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Abstract

The eight species of dynastine scarab beetles that occur in Chile are reviewed. Keys, descriptions, geographic distributions, monthly adult activity, notes on natural history, illustrations, and distribution maps are provided for all species. The erroneous records of 16 dynastine species reported from Chile are reviewed and clarified. The monotypic genus *Chiliphileurus* Endrödi, 1977 is reduced to **junior synonymy** with *Eophileurus* Arrow, 1908, and its only species, *Chiliphileurus tuberculatus* Endrödi, 1977, follows as a **new junior synonym** of the Asian *Eophileurus cingalensis* Arrow, 1908.

Resumen

Se revisan exhaustivamente las ocho especies de dinastinos que ocurren en Chile. Se proporcionan claves, descripciones, datos de distribución geográfica y actividad mensual de adultos, notas sobre su historia natural, ilustraciones y mapas de distribución para todas las especies. Se discuten y clarifican los registros erróneos de 16 especies de dinastinos reportadas de Chile. El género monotípico *Chiliphileurus* Endrödi, 1977 se reduce a **sinonimia junior** con *Eophileurