UNIVERSIDAD DEL VALLE

AGROECOLOGICAL CAUSES OF THE MASS DEATH OF PEACH PALM (*Bactris gasipaes*, ARECACEAE) IN COLOMBIA

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DOCTORADO EN CIENCIAS-BIOLOGÍA

FACULTAD DE CIENCIAS NATURALES Y EXACTAS

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ACEPTATION NOTE

Degree thesis “Agroecological causes of the mass death of peach palm (*Bactris gasipaes*, Arecaceae) in Colombia”, presented by the student AYMER ANDRÉS VÁSQUEZ ORDÓÑEZ, to qualify for the title of Doctor of Biological Sciences, was reviewed by the jury and qualified as:

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“It is interesting to contemplate an entangled bank, clothed with many plants of many kinds, with birds singing on the bushes, with various insects flitting about, and with worms crawling through the damp earth, and to reflect that these elaborately constructed forms, so different from each other, and dependent on each other in so complex a manner, have all been produced by laws acting around us.”

(Charles Robert Darwin, 1859)

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GENERAL ABSTRACT

New crop-pest interactions constitute excellent opportunities to understand the origins and mechanism of plant-pest relationships. The recent, unexplained mass deaths of the south American peach palm (*Bactris gasipaes*) in Colombian tropical agro-ecosystems enabled us to explore the ecological and evolutionary drivers of these peach palm - stem borer weevil interactions. For this, the insects and their damage were examined in 4098 peach palms from 36 fields in the Amazon, Andes, and Pacific regions in Colombia. The taxonomic identification required a morphological description of the larvae and molecular taxonomy with COI gene of the *Dynamis* and *Rhynchophorus* genera. Of 419 weevils collected in 87 damaged peach palms, 51 were *D. borassi* and 368 *R. palmarum*. *D. borassi* was determined as the primary pest attacking unopened inflorescences and tunnelling the petiole towards the stem, facilitating subsequent damage by *R. palmarum*. In 32 fields the infestation levels were evaluated with a variable area transects. The visible damage oscillated between 0 to 70% of palms affected and was highest on the Pacific coast. Also, new reports of damage were confirmed at the southern Pacific coast, the Andes, and the Amazon region. The infestation levels were related to 109 agro-ecological variables in all crops (e.g., type of management, surrounding forest cover, soil nutrients, climate, etc.). Weevil infestation was related to landscape variables in the three regions, particularly the density and shape of non-forest cover, which are indicators of forest fragmentation. The data support the idea that deforestation and decreasing resources (inflorescences of native palms like *O. bataua*) for *D. borassi* pushed its populations to increasingly infest peach palm inflorescences, therefore initiating the damage that finally caused the massive deaths. It was measured 17 body parts of 23 *D. borassi* adults from peach palm (22) and its natural host palm *Oenocarpus bataua* (1), and 107 *R. palmarum* from peach palm (43), sugarcane (59; a new host in Colombia), and *Bismarkia nobilis* (5). The 21 *D. borassi* from peach palm and 59 *R. palmarum* from sugarcane were smaller in comparison than the specimens from natural host plants. The COI gene sequences of eight samples of *R. palmarum* from sugarcane were genetically different from 149 sequences (9 from peach palm of this study and 138 from Brazil and two from Costa Rica of the

GenBank and Bold database). This research opens new questions on the role of alternative host palm species and their interaction with landscape variables in the origin of peach palm's new pests.

Key words: pest; ecology; insect-plant interaction; taxonomy; phytosanitary diagnostic; landscape ecology; alternative host.

RESUMEN GENERAL

Las nuevas interacciones entre cultivos y plagas son una oportunidad para entender el origen y mecanismos de la relación planta-plaga. La reciente e inexplicable muerte masiva de palmas de chontaduro (*Bactris gasipaes*) en agroecosistemas tropicales colombianos permite explorar las fuerzas ecológicas y evolutivas de la interacción de esta palma y sus picudos barrenadores del tallo. Para esto, los insectos y sus daños fueron examinados en 4098 palmas de chontaduro procedentes de 36 cultivos en las regiones de la Amazonia, Andes y Pacífico en Colombia. La identificación taxonómica de estas plagas requirió una descripción morfológica de las larvas y taxonomía molecular con el gen COI de los géneros *Dynamis* y *Rhynchophorus*. De los 419 picudos recolectados en 87 palmas de chontaduro dañadas, 51 fueron *D. borassi* y 368 *R. palmarum*. *D. borassi* fue la plaga inicial al atacar las inflorescencias sin abrir de la palma y barrenar el peciolo hacía el tallo, lo cual facilita el daño posterior de *R. palmarum*. En 32 de los cultivos se determine el nivel de infestación con un transecto de área variable. Los daños visibles estuvieron entre 0 a 70% de las palmas afectadas y estuvo más alto en la costa pacífica. Se realizaron nuevos reportes en el sur de la costa pacífica, los Andes y la Amazonía. Los niveles de infestación fueron relacionados con 109 variables agroecológicas en todos estos cultivos (ej., tipo de manejo, cobertura de bosque circundante, nutrientes del suelo, clima, etc.). La infestación de los picudos se relacionó con variables de paisaje en las tres regiones, particularmente con la densidad y forma de la cobertura no bosque, el cual es un indicador de la fragmentación del bosque. Los datos soportan la idea que la deforestación y el decrecimiento de recursos (inflorescencias de la palma natural como *O. bataua*) ocasiona que las poblaciones de *D. borassi* incremente la infestación de inflorescencias de palmas de chontaduro, la cual inicia el daño y causa finalmente su muerte masiva. Se midieron 17 partes del cuerpo de 23 adultos de *D. borassi* de palmas de chontaduro (22) y su palma hospedero nativa *Oenocarpus bataua* (1), y 107 *R. palmarum* de palmas de chontaduro (43), caña de azúcar (59) y la palma *Bismarkia nobilis* (5). La caña de azúcar es un nuevo hospedero en Colombia. Los 21 *D. borassi* de la palma de chontaduro y 59 de *R. palmarum* de caña de azúcar

fueron más pequeños que aquellos de las plantas hospederas nativas. Las secuencias del gen COI de ocho muestras de *R. palmarum* de caña de azúcar fueron genéticamente diferentes de 149 secuencias (9 de ellas de palmas de chontaduro de este estudio y 138 de Brasil y dos de Costa Rica, procedentes de las bases de datos de GenBank y Bold). Esta investigación genera nuevas preguntas sobre el rol de las especies de palmas hospederas alternativas y su interacción con el paisaje en el origen de una nueva plaga de chontaduro.

Palabras claves: plagas; ecología; interacción insecto-planta; taxonomía; diagnóstico fitosanitario; ecología de paisaje; hospederos alternativos.

INTRODUCCIÓN GENERAL

Las interacciones entre insectos y plantas se han documentado desde el período devónico (Labandeira, 2013). Este proceso es considerado como el mayor promotor de la diversificación de ambos grupos taxonómicos (Labandeira, 2002). Por lo general, dicho proceso inicia con la colonización de una nueva planta hospedera por parte de los insectos, lo cual puede ser afectada por múltiples factores, entre los que se destacan condiciones ambientales y la modificación del desarrollo del insecto (Forister y Wilson, 2013). En el caso ambiental se ha sugerido que las condiciones de microclima pueden afectar directamente en la fisiología de los organismos en interacción o la presencia de potenciales depredadores del insecto (Forister y Wilson, 2013), mientras que el desarrollo puede modificarse según las características químicas y físicas de la planta (Vanbergen et al., 2003). Existen pocos trabajos que evalúen estas dos variables al tiempo en una nueva asociación planta-insecto. Los estudios ambientales enfatizan sobre el efecto de estos en eventos invasivos (Tuda et al., 2009) o evalúan su relevancia en la diferenciación de comunidades de herbívoros (Weiblen et al., 2006; Rodríguez-Castañeda et al., 2010). Mientras que a nivel de desarrollo se han evaluado cambios del tamaño de los adultos en nuevos hospederos, principalmente en zonas templadas y en estudios experimentales de laboratorio (Vanbergen et al., 2003; Messina, 2004).

La reciente muerte masiva de palmas cultivadas de chontaduro (*Bactris gasipaes*) en Colombia ofrece una oportunidad para evaluar dichos factores en condiciones de campo en un ambiente tropical. Este daño es atribuido a los picudos *Rhynchophorus palmarum* y *Dynamis borassi* (Pardo Locarno et al., 2016). Ambos picudos han estado asociados con los tallos de esta palma desde 1996, sin consecuencias económicas (Pardo Locarno et al., 2005). Solo hasta 2010 empezaron los reportes de las muertes masivas de las palmas de chontaduro en Colombia (El Tiempo 2010, Pardo-Locardo et al. 2016) pero desconociendo cuál es el rol de cada una de estas especies en dicho daño. Estudios previos demuestran que, en otras palmas, *D. borassi* ataca inflorescencias sin abrir (Bautista-Giraldo et al., 2020) y, ocasionalmente, alcanza el tallo (Couturier et al., 2000; Pardo Locarno

et al., 2005; Beserra et al., 2006), mientras que *R. palmarum* se asocia a sitios con daño y que han empezado a descomponerse en las palmas (Alpizar et al., 2002). Solo existe un registro en un cultivo experimental de *Oenocarpus mapora* de que *D. borassi* inicia el daño en la inflorescencia y posteriormente pasa al tallo (Couturier et al., 2000). Se desconoce si este comportamiento se repite en las palmas de chontaduro.

La comprobación del rol de *D. borassi* y *R. palmarum* en las recientes muertes masivas de palmas de chontaduro requiere profundizar en la taxonomía de sus estadios larvales. Estos ocasionan los daños en inflorescencias y tallos (Couturier et al., 2000; Alpizar et al., 2002; Pardo Locarno et al., 2005; Beserra et al., 2006). Sin embargo, las claves taxonómicas y descripciones morfológicas disponibles presentan problemas en los términos anatómicos utilizados (Wattanapongsiri, 1966), lo cual causa dificultad en la identificación. Es necesario estandarizar estos términos para establecer cómo se relacionan estos picudos con el daño de la palma de chontaduro. Una alternativa que facilitaría dicho diagnóstico es la utilización de métodos moleculares, los cuales han demostrado ser eficientes en cualquier estadio de desarrollo (Fleck et al., 2006). Entre estos marcadores destaca el gen COI (Pentinsaari et al., 2016), el cual permite la identificación taxonómica de animales según la disponibilidad y calidad taxonómica de la base de datos de referencia (Lautredou et al., 2010). En la actualidad, se cuenta con las secuencias para todas las especies de *Rhynchophorus* (Ratnasingham & Hebert, 2007; Sayers, 2019) y cinco secuencias para dos de las tres especies de *Dynamis*. Es necesario aumentar el número de secuencias del gen COI para estos dos géneros, de tal forma que se genere un método robusto para identificar molecularmente sus especies.

Por otro lado, se desconoce la magnitud del daño que estos picudos ocasionan sobre los cultivos de chontaduro en todo Colombia, productor importante de este cultivo (Graefe et al., 2013). Los primeros reportes de las muertes masivas se registraron en el norte del Pacífico, posteriormente, el problema se extendió al centro de dicha región (El Tiempo, 2010, 2015; La Patria, 2012; Instituto Colombiano Agropecuario-ICA, 2015; Pardo-Locarno et al., 2016) y se desconoce si se ha

extendido a zonas productivas de la Amazonía y de los Andes colombianos. La mayoría de estos registros son anecdóticos y carecen de respaldo científico.

El conocimiento sobre el grado de infestación de los palmares de chontaduro posibilitaría un análisis ecológico que relacione dichos niveles con variables ambientales explicativas. Este cultivo se encuentra en tres regiones naturales de Colombia muy contrastantes en prácticas agronómicas, paisaje y climáticas (Rangel-CH, 2015). En la actualidad, los estudios ecológicos sobre picudos de las palmas se han concentrado en un solo tipo de variable. Por una parte, en el Medio Oriente se estableció que los ataques de *R. ferrugineus* a palmas datileras estaban relacionadas con las prácticas agrícolas de irrigación, distancia de siembra y características de las palmas cultivadas (i.e. número de troncos por cepa, altura, edad y variedad) (Azam et al., 2000; Sallam et al., 2012). Mientras que en Uganda la infestación de *R. phoenicis* a cultivos de palmas aceiteras (*Elaeis guineensis*) covarió con la temporada de sequía y cercanía de la vegetación natural (Baguma et al., 2019). Nunca se ha evaluado el nivel de contribución de estas diferentes variables en conjunto sobre la infestación de estos picudos, a pesar de que se ha comprobado su relevancia para entender los ataques de insectos plagas y plantear manejos de los cultivos desde un punto de vista ecológico (Parsa et al., 2012).

Finalmente, la colonización de la palma de chontaduro por parte de *D. borassi* también permite evaluar las consecuencias que tiene dicho evento en características morfológicas de este picudo. Se ha descubierto que la polilla *Operophtera brumata* disminuye su tamaño al colonizar la planta *Picea sitchensis* como consecuencia probable de una menor calidad nutricional del huésped (Vanbergen et al. 2003). De igual forma, en experimentos de selección se ha corroborado que el escarabajo *Callosobruchus maculatus* expuesto a un nuevo hospedero de la fabácea *Vigna unguiculata* disminuyó su tamaño corporal ocasionado posiblemente por eventos de competencia con sus conespecíficos y disminución de oxígeno en la nueva semilla (Messina 2004). Se ha establecido que *D. borassi* utiliza palmas naturales en sitios cercanos a los cultivos de chontaduro, tal como *Oe. bataua* (Bautista-Giraldo et al. 2020). La comparación de los

escarabajos procedentes de palmas naturales y cultivadas permitiría determinar qué cambios se presentan como consecuencia de este nuevo evento de colonización. En la misma región geográfica *R. palmarum*, asociado también a las palmas de chontaduro, también ha mostrado invasiones recientes a la caña de azúcar (Löhr et al. 2015). El examen de potenciales cambios morfológicos en este escarabajo permitiría establecer si dicho patrón se repite en otra especie de picudos de palmas, lo cual contribuiría a entender su gran capacidad para colonizar muchas especies de palmas en diferentes regiones geográficas.

Por consiguiente, este trabajo se planteó responder a las siguientes tres preguntas e hipótesis de investigación. Primero, ¿cómo se sucede la asociación entre *D. borassi*, *R. palmarum* y la palma de chontaduro? Se considera que *D. borassi* es la especie que inicia el daño en la inflorescencia, desde donde se mueve al tallo. Este paso genera un daño que atrae a *R. palmarum* al tallo, lo cual aumenta el efecto sobre la palma. Segundo, ¿qué factores ambientales están relacionados con los niveles de infestación de los cultivos de palmas de chontaduro generados por *D. borassi* y *R. palmarum*? Es muy probable que la deforestación en las zonas aledañas al cultivo sea el factor explicativo más importante, debido a la dependencia de *D. borassi* por las palmas nativas que cambian su densidad de acuerdo a las características de los bosques y zonas en regeneración. Tercero, ¿qué cambios morfológicos se están presentando en los picudos *D. borassi* que colonizaron las palmas de chontaduro? Se plantea que el tamaño de *D. borassi* disminuya porque el comportamiento mostrado hasta el momento por este picudo en chontaduro sugiere que no encuentra suficiente recurso alimenticio en la inflorescencia del chontaduro.

Chapter 1. Description of a new interaction between peach palm (*Bactris gasipaes*) and stem borer weevils (*Dynamis borassi* and *Rhynchophorus palmarum*)

Final undergraduate student project:

1. García-Chamizo, C. M. 2021. Hyperspectral analysis in peach palm (*Bactris gasipaes*) infested by *Rhynchophorus palmarum* and *Dynamis borassi* pests. Academic program of topographic engineering. School of Civil and Geomatric Engineering. Universidad del Valle. Advisor: F.L. Hernández Torres. Co-advisor: **A.A. VÁSQUEZ-ORDÓÑEZ** (The results of this project was presented in XLVI Congress of Entomological Society of Colombia-Socolen; Appendix 1).

Publications:

2. Gaviria, J., Montoya-Lerma, J., Armbrecht, Löhr, B. L., **VÁSQUEZ-ORDÓÑEZ, A. A.** *Dynamis borassi* (Coleoptera: Dryophthoridae) a new potential pest to the palms (Arecales: Arecaceae): an early warning for the palm producers. Florida Entomologist 104 (2), 107-116 (Appendix 2).

1. VÁSQUEZ-ORDÓÑEZ, A. A., Löhr, B. L., Marvaldi, A. E. 2020. Comparative morphology of the larvae of the palm weevils *Dynamis borassi* (Fabricius) and *Rhynchophorus palmarum* (Linnaeus) (Curculionidae: Dryophthorinae): Two major pests of peach palms in the Neotropics. Papéis Avulsos De Zoologia, e202060-sI (Appendix 3).

Events:

6. VÁSQUEZ-ORDÓÑEZ, A. A., Torres, W., Monmany-Garzia, A. C. 2021 (Presentation). Importance of landscape in pest-palm dynamics in a tropical agroecosystem. XXIX Reunión Argentina de Ecología. August 4-6 (accepted). Instituto de Ecología Regional (IER – CONICET – UNT) and the Asociación Argentina de Ecología (AsAE) (Appendix 4).

5. VÁSQUEZ-ORDÓÑEZ, A. A., Armbrecht, I., Montoya-Lerma, J., Torres, W., Monmany-Garzia, A. C, Löhr, B. L. 2021 (Video-poster). Ecological and evolutionary explanations for a new interaction between stem borer weevils (*Dynamis borassi* and *Rhynchophorus palmarum*) and peach palm (*Bactris gasipae*s) in a tropical agroecosystem. Virtual Meeting of the Association for Tropical Biology and Conservation (ATBC). July 21-23. ATBC (Appendix 5).

4. VÁSQUEZ-ORDÓÑEZ, A. A. 2021 (Presentation). Ecological and evolutionary explanations for a new interaction between stem borer weevils and peach palm (*Bactris gasipaes*). Seminario Internacional Intercambio Científico 2020-2021. June 02. Universidad del Quindío, Universidad Técnica de Cotopaxi y Universidad Regional Amazónica; Colombia and Ecuador (Appendix 6).

3. VÁSQUEZ-ORDÓÑEZ, A. A., Marin, D. V., Urcuqui, D., Löhr, B. L., Becerra Lopez-Lavalle, L. A. 2021 (Presentation). Molecular taxonomy of palm weevils *Rhynchophorus* and *Dynamis* (Coleoptera: Curculionidae: Dryophthorinae), and their geographical variation in morphology and genetics. Encontro de Coleoptera. March 15-19. Coleopterist Society, Brazil. (Appendix 7).

2. VÁSQUEZ-ORDÓÑEZ, A. A. 2019 (Presentation). Massive death of Peach Palm (*Bactris gasipaes*, Arecaceae) in Colombia: diagnostic and possible causes. Fourth Tropical Agroforestry Seminar and First International. August 22, 2019. Universidad del Valle, Palmira, Colombia (Appendix 8).

1. VÁSQUEZ-ORDÓÑEZ, A. A., Montoya Lerma, J., Armbrecht, I., Löhr, B. L. 2019 (Presentation). The weevil *Dynamis borassi* (Coleoptera: Dryophthoridae), the causal agent of the death of Peach Palm (Bactris gasipaes, Arecales:

Arecaceae) in Colombia. XLVI Congress of Entomological Society of Colombia-Socolen. July 17-19. Medellín, Colombia (Appendix 9).

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1. Student Fellowships: registration-waiver grants. 2021. Annual Virtual Meeting, Association for Tropical Biology and Conservation (Appendix 10).

Abstract

Emergent and potentially invasive weevils are a permanent threat to the survival of palm plantations. Hence, understanding the role of emergent pests may be key for preventing future phytosanitary emergencies. In the present study the role and the taxonomic confirmation of *Dynamis borassi* and *Rhynchophorus palmarum* (both Coleoptera: Curculionidae) as main causative agents of the peach palm (*Bactris gasipaes* Kunth; Arecaceae) crown toppling problem were investigated. The damage was described in four steps from observations on 4098 palms of 36 fields in the principal production areas of Colombia: a hole in different parts of unopened inflorescences; holes about 2 cm in diameter in the upper part of the palm near the crown at the point of attachment of the inflorescence to the stem; large longitudinal galleries inside the stem in the upper and middle parts of the palm and tilted or completely toppled palm crown. Visible damage oscillated between 0 to 70% of palms affected and was highest on the Pacific coast. New reports of damage were confirmed at the southern Pacific coast, from the Andes, and the Amazon region. From 87 damaged and dissected peach palms in 14 fields from all regions 399 weevils were collected. The identification of larvae was difficult because of problems with taxonomic keys and descriptions. Complementary diagnostic characters for species separation were developed with morphological and barcoding approach. The morphological description was developed from 23 individuals, 12 *D. borassi* and 11 *R. palmarum*, the epipharynx and maxillae were found to have important diagnostic character. The COI analysis was performed on one individual of *D. borassi* and seven of *R. palmarum* and compared to 979 COI sequences of two species of *Dynamis* and six of *Rhynchophorus* from GeneBank and Bold databases, respectively. The phylogeny of the COI gene and their intra and inter specific genetic distance confirmed the separation of these species and identification of peach palm samples. With this result it was possible to separate 321 larvae from peach palm as *D. borassi* (30) and *R. palmarum* (291). The *D. borassi* larvae were found exclusively in the inflorescences, suggesting that it initiates the damage, while adults of *D. borassi* and all stages of *R. palmarum* were

recovered from stem damage. The data strongly confirm the central role of *D. borassi* in peach palm damage.

Key words: Taxonomy, *Dynamis borassi*, *Rhynchophorus palmarum*, Dryophtorinae, morphology, molecular biology, infestation.

Resumen

Los picudos emergentes y potencialmente invasivos son un riesgo permanente para la supervivencia de plantaciones de palmas. El entendimiento del rol de una plaga emergente puede ser clave para prevenir futuros problemas fitosanitarios. En este estudio se confirma taxonómicamente a *Dynamis borassi* y *Rhynchophorus palmarum* (ambos Coleoptera: Curculionidae) como los agentes causales del problema de la caída de la corona de la palma de chontaduro (*Bactris gasipaes* Kunth; Arecaceae). Este daño fue descrito en cuatro etapas, mediante la observación de 4098 palmas de 36 cultivos en las principales áreas de producción de Colombia: un agujero en diferentes partes de la inflorescencia sin abrir; agujeros de aproximadamente 2 cm de diámetro en la parte alta de la palma cerca de la corona, en el punto de unión de la inflorescencia al tallo; galerías longitudinales alargadas dentro del tallo en las partes superiores y medias de las palmas; caída complete de la corona de la palma. El daño visible se presentó entre 0 a 70%, con la costa Pacífica como la zona más afectada. Se realizaron nuevos reportes de daño en el sur de la costa Pacífica, Andes y Amazonas. Se recolectaron 399 picudos procedentes de 87 palmas con daño disectadas en 14 cultivos. La identificación de la larva fue difícil por problemas en las claves taxonómicas y descripciones. Por lo tanto, se realizó una revisión morfológica y código barras para las especies de picudos. La descripción morfológica se realizó en 23 individuos, 12 *D. borassi* y 11 *R. palmarum*, con los caracteres diagnósticos más importantes en la epifaringe y maxila. El análisis de COI se realizó en un individuo de *D. borassi* y siete de *R. palmarum*, los cuales fueron comparados con 979 COI secuencias de dos especies de *Dynamis* y seis de *R. palmarum*, procedentes de las bases de datos de GenBank y Bold. La filogenia del gen COI y la distancia genética intra e interespecífica confirmaron la separación de estas especies e identificación de las muestras de las palmas de chontaduro. Con estos resultados, se identificaron 321 larvas de chontaduro como *D. borassi* (30) y *R. palmarum* (291). Las larvas de *D. borassi* se encontraron exclusivamente en las inflorescencias, sugiriendo que inicia el daño, mientras que los adultos de *D. borassi* y todos los estados de *R. palmarum* se obtuvieron de los daños del tallo.

Los datos confirmaron el papel principal de *D. borassi* en el daño de la palma de chontaduro.

Palabras claves: Taxonomía, *Dynamis borassi*, *Rhynchophorus palmarum*, Dryophtorinae, morfología, biología molecular, infestación.

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Introduction

Palms represent one of the largest families of commercially important plants of the tropics and subtropics. Species such as coconut (*Cocos nucifera* Linnaeus), African oil palm (*Elaeis guineensis* Jacquin), and date palm (*Phoenix dactylifera* Linnaeus) are widely cultured (Howard et al., 2001). Other palm species of regional or local importance have a great potential for development due to their food and ornamental products. One of these palms is the peach palm, *Bactris gasipaes* Kunth, used by indigenous and Afro-American populations in the humid tropical lowlands of the Amazon and the Pacific coast for subsistence and local commerce (Graefe et al., 2013; Mora-Urpí et al., 1997). It has been pointed out that this crop can be commercialized internationally, which could benefit developing countries (Graefe et al., 2013).

However, over the last decades, an increasing number of serious pests have been threatening palm production and international commerce. Two examples where exotic palm pest have become serious economic problems are the red palm weevil, *Rhynchophorus ferrugineus* Fabricius (Coleoptera: Curculionidae) and the red coconut mite, *Raoiella indica* Hirst (Acari: Tenuipalpidae), both of which have shown the ability to adapt to new host species and produce heavy damage (Faleiro et al., 2016). Early alert on such potential serious invasive pests constitutes invaluable information to prevent their spread and/or limit the damage to other palm cultures (Howard et al., 2001).

The peach palm is affected by few but severe phytosanitary problems in the Pacific coast of Colombia, the most productive region (Agronet, 2019). The first problem, the weevil *Palmelampius heinrichi* O'Brien and Kovarik (Coleoptera: Curculionidae) (Clement et al., 2004), causes losses of up to 100% of the fruits in specific locations. The second problem corresponds to mass death of peach palm caused by the toppling of the crown, which has destroyed about a million palms (B. Löhr, Unpublished data) and a reduction of 75% in peach palm production during the last ten years in Colombia (Agronet, 2019). This type of damage has only been reported in one coconut palm occasioned by a stem borer (Dean, 1979). On the

other hand, there are other peach palm production regions in Colombia besides the Pacific, located in the Andes and Amazon (Agronet, 2019). Information about the infestation level in the Pacific is scanty and the presence of the problem in the Andes and Amazon areas is unknown.

Rhynchophorus palmarum Linnaeus (Coleoptera: Curculionidae) and *Dynamis borassi* Fabricius (Coleoptera: Curculionidae) have been linked to the mass death of peach palm. The first was recorded by Colombian government (Instituto Colombiano Agropecuario-ICA, 2015), the second by Pardo-Locarno et al. (2016). Both species are natives of the American continent, *R. palmarum* is found in the subtropics and tropics, while *D. borassi* is an entirely tropical species (Wattanapongsiri 1966). In addition, *R. palmarum* oviposits on wounds or soft parts of ten species of palms and in sugar cane (Löhr et al., 2015; Milosavljević et al., 2019), whereas *D. borassi* oviposits in unopened inflorescences of nine palm species (Couturier et al., 1998; Bautista-Giraldo et., 2020). Finally, *R. palmarum* only develops on the stem (Milosavljević et al., 2019) and *D. borassi* in inflorescence and stem (Beserra et al., 2006). Each species has its own attack strategy, producing different sequences in the damage, which has not been described on the peach palm.

The separation of both species requires the study of small structures in adults and larvae (Wattananpongsiri, 1966; Giblin-Davis et al., 2013; Chamorro, 2019). The correct identification of the larva is crucial, as only larvae cause the damage. However, the morphological descriptions of this stage differ in the terminology used and problems often arise when doing the identifications (Cotton, 1924; Anderson, 1948; Wattanapongsiri, 1966; Chamorro, 2019.) Furthermore, details of body chaetotaxy and other taxonomic characters, widely documented in other weevils, are missing or poorly documented. A complementary approach is the molecular taxonomy, with the COI gene as the main resource in insects (Albo et al., 2019). For an adequate functioning of this method, a reference database with a high level of taxonomic verification is needed (Collins and Cruickshank, 2013). In this case, both genera have COI sequences in almost all species recognized by recent

taxonomic review (Wibmer and O'Brien, 1986). Additionally, with this gene all *Rhynchophorus* species have been very well separated (Rugman-Jones et al., 2013; Löhr et al., 2015) in contrast to other nuclear genes (Chamorro et al., 2021) with a phylogenetic approach.

Therefore, the purpose of this study is to perform a phytosanitary diagnostic of the mass death of peach palm in Colombia, which includes the description of infestation level, different stages of damage, and the weevils associated with each one. For the insect identification, a complete revision of larval morphology and molecular taxonomy was undertaken.

Material and methods

Ethical considerations

The Ministry of the Interior in Colombia confirmed that a priori consultation of communities for developing the present investigation was not necessary. The ethical committee of the Universidad del Valle gave the endorsement for studies with flora and fauna.

Study sites

A total of 37 peach palm production sites in the Amazon, Andes, and Pacific regions of Colombia (Figure 1, Supplementary material Table S1) were examined. These regions are slightly different in altitude, topography, and climate and it is not our aim to compare them. The Amazon and Pacific regions are at low altitude and of variable topography, but present high levels of precipitation and temperature compared to the Andes (Rangel-CH 2015). In all areas, the peach palms were planted in small agroforestry plots of relatively low maintenance (low or no external inputs) and associated with other crops, such as plantain, *Musa* x *paradisiaca* Linnaeus (Musaceae), coffee, *Coffea arabica* Linnaeus (Rubiaceae), and cocoa, *Theobroma cacao* Linnaeus (Malvaeae).

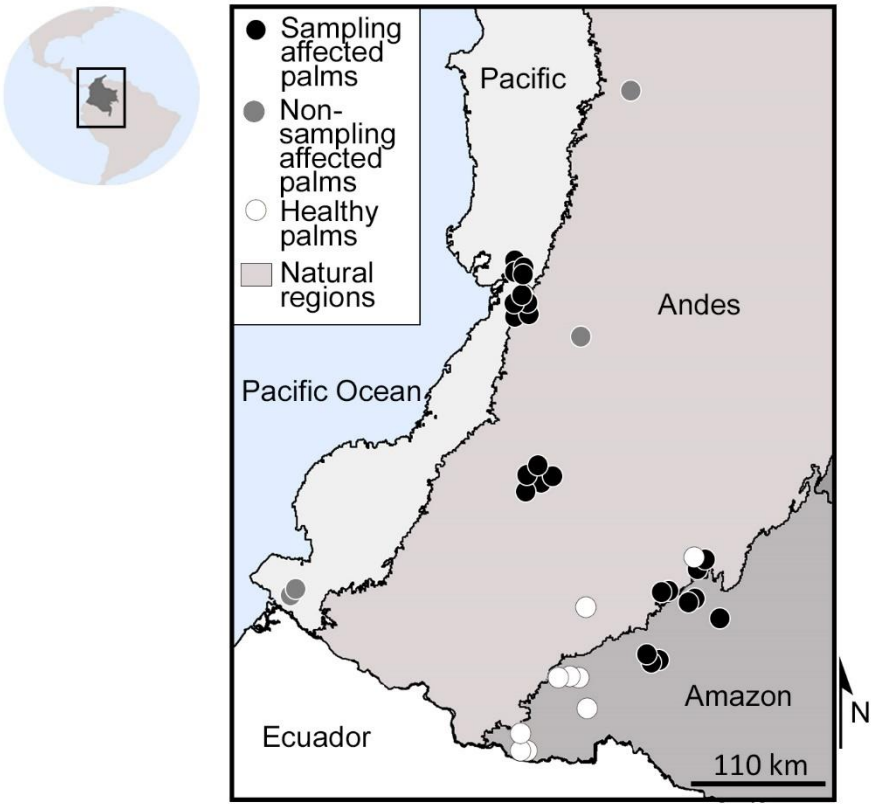


Figure 1. Geographical location of the 36 peach palm production sites (circles) visited during the surveys for palm weevil damage.

Description of damage and infestation levels

A visual evaluation was performed on all palms of the 37 production sites. In this case, other damage or signs associated with the fall of the crown were recorded. The damage survey was carried out in two stages. The first was a non-systematic survey in three production and one experimental field sites during November 2017 and 2019, as well as June 2021 (Figure 1). In these surveys more than half of all palms were inspected. The second was standardized, a variable area transect (Sheil et al., 2002) of maximum 80 m in length during March 2018 to July 2018 and December 2018 to February 2019. A central transect was demarcated and four rectangles 20 m wide (perpendicular to the transect) were marked along both sides

of this transect. The length of each rectangle was determined by measuring the distance from the central line to the sixth palm with signs of damage. When six damaged palms were not found, the search was stopped at 50 m (Figure 2). The damage in the palms of each transect was documented. In both surveys, palms with damage were cut down and dissected for a detailed description. In the case of the standardized transect, for each type of damage a maximum of six palms per site were randomly selected. Finally, in each rectangle the healthy and infested palms were counted, and the proportion of affected palms was calculated.

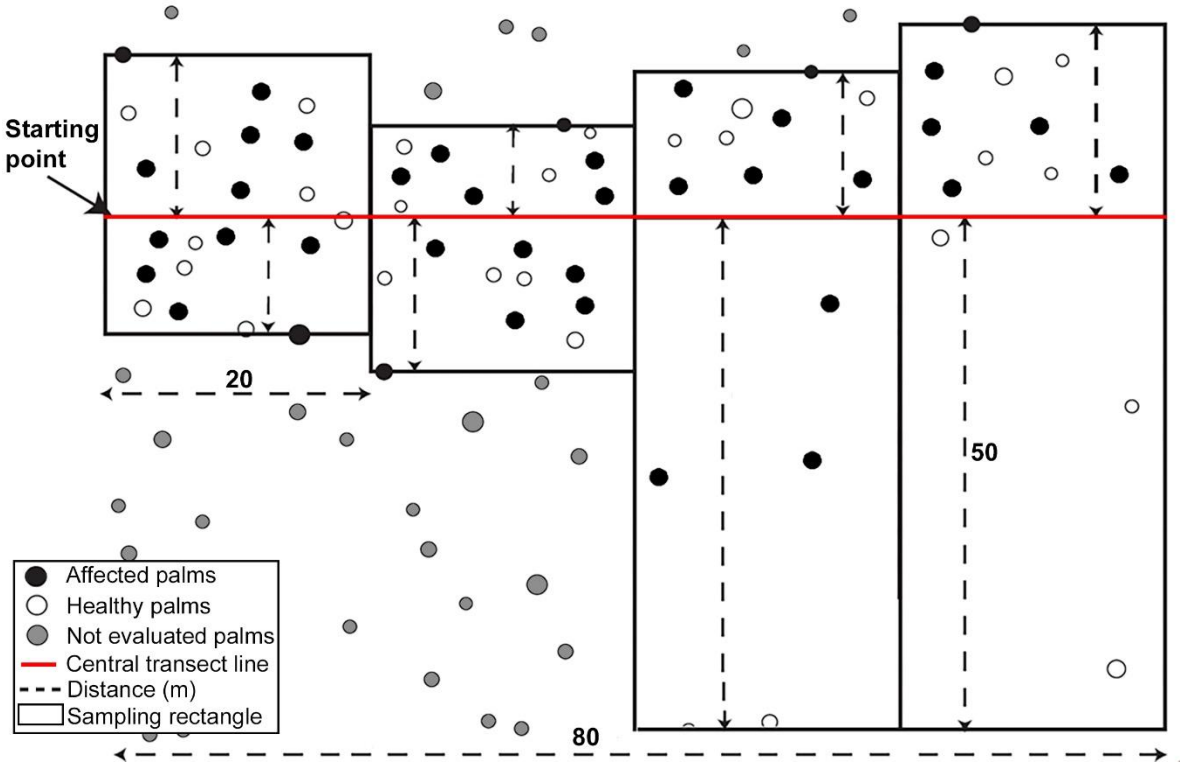


Figure 2. Variable area transects used in the evaluation of the Peach Palm infestation by *Dynamis borassi* and *Rhynchophorus palmarum* in 33 production sites in Colombia. The size of each sampling rectangle is determined by the number of the affected palms, as it is being illustrated.

Morphological and molecular taxonomy of the weevils associated with peach palm damage.

Morphological taxonomy

Larvae, pupae, and adult weevils associated with peach palm damage were obtained from the dissected palms used to describe the damage. Additional weevils were captured with pheromone traps in the field (Supplementary material S2). A part of the collected larvae was boiled in water for 5 minutes (Stehr, 1987), while the rest of the larvae and adults were preserved in 96% ethanol. Meanwhile, the pupae were kept in boxes until adults emerged, which were then stored in 96% ethanol.).

For the morphological identification, 118 adults collected were determined to species level following the keys and descriptions of Wattanapongsiri (1966) and Giblin-Davis et al. (2013), while for the larvae; a comparative morphological study was developed (Supplementary material Table S3). Eleven specimens of *R. palmarum* and twelve *D. borassi* were used for that purpose. In the case of *R. palmarum*, the mature larva was collected inside the stem of a peach palm at Pueblo Rico, Santa Cecilia (05°20′10.72″N, 76°08′23.06″W), on November 28, 2017. Additionally, one first instar, four submature and five mature larvae were reared from adults collected in pheromone traps at Palmira Research Center of the Colombian Corporation of Agricultural Research (AGROSAVIA), Valle del Cauca, Colombia (03°30′50.07″N, 76°18′56.88″W). For *D. borassi*, five mature and four submature larvae were collected at Tadó, Chocó (05°17′08.82″N, 76°29′16.34″W) on March 2016. In addition, two first instar and one second instar larvae were reared from females collected at Sabaletas and Bajo Calima, Buenaventura, Valle del Cauca (03°59′00.05″N, 76°58′49.77″W; 03°45′47.69″N, 76°57′49.69″W, respectively) in September 2017. The larvae were reared on artificial diet following the protocol described by Löhr (2016), in the entomology laboratory of AGROSAVIA. Subsequently, the larvae were dissected and prepared on microscopic slides as in May (1994) and Marvaldi (1999). The terminology followed for body parts and setae of the larva of Curculionidae is explained in Marvaldi

(1999), May (1994), and Oberprieler et al. (2014). Finally, the morphological description was compared with taxonomic keys of Wattanapongsiri (1966) and Chamorro (2019). The rest of the 311 field-collected larvae were identified applying the characters described in the taxonomic review (Vásquez-Ordóñez et al., 2020).

The observations, measurements, photographs, and illustrations for the morphological studies were accomplished using the following equipment: Canon EOS 6D Mk ii camera with EF100 mm f/2.8 lens associated with a light box; Nikon DS-Ri1 U3 and JVC KY-F75U cameras, associated with a Nikon SMZ-1500 and a Leica MZ16f stereo microscopes, respectively. Finally, the larval structural characters were documented and illustrated with a Leitz Laborlux S compound microscope and a Nikon SMZ800 stereomicroscope, using their attached drawing tubes.

Molecular taxonomy

The genome was extracted of 164 weevil adults and larvae of *D. borassi* (47) and *R. palmarum* (117), using a using a modified cetyltrimethylammonium bromide method (CTAB, Doyle and Doyle, 1990). For the adults, the hind and middle legs on the right-hand side were used, while for the larvae, samples were taken from a portion of the thorax and abdomen. The modifications of CTAB method were: 1) inclusion of proteinase K prior to the addition of the extraction buffer; 2) addition of metabisulfite to extraction buffer and 25 M potassium acetate (pH 55) with 20 min in -4°C; 3) one hour in water bath of extraction buffer; 4) substitution of chloroform for phenol-chloroform. Subsequently, the DNAs extracted of one individual of *D. borassi* and seven of *R. palmarum* were amplified of their subunit I – COI. The PCR reactions including: 1) universal DNA primers LCO LCO1490 (5′-GGTCAACAAATCATAAAGATATTGG-3′) and HCO2198 (5′-TAAACTTCAGGGTGACCAAAAAATCA-3′) (Folmer et al., 1994); 2) 12 µL volume using 0.25 U of Platinum® Taq (Invitrogen® Carlsbad, CA); 3) 1× PCR Buffer (buffer composition); 4) 2.5 mM of each dNTP (Promega Corp. Madison, WI); 5) 2.5 mM MgCl2; 6) 20 ng of DNA. The PCR condition was five cycles (40 sec at 94°C, 40 sec at 45°C, and 60 sec at 72°C) followed by 35 cycles (40 sec at 94°C,

40 sec at 51°C, and 60 sec at 72°C) with a final extension period of 72°C for 10 min, using a Mastercycler® pro (Eppendorf, Hamburg, Germany) (Ovalle et al. 2014). Posteriorly, the amplified COI regions were cloned into the PGEM®-T Easy vector (Promega Corp.), purifying with SV minipreps preparation (Promega Corp.) (Ovalle et al., 2014). The vectors with their DNA insert were sequenced by Macrogen in both directions using vector primers SP6 and T7. The DNA-barcode sequences were edited with Geneious Prime v2019.1.1 (Biomatters Ltd., Auckland, NZ) to remove the vector and universal primer sequence (Supplementary material S2 of the Chapter 1).

In addition, 977 COI gene sequences were downloaded from the GeneBank (963) and Bold (6) database. These sequences corresponded to *D. borassi* (1), *D. peropacus* (4), *R. bilineatus* (15), *R. cruentatus* (3), *R. ferrugineus* (681), *R. palmarum* (151), *R. phoenicis* (2), and *R. vulneratus* (112) (Supplementary Material Table S6). Furthermore, eleven COI sequences from the sub-families Dryophthorynae, Cerambycinae, and Entiminae were also downloaded, which correspond to external groups (Löhr et al., 2015; Supplementary material Table S6). On the other hand, the unique haplotypes were determined with a 100% identity, the haplotype name for *R. ferrugineus* followed El-Mergawy et al. (2011) and Rugman-Jones et al. (2013), while for *R. palmarum* sequences reported by Silva (2016), new codes were proposed (Supplementary material Table S6). An alignment of the sequences and their DNA substitution model were developed with MUSCLE algorithm and Substitution Model function in MEGA v10 software (Kumar et al. 2018; Supplementary material Table S3 of the Chapter 1). The phylogenetic analysis was developed with Bayes and Maximum Likelihood (ML) considering the best DNA substitution model. The Bayes and ML inference were developed with three replicates in MrBayes 3.2.7 (Ronquist e al., 2012) in Cipres portal (Miller et al., 2010) and W-IQ-TREE (Trifinopoulous et al., 2016) software, respectively. The support values were calculated with 10’000.000 generations for Bayes and 1.000 bootstrap replications for ML. Finally, the intra and interspecific population genetic differentiation of the *Dynamis* and *Rhynchophorus* species examined were calculated with p-distance in MEGA (Tamura et al., 2007).

Results

Description of damages and infestations of peach palm in Colombia

Four degrees of damage were determined based on observations from 378 peach palms in Colombia (Table 1):

1. The presence of holes in the different parts of unopened inflorescences (but also the distal section) (Figure 3a).
2. Holes about two centimeters in diameter in the upper part of the palm, near the crown, at the point of attachment of the inflorescence to the stem (Figure 3a).
3. The presence of large longitudinal galleries inside the stem in the upper and middle parts of the palm, with elongated or irregular shapes (Figure 3b-c).
4. The presence of a tilted or completely toppled palm crown (Figure 3d).

These symptoms were detected in the Pacific, Andes, and Amazon geographical regions (Figure 1). All localities of the Pacific and Andes region presented affected palms, while for the Amazon, the majority were found in the north-eastern localities examined (Figure 1). The records on the Pacific date from 2017 to 2019, the Andes were visited between 2018 and 2021, and the Amazon exclusively in 2019 (Supplementary material Table S1). The infestation level was variable at all sites but always highest in the Pacific region followed by the Andes and Amazon (Fig. 3e, Table 1). Noteworthy, the highest damage level was predominant on the Pacific compared with the other two zones. However, damage level three was significantly higher in the Amazon area, and one and two were higher in the Andes (Table 1).

Table 1. Number of palms examined and affected by attack of *Dynamis borassi* and *Rhynchophorous palmarum* weevils in three Colombian regions. Damage was categorized according to the physical characteristics.

Region	**Number of palms examined**	**Number of palms affected (%)**	**Damage types (%)**			
			1	**2**	**3**	**4**
Andes	713	83 (11.6)	28 (33.7)	24 (28.9)	13 (15.7)	18 (21.7)
Amazon	2503	94 (3.8)	1 (1.1)	5 (5.3)	84 (89.4)	4 (4.3)
Pacific	882	201 (22.8)	4 (2.0)	15 (7.5)	130 (64.7)	52 (25.9)
Total	4098	378 (9.3)	33 (8.7)	44 (11.6)	227 (60.1)	74 (19.6

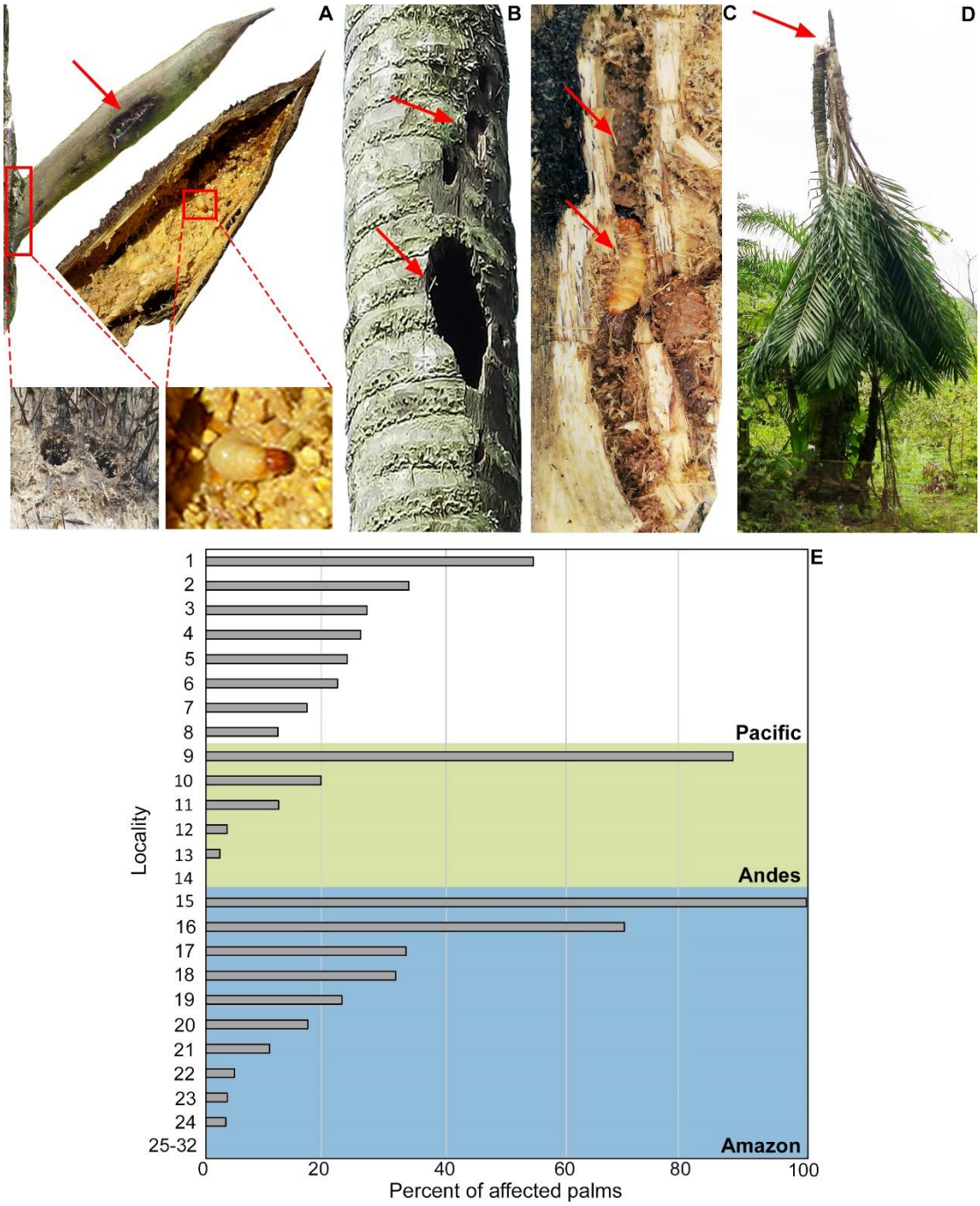


Figure 3. Types of damage (A-D) and percentage affected palms (E) of weevil-damaged peach palms in 32 localities of Colombia. Inflorescence with perforation (arrow), circular hole at the insertion points and weevil larva inside (squares) (A); external view of trunk perforated by larvae, with round perforation exactly at the spot where the inflorescence is attached to the stem (arrow) (B), and internal feeding galleries with larvae (arrow; C); toppled crown (D).

Morphological description and differentiation of the larvae of the subtribe Rhynchophorina and the genera *Rhynchophorus* and *Dynamis*.

Sub-tribe Rhynchophorina

(Figures. 4-13)

The following description applies to mature (and sub-mature) larvae of both *D. borassi* and *R. palmarum*, which are, respectively, the type species of the genera *Dynamis* and *Rhynchophorus*. It is descriptive of the larval stage of the sub-tribe Rhynchophorina of the current classification of dryophthorines (see Anderson & Marvaldi, 2014).

Mature larva (Figs. 4-7)

Body (Figures 4A-F) very robust, expanded at the middle of the abdomen between segments III and VI, narrowing posteriad, with abdominal segments VIII and IX forming a depressed terminal disc (Figures 6B, 7A-B). Thoracic and abdominal segments with sternellum (Figures 4B, E, 6A). Cuticle (Figure 6) sclerotized around setal groups, elsewhere with coarsely distributed asperities like small spicules; vestiture consisting of sparsely distributed red-brown setae, mostly short or minute, except longer on terminal disc.

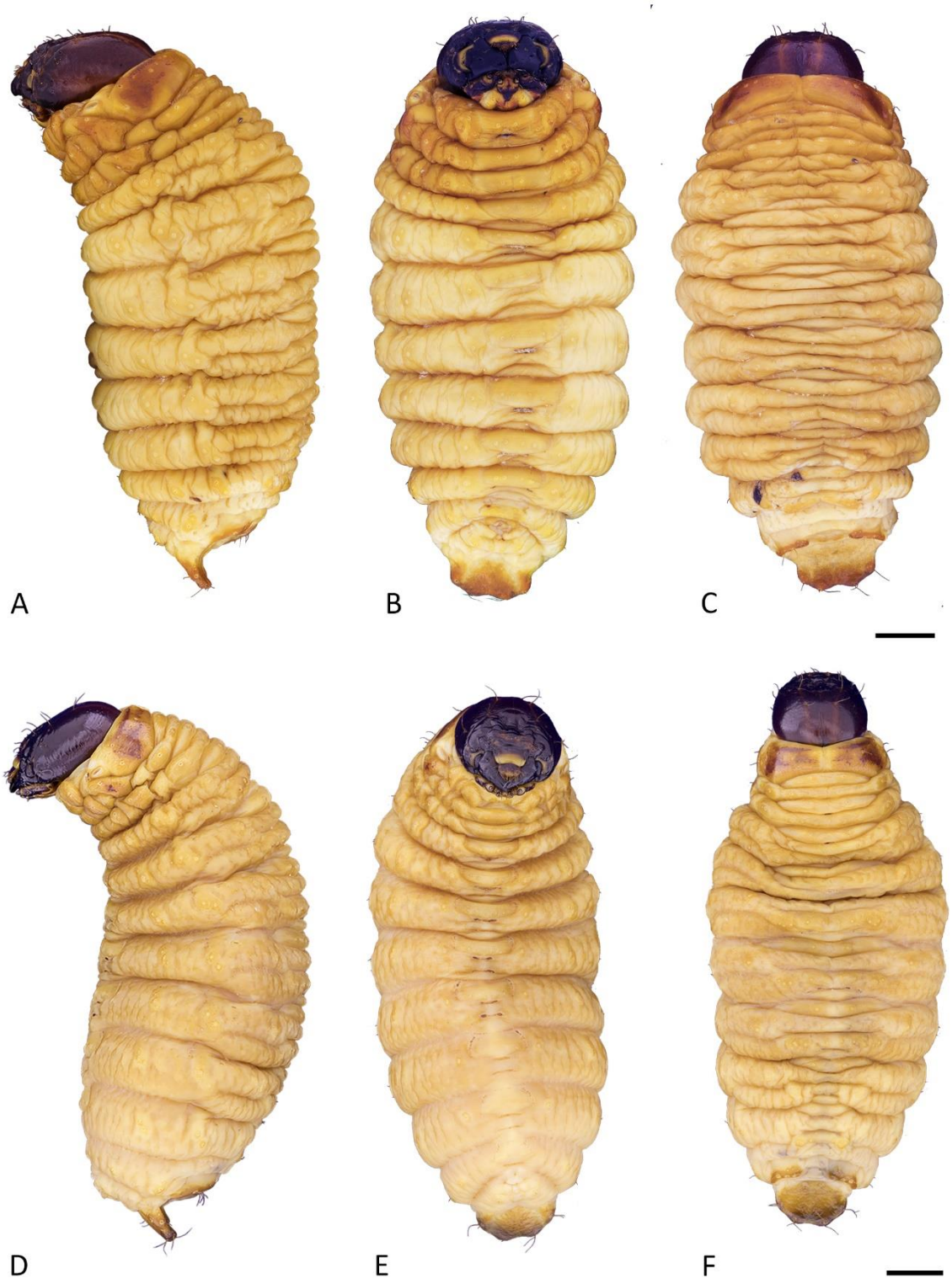


Figure 4. *Habitus* of mature larva (lateral, ventral, dorsal). *Dynamis borassi* (Fabricius) (A-C); *Rhynchophorus palmarum* (Linnaeus) (D-F). Scale bars: 5 mm.

Head (Figures 5A-B) exposed, longer than wide, strongly sclerotized, and deeply pigmented, with paler paramedian stripes. Cervix without typical postoccipital condyles, its dorsal side often thickened and with a pair of cervical sclerites on the membrane at the joint of head and prothorax (Figure 5C). Frontal lines distinct, reaching antennae; frons with two medial longitudinal grooves. Endocarina absent. Antennae in oblique position on anterior margin of head; sensorium longer than wide, subconical, circular in apical view (Figure 5D). Stemmata present, anterior one distinct, near antenna, posterior one faint in older larvae. Five dorsal epicranial setae (des) present; des1, des3 and des5 longest, des2 short and des4 minute; des3 on epicranium, close to frontal line; five frontal setae (fs), fs3 and fs5 longest, fs4 short to well developed, fs1 and fs2 minute; four-minute posterior epicranial setae (pes); two lateral epicranial setae (les) unequal in size, les1 much smaller; ventral cranial setae (vcs) inconspicuous. Hypopharyngeal bracon clear. Clypeus (Figure 6A) with two setae, unequal in size (cls 1 much larger than cls 2), and one sensillum between cls on each side. Labrum (Figure 6A) pigmented, with anterior margin truncate or slightly produced at middle; labrum with three pairs of setae (lms), with a pair of basal sensilla, and a pair of anterior sensilla, the latter situated near lms2. Epipharynx (Figures 6B-C, 6A-B) with simple setae, with five to more anterolateral setae (als); bearing patches of dense pubescence medially and laterally; epipharyngeal sensillum clusters present, a distal pair of three sensillae each, between labral rods, and a proximal pair of two sensillae each; labrum-epipharynx with labral rods elongate, slightly sinuate, joined posteriorly. Mandibles (Figures 7C-J) robust, dark, often bidentate at apex, with median tooth and a molar area on inner side; with basal sensillum and two short setae on outer surface (mds 1, 2) placed in pits, aligned longitudinally. Maxillae (Figures 8A-I) with mala truncate and slightly excised apically, bearing several dorsal setae (dms) aligned in a row medially and irregularly placed proximally (Figures 8E-F); some dms branched, mostly bifid; ventral malar setae (vms) simple (Fig. 8H); maxillary palpi 2-segmented, basal palpomere with two sensilla and one minute seta (Figure 8I). Labium (Figs. 8A-D) with palpi 2-segmented; premental sclerite trident shaped; postmentum sclerotized and pigmented in mesal and lateral areas, with a lighter

stripe between them; three postmental setae (pms), proximal pair (pms1) closer together than pms2 and pms3, median pair (pms2) the longest; hypopharynx (Figures 8C-D) densely setose in lateral areas, medially smooth with a longitudinal furrow.

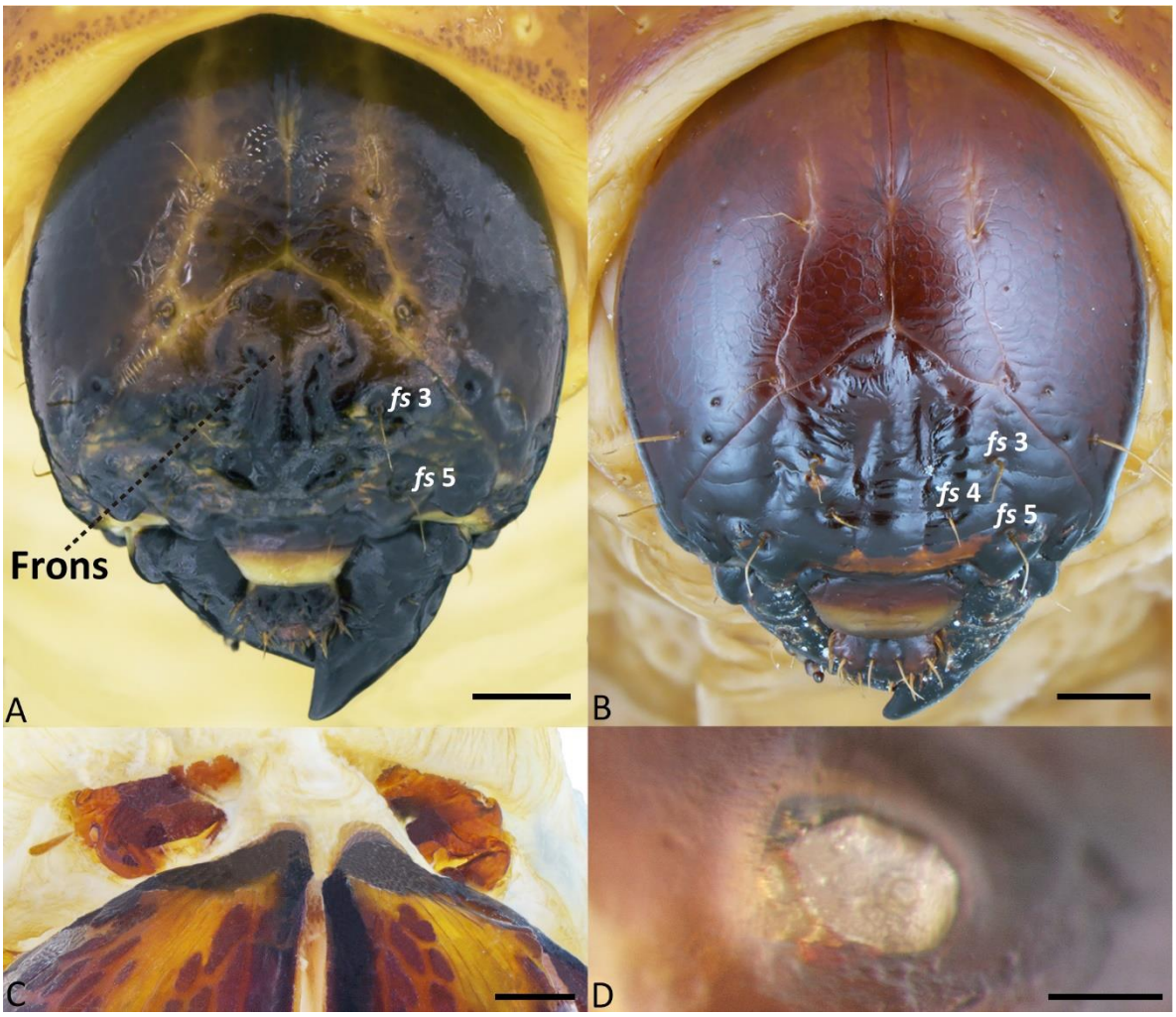


Figure 5. Head of larva, anterodorsal: *Dynamis borassi* (Fabricius) (A); *Rhynchophorus palmarum* (Linnaeus) (B); *D. borassi*, postoccipital membrane showing cervical sclerites (C); *R. palmarum*, antenna, apical (D). Scale bars: A and B = 2 mm, C = 0.4 mm, D = 0.1 mm.

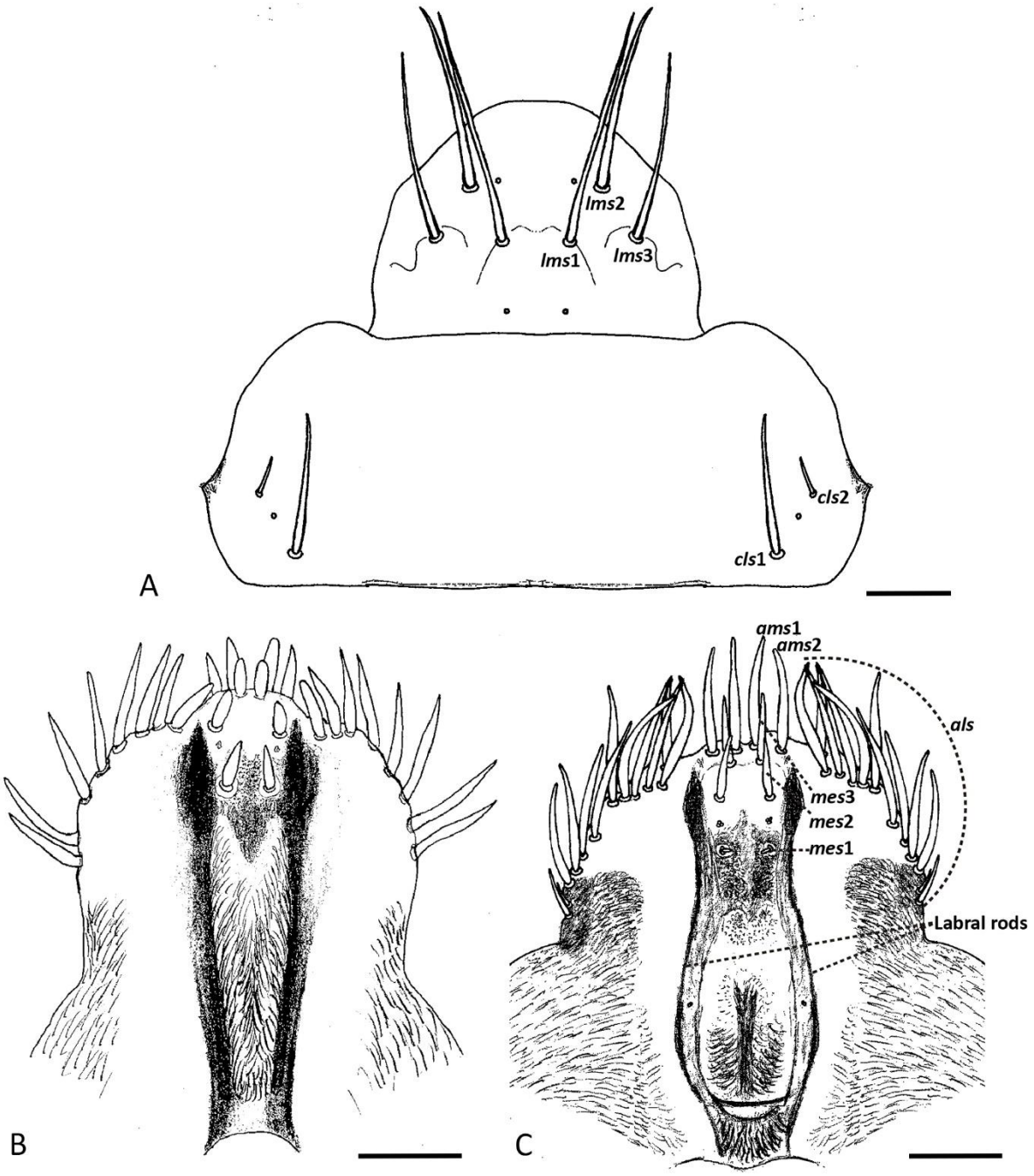


Figure 6. Larval mouthparts. *Rhynchophorus palmarum* (Linnaeus) (A), clypeus and labrum; *Dynamis borassi* (Fabricius), epipharynx (B); *R. palmarum*, epipharynx (C). Scale bars: 0.5 mm. Illustrated by Adriana Marvaldi.

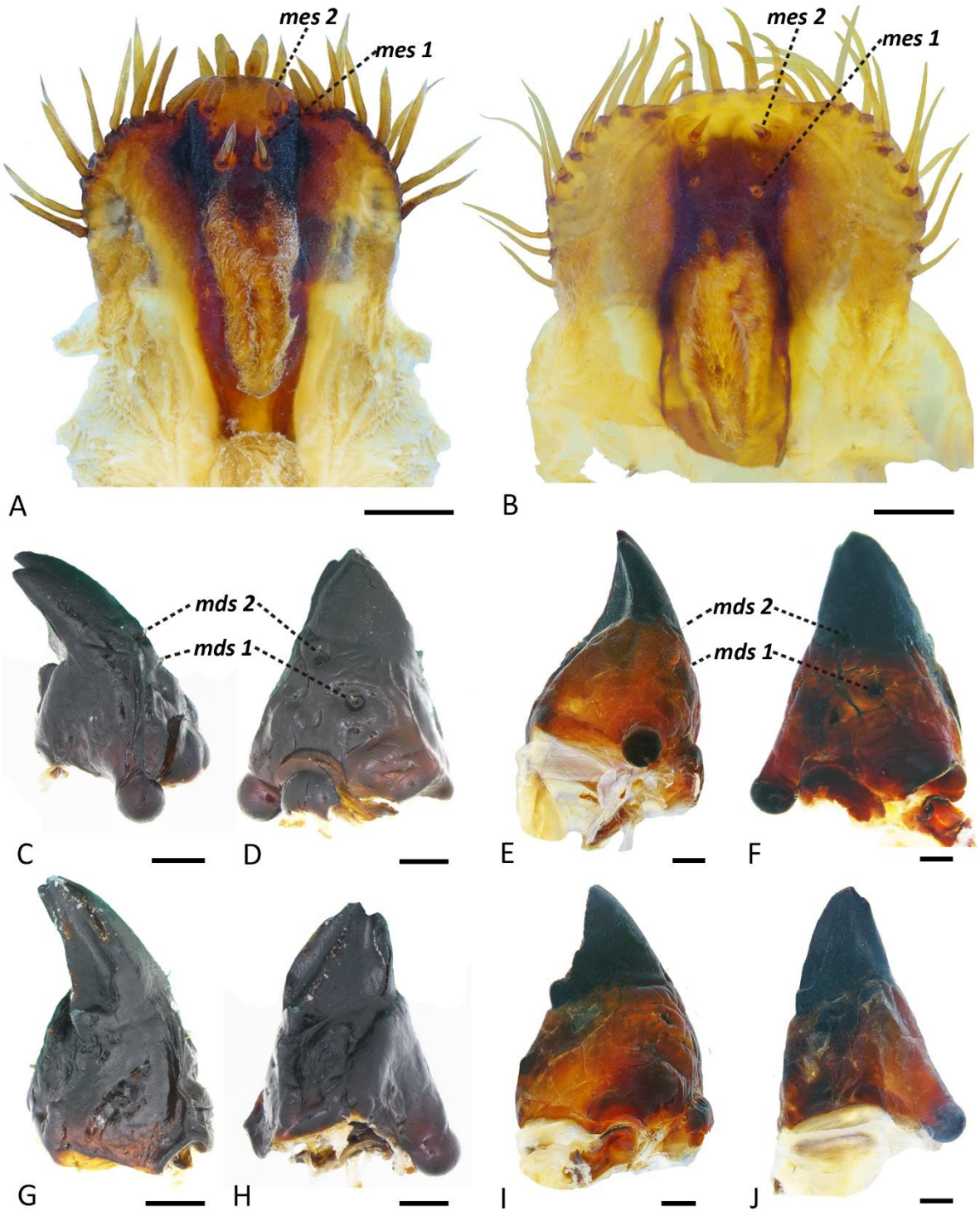


Figure 7. Larval mouthparts. *Dynamis borassi* (Fabricius): epipharynx (A); mandible in dorsal, outer, ventral, and inner views (C-D, G-H). *Rhynchophorus palmarum* (Linnaeus): epipharynx (B); mandible in dorsal, outer, ventral, and inner views (E-F, I-J). Scale bars: 0.5 mm.

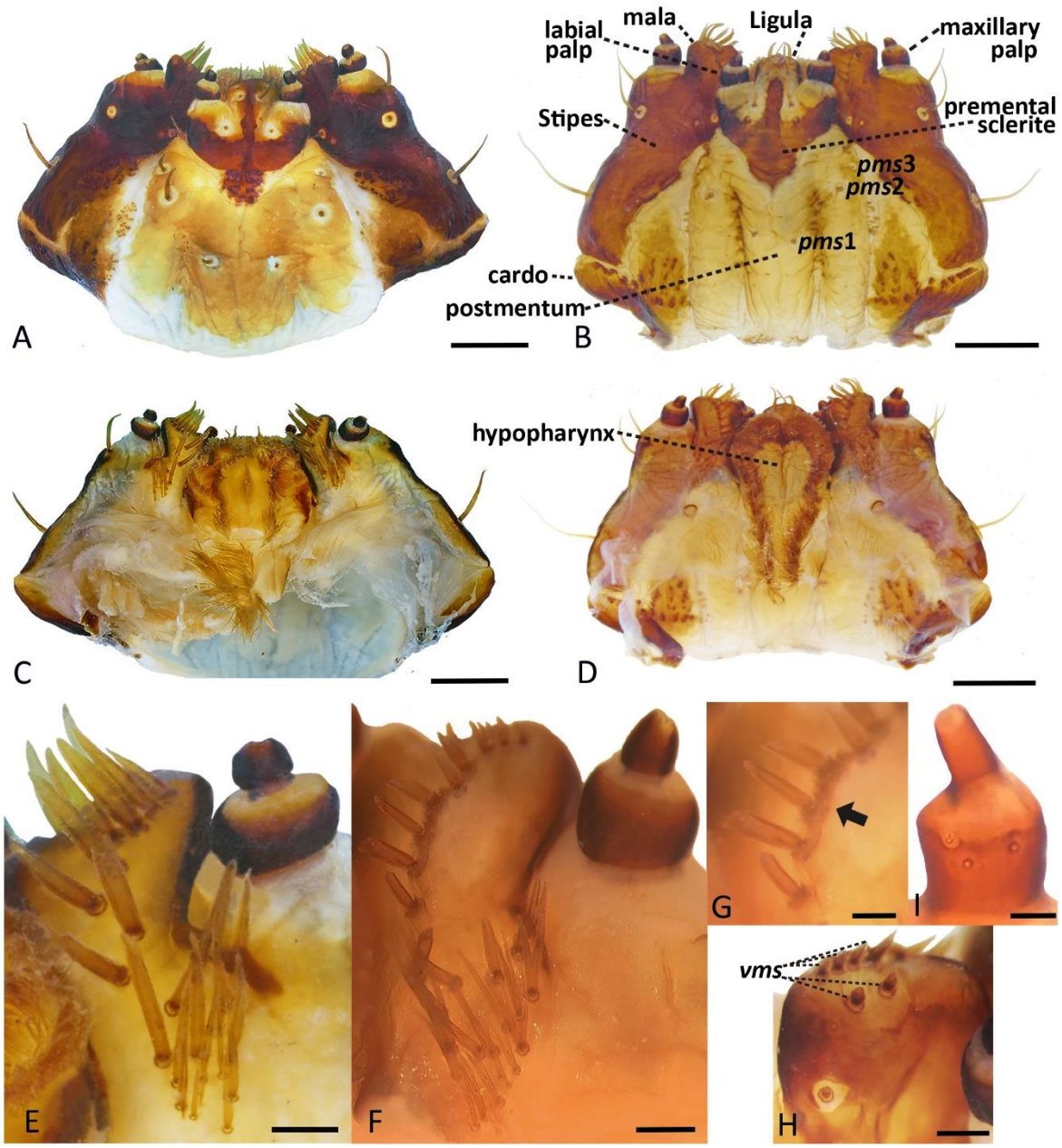


Figure 8. Maxillae and labium of larva. *Dynamis borassi* (Fabricius): ventral (A); dorsal (C); detail of mala, dorsal (E). *Rhynchophorus palmarum* (Linnaeus): ventral (B); dorsal (D); detail of mala, dorsal (F); detail of dorsal malar setae (G); detail of ventral malar setae (H); detail of maxillary palp (I). Scale bars: A-D = 1 mm, E and F = 0.2 mm, G and I = 0.1 mm, H = 0.2 mm.

Thorax (Figure 10A). Pronotum (Figures 9A, 4C, F) well pigmented, consisting of two sclerotized halves separated dorsally by a lighter band, bearing few pronotal

setae (five to seven). Prothoracic sternum with a median depression (Figures 9B, E). Meso- and metathorax (Figure 9A) with one seta on alar area and several very short spiracular setae (ss); epi- and pleural areas subdivided into two lobes. Pedal areas with six setae, one of them minute, close to the longest one. Thoracic spiracles (Figures 9A, 10C, F-G) placed on prothorax, narrow-ovate, without airtubes.

Abdomen (Figure 9). Typical abdominal segments (Figures 4, 9A) with four dorsal folds, bearing five postdorsal setae (pds). Segments VIII and IX (Figures 4, 9B) with fewer but longer dorsal setae, forming a sclerotized dorsal disc, with posterior margin extended into two pairs of broadly defined, seta-bearing lobes (Figures 9B, 10A-B). Epi- and pleural areas subdivided into three lobes (Figures 4, 9A). Anal region (Figure 10B) ventral, anus transverse, four anal lobes, the lateral ones bearing one or two small setae. Spiracles narrow-ovate, without air tubes (Figures. 9A-B, 10D-E, I-J); abdominal spiracles I to VII (Figures 9A, 10D-E) placed laterally near anterior margin of segments, much smaller than the VIII, but functional; spiracles of segment VIII (Figures. 9B, 10I-J) well developed and placed on dorsum, aligned longitudinally.

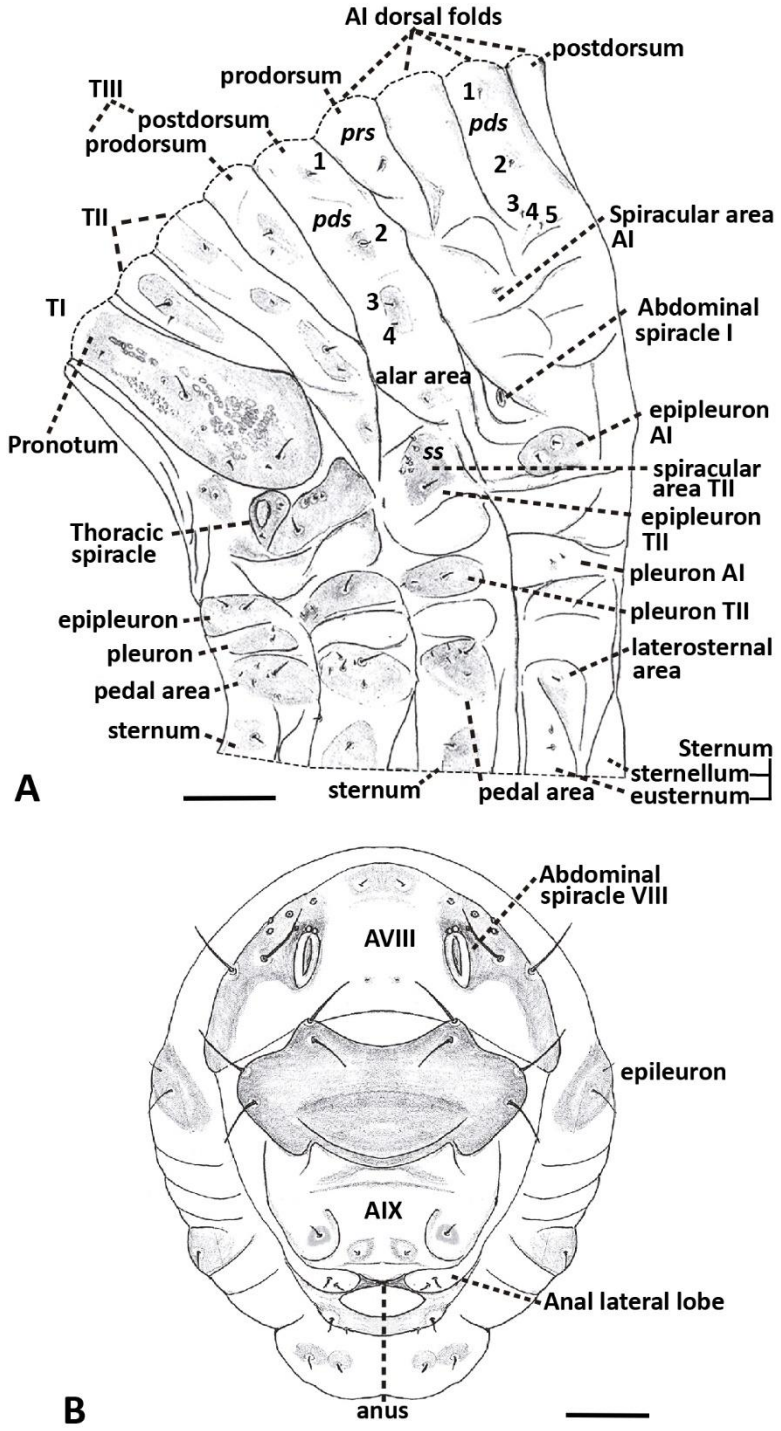


Figure 9. Chaetotaxy of thorax and abdomen, mature larva, *Rhynchophorus palmarum* (Linnaeus). Prothorax, mesothorax, metathorax and abdominal segment I (A). Abdominal apex, segments VIII to X, caudal (B). Scale bars: A = 3 mm, B = 2 mm. Illustrated by Adriana Marvaldi.

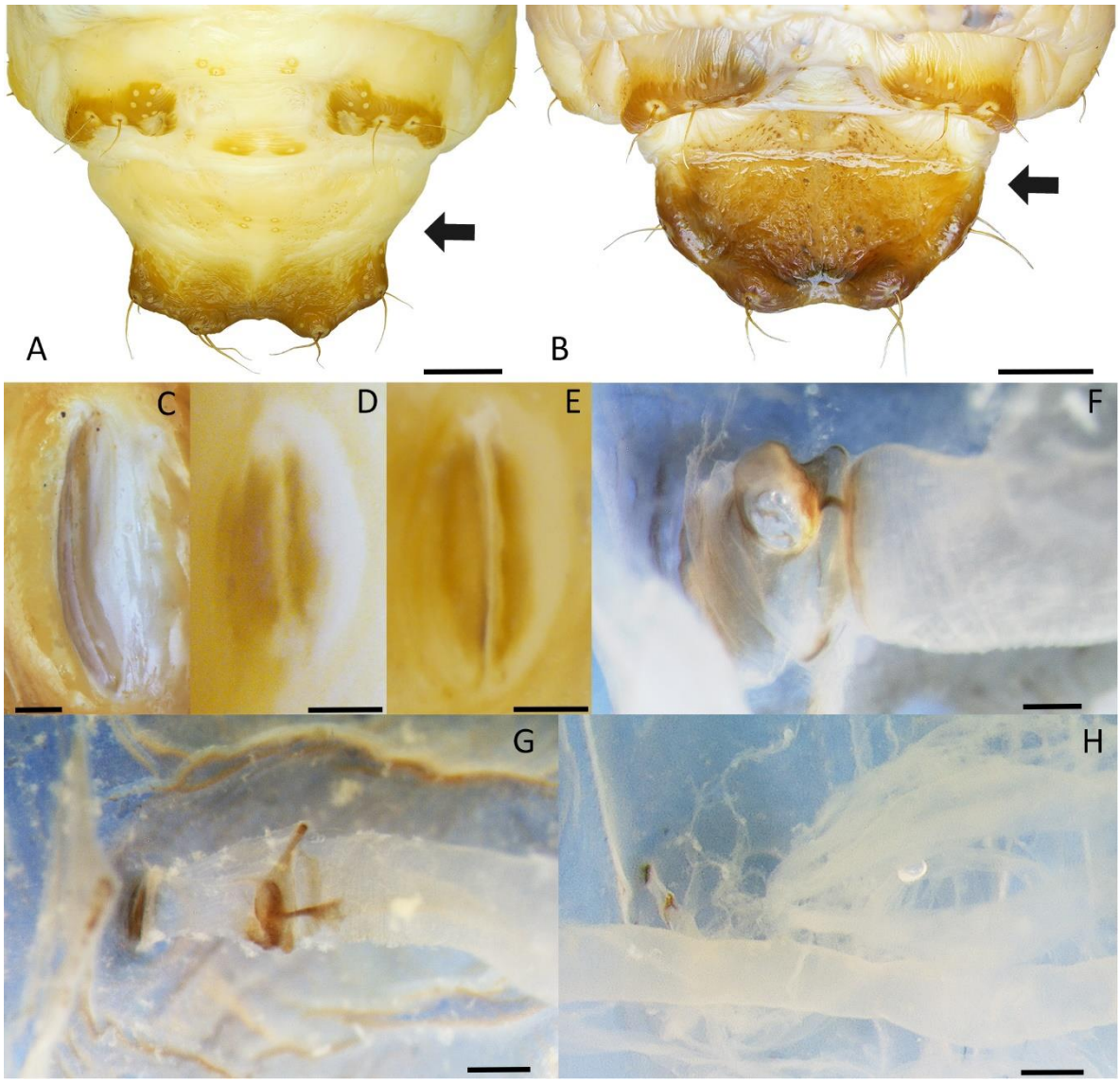


Figure 10. Larval abdominal apex showing posterior disc, dorsal: *Dynamis borassi* (Fabricius) (A); *Rhynchophorus palmarum* (Linnaeus) (B). Spiracles of *D. borassi* (external view, not at same scale): thoracic (C); abdominal I (D); abdominal IV (E). Thoracic spiracle and trachea of *R. palmarum*, seen from inside of body (F). Spiracles and tracheal system of *D. borassi*, seen from inside of body (G, H): thoracic, abdominal IV. Abdominal spiracle VIII: *D. borassi* (I); *R. palmarum* (J). Scale bars: A and B = 2 mm, C and F-H = 0.2 mm, D and E = 0.1 mm, I and J = 0.5 mm.

First instar larva (Figures. 11A-F, 12A-C)

Both anterior and posterior stemmata distinct, as dark pigmented spots, anterior larger than posterior (Fig. 11C). Egg-bursters (Fig. 11D) present on abdominal segments IV to VII, on either side in the dorso-lateral region of each segment, the posterior pair smaller than those in AIV-AVI; each egg burster (Fig. 11E) arising on a convex tubercle and consisting of a sub-conical, forwardly directed spine, situated anterior to a blunt seta. Only the spiracles of thorax and abdominal segment VIII (Fig. 11F) are distinct, abdominal spiracles I to VII absent. Abdominal terminal plate (Fig. 11F) with margins only weakly sinuated.

Comments: The characters mentioned above are exclusive of the first instar. Additional differences between early and older instar larvae involve relative dimension of structures, like the antennae, which are relatively much larger in the first instar; the pigmentation and level of sclerotization of body areas tend to increase in successive instars; the differences in length between setae of body areas are higher in early instars; when setae are supernumerary (compared to modal numbers), such as those placed laterally in the epipharynx or dorsally in the maxillary mala, their amount is higher in later instars.

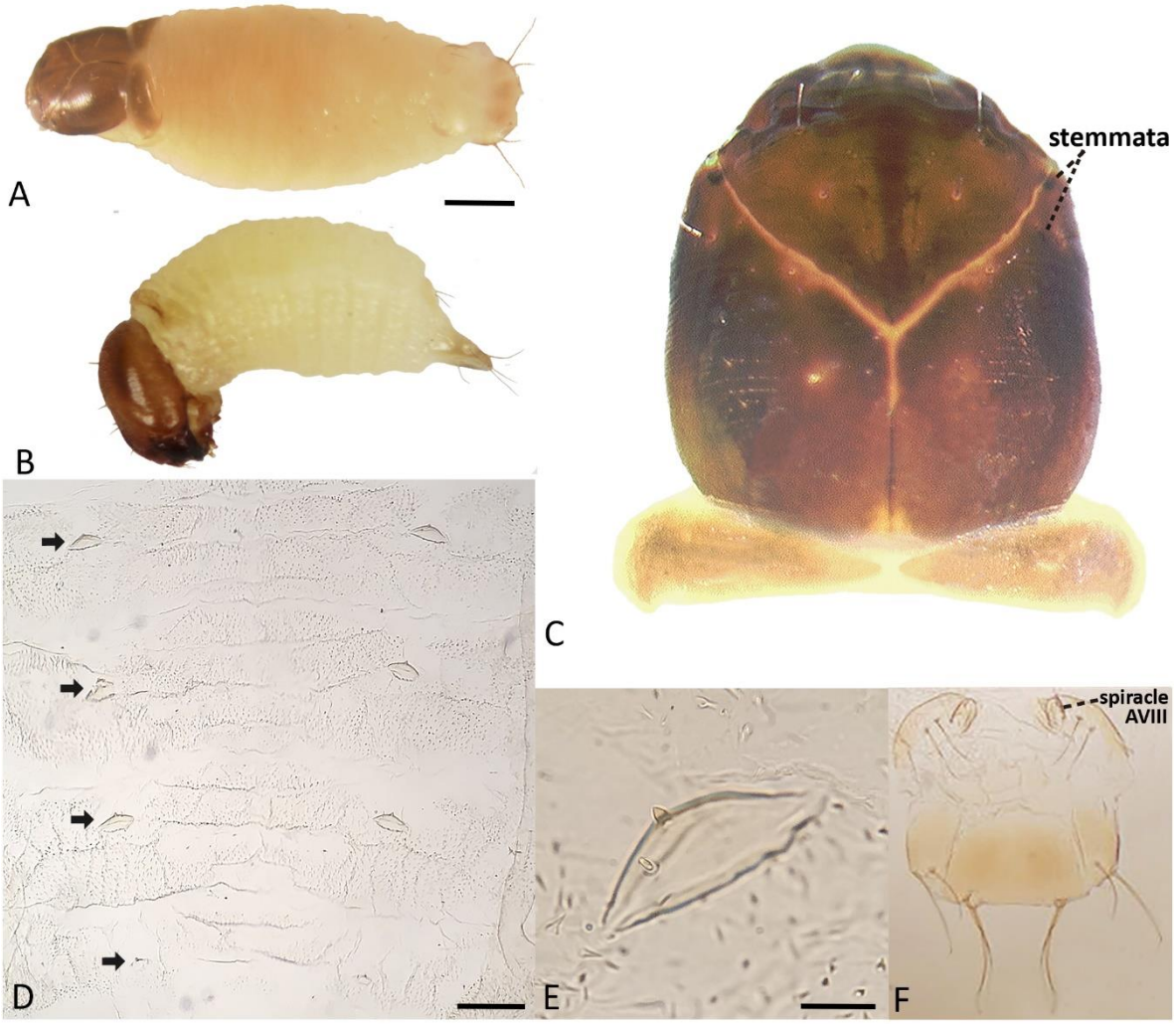


Figure 11. First instar larva. *Dynamis borassi* (Fabricius), habitus dorsolateral (A); *Rhynchophorus palmarum* (Linnaeus), habitus lateral (B). *D. borassi*: head and pronotum, dorsal (C); abdominal segments IV to VII, dorsal, showing egg bursters (D); detail of egg burster (E); terminal dorsal disc (abdominal tergites VIII and IX) (F). Scale bars: A and B = 0.5 mm, D = 0.2 mm, E = 0.03 mm.

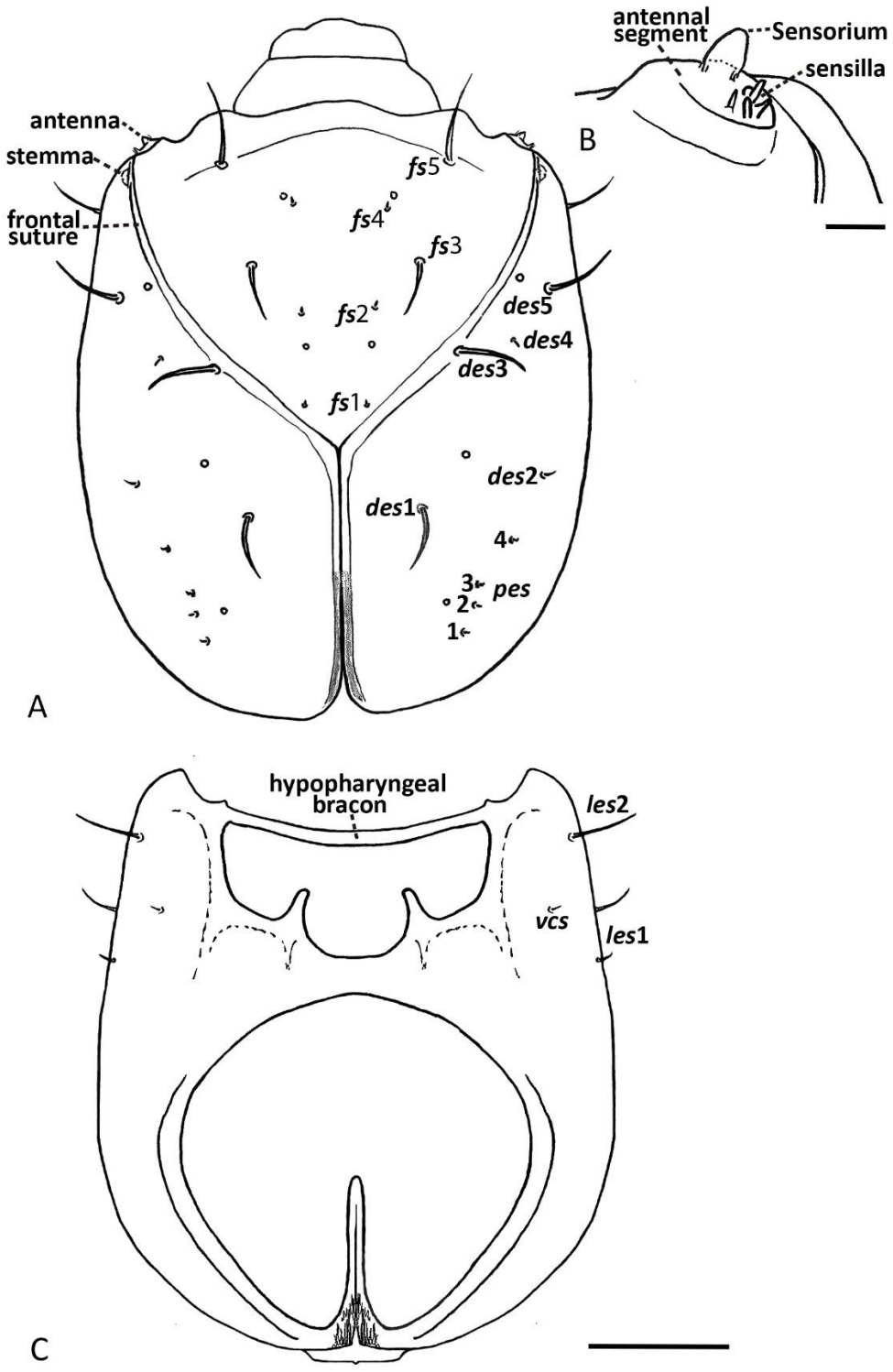


Figure 12. First instar larva of *Dynamis borassi* (Fabricius): head capsule, dorsal (A); detail of right antenna (B); head capsule, ventral (C). Scale bars: A and C = 0.2 mm, B = 0.02 mm. Illustrated by Adriana Marvaldi.

Dynamis borassi (Fabricius, 1801)

Mature larva: Figs. 4A-C, 5A, C, 6B, 7A, C-D, G-H, 8A, C, E, 9A, 11C-E, G-I.

First instar larva: Figs. 11A, C-F, 12A-C.

Maximum dimensions: 52.9 × 23.6 mm, head width 10.5 mm. Chaetotaxy (see Table 2). Frons (Figs. 5A, 10C, 11A) with two setae well developed (fs3 and fs5), fs4 minute (earlier instars) or short. Epipharynx (Figs. 5B, 6A): five (earlier instars) to eight anterolateral setae (als) on each side, none placed proximally near the limit with clypeus; median epipahryngeal setae 2 (mes2) thick, more widely separated than mes1, the latter smaller but well developed, distinct; mesal area of epipharynx (between labral rods) with asperities evenly distributed, not leaving a glabrous area; labral rods V-shaped, less widely separated towards their proximal junction than between their distal tips. Maxillae (Figs. 7A, C, E): with dorsal malar setae (dms) without pubescence at their bases; number of dms about 20 (earlier instars with fewer setae). Hypopharynx (Fig. 7C) more densely setose laterally than anteriorly. Abdominal posterior disc (Fig. 9A) with lateral margins inwardly curved, with seta-bearing lobes defined by sinuate posterior margin (weakly so in first instar).

Rhynchophorus palmarum (Linnaeus, 1758)

Mature larva: Figs. 3D-F, 4B, D, 5A, C, 6B, E-F, I-J, 7B, D, F-I, 8A-B, 9B, F, J.

First instar larva: Fig. 10B.

Maximum dimensions: 51.2 × 23.8 mm, head width 11.5 mm. Chaetotaxy (see Table 2). Frons (Fig. 4B) with three setae well developed (fs3, fs4 and fs5). Epipharynx (Figs. 5C, 6B): ten (earlier instars) to fourteen anterolateral setae (als) on each side, posterior ones can arise near the limit with clypeus; median epipahryngeal setae 2 (mes2) slender, about as widely separated as mes1, the latter weak, inconspicuous; mesal area of epipharynx (between labral rods) with an elongate glabrous area coarsely defined by surrounding asperities; labral rods U-

shaped, about as widely separated towards their proximal junction than between their distal tips. Maxillae (Figs. 7B, D, F-I): with dorsal malar setae (dms) (Figs. 7F, G) with pubescence at their bases; number of dms about 30 (earlier instars with fewer setae). Hypopharynx (Fig. 7D) densely setose in both anterior and lateral margins. Abdominal posterior disc (Fig. 9B) with lateral margins outwardly curved, with seta-bearing lobes broadly defined by slightly sinuate posterior margin.

Table 2. Body areas and chaetotaxy of Curculionidae (modal numbers), *Dynamis borassi* (Db) and *Rhynchophorus palmarum* (Rb). Terms and abbreviations follow Marvaldi (1999) and V= variable (see also May 1994; Oberprieler et al., 2014).

Body area	Setal numbers			Abbreviation	Meanings
	Modal	Db	Rp		
Head					
frontal	5	5	5	*fs*	Frontal setae
dorsal	5	5	5	*des*	Dorsal epicranial setae
posterior	4	4	4	*pes*	Posterior epicranial setae
lateral	2	2	2	*les*	Lateral epicranial setae
ventral	2	1	0	*vcs*	Ventral cranial setae
Clypeus	2	2	2	*vls*	Clypeal setae
Labrum	3	3	3	*lms*	Labral setae
Epipharynx					
anterolateral	3	5-8	10-14	*als*	Anterolateral setae
anteromedian	2	2	2	*ams*	Anteromedian setae
median	3	3	3	*mes*	Median epipharyngeal setae
Mandible	2	2	2	*mds*	Mandibular setae
Maxillae					
dorsal mala	V	~20	~30	*dms*	Dorsal malar setae
ventral mala	4-5	5	5	*vms*	Ventral malar setae
palp	1	1	1		
stipes	4	4	4	*stps*	Stipital setae
Labium					
prementum	1	1	1	*prms*	Premental setae
ligula	2	2	2	*lgs*	Lingular setae
postmentum	3	3	3	*pms*	Postmental setae
Prothorax				TI	
pronotum	V	6	5+2	*prns*	Pronotal setae
epipleuron	0-3	2	2	*epls*	Epipleural setae
pleuron	2	2	2	*pls*	Pleural setae
pedal area	V	6	6	*pds*	Pedal setae
sternum	1	1	1	*sts*	Sternal setae

Continuation of Table 3.

Body area		Setal numbers			Abbreviation	Meanings
		Modal	Db	Rp		
Meso-, Metathorax					TII, TIII	
prodorsum		1	1+1	1+1	*prs*	Prodorsal setae
postdorsum		4	4	4	*pds*	Postdorsal setae
alar area		1-2	1	1	*as*	Alar setae
spiracular area		1-3	3-9	3-8	*ss*	Spiracular setae
epipleuron		1	1	1	*epls*	Epipleural setae
pleuron		1	1	1+2	*pls*	Pleural setae
pedal		V	6	6	*pds*	Pedal setae
sternum		1	1	1	*sts*	Sternal setae
Abdomen, I-VIII segments					AI-VIII	
prodorsum		1	1	1	*prs*	Prodorsal setae
postdorsum	I-VII	5	5	5	*pds*	Postdorsal setae
	VIII	V	2	2		
spiracular	I-VII	2	1	1	*ss*	Spiracular setae
	VIII	1	5-6	7		
epipleuron		2	2	2	*epls*	Epipleural setae
pleuron	I-VII	2	2	2	*pls*	Pleural setae
	VIII	2	1	1		
laterosternal	I-VII	1	1	1	*lts*	Laterosternal setae
	VIII	1	0	0		
sternum		2	2	2	*sts*	Sternal setae
Abdomen, IX segment					AIX	
disc/dorsum		V	4/0	4/1	*ds*	Dorsal setae
lateral		2	0	1	*ls*	Lateral setae
Sternum		2	2	2	*sts*	Sternal setae
Abdomen, X segment					AX	
anal lateral		1-3	1	2	*as*	Anal setae

Comparative notes

A selection of characters useful to distinguish *D. borassi* and *R. palmarum*, at larval and adult stages, is provided below (see Supplementary Material Table S for a comparison in Spanish):

Dynamis borassi: LARVAE: Frons (Figure 4A) with two (pairs of) frontal setae well developed (fs3 and fs5). Epipharynx (Figures 5B, 6A) with mes1 well developed and distinctly less widely separated than mes2, mes2 thick; laterally with five (earlier instars) to eight als; labral rods V-shaped, less widely separated towards their proximal junction than between their distal tips. Maxillae with dms without pubescence at their bases (Figure 7E). Abdominal terminal disc (Figure 9A) with lateral margin inwardly curved. ADULTS (Figures 11A-B, E-F, I-J): Pronotum strongly produced posteriorly and scutellum very small, about 1/10 elytral length (Figures 11E-F). Male with profemora bearing dense, erect setae on ventral side (Figures 11A, I).

Rhynchophorus palmarum: LARVAE: Frons (Figure 4B) with three (pairs of) frontal setae well developed (fs3, fs4 and fs5). Epipharynx (Figures 5C, 6B) with mes1 very small and about as widely separated as mes2, mes2 slender; laterally with 10 (earlier instars) to 14 als; labral rods U-shaped, about as widely separated towards their proximal junction as between their distal tips. Maxillae with dms with pubescence at their bases (Figures 7F-G). Abdominal terminal disc (Figure 10B) with lateral margin outwardly curved. ADULTS (Figures 11C-D, G-H, K-L): Pronotum slightly produced posteriorly and scutellum very large, about ¼ elytral length (Figures 11G-H). Male with rostrum bearing dense, erect setae on dorsal side (Figures 11C, G).

Comments: The following additional adult characters (Wattanapongsiri, 1966; Löhr et al., 2015), in combination with those given above, distinguish *R. palmarum* from other species of *Rhynchophorus*: body entirely black, exceptionally reddish, interocular distance (dorsal view) ⅓ or less than ⅓ than the width of rostrum at base (Figures 11G-H), rostral ventral area between the antennal scrobes rugose and with setae (Figures 11K-L).

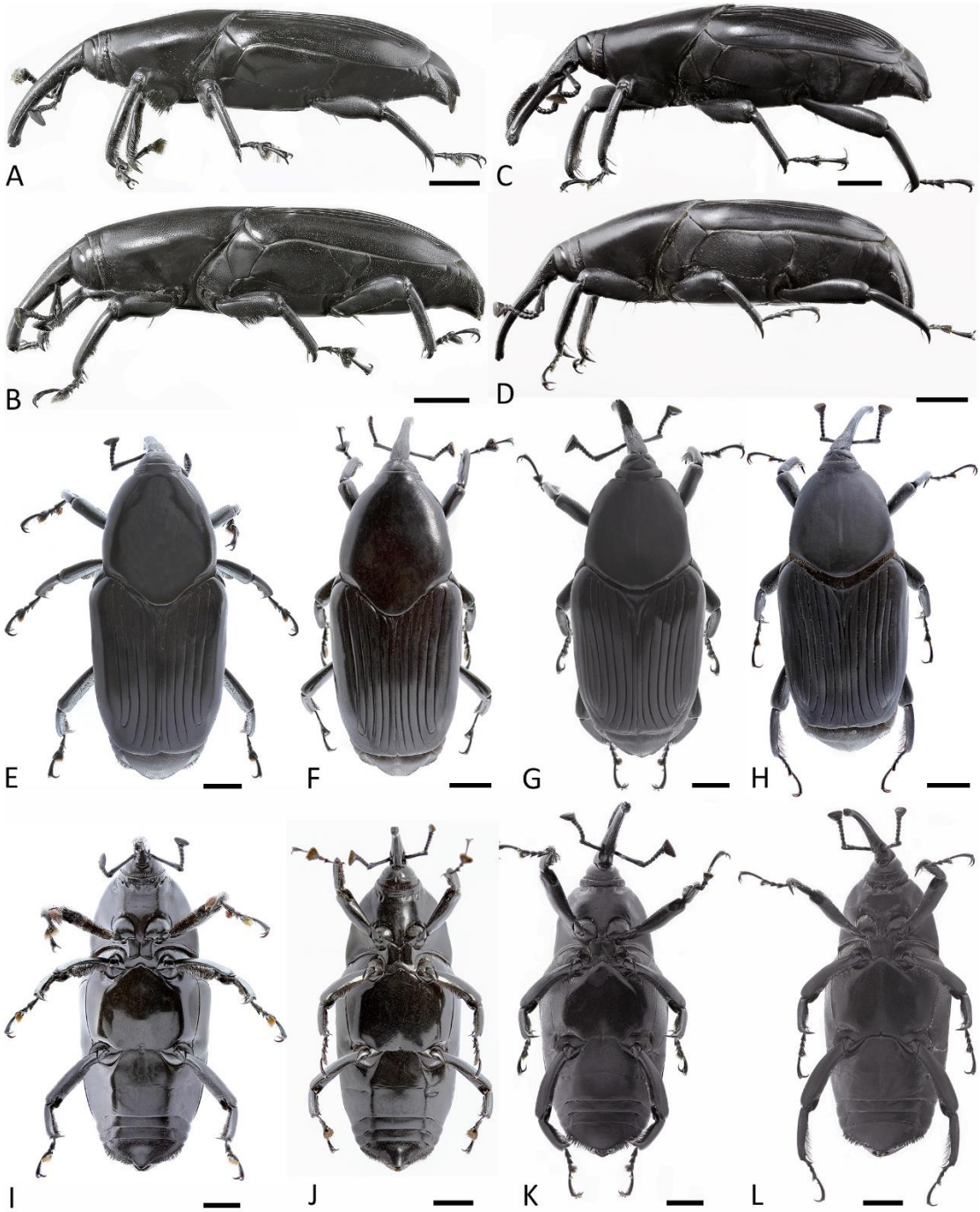


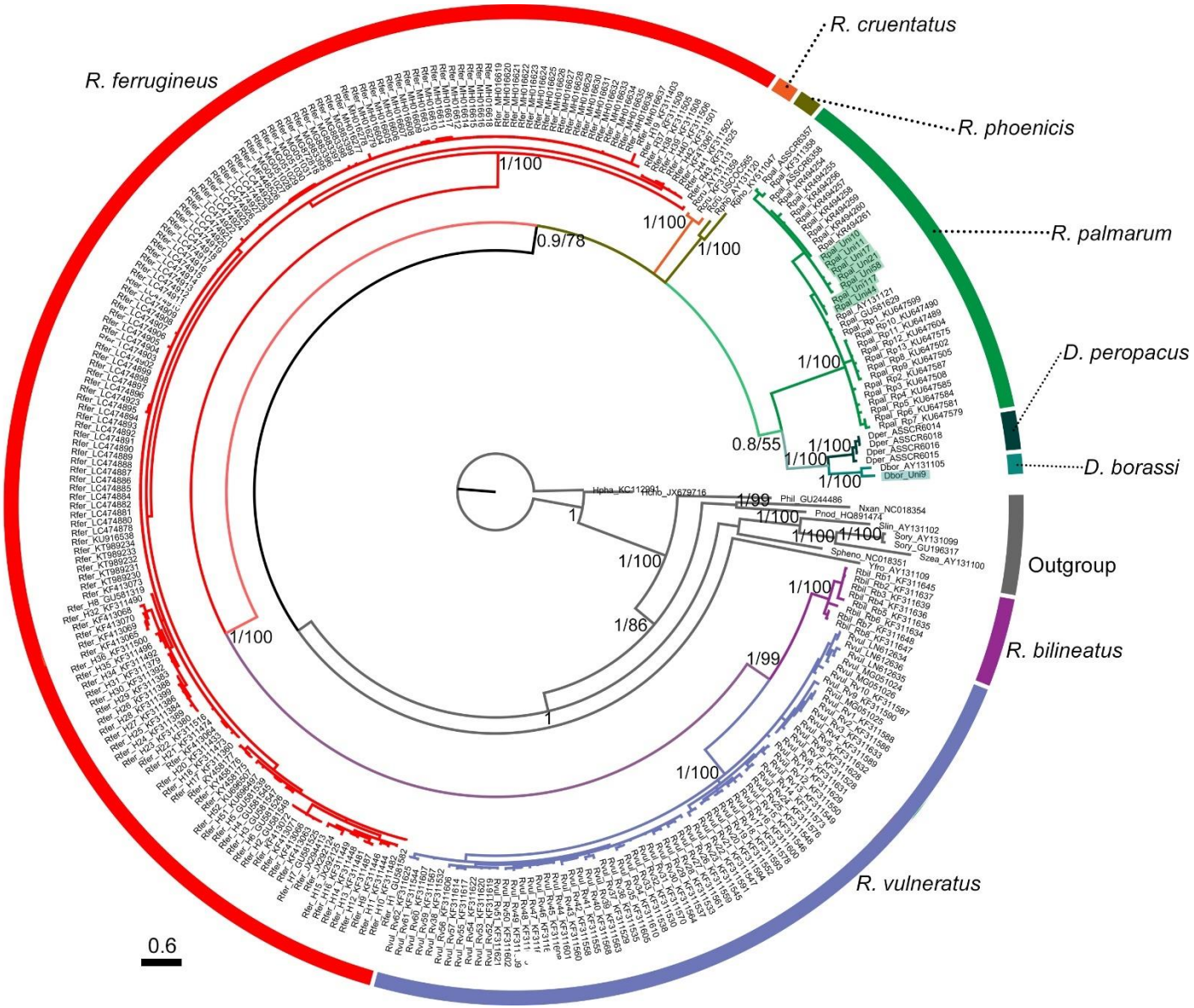
Figure 14. Adult, *habitus*. *Dynamis borassi* (Fabricius): male, lateral, note sexually dimorphic ventrally setose profemora (A); female, lateral (B); male, dorsal (E); female, dorsal (F); male, ventral (I); female, ventral (J). *Rhynchophorus palmarum* (Linnaeus): male, lateral, note sexually dimorphic dorsally setose rostrum (C); female, lateral (D); male, dorsal (G); female, dorsal (H); male, ventral (K); female, ventral (L). Scale bars: 5 mm.

Molecular taxonomy of *Dynamis* and *Rhynchophorus*

The 987 COI gene sequences deposited in the gene banks demonstrated the monophyly of two *Dynamis* and seven *Rhynchophorus* species according to tree topology and the corresponding posterior probability and bootstrap of the Bayesian and Maximum Likelihood analysis (Figure 15), respectively. These taxa corresponded to *D. borassi*, *D. peropacus, R. bilineatus*, *R. cruentatus*, *R. ferrugineus*, *R. phoenicis*, *R. palmarum*, and *R. vulneratus*. In similar way, the p-distance genetic value evidenced that these species are more different from each other than their internal genetic variation (Table 3).

Taxonomic identification of the weevils associated with peach palm damage.

A total of 88 damaged peach palms were dissected in 15 farms from all regions. Six additional samples were taken from inflorescences at two sites in Nariño and Risaralda departments. The collected weevils were in different stages of development: 321 in different larval stages, 21 as adults, and 345 as pupae. A total of 78 adults emerged of the pupae, generating a total 99 adults. From these, 30 larvae were identified as *D. borassi* and 291 as *R. palmarum* according to the morphological review described previously (Supplementary Material Table S2). Additionally, the adults corresponding to 22 *D. borassi* and 77 *R. palmarum* (Supplementary Material Table S2) based on Wattananpongsiri (1966). The eight adults sequenced for COI gene sequences corresponding one to *D. borassi* and seven to *R. palmarum*, according to phylogenetic analysis described previously (Figure 15, Supplementary Material Figure S8). Larvae of *D. borassi* were exclusively found in the inflorescences. In contrast, 254 adults of *D. borassi* and all stages of *R. palmarum* were recovered from stems.


R. cruentatus
R. phoenicis
R. palmarum
D. peropacus
D. borassi
Outgroup
R. bilineatus
R. vulneratus
R. ferrugineus
0.6

← **Figure 15.** Bayes COI phylogeny tree of two *Dynamis* species (*D. borassi* and *D. peropacus*) and six species of *Rhynchophorus* (*R. bilineatus*, *R. cruentatus*, *R. ferrugineus*, *R. phoenicis*, *R. palmarum*, and *R. vulneratus*) according to the COI gene. Posterior probabilities and Boostrap values (of the Maximum Likelihood analysis) of each species are indicated at each node when they were greater than 0.7 and 70%, respectively. The sequences studied are underlined in green and bluish green, and the percent divergence in the scale bar. See Supplementary Material Figure S1 for the support values of all clades.

Table 3. Intra and interspecific P - genetic distance of two species of *Dynamis* and seven *Rhynchophorus* (*D. borassi* and *D. peropaccus*, R. *bilineatus*, *R. cruentatus*, *R. ferrugineus*, *R. phoenicis*, *R. palmarum*, and *R. vulneratus*) according to COI gene. Interspecific genetic distance in bold

Interspecific/**Intraspecific** p-genetic distance		Species							
		D. borassi	*D. peropacus*	*R. bilineatus*	*R. cruentatus*	*R. ferrugineus*	*R. palmarum*	*R. phoenicis*	*R. vulneratus*
Species	*D. borassi*	**0.04**							
	D. peropacus	0.10	**0.01**						
	R. bilineatus	0.18	0.18	**0.02**					
	R. cruentatus	0.16	0.18	0.15	**0.01**				
	R. ferrugineus	0.17	0.20	0.11	0.15	**0.01**			
	R. palmarum	0.17	0.16	0.17	0.16	0.16	**0.03**		
	R. phoenicis	0.17	0.20	0.16	0.16	0.15	0.19	**0.07**	
	R. vulneratus	0.20	0.18	0.08	0.15	0.13	0.19	0.18	**0.02**

Discussion

The toppling of the crown appeared as a new problem in peach palm production around 2010 in the Pacific lowland of Colombia. The initial diagnosis attributed the damage solely to the *R. palmarum*. However, the fact that crown toppling was always associated with dead or even aborted developing inflorescences and with the migration of larvae through the stalk of the inflorescence to the stem of the palm (damage untypical for *R. palmarum*), suggested the presence of an additional species. This type of attack (reported in this study) in the palm inflorescence has also been documented for *D. borassi* in other native palms (Couturier et al., 2000; Beserra et al., 2006; Bautista-Giraldo et al., 2020), with a case in which the larva passes from the inflorescence to the stem in an experimental *Oenocarpus mapora* plantation (Couturier et al., 2000). *D. borassi* larvae were the only species collected inside inflorescences during this study while *R. palmarum* larvae were found exclusively within the stems. This confirms the idea that the latter species is opportunistic, as already observed by Alpizar et al. (2002), and likely uses the damage caused by *D. borassi* as its entry point. It is possible that the joint attack of these two weevil species causes extensive structural damage until the crown of the palm finally drops down (Pardo-Lorcano et al., 2016; Vásquez-Ordóñez et al., 2020). Early symptoms are almost negligible and difficult to detect. This might explain why the extensive and costly control efforts directed at *R. palmarum* did not contain the problem and, over time, more and more areas in Colombia have been negatively affected.

The taxonomy

The taxonomic confirmation of the species was possible with the morphological description of the larvae. In this case, *D. borassi* and *R. palmarum* were re-described in detail, using modern terminology to allow comparisons with other larvae in Dryophthorinae and across Curculionidae. Few structural characters, including chaetotaxy, show clear differences between both species. In agreement with Anderson (1948) and Wattanapongsiri (1966), the most useful characters to distinguish both species are found in the mouthparts, particularly the epipharynx

and maxillae. The observation of these features requires at least partial dissection of the head and examination under magnification, but the shape of the abdominal posterior plate, which also shows differences in both species, can be observed directly. This is advantageous to facilitate a rapid identification in the field, as required in most applied studies related to pest control. However, because differences in the abdominal plate of both species are only obvious and more distinct in older or mature larvae, it is worth to complement those with other (e.g., from mouthparts) diagnostic features.

The terminology used by Wattanapongsiri (1966) to describe larval structures and chaetotaxy of *Dynamis* and *Rhynchophorus*, differs in some important aspects with the ones adopted in the present work and other comparative studies (e.g., see Marvaldi, 1999; May, 1994; Chamorro & Huang, 2019). Among the differences worth to note are those involving the “anterolateral setae of the epipharynx (als)”, which in Wattanapongsiri (1966) are named “lateral setae of labrum” and, as additional source of confusion, their counting is given in full and not for one side, as it is standard for description of bilateral structures. Other discrepancies with Wattanapongsiri (1966) may arise because sometimes (e.g., in mandibles, stipes) he considers and counts as setae other sensilla that are not true setae (i.e., basal socket plus “hair”). This study also provided labeled figures to facilitate the determination of homology when compared with works using different terminology.

From a phylogenetic perspective, the larval characters described for both species agree with those diagnostics and synapomorphic characters of the Dryophthorinae subfamily, namely the maxillary malae with some dorsal setae branched, the pleura subdivided, the spiracles of AVIII placed on dorsum and oriented caudally, among others (May, 1994; Marvaldi, 1999; Anderson and Marvaldi, 2014). We also corroborate, as diagnostic of dryophthorines, that the first instar larva lacks the spiracles of abdominal segments I-VII, having only the thoracic and AVIII spiracles developed. The larvae of later instars of *Rhynchophorus* and *Dynamis* have the complete set of abdominal spiracles, and although those of AI to AVII are small, they are clearly functional (i.e., connected to tracheal system, see Fig. 7H).

Therefore, they are not absent as interpreted in the identification key by Chamorro (2019). The occurrence of egg-bursters in first instar larvae of Curculionoidea is less common, but also more poorly documented, than in their sister group Chrysomeloidea, where egg burster features (e.g., position, shape) were found to be phylogenetically informative at both higher and lower taxonomic levels (Cox, 1988). In Dryophthorinae, egg bursters were known to occur in first instar larvae of the genus *Sitophilus* of subtribe Litosomina, and in the present contribution, we report their occurrence in representatives of Rhynchophorina.

For the molecular taxonomy, the phylogenetic COI sequences tree is the more extensive for *Dynamis* and *Rhynchophorus*, with the monophyly of all species evaluated. In similar way, the intra and interspecific genetic distance suggested a taxonomical differentiation between taxa. Previous reports with the same gene documented similar results for the *Rhynchophorus* species (Rugman-Jones et al., 2013; Löhr et al., 2015; Silva, 2016; Lozano-Terol et al., 2017; Yaakop et al., 2021; Chamorro et al., 2021; Awad et al., 2021), except for two investigations that suggest the polyphyly of *R. bilineatus*, *R. cruentatus*, and *R. ferrugineus* (Löhr et al., 2015; Chamorro et al., 2020), using mitochondrial and nuclear evidence. The weevils' sequences associated with peach palm were presented in their corresponding clade of *D. borassi* and *R. palmarum*.

In the present study, the Pacific was the region that presented damage in all sampled localities. This situation might be a consequence of the old and continuous attacks of the weevils reported since 2015 (El Tiempo, 2010, 2015; La Patria, 2012; Instituto Colombiano Agropecuario-ICA, 2015; Pardo-Locarno et al., 2016). Other important information is the geographical extension of this phytosanitary problem. The first reports of this damage in Colombia were documented in the Pacific lowland of the Risaralda Department in 2010 (El Tiempo, 2010). Five years later, similar problems were reported in the Pacific area of the Valle del Cauca and Chocó departments (El Tiempo, 2015; La Patria 2012; Pardo-Locarno et al., 2016). The localities examined in the valley of the Cauca River in the Valle del Cauca, Cauca, and Nariño departments remained free of the

pest, according to visits and reports prior to the present study (B. Löhr and Hugo Mario Reyes, unpublished data), while the situation in Caquetá and Putumayo departments was unknown. This study confirmed the presence of affected peach palms in all the mentioned departments, with no damage until 2019 for southwest Putumayo.

Although both weevils are sympatric and have been around for years, *R. palmarum* has a significantly wider known host range than *D. borassi* (OEPP/EPPO, 2007; Bautista-Giraldo et al., 2020; Vásquez-Ordóñez et al., 2020). This makes the latter more susceptible to changes in the environment, especially deforestation or selective harvesting of its host palms and might have triggered a change in its host selection and acceptance behavior. Therefore, a former economically unimportant species may be turning into a potential key pest for palms. The problem may acquire enormous proportions if it is acknowledged that *D. borassi* has been reported in oil palm (Guerrero et al., 1995; Boari et al., 2016), for which Colombia is one of the main world producers (Potter, 2020). It should be noted that *D. borassi* recently affected an unopened inflorescence of *Roystonea oleracea* in Cali, Colombia, which it is a new hostplant for this species and demonstrated its capacity to use other palm species (Vásquez-Ordóñez, unpublished data).

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Supplementary Material (Chapter 1).

Table S1. Geographic and administrative information of the analyzed Peach Palm fields, with the number of weevils infested (*Dynamis borassi* and *Rhynchophorus palmarum*; NPI) and healthy palms (NPH) in Colombia (NA= does not apply, ID= locality code).

Sampling Type	ID	Department	Municipality	Latitude	Longitude	Sampling day	NPI	NPH
Non-sampling	N1	Nariño	San Andrés de Tumaco	1.5569	-78.6972	Feb 15, 2019	NA	NA
	N2			1.5360	-78.7023	Feb 14, 2019		
	N3	Risaralda	Santa Cecilia	5.3408	-76.1493	Nov 30, 2017		
	N4	Valle del Cauca	Palmira	3.5158	-76.3168	Mayo 23, 2021		
Sampling	S1	Valle del Cauca	Buenaventura	3.7629	-76.9632	Jul 01, 2018	24	38
	S2			3.9826	-76.9804	Mar 31, 2018	45	92
	S3			3.7015	-76.9629	Jun 28, 2018	11	35
	S4			4.0078	-76.9916	Jun 7, 2018	40	130
	S5			3.6905	-76.9474	Jul 5, 2018	11	41
	S6			3.6878	-76.9591	Jun 28, 2018	25	63
	S7			3.9894	-76.9780	Jun 4, 2018	22	115
	S8			3.7084	-76.9522	Jun 30, 2018	3	22
	S9			3.9536	-76.9764	Jun 01, 2018	20	145
	S10	Cauca	El Tambo	2.3518	-76.8937	Dec 01, 2018	36	3
	S11			2.4239	-76.8418	Nov, 2018	23	93
	S12			2.4008	-76.8487	Nov 29, 2018	13	100
	S13			2.4027	-76.8410	Nov 28, 2018	8	219
	S14			2.4239	-76.8418	Nov 30, 2018	3	126
	S15		Santa Rosa	1.4243	-76.4814	Feb 02, 2019	0	89
	S16	Caquetá	Florencia	1,5015	-75,6637	Feb 05, 2019	6	0
	S17			1,3471	-75,4752	Feb 05, 2019	12	5
	S18			1,5514	-75,8517	Feb 06, 2019	11	13
	S19			1,5492	-75,8608	Feb 06, 2019	6	13
	S20	Putumayo	Puerto Guzmán	1,0230	-75,9327	Feb 07, 2019	26	97
	S21	Caquetá	Curillo	1,0324	-75,9985	Feb 07, 2019	9	44

	S22		Florencia	1,4967	-75,6535	Feb 05, 2019	17	118
	S23			1,7257	-75,6558	Feb 08, 2019	4	80
	S24			1,7723	-75,6514	Feb 04, 2019	1	27
	S25		Curillo	1,0381	-76,0004	Feb 07, 2019	2	58
	S26		Florencia	1,7714	-75,6575	Feb 08, 2019	0	79
	S27	Putumayo	Puerto Caicedo	0,6624	-76,4704	Jan 30, 2019	0	335
	S28		San Miguel	0,3502	-76,9676	Feb 01, 2019	0	175
	S29			0,3485	-76,9269	Jan 31, 2019	0	483
	S30		Valle del Guamuez	0,4832	-76,9738	Jan 31, 2019	0	277
	S31		Villagarzon	0,8889	-76,6720	Jan 29, 2019	0	226
	S32			0,8842	-76,5887	Jan 29, 2019	0	192
	S33			0,8881	-76,6009	Feb 01, 2019	0	187

Table S2. Database of specimens collected, with their development stage, identification, and geographical origin.

ID	Region	Country	State Province	County	Locality
Cq01	Amazon	Colombia	Caquetá	Florencia	La Dorada. Finca los Papiros
Ca45	Andes	Colombia	Cauca	El Tambo	Mosquera. Finca la Planada
Ca46	Andes	Colombia	Cauca	El Tambo	Mosquera. Finca la Planada
Ca49	Andes	Colombia	Cauca	El Tambo	Cuatroesquinas. La Sarde
An01	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Tatabro
An53	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Tatabro
An54	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Tatabro
An56	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Tatabro
An58	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Tatabro
An60	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. San Marcos. Finca Santa Teresa
BC01	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 1. Bajo Calima. Las Colonias. Finca José Corozo
BC04	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 1. Bajo Calima. Estación Forestal Pedro Antonio Pineda- Universidad del Tolima
BC05	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 1. Bajo Calima. Las Colonias. Finca la Camila
BC06	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 1. Bajo Calima. Las Colonias. Finca el Esfuerzo
BC07	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 1. Bajo Calima. Las Colonias. Finca el Esfuerzo
BC08	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 1. Finca Odilio
BC09	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 1. Finca Odilio
BC10	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 1. Finca Odilio
BC11	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 1. Finca Odilio
BC14	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 1. Bajo Calima. Las Colonias. Finca el Esfuerzo
BC18	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 1. Bajo Calima. Las Colonias. Finca la Camila
Cq03	Amazon	Colombia	Caquetá	Florencia	La Dorada. Finca los Papiros
An02	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. San Marcos. Finca Santa Teresa
An03	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. San Marcos. Finca Santa Teresa
An04	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. San Marcos. Finca Santa Teresa
An05	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. San Marcos. Finca Santa Teresa
An06	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. San Marcos. Finca Santa Teresa
An07	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. San Marcos. Finca Santa Teresa
An08	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. San Marcos. Finca Santa Teresa
An09	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. San Marcos. Finca Santa Teresa
An10	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. San Marcos. Finca Santa Teresa
An11	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Playa Grande
An12	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Playa Grande
An13	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Playa Grande
An14	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Playa Grande
An15	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Playa Grande
An16	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Playa Grande
An17	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Playa Grande

An18	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Playa Grande
An19	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Playa Grande
An20	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Playa Grande
An21	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Playa Grande
An22	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Playa Grande
An23	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Playa Grande
An24	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Playa Grande
An25	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Playa Grande
An26	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Playa Grande
An27	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Playa Grande
An28	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Playa Grande
An29	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Playa Grande
An30	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Playa Grande
An31	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Playa Grande
An32	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Playa Grande
An33	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Playa Grande
An34	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Playa Grande
An35	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Playa Grande
An36	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Playa Grande
An37	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Playa Grande
An38	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Playa Grande
An39	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Playa Grande
An40	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Playa Grande
An41	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Playa Grande
An42	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Playa Grande
An43	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Playa Grande
An44	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Playa Grande
An45	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Playa Grande
An46	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Playa Grande
An47	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Playa Grande
An48	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Playa Grande
An49	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Playa Grande
An50	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Playa Grande
An51	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Playa Grande
An52	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Playa Grande
An55	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Tatabro
An57	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Tatabro
An59	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Zabaleta. Finca Alto Bonito
An61	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. San Marcos. Finca Santa Teresa
An62	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. San Marcos. Finca Santa Teresa
An63	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. San Marcos. Finca Santa Teresa
An64	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. San Marcos. Finca Santa Teresa

An65	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. San Marcos. Finca Santa Teresa
An66	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. San Marcos. Finca Santa Teresa
An67	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. San Marcos. Finca Santa Teresa
An68	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. San Marcos. Finca Santa Teresa
An72	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Playa Grande
BC02	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 1. Bajo Calima. Las Colonias. Finca la Camila
BC03	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 1. Bajo Calima. Las Colonias. Finca la Camila
BC12	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 1. Bajo Calima. Las Colonias. Finca la Camila
BC13	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 1. Bajo Calima. Las Colonias. Finca la Camila
BC15	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 1. Bajo Calima. Las Colonias. Finca el Esfuerzo
BC16	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 1. Bajo Calima. Las Colonias. Finca el Esfuerzo
BC17	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 1. Finca Odilio
BC19	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 1. Bajo Calima. Las Colonias. Finca la Camila
BC20	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 1. Bajo Calima. Las Colonias. Finca la Camila
BC21	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 1. Bajo Calima. Las Colonias. Finca la Camila
BC22	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 1. Bajo Calima. Las Colonias. Finca la Camila
BC23	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 1. Bajo Calima. Las Colonias. Finca la Camila
BC24	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 1. Bajo Calima. Las Colonias. Finca la Camila
L505	Amazon	Colombia	Caquetá	Florencia	La Dorada. Finca los Papiros
L191	Andes	Colombia	Cauca	El Tambo	Cuatroesquinas. La Sarde
L199	Andes	Colombia	Cauca	El Tambo	Cuatroesquinas. La Sarde
L200	Andes	Colombia	Cauca	El Tambo	Cuatroesquinas. La Sarde
L201	Andes	Colombia	Cauca	El Tambo	Cuatroesquinas. La Sarde
L202	Andes	Colombia	Cauca	El Tambo	Cuatroesquinas. La Sarde
L203	Andes	Colombia	Cauca	El Tambo	Cuatroesquinas. La Sarde
L204	Andes	Colombia	Cauca	El Tambo	Cuatroesquinas. La Sarde
L205	Andes	Colombia	Cauca	El Tambo	Cuatroesquinas. La Sarde
L206	Andes	Colombia	Cauca	El Tambo	Cuatroesquinas. La Sarde
L207	Andes	Colombia	Cauca	El Tambo	Cuatroesquinas. La Sarde
L208	Andes	Colombia	Cauca	El Tambo	Cuatroesquinas. San Roque
L209	Andes	Colombia	Cauca	El Tambo	Cuatroesquinas. San Roque
L210	Andes	Colombia	Cauca	El Tambo	Mosquera. Finca La Planada
L211	Andes	Colombia	Cauca	El Tambo	Mosquera. Finca La Planada
L212	Andes	Colombia	Cauca	El Tambo	Mosquera. Finca La Planada
L213	Andes	Colombia	Cauca	El Tambo	Mosquera. Finca La Planada
L214	Andes	Colombia	Cauca	El Tambo	Mosquera. Finca La Planada
L215	Andes	Colombia	Cauca	El Tambo	Mosquera. Finca La Planada
L216	Andes	Colombia	Cauca	El Tambo	Mosquera. Finca La Planada
L217	Andes	Colombia	Cauca	El Tambo	Mosquera. Finca La Planada
L218	Andes	Colombia	Cauca	El Tambo	Cuatroesquinas. Senda Magines. Finca la Lorena
L219	Andes	Colombia	Cauca	El Tambo	Cuatroesquinas. Senda Magines. Finca la Lorena
L220	Andes	Colombia	Cauca	El Tambo	Cuatroesquinas. Senda Magines. Finca la Lorena

L221	Andes	Colombia	Cauca	El Tambo	Cuatroesquinas. Senda Magines. Finca la Lorena
L222	Andes	Colombia	Cauca	El Tambo	Cuatroesquinas. Senda Magines. Finca la Lorena
L188	Pacific	Colombia	Nariño	San Andres de Tumaco	
L189	Pacific	Colombia	Nariño	San Andres de Tumaco	Finca Aurelio Figueroa
L190	Pacific	Colombia	Nariño	San Andres de Tumaco	Centro de Investigación el Mira, Agrosavia
L192	Pacific	Colombia	Risaralda	Pueblo Rico	Santa Cecilia
L193	Pacific	Colombia	Risaralda	Pueblo Rico	Santa Cecilia
L194	Pacific	Colombia	Risaralda	Pueblo Rico	Santa Cecilia
L195	Pacific	Colombia	Risaralda	Pueblo Rico	Santa Cecilia
L196	Pacific	Colombia	Risaralda	Pueblo Rico	Santa Cecilia
L197	Pacific	Colombia	Risaralda	Pueblo Rico	Santa Cecilia
L223	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Tatabro
L224	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Tatabro
L225	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Tatabro
L226	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Tatabro
L227	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Tatabro
L228	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Tatabro
L229	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Tatabro
L230	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Tatabro
L231	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Playa grande
L232	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Playa grande
L233	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Playa grande
L234	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Playa grande
L235	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Playa grande
L236	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Playa grande
L237	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Playa grande
L238	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Playa grande
L239	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Playa grande
L240	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Playa grande
L241	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Playa grande
L242	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Playa grande
L243	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Playa grande
L244	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Playa grande
L245	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Playa grande
L246	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Playa grande
L247	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Playa grande
L248	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Playa grande
L249	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Playa grande
L250	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Playa grande
L251	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Playa grande
L252	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Playa grande
L253	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Playa grande

L254	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Playa grande
L255	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Playa grande
L256	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Playa grande
L257	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Playa grande
L258	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Playa grande
L259	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Playa grande
L260	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Playa grande
L261	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Playa grande
L262	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Playa grande
L263	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Playa grande
L264	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Playa grande
L265	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Playa grande
L266	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Playa grande
L267	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Playa grande
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L293	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Playa grande
L294	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Playa grande
L295	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Playa grande

L296	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Playa grande
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L318	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Playa grande
L319	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Playa grande
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L326	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Playa grande
L327	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Playa grande
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L330	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Playa grande
L331	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Playa grande
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L334	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Playa grande
L335	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Playa grande
L336	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Playa grande
L337	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Playa grande

L338	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Playa grande
L339	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Playa grande
L340	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Playa grande
L341	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Playa grande
L342	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Playa grande
L343	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Playa grande
L344	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Playa grande
L345	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Playa grande
L346	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Playa grande
L347	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Playa grande
L348	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Playa grande
L349	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Playa grande
L350	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Playa grande
L351	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Playa grande
L352	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Playa grande
L353	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Playa grande
L354	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Playa grande
L355	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Playa grande
L356	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Playa grande
L357	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Playa grande
L358	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Playa grande
L359	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Playa grande
L360	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Playa grande
L361	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Playa grande
L362	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Playa grande
L363	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Playa grande
L364	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Playa grande
L365	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Playa grande
L366	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Playa grande
L367	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Playa grande
L368	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Playa grande
L369	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Playa grande
L370	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Playa grande
L371	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Playa grande
L372	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Playa grande
L373	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Playa grande
L374	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Playa grande
L375	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Playa grande
L376	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Playa grande
L377	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Playa grande
L378	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Playa grande
L379	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Playa grande

L380	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Playa grande
L381	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Playa grande
L382	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Playa grande
L383	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Playa grande
L384	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Playa grande
L385	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Playa grande
L386	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Playa grande
L387	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Playa grande
L388	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Playa grande
L389	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Playa grande
L390	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Playa grande
L391	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Playa grande
L392	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Playa grande
L393	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Playa grande
L394	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Playa grande
L395	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Playa grande
L396	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Playa grande
L397	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Playa grande
L398	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Playa grande
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L401	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Playa grande
L402	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Playa grande
L403	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Playa grande
L404	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Playa grande
L405	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Playa grande
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L408	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Playa grande
L409	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Playa grande
L410	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Playa grande
L411	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Playa grande
L412	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. San Marcos. Finca Santa Teresa
L413	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. San Marcos. Finca Santa Teresa
L414	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. San Marcos. Finca Santa Teresa
L415	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. San Marcos. Finca Santa Teresa
L416	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. San Marcos. Finca Santa Teresa
L417	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. San Marcos. Finca Santa Teresa
L418	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. San Marcos. Finca Santa Teresa
L419	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. San Marcos. Finca Santa Teresa
L420	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. San Marcos. Finca Santa Teresa
L421	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. San Marcos. Finca Santa Teresa

L422	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. San Marcos. Finca Santa Teresa
L423	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. San Marcos. Finca Santa Teresa
L424	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. San Marcos. Finca Santa Teresa
L425	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. San Marcos. Finca Santa Teresa
L426	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. San Marcos. Finca Santa Teresa
L427	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. San Marcos. Finca Santa Teresa
L428	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. San Marcos. Finca Santa Teresa
L429	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. San Marcos. Finca Santa Teresa
L430	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. San Marcos. Finca Santa Teresa
L431	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. San Marcos. Finca Santa Teresa
L432	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. San Marcos. Finca Santa Teresa
L433	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. San Marcos. Finca Santa Teresa
L434	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. San Marcos. Finca Santa Teresa
L435	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. San Marcos. Finca Santa Teresa
L436	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. San Marcos. Finca Santa Teresa
L437	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. San Marcos. Finca Santa Teresa
L438	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. San Marcos. Finca Santa Teresa
L439	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. San Marcos. Finca Santa Teresa
L440	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. San Marcos. Finca Santa Teresa
L441	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. San Marcos. Finca Santa Teresa
L442	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. San Marcos. Finca Santa Teresa
L443	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. San Marcos. Finca Santa Teresa
L444	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. San Marcos. Finca Santa Teresa
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L448	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. San Marcos. Finca Santa Teresa
L449	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. San Marcos. Finca Santa Teresa
L450	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. San Marcos. Finca Santa Teresa
L451	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. San Marcos. Finca Santa Teresa
L452	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. San Marcos. Finca Santa Teresa
L453	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. San Marcos. Finca Santa Teresa
L454	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. San Marcos. Finca Santa Teresa
L455	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. San Marcos. Finca Santa Teresa
L456	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. San Marcos. Finca Santa Teresa
L457	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. San Marcos. Finca Santa Teresa
L458	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. San Marcos. Finca Santa Teresa
L459	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. San Marcos. Finca Santa Teresa
L460	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 8. San Marcos. Finca Santa Teresa
L461	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 1. Bajo Calima. Las Colonias. Finca el Esfuerzo
L462	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 1. Bajo Calima. Las Colonias. Finca el Esfuerzo
L463	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 1. Bajo Calima. Las Colonias. Finca el Esfuerzo

L464	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 1. Bajo Calima. Las Colonias. Finca el Esfuerzo
L465	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 1. Bajo Calima. Las Colonias. Finca el Esfuerzo
L466	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 1. Bajo Calima. Las Colonias. Finca el Esfuerzo
L467	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 1. Bajo Calima. Las Colonias. Finca el Esfuerzo
L468	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 1. Bajo Calima. Las Colonias. Finca el Esfuerzo
L469	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 1. Bajo Calima. Las Colonias. Finca el Esfuerzo
L470	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 1. Bajo Calima. Las Colonias. Finca el Esfuerzo
L471	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 1. Bajo Calima. Las Colonias. Finca el Esfuerzo
L472	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 1. Bajo Calima. Las Colonias. Finca el Esfuerzo
L473	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 1. Bajo Calima. Las Colonias. Finca el Esfuerzo
L474	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 1. Bajo Calima. Las Colonias. Finca el Esfuerzo
L475	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 1. Bajo Calima. Las Colonias. Finca el Esfuerzo
L476	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 1. Bajo Calima. Las Colonias. Finca el Esfuerzo
L477	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 1. Bajo Calima. Las Colonias. Finca el Esfuerzo
L478	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 1. Bajo Calima. Las Colonias. Finca el Esfuerzo
L479	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 1. Bajo Calima. Las Colonias. Finca el Esfuerzo
L480	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 1. Bajo Calima. Las Colonias. Finca el Esfuerzo
L481	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 1. Bajo Calima. Las Colonias. Finca el Esfuerzo
L482	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 1. Bajo Calima. Las Colonias. Finca el Esfuerzo
L483	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 1. Bajo Calima. Las Colonias. Finca el Esfuerzo
L484	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 1. Bajo Calima. Las Colonias. Finca el Esfuerzo
L485	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 1. Bajo Calima. Las Colonias. Finca el Esfuerzo
L486	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 1. Bajo Calima. Las Colonias. Finca el Esfuerzo
L487	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 1. Bajo Calima. Las Colonias. Finca el Esfuerzo
L488	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 1. Bajo Calima. Las Colonias. Finca el Esfuerzo
L489	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 1. Bajo Calima. Las Colonias. Finca el Esfuerzo
L490	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 1. Bajo Calima. Las Colonias. Finca el Esfuerzo
L491	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 1. Bajo Calima. Las Colonias. Finca el Esfuerzo
L492	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 1. Bajo Calima. Las Colonias. Finca el Esfuerzo
L493	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 1. Bajo Calima. Las Colonias. Finca el Esfuerzo
L494	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 1. Bajo Calima. Las Colonias. Finca el Esfuerzo
L495	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 1. Bajo Calima. Las Colonias. Finca el Esfuerzo
L496	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 1. Bajo Calima. Las Colonias. Finca el Esfuerzo
L497	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 1. Bajo Calima. Las Colonias. Finca el Esfuerzo
L498	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 1. Bajo Calima. Las Colonias. Finca el Esfuerzo
L499	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 1. Bajo Calima. Las Colonias. Finca el Esfuerzo
L500	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 1. Bajo Calima. Las Colonias. Finca el Esfuerzo
L501	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 1. Bajo Calima. Las Colonias. Finca la Camila
L502	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 1. Bajo Calima. Las Colonias. Finca la Camila
L503	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 1. Bajo Calima. Las Colonias. Finca la Camila
L504	Pacific	Colombia	Valle del Cauca	Buenaventura	Corregimiento 1. Finca Odilio Clavijo

Table S2. (contd)

ID	Latitude	Longitude	Event Date	Host	Species	Stage
Cq01	1.7257	-75.6558	8/02/2019	Inside the stem of Bactris gasipaes	*Dynamis borassi*	Adult
Ca45	2.3518	-76.8937	1/12/2018	Inside the stem of Bactris gasipaes	*Dynamis borassi*	Adult
Ca46	2.3518	-76.8937	1/12/2018	Inside the stem of Bactris gasipaes	*Dynamis borassi*	Adult
Ca49	2.4005	-76.8462	29/11/2018	Inside the stem of Bactris gasipaes	*Dynamis borassi*	Adult
An01	3.6905	-76.9474	5/07/2018	Inside the stem of Bactris gasipaes	*Dynamis borassi*	Adult
An53	3.6905	-76.9474	5/07/2018	Inside the stem of Bactris gasipaes	*Dynamis borassi*	Adult
An54	3.6905	-76.9474	5/07/2018	Inside the stem of Bactris gasipaes	*Dynamis borassi*	Adult
An56	3.6905	-76.9474	5/07/2018	Inside the stem of Bactris gasipaes	*Dynamis borassi*	Adult
An58	3.6905	-76.9474	5/07/2018	Inside the stem of Bactris gasipaes	*Dynamis borassi*	Adult
An60	3.7084	-76.9522	30/06/2018	Inside the stem of Bactris gasipaes	*Dynamis borassi*	Adult
BC01	3.9536	-76.9764	1/06/2018	Inside the stem of Bactris gasipaes	*Dynamis borassi*	Adult
BC04	3.957032	-76.993824	3/06/2018	Inside the stem of Bactris gasipaes	*Dynamis borassi*	Adult
BC05	3.9826	-76.9804	31/05/2018	Inside the stem of Bactris gasipaes	*Dynamis borassi*	Adult
BC06	4.0078	-76.9916	7/06/2018	Inside the stem of Bactris gasipaes	*Dynamis borassi*	Adult
BC07	4.0078	-76.9916	7/06/2018	Inside the stem of Bactris gasipaes	*Dynamis borassi*	Adult
BC08	3.9894	-76.9780	4/06/2018	Inside the stem of Bactris gasipaes	*Dynamis borassi*	Adult
BC09	3.9894	-76.9780	4/06/2018	Inside the stem of Bactris gasipaes	*Dynamis borassi*	Adult
BC10	3.9894	-76.9780	4/06/2018	Inside the stem of Bactris gasipaes	*Dynamis borassi*	Adult
BC11	3.9894	-76.9780	4/06/2018	Inside the stem of Bactris gasipaes	*Dynamis borassi*	Adult
BC14	4.0078	-76.9916	7/06/2018	Inside the stem of Bactris gasipaes	*Dynamis borassi*	Adult
BC18	3.9826	-76.9804	31/05/2018	Inside the stem of Bactris gasipaes	*Dynamis borassi*	Adult
Cq03	1.7257	-75.6558	8/02/2019	Inside the stem of Bactris gasipaes	*Rhynchophorus palmarum*	Adult
An02	3.7084	-76.9522	30/06/2018	Inside the stem of Bactris gasipaes	*Rhynchophorus palmarum*	Adult
An03	3.7084	-76.9522	30/06/2018	Inside the stem of Bactris gasipaes	*Rhynchophorus palmarum*	Adult
An04	3.7084	-76.9522	30/06/2018	Inside the stem of Bactris gasipaes	*Rhynchophorus palmarum*	Adult
An05	3.7084	-76.9522	30/06/2018	Inside the stem of Bactris gasipaes	*Rhynchophorus palmarum*	Adult
An06	3.7084	-76.9522	30/06/2018	Inside the stem of Bactris gasipaes	*Rhynchophorus palmarum*	Adult
An07	3.7084	-76.9522	30/06/2018	Inside the stem of Bactris gasipaes	*Rhynchophorus palmarum*	Adult
An08	3.7084	-76.9522	30/06/2018	Inside the stem of Bactris gasipaes	*Rhynchophorus palmarum*	Adult
An09	3.7084	-76.9522	30/06/2018	Inside the stem of Bactris gasipaes	*Rhynchophorus palmarum*	Adult
An10	3.7084	-76.9522	30/06/2018	Inside the stem of Bactris gasipaes	*Rhynchophorus palmarum*	Adult
An11	3.6878	-76.9591	28/06/2018	Inside the stem of Bactris gasipaes	*Rhynchophorus palmarum*	Adult
An12	3.6878	-76.9591	28/06/2018	Inside the stem of Bactris gasipaes	*Rhynchophorus palmarum*	Adult
An13	3.6878	-76.9591	28/06/2018	Inside the stem of Bactris gasipaes	*Rhynchophorus palmarum*	Adult
An14	3.6878	-76.9591	28/06/2018	Inside the stem of Bactris gasipaes	*Rhynchophorus palmarum*	Adult
An15	3.6878	-76.9591	28/06/2018	Inside the stem of Bactris gasipaes	*Rhynchophorus palmarum*	Adult
An16	3.6878	-76.9591	28/06/2018	Inside the stem of Bactris gasipaes	*Rhynchophorus palmarum*	Adult
An17	3.6878	-76.9591	28/06/2018	Inside the stem of Bactris gasipaes	*Rhynchophorus palmarum*	Adult

An18	3.6878	-76.9591	28/06/2018	Inside the stem of Bactris gasipaes	*Rhynchophorus palmarum*	Adult
An19	3.6878	-76.9591	28/06/2018	Inside the stem of Bactris gasipaes	*Rhynchophorus palmarum*	Adult
An20	3.6878	-76.9591	28/06/2018	Inside the stem of Bactris gasipaes	*Rhynchophorus palmarum*	Adult
An21	3.6878	-76.9591	28/06/2018	Inside the stem of Bactris gasipaes	*Rhynchophorus palmarum*	Adult
An22	3.6878	-76.9591	28/06/2018	Inside the stem of Bactris gasipaes	*Rhynchophorus palmarum*	Adult
An23	3.6878	-76.9591	28/06/2018	Inside the stem of Bactris gasipaes	*Rhynchophorus palmarum*	Adult
An24	3.6878	-76.9591	28/06/2018	Inside the stem of Bactris gasipaes	*Rhynchophorus palmarum*	Adult
An25	3.6878	-76.9591	28/06/2018	Inside the stem of Bactris gasipaes	*Rhynchophorus palmarum*	Adult
An26	3.6878	-76.9591	28/06/2018	Inside the stem of Bactris gasipaes	*Rhynchophorus palmarum*	Adult
An27	3.6878	-76.9591	28/06/2018	Inside the stem of Bactris gasipaes	*Rhynchophorus palmarum*	Adult
An28	3.6878	-76.9591	28/06/2018	Inside the stem of Bactris gasipaes	*Rhynchophorus palmarum*	Adult
An29	3.6878	-76.9591	28/06/2018	Inside the stem of Bactris gasipaes	*Rhynchophorus palmarum*	Adult
An30	3.6878	-76.9591	28/06/2018	Inside the stem of Bactris gasipaes	*Rhynchophorus palmarum*	Adult
An31	3.6878	-76.9591	28/06/2018	Inside the stem of Bactris gasipaes	*Rhynchophorus palmarum*	Adult
An32	3.6878	-76.9591	28/06/2018	Inside the stem of Bactris gasipaes	*Rhynchophorus palmarum*	Adult
An33	3.6878	-76.9591	28/06/2018	Inside the stem of Bactris gasipaes	*Rhynchophorus palmarum*	Adult
An34	3.6878	-76.9591	28/06/2018	Inside the stem of Bactris gasipaes	*Rhynchophorus palmarum*	Adult
An35	3.6878	-76.9591	28/06/2018	Inside the stem of Bactris gasipaes	*Rhynchophorus palmarum*	Adult
An36	3.6878	-76.9591	28/06/2018	Inside the stem of Bactris gasipaes	*Rhynchophorus palmarum*	Adult
An37	3.6878	-76.9591	28/06/2018	Inside the stem of Bactris gasipaes	*Rhynchophorus palmarum*	Adult
An38	3.6878	-76.9591	28/06/2018	Inside the stem of Bactris gasipaes	*Rhynchophorus palmarum*	Adult
An39	3.6878	-76.9591	28/06/2018	Inside the stem of Bactris gasipaes	*Rhynchophorus palmarum*	Adult
An40	3.6878	-76.9591	28/06/2018	Inside the stem of Bactris gasipaes	*Rhynchophorus palmarum*	Adult
An41	3.6878	-76.9591	28/06/2018	Inside the stem of Bactris gasipaes	*Rhynchophorus palmarum*	Adult
An42	3.6878	-76.9591	28/06/2018	Inside the stem of Bactris gasipaes	*Rhynchophorus palmarum*	Adult
An43	3.6878	-76.9591	28/06/2018	Inside the stem of Bactris gasipaes	*Rhynchophorus palmarum*	Adult
An44	3.6878	-76.9591	28/06/2018	Inside the stem of Bactris gasipaes	*Rhynchophorus palmarum*	Adult
An45	3.6878	-76.9591	28/06/2018	Inside the stem of Bactris gasipaes	*Rhynchophorus palmarum*	Adult
An46	3.6878	-76.9591	28/06/2018	Inside the stem of Bactris gasipaes	*Rhynchophorus palmarum*	Adult
An47	3.6878	-76.9591	28/06/2018	Inside the stem of Bactris gasipaes	*Rhynchophorus palmarum*	Adult
An48	3.6878	-76.9591	28/06/2018	Inside the stem of Bactris gasipaes	*Rhynchophorus palmarum*	Adult
An49	3.6878	-76.9591	28/06/2018	Inside the stem of Bactris gasipaes	*Rhynchophorus palmarum*	Adult
An50	3.6878	-76.9591	28/06/2018	Inside the stem of Bactris gasipaes	*Rhynchophorus palmarum*	Adult
An51	3.6878	-76.9591	28/06/2018	Inside the stem of Bactris gasipaes	*Rhynchophorus palmarum*	Adult
An52	3.6878	-76.9591	28/06/2018	Inside the stem of Bactris gasipaes	*Rhynchophorus palmarum*	Adult
An55	3.6905	-76.9474	5/07/2018	Inside the stem of Bactris gasipaes	*Rhynchophorus palmarum*	Adult
An57	3.6905	-76.9474	5/07/2018	Inside the stem of Bactris gasipaes	*Rhynchophorus palmarum*	Adult
An59	3.7629	-76.9632	1/07/2018	Inside the stem of Bactris gasipaes	*Rhynchophorus palmarum*	Adult
An61	3.7084	-76.9522	30/06/2018	Inside the stem of Bactris gasipaes	*Rhynchophorus palmarum*	Adult
An62	3.7084	-76.9522	30/06/2018	Inside the stem of Bactris gasipaes	*Rhynchophorus palmarum*	Adult
An63	3.7084	-76.9522	30/06/2018	Inside the stem of Bactris gasipaes	*Rhynchophorus palmarum*	Adult
An64	3.7084	-76.9522	30/06/2018	Inside the stem of Bactris gasipaes	*Rhynchophorus palmarum*	Adult

An65	3.7084	-76.9522	30/06/2018	Inside the stem of Bactris gasipaes	*Rhynchophorus palmarum*	Adult
An66	3.7084	-76.9522	30/06/2018	Inside the stem of Bactris gasipaes	*Rhynchophorus palmarum*	Adult
An67	3.7084	-76.9522	30/06/2018	Inside the stem of Bactris gasipaes	*Rhynchophorus palmarum*	Adult
An68	3.7084	-76.9522	30/06/2018	Inside the stem of Bactris gasipaes	*Rhynchophorus palmarum*	Adult
An72	3.6878	-76.9591	2/07/2018	Inside the stem of Bactris gasipaes	*Rhynchophorus palmarum*	Adult
BC02	3.9826	-76.9804	31/05/2018	Inside the stem of Bactris gasipaes	*Rhynchophorus palmarum*	Adult
BC03	3.9826	-76.9804	31/05/2018	Inside the stem of Bactris gasipaes	*Rhynchophorus palmarum*	Adult
BC12	3.9826	-76.9804	31/05/2018	Inside the stem of Bactris gasipaes	*Rhynchophorus palmarum*	Adult
BC13	3.9826	-76.9804	31/05/2018	Inside the stem of Bactris gasipaes	*Rhynchophorus palmarum*	Adult
BC15	4.0078	-76.9916	7/06/2018	Inside the stem of Bactris gasipaes	*Rhynchophorus palmarum*	Adult
BC16	4.0078	-76.9916	7/06/2018	Inside the stem of Bactris gasipaes	*Rhynchophorus palmarum*	Adult
BC17	3.9894	-76.9780	4/06/2018	Inside the stem of Bactris gasipaes	*Rhynchophorus palmarum*	Adult
BC19	3.9826	-76.9804	31/05/2018	Inside the stem of Bactris gasipaes	*Rhynchophorus palmarum*	Adult
BC20	3.9826	-76.9804	31/05/2018	Inside the stem of Bactris gasipaes	*Rhynchophorus palmarum*	Adult
BC21	3.9826	-76.9804	31/05/2018	Inside the stem of Bactris gasipaes	*Rhynchophorus palmarum*	Adult
BC22	3.9826	-76.9804	31/05/2018	Inside the stem of Bactris gasipaes	*Rhynchophorus palmarum*	Adult
BC23	3.9826	-76.9804	31/05/2018	Inside the stem of Bactris gasipaes	*Rhynchophorus palmarum*	Adult
BC24	3.9826	-76.9804	3/06/2018	Inside the stem of Bactris gasipaes	*Rhynchophorus palmarum*	Adult
L505	1.7257	-75.6558	8/02/2019	In inflorescence of Bactris gasipaes	Dynamis borassi	Larva
L191	2.4005	-76.8462	26/03/2018	In inflorescence of Bactris gasipaes	Dynamis borassi	Larva
L199	2.4005	-76.8462	29/11/2018	In inflorescence of Bactris gasipaes	Dynamis borassi	Larva
L200	2.4005	-76.8462	29/11/2018	In inflorescence of Bactris gasipaes	Dynamis borassi	Larva
L201	2.4005	-76.8462	29/11/2018	In inflorescence of Bactris gasipaes	Dynamis borassi	Larva
L202	2.4005	-76.8462	29/11/2018	In inflorescence of Bactris gasipaes	Dynamis borassi	Larva
L203	2.4005	-76.8462	29/11/2018	In inflorescence of Bactris gasipaes	Dynamis borassi	Larva
L204	2.4005	-76.8462	29/11/2018	In inflorescence of Bactris gasipaes	Dynamis borassi	Larva
L205	2.4005	-76.8462	29/11/2018	In inflorescence of Bactris gasipaes	Dynamis borassi	Larva
L206	2.4005	-76.8462	29/11/2018	In inflorescence of Bactris gasipaes	Dynamis borassi	Larva
L207	2.4005	-76.8462	29/11/2018	In inflorescence of Bactris gasipaes	Dynamis borassi	Larva
L208	2.4097	-76.8230	30/11/2018	In inflorescence of Bactris gasipaes	Dynamis borassi	Larva
L209	2.4097	-76.8230	30/11/2018	In inflorescence of Bactris gasipaes	Dynamis borassi	Larva
L210	2.3518	-76.8937	1/12/2018	In inflorescence of Bactris gasipaes	Dynamis borassi	Larva
L211	2.3518	-76.8937	1/12/2018	In inflorescence of Bactris gasipaes	Dynamis borassi	Larva
L212	2.3518	-76.8937	1/12/2018	In inflorescence of Bactris gasipaes	Dynamis borassi	Larva
L213	2.3518	-76.8937	1/12/2018	In inflorescence of Bactris gasipaes	Dynamis borassi	Larva
L214	2.3518	-76.8937	1/12/2018	In inflorescence of Bactris gasipaes	Dynamis borassi	Larva
L215	2.3518	-76.8937	1/12/2018	In inflorescence of Bactris gasipaes	Dynamis borassi	Larva
L216	2.3518	-76.8937	1/12/2018	In inflorescence of Bactris gasipaes	Dynamis borassi	Larva
L217	2.3518	-76.8937	1/12/2018	In inflorescence of Bactris gasipaes	Dynamis borassi	Larva
L218	2.4008	-76.8487	29/11/2018	In inflorescence of Bactris gasipaes	Dynamis borassi	Larva
L219	2.4008	-76.8487	29/11/2018	In inflorescence of Bactris gasipaes	Dynamis borassi	Larva
L220	2.4008	-76.8487	29/11/2018	In inflorescence of Bactris gasipaes	Dynamis borassi	Larva

L221	2.4008	-76.8487	29/11/2018	In inflorescence of Bactris gasipaes	Dynamis borassi	Larva
L222	2.4008	-76.8487	29/11/2018	In inflorescence of Bactris gasipaes	Dynamis borassi	Larva
L188	1.5569	-78.6972	15/02/2019	In inflorescence of Bactris gasipaes	Dynamis borassi	Larva
L189	1.5360	-78.7023	15/02/2019	In inflorescence of Bactris gasipaes	Dynamis borassi	Larva
L190	1.5569	-78.6972	14/02/2019	In inflorescence of Bactris gasipaes	Dynamis borassi	Larva
L192	5.3408	-76.1493	30/11/2017	In inflorescence of Bactris gasipaes	Dynamis borassi	Larva
L193	5.3408	-76.1493	30/11/2017	In inflorescence of Bactris gasipaes	Dynamis borassi	Larva
L194	5.3408	-76.1493	28/11/2017	In inflorescence of Bactris gasipaes	Dynamis borassi	Larva
L195	5.3408	-76.1493	28/11/2017	In inflorescence of Bactris gasipaes	Dynamis borassi	Larva
L196	5.3408	-76.1493	28/11/2017	In inflorescence of Bactris gasipaes	Dynamis borassi	Larva
L197	5.3408	-76.1493	28/11/2017	In inflorescence of Bactris gasipaes	Dynamis borassi	Larva
L223	3.6905	-769474	5/07/2018	In inflorescence of Bactris gasipaes	Dynamis borassi	Larva
L224	3.6905	-769474	5/07/2018	In inflorescence of Bactris gasipaes	Dynamis borassi	Larva
L225	3.6905	-769474	5/07/2018	In inflorescence of Bactris gasipaes	Dynamis borassi	Larva
L226	3.6905	-769474	5/07/2018	In inflorescence of Bactris gasipaes	Dynamis borassi	Larva
L227	3.6905	-769474	5/07/2018	In inflorescence of Bactris gasipaes	Dynamis borassi	Larva
L228	3.6905	-769474	5/07/2018	In inflorescence of Bactris gasipaes	Dynamis borassi	Larva
L229	3.6905	-769474	5/07/2018	In inflorescence of Bactris gasipaes	Dynamis borassi	Larva
L230	3.6905	-769474	5/07/2018	In inflorescence of Bactris gasipaes	Dynamis borassi	Larva
L231	3.6878	-769591	28/06/2018	Inside the stem of Bactris gasipaes	Rhynchophorus palmarum	Larva
L232	3.6878	-769591	28/06/2018	Inside the stem of Bactris gasipaes	Rhynchophorus palmarum	Larva
L233	3.6878	-769591	28/06/2018	Inside the stem of Bactris gasipaes	Rhynchophorus palmarum	Larva
L234	3.6878	-769591	28/06/2018	Inside the stem of Bactris gasipaes	Rhynchophorus palmarum	Larva
L235	3.6878	-769591	28/06/2018	Inside the stem of Bactris gasipaes	Rhynchophorus palmarum	Larva
L236	3.6878	-769591	28/06/2018	Inside the stem of Bactris gasipaes	Rhynchophorus palmarum	Larva
L237	3.6878	-769591	28/06/2018	Inside the stem of Bactris gasipaes	Rhynchophorus palmarum	Larva
L238	3.6878	-769591	28/06/2018	Inside the stem of Bactris gasipaes	Rhynchophorus palmarum	Larva
L239	3.6878	-769591	28/06/2018	Inside the stem of Bactris gasipaes	Rhynchophorus palmarum	Larva
L240	3.6878	-769591	28/06/2018	Inside the stem of Bactris gasipaes	Rhynchophorus palmarum	Larva
L241	3.6878	-769591	28/06/2018	Inside the stem of Bactris gasipaes	Rhynchophorus palmarum	Larva
L242	3.6878	-769591	28/06/2018	Inside the stem of Bactris gasipaes	Rhynchophorus palmarum	Larva
L243	3.6878	-769591	28/06/2018	Inside the stem of Bactris gasipaes	Rhynchophorus palmarum	Larva
L244	3.6878	-769591	28/06/2018	Inside the stem of Bactris gasipaes	Rhynchophorus palmarum	Larva
L245	3.6878	-769591	28/06/2018	Inside the stem of Bactris gasipaes	Rhynchophorus palmarum	Larva
L246	3.6878	-769591	28/06/2018	Inside the stem of Bactris gasipaes	Rhynchophorus palmarum	Larva
L247	3.6878	-769591	28/06/2018	Inside the stem of Bactris gasipaes	Rhynchophorus palmarum	Larva
L248	3.6878	-769591	28/06/2018	Inside the stem of Bactris gasipaes	Rhynchophorus palmarum	Larva
L249	3.6878	-769591	28/06/2018	Inside the stem of Bactris gasipaes	Rhynchophorus palmarum	Larva
L250	3.6878	-769591	28/06/2018	Inside the stem of Bactris gasipaes	Rhynchophorus palmarum	Larva
L251	3.6878	-769591	28/06/2018	Inside the stem of Bactris gasipaes	Rhynchophorus palmarum	Larva
L252	3.6878	-769591	28/06/2018	Inside the stem of Bactris gasipaes	Rhynchophorus palmarum	Larva
L253	3.6878	-769591	28/06/2018	Inside the stem of Bactris gasipaes	Rhynchophorus palmarum	Larva

L254	3.6878	-769591	2/07/2018	Inside the stem of Bactris gasipaes	Rhynchophorus palmarum	Larva
L255	3.6878	-769591	2/07/2018	Inside the stem of Bactris gasipaes	Rhynchophorus palmarum	Larva
L256	3.6878	-769591	2/07/2018	Inside the stem of Bactris gasipaes	Rhynchophorus palmarum	Larva
L257	3.6878	-769591	2/07/2018	Inside the stem of Bactris gasipaes	Rhynchophorus palmarum	Larva
L258	3.6878	-769591	2/07/2018	Inside the stem of Bactris gasipaes	Rhynchophorus palmarum	Larva
L259	3.6878	-769591	2/07/2018	Inside the stem of Bactris gasipaes	Rhynchophorus palmarum	Larva
L260	3.6878	-769591	2/07/2018	Inside the stem of Bactris gasipaes	Rhynchophorus palmarum	Larva
L261	3.6878	-769591	2/07/2018	Inside the stem of Bactris gasipaes	Rhynchophorus palmarum	Larva
L262	3.6878	-769591	2/07/2018	Inside the stem of Bactris gasipaes	Rhynchophorus palmarum	Larva
L263	3.6878	-769591	2/07/2018	Inside the stem of Bactris gasipaes	Rhynchophorus palmarum	Larva
L264	3.6878	-769591	2/07/2018	Inside the stem of Bactris gasipaes	Rhynchophorus palmarum	Larva
L265	3.6878	-769591	2/07/2018	Inside the stem of Bactris gasipaes	Rhynchophorus palmarum	Larva
L266	3.6878	-769591	2/07/2018	Inside the stem of Bactris gasipaes	Rhynchophorus palmarum	Larva
L267	3.6878	-769591	2/07/2018	Inside the stem of Bactris gasipaes	Rhynchophorus palmarum	Larva
L268	3.6878	-769591	2/07/2018	Inside the stem of Bactris gasipaes	Rhynchophorus palmarum	Larva
L269	3.6878	-769591	2/07/2018	Inside the stem of Bactris gasipaes	Rhynchophorus palmarum	Larva
L270	3.6878	-769591	2/07/2018	Inside the stem of Bactris gasipaes	Rhynchophorus palmarum	Larva
L271	3.6878	-769591	2/07/2018	Inside the stem of Bactris gasipaes	Rhynchophorus palmarum	Larva
L272	3.6878	-769591	2/07/2018	Inside the stem of Bactris gasipaes	Rhynchophorus palmarum	Larva
L273	3.6878	-769591	2/07/2018	Inside the stem of Bactris gasipaes	Rhynchophorus palmarum	Larva
L274	3.6878	-769591	2/07/2018	Inside the stem of Bactris gasipaes	Rhynchophorus palmarum	Larva
L275	3.6878	-769591	2/07/2018	Inside the stem of Bactris gasipaes	Rhynchophorus palmarum	Larva
L276	3.6878	-769591	2/07/2018	Inside the stem of Bactris gasipaes	Rhynchophorus palmarum	Larva
L277	3.6878	-769591	2/07/2018	Inside the stem of Bactris gasipaes	Rhynchophorus palmarum	Larva
L278	3.6878	-769591	2/07/2018	Inside the stem of Bactris gasipaes	Rhynchophorus palmarum	Larva
L279	3.6878	-769591	2/07/2018	Inside the stem of Bactris gasipaes	Rhynchophorus palmarum	Larva
L280	3.6878	-769591	2/07/2018	Inside the stem of Bactris gasipaes	Rhynchophorus palmarum	Larva
L281	3.6878	-769591	2/07/2018	Inside the stem of Bactris gasipaes	Rhynchophorus palmarum	Larva
L282	3.6878	-769591	2/07/2018	Inside the stem of Bactris gasipaes	Rhynchophorus palmarum	Larva
L283	3.6878	-769591	2/07/2018	Inside the stem of Bactris gasipaes	Rhynchophorus palmarum	Larva
L284	3.6878	-769591	2/07/2018	Inside the stem of Bactris gasipaes	Rhynchophorus palmarum	Larva
L285	3.6878	-769591	2/07/2018	Inside the stem of Bactris gasipaes	Rhynchophorus palmarum	Larva
L286	3.6878	-769591	2/07/2018	Inside the stem of Bactris gasipaes	Rhynchophorus palmarum	Larva
L287	3.6878	-769591	2/07/2018	Inside the stem of Bactris gasipaes	Rhynchophorus palmarum	Larva
L288	3.6878	-769591	2/07/2018	Inside the stem of Bactris gasipaes	Rhynchophorus palmarum	Larva
L289	3.6878	-769591	2/07/2018	Inside the stem of Bactris gasipaes	Rhynchophorus palmarum	Larva
L290	3.6878	-769591	2/07/2018	Inside the stem of Bactris gasipaes	Rhynchophorus palmarum	Larva
L291	3.6878	-769591	2/07/2018	Inside the stem of Bactris gasipaes	Rhynchophorus palmarum	Larva
L292	3.6878	-769591	2/07/2018	Inside the stem of Bactris gasipaes	Rhynchophorus palmarum	Larva
L293	3.6878	-769591	2/07/2018	Inside the stem of Bactris gasipaes	Rhynchophorus palmarum	Larva
L294	3.6878	-769591	2/07/2018	Inside the stem of Bactris gasipaes	Rhynchophorus palmarum	Larva
L295	3.6878	-769591	2/07/2018	Inside the stem of Bactris gasipaes	Rhynchophorus palmarum	Larva

L296	3.6878	-769591	2/07/2018	Inside the stem of Bactris gasipaes	Rhynchophorus palmarum	Larva
L297	3.6878	-769591	2/07/2018	Inside the stem of Bactris gasipaes	Rhynchophorus palmarum	Larva
L298	3.6878	-769591	2/07/2018	Inside the stem of Bactris gasipaes	Rhynchophorus palmarum	Larva
L299	3.6878	-769591	2/07/2018	Inside the stem of Bactris gasipaes	Rhynchophorus palmarum	Larva
L300	3.6878	-769591	2/07/2018	Inside the stem of Bactris gasipaes	Rhynchophorus palmarum	Larva
L301	3.6878	-769591	2/07/2018	Inside the stem of Bactris gasipaes	Rhynchophorus palmarum	Larva
L302	3.6878	-769591	2/07/2018	Inside the stem of Bactris gasipaes	Rhynchophorus palmarum	Larva
L303	3.6878	-769591	2/07/2018	Inside the stem of Bactris gasipaes	Rhynchophorus palmarum	Larva
L304	3.6878	-769591	2/07/2018	Inside the stem of Bactris gasipaes	Rhynchophorus palmarum	Larva
L305	3.6878	-769591	2/07/2018	Inside the stem of Bactris gasipaes	Rhynchophorus palmarum	Larva
L306	3.6878	-769591	2/07/2018	Inside the stem of Bactris gasipaes	Rhynchophorus palmarum	Larva
L307	3.6878	-769591	2/07/2018	Inside the stem of Bactris gasipaes	Rhynchophorus palmarum	Larva
L308	3.6878	-769591	2/07/2018	Inside the stem of Bactris gasipaes	Rhynchophorus palmarum	Larva
L309	3.6878	-769591	2/07/2018	Inside the stem of Bactris gasipaes	Rhynchophorus palmarum	Larva
L310	3.6878	-769591	2/07/2018	Inside the stem of Bactris gasipaes	Rhynchophorus palmarum	Larva
L311	3.6878	-769591	2/07/2018	Inside the stem of Bactris gasipaes	Rhynchophorus palmarum	Larva
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L481	4.0078	-76.9916	7/06/2018	Inside the stem of Bactris gasipaes	Rhynchophorus palmarum	Larva
L482	4.0078	-76.9916	7/06/2018	Inside the stem of Bactris gasipaes	Rhynchophorus palmarum	Larva
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L492	4.0078	-76.9916	7/06/2018	Inside the stem of Bactris gasipaes	Rhynchophorus palmarum	Larva
L493	4.0078	-76.9916	7/06/2018	Inside the stem of Bactris gasipaes	Rhynchophorus palmarum	Larva
L494	4.0078	-76.9916	7/06/2018	Inside the stem of Bactris gasipaes	Rhynchophorus palmarum	Larva
L495	4.0078	-76.9916	7/06/2018	Inside the stem of Bactris gasipaes	Rhynchophorus palmarum	Larva
L496	4.0078	-76.9916	7/06/2018	Inside the stem of Bactris gasipaes	Rhynchophorus palmarum	Larva
L497	4.0078	-76.9916	7/06/2018	Inside the stem of Bactris gasipaes	Rhynchophorus palmarum	Larva
L498	4.0078	-76.9916	7/06/2018	Inside the stem of Bactris gasipaes	Rhynchophorus palmarum	Larva
L499	4.0078	-76.9916	7/06/2018	Inside the stem of Bactris gasipaes	Rhynchophorus palmarum	Larva
L500	4.0078	-76.9916	7/06/2018	Inside the stem of Bactris gasipaes	Rhynchophorus palmarum	Larva
L501	3.9826	-76.9804	3/06/2018	Inside the stem of Bactris gasipaes	Rhynchophorus palmarum	Larva
L502	3.9826	-76.9804	3/06/2018	Inside the stem of Bactris gasipaes	Rhynchophorus palmarum	Larva
L503	3.9826	-76.9804	3/06/2018	Inside the stem of Bactris gasipaes	Rhynchophorus palmarum	Larva
L504	3.9894	-76.9780	4/06/2018	Inside the stem of Bactris gasipaes	Rhynchophorus palmarum	Larva

Table S3. Diagnostic character for morphological identification of larvae and adults of the *Dynamis borassi* and *Rhynchophorus palmarum* (in Spanish).

	Dynamis borassi	*Rhynchophorus palmarum*
Larvas		
Cabeza: Cantidad de setas frontales (a cada lado) bien desarrolladas	Dos (Figura 5A)	Tres (Figura 5B)
Epifaringe: Setas epifaringeales medias (mes)	Setas del primer par (mes1) bien distinguibles, separadas entre sí por menor distancia que entre las del segundo par (mes2), éstas robustas (Figuras 5B, 6A)	Setas del primer par (mes1) muy débiles, pequeñas, separadas entre sí por igual distancia que las del segundo par (mes2), éstas delgadas (Figuras 5C, 6B)
Epifaringe: Cantidad de setas anterodorsales (als) a cada lado	Cinco a ocho (Figuras 5B, 6A)	10 a 14 (Figuras 5C, 6B)
Epifaringe: Forma de las varillas labrales	Parecida a una “V”, las varillas más separadas hacia el ápice que cerca de su base (Figuras 5B, 6A)	Parecida a una “U”, las varillas aproximadamente tan separadas cerca de su base como distalmente (Figuras 5C, 6B)
Maxilas: Setas dorsales de la mala (mds)	Sin pubescencia en su base (Figura 7E)	Con pubescencia en su base (Figuras 7F-G)
Abdomen: Margen lateral del disco terminal	Curvado hacia adentro (Figura 9A)	Curvado hacia afuera (Figura 9B)
Adultos		
Base del pronoto	Marcadamente extendida hacia atrás (Figuras 12E-F)	Suavemente extendida hacia atrás (Figuras 12G-H)
Escutelo	Muy pequeño, alrededor de 1/10 el largo de los élitros (Figuras 12E-F)	Muy grande, alrededor de ¼ el largo de los élitros (Figuras 12G-H)
Dimorfismo sexual	Macho con fémures anteriores densamente setosos en su cara ventral (Figuras 12A, I)	Macho con rostro provisto de setas densas, erectas, en su cara dorsal (Figuras 12C, G)

Nota: Los siguientes caracteres adicionales del adulto (Wattanapongsiri, 1966; Löhr et al., 2015), en combinación con los anteriores, distinguen a *R. palmarum* de otras especies de *Rhynchophorus*: cuerpo completamente negro, excepcionalmente rojizo, distancia entre los ojos (vista dorsal) ⅓ o menos de ⅓ que el ancho del rostro en la base (Figs. 10G-H), área ventral del rostro entre las escrobas antenales rugosa y con setas (Figs. 10K -L)

Table S4. COI sequences of eight specimens of *Dynamis borassi* and *Rhynchophorus palmarum* collected inside the stem of peach palm in Colombia, with their locality code explained in the Table S1.

Species	Locality code	Internal Code	COI sequences
D. borassi	4	Uni_9	TCAACAAATCATAAAGATATTGGAACCCTTTATTTTATTTTTGGTACTTGAGCTGGAATAGTAGGAAC TTCCTTAAGTATATTAATTCGTGCAGAATTAGGAAGACCTGGATCTTTAATTGGTGATGATCAAATTT ATAATGTAATTGTTACAGCTCATGCCTTTATTATAATTTTCTTTATAGTAATACCTATTATAATTGGAGG TTTCGGAAATTGACTGGTTCCTTTAATACTAGGAGCTCCCGATATAGCTTTCCCACGCTTAAATAATA TAAGATTCTGACTTTTACCCCCCTCTTTAACTCTTTTACTAATAAGAAGAATTGTTGAAAAAGGTGCA GGAACCGGTTGAACAGTTTACCCTCCTTTAGCCGCCAATATTGCTCATAGAGGAGCCTCTGTAGATT TAGCCATTTTTAGATTACACATAGCTGGAGTATCCTCTATTCTAGGGGCCATCAATTTTATCTCAACT GCTATTAATATACGACCTTCAGGAATATTATCAGATCGATTATCCTTATTCGTTTGAGCCGTTAGAAT TACTGCCCTTCTACTACTTCTTTCCCTACCAGTCTTAGCTGGAGCTATTACAATACTATTAACAGATC GAAATATTAATACATCTTTCTTTGACCCTGCAGGAGGAGGAGATCCCATTTTGTACCAACATCTATTT TGATTTTTTGGTCACCCTGAAGTTTAAGT
R. palmarum	7	Uni_10	TCAACAAATCATAAAGATATTGGAACCTTATATTTTATTTTTGGAACTTGAGCTGGAATAGTAGGAAC TTCATTAAGTATACTTATTCGAGCTGAATTAGGTAATCCAGGTTCCTTAATTGGAGATGATCAAATTTA TAATGTTATTGTTACAGCTCATGCTTTTATTATAATTTTTTTTATAGTTATACCAATTATAATTGGAGGT TTTGGAAATTGACTTGTACCATTAATACTAGGGGCACCAGATATGGCATTTCCACGACTTAATAATAT AAGATTCTGACTTTTACCTCCTTCTCTTACTTTACTATTAATAAGAAGAATCATTGAAAAAGGAGCAG GAACTGGATGAACAGTTTATCCCCCTTTAGCAGCAAATGTTGCACATGGTGGAGCATCTGTAGATTT AGCTATTTTTAGCCTTCATATAGCAGGAATCTCTTCTATTTTAGGAGCAATTAACTTTATTTCTACAGC TATTAATATACGTCCATCAGGAATATTATCCGATCAACTTTCTCTTTTTGTCTGAGCTGTCAGAATTAC AGCTCTTTTACTTCTCCTATCTCTTCCAGTATTAGCCGGTGCAATTACTATACTTCTAACTGACCGTA

			ATATTAATACATCATTTTTTGACCCTGCTGGAGGAGGAGATCCTATCCTATATCAACATTTATTTTGAT TTTTTGGTCACCCTGAAGTTTAAAT
R. palmarum	2	Uni_11	TCAACAAATCATAAAGATATTGGAACCTTATATTTTATTTTTGGAACTTGAGCTGGAATAGTAGGAAC TTCATTAAGTATACTTATTCGAGCTGAATTAGGTAATCCAGGTTCCTTAATTGGAGATGATCAAATTTA TAATGTTATTGTTACAGCTCATGCTTTTATTATAATTTTTTTTATAGTTATACCAATTATAATTGGAGGT TTTGGAAATTGACTTGTACCATTAATACTAGGGGCACCAGATATGGCATTTCCACGACTTAATAATAT AAGATTCTGACTTTTACCTCCTTCTCTTACTTTACTATTAATAAGAAGAATCATTGAAAAAGGAGCAG GAACTGGATGAACAGTTTATCCCCCTTTAGCAGCAAATGTTGCACATGGTGGAGCATCTGTAGATTT AGCTATTTTTAGCCTTCATATAGCAGGAATCTCTTCTATTTTAGGAGCAATTAACTTTATTTCTACAGC TATTAATATACGTCCATCAGGAATATTATCCGATCGACTTTCTCTTTTTGTCTGAGCTGTCAGAATTAC AGCTCTTTTACTTCTCCTATCTCTTCCAGTATTAGCCGGTGCAATTACTATACTTCTAACTGACCGTA ATATTAATACATCATTTTTTGACCCTGCTGGAGGAGGAGATCCTATCCTATATCAACATTTATTTTGAT TTTTTGGTCACCCTGAAGTTTAAAT
R. palmarum	2	Uni_17	CCAACAAATCATAAAGATATTGGAACCTTATATTTTATTTTTGGAACTTGAGCTGGAATAGTAGGAAC TTCATTAAGTATACTTATTCGAGCTGAATTAAGTAATCCAGGTTCCTTAATTGGAGATGATCAAATTTA TAATGTTATTGTTACAGCTCATGCTTTTATTATAATTTTTTTTATAGTTATACCAATTATAATTGGAGGT TTTGGAAATTGACTTGTACCATTAATACTAGGGGCACCAGATATGGCATTTCCACGACTTAATAATAT AAGATTCTGACTTTTACCTCCTTCTCTTACTTTACTATTAATAAGAAGAATCATTGAAAAAGGAGCAG GAACTGGATGAACAGTTTATCCCCCTTTAGCAGCAAATGTTGCACATGGTGGAGCATCTGTAGATTT AGCTATTTTTAGCCTTCATATAGCAGGAATCTCTTCTATTTTAGGAGCAATTAACTTTATTTCTACAGC TATTAATATACGTCCATCAGGAATATTATCCGATCGACTTTCTCTTTTTGTCTGAGCTGTCAGAATTAC AGCTCTTTTACTTCTCCTATCTCTTCCAGTATTAGCCGGTGCAATTACTATACTTCTAACTGACCGTA ATATTAATACATCATTTTTTGACCCTGCTGGAGGAGGAGATCCTATCCTATATCAACATTTATTTTGAT TTTTTGGTCACCCTGAAGTTTAAAT

R. palmarum	6	Uni_21	TCAACAAATCATAAAGATATTGGAACCTTATATTTTATTTTTGGAACTTGAGCTGGAATAGTAGGAAC TTCATTAAGTATACTTATTCGAGCTGAATTAGGTAATCCAGGTTCCTTAATTGGAGATGATCAAATTTA TAATGTTATTGTTACAGCTCATGCTTTTATTATGATTTTTTTTATAGTTATACCAATTATAATTGGAGGT TTTGGAAATTGACTTGTACCATTAATACTAGGGGCACCAGATATGGCATTTCCACGACTTAATAATAT AAGATTCTGACTTTTACCTCCTTCTCTTACTTTACTATTAATAAGAAGAATTATTGAAAAAGGAGCAGG AACTGGATGAACAGTTTATCCCCCTTTAGCAGCAAATGTTGCACATGGTGGAGCATCTGTAGATTTA GCTATTTTTAGCCTTCATATAGCAGGAATCTCTTCTATTTTAGGGGCGATTAACTTTATTTCTACAGCT ATTAATATACGTCCATCAGGAATATTATCCGATCGACTTTCTCTTTTTGTCTGAGCTGTTAGAATTACA GCTCTTTTACTTCTCCTATCTCTTCCAGTATTAGCCGGTGCAATTACTATACTTCTAACTGACCGTAA TATTAATACATCATTTTTTGACCCTGCTGGAGGAGGAGATCCTATCCTATATCAACATTTATTTTGATT TTTTGGTCACCCTGAAGTTTAAGT
R. palmarum	23	Uni_44	TCAACAAATCATAAAGATATTGGAACCTTATATTTTATTTTTGGAACTTGAGCTGGAATAGTGGGAAC TTCATTAAGTATACTTATTCGAGCTGAATTAGGTAACCCAGGTTCCTTAATTGGTGATGATCAAATTT ATAATGTTATTGTTACAGCTCATGCTTTTATTATAATTTTTTTTATAGTTATACCAATTATAATTGGAGG TTTTGGAAATTGACTTGTACCATTAATACTAGGAGCCCCAGACATGGCATTTCCACGACTTAATAATA TAAGATTCTGACTTTTACCTCCTTCTCTTACTTTACTATTAATAAGAAGAATTATTGAAAAAGGAGCAG GAACTGGATGAACAGTTTACCCTCCTTTAGCAGCAAATGTTGCACATGGTGGAGCATCTGTAGATTT AGCTATTTTTAGCCTTCATATAGCAGGAATCTCCTCTATTTTAGGAGCAATTAACTTTATTTCCACAGC TATTAATATACGTCCATCAGGAATATTATCAGATCGACTTTCTCTTTTTGTTTGAGCCGTCAGAATTAC AGCTCTTTTACTTCTCTTATCTCTTCCAGTATTAGCTGGTGCAATTACTATACTTCTAACTGATCGTAA TATTAATACATCATTTTTTGACCCTGCTGGAGGAGGAGATCCTATCCTATATCAACATTTATTTTGATT TTTTGGTCACCCTGAAGTTTAAGT
R. palmarum	6	Uni_58	TCAACAAATCATAAAGATATTGGAACCTTATATTTTATTTTTGGAACTTGAGCTGGAATAGTAGGAAC TTCATTAAGTATACTTATTCGAGCTGAATTAGGTAATCCAGGTTCCTTAATTGGAGATGATCAAATTTA TAATGTTATTGTTACAGCTCATGCTTTTATTATAATTTTTTTTATAGTTATACCAATTATAATTGGAGGT

			TTTGGAAATTGACTTGTACCATTAATACTAGGAGCACCAGATATGGCTTTTCCACGACTTAATAATAT AAGATTCTGACTTTTACCTCCTTCTCTTACTTTACTATTAATAAGAAGAATCATTGAAAAAGGAGCAG GAACTGGATGAACAGTTTATCCCCCTTTAGCAGCAAATGTTGCACATGGTGGAGCATCTGTAGATTT AGCTATTTTTAGCCTTCATATAGCAGGAATCTCTTCTATTTTAGGAGCAATTAACTTTATTTCTACAGC TATTAATATACGTCCATCAGGAATATTATCCGATCGACTTTCTCTTTTTGTCTGAGCTGTCAGAATTAC AGCTCTTTTACTTCTCCTATCTCTTCCAGTATTAGCCGGTGCAATTACTATACTTCTAACTGACCGTA ATATTAATACATCATTTTTTGACCCTGCTGGAGGAGGAGATCCTATCCTATATCAACATTTATTTTGAT TTTTTGGTCACCCTGAAGTTTAAGT
R. palmarum	32	Uni_117	TCAACAAATCATAAAGATATTGGAACCTTATATTTTATTTTTGGAACTTGAGCTGGAATAGTGGGAAC TTCATTAAGTATACTTATTCGAGCTGAATTAGGTAACCCAGGTTCCTTAATTGGTGATGATCAAATTT ATAATGTTATTGTTACAGCTCATGCTTTTATTATAATTTTTTTTATAGTTATACCAATTATAATTGGAGG TTTTGGAAATTGACTTGTACCATTAATACTAGGAGCCCCAGACATGGCATTTCCACGACTTAATAATG TAAGATTCTGACTTTTACCTCCTTCTCTTACTTTACTATTAATAAGAAGAATTATTGAAAAAGGAGCAG GAACTGGATGAACAGTTTACCCTCCTTTAGCAGCAAATGTTGCACATAGTGGAGCATCTGTAGATTT AGCTATTTTTAGCCTTCATATAGCAGGAATCTCCTCTATTTTAGGAGCAATTAACTTTATTTCCACAGC TATTAATATACGTCCATCAGGAATATTATCAGATCGACTTTCTCTTTTTGTTTGAGCCGTCAGAATTAC AGCTCTTTTACTTCTCTTATCTCTTCCAGTATTAGCTGGTGCAATTACTATACTTCTAACTGATCGTAA TATTAATACATCATTTTTTGACCCTGCTGGAGGAGGAGATCCTATCCTATATCAACATTTATTTTGATT TTTTGGTCACCCTGAAGTTTAAAT

Table S3. List of the GenBank, BOLD and internal code of the COI sequences (ID) analyzed in the molecular taxonomy of *Dynamis* and *Rhynchophorus*, with its haplotype (Ha), c and publication where these were reported.

Species	ID	Ha	Country	Literature
D. borassi	AY131105		Brazil	Brian Farrel (personal communication)
D. borassi	Univalle_9		Colombia	This study
D. peropacus	ASSCR6014		Costa Rica	Bold (2021)
D. peropacus	ASSCR6015		Costa Rica	Bold (2021)
D. peropacus	ASSCR6016		Costa Rica	Bold (2021)
D. peropacus	ASSCR6018		Costa Rica	Bold (2021)
R. bilineatus	KF311645	Rb1	Papua New Guinea	Rugman-Jones et al. (2013)
R. bilineatus	KF311637	Rb2	Papua New Guinea	Rugman-Jones et al. (2013)
R. bilineatus	KF311639	Rb3	Papua New Guinea	Rugman-Jones et al. (2013)
R. bilineatus	KF311636	Rb4	Papua New Guinea	Rugman-Jones et al. (2013)
R. bilineatus	KF311638	Rb4	Papua New Guinea	Rugman-Jones et al. (2013)
R. bilineatus	KF311640	Rb4	Papua New Guinea	Rugman-Jones et al. (2013)
R. bilineatus	KF311641	Rb4	Papua New Guinea	Rugman-Jones et al. (2013)
R. bilineatus	KF311642	Rb4	Papua New Guinea	Rugman-Jones et al. (2013)
R. bilineatus	KF311643	Rb4	Papua New Guinea	Rugman-Jones et al. (2013)
R. bilineatus	KF311644	Rb4	Papua New Guinea	Rugman-Jones et al. (2013)
R. bilineatus	KF311646	Rb4	Papua New Guinea	Rugman-Jones et al. (2013)
R. bilineatus	KF311635	Rb5	Papua New Guinea	Rugman-Jones et al. (2013)
R. bilineatus	KF311634	Rb6	Papua New Guinea	Rugman-Jones et al. (2013)
R. bilineatus	KF311648	Rb7	Papua New Guinea	Rugman-Jones et al. (2013)
R. bilineatus	KF311647	Rb8	Papua New Guinea	Rugman-Jones et al. (2013)
R. cruentatus	AY131113		Unknown	O'Meara, B.C. and Farrell, B.D. cited by GenBank (2021)
R. cruentatus	KF311359		United States of America	Rugman-Jones et al. (2013)
R. cruentatus	USCOC565		United States of America	
R. ferrugineus	GU581582	H1	Oman	El-Mergawy et al. (2011)
R. ferrugineus	GU581583	H1	United Arab Emirates	El-Mergawy et al. (2011)

R. ferrugineus	GU581584	H1	United Arab Emirates	El-Mergawy et al. (2011)
R. ferrugineus	GU581585	H1	United Arab Emirates	El-Mergawy et al. (2011)
R. ferrugineus	GU581586	H1	United Arab Emirates	El-Mergawy et al. (2011)
R. ferrugineus	GU581587	H1	United Arab Emirates	El-Mergawy et al. (2011)
R. ferrugineus	GU581588	H1	United Arab Emirates	El-Mergawy et al. (2011)
R. ferrugineus	GU581589	H1	United Arab Emirates	El-Mergawy et al. (2011)
R. ferrugineus	GU581590	H1	United Arab Emirates	El-Mergawy et al. (2011)
R. ferrugineus	GU581591	H1	United Arab Emirates	El-Mergawy et al. (2011)
R. ferrugineus	GU581592	H1	United Arab Emirates	El-Mergawy et al. (2011)
R. ferrugineus	GU581593	H1	United Arab Emirates	El-Mergawy et al. (2011)
R. ferrugineus	GU581594	H1	United Arab Emirates	El-Mergawy et al. (2011)
R. ferrugineus	GU581595	H1	United Arab Emirates	El-Mergawy et al. (2011)
R. ferrugineus	GU581596	H1	United Arab Emirates	El-Mergawy et al. (2011)
R. ferrugineus	GU581597	H1	Syria	El-Mergawy et al. (2011)
R. ferrugineus	GU581598	H1	Syria	El-Mergawy et al. (2011)
R. ferrugineus	GU581599	H1	Syria	El-Mergawy et al. (2011)
R. ferrugineus	GU581600	H1	Syria	El-Mergawy et al. (2011)
R. ferrugineus	GU581601	H1	Syria	El-Mergawy et al. (2011)
R. ferrugineus	GU581602	H1	Syria	El-Mergawy et al. (2011)
R. ferrugineus	GU581603	H1	Syria	El-Mergawy et al. (2011)
R. ferrugineus	GU581604	H1	Syria	El-Mergawy et al. (2011)
R. ferrugineus	GU581605	H1	Syria	El-Mergawy et al. (2011)
R. ferrugineus	GU581606	H1	Syria	El-Mergawy et al. (2011)
R. ferrugineus	GU581607	H1	Syria	El-Mergawy et al. (2011)
R. ferrugineus	GU581608	H1	Syria	El-Mergawy et al. (2011)
R. ferrugineus	GU581609	H1	Syria	El-Mergawy et al. (2011)
R. ferrugineus	GU581610	H1	Syria	El-Mergawy et al. (2011)
R. ferrugineus	GU581611	H1	Syria	El-Mergawy et al. (2011)
R. ferrugineus	GU581612	H1	Syria	El-Mergawy et al. (2011)
R. ferrugineus	GU581613	H1	Syria	El-Mergawy et al. (2011)
R. ferrugineus	GU581614	H1	Syria	El-Mergawy et al. (2011)
R. ferrugineus	GU581615	H1	Pakistan	El-Mergawy et al. (2011)
R. ferrugineus	GU581616	H1	Pakistan	El-Mergawy et al. (2011)
R. ferrugineus	GU581617	H1	Pakistan	El-Mergawy et al. (2011)
R. ferrugineus	GU581618	H1	Pakistan	El-Mergawy et al. (2011)

R. ferrugineus	GU581619	H1	Pakistan	El-Mergawy et al. (2011)
R. ferrugineus	GU581620	H1	Pakistan	El-Mergawy et al. (2011)
R. ferrugineus	GU581621	H1	Pakistan	El-Mergawy et al. (2011)
R. ferrugineus	GU581622	H1	Pakistan	El-Mergawy et al. (2011)
R. ferrugineus	GU581623	H1	Pakistan	El-Mergawy et al. (2011)
R. ferrugineus	GU581624	H1	Pakistan	El-Mergawy et al. (2011)
R. ferrugineus	GU581625	H1	Pakistan	El-Mergawy et al. (2011)
R. ferrugineus	GU581626	H1	Pakistan	El-Mergawy et al. (2011)
R. ferrugineus	GU581627	H1	Pakistan	El-Mergawy et al. (2011)
R. ferrugineus	GU581628	H1	Pakistan	El-Mergawy et al. (2011)
R. ferrugineus	KU311369	H1	Pakistan	Rugman-Jones et al. (2013)
R. ferrugineus	KU696489	H1	Pakistan	Rugman-Jones et al. (2013)
R. ferrugineus	KU696494	H1	Pakistan	Rugman-Jones et al. (2013)
R. ferrugineus	KU696496	H1	Pakistan	Rugman-Jones et al. (2013)
R. ferrugineus	KU696504	H1	Pakistan	Rugman-Jones et al. (2013)
R. ferrugineus	KU696506	H1	Pakistan	Rugman-Jones et al. (2013)
R. ferrugineus	KU696510	H1	Pakistan	Rugman-Jones et al. (2013)
R. ferrugineus	KU696511	H1	Pakistan	Rugman-Jones et al. (2013)
R. ferrugineus	KU696512	H1	Pakistan	Rugman-Jones et al. (2013)
R. ferrugineus	KU696513	H1	Pakistan	Rugman-Jones et al. (2013)
R. ferrugineus	KU696516	H1	Pakistan	Rugman-Jones et al. (2013)
R. ferrugineus	KU696518	H1	Pakistan	Rugman-Jones et al. (2013)
R. ferrugineus	KU696519	H1	Pakistan	Rugman-Jones et al. (2013)
R. ferrugineus	KU696524	H1	Pakistan	Rugman-Jones et al. (2013)
R. ferrugineus	KU696527	H1	Pakistan	Rugman-Jones et al. (2013)
R. ferrugineus	KU696529	H1	Pakistan	Rugman-Jones et al. (2013)
R. ferrugineus	KU696530	H1	Pakistan	Rugman-Jones et al. (2013)
R. ferrugineus	KF311482	H10	Sri Lanka	Rugman-Jones et al. (2013)
R. ferrugineus	KF311444	H11	India	Rugman-Jones et al. (2013)
R. ferrugineus	KF311487	H12	Sri Lanka	Rugman-Jones et al. (2013)
R. ferrugineus	KF311481	H13	Sri Lanka	Rugman-Jones et al. (2013)
R. ferrugineus	KF311483	H13	Sri Lanka	Rugman-Jones et al. (2013)
R. ferrugineus	KF311484	H13	Sri Lanka	Rugman-Jones et al. (2013)
R. ferrugineus	KF311485	H13	Sri Lanka	Rugman-Jones et al. (2013)
R. ferrugineus	KF311486	H13	Sri Lanka	Rugman-Jones et al. (2013)
R. ferrugineus	KF311488	H13	Sri Lanka	Rugman-Jones et al. (2013)
R. ferrugineus	KF311489	H13	Sri Lanka	Rugman-Jones et al. (2013)
R. ferrugineus	KF311448	H14	India	Rugman-Jones et al. (2013)
R. ferrugineus	JX292125	H15	India	Alhudaib et al. cited by Genbank (2021)
R. ferrugineus	KF311449	H16	India	Rugman-Jones et al. (2013)
R. ferrugineus	KF311360	H17	Israel	Rugman-Jones et al. (2013)
R. ferrugineus	KF311361	H17	Israel	Rugman-Jones et al. (2013)
R. ferrugineus	KF311427	H17	Saudi Arabia	Rugman-Jones et al. (2013)

R. ferrugineus	KF311432	H17	Saudi Arabia	Rugman-Jones et al. (2013)
R. ferrugineus	KF311471	H18	Thailand	Rugman-Jones et al. (2013)
R. ferrugineus	KF311473	H18	Thailand	Rugman-Jones et al. (2013)
R. ferrugineus	KF311403	H19	Malaysia	Rugman-Jones et al. (2013)
R. ferrugineus	KF311468	H19	Thailand	Rugman-Jones et al. (2013)
R. ferrugineus	KF311477	H19	Thailand	Rugman-Jones et al. (2013)
R. ferrugineus	KF311478	H19	Thailand	Rugman-Jones et al. (2013)
R. ferrugineus	GU581549	H2	Iran	El-Mergawy et al. (2011)
R. ferrugineus	GU581550	H2	Iran	El-Mergawy et al. (2011)
R. ferrugineus	GU581551	H2	Iran	El-Mergawy et al. (2011)
R. ferrugineus	GU581552	H2	Iran	El-Mergawy et al. (2011)
R. ferrugineus	GU581553	H2	Iran	El-Mergawy et al. (2011)
R. ferrugineus	GU581554	H2	Iran	El-Mergawy et al. (2011)
R. ferrugineus	GU581555	H2	Iran	El-Mergawy et al. (2011)
R. ferrugineus	GU581556	H2	Iran	El-Mergawy et al. (2011)
R. ferrugineus	GU581557	H2	Iran	El-Mergawy et al. (2011)
R. ferrugineus	GU581558	H2	Iran	El-Mergawy et al. (2011)
R. ferrugineus	GU581559	H2	Iran	El-Mergawy et al. (2011)
R. ferrugineus	GU581560	H2	Iran	El-Mergawy et al. (2011)
R. ferrugineus	GU581561	H2	Iran	El-Mergawy et al. (2011)
R. ferrugineus	GU581562	H2	Iran	El-Mergawy et al. (2011)
R. ferrugineus	GU581563	H2	Iran	El-Mergawy et al. (2011)
R. ferrugineus	GU581564	H2	Iran	El-Mergawy et al. (2011)
R. ferrugineus	GU581565	H2	Iran	El-Mergawy et al. (2011)
R. ferrugineus	GU581566	H2	Iran	El-Mergawy et al. (2011)
R. ferrugineus	GU581567	H2	Iran	El-Mergawy et al. (2011)
R. ferrugineus	GU581568	H2	Iran	El-Mergawy et al. (2011)
R. ferrugineus	GU581569	H2	Iran	El-Mergawy et al. (2011)
R. ferrugineus	GU581570	H2	Iran	El-Mergawy et al. (2011)
R. ferrugineus	GU581571	H2	Iran	El-Mergawy et al. (2011)
R. ferrugineus	GU581572	H2	Iran	El-Mergawy et al. (2011)
R. ferrugineus	GU581573	H2	Iran	El-Mergawy et al. (2011)
R. ferrugineus	GU581574	H2	Iran	El-Mergawy et al. (2011)
R. ferrugineus	GU581575	H2	Iran	El-Mergawy et al. (2011)
R. ferrugineus	GU581576	H2	Iran	El-Mergawy et al. (2011)
R. ferrugineus	GU581577	H2	Iran	El-Mergawy et al. (2011)
R. ferrugineus	GU581578	H2	Iran	El-Mergawy et al. (2011)
R. ferrugineus	GU581579	H2	Iran	El-Mergawy et al. (2011)
R. ferrugineus	GU581580	H2	Iran	El-Mergawy et al. (2011)
R. ferrugineus	GU581581	H2	Iran	El-Mergawy et al. (2011)
R. ferrugineus	KF311433	H20	Aruba	Rugman-Jones et al. (2013)
R. ferrugineus	KF311474	H21	Thailand	Rugman-Jones et al. (2013)
R. ferrugineus	KF311511	H22	Thailand	Rugman-Jones et al. (2013)

R. ferrugineus	KF311512	H22	Thailand	Rugman-Jones et al. (2013)
R. ferrugineus	KF311512	H22	Thailand	Rugman-Jones et al. (2013)
R. ferrugineus	KF311513	H22	Thailand	Rugman-Jones et al. (2013)
R. ferrugineus	KF311514	H22	Thailand	Rugman-Jones et al. (2013)
R. ferrugineus	KF311515	H22	Thailand	Rugman-Jones et al. (2013)
R. ferrugineus	KF311516	H22	Thailand	Rugman-Jones et al. (2013)
R. ferrugineus	KF311517	H22	Thailand	Rugman-Jones et al. (2013)
R. ferrugineus	KF311518	H22	Thailand	Rugman-Jones et al. (2013)
R. ferrugineus	KF311520	H22	Thailand	Rugman-Jones et al. (2013)
R. ferrugineus	KF311522	H22	Thailand	Rugman-Jones et al. (2013)
R. ferrugineus	KF311523	H22	Thailand	Rugman-Jones et al. (2013)
R. ferrugineus	KF311524	H22	Thailand	Rugman-Jones et al. (2013)
R. ferrugineus	KF311526	H22	Thailand	Rugman-Jones et al. (2013)
R. ferrugineus	KF311527	H22	Thailand	Rugman-Jones et al. (2013)
R. ferrugineus	KF311380	H23	Philippines	Rugman-Jones et al. (2013)
R. ferrugineus	KF311381	H23	Philippines	Rugman-Jones et al. (2013)
R. ferrugineus	KF311382	H23	Philippines	Rugman-Jones et al. (2013)
R. ferrugineus	KF311387	H23	Philippines	Rugman-Jones et al. (2013)
R. ferrugineus	KF311389	H24	Philippines	Rugman-Jones et al. (2013)
R. ferrugineus	KF311384	H25	Philippines	Rugman-Jones et al. (2013)
R. ferrugineus	KF311388	H26	Philippines	Rugman-Jones et al. (2013)
R. ferrugineus	KF311386	H27	Philippines	Rugman-Jones et al. (2013)
R. ferrugineus	KF311399	H28	Philippines	Rugman-Jones et al. (2013)
R. ferrugineus	KF311383	H29	Philippines	Rugman-Jones et al. (2013)
R. ferrugineus	KF311385	H29	Philippines	Rugman-Jones et al. (2013)
R. ferrugineus	KF311390	H29	Philippines	Rugman-Jones et al. (2013)
R. ferrugineus	KF311391	H29	Philippines	Rugman-Jones et al. (2013)
R. ferrugineus	KF311393	H29	Philippines	Rugman-Jones et al. (2013)
R. ferrugineus	KF311394	H29	Philippines	Rugman-Jones et al. (2013)
R. ferrugineus	KF311395	H29	Philippines	Rugman-Jones et al. (2013)
R. ferrugineus	KF311396	H29	Philippines	Rugman-Jones et al. (2013)
R. ferrugineus	KF311397	H29	Philippines	Rugman-Jones et al. (2013)
R. ferrugineus	KF311398	H29	Philippines	Rugman-Jones et al. (2013)
R. ferrugineus	KF311400	H29	Philippines	Rugman-Jones et al. (2013)
R. ferrugineus	GU581547	H3	United Arab Emirates	El-Mergawy et al. (2011)
R. ferrugineus	GU581548	H3	United Arab Emirates	El-Mergawy et al. (2011)
R. ferrugineus	KF311392	H30	Philippines	Rugman-Jones et al. (2013)
R. ferrugineus	KF311379	H31	Philippines	Rugman-Jones et al. (2013)
R. ferrugineus	KF311490	H32	Cambodia	Rugman-Jones et al. (2013)
R. ferrugineus	KF311491	H32	Cambodia	Rugman-Jones et al. (2013)
R. ferrugineus	KF311492	H34	Cambodia	Rugman-Jones et al. (2013)
R. ferrugineus	KF311493	H34	Cambodia	Rugman-Jones et al. (2013)

R. ferrugineus	KF311494	H34	Cambodia	Rugman-Jones et al. (2013)
R. ferrugineus	KF311495	H34	Cambodia	Rugman-Jones et al. (2013)
R. ferrugineus	KF311496	H35	Vietnam	Rugman-Jones et al. (2013)
R. ferrugineus	KF311497	H35	Vietnam	Rugman-Jones et al. (2013)
R. ferrugineus	KF311498	H36	Vietnam	Rugman-Jones et al. (2013)
R. ferrugineus	KF311499	H36	Vietnam	Rugman-Jones et al. (2013)
R. ferrugineus	KF311500	H36	Vietnam	Rugman-Jones et al. (2013)
R. ferrugineus	KF311509	H37	Vietnam	Rugman-Jones et al. (2013)
R. ferrugineus	KF311504	H38	Vietnam	Rugman-Jones et al. (2013)
R. ferrugineus	KF311505	H38	Vietnam	Rugman-Jones et al. (2013)
R. ferrugineus	KF311508	H39	Vietnam	Rugman-Jones et al. (2013)
R. ferrugineus	GU581545	H4	United Arab Emirates	El-Mergawy et al. (2011)
R. ferrugineus	GU581546	H4	United Arab Emirates	El-Mergawy et al. (2011)
R. ferrugineus	KF311506	H40	Vietnam	Rugman-Jones et al. (2013)
R. ferrugineus	KF311502	H41	Vietnam	Rugman-Jones et al. (2013)
R. ferrugineus	KF311503	H41	Vietnam	Rugman-Jones et al. (2013)
R. ferrugineus	KF311507	H41	Vietnam	Rugman-Jones et al. (2013)
R. ferrugineus	KF311501	H42	Vietnam	Rugman-Jones et al. (2013)
R. ferrugineus	KF311507	H42	Vietnam	Rugman-Jones et al. (2013)
R. ferrugineus	KF311525	H43	Thailand	Rugman-Jones et al. (2013)
R. ferrugineus	GU581539	H5	United Arab Emirates	El-Mergawy et al. (2011)
R. ferrugineus	GU581540	H5	United Arab Emirates	El-Mergawy et al. (2011)
R. ferrugineus	GU581541	H5	United Arab Emirates	El-Mergawy et al. (2011)
R. ferrugineus	GU581542	H5	United Arab Emirates	El-Mergawy et al. (2011)
R. ferrugineus	GU581543	H5	Oman	El-Mergawy et al. (2011)
R. ferrugineus	GU581544	H5	Oman	El-Mergawy et al. (2011)
R. ferrugineus	KF311366	H5	Pakistan	Rugman-Jones et al. (2013)
R. ferrugineus	KF311367	H5	Pakistan	Rugman-Jones et al. (2013)
R. ferrugineus	KF311368	H5	Pakistan	Rugman-Jones et al. (2013)
R. ferrugineus	KF311370	H5	Pakistan	Rugman-Jones et al. (2013)
R. ferrugineus	KU696490	H5	Pakistan	Rugman-Jones et al. (2013)
R. ferrugineus	KU696491	H5	Pakistan	Rugman-Jones et al. (2013)
R. ferrugineus	KU696493	H5	Pakistan	Rugman-Jones et al. (2013)
R. ferrugineus	KU696495	H5	Pakistan	Rugman-Jones et al. (2013)
R. ferrugineus	KU696498	H5	Pakistan	Rugman-Jones et al. (2013)
R. ferrugineus	KU696499	H5	Pakistan	Rugman-Jones et al. (2013)
R. ferrugineus	KU696501	H5	Pakistan	Rugman-Jones et al. (2013)
R. ferrugineus	KU696502	H5	Pakistan	Rugman-Jones et al. (2013)
R. ferrugineus	KU696503	H5	Pakistan	Rugman-Jones et al. (2013)

R. ferrugineus	KU696505	H5	Pakistan	Rugman-Jones et al. (2013)
R. ferrugineus	KU696509	H5	Pakistan	Rugman-Jones et al. (2013)
R. ferrugineus	KU696514	H5	Pakistan	Rugman-Jones et al. (2013)
R. ferrugineus	KU696515	H5	Pakistan	Rugman-Jones et al. (2013)
R. ferrugineus	KU696517	H5	Pakistan	Rugman-Jones et al. (2013)
R. ferrugineus	KU696521	H5	Pakistan	Rugman-Jones et al. (2013)
R. ferrugineus	KU696522	H5	Pakistan	Rugman-Jones et al. (2013)
R. ferrugineus	KU696523	H5	Pakistan	Rugman-Jones et al. (2013)
R. ferrugineus	KU696525	H5	Pakistan	Rugman-Jones et al. (2013)
R. ferrugineus	KU696526	H5	Pakistan	Rugman-Jones et al. (2013)
R. ferrugineus	KU696528	H5	Pakistan	Rugman-Jones et al. (2013)
R. ferrugineus	KU696531	H5	Pakistan	Rugman-Jones et al. (2013)
R. ferrugineus	KU696533	H5	Pakistan	Rugman-Jones et al. (2013)
R. ferrugineus	KU696534	H5	Pakistan	Rugman-Jones et al. (2013)
R. ferrugineus	KU696535	H5	Pakistan	Rugman-Jones et al. (2013)
R. ferrugineus	KU696536	H5	Pakistan	Rugman-Jones et al. (2013)
R. ferrugineus	KU696537	H5	Pakistan	Rugman-Jones et al. (2013)
R. ferrugineus	KU696492	H51	Pakistan	Rugman-Jones et al. (2013)
R. ferrugineus	KU696497	H51	Pakistan	Rugman-Jones et al. (2013)
R. ferrugineus	KU696500	H51	Pakistan	Rugman-Jones et al. (2013)
R. ferrugineus	KU696520	H51	Pakistan	Rugman-Jones et al. (2013)
R. ferrugineus	KU696507	H52	Pakistan	Rugman-Jones et al. (2013)
R. ferrugineus	KU696508	H52	Pakistan	Rugman-Jones et al. (2013)
R. ferrugineus	KU696532	H52	Pakistan	Rugman-Jones et al. (2013)
R. ferrugineus	GU581526	H6	Oman	El-Mergawy et al. (2011)
R. ferrugineus	GU581527	H6	Oman	El-Mergawy et al. (2011)
R. ferrugineus	GU581528	H6	Oman	El-Mergawy et al. (2011)
R. ferrugineus	GU581529	H6	Oman	El-Mergawy et al. (2011)
R. ferrugineus	GU581530	H6	Oman	El-Mergawy et al. (2011)
R. ferrugineus	GU581531	H6	Oman	El-Mergawy et al. (2011)
R. ferrugineus	GU581532	H6	Oman	El-Mergawy et al. (2011)
R. ferrugineus	GU581533	H6	Oman	El-Mergawy et al. (2011)
R. ferrugineus	GU581534	H6	Oman	El-Mergawy et al. (2011)
R. ferrugineus	GU581535	H6	Oman	El-Mergawy et al. (2011)
R. ferrugineus	GU581536	H6	Oman	El-Mergawy et al. (2011)
R. ferrugineus	GU581537	H6	Oman	El-Mergawy et al. (2011)
R. ferrugineus	GU581538	H6	Oman	El-Mergawy et al. (2011)
R. ferrugineus	GU581517	H7	Japan	El-Mergawy et al. (2011)
R. ferrugineus	GU581518	H7	Japan	El-Mergawy et al. (2011)
R. ferrugineus	GU581519	H7	Japan	El-Mergawy et al. (2011)
R. ferrugineus	GU581520	H7	Japan	El-Mergawy et al. (2011)
R. ferrugineus	GU581521	H7	Japan	El-Mergawy et al. (2011)
R. ferrugineus	GU581522	H7	Japan	El-Mergawy et al. (2011)

R. ferrugineus	GU581523	H7	Japan	El-Mergawy et al. (2011)
R. ferrugineus	GU581524	H7	Japan	El-Mergawy et al. (2011)
R. ferrugineus	GU581525	H7	Japan	El-Mergawy et al. (2011)
R. ferrugineus	GU581319	H8	Egypt	El-Mergawy et al. (2011)
R. ferrugineus	GU581320	H8	Egypt	El-Mergawy et al. (2011)
R. ferrugineus	GU581321	H8	Egypt	El-Mergawy et al. (2011)
R. ferrugineus	GU581322	H8	Egypt	El-Mergawy et al. (2011)
R. ferrugineus	GU581323	H8	Egypt	El-Mergawy et al. (2011)
R. ferrugineus	GU581324	H8	Egypt	El-Mergawy et al. (2011)
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R. ferrugineus	GU581327	H8	Egypt	El-Mergawy et al. (2011)
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R. ferrugineus	GU581349	H8	Egypt	El-Mergawy et al. (2011)
R. ferrugineus	GU581350	H8	Egypt	El-Mergawy et al. (2011)
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R. ferrugineus	GU581352	H8	Egypt	El-Mergawy et al. (2011)
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R. ferrugineus	GU581357	H8	Egypt	El-Mergawy et al. (2011)
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R. ferrugineus	GU581360	H8	Egypt	El-Mergawy et al. (2011)
R. ferrugineus	GU581361	H8	Egypt	El-Mergawy et al. (2011)
R. ferrugineus	GU581362	H8	Egypt	El-Mergawy et al. (2011)
R. ferrugineus	GU581363	H8	Egypt	El-Mergawy et al. (2011)
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R. ferrugineus	GU581374	H8	Egypt	El-Mergawy et al. (2011)
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R. ferrugineus	GU581376	H8	Egypt	El-Mergawy et al. (2011)
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R. ferrugineus	GU581383	H8	Egypt	El-Mergawy et al. (2011)
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R. ferrugineus	GU581398	H8	Egypt	El-Mergawy et al. (2011)
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R. ferrugineus	GU581403	H8	Egypt	El-Mergawy et al. (2011)
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R. ferrugineus	GU581408	H8	Egypt	El-Mergawy et al. (2011)
R. ferrugineus	GU581409	H8	Egypt	El-Mergawy et al. (2011)
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R. ferrugineus	GU581420	H8	Egypt	El-Mergawy et al. (2011)
R. ferrugineus	GU581421	H8	Egypt	El-Mergawy et al. (2011)
R. ferrugineus	GU581422	H8	Egypt	El-Mergawy et al. (2011)
R. ferrugineus	GU581423	H8	Egypt	El-Mergawy et al. (2011)
R. ferrugineus	GU581424	H8	Egypt	El-Mergawy et al. (2011)
R. ferrugineus	GU581425	H8	Egypt	El-Mergawy et al. (2011)
R. ferrugineus	GU581426	H8	Egypt	El-Mergawy et al. (2011)
R. ferrugineus	GU581427	H8	Egypt	El-Mergawy et al. (2011)
R. ferrugineus	GU581428	H8	Egypt	El-Mergawy et al. (2011)
R. ferrugineus	GU581429	H8	Saudi Arabia	El-Mergawy et al. (2011)
R. ferrugineus	GU581430	H8	Saudi Arabia	El-Mergawy et al. (2011)
R. ferrugineus	GU581431	H8	Saudi Arabia	El-Mergawy et al. (2011)
R. ferrugineus	GU581432	H8	Saudi Arabia	El-Mergawy et al. (2011)
R. ferrugineus	GU581433	H8	Saudi Arabia	El-Mergawy et al. (2011)
R. ferrugineus	GU581434	H8	Saudi Arabia	El-Mergawy et al. (2011)
R. ferrugineus	GU581435	H8	Saudi Arabia	El-Mergawy et al. (2011)
R. ferrugineus	GU581436	H8	Saudi Arabia	El-Mergawy et al. (2011)
R. ferrugineus	GU581437	H8	Saudi Arabia	El-Mergawy et al. (2011)
R. ferrugineus	GU581438	H8	Saudi Arabia	El-Mergawy et al. (2011)
R. ferrugineus	GU581439	H8	Saudi Arabia	El-Mergawy et al. (2011)
R. ferrugineus	GU581440	H8	Saudi Arabia	El-Mergawy et al. (2011)
R. ferrugineus	GU581441	H8	Spain	El-Mergawy et al. (2011)
R. ferrugineus	GU581442	H8	Spain	El-Mergawy et al. (2011)
R. ferrugineus	GU581443	H8	Spain	El-Mergawy et al. (2011)
R. ferrugineus	GU581444	H8	Spain	El-Mergawy et al. (2011)

R. ferrugineus	GU581445	H8	Spain	El-Mergawy et al. (2011)
R. ferrugineus	GU581446	H8	Spain	El-Mergawy et al. (2011)
R. ferrugineus	GU581447	H8	Spain	El-Mergawy et al. (2011)
R. ferrugineus	GU581448	H8	Spain	El-Mergawy et al. (2011)
R. ferrugineus	GU581449	H8	Spain	El-Mergawy et al. (2011)
R. ferrugineus	GU581450	H8	Spain	El-Mergawy et al. (2011)
R. ferrugineus	GU581451	H8	Spain	El-Mergawy et al. (2011)
R. ferrugineus	GU581452	H8	TurKey	El-Mergawy et al. (2011)
R. ferrugineus	GU581453	H8	TurKey	El-Mergawy et al. (2011)
R. ferrugineus	GU581454	H8	TurKey	El-Mergawy et al. (2011)
R. ferrugineus	GU581455	H8	TurKey	El-Mergawy et al. (2011)
R. ferrugineus	GU581456	H8	TurKey	El-Mergawy et al. (2011)
R. ferrugineus	GU581457	H8	TurKey	El-Mergawy et al. (2011)
R. ferrugineus	GU581458	H8	TurKey	El-Mergawy et al. (2011)
R. ferrugineus	GU581459	H8	TurKey	El-Mergawy et al. (2011)
R. ferrugineus	GU581460	H8	TurKey	El-Mergawy et al. (2011)
R. ferrugineus	GU581461	H8	TurKey	El-Mergawy et al. (2011)
R. ferrugineus	GU581462	H8	TurKey	El-Mergawy et al. (2011)
R. ferrugineus	GU581463	H8	TurKey	El-Mergawy et al. (2011)
R. ferrugineus	GU581464	H8	TurKey	El-Mergawy et al. (2011)
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R. ferrugineus	GU581466	H8	Greece	El-Mergawy et al. (2011)
R. ferrugineus	GU581467	H8	Greece	El-Mergawy et al. (2011)
R. ferrugineus	GU581468	H8	Greece	El-Mergawy et al. (2011)
R. ferrugineus	GU581469	H8	Greece	El-Mergawy et al. (2011)
R. ferrugineus	GU581470	H8	Greece	El-Mergawy et al. (2011)
R. ferrugineus	GU581471	H8	Greece	El-Mergawy et al. (2011)
R. ferrugineus	GU581472	H8	Greece	El-Mergawy et al. (2011)
R. ferrugineus	GU581473	H8	Greece	El-Mergawy et al. (2011)
R. ferrugineus	GU581474	H8	Cyprus	El-Mergawy et al. (2011)
R. ferrugineus	GU581475	H8	Cyprus	El-Mergawy et al. (2011)
R. ferrugineus	GU581476	H8	Cyprus	El-Mergawy et al. (2011)
R. ferrugineus	GU581477	H8	Cyprus	El-Mergawy et al. (2011)
R. ferrugineus	GU581478	H8	Cyprus	El-Mergawy et al. (2011)
R. ferrugineus	GU581479	H8	Cyprus	El-Mergawy et al. (2011)
R. ferrugineus	GU581480	H8	Cyprus	El-Mergawy et al. (2011)
R. ferrugineus	GU581481	H8	Cyprus	El-Mergawy et al. (2011)
R. ferrugineus	GU581482	H8	Cyprus	El-Mergawy et al. (2011)
R. ferrugineus	GU581483	H8	Cyprus	El-Mergawy et al. (2011)
R. ferrugineus	GU581484	H8	Cyprus	El-Mergawy et al. (2011)
R. ferrugineus	GU581485	H8	Cyprus	El-Mergawy et al. (2011)
R. ferrugineus	GU581486	H8	Cyprus	El-Mergawy et al. (2011)
R. ferrugineus	GU581487	H8	Cyprus	El-Mergawy et al. (2011)

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R. ferrugineus	GU581490	H8	Italy	El-Mergawy et al. (2011)
R. ferrugineus	GU581491	H8	Italy	El-Mergawy et al. (2011)
R. ferrugineus	GU581492	H8	Italy	El-Mergawy et al. (2011)
R. ferrugineus	GU581493	H8	Italy	El-Mergawy et al. (2011)
R. ferrugineus	GU581494	H8	Italy	El-Mergawy et al. (2011)
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R. ferrugineus	GU581497	H8	Italy	El-Mergawy et al. (2011)
R. ferrugineus	GU581498	H8	Italy	El-Mergawy et al. (2011)
R. ferrugineus	GU581499	H8	Italy	El-Mergawy et al. (2011)
R. ferrugineus	GU581500	H8	Italy	El-Mergawy et al. (2011)
R. ferrugineus	GU581501	H8	Italy	El-Mergawy et al. (2011)
R. ferrugineus	GU581502	H8	Italy	El-Mergawy et al. (2011)
R. ferrugineus	GU581503	H8	France	El-Mergawy et al. (2011)
R. ferrugineus	GU581504	H8	France	El-Mergawy et al. (2011)
R. ferrugineus	GU581505	H8	France	El-Mergawy et al. (2011)
R. ferrugineus	GU581506	H8	France	El-Mergawy et al. (2011)
R. ferrugineus	GU581507	H8	France	El-Mergawy et al. (2011)
R. ferrugineus	GU581508	H8	France	El-Mergawy et al. (2011)
R. ferrugineus	GU581509	H8	France	El-Mergawy et al. (2011)
R. ferrugineus	GU581510	H8	France	El-Mergawy et al. (2011)
R. ferrugineus	GU581511	H8	France	El-Mergawy et al. (2011)
R. ferrugineus	GU581512	H8	France	El-Mergawy et al. (2011)
R. ferrugineus	GU581513	H8	France	El-Mergawy et al. (2011)
R. ferrugineus	GU581514	H8	France	El-Mergawy et al. (2011)
R. ferrugineus	GU581515	H8	France	El-Mergawy et al. (2011)
R. ferrugineus	GU581516	H8	France	El-Mergawy et al. (2011)
R. ferrugineus	GU581524	H8	Egypt	El-Mergawy et al. (2011)
R. ferrugineus	H8	H8	Spain	El-Mergawy et al. (2011)
R. ferrugineus	H8	H8	Curacao	Rugman-Jones et al. (2013)
R. ferrugineus	H8	H8	Cyprus	Rugman-Jones et al. (2013)
R. ferrugineus	H8	H8	Egypt	Rugman-Jones et al. (2013)
R. ferrugineus	KF311362	H8	Israel	Rugman-Jones et al. (2013)
R. ferrugineus	KF311363	H8	Israel	Rugman-Jones et al. (2013)
R. ferrugineus	KF311364	H8	Israel	Rugman-Jones et al. (2013)
R. ferrugineus	KF311365	H8	TurKey	Rugman-Jones et al. (2017)
R. ferrugineus	KF311371	H8	Portugal	Rugman-Jones et al. (2013)
R. ferrugineus	KF311372	H8	Portugal	Rugman-Jones et al. (2013)
R. ferrugineus	KF311373	H8	France	Rugman-Jones et al. (2013)
R. ferrugineus	KF311374	H8	France	Rugman-Jones et al. (2013)
R. ferrugineus	KF311375	H8	France	Rugman-Jones et al. (2013)

R. ferrugineus	KF311376	H8	France	Rugman-Jones et al. (2013)
R. ferrugineus	KF311377	H8	France	Rugman-Jones et al. (2013)
R. ferrugineus	KF311401	H8	Malaysia	Rugman-Jones et al. (2013)
R. ferrugineus	KF311402	H8	Malaysia	Rugman-Jones et al. (2013)
R. ferrugineus	KF311403	H8	Malaysia	Rugman-Jones et al. (2013)
R. ferrugineus	KF311404	H8	Malaysia	Rugman-Jones et al. (2013)
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R. ferrugineus	KF311406	H8	Malaysia	Rugman-Jones et al. (2013)
R. ferrugineus	KF311407	H8	Malaysia	Rugman-Jones et al. (2013)
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R. ferrugineus	KF311409	H8	Malaysia	Rugman-Jones et al. (2013)
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R. ferrugineus	KF311411	H8	Malaysia	Rugman-Jones et al. (2013)
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R. ferrugineus	KF311413	H8	Malaysia	Rugman-Jones et al. (2013)
R. ferrugineus	KF311414	H8	Malaysia	Rugman-Jones et al. (2013)
R. ferrugineus	KF311415	H8	Malaysia	Rugman-Jones et al. (2013)
R. ferrugineus	KF311416	H8	Malaysia	Rugman-Jones et al. (2013)
R. ferrugineus	KF311417	H8	Malaysia	Rugman-Jones et al. (2013)
R. ferrugineus	KF311418	H8	Malaysia	Rugman-Jones et al. (2013)
R. ferrugineus	KF311419	H8	Malaysia	Rugman-Jones et al. (2013)
R. ferrugineus	KF311420	H8	Malaysia	Rugman-Jones et al. (2013)
R. ferrugineus	KF311421	H8	Malaysia	Rugman-Jones et al. (2013)
R. ferrugineus	KF311422	H8	Malaysia	Rugman-Jones et al. (2013)
R. ferrugineus	KF311423	H8	Malaysia	Rugman-Jones et al. (2013)
R. ferrugineus	KF311424	H8	Malaysia	Rugman-Jones et al. (2013)
R. ferrugineus	KF311425	H8	Malaysia	Rugman-Jones et al. (2013)
R. ferrugineus	KF311426	H8	Malaysia	Rugman-Jones et al. (2013)
R. ferrugineus	KF311435	H8	Spain	El-Mergawy et al. (2011)
R. ferrugineus	KF311437	H8	Spain	El-Mergawy et al. (2011)
R. ferrugineus	KF311438	H8	Italia	Rugman-Jones et al. (2013)
R. ferrugineus	KF311439	H8	Italia	Rugman-Jones et al. (2013)
R. ferrugineus	KF311441	H8	Italia	Rugman-Jones et al. (2013)
R. ferrugineus	KF311442	H8	Italia	Rugman-Jones et al. (2013)
R. ferrugineus	KF311450	H8	TurKey	Rugman-Jones et al. (2017)
R. ferrugineus	KF311451	H8	TurKey	Rugman-Jones et al. (2017)
R. ferrugineus	KF311452	H8	TurKey	Rugman-Jones et al. (2017)
R. ferrugineus	KF311453	H8	TurKey	Rugman-Jones et al. (2017)
R. ferrugineus	KF31146	H8	Spain	El-Mergawy et al. (2011)
R. ferrugineus	KF311467	H8	Thailand	Rugman-Jones et al. (2013)
R. ferrugineus	KF311469	H8	Thailand	Rugman-Jones et al. (2013)
R. ferrugineus	KF311470	H8	Thailand	Rugman-Jones et al. (2013)
R. ferrugineus	KF311472	H8	Thailand	Rugman-Jones et al. (2013)

R. ferrugineus	KF311475	H8	Thailand	Rugman-Jones et al. (2013)
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R. ferrugineus	KF311479	H8	Thailand	Rugman-Jones et al. (2013)
R. ferrugineus	KF311480	H8	Thailand	Rugman-Jones et al. (2013)
R. ferrugineus	KF311521	H8	Thailand	Rugman-Jones et al. (2013)
R. ferrugineus	KX228866	H8	Tunisia	Rugman-Jones et al. (2017)
R. ferrugineus	KX228867	H8	Tunisia	Rugman-Jones et al. (2017)
R. ferrugineus	KX228868	H8	Tunisia	Rugman-Jones et al. (2017)
R. ferrugineus	KX228869	H8	Tunisia	Rugman-Jones et al. (2017)
R. ferrugineus	KX228870	H8	Tunisia	Rugman-Jones et al. (2017)
R. ferrugineus	KX228871	H8	Tunisia	Rugman-Jones et al. (2017)
R. ferrugineus	KX228872	H8	Tunisia	Rugman-Jones et al. (2017)
R. ferrugineus	KX228873	H8	Tunisia	Rugman-Jones et al. (2017)
R. ferrugineus	KX228874	H8	Tunisia	Rugman-Jones et al. (2017)
R. ferrugineus	KX228875	H8	Tunisia	Rugman-Jones et al. (2017)
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R. ferrugineus	KX228877	H8	Tunisia	Rugman-Jones et al. (2017)
R. ferrugineus	KX228878	H8	Tunisia	Rugman-Jones et al. (2017)
R. ferrugineus	KX228879	H8	Tunisia	Rugman-Jones et al. (2017)
R. ferrugineus	KX228880	H8	Tunisia	Rugman-Jones et al. (2017)
R. ferrugineus	KX228881	H8	Tunisia	Rugman-Jones et al. (2017)
R. ferrugineus	KX228882	H8	Tunisia	Rugman-Jones et al. (2017)
R. ferrugineus	KX228883	H8	Tunisia	Rugman-Jones et al. (2017)
R. ferrugineus	KX228884	H8	Tunisia	Rugman-Jones et al. (2017)
R. ferrugineus	KX228885	H8	Tunisia	Rugman-Jones et al. (2017)
R. ferrugineus	KX228886	H8	Tunisia	Rugman-Jones et al. (2017)
R. ferrugineus	KX228887	H8	Tunisia	Rugman-Jones et al. (2017)
R. ferrugineus	KX228888	H8	Tunisia	Rugman-Jones et al. (2017)
R. ferrugineus	KX228889	H8	Tunisia	Rugman-Jones et al. (2017)
R. ferrugineus	KX228890	H8	Tunisia	Rugman-Jones et al. (2017)
R. ferrugineus	KX228891	H8	Tunisia	Rugman-Jones et al. (2017)
R. ferrugineus	KX228892	H8	Tunisia	Rugman-Jones et al. (2017)
R. ferrugineus	KX228893	H8	Tunisia	Rugman-Jones et al. (2017)
R. ferrugineus	KX228894	H8	Tunisia	Rugman-Jones et al. (2017)
R. ferrugineus	KX228895	H8	Tunisia	Rugman-Jones et al. (2017)
R. ferrugineus	KX228896	H8	Tunisia	Rugman-Jones et al. (2017)
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R. ferrugineus	KX228899	H8	Tunisia	Rugman-Jones et al. (2017)
R. ferrugineus	KX228900	H8	Tunisia	Rugman-Jones et al. (2017)
R. ferrugineus	KX228901	H8	Tunisia	Rugman-Jones et al. (2017)
R. ferrugineus	KX228902	H8	Tunisia	Rugman-Jones et al. (2017)
R. ferrugineus	KX228903	H8	Tunisia	Rugman-Jones et al. (2017)

R. ferrugineus	KX228904	H8	Tunisia	Rugman-Jones et al. (2017)
R. ferrugineus	KX228905	H8	Tunisia	Rugman-Jones et al. (2017)
R. ferrugineus	KX228906	H8	Tunisia	Rugman-Jones et al. (2017)
R. ferrugineus	KF311446	H9	India	Rugman-Jones et al. (2013)
R. ferrugineus	H16		India	Rugman-Jones et al. (2013)
R. ferrugineus	H16		India	Rugman-Jones et al. (2013)
R. ferrugineus	JX292124		India	Alhudaib et al. cited by Genbank (2021)
R. ferrugineus	JX294413		Saudi Arabia	Alhudaib et al. cited by Genbank (2021)
R. ferrugineus	KF413063		China	Wang et al. (2015)
R. ferrugineus	KF413064		China	Wang et al. (2015)
R. ferrugineus	KF413065		China	Wang et al. (2015)
R. ferrugineus	KF413066		China	Wang et al. (2015)
R. ferrugineus	KF413067		China	Wang et al. (2015)
R. ferrugineus	KF413068		China	Wang et al. (2015)
R. ferrugineus	KF413069		China	Wang et al. (2015)
R. ferrugineus	KF413070		China	Wang et al. (2015)
R. ferrugineus	KF413071		China	Wang et al. (2015)
R. ferrugineus	KF413072		China	Wang et al. (2015)
R. ferrugineus	KF413073		China	Wang et al. (2015)
R. ferrugineus	KM438512		Unknown	Hussain et al. cited by GenBank (2021)
R. ferrugineus	KT989230		Saudi Arabia	Surkirno et al. (2018)
R. ferrugineus	KT989231		Saudi Arabia	Surkirno et al. (2018)
R. ferrugineus	KT989232		Saudi Arabia	Surkirno et al. (2018)
R. ferrugineus	KT989233		Saudi Arabia	Surkirno et al. (2018)
R. ferrugineus	KT989234		Saudi Arabia	Surkirno et al. (2018)
R. ferrugineus	KU366272		Egypt	Hashem (2016)
R. ferrugineus	KU366273		Egypt	Hashem (2016)
R. ferrugineus	KU366274		Egypt	Hashem (2016)
R. ferrugineus	KU916538		Italy	Rulik et al. (2017)
R. ferrugineus	KY458175		Pakistan	Gonzalez et al. cited by GenBank (2021)
R. ferrugineus	KY458176		Pakistan	Gonzalez et al. cited by GenBank (2021)
R. ferrugineus	KY458177		Pakistan	Gonzalez et al. cited by GenBank (2021)
R. ferrugineus	LC474878		Egypt	Fouda et al. cited by GenBank (2021)
R. ferrugineus	LC474879		Egypt	Fouda et al. cited by GenBank (2021)
R. ferrugineus	LC474880		Egypt	Fouda et al. cited by GenBank (2021)
R. ferrugineus	LC474881		Egypt	Fouda et al. cited by GenBank (2021)
R. ferrugineus	LC474882		Egypt	Fouda et al. cited by GenBank (2021)
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R. ferrugineus	LC474884		Egypt	Fouda et al. cited by GenBank (2021)
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R. ferrugineus	LC474887		Egypt	Fouda et al. cited by GenBank (2021)
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R. ferrugineus	LC474889		Egypt	Fouda et al. cited by GenBank (2021)
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R. ferrugineus	LC474892		Egypt	Fouda et al. cited by GenBank (2021)
R. ferrugineus	LC474893		Egypt	Fouda et al. cited by GenBank (2021)
R. ferrugineus	LC474894		Egypt	Fouda et al. cited by GenBank (2021)
R. ferrugineus	LC474895		Egypt	Fouda et al. cited by GenBank (2021)
R. ferrugineus	LC474896		Egypt	Fouda et al. cited by GenBank (2021)
R. ferrugineus	LC474897		Egypt	Fouda et al. cited by GenBank (2021)
R. ferrugineus	LC474898		Egypt	Fouda et al. cited by GenBank (2021)
R. ferrugineus	LC474899		Egypt	Fouda et al. cited by GenBank (2021)
R. ferrugineus	LC474900		Egypt	Fouda et al. cited by GenBank (2021)
R. ferrugineus	LC474901		Egypt	Fouda et al. cited by GenBank (2021)
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R. ferrugineus	LC474903		Egypt	Fouda et al. cited by GenBank (2021)
R. ferrugineus	LC474904		Egypt	Fouda et al. cited by GenBank (2021)
R. ferrugineus	LC474905		Egypt	Fouda et al. cited by GenBank (2021)
R. ferrugineus	LC474906		Egypt	Fouda et al. cited by GenBank (2021)
R. ferrugineus	LC474907		Egypt	Fouda et al. cited by GenBank (2021)
R. ferrugineus	LC474908		Egypt	Fouda et al. cited by GenBank (2021)
R. ferrugineus	LC474909		Egypt	Fouda et al. cited by GenBank (2021)
R. ferrugineus	LC474910		Egypt	Fouda et al. cited by GenBank (2021)
R. ferrugineus	LC474911		Egypt	Fouda et al. cited by GenBank (2021)
R. ferrugineus	LC474912		Egypt	Fouda et al. cited by GenBank (2021)
R. ferrugineus	LC474913		Egypt	Fouda et al. cited by GenBank (2021)
R. ferrugineus	LC474914		Egypt	Fouda et al. cited by GenBank (2021)
R. ferrugineus	LC474915		Egypt	Fouda et al. cited by GenBank (2021)
R. ferrugineus	LC474916		Egypt	Fouda et al. cited by GenBank (2021)
R. ferrugineus	LC474917		Egypt	Fouda et al. cited by GenBank (2021)
R. ferrugineus	LC474918		Egypt	Fouda et al. cited by GenBank (2021)
R. ferrugineus	LC474919		Egypt	Fouda et al. cited by GenBank (2021)
R. ferrugineus	LC474920		Egypt	Fouda et al. cited by GenBank (2021)
R. ferrugineus	LC474921		Egypt	Fouda et al. cited by GenBank (2021)
R. ferrugineus	LC474922		Egypt	Fouda et al. cited by GenBank (2021)
R. ferrugineus	LC474923		Egypt	Fouda et al. cited by GenBank (2021)
R. ferrugineus	LC474924		Egypt	Fouda et al. cited by GenBank (2021)
R. ferrugineus	LC474925		Egypt	Fouda et al. cited by GenBank (2021)
R. ferrugineus	LC474926		Egypt	Fouda et al. cited by GenBank (2021)
R. ferrugineus	LC474927		Egypt	Fouda et al. cited by GenBank (2021)
R. ferrugineus	LC474928		Egypt	Fouda et al. cited by GenBank (2021)
R. ferrugineus	LC474929		Egypt	Fouda et al. cited by GenBank (2021)
R. ferrugineus	MF448526		Egypt	Mahmoud et al. cited by GenBank (2021)

R. ferrugineus	MG051027		Peninsular Malaysia	Aman-Zuki et al. 2021
R. ferrugineus	MG051028		Peninsular Malaysia	Aman-Zuki et al. 2021
R. ferrugineus	MG051029		Peninsular Malaysia	Aman-Zuki et al. 2021
R. ferrugineus	MG051030		Peninsular Malaysia	Aman-Zuki et al. 2021
R. ferrugineus	MG051031		Peninsular Malaysia	Aman-Zuki et al. 2021
R. ferrugineus	MG872818		Egypt	Fouda et al. cited by GenBank (2021)
R. ferrugineus	MG883395		Egypt	Fouda et al. cited by GenBank (2021)
R. ferrugineus	MG883396		Egypt	Fouda et al. cited by GenBank (2021)
R. ferrugineus	MG883397		Egypt	Fouda et al. cited by GenBank (2021)
R. ferrugineus	MG883398		Egypt	Fouda et al. cited by GenBank (2021)
R. ferrugineus	MG883399		Egypt	Fouda et al. cited by GenBank (2021)
R. ferrugineus	MH016277		Saudi Arabia	Alajmi (2020)
R. ferrugineus	MH016278		Saudi Arabia	Alajmi (2020)
R. ferrugineus	MH016279		Saudi Arabia	Alajmi (2020)
R. ferrugineus	MH016604		Egypt	Fouda et al. cited by GenBank (2021)
R. ferrugineus	MH016605		Egypt	Fouda et al. cited by GenBank (2021)
R. ferrugineus	MH016606		Egypt	Fouda et al. cited by GenBank (2021)
R. ferrugineus	MH016607		Egypt	Fouda et al. cited by GenBank (2021)
R. ferrugineus	MH016608		Egypt	Fouda et al. cited by GenBank (2021)
R. ferrugineus	MH016609		Egypt	Fouda et al. cited by GenBank (2021)
R. ferrugineus	MH016610		Egypt	Fouda et al. cited by GenBank (2021)
R. ferrugineus	MH016611		Egypt	Fouda et al. cited by GenBank (2021)
R. ferrugineus	MH016612		Egypt	Fouda et al. cited by GenBank (2021)
R. ferrugineus	MH016613		Egypt	Fouda et al. cited by GenBank (2021)
R. ferrugineus	MH016614		Egypt	Fouda et al. cited by GenBank (2021)
R. ferrugineus	MH016615		Egypt	Fouda et al. cited by GenBank (2021)
R. ferrugineus	MH016616		Egypt	Fouda et al. cited by GenBank (2021)
R. ferrugineus	MH016617		Egypt	Fouda et al. cited by GenBank (2021)
R. ferrugineus	MH016618		Egypt	Fouda et al. cited by GenBank (2021)
R. ferrugineus	MH016619		Egypt	Fouda et al. cited by GenBank (2021)
R. ferrugineus	MH016620		Egypt	Fouda et al. cited by GenBank (2021)
R. ferrugineus	MH016621		Egypt	Fouda et al. cited by GenBank (2021)
R. ferrugineus	MH016622		Egypt	Fouda et al. cited by GenBank (2021)
R. ferrugineus	MH016623		Egypt	Fouda et al. cited by GenBank (2021)
R. ferrugineus	MH016624		Egypt	Fouda et al. cited by GenBank (2021)
R. ferrugineus	MH016625		Egypt	Fouda et al. cited by GenBank (2021)
R. ferrugineus	MH016626		Egypt	Fouda et al. cited by GenBank (2021)
R. ferrugineus	MH016627		Egypt	Fouda et al. cited by GenBank (2021)
R. ferrugineus	MH016628		Egypt	Fouda et al. cited by GenBank (2021)
R. ferrugineus	MH016629		Egypt	Fouda et al. cited by GenBank (2021)

R. ferrugineus	MH016630		Egypt	Fouda et al. cited by GenBank (2021)
R. ferrugineus	MH016631		Egypt	Fouda et al. cited by GenBank (2021)
R. ferrugineus	MH016632		Egypt	Fouda et al. cited by GenBank (2021)
R. ferrugineus	MH016633		Egypt	Fouda et al. cited by GenBank (2021)
R. ferrugineus	MH016634		Egypt	Fouda et al. cited by GenBank (2021)
R. ferrugineus	MH016635		Egypt	Fouda et al. cited by GenBank (2021)
R. ferrugineus	MH016636		Egypt	Fouda et al. cited by GenBank (2021)
R. ferrugineus	MH016637		Egypt	Fouda et al. cited by GenBank (2021)
R. palmarum	KU647599	Rp1	Brazil	Silva (2016)
R. palmarum	KU647600	Rp1	Brazil	Silva (2016)
R. palmarum	KU647601	Rp1	Brazil	Silva (2016)
R. palmarum	KU647490	Rp10	Brazil	Silva (2016)
R. palmarum	KU647494	Rp10	Brazil	Silva (2016)
R. palmarum	KU647509	Rp10	Brazil	Silva (2016)
R. palmarum	KU647529	Rp10	Brazil	Silva (2016)
R. palmarum	KU647530	Rp10	Brazil	Silva (2016)
R. palmarum	KU647534	Rp10	Brazil	Silva (2016)
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R. palmarum	KU647549	Rp10	Brazil	Silva (2016)
R. palmarum	KU647551	Rp10	Brazil	Silva (2016)
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R. palmarum	KU647560	Rp10	Brazil	Silva (2016)
R. palmarum	KU647566	Rp10	Brazil	Silva (2016)
R. palmarum	KU647621	Rp10	Brazil	Silva (2016)
R. palmarum	KU647625	Rp10	Brazil	Silva (2016)
R. palmarum	KU647489	Rp11	Brazil	Silva (2016)
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R. palmarum	KU647493	Rp11	Brazil	Silva (2016)
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R. palmarum	KU647497	Rp11	Brazil	Silva (2016)
R. palmarum	KU647498	Rp11	Brazil	Silva (2016)
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R. palmarum	KU647511	Rp11	Brazil	Silva (2016)

R. palmarum	KU647512	Rp11	Brazil	Silva (2016)
R. palmarum	KU647513	Rp11	Brazil	Silva (2016)
R. palmarum	KU647514	Rp11	Brazil	Silva (2016)
R. palmarum	KU647515	Rp11	Brazil	Silva (2016)
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R. palmarum	KU647518	Rp11	Brazil	Silva (2016)
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R. palmarum	KU647554	Rp11	Brazil	Silva (2016)
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R. palmarum	KU647603	Rp11	Brazil	Silva (2016)
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R. palmarum	KU647619	Rp11	Brazil	Silva (2016)
R. palmarum	KU647620	Rp11	Brazil	Silva (2016)
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R. palmarum	KU647623	Rp11	Brazil	Silva (2016)
R. palmarum	KU647624	Rp11	Brazil	Silva (2016)
R. palmarum	KU647604	Rp12	Brazil	Silva (2016)
R. palmarum	KU647605	Rp12	Brazil	Silva (2016)
R. palmarum	KU647606	Rp12	Brazil	Silva (2016)
R. palmarum	KU647575	Rp13	Brazil	Silva (2016)
R. palmarum	KU647587	Rp2	Brazil	Silva (2016)
R. palmarum	KU647508	Rp3	Brazil	Silva (2016)
R. palmarum	KU647585	Rp4	Brazil	Silva (2016)
R. palmarum	KU647597	Rp4	Brazil	Silva (2016)
R. palmarum	KU647584	Rp5	Brazil	Silva (2016)
R. palmarum	KU647590	Rp5	Brazil	Silva (2016)
R. palmarum	KU647591	Rp5	Brazil	Silva (2016)
R. palmarum	KU647596	Rp5	Brazil	Silva (2016)
R. palmarum	KU647607	Rp5	Brazil	Silva (2016)
R. palmarum	KU647581	Rp6	Brazil	Silva (2016)

R. palmarum	KU647583	Rp6	Brazil	Silva (2016)
R. palmarum	KU647588	Rp6	Brazil	Silva (2016)
R. palmarum	KU647589	Rp6	Brazil	Silva (2016)
R. palmarum	KU647593	Rp6	Brazil	Silva (2016)
R. palmarum	KU647595	Rp6	Brazil	Silva (2016)
R. palmarum	KU647579	Rp7	Brazil	Silva (2016)
R. palmarum	KU647580	Rp7	Brazil	Silva (2016)
R. palmarum	KU647582	Rp7	Brazil	Silva (2016)
R. palmarum	KU647586	Rp7	Brazil	Silva (2016)
R. palmarum	KU647592	Rp7	Brazil	Silva (2016)
R. palmarum	KU647594	Rp7	Brazil	Silva (2016)
R. palmarum	KU647598	Rp7	Brazil	Silva (2016)
R. palmarum	KU647614	Rp7	Brazil	Silva (2016)
R. palmarum	KU647502	Rp8	Brazil	Silva (2016)
R. palmarum	KU647505	Rp9	Brazil	Silva (2016)
R. palmarum	KU647532	Rp9	Brazil	Silva (2016)
R. palmarum	ASSCR6357		Costa Rica	Bold (2021)
R. palmarum	ASSCR6358		Costa Rica	Bold (2021)
R. palmarum	ASSCR6359		Costa Rica	Bold (2021)
R. palmarum	AY131121		Unknown	O'Meara, B.C. and Farrell, B.D. cited by GenBank (2021)
R. palmarum	GU581629		French Guiana	El-Mergawy et al. (2011)
R. palmarum	KF311358		Mexico	Rugman-Jones et al. (2013)
R. palmarum	KR494254		Colombia	Löhr et al. (2015)
R. palmarum	KR494255		Colombia	Löhr et al. (2015)
R. palmarum	KR494256		Colombia	Löhr et al. (2015)
R. palmarum	KR494257		Colombia	Löhr et al. (2015)
R. palmarum	KR494258		Colombia	Löhr et al. (2015)
R. palmarum	KR494259		Colombia	Löhr et al. (2015)
R. palmarum	KR494260		Colombia	Löhr et al. (2015)
R. palmarum	KR494261		Colombia	Löhr et al. (2015)
R. palmarum	Univalle_10		Colombia	This study
R. palmarum	Univalle_11		Colombia	This study
R. palmarum	Univalle_17		Colombia	This study
R. palmarum	Univalle_21		Colombia	This study
R. palmarum	Univalle_44		Colombia	This study
R. palmarum	Univalle_58		Colombia	This study
R. palmarum	Univalle_117		Colombia	This study
R. phoenicis	AY131120		Unknown	O'Meara, B.C. and Farrell, B.D. cited by GenBank (2021)
R. phoenicis	KY511047		Liberia	Utomo et al. cited by GenBank (2021)
R. vulneratus	KF311588	Rv1	Malaysia	Rugman-Jones et al. (2013)
R. vulneratus	KF311587	Rv10	Malaysia	Rugman-Jones et al. (2013)
R. vulneratus	KF311629	Rv11	Singapore	Rugman-Jones et al. (2013)

R. vulneratus	KF311550	Rv12	Indonesia	Rugman-Jones et al. (2013)
R. vulneratus	KF311575	Rv12	Indonesia	Rugman-Jones et al. (2013)
R. vulneratus	KF311549	Rv13	Indonesia	Rugman-Jones et al. (2013)
R. vulneratus	KF311574	Rv13	Indonesia	Rugman-Jones et al. (2013)
R. vulneratus	KF311579	Rv13	Indonesia	Rugman-Jones et al. (2013)
R. vulneratus	KF311573	Rv14	Indonesia	Rugman-Jones et al. (2013)
R. vulneratus	KF311546	RV15	Indonesia	Rugman-Jones et al. (2013)
R. vulneratus	KF311553	Rv15	Indonesia	Rugman-Jones et al. (2013)
R. vulneratus	KF311572	Rv15	Indonesia	Rugman-Jones et al. (2013)
R. vulneratus	KF311600	Rv16	Indonesia	Rugman-Jones et al. (2013)
R. vulneratus	KF311578	Rv17	Indonesia	Rugman-Jones et al. (2013)
R. vulneratus	KF311593	Rv18	Indonesia	Rugman-Jones et al. (2013)
R. vulneratus	KF311552	Rv19	Indonesia	Rugman-Jones et al. (2013)
R. vulneratus	KF311554	Rv19	Indonesia	Rugman-Jones et al. (2013)
R. vulneratus	KF311586	Rv2	Malaysia	Rugman-Jones et al. (2013)
R. vulneratus	KF311594	Rv20	Indonesia	Rugman-Jones et al. (2013)
R. vulneratus	KF311595	Rv20	Indonesia	Rugman-Jones et al. (2013)
R. vulneratus	KF311596	Rv20	Indonesia	Rugman-Jones et al. (2013)
R. vulneratus	KF311597	Rv20	Indonesia	Rugman-Jones et al. (2013)
R. vulneratus	KF311598	Rv20	Indonesia	Rugman-Jones et al. (2013)
R. vulneratus	KF311599	Rv20	Indonesia	Rugman-Jones et al. (2013)
R. vulneratus	KF311547	Rv21	Indonesia	Rugman-Jones et al. (2013)
R. vulneratus	KF311591	Rv22	Indonesia	Rugman-Jones et al. (2013)
R. vulneratus	KF311545	Rv23	Indonesia	Rugman-Jones et al. (2013)
R. vulneratus	KF311551	Rv23	Indonesia	Rugman-Jones et al. (2013)
R. vulneratus	KF311576	Rv24	Indonesia	Rugman-Jones et al. (2013)
R. vulneratus	KF311577	Rv24	Indonesia	Rugman-Jones et al. (2013)
R. vulneratus	KF311548	Rv25	Indonesia	Rugman-Jones et al. (2013)
R. vulneratus	KF311592	Rv25	Indonesia	Rugman-Jones et al. (2013)
R. vulneratus	KF311559	RV26	Indonesia	Rugman-Jones et al. (2013)
R. vulneratus	KF311561	Rv27	Indonesia	Rugman-Jones et al. (2013)
R. vulneratus	KF311533	Rv28	Indonesia	Rugman-Jones et al. (2013)
R. vulneratus	KF311534	Rv28	Indonesia	Rugman-Jones et al. (2013)
R. vulneratus	KF311540	Rv28	Indonesia	Rugman-Jones et al. (2013)
R. vulneratus	KF311537	Rv29	Indonesia	Rugman-Jones et al. (2013)
R. vulneratus	KF311633	Rv3	Thailand	Rugman-Jones et al. (2013)
R. vulneratus	KF311564	Rv30	Indonesia	Rugman-Jones et al. (2013)
R. vulneratus	KF311570	Rv31	Indonesia	Rugman-Jones et al. (2013)
R. vulneratus	KF311530	Rv32	Indonesia	Rugman-Jones et al. (2013)
R. vulneratus	KF311531	Rv32	Indonesia	Rugman-Jones et al. (2013)
R. vulneratus	KF311569	Rv32	Indonesia	Rugman-Jones et al. (2013)
R. vulneratus	KF311538	Rv33	Indonesia	Rugman-Jones et al. (2013)
R. vulneratus	KF311539	Rv33	Indonesia	Rugman-Jones et al. (2013)

R. vulneratus	KF311542	Rv33	Indonesia	Rugman-Jones et al. (2013)
R. vulneratus	KF311543	Rv33	Indonesia	Rugman-Jones et al. (2013)
R. vulneratus	KF311565	Rv33	Indonesia	Rugman-Jones et al. (2013)
R. vulneratus	KF311610	Rv34	Indonesia	Rugman-Jones et al. (2013)
R. vulneratus	KF311612	Rv34	Indonesia	Rugman-Jones et al. (2013)
R. vulneratus	KF311605	Rv35	Indonesia	Rugman-Jones et al. (2013)
R. vulneratus	KF311535	Rv36	Indonesia	Rugman-Jones et al. (2013)
R. vulneratus	KF311529	RV37	Indonesia	Rugman-Jones et al. (2013)
R. vulneratus	KF311541	Rv37	Indonesia	Rugman-Jones et al. (2013)
R. vulneratus	KF311562	Rv37	Indonesia	Rugman-Jones et al. (2013)
R. vulneratus	KF311566	Rv37	Indonesia	Rugman-Jones et al. (2013)
R. vulneratus	KF311532	Rv38	Indonesia	Rugman-Jones et al. (2013)
R. vulneratus	KF311536	Rv38	Indonesia	Rugman-Jones et al. (2013)
R. vulneratus	KF311571	Rv38	Indonesia	Rugman-Jones et al. (2013)
R. vulneratus	KF311563	Rv39	Indonesia	Rugman-Jones et al. (2013)
R. vulneratus	KF311589	Rv4	Malaysia	Rugman-Jones et al. (2013)
R. vulneratus	KF311568	Rv40	Indonesia	Rugman-Jones et al. (2013)
R. vulneratus	KF311555	Rv41	Indonesia	Rugman-Jones et al. (2013)
R. vulneratus	KF311556	Rv41	Indonesia	Rugman-Jones et al. (2013)
R. vulneratus	KF311557	Rv41	Indonesia	Rugman-Jones et al. (2013)
R. vulneratus	KF311558	RV42	Indonesia	Rugman-Jones et al. (2013)
R. vulneratus	KF311560	Rv43	Indonesia	Rugman-Jones et al. (2013)
R. vulneratus	KF311601	Rv44	Indonesia	Rugman-Jones et al. (2013)
R. vulneratus	KF311608	Rv45	Indonesia	Rugman-Jones et al. (2013)
R. vulneratus	KF311611	Rv45	Indonesia	Rugman-Jones et al. (2013)
R. vulneratus	KF311604	Rv46	Indonesia	Rugman-Jones et al. (2013)
R. vulneratus	KF311615	Rv47	Indonesia	Rugman-Jones et al. (2013)
R. vulneratus	KF311603	Rv48	Indonesia	Rugman-Jones et al. (2013)
R. vulneratus	KF311618	Rv48	Indonesia	Rugman-Jones et al. (2013)
R. vulneratus	KF311609	Rv49	Indonesia	Rugman-Jones et al. (2013)
R. vulneratus	KF311613	Rv49	Indonesia	Rugman-Jones et al. (2013)
R. vulneratus	KF311632	Rv5	Thailand	Rugman-Jones et al. (2013)
R. vulneratus	KF311602	Rv50	Indonesia	Rugman-Jones et al. (2013)
R. vulneratus	KF311616	Rv50	Indonesia	Rugman-Jones et al. (2013)
R. vulneratus	KF311621	Rv51	Indonesia	Rugman-Jones et al. (2013)
R. vulneratus	KF311623	Rv51	Indonesia	Rugman-Jones et al. (2013)
R. vulneratus	KF311626	Rv51	Indonesia	Rugman-Jones et al. (2013)
R. vulneratus	KF311619	Rv52	Indonesia	Rugman-Jones et al. (2013)
R. vulneratus	KF311620	Rv53	Indonesia	Rugman-Jones et al. (2013)
R. vulneratus	KF311622	Rv54	Indonesia	Rugman-Jones et al. (2013)
R. vulneratus	KF311624	Rv54	Indonesia	Rugman-Jones et al. (2013)
R. vulneratus	KF311617	Rv55	Indonesia	Rugman-Jones et al. (2013)
R. vulneratus	KF311606	Rv56	Indonesia	Rugman-Jones et al. (2013)

R. vulneratus	KF311614	Rv57	Indonesia	Rugman-Jones et al. (2013)
R. vulneratus	KF311567	Rv59	Indonesia	Rugman-Jones et al. (2013)
R. vulneratus	KF311628	Rv6	Singapore	Rugman-Jones et al. (2013)
R. vulneratus	KF311630	Rv6	Thailand	Rugman-Jones et al. (2013)
R. vulneratus	KF311607	Rv60	Indonesia	Rugman-Jones et al. (2013)
R. vulneratus	KF311544	Rv61	United States of America	Rugman-Jones et al. (2013)
R. vulneratus	KF311580	Rv61	United States of America	Rugman-Jones et al. (2013)
R. vulneratus	KF311581	Rv61	United States of America	Rugman-Jones et al. (2013)
R. vulneratus	KF311582	Rv61	United States of America	Rugman-Jones et al. (2013)
R. vulneratus	KF311583	Rv61	United States of America	Rugman-Jones et al. (2013)
R. vulneratus	KF311584	Rv61	United States of America	Rugman-Jones et al. (2013)
R. vulneratus	KF311585	Rv61	United States of America	Rugman-Jones et al. (2013)
R. vulneratus	KF311627	Rv61	United States of America	Rugman-Jones et al. (2013)
R. vulneratus	KF311625	Rv62	Indonesia	Rugman-Jones et al. (2013)
R. vulneratus	KF311528	Rv7	Thailand	Rugman-Jones et al. (2013)
R. vulneratus	KF311631	RV8	Thailand	Rugman-Jones et al. (2013)
R. vulneratus	KF311590	Rv9	Malaysia	Rugman-Jones et al. (2013)
R. vulneratus	LN612634		Malaysia	Montagna et al. (2015)
R. vulneratus	LN612635		Malaysia	Montagna et al. (2015)
R. vulneratus	LN612636		Malaysia	Montagna et al. (2015)
R. vulneratus	MG051024		Peninsular Malaysia	Aman-Zuki et al. 2021
R. vulneratus	MG051025		Peninsular Malaysia	Aman-Zuki et al. 2021
R. vulneratus	MG051026		Peninsular Malaysia	Aman-Zuki et al. 2021

Table S4. Final alignment of the COI sequences analyzed in phylogenetic approach with species name, haplotype (Ha), and sequence code. Dbor= *Dynamis borassi*; Dper= *D. peropacus*; Hcho= *Hycleus chodschenticus*; Hpha= *H. phaleratus*; Phil= *Psacothea hilliaris*; Pnod= *Panadeleteius nodifer*; Rbil= *Rhynchophorus bilineatus*; Rcru= *R. cruentatus*; Rfer= *R. ferrugineus*; Rpal= *R. palmarum*; Rpho= *R. phoenicis*; Rvul= *R. vulneratus*; Slin= *Sitophilus linearis*; Sory= *Si. oryzae*; Spheno= *Sphenophorus* sp.; Szea= *Si. zeamais*; Yfro= *Yuccaborus frontalis*.

			Position					
Species	Ha	Sequences	1-10	11-20	21-30	31-40	41-50	51-60
Dbor		AY131105	----------	----------	----------	----------	----------	----------
Dbor		Uni9	TCAACAAATC	ATAAAGATAT	TGGAACCCTT	TATTTTATTT	TTGGTACTTG	AGCTGGAATA
Dper		ASSCR6014	----------	----------	---AACTCTT	TATTTTATTT	TTGGTTCTTG	AGCTGGGATA
Dper		ASSCR6015	----------	----------	---AACTCTT	TATTTTATTT	TTGGTTCTTG	AGCTGGAATA
Dper		ASSCR6016	----------	----------	---AACTCTT	TATTTTATTT	TTGGTTCTTG	AGCTGGGATA
Dper		ASSCR6018	----------	----------	---AACTCTT	TATTTTATTT	TTGGTTCTTG	AGCTGGGATA
Hcho		JX679716	TCAACAAATC	ATAAAGATAT	TGGAACACTT	TATTTAATTT	TCGGTGCATG	AGCGGGAATA
Hpha		KC112991	CAACAAAATC	ATAAAGATAT	TGGTACTCTT	TACTTGATTT	TTGGTGCATG	AGCAGGAATA
Nxan		NC018354	TCTACTAATC	ACAAGGACAT	TGGAACATTA	TATTTTATTT	TTGGAGCATG	ATCCGGAATA
Phil		GU244486	TCAACTAATC	ATAAAGATAT	TGGAACATTA	TACTTCCTAT	TTGGAGCTTG	ATCTGGAATA
Pnod		HQ891474	------AATC	ATAAAGACAT	TGGAACATTA	TACTTTATTT	TTGGTGCCTG	ATCAGGTATA
Rbil	Rb1	KF311645	----------	----------	----------	----------	----------	----------
Rbil	Rb2	KF311637	----------	----------	----------	----------	----------	----------
Rbil	Rb3	KF311639	----------	----------	----------	----------	----------	----------
Rbil	Rb4	KF311636	----------	----------	----------	----------	----------	----------
Rbil	Rb5	KF311635	----------	----------	----------	----------	----------	----------
Rbil	Rb6	KF311634	----------	----------	----------	----------	----------	----------
Rbil	Rb7	KF311648	----------	----------	----------	----------	----------	----------
Rbil	Rb8	KF311647	----------	----------	----------	----------	----------	----------

Rcru		AY131113	TCAACAAATC	ATAAAGATAT	TGGCACCTTA	TATTTCATTT	TTGGTACTTG	ATCAGGAATA
Rcru		KF311359	----------	----------	----------	----------	----------	----------
Rcru		USCOC565	----------	----------	---CACCTTA	TATTTCATTT	TTGGTACTTG	ATCGGGGAAA
Rfer	H1	GU581582	----------	----------	----------	----------	----------	----------
Rfer	H10	KF311482	----------	----------	----------	----------	----------	----------
Rfer	H11	KF311444	----------	----------	----------	----------	----------	----------
Rfer	H12	KF311487	----------	----------	----------	----------	----------	----------
Rfer	H13	KF311481	----------	----------	----------	----------	----------	----------
Rfer	H14	KF311448	----------	----------	----------	----------	----------	----------
Rfer	H15	JX292125	----------	----------	----------	----------	----------	----------
Rfer	H16	KF311449	----------	----------	----------	----------	----------	----------
Rfer	H17	KF311360	----------	----------	----------	----------	----------	----------
Rfer	H18	KF311473	----------	----------	----------	----------	----------	----------
Rfer	H2	GU581549	----------	----------	----------	----------	----------	----------
Rfer	H20	KF311433	----------	----------	----------	----------	----------	----------
Rfer	H21	KF311474	----------	----------	----------	----------	----------	----------
Rfer	H22	KF311516	----------	----------	----------	----------	----------	----------
Rfer	H23	KF311380	----------	----------	----------	----------	----------	----------
Rfer	H24	KF311389	----------	----------	----------	----------	----------	----------
Rfer	H25	KF311384	----------	----------	----------	----------	----------	----------
Rfer	H26	KF311388	----------	----------	----------	----------	----------	----------
Rfer	H27	KF311386	----------	----------	----------	----------	----------	----------
Rfer	H28	KF311399	----------	----------	----------	----------	----------	----------
Rfer	H29	KF311383	----------	----------	----------	----------	----------	----------
Rfer	H3	GU581547	----------	----------	----------	----------	----------	----------
Rfer	H30	KF311392	----------	----------	----------	----------	----------	----------
Rfer	H31	KF311379	----------	----------	----------	----------	----------	----------
Rfer	H32	KF311490	----------	----------	----------	----------	----------	----------
Rfer	H34	KF311492	----------	----------	----------	----------	----------	----------

Rfer	H35	KF311496	----------	----------	----------	----------	----------	----------
Rfer	H36	KF311500	----------	----------	----------	----------	----------	----------
Rfer	H37	KF311509	----------	----------	----------	----------	----------	----------
Rfer	H38	KF311505	----------	----------	----------	----------	----------	----------
Rfer	H39	KF311508	----------	----------	----------	----------	----------	----------
Rfer	H4	GU581545	----------	----------	----------	----------	----------	----------
Rfer	H40	KF311506	----------	----------	----------	----------	----------	----------
Rfer	H42	KF311501	----------	----------	----------	----------	----------	----------
Rfer	H43	KF311525	----------	----------	----------	----------	----------	----------
Rfer	H5	GU581539	----------	----------	----------	----------	----------	----------
Rfer	H51	KU696497	----------	----------	----------	----------	----------	----------
Rfer	H52	KU696507	----------	----------	----------	----------	----------	----------
Rfer	H6	GU581526	----------	----------	----------	----------	----------	----------
Rfer	H7	GU581525	----------	----------	----------	----------	----------	----------
Rfer	H8	GU581319	----------	----------	----------	----------	----------	----------
Rfer	H9	KF311446	----------	----------	----------	----------	----------	----------
Rfer		JX292124	----------	----------	----------	----------	----------	----------
Rfer		JX294413	----------	----------	----------	----------	----------	----------
Rfer		KF413063	----------	----------	----------	----------	----------	----------
Rfer		KF413064	----------	----------	----------	----------	----------	----------
Rfer		KF413065	----------	----------	----------	----------	----------	----------
Rfer		KF413066	----------	----------	----------	----------	----------	----------
Rfer		KF413067	----------	----------	----------	----------	----------	----------
Rfer		KF413068	----------	----------	----------	----------	----------	----------
Rfer		KF413069	----------	----------	----------	----------	----------	----------
Rfer		KF413070	----------	----------	----------	----------	----------	----------
Rfer		KF413071	----------	----------	----------	----------	----------	----------
Rfer		KF413072	----------	----------	----------	----------	----------	----------
Rfer		KF413073	----------	----------	----------	----------	----------	----------

Rfer		KT989230	----------	----------	---AACTTTA	TACTTTATTT	TTGGAACTTG	AGCAGGAATA
Rfer		KT989231	----------	----------	---AACTTTA	TACTTTATTT	TTGGAACTTG	AGCAGGAATA
Rfer		KT989232	----------	----------	---AACTTTA	TACTTTATTT	TTGGAACTTG	AGCAGGAATA
Rfer		KT989233	----------	----------	---AACTTTA	TACTTTATTT	TTGGAACTTG	AGCAGGAATA
Rfer		KT989234	----------	----------	---AACTTTA	TACTTTATTT	TTGGAACTTG	AGCAGGAATA
Rfer		KU916538	----------	----------	---AACTTTA	TACTTTATTT	TTGGAACTTG	GGCAGGAATA
Rfer		KY458175	TCAACAAATC	ATAAAGATAT	TGGAACTTTA	TACTTTATTT	TTGGAACTTG	AGCAGGAATA
Rfer		KY458176	TCAACAAATC	ATAAAGATAT	TGGAACTTTA	TACTTTATTT	TTGGAACTTG	AGCAGGAATA
Rfer		KY458177	TCAACAAATC	ATAAAGATAT	TGGAACTTTA	TACTTTATTT	TTGGAACTTG	AGCAGGAATA
Rfer		LC474878	----------	----------	----------	----------	----------	----------
Rfer		LC474880	----------	----------	----------	----------	----------	----------
Rfer		LC474881	----------	----------	----------	----------	----------	----------
Rfer		LC474882	----------	----------	----------	----------	----------	----------
Rfer		LC474884	----------	----------	----------	----------	----------	----------
Rfer		LC474885	----------	----------	----------	----------	----------	----------
Rfer		LC474886	----------	----------	----------	----------	----------	----------
Rfer		LC474887	----------	----------	----------	----------	----------	----------
Rfer		LC474888	----------	----------	----------	----------	----------	----------
Rfer		LC474889	----------	----------	----------	----------	----------	----------
Rfer		LC474890	----------	----------	----------	----------	----------	----------
Rfer		LC474891	----------	----------	----------	----------	----------	----------
Rfer		LC474892	----------	----------	----------	----------	----------	----------
Rfer		LC474893	----------	----------	----------	----------	----------	----------
Rfer		LC474894	----------	----------	----------	----------	----------	----------
Rfer		LC474895	----------	----------	----------	----------	----------	----------
Rfer		LC474896	----------	----------	----------	----------	----------	----------
Rfer		LC474897	----------	----------	----------	----------	----------	----------
Rfer		LC474898	----------	----------	----------	----------	----------	----------
Rfer		LC474899	----------	----------	----------	----------	----------	----------

Rfer		LC474902	----------	----------	----------	----------	----------	----------
Rfer		LC474903	----------	----------	----------	----------	----------	----------
Rfer		LC474904	----------	----------	----------	----------	----------	----------
Rfer		LC474905	----------	----------	----------	----------	----------	----------
Rfer		LC474906	----------	----------	----------	----------	----------	----------
Rfer		LC474907	----------	----------	----------	----------	----------	----------
Rfer		LC474908	----------	----------	----------	----------	----------	----------
Rfer		LC474909	----------	----------	----------	----------	----------	----------
Rfer		LC474910	----------	----------	----------	----------	----------	----------
Rfer		LC474911	----------	----------	----------	----------	----------	----------
Rfer		LC474912	----------	----------	----------	----------	----------	----------
Rfer		LC474913	----------	----------	----------	----------	----------	----------
Rfer		LC474914	----------	----------	----------	----------	----------	----------
Rfer		LC474915	----------	----------	----------	----------	----------	----------
Rfer		LC474916	----------	----------	----------	----------	----------	----------
Rfer		LC474917	----------	----------	----------	----------	----------	----------
Rfer		LC474918	----------	----------	----------	----------	----------	----------
Rfer		LC474919	----------	----------	----------	----------	----------	----------
Rfer		LC474920	----------	----------	----------	----------	----------	----------
Rfer		LC474921	----------	----------	----------	----------	----------	----------
Rfer		LC474922	----------	----------	----------	----------	----------	----------
Rfer		LC474923	----------	----------	----------	----------	----------	----------
Rfer		LC474924	----------	----------	----------	----------	----------	----------
Rfer		LC474925	----------	----------	----------	----------	----------	----------
Rfer		LC474926	----------	----------	----------	----------	----------	----------
Rfer		LC474927	----------	----------	----------	----------	----------	----------
Rfer		LC474928	----------	----------	----------	----------	----------	----------
Rfer		LC474929	----------	----------	----------	----------	----------	----------
Rfer		MF448526	----------	----------	----------	----------	----------	----------

Rfer		MG051027	TCAACAAATC	ATAAAGATAT	TGGAACTTTA	TACTTTATTT	TTGGAACTTG	AGCAGGAATA
Rfer		MG051028	TCAACAAATC	ATAAAGATAT	TGGAACTTTA	TACTTTATTT	TTGGAACTTG	AGCAGGAATA
Rfer		MG051029	TCAACAAATC	ATAAAGATAT	TGGAACTTTA	TACTTTATTT	TTGGAACTTG	AGCAGGAATA
Rfer		MG051030	TCAACAAATC	ATAAAGATAT	TGGAACTTTA	TACTTTATTT	TTGGAACTTG	AGCAGGAATA
Rfer		MG051031	TCAACAAATC	ATAAAGATAT	TGGAACTTTA	TACTTTATTT	TTGGAACTTG	AGCAGGAATA
Rfer		MG872818	----------	----------	----------	----------	----------	----------
Rfer		MG883395	----------	----------	----------	----------	----------	----------
Rfer		MG883396	----------	----------	----------	----------	----------	----------
Rfer		MG883397	----------	----------	----------	----------	----------	----------
Rfer		MG883398	----------	----------	----------	----------	----------	----------
Rfer		MG883399	----------	----------	----------	----------	----------	----------
Rfer		MH016277	----------	----------	----------	----------	----------	-----GAATA
Rfer		MH016278	----------	----------	----------	-TCTTTAGTT	CTGTGACTTG	TGCAGGAATA
Rfer		MH016279	----------	----------	----------	----------	----------	----------
Rfer		MH016604	----------	----------	----------	----------	----------	----------
Rfer		MH016605	----------	----------	----------	----------	----------	----------
Rfer		MH016606	----------	----------	----------	----------	----------	----------
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Rfer		MH016609	----------	----------	----------	----------	----------	----------
Rfer		MH016610	----------	----------	----------	----------	----------	----------
Rfer		MH016611	----------	----------	----------	----------	----------	----------
Rfer		MH016612	----------	----------	----------	----------	----------	----------
Rfer		MH016613	----------	----------	----------	----------	----------	----------
Rfer		MH016614	----------	----------	----------	----------	----------	----------
Rfer		MH016615	----------	----------	----------	----------	----------	----------
Rfer		MH016616	----------	----------	----------	----------	----------	----------
Rfer		MH016617	----------	----------	----------	----------	----------	----------
Rfer		MH016618	----------	----------	----------	----------	----------	----------

Rfer		MH016619	----------	----------	----------	----------	----------	----------
Rfer		MH016620	----------	----------	----------	----------	----------	----------
Rfer		MH016621	----------	----------	----------	----------	----------	----------
Rfer		MH016622	----------	----------	----------	----------	----------	----------
Rfer		MH016623	----------	----------	----------	----------	----------	----------
Rfer		MH016624	----------	----------	----------	----------	----------	----------
Rfer		MH016625	----------	----------	----------	----------	----------	----------
Rfer		MH016626	----------	----------	----------	----------	----------	----------
Rfer		MH016627	----------	----------	----------	----------	----------	----------
Rfer		MH016628	----------	----------	----------	----------	----------	----------
Rfer		MH016629	----------	----------	----------	----------	----------	----------
Rfer		MH016630	----------	----------	----------	----------	----------	----------
Rfer		MH016631	----------	----------	----------	----------	----------	----------
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Rfer		MH016634	----------	----------	----------	----------	----------	----------
Rfer		MH016635	----------	----------	----------	----------	----------	----------
Rfer		MH016636	----------	----------	----------	----------	----------	----------
Rfer		MH016637	----------	----------	----------	----------	----------	----------
Rfer	H19	KF311403	----------	----------	----------	----------	----------	----------
Rfer	H41	KF311502	----------	----------	----------	----------	----------	----------
Rpal		ASSCR6357	----------	----------	---AACCTTA	TATTTTATTT	TTGGAACTTG	AGCTGGAATA
Rpal		ASSCR6358	----------	----------	---AACCTTA	TATTTTATTT	TTGGAACTTG	AGCTGGAATA
Rpal		AY131121	----------	----------	----------	----------	----------	----------
Rpal		GU581629	----------	----------	----------	----------	----------	----------
Rpal		KF311358	----------	----------	----------	----------	----------	----------
Rpal		KR494254	TCAACAAATC	ATAAAGATAT	TGGAACCTTA	TATTTTATTT	TTGGAACTTG	AGCTGGAATG
Rpal		KR494255	TCAACAAATC	ATAAAGATAT	TGGAACCCTA	TATTTTATTT	TTGGAACTTG	AGCTGGAATG
Rpal		KR494256	TCAACAAATC	ATAAAGATAT	TGGAACCTTA	TATTTTATTT	TTGGAACTTG	AGCTGGAATG

Rpal		KR494257	TCAACAAATC	ATAAAGATAT	TGGAACCTTA	TATTTTATTT	TTGGAACTTG	AGCTGGAATG
Rpal		KR494258	TCAACAAATC	ATAAAGATAT	TGGAACCTTA	TATTTTATTT	TTGGAACTTG	AGCTGGAATG
Rpal		KR494259	TCAACAAATC	ATAAAGATAT	TGGAACCTTA	TATTTTATTT	TTGGAACTTG	AGCTGGAATG
Rpal		KR494260	TCAACAAATC	ATAAAGATAT	TGGAACCTTA	TATTTTATTT	TTGGAACTTG	AGCTGGAATG
Rpal		KR494261	TCAACAAATC	ATAAAGATAT	TGGAACCTTA	TATTTTATTT	TTGGAACTTG	AGCTGGAATG
Rpal	Rp1	KU647599	----------	----------	----------	----------	----------	----------
Rpal	Rp10	KU647490	----------	----------	----------	----------	----------	----------
Rpal	Rp11	KU647489	----------	----------	----------	----------	----------	----------
Rpal	Rp12	KU647604	----------	----------	----------	----------	----------	----------
Rpal	Rp13	KU647575	----------	----------	----------	----------	----------	----------
Rpal	Rp2	KU647587	----------	----------	----------	----------	----------	----------
Rpal	Rp3	KU647508	----------	----------	----------	----------	----------	----------
Rpal	Rp4	KU647585	----------	----------	----------	----------	----------	----------
Rpal	Rp5	KU647584	----------	----------	----------	----------	----------	----------
Rpal	Rp6	KU647581	----------	----------	----------	----------	----------	----------
Rpal	Rp7	KU647579	----------	----------	----------	----------	----------	----------
Rpal	Rp8	KU647502	----------	----------	----------	----------	----------	----------
Rpal	Rp9	KU647505	----------	----------	----------	----------	----------	----------
Rpal		Uni10	TCAACAAATC	ATAAAGATAT	TGGAACCTTA	TATTTTATTT	TTGGAACTTG	AGCTGGAATA
Rpal		Uni11	TCAACAAATC	ATAAAGATAT	TGGAACCTTA	TATTTTATTT	TTGGAACTTG	AGCTGGAATA
Rpal		Uni117	TCAACAAATC	ATAAAGATAT	TGGAACCTTA	TATTTTATTT	TTGGAACTTG	AGCTGGAATA
Rpal		Uni17	CCAACAAATC	ATAAAGATAT	TGGAACCTTA	TATTTTATTT	TTGGAACTTG	AGCTGGAATA
Rpal		Uni21	TCAACAAATC	ATAAAGATAT	TGGAACCTTA	TATTTTATTT	TTGGAACTTG	AGCTGGAATA
Rpal		Uni44	TCAACAAATC	ATAAAGATAT	TGGAACCTTA	TATTTTATTT	TTGGAACTTG	AGCTGGAATA
Rpal		Uni58	TCAACAAATC	ATAAAGATAT	TGGAACCTTA	TATTTTATTT	TTGGAACTTG	AGCTGGAATA
Rpho		AY131120	----------	----------	----------	----------	----------	----------
Rpho		KY511047	----------	----------	----------	----------	----------	----------
Rvul		LN612634	----------	----------	----------	----------	----------	----------
Rvul		LN612635	----------	----------	----------	----------	----------	----------

Rvul		LN612636	----------	----------	----------	----------	----------	----------
Rvul		MG051024	TCAACAAATC	ATAAAGATAT	TGGAACTCTA	TACTTTATTT	TTGGAACTTG	GGCAGGAATA
Rvul		MG051025	TCAACAAATC	ATAAAGATAT	TGGAACTCTA	TACTTTATTT	TTGGAACTTG	AGCAGGAATA
Rvul		MG051026	TCAACAAATC	ATAAAGATAT	TGGAACTCTA	TACTTTATTT	TTGGAACTTG	AGCAGGAATA
Rvul	Rv1	KF311588	----------	----------	----------	----------	----------	----------
Rvul	Rv10	KF311587	----------	----------	----------	----------	----------	----------
Rvul	Rv11	KF311629	----------	----------	----------	----------	----------	----------
Rvul	Rv12	KF311550	----------	----------	----------	----------	----------	----------
Rvul	Rv13	KF311549	----------	----------	----------	----------	----------	----------
Rvul	Rv14	KF311573	----------	----------	----------	----------	----------	----------
Rvul	Rv15	KF311546	----------	----------	----------	----------	----------	----------
Rvul	Rv16	KF311600	----------	----------	----------	----------	----------	----------
Rvul	Rv17	KF311578	----------	----------	----------	----------	----------	----------
Rvul	Rv18	KF311593	----------	----------	----------	----------	----------	----------
Rvul	Rv19	KF311552	----------	----------	----------	----------	----------	----------
Rvul	Rv2	KF311586	----------	----------	----------	----------	----------	----------
Rvul	Rv20	KF311594	----------	----------	----------	----------	----------	----------
Rvul	Rv21	KF311547	----------	----------	----------	----------	----------	----------
Rvul	Rv22	KF311591	----------	----------	----------	----------	----------	----------
Rvul	Rv23	KF311545	----------	----------	----------	----------	----------	----------
Rvul	Rv24	KF311576	----------	----------	----------	----------	----------	----------
Rvul	Rv25	KF311548	----------	----------	----------	----------	----------	----------
Rvul	Rv26	KF311559	----------	----------	----------	----------	----------	----------
Rvul	Rv27	KF311561	----------	----------	----------	----------	----------	----------
Rvul	Rv28	KF311533	----------	----------	----------	----------	----------	----------
Rvul	Rv29	KF311537	----------	----------	----------	----------	----------	----------
Rvul	Rv3	KF311633	----------	----------	----------	----------	----------	----------
Rvul	Rv30	KF311564	----------	----------	----------	----------	----------	----------
Rvul	Rv31	KF311570	----------	----------	----------	----------	----------	----------

Rvul	Rv32	KF311530	----------	----------	----------	----------	----------	----------
Rvul	Rv33	KF311538	----------	----------	----------	----------	----------	----------
Rvul	Rv34	KF311610	----------	----------	----------	----------	----------	----------
Rvul	Rv35	KF311605	----------	----------	----------	----------	----------	----------
Rvul	Rv36	KF311535	----------	----------	----------	----------	----------	----------
Rvul	Rv37	KF311529	----------	----------	----------	----------	----------	----------
Rvul	Rv38	KF311532	----------	----------	----------	----------	----------	----------
Rvul	Rv39	KF311563	----------	----------	----------	----------	----------	----------
Rvul	Rv4	KF311589	----------	----------	----------	----------	----------	----------
Rvul	Rv40	KF311568	----------	----------	----------	----------	----------	----------
Rvul	Rv41	KF311555	----------	----------	----------	----------	----------	----------
Rvul	Rv42	KF311558	----------	----------	----------	----------	----------	----------
Rvul	Rv43	KF311560	----------	----------	----------	----------	----------	----------
Rvul	Rv44	KF311601	----------	----------	----------	----------	----------	----------
Rvul	Rv45	KF311608	----------	----------	----------	----------	----------	----------
Rvul	Rv46	KF311604	----------	----------	----------	----------	----------	----------
Rvul	Rv47	KF311615	----------	----------	----------	----------	----------	----------
Rvul	Rv48	KF311603	----------	----------	----------	----------	----------	----------
Rvul	Rv49	KF311609	----------	----------	----------	----------	----------	----------
Rvul	Rv5	KF311632	----------	----------	----------	----------	----------	----------
Rvul	Rv50	KF311602	----------	----------	----------	----------	----------	----------
Rvul	Rv51	KF311621	----------	----------	----------	----------	----------	----------
Rvul	Rv52	KF311619	----------	----------	----------	----------	----------	----------
Rvul	Rv53	KF311620	----------	----------	----------	----------	----------	----------
Rvul	Rv54	KF311622	----------	----------	----------	----------	----------	----------
Rvul	Rv55	KF311617	----------	----------	----------	----------	----------	----------
Rvul	Rv56	KF311606	----------	----------	----------	----------	----------	----------
Rvul	Rv57	KF311614	----------	----------	----------	----------	----------	----------
Rvul	Rv59	KF311567	----------	----------	----------	----------	----------	----------

Rvul	Rv6	KF311628	----------	----------	----------	----------	----------	----------
Rvul	Rv60	KF311607	----------	----------	----------	----------	----------	----------
Rvul	Rv61	KF311544	----------	----------	----------	----------	----------	----------
Rvul	Rv62	KF311625	----------	----------	----------	----------	----------	----------
Rvul	Rv7	KF311528	----------	----------	----------	----------	----------	----------
Rvul	Rv8	KF311631	----------	----------	----------	----------	----------	----------
Rvul	Rv9	KF311590	----------	----------	----------	----------	----------	----------
Slin		AY131102	TCTACAAACC	ATAAAGATAT	TGGCACTCTT	TACTTCATCT	TTGGATCATG	ATCAGGAATA
Sory		AY131099	TCTACTAACC	ACAAAGATAT	CGGAACATTA	TACTTTATTT	TTGGAACATG	ATCAGGAATA
Sory		GU196317	TCAACAAATC	ATAAAGATAT	TGGAACATTA	TACTTTATTT	TTGGAACATG	ATCAGGAATA
Spheno		NC018351	TCGACAAATC	ATAAAGATAT	TGGAACCCTT	TATTTTATTT	TTGGGGCTTG	AGCTGGAATA
Szea		AY131100	TCTACTAACC	ATAAAGATAT	TGGAACATTA	TACTTTATTT	TTGGAGCATG	ATCAGGAATA
Yfro		AY131109	TCCACAAACC	ACAAAGATAT	CGGAACCCTT	TATTTTATTT	TTGGCGCATG	GGCAGGAATA

Continuation of the Table S4.

Species	Ha	Sequences	Position					
			61-70	71-80	81-90	91-100	101-110	111-120
Dbor		AY131105	----------	----------	--------GT	GCAGAATTAG	GAAGACCTGG	GTCTTTAATT
Dbor		Uni9	GTAGGAACTT	CCTTAAGTAT	ATTAATTCGT	GCAGAATTAG	GAAGACCTGG	ATCTTTAATT
Dper		ASSCR6014	GTAGGGACCT	CTTTAAGTAT	ACTAATTCGT	GCAGAATTAG	GAAGACCTGG	GTCTCTAATT
Dper		ASSCR6015	GTAGGGACCT	CTTTAAGTAT	ACTAATTCGT	GCAGAATTAG	GAAGACCTGG	ATCTCTAATT
Dper		ASSCR6016	GTAGGGACCT	CTTTAAGTAT	ACTAATTCGT	GCAGAATTAG	GAAGACCTGG	GTCTCTAATT
Dper		ASSCR6018	GTAGGGACCT	CTTTAAGTAT	ACTAATTCGT	GCAGAATTAG	GAAGACCTGG	GTCTCTAATT
Hcho		JX679716	GTAGGTACTT	CACTCAGAAT	ACTTATCCGC	TCAGAACTCG	GAAATCCAGG	AACTCTAATT
Hpha		KC112991	GTAGGAACCT	CCCTCAGAAT	ACTAATCCGT	TCAGAACTAG	GAAATCCCGG	CACACTCATC
Nxan		NC018354	ATTGGAACTT	CATTAAGAAT	ACTAATTCGA	TCAGAACTAG	GAAATCCTGG	TTCACTAATT
Phil		GU244486	GTAGGAACAT	CTTTAAGACT	TTTGATTCGA	TCAGAATTAG	GAAACCCTGG	ATCTTTAATT
Pnod		HQ891474	GTGGGTACGT	CCTTAAGAAT	ATTAATTCGT	ACTGAATTAG	GAAACCCCGG	ATCATTAATT
Rbil	Rb1	KF311645	----------	----------	----------	----------	----------	----------
Rbil	Rb2	KF311637	----------	----------	----------	----------	----------	----------
Rbil	Rb3	KF311639	----------	----------	----------	----------	----------	----------
Rbil	Rb4	KF311636	----------	----------	----------	----------	----------	----------
Rbil	Rb5	KF311635	----------	----------	----------	----------	----------	----------
Rbil	Rb6	KF311634	----------	----------	----------	----------	----------	----------
Rbil	Rb7	KF311648	----------	----------	----------	----------	----------	----------
Rbil	Rb8	KF311647	----------	----------	----------	----------	----------	----------
Rcru		AY131113	GTAGGGACTT	CTCTCAAAAT	ACTTATTCCA	GCTGAATTAG	GAAGACCTGG	CTCTTTAATT
Rcru		KF311359	----------	----------	----------	----------	----------	----------
Rcru		USCOC565	TTAGGGATTT	CTCTCAGAAT	ACTTATTCGA	GCTGAATTAG	GAAGACCTGG	CTCTTTAATT
Rfer	H1	GU581582	----------	----------	----------	----------	----------	----------
Rfer	H10	KF311482	----------	----------	----------	----------	----------	----------
Rfer	H11	KF311444	----------	----------	----------	----------	----------	----------

Rfer	H12	KF311487	----------	----------	----------	----------	----------	----------
Rfer	H13	KF311481	----------	----------	----------	----------	----------	----------
Rfer	H14	KF311448	----------	----------	----------	----------	----------	----------
Rfer	H15	JX292125	----------	----------	----------	----------	----------	----------
Rfer	H16	KF311449	----------	----------	----------	----------	----------	----------
Rfer	H17	KF311360	----------	----------	----------	----------	----------	----------
Rfer	H18	KF311473	----------	----------	----------	----------	----------	----------
Rfer	H2	GU581549	----------	----------	----------	----------	----------	----------
Rfer	H20	KF311433	----------	----------	----------	----------	----------	----------
Rfer	H21	KF311474	----------	----------	----------	----------	----------	----------
Rfer	H22	KF311516	----------	----------	----------	----------	----------	----------
Rfer	H23	KF311380	----------	----------	----------	----------	----------	----------
Rfer	H24	KF311389	----------	----------	----------	----------	----------	----------
Rfer	H25	KF311384	----------	----------	----------	----------	----------	----------
Rfer	H26	KF311388	----------	----------	----------	----------	----------	----------
Rfer	H27	KF311386	----------	----------	----------	----------	----------	----------
Rfer	H28	KF311399	----------	----------	----------	----------	----------	----------
Rfer	H29	KF311383	----------	----------	----------	----------	----------	----------
Rfer	H3	GU581547	----------	----------	----------	----------	----------	----------
Rfer	H30	KF311392	----------	----------	----------	----------	----------	----------
Rfer	H31	KF311379	----------	----------	----------	----------	----------	----------
Rfer	H32	KF311490	----------	----------	----------	----------	----------	----------
Rfer	H34	KF311492	----------	----------	----------	----------	----------	----------
Rfer	H35	KF311496	----------	----------	----------	----------	----------	----------
Rfer	H36	KF311500	----------	----------	----------	----------	----------	----------
Rfer	H37	KF311509	----------	----------	----------	----------	----------	----------
Rfer	H38	KF311505	----------	----------	----------	----------	----------	----------
Rfer	H39	KF311508	----------	----------	----------	----------	----------	----------
Rfer	H4	GU581545	----------	----------	----------	----------	----------	----------

Rfer	H40	KF311506	----------	----------	----------	----------	----------	----------
Rfer	H42	KF311501	----------	----------	----------	----------	----------	----------
Rfer	H43	KF311525	----------	----------	----------	----------	----------	----------
Rfer	H5	GU581539	----------	----------	----------	----------	----------	----------
Rfer	H51	KU696497	----------	----------	----------	----------	----------	----------
Rfer	H52	KU696507	----------	----------	----------	----------	----------	----------
Rfer	H6	GU581526	----------	----------	----------	----------	----------	----------
Rfer	H7	GU581525	----------	----------	----------	----------	----------	----------
Rfer	H8	GU581319	----------	----------	----------	----------	----------	----------
Rfer	H9	KF311446	----------	----------	----------	----------	----------	----------
Rfer		JX292124	----------	----------	----------	----------	----------	----------
Rfer		JX294413	----------	----------	----------	----------	----------	----------
Rfer		KF413063	----------	----------	----------	----------	----------	----------
Rfer		KF413064	----------	----------	----------	----------	----------	----------
Rfer		KF413065	----------	----------	----------	----------	----------	----------
Rfer		KF413066	----------	----------	----------	----------	----------	----------
Rfer		KF413067	----------	----------	----------	----------	----------	----------
Rfer		KF413068	----------	----------	----------	----------	----------	----------
Rfer		KF413069	----------	----------	----------	----------	----------	----------
Rfer		KF413070	----------	----------	----------	----------	----------	----------
Rfer		KF413071	----------	----------	----------	----------	----------	----------
Rfer		KF413072	----------	----------	----------	----------	----------	----------
Rfer		KF413073	----------	----------	----------	----------	----------	----------
Rfer		KT989230	GTAGGAACCT	CCCTAAGAAT	ATTAATTCGG	GCAGAATTAG	GGAACCCTGG	TTCACTAATT
Rfer		KT989231	GTAGGAACCT	CCCTAAGAAT	ATTAATTCGG	GCAGAATTAG	GGAACCCTGG	TTCACTAATT
Rfer		KT989232	GTAGGAACCT	CCCTAAGAAT	ATTAATTCGG	GCAGAATTAG	GGAACCCTGG	TTCACTAATT
Rfer		KT989233	GTAGGAACCT	CCCTAAGAAT	ATTAATTCGG	GCAGAATTAG	GGAACCCTGG	TTCACTAATT
Rfer		KT989234	GTAGGAACCT	CCCTAAGAAT	ATTAATTCGG	GCAGAATTAG	GGAACCCTGG	TTCACTAATT
Rfer		KU916538	GTAGGAACCT	CCCTAAGAAT	ATTAATTCGG	GCAGAATTAG	GGAACCCTGG	CTCACTAATT

Rfer		KY458175	GTAGGAACCT	CCCTAAGAAT	ATTAATTCGA	GCAGAATTAG	GGAGCCCCGG	CTCACTGATT
Rfer		KY458176	GTAGGAACCT	CCCTAAGAAT	ATTAATTCGA	GCAGAATTAG	GGAGCCCCGG	CTCACTGATT
Rfer		KY458177	GTAGGAACCT	CCCTAAGAAT	ATTAATTCGA	GCAGAATTAG	GGAGCCCCGG	CTCACTGATT
Rfer		LC474878	----------	----------	----------	----------	----------	----------
Rfer		LC474880	----------	----------	----------	----------	----------	----------
Rfer		LC474881	----------	----------	----------	----------	----------	----------
Rfer		LC474882	----------	----------	----------	----------	----------	----------
Rfer		LC474884	----------	----------	----------	----------	----------	----------
Rfer		LC474885	----------	----------	----------	----------	----------	----------
Rfer		LC474886	----------	----------	----------	----------	----------	----------
Rfer		LC474887	----------	----------	----------	----------	----------	----------
Rfer		LC474888	----------	----------	----------	----------	----------	----------
Rfer		LC474889	----------	----------	----------	----------	----------	----------
Rfer		LC474890	----------	----------	----------	----------	----------	----------
Rfer		LC474891	----------	----------	----------	----------	----------	----------
Rfer		LC474892	----------	----------	----------	----------	----------	----------
Rfer		LC474893	----------	----------	----------	----------	----------	----------
Rfer		LC474894	----------	----------	----------	----------	----------	----------
Rfer		LC474895	----------	----------	----------	----------	----------	----------
Rfer		LC474896	----------	----------	----------	----------	----------	----------
Rfer		LC474897	----------	----------	----------	----------	----------	----------
Rfer		LC474898	----------	----------	----------	----------	----------	----------
Rfer		LC474899	----------	----------	----------	----------	----------	----------
Rfer		LC474902	----------	----------	----------	----------	----------	----------
Rfer		LC474903	----------	----------	----------	----------	----------	----------
Rfer		LC474904	----------	----------	----------	----------	----------	----------
Rfer		LC474905	----------	----------	----------	----------	----------	----------
Rfer		LC474906	----------	----------	----------	----------	----------	----------
Rfer		LC474907	----------	----------	----------	----------	----------	----------

Rfer		LC474908	----------	----------	----------	----------	----------	----------
Rfer		LC474909	----------	----------	----------	----------	----------	----------
Rfer		LC474910	----------	----------	----------	----------	----------	----------
Rfer		LC474911	----------	----------	----------	----------	----------	----------
Rfer		LC474912	----------	----------	----------	----------	----------	----------
Rfer		LC474913	----------	----------	----------	----------	----------	----------
Rfer		LC474914	----------	----------	----------	----------	----------	----------
Rfer		LC474915	----------	----------	----------	----------	----------	----------
Rfer		LC474916	----------	----------	----------	----------	----------	----------
Rfer		LC474917	----------	----------	----------	----------	----------	----------
Rfer		LC474918	----------	----------	----------	----------	----------	----------
Rfer		LC474919	----------	----------	----------	----------	----------	----------
Rfer		LC474920	----------	----------	----------	----------	----------	----------
Rfer		LC474921	----------	----------	----------	----------	----------	----------
Rfer		LC474922	----------	----------	----------	----------	----------	----------
Rfer		LC474923	----------	----------	----------	----------	----------	----------
Rfer		LC474924	----------	----------	----------	----------	----------	----------
Rfer		LC474925	----------	----------	----------	----------	----------	----------
Rfer		LC474926	----------	----------	----------	----------	----------	----------
Rfer		LC474927	----------	----------	----------	----------	----------	----------
Rfer		LC474928	----------	----------	----------	----------	----------	----------
Rfer		LC474929	----------	----------	----------	----------	----------	----------
Rfer		MF448526	----------	----------	----------	----------	----------	----------
Rfer		MG051027	GTAGGAACCT	CCCTAAGAAT	ATTAATTCGG	GCAGAATTAG	GGAACCCTGG	CTCACTAATT
Rfer		MG051028	GTAGGAACCT	CCCTAAGAAT	ATTAATTCGG	GCAGAATTAG	GGAACCCTGG	CTCACTAATT
Rfer		MG051029	GTAGGAACCT	CCCTAAGAAT	ATTAATTCGG	GCAGAATTAG	GGAACCCTGG	CTCACTAATT
Rfer		MG051030	GTAGGAACCT	CCCTAAGAAT	ATTAATTCGG	GCAGAATTAG	GGAACCCTGG	CTCACTAATT
Rfer		MG051031	GTAGGAACCT	CCCTAAGAAT	ATTAATTCGG	GCAGAATTAG	GGAACCCTGG	CTCACTAATT
Rfer		MG872818	----------	----------	----------	----------	----------	----------

Rfer		MG883395	----------	----------	----------	----------	----------	----------
Rfer		MG883396	----------	----------	----------	----------	----------	----------
Rfer		MG883397	----------	----------	----------	----------	----------	----------
Rfer		MG883398	----------	----------	----------	----------	----------	----------
Rfer		MG883399	----------	----------	----------	----------	----------	----------
Rfer		MH016277	GTAGGAACCT	CCCTAAGAAT	ATTAATTCGG	GCAGAATTAG	GGAACCCTGG	CTCACTAATT
Rfer		MH016278	GTAGGAACCT	CCCTAAGAAT	ATTAATTCGG	GCAGAATTAG	GGAACCCTGG	TTCACTAATT
Rfer		MH016279	----------	CCCTAAGAAT	ATTAATTCGG	GCAGAATTAG	GGAACCCTGG	CTCACTAATT
Rfer		MH016604	----------	----------	----------	----------	----------	----------
Rfer		MH016605	----------	----------	----------	----------	----------	----------
Rfer		MH016606	----------	----------	----------	----------	----------	----------
Rfer		MH016607	----------	----------	----------	----------	----------	----------
Rfer		MH016608	----------	----------	----------	----------	----------	----------
Rfer		MH016609	----------	----------	----------	----------	----------	----------
Rfer		MH016610	----------	----------	----------	----------	----------	----------
Rfer		MH016611	----------	----------	----------	----------	----------	----------
Rfer		MH016612	----------	----------	----------	----------	----------	----------
Rfer		MH016613	----------	----------	----------	----------	----------	----------
Rfer		MH016614	----------	----------	----------	----------	----------	----------
Rfer		MH016615	----------	----------	----------	----------	----------	----------
Rfer		MH016616	----------	----------	----------	----------	----------	----------
Rfer		MH016617	----------	----------	----------	----------	----------	----------
Rfer		MH016618	----------	----------	----------	----------	----------	----------
Rfer		MH016619	----------	----------	----------	----------	----------	----------
Rfer		MH016620	----------	----------	----------	----------	----------	----------
Rfer		MH016621	----------	----------	----------	----------	----------	----------
Rfer		MH016622	----------	----------	----------	----------	----------	----------
Rfer		MH016623	----------	----------	----------	----------	----------	----------
Rfer		MH016624	----------	----------	----------	----------	----------	----------

Rfer		MH016625	----------	----------	----------	----------	----------	----------
Rfer		MH016626	----------	----------	----------	----------	----------	----------
Rfer		MH016627	----------	----------	----------	----------	----------	----------
Rfer		MH016628	----------	----------	----------	----------	----------	----------
Rfer		MH016629	----------	----------	----------	----------	----------	----------
Rfer		MH016630	----------	----------	----------	----------	----------	----------
Rfer		MH016631	----------	----------	----------	----------	----------	----------
Rfer		MH016632	----------	----------	----------	----------	----------	----------
Rfer		MH016633	----------	----------	----------	----------	----------	----------
Rfer		MH016634	----------	----------	----------	----------	----------	----------
Rfer		MH016635	----------	----------	----------	----------	----------	----------
Rfer		MH016636	----------	----------	----------	----------	----------	----------
Rfer		MH016637	----------	----------	----------	----------	----------	----------
Rfer	H19	KF311403	----------	----------	----------	----------	----------	----------
Rfer	H41	KF311502	----------	----------	----------	----------	----------	----------
Rpal		ASSCR6357	GTAGGAACTT	CATTAAGTAT	ACTTATTCGA	GCTGAATTAG	GTAATCCAGG	TTCCTTAATT
Rpal		ASSCR6358	GTAGGAACTT	CATTAAGTAT	ACTTATTCGA	GCTGAATTAG	GTAATCCAGG	TTCCTTAATT
Rpal		AY131121	----------	----------	----ATTCGA	GCTGAATTAG	GTAACCCAGG	TTCCTTAATT
Rpal		GU581629	----------	----------	----------	----------	----------	----------
Rpal		KF311358	----------	----------	----------	----------	----------	----------
Rpal		KR494254	GTAGGAACTT	CATTAAGTAT	ACTTATTCGA	GCTGAATTAG	GTAATCCGGG	TTCCTTAATT
Rpal		KR494255	GTAGGAACTT	CATTAAGTAT	ACTTATTCGA	GCTGAATTAG	GTAATCCGGG	TTCCTTAATT
Rpal		KR494256	GTAGGAACTT	CATTAAGTAT	ACTTATTCGA	GCTGAATTAG	GTAATCCGGG	TTCCTTAATT
Rpal		KR494257	GTAGGAACTT	CATTAAGTAT	ACTTATTCGA	GCTGAATTAG	GTAATCCGGG	TTCCTTAATT
Rpal		KR494258	GTAGGAACTT	CATTAAGTAT	ACTTATTCGA	GCTGAATTAG	GTAATCCGGG	TTCCTTAATT
Rpal		KR494259	GTAGGAACTT	CATTAAGTAT	ACTTATTCGA	GCTGAATTAG	GTAATCCGGG	TTCCTTAATT
Rpal		KR494260	GTAGGAACTT	CATTAAGTAT	ACTTATTCGA	GCTGAATTAG	GTAATCCGGG	TTCCTTAATT
Rpal		KR494261	GTAGGAACTT	CATTAAGTAT	ACTTATTCGA	GCTGAATTAG	GTAATCCGGG	TTCCTTAATT
Rpal	Rp1	KU647599	----------	----------	----------	----------	----------	----------

Rpal	Rp10	KU647490	----------	----------	----------	----------	----------	----------
Rpal	Rp11	KU647489	----------	----------	----------	----------	----------	----------
Rpal	Rp12	KU647604	----------	----------	----------	----------	----------	----------
Rpal	Rp13	KU647575	----------	----------	----------	----------	----------	----------
Rpal	Rp2	KU647587	----------	----------	----------	----------	----------	----------
Rpal	Rp3	KU647508	----------	----------	----------	----------	----------	----------
Rpal	Rp4	KU647585	----------	----------	----------	----------	----------	----------
Rpal	Rp5	KU647584	----------	----------	----------	----------	----------	----------
Rpal	Rp6	KU647581	----------	----------	----------	----------	----------	----------
Rpal	Rp7	KU647579	----------	----------	----------	----------	----------	----------
Rpal	Rp8	KU647502	----------	----------	----------	----------	----------	----------
Rpal	Rp9	KU647505	----------	----------	----------	----------	----------	----------
Rpal		Uni10	GTAGGAACTT	CATTAAGTAT	ACTTATTCGA	GCTGAATTAG	GTAATCCAGG	TTCCTTAATT
Rpal		Uni11	GTAGGAACTT	CATTAAGTAT	ACTTATTCGA	GCTGAATTAG	GTAATCCAGG	TTCCTTAATT
Rpal		Uni117	GTGGGAACTT	CATTAAGTAT	ACTTATTCGA	GCTGAATTAG	GTAACCCAGG	TTCCTTAATT
Rpal		Uni17	GTAGGAACTT	CATTAAGTAT	ACTTATTCGA	GCTGAATTAA	GTAATCCAGG	TTCCTTAATT
Rpal		Uni21	GTAGGAACTT	CATTAAGTAT	ACTTATTCGA	GCTGAATTAG	GTAATCCAGG	TTCCTTAATT
Rpal		Uni44	GTGGGAACTT	CATTAAGTAT	ACTTATTCGA	GCTGAATTAG	GTAACCCAGG	TTCCTTAATT
Rpal		Uni58	GTAGGAACTT	CATTAAGTAT	ACTTATTCGA	GCTGAATTAG	GTAATCCAGG	TTCCTTAATT
Rpho		AY131120	----------	----------	----------	----------	----------	----------
Rpho		KY511047	----------	----------	----------	----------	----------	----------
Rvul		LN612634	----------	-----AGAAT	ACTCATTCGA	GCAGAACTAG	GAAATCCAGG	ATCATTAATC
Rvul		LN612635	----GGACTT	CTCTAAGAAT	ACTCATTCGA	GCAGAACTAG	GAAATCCGGG	GTCATTAATT
Rvul		LN612636	---GGGACTT	CTCTAAGAAT	ACTCATTCGA	GCAGAACTAG	GAAATCCAGG	ATCATTAATC
Rvul		MG051024	GTAGGGACTT	CTCTAAGAAT	ACTCATTCGA	GCAGAACTAG	GAAATCCGGG	GTCATTAATC
Rvul		MG051025	GTAGGAACTT	CTCTAAGAAT	ACTCATTCGA	GCAGAACTAG	GAAATCCAGG	GTCATTAATC
Rvul		MG051026	GTAGGAACTT	CCCTAAGAAT	ACTCATTCGA	GCAGAACTAG	GAAATCCGGG	GTCATTAATC
Rvul	Rv1	KF311588	----------	----------	----------	----------	----------	----------
Rvul	Rv10	KF311587	----------	----------	----------	----------	----------	----------

Rvul	Rv11	KF311629	----------	----------	----------	----------	----------	----------
Rvul	Rv12	KF311550	----------	----------	----------	----------	----------	----------
Rvul	Rv13	KF311549	----------	----------	----------	----------	----------	----------
Rvul	Rv14	KF311573	----------	----------	----------	----------	----------	----------
Rvul	Rv15	KF311546	----------	----------	----------	----------	----------	----------
Rvul	Rv16	KF311600	----------	----------	----------	----------	----------	----------
Rvul	Rv17	KF311578	----------	----------	----------	----------	----------	----------
Rvul	Rv18	KF311593	----------	----------	----------	----------	----------	----------
Rvul	Rv19	KF311552	----------	----------	----------	----------	----------	----------
Rvul	Rv2	KF311586	----------	----------	----------	----------	----------	----------
Rvul	Rv20	KF311594	----------	----------	----------	----------	----------	----------
Rvul	Rv21	KF311547	----------	----------	----------	----------	----------	----------
Rvul	Rv22	KF311591	----------	----------	----------	----------	----------	----------
Rvul	Rv23	KF311545	----------	----------	----------	----------	----------	----------
Rvul	Rv24	KF311576	----------	----------	----------	----------	----------	----------
Rvul	Rv25	KF311548	----------	----------	----------	----------	----------	----------
Rvul	Rv26	KF311559	----------	----------	----------	----------	----------	----------
Rvul	Rv27	KF311561	----------	----------	----------	----------	----------	----------
Rvul	Rv28	KF311533	----------	----------	----------	----------	----------	----------
Rvul	Rv29	KF311537	----------	----------	----------	----------	----------	----------
Rvul	Rv3	KF311633	----------	----------	----------	----------	----------	----------
Rvul	Rv30	KF311564	----------	----------	----------	----------	----------	----------
Rvul	Rv31	KF311570	----------	----------	----------	----------	----------	----------
Rvul	Rv32	KF311530	----------	----------	----------	----------	----------	----------
Rvul	Rv33	KF311538	----------	----------	----------	----------	----------	----------
Rvul	Rv34	KF311610	----------	----------	----------	----------	----------	----------
Rvul	Rv35	KF311605	----------	----------	----------	----------	----------	----------
Rvul	Rv36	KF311535	----------	----------	----------	----------	----------	----------
Rvul	Rv37	KF311529	----------	----------	----------	----------	----------	----------

Rvul	Rv38	KF311532	----------	----------	----------	----------	----------	----------
Rvul	Rv39	KF311563	----------	----------	----------	----------	----------	----------
Rvul	Rv4	KF311589	----------	----------	----------	----------	----------	----------
Rvul	Rv40	KF311568	----------	----------	----------	----------	----------	----------
Rvul	Rv41	KF311555	----------	----------	----------	----------	----------	----------
Rvul	Rv42	KF311558	----------	----------	----------	----------	----------	----------
Rvul	Rv43	KF311560	----------	----------	----------	----------	----------	----------
Rvul	Rv44	KF311601	----------	----------	----------	----------	----------	----------
Rvul	Rv45	KF311608	----------	----------	----------	----------	----------	----------
Rvul	Rv46	KF311604	----------	----------	----------	----------	----------	----------
Rvul	Rv47	KF311615	----------	----------	----------	----------	----------	----------
Rvul	Rv48	KF311603	----------	----------	----------	----------	----------	----------
Rvul	Rv49	KF311609	----------	----------	----------	----------	----------	----------
Rvul	Rv5	KF311632	----------	----------	----------	----------	----------	----------
Rvul	Rv50	KF311602	----------	----------	----------	----------	----------	----------
Rvul	Rv51	KF311621	----------	----------	----------	----------	----------	----------
Rvul	Rv52	KF311619	----------	----------	----------	----------	----------	----------
Rvul	Rv53	KF311620	----------	----------	----------	----------	----------	----------
Rvul	Rv54	KF311622	----------	----------	----------	----------	----------	----------
Rvul	Rv55	KF311617	----------	----------	----------	----------	----------	----------
Rvul	Rv56	KF311606	----------	----------	----------	----------	----------	----------
Rvul	Rv57	KF311614	----------	----------	----------	----------	----------	----------
Rvul	Rv59	KF311567	----------	----------	----------	----------	----------	----------
Rvul	Rv6	KF311628	----------	----------	----------	----------	----------	----------
Rvul	Rv60	KF311607	----------	----------	----------	----------	----------	----------
Rvul	Rv61	KF311544	----------	----------	----------	----------	----------	----------
Rvul	Rv62	KF311625	----------	----------	----------	----------	----------	----------
Rvul	Rv7	KF311528	----------	----------	----------	----------	----------	----------
Rvul	Rv8	KF311631	----------	----------	----------	----------	----------	----------

Rvul	Rv9	KF311590	----------	----------	----------	----------	----------	----------
Slin		AY131102	GTAGGGACAT	CATTAANTGT	ATTGATTCGA	GCAGAACTTG	GAAACCCGGG	ATCCCTAATC
Sory		AY131099	GTAGGTACAT	CCTTAAGTTT	GCTAATTCGG	GCAGAACTAG	GAAATCCTGG	ATCACTAATT
Sory		GU196317	GTAGGTACAT	CCTTAAGTTT	GCTAATTCGG	GCAGAACTAG	GAAATCCTGG	ATCACTAATT
Spheno		NC018351	GTAGGTACAT	CTTTAAGAAT	CCTAATCCGA	GCAGAATTAG	GAAACCCGGG	ATCCTTAATC
Szea		AY131100	GTGGGAACCT	CATTGAGTTT	ACTAATTCGG	GCTGAATTAG	GGAATCCTGG	ATCATTAATT
Yfro		AY131109	ACAGGTACAT	CCCTAAAAAT	CCTTATTCGT	GCTGAACTAG	GAAGACCAGG	ATCACTAATT

Continuation of the Table S4.

Species	Ha	Sequences	Position					
			121-130	131-140	141-150	151-160	161-170	171-180
Dbor		AY131105	GGTGATGATC	AAATTTATAA	TGTAATTGTT	ACAGCTCATG	CTTTTATCAT	AATTTTTTTT
Dbor		Uni9	GGTGATGATC	AAATTTATAA	TGTAATTGTT	ACAGCTCATG	CCTTTATTAT	AATTTTCTTT
Dper		ASSCR6014	GGAGATGACC	AGATCTATAA	TGTAATTGTT	ACAGCCCATG	CTTTTATTAT	AATTTTTTTT
Dper		ASSCR6015	GGAGATGACC	AAATCTATAA	TGTAATTGTT	ACAGCCCATG	CTTTTATTAT	AATTTTTTTT
Dper		ASSCR6016	GGAGATGACC	AAATCTATAA	TGTAATTGTT	ACAGCCCATG	CTTTTATTAT	AATTTTTTTT
Dper		ASSCR6018	GGAGATGACC	AGATCTATAA	TGTAATTGTT	ACAGCCCATG	CTTTTATTAT	AATTTTTTTT
Hcho		JX679716	GGAGATGACC	AGATTTATAA	TGTTATTGTT	ACAGCTCACG	CTTTCATTAT	AATTTTCTTT
Hpha		KC112991	GGAGATGACC	AAATCTATAA	TGTTATTGTT	ACTGCCCATG	CATTCATCAT	AATTTTCTTT
Nxan		NC018354	GGTGATGACC	AAATTTATAA	CGTCATTGTT	ACTGCTCATG	CTTTTATTAT	AATTTTCTTT
Phil		GU244486	GGTGATGATC	AAATTTATAA	CACAATTGTT	ACTGCTCATG	CTTTTATTAT	AATTTTTTTT
Pnod		HQ891474	GGAGATGATC	AAATCTATAA	TGTTATTGTT	ACAGCTCATG	CCTTCATTAT	AATTTTTTTT
Rbil	Rb1	KF311645	----------	----------	----------	----------	----------	----------
Rbil	Rb2	KF311637	----------	----------	----------	----------	----------	----------
Rbil	Rb3	KF311639	----------	----------	----------	----------	----------	----------
Rbil	Rb4	KF311636	----------	----------	----------	----------	----------	----------
Rbil	Rb5	KF311635	----------	----------	----------	----------	----------	----------
Rbil	Rb6	KF311634	----------	----------	----------	----------	----------	----------
Rbil	Rb7	KF311648	----------	----------	----------	----------	----------	----------
Rbil	Rb8	KF311647	----------	----------	----------	----------	----------	----------
Rcru		AY131113	GGTGATGATC	AAATTTATAA	TGTAATTGTT	ACTGCTCATG	CTTTTATCAT	AATTTTTTTT
Rcru		KF311359	----------	----------	----------	----------	----------	----------
Rcru		USCOC565	GGTGATGATC	AAATTTATAA	TGTAATTGTT	ACTGCTCATG	CTTTTATCAT	AATTTTTTTT
Rfer	H1	GU581582	----------	----------	----------	----------	----------	----------
Rfer	H10	KF311482	----------	----------	----------	----------	----------	----------
Rfer	H11	KF311444	----------	----------	----------	----------	----------	----------

Rfer	H12	KF311487	----------	----------	----------	----------	----------	----------
Rfer	H13	KF311481	----------	----------	----------	----------	----------	----------
Rfer	H14	KF311448	----------	----------	----------	----------	----------	----------
Rfer	H15	JX292125	----------	----------	----------	----------	----------	----------
Rfer	H16	KF311449	----------	----------	----------	----------	----------	----------
Rfer	H17	KF311360	----------	----------	----------	----------	----------	----------
Rfer	H18	KF311473	----------	----------	----------	----------	----------	----------
Rfer	H2	GU581549	----------	----------	----------	----------	----------	----------
Rfer	H20	KF311433	----------	----------	----------	----------	----------	----------
Rfer	H21	KF311474	----------	----------	----------	----------	----------	----------
Rfer	H22	KF311516	----------	----------	----------	----------	----------	----------
Rfer	H23	KF311380	----------	----------	----------	----------	----------	----------
Rfer	H24	KF311389	----------	----------	----------	----------	----------	----------
Rfer	H25	KF311384	----------	----------	----------	----------	----------	----------
Rfer	H26	KF311388	----------	----------	----------	----------	----------	----------
Rfer	H27	KF311386	----------	----------	----------	----------	----------	----------
Rfer	H28	KF311399	----------	----------	----------	----------	----------	----------
Rfer	H29	KF311383	----------	----------	----------	----------	----------	----------
Rfer	H3	GU581547	----------	----------	----------	----------	----------	----------
Rfer	H30	KF311392	----------	----------	----------	----------	----------	----------
Rfer	H31	KF311379	----------	----------	----------	----------	----------	----------
Rfer	H32	KF311490	----------	----------	----------	----------	----------	----------
Rfer	H34	KF311492	----------	----------	----------	----------	----------	----------
Rfer	H35	KF311496	----------	----------	----------	----------	----------	----------
Rfer	H36	KF311500	----------	----------	----------	----------	----------	----------
Rfer	H37	KF311509	----------	----------	----------	----------	----------	----------
Rfer	H38	KF311505	----------	----------	----------	----------	----------	----------
Rfer	H39	KF311508	----------	----------	----------	----------	----------	----------
Rfer	H4	GU581545	----------	----------	----------	----------	----------	----------

Rfer	H40	KF311506	----------	----------	----------	----------	----------	----------
Rfer	H42	KF311501	----------	----------	----------	----------	----------	----------
Rfer	H43	KF311525	----------	----------	----------	----------	----------	----------
Rfer	H5	GU581539	----------	----------	----------	----------	----------	----------
Rfer	H51	KU696497	----------	----------	----------	----------	----------	----------
Rfer	H52	KU696507	----------	----------	----------	----------	----------	----------
Rfer	H6	GU581526	----------	----------	----------	----------	----------	----------
Rfer	H7	GU581525	----------	----------	----------	----------	----------	----------
Rfer	H8	GU581319	----------	----------	----------	----------	----------	----------
Rfer	H9	KF311446	----------	----------	----------	----------	----------	----------
Rfer		JX292124	----------	----------	----------	----------	----------	----------
Rfer		JX294413	----------	----------	----------	----------	----------	----------
Rfer		KF413063	----------	----------	----------	----------	----------	----------
Rfer		KF413064	----------	----------	----------	----------	----------	----------
Rfer		KF413065	----------	----------	----------	----------	----------	----------
Rfer		KF413066	----------	----------	----------	----------	----------	----------
Rfer		KF413067	----------	----------	----------	----------	----------	----------
Rfer		KF413068	----------	----------	----------	----------	----------	----------
Rfer		KF413069	----------	----------	----------	----------	----------	----------
Rfer		KF413070	----------	----------	----------	----------	----------	----------
Rfer		KF413071	----------	----------	----------	----------	----------	----------
Rfer		KF413072	----------	----------	----------	----------	----------	----------
Rfer		KF413073	----------	----------	----------	----------	----------	----------
Rfer		KT989230	GGAGAC-ATC	AAATCTATAA	TGTTATCGTC	ACAGCTCATG	CTTTCATTAT	AATTTTTTTT
Rfer		KT989231	GGAG-CGATC	AAATCTATAA	TGTTATCGTC	ACAGCTCATG	CTTTCATTAT	AATTTTTTTT
Rfer		KT989232	GGA-ACGATC	AAATCTATAA	TGTTATCGTC	ACAGCTCATG	CTTTCATTAT	AATTTTTTTT
Rfer		KT989233	GGAG-CGATC	AAATCTATAA	TGTTATCGTC	ACAGCTCATG	CTTTCATTAT	AATTTTTTTT
Rfer		KT989234	GG-GACGATC	AAATCTATAA	TGTTATCGTC	ACAGCTCATG	CTTTCATTAT	AATTTTTTTT
Rfer		KU916538	GGAGACGATC	AGATCTATAA	TGTTATCGTC	ACAGCTCATG	CTTTCATTAT	AATTTTTTTT

Rfer		KY458175	GGAGACGATC	AAATCTATAA	TGTTATCGTC	ACAGCTCATG	CTTTCATTAT	AATTTTTTTT
Rfer		KY458176	GGAGACGATC	AAATCTATAA	TGTTATCGTC	ACAGCTCATG	CTTTCATTAT	AATTTTTTTT
Rfer		KY458177	GGAAACGATC	AAATCTATAA	TGTTATCGTC	ACAGCTCATG	CTTTCATTAT	AATTTTTTTT
Rfer		LC474878	----------	----------	----------	----------	----------	----------
Rfer		LC474880	----------	----------	----------	----------	----------	----------
Rfer		LC474881	----------	----------	----------	----------	----------	----------
Rfer		LC474882	----------	----------	----------	----------	----------	----------
Rfer		LC474884	----------	----------	----------	----------	----------	----------
Rfer		LC474885	----------	----------	----------	----------	----------	----------
Rfer		LC474886	----------	----------	----------	----------	----------	----------
Rfer		LC474887	----------	----------	----------	----------	----------	----------
Rfer		LC474888	----------	----------	----------	----------	----------	----------
Rfer		LC474889	----------	----------	----------	----------	----------	----------
Rfer		LC474890	----------	----------	----------	----------	----------	----------
Rfer		LC474891	----------	----------	----------	----------	----------	----------
Rfer		LC474892	----------	----------	----------	----------	----------	----------
Rfer		LC474893	----------	----------	----------	----------	----------	----------
Rfer		LC474894	----------	----------	----------	----------	----------	----------
Rfer		LC474895	----------	----------	----------	----------	----------	----------
Rfer		LC474896	----------	----------	----------	----------	----------	----------
Rfer		LC474897	----------	----------	----------	----------	----------	----------
Rfer		LC474898	----------	----------	----------	----------	----------	----------
Rfer		LC474899	----------	----------	----------	----------	----------	----------
Rfer		LC474902	----------	----------	----------	----------	----------	----------
Rfer		LC474903	----------	----------	----------	----------	----------	----------
Rfer		LC474904	----------	----------	----------	----------	----------	----------
Rfer		LC474905	----------	----------	----------	----------	----------	----------
Rfer		LC474906	----------	----------	----------	----------	----------	----------
Rfer		LC474907	----------	----------	----------	----------	----------	----------

Rfer		LC474908	----------	----------	----------	----------	----------	----------
Rfer		LC474909	----------	----------	----------	----------	----------	----------
Rfer		LC474910	----------	----------	----------	----------	----------	----------
Rfer		LC474911	----------	----------	----------	----------	----------	----------
Rfer		LC474912	----------	----------	----------	----------	----------	----------
Rfer		LC474913	----------	----------	----------	----------	----------	----------
Rfer		LC474914	----------	----------	----------	----------	----------	----------
Rfer		LC474915	----------	----------	----------	----------	----------	----------
Rfer		LC474916	----------	----------	----------	----------	----------	----------
Rfer		LC474917	----------	----------	----------	----------	----------	----------
Rfer		LC474918	----------	----------	----------	----------	----------	----------
Rfer		LC474919	----------	----------	----------	----------	----------	----------
Rfer		LC474920	----------	----------	----------	----------	----------	----------
Rfer		LC474921	----------	----------	----------	----------	----------	----------
Rfer		LC474922	----------	----------	----------	----------	----------	----------
Rfer		LC474923	----------	----------	----------	----------	----------	----------
Rfer		LC474924	----------	----------	----------	----------	----------	----------
Rfer		LC474925	----------	----------	----------	----------	----------	----------
Rfer		LC474926	----------	----------	----------	----------	----------	----------
Rfer		LC474927	----------	----------	----------	----------	----------	----------
Rfer		LC474928	----------	----------	----------	----------	----------	----------
Rfer		LC474929	----------	----------	----------	----------	----------	----------
Rfer		MF448526	----------	----------	----------	----------	----------	----------
Rfer		MG051027	GGAGACGATC	AAATCTATAA	TGTTATCGTC	ACAGCTCATG	CTTTCATTAT	AATTTTTTTT
Rfer		MG051028	GGAGACGATC	AAATCTATAA	TGTTATCGTC	ACAGCTCATG	CTTTCATTAT	AATTTTTTTT
Rfer		MG051029	GGAGACGATC	AAATCTATAA	TGTTATCGTC	ACAGCTCATG	CTTTCATTAT	AATTTTTTTT
Rfer		MG051030	GGAGACGATC	AAATCTATAA	TGTTATCGTC	ACAGCTCATG	CTTTCATTAT	AATTTTTTTT
Rfer		MG051031	GGAGACGATC	AAATCTATAA	TGTTATCGTC	ACAGCTCATG	CTTTCATTAT	AATTTTTTTT
Rfer		MG872818	----------	----------	----------	----------	----------	----------

Rfer		MG883395	----------	----------	----------	----------	----------	----------
Rfer		MG883396	----------	----------	----------	----------	----------	----------
Rfer		MG883397	----------	----------	----------	----------	----------	----------
Rfer		MG883398	----------	----------	----------	----------	----------	----------
Rfer		MG883399	----------	----------	----------	----------	----------	----------
Rfer		MH016277	GGAGACGATC	AGATCTATAA	TGTTATCGTC	ACAGCTCATG	CTTTCATTAT	AATTTTTTTT
Rfer		MH016278	GGAGACGATC	AAATCTATAA	TGTTATCGTC	ACAGCTCATG	CTTTCATTAT	AATTTTTTTT
Rfer		MH016279	GGAGACGATC	AGATCTATAA	TGTTATCGTC	ACAGCTCATG	CTTTCATTAT	AATTTTTTTT
Rfer		MH016604	----------	----------	----------	----------	----------	----------
Rfer		MH016605	----------	----------	----------	----------	----------	----------
Rfer		MH016606	----------	----------	----------	----------	----------	----------
Rfer		MH016607	----------	----------	----------	----------	----------	----------
Rfer		MH016608	----------	----------	----------	----------	----------	----------
Rfer		MH016609	----------	----------	----------	----------	----------	----------
Rfer		MH016610	----------	----------	----------	----------	----------	----------
Rfer		MH016611	----------	----------	----------	----------	----------	----------
Rfer		MH016612	----------	----------	----------	----------	----------	----------
Rfer		MH016613	----------	----------	----------	----------	----------	----------
Rfer		MH016614	----------	----------	----------	----------	----------	----------
Rfer		MH016615	----------	----------	----------	----------	----------	----------
Rfer		MH016616	----------	----------	----------	----------	----------	----------
Rfer		MH016617	----------	----------	----------	----------	----------	----------
Rfer		MH016618	----------	----------	----------	----------	----------	----------
Rfer		MH016619	----------	----------	----------	----------	----------	----------
Rfer		MH016620	----------	----------	----------	----------	----------	----------
Rfer		MH016621	----------	----------	----------	----------	----------	----------
Rfer		MH016622	----------	----------	----------	----------	----------	----------
Rfer		MH016623	----------	----------	----------	----------	----------	----------
Rfer		MH016624	----------	----------	----------	----------	----------	----------

Rfer		MH016625	----------	----------	----------	----------	----------	----------
Rfer		MH016626	----------	----------	----------	----------	----------	----------
Rfer		MH016627	----------	----------	----------	----------	----------	----------
Rfer		MH016628	----------	----------	----------	----------	----------	----------
Rfer		MH016629	----------	----------	----------	----------	----------	----------
Rfer		MH016630	----------	----------	----------	----------	----------	----------
Rfer		MH016631	----------	----------	----------	----------	----------	----------
Rfer		MH016632	----------	----------	----------	----------	----------	----------
Rfer		MH016633	----------	----------	----------	----------	----------	----------
Rfer		MH016634	----------	----------	----------	----------	----------	----------
Rfer		MH016635	----------	----------	----------	----------	----------	----------
Rfer		MH016636	----------	----------	----------	----------	----------	----------
Rfer		MH016637	----------	----------	----------	----------	----------	----------
Rfer	H19	KF311403	----------	----------	----------	----------	----------	----------
Rfer	H41	KF311502	----------	----------	----------	----------	----------	----------
Rpal		ASSCR6357	GGAGATGATC	AAATTTATAA	CGTTATTGTT	ACAGCTCATG	CTTTTATTAT	AATTTTTTTT
Rpal		ASSCR6358	GGAGATGATC	AAATTTATAA	TGTTATTGTT	ACAGCTCATG	CTTTTATTAT	AATTTTTTTT
Rpal		AY131121	GGTGATGATC	AAATTTATAA	TGNTATTGTT	ACAGCTCATG	CNTTTATTAT	AATTTTTTTT
Rpal		GU581629	----------	----------	----------	----------	----------	----------
Rpal		KF311358	----------	----------	----------	----------	----------	----------
Rpal		KR494254	GGAGATGATC	AAATTTATAA	TGTTATTGTT	ACAGCTCATG	CTTTTATTAT	AATTTTTTTT
Rpal		KR494255	GGAGATGATC	AAATTTATAA	TGCTATTGTT	ACAGCTCATG	CTTTTATTAT	AATTTTTTTT
Rpal		KR494256	GGAGATGATC	AAATTTATAA	TGTTATTGTT	ACAGCTCATG	CTTTTATTAT	AATTTTTTTT
Rpal		KR494257	GGAGATGATC	AAATTTATAA	TGTTATTGTT	ACAGCTCATG	CTTTTATTAT	AATTTTTTTT
Rpal		KR494258	GGAGATGATC	AAATTTATAA	TGTTATTGTT	ACAGCTCATG	CTTTTATTAT	AATTTTTTTT
Rpal		KR494259	GGAGATGATC	AAATTTATAA	TGTTATTGTT	ACAGCTCATG	CTTTTATTAT	AATTTTTTTT
Rpal		KR494260	GGAGATGATC	AAATTTATAA	TGTTATTGTT	ACAGCTCATG	CTTTTATTAT	AATTTTTTTT
Rpal		KR494261	GGAGATGATC	AAATTTATAA	TGTTATTGTT	ACAGCTCATG	CTTTTATTAT	AATTTTTTTT
Rpal	Rp1	KU647599	----------	----------	----------	----------	----------	----------

Rpal	Rp10	KU647490	----------	----------	----------	----------	----------	----------
Rpal	Rp11	KU647489	----------	----------	----------	----------	----------	----------
Rpal	Rp12	KU647604	----------	----------	----------	----------	----------	----------
Rpal	Rp13	KU647575	----------	----------	----------	----------	----------	----------
Rpal	Rp2	KU647587	----------	----------	----------	----------	----------	----------
Rpal	Rp3	KU647508	----------	----------	----------	----------	----------	----------
Rpal	Rp4	KU647585	----------	----------	----------	----------	----------	----------
Rpal	Rp5	KU647584	----------	----------	----------	----------	----------	----------
Rpal	Rp6	KU647581	----------	----------	----------	----------	----------	----------
Rpal	Rp7	KU647579	----------	----------	----------	----------	----------	----------
Rpal	Rp8	KU647502	----------	----------	----------	----------	----------	----------
Rpal	Rp9	KU647505	----------	----------	----------	----------	----------	----------
Rpal		Uni10	GGAGATGATC	AAATTTATAA	TGTTATTGTT	ACAGCTCATG	CTTTTATTAT	AATTTTTTTT
Rpal		Uni11	GGAGATGATC	AAATTTATAA	TGTTATTGTT	ACAGCTCATG	CTTTTATTAT	AATTTTTTTT
Rpal		Uni117	GGTGATGATC	AAATTTATAA	TGTTATTGTT	ACAGCTCATG	CTTTTATTAT	AATTTTTTTT
Rpal		Uni17	GGAGATGATC	AAATTTATAA	TGTTATTGTT	ACAGCTCATG	CTTTTATTAT	AATTTTTTTT
Rpal		Uni21	GGAGATGATC	AAATTTATAA	TGTTATTGTT	ACAGCTCATG	CTTTTATTAT	GATTTTTTTT
Rpal		Uni44	GGTGATGATC	AAATTTATAA	TGTTATTGTT	ACAGCTCATG	CTTTTATTAT	AATTTTTTTT
Rpal		Uni58	GGAGATGATC	AAATTTATAA	TGTTATTGTT	ACAGCTCATG	CTTTTATTAT	AATTTTTTTT
Rpho		AY131120	----------	----------	----------	----------	----------	----------
Rpho		KY511047	----------	----------	----------	----------	----------	----------
Rvul		LN612634	GGCGATGATC	AAATCTATAA	TGTTATTGTC	ACAGCTCATG	CTTTTATTAT	AATTTTTTTT
Rvul		LN612635	GGTGATGATC	AAATCTATAA	TGTTATTGTC	ACAGCTCATG	CTTTTATTAT	AATTTTTTTT
Rvul		LN612636	GGCGATGATC	AAATCTATAA	TGTTATTGTC	ACAGCTCATG	CTTTTATTAT	AATTTTTTTT
Rvul		MG051024	GGCGATGATC	AAATCTATAA	TGTTATTGTC	ACAGCTCATG	CTTTTATTAT	AATTTTTTTT
Rvul		MG051025	GGCGATGATC	AAATCTATAA	TGTTATTGTC	ACAGCTCATG	CTTTTATTAT	AATTTTTTTT
Rvul		MG051026	GGCGATGATC	AAATCTATAA	TGTTATTGTC	ACAGCTCATG	CTTTTATTAT	AATTTTTTTT
Rvul	Rv1	KF311588	----------	----------	----------	----------	----------	----------
Rvul	Rv10	KF311587	----------	----------	----------	----------	----------	----------

Rvul	Rv11	KF311629	----------	----------	----------	----------	----------	----------
Rvul	Rv12	KF311550	----------	----------	----------	----------	----------	----------
Rvul	Rv13	KF311549	----------	----------	----------	----------	----------	----------
Rvul	Rv14	KF311573	----------	----------	----------	----------	----------	----------
Rvul	Rv15	KF311546	----------	----------	----------	----------	----------	----------
Rvul	Rv16	KF311600	----------	----------	----------	----------	----------	----------
Rvul	Rv17	KF311578	----------	----------	----------	----------	----------	----------
Rvul	Rv18	KF311593	----------	----------	----------	----------	----------	----------
Rvul	Rv19	KF311552	----------	----------	----------	----------	----------	----------
Rvul	Rv2	KF311586	----------	----------	----------	----------	----------	----------
Rvul	Rv20	KF311594	----------	----------	----------	----------	----------	----------
Rvul	Rv21	KF311547	----------	----------	----------	----------	----------	----------
Rvul	Rv22	KF311591	----------	----------	----------	----------	----------	----------
Rvul	Rv23	KF311545	----------	----------	----------	----------	----------	----------
Rvul	Rv24	KF311576	----------	----------	----------	----------	----------	----------
Rvul	Rv25	KF311548	----------	----------	----------	----------	----------	----------
Rvul	Rv26	KF311559	----------	----------	----------	----------	----------	----------
Rvul	Rv27	KF311561	----------	----------	----------	----------	----------	----------
Rvul	Rv28	KF311533	----------	----------	----------	----------	----------	----------
Rvul	Rv29	KF311537	----------	----------	----------	----------	----------	----------
Rvul	Rv3	KF311633	----------	----------	----------	----------	----------	----------
Rvul	Rv30	KF311564	----------	----------	----------	----------	----------	----------
Rvul	Rv31	KF311570	----------	----------	----------	----------	----------	----------
Rvul	Rv32	KF311530	----------	----------	----------	----------	----------	----------
Rvul	Rv33	KF311538	----------	----------	----------	----------	----------	----------
Rvul	Rv34	KF311610	----------	----------	----------	----------	----------	----------
Rvul	Rv35	KF311605	----------	----------	----------	----------	----------	----------
Rvul	Rv36	KF311535	----------	----------	----------	----------	----------	----------
Rvul	Rv37	KF311529	----------	----------	----------	----------	----------	----------

Rvul	Rv38	KF311532	----------	----------	----------	----------	----------	----------
Rvul	Rv39	KF311563	----------	----------	----------	----------	----------	----------
Rvul	Rv4	KF311589	----------	----------	----------	----------	----------	----------
Rvul	Rv40	KF311568	----------	----------	----------	----------	----------	----------
Rvul	Rv41	KF311555	----------	----------	----------	----------	----------	----------
Rvul	Rv42	KF311558	----------	----------	----------	----------	----------	----------
Rvul	Rv43	KF311560	----------	----------	----------	----------	----------	----------
Rvul	Rv44	KF311601	----------	----------	----------	----------	----------	----------
Rvul	Rv45	KF311608	----------	----------	----------	----------	----------	----------
Rvul	Rv46	KF311604	----------	----------	----------	----------	----------	----------
Rvul	Rv47	KF311615	----------	----------	----------	----------	----------	----------
Rvul	Rv48	KF311603	----------	----------	----------	----------	----------	----------
Rvul	Rv49	KF311609	----------	----------	----------	----------	----------	----------
Rvul	Rv5	KF311632	----------	----------	----------	----------	----------	----------
Rvul	Rv50	KF311602	----------	----------	----------	----------	----------	----------
Rvul	Rv51	KF311621	----------	----------	----------	----------	----------	----------
Rvul	Rv52	KF311619	----------	----------	----------	----------	----------	----------
Rvul	Rv53	KF311620	----------	----------	----------	----------	----------	----------
Rvul	Rv54	KF311622	----------	----------	----------	----------	----------	----------
Rvul	Rv55	KF311617	----------	----------	----------	----------	----------	----------
Rvul	Rv56	KF311606	----------	----------	----------	----------	----------	----------
Rvul	Rv57	KF311614	----------	----------	----------	----------	----------	----------
Rvul	Rv59	KF311567	----------	----------	----------	----------	----------	----------
Rvul	Rv6	KF311628	----------	----------	----------	----------	----------	----------
Rvul	Rv60	KF311607	----------	----------	----------	----------	----------	----------
Rvul	Rv61	KF311544	----------	----------	----------	----------	----------	----------
Rvul	Rv62	KF311625	----------	----------	----------	----------	----------	----------
Rvul	Rv7	KF311528	----------	----------	----------	----------	----------	----------
Rvul	Rv8	KF311631	----------	----------	----------	----------	----------	----------

Rvul	Rv9	KF311590	----------	----------	----------	----------	----------	----------
Slin		AY131102	GGAAATGATC	AAATCTATAA	TTCTATTGTT	ACAGCTCATG	CATTTATTAT	AATTTTCTTT
Sory		AY131099	GGAAATGACC	AAATTTATAA	TACTATTGTC	ACAGCACATG	CATTCATTAT	AATTTTCTTT
Sory		GU196317	GGAAATGACC	AAATTTATAA	TACTATTGTC	ACAGCACATG	CATTCATTAT	AATTTTCTTT
Spheno		NC018351	GGTGATGACC	AAATTTATAA	CGTTATCGTG	ACAGCTCATG	CATTCATCAT	AATTTTCTTC
Szea		AY131100	GGAAATGATC	AAATTTACAA	TACTATTGTT	ACAGCTCACG	CATTCATTAT	AATTTTCTTT
Yfro		AY131109	GGTGATGACC	AAATCTATAA	CGTCATTGTN	ACAGCCCATG	CCTTTATTAT	AATCTTCTTT

Continuation of the Table S4.

Species	Ha	Sequences	Position					
			181-190	191-200	201-210	211-220	221-230	231-240
Dbor		AY131105	ATAGTAATAC	CTATTATAAT	TGGAGGTTTC	GGAAATTGAT	TGGTTCCTTT	AATACTAGGA
Dbor		Uni9	ATAGTAATAC	CTATTATAAT	TGGAGGTTTC	GGAAATTGAC	TGGTTCCTTT	AATACTAGGA
Dper		ASSCR6014	ATAGTAATAC	CTATTATAAT	TGGAGGATTC	GGTAATTGAT	TAGTCCCTTT	AATACTAGGG
Dper		ASSCR6015	ATAGTAATAC	CTATTATAAT	TGGAGGATTC	GGTAATTGAT	TAGTCCCTTT	AATACTAGGA
Dper		ASSCR6016	ATAGTAATAC	CTATTATAAT	TGGAGGATTC	GGTAATTGAT	TAGTCCCTTT	AATACTAGGA
Dper		ASSCR6018	ATAGTAATAC	CTATTATAAT	TGGAGGATTC	GGTAATTGAT	TAGTCCCTTT	AATACTAGGG
Hcho		JX679716	ATAGTGATAC	CCATTGTTAT	TGGTGGATTT	GGGAACTGGC	TTGTACCCTT	AATGCTAGGG
Hpha		KC112991	ATGGTAATGC	CTATCATAAT	TGGTGGTTTT	GGGAACTGAC	TAGTACCCCT	AATATTAGGG
Nxan		NC018354	ATAGTTATAC	CAATTATAAT	TGGAGGATTT	GGAAATTGAT	TAGTTCCATT	AATATTAGGA
Phil		GU244486	ATAGTTATGC	CTATTATAAT	TGGAGGATTT	GGAAATTGAT	TAGTCCCTTT	AATACTTGGA
Pnod		HQ891474	ATAGTAATAC	CAATTATAAT	CGGGGGATTC	GGAAATTGAC	TAGTCCCCCT	TATATTAGGA
Rbil	Rb1	KF311645	----------	----------	----------	----------	----------	----------
Rbil	Rb2	KF311637	----------	----------	----------	----------	----------	----------
Rbil	Rb3	KF311639	----------	----------	----------	----------	----------	----------
Rbil	Rb4	KF311636	----------	----------	----------	----------	----------	----------
Rbil	Rb5	KF311635	----------	----------	----------	----------	----------	----------
Rbil	Rb6	KF311634	----------	----------	----------	----------	----------	----------
Rbil	Rb7	KF311648	----------	----------	----------	----------	----------	----------
Rbil	Rb8	KF311647	----------	----------	----------	----------	----------	----------
Rcru		AY131113	ATAGTAATAC	CTATTATAAT	TGGAGGATTC	GGAAATTGAT	TAGTTCCTTT	AATATTAGGA
Rcru		KF311359	----------	----------	----------	----------	----------	----------
Rcru		USCOC565	ATAGTAATAC	CTATTATAAT	TGGAGGATTC	GGAAATTGAT	TAGTTCCTTT	AATATTAGGA
Rfer	H1	GU581582	----------	----------	----------	----------	----------	----------
Rfer	H10	KF311482	----------	----------	----------	----------	----------	----------
Rfer	H11	KF311444	----------	----------	----------	----------	----------	----------

Rfer	H12	KF311487	----------	----------	----------	----------	----------	----------
Rfer	H13	KF311481	----------	----------	----------	----------	----------	----------
Rfer	H14	KF311448	----------	----------	----------	----------	----------	----------
Rfer	H15	JX292125	----------	----------	----------	----------	----------	----------
Rfer	H16	KF311449	----------	----------	----------	----------	----------	----------
Rfer	H17	KF311360	----------	----------	----------	----------	----------	----------
Rfer	H18	KF311473	----------	----------	----------	----------	----------	----------
Rfer	H2	GU581549	----------	----------	----------	----------	----------	----------
Rfer	H20	KF311433	----------	----------	----------	----------	----------	----------
Rfer	H21	KF311474	----------	----------	----------	----------	----------	----------
Rfer	H22	KF311516	----------	----------	----------	----------	----------	----------
Rfer	H23	KF311380	----------	----------	----------	----------	----------	----------
Rfer	H24	KF311389	----------	----------	----------	----------	----------	----------
Rfer	H25	KF311384	----------	----------	----------	----------	----------	----------
Rfer	H26	KF311388	----------	----------	----------	----------	----------	----------
Rfer	H27	KF311386	----------	----------	----------	----------	----------	----------
Rfer	H28	KF311399	----------	----------	----------	----------	----------	----------
Rfer	H29	KF311383	----------	----------	----------	----------	----------	----------
Rfer	H3	GU581547	----------	----------	----------	----------	----------	----------
Rfer	H30	KF311392	----------	----------	----------	----------	----------	----------
Rfer	H31	KF311379	----------	----------	----------	----------	----------	----------
Rfer	H32	KF311490	----------	----------	----------	----------	----------	----------
Rfer	H34	KF311492	----------	----------	----------	----------	----------	----------
Rfer	H35	KF311496	----------	----------	----------	----------	----------	----------
Rfer	H36	KF311500	----------	----------	----------	----------	----------	----------
Rfer	H37	KF311509	----------	----------	----------	----------	----------	----------
Rfer	H38	KF311505	----------	----------	----------	----------	----------	----------
Rfer	H39	KF311508	----------	----------	----------	----------	----------	----------
Rfer	H4	GU581545	----------	----------	----------	----------	----------	----------

Rfer	H40	KF311506	----------	----------	----------	----------	----------	----------
Rfer	H42	KF311501	----------	----------	----------	----------	----------	----------
Rfer	H43	KF311525	----------	----------	----------	----------	----------	----------
Rfer	H5	GU581539	----------	----------	----------	----------	----------	----------
Rfer	H51	KU696497	----------	----------	----------	----------	----------	----------
Rfer	H52	KU696507	----------	----------	----------	----------	----------	----------
Rfer	H6	GU581526	----------	----------	----------	----------	----------	----------
Rfer	H7	GU581525	----------	----------	----------	----------	----------	----------
Rfer	H8	GU581319	----------	----------	----------	----------	----------	----------
Rfer	H9	KF311446	----------	----------	----------	----------	----------	----------
Rfer		JX292124	----------	----------	----------	----------	----------	----------
Rfer		JX294413	----------	----------	----------	----------	----------	----------
Rfer		KF413063	----------	----------	----------	----------	----------	----------
Rfer		KF413064	----------	----------	----------	----------	----------	----------
Rfer		KF413065	----------	----------	----------	----------	----------	----------
Rfer		KF413066	----------	----------	----------	----------	----------	----------
Rfer		KF413067	----------	----------	----------	----------	----------	----------
Rfer		KF413068	----------	----------	----------	----------	----------	----------
Rfer		KF413069	----------	----------	----------	----------	----------	----------
Rfer		KF413070	----------	----------	----------	----------	----------	----------
Rfer		KF413071	----------	----------	----------	----------	----------	----------
Rfer		KF413072	----------	----------	----------	----------	----------	----------
Rfer		KF413073	----------	----------	----------	----------	----------	----------
Rfer		KT989230	ATAGTAATAC	CTATTATAAT	TGGAGGCTTT	GGAAACTGGT	TAGTTCCTCT	TATATTAGGA
Rfer		KT989231	ATAGTAATAC	CTATTATAAT	TGGAGGCTTT	GGAAACTGGT	TAGTTCCTCT	TATATTAGGA
Rfer		KT989232	ATAGTAATAC	CTATTATAAT	TGGAGGCTTT	GGAAACTGGT	TAGTTCCTCT	TATATTAGGA
Rfer		KT989233	ATAGTAATAC	CTATTATAAT	TGGAGGCTTT	GGAAACTGGT	TAGTTCCTCT	TATATTAGGA
Rfer		KT989234	ATAGTAATAC	CTATTATAAT	TGGAGGCTTT	GGAAACTGGT	TAGTTCCTCT	TATATTAGGA
Rfer		KU916538	ATAGTAATAC	CTATTATAAT	TGGAGGCTTT	GGAAACTGGT	TAGTTCCTCT	TATATTAGGA

Rfer		KY458175	ATAGTAATAC	CTATTATAAT	TGGAGGCTTT	GGAAACTGAT	TAGTTCCTCT	TATATTAGGA
Rfer		KY458176	ATAGTAATAC	CTATTATAAT	TGGAGGCTTT	GGAAACTGAT	TAGTTCCTCT	TATATTAGGA
Rfer		KY458177	ATAGTAATAC	CTATTATAAT	TGGAGGCTTT	GGAAACTGAT	TAGTTCCTCT	TATATTAGGA
Rfer		LC474878	----------	----------	----------	----------	----------	----------
Rfer		LC474880	----------	----------	----------	----------	----------	----------
Rfer		LC474881	----------	----------	----------	----------	----------	----------
Rfer		LC474882	----------	----------	----------	----------	----------	----------
Rfer		LC474884	----------	----------	----------	----------	----------	----------
Rfer		LC474885	----------	----------	----------	----------	----------	----------
Rfer		LC474886	----------	----------	----------	----------	----------	----------
Rfer		LC474887	----------	----------	----------	----------	----------	----------
Rfer		LC474888	----------	----------	----------	----------	----------	----------
Rfer		LC474889	----------	----------	----------	----------	----------	----------
Rfer		LC474890	----------	----------	----------	----------	----------	----------
Rfer		LC474891	----------	----------	----------	----------	----------	----------
Rfer		LC474892	----------	----------	----------	----------	----------	----------
Rfer		LC474893	----------	----------	----------	----------	----------	----------
Rfer		LC474894	----------	----------	----------	----------	----------	----------
Rfer		LC474895	----------	----------	----------	----------	----------	----------
Rfer		LC474896	----------	----------	----------	----------	----------	----------
Rfer		LC474897	----------	----------	----------	----------	----------	----------
Rfer		LC474898	----------	----------	----------	----------	----------	----------
Rfer		LC474899	----------	----------	----------	----------	----------	----------
Rfer		LC474902	----------	----------	----------	----------	----------	----------
Rfer		LC474903	----------	----------	----------	----------	----------	----------
Rfer		LC474904	----------	----------	----------	----------	----------	----------
Rfer		LC474905	----------	----------	----------	----------	----------	----------
Rfer		LC474906	----------	----------	----------	----------	----------	----------
Rfer		LC474907	----------	----------	----------	----------	----------	----------

Rfer		LC474908	----------	----------	----------	----------	----------	----------
Rfer		LC474909	----------	----------	----------	----------	----------	----------
Rfer		LC474910	----------	----------	----------	----------	----------	----------
Rfer		LC474911	----------	----------	----------	----------	----------	----------
Rfer		LC474912	----------	----------	----------	----------	----------	----------
Rfer		LC474913	----------	----------	----------	----------	----------	----------
Rfer		LC474914	----------	----------	----------	----------	----------	----------
Rfer		LC474915	----------	----------	----------	----------	----------	----------
Rfer		LC474916	----------	----------	----------	----------	----------	----------
Rfer		LC474917	----------	----------	----------	----------	----------	----------
Rfer		LC474918	----------	----------	----------	----------	----------	----------
Rfer		LC474919	----------	----------	----------	----------	----------	----------
Rfer		LC474920	----------	----------	----------	----------	----------	----------
Rfer		LC474921	----------	----------	----------	----------	----------	----------
Rfer		LC474922	----------	----------	----------	----------	----------	----------
Rfer		LC474923	----------	----------	----------	----------	----------	----------
Rfer		LC474924	----------	----------	----------	----------	----------	----------
Rfer		LC474925	----------	----------	----------	----------	----------	----------
Rfer		LC474926	----------	----------	----------	----------	----------	----------
Rfer		LC474927	----------	----------	----------	----------	----------	----------
Rfer		LC474928	----------	----------	----------	----------	----------	----------
Rfer		LC474929	----------	----------	----------	----------	----------	----------
Rfer		MF448526	----------	----------	----------	----------	----------	----------
Rfer		MG051027	ATAGTAATAC	CTATTATAAT	TGGAGGCTTT	GGAAACTGGT	TAGTTCCTCT	TATATTAGGG
Rfer		MG051028	ATAGTAATAC	CTATTATAAT	TGGAGGCTTT	GGAAACTGGT	TAGTTCCTCT	TATATTAGGG
Rfer		MG051029	ATAGTAATAC	CTATTATAAT	TGGAGGCTTT	GGAAACTGGT	TAGTTCCTCT	TATATTAGGG
Rfer		MG051030	ATAGTAATAC	CTATTATAAT	TGGAGGCTTT	GGAAACTGGT	TAGTTCCTCT	TATATTAGGG
Rfer		MG051031	ATAGTAATAC	CTATTATAAT	TGGAGGCTTT	GGAAACTGGT	TAGTTCCTCT	TATATTAGGG
Rfer		MG872818	----------	----------	----------	----------	----------	----------

Rfer		MG883395	----------	----------	----------	----------	----------	----------
Rfer		MG883396	----------	----------	----------	----------	----------	----------
Rfer		MG883397	----------	----------	----------	----------	----------	----------
Rfer		MG883398	----------	----------	----------	----------	----------	----------
Rfer		MG883399	----------	----------	----------	----------	----------	----------
Rfer		MH016277	ATAGTAATAC	CTATTATAAT	TGGAGGCTTT	GGAAACTGGT	TAGTTCCTCT	TATATTAGGA
Rfer		MH016278	ATAGTAATAC	CTATTATAAT	TGGAGGCTTT	GGAAACTGGT	TAGTTCCTCT	TATATTAGGA
Rfer		MH016279	ATAGTAATAC	CTATTATAAT	TGGAGGCTTT	GGAAACTGGT	TAGTTCCTCT	TATATTAGGA
Rfer		MH016604	----------	----------	----------	----------	----------	----------
Rfer		MH016605	----------	----------	----------	----------	----------	----------
Rfer		MH016606	----------	----------	----------	----------	----------	----------
Rfer		MH016607	----------	----------	----------	----------	----------	----------
Rfer		MH016608	----------	----------	----------	----------	----------	----------
Rfer		MH016609	----------	----------	----------	----------	----------	----------
Rfer		MH016610	----------	----------	----------	----------	----------	----------
Rfer		MH016611	----------	----------	----------	----------	----------	----------
Rfer		MH016612	----------	----------	----------	----------	----------	----------
Rfer		MH016613	----------	----------	----------	----------	----------	----------
Rfer		MH016614	----------	----------	----------	----------	----------	----------
Rfer		MH016615	----------	----------	----------	----------	----------	----------
Rfer		MH016616	----------	----------	----------	----------	----------	----------
Rfer		MH016617	----------	----------	----------	----------	----------	----------
Rfer		MH016618	----------	----------	----------	----------	----------	----------
Rfer		MH016619	----------	----------	----------	----------	----------	----------
Rfer		MH016620	----------	----------	----------	----------	----------	----------
Rfer		MH016621	----------	----------	----------	----------	----------	----------
Rfer		MH016622	----------	----------	----------	----------	----------	----------
Rfer		MH016623	----------	----------	----------	----------	----------	----------
Rfer		MH016624	----------	----------	----------	----------	----------	----------

Rfer		MH016625	----------	----------	----------	----------	----------	----------
Rfer		MH016626	----------	----------	----------	----------	----------	----------
Rfer		MH016627	----------	----------	----------	----------	----------	----------
Rfer		MH016628	----------	----------	----------	----------	----------	----------
Rfer		MH016629	----------	----------	----------	----------	----------	----------
Rfer		MH016630	----------	----------	----------	----------	----------	----------
Rfer		MH016631	----------	----------	----------	----------	----------	----------
Rfer		MH016632	----------	----------	----------	----------	----------	----------
Rfer		MH016633	----------	----------	----------	----------	----------	----------
Rfer		MH016634	----------	----------	----------	----------	----------	----------
Rfer		MH016635	----------	----------	----------	----------	----------	----------
Rfer		MH016636	----------	----------	----------	----------	----------	----------
Rfer		MH016637	----------	----------	----------	----------	----------	----------
Rfer	H19	KF311403	----------	----------	----------	----------	----------	----------
Rfer	H41	KF311502	----------	----------	----------	----------	----------	----------
Rpal		ASSCR6357	ATAGTTATAC	CAATTATAAT	TGGAGGTTTT	GGAAATTGAC	TTGTACCATT	AATACTAGGA
Rpal		ASSCR6358	ATAGTTATAC	CAATTATAAT	TGGAGGTTTT	GGAAATTGAC	TTGTACCATT	AATACTAGGG
Rpal		AY131121	ATAGTTATAC	CAATTATAAT	TGGAGGTTTT	GGAAATTGAC	TTGTACCATT	AATACTAGGA
Rpal		GU581629	----------	----------	----------	----------	----------	----------
Rpal		KF311358	----------	----------	----------	----------	----------	----------
Rpal		KR494254	ATAGTTATAC	CAATTATAAT	TGGAGGTTTT	GGAAATTGAC	TTGTACCATT	AATACTAGAG
Rpal		KR494255	ATAGTTATAC	CAATTATAAT	TGGAGGTTTT	GGAAATTGAC	TTGTACCATT	AATACTAGGG
Rpal		KR494256	ATAGTTAAGC	CAATTATAAT	TGGAGGTTTT	GGAAATTGAC	TTGTACCATT	AATACTAGGG
Rpal		KR494257	ATAGTTATAC	CAATTATAAT	TGGAGGTTTT	GGAAATTGAC	TTGTACCATT	AATACTAGGG
Rpal		KR494258	ATAGTTATAC	CAATTATAAT	TGGAGGTTTT	GGAAATTGAC	TTGTACCATT	AATACTAGGG
Rpal		KR494259	ATAGTTATAC	CAATTATAAT	TGGAGGTTTT	GGAAATTGAC	TTGTACCATT	AATACTAGGG
Rpal		KR494260	ATAGTTATAC	CAATTATAAT	TGGAGGTTTT	GGAAATTGAC	TTGTACCATT	AATACTAGGG
Rpal		KR494261	ATAGTTATAC	CAATTATAAT	TGGAGGTTTT	GGAAATTGAC	TTGTACCATT	AATACTAGGG
Rpal	Rp1	KU647599	----------	----------	----------	----------	----------	-------GGA

Rpal	Rp10	KU647490	----------	----------	----------	----------	----------	-------GGG
Rpal	Rp11	KU647489	----------	----------	----------	----------	----------	-------GGG
Rpal	Rp12	KU647604	----------	----------	----------	----------	----------	-------GGG
Rpal	Rp13	KU647575	----------	----------	----------	----------	----------	-------GGG
Rpal	Rp2	KU647587	----------	----------	----------	----------	----------	-------GGA
Rpal	Rp3	KU647508	----------	----------	----------	----------	----------	-------GGA
Rpal	Rp4	KU647585	----------	----------	----------	----------	----------	-------GGA
Rpal	Rp5	KU647584	----------	----------	----------	----------	----------	-------GGA
Rpal	Rp6	KU647581	----------	----------	----------	----------	----------	-------GGA
Rpal	Rp7	KU647579	----------	----------	----------	----------	----------	-------GGA
Rpal	Rp8	KU647502	----------	----------	----------	----------	----------	-------GGG
Rpal	Rp9	KU647505	----------	----------	----------	----------	----------	-------GGG
Rpal		Uni10	ATAGTTATAC	CAATTATAAT	TGGAGGTTTT	GGAAATTGAC	TTGTACCATT	AATACTAGGG
Rpal		Uni11	ATAGTTATAC	CAATTATAAT	TGGAGGTTTT	GGAAATTGAC	TTGTACCATT	AATACTAGGG
Rpal		Uni117	ATAGTTATAC	CAATTATAAT	TGGAGGTTTT	GGAAATTGAC	TTGTACCATT	AATACTAGGA
Rpal		Uni17	ATAGTTATAC	CAATTATAAT	TGGAGGTTTT	GGAAATTGAC	TTGTACCATT	AATACTAGGG
Rpal		Uni21	ATAGTTATAC	CAATTATAAT	TGGAGGTTTT	GGAAATTGAC	TTGTACCATT	AATACTAGGG
Rpal		Uni44	ATAGTTATAC	CAATTATAAT	TGGAGGTTTT	GGAAATTGAC	TTGTACCATT	AATACTAGGA
Rpal		Uni58	ATAGTTATAC	CAATTATAAT	TGGAGGTTTT	GGAAATTGAC	TTGTACCATT	AATACTAGGA
Rpho		AY131120	----------	----------	----------	----------	----------	----------
Rpho		KY511047	----------	----------	----------	-------GAC	TTGTTCCCCT	AATATTAGGA
Rvul		LN612634	ATAGTTATAC	CAATTATAAT	TGGAGGTTTT	GGAAATTGAT	TAGTCCCCCT	TATATTAGGA
Rvul		LN612635	ATAGTTATAC	CAATTATAAT	TGGAGGTTTT	GGAAATTGAT	TAGTCCCCCT	TATATTAGGG
Rvul		LN612636	ATAGTTATAC	CAATTATAAT	TGGAGGTTTT	GGAAATTGAT	TAGTCCCCCT	TATATTAGGA
Rvul		MG051024	ATAGTTATAC	CAATTATAAT	TGGAGGTTTT	GGAAATTGAT	TAGTCCCCCT	TATATTAGGA
Rvul		MG051025	ATAGTTATAC	CAATTATAAT	TGGGGGTTTT	GGAAATTGAT	TAGTCCCCCT	TATATTAGGA
Rvul		MG051026	ATAGTTATAC	CAATTATAAT	TGGAGGTTTT	GGAAATTGAT	TAGTCCCCCT	TATATTAGGA
Rvul	Rv1	KF311588	----------	----------	----------	----------	----------	----------
Rvul	Rv10	KF311587	----------	----------	----------	----------	----------	----------

Rvul	Rv11	KF311629	----------	----------	----------	----------	----------	----------
Rvul	Rv12	KF311550	----------	----------	----------	----------	----------	----------
Rvul	Rv13	KF311549	----------	----------	----------	----------	----------	----------
Rvul	Rv14	KF311573	----------	----------	----------	----------	----------	----------
Rvul	Rv15	KF311546	----------	----------	----------	----------	----------	----------
Rvul	Rv16	KF311600	----------	----------	----------	----------	----------	----------
Rvul	Rv17	KF311578	----------	----------	----------	----------	----------	----------
Rvul	Rv18	KF311593	----------	----------	----------	----------	----------	----------
Rvul	Rv19	KF311552	----------	----------	----------	----------	----------	----------
Rvul	Rv2	KF311586	----------	----------	----------	----------	----------	----------
Rvul	Rv20	KF311594	----------	----------	----------	----------	----------	----------
Rvul	Rv21	KF311547	----------	----------	----------	----------	----------	----------
Rvul	Rv22	KF311591	----------	----------	----------	----------	----------	----------
Rvul	Rv23	KF311545	----------	----------	----------	----------	----------	----------
Rvul	Rv24	KF311576	----------	----------	----------	----------	----------	----------
Rvul	Rv25	KF311548	----------	----------	----------	----------	----------	----------
Rvul	Rv26	KF311559	----------	----------	----------	----------	----------	----------
Rvul	Rv27	KF311561	----------	----------	----------	----------	----------	----------
Rvul	Rv28	KF311533	----------	----------	----------	----------	----------	----------
Rvul	Rv29	KF311537	----------	----------	----------	----------	----------	----------
Rvul	Rv3	KF311633	----------	----------	----------	----------	----------	----------
Rvul	Rv30	KF311564	----------	----------	----------	----------	----------	----------
Rvul	Rv31	KF311570	----------	----------	----------	----------	----------	----------
Rvul	Rv32	KF311530	----------	----------	----------	----------	----------	----------
Rvul	Rv33	KF311538	----------	----------	----------	----------	----------	----------
Rvul	Rv34	KF311610	----------	----------	----------	----------	----------	----------
Rvul	Rv35	KF311605	----------	----------	----------	----------	----------	----------
Rvul	Rv36	KF311535	----------	----------	----------	----------	----------	----------
Rvul	Rv37	KF311529	----------	----------	----------	----------	----------	----------

Rvul	Rv38	KF311532	----------	----------	----------	----------	----------	----------
Rvul	Rv39	KF311563	----------	----------	----------	----------	----------	----------
Rvul	Rv4	KF311589	----------	----------	----------	----------	----------	----------
Rvul	Rv40	KF311568	----------	----------	----------	----------	----------	----------
Rvul	Rv41	KF311555	----------	----------	----------	----------	----------	----------
Rvul	Rv42	KF311558	----------	----------	----------	----------	----------	----------
Rvul	Rv43	KF311560	----------	----------	----------	----------	----------	----------
Rvul	Rv44	KF311601	----------	----------	----------	----------	----------	----------
Rvul	Rv45	KF311608	----------	----------	----------	----------	----------	----------
Rvul	Rv46	KF311604	----------	----------	----------	----------	----------	----------
Rvul	Rv47	KF311615	----------	----------	----------	----------	----------	----------
Rvul	Rv48	KF311603	----------	----------	----------	----------	----------	----------
Rvul	Rv49	KF311609	----------	----------	----------	----------	----------	----------
Rvul	Rv5	KF311632	----------	----------	----------	----------	----------	----------
Rvul	Rv50	KF311602	----------	----------	----------	----------	----------	----------
Rvul	Rv51	KF311621	----------	----------	----------	----------	----------	----------
Rvul	Rv52	KF311619	----------	----------	----------	----------	----------	----------
Rvul	Rv53	KF311620	----------	----------	----------	----------	----------	----------
Rvul	Rv54	KF311622	----------	----------	----------	----------	----------	----------
Rvul	Rv55	KF311617	----------	----------	----------	----------	----------	----------
Rvul	Rv56	KF311606	----------	----------	----------	----------	----------	----------
Rvul	Rv57	KF311614	----------	----------	----------	----------	----------	----------
Rvul	Rv59	KF311567	----------	----------	----------	----------	----------	----------
Rvul	Rv6	KF311628	----------	----------	----------	----------	----------	----------
Rvul	Rv60	KF311607	----------	----------	----------	----------	----------	----------
Rvul	Rv61	KF311544	----------	----------	----------	----------	----------	----------
Rvul	Rv62	KF311625	----------	----------	----------	----------	----------	----------
Rvul	Rv7	KF311528	----------	----------	----------	----------	----------	----------
Rvul	Rv8	KF311631	----------	----------	----------	----------	----------	----------

Rvul	Rv9	KF311590	----------	----------	----------	----------	----------	----------
Slin		AY131102	ATAGTTATAC	CAATTATAAT	TGGAGGGTTT	GGAAATTGAT	TAGTCCCATT	AATACTAGGA
Sory		AY131099	ATAGTAATAC	CAATTATAAT	TGGAGGATTT	GGAAACTGAT	TAATCCCATT	AATATTAGGA
Sory		GU196317	ATAGTAATAC	CAATTATAAT	TGGAGGATTT	GGAAACTGAT	TAATCCCATT	AATATTAGGA
Spheno		NC018351	ATAGTTATAC	CTATTATAAT	TGGGGGATTC	GGAAATTGAC	TAGTCCCCCT	AATATTAGGG
Szea		AY131100	ATAGTGATAC	CTATTATAAT	TGGAGGTTTC	GGAAACTGAT	TAGTCCCACT	AATACTAGGA
Yfro		AY131109	ATAGTTATAC	CCATCATAAT	TGGTGGATTT	GGAAATTGAC	TTGTTCCTTT	AATATTAGGT

Continuation of the Table S4.

Species	Ha	Sequences	Position					
			241-250	251-260	261-270	271-280	281-290	291-300
Dbor		AY131105	GCTCCCGATA	TAGCTTTCCC	ACGCTTAAAT	AATATAAGAT	TCTGACTTTT	ACCTCCCTCT
Dbor		Uni9	GCTCCCGATA	TAGCTTTCCC	ACGCTTAAAT	AATATAAGAT	TCTGACTTTT	ACCCCCCTCT
Dper		ASSCR6014	GCCCCTGATA	TAGCCTTTCC	ACGTTTAAAT	AACATAAGAT	TCTGACTTTT	ACCCCCCTCT
Dper		ASSCR6015	GCCCCTGATA	TAGCCTTTCC	ACGTTTAAAT	AACATAAGAT	TCTGGCTTTT	ACCCCCCTCT
Dper		ASSCR6016	GCCCCTGATA	TAGCCTTTCC	ACGTTTAAAT	AACATAAGAT	TCTGACTTTT	ACCCCCCTCT
Dper		ASSCR6018	GCCCCTGATA	TAGCCTTTCC	ACGTTTAAAT	AACATAAGAT	TCTGACTTTT	ACCCCCCTCT
Hcho		JX679716	GCCCCCGACA	TAGCCTTTCC	CCGTATAAAT	AACATAAGAT	TTTGATTACT	ACCCCCATCT
Hpha		KC112991	GCCCCTGATA	TAGCTTTCCC	TCGAATAAAC	AACATAAGAT	TTTGATTACT	TCCACCTTCA
Nxan		NC018354	GCTCCAGATA	TAGCCTTTCC	TCGTTTAAAC	AATATAAGAT	TTTGACTTTT	ACCTCCCTCT
Phil		GU244486	GCCCCAGATA	TAGCATTCCC	CCGAATAAAT	AATATGAGAT	TCTGACTTTT	ACCCCCATCA
Pnod		HQ891474	GCCCCTGACA	TAGCCTTCCC	CCGTCTTAAT	AATATAAGAT	TTTGACTTTT	ACCCCCATCT
Rbil	Rb1	KF311645	----------	----------	----------	----------	--TGACTTCT	TCCCCCCTCT
Rbil	Rb2	KF311637	----------	----------	----------	----------	--TGACTTCT	TCCCCCCTCT
Rbil	Rb3	KF311639	----------	----------	----------	----------	--TGACTTCT	TCCCCCCTCT
Rbil	Rb4	KF311636	----------	----------	----------	----------	--TGACTTCT	TCCCCCCTCT
Rbil	Rb5	KF311635	----------	----------	----------	----------	--TGACTTCT	TCCCCCCTCT
Rbil	Rb6	KF311634	----------	----------	----------	----------	--TGACTTCT	TCCTCCCTCT
Rbil	Rb7	KF311648	----------	----------	----------	----------	--TGGCTTCT	TCCCCCCTCT
Rbil	Rb8	KF311647	----------	----------	----------	----------	--TGGCTTCT	TCCCCCCTCT
Rcru		AY131113	GCTCCTGATA	TGGCCTTTCC	TCGATTAAAT	AATATGAGAT	TTTGGCTGCT	TCCACCTTCT
Rcru		KF311359	----------	----------	----------	----------	--TGGCTACT	TCCACCTTCT
Rcru		USCOC565	GCTCCTGATA	TGGCCTTTCC	TCGATTAAAT	AATATGAGAT	TTTGACTACT	TCCACCTTCT
Rfer	H1	GU581582	----------	----------	----------	----------	--TGACTCTT	ACCCCCTTCT
Rfer	H10	KF311482	----------	----------	----------	----------	--TGGCTCTT	ACCCCCTTCT
Rfer	H11	KF311444	----------	----------	----------	----------	--TGGCTCTT	ACCCCCTTCT

Rfer	H12	KF311487	----------	----------	----------	----------	--TGGCTCTT	ACCCCCTTCT
Rfer	H13	KF311481	----------	----------	----------	----------	--TGGCTCTT	ACCCCCTTCT
Rfer	H14	KF311448	----------	----------	----------	----------	--TGGCTCTT	ACCCCCTTCT
Rfer	H15	JX292125	---------T	ATAGCATTCC	CCGTTTAAAT	AACATAAGCT	TCTGGCTCTT	ACCCCCTTCT
Rfer	H16	KF311449	----------	----------	----------	----------	--TGGCTCTT	ACCCCCTTCT
Rfer	H17	KF311360	----------	----------	----------	----------	--TGACTCTT	ACCTCCCTCT
Rfer	H18	KF311473	----------	----------	----------	----------	--TGACTCTT	ACCCCCCTCT
Rfer	H2	GU581549	----------	----------	----------	----------	--TGACTCTT	ACCCCCTTCT
Rfer	H20	KF311433	----------	----------	----------	----------	--TGACTCTT	ACCCCCCTCT
Rfer	H21	KF311474	----------	----------	----------	----------	--TGACTCTT	ACCCCCCTCT
Rfer	H22	KF311516	----------	----------	----------	----------	--TGACTCTT	ACCCCCCTCT
Rfer	H23	KF311380	----------	----------	----------	----------	--TGACTCTT	GCCCCCCTCT
Rfer	H24	KF311389	----------	----------	----------	----------	--TGACTCTT	GCCCCCCTCT
Rfer	H25	KF311384	----------	----------	----------	----------	--TGACTCTT	GCCCCCCTCT
Rfer	H26	KF311388	----------	----------	----------	----------	--TGACTCTT	GCCCCCCTCT
Rfer	H27	KF311386	----------	----------	----------	----------	--TGACTCTT	GCCCCCCTCT
Rfer	H28	KF311399	----------	----------	----------	----------	--TGACTCTT	GCCCCCCTCT
Rfer	H29	KF311383	----------	----------	----------	----------	--TGACTCTT	GCCCCCCTCT
Rfer	H3	GU581547	----------	----------	----------	----------	--TGACTCTT	ACCCCCTTCT
Rfer	H30	KF311392	----------	----------	----------	----------	--TGACTCTT	GCCCCCCTCT
Rfer	H31	KF311379	----------	----------	----------	----------	--TGACTCTT	GCCCCCCTCT
Rfer	H32	KF311490	----------	----------	----------	----------	--TGACTCTT	ACCCCCCTCT
Rfer	H34	KF311492	----------	----------	----------	----------	--TGGCTCTT	ACCCCCCTCT
Rfer	H35	KF311496	----------	----------	----------	----------	--TGGCTCTT	ACCCCCCTCT
Rfer	H36	KF311500	----------	----------	----------	----------	--TGGCTCTT	ACCCCCCTCT
Rfer	H37	KF311509	----------	----------	----------	----------	--TGGCTCTT	ACCCCCCTCT
Rfer	H38	KF311505	----------	----------	----------	----------	--TGGCTCTT	ACCCCCCTCT
Rfer	H39	KF311508	----------	----------	----------	----------	--TGGCTCTT	ACCCCCCTCT
Rfer	H4	GU581545	----------	----------	----------	----------	--TGACTCTT	ACCCCCTTCT

Rfer	H40	KF311506	----------	----------	----------	----------	--TGGCTCTT	ACCCCCCTCT
Rfer	H42	KF311501	----------	----------	----------	----------	--TGGCTCTT	ACCCCCCTCT
Rfer	H43	KF311525	----------	----------	----------	----------	--TGGCTCTT	ACCCCCCTCT
Rfer	H5	GU581539	----------	----------	----------	----------	--TGACTCTT	ACCCCCTTCT
Rfer	H51	KU696497	----------	----------	----------	----------	--TGACTCTT	ACCCCCTTCT
Rfer	H52	KU696507	----------	----------	----------	----------	--TGACTCTT	ACCCCCTTCT
Rfer	H6	GU581526	----------	----------	----------	----------	--TGACTCTT	ACCCCCTTCT
Rfer	H7	GU581525	----------	----------	----------	----------	--TGGCTCTT	ACCCCCCTCT
Rfer	H8	GU581319	----------	----------	----------	----------	--TGACTCTT	ACCCCCCTCT
Rfer	H9	KF311446	----------	----------	----------	----------	--TGGCTCTT	ACCCCCTTCT
Rfer		JX292124	---------T	ATAGCATTCC	CCGTTTAAAT	AACATAAGCT	TCTGGCTCTT	ACCCCCTTCT
Rfer		JX294413	---------T	ATAGCATTCC	CCGTTTAAAT	AACATAAGCT	TCTGGCTCTT	ACCCCCTTCT
Rfer		KF413063	----------	----------	----------	----------	--TGGCTCTT	ACCCCCCTCT
Rfer		KF413064	----------	----------	----------	----------	--TGACTCTT	ACCCCCCTCT
Rfer		KF413065	----------	----------	----------	----------	--TGGCTCTT	ACCTCCCTCT
Rfer		KF413066	----------	----------	----------	----------	--TGGCTCTT	ACCCCCCTCT
Rfer		KF413067	----------	----------	----------	----------	--TGGCTCTT	ACCCCCCTCT
Rfer		KF413068	----------	----------	----------	----------	--TGGCTCTT	ACCTCCCTCT
Rfer		KF413069	----------	----------	----------	----------	--TGGCTCTT	ACCTCCCTCT
Rfer		KF413070	----------	----------	----------	----------	--TGGCTCTT	ACCTCCCTCT
Rfer		KF413071	----------	----------	----------	----------	--TGGCTCTT	ACCCCCCTCT
Rfer		KF413072	----------	----------	----------	----------	--TGGCTCTT	ACCCCCCTCT
Rfer		KF413073	----------	----------	----------	----------	--TGACTCTT	ACCCCCCTCT
Rfer		KT989230	GCACCTGATA	TGGCTTTTCC	CCGTTTAAAT	AACATAAGCT	TCTGACTCTT	ACCTCCCTCT
Rfer		KT989231	GCACCTGATA	TGGCTTTTCC	CCGTTTAAAT	AACATAAGCT	TCTGACTCTT	ACCTCCCTCT
Rfer		KT989232	GCACCTGATA	TGGCTTTTCC	CCGTTTAAAT	AACATAAGCT	TCTGACTCTT	ACCTCCCTCT
Rfer		KT989233	GCACCTGATA	TGGCTTTTCC	CCGTTTAAAT	AACATAAGCT	TCTGACTCTT	ACCTCCCTCT
Rfer		KT989234	GCACCTGATA	TGGCTTTTCC	CCGTTTAAAT	AACATAAGCT	TCTGACTCTT	ACCTCCCTCT
Rfer		KU916538	GCACCTGATA	TGGCTTTTCC	CCGTTTAAAT	AACATAAGCT	TCTGACTCTT	ACCCCCCTCT

Rfer		KY458175	GCACCTGATA	TGGCTTTTCC	CCGTTTAAAT	AACATAAGCT	TCTGACTCTT	ACCCCCTTCT
Rfer		KY458176	GCACCTGATA	TGGCTTTTCC	CCGTTTAAAT	AACATAAGCT	TCTGACTCTT	ACCCCCTTCT
Rfer		KY458177	GCACCTGATA	TGGCTTTTCC	CCGTTTAAAT	AACATAAGCT	TCTGACTCTT	ACCCCCTTCT
Rfer		LC474878	----------	----------	----------	---ATAAGCT	TCTGACTCTT	ACCCCCCTCT
Rfer		LC474880	----------	----------	----------	---ATAAGCT	TCTGACTCTT	ACCCCCCTCT
Rfer		LC474881	----------	----------	----------	---ATAAGCT	TCTGACTCTT	ACCCCCCTCT
Rfer		LC474882	----------	----------	----------	---ATAAGCT	TCTGACTCTT	ACCCCCCTCT
Rfer		LC474884	----------	----------	----------	---ATAAGCT	TCTGACTCTT	ACCCCCCTCT
Rfer		LC474885	----------	----------	----------	----------	----------	----------
Rfer		LC474886	----------	----------	----------	----------	----------	----------
Rfer		LC474887	----------	----------	----------	---ATAAGCT	TCTGACTCTT	ACCCCCCTCT
Rfer		LC474888	----------	----------	----------	---ATAAGCT	TCTGACTCTT	ACCCCCCTCT
Rfer		LC474889	----------	----------	----------	---ATAAGCT	TCTGACTCTT	ACCCCCCTCT
Rfer		LC474890	----------	----------	----------	---ATAAGCT	TCTGACTCTT	ACCCCCCTCT
Rfer		LC474891	----------	----------	----------	---ATAAGCT	TCTGACTCTT	ACCCCCCTCT
Rfer		LC474892	----------	----------	----------	---ATAAGCT	TCTGACTCTT	ACCCCCCTCT
Rfer		LC474893	----------	----------	----------	---ATAAGCT	TCTGACTCTT	ACCCCCCTCT
Rfer		LC474894	----------	----------	----------	---ATAAGCT	TCTGACTCTT	ACCCCCCTCT
Rfer		LC474895	----------	----------	----------	----------	----------	----------
Rfer		LC474896	----------	----------	----------	----------	----------	----------
Rfer		LC474897	----------	----------	----------	----------	----------	----------
Rfer		LC474898	----------	----------	----------	----------	----------	----------
Rfer		LC474899	----------	----------	----------	----------	----------	----------
Rfer		LC474902	----------	----------	----------	----------	----------	----------
Rfer		LC474903	----------	----------	----------	----------	----------	----------
Rfer		LC474904	----------	----------	----------	----------	----------	----------
Rfer		LC474905	----------	----------	----------	----------	----------	----------
Rfer		LC474906	----------	----------	----------	----------	----------	----------
Rfer		LC474907	----------	----------	----------	----------	----------	----------

Rfer		LC474908	----------	----------	----------	----------	----------	----------
Rfer		LC474909	----------	----------	----------	----------	----------	----------
Rfer		LC474910	----------	----------	----------	----------	----------	----------
Rfer		LC474911	----------	----------	----------	----------	----------	----------
Rfer		LC474912	----------	----------	----------	---ATAAGCT	TCTGACTCTT	ACCCCCCTCT
Rfer		LC474913	----------	----------	----------	----------	----------	----------
Rfer		LC474914	----------	----------	----------	----------	----------	----------
Rfer		LC474915	----------	----------	----------	----------	----------	----------
Rfer		LC474916	----------	----------	----------	----------	----------	----------
Rfer		LC474917	----------	----------	----------	----------	----------	----------
Rfer		LC474918	----------	----------	----------	----------	----------	----------
Rfer		LC474919	----------	----------	----------	---ATAAGCT	TCTGACTCTT	ACCCCCCTCT
Rfer		LC474920	----------	----------	----------	---ATAAGCT	TCTGACTCTT	ACCCCCCTCT
Rfer		LC474921	----------	----------	----------	---ATAAGCT	TCTGACTCTT	ACCCCCCTCT
Rfer		LC474922	----------	----------	----------	---ATAAGCT	TCTGACTCTT	ACCCCCCTCT
Rfer		LC474923	----------	----------	----------	---ATAAGCT	TCTGACTCTT	ACCCCCCTCT
Rfer		LC474924	----------	----------	----------	---ATAAGCT	TCTGACTCTT	ACCCCCCTCT
Rfer		LC474925	----------	----------	----------	----------	----------	----------
Rfer		LC474926	----------	----------	----------	---ATAAGCT	TCTGACTCTT	ACCCCCCTCT
Rfer		LC474927	----------	----------	----------	----------	----------	----------
Rfer		LC474928	----------	----------	----------	----------	----------	----------
Rfer		LC474929	----------	----------	----------	----------	----------	----------
Rfer		MF448526	----------	----------	----------	----------	----------	------CTCT
Rfer		MG051027	GCACCTGATA	TGGCTTTTCC	CCGTTTAAAT	AACATAAGCT	TCTGACTCTT	ACCCCCCTCT
Rfer		MG051028	GCACCTGATA	TGGCTTTTCC	CCGTTTAAAT	AACATAAGCT	TCTGACTCTT	ACCCCCCTCT
Rfer		MG051029	GCACCTGATA	TGGCTTTTCC	CCGTTTAAAT	AACATAAGCT	TCTGACTCTT	ACCCCCCTCT
Rfer		MG051030	GCACCTGATA	TGGCTTTTCC	CCGTTTAAAT	AACATAAGCT	TCTGACTCTT	ACCCCCCTCT
Rfer		MG051031	GCACCTGATA	TGGCTTTTCC	CCGTTTAAAT	AACATAAGCT	TCTGACTCTT	ACCCCCCTCT
Rfer		MG872818	----------	----------	----------	----------	----------	--------CT

Rfer		MG883395	----------	----------	----------	----------	----------	----CCCTCT
Rfer		MG883396	----------	----------	----------	----------	----------	--------CT
Rfer		MG883397	----------	----------	----------	----------	----------	----------
Rfer		MG883398	----------	----------	----------	----------	----------	-------TCT
Rfer		MG883399	----------	----------	----------	----------	----------	--------CT
Rfer		MH016277	GCACCTGATA	TGGCTTTTCC	CCGTTTAAAT	AACATAAGCT	TCTGACTCTT	ACCCCCCTCT
Rfer		MH016278	GCACCTGATA	TGGCTTTTCC	CCGTTTAAAT	AACATAAGCT	TCTGACTCTT	ACCTCCCTCT
Rfer		MH016279	GCACCTGATA	TGGCTTTTCC	CCGTTTAAAT	AACATAAGCT	TCTGACTCTT	ACCCCCCTCT
Rfer		MH016604	----------	----------	----------	----------	----------	TACCCCCTCT
Rfer		MH016605	----------	----------	----------	----------	----------	--------CT
Rfer		MH016606	----------	----------	----------	----------	----------	----CCCTCT
Rfer		MH016607	----------	----------	----------	----------	----------	-----CCTCT
Rfer		MH016608	----------	----------	CCGTTTAAAT	AACATAAGCT	TCTGACTCTT	ACCCCCCTCT
Rfer		MH016609	----------	----------	---TTTAAAT	AACATAAGCT	TCTGACTCTT	ACCCCCCTCT
Rfer		MH016610	----------	---------C	CCGTTTAAAT	AACATAAGCT	TCTGACTCTT	ACCCCCCTCT
Rfer		MH016611	----------	---------C	CCGTTTAAAT	AACATAAGCT	TCTGACTCTT	ACCCCCCTCT
Rfer		MH016612	----------	---------C	CCGTTTAAAT	AACATAAGCT	TCTGACTCTT	ACCCCCCTCT
Rfer		MH016613	----------	-----TTTCC	CCGTTTAAAT	AACATAAGCT	TCTGACTCTT	ACCCCCCTCT
Rfer		MH016614	----------	----------	----------	----------	----------	----CCCTCT
Rfer		MH016615	----------	----------	----------	----------	----------	----CCCTCT
Rfer		MH016616	----------	----------	----------	----------	----------	----------
Rfer		MH016617	------TTTA	TAGCATTTCC	CCGTTTAAAT	AACATAAGCT	TCTGACTCTT	ACCCCCCTCT
Rfer		MH016618	----------	----------	----------	----------	----------	--CCCCCTCT
Rfer		MH016619	----------	----------	----------	----------	----------	----CCCTCT
Rfer		MH016620	----------	----------	----------	----------	----------	----------
Rfer		MH016621	----------	----------	----------	----------	----------	----------
Rfer		MH016622	----------	----------	----------	----------	----------	----------
Rfer		MH016623	----------	----------	---TTTAAAT	AACATAAGCT	TCTGACTCTT	ACCCCCCTCT
Rfer		MH016624	----------	---------C	CCGTTTAAAT	AACATAAGCT	TCTGACTCTT	ACCCCCCTCT

Rfer		MH016625	----------	---------C	CCGTTTAAAT	AACATAAGCT	TCTGACTCTT	ACCCCCCTCT
Rfer		MH016626	----------	---------C	CCGTTTAAAT	AACATAAGCT	TCTGACTCTT	ACCCCCCTCT
Rfer		MH016627	----------	----------	--GTTTAAAT	AACATAAGCT	TCTGACTCTT	ACCCCCCTCT
Rfer		MH016628	----------	----------	--GTTTAAAT	AACATAAGCT	TCTGACTCTT	ACCCCCCTCT
Rfer		MH016629	----------	----------	----------	----------	----------	----------
Rfer		MH016630	----------	----------	----------	----------	----------	----------
Rfer		MH016631	----------	----------	----------	----------	----------	----CCCTCT
Rfer		MH016632	----------	----------	----------	----------	----------	----------
Rfer		MH016633	----------	----------	----------	----------	----------	----------
Rfer		MH016634	----------	----------	----------	----------	----------	----------
Rfer		MH016635	----------	----------	----------	----------	----------	---CCCCTCT
Rfer		MH016636	----------	----------	----------	----------	----------	----CCCTCT
Rfer		MH016637	----------	----------	----------	----------	----------	-------TCT
Rfer	H19	KF311403	----------	----------	----------	----------	--TGACTCTT	ACCCCCCTCT
Rfer	H41	KF311502	----------	----------	----------	----------	--TGGCTCTT	ACCCCCCTCT
Rpal		ASSCR6357	GCACCAGATA	TGGCATTTCC	ACGACTTAAT	AATATAAGAT	TCTGACTTTT	ACCTCCTTCT
Rpal		ASSCR6358	GCACCAGATA	TGGCATTTCC	ACGACTTAAT	AATATAAGAT	TCTGACTTTT	ACCTCCTTCT
Rpal		AY131121	GCCCCAGACA	TAGCATTCCN	ACGACTTAAT	AATATAAGAT	TCTGACTNTT	ACCTCCTTCT
Rpal		GU581629	----------	----------	----------	----------	--TGACTTTT	ACCTCCTTCT
Rpal		KF311358	----------	----------	----------	----------	--TGACTTTT	ACCTCCTTCT
Rpal		KR494254	GCACCAGATA	TGGCATTTCC	ACGACTTAAT	AATATAAGAT	TCTGACTTTT	ACCTCCTTCT
Rpal		KR494255	GCACCAGATA	TGGCATTTCC	ACGACTTAAT	AATATAAGAT	TCTGACTTTT	ACCTCCTTCT
Rpal		KR494256	GCACCAGATA	TGGCATTTCC	ACGACTTAAT	AATATAAGAT	TCTGACTTTT	ACCTCCTTCT
Rpal		KR494257	GCACCAGATA	TGGCATTTCC	ACGACTTAAT	AATATAAGAT	TCTGACTTTT	ACCTCCTTCT
Rpal		KR494258	GCACCAGATA	TGGCATTTCC	ACGACTTAAT	AATATAAGAT	TCTGACTTTT	ACCTCCTTCT
Rpal		KR494259	GCACCAGATA	TGGCATTTCC	ACGACTTAAT	AATATAAGAT	TCTGACTTTT	ACCTCCTTCT
Rpal		KR494260	GCACCAGATA	TGGCATTTCC	ACGACTTAAT	AATATAAGAT	TCTGACTTTT	ACCTCCTTCT
Rpal		KR494261	GCACCAGATA	TGGCATTTCC	ACGACTTAAT	AATATAAGAT	TCTGACTTTT	ACCTCCTTCT
Rpal	Rp1	KU647599	GCCCCAGACA	TAGCATTTCC	ACGACTTAAT	AATATAAGAT	TCTGACTTTT	ACCTCCTTCT

Rpal	Rp10	KU647490	GCCCCAGACA	TGGCATTTCC	ACGACTTAAT	AATATAAGAT	TCTGACTCTT	ACCTCCTTCT
Rpal	Rp11	KU647489	GCCCCAGACA	TGGCATTTCC	ACGACTTAAT	AATATAAGAT	TCTGACTCTT	ACCTCCTTCT
Rpal	Rp12	KU647604	GCCCCAGACA	TGGCATTTCC	ACGACTTAAT	AATATAAGAT	TCTGACTTTT	ACCTCCTTCT
Rpal	Rp13	KU647575	GCCCCAGACA	TGGCATTTCC	ACGACTTAAT	AATATAAGAT	TTTGACTCTT	ACCTCCTTCT
Rpal	Rp2	KU647587	GCCCCAGACA	TAGCATTTCC	ACGACTTAAT	AATATAAGAT	TCTGACTTTT	ACCTCCTTCT
Rpal	Rp3	KU647508	GCCCCAGACA	TAGCATTTCC	ACGACTTAAT	AATATAAGAT	TCTGACTTTT	ACCTCCTTCT
Rpal	Rp4	KU647585	GCCCCAGACA	TAGCATTTCC	ACGACTTAAT	AATATAAGAT	TCTGACTTTT	ACCTCCTTCT
Rpal	Rp5	KU647584	GCCCCAGACA	TAGCATTTCC	ACGACTTAAT	AATATAAGAT	TCTGACTTTT	ACCTCCTTCT
Rpal	Rp6	KU647581	GCTCCAGACA	TGGCATTTCC	ACGACTTAAT	AATATAAGAT	TCTGACTTTT	ACCTCCTTCT
Rpal	Rp7	KU647579	GCTCCAGACA	TGGCATTTCC	ACGACTTAAT	AATATAAGAT	TCTGACTTTT	ACCTCCTTCT
Rpal	Rp8	KU647502	GCCCCAGACA	TAGCATTTCC	ACGACTTAAT	AATATAAGAT	TCTGACTCTT	ACCTCCTTCT
Rpal	Rp9	KU647505	GCCCCAGACA	TGGCATTTCC	ACGACTTAAT	AATATAAGAT	TCTGACTCTT	ACCTCCTTCT
Rpal		Uni10	GCACCAGATA	TGGCATTTCC	ACGACTTAAT	AATATAAGAT	TCTGACTTTT	ACCTCCTTCT
Rpal		Uni11	GCACCAGATA	TGGCATTTCC	ACGACTTAAT	AATATAAGAT	TCTGACTTTT	ACCTCCTTCT
Rpal		Uni117	GCCCCAGACA	TGGCATTTCC	ACGACTTAAT	AATGTAAGAT	TCTGACTTTT	ACCTCCTTCT
Rpal		Uni17	GCACCAGATA	TGGCATTTCC	ACGACTTAAT	AATATAAGAT	TCTGACTTTT	ACCTCCTTCT
Rpal		Uni21	GCACCAGATA	TGGCATTTCC	ACGACTTAAT	AATATAAGAT	TCTGACTTTT	ACCTCCTTCT
Rpal		Uni44	GCCCCAGACA	TGGCATTTCC	ACGACTTAAT	AATATAAGAT	TCTGACTTTT	ACCTCCTTCT
Rpal		Uni58	GCACCAGATA	TGGCTTTTCC	ACGACTTAAT	AATATAAGAT	TCTGACTTTT	ACCTCCTTCT
Rpho		AY131120	----------	----------	----------	----------	----------	ACCCCCATCT
Rpho		KY511047	GCTCCTGATA	TAGCCTTTCC	TCGACTAAAT	AATATAAGCT	TTTGGTTGTT	ACCCCCTTCC
Rvul		LN612634	GCCCCTGATA	TAGCTTTTCC	CCGTTTAAAT	AACATAAGAT	TCTGGCTTCT	TCCCCCCTCT
Rvul		LN612635	GCCCCTGATA	TAGCTTTTCC	CCGTTTAAAT	AACATAAGAT	TCTGGCTTCT	TCCCCCCTCT
Rvul		LN612636	GCCCCTGATA	TAGCTTTTCC	CCGTTTAAAT	AACATAAGAT	TCTGGCTTCT	TCCCCCCTCT
Rvul		MG051024	GCCCCTGATA	TAGCTTTTCC	CCGTTTAAAT	AACATAAGAT	TCTGGCTTCT	TCCCCCCTCT
Rvul		MG051025	GCCCCTGATA	TAGCTTTTCC	CCGTTTAAAT	AACATAAGAT	TCTGGCTTCT	CCCCCCCTCT
Rvul		MG051026	GCCCCTGATA	TAGCTTTTCC	CCGTTTAAAT	AACATAAGAT	TCTGGCTTCT	TCCCCCCTCT
Rvul	Rv1	KF311588	----------	----------	----------	----------	--TGGCTTCT	CCCCCCCTCT
Rvul	Rv10	KF311587	----------	----------	----------	----------	--TGACTTCT	TCCCCCCTCT

Rvul	Rv11	KF311629	----------	----------	----------	----------	--TGGCTTCT	TCCCCCCTCT
Rvul	Rv12	KF311550	----------	----------	----------	----------	--TGGCTTCT	TCCCCCCTCT
Rvul	Rv13	KF311549	----------	----------	----------	----------	--TGGCTTCT	TCCCCCCTCT
Rvul	Rv14	KF311573	----------	----------	----------	----------	--TGGCTTCT	TCCCCCCTCT
Rvul	Rv15	KF311546	----------	----------	----------	----------	--TGGCTTCT	TCCCCCCTCT
Rvul	Rv16	KF311600	----------	----------	----------	----------	--TGGCTTCT	TCCCCCCTCT
Rvul	Rv17	KF311578	----------	----------	----------	----------	--TGGCTTCT	TCCTCCCTCT
Rvul	Rv18	KF311593	----------	----------	----------	----------	--TGGCTTCT	TCCCCCCTCT
Rvul	Rv19	KF311552	----------	----------	----------	----------	--TGGCTTCT	TCCCCCCTCT
Rvul	Rv2	KF311586	----------	----------	----------	----------	--TGGCTTCT	TCCCCCCTCT
Rvul	Rv20	KF311594	----------	----------	----------	----------	--TGGCTTCT	TCCCCCCTCT
Rvul	Rv21	KF311547	----------	----------	----------	----------	--TGGCTTCT	TCCCCCCTCT
Rvul	Rv22	KF311591	----------	----------	----------	----------	--TGGCTTCT	TCCCCCCTCT
Rvul	Rv23	KF311545	----------	----------	----------	----------	--TGGCTTCT	TCCCCCCTCT
Rvul	Rv24	KF311576	----------	----------	----------	----------	--TGGCTTCT	TCCCCCCTCT
Rvul	Rv25	KF311548	----------	----------	----------	----------	--TGGCTTCT	TCCCCCCTCT
Rvul	Rv26	KF311559	----------	----------	----------	----------	--TGGCTTCT	TCCCCCCTCT
Rvul	Rv27	KF311561	----------	----------	----------	----------	--TGGCTTCT	TCCCCCCTCT
Rvul	Rv28	KF311533	----------	----------	----------	----------	--TGGCTTCT	TCCCCCCTCT
Rvul	Rv29	KF311537	----------	----------	----------	----------	--TGGCTTCT	TCCCCCCTCT
Rvul	Rv3	KF311633	----------	----------	----------	----------	--TGGCTTCT	CCCCCCCTCT
Rvul	Rv30	KF311564	----------	----------	----------	----------	--TGGCTTCT	TCCCCCCTCT
Rvul	Rv31	KF311570	----------	----------	----------	----------	--TGGCTTCT	TCCCCCCTCT
Rvul	Rv32	KF311530	----------	----------	----------	----------	--TGGCTTCT	TCCCCCCTCT
Rvul	Rv33	KF311538	----------	----------	----------	----------	--TGACTTCT	TCCCCCCTCT
Rvul	Rv34	KF311610	----------	----------	----------	----------	--TGGCTTCT	TCCCCCCTCT
Rvul	Rv35	KF311605	----------	----------	----------	----------	--TGGCTTCT	TCCCCCCTCT
Rvul	Rv36	KF311535	----------	----------	----------	----------	--TGGCTTCT	TCCCCCCTCT
Rvul	Rv37	KF311529	----------	----------	----------	----------	--TGGCTTCT	TCCCCCCTCT

Rvul	Rv38	KF311532	----------	----------	----------	----------	--TGGCTTCT	TCCCCCCTCT
Rvul	Rv39	KF311563	----------	----------	----------	----------	--TGGCTTCT	TCCCCCCTCT
Rvul	Rv4	KF311589	----------	----------	----------	----------	--TGGCTTCT	CCCCCCCTCT
Rvul	Rv40	KF311568	----------	----------	----------	----------	--TGGCTTCT	TCCCCCCTCT
Rvul	Rv41	KF311555	----------	----------	----------	----------	--TGGCTTCT	TCCCCCCTCT
Rvul	Rv42	KF311558	----------	----------	----------	----------	--TGGCTTCT	TCCCCCCTCT
Rvul	Rv43	KF311560	----------	----------	----------	----------	--TGGCTTCT	TCCCCCCTCT
Rvul	Rv44	KF311601	----------	----------	----------	----------	--TGGCTTCT	TCCCCCCTCT
Rvul	Rv45	KF311608	----------	----------	----------	----------	--TGGCTTCT	TCCCCCCTCT
Rvul	Rv46	KF311604	----------	----------	----------	----------	--TGGCTTCT	TCCCCCCTCT
Rvul	Rv47	KF311615	----------	----------	----------	----------	--TGGCTTCT	TCCCCCCTCT
Rvul	Rv48	KF311603	----------	----------	----------	----------	--TGGCTTCT	TCCCCCCTCT
Rvul	Rv49	KF311609	----------	----------	----------	----------	--TGGCTTCT	TCCCCCCTCT
Rvul	Rv5	KF311632	----------	----------	----------	----------	--TGGCTTCT	CCCCCCCTCT
Rvul	Rv50	KF311602	----------	----------	----------	----------	--TGGCTTCT	TCCCCCCTCT
Rvul	Rv51	KF311621	----------	----------	----------	----------	--TGGCTTCT	TCCCCCCTCT
Rvul	Rv52	KF311619	----------	----------	----------	----------	--TGGCTTCT	TCCCCCCTCT
Rvul	Rv53	KF311620	----------	----------	----------	----------	--TGGCTTCT	TCCCCCTTCT
Rvul	Rv54	KF311622	----------	----------	----------	----------	--TGGCTTCT	TCCCCCCTCT
Rvul	Rv55	KF311617	----------	----------	----------	----------	--TGGCTTCT	TCCCCCCTCT
Rvul	Rv56	KF311606	----------	----------	----------	----------	--TGGCTTCT	TCCCCCCTCT
Rvul	Rv57	KF311614	----------	----------	----------	----------	--TGGCTTCT	TCCCCCCTCT
Rvul	Rv59	KF311567	----------	----------	----------	----------	--TGGCTTCT	TCCCCCCTCT
Rvul	Rv6	KF311628	----------	----------	----------	----------	--TGGCTTCT	CCCCCCCTCT
Rvul	Rv60	KF311607	----------	----------	----------	----------	--TGGCTTCT	TCCCCCCTCT
Rvul	Rv61	KF311544	----------	----------	----------	----------	--TGGCTTCT	TCCCCCCTCT
Rvul	Rv62	KF311625	----------	----------	----------	----------	--TGGCTTCT	TCCCCCCTCT
Rvul	Rv7	KF311528	----------	----------	----------	----------	--TGGCTTCT	CCCCCCCTCT
Rvul	Rv8	KF311631	----------	----------	----------	----------	--TGGCTTCT	CCCCCCCTCT

Rvul	Rv9	KF311590	----------	----------	----------	----------	--TGGCTTCT	TCCCCCCTCT
Slin		AY131102	GCTCCAGATA	TAGCTTTCCC	ACGATTAAAT	AATATAAGAT	TCTGGCTACT	TCCACCTTCA
Sory		AY131099	GCCCCAGATA	TAGCATTCCC	CCGTTTAAAT	AATATAAGAT	TTTGATTACT	TCCACCCTCC
Sory		GU196317	GCCCCAGATA	TAGCATTCCC	CCGTTTAAAT	AATATAAGAT	TTTGATTACT	TCCACCCTCC
Spheno		NC018351	GCTCCTGATA	TAGCCTTTCC	TCGATTAAAT	AATATAAGTT	TCTGGCTTTT	ACCTCCTTCC
Szea		AY131100	GCCCCAGATA	TAGCATTCCC	ACGATTAAAC	AATATAAGGT	TCTGATTACT	CCCTCCATCA
Yfro		AY131109	GCTCCAGATA	TAGCCTTTCC	ACGATTAAAC	AATATAAGAT	TCTGACTACT	TCCCCCCTCC

Continuation of the Table S4.

Species	Ha	Sequences	Position					
			301-310	311-320	321-330	331-340	341-350	351-360
Dbor		AY131105	TTAACTCTTT	TACTAATAAG	AAGAATTATT	GAAAAAGGTG	CAGGAACCGG	TTGAACAGTT
Dbor		Uni9	TTAACTCTTT	TACTAATAAG	AAGAATTGTT	GAAAAAGGTG	CAGGAACCGG	TTGAACAGTT
Dper		ASSCR6014	TTGACTTTTT	TATTAATAAG	AAGAATTAT-	----------	----------	----------
Dper		ASSCR6015	TTGACTTTTT	TATTAATAAG	AAGAATTATT	----------	----------	----------
Dper		ASSCR6016	TTGACTTTTT	TATTAATAAG	AAGAATTATT	----------	----------	----------
Dper		ASSCR6018	TTGACTTTTT	TATTAATAAG	AAGAATTATT	----------	----------	----------
Hcho		JX679716	CTTACTCTTT	TAATCATAAG	AAGAATTGTA	GAAAATGGAG	CAGGAACAGG	ATGAACAGTC
Hpha		KC112991	TTAACCCTTT	TAATCATAAG	AAGAATTGTA	GAAAATGGAG	CAGGAACCGG	ATGAACTGTA
Nxan		NC018354	TTAACTTTCC	TTCTAATAAG	AAGTATTGTT	GATAAAGGAG	CAGGAACAGG	GTGAACAGTT
Phil		GU244486	CTAACTCTTC	TGATTATAAG	AAGAATTGTT	GAAAATGGAG	CAGGGACAGG	TTGAACAGTT
Pnod		HQ891474	CTAATATTTC	TTCTTATAAG	AAGAATTGTA	GATAAGGGAG	CAGGAACAGG	ATGAACAGTT
Rbil	Rb1	KF311645	TTAACTCTTC	TTTTAATAAG	AAGAATCGTT	GAAAAAGGTG	CAGGAACAGG	TTGAACAGTT
Rbil	Rb2	KF311637	TTAATTCTTC	TTTTAATAAG	AAGAATCGTT	GAAAAAGGTG	CAGGAACAGG	TTGAACAGTT
Rbil	Rb3	KF311639	TTAACTCTTC	TTTTAATAAG	AAGAATCGTT	GAAAAAGGTG	CAGGAACAGG	TTGAACAGTT
Rbil	Rb4	KF311636	TTAACTCTTC	TTTTAATAAG	AAGAATCGTT	GAAAAAGGTG	CAGGAACAGG	TTGAACAGTT
Rbil	Rb5	KF311635	TTAACTCTTC	TTTTAATAAG	AAGAATCGTT	GAAAAAGGTG	CAGGAACAGG	CTGAACAGTT
Rbil	Rb6	KF311634	TTAACTCTTC	TTTTAATAAG	AAGAATCGTT	GAAAAAGGTG	CAGGAACAGG	TTGAACAGTT
Rbil	Rb7	KF311648	TTAACTCTTC	TTTTAATAAG	AAGAATCGTT	GAAAAAGGTG	CAGGGACAGG	TTGAACAGTT
Rbil	Rb8	KF311647	TTAACTCTTC	TTTTAATAAG	AAGAATCGTT	GAAAAAGGTG	CAGGGACAGG	TTGAACAGTT
Rcru		AY131113	TTAACTCTTC	TATTAATAAG	AAGAATTGTA	GAAAAGGGAG	CAGGAACAGG	TTGAACTGTT
Rcru		KF311359	TTAACTCTTC	TATTAATAAG	AAGAATTGTA	GAAAAGGGAG	CAGGAACAGG	TTGAACTGTT
Rcru		USCOC565	TTAACTCTTC	TATTAATAAG	AAGAATTGTA	GAAAAGGGAG	CAGGAACAGG	TTGAACTGTT
Rfer	H1	GU581582	CTCACTCTTC	TCTTAATAAG	AAGAGTCGTA	GAAAAGGGAG	CAGGAACAGG	TTGAACAGTA
Rfer	H10	KF311482	CTCACTCTTC	TCTTAATAAG	AAGAGTCGTA	GAAAAGGGAG	CAGGAACAGG	TTGAACAGTA
Rfer	H11	KF311444	CTCACTCTTC	TCTTAATAAG	AAGAGTCGTA	GAAAAGGGAG	CAGGAACAGG	TTGAACAGTA

Rfer	H12	KF311487	CTCACTCTTC	TCTTAATAAG	AAGAGTCGTA	GAAAAGGGAG	CAGGAACAGG	TTGAACAGTG
Rfer	H13	KF311481	CTCACTCTTC	TCTTAATAAG	AAGAGTCGTA	GAAAAGGGAG	CAGGAACAGG	TTGAACAGTG
Rfer	H14	KF311448	CTCACTCTTC	TCTTAATAAG	AAGAGTCGTA	GAAAAGGGAG	CAGGAACAGG	TTGAACAGTG
Rfer	H15	JX292125	CTCACTCTTC	TCTT-ATAAG	AAGAGTCGTA	GAAAAGGGAG	CAGGAACAGG	TTGCCCTTTA
Rfer	H16	KF311449	CTCACTCTTC	TCTTAATAAG	AAGAGTCGTA	GAAAAGGGAG	CAGGAACAGG	TTGAACAGTG
Rfer	H17	KF311360	CTCACTCTTC	TCTTAATAAG	AAGAATCGTA	GAAAAGGGGG	CAGGAACAGG	TTGAACAGTA
Rfer	H18	KF311473	CTCACTCTTC	TCTTAATAAG	AAGAATCGTA	GAAAAGGGGG	CAGGAACAGG	TTGAACAGTA
Rfer	H2	GU581549	CTCACTCTTC	TCTTAATAAG	AAGAGTCGTA	GAAAAGGGAG	CAGGAACAGG	TTGAACAGTT
Rfer	H20	KF311433	CTCACTCTTC	TCTTAATAAG	AAGAATCGTA	GAAAAGGGGG	CAGGAACAGG	TTGAACAGTA
Rfer	H21	KF311474	CTCACTCTTC	TCTTAATAAG	AAGAATCGTA	GAAAAAGGGG	CAGGAACAGG	TTGAACAGTA
Rfer	H22	KF311516	CTCACTCTTC	TCTTAATAAG	AAGAATCGTA	GAAAAAGGGG	CAGGAACAGG	TTGAACAGTA
Rfer	H23	KF311380	CTCACTCTTC	TCTTAATAAG	AAGAATCGTT	GAAAAGGGAG	CAGGAACAGG	TTGAACAGTA
Rfer	H24	KF311389	CTCACTCTTC	TCTTAATAAG	AAGAATCATT	GAAAAGGGAG	CAGGGACAGG	TTGAACAGTA
Rfer	H25	KF311384	CTCACTCTTC	TCTTAATAAG	AAGAATCGTT	GAAAAGGGAG	CAGGAACAGG	TTGAACAGTA
Rfer	H26	KF311388	CTCACTCTTC	TCTTAATAAG	AAGAATCGTA	GAAAAGGGAG	CAGGAACAGG	TTGAACAGTA
Rfer	H27	KF311386	CTCACTCTTC	TCTTAATAAG	AAGAATCGTT	GAAAAGGGAG	CAGGAACAGG	TTGAACAGTA
Rfer	H28	KF311399	CTCACTCTTC	TCTTAATAAG	AAGAATCGTT	GAAAAGGGAG	CAGGAACAGG	TTGAACAGTA
Rfer	H29	KF311383	CTCACTCTTC	TCTTAATAAG	AAGAATCGTA	GAAAAGGGAG	CAGGAACAGG	TTGAACAGTA
Rfer	H3	GU581547	CTCACTCTTC	TCTTAATAAG	AAGAGTCGTA	GAAAAGGGAG	CAGGAACAGG	TTGAACAGTA
Rfer	H30	KF311392	CTCACTCTTC	TCTTAATAAG	AAGAATCGTA	GAAAAGGGAG	CAGGAACAGG	TTGAACAGTA
Rfer	H31	KF311379	CTCACTCTTC	TCTTAATAAG	AAGAATCGTA	GAAAAGGGAG	CAGGAACAGG	TTGAACAGTA
Rfer	H32	KF311490	CTCACTCTTC	TCTTAATAAG	AAGAATCGTA	GAAAAGGGAG	CAGGAACAGG	TTGAACAGTA
Rfer	H34	KF311492	CTCACTCTTC	TCTTAATAAG	AAGAATCGTA	GAAAAGGGAG	CAGGAACAGG	TTGAACAGTA
Rfer	H35	KF311496	CTCACTCTTC	TCTTAATAAG	AAGAATCGTA	GAAAAGGGAG	CAGGAACAGG	TTGAACAGTA
Rfer	H36	KF311500	CTCACTCTTC	TCTTAATAAG	AAGAATCGTA	GAAAAGGGAG	CAGGAACAGG	TTGAACAGTA
Rfer	H37	KF311509	CTCACTCTTC	TCTTAATAAG	AAGAATCGTA	GAAAAAGGAG	CAGGAACAGG	TTGAACAGTA
Rfer	H38	KF311505	CTCACTCTTC	TCTTAATAAG	AAGAATCGTA	GAAAAAGGAG	CAGGAACAGG	TTGAACAGTA
Rfer	H39	KF311508	CTCACTCTTC	TCTTAATAAG	AAGAATCGTA	GAAAAAGGAG	CAGGAACAGG	TTGAACAGTA
Rfer	H4	GU581545	CTCACTCTTC	TCTTAATAAG	AAGAGTCGTA	GAAAAGGGAG	CAGGAACAGG	TTGAACAGTA

Rfer	H40	KF311506	CTCACTCTTC	TCTTAATAAG	AAGAATCGTA	GAAAAAGGAG	CAGGAACAGG	TTGAACAGTA
Rfer	H42	KF311501	CTCACTCTTC	TCTTAATAAG	AAGAATCGTA	GAAAAAGGAG	CAGGAACAGG	TTGAACAGTA
Rfer	H43	KF311525	CTCACTCTTC	TCTTAATAAG	AAGAATCGTA	GAAAAGGGAG	CAGGAACAGG	TTGAACAGTA
Rfer	H5	GU581539	CTCACTCTTC	TCTTAATAAG	AAGAGTCGTA	GAAAAGGGAG	CAGGAACAGG	TTGAACAGTA
Rfer	H51	KU696497	CTCACTCTTC	TCTTAATAAG	AAGAGTCGTA	GAAAAGGGAG	CAGGGACAGG	TTGAACAGTA
Rfer	H52	KU696507	CTCACTCTTC	TCTTAATAAG	AAGAGTCGTA	GAAAAGGGAG	CAGGAACAGG	TTGAACAGTA
Rfer	H6	GU581526	CTCACTCTTC	TCTTAATAAG	AAGAGTCGTA	GAAAAGGGAG	CAGGAACAGG	TTGAACAGTA
Rfer	H7	GU581525	CTCACTCTTC	TCTTAATAAG	AAGAGTCGTA	GAAAAAGGGG	CAGGAACAGG	TTGAACAGTG
Rfer	H8	GU581319	CTCACTCTTC	TCTTAATAAG	AAGAATCGTA	GAAAAGGGGG	CAGGAACAGG	TTGAACAGTA
Rfer	H9	KF311446	CTCACTCTTC	TCTTAATAAG	AAGAGTCGTA	GAAAAGGGAG	CAGGAACAGG	TTGAACAGTA
Rfer		JX292124	CTCACTCTTC	TCTTAATAAG	AAGAGTCGTA	GAAAAGGGAG	CAGGAACAGG	TTGAACAGTA
Rfer		JX294413	CTCACTCTTC	TCTTAATAAG	AAGAGTCGTA	GAAAAGGGAG	CAGGAACAGG	TTGGACAGTA
Rfer		KF413063	CTCACTCTTC	TCTTAATAAG	AAGAGTCGTA	GAAAAAGGGG	CAGGAACAGG	TTGAACAGTG
Rfer		KF413064	CTCACTCTTC	TCTTAATAAG	AAGAATCGTA	GAAAAGGGGG	CAGGAACAGG	TTGAACAGTA
Rfer		KF413065	CTCACTCTTC	TCTTAATAAG	AAGAATCGTA	GAAAAGGGAG	CAGGAACAGG	TTGAACAGTA
Rfer		KF413066	CTCACTCTTC	TCTTAATAAG	AAGAGTCGTA	GAAAAAGGGG	CAGGAACAGG	TTGAACAGTG
Rfer		KF413067	CTCACTCTTC	TCTTAATAAG	AAGAATCGTA	GAAAAAGGAG	CAGGAACAGG	TTGAACAGTA
Rfer		KF413068	CTCACTCTTC	TCTTAATAAG	AAGAATCGTA	GAAAAGGGAG	CAGGAACAGG	TTGAACAGTA
Rfer		KF413069	CTCACTCTTC	TCTTAATAAG	AAGAATCGTA	GAAAAGGGAG	CAGGAACAGG	TTGAACAGTA
Rfer		KF413070	CTCACTCTTC	TCTTAATAAG	AAGAATCGTA	GAAAAAGGAG	CAGGAACAGG	TTGAACAGTA
Rfer		KF413071	CTCACTCTTC	TCTTAATAAG	AAGAGTCGTA	GAAAAAGGGG	CAGGAACAGG	TTGAACAGTG
Rfer		KF413072	CTCACTCTTC	TCTTAATAAG	AAGAGTCGTA	GAAAAAGGGG	CAGGAACAGG	TTGAACAGTG
Rfer		KF413073	CTCACTCTTC	TCTTAATAAG	AAGAATCGTA	GAAAAGGGGG	CAGGAACAGG	TTGAACAGTA
Rfer		KT989230	CTCACTCTTC	TCTTAATAAG	AAGAATCGTA	GAAAAGGGGG	CAGGAACAGG	TTGAACAGTA
Rfer		KT989231	CTCACTCTTC	TCTTAATAAG	AAGAATCGTA	GAAAAGGGGG	CAGGAACAGG	TTGAACAGTA
Rfer		KT989232	CTCACTCTTC	TCTTAATAAG	AAGAATCGTA	GAAAAGGGGG	CAGGAACAGG	TTGAACAGTA
Rfer		KT989233	CTCACTCTTC	TCTTAATAAG	AAGAATCGTA	GAAAAGGGGG	CAGGAACAGG	TTGAACAGTA
Rfer		KT989234	CTCACTCTTC	TCTTAATAAG	AAGAATCGTA	GAAAAGGGGG	CAGGAACAGG	TTGAACAGTA
Rfer		KU916538	CTCACTCTTC	TCTTAATAAG	AAGAATCGTA	GAAAAGGGGG	CAGGAACAGG	TTGAACAGTA

Rfer		KY458175	CTCACTCTTC	TCTTAATAAG	AAGAGTCGTA	GAAAAGGGAG	CAGGAACAGG	TTGAACAGTA
Rfer		KY458176	CTCACTCTTC	TCTTAATAAG	AAGAGTCGTA	GAAAAGGGAG	CAGGAACAGG	TTGAACAGTA
Rfer		KY458177	CTCACTCTTC	TCTTAATAAG	AAGAGTCGTA	GAAAAGGGAG	CAGGAACAGG	TTGAACAGTA
Rfer		LC474878	CTCACTCTTC	TCTTAATAAG	AAGAATCGTA	GAAAAGGGGG	CAGGAACAGG	TTGAACAGTA
Rfer		LC474880	CTCACTCTTC	TCTTAATAAG	AAGAATCGTA	GAAAAGGGGG	CAGGAACAGG	TTGAACAGTA
Rfer		LC474881	CTCACTCTTC	TCTTAATAAG	AAGAATCGTA	GAAAAGGGGG	CAGGAACAGG	TTGAACAGTA
Rfer		LC474882	CTCACTCTTC	TCTTAATAAG	AAGAATCGTA	GAAAAGGGGG	CAGGAACAGG	TTGAACAGTA
Rfer		LC474884	CTCACTCTTC	TCTTAATAAG	AAGAATCGTA	GAAAAGGGGG	CAGGAACAGG	TTGAACAGTA
Rfer		LC474885	----------	-----ATAAG	AAGAATCGTA	GAAAAGGGGG	CAGGAACAGG	TTGAACAGTA
Rfer		LC474886	----------	-----ATAAG	AAGAATCGTA	GAAAAGGGGG	CAGGAACAGG	TTGAACAGTA
Rfer		LC474887	CTCACTCTTC	TCTTAATAAG	AAGAATCGTA	GAAAAGGGGG	CAGGAACAGG	TTGAACAGTA
Rfer		LC474888	CTCACTCTTC	TCTTAATAAG	AAGAATCGTA	GAAAAGGGGG	CAGGAACAGG	TTGAACAGTA
Rfer		LC474889	CTCACTCTTC	TCTTAATAAG	AAGAATCGTA	GAAAAGGGGG	CAGGAACAGG	TTGAACAGTA
Rfer		LC474890	CTCACTCTTC	TCTTAATAAG	AAGAATCGTA	GAAAAGGGGG	CAGGAACAGG	TTGAACAGTA
Rfer		LC474891	CTCACTCTTC	TCTTAATAAG	AAGAATCGTA	GAAAAGGGGG	CAGGAACAGG	TTGAACAGTA
Rfer		LC474892	CTCACTCTTC	TCTTAATAAG	AAGAATCGTA	GAAAAGGGGG	CAGGAACAGG	TTGAACAGTA
Rfer		LC474893	CTCACTCTTC	TCTTAATAAG	AAGAATCGTA	GAAAAGGGGG	CAGGAACAGG	TTGAACAGTA
Rfer		LC474894	CTCACTCTTC	TCTTAATAAG	AAGAATCGTA	GAAAAGGGGG	CAGGAACAGG	TTGAACAGTA
Rfer		LC474895	----------	-----ATAAG	AAGAATCGTA	GAAAAGGGGG	CAGGAACAGG	TTGAACAGTA
Rfer		LC474896	----------	-----ATAAG	AAGAATCGTA	GAAAAGGGGG	CAGGAACAGG	TTGAACAGTA
Rfer		LC474897	----------	-----ATAAG	AAGAATCGTA	GAAAAGGGGG	CAGGAACAGG	TTGAACAGTA
Rfer		LC474898	----------	-----ATAAG	AAGAATCGTA	GAAAAGGGGG	CAGGAACAGG	TTGAACAGTA
Rfer		LC474899	----------	-----ATAAG	AAGAATCGTA	GAAAAGGGGG	CAGGAACAGG	TTGAACAGTA
Rfer		LC474902	----------	-----ATAAG	AAGAATCGTA	GAAAAGGGGG	CAGGAACAGG	TTGAACAGTA
Rfer		LC474903	----------	-----ATAAG	AAGAATCGTA	GAAAAGGGGG	CAGGAACAGG	TTGAACAGTA
Rfer		LC474904	----------	-----ATAAG	AAGAATCGTA	GAAAAGGGGG	CAGGAACAGG	TTGAACAGTA
Rfer		LC474905	----------	-----ATAAG	AAGAATCGTA	GAAAAGGGGG	CAGGAACAGG	TTGAACAGTA
Rfer		LC474906	----------	-----ATAAG	AAGAATCGTA	GAAAAGGGGG	CAGGAACAGG	TTGAACAGTA
Rfer		LC474907	----------	-----ATAAG	AAGAATCGTA	GAAAAGGGGG	CAGGAACAGG	TTGAACAGTA

Rfer		LC474908	----------	-----ATAAG	AAGAATCGTA	GAAAAGGGGG	CAGGAACAGG	TTGAACAGTA
Rfer		LC474909	----------	-----ATAAG	AAGAATCGTA	GAAAAGGGGG	CAGGAACAGG	TTGAACAGTA
Rfer		LC474910	----------	-----ATAAG	AAGAATCGTA	GAAAAGGGGG	CAGGAACAGG	TTGAACAGTA
Rfer		LC474911	----------	-----ATAAG	AAGAATCGTA	GAAAAGGGGG	CAGGAACAGG	TTGAACAGTA
Rfer		LC474912	CTCACTCTTC	TCTTAATAAG	AAGAATCGTA	GAAAAGGGGG	CAGGAACAGG	TTGAACAGTA
Rfer		LC474913	----------	-----ATAAG	AAGAATCGTA	GAAAAGGGGG	CAGGAACAGG	TTGAACAGTA
Rfer		LC474914	----------	-----ATAAG	AAGAATCGTA	GAAAAGGGGG	CAGGAACAGG	TTGAACAGTA
Rfer		LC474915	----------	-----ATAAG	AAGAATCGTA	GAAAAGGGGG	CAGGAACAGG	TTGAACAGTA
Rfer		LC474916	----------	-----ATAAG	AAGAATCGTA	GAAAAGGGGG	CAGGAACAGG	TTGAACAGTA
Rfer		LC474917	----------	-----ATAAG	AAGAATCGTA	GAAAAGGGGG	CAGGAACAGG	TTGAACAGTA
Rfer		LC474918	----------	-----ATAAG	AAGAATCGTA	GAAAAGGGGG	CAGGAACAGG	TTGAACAGTA
Rfer		LC474919	CTCACTCTTC	TCTTAATAAG	AAGAATCGTA	GAAAAGGGGG	CAGGAACAGG	TTGAACAGTA
Rfer		LC474920	CTCACTCTTC	TCTTAATAAG	AAGAATCGTA	GAAAAGGGGG	CAGGAACAGG	TTGAACAGTA
Rfer		LC474921	CTCACTCTTC	TCTTAATAAG	AAGAATCGTA	GAAAAGGGGG	CAGGAACAGG	TTGAACAGTA
Rfer		LC474922	CTCACTCTTC	TCTTAATAAG	AAGAATCGTA	GAAAAGGGGG	CAGGAACAGG	TTGAACAGTA
Rfer		LC474923	CTCACTCTTC	TCTTAATAAG	AAGAATCGTA	GAAAAGGGGG	CAGGAACAGG	TTGAACAGTA
Rfer		LC474924	CTCACTCTTC	TCTTAATAAG	AAGAATCGTA	GAAAAGGGGG	CAGGAACAGG	TTGAACAGTA
Rfer		LC474925	----------	-----ATAAG	AAGAATCGTA	GAAAAGGGGG	CAGGAACAGG	TTGAACAGTA
Rfer		LC474926	CTCACTCTTC	TCTTAATAAG	AAGAATCGTA	GAAAAGGGGG	CAGGAACAGG	TTGAACAGTA
Rfer		LC474927	----------	-----ATAAG	AAGAATCGTA	GAAAAGGGGG	CAGGAACAGG	TTGAACAGTA
Rfer		LC474928	----------	-----ATAAG	AAGAATCGTA	GAAAAGGGGG	CAGGAACAGG	TTGAACAGTA
Rfer		LC474929	----------	-----ATAAG	AAGAATCGTA	GAAAAGGGGG	CAGGAACAGG	TTGAACAGTA
Rfer		MF448526	CTCACTCTTC	TCTTAATAAG	AAGAATCGTA	GAAAAGGGGG	CAGGAACAGG	TTGAACAGTA
Rfer		MG051027	CTCACTCTTC	TCTTAATAAG	AAGAATCGTA	GAAAAGGGGG	CAGGAACAGG	TTGAACAGTA
Rfer		MG051028	CTCACTCTTC	TCTTAATAAG	AAGAATCGTA	GAAAAGGGGG	CAGGAACAGG	TTGAACAGTA
Rfer		MG051029	CTCACTCTTC	TCTTAATAAG	AAGAATCGTA	GAAAAGGGGG	CAGGAACAGG	TTGAACAGTA
Rfer		MG051030	CTCACTCTTC	TCTTAATAAG	AAGAATCGTA	GAAAAGGGGG	CAGGAACAGG	TTGAACAGTA
Rfer		MG051031	CTCACTCTTC	TCTTAATAAG	AAGAATCGTA	GAAAAGGGGG	CAGGAACAGG	TTGAACAGTA
Rfer		MG872818	CTCACTCTTC	TCTTAATAAG	AAGAATCGTA	GAAAAGGGGG	CAGGAACAGG	TTGAACAGTA

Rfer		MG883395	CTCACTCTTC	TCTTAATAAG	AAGAATCGTA	GAAAAGGGGG	CAGGAACAGG	TTGAACAGTA
Rfer		MG883396	CTCACTCTTC	TCTTAATAAG	AAGAATCGTA	GAAAAGGGGG	CAGGAACAGG	TTGAACNGTA
Rfer		MG883397	-TCACTCTTC	TCTTAATAAG	AAGAATCGTA	GAAAAGGGGG	CAGGAACAGG	TTGAACAGTA
Rfer		MG883398	CTCACTCTTC	TCTTAATAAG	AAGAATCGTA	GAAAAGGGGG	CAGGAACAGG	TTGAACAGTA
Rfer		MG883399	CTCACTCTTC	TCTTAATAAG	AAGAATCGTA	GAAAAGGGGG	CAGGAACAGG	TTGAACAGTA
Rfer		MH016277	CTCACTCTTC	TCTTAATAAG	AAGAATCGTA	GAAAAGGGGG	CAGGAACAGG	TTGAACAGTA
Rfer		MH016278	CTCACTCTTC	TCTTAATAAG	AAGAATCGTA	GAAAAGGGGG	CAGGAACAGG	TTGAACAGTA
Rfer		MH016279	CTCACTCTTC	TCTTAATAAG	AAGAATCGTA	GAAAAGGGGG	CAGGAACAGG	TTGAACAGTA
Rfer		MH016604	CTCACTCTTC	TCTTAATAAG	AAGAATCGTA	GAAAAGGGGG	CAGGAACAGG	TTGAACAGTA
Rfer		MH016605	CTCACTCTTC	TCTTAATAAG	AAGAATCGTA	GAAAAGGGGG	CAGGAACAGG	TTGAACAGTA
Rfer		MH016606	CTCACTCTTC	TCTTAATAAG	AAGAATCGTA	GAAAAGGGGG	CAGGAACAGG	TTGAACAGTA
Rfer		MH016607	CTCACTCTTC	TCTTAATAAG	AAGAATCGTA	GAAAAGGGGG	CAGGAACAGG	TTGAACAGTA
Rfer		MH016608	CTCACTCTTC	TCTTAATAAG	AAGAATCGTA	GAAAAGGGGG	CAGGAACAGG	TTGAACAGTA
Rfer		MH016609	CTCACTCTTC	TCTTAATAAG	AAGAATCGTA	GAAAAGGGGG	CAGGAACAGG	TTGAACAGTA
Rfer		MH016610	CTCACTCTTC	TCTTAATAAG	AAGAATCGTA	GAAAAGGGGG	CAGGAACAGG	TTGAACAGTA
Rfer		MH016611	CTCACTCTTC	TCTTAATAAG	AAGAATCGTA	GAAAAGGGGG	CAGGAACAGG	TTGAACAGTA
Rfer		MH016612	CTCACTCTTC	TCTTAATAAG	AAGAATCGTA	GAAAAGGGGG	CAGGAACAGG	TTGAACAGTA
Rfer		MH016613	CTCACTCTTC	TCTTAATAAG	AAGAATCGTA	GAAAAGGGGG	CAGGAACAGG	TTGAACAGTA
Rfer		MH016614	CTCACTCTTC	TCTTAATAAG	AAGAATCGTA	GAAAAGGGGG	CAGGAACAGG	TTGAACAGTA
Rfer		MH016615	CTCACTCTTC	TCTTAATAAG	AAGAATCGTA	GAAAAGGGGG	CAGGAACAGG	TTGAACAGTA
Rfer		MH016616	----CTCTTC	TCTTAATAAG	AAGAATCGTA	GAAAAGGGGG	CAGGAACAGG	TTGAACAGTA
Rfer		MH016617	CTCACTCTTC	TCTTAATAAG	AAGAATCGTA	GAAAAGGGGG	CAGGAACAGG	TTGAACAGTA
Rfer		MH016618	CTCACTCTTC	TCTTAATAAG	AAGAATCGTA	GAAAAGGGGG	CAGGAACAGG	TTGAACAGTA
Rfer		MH016619	CTCACTCTTC	TCTTAATAAG	AAGAATCGTA	GAAAAGGGGG	CAGGAACAGG	TTGAACAGTA
Rfer		MH016620	-----TCTTC	TCTTAATAAG	AAGAATCGTA	GAAAAGGGGG	CAGGAACAGG	TTGAACAGTA
Rfer		MH016621	-----TCTTC	TCTTAATAAG	AAGAATCGTA	GAAAAGGGGG	CAGGAACAGG	TTGAACAGTA
Rfer		MH016622	----------	TCTTAATAAG	AAGAATCGTA	GAAAAGGGGG	CAGGAACAGG	TTGAACAGTA
Rfer		MH016623	CTCACTCTTC	TCTTAATAAG	AAGAATCGTA	GAAAAGGGGG	CAGGAACAGG	TTGAACAGTA
Rfer		MH016624	CTCACTCTTC	TCTTAATAAG	AAGAATCGTA	GAAAAGGGGG	CAGGAACAGG	TTGAACAGTA

Rfer		MH016625	CTCACTCTTC	TCTTAATAAG	AAGAATCGTA	GAAAAGGGGG	CAGGAACAGG	TTGAACAGTA
Rfer		MH016626	CTCACTCTTC	TCTTAATAAG	AAGAATCGTA	GAAAAGGGGG	CAGGAACAGG	TTGAACAGTA
Rfer		MH016627	CTCACTCTTC	TCTTAATAAG	AAGAATCGTA	GAAAAGGGGG	CAGGAACAGG	TTGAACAGTA
Rfer		MH016628	CTCACTCTTC	TCTTAATAAG	AAGAATCGTA	GAAAAGGGGG	CAGGAACAGG	TTGAACAGTA
Rfer		MH016629	-----TCTTC	TCTTAATAAG	AAGAATCGTA	GAAAAGGGGG	CAGGAACAGG	TTGAACAGTA
Rfer		MH016630	----CTCTTC	TCTTAATAAG	AAGAATCGTA	GAAAAGGGGG	CAGGAACAGG	TTGAACAGTA
Rfer		MH016631	CTCACTCTTC	TCTTAATAAG	AAGAATCGTA	GAAAAGGGGG	CAGGAACAGG	TTGAACAGTA
Rfer		MH016632	-----TCTTC	TCTTAATAAG	AAGAATCGTA	GAAAAGGGGG	CAGGAACAGG	TTGAACAGTA
Rfer		MH016633	-----TCTTC	TCTTAATAAG	AAGAATCGTA	GAAAAGGGGG	CAGGAACAGG	TTGAACAGTA
Rfer		MH016634	-------TTC	TCTTAATAAG	AAGAATCGTA	GAAAAGGGGG	CAGGAACAGG	TTGAACAGTA
Rfer		MH016635	CTCACTCTTC	TCTTAATAAG	AAGAATCGTA	GAAAAGGGGG	CAGGAACAGG	TTGAACAGTA
Rfer		MH016636	CTCACTCTTC	TCTTAATAAG	AAGAATCGTA	GAAAAGGGGG	CAGGAACAGG	TTGAACAGTA
Rfer		MH016637	CTCACTCTTC	TCTTAATAAC	AAGAATCGTA	GAAAAGGGGG	CAGGAACGGG	TTGAACAGTA
Rfer	H19	KF311403	CTCACTCTTC	TCTTAATAAG	AAGAATCGTA	GAAAAGGGAG	CAGGAACAGG	TTGAACAGTA
Rfer	H41	KF311502	CTCACTCTTC	TCTTAATAAG	AAGAATCGTA	GAAAAAGGAG	CAGGAACAGG	TTGAACAGTA
Rpal		ASSCR6357	CTTACTTTAC	TATTAATAAG	AAGAATCATT	GAAAAAGGAG	CAGGAACTGG	ATGAACAGTT
Rpal		ASSCR6358	CTTACTTTAC	TATTAATAAG	AAGAATCATT	GAAAAAGGAG	CAGGAACTGG	ATGAACAGTT
Rpal		AY131121	CTTACTTTAC	TATTAATAAG	AAGAATTATT	GAAAANGGAG	CAGGAACTGG	GTGAACAGTT
Rpal		GU581629	CTTACTTTAC	TATTAATAAG	AAGAATTATT	GAAAAAGGAG	CAGGAACTGG	GTGAACAGTT
Rpal		KF311358	CTTACTTTAC	TATTAATAAG	AAGAATCATT	GAAAAAGGAG	CAGGAACTGG	ATGAACAGTT
Rpal		KR494254	CTTACTTTAC	TATTAATAAG	AAGAATCATT	GAAAAAGGAG	CAGGAACTGG	ATGAACAGTT
Rpal		KR494255	CTTACTTTAC	TATTAATAAG	AAGAATCATT	GAAAAAGGAG	CAGGAACTGG	ATGAACAGTT
Rpal		KR494256	CTTACTTTAC	TATTAATAAG	AAGAATCATT	GAAAAAGGAG	CAGGAACTGG	ATGAACAGTT
Rpal		KR494257	CTTACTTTAC	TATTAATAAG	AAGAATCATT	GAAAAAGGAG	CAGGAACTGG	ATGAACAGTT
Rpal		KR494258	CTTACTTTAC	TATTAATAAG	AAGAATCATT	GAAAAAGGAG	CAGGAACTGG	ATGAACAGTT
Rpal		KR494259	CTTACTTTAC	TATTAATAAG	AAGAATCATT	GAAAAAGGAG	CAGGAACTGG	ATGAACAGTT
Rpal		KR494260	CTTACTTTAC	TATTAATAAG	AAGAATCATT	GAAAAAGGAG	CAGGAACTGG	ATGAACAGTT
Rpal		KR494261	CTTACTTTAC	TATTAATAAG	AAGAATCATT	GAAAAAGGAG	CAGGAACTGG	ATGAACAGTT
Rpal	Rp1	KU647599	CTTACTTTAC	TATTAATAAG	AAGAATTATT	GAAAAAGGAG	CAGGAACTGG	ATGAACAGTT

Rpal	Rp10	KU647490	CTTACTTTAT	TATTAATAAG	AAGAATTATT	GAAAAAGGAG	CAGGAACTGG	ATGAACAGTT
Rpal	Rp11	KU647489	CTTACTTTAT	TATTAATAAG	AAGAATTATT	GAAAAAGGAG	CAGGAACTGG	ATGAACAGTT
Rpal	Rp12	KU647604	CTTACTTTAT	TATTAATAAG	AAGAATTATT	GAAAAAGGAG	CAGGAACTGG	ATGAACAGTT
Rpal	Rp13	KU647575	CTTACTTTAT	TATTAATAAG	AAGAATTATT	GAAAAAGGAG	CAGGAACTGG	ATGAACAGTT
Rpal	Rp2	KU647587	CTTACTTTAC	TATTAATAAG	AAGAATTATT	GAAAAAGGAG	CAGGAACTGG	GTGAACAGTT
Rpal	Rp3	KU647508	CTTACTTTAC	TATTAATAAG	AAGAATTATT	GAAAAAGGAG	CAGGAACTGG	GTGAACAGTT
Rpal	Rp4	KU647585	CTTACTTTAC	TATTAATAAG	AAGAATTATT	GAAAAAGGAG	CAGGAACTGG	GTGAACAGTT
Rpal	Rp5	KU647584	CTTACTTTAC	TATTAATAAG	AAGAATTATT	GAAAAAGGAG	CAGGAACTGG	GTGAACAGTT
Rpal	Rp6	KU647581	CTTACTTTAC	TATTAATAAG	AAGAATTATT	GAAAAAGGAG	CAGGAACTGG	GTGAACAGTT
Rpal	Rp7	KU647579	CTTACTTTAC	TATTAATAAG	AAGAATTATT	GAAAAAGGAG	CAGGAACTGG	GTGAACAGTT
Rpal	Rp8	KU647502	CTTACTTTAT	TATTAATAAG	AAGAATTATT	GAAAAAGGAG	CAGGAACTGG	ATGAACAGTT
Rpal	Rp9	KU647505	CTTACTTTAT	TATTAATAAG	AAGAATTATT	GAAAAAGGAG	CAGGAACTGG	ATGAACAGTT
Rpal		Uni10	CTTACTTTAC	TATTAATAAG	AAGAATCATT	GAAAAAGGAG	CAGGAACTGG	ATGAACAGTT
Rpal		Uni11	CTTACTTTAC	TATTAATAAG	AAGAATCATT	GAAAAAGGAG	CAGGAACTGG	ATGAACAGTT
Rpal		Uni117	CTTACTTTAC	TATTAATAAG	AAGAATTATT	GAAAAAGGAG	CAGGAACTGG	ATGAACAGTT
Rpal		Uni17	CTTACTTTAC	TATTAATAAG	AAGAATCATT	GAAAAAGGAG	CAGGAACTGG	ATGAACAGTT
Rpal		Uni21	CTTACTTTAC	TATTAATAAG	AAGAATTATT	GAAAAAGGAG	CAGGAACTGG	ATGAACAGTT
Rpal		Uni44	CTTACTTTAC	TATTAATAAG	AAGAATTATT	GAAAAAGGAG	CAGGAACTGG	ATGAACAGTT
Rpal		Uni58	CTTACTTTAC	TATTAATAAG	AAGAATCATT	GAAAAAGGAG	CAGGAACTGG	ATGAACAGTT
Rpho		AY131120	TTAACACTTT	TATTAATAAG	AAGAATCGNA	NAAAAAGGTG	CAGGAACAGG	TTGAACAGTT
Rpho		KY511047	TTAACCCTTC	TATTAATAAG	AAGAATCGTA	GAAAAAGGTG	CAGGAACAGG	TTGAACAGTA
Rvul		LN612634	TTAACTCTTC	TTTTAATAAG	AAGAATTGTC	GAAAAAGGTG	CAGGAACAGG	CTGAACAGTT
Rvul		LN612635	TTAACTCTTC	TTTTAATAAG	AAGAATTGTC	GAAAAAGGTG	CAGGAACAGG	CTGAACAGTT
Rvul		LN612636	TTAACTCTTC	TTTTAATAAG	AAGAATTGTC	GAAAAAGGTG	CAGGAACAGG	CTGAACAGTT
Rvul		MG051024	TTAACTCTTC	TTTTAATAAG	AAGAATTGTC	GAAAAAGGTG	CAGGAACAGG	CTGAACAGTT
Rvul		MG051025	TTAACTCTTC	TTTTAATAAG	AAGAATTGTC	GAAAAAGGTG	CAGGAACAGG	CTGAACAGTT
Rvul		MG051026	TTAACTCTTC	TTTTAATAAG	AAGAATTGTC	GAAAAAGGTG	CAGGAACAGG	CTGAACAGTT
Rvul	Rv1	KF311588	TTAACTCTTC	TTTTAATAAG	AAGAATTGTC	GAAAAAGGTG	CAGGAACAGG	CTGAACAGTT
Rvul	Rv10	KF311587	TTAACTCTTC	TTTTAATAAG	AAGAATTGTC	GAAAAAGGTG	CAGGAACAGG	TTGAACAGTT

Rvul	Rv11	KF311629	TTAACTCTTC	TTTTAATAAG	AAGAATTGTC	GAAAAAGGTG	CAGGAACAGG	CTGAACAGTT
Rvul	Rv12	KF311550	TTAACTCTTC	TTTTAATAAG	AAGAATTGTC	GAAAAAGGTG	CAGGAACAGG	CTGAACAGTT
Rvul	Rv13	KF311549	TTAACTCTTC	TTTTAATAAG	AAGAATTGTC	GAAAAAGGTG	CAGGAACAGG	CTGAACAGTT
Rvul	Rv14	KF311573	TTAACTCTTC	TTTTAATAAG	AAGAATTGTC	GAAAAAGGTG	CAGGAACAGG	CTGAACAGTT
Rvul	Rv15	KF311546	TTAACTCTTC	TTTTAATAAG	AAGAATTGTC	GAAAAAGGTG	CAGGAACAGG	CTGAACAGTT
Rvul	Rv16	KF311600	TTAACTCTTC	TTTTAATAAG	AAGAATTGTC	GAAAAAGGTG	CAGGAACAGG	CTGAACAGTT
Rvul	Rv17	KF311578	TTAACTCTTC	TTTTAATAAG	AAGAATTATC	GAAAAAGGTG	CAGGAACAGG	CTGAACAGTT
Rvul	Rv18	KF311593	TTAACTCTTC	TTTTAATAAG	AAGAATTGTC	GAAAAAGGTG	CAGGAACAGG	CTGAACAGTT
Rvul	Rv19	KF311552	TTAACTCTTC	TTTTAATAAG	AAGAATTGTC	GAAAAAGGTG	CAGGAACAGG	CTGAACAGTT
Rvul	Rv2	KF311586	TTAACTCTTC	TTTTAATAAG	AAGAATTGTC	GAAAAAGGTG	CAGGAACAGG	CTGAACAGTT
Rvul	Rv20	KF311594	TTAACTCTTC	TTTTAATAAG	AAGAATTGTC	GAAAAAGGTG	CAGGAACAGG	CTGAACAGTT
Rvul	Rv21	KF311547	TTAACTCTTC	TTTTAATAAG	AAGAATTGTC	GAAAAAGGTG	CAGGAACAGG	CTGAACAGTT
Rvul	Rv22	KF311591	TTAACTCTTC	TTTTAATAAG	AAGAATTGTC	GAAAAAGGTG	CAGGAACAGG	CTGAACAGTT
Rvul	Rv23	KF311545	TTAACTCTTC	TTTTAATAAG	AAGAATTGTC	GAAAAAGGTG	CAGGAACAGG	CTGAACAGTT
Rvul	Rv24	KF311576	TTAACTCTTC	TTTTAATAAG	AAGAATTATC	GAAAAAGGTG	CAGGAACAGG	CTGAACAGTT
Rvul	Rv25	KF311548	TTAACTCTTC	TTTTAATAAG	AAGAATTGTC	GAAAAAGGTG	CAGGAACAGG	CTGAACAGTT
Rvul	Rv26	KF311559	TTAACTCTTC	TTTTAATAAG	AAGAATTGTC	GAAAAAGGTG	CAGGAACAGG	CTGAACAGTT
Rvul	Rv27	KF311561	TTAACTCTTC	TTTTAATAAG	AAGAATTGTC	GAAAAAGGTG	CAGGAACAGG	CTGAACAGTT
Rvul	Rv28	KF311533	TTAACTCTTC	TTTTAATAAG	AAGAATTGTC	GAAAAAGGTG	CGGGAACAGG	CTGAACAGTT
Rvul	Rv29	KF311537	TTAACTCTTC	TTTTAATAAG	AAGAATTGTC	GAAAAAGGTG	CAGGAACAGG	CTGAACAGTT
Rvul	Rv3	KF311633	TTAACTCTTC	TTTTAATAAG	AAGAATTGTC	GAAAAAGGTG	CAGGAACAGG	CTGAACAGTT
Rvul	Rv30	KF311564	TTAACTCTTC	TTTTAATAAG	AAGAATTGTC	GAAAAAGGTG	CAGGAACAGG	CTGAACAGTT
Rvul	Rv31	KF311570	TTAACTCTTC	TTTTAATAAG	AAGAATTGTC	GAAAAAGGTG	CAGGAACAGG	CTGAACAGTT
Rvul	Rv32	KF311530	TTAACTCTTC	TTTTAATAAG	AAGAATTGTC	GAAAAAGGTG	CAGGAACAGG	CTGAACAGTT
Rvul	Rv33	KF311538	TTAACTCTTC	TTTTAATAAG	AAGAATTGTC	GAAAAAGGTG	CAGGAACAGG	CTGAACAGTT
Rvul	Rv34	KF311610	TTAACCCTTC	TTTTAATAAG	AAGAATTGTC	GAAAAAGGTG	CAGGAACAGG	CTGAACAGTT
Rvul	Rv35	KF311605	TTAACCCTTC	TTTTAATAAG	AAGAATTGTC	GAAAAAGGTG	CAGGGACAGG	CTGAACAGTT
Rvul	Rv36	KF311535	TTAACTCTTC	TTTTAATAAG	AAGAATTGTC	GAAAAAGGTG	CAGGAACAGG	CTGAACAGTT
Rvul	Rv37	KF311529	TTAACTCTTC	TTTTAATAAG	AAGAATTGTC	GAAAAAGGTG	CAGGAACAGG	CTGAACAGTT

Rvul	Rv38	KF311532	TTAACTCTTC	TTTTAATAAG	AAGAATTGTC	GAAAAAGGTG	CAGGAACAGG	CTGAACAGTT
Rvul	Rv39	KF311563	TTAACTCTTC	TTTTAATAAG	AAGAATTATC	GAAAAAGGCG	CAGGAACAGG	CTGAACAGTT
Rvul	Rv4	KF311589	TTAACTCTTC	TTTTAATAAG	AAGAATTGTC	GAAAAAGGTG	CAGGAACAGG	CTGAACAGTT
Rvul	Rv40	KF311568	TTAACTCTTC	TTTTAATAAG	AAGAATTGTC	GAAAAGGGCG	CAGGAACAGG	CTGAACAGTT
Rvul	Rv41	KF311555	TTAACTCTTC	TTTTAATAAG	AAGAATTGTC	GAAAAAGGTG	CAGGAACAGG	CTGAACAGTT
Rvul	Rv42	KF311558	TTAACTCTTC	TTTTAATAAG	AAGAATTGTC	GAAAAAGGTG	CAGGAACAGG	CTGAACAGTT
Rvul	Rv43	KF311560	TTAACTCTTC	TTTTAATAAG	AAGAATTGTC	GAAAAAGGTG	CAGGGACAGG	CTGAACAGTT
Rvul	Rv44	KF311601	TTAACTCTTC	TTTTAATAAG	AAGAATTGTC	GAAAAAGGTG	CAGGAACAGG	CTGAACAGTT
Rvul	Rv45	KF311608	TTAACTCTTC	TTTTAATAAG	AAGAATTGTC	GAAAAAGGTG	CAGGAACAGG	CTGAACAGTT
Rvul	Rv46	KF311604	TTAACTCTTC	TTTTAATAAG	AAGAATTGTC	GAAAAAGGTG	CAGGAACAGG	CTGAACAGTT
Rvul	Rv47	KF311615	TTAACTCTTC	TTTTAATAAG	AAGAATTGTC	GAAAAAGGTG	CAGGAACAGG	CTGAACAGTT
Rvul	Rv48	KF311603	TTAACTCTTC	TTTTAATAAG	AAGAATTGTC	GAAAAAGGTG	CAGGAACAGG	CTGAACAGTT
Rvul	Rv49	KF311609	TTAACTCTTC	TTTTAATAAG	AAGAATTGTC	GAAAAAGGTG	CAGGAACAGG	CTGAACAGTT
Rvul	Rv5	KF311632	TTAACTCTTC	TTTTAATAAG	AAGAATTGTC	GAAAAAGGTG	CAGGAACAGG	CTGAACAGTT
Rvul	Rv50	KF311602	TTAACTCTTC	TTTTAATAAG	AAGAATTGTC	GAAAAAGGTG	CAGGAACAGG	CTGAACAGTT
Rvul	Rv51	KF311621	TTAACTCTTC	TTTTAATAAG	AAGAATTGTC	GAAAAAGGTG	CAGGAACAGG	CTGAACAGTT
Rvul	Rv52	KF311619	TTAACTCTTC	TTTTAATAAG	AAGAATTGTC	GAAAAAGGTG	CAGGAACAGG	CTGAACAGTT
Rvul	Rv53	KF311620	TTAACTCTTC	TTTTAATAAG	AAGAATTGTC	GAAAAAGGTG	CAGGAACAGG	CTGAACAGTT
Rvul	Rv54	KF311622	TTAACTCTTC	TTTTAATAAG	AAGAATTGTC	GAAAAAGGTG	CAGGAACAGG	CTGAACAGTT
Rvul	Rv55	KF311617	TTAACTCTTC	TTTTAATAAG	AAGAATTGTC	GAAAAAGGTG	CAGGAACAGG	CTGAACAGTT
Rvul	Rv56	KF311606	TTAACTCTTC	TTTTAATAAG	AAGAATTGTC	GAAAAAGGTG	CAGGAACAGG	CTGAACAGTT
Rvul	Rv57	KF311614	TTAACTCTTC	TTTTAATAAG	AAGAATTGTC	GAAAAAGGTG	CAGGAACAGG	CTGAACAGTT
Rvul	Rv59	KF311567	TTAACTCTTC	TTTTAATAAG	AAGAATTGTC	GAAAAAGGTG	CAGGAACAGG	CTGAACAGTT
Rvul	Rv6	KF311628	TTAACTCTTC	TTTTAATAAG	AAGAATTGTC	GAAAAAGGTG	CAGGAACAGG	CTGAACAGTT
Rvul	Rv60	KF311607	TTAACTCTTC	TTTTAATAAG	AAGAATTGTC	GAAAAAGGTG	CAGGAACAGG	CTGAACAGTT
Rvul	Rv61	KF311544	TTAACTCTTC	TTTTAATAAG	AAGAATTGTC	GAAAAAGGTG	CAGGAACAGG	CTGAACAGTT
Rvul	Rv62	KF311625	TTAACTCTTC	TTTTAATAAG	AAGAATTGTC	GAAAAAGGTG	CAGGAACAGG	CTGAACAGTT
Rvul	Rv7	KF311528	TTAACTCTTC	TTTTAATGAG	AAGAATTGTC	GAAAAAGGTG	CAGGAACAGG	CTGAACAGTT
Rvul	Rv8	KF311631	TTAACTCTTC	TTTTAATAAG	AAGAATTGTC	GAAAAAGGTG	CAGGAACAGG	CTGAACAGTT

Rvul	Rv9	KF311590	TTAACTCTTC	TTTTAATAAG	AAGAATTGTC	GAAAAAGGTG	CAGGAACAGG	CTGAACAGTT
Slin		AY131102	TTAAGACTAT	TACTAATAAG	AAGATTAGTA	GAAAAAGGAG	CTGGAACAGG	ATGAACAGTT
Sory		AY131099	TTAACTCTTT	TACTAATAAG	AAGATTTATT	GAAAAGGGAG	CAGGAACAGG	ATGAACCGTC
Sory		GU196317	TTAACTCTTT	TACTAATAAG	AAGATTTATT	GAAAAGGGAG	CAGGAACAGG	ATGAACCGTC
Spheno		NC018351	TTGACCCTTC	TACTTATGAG	AAGAATTATT	GATAAAGGAG	CAGGAACTGG	ATGGACTGTC
Szea		AY131100	TTAATTCTTT	TATTAATAAG	AAGATTCATT	GAAAAAGGTG	CCGGAACAGG	ATGAACTGTT
Yfro		AY131109	CTAACCCTTC	TTATTATAAG	AAGAATTGTA	GAAAAGGGAG	CAGGCACAGG	ATGGACCGTC

Continuation of the Table S4.

Species	Ha	Sequences	Position					
			361-370	371-380	381-390	391-400	401-410	411-420
Dbor		AY131105	TATCCTCCTT	TAGCCGCCAA	TATTGCTCAT	AGAGGAGCCT	CTGTAGATTT	AGCCATTTTT
Dbor		Uni9	TACCCTCCTT	TAGCCGCCAA	TATTGCTCAT	AGAGGAGCCT	CTGTAGATTT	AGCCATTTTT
Dper		ASSCR6014	----------	----------	----------	----------	----------	----------
Dper		ASSCR6015	----------	----------	----------	----------	----------	----------
Dper		ASSCR6016	----------	----------	----------	----------	----------	----------
Dper		ASSCR6018	----------	----------	----------	----------	----------	----------
Hcho		JX679716	TACCCCCCAC	TGTCATCTAA	TATTGCCCAT	GGAGGTTCTT	CTGTAGATTT	AGCCATCTTT
Hpha		KC112991	TACCCCCCAC	TCTCATCCAA	CATTGCCCAT	GGAGGTTCTT	CAGTAGATTT	AGCCATCTTT
Nxan		NC018354	TATCCCCCTT	TATCCGCAAA	TATTGCTCAT	GAAGGCTCAT	CTGTTGATTT	AGCAATTTTT
Phil		GU244486	TACCCCCCAT	TAGCTGCTAA	TGTAGCCCAT	AGAGGTGCTT	CAGTAGATCT	AGCAATTTTC
Pnod		HQ891474	TATCCACCGC	TATCAGCTAA	TATCGCCCAT	GAAGGCTCTT	CTGTTGATAT	GGCAATTTTT
Rbil	Rb1	KF311645	TACCCCCCAT	TAGCAGGAAA	TGTAGCCCAT	AGAGGAGCTT	CTGTAGATTT	AGCTATTTTT
Rbil	Rb2	KF311637	TACCCCCCAT	TAGCAGGAAA	TGTAGCCCAT	AGAGGAGCTT	CTGTAGATTT	AGCTATTTTT
Rbil	Rb3	KF311639	TACCCCCCAT	TAGCAGGAAA	TGTAGCCCAT	AGAGGAGCTT	CTGTAGATTT	AGCTATTTTT
Rbil	Rb4	KF311636	TACCCCCCAT	TAGCAGGAAA	TGTAGCCCAT	AGAGGAGCTT	CTGTAGATTT	AGCTATTTTT
Rbil	Rb5	KF311635	TACCCCCCAT	TAGCAGGAAA	TGTGGCCCAT	AGAGGGGCTT	CTGTAGATTT	AGCTATTTTT
Rbil	Rb6	KF311634	TACCCCCCAT	TAGCAGGAAA	TGTAGCCCAT	AGAGGAGCTT	CTGTAGATTT	AGCTATTTTT
Rbil	Rb7	KF311648	TACCCTCCAT	TAGCAGGAAA	TGTAGCCCAT	AGAGGAGCTT	CTGTAGATTT	AGCTATTTTT
Rbil	Rb8	KF311647	TATCCTCCAT	TAGCAGGAAA	TGTAGCCCAT	AGAGGAGCTT	CTGTAGATTT	AGCTATTTTT
Rcru		AY131113	TATCCCCCAT	TAGCAGCTAA	TATTGCTCAT	AGAGGAGCTT	CTGTTGATTT	AGCTATTTTT
Rcru		KF311359	TATCCCCCAT	TAGCAGCTAA	TATTGCTCAT	AGAGGAGCTT	CTGTTGATTT	AGCTATTTTT
Rcru		USCOC565	TATCCCCCAT	TAGCAACTAA	TATTGCTCAT	AGAGGAGCTT	CTGTCGATTT	AGCTATTTTT
Rfer	H1	GU581582	TATCCTCCTT	TAGCAAGAAA	TGTGGCCCAC	AGAGGAGCAT	CTGTAGATTT	AGCTATTTTT
Rfer	H10	KF311482	TATCCTCCTT	TAGCAAGAAA	TGTAGCCCAC	AGAGGAGCAT	CTGTAGATTT	AGCTATTTTT
Rfer	H11	KF311444	TATCCTCCTT	TAGCAAGAAA	TGTGGCCCAC	AGAGGAGCAT	CTGTAGATTT	AGCTATTTTT

Rfer	H12	KF311487	TATCCTCCTT	TAGCAAGAAA	TGTGGCCCAC	AGAGGAGCAT	CTGTAGATTT	AGCTATTTTT
Rfer	H13	KF311481	TATCCTCCTT	TAGCAAGAAA	TGTGGCCCAC	AGAGGAGCAT	CTGTAGATTT	AGCTATTTTT
Rfer	H14	KF311448	TATCCTCCTT	TAGCAAGAAA	TGTGGCCCAC	AGAGGAGCAT	CTGTAGATTT	AGCTATTTTT
Rfer	H15	JX292125	TATCCTCCTT	TAGCAAGAAA	TGTGGCCCAC	AGAGGAGCAT	CTGTAGATTT	AGCTATTTTT
Rfer	H16	KF311449	TATCCTCCTT	TAGCAAGAAA	TGTGGCCCAC	AGAGGAGCAT	CTGTAGATTT	AGCTATTTTT
Rfer	H17	KF311360	TACCCTCCTT	TAGCAGGAAA	TGTAGCCCAC	AGAGGAGCAT	CTGTAGATTT	AGCTATTTTT
Rfer	H18	KF311473	TACCCTCCTT	TAGCAGGAAA	TGTAGCCCAC	AGAGGAGCAT	CTGTAGATTT	AGCTATTTTT
Rfer	H2	GU581549	TATCCTCCTC	TAGCAGGAAA	TGTGGCCCAC	AGAGGAGCAT	CTGTAGATTT	AGCTATTTTT
Rfer	H20	KF311433	TACCCTCCTT	TAGCAGGAAA	TGTAGCCCAC	AGAGGAGCAT	CTGTAGATTT	AGCTATTTTT
Rfer	H21	KF311474	TACCCTCCTT	TAGCAGGAAA	TGTAGCCCAC	AGAGGAGCAT	CTGTAGATTT	AGCTATTTTT
Rfer	H22	KF311516	TACCCTCCTT	TAGCAGGAAA	TGTAGCCCAC	AGAGGAGCAT	CTGTAGATTT	AGCTATTTTT
Rfer	H23	KF311380	TACCCTCCTT	TAGCAGGAAA	TGTAGCCCAC	AGAGGGGCAT	CTGTAGATTT	AGCTATTTTT
Rfer	H24	KF311389	TACCCTCCTT	TAGCAGGAAA	TGTAGCCCAC	AGAGGGGCAT	CTGTAGATTT	AGCTATTTTT
Rfer	H25	KF311384	TACCCTCCTT	TAGCAGGAAA	TGTAGCCCAC	AGAGGGGCAT	CTGTAGATTT	AGCTATTTTT
Rfer	H26	KF311388	TACCCTCCTT	TAGCAGGAAA	TGTAGCCCAC	AGAGGGGCAT	CTGTAGATTT	AGCTATTTTT
Rfer	H27	KF311386	TACCCTCCTT	TAGCAGGAAA	TGTAGCCCAC	AGAGGGGCAT	CTGTAGATTT	AGCTATTTTT
Rfer	H28	KF311399	TACCCTCCTT	TAGCAGGAAA	TGTAGCCCAC	AGAGGAGCAT	CTGTAGATTT	AGCTATTTTT
Rfer	H29	KF311383	TACCCCCCTT	TAGCAGGAAA	TGTAGCCCAC	AGAGGGGCAT	CTGTAGATTT	AGCTATTTTT
Rfer	H3	GU581547	TATCCTCCTT	TAGCAAGAAA	TGTGGCCCAC	AGAGGAGCAT	CTGTAGATTT	AGCTATTTTT
Rfer	H30	KF311392	TACCCCCCTT	TAGCAGGAAA	TGTAGCCCAC	AGAGGGGCAT	CTGTAGATTT	AGCTATTTTT
Rfer	H31	KF311379	TACCCCCCTT	TAGCAGGAAA	TGTAGCCCAC	AGAGGGGCAT	CTGTAGATTT	AGCTATTTTT
Rfer	H32	KF311490	TACCCCCCTT	TAGCAGGAAA	TGTAGCCCAC	AGAGGAGCAT	CTGTAGATTT	AGCTATTTTT
Rfer	H34	KF311492	TACCCCCCTT	TAGCAGGAAA	TGTAGCCCAC	AGAGGGGCAT	CTGTAGATTT	AGCTATTTTT
Rfer	H35	KF311496	TACCCTCCTT	TAGCAGGAAA	TGTAGCCCAC	AGAGGGGCAT	CTGTAGATTT	AGCTATTTTT
Rfer	H36	KF311500	TACCCTCCTT	TAGCAGGAAA	TGTAGCCCAC	AGAGGGGCAT	CTGTAGATTT	AGCTATTTTT
Rfer	H37	KF311509	TATCCTCCTT	TAGCAGGAAA	TGTGGCCCAC	AGAGGAGCAT	CTGTAGATTT	AGCTATTTTT
Rfer	H38	KF311505	TATCCTCCTT	TAGCAGGAAA	TGTGGCCCAC	AGAGGAGCAT	CTGTAGATTT	AGCTATTTTT
Rfer	H39	KF311508	TATCCTCCTT	TAGCAGGAAA	TGTGGCCCAC	AGAGGAGCAT	CTGTAGATTT	AGCTATTTTT
Rfer	H4	GU581545	TATCCTCCTT	TAGCAAGAAA	TGTGGCCCAC	AGAGGAGCAT	CTGTAGATTT	AGCTATTTTT

Rfer	H40	KF311506	TATCCTCCTT	TAGCAGGAAA	TGTGGCCCAC	AGAGGAGCAT	CTGTAGATTT	AGCTATTTTT
Rfer	H42	KF311501	TATCCTCCTT	TAGCAGGAAA	TGTGGCCCAC	AGAGGAGCAT	CTGTAGATTT	AGCTATTTTT
Rfer	H43	KF311525	TACCCTCCTT	TAGCAGGAAA	TGTAGCCCAC	AGAGGGGCAT	CTGTAGATTT	AGCTATTTTT
Rfer	H5	GU581539	TATCCTCCTT	TAGCAAGAAA	TGTGGCCCAC	AGAGGAGCAT	CTGTAGATTT	AGCTATTTTT
Rfer	H51	KU696497	TATCCTCCTT	TAGCAAGAAA	TGTGGCCCAC	AGAGGAGCAT	CTGTAGATTT	AGCTATTTTT
Rfer	H52	KU696507	TATCCTCCTT	TAGCAAGAAA	TGTGGCCCAC	AGAGGAGCAT	CTGTAGATTT	AGCTATTTTT
Rfer	H6	GU581526	TATCCTCCTC	TAGCAGGAAA	TGTGGCCCAC	AGAGGAGCAT	CTGTAGATTT	AGCTATTTTT
Rfer	H7	GU581525	TATCCTCCTT	TAGCAAGAAA	TGTAGCCCAC	AGAGGGGCAT	CTGTAGATTT	AGCTATTTTT
Rfer	H8	GU581319	TACCCTCCTT	TAGCAGGAAA	TGTAGCCCAC	AGAGGAGCAT	CTGTAGATTT	AGCTATTTTT
Rfer	H9	KF311446	TATCCTCCTT	TAGCAAGAAA	TGTGGCCCAC	AGAGGAGCAT	CTGTAGATTT	AGCTATTTTT
Rfer		JX292124	TATCCTCCTT	TAGCAAGAAA	TGTGGCCCAC	AGAGGAGCAT	CTGTAGATTT	AGCTATTTTT
Rfer		JX294413	TATCCTCCTT	TAGCAAGAAA	TGTGGCCCAC	AGAGGAGCAT	CTGTAGATTT	AGCTATTTTT
Rfer		KF413063	TATCCTCCTT	TGGCAAGAAA	TGTAGCCCAC	AGAGGGGCAT	CTGTAGATTT	AGCTATTTTT
Rfer		KF413064	TACCCTCCTT	TAGCAGGAAA	TGTAGCCCAC	AGAGGAGCAT	CTGTAGATTT	AGCTATTTTT
Rfer		KF413065	TACCCCCCTT	TAGCAGGAAA	TGTAGCCCAC	AGAGGGGCAT	CTGTAGATTT	AGCTATTTTT
Rfer		KF413066	TATCCTCCTT	TAGCAAGAAA	TGTAGCCCAC	AGAGGGGCAT	CTGTAGATTT	AGCTATTTTT
Rfer		KF413067	TATCCTCCTT	TAGCGGGAAA	TGTGGCCCAC	AGAGGAGCAT	CTGTAGATTT	AGCTATTTTT
Rfer		KF413068	TACCCCCCTT	TAGCAGGAAA	TGTAGCCCAC	AGAGGAGCAT	CTGTAGATTT	AGCTATTTTT
Rfer		KF413069	TACCCCCCTT	TAGCAGGAAA	TGTAGCCCAC	AGAGGGGCAT	CTGTAGATTT	AGCTATTTTT
Rfer		KF413070	TACCCCCCTT	TAGCAGGAAA	TGTAGCCCAC	AGAGGGGCAT	CTGTAGATTT	AGCTATTTTT
Rfer		KF413071	TATCCTCCTT	TAGCAAGAAA	TGTAGCCCAC	AGAGGGGCAT	CTGTAGATTT	AGCTATTTTT
Rfer		KF413072	TATCCTCCTT	TAGCAAGAAA	TGTAGCCCAC	AGAGGGGCAT	CTGTAGATTT	AGCTATTTTT
Rfer		KF413073	TACCCTCCTT	TAGCAGGAAA	TGTAGCCCAC	AGAGGAGCAT	CTGTAGATTT	AGCTATTTTT
Rfer		KT989230	TACCCTCCTT	TAGCAGGAAA	TGTAGCCCAC	AGAGGAGCAT	CTGTAGATTT	AGCTATTTTT
Rfer		KT989231	TACCCTCCTT	TAGCAGGAAA	TGTAGCCCAC	AGAGGAGCAT	CTGTAGATTT	AGCTATTTTT
Rfer		KT989232	TACCCTCCTT	TAGCAGGAAA	TGTAGCCCAC	AGAGGAGCAT	CTGTAGATTT	AGCTATTTTT
Rfer		KT989233	TACCCTCCTT	TAGCAGGAAA	TGTAGCCCAC	AGAGGAGCAT	CTGTAGATTT	AGCTATTTTT
Rfer		KT989234	TACCCTCCTT	TAGCAGGAAA	TGTAGCCCAC	AGAGGAGCAT	CTGTAGATTT	AGCTATTTTT
Rfer		KU916538	TACCCTCCTT	TAGCAGGAAA	TGTAGCCCAC	AGAGGAGCAT	CTGTAGATTT	AGCTATTTTT

Rfer		KY458175	TATCCTCCTT	TAGCAAGAAA	TGTGGCCCAC	AGAGGAGCAT	CTGTAGATTT	AGCTATTTTT
Rfer		KY458176	TATCCTCCTT	TAGCAAGAAA	TGTRGCCCAC	AGAGGAGCAT	CTGTAGATTT	AGCTATTTTT
Rfer		KY458177	TATCCTCCTT	TAGCAAGAAA	TGTGGCCCAC	AGAGGAGCAT	CTGTAGATTT	AGCTATTTTT
Rfer		LC474878	TACCCTCCTT	TAGCAGGAAA	TGTAGCCCAC	AGAGGAGCAT	CTGTAGATTT	AGCTATTTTT
Rfer		LC474880	TACCCTCCTT	TAGCAGGAAA	TGTAGCCCAC	AGAGGAGCAT	CTGTAGATTT	AGCTATTTTT
Rfer		LC474881	TACCCTCCTT	TAGCAGGAAA	TGTAGCCCAC	AGAGGAGCAT	CTGTAGATTT	AGCTATTTTT
Rfer		LC474882	TACCCTCCTT	TAGCAGGAAA	TGTAGCCCAC	AGAGGAGCAT	CTGTAGATTT	AGCTATTTTT
Rfer		LC474884	TACCCTCCTT	TAGCAGGAAA	TGTAGCCCAC	AGAGGAGCAT	CTGTAGATTT	AGCTATTTTT
Rfer		LC474885	TACCCTCCTT	TAGCAGGAAA	TGTAGCCCAC	AGAGGAGCAT	CTGTAGATTT	AGCTATTTTT
Rfer		LC474886	TACCCTCCTT	TAGCAGGAAA	TGTAGCCCAC	AGAGGAGCAT	CTGTAGATTT	AGCTATTTTT
Rfer		LC474887	TACCCTCCTT	TAGCAGGAAA	TGTAGCCCAC	AGAGGAGCAT	CTGTAGATTT	AGCTATTTTT
Rfer		LC474888	TACCCTCCTT	TAGCAGGAAA	TGTAGCCCAC	AGAGGAGCAT	CTGTAGATTT	AGCTATTTTT
Rfer		LC474889	TACCCTCCTT	TAGCAGGAAA	TGTAGCCCAC	AGAGGAGCAT	CTGTAGATTT	AGCTATTTTT
Rfer		LC474890	TACCCTCCTT	TAGCAGGAAA	TGTAGCCCAC	AGAGGAGCAT	CTGTAGATTT	AGCTATTTTT
Rfer		LC474891	TACCCTCCTT	TAGCAGGAAA	TGTAGCCCAC	AGAGGAGCAT	CTGTAGATTT	AGCTATTTTT
Rfer		LC474892	TACCCTCCTT	TAGCAGGAAA	TGTAGCCCAC	AGAGGAGCAT	CTGTAGATTT	AGCTATTTTT
Rfer		LC474893	TACCCTCCTT	TAGCAGGAAA	TGTAGCCCAC	AGAGGAGCAT	CTGTAGATTT	AGCTATTTTT
Rfer		LC474894	TACCCTCCTT	TAGCAGGAAA	TGTAGCCCAC	AGAGGAGCAT	CTGTAGATTT	AGCTATTTTT
Rfer		LC474895	TACCCTCCTT	TAGCAGGAAA	TGTAGCCCAC	AGAGGAGCAT	CTGTAGATTT	AGCTATTTTT
Rfer		LC474896	TACCCTCCTT	TAGCAGGAAA	TGTAGCCCAC	AGAGGAGCAT	CTGTAGATTT	AGCTATTTTT
Rfer		LC474897	TACCCTCCTT	TAGCAGGAAA	TGTAGCCCAC	AGAGGAGCAT	CTGTAGATTT	AGCTATTTTT
Rfer		LC474898	TACCCTCCTT	TAGCAGGAAA	TGTAGCCCAC	AGAGGAGCAT	CTGTAGATTT	AGCTATTTTT
Rfer		LC474899	TACCCTCCTT	TAGCAGGAAA	TGTAGCCCAC	AGAGGAGCAT	CTGTAGATTT	AGCTATTTTT
Rfer		LC474902	TACCCTCCTT	TAGCAGGAAA	TGTAGCCCAC	AGAGGAGCAT	CTGTAGATTT	AGCTATTTTT
Rfer		LC474903	TACCCTCCTT	TAGCAGGAAA	TGTAGCCCAC	AGAGGAGCAT	CTGTAGATTT	AGCTATTTTT
Rfer		LC474904	TACCCTCCTT	TAGCAGGAAA	TGTAGCCCAC	AGAGGAGCAT	CTGTAGATTT	AGCTATTTTT
Rfer		LC474905	TACCCTCCTT	TAGCAGGAAA	TGTAGCCCAC	AGAGGAGCAT	CTGTAGATTT	AGCTATTTTT
Rfer		LC474906	TACCCTCCTT	TAGCAGGAAA	TGTAGCCCAC	AGAGGAGCAT	CTGTAGATTT	AGCTATTTTT
Rfer		LC474907	TACCCTCCTT	TAGCAGGAAA	TGTAGCCCAC	AGAGGAGCAT	CTGTAGATTT	AGCTATTTTT

Rfer		LC474908	TACCCTCCTT	TAGCAGGAAA	TGTAGCCCAC	AGAGGAGCAT	CTGTAGATTT	AGCTATTTTT
Rfer		LC474909	TACCCTCCTT	TAGCAGGAAA	TGTAGCCCAC	AGAGGAGCAT	CTGTAGATTT	AGCTATTTTT
Rfer		LC474910	TACCCTCCTT	TAGCAGGAAA	TGTAGCCCAC	AGAGGAGCAT	CTGTAGATTT	AGCTATTTTT
Rfer		LC474911	TACCCTCCTT	TAGCAGGAAA	TGTAGCCCAC	AGAGGAGCAT	CTGTAGATTT	AGCTATTTTT
Rfer		LC474912	TACCCTCCTT	TAGCAGGAAA	TGTAGCCCAC	AGAGGAGCAT	CTGTAGATTT	AGCTATTTTT
Rfer		LC474913	TACCCTCCTT	TAGCAGGAAA	TGTAGCCCAC	AGAGGAGCAT	CTGTAGATTT	AGCTATTTTT
Rfer		LC474914	TACCCTCCTT	TAGCAGGAAA	TGTAGCCCAC	AGAGGAGCAT	CTGTAGATTT	AGCTATTTTT
Rfer		LC474915	TACCCTCCTT	TAGCAGGAAA	TGTAGCCCAC	AGAGGAGCAT	CTGTAGATTT	AGCTATTTTT
Rfer		LC474916	TACCCTCCTT	TAGCAGGAAA	TGTAGCCCAC	AGAGGAGCAT	CTGTAGATTT	AGCTATTTTT
Rfer		LC474917	TACCCTCCTT	TAGCAGGAAA	TGTAGCCCAC	AGAGGAGCAT	CTGTAGATTT	AGCTATTTTT
Rfer		LC474918	TACCCTCCTT	TAGCAGGAAA	TGTAGCCCAC	AGAGGAGCAT	CTGTAGATTT	AGCTATTTTT
Rfer		LC474919	TACCCTCCTT	TAGCAGGAAA	TGTAGCCCAC	AGAGGAGCAT	CTGTAGATTT	AGCTATTTTT
Rfer		LC474920	TACCCTCCTT	TAGCAGGAAA	TGTAGCCCAC	AGAGGAGCAT	CTGTAGATTT	AGCTATTTTT
Rfer		LC474921	TACCCTCCTT	TAGCAGGAAA	TGTAGCCCAC	AGAGGAGCAT	CTGTAGATTT	AGCTATTTTT
Rfer		LC474922	TACCCTCCTT	TAGCAGGAAA	TGTAGCCCAC	AGAGGAGCAT	CTGTAGATTT	AGCTATTTTT
Rfer		LC474923	TACCCTCCTT	TAGCAGGAAA	TGTAGCCCAC	AGAGGAGCAT	CTGTAGATTT	AGCTATTTTT
Rfer		LC474924	TACCCTCCTT	TAGCAGGAAA	TGTAGCCCAC	AGAGGAGCAT	CTGTAGATTT	AGCTATTTTT
Rfer		LC474925	TACCCTCCTT	TAGCAGGAAA	TGTAGCCCAC	AGAGGAGCAT	CTGTAGATTT	AGCTATTTTT
Rfer		LC474926	TACCCTCCTT	TAGCAGGAAA	TGTAGCCCAC	AGAGGAGCAT	CTGTAGATTT	AGCTATTTTT
Rfer		LC474927	TACCCTCCTT	TAGCAGGAAA	TGTAGCCCAC	AGAGGAGCAT	CTGTAGATTT	AGCTATTTTT
Rfer		LC474928	TACCCTCCTT	TAGCAGGAAA	TGTAGCCCAC	AGAGGAGCAT	CTGTAGATTT	AGCTATTTTT
Rfer		LC474929	TACCCTCCTT	TAGCAGGAAA	TGTAGCCCAC	AGAGGAGCAT	CTGTAGATTT	AGCTATTTTT
Rfer		MF448526	TACCCTCCTT	TAGCAGGAAA	TGTAGCCCAC	AGAGGAGCAT	CTGTAGATTT	AGCTATTTTT
Rfer		MG051027	TACCCTCCTT	TAGCAGGAAA	TGTAGCCCAC	AGAGGAGCAT	CTGTAGATTT	AGCTATTTTT
Rfer		MG051028	TACCCTCCTT	TAGCAGGAAA	TGTAGCCCAC	AGAGGAGCAT	CTGTAGATTT	AGCTATTTTT
Rfer		MG051029	TACCCTCCTT	TAGCAGGAAA	TGTAGCCCAC	AGAGGAGCAT	CTGTAGATTT	AGCTATTTTT
Rfer		MG051030	TACCCTCCTT	TAGCAGGAAA	TGTAGCCCAC	AGAGGAGCAT	CTGTAGATTT	AGCTATTTTT
Rfer		MG051031	TACCCTCCTT	TAGCAGGAAA	TGTAGCCCAC	AGAGGAGCAT	CTGTAGATTT	AGCTATTTTT
Rfer		MG872818	TACCCTCCTT	TAGCAGGAAA	TGTAGCCCAC	AGAGGAGCAT	CTGTAGATTT	AGCTATTTTT

Rfer		MG883395	TACCCTCCTT	TAGCAGGAAA	TGTAGCCCAC	AGAGGAGCAT	CTGTAGATTT	AGCTATTTTT
Rfer		MG883396	TACCCTCCTT	TAGCAGGAAA	TGTAGCCCAC	AGAGGAGCAT	CTGTAGATTT	AGCTATTTTT
Rfer		MG883397	TACCCTCCTT	TAGCAGGAAA	TGTAGCCCAC	AGAGGAGCAT	CTGTAGATTT	AGCTATTTTT
Rfer		MG883398	TACCCTCCTT	TACCAGGAGA	TGTAGCCCAC	AGAGGAGCAT	CTGTAGATTT	AGCTATTTTT
Rfer		MG883399	TACCCTCCTT	TAGCAGGAAA	TGTAGCCCAC	AGAGGAGCAT	CTGTAGATTT	AGCTATTTTT
Rfer		MH016277	TACCCTCCTT	TAGCAGGAAA	TGTAGCCCAC	AGAGGAGCAT	CTGTAGATTT	AGCTATTTTT
Rfer		MH016278	TACCCTCCTT	TAGCAGGAAA	TGTAGCCCAC	AGAGGAGCAT	CTGTAGATTT	AGCTATTTTT
Rfer		MH016279	TACCCTCCTT	TAGCAGGAAA	TGTAGCCCAC	AGAGGAGCAT	CTGTAGATTT	AGCTATTTTT
Rfer		MH016604	TACCCTCCTT	TAGCAGGAAA	TGTAGCCCAC	AGAGGAGCAT	CTGTAGATTT	AGCTATTTTT
Rfer		MH016605	TACCCTCCTT	TAGCAGGAAA	TGTAGCCCAC	AGAGGAGCAT	CTGTAGATTT	AGCTATTTTT
Rfer		MH016606	TACCCTCCTT	TAGCAGGAAA	TGTAGCCCAC	AGAGGAGCAT	CTGTAGATTT	AGCTATTTTT
Rfer		MH016607	TACCCTCCTT	TAGCAGGAAA	TGTAGCCCAC	AGAGGAGCAT	CTGTAGATTT	AGCTATTTTT
Rfer		MH016608	TACCCTCCTT	TAGCAGGAAA	TGTAGCCCAC	AGAGGAGCAT	CTGTAGATTT	AGCTATTTTT
Rfer		MH016609	TACCCTCCTT	TAGCAGGAAA	TGTAGCCCAC	AGAGGAGCAT	CTGTAGATTT	AGCTATTTTT
Rfer		MH016610	TACCCTCCTT	TAGCAGGAAA	TGTAGCCCAC	AGAGGAGCAT	CTGTAGATTT	AGCTATTTTT
Rfer		MH016611	TACCCTCCTT	TAGCAGGAAA	TGTAGCCCAC	AGAGGAGCAT	CTGTAGATTT	AGCTATTTTT
Rfer		MH016612	TACCCTCCTT	TAGCAGGAAA	TGTAGCCCAC	AGAGGAGCAT	CTGTAGATTT	AGCTATTTTT
Rfer		MH016613	TACCCTCCTT	TAGCAGGAAA	TGTAGCCCAC	AGAGGAGCAT	CTGTAGATTT	AGCTATTTTT
Rfer		MH016614	TACCCTCCTT	TAGCAGGAAA	TGTAGCCCAC	AGAGGAGCAT	CTGTAGATTT	AGCTATTTTT
Rfer		MH016615	TACCCTCCTT	TAGCAGGAAA	TGTAGCCCAC	AGAGGAGCAT	CTGTAGATTT	AGCTATTTTT
Rfer		MH016616	TACCCTCCTT	TAGCAGGAAA	TGTAGCCCAC	AGAGGAGCAT	CTGTAGATTT	AGCTATTTTT
Rfer		MH016617	TACCCTCCTT	TAGCAGGAAA	TGTAGCCCAC	AGAGGAGCAT	CTGTAGATTT	AGCTATTTTT
Rfer		MH016618	TACCCTCCTT	TAGCAGGAAA	TGTAGCCCAC	AGAGGAGCAT	CTGTAGATTT	AGCTATTTTT
Rfer		MH016619	TACCCTCCTT	TAGCAGGAAA	TGTAGCCCAC	AGAGGAGCAT	CTGTAGATTT	AGCTATTTTT
Rfer		MH016620	TACCCTCCTT	TAGCAGGAAA	TGTAGCCCAC	AGAGGAGCAT	CTGTAGATTT	AGCTATTTTT
Rfer		MH016621	TACCCTCCTT	TAGCAGGAAA	TGTAGCCCAC	AGAGGAGCAT	CTGTAGATTT	AGCTATTTTT
Rfer		MH016622	TACCCTCCTT	TAGCAGGAAA	TGTAGCCCAC	AGAGGAGCAT	CTGTAGATTT	AGCTATTTTT
Rfer		MH016623	TACCCTCCTT	TAGCAGGAAA	TGTAGCCCAC	AGAGGAGCAT	CTGTAGATTT	AGCTATTTTT
Rfer		MH016624	TACCCTCCTT	TAGCAGGAAA	TGTAGCCCAC	AGAGGAGCAT	CTGTAGATTT	AGCTATTTTT

Rfer		MH016625	TACCCTCCTT	TAGCAGGAAA	TGTAGCCCAC	AGAGGAGCAT	CTGTAGATTT	AGCTATTTTT
Rfer		MH016626	TACCCTCCTT	TAGCAGGAAA	TGTAGCCCAC	AGAGGAGCAT	CTGTAGATTT	AGCTATTTTT
Rfer		MH016627	TACCCTCCTT	TAGCAGGAAA	TGTAGCCCAC	AGAGGAGCAT	CTGTAGATTT	AGCTATTTTT
Rfer		MH016628	TACCCTCCTT	TAGCAGGAAA	TGTAGCCCAC	AGAGGAGCAT	CTGTAGATTT	AGCTATTTTT
Rfer		MH016629	TACCCTCCTT	TAGCAGGAAA	TGTAGCCCAC	AGAGGAGCAT	CTGTAGATTT	AGCTATTTTT
Rfer		MH016630	TACCCTCCTT	TAGCAGGAAA	TGTAGCCCAC	AGAGGAGCAT	CTGTAGATTT	AGCTATTTTT
Rfer		MH016631	TACCCTCCTT	TAGCAGGAAA	TGTAGCCCAC	AGAGGAGCAT	CTGTAGATTT	AGCTATTTTT
Rfer		MH016632	TACCCTCCTT	TAGCAGGAAA	TGTAGCCCAC	AGAGGAGCAT	CTGTAGATTT	AGCTATTTTT
Rfer		MH016633	TACCCTCCTT	TAGCAGGAAA	TGTAGCCCAC	AGAGGAGCAT	CTGTAGATTT	AGCTATTTTT
Rfer		MH016634	TACCCTCCTT	TAGCAGGAAA	TGTAGCCCAC	AGAGGAGCAT	CTGTAGATTT	AGCTATTTTT
Rfer		MH016635	TACCCTCCTT	TAGCAGGAAA	TGTAGCCCAC	AGAGGAGCAT	CTGTAGATTT	AGCTATTTTT
Rfer		MH016636	TACCCTCCTT	TAGCAGGAAA	TGTAGCCCAC	AGAGGAGCAT	CTGTAGATTT	AGCTATTTTT
Rfer		MH016637	TACCCTCCTT	TAGCAGGAAA	TGTAGCCCAC	ACAGGAGCAT	CTGTATATTT	AGCTATTTTT
Rfer	H19	KF311403	TACCCTCCTT	TAGCAGGAAA	TGTAGCCCAC	AGAGGAGCAT	CTGTAGATTT	AGCTATTTTT
Rfer	H41	KF311502	TATCCTCCTT	TAGCAGGAAA	TGTGGCCCAC	AGAGGAGCAT	CTGTAGATTT	AGCTATTTTT
Rpal		ASSCR6357	TATCCCCCTT	TAGCAGCAAA	TGCTGCACAT	GGTGGAGCAT	CTGTAGATTT	AGCTATTTTT
Rpal		ASSCR6358	TATCCCCCTT	TAGCAGCAAA	TGTTGCACAT	GGTGGAGCAT	CTGTAGATTT	AGCTATTTTT
Rpal		AY131121	TACCNTCCTT	TAGCAGCAAA	TGTTGCGCAT	GGTGGAGCAT	CTGTAGATTT	AGCTATTTTT
Rpal		GU581629	TACCCTCCTT	TAGCAGCAAA	TGTTGCGCAT	GGTGGAGCAT	CTGTAGATTT	AGCTATTTTT
Rpal		KF311358	TATCCCCCTT	TAGCAGCAAA	TGCTGCACAT	GGTGGAGCAT	CTGTAGATTT	AGCCATTTTT
Rpal		KR494254	TATCCCCCTT	TAGCAGCAAA	TGTTGCACAT	GGTGGAGCAT	CTGTAGATTT	AGCTATTTTT
Rpal		KR494255	TATCCCCCTT	TAGCAGCAAA	TGTTGCACAT	GGTGGAGCAC	CTGTAGATTT	AGCTATTCTT
Rpal		KR494256	TATCCCCCTT	TAGCAGCAAA	TGTTGCACAT	GGTGGAGCAT	CTGTAGATTT	AGCTATTTTT
Rpal		KR494257	TATCCCCCTT	TAGCAGCAAA	TGTTGCACAT	GGTGGAGCAT	CTGTAGATTT	AGCTATTTTT
Rpal		KR494258	TATCCCCCTT	TAGCAGCAAA	TGTTGCACAT	GGTGGAGCAT	CTGTAGATTT	AGCTATTTTT
Rpal		KR494259	TATCCCCCTT	TAGCAGCAAA	TGTTGCACAT	GGTGGAGCAT	CTGTAGGTTT	AGCTATTTTT
Rpal		KR494260	TATCCCCCTT	TAGCAGCAAA	TGTTGCACAT	GGTGGAGCAT	CTGTAGATTT	AGCTATTTTT
Rpal		KR494261	TATCCCCCTT	TAGCAGCAAA	TGTTGCACAT	GGTGGAGCAT	CTGTAGATTT	AGCTATTTTT
Rpal	Rp1	KU647599	TACCCTCCTT	TAGCAGCAAA	TGTTGCGCAT	GGTGGAGCAT	CTGTAGATTT	AGCTATTTTT

Rpal	Rp10	KU647490	TACCCTCCTT	TAGCAGCAAA	TGTTGCGCAT	GGTGGAGCAT	CTGTAGATTT	AGCTATTTTT
Rpal	Rp11	KU647489	TACCCTCCTT	TAGCAGCAAA	TGTTGCGCAT	GGTGGAGCAT	CTGTAGATTT	AGCTATTTTT
Rpal	Rp12	KU647604	TACCCTCCTT	TAGCAGCAAA	TGTTGCGCAT	GGTGGAGCAT	CTGTAGATTT	AGCTATTTTT
Rpal	Rp13	KU647575	TACCCTCCTT	TAGCAGCAAA	TGTTGCGCAT	GGTGGAGCAT	CTGTAGATTT	AGCTATTTTT
Rpal	Rp2	KU647587	TACCCCCCTT	TAGCAGCAAA	TGTTGCGCAT	GGTGGAGCAT	CTGTAGATTT	AGCTATTTTT
Rpal	Rp3	KU647508	TACCCTCCTT	TAGCAGCAAA	TGTTGCGCAT	GGTGGAGCAT	CTGTAGATTT	AGCTATTTTT
Rpal	Rp4	KU647585	TACCCTCCTT	TAGCAGCAAA	TGTTGCGCAT	GGTGGAGCAT	CTGTAGATTT	AGCTATTTTT
Rpal	Rp5	KU647584	TACCCTCCTT	TAGCAGCAAA	TGTTGCGCAT	GGTGGAGCAT	CTGTAGATTT	AGCTATTTTT
Rpal	Rp6	KU647581	TACCCTCCTT	TAGCGGCAAA	TGTTGCGCAT	GGTGGAGCAT	CTGTAGATTT	AGCTATTTTT
Rpal	Rp7	KU647579	TACCCTCCTT	TAGCGGCAAA	TGTTGCGCAT	GGTGGGGCAT	CTGTAGATTT	AGCTATTTTT
Rpal	Rp8	KU647502	TACCCTCCTT	TAGCAGCAAA	TGTTGCGCAT	GGTGGAGCAT	CTGTAGATTT	AGCTATTTTT
Rpal	Rp9	KU647505	TACCCTCCTT	TAGCAGCAAA	TGTTGCGCAT	GGTGGAGCAT	CAGTAGATTT	AGCTATTTTT
Rpal		Uni10	TATCCCCCTT	TAGCAGCAAA	TGTTGCACAT	GGTGGAGCAT	CTGTAGATTT	AGCTATTTTT
Rpal		Uni11	TATCCCCCTT	TAGCAGCAAA	TGTTGCACAT	GGTGGAGCAT	CTGTAGATTT	AGCTATTTTT
Rpal		Uni117	TACCCTCCTT	TAGCAGCAAA	TGTTGCACAT	AGTGGAGCAT	CTGTAGATTT	AGCTATTTTT
Rpal		Uni17	TATCCCCCTT	TAGCAGCAAA	TGTTGCACAT	GGTGGAGCAT	CTGTAGATTT	AGCTATTTTT
Rpal		Uni21	TATCCCCCTT	TAGCAGCAAA	TGTTGCACAT	GGTGGAGCAT	CTGTAGATTT	AGCTATTTTT
Rpal		Uni44	TACCCTCCTT	TAGCAGCAAA	TGTTGCACAT	GGTGGAGCAT	CTGTAGATTT	AGCTATTTTT
Rpal		Uni58	TATCCCCCTT	TAGCAGCAAA	TGTTGCACAT	GGTGGAGCAT	CTGTAGATTT	AGCTATTTTT
Rpho		AY131120	TATCCACCTC	TAGCAGCAAA	TATCGCCCAT	AGAGGANCTT	CTGTTGACTT	AGCTATTTTT
Rpho		KY511047	TATCCACCTC	TAGCAGCAAA	TATTGCCCAC	AGAGGGGCTT	CTGTTGACTT	AGCCATCTTT
Rvul		LN612634	TACCCCCCAT	TGGCAGGAAA	TGTAGCCCAT	AGAGGCGCTT	CTGTAGACTT	AGCTATTTTT
Rvul		LN612635	TATCCCCCAT	TAGCAGGAAA	TGTAGCCCAT	AGAGGCGCTT	CTGTAGACTT	AGCTATTTTT
Rvul		LN612636	TACCCCCCAT	TGGCAGGAAA	TGTAGCCCAT	AGAGGCGCTT	CTGTAGACTT	AGCTATTTTT
Rvul		MG051024	TATCCCCCAT	TAGCAGGAAA	TGTAGCCCAT	AGAGGCGCTT	CTGTAGACTT	AGCTATTTTT
Rvul		MG051025	TACCCCCCAT	TAGCAGGAAA	TGTGGCCCAT	AGAGGAGCTT	CTGTAGACTT	AGCTATTTTT
Rvul		MG051026	TACCCCCCAT	TAGCAGGAAA	TGTAGCCCAT	AGAGGCGCTT	CTGTAGACTT	AGCTATTTTT
Rvul	Rv1	KF311588	TACCCCCCAT	TAGCAGGAAA	TGTGGCCCAT	AGAGGAGCTT	CTGTAGACTT	AGCTATTTTT
Rvul	Rv10	KF311587	TACCCCCCAT	TAGCAGGAAA	TGTAGCCCAT	AGAGGCGCTT	CTGTAGACTT	AGCTATTTTT

Rvul	Rv11	KF311629	TACCCCCCAT	TAGCAGGAAA	TGTGGCCCAT	AGAGGGGCTT	CTGTAGACTT	AGCTATTTTT
Rvul	Rv12	KF311550	TACCCCCCAT	TAGCAGGAAA	TGTGGCTCAT	AGAGGAGCTT	CTGTAGACTT	AGCTATTTTT
Rvul	Rv13	KF311549	TACCCTCCAT	TAGCAGGAAA	TGTGGCTCAT	AGAGGAGCTT	CTGTAGACTT	AGCTATTTTT
Rvul	Rv14	KF311573	TACCCCCCAT	TAGCAGGAAA	TGTGGCCCAT	AGAGGAGCTT	CTGTAGACTT	AGCTATTTTT
Rvul	Rv15	KF311546	TACCCCCCAT	TAGCAGGAAA	TGTGGCTCAT	AGAGGAGCTT	CTGTAGACTT	AGCTATTTTT
Rvul	Rv16	KF311600	TACCCCCCAT	TAGCAGGAAA	TGTGGCTCAT	AGAGGAGCTT	CTGTGGACTT	AGCTATTTTT
Rvul	Rv17	KF311578	TACCCCCCAT	TAGCAGGAAA	TGTGGCTCAT	AGAGGAGCTT	CTGTAGACTT	AGCTATTTTT
Rvul	Rv18	KF311593	TACCCCCCAT	TAGCAGGAAA	TGTAGCTCAT	AGAGGAGCTT	CTGTAGACTT	AGCTATTTTT
Rvul	Rv19	KF311552	TACCCCCCAT	TAGCAGGAAA	TGTAGCTCAT	AGAGGAGCTT	CTGTAGACTT	AGCTATTTTT
Rvul	Rv2	KF311586	TACCCCCCAT	TAGCAGGAAA	TGTGGCCCAT	AGAGGAGCTT	CTGTAGACTT	AGCTATTTTT
Rvul	Rv20	KF311594	TACCCTCCAT	TAGCAGGAAA	TGTGGCTCAT	AGAGGAGCTT	CTGTAGACTT	AGCTATTTTT
Rvul	Rv21	KF311547	TACCCCCCAT	TAGCAGGAAA	TGTGGCTCAT	AGAGGAGCTT	CTGTAGACTT	AGCTATTTTT
Rvul	Rv22	KF311591	TACCCCCCAT	TAGCAGGAAA	TGTAGCTCAT	AGAGGGGCTT	CTGTAGACTT	AGCTATTTTT
Rvul	Rv23	KF311545	TACCCTCCAT	TAGCAGGAAA	TGTAGCTCAT	AGAGGAGCTT	CTGTGGACTT	AGCTATTTTT
Rvul	Rv24	KF311576	TACCCCCCAT	TAGCAGGAAA	TGTGGCTCAT	AGAGGAGCTT	CTGTAGACTT	AGCTATTTTT
Rvul	Rv25	KF311548	TACCCCCCAT	TAGCAGGAAA	TGTGGCTCAT	AGAGGAGCTT	CTGTAGACTT	AGCTATTTTT
Rvul	Rv26	KF311559	TACCCCCCAT	TAGCGGGAAA	TGTGGCCCAT	AGAGGAGCTT	CTGTAGACTT	AGCTATTTTT
Rvul	Rv27	KF311561	TACCCCCCAT	TAGCGGGAAA	TGTGGCCCAT	AGAGGGGCTT	CTGTAGACTT	AGCTATTTTT
Rvul	Rv28	KF311533	TACCCCCCAT	TAGCGGGAAA	TGTGGCCCAT	AGAGGAGCTT	CTGTAGACTT	AGCTATTTTT
Rvul	Rv29	KF311537	TACCCCCCAT	TAGCGGGAAA	TGTGGCCCAT	AGAGGAGCTT	CTGTAGACTT	AGCTATTTTT
Rvul	Rv3	KF311633	TACCCCCCAT	TAGCAGGAAA	TGTGGCCCAT	AGAGGAGCTT	CTGTAGACTT	AGCTATTTTT
Rvul	Rv30	KF311564	TACCCCCCAT	TAGCGGGAAA	TGTGGCCCAT	AGAGGAGCTT	CTGTAGACTT	AGCTATTTTT
Rvul	Rv31	KF311570	TACCCCCCAT	TAGCGGGAAA	TGTGGCCCAT	AGAGGAGCTT	CTGTAGACTT	AGCTATTTTT
Rvul	Rv32	KF311530	TACCCCCCAT	TAGCGGGAAA	TGTGGCCCAT	AGAGGAGCTT	CTGTAGACTT	AGCTATTTTT
Rvul	Rv33	KF311538	TACCCCCCAT	TAGCGGGAAA	TGTGGCCCAT	AGAGGAGCTT	CTGTAGACTT	AGCTATTTTT
Rvul	Rv34	KF311610	TACCCCCCAT	TAGCAGGAAA	TGTGGCCCAT	AGAGGAGCTT	CTGTAGACTT	AGCTATTTTT
Rvul	Rv35	KF311605	TACCCCCCAT	TAGCAGGAAA	TGTGGCCCAT	AGAGGAGCTT	CTGTAGACTT	AGCTATTTTT
Rvul	Rv36	KF311535	TACCCCCCAT	TAGCAGGAAA	TGTGGCCCAT	AGAGGAGCTT	CTGTAGACTT	AGCTATTTTT
Rvul	Rv37	KF311529	TACCCCCCAT	TAGCAGGAAA	TGTGGCCCAT	AGAGGAGCTT	CTGTAGACTT	AGCTATTTTT

Rvul	Rv38	KF311532	TACCCCCCAT	TAGCAGGAAA	TGTGGCCCAT	AGAGGAGCTT	CTGTAGACTT	AGCTATTTTT
Rvul	Rv39	KF311563	TACCCCCCAT	TAGCAGGAAA	TGTAGCCCAT	AGAGGAGCTT	CTGTAGACTT	AGCTATTTTT
Rvul	Rv4	KF311589	TACCCCCCAT	TAGCAGGAAA	TGTGGCCCAT	AGAGGAGCTT	CTGTAGACTT	AGCTATTTTT
Rvul	Rv40	KF311568	TACCCCCCAT	TAGCAGGAAA	TGTAGCCCAT	AGAGGAGCTT	CTGTAGACTT	AGCTATTTTT
Rvul	Rv41	KF311555	TACCCCCCAT	TAGCAGGAAA	TGTGGCCCAT	AGAGGAGCTT	CTGTAGACTT	AGCTATTTTT
Rvul	Rv42	KF311558	TACCCCCCAT	TAGCAGGAAA	TGTAGCCCAT	AGAGGAGCTT	CTGTAGACTT	AGCTATTTTT
Rvul	Rv43	KF311560	TACCCCCCAT	TAGCAGGAAA	TGTAGCCCAT	AGAGGAGCTT	CTGTAGACTT	AGCTATTTTT
Rvul	Rv44	KF311601	TACCCCCCAT	TAGCAGGAAA	TGTGGCCCAT	AGAGGAGCTT	CTGTAGACTT	AGCTATTTTT
Rvul	Rv45	KF311608	TACCCCCCAT	TAGCAGGAAA	TGTGGCCCAT	AGAGGAGCTT	CTGTAGACTT	AGCTATTTTT
Rvul	Rv46	KF311604	TACCCCCCAT	TAGCAGGAAA	TGTGGCCCAT	AGAGGAGCTT	CTGTAGACTT	AGCTATTTTT
Rvul	Rv47	KF311615	TACCCCCCAT	TAGCAGGAAA	TGTGGCCCAT	AGAGGAGCTT	CTGTAGACTT	AGCTATTTTT
Rvul	Rv48	KF311603	TACCCCCCAT	TAGCAGGAAA	TGTGGCCCAT	AGAGGAGCTT	CTGTAGACTT	AGCTATTTTT
Rvul	Rv49	KF311609	TACCCCCCAT	TAGCAGGAAA	TGTGGCCCAT	AGAGGAGCTT	CTGTAGACTT	AGCTATTTTT
Rvul	Rv5	KF311632	TACCCCCCAT	TAGCAGGAAA	TGTGGCCCAT	AGAGGAGCTT	CTGTAGACTT	AGCTATTTTT
Rvul	Rv50	KF311602	TACCCCCCAT	TAGCAGGAAA	TGTGGCCCAT	AGAGGAGCTT	CTGTAGACTT	AGCTATTTTT
Rvul	Rv51	KF311621	TACCCCCCAT	TAGCAGGAAA	TGTAGCCCAT	AGAGGAGCTT	CTGTAGACTT	AGCTATTTTT
Rvul	Rv52	KF311619	TACCCCCCAT	TAGCAGGAAA	TGTGGCCCAT	AGAGGAGCTT	CTGTAGACTT	AGCTATTTTT
Rvul	Rv53	KF311620	TACCCCCCAT	TAGCAGGAAA	TGTGGCCCAT	AGAGGAGCTT	CTGTAGACTT	AGCTATTTTT
Rvul	Rv54	KF311622	TACCCCCCAT	TAGCAGGAAA	TGTGGCCCAT	AGAGGAGCTT	CTGTAGACTT	AGCTATTTTT
Rvul	Rv55	KF311617	TACCCCCCAT	TAGCAGGAAA	TGTGGCCCAT	AGAGGAGCTT	CTGTAGACTT	AGCTATTTTT
Rvul	Rv56	KF311606	TACCCCCCAT	TAGCAGGAAA	TGTGGCCCAT	AGAGGAGCTT	CTGTAGACTT	AGCTATTTTT
Rvul	Rv57	KF311614	TACCCCCCAT	TAGCAGGAAA	TGTGGCCCAT	AGAGGAGCTT	CTGTAGACTT	AGCTATTTTT
Rvul	Rv59	KF311567	TACCCCCCAT	TAGCAGGAAA	TGTGGCCCAT	AGAGGAGCTT	CTGTAGACTT	AGCTATTTTT
Rvul	Rv6	KF311628	TACCCCCCAT	TAGCAGGAAA	TGTGGCCCAT	AGAGGAGCTT	CTGTAGACTT	AGCTATTTTT
Rvul	Rv60	KF311607	TACCCCCCAT	TAGCAGGAAA	TGTGGCCCAT	AGAGGAGCTT	CTGTAGACTT	AGCTATTTTT
Rvul	Rv61	KF311544	TACCCCCCAT	TAGCAGGAAA	TGTGGCCCAT	AGAGGAGCTT	CTGTAGACTT	AGCTATTTTT
Rvul	Rv62	KF311625	TACCCCCCAT	TAGCAGGAAA	TGTGGCCCAT	AGAGGAGCTT	CTGTAGACTT	AGCTATTTTT
Rvul	Rv7	KF311528	TACCCCCCAT	TAGCAGGAAA	TGTGGCCCAT	AGAGGAGCTT	CTGTAGACTT	AGCTATTTTT
Rvul	Rv8	KF311631	TACCCCCCAT	TAGCAGGAAA	TGTGGCCCAT	AGAGGAGCTT	CTGTAGACTT	AGCTATTTTT

Rvul	Rv9	KF311590	TATCCCCCAT	TAGCAGGAAA	TGTAGCCCAT	AGAGGCGCTT	CTGTAGACTT	AGCTATTTTT
Slin		AY131102	TACCCACCTC	TATCATCTAA	TATTGCCCAT	GAAGGAGCTT	CTGTAGATCT	AGCAATTTTT
Sory		AY131099	TACCCCCCGC	TCTCATCCAA	TATTGCCCAT	GAAGGAGCTT	CTGTTGATCT	GGCCATTTTC
Sory		GU196317	TACCCCCCGC	TCTCATCCAA	TATTGCCCAT	GAAGGAGCTT	CTGTTGATCT	GGCCATTTTC
Spheno		NC018351	TACCCCCCGC	TTTCTTCTAA	TATTGCCCAT	AATGGAGCTT	CTGTAGATTT	AGCTATTTTT
Szea		AY131100	TATCCCCCAT	TATCCTCAAA	TATTGCACAC	GAAGGAGCCT	CTGTTGATTT	AGCAATTTTT
Yfro		AY131109	TACCCTCCTT	TATCAGCTAA	TATCGCTCAC	GGGGGAGCAT	CTGTTGACTT	GGCAATTTTT

Continuation of the Table S4.

			Position					
Species	Ha	Sequences	421-430	431-440	441-450	451-460	461-470	471-480
Dbor		AY131105	AGATTACACA	TAGCTGGAGT	ATCCTCTATT	CTAGGAGCCA	TTAATTTTAT	CTCAACTGCT
Dbor		Uni9	AGATTACACA	TAGCTGGAGT	ATCCTCTATT	CTAGGGGCCA	TCAATTTTAT	CTCAACTGCT
Dper		ASSCR6014	----------	----------	----------	----------	----------	----------
Dper		ASSCR6015	----------	----------	----------	----------	----------	----------
Dper		ASSCR6016	----------	----------	----------	----------	----------	----------
Dper		ASSCR6018	----------	----------	----------	----------	----------	----------
Hcho		JX679716	AGACTACACT	TGGCTGGAGT	ATCATCAATT	TTAGGAGCTG	TAAACTTTAT	TACAACTGTA
Hpha		KC112991	AGACTTCACT	TGGCCGGAGT	TTCATCAATC	CTGGGAGCAG	TCAACTTTAT	TTCTACTGTT
Nxan		NC018354	AGATTACACA	TAGCAGGAGT	ATCCTCAATC	TTAGGCGCAG	TAAATTTTAT	TTCTACAGTT
Phil		GU244486	AGTCTTCATT	TAGCAGGAAT	TTCTTCTATT	CTAGGTGCCG	TAAATTTTAT	TACAACAGTA
Pnod		HQ891474	AGTCTACATA	TAGCAGGAGT	TTCATCTATT	CTAGGGGCTA	TTAACTTTAT	TTCAACAGTT
Rbil	Rb1	KF311645	AGCCTCCATA	TAACAGGAAT	CTCTTCTATC	TTAGGAGCTA	TCAATTTTAT	TTCTACAGCC
Rbil	Rb2	KF311637	AGCCTCCATA	TAGCAGGAAT	CTCTTCTATC	TTAGGAGCTA	TCAATTTTAT	TTCTACAGCC
Rbil	Rb3	KF311639	AGCCTCCATA	TAGCAGGAAT	CTCTTCTATC	TTAGGAGCTA	TCAATTTTAT	TTCTACAGCC
Rbil	Rb4	KF311636	AGCCTCCATA	TAGCAGGAAT	CTCTTCTATC	TTAGGAGCTA	TCAATTTTAT	TTCTACAGCC
Rbil	Rb5	KF311635	AGCCTCCATA	TAGCAGGAAT	CTCTTCTATC	TTAGGAGCTA	TCAATTTTAT	TTCTACAGCC
Rbil	Rb6	KF311634	AGCCTCCATA	TAGCGGGGAT	CTCTTCTATC	TTAGGAGCTA	TTAATTTTAT	CTCTACAGCC
Rbil	Rb7	KF311648	AGCCTCCATA	TAGCAGGAAT	CTCTTCTATC	TTAGGAGCTA	TTAATTTTAT	CTCTACAGCC
Rbil	Rb8	KF311647	AGCCTCCATA	TAGCAGGAAT	CTCTTCTATC	TTAGGAGCTA	TTAATTTTAT	CTCTACAGCC
Rcru		AY131113	AGTCTTCATA	TAGCAGGAGT	TTCTTCTATT	TTAGGTGCTA	TTAATTTTAT	TTCTACTGCT
Rcru		KF311359	AGTCTTCATA	TAGCAGGAGT	TTCTTCTATT	TTAGGTGCTA	TTAATTTTAT	TTCTACTGCT
Rcru		USCOC565	AGTCTTCATA	TAGCAGGAGT	TTCTTCTATT	TTAGGTGCTA	TTAATTTTAT	TTCTACTGCT
Rfer	H1	GU581582	AGTCTTCATA	TAGCAGGGAT	CTCCTCTATT	CTAGGGGCTA	TTAACTTTAT	CTCTACAGCT
Rfer	H10	KF311482	AGTCTTCATA	TAGCAGGGAT	CTCCTCTATT	CTAGGGGCTA	TTAACTTTAT	CTCTACAGCT
Rfer	H11	KF311444	AGTCTTCATA	TAGCAGGGAT	CTCCTCTATT	CTAGGGGCTA	TTAACTTTAT	CTCTACAGCT

Rfer	H12	KF311487	AGTCTTCATA	TAGCAGGGAT	CTCCTCTATT	CTAGGGGCTA	TTAACTTTAT	CTCTACAGCC
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Rfer	H14	KF311448	AGTCTTCATA	TAGCAGGGAT	CTCCTCTATT	CTAGGAGCTA	TTAACTTTAT	CTCTACAGCT
Rfer	H15	JX292125	AGTCTTCATA	TAGCAGGGAT	CTCCTCTATT	CTAGGAGCTA	TTAACTTTAT	CTCTACAGCT
Rfer	H16	KF311449	AGTCTTCATA	TAGCAGGGAT	CTCCTCTATT	CTAGGAGCTA	TTAACTTTAT	CTCTACAGCT
Rfer	H17	KF311360	AGTCTTCATA	TAGCAGGGAT	CTCCTCTATT	CTAGGAGCTA	TTAACTTTAT	CTCTACAGCT
Rfer	H18	KF311473	AGTCTTCATA	TAGCAGGGAT	CTCCTCTATT	CTAGGAGCTA	TTAACTTTAT	CTCTACAGCT
Rfer	H2	GU581549	AGTCTTCATA	TAGCAGGGAT	CTCCTCTATT	CTAGGGGCTA	TTAACTTTAT	CTCTACAGCT
Rfer	H20	KF311433	AGTCTTCATA	TAGCAGGGAT	CTCCTCTATT	CTAGGAGCTA	TTAACTTTAT	CTCTACAGCT
Rfer	H21	KF311474	AGTCTTCATA	TAGCAGGGAT	CTCCTCTATT	CTAGGAGCTA	TTAACTTTAT	CTCTACAGCT
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Rfer	H23	KF311380	AGTCTTCATA	TAGCAGGGAT	CTCCTCTATT	CTAGGAGCTA	TTAACTTTAT	CTCTACAGCT
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Rfer	H26	KF311388	AGTCTTCATA	TAGCAGGGAT	CTCCTCTATT	CTAGGAGCTA	TTAACTTTAT	CTCTACAGCT
Rfer	H27	KF311386	AGTCTTCATA	TAGCAGGGAT	CTCCTCTATT	CTAGGAGCTA	TTAACTTTAT	CTCTACAGCT
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Rfer	H30	KF311392	AGTCTTCATA	TAGCAGGGAT	CTCCTCTATT	CTAGGAGCTA	TTAACTTTAT	CTCTACAGCT
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Rfer	H32	KF311490	AGTCTTCATA	TAGCAGGGAT	CTCCTCTATT	CTAGGAGCTA	TTAACTTTAT	CTCTACAGCT
Rfer	H34	KF311492	AGTCTTCATA	TAGCAGGGGT	CTCCTCTATT	CTAGGAGCTA	TTAACTTTAT	CTCTACAGCT
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Rfer	H37	KF311509	AGTCTTCATA	TAGCAGGAAT	CTCCTCTATT	CTAGGAGCTA	TTAACTTTAT	CTCTACAGCT
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Rfer	H39	KF311508	AGTCTTCATA	TAGCAGGAAT	CTCCTCTATT	CTAGGAGCTA	TTAACTTTAT	CTCTACAGCT
Rfer	H4	GU581545	AGTCTTCATA	TAGCAGGGAT	CTCCTCTATT	CTAGGGGCTA	TTAACTTTAT	CTCTACAGCT

Rfer	H40	KF311506	AGTCTTCATA	TAGCAGGAAT	CTCCTCTATT	CTAGGAGCTA	TTAACTTTAT	CTCTACAGCT
Rfer	H42	KF311501	AGTCTTCATA	TAGCAGGAAT	CTCCTCTATT	CTAGGAGCTA	TTAACTTTAT	CTCTACAGCT
Rfer	H43	KF311525	AGTCTTCATA	TAGCAGGAAT	CTCCTCTATT	CTAGGAGCTA	TTAACTTTAT	CTCTACAGCT
Rfer	H5	GU581539	AGTCTTCATA	TAGCAGGGAT	CTCCTCTATT	CTAGGAGCTA	TTAACTTTAT	CTCTACAGCT
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Rfer	H52	KU696507	AGTCTTCATA	TAGCAGGAAT	CTCCTCTATT	CTAGGAGCTA	TTAACTTTAT	CTCTACAGCT
Rfer	H6	GU581526	AGTCTTCATA	TAGCAGGGAT	CTCCTCTATT	CTAGGGGCTA	TTAACTTTAT	CTCTACAGCT
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Rfer		KY458175	AGTCTTCATA	TAGCAGGGAT	CTCCTCTATT	CTAGGAGCTA	TTAACTTTAT	CTCTACAGCT
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Rfer		KY458177	AGTCTTCATA	TAGCAGGGAT	CTCCTCTATT	CTAGGGGCTA	TTAACTTTAT	CTCTACAGCT
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Rfer	H41	KF311502	AGTCTTCATA	TAGCAGGAAT	CTCCTCTATT	CTAGGAGCTA	TTAACTTTAT	CTCTACAGCT
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Rpal		KR494256	AGCCTTCATA	TAGCAGGAAT	CTCTTCTATT	TTAGGAGCAA	TTAACTTTAT	TTCTACAGCT
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Rpal	Rp10	KU647490	AGCCTTCATA	TAGCAGGAAT	CTCCTCTATT	TTAGGAGCAA	TTAACTTTAT	TTCCACAGCT
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Rpal	Rp12	KU647604	AGCCTTCATA	TAGCAGGAAT	CTCCTCTATT	TTAGGAGCAA	TTAACTTTAT	TTCCACGGCT
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Rpal	Rp3	KU647508	AGCCTTCATA	TAGCAGGAAT	CTCCTCTATT	TTAGGAGCAA	TTAACTTTAT	TTCCACAGCT
Rpal	Rp4	KU647585	AGCCTTCATA	TAGCAGGAAT	CTCCTCTATT	TTAGGAGCAA	TTAACTTTAT	TTCCACAGCT
Rpal	Rp5	KU647584	AGCCTTCATA	TAGCAGGAAT	CTCCTCTATT	TTAGGAGCAA	TTAACTTTAT	TTCCACAGCT
Rpal	Rp6	KU647581	AGCCTTCATA	TAGCAGGAAT	CTCCTCTATT	TTAGGAGCAA	TTAACTTTAT	TTCCACAGCT
Rpal	Rp7	KU647579	AGCCTTCATA	TAGCAGGAAT	CTCCTCTATT	TTAGGAGCAA	TTAACTTTAT	TTCCACAGCT
Rpal	Rp8	KU647502	AGCCTTCATA	TAGCAGGAAT	CTCCTCTATT	TTAGGAGCAA	TTAACTTTAT	TTCCACGGCT
Rpal	Rp9	KU647505	AGCCTTCATA	TAGCAGGAAT	CTCCTCTATT	TTAGGAGCAA	TTAACTTTAT	TTCCACGGCT
Rpal		Uni10	AGCCTTCATA	TAGCAGGAAT	CTCTTCTATT	TTAGGAGCAA	TTAACTTTAT	TTCTACAGCT
Rpal		Uni11	AGCCTTCATA	TAGCAGGAAT	CTCTTCTATT	TTAGGAGCAA	TTAACTTTAT	TTCTACAGCT
Rpal		Uni117	AGCCTTCATA	TAGCAGGAAT	CTCCTCTATT	TTAGGAGCAA	TTAACTTTAT	TTCCACAGCT
Rpal		Uni17	AGCCTTCATA	TAGCAGGAAT	CTCTTCTATT	TTAGGAGCAA	TTAACTTTAT	TTCTACAGCT
Rpal		Uni21	AGCCTTCATA	TAGCAGGAAT	CTCTTCTATT	TTAGGGGCGA	TTAACTTTAT	TTCTACAGCT
Rpal		Uni44	AGCCTTCATA	TAGCAGGAAT	CTCCTCTATT	TTAGGAGCAA	TTAACTTTAT	TTCCACAGCT
Rpal		Uni58	AGCCTTCATA	TAGCAGGAAT	CTCTTCTATT	TTAGGAGCAA	TTAACTTTAT	TTCTACAGCT
Rpho		AY131120	ANTCTCCATA	TAGCAGGAAT	CTCCTCTATT	CTCGGGGCCA	TTAATTTTAT	TTCCACTGCT
Rpho		KY511047	AGTTTACATA	TAGCAGGAAT	TTCCTCTATT	CTTGGGGCCA	TTAATTTTAT	CTCCACTGCT
Rvul		LN612634	AGCCTTCATA	TAGCAGGAAT	CTCTTCAATC	TTAGGGGCTA	TTAACTTTAT	CTCTACAGCT
Rvul		LN612635	AGCCTTCATA	TAGCAGGAAT	CTCTTCAATC	TTAGGGGCTA	TTAACTTTAT	CTCTACAGCT
Rvul		LN612636	AGCCTTCATA	TAGCAGGAAT	CTCTTCAATC	TTAGGGGCTA	TTAACTTTAT	CTCTACAGCT
Rvul		MG051024	AGCCTTCATA	TAGCAGGAAT	CTCTTCAATC	TTAGGGGCTA	TTAACTTTAT	CTCTACAGCT
Rvul		MG051025	AGCCTTCATA	TAGCAGGGAT	CTCTTCAATC	TTAGGAGCTA	TTAACTTTAT	CTCCACAGCT
Rvul		MG051026	AGCCTTCATA	TAGCAGGAAT	CTCTTCAATC	TTAGGGGCTA	TTAACTTTAT	CTCTACAGCT
Rvul	Rv1	KF311588	AGCCTTCATA	TAGCAGGGAT	CTCTTCAATC	TTAGGAGCTA	TTAACTTTAT	CTCCACAGCT
Rvul	Rv10	KF311587	AGCCTTCATA	TAGCAGGAAT	CTCTTCAATC	TTAGGGGCTA	TTAACTTTAT	CTCTACAGCT

Rvul	Rv11	KF311629	AGCCTTCATA	TAGCAGGAAT	CTCTTCAATC	TTAGGGGCTA	TTAACTTTAT	CTCTACAGCT
Rvul	Rv12	KF311550	AGCCTTCATA	TAGCAGGAAT	CTCTTCAATC	TTAGGGGCTA	TTAACTTTAT	CTCTACAGCT
Rvul	Rv13	KF311549	AGCCTTCATA	TAGCAGGAAT	CTCTTCAATC	TTAGGAGCTA	TTAACTTTAT	CTCTACAGCT
Rvul	Rv14	KF311573	AGCCTTCATA	TAGCAGGAAT	CTCTTCAATC	TTAGGGGCTA	TTAACTTTAT	CTCTACAGCT
Rvul	Rv15	KF311546	AGCCTTCATA	TAGCAGGAAT	CTCTTCAATC	TTAGGGGCTA	TTAACTTTAT	CTCTACAGCT
Rvul	Rv16	KF311600	AGCCTTCATA	TAGCAGGAAT	CTCTTCAATC	TTGGGGGCTA	TTAACTTTAT	CTCTACAGCT
Rvul	Rv17	KF311578	AGCCTTCATA	TAGCAGGAAT	CTCTTCAATC	TTAGGGGCTA	TTAACTTTAT	CTCTACAGCT
Rvul	Rv18	KF311593	AGCCTTCATA	TAGCAGGAAT	CTCTTCAATC	TTAGGGGCTA	TTAACTTTAT	CTCTACAGCC
Rvul	Rv19	KF311552	AGCCTTCATA	TAGCAGGAAT	CTCTTCAATC	TTAGGGGCTA	TTAACTTTAT	CTCTACAGCT
Rvul	Rv2	KF311586	AGCCTTCATA	TAGCAGGGAT	CTCTTCAATC	TTAGGAGCTA	TTAACTTTAT	CTCCACAGCT
Rvul	Rv20	KF311594	AGCCTTCATA	TAGCAGGAAT	CTCTTCAATC	TTAGGGGCTA	TTAACTTTAT	CTCTACAGCT
Rvul	Rv21	KF311547	AGCCTTCATA	TAGCAGGAAT	CTCTTCAATC	TTAGGGGCTA	TTAACTTTAT	CTCTACAGCT
Rvul	Rv22	KF311591	AGCCTTCATA	TAGCAGGAAT	CTCTTCAATC	TTAGGGGCCA	TTAACTTTAT	CTCTACAGCT
Rvul	Rv23	KF311545	AGCCTTCATA	TAGCAGGAAT	CTCTTCAATC	TTAGGGGCCA	TTAACTTTAT	CTCTACAGCT
Rvul	Rv24	KF311576	AGCCTTCATA	TAGCAGGAAT	CTCTTCAATC	TTAGGGGCTA	TTAACTTTAT	CTCTACAACT
Rvul	Rv25	KF311548	AGCCTTCATA	TAGCAGGAAT	CTCTTCAATC	TTAGGGGCTA	TTAACTTTAT	CTCTACAACT
Rvul	Rv26	KF311559	AGCCTCCATA	TAGCAGGAAT	CTCTTCAATC	TTAGGGGCTA	TTAACTTTAT	CTCTACAGCC
Rvul	Rv27	KF311561	AGCCTCCATA	TAGCAGGAAT	CTCTTCAATC	TTAGGGGCTA	TTAACTTTAT	CTCTACAGCC
Rvul	Rv28	KF311533	AGCCTCCATA	TAGCAGGAAT	CTCTTCAATC	TTAGGAGCTA	TTAACTTTAT	CTCTACAGCC
Rvul	Rv29	KF311537	AGCCTCCATA	TAGCAGGAAT	CTCTTCAATC	TTAGGGGCTA	TTAACTTTAT	CTCTACAGCC
Rvul	Rv3	KF311633	AGCCTTCATA	TAGCAGGGAT	CTCTTCAATC	TTAGGAGCTA	TTAACTTTAT	CTCCACAGCT
Rvul	Rv30	KF311564	AGCCTCCATA	TAGCAGGAAT	CTCTTCAATC	TTAGGAGCTA	TTAACTTTAT	CTCTACAGCC
Rvul	Rv31	KF311570	AGCCTCCATA	TAGCAGGAAT	CTCTTCAATC	TTAGGGGCTA	TTAACTTTAT	CTCTACAGCC
Rvul	Rv32	KF311530	AGCCTCCATA	TAGCAGGAAT	CTCTTCAATC	TTAGGGGCTA	TTAACTTTAT	CTCTACAGCC
Rvul	Rv33	KF311538	AGCCTCCATA	TAGCAGGAAT	CTCTTCAATC	TTAGGGGCTA	TTAACTTTAT	CTCTACAGCC
Rvul	Rv34	KF311610	AGCCTCCATA	TAGCAGGAAT	CTCTTCAATC	TTAGGAGCTA	TTAACTTTAT	CTCTACAGCC
Rvul	Rv35	KF311605	AGCCTCCATA	TAGCAGGAAT	CTCTTCAATC	TTAGGAGCTA	TTAACTTTAT	CTCTACAGCC
Rvul	Rv36	KF311535	AGCCTCCATA	TAGCAGGAAT	CTCTTCAATC	TTAGGGGCTA	TTAACTTTAT	CTCTACAGCC
Rvul	Rv37	KF311529	AGCCTCCATA	TAGCAGGAAT	CTCTTCAATC	TTAGGGGCTA	TTAACTTTAT	CTCTACAGCC

Rvul	Rv38	KF311532	AGCCTCCATA	TAGCAGGAAT	CTCTTCAATC	TTAGGGGCTA	TTAACTTTAT	CTCTACAGCC
Rvul	Rv39	KF311563	AGCCTCCATA	TAGCAGGAAT	CTCTTCAATC	TTAGGGGCTA	TTAACTTTAT	CTCTACAGCC
Rvul	Rv4	KF311589	AGCCTTCATA	TAGCAGGGAT	CTCTTCAATC	TTAGGAGCTA	TTAACTTTAT	CTCCACAGCT
Rvul	Rv40	KF311568	AGCCTCCATA	TAGCAGGAAT	CTCTTCAATC	TTAGGGGCTA	TTAACTTTAT	CTCTACAGCC
Rvul	Rv41	KF311555	AGCCTCCATA	TAGCAGGAAT	CTCTTCAATC	TTAGGGGCTA	TTAACTTTAT	CTCTACAGCC
Rvul	Rv42	KF311558	AGCCTCCATA	TAGCAGGAAT	CTCTTCAATC	TTAGGGGCTA	TTAACTTTAT	CTCTACAGCC
Rvul	Rv43	KF311560	AGCCTCCATA	TAGCAGGAAT	CTCTTCAATC	TTAGGGGCTA	TTAACTTTAT	CTCTACAGCC
Rvul	Rv44	KF311601	AGCCTCCATA	TAGCAGGAAT	CTCTTCAATC	TTAGGGGCTA	TTAACTTTAT	CTCTACAGCC
Rvul	Rv45	KF311608	AGCCTCCATA	TAGCAGGAAT	CTCTTCAATC	TTAGGGGCTA	TTAACTTTAT	CTCTACAGCC
Rvul	Rv46	KF311604	AGCCTCCATA	TAGCAGGAAT	CTCTTCAATC	TTAGGGGCTA	TTAACTTTAT	CTCTACAGCC
Rvul	Rv47	KF311615	AGCCTCCATA	TAGCAGGAAT	CTCTTCAATC	TTAGGGGCTA	TTAACTTTAT	CTCTACAGCC
Rvul	Rv48	KF311603	AGTCTCCATA	TAGCAGGAAT	CTCTTCAATC	TTAGGGGCTA	TTAACTTTAT	CTCTACAGCC
Rvul	Rv49	KF311609	AGTCTCCATA	TGGCAGGAAT	CTCTTCAATC	TTAGGGGCTA	TTAACTTTAT	CTCTACAGCC
Rvul	Rv5	KF311632	AGCCTTCATA	TAGCAGGGAT	CTCTTCAATC	TTAGGAGCTA	TTAACTTTAT	CTCCACAGCT
Rvul	Rv50	KF311602	AGTCTCCATA	TAGCAGGAAT	CTCTTCAATC	TTAGGGGCTA	TTAACTTTAT	CTCTACAGCC
Rvul	Rv51	KF311621	AGTCTCCATA	TAGCAGGAAT	CTCTTCAATC	TTAGGGGCTA	TTAACTTTAT	CTCTACAGCC
Rvul	Rv52	KF311619	AGTCTCCATA	TAGCAGGAAT	CTCTTCAATC	TTAGGAGCTA	TTAACTTTAT	CTCTACAGCC
Rvul	Rv53	KF311620	AGTCTCCATA	TAGCAGGAAT	CTCTTCAATC	TTAGGGGCTA	TTAACTTTAT	CTCTACAGCC
Rvul	Rv54	KF311622	AGTCTCCATA	TAGCAGGAAT	CTCTTCAATC	TTAGGGGCTA	TTAACTTTAT	CTCTACAGCC
Rvul	Rv55	KF311617	AGTCTCCATA	TAGCAGGAAT	CTCTTCAATC	TTAGGGGCTA	TTAACTTTAT	CTCTACAGCC
Rvul	Rv56	KF311606	AGTCTCCATA	TAGCAGGAAT	CTCTTCAATC	TTAGGGGCTA	TTAACTTTAT	CTCTACAGCC
Rvul	Rv57	KF311614	AGTCTCCATA	TAGCAGGAAT	CTCTTCAATC	TTAGGGGCTA	TTAACTTTAT	CTCTACAGCC
Rvul	Rv59	KF311567	AGCCTCCATA	TAGCAGGAAT	CTCTTCAATC	TTAGGGGCTA	TTAACTTTAT	CTCTACAGCC
Rvul	Rv6	KF311628	AGCCTTCATA	TAGCAGGGAT	CTCTTCAATC	TTAGGAGCTA	TTAACTTTAT	CTCCACAGCT
Rvul	Rv60	KF311607	AGCCTCCATA	TAGCAGGAAT	CTCTTCAATC	TTAGGGGCTA	TTAACTTTAT	CTCTACAGCC
Rvul	Rv61	KF311544	AGCCTCCATA	TAGCAGGAAT	CTCTTCAATT	TTAGGGGCTA	TTAACTTTAT	CTCTACAGCC
Rvul	Rv62	KF311625	AGCCTCCATA	TAGCAGGAAT	CTCTTCAATT	TTAGGGGCTA	TTAACTTTAT	CTCTACAGCC
Rvul	Rv7	KF311528	AGCCTTCATA	TAGCAGGGAT	CTCTTCAATC	TTAGGAGCTA	TTAACTTTAT	CTCCACAGCT
Rvul	Rv8	KF311631	AGCCTTCATA	TAGCAGGGAT	CTCTTCAATC	TTAGGGGCTA	TTAACTTTAT	CTCCACAGCT

Rvul	Rv9	KF311590	AGCCTTCATA	TAGCAGGAAT	CTCTTCAATC	TTAGGGGCTA	TTAACTTTAT	CTCTACAGCT
Slin		AY131102	AGCCTCCATA	TAGCAGGTAT	TTCTTCTATT	CTAGGAGCAA	TTAATTTTAT	TACAACAGCA
Sory		AY131099	AGTTTACATA	TAGCAGGAAT	TTCATCTATT	CTAGGAGCTA	TTAATTTTAT	TACAACAGCC
Sory		GU196317	AGTTTACATA	TAGCAGGAAT	TTCATCTATT	CTAGGAGCTA	TTAATTTTAT	TACAACAGCC
Spheno		NC018351	AGCTTACACA	TAGCAGGTAT	TTCTAGTATT	TTAGGGGCTA	TTAATTTTAT	TTCTACTGCT
Szea		AY131100	AGTCTTCATA	TAGCAGGTAT	TTCATCTATT	CTTGGAGCTA	TTAATTTTAT	TTCTACTACT
Yfro		AY131109	AGTCTTCATA	TAGCTGGTAT	TTCCTCCATT	CTAGGAGCTA	TTAACTTTAT	CTCCACAGCT

Continuation of the Table S4.

			Position					
Species	Ha	Sequences	481-490	491-500	501-510	511-520	521-530	531-540
Dbor		AY131105	ATTAATATAC	GACCTTCAGG	AATATTATCG	GATCGATTAT	CCTTATTTGT	TTGAGCCGTT
Dbor		Uni9	ATTAATATAC	GACCTTCAGG	AATATTATCA	GATCGATTAT	CCTTATTCGT	TTGAGCCGTT
Dper		ASSCR6014	----------	----------	----------	----------	----------	----------
Dper		ASSCR6015	----------	----------	----------	----------	----------	----------
Dper		ASSCR6016	----------	----------	----------	----------	----------	----------
Dper		ASSCR6018	----------	----------	----------	----------	----------	----------
Hcho		JX679716	ATTAATATAC	GACCTGCTGG	TATAACATTT	GATCGTATAC	CTTTATTTGT	ATGAGCAGTT
Hpha		KC112991	ATCAACATAC	GCCCAGCTGG	AATGACATTC	GATCGTATAC	CCCTCTTTGT	ATGGGCAGTT
Nxan		NC018354	TTAAATATAC	GACCTTCTGG	TATATCACCA	GACCGAATAC	CTTTATTTGT	ATGAGCTGTA
Phil		GU244486	ATTAATATAC	GGCCTAGAGG	AATATCTTTA	GATCGTTTAC	CCCTATTTGT	TTGAGCCGTA
Pnod		HQ891474	TTAAATATAC	GACCTAGAGG	GATAACTACA	GATCGTATAT	CTTTATTTGT	CTGAGCAGTA
Rbil	Rb1	KF311645	ATTAATATAC	GACCAACAGG	TATACTCTCT	GACCGCCTCT	CTCTATTTAT	TTGAGCCGTA
Rbil	Rb2	KF311637	ATTAATATAC	GACCAACAGG	TATACTCTCT	GACCGCCTCT	CTCTATTTAT	TTGAGCCGTA
Rbil	Rb3	KF311639	ATTAATATAC	GACCAGCAGG	TATACTCTCT	GACCGCCTCT	CTCTATTTAT	TTGAGCCGTA
Rbil	Rb4	KF311636	ATTAATATAC	GACCAACAGG	TATACTCTCT	GACCGCCTCT	CTCTATTTAT	TTGAGCCGTA
Rbil	Rb5	KF311635	ATTAATATAC	GACCAGCAGG	TATACTCTCT	GACCGCCTCT	CTCTATTTAT	TTGAGCCGTA
Rbil	Rb6	KF311634	ATTAATATAC	GACCAACAGG	TATACTCTCT	GATCGTCTCT	CTCTATTTAT	TTGAGCCGTA
Rbil	Rb7	KF311648	ATTAATATAC	GACCAACAGG	TATACTCTCT	GACCGTCTCT	CTCTATTTAT	TTGAGCCGTA
Rbil	Rb8	KF311647	ATTAATATAC	GACCAACAGG	TATACTCTCT	GACCGTCTCT	CTCTATTTAT	TTGAGCCGTA
Rcru		AY131113	ATTAATATAC	GACCTTCTGG	AATACTTTCT	GATCGTCTTT	CTCTATTTAT	TTGAGCAGTT
Rcru		KF311359	ATTAATATAC	GACCTTCTGG	AATACTTTCT	GATCGTCTTT	CTCTATTTAT	TTGAGCAGTT
Rcru		USCOC565	ATTAATATAC	GACCTTCTGG	AATACTTTCT	GATCGTCTTT	CTCTATTTAT	TTGAGCAGTT
Rfer	H1	GU581582	ATTAATATAC	GACCAACGGG	CATACTTTCT	GATCGCCTCT	CTTTATTTGT	TTGAGCTGTA
Rfer	H10	KF311482	ATTAATATAC	GACCAACGGG	CATACTTTCT	GATCGCCTCT	CTTTATTTGT	TTGAGCTGTA
Rfer	H11	KF311444	ATTAATATAC	GACCAACGGG	CATACTTTCT	GATCGCCTCT	CTTTATTTGT	TTGAGCTGTA

Rfer	H12	KF311487	ATTAATATAC	GACCAACGGG	CATACTTTCT	GATCGCCTCT	CTTTATTTGT	TTGAGCTGTA
Rfer	H13	KF311481	ATTAATATAC	GACCAACGGG	CATACTTTCT	GATCGCCTCT	CTTTATTTGT	TTGAGCTGTA
Rfer	H14	KF311448	ATTAATATAC	GACCAACGGG	CATACTTTCT	GATCGCCTCT	CTTTATTTGT	TTGAGCTGTA
Rfer	H15	JX292125	ATTAATATAC	GACCAACGGG	CATACTTTCT	GATCGCCTCT	CTTTATTTGT	TTGAGCTGTA
Rfer	H16	KF311449	ATTAATATAC	GACCAACGGG	CATACTTTCT	GATCGCCTCT	CTTTATTTGT	TTGAGCTGTA
Rfer	H17	KF311360	ATTAATATAC	GACCAACAGG	CATACTTTCT	GATCGCCTCT	CTTTATTTGT	TTGAGCTGTA
Rfer	H18	KF311473	ATTAATATGC	GACCGACAGG	CATACTTTCT	GATCGCCTCT	CTTTATTTGT	TTGAGCTGTA
Rfer	H2	GU581549	ATTAATATAC	GACCAACGGG	CATACTTTCT	GATCGCCTCT	CTTTATTTGT	TTGAGCTGTA
Rfer	H20	KF311433	ATTAATATAC	GACCAACAGG	CATACTTTCT	GATCGCCTCT	CTTTATTTAT	TTGAGCTGTA
Rfer	H21	KF311474	ATTAATATAC	GACCAACAGG	CATACTTTCT	GATCGCCTCT	CTTTATTTGT	TTGAGCTGTA
Rfer	H22	KF311516	ATTAATATAC	GACCAACAGG	CATACTTTCT	GATCGCCTCT	CTTTATTTGT	TTGAGCTGTA
Rfer	H23	KF311380	ATTAATATAC	GACCAACAGG	CATACTTTCT	GATCGCCTCT	CTTTATTTGT	TTGAGCTGTA
Rfer	H24	KF311389	ATTAATATAC	GACCAACAGG	CATACTTTCT	GATCGCCTCT	CTTTATTTGT	TTGAGCTGTA
Rfer	H25	KF311384	ATTAATATAC	GACCAACAGG	CATACTTTCT	GATCGCCTCT	CTTTATTTGT	TTGAGCTGTA
Rfer	H26	KF311388	ATTAATATAC	GACCAACAGG	CATACTTTCT	GATCGCCTCT	CTTTATTTGT	TTGAGCTGTA
Rfer	H27	KF311386	ATTAATATAC	GACCAACAGG	CATACTTTCT	GATCGCCTCT	CTTTATTTGT	TTGAGCTGTA
Rfer	H28	KF311399	ATTAATATAC	GACCAACAGG	CATACTTTCT	GATCGCCTCT	CTTTATTTGT	TTGAGCTGTA
Rfer	H29	KF311383	ATTAATATAC	GACCAACAGG	CATACTTTCT	GATCGCCTCT	CTTTATTTGT	TTGAGCTGTA
Rfer	H3	GU581547	ATTAATATAC	GACCAACGGG	CATACTTTCT	GATCACCTCT	CTTTATTTGT	TTGAGCTGTA
Rfer	H30	KF311392	ATTAATATAC	GACCAACAGG	CATACTTTCT	GATCGCCTCT	CTTTATTTGT	TTGAGCTGTA
Rfer	H31	KF311379	ATTAATATAC	GACCAACAGG	CATACTTTCT	GATCGCCTCT	CTTTATTTGT	TTGAGCTGTA
Rfer	H32	KF311490	ATTAATATAC	GACCAACAGG	CATACTTTCT	GATCGCCTCT	CTTTATTTGT	TTGAGCTGTA
Rfer	H34	KF311492	ATTAATATAC	GACCAACAGG	CATACTTTCT	GATCGCCTCT	CTTTATTTGT	TTGAGCTGTA
Rfer	H35	KF311496	ATTAATATAC	GACCAACAGG	CATACTTTCT	GATCGCCTCT	CTTTATTTGT	TTGAGCTGTA
Rfer	H36	KF311500	ATTAATATAC	GACCAACAGG	CATACTTTCT	GATCGCCTCT	CTTTATTTGT	TTGAGCTGTA
Rfer	H37	KF311509	ATTAATATAC	GACCAACGGG	CATACTTTCT	GATCGCCTCT	CTTTATTTGT	TTGAGCTGTA
Rfer	H38	KF311505	ATTAATATAC	GACCAACGGG	CATACTTTCT	GATCGCCTCT	CTTTATTTGT	TTGAGCTGTA
Rfer	H39	KF311508	ATTAATATAC	GACCAACGGG	CATACTTTCT	GATCGCCTCT	CTTTATTTGT	TTGAGCTGTA
Rfer	H4	GU581545	ATTAATATAC	GACCAACGGG	CATACTTTCT	GATCACCTCT	CTTTATTTGT	TTGAGCTGTA

Rfer	H40	KF311506	ATTAATATAC	GACCAACGGG	CATACTTTCT	GATCGCCTCT	CTTTATTTGT	TTGAGCTGTA
Rfer	H42	KF311501	ATTAATATAC	GACCAACGGG	CATACTTTCT	GATCGCCTCT	CTTTATTTGT	TTGAGCTGTA
Rfer	H43	KF311525	ATTAATATAC	GACCAACGGG	CATACTTTCT	GATCGCCTCT	CTTTATTTGT	TTGAGCTGTA
Rfer	H5	GU581539	ATTAATATAC	GACCAACGGG	CATACTTTCT	GATCGCCTCT	CTTTATTTGT	TTGAGCTGTA
Rfer	H51	KU696497	ATTAATATAC	GACCAACGGG	CATACTTTCT	GATCGCCTCT	CTTTATTTGT	TTGAGCTGTA
Rfer	H52	KU696507	ATTAATATAC	GACCAACGGG	CATACTTTCT	GATCGCCTCT	CTTTATTTGT	TTGAGCTGTA
Rfer	H6	GU581526	ATTAATATAC	GACCAACGGG	CATACTTTCT	GATCGCCTCT	CTTTATTTGT	TTGAGCTGTA
Rfer	H7	GU581525	ATTAATATAC	GACCAACGGG	CATACTTTCT	GATCGCCTCT	CTTTATTTGT	TTGAGCTGTA
Rfer	H8	GU581319	ATTAATATAC	GACCAACAGG	CATACTTTCT	GATCGCCTCT	CTTTATTTGT	TTGAGCTGTA
Rfer	H9	KF311446	ATTAATATAC	GACCAACGGG	CATACTTTCT	GATCGCCTCT	CTTTATTTGT	TTGAGCTGTA
Rfer		JX292124	ATTAATATAC	GACCAACGGG	CATACTTTCT	GATCGCCTCT	CTTTATTTGT	TTGAGCTGTA
Rfer		JX294413	ATTAATATAC	GACCAACGGG	CATACTTTCT	GATCGCCTCT	CTTTATTTGT	TTGGGCTGTA
Rfer		KF413063	ATTAATATAC	GACCAACGGG	CATACTTTCT	GATCGCCTCT	CTTTATTTGT	TTGAGCTGTA
Rfer		KF413064	ATTAATATAC	GACCAACAGG	CATACTTTCT	GATCGCCTCT	CTTTATTTAT	TTGAGCTGTA
Rfer		KF413065	ATTAATATAC	GACCGACAGG	TATACTTTCT	GATCGCCTCT	CTTTATTTGT	TTGAGCTGTA
Rfer		KF413066	ATTAATATAC	GACCAACGGG	AATACTTTCT	GATCGCCTCT	CTTTATTTGT	TTGAGCTGTA
Rfer		KF413067	ATTAATATAC	GACCAACGGG	CATACTTTCT	GATCGCCTCT	CTTTATTTGT	TTGAGCTGTA
Rfer		KF413068	ATTAATATAC	GACCAACAGG	CATACTTTCT	GATCGCCTCT	CTTTATTTGT	TTGAGCTGTA
Rfer		KF413069	ATTAATATAC	GACCGACAGG	CATACTTTCT	GATCGCCTCT	CTTTATTTGT	TTGAGCTGTA
Rfer		KF413070	ATTAATATAC	GACCAACAGG	CATACTTTCT	GATCGCCTCT	CTTTATTTGT	TTGAGCTGTA
Rfer		KF413071	ATTAATATAC	GACCAACGGG	CATACTTTCT	GATCGCCTCT	CTTTATTTGT	TTGAGCTGTA
Rfer		KF413072	ATTAATATAC	GACCAACGGG	CATACTTTCT	GATCGCCTCT	CTTTATTTGT	TTGAGCTGTA
Rfer		KF413073	ATTAATATAC	GACCAACAGG	CATACTTTCT	GATCGCCTCT	CTTTATTTGT	TTGAGCTGTA
Rfer		KT989230	ATTAATATAC	GACCAACAGG	CATACTTTCT	GATCGCCTCT	CTTTATTTGT	TTGAGCTGTA
Rfer		KT989231	ATTAATATAC	GACCAACAGG	CATACTTTCT	GATCGCCTCT	CTTTATTTGT	TTGAGCTGTA
Rfer		KT989232	ATTAATATAC	GACCAACAGG	CATACTTTCT	GATCGCCTCT	CTTTATTTGT	TTGAGCTGTA
Rfer		KT989233	ATTAATATAC	GACCAACAGG	CATACTTTCT	GATCGCCTCT	CTTTATTTGT	TTGAGCTGTA
Rfer		KT989234	ATTAATATAC	GACCAACAGG	CATACTTTCT	GATCGCCTCT	CTTTATTTGT	TTGAGCTGTA
Rfer		KU916538	ATTAATATAC	GACCAACAGG	CATACTTTCT	GATCGCCTCT	CTTTATTTGT	TTGAGCTGTA

Rfer		KY458175	ATTAATATAC	GACCAACGGG	CATACTTTCT	GATCGCCTCT	CTTTATTTGT	TTGAGCTGTA
Rfer		KY458176	ATTAATATAC	GACCAACGGG	CATACTTTCT	GATCGCCTCT	CTTTATTTGT	TTGAGCTGTA
Rfer		KY458177	ATTAATATAC	GACCAACGGG	CATACTTTCT	GATCGCCTCT	CTTTATTTGT	TTGAGCTGTA
Rfer		LC474878	ATTAATATAC	GACCAACAGG	CATACTTTCT	GATCGCCTCT	CTTTATTTGT	TTGAGCTGTA
Rfer		LC474880	ATTAATATAC	GACCAACAGG	CATACTTTCT	GATCGCCTCT	CTTTATTTGT	TTGAGCTGTA
Rfer		LC474881	ATTAATATAC	GACCAACAGG	CATACTTTCT	GATCGCCTCT	CTTTATTTGT	TTGAGCTGTA
Rfer		LC474882	ATTAATATAC	GACCAACAGG	CATACTTTCT	GATCGCCTCT	CTTTATTTGT	TTGAGCTGTA
Rfer		LC474884	ATTAATATAC	GACCAACAGG	CATACTTTCT	GATCGCCTCT	CTTTATTTGT	TTGAGCTGTA
Rfer		LC474885	ATTAATATAC	GACCAACAGG	CATACTTTCT	GATCGCCTCT	CTTTATTTGT	TTGAGCTGTA
Rfer		LC474886	ATTAATATAC	GACCAACAGG	CATACTTTCT	GATCGCCTCT	CTTTATTTGT	TTGAGCTGTA
Rfer		LC474887	ATTAATATAC	GACCAACAGG	CATACTTTCT	GATCGCCTCT	CTTTATTTGT	TTGAGCTGTA
Rfer		LC474888	ATTAATATAC	GACCAACAGG	CATACTTTCT	GATCGCCTCT	CTTTATTTGT	TTGAGCTGTA
Rfer		LC474889	ATTAATATAC	GACCAACAGG	CATACTTTCT	GATCGCCTCT	CTTTATTTGT	TTGAGCTGTA
Rfer		LC474890	ATTAATATAC	GACCAACAGG	CATACTTTCT	GATCGCCTCT	CTTTATTTGT	TTGAGCTGTA
Rfer		LC474891	ATTAATATAC	GACCAACAGG	CATACTTTCT	GATCGCCTCT	CTTTATTTGT	TTGAGCTGTA
Rfer		LC474892	ATTAATATAC	GACCAACAGG	CATACTTTCT	GATCGCCTCT	CTTTATTTGT	TTGAGCTGTA
Rfer		LC474893	ATTAATATAC	GACCAACAGG	CATACTTTCT	GATCGCCTCT	CTTTATTTGT	TTGAGCTGTA
Rfer		LC474894	ATTAATATAC	GACCAACAGG	CATACTTTCT	GATCGCCTCT	CTTTATTTGT	TTGAGCTGTA
Rfer		LC474895	ATTAATATAC	GACCAACAGG	CATACTTTCT	GATCGCCTCT	CTTTATTTGT	TTGAGCTGTA
Rfer		LC474896	ATTAATATAC	GACCAACAGG	CATACTTTCT	GATCGCCTCT	CTTTATTTGT	TTGAGCTGTA
Rfer		LC474897	ATTAATATAC	GACCAACAGG	CATACTTTCT	GATCGCCTCT	CTTTATTTGT	TTGAGCTGTA
Rfer		LC474898	ATTAATATAC	GACCAACAGG	CATACTTTCT	GATCGCCTCT	CTTTATTTGT	TTGAGCTGTA
Rfer		LC474899	ATTAATATAC	GACCAACAGG	CATACTTTCT	GATCGCCTCT	CTTTATTTGT	TTGAGCTGTA
Rfer		LC474902	ATTAATATAC	GACCAACAGG	CATACTTTCT	GATCGCCTCT	CTTTATTTGT	TTGAGCTGTA
Rfer		LC474903	ATTAATATAC	GACCAACAGG	CATACTTTCT	GATCGCCTCT	CTTTATTTGT	TTGAGCTGTA
Rfer		LC474904	ATTAATATAC	GACCAACAGG	CATACTTTCT	GATCGCCTCT	CTTTATTTGT	TTGAGCTGTA
Rfer		LC474905	ATTAATATAC	GACCAACAGG	CATACTTTCT	GATCGCCTCT	CTTTATTTGT	TTGAGCTGTA
Rfer		LC474906	ATTAATATAC	GACCAACAGG	CATACTTTCT	GATCGCCTCT	CTTTATTTGT	TTGAGCTGTA
Rfer		LC474907	ATTAATATAC	GACCAACAGG	CATACTTTCT	GATCGCCTCT	CTTTATTTGT	TTGAGCTGTA

Rfer		LC474908	ATTAATATAC	GACCAACAGG	CATACTTTCT	GATCGCCTCT	CTTTATTTGT	TTGAGCTGTA
Rfer		LC474909	ATTAATATAC	GACCAACAGG	CATACTTTCT	GATCGCCTCT	CTTTATTTGT	TTGAGCTGTA
Rfer		LC474910	ATTAATATAC	GACCAACAGG	CATACTTTCT	GATCGCCTCT	CTTTATTTGT	TTGAGCTGTA
Rfer		LC474911	ATTAATATAC	GACCAACAGG	CATACTTTCT	GATCGCCTCT	CTTTATTTGT	TTGAGCTGTA
Rfer		LC474912	ATTAATATAC	GACCAACAGG	CATACTTTCT	GATCGCCTCT	CTTTATTTGT	TTGAGCTGTA
Rfer		LC474913	ATTAATATAC	GACCAACAGG	CATACTTTCT	GATCGCCTCT	CTTTATTTGT	TTGAGCTGTA
Rfer		LC474914	ATTAATATAC	GACCAACAGG	CATACTTTCT	GATCGCCTCT	CTTTATTTGT	TTGAGCTGTA
Rfer		LC474915	ATTAATATAC	GACCAACAGG	CATACTTTCT	GATCGCCTCT	CTTTATTTGT	TTGAGCTGTA
Rfer		LC474916	ATTAATATAC	GACCAACAGG	CATACTTTCT	GATCGCCTCT	CTTTATTTGT	TTGAGCTGTA
Rfer		LC474917	ATTAATATAC	GACCAACAGG	CATACTTTCT	GATCGCCTCT	CTTTATTTGT	TTGAGCTGTA
Rfer		LC474918	ATTAATATAC	GACCAACAGG	CATACTTTCT	GATCGCCTCT	CTTTATTTGT	TTGAGCTGTA
Rfer		LC474919	ATTAATATAC	GACCAACAGG	CATACTTTCT	GATCGCCTCT	CTTTATTTGT	TTGAGCTGTA
Rfer		LC474920	ATTAATATAC	GACCAACAGG	CATACTTTCT	GATCGCCTCT	CTTTATTTGT	TTGAGCTGTA
Rfer		LC474921	ATTAATATAC	GACCAACAGG	CATACTTTCT	GATCGCCTCT	CTTTATTTGT	TTGAGCTGTA
Rfer		LC474922	ATTAATATAC	GACCAACAGG	CATACTTTCT	GATCGCCTCT	CTTTATTTGT	TTGAGCTGTA
Rfer		LC474923	ATTAATATAC	GACCAACAGG	CATACTTTCT	GATCGCCTCT	CTTTATTTGT	TTGAGCTGTA
Rfer		LC474924	ATTAATATAC	GACCAACAGG	CATACTTTCT	GATCGCCTCT	CTTTATTTGT	TTGAGCTGTA
Rfer		LC474925	ATTAATATAC	GACCAACAGG	CATACTTTCT	GATCGCCTCT	CTTTATTTGT	TTGAGCTGTA
Rfer		LC474926	ATTAATATAC	GACCAACAGG	CATACTTTCT	GATCGCCTCT	CTTTATTTGT	TTGAGCTGTA
Rfer		LC474927	ATTAATATAC	GACCAACAGG	CATACTTTCT	GATCGCCTCT	CTTTATTTGT	TTGAGCTGTA
Rfer		LC474928	ATTAATATAC	GACCAACAGG	CATACTTTCT	GATCGCCTCT	CTTTATTTGT	TTGAGCTGTA
Rfer		LC474929	ATTAATATAC	GACCAACAGG	CATACTTTCT	GATCGCCTCT	CTTTATTTGT	TTGAGCTGTA
Rfer		MF448526	ATTAATATAC	GACCAACAGG	CATACTTTCT	GATCGCCTCT	CTTTATTTGT	TTGAGCTGTA
Rfer		MG051027	ATTAATATAC	GACCAACAGG	CATACTTTCT	GATCGCCTCT	CTTTATTTGT	TTGAGCTGTA
Rfer		MG051028	ATTAATATAC	GACCAACAGG	CATACTTTCT	GATCGCCTCT	CTTTATTTGT	TTGAGCTGTA
Rfer		MG051029	ATTAATATAC	GACCAACAGG	CATACTTTCT	GATCGCCTCT	CTTTATTTGT	TTGAGCTGTA
Rfer		MG051030	ATTAATATAC	GACCAACAGG	CATACTTTCT	GATCGCCTCT	CTTTATTTGT	TTGAGCTGTA
Rfer		MG051031	ATTAATATAC	GACCAACAGG	CATACTTTCT	GATCGCCTCT	CTTTATTTGT	TTGAGCTGTA
Rfer		MG872818	ATTAATATAC	GACCAACAGG	CATACTTTCT	GATCGCCTCT	CTTTATTTGT	TTGAGCTGTA

Rfer		MG883395	ATTAATATAC	GACCAACAGG	CATACTTTCT	GATCGCCTCT	CTTTATTTGT	TTGAGCTGTA
Rfer		MG883396	ATTAATATAC	GACCAACAGG	CATACTTTCT	GATCGCCTCT	CTTTATTTGT	TTGAGCTGTA
Rfer		MG883397	ATTAATATAC	GACCAACAGG	CATACTTTCT	GATCGCCTCT	CTTTATTTGT	TTGAGCTGTA
Rfer		MG883398	ATTAATATAC	GACCAACAGG	CATACTTTCT	GATCGCCTCT	CTTTATTTGT	TTGAGCTGTA
Rfer		MG883399	ATTAATATAC	GACCAACAGG	CATACTTTCT	GATCGCCTCT	CTTTATTTGT	TTGAGCTGTA
Rfer		MH016277	ATTAATATAC	GACCAACAGG	CATACTTTCT	GATCGCCTCT	CTTTATTTGT	TTGAGCTGTA
Rfer		MH016278	ATTAATATAC	GACCAACAGG	CATACTTTCT	GATCGCCTCT	CTTTATTTGT	TTGAGCTGTA
Rfer		MH016279	ATTAATATAC	GACCAACAGG	CATACTTTCT	GATCGCCTCT	CTTTATTTGT	TTGAGCTGTA
Rfer		MH016604	ATTAATATAC	GACCAACAGG	CATACTTTCT	GATCGCCTCT	CTTTATTTGT	TTGAGCTGTA
Rfer		MH016605	ATTAATATAC	GACCAACAGG	CATACTTTCT	GATCGCCTCT	CTTTATTTGT	TTGAGCTGTA
Rfer		MH016606	ATTAATATAC	GACCAACAGG	CATACTTTCT	GATCGCCTCT	CTTTATTTGT	TTGAGCTGTA
Rfer		MH016607	ATTAATATAC	GACCAACAGG	CATACTTTCT	GATCGCCTCT	CTTTATTTGT	TTGAGCTGTA
Rfer		MH016608	ATTAATATAC	GACCAACAGG	CATACTTTCT	GATCGCCTCT	CTTTATTTGT	TTGAGCTGTA
Rfer		MH016609	ATTAATATAC	GACCAACAGG	CATACTTTCT	GATCGCCTCT	CTTTATTTGT	TTGAGCTGTA
Rfer		MH016610	ATTAATATAC	GACCAACAGG	CATACTTTCT	GATCGCCTCT	CTTTATTTGT	TTGAGCTGTA
Rfer		MH016611	ATTAATATAC	GACCAACAGG	CATACTTTCT	GATCGCCTCT	CTTTATTTGT	TTGAGCTGTA
Rfer		MH016612	ATTAATATAC	GACCAACAGG	CATACTTTCT	GATCGCCTCT	CTTTATTTGT	TTGAGCTGTA
Rfer		MH016613	ATTAATATAC	GACCAACAGG	CATACTTTCT	GATCGCCTCT	CTTTATTTGT	TTGAGCTGTA
Rfer		MH016614	ATTAATATAC	GACCAACAGG	CATACTTTCT	GATCGCCTCT	CTTTATTTGT	TTGAGCTGTA
Rfer		MH016615	ATTAATATAC	GACCAACAGG	CATACTTTCT	GATCGCCTCT	CTTTATTTGT	TTGAGCTGTA
Rfer		MH016616	ATTAATATAC	GACCAACAGG	CATACTTTCT	GATCGCCTCT	CTTTATTTGT	TTGAGCTGTA
Rfer		MH016617	ATTAATATAC	GACCAACAGG	CATACTTTCT	GATCGCCTCT	CTTTATTTGT	TTGAGCTGTA
Rfer		MH016618	ATTAATATAC	GACCAACAGG	CATACTTTCT	GATCGCCTCT	CTTTATTTGT	TTGAGCTGTA
Rfer		MH016619	ATTAATATAC	GACCAACAGG	CATACTTTCT	GATCGCCTCT	CTTTATTTGT	TTGAGCTGTA
Rfer		MH016620	ATTAATATAC	GACCAACAGG	CATACTTTCT	GATCGCCTCT	CTTTATTTGT	TTGAGCTGTA
Rfer		MH016621	ATTAATATAC	GACCAACAGG	CATACTTTCT	GATCGCCTCT	CTTTATTTGT	TTGAGCTGTA
Rfer		MH016622	ATTAATATAC	GACCAACAGG	CATACTTTCT	GATCGCCTCT	CTTTATTTGT	TTGAGCTGTA
Rfer		MH016623	ATTAATATAC	GACCAACAGG	CATACTTTCT	GATCGCCTCT	CTTTATTTGT	TTGAGCTGTA
Rfer		MH016624	ATTAATATAC	GACCAACAGG	CATACTTTCT	GATCGCCTCT	CTTTATTTGT	TTGAGCTGTA

Rfer		MH016625	ATTAATATAC	GACCAACAGG	CATACTTTCT	GATCGCCTCT	CTTTATTTGT	TTGAGCTGTA
Rfer		MH016626	ATTAATATAC	GACCAACAGG	CATACTTTCT	GATCGCCTCT	CTTTATTTGT	TTGAGCTGTA
Rfer		MH016627	ATTAATATAC	GACCAACAGG	CATACTTTCT	GATCGCCTCT	CTTTATTTGT	TTGAGCTGTA
Rfer		MH016628	ATTAATATAC	GACCAACAGG	CATACTTTCT	GATCGCCTCT	CTTTATTTGT	TTGAGCTGTA
Rfer		MH016629	ATTAATATAC	GACCAACAGG	CATACTTTCT	GATCGCCTCT	CTTTATTTGT	TTGAGCTGTA
Rfer		MH016630	ATTAATATAC	GACCAACAGG	CATACTTTCT	GATCGCCTCT	CTTTATTTGT	TTGAGCTGTA
Rfer		MH016631	ATTAATATAC	GACCAACAGG	CATACTTTCT	GATCGCCTCT	CTTTATTTGT	TTGAGCTGTA
Rfer		MH016632	ATTAATATAC	GACCAACAGG	CATACTTTCT	GATCGCCTCT	CTTTATTTGT	TTGAGCTGTA
Rfer		MH016633	ATTAATATAC	GACCAACAGG	CATACTTTCT	GATCGCCTCT	CTTTATTTGT	TTGAGCTGTA
Rfer		MH016634	ATTAATATAC	GACCAACAGG	CATACTTTCT	GATCGCCTCT	CTTTATTTGT	TTGAGCTGTA
Rfer		MH016635	ATTAATATAC	GACCAACAGG	CATACTTTCT	GATCGCCTCT	CTTTATTTGT	TTGAGCTGTA
Rfer		MH016636	ATTAATATAC	GACCAACAGG	CATACTTTCT	GATCGCCTCT	CTTTATTTGT	TTGAGCTGTA
Rfer		MH016637	ATTAATATAC	GACCAACAGG	CATACTTTCT	GATCGCCTCT	CTTTATTTGT	TTGATCTGTA
Rfer	H19	KF311403	ATTAATATAC	GACCAACAGG	CATACTTTCT	GATCGCCTCT	CTTTATTTGT	TTGAGCTGTA
Rfer	H41	KF311502	ATTAATATAC	GACCAACGGG	CATACTTTCT	GATCGCCTCT	CTTTATTTGT	TTGAGCTGTA
Rpal		ASSCR6357	ATTAATATAC	GTCCATCAGG	AATATTATCC	GATCGACTTT	CTCTTTTTGT	CTGAGCTGTT
Rpal		ASSCR6358	ATTAATATAC	GTCCATCAGG	AATATTATCC	GATCGACTTT	CTCTTTTTGT	CTGAGCTGTT
Rpal		AY131121	ATTAATATAC	GTCCATCAGG	AATATTATCA	GATCGACTTT	CTCTTTTTGT	TTGAGCCGTC
Rpal		GU581629	ATTAATATAC	GTCCATCAGG	AATATTATCA	GATCGACTTT	CTCTTTTTGT	TTGAGCCGTC
Rpal		KF311358	ATTAATATAC	GTCCATCAGG	AATATTATCC	GATCGACTTT	CTCTTTTTGT	CTGAGCTGTT
Rpal		KR494254	ATTAATATAC	GTCCATCAGG	AATATTATCC	GATCGACTTT	CTCTTTTTGT	CTGAGCTGTC
Rpal		KR494255	ATTAATATAC	GTCCATCAGG	AATATTATCC	GATCGACTTT	CTCTTTTTGT	CTGAGCTGTC
Rpal		KR494256	ATTAATATAC	GTCCATCAGG	AATATTATCC	GATCGACTTT	CTCTTTTTGT	CTGAGCTGTC
Rpal		KR494257	ATTAATATAC	GTCCATCAGG	AATATTATCC	GATCGACTTT	CTCTTTTTGT	CTGAGCTGTC
Rpal		KR494258	ATTAATATAC	GTCCATCAGG	AATATTATCC	GATCGACTTT	CTCTTTTTGT	CTGAGCTGTC
Rpal		KR494259	ATTAATATAC	GTCCATCAGG	AATATTATCC	GATCGACTTT	CTCTTTTTGT	CTGAGCTGTC
Rpal		KR494260	ATTAATATAC	GTCCATCAGG	AATATTATCC	GATCGACTTT	CTCTTTTTGT	CTGAGCTGTC
Rpal		KR494261	ATTAATATAC	GTCCATCAGG	AATATTATCC	GATCGACTTT	CTCTTTTTGT	CTGAGCTGTC
Rpal	Rp1	KU647599	ATTAATATAC	GTCCATCAGG	AATATTATCA	GATCGACTTT	CTCTTTTTGT	TTGAGCCGTC

Rpal	Rp10	KU647490	ATTAATATAC	GTCCATCAGG	AATATTATCA	GATCGACTTT	CTCTTTTTGT	TTGAGCTGTC
Rpal	Rp11	KU647489	ATTAATATAC	GTCCATCAGG	AATATTATCA	GATCGACTTT	CTCTTTTTGT	TTGAGCTGTC
Rpal	Rp12	KU647604	ATTAATATAC	GTCCATCAGG	AATATTATCA	GATCGACTTT	CTCTTTTTGT	TTGAGCTGTC
Rpal	Rp13	KU647575	ATTAATATAC	GTCCATCAGG	AATATTATCA	GATCGACTTT	CTCTTTTTGT	TTGAGCTGTC
Rpal	Rp2	KU647587	ATTAATATAC	GTCCATCAGG	AATATTATCA	GATCGACTTT	CTCTTTTTGT	TTGAGCCGTC
Rpal	Rp3	KU647508	ATTAATATAC	GTCCATCAGG	AATATTATCA	GATCGACTTT	CTCTTTTTGT	TTGAGCCGTC
Rpal	Rp4	KU647585	ATTAATATAC	GTCCATCAGG	AATATTATCA	GATCGACTTT	CTCTTTTTGT	TTGAGCCGTC
Rpal	Rp5	KU647584	ATTAATATAC	GTCCATCAGG	AATATTATCA	GATCGACTTT	CTCTTTTTGT	TTGAGCTGTC
Rpal	Rp6	KU647581	ATTAATATAC	GTCCATCAGG	AATATTATCA	GATCGACTTT	CTCTTTTTGT	TTGAGCCGTC
Rpal	Rp7	KU647579	ATTAATATAC	GTCCATCAGG	AATATTATCA	GATCGACTTT	CTCTTTTTGT	TTGAGCCGTC
Rpal	Rp8	KU647502	ATTAATATAC	GTCCATCAGG	AATATTATCA	GATCGACTTT	CTCTTTTTGT	TTGAGCTGTC
Rpal	Rp9	KU647505	ATTAATATAC	GTCCATCAGG	AATATTATCA	GATCGACTTT	CTCTTTTTGT	TTGAGCTGTC
Rpal		Uni10	ATTAATATAC	GTCCATCAGG	AATATTATCC	GATCAACTTT	CTCTTTTTGT	CTGAGCTGTC
Rpal		Uni11	ATTAATATAC	GTCCATCAGG	AATATTATCC	GATCGACTTT	CTCTTTTTGT	CTGAGCTGTC
Rpal		Uni117	ATTAATATAC	GTCCATCAGG	AATATTATCA	GATCGACTTT	CTCTTTTTGT	TTGAGCCGTC
Rpal		Uni17	ATTAATATAC	GTCCATCAGG	AATATTATCC	GATCGACTTT	CTCTTTTTGT	CTGAGCTGTC
Rpal		Uni21	ATTAATATAC	GTCCATCAGG	AATATTATCC	GATCGACTTT	CTCTTTTTGT	CTGAGCTGTT
Rpal		Uni44	ATTAATATAC	GTCCATCAGG	AATATTATCA	GATCGACTTT	CTCTTTTTGT	TTGAGCCGTC
Rpal		Uni58	ATTAATATAC	GTCCATCAGG	AATATTATCC	GATCGACTTT	CTCTTTTTGT	CTGAGCTGTC
Rpho		AY131120	ATCAATATAC	GTCCAGCAGG	TATACTCTCA	GATCGTCTTT	CTCTTTTTGT	TTGAGCAGTA
Rpho		KY511047	ATCAATATAC	GTCCAGCAGG	AATACTTTCA	GATCGACTTT	CTCTTTTTGT	TTGAGCAGTA
Rvul		LN612634	ATTAATATAC	GACCAAAGGG	CATACTTTCC	GACCGACTTT	CTCTATTTAT	CTGAGCCGTT
Rvul		LN612635	ATTAATATAC	GACCAAAGGG	CATACTTTCC	GACCGACTTT	CTCTATTTAT	CTGAGCCGTT
Rvul		LN612636	ATTAATATAC	GACCAAAGGG	CATACTTTCC	GACCGACTTT	CTCTATTTAT	CTGAGCCGTT
Rvul		MG051024	ATTAATATAC	GACCAAAGGG	CATACTTTCC	GACCGACTTT	CTCTATTTAT	CTGAGCCGTT
Rvul		MG051025	ATTAATATAC	GACCAAAGGG	TATACTTTCC	GACCGACTTT	CTCTATTTAT	CTGAGCCGTT
Rvul		MG051026	ATTAATATAC	GACCAAAGGG	CATACTTTCC	GACCGACTTT	CTCTATTTAT	CTGAGCCGTT
Rvul	Rv1	KF311588	ATTAATATAC	GGCCAAAGGG	TATACTTTCC	GACCGACTTT	CTCTATTTAT	CTGAGCCGTT
Rvul	Rv10	KF311587	ATTAATATAC	GACCAAAGGG	CATACTTTCC	GACCGACTTT	CTCTATTTAT	CTGAGCCGTT

Rvul	Rv11	KF311629	ATTAATATAC	GACCAAAGGG	CATACTTTCC	GACCGACTTT	CTCTATTTAT	CTGGGCCGTT
Rvul	Rv12	KF311550	ATTAATATAC	GACCAAAGGG	CATACTTTCC	GACCGACTTT	CTCTATTTAT	CTGAGCCGTT
Rvul	Rv13	KF311549	ATTAATATAC	GACCAAAGGG	CATACTTTCC	GACCGACTTT	CTCTATTTAT	CTGAGCCGTT
Rvul	Rv14	KF311573	ATTAATATAC	GACCAAAGGG	CATACTTTCC	GACCGACTTT	CTCTATTTAT	CTGAGCCGTT
Rvul	Rv15	KF311546	ATTAATATAC	GGCCAAAGGG	CATACTTTCC	GACCGACTTT	CTCTATTTAT	CTGAGCCGTT
Rvul	Rv16	KF311600	ATTAATATAC	GGCCAAAGGG	CATACTTTCC	GACCGACTTT	CTCTATTTAT	CTGAGCCGTT
Rvul	Rv17	KF311578	ATTAATATAC	GGCCAAAGGG	CATACTTTCC	GACCGACTTT	CTCTATTTAT	CTGAGCCGTT
Rvul	Rv18	KF311593	ATTAATATAC	GACCAAAGGG	CATACTTTCC	GACCGACTTT	CTCTATTTAT	CTGAGCCGTT
Rvul	Rv19	KF311552	ATTAATATAC	GACCAAAGGG	CATACTTTCC	GACCGACTTT	CTCTATTTAT	CTGAGCCGTT
Rvul	Rv2	KF311586	ATTAATATAC	GGCCAAAGGG	TATACTTTCC	GACCGACTTT	CTCTATTTAT	CTGAGCCGTT
Rvul	Rv20	KF311594	ATTAATATAC	GACCAAAGGG	CATACTTTCC	GACCGACTTT	CTCTATTTAT	CTGAGCCGTT
Rvul	Rv21	KF311547	ATTAATATAC	GACCAAAGGG	CATACTTTCC	GACCGACTTT	CTCTATTTAT	CTGAGCCGTT
Rvul	Rv22	KF311591	ATTAATATAC	GACCAAAGGG	CATACTTTCC	GACCGACTTT	CTCTATTTAT	CTGAGCCGTT
Rvul	Rv23	KF311545	ATTAATATAC	GACCAAAGGG	CATACTTTCC	GACCGACTTT	CTCTATTTAT	CTGAGCCGTT
Rvul	Rv24	KF311576	ATTAATATAC	GACCAAAGGG	CATACTTTCC	GACCGACTTT	CTCTATTTAT	CTGAGCCGTT
Rvul	Rv25	KF311548	ATTAATATAC	GACCAAAGGG	CATACTTTCC	GACCGACTTT	CTCTATTTAT	CTGAGCCGTT
Rvul	Rv26	KF311559	ATTAATATAC	GACCAAAGGG	CATACTTTCC	GACCGACTTT	CTCTATTTAT	CTGAGCCGTT
Rvul	Rv27	KF311561	ATTAATATAC	GACCAAAGGG	CATACTTTCC	GACCGACTTT	CTCTATTTAT	CTGAGCCGTT
Rvul	Rv28	KF311533	ATTAATATAC	GACCAAAGGG	CATACTTTCC	GACCGACTTT	CTCTATTTAT	CTGAGCCGTT
Rvul	Rv29	KF311537	ATTAATATAC	GACCAAAGGG	CATACTTTCC	GACCGACTTT	CTCTATTTAT	CTGAGCCGTT
Rvul	Rv3	KF311633	ATTAATATAC	GACCAAAGGG	TATACTTTCC	GACCGACTTT	CTCTATTTAT	CTGAGCCGTT
Rvul	Rv30	KF311564	ATTAATATAC	GACCAAAGGG	CATACTTTCC	GACCGACTTT	CTCTATTTAT	CTGAGCCGTT
Rvul	Rv31	KF311570	ATTAATATAC	GACCAAAGGG	CATACTTTCC	GACCGGCTTT	CTCTATTTAT	CTGAGCCGTT
Rvul	Rv32	KF311530	ATTAATATAC	GACCAAAGGG	CATACTTTCC	GACCGACTTT	CTCTATTTAT	CTGAGCCGTT
Rvul	Rv33	KF311538	ATTAATATAC	GACCAAAGGG	CATACTTTCC	GACCGACTTT	CTCTATTTAT	CTGAGCCGTT
Rvul	Rv34	KF311610	ATTAATATAC	GACCAAAGGG	CATACTTTCC	GACCGACTTT	CTCTATTTAT	CTGAGCCGTT
Rvul	Rv35	KF311605	ATTAATATAC	GGCCAAAGGG	CATACTTTCC	GACCGACTTT	CTCTATTTAT	CTGAGCCGTT
Rvul	Rv36	KF311535	ATTAATATAC	GACCAAAGGG	CATACTTTCC	GACCGACTTT	CTCTATTTAT	CTGAGCCGTT
Rvul	Rv37	KF311529	ATTAATATAC	GACCAAAGGG	CATACTTTCC	GACCGACTTT	CTCTATTTAT	CTGAGCCGTT

Rvul	Rv38	KF311532	ATTAATATAC	GACCAAAGGG	CATACTTTCC	GACCGACTTT	CTCTATTTAT	CTGAGCCGTT
Rvul	Rv39	KF311563	ATTAATATAC	GACCAAAGGG	CATACTTTCC	GACCGACTTT	CTCTATTTAT	CTGAGCCGTT
Rvul	Rv4	KF311589	ATTAATATAC	GACCAAAGGG	TATACTTTCC	GACCGACTTT	CTCTATTTAT	CTGAGCCGTT
Rvul	Rv40	KF311568	ATTAATATAC	GACCAAAGGG	CATACTTTCC	GACCGACTTT	CTCTATTTAT	CTGAGCCGTT
Rvul	Rv41	KF311555	ATTAATATGC	GACCAAAGGG	CATACTTTCC	GACCGACTTT	CTCTATTTAT	CTGAGCCGTT
Rvul	Rv42	KF311558	ATTAATATGC	GACCAAAGGG	CATACTTTCC	GACCGACTTT	CTCTATTTAT	CTGAGCCGTT
Rvul	Rv43	KF311560	ATTAATATGC	GACCAAAGGG	CATACTTTCC	GACCGACTTT	CTCTATTTAT	CTGAGCCGTT
Rvul	Rv44	KF311601	ATTAATATAC	GACCAAAGGG	CATACTTTCC	GACCGACTTT	CTCTATTTAT	CTGAGCCGTT
Rvul	Rv45	KF311608	ATTAATATAC	GACCAAAGGG	CATACTTTCC	GACCGACTTT	CTCTATTTAT	CTGAGCCGTT
Rvul	Rv46	KF311604	ATTAATATAC	GACCAAAGGG	CATACTTTCC	GACCGGCTTT	CTCTATTTAT	CTGAGCCGTT
Rvul	Rv47	KF311615	ATTAATATAC	GACCAAAGGG	CATACTTTCC	GACCGACTTT	CTCTATTTAT	CTGAGCCGTT
Rvul	Rv48	KF311603	ATTAATATAC	GACCAAAGGG	CATACTTTCC	GACCGACTTT	CTCTATTTAT	CTGAGCCGTT
Rvul	Rv49	KF311609	ATTAATATAC	GACCAAAGGG	CATACTTTCC	GACCGACTTT	CTCTATTTAT	CTGAGCCGTT
Rvul	Rv5	KF311632	ATTAATATAC	GACCAAAGGG	TATACTTTCC	GACCGACTTT	CTCTATTTAT	CTGAGCCGTT
Rvul	Rv50	KF311602	ATTAATATAC	GACCAAAGGG	CATACTTTCC	GACCGACTTT	CTCTATTTAT	CTGAGCCGTT
Rvul	Rv51	KF311621	ATTAATATAC	GACCAAAGGG	CATACTTTCC	GACCGACTTT	CTCTATTTAT	CTGAGCCGTT
Rvul	Rv52	KF311619	ATTAATATAC	GACCAAAGGG	CATACTTTCC	GACCGACTTT	CTCTATTTAT	CTGAGCCGTT
Rvul	Rv53	KF311620	ATTAATATAC	GACCAAAGGG	CATACTTTCC	GACCGACTTT	CTCTATTTAT	CTGAGCCGTT
Rvul	Rv54	KF311622	ATTAATATAC	GACCAAAGGG	CATACTTTCC	GACCGACTTT	CTCTATTTAT	CTGAGCCGTT
Rvul	Rv55	KF311617	ATTAATATAC	GACCAAAGGG	CATACTTTCC	GACCGACTTT	CTCTATTTAT	CTGAGCCGTT
Rvul	Rv56	KF311606	ATTAATATAC	GACCAAAGGG	CATACTTTCC	GACCGACTTT	CTCTATTTAT	CTGAGCCGTT
Rvul	Rv57	KF311614	ATTAATATAC	GACCAAAGGG	CATACTTTCC	GACCGACTTT	CTCTATTTAT	CTGAGCCGTT
Rvul	Rv59	KF311567	ATTAATATAC	GACCAAAGGG	CATACTTTCC	GACCGACTTT	CTCTATTTAT	CTGAGCCGTT
Rvul	Rv6	KF311628	ATTAATATAC	GACCAAAGGG	TATACTTTCC	GACCGACTTT	CTCTATTTAT	CTGAGCCGTT
Rvul	Rv60	KF311607	ATTAATATAC	GACCAAAGGG	CATACTTTCC	GACCGACTTT	CTCTATTTAT	CTGAGCCGTT
Rvul	Rv61	KF311544	ATTAATATAC	GACCAAAGGG	CATACTTTCC	GACCGACTTT	CTCTATTTAT	CTGAGCCGTT
Rvul	Rv62	KF311625	ATTAATATAC	GACCAAAGGG	CATACTTTCC	GACCGACTTT	CTCTATTTAT	CTGAGCCGTT
Rvul	Rv7	KF311528	ATTAATATAC	GACCAAAGGG	TATACTTTCC	GACCGACTTT	CTCTATTTAT	CTGAGCCGTT
Rvul	Rv8	KF311631	ATTAATATAC	GACCAAAGGG	TATACTTTCC	GACCGACTTT	CTCTATTTAT	CTGAGCCGTT

Rvul	Rv9	KF311590	ATTAATATAC	GACCAAAGGG	CATACTTTCC	GACCGACTTT	CTCTATTTAT	CTGAGCCGTT
Slin		AY131102	TATAATATAC	GACCATCAGG	TATATTCTCA	GACCAAATAG	CCCTATTTAT	TTGAGCAGTA
Sory		AY131099	TATAATATAC	GACCCTCAGG	AATATTATCT	GAACGAATAA	CCCTATTTAT	TTGAGCAGTA
Sory		GU196317	TATAATATAC	GACCCTCAGG	AATATTATCT	GAACGAATAA	CCCTATTTAT	TTGAGCAGTA
Spheno		NC018351	ATTAATATAC	GGCCAACAGG	TATATTTTCT	GAACGTCTTA	CTTTATTTAT	CTGAGCAGTA
Szea		AY131100	TATAATATAC	GCCCCTCCGG	TATATTATCA	GATCGAATAA	CTTTATTTAT	TTGAGCAGTT
Yfro		AY131109	ATTAATATAC	GACCCATAGG	AATCTTGTCA	GATCGACTAT	CATTATTCAT	TTGAGCAGTA

Continuation of the Table S4.

Species	Ha	Sequences	Position					
			541-550	551-560	561-570	571-580	581-590	591-600
Dbor		AY131105	AGAATTACTG	CCCTTCTACT	ACTTCTTTCC	CTACCAGTCT	TAGCTGGAGC	TATTACAATG
Dbor		Uni9	AGAATTACTG	CCCTTCTACT	ACTTCTTTCC	CTACCAGTCT	TAGCTGGAGC	TATTACAATA
Dper		ASSCR6014	----------	----------	----------	----------	----------	----------
Dper		ASSCR6015	----------	----------	----------	----------	----------	----------
Dper		ASSCR6016	----------	----------	----------	----------	----------	----------
Dper		ASSCR6018	----------	----------	----------	----------	----------	----------
Hcho		JX679716	GCCATTACAG	CTCTTCTTCT	ACTTCTTTCT	CTACCTGTTT	TAGCAGGGGC	AATTACTATA
Hpha		KC112991	GCCATCACTG	CCCTTCTCCT	GCTGCTATCC	CTTCCTGTCT	TAGCGGGTGC	AATTACCATG
Nxan		NC018354	GAAATTACTG	CAATTTTATT	ATTATTATCT	CTCCCGGTCT	TAGCAGGTGC	TATTACTATA
Phil		GU244486	AAAATTACTG	CAATTCTTCT	TCTCCTATCT	TTACCAGTAT	TAGCTGGAGC	AATTACAATA
Pnod		HQ891474	AAAATTACTG	CAATTCTACT	TTTACTCTCA	CTACCTGTTT	TAGCCGGAGC	TATTACTATA
Rbil	Rb1	KF311645	AGAATCACCG	CCCTTCTTCT	TCTCCTTTCT	CTTCCTGTTT	TAGCAGGAGC	TATTACTATA
Rbil	Rb2	KF311637	AGAATCACCG	CCCTTCTTCT	TCTCCTTTCT	CTTCCTGTTT	TAGCAGGAGC	TATTACTATA
Rbil	Rb3	KF311639	AGAATCACCG	CCCTTCTTCT	TCTCCTTTCT	CTTCCTGTTT	TAGCAGGAGC	TATTACTATA
Rbil	Rb4	KF311636	AGAATCACCG	CCCTTCTTCT	TCTCCTTTCT	CTTCCTGTTT	TAGCAGGAGC	TATTACTATA
Rbil	Rb5	KF311635	AGAATCACCG	CCCTTCTTCT	TCTCCTTTCT	CTTCCTGTTT	TAGCAGGAGC	TATTACTATA
Rbil	Rb6	KF311634	AGAATCACCG	CCCTTCTTCT	TCTCCTTTCT	CTTCCTGTTT	TAGCAGGAGC	TATTACTATA
Rbil	Rb7	KF311648	AGAATCACCG	CCCTTCTTCT	TCTCCTTTCT	CTTCCTGTTT	TAGCAGGAGC	TATTACTATA
Rbil	Rb8	KF311647	AGAATCACCG	CCCTTCTTCT	TCTCCTTTCT	CTTCCTGTTT	TAGCAGGAGC	TATTACTATA
Rcru		AY131113	AGAATTACTG	CCCTTCTTCT	ACTTTTATCT	CTTCCTGTTC	TTGCAGGAGC	AATTACTATA
Rcru		KF311359	AGAATTACTG	CCCTTCTTCT	ACTTTTATCT	CTTCCTGTTC	TTGCAGGAGC	AATTACTATA
Rcru		USCOC565	AGAATTACTG	CCCTTCTTCT	ACTTTTATCT	CTTCCTGTTC	TTGCAGGAGC	AATTACTATA
Rfer	H1	GU581582	AGAATTACTG	CCCTTCTTCT	TCTTCTCTCC	CTTCCTGTCC	TAGCAGGAGC	AATTACTATA
Rfer	H10	KF311482	AGAATTACTG	CCCTTCTTCT	TCTTCTCTCC	CTTCCTGTCC	TAGCAGGAGC	AATTACTATA
Rfer	H11	KF311444	AGAATTACTG	CCCTTCTTCT	TCTTCTCTCC	CTTCCTGTCC	TAGCTGGAGC	AATTACTATA
Rfer	H12	KF311487	AGAATTACTG	CCCTTCTTCT	TCTTCTCTCC	CTTCCTGTCC	TAGCAGGAGC	AATTACTATA
Rfer	H13	KF311481	AGAATTACTG	CCCTTCTTCT	TCTTCTCTCC	CTTCCTGTCC	TAGCAGGAGC	AATTACTATA
Rfer	H14	KF311448	AGAATTACTG	CCCTTCTTCT	TCTTCTCTCC	CTTCCTGTCC	TAGCAGGAGC	AATTACTATA
Rfer	H15	JX292125	AGAATTACTG	CCCTTCTTCT	TCTTCTCTCC	CTTCCTGTCC	TAGCAGGAGC	AATTACTATA
Rfer	H16	KF311449	AGAATTACTG	CCCTTCTTCT	TCTTCTCTCC	CTTCCTGTCC	TAGCAGGAGC	AATTACTATA

Rfer	H17	KF311360	AGAATTACTG	CCCTTCTTCT	TCTTCTCTCC	CTTCCTGTCC	TAGCGGGAGC	AATTACTATG
Rfer	H18	KF311473	AGAATTACTG	CCCTTCTTCT	TCTTCTCTCC	CTTCCTGTCC	TAGCGGGAGC	AATTACTATG
Rfer	H2	GU581549	AGAATTACTG	CCCTTCTTCT	TCTTCTCTCC	CTTCCTGTCC	TAGCAGGAGC	AATTACTATA
Rfer	H20	KF311433	AGAATTACTG	CCCTTCTTCT	TCTTCTCTCC	CTTCCTGTCC	TAGCGGGAGC	AATTACTATG
Rfer	H21	KF311474	AGAATTACTG	CCCTTCTTCT	TCTTCTCTCC	CTTCCTGTCC	TAGCGGGAGC	AATTACTATG
Rfer	H22	KF311516	AGAATTACTG	CCCTTCTTCT	TCTTCTCTCC	CTTCCTGTCC	TAGCGGGAGC	AATTACTATG
Rfer	H23	KF311380	AGAATTACTG	CCCTTCTTCT	TCTTCTCTCC	CTTCCTGTCC	TAGCGGGAGC	AATTACTATG
Rfer	H24	KF311389	AGAATTACTG	CCCTTCTTCT	TCTTCTCTCC	CTTCCTGTCC	TAGCGGGAGC	AATTACTATG
Rfer	H25	KF311384	AGAATTACTG	CCCTTCTTCT	TCTTCTCTCC	CTTCCTGTCC	TAGCAGGAGC	AATTACTATG
Rfer	H26	KF311388	AGAATTACTG	CCCTTCTTCT	TCTTCTCTCC	CTTCCTGTCC	TAGCGGGAGC	AATTACTATG
Rfer	H27	KF311386	AGAATTACTG	CCCTTCTTCT	TCTTCTCTCC	CTTCCTGTCC	TAGCGGGAGC	AATTACTATG
Rfer	H28	KF311399	AGAATTACTG	CCCTTCTTCT	TCTTCTCTCC	CTTCCTGTCC	TAGCGGGAGC	AATTACTATG
Rfer	H29	KF311383	AGAATTACTG	CCCTTCTTCT	TCTTCTCTCC	CTTCCTGTCC	TAGCGGGAGC	AATTACTATG
Rfer	H3	GU581547	AGAATTACTG	CCCTTCTTCT	TCTTCTCTCC	CTTCCTGTCC	TAGCAGGAGC	AATTACTATA
Rfer	H30	KF311392	AGAATTACTG	CCCTTCTTCT	TCTTCTCTCC	CTTCCTGTCC	TAGCAGGAGC	AATTACTATG
Rfer	H31	KF311379	AGAATTACTG	CCCTTCTTCT	TCTTCTCTCC	CTTCCTGTCC	TAGCGGGAGC	AATTACTATG
Rfer	H32	KF311490	AGAATTACTG	CCCTTCTTCT	TCTTCTCTCC	CTTCCTGTCC	TAGCGGGAGC	AATTACTATG
Rfer	H34	KF311492	AGAATTACTG	CCCTTCTTCT	TCTTCTCTCC	CTTCCTGTCC	TAGCGGGAGC	AATTACTATG
Rfer	H35	KF311496	AGAATTACTG	CCCTTCTTCT	TCTTCTCTCC	CTTCCTGTCC	TAGCGGGAGC	AATTACTATG
Rfer	H36	KF311500	AGAATTACTG	CCCTTCTTCT	TCTTCTCTCC	CTTCCTGTCC	TAGCGGGAGC	AATTACTATG
Rfer	H37	KF311509	AGAATTACTG	CCCTTCTTCT	TCTTCTCTCC	CTTCCTGTCC	TAGCGGGAGC	AATTACTATG
Rfer	H38	KF311505	AGAATTACTG	CCCTTCTTCT	TCTTCTCTCC	CTTCCTGTCC	TAGCGGGAGC	AATTACTATG
Rfer	H39	KF311508	AGAATTACTG	CCCTTCTTCT	TCTTCTCTCC	CTTCCTGTCC	TAGCGGGAGC	AATTACTATG
Rfer	H4	GU581545	AGAATTACTG	CCCTTCTTCT	TCTTCTCTCC	CTTCCTGTCC	TAGCAGGAGC	AATTACTATA
Rfer	H40	KF311506	AGAATTACTG	CCCTTCTTCT	TCTTCTCTCC	CTTCCTGTCC	TAGCGGGAGC	AATTACTATG
Rfer	H42	KF311501	AGAATTACTG	CCCTTCTTCT	TCTTCTCTCC	CTTCCTGTCC	TAGCGGGAGC	AATTACTATG
Rfer	H43	KF311525	AGAATTACTG	CCCTTCTTCT	TCTTCTCTCC	CTTCCTGTCC	TAGCGGGAGC	AATTACTATG
Rfer	H5	GU581539	AGAATTACTG	CCCTTCTTCT	TCTTCTCTCC	CTTCCTGTCC	TAGCAGGAGC	AATTACTATA
Rfer	H51	KU696497	AGAATTACTG	CCCTTCTTCT	TCTTCTCTCC	CTTCCTGTCC	TAGCAGGAGC	AATTACTATA
Rfer	H52	KU696507	AGAATTACTG	CCCTTCTTCT	TCTTCTCTCC	CTTCCTGTCC	TAGCAGGAGC	AATTACTATA
Rfer	H6	GU581526	AGAATTACTG	CCCTTCTTCT	TCTTCTCTCC	CTTCCTGTCC	TGGCAGGAGC	AATTACTATA
Rfer	H7	GU581525	AGAATTACTG	CCCTTCTTCT	TCTTCTCTCC	CTTCCTGTCC	TAGCAGGAGC	AATTACTATA
Rfer	H8	GU581319	AGAATTACTG	CCCTTCTTCT	TCTTCTCTCC	CTTCCTGTCC	TAGCGGGAGC	AATTACTATG

Rfer	H9	KF311446	AGAATTACTG	CCCTTCTTCT	TCTTCTCTCC	CTTCCTGTCC	TAGCAGGAGC	AATTACTATA
Rfer		JX292124	AGAATTACTG	CCCTTCTTCT	TCTTCTCTCC	CTTCCTGTCC	TAGCAGGAGC	AATTACTATA
Rfer		JX294413	AGAATTACTG	CCCTTCTTCT	TCTTCTCTCC	CTTCCTGTCC	TAGCAGGAGC	AATTACTATA
Rfer		KF413063	AGAATTACTG	CCCTTCTTCT	TCTTCTCTCC	CTTCCTGTCC	TAGCAGGAGC	AATTACTATA
Rfer		KF413064	AGAATTACTG	CCCTTCTTCT	TCTTCTCTCC	CTTCCTGTCC	TAGCGGGAGC	AATTACTATG
Rfer		KF413065	AGAATTACTG	CCCTTCTTCT	TCTTCTCTCC	CTCCCTGTCC	TAGCGGGAGC	AATTACTATG
Rfer		KF413066	AGAATTACTG	CCCTTCTTCT	TCTTCTCTCC	CTTCCTGTCC	TAGCAGGAGC	AATTACTATA
Rfer		KF413067	AGAATTACTG	CCCTTCTTCT	TCTTCTCTCC	CTTCCTGTCC	TAGCGGGAGC	AATTACTATG
Rfer		KF413068	AGAATTACTG	CCCTTCTTCT	TCTTCTCTCC	CTCCCTGTCC	TAGCGGGAGC	AATTACTATG
Rfer		KF413069	AGAATTACTG	CCCTTCTTCT	TCTTCTCTCC	CTCCCTGTCC	TAGCGGGAGC	AATTACTATG
Rfer		KF413070	AGAATTACTG	CCCTTCTTCT	TCTTCTCTCC	CTCCCTGTCC	TAGCGGGAGC	AATTACTATG
Rfer		KF413071	AGAATTACTG	CCCTTCTTCT	TCTTCTCTCC	CTTCCTGTCC	TAGCAGGAGC	AATTACTATA
Rfer		KF413072	AGAATTACTG	CCCTTCTTCT	TCTTCTCTCC	CTTCCTGTCC	TAGCAGGAGC	AATTACTATA
Rfer		KF413073	AGAATTACTG	CCCTTCTTCT	TCTTCTCTCC	CTTCCTGTCC	TAGCGGGAGC	AATTACTATG
Rfer		KT989230	AGAATTACTG	CCCTTCTTCT	TCTTCTCTCC	CTTCCTGTCC	TAGCGGGAGC	AATTACTATG
Rfer		KT989231	AGAATTACTG	CCCTTCTTCT	TCTTCTCTCC	CTTCCTGTCC	TAGCGGGAGC	AATTACTATG
Rfer		KT989232	AGAATTACTG	CCCTTCTTCT	TCTTCTCTCC	CTTCCTGTCC	TAGCGGGAGC	AATTACTATG
Rfer		KT989233	AGAATTACTG	CCCTTCTTCT	TCTTCTCTCC	CTTCCTGTCC	TAGCGGGAGC	AATTACTATG
Rfer		KT989234	AGAATTACTG	CCCTTCTTCT	TCTTCTCTCC	CTTCCTGTCC	TAGCGGGAGC	AATTACTATG
Rfer		KU916538	AGAATTACTG	CCCTTCTTCT	TCTTCTCTCC	CTTCCTGTCC	TAGCGGGAGC	AATTACTATG
Rfer		KY458175	AGAATTACTG	CCCTTCTTCT	TCTTCTCTCC	CTTCCTGTCC	TAGCAGGAGC	AATTACTATA
Rfer		KY458176	AGAATTACTG	CCCTTCTTCT	TCTTCTCTCC	CTTCCTGTCC	TAGCAGGAGC	AATTACTATA
Rfer		KY458177	AGAATTACTG	CCCTTCTTCT	TCTTCTCTCC	CTTCCTGTCC	TAGCAGGAGC	AATTACTATA
Rfer		LC474878	AGAATTACTG	CCCTTCTTCT	TCTTCTCTCC	CTTCCTGTCC	TAGCGGGAGC	AATTACTATG
Rfer		LC474880	AGAATTACTG	CCCTTCTTCT	TCTTCTCTCC	CTTCCTGTCC	TAGCGGGAGC	AATTACTATG
Rfer		LC474881	AGAATTACTG	CCCTTCTTCT	TCTTCTCTCC	CTTCCTGTCC	TAGCGGGAGC	AATTACTATG
Rfer		LC474882	AGAATTACTG	CCCTTCTTCT	TCTTCTCTCC	CTTCCTGTCC	TAGCGGGAGC	AATTACTATG
Rfer		LC474884	AGAATTACTG	CCCTTCTTCT	TCTTCTCTCC	CTTCCTGTCC	TAGCGGGAGC	AATTACTATG
Rfer		LC474885	AGAATTACTG	CCCTTCTTCT	TCTTCTCTCC	CTTCCTGTCC	TAGCGGGAGC	AATTACTATG
Rfer		LC474886	AGAATTACTG	CCCTTCTTCT	TCTTCTCTCC	CTTCCTGTCC	TAGCGGGAGC	AATTACTATG
Rfer		LC474887	AGAATTACTG	CCCTTCTTCT	TCTTCTCTCC	CTTCCTGTCC	TAGCGGGAGC	AATTACTATG
Rfer		LC474888	AGAATTACTG	CCCTTCTTCT	TCTTCTCTCC	CTTCCTGTCC	TAGCGGGAGC	AATTACTATG
Rfer		LC474889	AGAATTACTG	CCCTTCTTCT	TCTTCTCTCC	CTTCCTGTCC	TAGCGGGAGC	AATTACTATG

Rfer		LC474890	AGAATTACTG	CCCTTCTTCT	TCTTCTCTCC	CTTCCTGTCC	TAGCGGGAGC	AATTACTATG
Rfer		LC474891	AGAATTACTG	CCCTTCTTCT	TCTTCTCTCC	CTTCCTGTCC	TAGCGGGAGC	AATTACTATG
Rfer		LC474892	AGAATTACTG	CCCTTCTTCT	TCTTCTCTCC	CTTCCTGTCC	TAGCGGGAGC	AATTACTATG
Rfer		LC474893	AGAATTACTG	CCCTTCTTCT	TCTTCTCTCC	CTTCCTGTCC	TAGCGGGAGC	AATTACTATG
Rfer		LC474894	AGAATTACTG	CCCTTCTTCT	TCTTCTCTCC	CTTCCTGTCC	TAGCGGGAGC	AATTACTATG
Rfer		LC474895	AGAATTACTG	CCCTTCTTCT	TCTTCTCTCC	CTTCCTGTCC	TAGCGGGAGC	AATTACTATG
Rfer		LC474896	AGAATTACTG	CCCTTCTTCT	TCTTCTCTCC	CTTCCTGTCC	TAGCGGGAGC	AATTACTATG
Rfer		LC474897	AGAATTACTG	CCCTTCTTCT	TCTTCTCTCC	CTTCCTGTCC	TAGCGGGAGC	AATTACTATG
Rfer		LC474898	AGAATTACTG	CCCTTCTTCT	TCTTCTCTCC	CTTCCTGTCC	TAGCGGGAGC	AATTACTATG
Rfer		LC474899	AGAATTACTG	CCCTTCTTCT	TCTTCTCTCC	CTTCCTGTCC	TAGCGGGAGC	AATTACTATG
Rfer		LC474902	AGAATTACTG	CCCTTCTTCT	TCTTCTCTCC	CTTCCTGTCC	TAGCGGGAGC	AATTACTATG
Rfer		LC474903	AGAATTACTG	CCCTTCTTCT	TCTTCTCTCC	CTTCCTGTCC	TAGCGGGAGC	AATTACTATG
Rfer		LC474904	AGAATTACTG	CCCTTCTTCT	TCTTCTCTCC	CTTCCTGTCC	TAGCGGGAGC	AATTACTATG
Rfer		LC474905	AGAATTACTG	CCCTTCTTCT	TCTTCTCTCC	CTTCCTGTCC	TAGCGGGAGC	AATTACTATG
Rfer		LC474906	AGAATTACTG	CCCTTCTTCT	TCTTCTCTCC	CTTCCTGTCC	TAGCGGGAGC	AATTACTATG
Rfer		LC474907	AGAATTACTG	CCCTTCTTCT	TCTTCTCTCC	CTTCCTGTCC	TAGCGGGAGC	AATTACTATG
Rfer		LC474908	AGAATTACTG	CCCTTCTTCT	TCTTCTCTCC	CTTCCTGTCC	TAGCGGGAGC	AATTACTATG
Rfer		LC474909	AGAATTACTG	CCCTTCTTCT	TCTTCTCTCC	CTTCCTGTCC	TAGCGGGAGC	AATTACTATG
Rfer		LC474910	AGAATTACTG	CCCTTCTTCT	TCTTCTCTCC	CTTCCTGTCC	TAGCGGGAGC	AATTACTATG
Rfer		LC474911	AGAATTACTG	CCCTTCTTCT	TCTTCTCTCC	CTTCCTGTCC	TAGCGGGAGC	AATTACTATG
Rfer		LC474912	AGAATTACTG	CCCTTCTTCT	TCTTCTCTCC	CTTCCTGTCC	TAGCGGGAGC	AATTACTATG
Rfer		LC474913	AGAATTACTG	CCCTTCTTCT	TCTTCTCTCC	CTTCCTGTCC	TAGCGGGAGC	AATTACTATG
Rfer		LC474914	AGAATTACTG	CCCTTCTTCT	TCTTCTCTCC	CTTCCTGTCC	TAGCGGGAGC	AATTACTATG
Rfer		LC474915	AGAATTACTG	CCCTTCTTCT	TCTTCTCTCC	CTTCCTGTCC	TAGCGGGAGC	AATTACTATG
Rfer		LC474916	AGAATTACTG	CCCTTCTTCT	TCTTCTCTCC	CTTCCTGTCC	TAGCGGGAGC	AATTACTATG
Rfer		LC474917	AGAATTACTG	CCCTTCTTCT	TCTTCTCTCC	CTTCCTGTCC	TAGCGGGAGC	AATTACTATG
Rfer		LC474918	AGAATTACTG	CCCTTCTTCT	TCTTCTCTCC	CTTCCTGTCC	TAGCGGGAGC	AATTACTATG
Rfer		LC474919	AGAATTACTG	CCCTTCTTCT	TCTTCTCTCC	CTTCCTGTCC	TAGCGGGAGC	AATTACTATG
Rfer		LC474920	AGAATTACTG	CCCTTCTTCT	TCTTCTCTCC	CTTCCTGTCC	TAGCGGGAGC	AATTACTATG
Rfer		LC474921	AGAATTACTG	CCCTTCTTCT	TCTTCTCTCC	CTTCCTGTCC	TAGCGGGAGC	AATTACTATG
Rfer		LC474922	AGAATTACTG	CCCTTCTTCT	TCTTCTCTCC	CTTCCTGTCC	TAGCGGGAGC	AATTACTATG
Rfer		LC474923	AGAATTACTG	CCCTTCTTCT	TCTTCTCTCC	CTTCCTGTCC	TAGCGGGAGC	AATTACTATG
Rfer		LC474924	AGAATTACTG	CCCTTCTTCT	TCTTCTCTCC	CTTCCTGTCC	TAGCGGGAGC	AATTACTATG

Rfer		LC474925	AGAATTACTG	CCCTTCTTCT	TCTTCTCTCC	CTTCCTGTCC	TAGCGGGAGC	AATTACTATG
Rfer		LC474926	AGAATTACTG	CCCTTCTTCT	TCTTCTCTCC	CTTCCTGTCC	TAGCGGGAGC	AATTACTATG
Rfer		LC474927	AGAATTACTG	CCCTTCTTCT	TCTTCTCTCC	CTTCCTGTCC	TAGCGGGAGC	AATTACTATG
Rfer		LC474928	AGAATTACTG	CCCTTCTTCT	TCTTCTCTCC	CTTCCTGTCC	TAGCGGGAGC	AATTACTATG
Rfer		LC474929	AGAATTACTG	CCCTTCTTCT	TCTTCTCTCC	CTTCCTGTCC	TAGCGGGAGC	AATTACTATG
Rfer		MF448526	AGAATTACTG	CCCTTCTTCT	TCTTCTCTCC	CTTCCTGTCC	TAGCGGGAGC	AATTACTATG
Rfer		MG051027	AGAATTACTG	CCCTTCTTCT	TCTTCTCTCC	CTTCCTGTCC	TAGCGGGAGC	AATTACTATG
Rfer		MG051028	AGAATTACTG	CCCTTCTTCT	TCTTCTCTCC	CTTCCTGTCC	TAGCGGGAGC	AATTACTATG
Rfer		MG051029	AGAATTACTG	CCCTTCTTCT	TCTTCTCTCC	CTTCCTGTCC	TAGCGGGAGC	AATTACTATG
Rfer		MG051030	AGAATTACTG	CCCTTCTTCT	TCTTCTCTCC	CTTCCTGTCC	TAGCGGGAGC	AATTACTATG
Rfer		MG051031	AGAATTACTG	CCCTTCTTCT	TCTTCTCTCC	CTTCCTGTCC	TAGCGGGAGC	AATTACTATG
Rfer		MG872818	AGAATTACTG	CCCTTCTTCT	TCTTCTCTCC	CTTCCTGTCC	TAGCGGGAGC	AATTACTATG
Rfer		MG883395	AGAATTACTG	CCCTTCTTCT	TCTTCTCTCC	CTTCCTGTCC	TAGCGGGAGC	AATTACTATG
Rfer		MG883396	AGAATTACTG	CCCTTCTTCT	TCTTCTCTCC	CTTCCTGTCC	TAGCGGGAGC	AATTACTATG
Rfer		MG883397	AGAATTACTG	CCCTTCTTCT	TCTTCTCTCC	CTTCCTGTCC	TAGCGGGAGC	AATTACTATG
Rfer		MG883398	AGAATTACTG	CCCTTCTTCT	TCTTCTCTCC	CTTCCTGTCC	TAGCGGGAGC	AATTACTATG
Rfer		MG883399	AGAATTACTG	CCCTTCTTCT	TCTTCTCTCC	CTTCCTGTCC	TAGCGGGAGC	AATTACTATG
Rfer		MH016277	AGAATTACTG	CCCTTCTTCT	TCTTCTCTCC	CTTCCTGTCC	TAGCGGGAGC	AATTACTATG
Rfer		MH016278	AGAATTACTG	CCCTTCTTCT	TCTTCTCTCC	CTTCCTGTCC	TAGCGGGAGC	AATTACTATG
Rfer		MH016279	AGAATTACTG	CCCTTCTTCT	TCTTCTCTCC	CTTCCTGTCC	TAGCGGGAGC	AATTACTATG
Rfer		MH016604	AGAATTACTG	CCCTTCTTCT	TCTTCTCTCC	CTTCCTGTCC	TAGCGGGAGC	AATTACTATG
Rfer		MH016605	AGAATTACTG	CCCTTCTTCT	TCTTCTCTCC	CTTCCTGTCC	TAGCGGGAGC	AATTACTATG
Rfer		MH016606	AGAATTACTG	CCCTTCTTCT	TCTTCTCTCC	CTTCCTGTCC	TAGCGGGAGC	AATTACTATG
Rfer		MH016607	AGAATTACTG	CCCTTCTTCT	TCTTCTCTCC	CTTCCTGTCC	TAGCGGGAGC	AATTACTATG
Rfer		MH016608	AGAATTACTG	CCCTTCTTCT	TCTTCTCTCC	CTTCCTGTCC	TAGCGGGAGC	AATTACTATG
Rfer		MH016609	AGAATTACTG	CCCTTCTTCT	TCTTCTCTCC	CTTCCTGTCC	TAGCGGGAGC	AATTACTATG
Rfer		MH016610	AGAATTACTG	CCCTTCTTCT	TCTTCTCTCC	CTTCCTGTCC	TAGCGGGAGC	AATTACTATG
Rfer		MH016611	AGAATTACTG	CCCTTCTTCT	TCTTCTCTCC	CTTCCTGTCC	TAGCGGGAGC	AATTACTATG
Rfer		MH016612	AGAATTACTG	CCCTTCTTCT	TCTTCTCTCC	CTTCCTGTCC	TAGCGGGAGC	AATTACTATG
Rfer		MH016613	AGAATTACTG	CCCTTCTTCT	TCTTCTCTCC	CTTCCTGTCC	TAGCGGGAGC	AATTACTATG
Rfer		MH016614	AGAATTACTG	CCCTTCTTCT	TCTTCTCTCC	CTTCCTGTCC	TAGCGGGAGC	AATTACTATG
Rfer		MH016615	AGAATTACTG	CCCTTCTTCT	TCTTCTCTCC	CTTCCTGTCC	TAGCGGGAGC	AATTACTATG
Rfer		MH016616	AGAATTACTG	CCCTTCTTCT	TCTTCTCTCC	CTTCCTGTCC	TAGCGGGAGC	AATTACTATG

Rfer		MH016617	AGAATTACTG	CCCTTCTTCT	TCTTCTCTCC	CTTCCTGTCC	TAGCGGGAGC	AATTACTATG
Rfer		MH016618	AGAATTACTG	CCCTTCTTCT	TCTTCTCTCC	CTTCCTGTCC	TAGCGGGAGC	AATTACTATG
Rfer		MH016619	AGAATTACTG	CCCTTCTTCT	TCTTCTCTCC	CTTCCTGTCC	TAGCGGGAGC	AATTACTATG
Rfer		MH016620	AGAATTACTG	CCCTTCTTCT	TCTTCTCTCC	CTTCCTGTCC	TAGCGGGAGC	AATTACTATG
Rfer		MH016621	AGAATTACTG	CCCTTCTTCT	TCTTCTCTCC	CTTCCTGTCC	TAGCGGGAGC	AATTACTATG
Rfer		MH016622	AGAATTACTG	CCCTTCTTCT	TCTTCTCTCC	CTTCCTGTCC	TAGCGGGAGC	AATTACTATG
Rfer		MH016623	AGAATTACTG	CCCTTCTTCT	TCTTCTCTCC	CTTCCTGTCC	TAGCGGGAGC	AATTACTATG
Rfer		MH016624	AGAATTACTG	CCCTTCTTCT	TCTTCTCTCC	CTTCCTGTCC	TAGCGGGAGC	AATTACTATG
Rfer		MH016625	AGAATTACTG	CCCTTCTTCT	TCTTCTCTCC	CTTCCTGTCC	TAGCGGGAGC	AATTACTATG
Rfer		MH016626	AGAATTACTG	CCCTTCTTCT	TCTTCTCTCC	CTTCCTGTCC	TAGCGGGAGC	AATTACTATG
Rfer		MH016627	AGAATTACTG	CCCTTCTTCT	TCTTCTCTCC	CTTCCTGTCC	TAGCGGGAGC	AATTACTATG
Rfer		MH016628	AGAATTACTG	CCCTTCTTCT	TCTTCTCTCC	CTTCCTGTCC	TAGCGGGAGC	AATTACTATG
Rfer		MH016629	AGAATTACTG	CCCTTCTTCT	TCTTCTCTCC	CTTCCTGTCC	TAGCGGGAGC	AATTACTATG
Rfer		MH016630	AGAATTACTG	CCCTTCTTCT	TCTTCTCTCC	CTTCCTGTCC	TAGCGGGAGC	AATTACTATG
Rfer		MH016631	AGAATTACTG	CCCTTCTTCT	TCTTCTCTCC	CTTCCTGTCC	TAGCGGGAGC	AATTACTATG
Rfer		MH016632	AGAATTACTG	CCCTTCTTCT	TCTTCTCTCC	CTTCCTGTCC	TAGCGGGAGC	AATTACTATG
Rfer		MH016633	AGAATTACTG	CCCTTCTTCT	TCTTCTCTCC	CTTCCTGTCC	TAGCGGGAGC	AATTACTATG
Rfer		MH016634	AGAATTACTG	CCCTTCTTCT	TCTTCTCTCC	CTTCCTGTCC	TAGCGGGAGC	AATTACTATG
Rfer		MH016635	AGAATTACTG	CCCTTCTTCT	TCTTCTCTCC	CTTCCTGTCC	TAGCGGGAGC	AATTACTATG
Rfer		MH016636	AGAATTACTG	CCCTTCTTCT	TCTTCTCTCC	CTTCCTGTCC	TAGCGGGAGC	AATTACTATG
Rfer		MH016637	AGAATTACTG	CCCTTCTTCT	TCTTCTCACC	CTTCCTGTCC	TAGCGGGAGC	AATTACTATG
Rfer	H19	KF311403	AGAATTACTG	CCCTTCTTCT	TCTTCTCTCC	CTTCCTGTCC	TAGCGGGAGC	AATTACTATG
Rfer	H41	KF311502	AGAATTACTG	CCCTTCTTCT	TCTTCTCTCC	CTTCCTGTCC	TAGCGGGAGC	AATTACTATG
Rpal		ASSCR6357	AGAATTACAG	CTCTTTTACT	TCTCTTATCT	CTTCCAGTAT	TAGCCGGTGC	AATTACTATA
Rpal		ASSCR6358	AGAATTACAG	CTCTTTTACT	TCTCCTATCT	CTTCCAGTAT	TAGCCGGTGC	AATTACTATA
Rpal		AY131121	AGAATTACAG	CTCTTCTACT	TCTCTTATCT	CTTCCAGTAT	TAGCTGGTGC	AATTACTATA
Rpal		GU581629	AGAATTACAG	CTCTTCTACT	TCTCTTATCT	CTTCCAGTAT	TAGCTGGTGC	AATTACTATA
Rpal		KF311358	AGAATTACAG	CTCTTTTACT	TCTCCTATCT	CTTCCAGTAT	TAGCCGGTGC	AATTACTATA
Rpal		KR494254	AGAATTACAG	CTCTTTTACT	TCTCCTATCT	CTTCCAGTAT	TAGCCGGTGC	AATTACTATA
Rpal		KR494255	AGAATTACAG	CTCTTTTACT	TCTCCTATCT	CTTCCAGTAT	TAGCCGGTGC	AATTACTATA
Rpal		KR494256	AGAATTACAG	CTCTTTTACT	TCTCCTATCT	CTTCCAGTAT	TAGCCGGTGC	AATTACTATA
Rpal		KR494257	AGAATTACAG	CTCTTTTACT	TCTCCTATCT	CTTCCAGTAT	TAGCCGGTGC	AATTACTATA
Rpal		KR494258	AGAATTACAG	CTCTTTTACT	TCTCCTATCT	CTTCCAGTAT	TAGCCGGTGC	AATTACTATA

Rpal		KR494259	AGAATTACAG	CTCTTTTACT	TCTCCTATCT	CTTCCAGTAT	TAGCCGGTGC	AATTACTATA
Rpal		KR494260	AGAATTACAG	CTCTTTTACT	TCTCCTATCT	CTTCCAGTAT	TAGCCGGTGC	AATTGCTATA
Rpal		KR494261	AGAATTACAG	CTCTTTTACT	TCTCCTATCT	CTTCCAGTAT	TAGCCGGTGC	AATTACTATA
Rpal	Rp1	KU647599	AGAATTACAG	CTCTTCTACT	TCTCTTATCT	CTT-------	----------	----------
Rpal	Rp10	KU647490	AGAATTACAG	CTCTTCTACT	TCTCTTATCT	CTT-------	----------	----------
Rpal	Rp11	KU647489	AGAATTACAG	CTCTTCTACT	TCTCTTATCT	CTT-------	----------	----------
Rpal	Rp12	KU647604	AGAATTACAG	CTCTTCTACT	TCTCTTATCT	CTT-------	----------	----------
Rpal	Rp13	KU647575	AGAATTACAG	CTCTTCTACT	TCTCTTATCT	CTTT------	----------	----------
Rpal	Rp2	KU647587	AGAATTACAG	CTCTTCTACT	TCTCTTATCT	CTTNT-----	----------	----------
Rpal	Rp3	KU647508	AGAATTACAG	CTCTTCTACT	TCTCTTATCT	CTTN------	----------	----------
Rpal	Rp4	KU647585	AGAATTACCG	CTCTTCTACT	TCTCTTATCT	CTTT------	----------	----------
Rpal	Rp5	KU647584	AGAATTACAG	CTCTTCTACT	TCTCTTATCT	CTTA------	----------	----------
Rpal	Rp6	KU647581	AGAATTACAG	CTCTTCTACT	TCTCTTATCT	CTTC------	----------	----------
Rpal	Rp7	KU647579	AGAATTACAG	CTCTTCTACT	TCTCTTATCT	CTTT------	----------	----------
Rpal	Rp8	KU647502	AGAATTACAG	CTCTTCTACT	TCTCTTATCT	CTTN------	----------	----------
Rpal	Rp9	KU647505	AGAATTACAG	CTCTTCTACT	TCTCTTATCT	CTTN------	----------	----------
Rpal		Uni10	AGAATTACAG	CTCTTTTACT	TCTCCTATCT	CTTCCAGTAT	TAGCCGGTGC	AATTACTATA
Rpal		Uni11	AGAATTACAG	CTCTTTTACT	TCTCCTATCT	CTTCCAGTAT	TAGCCGGTGC	AATTACTATA
Rpal		Uni117	AGAATTACAG	CTCTTTTACT	TCTCTTATCT	CTTCCAGTAT	TAGCTGGTGC	AATTACTATA
Rpal		Uni17	AGAATTACAG	CTCTTTTACT	TCTCCTATCT	CTTCCAGTAT	TAGCCGGTGC	AATTACTATA
Rpal		Uni21	AGAATTACAG	CTCTTTTACT	TCTCCTATCT	CTTCCAGTAT	TAGCCGGTGC	AATTACTATA
Rpal		Uni44	AGAATTACAG	CTCTTTTACT	TCTCTTATCT	CTTCCAGTAT	TAGCTGGTGC	AATTACTATA
Rpal		Uni58	AGAATTACAG	CTCTTTTACT	TCTCCTATCT	CTTCCAGTAT	TAGCCGGTGC	AATTACTATA
Rpho		AY131120	AGAATCACAG	CCCTTCTTCT	TCTTCTTTCC	CTCCCAGTTC	TTGCAGGAGC	TATTACTATA
Rpho		KY511047	AGAATTACAG	CTCTCCTCCT	TCTTCTCTCT	CTCCCAGTTC	TTGCAGGAGC	TATTACTATA
Rvul		LN612634	AGAATCACGG	CCCTTCTTCT	CCTTCTTTCA	CTTCCTGTTT	TAGCCGGAGC	CATTACTATA
Rvul		LN612635	AGAATCACGG	CGCTTCTTCT	CCTTCTTTCA	CTTCCTGTTT	TAGCCGGAGC	CATTACTATA
Rvul		LN612636	AGAATCACGG	CCCTTCTTCT	CCTTCTTTCA	CTTCCTGTTT	TAGCCGGAGC	CATTACTATA
Rvul		MG051024	AGAATCACGG	CGCTTCTTCT	CCTTCTTTCA	CTTCCTGTTT	TAGCCGGAGC	CATTACTATA
Rvul		MG051025	AGAATCACGG	CCCTTCTTCT	CCTTCTCTCA	CTTCCTGTTT	TAGCCGGAGC	CATTACTATA
Rvul		MG051026	AGAATCACGG	CCCTTCTTCT	CCTTCTTTCA	CTTCCTGTTT	TAGCCGGAGC	CATTACTATA
Rvul	Rv1	KF311588	AGAATCACAG	CCCTTCTTCT	CCTTCTCTCA	CTTCCTGTTT	TAGCCGGGGC	CATTACTATA
Rvul	Rv10	KF311587	AGAATCACGG	CCCTTCTTCT	CCTTCTTTCA	CTTCCTGTTT	TAGCCGGAGC	CATTACTATA

Rvul	Rv11	KF311629	AGAATCACAG	CCCTTCTTCT	CCTTCTTTCA	CTTCCTGTTT	TAGCCGGAGC	CATTACTATA
Rvul	Rv12	KF311550	AGAATCACGG	CCCTTCTTCT	CCTTCTTTCT	CTTCCTGTTT	TAGCTGGAGC	CATTACTATA
Rvul	Rv13	KF311549	AGAATCACGG	CCCTTCTTCT	CCTTCTTTCT	CTTCCTGTTT	TAGCTGGAGC	CATTACTATA
Rvul	Rv14	KF311573	AGAATCACGG	CCCTTCTTCT	CCTTCTTTCT	CTTCCTGTTT	TAGCTGGAGC	CATTACTATA
Rvul	Rv15	KF311546	AGAATCACGG	CCCTTCTTCT	CCTTCTTTCA	CTTCCTGTTT	TAGCCGGAGC	CATTACTATA
Rvul	Rv16	KF311600	AGAATCACGG	CCCTTCTTCT	CCTTCTTTCA	CTTCCTGTTT	TAGCTGGGGC	CATTACTATA
Rvul	Rv17	KF311578	AGAATCACGG	CCCTTCTTCT	CCTTCTTTCA	CTTCCTGTTT	TAGCTGGAGC	CATTACTATA
Rvul	Rv18	KF311593	AGAATCACGG	CCCTTCTTCT	CCTTCTTTCA	CTTCCTGTTT	TAGCTGGAGC	CATTACTATA
Rvul	Rv19	KF311552	AGAATCACGG	CCCTTCTTCT	CCTTCTTTCA	CTTCCTGTTT	TAGCTGGAGC	CATTACTATA
Rvul	Rv2	KF311586	AGAATCACAG	CCCTTCTTCT	CCTTCTCTCA	CTTCCTGTTT	TAGCCGGGGC	CATTACTATA
Rvul	Rv20	KF311594	AGAATCACGG	CCCTTCTTCT	CCTTCTTTCA	CTTCCTGTTT	TAGCTGGAGC	CATTACTATA
Rvul	Rv21	KF311547	AGAATCACGG	CCCTTCTTCT	CCTTCTTTCA	CTTCCTGTTT	TAGCTGGAGC	CATTACTATA
Rvul	Rv22	KF311591	AGAATCACGG	CCCTTCTTCT	CCTTCTTTCA	CTTCCTGTTT	TAGCTGGAGC	CATCACTATA
Rvul	Rv23	KF311545	AGAATCACGG	CCCTTCTTCT	CCTTCTTTCA	CTTCCTGTTT	TAGCTGGAGC	CATCACTATA
Rvul	Rv24	KF311576	AGAATCACGG	CCCTTCTTCT	CCTTCTTTCT	CTTCCTGTTT	TAGCTGGAGC	CATTACTATA
Rvul	Rv25	KF311548	AGAATCACGG	CCCTTCTTCT	CCTTCTTTCT	CTTCCTGTTT	TAGCTGGAGC	CATTACTATA
Rvul	Rv26	KF311559	AGAATCACGG	CCCTTCTTCT	CCTTCTTTCA	CTTCCTGTTT	TAGCTGGAGC	CATTACTATA
Rvul	Rv27	KF311561	AGAATCACGG	CCCTTCTTCT	CCTTCTTTCA	CTTCCTGTTT	TAGCTGGAGC	CATTACTATA
Rvul	Rv28	KF311533	AGAATCACGG	CCCTTCTTCT	CCTTCTTTCA	CTTCCTGTTT	TAGCTGGAGC	CATTACTATA
Rvul	Rv29	KF311537	AGAATCACGG	CCCTTCTTCT	CCTTCTTTCA	CTTCCTGTTT	TAGCTGGAGC	CATTACTATA
Rvul	Rv3	KF311633	AGAATCACAG	CCCTTCTTCT	CCTTCTCTCA	CTTCCTGTTT	TAGCCGGGGC	CATTACTATA
Rvul	Rv30	KF311564	AGAATCACGG	CCCTTCTTCT	CCTTCTTTCA	CTTCCTGTTT	TAGCTGGAGC	CATTACTATA
Rvul	Rv31	KF311570	AGAATCACGG	CCCTTCTTCT	CCTTCTTTCA	CTTCCTGTTT	TAGCTGGAGC	CATTACTATA
Rvul	Rv32	KF311530	AGAATCACGG	CCCTTCTTCT	CCTTCTTTCA	CTTCCTGTTT	TAGCTGGAGC	CATTACTATA
Rvul	Rv33	KF311538	AGAATCACGG	CCCTTCTTCT	CCTTCTTTCA	CTTCCTGTTT	TAGCTGGAGC	CATTACTATA
Rvul	Rv34	KF311610	AGAATCACGG	CCCTTCTTCT	CCTTCTTTCA	CTTCCTGTTT	TAGCTGGAGC	CATTACTATA
Rvul	Rv35	KF311605	AGAATCACGG	CCCTTCTTCT	CCTTCTTTCA	CTTCCTGTTT	TAGCTGGAGC	CATTACTATA
Rvul	Rv36	KF311535	AGAATCACGG	CCCTTCTTCT	CCTTCTTTCA	CTTCCTGTTT	TAGCTGGAGC	CATTACTATA
Rvul	Rv37	KF311529	AGAATCACGG	CCCTTCTTCT	CCTTCTTTCA	CTTCCTGTTT	TAGCTGGAGC	CATTACTATA
Rvul	Rv38	KF311532	AGAATCACGG	CCCTTCTTCT	CCTTCTTTCA	CTTCCTGTTT	TAGCTGGAGC	CATTACTATA
Rvul	Rv39	KF311563	AGAATCACGG	CCCTTCTTCT	CCTTCTTTCA	CTTCCTGTTT	TAGCTGGAGC	CATTACTATA
Rvul	Rv4	KF311589	AGAATCACAG	CCCTTCTTCT	CCTTCTCTCA	CTTCCTGTTT	TAGCCGGGGC	CATTACTATA
Rvul	Rv40	KF311568	AGAATCACGG	CCCTTCTTCT	CCTTCTTTCA	CTTCCTGTTT	TAGCTGGAGC	CATTACTATA

Rvul	Rv41	KF311555	AGAATCACGG	CCCTTCTTCT	CCTTCTTTCA	CTTCCTGTTT	TAGCTGGAGC	CATTACTATA
Rvul	Rv42	KF311558	AGAATCACGG	CCCTTCTTCT	CCTTCTTTCA	CTTCCTGTTT	TAGCTGGAGC	CATTACTATA
Rvul	Rv43	KF311560	AGAATCACGG	CCCTTCTTCT	CCTTCTCTCA	CTTCCTGTTT	TAGCTGGAGC	CATTACTATA
Rvul	Rv44	KF311601	AGAATCACGG	CCCTTCTTCT	CCTTCTTTCA	CTCCCTGTTT	TAGCTGGGGC	CATTACTATA
Rvul	Rv45	KF311608	AGAATCACGG	CCCTTCTTCT	CCTTCTTTCA	CTTCCTGTTT	TAGCTGGGGC	CATTACTATA
Rvul	Rv46	KF311604	AGAATCACGG	CCCTTCTTCT	CCTTCTTTCA	CTTCCTGTTT	TAGCTGGGGC	CATTACTATA
Rvul	Rv47	KF311615	AGAATCACAG	CCCTTCTTCT	CCTTCTTTCA	CTTCCTGTTT	TAGCTGGGGC	CATTACTATA
Rvul	Rv48	KF311603	AGAATCACGG	CCCTTCTTCT	CCTTCTTTCA	CTTCCTGTTT	TAGCTGGGGC	CATTACTATA
Rvul	Rv49	KF311609	AGAATCACGG	CCCTTCTTCT	CCTTCTTTCA	CTTCCTGTTT	TAGCTGGGGC	CATTACTATA
Rvul	Rv5	KF311632	AGAATCACGG	CCCTTCTTCT	CCTTCTCTCA	CTTCCTGTTT	TAGCCGGGGC	CATTACTATA
Rvul	Rv50	KF311602	AGAATCACGG	CCCTTCTTCT	CCTTCTTTCA	CTTCCTGTTT	TAGCTGGGGC	CATTACTATA
Rvul	Rv51	KF311621	AGAATCACGG	CCCTTCTTCT	CCTTCTTTCA	CTTCCTGTTT	TAGCTGGAGC	CATTACTATA
Rvul	Rv52	KF311619	AGAATCACGG	CCCTTCTTCT	CCTTCTTTCA	CTTCCTGTTT	TAGCTGGAGC	CATTACTATA
Rvul	Rv53	KF311620	AGAATCACGG	CCCTTCTTCT	CCTTCTTTCA	CTTCCTGTTT	TAGCTGGAGC	CATTACTATA
Rvul	Rv54	KF311622	AGAATCACGG	CCCTTCTTCT	CCTTCTTTCA	CTTCCTGTTT	TAGCTGGAGC	CATTACTATA
Rvul	Rv55	KF311617	AGAATCACAG	CCCTTCTTCT	CCTTCTTTCA	CTTCCTGTTT	TAGCTGGAGC	CATTACTATA
Rvul	Rv56	KF311606	AGAATCACGG	CCCTTCTTCT	CCTTCTTTCA	CTTCCTGTTT	TAGCTGGAGC	CATTACTATG
Rvul	Rv57	KF311614	AGAATCACGG	CCCTTCTTCT	CCTTCTTTCA	CTTCCTGTTT	TAGCTGGAGC	CATTACTATA
Rvul	Rv59	KF311567	AGAATCACAG	CCCTTCTTCT	CCTTCTTTCA	CTTCCTGTTT	TAGCTGGAGC	CATTACTATA
Rvul	Rv6	KF311628	AGAATCACGG	CCCTTCTTCT	CCTTCTCTCA	CTTCCTGTTT	TAGCCGGAGC	CATTACTATA
Rvul	Rv60	KF311607	AGAATCACGG	CCCTTCTTCT	CCTTCTTTCA	CTTCCTGTTT	TAGCTGGAGC	CATTACTATA
Rvul	Rv61	KF311544	AGAATCACGG	CCCTTCTTCT	CCTTCTTTCA	CTTCCTGTTT	TAGCTGGAGC	CATTACTATA
Rvul	Rv62	KF311625	AGAATCACGG	CCCTTCTTCT	CCTTCTTTCA	CTTCCTGTTT	TAGCTGGAGC	CATTACTATA
Rvul	Rv7	KF311528	AGAATCACGG	CCCTTCTTCT	CCTTCTCTCA	CTTCCTGTTT	TAGCCGGAGC	CATTACTATA
Rvul	Rv8	KF311631	AGAATCACGG	CCCTTCTTCT	CCTTCTCTCA	CTTCCTGTTT	TAGCCGGAGC	CATTACTATA
Rvul	Rv9	KF311590	AGAATCACGG	CGCTTCTTCT	CCTTCTTTCA	CTTCCTGTTT	TAGCCGGAGC	CATTACTATA
Slin		AY131102	AGAATCACAG	CTATCCTTCT	TCTATTAAGA	TTACCAGTAC	TAGCTGGTGC	TATTACTATA
Sory		AY131099	AGAATCACTG	CTATTCTCCT	CCTCTTTAGA	TTACCTGTAT	TAGCAGGAGC	AATCACTATA
Sory		GU196317	AGAATCACTG	CTATTCTCCT	CCTCTTTAGA	TTACCTGTAT	TAGCAGGAGC	AATCACTATA
Spheno		NC018351	AGAATCACAG	CTCTTCTTCT	TCTTTTATCC	TTACCAGTGC	TAGCAGGAGC	AATTACAATA
Szea		AY131100	AGAATTACAG	CCATTCTTCT	TTTACTTAGA	TTACCTGTTT	TAGCTGGAGC	AATCACTATG
Yfro		AY131109	AGAATCACAG	CTATTCTTCT	CCTCCTATCC	CTCCCTGTCC	TTGCAGGAGS	TATTACTATA

Continuation of the Table S4.

Species	Ha	Sequences	Position					
			601-610	611-620	621-630	631-640	641-650	651-660
Dbor		AY131105	CTATTAACAG	ATCGAAATAT	CAATACATCT	TTCTTTGACC	CTGCAGGAGG	GGGAGACCCC
Dbor		Uni9	CTATTAACAG	ATCGAAATAT	TAATACATCT	TTCTTTGACC	CTGCAGGAGG	AGGAGATCCC
Dper		ASSCR6014	----------	----------	----------	----------	----------	----------
Dper		ASSCR6015	----------	----------	----------	----------	----------	----------
Dper		ASSCR6016	----------	----------	----------	----------	----------	----------
Dper		ASSCR6018	----------	----------	----------	----------	----------	----------
Hcho		JX679716	TTATTAACTG	ATCGAAATTT	AAATACTTCC	TTTTTTGACC	CAGCAGGTGG	GGGAGACCCA
Hpha		KC112991	CTATTAACAG	ACCGAAACTT	AAATACTTCA	TTTTTTGACC	CGGCCGGAGG	TGGAGATCCA
Nxan		NC018354	CTTTTAACAG	ACCGTAATAT	CAATACTTCC	TTTTTTGATC	CTGCTGGTGG	AGGAGACCCA
Phil		GU244486	TTATTAACGG	ATCGAAACTT	AAATACTTCA	TTTTTTGACC	CGGCAGGAGG	AGGAGATCCA
Pnod		HQ891474	CTTCTAACCG	ATCGTAATAT	TAACACATCT	TTTTTTGACC	CCGCAGGAGG	GGGAGACCCA
Rbil	Rb1	KF311645	TTATTAACTG	ACCGAAATAT	CAATACCTCA	TTTTTCGACC	CTGCGGGAGG	AGGAGATCCA
Rbil	Rb2	KF311637	TTATTAACTG	ACCGAAATAT	CAATACCTCA	TTTTTCGACC	CTGCGGGAGG	AGGAGATCCA
Rbil	Rb3	KF311639	TTATTAACTG	ACCGAAATAT	CAATACCTCA	TTTTTCGACC	CTGCGGGAGG	AGGAGATCCA
Rbil	Rb4	KF311636	TTATTAACTG	ACCGAAATAT	CAATACCTCA	TTTTTCGACC	CTGCGGGAGG	AGGAGATCCA
Rbil	Rb5	KF311635	TTATTAACTG	ACCGAAATAT	CAATACCTCA	TTTTTCGACC	CTGCAGGAGG	AGGGGATCCA
Rbil	Rb6	KF311634	CTATTAACTG	ACCGAAATAT	CAATACCTCA	TTTTTCGATC	CTGCAGGAGG	AGGGGATCCA
Rbil	Rb7	KF311648	TTATTAACTG	ACCGAAATAT	CAATACCTCA	TTTTTCGACC	CTGCAGGAGG	AGGGGATCCA
Rbil	Rb8	KF311647	TTATTAACTG	ACCGAAATAT	CAATACCTCA	TTTTTCGACC	CTGCAGGAGG	AGGGGATCCA
Rcru		AY131113	CTTTTAACAG	ATCGAAATAT	TAATACATCA	TTTTTTGATC	CAGCAGGAGG	AGGAGACCCT
Rcru		KF311359	CTTTTAACAG	ATCGAAATAT	TAATACATCA	TTTTTTGATC	CAGCAGGAGG	AGGAGACCCT
Rcru		USCOC565	CTTTTAACAG	ATCGAAATAT	TAATACATCA	TTTTTTGATC	CAGCAGGAGG	AGGAGACCCT
Rfer	H1	GU581582	CTATTAACTG	ACCGAAATAT	CAATACATCA	TTTTTCGATC	CTGCGGGAGG	TGGGGACCCT
Rfer	H10	KF311482	CTATTAACTG	ACCGAAATAT	CAACACATCA	TTTTTCGATC	CTGCGGGAGG	TGGAGACCCT
Rfer	H11	KF311444	CTATTAACTG	ACCGAAATAT	CAACACATCA	TTTTTCGATC	CTGCGGGAGG	TGGAGACCCT
Rfer	H12	KF311487	CTATTAACTG	ACCGAAATAT	CAACACATCA	TTTTTCGATC	CTGCGGGAGG	TGGAGACCCT
Rfer	H13	KF311481	CTATTAACTG	ACCGAAATAT	CAACACATCA	TTTTTCGATC	CTGCGGGAGG	TGGAGACCCT
Rfer	H14	KF311448	CTATTAACTG	ACCGAAATAT	CAACACATCA	TTTTTCGATC	CTGCAGGAGG	TGGAGACCCT
Rfer	H15	JX292125	CTATTAACTG	ACCGAAATAT	CAACACATCA	TTTTTCGATC	CTGCGGGAGG	TGGAGACCCT
Rfer	H16	KF311449	CTATTAACTG	ACCGAAATAT	CAACACATCA	TTTTTCGATC	CTGCGGGAGG	TGGAGACCCT

Rfer	H17	KF311360	CTATTAACTG	ACCGAAATAT	CAATACATCA	TTTTTCGATC	CTGCGGGAGG	CGGAGACCCT
Rfer	H18	KF311473	CTATTAACTG	ACCGAAATAT	CAATACATCA	TTTTTCGATC	CTGCGGGAGG	CGGAGACCCT
Rfer	H2	GU581549	CTATTAACTG	ACCGAAATAT	CAATACATCA	TTTTTCGATC	CTGCGGGAGG	TGGGGACCCT
Rfer	H20	KF311433	CTATTAACTG	ACCGAAATAT	CAATACATCA	TTTTTCGATC	CTGCGGGAGG	CGGAGACCCT
Rfer	H21	KF311474	CTATTAACTG	ACCGAAATAT	CAATACATCA	TTTTTCGATC	CTGCGGGAGG	CGGAGACCCT
Rfer	H22	KF311516	CTATTAACTG	ACCGAAATAT	CAATACATCA	TTTTTCGATC	CTGCAGGAGG	CGGAGACCCT
Rfer	H23	KF311380	CTATTAACTG	ACCGAAATAT	CAATACATCA	TTTTTCGATC	CTGCAGGAGG	CGGAGACCCT
Rfer	H24	KF311389	CTATTAACTG	ACCGAAATAT	CAATACATCA	TTTTTCGATC	CTGCAGGAGG	CGGAGACCCT
Rfer	H25	KF311384	CTATTAACTG	ACCGAAATAT	CAATACATCA	TTTTTCGATC	CTGCAGGAGG	CGGAGACCCT
Rfer	H26	KF311388	CTATTAACTG	ACCGAAATAT	CAATACATCA	TTTTTCGATC	CTGCAGGAGG	CGGAGACCCT
Rfer	H27	KF311386	CTATTAACTG	ACCGAAATAT	CAATACATCA	TTTTTCGATC	CTGCAGGAGG	CGGAGACCCT
Rfer	H28	KF311399	CTATTAACTG	ACCGAAATAT	CAATACATCA	TTTTTCGATC	CTGCAGGAGG	CGGAGACCCT
Rfer	H29	KF311383	CTATTAACTG	ACCGAAATAT	CAATACATCA	TTTTTCGATC	CTGCGGGAGG	CGGAGACCCT
Rfer	H3	GU581547	CTATTAACTG	ACCGAAATAT	CAATACATCA	TTTTTCGATC	CTGCGGGAGG	TGGGGACCCT
Rfer	H30	KF311392	CTATTAACTG	ACCGAAATAT	CAATACATCA	TTTTTCGATC	CTGCGGGAGG	CGGAGACCCT
Rfer	H31	KF311379	CTATTAACTG	ACCGAAATAT	CAATACATCA	TTTTTCGATC	CTGCGGGAGG	CGGGGACCCT
Rfer	H32	KF311490	CTATTAACTG	ACCGAAATAT	CAATACATCA	TTTTTCGATC	CTGCGGGAGG	CGGAGACCCT
Rfer	H34	KF311492	CTATTAACTG	ACCGAAATAT	CAATACATCA	TTTTTCGATC	CTGCGGGAGG	CGGAGACCCT
Rfer	H35	KF311496	CTATTAACTG	ACCGAAATAT	CAATACATCA	TTTTTCGATC	CTGCGGGAGG	CGGAGACCCT
Rfer	H36	KF311500	CTATTAACTG	ACCGAAATAT	CAATACATCA	TTTTTCGACC	CTGCGGGAGG	CGGAGACCCT
Rfer	H37	KF311509	CTATTAACTG	ACCGAAATAT	CAATACATCA	TTTTTCGACC	CTGCAGGAGG	TGGGGACCCT
Rfer	H38	KF311505	CTATTAACTG	ACCGAAATAT	CAATACATCA	TTTTTCGATC	CTGCAGGAGG	TGGGGACCCT
Rfer	H39	KF311508	CTATTAACTG	ACCGAAATAT	CAATACATCA	TTTTTCGATC	CTGCAGGAGG	TGGGGACCCT
Rfer	H4	GU581545	CTATTAACTG	ACCGAAATAT	CAATACATCA	TTTTTCGATC	CTGCGGGAGG	TGGGGACCCT
Rfer	H40	KF311506	CTATTAACTG	ACCGAAATAT	CAATACATCA	TTTTTCGATC	CTGCAGGAGG	TGGGGACCCT
Rfer	H42	KF311501	CTATTAACTG	ACCGAAATAT	CAATACATCA	TTTTTCGATC	CTGCAGGAGG	TGGGGACCCT
Rfer	H43	KF311525	CTATTAACTG	ACCGAAATAT	CAATACCTCA	TTTTTCGATC	CTGCAGGAGG	AGGGGACCCT
Rfer	H5	GU581539	CTATTAACTG	ACCGAAATAT	CAATACATCA	TTTTTCGATC	CTGCGGGAGG	TGGGGACCCT
Rfer	H51	KU696497	CTATTAACTG	ACCGAAATAT	CAATACATCA	TTTTTCGATC	CTGCGGGAGG	TGGGGACCCT
Rfer	H52	KU696507	CTATTAACTG	ACCGAAATAT	CAATACATCA	TTTTTCGATC	CTGCGGGAGG	TGGGGACCCT
Rfer	H6	GU581526	CTATTAACTG	ACCGAAATAT	CAATACATCA	TTTTTCGATC	CTGCGGGAGG	TGGGGACCCT
Rfer	H7	GU581525	CTATTAACTG	ACCGAAATAT	CAATACATCA	TTTTTTGATC	CTGCAGGAGG	TGGGGACCCT
Rfer	H8	GU581319	CTATTAACTG	ACCGAAATAT	CAATACATCA	TTTTTCGATC	CTGCGGGAGG	CGGAGACCCT

Rfer	H9	KF311446	CTATTAACTG	ACCGAAATAT	CAACACATCA	TTTTTCGATC	CTGCAGGAGG	TGGGGACCCT
Rfer		JX292124	CTATTAACTG	ACCGAAATAT	CAACACATCA	TTTTTCGATC	CTGCGGGAGG	TGGAGACCCT
Rfer		JX294413	CTATTAACTG	ACCGAAATAT	CAACACATCA	TTTTTCGATC	CTGCGGGAGG	TGGAGACCCT
Rfer		KF413063	CTATTAACTG	ACCGAAATAT	CAATACATCA	TTTTTTGATC	CTGCAGGAGG	TGGGGACCCT
Rfer		KF413064	CTATTAACTG	ACCGAAATAT	CAATACATCA	TTTTTCGATC	CTGCGGGAGG	CGGAGACCCT
Rfer		KF413065	CTATTAACTG	ACCGAAATAT	CAATACATCA	TTTTTCGATC	CTGCGGGAGG	CGGAGACCCT
Rfer		KF413066	CTATTAACTG	ACCGAAATAT	CAATACATCA	TTTTTTGATC	CTGCAGGAGG	TGGGGACCCT
Rfer		KF413067	CTATTAACTG	ACCGAAATAT	CAATACATCA	TTTTTCGATC	CTGCAGGAGG	TGGGGACCCT
Rfer		KF413068	CTATTAACTG	ACCGAAATAT	CAATACATCA	TTTTTCGATC	CTGCAGGAGG	CGGAGACCCT
Rfer		KF413069	CTATTAACTG	ACCGAAATAT	CAATACATCA	TTTTTCGATC	CTGCGGGAGG	CGGAGACCCT
Rfer		KF413070	CTATTAACTG	ACCGAAATAT	CAATACATCA	TTTTTCGATC	CTGCGGGAGG	CGGAGACCCT
Rfer		KF413071	CTATTAACTG	ACCGAAATAT	CAATACATCA	TTTTTTGATC	CTGCAGGAGG	TGGGGACCCT
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Rfer		KF413073	CTATTAACTG	ACCGAAATAT	CAATACATCA	TTTTTCGATC	CTGCGGGAGG	CGGAGACCCT
Rfer		KT989230	CTATTAACTG	ACCGAAATAT	CAATACATCA	TTTTTCGATC	CTGCGGGAGG	CGGAGACCCT
Rfer		KT989231	CTATTAACTG	ACCGAAATAT	CAATACATCA	TTTTTCGATC	CTGCGGGAGG	CGGAGACCCT
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Rfer		KT989234	CTATTAACTG	ACCGAAATAT	CAATACATCA	TTTTTCGATC	CTGCGGGAGG	CGGAGACCCT
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Rfer		KY458175	CTATTAACTG	ACCGAAATAT	CAATACATCA	TTTTTCGATC	CTGCGGGAGG	TGGGGACCCT
Rfer		KY458176	CTATTAACTG	ACCGAAATAT	CAATACATCA	TTTTTCGATC	CTGCGGGAGG	TGGGGACCCT
Rfer		KY458177	CTATTAACTG	ACCGAAATAT	CAATACATCA	TTTTTCGATC	CTGCGGGAGG	TGGGGACCCT
Rfer		LC474878	CTATTAACTG	ACCGAAATAT	CAATACATCA	TTTTTCGATC	CTGCGGGAGG	CGGAGACCCT
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Rfer		LC474881	CTATTAACTG	ACCGAAATAT	CAATACATCA	TTTTTCGATC	CTGCGGGAGG	CGGAGACCCT
Rfer		LC474882	CTATTAACTG	ACCGAAATAT	CAATACATCA	TTTTTCGATC	CTGCGGGAGG	CGGAGACCCT
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Rfer		LC474888	CTATTAACTG	ACCGAAATAT	CAATACATCA	TTTTTCGATC	CTGCGGGAGG	CGGAGACCCT
Rfer		LC474889	CTATTAACTG	ACCGAAATAT	CAATACATCA	TTTTTCGATC	CTGCGGGAGG	CGGAGACCCT

Rfer		LC474890	CTATTAACTG	ACCGAAATAT	CAATACATCA	TTTTTCGATC	CTGCGGGAGG	CGGAGACCCT
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Rfer		LC474892	CTATTAACTG	ACCGAAATAT	CAATACATCA	TTTTTCGATC	CTGCGGGAGG	CGGAGACCCT
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Rfer		LC474895	CTATTAACTG	ACCGAAATAT	CAATACATCA	TTTTTCGATC	CTGCGGGAGG	CGGAGACCCT
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Rfer		LC474923	CTATTAACTG	ACCGAAATAT	CAATACATCA	TTTTTCGATC	CTGCGGGAGG	CGGAGACCCT
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Rfer		LC474925	CTATTAACTG	ACCGAAATAT	CAATACATCA	TTTTTCGATC	CTGCGGGAGG	CGGAGACCCT
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Rfer		LC474927	CTATTAACTG	ACCGAAATAT	CAATACATCA	TTTTTCGATC	CTGCGGGAGG	CGGAGACCCT
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Rfer		MH016625	CTATTAACTG	ACCGAAATAT	CAATACATCA	TTTTTCGATC	CTGCGGGAGG	CGGAGACCCT
Rfer		MH016626	CTATTAACTG	ACCGAAATAT	CAATACATCA	TTTTTCGATC	CTGCGGGAGG	CGGAGACCCT
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Rfer		MH016631	CTATTAACTG	ACCGAAATAT	CAATACATCA	TTTTTCGATC	CTGCGGGAGG	CGGAGACCCT
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Rfer	H19	KF311403	CTATTAACTG	ACCGAAATAT	CAATACATCA	TTTTTCGATC	CTGCGGGAGG	CGGAGACCCT
Rfer	H41	KF311502	CTATTAACTG	ACCGAAATAT	CAATACATCA	TTTTTCGATC	CTGCAGGAGG	TGGGGACCCT
Rpal		ASSCR6357	CTTCTAACTG	ACCGTAATAT	TAATACATCA	TTTTTTGACC	CTGCTGGAGG	AGGAGATCCT
Rpal		ASSCR6358	CTTCTAACTG	ACCGTAATAT	TAATACATCA	TTTTTTGACC	CTGCTGGAGG	AGGAGATCCT
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Rpal		KR494255	CTTCTAACTG	ACCGTAATAT	TAATACAACA	TTTTTTGACC	CTGCTGGAGG	AGGAGATCCT
Rpal		KR494256	CTTCTAACTG	ACCGTAATAT	TAATACATCA	TTTTTTGACC	CTGCTGGAGG	AGGAGATCCT
Rpal		KR494257	CTTCTAACTG	ACCGTAATAT	TAATACATCA	TTTTTTGACC	CTGCTGGAGG	AGGAGATCCT
Rpal		KR494258	CTTCTAACTG	ACCGTAATAT	TAATACATCA	TTTTTTGACC	CTGCTGGAGG	AGGAGATCCT

Rpal		KR494259	CTTCTAACTG	ACCGTAATAT	TAATACATCA	TTTTTTGACC	CTGCTGGAGG	AGGAGATCCT
Rpal		KR494260	CTTCTAACTG	ACCGTAATAT	TAATACATCA	TTTTTTGACC	CTGCTGGAGG	AGGAGATCCT
Rpal		KR494261	CTTCTAACTG	ACCGTAATAT	TAATACATCA	TTTTTTGACC	CTGCTGAAGG	AGGAGATCCT
Rpal	Rp1	KU647599	----------	----------	----------	----------	----------	----------
Rpal	Rp10	KU647490	----------	----------	----------	----------	----------	----------
Rpal	Rp11	KU647489	----------	----------	----------	----------	----------	----------
Rpal	Rp12	KU647604	----------	----------	----------	----------	----------	----------
Rpal	Rp13	KU647575	----------	----------	----------	----------	----------	----------
Rpal	Rp2	KU647587	----------	----------	----------	----------	----------	----------
Rpal	Rp3	KU647508	----------	----------	----------	----------	----------	----------
Rpal	Rp4	KU647585	----------	----------	----------	----------	----------	----------
Rpal	Rp5	KU647584	----------	----------	----------	----------	----------	----------
Rpal	Rp6	KU647581	----------	----------	----------	----------	----------	----------
Rpal	Rp7	KU647579	----------	----------	----------	----------	----------	----------
Rpal	Rp8	KU647502	----------	----------	----------	----------	----------	----------
Rpal	Rp9	KU647505	----------	----------	----------	----------	----------	----------
Rpal		Uni10	CTTCTAACTG	ACCGTAATAT	TAATACATCA	TTTTTTGACC	CTGCTGGAGG	AGGAGATCCT
Rpal		Uni11	CTTCTAACTG	ACCGTAATAT	TAATACATCA	TTTTTTGACC	CTGCTGGAGG	AGGAGATCCT
Rpal		Uni117	CTTCTAACTG	ATCGTAATAT	TAATACATCA	TTTTTTGACC	CTGCTGGAGG	AGGAGATCCT
Rpal		Uni17	CTTCTAACTG	ACCGTAATAT	TAATACATCA	TTTTTTGACC	CTGCTGGAGG	AGGAGATCCT
Rpal		Uni21	CTTCTAACTG	ACCGTAATAT	TAATACATCA	TTTTTTGACC	CTGCTGGAGG	AGGAGATCCT
Rpal		Uni44	CTTCTAACTG	ATCGTAATAT	TAATACATCA	TTTTTTGACC	CTGCTGGAGG	AGGAGATCCT
Rpal		Uni58	CTTCTAACTG	ACCGTAATAT	TAATACATCA	TTTTTTGACC	CTGCTGGAGG	AGGAGATCCT
Rpho		AY131120	TTATTAACTG	ATCGAAATAT	TAATACATCT	TTCTTTGATC	CCGCAGGAGG	GGGTGACCCA
Rpho		KY511047	TTATTAACTG	ATCGAAATAT	TAATACATCT	TTCTTTGATC	CTGCCGGAGG	GGGAGACCCA
Rvul		LN612634	CTATTAACTG	ACCGAAATAT	CAATACCTCA	TTTTTCGACC	CAGCAGGAGG	AGGGGACCCA
Rvul		LN612635	CTATTAACTG	ACCGAAATAT	CAATACCTCA	TTTTTCGACC	CAGCAGGAGG	AGGAGACCCA
Rvul		LN612636	CTATTAACTG	ACCGAAATAT	CAATACCTCA	TTTTTCGACC	----------	----------
Rvul		MG051024	CTATTAACTG	ACCGAAATAT	CAATACCTCA	TTTTTCGACC	CAGCGGGAGG	AGGGGACCCA
Rvul		MG051025	CTATTAACTG	ACCGAAATAT	CAATACCTCA	TTTTTCGACC	CAGCAGGAGG	AGGGGACCCA
Rvul		MG051026	CTATTAACTG	ACCGAAATAT	CAATACCTCA	TTTTTCGACC	CAGCAGGAGG	AGGAGACCCA
Rvul	Rv1	KF311588	CTATTAACTG	ACCGAAATAT	CAATACCTCA	TTTTTCGACC	CAGCAGGAGG	AGGGGACCCA
Rvul	Rv10	KF311587	CTATTAACTG	ACCGAAATAT	CAATACCTCA	TTTTTCGACC	CAGCGGGAGG	AGGAGACCCA

Rvul	Rv11	KF311629	CTATTAACTG	ACCGAAATAT	CAATACCTCA	TTTTTCGACC	CAGCAGGAGG	AGGGGACCCA
Rvul	Rv12	KF311550	CTATTAACTG	ACCGAAATAT	TAATACCTCA	TTTTTCGACC	CAGCAGGGGG	AGGGGATCCG
Rvul	Rv13	KF311549	CTATTAACTG	ACCGAAATAT	TAATACCTCA	TTTTTCGACC	CAGCAGGGGG	AGGGGATCCG
Rvul	Rv14	KF311573	CTATTAACTG	ACCGAAATAT	CAATACCTCA	TTTTTCGACC	CAGCAGGGGG	AGGGGATCCG
Rvul	Rv15	KF311546	CTATTAACTG	ACCGAAATAT	CAATACCTCA	TTTTTCGACC	CAGCAGGGGG	AGGGGATCCA
Rvul	Rv16	KF311600	CTATTAACTG	ACCGAAATAT	CAATACCTCA	TTTTTCGACC	CAGCAGGGGG	AGGGGATCCG
Rvul	Rv17	KF311578	CTATTAACTG	ACCGAAATAT	CAATACCTCA	TTTTTCGACC	CAGCAGGGGG	AGGGGATCCG
Rvul	Rv18	KF311593	CTATTAACTG	ACCGAAATAT	CAATACCTCA	TTTTTCGACC	CAGCAGGGGG	AGGGGATCCG
Rvul	Rv19	KF311552	CTATTAACTG	ACCGAAATAT	CAATACCTCA	TTTTTCGACC	CAGCAGGGGG	AGGGGATCCG
Rvul	Rv2	KF311586	CTATTAACTG	ACCGAAATAT	CAATACCTCA	TTTTTCGACC	CAGCAGGAGG	AGGGGACCCA
Rvul	Rv20	KF311594	CTATTAACTG	ACCGAAATAT	CAATACCTCA	TTTTTCGACC	CAGCAGGGGG	AGGGGACCCG
Rvul	Rv21	KF311547	CTATTAACTG	ACCGGAATAT	CAATACCTCA	TTTTTCGACC	CAGCAGGGGG	AGGGGACCCG
Rvul	Rv22	KF311591	CTATTAACTG	ACCGAAATAT	CAATACCTCA	TTTTTCGACC	CAGCAGGAGG	AGGGGATCCG
Rvul	Rv23	KF311545	CTATTAACTG	ACCGAAATAT	CAATACCTCA	TTTTTCGACC	CAGCAGGAGG	AGGGGATCCG
Rvul	Rv24	KF311576	CTATTAACTG	ACCGAAATAT	CAATACCTCA	TTTTTCGACC	CAGCAGGGGG	AGGGGACCCA
Rvul	Rv25	KF311548	CTATTAACTG	ACCGAAATAT	CAATACCTCA	TTTTTCGACC	CAGCGGGGGG	AGGGGACCCA
Rvul	Rv26	KF311559	CTATTGACTG	ACCGAAATAT	CAATACCTCA	TTTTTCGACC	CAGCAGGAGG	AGGAGACCCA
Rvul	Rv27	KF311561	CTATTGACTG	ACCGAAATAT	CAATACCTCA	TTTTTCGACC	CAGCAGGAGG	AGGGGACCCA
Rvul	Rv28	KF311533	CTATTGACTG	ACCGAAATAT	CAATACCTCA	TTTTTCGACC	CAGCAGGAGG	AGGGGACCCA
Rvul	Rv29	KF311537	CTATTAACTG	ACCGAAATAT	CAATACCTCA	TTTTTCGACC	CAGCAGGAGG	AGGAGACCCA
Rvul	Rv3	KF311633	CTATTAACTG	ACCGAAATAT	CAATACCTCA	TTTTTCGACC	CAGCAGGAGG	AGGGGACCCA
Rvul	Rv30	KF311564	CTATTAACTG	ACCGAAATGT	CAATACCTCA	TTTTTCGACC	CAGCAGGAGG	AGGGGACCCA
Rvul	Rv31	KF311570	CTATTGACTG	ACCGAAATAT	CAATACCTCA	TTTTTCGACC	CAGCAGGAGG	AGGGGACCCA
Rvul	Rv32	KF311530	CTATTGACTG	ACCGAAATAT	CAATACCTCA	TTTTTCGACC	CAGCAGGAGG	AGGGGACCCA
Rvul	Rv33	KF311538	CTATTGACTG	ACCGAAATAT	CAATACCTCA	TTTTTCGACC	CAGCAGGAGG	AGGGGACCCA
Rvul	Rv34	KF311610	CTATTGACTG	ACCGAAATAT	CAATACCTCA	TTTTTCGACC	CAGCAGGAGG	AGGGGACCCA
Rvul	Rv35	KF311605	CTATTGACTG	ACCGAAATAT	CAATACCTCA	TTTTTCGACC	CAGCAGGAGG	AGGGGACCCA
Rvul	Rv36	KF311535	CTATTGACTG	ACCGAAATAT	CAATACCTCA	TTTTTCGACC	CAGCAGGAGG	GGGGGACCCA
Rvul	Rv37	KF311529	CTATTGACTG	ACCGAAATAT	CAATACCTCA	TTTTTCGACC	CAGCAGGAGG	AGGGGACCCA
Rvul	Rv38	KF311532	CTATTGACTG	ACCGAAATAT	CAATACCTCA	TTTTTCGACC	CAGCAGGAGG	AGGGGACCCA
Rvul	Rv39	KF311563	CTATTAACTG	ACCGAAATAT	CAATACCTCA	TTTTTCGACC	CAGCAGGAGG	AGGGGACCCA
Rvul	Rv4	KF311589	CTATTAACTG	ACCGAAATAT	CAATACCTCA	TTTTTCGACC	CAGCAGGAGG	AGGGGACCCA
Rvul	Rv40	KF311568	CTATTGACTG	ACCGAAATAT	CAATACCTCA	TTTTTCGACC	CAGCAGGAGG	AGGGGACCCA

Rvul	Rv41	KF311555	CTATTGACTG	ACCGAAATAT	CAATACCTCA	TTTTTCGACC	CAGCAGGAGG	AGGGGACCCA
Rvul	Rv42	KF311558	CTATTGACTG	ACCGAAATAT	CAATACCTCA	TTTTTCGACC	CAGCAGGAGG	AGGGGACCCA
Rvul	Rv43	KF311560	CTATTGACTG	ACCGAAATAT	CAATACCTCA	TTTTTCGACC	CAGCAGGAGG	AGGGGACCCA
Rvul	Rv44	KF311601	CTATTGACTG	ACCGAAATAT	CAATACCTCA	TTTTTCGACC	CAGCAGGAGG	AGGGGACCCA
Rvul	Rv45	KF311608	CTATTGACTG	ACCGAAATAT	CAATACCTCA	TTTTTCGACC	CAGCAGGAGG	AGGGGACCCA
Rvul	Rv46	KF311604	CTATTGACTG	ACCGAAATAT	CAATACCTCA	TTTTTCGACC	CAGCAGGAGG	AGGGGACCCA
Rvul	Rv47	KF311615	CTACTGACTG	ACCGAAATAT	CAATACCTCA	TTTTTCGACC	CAGCAGGAGG	AGGGGACCCA
Rvul	Rv48	KF311603	CTATTGACTG	ACCGAAATAT	CAATACCTCA	TTTTTCGACC	CAGCAGGAGG	AGGGGACCCA
Rvul	Rv49	KF311609	CTATTGACTG	ACCGAAATAT	CAATACCTCA	TTTTTCGACC	CAGCAGGAGG	GGGGGACCCA
Rvul	Rv5	KF311632	CTATTAACTG	ACCGAAATAT	CAATACCTCA	TTTTTCGACC	CAGCAGGAGG	AGGGGACCCA
Rvul	Rv50	KF311602	CTATTGACTG	ACCGAAATAT	CAATACCTCA	TTTTTCGACC	CAGCAGGAGG	AGGGGACCCA
Rvul	Rv51	KF311621	CTATTGACTG	ACCGAAATAT	CAATACCTCA	TTTTTCGACC	CAGCAGGAGG	AGGGGACCCA
Rvul	Rv52	KF311619	CTATTGACTG	ACCGAAATAT	CAATACCTCA	TTTTTCGACC	CAGCAGGAGG	AGGGGACCCA
Rvul	Rv53	KF311620	CTATTGACTG	ACCGAAATAT	CAATACCTCA	TTTTTCGACC	CAGCAGGAGG	AGGGGACCCA
Rvul	Rv54	KF311622	CTATTGACTG	ACCGAAATAT	CAATACCTCA	TTTTTCGACC	CAGCAGGAGG	AGGGGACCCA
Rvul	Rv55	KF311617	CTATTGACTG	ACCGAAATAT	CAATACCTCA	TTTTTCGACC	CAGCAGGAGG	AGGGGACCCA
Rvul	Rv56	KF311606	CTATTGACTG	ACCGAAATAT	CAATACCTCA	TTTTTCGACC	CAGCAGGAGG	AGGAGACCCA
Rvul	Rv57	KF311614	CTATTGACTG	ACCGAAATAT	CAATACCTCA	TTTTTCGACC	CAGCAGGAGG	AGGAGACCCA
Rvul	Rv59	KF311567	CTATTGACTG	ACCGAAATAT	CAATACCTCA	TTTTTCGACC	CAGCAGGAGG	AGGGGACCCA
Rvul	Rv6	KF311628	CTATTAACTG	ACCGAAATAT	CAATACCTCA	TTTTTCGACC	CAGCAGGAGG	AGGGGACCCA
Rvul	Rv60	KF311607	CTATTGACTG	ACCGAAATAT	CAATACCTCA	TTTTTCGACC	CAGCAGGAGG	AGGGGACCCA
Rvul	Rv61	KF311544	CTATTGACCG	ACCGAAATAT	CAATACCTCA	TTTTTTGACC	CAGCAGGAGG	AGGGGACCCA
Rvul	Rv62	KF311625	CTATTGACTG	ACCGAAATAT	CAATACCTCA	TTTTTTGACC	CAGCAGGAGG	AGGGGACCCA
Rvul	Rv7	KF311528	CTATTGACTG	ACCGAAATAT	CAATACCTCA	TTTTTCGACC	CAGCAGGAGG	AGGGGACCCA
Rvul	Rv8	KF311631	CTATTAACTG	ACCGAAATAT	CAATACCTCA	TTTTTCGACC	CAGCAGGAGG	AGGGGACCCA
Rvul	Rv9	KF311590	CTATTAACTG	ACCGAAATAT	CAATACCTCA	TTTTTCGACC	CAGCAGGAGG	AGGGGACCCA
Slin		AY131102	CTCTTAACTG	ATCGAAATAT	TAATACCTCT	TTTTTTGATC	CAGCAGGAGG	AGGAGACCCT
Sory		AY131099	CTTCTTACTG	ATCGAAATAT	TAATACTTCC	TTTTTTGATC	CTGCCGGAGG	AGGAGACCCA
Sory		GU196317	CTTCTTACTG	ATCGAAATAT	TAATACTTCC	TTTTTTGATC	CTGCCGGAGG	AGGAGACCCA
Spheno		NC018351	CTTTTAACTG	ATCGAAATAT	TAATACTTCT	TTCTTTGACC	CTGCCGGAGG	AGGAGACCCA
Szea		AY131100	CTTCTTACTG	ATCGTAATAT	CAATACCTCT	TTTTTTGATC	CTGCTGGAGG	CGGAGACCCT
Yfro		AY131109	CTACTAACCG	ATCGTAACAT	TAATACAACA	TTTTTTGACC	CAGCTGGAGG	AGGAGACCCC

Continuation of the Table S4.

Species	Ha	Sequences	Position					
			661-670	671-680	681-690	691-700	701-710	711-720
Dbor		AY131105	ATCTTGTACC	AACATCTATT	TTGATTCTTT	GGACACCCAG	AAGTTTATAT	TCTCATTCTA
Dbor		Uni9	ATTTTGTACC	AACATCTATT	TTGATTTTTT	GGTCACCCTG	AAGTTTAAGT	----------
Dper		ASSCR6014	----------	----------	----------	----------	----------	----------
Dper		ASSCR6015	----------	----------	----------	----------	----------	----------
Dper		ASSCR6016	----------	----------	----------	----------	----------	----------
Dper		ASSCR6018	----------	----------	----------	----------	----------	----------
Hcho		JX679716	ATCCTTTACC	AGCATCTTTT	CTGATTTTTT	GGTCACCC--	----------	----------
Hpha		KC112991	ATTCTCTACC	AACATCTATT	CTGATTTTTT	GGTCACCCGA	AAGTTTAA--	----------
Nxan		NC018354	ATTCTCTATC	AACATTTATT	TTGATTTTTT	GGACACCCTG	AAGTTTATAT	TTTAATTCTT
Phil		GU244486	ATTCTCTATC	AACATTTATT	TTGATTTTTT	GGACACCCAG	AAGTTTA---	----------
Pnod		HQ891474	ATTCTATACC	AGCATTTATT	TTGATTTTTT	GGTCACCCTG	AAGTTTATAT	TCTTATTCTT
Rbil	Rb1	KF311645	ATTCTTTACC	AACATTTATT	TTGATTTTTT	GGACACCCTG	AAGTCTATAT	TCTCATCCTT
Rbil	Rb2	KF311637	ATTCTTTACC	AACATTTATT	TTGATTTTTT	GGACACCCTG	AAGTCTATAT	TCTCATCCTT
Rbil	Rb3	KF311639	ATTCTTTACC	AACATTTATT	TTGATTTTTT	GGACACCCTG	AAGTCTATAT	TCTCATCCTT
Rbil	Rb4	KF311636	ATTCTTTACC	AACATTTATT	TTGATTTTTT	GGACACCCTG	AAGTCTATAT	TCTCATCCTT
Rbil	Rb5	KF311635	ATTCTTTACC	AACATTTATT	TTGATTTTTT	GGACACCCTG	AAGTCTATAT	TCTCATCCTT
Rbil	Rb6	KF311634	ATTCTTTACC	AACATTTATT	TTGATTTTTT	GGACACCCTG	AAGTCTATAT	TCTCATCCTT
Rbil	Rb7	KF311648	ATTCTTTACC	AACATTTATT	TTGATTTTTT	GGACACCCTG	AAGTCTATAT	TCTCATCCTT
Rbil	Rb8	KF311647	ATTCTTTACC	AACATTTATT	TTGATTTTTT	GGACACCCTG	AAGTCTATAT	TCTCATCCTT
Rcru		AY131113	ATTCTATACC	AACATTTATT	TTGATTCTTT	GGTCATCCAG	AAGTTTATAT	TTTAATTTTA
Rcru		KF311359	ATTCTATACC	AACATTTATT	TTGATTCTTT	GGTCATCCAG	AAGTTTATAT	TTTAATTTTA
Rcru		USCOC565	ATTCTATACC	AACATTTATT	T---------	----------	----------	----------
Rfer	H1	GU581582	ATTCTTTACC	AACATTTATT	TTGATTCTTT	GGACACCCAG	AAGTTTATAT	TCTTATCCTT
Rfer	H10	KF311482	ATTCTTTACC	AACATTTATT	TTGATTCTTT	GGACACCCAG	AAGTTTATAT	TCTTATCCTT
Rfer	H11	KF311444	ATTCTTTACC	AACATTTATT	TTGATTCTTT	GGACACCCAG	AAGTTTATAT	TCTTATCCTC
Rfer	H12	KF311487	ATTCTCTACC	AACATTTATT	TTGATTCTTT	GGGCACCCAG	AAGTTTATAT	TCTTATCCTT
Rfer	H13	KF311481	ATTCTCTACC	AACATTTATT	TTGATTCTTT	GGACACCCAG	AAGTTTATAT	TCTTATCCTT
Rfer	H14	KF311448	ATTCTTTACC	AACATTTATT	TTGATTCTTT	GGACACCCAG	AAGTTTATAT	TCTTATCCTT
Rfer	H15	JX292125	ATTCTTTACC	AACATTTATT	TTGATTCTTT	GGACACCCAG	AAGTTTATAT	TCTTATCCTT
Rfer	H16	KF311449	ATTCTTTACC	AACATTTATT	TTGATTCTTT	GGACACCCAG	AAGTTTATAT	TCTTATCCTT

Rfer	H17	KF311360	ATTCTTTACC	AACATTTATT	TTGATTTTTT	GGACACCCAG	AAGTTTATAT	TCTTATCCTT
Rfer	H18	KF311473	ATTCTTTACC	AACATTTATT	TTGATTTTTT	GGACACCCAG	AAGTTTATAT	TCTTATCCTT
Rfer	H2	GU581549	ATTCTTTACC	AACATTTATT	TTGATTCTTT	GGACACCCAG	AAGTTTATAT	TCTTATCCTT
Rfer	H20	KF311433	ATTCTTTACC	AACATTTATT	TTGATTTTTT	GGACACCCAG	AAGTTTATAT	TCTTATCCTT
Rfer	H21	KF311474	ATTCTTTACC	AACATTTATT	TTGATTTTTT	GGACACCCAG	AAGTTTATAT	TCTTATCCTT
Rfer	H22	KF311516	ATTCTTTACC	AACATTTATT	TTGATTTTTT	GGACACCCAG	AAGTTTATAT	TCTTATCCTT
Rfer	H23	KF311380	ATTCTTTACC	AACATTTATT	TTGATTTTTT	GGACACCCAG	AAGTTTATAT	TCTTATCCTC
Rfer	H24	KF311389	ATTCTTTACC	AACATTTATT	TTGATTTTTT	GGACACCCAG	AAGTTTATAT	TCTTATCCTC
Rfer	H25	KF311384	ATTCTTTACC	AACATTTATT	TTGATTTTTT	GGACACCCAG	AAGTTTATAT	TCTTATCCTC
Rfer	H26	KF311388	ATTCTTTACC	AACATTTATT	TTGATTTTTT	GGACACCCAG	AAGTTTATAT	TCTTATCCTC
Rfer	H27	KF311386	ATTCTTTACC	AACATTTATT	TTGATTTTTT	GGACATCCAG	AAGTTTATAT	TCTTATCCTC
Rfer	H28	KF311399	ATTCTTTACC	AACATTTATT	TTGATTTTTT	GGACACCCAG	AAGTTTATAT	TCTTATCCTC
Rfer	H29	KF311383	ATTCTTTACC	AACATTTATT	TTGATTTTTT	GGACACCCAG	AAGTTTATAT	TCTTATCCTC
Rfer	H3	GU581547	ATTCTTTACC	AACATTTATT	TTGATTCTTT	GGACACCCAG	AAGTTTATAT	TCTTATCCTT
Rfer	H30	KF311392	ATTCTTTACC	AACATTTATT	TTGATTTTTT	GGACACCCAG	AAGTTTATAT	TCTTATCCTC
Rfer	H31	KF311379	ATTCTTTACC	AACATTTATT	TTGATTTTTT	GGACACCCAG	AAGTTTATAT	TCTTATCCTC
Rfer	H32	KF311490	ATTCTTTACC	AACATTTATT	TTGATTTTTT	GGACACCCAG	AAGTTTATAT	T---------
Rfer	H34	KF311492	ATTCTTTACC	AACATTTATT	TTGATTTTTT	GGACACCCAG	AAGTTTATAT	TCTTATCCTC
Rfer	H35	KF311496	ATTCTTTACC	AACATTTATT	TTGATTTTTT	GGGCACCCAG	AAGTTTATAT	TCTTATCCTC
Rfer	H36	KF311500	ATCCTTTACC	AACATTTATT	TTGATTTTTT	GGACACCCAG	AAGTTTATAT	TCTTATCCTC
Rfer	H37	KF311509	ATTCTTTACC	AACATTTATT	TTGATTTTTT	GGACACCCAG	AAGTTTATAT	TCTTATCCTT
Rfer	H38	KF311505	ATTCTTTACC	AACATTTATT	TTGATTTTTT	GGACACCCAG	AAGTTTATAT	TCTTATCCTT
Rfer	H39	KF311508	ATTCTTTACC	AACATTTATT	TTGATTTTTT	GGACACCCAG	AAGTTTATAT	TCTTATCCTT
Rfer	H4	GU581545	ATTCTTTACC	AACATTTATT	TTGATTCTTT	GGACACCCAG	AAGTTTATAT	TCTTATCCTT
Rfer	H40	KF311506	ATTCTTTACC	AACATTTATT	TTGATTTTTT	GGACACCCAG	AAGTTTATAT	TCTTATCCTT
Rfer	H42	KF311501	ATTCTTTACC	AACATTTATT	TTGATTTTTT	GGACACCCAG	AAGTTTATAT	TCTTATCCTT
Rfer	H43	KF311525	ATTCTTTACC	AGCATTTATT	TTGATTTTTT	GGACACCCAG	AAGTTTATAT	TCTTATCCTT
Rfer	H5	GU581539	ATTCTTTACC	AACATTTATT	TTGATTCTTT	GGACACCCAG	AAGTTTATAT	TCTTATCCTT
Rfer	H51	KU696497	ATTCTTTACC	AACATTTATT	TTGATTCTTT	GGACACCCAG	AAGTTTATAT	TCTTATCCTT
Rfer	H52	KU696507	ATTCTTTACC	AACATTTATT	TTGATTCTTT	GGACACCCAG	AAGTTTATAT	TCTTATCCTT
Rfer	H6	GU581526	ATTCTTTACC	AACATTTATT	TTGATTCTTT	GGACACCCAG	AAGTTTATAT	TCTTATCCTT
Rfer	H7	GU581525	ATCCTTTACC	AACATTTATT	TTGATTCTTT	GGACACCCAG	AAGTTTATAT	TCTTATCCTT
Rfer	H8	GU581319	ATTCTTTACC	AACATTTATT	TTGATTTTTT	GGACACCCAG	AAGTTTATAT	TCTTATCCTT

Rfer	H9	KF311446	ATTCTTTACC	AACATTTATT	TTGATTCTTT	GGACACCCAG	AAGTTTATAT	TCTTATCCTC
Rfer		JX292124	ATTCTTTACC	AACATTTATT	TTGATTCTTT	GGACACCCAG	AAGTTTATAT	TCTTATCCTT
Rfer		JX294413	ATTCTTTACC	AACATTTATT	TTGGTTCTTT	GGACACCCAG	AAGTTTATAT	TCTTATCCTT
Rfer		KF413063	ATCCTTTACC	AACATTTATT	TTGATTCTTT	GGACACCCAG	AAGTTTATAT	TCTTATCCTT
Rfer		KF413064	ATTCTTTACC	AACATTTATT	TTGATTTTTT	GGACACCCAG	AAGTTTATAT	TCTTATCCTT
Rfer		KF413065	ATTCTTTACC	AACATTTATT	TTGATTTTTT	GGACACCCAG	AAGTTTATAT	TCTTATCCTT
Rfer		KF413066	ATCCTTTACC	AACATTTATT	TTGATTCTTT	GGACACCCAG	AAGTTTATAT	TCTTATCCTT
Rfer		KF413067	ATTCTTTACC	AACATTTATT	TTGATTTTTT	GGACACCCAG	AAGTTTATAT	TCTTATCCTT
Rfer		KF413068	ATTCTTTACC	AACATTTATT	TTGATTTTTT	GGACACCCAG	AAGTTTATAT	TCTTATCCTC
Rfer		KF413069	ATTCTTTACC	AACATTTATT	TTGATTTTTT	GGACACCCAG	AAGTTTATAT	TCTTATCCTT
Rfer		KF413070	ATTCTTTACC	AACATTTATT	TTGATTTTTT	GGACACCCAG	AAGTTTATAT	TCTTATCCTT
Rfer		KF413071	ATCCTTTACC	AACATTTATT	TTGATTCTTT	GGACACCCAG	AAGTTTATAT	TCTTATCCTT
Rfer		KF413072	ATCCTTTACC	AACATTTATT	TTGATTCTTT	GGACACCCAG	AAGTTTATAT	TCTTATCCTT
Rfer		KF413073	ATTCTTTACC	AACATTTATT	TTGATTTTTT	GGACACCCAG	AAGTTTATAT	TCTTATCCTT
Rfer		KT989230	ATTCTTTACC	AACATTTATT	T---------	----------	----------	----------
Rfer		KT989231	ATTCTTTACC	AACATTTATT	T---------	----------	----------	----------
Rfer		KT989232	ATTCTTTACC	AACATTTATT	T---------	----------	----------	----------
Rfer		KT989233	ATTCTTTACC	AACATTTATT	T---------	----------	----------	----------
Rfer		KT989234	ATTCTTTACC	AACATTTATT	T---------	----------	----------	----------
Rfer		KU916538	ATTCTTTACC	AACATTTATT	T---------	----------	----------	----------
Rfer		KY458175	ATTCTTTACC	AACATTTATT	TTGATTTTTT	GGTCACCCTG	AAGTTTA---	----------
Rfer		KY458176	ATTCTTTACC	AACATTTATT	TTGATTTTTT	GGTCACCCTG	AAGTTTA---	----------
Rfer		KY458177	ATTCTTTACC	AACATTTATT	TTGATTTTTT	GGTCACCCTG	AAGTTTAA--	----------
Rfer		LC474878	ATTCTTTACC	AACATTTATT	TTGATTTTTT	GGACACCCAG	AAGTTTATAT	TCTTATCCTT
Rfer		LC474880	ATTCTTTACC	AACATTTATT	TTGATTTTTT	GGACACCCAG	AAGTTTATAT	TCTTATCCTT
Rfer		LC474881	ATTCTTTACC	AACATTTATT	TTGATTTTTT	GGACACCCAG	AAGTTTATAT	TCTTATCCTT
Rfer		LC474882	ATTCTTTACC	AACATTTATT	TTGATTTTTT	GGACACCCAG	AAGTTTATAT	TCTTATCCTT
Rfer		LC474884	ATTCTTTACC	AACATTTATT	TTGATTTTTT	GGACACCCAG	AAGTTTATAT	TCTTATCCTT
Rfer		LC474885	ATTCTTTACC	AACATTTATT	TTGATTTTTT	GGACACCCAG	AAGTTTATAT	TCTTATCCTT
Rfer		LC474886	ATTCTTTACC	AACATTTATT	TTGATTTTTT	GGACACCCAG	AAGTTTATAT	TCTTATCCTT
Rfer		LC474887	ATTCTTTACC	AACATTTATT	TTGATTTTTT	GGACACCCAG	AAGTTTATAT	TCTTATCCTT
Rfer		LC474888	ATTCTTTACC	AACATTTATT	TTGATTTTTT	GGACACCCAG	AAGTTTATAT	TCTTATCCTT
Rfer		LC474889	ATTCTTTACC	AACATTTATT	TTGATTTTTT	GGACACCCAG	AAGTTTATAT	TCTTATCCTT

Rfer		LC474890	ATTCTTTACC	AACATTTATT	TTGATTTTTT	GGACACCCAG	AAGTTTATAT	TCTTATCCTT
Rfer		LC474891	ATTCTTTACC	AACATTTATT	TTGATTTTTT	GGACACCCAG	AAGTTTATAT	TCTTATCCTT
Rfer		LC474892	ATTCTTTACC	AACATTTATT	TTGATTTTTT	GGACACCCAG	AAGTTTATAT	TCTTATCCTT
Rfer		LC474893	ATTCTTTACC	AACATTTATT	TTGATTTTTT	GGACACCCAG	AAGTTTATAT	TCTTATCCTT
Rfer		LC474894	ATTCTTTACC	AACATTTATT	TTGATTTTTT	GGACACCCAG	AAGTTTATAT	TCTTATCCTT
Rfer		LC474895	ATTCTTTACC	AACATTTATT	TTGATTTTTT	GGACACCCAG	AAGTTTATAT	TCTTATCCTT
Rfer		LC474896	ATTCTTTACC	AACATTTATT	TTGATTTTTT	GGACACCCAG	AAGTTTATAT	TCTTATCCTT
Rfer		LC474897	ATTCTTTACC	AACATTTATT	TTGATTTTTT	GGACACCCAG	AAGTTTATAT	TCTTATCCTT
Rfer		LC474898	ATTCTTTACC	AACATTTATT	TTGATTTTTT	GGACACCCAG	AAGTTTATAT	TCTTATCCTT
Rfer		LC474899	ATTCTTTACC	AACATTTATT	TTGATTTTTT	GGACACCCAG	AAGTTTATAT	TCTTATCCTT
Rfer		LC474902	ATTCTTTACC	AACATTTATT	TTGATTTTTT	GGACACCCAG	AAGTTTATAT	TCTTATCCTT
Rfer		LC474903	ATTCTTTACC	AACATTTATT	TTGATTTTTT	GGACACCCAG	AAGTTTATAT	TCTTATCCTT
Rfer		LC474904	ATTCTTTACC	AACATTTATT	TTGATTTTTT	GGACACCCAG	AAGTTTATAT	TCTTATCCTT
Rfer		LC474905	ATTCTTTACC	AACATTTATT	TTGATTTTTT	GGACACCCAG	AAGTTTATAT	TCTTATCCTT
Rfer		LC474906	ATTCTTTACC	AACATTTATT	TTGATTTTTT	GGACACCCAG	AAGTTTATAT	TCTTATCCTT
Rfer		LC474907	ATTCTTTACC	AACATTTATT	TTGATTTTTT	GGACACCCAG	AAGTTTATAT	TCTTATCCTT
Rfer		LC474908	ATTCTTTACC	AACATTTATT	TTGATTTTTT	GGACACCCAG	AAGTTTATAT	TCTTATCCTT
Rfer		LC474909	ATTCTTTACC	AACATTTATT	TTGATTTTTT	GGACACCCAG	AAGTTTATAT	TCTTATCCTT
Rfer		LC474910	ATTCTTTACC	AACATTTATT	TTGATTTTTT	GGACACCCAG	AAGTTTATAT	TCTTATCCTT
Rfer		LC474911	ATTCTTTACC	AACATTTATT	TTGATTTTTT	GGACACCCAG	AAGTTTATAT	TCTTATCCTT
Rfer		LC474912	ATTCTTTACC	AACATTTATT	TTGATTTTTT	GGACACCCAG	AAGTTTATAT	TCTTATCCTT
Rfer		LC474913	ATTCTTTACC	AACATTTATT	TTGATTTTTT	GGACACCCAG	AAGTTTATAT	TCTTATCCTT
Rfer		LC474914	ATTCTTTACC	AACATTTATT	TTGATTTTTT	GGACACCCAG	AAGTTTATAT	TCTTATCCTT
Rfer		LC474915	ATTCTTTACC	AACATTTATT	TTGATTTTTT	GGACACCCAG	AAGTTTATAT	TCTTATCCTT
Rfer		LC474916	ATTCTTTACC	AACATTTATT	TTGATTTTTT	GGACACCCAG	AAGTTTATAT	TCTTATCCTT
Rfer		LC474917	ATTCTTTACC	AACATTTATT	TTGATTTTTT	GGACACCCAG	AAGTTTATAT	TCTTATCCTT
Rfer		LC474918	ATTCTTTACC	AACATTTATT	TTGATTTTTT	GGACACCCAG	AAGTTTATAT	TCTTATCCTT
Rfer		LC474919	ATTCTTTACC	AACATTTATT	TTGATTTTTT	GGACACCCAG	AAGTTTATAT	TCTTATCCTT
Rfer		LC474920	ATTCTTTACC	AACATTTATT	TTGATTTTTT	GGACACCCAG	AAGTTTATAT	TCTTATCCTT
Rfer		LC474921	ATTCTTTACC	AACATTTATT	TTGATTTTTT	GGACACCCAG	AAGTTTATAT	TCTTATCCTT
Rfer		LC474922	ATTCTTTACC	AACATTTATT	TTGATTTTTT	GGACACCCAG	AAGTTTATAT	TCTTATCCTT
Rfer		LC474923	ATTCTTTACC	AACATTTATT	TTGATTTTTT	GGACACCCAG	AAGTTTATAT	TCTTATCCTT
Rfer		LC474924	ATTCTTTACC	AACATTTATT	TTGATTTTTT	GGACACCCAG	AAGTTTATAT	TCTTATCCTT

Rfer		LC474925	ATTCTTTACC	AACATTTATT	TTGATTTTTT	GGACACCCAG	AAGTTTATAT	TCTTATCCTT
Rfer		LC474926	ATTCTTTACC	AACATTTATT	TTGATTTTTT	GGACACCCAG	AAGTTTATAT	TCTTATCCTT
Rfer		LC474927	ATTCTTTACC	AACATTTATT	TTGATTTTTT	GGACACCCAG	AAGTTTATAT	TCTTATCCTT
Rfer		LC474928	ATTCTTTACC	AACATTTATT	TTGATTTTTT	GGACACCCAG	AAGTTTATAT	TCTTATCCTT
Rfer		LC474929	ATTCTTTACC	AACATTTATT	TTGATTTTTT	GGACACCCAG	AAGTTTATAT	TCTTATCCTT
Rfer		MF448526	ATTCTTTACC	AACATTTATT	TTGATTTTTT	GGACACCCAG	AAGTTTATAT	TCTTATCCTT
Rfer		MG051027	ATTCTTTACC	AACATTTATT	TTGATTTTTT	GGTCACCC--	----------	----------
Rfer		MG051028	ATTCTTTACC	AACATTTATT	TTGATTTTTT	GGTCACCC--	----------	----------
Rfer		MG051029	ATTCTTTACC	AACATTTATT	TTGATTTTTT	GGTCACCC--	----------	----------
Rfer		MG051030	ATTCTTTACC	AACATTTATT	TTGATTTTTT	GGTCACCC--	----------	----------
Rfer		MG051031	ATTCTTTACC	AACATTTATT	TTGATTTTTT	GGTCACCC--	----------	----------
Rfer		MG872818	ATTCTTTACC	AACATTTATT	TTGATTTTTT	GGACACCCAG	AAGTTTATAT	TCTTATCCTT
Rfer		MG883395	ATTCTTTACC	AACATTTATT	TTGATTTTTT	GGACACCCAG	AAGTTTATAT	TCTTATCCTT
Rfer		MG883396	ATTCTTTACC	AACATTTATT	TTGATTTTTT	GGACACCCAG	AAGTTTATAT	TCTTATCCTT
Rfer		MG883397	ATTCTTTACC	AACATTTATT	TTGATTTTTT	GGACACCCAG	AAGTTTATAT	TCTTATCCTT
Rfer		MG883398	ATTCTTTACC	AACATTTATT	TTGATTTTTT	GGACACCCAG	AAGTTTATAT	TCTTATCCTT
Rfer		MG883399	ATTCTTTACC	AACATTTATT	----------	----------	----------	----------
Rfer		MH016277	ATTCTTTACC	AACATTTATT	TTGATTTTTT	----------	----------	----------
Rfer		MH016278	ATTCTTTACC	AACATTTATT	TTGATTTTTT	GGTCACCT--	----------	----------
Rfer		MH016279	ATTCTTTACC	AACATTTATT	TTGATTTTTT	GGTCACCC--	----------	----------
Rfer		MH016604	ATTCTTTACC	AACATTTATT	TTGATTTTTT	GGACACCCAG	AAGTTTATAT	TCTTATCCTT
Rfer		MH016605	ATTCTTTACC	AACATTTATT	TTGATTTTTT	GGACACCCAG	AAGTTTATAT	TCTTATCCTT
Rfer		MH016606	ATTCTTTACC	AACATTTATT	TTGATTTTTT	GGACACCCAG	AAGTTTATAT	TCTTATCCTT
Rfer		MH016607	ATTCTTTACC	AACATTTATT	TTGATTTTTT	GGACACCCAG	AAGTTTATAT	TCTTATCCTT
Rfer		MH016608	ATTCTTTACC	AACATTTATT	TTGATTTTTT	GGACACCCAG	AAGTTTATAT	TCTTATCCTT
Rfer		MH016609	ATTCTTTACC	AACATTTATT	TTGATTTTTT	GGACACCCAG	AAGTTTATAT	TCTTATCCTT
Rfer		MH016610	ATTCTTTACC	AACATTTATT	TTGATTTTTT	GGACACCCAG	AAGTTTATAT	TCTTATCCTT
Rfer		MH016611	ATTCTTTACC	AACATTTATT	TTGATTTTTT	GGACACCCAG	AAGTTTATAT	TCTTATCCTT
Rfer		MH016612	ATTCTTTACC	AACATTTATT	TTGATTTTTT	GGACACCCAG	AAGTTTATAT	TCTTATCCTT
Rfer		MH016613	ATTCTTTACC	AACATTTATT	TTGATTTTTT	GGACACCCAG	AAGTTTATAT	TCTTATCCTT
Rfer		MH016614	ATTCTTTACC	AACATTTATT	TTGATTTTTT	GGACACCCAG	AAGTTTATAT	TCTTATCCTT
Rfer		MH016615	ATTCTTTACC	AACATTTATT	TTGATTTTTT	GGACACCCAG	AAGTTTATAT	TCTTATCCTT
Rfer		MH016616	ATTCTTTACC	AACATTTATT	TTGATTTTTT	GGACACCCAG	AAGTTTATAT	TCTTATCCTT

Rfer		MH016617	ATTCTTTACC	AACATTTATT	TTGATTTTTT	GGACACCCAG	AAGTTTATAT	TCTTATCCTT
Rfer		MH016618	ATTCTTTACC	AACATTTATT	TTGATTTTTT	GGACACCCAG	AAGTTTATAT	TCTTATCCTT
Rfer		MH016619	ATTCTTTACC	AACATTTATT	TTGATTTTTT	GGACACCCAG	AAGTTTATAT	TCTTATCCTT
Rfer		MH016620	ATTCTTTACC	AACATTTATT	TTGATTTTTT	GGACACCCAG	AAGTTTATAT	TCTTATCCTT
Rfer		MH016621	ATTCTTTACC	AACATTTATT	TTGATTTTTT	GGACACCCAG	AAGTTTATAT	TCTTATCCTT
Rfer		MH016622	ATTCTTTACC	AACATTTATT	TTGATTTTTT	GGACACCCAG	AAGTTTATAT	TCTTATCCTT
Rfer		MH016623	ATTCTTTACC	AACATTTATT	TTGATTTTTT	GGACACCCAG	AAGTTTATAT	TCTTATCCTT
Rfer		MH016624	ATTCTTTACC	AACATTTATT	TTGATTTTTT	GGACACCCAG	AAGTTTATAT	TCTTATCCTT
Rfer		MH016625	ATTCTTTACC	AACATTTATT	TTGATTTTTT	GGACACCCAG	AAGTTTATAT	TCTTATCCTT
Rfer		MH016626	ATTCTTTACC	AACATTTATT	TTGATTTTTT	GGACACCCAG	AAGTTTATAT	TCTTATCCTT
Rfer		MH016627	ATTCTTTACC	AACATTTATT	TTGATTTTTT	GGACACCCAG	AAGTTTATAT	TCTTATCCTT
Rfer		MH016628	ATTCTTTACC	AACATTTATT	TTGATTTTTT	GGACACCCAG	AAGTTTATAT	TCTTATCCTT
Rfer		MH016629	ATTCTTTACC	AACATTTATT	TTGATTTTTT	GGACACCCAG	AAGTTTATAT	TCTTATCCTT
Rfer		MH016630	ATTCTTTACC	AACATTTATT	TTGATTTTTT	GGACACCCAG	AAGTTTATAT	TCTTATCCTT
Rfer		MH016631	ATTCTTTACC	AACATTTATT	TTGATTTTTT	GGACACCCAG	AAGTTTATAT	TCTTATCCTT
Rfer		MH016632	ATTCTTTACC	AACATTTATT	TTGATTTTTT	GGACACCCAG	AAGTTTATAT	TCTTATCCTT
Rfer		MH016633	ATTCTTTACC	AACATTTATT	TTGATTTTTT	GGACACCCAG	AAGTTTATAT	TCTTATCCTT
Rfer		MH016634	ATTCTTTACC	AACATTTATT	TTGATTTTTT	GGACACCCAG	AAGTTTATAT	TCTTATCCTT
Rfer		MH016635	ATTCTTTACC	AACATTTATT	TTGATTTTTT	GGACACCCAG	AAGTTTATAT	TCTTATCCTT
Rfer		MH016636	ATTCTTTACC	AACATTTATT	TTGATTTTTT	GGACACCCAG	AAGTTTATAT	TCTTATCCTT
Rfer		MH016637	ATTCTTTACC	AACATTTATT	TTGATTTTTT	GGACACCCAG	AAGTTTATAT	TCTTATCCTT
Rfer	H19	KF311403	ATTCTTTACC	AACATTTATT	TTGATTTTTT	GGACACCCAG	AAGTTTATAT	TCTTATCCTT
Rfer	H41	KF311502	ATTCTTTACC	AACATTTATT	TTGATTTTTT	GGACACCCAG	AAGTTTATAT	TCTTATCCTT
Rpal		ASSCR6357	ATCCTATACC	AACATTTATT	T---------	----------	----------	----------
Rpal		ASSCR6358	ATCCTATATC	AACATTTATT	T---------	----------	----------	----------
Rpal		AY131121	ATCCTATATC	AACATTTATT	TTGATTTTTT	GGTCATCCAG	AAGTATATAT	TTTAATTCTT
Rpal		GU581629	ATCCTATATC	AACATTTATT	TTGATTTTTT	GGTCATCCAG	AAGTATATAT	TTTAATTCTT
Rpal		KF311358	ATCCTATACC	AACATTTATT	TTGATTTTTT	GGTCATCCAG	AAGTATATAT	TTTAATTCTT
Rpal		KR494254	ATCCTATACC	AACATTTATT	TTGATTTTTT	GGTCACCCTG	AAGTTTAA--	----------
Rpal		KR494255	ATCCTATACC	AACATTTATT	TTGATTTTTT	GGTCACCCTG	AAGTTTA---	----------
Rpal		KR494256	ATCCTATACC	AACATTTATT	TTGATTTTTT	GGTCACCCTG	AAGTTTA---	----------
Rpal		KR494257	ATCCTATACC	AACATTTATT	TTGATTTTTT	GGTCACCCTG	AAGTTTA---	----------
Rpal		KR494258	ATCCTATACC	AACATTTATT	TTGATTTTTT	GGTCACCCTG	AAGTTTA---	----------

Rpal		KR494259	ATCCTATACC	AACATTTATT	TTGATTTTTT	GGTCACCCTG	AAGTTTA---	----------
Rpal		KR494260	ATCCTATACC	AACATTTATT	TTGATTTTTT	GGTCACCCTG	AAGTTTA---	----------
Rpal		KR494261	ATCCTATACC	AACATTTATT	TTGATTTTTT	GGTCACCCTG	AAGTTTA---	----------
Rpal	Rp1	KU647599	----------	----------	----------	----------	----------	----------
Rpal	Rp10	KU647490	----------	----------	----------	----------	----------	----------
Rpal	Rp11	KU647489	----------	----------	----------	----------	----------	----------
Rpal	Rp12	KU647604	----------	----------	----------	----------	----------	----------
Rpal	Rp13	KU647575	----------	----------	----------	----------	----------	----------
Rpal	Rp2	KU647587	----------	----------	----------	----------	----------	----------
Rpal	Rp3	KU647508	----------	----------	----------	----------	----------	----------
Rpal	Rp4	KU647585	----------	----------	----------	----------	----------	----------
Rpal	Rp5	KU647584	----------	----------	----------	----------	----------	----------
Rpal	Rp6	KU647581	----------	----------	----------	----------	----------	----------
Rpal	Rp7	KU647579	----------	----------	----------	----------	----------	----------
Rpal	Rp8	KU647502	----------	----------	----------	----------	----------	----------
Rpal	Rp9	KU647505	----------	----------	----------	----------	----------	----------
Rpal		Uni10	ATCCTATATC	AACATTTATT	TTGATTTTTT	GGTCACCCTG	AAGTTTAAAT	----------
Rpal		Uni11	ATCCTATATC	AACATTTATT	TTGATTTTTT	GGTCACCCTG	AAGTTTAAAT	----------
Rpal		Uni117	ATCCTATATC	AACATTTATT	TTGATTTTTT	GGTCACCCTG	AAGTTTAAAT	----------
Rpal		Uni17	ATCCTATATC	AACATTTATT	TTGATTTTTT	GGTCACCCTG	AAGTTTAAAT	----------
Rpal		Uni21	ATCCTATATC	AACATTTATT	TTGATTTTTT	GGTCACCCTG	AAGTTTAAGT	----------
Rpal		Uni44	ATCCTATATC	AACATTTATT	TTGATTTTTT	GGTCACCCTG	AAGTTTAAGT	----------
Rpal		Uni58	ATCCTATATC	AACATTTATT	TTGATTTTTT	GGTCACCCTG	AAGTTTAAGT	----------
Rpho		AY131120	NTTCTATACC	AACACTTATT	CTGATTCTTT	GGACATCCTG	AAGNATATAT	TCTTATTCTT
Rpho		KY511047	ATCCTTTACC	AACACTTATT	CTGATTCTTT	GGACATCCTG	AAGTTTATAT	TCTTATTCTC
Rvul		LN612634	ATTCTTTACC	AACACTTATT	TTGATTTTTT	G---------	----------	----------
Rvul		LN612635	ATTCTTTACC	AACACTTATT	TTGATTTTTT	G---------	----------	----------
Rvul		LN612636	----------	----------	----------	----------	----------	----------
Rvul		MG051024	ATTCTTTACC	AACACTTATT	TTGATTTTTT	GGTCACCC--	----------	----------
Rvul		MG051025	ATTCTTTACC	AGCACTTATT	TTGATTTTTT	GGTCACCC--	----------	----------
Rvul		MG051026	ATTCTTTACC	AACACTTATT	TTGATTTTTT	GGTCACCC--	----------	----------
Rvul	Rv1	KF311588	ATTCTTTACC	AGCACTTATT	TTGATTTTTC	GGACATCCAG	AAGTCTATAT	TCTTATTCTT
Rvul	Rv10	KF311587	ATTCTTTATC	AACACTTATT	TTGATTTTTC	GGACATCCAG	AAGTCTATAT	TCTTATTCTT

Rvul	Rv11	KF311629	ATTCTTTACC	AACACTTATT	TTGATTTTTC	GGACATCCAG	AAGTCTATAT	TCTTATTCTT
Rvul	Rv12	KF311550	ATTCTTTACC	AACACTTATT	TTGATTTTTC	GGACATCCAG	AAGTCTATAT	TCTTATTCTT
Rvul	Rv13	KF311549	ATTCTTTACC	AACACTTATT	TTGATTTTTC	GGGCATCCAG	AAGTCTATAT	TCTTATTCTT
Rvul	Rv14	KF311573	ATTCTTTACC	AACACTTATT	TTGATTTTTC	GGACATCCAG	AAGTCTATAT	TCTTATTCTT
Rvul	Rv15	KF311546	ATTCTTTACC	AACACTTATT	TTGATTTTTC	GGACATCCAG	AAGTCTATAT	TCTTATTCTT
Rvul	Rv16	KF311600	ATTCTTTACC	AACACTTATT	TTGATTTTTC	GGGCATCCAG	AAGTCTATAT	TCTTATTCTT
Rvul	Rv17	KF311578	ATTCTTTACC	AACACTTATT	TTGATTTTTC	GGGCATCCAG	AAGTCTATAT	TCTTATTCTT
Rvul	Rv18	KF311593	ATTCTTTACC	AGCACTTATT	TTGATTTTTC	GGGCATCCAG	AAGTCTATAT	TCTTATTCTT
Rvul	Rv19	KF311552	ATTCTTTACC	AGCACTTATT	TTGATTTTTC	GGGCATCCAG	AAGTCTATAT	TCTTATTCTT
Rvul	Rv2	KF311586	ATTCTTTACC	AGCACTTATT	TTGATTTTTC	GGACATCCAG	AAGTCTATAT	TCTTATTCTT
Rvul	Rv20	KF311594	ATTCTTTACC	AACACTTATT	TTGATTTTTC	GGGCATCCAG	AAGTCTATAT	TCTTATTCTT
Rvul	Rv21	KF311547	ATTCTTTACC	AACACTTATT	TTGATTTTTC	GGGCATCCAG	AAGTCTATAT	TCTTATTCTT
Rvul	Rv22	KF311591	ATTCTTTACC	AACACTTATT	TTGATTTTTC	GGACATCCAG	AAGTCTATAT	TCTTATTCTT
Rvul	Rv23	KF311545	ATTCTTTACC	AACACTTATT	TTGATTTTTC	GGACATCCAG	AAGTCTATAT	TCTTATTCTT
Rvul	Rv24	KF311576	ATTCTTTACC	AACACTTATT	TTGATTTTTC	GGACATCCAG	AAGTCTATAT	TCTTATTCTT
Rvul	Rv25	KF311548	ATTCTTTACC	AACACTTATT	TTGATTTTTC	GGACATCCAG	AAGTCTATAT	TCTTATTCTT
Rvul	Rv26	KF311559	ATTCTTTATC	AACACTTATT	TTGATTTTTC	GGGCATCCAG	AAGTCTATAT	TCTTATTCTT
Rvul	Rv27	KF311561	ATTCTTTATC	AACACTTATT	TTGATTTTTC	GGGCATCCAG	AAGTCTATAT	TCTTATTCTT
Rvul	Rv28	KF311533	ATTCTTTATC	AACACTTATT	TTGATTTTTC	GGGCATCCAG	AAGTCTATAT	TCTTATTCTT
Rvul	Rv29	KF311537	ATTCTTTATC	AACACTTATT	TTGATTTTTC	GGGCATCCAG	AAGTCTATAT	TCTTATTCTT
Rvul	Rv3	KF311633	ATTCTTTACC	AGCACTTATT	TTGATTTTTC	GGACATCCAG	AAGTCTATAT	TCTTATTCTT
Rvul	Rv30	KF311564	ATTCTTTATC	AACACTTATT	TTGATTTTTC	GGGCATCCAG	AAGTCTATAT	TCTTATTCTT
Rvul	Rv31	KF311570	ATTCTTTATC	AACACTTATT	TTGATTTTTC	GGGCATCCAG	AAGTCTATAT	TCTTATTCTT
Rvul	Rv32	KF311530	ATTCTTTATC	AACACTTATT	TTGATTTTTC	GGGCATCCAG	AAGTCTATAT	TCTTATTCTT
Rvul	Rv33	KF311538	ATTCTTTATC	AACACTTATT	TTGATTTTTC	GGGCATCCAG	AAGTCTATAT	TCTTATTCTT
Rvul	Rv34	KF311610	ATTCTTTATC	AACACTTATT	TTGATTTTTC	GGGCATCCAG	AAGTCTATAT	TCTTATTCTT
Rvul	Rv35	KF311605	ATTCTTTATC	AACACTTATT	TTGATTTTTC	GGGCATCCAG	AAGTCTATAT	TCTTATTCTT
Rvul	Rv36	KF311535	ATTCTTTATC	AACACTTATT	TTGATTTTTC	GGGCATCCAG	AAGTCTATAT	TCTTATTCTT
Rvul	Rv37	KF311529	ATTCTTTATC	AACACTTATT	TTGATTTTTC	GGGCATCCAG	AAGTCTATAT	TCTTATTCTT
Rvul	Rv38	KF311532	ATTCTTTACC	AACACTTATT	TTGATTTTTC	GGGCATCCAG	AAGTCTATAT	TCTTATTCTT
Rvul	Rv39	KF311563	ATTCTTTATC	AACACTTATT	TTGATTTTTC	GGGCATCCAG	AAGTCTATAT	TCTTATTCTT
Rvul	Rv4	KF311589	ATTCTTTACC	AGCACTTATT	TTGATTTTTC	GGACATCCAG	AAGTCTATAT	TCTTATTCTT
Rvul	Rv40	KF311568	ATTCTTTATC	AACACTTATT	TTGATTTTTC	GGGCATCCAG	AAGTCTATAT	TCTTATTCTT

Rvul	Rv41	KF311555	ATTCTTTATC	AACACTTATT	TTGATTTTTC	GGGCATCCAG	AAGTCTATAT	TCTTATTCTT
Rvul	Rv42	KF311558	ATTCTTTATC	AACACTTATT	TTGATTTTTC	GGGCATCCAG	AAGTCTATAT	TCTTATTCTT
Rvul	Rv43	KF311560	ATTCTTTATC	AACACTTATT	TTGATTTTTC	GGGCATCCAG	AAGTCTATAT	TCTTATTCTT
Rvul	Rv44	KF311601	ATTCTTTATC	AACACTTATT	TTGATTTTTC	GGGCATCCAG	AAGTCTATAT	TCTTATTCTT
Rvul	Rv45	KF311608	ATTCTTTATC	AACACTTATT	TTGATTTTTC	GGGCATCCAG	AAGTCTATAT	TCTTATTCTT
Rvul	Rv46	KF311604	ATTCTTTATC	AACACTTATT	TTGATTTTTC	GGGCATCCAG	AAGTCTATAT	TCTTATTCTT
Rvul	Rv47	KF311615	ATTCTTTATC	AACACTTATT	TTGATTTTTC	GGGCATCCAG	AAGTCTATAT	TCTTATTCTT
Rvul	Rv48	KF311603	ATTCTTTATC	AACACTTATT	TTGATTTTTC	GGGCATCCAG	AAGTCTATAT	TCTTATTCTT
Rvul	Rv49	KF311609	ATTCTTTATC	AACACTTATT	TTGATTTTTC	GGGCATCCAG	AAGTCTATAT	TCTTATTCTT
Rvul	Rv5	KF311632	ATTCTTTACC	AGCACTTATT	TTGATTTTTC	GGACATCCAG	AAGTCTATAT	TCTTATTCTT
Rvul	Rv50	KF311602	ATTCTTTATC	AACACTTATT	TTGATTTTTC	GGGCATCCAG	AAGTCTATAT	TCTTATTCTT
Rvul	Rv51	KF311621	ATTCTTTATC	AACACTTATT	TTGATTTTTC	GGACATCCAG	AAGTCTATAT	TCTTATTCTT
Rvul	Rv52	KF311619	ATTCTTTATC	AACACTTATT	TTGATTTTTC	GGACATCCAG	AAGTCTATAT	TCTTATTCTT
Rvul	Rv53	KF311620	ATTCTTTATC	AACACTTATT	TTGATTTTTC	GGACATCCAG	AAGTCTATAT	TCTTATTCTT
Rvul	Rv54	KF311622	ATTCTTTATC	AACACTTATT	TTGATTTTTC	GGACATCCAG	AAGTCTATAT	TCTTATTCTT
Rvul	Rv55	KF311617	ATTCTTTATC	AACACTTATT	TTGATTTTTC	GGACATCCAG	AAGTCTATAT	TCTTATTCTT
Rvul	Rv56	KF311606	ATTCTTTATC	AACACTTATT	TTGATTTTTC	GGACATCCAG	AAGTCTATAT	TCTTATTCTT
Rvul	Rv57	KF311614	ATTCTTTATC	AACACTTATT	TTGATTTTTC	GGACATCCAG	AAGTCTATAT	TCTTATTCTT
Rvul	Rv59	KF311567	ATTCTTTACC	AACACTTATT	TTGATTTTTC	GGGCATCCAG	AAGTCTATAT	TCTTATTCTT
Rvul	Rv6	KF311628	ATTCTTTACC	AGCACTTATT	TTGATTTTTC	GGACATCCAG	AAGTCTATAT	TCTTATTCTT
Rvul	Rv60	KF311607	ATTCTTTACC	AACACTTATT	TTGATTTTTC	GGGCATCCAG	AAGTCTATAT	TCTTATTCTT
Rvul	Rv61	KF311544	ATTCTTTACC	AACACTTATT	TTGATTTTTC	GGACATCCAG	AAGTCTATAT	TCTTATTCTT
Rvul	Rv62	KF311625	ATTCTTTACC	AACACTTATT	TTGATTTTTC	GGACATCCAG	AAGTCTATAT	TCTTATTCTT
Rvul	Rv7	KF311528	ATTCTTTACC	AGCACTTATT	TTGATTTTTC	GGACATCCAG	AAGTCTATAT	TCTTATTCTT
Rvul	Rv8	KF311631	ATTCTTTACC	AGCACTTATT	TTGATTTTTC	GGACATCCAG	AAGTCTATAT	TCTTATTCTT
Rvul	Rv9	KF311590	ATTCTTTACC	AACACTTATT	TTGATTTTTC	GGACATCCAG	AAGTCTATAT	TCTTATTCTT
Slin		AY131102	ATTCTCTACC	AGCATCTATT	TTGATTCTTC	GGTCATCCAG	AAGTTTATAT	TCTTATTCTC
Sory		AY131099	ATTCTCTATC	AACATTTATT	TTGATTTTTT	GGTCACCCAG	AAGTTTATAT	TTTAATTCTT
Sory		GU196317	ATTCTCTATC	AACATTTATT	TTGATTTTTT	GGTCACCCTG	AAGTTTA---	----------
Spheno		NC018351	ATTCTTTACC	AACATTTATT	CTGATTTTTT	GGTCATCCAG	AAGTTTATAT	TCTTATTCTT
Szea		AY131100	ATTCTCTATC	AACACTTATT	TTGATTCTTC	GGACACCCAG	AAGTTTACAT	TTTAATTCTC
Yfro		AY131109	ATTCTTTATC	AACACTTATT	CTGATTCTTT	GGTCACCCYG	AAGTATATAT	TTTAATYTTA

Continuation of the Table S4.

Species	Ha	Sequences	Position					
			721-730	731-740	741-750	751-760	761-770	771-780
Dbor		AY131105	CCAGGTTTTG	GAATAATCTC	CCATATTATT	ACCAATGAAA	GAGGAAAAAA	AGAAACTTTT
Dbor		Uni9	----------	----------	----------	----------	----------	----------
Dper		ASSCR6014	----------	----------	----------	----------	----------	----------
Dper		ASSCR6015	----------	----------	----------	----------	----------	----------
Dper		ASSCR6016	----------	----------	----------	----------	----------	----------
Dper		ASSCR6018	----------	----------	----------	----------	----------	----------
Hcho		JX679716	----------	----------	----------	----------	----------	----------
Hpha		KC112991	----------	----------	----------	----------	----------	----------
Nxan		NC018354	CCTGGGTTTG	GTATAATTTC	TCATATTATT	ACTCAAGAAA	GAAGAAAAAA	AGAATCTTTT
Phil		GU244486	----------	----------	----------	----------	----------	----------
Pnod		HQ891474	CCAGGATTTG	GTATAATTTC	CCATATTATT	AGCCAAGAAA	GAAGAAAAAA	AGAAGCATTT
Rbil	Rb1	KF311645	CCAGGCTTTG	GAATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	AGAAACCTTT
Rbil	Rb2	KF311637	CCAGGCTTTG	GAATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	AGAAACCTTT
Rbil	Rb3	KF311639	CCAGGCTTTG	GAATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	AGAAACCTTT
Rbil	Rb4	KF311636	CCAGGCTTTG	GAATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	AGAAACCTTT
Rbil	Rb5	KF311635	CCAGGCTTTG	GGATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	AGAAACCTTT
Rbil	Rb6	KF311634	CCAGGCTTTG	GGATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	AGAAACCTTT
Rbil	Rb7	KF311648	CCAGGCTTTG	GAATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	AGAAACCTTT
Rbil	Rb8	KF311647	CCAGGCTTTG	GAATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	AGAAACCTTT
Rcru		AY131113	CCCGGATTCG	GNATAATTTC	TCATATTATC	TCTAATGAAA	GAGGAAAAAA	AGAAACTTTT
Rcru		KF311359	CCTGGATTCG	GTATAATTTC	TCATATTATC	TCTAATGAAA	GAGGAAAAAA	AGAAACTTTT
Rcru		USCOC565	----------	----------	----------	----------	----------	----------
Rfer	H1	GU581582	CCAGGATTTG	GAATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	AGAAACCTTT
Rfer	H10	KF311482	CCAGGATTTG	GAATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	AGAAACCTTT
Rfer	H11	KF311444	CCAGGATTTG	GAATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	AGAAACCTTT
Rfer	H12	KF311487	CCAGGATTTG	GAATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	AGAAACCTTT
Rfer	H13	KF311481	CCAGGATTTG	GAATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	AGAAACCTTT
Rfer	H14	KF311448	CCAGGATTTG	GAATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	AGAAACCTTT
Rfer	H15	JX292125	CCAGGATTTG	GAATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	AGAAACCTTT
Rfer	H16	KF311449	CCAGGATTTG	GAATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	AGAAACCTTT

Rfer	H17	KF311360	CCAGGATTTG	GAATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	AGAAACCTTT
Rfer	H18	KF311473	CCAGGATTTG	GAATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	AGAAACCTTT
Rfer	H2	GU581549	CCAGGATTTG	GAATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	AGAAACCTTT
Rfer	H20	KF311433	CCAGGATTTG	GAATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	AGAAACCTTT
Rfer	H21	KF311474	CCAGGATTTG	GAATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	AGAAACCTTT
Rfer	H22	KF311516	CCAGGATTTG	GAATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	AGAAACCTTT
Rfer	H23	KF311380	CCAGGATTTG	GAATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	AGAAACCTTT
Rfer	H24	KF311389	CCAGGATTTG	GAATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	AGAAACCTTT
Rfer	H25	KF311384	CCAGGATTTG	GAATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	AGAAACCTTT
Rfer	H26	KF311388	CCAGGATTTG	GAATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	AGAAACCTTT
Rfer	H27	KF311386	CCAGGATTTG	GAATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	AGAAACCTTT
Rfer	H28	KF311399	CCAGGATTTG	GAATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	AGAAACCTTT
Rfer	H29	KF311383	CCAGGATTTG	GAATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	AGAAACCTTT
Rfer	H3	GU581547	CCAGGATTTG	GAATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	AGAAACCTTT
Rfer	H30	KF311392	CCAGGATTTG	GAATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	AGAAACCTTT
Rfer	H31	KF311379	CCAGGATTTG	GAATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	AGAAACCTTT
Rfer	H32	KF311490	----------	----------	----------	----------	----------	----------
Rfer	H34	KF311492	CCAGGATTTG	GAATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	AGAAACCTTT
Rfer	H35	KF311496	CCAGGATTTG	GAATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	AGAAACCTTT
Rfer	H36	KF311500	CCAGGATTTG	GAATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	AGAAACCTTT
Rfer	H37	KF311509	CCAGGATTTG	GAATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	AGAAACCTTT
Rfer	H38	KF311505	CCAGGATTTG	GAATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	AGAAACCTTT
Rfer	H39	KF311508	CCAGGATTTG	GAATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAGAA	AGAAACCTTT
Rfer	H4	GU581545	CCAGGATTTG	GAATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	AGAAACCTTT
Rfer	H40	KF311506	CCAGGATTTG	GAATAATTTC	CCATATTATT	ACTAATGAAA	GAGGTAAGAA	AGAAACCTTT
Rfer	H42	KF311501	CCAGGATTTG	GAATAATTTC	CCATATTATT	ACTAATGAAA	GAGGGAAAAA	AGAAACCTTT
Rfer	H43	KF311525	CCAGGATTTG	GAATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	AGAAACCTTT
Rfer	H5	GU581539	CCAGGATTTG	GAATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	AGAAACCTTT
Rfer	H51	KU696497	CCAGGATTTG	GAATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	AGAAACCTTT
Rfer	H52	KU696507	CCAGGATTTG	GAATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	AGAAACCTTT
Rfer	H6	GU581526	CCAGGATTTG	GAATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	AGAAACCTTT
Rfer	H7	GU581525	CCAGGATTTG	GAATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	AGAAACCTTT
Rfer	H8	GU581319	CCAGGATTTG	GAATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	AGAAACCTTT

Rfer	H9	KF311446	CCAGGATTTG	GAATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	AGAAACCTTT
Rfer		JX292124	CCAGGATTTG	GAATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	AGAAACCTTT
Rfer		JX294413	CCAGGATTTG	GAATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	AGAAACCTTT
Rfer		KF413063	CCAGGATTTG	GAATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	AGAAACCTTT
Rfer		KF413064	CCAGGATTTG	GAATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	AGAAACCTTT
Rfer		KF413065	CCAGGATTCG	GAATAATCTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	AGAAACCTTT
Rfer		KF413066	CCAGGATTTG	GAATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	AGAAACCTTT
Rfer		KF413067	CCAGGATTTG	GAATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	AGAAACCTTT
Rfer		KF413068	CCAGGATTCG	GGATAATCTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	AGAAACCTTT
Rfer		KF413069	CCAGGATTCG	GAATAATCTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	AGAAACCTTT
Rfer		KF413070	CCAGGATTCG	GAATAATCTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	AGAAACCTTT
Rfer		KF413071	CCAGGATTTG	GAATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	AGAAACCTTT
Rfer		KF413072	CCAGGATTTG	GAATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	AGAAACCTTT
Rfer		KF413073	CCAGGATTTG	GAATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	AGAAACCTTT
Rfer		KT989230	----------	----------	----------	----------	----------	----------
Rfer		KT989231	----------	----------	----------	----------	----------	----------
Rfer		KT989232	----------	----------	----------	----------	----------	----------
Rfer		KT989233	----------	----------	----------	----------	----------	----------
Rfer		KT989234	----------	----------	----------	----------	----------	----------
Rfer		KU916538	----------	----------	----------	----------	----------	----------
Rfer		KY458175	----------	----------	----------	----------	----------	----------
Rfer		KY458176	----------	----------	----------	----------	----------	----------
Rfer		KY458177	----------	----------	----------	----------	----------	----------
Rfer		LC474878	CCAGGATTTG	GAATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	AGAA------
Rfer		LC474880	CCAGGATTTG	GAATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	AGAAACCTAA
Rfer		LC474881	CCAGGATTTG	GAATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	AGAAACCTAA
Rfer		LC474882	CCAGGATTTG	GAATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	AGAAACCTAA
Rfer		LC474884	CCAGGATTTG	GAATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	AGAAACCTAA
Rfer		LC474885	CCAGGATTTG	GAATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	AGAAACCTTT
Rfer		LC474886	CCAGGATTTG	GAATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	AGAAACCTTT
Rfer		LC474887	CCAGGATTTG	GAATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	AGAAACCTAA
Rfer		LC474888	CCAGGATTTG	GAATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	AGAAACCTT-
Rfer		LC474889	CCAGGATTTG	GAATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	AGAAACCTAA

Rfer		LC474890	CCAGGATTTG	GAATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	AGAAACCTAA
Rfer		LC474891	CCAGGATTTG	GAATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	AGAAACCTAA
Rfer		LC474892	CCAGGATTTG	GAATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	AGAAACCTAA
Rfer		LC474893	CCAGGATTTG	GAATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	AGAAACCTAA
Rfer		LC474894	CCAGGATTTG	GAATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	AGAAACCTAA
Rfer		LC474895	CCAGGATTTG	GAATAATTTC	CCATATTATT	ACTAATGAAA	GAGGATAAT-	----------
Rfer		LC474896	CCAGGATTTG	GAATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	AGAAACCTTT
Rfer		LC474897	CCAGGATTTG	GAATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	AGAAACCTTT
Rfer		LC474898	CCAGGATTTG	GAATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	AGAAACCTTT
Rfer		LC474899	CCAGGATTTG	GAATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	AGAAACCTTT
Rfer		LC474902	CCAGGATTTG	GAATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	AGAAACCTTT
Rfer		LC474903	CCAGGATTTG	GAATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	AGAAACCTTT
Rfer		LC474904	CCAGGATTTG	GAATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	AGAAACCTTT
Rfer		LC474905	CCAGGATTTG	GAATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	AGAAACCTTT
Rfer		LC474906	CCAGGATTTG	GAATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	AGAAACCTTT
Rfer		LC474907	CCAGGATTTG	GAATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	AGAAACCTTT
Rfer		LC474908	CCAGGATTTG	GAATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	AGAAACCTTT
Rfer		LC474909	CCAGGATTTG	GAATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	AGAAACCTTT
Rfer		LC474910	CCAGGATTTG	GAATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	AGAAACCTTT
Rfer		LC474911	CCAGGATTTG	GAATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	AGAAACCTTT
Rfer		LC474912	CCAGGATTTG	GAATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	AGAAACCTAA
Rfer		LC474913	CCAGGATTTG	GAATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	AGAAACCTTT
Rfer		LC474914	CCAGGATTTG	GAATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	AGAA------
Rfer		LC474915	CCAGGATTTG	GAATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	AGAAACCTTT
Rfer		LC474916	CCAGGATTTG	GAATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	AGAAACCTTT
Rfer		LC474917	CCAGGATTTG	GAATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	AGAAACCTTT
Rfer		LC474918	CCAGGATTTG	GAATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	AGAAACCTTT
Rfer		LC474919	CCAGGATTTG	GAATAATTTC	CCAT------	----------	----------	----------
Rfer		LC474920	CCAGGATTTG	GAATAATTTC	----------	----------	----------	----------
Rfer		LC474921	CCAGGATTTG	GAATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	AGAAACCTAA
Rfer		LC474922	CCAGGATTTG	GAATAATTTC	CCATATTATT	TAAA------	----------	----------
Rfer		LC474923	CCAGGATTTG	GAATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAATA	A---------
Rfer		LC474924	CCAGGATTTG	GAATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	AGAAACCTT-

Rfer		LC474925	CCAGGATTTG	GAATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	AGAAACCT--
Rfer		LC474926	CCAGGATTTG	GAATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	AGAAACCTTT
Rfer		LC474927	CCAGGATTTG	GAATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	AGAAACCTTT
Rfer		LC474928	CCAGGATTTG	GAATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	AGAAACCTTT
Rfer		LC474929	CCAGGATTTG	GAATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	AGAAACCTTT
Rfer		MF448526	CCAGGATTTG	GAATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	AGAAACCTTT
Rfer		MG051027	----------	----------	----------	----------	----------	----------
Rfer		MG051028	----------	----------	----------	----------	----------	----------
Rfer		MG051029	----------	----------	----------	----------	----------	----------
Rfer		MG051030	----------	----------	----------	----------	----------	----------
Rfer		MG051031	----------	----------	----------	----------	----------	----------
Rfer		MG872818	CCAGGATTTG	GAATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	AGAAACCTTT
Rfer		MG883395	CCAGGATTTG	GAATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	AGAAACCTTT
Rfer		MG883396	CCAGGATTTG	GAATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	AGAAACCTTT
Rfer		MG883397	CCAGGATTTG	GAATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	AGAAACCTTT
Rfer		MG883398	CCAGGATTTG	GAATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	AGAAACCTTT
Rfer		MG883399	----------	----------	----------	----------	----------	----------
Rfer		MH016277	----------	----------	----------	----------	----------	----------
Rfer		MH016278	----------	----------	----------	----------	----------	----------
Rfer		MH016279	----------	----------	----------	----------	----------	----------
Rfer		MH016604	CCAGGATTTG	GAATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	AGAAACCTTT
Rfer		MH016605	CCAGGATTTG	GAATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	AGAAACCTTT
Rfer		MH016606	CCAGGATTTG	GAATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	AGAAACCTTT
Rfer		MH016607	CCAGGATTTG	GAATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	AGAAACCTTT
Rfer		MH016608	CCAGGATTTG	GAATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	AGAAACCC--
Rfer		MH016609	CCAGGATTTG	GAATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	AGAAACCA--
Rfer		MH016610	CCAGGATTTG	GAATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	AGAAACCTTG
Rfer		MH016611	CCAGGATTTG	GAATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	AGAAACCTTG
Rfer		MH016612	CCAGGATTTG	GAATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	AGAAACCTT-
Rfer		MH016613	CCAGGATTTG	GAATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	AGAAACCA--
Rfer		MH016614	CCAGGATTTG	GAATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	AGAAACCTTT
Rfer		MH016615	CCAGGATTTG	GAATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	AGAAACCTTT
Rfer		MH016616	CCAGGATTTG	GAATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	AGAAACCTTT

Rfer		MH016617	CCAGGATTTG	GAATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	AGAAACCTTG
Rfer		MH016618	CCAGGATTTG	GAATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	AGAAACCTTT
Rfer		MH016619	CCAGGATTTG	GAATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	AGAAACCTTT
Rfer		MH016620	CCAGGATTTG	GAATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	AGAAACCTTT
Rfer		MH016621	CCAGGATTTG	GAATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	AGAAACCTTT
Rfer		MH016622	CCAGGATTTG	GAATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	AGAAACCTTT
Rfer		MH016623	CCAGGATTTG	GAATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	AGAAACCTA-
Rfer		MH016624	CCAGGATTTG	GAATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	AGAAACC---
Rfer		MH016625	CCAGGATTTG	GAATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	AGAAACCTTT
Rfer		MH016626	CCAGGATTTG	GAATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	AGAAACCT--
Rfer		MH016627	CCAGGATTTG	GAATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	AGAAACCTTT
Rfer		MH016628	CCAGGATTTG	GAATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	AGAAACCTT-
Rfer		MH016629	CCAGGATTTG	GAATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	AGAAACCTTT
Rfer		MH016630	CCAGGATTTG	GAATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	AGAAACCTTT
Rfer		MH016631	CCAGGATTTG	GAATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	AGAAACCTTT
Rfer		MH016632	CCAGGATTTG	GAATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	AGAAACCTTT
Rfer		MH016633	CCAGGATTTG	GAATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	AGAAACCTTT
Rfer		MH016634	CCAGGATTTG	GAATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	AGAAACCTTT
Rfer		MH016635	CCAGGATTTG	GAATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	AGAAACCTTT
Rfer		MH016636	CCAGGATTTG	GAATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	AGAAACCTTT
Rfer		MH016637	CCAGGATTTG	GAATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	AGAAACCTTT
Rfer	H19	KF311403	CCAGGATTTG	GAATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	AGAAACCTTT
Rfer	H41	KF311502	CCAGGATTTG	GAATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	AGAAACCTTT
Rpal		ASSCR6357	----------	----------	----------	----------	----------	----------
Rpal		ASSCR6358	----------	----------	----------	----------	----------	----------
Rpal		AY131121	CCAGGTTTTG	GAATAATCTC	ACACATTATT	ACTAATGAAA	GAGGAAAAAA	AGAAACATTT
Rpal		GU581629	CCAGGTTTTG	GAATAATCTC	ACACATTATT	ACTAATGAAA	GAGGAAAAAA	AGAAACATTT
Rpal		KF311358	CCAGGTTTTG	GAATAATCTC	ACACATTATT	ACTAATGAAA	GAGGAAAAAA	AGAAACATTT
Rpal		KR494254	----------	----------	----------	----------	----------	----------
Rpal		KR494255	----------	----------	----------	----------	----------	----------
Rpal		KR494256	----------	----------	----------	----------	----------	----------
Rpal		KR494257	----------	----------	----------	----------	----------	----------
Rpal		KR494258	----------	----------	----------	----------	----------	----------

Rpal		KR494259	----------	----------	----------	----------	----------	----------
Rpal		KR494260	----------	----------	----------	----------	----------	----------
Rpal		KR494261	----------	----------	----------	----------	----------	----------
Rpal	Rp1	KU647599	----------	----------	----------	----------	----------	----------
Rpal	Rp10	KU647490	----------	----------	----------	----------	----------	----------
Rpal	Rp11	KU647489	----------	----------	----------	----------	----------	----------
Rpal	Rp12	KU647604	----------	----------	----------	----------	----------	----------
Rpal	Rp13	KU647575	----------	----------	----------	----------	----------	----------
Rpal	Rp2	KU647587	----------	----------	----------	----------	----------	----------
Rpal	Rp3	KU647508	----------	----------	----------	----------	----------	----------
Rpal	Rp4	KU647585	----------	----------	----------	----------	----------	----------
Rpal	Rp5	KU647584	----------	----------	----------	----------	----------	----------
Rpal	Rp6	KU647581	----------	----------	----------	----------	----------	----------
Rpal	Rp7	KU647579	----------	----------	----------	----------	----------	----------
Rpal	Rp8	KU647502	----------	----------	----------	----------	----------	----------
Rpal	Rp9	KU647505	----------	----------	----------	----------	----------	----------
Rpal		Uni10	----------	----------	----------	----------	----------	----------
Rpal		Uni11	----------	----------	----------	----------	----------	----------
Rpal		Uni117	----------	----------	----------	----------	----------	----------
Rpal		Uni17	----------	----------	----------	----------	----------	----------
Rpal		Uni21	----------	----------	----------	----------	----------	----------
Rpal		Uni44	----------	----------	----------	----------	----------	----------
Rpal		Uni58	----------	----------	----------	----------	----------	----------
Rpho		AY131120	CCAGGATTTG	GAATAATCTC	TCATATCATT	ACTAATGAAA	GAGGAAAAAA	AGAAACCTTT
Rpho		KY511047	CCAGGTTTTG	GAATAATTTC	TCATATCATT	ACTAACGAAA	GAGGAAAAAA	AGAAACCTTT
Rvul		LN612634	----------	----------	----------	----------	----------	----------
Rvul		LN612635	----------	----------	----------	----------	----------	----------
Rvul		LN612636	----------	----------	----------	----------	----------	----------
Rvul		MG051024	----------	----------	----------	----------	----------	---------T
Rvul		MG051025	----------	----------	----------	----------	----------	---------T
Rvul		MG051026	----------	----------	----------	----------	----------	----------
Rvul	Rv1	KF311588	CCAGGCTTTG	GAATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	AGAAACCTTT
Rvul	Rv10	KF311587	CCAGGCTTTG	GAATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	AGAAACCTTT

Rvul	Rv11	KF311629	CCAGGCTTTG	GAATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	AGAAACCTTT
Rvul	Rv12	KF311550	CCAGGCTTTG	GAATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	AGAAACCTTT
Rvul	Rv13	KF311549	CCAGGCTTTG	GAATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	AGAAACCTTT
Rvul	Rv14	KF311573	CCAGGCTTTG	GAATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	AGAAACCTTT
Rvul	Rv15	KF311546	CCAGGCTTTG	GAATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	AGAAACCTTT
Rvul	Rv16	KF311600	CCAGGCTTTG	GAATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	AGAAACCTTT
Rvul	Rv17	KF311578	CCAGGCTTTG	GAATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	AGAAACCTTT
Rvul	Rv18	KF311593	CCAGGCTTTG	GAATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	AGAAACCTTT
Rvul	Rv19	KF311552	CCAGGCTTTG	GAATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	AGAAACCTTT
Rvul	Rv2	KF311586	CCAGGCTTTG	GAATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	AGAAACCTTT
Rvul	Rv20	KF311594	CCAGGCTTTG	GAATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	AGAAACCTTT
Rvul	Rv21	KF311547	CCAGGCTTTG	GAATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	AGAAACCTTT
Rvul	Rv22	KF311591	CCAGGCTTTG	GAATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	AGAAACCTTT
Rvul	Rv23	KF311545	CCAGGCTTTG	GGATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	AGAAACCTTT
Rvul	Rv24	KF311576	CCAGGCTTTG	GAATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	AGAAACCTTT
Rvul	Rv25	KF311548	CCAGGCTTTG	GAATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	AGAAACCTTT
Rvul	Rv26	KF311559	CCAGGCTTTG	GAATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	GGAAACCTTT
Rvul	Rv27	KF311561	CCAGGCTTTG	GAATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	GGAAACCTTT
Rvul	Rv28	KF311533	CCAGGCTTTG	GAATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	GGAAACCTTT
Rvul	Rv29	KF311537	CCAGGCTTTG	GGATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	GGAAACCTTT
Rvul	Rv3	KF311633	CCAGGCTTTG	GAATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	AGAAACCTTT
Rvul	Rv30	KF311564	CCAGGCTTTG	GGATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	GGAAACCTTT
Rvul	Rv31	KF311570	CCAGGCTTTG	GGATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	GGAAACCTTT
Rvul	Rv32	KF311530	CCAGGCTTTG	GGATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	GGAAACCTTT
Rvul	Rv33	KF311538	CCAGGCTTTG	GGATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	GGAAACCTTT
Rvul	Rv34	KF311610	CCAGGCTTTG	GGATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	GGAAACCTTT
Rvul	Rv35	KF311605	CCAGGCTTTG	GGATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	GGAAACCTTT
Rvul	Rv36	KF311535	CCAGGCTTTG	GGATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	GGAAACCTTT
Rvul	Rv37	KF311529	CCAGGCTTTG	GGATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	GGAAACCTTT
Rvul	Rv38	KF311532	CCAGGCTTTG	GGATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	GGAAACCTTT
Rvul	Rv39	KF311563	CCAGGCTTTG	GGATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	GGAAACCTTT
Rvul	Rv4	KF311589	CCAGGCTTTG	GAATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	GGAAACCTTT
Rvul	Rv40	KF311568	CCAGGCTTTG	GGATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	AGAAACCTTT

Rvul	Rv41	KF311555	CCAGGCTTTG	GGATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	GGAAACCTTT
Rvul	Rv42	KF311558	CCAGGCTTTG	GGATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	GGAAACCTTT
Rvul	Rv43	KF311560	CCAGGCTTTG	GGATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	GGAAACCTTT
Rvul	Rv44	KF311601	CCAGGCTTTG	GGATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	GGAAACCTTT
Rvul	Rv45	KF311608	CCAGGCTTTG	GGATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	GGAAACCTTT
Rvul	Rv46	KF311604	CCAGGCTTTG	GGATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	GGAAACCTTT
Rvul	Rv47	KF311615	CCAGGCTTTG	GGATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	GGAAACCTTT
Rvul	Rv48	KF311603	CCAGGCTTTG	GGATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	GGAAACCTTT
Rvul	Rv49	KF311609	CCAGGCTTTG	GGATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	GGAAACCTTT
Rvul	Rv5	KF311632	CCAGGCTTTG	GAATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	AGAAACCTTT
Rvul	Rv50	KF311602	CCAGGCTTTG	GAATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	GGAAACCTTT
Rvul	Rv51	KF311621	CCAGGCTTTG	GGATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	GGAAACCTTT
Rvul	Rv52	KF311619	CCAGGCTTTG	GGATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	GGAAACCTTT
Rvul	Rv53	KF311620	CCAGGCTTTG	GGATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	GGAAACCTTT
Rvul	Rv54	KF311622	CCAGGCTTTG	GGATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	GGAAACCTTT
Rvul	Rv55	KF311617	CCGGGCTTTG	GGATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	GGAAACCTTT
Rvul	Rv56	KF311606	CCAGGCTTTG	GGATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	GGAAACCTTT
Rvul	Rv57	KF311614	CCGGGCTTTG	GGATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	GGAAACCTTT
Rvul	Rv59	KF311567	CCAGGCTTTG	GGATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	GGAAACCTTT
Rvul	Rv6	KF311628	CCAGGCTTTG	GAATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	AGAAACCTTT
Rvul	Rv60	KF311607	CCAGGCTTTG	GAATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	GGAAACCTTT
Rvul	Rv61	KF311544	CCAGGCTTTG	GGATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	GGAAACCTTT
Rvul	Rv62	KF311625	CCAGGCTTTG	GGATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	GGAAACCTTT
Rvul	Rv7	KF311528	CCAGGCTTTG	GAATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	AGAAACCTTT
Rvul	Rv8	KF311631	CCAGGCTTTG	GAATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	AGAAACCTTT
Rvul	Rv9	KF311590	CCAGGCTTTG	GAATAATTTC	CCATATTATT	ACTAATGAAA	GAGGAAAAAA	AGAAACCTTT
Slin		AY131102	CCAGGATTTG	GTATAATTTC	TCATATCATT	AGATACGAGA	GAGGAAAAAA	AGAAGCTTTT
Sory		AY131099	CCAGGATTTG	GAATAATCTC	CCACATTATT	AGATATGAAA	GAGGGAAAAA	AGAAACTTTC
Sory		GU196317	----------	----------	----------	----------	----------	----------
Spheno		NC018351	CCAGGTTTTG	GGATAATTTC	CCACATTATT	GGGCAAGATA	GAGGAAAAAA	AGAAGCTTTT
Szea		AY131100	CCAGGATTTG	GNATAATCTC	TCATATTATT	AGTTACGAAA	GAGGAAAAAA	AGAAACTTTC
Yfro		AY131109	CCAGGATTTG	GNATAATTTC	CCATATTATT	TCTCAAGAGA	GTGGAAAAAA	GGAAGCATTT

Continuation of the Table S4.

Species	Ha	Sequences	Position					
			781-790	791-800	801-810	811-820	821-830	831-840
Dbor		AY131105	GGAGTTCTAG	GAATAATCTA	TGCAATATTA	GCAATTGGAT	TATTAGGATT	TGTAGTTTGR
Dbor		Uni9	----------	----------	----------	----------	----------	----------
Dper		ASSCR6014	----------	----------	----------	----------	----------	----------
Dper		ASSCR6015	----------	----------	----------	----------	----------	----------
Dper		ASSCR6016	----------	----------	----------	----------	----------	----------
Dper		ASSCR6018	----------	----------	----------	----------	----------	----------
Hcho		JX679716	----------	----------	----------	----------	----------	----------
Hpha		KC112991	----------	----------	----------	----------	----------	----------
Nxan		NC018354	GGTGTCCTTG	GAATAATTTA	TGCTATAATA	GCGATTGGTT	TATTAGGATT	TGTTGTTTGA
Phil		GU244486	----------	----------	----------	----------	----------	----------
Pnod		HQ891474	GGAGTATTAG	GAATAATTTA	CGCTATAATA	GCAATTGGCC	TACTTGGATT	TGTTGTTTGA
Rbil	Rb1	KF311645	GGGATTTTAG	GTATAATTTA	TGCTATAATA	----------	----------	----------
Rbil	Rb2	KF311637	GGGATTTTAG	GTATAATTTA	TGCTATAATA	G---------	----------	----------
Rbil	Rb3	KF311639	GGGATTTTAG	GTATAATTTA	TGCTATAATA	----------	----------	----------
Rbil	Rb4	KF311636	GGGATTTTAG	GTATAATTTA	TGCTATAATA	----------	----------	----------
Rbil	Rb5	KF311635	GGGATTTTAG	GTATAATTTA	TGCTATAATA	----------	----------	----------
Rbil	Rb6	KF311634	GGGATCTTAG	GTATAATTTA	TGCTATAATA	T---------	----------	----------
Rbil	Rb7	KF311648	GGGATCTTAG	GTATAATTTA	TGCTATAATA	----------	----------	----------
Rbil	Rb8	KF311647	GGGATCTTAG	GTATAATTTA	TGCTATAATA	----------	----------	----------
Rcru		AY131113	GGAATTTTAG	GTATAATTTA	TGCCATAATA	GCAATTGGAT	TATTAGGATT	TGTTGTTTGA
Rcru		KF311359	GGAATTTTAG	GTATAATTTA	TGCCATAATA	----------	----------	----------
Rcru		USCOC565	----------	----------	----------	----------	----------	----------
Rfer	H1	GU581582	GGAATTCTTG	GTATAATTTA	TGCCATAATA	GCAATTGGTT	TATTAGGA--	----------
Rfer	H10	KF311482	GGAATTCTTG	GTATAATTTA	TGCCATAATA	----------	----------	----------
Rfer	H11	KF311444	GGAATTCTTG	GTATAATTTA	TGCCATAATA	----------	----------	----------
Rfer	H12	KF311487	GGAATTCTTG	GTATAATTTA	TGCCATAATA	----------	----------	----------
Rfer	H13	KF311481	GGAATTCTTG	GTATAATTTA	TGCCATAATA	----------	----------	----------
Rfer	H14	KF311448	GGAATTCTTG	GTATAATTTA	TGCCATAATA	----------	----------	----------
Rfer	H15	JX292125	GGAATTCTTG	GTATAATTTA	TGCCATAATA	GCAATTGGTT	TATTAGGAA-	----------
Rfer	H16	KF311449	GGAATTCTTG	GTATAATTTA	TGCCATAATA	----------	----------	----------

Rfer	H17	KF311360	GGAATTCTTG	GTATAATTTA	TGCCATAATA	----------	----------	----------
Rfer	H18	KF311473	GGAATTCTTG	GTATAATTTA	TGCCATAATA	----------	----------	----------
Rfer	H2	GU581549	GGAATTCTTG	GTATAATTTA	TGCCATAATA	GCAATTGGTT	TATTAGGA--	----------
Rfer	H20	KF311433	GGAATTCTTG	GTATAATTTA	TGCCATAATA	----------	----------	----------
Rfer	H21	KF311474	GGAATTCTTG	GTATAATTTA	TGCCATAATA	----------	----------	----------
Rfer	H22	KF311516	GGAATTCTTG	GTATAATTTA	TGCCATAATA	----------	----------	----------
Rfer	H23	KF311380	GGAATTCTTG	GTATAATTTA	TGCCATAATA	----------	----------	----------
Rfer	H24	KF311389	GGAATTCTTG	GTATAATTTA	TGCCATAATA	----------	----------	----------
Rfer	H25	KF311384	GGAATTCTTG	GTATAATTTA	TGCCATAATA	----------	----------	----------
Rfer	H26	KF311388	GGAATTCTTG	GTATAATTTA	TGCCATAATA	----------	----------	----------
Rfer	H27	KF311386	GGAATTCTTG	GTATAATTTA	TGCCATAATA	----------	----------	----------
Rfer	H28	KF311399	GGAATTCTTG	GTATAATTTA	TGCCATAATA	A---------	----------	----------
Rfer	H29	KF311383	GGAATTCTTG	GTATAATTTA	TGCCATAATA	----------	----------	----------
Rfer	H3	GU581547	GGAATTCTTG	GTATAATTTA	TGCCATAATA	GCAATTGGTT	TATTAGGA--	----------
Rfer	H30	KF311392	GGAATTCTTG	GTATAATTTA	TGCCATAATA	----------	----------	----------
Rfer	H31	KF311379	GGAATTCTTG	GTATAATTTA	TGCCATAATA	----------	----------	----------
Rfer	H32	KF311490	----------	----------	----------	----------	----------	----------
Rfer	H34	KF311492	GGAATTCTTG	GTATAATTTA	TGCCATAATA	----------	----------	----------
Rfer	H35	KF311496	GGAATTCTTG	GTATAATTTA	TGCCATAATA	----------	----------	----------
Rfer	H36	KF311500	GGAATTCTTG	GTATAATTTA	TGCCATAATA	----------	----------	----------
Rfer	H37	KF311509	GGAATTCTTG	GTATAATTTA	TGCCATAATA	----------	----------	----------
Rfer	H38	KF311505	GGAATTCTTG	GTATAATTTA	TGCCATAATA	----------	----------	----------
Rfer	H39	KF311508	GGAATTCTTG	GTATAATTTA	TGCCATAATA	----------	----------	----------
Rfer	H4	GU581545	GGAATTCTTG	GTATAATTTA	TGCCATAATA	GCAATTGGTT	TATTAGGA--	----------
Rfer	H40	KF311506	GGAATTCTTG	GTATAATTTA	TGCCATAATA	----------	----------	----------
Rfer	H42	KF311501	GGAATTCTTG	GTATAATTTA	TGCCATAATA	----------	----------	----------
Rfer	H43	KF311525	GGAATTCTTG	GTATAATTTA	TGCCATAATA	----------	----------	----------
Rfer	H5	GU581539	GGAATTCTTG	GTATAATTTA	TGCCATAATA	GCAATTGGTT	TATTAGGA--	----------
Rfer	H51	KU696497	GGAATTCTTG	GTATAATTTA	TGCCATAATA	A---------	----------	----------
Rfer	H52	KU696507	GGAATTCTTG	GTATAATTTA	TGCCATAATA	A---------	----------	----------
Rfer	H6	GU581526	GGAATTCTTG	GTATAATTTA	TGCCATAATA	GCAATTGGTT	TATTAGGA--	----------
Rfer	H7	GU581525	GGAATTCTTG	GTATAATTTA	TGCCATAATA	GCAATTGGTT	TATTAGGA--	----------
Rfer	H8	GU581319	GGAATTCTTG	GTATAATTTA	TGCCATAATA	GCAATTGGTT	TATTAGGAT-	----------

Rfer	H9	KF311446	GGAATTCTTG	GTATAATTTA	TGCCATAATA	----------	----------	----------
Rfer		JX292124	GGAATTCTTG	GTATAATTTA	TGCCATAATA	GCAATTGGTT	TATTAGGA--	----------
Rfer		JX294413	GGAATTCTTG	GTATAATTTA	TGCCATAATA	GCAATTGGTT	TATTAGGA--	----------
Rfer		KF413063	GGAATTCTTG	GTATAATTTA	TGCCATAATA	GC--------	----------	----------
Rfer		KF413064	GGAATTCTTG	GTATAATTTA	TGCCATAATA	GC--------	----------	----------
Rfer		KF413065	GGAATTCTTG	GTATAATTTA	TGCCATAATA	GC--------	----------	----------
Rfer		KF413066	GGAATTCTTG	GTATAATTTA	TGCCATAATA	GC--------	----------	----------
Rfer		KF413067	GGAATTCTTG	GTATAATTTA	TGCCATAATA	GC--------	----------	----------
Rfer		KF413068	GGAATTCTTG	GTATAATTTA	TGCCATAATA	GC--------	----------	----------
Rfer		KF413069	GGAATTCTTG	GTATAATTTA	TGCCATAATA	GC--------	----------	----------
Rfer		KF413070	GGAATTCTTG	GTATAATTTA	TGCCATAATA	GC--------	----------	----------
Rfer		KF413071	GGAATTCTTG	GTATAATTTA	TGCCATAATA	GC--------	----------	----------
Rfer		KF413072	GGAATTCTTG	GTATAATTTA	TGCCATAATA	GC--------	----------	----------
Rfer		KF413073	GGAATTCTTG	GTATAATTTA	TGCCATAATA	GC--------	----------	----------
Rfer		KT989230	----------	----------	----------	----------	----------	----------
Rfer		KT989231	----------	----------	----------	----------	----------	----------
Rfer		KT989232	----------	----------	----------	----------	----------	----------
Rfer		KT989233	----------	----------	----------	----------	----------	----------
Rfer		KT989234	----------	----------	----------	----------	----------	----------
Rfer		KU916538	----------	----------	----------	----------	----------	----------
Rfer		KY458175	----------	----------	----------	----------	----------	----------
Rfer		KY458176	----------	----------	----------	----------	----------	----------
Rfer		KY458177	----------	----------	----------	----------	----------	----------
Rfer		LC474878	----------	----------	----------	----------	----------	----------
Rfer		LC474880	----------	----------	----------	----------	----------	----------
Rfer		LC474881	----------	----------	----------	----------	----------	----------
Rfer		LC474882	----------	----------	----------	----------	----------	----------
Rfer		LC474884	----------	----------	----------	----------	----------	----------
Rfer		LC474885	GGAATTCTTG	GTATAATTTA	T---------	----------	----------	----------
Rfer		LC474886	GGAATTCTTG	GTATAATTTA	T---------	----------	----------	----------
Rfer		LC474887	----------	----------	----------	----------	----------	----------
Rfer		LC474888	----------	----------	----------	----------	----------	----------
Rfer		LC474889	G---------	----------	----------	----------	----------	----------

Rfer		LC474890	G---------	----------	----------	----------	----------	----------
Rfer		LC474891	G---------	----------	----------	----------	----------	----------
Rfer		LC474892	G---------	----------	----------	----------	----------	----------
Rfer		LC474893	G---------	----------	----------	----------	----------	----------
Rfer		LC474894	G---------	----------	----------	----------	----------	----------
Rfer		LC474895	----------	----------	----------	----------	----------	----------
Rfer		LC474896	GGAATTCTTG	GTATAATTTA	TGCCATAATA	GCATAA----	----------	----------
Rfer		LC474897	GGAATTCTTG	GTATAATTTA	TGCCATAATA	TAAT------	----------	----------
Rfer		LC474898	GGAATTCTTG	GTATAATTTA	TGCCATAATA	TAAT------	----------	----------
Rfer		LC474899	GGAATTCTTG	GTATAATTTA	TGCCATAATA	TAAT------	----------	----------
Rfer		LC474902	GGAATTCTTG	GTATAATTTA	TGCCATAATA	GCATAA----	----------	----------
Rfer		LC474903	GGAATTCTTG	GTATAATTTA	TGCCATAAT-	----------	----------	----------
Rfer		LC474904	GGAATTCTTG	GTATAATTTA	TGCCATAATA	GCATAA----	----------	----------
Rfer		LC474905	GGATAAC---	----------	----------	----------	----------	----------
Rfer		LC474906	GGAATTCTTG	GTATAATTTA	TGCCATAATA	TAA-------	----------	----------
Rfer		LC474907	GGAATTCTTG	GTTAAA----	----------	----------	----------	----------
Rfer		LC474908	GGAATTCTTG	GTATAATTTA	TGCCATAATA	GCAATTGGTT	AA--------	----------
Rfer		LC474909	GGAATTCTTG	GTATAATTTA	TGCCATAATA	GCA-------	----------	----------
Rfer		LC474910	GGAATTCTTG	GTATAATTTA	TGCCATAATA	TAAT------	----------	----------
Rfer		LC474911	GGAATTCTTG	GTATAATTTA	TGCCATAATA	TAAT------	----------	----------
Rfer		LC474912	----------	----------	----------	----------	----------	----------
Rfer		LC474913	GGAATTCTTG	GTATA-----	----------	----------	----------	----------
Rfer		LC474914	----------	----------	----------	----------	----------	----------
Rfer		LC474915	GGAATTCTTG	GTATAATTTA	TGCCATAATA	GCAATTGGTT	AA--------	----------
Rfer		LC474916	GGAATTCTTG	GTATAATTTA	TGCCATAATA	GCA-------	----------	----------
Rfer		LC474917	GGAATTCTTG	GTATAATTTA	AG--------	----------	----------	----------
Rfer		LC474918	GGAATTCTTG	GTATAATTTA	TGCCATAATA	GCATAA----	----------	----------
Rfer		LC474919	----------	----------	----------	----------	----------	----------
Rfer		LC474920	----------	----------	----------	----------	----------	----------
Rfer		LC474921	----------	----------	----------	----------	----------	----------
Rfer		LC474922	----------	----------	----------	----------	----------	----------
Rfer		LC474923	----------	----------	----------	----------	----------	----------
Rfer		LC474924	----------	----------	----------	----------	----------	----------

Rfer		LC474925	----------	----------	----------	----------	----------	----------
Rfer		LC474926	TAA-------	----------	----------	----------	----------	----------
Rfer		LC474927	GGAATTCTTG	GTATAATTTA	TGCCATAATA	GCA-------	----------	----------
Rfer		LC474928	GGAATTCTTG	GTATAATTTA	TGCCATAATA	GCA-------	----------	----------
Rfer		LC474929	GGAATTCTTG	GTATAATTTA	TGCCATAATA	GCATAAA---	----------	----------
Rfer		MF448526	GGAATTCTTG	GTATAATTTA	TGCCATAATA	GC--------	----------	----------
Rfer		MG051027	----------	----------	----------	----------	----------	----------
Rfer		MG051028	----------	----------	----------	----------	----------	----------
Rfer		MG051029	----------	----------	----------	----------	----------	----------
Rfer		MG051030	----------	----------	----------	----------	----------	----------
Rfer		MG051031	----------	----------	----------	----------	----------	----------
Rfer		MG872818	GGAATTCTTG	GTATAATTTA	TGCCATAATA	GCG-------	----------	----------
Rfer		MG883395	GGAATTCTTG	GTATAATTTA	TGCCATAATA	GCG-------	----------	----------
Rfer		MG883396	GGAATTCTTG	GTATAATTTA	TGCCATAATA	GCT-------	----------	----------
Rfer		MG883397	GGAATTCTTG	GTATAATTTA	TGCCATAATA	GCAAC-----	----------	----------
Rfer		MG883398	GGAATTCTTG	GTATAATTTA	TGCCATAATA	GCAATTGGTT	TATTA-----	----------
Rfer		MG883399	----------	----------	----------	----------	----------	----------
Rfer		MH016277	----------	----------	----------	----------	----------	----------
Rfer		MH016278	----------	----------	----------	----------	----------	----------
Rfer		MH016279	----------	----------	----------	----------	----------	----------
Rfer		MH016604	GGAATTCTTG	GTATAATTTA	TGCCATAATA	GCAATTGA--	----------	----------
Rfer		MH016605	GGAATTCTTG	GTATAATTTA	TGCCATAATA	GCA-------	----------	----------
Rfer		MH016606	GGAATTCTTG	GTATAATTTA	TGCCATAATA	GCT-------	----------	----------
Rfer		MH016607	GGAATTCTTG	GTATT-----	----------	----------	----------	----------
Rfer		MH016608	----------	----------	----------	----------	----------	----------
Rfer		MH016609	----------	----------	----------	----------	----------	----------
Rfer		MH016610	GA--------	----------	----------	----------	----------	----------
Rfer		MH016611	GA--------	----------	----------	----------	----------	----------
Rfer		MH016612	----------	----------	----------	----------	----------	----------
Rfer		MH016613	----------	----------	----------	----------	----------	----------
Rfer		MH016614	GGAATTCTTG	GTATAATTTA	TGCCATAATA	GCAATTGGTT	G---------	----------
Rfer		MH016615	GGAATTCTTG	GTATAATTTA	TGCCATAATA	GCAA------	----------	----------
Rfer		MH016616	GGAATTCTTG	GTATAATTTA	TGCCATAATA	GCAATTGA--	----------	----------

Rfer		MH016617	GA--------	----------	----------	----------	----------	----------
Rfer		MH016618	GGAATTCTTG	GTATAATTTA	TGCCATAATA	GCAA------	----------	----------
Rfer		MH016619	GGAATTCTTG	GTATAATTTA	TGCCATAATA	GCAATTGG--	----------	----------
Rfer		MH016620	GGAATTCTTG	GTATAATTTA	TGCCATAATA	GCG-------	----------	----------
Rfer		MH016621	GGAATTCTTG	GTATAATTTA	TGCCATAATA	GCA-------	----------	----------
Rfer		MH016622	GGAATTCTTG	GTATAATTTA	TGCCATAATA	T---------	----------	----------
Rfer		MH016623	----------	----------	----------	----------	----------	----------
Rfer		MH016624	----------	----------	----------	----------	----------	----------
Rfer		MH016625	----------	----------	----------	----------	----------	----------
Rfer		MH016626	----------	----------	----------	----------	----------	----------
Rfer		MH016627	GGA-------	----------	----------	----------	----------	----------
Rfer		MH016628	----------	----------	----------	----------	----------	----------
Rfer		MH016629	GGAATTCTTG	GTATAATTTA	TGCCATAATA	GCAA------	----------	----------
Rfer		MH016630	GGAATTCTTG	GTATAATTTA	TGCCATAATA	C---------	----------	----------
Rfer		MH016631	GGAATTCTTG	GTATAATTTA	TGCCATAATA	GCAG------	----------	----------
Rfer		MH016632	GGAATTCTTG	GTATAATTTA	T---------	----------	----------	----------
Rfer		MH016633	GGAATTCTTG	GTATAAATTA	TGCCATAATA	A---------	----------	----------
Rfer		MH016634	GGAATTCTTG	GTATAATTTA	TGCCATAATA	GCC-------	----------	----------
Rfer		MH016635	GGAATTCTTG	GTATAATTTA	TGCCATAATA	GCAATTG---	----------	----------
Rfer		MH016636	GGAATTCTTG	GTATAATTTA	TGCCATAATA	GCCT------	----------	----------
Rfer		MH016637	GGAATTCTTG	GTATAATTTA	TGCCATAATA	GCAACT----	----------	----------
Rfer	H19	KF311403	GGAATTCTTG	GTATAATTTA	TGCCATAATA	----------	----------	----------
Rfer	H41	KF311502	GGAATTCTTG	GTATAATTTA	TGCCATAATA	----------	----------	----------
Rpal		ASSCR6357	----------	----------	----------	----------	----------	----------
Rpal		ASSCR6358	----------	----------	----------	----------	----------	----------
Rpal		AY131121	GGAGTCTTAG	GTATAATCTA	TGCTATAATA	GCAATTGGTT	TATTAGGATT	TGTTGTATGA
Rpal		GU581629	GGAGTCTTAG	GTATAATCTA	TGCTATAATA	GCCAATTGTT	TATTAGGATA	----------
Rpal		KF311358	GGAGTCTTAG	GTATAATCTA	TGCTATAATA	A---------	----------	----------
Rpal		KR494254	----------	----------	----------	----------	----------	----------
Rpal		KR494255	----------	----------	----------	----------	----------	----------
Rpal		KR494256	----------	----------	----------	----------	----------	----------
Rpal		KR494257	----------	----------	----------	----------	----------	----------
Rpal		KR494258	----------	----------	----------	----------	----------	----------

Rpal		KR494259	----------	----------	----------	----------	----------	----------
Rpal		KR494260	----------	----------	----------	----------	----------	----------
Rpal		KR494261	----------	----------	----------	----------	----------	----------
Rpal	Rp1	KU647599	----------	----------	----------	----------	----------	----------
Rpal	Rp10	KU647490	----------	----------	----------	----------	----------	----------
Rpal	Rp11	KU647489	----------	----------	----------	----------	----------	----------
Rpal	Rp12	KU647604	----------	----------	----------	----------	----------	----------
Rpal	Rp13	KU647575	----------	----------	----------	----------	----------	----------
Rpal	Rp2	KU647587	----------	----------	----------	----------	----------	----------
Rpal	Rp3	KU647508	----------	----------	----------	----------	----------	----------
Rpal	Rp4	KU647585	----------	----------	----------	----------	----------	----------
Rpal	Rp5	KU647584	----------	----------	----------	----------	----------	----------
Rpal	Rp6	KU647581	----------	----------	----------	----------	----------	----------
Rpal	Rp7	KU647579	----------	----------	----------	----------	----------	----------
Rpal	Rp8	KU647502	----------	----------	----------	----------	----------	----------
Rpal	Rp9	KU647505	----------	----------	----------	----------	----------	----------
Rpal		Uni10	----------	----------	----------	----------	----------	----------
Rpal		Uni11	----------	----------	----------	----------	----------	----------
Rpal		Uni117	----------	----------	----------	----------	----------	----------
Rpal		Uni17	----------	----------	----------	----------	----------	----------
Rpal		Uni21	----------	----------	----------	----------	----------	----------
Rpal		Uni44	----------	----------	----------	----------	----------	----------
Rpal		Uni58	----------	----------	----------	----------	----------	----------
Rpho		AY131120	GGTGTCCTAG	GAATAATTTA	TGCTATAATA	GCAATTGGAT	TATTAGGTTT	CGTAGTATGA
Rpho		KY511047	GGTGTCCTAG	GAATAATTTA	TGCTATAATA	GCAATTGGGC	TTTTAGGATT	CGTAGTATGA
Rvul		LN612634	----------	----------	----------	----------	----------	----------
Rvul		LN612635	----------	----------	----------	----------	----------	----------
Rvul		LN612636	----------	----------	----------	----------	----------	----------
Rvul		MG051024	GGAAGTTTAA	----------	----------	----------	----------	----------
Rvul		MG051025	GGAAGTTTAA	----------	----------	----------	----------	----------
Rvul		MG051026	----------	----------	----------	----------	----------	----------
Rvul	Rv1	KF311588	GGAATTTTAG	GTATAATTTA	TGCTATAATA	A---------	----------	----------
Rvul	Rv10	KF311587	GGAATTTTAG	GTATAATTTA	TGCTATAATA	A---------	----------	----------

Rvul	Rv11	KF311629	GGAATTTTAG	GTATAATTTA	TGCTATAATA	A---------	----------	----------
Rvul	Rv12	KF311550	GGAATTTTAG	GTATAATTTA	TGCTATAATA	AC--------	----------	----------
Rvul	Rv13	KF311549	GGAATTTTAG	GTATAATTTA	TGCTATAATA	AT--------	----------	----------
Rvul	Rv14	KF311573	GGAATTTTAG	GTATAATTTA	TGCTATAATA	A---------	----------	----------
Rvul	Rv15	KF311546	GGAATTTTAG	GTATAATTTA	TGCTATAATA	AA--------	----------	----------
Rvul	Rv16	KF311600	GGAATTTTAG	GTATAATTTA	TGCTATAATA	A---------	----------	----------
Rvul	Rv17	KF311578	GGAATTTTAG	GTATAATTTA	TGCTATAATA	A---------	----------	----------
Rvul	Rv18	KF311593	GGAATTTTAG	GTATAATTTA	TGCTATAATA	A---------	----------	----------
Rvul	Rv19	KF311552	GGAATTTTAG	GTATAATTTA	TGCTATAATA	AA--------	----------	----------
Rvul	Rv2	KF311586	GGAATTTTAG	GTATAATTTA	TGCTATAATA	A---------	----------	----------
Rvul	Rv20	KF311594	GGAATTTTAG	GTATAATTTA	TGCTATAATA	A---------	----------	----------
Rvul	Rv21	KF311547	GGAATTTTAG	GTATAATTTA	TGCTATAATA	AA--------	----------	----------
Rvul	Rv22	KF311591	GGAATTTTAG	GTATAATTTA	TGCTATAATA	A---------	----------	----------
Rvul	Rv23	KF311545	GGAATTTTAG	GTATAATTTA	TGCTATAATA	AT--------	----------	----------
Rvul	Rv24	KF311576	GGAATTTTAG	GTATAATTTA	TGCTATAATA	A---------	----------	----------
Rvul	Rv25	KF311548	GGAATTTTAG	GTATAATTTA	TGCTATAATA	AT--------	----------	----------
Rvul	Rv26	KF311559	GGAATTTTAG	GTATAATTTA	TGCTATAATA	AT--------	----------	----------
Rvul	Rv27	KF311561	GGAATTTTAG	GTATAATTTA	TGCTATAATA	AA--------	----------	----------
Rvul	Rv28	KF311533	GGAATTTTAG	GTATAATTTA	TGCTATAATA	AA--------	----------	----------
Rvul	Rv29	KF311537	GGAATTTTAG	GTATAATTTA	TGCTATAATA	AA--------	----------	----------
Rvul	Rv3	KF311633	GGAATTTTAG	GTATAATTTA	TGCTATAATA	----------	----------	----------
Rvul	Rv30	KF311564	GGAATTTTAG	GTATAATTTA	TGCTATAATA	AA--------	----------	----------
Rvul	Rv31	KF311570	GGAATTTTAG	GTATAATTTA	TGCTATAATA	A---------	----------	----------
Rvul	Rv32	KF311530	GGAATTTTAG	GTATAATTTA	TGCTATAATA	A---------	----------	----------
Rvul	Rv33	KF311538	GGAATTTTAG	GTATAATTTA	TGCTATAATA	AT--------	----------	----------
Rvul	Rv34	KF311610	GGAATTTTAG	GTATAATTTA	TGCTATAATA	A---------	----------	----------
Rvul	Rv35	KF311605	GGAATTTTAG	GTATAATTTA	TGCTATAATA	A---------	----------	----------
Rvul	Rv36	KF311535	GGAATTTTAG	GTATAATTTA	TGCTATAATA	AA--------	----------	----------
Rvul	Rv37	KF311529	GGAATTTTAG	GTATAATTTA	TGCTATAATA	A---------	----------	----------
Rvul	Rv38	KF311532	GGAATTTTAG	GTATAATTTA	TGCTATAATA	AA--------	----------	----------
Rvul	Rv39	KF311563	GGAATTTTAG	GTATAATTTA	TGCTATAATA	AG--------	----------	----------
Rvul	Rv4	KF311589	GGAATTTTAG	GTATAATTTA	TGCTATAATA	A---------	----------	----------
Rvul	Rv40	KF311568	GGAATTTTAG	GTATAATTTA	TGCTATAATA	A---------	----------	----------

Rvul	Rv41	KF311555	GGAATTTTAG	GTATAATTTA	TGCTATAATA	AT--------	----------	----------
Rvul	Rv42	KF311558	GGAATTTTAG	GTATAATTTA	TGCTATAATA	AT--------	----------	----------
Rvul	Rv43	KF311560	GGAATTTTAG	GTATAATTTA	TGCTATAATA	AA--------	----------	----------
Rvul	Rv44	KF311601	GGAATTTTAG	GTATAATTTA	TGCTATAATA	A---------	----------	----------
Rvul	Rv45	KF311608	GGAATTTTAG	GTATAATTTA	TGCTATAATA	A---------	----------	----------
Rvul	Rv46	KF311604	GGAATTTTAG	GTATAATTTA	TGCTATAATA	A---------	----------	----------
Rvul	Rv47	KF311615	GGAATTTTAG	GTATAATTTA	TGCTATAATA	A---------	----------	----------
Rvul	Rv48	KF311603	GGAATTTTAG	GTATAATTTA	TGCTATAATA	A---------	----------	----------
Rvul	Rv49	KF311609	GGAATTTTAG	GTATAATTTA	TGCTATAATA	A---------	----------	----------
Rvul	Rv5	KF311632	GGAATTTTAG	GTATAATTTA	TGCTATAATA	A---------	----------	----------
Rvul	Rv50	KF311602	GGAATTTTAG	GTATAATTTA	TGCTATAATA	A---------	----------	----------
Rvul	Rv51	KF311621	GGAATTTTAG	GTATAATTTA	TGCTATAATA	A---------	----------	----------
Rvul	Rv52	KF311619	GGAATTTTAG	GTATAATTTA	TGCTATAATA	A---------	----------	----------
Rvul	Rv53	KF311620	GGAATTTTAG	GTATAATTTA	TGCTATAATA	A---------	----------	----------
Rvul	Rv54	KF311622	GGAATTTTAG	GTATAATTTA	TGCTATAATA	A---------	----------	----------
Rvul	Rv55	KF311617	GGAATTTTAG	GTATAATTTA	TGCTATAATA	A---------	----------	----------
Rvul	Rv56	KF311606	GGAATTTTAG	GTATAATTTA	TGCTATAATA	A---------	----------	----------
Rvul	Rv57	KF311614	GGAATTTTAG	GTATAATTTA	TGCTATAATA	A---------	----------	----------
Rvul	Rv59	KF311567	GGAATTTTAG	GTATAATTTA	TGCTATAATA	AT--------	----------	----------
Rvul	Rv6	KF311628	GGAATTTTAG	GTATAATTTA	TGCTATAATA	A---------	----------	----------
Rvul	Rv60	KF311607	GGAATTTTAG	GTATAATTTA	TGCTATAATA	A---------	----------	----------
Rvul	Rv61	KF311544	GGAATTTTAG	GTATAATTTA	TGCTATAATA	AT--------	----------	----------
Rvul	Rv62	KF311625	GGAATTTTAG	GTATAATTTA	TGCTATAATA	A---------	----------	----------
Rvul	Rv7	KF311528	GGAATTTTAG	GTATAATTTA	TGCTATAATA	A---------	----------	----------
Rvul	Rv8	KF311631	GGAATTTTAG	GTATAATTTA	TGCTATAATA	A---------	----------	----------
Rvul	Rv9	KF311590	GGAATTTTAG	GTATAATTTA	TGCTATAATA	A---------	----------	----------
Slin		AY131102	GGAGTTCTAG	GAATAATTTA	TGCAATAATT	GCTATTGGAT	TACTTGGATT	TGTCGTATGA
Sory		AY131099	GGAGTTTTAG	GTATAATCTA	TGCAATAATT	GCAATTGGCT	TATTAGGATT	CGTAGTATGA
Sory		GU196317	----------	----------	----------	----------	----------	----------
Spheno		NC018351	GGAGTCTTAG	GAATAATTTA	TGCTATAATA	GCAATCGGCC	TTCTAGGATT	TGTTGTTTGA
Szea		AY131100	GGAGTATTAG	GAATAATCTA	TGCAATAATC	GCAATTGGTT	TATTAGGATT	CGTAGTTTGA
Yfro		AY131109	GGTATACTAG	GGATAATTTA	TGCTATAATA	GCAATTGGAC	TACTAGGATT	TGTAGTTTGA

Continuation of the Table S4.

Species	Ha	Sequences	Position 841
Dbor		Uni9	-
Dper		ASSCR6014	-
Dper		ASSCR6015	-
Dper		ASSCR6016	-
Dper		ASSCR6018	-
Hcho		JX679716	-
Hpha		KC112991	-
Nxan		NC018354	G
Phil		GU244486	-
Pnod		HQ891474	G
Rbil	Rb1	KF311645	-
Rbil	Rb2	KF311637	-
Rbil	Rb3	KF311639	-
Rbil	Rb4	KF311636	-
Rbil	Rb5	KF311635	-
Rbil	Rb6	KF311634	-
Rbil	Rb7	KF311648	-
Rbil	Rb8	KF311647	-
Rcru		AY131113	G
Rcru		KF311359	-
Rcru		USCOC565	-
Rfer	H1	GU581582	-
Rfer	H10	KF311482	-
Rfer	H11	KF311444	-
Rfer	H12	KF311487	-
Rfer	H13	KF311481	-
Rfer	H14	KF311448	-
Rfer	H15	JX292125	-
Rfer	H16	KF311449	-
Rfer	H17	KF311360	-
Rfer	H18	KF311473	-
Rfer	H2	GU581549	-
Rfer	H20	KF311433	-
Rfer	H21	KF311474	-
Rfer	H22	KF311516	-
Rfer	H23	KF311380	-
Rfer	H24	KF311389	-
Rfer	H25	KF311384	-
Rfer	H26	KF311388	-
Rfer	H27	KF311386	-
Rfer	H28	KF311399	-
Rfer	H29	KF311383	-
Rfer	H3	GU581547	-
Rfer	H30	KF311392	-
Rfer	H31	KF311379	-
Rfer	H32	KF311490	-

Rfer	H34	KF311492	-
Rfer	H35	KF311496	-
Rfer	H36	KF311500	-
Rfer	H37	KF311509	-
Rfer	H38	KF311505	-
Rfer	H39	KF311508	-
Rfer	H4	GU581545	-
Rfer	H40	KF311506	-
Rfer	H42	KF311501	-
Rfer	H43	KF311525	-
Rfer	H5	GU581539	-
Rfer	H51	KU696497	-
Rfer	H52	KU696507	-
Rfer	H6	GU581526	-
Rfer	H7	GU581525	-
Rfer	H8	GU581319	-
Rfer	H9	KF311446	-
Rfer		JX292124	-
Rfer		JX294413	-
Rfer		KF413063	-
Rfer		KF413064	-
Rfer		KF413065	-
Rfer		KF413066	-
Rfer		KF413067	-
Rfer		KF413068	-
Rfer		KF413069	-
Rfer		KF413070	-
Rfer		KF413071	-
Rfer		KF413072	-
Rfer		KF413073	-
Rfer		KT989230	-
Rfer		KT989231	-
Rfer		KT989232	-
Rfer		KT989233	-
Rfer		KT989234	-
Rfer		KU916538	-
Rfer		KY458175	-
Rfer		KY458176	-
Rfer		KY458177	-
Rfer		LC474878	-
Rfer		LC474880	-
Rfer		LC474881	-
Rfer		LC474882	-
Rfer		LC474884	-
Rfer		LC474885	-
Rfer		LC474886	-
Rfer		LC474887	-
Rfer		LC474888	-
Rfer		LC474889	-

Rfer		LC474890	-
Rfer		LC474891	-
Rfer		LC474892	-
Rfer		LC474893	-
Rfer		LC474894	-
Rfer		LC474895	-
Rfer		LC474896	-
Rfer		LC474897	-
Rfer		LC474898	-
Rfer		LC474899	-
Rfer		LC474902	-
Rfer		LC474903	-
Rfer		LC474904	-
Rfer		LC474905	-
Rfer		LC474906	-
Rfer		LC474907	-
Rfer		LC474908	-
Rfer		LC474909	-
Rfer		LC474910	-
Rfer		LC474911	-
Rfer		LC474912	-
Rfer		LC474913	-
Rfer		LC474914	-
Rfer		LC474915	-
Rfer		LC474916	-
Rfer		LC474917	-
Rfer		LC474918	-
Rfer		LC474919	-
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Rfer		LC474921	-
Rfer		LC474922	-
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Rfer		LC474926	-
Rfer		LC474927	-
Rfer		LC474928	-
Rfer		LC474929	-
Rfer		MF448526	-
Rfer		MG051027	-
Rfer		MG051028	-
Rfer		MG051029	-
Rfer		MG051030	-
Rfer		MG051031	-
Rfer		MG872818	-
Rfer		MG883395	-
Rfer		MG883396	-
Rfer		MG883397	-
Rfer		MG883398	-

Rfer		MG883399	-
Rfer		MH016277	-
Rfer		MH016278	-
Rfer		MH016279	-
Rfer		MH016604	-
Rfer		MH016605	-
Rfer		MH016606	-
Rfer		MH016607	-
Rfer		MH016608	-
Rfer		MH016609	-
Rfer		MH016610	-
Rfer		MH016611	-
Rfer		MH016612	-
Rfer		MH016613	-
Rfer		MH016614	-
Rfer		MH016615	-
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Rfer		MH016634	-
Rfer		MH016635	-
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Rvul	Rv39	KF311563	-
Rvul	Rv4	KF311589	-
Rvul	Rv40	KF311568	-
Rvul	Rv41	KF311555	-
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Rvul	Rv6	KF311628	-
Rvul	Rv60	KF311607	-
Rvul	Rv61	KF311544	-
Rvul	Rv62	KF311625	-
Rvul	Rv7	KF311528	-
Rvul	Rv8	KF311631	-
Rvul	Rv9	KF311590	-
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Sory		AY131099	G
Sory		GU196317	-
Spheno		NC018351	G
Szea		AY131100	G

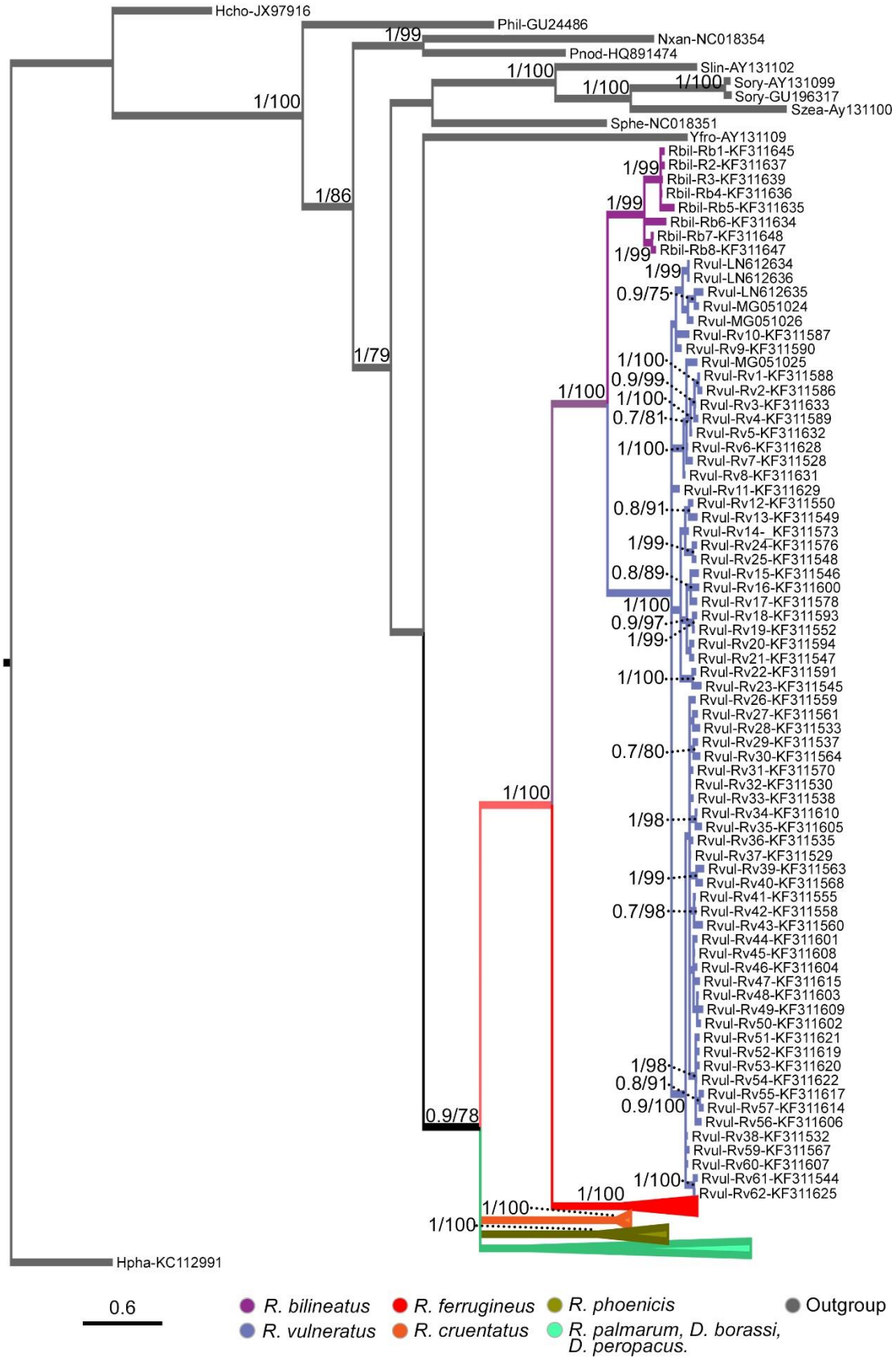
Yfro		AY131109	G

Table S5. DNA substitution models and its metrics of the aligned sequence of the COI gene of *Dynamis* and *Rhynchophorus* species available in GenBank, BOLD and this study (See Table S4).

Model	#Param	BIC	AICc	lnL	Invariant	Gamma	R	Freq A	Freq T	Freq C	Freq G
GTR+G+I	593.00	27005.59	21090.74	-9950.16	0.40	0.97	2.01	0.28	0.34	0.21	0.17
GTR+G	592.00	27058.13	21153.25	-9982.42	n/a	0.32	1.93	0.28	0.34	0.21	0.17
HKY+G+I	589.00	27109.24	21234.26	-10025.95	0.39	0.75	2.41	0.28	0.34	0.21	0.17
TN93+G+I	590.00	27120.76	21235.81	-10025.71	0.39	0.76	2.41	0.28	0.34	0.21	0.17
T92+G+I	587.00	27133.25	21278.20	-10049.93	0.38	0.71	2.49	0.31	0.31	0.19	0.19
HKY+G	588.00	27154.78	21289.77	-10054.71	n/a	0.30	2.37	0.28	0.34	0.21	0.17
TN93+G	589.00	27166.72	21291.74	-10054.69	n/a	0.30	2.37	0.28	0.34	0.21	0.17
T92+G	586.00	27180.52	21335.44	-10079.56	n/a	0.29	2.47	0.31	0.31	0.19	0.19
GTR+I	592.00	27447.03	21542.15	-10176.87	0.48	n/a	1.76	0.28	0.34	0.21	0.17
K2+G+I	586.00	27624.34	21779.26	-10301.47	0.39	0.82	2.56	0.25	0.25	0.25	0.25
K2+G	585.00	27647.97	21812.86	-10319.28	n/a	0.32	2.27	0.25	0.25	0.25	0.25
HKY+I	588.00	27650.04	21785.02	-10302.34	0.48	n/a	1.87	0.28	0.34	0.21	0.17
TN93+I	589.00	27659.01	21784.03	-10300.83	0.48	n/a	1.87	0.28	0.34	0.21	0.17
T92+I	586.00	27689.24	21844.16	-10333.92	0.49	n/a	1.88	0.31	0.31	0.19	0.19
K2+I	585.00	28051.42	22216.31	-10521.00	0.49	n/a	1.72	0.25	0.25	0.25	0.25
JC+G+I	585.00	28262.65	22427.54	-10626.62	0.41	1.13	0.50	0.25	0.25	0.25	0.25
JC+G	584.00	28294.97	22469.82	-10648.77	n/a	0.33	0.50	0.25	0.25	0.25	0.25
JC+I	584.00	28659.72	22834.57	-10831.14	0.48	n/a	0.50	0.25	0.25	0.25	0.25
GTR	591.00	29080.02	23185.10	-10999.35	n/a	n/a	1.67	0.28	0.34	0.21	0.17
HKY	587.00	29487.39	23632.34	-11227.00	n/a	n/a	1.63	0.28	0.34	0.21	0.17
TN93	588.00	29496.32	23631.30	-11225.48	n/a	n/a	1.85	0.28	0.34	0.21	0.17
T92	585.00	29535.22	23700.11	-11262.90	n/a	n/a	1.63	0.31	0.31	0.19	0.19
K2	584.00	29779.91	23954.76	-11391.24	n/a	n/a	1.85	0.25	0.25	0.25	0.25
JC	583.00	30343.08	24527.90	-11678.81	n/a	n/a	0.50	0.25	0.25	0.25	0.25

Continuation of the Table S5.

Model	A=>T	A=>C	A=>G	T=>A	T=>C	T=>G	C=>A	C=>T	C=>G	G=>A	G=>T	G=>C
GTR+G+I	0.10	0.01	0.09	0.08	0.17	0.02	0.02	0.28	0.02	0.16	0.03	0.02
GTR+G	0.10	0.01	0.09	0.08	0.17	0.02	0.02	0.27	0.02	0.16	0.04	0.02
HKY+G+I	0.05	0.03	0.12	0.04	0.15	0.02	0.04	0.25	0.02	0.20	0.05	0.03
TN93+G+I	0.05	0.03	0.12	0.04	0.15	0.02	0.04	0.25	0.02	0.20	0.05	0.03
T92+G+I	0.04	0.03	0.14	0.04	0.14	0.03	0.04	0.23	0.03	0.23	0.04	0.03
HKY+G	0.05	0.03	0.12	0.04	0.15	0.02	0.04	0.24	0.02	0.20	0.05	0.03
TN93+G	0.05	0.03	0.12	0.04	0.15	0.02	0.04	0.24	0.02	0.20	0.05	0.03
T92+G	0.04	0.03	0.14	0.04	0.14	0.03	0.04	0.23	0.03	0.23	0.04	0.03
GTR+I	0.11	0.02	0.11	0.09	0.14	0.01	0.03	0.24	0.03	0.18	0.01	0.04
K2+G+I	0.04	0.04	0.18	0.04	0.18	0.04	0.04	0.18	0.04	0.18	0.04	0.04
K2+G	0.04	0.04	0.17	0.04	0.17	0.04	0.04	0.17	0.04	0.17	0.04	0.04
HKY+I	0.06	0.04	0.11	0.05	0.14	0.03	0.05	0.23	0.03	0.19	0.06	0.04
TN93+I	0.06	0.04	0.10	0.05	0.15	0.03	0.05	0.24	0.03	0.17	0.06	0.04
T92+I	0.05	0.03	0.13	0.05	0.13	0.03	0.05	0.21	0.03	0.21	0.05	0.03
K2+I	0.05	0.05	0.16	0.05	0.16	0.05	0.05	0.16	0.05	0.16	0.05	0.05
JC+G+I	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08
JC+G	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08
JC+I	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08
GTR	0.13	0.03	0.10	0.11	0.15	0.01	0.04	0.25	0.01	0.17	0.01	0.01
HKY	0.06	0.04	0.10	0.05	0.13	0.03	0.05	0.22	0.03	0.18	0.06	0.04
TN93	0.06	0.04	0.10	0.05	0.14	0.03	0.05	0.24	0.03	0.18	0.06	0.04
T92	0.06	0.03	0.12	0.06	0.12	0.03	0.06	0.20	0.03	0.20	0.06	0.03
K2	0.04	0.04	0.16	0.04	0.16	0.04	0.04	0.16	0.04	0.16	0.04	0.04
JC	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08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Pnod-HQ891474
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Sory-AY131099
Sory-GU196317
Szea-Ay131100
Sphe-NC018351
Yfro-AY131109
Rbil-Rb1-KF311645
Rbil-R2-KF311637
Rbil-R3-KF311639
Rbil-Rb4-KF311636
Rbil-Rb5-KF311635
Rbil-Rb6-KF311634
Rbil-Rb7-KF311648
Rbil-Rb8-KF311647
Rvul-LN612634
Rvul-LN612636
Rvul-LN612635
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Rvul-MG051026
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Rvul-Rv9-KF311590
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Rvul-Rv24-KF311576
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Rvul-Rv16-KF311600
Rvul-Rv17-KF311578
Rvul-Rv18-KF311593
Rvul-Rv19-KF311552
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Rvul-Rv62-KF311625
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0.9/97
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0.7/80
1/100
1/98
1/99
0.7/98
1/98
0.8/91
0.9/100
0.9/78
1/100
1/100
1/100
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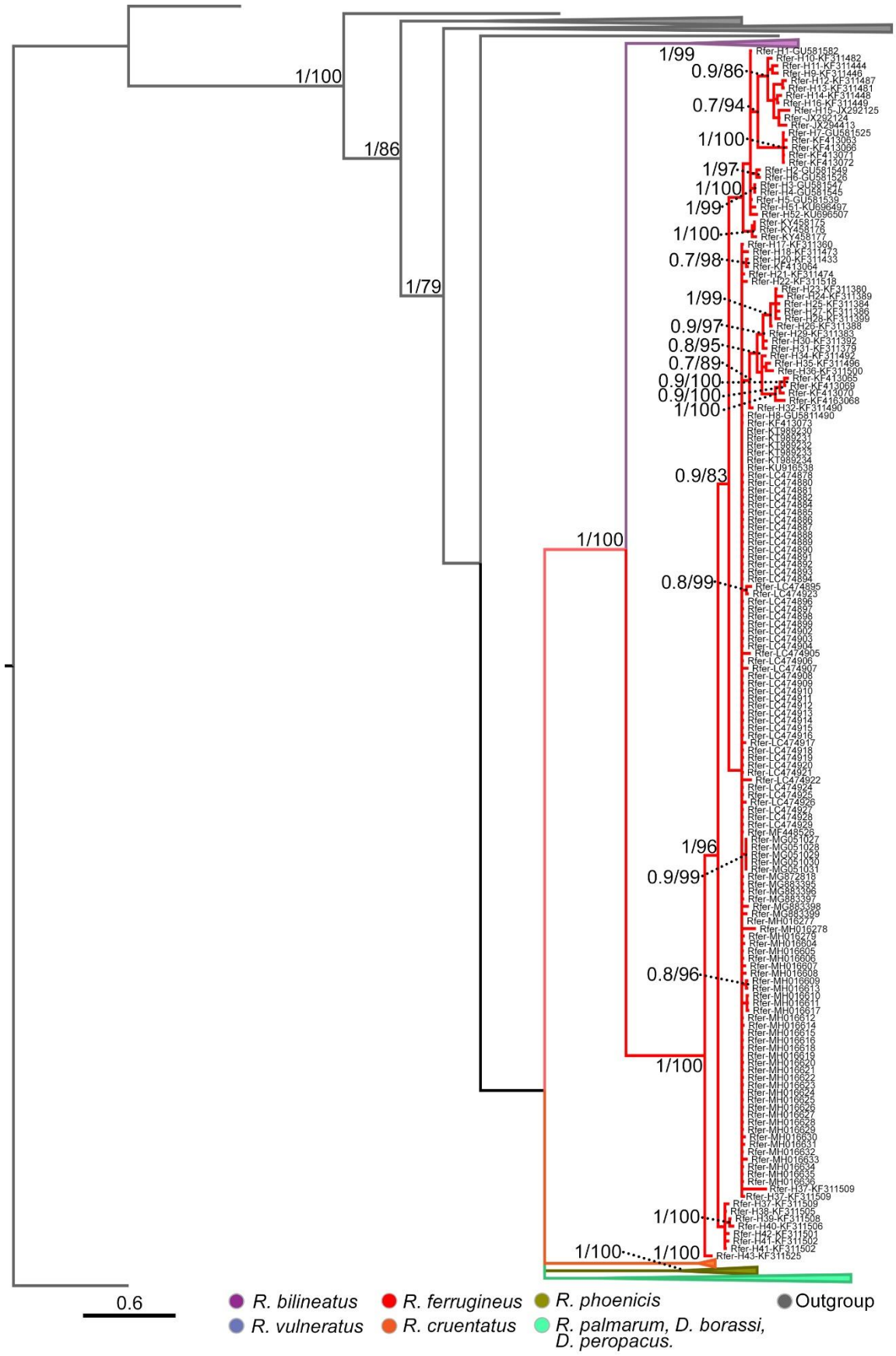
0.6
R. bilineatus
R. ferrugineus
R. phoenicis
Outgroup
R. vulneratus
R. cruentatus
R. palmarum, D. borassi, D. peropacus.

← Figure S1. Bayes COI phylogenetic tree of two and six species of *Dynamis* (*D. borassi* and *D. peropaccus*) and *Rhynchophorus* (*R. bilineatus*, *R. cruentatus*, *R. ferrugineus*, *R. phoenicis*, *R. palmarum*, and *R. vulneratus*) according to COI gene, respectively. Posterior probabilities and Boostrap values of each species and *R. palmarum*'s clades are indicated at each node when were greater than 0.7 and 70%, respectively. The percent divergence in the scale bar.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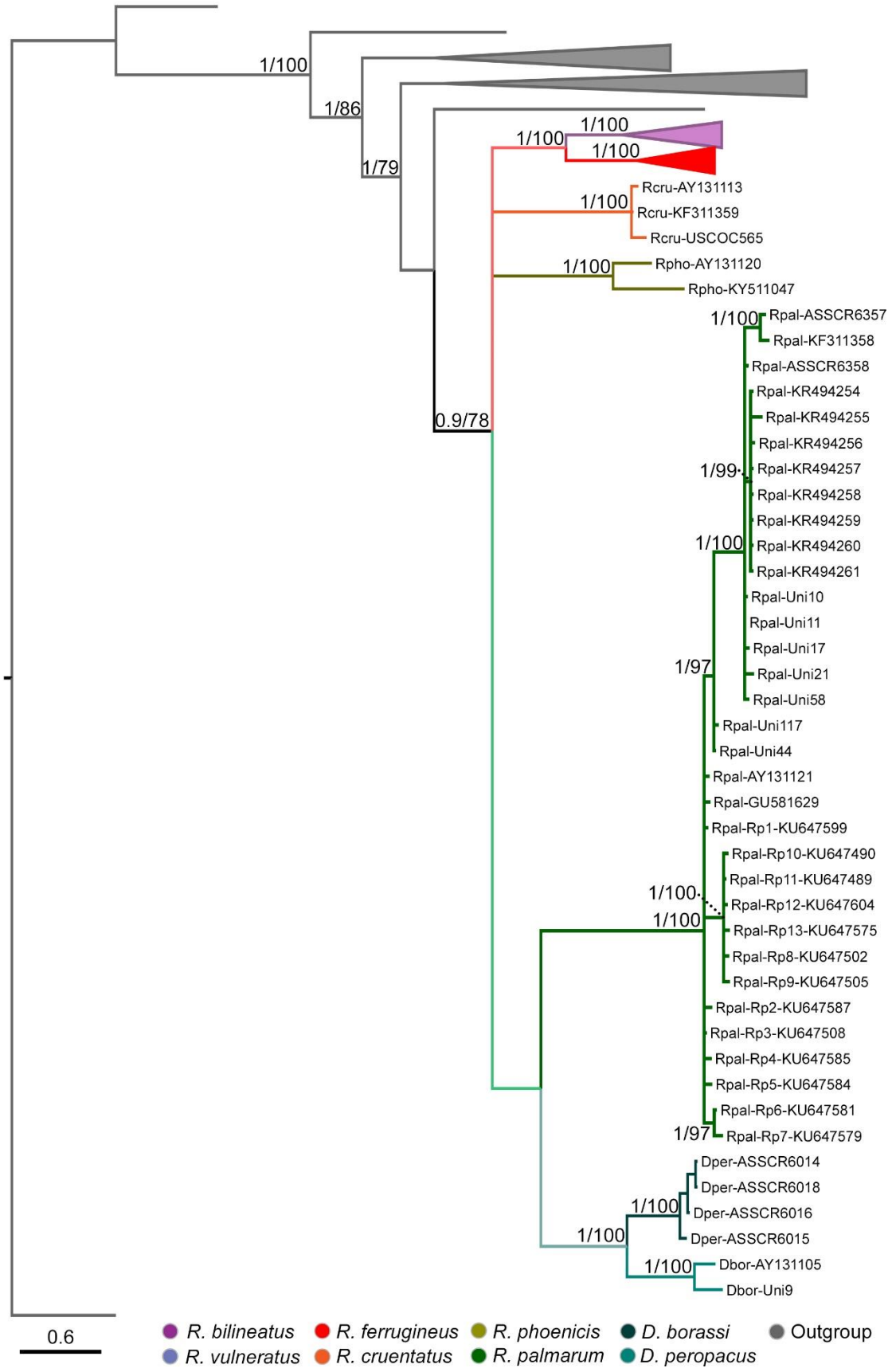
1/100
1/100
1/100
1/100
0.6
R. bilineatus
R. vulneratus
R. ferrugineus
R. cruentatus
R. phoenicis
R. palmarum, D. borassi, D. peropacus.
Outgroup

← Figure S1 (contd)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1/100
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1/100
Dbor-AY131105
Dbor-Uni9
0.6
R. bilineatus
R. ferrugineus
R. phoenicis
D. borassi
Outgroup
R. vulneratus
R. cruentatus
R. palmarum
D. peropacus

← Figure S1 (contd)

Chapter 2. Ecological causes of the mass death of peach palm (*Bactris gasipaes*, Arecaceae) in Colombia

Final undergraduate student project:

1. Bautista Giraldo, M. A. 2020. Association of *Dynamis borassi* weevils (Coleoptera: Dryophthoridae) with native palm *Oenocarpus bataua* (Arecales: Arecaceae) in Buenaventura, Valle del Cauca. Biological program, Universidad de Caldas. Advisor: I. Armbrecht. Co-advisor: **A. A. VÁSQUEZ-ORDÓÑEZ** (The results of this project was published in the Revista Colombiana de Entomología and presented in the VII Latin America Congress of Agroecology, SOCLA; Appendix 11).

Events:

3. VÁSQUEZ-ORDÓÑEZ, A. A., Torres, W., Monmany-Garzia, A. C. 2021 (Presentation). Importance of landscape in pest-palm dynamics in a tropical agroecosystem. XXIX Reunión Argentina de Ecología. August 4-6 (accepted). Instituto de Ecología Regional (IER – CONICET – UNT) and the Asociación Argentina de Ecología (AsAE) (Appendix 4).

2. VÁSQUEZ-ORDÓÑEZ, A. A., Armbrecht, I., Montoya-Lerma, J., Torres, W., Monmany-Garzia, A. C, Löhr, B. L. 2021 (Video-poster). Ecological and evolutionary explanations for a new interaction between stem borer weevils (*Dynamis borassi* and *Rhynchophorus palmarum*) and peach palm (*Bactris gasipaes*) in a tropical agroecosystem. Virtual Meeting of the Association for Tropical Biology and Conservation (ATBC). July 21-23. ATBC (Appendix 5).

1. VÁSQUEZ-ORDÓÑEZ, A. A. 2021 (Presentation). Ecological and evolutionary explanations for a new interaction between stem borer weevils and peach palm (*Bactris gasipaes*). Seminario Internacional Intercambio Científico 2020-2021. June

02. Universidad del Quindío, Universidad Técnica de Cotopaxi y Universidad Regional Amazónica; Colombia and Ecuador (Appendix 6).

Awards and fellowships:

1. Student Fellowships: registration-waiver grants. 2021. Annual Virtual Meeting, Association for Tropical Biology and Conservation (Appendix 10).

Abstract

The study of crop pests in a multiple spatial scale has been concentrated in the temperate region. The research in the tropics is scarce; nevertheless the most recent phytosanitary crisis in peach palm (*Bactris gasipaes*) in Colombia occasioned by stem borer weevils (*Dynamis borassi* and *Rhynchophorus palmarum*) is an important opportunity to evaluate this relationship. This palm-weevil system can be observed in a widely variable growing environment. For this reason, the infestation levels attributed to *D. borassi* and *R. palmarum* were described in 32 peach palm fields with a variable area transect in the Pacific, Andes, and Amazon natural regions. The infestation level was checked against 109 agronomic, landscape, topography, soil, and weather factors. Eleven agronomic management variables were also examined with a structured survey of the farmers while the other factors were characterized from the georeferencing of the crop and free databases. The crop area and six topography metrics were calculated with a Digital Elevation Database in ArcGIS for each plantation. Sixty-four variables of the composition and configuration of the landscape were estimated of three types of habitats (forest, non-forest, and rivers) extracted of the satellite images of the Sentinel-2 in a circular area of 1 km of diameter from the center of the crop with Google Earth Engine and Landscape Ecology Statistics in Qgis. Sixteen soil and eleven weather variables were extracted from the Soil Grids 250 m database for a depth of 0-30 cm and the Climate Hazards Group InfraRed Precipitation with Station data in the geographic centroid coordinate of each field, respectively. The group of variables were analyzed independent as local, landscape, soil, and weather factors. The local factor corresponded to agronomic management, crop area, and plantation topography. The infestation levels were explained mainly for the landscape factors, using a Partial Least Squares-Generalized Linear Model and Generalized Linear Model. A combined analysis of the most relevant variables demonstrated that number and shape of non-forest patches were the most important with Generalized Linear Models. Both variables are associated with forest fragmentation, which, in turn, may be affecting the

density of the natural *D. borassi* host palms. This modification could generate that this weevil to be pressured to attack the peach palm crop more frequently.

Key words: Landscape, deforestation, weevil stem borer, *Dynamis borassi*, *Rhynchophorus palmarum*, *Oenocarpus bataua*.

Resumen

El estudio de las plagas de cultivos en múltiples escalas espaciales se ha realizado principalmente en la región templada. Este tipo de investigación en el trópico es escaza. No obstante, la reciente crisis fitosanitaria de las palmas de chontaduro (*Bactris gasipaes*) en Colombia ocasionada por los picudos barrenadores del tallo (*Dynamis borassi* y *Rhynchophorus palmarum*) es una excelente oportunidad para evaluar esta relación. El sistema palma-picudo se puede observar en una gran variedad de ambientes. Por esta razón, los niveles de infestación atribuidos a *D. borassi* y *R. palmarum* fueron descritos en 32 cultivos de chontaduro con un transecto de área variable en las regiones naturales del Pacífico, Andes y Amazonía. Los niveles de infestación fueron relacionados con 109 factores agronómicos, paisajísticos, topografía, suelo y clima. Once variables de manejo agronómicos se caracterizaron con encuentras estructuradas realizadas a los cultivadores, mientras que los otros factores se documentaron de las coordenadas geográficas del cultivo y de bases de datos libres. El área del cultivo y seis métricas de topografía se calcularon con la “Digital Elevation Database” en ArcGis para cada plantación. Sesenta y cuatro variables de la composición y configuración del paisaje se estimaron de tres tipos de hábitat (bosque, no bosque y ríos), los cuales se obtuvieron de imágenes satelitales de Sentinel-2 en u área circular de 1 km de diámetro desde el centro del cultivo con Google Earth Engine y “Landscape Ecology Statistics” en Qgis. Dieciséis variables de suelo y once de clima se obtuvieron de la base de datos Soil Grids 250 para una profundidad de suelo de 0-30 cm y la Climate Hazard Group InfraRed Precipitation con datos de estaciones en el centroide geográfico de cada cultivo, respectivamente. Cada grupo de variables fueron analizadas independientemente como factores locales, paisaje, suelo y clima. Los factores locales correspondieron al manejo agronómico, área de cultivo y topografía de la plantación. Los niveles de infestación fueron explicados principalmente por los factores de paisaje, usando un modelo de lineal generalizado de mínimos parciales cuadraros y un modelo lineal generalizado. Un análisis combinado de las variables más importante demostró que número y formas de los parches no boscosos fueron las más

importantes en el modelo lineal generalizado. Ambas variables están asociadas con la fragmentación de los bosques, lo cual puede afectar la densidad de la palma nativa de *D. borassi*. Esta modificación podría generar que este picudo sea presionado a atacar las palmas de chontaduro con mayor frecuencia.

Palabras claves: Paisaje, deforestación, picudos barrenadores del tallo, *Dynamis borassi*, *Rhynchophorus palmarum*, *Oenocarpus bataua*.

Introduction

Humans started to study insect pests of plants probably at the same moment at which plants were domesticated. The first publications on plant pests and efforts to mitigate damage came from temperate environments and they have traditionally been limited to a plot or small area of crop (e.g., Barnes, 1932). Later, variables influencing pest-plant interactions at larger scales, such as landscape composition and configuration (Kruess and Tscharntke, 1994; Bianchi et al., 2006), topography, and climate (Davis et al., 1996) were incorporated in the study of these interactions. Including variables at scales larger than a plot enabled understanding spatial and temporal mechanisms of pest persistence that could not be detected at the scale of a plot. For example, by incorporating a landscape perspective Kruess and Tscharntke (1994) showed that high abundances of a pest in a plot were correlated to a high degree of isolation of the plot, which prevented natural enemies to maintain viable populations there. Still, responses of pests and control by their natural enemies in relation to landscape are unclear when considering large spatial scales (Karp et al., 2018).

Most of our understanding of pest-plant interactions at large scale have been built on lines of evidence from temperate environments, while fewer studies have tested the validity of those mechanisms for explaining pest-plant interactions in the tropics. The tropical agroecosystems have more stable annual temperature in comparison with temperate region, but climate variables may strongly interact with local characteristics and with soil and landscape at large spatial scales (Hilje et al., 2002). The few investigations suggest a combined contribution on infestation or pest abundance of the landscape, the weather condition, and the agronomic practices in cassava, coffee, maize, oil palm, potato, and tree crops (Backlund, 2012; Parsa et al., 2012; Poveda et al., 2012; Tsafack et al., 2013; Midega et al., 2014; Jonsson et al., 2015; Baguma et al., 2019; Medeiros, 2019; Soti et al., 2019).

For cultivated palms, only one study considered a multiscale effect in oil palm affected by the palm weevil *Rhynchophorus phoenicis* in Uganda (Baguma et al., 2019). In this case, the most relevant variables were the distance of natural

vegetation and climate season, but the variation of the weather conditions did not relate to the infestation (Baguma et al., 2019). In a study in Oman, the attack of *R. ferrugineus* on date palms was related to palm age and height (Azam et al. 2000). Finally, a large-scale spatial effect was detected in predation on “dummy caterpillars” in oil palm in Indonesia (Nurdiansyah, 2016), specifically an effect of distance to the natural vegetation.

The recent phytosanitary crisis in peach palm (*Bactris gasipaes*) in Colombia (Gaviria et al., 2021) is an opportunity to evaluate a multiscale effect in a pest-plant interaction in a tropical system. This palm is cultivated mainly in the Colombian southwest, an area with a highly variable orogeny which generates a great diversity in soil, landscape, climate, and agricultural practices (Rangel-CH, 2015). The phytosanitary problem corresponds to stem borer damage occasioned by the palm weevils *Dynamis borassi* and *Rhynchophorus palmarum* (Pardo-Locarno et al., 2016; Vásquez-Ordóñez et al., 2020; Gaviria et al., 2021). *Dynamis borassi* initiates the damage by attacking the unopened inflorescence of the palm and subsequently tunneling the petiole of the inflorescence towards the stem. These lesions attract *R. palmarum* (Gaviria et al., 2021). It should be noted that the levels of infestation caused by these weevils are variable between and within natural regions in the Colombian southwest (Gaviria et al., 2021).

In addition, a recent study in forests close to Pacific peach palm fields demonstrated that *D. borassi* thrived exclusively on native *Oenocarpus bataua* palms (Bautista-Giraldo et al., 2020). In the same region, the abundance of *D. borassi* and *R. palmarum* were contrasting between two distant locations (Gaviria et al., 2021), differing in abundance of *O. bataua* (Bautista-Giraldo et al., 2020) and level of forest conservation.

For these reasons, this study evaluates the combined effect of the agronomic, landscape, topography, soil, and weather variables on infestation level of peach palm occasioned by stem borer (*D. borassi* and *R. palmarum*) in the Colombian southwest and which group of variables best explains this interaction.

Material and methods

Ethical considerations

The Ministry of Interior in Colombia confirmed that a priori consultation of communities for developing the present investigation was not necessary. The ethical committee of the Universidad del Valle gave the endorsement for studies with flora and fauna. The interviews included in this study were performed only with adults and were anonymous, following the Helsinki Declaration.

Study site

The study was conducted in 32 localities of peach palm production in three geographical regions of Colombia (Rangel-Ch, 2015), including 18 localities in the Amazon, six in the Andes and eight in the Pacific (Fig. 1, supplementary material Table S1). These fields were orchards with an area of 0.1 to 12.7 ha; most of them (93.8%) with less than 3.4 ha (Supplementary materials Table S2) and under traditional management practices in home gardens (Graefe et al., 2013). The fresh fruit is part of the rural diet, and its sales represent the main income of the producers during the harvest period (Graefe et al., 2013). The palm stands were mixed mainly with different types of Musaceae, cacao, and coffee (Supplementary material Table S2); the last was used exclusively in the Andes regions. The study locations were immersed in different topographic and weather conditions. The Pacific region is a mixture of small mountains and flatlands, the Amazon region is like the Pacific but has steeper slopes, given its location on the eastern side of the Andes, and the Andes region was very rough (Supplementary material Table S2). The Amazons and Pacific had a very high level of precipitation and temperature in all years; however, the Andes is very variable with a decrease in temperature with increasing in altitude (Supplementary material Table S3).

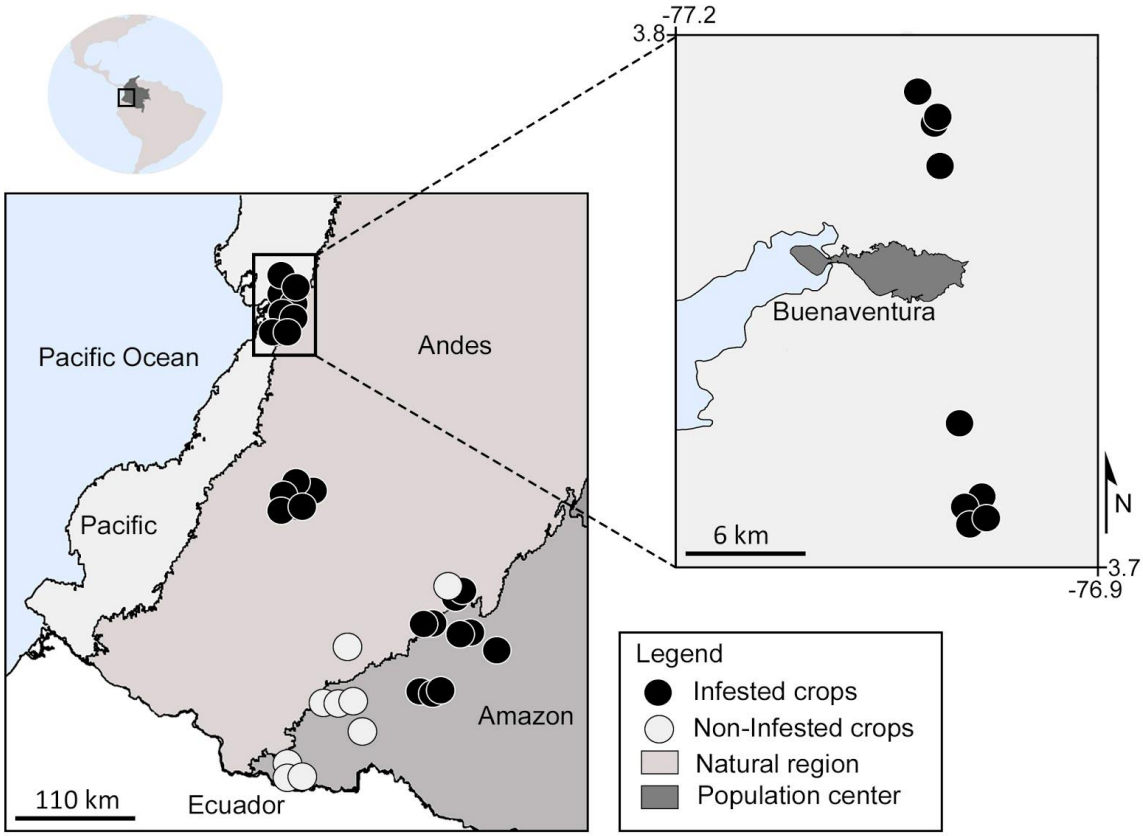

Figure 1. Geographical location of the 32 peach palm fields (circles) used to study infestation levels of *Dynamis borassi* and *Rhynchophorus palmarum* in Colombia.

Study species

Bactris gasipaes Kunth

The peach palm (*B. gasipaes*) has been domesticated by native Americans for centuries (Mora-Urpí et al., 1997; Clement et al., 2010). It is characterized by multiple, straight, cylindrical, unbranched stems of 6-24 m height, and a canopy of 10-30 pinnate leaves (Mora-Urpí et al., 1997). Peach palms can develop in wide ecological conditions, as it is documented by their distribution in the neotropics, from Nicaragua to Bolivia (Mora-Urpí et al., 1997; Clement et al., 2010). Best for their development is the middle altitudes (<800 m), whith relatively deep, fertile, well-drained soils, and continuous rain (2000-5000 mm/year) (Mora-Urpi et al.,

1997). Peach palm can be cultivated as a monoculture or in an agroforestry system, in the latter case, it is associated with different kinds of crops, such as cassava, cacao, coffee, etc. (Graefe et al., 2013). There are more than 41 species of arthropods which affect this crop (Couturier et al., 1996; Vásquez et al., 2000; Arroyo Oquendo et al., 2004; Pardo Locarno et al., 2016), with incidence reports in Costa Rica and the Amazon associated with more large-scale cultivation (Mora-Urpi et al., 1997). The more serious infestations have been reported for *Palmelampius heinrichi* O'Brien & Kovarick 2000 (Sanabria Ujieta, 2014), a fruit borer, and *D. borassi-R. palmarum* (Pardo-Locarno et al., 2016; Gaviria et al., 2021).

Dynamis borassi and *Rhynchophorus palmarum*

These species of weevils are associated with palms (Löhr et al., 2015; Vásquez-Ordóñez et al., 2020), with differences in morphology (Vásquez-Ordóñez et al. 2020) and biology. *Dynamis borassi* is reported in cultivated and native palms, with economic damage only in peach palm in Colombia (Couturier et al., 2000; Bautista Giraldo et al., 2020; Vásquez-Ordóñez et al., 2020; Gaviria et al., 2021). In the past, *R. palmarum* was the most important pest in cultivated palm species, such as coconut, oil palm, and ornamental palms (Oehlschlager et al., 2002, Milosavljević et al., 2020). The pest-host relationship of each weevil species is different. *D. borassi* lays its eggs in the inflorescences (Bautista-Giraldo et al., 2020; Vásquez-Ordóñez et al. 2020; Gaviria et al., 2021), while *R. palmarum* oviposits at the apex of the stem and into lesions in other parts (Alpizar et al., 2002). Both species are endemic to the Neotropical region, with a greater extension for *R. palmarum* from United States of America to Argentina (Giblin-Davis, 2001; Milosavljević et al., 2020). The temporal abundances of *D. borassi* is affected negatively by the precipitation (Gaviria et al., 2021) and its associations with its host *Oenocarpus bataua* is more intensive in disturbed forests (Bautista-Giraldo et al., 2020). *Rhynchophorus palmarum* is more active during rainy periods (Murguía-Gonzalez et al., 2017).

Sampling and response variable

The surveys were conducted in 32 peach palm fields in southwest Colombia and followed the variable area transect system (Sheil et al., 2002). In this case, a central line of maximum 80 m in length and varying width were demarcated, according to the inspected field. On the right and left side of the central line up to eight perpendicular rectangles were located, with 20 m width and their length determined by the distance from the central line to the sixth palm with signs of weevil damages. The maximum length of the rectangles was 50 m for the cases where six damaged palms were not found (Figure 2). The number of healthy and damaged palms was reported, from which the proportion of infested palms was estimated with respect to the total of palms.

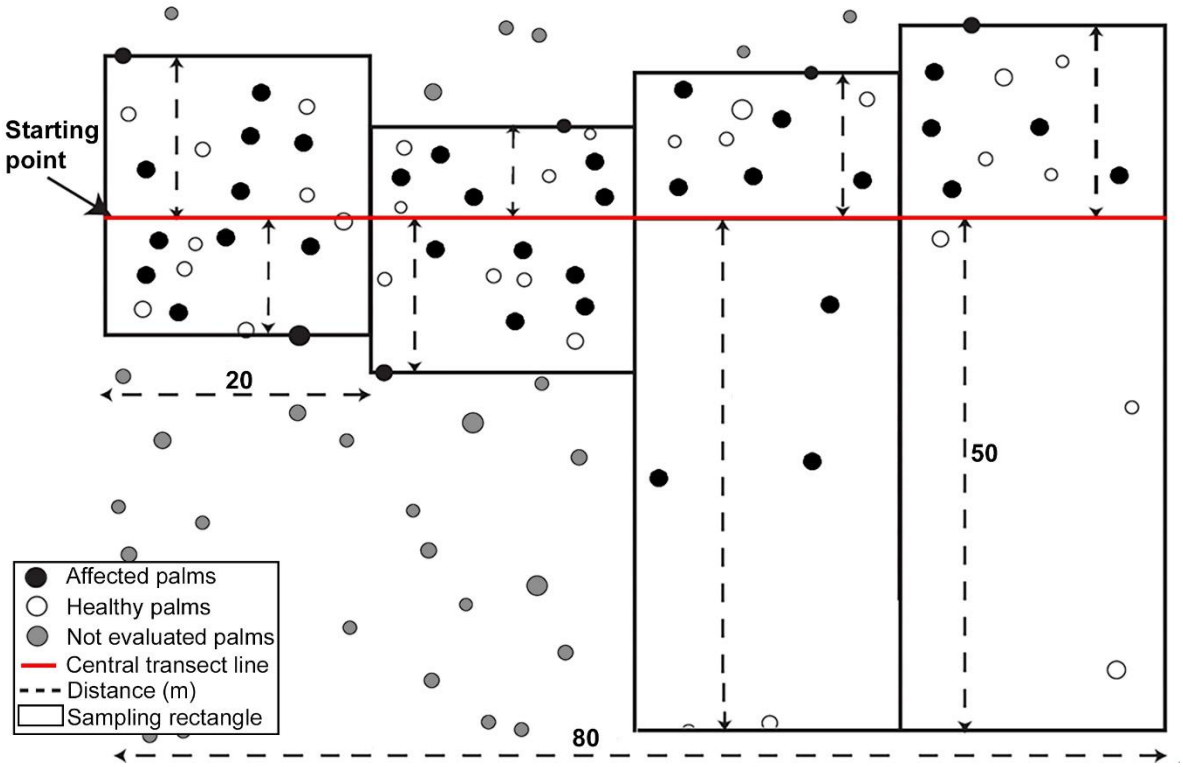

Figure 2. Variable area transects used in the evaluation of the peach palm infestation by *Dynamis borassi* and *Rhynchophorus palmarum* in 32 production sites in Colombia. The size of each sampling rectangle is determined by the number of the affected palms, as it is being illustrated.

Explanatory variables

Local variables

Eighteen local variables were recorded in all fields (Supplementary materials Table S2). The first nine correspond to semi-structured questionnaires (Supplementary materials Table S4), which are focused on characteristics of the crop (e.g., age, variety, size) and management (e.g., insecticides, liming, fertilizers). Other seven were derived from georeferencing of the limits of each crop with GPSMAP 64s Garmin. The points were charged in ArcGis 10.5, and with the “Calculate Geometry” function the area of each palm grove was estimated. In the same

software, we used SRTM 90m DEM Digital Elevation Database (Reuter et al. 2007), and the “Slope” and “Zonal Statistics” functions for estimating the minimal, maximum, mean, deviation, sum, and range of slopes of the polygon. Two additional variables were calculated by evaluating in the same transect described previously, but in this case, we evaluated other crops present. Up to ten plants were recorded per species to estimate their density. The number of species (richness) of other crops different to PP and the Shannon Diversity Index were calculated with the “diversity” package in R (R Core Team 2019).

Landscape variables

Sixty-four landscape variables were determined for all fields (Supplementary materials Table S5). First, the geographic centroid coordinates were calculated using the “Calculate Geometry” function of ArcGis 10.5 (Supplementary materials Table S5). Second, for each centroid coordinate, the most recent cloudless satellite image was searched, which came from Sentinel-2 MSI: MultiSpectral Instrument, Level-1C (Baillarin et al., 2012) according to a search with Google Earth Engine (Gorelick et al., 2017). The images were of the bands B2, B3, B4, B5, B6, B7, B8, B11, and B12. Third, the images were cut in a circle of 1km of diameter and in each circle three types of cover were identified: forest-PP crop (called Forest), land area without forest, and water. Fourth, in each cover, at least 30 training points were arranged for executing a Random Forest – Supervised classification machine learning algorithm with 50 trees, in Google Earth Engine (Supplementary materials Fig. S1). Finally, with the classification, 71 landscape statistics were developed with LecoS-QGIS plugin (Jung, 2013), seven parameters remained without variability and were removed from the analysis (Supplementary materials Table S4).

Soil and climate variables

Sixteen soil types (Supplementary materials Table S6) and eleven climatic variables (Supplementary materials Table S3) were extracted of each geographic centroid coordinates of the peach palm fields. For the soils, the Soil Grids 250 m database for a depth of 0-30 cm (Hengl et al., 2017) was used, including the chemical and physical properties, as well as the soil type. For the climate variables, the original information were daily minimum and maximum temperature, and daily precipitation for 2010-2016, from the Climate Hazards Group InfraRed Precipitation with Station data (CHIRPS; Funk et al., 2015) and Climate Data Record Based on Infrared Temperatures and Stations by the Climate Hazard (CHIRTS; Funk et al. 2019). For temperature variables, monthly averages were calculated and for precipitation, the monthly sums were estimated. With this information, eleven bioclimatic variables were determined (O'Donnell & Ignizio, 2012), corresponding to the Annual Mean Diurnal Range (BIO 2), Isothermality (BIO 3), Maximum Temperature of Warmest Month (BIO 5), Minimum Temperature of Coldest Month (BIO 6), Annual Temperature Range (BIO 7), Annual Precipitation (BIO 12), Precipitation of Wettest Month (BIO 13), Precipitation of Driest Month (BIO 14), Precipitation Seasonality (BIO 15), Precipitation of Wettest Quarter (BIO 16), and Precipitation of Driest Quarter (BIO 17).

Data analysis

We evaluated the peach palm crop infestation levels of three Colombian natural regions (Amazons, Andes, and Pacific) with a generalized linear model, following a binomial model, and a posterior change to a quasibinomial model according to overdispersion. Additionally, we developed a principal component analysis for the 81 qualitative variables from local, landscape, soils, and climatic; two variables were excluded due to the absence of information in some localities (i.e., crop age and palm spacing).

The local, landscape, soils, and climatic variables were analyzed separately, with the proportion of damaged palms as the response variable. At the local level, the correlation of quantitative factors was evaluated with the Spearman test (Supplementary materials Table S7), because normality could not be confirmed for all parameters in the Shapiro test. Eventually, the association of qualitative factors were compared with a Fisher test (Supplementary materials Table S8). The variables of the age of weevil infestation, harvest strategy, lime management, weed control, and crop distance were eliminated of the analysis because of many missing data (Supplementary materials Table S2, S7, S8). In a similar way, the information of two localities from the Amazon were deleted due to missing data (Supplementary materials Table S2). Otherwise, for landscape, soils, and climate variables, the models were the Partial Least Squares Generalized Linear Regressions (PLS-GLM, Bastien et al., 2005), with a “Binomial” family distribution for response variables. We used the Akaike Information Criterion (AIC) to select the best model with its different components, and we compared the R^2. Subsequently, we calculated the coefficients of each explanatory variable and a 95% confidence interval (1000 bootstraps). The variables with confidence intervals different to zero was correlated with the Spearman test because not all parameters complied to normality in the Shapiro test.

Generalized linear models were developed with peach palm infestation proportion and all significant explanatory variables. The inclusion of the variables in the model were one by one considering that they are redundant with each other. This relationship between the significant variables of the local, soil, landscape, and weather were evaluated using Fisher test, Kruskal Wallis Test and ANOVA according to assumptions of normality and homoscedasticity (Supplementary materials Table S9). The distribution of the generalized linear models was binomial and changed to quasibinomial due to overdispersion. The best model presented the lowest value of residual deviance. All statistical analyses were developed in R version 3.6.2 (R Core Team, 2019), with a significance level of 5% and the packages of “boot”, “car”, “multcomp”, “lsmeans”, “plsRglm”, and “psych”.

Results

Peach palm infestation level and environmental conditions of the three Colombian natural regions investigated.

The peach palm infestations by *D. borassi* and *R. palmarum* were different between natural regions ($\chi2 = 6.28$, df = 2, P = 0.04), with higher values for the Pacific in comparison with the Amazon and the Andes (z= 14.51, df = inf., P = 0.00; $\chi2 = 7.61$, df = inf., P = 0.00; respectively), as well as less differentiation between Amazon and Andes (z=5.31, df = inf., P = 0.00; Fig. 3A). The characterization of 81 qualitative environmental variables of peach palm fields resulted in a separation of the three natural regions examined (Fig. 3C, Supplementary material Fig. S2), with only 44.7% of the variation explaned.

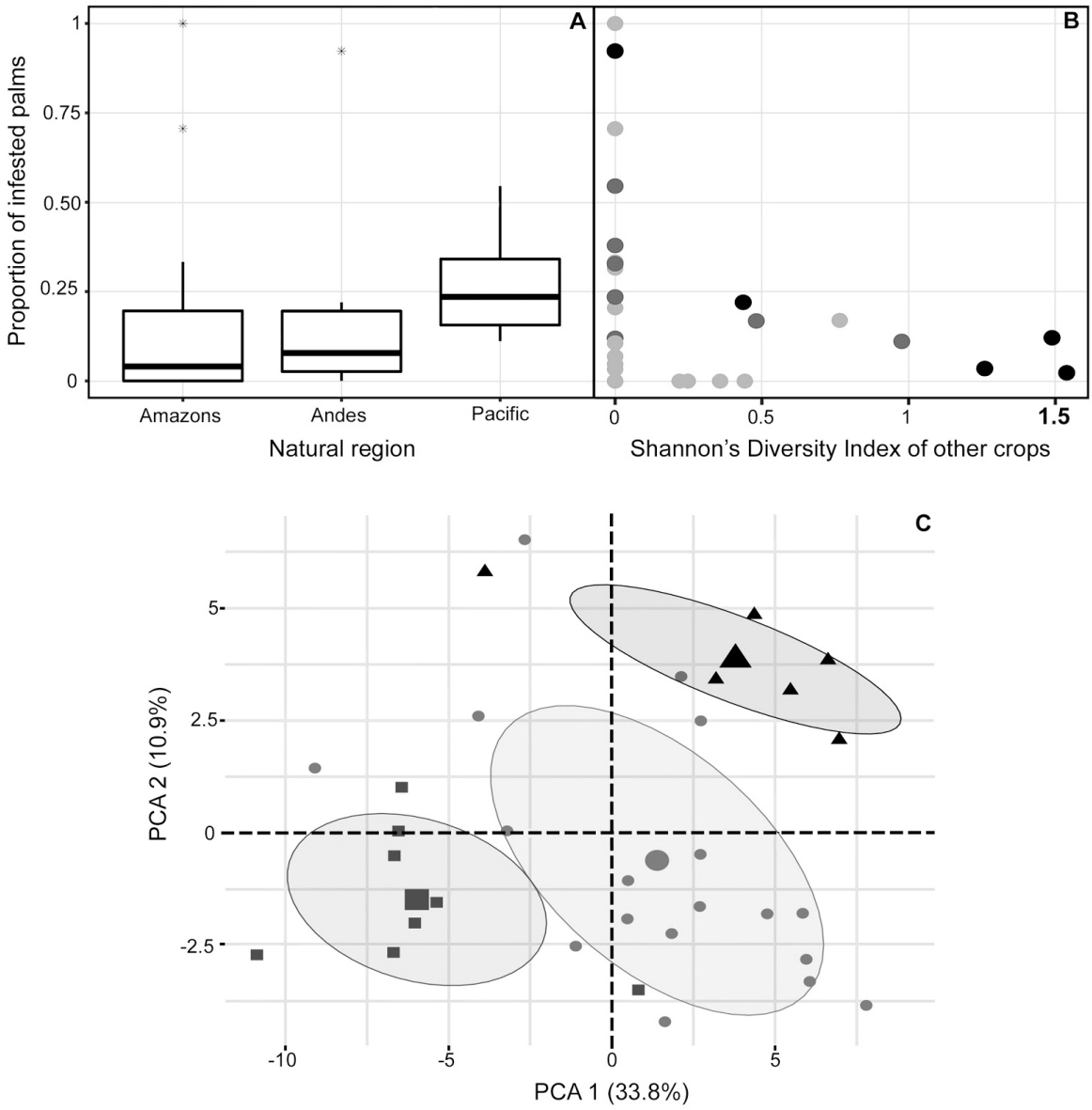

Figure 3. Proportion of infested Peach Palm (*Bactris gasipaes*) by *Dynamis borassi* and *Rhynchophorus palmarum* (Coleoptera, Curculionidae) with respect to Colombian natural region (A) and Shannon Diversity Index of other crops (B) and plotting of these crops with respect to the first two principal components of 81 qualitative environmental variables (C). The light gray points represent data from the Amazon, the black ones of the Andes and the dark gray ones of the Pacific, with concentration ellipse in PCA.

Local management

No local variable was related to the proportion of infested palms in the 27 fields evaluated according to the best model of the 959 evaluated (Supplementary materials Table S10 and Fig. S3 and S4). However, the variable of the “weevil trapping” was associated ($\chi2 = 5.52$, df = 1, P = 0.02; Supplementary materials Table S10) when the variable of the crop age was removed because of two missing data. This new analysis increased to 29 samples and evaluated 481 models. The “weevil trapping” variable was related with the natural region of localities (Fisher Test P=0.00, Supplementary materials Fig S4), for this reason, it is considered a confused variable. On other hand, the variable “other crops Shannon diversity index” showed a particular distribution when it was graphed with the proportion of damaged palms (Fig. 2B). The peach palm monoculture fields presented a high variability (Range= 0.00-0.92, SD=0.30, n=21) in comparison to polyculture (Range= 0.00-0.22, SD=0.08, n=11). Nonetheless, there was no difference between both types of cultivation strategies ($\chi2 = 0.95$, df = 1, P = 0.33).

Individual and combined analysis of landscape, soil, and climatic variables

The individual analysis of landscape variables explained more variation of palm weevil infestation than soil and climatic factors (R^2 of 77%, 16%, and 51%, respectively; Supplementary materials Table S11 and Fig. S5). For the landscape, the best PLS-GLM includes four components, with 22 variables of configuration and composition with a relevant contribution in all types of covers (Fig. 4, Supplementary material Table S12 and Fig. S6). Most significant, non-forest variables associated with the fragmentation of this cover have a positive effect on weevil infestations, while for the forest, significant factors were related with the amount of its cover (Fig. 4). The water presented a variable response with about half of the descriptors as relevant (Fig. 4), but the number of observations was reduced to 14 localities (Supplementary material Table S5). For soil and climatic conditions, the best models have one and two components respectively, with three variables being important for each case (Fig. 5 and 6, respectively; Supplementary

material Table S13 and S14, and Fig. S7 and S8). In the soil, the most important variables corresponded to carbon density, clay content and coarse fragments (Fig. 4, Supplementary material Fig. S9), and, in the climatic condition, the diurnal and annual range of temperature and its isothermality (Fig. 6, Supplementary material Fig. S10). The isothermality “quantifies how large the dayto-night temperatures oscillate relative to the summer to-winter (annual) oscillations” (O’Donnell & Ignizio 2012).

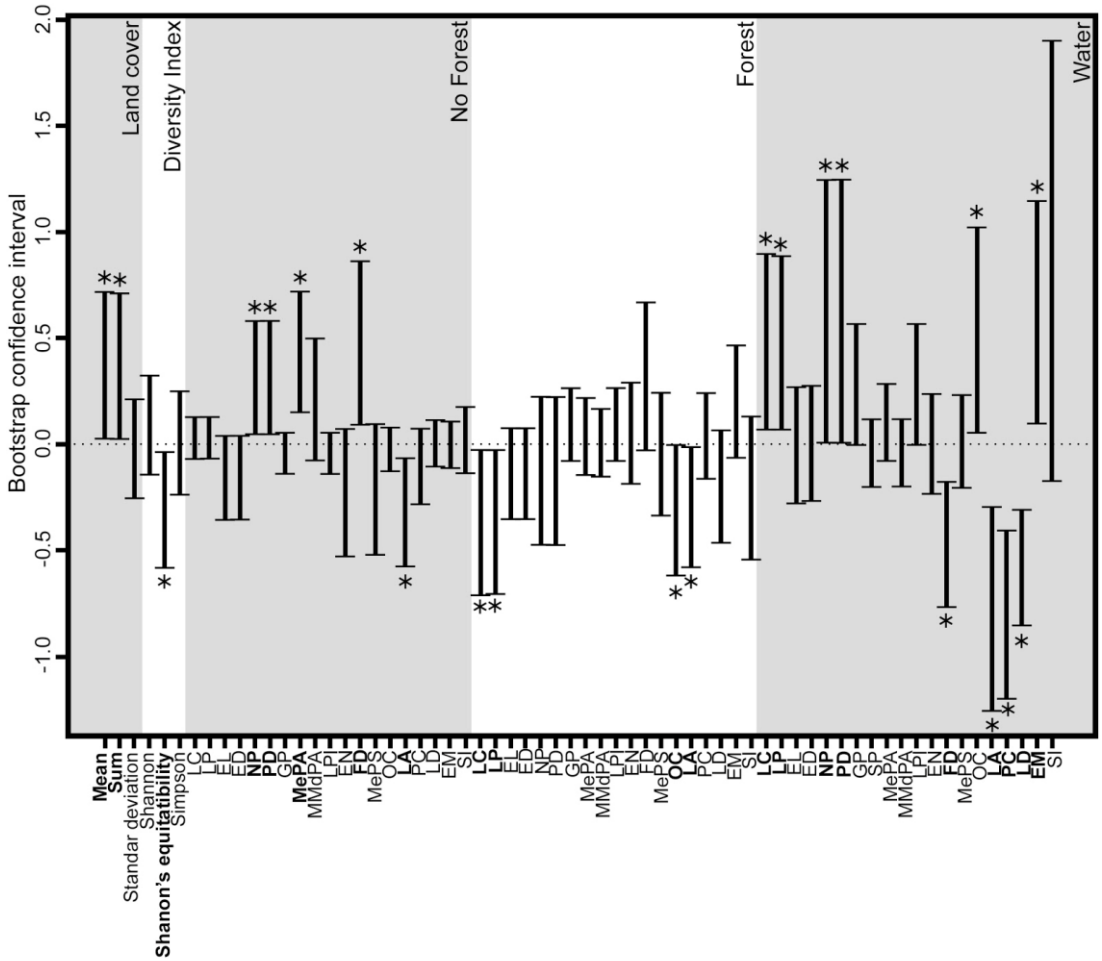

Figure 4. Bootstrap confidence interval of landscape variables to the PLS-GLM of proportion of peach palms affected (*Bactris gasipaes*) by *Dynamis borassi* and *Rhynchophorus palmarum* (Coleoptera, Curculionidae). LC: Land Cover, LP: Landscape proportion, EL: Edge length, ED: Edge density, NP: Number of patches, PD: Patch density, GP: Greatest patch area, SP: Smallest patch area, MePA: Mean patch area, MdPA: Median patch area, LP: Largest patch index, LPI: Largest patch index, EN: Euclidean Nearest-Neighbor distance, FD: Fractal dimension index, MePS: Mean patch shape ratio, OC: Overall core area, LA: Like adjacencies, PC: Patch cohesion index, LD: Landscape division, EM: Effective MeshSize, SI: Splitting index. The asterisks correspond to intervals without cero, with its variable in bold.

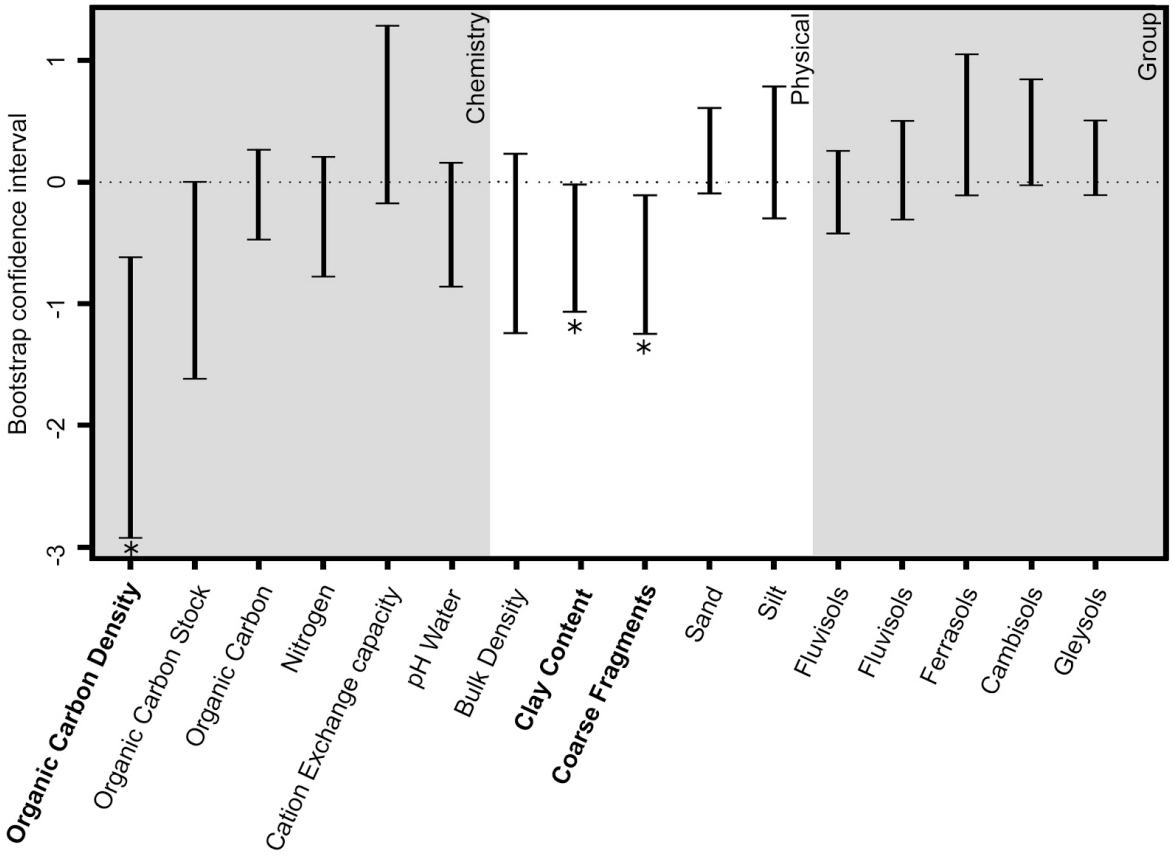

Figure 5. Bootstrap confidence interval of soil variables to the PLS-GLM of the proportion of peach palm affected (*Bactris gasipaes*) by *Dynamis borassi* and *Rhynchophorus palmarum* (Coleoptera, Curculionidae). The asterisks correspond to intervals without zero, with its variable in bold.

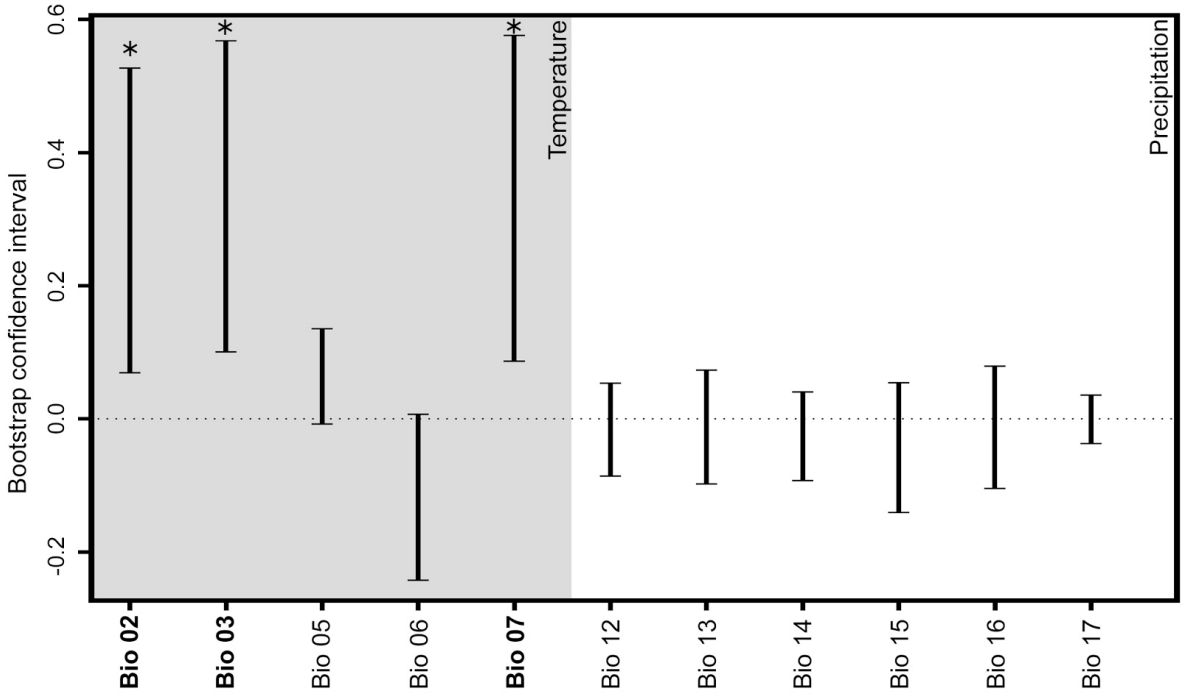

Figure 6. Bootstrap confidence interval of climatic variables to the PLS-GLM of the proportion of peach palm affected (*Bactris gasipaes*) by *Dynamis borassi* and *Rhynchophorus palmarum* (Coleoptera, Curculionidae). Bio 02: Annual Mean Diurnal Range, Bio 03: Isothermality, Bio 05: Maximum Temperature of Warmest Month, Bio06: Minimum Temperature of Coldest Month, Bio 07: Annual Temperature Range, Bio 12: Annual Precipitation, Bio 13: Precipitation of Wettest Month, Bio 14 Precipitation of Driest Month, Bio 15: Precipitation Seasonality, Bio 16: Precipitation of Wettest Quarter, Bio 17: Precipitation of the Driest Quarter. The asterisks correspond to intervals without zero, with its variable in bold.

In total, 18 variables presented significant contributions in individual analysis without missing data. The correlation between these variables demonstrated a relationship between climatic and landscape variables, except with landscape fractal dimension of the non-forest and soil variables (Supplementary material Table S15). The landscape variables corresponding to number and fractal dimension of non-forest patches were positively related with the infested peach palm proportion according to the best model of the 4031 evaluated ($\chi 2 = 4.79$,

df = 1, P = 0.03, $\chi 2$ = 7.14, df = 1, P = 0.00, respectively; Fig. 7; Supplementary material Table S16). Both variables were not associated with the variable of the natural region of crops ($\chi 2$ = 3.91, df = 2, P = 0.14, and $\chi 2$ = 2.64, df = 2, P = 0.27, respectively; Supplementary material Table S19).

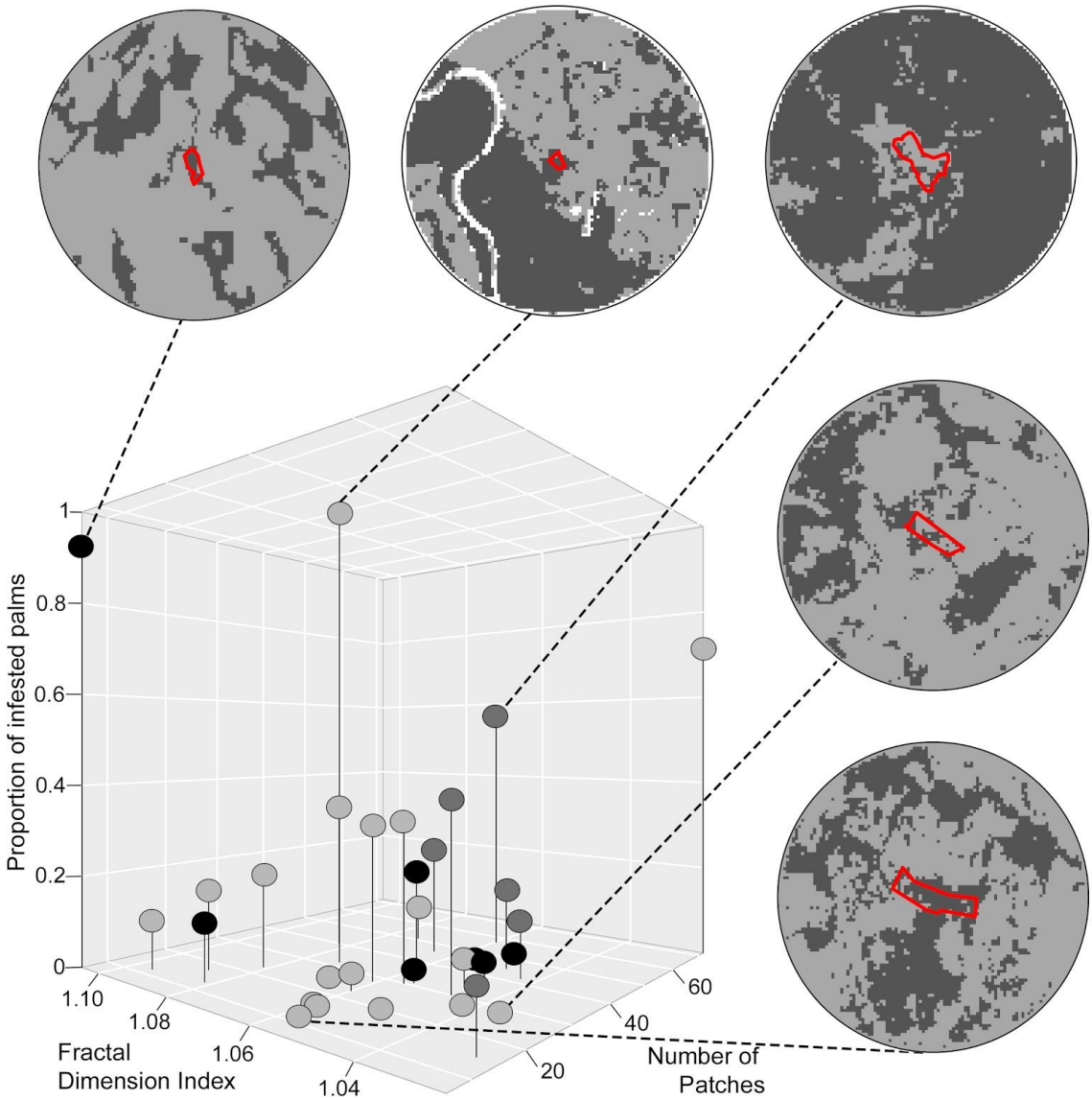

Figure 7. Proportion of infested Peach Palm (*Bactris gasipaes*) by *Dynamis borassi* and *Rhynchophorus palmarum* (Coleoptera, Curculionidae) with respect to fractal dimension index and number of patches of non-forest cover. Light gray points represent the Amazon, black the Andes and dark gray the Pacific. The circular landscape buffers of one kilometer around the five crops are illustrated. The dark gray polygon is forest, light gray is no forest, white is water, and red is the crop.

Discussion

The infestation level of peach palm fields by *D. borassi* and *R. palmarum* was different between the Amazon, Pacific, and Andes natural regions in Colombia. This differentiation could be related with the history of pest affectation in each region. The first damage record comes from the Pacific in 2010, posteriorly, from the Andes and Amazon in 2017 and 2018, respectively (Gaviria et al., 2021). It should be noted that in each region the infestation level is variable. For this reason, it is important to examine the relationship of these factors with infestation levels independent of the natural region. This evaluation demonstrated that the landscape was the most relevant to explain the peach palm infestation, with most significant variables not related to the natural regions.

The relevant landscape variables documented the number of non-forest patches and their shapes, associated with the edge effect and the opening sites (Farina 2008, Liu et al. 2008). These explanatory factors are related with peach palm infestation, possibly through the alternative hosts of weevils, as had been documented in other insect-crop interaction (Ricci et al., 2009; Veres et al., 2013; Saeed et al., 2015). *D. borassi* initiated the peach palm damage in an agroforest system (Vásquez-Ordóñez et al., 2020; Gaviria et al., 2021), in addition, uses other native palms, as *O. bataua* in the Pacific (Couturier et al., 1998; Bautista-Giraldo et al., 2020). These native palms are affected by the increase of forest edge (Browne and Karubian 2016) and human activity linked to opening sites (Aguilar 2005; Hernández Muñoz and Martínez Santacruz, 2018). The Pacific native palms present different habitat preferences, such as natural regeneration areas in *O. bataua* (Valencia Marin et al., 2008; Galeano & Bernal, 2010; Bautista-Giraldo et al., 2020). For this reason, the increase of areas with more favorable habitats can increase the density of these palms which is related with higher infestation by *D. borassi* in *O. bataua* (Bautista-Giraldo et al., 2020).

The impact of alternative hosts on the peach palm infestation can be inferred from the central area of the Colombian Pacific region. In this area, it was possible to relate the weevil abundances and number of damaged peach palm inflorescences

in two locations (Gaviria et al., 2021). In one of the localities, the palm infestation was high, as well as the weevil abundance was low (Gaviria et al., 2021) and the landscape presented many irregular patches of non-forest. In addition, the weevil abundance was related to the number of inflorescences damaged over time (Gaviria et al., 2021). In the other locality, the trends were completely opposite (Gaviria et al., 2021). It is worth highlighting the counterintuitive finding, which corresponds to the fact that there was less infestation in sites with a greater abundance of the weevil. At this point, the effect of the landscape on *O. bataua* (the natural host) is the key in three possible scenarios.

The first scenario, landscapes with many irregular non-forest patches reduced the *O. bataua*, which could generate pressure on *D. borassi* to use other hosts, such as peach palm. In the second scenario, the presence of few larger and more regular non-forest patches produces better habitats for *O. bataua* (corresponding to regeneration areas; Valencia Marin et al., 2008; Galeano & Bernal, 2010; Bautista-Giraldo et al., 2020), and, therefore, its greater abundance. In this way, the weevils have more opportunities to reproduce in their natural host, reducing attacks on the peach palm. However, there is a third scenario related with the low infestation in the Amazon and Andes. In a similar way to scenario two, the landscape presented few larger regular non-forest patches but, in these cases, the non-forest area was larger and corresponded to pastures (Vásquez-Ordóñez, unpublished results). This type of habitat is not widely used by alternative hosts of *D. borassi* (Galeano and Bernal, 2010), quite possibly generating a dramatic reduction in their densities, leaving peach palm as the only host. It is very likely that the *D. borassi* population is reduced in the long term in peach palm crop as the exclusive host.

Additionally, *D. borassi* has a life cycle duration of six to seven months (Wattanapongsiri, 1966; Cuellar-Palacios et al., 2020) and its principal hosts have a variable flowering phenology; for example, peach palm is uni- and bimodal (Bernal, 1975) and *O. bataua* is continuous (Galeano and Bernal, 2010). For this reason, the presence of alternative hosts should be key for a stable local pest

population. Another factor that would facilitate the stability of this population is the capacity of its movement. If it is assumed that *D. borassi* has a similar capacity as *Rhynchophorus* species (Hoddle et al., 2020, 2021), it could easily move across the landscape. This movement would allow finding alternative hosts when peach palm inflorescences are not present, facilitating the survival of their descendants and the population.

In conclusion, this study contributes to the understanding of the peach palm - palm weevil interaction and its management. The analysis of the role of the landscape and environmental factors allowed us to identify the relevance of alternative host palm species in the peach palm infestation. It should be very interesting to demonstrate how these ecological changes could be generating evolutionary changes. Regarding management, it is necessary to consider a landscape perspective, focusing on the conservation of alternative hosts in the agroforest conditions. For this reason, it is necessary to evaluate new management strategies, one proven alternative is the use of the *D. borassi* pheromone which is showing good captures of this pest (Gaviria et al., 2021).

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Supplementary Material (Chapter 2).

Table S1. GPS geographical coordinates, sampling dates of sampled peach palm sites in Colombia, number of palms infested by *Dynamis borassi* and *Rhynchophorus palmarum* (NIP), and healthy palms (NHP) at each site (ID) (NA= does not apply).

Sampling Type	ID	Natural Region	Department	Municipality	Latitude	Longitude	Sampling date	NIP	NHP
Presampling	NA	Pacific	Nariño	San Andrés de Tumaco	1.5569	-78.6972	Nov 30, 2017	NA	NA
					1.5360	-78.7023	Feb 14, 2019		
			Risaralda	Santa Cecilia	5.3408	-76.1493	Feb 15, 2019		
Sampling	1		Valle del Cauca	Buenaventura	3.7629	-76.9632	Jul 01, 2018	24	38
	2				3.9826	-76.9804	Mar 31, 2018	45	92
	3				3.7015	-76.9629	Jun 28, 2018	11	35
	4				4.0078	-76.9916	Jun 7, 2018	40	130
	5				3.6905	-76.9474	Jul 5, 2018	11	41
	6				3.6878	-76.9591	Jun 28, 2018	25	63
	7				3.9894	-76.9780	Jun 4, 2018	22	115
	8				3.9536	-76.9764	Jun 01, 2018	20	145
	9	Andes	Cauca	El Tambo	2.3518	-76.8937	Dec 01, 2018	36	3
	10				2.4097	-76.8230	Nov 30, 2018	13	46
	11				2.4008	-76.8487	Nov 29, 2018	12	88
	12				2.4027	-76.8410	Nov 28, 2018	8	219
	13				2.4239	-76.8418	Nov 30, 2018	3	126
	14			Santa Rosa	1.4243	-76.4814	Feb 02, 2019	0	89
	15	Amazonas	Caquetá	Florencia	1,5015	-75,6637	Feb 05, 2019	6	0
	16				1,3471	-75,4752	Feb 05, 2019	12	5
	17				1,5514	-75,8517	Feb 06, 2019	11	13
	18				1,5492	-75,8608	Feb 06, 2019	6	13
	19		Putumayo	Puerto Guzmán	1,0230	-75,9327	Feb 07, 2019	26	97
	20		Caquetá	Curillo	1,0324	-75,9985	Feb 07, 2019	9	44
	21			Florencia	1,4967	-75,6535	Feb 05, 2019	17	118
	22				1,7257	-75,6558	Feb 08, 2019	4	80
	23				1,7723	-75,6514	Feb 04, 2019	1	27

	24			Curillo	1,0381	-76,0004	Feb 07, 2019	2	58
	25			Florencia	1,7714	-75,6575	Feb 08, 2019	0	79
	26		Putumayo	Puerto Caicedo	0,6624	-76,4704	Jan 30, 2019	0	335
	27			San Miguel	0,3502	-76,9676	Feb 01, 2019	0	175
	28				0,3485	-76,9269	Jan 31, 2019	0	483
	29			Valle del Guamuez	0,4832	-76,9738	Jan 31, 2019	0	277
	30			Villagarzon	0,8889	-76,6720	Jan 29, 2019	0	226
	31				0,8842	-76,5887	Jan 29, 2019	0	192
	32				0,8881	-76,6009	Feb 01, 2019	0	187

Table S2. Characterization of the 32 peach palm crops at each sampled site (ID) in Colombia, including density and diversity of surrounding crops (Other crops), and area, age, agricultural practices, and topography of the PP plots. The georeferences of each site (ID) are documented in Table S1. In parenthesis the identification code for qualitative variable with complete information for all crops.

ID	Other crops											Diversity Index	
	Alibertia patinoi	Citrus	Cocoa	Coffee	*Inga* sp.	Maize	Mango	Musaceae	Sugarcane	Trees	Unknown		
	Density (number/ha)											Richness (C1)	Shannon (C2)
1	0	0	511	0	0	0	0	0	0	0	0	1	0
2	0	0	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0	0	0
4	0	0	771	0	0	0	0	0	0	138	0	3	0.48
5	0	0	0	0	0	0	0	1556	0	0	0	1	0
6	0	0	688	0	0	0	0	0	0	0	0	1	0
7	0	0	0	0	0	0	0	0	0	0	0	0	0
8	40	0	270	0	0	0	0	412	0	0	0	3	0.98
9	0	0	356	0	187	0	0	238	0	0	0	4	1.26
10	0	0	857	333.33	15	0	20	667	333	0	1537.04	7	1.49
11	0	0	0	1865.74	0	0	0	0	0	350	0	2	0.44
12	0	20	283	675.24	10	166.67	10	500	0	0	0	8	1.54
13	0	0	0	0	255	0	0	0	0	0	0	1	0
14	0	0	0	0	0	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0	0	0	0	1	0
16	0	0	500	0	0	0	0	0	0	0	0	1	0
17	0	0	524	0	0	0	0	0	0	0	0	3	0.77
18	0	0	0	0	0	0	0	0	0	0	0	1	0
19	0	0	0	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0	0	0	0
21	0	0	0	0	0	0	0	0	0	0	0	0	0
22	0	0	0	0	0	0	0	0	0	0	0	0	0
23	0	0	0	0	0	0	0	0	0	0	0	0	79
24	0	0	0	0	0	0	0	0	0	0	0	0	0

25	0	0	0	0	0	0	0	0	0	0	0	0	0
26	0	0	0	0	0	0	0	1333	0	0	0	1	0
27	0	95	0	0	0	0	0	65	0	0	3281.25	3	0.22
28	0	0	217	0	0	0	0	0	0	0	0	1	0
29	0	0	10	0	0	0	0	77	0	0	0	2	0.36
30	0	0	0	0	0	0	0	0	0	0	0	1	0
31	0	0	995	0	0	112.5	0	30	0	0	0	3	0.44
32	0	10	0	0	0	0	0	825	40	0	0	3	0.25

Continuation of the Table S2

ID	PP Crops									
	Characteristics		Management							
	Area (ha, C3)	Age (years)	Age weevil's infestation (years)	Fertilizer	Harvest strategy	Insecticide	Lime	Palm spacing (m)	Weeds	Weevil's trapping
1	1.15	7	4	Present	Both	Present	Added	6	Present	Present
2	1.44	18	9.5	Present	Tree climbing	Present	Added	11	Present	Present
3	12.65	6	3	Present	Sickle	Absent	Not added	7	Absent	Present
4	1.55	5	3	Present	Sickle	Absent	Not added	6	Present	Present
5	0.33	16	-	Absent	Both	Absent	Not added	-	Absent	Present
6	1.45	20	1	Absent	Sickle	Absent	Not added	6	Present	Present
7	1.18	16	-	Absent	Tree climbing	Present	Not added	4.5	Absent	Present
8	1.03	8	-	Present	Both	Present	Not added	4.5	Present	Present
9	2.47	-	-	-	-	-	-	-	-	Present
10	1.63	-	1	Present	Both	Present	Added	4	Present	Present
11	0.78	5	1	Present	Tree climbing	Present	Added	-	Present	Present
12	0.44	-	1	Present	Tree climbing	Present	Added	10	Present	Present
13	0.35	12	1.5	Present	Tree climbing	Present	Added	3	Absent	Present
14	0.98	5	-	Present	-	Present	Not added	-	Absent	Absent
15	0.35	10	5	Absent	Both	Absent	Not added	-	Absent	Absent
16	0.16	10	4.5	Absent	Tree climbing	Absent	Not added	-	-	Absent
17	0.56	10	8	Absent	Tree climbing	Absent	Not added	-	Absent	Absent
18	0.81	20	-	Present	Tree climbing	Present	Not added	-	Present	Absent
19	0.11	13.5	-	Absent	Tree climbing	Absent	Added	5	Absent	Absent
20	0.14	18	-	Absent	Sickle	Absent	-	-	Absent	Absent
21	0.97	-	-	-	-	-	-	-	-	Absent
22	0.34	15	4.5	Absent	Both	Absent	Not added	-	Absent	Absent
23	0	4	-	Present	Tree climbing	Present	-	4	Absent	Absent
24	0.81	8	-	Absent	Tree climbing	Absent	Not added	10	Absent	Absent
25	2.56	8	-	Absent	Tree climbing	Present	Added	7	Present	Absent
26	3.12	10	4.5	Present	Tree climbing	Present	Added	-	Absent	Absent
27	8.06	-	-	-	-	-	-	7	-	-
28	1.77	6	-	Absent	Tree climbing	Present	-	-	-	Absent
29	0.91	8	-	Present	Tree climbing	Present	Not added	-	Present	Absent
30	2.16	7.5	-	Present	Both	Present	Added	6	Present	Present

31	3.44	6.5	-	Present	Tree climbing	Present	Added	7	Present	Present
32	0.98	4.5	-	Absent	Both	Present	Not added	10	Present	Absent

Continuation of the Table S2

ID	PP crop slope (topography)					
	Average (°, C4)	Deviation (C5)	Minimum (°C, C6)	Maximum (°C, C7)	Range(C8)	Sum (C9)
1	3.28	1.66	0.93	6.72	5.80	374.06
2	5.09	2.47	0	9.89	9.89	748.31
3	4.41	2.06	0	9.48	9.48	5662.03
4	3.90	1.68	0.93	7.83	6.90	607.743
5	5.46	2.17	1.86	9.21	7.35	185.50
6	3.12	1.34	0.93	5.64	4.71	464.31
7	2.50	1.19	0.93	8.70	7.77	297.97
8	2.77	1.05	0.93	4.98	4.05	285.69
9	12.97	6.46	0	24.13	24.13	3203.60
10	13.50	3.65	7.44	21.39	13.95	2227.90
11	11.64	4.30	3.71	18.95	15.24	919.61
12	15.88	3.961	6.20	22.04	15.85	682.87
13	11.75	5.62	4.72	25.20	20.49	434.91
14	17.72	3.64	8.24	22.10	13.86	1736.76
15	7.14	1.27	4.98	11.03	6.05	257.05
16	18.02	4.96	11.03	30.71	19.68	306.34
17	3.92	2.46	1.31	8.34	7.03	219.60
18	3.85	2.02	0.93	9.37	8.45	320.00
19	14.65	0.79	13.4	15.39	1.95	146.49
20	1.98	0.87	0	2.78	2.78	27.71
21	9.42	2.69	3.34	15.79	12.45	941.52
22	19.09	5.11	13.44	32.73	19.29	649.08
23	41.16	13.84	0	0.50	27.32	34.85
24	4.86	2.65	2.07	10.26	8.19	369.49
25	5.36	3.03	0	11.92	11.92	1405.43
26	2.57	1.29	0	4.98	4.98	801.35
27	2.38	1.26	0	7.03	7.03	1928.73
28	4.30	1.30	0.93	6.72	5.79	761.52
29	3.15	1.65	1.31	8.49	7.18	289.75
30	2.70	1.44	0.93	5.92	4.99	587.72
31	3.23	1.46	0.93	7.44	6.51	1109.29
32	2.70	1.19	0.93	5.55	4.62	267.04

Table S3. Climatic characterization of each sampled site (ID) in Colombia, including Annual Mean Diurnal Range (BIO 2), Isothermality (BIO 3), Maximum Temperature of Warmest Month (°C, BIO 5), Minimum Temperature of Coldest Month (°C, BIO 6), Annual Temperature Range (BIO 7), Annual Precipitation (mm, BIO 12), Precipitation of Wettest Month (mm, BIO 13), Precipitation of Driest Month (mm, BIO 14), Precipitation Seasonality (BIO 15), Precipitation of Wettest Quarter (mm, BIO 16), and Precipitation of Driest Quarter (mm, BIO 17). These variables were calculated from the Climate Hazards Group InfraRed Precipitation with Station data (CHIRPS, Funk et al. 2015) and Climate Data Record Based on Infrared Temperatures and Stations by the Climate Hazard (CHIRTS, Funk et al. 2019) from 2010 to 2016. The georeferentiation of each site are documented in Table S1.

ID	Climatic variables										
	BIO 2	BIO 3	BIO 5	BIO 6	BIO 7	BIO 12	BIO 13	BIO 14	BIO 15	BIO 16	BIO 17
1	8.47	70.48	33.19	21.56	11.64	5100.67	769.28	222.48	38.29	1594.10	826.12
2	8.31	72.13	33.45	22.17	11.28	6162.02	892.66	262.31	36.70	1907.89	1000.70
3	8.57	71.02	33.47	21.85	11.62	4871.97	744.44	213.17	38.41	1519.14	799.25
4	8.68	72.36	33.25	21.53	11.72	6114.44	872.58	247.44	37.01	1902.58	968.86
5	7.84	68.13	33.08	21.88	11.21	3730.19	563.96	152.95	40.05	1172.64	619.43
6	8.50	69.05	33.11	21.27	11.84	4514.36	680.70	189.52	39.06	1414.87	751.30
7	8.81	72.31	33.45	21.57	11.87	6162.02	892.66	262.31	36.70	1907.89	1000.70
8	8.53	72.14	33.45	21.88	11.56	6162.02	892.66	262.31	36.70	1907.89	1000.70
9	6.29	67.61	26.82	17.51	9.31	2423.52	403.45	38.53	61.92	912.24	174.52
10	3.82	48.71	23.90	17.28	6.62	2343.58	390.98	38.97	62.07	892.81	175.23
11	4.82	57.75	23.90	15.93	7.97	2343.58	390.98	38.97	62.07	892.81	175.23
12	6.91	71.77	23.90	14.25	9.64	2343.58	390.98	38.97	62.07	892.81	175.23
13	3.82	48.71	23.90	17.28	6.62	2343.58	390.98	38.97	62.07	892.81	175.23
14	9.31	77.77	26.01	14.02	11.99	3001.45	418.11	117.65	35.65	900.58	538.35
15	9.38	74.97	29.68	17.17	12.51	3501.92	499.48	92.21	42.62	1168.04	572.49
16	11.27	78.33	29.72	15.49	14.24	3251.19	467.71	92.89	42.94	1087.34	520.46
17	7.06	67.67	26.30	15.90	10.40	2943.68	385.60	93.98	36.47	914.56	534.08
18	10.01	75.83	28.38	15.19	13.19	3042.42	406.67	94.07	37.59	963.73	542.17
19	5.12	54.76	30.47	21.04	9.43	3565.18	468.45	130.67	35.19	1099.57	626.27
20	11.49	80.19	30.42	16.35	14.07	3622.16	479.27	136.61	34.47	1107.54	649.63
21	9.62	78.03	29.83	17.52	12.32	3471.01	489.46	93.39	42.23	1156.60	569.46
22	9.56	74.19	29.09	16.19	12.90	2739.26	387.60	70.66	39.33	874.98	460.91
23	7.17	68.52	27.39	16.88	10.51	2577.68	370.98	64.58	39.69	819.93	434.28
24	11.50	80.41	30.41	16.35	14.06	3778.11	513.43	139.02	35.69	1175.90	674.75

25	8.61	72.20	27.39	15.41	11.98	2577.68	370.98	64.58	39.69	819.93	434.28
26	5.63	59.02	30.21	21.08	9.13	4026.90	582.71	148.63	38.52	1243.57	715.86
27	5.25	58.77	29.98	21.40	8.58	3738.92	534.14	147.29	35.49	1103.84	659.00
28	5.29	57.12	29.99	21.16	8.83	3796.18	519.45	152.05	33.86	1101.09	685.99
29	5.16	58.68	29.63	21.21	8.42	3717.74	521.51	151.82	34.39	1083.97	662.64
30	5.22	57.88	30.51	21.63	8.88	3986.97	571.56	148.86	38.70	1255.42	688.84
31	5.15	57.36	30.37	22.00	8.38	4150.76	592.06	155.61	38.65	1287.04	735.49
32	5.21	57.72	30.49	21.88	8.61	4122.87	592.15	153.24	38.68	1291.53	718.12

Table S4. List of questions included in the semi-structured questionnaire about local variables presented to the farmers at the 32 peach palm crops in this study in Colombia.

Number	Question	Remarks
1	What is the age of the crop?	-
2	What is the plant spacing design?	-
3	Do you practice weed management?	If YES, continue with question 4.
4	What is the frequency of weed management?	-
5	Do you fertilize the crop?	If YES, continue with question 6.
6	How much fertilizer do you apply?	-
7	How long has the problem with stem borer weevil been around?	-
8	What is the percentage of weevil damage in your crop?	-
9	Do you apply insecticide?	If YES, continue with question 10.
10	Which insecticide do you apply and in what quantities?	-
11	What harvesting method do you use to collect the peach palm fruits?	If more than one method is described, continue with question 12.
12	Indicate the proportion of use of each of the harvesting methods?	-
13	Indicate the variety or geographical place from where the peach palm you grow comes from.	-
14	Do you add lime to the crop?	If YES, continue with question 15.
15	Indicate the amount of lime that you add to each plant?	-
16	Do you practice weevils' trapping?	If YES, continue with question 17.
17	Indicate the type of bait used and the number of traps installed in your crop.	-
18	What is the area (hectares) of your peach palm crop?	-
19	What do you think is the cause of weevils' presence in your crop?	-

Table S5 Landscape characterization of the 32 peach palms sampled crops (ID) in Colombia. LM: Total landcover mean; LS: Total landcover sum; LC: Landcover; LP: Landscape proportion; EL: Edge length; ED: Edge density; NP: Number of patches; PD: Patch density; GP: Greatest patch area; SP: Smallest patch area; MePA: Mean patch area; MdPA: Median patch area; LP: Largest patch index; LPI: Largest patch index; EN: Euclidean Nearest-Neighbor distance; FD: Fractal dimension index; MePS: Mean patch shape ratio; OC: Overall core area; LA: Like adjacencies; PC: Patch cohesion index; LD: Landscape division; EM: Effective Meshsize; SI: Splitting index. These variables were extracted from Sentinel 2 images with a supervised classification (see Fig. S2). The geographic information of each crop is documented in Table S1.

ID	Land cover								Diversity Index		
	Mean	Sum	Minimum	Maximum	Standard deviation	Low quartile	Median	Upper quartile	Shannon	Shannon's equitability	Simpson
1	1.18	9363	1	2	0.38	1	1	1	0.46	0.67	0.29
2	1.14	9079	1	2	0.35	1	1	1	0.41	0.59	0.24
3	1.19	9488	1	2	0.39	1	1	1	0.49	0.70	0.31
4	1.24	9844	1	3	0.48	1	1	1	0.59	0.54	0.34
5	1.38	10968	1	3	0.66	1	1	2	0.77	0.70	0.44
6	1.40	11172	1	3	0.67	1	1	2	0.80	0.73	0.46
7	1.40	11154	1	3	0.74	1	1	1	0.72	0.65	0.40
8	1.24	9884	1	3	0.64	1	1	1	0.43	0.40	0.23
9	1.56	12390	1	2	0.50	1	2	2	0.69	0.99	0.49
10	1.59	12675	1	2	0.49	1	2	2	0.68	0.98	0.48
11	1.59	12664	1	2	0.49	1	2	2	0.68	0.98	0.48
12	1.67	13290	1	2	0.47	1	2	2	0.64	0.92	0.44
13	1.73	13795	1	2	0.44	1	2	2	0.58	0.84	0.39
14	1.25	9944	1	2	0.43	1	1	1	0.56	0.81	0.37
15	1.65	13084	1	3	0.64	1	2	2	0.94	0.85	0.58
16	1.52	12112	1	2	0.50	1	2	2	0.69	1.00	0.50
17	1.67	13290	1	2	0.47	1	2	2	0.64	0.92	0.44
18	1.67	13290	1	2	0.47	1	2	2	0.64	0.92	0.44
19	1.34	10697	1	3	0.56	1	1	2	0.74	0.67	0.44
20	1.57	12441	1	3	0.56	1	2	2	0.81	0.74	0.53
21	1.35	10712	1	2	0.48	1	1	2	0.65	0.93	0.45
22	1.47	11674	1	2	0.50	1	1	2	0.69	1.00	0.50
23	1.30	10371	1	2	0.46	1	1	2	0.61	0.89	0.42
24	2.02	16089	1	3	0.83	1	2	3	1.10	1.00	0.67

25	1.44	11487	1	2	0.50	1	1	2	0.69	0.99	0.49
26	1.67	13290	1	2	0.47	1	2	2	0.64	0.92	0.44
27	1.56	12403	1	2	0.50	1	2	2	0.69	0.99	0.49
28	1.62	12897	1	2	0.49	1	2	2	0.66	0.96	0.47
29	1.82	14488	1	3	0.54	2	2	2	0.80	0.73	0.47
30	1.54	12233	1	3	0.63	1	1	2	0.90	0.82	0.56
31	1.78	14142	1	2	0.42	2	2	2	0.53	0.76	0.35
32	1.70	13543	1	2	0.46	1	2	2	0.61	0.88	0.42

Continuation of the Table S5

ID	No Forest														
	LC	LP	EL	ED	NP	PD	GP	SP	MePA	MdPA	LPI	EN	FD	MePS	OC
1	139400	0.18	12160	0.02	30	0	103400	100	4646.67	350	12.98	415.08	1.06	1.39	44700
2	111600	0.14	12300	0.02	57	0	38500	100	1957.90	200	4.84	400.12	1.06	1.38	27000
3	151900	0.19	11340	0.01	42	0	99100	100	3616.67	200	12.44	361.80	1.04	1.50	63400
4	146900	0.18	12440	0.02	45	0	70200	100	3264.44	200	8.81	440.71	1.05	1.47	53600
5	144600	0.18	13300	0.02	50	0	50200	100	2892.00	200	6.30	434.80	1.06	1.43	45600
6	151800	0.19	14480	0.02	15	0	31800	100	3300.00	500	3.99	321.85	1.07	1.19	41600
7	71600	0.09	6400	0.01	30	0	19200	100	2386.67	400	2.41	421.49	1.05	1.10	22500
8	13500	0.02	1700	0.00	42	0	6800	100	900.00	300	0.85	448.44	1.03	1.27	3000
9	443700	0.56	22000	0.03	37	0	399700	100	11991.89	300	50.26	429.20	1.05	1.32	253300
10	471600	0.59	21700	0.03	13	0	453100	100	36276.92	700	56.93	412.81	1.08	1.08	268000
11	469800	0.59	20600	0.03	33	0	269500	100	14236.36	200	33.83	337.43	1.06	1.36	287000
12	532900	0.67	23720	0.03	31	0	517800	100	17190.32	200	65.04	388.52	1.06	1.57	323700
13	583900	0.73	17480	0.02	6	0	559700	100	97316.67	1300	70.35	286.87	1.11	0.92	415900
14	198100	0.25	13520	0.02	49	0	157800	100	4042.86	300	19.82	434.80	1.05	1.36	97400
15	366800	0.46	23500	0.03	40	0	240100	100	9170.00	600	30.18	438.47	1.08	1.22	174800
16	416100	0.52	19440	0.02	28	0	392700	100	14860.71	200	49.39	378.86	1.06	1.46	251300
17	488700	0.62	19500	0.03	17	0	461800	100	28747.06	400	58.10	444.70	1.09	1.23	304800
18	392900	0.49	21280	0.03	23	0	287100	100	17082.61	200	36.10	433.82	1.06	1.35	198900
19	202600	0.25	14420	0.02	51	0	86500	100	3972.55	400	10.86	400.63	1.07	1.33	97900
20	397300	0.50	19480	0.02	32	0	348600	100	12415.63	250	43.84	411.83	1.07	1.46	221200
21	275000	0.35	11080	0.01	12	0	125000	100	22916.67	3500	15.70	360.15	1.10	0.88	175200
22	371400	0.47	20800	0.03	35	0	335100	100	10611.43	200	42.10	437.71	1.05	1.44	190000
23	241100	0.30	9180	0.01	19	0	228100	100	12689.47	100	28.66	423.21	1.05	1.57	159100
24	252600	0.32	13720	0.02	72	0	110000	100	3508.33	100	13.82	390.60	1.03	1.68	146900
25	353000	0.444	12420	0.02	15	0	338300	100	23533.33	200	42.52	265.81	1.06	1.48	239000
26	342300	0.430	17660	0.02	23	0	101900	100	14882.61	2200	12.81	310.88	1.08	0.90	179500
27	445400	0.560	19760	0.03	24	0	375200	100	18558.33	250	47.20	438.58	1.07	1.24	273300
28	494900	0.623	27520	0.04	28	0	429600	100	17675.00	100	54.05	405.34	1.04	1.66	242100
29	540600	0.680	18540	0.02	14	0	451200	100	38614.29	150	56.73	440.84	1.06	1.35	364000
30	305500	0.384	17760	0.02	42	0	185500	100	7273.81	200	23.32	412.29	1.05	1.43	165100
31	618900	0.778	19300	0.02	11	0	616400	100	56263.64	100	77.51	344.80	1.06	1.59	433200
32	559200	0.703	21180	0.03	28	0	533700	100	19971.43	100	67.12	383.14	1.04	1.61	362700

Table S5 (cont.)

ID	No Forest						Forest								
	OC	LA	PC	LD	EM	SI	LC	LP	EL	ED	NP	PD	GP	SP	MePA
1	44700	0.64	9.54	0.98	13977.99	9.54	657500	0.83	15200	0.02	18	0	510000	100	36527.78
2	27000	0.57	9.26	1.00	3464.47	9.26	684700	0.86	15480	0.02	7	0	682600	100	97814.29
3	63400	0.69	9.51	0.98	13300.50	9.51	645000	0.81	14580	0.02	12	0	460500	100	53750.00
4	53600	0.65	9.48	0.99	10374.55	9.48	630000	0.79	15700	0.02	9	0	411200	100	70000.00
5	45600	0.63	9.30	0.99	5153.32	9.30	573900	0.72	17020	0.02	6	0	303700	100	95650.00
6	41600	0.62	9.13	1.00	3445.91	9.13	561300	0.70	16700	0.02	20	0	477200	100	28065.00
7	22500	0.64	8.90	1.00	916.91	8.90	602300	0.76	12040	0.02	6	0	325000	100	100383.33
8	3000	0.52	8.37	1.00	68.25	8.37	694400	0.87	8380	0.01	3	0	396600	100	231466.67
9	253300	0.78	9.73	0.75	201394.35	9.73	351600	0.44	21920	0.03	36	0	111700	100	9766.67
10	268000	0.79	9.75	0.68	258041.74	9.75	324300	0.41	20460	0.03	39	0	117700	100	8315.39
11	287000	0.80	9.68	0.85	118707.13	9.68	326800	0.41	18960	0.02	46	0	287600	100	7104.35
12	323700	0.80	9.76	0.58	336823.73	9.76	263200	0.33	22280	0.03	59	0	144900	100	4461.02
13	415900	0.86	9.76	0.50	394320.38	9.76	211700	0.27	15380	0.02	25	0	82000	100	8468.00
14	97400	0.71	9.61	0.96	31478.70	9.61	598200	0.75	16440	0.02	5	0	411500	100	119640.00
15	174800	0.72	9.64	0.91	366800.00	9.64	355800	0.45	21600	0.03	39	0	151600	100	9123.08
16	251300	0.79	9.74	0.76	194057.59	9.74	379000	0.48	19820	0.03	29	0	261200	100	13068.97
17	304800	0.82	9.75	0.66	268623.62	9.75	191500	0.24	16820	0.02	42	0	48400	100	4559.52
18	198900	0.76	9.68	0.86	110568.62	9.68	272100	0.34	18320	0.02	68	0	166000	100	4001.47
19	97900	0.70	9.47	0.98	13799.25	9.47	558900	0.70	17380	0.02	12	0	506800	100	46575.00
20	221200	0.78	9.72	0.81	154294.81	9.72	372100	0.47	19280	0.02	63	0	292700	100	5906.35
21	175200	0.82	9.54	0.97	27667.75	9.54	521200	0.66	11220	0.01	16	0	517200	100	32575.00
22	190000	0.75	9.72	0.82	141429.40	9.72	424600	0.53	21800	0.03	37	0	271200	100	11475.68
23	159100	0.83	9.69	0.92	65480.99	9.69	554900	0.70	10100	0.01	13	0	456900	100	42684.62
24	146900	0.76	9.54	0.97	23914.42	9.54	262800	0.33	14640	0.02	29	0	154500	100	9062.07
25	239000	0.84	9.73	0.82	143912.63	9.73	442700	0.56	12380	0.02	20	0	242500	100	22135.00
26	179500	0.77	9.51	0.96	29733.34	9.51	254100	0.32	15480	0.02	37	0	196400	100	6867.57
27	273300	0.80	9.72	0.77	180009.16	9.72	349500	0.44	19620	0.03	31	0	301200	100	11274.19
28	242100	0.76	9.74	0.70	236418.91	9.74	299900	0.38	24920	0.03	83	0	105300	100	3613.25
29	364000	0.84	9.74	0.67	264122.13	9.74	198400	0.25	15580	0.02	63	0	62600	100	3149.21
30	165100	0.75	9.60	0.94	48006.12	9.60	428700	0.54	17500	0.02	24	0	345300	100	17862.50
31	433200	0.86	9.78	0.40	477744.44	9.78	176400	0.22	17760	0.02	69	0	42300	100	2556.52
32	362700	0.83	9.76	0.55	358563.95	9.76	235900	0.30	19960	0.03	67	0	103500	100	3520.90

Continuation of the Table S5

ID	Forest											Water		
	MdPA	LPI	EN	FD	MePS	OC	LA	PC	LD	EM	SI	LC	LP	EL
1	100	64.00	307.29	1.03	3.36	523000	0.89	9.75	0.56	352883.03	2.26	-	-	-
2	200	85.72	118.60	1.06	2.85	531400	0.89	9.78	0.27	585137.02	1.36	-	-	-
3	100	57.79	258.91	1.05	2.81	499400	0.89	9.73	0.63	295699.91	2.70	-	-	-
4	2100	51.59	177.20	1.09	1.58	481700	0.88	9.73	0.67	262370.39	3.04	20200	0.03	1760
5	9400	38.13	158.70	1.13	1.71	407100	0.86	9.71	0.76	195332.61	4.08	77900	0.10	4400
6	650	59.86	311.17	1.08	2.22	405200	0.86	9.74	0.64	288401.64	2.76	84100	0.11	5400
7	9900	40.77	300.05	1.09	1.43	478800	0.91	9.71	0.73	215733.30	3.70	123300	0.16	7840
8	297700	49.77	163.21	1.06	1.41	608700	0.94	9.73	0.61	308591.87	2.58	89000	0.11	4500
9	400	14.05	367.70	1.07	2.48	161300	0.73	9.54	0.96	35453.54	22.43	-	-	-
10	300	14.79	400.89	1.08	2.79	157900	0.73	9.57	0.95	37617.03	21.16	-	-	-
11	200	36.10	468.52	1.05	2.83	164500	0.75	9.70	0.87	104011.22	7.66	-	-	-
12	300	18.20	434.19	1.07	2.75	88000	0.65	9.55	0.96	29621.98	26.88	-	-	-
13	900	10.31	416.33	1.09	2.03	83900	0.69	9.47	0.98	15120.83	52.62	-	-	-
14	200	51.68	143.53	1.09	2.31	435600	0.87	9.73	0.68	256235.09	3.11	-	-	-
15	500	19.06	333.50	1.09	2.52	174700	0.74	9.58	0.94	45448.97	17.51	0.092	4200.00	0.005
16	600	32.85	378.42	1.07	2.40	207200	0.77	9.67	0.89	91522.78	8.69	-	-	-
17	350	6.09	310.78	1.08	2.62	63200	0.64	9.32	0.99	7270.14	109.32	114600	0.14	3020
18	250	20.88	424.81	1.05	2.81	137500	0.71	9.59	0.95	37486.41	21.21	130200	0.16	4520
19	100	63.61	359.56	1.04	3.01	391800	0.86	9.75	0.59	325576.54	2.45	35200	0.04	3620
20	300	36.81	395.95	1.08	2.63	228500	0.77	9.69	0.86	108674.81	7.32	25800	0.03	4740
21	200	64.96	482.28	1.04	2.89	423000	0.90	9.76	0.58	335967.72	2.37	61200	0.08	3300
22	300	34.07	376.00	1.08	2.55	245800	0.77	9.66	0.88	98770.88	8.06	-	-	-
23	200	57.40	145.76	1.04	2.74	460900	0.91	9.74	0.66	270070.06	2.95	-	-	-
24	300	19.42	435.86	1.07	2.50	138700	0.76	9.57	0.96	33335.28	23.87	280300	0.35	8080
25	200	30.48	258.61	1.05	2.83	330900	0.87	9.69	0.85	120108.12	6.63	-	-	-
26	200	24.69	433.91	1.05	2.82	124400	0.74	9.64	0.94	50237.85	15.84	199100	0.25	3120
27	200	37.89	370.26	1.07	2.96	187700	0.75	9.70	0.86	115155.38	6.90	-	-	-
28	200	13.25	434.53	1.06	3.03	119100	0.66	9.53	0.97	27853.38	28.54	-	-	-
29	300	7.87	382.01	1.06	2.67	83100	0.67	9.37	0.99	8842.07	89.96	56400	0.07	2580
30	550	43.41	378.47	1.09	2.06	282000	0.82	9.71	0.81	152978.67	5.20	-	-	-
31	400	5.32	403.84	1.07	2.56	53300	0.60	9.22	0.99	5223.99	152.24	-	-	-
32	300	13.02	413.74	1.07	2.75	89500	0.65	9.47	0.98	16860.53	47.16	-	-	-

Table S5 (cont.)

ID	Water													
	ED	NP	PD	GP	SP	MePA	MdPA	LP	EN	FD	MePS	OC	LA	PC
1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4	0	6	0	11200	100	3366.67	500	1.41	140.40	1.06	0.77	5500	0.64	8.87
5	0.01	14	0	73500	100	5564.29	200	9.23	266.64	1.03	0.93	39900	0.75	9.53
6	0.01	12	0	76500	100	7008.33	150	9.60	383.10	1.05	0.97	37100	0.72	9.52
7	0.01	14	0	72400	100	8807.14	400	9.08	386.85	1.06	0.68	54000	0.73	9.49
8	0.01	3	0	69200	4100	29666.67	15700	8.68	262.88	1.17	0.27	47300	0.78	9.48
9	-	-	-	-	-	-	-	-	-	-	-	-	-	-
10	-	-	-	-	-	-	-	-	-	-	-	-	-	-
11	-	-	-	-	-	-	-	-	-	-	-	-	-	-
12	-	-	-	-	-	-	-	-	-	-	-	-	-	-
13	-	-	-	-	-	-	-	-	-	-	-	-	-	-
14	-	-	-	-	-	-	-	-	-	-	-	-	-	-
15	1.00	0	73000	73000	73000	73000	9.18	0.00	1.24	0.19	32200	0.75	9.54	0.99
16	-	-	-	-	-	-	-	-	-	-	-	-	-	-
17	0	6	0	113300	100	19100	350	14.26	205.25	1.06	0.91	88200	0.88	9.61
18	0.01	6	0	121500	700	21700	1600	15.28	257.04	1.11	0.45	90300	0.84	9.61
19	0.01	12	0	23400	100	2933.33	200	2.94	371.66	1.06	0.83	6800	0.59	9.12
20	0.01	29	0	8500	100	889.66	200	1.07	434.58	1.06	1.04	300	0.37	8.53
21	0	3	0	61000	100	20400	100	7.67	505.89	1.07	0.95	29400	0.76	9.50
22	-	-	-	-	-	-	-	-	-	-	-	-	-	-
23	-	-	-	-	-	-	-	-	-	-	-	-	-	-
24	0.01	5	0	219900	800	56060	5900	27.64	132.33	1.16	0.36	205000	0.87	9.66
25	-	-	-	-	-	-	-	-	-	-	-	-	-	-
26	0	1	0	199100	199100	199100	199100	25.03	0	1.09	0.05	168500	0.93	9.68
27	-	-	-	-	-	-	-	-	-	-	-	-	-	-
28	-	-	-	-	-	-	-	-	-	-	-	-	-	-
29	0	1	0	56400	56400	56400	56400	7.09	0	1.18	0.15	32400	0.80	9.48
30	-	-	-	-	-	-	-	-	-	-	-	-	-	-
31	-	-	-	-	-	-	-	-	-	-	-	-	-	-
32	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Continuation of the Table S5

ID	Water		
	LD	EM	SI
1	-	-	-
2	-	-	-
3	-	-	-
4	1.00	234.45	3399.87
5	0.99	6786.93	117.34
6	0.99	7365.04	108.24
7	0.99	9088.32	87.72
8	0.99	6339.49	125.70
9	-	-	-
10	-	-	-
11	-	-	-
12	-	-	-
13	-	-	-
14	-	-	-
15	6698.09	118.78	0.09
16	-	-	-
17	0.98	16151.64	49.21
18	0.98	18592.03	42.77
19	1.00	748.56	1064.31
20	1.00	162.78	4885.22
21	0.99	4678.18	170.02
22	-	-	-
23	-	-	-
24	0.92	64010.44	12.43
25	-	-	-
26	0.94	49831.31	15.96
27	-	-	-
28	-	-	-
29	1.00	3999.20	198.89
30	-	-	-
31	-	-	-
32	-	-	-

Table S6. Soil characterization at 32 peach palms sampled crops (ID) in Colombia. The values are presented at the depths of 0-5m, 5-15m, and 15-30m, from which the weighted and arithmetic mean (WM and AM, respectively) were calculated. These variables were extracted from Soil Grids 250 m database (Hengl et al. 2017). The geographic information of each crop is documented in Table S1. In parenthesis the units and identification code of each variable.

	Chemical properties															
	Organic Carbon Density (g/dm3, S1)					Soil Organic Carbon Stock (t/ha, S2)	Soil Organic Carbon (dg/kg, S3)					Nitrogen (cg/kg, S4)				
ID	0-5m	5-15m	15-30m	WM	AM		0-5m	5-15m	15-30m	WM	AM	0-5m	5-15m	15-30m	WM	AM
1	539	413	252	322.1	412.67	57	1542	1101	1304	1683.2	1671.00	729	363	294	359.5	443.33
2	590	419	229	324.5	395.33	60	1829	1367	1817	1169.3	1297.33	646	385	299	349.1	459.00
3	550	407	218	277.3	355.67	57	1446	1067	965	1164.2	1265.67	658	329	283	255.2	317.33
4	533	402	251	315	391.33	60	1676	1093	1123	1282.1	1326.00	746	347	284	418.9	490.33
5	575	339	224	293.6	379.33	57	1518	947	1800	1515.9	1421.67	417	281	199	245.4	299.00
6	537	403	234	267.8	344.67	54	1607	1004	1367	1445.1	1388.67	709	364	398	266.5	314.67
7	529	328	210	329	401.33	61	1571	1095	1131	1266.9	1315.67	461	285	206	358.2	462.00
8	518	312	204	307.9	391.67	57	1512	995	1659	1043.7	1159.33	421	298	225	334.3	423.33
9	483	415	339	290.9	333.33	68	592	573	356	322.1	401.00	345	414	261	194.6	234.67
10	480	373	300	336.6	372.67	93	477	415	290	445.8	495.33	358	341	185	368.6	388.00
11	483	309	326	339.9	384.33	85	594	496	396	346.2	394.00	383	461	320	249.1	294.67
12	540	443	340	376.2	412.33	92	806	750	415	444.7	507.00	468	516	308	315.3	340.00
13	428	317	255	390.9	441.00	105	533	444	226	554.6	657.00	308	246	150	386.4	430.67
14	560	480	360	416	305.33	61	841	586	320	451.9	517.67	425	384	251	308.3	225.00
15	426	277	182	229.9	282.33	54	525	243	232	436.1	452.00	350	224	112	199.5	242.00
16	437	291	231	219.7	277.00	52	579	258	201	456.4	520.00	373	238	130	233.6	274.33
17	474	328	228	234.9	295.00	61	738	587	579	264.6	333.33	390	276	207	169.4	228.67
18	459	326	220	269.6	319.67	60	773	637	603	255.9	346.00	368	263	201	186.7	247.00
19	493	401	282	271.3	340.33	70	635	662	320	643.4	685.67	355	270	170	251.7	299.33
20	379	296	172	282.6	343.33	65	542	355	459	597.3	634.67	336	227	163	246	291.00
21	381	313	222	265.2	466.67	117	640	410	503	488.8	582.33	341	202	132	173.9	353.33
22	451	357	259	307.6	355.67	67	557	419	248	330.2	408.00	332	284	198	237.2	271.33
23	507	436	343	338.8	392.00	77	723	604	282	454.1	539.00	434	314	201	218.5	265.00
24	385	288	158	275.7	335.00	68	631	547	382	630.2	671.00	359	269	195	236.3	277.33
25	500	318	238	387.3	428.67	76	612	321	316	422.7	536.33	471	254	167	258.2	316.33
26	484	331	206	288.2	352.00	62	767	691	599	347.1	416.33	396	297	205	223.5	297.33
27	554	333	244	301.7	377.00	55	600	358	348	376.2	435.33	483	266	175	233.1	308.00

28	540	331	265	312.3	378.67	63	761	424	533	523.1	572.67	464	284	180	239.6	309.33
29	579	372	266	329.1	405.67	75	799	402	411	447.1	537.33	451	235	212	242.8	299.33
30	535	353	260	315.4	382.67	70	1338	822	1233	1120.2	1131.00	451	238	161	213.1	283.33
31	492	344	351	363	395.67	59	1439	898	1152	1104.5	1163.00	467	261	160	221	296.00
32	494	356	249	305.6	366.33	66	1428	933	1148	1111.5	1169.67	468	318	214	270.6	333.33

Continuation of the Table S6.

	Chemical properties										Physical properties				
	Cation Exchange Capacity at pH7 (mmol/kg, S5)					pH Water (pH*10, S6)					Bulk Density (cg/cm3, S7)				
ID	0-5m	5-15m	15-30m	WM	AM	0-5m	5-15m	15-30m	WM	AM	0-5m	5-15m	15-30m	WM	AM
1	226	202	182	183.5	194.33	49	50	50	48.9	48.67	110	111	115	112.4	111.33
2	221	186	176	188.6	199.00	48	49	49	50.9	50.67	110	110	114	113.9	112.33
3	186	152	140	171	178.33	49	50	50	48.1	48.33	111	111	115	110.6	109.33
4	221	197	179	164.5	177.00	50	51	51	49.6	49.33	110	111	116	113	111.67
5	204	146	132	143.4	160.67	48	48	49	48.6	48.33	111	110	115	113.1	112.00
6	205	172	154	159.3	171.00	49	49	50	49	49.00	110	110	115	113.1	112.00
7	195	175	165	192.4	203.33	49	48	48	49.9	49.67	107	109	112	113.3	112.00
8	198	165	150	148.2	159.33	49	49	49	49.9	49.67	111	110	115	113.4	112.33
9	220	238	212	220.7	221.67	53	53	53	51	51.00	102	104	106	107.4	106.67
10	202	222	203	237.1	240.33	51	51	51	50	50.00	99	100	100	93.7	93.00
11	241	250	230	208.6	209.00	50	50	50	51	51.00	91	94	94	99.9	996.67
12	235	251	233	220.6	223.33	49	49	50	53	53.00	96	99	98	105	104.00
13	224	221	220	238.6	239.67	51	51	51	49.6	49.33	105	107	108	98.1	976.67
14	272	222	197	212	167.00	29	29	29	49	47.33	94	96	100	98.2	113.00
15	244	164	145	102.9	129.67	46	47	48	46.9	46.67	109	111	118	114.2	112.67
16	227	168	145	128.2	143.33	46	47	47	47.7	47.67	107	109	115	113.7	111.67
17	236	182	164	160.6	184.33	50	51	51	47.5	47.00	108	112	115	115	112.67
18	229	189	170	160.1	180.00	48	48	49	46.9	46.67	102	106	110	112.4	110.33
19	205	170	159	149.1	163.67	51	51	52	51.6	51.33	100	102	106	115.9	113.67
20	198	105	86	176.6	194.00	46	47	47	50.9	50.67	110	112	116	113.4	111.67
21	219	153	129	145.2	230.33	47	47	48	47.6	49.00	110	112	117	114.8	966.67
22	232	189	170	181.9	197.00	50	50	50	50	50.00	105	108	114	111.3	109.00
23	196	165	156	166.9	178.00	52	53	52	51.6	51.33	92	95	99	104.2	102.67
24	181	131	118	181.6	196.00	48	47	48	48.6	48.33	108	111	116	108	106.00
25	244	134	110	162.7	172.33	48	49	50	52.3	52.33	106	109	109	97.1	953.33
26	198	155	138	130.6	162.67	51	51	52	49.5	49.00	109	114	118	108.7	108.00

27	306	205	191	206.7	234.00	49	49	50	49.6	49.33	103	105	108	106.6	105.33
28	245	170	146	163.1	187.00	49	50	50	49.9	49.67	102	104	106	105	104.00
29	263	167	136	158	188.67	49	49	49	49	49.00	105	107	111	109.2	107.67
30	224	140	118	135.2	160.67	50	50	50	50	50.00	105	108	113	110.7	108.67
31	227	127	113	128.6	155.67	49	49	50	49.6	49.33	105	108	109	108.3	107.33
32	227	143	122	138.8	164.00	49	49	50	49.6	49.33	103	106	108	106.9	105.67

Continuation of the Table S6.

	Physical properties														
	Clay Content (g/kg, S8)					Coarse Fragments (cm3/dm3, S9)					Sand (g/kg, S10)				
ID	0-5m	5-15m	15-30m	WM	AM	0-5m	5-15m	15-30m	WM	AM	0-5m	5-15m	15-30m	WM	AM
1	263	266	281	366.3	358.33	31	35	34	71.3	71.00	418	417	411	333.3	337.00
2	348	349	378	255.4	255.33	71	70	72	37.6	366.67	342	341	328	444	442.67
3	226	225	254	296.7	285.00	46	46	49	40.9	396.67	423	426	416	377.9	387.33
4	256	254	256	222.1	226.00	34	38	38	30.5	296.67	441	441	446	498	493.00
5	271	269	303	289.6	281.00	94	103	107	104.5	101.33	409	406	387	394.9	400.67
6	232	229	217	306.6	304.00	29	28	32	80.8	80.00	486	488	505	396.8	401.00
7	270	271	314	274.7	270.00	37	40	42	34	333.33	401	396	365	413.5	415.33
8	297	307	308	242.5	235.00	79	79	82	47.8	47.00	410	400	393	419.7	421.67
9	290	289	317	304	296.33	46	48	50	43.5	39.00	330	335	321	332.4	336.67
10	289	281	305	289.3	284.67	42	45	49	46.4	43.00	335	343	326	351.7	354.00
11	274	287	293	296.2	291.67	38	40	51	47.1	453.33	358	355	349	332	334.67
12	306	309	323	305.9	298.67	51	56	59	49	48.00	388	388	387	326.1	328.67
13	289	283	317	317.1	312.67	30	39	48	57.3	553.33	339	347	324	387.4	387.67
14	368	373	386	380.3	299.33	95	95	96	95.6	913.33	381	384	371	375.9	450.00
15	226	232	286	321.4	303.67	82	86	90	52.6	52.00	466	473	431	444.6	457.00
16	244	241	302	344.2	330.67	75	78	76	62.6	596.67	473	486	441	370.4	378.33
17	272	274	317	263.8	248.00	46	53	53	88	86.00	413	411	391	447.1	456.67
18	284	281	320	277.9	262.33	39	44	42	76.5	763.33	404	406	382	457.7	466.67
19	339	339	363	330.7	316.67	90	89	88	87.2	89.00	368	372	353	414.5	421.00
20	280	284	347	299.6	287.67	49	55	52	52.3	506.67	474	470	427	399.2	405.00
21	278	279	341	316.1	375.67	94	95	85	88.9	953.33	465	464	421	438.3	378.67
22	349	368	341	349.9	352.67	83	81	90	86.6	846.67	399	395	400	398.4	398.00
23	377	372	398	353.4	347.00	92	88	80	88.5	89.00	353	359	336	360.2	364.33
24	313	315	364	304.7	295.00	56	56	67	42.3	416.67	389	387	359	391.4	397.33
25	380	394	375	388.1	382.33	66	71	74	83.6	866.67	286	290	307	344.6	349.33
26	298	301	351	381.2	383.00	92	90	85	72.3	703.33	428	431	404	299.8	294.33
27	353	358	444	409.1	385.00	68	72	65	67.4	683.33	283	281	243	258.4	269.00

28	372	371	438	411.3	393.67	70	73	66	68.5	696.67	292	297	265	277.3	284.67
29	296	304	380	348.8	326.67	73	83	76	77.8	773.33	331	331	294	308.8	318.67
30	384	391	380	383.7	385.00	65	67	56	60.2	626.67	311	313	320	317	314.67
31	392	393	418	407.9	401.00	31	36	34	34.3	336.67	275	280	269	272.9	274.67
32	378	386	400	393.6	388.00	44	51	50	49.7	483.33	290	291	288	289.1	289.67

Continuation of the Table S6.

	Physical properties					Soil Group (%)				
	Silt (g/kg, S11)									
ID	0-5m	5-15m	15-30m	WM	AM	Fluvisols (S12)	Histosols (S13)	Ferrasols (S14)	Cambisols (S15)	Gleysols (S16)
1	319	317	307	300.4	304.67	28	11	10	10	8
2	310	310	294	300	301.67	22	16	14	14	11
3	351	348	330	325.1	327.33	17	16	15	12	12
4	303	305	297	279.9	281.00	28	12	10	9	8
5	320	326	310	315.8	318.67	31	19	11	9	8
6	282	283	278	296.5	294.67	25	13	12	10	9
7	329	332	321	311.2	314.33	31	16	12	8	8
8	292	293	299	337.5	343.00	29	16	11	9	7
9	380	376	361	364.2	367.33	27	14	12	12	8
10	377	376	368	358.4	361.00	26	18	11	9	8
11	368	358	357	371.3	373.67	23	12	10	9	9
12	306	303	290	367.4	372.33	26	16	14	10	6
13	372	370	360	295.5	299.67	19	18	16	10	7
14	251	243	242	243.2	251.00	20	12	12	10	7
15	308	295	283	234.6	239.67	28	18	11	6	6
16	283	273	257	284.8	290.67	25	15	14	11	4
17	315	315	293	289.1	295.33	29	13	11	9	8
18	312	313	298	264.4	271.00	23	17	9	9	7
19	293	290	285	255.4	263.67	18	15	13	13	11
20	246	246	227	301.8	307.67	23	16	13	7	6
21	257	257	239	246.2	245.33	18	18	12	8	7
22	251	237	259	251.6	249.00	21	18	16	10	6
23	270	269	266	287.3	289.33	25	17	16	8	7
24	298	298	276	303.9	307.67	17	16	13	10	6
25	334	316	318	267.3	268.33	21	21	12	6	5
26	277	269	245	319	322.67	15	13	12	11	11
27	364	361	314	333.1	346.33	19	15	14	10	7

28	336	332	297	311.4	321.67	16	15	14	9	6
29	373	364	326	342.1	354.33	17	16	15	7	6
30	305	296	299	298.7	300.00	29	15	10	7	5
31	333	328	313	319.5	324.67	20	15	12	6	6
32	332	323	312	317.3	322.33	20	17	15	7	6

Table S7. Correlation matrix of local qualitative variables at 32 peach palm crops in this study Colombia. Spearman correlation values are shown at the upper right from diagonal and p-values are at the lower left from diagonal. Bold values corresponding to p-value <0.05 and Spearman correlation >0.8.

p-value/Spearman correlation		Other crops		Crop age	Cultivation area	Age of weevil's infestation	Crop slope					
		Richness	Shannon diversity				Minimum	Maximum	Range	Average	Deviation	Sum
Other crops	Richness	-	**0.87**	-0.26	0.22	0.47	-0.06	-0.2	-0.3	-0.16	0.01	0.03
	Shannon diversity	**0.05**	-	-0.38	0.19	0.4	-0.01	-0.04	0.1	-0.03	0.11	0.15
Crop age		0.19	0.75	-	-0.33	0.27	-0.07	-0.05	-0.07	-0.13	-0.13	-0.49
Cultivation area		0.23	0.29	0.09	-	-0.22	-0.7	-0.38	-0.13	-0.44	-0.16	0.65
Age weevil's infestation		0.09	0.15	0.40	0.45	-	-0.17	0.09	-0.13	-0.11	-0.21	-0.43
Crop slope	Minimum	0.75	0.96	0.72	**0.00**	0.56	-	0.65	0.36	0.73	0.38	-0.18
	Maximum	0.26	0.83	0.81	**0.03**	0.77	**0.00**	-	**0.87**	**0.92**	**0.81**	0.34
	Range	0.6	0.47	0.73	0.47	0.65	**0.04**	**0.00**	-	0.72	**0.94**	0.5
	Average	0.39	0.88	0.51	**0.01**	0.71	**0.00**	**0.00**	**0.00**	-	0.76	0.27
	Deviation	0.94	0.54	0.53	0.40	0.45	**0.03**	**0.00**	**0.00**	**0.00**	-	0.47
	Sum	0.89	0.85	0.01	0.42	0.12	0.34	0.06	**0.00**	0.13	**0.01**	-

Table S8. Association of local qualitative variables at 32 peach palm crops in Colombia, according to a Fisher test. Bold values corresponding to p-value <0.05.

Crop management variables		p-value
Weeds	Fertilizer	**0.05**
	Insecticide	**0.02**
	Lime	0.24
	Harvest strategy	0.87
	Weevil's tramping	0.06
Fertilizer	Insecticide	**0.00**
	Lime	0.10
	Harvest strategy	1.00
	Weevil's tramping	**0.03**
Insecticide	Lime	**0.03**
	Harvest strategy	**0.04**
	Weevil's tramping	0.45
Lime	Harvest strategy	0.18
	Weevil's tramping	0.23
Harvest strategy	Weevil's tramping	0.38

Table S9. Comparison by Colombian natural region of significant variables for infestation levels of the *D. borassi-R. palmarum* in Peach Palms crops. Bold values correspond to the p-value <0.05. "-" symbol corresponds to do not apply.

Type of variable	Significant variable	Statistic	Statistic value	Degree freedom	p-value
Local	**Weevil's Tramping**	Fisher's exact test	-	-	**0.000**
Landscape	**Simpson's Diversity index**	Kruskal-Wallis test	12.05	2	**0.002**
	Number of non-forest Patches		3.91		0.142
	Total Land cover		13.39		**0.001**
	Fractal Dimension Index of non-forest		2.64		0.267
Soil	**Organic Carbon Density**		7.6346		**0.022**
	Coarse Fragments		4.468		0.107
	Soil Organic Carbon Stock	ANOVA	31.32		**0.000**
Weather	Isothermality	Kruskal-Wallis test	2.38		0.304

Table S10. Results of the best generalized lineal model of relationship between infestation levels of the *D. borassi-R. palmarum* in Peach Palms and local variables. The model 1 including the "Crop Age" variable with 27 sampling sites and model 2 without the "Crop Age" variable with 30 sampling sites. Bold values correspond to the p-value <0.05. For each model, the distribution family was quasibinomial and degree of the freedom was one. "-" symbol corresponds to do not apply.

Models	Statistic result	Variable							Number of models evaluated
		Weevil's Tramping	Richness index of the other crops	Crop area	Crop age	Minimum slope average	Slope deviation	Slope sum	
1	Chi square value for variable	3.12	0.27	0.41	0.83	0.31	2.45	0.57	959
	P-value	0.07	0.60	0.52	0.36	0.58	0.12	0.45	
2	Chi square value for variable	5.03	1.85	0.00	-	0.17	1.51	0.08	481
	P-value	**0.02**	0.17	0.96	-	0.68	0.22	0.78	

Table S11. Coefficient of determination (R^2) and AIC values of the Partial Least Squares Regression Generalized Linear Models of the proportion of peach palm crops infested by *D. borassi-R. palmarum* with respect to landscape, climatic, and soil variables (See Table S2,3, and 5). The distribution family of the response variable is binomial. Bold values correspond to the lowest AIC metric.

Component	Landscape		Weather		Soil	
	R^2	AIC	R^2	AIC	R^2	AIC
0			-	27.40	-	27.40
1	0.21	27.47	0.16	**27.30**	0,35	25,92
2	0.63	23.58	0.19	28.63	0,51	**24,21**
3	0.66	23.21	0.27	30.48	0,59	24,63
4	0.77	**22.03**	0.30	31.61	0,67	24,91
5	0.80	23.49	0.37	31.48	0,67	27,12
6	0.86	23.82	0.19	31.51	0,70	28,83
7	0.89	25.91	1.07	32.71	0,71	30,74
8	0.90	27.61	1.02	34.58	0,71	32,93
9	0.91	29.22	0.81	34.46	0,71	34,85
10	0.94	31.13	0.75	36.24	0,71	36,91

Table S12. Confidence Intervals resulting from Partial Least Squares Regression Generalized Linear Models of the proportion of peach palm crops infested by *D. borassi-R. palmarum* with respect to landscape variables (See Table S14). LC: Landcover; LP: Landscape proportion; EL: Edge length; ED: Edge density; NP: Number of patches; PD: Patch density; GP: Greatest patch area; SP: Smallest patch area; MePA: Mean patch area; MdPA: Median patch area; LP: Largest patch index; LPI: Largest patch index; EN: Euclidean Nearest-Neighbor distance; FD: Fractal dimension index; MePS: Mean patch shape ratio; OC: Overall core area; LA: Like adjacencies; PC: Patch cohesion index; LD: Landscape division; EM: Effective Meshsize; SI: Splitting index. Bold values and variables do not include the cero in their intervals.

		95% Confidence Intervals	
Type	Variable	Lower	Upper
Land cover	**Mean**	**0.03**	**0.72**
	Sum	**0.03**	**0.71**
	Standard deviation	-0.26	0.21
Diversity Index	Shannon	-0.14	0.32
	Shannon's equitability	**-0.58**	**-0.04**
	Simpson	-0.24	0.25
No Forest	LC	-0.07	0.13
	LP	-0.07	0.13
	EL	-0.36	0.04
	ED	-0.36	0.04
	NP	**0.05**	**0.58**
	PD	**0.05**	**0.58**
	GP	-0.14	0.05
	MePA	**0.15**	**0.72**
	MdPA	-0.08	0.50
	LPI	-0.14	0.05
	EN	-0.53	0.07
	FD	**0.09**	**0.86**
	MePS	-0.52	0.09
	OC	-0.13	0.08
	LA	**-0.58**	**-0.07**
	PC	-0.28	0.07
	LD	-0.11	0.11
	EM	-0.11	0.11
	SI	-0.14	0.18
Forest	**LC**	**-0.71**	**-0.03**
	LP	**-0.71**	**-0.03**
	EL	-0.35	0.07
	ED	-0.35	0.08
	NP	-0.47	0.22

	PD	-0.47	0.22
	GP	-0.08	0.26
	MePA	-0.15	0.22
	MdPA	-0.15	0.17
	LPI	-0.08	0.26
	EN	-0.19	0.29
	FD	-0.03	0.67
	MePS	-0.34	0.24
	OC	**-0.62**	**0.00**
	LA	**-0.58**	**-0.01**
	PC	-0.16	0.24
	LD	-0.46	0.06
	EM	-0.06	0.47
	SI	-0.54	0.13
Water	**LC**	**0.07**	**0.90**
	LP	**0.07**	**0.89**
	EL	-0.28	0.27
	ED	-0.27	0.27
	NP	**0.00**	**1.24**
	PD	**0.00**	**1.25**
	GP	-0.00	0.57
	SP	-0.20	0.12
	MePA	-0.08	0.28
	MdPA	-0.20	0.12
	LPI	**0.00**	**0.57**
	EN	-0.23	0.24
	FD	**-0.77**	**-0.18**
	MePS	-0.21	0.23
	OC	**0.05**	**1.02**
	LA	**-1.26**	**-0.30**
	PC	**-1.20**	**-0.41**
	LD	**-0.85**	**-0.31**
	EM	**0.10**	**1.15**
	SI	-0.17	1.90

Table S13. Confidence Intervals resulting from Partial Least Squares Regression Generalized Linear Models of the proportion of peach palm crops infested by *D. borassi-R. palmarum* with respect to soil variables (See Table S14). Bold values and variables do not include the cero in their intervals.

Type	Variable	95% Confidence Intervals	
		Lower	Upper
Chemical properties	**Organic Carbon Density**	**-2.92**	**-0.61**
	Soil Organic Carbon Stock	**-1.62**	**0.00**
	Soil Organic Carbon	-0.48	0.27
	Nitrogen	-0.77	0.22
	Cation Exchange Capacity	-0.18	1.29
Physical properties	pH Water	-0.86	0.16
	Bulk Density	-1.24	0.23
	Clay Content	-1.07	0.02
	Coarse Fragments	**-1.25**	**-0.11**
	Sand	-0.09	0.61
	Silt	-0.30	0.79
Soil group	Fluvisols	-0.42	0.26
	Histosols	-0.31	0.50
	Ferrasols	-0.11	1.05
	Cambisols	-0.03	0.84
	Gleysols	-0.11	0.51

Table S14. Confidence Intervals resulting from Partial Least Squares Regression Generalized Linear Models of the proportion of peach palm crops infested by *D. borassi-R. palmarum* with respect to climatic variables (See Table S14). Annual Mean Diurnal Range (BIO 2), Isothermality (BIO 3), Maximum Temperature of Warmest Month (°C, BIO 5), Minimum Temperature of Coldest Month (°C, BIO 6), Annual Temperature Range (BIO 7), Annual Precipitation (mm, BIO 12), Precipitation of Wettest Month (mm, BIO 13), Precipitation of Driest Month (mm, BIO 14), Precipitation Seasonality (BIO 15), Precipitation of Wettest Quarter (mm, BIO 16), and Precipitation of Driest Quarter (mm, BIO 17). Bold values and variables do not include the cero in their intervals.

Type	Variable	95% Confidence Intervals	
		Lower	Upper
Temperature	**BIO 2**	**0.07**	**0.53**
	BIO 3	**0.10**	**0.57**
	BIO 5	0.00	0.14
	BIO 6	-0.24	0.01
	BIO 7	**0.09**	**0.58**
Precipitation	BIO 12	-0.09	0.05
	BIO 13	-0.10	0.07
	BIO 14	-0.09	0.04
	BIO 15	-0.14	0.06
	BIO 16	-0.10	0.08
	BIO 17	-0.04	0.04

Table S15. Spearman correlation matrix of landscape, climatic, and soil variables with Confidence Intervals not containing zero values from Non-Parametric Bootstrap (see Table S15, S16, and S17). Lme: Land cover mean; Lsu: Land cover sum; DE: Shannon's equitability index; NNP: Number of no forest patches; NPD: No forest patch density; NMePA: Mean patch area of no forest; NFD: No Forest fractal dimension index; NLA: No forest like adjacencies; BLC: Forest landcover; BLP: Forest landscape proportion; BOC: Forest overall core area; BLA: Forest like adjacencies; Bio2: Temperature Annual Mean Diurnal Range; Bio3: Isothermality; Bio7: Annual Temperature Range; OCD: Organic Carbon Density; OCS: Soil Organic Carbon Stock; CF: Coarse Fragments. Bold values corresponding to p-value <0.05 and Spearman correlation >0.8.

p-value/ Spearman correlation		Landscape													Weather			Soil		
		Lme	Lsu	DE	DS	NNP	NPD	NMePA	NFD	NLA	BLC	BLP	BOC	BLA	Bio2	Bio3	Bio7	OCD	OCS	CF
Landscape	Lme	-	**1**	0.48	0.45	-0.38	-0.38	0.67	0.19	0.65	**-0.96**	**-0.96**	**-0.88**	**-0.88**	-0.32	-0.31	-0.32	0.05	0.26	-0.12
	Lsu	**0.00**	-	0.48	0.45	-0.38	-0.38	0.67	0.19	0.65	**-0.96**	**-0.96**	**-0.88**	**-0.88**	-0.32	-0.31	-0.32	0.05	0.26	-0.12
	DE	**0.01**	**0.01**	-	**0.71**	-0.22	-0.21	0.51	0.09	0.54	-0.53	-0.53	-0.42	-0.42	-0.04	-0.02	-0.02	0.07	0.32	0.16
	DS	**0.01**	**0.01**	**0.00**	-	0.07	0.08	0.25	0.19	0.28	-0.38	-0.38	-0.38	-0.31	0.00	0.02	-0.02	-0.08	0.16	0.23
	NNP	**0.03**	**0.03**	0.23	0.7	-	**1**	-0.77	-0.33	-0.69	0.47	0.47	0.41	0.31	0.24	0.24	0.24	0.12	-0.13	0.11
	NPD	**0.03**	**0.03**	0.24	0.66	**0.00**	-	-0.77	-0.33	-0.68	0.46	0.46	0.41	0.31	0.24	0.24	0.23	0.13	-0.12	0.11
	NMePA	**0.00**	**0.00**	**0.00**	0.17	**0.00**	**0.00**	-	0.44	**0.91**	-0.79	-0.79	-0.77	-0.7	-0.38	-0.33	-0.41	0.10	0.40	-0.09
	NFD	0.31	0.31	0.62	0.29	0.06	0.06	**0.01**	-	0.31	-0.26	-0.26	-0.25	-0.22	-0.03	0.02	-0.03	-0.35	0.08	0.08
	NLA	**0.00**	**0.00**	**0.00**	0.12	**0.00**	**0.00**	**0.00**	0.08	-	-0.77	-0.77	-0.71	-0.59	-0.32	-0.26	-0.34	0.17	0.38	-0.04
	BLC	**0.00**	**0.00**	**0.00**	**0.03**	**0.01**	**0.01**	**0.00**	0.15	**0.00**	-	**1**	**0.98**	**0.92**	0.34	0.32	0.34	-0.12	-0.36	0.11
	BLP	**0.00**	**0.00**	**0.00**	**0.03**	**0.01**	**0.01**	**0.00**	0.15	**0.00**	**0.00**	-	**0.98**	**0.92**	0.34	0.32	0.34	-0.12	-0.36	0.11
	BOC	**0.00**	**0.00**	**0.00**	**0.03**	**0.02**	**0.02**	**0.00**	0.17	**0.00**	**0.00**	**0.00**	-	**0.96**	0.37	0.35	0.38	-0.16	-0.39	0.13
	BLA	**0.00**	**0.00**	**0.02**	0.08	0.08	0.09	**0.00**	0.22	**0.00**	**0.00**	**0.00**	**0.00**	-	0.4	0.38	0.43	-0.18	-0.37	0.21
Weather	BIO2	0.08	0.08	0.83	0.98	0.19	0.19	**0.03**	0.88	0.08	0.06	0.06	**0.04**	**0.02**	-	**0.97**	**0.98**	-0.35	-0.37	0.08
	BIO3	0.08	0.08	0.92	0.92	0.19	0.19	0.06	0.93	0.14	0.08	0.08	**0.05**	**0.03**	**0.00**	-	**0.94**	-0.24	-0.28	0.03
	BIO7	0.08	0.08	0.89	0.92	0.19	0.20	**0.02**	0.88	0.06	0.06	0.06	**0.03**	**0.01**	**0.00**	**0.00**	-	-0.38	-0.34	0.18
Soil	OCD	0.77	0.77	0.70	0.67	0.50	0.48	0.57	**0.05**	0.36	0.50	0.50	0.40	0.32	**0.05**	0.18	**0.03**	-	0.62	-0.17
	OCS	0.15	0.15	0.07	0.40	0.49	0.52	**0.02**	0.68	**0.03**	**0.04**	**0.04**	**0.03**	**0.03**	**0.04**	0.12	0.06	**0.00**	-	0.1
	CF	0.51	0.51	0.37	0.21	0.53	0.54	0.64	0.65	0.84	0.55	0.55	0.49	0.25	0.65	0.87	0.33	0.36	0.58	-

Table S16. Results of the best generalized lineal model of the 4031 possible for local variables in relationship with infestation levels of the *D. borassi-R. palmarum* in Peach Palms crops (PI). Bold values correspond to the p-value <0.05. The degree of freedom was 2 and the distribution family quasibinomial.

Statistic result	Variable							
	Landscape				Soil			Weather
	Total land cover	Shannon's Diversity index	**Number of non-forest patches**	**Fractal Dimension index of non-forest**	Organic carbon density	Organic carbon stock	Coarse Fragments	Isothermality
Chi square value for variable	0.523	2.986	4.785	7.135	1.649	0.379	1.856	0.208
Degree of freedom	1	1	1	1	1	1	1	1
P-value	0.469	0.084	**0.029**	**0.008**	0.199	0.538	0.173	0.648

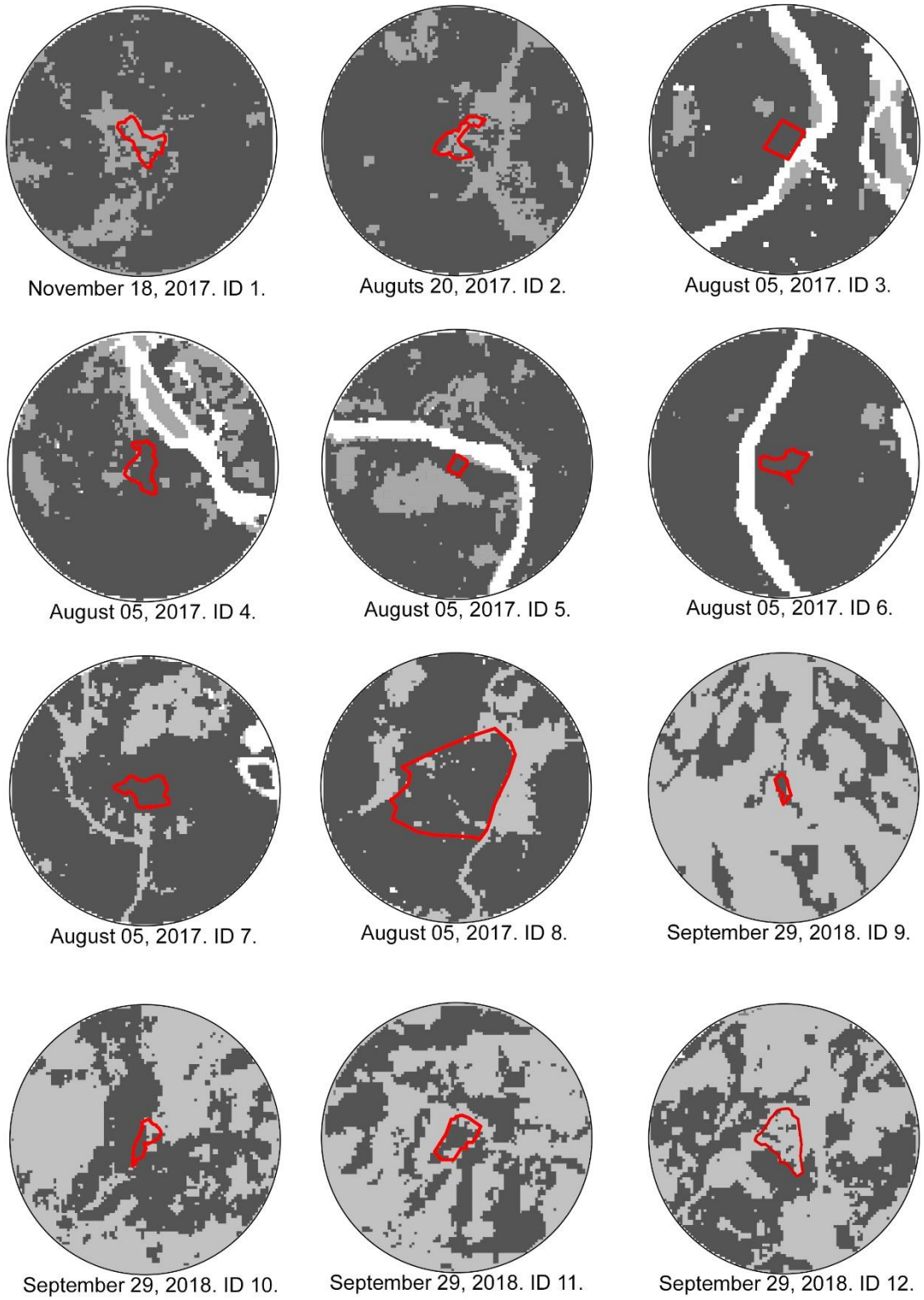
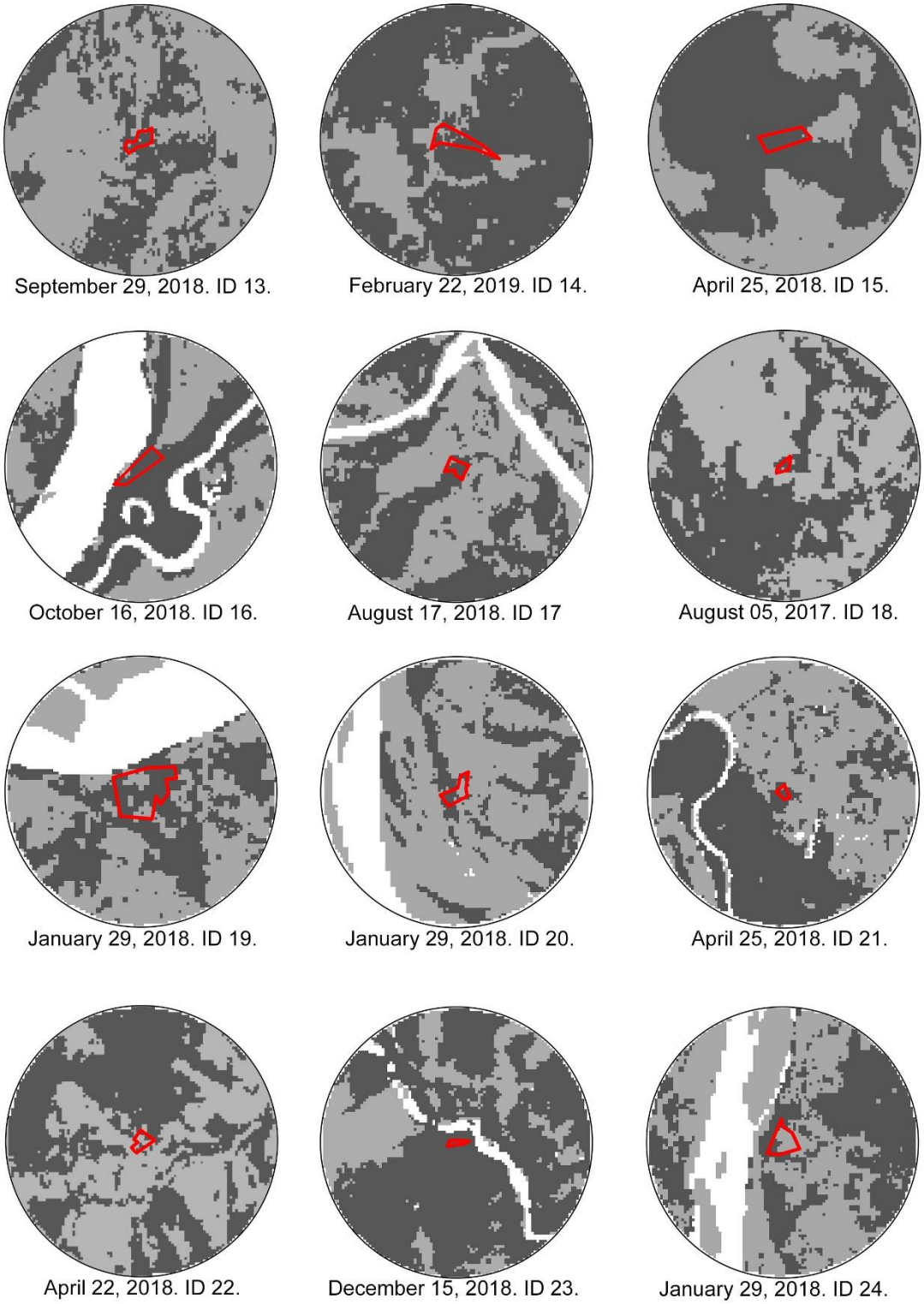


Figure S1. 1 km circular buffer around of the 32 production sites of the peach palm crops in Colombia. Forest cover: dark gray, No Forest: light gray, Water: white, Crop: red. The dates of the satellite images and the ID location (Table S1) are indicated.



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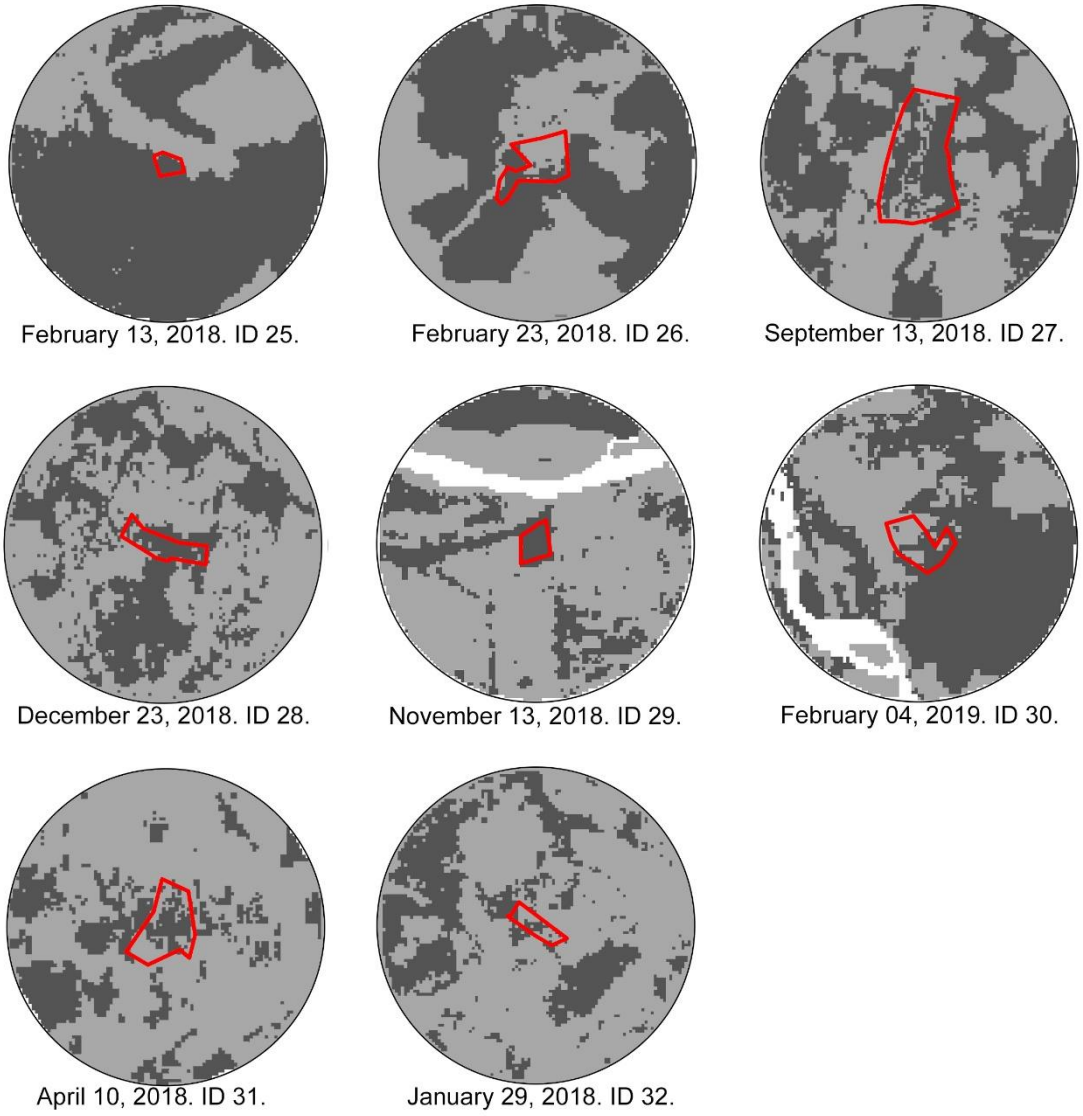

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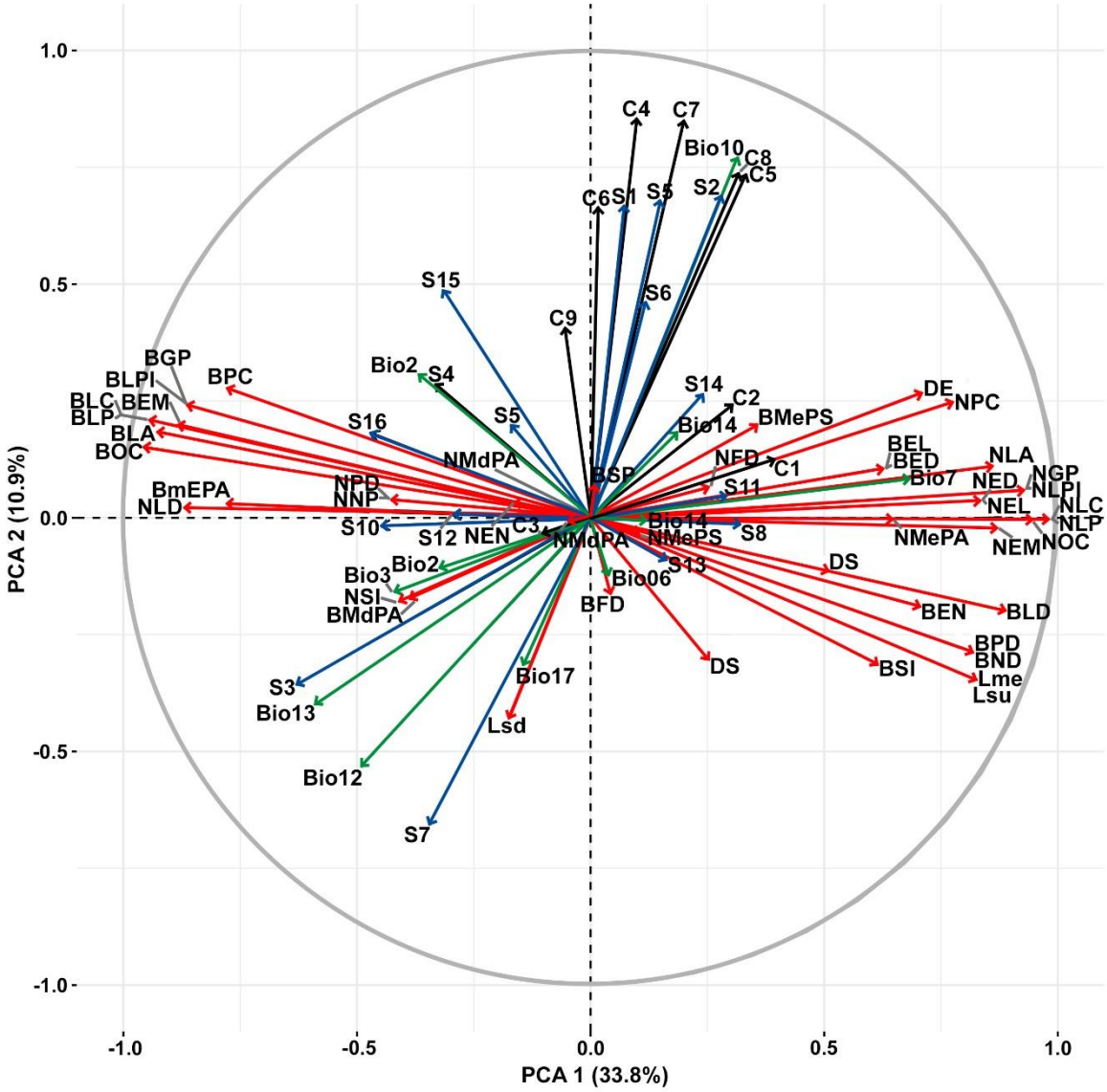


Figure S2. Individual Factor Map of first two principal component analysis for 81 variables of local, landscape, soil, and climatic of 32 peach palm production sites in Colombia.

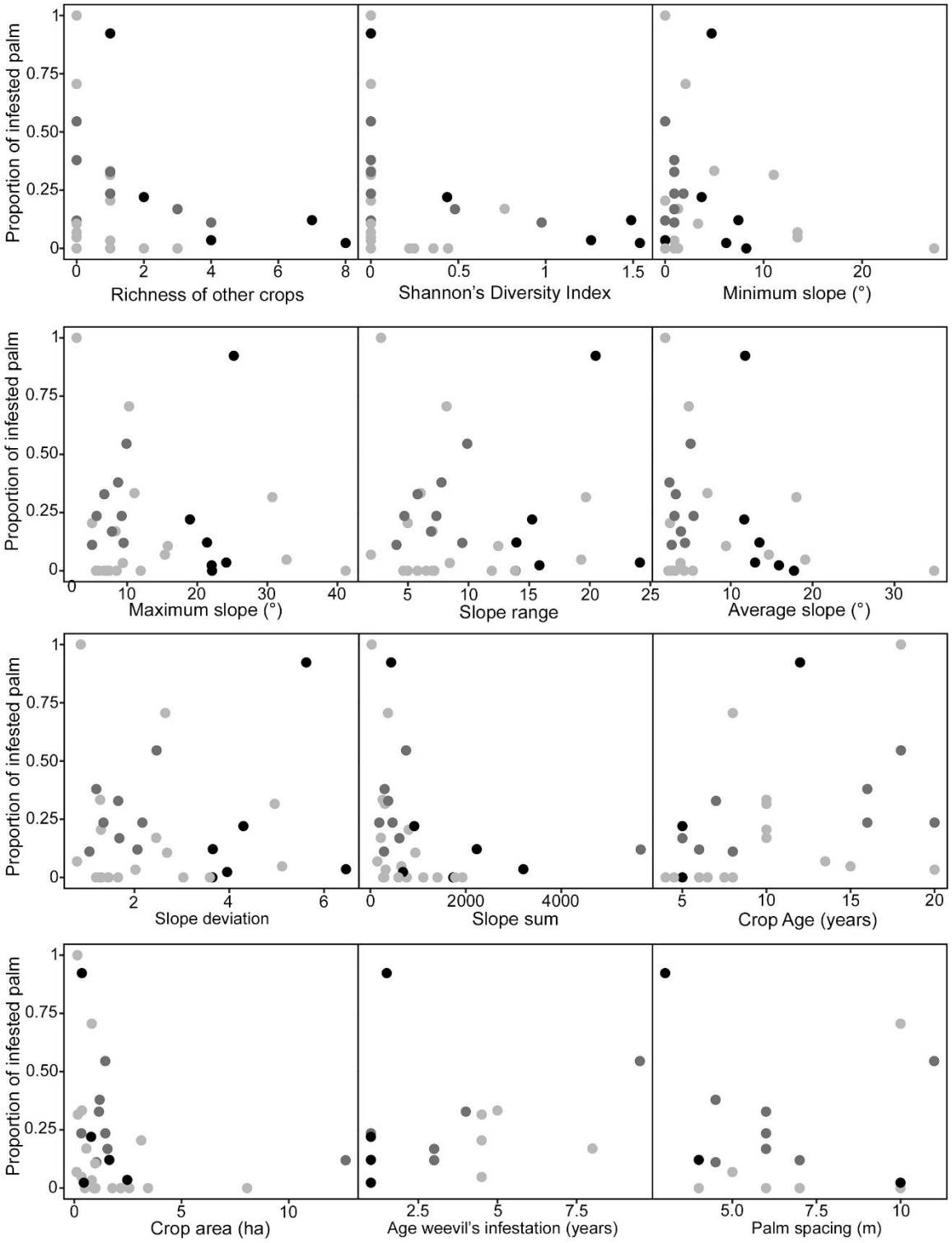


Figure S3. Scatterplots of the proportion of peach palm infested by *D. borassi-R. palmarum* with respect to explanatory variables at local scales (quantitative variables) (Table S2). Andes: black points, Pacific: dark gray points, Amazons: light gray points.

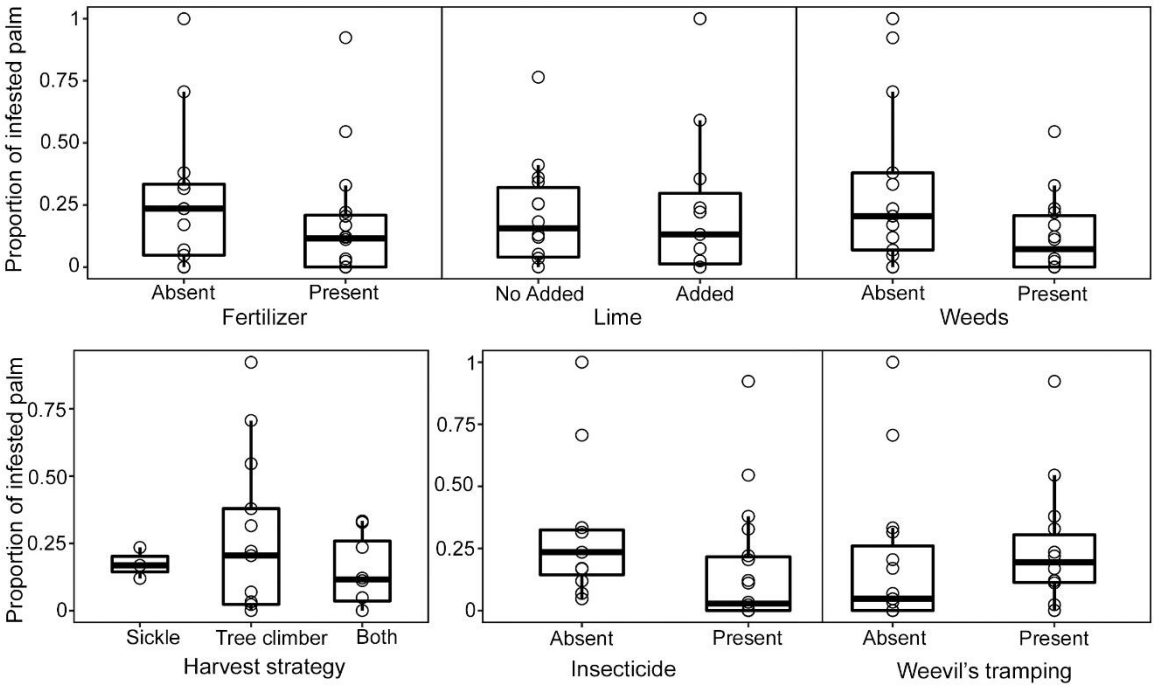


Figure S4. Box plots and data distribution (circles) of the proportion of peach palm infested by *D. borassi-R. palmarum* with respect to explanatory and local qualitative variables (Table S2).

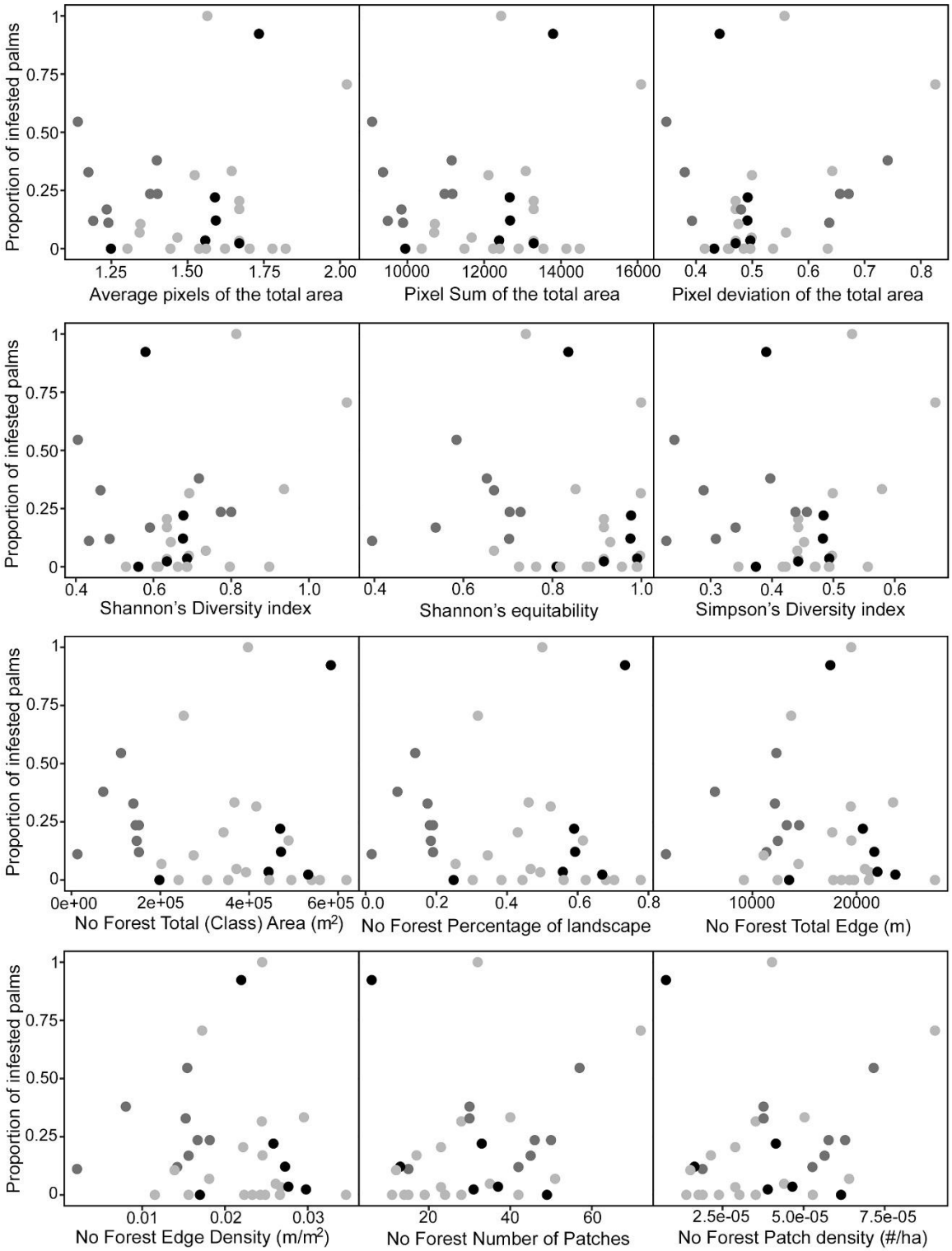
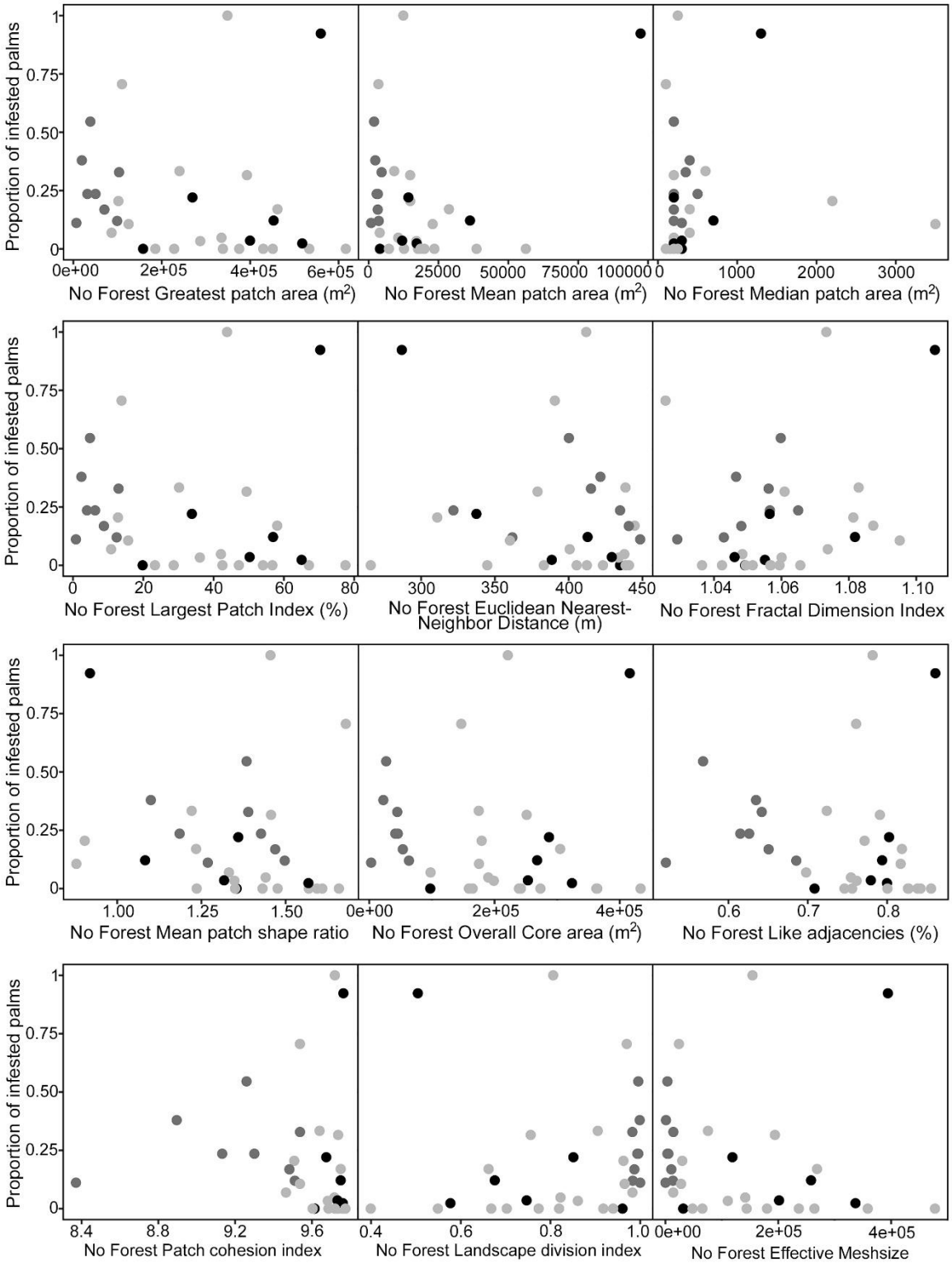


Figure S5. Graph plotting of infested Peach Palm proportion by *D. borassi-R. palmarum* with respect to the landscape explanatory variables (Table S5). Black points: Andes; Dark gray points: Pacific; Light gray points: Amazons.



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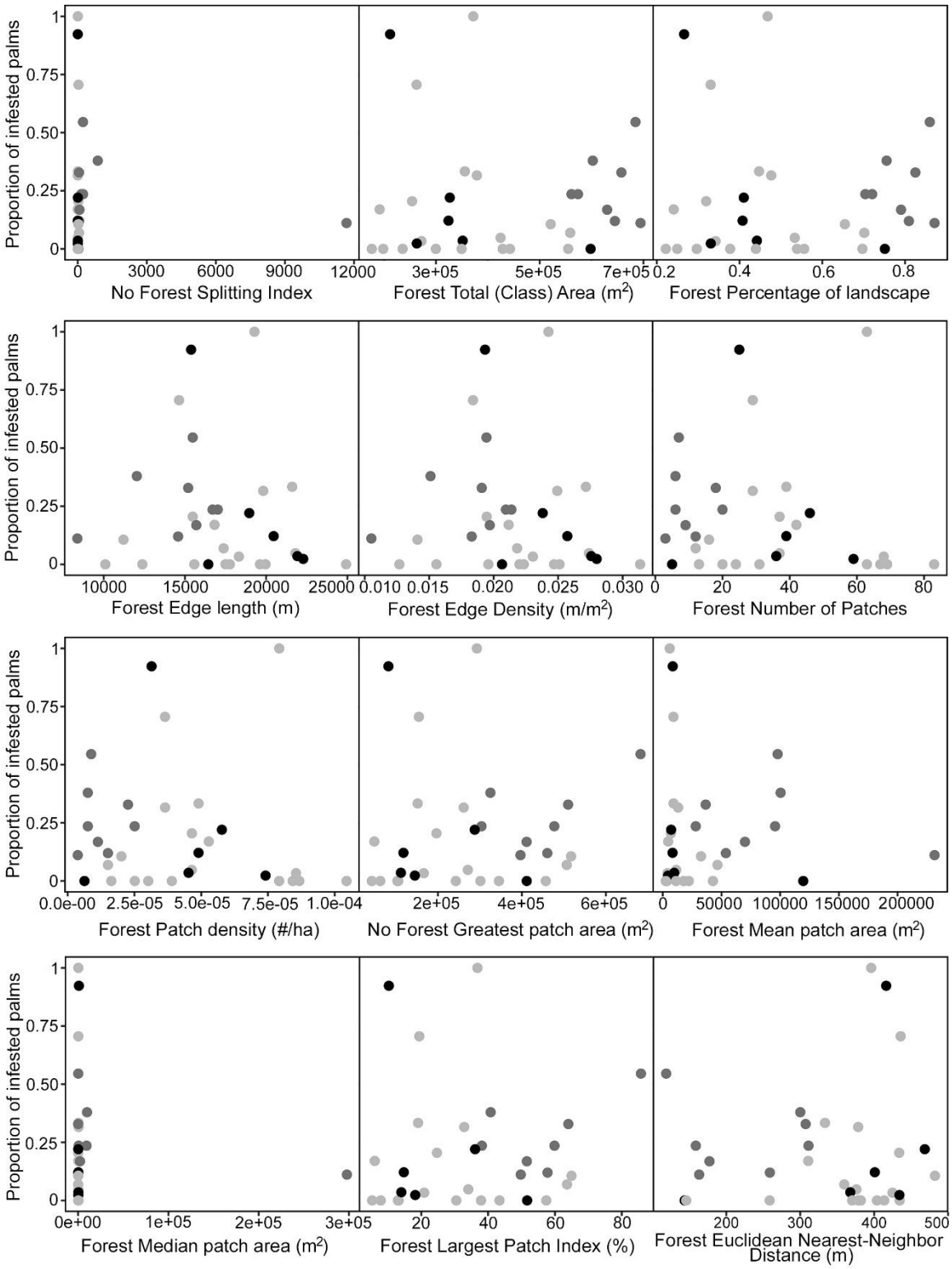

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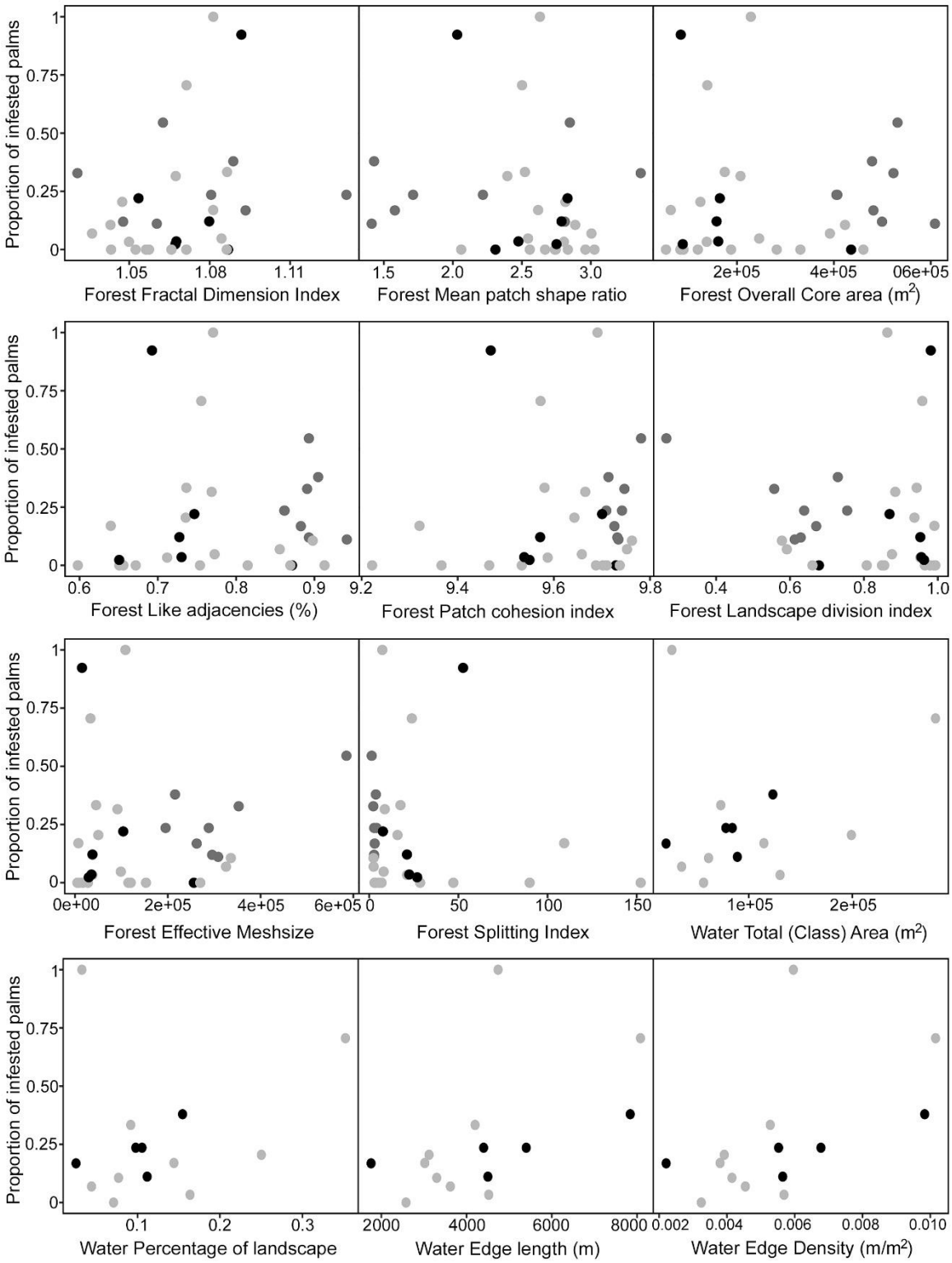

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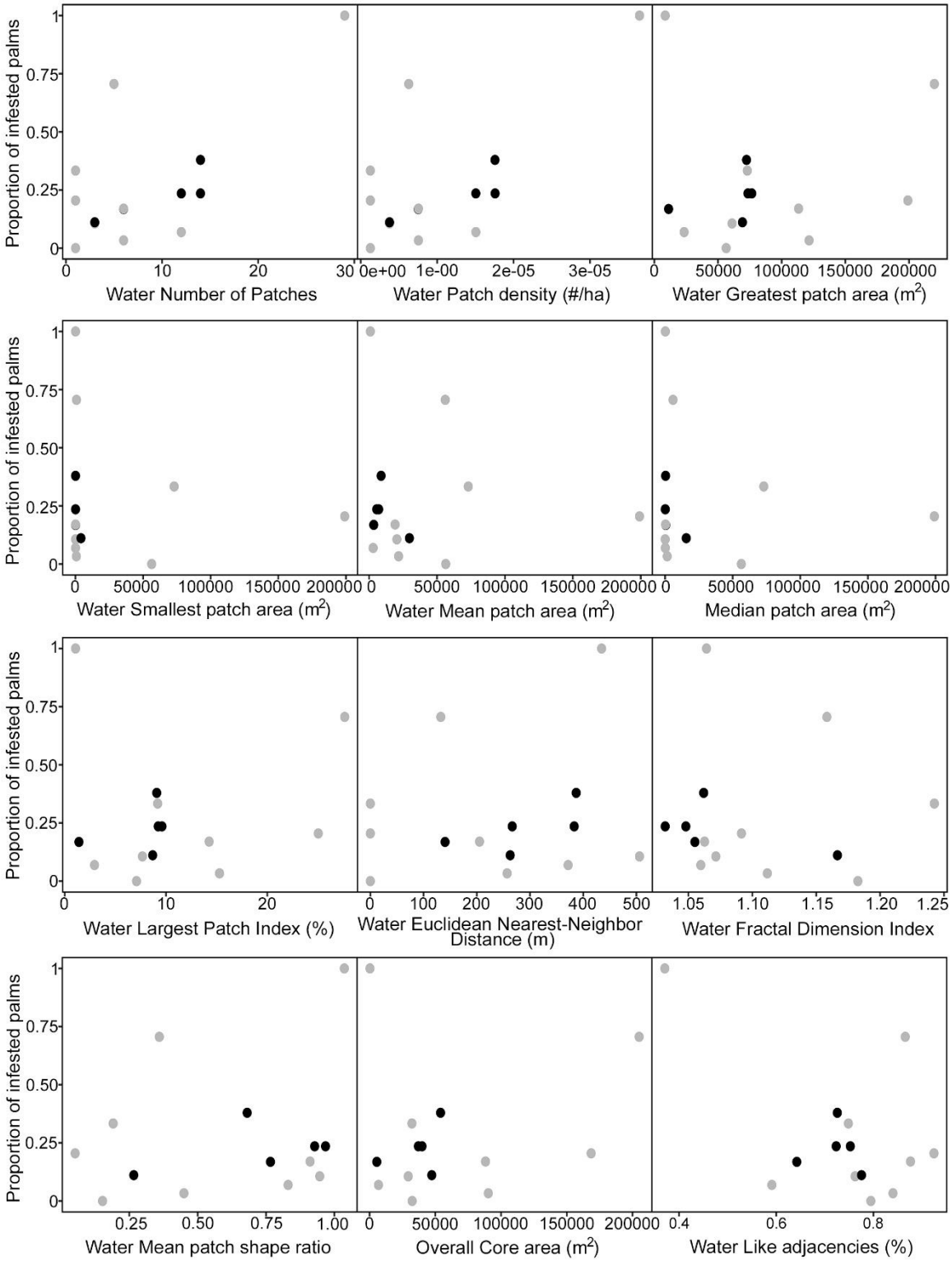

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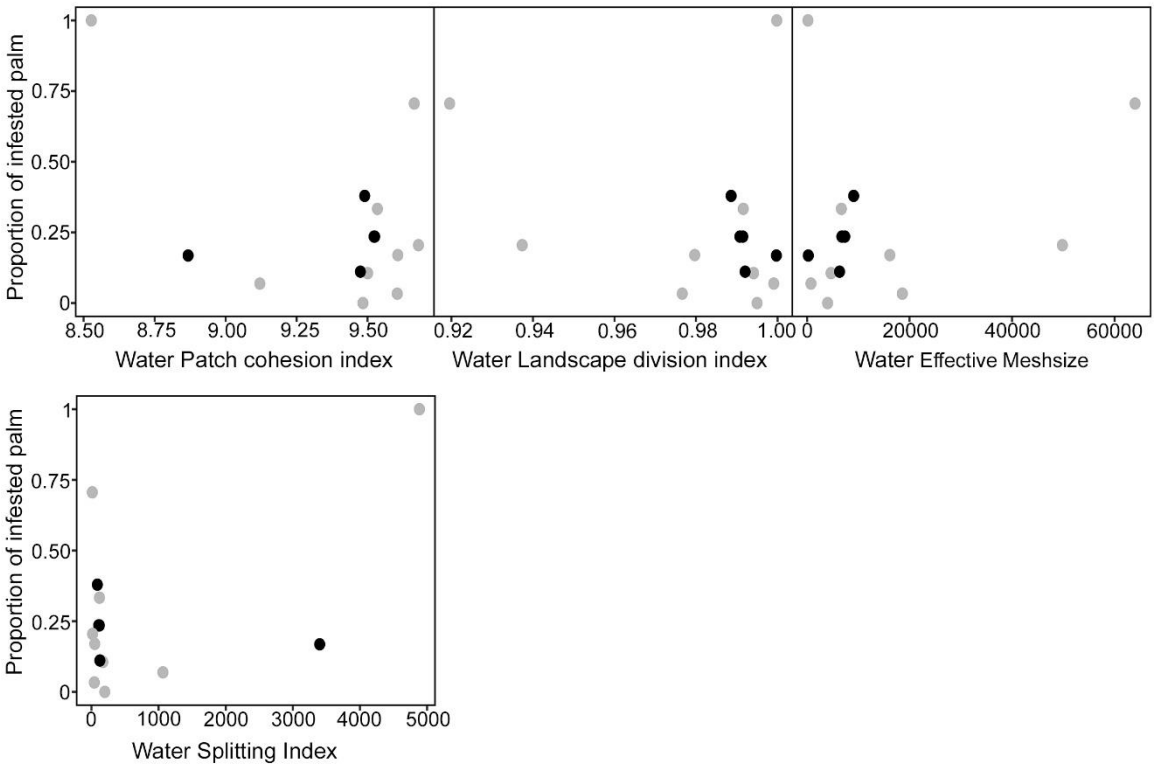

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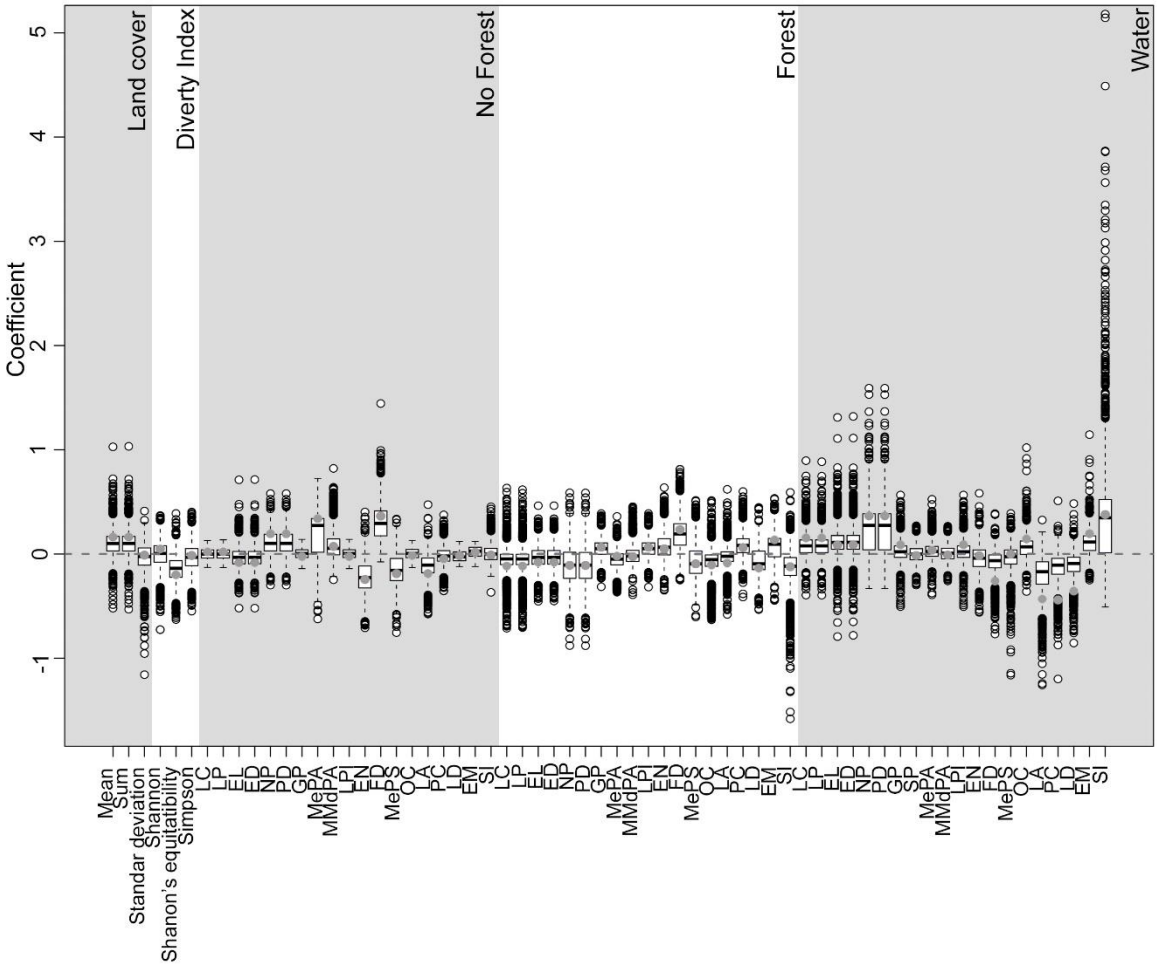


Figure S6. Boxplots and distributions of non-parametric Bootstrap for Partial least squares Regression generalized linear models of infested Peach Palm proportion by *D. borassi-R. palmarum* with respect to landscape variables (Table S5).

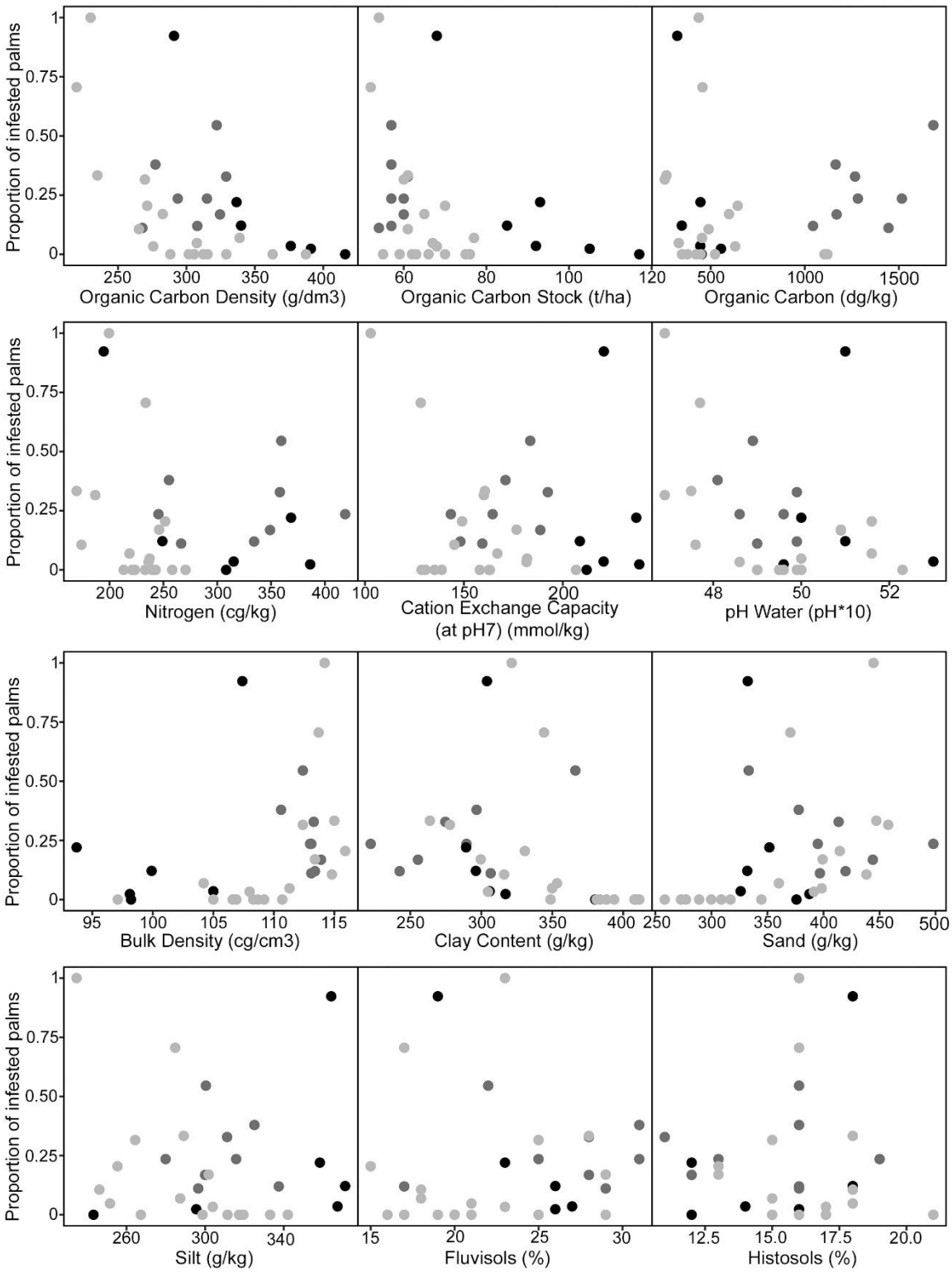
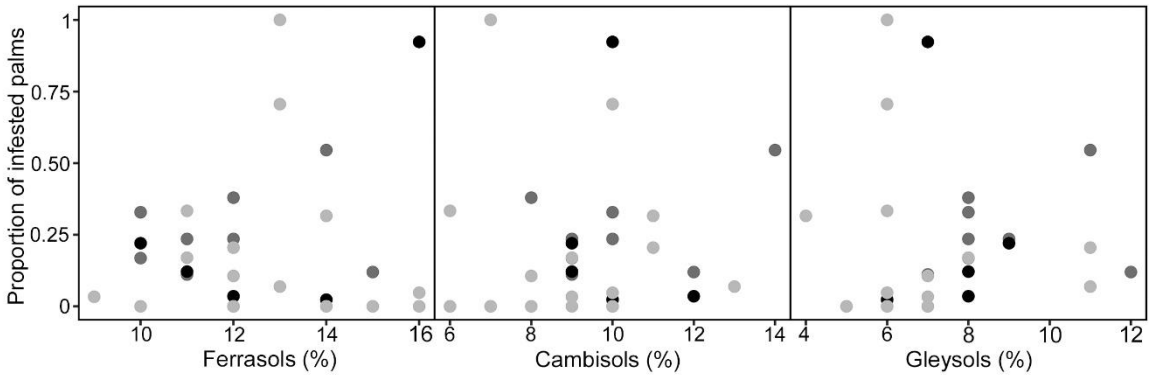


Figure S7. Graph plotting of infested Peach Palm proportion by *D. borassi-R. palmarum* with respect to the soil variables (Table S6). Black points: Andes; Dark gray points: Pacific; Light gray points: Amazons.



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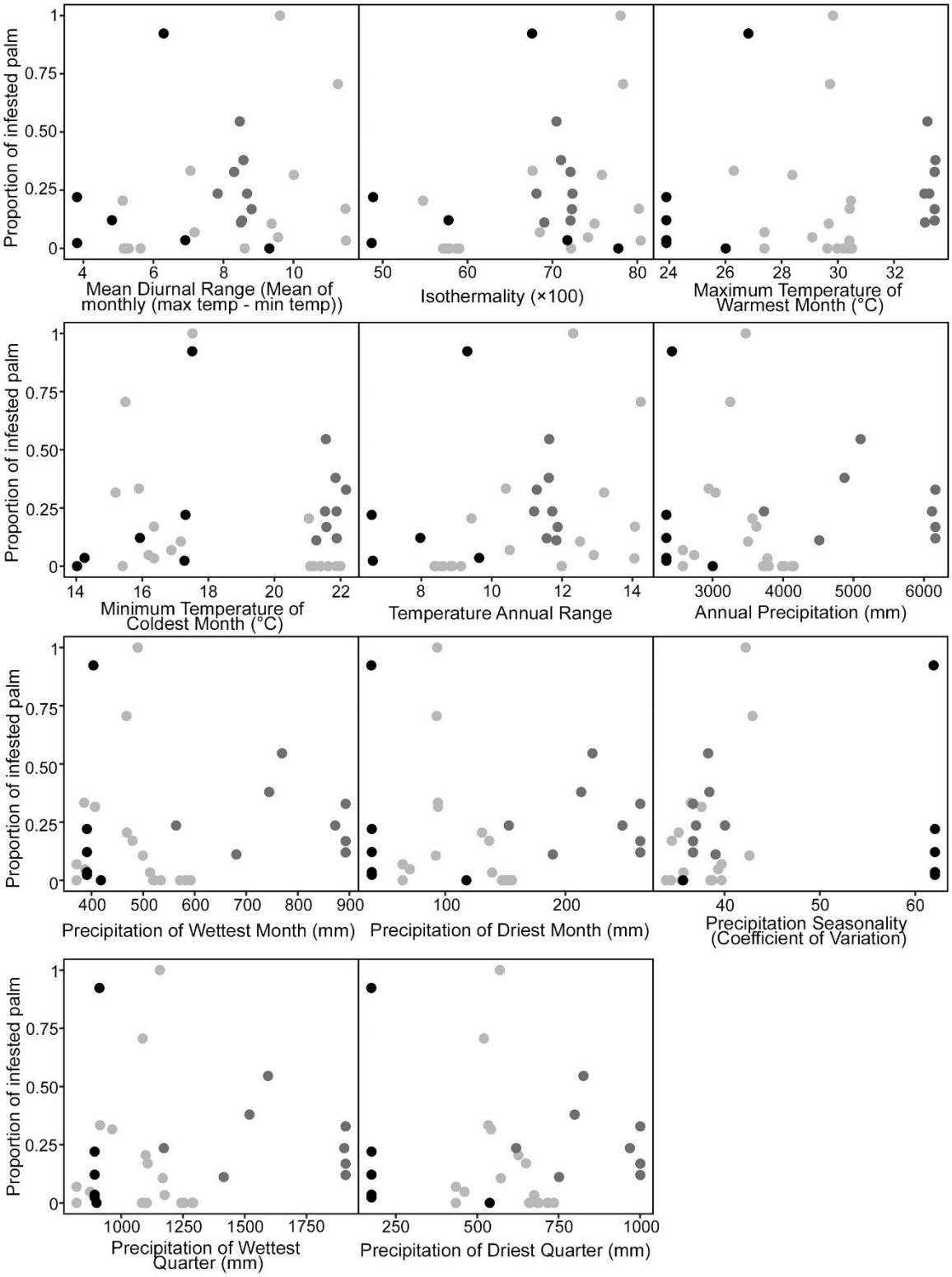


Figure S8. Graph plotting of infested Peach Palm proportion by *D. borassi-R. palmarum* with respect to the climatic variables (Table S3). Black points: Andes; Dark gray points: Pacific; Light gray points: Amazons.

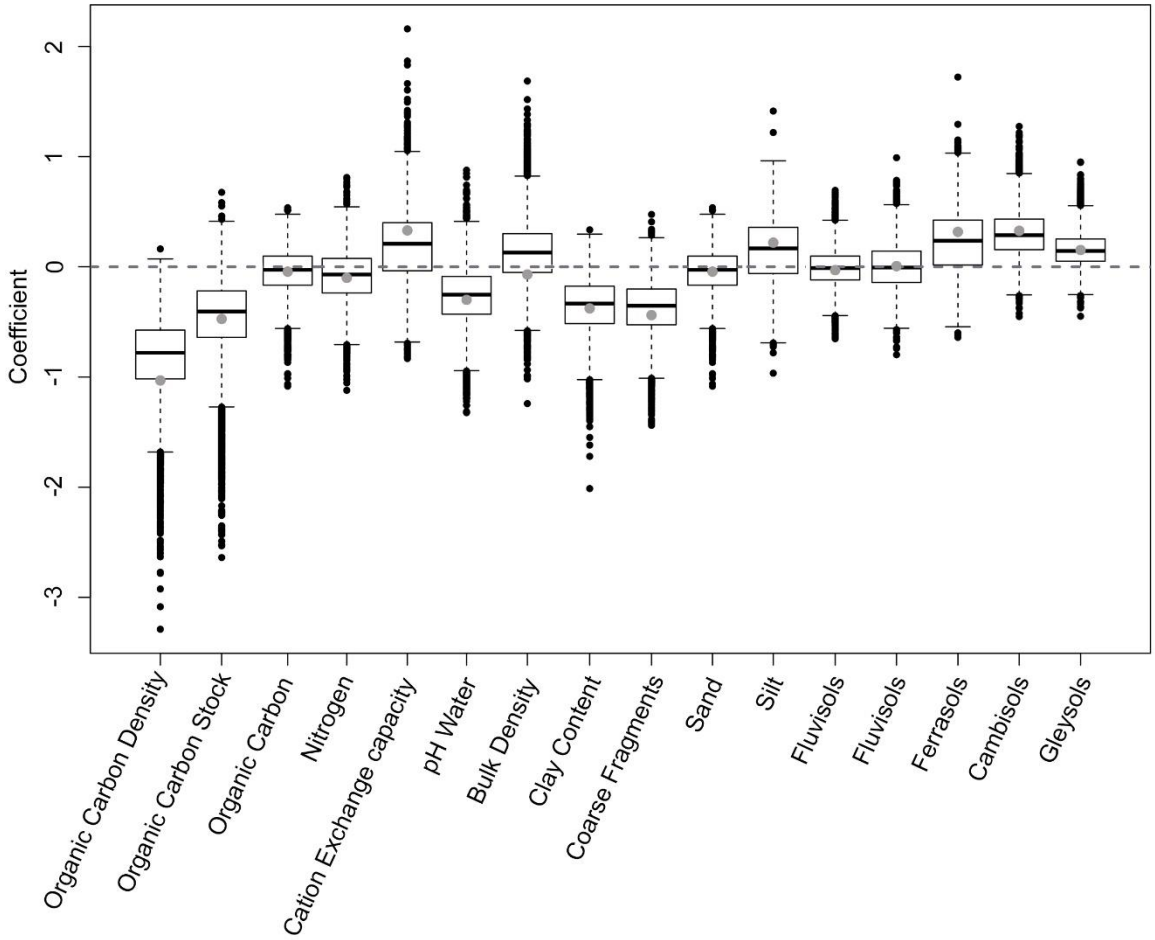


Figure S9. Boxplots and distributions of non-parametric Bootstrap for Partial least squares Regression generalized linear models of infested Peach Palm proportion by *D. borassi-R. palmarum* with respect to soil variables (Table S6).

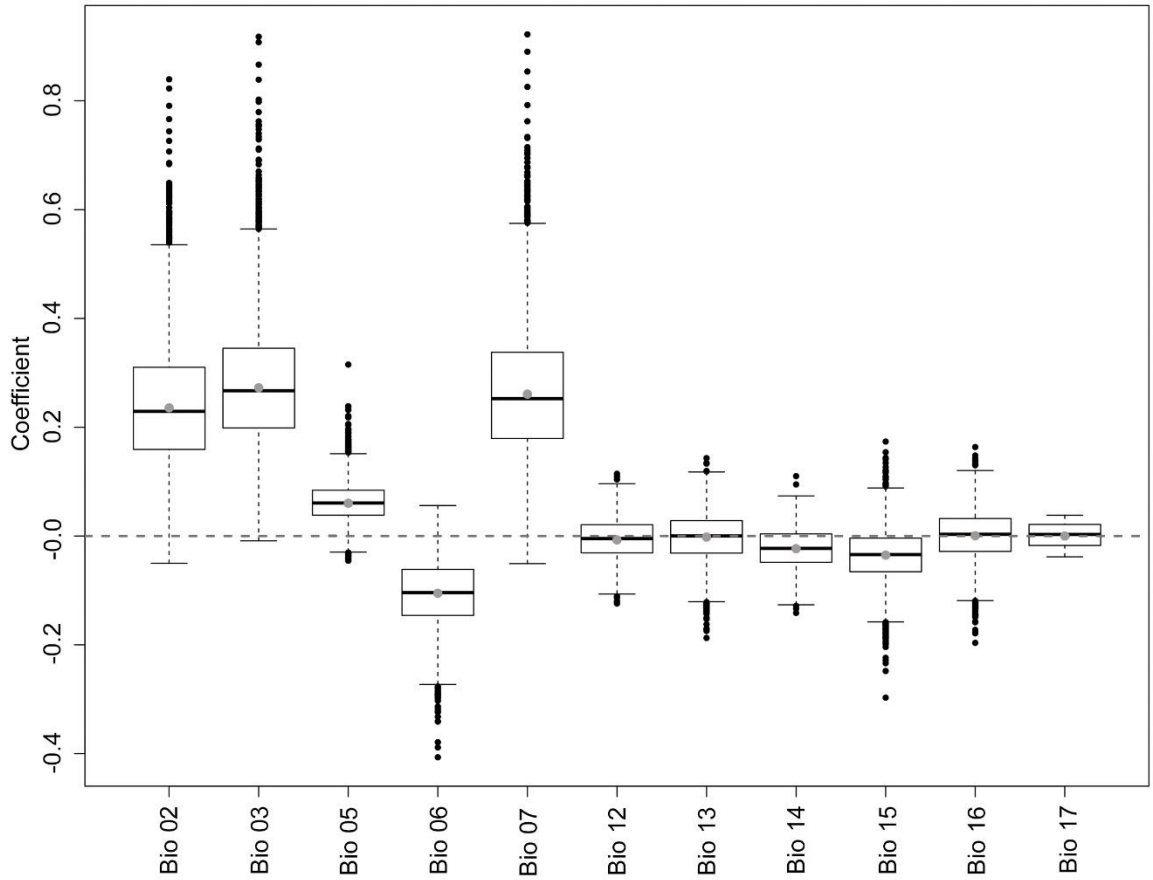


Figure S10. Boxplots and distributions of non-parametric Bootstrap for Partial least squares Regression generalized linear models of infested Peach Palm proportion by *D. borassi-R. palmarum* with respect to climatic variables (Table S3).

Chapter 3. Morphological and genetic variation of *Dynamis borassi* and *Rhynchophorus palmarum* populations according to host plant and geography.

Manuscript in preparation:

2. VÁSQUEZ-ORDÓÑEZ, A. A., Castañeda, M. R., Marin, D.V., Urcuqui, D., Löhr, B. L., Becerra Lopez-Lavalle, L.A. Morphological and molecular taxonomy of palm weevils *Rhynchophorus* and *Dynamis* (Coleoptera: Curculionidae: Dryophthorinae), and their geographical plant host variation in morphology and genetics.

1. VÁSQUEZ-ORDÓÑEZ, A. A. A global database of the genera *Rhynchophorus* and *Dynamis* (Coleoptera: Curculionidae: Dryophthorinae): geographical distribution, molecular data, and morphology.

Events:

3. VÁSQUEZ-ORDÓÑEZ, A. A., Armbrecht, I., Montoya-Lerma, J., Torres, W., Monmany-Garzia, A. C, Löhr, B. L. 2021 (Video-poster). Ecological and evolutionary explanations for a new interaction between stem borer weevils (*Dynamis borassi* and *Rhynchophorus palmarum*) and peach palm (*Bactris gasipaes*) in a tropical agroecosystem. Virtual Meeting of the Association for Tropical Biology and Conservation (ATBC). July 21-23. ATBC (Supplementary material 5) (Appendix 5).

2. VÁSQUEZ-ORDÓÑEZ, A. A. 2021 (Presentation). Ecological and evolutionary explanations for a new interaction between stem borer weevils and peach palm (*Bactris gasipaes*). Seminario Internacional Intercambio Científico 2020-2021. June 02. Universidad del Quindío, Universidad Técnica de Cotopaxi y Universidad Regional Amazónica; Colombia and Ecuador (Appendix 6).

1. VÁSQUEZ-ORDÓÑEZ, A. A., Marin, D.V., Urcuqui, D., Löhr, B., Becerra Lopez-Lavalle, L.A. 2021 (Presentation). Molecular taxonomy of palm weevils

Rhynchophorus and *Dynamis* (Coleoptera: Curculionidae: Dryophthorinae), and their geographical variation in morphology and genetics. Encontro de Coleoptera. March 15-19. Coleopterist Society, Brazil. (Appendix 9).

Awards and fellowships:

1. Student Fellowships: registration-waiver grants. 2021. Annual Virtual Meeting, Association for Tropical Biology and Conservation (Appendix 10).

Abstract

The peach palm (*Bactris gasipaes*) has colonized recently by the weevil *D. borassi* in Colombia. The individuals of this weevil collected inside of peach palm (21) were smaller of one reared from *Oenocarpus bataua* independent of geography. For these, 17 lineal measurements were documented and analyzed with principal component analysis (PCA). The addition, by PCA analysis, 111 museum specimens demonstrated that those from Pacific region were closer to one specimen from *O. bataua* while those from Andes were to the peach palm. A similar result was detected in *R. palmarum,* but in this case smaller individuals were associated with sugarcane respect to peach palm and *Bismarkia nobilis* independent of geography. The phylogenetic analysis of *R.* palmarum demonstrated that weevils from sugarcane were monophyletic and genetically different. The reduction of body size in both species could suggest that new plants colonized by these species restrict the development of their immature stages. This explanation has been suggested in other insect studies in field and selection experiment. The pattern detected in two palm weevils could help to understand the great capacity of these beetles to colonize new hostplants.

Key words: Host-shift, development, size, morphometry, COI gen, genetic distance, phylogeny.

Resumen

La palma de chontaduro (*Bactris gasipaes*) ha sido colonizada recientemente por el picudo *D. borassi* en Colombia. Los individuos de este picudo recolectados en el interior de la palma de chontaduro (21) fueron más pequeños que uno obtenido de *Oenocarpus bataua*, independiente de la geografía. Para esto, se documentaron y analizaron 17 medidas lineales con un análisis de componentes principales (PCA). Al adicionar 111 especímenes de museo al PCA se demostró que aquellos procedentes de la región Pacífica estuvieron más cercanos al especimen de *O. bataua* mientras que aquellos de los Andes a los de palmas de chontaduro. Un resultado similar fue observado en *R. palmarum*, pero en este caso los individuos pequeños provenían de caña de azúcar respecto a aquellos procedentes de la palma de chontaduro y de *Bismarkia nobilis*, independiente de la geografía. En el análisis filogenético, se demostró que los picudos *R. palmarum* de caña de azúcar fueron monofiléticos y genéticamente diferentes. La reducción del tamaño corporal en ambas especies podría sugerir que las nuevas plantas colonizadas por estas especies restringen el desarrollo de sus estadios inmaduros. Esta explicación ha sido sugerida para otros insectos estudiados en campo y experimentos de selección. El patrón detectado en los dos picudos de las palmas ayudará a entender la gran capacidad que tienen estos escarabajos para colonizar nuevos hospederos.

Palabras claves: Cambio de hospedero, desarrollo, tamaño, morfometría, gen COI, distancia genética, filogenia.

Chapter 3. Morphological and genetic variation of *Dynamis borassi* and *Rhynchophorus palmarum* populations according to host plant and geography.

Introduction

Herbivorous insects are associated with approximately 300.000 species of vascular plants (Schoonhoven et al., 2005), which shows that insects have a high capacity to colonize new host plants. Successful colonization requires the insect to overcome different plant defensive strategies and food availability. One of the mechanisms of adaptation used by insects is to modify their development, which allows them to complete their cycle regardless of the nutritional or ecological characteristics of the host plant. This process has been documented in the moth *Operophtera brumata* in field conditions, because its adults were smaller in recently colonized plants, which is explained by an insufficient nutritional quality of the new host (Vanbergen et al., 2003). Similarly, the experimental host shift of the beetle *Callosobruchus maculatus* since ancestral host (mung bean) to novel host (cowpea) produced the body size reduction (Messina, 2004). Again, it is considered that the limitation of the food resource explains this morphological change. There are no other similar reports in other groups of insects, even though hundreds of new interactions between insects and plants are documented annually.

The genus *Dynamis* has three species in the neotropical region (Wibmer and O'Brien, 1986), all associated with unopened inflorescences of nine palm species (Couturier et al., 1998; Bautista-Giraldo et., 2020). Nevertheless, there are three reports that this species also develops in the stem (Couturier et al., 2000; Pardo Locarno et al., 2005; Beserra et al., 2006). In Brazil, the infestation occurred in an experimental plantation of *Oenocarpus mapora* (Couturier et al., 2000; Oliveira et al., 2000), where the larvae moved to the stem after eating the inflorescence. The illustrated specimen of this attack is smaller (Couturier et al., 2000) compared to the others presented in the redescription of the species in the American continent (Wattanapongsiri, 1966).

In Colombia, *D. borassi* was found in a new host plant association with the domesticated peach palm (*Bactris gasipaes*) since 1996 (Pardo Locarno et al., 2005), and with widespread attacks across the country since 2010 (Gaviria et al., 2021). In this case, there are no reports of the body size of weevils, but because of the similar size of inflorescences of *B. gasipaes* and *O. mapora*, changes in body size might expected on the new host as well.

A similar situation has been observed with *Rhynchophorus palmarum*, which is phylogenetically related with *D. borassi* (Chamorro et al., 2021). This weevil is known to attack thirteen palm species (Löhr et al., 2015; Milosavljević et al., 2019, Löhr, pers. comm.). However, one population of the Cauca River Valley infests sugarcane since 1940 (Verano, 1940). There are no other similar reports in the rest of its geographical distribution. In the sugarcane growing region, morphological variation in the color and buccal structures have been reported in a few individuals (Löhr et al., 2015). Additionally, the specimens reported in 1940 are smaller (Verano, 1940) with respect to those reported in the redescription of the species in different localities and host of American continent (Wattanapongsiri 1966). It has also been demonstrated that the life cycle duration in sugarcane was shorter that for those developing in palms (Hagley, 1965; Restrepo et al., 1982; Mexzón et al., 1994; Löhr, 2016).

Host-mediated morphological changes may be accompanied by genetic differentiation. This was evident in the selection experiment of *C. maculatus* mentioned previously, where the genetic divergence was reflected in fitness-related characteristics such as size (Messina, 2004). In other studies, the genetic divergence associated with a host shift has been demonstrated using complete genome and gene (such as COI) analysis (Vertacnik & Linnen, 2017). Divergence in the COI gene was also detected in invasive populations of the beetle *C. maculatus* in Asia, whose genetic structure is mainly maintained by hostplant association (Tuda et al., 2014). Another case is the moth *Spodoptera frugiperda* with a COI gene differentiation according to crop species in a local population of Colombia (Saldamando & Vélez-Arango, 2010). In the aphid genus *Hyalopterus,* three differing

COI gene lineages showed a close association with their host plant species (Lozier et al., 2007). Such a molecular change can be investigated in *R. palmarum*, since there is a reference database of these weevils on sugarcane (Löhr et al., 2015), which can be compared with those from palms from Colombia.

The purpose of this work is describing the morphological and molecular differentiation the Colombian southwest populations of *D. borassi* according to new host plant association with peach palm, as well as documenting a similar morphological and molecular pattern in *R. palmarum*.

Material and methods

Ethical considerations

The Ministry of Interior in Colombia confirmed that a priori consultation of communities for developing the present investigation was not necessary. The specimens reviewed are deposited in the Entomological Collections with National Registry of Biological Collections in Colombia.

Sample collection and specimen's origin

A total of 23 adults of *D. borassi* and 108 *R. palmarum* specimens from Colombia with varying host plant species association were examined. The taxonomic identification was corroborated with morphological identification keys and descriptions (Wattananpongsiri, 1966; Vásquez-Ordóñez et al., 2020). The *D. borassi* samples come from peach palm (15 females, 7 males) and *O. bataua* (1 female), while *R. palmarum* was collected from peach palm (27 females, 16 males), sugarcane (27 females and 32 males) and *Bismarckia nobilis* (1 female and 5 males). The peach palm and *B. nobilis* samples were found in pupal stage inside damaged palms, removed, and kept in boxes until adults emerged. These were mounted on entomological pins. The sugarcane specimens were available in the CIAT Arthropod Reference Collection. The peach palm specimens were

collected from May to November 2018 in Buenaventura, Valle del Cauca, and El Tambo, Cauca, respectively, in February 2019 in Florencia, Caquetá, and December 2020 to June 2021 in Palmira, Valle del Cauca (Gaviria et al., 2021; Figure 1, Supplementary material Table S1). The specimens from *B. nobilis* were collected in April 2021 in Cali, Valle del Cauca (Figure 1). The 43 sugarcane specimens were all collected in the middle of sugarcane fields at the International Center for Tropical Agriculture headquarter from 2012 to 2013 in Palmira, Valle del Cauca, where this species has been documented to occasion damage (Löhr et al., 2015). Furthermore, 111 *D. borassi* and 182 *R. palmarum* without host plant information were investigated. These specimens were collected in Chocó, Caquetá, Cauca, Putumayo, and Valle del Cauca departments (Figure 1) and deposited in the entomological collection of Universidad del Valle (MUSENUV) and Centro de Investigación de la Caña de Azucar de Colombia (Cenicaña), Valle del Cauca, Colombia.

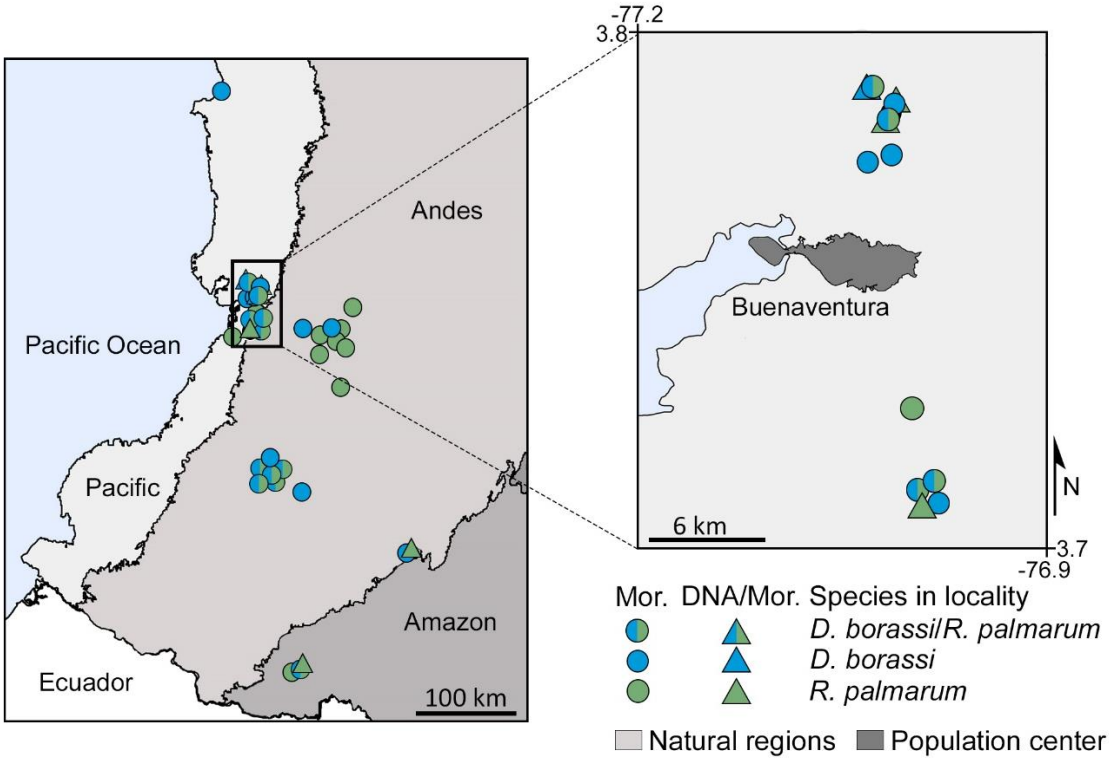


Figure 1. Distribution of *Dynamis borassi* and *Rhynchophorus palmarum* adults used for morphometric and molecular analysis in Colombia.

Finally, one *D. borassi* and seven *R. palmarum* specimens were selected for the COI gene analysis (see COI gene analysis section). The *D. borassi* individual and the five of *R. palmarum* were collected inside of peach palms from May to July 2018 in Buenaventura, Valle del Cauca. The other two *R. palmarum* were collected in pheromone traps in peach palm fields in Florencia, Caquetá and Villagarzón, Putumayo from January to February 2019, respectively (Figure 2). In addition, 914 COI gene sequences were downloaded from the GeneBank and Bold database. The taxonomic identification, hostplant, and geographical information were compilated (Supplementary material Table S2). For the sequences without geographical coordinates a georeferencing process was developed following to Vásquez-Ordóñez et al. (2015). In these cases, the more specific locality names were searched in Google maps. The administrative division used for georeferencing was indicated.

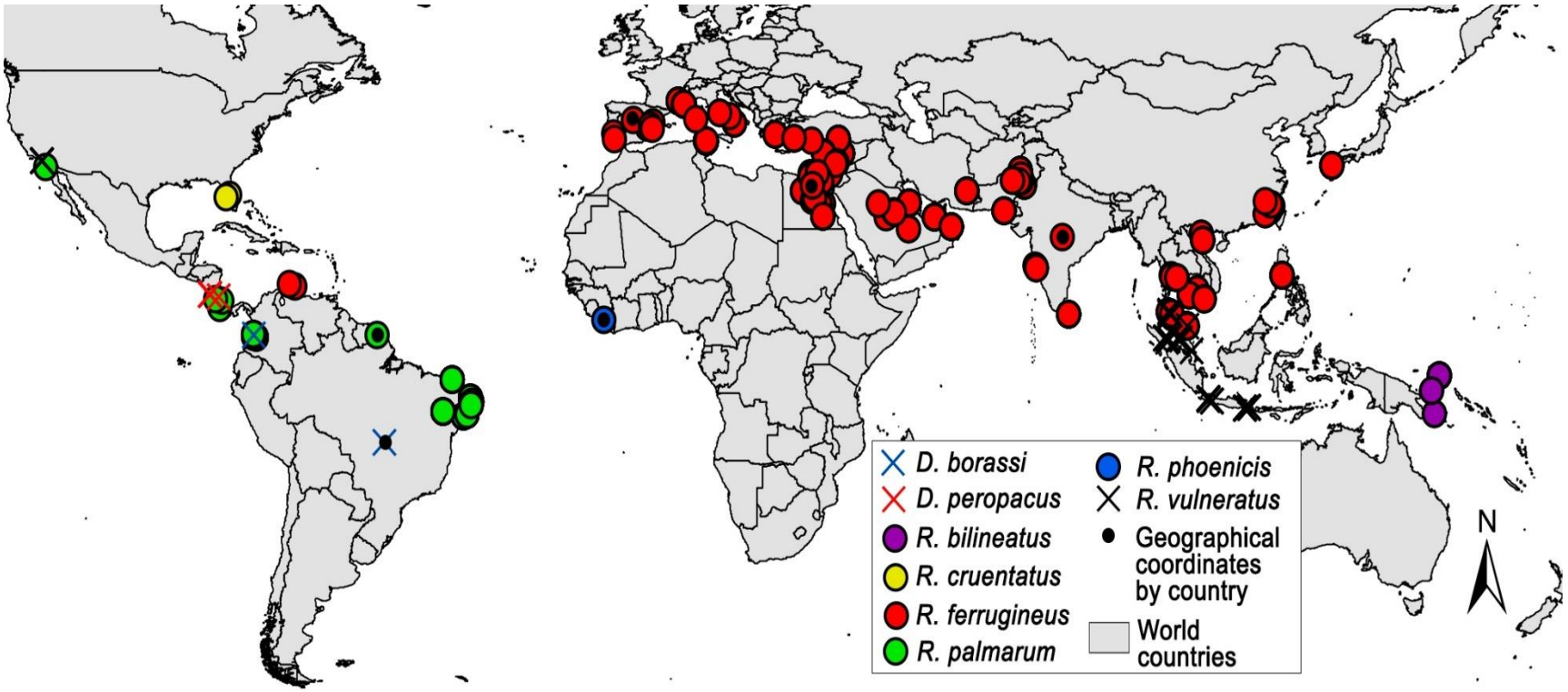


Figure 2. Origin places of the 924 COI sequences of two species of *Dynamis* and six species of *Rhynchophorus* examined in this study from own collections and GeneBank and Bold databases. Small black points represent geographical coordinates from larger areas such as country.

Linear morphometric analysis

Seventeen linear morphometric measurements were taken from head, thorax, and abdomen (Table 1, Figure 3), on 134 adults of *D. borassi* and 290 *R. palmarum* following the procedure of Tambe et al. (2013), Sazali et al. (2019), and Löhr et al (2015). The observations were made with a Nikon SMZ745 and Olympus SZX7 stereomicroscope fitted with an ocular micrometer. Two databases were constructed for each species by sex. One of them included all specimens and the other exclusively those with knowledge of the plant host (19 *D. borassi* and 97 *R. palmarum*) (Supplementary material Table S1). The samples were grouped in Pacific, Amazon, Low Andes, and High Andes natural region to allow for a comparison of the regions. The Andean population were grouped according to the altitude above sea level, with those from Timbío and El Tambo municipalities (Cauca) with elevations greater than 1.100 m, while those from the Cauca River Valley came from elevations below 1.100 m (Figure 1). The databases were examined with principal component analysis (PCA). In the female *D. borassi* analysis, an individual was removed because information for two characters were missing, while in the male analysis, a character was removed because it was not present in the only individual collected in the native palm. Posteriorly, the sex dimorphism of the weevil individuals of both species was evaluated, as well as the *R. palmarum* differentiation according to host plant. In these cases, a new PCA analysis was performed to estimate the most important variable for each principal component. The contribution of each character was estimated for each principal component (Supplementary Material Table S3 and S4). For the most important characters, the normality and homoscedasticity of the data were determined (Supplementary Material Table S5 and S6), for developing of ANOVA and Kruskal-Wallis statistics. For *R. palmarum*, the body size was compared with those values reported by Verano (1940, Supplementary Material Table S1). The analysis was conducted with “car”, “carData”, “psych”, “ggplot2”, “ggfortify”, “FactoMineR”, and “factoextra” libraries in R project (R Core Team, 2019).

Table 1. List of linear morphometric measurements performed in *Dynamis borassi* and *Rhynchophorus palmarum* from Colombia.

Body part	Acronym	Description
Head	MVDAS	Maximum ventral distance between antennal scrobes
	DIS	Dorsal interocular space
	WRB	Width of rostrum at base
	LLAS	Length of the last antennal segment
	WLAS	Width of the last antennal segment
	RL	Rostrum length
	DRS	Distance between the apex of the face and the apex of the scrobe.
Thorax	PL	Pronotum length
	PW	Pronotum width
	PtL	Protibia length
	EL	Elytra length
	EW	Elytra width
	MD	Mesocoxal distance
	ML	Mesofemur length
Abdomen	AB	Abdomen length: sum of the lengths of the elytra and pygidium.
	PyL	Pygidium length
Body	BL	Body length: sum of the lengths of the pronotum, elytra, and pygidium.

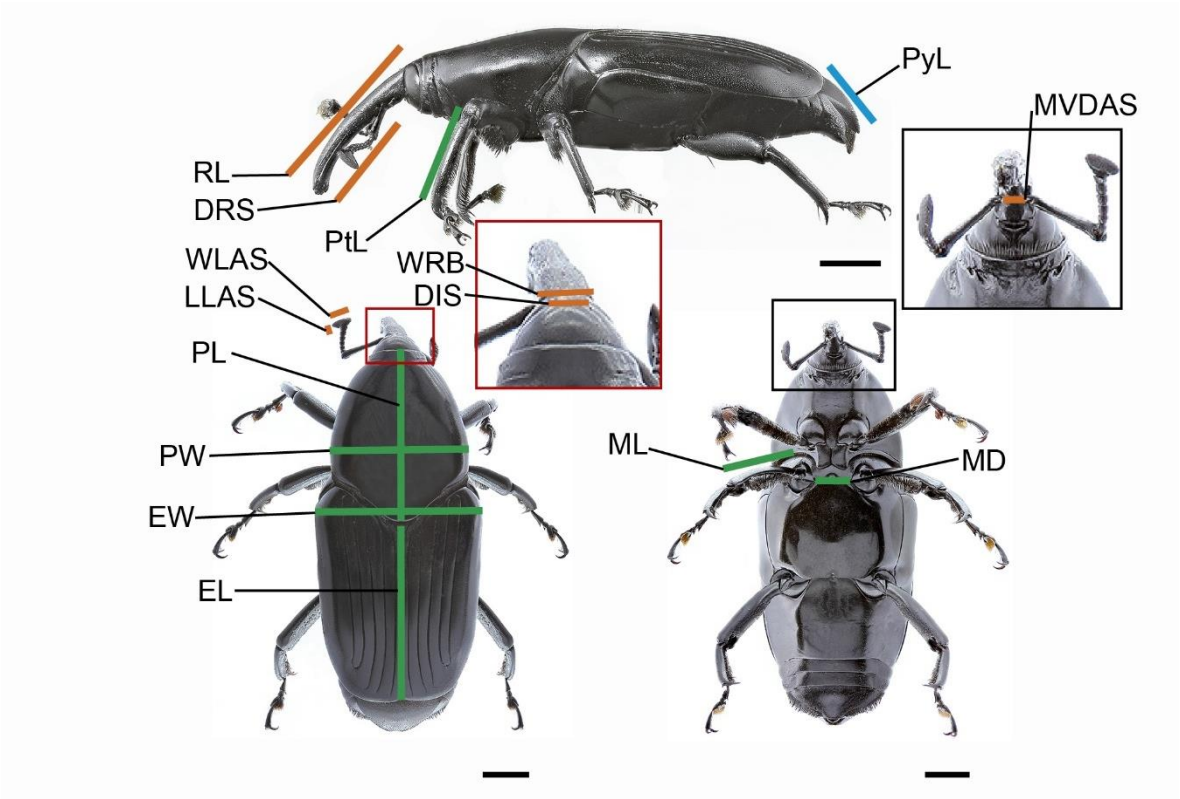


Figure 3. Illustration of 15 linear morphometric measurements taken on *Dynamis borassi* and *Rhynchophorus palmarum* from Colombia. See table 1 for the extended version of each acronym. The photos show *D. borassi* and the scale is 5 mm.

COI gene analysis

The genomic DNA was extracted from weevil adults and larvae of *D. borassi* (47) and *R. palmarum* (117), using a modified cetyltrimethylammonium bromide method (CTAB, Doyle and Doyle, 1990). For the adults, the hind and middle legs on the right-hand were used, while for the larvae, a portion of the thorax and abdomen was excised. The modifications of CTAB method were: 1) inclusion of proteinase K prior to the addition of the extraction buffer; 2) addition of metabisulfite to extraction buffer and 25 M potassium acetate (pH 55) with 20 min in -4°C; 3) one hour in water bath of extraction buffer; 4) substituting chloroform for phenol-chloroform. Subsequently, the DNAs extracted of one individual of *D. borassi* and seven of *R.*

palmarum were amplified of their subunit I – COI. The PCR reactions including: 1) universal DNA primers LCO LCO1490 (5′-GGTCAACAAATCATAAAGATATTGG-3′) and HCO2198 (5′-TAAACTTCAGGGTGACCAAAAAATCA-3′) (Folmer et al., 1994); 2) 12 µL volume using 0.25 U of Platinum® Taq (Invitrogen® Carlsbad, CA); 3) 1× PCR Buffer (buffer composition); 4) 2.5 mM of each dNTP (Promega Corp. Madison, WI); 5) 2.5 mM MgCl2; 6) 20 ng of DNA. The PCR condition was five cycles (40 sec at 94°C, 40 sec at 45°C, and 60 sec at 72°C) followed by 35 cycles (40 sec at 94°C, 40 sec at 51°C, and 60 sec at 72°C) with a final extension period of 72°C for 10 min, using a Mastercycler® pro (Eppendorf, Hamburg, Germany) (Ovalle et al., 2014). Posteriorly, the amplified COI region was cloned into the PGEM®-T Easy vector (Promega Corp.), purifying with SV minipreps preparation (Promega Corp.) (Ovalle et al., 2014). The vectors with their DNA insert were sequenced by Macrogen in both directions using vector primers SP6 and T7. The DNA-barcode sequences were edited with Geneious Prime v2019.1.1 (Biomatters Ltd., Auckland, NZ) to remove the vector and universal primer sequence (Supplementary material Table S2 of the Chapter 1).

In addition, 977 COI gene sequences were downloaded from the GeneBank (963) and Bold (6) database. These sequences corresponded to *D. borassi* (1), *D. peropacus* (4), *R. bilineatus* (15), *R. cruentantus* (3), *R. ferrugineus* (681), *R. palmarum* (151), *R. phoenicis* (2), and *R. vulneratus* (112) (Supplementary Material Table S2). Furthermore, eleven COI sequences from the sub-families Dryophthorynae, Cerambycinae, and Entiminae were also downloaded, which correspond to external groups (Löhr et al., 2015; Supplementary material Table S2). On the other hand, the unique haplotypes were determined with a 100% identity, the haplotype names for *R. ferrugineus* followed El-Mergawy et al. (2011) and Rugman-Jones et al. (2013), while for *R. palmarum* sequences reported by Silva (2016) new codes were proposed (Supplementary material Table S2). An alignment of the sequences and their DNA substitution model were developed with MUSCLE algorithm and Substitution Model function in MEGA v10 software (Tamura et al., 2007; Supplementary material Table S3 of the Chapter 1). The phylogenetic analysis was developed with Bayes and Maximum Likelihood (ML)

considering the best DNA substitution model. The Bayes and ML inference were developed with three replicates in MrBayes 3.2.7 (Ronquist et al., 2012) in Cipres portal (Miller et al., 2010) and W-IQ-TREE (Trifinopoulos et al., 2016) software, respectively. The support values were calculated with 10’000.000 generation for Bayes and 1.000 bootstrap replications for ML. Finally, the intra and interspecific genetic differentiation for *D. borassi* and *R. palmarum* individuals according to hostplant species were calculated with p-distance in MEGA.

Results

The Colombian *D. borassi* males from peach palm were morphometrically similar independent of geography, but different from one collected from the natural host plant *O. bataua* (Figure 4a). The addition of 57 males without host plant record from the Andes and the Pacific in the morphometric analysis grouped the specimen from the Andes close to the individuals from peach palm and those from the Pacific to *O*. *bataua*, respectively (Figure 4b).

All females with host plant information were collected from peach palm, forming a homogeneous group, independent of the geographic region (Figure 4c). The addition of 53 females from Amazon, Andes, and Pacific without a host plant record in the morphometrica analysis resulted in a grouping of the Amazon and Pacific samples apart from the rest, with samples of the Andes associated with those collected in peach palm (Figure 4c). The weevils from peach palm were smaller than those reported by Wattananpongsiri (1966) in the taxonomical redescription of *D. borassi* (Table 2). Finally, the High Andes and Central Pacific presented a marked sexual dimorphism in the body size which is the most important character in the principal component 1 (Figure 5a,d, Table 3), while in the North Pacific the dimorphism was not present (Figure 5b, Table 3).

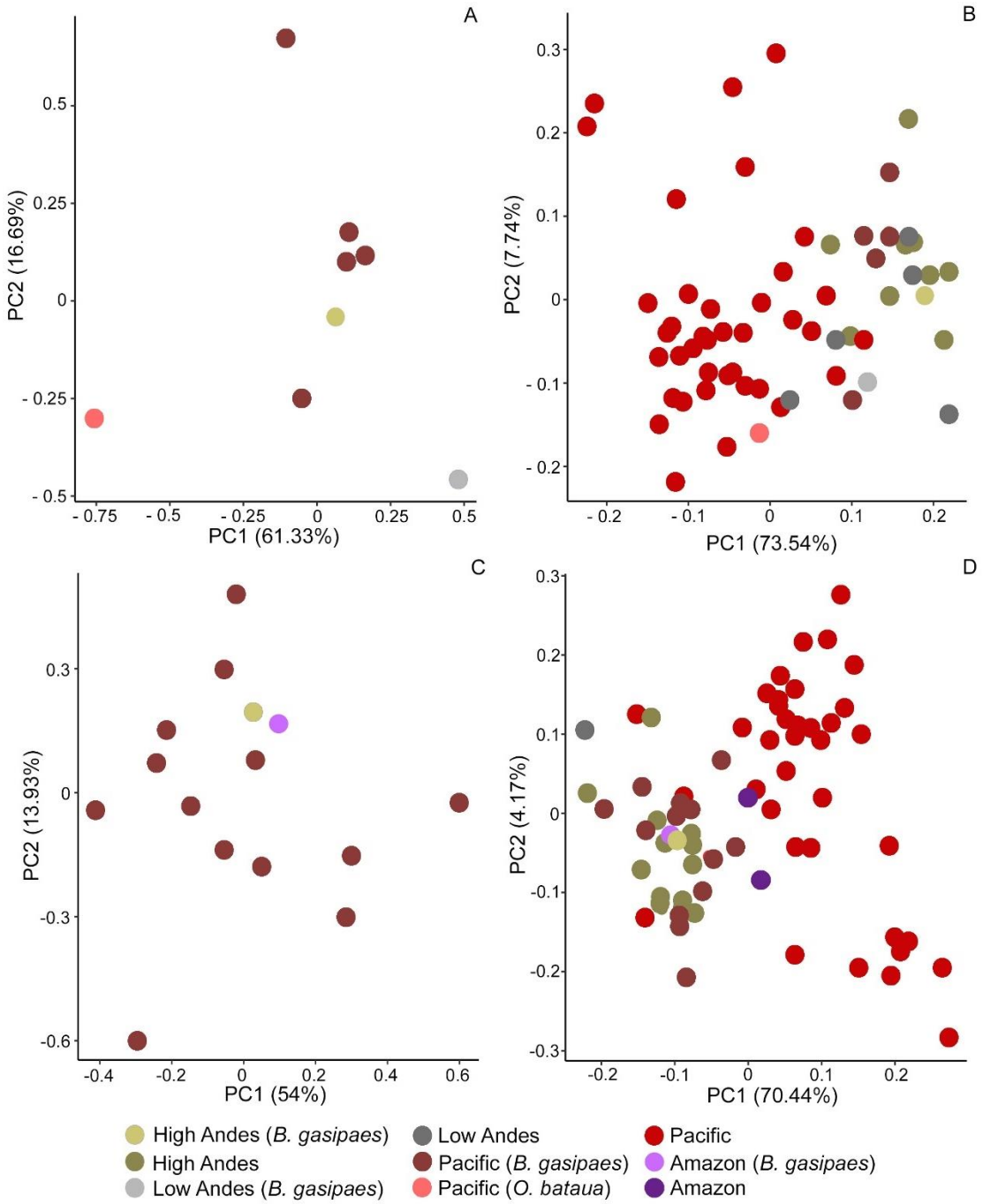


Figure 4. Distribution of *Dynamis borassi* males (A, B) and females (C, D) according to two principal components analyses with 16 morphometric characteristics (See Table 1 and Figure 1 for morphometric description). The figure represented individuals with known host plant (A, C) and with the addition of data without host knowledge (B, D). The host plants were *Bactris gasipaes* and *Oenocarpus bataua*.

Table 2. Mean and range (mm) of body length of *Dynamis borassi* and *Rhynchophorus palmarum* of this study, Wattananpongsiri (1966), and Couturier et al. (2000). The host plants correspond to *Bactris gasipaes*, *Bismarkia nobilis*, *Oenocarpus bataua*, *O. mapora*, and *Saccharum officinarum*. See Table 1 for morphological character description.

Species	Sex	Mean	Range	Hostplant	References
D. borassi	Male	43.23*	-	*O. bataua*	This study
		38.27*	36.57-39.39	*B. gasipaes*	This study
		47.34*	46.00-55.00	-	Wattananpongsiri (1966)
		36.25*	-	*O. mapora*	Couturier et al. (2000)
	Female	36.74*	32.00-39.86	*B. gasipaes*	This study
		44.00*	43.00-45.00	-	Wattananpongsiri (1966)
R. palmarum	Male	34.80*	31.86-38.00	*B. gasipaes*	This study
		35.85*	33.69-38.15	*Bi. nobilis*	This study
		25.80*	19.29-32.29	*S. officinarum*	This study
		36.40*	29.00-44.00	-	Wattananpongsiri (1966)
		32.16**	25.00-41.00	*S. officinarum*	Restrepo et al. (1982)
		29.90*	26.00-35.00	-	Verano (1940)
	Female	36.35*	33.29-38.71	*B. gasipaes*	This study
		36.46*	-	*Bi. nobilis*	This study
		26.64*	20.29-32.43	*S. officinarum*	This study
		36.80*	26.00-42.00	-	Wattananpongsiri (1966)
		33.47**	25.00-41.00	*S. officinarum*	Restrepo et al. (1982)
		30.85*	25.00-35.00	-	Verano (1940)

* Body length from the anterior apex of the pronotum to the posterior apex of the pygidium. ** Body length from the anterior apex of the rostrum to the posterior apex of the pygidium.

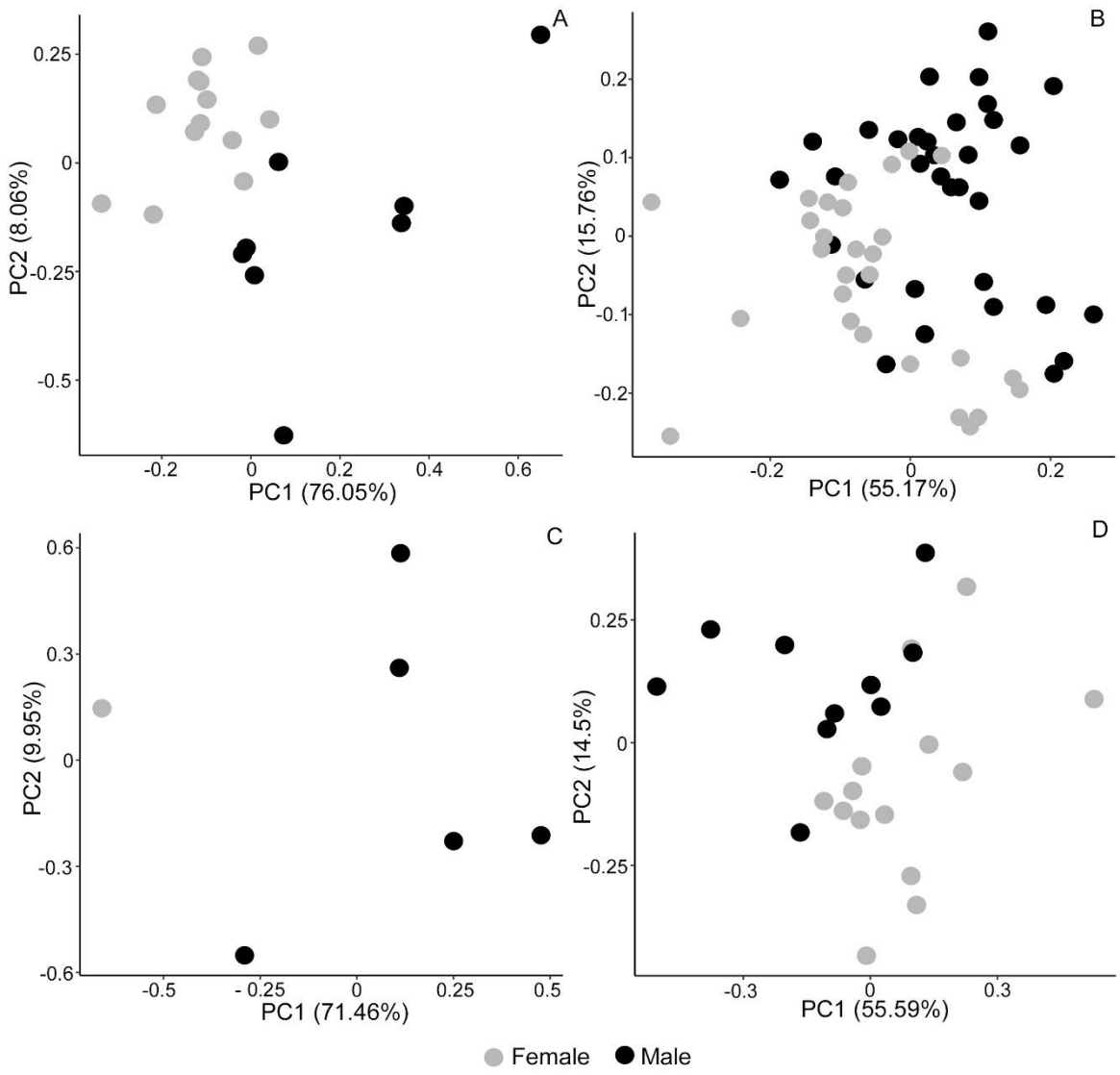


Figure 5. Sexual dimorphism of *Dynamis borassi* in four populations in Colombia: Central Pacific (A), North Pacific (B), Low Andes (C), and High Andes (D).

Table 3. Statistics of the sexual dimorphism of the most relevant morphological variables of the first principal component of *D. borassi* and *R. palmarum* populations of the Colombian southwest. The morphological variables are described in the Table 1. The significant differences are in bold.

Species	Population (host plant)	Variable	Anova (p-value)	Kruskal (p-value)
D. borassi	High Andes	PL	**6.16 (0.02)**	-
	Central Pacific (*B. gasipaes*)	PL	**5.33 (0.04)**	-
	Central Pacific (without hostplant information and from *B. gasipaes*)	BL	-	**6.78 (0.01)**
	North Pacific (without hostplant information)	BL	2.16 (0.15)	**-**
R. palmarum	Amazon	BL	**6.65 (0.01)**	-
	Low Andes (*S. officinarum*)	BL	0.75 (0.39)	**-**
	Low Andes (<1940)	BL	-	1.6 (0.21)
	Low Andes (>1978)	BL	0.01 (0.93)	-
	High Andes	BL	-	0.76 (0.38)
	Central Pacific (*B. gasipaes*)	BL	-	**4.19 (0.05)**
	Central Pacific (without hostplant information and from *B. gasipaes*)	BL	-	2.22 (0.14)
	North Pacific (without hostplant information)	BL	0.07 (0.80)	-

On the other hand, the Colombian *R. palmarum* individuals from sugarcane were morphometrically differentiated of those from palms (*B. gasipaes* and *Bi. nobilis*), independent of sex and geography (Figure 6a, b; Table 4). The males collected from *B. gasipaes* and *Bi. nobilis* were not different (Table 4). The addition of the new samples from the Cauca River Valley but without host plant information were grouped with those from sugarcane in the morphometric analysis, while the

individuals from Amazon and Pacific regions were close to those from the other palms (Figure 6c, d). The weevils from sugarcane were considerably smaller than those reported by Wattananpongsiri (1966) in the taxonomical redescription of *R. palmarum* (Table 2). Additionally, only the Amazon populations presented a marked dimorphism in the body size, which was the most important character in the principal component 1 (Figure 7, Table 3). However, the Central and North Pacific populations showed dimorphism in the dorsal interocular space and length of the last antennal segment, respectively, which are the most important character in the principal component 2 (Figure 7a, b, Supplementary material). Finally, the COI sequences of *R. palmarum* from sugarcane were monophyletic and presented a genetical distance of 1% in comparison with other seven samples from peach palm in the Pacific (Figure 8 A, B, Table 5).

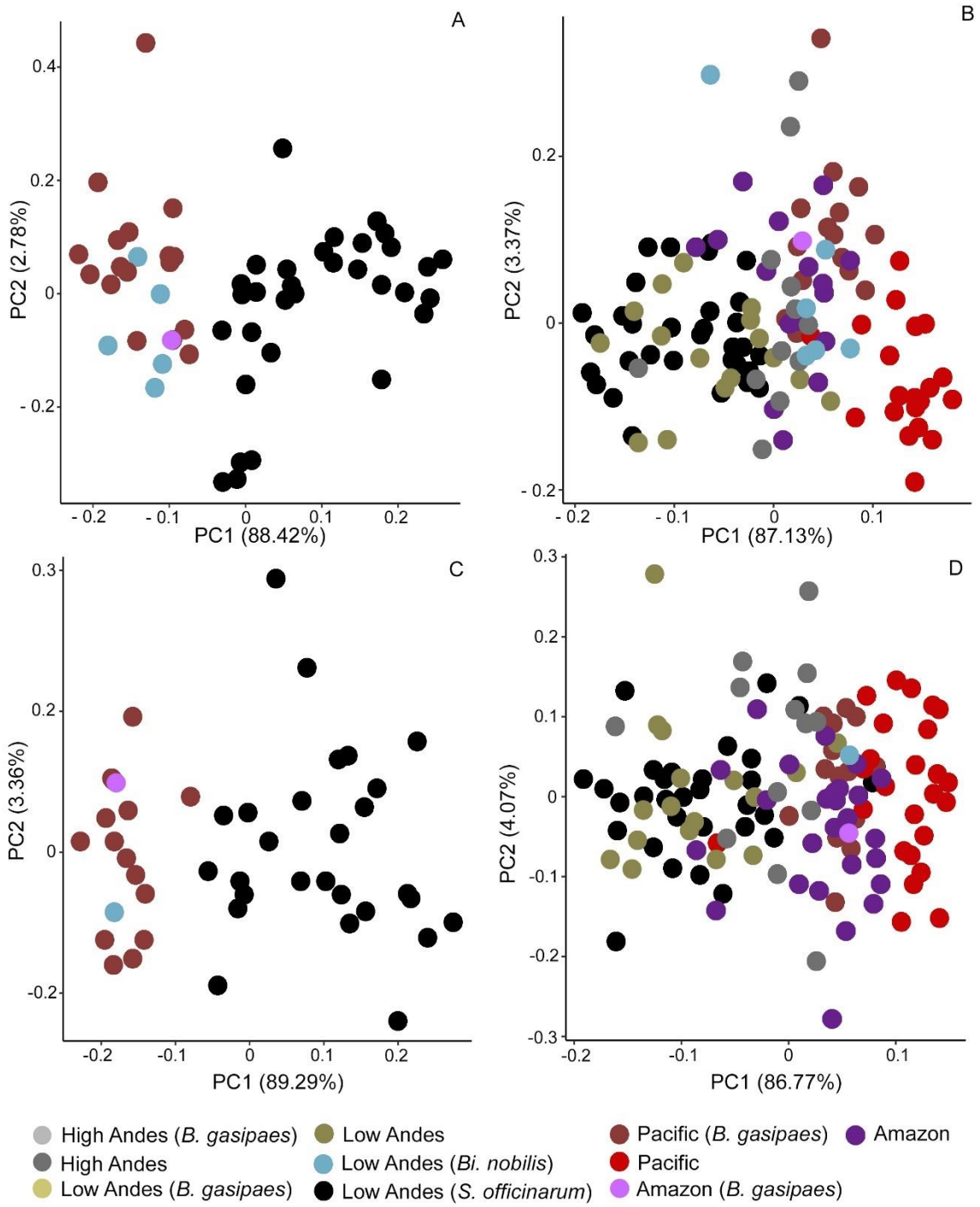
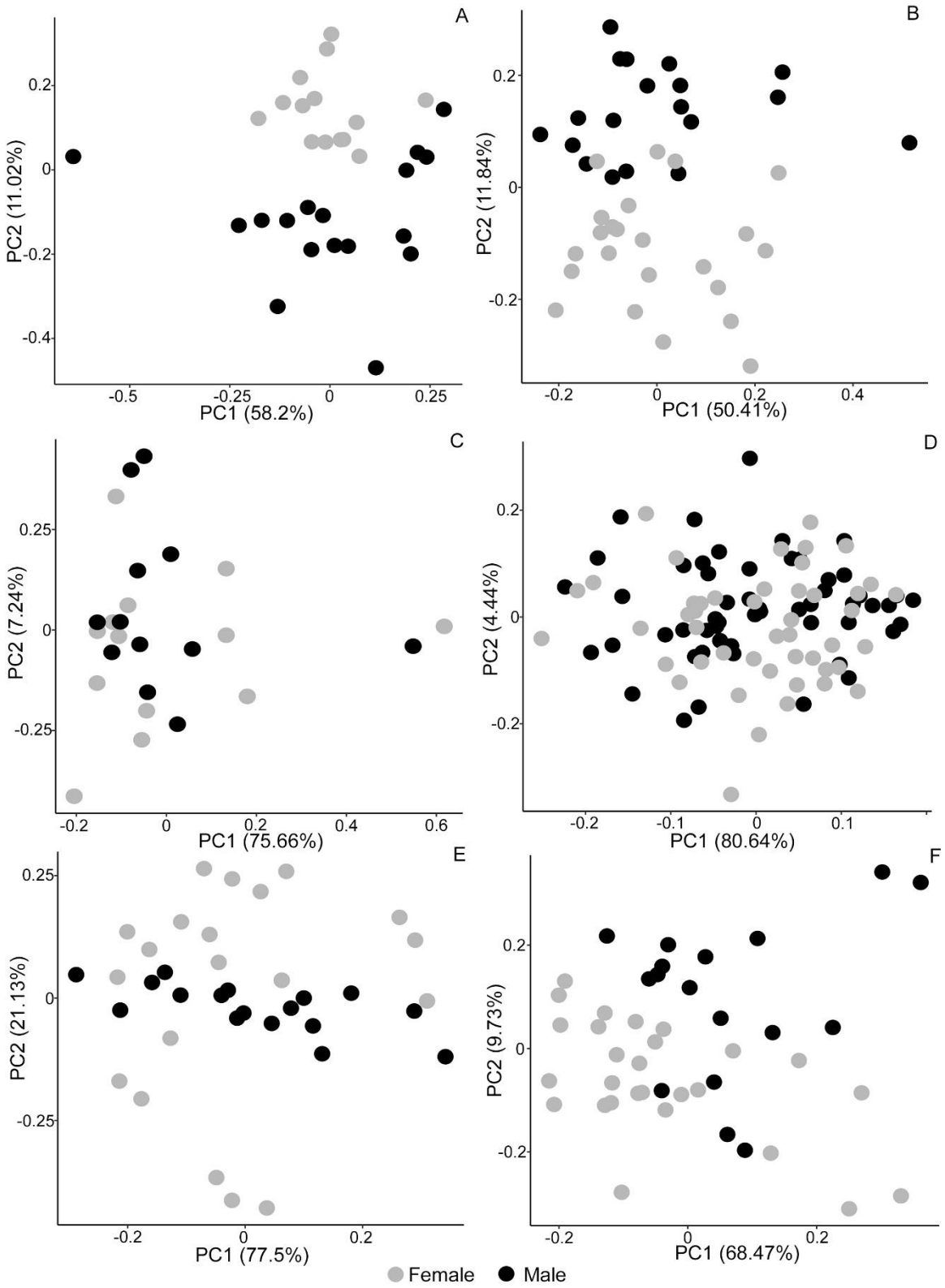


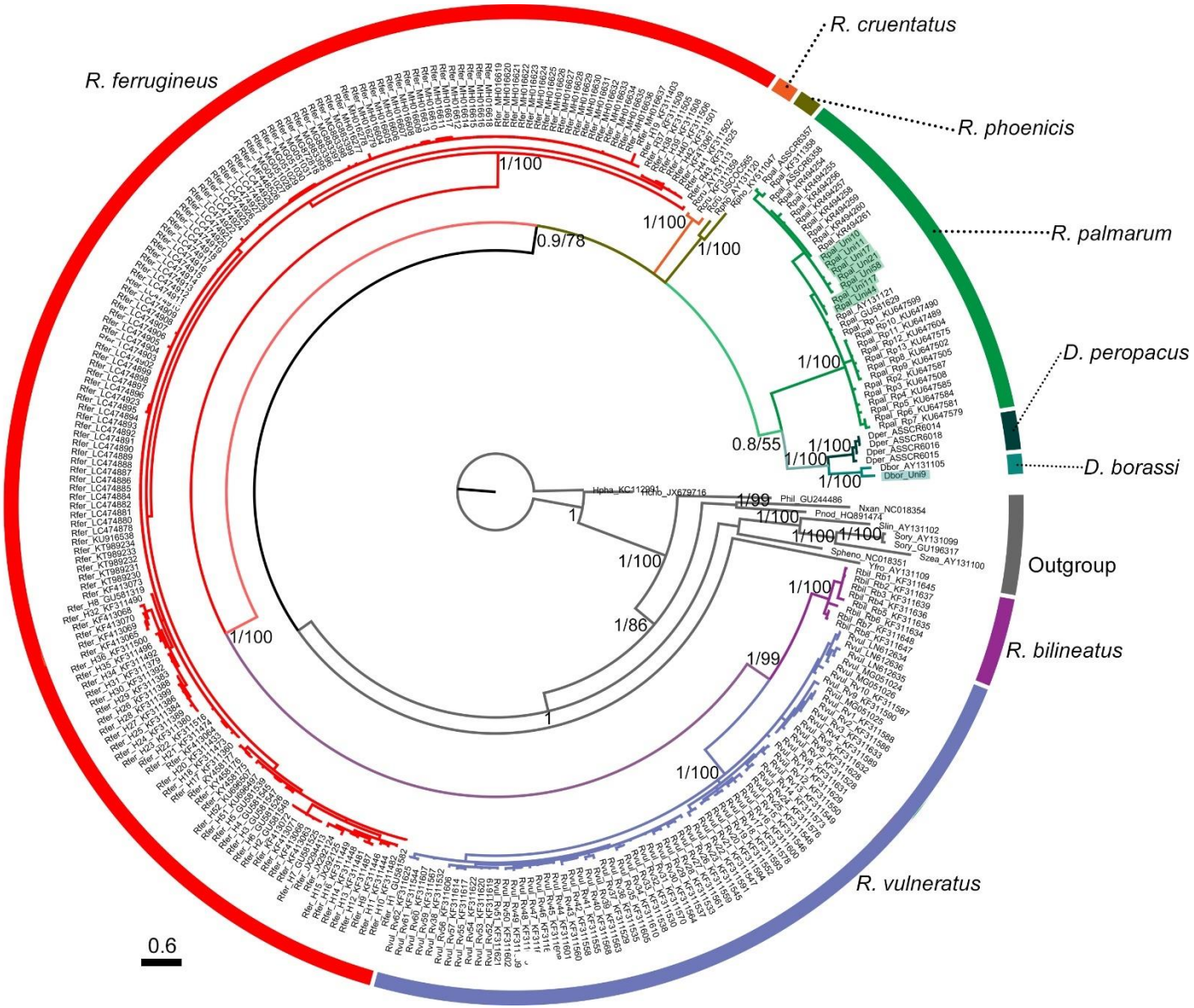
Figure 6. Distribution of *Rhynchophorus palmarum* male (A, C) and female (B, D) according to two principal components of morphometric characteristics. Clusters are shown for individuals with known host plant (A, B) and with the addition of data without host knowledge (B, D). The hostplants were *Bactris gasipaes*, *Bismarkia nobilis*, and *Saccharum officinarum*.

Table 4. Statistics of the differentiation of the body length with highest contribution to principal component 1 between *Rhychophorus palmarum* populations from different host plants in the Colombian southwest. The hostplants were *Bactris gasipaes*, *Bismarkia nobilis*, and *Saccharum officinarum*.

Sex	Population in Comparison	Kruskal test (p-value)	Wicox test
Male	Low Andes (*S. officinarum*) – Low Andes (*Bi. nobilis*)- Pacific (*B. gasipaes*)	**37.05 (0.00)**	**-**
	Low Andes (*S. officinarum*) – Low Andes (*Bi. nobilis*)	-	**0.00**
	Low Andes (*S. officinarum*) – Pacific (*B. gasipaes*)	-	**0.00**
	Low Andes (*Bi. nobilis*) - Pacific (*B. gasipaes*)	-	0.38
Female	Low Andes (*S. officinarum*) - Pacific (*B. gasipaes*)	**27.02 (0.00)**	-


A
PC2 (11.02%)
PC1 (58.2%)
B
PC2 (11.84%)
PC1 (50.41%)
C
PC2 (7.24%)
PC1 (75.66%)
D
PC2 (4.44%)
PC1 (80.64%)
E
PC2 (21.13%)
PC1 (77.5%)
F
PC2 (9.73%)
PC1 (68.47%)
Female
Male

← **Figure 7.** Dimorphism of the *Rhynchophorus palmarum* from six populations and different collection times in Colombia: Central Pacific (A), North Pacific (B), High Andes (C), Low Andes (individuals collected after to 1978, D), Low Andes (individuals collected before to 1940, E), and Amazon (F).


R. cruentatus
R. phoenicis
R. palmarum
D. peropacus
D. borassi
Outgroup
R. bilineatus
R. vulneratus
R. ferrugineus
0.6

← **Figure 8.** Bayes COI phylogeny of *Dynamis* and *Rhynchophorus* (A), with the *R. palmarum* relationship (B) and their geographical origin and host plant (C). Posterior probabilities and Boostrap values of each species and *R. palmarum* clades are indicated at each node when greater than 0.7 and 70%, respectively. The sequences studied are underlined in green and bluish green, and the percent divergence in the scale bar. Mamsl= Meters above mean sea level.

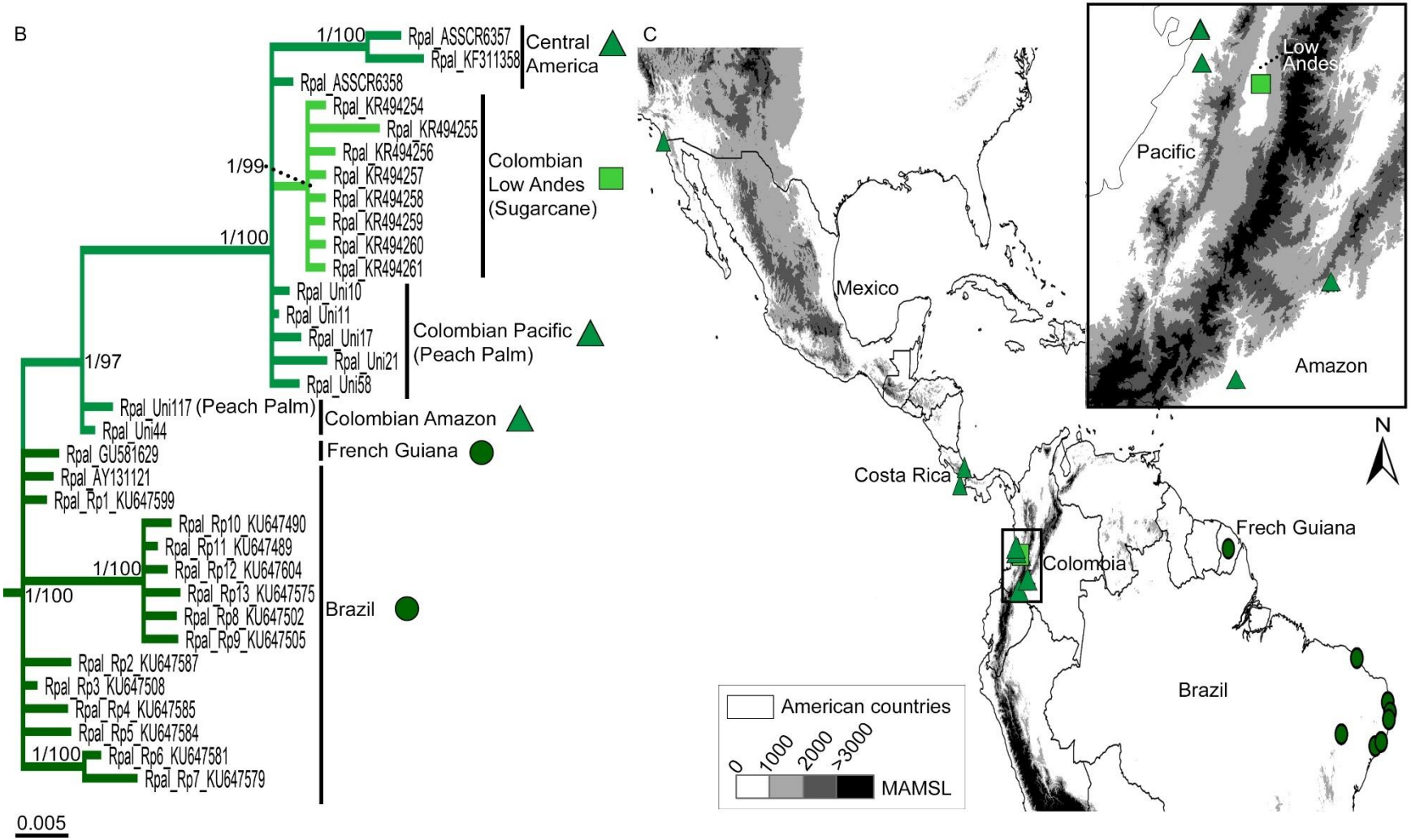


Figure 8 (contd). Mamsl= Meters above mean sea level.

Table 5. The genetic distance of *Rhynchophorus palmarum* samples with different host plant records (e.i. *Bactris gasipaes* and *Saccharum officinarum*), according to COI gene. The comparison between principal clades of *R. palmarum* is shown (See phylogeny in Figure 8).

Host plant report	
	Inter
	Low Andes (*S. officinarum*)
Colombian Pacific (*B. gasipaes*)	0.009
	Intra
Low Andes (*S. officinarum*)	0.005
Colombian Pacific (*B. gasipaes*)	0.005
Clade	
Samples	Inter
	Colombia + Central America
Brazil + French Guiana	0.047
	Intra
Colombia + Central America	0.015
Brazil + French Guiana	0.015
	Inter
	Colombian Amazon
Colombian Andes and Pacific + Central America	0.032
	Intra
Colombian Amazon	0.004
Colombian Andes and Pacific + Central America	0.010

Discussion

The new host plant association of the weevil *D. borassi* with peach palm seems to have a negative effect on its body size. This is supported by the morphometric analysis of 17 variables and the comparison with previous reports of body size of this species (Wattananpongsiri, 1966; Couturier et al., 2000) and specimen in museum collections. The morphometric analysis also documented that one male collected in its natural host plant *O. bataua* and specimens from Pacific tended to be distinct of those from peach palm and the Andes. In the Pacific this weevil is known principally from its natural host (Bautista-Giraldo et al., 2020), while in the Andes it has only been reported attacking peach palm (see chapter 1 and Gaviria et al., 2021). On the other hand, the average and range of body size of the individuals from peach palm were closer to those reported from *O. mapora* in Brazil (Couturier et al., 2000), where weevil larvae are forced by lack of sufficient food in the inflorescence to burrow into the stem (Couturier et al., 2000), in similar way as in peach palm (Gaviria et al., 2021).

A similar observation was done for *R. palmarum* in the Cauca River Valley which specimens collected in sugarcane were smaller than those from peach palm, *Bi. nobilis* in this region and generally, from the Pacific. This interaction with sugarcane has been documented since 1940 (Verano, 1940), with all its specimens smaller in comparison with the ones reported by Wattananpongsiri (1966) in the *R. palmarum* redescription and those examined from various palm species in this study. *Bi. nobilis* weevils were collected in the Cauca River Valley, demonstrating that the host plant effect occurs in the same locality.

A morphological differentiation according to host plant was documented in *R. ferrugineus* exposed to four cultivars of date palm in laboratory conditions (Al-Ayedh, 2008). Larval and adult stages were smaller in three of the four varieties. The explanation of this pattern was the higher sugar content in the variety that produced bigger specimens. In *D. borassi*, the comparison of the attack on the native host *O. bataua* to peach palm (Gaviria et al., 2021) and *O. mapora* (Couturier et al., 2000) suggests that both are not optimal hosts, because the life

cycle would be not completed in the inflorescence as in *O. bataua* (Bautista-Giraldo et al., 2020). In the laboratory, the duration of the *D. borassi* life cycle in an artificial diet did not change when peach palm inflorescences were added to the diet (Cuellar-Palacios et al., 2020a). Complementary results were obtained in laboratory with *R. palmarum*, where the exposition to sugarcane produced a shorter life cycle compared to those developing in palms (Hagley, 1965; Restrepo et al., 1982; Mexzón et al., 1994; Löhr et al. 2016). All this information suggests that in both cases the new host is not optimal.

Nevertheless, it is possible that the body size reduction in *D. borassi* and *R. palmarum* has been influenced also by larval competition, such as has been documented in the beetle *C. maculatus* (Messina, 2004). In this case, the body size reduction is explained by encounters of the larvae that burrow the seed, which generate interference by repeated biting, as well as limitation of respiration in large seed which produces greater seed consumption and reduce the resources availability (Messina, 2004). In both weevil species, cannibalism between the larvae has been reported as result of limited food availability (Löhr et al., 2016; Cuellar-Palacios et al., 2020b).

It is important to highlight that the sugarcane population of *R. palmarum* in the Cauca River Valley presented genetic differentiation of the COI gene to all sequences available for this species. As the interaction with this plant has been continuing for 80 years (Verano, 1940), this could be contributing to the genetic differentiation of the population. In selection experiments of the bruchid *C. maculatus* those morphological changes mediated by host shift led to genetic changes (Messina, 2004). In *S. frugiperda* and *C. maculatus*, COI gene changes have been reported as result of colonization of new host plants (Saldamando & Vélez-Arango, 2010; Tuda et al., 2014). Additionally, the lack of dimorphism in this population since 1940 (Verano, 1940) demonstrates that sexual characteristics are being affected.

In conclusion, it is likely that *D. borassi* populations in Colombia showed a morphological differentiation as consequence of colonization of peach palm. This

pattern is repeated in *R. palmarum* with its 80 years of association with sugarcane, which also possibly generated a genetic divergence. It is feasible that both host plants are not optimal for the weevil development, generating smaller individuals. These results have relevance to explain the great plasticity of both species to colonize different host plant species, which also has been documented in *R. ferrugineus*, the most dangerous and invasive palm species in the world**.**

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Supplementary material (Chapter 3).

Table S1. Morphometric measurement of the *Dynamis borassi* and *Rhynchophorus palmarum* examined, with their museum code reference (ID), geographical origin, and host plant. The measurements were described in the Table 1 of this chapter.

ID	Species	Sex	Natural Region	Department	Municipality	Locality
Univalle_1	D. borassi	Female	Low Andes	Valle del Cauca	Palmira	Centro de Investigación Palmira Agrosavia
Univalle_An01	D. borassi	Female	Central Pacific	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Tatabro
Univalle_An53	D. borassi	Female	Central Pacific	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Tatabro
Univalle_An54	D. borassi	Female	Central Pacific	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Tatabro
Univalle_An56	D. borassi	Female	Central Pacific	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Tatabro
Univalle_An58	D. borassi	Female	Central Pacific	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Tatabro
Univalle_BC01	D. borassi	Female	Central Pacific	Valle del Cauca	Buenaventura	Corregimiento 1. Bajo Calima. Las Colonias
Univalle_BC04	D. borassi	Female	Central Pacific	Valle del Cauca	Buenaventura	Corregimiento 1. Bajo Calima. Estación Forestal Pedro Antonio Pineda- Universidad del Tolima
Univalle_BC05	D. borassi	Female	Central Pacific	Valle del Cauca	Buenaventura	Corregimiento 1. Bajo Calima. Las Colonias. Finca la Camila
Univalle_BC06	D. borassi	Female	Central Pacific	Valle del Cauca	Buenaventura	Corregimiento 1. Bajo Calima. Las Colonias. Finca el Esfuerzo
Univalle_BC08	D. borassi	Female	Central Pacific	Valle del Cauca	Buenaventura	Corregimiento 1.
Univalle_BC10	D. borassi	Female	Central Pacific	Valle del Cauca	Buenaventura	Corregimiento 1.
Univalle_BC101	D. borassi	Female	Central Pacific	Valle del Cauca	Buenaventura	Corregimiento 1.
Univalle_BC14	D. borassi	Female	Central Pacific	Valle del Cauca	Buenaventura	Corregimiento 1. Bajo Calima. Las Colonias. Finca el Esfuerzo
Univalle_BC18	D. borassi	Female	Central Pacific	Valle del Cauca	Buenaventura	Corregimiento 1. Bajo Calima. Las Colonias. Finca la Camila
Univalle_Ca02	D. borassi	Female	High Andes	Cauca	El Tambo	Cuatroesquinas.
Univalle_Ca05	D. borassi	Female	High Andes	Cauca	El Tambo	Cuatroesquinas.
Univalle_Ca09	D. borassi	Female	High Andes	Cauca	El Tambo	Cuatroesquinas.

Univalle_Ca20	D. borassi	Female	High Andes	Cauca	Timbio	Corregimiento Porvenir
Univalle_Ca21	D. borassi	Female	High Andes	Cauca	Timbio	Corregimiento Porvenir
Univalle_Ca22	D. borassi	Female	High Andes	Cauca	Timbio	Corregimiento Porvenir
Univalle_Ca23	D. borassi	Female	High Andes	Cauca	Timbio	Corregimiento Porvenir
Univalle_Ca27	D. borassi	Female	High Andes	Cauca	Timbio	Corregimiento Porvenir
Univalle_Ca28	D. borassi	Female	High Andes	Cauca	Timbio	Corregimiento Porvenir
Univalle_Ca31	D. borassi	Female	High Andes	Cauca	Timbio	Corregimiento Porvenir
Univalle_Ca43	D. borassi	Female	High Andes	Cauca	El Tambo	Cuatroesquinas. San Roque
Univalle_Ca44	D. borassi	Female	High Andes	Cauca	El Tambo	Cuatroesquinas.
Univalle_Ca45	D. borassi	Female	High Andes	Cauca	El Tambo	Mosquera. Finca la Planada
Univalle_Ca48	D. borassi	Female	High Andes	Cauca	El Tambo	Cuatroesquinas. San Roque
Univalle_Cq01	D. borassi	Female	Amazon	Caquetá	Florencia	La Dorada. Finca los Papiros
Univalle_Pu58	D. borassi	Female	Amazon	Putumayo	Villa Garzon	Islandia. Finca la Esperanza
Univalle_Pu59	D. borassi	Female	Amazon	Putumayo	Villa Garzon	Islandia. Finca la Esperanza
Univalle_Ch1	D. borassi	Female	North Pacific	Chocó	Nuquí	
Univalle_Ch2	D. borassi	Female	North Pacific	Chocó	Nuquí	
Univalle_Ch3	D. borassi	Female	North Pacific	Chocó	Nuquí	
Univalle_Ch4	D. borassi	Female	North Pacific	Chocó	Nuquí	
Univalle_Ch5	D. borassi	Female	North Pacific	Chocó	Nuquí	
Univalle_Ch6	D. borassi	Female	North Pacific	Chocó	Nuquí	
Univalle_Ch7	D. borassi	Female	North Pacific	Chocó	Nuquí	
Univalle_Ch8	D. borassi	Female	North Pacific	Chocó	Nuquí	
Univalle_Ch9	D. borassi	Female	North Pacific	Chocó	Nuquí	
Univalle_Ch10	D. borassi	Female	North Pacific	Chocó	Nuquí	Choíba
Univalle_Ch11	D. borassi	Female	North Pacific	Chocó	Nuquí	Choíba
Univalle_Ch12	D. borassi	Female	North Pacific	Chocó	Nuquí	Choíba
Univalle_Ch13	D. borassi	Female	North Pacific	Chocó	Nuquí	Choíba
Univalle_Ch14	D. borassi	Female	North Pacific	Chocó	Nuquí	Choíba
Univalle_Ch15	D. borassi	Female	North Pacific	Chocó	Nuquí	Choíba
Univalle_Ch16	D. borassi	Female	North Pacific	Chocó	Nuquí	Choíba
Univalle_Ch17	D. borassi	Female	North Pacific	Chocó	Nuquí	Choíba
Univalle_Ch18	D. borassi	Female	North Pacific	Chocó	Nuquí	Choíba
Univalle_Ch19	D. borassi	Female	North Pacific	Chocó	Nuquí	Choíba

Univalle_Ch20	D. borassi	Female	North Pacific	Chocó	Nuquí	Choíba
Univalle_Ch21	D. borassi	Female	North Pacific	Chocó	Nuquí	Choíba
Univalle_Ch22	D. borassi	Female	North Pacific	Chocó	Nuquí	Choíba
Univalle_Ch23	D. borassi	Female	North Pacific	Chocó	Nuquí	Choíba
Univalle_Ch24	D. borassi	Female	North Pacific	Chocó	Nuquí	Choíba
Univalle_Ch25	D. borassi	Female	North Pacific	Chocó	Nuquí	Choíba
Univalle_Ch26	D. borassi	Female	North Pacific	Chocó	Nuquí	Choíba
Univalle_Ch27	D. borassi	Female	North Pacific	Chocó	Nuquí	Choíba
Univalle_Ch28	D. borassi	Female	North Pacific	Chocó	Nuquí	Choíba
Univalle_Ch29	D. borassi	Female	North Pacific	Chocó	Nuquí	Choíba
Univalle_Ch30	D. borassi	Female	North Pacific	Chocó	Nuquí	Choíba
Univalle_Ch31	D. borassi	Female	North Pacific	Chocó	Nuquí	Choíba
Univalle_Ch32	D. borassi	Female	North Pacific	Chocó	Nuquí	Choíba
Univalle_Ch33	D. borassi	Female	North Pacific	Chocó	Nuquí	Choíba
MUSENUV_29193	D. borassi	Male	Central Pacific	Buenaventura	Bajo Calima	
MUSENUV_7895	D. borassi	Male	Central Pacific	Chocó	Nuquí	
MUSENUV28115	D. borassi	Male	Low Andes	Cali	Vía al Mar	
Univalle_2	D. borassi	Male	Low Andes	Valle del Cauca	Palmira	Centro de Investigación Palmira Agrosavia
Univalle_3	D. borassi	Male	Central Pacific			
Univalle_4	D. borassi	Male	Low Andes	Valle del Cauca	Palmira	Centro de Investigación Palmira Agrosavia
Univalle_5	D. borassi	Male	Low Andes	Valle del Cauca	Palmira	Centro de Investigación Palmira Agrosavia
Univalle_6	D. borassi	Male	Low Andes	Valle del Cauca	Palmira	Centro de Investigación Palmira Agrosavia
Univalle_An60	D. borassi	Male	Central Pacific	Valle del Cauca	Buenaventura	Corregimiento 8. San Marcos. Finca Santa Teresa
Univalle_BC07	D. borassi	Male	Central Pacific	Valle del Cauca	Buenaventura	Corregimiento 1. Bajo Calima. Las Colonias. Finca el Esfuerzo
Univalle_BC09	D. borassi	Male	Central Pacific	Valle del Cauca	Buenaventura	Corregimiento 1.
Univalle_BC100	D. borassi	Male	Central Pacific	Valle del Cauca	Buenaventura	Corregimiento 1. Bajo Calima. Las Colonias. Finca la Camila
Univalle_BC11	D. borassi	Male	Central Pacific	Valle del Cauca	Buenaventura	Corregimiento 1.
Univalle_Ca03	D. borassi	Male	High Andes	Cauca	El Tambo	Cuatroesquinas.

Univalle_Ca07	D. borassi	Male	High Andes	Cauca	El Tambo	Cuatroesquinas.
Univalle_Ca08	D. borassi	Male	High Andes	Cauca	El Tambo	Cuatroesquinas.
Univalle_Ca12	D. borassi	Male	High Andes	Cauca	El Tambo	Cuatroesquinas.
Univalle_Ca25	D. borassi	Male	High Andes	Cauca	Timbio	Corregimiento Porvenir
Univalle_Ca32	D. borassi	Male	High Andes	Cauca	Timbio	Corregimiento Porvenir
Univalle_Ca38	D. borassi	Male	High Andes	Cauca	Timbio	Corregimiento Porvenir
Univalle_Ca46	D. borassi	Male	High Andes	Cauca	El Tambo	Mosquera. Finca la Planada
Univalle_Ca47	D. borassi	Male	High Andes	Cauca	El Tambo	Cuatroesquinas. San Roque
Univalle_Ca49	D. borassi	Male	High Andes	Cauca	El Tambo	Cuatroesquinas. La Sarde
Univalle_Ch1	D. borassi	Male	North Pacific	Chocó	Nuquí	
Univalle_Ch2	D. borassi	Male	North Pacific	Chocó	Nuquí	
Univalle_Ch3	D. borassi	Male	North Pacific	Chocó	Nuquí	
Univalle_Ch4	D. borassi	Male	North Pacific	Chocó	Nuquí	
Univalle_Ch5	D. borassi	Male	North Pacific	Chocó	Nuquí	
Univalle_Ch6	D. borassi	Male	North Pacific	Chocó	Nuquí	
Univalle_Ch7	D. borassi	Male	North Pacific	Chocó	Nuquí	
Univalle_Ch8	D. borassi	Male	North Pacific	Chocó	Nuquí	
Univalle_Ch9	D. borassi	Male	North Pacific	Chocó	Nuquí	
Univalle_Ch10	D. borassi	Male	North Pacific	Chocó	Nuquí	Choíba
Univalle_Ch11	D. borassi	Male	North Pacific	Chocó	Nuquí	Choíba
Univalle_Ch12	D. borassi	Male	North Pacific	Chocó	Nuquí	Choíba
Univalle_Ch13	D. borassi	Male	North Pacific	Chocó	Nuquí	Choíba
Univalle_Ch14	D. borassi	Male	North Pacific	Chocó	Nuquí	Choíba
Univalle_Ch15	D. borassi	Male	North Pacific	Chocó	Nuquí	Choíba
Univalle_Ch16	D. borassi	Male	North Pacific	Chocó	Nuquí	Choíba
Univalle_Ch17	D. borassi	Male	North Pacific	Chocó	Nuquí	Choíba
Univalle_Ch18	D. borassi	Male	North Pacific	Chocó	Nuquí	Choíba
Univalle_Ch19	D. borassi	Male	North Pacific	Chocó	Nuquí	Choíba
Univalle_Ch20	D. borassi	Male	North Pacific	Chocó	Nuquí	Choíba
Univalle_Ch21	D. borassi	Male	North Pacific	Chocó	Nuquí	Choíba
Univalle_Ch22	D. borassi	Male	North Pacific	Chocó	Nuquí	Choíba
Univalle_Ch23	D. borassi	Male	North Pacific	Chocó	Nuquí	Choíba
Univalle_Ch24	D. borassi	Male	North Pacific	Chocó	Nuquí	Choíba

Univalle_Ch25	D. borassi	Male	North Pacific	Chocó	Nuquí	Choíba
Univalle_Ch26	D. borassi	Male	North Pacific	Chocó	Nuquí	Choíba
Univalle_Ch27	D. borassi	Male	North Pacific	Chocó	Nuquí	Choíba
Univalle_Ch28	D. borassi	Male	North Pacific	Chocó	Nuquí	Choíba
Univalle_Ch29	D. borassi	Male	North Pacific	Chocó	Nuquí	Choíba
Univalle_Ch30	D. borassi	Male	North Pacific	Chocó	Nuquí	Choíba
Univalle_Ch31	D. borassi	Male	North Pacific	Chocó	Nuquí	Choíba
Univalle_Ch32	D. borassi	Male	North Pacific	Chocó	Nuquí	Choíba
Univalle_Ch33	D. borassi	Male	North Pacific	Chocó	Nuquí	Choíba
CCENT-0172	R. palmarum	Female	Low Andes	Valle del Cauca	Florida	Cenicaña
CCENT-0173	R. palmarum	Female	Low Andes	Valle del Cauca	Candelaria	Ingenio Mayagüez, Hacienda Llano de Párraga
CCENT-0175	R. palmarum	Female	Low Andes	Valle del Cauca	Jamundí	Condominio Camprestre La Merced
CCENT-0274	R. palmarum	Female	Low Andes	Valle del Cauca	Palmira	Centro Internacional de Agricultura Tropical
CCENT-0275	R. palmarum	Female	Low Andes	Valle del Cauca	Candelaria	Ingenio Mayagüez, Hacienda Llano de Párraga
CCENT-0276	R. palmarum	Female	Low Andes	Valle del Cauca	Candelaria	Ingenio Mayagüez, Hacienda Llano de Párraga
CCENT-0281	R. palmarum	Female	Low Andes	Valle del Cauca	Florida	Cenicaña
Cenicaña_564	R. palmarum	Female	Low Andes	Valle del Cauca	Jamundi	L. A. Lastra
CIATARC_1	R. palmarum	Female	Low Andes	Valle del Cauca	Palmira	Centro Internacional de Agricultura Tropical
CIATARC_101	R. palmarum	Female	Low Andes	Valle del Cauca	Palmira	Centro Internacional de Agricultura Tropical
CIATARC_102	R. palmarum	Female	Low Andes	Valle del Cauca	Palmira	Centro Internacional de Agricultura Tropical
CIATARC_106	R. palmarum	Female	Low Andes	Valle del Cauca	Palmira	Centro Internacional de Agricultura Tropical
CIATARC_107	R. palmarum	Female	Low Andes	Valle del Cauca	Palmira	Centro Internacional de Agricultura Tropical
CIATARC_114	R. palmarum	Female	Low Andes	Valle del Cauca	Palmira	Centro Internacional de Agricultura Tropical
CIATARC_115	R. palmarum	Female	Low Andes	Valle del Cauca	Palmira	Centro Internacional de Agricultura Tropical
CIATARC_121	R. palmarum	Female	Low Andes	Valle del Cauca	Palmira	Centro Internacional de Agricultura Tropical
CIATARC_123	R. palmarum	Female	Low Andes	Valle del Cauca	Palmira	Centro Internacional de Agricultura Tropical

CIATARC_130	R. palmarum	Female	Low Andes	Valle del Cauca	Palmira	Centro Internacional de Agricultura Tropical
CIATARC_133	R. palmarum	Female	Low Andes	Valle del Cauca	Palmira	Centro Internacional de Agricultura Tropical
CIATARC_137	R. palmarum	Female	Low Andes	Valle del Cauca	Palmira	Centro Internacional de Agricultura Tropical
CIATARC_15	R. palmarum	Female	Low Andes	Valle del Cauca	Palmira	Centro Internacional de Agricultura Tropical
CIATARC_157	R. palmarum	Female	Low Andes	Valle del Cauca	Palmira	Centro Internacional de Agricultura Tropical
CIATARC_180	R. palmarum	Female	Low Andes	Valle del Cauca	Palmira	Centro Internacional de Agricultura Tropical
CIATARC_181	R. palmarum	Female	Low Andes	Valle del Cauca	Palmira	Centro Internacional de Agricultura Tropical
CIATARC_25	R. palmarum	Female	Low Andes	Valle del Cauca	Palmira	Centro Internacional de Agricultura Tropical
CIATARC_40	R. palmarum	Female	Low Andes	Valle del Cauca	Palmira	Centro Internacional de Agricultura Tropical
CIATARC_45	R. palmarum	Female	Low Andes	Valle del Cauca	Palmira	Centro Internacional de Agricultura Tropical
CIATARC_46	R. palmarum	Female	Low Andes	Valle del Cauca	Palmira	Centro Internacional de Agricultura Tropical
CIATARC_54	R. palmarum	Female	Low Andes	Valle del Cauca	Palmira	Centro Internacional de Agricultura Tropical
CIATARC_55	R. palmarum	Female	Low Andes	Valle del Cauca	Palmira	Centro Internacional de Agricultura Tropical
CIATARC_57	R. palmarum	Female	Low Andes	Valle del Cauca	Palmira	Centro Internacional de Agricultura Tropical
CIATARC_57	R. palmarum	Female	Low Andes	Valle del Cauca	Palmira	Centro Internacional de Agricultura Tropical
CIATARC_82	R. palmarum	Female	Low Andes	Valle del Cauca	Palmira	Centro Internacional de Agricultura Tropical
CIATARC_R1	R. palmarum	Female	Low Andes	Valle del Cauca	Palmira	Centro Internacional de Agricultura Tropical
CIATARC_R2	R. palmarum	Female	Low Andes	Valle del Cauca	Palmira	Centro Internacional de Agricultura Tropical
MUSENUV_7892	R. palmarum	Female	Central Pacific	Valle del Cauca	Buenaventura	Bajo Anchicaya
MUSENUV_7894	R. palmarum	Female	Low Andes	Valle del Cauca	Cali	
MUSENUV_7897	R. palmarum	Female	Low Andes	Valle del Cauca	Palmira	
MUSENUV_7898	R. palmarum	Female	Central Pacific	Valle del Cauca	Buenaventura	Cajambre
Univalle_10	R. palmarum	Female	Low Andes	Valle del Cauca	Palmira	

Univalle_11	R. palmarum	Female	Low Andes	Valle del Cauca	Jamundí	
Univalle_12	R. palmarum	Female	Low Andes	Valle del Cauca	Cali	Barrio Nuevo Rey
Univalle_13	R. palmarum	Female	Low Andes	Valle del Cauca	Cali	
Univalle_14	R. palmarum	Female	Low Andes	Valle del Cauca	Cali	Universidad del Valle, sede Meléndez
Univalle_15	R. palmarum	Female	Low Andes	Valle del Cauca	Cali	Universidad del Valle, sede Meléndez
Univalle_16	R. palmarum	Female	Low Andes	Valle del Cauca	Cerrito	Ingenio Providencia
Univalle_7	R. palmarum	Female	Low Andes	Cauca	Miranda	Incauca
Univalle_8	R. palmarum	Female	Low Andes	Valle del Cauca	Florida	Cenicaña
Univalle_9	R. palmarum	Female	Low Andes	Cauca	Miranda	Incauca
Univalle_An02	R. palmarum	Female	Central Pacific	Valle del Cauca	Buenaventura	Corregimiento 8. San Marcos. Finca Santa Teresa
Univalle_An03	R. palmarum	Female	Central Pacific	Valle del Cauca	Buenaventura	Corregimiento 8. San Marcos. Finca Santa Teresa
Univalle_An05	R. palmarum	Female	Central Pacific	Valle del Cauca	Buenaventura	Corregimiento 8. San Marcos. Finca Santa Teresa
Univalle_An07	R. palmarum	Female	Central Pacific	Valle del Cauca	Buenaventura	Corregimiento 8. San Marcos. Finca Santa Teresa
Univalle_An11	R. palmarum	Female	Central Pacific	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Playa Grande
Univalle_An13	R. palmarum	Female	Central Pacific	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Playa Grande
Univalle_An15	R. palmarum	Female	Central Pacific	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Playa Grande
Univalle_An16	R. palmarum	Female	Central Pacific	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Playa Grande
Univalle_BC02	R. palmarum	Female	Central Pacific	Valle del Cauca	Buenaventura	Corregimiento 1. Bajo Calima. Las Colonias. Finca la Camila
Univalle_BC03	R. palmarum	Female	Central Pacific	Valle del Cauca	Buenaventura	Corregimiento 1. Bajo Calima. Las Colonias. Finca la Camila
Univalle_BC13	R. palmarum	Female	Central Pacific	Valle del Cauca	Buenaventura	Corregimiento 1. Bajo Calima. Las Colonias. Finca la Camila
Univalle_BC16	R. palmarum	Female	Central Pacific	Valle del Cauca	Buenaventura	Corregimiento 1. Bajo Calima. Las Colonias. Finca el Esfuerzo
Univalle_BC19	R. palmarum	Female	Central Pacific	Valle del Cauca	Buenaventura	Corregimiento 1. Bajo Calima. Las Colonias. Finca la Camila
Univalle_BC23	R. palmarum	Female	Central Pacific	Valle del Cauca	Buenaventura	Corregimiento 1. Bajo Calima. Las Colonias. Finca la Camila
Univalle_Ca10	R. palmarum	Female	High Andes	Cauca	El Tambo	Cuatroesquinas.

Univalle_Ca11	R. palmarum	Female	High Andes	Cauca	El Tambo	Cuatroesquinas.
Univalle_Ca13	R. palmarum	Female	High Andes	Cauca	El Tambo	Cuatroesquinas.
Univalle_Ca14	R. palmarum	Female	High Andes	Cauca	El Tambo	Cuatroesquinas.
Univalle_Ca16	R. palmarum	Female	High Andes	Cauca	El Tambo	Cuatroesquinas.
Univalle_Ca17	R. palmarum	Female	High Andes	Cauca	El Tambo	Cuatroesquinas.
Univalle_Ca24	R. palmarum	Female	High Andes	Cauca	Timbio	Corregimiento Porvenir
Univalle_Ca26	R. palmarum	Female	High Andes	Cauca	Timbio	Corregimiento Porvenir
Univalle_Ca34	R. palmarum	Female	High Andes	Cauca	Timbio	Corregimiento Porvenir
Univalle_Ca35	R. palmarum	Female	High Andes	Cauca	Timbio	Corregimiento Porvenir
Univalle_Ca36	R. palmarum	Female	High Andes	Cauca	Timbio	Corregimiento Porvenir
Univalle_Ca37	R. palmarum	Female	High Andes	Cauca	Timbio	Corregimiento Porvenir
Univalle_Ca42	R. palmarum	Female	High Andes	Cauca	El Tambo	Cuatroesquinas. Senda Magines. Finca la Lorena
Univalle_Cq03	R. palmarum	Female	Amazon	Caquetá	Florencia	La Dorada. Finca los Papiros
Univalle_Pu01	R. palmarum	Female	Amazon	Putumayo	Villa Garzon	San Miguel de la Castilla. Finca la Libertad
Univalle_Pu02	R. palmarum	Female	Amazon	Putumayo	Villa Garzon	San Miguel de la Castilla. Finca la Libertad
Univalle_Pu03	R. palmarum	Female	Amazon	Putumayo	Villa Garzon	San Miguel de la Castilla. Finca la Libertad
Univalle_Pu04	R. palmarum	Female	Amazon	Putumayo	Villa Garzon	San Miguel de la Castilla. Finca la Libertad
Univalle_Pu07	R. palmarum	Female	Amazon	Putumayo	Villa Garzon	San Miguel de la Castilla. Finca la Libertad
Univalle_Pu09	R. palmarum	Female	Amazon	Putumayo	Villa Garzon	San Miguel de la Castilla. Finca la Libertad
Univalle_Pu11	R. palmarum	Female	Amazon	Putumayo	Villa Garzon	San Miguel de la Castilla. Finca la Libertad
Univalle_Pu12	R. palmarum	Female	Amazon	Putumayo	Villa Garzon	San Miguel de la Castilla. Finca la Libertad
Univalle_Pu13	R. palmarum	Female	Amazon	Putumayo	Villa Garzon	San Miguel de la Castilla. Finca la Libertad
Univalle_Pu16	R. palmarum	Female	Amazon	Putumayo	Villa Garzon	San Miguel de la Castilla. Finca la Libertad
Univalle_Pu18	R. palmarum	Female	Amazon	Putumayo	Villa Garzon	San Miguel de la Castilla. Finca la Libertad
Univalle_Pu19	R. palmarum	Female	Amazon	Putumayo	Villa Garzon	San Miguel de la Castilla. Finca la Libertad
Univalle_Pu20	R. palmarum	Female	Amazon	Putumayo	Villa Garzon	San Miguel de la Castilla. Finca la Libertad
Univalle_Pu24	R. palmarum	Female	Amazon	Putumayo	Villa Garzon	San Miguel de la Castilla. Finca la Libertad
Univalle_Pu26	R. palmarum	Female	Amazon	Putumayo	Villa Garzon	San Miguel de la Castilla. Finca la Libertad
Univalle_Pu27	R. palmarum	Female	Amazon	Putumayo	Villa Garzon	San Miguel de la Castilla. Finca la Libertad
Univalle_Pu29	R. palmarum	Female	Amazon	Putumayo	Villa Garzon	San Miguel de la Castilla. Finca la Libertad
Univalle_Pu30	R. palmarum	Female	Amazon	Putumayo	Villa Garzon	San Miguel de la Castilla. Finca la Libertad
Univalle_Pu31	R. palmarum	Female	Amazon	Putumayo	Villa Garzon	San Miguel de la Castilla. Finca la Libertad
Univalle_Pu32	R. palmarum	Female	Amazon	Putumayo	Villa Garzon	San Miguel de la Castilla. Finca la Libertad

Univalle_Pu35	R. palmarum	Female	Amazon	Putumayo	Villa Garzon	San Miguel de la Castilla. Finca la Libertad
Univalle_Pu36	R. palmarum	Female	Amazon	Putumayo	Villa Garzon	San Miguel de la Castilla. Finca la Libertad
Univalle_Pu37	R. palmarum	Female	Amazon	Putumayo	Villa Garzon	San Miguel de la Castilla. Finca la Libertad
Univalle_Pu38	R. palmarum	Female	Amazon	Putumayo	Villa Garzon	San Miguel de la Castilla. Finca la Libertad
Univalle_Pu39	R. palmarum	Female	Amazon	Putumayo	Villa Garzon	San Miguel de la Castilla. Finca la Libertad
Univalle_Pu73	R. palmarum	Female	Amazon	Putumayo	Villa Garzon	Islandia. Finca la Esperanza
Verano_1	R. palmarum	Female	Low Andes	Valle del Cauca		
Verano_10	R. palmarum	Female	Low Andes	Valle del Cauca		
Verano_11	R. palmarum	Female	Low Andes	Valle del Cauca		
Verano_12	R. palmarum	Female	Low Andes	Valle del Cauca		
Verano_13	R. palmarum	Female	Low Andes	Valle del Cauca		
Verano_14	R. palmarum	Female	Low Andes	Valle del Cauca		
Verano_15	R. palmarum	Female	Low Andes	Valle del Cauca		
Verano_16	R. palmarum	Female	Low Andes	Valle del Cauca		
Verano_17	R. palmarum	Female	Low Andes	Valle del Cauca		
Verano_18	R. palmarum	Female	Low Andes	Valle del Cauca		
Verano_19	R. palmarum	Female	Low Andes	Valle del Cauca		
Verano_2	R. palmarum	Female	Low Andes	Valle del Cauca		
Verano_20	R. palmarum	Female	Low Andes	Valle del Cauca		
Verano_3	R. palmarum	Female	Low Andes	Valle del Cauca		
Verano_4	R. palmarum	Female	Low Andes	Valle del Cauca		
Verano_5	R. palmarum	Female	Low Andes	Valle del Cauca		
Verano_6	R. palmarum	Female	Low Andes	Valle del Cauca		
Verano_7	R. palmarum	Female	Low Andes	Valle del Cauca		
Verano_8	R. palmarum	Female	Low Andes	Valle del Cauca		

Verano_9	R. palmarum	Female	Low Andes	Valle del Cauca		
CCENT-0171	R. palmarum	Male	Low Andes	Valle del Cauca	Florida	Cenicaña
CCENT-0174	R. palmarum	Male	Low Andes	Valle del Cauca	Palmira	Centro Internacional de Agricultura Tropical
CCENT-0273	R. palmarum	Male	Low Andes	Valle del Cauca	Florida	Centro Internacional de Agricultura Tropical
CCENT-0277	R. palmarum	Male	Low Andes	Valle del Cauca	Florida	Cenicaña
CCENT-0278	R. palmarum	Male	Low Andes	Valle del Cauca	Florida	Cenicaña
CCENT-0279	R. palmarum	Male	Low Andes	Valle del Cauca	Florida	Cenicaña
CCENT-0280	R. palmarum	Male	Low Andes	Valle del Cauca	Florida	Cenicaña
CCENT-0282	R. palmarum	Male	Low Andes	Valle del Cauca	Florida	Cenicaña
CCENT-0283	R. palmarum	Male	Low Andes	Valle del Cauca	Florida	Cenicaña
CIATARC_108	R. palmarum	Male	Low Andes	Valle del Cauca	Palmira	Centro Internacional de Agricultura Tropical
CIATARC_109	R. palmarum	Male	Low Andes	Valle del Cauca	Palmira	Centro Internacional de Agricultura Tropical
CIATARC_110	R. palmarum	Male	Low Andes	Valle del Cauca	Palmira	Centro Internacional de Agricultura Tropical
CIATARC_111	R. palmarum	Male	Low Andes	Valle del Cauca	Palmira	Centro Internacional de Agricultura Tropical
CIATARC_112	R. palmarum	Male	Low Andes	Valle del Cauca	Palmira	Centro Internacional de Agricultura Tropical
CIATARC_113	R. palmarum	Male	Low Andes	Valle del Cauca	Palmira	Centro Internacional de Agricultura Tropical
CIATARC_117	R. palmarum	Male	Low Andes	Valle del Cauca	Palmira	Centro Internacional de Agricultura Tropical
CIATARC_118	R. palmarum	Male	Low Andes	Valle del Cauca	Palmira	Centro Internacional de Agricultura Tropical
CIATARC_127	R. palmarum	Male	Low Andes	Valle del Cauca	Palmira	Centro Internacional de Agricultura Tropical
CIATARC_131	R. palmarum	Male	Low Andes	Valle del Cauca	Palmira	Centro Internacional de Agricultura Tropical
CIATARC_154	R. palmarum	Male	Low Andes	Valle del Cauca	Palmira	Centro Internacional de Agricultura Tropical
CIATARC_16	R. palmarum	Male	Low Andes	Valle del Cauca	Palmira	Centro Internacional de Agricultura Tropical
CIATARC_170	R. palmarum	Male	Low Andes	Valle del Cauca	Palmira	Centro Internacional de Agricultura Tropical

CIATARC_179	R. palmarum	Male	Low Andes	Valle del Cauca	Palmira	Centro Internacional de Agricultura Tropical
CIATARC_182	R. palmarum	Male	Low Andes	Valle del Cauca	Palmira	Centro Internacional de Agricultura Tropical
CIATARC_184	R. palmarum	Male	Low Andes	Valle del Cauca	Palmira	Centro Internacional de Agricultura Tropical
CIATARC_24	R. palmarum	Male	Low Andes	Valle del Cauca	Palmira	Centro Internacional de Agricultura Tropical
CIATARC_4	R. palmarum	Male	Low Andes	Valle del Cauca	Palmira	Centro Internacional de Agricultura Tropical
CIATARC_5	R. palmarum	Male	Low Andes	Valle del Cauca	Palmira	Centro Internacional de Agricultura Tropical
CIATARC_60	R. palmarum	Male	Low Andes	Valle del Cauca	Palmira	Centro Internacional de Agricultura Tropical
CIATARC_61	R. palmarum	Male	Low Andes	Valle del Cauca	Palmira	Centro Internacional de Agricultura Tropical
CIATARC_63	R. palmarum	Male	Low Andes	Valle del Cauca	Palmira	Centro Internacional de Agricultura Tropical
CIATARC_76	R. palmarum	Male	Low Andes	Valle del Cauca	Palmira	Centro Internacional de Agricultura Tropical
CIATARC_79	R. palmarum	Male	Low Andes	Valle del Cauca	Palmira	Centro Internacional de Agricultura Tropical
CIATARC_80	R. palmarum	Male	Low Andes	Valle del Cauca	Palmira	Centro Internacional de Agricultura Tropical
CIATARC_81	R. palmarum	Male	Low Andes	Valle del Cauca	Palmira	Centro Internacional de Agricultura Tropical
CIATARC_90	R. palmarum	Male	Low Andes	Valle del Cauca	Palmira	Centro Internacional de Agricultura Tropical
CIATARC_94	R. palmarum	Male	Low Andes	Valle del Cauca	Palmira	Centro Internacional de Agricultura Tropical
CIATARC_95	R. palmarum	Male	Low Andes	Valle del Cauca	Palmira	Centro Internacional de Agricultura Tropical
CIATARC_97	R. palmarum	Male	Low Andes	Valle del Cauca	Palmira	Centro Internacional de Agricultura Tropical
CIATARC_98	R. palmarum	Male	Low Andes	Valle del Cauca	Palmira	Centro Internacional de Agricultura Tropical
CIATARC_R3	R. palmarum	Male	Low Andes	Valle del Cauca	Palmira	Centro Internacional de Agricultura Tropical
MUSENUV_22542	R. palmarum	Male	Low Andes	Valle del Cauca	Candelaria	
MUSENUV_7890	R. palmarum	Male	Low Andes	Valle del Cauca	Cali	
MUSENUV_7893	R. palmarum	Male	Low Andes	Valle del Cauca	Cali	
MUSENUV_7896	R. palmarum	Male	Low Andes	Valle del Cauca	Cali	

MUSENUV_7900	R. palmarum	Male	Central Pacific	Valle del Cauca	Buenaventura	Río Calima
Univalle_16	R. palmarum	Male	Low Andes	Cauca	Miranda	Incauca
Univalle_17	R. palmarum	Male	Low Andes	Valle del Cauca	Cali	Barrio Nuevo Rey
Univalle_18	R. palmarum	Male	Low Andes	Valle del Cauca	Cali	Barrio Nuevo Rey
Univalle_19	R. palmarum	Male	Low Andes	Valle del Cauca	Cali	Barrio Nuevo Rey
Univalle_20	R. palmarum	Male	Low Andes	Valle del Cauca	Cali	Barrio Nuevo Rey
Univalle_21	R. palmarum	Male	Low Andes	Valle del Cauca	Cali	Barrio Nuevo Rey
Univalle_22	R. palmarum	Male	Low Andes	Valle del Cauca	Cali	Universidad del Valle, sede Meléndez
Univalle_23	R. palmarum	Male	Low Andes	Valle del Cauca	Palmira	Aguaclara
Univalle_24	R. palmarum	Male	Low Andes	Valle del Cauca		
Univalle_An04	R. palmarum	Male	Central Pacific	Valle del Cauca	Buenaventura	Corregimiento 8. San Marcos. Finca Santa Teresa
Univalle_An06	R. palmarum	Male	Central Pacific	Valle del Cauca	Buenaventura	Corregimiento 8. San Marcos. Finca Santa Teresa
Univalle_An08	R. palmarum	Male	Central Pacific	Valle del Cauca	Buenaventura	Corregimiento 8. San Marcos. Finca Santa Teresa
Univalle_An09	R. palmarum	Male	Central Pacific	Valle del Cauca	Buenaventura	Corregimiento 8. San Marcos. Finca Santa Teresa
Univalle_An10	R. palmarum	Male	Central Pacific	Valle del Cauca	Buenaventura	Corregimiento 8. San Marcos. Finca Santa Teresa
Univalle_An12	R. palmarum	Male	Central Pacific	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Playa Grande
Univalle_An14	R. palmarum	Male	Central Pacific	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Playa Grande
Univalle_An18	R. palmarum	Male	Central Pacific	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Playa Grande
Univalle_An19	R. palmarum	Male	Central Pacific	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Playa Grande
Univalle_An20	R. palmarum	Male	Central Pacific	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Playa Grande
Univalle_BC12	R. palmarum	Male	Central Pacific	Valle del Cauca	Buenaventura	Corregimiento 1. Bajo Calima. Las Colonias. Finca la Camila
Univalle_BC15	R. palmarum	Male	Central Pacific	Valle del Cauca	Buenaventura	Corregimiento 1. Bajo Calima. Las Colonias. Finca el Esfuerzo
Univalle_BC17	R. palmarum	Male	Central Pacific	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Playa Grande

Univalle_BC20	R. palmarum	Male	Central Pacific	Valle del Cauca	Buenaventura	Corregimiento 1. Bajo Calima. Las Colonias. Finca la Camila
Univalle_BC21	R. palmarum	Male	Central Pacific	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Playa Grande
Univalle_BC22	R. palmarum	Male	Central Pacific	Valle del Cauca	Buenaventura	Corregimiento 8. Llano Bajo. Playa Grande
Univalle_Ca01	R. palmarum	Male	High Andes	Cauca	El Tambo	Cuatroesquinas.
Univalle_Ca15	R. palmarum	Male	High Andes	Cauca	El Tambo	Cuatroesquinas.
Univalle_Ca18	R. palmarum	Male	High Andes	Cauca	El Tambo	Cuatroesquinas.
Univalle_Ca19	R. palmarum	Male	High Andes	Cauca	El Tambo	Cuatroesquinas.
Univalle_Ca29	R. palmarum	Male	High Andes	Cauca	Timbio	Corregimiento Porvenir
Univalle_Ca30	R. palmarum	Male	High Andes	Cauca	Timbio	Corregimiento Porvenir
Univalle_Ca33	R. palmarum	Male	High Andes	Cauca	Timbio	Corregimiento Porvenir
Univalle_Ca39	R. palmarum	Male	High Andes	Cauca	Timbio	Corregimiento Porvenir
Univalle_Ca40	R. palmarum	Male	High Andes	Cauca	Timbio	Corregimiento Porvenir
Univalle_Ca41	R. palmarum	Male	High Andes	Cauca	El Tambo	Cuatroesquinas. Senda Magines. Finca la Lorena
Univalle_Ca50	R. palmarum	Male	High Andes	Cauca	El Tambo	Cuatroesquinas.
Univalle_Ca51	R. palmarum	Male	High Andes	Cauca	El Tambo	Cuatroesquinas.
Univalle_Cq02	R. palmarum	Male	Amazon	Caquetá	Florencia	La Dorada. Finca los Papiros
Univalle_Pu05	R. palmarum	Male	Amazon	Putumayo	Villa Garzon	San Miguel de la Castilla. Finca la Libertad
Univalle_Pu06	R. palmarum	Male	Amazon	Putumayo	Villa Garzon	San Miguel de la Castilla. Finca la Libertad
Univalle_Pu08	R. palmarum	Male	Amazon	Putumayo	Villa Garzon	San Miguel de la Castilla. Finca la Libertad
Univalle_Pu10	R. palmarum	Male	Amazon	Putumayo	Villa Garzon	San Miguel de la Castilla. Finca la Libertad
Univalle_Pu14	R. palmarum	Male	Amazon	Putumayo	Villa Garzon	San Miguel de la Castilla. Finca la Libertad
Univalle_Pu15	R. palmarum	Male	Amazon	Putumayo	Villa Garzon	San Miguel de la Castilla. Finca la Libertad
Univalle_Pu17	R. palmarum	Male	Amazon	Putumayo	Villa Garzon	San Miguel de la Castilla. Finca la Libertad
Univalle_Pu21	R. palmarum	Male	Amazon	Putumayo	Villa Garzon	San Miguel de la Castilla. Finca la Libertad
Univalle_Pu22	R. palmarum	Male	Amazon	Putumayo	Villa Garzon	San Miguel de la Castilla. Finca la Libertad
Univalle_Pu23	R. palmarum	Male	Amazon	Putumayo	Villa Garzon	San Miguel de la Castilla. Finca la Libertad
Univalle_Pu25	R. palmarum	Male	Amazon	Putumayo	Villa Garzon	San Miguel de la Castilla. Finca la Libertad
Univalle_Pu28	R. palmarum	Male	Amazon	Putumayo	Villa Garzon	San Miguel de la Castilla. Finca la Libertad
Univalle_Pu33	R. palmarum	Male	Amazon	Putumayo	Villa Garzon	San Miguel de la Castilla. Finca la Libertad
Univalle_Pu34	R. palmarum	Male	Amazon	Putumayo	Villa Garzon	San Miguel de la Castilla. Finca la Libertad
Univalle_Pu40	R. palmarum	Male	Amazon	Putumayo	Villa Garzon	San Miguel de la Castilla. Finca la Libertad
Univalle_Pu77	R. palmarum	Male	Amazon	Putumayo	Villa Garzon	Islandia. Finca la Esperanza

Verano_21	R. palmarum	Male	Low Andes	Valle del Cauca		
Verano_22	R. palmarum	Male	Low Andes	Valle del Cauca		
Verano_23	R. palmarum	Male	Low Andes	Valle del Cauca		
Verano_24	R. palmarum	Male	Low Andes	Valle del Cauca		
Verano_25	R. palmarum	Male	Low Andes	Valle del Cauca		
Verano_26	R. palmarum	Male	Low Andes	Valle del Cauca		
Verano_27	R. palmarum	Male	Low Andes	Valle del Cauca		
Verano_28	R. palmarum	Male	Low Andes	Valle del Cauca		
Verano_29	R. palmarum	Male	Low Andes	Valle del Cauca		
Verano_30	R. palmarum	Male	Low Andes	Valle del Cauca		
Verano_31	R. palmarum	Male	Low Andes	Valle del Cauca		
Verano_32	R. palmarum	Male	Low Andes	Valle del Cauca		
Verano_33	R. palmarum	Male	Low Andes	Valle del Cauca		
Verano_34	R. palmarum	Male	Low Andes	Valle del Cauca		
Verano_35	R. palmarum	Male	Low Andes	Valle del Cauca		
Verano_36	R. palmarum	Male	Low Andes	Valle del Cauca		
Verano_37	R. palmarum	Male	Low Andes	Valle del Cauca		
Verano_38	R. palmarum	Male	Low Andes	Valle del Cauca		
Verano_39	R. palmarum	Male	Low Andes	Valle del Cauca		
Verano_40	R. palmarum	Male	Low Andes	Valle del Cauca		

Continuation of the Table S1.

ID	Latitude	Longitude	Georeferencing method	Collection Date	Host plant
Univalle_1	3.515742	-76.316851	GPS		
Univalle_An01	3.6905	-76.9474	GPS	5/07/2018	*B. gasipaes*
Univalle_An53	3.6905	-76.9474	GPS	5/07/2018	*B. gasipaes*
Univalle_An54	3.6905	-76.9474	GPS	5/07/2018	*B. gasipaes*
Univalle_An56	3.6905	-76.9474	GPS	5/07/2018	*B. gasipaes*
Univalle_An58	3.6905	-76.9474	GPS	5/07/2018	*B. gasipaes*
Univalle_BC01	3.9536	-76.9764	GPS	1/06/2018	*B. gasipaes*
Univalle_BC04	3.957032	-76.993824	GPS	4/06/2018	*B. gasipaes*
Univalle_BC05	3.9826	-76.9804	GPS	1/06/2018	*B. gasipaes*
Univalle_BC06	4.0078	-76.9916	GPS	7/06/2018	*B. gasipaes*
Univalle_BC08	3.9894	-76.9780	GPS	4/06/2018	*B. gasipaes*
Univalle_BC10	3.9894	-76.9780	GPS	4/06/2018	*B. gasipaes*
Univalle_BC101	3.9894	-76.9780	GPS	4/06/2018	*B. gasipaes*
Univalle_BC14	4.0078	-76.9916	GPS	7/06/2018	*B. gasipaes*
Univalle_BC18	3.9826	-76.9804	GPS	1/06/2018	*B. gasipaes*
Univalle_Ca02	2.4025	-76.8349	GPS	26/03/2018	
Univalle_Ca05	2.4025	-76.8349	GPS	26/03/2018	
Univalle_Ca09	2.4025	-76.8349	GPS	26/03/2018	
Univalle_Ca20	2.336886	-76.710563	Locality	2/10/2018	
Univalle_Ca21	2.336886	-76.710563	Locality	2/10/2018	
Univalle_Ca22	2.336886	-76.710563	Locality	2/10/2018	
Univalle_Ca23	2.336886	-76.710563	Locality	2/10/2018	
Univalle_Ca27	2.336886	-76.710563	Locality	2/10/2018	
Univalle_Ca28	2.336886	-76.710563	Locality	2/10/2018	
Univalle_Ca31	2.336886	-76.710563	Locality	2/10/2018	
Univalle_Ca43	2.4239	-76.8418	GPS	30/11/2018	
Univalle_Ca44	2.4025	-76.8349	GPS	26/03/2018	
Univalle_Ca45	2.3518	-76.8937	GPS	1/12/2018	*B. gasipaes*
Univalle_Ca48	2.4239	-76.8418	GPS	30/11/2018	
Univalle_Cq01	1.7257	-75.6558	GPS	8/02/2019	*B. gasipaes*
Univalle_Pu58	0.8842	-76.5887	GPS	29/01/2019	
Univalle_Pu59	0.8842	-76.5887	GPS	29/01/2019	
Univalle_Ch1	5,7137	-77,2715	Locality	6/07/2021	
Univalle_Ch2	5,7137	-77,2715	Locality	6/07/2021	
Univalle_Ch3	5,7137	-77,2715	Locality	6/07/2021	
Univalle_Ch4	5,7137	-77,2715	Locality	6/07/2021	
Univalle_Ch5	5,7137	-77,2715	Locality	6/07/2021	
Univalle_Ch6	5,7137	-77,2715	Locality	6/07/2021	
Univalle_Ch7	5,7137	-77,2715	Locality	6/07/2021	
Univalle_Ch8	5,7137	-77,2715	Locality	26/07/2021	
Univalle_Ch9	5,7137	-77,2715	Locality	6/07/2021	
Univalle_Ch10	5,6918	-77,2722	Locality	1/08/2021	
Univalle_Ch11	5,6918	-77,2722	Locality	1/08/2021	
Univalle_Ch12	5,6918	-77,2722	Locality	1/08/2021	
Univalle_Ch13	5,6918	-77,2722	Locality	1/08/2021	
Univalle_Ch14	5,6918	-77,2722	Locality	1/08/2021	
Univalle_Ch15	5,6918	-77,2722	Locality	1/08/2021	
Univalle_Ch16	5,6918	-77,2722	Locality	1/08/2021	
Univalle_Ch17	5,6918	-77,2722	Locality	1/07/2021	
Univalle_Ch18	5,6918	-77,2722	Locality	1/07/2021	
Univalle_Ch19	5,6918	-77,2722	Locality	1/07/2021	
Univalle_Ch19	5,6918	-77,2722	Locality	1/07/2021	
Univalle_Ch20	5,6918	-77,2722	Locality	1/07/2021	
Univalle_Ch21	5,6918	-77,2722	Locality	1/07/2021	
Univalle_Ch22	5,6918	-77,2722	Locality	1/07/2021	
Univalle_Ch23	5,6918	-77,2722	Locality	1/07/2021	
Univalle_Ch24	5,6918	-77,2722	Locality	1/07/2021	

Univalle_Ch25	5,6918	-77,2722	Locality	1/07/2021	
Univalle_Ch26	5,6918	-77,2722	Locality	1/07/2021	
Univalle_Ch27	5,6918	-77,2722	Locality	1/07/2021	
Univalle_Ch28	5,6918	-77,2722	Locality	1/07/2021	
Univalle_Ch29	5,6918	-77,2722	Locality	1/07/2021	
Univalle_Ch30	5,6918	-77,2722	Locality	1/07/2021	
Univalle_Ch31	5,6918	-77,2722	Locality	1/07/2021	
Univalle_Ch32	5,6918	-77,2722	Locality	1/07/2021	
Univalle_Ch33	5,6918	-77,2722	Locality	1/07/2021	
MUSENUV_29193	3.957263	-76.994366	GPS	8/06/2018	*O. bataua*
MUSENUV_7895	5.709562	-77.266697	Locality	27/02/1997	
MUSENUV28115	3.4639	-76.588736	GPS	25/11/2013	
Univalle_2	3.515742	-76.316851	GPS	23/06/2021	*B. gasipaes*
Univalle_3					
Univalle_4	3.515742	-76.316851	GPS	4/11/2020	
Univalle_5	3.515742	-76.316851	GPS	4/11/2020	
Univalle_6	3.515742	-76.316851	GPS	27/01/2021	
Univalle_An60	3.7084	-76.9522	GPS	30/06/2018	*B. gasipaes*
Univalle_BC07	4.0078	-76.9916	GPS	7/06/2018	*B. gasipaes*
Univalle_BC09	3.9894	-76.9780	GPS	4/06/2018	*B. gasipaes*
Univalle_BC100	3.9826	-76.9804	GPS	1/06/2018	*B. gasipaes*
Univalle_BC11	3.9894	-76.9780	GPS	4/06/2018	*B. gasipaes*
Univalle_Ca03	2.4025	-76.8349	GPS	26/03/2018	
Univalle_Ca07	2.4025	-76.8349	GPS	26/03/2018	
Univalle_Ca08	2.4025	-76.8349	GPS	26/03/2018	
Univalle_Ca12	2.4025	-76.8349	GPS	26/03/2018	
Univalle_Ca25	2.336886	-76.710563	Locality	2/10/2018	
Univalle_Ca32	2.336886	-76.710563	Locality	2/10/2018	
Univalle_Ca38	2.336886	-76.710563	Locality	2/10/2018	
Univalle_Ca46	2.3518	-76.8937	GPS	1/12/2018	*B. gasipaes*
Univalle_Ca47	2.4239	-76.8418		30/11/2018	
Univalle_Ca49	2.4005	-76.8462	GPS	29/11/2018	
Univalle_LA1	3,39261	-76,53712	GPS	6/07/2021	
Univalle_Ch34	5,71371	-77,27150	Locality	6/07/2021	
Univalle_Ch35	5,71371	-77,27150	Locality	6/07/2021	
Univalle_Ch36	5,71371	-77,27150	Locality	6/07/2021	
Univalle_Ch37	5,71371	-77,27150	Locality	6/07/2021	
Univalle_Ch38	5,71371	-77,27150	Locality	6/07/2021	
Univalle_Ch39	5,71371	-77,27150	Locality	6/07/2021	
Univalle_Ch40	5,71371	-77,27150	Locality	6/07/2021	
Univalle_Ch41	5,71371	-77,27150	Locality	6/07/2021	
Univalle_Ch42	5,69181	-77,27216	Locality	1/08/2021	
Univalle_Ch43	5,69181	-77,27216	Locality	1/08/2021	
Univalle_Ch44	5,69181	-77,27216	Locality	1/08/2021	
Univalle_Ch45	5,69181	-77,27216	Locality	1/08/2021	
Univalle_Ch46	5,69181	-77,27216	Locality	1/08/2021	
Univalle_Ch47	5,69181	-77,27216	Locality	1/08/2021	
Univalle_Ch48	5,69181	-77,27216	Locality	1/08/2021	
Univalle_Ch49	5,69181	-77,27216	Locality	1/08/2021	
Univalle_Ch50	5,69181	-77,27216	Locality	1/07/2021	
Univalle_Ch51	5,69181	-77,27216	Locality	1/07/2021	
Univalle_Ch52	5,69181	-77,27216	Locality	1/07/2021	
Univalle_Ch53	5,69181	-77,27216	Locality	1/07/2021	
Univalle_Ch54	5,69181	-77,27216	Locality	1/07/2021	
Univalle_Ch55	5,69181	-77,27216	Locality	1/07/2021	
Univalle_Ch56	5,69181	-77,27216	Locality	1/07/2021	
Univalle_Ch57	5,69181	-77,27216	Locality	1/07/2021	
Univalle_Ch58	5,69181	-77,27216	Locality	1/07/2021	
Univalle_Ch59	5,69181	-77,27216	Locality	1/07/2021	
Univalle_Ch60	5,69181	-77,27216	Locality	1/07/2021	
Univalle_Ch61	5,69181	-77,27216	Locality	1/07/2021	

Univalle_Ch62	5,69181	-77,27216	Locality	1/07/2021	
Univalle_Ch63	5,69181	-77,27216	Locality	1/07/2021	
Univalle_Ch64	5,69181	-77,27216	Locality	1/07/2021	
Univalle_Ch65	5,69181	-77,27216	Locality	1/07/2021	
Univalle_Ch66	5,69181	-77,27216	Locality	1/07/2021	
Univalle_Ch67	5,69181	-77,27216	Locality	1/07/2021	
Univalle_Ch68	5,69181	-77,27216	Locality	1/07/2021	
CCENT-0172	3.359437	-76.301344	Locality	16/07/2012	
CCENT-0173	3.399138	-76.32867	Locality	20/01/2000	
CCENT-0175	3.256468	-76.559456	Locality	20/10/2012	
CCENT-0274	3.50259	-76.355046	Locality	2/10/2000	
CCENT-0275	3.399138	-76.32867	Locality	20/01/2000	
CCENT-0276	3.399138	-76.32867	Locality	20/01/2000	
CCENT-0281	3.359437	-76.301344	Locality	16/07/2012	
Cenicaña_564	3.260383	-76.541171	Locality	6/11/2015	
CIATARC_1	3.50259	-76.355046	Locality	2012-2013	*S. officinarum*
CIATARC_101	3.50259	-76.355046	Locality	2012-2013	*S. officinarum*
CIATARC_102	3.50259	-76.355046	Locality	2012-2013	*S. officinarum*
CIATARC_106	3.50259	-76.355046	Locality	2012-2013	*S. officinarum*
CIATARC_107	3.50259	-76.355046	Locality	2012-2013	*S. officinarum*
CIATARC_114	3.50259	-76.355046	Locality	2012-2013	*S. officinarum*
CIATARC_115	3.50259	-76.355046	Locality	2012-2013	*S. officinarum*
CIATARC_121	3.50259	-76.355046	Locality	2012-2013	*S. officinarum*
CIATARC_123	3.50259	-76.355046	Locality	2012-2013	*S. officinarum*
CIATARC_130	3.50259	-76.355046	Locality	2012-2013	*S. officinarum*
CIATARC_133	3.50259	-76.355046	Locality	2012-2013	*S. officinarum*
CIATARC_137	3.50259	-76.355046	Locality	2012-2013	*S. officinarum*
CIATARC_15	3.50259	-76.355046	Locality	2012-2013	*S. officinarum*
CIATARC_157	3.50259	-76.355046	Locality	2012-2013	*S. officinarum*
CIATARC_180	3.50259	-76.355046	Locality	2012-2013	*S. officinarum*
CIATARC_181	3.50259	-76.355046	Locality	2012-2013	*S. officinarum*
CIATARC_25	3.50259	-76.355046	Locality	2012-2013	*S. officinarum*
CIATARC_40	3.50259	-76.355046	Locality	2012-2013	*S. officinarum*
CIATARC_45	3.50259	-76.355046	Locality	2012-2013	*S. officinarum*
CIATARC_46	3.50259	-76.355046	Locality	2012-2013	*S. officinarum*
CIATARC_54	3.50259	-76.355046	Locality	2012-2013	*S. officinarum*
CIATARC_55	3.50259	-76.355046	Locality	2012-2013	*S. officinarum*
CIATARC_57	3.50259	-76.355046	Locality	2012-2013	*S. officinarum*
CIATARC_57	3.50259	-76.355046	Locality	2012-2013	*S. officinarum*
CIATARC_82	3.50259	-76.355046	Locality	2012-2013	*S. officinarum*
CIATARC_R1	3.50259	-76.355046	Locality	2012-2013	*S. officinarum*
CIATARC_R2	3.50259	-76.355046	Locality	2012-2013	*S. officinarum*
MUSENUV_7892	3.690006	-76.940008	Locality	1/04/1982	
MUSENUV_7894	3.537932	-76.29723	Locality	1978	
MUSENUV_7897	3.537932	-76.29723	Locality	1/09/1986	
MUSENUV_7898	3.43829	-77.17449	Locality	1/08/1986	
Univalle_10	3.537932	-76.29723	Locality		
Univalle_11	3.261773	-76.540318	Locality		
Univalle_12	3.392267	-76.538814	GPS	20/04/2021	*B. nobilis*
Univalle_13	3.45185	-76.531432	Locality	1/11/1989	
Univalle_14	3.374102	-76.533365	Locality	1/10/1994	
Univalle_15	3.374102	-76.533365	Locality	1/10/1992	
Univalle_16	3.63424	-76.27971	Locality	1/01/1983	
Univalle_7	3.27555	-76.317899	Locality	27/09/2003	
Univalle_8	3.359437	-76.301344	Locality		
Univalle_9	3.27555	-76.317899	Locality		
Univalle_An02	3.7084	-76.9522	GPS	30/06/2018	*B. gasipaes*
Univalle_An03	3.7084	-76.9522	GPS	30/06/2018	*B. gasipaes*
Univalle_An05	3.7084	-76.9522	GPS	30/06/2018	*B. gasipaes*
Univalle_An07	3.7084	-76.9522	GPS	30/06/2018	*B. gasipaes*
Univalle_An11	3.6878	-76.9591	GPS	28/06/2018	*B. gasipaes*

Univalle_An13	3.6878	-76.9591	GPS	28/06/2018	*B. gasipaes*
Univalle_An15	3.6878	-76.9591	GPS	28/06/2018	*B. gasipaes*
Univalle_An16	3.6878	-76.9591	GPS	28/06/2018	*B. gasipaes*
Univalle_BC02	3.9826	-76.9804	GPS	1/06/2018	*B. gasipaes*
Univalle_BC03	3.9826	-76.9804	GPS	1/06/2018	*B. gasipaes*
Univalle_BC13	3.9826	-76.9804	GPS	1/06/2018	*B. gasipaes*
Univalle_BC16	4.0078	-76.9916	GPS	7/06/2018	*B. gasipaes*
Univalle_BC19	3.9826	-76.9804	GPS	1/06/2018	*B. gasipaes*
Univalle_BC23	3.9826	-76.9804	GPS	1/06/2018	*B. gasipaes*
Univalle_Ca10	2.4025	-76.8349	GPS	26/03/2018	
Univalle_Ca11	2.4025	-76.8349	GPS	26/03/2018	
Univalle_Ca13	2.4025	-76.8349	GPS	26/03/2018	
Univalle_Ca14	2.4025	-76.8349	GPS	26/03/2018	
Univalle_Ca16	2.4025	-76.8349	GPS	26/03/2018	
Univalle_Ca17	2.4025	-76.8349	GPS	26/03/2018	
Univalle_Ca24	2.336886	-76.710563	Locality	2/10/2018	
Univalle_Ca26	2.336886	-76.710563	Locality	2/10/2018	
Univalle_Ca34	2.336886	-76.710563	Locality	2/10/2018	
Univalle_Ca35	2.336886	-76.710563	Locality	2/10/2018	
Univalle_Ca36	2.336886	-76.710563	Locality	2/10/2018	
Univalle_Ca37	2.336886	-76.710563	Locality	2/10/2018	
Univalle_Ca42	2.4008	-76.8487	GPS	29/11/2018	
Univalle_Cq03	1.7257	-75.6558	GPS	8/02/2019	*B. gasipaes*
Univalle_Pu01	0.8889	-76.6720	GPS	29/01/2019	
Univalle_Pu02	0.8889	-76.6720	GPS	29/01/2019	
Univalle_Pu03	0.8889	-76.6720	GPS	29/01/2019	
Univalle_Pu04	0.8889	-76.6720	GPS	29/01/2019	
Univalle_Pu07	0.8889	-76.6720	GPS	29/01/2019	
Univalle_Pu09	0.8889	-76.6720	GPS	29/01/2019	
Univalle_Pu11	0.8889	-76.6720	GPS	29/01/2019	
Univalle_Pu12	0.8889	-76.6720	GPS	29/01/2019	
Univalle_Pu13	0.8889	-76.6720	GPS	29/01/2019	
Univalle_Pu16	0.8889	-76.6720	GPS	29/01/2019	
Univalle_Pu18	0.8889	-76.6720	GPS	29/01/2019	
Univalle_Pu19	0.8889	-76.6720	GPS	29/01/2019	
Univalle_Pu20	0.8889	-76.6720	GPS	29/01/2019	
Univalle_Pu24	0.8889	-76.6720	GPS	29/01/2019	
Univalle_Pu26	0.8889	-76.6720	GPS	29/01/2019	
Univalle_Pu27	0.8889	-76.6720	GPS	29/01/2019	
Univalle_Pu29	0.8889	-76.6720	GPS	29/01/2019	
Univalle_Pu30	0.8889	-76.6720	GPS	29/01/2019	
Univalle_Pu31	0.8889	-76.6720	GPS	29/01/2019	
Univalle_Pu32	0.8889	-76.6720	GPS	29/01/2019	
Univalle_Pu35	0.8889	-76.6720	GPS	29/01/2019	
Univalle_Pu36	0.8889	-76.6720	GPS	29/01/2019	
Univalle_Pu37	0.8889	-76.6720	GPS	29/01/2019	
Univalle_Pu38	0.8889	-76.6720	GPS	29/01/2019	
Univalle_Pu39	0.8889	-76.6720	GPS	29/01/2019	
Univalle_Pu73	0.8842	-76.5887	GPS	29/01/2019	
Verano_1				1940	
Verano_10				1940	
Verano_11				1940	
Verano_12				1940	
Verano_13				1940	
Verano_14				1940	
Verano_15				1940	
Verano_16				1940	
Verano_17				1940	
Verano_18				1940	
Verano_19				1940	
Verano_2				1940	

Verano_20				1940	
Verano_3				1940	
Verano_4				1940	
Verano_5				1940	
Verano_6				1940	
Verano_7				1940	
Verano_8				1940	
Verano_9				1940	
CCENT-0171	3.359437	-76.301344	Locality	16/07/2012	
CCENT-0174	3.50259	-76.355046	Locality	2/10/2000	
CCENT-0273	3.50259	-76.355046	Locality	2/10/2000	
CCENT-0277	3.359437	-76.301344	Locality	16/07/2012	
CCENT-0278	3.359437	-76.301344	Locality	16/07/2012	
CCENT-0279	3.359437	-76.301344	Locality	3/08/2012	
CCENT-0280	3.359437	-76.301344	Locality	22/10/2012	
CCENT-0282	3.359437	-76.301344	Locality	16/07/2012	
CCENT-0283	3.359437	-76.301344	Locality	22/10/2012	
CIATARC_108	3.50259	-76.355046	Locality	2012-2013	*S. officinarum*
CIATARC_109	3.50259	-76.355046	Locality	2012-2013	*S. officinarum*
CIATARC_110	3.50259	-76.355046	Locality	2012-2013	*S. officinarum*
CIATARC_111	3.50259	-76.355046	Locality	2012-2013	*S. officinarum*
CIATARC_112	3.50259	-76.355046	Locality	2012-2013	*S. officinarum*
CIATARC_113	3.50259	-76.355046	Locality	2012-2013	*S. officinarum*
CIATARC_117	3.50259	-76.355046	Locality	2012-2013	*S. officinarum*
CIATARC_118	3.50259	-76.355046	Locality	2012-2013	*S. officinarum*
CIATARC_127	3.50259	-76.355046	Locality	2012-2013	*S. officinarum*
CIATARC_131	3.50259	-76.355046	Locality	2012-2013	*S. officinarum*
CIATARC_154	3.50259	-76.355046	Locality	2012-2013	*S. officinarum*
CIATARC_16	3.50259	-76.355046	Locality	2012-2013	*S. officinarum*
CIATARC_170	3.50259	-76.355046	Locality	2012-2013	*S. officinarum*
CIATARC_179	3.50259	-76.355046	Locality	2012-2013	*S. officinarum*
CIATARC_182	3.50259	-76.355046	Locality	2012-2013	*S. officinarum*
CIATARC_184	3.50259	-76.355046	Locality	2012-2013	*S. officinarum*
CIATARC_24	3.50259	-76.355046	Locality	2012-2013	*S. officinarum*
CIATARC_4	3.50259	-76.355046	Locality	2012-2013	*S. officinarum*
CIATARC_5	3.50259	-76.355046	Locality	2012-2013	*S. officinarum*
CIATARC_60	3.50259	-76.355046	Locality	2012-2013	*S. officinarum*
CIATARC_61	3.50259	-76.355046	Locality	2012-2013	*S. officinarum*
CIATARC_63	3.50259	-76.355046	Locality	2012-2013	*S. officinarum*
CIATARC_76	3.50259	-76.355046	Locality	2012-2013	*S. officinarum*
CIATARC_79	3.50259	-76.355046	Locality	2012-2013	*S. officinarum*
CIATARC_80	3.50259	-76.355046	Locality	2012-2013	*S. officinarum*
CIATARC_81	3.50259	-76.355046	Locality	2012-2013	*S. officinarum*
CIATARC_90	3.50259	-76.355046	Locality	2012-2013	*S. officinarum*
CIATARC_94	3.50259	-76.355046	Locality	2012-2013	*S. officinarum*
CIATARC_95	3.50259	-76.355046	Locality	2012-2013	*S. officinarum*
CIATARC_97	3.50259	-76.355046	Locality	2012-2013	*S. officinarum*
CIATARC_98	3.50259	-76.355046	Locality	2012-2013	*S. officinarum*
CIATARC_R3	3.50259	-76.355046	Locality	2012-2013	*S. officinarum*
MUSENUV_22542	3.410231	-76.349287	Locality		
MUSENUV_7890	3.537932	-76.29723	Locality	1/04/1980	
MUSENUV_7893	3.537932	-76.29723	Locality	1/03/1980	
MUSENUV_7896	3.537932	-76.29723	Locality	1/11/1994	
MUSENUV_7900	4.078297	-77.016447	Locality		
Univalle_16	3.27555	-76.317899	Locality		
Univalle_17	3.392267	-76.538814	GPS	20/04/2021	*B. nobilis*
Univalle_18	3.392267	-76.538814	GPS	20/04/2021	*B. nobilis*
Univalle_19	3.392267	-76.538814	GPS	20/04/2021	*B. nobilis*
Univalle_20	3.392267	-76.538814	GPS	20/04/2021	*B. nobilis*
Univalle_21	3.392267	-76.538814	GPS	20/04/2021	*B. nobilis*
Univalle_22	3.374102	-76.533365	Locality	1/11/1994	

Univalle_23	3.503177	-76.235497	Locality	1/10/1987	
Univalle_24	3.537932	-76.29723	Locality		
Univalle_An04	3.7084	-76.9522	GPS	30/06/2018	*B. gasipaes*
Univalle_An06	3.7084	-76.9522	GPS	30/06/2018	*B. gasipaes*
Univalle_An08	3.7084	-76.9522	GPS	30/06/2018	*B. gasipaes*
Univalle_An09	3.7084	-76.9522	GPS	30/06/2018	*B. gasipaes*
Univalle_An10	3.7084	-76.9522	GPS	30/06/2018	*B. gasipaes*
Univalle_An12	3.6878	-76.9591	GPS	28/06/2018	*B. gasipaes*
Univalle_An14	3.6878	-76.9591	GPS	28/06/2018	*B. gasipaes*
Univalle_An18	3.6878	-76.9591	GPS	28/06/2018	*B. gasipaes*
Univalle_An19	3.6878	-76.9591	GPS	28/06/2018	*B. gasipaes*
Univalle_An20	3.6878	-76.9591	GPS	28/06/2018	*B. gasipaes*
Univalle_BC12	3.9826	-76.9804	GPS	1/06/2018	*B. gasipaes*
Univalle_BC15	4.0078	-76.9916	GPS	7/06/2018	*B. gasipaes*
Univalle_BC17	3.6878	-76.9591	GPS	28/06/2018	*B. gasipaes*
Univalle_BC20	3.9826	-76.9804	GPS	1/06/2018	*B. gasipaes*
Univalle_BC21	3.6878	-76.9591	GPS	28/06/2018	*B. gasipaes*
Univalle_BC22	3.6878	-76.9591	GPS	28/06/2018	*B. gasipaes*
Univalle_Ca01	2.4025	-76.8349	GPS	26/03/2018	
Univalle_Ca15	2.4025	-76.8349	GPS	26/03/2018	
Univalle_Ca18	2.4025	-76.8349	GPS	26/03/2018	
Univalle_Ca19	2.4025	-76.8349	GPS	26/03/2018	
Univalle_Ca29	2.336886	-76.710563	GPS	2/10/2018	
Univalle_Ca30	2.336886	-76.710563	GPS	2/10/2018	
Univalle_Ca33	2.336886	-76.710563	GPS	2/10/2018	
Univalle_Ca39	2.336886	-76.710563	GPS	2/10/2018	
Univalle_Ca40	2.336886	-76.710563	GPS	2/10/2018	
Univalle_Ca41	2.4008	-76.8487	GPS	29/11/2018	
Univalle_Ca50	2.4025	-76.8349	GPS	26/03/2018	
Univalle_Ca51	2.4025	-76.8349	GPS	26/03/2018	
Univalle_Cq02	1.7257	-75.6558	GPS	8/02/2019	*B. gasipaes*
Univalle_Pu05	0.8889	-76.6720	GPS	29/01/2019	
Univalle_Pu06	0.8889	-76.6720	GPS	29/01/2019	
Univalle_Pu08	0.8889	-76.6720	GPS	29/01/2019	
Univalle_Pu10	0.8889	-76.6720	GPS	29/01/2019	
Univalle_Pu14	0.8889	-76.6720	GPS	29/01/2019	
Univalle_Pu15	0.8889	-76.6720	GPS	29/01/2019	
Univalle_Pu17	0.8889	-76.6720	GPS	29/01/2019	
Univalle_Pu21	0.8889	-76.6720	GPS	29/01/2019	
Univalle_Pu22	0.8889	-76.6720	GPS	29/01/2019	
Univalle_Pu23	0.8889	-76.6720	GPS	29/01/2019	
Univalle_Pu25	0.8889	-76.6720	GPS	29/01/2019	
Univalle_Pu28	0.8889	-76.6720	GPS	29/01/2019	
Univalle_Pu33	0.8889	-76.6720	GPS	29/01/2019	
Univalle_Pu34	0.8889	-76.6720	GPS	29/01/2019	
Univalle_Pu40	0.8889	-76.6720	GPS	29/01/2019	
Univalle_Pu77	0.8842	-76.5887	GPS	29/01/2019	
Verano_21				1940	
Verano_22				1940	
Verano_23				1940	
Verano_24				1940	
Verano_25				1940	
Verano_26				1940	
Verano_27				1940	
Verano_28				1940	
Verano_29				1940	
Verano_30				1940	
Verano_31				1940	
Verano_32				1940	
Verano_33				1940	
Verano_34				1940	

Verano_35				1940	
Verano_36				1940	
Verano_37				1940	
Verano_38				1940	
Verano_39				1940	
Verano_40					

Continuation of the Table S1.

	Head							Thorax							Abdomen		Body	
ID	MVDAS	DIS	WRB	LLAS	WLAS	RL	DRS	PL	PW	PtL	EL	EW	MD	ML	AB	PyL	BL	References
Univalle_1	1.36	0.81	2.20	1.10	1.89	5.08	8.92	13.08	8.86	5.38	13.69	11.00	2.77	6.15	31.38	4.62	18.31	This study
Univalle_An01	1.32	0.90	2.22	1.10	2.11	6.86	11.29	15.57	12.86	6.00	16.29	15.57	3.43	7.14	38.00	6.14	22.43	This study
Univalle_An53	1.19	0.94	1.98	1.10	1.82	6.43	11.29	15.43	12.29	5.86	17.00	14.57	3.27	7.00	38.14	5.71	22.71	This study
Univalle_An54	1.38	0.97	2.24	1.16	2.11	7.29	11.29	15.86	11.71	6.00	16.71	16.29	3.40	7.29	38.29	5.71	22.43	This study
Univalle_An56	1.27	0.83	1.98	1.08	2.09	6.57	11.29	14.71	11.86	6.00	15.86	14.00	3.27	7.00	37.29	6.71	22.57	This study
Univalle_An58	1.27	0.90	2.15	1.12	2.00	6.00	10.00	14.57	11.43	5.00	15.43	13.43	3.40	6.71	34.43	4.43	19.86	This study
Univalle_BC01	1.32	0.94	1.98	1.05	1.91	5.86	9.71	12.71	10.57	5.00	14.57	12.43	2.83	6.14	32.00	4.71	19.29	This study
Univalle_BC04	1.43	1.16	2.35	1.10	2.00	6.00	10.43	16.86	13.00	6.00	16.71	15.57	3.97	7.29	39.43	5.86	22.57	This study
Univalle_BC05	1.34	1.08	2.09	1.03	1.82	6.29	10.00	13.71	11.57	5.43	14.71	14.57	3.37	6.57	33.57	5.14	19.86	This study
Univalle_BC06	1.30	0.94	2.20	0.72	1.78	6.86	11.29	15.57	12.43	6.00	16.29	15.00	3.60	7.57	37.43	5.57	21.86	This study
Univalle_BC08	1.32	1.12	2.09	1.14	1.87	6.43	10.43	14.00	12.00	5.57	15.57	14.29	3.57	7.29	35.57	6.00	21.57	This study
Univalle_BC10	1.21	0.99	2.15	1.10	2.11	6.29	10.43	14.57	12.14	5.29	16.00	14.00	3.57	6.86	36.86	6.29	22.29	This study
Univalle_BC101	1.51			1.30	2.09	6.92	11.38	15.38	12.14	6.46	17.08	14.29	3.10	7.38	36.92	4.46	21.54	This study
Univalle_BC14	1.32	1.10	2.33	1.16	2.02	7.00	11.57	16.14	12.71	6.29	17.71	15.43	3.63	7.57	39.86	6.00	23.71	This study
Univalle_BC18	1.45	0.94	2.26	1.19	1.89	6.43	10.43	14.71	12.57	6.14	15.71	14.57	3.30	7.00	36.57	6.14	21.86	This study
Univalle_Ca02	1.32	0.83	2.20	1.10	2.02	6.71	11.29	16.00	12.43	6.14	17.14	14.86	3.30	7.43	38.29	5.14	22.29	This study
Univalle_Ca05	1.27	0.88	2.24	1.21	2.00	6.71	11.14	14.86	12.14	5.71	15.86	14.29	3.47	7.14	36.57	5.86	21.71	This study
Univalle_Ca09	1.27	0.92	2.24	1.10	2.06	6.57	11.29	14.86	11.71	5.86	14.86	14.71	3.40	6.86	34.00	4.29	19.14	This study
Univalle_Ca20	1.21	0.88	1.93	1.05	1.93	5.43	9.29	12.57	9.86	5.00	13.57	12.43	3.00	6.14	31.00	4.86	18.43	This study
Univalle_Ca21	1.25	0.99	2.20	1.12	1.98	6.71	11.00	15.00	12.14	6.00	16.14	15.00	3.50	7.14	37.00	5.86	22.00	This study
Univalle_Ca22	0.99	0.94	2.15	1.05	1.93	6.43	10.29	14.43	11.57	5.71	16.29	14.43	3.43	7.14	36.43	5.71	22.00	This study
Univalle_Ca23	1.14	0.83	1.98	1.12	2.00	6.43	10.29	14.29	11.29	5.57	14.86	13.86	3.23	6.71	34.29	5.14	20.00	This study
Univalle_Ca27	1.23	0.86	2.11	1.16	2.04	6.29	10.57	14.43	11.57	5.57	15.14	14.14	3.43	6.71	34.71	5.14	20.29	This study
Univalle_Ca28	1.27	1.16	2.28	1.14	2.09	5.86	10.00	13.57	11.14	5.43	14.57	13.57	2.93	6.86	33.71	5.57	20.14	This study
Univalle_Ca31	1.16	0.83	2.15	1.10	2.09	6.71	11.14	15.29	12.14	5.71	16.43	15.00	3.40	7.29	37.00	5.29	21.71	This study
Univalle_Ca43	1.23	0.72	1.98	1.14	2.00	6.43	10.57	14.43	12.29	6.00	16.43	14.43	3.73	7.00	37.43	6.57	23.00	This study
Univalle_Ca44	1.23	0.86	2.00	1.05	1.95	6.14	10.29	14.57	11.57	5.71	15.57	13.86	3.20	6.86	37.29	7.14	22.71	This study
Univalle_Ca45	1.27	0.88	2.09	1.19	1.95	6.43	10.57	14.71	12.14	5.71	15.86	14.14	3.37	7.00	36.71	6.14	22.00	This study
Univalle_Ca48	1.30	1.03	2.30	1.08	1.98	6.43	11.00	15.00	12.43	5.71	16.86	14.71	3.47	7.00	37.86	6.00	22.86	This study
Univalle_Cq01	1.23	0.97	2.15	1.21	1.89	6.71	10.57	14.71	11.86	5.86	14.86	14.43	3.10	6.86	35.57	6.00	20.86	This study
Univalle_Pu58	1.62	1.08	2.50	1.05	1.76	6.43	11.29	17.86	14.57	6.43	18.00	16.71	3.60	8.00	42.71	6.86	24.86	This study
Univalle_Pu59	1.54	1.16	2.39	1.21	1.93	6.71	11.43	17.14	13.43	6.43	17.00	15.71	3.43	8.57	39.57	5.43	22.43	This study
Univalle_Ch1	1,67	1,14	2,85	1,19	2,24	5,85	11,08	18,46	13,71	6,92	19,23	16,29	3,50	8,00	25,23	6,00	43,69	This study
Univalle_Ch2	1,65	1,25	3,01	1,23	2,50	6,15	12,31	18,77	14,29	6,15	18,92	16,86	4,13	8,46	26,46	7,54	45,23	This study
Univalle_Ch3	1,58	1,19	2,68	1,19	2,20	7,23	12,00	17,69	13,14	6,77	18,46	15,29	3,80	7,54	25,38	6,92	43,08	This study
Univalle_Ch4	1,82	1,32	2,96	1,21	2,30	7,54	12,77	19,69	14,71	6,92	20,46	16,86	4,10	8,15	28,15	7,69	47,85	This study

Univalle_Ch5	1,49	1,16	2,46	1,14	2,02	6,46	11,08	17,38	12,86	6,31	18,15	14,86	3,60	7,54	25,54	7,38	42,92	This study
Univalle_Ch6	1,54	0,99	2,57	1,16	2,26	6,92	11,69	17,38	12,86	6,62	19,08	15,00	3,77	7,69	26,00	6,92	43,38	This study
Univalle_Ch7	1,40	0,99	2,11	1,21	2,20	6,92	11,23	14,77	10,86	6,46	15,08	12,43	3,00	6,92	21,23	6,15	36,00	This study
Univalle_Ch8	1,78	1,23	2,92	1,30	2,41	7,38	12,77	19,69	13,86	7,08	19,38	16,14	3,67	8,15	27,54	8,15	47,23	This study
Univalle_Ch9	1,58	1,16	2,72	1,12	2,26	6,77	11,38	16,46	12,43	5,85	17,38	14,29	3,57	7,38	23,54	6,15	40,00	This study
Univalle_Ch10	1,76	1,05	2,59	1,23	2,26	8,15	13,08	20,92	15,71	7,85	23,08	18,43	3,73	9,69	31,54	8,46	52,46	This study
Univalle_Ch11	1,71	1,14	2,83	1,21	2,30	8,46	14,92	22,46	16,86	8,00	23,08	21,14	4,27	9,38	32,31	9,23	54,77	This study
Univalle_Ch12	1,62	1,19	2,92	1,12	2,26	8,00	13,85	20,62	15,43	7,38	22,77	19,71	3,73	8,92	33,08	10,31	53,69	This study
Univalle_Ch13	1,38	1,19	2,52	1,21	2,09	7,85	12,92	19,85	14,71	8,62	21,54	17,86	3,57	9,38	29,54	8,00	49,38	This study
Univalle_Ch14	1,34	1,03	2,15	1,14	1,93	6,15	11,23	16,15	11,71	6,46	17,38	14,57	3,13	7,54	24,15	6,77	40,31	This study
Univalle_Ch15	1,65	1,21	2,72	1,16	2,24	8,15	15,85	20,92	16,43	9,23	24,00	19,57	3,93	11,08	33,08	9,08	54,00	This study
Univalle_Ch16	1,71	1,16	2,59	1,16	2,26	7,54	13,69	21,69	16,29	7,69	23,08	19,29	3,80	9,69	32,77	9,69	54,46	This study
Univalle_Ch17	1,62	1,03	2,57	1,25	2,15	8,00	13,85	21,85	15,57	7,69	22,92	19,14	3,53	9,08	32,00	9,08	53,85	This study
Univalle_Ch18	1,21	0,92	1,89	0,99	1,91	6,00	9,38	13,54	11,14	5,69	16,15	12,86	2,73	6,46	24,62	8,46	38,15	This study
Univalle_Ch19	1,78	1,08	2,55	1,10	2,22	5,69	10,77	22,46	13,00	6,31	18,31	16,43	3,80	8,15	26,77	8,46	49,23	This study
Univalle_Ch20	1,65	1,23	2,52	1,25	2,26	6,46	11,08	17,38	12,57	6,00	18,00	14,57	3,63	7,85	26,62	8,62	44,00	This study
Univalle_Ch21	1,87	1,34	2,96	1,25	2,35	8,92	14,77	18,77	13,86	8,46	19,54	16,57	3,53	9,85	27,54	8,00	46,31	This study
Univalle_Ch22	1,65	1,16	2,68	1,23	2,28	5,85	11,08	17,69	13,14	6,62	19,69	15,71	3,60	8,00	28,31	8,62	46,00	This study
Univalle_Ch23	1,69	1,08	2,59	1,21	2,37	6,46	10,92	16,92	13,86	6,77	18,00	16,57	3,90	8,62	24,92	6,92	41,85	This study
Univalle_Ch24	1,49	1,14	2,50	1,25	2,24			19,54	12,29	6,15	17,69	16,29	3,57	7,85	23,54	5,85	43,08	This study
Univalle_Ch25	1,69	1,14	2,46	1,25	2,04	6,62	11,08	16,92	12,43	6,62	18,46	16,86	3,63	7,69	25,38	6,92	42,31	This study
Univalle_Ch26	1,69	1,14	2,94	1,25	2,26	6,62	11,08	17,85	14,29	7,23	20,62	17,57	3,90	8,77	28,15	7,54	46,00	This study
Univalle_Ch27	1,80	1,25	1,82	1,23	2,15	6,77	12,15	18,77	13,57	7,23	18,92	16,43	4,20	8,92	27,38	8,46	46,15	This study
Univalle_Ch28	1,78	1,30	2,94	1,32	2,35	6,15	11,54	18,92	14,29	6,77	20,00	16,57	4,23	8,15	27,54	7,54	46,46	This study
Univalle_Ch29	1,56	1,21	2,57	1,25	2,24	6,31	11,08	16,31	12,86	6,62	18,00	15,43	3,63	8,15	25,08	7,08	41,38	This study
Univalle_Ch30	1,73	1,12	2,83	1,32	2,39	6,00	11,23	17,85	13,57	7,08	18,77	16,14	3,53	8,31	26,31	7,54	44,15	This study
Univalle_Ch31	1,58	1,23	2,83	1,19	2,24	6,46	11,38	18,77	14,43	6,92	18,92	16,14	3,87	8,15	26,62	7,69	45,38	This study
Univalle_Ch32	1,60	1,14	2,48	1,19	2,24	6,77	10,77	17,38	12,43	6,77	19,85	29,14	3,47	8,15	27,54	7,69	44,92	This study
Univalle_Ch33	1,40	1,03	2,28	1,10	2,02	5,54	9,69	13,69	10,71	5,38	14,62	12,29	3,07	6,46	20,00	5,38	33,69	This study
MUSENUV_29193	1.76	1.27	2.77	0.03	2.28	8.15	13.08	18.46	14.71		18.77	16.00	4.40	8.77	43.23	6.00	24.77	This study
MUSENUV_7895	1.84	1.45	2.90	0.03	2.35	8.77	14.92	21.54	16.14	10.15	20.46	18.29	4.33		51.23	9.23	29.69	This study
MUSENUV28115	1.30	1.03	2.09	0.03	2.04	5.85	10.15	14.62	10.43	6.46	15.08	12.57	2.93	6.92	35.54	5.85	20.92	This study
Univalle_2	1.40	1.01	2.33	1.32	2.37	6.62	12.77	16.31	11.14	8.46	16.62	13.71	3.27	8.15	39.38	6.46	23.08	This study
Univalle_3	1.73	1.21	2.72	0.03	2.30	8.62	14.15	18.46	14.29	8.77	18.92	16.43	4.17	8.92	43.54	6.15	25.08	This study
Univalle_4	1.51	1.05	2.59	1.21	2.41	6.46	12.62	16.31	12.43	8.15	17.69	14.71	3.43	8.46	41.23	7.23	24.92	This study
Univalle_5	1.43	1.10	2.48	1.10	2.30	6.77	11.38	15.85	11.86	6.77	16.46	14.29	1.58	7.38	37.54	5.23	21.69	This study
Univalle_6	1.49	0.94	2.26	0.99	2.26	7.54	12.15	16.77	11.71	7.54	15.85	13.29	3.17	7.85	37.54	4.92	20.77	This study
Univalle_An60	1.34	1.01	2.17	1.19	2.26	7.71	12.71	15.71	12.43	7.29	16.29	15.00	3.13	8.14	37.86	5.86	22.14	This study
Univalle_BC07	1.47	1.12	2.30	1.10	2.11	7.43	12.29	16.14	12.71	7.57	17.14	15.43	3.60	7.86	39.29	6.00	23.14	This study
Univalle_BC09	1.14	0.99	2.26	1.08	2.15	7.71	12.14	16.43	12.86	7.57	16.86	15.00	3.30	8.00	38.57	5.29	22.14	This study
Univalle_BC100	1.40	1.03	2.77	0.03	2.44	8.00	12.62	16.77	11.86	8.15	17.54	14.29	3.53	8.15	38.62	4.31	21.85	This study
Univalle_BC11	1.36	1.08	2.28	1.05	2.20	7.71	12.00	15.71	12.29	7.00	16.14	14.29	3.23	8.00	37.57	5.71	21.86	This study

Univalle_Ca03	1.38	1.01	2.39	1.30	2.24	7.86	12.86	16.57	12.86	7.71	16.57	15.00	3.73	8.00	39.00	5.86	22.43	This study
Univalle_Ca07	1.32	1.01	2.15	1.12	2.06	7.00	11.43	15.57	12.29	7.00	15.43	14.43	3.43	7.43	37.00	6.00	21.43	This study
Univalle_Ca08	1.30	0.90	2.15	1.30	2.15	7.57	12.43	16.00	12.43	7.14	16.57	15.00	3.30	7.71	37.43	4.86	21.43	This study
Univalle_Ca12	1.40	1.05	2.39	1.16	2.28	7.86	13.14	16.71	13.29	8.14	17.71	16.14	3.63	8.71	40.57	6.14	23.86	This study
Univalle_Ca25	1.32	0.99	2.06	1.19	1.91	6.14	11.29	14.71	11.71	6.43	14.71	14.29	3.10	7.14	34.71	5.29	20.00	This study
Univalle_Ca32	1.43	0.92	2.02	1.14	1.60	7.14	12.00	15.71	12.43	7.14	16.86	14.86	3.53	7.71	38.29	5.71	22.57	This study
Univalle_Ca38	1.34	1.12	2.24	1.16	2.04	6.14	10.43	14.29	11.29	6.43	14.71	13.57	2.93	7.57	34.29	5.29	20.00	This study
Univalle_Ca46	1.34	0.97	2.06	1.25	2.09	6.57	10.71	14.43	12.00	6.43	15.71	14.00	2.97	6.86	36.57	6.43	22.14	This study
Univalle_Ca47	1.32	0.88	2.13	1.21	2.11	7.29	12.00	15.29	11.57	6.86	16.43	13.71	3.13	7.57	38.00	6.29	22.71	This study
Univalle_Ca49	1.27	0.88	2.00	1.16	2.20	7.00	11.43	14.86	11.71	7.00	15.71	14.00	3.27	7.43	35.71	5.14	20.86	This study
Univalle_LA1	1,65	1,32	2,72	1,32	2,28	7,69	12,62	17,23	13,14	8,00	17,85	17,00	3,73	8,46	24,62	6,77	41,85	This study
Univalle_Ch34	1,76	1,32	2,52	1,38	2,55	8,77	14,00	20,15	14,86	10,15	22,00	17,14	3,83	8,15	29,54	7,54	49,69	This study
Univalle_Ch35	1,78	1,40	3,12	1,34	2,39	8,00	13,23	21,38	14,14	8,77	19,69	16,57	3,83	9,85	27,38	7,69	48,77	This study
Univalle_Ch36	1,54	1,10	2,52	1,25	2,20	7,54	12,77	18,92	13,00	8,46	18,62	14,71	3,37	7,69	24,46	5,85	43,38	This study
Univalle_Ch37	1,65	1,25	2,74	1,27	2,13	6,92	11,85	18,46	13,71	7,23	18,92	16,14	3,77	7,38	26,77	7,85	45,23	This study
Univalle_Ch38	1,73	1,32	2,94	1,32	2,61	9,38	15,08	20,77	16,71	9,69	20,62	17,71	4,07	9,54	27,85	7,23	48,62	This study
Univalle_Ch39	1,95	1,36	3,07	1,30	2,66	8,92	14,62	20,31	15,00	9,54	21,23	19,00	4,97	9,23	28,62	7,38	48,92	This study
Univalle_Ch40	1,98	1,54	2,96	1,32	2,30	8,31	14,46	20,62	15,29	10,00	20,15	19,71	3,97	10,00	28,31	8,15	48,92	This study
Univalle_Ch41	1,91	1,43	3,29	1,43	2,48	9,54	15,38	21,69	17,29	10,46	20,92	18,86	5,20	9,23	28,92	8,00	50,62	This study
Univalle_Ch42	1,65	1,32	2,99	1,16	2,35	9,69	17,08	23,08	17,14	10,31	23,85	20,14	3,87	8,62	33,38	9,54	56,46	This study
Univalle_Ch43	1,65	1,47	2,94	1,27	2,41	9,69	15,85	22,77	16,29	7,08	23,69	19,57	3,90	10,77	34,46	10,77	57,23	This study
Univalle_Ch44	1,58	1,05	2,30	1,10	2,06	8,31	13,54	20,62	13,86	8,46	20,31	16,29	3,33	9,38	27,85	7,54	48,46	This study
Univalle_Ch45	1,71	1,25	2,70	1,19	2,20	8,92	15,38	20,77	15,71	9,85	22,31	17,14	3,87	10,46	30,77	8,46	51,54	This study
Univalle_Ch46	1,82	1,30	2,79	1,38	2,44	9,54	15,69	22,00	17,57	10,92	24,00	21,14	3,77	11,38	34,31	10,31	56,31	This study
Univalle_Ch47	1,65	1,23	3,05	1,32	2,30	8,62	15,08	19,08	14,71	8,92	21,38	19,00	3,57	10,31	31,08	9,69	50,15	This study
Univalle_Ch48	1,65	1,14	2,68	1,21	2,20	7,85	14,15	19,23	14,86	8,77	20,31	17,29	3,47	9,38	28,31	8,00	47,54	This study
Univalle_Ch49	1,60	1,16	2,39	1,12	2,26	8,46	14,46	20,46	15,29	8,77	20,00	18,00	3,53	9,85	28,00	8,00	48,46	This study
Univalle_Ch50	1,69	1,25	2,52	1,32	2,26	8,77	15,85	23,69	19,57	10,31	23,38	19,86	3,90	10,92	30,46	7,08	54,15	This study
Univalle_Ch51	1,60	1,16	2,20	1,16	2,13	6,46	11,08	14,92	10,86	6,62	15,54	13,14	2,90	0,00	22,77	7,23	37,69	This study
Univalle_Ch52	1,82	1,21	2,46	1,23	2,26	7,69	13,08	18,46	13,29	6,00	18,15	15,43	1,83	8,62	25,85	7,69	44,31	This study
Univalle_Ch53	1,80	1,21	2,57	1,32	2,52	8,46	14,15	19,08	13,71	8,77	19,69	16,00	4,17	9,38	26,92	7,23	46,00	This study
Univalle_Ch54	1,84	1,21	2,81	1,32	2,35	8,31	14,31	20,00	14,29	8,77	20,00	17,71	4,07	9,23	28,15	8,15	48,15	This study
Univalle_Ch55	1,80	1,47	2,52	1,38	2,26	7,54	13,54	19,38	14,29	8,77	20,31	17,14	3,77	8,92	28,77	8,46	48,15	This study
Univalle_Ch56	1,58	1,14	2,57	1,23	2,30	6,77	11,85	18,92	13,86	6,77	19,54	16,71	3,77	8,46	27,54	8,00	46,46	This study
Univalle_Ch57	1,80	1,25	2,61	1,27	2,41	7,85	13,38	19,54	14,00	9,08	19,69	16,57	3,83	9,54	26,77	7,08	46,31	This study
Univalle_Ch58	1,87	1,21	2,85	1,43	2,57	8,77	14,92	21,54	12,29	9,85	21,69	19,14	4,27	10,00	28,92	7,23	50,46	This study
Univalle_Ch59	1,98	1,38	2,96	1,21	2,74	8,77	14,92	20,77	15,00	9,38	20,62	17,71	4,13	10,00	26,62	6,00	47,38	This study
Univalle_Ch60	1,87	1,25	3,16	1,34	2,63	8,77	14,92	21,38	15,29	10,77	21,23	17,57	4,10	10,31	29,38	8,15	50,77	This study
Univalle_Ch61	1,84	1,32	2,96	1,32	2,41	7,23	13,08	19,85	15,29	9,54	20,31	17,00	3,73	9,85	29,08	8,77	48,92	This study
Univalle_Ch62	1,84	1,36	2,83	1,38	2,33	8,15	13,69	20,00	14,86	9,08	20,00	19,29	4,07	9,54	28,15	8,15	48,15	This study
Univalle_Ch63	1,65	1,08	2,46	1,30	2,28	7,54	12,15	17,23	12,57	7,85	18,00	14,57	3,40	8,15	23,54	5,54	40,77	This study
Univalle_Ch64	1,87	1,43	3,03	1,36	2,41	8,00	13,38	17,23	14,14	8,92	19,54	17,71	3,83	9,08	26,92	7,38	44,15	This study

Univalle_Ch65	1,73	1,23	2,85	1,36	2,28	7,69	12,62	18,62	13,86	8,31	18,92	16,00	3,87	9,23	26,15	7,23	44,77	This study
Univalle_Ch66	1,58	1,05	2,48	1,19	2,26	7,23	11,85	15,85	12,14	7,54	16,31	14,57	3,37	8,00	22,77	6,46	38,62	This study
Univalle_Ch67	1,80	1,25	2,88	1,30	2,37	6,92	13,08	16,92	12,86	8,15	17,85	16,29	3,47	8,92	25,69	7,85	42,62	This study
Univalle_Ch68	1,54	1,21	2,90	1,21	2,26	8,00	12,46	17,69	13,14	7,54	17,23	15,29	3,40	8,15	24,15	6,92	41,85	This study
CCENT-0172	0.91	0.31	1.60	1.09	1.63	6.38	10.13	9.88	8.75	4.88	12.38	11.00	1.91	6.38	27.25	5.00	17.38	This study
CCENT-0173	0.89	0.26	1.31	1.00	1.63	5.75	9.25	9.00	7.88	4.38	11.13	10.00	1.71	5.50	23.25	3.13	14.25	This study
CCENT-0175	0.91	0.29	1.37	1.00	1.63	6.00	8.88	9.13	7.75	4.38	11.25	10.00	1.77	5.63	23.50	3.13	14.38	This study
CCENT-0274	0.86	0.26	1.26	1.00	1.54	6.00	8.75	8.50	7.25	3.88	10.88	9.00	1.49	5.25	22.00	2.63	13.50	This study
CCENT-0275	0.86	0.31	1.29	0.97	1.57	5.13	8.63	8.88	8.63	4.63	12.00	10.63	1.71	6.13	24.50	3.63	15.63	This study
CCENT-0276	0.83	0.34	1.34	1.09	1.94	5.38	9.00	9.38	8.25	4.75	11.38	0.00	2.34	5.88	25.13	4.38	15.75	This study
CCENT-0281	0.86	0.54	1.34	0.94	1.63	5.88	9.38	9.38	8.38	4.25	11.63	10.25	1.66	5.50	24.75	3.75	15.38	This study
Cenicaña_564	0.97	0.31	1.51	1.14	1.83	6.63	10.75	11.00	10.00	5.25	12.88	12.50	2.00	6.50	28.50	4.63	17.50	This study
CIATARC_1	1.16	0.37	1.91	1.25	2.13	7.14	11.71	12.29	11.00	4.29	14.43	14.00	2.67	7.14	31.43	4.71	19.14	This study
CIATARC_101	0.81	0.33	1.43	1.01	1.69	4.29	7.86	9.29	8.86	4.43	11.57	10.71	2.07	5.29	24.86	4.00	15.57	This study
CIATARC_102	0.99	0.33	1.65	0.99	1.78	6.29	10.29	10.57	9.29	5.14	13.00	11.86	2.27	6.71	27.57	4.00	17.00	This study
CIATARC_106	0.88	0.42	1.47	0.99	1.65	5.29	8.57	8.43	7.29	4.00	11.00	9.29	1.70	5.14	22.29	2.86	13.86	This study
CIATARC_107	0.97	0.37	1.43	1.14	1.71	5.86	9.57	9.57	8.57	4.57	12.29	10.86	2.07	5.86	25.00	3.14	15.43	This study
CIATARC_114	1.19	0.37	1.71	1.21	1.91	7.00	11.14	12.14	10.71	5.43	15.00	13.00	2.33	6.29	32.43	5.29	20.29	This study
CIATARC_115	0.94	0.31	1.51	0.94	1.60	5.29	8.57	8.29	7.43	4.00	10.57	9.43	1.90	5.00	21.86	3.00	13.57	This study
CIATARC_121	0.88	0.31	1.40	0.90	1.69	5.29	8.29	8.14	6.86	3.86	10.29	8.86	1.37	5.14	21.57	3.14	13.43	This study
CIATARC_123	0.88	0.31	1.30	0.97	1.51	4.57	7.29	7.57	6.57	3.86	9.86	8.57	1.33	4.71	20.29	2.86	12.71	This study
CIATARC_130	1.16	0.40	1.80	1.05	2.00	6.86	10.86	11.57	10.43	5.43	14.00	13.14	2.23	6.71	30.43	4.86	18.86	This study
CIATARC_133	0.86	0.29	1.38	0.99	1.76	5.29	8.57	8.14	7.29	4.00	10.71	9.71	1.50	6.43	21.00	2.14	12.86	This study
CIATARC_137	0.88	0.33	1.45	0.94	1.71	5.00	8.14	10.86	9.14	5.71	13.29	11.43	1.63	5.29	27.86	3.71	17.00	This study
CIATARC_15	1.10	0.35	1.76	1.10	2.02	6.71	11.00	11.00	10.00	5.29	14.00	12.71	2.43	6.71	30.29	5.29	19.29	This study
CIATARC_157	1.05	0.42	1.71	1.12	1.76	5.29	9.57	11.57	10.00	5.29	14.43	12.71	2.37	6.57	30.29	4.29	18.71	This study
CIATARC_180	0.94	0.35	1.65	0.97	1.76	5.86	9.43	9.71	8.57	4.29	11.86	10.43	1.83	6.71	24.71	3.14	15.00	This study
CIATARC_181	1.01	0.35	1.54	1.03	1.62	5.29	9.00	9.29	8.14	4.71	11.71	10.43	1.73	5.86	24.00	3.00	14.71	This study
CIATARC_25	1.16	0.42	1.78	1.12	1.95	7.00	11.00	11.57	10.00	5.29	13.57	12.57	2.43	6.86	30.14	5.00	18.57	This study
CIATARC_40	1.12	0.50	1.71	1.14	2.15	7.14	11.43	12.14	10.00	5.71	14.29	13.43	2.33	7.14	30.86	4.43	18.71	This study
CIATARC_45	0.88	0.18	1.38	0.97	1.69	5.43	8.57	8.57	7.29	4.14	10.71	9.29	1.57	5.29	22.86	3.57	14.29	This study
CIATARC_46	0.88	0.33	1.47	1.05	1.51	5.57	9.14	9.57	8.57	4.43	12.57	11.00	2.57	6.14	26.57	4.43	17.00	This study
CIATARC_54	0.99	0.37	1.56	1.10	1.98	6.43	10.29	9.86	8.71	5.43	12.71	11.00	2.00	6.29	27.00	4.43	17.14	This study
CIATARC_55	0.97	0.35	1.56	1.12	1.80	6.14	9.71	9.86	8.57	4.43	12.43	11.14	2.00	5.71	26.43	4.14	16.57	This study
CIATARC_57	0.94	0.29	1.40	1.03	1.80	5.86	9.43	11.00	9.57	5.86	13.57	12.00	2.20	5.71	29.00	4.43	18.00	This study
CIATARC_57	0.92	0.29	1.47	0.99	1.73	5.86	8.71	9.29	8.00	4.57	11.71	10.29	1.97	5.71	24.86	3.86	15.57	This study
CIATARC_82	0.99	0.29	1.58	1.05	1.93	6.14	9.86	9.71	8.57	4.57	12.43	10.71	2.10	6.00	24.86	2.71	15.14	This study
CIATARC_R1	0.86	0.29	1.40	1.14	1.73	5.71	9.29	11.43	10.29	6.14	14.57	13.00	2.47	6.43	31.00	5.00	19.57	This study
CIATARC_R2	1.16	0.37	1.73	1.19	2.11	6.86	11.29	11.29	9.57	5.43	14.00	12.43	2.10	7.00	29.71	4.43	18.43	This study
MUSENUV_7892	1.14	0.31	1.76	0.99	2.06	6.46	10.62	10.62	8.57	5.54	13.23	10.86	2.10	6.62	28.46	4.62	17.85	This study
MUSENUV_7894	1.05	0.35	1.69	0.94	2.09	6.00	9.85	9.54	7.86	5.08	12.00	9.86	1.87	6.15	25.54	4.00	16.00	This study
MUSENUV_7897	1.38	0.46	2.20	1.36	2.35	8.31	13.54	14.31	12.14	6.46	17.38	15.14	2.93	8.15	38.77	7.08	24.46	This study

MUSENUV_7898	1.47	0.40	2.59	1.30	2.46	8.62	14.15	15.38	12.43	7.23	18.00	15.86	2.87	8.92	40.31	6.92	24.92	This study
Univalle_10	1.21	0.37	1.87	1.19	2.09	7.23	10.62	11.23	9.43	5.23	13.85	11.86	2.20	6.62	31.23	6.15	20.00	This study
Univalle_11	1.21	0.46	1.80	1.14	2.06	6.77	11.08	11.23	9.00	9.69	13.23	11.57	2.90		30.15	5.69	18.92	This study
Univalle_12	1.43	0.46	2.20	1.30	2.24	7.85	12.92	13.23	11.29	6.62	17.08	14.14	2.67	7.85	36.46	6.15	23.23	This study
Univalle_13	1.21	0.42	2.02	1.01	2.20	7.08	11.38	12.62	10.71	5.69	16.00	13.71	2.50	7.69	34.62	6.00	22.00	This study
Univalle_14	1.03	0.33	1.65	1.12	2.11	6.46	10.15	10.00	8.14	4.77	12.00	10.14	2.03	6.15	26.31	4.31	16.31	This study
Univalle_15	1.36	0.46	2.04	1.23	2.24	7.85	13.08	14.15	11.00	6.62	16.00	13.57	2.37	8.00	36.46	6.31	22.31	This study
Univalle_16	1.14	0.33	1.87	0.97	2.22	8.77	11.38	11.85	9.43	5.69	14.31	11.86	2.27	7.08	30.15	4.00	18.31	This study
Univalle_7	0.94	0.40	1.60	1.10	1.80	5.85	9.38	9.23	7.57	4.62	11.23	9.57	1.47	5.54	24.62	4.15	15.38	This study
Univalle_8	1.03	0.37	1.80	0.99	2.11	6.46	10.62	11.85	8.71	5.85	13.54	11.14	2.03	7.08	30.92	5.54	19.08	This study
Univalle_9	0.97	0.40	1.60	1.10	1.78	5.69	9.23	9.08	7.71	4.46	11.54	9.71	1.80	5.54	24.62	4.00	15.54	This study
Univalle_An02	1.36	0.46	2.00	1.27	2.06	7.57	11.57	13.86	11.71	6.14	16.29	14.71	2.60	7.86	36.57	6.43	22.71	This study
Univalle_An03	1.36	0.48	2.15	1.21	2.26	7.57	12.43	13.00	11.43	5.86	16.14	15.14	2.37	7.43	36.00	6.86	23.00	This study
Univalle_An05	1.32	0.50	2.09	1.30	2.30	8.00	12.86	13.43	12.00	6.00	16.14	14.71	2.33	7.71	37.14	7.57	23.71	This study
Univalle_An07	1.36	0.46	2.09	1.27	2.24	8.43	13.43	14.29	12.43	6.57	16.43	15.29	2.83	8.57	38.71	8.00	24.43	This study
Univalle_An11	1.23	0.37	2.06	0.97	2.09	7.14	11.71	12.43	11.14	6.14	15.00	14.00	2.63	7.29	33.29	5.86	20.86	This study
Univalle_An13	1.40	0.50	2.15	1.21	2.41	8.00	12.86	13.71	11.86	6.43	16.57	14.71	2.83	7.43	37.00	6.71	23.29	This study
Univalle_An15	1.32	0.48	2.15	1.19	2.06	7.43	12.71	12.86	11.43	6.14	16.86	13.86	2.47	7.71	35.57	5.86	22.71	This study
Univalle_An16	1.32	0.44	2.24	1.10	2.26	7.57	12.29	13.14	11.57	6.14	15.86	14.57	2.73	7.86	34.57	5.57	21.43	This study
Univalle_BC02	1.27	0.40	2.04	1.30	2.35	7.86	12.71	13.57	11.86	6.00	16.57	15.14	2.73	7.43	36.14	6.00	22.57	This study
Univalle_BC03	1.23	0.33	2.02	1.25	2.35	7.86	13.00	13.43	11.43	6.43	16.29	14.71	2.80	8.00	36.14	6.43	22.71	This study
Univalle_BC13	1.30	0.40	2.00	1.30	2.33	8.00	13.00	14.00	11.86	6.43	16.86	15.71	2.93	8.57	36.43	5.57	22.43	This study
Univalle_BC16	1.30	0.44	2.04	1.23	2.24	7.57	12.29	13.86	11.86	6.29	16.43	14.86	2.40	8.14	37.14	6.86	23.29	This study
Univalle_BC19	1.23	0.46	2.15	1.30	2.28	7.57	12.57	13.43	12.00	6.43	16.86	15.00	3.00	8.14	36.29	6.00	22.86	This study
Univalle_BC23	1.25	0.42	2.24	1.25	2.33	8.00	13.29	13.57	12.71	6.43	17.43	15.29	2.67	8.00	37.29	6.29	23.71	This study
Univalle_Ca10	1.27	0.26	2.06	1.25	2.30	7.43	12.14	13.14	11.43	5.57	16.00	15.00	2.67	7.43	35.57	6.43	22.43	This study
Univalle_Ca11	1.19	0.48	2.09	1.16	2.04	7.29	11.86	12.43	11.00	5.86	14.71	13.71	2.43	7.43	33.00	5.86	20.57	This study
Univalle_Ca13	1.23	0.59	2.06	1.19	1.98	7.14	11.86	12.43	11.00	7.14	14.86	14.00	2.50	7.14	33.14	5.86	20.71	This study
Univalle_Ca14	1.21	0.48	1.93	1.19	2.09	7.14	11.57	12.57	10.86	5.29	15.00	13.43	3.43	7.43	33.86	6.29	21.29	This study
Univalle_Ca16	1.21	0.40	1.98	1.14	2.13	7.71	12.43	12.86	11.29	6.00	14.86	14.57	2.60	7.86	34.29	6.57	21.43	This study
Univalle_Ca17	1.30	0.48	1.95	1.21	2.09	7.57	12.29	12.86	11.14	5.71	14.57	13.86	2.93	8.14	33.71	6.29	20.86	This study
Univalle_Ca24	1.30	0.53	1.76	1.19	2.11	7.00	11.57	12.86	11.57	5.57	14.86	14.57	2.67	7.57	34.14	6.43	21.29	This study
Univalle_Ca26	1.05	0.33	1.73	1.10	1.78	6.57	10.71	11.14	10.00	4.71	13.14	11.43	2.50	6.43	29.57	5.29	18.43	This study
Univalle_Ca34	1.08	0.46	1.69	1.16	1.82	6.14	10.29	10.71	9.29	5.71	13.43	12.14	1.93	7.14	30.57	6.43	19.86	This study
Univalle_Ca35	1.27	0.31	1.93	1.14	2.00	7.00	11.43	12.29	11.14	5.71	14.29	14.14	1.80	7.43	33.29	6.71	21.00	This study
Univalle_Ca36	1.19	0.40	1.87	1.25	1.98	7.29	11.71	12.43	10.71	5.43	14.86	13.86	1.67	7.00	33.43	6.14	21.00	This study
Univalle_Ca37	0.81	0.37	1.43	0.94	1.58	5.14	8.43	8.14	7.14	3.86	10.57	9.00	1.63	5.14	22.43	3.71	14.29	This study
Univalle_Ca42	1.16	0.50	1.82	1.12	1.93	6.57	10.57	11.29	10.00	4.86	13.71	12.43	2.23	6.86	29.29	4.29	18.00	This study
Univalle_Cq03	1.34	0.40	2.13	1.25	2.20	7.71	13.00	14.00	12.14	6.29	16.29	15.43	2.90	7.71	37.00	6.71	23.00	This study
Univalle_Pu01	1.32	0.44	2.26	1.19	2.26	8.29	13.43	13.86	12.57	6.71	16.29	15.86	3.03	8.14	36.14	6.00	22.29	This study
Univalle_Pu02	1.12	0.46	1.91	1.10	1.95	6.71	10.86	11.71	9.86	5.57	14.00	12.57	2.33	7.14	30.71	5.00	19.00	This study
Univalle_Pu03	1.21	0.40	2.09	1.19	2.26	7.86	12.71	14.14	11.43	6.43	15.86	14.43	2.83	7.86	36.43	6.43	22.29	This study

Univalle_Pu04	1.27	0.44	2.11	1.30	2.35	7.71	12.57	13.71	11.71	6.43	16.14	14.71	2.77	7.86	35.71	5.86	22.00	This study
Univalle_Pu07	1.27	0.42	2.02	1.30	2.46	7.86	12.86	13.71	11.71	6.29	16.86	15.00	2.73	8.14	36.86	6.29	23.14	This study
Univalle_Pu09	1.27	0.44	2.02	1.25	2.22	8.00	12.86	13.14	12.00	6.14	17.14	15.00	2.77	8.00	35.71	5.43	22.57	This study
Univalle_Pu11	1.23	0.37	1.95	1.23	2.20	7.43	12.29	13.57	11.43	6.00	14.43	14.14	2.90	8.00	34.00	6.00	20.43	This study
Univalle_Pu12	1.25	0.37	2.20	1.32	2.48	8.43	13.00	14.71	12.71	6.71	17.86	16.00	3.00	8.86	39.29	6.71	24.57	This study
Univalle_Pu13	1.23	0.48	2.09	1.19	2.20	7.71	12.71	13.57	11.57	6.00	16.00	15.00	2.87	7.86	34.86	5.29	21.29	This study
Univalle_Pu16	1.27	0.22	2.06	1.30	2.22	8.00	13.14	13.57	11.86	6.29	16.71	15.00	2.70	7.71	36.71	6.43	23.14	This study
Univalle_Pu18	1.16	0.40	1.82	1.16	1.89	7.14	11.57	11.86	10.71	5.43	15.29	13.29	2.67	5.71	32.14	5.00	20.29	This study
Univalle_Pu19	1.05	0.40	1.80	1.10	2.04	6.57	11.00	10.29	9.57	5.00	13.14	11.71	2.17	6.29	27.57	4.14	17.29	This study
Univalle_Pu20	0.99	0.26	1.76	1.10	1.93	6.57	10.71	10.71	9.57	5.14	13.43	12.43	2.17	6.57	28.86	4.71	18.14	This study
Univalle_Pu24	1.10	0.44	2.02	1.16	2.24	7.00	11.71	12.29	11.14	5.71	15.00	13.86	2.67	7.43	32.29	5.00	20.00	This study
Univalle_Pu26	1.25	0.33	2.02	1.19	2.26	7.71	12.86	13.14	11.43	6.14	15.57	14.43	2.70	8.00	34.57	5.86	21.43	This study
Univalle_Pu27	1.27	0.31	2.06	1.30	2.46	8.00	13.00	13.57	11.71	6.57	16.43	15.00	2.77	8.29	36.43	6.43	22.86	This study
Univalle_Pu29	1.27	0.42	2.15	1.23	2.26	7.86	12.57	13.14	11.29	6.14	15.57	14.57	2.77	7.86	34.71	6.00	21.57	This study
Univalle_Pu30	1.36	0.40	2.26	1.27	2.30	8.43	13.71	14.71	13.00	7.29	17.14	16.14	3.03	8.57	37.43	5.57	22.71	This study
Univalle_Pu31	1.36	0.42	2.39	1.36	2.52	8.14	13.14	14.29	12.43	6.29	17.00	16.00	3.27	8.14	37.14	5.86	22.86	This study
Univalle_Pu32	1.30	0.46	2.24	1.19	2.35	7.29	13.14	14.00	12.14	6.29	17.29	16.00	2.63	8.43	37.57	6.29	23.57	This study
Univalle_Pu35	1.25	0.42	2.06	1.19	2.22	8.14	12.14	13.43	12.00	6.14	16.00	15.29	2.60	8.00	36.29	6.86	22.86	This study
Univalle_Pu36	1.38	0.46	2.35	1.25	2.30	8.43	13.14	14.57	12.43	6.86	17.29	16.14	2.93	8.57	38.29	6.43	23.71	This study
Univalle_Pu37	1.23	0.33	2.04	1.14	2.30	7.43	12.00	13.14	11.29	6.00	15.14	14.29	2.73	7.29	33.57	5.29	20.43	This study
Univalle_Pu38	1.01	0.31	1.58	1.08	1.89	6.29	10.14	9.43	9.00	4.86	12.86	11.29	2.40	6.00	26.57	4.29	17.14	This study
Univalle_Pu39	1.27	0.37	2.09	1.23	2.24	8.14	13.14	14.00	12.29	6.57	16.57	15.14	3.00	8.29	37.00	6.43	23.00	This study
Univalle_Pu73	1.38	0.35	2.04	1.30	2.39	8.43	13.86	14.43	13.14	6.57	17.14	16.57	2.83	8.57	38.43	6.86	24.00	This study
Verano_1															34.00			Verano (1940)
Verano_10															24.00			Verano (1940)
Verano_11															26.00			Verano (1940)
Verano_12															29.00			Verano (1940)
Verano_13															32.00			Verano (1940)
Verano_14															31.00			Verano (1940)
Verano_15															33.00			Verano (1940)
Verano_16															34.00			Verano (1940)
Verano_17															30.00			Verano (1940)
Verano_18															28.00			Verano (1940)
Verano_19															26.00			Verano (1940)
Verano_2															33.00			Verano (1940)
Verano_20															34.00			Verano (1940)
Verano_3															34.00			Verano (1940)
Verano_4															25.00			Verano (1940)
Verano_5															31.00			Verano (1940)
Verano_6															35.00			Verano (1940)
Verano_7															30.00			Verano (1940)
Verano_8															33.00			Verano (1940)

Verano_9															35.00			Verano (1940)
CCENT-0171	1.17	0.40	1.77	1.14	1.74	7.50	12.13	13.13	11.13	6.38	15.13	14.00	2.31	8.38	35.50	7.25	22.38	This study
CCENT-0174	0.83	0.26	1.34	1.03	1.69	5.38	8.88	8.50	7.38	4.50	11.13	9.63	1.51	5.50	23.88	4.25	15.38	This study
CCENT-0273	0.89	0.26	1.40	1.03	1.60	5.88	9.75	10.13	8.63	4.75	12.50	10.63	1.71	5.88	26.38	3.75	16.25	This study
CCENT-0277	0.89	0.40	1.46	0.97	1.57	5.38	8.88	9.13	8.13	5.00	11.38	10.38	1.89	5.88	24.75	4.25	15.63	This study
CCENT-0278	1.00	0.43	1.66	1.11	1.80	6.75	11.00	12.00	10.25	6.13	14.00	14.25	2.14	7.00	31.00	5.00	19.00	This study
CCENT-0279	0.77	0.31	1.29	0.91	1.46	4.88	8.13	7.75	6.50	4.25	10.00	8.38	1.34	5.00	21.13	3.38	13.38	This study
CCENT-0280	0.91	0.37	1.51	1.09	1.91	6.13	10.00	10.63	8.75	5.38	12.88	11.00	1.63	6.75	28.00	4.50	17.38	This study
CCENT-0282	1.00	0.34	1.66	1.14	1.86	6.50	10.75	11.13	9.38	5.63	13.50	12.13	1.89	6.88	29.00	4.38	17.88	This study
CCENT-0283	0.86	0.34	1.49	1.00	1.69	6.00	9.63	9.63	8.50	4.63	11.63	10.63	1.71	5.88	24.38	3.13	14.75	This study
CIATARC_108	1.21	0.42	1.80	1.14	1.93	6.29	10.43	11.43	9.71	6.00	13.43	12.14	2.20	7.14	29.00	4.14	17.57	This study
CIATARC_109	1.05	0.31	1.51	0.97	1.76	5.14	8.71	9.00	7.57	4.71	11.29	9.86	1.70	5.86	23.57	3.29	14.57	This study
CIATARC_110	1.10	0.46	1.93	1.10	2.00	6.29	10.57	11.29	9.71	5.71	13.43	12.57	2.40	7.00	29.14	4.43	17.86	This study
CIATARC_111	0.83	0.31	1.40	0.99	1.67	5.14	9.14	8.57	7.43	4.43	10.86	9.14	1.40	5.43	22.43	3.00	13.86	This study
CIATARC_112	0.90	0.26	1.40	1.03	1.73	4.86	7.43	7.86	7.00	4.43	10.57	8.86	1.47	5.14	20.86	2.43	13.00	This study
CIATARC_113	0.88	0.31	1.27	0.92	1.45	3.57	6.43	7.29	7.14	3.86	9.71	8.14	1.47	4.86	19.29	2.29	12.00	This study
CIATARC_117	1.03	0.40	1.76	1.05	1.78	6.14	10.00	10.29	9.00	5.29	12.71	11.43	2.03	6.43	27.57	4.57	17.29	This study
CIATARC_118	0.99	0.35	1.45	0.99	1.71	5.57	9.29	9.71	8.57	5.00	12.43	10.57	1.70	6.29	25.43	3.29	15.71	This study
CIATARC_127	0.81	0.26	1.32	0.97	1.58	4.57	7.57	7.57	6.86	3.86	10.29	8.57	1.60	4.86	20.29	2.43	12.71	This study
CIATARC_131	1.01	0.37	1.60	1.08	1.84	6.00	9.86	10.43	8.86	5.29	12.71	11.43	1.97	6.57	27.14	4.00	16.71	This study
CIATARC_154	1.10	0.37	1.82	1.16	1.95	5.86	11.00	11.43	10.14	5.86	13.57	12.71	2.47	7.14	29.00	4.00	17.57	This study
CIATARC_16	1.19	0.44	1.91	0.99	1.98	7.00	11.43	9.29	8.00	4.71	11.71	10.29	2.00	7.43	24.71	3.71	15.43	This study
CIATARC_170	0.92	0.37	1.43	0.94	1.67	5.00	8.43	9.00	7.71	4.29	10.71	9.71	1.63	5.43	22.71	3.00	13.71	This study
CIATARC_179	1.05	0.37	1.60	0.99	1.78	6.14	10.00	10.43	8.57	5.43	13.71	11.43	1.97	6.43	28.29	4.14	17.86	This study
CIATARC_182	0.90	0.42	1.54	0.94	1.45	5.29	8.71	8.86	7.71	4.43	11.29	9.86	1.97	5.57	23.57	3.43	14.71	This study
CIATARC_184	1.19	0.37	1.84	1.14	2.02	6.71	11.43	10.57	9.14	5.29	12.71	11.57	2.07	7.71	27.29	4.00	16.71	This study
CIATARC_24	1.05	0.35	1.73	1.12	1.91	6.14	9.86	12.29	10.57	5.71	14.86	13.43	2.73	6.86	31.29	4.14	19.00	This study
CIATARC_4	1.12	0.37	1.65	1.14	2.00	7.00	10.43	10.14	9.00	5.00	13.43	11.57	2.97	7.00	28.14	4.57	18.00	This study
CIATARC_5	1.14	0.37	1.73	1.19	1.80	6.71	10.71	11.14	9.71	5.29	13.43	12.29	1.93	6.86	29.14	4.57	18.00	This study
CIATARC_60	1.01	0.35	1.56	1.08	1.91	5.86	9.86	10.29	7.14	4.43	13.00	9.29	1.63	6.43	26.43	3.14	16.14	This study
CIATARC_61	1.12	0.35	1.82	1.12	1.71	6.43	10.43	11.86	10.29	6.14	14.71	13.14	2.87	6.57	32.29	5.71	20.43	This study
CIATARC_63	1.14	0.44	1.67	0.99	1.82	5.86	9.86	10.14	9.14	5.29	12.71	11.57	2.43	6.43	26.71	3.86	16.57	This study
CIATARC_76	0.83	0.24	1.38	1.03	1.56	5.29	8.86	8.57	7.43	4.43	11.29	9.71	1.87	5.43	22.71	2.86	14.14	This study
CIATARC_79	0.86	0.31	1.32	0.97	1.49	4.43	7.57	7.57	6.57	3.86	10.14	8.43	1.53	4.86	20.00	2.29	12.43	This study
CIATARC_80	0.88	0.26	1.30	0.90	1.49	4.29	7.29	7.71	6.43	3.86	10.29	8.29	1.57	4.86	20.57	2.57	12.86	This study
CIATARC_81	1.12	0.40	1.84	1.16	1.91	6.71	10.86	12.43	10.00	6.00	13.86	12.43	2.30	7.43	31.71	5.43	19.29	This study
CIATARC_90	1.08	0.40	1.71	1.08	1.91	6.57	10.86	11.29	9.71	5.71	13.14	12.57	2.37	7.00	28.86	4.43	17.57	This study
CIATARC_94	0.90	0.33	1.43	0.97	1.51	4.86	8.29	8.71	7.86	4.43	11.00	10.00	1.73	5.43	22.57	2.86	13.86	This study
CIATARC_95	0.99	0.33	1.71	1.08	1.93	6.43	10.57	10.71	9.43	5.57	13.43	12.00	2.17	6.71	28.57	4.43	17.86	This study
CIATARC_97	0.92	0.44	1.60	1.03	1.60	5.57	9.00	9.14	8.00	4.86	12.14	10.29	1.93	6.14	24.71	3.43	15.57	This study
CIATARC_98	0.81	0.35	1.40	0.94	1.58	5.00	8.29	8.14	7.14	4.29	10.43	9.14	1.70	5.29	22.00	3.43	13.86	This study
CIATARC_R3	1.14	0.35	1.65	1.16	1.98	6.43	10.57	11.57	9.71	6.00	14.29	12.43	2.73	7.29	29.71	3.86	18.14	This study

MUSENUV_22542	1.12	0.35	1.80	1.19	1.98	6.31	10.31	10.92	9.14	5.69	13.23	11.00	2.07	6.62	28.62	4.46	17.69	This study
MUSENUV_7890	0.99	0.40	2.06	1.03	2.15	7.23	11.85	12.77	10.00	5.54	15.08	12.86	2.27	7.23	33.69	5.85	20.92	This study
MUSENUV_7893	0.90	0.37	1.76	1.16	2.09	6.77	10.77	11.23	9.43	5.08	13.69	11.86	2.27	6.46	29.54	4.62	18.31	This study
MUSENUV_7896	1.21	0.44	1.91	1.25	2.09	6.62	10.77	10.77	9.00	6.62	13.23	11.14	2.10	7.23	28.92	4.92	18.15	This study
MUSENUV_7900	1.54	0.53	2.41	1.47	2.72	9.08	14.92	14.46	12.43	8.15	21.08	16.29	2.80	9.85	45.69		31.23	This study
Univalle_16	1.21	0.42	1.80	1.21	2.13	6.77	11.08	11.69	9.43	6.00	14.46	11.86	2.27	7.54	30.62	4.46	18.92	This study
Univalle_17	1.27	0.44	1.65	1.21	2.26	7.23	11.23	13.23	11.14	7.23	17.38	14.14	2.47	8.00	36.31	5.69	23.08	This study
Univalle_18	1.27	0.50	1.89	1.38	2.57	6.15	11.23	12.62	10.14	6.92	16.77	12.71	2.17	8.15	34.46	5.08	21.85	This study
Univalle_19	1.36	0.48	2.20	1.38	2.28	6.92	12.31	13.23	10.86	7.23	18.15	14.29	2.50	8.62	38.15	6.77	24.92	This study
Univalle_20	1.25	0.44	2.04	1.36	2.15	7.23	12.15	13.08	10.71	6.62	15.23	13.29	2.53	7.69	33.69	5.38	20.62	This study
Univalle_21	1.21	0.53	2.04	1.03	2.28	7.38	12.46	13.54	10.57	7.23	16.46	13.71	2.60	8.46	36.62	6.62	23.08	This study
Univalle_22	1.05	0.42	1.54	0.92	1.87	5.85	9.38	10.00	8.00	5.38	12.46	10.29	1.87	6.46	26.00	3.54	16.00	This study
Univalle_23	1.25	0.40	2.13	1.34	2.22	7.38	12.62	13.69	12.29	6.62	16.00	13.86	2.73	8.62	35.54	5.85	21.85	This study
Univalle_24	0.94	0.37	1.43	1.05	1.76	4.92	8.31	8.31	6.86	4.62	10.77	8.71	1.57	5.54	22.31	3.23	14.00	This study
Univalle_An04	1.30	0.50	1.98	1.21	2.28	6.86	11.57	12.14	10.71	6.43	15.71	13.86	2.77	7.86	32.14	4.29	20.00	This study
Univalle_An06	1.25	0.44	1.91	1.21	2.15	6.86	11.57	12.57	11.00	6.29	14.57	13.86	2.47	7.86	32.43	5.29	19.86	This study
Univalle_An08	1.38	0.61	2.22	1.30	2.09	8.14	13.14	14.00	12.00	7.29	16.43	15.14	2.40	9.00	37.00	6.57	23.00	This study
Univalle_An09	1.32	0.53	2.04	1.19	1.98	7.14	12.00	13.29	11.86	7.43	16.57	14.86	2.83	8.71	34.86	5.00	21.57	This study
Univalle_An10	1.27	0.53	2.24	1.27	2.33	8.14	13.14	14.00	12.29	7.29	16.86	15.00	2.57	9.14	38.00	7.14	24.00	This study
Univalle_An12	1.30	0.57	2.20	1.23	2.24	7.57	12.57	13.57	11.71	7.14	16.14	15.14	2.67	7.57	35.86	6.14	22.29	This study
Univalle_An14	1.27	0.53	2.15	1.14	2.28	8.43	12.71	13.71	11.71	7.14	16.86	14.57	2.43	8.29	37.00	6.43	23.29	This study
Univalle_An18	1.40	0.59	2.13	1.21	2.20	7.00	12.14	13.29	12.00	6.71	16.14	15.14	2.57	8.00	35.43	6.00	22.14	This study
Univalle_An19	1.14	0.55	1.98	1.12	2.13	7.00	11.57	12.57	11.29	7.14	15.29	14.14	2.23	7.57	33.71	5.86	21.14	This study
Univalle_An20	1.32	0.72	2.04	1.21	2.11	7.43	12.43	12.86	11.43	6.86	14.00	14.86	2.17	8.29	32.86	6.00	20.00	This study
Univalle_BC12	1.40	0.57	2.26	1.27	2.57	8.00	13.57	14.29	12.43	7.43	17.57	15.57	2.60	8.71	38.00	6.14	23.71	This study
Univalle_BC15	1.08	0.48	2.11	1.16	2.15	6.71	11.43	12.43	11.14	7.14	15.43	14.57	2.27	8.00	33.71	5.86	21.29	This study
Univalle_BC17	1.40	0.53	2.15	1.27	2.04	7.14	12.43	14.29	12.43	6.43	16.57	15.86	2.40	8.43	36.14	5.29	21.86	This study
Univalle_BC20	1.21	0.44	2.00	1.23	2.26	6.71	11.57	12.00	10.57	6.00	15.14	13.14	2.57	7.43	31.86	4.71	19.86	This study
Univalle_BC21	1.14	0.44	2.11	1.25	2.26	7.00	12.71	12.43	11.14	6.29	15.29	13.57	2.07	7.57	33.00	5.29	20.57	This study
Univalle_BC22	1.30	0.50	2.09	1.23	2.41	7.86	13.29	14.29	12.29	7.29	17.43	15.71	2.40	8.57	36.57	4.86	22.29	This study
Univalle_Ca01	1.08	0.33	1.78	1.30	2.04	6.57	11.00	11.86	10.14	5.86	14.00	12.86	2.33	7.57	31.43	5.57	19.57	This study
Univalle_Ca15	1.21	0.68	2.00	1.14	2.04	6.57	11.29	12.43	10.57	6.29	15.29	13.43	2.30	7.57	33.71	6.00	21.29	This study
Univalle_Ca18	0.92	0.31	1.45	0.97	1.51	5.14	8.57	8.57	7.29	4.57	11.00	9.43	1.67	5.57	23.71	4.14	15.14	This study
Univalle_Ca19	1.23	0.61	1.95	1.14	1.80	7.00	11.43	11.86	11.00	6.43	15.57	13.57	2.27	7.71	32.43	5.00	20.57	This study
Univalle_Ca29	1.21	0.42	1.89	1.25	2.09	6.43	11.43	12.57	10.71	6.29	14.86	13.57	2.27	7.57	33.00	5.57	20.43	This study
Univalle_Ca30	1.08	0.37	1.93	1.27	2.11	6.86	11.29	12.43	10.57	6.00	14.00	14.00	2.50	7.86	32.00	5.57	19.57	This study
Univalle_Ca33	1.14	0.46	1.87	1.19	2.11	7.14	11.86	12.71	11.00	6.43	15.14	14.00	2.67	7.71	32.14	4.29	19.43	This study
Univalle_Ca39	1.16	0.46	1.95	1.23	2.09	7.29	12.00	12.14	11.00	6.43	14.57	14.29	2.37	8.00	32.57	5.86	20.43	This study
Univalle_Ca40	1.12	0.42	2.09	1.27	1.95	7.29	12.14	12.71	11.29	6.43	14.71	14.14	2.47	7.57	33.57	6.14	20.86	This study
Univalle_Ca41	1.14	0.48	1.91	1.16	1.98	6.71	11.29	11.86	10.43	6.29	14.71	13.00	2.40	7.43	31.29	4.71	19.43	This study
Univalle_Ca50	1.21	0.44	2.06	1.14	2.11	7.57	12.43	13.14	11.00	6.43	15.14	13.86	2.67	7.71	34.43	6.14	21.29	This study
Univalle_Ca51	1.10	0.37	1.76	1.16	2.09	6.29	10.71	11.57	9.71	6.14	14.14	12.71	2.33	7.86	30.86	5.14	19.29	This study

Univalle_Cq02	1.34	0.50	2.02	1.16	2.20	7.00	11.86	13.00	11.00	6.57	14.71	13.86	2.43	7.71	33.00	5.29	20.00	This study
Univalle_Pu05	1.34	0.50	2.24	1.21	2.28	7.71	13.14	14.29	12.43	7.29	16.71	15.57	2.47	9.00	36.14	5.14	21.86	This study
Univalle_Pu06	1.16	0.33	1.93	1.23	2.04	7.00	11.86	11.86	10.71	6.14	15.29	13.43	2.53	7.43	32.71	5.57	20.86	This study
Univalle_Pu08	1.33	0.44	2.07	1.18	2.18	4.90	8.30	9.30	7.90	4.70	10.50	10.00	2.37	5.70	23.90	4.10	14.60	This study
Univalle_Pu10	1.20	0.49	2.04	1.22	2.49	5.20	8.90	9.80	8.30	4.90	11.30	10.40	2.50	6.00	25.50	4.40	15.70	This study
Univalle_Pu14	1.21	0.42	2.09	1.19	2.00	6.86	11.86	12.00	11.00	6.86	15.29	14.14	2.33	8.29	31.86	4.57	19.86	This study
Univalle_Pu15	1.16	0.33	1.87	1.08	2.02	6.43	11.00	12.14	11.00	6.00	16.57	13.00	2.47	7.43	33.86	5.14	21.71	This study
Univalle_Pu17	1.12	0.53	1.98	1.19	2.30	6.43	11.29	12.00	10.57	6.57	14.57	12.86	2.40	7.86	30.86	4.29	18.86	This study
Univalle_Pu21	1.25	0.44	2.09	1.25	2.48	8.00	12.43	12.86	11.71	6.86	16.29	15.00	2.33	8.57	34.14	5.00	21.29	This study
Univalle_Pu22	1.25	0.48	2.11	1.19	2.09	7.14	12.29	12.86	11.43	7.00	15.71	14.29	2.53	7.71	33.43	4.86	20.57	This study
Univalle_Pu23	1.10	0.55	1.71	1.10	2.00	6.00	10.43	11.00	10.14	5.43	13.86	12.14	2.10	6.86	29.86	5.00	18.86	This study
Univalle_Pu25	1.19	0.46	1.93	1.16	1.91	6.43	11.00	12.14	10.57	6.14	14.57	13.29	2.33	7.29	31.29	4.57	19.14	This study
Univalle_Pu28	1.14	0.42	2.00	1.08	1.98	6.71	11.43	12.43	10.86	6.86	15.43	13.43	3.57	8.00	32.86	5.00	20.43	This study
Univalle_Pu33	1.21	0.48	2.24	1.25	2.24	7.14	12.29	12.86	11.71	6.86	16.29	14.57	2.63	8.14	34.14	5.00	21.29	This study
Univalle_Pu34	1.21	0.48	2.09	1.21	2.37	7.29	12.43	13.43	11.29	7.00	16.29	14.57	2.57	8.57	34.86	5.14	21.43	This study
Univalle_Pu40	1.21	0.40	2.06	1.19	2.09	6.86	12.00	13.29	11.57	6.71	15.86	14.29	2.73	8.29	35.71	6.57	22.43	This study
Univalle_Pu77	1.32	0.55	2.06	0.99	2.37	7.14	12.43	12.86	11.86	6.86	15.71	14.71	2.50	8.43	34.43	5.86	21.57	This study
Verano_21															32.00			Verano (1940)
Verano_22															29.00			Verano (1940)
Verano_23															30.00			Verano (1940)
Verano_24															28.00			Verano (1940)
Verano_25															30.00			Verano (1940)
Verano_26															33.00			Verano (1940)
Verano_27															29.00			Verano (1940)
Verano_28															33.00			Verano (1940)
Verano_29															28.00			Verano (1940)
Verano_30															31.00			Verano (1940)
Verano_31															29.00			Verano (1940)
Verano_32															35.00			Verano (1940)
Verano_33															31.00			Verano (1940)
Verano_34															29.00			Verano (1940)
Verano_35															30.00			Verano (1940)
Verano_36															33.00			Verano (1940)
Verano_37															31.00			Verano (1940)
Verano_38															24.00			Verano (1940)
Verano_39															26.00			Verano (1940)
Verano_40															27.00			Verano (1940)

Table S2. Database of COI gene sequences of *Dynamis* and *Rhynchophorus* fromGenBank, BOLD, and this study, with their geographical coordinates, haplotype (Ha), geographical origin, and publication where were reported.

Species	ID	Ha	Country	Locality
D. borassi	AY131105		Brazil	
D. borassi	Univalle_9		Colombia	Valle del Cauca, Buenaventura, Corregimiento 1, Bajo Calima, Finca El Esfuerzo
D. peropacus	ASSCR6014		Costa Rica	Alajuela, Area de conservacion Guanacaste, Upala, Estacion Caribe
D. peropacus	ASSCR6015		Costa Rica	Alajuela, Area de conservacion Guanacaste, La Cruz, Estacion Pitilla, 9 Km S Santa Cecilia
D. peropacus	ASSCR6016		Costa Rica	Limon, Area de conservacion Tortuguero, Pococi, Colorado, Sector Cerro Cocori, 30 Km N de
D. peropacus	ASSCR6018		Costa Rica	Guanacaste, Area de conservacion Guanacaste, La Cruz, Estacion Pitilla, 9 Km S Santa Cecilia
R. bilineatus	KF311645	Rb1	Papua New Guinea	Poliamba, New Ireland
R. bilineatus	KF311637	Rb2	Papua New Guinea	Poliamba, New Ireland
R. bilineatus	KF311639	Rb3	Papua New Guinea	Poliamba, New Ireland
R. bilineatus	KF311636	Rb4	Papua New Guinea	Poliamba, New Ireland
R. bilineatus	KF311638	Rb4	Papua New Guinea	Poliamba, New Ireland
R. bilineatus	KF311640	Rb4	Papua New Guinea	Poliamba, New Ireland
R. bilineatus	KF311641	Rb4	Papua New Guinea	Poliamba, New Ireland
R. bilineatus	KF311642	Rb4	Papua New Guinea	Poliamba, New Ireland
R. bilineatus	KF311643	Rb4	Papua New Guinea	Poliamba, New Ireland
R. bilineatus	KF311644	Rb4	Papua New Guinea	Poliamba, New Ireland
R. bilineatus	KF311646	Rb4	Papua New Guinea	Poliamba, New Ireland
R. bilineatus	KF311635	Rb5	Papua New Guinea	Milne Bay Province
R. bilineatus	KF311634	Rb6	Papua New Guinea	Milne Bay Province
R. bilineatus	KF311648	Rb7	Papua New Guinea	Dami Research Station, West New Britain
R. bilineatus	KF311647	Rb8	Papua New Guinea	Dami Research Station, West New Britain
R. cruentatus	AY131113		Unknown	
R. cruentatus	KF311359		United States of America	Florida
R. cruentatus	USCOC565		United States of America	Florida, Myakka River SP, Fox`s Low Trail, Dry Prairie
R. ferrugineus	GU581582	H1	Oman	
R. ferrugineus	GU581583	H1	United Arab Emirates	
R. ferrugineus	GU581584	H1	United Arab Emirates	
R. ferrugineus	GU581585	H1	United Arab Emirates	
R. ferrugineus	GU581586	H1	United Arab Emirates	
R. ferrugineus	GU581587	H1	United Arab Emirates	
R. ferrugineus	GU581588	H1	United Arab Emirates	
R. ferrugineus	GU581589	H1	United Arab Emirates	
R. ferrugineus	GU581590	H1	United Arab Emirates	
R. ferrugineus	GU581591	H1	United Arab Emirates	
R. ferrugineus	GU581592	H1	United Arab Emirates	
R. ferrugineus	GU581593	H1	United Arab Emirates	
R. ferrugineus	GU581594	H1	United Arab Emirates	
R. ferrugineus	GU581595	H1	United Arab Emirates	
R. ferrugineus	GU581596	H1	United Arab Emirates	
R. ferrugineus	GU581597	H1	Syria	
R. ferrugineus	GU581598	H1	Syria	
R. ferrugineus	GU581599	H1	Syria	
R. ferrugineus	GU581600	H1	Syria	
R. ferrugineus	GU581601	H1	Syria	
R. ferrugineus	GU581602	H1	Syria	
R. ferrugineus	GU581603	H1	Syria	
R. ferrugineus	GU581604	H1	Syria	
R. ferrugineus	GU581605	H1	Syria	
R. ferrugineus	GU581606	H1	Syria	
R. ferrugineus	GU581607	H1	Syria	
R. ferrugineus	GU581608	H1	Syria	

R. ferrugineus	GU581609	H1	Syria	
R. ferrugineus	GU581610	H1	Syria	
R. ferrugineus	GU581611	H1	Syria	
R. ferrugineus	GU581612	H1	Syria	
R. ferrugineus	GU581613	H1	Syria	
R. ferrugineus	GU581614	H1	Syria	
R. ferrugineus	GU581615	H1	Pakistan	
R. ferrugineus	GU581616	H1	Pakistan	
R. ferrugineus	GU581617	H1	Pakistan	
R. ferrugineus	GU581618	H1	Pakistan	
R. ferrugineus	GU581619	H1	Pakistan	
R. ferrugineus	GU581620	H1	Pakistan	
R. ferrugineus	GU581621	H1	Pakistan	
R. ferrugineus	GU581622	H1	Pakistan	
R. ferrugineus	GU581623	H1	Pakistan	
R. ferrugineus	GU581624	H1	Pakistan	
R. ferrugineus	GU581625	H1	Pakistan	
R. ferrugineus	GU581626	H1	Pakistan	
R. ferrugineus	GU581627	H1	Pakistan	
R. ferrugineus	GU581628	H1	Pakistan	
R. ferrugineus	KU311369	H1	Pakistan	Muzaffargarh, Punjab Province
R. ferrugineus	KU696489	H1	Pakistan	Bahawalpur, Punjab Province
R. ferrugineus	KU696494	H1	Pakistan	Bahawalpur, Punjab Province
R. ferrugineus	KU696496	H1	Pakistan	Bahawalpur, Punjab Province
R. ferrugineus	KU696504	H1	Pakistan	Dera Ismael Khan, Khyber Pakhtunkhwa
R. ferrugineus	KU696506	H1	Pakistan	Dera Ismael Khan, Khyber Pakhtunkhwa
R. ferrugineus	KU696510	H1	Pakistan	Layyah, Punjab Province
R. ferrugineus	KU696511	H1	Pakistan	Layyah, Punjab Province
R. ferrugineus	KU696512	H1	Pakistan	Layyah, Punjab Province
R. ferrugineus	KU696513	H1	Pakistan	Layyah, Punjab Province
R. ferrugineus	KU696516	H1	Pakistan	Muzaffargarh, Punjab Province
R. ferrugineus	KU696518	H1	Pakistan	Muzaffargarh, Punjab Province
R. ferrugineus	KU696519	H1	Pakistan	Muzaffargarh, Punjab Province
R. ferrugineus	KU696524	H1	Pakistan	Muzaffargarh, Punjab Province
R. ferrugineus	KU696527	H1	Pakistan	Muzaffargarh, Punjab Province
R. ferrugineus	KU696529	H1	Pakistan	Muzaffargarh, Punjab Province
R. ferrugineus	KU696530	H1	Pakistan	Dera Ghazi Khan, Punjab Province
R. ferrugineus	KF311482	H10	Sri Lanka	Narammala, North Western Province
R. ferrugineus	KF311444	H11	India	Seraulim, Goa
R. ferrugineus	KF311487	H12	Sri Lanka	Narammala, North Western Province
R. ferrugineus	KF311481	H13	Sri Lanka	Narammala, North Western Province
R. ferrugineus	KF311483	H13	Sri Lanka	Narammala, North Western Province
R. ferrugineus	KF311484	H13	Sri Lanka	Narammala, North Western Province
R. ferrugineus	KF311485	H13	Sri Lanka	Narammala, North Western Province
R. ferrugineus	KF311486	H13	Sri Lanka	Narammala, North Western Province
R. ferrugineus	KF311488	H13	Sri Lanka	Narammala, North Western Province
R. ferrugineus	KF311489	H13	Sri Lanka	Narammala, North Western Province
R. ferrugineus	KF311448	H14	India	Siolim, Goa
R. ferrugineus	JX292125	H15	India	Raia
R. ferrugineus	KF311449	H16	India	Duler, Mapusa, Goa
R. ferrugineus	KF311360	H17	Israel	Na'ama
R. ferrugineus	KF311361	H17	Israel	Na'ama
R. ferrugineus	KF311427	H17	Saudi Arabia	Al-Ahsa
R. ferrugineus	KF311432	H17	Saudi Arabia	Al-Ahsa
R. ferrugineus	KF311471	H18	Thailand	Chachoengsao
R. ferrugineus	KF311473	H18	Thailand	Chachoengsao
R. ferrugineus	KF311403	H19	Malaysia	Rhu Tapai, Kuala, Terengganu
R. ferrugineus	KF311468	H19	Thailand	Chachoengsao
R. ferrugineus	KF311477	H19	Thailand	Chachoengsao
R. ferrugineus	KF311478	H19	Thailand	Chachoengsao
R. ferrugineus	GU581549	H2	Iran	

R. ferrugineus	GU581550	H2	Iran	
R. ferrugineus	GU581551	H2	Iran	
R. ferrugineus	GU581552	H2	Iran	
R. ferrugineus	GU581553	H2	Iran	
R. ferrugineus	GU581554	H2	Iran	
R. ferrugineus	GU581555	H2	Iran	
R. ferrugineus	GU581556	H2	Iran	
R. ferrugineus	GU581557	H2	Iran	
R. ferrugineus	GU581558	H2	Iran	
R. ferrugineus	GU581559	H2	Iran	
R. ferrugineus	GU581560	H2	Iran	
R. ferrugineus	GU581561	H2	Iran	
R. ferrugineus	GU581562	H2	Iran	
R. ferrugineus	GU581563	H2	Iran	
R. ferrugineus	GU581564	H2	Iran	
R. ferrugineus	GU581565	H2	Iran	
R. ferrugineus	GU581566	H2	Iran	
R. ferrugineus	GU581567	H2	Iran	
R. ferrugineus	GU581568	H2	Iran	
R. ferrugineus	GU581569	H2	Iran	
R. ferrugineus	GU581570	H2	Iran	
R. ferrugineus	GU581571	H2	Iran	
R. ferrugineus	GU581572	H2	Iran	
R. ferrugineus	GU581573	H2	Iran	
R. ferrugineus	GU581574	H2	Iran	
R. ferrugineus	GU581575	H2	Iran	
R. ferrugineus	GU581576	H2	Iran	
R. ferrugineus	GU581577	H2	Iran	
R. ferrugineus	GU581578	H2	Iran	
R. ferrugineus	GU581579	H2	Iran	
R. ferrugineus	GU581580	H2	Iran	
R. ferrugineus	GU581581	H2	Iran	
R. ferrugineus	KF311433	H20	Aruba	
R. ferrugineus	KF311474	H21	Thailand	Kamphaeng Saen, nr. Nakhon Pathom
R. ferrugineus	KF311511	H22	Thailand	Thung Tam Sao, Hat Yai, Songkhla Province
R. ferrugineus	KF311512	H22	Thailand	Tha Khae, Patthalung Provinc
R. ferrugineus	KF311512	H22	Thailand	Thung Tam Sao, Hat Yai, Songkhla Province
R. ferrugineus	KF311513	H22	Thailand	Tha Khae, Patthalung Provinc
R. ferrugineus	KF311514	H22	Thailand	Na Khao Sia, Na Yong, Trang Province
R. ferrugineus	KF311515	H22	Thailand	Na Khao Sia, Na Yong, Trang Province
R. ferrugineus	KF311516	H22	Thailand	Bang Kung, Huai Yot, Trang Province
R. ferrugineus	KF311517	H22	Thailand	Bang Kung, Huai Yot, Trang Province
R. ferrugineus	KF311518	H22	Thailand	Bang Kung, Huai Yot, Trang Province
R. ferrugineus	KF311520	H22	Thailand	Khao Kob, Huai Yot, Trang Province
R. ferrugineus	KF311522	H22	Thailand	Tha Khae, Patthalung Provinc
R. ferrugineus	KF311523	H22	Thailand	Ta Pab, Trang Province
R. ferrugineus	KF311524	H22	Thailand	Ta Pab, Trang Province
R. ferrugineus	KF311526	H22	Thailand	Bang Kung, Huai Yot, Trang Province
R. ferrugineus	KF311527	H22	Thailand	Bang Kung, Huai Yot, Trang Province
R. ferrugineus	KF311380	H23	Philippines	nr. San Pablo City,Luzon
R. ferrugineus	KF311381	H23	Philippines	nr. San Pablo City,Luzon
R. ferrugineus	KF311382	H23	Philippines	nr. San Pablo City,Luzon
R. ferrugineus	KF311387	H23	Philippines	nr. San Pablo City,Luzon
R. ferrugineus	KF311389	H24	Philippines	nr. San Pablo City,Luzon
R. ferrugineus	KF311384	H25	Philippines	nr. San Pablo City,Luzon
R. ferrugineus	KF311388	H26	Philippines	nr. San Pablo City,Luzon
R. ferrugineus	KF311386	H27	Philippines	nr. San Pablo City,Luzon
R. ferrugineus	KF311399	H28	Philippines	nr. San Pablo City,Luzon
R. ferrugineus	KF311383	H29	Philippines	nr. San Pablo City,Luzon
R. ferrugineus	KF311385	H29	Philippines	nr. San Pablo City,Luzon
R. ferrugineus	KF311390	H29	Philippines	nr. San Pablo City,Luzon

R. ferrugineus	KF311391	H29	Philippines	nr. San Pablo City,Luzon
R. ferrugineus	KF311393	H29	Philippines	nr. San Pablo City,Luzon
R. ferrugineus	KF311394	H29	Philippines	nr. San Pablo City,Luzon
R. ferrugineus	KF311395	H29	Philippines	nr. San Pablo City,Luzon
R. ferrugineus	KF311396	H29	Philippines	nr. San Pablo City,Luzon
R. ferrugineus	KF311397	H29	Philippines	nr. San Pablo City,Luzon
R. ferrugineus	KF311398	H29	Philippines	nr. San Pablo City,Luzon
R. ferrugineus	KF311400	H29	Philippines	nr. San Pablo City,Luzon
R. ferrugineus	GU581547	H3	United Arab Emirates	
R. ferrugineus	GU581548	H3	United Arab Emirates	
R. ferrugineus	KF311392	H30	Philippines	nr. San Pablo City,Luzon
R. ferrugineus	KF311379	H31	Philippines	nr. San Pablo City,Luzon
R. ferrugineus	KF311490	H32	Cambodia	Phnom Penh
R. ferrugineus	KF311491	H32	Cambodia	Phnom Penh
R. ferrugineus	KF311492	H34	Cambodia	Sihanoukville
R. ferrugineus	KF311493	H34	Cambodia	Sihanoukville
R. ferrugineus	KF311494	H34	Cambodia	Sihanoukville
R. ferrugineus	KF311495	H34	Cambodia	Sihanoukville
R. ferrugineus	KF311496	H35	Vietnam	Mo Cay Bac District, Ben Tre Province
R. ferrugineus	KF311497	H35	Vietnam	Mo Cay Bac District, Ben Tre Province
R. ferrugineus	KF311498	H36	Vietnam	An Dihn Village, Mo Cay Nam District
R. ferrugineus	KF311499	H36	Vietnam	An Dihn Village, Mo Cay Nam District
R. ferrugineus	KF311500	H36	Vietnam	An Dihn Village, Mo Cay Nam District
R. ferrugineus	KF311509	H37	Vietnam	Hanoi
R. ferrugineus	KF311504	H38	Vietnam	Nga Tien Commune, Nga Son District, Thanh Hoa Province
R. ferrugineus	KF311505	H38	Vietnam	Nga Tien Commune, Nga Son District, Thanh Hoa Province
R. ferrugineus	KF311508	H39	Vietnam	Hanoi
R. ferrugineus	GU581545	H4	United Arab Emirates	
R. ferrugineus	GU581546	H4	United Arab Emirates	
R. ferrugineus	KF311506	H40	Vietnam	Nga Tien Commune, Nga Son District, Thanh Hoa Province
R. ferrugineus	KF311502	H41	Vietnam	Nga Tien Commune, Nga Son District, Thanh Hoa Province
R. ferrugineus	KF311503	H41	Vietnam	Nga Tien Commune, Nga Son District, Thanh Hoa Province
R. ferrugineus	KF311507	H41	Vietnam	Nga Tien Commune, Nga Son District, Thanh Hoa Province
R. ferrugineus	KF311501	H42	Vietnam	Nga Tien Commune, Nga Son District, Thanh Hoa Province
R. ferrugineus	KF311507	H42	Vietnam	Nga Tien Commune, Nga Son District, Thanh Hoa Province
R. ferrugineus	KF311525	H43	Thailand	Bang Kung, Huai Yot, Trang Province
R. ferrugineus	GU581539	H5	United Arab Emirates	
R. ferrugineus	GU581540	H5	United Arab Emirates	
R. ferrugineus	GU581541	H5	United Arab Emirates	
R. ferrugineus	GU581542	H5	United Arab Emirates	
R. ferrugineus	GU581543	H5	Oman	
R. ferrugineus	GU581544	H5	Oman	
R. ferrugineus	KF311366	H5	Pakistan	Bhawalpur, Punjab
R. ferrugineus	KF311367	H5	Pakistan	Bhawalpur, Punjab
R. ferrugineus	KF311368	H5	Pakistan	Bhawalpur, Punjab
R. ferrugineus	KF311370	H5	Pakistan	Bhawalpur, Punjab
R. ferrugineus	KU696490	H5	Pakistan	Bahawalpur, Punjab Province
R. ferrugineus	KU696491	H5	Pakistan	Bahawalpur, Punjab Province
R. ferrugineus	KU696493	H5	Pakistan	Bahawalpur, Punjab Province
R. ferrugineus	KU696495	H5	Pakistan	Bahawalpur, Punjab Province
R. ferrugineus	KU696498	H5	Pakistan	Bahawalpur, Punjab Province
R. ferrugineus	KU696499	H5	Pakistan	Bahawalpur, Punjab Province
R. ferrugineus	KU696501	H5	Pakistan	Dera Ismael Khan, Khyber Pakhtunkhwa
R. ferrugineus	KU696502	H5	Pakistan	Dera Ismael Khan, Khyber Pakhtunkhwa
R. ferrugineus	KU696503	H5	Pakistan	Dera Ismael Khan, Khyber Pakhtunkhwa

R. ferrugineus	KU696505	H5	Pakistan	Dera Ismael Khan, Khyber Pakhtunkhwa
R. ferrugineus	KU696509	H5	Pakistan	Layyah, Punjab Province
R. ferrugineus	KU696514	H5	Pakistan	Muzaffargarh, Punjab Province
R. ferrugineus	KU696515	H5	Pakistan	Muzaffargarh, Punjab Province
R. ferrugineus	KU696517	H5	Pakistan	Muzaffargarh, Punjab Province
R. ferrugineus	KU696521	H5	Pakistan	Muzaffargarh, Punjab Province
R. ferrugineus	KU696522	H5	Pakistan	Muzaffargarh, Punjab Province
R. ferrugineus	KU696523	H5	Pakistan	Muzaffargarh, Punjab Province
R. ferrugineus	KU696525	H5	Pakistan	Muzaffargarh, Punjab Province
R. ferrugineus	KU696526	H5	Pakistan	Muzaffargarh, Punjab Province
R. ferrugineus	KU696528	H5	Pakistan	Muzaffargarh, Punjab Province
R. ferrugineus	KU696531	H5	Pakistan	Dera Ghazi Khan, Punjab Province
R. ferrugineus	KU696533	H5	Pakistan	Dera Ghazi Khan, Punjab Province
R. ferrugineus	KU696534	H5	Pakistan	Dera Ghazi Khan, Punjab Province
R. ferrugineus	KU696535	H5	Pakistan	Dera Ghazi Khan, Punjab Province
R. ferrugineus	KU696536	H5	Pakistan	Dera Ghazi Khan, Punjab Province
R. ferrugineus	KU696537	H5	Pakistan	Dera Ghazi Khan, Punjab Province
R. ferrugineus	KU696492	H51	Pakistan	Bahawalpur, Punjab Province
R. ferrugineus	KU696497	H51	Pakistan	Bahawalpur, Punjab Province
R. ferrugineus	KU696500	H51	Pakistan	Dera Ismael Khan, Khyber Pakhtunkhwa
R. ferrugineus	KU696520	H51	Pakistan	Muzaffargarh, Punjab Province
R. ferrugineus	KU696507	H52	Pakistan	Layyah, Punjab Province
R. ferrugineus	KU696508	H52	Pakistan	Layyah, Punjab Province
R. ferrugineus	KU696532	H52	Pakistan	Dera Ghazi Khan, Punjab Province
R. ferrugineus	GU581526	H6	Oman	
R. ferrugineus	GU581527	H6	Oman	
R. ferrugineus	GU581528	H6	Oman	
R. ferrugineus	GU581529	H6	Oman	
R. ferrugineus	GU581530	H6	Oman	
R. ferrugineus	GU581531	H6	Oman	
R. ferrugineus	GU581532	H6	Oman	
R. ferrugineus	GU581533	H6	Oman	
R. ferrugineus	GU581534	H6	Oman	
R. ferrugineus	GU581535	H6	Oman	
R. ferrugineus	GU581536	H6	Oman	
R. ferrugineus	GU581537	H6	Oman	
R. ferrugineus	GU581538	H6	Oman	
R. ferrugineus	GU581517	H7	Japan	
R. ferrugineus	GU581518	H7	Japan	
R. ferrugineus	GU581519	H7	Japan	
R. ferrugineus	GU581520	H7	Japan	
R. ferrugineus	GU581521	H7	Japan	
R. ferrugineus	GU581522	H7	Japan	
R. ferrugineus	GU581523	H7	Japan	
R. ferrugineus	GU581524	H7	Japan	
R. ferrugineus	GU581525	H7	Japan	
R. ferrugineus	GU581319	H8	Egypt	
R. ferrugineus	GU581320	H8	Egypt	
R. ferrugineus	GU581321	H8	Egypt	
R. ferrugineus	GU581322	H8	Egypt	
R. ferrugineus	GU581323	H8	Egypt	
R. ferrugineus	GU581324	H8	Egypt	
R. ferrugineus	GU581325	H8	Egypt	
R. ferrugineus	GU581326	H8	Egypt	
R. ferrugineus	GU581327	H8	Egypt	
R. ferrugineus	GU581328	H8	Egypt	
R. ferrugineus	GU581329	H8	Egypt	
R. ferrugineus	GU581330	H8	Egypt	
R. ferrugineus	GU581331	H8	Egypt	
R. ferrugineus	GU581332	H8	Egypt	
R. ferrugineus	GU581333	H8	Egypt	

R. ferrugineus	GU581334	H8	Egypt	
R. ferrugineus	GU581335	H8	Egypt	
R. ferrugineus	GU581336	H8	Egypt	
R. ferrugineus	GU581337	H8	Egypt	
R. ferrugineus	GU581338	H8	Egypt	
R. ferrugineus	GU581339	H8	Egypt	
R. ferrugineus	GU581340	H8	Egypt	
R. ferrugineus	GU581341	H8	Egypt	
R. ferrugineus	GU581342	H8	Egypt	
R. ferrugineus	GU581343	H8	Egypt	
R. ferrugineus	GU581344	H8	Egypt	
R. ferrugineus	GU581345	H8	Egypt	
R. ferrugineus	GU581346	H8	Egypt	
R. ferrugineus	GU581347	H8	Egypt	
R. ferrugineus	GU581348	H8	Egypt	
R. ferrugineus	GU581349	H8	Egypt	
R. ferrugineus	GU581350	H8	Egypt	
R. ferrugineus	GU581351	H8	Egypt	
R. ferrugineus	GU581352	H8	Egypt	
R. ferrugineus	GU581353	H8	Egypt	
R. ferrugineus	GU581354	H8	Egypt	
R. ferrugineus	GU581355	H8	Egypt	
R. ferrugineus	GU581356	H8	Egypt	
R. ferrugineus	GU581357	H8	Egypt	
R. ferrugineus	GU581358	H8	Egypt	
R. ferrugineus	GU581359	H8	Egypt	
R. ferrugineus	GU581360	H8	Egypt	
R. ferrugineus	GU581361	H8	Egypt	
R. ferrugineus	GU581362	H8	Egypt	
R. ferrugineus	GU581363	H8	Egypt	
R. ferrugineus	GU581364	H8	Egypt	
R. ferrugineus	GU581365	H8	Egypt	
R. ferrugineus	GU581366	H8	Egypt	
R. ferrugineus	GU581367	H8	Egypt	
R. ferrugineus	GU581368	H8	Egypt	
R. ferrugineus	GU581369	H8	Egypt	
R. ferrugineus	GU581370	H8	Egypt	
R. ferrugineus	GU581371	H8	Egypt	
R. ferrugineus	GU581372	H8	Egypt	
R. ferrugineus	GU581373	H8	Egypt	
R. ferrugineus	GU581374	H8	Egypt	
R. ferrugineus	GU581375	H8	Egypt	
R. ferrugineus	GU581376	H8	Egypt	
R. ferrugineus	GU581377	H8	Egypt	
R. ferrugineus	GU581378	H8	Egypt	
R. ferrugineus	GU581379	H8	Egypt	
R. ferrugineus	GU581380	H8	Egypt	
R. ferrugineus	GU581381	H8	Egypt	
R. ferrugineus	GU581382	H8	Egypt	
R. ferrugineus	GU581383	H8	Egypt	
R. ferrugineus	GU581384	H8	Egypt	
R. ferrugineus	GU581385	H8	Egypt	
R. ferrugineus	GU581386	H8	Egypt	
R. ferrugineus	GU581387	H8	Egypt	
R. ferrugineus	GU581388	H8	Egypt	
R. ferrugineus	GU581389	H8	Egypt	
R. ferrugineus	GU581390	H8	Egypt	
R. ferrugineus	GU581391	H8	Egypt	
R. ferrugineus	GU581392	H8	Egypt	
R. ferrugineus	GU581393	H8	Egypt	
R. ferrugineus	GU581394	H8	Egypt	

R. ferrugineus	GU581395	H8	Egypt	
R. ferrugineus	GU581396	H8	Egypt	
R. ferrugineus	GU581397	H8	Egypt	
R. ferrugineus	GU581398	H8	Egypt	
R. ferrugineus	GU581399	H8	Egypt	
R. ferrugineus	GU581400	H8	Egypt	
R. ferrugineus	GU581401	H8	Egypt	
R. ferrugineus	GU581402	H8	Egypt	
R. ferrugineus	GU581403	H8	Egypt	
R. ferrugineus	GU581404	H8	Egypt	
R. ferrugineus	GU581405	H8	Egypt	
R. ferrugineus	GU581406	H8	Egypt	
R. ferrugineus	GU581407	H8	Egypt	
R. ferrugineus	GU581408	H8	Egypt	
R. ferrugineus	GU581409	H8	Egypt	
R. ferrugineus	GU581410	H8	Egypt	
R. ferrugineus	GU581411	H8	Egypt	
R. ferrugineus	GU581412	H8	Egypt	
R. ferrugineus	GU581413	H8	Egypt	
R. ferrugineus	GU581414	H8	Egypt	
R. ferrugineus	GU581415	H8	Egypt	
R. ferrugineus	GU581416	H8	Egypt	
R. ferrugineus	GU581417	H8	Egypt	
R. ferrugineus	GU581418	H8	Egypt	
R. ferrugineus	GU581419	H8	Egypt	
R. ferrugineus	GU581420	H8	Egypt	
R. ferrugineus	GU581421	H8	Egypt	
R. ferrugineus	GU581422	H8	Egypt	
R. ferrugineus	GU581423	H8	Egypt	
R. ferrugineus	GU581424	H8	Egypt	
R. ferrugineus	GU581425	H8	Egypt	
R. ferrugineus	GU581426	H8	Egypt	
R. ferrugineus	GU581427	H8	Egypt	
R. ferrugineus	GU581428	H8	Egypt	
R. ferrugineus	GU581429	H8	Saudi Arabia	
R. ferrugineus	GU581430	H8	Saudi Arabia	
R. ferrugineus	GU581431	H8	Saudi Arabia	
R. ferrugineus	GU581432	H8	Saudi Arabia	
R. ferrugineus	GU581433	H8	Saudi Arabia	
R. ferrugineus	GU581434	H8	Saudi Arabia	
R. ferrugineus	GU581435	H8	Saudi Arabia	
R. ferrugineus	GU581436	H8	Saudi Arabia	
R. ferrugineus	GU581437	H8	Saudi Arabia	
R. ferrugineus	GU581438	H8	Saudi Arabia	
R. ferrugineus	GU581439	H8	Saudi Arabia	
R. ferrugineus	GU581440	H8	Saudi Arabia	
R. ferrugineus	GU581441	H8	Spain	
R. ferrugineus	GU581442	H8	Spain	
R. ferrugineus	GU581443	H8	Spain	
R. ferrugineus	GU581444	H8	Spain	
R. ferrugineus	GU581445	H8	Spain	
R. ferrugineus	GU581446	H8	Spain	
R. ferrugineus	GU581447	H8	Spain	
R. ferrugineus	GU581448	H8	Spain	
R. ferrugineus	GU581449	H8	Spain	
R. ferrugineus	GU581450	H8	Spain	
R. ferrugineus	GU581451	H8	Spain	
R. ferrugineus	GU581452	H8	TurKey	
R. ferrugineus	GU581453	H8	TurKey	
R. ferrugineus	GU581454	H8	TurKey	
R. ferrugineus	GU581455	H8	TurKey	

R. ferrugineus	GU581456	H8	TurKey	
R. ferrugineus	GU581457	H8	TurKey	
R. ferrugineus	GU581458	H8	TurKey	
R. ferrugineus	GU581459	H8	TurKey	
R. ferrugineus	GU581460	H8	TurKey	
R. ferrugineus	GU581461	H8	TurKey	
R. ferrugineus	GU581462	H8	TurKey	
R. ferrugineus	GU581463	H8	TurKey	
R. ferrugineus	GU581464	H8	TurKey	
R. ferrugineus	GU581465	H8	Greece	
R. ferrugineus	GU581466	H8	Greece	
R. ferrugineus	GU581467	H8	Greece	
R. ferrugineus	GU581468	H8	Greece	
R. ferrugineus	GU581469	H8	Greece	
R. ferrugineus	GU581470	H8	Greece	
R. ferrugineus	GU581471	H8	Greece	
R. ferrugineus	GU581472	H8	Greece	
R. ferrugineus	GU581473	H8	Greece	
R. ferrugineus	GU581474	H8	Cyprus	
R. ferrugineus	GU581475	H8	Cyprus	
R. ferrugineus	GU581476	H8	Cyprus	
R. ferrugineus	GU581477	H8	Cyprus	
R. ferrugineus	GU581478	H8	Cyprus	
R. ferrugineus	GU581479	H8	Cyprus	
R. ferrugineus	GU581480	H8	Cyprus	
R. ferrugineus	GU581481	H8	Cyprus	
R. ferrugineus	GU581482	H8	Cyprus	
R. ferrugineus	GU581483	H8	Cyprus	
R. ferrugineus	GU581484	H8	Cyprus	
R. ferrugineus	GU581485	H8	Cyprus	
R. ferrugineus	GU581486	H8	Cyprus	
R. ferrugineus	GU581487	H8	Cyprus	
R. ferrugineus	GU581488	H8	Cyprus	
R. ferrugineus	GU581489	H8	Cyprus	
R. ferrugineus	GU581490	H8	Italy	
R. ferrugineus	GU581491	H8	Italy	
R. ferrugineus	GU581492	H8	Italy	
R. ferrugineus	GU581493	H8	Italy	
R. ferrugineus	GU581494	H8	Italy	
R. ferrugineus	GU581495	H8	Italy	
R. ferrugineus	GU581496	H8	Italy	
R. ferrugineus	GU581497	H8	Italy	
R. ferrugineus	GU581498	H8	Italy	
R. ferrugineus	GU581499	H8	Italy	
R. ferrugineus	GU581500	H8	Italy	
R. ferrugineus	GU581501	H8	Italy	
R. ferrugineus	GU581502	H8	Italy	
R. ferrugineus	GU581503	H8	France	
R. ferrugineus	GU581504	H8	France	
R. ferrugineus	GU581505	H8	France	
R. ferrugineus	GU581506	H8	France	
R. ferrugineus	GU581507	H8	France	
R. ferrugineus	GU581508	H8	France	
R. ferrugineus	GU581509	H8	France	
R. ferrugineus	GU581510	H8	France	
R. ferrugineus	GU581511	H8	France	
R. ferrugineus	GU581512	H8	France	
R. ferrugineus	GU581513	H8	France	
R. ferrugineus	GU581514	H8	France	
R. ferrugineus	GU581515	H8	France	
R. ferrugineus	GU581516	H8	France	

R. ferrugineus	GU581524	H8	Egypt	
R. ferrugineus	H8	H8	Spain	Luria
R. ferrugineus	H8	H8	Curacao	
R. ferrugineus	H8	H8	Cyprus	Limassol
R. ferrugineus	H8	H8	Egypt	Paradise Park, 177 km south of Alexandria
R. ferrugineus	KF311362	H8	Israel	Kerem Shalom
R. ferrugineus	KF311363	H8	Israel	Kfar Yuval
R. ferrugineus	KF311364	H8	Israel	Eylon
R. ferrugineus	KF311365	H8	TurKey	Antalya
R. ferrugineus	KF311371	H8	Portugal	Tres Fontes, Algarve
R. ferrugineus	KF311372	H8	Portugal	Ayamonte, Andalucia
R. ferrugineus	KF311373	H8	France	Hyères, Almanarre
R. ferrugineus	KF311374	H8	France	Hyères, Almanarre
R. ferrugineus	KF311375	H8	France	Claret, Toulon
R. ferrugineus	KF311376	H8	France	Le Pradet
R. ferrugineus	KF311377	H8	France	Le Pradet
R. ferrugineus	KF311401	H8	Malaysia	Rhu Tapai, Kuala, Terengganu
R. ferrugineus	KF311402	H8	Malaysia	Rhu Tapai, Kuala, Terengganu
R. ferrugineus	KF311403	H8	Malaysia	Rhu Tapai, Kuala, Terengganu
R. ferrugineus	KF311404	H8	Malaysia	Rhu Tapai, Kuala, Terengganu
R. ferrugineus	KF311405	H8	Malaysia	Rhu Tapai, Kuala, Terengganu
R. ferrugineus	KF311406	H8	Malaysia	Rhu Tapai, Kuala, Terengganu
R. ferrugineus	KF311407	H8	Malaysia	Rhu Tapai, Kuala, Terengganu
R. ferrugineus	KF311408	H8	Malaysia	Rhu Tapai, Kuala, Terengganu
R. ferrugineus	KF311409	H8	Malaysia	Rhu Tapai, Kuala, Terengganu
R. ferrugineus	KF311410	H8	Malaysia	Rhu Tapai, Kuala, Terengganu
R. ferrugineus	KF311411	H8	Malaysia	Rhu Tapai, Kuala, Terengganu
R. ferrugineus	KF311412	H8	Malaysia	Rhu Tapai, Kuala, Terengganu
R. ferrugineus	KF311413	H8	Malaysia	Rhu Tapai, Kuala, Terengganu
R. ferrugineus	KF311414	H8	Malaysia	Rhu Tapai, Kuala, Terengganu
R. ferrugineus	KF311415	H8	Malaysia	Rhu Tapai, Kuala, Terengganu
R. ferrugineus	KF311416	H8	Malaysia	Rhu Tapai, Kuala, Terengganu
R. ferrugineus	KF311417	H8	Malaysia	Rhu Tapai, Kuala, Terengganu
R. ferrugineus	KF311418	H8	Malaysia	Rhu Tapai, Kuala, Terengganu
R. ferrugineus	KF311419	H8	Malaysia	Rhu Tapai, Kuala, Terengganu
R. ferrugineus	KF311420	H8	Malaysia	Rhu Tapai, Kuala, Terengganu
R. ferrugineus	KF311421	H8	Malaysia	Rhu Tapai, Kuala, Terengganu
R. ferrugineus	KF311422	H8	Malaysia	Rhu Tapai, Kuala, Terengganu
R. ferrugineus	KF311423	H8	Malaysia	Rhu Tapai, Kuala, Terengganu
R. ferrugineus	KF311424	H8	Malaysia	Rhu Tapai, Kuala, Terengganu
R. ferrugineus	KF311425	H8	Malaysia	Rhu Tapai, Kuala, Terengganu
R. ferrugineus	KF311426	H8	Malaysia	Rhu Tapai, Kuala, Terengganu
R. ferrugineus	KF311435	H8	Spain	Benicassim
R. ferrugineus	KF311437	H8	Spain	Benimamet
R. ferrugineus	KF311438	H8	Italia	Lazio, Roma
R. ferrugineus	KF311439	H8	Italia	Lazio, Roma
R. ferrugineus	KF311441	H8	Italia	Campania (NA)
R. ferrugineus	KF311442	H8	Italia	Lazio, Roma
R. ferrugineus	KF311450	H8	TurKey	Didim
R. ferrugineus	KF311451	H8	TurKey	Didim
R. ferrugineus	KF311452	H8	TurKey	Didim
R. ferrugineus	KF311453	H8	TurKey	Didim
R. ferrugineus	KF31146	H8	Spain	Olliva
R. ferrugineus	KF311467	H8	Thailand	Chachoengsao
R. ferrugineus	KF311469	H8	Thailand	Chachoengsao
R. ferrugineus	KF311470	H8	Thailand	Chachoengsao
R. ferrugineus	KF311472	H8	Thailand	Chachoengsao
R. ferrugineus	KF311475	H8	Thailand	Nakhon Pathom
R. ferrugineus	KF311476	H8	Thailand	Nakhon Pathom
R. ferrugineus	KF311479	H8	Thailand	Chachoengsao
R. ferrugineus	KF311480	H8	Thailand	Chachoengsao

R. ferrugineus	KF311521	H8	Thailand	Tha Khae, Patthalung Provinc
R. ferrugineus	KX228866	H8	Tunisia	Tunis: El Kram
R. ferrugineus	KX228867	H8	Tunisia	Tunis: El Kram
R. ferrugineus	KX228868	H8	Tunisia	Tunis: El Kram
R. ferrugineus	KX228869	H8	Tunisia	Tunis: El Kram
R. ferrugineus	KX228870	H8	Tunisia	Tunis: El Kram
R. ferrugineus	KX228871	H8	Tunisia	Tunis: El Kram
R. ferrugineus	KX228872	H8	Tunisia	Tunis: El Kram
R. ferrugineus	KX228873	H8	Tunisia	Tunis: El Kram
R. ferrugineus	KX228874	H8	Tunisia	Tunis: El Kram
R. ferrugineus	KX228875	H8	Tunisia	Tunis: La Souka
R. ferrugineus	KX228876	H8	Tunisia	Tunis: La Souka
R. ferrugineus	KX228877	H8	Tunisia	Tunis: La Souka
R. ferrugineus	KX228878	H8	Tunisia	Tunis: La Souka
R. ferrugineus	KX228879	H8	Tunisia	Tunis: La Souka
R. ferrugineus	KX228880	H8	Tunisia	Tunis: La Souka
R. ferrugineus	KX228881	H8	Tunisia	Tunis: La Souka
R. ferrugineus	KX228882	H8	Tunisia	Tunis: La Souka
R. ferrugineus	KX228883	H8	Tunisia	Tunis: La Souka
R. ferrugineus	KX228884	H8	Tunisia	Tunis: La Souka
R. ferrugineus	KX228885	H8	Tunisia	Tunis: La Souka
R. ferrugineus	KX228886	H8	Tunisia	Tunis: La Souka
R. ferrugineus	KX228887	H8	Tunisia	Tunis: La Souka
R. ferrugineus	KX228888	H8	Tunisia	Tunis: La Souka
R. ferrugineus	KX228889	H8	Tunisia	Tunis: La Souka
R. ferrugineus	KX228890	H8	Tunisia	Tunis: La Souka
R. ferrugineus	KX228891	H8	Tunisia	Tunis: El Kram
R. ferrugineus	KX228892	H8	Tunisia	Tunis: El Kram
R. ferrugineus	KX228893	H8	Tunisia	Tunis: El Kram
R. ferrugineus	KX228894	H8	Tunisia	Tunis: El Kram
R. ferrugineus	KX228895	H8	Tunisia	Tunis: El Kram
R. ferrugineus	KX228896	H8	Tunisia	Tunis: El Kram
R. ferrugineus	KX228897	H8	Tunisia	Tunis: El Kram
R. ferrugineus	KX228898	H8	Tunisia	Tunis: El Kram
R. ferrugineus	KX228899	H8	Tunisia	Tunis: Carthage
R. ferrugineus	KX228900	H8	Tunisia	Tunis: Carthage
R. ferrugineus	KX228901	H8	Tunisia	Tunis: Carthage
R. ferrugineus	KX228902	H8	Tunisia	Tunis: Carthage
R. ferrugineus	KX228903	H8	Tunisia	Tunis: Carthage
R. ferrugineus	KX228904	H8	Tunisia	Tunis: Carthage
R. ferrugineus	KX228905	H8	Tunisia	Tunis: La Marsa
R. ferrugineus	KX228906	H8	Tunisia	Tunis: La Marsa
R. ferrugineus	KF311446	H9	India	Loutolim, Goa
R. ferrugineus	H16		India	Majorda, Goa
R. ferrugineus	H16		India	Sao Jose de Areal (Nesai), Goa
R. ferrugineus	JX292124		India	
R. ferrugineus	JX294413		Saudi Arabia	
R. ferrugineus	KF413063		China	Cangshan area, Fuzhou
R. ferrugineus	KF413064		China	Cangshan area, Fuzhou
R. ferrugineus	KF413065		China	Jinan area, Fuzhou
R. ferrugineus	KF413066		China	Meizhou Island, Putian
R. ferrugineus	KF413067		China	Qingrong avenue, Fuqing
R. ferrugineus	KF413068		China	Jinjiang, Quanzhou
R. ferrugineus	KF413069		China	Gaoqi, Xiamen
R. ferrugineus	KF413070		China	Gaoqi, Xiamen
R. ferrugineus	KF413071		China	Gaoqi, Xiamen
R. ferrugineus	KF413072		China	Cangshan area, Fuzhou
R. ferrugineus	KF413073		China	Nanping city
R. ferrugineus	KM438512		Unknown	
R. ferrugineus	KT989230		Saudi Arabia	Al Amariyah Riyadh
R. ferrugineus	KT989231		Saudi Arabia	Al Amariyah Riyadh

R. ferrugineus	KT989232		Saudi Arabia	Al Amariyah Riyadh
R. ferrugineus	KT989233		Saudi Arabia	Al Amariyah Riyadh
R. ferrugineus	KT989234		Saudi Arabia	Al Amariyah Riyadh
R. ferrugineus	KU366272		Egypt	Quina-Eg
R. ferrugineus	KU366273		Egypt	Ismailia
R. ferrugineus	KU366274		Egypt	Rashed
R. ferrugineus	KU916538		Italy	Sardinien, Alghero
R. ferrugineus	KY458175		Pakistan	
R. ferrugineus	KY458176		Pakistan	
R. ferrugineus	KY458177		Pakistan	
R. ferrugineus	LC474878		Egypt	Behera
R. ferrugineus	LC474879		Egypt	Ismailia
R. ferrugineus	LC474880		Egypt	Ismailia
R. ferrugineus	LC474881		Egypt	Ismailia
R. ferrugineus	LC474882		Egypt	Ismailia
R. ferrugineus	LC474883		Egypt	Ismailia
R. ferrugineus	LC474884		Egypt	Ismailia
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R. ferrugineus	LC474889		Egypt	Ismailia
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R. ferrugineus	LC474892		Egypt	Ismailia
R. ferrugineus	LC474893		Egypt	Ismailia
R. ferrugineus	LC474894		Egypt	Ismailia
R. ferrugineus	LC474895		Egypt	Ismailia
R. ferrugineus	LC474896		Egypt	Cairo, Alex road
R. ferrugineus	LC474897		Egypt	Cairo, Alex road
R. ferrugineus	LC474898		Egypt	Cairo, Alex road
R. ferrugineus	LC474899		Egypt	Cairo, Alex road
R. ferrugineus	LC474900		Egypt	Cairo, Alex road
R. ferrugineus	LC474901		Egypt	Cairo, Alex road
R. ferrugineus	LC474902		Egypt	Cairo, Alex road
R. ferrugineus	LC474903		Egypt	Cairo, Alex road
R. ferrugineus	LC474904		Egypt	Cairo, Alex road
R. ferrugineus	LC474905		Egypt	Naga Hamadi
R. ferrugineus	LC474906		Egypt	Naga Hamadi
R. ferrugineus	LC474907		Egypt	Naga Hamadi
R. ferrugineus	LC474908		Egypt	Naga Hamadi
R. ferrugineus	LC474909		Egypt	Naga Hamadi
R. ferrugineus	LC474910		Egypt	Rasheed
R. ferrugineus	LC474911		Egypt	Suez
R. ferrugineus	LC474912		Egypt	Suez
R. ferrugineus	LC474913		Egypt	Suez
R. ferrugineus	LC474914		Egypt	Suez
R. ferrugineus	LC474915		Egypt	Suez
R. ferrugineus	LC474916		Egypt	Suez
R. ferrugineus	LC474917		Egypt	Suez
R. ferrugineus	LC474918		Egypt	Suez
R. ferrugineus	LC474919		Egypt	Wahat
R. ferrugineus	LC474920		Egypt	Wahat
R. ferrugineus	LC474921		Egypt	Wahat
R. ferrugineus	LC474922		Egypt	Wahat
R. ferrugineus	LC474923		Egypt	Wahat
R. ferrugineus	LC474924		Egypt	Wahat
R. ferrugineus	LC474925		Egypt	Wahat
R. ferrugineus	LC474926		Egypt	Wahat
R. ferrugineus	LC474927		Egypt	Wahat
R. ferrugineus	LC474928		Egypt	Wahat

R. ferrugineus	LC474929		Egypt	Wahat
R. ferrugineus	MF448526		Egypt	
R. ferrugineus	MG051027		Peninsular Malaysia	Terengganu, Kuala Terengganu
R. ferrugineus	MG051028		Peninsular Malaysia	Terengganu, Kuala Terengganu
R. ferrugineus	MG051029		Peninsular Malaysia	Terengganu, Kuala Terengganu
R. ferrugineus	MG051030		Peninsular Malaysia	Terengganu, Kuala Terengganu
R. ferrugineus	MG051031		Peninsular Malaysia	Terengganu, Kuala Terengganu
R. ferrugineus	MG872818		Egypt	
R. ferrugineus	MG883395		Egypt	Wahat
R. ferrugineus	MG883396		Egypt	Assuit
R. ferrugineus	MG883397		Egypt	Assuit
R. ferrugineus	MG883398		Egypt	Assuit
R. ferrugineus	MG883399		Egypt	Aswan
R. ferrugineus	MH016277		Saudi Arabia	Al-Qassim
R. ferrugineus	MH016278		Saudi Arabia	Riyadh
R. ferrugineus	MH016279		Saudi Arabia	Al-Qassim
R. ferrugineus	MH016604		Egypt	Aswan
R. ferrugineus	MH016605		Egypt	Aswan
R. ferrugineus	MH016606		Egypt	Aswan
R. ferrugineus	MH016607		Egypt	Aswan
R. ferrugineus	MH016608		Egypt	Abohammad
R. ferrugineus	MH016609		Egypt	Abohammad
R. ferrugineus	MH016610		Egypt	Assuit
R. ferrugineus	MH016611		Egypt	Assuit
R. ferrugineus	MH016612		Egypt	Assuit
R. ferrugineus	MH016613		Egypt	Aswan
R. ferrugineus	MH016614		Egypt	Aswan
R. ferrugineus	MH016615		Egypt	Behera
R. ferrugineus	MH016616		Egypt	Behera
R. ferrugineus	MH016617		Egypt	Behera
R. ferrugineus	MH016618		Egypt	Domiat Gadeda
R. ferrugineus	MH016619		Egypt	Domiat Gadeda
R. ferrugineus	MH016620		Egypt	Domiat Gadeda
R. ferrugineus	MH016621		Egypt	Domiat Gadeda
R. ferrugineus	MH016622		Egypt	Domiat Gadeda
R. ferrugineus	MH016623		Egypt	Domiat Gadeda
R. ferrugineus	MH016624		Egypt	Domiat Gadeda
R. ferrugineus	MH016625		Egypt	Domiat Gadeda
R. ferrugineus	MH016626		Egypt	Domiat Gadeda
R. ferrugineus	MH016627		Egypt	Domiat Gadeda
R. ferrugineus	MH016628		Egypt	Domiat Gadeda
R. ferrugineus	MH016629		Egypt	Fayoum
R. ferrugineus	MH016630		Egypt	Fayoum
R. ferrugineus	MH016631		Egypt	Fayoum
R. ferrugineus	MH016632		Egypt	Fayoum
R. ferrugineus	MH016633		Egypt	Fayoum
R. ferrugineus	MH016634		Egypt	Fayoum
R. ferrugineus	MH016635		Egypt	Fayoum
R. ferrugineus	MH016636		Egypt	Fayoum
R. ferrugineus	MH016637		Egypt	Fayoum
R. palmarum	KU647599	Rp1	Brazil	Pernambuco, Petrolina
R. palmarum	KU647600	Rp1	Brazil	Pernambuco, Petrolina
R. palmarum	KU647601	Rp1	Brazil	Pernambuco, Petrolina
R. palmarum	KU647490	Rp10	Brazil	Alagoas: Santa Luzia do Norte
R. palmarum	KU647494	Rp10	Brazil	Alagoas: Santa Luzia do Norte
R. palmarum	KU647509	Rp10	Brazil	Paraíba: Pitimbu
R. palmarum	KU647529	Rp10	Brazil	Pernambuco, Recife
R. palmarum	KU647530	Rp10	Brazil	Pernambuco, Recife
R. palmarum	KU647534	Rp10	Brazil	Pernambuco, Recife
R. palmarum	KU647545	Rp10	Brazil	Alagoas, Sao Sebastiao
R. palmarum	KU647546	Rp10	Brazil	Alagoas, Sao Sebastiao

R. palmarum	KU647549	Rp10	Brazil	Alagoas, Sao Sebastiao
R. palmarum	KU647551	Rp10	Brazil	Alagoas, Sao Sebastiao
R. palmarum	KU647552	Rp10	Brazil	Alagoas, Sao Sebastiao
R. palmarum	KU647560	Rp10	Brazil	Paraíba: Rio Tinto
R. palmarum	KU647566	Rp10	Brazil	Paraíba: Rio Tinto
R. palmarum	KU647621	Rp10	Brazil	Pernambuco, Petrolina
R. palmarum	KU647625	Rp10	Brazil	Pernambuco, Petrolina
R. palmarum	KU647489	Rp11	Brazil	Alagoas: Santa Luzia do Norte
R. palmarum	KU647491	Rp11	Brazil	Alagoas: Santa Luzia do Norte
R. palmarum	KU647492	Rp11	Brazil	Alagoas: Santa Luzia do Norte
R. palmarum	KU647493	Rp11	Brazil	Alagoas: Santa Luzia do Norte
R. palmarum	KU647495	Rp11	Brazil	Alagoas: Santa Luzia do Norte
R. palmarum	KU647496	Rp11	Brazil	Alagoas: Santa Luzia do Norte
R. palmarum	KU647497	Rp11	Brazil	Alagoas: Santa Luzia do Norte
R. palmarum	KU647498	Rp11	Brazil	Alagoas: Santa Luzia do Norte
R. palmarum	KU647499	Rp11	Brazil	Alagoas: Santa Luzia do Norte
R. palmarum	KU647500	Rp11	Brazil	Alagoas: Santa Luzia do Norte
R. palmarum	KU647501	Rp11	Brazil	Alagoas: Santa Luzia do Norte
R. palmarum	KU647503	Rp11	Brazil	Alagoas: Santa Luzia do Norte
R. palmarum	KU647504	Rp11	Brazil	Alagoas: Santa Luzia do Norte
R. palmarum	KU647506	Rp11	Brazil	Alagoas: Santa Luzia do Norte
R. palmarum	KU647507	Rp11	Brazil	Paraíba: Pitimbu
R. palmarum	KU647510	Rp11	Brazil	Paraíba: Pitimbu
R. palmarum	KU647511	Rp11	Brazil	Paraíba: Pitimbu
R. palmarum	KU647512	Rp11	Brazil	Paraíba: Pitimbu
R. palmarum	KU647513	Rp11	Brazil	Paraíba: Pitimbu
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R. palmarum	KU647525	Rp11	Brazil	Paraíba: Pitimbu
R. palmarum	KU647526	Rp11	Brazil	Paraíba: Pitimbu
R. palmarum	KU647527	Rp11	Brazil	Pernambuco, Recife
R. palmarum	KU647528	Rp11	Brazil	Pernambuco, Recife
R. palmarum	KU647531	Rp11	Brazil	Pernambuco, Recife
R. palmarum	KU647533	Rp11	Brazil	Pernambuco, Recife
R. palmarum	KU647535	Rp11	Brazil	Pernambuco, Recife
R. palmarum	KU647536	Rp11	Brazil	Pernambuco, Recife
R. palmarum	KU647537	Rp11	Brazil	Pernambuco, Recife
R. palmarum	KU647538	Rp11	Brazil	Pernambuco, Recife
R. palmarum	KU647539	Rp11	Brazil	Pernambuco, Recife
R. palmarum	KU647540	Rp11	Brazil	Alagoas, Sao Sebastiao
R. palmarum	KU647541	Rp11	Brazil	Alagoas, Sao Sebastiao
R. palmarum	KU647542	Rp11	Brazil	Alagoas, Sao Sebastiao
R. palmarum	KU647543	Rp11	Brazil	Alagoas, Sao Sebastiao
R. palmarum	KU647544	Rp11	Brazil	Alagoas, Sao Sebastiao
R. palmarum	KU647547	Rp11	Brazil	Alagoas, Sao Sebastiao
R. palmarum	KU647548	Rp11	Brazil	Alagoas, Sao Sebastiao
R. palmarum	KU647550	Rp11	Brazil	Alagoas, Sao Sebastiao
R. palmarum	KU647553	Rp11	Brazil	Paraíba: Rio Tinto
R. palmarum	KU647554	Rp11	Brazil	Paraíba: Rio Tinto
R. palmarum	KU647555	Rp11	Brazil	Paraíba: Rio Tinto
R. palmarum	KU647556	Rp11	Brazil	Paraíba: Rio Tinto
R. palmarum	KU647557	Rp11	Brazil	Paraíba: Rio Tinto

R. palmarum	KU647558	Rp11	Brazil	Paraíba: Rio Tinto
R. palmarum	KU647559	Rp11	Brazil	Paraíba: Rio Tinto
R. palmarum	KU647561	Rp11	Brazil	Paraíba: Rio Tinto
R. palmarum	KU647562	Rp11	Brazil	Paraíba: Rio Tinto
R. palmarum	KU647563	Rp11	Brazil	Paraíba: Rio Tinto
R. palmarum	KU647564	Rp11	Brazil	Paraíba: Rio Tinto
R. palmarum	KU647565	Rp11	Brazil	Paraíba: Rio Tinto
R. palmarum	KU647567	Rp11	Brazil	Paraíba: Rio Tinto
R. palmarum	KU647568	Rp11	Brazil	Paraíba: Rio Tinto
R. palmarum	KU647569	Rp11	Brazil	Paraíba: Rio Tinto
R. palmarum	KU647570	Rp11	Brazil	Paraíba: Rio Tinto
R. palmarum	KU647571	Rp11	Brazil	Paraíba: Rio Tinto
R. palmarum	KU647572	Rp11	Brazil	Paraíba: Rio Tinto
R. palmarum	KU647573	Rp11	Brazil	Paraíba: Rio Tinto
R. palmarum	KU647574	Rp11	Brazil	Paraíba: Rio Tinto
R. palmarum	KU647576	Rp11	Brazil	Paraíba: Rio Tinto
R. palmarum	KU647577	Rp11	Brazil	Paraíba: Rio Tinto
R. palmarum	KU647578	Rp11	Brazil	Paraíba: Rio Tinto
R. palmarum	KU647602	Rp11	Brazil	Pernambuco, Petrolina
R. palmarum	KU647603	Rp11	Brazil	Pernambuco, Petrolina
R. palmarum	KU647608	Rp11	Brazil	Pernambuco, Petrolina
R. palmarum	KU647609	Rp11	Brazil	Pernambuco, Petrolina
R. palmarum	KU647610	Rp11	Brazil	Pernambuco, Petrolina
R. palmarum	KU647611	Rp11	Brazil	Pernambuco, Petrolina
R. palmarum	KU647612	Rp11	Brazil	Pernambuco, Petrolina
R. palmarum	KU647613	Rp11	Brazil	Pernambuco, Petrolina
R. palmarum	KU647615	Rp11	Brazil	Pernambuco, Petrolina
R. palmarum	KU647616	Rp11	Brazil	Pernambuco, Petrolina
R. palmarum	KU647617	Rp11	Brazil	Pernambuco, Petrolina
R. palmarum	KU647618	Rp11	Brazil	Pernambuco, Petrolina
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R. palmarum	KU647620	Rp11	Brazil	Pernambuco, Petrolina
R. palmarum	KU647622	Rp11	Brazil	Pernambuco, Petrolina
R. palmarum	KU647623	Rp11	Brazil	Pernambuco, Petrolina
R. palmarum	KU647624	Rp11	Brazil	Pernambuco, Petrolina
R. palmarum	KU647604	Rp12	Brazil	Pernambuco, Petrolina
R. palmarum	KU647605	Rp12	Brazil	Pernambuco, Petrolina
R. palmarum	KU647606	Rp12	Brazil	Pernambuco, Petrolina
R. palmarum	KU647575	Rp13	Brazil	Paraíba: Rio Tinto
R. palmarum	KU647587	Rp2	Brazil	Ceará, Fortaleza
R. palmarum	KU647508	Rp3	Brazil	Paraíba: Pitimbu
R. palmarum	KU647585	Rp4	Brazil	Ceará, Fortaleza
R. palmarum	KU647597	Rp4	Brazil	Ceará, Fortaleza
R. palmarum	KU647584	Rp5	Brazil	Ceará, Fortaleza
R. palmarum	KU647590	Rp5	Brazil	Ceará, Fortaleza
R. palmarum	KU647591	Rp5	Brazil	Ceará, Fortaleza
R. palmarum	KU647596	Rp5	Brazil	Ceará, Fortaleza
R. palmarum	KU647607	Rp5	Brazil	Pernambuco, Petrolina
R. palmarum	KU647581	Rp6	Brazil	Ceará, Fortaleza
R. palmarum	KU647583	Rp6	Brazil	Ceará, Fortaleza
R. palmarum	KU647588	Rp6	Brazil	Ceará, Fortaleza
R. palmarum	KU647589	Rp6	Brazil	Ceará, Fortaleza
R. palmarum	KU647593	Rp6	Brazil	Ceará, Fortaleza
R. palmarum	KU647595	Rp6	Brazil	Ceará, Fortaleza
R. palmarum	KU647579	Rp7	Brazil	Ceará, Fortaleza
R. palmarum	KU647580	Rp7	Brazil	Ceará, Fortaleza
R. palmarum	KU647582	Rp7	Brazil	Ceará, Fortaleza
R. palmarum	KU647586	Rp7	Brazil	Ceará, Fortaleza
R. palmarum	KU647592	Rp7	Brazil	Ceará, Fortaleza
R. palmarum	KU647594	Rp7	Brazil	Ceará, Fortaleza
R. palmarum	KU647598	Rp7	Brazil	Ceará, Fortaleza

R. palmarum	KU647614	Rp7	Brazil	Pernambuco, Petrolina
R. palmarum	KU647502	Rp8	Brazil	Alagoas: Santa Luzia do Norte
R. palmarum	KU647505	Rp9	Brazil	Alagoas: Santa Luzia do Norte
R. palmarum	KU647532	Rp9	Brazil	Pernambuco, Recife
R. palmarum	ASSCR6357		Costa Rica	Puntarenas, Area de conservacion Osa, Golfito, Estacion La Leona. Alrededores
R. palmarum	ASSCR6358		Costa Rica	Limon, Area de conservacion La Amistad Caribe, Limon, Reserva Biologica Hitoy Cerere. Estacion Hitoy Cer
R. palmarum	ASSCR6359		Costa Rica	Heredia, Area de conservacion Cordillera Volcanica Central, Belen, La Ribera de Belen
R. palmarum	AY131121		Unknown	
R. palmarum	GU581629		French Guiana	
R. palmarum	KF311358		Mexico	Tijuana
R. palmarum	KR494254		Colombia	Valle del Cauca, Palmira, Centro Internacional de Agricultura Tropical headquarter
R. palmarum	KR494255		Colombia	Valle del Cauca, Palmira, Centro Internacional de Agricultura Tropical headquarter
R. palmarum	KR494256		Colombia	Valle del Cauca, Palmira, Centro Internacional de Agricultura Tropical headquarter
R. palmarum	KR494257		Colombia	Valle del Cauca, Palmira, Centro Internacional de Agricultura Tropical headquarter
R. palmarum	KR494258		Colombia	Valle del Cauca, Palmira, Centro Internacional de Agricultura Tropical headquarter
R. palmarum	KR494259		Colombia	Valle del Cauca, Palmira, Centro Internacional de Agricultura Tropical headquarter
R. palmarum	KR494260		Colombia	Valle del Cauca, Palmira, Centro Internacional de Agricultura Tropical headquarter
R. palmarum	KR494261		Colombia	Valle del Cauca, Palmira, Centro Internacional de Agricultura Tropical headquarter
R. palmarum	Univalle_10		Colombia	Valle del Cauca, Buenaventura, Corregimiento 1, Bajo Calima
R. palmarum	Univalle_11		Colombia	Valle del Cauca, Buenaventura, Corregimiento 1, Bajo Calima, Finca La Camila
R. palmarum	Univalle_17		Colombia	Valle del Cauca, Buenaventura, Corregimiento 1, Bajo Calima, Finca La Camila
R. palmarum	Univalle_21		Colombia	Valle del Cauca, Buenaventura, Corregimiento 8. Llano Bajo. Playa Grande
R. palmarum	Univalle_44		Colombia	Caquetá, Florencia, La Dorada. Finca los Papiros
R. palmarum	Univalle_58		Colombia	Valle del Cauca, Buenaventura, Corregimiento 8. Llano Bajo. Playa Grande
R. palmarum	Univalle_117		Colombia	Putumayo, Villagarzón, Islandia. Finca la Esperanza
R. phoenicis	AY131120		Unknown	
R. phoenicis	KY511047		Liberia	
R. vulneratus	KF311588	Rv1	Malaysia	Sungai Burong
R. vulneratus	KF311587	Rv10	Malaysia	Sungai Burong
R. vulneratus	KF311629	Rv11	Singapore	Singapore
R. vulneratus	KF311550	Rv12	Indonesia	Bah Lias Estate, nr. Pematangsiantar, Sumatra
R. vulneratus	KF311575	Rv12	Indonesia	Bah Lias Estate, nr. Pematangsiantar, Sumatra
R. vulneratus	KF311549	Rv13	Indonesia	Bah Lias Estate, nr. Pematangsiantar, Sumatra
R. vulneratus	KF311574	Rv13	Indonesia	Bah Lias Estate, nr. Pematangsiantar, Sumatra
R. vulneratus	KF311579	Rv13	Indonesia	Bah Lias Estate, nr. Pematangsiantar, Sumatra
R. vulneratus	KF311573	Rv14	Indonesia	Bah Lias Estate, nr. Pematangsiantar, Sumatra
R. vulneratus	KF311546	RV15	Indonesia	Bah Lias Estate, nr. Pematangsiantar, Sumatra
R. vulneratus	KF311553	Rv15	Indonesia	Bah Lias Estate, nr. Pematangsiantar, Sumatra
R. vulneratus	KF311572	Rv15	Indonesia	Bah Lias Estate, nr. Pematangsiantar, Sumatra
R. vulneratus	KF311600	Rv16	Indonesia	Pancur Batu, Sumatra
R. vulneratus	KF311578	Rv17	Indonesia	Bah Lias Estate, nr. Pematangsiantar, Sumatra
R. vulneratus	KF311593	Rv18	Indonesia	Pancur Batu, Sumatra
R. vulneratus	KF311552	Rv19	Indonesia	Bah Lias Estate, nr. Pematangsiantar, Sumatra
R. vulneratus	KF311554	Rv19	Indonesia	Bah Lias Estate, nr. Pematangsiantar, Sumatra
R. vulneratus	KF311586	Rv2	Malaysia	Sungai Burong
R. vulneratus	KF311594	Rv20	Indonesia	Pancur Batu, Sumatra
R. vulneratus	KF311595	Rv20	Indonesia	Pancur Batu, Sumatra

R. vulneratus	KF311596	Rv20	Indonesia	Pancur Batu, Sumatra
R. vulneratus	KF311597	Rv20	Indonesia	Pancur Batu, Sumatra
R. vulneratus	KF311598	Rv20	Indonesia	Pancur Batu, Sumatra
R. vulneratus	KF311599	Rv20	Indonesia	Pancur Batu, Sumatra
R. vulneratus	KF311547	Rv21	Indonesia	Bah Lias Estate, nr. Pematangsiantar, Sumatra
R. vulneratus	KF311591	Rv22	Indonesia	Pancur Batu, Sumatra
R. vulneratus	KF311545	Rv23	Indonesia	Bah Lias Estate, nr. Pematangsiantar, Sumatra
R. vulneratus	KF311551	Rv23	Indonesia	Bah Lias Estate, nr. Pematangsiantar, Sumatra
R. vulneratus	KF311576	Rv24	Indonesia	Bah Lias Estate, nr. Pematangsiantar, Sumatra
R. vulneratus	KF311577	Rv24	Indonesia	Bah Lias Estate, nr. Pematangsiantar, Sumatra
R. vulneratus	KF311548	Rv25	Indonesia	Bah Lias Estate, nr. Pematangsiantar, Sumatra
R. vulneratus	KF311592	Rv25	Indonesia	Pancur Batu, Sumatra
R. vulneratus	KF311559	RV26	Indonesia	Cijangkar, Java
R. vulneratus	KF311561	Rv27	Indonesia	Bunikasih, Java
R. vulneratus	KF311533	Rv28	Indonesia	Bunikasih, Java
R. vulneratus	KF311534	Rv28	Indonesia	Bunikasih, Java
R. vulneratus	KF311540	Rv28	Indonesia	Bunikasih, Java
R. vulneratus	KF311537	Rv29	Indonesia	Bunikasih, Java
R. vulneratus	KF311633	Rv3	Thailand	Bang Kung, Huai Yot, Trang Province
R. vulneratus	KF311564	Rv30	Indonesia	Bunikasih, Java
R. vulneratus	KF311570	Rv31	Indonesia	Cijangkar, Java
R. vulneratus	KF311530	Rv32	Indonesia	Cikemang, Java
R. vulneratus	KF311531	Rv32	Indonesia	Cikemang, Java
R. vulneratus	KF311569	Rv32	Indonesia	Cijangkar, Java
R. vulneratus	KF311538	Rv33	Indonesia	Bunikasih, Java
R. vulneratus	KF311539	Rv33	Indonesia	Bunikasih, Java
R. vulneratus	KF311542	Rv33	Indonesia	Bunikasih, Java
R. vulneratus	KF311543	Rv33	Indonesia	Bunikasih, Java
R. vulneratus	KF311565	Rv33	Indonesia	Bunikasih, Java
R. vulneratus	KF311610	Rv34	Indonesia	Treblasala Estate, Kalibaru, Java
R. vulneratus	KF311612	Rv34	Indonesia	Treblasala Estate, Kalibaru, Java
R. vulneratus	KF311605	Rv35	Indonesia	Treblasala Estate, Kalibaru, Java
R. vulneratus	KF311535	Rv36	Indonesia	Bunikasih, Java
R. vulneratus	KF311529	RV37	Indonesia	Cikemang, Java
R. vulneratus	KF311541	Rv37	Indonesia	Bunikasih, Java
R. vulneratus	KF311562	Rv37	Indonesia	Bunikasih, Java
R. vulneratus	KF311566	Rv37	Indonesia	Bunikasih, Java
R. vulneratus	KF311532	Rv38	Indonesia	Cikemang, Java
R. vulneratus	KF311536	Rv38	Indonesia	Bunikasih, Java
R. vulneratus	KF311571	Rv38	Indonesia	Cijangkar, Java
R. vulneratus	KF311563	Rv39	Indonesia	Bunikasih, Java
R. vulneratus	KF311589	Rv4	Malaysia	Sungai Burong
R. vulneratus	KF311568	Rv40	Indonesia	Cikemang, Java
R. vulneratus	KF311555	Rv41	Indonesia	Bunikasih, Java
R. vulneratus	KF311556	Rv41	Indonesia	Bunikasih, Java
R. vulneratus	KF311557	Rv41	Indonesia	Bunikasih, Java
R. vulneratus	KF311558	RV42	Indonesia	Cijangkar, Java
R. vulneratus	KF311560	Rv43	Indonesia	Cijangkar, Java
R. vulneratus	KF311601	Rv44	Indonesia	Treblasala Estate, Kalibaru, Java
R. vulneratus	KF311608	Rv45	Indonesia	Treblasala Estate, Kalibaru, Java
R. vulneratus	KF311611	Rv45	Indonesia	Treblasala Estate, Kalibaru, Java
R. vulneratus	KF311604	Rv46	Indonesia	Treblasala Estate, Kalibaru, Java
R. vulneratus	KF311615	Rv47	Indonesia	Treblasala Estate, Kalibaru, Java
R. vulneratus	KF311603	Rv48	Indonesia	Treblasala Estate, Kalibaru, Java
R. vulneratus	KF311618	Rv48	Indonesia	Treblasala Estate, Kalibaru, Java
R. vulneratus	KF311609	Rv49	Indonesia	Treblasala Estate, Kalibaru, Java
R. vulneratus	KF311613	Rv49	Indonesia	Treblasala Estate, Kalibaru, Java
R. vulneratus	KF311632	Rv5	Thailand	La Mor, Trang Province
R. vulneratus	KF311602	Rv50	Indonesia	Treblasala Estate, Kalibaru, Java
R. vulneratus	KF311616	Rv50	Indonesia	Treblasala Estate, Kalibaru, Java
R. vulneratus	KF311621	Rv51	Indonesia	Desa Tingan, Bali

R. vulneratus	KF311623	Rv51	Indonesia	Desa Tingan, Bali
R. vulneratus	KF311626	Rv51	Indonesia	Desa Tingan, Bali
R. vulneratus	KF311619	Rv52	Indonesia	Desa Tingan, Bali
R. vulneratus	KF311620	Rv53	Indonesia	Desa Tingan, Bali
R. vulneratus	KF311622	Rv54	Indonesia	Desa Tingan, Bali
R. vulneratus	KF311624	Rv54	Indonesia	Desa Tingan, Bali
R. vulneratus	KF311617	Rv55	Indonesia	Treblasala Estate, Kalibaru, Java
R. vulneratus	KF311606	Rv56	Indonesia	Treblasala Estate, Kalibaru, Java
R. vulneratus	KF311614	Rv57	Indonesia	Treblasala Estate, Kalibaru, Java
R. vulneratus	KF311567	Rv59	Indonesia	Bunikasih, Java
R. vulneratus	KF311628	Rv6	Singapore	Singapore
R. vulneratus	KF311630	Rv6	Thailand	Bang Kung, Huai Yot, Trang Province
R. vulneratus	KF311607	Rv60	Indonesia	Treblasala Estate, Kalibaru, Java
R. vulneratus	KF311544	Rv61	United States of America	Laguna Beach, California
R. vulneratus	KF311580	Rv61	United States of America	Laguna Beach, California
R. vulneratus	KF311581	Rv61	United States of America	Laguna Beach, California
R. vulneratus	KF311582	Rv61	United States of America	Laguna Beach, California
R. vulneratus	KF311583	Rv61	United States of America	Laguna Beach, California
R. vulneratus	KF311584	Rv61	United States of America	Laguna Beach, California
R. vulneratus	KF311585	Rv61	United States of America	Laguna Beach, California
R. vulneratus	KF311627	Rv61	United States of America	Laguna Beach, California
R. vulneratus	KF311625	Rv62	Indonesia	Desa Tingan, Bali
R. vulneratus	KF311528	Rv7	Thailand	Chong, Trang Province
R. vulneratus	KF311631	RV8	Thailand	Bang Khan, Nakhon Si Thammarat
R. vulneratus	KF311590	Rv9	Malaysia	Rhu Tapai, Kuala, Terengganu
R. vulneratus	LN612634		Malaysia	Pahang, Bentong, Genting Sempah
R. vulneratus	LN612635		Malaysia	Pahang, Bentong, Genting Sempah
R. vulneratus	LN612636		Malaysia	Pahang, Bentong, Genting Sempah
R. vulneratus	MG051024		Peninsular Malaysia	Selangor, Kuala Selangor
R. vulneratus	MG051025		Peninsular Malaysia	Selangor, Kuala Selangor
R. vulneratus	MG051026		Peninsular Malaysia	Selangor, Kuala Selangor

Continuation of the Table S6.

ID	Latitude	Longitude	Georeferentiation	Literature
AY131105	-14.234998	-51.925279	Country	Brian Farrel (personal communication)
Univalle_9	4.0078	-76.9916	GPS	This study
ASSCR6014	10.902	-85.281	GPS	Bold (2021)
ASSCR6015	10.993	-85.429	GPS	Bold (2021)
ASSCR6016	10.594	-83.717	GPS	Bold (2021)
ASSCR6018	10.993	-85.429	GPS	Bold (2021)
KF311645	-3.043557	151.630497	Locality	Rugman-Jones et al. (2013)
KF311637	-3.043557	151.630497	Locality	Rugman-Jones et al. (2013)
KF311639	-3.043557	151.630497	Locality	Rugman-Jones et al. (2013)
KF311636	-3.043557	151.630497	Locality	Rugman-Jones et al. (2013)
KF311638	-3.043557	151.630497	Locality	Rugman-Jones et al. (2013)
KF311640	-3.043557	151.630497	Locality	Rugman-Jones et al. (2013)
KF311641	-3.043557	151.630497	Locality	Rugman-Jones et al. (2013)
KF311642	-3.043557	151.630497	Locality	Rugman-Jones et al. (2013)
KF311643	-3.043557	151.630497	Locality	Rugman-Jones et al. (2013)
KF311644	-3.043557	151.630497	Locality	Rugman-Jones et al. (2013)
KF311646	-3.043557	151.630497	Locality	Rugman-Jones et al. (2013)
KF311635	-9.522144	150.674962	Locality	Rugman-Jones et al. (2013)
KF311634	-9.522144	150.674962	Locality	Rugman-Jones et al. (2013)
KF311648	-5.55169	150.138962	Locality	Rugman-Jones et al. (2013)
KF311647	-5.55169	150.138962	Locality	Rugman-Jones et al. (2013)
AY131113			Not	O'Meara, B.C. and Farrell, B.D. cited by GenBank (2021)
KF311359	27.664826	-81.515753	Locality	Rugman-Jones et al. (2013)
USCOC565	27.2756	-82.2661		
GU581582	22.333592	57.634577	Map	El-Mergawy et al. (2011)
GU581583	23.89988	54.301466	Map	El-Mergawy et al. (2011)
GU581584	23.89988	54.301466	Map	El-Mergawy et al. (2011)
GU581585	23.89988	54.301466	Map	El-Mergawy et al. (2011)
GU581586	23.89988	54.301466	Map	El-Mergawy et al. (2011)
GU581587	23.89988	54.301466	Map	El-Mergawy et al. (2011)
GU581588	23.89988	54.301466	Map	El-Mergawy et al. (2011)

GU581589	23.89988	54.301466	Map	El-Mergawy et al. (2011)
GU581590	23.89988	54.301466	Map	El-Mergawy et al. (2011)
GU581591	23.89988	54.301466	Map	El-Mergawy et al. (2011)
GU581592	23.89988	54.301466	Map	El-Mergawy et al. (2011)
GU581593	23.89988	54.301466	Map	El-Mergawy et al. (2011)
GU581594	23.89988	54.301466	Map	El-Mergawy et al. (2011)
GU581595	23.89988	54.301466	Map	El-Mergawy et al. (2011)
GU581596	23.89988	54.301466	Map	El-Mergawy et al. (2011)
GU581597	34.726299	36.571538	Map	El-Mergawy et al. (2011)
GU581598	34.726299	36.571538	Map	El-Mergawy et al. (2011)
GU581599	34.726299	36.571538	Map	El-Mergawy et al. (2011)
GU581600	34.726299	36.571538	Map	El-Mergawy et al. (2011)
GU581601	34.726299	36.571538	Map	El-Mergawy et al. (2011)
GU581602	34.726299	36.571538	Map	El-Mergawy et al. (2011)
GU581603	34.726299	36.571538	Map	El-Mergawy et al. (2011)
GU581604	34.726299	36.571538	Map	El-Mergawy et al. (2011)
GU581605	34.726299	36.571538	Map	El-Mergawy et al. (2011)
GU581606	34.726299	36.571538	Map	El-Mergawy et al. (2011)
GU581607	34.726299	36.571538	Map	El-Mergawy et al. (2011)
GU581608	34.726299	36.571538	Map	El-Mergawy et al. (2011)
GU581609	34.726299	36.571538	Map	El-Mergawy et al. (2011)
GU581610	34.726299	36.571538	Map	El-Mergawy et al. (2011)
GU581611	34.726299	36.571538	Map	El-Mergawy et al. (2011)
GU581612	34.726299	36.571538	Map	El-Mergawy et al. (2011)
GU581613	34.726299	36.571538	Map	El-Mergawy et al. (2011)
GU581614	34.726299	36.571538	Map	El-Mergawy et al. (2011)
GU581615	25.061852	67.78174	Map	El-Mergawy et al. (2011)
GU581616	25.061852	67.78174	Map	El-Mergawy et al. (2011)
GU581617	25.061852	67.78174	Map	El-Mergawy et al. (2011)
GU581618	25.061852	67.78174	Map	El-Mergawy et al. (2011)
GU581619	25.061852	67.78174	Map	El-Mergawy et al. (2011)
GU581620	25.061852	67.78174	Map	El-Mergawy et al. (2011)
GU581621	25.061852	67.78174	Map	El-Mergawy et al. (2011)

GU581622	25.061852	67.78174	Map	El-Mergawy et al. (2011)
GU581623	25.061852	67.78174	Map	El-Mergawy et al. (2011)
GU581624	25.061852	67.78174	Map	El-Mergawy et al. (2011)
GU581625	25.061852	67.78174	Map	El-Mergawy et al. (2011)
GU581626	25.061852	67.78174	Map	El-Mergawy et al. (2011)
GU581627	25.061852	67.78174	Map	El-Mergawy et al. (2011)
GU581628	25.061852	67.78174	Map	El-Mergawy et al. (2011)
KU311369	30.073611	71.180498	Locality	Rugman-Jones et al. (2013)
KU696489	29.35435	71.691066	Locality	Rugman-Jones et al. (2013)
KU696494	29.35435	71.691066	Locality	Rugman-Jones et al. (2013)
KU696496	29.35435	71.691066	Locality	Rugman-Jones et al. (2013)
KU696504	31.862571	70.901869	Locality	Rugman-Jones et al. (2013)
KU696506	31.862571	70.901869	Locality	Rugman-Jones et al. (2013)
KU696510	30.969349	70.942791	Locality	Rugman-Jones et al. (2013)
KU696511	30.969349	70.942791	Locality	Rugman-Jones et al. (2013)
KU696512	30.969349	70.942791	Locality	Rugman-Jones et al. (2013)
KU696513	30.969349	70.942791	Locality	Rugman-Jones et al. (2013)
KU696516	30.073611	71.180498	Locality	Rugman-Jones et al. (2013)
KU696518	30.073611	71.180498	Locality	Rugman-Jones et al. (2013)
KU696519	30.073611	71.180498	Locality	Rugman-Jones et al. (2013)
KU696524	30.073611	71.180498	Locality	Rugman-Jones et al. (2013)
KU696527	30.073611	71.180498	Locality	Rugman-Jones et al. (2013)
KU696529	30.073611	71.180498	Locality	Rugman-Jones et al. (2013)
KU696530	30.048942	70.645473	Locality	Rugman-Jones et al. (2013)
KF311482	7.432513	80.2154	Locality	Rugman-Jones et al. (2013)
KF311444	15.283015	73.938921	Locality	Rugman-Jones et al. (2013)
KF311487	7.432513	80.2154	Locality	Rugman-Jones et al. (2013)
KF311481	7.432513	80.2154	Locality	Rugman-Jones et al. (2013)
KF311483	7.432513	80.2154	Locality	Rugman-Jones et al. (2013)
KF311484	7.432513	80.2154	Locality	Rugman-Jones et al. (2013)
KF311485	7.432513	80.2154	Locality	Rugman-Jones et al. (2013)
KF311486	7.432513	80.2154	Locality	Rugman-Jones et al. (2013)
KF311488	7.432513	80.2154	Locality	Rugman-Jones et al. (2013)

KF311489	7.432513	80.2154	Locality	Rugman-Jones et al. (2013)
KF311448	15.626645	73.766142	Locality	Rugman-Jones et al. (2013)
JX292125	15.303913	73.991818	Locality	Alhudaib et al. cited by Genbank (2021)
KF311449	15.599806	73.815749	Locality	Rugman-Jones et al. (2013)
KF311360	33.175555	35.595277	Locality	Rugman-Jones et al. (2013)
KF311361	33.175555	35.595277	Locality	Rugman-Jones et al. (2013)
KF311427	21.91133	49.365313	Locality	Rugman-Jones et al. (2013)
KF311432	21.91133	49.365313	Locality	Rugman-Jones et al. (2013)
KF311471	13.690419	101.07796	Locality	Rugman-Jones et al. (2013)
KF311473	13.690419	101.07796	Locality	Rugman-Jones et al. (2013)
KF311403	5.513375	102.980005	Locality	Rugman-Jones et al. (2013)
KF311468	13.690419	101.07796	Locality	Rugman-Jones et al. (2013)
KF311477	13.690419	101.07796	Locality	Rugman-Jones et al. (2013)
KF311478	13.690419	101.07796	Locality	Rugman-Jones et al. (2013)
GU581549	28.452677	60.6442	Map	El-Mergawy et al. (2011)
GU581550	28.452677	60.6442	Map	El-Mergawy et al. (2011)
GU581551	28.452677	60.6442	Map	El-Mergawy et al. (2011)
GU581552	28.452677	60.6442	Map	El-Mergawy et al. (2011)
GU581553	28.452677	60.6442	Map	El-Mergawy et al. (2011)
GU581554	28.452677	60.6442	Map	El-Mergawy et al. (2011)
GU581555	28.452677	60.6442	Map	El-Mergawy et al. (2011)
GU581556	28.452677	60.6442	Map	El-Mergawy et al. (2011)
GU581557	28.452677	60.6442	Map	El-Mergawy et al. (2011)
GU581558	28.452677	60.6442	Map	El-Mergawy et al. (2011)
GU581559	28.452677	60.6442	Map	El-Mergawy et al. (2011)
GU581560	28.452677	60.6442	Map	El-Mergawy et al. (2011)
GU581561	28.452677	60.6442	Map	El-Mergawy et al. (2011)
GU581562	28.452677	60.6442	Map	El-Mergawy et al. (2011)
GU581563	28.452677	60.6442	Map	El-Mergawy et al. (2011)
GU581564	28.452677	60.6442	Map	El-Mergawy et al. (2011)
GU581565	28.452677	60.6442	Map	El-Mergawy et al. (2011)
GU581566	28.452677	60.6442	Map	El-Mergawy et al. (2011)
GU581567	28.452677	60.6442	Map	El-Mergawy et al. (2011)

GU581568	28.452677	60.6442	Map	El-Mergawy et al. (2011)
GU581569	28.452677	60.6442	Map	El-Mergawy et al. (2011)
GU581570	28.452677	60.6442	Map	El-Mergawy et al. (2011)
GU581571	28.452677	60.6442	Map	El-Mergawy et al. (2011)
GU581572	28.452677	60.6442	Map	El-Mergawy et al. (2011)
GU581573	28.452677	60.6442	Map	El-Mergawy et al. (2011)
GU581574	28.452677	60.6442	Map	El-Mergawy et al. (2011)
GU581575	28.452677	60.6442	Map	El-Mergawy et al. (2011)
GU581576	28.452677	60.6442	Map	El-Mergawy et al. (2011)
GU581577	28.452677	60.6442	Map	El-Mergawy et al. (2011)
GU581578	28.452677	60.6442	Map	El-Mergawy et al. (2011)
GU581579	28.452677	60.6442	Map	El-Mergawy et al. (2011)
GU581580	28.452677	60.6442	Map	El-Mergawy et al. (2011)
GU581581	28.452677	60.6442	Map	El-Mergawy et al. (2011)
KF311433	12.52111	-69.968338	Country	Rugman-Jones et al. (2013)
KF311474	14.006457	99.988913	Locality	Rugman-Jones et al. (2013)
KF311511	6.916571	100.282446	Locality	Rugman-Jones et al. (2013)
KF311512	7.54947	100.047155	Locality	Rugman-Jones et al. (2013)
KF311512	6.916571	100.282446	Locality	Rugman-Jones et al. (2013)
KF311513	7.54947	100.047155	Locality	Rugman-Jones et al. (2013)
KF311514	7.530201	99.717694	Locality	Rugman-Jones et al. (2013)
KF311515	7.530201	99.717694	Locality	Rugman-Jones et al. (2013)
KF311516	7.771999	99.450599	Locality	Rugman-Jones et al. (2013)
KF311517	7.771999	99.450599	Locality	Rugman-Jones et al. (2013)
KF311518	7.771999	99.450599	Locality	Rugman-Jones et al. (2013)
KF311520	7.796502	99.556218	Locality	Rugman-Jones et al. (2013)
KF311522	7.54947	100.047155	Locality	Rugman-Jones et al. (2013)
KF311523	7.559498	99.611033	Locality	Rugman-Jones et al. (2013)
KF311524	7.559498	99.611033	Locality	Rugman-Jones et al. (2013)
KF311526	7.771999	99.450599	Locality	Rugman-Jones et al. (2013)
KF311527	7.771999	99.450599	Locality	Rugman-Jones et al. (2013)
KF311380	14.064211	121.323337	Locality	Rugman-Jones et al. (2013)
KF311381	14.064211	121.323337	Locality	Rugman-Jones et al. (2013)

KF311382	14.064211	121.323337	Locality	Rugman-Jones et al. (2013)
KF311387	14.064211	121.323337	Locality	Rugman-Jones et al. (2013)
KF311389	14.064211	121.323337	Locality	Rugman-Jones et al. (2013)
KF311384	14.064211	121.323337	Locality	Rugman-Jones et al. (2013)
KF311388	14.064211	121.323337	Locality	Rugman-Jones et al. (2013)
KF311386	14.064211	121.323337	Locality	Rugman-Jones et al. (2013)
KF311399	14.064211	121.323337	Locality	Rugman-Jones et al. (2013)
KF311383	14.064211	121.323337	Locality	Rugman-Jones et al. (2013)
KF311385	14.064211	121.323337	Locality	Rugman-Jones et al. (2013)
KF311390	14.064211	121.323337	Locality	Rugman-Jones et al. (2013)
KF311391	14.064211	121.323337	Locality	Rugman-Jones et al. (2013)
KF311393	14.064211	121.323337	Locality	Rugman-Jones et al. (2013)
KF311394	14.064211	121.323337	Locality	Rugman-Jones et al. (2013)
KF311395	14.064211	121.323337	Locality	Rugman-Jones et al. (2013)
KF311396	14.064211	121.323337	Locality	Rugman-Jones et al. (2013)
KF311397	14.064211	121.323337	Locality	Rugman-Jones et al. (2013)
KF311398	14.064211	121.323337	Locality	Rugman-Jones et al. (2013)
KF311400	14.064211	121.323337	Locality	Rugman-Jones et al. (2013)
GU581547	23.89988	54.301466	Map	El-Mergawy et al. (2011)
GU581548	23.89988	54.301466	Map	El-Mergawy et al. (2011)
KF311392	14.064211	121.323337	Locality	Rugman-Jones et al. (2013)
KF311379	14.064211	121.323337	Locality	Rugman-Jones et al. (2013)
KF311490	11.556378	104.928193	Locality	Rugman-Jones et al. (2013)
KF311491	11.556378	104.928193	Locality	Rugman-Jones et al. (2013)
KF311492	10.626787	103.511555	Locality	Rugman-Jones et al. (2013)
KF311493	10.626787	103.511555	Locality	Rugman-Jones et al. (2013)
KF311494	10.626787	103.511555	Locality	Rugman-Jones et al. (2013)
KF311495	10.626787	103.511555	Locality	Rugman-Jones et al. (2013)
KF311496	10.170076	106.287521	Locality	Rugman-Jones et al. (2013)
KF311497	10.170076	106.287521	Locality	Rugman-Jones et al. (2013)
KF311498	10.04684	106.369927	Locality	Rugman-Jones et al. (2013)
KF311499	10.04684	106.369927	Locality	Rugman-Jones et al. (2013)
KF311500	10.04684	106.369927	Locality	Rugman-Jones et al. (2013)

KF311509	21.027764	105.83416	Locality	Rugman-Jones et al. (2013)
KF311504	19.998188	105.993491	Locality	Rugman-Jones et al. (2013)
KF311505	19.998188	105.993491	Locality	Rugman-Jones et al. (2013)
KF311508	21.027764	105.83416	Locality	Rugman-Jones et al. (2013)
GU581545	23.89988	54.301466	Map	El-Mergawy et al. (2011)
GU581546	23.89988	54.301466	Map	El-Mergawy et al. (2011)
KF311506	19.998188	105.993491	Locality	Rugman-Jones et al. (2013)
KF311502	19.998188	105.993491	Locality	Rugman-Jones et al. (2013)
KF311503	19.998188	105.993491	Locality	Rugman-Jones et al. (2013)
KF311507	19.998188	105.993491	Locality	Rugman-Jones et al. (2013)
KF311501	19.998188	105.993491	Locality	Rugman-Jones et al. (2013)
KF311507	19.998188	105.993491	Locality	Rugman-Jones et al. (2013)
KF311525	7.771999	99.450599	Locality	Rugman-Jones et al. (2013)
GU581539	23.89988	54.301466	Map	El-Mergawy et al. (2011)
GU581540	23.89988	54.301466	Map	El-Mergawy et al. (2011)
GU581541	23.89988	54.301466	Map	El-Mergawy et al. (2011)
GU581542	23.89988	54.301466	Map	El-Mergawy et al. (2011)
GU581543	22.333592	57.634577	Map	El-Mergawy et al. (2011)
GU581544	22.333592	57.634577	Map	El-Mergawy et al. (2011)
KF311366	29.35435	71.691066	Locality	Rugman-Jones et al. (2013)
KF311367	29.35435	71.691066	Locality	Rugman-Jones et al. (2013)
KF311368	29.35435	71.691066	Locality	Rugman-Jones et al. (2013)
KF311370	29.35435	71.691066	Locality	Rugman-Jones et al. (2013)
KU696490	29.35435	71.691066	Locality	Rugman-Jones et al. (2013)
KU696491	29.35435	71.691066	Locality	Rugman-Jones et al. (2013)
KU696493	29.35435	71.691066	Locality	Rugman-Jones et al. (2013)
KU696495	29.35435	71.691066	Locality	Rugman-Jones et al. (2013)
KU696498	29.35435	71.691066	Locality	Rugman-Jones et al. (2013)
KU696499	29.35435	71.691066	Locality	Rugman-Jones et al. (2013)
KU696501	31.862571	70.901869	Locality	Rugman-Jones et al. (2013)
KU696502	31.862571	70.901869	Locality	Rugman-Jones et al. (2013)
KU696503	31.862571	70.901869	Locality	Rugman-Jones et al. (2013)
KU696505	31.862571	70.901869	Locality	Rugman-Jones et al. (2013)

KU696509	30.969349	70.942791	Locality	Rugman-Jones et al. (2013)
KU696514	30.073611	71.180498	Locality	Rugman-Jones et al. (2013)
KU696515	30.073611	71.180498	Locality	Rugman-Jones et al. (2013)
KU696517	30.073611	71.180498	Locality	Rugman-Jones et al. (2013)
KU696521	30.073611	71.180498	Locality	Rugman-Jones et al. (2013)
KU696522	30.073611	71.180498	Locality	Rugman-Jones et al. (2013)
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KU696525	30.073611	71.180498	Locality	Rugman-Jones et al. (2013)
KU696526	30.073611	71.180498	Locality	Rugman-Jones et al. (2013)
KU696528	30.073611	71.180498	Locality	Rugman-Jones et al. (2013)
KU696531	30.048942	70.645473	Locality	Rugman-Jones et al. (2013)
KU696533	30.048942	70.645473	Locality	Rugman-Jones et al. (2013)
KU696534	30.048942	70.645473	Locality	Rugman-Jones et al. (2013)
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KU696536	30.048942	70.645473	Locality	Rugman-Jones et al. (2013)
KU696537	30.048942	70.645473	Locality	Rugman-Jones et al. (2013)
KU696492	29.35435	71.691066	Locality	Rugman-Jones et al. (2013)
KU696497	29.35435	71.691066	Locality	Rugman-Jones et al. (2013)
KU696500	31.862571	70.901869	Locality	Rugman-Jones et al. (2013)
KU696520	30.073611	71.180498	Locality	Rugman-Jones et al. (2013)
KU696507	30.969349	70.942791	Locality	Rugman-Jones et al. (2013)
KU696508	30.969349	70.942791	Locality	Rugman-Jones et al. (2013)
KU696532	30.048942	70.645473	Locality	Rugman-Jones et al. (2013)
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GU581527	22.333592	57.634577	Map	El-Mergawy et al. (2011)
GU581528	22.333592	57.634577	Map	El-Mergawy et al. (2011)
GU581529	22.333592	57.634577	Map	El-Mergawy et al. (2011)
GU581530	22.333592	57.634577	Map	El-Mergawy et al. (2011)
GU581531	22.333592	57.634577	Map	El-Mergawy et al. (2011)
GU581532	22.333592	57.634577	Map	El-Mergawy et al. (2011)
GU581533	22.333592	57.634577	Map	El-Mergawy et al. (2011)
GU581534	22.333592	57.634577	Map	El-Mergawy et al. (2011)
GU581535	22.333592	57.634577	Map	El-Mergawy et al. (2011)

GU581536	22.333592	57.634577	Map	El-Mergawy et al. (2011)
GU581537	22.333592	57.634577	Map	El-Mergawy et al. (2011)
GU581538	22.333592	57.634577	Map	El-Mergawy et al. (2011)
GU581517	32.699494	130.894988	Map	El-Mergawy et al. (2011)
GU581518	32.699494	130.894988	Map	El-Mergawy et al. (2011)
GU581519	32.699494	130.894988	Map	El-Mergawy et al. (2011)
GU581520	32.699494	130.894988	Map	El-Mergawy et al. (2011)
GU581521	32.699494	130.894988	Map	El-Mergawy et al. (2011)
GU581522	32.699494	130.894988	Map	El-Mergawy et al. (2011)
GU581523	32.699494	130.894988	Map	El-Mergawy et al. (2011)
GU581524	32.699494	130.894988	Map	El-Mergawy et al. (2011)
GU581525	32.699494	130.894988	Map	El-Mergawy et al. (2011)
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GU581320	30.726643	31.000461	Map	El-Mergawy et al. (2011)
GU581321	30.726643	31.000461	Map	El-Mergawy et al. (2011)
GU581322	30.726643	31.000461	Map	El-Mergawy et al. (2011)
GU581323	30.726643	31.000461	Map	El-Mergawy et al. (2011)
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GU581371	30.726643	31.000461	Map	El-Mergawy et al. (2011)
GU581372	30.726643	31.000461	Map	El-Mergawy et al. (2011)

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GU581375	30.726643	31.000461	Map	El-Mergawy et al. (2011)
GU581376	30.726643	31.000461	Map	El-Mergawy et al. (2011)
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GU581399	30.726643	31.000461	Map	El-Mergawy et al. (2011)
GU581400	30.726643	31.000461	Map	El-Mergawy et al. (2011)
GU581401	30.726643	31.000461	Map	El-Mergawy et al. (2011)
GU581402	30.726643	31.000461	Map	El-Mergawy et al. (2011)
GU581403	30.726643	31.000461	Map	El-Mergawy et al. (2011)
GU581404	30.726643	31.000461	Map	El-Mergawy et al. (2011)
GU581405	30.726643	31.000461	Map	El-Mergawy et al. (2011)

GU581406	30.726643	31.000461	Map	El-Mergawy et al. (2011)
GU581407	30.726643	31.000461	Map	El-Mergawy et al. (2011)
GU581408	30.726643	31.000461	Map	El-Mergawy et al. (2011)
GU581409	30.726643	31.000461	Map	El-Mergawy et al. (2011)
GU581410	30.726643	31.000461	Map	El-Mergawy et al. (2011)
GU581411	30.726643	31.000461	Map	El-Mergawy et al. (2011)
GU581412	30.726643	31.000461	Map	El-Mergawy et al. (2011)
GU581413	30.726643	31.000461	Map	El-Mergawy et al. (2011)
GU581414	30.726643	31.000461	Map	El-Mergawy et al. (2011)
GU581415	30.726643	31.000461	Map	El-Mergawy et al. (2011)
GU581416	30.726643	31.000461	Map	El-Mergawy et al. (2011)
GU581417	30.726643	31.000461	Map	El-Mergawy et al. (2011)
GU581418	30.726643	31.000461	Map	El-Mergawy et al. (2011)
GU581419	30.726643	31.000461	Map	El-Mergawy et al. (2011)
GU581420	30.726643	31.000461	Map	El-Mergawy et al. (2011)
GU581421	30.726643	31.000461	Map	El-Mergawy et al. (2011)
GU581422	30.726643	31.000461	Map	El-Mergawy et al. (2011)
GU581423	30.726643	31.000461	Map	El-Mergawy et al. (2011)
GU581424	30.726643	31.000461	Map	El-Mergawy et al. (2011)
GU581425	30.726643	31.000461	Map	El-Mergawy et al. (2011)
GU581426	30.726643	31.000461	Map	El-Mergawy et al. (2011)
GU581427	30.726643	31.000461	Map	El-Mergawy et al. (2011)
GU581428	30.726643	31.000461	Map	El-Mergawy et al. (2011)
GU581429	26.370938	49.494162	Map	El-Mergawy et al. (2011)
GU581430	26.370938	49.494162	Map	El-Mergawy et al. (2011)
GU581431	26.370938	49.494162	Map	El-Mergawy et al. (2011)
GU581432	26.370938	49.494162	Map	El-Mergawy et al. (2011)
GU581433	26.370938	49.494162	Map	El-Mergawy et al. (2011)
GU581434	26.370938	49.494162	Map	El-Mergawy et al. (2011)
GU581435	26.370938	49.494162	Map	El-Mergawy et al. (2011)
GU581436	26.370938	49.494162	Map	El-Mergawy et al. (2011)
GU581437	26.370938	49.494162	Map	El-Mergawy et al. (2011)
GU581438	26.370938	49.494162	Map	El-Mergawy et al. (2011)

GU581439	26.370938	49.494162	Map	El-Mergawy et al. (2011)
GU581440	26.370938	49.494162	Map	El-Mergawy et al. (2011)
GU581441	39.271742	-1.022617	Map	El-Mergawy et al. (2011)
GU581442	39.271742	-1.022617	Map	El-Mergawy et al. (2011)
GU581443	39.271742	-1.022617	Map	El-Mergawy et al. (2011)
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GU581446	39.271742	-1.022617	Map	El-Mergawy et al. (2011)
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GU581452	37.163355	35.780935	Map	El-Mergawy et al. (2011)
GU581453	37.163355	35.780935	Map	El-Mergawy et al. (2011)
GU581454	37.163355	35.780935	Map	El-Mergawy et al. (2011)
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GU581456	37.163355	35.780935	Map	El-Mergawy et al. (2011)
GU581457	37.163355	35.780935	Map	El-Mergawy et al. (2011)
GU581458	37.163355	35.780935	Map	El-Mergawy et al. (2011)
GU581459	37.163355	35.780935	Map	El-Mergawy et al. (2011)
GU581460	37.163355	35.780935	Map	El-Mergawy et al. (2011)
GU581461	37.163355	35.780935	Map	El-Mergawy et al. (2011)
GU581462	37.163355	35.780935	Map	El-Mergawy et al. (2011)
GU581463	37.163355	35.780935	Map	El-Mergawy et al. (2011)
GU581464	37.163355	35.780935	Map	El-Mergawy et al. (2011)
GU581465	38.020262	23.605202	Map	El-Mergawy et al. (2011)
GU581466	38.020262	23.605202	Map	El-Mergawy et al. (2011)
GU581467	38.020262	23.605202	Map	El-Mergawy et al. (2011)
GU581468	38.020262	23.605202	Map	El-Mergawy et al. (2011)
GU581469	38.020262	23.605202	Map	El-Mergawy et al. (2011)
GU581470	38.020262	23.605202	Map	El-Mergawy et al. (2011)
GU581471	38.020262	23.605202	Map	El-Mergawy et al. (2011)

GU581472	38.020262	23.605202	Map	El-Mergawy et al. (2011)
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GU581474	34.84477	32.965747	Map	El-Mergawy et al. (2011)
GU581475	34.84477	32.965747	Map	El-Mergawy et al. (2011)
GU581476	34.84477	32.965747	Map	El-Mergawy et al. (2011)
GU581477	34.84477	32.965747	Map	El-Mergawy et al. (2011)
GU581478	34.84477	32.965747	Map	El-Mergawy et al. (2011)
GU581479	34.84477	32.965747	Map	El-Mergawy et al. (2011)
GU581480	34.84477	32.965747	Map	El-Mergawy et al. (2011)
GU581481	34.84477	32.965747	Map	El-Mergawy et al. (2011)
GU581482	34.84477	32.965747	Map	El-Mergawy et al. (2011)
GU581483	34.84477	32.965747	Map	El-Mergawy et al. (2011)
GU581484	34.84477	32.965747	Map	El-Mergawy et al. (2011)
GU581485	34.84477	32.965747	Map	El-Mergawy et al. (2011)
GU581486	34.84477	32.965747	Map	El-Mergawy et al. (2011)
GU581487	34.84477	32.965747	Map	El-Mergawy et al. (2011)
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GU581490	39.889906	15.838312	Map (Middle point of two point referenced in publication)	El-Mergawy et al. (2011)
GU581491	39.889906	15.838312	Map (Middle point of two point referenced in publication)	El-Mergawy et al. (2011)
GU581492	39.889906	15.838312	Map (Middle point of two point referenced in publication)	El-Mergawy et al. (2011)
GU581493	39.889906	15.838312	Map (Middle point of two point referenced in publication)	El-Mergawy et al. (2011)
GU581494	39.889906	15.838312	Map (Middle point of two point referenced in publication)	El-Mergawy et al. (2011)
GU581495	39.889906	15.838312	Map (Middle point of two point referenced in publication)	El-Mergawy et al. (2011)
GU581496	39.889906	15.838312	Map (Middle point of two point referenced in publication)	El-Mergawy et al. (2011)

GU581497	39.889906	15.838312	Map (Middle point of two point referenced in publication)	El-Mergawy et al. (2011)
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GU581499	39.889906	15.838312	Map (Middle point of two point referenced in publication)	El-Mergawy et al. (2011)
GU581500	39.889906	15.838312	Map (Middle point of two point referenced in publication)	El-Mergawy et al. (2011)
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GU581509	43.729584	4.920333	Map	El-Mergawy et al. (2011)
GU581510	43.729584	4.920333	Map	El-Mergawy et al. (2011)
GU581511	43.729584	4.920333	Map	El-Mergawy et al. (2011)
GU581512	43.729584	4.920333	Map	El-Mergawy et al. (2011)
GU581513	43.729584	4.920333	Map	El-Mergawy et al. (2011)
GU581514	43.729584	4.920333	Map	El-Mergawy et al. (2011)
GU581515	43.729584	4.920333	Map	El-Mergawy et al. (2011)
GU581516	43.729584	4.920333	Map	El-Mergawy et al. (2011)
GU581524	30.726643	31.000461	Map	El-Mergawy et al. (2011)
H8	40.463667	-3.749221	Country	El-Mergawy et al. (2011)
H8	12.16957	-68.99002	Country	Rugman-Jones et al. (2013)
H8	34.70713	33.022618	Locality	Rugman-Jones et al. (2013)
H8	30.17124	31.109345	Locality	Rugman-Jones et al. (2013)
KF311362	31.228281	34.284559	Locality	Rugman-Jones et al. (2013)
KF311363	33.246577	35.597063	Locality	Rugman-Jones et al. (2013)

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KF311365	36.896891	30.713323	Locality	Rugman-Jones et al. (2017)
KF311371	38.14379	-7.449897	Locality	Rugman-Jones et al. (2013)
KF311372	37.214124	-7.404341	Locality	Rugman-Jones et al. (2013)
KF311373	43.068418	6.130002	Locality	Rugman-Jones et al. (2013)
KF311374	43.068418	6.130002	Locality	Rugman-Jones et al. (2013)
KF311375	43.124237	5.927996	Locality	Rugman-Jones et al. (2013)
KF311376	43.106933	6.018687	Locality	Rugman-Jones et al. (2013)
KF311377	43.106933	6.018687	Locality	Rugman-Jones et al. (2013)
KF311401	5.513375	102.980005	Locality	Rugman-Jones et al. (2013)
KF311402	5.513375	102.980005	Locality	Rugman-Jones et al. (2013)
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KF311406	5.513375	102.980005	Locality	Rugman-Jones et al. (2013)
KF311407	5.513375	102.980005	Locality	Rugman-Jones et al. (2013)
KF311408	5.513375	102.980005	Locality	Rugman-Jones et al. (2013)
KF311409	5.513375	102.980005	Locality	Rugman-Jones et al. (2013)
KF311410	5.513375	102.980005	Locality	Rugman-Jones et al. (2013)
KF311411	5.513375	102.980005	Locality	Rugman-Jones et al. (2013)
KF311412	5.513375	102.980005	Locality	Rugman-Jones et al. (2013)
KF311413	5.513375	102.980005	Locality	Rugman-Jones et al. (2013)
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KF311421	5.513375	102.980005	Locality	Rugman-Jones et al. (2013)
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KF311424	5.513375	102.980005	Locality	Rugman-Jones et al. (2013)

KF311425	5.513375	102.980005	Locality	Rugman-Jones et al. (2013)
KF311426	5.513375	102.980005	Locality	Rugman-Jones et al. (2013)
KF311435	40.055385	0.06415	Locality	El-Mergawy et al. (2011)
KF311437	39.502778	-0.419817	Locality	El-Mergawy et al. (2011)
KF311438	41.655241	12.989615	Locality	Rugman-Jones et al. (2013)
KF311439	41.655241	12.989615	Locality	Rugman-Jones et al. (2013)
KF311441	41.109947	14.847514	Locality	Rugman-Jones et al. (2013)
KF311442	41.655241	12.989615	Locality	Rugman-Jones et al. (2013)
KF311450	37.376094	27.264729	Locality	Rugman-Jones et al. (2017)
KF311451	37.376094	27.264729	Locality	Rugman-Jones et al. (2017)
KF311452	37.376094	27.264729	Locality	Rugman-Jones et al. (2017)
KF311453	37.376094	27.264729	Locality	Rugman-Jones et al. (2017)
KF31146	38.919759	-0.118786	Locality	El-Mergawy et al. (2011)
KF311467	13.690419	101.07796	Locality	Rugman-Jones et al. (2013)
KF311469	13.690419	101.07796	Locality	Rugman-Jones et al. (2013)
KF311470	13.690419	101.07796	Locality	Rugman-Jones et al. (2013)
KF311472	13.690419	101.07796	Locality	Rugman-Jones et al. (2013)
KF311475	13.819921	100.062168	Locality	Rugman-Jones et al. (2013)
KF311476	13.819921	100.062168	Locality	Rugman-Jones et al. (2013)
KF311479	13.690419	101.07796	Locality	Rugman-Jones et al. (2013)
KF311480	13.690419	101.07796	Locality	Rugman-Jones et al. (2013)
KF311521	7.54947	100.047155	Locality	Rugman-Jones et al. (2013)
KX228866	36.84565	10.31868	GPS	Rugman-Jones et al. (2017)
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KX228868	36.84565	10.31868	GPS	Rugman-Jones et al. (2017)
KX228869	36.84565	10.31868	GPS	Rugman-Jones et al. (2017)
KX228870	36.84565	10.31868	GPS	Rugman-Jones et al. (2017)
KX228871	36.84565	10.31868	GPS	Rugman-Jones et al. (2017)
KX228872	36.84565	10.31868	GPS	Rugman-Jones et al. (2017)
KX228873	36.84565	10.31868	GPS	Rugman-Jones et al. (2017)
KX228874	36.84565	10.31868	GPS	Rugman-Jones et al. (2017)
KX228875	36.86294	10.24004	GPS	Rugman-Jones et al. (2017)
KX228876	36.86294	10.24004	GPS	Rugman-Jones et al. (2017)

KX228877	36.86294	10.24004	GPS	Rugman-Jones et al. (2017)
KX228878	36.86294	10.24004	GPS	Rugman-Jones et al. (2017)
KX228879	36.86294	10.24004	GPS	Rugman-Jones et al. (2017)
KX228880	36.86294	10.24004	GPS	Rugman-Jones et al. (2017)
KX228881	36.86294	10.24004	GPS	Rugman-Jones et al. (2017)
KX228882	36.86294	10.24004	GPS	Rugman-Jones et al. (2017)
KX228883	36.86294	10.24004	GPS	Rugman-Jones et al. (2017)
KX228884	36.86294	10.24004	GPS	Rugman-Jones et al. (2017)
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KX228886	36.86294	10.24004	GPS	Rugman-Jones et al. (2017)
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KX228890	36.86294	10.24004	GPS	Rugman-Jones et al. (2017)
KX228891	36.84565	10.31868	GPS	Rugman-Jones et al. (2017)
KX228892	36.84565	10.31868	GPS	Rugman-Jones et al. (2017)
KX228893	36.84565	10.31868	GPS	Rugman-Jones et al. (2017)
KX228894	36.84565	10.31868	GPS	Rugman-Jones et al. (2017)
KX228895	36.84565	10.31868	GPS	Rugman-Jones et al. (2017)
KX228896	36.84565	10.31868	GPS	Rugman-Jones et al. (2017)
KX228897	36.84565	10.31868	GPS	Rugman-Jones et al. (2017)
KX228898	36.84565	10.31868	GPS	Rugman-Jones et al. (2017)
KX228899	36.85085	10.32264	GPS	Rugman-Jones et al. (2017)
KX228900	36.85085	10.32264	GPS	Rugman-Jones et al. (2017)
KX228901	36.85085	10.32264	GPS	Rugman-Jones et al. (2017)
KX228902	36.85085	10.32264	GPS	Rugman-Jones et al. (2017)
KX228903	36.85085	10.32264	GPS	Rugman-Jones et al. (2017)
KX228904	36.85085	10.32264	GPS	Rugman-Jones et al. (2017)
KX228905	36.88058	10.32857	GPS	Rugman-Jones et al. (2017)
KX228906	36.88058	10.32857	GPS	Rugman-Jones et al. (2017)
KF311446	15.351103	73.977126	Locality	Rugman-Jones et al. (2013)
H16	15.316152	73.919863	Locality	Rugman-Jones et al. (2013)
H16	15.251481	74.012385	Locality	Rugman-Jones et al. (2013)

JX292124	20.593684	78.962877	Country	Alhudaib et al. cited by Genbank (2021)
JX294413	23.885935	45.079163	Country	Alhudaib et al. cited by Genbank (2021)
KF413063	26.0833333	119.2333333	GPS	Wang et al. (2015)
KF413064	26.0833333	119.2333333	GPS	Wang et al. (2015)
KF413065	26.15	119.3	GPS	Wang et al. (2015)
KF413066	25.0666667	119.1166667	GPS	Wang et al. (2015)
KF413067	25.85	119.55	GPS	Wang et al. (2015)
KF413068	24.7833333	118.55	GPS	Wang et al. (2015)
KF413069	24.5333333	118.1166667	GPS	Wang et al. (2015)
KF413070	24.5333333	118.1166667	GPS	Wang et al. (2015)
KF413071	24.5333333	118.1166667	GPS	Wang et al. (2015)
KF413072	26.0833333	119.2333333	GPS	Wang et al. (2015)
KF413073	26.6333333	118.1666667	GPS	Wang et al. (2015)
KM438512				Hussain et al. cited by GenBank (2021)
KT989230	24.8045	46.5087	GPS	Surkirno et al. (2018)
KT989231	24.8045	46.5087	GPS	Surkirno et al. (2018)
KT989232	24.8175	46.514	GPS	Surkirno et al. (2018)
KT989233	24.8175	46.514	GPS	Surkirno et al. (2018)
KT989234	24.8175	46.514	GPS	Surkirno et al. (2018)
KU366272	26.206176	32.985815	Locality	Hashem (2016)
KU366273	30.596492	32.271459	Locality	Hashem (2016)
KU366274	31.393988	30.414831	Locality	Hashem (2016)
KU916538	40.557952	8.319295	Locality	Rulik et al. (2017)
KY458175	30.098724	69.345115	Country	Gonzalez et al. cited by GenBank (2021)
KY458176	30.098724	69.345115	Country	Gonzalez et al. cited by GenBank (2021)
KY458177	30.098724	69.345115	Country	Gonzalez et al. cited by GenBank (2021)
LC474878	30.802695	30.343551	Locality	Fouda et al. cited by GenBank (2021)
LC474879	30.596492	32.271459	Locality	Fouda et al. cited by GenBank (2021)
LC474880	30.596492	32.271459	Locality	Fouda et al. cited by GenBank (2021)
LC474881	30.596492	32.271459	Locality	Fouda et al. cited by GenBank (2021)
LC474882	30.596492	32.271459	Locality	Fouda et al. cited by GenBank (2021)
LC474883	30.596492	32.271459	Locality	Fouda et al. cited by GenBank (2021)
LC474884	30.596492	32.271459	Locality	Fouda et al. cited by GenBank (2021)

LC474885	30.596492	32.271459	Locality	Fouda et al. cited by GenBank (2021)
LC474886	30.596492	32.271459	Locality	Fouda et al. cited by GenBank (2021)
LC474887	30.596492	32.271459	Locality	Fouda et al. cited by GenBank (2021)
LC474888	30.596492	32.271459	Locality	Fouda et al. cited by GenBank (2021)
LC474889	30.596492	32.271459	Locality	Fouda et al. cited by GenBank (2021)
LC474890	30.596492	32.271459	Locality	Fouda et al. cited by GenBank (2021)
LC474891	30.596492	32.271459	Locality	Fouda et al. cited by GenBank (2021)
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LC474893	30.596492	32.271459	Locality	Fouda et al. cited by GenBank (2021)
LC474894	30.596492	32.271459	Locality	Fouda et al. cited by GenBank (2021)
LC474895	30.596492	32.271459	Locality	Fouda et al. cited by GenBank (2021)
LC474896	30.449525	30.317496	Locality	Fouda et al. cited by GenBank (2021)
LC474897	30.449525	30.317496	Locality	Fouda et al. cited by GenBank (2021)
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LC474901	30.449525	30.317496	Locality	Fouda et al. cited by GenBank (2021)
LC474902	30.449525	30.317496	Locality	Fouda et al. cited by GenBank (2021)
LC474903	30.449525	30.317496	Locality	Fouda et al. cited by GenBank (2021)
LC474904	30.449525	30.317496	Locality	Fouda et al. cited by GenBank (2021)
LC474905	26.045155	32.242761	Locality	Fouda et al. cited by GenBank (2021)
LC474906	26.045155	32.242761	Locality	Fouda et al. cited by GenBank (2021)
LC474907	26.045155	32.242761	Locality	Fouda et al. cited by GenBank (2021)
LC474908	26.045155	32.242761	Locality	Fouda et al. cited by GenBank (2021)
LC474909	26.045155	32.242761	Locality	Fouda et al. cited by GenBank (2021)
LC474910	31.393988	30.414831	Locality	Fouda et al. cited by GenBank (2021)
LC474911	29.966834	32.549807	Locality	Fouda et al. cited by GenBank (2021)
LC474912	29.966834	32.549807	Locality	Fouda et al. cited by GenBank (2021)
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LC474915	29.966834	32.549807	Locality	Fouda et al. cited by GenBank (2021)
LC474916	29.966834	32.549807	Locality	Fouda et al. cited by GenBank (2021)
LC474917	29.966834	32.549807	Locality	Fouda et al. cited by GenBank (2021)

LC474918	29.966834	32.549807	Locality	Fouda et al. cited by GenBank (2021)
LC474919	28.385018	28.90845	Locality	Fouda et al. cited by GenBank (2021)
LC474920	28.385018	28.90845	Locality	Fouda et al. cited by GenBank (2021)
LC474921	28.385018	28.90845	Locality	Fouda et al. cited by GenBank (2021)
LC474922	28.385018	28.90845	Locality	Fouda et al. cited by GenBank (2021)
LC474923	28.385018	28.90845	Locality	Fouda et al. cited by GenBank (2021)
LC474924	28.385018	28.90845	Locality	Fouda et al. cited by GenBank (2021)
LC474925	28.385018	28.90845	Locality	Fouda et al. cited by GenBank (2021)
LC474926	28.385018	28.90845	Locality	Fouda et al. cited by GenBank (2021)
LC474927	28.385018	28.90845	Locality	Fouda et al. cited by GenBank (2021)
LC474928	28.385018	28.90845	Locality	Fouda et al. cited by GenBank (2021)
LC474929	28.385018	28.90845	Locality	Fouda et al. cited by GenBank (2021)
MF448526	26.820556	30.802501	Country	Mahmoud et al. cited by GenBank (2021)
MG051027	5.329624	103.137014	Locality	Aman-Zuki et al. 2021
MG051028	5.329624	103.137014	Locality	Aman-Zuki et al. 2021
MG051029	5.329624	103.137014	Locality	Aman-Zuki et al. 2021
MG051030	5.329624	103.137014	Locality	Aman-Zuki et al. 2021
MG051031	5.329624	103.137014	Locality	Aman-Zuki et al. 2021
MG872818	26.820556	30.802501	Country	Fouda et al. cited by GenBank (2021)
MG883395	28.385018	28.90845	Locality	Fouda et al. cited by GenBank (2021)
MG883396	27.178312	31.185926	Locality	Fouda et al. cited by GenBank (2021)
MG883397	27.178312	31.185926	Locality	Fouda et al. cited by GenBank (2021)
MG883398	27.178312	31.185926	Locality	Fouda et al. cited by GenBank (2021)
MG883399	24.088938	32.899829	Locality	Fouda et al. cited by GenBank (2021)
MH016277	26.207828	43.483737	Locality	Alajmi (2020)
MH016278	24.713551	46.675296	Locality	Alajmi (2020)
MH016279	26.207828	43.483737	Locality	Alajmi (2020)
MH016604	24.088938	32.899829	Locality	Fouda et al. cited by GenBank (2021)
MH016605	24.088938	32.899829	Locality	Fouda et al. cited by GenBank (2021)
MH016606	24.088938	32.899829	Locality	Fouda et al. cited by GenBank (2021)
MH016607	24.088938	32.899829	Locality	Fouda et al. cited by GenBank (2021)
MH016608	26.820556	30.802501	Country	Fouda et al. cited by GenBank (2021)
MH016609	26.820556	30.802501	Country	Fouda et al. cited by GenBank (2021)

MH016610	27.178312	31.185926	Locality	Fouda et al. cited by GenBank (2021)
MH016611	27.178312	31.185926	Locality	Fouda et al. cited by GenBank (2021)
MH016612	27.178312	31.185926	Locality	Fouda et al. cited by GenBank (2021)
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MH016614	24.088938	32.899829	Locality	Fouda et al. cited by GenBank (2021)
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MH016631	29.308402	30.84285	Locality	Fouda et al. cited by GenBank (2021)
MH016632	29.308402	30.84285	Locality	Fouda et al. cited by GenBank (2021)
MH016633	29.308402	30.84285	Locality	Fouda et al. cited by GenBank (2021)
MH016634	29.308402	30.84285	Locality	Fouda et al. cited by GenBank (2021)
MH016635	29.308402	30.84285	Locality	Fouda et al. cited by GenBank (2021)
MH016636	29.308402	30.84285	Locality	Fouda et al. cited by GenBank (2021)
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KU647600	-9.0702972	-40.3220583	GPS	Silva (2016)
KU647601	-9.0702972	-40.3220583	GPS	Silva (2016)
KU647490	-9.6055972	-35.8203667	GPS	Silva (2016)
KU647494	-9.6055972	-35.8203667	GPS	Silva (2016)

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KU647530	-8.0147417	-34.9477278	GPS	Silva (2016)
KU647534	-8.0147417	-34.9477278	GPS	Silva (2016)
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KU647594	-3.7461667	-38.5750306	GPS	Silva (2016)
KU647598	-3.7461667	-38.5750306	GPS	Silva (2016)
KU647614	-9.0702972	-40.3220583	GPS	Silva (2016)
KU647502	-9.6055972	-35.8203667	GPS	Silva (2016)
KU647505	-9.6055972	-35.8203667	GPS	Silva (2016)
KU647532	-8.0147417	-34.9477278	GPS	Silva (2016)

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ASSCR6358	9.671	-83.026	GPS	Bold (2021)
ASSCR6359	9.99	-84.183	GPS	Bold (2021)
AY131121			Not	O'Meara, B.C. and Farrell, B.D. cited by GenBank (2021)
GU581629	3.933889	-53.125782	Country	El-Mergawy et al. (2011)
KF311358	32.514947	-117.038247	Locality	Rugman-Jones et al. (2013)
KR494254	3.50259	-76.355046	GPS	Löhr et al. (2015)
KR494255	3.50259	-76.355046	GPS	Löhr et al. (2015)
KR494256	3.50259	-76.355046	GPS	Löhr et al. (2015)
KR494257	3.50259	-76.355046	GPS	Löhr et al. (2015)
KR494258	3.50259	-76.355046	GPS	Löhr et al. (2015)
KR494259	3.50259	-76.355046	GPS	Löhr et al. (2015)
KR494260	3.50259	-76.355046	GPS	Löhr et al. (2015)
KR494261	3.50259	-76.355046	GPS	Löhr et al. (2015)
Univalle_10	3.9894	-76.978	GPS	This study
Univalle_11	3.9826	-76.9804	GPS	This study
Univalle_17	3.9826	-76.9804	GPS	This study
Univalle_21	3.6878	-76.9591	GPS	This study
Univalle_44	1.7257	-75.6558	GPS	This study
Univalle_58	3.6878	-76.9591	GPS	This study
Univalle_117	0.8842	-76.5887	GPS	This study
AY131120			Not	O'Meara, B.C. and Farrell, B.D. cited by GenBank (2021)
KY511047	6.428055	-9.429499	Country	Utomo et al. cited by GenBank (2021)
KF311588	3.460655	101.134842	Locality	Rugman-Jones et al. (2013)
KF311587	3.460655	101.134842	Locality	Rugman-Jones et al. (2013)
KF311629	1.352083	103.819839	Locality	Rugman-Jones et al. (2013)
KF311550	3.181761	99.339694	Locality	Rugman-Jones et al. (2013)
KF311575	3.181761	99.339694	Locality	Rugman-Jones et al. (2013)
KF311549	3.181761	99.339694	Locality	Rugman-Jones et al. (2013)
KF311574	3.181761	99.339694	Locality	Rugman-Jones et al. (2013)
KF311579	3.181761	99.339694	Locality	Rugman-Jones et al. (2013)
KF311573	3.181761	99.339694	Locality	Rugman-Jones et al. (2013)
KF311546	2.97004	99.068168	Locality	Rugman-Jones et al. (2013)

KF311553	3.181761	99.339694	Locality	Rugman-Jones et al. (2013)
KF311572	3.181761	99.339694	Locality	Rugman-Jones et al. (2013)
KF311600	3.471235	98.583091	Locality	Rugman-Jones et al. (2013)
KF311578	3.181761	99.339694	Locality	Rugman-Jones et al. (2013)
KF311593	3.471235	98.583091	Locality	Rugman-Jones et al. (2013)
KF311552	3.181761	99.339694	Locality	Rugman-Jones et al. (2013)
KF311554	3.181761	99.339694	Locality	Rugman-Jones et al. (2013)
KF311586	3.460655	101.134842	Locality	Rugman-Jones et al. (2013)
KF311594	3.471235	98.583091	Locality	Rugman-Jones et al. (2013)
KF311595	3.471235	98.583091	Locality	Rugman-Jones et al. (2013)
KF311596	3.471235	98.583091	Locality	Rugman-Jones et al. (2013)
KF311597	3.471235	98.583091	Locality	Rugman-Jones et al. (2013)
KF311598	3.471235	98.583091	Locality	Rugman-Jones et al. (2013)
KF311599	3.471235	98.583091	Locality	Rugman-Jones et al. (2013)
KF311547	3.181761	99.339694	Locality	Rugman-Jones et al. (2013)
KF311591	3.471235	98.583091	Locality	Rugman-Jones et al. (2013)
KF311545	3.181761	99.339694	Locality	Rugman-Jones et al. (2013)
KF311551	3.181761	99.339694	Locality	Rugman-Jones et al. (2013)
KF311576	3.181761	99.339694	Locality	Rugman-Jones et al. (2013)
KF311577	3.181761	99.339694	Locality	Rugman-Jones et al. (2013)
KF311548	3.181761	99.339694	Locality	Rugman-Jones et al. (2013)
KF311592	3.471235	98.583091	Locality	Rugman-Jones et al. (2013)
KF311559	-6.988887	106.953569	Locality	Rugman-Jones et al. (2013)
KF311561	-6.81842	107.027369	Locality	Rugman-Jones et al. (2013)
KF311533	-6.81842	107.027369	Locality	Rugman-Jones et al. (2013)
KF311534	-6.81842	107.027369	Locality	Rugman-Jones et al. (2013)
KF311540	-6.81842	107.027369	Locality	Rugman-Jones et al. (2013)
KF311537	-6.81842	107.027369	Locality	Rugman-Jones et al. (2013)
KF311633	7.771999	99.450599	Locality	Rugman-Jones et al. (2013)
KF311564	-6.81842	107.027369	Locality	Rugman-Jones et al. (2013)
KF311570	-6.988887	106.953569	Locality	Rugman-Jones et al. (2013)
KF311530	-7.209025	107.686647	Locality	Rugman-Jones et al. (2013)
KF311531	-7.209025	107.686647	Locality	Rugman-Jones et al. (2013)

KF311569	-6.988887	106.953569	Locality	Rugman-Jones et al. (2013)
KF311538	-6.81842	107.027369	Locality	Rugman-Jones et al. (2013)
KF311539	-6.81842	107.027369	Locality	Rugman-Jones et al. (2013)
KF311542	-6.81842	107.027369	Locality	Rugman-Jones et al. (2013)
KF311543	-6.81842	107.027369	Locality	Rugman-Jones et al. (2013)
KF311565	-6.81842	107.027369	Locality	Rugman-Jones et al. (2013)
KF311610	-8.39081	114.019067	Locality	Rugman-Jones et al. (2013)
KF311612	-8.39081	114.019067	Locality	Rugman-Jones et al. (2013)
KF311605	-8.39081	114.019067	Locality	Rugman-Jones et al. (2013)
KF311535	-6.81842	107.027369	Locality	Rugman-Jones et al. (2013)
KF311529	-7.209025	107.686647	Locality	Rugman-Jones et al. (2013)
KF311541	-6.81842	107.027369	Locality	Rugman-Jones et al. (2013)
KF311562	-6.81842	107.027369	Locality	Rugman-Jones et al. (2013)
KF311566	-6.81842	107.027369	Locality	Rugman-Jones et al. (2013)
KF311532	-7.209025	107.686647	Locality	Rugman-Jones et al. (2013)
KF311536	-6.81842	107.027369	Locality	Rugman-Jones et al. (2013)
KF311571	-6.988887	106.953569	Locality	Rugman-Jones et al. (2013)
KF311563	-6.81842	107.027369	Locality	Rugman-Jones et al. (2013)
KF311589	3.460655	101.134842	Locality	Rugman-Jones et al. (2013)
KF311568	-7.209025	107.686647	Locality	Rugman-Jones et al. (2013)
KF311555	-6.81842	107.027369	Locality	Rugman-Jones et al. (2013)
KF311556	-6.81842	107.027369	Locality	Rugman-Jones et al. (2013)
KF311557	-6.81842	107.027369	Locality	Rugman-Jones et al. (2013)
KF311558	-6.988887	106.953569	Locality	Rugman-Jones et al. (2013)
KF311560	-6.988887	106.953569	Locality	Rugman-Jones et al. (2013)
KF311601	-8.39081	114.019067	Locality	Rugman-Jones et al. (2013)
KF311608	-8.39081	114.019067	Locality	Rugman-Jones et al. (2013)
KF311611	-8.39081	114.019067	Locality	Rugman-Jones et al. (2013)
KF311604	-8.39081	114.019067	Locality	Rugman-Jones et al. (2013)
KF311615	-8.39081	114.019067	Locality	Rugman-Jones et al. (2013)
KF311603	-8.39081	114.019067	Locality	Rugman-Jones et al. (2013)
KF311618	-8.39081	114.019067	Locality	Rugman-Jones et al. (2013)
KF311609	-8.39081	114.019067	Locality	Rugman-Jones et al. (2013)

KF311613	-8.39081	114.019067	Locality	Rugman-Jones et al. (2013)
KF311632	7.559385	99.611006	Locality	Rugman-Jones et al. (2013)
KF311602	-8.39081	114.019067	Locality	Rugman-Jones et al. (2013)
KF311616	-8.39081	114.019067	Locality	Rugman-Jones et al. (2013)
KF311621	-8.257289	114.827074	Locality	Rugman-Jones et al. (2013)
KF311623	-8.257289	114.827074	Locality	Rugman-Jones et al. (2013)
KF311626	-8.257289	114.827074	Locality	Rugman-Jones et al. (2013)
KF311619	-8.257289	114.827074	Locality	Rugman-Jones et al. (2013)
KF311620	-8.257289	114.827074	Locality	Rugman-Jones et al. (2013)
KF311622	-8.257289	114.827074	Locality	Rugman-Jones et al. (2013)
KF311624	-8.257289	114.827074	Locality	Rugman-Jones et al. (2013)
KF311617	-8.39081	114.019067	Locality	Rugman-Jones et al. (2013)
KF311606	-8.39081	114.019067	Locality	Rugman-Jones et al. (2013)
KF311614	-8.39081	114.019067	Locality	Rugman-Jones et al. (2013)
KF311567	-6.81842	107.027369	Locality	Rugman-Jones et al. (2013)
KF311628	1.352083	103.819839	Locality	Rugman-Jones et al. (2013)
KF311630	7.771999	99.450599	Locality	Rugman-Jones et al. (2013)
KF311607	-8.39081	114.019067	Locality	Rugman-Jones et al. (2013)
KF311544	33.542719	-117.785357	Locality	Rugman-Jones et al. (2013)
KF311580	33.542719	-117.785357	Locality	Rugman-Jones et al. (2013)
KF311581	33.542719	-117.785357	Locality	Rugman-Jones et al. (2013)
KF311582	33.542719	-117.785357	Locality	Rugman-Jones et al. (2013)
KF311583	33.542719	-117.785357	Locality	Rugman-Jones et al. (2013)
KF311584	33.542719	-117.785357	Locality	Rugman-Jones et al. (2013)
KF311585	33.542719	-117.785357	Locality	Rugman-Jones et al. (2013)
KF311627	33.542719	-117.785357	Locality	Rugman-Jones et al. (2013)
KF311625	-8.257289	114.827074	Locality	Rugman-Jones et al. (2013)
KF311528	7.550585	99.786321	Locality	Rugman-Jones et al. (2013)
KF311631	8.088979	99.478382	Locality	Rugman-Jones et al. (2013)
KF311590	5.513375	102.980005	Locality	Rugman-Jones et al. (2013)
LN612634	3.3561333	101.7947333	GPS	Montagna et al. (2015)
LN612635	3.3561333	101.7947333	GPS	Montagna et al. (2015)
LN612636	3.3561333	101.7947333	GPS	Montagna et al. (2015)

MG051024	3.340184	101.249762	Locality	Aman-Zuki et al. 2021
MG051025	3.340184	101.249762	Locality	Aman-Zuki et al. 2021
MG051026	3.340184	101.249762	Locality	Aman-Zuki et al. 2021

Table S3. Contribution of each morphometric character to the Principal Component Analysis for describing the dimorphism in each geographical population. Host plants were *Bactris gasipaes* and *Saccharum officinarum*. In bold the morphometric character more relevant for each principal component.

D. borassi					
Population (Host plant report)			High Andes		
Morphometric Character	Principal Component				
	1	2	3	4	5
MVDAS	3.19	7.41	10.07	4.68	17.01
DIS	0.19	**17.81**	11.97	**23.93**	2.79
WRB	3.49	7.06	0.02	31.89	1.07
LLAS	2.46	8.68	1.00	20.49	5.08
WLAS	1.51	8.85	1.54	0.27	**59.94**
RL	9.08	0.60	1.89	3.29	0.59
DRS	9.07	1.95	1.54	2.31	0.85
PL	**9.65**	0.01	1.90	0.09	0.91
PW	9.28	1.08	0.10	0.56	0.30
PtL	7.47	4.05	0.54	5.49	0.81
EL	7.94	6.14	0.02	0.50	0.02
EW	7.79	0.74	6.48	5.00	1.58
MD	4.26	8.35	10.34	1.16	0.24
ML	8.63	1.94	0.05	0.01	0.50
AB	8.97	4.51	1.83	0.05	0.19
PyL	0.90	10.11	**41.79**	0.00	6.44
BL	6.13	10.85	8.92	0.30	1.68
Population (Host plant report)			Central Pacific (*B. gasipaes*)		
Morphometric character	Principal Component				
	1	2	3	4	5
MVDAS	5.95	0.12	14.81	0.39	19.28
DIS	5.78	1.18	12.95	1.68	**20.68**
WRB	6.56	5.44	5.74	5.38	1.36
LLAS	3.62	2.84	**21.90**	**47.36**	2.76
WLAS	4.08	**29.76**	0.34	6.07	1.40
RL	5.99	12.07	7.24	0.87	7.79
DRS	6.85	4.64	8.93	0.07	3.47
PL	7.80	0.00	0.61	1.17	5.24
PW	7.32	3.82	0.02	0.14	0.22
EL	7.57	0.02	0.54	0.50	10.52
EW	6.28	5.16	2.21	0.72	2.42
MD	5.76	3.91	11.49	11.18	10.34
ML	7.47	1.56	2.79	0.97	5.04
AB	7.29	4.44	2.63	2.63	1.07

PyL	3.84	0.23	6.23	20.74	5.68
BL	**7.84**	1.32	1.57	0.13	1.07
MVDAS	5.95	0.12	14.81	0.39	19.28
DIS	5.78	1.18	12.95	1.68	**20.68**
WRB	6.56	5.44	5.74	5.38	1.36
Population (Hostplant report)			Central Pacific (*B. gasipaes* and without hostplant information)		
Morphometric Character	Principal Component				
	1	2	3	4	5
MVDAS	5.95	0.12	14.81	0.39	19.28
DIS	5.78	1.18	12.95	1.68	**20.68**
WRB	6.56	5.44	5.74	5.38	1.36
LLAS	3.62	2.84	**21.90**	**47.36**	2.76
WLAS	4.08	**29.76**	0.34	6.07	1.40
RL	5.99	12.07	7.24	0.87	7.79
DRS	6.85	4.64	8.93	0.07	3.47
PL	7.80	0.00	0.61	1.17	5.24
PW	7.32	3.82	0.02	0.14	0.22
EL	7.57	0.02	0.54	0.50	10.52
EW	6.28	5.16	2.21	0.72	2.42
MD	5.76	3.91	11.49	11.18	10.34
ML	7.47	1.56	2.79	0.97	5.04
AB	7.29	4.44	2.63	2.63	1.07
PyL	3.84	0.23	6.23	20.74	5.68
BL	**7.84**	1.32	1.57	0.13	1.07
Population (Hostplant report)			North Pacific (without hostplant information)		
Morphometric Character	Principal Component				
	1	2	3	4	5
MVDAS	4.02	14.14	2.72	0.00	0.09
DIS	3.32	10.10	5.55	21.79	0.52
WRB	3.78	7.57	5.49	6.47	1.32
LLAS	2.58	**16.07**	1.96	0.06	0.29
WLAS	2.56	8.65	1.35	15.59	**33.75**
RL	8.77	0.00	10.51	2.36	0.27
DRS	7.63	0.27	16.06	2.16	0.00
PL	8.37	1.38	0.05	0.25	3.17
PW	7.79	2.82	0.06	0.36	4.29
PtL	6.86	2.48	13.78	0.70	3.09
EL	8.69	4.54	0.13	0.92	0.11
EW	4.28	2.68	2.31	**26.41**	8.86
MD	3.48	1.93	**22.73**	11.76	28.61
ML	8.64	0.06	5.52	0.08	0.35

AB	7.64	8.58	1.94	0.30	1.36
PyL	2.80	13.47	8.95	10.8	13.91
BL	**8.79**	5.27	0.89	0.01	0.01

Rhynchophorus palmarum

Population (Hostplant report)			Amazon (without hostplant information)		
Morphometric Character	Principal Component				
	1	2	3	4	5
MVDAS	4.50	10.10	5.77	1.05	11.05
DIS	0.02	**41.51**	13.00	0.53	7.80
WRB	4.91	14.81	2.89	4.07	2.07
LLAS	3.45	0.58	**27.41**	8.11	17.68
WLAS	3.13	12.09	14.87	10.82	0.57
RL	7.18	3.23	0.05	1.04	0.06
DRS	7.71	1.43	1.04	0.72	0.29
PL	8.19	0.01	0.29	0.21	0.31
PW	8.04	0.34	2.16	0.04	0.02
PtL	5.45	3.10	12.66	0.20	14.05
EL	7.37	1.58	3.53	0.58	1.00
EW	8.19	0.16	0.45	0.28	0.03
MD	3.67	0.57	5.55	**70.66**	2.59
ML	6.66	1.50	6.22	1.41	2.89
AB	7.78	2.90	0.52	0.26	2.22
PyL	5.54	4.90	2.77	0.01	**36.03**
BL	**8.21**	1.21	0.44	0.19	1.32

Population (date report)			Low Andes (*S. officinarum*)		
Morphometric Character	Principal Component				
	1	2	3	4	5
MVDAS	5.41	11.12	0.09	0.30	0.05
DIS	2.62	**17.48**	**58.78**	1.73	4.84
WRB	5.79	9.68	0.88	0.12	4.46
LLAS	5.26	0.16	8.90	19.31	**35.41**
WLAS	5.17	7.23	14.90	5.37	2.34
RL	5.94	5.30	6.68	0.14	11.11
DRS	6.41	6.11	3.16	0.00	2.35
PL	6.95	2.08	0.14	2.19	2.01
PW	6.64	4.23	0.42	0.08	1.16
PtL	5.32	5.46	3.35	**34.46**	1.74
EL	6.74	4.44	0.01	0.40	1.96
EW	6.89	2.94	2.58	0.06	0.70
MD	5.32	3.48	0.59	33.73	2.71
ML	5.94	6.35	0.71	1.15	0.22
AB	6.85	5.11	0.17	0.02	1.27

PyL	5.74	5.29	0.80	0.47	27.96
BL	**7.02**	3.84	0.16	0.45	0.02
Population (date report)			Low Andes <1940 (without hostplant information)		
Morphometric Character	Principal Component				
	1	2	3		
BL	21.68	**78.27**	0.06		
EW	38.85	12.07	49.08		
Wing Length	**39.47**	9.67	**50.86**		
Population (Hostplant report)			Low Andes >1978 (without hostplant information)		
Morphometric Character	Principal Component				
	1	2	3	4	5
MVDAS	5.80	8.42	3.53	1.77	0.02
DIS	3.28	**40.76**	**30.24**	1.26	17.59
WRB	6.03	6.05	3.28	1.40	0.81
LLAS	4.68	0.16	6.66	**56.95**	12.09
WLAS	5.38	7.41	12.96	0.81	1.55
RL	5.61	0.12	15.67	18.65	0.63
DRS	6.56	0.32	6.27	4.78	0.01
PL	6.88	2.06	0.11	0.76	0.11
PW	6.36	8.84	0.85	0.15	4.65
PtL	5.28	0.46	11.88	8.68	**40.48**
EL	6.72	2.12	0.34	0.15	0.45
EW	6.39	8.18	1.65	0.81	3.61
MD	5.15	4.90	2.58	0.38	0.7
ML	6.13	3.14	0.17	0.52	16.97
AB	6.58	2.31	0.94	0.13	0.00
PyL	5.88	2.20	2.33	2.47	0.94
BL	**7.00**	2.25	0.55	0.31	0.03
Population (date report)			High Andes (without hostplant information)		
Morphometric Character	Principal Component				
	1	2	3	4	5
MVDAS	6.19	0.51	0.08	11.91	0.00
DIS	0.68	**66.57**	0.04	3.90	7.96
WRB	6.35	1.13	0.15	0.01	16.78
LLAS	4.79	4.93	6.12	17.34	10.07
WLAS	6.01	3.90	2.24	5.61	1.83
RL	6.62	0.39	2.08	1.10	16.89
DRS	7.34	0.04	0.24	0.00	7.32
PL	7.55	0.18	0.30	0.18	0.29
PW	7.36	0.00	0.13	0.36	2.70
PtL	4.31	10.52	16.57	13.05	0.02

EL	7.07	1.41	0.08	0.05	0.49
EW	7.39	0.28	0.94	0.02	0.67
MD	3.15	0.38	**66.94**	3.42	6.41
ML	6.28	0.23	0.42	8.14	6.85
AB	7.20	0.31	0.86	5.13	2.25
PyL	4.12	8.93	2.67	**28.32**	**18.99**
BL	**7.58**	0.26	0.12	1.47	0.48
Population (date report)			Central Pacific (*B. gasipaes*)		
Morphometric Character	Principal Component				
	1	2	3	4	5
MVDAS	3.26	1.14	0.00	**36.60**	1.15
DIS	0.16	**33.65**	3.31	0.91	0.74
WRB	4.54	1.19	5.06	8.04	14.92
LLAS	3.70	0.15	3.35	1.74	**54.18**
WLAS	2.38	6.77	1.60	22.23	5.69
RL	9.00	1.33	2.22	0.47	0.01
DRS	8.78	0.24	0.15	4.89	2.46
PL	10.10	0.30	0.85	2.79	0.10
PW	10.01	0.48	0.05	0.38	0.51
PtL	1.11	25.01	3.75	13.31	1.93
EL	8.26	1.35	5.20	1.44	2.73
EW	8.02	1.40	2.40	2.14	0.01
MD	1.19	10.11	24.39	3.83	13.79
ML	4.43	12.41	8.34	0.15	0.75
AB	9.75	2.23	4.28	0.05	0.62
PyL	4.34	1.50	**33.77**	0.84	0.21
BL	**10.98**	0.74	1.28	0.19	0.20
Population (date report)			Central Pacific (*B. gasipaes* and without hostplant information)		
Morphometric Character	Principal Component				
	1	2	3	4	5
MVDAS	5.95	0.11	14.81	0.39	19.28
DIS	5.80	1.81	12.95	1.67	**20.68**
WRB	6.56	5.44	5.74	5.38	1.36
LLAS	3.62	2.84	**21.90**	**47.36**	2.76
WLAS	4.08	**29.76**	0.34	6.07	1.40
RL	5.98	12.07	7.24	0.87	7.79
DRS	6.85	4.63	8.93	0.07	3.47
PL	7.80	0.00	0.61	1.17	5.24
PW	7.32	3.82	0.02	0.14	0.22
EL	7.57	0.02	0.54	0.50	10.52
EW	6.28	5.16	2.21	0.72	2.42

MD	5.76	3.91	11.49	11.18	10.33
ML	7.47	1.56	2.79	0.97	5.04
AB	7.29	4.44	2.63	2.63	1.07
PyL	3.84	23.09	6.23	20.74	5.68
BL	**7.84**	1.32	1.57	0.13	2.74
Population (date report)			North Pacific (without hostplant information)		
Morphometric Character	Principal Component				
	1	2	3	4	5
MVDAS	2.91	0.87	0.15	**33.51**	3.23
DIS	0.04	7.52	3.66	9.47	**68.48**
WRB	5.94	0.15	5.56	3.37	6.38
LLAS	1.16	**22.30**	9.57	0.04	0.41
WLAS	1.53	6.51	9.32	16.10	6.23
RL	8.11	5.05	1.83	0.79	1.45
DRS	5.49	15.40	3.45	0.11	0.83
PL	9.60	0.05	0.00	3.02	0.21
PW	9.66	0.15	0.80	1.94	0.51
PtL	3.62	19.64	02.98	3.51	3.83
EL	8.34	0.02	1.25	5.98	2.07
EW	9.51	0.60	0.16	0.85	0.11
MD	4.77	3.99	19.28	0.86	1.72
ML	7.60	10.53	1.00	0.81	0.25
AB	8.86	0.99	11.58	0.12	0.00
PyL	2.54	2.88	**24.11**	16.31	4.28
BL	**10.42**	0.35	5.65	0.21	0.03

Table S4. Contribution of each morphometric character to the Principal Component Analysis for the different population comparison according to hostplant reports for each sex of *Rhynchophorus palmarum*. Host plants were *Bactris gasipaes*, *Bismarkia nobilis*, and *Saccharum officinarum*. In bold the morphometric character more relevant for each principal component.

Male					
Morphometric Character	Principal Component				
	1	2	3	4	5
MVDAS	5.83	0.64	0.68	**16.86**	6.74
DIS	4.72	40.29	7.82	1.43	17.51
WRB	6.07	3.68	0.08	2.46	0.54
LLAS	5.01	4.05	**36.07**	1.06	13.00
WLAS	5.45	0.07	21.05	1.98	4.86
RL	5.88	0.64	1.42	4.40	**30.16**
DRS	6.20	1.74	0.17	4.63	12.28
PL	6.44	0.40	0.01	2.04	0.14
PW	6.27	0.13	1.69	0.85	4.05
PtL	6.27	0.01	0.11	8.88	0.73
EL	6.21	3.15	1.55	6.16	0.10
EW	6.32	0.17	2.81	0.64	3.22
MD	4.32	**42.29**	22.69	15.64	0.83
ML	6.29	0.71	0.49	2.83	1.62
AB	6.39	0.74	0.02	9.29	0.27
PyL	5.84	0.69	3.34	14.76	3.88
BL	**6.50**	0.61	0.00	6.08	0.04

Female					
Morphometric Character	Principal Component				
	1	2	3	4	5
MVDAS	5.94	9.13	0.77	2.81	0.56
DIS	3.77	**47.10**	**33.41**	3.88	3.03
WRB	5.93	6.00	1.44	7.66	5.76
LLAS	5.05	0.00	2.10	**62.36**	15.53
WLAS	5.79	1.99	12.57	2.57	3.39
RL	6.02	2.16	12.54	0.71	1.35
DRS	6.31	1.59	8.27	0.17	0.01
PL	6.49	1.44	1.06	0.02	0.01
PW	6.45	2.17	1.06	0.00	0.59
PtL	5.38	11.05	10.50	9.03	1.55
EL	6.44	2.22	1.46	0.05	0.00
EW	6.48	1.76	0.19	0.14	0.69
MD	5.23	8.77	0.62	8.98	**48.06**
ML	5.91	0.11	5.74	0.04	5.21

AB	6.48	1.79	2.42	0.12	1.82
PyL	5.79	1.05	3.94	1.38	11.63
BL	**6.55**	1.67	1.89	0.08	0.82

Table S5. Normality (Shapiro test) and Homoscedasticity (Levene test) analysis for the *Drynamis borassi* and *Rhynchophorus palmarum* populations according to the morphological variable most relevant to each PCA Analysis (Table S2) from different sex. See Table 1 and Figure 1 for the description of each character.

Species	Geography	Sex	Shapiro Test (p-value)					Levene test (p-value)				
			Variable									
D.borassi	High Andes		PL	DIS	PyL	WRB	WLAS	PL	DIS	PyL	WRB	MVDAS
		Male	0.95 (0.63)	0.91 (0.13)	0.95 (0.65)	0.88 (0.14)	0.86 (0.08)	0.61 (0.44)	0.06 (0.81)	0.57 (0.46)	0.84 (0.04)	4.78 (0.04)
		Female	0.91 (0.15)	0.91 (0.13)	0.98 (0.97)	0.94 (0.37)	0.93 (0.28)					
	Central Pacific (*B. gasipaes*)		PL	PyL	DIS	MVDAS		PL	PyL	DIS	MVDAS	
		Male	0.98 (0.97)	0.93 (0.37)	0.92 (0.26)	0.95 (0.63)		2.39 (0.14)	0.00 (0.97)	0.86 (0.37)	0.65 (0.43)	
		Female	0.91 (0.45)	0.85 (0.21)	0.96 (0.79)	0.91 (0.42)						
	Central Pacific (without host plant and *B. gasipaes*)		BL	WLAS	LLAS	DIS		BL	WLAS	LLAS	DIS	
		Male	0.79 (0.02)	0.98 (0.98)	0.87 (0.15)	0.90 (0.29)		1.22 (0.28)	0.50 (0.49)	0.61 (0.44)	1.30 (0.27)	
		Female	0.95 (0.54)	0.90 (0.13)	0.68 (0.00)	0.92 (0.26)						
	North Pacific		BL	LLAS	MD	WLLAS		BL	LLAS	MD	WLLAS	
		Male	0.97 (0.41)	0.95 (0.11)	0.78 (0.00)	0.10 (0.10)		0.84 (0.36)	0.28 (0.60)	0.23 (0.64)	0.20 (0.66)	
		Female	0.95 (0.20)	0.95 (0.16)	0.93 (0.00)	0.70 (0.00)						
R. palmarum	Amazon		BL	DIS	LLAS	MD	PyL	BL	DIS	LLAS	MD	PyL
		Male	0.85 (0.01)	0.93 (0.08)	0.88 (0.03)	0.71 (0.00)	0.93 (0.24)	0.03 (0.87)	0.06 (0.81)	1.02 (0.32)	0.06 (0.81)	2.08 (0.16)
		Female	0.88 (0.00)	0.93 (0.23)	0.96 (0.32)	0.94 (0.10)	0.94 (0.10)					

	Low Andes (*S. officinarum*)		BL	DIS	PtL	LLAS		BL	DIS	PtL	LLAS	
		Male	0.95 (0.17)	0.96 (0.33)	0.94 (0.06)	0.94 (0.06)		0.04 (0.85)	0.06 (0.82)	0.06 (0.81)	0.06 (0.81)	
		Female	0.94 (0.15)	0.95 (0.16)	0.93 (0.06)	0.96 (0.43)						
	Low Andes (<1940)		BL	EW	Wing length			BL	EW	Wing length		
		Male	0.98 (0.93)	0.93 (0.18)	0.98 (0.96)			2.14 (0.15)	0.28 (0.60)	0.73 (0.40)		
		Female	0.90 (0.05)	0.89 (0.02)	0.91 (0.07)							
	Low Andes (>1978)		BL	DIS	LLAS	PtL		BL	DIS	LLAS	PtL	
		Male	0.97 (0.23)	0.68 (0.35)	0.93 (0.01)	1.00 (0.09)		0.36 (0.55)	0.30 (0.59)	0.68 (0.41)	0.02 (0.89)	
		Female	0.96 (0.07)	0.97 (0.26)	0.94 (0.03)	0.8 (0.00)						
	High Andes		BL	DIS	MD	PyL	RL	BL	DIS	MD	PyL	RL
		Male	0.71 (0.00)	0.91 (0.19)	0.82 (0.01)	0.92 (0.24)	0.90 (0.15)	0.27 (0.61)	0.00 (0.98)	4.18 (0.05)	0.05 (0.83)	0.00 (0.96)
		Female	0.77 (0.00)	0.96 (0.83)	0.95 (0.56)	0.79 (0.01)	0.87 (0.05)					
	Central Pacific (*B. gasipaes*)		BL	DIS	PyL	WLAS	LLAS	BL	DIS	PyL	WLAS	LLAS
		Male	0.92 (0.16)	0.91 (0.10)	0.98 (0.93)	0.93 (0.18)	0.96 (0.68)	8.65 (0.01)	0.28 (0.60)	0.11 (0.74)	0.63 (0.44)	1.10 (0.30)
		Female	0.93 (0.34)	(0.94 (0.46)	0.92 (0.22)	0.88 (0.06)	0.76 (0.00)					
	Central Pacific (without hostplant and *B. gasipaes*)		BL	DIS	MD	PtL	LLAS	BL	DIS	MD	PtL	LLAS
		Male	0.93 (0.34)	0.94 (0.46)	0.92 (0.22)	0.93 (0.33)	0.77 (0.00)	4.98 (0.03)	0.20 (0.66)	0.01 (0.91)	4.58 (0.05)	0.15 (0.70)
		Female	0.84 (0.01)	0.91 (0.09)	0.97 (0.83)	0.94 (0.31)	0.86 (0.01)					

	North Pacific		BL	LLAS	PyL	MVDAS	DIS	BL	LLAS	PyL	MVDAS	DIS
	(without hostplant information)	Male	0.92 (0.11)	0.95 (0.46)	0.95 (0.45)	0.89 (0.03)	0.98 (0.89)	0.68 (0.41)	1.86 (0.18)	0.38 (0.54)	0.31 (0.58)	1.55 (0.22)
		Female	0.97 (0.62)	0.92 (0.06)	0.95 (0.25)	0.97 (0.72)	0.95 (0.27)					

Table S6. Normality (Shapiro test) and Homoscedasticity (Levene test) analysis for the *Rhynchophorus palmarum* sex according to the morphological variable most relevant to each PCA (Table S2) from different geographical origin and host plant (*Bactris gasipaes* and *Saccharum officinarum*). See Table 1 and Figure 1 for the description of each character.

Sex	Geography (Host plant)	Shapiro Test (p-value)					Levene test (p-value)				
		Variable									
Male	Low Andes (*S. officinarum)*	BL	MD	LLAS	MVDAS	RL	BL	MD	LLAS	MVDAS	RL
		0.93 (0.22)	0.98 (0.95)	0.96 (0.59)	0.92 (0.20)	0.89 (0.06)	5.05 (0.01)	4.71 (0.13)	3.66 (0.03)	3.72 (0.03)	2.49 (0.09)
	Low Andes (*B. nobilis*)	0.96 (0.79)	0.82 (0.12)	0.81 (0.09)	0.92 (0.54)	0.82 (0.11)					
	Pacific (*B. gasipaes*)	0.95 (0.17)	0.94 (0.08)	0.94 (0.06)	0.94 (0.06)	0.96 (0.24)					
Female	Low Andes (*S. officinarum)*	BL	DIS	LLAS	MD		BL	DIS	LLAS	MD	
		0.93 (0.34)	0.94 (0.46)	0.77 (0.00)	0.95 (0.59)		18.71 (0.00)	0.14 (0.71)	0.63 (0.43)	3.86 (0.06)	
	Pacific (*B. gasipaes*)	0.94 (0.15)	0.95 (0.16)	0.96 (0.43)	0.97 (0.57)						

Table S8. Statistical analysis of dimorphism of *Dynamis borassi* and *Rhynchophorus palmarum* populations.

Species	Population (Host plant)	Variable	Anova (p-value)	Kruskal (p-value)
D. borassi	High Andes	PL	6.16 (0.02)	-
		DIS	2.29 (0.60)	-
		PyL	0.08 (0.78)	-
		WRB	0.29 (0.60)	-
		WLAS	-	4.22 (0.04)
	Pacific (without host plant and *B. gasipaes*)	BL	-	6.78 (0.01)
		WLAS	32.84 (0.00)	-
		LLAS	-	3.08 (0.08)
		DIS	8.14 (0.01)	-
R. palmarum	Amazon	BL	6.65 (0.01)	-
		DIS	12.48 (0.00)	-
		LLAS	-	3.64 (0.06)
		MD	-	11.42 (0.00)
		PyL	13.01 (0.00)	-
	Low Andes (*S. officinarum*)	BL	0.75 (0.39)	-
		DIS	0.88 (0.35)	-
		PtL	0.73 (0.40)	-
		LLAS	0.35 (0.56)	-
	Low Andes (<1940)	BL	-	1.6 (0.21)
		EW	-	0.94 (0.33)
		Wing length	0.33 (0.57)	-
	Low Andes (>1978)	BL	0.01 (0.93)	-
		DIS	1.66 (0.02)	-
		LLAS	-	0.92 (0.34)
		PtL	-	8.41 (0.00)
	Central Pacific (*B. gasipaes*)	BL	-	4.19 (0.05)
		DIS	16.57 (0.00)	-
		PyL	8.56 (0.01)	-
		MVDAS	0.44 (0.51)	-
		LLAS	0.09 (0.76)	-
	High Andes	BL	-	0.76 (0.38)
		DIS	0.15 (0.70)	-
		MD	-	0.22 (0.64)
		PyL	-	4.89 (0.03)
		RL	0.48 (0.49)	-
	Pacific (without host plant and *B. gasipaes*)	BL		2.22 (0.14)
		DIS	17.14 (0.00)	
		MD	5.56 (0.03)	
		PtL		12.14 (0.00)
		LLAS		0.52 (0.47)

	North Pacific (without host plant)	BL	0.07 (0.80)	
		LLAS		7.97 (0.01)
		PyL	0.55 (0.46)	
		MVDAS	0.24 (0.63)	
		DIS	1.68 (0.20)	

Table S7. Statistical analysis of population comparison of *Rhynchophorus palmarum* according to their geography and host plant for each sex.

Sex	Population in comparison (host plant)	Variable	Anova (p-value)	Pairwise test	Kruskal (p-value)	Wilcox test
Male	Low Andes (*S. officinarum*) – Low Andes (*B. nobilis*)- Pacific (*B. gasipaes*)	BL	-	-	37.05 (0.00)	-
	Low Andes (*S. officinarum*) – Low Andes (*B. nobilis*)	BL	-	-	-	0.00
	Low Andes (*S. officinarum*) – Pacific (*B. gasipaes*)	BL	-	-	-	0.00
	Low Andes (*B. nobilis*) - Pacific (*B. gasipaes*)	BL	-	-	-	0.38
	Low Andes (*S. officinarum*) – Low Andes (*B. nobilis*)- Pacific (*B. gasipaes*)	MD	-	-	15.39 (0.00)	-
	Low Andes (*S. officinarum*) – Low Andes (*B. nobilis*)	MD	-	-	-	0.04
	Low Andes (*S. officinarum*) – Pacific (*B. gasipaes*)	MD	-	-	-	0.00
	Low Andes (*B. nobilis*) - Pacific (*B. gasipaes*)	MD	-	-	-	1
	Low Andes (*S. officinarum*) – Low Andes (*B. nobilis*)- Pacific (*B. gasipaes*)	LLAS	-	-	30.53 (0.00)	-
	Low Andes (*S. officinarum*) – Low Andes (*B. nobilis*)	LLAS	-	-	-	0.01
	Low Andes (*S. officinarum*) – Pacific (*B. gasipaes*)	LLAS	-	-	-	0.00
	Low Andes (*B. nobilis*) - Pacific (*B. gasipaes*)	LLAS	-	-	-	0.26
	Low Andes (*S. officinarum*) – Low Andes (*B. nobilis*)- Pacific (*B. gasipaes*)	MVDAS	-	-	32.81 (0.00)	-
	Low Andes (*S. officinarum*) – Low Andes (*B. nobilis*)	MVDAS	-	-	-	0.00
	Low Andes (*S. officinarum*) – Pacific (*B. gasipaes*)	MVDAS	-	-	-	0.00

	Low Andes (*B. nobilis*) - Pacific (*B. gasipaes*)	MVDAS	-	-	-	0.53
	Low Andes (*S. officinarum*) – Low Andes (*B. nobilis*)- Pacific (*B. gasipaes*)	RL	27.13 (0.00)	-	-	-
	Low Andes (*S. officinarum*) – Low Andes (*B. nobilis*)	RL	-	0.00	-	-
	Low Andes (*S. officinarum*) – Pacific (*B. gasipaes*)	RL	-	0.00	-	-
	Low Andes (*B. nobilis*) - Pacific (*B. gasipaes*)	RL	-	0.32	-	-
Female	Low Andes (*S. officinarum*) - Pacific (*B. gasipaes*)	BL	-	-	27.02 (0.00)	-
	Low Andes (*S. officinarum*) - Pacific (*B. gasipaes*)	DIS	24.68 (0.00)	-	-	-
	Low Andes (*S. officinarum*) - Pacific (*B. gasipaes*)	LLAS	-	-	16.87 (0.00)	-
	Low Andes (*S. officinarum*) - Pacific (*B. gasipaes*)	MD	1.98 (0.16)	-	-	-

Discusión general

Se comprobó el rol principal de *D. borassi* en la muerte masiva de la palma de chontaduro en Colombia. En este caso, la hembra del picudo oviposita en la inflorescencia sin abrir, las larvas emergen y empiezan a alimentarse de las inflorescencias. Posteriormente, por insuficiencia de alimento ingresan al tallo por la base de la inflorescencia y empiezan a alimentarse de su interior. Este proceso es similar al descrito previamente para *D. borassi* sobre *O. mapora* en Brasil (Couturier et al. 2000). El daño ocasionado por *D. borassi* facilita el ingreso de *R. palmarum*, tal como se ha documentado en otras palmas a lo largo de su distribución geográfica (Alpizar et al. 2002). Como los estados de los picudos que causan el daño son las larvas que no se podían distinguir con las descriciones existentes, la corroboración de esta hipótesis requirió corregir problemas nomenclaturales en las descripciones previas de las larvas de ambas especies de Wattanapongsiri (1966) al seguir a May (1994), Marvaldi (1999) y Chamorro y Huang (2019). De igual forma, se presentan datos moleculares que corroboran las identificaciones morfológicas realizadas, al obtener el árbol filogenético más resuelto para *Rhynchophorus* y *Dynamis*, con todas las secuencias disponibles en las bases de datos de GenBank y BOLD. Por consiguiente, se ofrecen herramientas taxonómicas que permiten identificar todos los estadios de desarrollo de estos picudos de importancia agrícola y biológica.

Por otra parte, se corroboró que el daño ocasionado por *D. borassi* se extendió a la región del Amazonas y Andes colombiano en menos de 5 años. Esto demuestra que dichos ataques representan un problema nacional con potencialidad para expandirse a otros países. Esta tendencia invasiva ha sido reportada en *R. palmarum* (Milosavljević et al., 2019) y *R. ferrugineus* (Hoddle et al., 2013), destacando la importancia de continuar documentando la ampliación de la distribución de *D. borassi* en cultivos agrícolas y ornamentales de palmas en el continente americano.

Los niveles de infestación del chontaduro estuvieron relacionados principalmente con las variables del paisaje circundante a cada cultivo, específicamente con el

número y forma de parches abiertos o sin bosque. Ambas variables se relacionan con un efecto borde y mayor presencia de sitios abiertos (Farina, 2008; Liu et al., 2008). Es muy posible que estos cambios en el paisaje ocasionen una disminución de hospederos naturales del *D. borassi*, como *O. bataua*, el cual fue utilizado por este picudo en zonas boscosas y abiertas cercanas a los cultivos de chontaduro examinados (Bautista-Giraldo et al., 2020). Se ha destacado que las palmas silvestres pueden ser afectadas por las dos variables de paisaje antes mencionadas (Aguilar Mena, 2005; Browne y Karubian, 2016; Hernández Muñoz y Martínez Santacruz, 2018). Estudios previos destacan la importancia del paisaje natural sobre los niveles de infestación de plagas (Kruess and Tscharntke, 1994; Bianchi et al., 2006), no obstante, este es el reporte más extenso para picudos de palmas considerando diferentes tipos de variables de análisis a escalas espaciales distintas, correspondientes a prácticas agronómicas, paisaje, suelo, topografía y clima.

Finalmente, se acumuló información que sugiere que los adultos de *D. borassi* presentaron un menor tamaño al colonizar las palmas de chontaduro. Está hipótesis fue corroborada en *R. palmarum*, una especie cercana filogenéticamente a *D. borassi* y presente en la misma zona de estudio, cuya morfología y genética del gen COI se diferencia en picudos provenientes de caña de azúcar. Es muy posible que la disminución del tamaño de ambas especies sea el resultado de que estos nuevos hospederos presentan características que limitan el desarrollo de sus estados larvales y púpales. Este tipo de explicación has sido propuesta para el picudo *R. ferrugineus* en variedades de palma datilera, en consecuencia, de una menor presencia de niveles de azucares (Al-Ayedh, 2008). En otros grupos taxonómicos también se han sugerido mecanismos similares (Vanbergen et al., 2003; Messina, 2004), lo cual puede generar efectos tanto en la nutrición, fisiología y competencia de las larvas.

Conclusiones generales

En conclusión, se pudo corroborar el rol principal de *D. borassi* como iniciador del daño actual en palmas de chontaduro, el cual abre paso a los ataques de *R. palmarum*. De igual forma, se corroboró la presencia de estos daños en las principales áreas de producción de chontaduro correspondientes a la Amazonia, Andes y Pacífico. Las características del paisaje se relacionaron considerablemente con los niveles de infestación, destacando la relevancia potencial de las palmas silvestres hospederas de *D. borassi* en la colonización de la palma de chontaduro. Por último, se obtuvo evidencia que sugiere que *D. borassi* presenta un tamaño más pequeño al utilizar la palma de chontaduro, de manera similar como se documentó en *R. palmarum* al colonizar la caña de azúcar.

Se recomienda continuar con el monitoreo de la expansión geográfica de *D. borassi* en el resto del continente americano, especialmente en cultivos de chontaduro y otras palmas. Por otro parte, tiene gran valor científico corroborar la explicación sugerida sobre el efecto que tiene la disminución de palmas silvestres en los mayores niveles de los cultivos de chontaduro. Así como, aumentar el muestreo de *D. borassi* en dichas palmas para corroborar que este picudo puede modificar su desarrollo para colonizar la palma de chontaduro. Estos temas de investigación podrían contribuir a entender cómo los insectos nativos tropicales pueden convertirse en plagas agrícolas y cómo cambian su biología para colonizar nuevas plantas hospederas.

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Appendix.

Appendix 1. Certification of the undergraduate student project of the Claudia García Chamizo, and her abstract and attendance certificate of the XLVI Congress of Entomological Society of Colombia-Socolen:

Universidad del Valle

Universidad del Valle
Radicación No: 2021-06-16-8602-I
Fecha: 16/06/2021-15:30:13
Asunto: Constancia de Matrí...
Origen: JACKELINE MURILLO HOYOS
Destino: CLAUDIA MARCELA GARCÍ...
El radicado no implica su aceptación

Facultad de Ingeniería
Escuela de Ingeniería Civil y Geomática
Programa Académico de Ingeniería Topográfica

2021-06-16-8602-I

HAGO CONSTAR QUE:

La estudiante CLAUDIA MARCELA GARCÍA CHAMIZO identificado con Cédula de Ciudadanía No. 1144025460 y Código de Estudiante 201510031 se encuentra matriculada en el periodo Febrero-Junio 2021 y actualmente solo tiene pendiente culminar el ciclo de asignaturas correspondientes al Proyecto de Grado.

La estudiante se encuentra desarrollando su proyecto de grado titulado: *"Análisis de datos hiperespectrales de palmas de chontaduro (Bactris gasipaes, arecales: Arecaceae) afectadas con las plagas Rhynchophorus palmarum y Dynamis borassi (Coleoptera: dryphthoridae) en el pacífico colombiano".* El director del Proyecto de Grado es el profesor Francisco Luis Hernández y Codirector el biólogo Aymer Andrés Vásquez

Esta constancia se expide a solicitud de la interesada en la Ciudad de Santiago de Cali el 16 de junio de 2021.

Cordialmente,

Jackeline Murillo Hoyos

JACKELINE MURILLO HOYOS, PH.D.
Directora
Programa Académico de Ingeniería Topográfica

PROGRAMA INGENIERÍA TOPOGRÁFICA
DIRECTOR

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MIP-P-18. Análisis de datos hiperespectrales de palmas de chontaduro (*Bactris gasipaes*, Arecales: Arecaceae) afectadas con las plagas *Rhynchophorus palmarum* y *Dynamis borassi* (Coleoptera: Dryophthoridae) en el pacífico colombiano.

Claudia Marcela García Chamizo[1]; Aymer Andrés Vásquez-Ordóñez[2]; Francisco Luis Hernández Torres[1]

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Resumen

En el pacífico colombiano el chontaduro (*Bactris gasipaes* HBK, Arecales: Arecaceae) es un cultivo de alta importancia económica. Sin embargo, su producción se ha visto afectada desde el año 2010 por un complejo de plagas conocida comúnmente como "El Picudo", correspondiente a *Rhynchophorus palmarum* (L) y *Dynamis borassi* F. (Coleoptera: Dryophthoridae). Estas plagas atacan la inflorescencia y el tallo de las palmas, ocasionando su muerte. Se ha registrado la afectación de cerca de un millón de palmas, con impacto económico a los pobladores. Al inicio del daño es complicada su detección, debido a que se requiere un entrenamiento de los tipos de daño y una evaluación visual de todas las palmas del cultivo, generando costos importantes a los agricultores. La espectroradiometría es una técnica que permite el diagnostico fitosanitario de forma rápida y puntual, midiendo la reflectancia de sus hojas y correlacionando dichos datos con características biofísicas de las mismas. Se utilizó esta técnica para examinar el daño ocasionado por *R. palmarum/D. borassi* en dos cultivos de Buenaventura del Valle del Cauca, Colombia. Las firmas espectrales mostraron patrones de regiones espectrales diferentes entre las palmas con daños severos y sanas. Se encontró que en la región de 500-600 nm y en la región de 690-800 nm hubo una variación del -38% entre las firmas de las palmas sanas y las afectadas por el complejo de picudos. Estos resultados permiten realizar un diagnóstico temprano del ataque de barrenadores de inflorescencia y tallo, y facilitará el control de la plaga.

Sociedad Colombiana de Entomología SOCOLEN

VII ELEN Encuentro sobre Lepidópteros Neotropicales

La Sociedad Colombiana de Entomología - Socolen, certifica que:

Claudia Marcela García Chamizo

Participó en calidad de EXPOSITOR

EN EL 46 CONGRESO DE ENTOMOLOGÍA

Desafios entomológicos en la ocupación del territorio

17,18 y 19 de julio de 2019 - Medellín, Colombia.

Juan Humberto Guarín
Presidente 46 Congreso SOCOLEN

Amanda Varela Ramírez
Presidente Junta Directiva SOCOLEN

Appendix 2. Publication in Florida Entomologist:

Dynamis borassi (Coleoptera: Curculionidae), a new potential pest to the palms (Arecaceae): an early warning for the palm producers

Jackeline Gaviria[1,], James Montoya-Lerma[2], Inge Armbrecht[2], Bernhard Löhr[1], and Aymer Andrés Vásquez-Ordóñez[2]*

Abstract

Emergent and potentially invasive weevils are a permanent threat to the survival of palm plantations. Hence, understanding the role of emergent pests may be key for preventing future phytosanitary emergencies. In the present study, the role of *Rhynchophorus palmarum* L. and *Dynamis borassi* F. (both Coleoptera: Curculionidae) as main causative agents of the peach palm (*Bactris gasipaes* Kunth; Arecaceae) crown toppling problem were investigated, and the damage was described in 36 farms in the principal production areas of Colombia. A management strategy with the use of 2 pheromones (Rhynchophorol and Ferrolure) in 2 production areas also was evaluated. In total, 4,098 palms were examined from Nov 2017 to Feb 2019. Visible damage oscillated between 0 to 70% of palms affected and was highest on the Pacific coast. Larvae of *D. borassi* were found exclusively in the inflorescences suggesting that it initiates the damage. Meanwhile, adults of *D. borassi* and all stages of *R. palmarum* were recovered from stem damages. Also, new reports of damage were confirmed at the southern Pacific coast, the Andes, and the Amazon region. A total of 8,239 *D. borassi* and 2,886 *R. palmarum* were captured in pheromone traps for 14 mo on the Pacific coast. The traps baited with Ferrolure + Rhynchophorol captured a greater number of *D. borassi* specimens. The data strongly confirm the central role of *D. borassi* in peach palm damage. Therefore, it is recommended strongly that pheromones be used to prevent further spread of this pest in other countries of this region and to protect palm industries.

Key Words: American palm weevil; economic damage; pheromone traps; Neotropical palm weevil

Resumen

Los picudos emergentes y potencialmente invasivos son una amenaza constante para la supervivencia de las plantaciones de palmas. Por lo tanto, el comprender el papel de las plagas emergentes puede ser clave para prevenir futuras emergencias fitosanitarias. En el presente estudio se investigó el papel de *Rhynchophorus palmarum* L. y *Dynamis borassi* F. (ambos Coleoptera: Curculionidae) como principales causantes del problema de derribo de la corona de la palma de chontaduro (*Bactris gasipaes* Kunth; Arecaceae) y se describieron los daños en 36 fincas de las principales zonas de producción de Colombia. Además, se evaluó una estrategia de manejo con el uso de dos feromonas (Rhynchophorol y Ferrolure) en dos zonas de producción. En total, se examinaron 4,098 palmas entre noviembre de 2017 y febrero de 2019. Los daños visibles oscilaron entre el 0 a 70% de las palmas afectadas y fueron mayores en la costa del Pacífico. Las larvas de *D. borassi* se encontraron exclusivamente en las inflorescencias, lo que sugiere que es la causa del daño. Mientras tanto, los adultos de *D. borassi* y todos los estadios de *R. palmarum* se recuperaron de daños en los tallos. Se confirmaron nuevos reportes de presencia y daños en las regiones de la costa sur del Pacífico, los Andes, y del Amazonas. Un total de 8,239 *D. borassi* y 2,886 *R. palmarum* fueron capturados en trampas de feromonas durante 14 meses en la costa del Pacífico. Las trampas cebadas con Ferrolure + Rhynchophorol capturaron un mayor número de especímenes de *D. borassi*. Los datos confirman firmemente el papel central de *D. borassi* en el daño de las palmas del chontaduro. Se recomienda el uso de feromonas como una intervención temprana para prevenir la distribución de esta plaga a otros países de la región y proteger así las diferentes industrias asociadas a las palmas.

Palabras Claves: picudo americano de las palmas; daño económico; trampas de feromonas; picudo de las palmeras neotropicales

Palms represent one of the largest families of commercially important plants of the tropics and subtropics. Species such as coconut, *Cocos nucifera* L., African oil palm, *Elaeis guineensis* Jacquin, and date palm, *Phoenix dactylifera* L. (Arecaceae) are cultivated widely (Howard et al. 2001). Other palm species of regional or local importance have great potential for development due to their food and ornamental products. However, over the past few decades, an increasing number of serious pests have been threatening palm production and international commerce. Two examples where exotic palm pests have become serious economic problems are the red palm weevil, *Rhynchophorus ferrugineus* F. (Coleoptera: Curculionidae) (Fiaboe et al. 2012), and the red coconut mite, *Raoiella indica* Hirst (Acari: Tenuipalpidae) (Amaro & de Morais 2013), both of which have shown the ability to adapt to new host species and produce heavy damage (Faleiro et al. 2016;

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Milosavljević et al. 2019). Palm pests in their native range also may become a serious economic problem, such as the case of *Rhynchophorus palmarum* L. (Coleoptera: Curculionidae). This species has been shown to have high potential for invasiveness (Giblin-Davis et al. 2013) and the ability to adapt to new host species (Milosavljević et al. 2019, 2020a). This have been confirmed by recent reports of expansion into southern California and northwestern Mexico (García-Hernández et al. 2003; Aguilar 2017; Hoddle et al. 2020). Early alerts on such potentially serious invasive pests constitutes valuable information to prevent their spread, and to limit damage to other palm cultivation (Howard et al. 2001).

Dynamis borassi F. (Coleoptera: Curculionidae) is a native South America palm weevil of wide distribution that has been reported in the past principally on native, non-commercial palm species, mainly of the genera *Oenocarpus* (Couturier et al. 2000; Bautista-Giraldo et al. 2020) and *Astrocaryum* (both Arecaceae) (Couturier et al. 1998). However, here we present evidence of a host range expansion of this serious pest to peach palm, *Bactris gasipaes* Kunth (Aracaceae), the only domesticated native palm species of South America (Clement et al. 2010), widely used by indigenous and African-American populations in the humid tropical lowlands of the Amazon and Pacific coast for subsistence and local commerce (Mora-Urpí et al. 1997; Graefe et al. 2013).

Recently, in the Colombian Pacific coast area, this crop has been affected by 2 phytosanitary problems which have caused a drastic reduction in production, area, and yield (Agronet 2019). First, fruit abortion due to attack by the weevil *Palmelampius heinrichi* O'Brien & Kovarik (Coleoptera: Curculionidae), which causes losses of up to 100% of the fruits in the principal areas of production (Clement et al. 2004). More recently, the toppling of the crown, locally known as "desnucamiento" (broken neck), has led to a 75% reduction in the country's production (Agronet 2019).

The latter initially was attributed to *R. palmarum*, and a general pest alert was published by the Colombian phytosanitary authority (ICA 2015). However, Pardo-Locarno et al. (2016) and later Vásquez-Ordóñez et al. (2020) associated the problem with the Neotropical palm weevil, *D. borassi*. Both weevil species share similar morphological characteristics that make diagnosis difficult, particularly in the larval stage, where the damage occurs (Vásquez-Ordóñez et al. 2020).

Control measures suggested by the phytosanitary authority integrated mechanical, chemical, and ethological strategies. The last 2 focused on the use of the synthetic aggregation pheromone Rhynchophorol (2-methyl 5-hepten-4-ol), which is specific to *R. palmarum* (Giblin-Davis et al. 2013). However, this did not lead to a recovery of production (B. Löhr, unpublished), probably because *D. borassi* was not covered by the control strategy. A worrisome observation is that *D. borassi* has been reported as a vector of *Bursaphelenchus cocophilus* (Cobb) Baujard (Nematoda: Aphelenchoididae), a nematode causing the lethal disease known as red ring on coconut (Gerber et al. 1990; Giblin-Davis et al. 1997; Claro et al. 2009) and oil palm (Guerrero et al. 1995; Boari et al. 2016). At present, both are crops with huge commercial importance, the latter with great potential for further expansion into Colombia and other countries in Latin America (Mariau 2001; FAO 2009). Hence, *D. borassi* could develop into a considerable problem for the oil palm industry and for other palm species in many countries.

The principal purposes of this study were to: (1) properly identify the causative agent and document the process leading to the toppling of the palm crown; (2) to describe and quantify the extent of damage in the main production areas of Colombia; and (3) to propose a potential control with the use of 2 pheromones (Rhynchophorol and Ferrolure).

Materials and Methods

STUDY SITES

A total of 36 peach palm production sites in the Amazon, Andes, and Pacific regions of Colombia (Fig. 1) were included in this study. These regions are different slightly in altitude, topography, and climate, but it is not our aim to compare them. The Amazon and Pacific regions are at low altitude and of variable topography, but present high levels of precipitation and temperature compared to the Andes (Rangel-CH & Aguilar-P 2011). In the Pacific region, 2 locations were selected for the evaluation of the pheromone traps (Fig. 1). Both sites are accessible and are representative of the environmental conditions of this region; additionally, these were severely affected by crown toppling. In all areas, the peach palms were planted in small agroforestry plots requiring relatively low maintenance costs (low or no external inputs) and associated with other crops, such as plantain (*Musa × paradisiaca* L.; Musaceae), coffee (*Coffea arabica* L.; Rubiaceae), and cocoa (*Theobroma cacao* L.; Malvaceae). Basically, the plots were not intensively managed (except for eventual application of lime, insecticides, and fertilizers).

SAMPLING METHODS

For all sites (Supplementary Material 1), the crops were inspected, and weevil samples were taken. During Mar 2018 to Jul 2018 and Dec 2018 to Feb 2019, a variable area transect was delimited following, with modifications, the method described by Sheil et al. (2002). Specifically, a central transect line of maximum 80 m in length was established according to the size of the inspected field. Four rectangles, 20 m wide (perpendicular to the transect) were marked all along the transect from both the right and left of the central line. The length of each rectangle was determined by measuring the distance from the central line to the sixth palm with signs of damage. When 6 damaged palms were not found, the search was stopped at 50 m (Fig. 2). Healthy and damaged palms present in each rectangle were counted, and the proportion of affected palms was calculated for the entire transect.

DESCRIPTION OF PALM DAMAGE AND WEEVIL INFESTATIONS

In all sites, the types of damage attributable to weevils were described and, for each type, up to 6 palms per site were selected randomly for dissection. The infested palm was cut down after which the internal and external damage was recorded. All adults, pupae, and larvae belonging to any weevil species were collected. Larvae were boiled in water for 5 min (Stehr 1987); adults and larvae were preserved in 96% ethanol. The pupae were kept in 1.5 L multi plastic storage boxes (Home Collection, Cali, Colombia) until adults emerged, which were then stored in 96% ethanol. Both the adults collected from the stems and larvae collected in inflorescences were identified to species level following the keys of Wattanapongsiri (1966), Chamorro (2019), and direct examination of specimens as documented in Vásquez-Ordóñez et al. (2020).

PHEROMONE TRAPPING

The trapping system for both *R. palmarum* and *D. borassi* was established in 2 peach palm production sites, Bajo Calima (3.9536°N, 76.9764°W) and Sabaletas (3.7629°N, 76.9632°W), municipality of Buenaventura, Valle del Cauca, Colombia. During the 14 mo of the sampling period, 3 precipitation variables, i.e., mean daily rainfall, the proportion of d with rain, and maximum rainfall were analyzed. The mean daily rainfall corresponds to the monthly average of rainfall val-

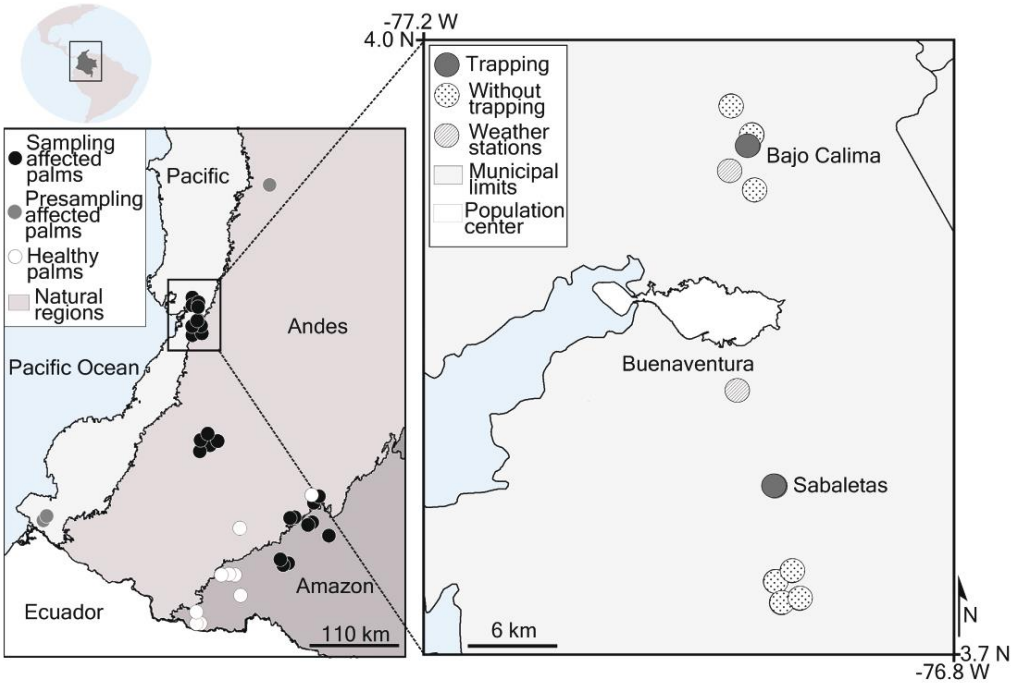

Fig. 1. Geographical location of the 36 peach palm production sites (circles) visited during the survey for palm weevil damage and pheromone trapping.

ues for every d and maximum rainfall at the highest daily rainfall value. This information was obtained from Bajo Calima (3.954°N, 76.990°W) and Buenaventura Airport (3.820°N, 76,992°W) meteorological stations, Valle del Cauca, Colombia (Institute of Hydrology, Meteorology and Environmental Studies, Bogotá, Colombia). Both stations are the closest to the 2 farms where the trapping was conducted.

At each site, 20 pheromone traps as described by Löhr and Parra (2014) were installed, 10 containing 0.5 mL of Rhynchophorol (2 methyl 5 hepten 4 ol, the synthetic aggregation pheromone of *R. palmarum*) (Cenipalma, Bogotá, Colombia) whereas the other 10 traps contained 0.5 mL of Rhynchophorol added with 700 mg of Ferrolure™ (4-methyl-5-nonanol) (Chemtica, San Jose, Costa Rica), the latter being the synthetic aggregation pheromone for *R. ferrugineus* and also for *D. borassi* (Giblin-Davis et al. 1997). As an attractive synergist, 4.5 mL of ethyl acetate was dispensed in each trap from Eppendorf tubes (Merk, Bogotá, Colombia). Freshly cut pineapple peel was used as food bait. To prevent weevil escape from the traps, deltamethrin insecticide 1 cm^3 L^{-1} (C22H-19Br2NO3) (Decis® Bayer, Leverkusen, North Rhine-Westphalia, Germany) was mixed with the food bait. The distance between traps was 120 m, selected due to the high infestation of weevils in the area. All traps were examined at weekly intervals from Sep 2018 to Oct 2019 to change (as necessary) the pheromones, pineapple peels, and addition of ethyl acetate. The captures for each trap were separated into their respective 1.5 L multi plastic storage box (Home Collection, Cali, Colombia), and later were sexed and counted by species (*R. palmarum* or *D. borassi*) according to morphological characteristics (Vásquez-Ordóñez et al. 2020).

The number of inflorescences was recorded monthly (Oct 2018 to Oct 2019) by selecting 3 palms near the position where traps were installed (60 palms for each site). In each review, the number of mature stems per palm and the number of damaged and healthy inflorescences were recorded.

STATISTICAL ANALYSES

A generalized linear mixed model was used to compare the effect of the 2 pheromone treatments on the abundance of the 2 weevil species throughout 14 mo at both sites. The generalized linear mixed model used Poisson error due to the discrete nature of data (counts) and because of the repeated measures throughout time in the same traps. Different models were adjusted according to the interactions among the explained factors with different random effects, and further selecting the best model according to the Akaike's Information Criterion and the Bayesian Information Criterion, and additionally evaluating the possible model overdispersion.

To detect the possible effects of pheromone type, weevil abundance, weevil species, and location of the traps on the average of healthy and damaged inflorescence (calculated from bimonthly data, thus avoiding re-counting of inflorescences), a generalized linear mixed model with different interactions between the factors, as well as tests of structures of different variance (homogeneous or heterogeneous) and a temporal correction was used. The best model was selected by penalized plausibility (Akaike's Information Criterion and Bayesian In-

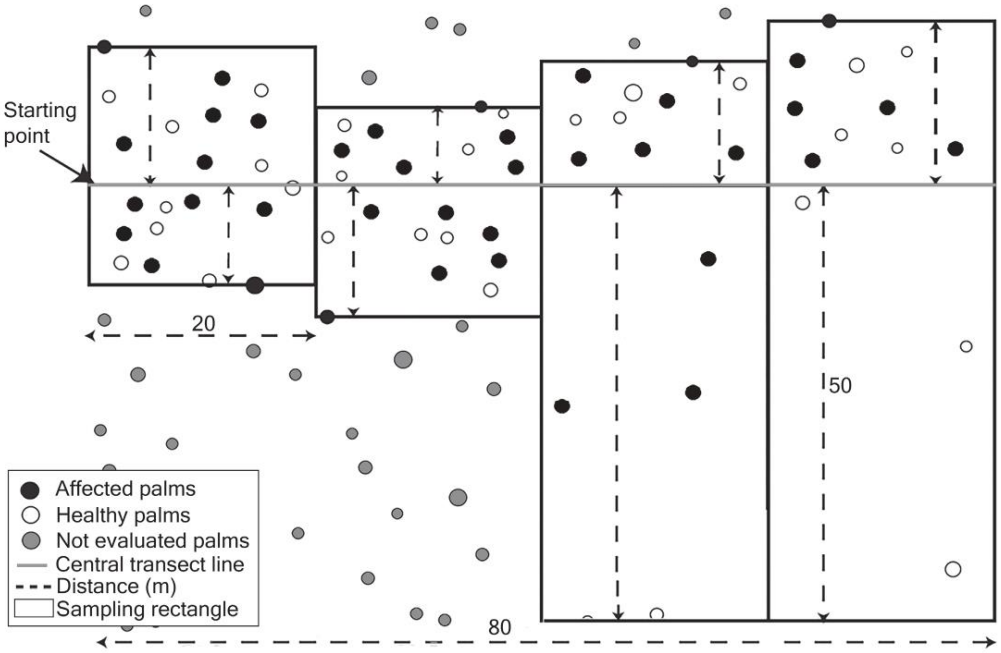

Fig. 2. Variable area transects used in the evaluation of the peach palm infestation by *Dynamis borassi* and *Rhynchophorus palmarum* in 33 production sites in Colombia. The size of each sampling rectangle is determined for the number of affected palms, as illustrated.

formation Criterion) and by plausibility ratio. Due to the absence of data for daily reports in some mo, the mean daily rainfall per mo was used instead of the use of the sum (WMO 2018). Other variables used were the maximum rainfall and the proportion of d with rain. All the statistical analyses were carried out using the free distribution program R version 3.6.2 (R Development Core Team 2019) with a significance level of 5%.

Results

DESCRIPTION OF PALM DAMAGE AND WEEVIL INFESTATIONS

In total, 4,098 peach palms in 36 production sites of the Amazon (Caquetá and Putumayo), Andes (Cauca), and Pacific (Nariño, Risaralda, and Valle del Cauca) region were examined between Nov 2017 and Feb 2019. We identified 4 stages of damage. First, the presence of holes in different parts of unopened inflorescences (also the distal section), where the larva consumes the flowers and rachis (Fig. 3a). Second, holes about 2 cm in diam in the upper part of the palm near the crown at the point of attachment of the inflorescence to the stem (Fig. 3a). Third, the presence of large longitudinal galleries inside the stem in the upper and middle parts of the palm, with elongated or irregular shapes (Fig. 3b, c). Fourth, the presence of a tilted or completely toppled crown palm (Fig. 3d).

The infestation was variable in all sites but always highest in the Pacific region followed by the Andes and Amazon (Figs. 1, 3e; Table 1). Noteworthy, damage level 4 was higher in the Pacific compared with the other 2 zones. However, damage level 3 was significantly higher in the Amazon area, and 1 and 2 were higher in the Andes (Table 1).

Of the 378 damaged palms, 87 were dissected in 14 farms from all regions. Six samples of inflorescences were taken from 2 sites in Nariño and 1 from Risaralda. A total of 686 weevils in different stages of development were found: 321 in different larval stages, 20 as adults, and 345 as pupae. From these, 30 larvae were identified as *D. borassi* and 291 as *R. palmarum*. Further, 78 adults emerged from pupae, totaling 98 adults (21 *D. borassi* and 77 *R. palmarum*). Larvae of *D. borassi* were found exclusively in the inflorescences. In contrast, adults of *D. borassi* and all stages of *R. palmarum* were recovered from stems.

PHEROMONE TRAPPING

The abundance of weevils captured showed significant differences (χ^2 = 1448.99; df = 1; P < 0.001) with a total of 8,239 *D. borassi* and 2,886 *R. palmarum* captured during the 14 mo of evaluation (Sep 2018 to Oct 2019) in the 2 production sites of Bajo Calima and Sabaletas. A higher number of weevils was trapped in the Bajo Calima with respect to Sabaletas (Table 2) (χ^2 = 5.27; df = 1; P = 0.022) (Supplementary Material 2).

Several factors such as the kind of pheromone, climate, and production sites significantly affected the abundance of *D. borassi*, but the kind of pheromone did not affect the abundance of *R. palmarum* (Supplementary Material 3; Table 3). The use of the combined pheromones Ferrolure + Rhynchophorol resulted in a significant effect on the

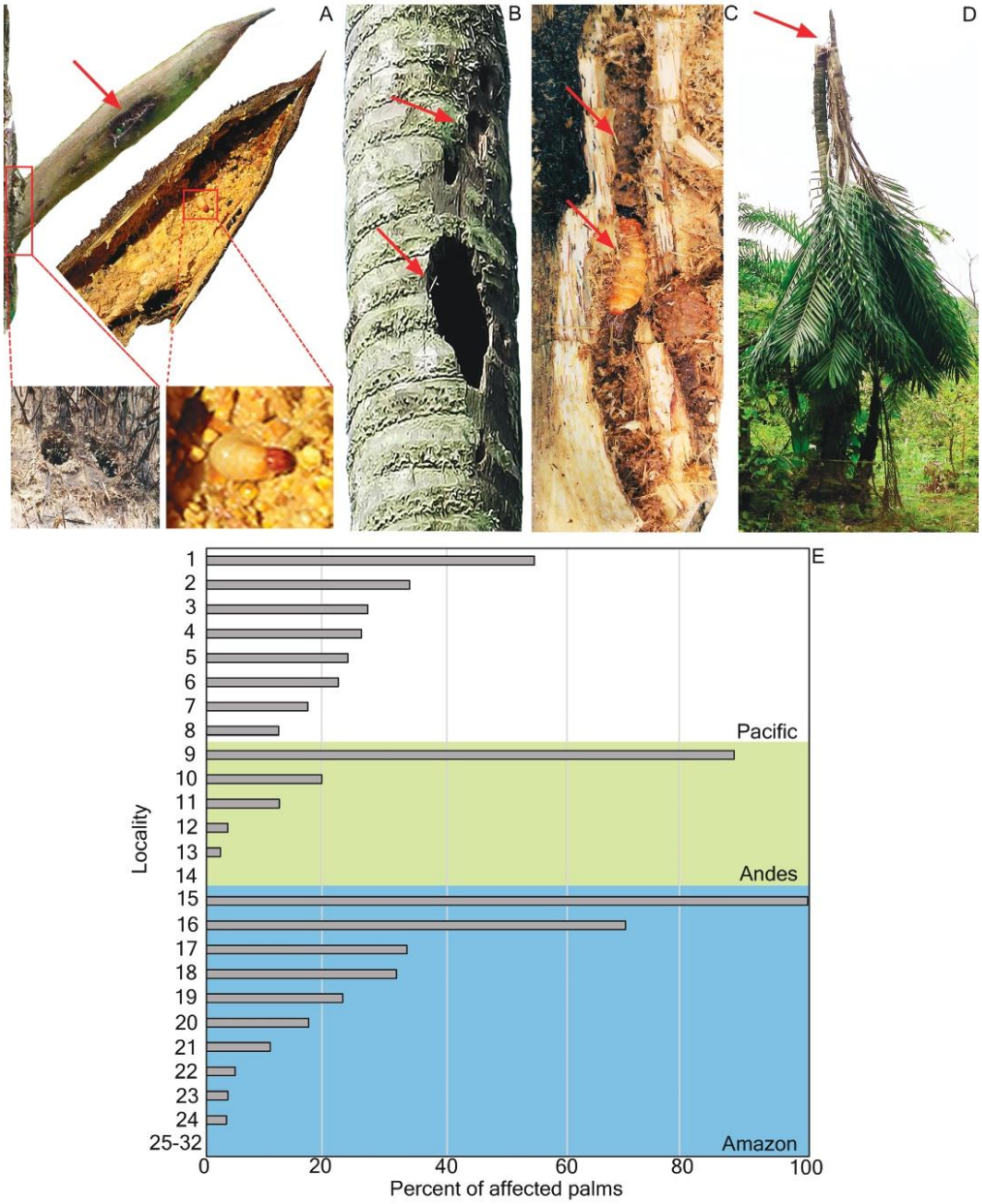

Fig. 3. Types of damages of weevil-damaged peach palms in 32 localities of Colombia. Inflorescence with perforation (arrow), circular hole at the insertion points and weevil larva inside (squares) (a); external view of trunk perforated by larvae, with round perforation exactly at the spot where the inflorescence is attached to the stem (arrow) (b); internal feeding galleries with larvae (arrow) (c); toppled crown (d); percent of affected palms by locality (e).

Table 1. Number of palms examined and affected by attack of *Dynamis borassi* and *Rhynchophorus palmarum* weevils in 3 Colombian regions. Damage was categorized according the physical characteristics.

Region	Number of palms examined	Number of palms affected (%)	Damage type (%)			
			1	2	3	4
Andes	713	83 (11.6)	28 (33.7)	24 (28.9)	13 (15.7)	18 (21.7)
Amazon	2,503	94 (3.8)	1 (1.1)	5 (5.3)	84 (89.4)	4 (4.3)
Pacific	882	201 (22.8)	4 (2.0)	15 (7.5)	130 (64.7)	52 (25.9)
Total	4,098	378 (9.3)	33 (8.7)	44 (11.6)	227 (60.1)	74 (19.6)

capture of *D. borassi* versus the use of the Rhynchophorol pheromone. *Rhynchophorus palmarum* capture numbers, as expected, were not affected by the pheromones (Tables 2, 3). The production site also played an important role in the abundance of *D. borassi*; the capture in Bajo Calima was significantly higher than the capture of this same species at Sabaletas (Table 2). The temporal variability was evident principally during 2019 for *D. borassi*, which had high abundance from Mar to Aug in Bajo Calima and Jan to Apr in Sabaletas (Fig. 4).

Between Oct 2018 and Oct 2019, a total of 291 damaged inflorescences and 110 healthy inflorescences were found in Bajo Calima, and 177 damaged inflorescences and 51 healthy inflorescences in Sabaletas. The highest damage figures were recorded in Feb and Sep of 2019 in Bajo Calima, and a higher value was reported only in Jan of 2019 in Sabaletas (Fig. 4). The best generalized linear mixed model (Akaike's Information Criterion = 109.4; Bayesian Information Criterion = 173.7; Log-likelihood = −39.7) showed a significant effect of the collecting mo, which suggests that the change in the average number of healthy and damaged inflorescences varies throughout the evaluated mo (Supplementary Material 4). On the other hand, a relationship between the average of damaged inflorescences and the total of weevils per mo for *D. borassi* in Sabaletas was found (Spearman = 0.82; df = 6; P = 0.02) (Fig. 5; Supplementary Material 5a).

Finally, we detected a clear effect of mo in the response variables. In Sabaletas, the mean daily rainfall and proportion of d with rain was correlated with *D. borassi* abundance (Spearman = −0.86; df = 6; P = 0.01; Spearman = −0.77; df = 6; P = 0.04, respectively) (Fig. 5e, f; Supplementary Material 5). The proportion of d with rain also was correlated with the average of damaged inflorescences (Spearman = −0.81; df = 6; P = 0.03). In Bajo Calima, the mean daily rainfall was correlated significantly with the average number of the total and healthy inflorescences (Spearman = −0.89; df = 6; P = 0.01; Spearman = −0.86; df = 6; P = 0.01, respectively) (Fig. 5c).

Discussion

The toppling of the crown appeared as a new problem in peach palm production around 2010 in the Pacific lowland of Colombia. The initial diagnosis attributed the damage solely to *R. palmarum*. However, the fact that crown toppling damage always was associated with dead or aborted developing inflorescences and with the migration of larvae through the stalk of the inflorescence to the stem of the palm (damage not typical for *R. palmarum*) suggested the presence of an additional species. This type of attack (reported in this study) in the palm inflorescence also has been documented for *D. borassi* in other native palms (Couturier et al. 2000; Beserra et al. 2006; Bautista-Giraldo et al. 2020). *Dynamis borassi* larvae were the only species collected inside inflorescences during our studies, whereas *R. palmarum* larvae were found exclusively within the stems. This confirms the idea that the latter species is opportunistic, as observed previously by Alpizar et al. (2002), and likely uses the damage caused by *D. borassi* as its entry point. It is likely that the joint attack of these 2 weevil species causes extensive structural damage until the crown of the palm finally drops (Pardo-Lorcano et al. 2016; Vásquez-Ordóñez et al. 2020). Early symptoms are negligible and quite difficult to detect. This may explain why the extensive and costly control efforts directed at *R. palmarum* did not contain the problem, and over time more and more areas in Colombia have been affected negatively.

Although both weevils are sympatric and have been around for yr, the known host range for *R. palmarum* is wider significantly than that for *D. borassi* (EPPO 2005; Bautista-Giraldo et al. 2020; Vásquez-Ordóñez et al. 2020). This makes the latter more vulnerable to changes in the environment, especially deforestation or selective harvesting of its host palms, and may have triggered a change in its host selection and acceptance behavior. Therefore, a former economically unimportant species may be developing into a potential key pest for palms. The problem may become more widespread if *D. borassi* is reported in oil palm (Guerrero et al. 1995; Boari et al. 2016), for which Colombia is one of the main world producers (Potter 2020).

In the present study, the Pacific was the region that presented damage in all sampled localities. This situation may be a consequence of the continuous weevil attacks reported since 2010 (ICA 2015; Pardo-Locarno et al. 2016).

As the traps baited with Ferrolure + Rhynchophorol captured a greater number of *D. borassi* specimens, it is evident that there is no significant repellency or inhibition effect when these semiochemicals

Table 2. Number of males and females of *Rhynchophorus palmarum* and *Dynamis borassi* captured in 2 peach palm production sites, Bajo Calima and Sabaletas, municipality of Buenaventura, Valle del Cauca, Colombia, during a 14 mo period, using 2 aggregation pheromones (Ferrolure and Rhynchophorol).

Locality	Pheromone	*Dynamis borassi*		*Rhynchophorus palmarum*		Total
		males	females	males	females	
Sabaletas	Ferrolure + Rhynchophorol	524	690	385	445	2,044
	Rhynchophorol	252	333	328	432	1,345
Bajo Calima	Ferrolure + Rhynchophorol	1722	2,062	236	449	4,469
	Rhynchophorol	1247	1,409	220	391	3,267
	Total	3,745	4,494	1,169	1,717	11,125

Table 3. Analysis of variance of the best mixed generalized linear model of relationship between *Dynamis borassi* and *Rhynchophorus palmarum* abundances in traps with respect to pheromones, sampling mo, and locality. Details of selection of model in Supplementary Material 3.

	Dynamis borassi (NPW)			*Rhynchophorus palmarum* (APW)		
	χ^2	DF	P-value	χ^2	DF	P-value
Pheromone	4.196	1	0.04052	0.54	1	0.4634
Mo	623.32	13	< 2.2e–16	82.13	13	4.4E–12
Sites	15.34	1	9.0E–05	20.14	1	7.2E–06
Pheromone: mo	97.0564	13	6.16E–15	45.64	13	1.6E–05
Pheromone: sites	0.02	1	0.8834	2.82	1	0.0934
Mo: sites	417.18	13	< 2.2e–16	61.59	13	2.7E–08
Pheromone: mo: sites	41.0255	13	9.44E–05	19.59	13	0.1059

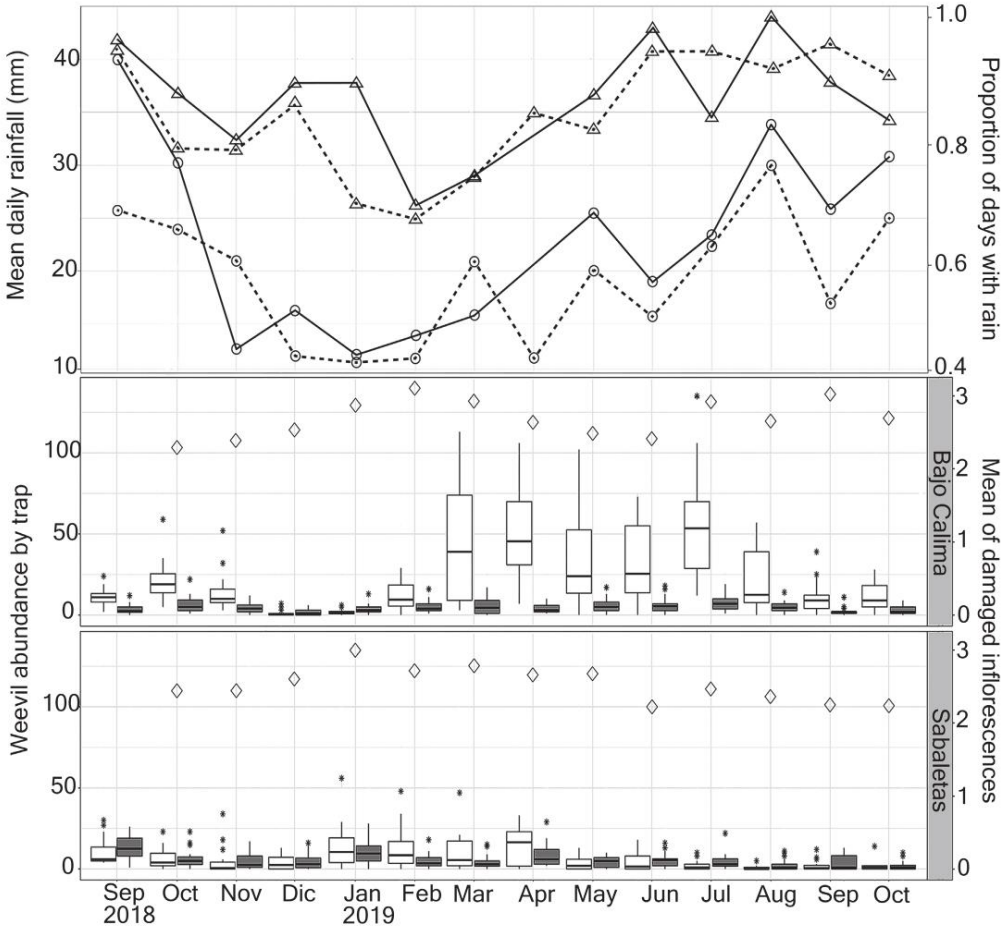

Fig. 4. Precipitation, weevil abundance, and mean of damaged inflorescences between Sep 2018 and Oct 2019. The precipitations (top panel) corresponding to mean daily rainfall (circle) and proportion of d with rain (triangles) were documented for Bajo Calima (solid line) and Sabaletas (dashed line). The abundance was represented with whiskers diagram for *Dynamis borassi* (white boxes) and *Rhynchophorus palmarum* (gray boxes). The asterisks are outliers. The damaged inflorescences were reported with rhombus.

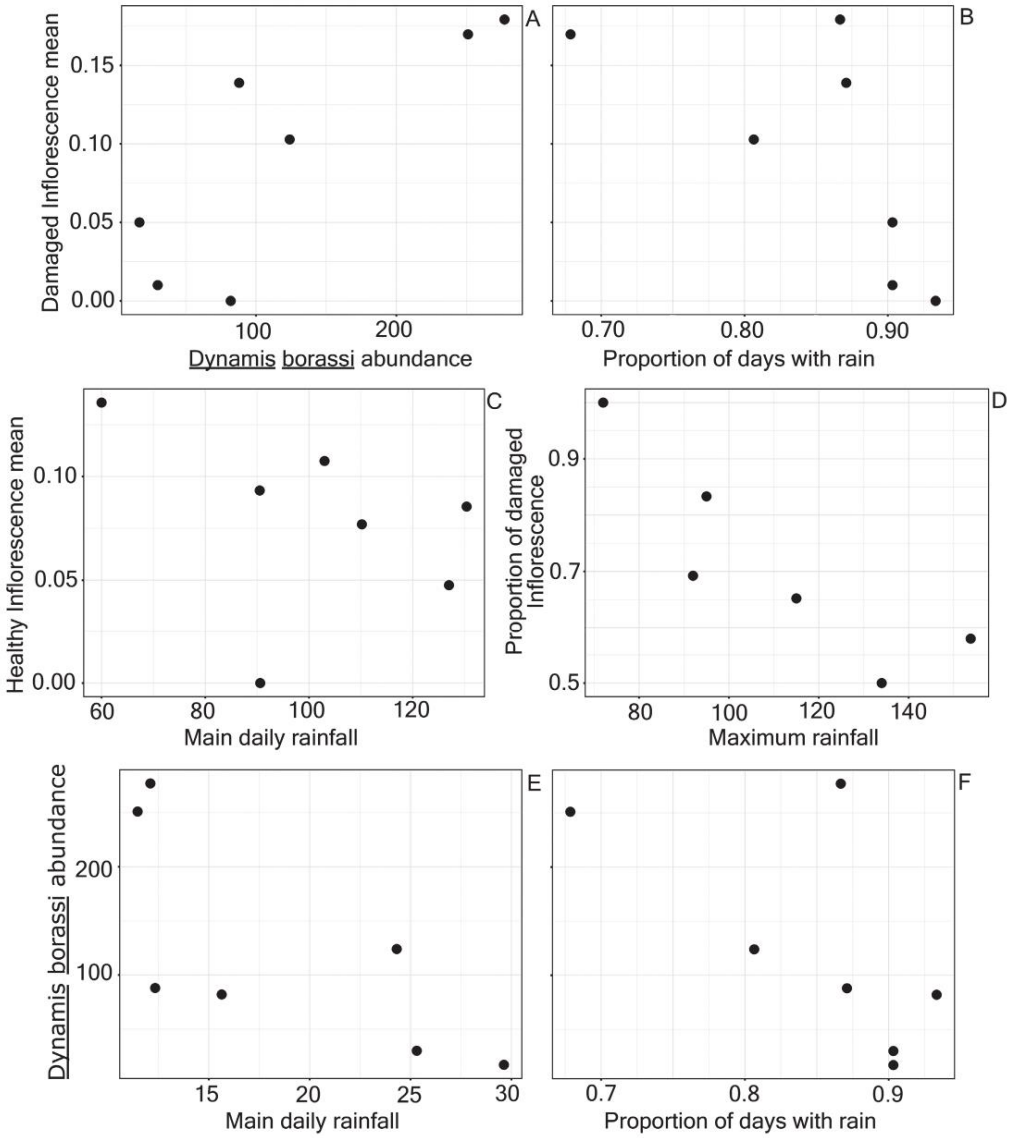

Fig. 5. Relationship between damaged inflorescence average with respect to the *Dynamis borassi* abundance (A) and proportion of d with rain (B); the proportion of healthy and main daily rainfall (C) damaged inflorescences; proportion of damaged inflorescence and maximum rainfall (D); the *D. borassi* abundance with respect main daily rainfall (E) and proportion of d with rain (F). Data was obtained in Sabaletas (A, B, D–F) and Bajo Calima (C), Valle del Cauca, Colombia.

are combined; similar results were reported by Milosavljević et al. (2019). This may represent a useful tool for pest control in palm plantations (Giblin-Davis et al. 1997). Ferrolure (4-methyl-5-nonanol) is a pheromone specific to the capture of *D. borassi*; however, Giblin-Davis et al. (1997) and Rochat et al. (2000) also found attraction of this species to the specific pheromone for *R. palmarum*, i.e., Rhynchophorol (6-methyl-2-hepten-4-ol). Pineapple peel used as food bait in this work also could have played an important role in the number of catches,

as suggested by Rochat et al. (2000). The effectiveness of this bait to attract large numbers of weevils on its own also have been observed in other studies (Wahizatul & Haris-Hussain 2014; Murguía-González et al. 2018). The use of different types of traps and other food baits may render better results (Abdel-Azim et al. 2017; Milosavljević et al. 2020a, b); however, this specific subject was not our purpose.

The differential response in the abundance of weevils and damaged inflorescences in Bajo Calima and Sabaletas demonstrates that there are local particularities in different localities despite their proximity (24.3 km), even with similarity in the evaluated precipitation variables (Fig. 1). The larger *D. borassi* catch in Bajo Calima should be related to the landscape component of the area: *D. borassi* has been reported in native palms such as "naidi" (*Euterpe oleracea* Mart), "guérregue" (*Astrocaryum standleyanum* L. H. Bailey), but principally associated with "milpesos" (*Oenocarpus bataua* Mart) (all Arecaceae) (Couturier et al. 2000), a palm species widely distributed in the Bajo Calima landscape (Bautista-Giraldo et al. 2020).

As expected, damage to inflorescence was correlated significantly with the abundance of *D. borassi*, corroborating the fact that this species initiates damage to the palm with an attack on the inflorescence, as indicated above. This factor must be considered when planning pest control campaigns in peach palm, i.e., whenever increases in *D. borassi* numbers are detected on time and taken care of, further damage by both weevils can be prevented.

For both species, the capture of females always was higher than that of males. This result coincides with that reported by several authors (Ramírez et al. 2000; Ferreira et al. 2003; Sumano et al. 2012; Moya-Murillo et al. 2015; Milosavljević et al. 2020a), who obtained a higher capture of females in traps baited with aggregation pheromone. According to Sánchez et al. (1993), the biotic potential or fertility of a female of *R. palmarum* is high with an oviposition capacity between 697 and 924 eggs throughout her life. A study on the life cycle of *D. borassi* showed that a female can lay hundreds of eggs (around 300 per female in laboratory conditions), and it takes about 201 d to develop to the adult stage (Cuéllar-Palacios et al. 2020). We suggest that an efficient management strategy for *D. borassi* in peach palm would be based on an integrated approach. First, it would be essential to determine the areas with low and high infestation levels in order to establish the number of pheromone-baited traps to deploy in each area. It is expected that pheromone-baited traps would reduce populations of both *D. borassi* and *R. palmarum*. This strategy could be complemented by removal of seriously damaged palms to reduce reproduction. In addition, we are studying the possibilities to collect and introduce a tachinid parasitoid from Brazil that may provide durable relief from damage by the palm weevil (Löhr et al. 2019).

In conclusion, the peach palm in Colombia has a new serious weevil pest that causes considerable economic losses and attacks other palms. The relatively recent appearance of this problem on the southern Pacific coast of Colombia, the invasion of an inter-Andean area during our study (A. Vasquez, unpublished), and the first report in the Colombian Amazon demonstrated its potential for further expansion. A genetic study of the natural and invasive populations should be able to demonstrate a possible selection process for adaptation of this weevil species to peach palm and help in diagnostics should neighboring countries be affected.

The confirmation of the central role of *D. borassi* in the toppling of the crown of the peach palm is the main contribution of this study and should lead to the redirection of pest management plans. It also should alert managers about the potential of this pest to expand to other economically important palms. As for control methods, the *D. borassi* pheromone was shown to be very effective in capturing high numbers of individuals. As *D. borassi* is the agent that initiates the problem, the use of pheromones could prevent further outbreaks as discussed above.

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ARTICLE

Comparative morphology of the larvae of the palm weevils *Dynamis borassi* (Fabricius) and *Rhynchophorus palmarum* (Linnaeus) (Curculionidae: Dryophthorinae): Two major pests of peach palms in the Neotropics

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Abstract. The morphology of the larvae of *Dynamis borassi* (Fabricius) and *Rhynchophorus palmarum* (Linnaeus) was compared, described and illustrated. A complete definition of subtribe Rhynchophorina at the larval stage was elaborated, based on mature and submature larvae, and characters of the first instar larvae are provided for the first time. Diagnostic characters to distinguish the larvae of *D. borassi* and *R. palmarum* are mainly from the epipharynx and maxillae, but the abdominal terminal plate also provides differential features that can aid in the identification. The characterization of both species at the larval stage is expected to be useful in the implementation of new control strategies in palm plantations in South America. For practical reasons, a comparative table is appended in Spanish to serve as a quick diagnostic guide for species identification.

Key-Words. Coleoptera; Palm weevils; Larval morphology; *Bactris gasipaes;* Neotropical Region.

INTRODUCTION

The weevils *Dynamis borassi* (Fabricius, 1801) and *Rhynchophorus palmarum* (Linnaeus, 1758) attack native, ornamental and commercially cultivated palms in tropical America (Couturier *et al.,* 2000; Löhr *et al.,* 2015), with significant economic impacts. *Dynamis borassi* has generated losses of up to 57% in experimental cultures of the palm *Oenocarpus mapora* Karst (Couturier *et al.,* 2000). Meanwhile, for *R. palmarum,* its effect as a vector of the nematode *Bursaphelenchus cocophilus* (Cobb, 1919) on oil and coconut palms has been widely documented, having caused the elimination of large-scale production areas such as Tumaco Bay in Colombia (Löhr *et al.,* 2015).

A similar situation has developed over the last decade in the production areas of peach palm, *Bactris gasipaes* Kunth (locally known as "chontaduro"), in Colombia. There has been a production loss of 48% (Agronet, 2016), attributable to the attacks of both *D. borassi* and *R. palmarum* (ICA, 2015; Pardo-Locarno *et al.,* 2016). Although the presence of *D. borassi* has been documented, current management plans are designed exclusively to control *R. palmarum* (ICA, 2015). Consequently, peach palm production in most of the Pacific lowlands of Colombia has come to a stand-still (A.A. Vásquez-Ordóñez, unpublished). There is ample evidence now that the attack on the peach palm is initiated by *D. borassi,* and *R. palmarum* only comes in as an opportunist pest (A.A. Vásquez-Ordóñez, unpublished). This may be due to the difficulty to distinguish the larvae of both species, indispensable to determine the role of each species.

A key step in palm weevil research is to develop identification tools that allow field researchers to distinguish the larvae of these species since it is at this stage that major damage is caused. Morphological descriptions of the larvae of *D. borassi* and *R. palmarum* were made and illustrated by Wattanapongsiri (1966), in addition to those by Cotton (1924) and Anderson (1948). These authors

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recognize the high structural similarity of both species at the larval stage, highlighting the value of some mouthpart structures for differentiation. However, these larval descriptions differ in the terminology used and problems often arise when doing the identifications. Furthermore, details of body chaetotaxy and other taxonomic characters, widely documented in other weevils, are missing or poorly documented. Recently, Chamorro (2019) provided a synoptic key to larvae of genera of Dryophthorinae, based mainly on characters of the mouthparts. The key includes both genera, but information on *Dynamis* is rather incomplete as no material was available for examination, with only a few characters extracted from existing literature. Therefore, a comparative morphological study of the larvae of *D. borassi* and *R. palmarum,* using standardized terminology is urgently needed to facilitate accurate identification of both species at the larval stage. This is fundamental to document the occurrence and role of *D. borassi* in the recent wide-spread mortality of peach palms in Colombia. It is expected that the new morphological tools will facilitate rapid phytosanitary diagnoses in the field, since rearing larvae to the adult stage can take up to six months (Wattanapongsiri, 1966; Cuellar Palacios, 2019), making the monitoring and control processes too lengthy.

MATERIAL AND METHODS

We studied 23 larvae, 12 belonging to *D. borassi* and 11 to *R. palmarum.* All larvae of *D. borassi* were obtained from adults collected in pheromone traps (ferrugineol) from peach palm plantations in Colombia. The progenitors of five mature and four submature larvae were collected at Tadó, Chocó (05°17'08.82"N, 76°29'16.34"W) in March 2016. Two first instar and one second instar larvae were produced by females collected in Zabaletas and Bajo Calima, Buenaventura, Valle del Cauca (03°59'00.05"N, 76°58'49.77"W; 03°45'47.69"N, 76°57'49.69"W, respectively) in September 2017. The larvae were reared on artificial diet following the protocol described by Löhr (2016), in the entomology laboratory of the Colombian Corporation of Agricultural Research (AGROSAVIA), Palmira Research Center, Valle del Cauca, Colombia. On the other hand, a mature larva of *R. palmarum* was collected inside the stem of a peach palm at Pueblo Rico, Santa Cecilia (05°20'10.72"N, 76°08'23.06"W), in November 28, 2017. One first instar, four submature and five mature larvae of *R. palmarum* were reared from adults collected in pheromone traps at Palmira Research Center.

The taxonomic identity of the larval specimens and of their associated adults was corroborated with the keys of Wattanapongsiri (1966), Giblin-Davis *et al.* (2013) and Chamorro (2019).

The observations, photographs and illustrations for the morphological descriptions were done using the following equipment: Canon EOS 6D Mk ii camera with EF100 mm f/2.8 lens associated with a light box; Nikon DS-Ri1 U3 and JVC KY-F75U cameras, associated with a Nikon SMZ-1500 and a Leica MZ16f stereo microscopes, respectively. Subsequently, the larvae were dissected and prepared on microscopic slides as in May (1994) and Marvaldi (1999). Finally, the structural characters were documented and illustrated with a Leitz Laborlux S compound microscope and a Nikon SMZ800 stereomicroscope, using their attached drawing tubes. The terminology followed for body parts and setae of the larva of Curculionidae is explained in Marvaldi (1999), May (1994) and Oberprieler *et al.* (2014). Most larval specimens studied were deposited in the Entomology collection of Museum of La Plata, Buenos Aires, Argentina (MLP). The mature larvae of *D. borassi,* one first instar larva of *R. palmarum,* and adult specimens of both species were deposited in the Entomology Museum of the Universidad del Valle (MUSENUV), Cali, Valle del Cauca, Colombia.

RESULTS

The morphology of the larvae of *Dynamis borassi* and *Rhynchophorus palmarum* was compared, described and illustrated. A complete larval re-description was elaborated, based on mature and submature larvae, and a characterization of the first instar larva is newly provided. For *D. borassi* and *R. palmarum,* the diagnostic larval characters that distinguish them are given.

Subtribe Rhynchophorina (Figs. 1-9)

The following description applies to mature (and submature) larvae of both *Dynamis borassi* and *Rhynchophorus palmarum,* which are, respectively, the type species of the genera *Dynamis* and *Rhynchophorus.* It is descriptive of the larval stage of the subtribe Rhynchophorina of the current classification of dryophthorines (see Anderson & Marvaldi, 2014).

Mature larva (Figs. 1-7)

Body (Figs. 1A-F) very robust, expanded at middle of abdomen between segments III and VI, narrowing posteriad, with abdominal segments VIII and IX forming a depressed terminal disc (Figs. 6B, 7A-B). Thoracic and abdominal segments with sternellum present (Figs. 1B, E, 6A). Cuticle (Fig. 6) sclerotized around setal groups, elsewhere with coarsely distributed asperities like small spicules; vestiture consisting of sparsely-distributed red-brown setae, mostly short or minute, except longer on terminal disc.

Head (Figs. 2A-B) exposed, longer than wide, strongly sclerotized and deeply pigmented, with paler paramedian stripes. Cervix without typical postoccipital condyles, its dorsal side often thickened and with a pair of cervical sclerites on the membrane at joint of head and prothorax (Fig. 2C). Frontal lines distinct, reaching antennae; frons with two medial longitudinal grooves. Endocarina absent. Antennae in oblique position on anterior margin

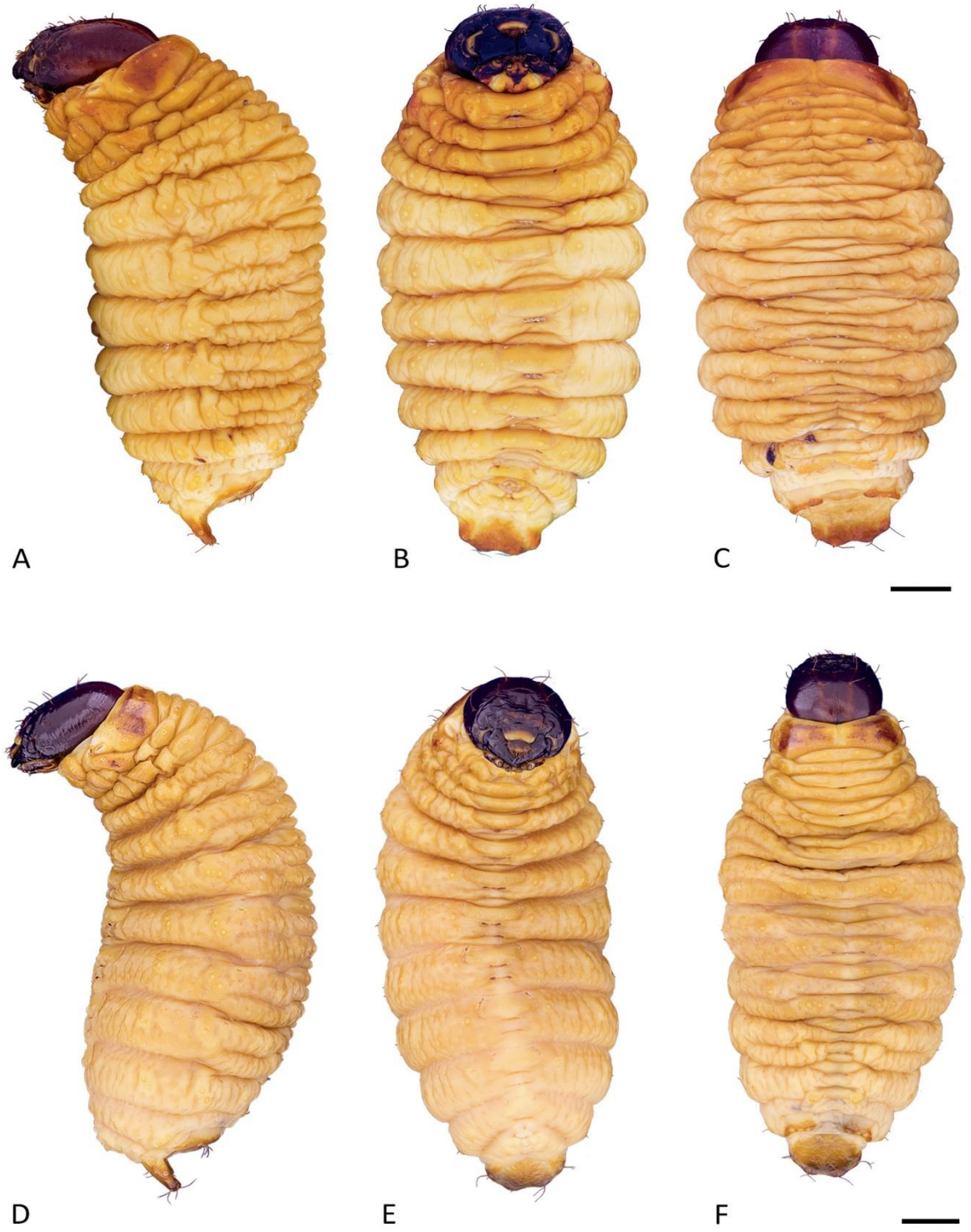

Figure 1. Habitus of mature larva (lateral, ventral, dorsal). (A-C) *Dynamis borassi* (Fabricius); (D-F) *Rhynchophorus palmarum* (Linnaeus). Scale bars: 5 mm.

of head; sensorium longer than wide, subconical, circular in apical view (Fig. 2D). Stemmata present, anterior one distinct, near antenna, posterior one faint in older larvae. Five dorsal epicranial setae (*des*) present; *des1*, *des3* and *des5* longest, *des2* short and *des4* minute; *des3* on epicranium, close to frontal line; five frontal setae (*fs*), *fs3* and *fs5* longest, *fs4* short to well developed, *fs1* and *fs2* minute; four minute posterior epicranial setae (*pes*); two lateral epicranial setae (*les*) unequal in size, *les1* much smaller; ventral cranial setae (*vcs*) unconspicuos. Hypopharyngeal bracon clear. Clypeus (Fig. 3A) with two setae, unequal in size (*cls 1* much larger than *cls 2*), and one sensillum between *cls* on each side. Labrum (Fig. 3A) pigmented, with anterior margin truncate or slightly produced at middle; labrum with three pairs of setae (*lms*), with a pair of basal sensilla, and a pair of anterior sensilla, the latter situated near *lms2*. Epipharynx (Figs. 3B-C, 4A-B) with simple setae, with five to more anterolateral setae (*als*); bearing patches of dense pubescence medially and laterally; epipharyngeal sensillum clusters present, a distal pair of three sensillae each, between labral rods, and a proximal pair of two sensillae each; labrum-epipharynx with labral rods elongate, slightly sinuate, joined posteriorly. Mandibles (Figs. 4C-J) robust, dark, often bidentate at apex, with median tooth and a molar area on inner side; with basal sensillum and two short setae on outer surface (*mds 1, 2*) placed in pits, aligned longitudinally. Maxillae (Figs. 5A-I) with mala truncate and slightly excised apically, bearing several dorsal setae (*dms*) aligned in a row medially and irregularly placed proximally (Figs. 5E-F); some *dms* branched, mostly bifid; ventral malar setae (*vms*) simple (Fig. 5H); maxillary palpi 2-segmented, basal palpomere with two sensilla and one minute seta (Fig. 5I). Labium (Figs. 5A-D) with palpi 2-segmented; premental sclerite trident shaped; postmentum sclerotized and pigmented in mesal and lateral areas, with a lighter stripe between them; three postmental setae (*pms*), proximal pair (*pms1*) closer together than *pms2* and *pms3,* median pair (*pms2*) the longest; hypopharynx (Figs. 5C-D) densely setose in lateral areas, medially smooth with a longitudinal furrow.

Thorax (Fig. 6A). Pronotum (Figs. 6A, 1C, F) well pigmented, consisting of two sclerotized halves separated

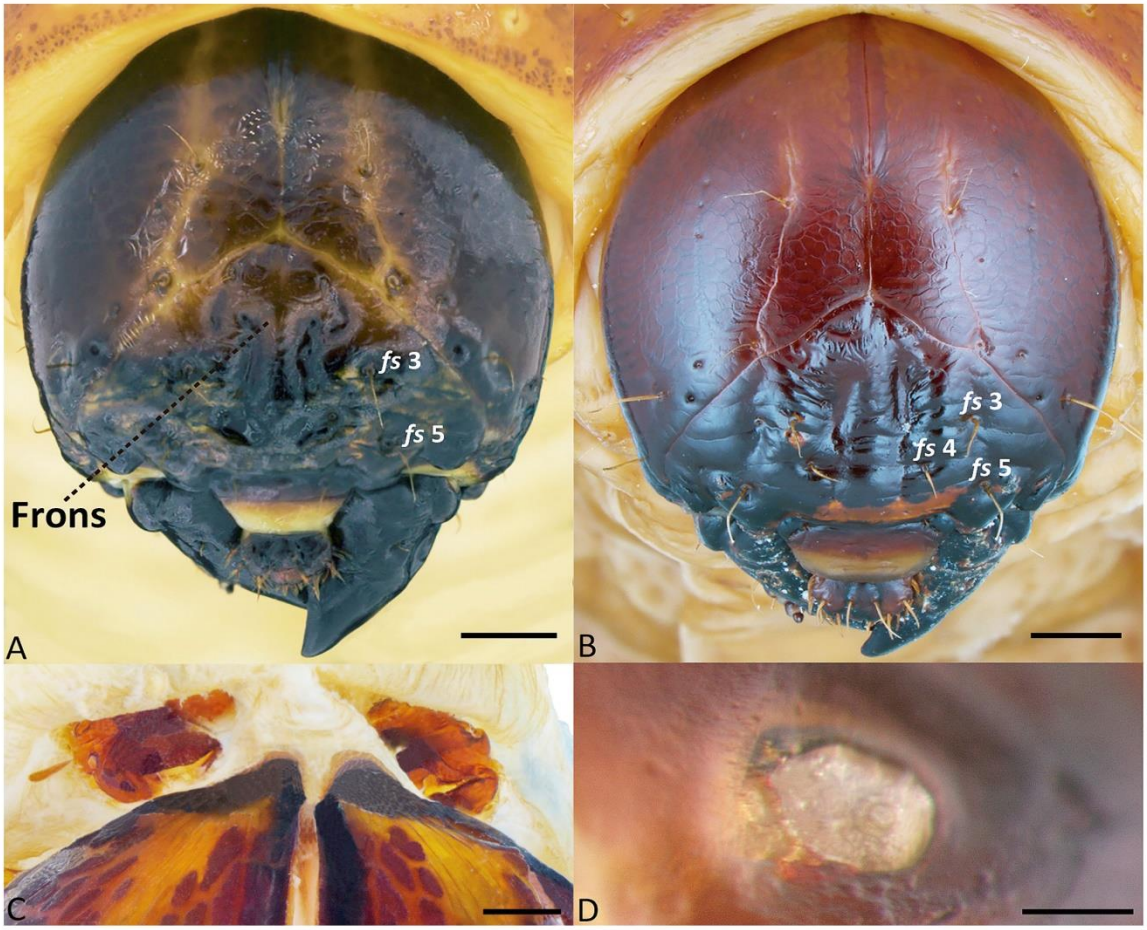

Figure 2. Head of larva, anterodorsal: (A) *Dynamis borassi* (Fabricius); (B) *Rhynchophorus palmarum* (Linnaeus). (C) *D. borassi,* postoccipital membrane showing cervical sclerites; (D) *R. palmarum,* antenna, apical. Scale bars: A and B = 2 mm, C = 0.4 mm, D = 0.1 mm.

dorsally by a lighter band, bearing few pronotal setae (five to seven). Prothoracic sternum with a median depression (Figs. 1B, E). Meso- and metathorax (Fig. 6A) with one seta on alar area and several very short spiracular setae (*ss*); epi- and pleural areas subdivided into two lobes. Pedal areas with six setae, one of them minute, close to the longest one. Thoracic spiracles (Figs. 6A, 7C, F-G) placed on prothorax, narrow-ovate, without airtubes.

Abdomen (Fig. 6). Typical abdominal segments (Figs. 1, 6A) with four dorsal folds, bearing five postdorsal setae (*pds*). Segments VIII and IX (Figs. 1, 6B) with fewer but longer dorsal setae, forming a sclerotized dorsal disc, with posterior margin extended into two pairs of broadly defined, seta-bearing lobes (Figs. 6B, 7A-B). Epi- and pleural areas subdivided into three lobes (Figs. 1, 6A). Anal region (Fig. 6B) ventral, anus transverse, four anal lobes, the lateral ones bearing one or two small setae. Spiracles narrow-ovate, without airtubes (Figs. 6A-B, 7D-E, I-J); abdominal spiracles I to VII (Figs. 6A, 7D-E) placed laterally near anterior margin of segments, much smaller than the VIII, but functional; spiracles of segment VIII (Figs. 6B, 7I-J) well developed and placed on dorsum, aligned longitudinally.

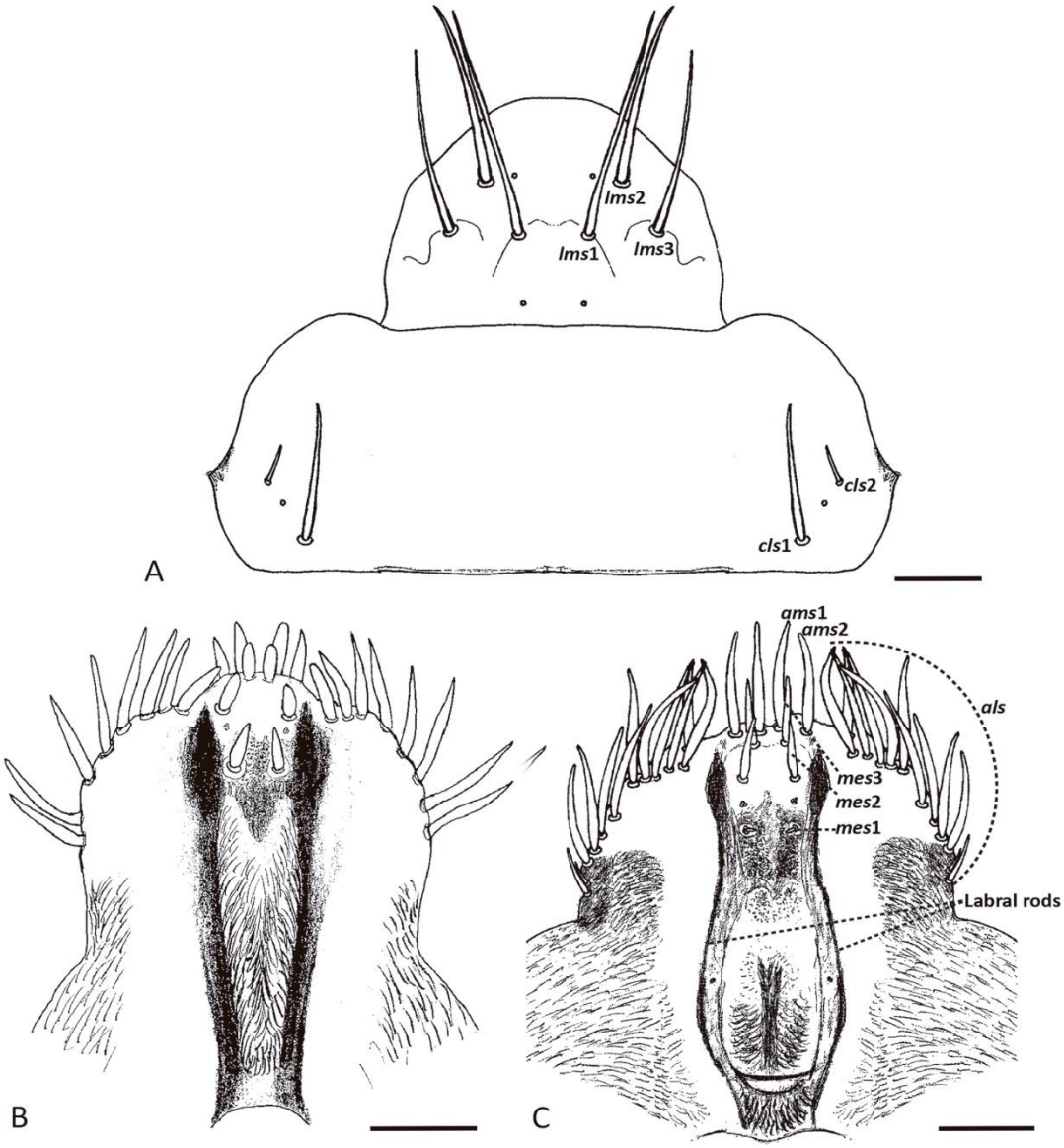

Figure 3. Larval mouthparts. (A) *Rhynchophorus palmarum* (Linnaeus), clypeus and labrum; (B) *Dynamis borassi* (Fabricius), epipharynx; (C) *R. palmarum,* epipharynx. Scale bars: 0.5 mm.

First instar larva (Figs. 8A-F, 9A-C)

Both anterior and posterior stemmata distinct, as dark pigmented spots, anterior larger than posterior (Fig. 8C). Egg-bursters (Fig. 8D) present on abdominal segments IV to VII, on either side in the dorso-lateral region of each segment, the posterior pair smaller than those in AIV-AVI; each egg burster (Fig. 8E) arising on a convex tubercle and consisting of a sub-conical, forwardly directed spine, situated anterior to a blunt seta. Only the spiracles of

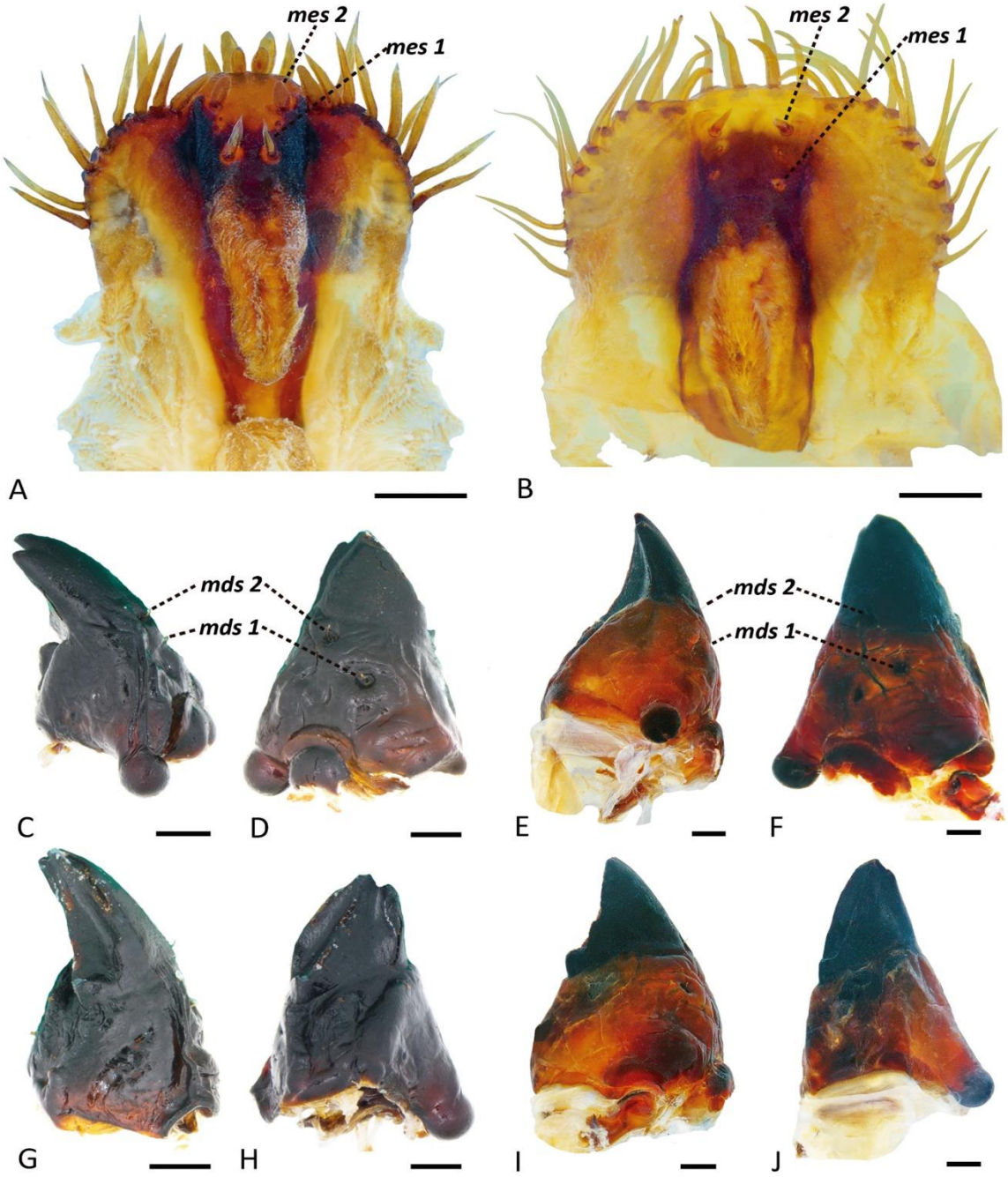

Figure 4. Larval mouthparts. *Dynamis borassi* (Fabricius): (A) epipharynx; (C-D, G-H) mandible in dorsal, outer, ventral and inner views. *Rhynchophorus palmarum* (Linnaeus): (B) epipharynx; (E-F, I-J) mandible in dorsal, outer, ventral and inner views. Scale bars: 0.5 mm.

thorax and abdominal segment VIII (Fig. 8F) are distinct, abdominal spiracles I to VII absent. Abdominal terminal plate (Fig. 8F) with margins only weakly sinuated.

Comments: The characters mentioned above are exclusive of the first instar. Additional differences between early and older instar larvae involve relative dimension of structures, like the antennae, which are relatively much larger in the first instar; the pigmentation and level of sclerotization of body areas tend to increase in successive instars; the differences in length between setae of body areas are higher in early instars; when setae are supernumerary (compared to modal numbers), such as those placed laterally in the epipharynx or dorsally in the maxillary mala, their amount is higher in later instars.

Dynamis borassi (Fabricius, 1801)

Mature larva: Figs. 1A-C, 2A, C, 3B, 4A, C-D, G-H, 5A, C, E, 7A, 7C-E, G-I.

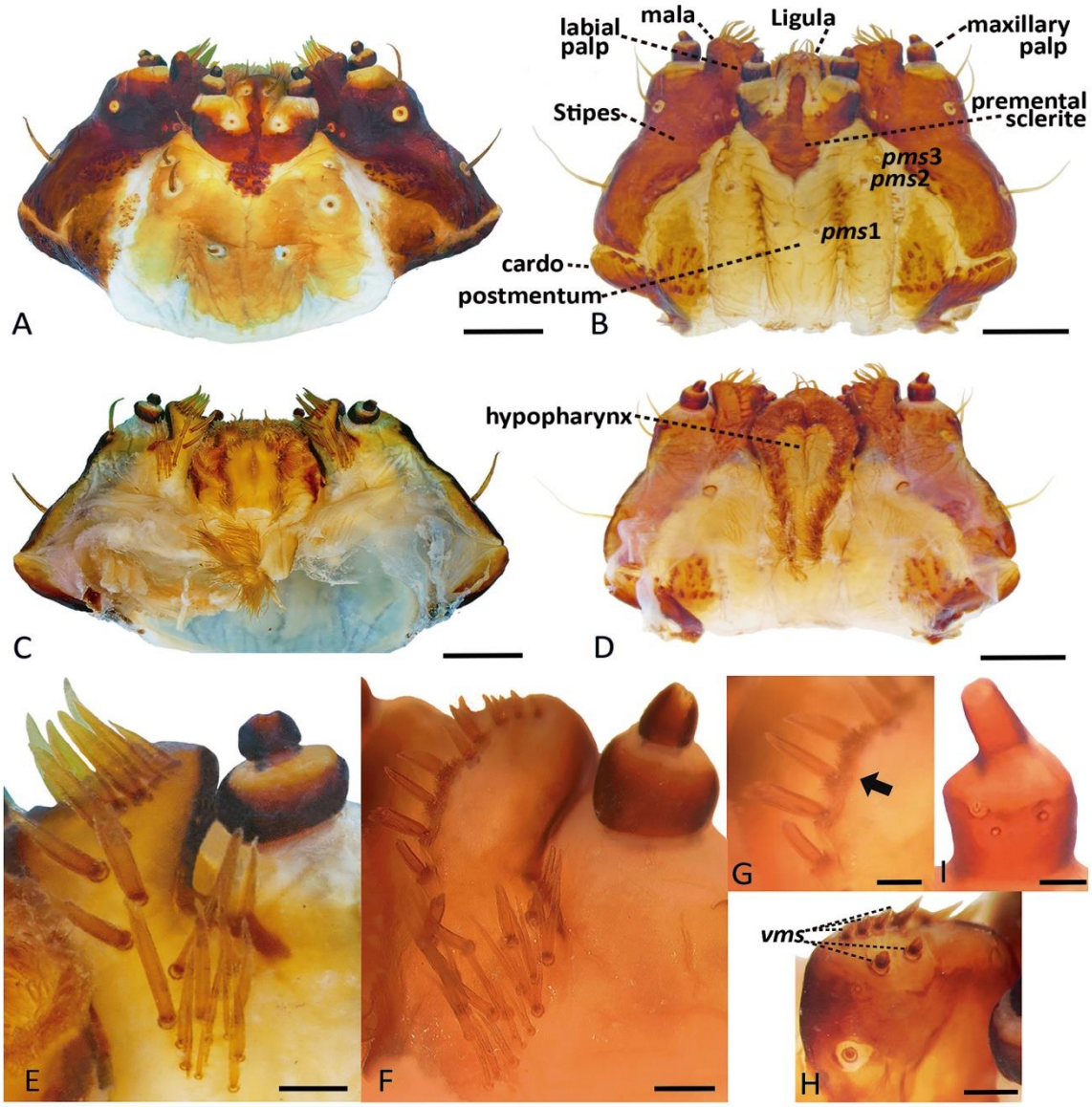

Figure 5. Maxillae and labium of larva. *Dynamis borassi* (Fabricius): (A) ventral; (C) dorsal; (E) detail of mala, dorsal. *Rhynchophorus palmarum* (Linnaeus): (B) ventral; (D) dorsal; (F) detail of mala, dorsal; (G) detail of dorsal malar setae; (H) detail of ventral malar setae; (I) detail of maxillary palp. Scale bars: A-D = 1 mm, E and F = 0.2 mm, G and I = 0.1 mm, H = 0.2 mm.

First instar larva: Figs. 8A, C-F, 9A-C.

Maximum dimensions: 52.9 × 23.6 mm, head width 10.5 mm. Chaetotaxy (see Table 1).

Frons (Figs. 2A, 8C, 9A) with two setae well developed (*fs3* and *fs5*), *fs4* minute (earlier instars) or short. Epipharynx (Figs. 3B, 4A): five (earlier instars) to eight anterolateral setae (*als*) on each side, none placed proximally near the limit with clypeus; median epipahryngeal setae 2 (*mes2*) thick, more widely separated than *mes1*, the latter smaller but well developed, distinct; mesal area of epipharynx (between labral rods) with asperities evenly distributed, not leaving a glabrous area; labral rods V-shaped, less widely separated towards their proximal junction than between their distal tips. Maxillae (Figs. 5A, C, E): with dorsal malar setae (*dms*) without pubescence at their bases; number of *dms* about 20 (earlier

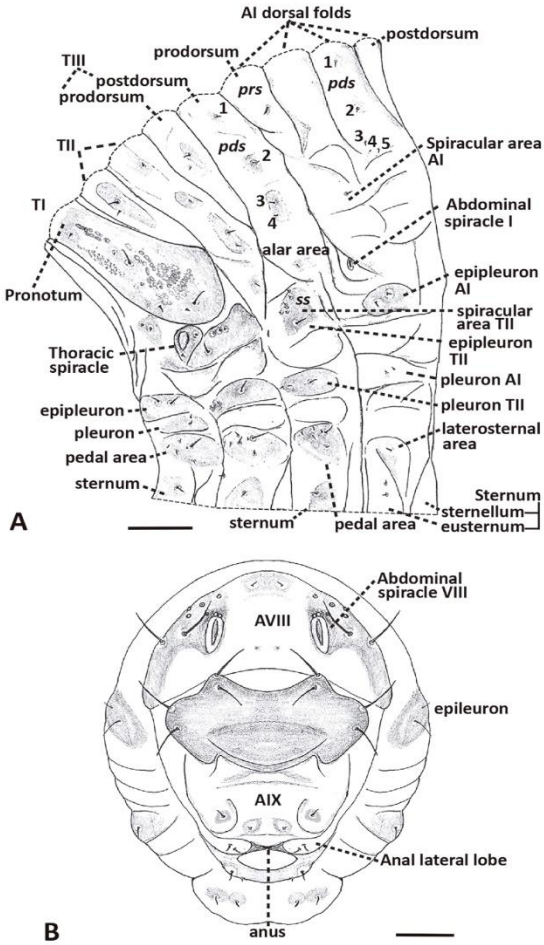

Figure 6. Chaetotaxy of thorax and abdomen, mature larva, *Rhynchophorus palmarum* (Linnaeus). (A) Prothorax, mesothorax, metathorax and abdominal segment I. (B) Abdominal apex, segments VIII to X, caudal. Scale bars: A = 3 mm, B = 2 mm.

Table 1. Larvae of *Dynamis borassi* (Db) and *Rhynchophorus palmarum* (Rp): Body areas and chaetotaxy; modal numbers of setae of Curculionidae, *D. borassi* and *R. palmarum* (V = variable). Terms and abbreviations follow Marvaldi (1999) (see also May, 1994; Oberprieler *et al.*, 2014).

Body area			Setal numbers			Abbreviations	Meanings
			Modal	Db	Rp		
Head							
	frontal		5	5	5	*fs*	Frontal setae
	dorsal		5	5	5	*des*	Dorsal epicranial setae
	posterior		4	4	4	*pes*	Posterior epicranial setae
	lateral		2	2	2	*les*	Lateral epicranial setae
	ventral		2	1	0	*vcs*	Ventral cranial setae
Clypeus			2	2	2	*cls*	Clypeal setae
Labrum			3	3	3	*lms*	Labral setae
Epipharynx							
	anterolateral		3	5-8	10-14	*als*	Anterolateral setae
	anteromedian		2	2	2	*ams*	Anteromedian setae
	median		3	3	3	*mes*	Median epipharyngeal setae
Mandible			2	2	2	*mds*	Mandibular setae
Maxillae							
	dorsal mala		V	~20	~30	*dms*	Dorsal malar setae
	ventral mala		4-5	5	5	*vms*	Ventral malar setae
	palp		1	1	1		
	stipes		4	4	4	*stps*	Stipital setae
Labium							
	prementum		1	1	1	*prms*	Premental setae
		ligula	2	2	2	*lgs*	Ligular setae
	postmentum		3	3	3	*pms*	Postmental setae
Prothorax						TI	
	pronotum		V	6	5 + 2	*prns*	Pronotal setae
	epipleuron		0-3	2	2	*epls*	Epipleural setae
	pleuron		2	2	2	*pls*	Pleural setae
	pedal area		V	6	6	*pds*	Pedal setae
	sternum		1	1	1	*sts*	Sternal setae
Meso-, Metathorax						TII, III	
	prodorsum		1	1 + 1	1 + 1	*prs*	Prodorsal setae
	postdorsum		4	4	4	*pds*	Postdorsal setae
	alar area		1-2	1	1	*as*	Alar setae
	spiracular area		1-3	3-9	3-8	*ss*	Spiracular setae
	epipleuron		1	1	1	*epls*	Epipleural setae
	pleuron		1	1	1 + 2	*pls*	Pleural setae
	pedal		V	6	6	*pds*	Pedal setae
	sternum		1	1	1	*sts*	Sternal setae
Abdomen, I-VIII segments						AI-VIII	
	prodorsum		1	1	1	*prs*	Prodorsal setae
	postdorsum	I-VII	5	5	5	*pds*	Postdorsal setae
		VIII	V	2	2		
	spiracular	I-VII	2	1	1	*ss*	Spiracular setae
		VIII	1	5-6	7		
	epipleuron		2	2	2	*epls*	Epipleural setae
	pleuron	I-VII	2	2	2	*pls*	Pleural setae
		VIII	2	1	1		
	laterosternal	I-VII	1	1	1	*lts*	Laterosternal setae
		VIII	1	0	0		
	sternum		2	2	2	*sts*	Sternal setae
Abdomen, IX segment						AIX	
	disc/dorsum		V	4/0	4/1	*ds*	Dorsal setae
	lateral		2	0	1	*ls*	Lateral setae
	sternum		2	2	2	*sts*	Sternal setae
Abdomen, X segment						AX	
	anal lateral		1-3	1	2	*as*	Anal setae

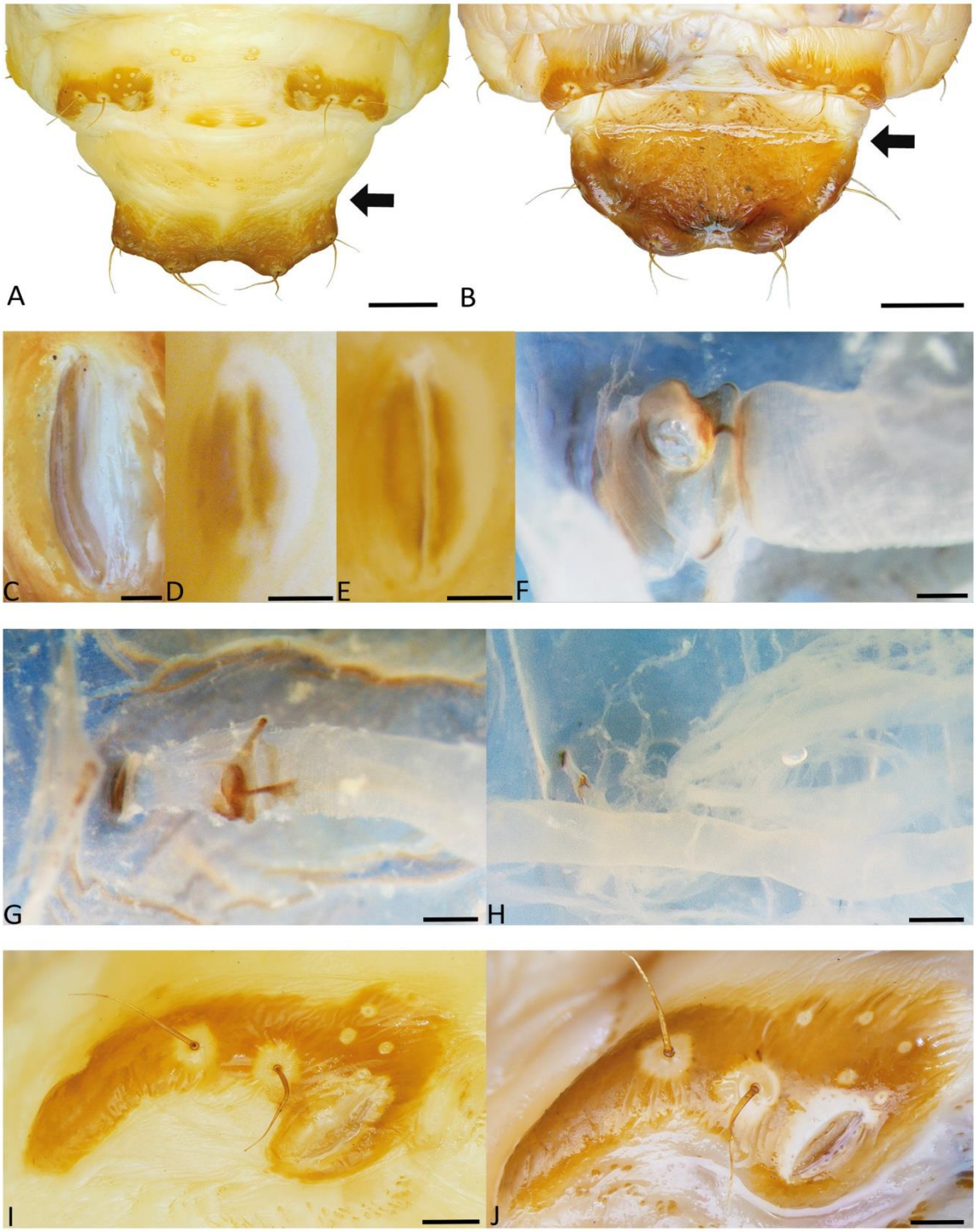

Figure 7. Larval abdominal apex showing posterior disc, dorsal: (A) *Dynamis borassi* (Fabricius); (B) *Rhynchophorus palmarum* (Linnaeus). Spiracles of *D. borassi* (external view, not at same scale): (C) thoracic; (D) abdominal I; (E) abdominal IV. (F) Thoracic spiracle and trachea of *R. palmarum,* seen from inside of body. (G, H) Spiracles and tracheal system of *D. borassi,* seen from inside of body: thoracic, abdominal IV. Abdominal spiracle VIII: (I) *D. borassi*; (J) *R. palmarum*. Scale bars: A and B = 2 mm, C and F-H = 0.2 mm, D and E = 0.1 mm, I and J = 0.5 mm.

instars with fewer setae). Hypopharynx (Fig. 5C) more densely setose laterally than anteriorly. Abdominal posterior disc (Fig. 7A) with lateral margins inwardly curved, with seta-bearing lobes defined by sinuate posterior margin (weakly so in first instar).

Rhynchophorus palmarum (Linnaeus, 1758)

Mature larva: Figs. 1D-F, 2B, D, 3A, C, 4B, E-F, I-J, 5B, D, F-I, 6A-B, 7B, F, J.

First instar larva: Fig. 8B.

Maximum dimensions: 51.2 × 23.8 mm, head width 11.5 mm. Chaetotaxy (see Table 1).

Frons (Fig. 2B) with three setae well developed (*fs3, fs4* and *fs5*). Epipharynx (Figs. 3C, 4B): ten (earlier instars) to fourteen anterolateral setae (*als*) on each side, posterior ones can arise near the limit with clypeus; median epipahryngeal setae 2 (*mes2*) slender, about as widely separated than *mes1,* the latter weak, unconspicuous; mesal area of epipharynx (between labral rods) with an elongate glabrous area coarsely defined by surrounding asperities; labral rods U-shaped, about as widely separated towards their proximal junction than between their distal tips. Maxillae (Figs. 5B, D, F-I): with dorsal malar setae (*dms*) (Figs. 5F, G) with pubescence at their bases; number of *dms* about 30 (earlier instars with fewer setae). Hypopharynx (Fig. 5D) densely setose in both anterior and lateral margins. Abdominal posterior disc (Fig. 7B) with lateral margins outwardly curved, with seta-bearing lobes broadly defined by slightly sinuate posterior margin.

Comparative notes

A selection of characters useful to distinguish *D. borassi* and *R. palmarum,* at larval and adult stages, is provided below (see Appendix 1 for a comparison in Spanish):

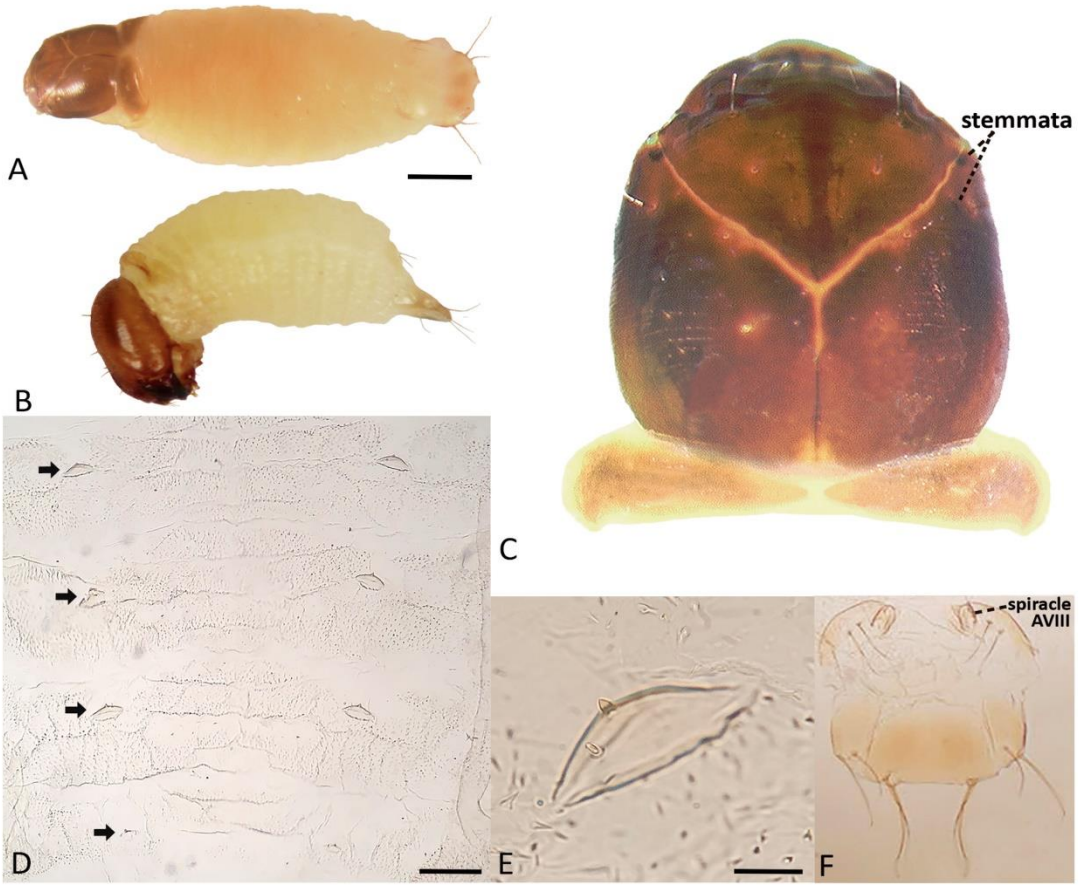

Figure 8. First instar larva. (A) *Dynamis borassi* (Fabricius), habitus dorsolateral; (B) *Rhynchophorus palmarum* (Linnaeus), habitus lateral. *D. borassi*: (C) head and pronotum, dorsal; (D) abdominal segments IV to VII, dorsal, showing egg bursters; (E) detail of egg burster; (F) terminal dorsal disc (abdominal tergites VIII and IX). Scale bars: A and B = 0.5 mm, D = 0.2 mm, E = 0.03 mm.

Dynamis borassi: LARVAE: Frons (Fig. 2A) with two (pairs of) frontal setae well developed (*fs3* and *fs5*). Epipharynx (Figs. 3B, 4A) with *mes1* well developed and distinctly less widely separated than *mes2, mes2* thick; laterally with five (earlier instars) to eight *als;* labral rods V-shaped, less widely separated towards their proximal junction than between their distal tips. Maxillae with *dms* without pubescence at their bases (Fig. 5E). Abdominal terminal disc (Fig. 7A) with lateral margin inwardly curved. ADULTS (Figs. 10A-B, E-F, I-J): Pronotum strongly produced posteriorly and scutellum very small, about 1/10 elytral length (Figs. 10E-F). Male with profemora bearing dense, erect setae on ventral side (Figs. 10A, I).

Rhynchophorus palmarum: LARVAE: Frons (Fig. 2B) with three (pairs of) frontal setae well developed (*fs3, fs4* and *fs5*). Epipharynx (Figs. 3C, 4B) with *mes1* very small and about as widely separated than *mes2, mes2* slender; laterally with 10 (earlier instars) to 14 *als;* labral rods U-shaped, about as widely separated towards their proximal junction than between their distal tips. Maxillae with *dms* with pubescence at their bases (Figs. 5F-G). Abdominal terminal disc (Fig. 7B) with lateral margin outwardly curved. ADULTS (Figs. 10C-D, G-H, K-L): Pronotum slightly produced posteriorly and scutellum very large, about ¼ elytral length (Figs. 10G-H). Male with rostrum bearing dense, erect setae on dorsal side (Figs. 10C, G).

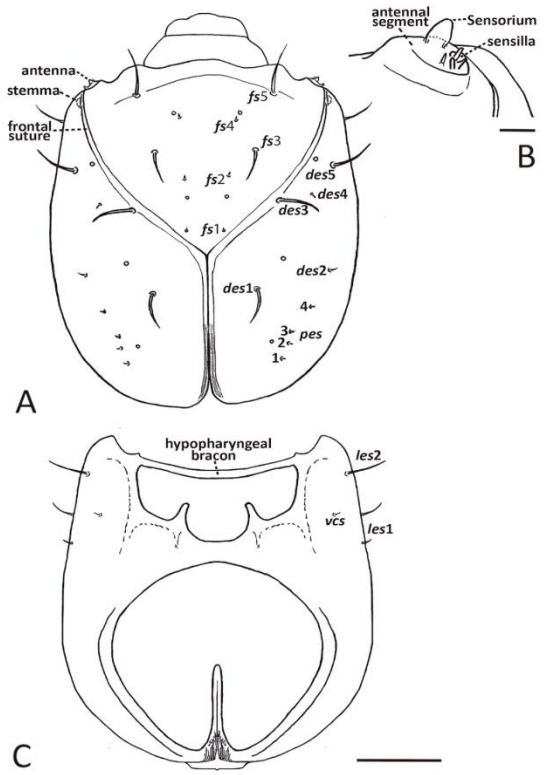

Figure 9. First instar larva of *Dynamis borassi* (Fabricius): (A) head capsule, dorsal; (B) detail of right antenna; (C) head capsule, ventral. Scale bars: A and C = 0.2 mm, B = 0.02 mm.

Comments: The following additional adult characters (Wattanapongsiri, 1966; Löhr *et al.,* 2015), in combination with those given above, distinguish *R. palmarum* from other species of *Rhynchophorus:* body entirely black, exceptionally reddish, interocular distance (dorsal view) ⅓ or less than ⅓ than the width of rostrum at base (Figs. 10G-H), rostral ventral area between the antennal scrobes rugose and with setae (Figs. 10K-L).

DISCUSSION

The larvae of *Dynamis borassi* and *Rhynchophorus palmarum* were redescribed in detail in this contribution, using modern terminology to allow comparisons with other larvae in Dryophthorinae and across Curculionidae. Few structural characters, including chaetotaxy, show clear differences between both species. In agreement with Anderson (1948) and Wattanapongsiri (1966), the most useful characters to distinguish *D. borassi* and *R. palmarum* are found in the mouthparts, particularly the epipharynx and maxillae. The observation of these features requires at least partial dissection of the head and examination under magnification, but the shape of the abdominal posterior plate, which also shows differences in both species, can be observed directly. This is advantageous to facilitate a rapid identification in the field, as required in most applied studies related to pest control. However, because differences in the abdominal plate of both species are only obvious and more distinct in older or mature larvae, it is worth to complement with other (*e.g.,* from mouthparts) diagnostic features.

The terminology used by Wattanapongsiri (1966), to describe larval structures and chaetotaxy of *Rhynchophorus* and *Dynamis,* differs in some important aspects with the one adopted in the present work and other comparative studies (*e.g.,* see Marvaldi, 1999; May, 1994; Chamorro & Huang, 2019). Among the differences worth to note are those involving the "anterolateral setae of epipharynx (*als*)", which in Wattanapongsiri (1966) are named "lateral setae of labrum" and, as additional source of confusion, their counting is given in full and not for one side, as it is standard for description of bilateral structures. Other discrepancies with Wattanapongsiri (1966) may arise because sometimes (*e.g.,* in mandibles, stipes) he considers and counts as setae other sensilla that are not true setae (*i.e.,* basal socket plus "hair"). In our study, we also provided labeled figures to facilitate the determination of homology when compared with works using different terminology.

From a phylogenetic perspective, the larval characters described for both species studied are in agreement with those diagnostic and synapomorphic of subfamily Dryophthorinae, such as maxillary malae with some dorsal setae branched, the pleura subdivided, the spiracles of AVIII placed on dorsum and oriented caudally, among others (May, 1994; Marvaldi, 1999; Anderson & Marvaldi,

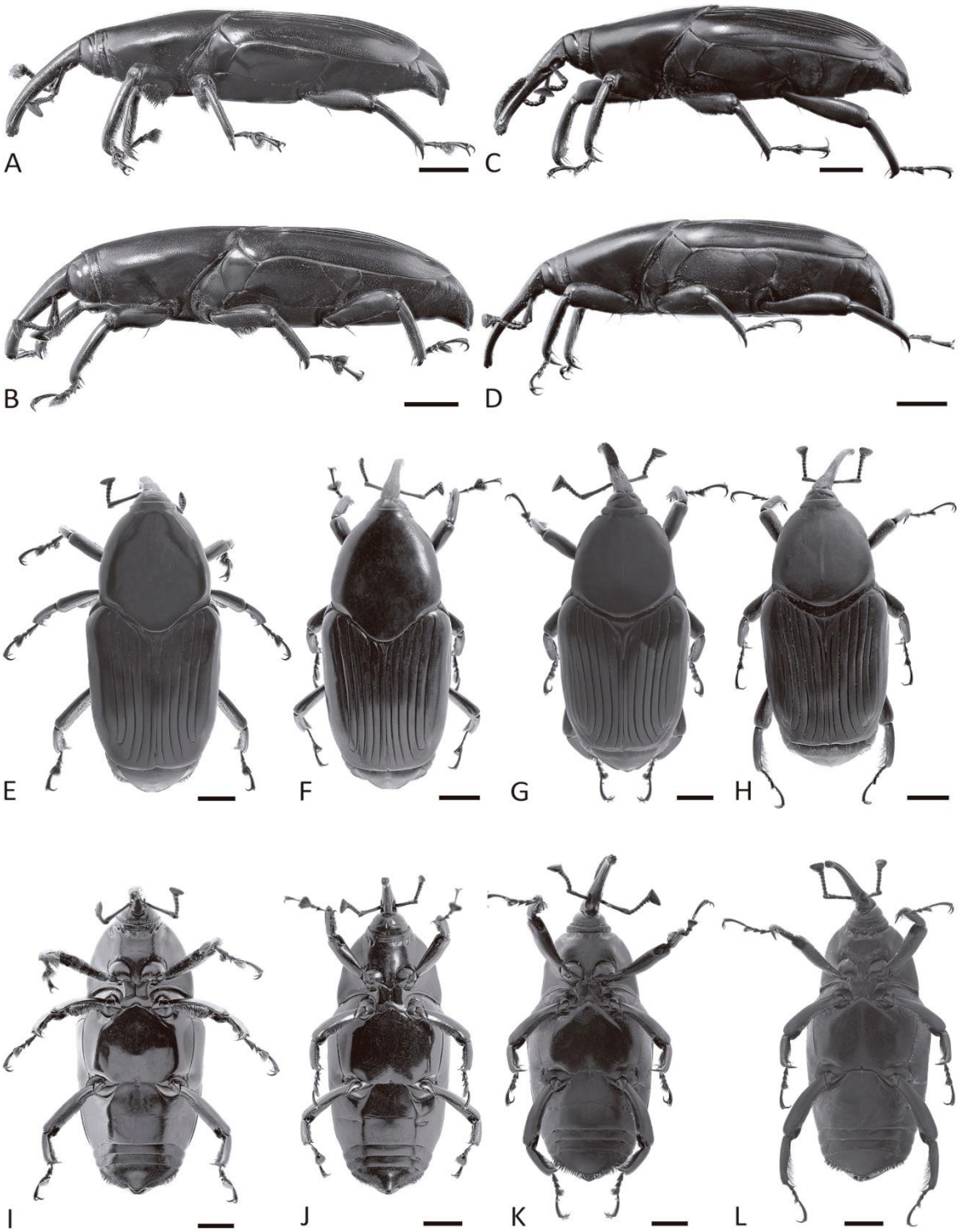

Figure 10. Adult, habitus. *Dynamis borassi* (Fabricius): (A) male, lateral, note sexually dimorphic ventrally setose profemora; (B) female, lateral; (E) male, dorsal; (F) female, dorsal; (I) male, ventral; (J) female, ventral. *Rhynchophorus palmarum* (Linnaeus): (C) male, lateral, note sexually dimorphic dorsally setose rostrum; (D) female, lateral; (G) male, dorsal; (H) female, dorsal; (K) male, ventral; (L) female, ventral. Scale bars: 5 mm.

2014). We also corroborate, as diagnostic of dryophthorines, that the first instar larva lacks the spiracles of abdominal segments I-VII, having only the thoracic and AVIII spiracles developed. The larvae of later instars of *Dynamis* and *Rhynchophorus* have the complete set of abdominal spiracles, and although those of AI to AVII are small, they are clearly functional (*i.e.,* connected to tracheal system, see Fig. 7H); therefore, they are not absent as interpreted in the identification key by Chamorro (2019). The occurrence of egg-bursters in first instar larvae of Curculionoidea is less common, but also more poorly documented, than in their sister group Chrysomeloidea, where egg burster's features (*e.g.,* position, shape) were found to be phylogenetic informative at both higher and lower taxonomic levels (Cox, 1988). In Dryophthorinae, egg bursters were known to occur in first instar larvae of genus *Sitophilus* of subtribe Litosomina, and in the present contribution, we report their occurrence in representatives of Rhynchophorina.

ACKNOWLEDGMENTS

We are grateful to the different communities and secretaries of agriculture of the municipalities and departments visited, who facilitated the work. We also thank Inge Armbrecht and James Montoya, for their management of the Colciencias's project; Jackelinae Gaviria and Claudia Marcela Cuellar, for providing specimens; and Diana Marcela Urcuqui, Francisco Lopez Machado and Juan Felipe Ortega, for their technical help with photography at Universidad del Valle. This paper is dedicated in homage to Dr. Cleide Costa, in recognition of her contributions to the knowledge on immature stages and biology of Neotropical beetles.

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APPENDIX 1

Caracteres diagnósticos para la identificación morfológica de larvas y adultos de *Dynamis borassi* y *Rhynchophorus palmarum.*

	Dynamis borassi	*Rhynchophorus palmarum*
LARVAS		
Cabeza: Cantidad de setas frontales (a cada lado) bien desarrolladas	Dos (Fig. 2A)	Tres (Fig. 2B)
Epifaringe: Setas epifaringeales medias (*mes*)	Setas del primer par (*mes1*) bien distinguibles, separadas entre sí por menor distancia que entre las del segundo par (*mes2*), éstas robustas (Figs. 3B, 4A)	Setas del primer par (*mes1*) muy débiles, pequeñas, separadas entre sí por igual distancia que las del segundo par (*mes2*), éstas delgadas (Figs. 3C, 4B)
Epifaringe: Cantidad de setas anterodorsales (*als*) a cada lado	Cinco a ocho (Figs. 3B, 4A)	10 a 14 (Figs. 3C, 4B)
Epifaringe: Forma de las varillas labrales	Parecida a una "V", las varillas más separadas hacia el ápice que cerca de su base (Figs. 3B, 4A)	Parecida a una "U", las varillas aproximadamente tan separadas cerca de su base como distalmente (Figs. 3C, 4B)
Maxilas: Setas dorsales de la mala (*mds*)	Sin pubescencia en su base (Fig. 5E)	Con pubescencia en su base (Figs. 5F-G)
Abdomen: Margen lateral del disco terminal	Curvado hacia adentro (Fig. 7A)	Curvado hacia afuera (Fig. 7B)
ADULTOS		
Base del pronoto	Marcadamente extendida hacia atrás (Figs. 10E-F)	Suavemente extendida hacia atrás (Figs. 10G-H)
Escutelo	Muy pequeño, alrededor de 1/10 el largo de los élitros (Figs. 10E-F)	Muy grande, alrededor de ¼ el largo de los élitros (Figs. 10G-H)
Dimorfismo sexual	Macho con fémures anteriores densamente setosos en su cara ventral (Figs. 10A, I)	Macho con rostro provisto de setas densas, erectas, en su cara dorsal (Figs. 10C, G)

Nota: Los siguientes caracteres adicionales del adulto (Wattanapongsiri, 1966; Löhr *et al.,* 2015), en combinación con los anteriores, distinguen a *R. palmarum* de otras especies de *Rhynchophorus:* cuerpo completamente negro, excepcionalmente rojizo, distancia entre los ojos (vista dorsal) ⅓ o menos de ⅔ que el ancho del rostro en la base (Figs. 10G-H), área ventral del rostro entre las escrobas antenales rugosa y con setas (Figs. 10K-L).

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Appendix 4. Abstract and attendance certificate in the XXIX Reunión Argentina de Ecología:

Importancia del paisaje en la dinámica plaga-palma en un agroecosistema tropical

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Presentación Oral

El estudio de las plagas agrícolas a múltiples escalas espaciales se ha concentrado en las zonas templadas. En los trópicos los trabajos son escasos; no obstante, la más reciente crisis fitosanitaria de la palma de chontaduro (Bactris gasipaes) en Colombia ocasionada por picudos barrenadores (Dynamis borassi y Rhynchophorus palmarum) es una oportunidad para implementar dicha aproximación. Este sistema palma-picudos se distribuye en un territorio ambientalmente cambiante. Estudiamos 32 cultivos de chontaduro del Pacífico, Andes y Amazonas, donde describimos los niveles de infestación en transectos de área variable. Posteriormente, en esos mismos cultivos caracterizamos 109 variables del manejo agronómico, paisaje, topografía, suelo y clima. El manejo se examinó con una encuesta mientras que las otras variables se obtuvieron de bases de datos. El paisaje se caracterizó usando imágenes satelitales, mediante la determinación de tres coberturas de suelo y métricas derivadas, dentro de un área circular de 1 km de diámetro desde el centro del cultivo. Utilizando un análisis de PLS-GLM y GLM, encontramos que las variables de paisaje estuvieron más relacionadas con las tasas de infestación que las variables a otras escalas. En particular, el número y forma de los parches no boscosos fueron las más importantes. Posiblemente, la interacción infestación-paisaje fue mediada por los hospederos alternativos de los picudos, quienes podrían afectar la frecuencia de utilización del cultivo. La relevancia del paisaje, antes no documentada en esta problemática, es útil para establecer planes de manejo de la crisis fitosanitaria del chontaduro y de otros cultivos tropicales.

Bactris gasiapes, Dryophthorinae, ecología, escala, infestación

"Ecosistemas del presente, el legado para el futuro: desde la ecología evolutiva, a la ecología del Antropoceno"

XXIX REUNION ARGENTINA DE ECOLOGIA

4 al 6 DE AGOSTO 2021

Se certifica que Aymer Andrés Vásquez Ordoñez ha participado en carácter de Disertante de la *XXIX Reunión Argentina de Ecología* realizada entre el 4 y el 6 de agosto de 2021 en Tucumán, Argentina (modalidad virtual)

Dra. Irina Izaguirre

Presidenta

Asociación Argentina de Ecología

Dra. Roxana Aragón

Coordinadora comisión organizadora

Instituto de Ecología Regional

Appendix 5. Abstract and **a**ttendance certificate in the Virtual Meeting 2021 of the Association for Tropical Biology and Conservation:

ID: ATBC20213

Primary Contact:
Aymer A Vasquez, Universidad del Valle
Cali, Colombia

All Authors:
Aymer A Vasquez, Universidad del Valle **(Primary Presenter)**
Inge Armbrecht
James Montoya Lerma
Wilmar Torres
Carolina Monmany-Garzia
Bernhard Leo Löhr

Submission Type:
Lightning Poster Talk

Are you currently an ATBC Member?:
No

Do you wish to apply for one of the following awards?:
Gentry award for best student oral or poster presentation

Conference sub-theme:
3

Is your abstract part of a symposium?:
No

Title:
Ecological and evolutionary explanations for a new interaction between stem borer weevils and peach palm in a tropical agroecosystem

Abstract:

New crop-pest interactions constitute excellent opportunities to understand the origins and mechanisms of plant-pest relationships. The recent, unexplained mass deaths of the South American peach palms (Bactris gasipaes) in Colombian tropical agroecosystems enabled us to explore the ecological and evolutionary drivers of these peach palm - stem borer weevil interactions. We determined the identity of 419 palm weevils associated with 87 damaged peach palms from 32 plots within the Amazon, Andes, and Pacific regions in Colombia; 51 were D. borassi and 368 R. palmarum. We also related infestation levels measured in 4098 peach palms to 109 agro-ecological variables in all crops (e.g., type of management, surrounding forest cover, soil nutrients, climate, etc.). In the same 32 fields, D. borassi was determined as the primary pest attacking unopened inflorescences and tunneling the petiole towards the stem, favoring subsequent damage by R. palmarum. Both weevil species cause the crown toppling of peach palms. Weevil infestation was related to landscape variables in the three regions, particularly the density and shape of non-forest cover, which are indicators of forest fragmentation. Our data support the idea that deforestation and decreasing resources (inflorescences of native palms like O. bataua) for D. borassi pushed its

populations to increasingly infest peach palm inflorescences, therefore initiating the damage that finally caused the massive deaths. We compared the measurements of 19 body parts of 26 D. borassi adults from peach palm (21) and natural host palm (5), and 102 R. palmarum from peach palm (43), sugarcane (59), new host in Colombia. The 21 D. borassi from peach palm and 59 R. palmarum from sugarcane were smaller in comparison with the specimens from natural host plants. The COI gene sequences of eight samples of R. palmarum from sugarcane were genetically different from 149 sequences (9 from peach palm of this study and 138 from Brazil and two from Costa Rica of the GenBank and Bold database). A similar analysis comparing D. borassi from peach palm and natural host palms is in preparation. This research opens new questions on the role of alternative host palm species and their interaction with landscape variables in the origin of peach palm's new pests.New crop-pest interactions constitute excellent opportunities to understand the origins and mechanisms of plant-pest relationships. The recent, unexplained mass deaths of the South American peach palms (Bactris gasipaes) in Colombian tropical agroecosystems enabled us to explore the ecological and evolutionary drivers of these.

Keywords:
Plant-insect interaction, Landscape ecology, Dynamis borassi, Rhynchophorus palmarum, Bactris gasiapes.

ATBC 2021
Virtual Meeting

2021 VIRTUAL MEETING OF THE
ASSOCIATION FOR TROPICAL BIOLOGY AND CONSERVATION

"Lessons, advances, and opportunities in the face of global change"

Certificate of presentation

awarded to

Aymer Vasquez, Inge Armbrecht, James Montoya Lerma, Wilmar Torres, Carolina Monmany-Garzia & Bernhard Leo Löhr

in sincere appreciation for the valuable oral contribution

Ecological and evolutionary explanations for a new interaction between stem borer weevils and peach palm in a tropical agroecosystem

presented as part of the session

Biotic Interactions in the Face of Global Change

Dr. Miguel Martínez-Ramos
ATBC Conferences Committee Chair

Dr. Lúcia G. Lohmann
ATBC Executive Director

Dr. Emilio Bruna
ATBC President

atbc

July 21st-23rd, 2021

ATBC20213

Appendix 6. Attendance certificate of the Seminario Internacional Intercambio Científico 2020-2021:

Universidad Técnica de Cotopaxi

A través de la Facultad de Ciencias Agropecuarias y Recursos Naturales, confieren el presente

Certificado

A: Aymer Andrés Vásquez Ordóñez

Por haber Participado como **PONENTE** con el tema **"Explicaciones ecológicas y evolutivas de una nueva interacción entre picudos barrenadores del tallo y el chontaduro (Bactris gasipaes)"** que se llevó a cabo el 2 de junio de 2021 en la República del Ecuador.

En el **Seminario Internacional Intercambio Científico**, realizado por la **Universidad Técnica de Cotopaxi-Ecuador**, **Universidad Regional Amazónica IKIAM-Ecuador** y la **Universidad del Quindío-Colombia** desde noviembre del 2020 a diciembre del 2021.

KARINA PAOLA MARIN QUEVEDO

Firmado digitalmente por KARINA PAOLA MARIN QUEVEDO Fecha: 2021.06.30 21:40:57 -05'00'

Universidad Técnica de Cotopaxi

Decanato de la Facultad de CAREN

Karina Paola Marín Quevedo, Ing. Mag.
DECANA FACULTAD CAREN
UNIVERSIDAD TÉCNICA DE COTOPAXI

FOLIO: 9546 **Número:** 180 del libro de secretaría de la UTC

FACULTAD DE CIENCIAS AGROPECUARIAS Y RECURSOS NATURALES

Appendix 7. Abstract and attendance certificate of the Encontro de Coleoptera:

Molecular taxonomy of palm weevils Rhynchophorus and Dynamis (Coleoptera: Curculionidae: Dryophthorinae), and their geographical variation in morphology and genetics

Aymer A. Vásquez-Ordóñez[1,2], Diana Marin[2], Diana Urcuqui[1], Bernhard Löhr[3], Luis Augusto Becerra Lopez-Lavalle[2]

1 Sección de Entomología, Universidad del Valle, Cali, Valle del Cauca, Colombia.

2 Centro Internacional de Agricultura Tropical (CIAT), Palmira, Valle del Cauca, Colombia.

3 Independent palm specialists, Germany.

E-mail: aymer.vasquez@correounivalle.edu.co.

The genera *Rhynchophorus* Herbst, 1795 and *Dynamis* Chevrolat, 1882 are serious pests of palms. Various species of *Rhynchophorus* have generated economic losses in Africa, Asia, Europe, and America, in particular the invasive species *R. ferrugineus* (Olivier, 1790) (Löhr et al. 2015). *Dynamis* is distributed widely in South America with *D. borassi* (F., 1801) recently caused catastrophic damage in peach palm production in Colombia (Gaviria et al. 2021). Species in both genera present a strong morphological variation (Wattanapongsiri 1966), which have generated complications in the traditional identification. This has led to a major effort in molecular characterization for the Asian species of *Rhynchophorus* (Rugman-Jones et al. 2013) and R. palmarum (L., 1758) (Löhr et al. 2015). We detected new sequences of cytochrome C oxidase subunit I gene (cox1 or COI) of *Rhynchophorus* and *Dynamis* in Colombia and compared those with all published COI sequences of both genera using the genetic distance and Maximum Likelihood (ML) approach. Additionally, we documented as these phylogenetic groups were associated with the distribution of the population documented, as well as described the morphological differentiation of four populations of *R. palmarum* and *D. borassi* in southeast Colombia. We detected that all species have a bootstrap support superior to 81% in ML. In *R. vulneratus* (Panzer, 1798), *R. ferrugineus* and *R. palmarum* we identified clades coinciding with geographical distribution. Moreover, the *R. palmarum* presented a strong geographical differentiation of characteristics associated with body size. *D. borassi* does not present a geographical pattern but there is some tendency to differentiation related to the host plant in sympatric population. This study has the widest coverage of molecular taxonomy for *Rhynchophorus* and *Dynamis* using the COI gene with relevant geographical patterns. It is also the first characterization of geographical variation of the morphology in *R. palmarum* and *D. borassi*.

Key words: Pest, COI, Identification, Body size, *Rhynchophorus palmarum*, *Dynamis borassi*.

References

GAVIRIA J., J. MONTOYA-LERMA, I. ARMBRECHT, B. LÖHR, A. A. VÁSQUEZ-ORDÓÑEZ. 2021. *Dynamis borassi* (Coleoptera: Dryophthoridae) a new potential pest to the palms (Arecales: Arecaceae). Florida Entomologist (accepted).

LÖHR B., A. A. VÁSQUEZ-ORDÓÑEZ & L. A. BECERRA LÓPEZ-LAVALLE. 2015. *Rhynchophorus palmarum* in disguise: Undescribed polymorphism in the “Black” Palm Weevil. PloS one 10(12): e0143210.

RUGMAN-JONES P. F., C. D. HODDLE, M. S. HODDLE & R. STOUTHAMER. 2013. The lesser of two weevils: Molecular-genetics of pest palm weevil populations confirm *Rhynchophorus vulneratus* (Panzer 1798) as a valid species distinct from *R. ferrugineus* (Olivier1790), and reveal the global extent of both. PLoS ONE 8: e78379.

WATTANAPONGSIRI A. 1966. A revision to the genera *Rhynchophorus* and *Dynamis* (Coleoptera: Curculionidae). 1965. Doctoral thesis. Oregon State University, USA.

Financing: Ministerio de Ciencias, Colombia.

Encontro de Coleoptera

Março - 2021

Certificamos que Aymer Andrés Vásquez-Ordóñez participou como **PALESTRANTE** do ENCONTRO DE COLEOPTERA, realizado no dia **18 de março de 2021** na modalidade remota pela plataforma Zoom, proferindo a palestra intitulada "Molecular taxonomy of palm weevils Rhynchophorus and Dynamis (Coleoptera: Curculionidae: Dryophthorinae), and their geographical variation in morphology and genetics".

Adaiane Catarina Marcondes Jacobina
COORDENAÇÃO
ENCONTRO DE COLEOPTERA 2021

Jéssica Hengge Viana
COORDENAÇÃO
ENCONTRO DE COLEOPTERA 2021

APOIO/SUPPORT:

THE COLEOPTERISTS SOCIETY
AN INTERNATIONAL SOCIETY DEVOTED TO THE STUDY OF BEETLES

Appendix 8. Abstract and attendance certificate of the Fourth Tropical Agroforestry Seminar and First International:

Titulo:

Muerte masiva de palmas de chontaduro (Bactris gasipaes, Arecaceae) en Colombia: diagnóstico y posibles causas.

Resumen:

El cultivo de la palma de chontaduro (Bactris gasipaes, Arecales: Arecaceae) es de gran importancia económica para las comunidades rurales de Colombia. En los últimos nueve años la producción del país se ha reducido en 48,4% debido a la muerte masiva de palmas, como consecuencia de la fractura de los tallos y caída de la corona. Se han sugerido a los escarabajos picudos *Rhynchophorus palmarum* y *Dynamis borassi* (Coleoptera: Dryophthoridae) como agentes causales, aunque no existe un diagnóstico formal. Por otra parte, esta problemática es inédita para este cultivo, teniendo gran interés entender las posibles causas de su aparición. Visite 36 sitios de producción de chontaduro en el Pacífico, Andes y Amazona colombiano, entre marzo de 2018 a febrero de 2019. Cuantifiqué la densidad del daño y seleccioné 87 palmas a diseccionar con un transecto de área variable de 80 m de largo. Evalué un total de 4098 palmas de chontaduro, presentando 378 daños. Identifiqué tres tipos de afectación, correspondientes a agujeros externos y barrenado interno de la inflorescencia, perforación del tallo y caída de la corona. Recolecté 722 picudos, de los cuales identifiqué morfológicamente todos los provenientes de la inflorescencia como *Dynamis*, confirmando que este género inicia el daño por esta estructura. Así mismo, observé síntomas y picudos en todas las regiones, con altas densidades en la región andina y ausencia en el suroeste del Amazonas colombiano. Actualmente, estoy profundizando en la identificación taxonómica y diversidad poblacional con datos morfológicos y moleculares (COI y microsatélites), y estoy evaluando el rol de los factores climáticos, paisajísticos y agronómicos sobre los datos de densidad de palmas con daño, destacando el uso de imágenes de Radar de apertura sintética debido a la alta nubosidad en los bosques del pacífico y amazonas. La información generada contribuirá a mejorar la economía de agricultores de zonas marginadas, que están en un proceso de postconflicto.

Universidad del Valle
PALMIRA

La Universidad del Valle Sede Palmira

CERTIFICA QUE:

AYMER ANDRÉS VÁSQUEZ

C.C. 1.130.618.625.

Participó como ponente en el del evento llamado: 4to Seminario de Agroforestería Tropical y 1ro Internacional, realizado el día 22 de Agosto de 2019, en la Universidad del Valle Sede Palmira.

Para constancia se firma en la ciudad de Palmira a los veintidós (22) días del mes de Agosto de 2019

ADOLFO MARIO CONSUEGRA CAIAFFA
Coordinador Programa
Tecnología en Agroforestería

10 Años Acreditación Institucional de Alta Calidad 2014 - 2024

Appendix 9. Abstract and attendance certificate of the XLVI Congress of Entomological Society of Colombia-Socolen:

MIP-O-25. El picudo *Dynamis borassi* (Coleoptera: Dryophthoridae), agente causal de la muerte de la palma de chontaduro (*Bactris gasipaes*, Arecales: Arecaceae) en Colombia

Aymer Andrés Vásquez-Ordóñez[1]; James Montoya Lerma[2]; Inge Armbrecht[1]; Bernhard Leo Löhr[2]

[1]Departamento Biología, Universidad del Valle, Colombia; [2]Corporación Colombiana de Investigación Agropecuaria, Agrosavia, Colombia

Correo electrónico para correspondencia: aymer.vasquez@correounivalle.edu.co

Resumen

El cultivo de la palma de chontaduro (*Bactris gasipaes* HBK, Arecales: Arecaceae) es de gran importancia económica para las comunidades rurales de Colombia. En los últimos años la producción del país se ha reducido en 48,4% debido a la muerte masiva de palmas atribuida al ataque de los picudos *Rhynchophorus palmarum* (L.) y *Dynamis borassi* (F.) (Coleoptera: Dryophthoridae). Hasta el momento no se ha diagnosticado el agente causal ni la magnitud del problema a nivel nacional. En este trabajo se caracterizó el tipo y seriedad del daño, y se identificó el agente causal en las principales áreas de producción de chontaduro en Colombia. Se visitaron 36 sitios de producción en los departamentos de Caquetá, Cauca, Nariño, Risaralda, Putumayo y Valle del Cauca entre junio de 2018 y febrero de 2019. Se definió un transecto de área variable y se examinaron 4098 palmas de chontaduro, 378 presentaron daños atribuibles a los picudos. El daño fue categorizado en cuatro tipos y se determinó que el desnucamiento de las palmas inicia con un ataque a las inflorescencias. En 87 palmas disectadas, se encontraron 722 picudos de *R. palmarum* y *D. borassi*. Todas las larvas extraídas de inflorescencias fueron identificadas como *D. borassi*, soportando la hipótesis de que esta especie es el primer agente causal del daño. Todos los departamentos presentaron daños, los más serios en Cauca, Caquetá y Valle del Cauca, en contraste con poca afectación en Putumayo. En conclusión, se documenta a *D. borassi* como agente causal del daño económico en palmas de chontaduro en Colombia.

Sociedad Colombiana de Entomología | SOCOLEN

VII ELEN Encuentro sobre Lepidópteros Neotropicales

La Sociedad Colombiana de Entomología - Socolen, certifica que:

Aymer Vásquez Ordoñez

Participó en calidad de EXPOSITOR

EN EL 46 CONGRESO DE ENTOMOLOGÍA

Desafios entomológicos en la ocupación del territorio

17,18 y 19 de julio de 2019 - Medellín, Colombia.

Juan Humberto Guarín
Presidente 46 Congreso SOCOLEN

Amanda Varela Ramírez
Presidente Junta Directiva SOCOLEN

Appendix 10. Student Fellowship: registration-waiver grants of the Annual Virtual Meeting 2021, Association for Tropical Biology and Conservation:

AYMER ANDRES VASQUEZ ORDOÑEZ <aymer.vasquez@correounivalle.edu.co>

Fellowship ATBC 2021

ATBC 2021 Virtual Meeting <noreply@xcdsystem.com> 2 de junio de 2021, 12:43
Responder a: info@atbc2021.org
Para: aymer.vasquez@correounivalle.edu.co

ATBC 2021
Virtual Meeting

Dear Aymer,

The Organizing Committee of the Virtual Meeting 2021 of the Association for Tropical Biology and Conservation is pleased to inform you of the **ACCEPTANCE** of your Fellowship application for participating in the conference.

To complete the process and confirm your participation, please register at http://www.atbc2021.org/fees/ by **June 25th, 2021** using the non-transferable code "**ATBC2021FELLOW**".

Please do not hesitate to contact us if you have any questions or in case there is anything we can do to assist you during your preparations for the meeting.

Yours sincerely,
The Organizing Committee

Appendix 12. Act of the undergraduate project of Maria Alejandra Bautista Giraldo, with her publication and attendance certificate and abstract of the VII The Latin America Congress of Agroecology, SOCLA:

Universidad de Caldas

ACTA DE SUSTENTACION DE TRABAJO DE GRADO

NUMERO DE ACTA: 044

FECHA: 2 DE ABRIL DE 2019

HORA DE INICIACIÓN: 10:00 a.m

HORA DE TERMINACIÓN: 11:00 a.m.

LUGAR: Auditorio "Humberto Gallego Gamboa"

DIRECTORES DEL TRABAJO: INGE ARMBRECHT
AYMER ANDRÉS VÁSQUEZ

TITULO DEL TRABAJO DE GRADO: "Asociación del picudo *Dynamis borassi* (Coleóptera: Dryophthoridae) con la palma nativa *Oenocarpus bataua* (Arecales: Arecaceae) en Buenaventura, Valle del Cauca".

AUTOR: MARIA ALEJANDRA BAUTISTA GIRALDO Código 1711310737

UNA VEZ REALIZADA LA EXPOSICIÓN POR PARTE DE LO(S) ESTUDIANTE(S) ARRIBA MENCIONADO(S), Y EN CORRESPONDENCIA AL ACUERDO 004 DEL CONSEJO SUPERIOR DEL 4 DE MARZO DE 2003, EL DIRECTOR DEL TRABAJO DE GRADO DECIDE DARLE UNA CALIFICACIÓN A LA SUSTENTACIÓN DE:

APROBADO

INGE ARMBRECHT

P/ Aymer Andrés Vásquez
AYMER ANDRÉS VÁSQUEZ

Reacreditación de alta calidad 2012 / 2018
RES. 16314 MIN. EDUCACIÓN

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Manizales - Colombia

Revista Colombiana de Entomología 2020, 46 (2): e7721 • https://doi.org/10.25100/socolen.v46i2.7721

Sección Básica / Basic
Artículos de investigación / Research paper

The weevil *Dynamis borassi* (Coleoptera: Curculionidae: Dryophthorinae) associated with native palms in forests and disturbed areas in Buenaventura, Colombia

El picudo *Dynamis borassi* (Coleoptera: Curculionidae: Dryophthorinae) asociado a palmas nativas en bosques y zonas perturbadas en Buenaventura, Colombia

MARIA ALEJANDRA BAUTISTA-GIRALDO[1]; INGE ARMBRECHT[2]; AYMER ANDRÉS VÁSQUEZ-ORDOÑEZ[3]

[1] Biologist. Department in Biological Sciences, Universidad de Caldas, Manizales, Caldas, Colombia, *alejandra.bautista.giraldo@gmail.com*, https://orcid.org/0000-0003-2669-2386. [2] Ph. D. Titular Professor, Biology Department, Universidad del Valle, Santiago de Cali, Valle del Cauca, Colombia, *inge.armbrecht@correounivalle.edu.co,* https://orcid.org/0000-0003-0574-2559. [3] B. Sc. Ph. D. candidate in Biology-Sciences, Universidad del Valle, Santiago de Cali, Valle del Cauca, Colombia, *aymer.vasquez@correounivalle.edu.co,* https://orcid.org/0000-0002-4970-9067.

Abstract: Deforestation produces homogeneous agricultural environments creating an imbalance between herbivores and their hosts. Since 2010, there has been a phytosanitary crisis in the peach palm (or chontaduro), *Bactris gasipaes* in the Colombian Pacific Region which can be attributed to two species of palm weevils: *Rhynchophorus palmarum* and *Dynamis borassi*. It has been proposed that deforestation of native palms, used by these weevils, induces these to find new resources in the peach palm. This study examined the association of these two weevils with native palms near chontaduro crops and how this occurs in two types of habitats. Six secondary forests and six anthropogenically disturbed areas were visited in third administrative division: "corregimientos" 1 and 2 (Zone A) and 7 and 8 (Zone B) in the municipality of Buenaventura. Three 50 x 100 m plots were designated in each zone, all palms with damage being recorded; the sampling was also complemented with a free sample. Twelve palm species distributed into one subfamily and nine genera were identified. A total of 271 unopened inflorescences were examined in Zone A and 501 in Zone B. Only evidence of damage was found in individuals of the "milpesos" palm (*Oenocarpus bataua*), an economically exploitable species. The proportion of palms affected in terms of habitat was significantly higher in the disturbed habitat. This is the first record that quantifies a high percentage of association between *D. borassi* and the "milpesos" palm in the Colombian Pacific Region, a phenomenon that could be explained by agroecological hypotheses.

Keywords: Secondary forest, palm inflorescences, tropical deforestation, palm borers, disturbed zones, chontaduro, Coleoptera, *Bactris gasipaes, Rhynchophorus palmarum, Dynamis borassi*.

Resumen: La deforestación produce ambientes agrícolas homogéneos y puede generar desequilibrios entre los herbívoros y sus hospederos. Desde 2010, ha ocurrido una crisis fitosanitaria en el cultivo de la palma de chontaduro (*Bactris gasipaes*) en el Pacífico colombiano, atribuida a los picudos *Rhynchophorus palmarum* y *Dynamis borassi*. Se ha planteado que la deforestación de palmas nativas utilizadas por estos picudos, hace que busquen nuevos recursos y los encuentran en el chontaduro. Esta investigación examinó la asociación de estos picudos con palmas nativas cercanas a cultivos de chontaduro, y cómo se da en dos tipos de hábitats. Se visitaron seis bosques secundarios y áreas antropogénicamente intervenidas en los corregimientos 1 y 2 (zona A), y 7 y 8 (zona B) de Buenaventura. En cada una se delimitaron tres parcelas de 100 x 50 m y se registraron todas las palmas con daño, además se complementó con un muestreo libre. Se identificaron doce especies de palmas distribuidas en una subfamilia y nueve géneros. Se examinaron 271 inflorescencias sin abrir en la zona A y 501 en B. Solo se evidenció daño en individuos de la palma "milpesos" (*Oenocarpus bataua*), especie económicamente explotable. La proporción de palmas afectadas en términos de hábitat fue significativamente mayor en el área intervenida. Este es el primer registro que cuantifica un alto porcentaje de asociación entre *D. borassi* y la palma "milpesos", fenómeno que podría ser explicado por hipótesis agroecológicas.

Palabras clave: Bosque secundario, inflorescencias de palmas, deforestación tropical, barrenadores de palmas, zonas perturbadas, chontaduro, Coleoptera, *Bactris gasipaes, Rhynchophorus palmarum, Dynamis borassi*.

Corresponding author
Maria Alejandra Bautista-Giraldo. Biologist. Department in Biological Sciences, Universidad de Caldas, Manizales, Caldas, Colombia, *alejandra.bautista.giraldo@gmail.com*

Suggested citation
BAUTISTA-GIRALDO, M. A.; ARMBRECHT, I.; VÁSQUEZ-ORDOÑEZ, A. A. 2020. The weevil *Dynamis borassi* (Coleoptera: Curculionidae: Dryophthorinae) associated with native palms in forests and disturbed areas in Buenaventura, Colombia. Revista Colombiana de Entomología 46 (2): e7721. https://doi.org/10.25100/socolen.v46i2.7721

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Introduction

Anthropogenic activities in terrestrial landscapes transform heterogeneous agricultural environments into homogeneous ones (Perfecto *et al*. 2009). This homogenization can lead to rapid production improvement; however, in the long term, it can produce negative consequences when important ecological functions that regulate pests are lost (Lindgren *et al*. 2018). For instance, the loss of plant architecture, that supports natural enemies or physically and chemically barriers from complex vegetation, directly inhibits pest attack (Altieri 1992).

An ecological consequence of habitat transformation by humans is that some herbivore populations increase as a response to resource homogenization, thus giving rise to economic problems for a crop (Armbrecht 2016). It has been suggested that decreased diversity could result in a greater abundance of focal host species (Pagán *et al*. 2012). Furthermore, greater plant diversity in agroecosystems has been related to an increase in insect diversity which, in turn, can result in less damage by insect herbivory (Letourneau *et al*. 2011).

Insect pests, especially species those with a limited host range, have greater difficulty in locating and remaining on their host plants in small, scattered crops rather than on large, dense crops (Root 1973). These changes in behavior may be due to the chemical and visual interference used for locating the host plant or to the quality of microhabitats (Andow 1991). In agroecology, the pattern just described is known as the resource concentration hypothesis, which leads to the prediction that crop herbivory will tend to decrease in more biodiverse contexts (Vandermeer 1989; Armbrecht 2016). Recent empirical evidence demonstrates that both the presence of forests and the design of diversified agricultural systems guarantee beneficial inter-species interactions, better weed suppression and the disruption of the life cycle of pests (Cong *et al*. 2015; Palomo-Campesino *et al*. 2018).

The chontaduro, "pejibaye" or peach palm (*Bactris gasipaes* Kunth, 1816; Arecaceae) was domesticated in pre-Columbian times by the Amerindians in the humid lowland neotropics. At present, it is widely cultivated outside of its original area (Ordoñez-Santos *et al*. 2015) occupying most of the neotropics (Mora-Urpí *et al*. 1997) from Honduras to Bolivia (along the Atlantic Coast of Central and South America to Brazil, and along the Pacific Coast from Costa Rica to the extreme south of Peru). Brazil, Colombia, Costa Rica, and Peru are the greatest producers (Clement *et al*. 2004). In Colombia, the peach palm is best represented in the Pacific and Amazon Regions (Godoy *et al*. 2007).

In 2010, a phytosanitary crisis was detected in peach palm production areas on the Colombian Pacific Coast. The damage was characterized by the toppling of palm crowns, causing the death of at least 253.000 plants (ICA 2015) This has been widely attributed to the palm weevil, *Rhynchophorus palmarum* L., 1758 (Coleoptera: Curculionidae). However, the presence of another very similar weevil, *Dynamis borassi* (Fabricius, 1801) (Coleoptera: Curculionidae), has also been recorded in chontaduro (Pardo-Locarno *et al*. 2016). As pointed out by farmers, this phytosanitary crisis coincided with the indiscriminate removal of native palms in different chontaduro production areas (Löhr and Vasquez-Ordóñez, pers. comm, November and December 2017), which are used for building material, food, and other purposes (Bernal and Galeano 2013). All of this has exerted a negative effect on palm diversity and population dynamics (Navarro 2015). Therefore, the phenomenon has probably important changes in forest dynamics since these palms are key components of tropical rain forest structure (Benchimol *et al*. 2017).

Damage promoted by *D. borassi* has been recorded in *Astrocaryum chonta* Mart. (1844) and *A. carnosum* F. Kahn and B. Millán (1992) in Peru (Couturier *et al*. 2000); *Euterpe oleracea* Mart. (1824) and *Oenocarpus minor* Mart. (1823) in Brazil (Couturier *et al*. 1998a, 1998b, 2000; Beserra *et al*. 2006); *Cocos nucifera* L. (1753) in Ecuador (Gerber *et al*. 1990) and *Syagrus schizophylla* (Mart.) Glassman (1968) and *S. vagans* (Bondar) A.D. Hawkes (1952) (Couturier *et al*. 1998a) in Brazil. In Colombia, this insect is associated with coconut palms (Mora-Urpi *et al*. 1997) and, specifically in Buenaventura municipality, with peach palm or chontaduro (Pardo-Locarno *et al*. 2005, 2016). Therefore, in this study we expected to find inflorescences of different species of native palms (besides chontaduro) being attacked by these weevils.

Details of the interaction between the *Oenocarpus bataua* Mart. (1823) or "milpesos" palm and *D. borassi* are unknown and how this interaction may vary in different types of habitats has not been evaluated. Therefore, the present study aimed to determine which species of native palms are used by *D. borassi* and the incidence of these weevils on native palms in two types of habitats: secondary forest and disturbed areas in two zones in the municipality of Buenaventura, Valle del Cauca, Colombia.

Materials and methods

Study area. The samplings were carried out in third administrative division: "Corregimientos" 1 and 2 (hereafter Zone A) and 7 and 8 (hereafter Zone B) in the municipality of Buenaventura, Valle del Cauca (Alcaldía Distrital de Buenaventura 2015). In the Bajo Calima area, near Zone A, average annual temperature is 26.5 °C, relative humidity is 90 % and precipitation is ca. 7,500 mm (Bocanegra-Gonzaléz *et al*. 2015). The Anchicaya River Basin, near the Zone B, has an average annual temperature of 26 °C, relative humidity of 86 % (Angulo 2012) and annual precipitation between 4,000 and 8,000 mm (Pardo-Locarno *et al*. 2016).

Sampling sites located in Zone A were studied between May 30 and June 8, 2018 whereas the sites in Zone B were studied between June 26 and July 7, 2018. The geographical coordinates and names of all the sampling sites are listed in Table 1. In each zone, seven sampling points were identified: three were classified as secondary forest (Habitat 1), three as anthropogenically disturbed areas (Habitat 2) and one was a free sampling point (see below). The secondary forest had at least four vertical vegetation layers and signs of healthy regeneration such as seedlings, herbaceous vegetation, and adult trees with overlapping canopies. The soil in the forest had abundant decomposing leaf litter and lacked dominant grasses. The criterion for selecting the "forest" habitat was the presence of arboreal tree structure and closed canopy. The disturbed areas were characterized by having very exposed palms, no canopy cover and, on many occasions, clearings at ground level. Ground cover was mainly characterized by the presence of one species of fern, *Dicranopteris* sp. (Gleicheniaceae), which normally grows in open or deforested tropical soils (Zhao *et al*. 2012), or pastureland with little vegetation (Fig. 1). Finally, a free sampling was carried out in the two Zones (A and B) by following dirt roads in primary succession areas for approximately 3 h (time was not standardized).

Table 1. Geographic location of Zone A ("Corregimientos" 1 and 2) and Zone B ("Corregimientos" 7 and 8) sampling sites in the municipality of Buenaventura, Valle del Cauca, Colombia.

Name of location (Type of habitat)	Coordinates
Zone A	
"El Guineo"- Stations of "Universidad del Tolima" (disturbed habitat)	3º57'07.32"N 76º59'16.21"W
"Tatabro" (Km 15) (disturbed habitat)	3º57'33.72"N 77º00'23.14"W
"El Vivero" (disturbed habitat)	3º56'26.26"N 76º59'06.05"W
"Guineo" (secondary forest habitat)	3º58'27.30"N 77º00'12.38"W
"Tatabro" (Km 15) (secondary forest habitat)	3º57'30.46"N 77º00'30.01"W
"El Vivero" (secondary forest habitat)	3º56'07.69"N 76º59'17.14"W
"Brisas" (free sampling)	3º57'31.22"N 77º00'13.64"W
Zone B	
"Alto Potedó" (disturbed habitat)	3º45'48.38"N 76º57'49.49"W
"Bogotá" (disturbed habitat)	3º46'06.70"N 76º58'04.73"W
"San Marcos" (disturbed habitat)	3º42'47.83"N 76º57'31.89"W
"Bartolo" (secondary forest habitat)	3º41'30.40"N 76º57'59.84"W
"El Colegial" (secondary forest habitat)	3º41'06.08"N 76º57'13.48"W
"Chaverra" (secondary forest habitat)	3º41'47.41"N 76º57'49.59"W
"Potedó" (free sampling)	3º47'39.58"N 76º59'20.18"W

Sampling design. At each of the sites (except those for free sampling), three 50 x 100 m plots were measured for a total of 36 plots in the entire study. Each plot was divided into four 25 x 50 m cells (Fig. 2). Distance between plots was a least 20 m. In each of the plots, the species of palms were identified and evidence of damage to inflorescences by borers was carefully searched for using binoculars. All sites evaluated were within a range of 500-1,000 m from the peach palm crops.

Free sampling was focused on specimens of the "milpesos" palm in order to increase the number of captured weevils and document the damage they cause to this specific species of interest. Free sampling time was five hours for Zone A and one hour for Zone B. Although time could not be standardized due to access logistics and security issues, the shorter sampling period in the second zone was partially rectified by having two researchers conduct the evaluation, both with more experience than in Zone A.

Damaged bracts (unopened inflorescences) were collected with the aid of a tree pruner (the maximum height of the palms from which the bracts were obtained was 15 m) when tree height and slope of terrain permitted. These were subsequently dissected in search of insects. Recovered adult weevils were preserved in 96 % ethanol. Following the Stehr (1987) protocol, the larvae were boiled (in 100 °C water) and placed in labeled vials with 96 % ethanol. The pupae were extracted from the palm inflorescences along with their cocoon and taken to the laboratory at the Universidad del Valle in Cali, Colombia, where they were raised until the emergence of imagos.

Sample processing. All palms were identified according to Galeano and Bernal (2010). Samples of vegetative and/or reproductive parts were collected when further examination was required for reliable identification. Voucher specimens were deposited at the "Luis Sigifredo Espinal Tascón Herbarium", Universidad del Valle (CUVC), under the following codes: *Bactris coloradonis* L. H. Bailey (1933) (CUVC-67962 to CUVC-67965), *Euterpe precatoria* Mart. (1842). (CUVC-67955 to CUVC-67958), *Manicaria saccifera* Gaertn. (1791) (CUVC-67959 to CUVC-67961), *Oenocarpus bataua* Mart. (1823) (CUVC-67974 to CUVC-67977), *Oenocarpus* sp. (CUVC-67982 to CUVC-67985), *Pholidostachys dactyloides* H. E. Moore (1967) (CUVC-67978 to CUVC-67981), *Wettinia quinaria* (O. F. Cook & Doyle) Burret (1930) (CUVC-

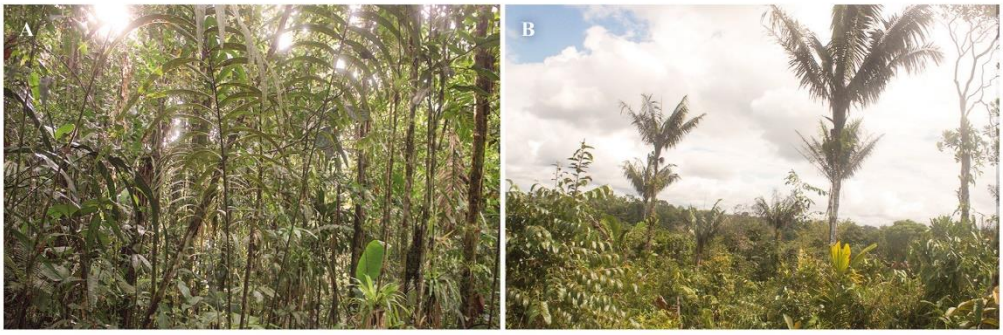

Figure 1. Characteristic habitats at studied sampling sites in rural areas of Buenaventura, Valle del Cauca, Colombia: **A.** Secondary forest. **B.** Disturbed areas.

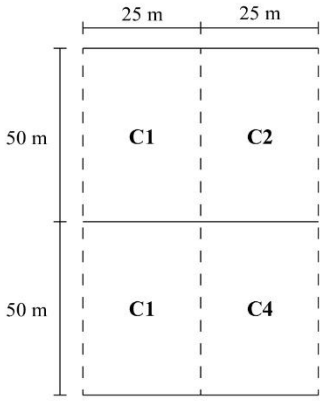

Figure 2. Organization of one of the 36 sampling plots (three at each sampling site): C1, C2, C3 and C4 are Cell 1, 2, 3, and 4, respectively.

67966 to CUVC-67969) and *Wettinia radiata* (O. F. Cook & Doyle) R. Bernal (1995) (CUVC-67970 to CUVC-67973).

Adult and larvae weevil were identified based on Wattanapongsiri (1966). All material was examined at the "Laboratorio de Biología, Ecología y Evolución de Artrópodos", Universidad del Valle, and deposited at the "Museo de Entomología de la Universidad del Valle" (MUSENUV) under the following voucher codes: *D. borassi* (MUSENUV-29193, MUSENUV-29193-1 and MUSENUV-29193-2).

Data analyses. A Generalized Mixed Linear Model with binomial error distribution was made to assess the differences in the proportion of palms and inflorescences of *O. bataua* in both in zones and in the sampled habitats. All statistical analyses were carried out using the R version 3.1.5 free distribution program (Core Team 2018) and the lme4 package to adjust Mixed Effect Generalized Linear Models. Level of significance was 5 %.

Results

A total of twelve species of palms were identified at the study area (including the two zones) and a total of 772 unopened inflorescences were collected (Table 2).

Table 2. Number of unopened inflorescences per palm species collected in Zone A ("Corregimientos" 1 and 2) and Zone B ("Corregimientos" 7 and 8) in Buenaventura, Valle del Cauca, Colombia.

Species	Number of unopened inflorescences	
	Zone A	Zone B
Attalea allenii H. E. Moore. (1949)	0	3
Bactris coloradonis	3	1
Euterpe precatoria	7	8
Iriartea deltoidea Ruiz y Pav (1798)	0	5
Manicaria saccifera	45	2
Oenocarpus bataua	63	40
Oenocarpus minor	0	2
Oenocarpus sp.	0	1
Pholidostachys dactyloides	3	0
Socratea exorrhiza (Mart.) H. Wendl (1860)	3	15
Wettinia quinaria	61	324
Wettinia radiata	86	100
Total	271	501

Of the twelve palm species identified, damage was only found in *O. bataua* in both samples (plots and free samples). Complete damage to the inflorescence was observed and more than 50 % of the inflorescences showed various perforations at the apex, the central and basal part of the unopened inflorescences (Figs. 3B-3D). The largest number of perforations was recorded in the central part of the inflorescence in both zones (Zone A: 98 perforations and Zone B: 31 perforations), followed by perforations in the apex (35 and 9, respectively) and the base (24 and 8, respectively). The affected bracts (unopened inflorescences) were also totally consumed (rachis, raquilla and flowers) (Fig. 3E). Statistical analyses could not be carried out for this descriptive data because they included observations made by free sampling for which time was not standardized. The pupae were observed at the base of the bracts, each enclosed within a pupal case made from bract fibers (Fig. 3F). For both, the sampling of plots and free sampling, empty pupal cases were found to drop off the inflorescences while the larvae and pupae were found inside. The pupal phase lasted for 40 days until the emergence of the imagoes. Both adult and larvae were identified as *D. borassi* (Fig. 4).

Some inflorescences with incomplete weevil-induced perforations (13 in Zone A and 5 in Zone B) were observed. A pattern to identify affected inflorescences was determined: whereas healthy inflorescences normally tilt forwards before the bracts open to expose the reproductive structures, damaged unopened inflorescences exhibited a tendency to maintain an upright position.

In plot samplings, the percentage of *O. bataua* affectation was 49.2 % (62/126) in Zone A, where six empty pupae and two larvae were found. In Zone B, percentage of affectation was 42.8 % (21/49) and five empty pupae were found.

In *O. bataua* free sampling, percentage of palm affectation in Zone A was 47.6 % (30/63), where five empty pupae, two larvae, and one pupa with a live individual were found. In Zone B, the percentage of affectation was 25 % (2/8) and two empty pupae were found (Fig. 5).

No significant statistical differences were found, in terms of damage percentaje, between Zone A and Zone B (P = 0.318). However, there was a statistically significant effect for habitat (P = 0.043) on the mean proportion of palms affected for *O. bataua*, the effect being greater in the disturbed zone habitat than in the secondary forest (Table 3, Fig. 6A). Regarding affected *O. bataua* bracts, no significant differences were found between Zones A and B (P = 0.222) (Table 3). Nevertheless, a marginal, but statistically negligible, effect was found on comparing habitats (secondary forests vs. disturbed zones) regarding the proportion of affected unopened inflorescences (P = 0.058) (Table 3, Fig. 6B)

Discussion

Our results showed that, during the season sampled, there was an exclusive association of the weevil *D. borassi* on *O. bataua* since no attack on the other eleven co-occuring palms in the region was recorded. Although the number of sampled inflorescenses was very different, and there are still uncertainties, our results suggest that *D. borassi* weevils can be host-selective. Their preference for *O. batatua* may be related to a chemical preference for volatile substances produced by this host plant. This behavior was previously reported in literature on other weevils of this subfamily (Reddy and Guerrero 2004; Aldana de la Torre *et al.* 2011).

Figure 3. *Oenocarpus bataua* inflorescences. **A.** Healthy inflorescence and normal development. **B.** Damage to the apical portion. **C.** Damage to the mid-apical portion. **D.** Damage to the base. **E.** Completely empty bract affected by the weevil. **F.** Pupa of *Dynamis borassi* at the base of the inflorescence. **G.** Empty *D. borassi* pupal case.

It is also possible that, due to phenology or other unknown ecological factors, the *D. borassi* would not have attacked other native palm species. Further, it has been shown that it does attack other palms such as peach palm (chontaduro) (Pardo-Locarno *et al.* 2016) among other palms (Couturier *et al.* 2000). It seems likely that habitat deterioration and the increase of monocultures in the Pacific region, added to palm deforestation affects peach palm and "milpesos" palm infestation rates.

Our observations also showed that *D. borassi* completes the larval cycle inside *O. bataua* inflorescences. This is consistent with literature reports, which confirm that this species attacks and undergoes its inmature stages in palm inflorescences (Giblin-Davis *et al.* 1996; Couturier *et al.* 1998a, 1998b; 2000). A different damage pattern occurs in chontaduro (*B. gasipaes* or peach palm) crops, where the larva often burrows into the apical portion of the stem to complete its development (A. A. Vásquez-Ordóñez, pers. obs.). This behavior has also been documented in other palms, such as in *O. mapora* H. Karst 1857; and it has been found that, on occasions, it only affects the stem, such as in *E. oleracea* (Beserra *et al.* 2006).

An important observation for the diagnosis of attack is that affected inflorescences (bracts) remain in an upright position and do not tilt forward, a symptom of great importance for differencial identification when the height of the palm hinders a more detailed diagnosis.

Seventeen (17) empty pupal cases were found in inflorescences: almost half of the inflorescences sampled were found to be damaged and with evidence of insect exit but without insect presence. Up to three individuals in any state of development were found per inflorescence, which means that various individuals can develop in an inflorescence. This also suggests the seasonality of the occurrence of *D. borassi* at our study site, which was reinforced by peach palm (*B. gasipaes*)

Figure 4. *Dynamis borassi* Olivier (Curculionidae, Dryophthorinae) larva and adult. **A.** Larva. **B.** Adult male (dorsal view). **C.** Adult male (lateral view).

Figure 5. *Dynamis borassi* attack on developing *Oenocarpus bataua* inflorescences at Zone A ("corregimientos" 1 and 2) and Zone B ("corregimientos" 7 and 8) in the municipality of Buenaventura, Valle del Cauca, Colombia.

observations near the study sites during the same season that showed a similar seasonal pattern of *D. borassi* abundance. However, we also found larvae inside inflorescences thus demonstrating the possibility of an asynchronous population cycle. This asynchrony may be related to the variable phenology of the host palm (*O. bataua*) (Nuñez-Avellaneda and Rojas-Robles 2008) that maintains floral resources over the entire year thus allowing the continuous development of *D. borassi* populations. This may also be explained by a multivoltine behavior of this weevil, something which has also been reported for other species of this subfamily (Riba and Alonso 2007). However, more studies on this aspect are needed specifically for *D. borassi*.

Greater affectation of the weevil in *O. bataua* was observed in disturbed habitats. A possible, yet scientifically unproven, explanation is that weevil populations are directly influenced by the concentration or spatial dispersion of the suitable host palms. In the disturbed habitats and peach palm monocultures, where the palms are more exposed and concentrated, weevils can localize food resources more easily (Root 1973). Instead, when within the forest, the weevil is less likely to easily find its host plant, because there is more vegetation diversity and a greater abundance of plants with different phytochemicals that produce different aromas. This could mask chemical stimuli and physical obstacles (Vandermeer 1989) that act as barriers, thus permitting the insects to infest more plants and inflorescences. Nevertheless, more research is required to confirm this hypothesis and this study does not claim to have found evidence of it.

Table 3. Deviation analysis (chi square, χ^2; degrees of freedom, Df; and probability, Pr) for two response variables: proportions of affected *Oenocarpus bataua* individuals and inflorescences in the two sampled areas (Zones A and B); the two sampled habitat types (secondary forest and disturbed site); and zone-habitat interaction in Buenaventura, Valle del Cauca, Colombia.

Area	Proportion of affected palms			Proportion of affected unopened inflorescences		
	χ^2	Gl	Pr (> χ^2)	χ^2	Gl	Pr (> χ^2)
Zone	0.998	1	0.318	1.489	1	0.222
Habitat	4.088	1	0.043*	3.608	1	0.058
Zone-Habitat	2.003	1	0.157	1.536	1	0.215

Conclusions

A descriptive and quantitative report on an exclusive *D. borassi* association with the *O. bataua* palm in the tropical region was produced. All damage was reported within unopened inflorescences, where the weevil seems to carry out all immature stages. This is extremely important for understanding the ecology of this weevil in non-cultivated palms and contributes to understanding their impact on peach palm (chontaduro) crops.

Our results suggest that increasing deforestation, particularly of native palms, and replacement of natural forest cover with peach palm monoculture favor the scenario of the agroecological resource concentration hypothesis. Although more research is required, our results present possible explanations and hypotheses for further work. Studies regarding direct temporal relationships between the deforestation of native palms and increased infestation of the peach palm by *D. borassi*, together with plausible reasons behind host preference, should continue. It is also necessary to spatially and temporally increase research, such as that reported for the Colombian Choco, in order to establish associations with other species of native palms.

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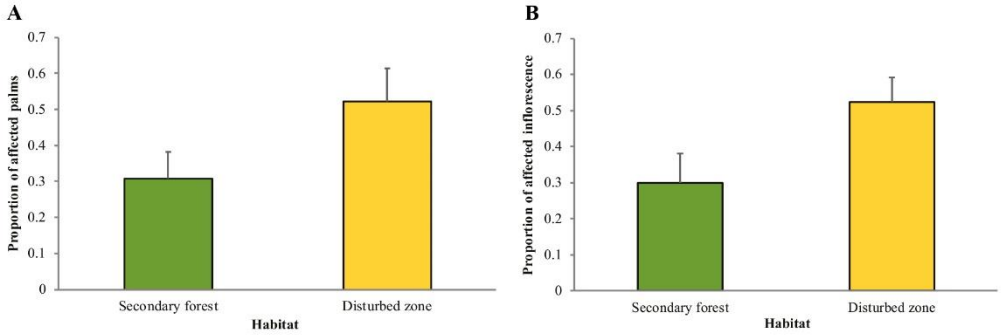

Figure 6. *Dynamis borassi* damage to *Oenocarpus bataua* palms (**A**), and infloresences (**B**), in secondary forests and disturbed zones in the municipality of Buenaventura on the Colombian Pacific Coast.

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VII CONGRESO LATINOAMERICANO

AGROECOLOGÍA

"AGROECOLOGÍA: CIENCIA, PRÁCTICA Y MOVIMIENTO PARA ALCANZAR LA SOBERANÍA ALIMENTARIA"

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Certificado Concedido A:

María Alejandra Bautista

Por haber participado en calidad de PONENTE con el tema:

"Los picudos (coleoptera: dryophthoridae) en chontaduro: ¿plagas inducidas por la deforestación de palmas nativas en buenaventura, Colombia".

En el "VII Congreso Latinoamericano de Agroecología" realizado del 2 al 5 de Octubre del 2018 en la ciudad de Guayaquil

Guayaquil, 10 de Octubre del 2018

Clara Nicholls
Presidente
Sociedad Científica Latinoamericana de Agroecología

Richard Intriago Barreno
Presidente
Comité Organizador
VII Congreso Latinoamericano de Agroecología

LOS PICUDOS (COLEOPTERA: DRYOPHTHORIDAE) EN CHONTADURO: ¿PLAGAS INDUCIDAS POR LA DEFORESTACIÓN DE PALMAS NATIVAS EN BUENAVENTURA, COLOMBIA?

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Resumen

La deforestación de bosques para dar paso a entornos agrícolas homogéneos genera impactos negativos sobre la biodiversidad, ya que conducen a una disminución de los servicios ecosistémicos y al aumento de las especies dominantes que pueden alterar un hábitat determinado. Las palmas son componentes clave de la estructura del bosque tropical y muchas especies han sido extensamente cosechadas por humanos en los trópicos; desde el 2010 se está presentando una crisis fitosanitaria en la palma de chontaduro (*Bactris gasipaes*), conocida como "desnucamiento", atribuida al picudo coleóptero *Dynamis borassi*. Esta crisis parece coincidir con una disminución de palmas nativas, las cuales son deforestadas para diferentes usos. Por lo tanto, el objetivo de esta investigación es determinar qué especies de palmas nativas son usadas por picudos, en especial por *D. borassi*, y evaluar la incidencia de esas especie en dos tipos de hábitats (bosque y zona intervenida). Para esto se trazaron tres parcelas (100x50m) en dos tipos de hábitats y se observó si había evidencia de barrenadores de inflorescencia. Se identificaron siete especies de palmas y 351 inflorescencias de las cuales 60 presentaron daño, todas pertenecientes a *Oenocarpus bataua*; en cuanto al hábitat, en dos de las zonas se encontró mayor afectación en la zona intervenida, apoyando la hipótesis de recursos, es decir, que las poblaciones de insectos pueden ser influenciadas directamente por la concentración o dispersión espacial de sus plantas alimenticias

Palabras clave: palmas nativas, *Dynamis borassi*, botón floral, deforestación

Introducción

Los cambios antropogénicos en el paisaje vienen transformado los entornos agrícolas heterogéneos en homogéneos, con hábitats menos naturales, es decir, las plantaciones de monocultivo ha reemplazado bosques tropicales y subtropicales de enorme biodiversidad (Perfecto, Vander-

mer y Wright, 2009). La homogenización de los agroecosistemas y la expansión de los monocultivos están afectando negativamente a la biodiversidad (Winkvist et al., 2011). La disminución de la biodiversidad a menudo también conduce a cambios en las funciones del ecosistema, pues la diversidad de especies aumenta la capacidad de sostener la producción agrícola mientras se mantienen funciones ecosistémicas sustanciales en el sistema (Lindgren et al., 2018)

Una consecuencia ecológica cuando un hábitat previamente natural, se transforma en una gran biomasa de materia vegetal monoespecífica, es decir, cultivos extensivos, es que inevitablemente aparecerán organismos que podrán sacar provecho de estas masas de nutrientes y aumentarán sus poblaciones, estas son las llamadas plagas (Armbrecht, 2016). Se ha sugerido que la disminución de la diversidad podría resultar en una mayor abundancia de especies hospederas focales (Pagán et al. 2012).

Así mismo, en los agroecosistemas, el aumento de la diversidad de plantas se ha relacionado con un aumento en la diversidad de insectos lo que, a su turno, también puede dar como resultado un menor daño por herbivoría por insectos (Gazhali et al. 2016) en la medida que una mayor cantidad de recursos, el sistema puede soportar poblaciones más grandes (Ziesche, 2017). Además los insectos plaga, especialmente las especies con un limitado índice de huéspedes, tienen mayor dificultad para ubicar y permanecer en las plantas huéspedes en sembrados pequeños y dispersos que para hacerlo en cultivos grandes y densos (Root, 1973); estos cambios en el comportamiento se deben quizás a la gran interferencia química y visual que existe con las señales usadas para la ubicación de la planta huésped o a las modificaciones de su microhábitat y se su calidad (Andow 1991).

La palma de pejibaye o chontaduro (*Bactris gasipaes*) fue domesticada en la época precolombina por los amerindios de de tierras bajas húmedas. Hoy se encuentra desde Honduras a Bolivia (Mora-Urpí et al., 1997) y es ampliamente cultivado fuera de su región original (Ordoñez-Santos et al. 2015) con Brasil, Colombia, Costa Rica y Perú como los de mayor producción (Clement et al., 2004). En Colombia se encuentra bien representado en las regiones del Pacífico y Amazonía (Godoy et al. 2007).

En 2010 inició una crisis fitosanitaria, denominada “desnucamiento”, que ocasionó la muerte de por lo menos 253.000 palmas de chontaduro en el Pacífico Colombiano (Instituto Colombiano Agropecuario, ICA, B. Löhr, datos sin publicar). Este daño se caracteriza por el volcamiento de la corona de la palma y su posterior muerte (B. Löhr, datos sin publicar). Aunque existen varias especies de picudos, dicha crisis fitosanitaria se le ha atribuido al coleóptero *Dynamis borassi*, ya que para esta especie se ha reportado el aborto masivo de inflorescencias sin abrir (Couturier et al. 1998, 2000).

La crisis fitosanitaria coincide con la deforestación de palmas nativas en la zona (Löhr &

Vásquez, obs. pers.). Esta actividad se da con el fin de obtener diferentes usos de las palmas como: construcción, alimentación entre otros (Bernal & Galeano, 2013). Las palmas son componentes clave de la estructura del bosque, una pérdida y fragmentación del hábitat ha llevado a varios cambios en la estructura y configuración del paisaje, lo que afecta en gran medida la dinámica de la población y la comunidad (Benchimol et al., 2017). Un disminución en la diversidad de palmas puede afectar otras poblaciones, por ejemplo puede que ciertos grupos ecológicos sean favorecidos por la perturbación y, consecuentemente, compensar la reducción en otros (Scariot, 1999).

Sin embargo, se desconoce la identidad de las palmas nativas usadas por *D. borassi* y cómo puede afectar la deforestación de estas a un aumento de este coleóptero en los cultivos de chontaduro y, además, cómo puede variar la incidencia de dicho insecto en el bosque y en zonas intervenidas. Con el objeto de abordar estos interrogantes agroecológicos, se planteó la presente investigación que busca determinar qué especies de palmas nativas son usadas por *D. borassi* y evaluar la incidencia de éste en dos tipos de hábitats (bosque y zona intervenida).

Métodos

Se realizó un muestreo en mayo de 2018 en la región de Bajo Calima, Valle del Cauca, bosque lluvioso tropical, con temperatura promedio anual de 26°C, precipitación media anual de 7467 mm y humedad relativa de 88%.

Se trazaron tres parcelas de 50m x 100m en dos tipos de hábitats (bosque y zona intervenida) con tres repeticiones, cada una de las parcelas se dividió en cuatro celdas de 50m x 25m; y se mantuvo una distancia de 20m entre ellas (figura 1).

Se identificaron las palmas presentes en cada parcela y se observó si había evidencia de barrenadores de tallo o inflorescencia; las inflorescencias que presentaron daño se procedieron a bajar y diseccionaron en búsqueda de larvas; estas larvas se preservaron en alcohol al 96% y fueron identificadas en el laboratorio en la Universidad del Valle.

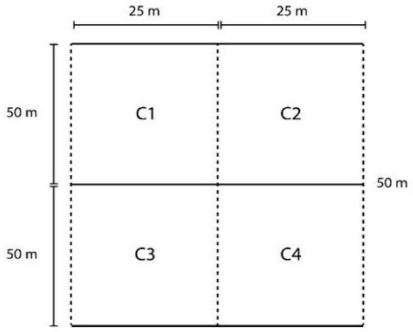

Figura. 1. Montaje de la parcela.

Resultados y discusión

Se identificaron siete especies de palmas y fueron muestreados 351 botones florales, la especie de palma que se encontró en mayor proporción (35,89%) fue *Oenocarpus bataua* ("milpesos") seguida de *Wettinia radiata* (Abuelita) con un 29,05%.

Tabla. 1. Número de botones florales por especie de palma

Especie	Número de botones florales
Oenocarpus bataua	126
Euterpe oleracea	7
Wettinia radiata	102
Wettinia quinaria	63
Manicaria saccifera	45
Socratea exorrhiza	5
Bactris barronis	3
TOTAL	351

Se encontraron 60 brácteas o botones florales afectados, todos pertenecientes a la especie *Oenocarpus bataua*. El porcentaje de brácteas afectadas de esta especie fue representativo, ya que de todas las brácteas examinadas el 47,61% presentaba daño.

En cuanto al tipo de hábitat la mayoría de brácteas afectadas se encontró en las zonas intervenidas (figura 2).

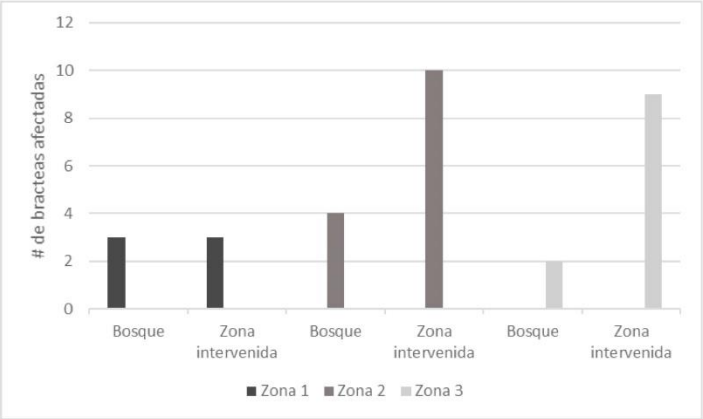

Tabla. 2. Número de brácteas de *Oenocarpus bataua* afectadas por picudos, de acuerdo a zona de muestreo y hábitat.

La zona uno presentó igual afectación por picudos en ambos hábitats, sin embargo en las

otras dos zonas la afectación fue mayor en la zona intervenida, esto apoya la hipótesis de concentración de recursos (Root, 1973), es decir, que las poblaciones de insectos pueden ser influenciadas directamente por la concentración o dispersión espacial de sus plantas alimenticias; en las zonas intervenidas, al estar más expuestas y concentradas las palmas, puede facilitar la localización del recurso por parte del insecto. Además, en el bosque al haber más diversidad de palmas puede generar un enmascaramiento de estímulos químicos y obstáculos físicos. Estas evidencias ofrecen soporte a la hipótesis que la deforestación de vegetación nativa y palmas desequilibra las poblaciones de herbívoros exponiendo a los cultivos a problemas fitosanitarios en el chontaduro.

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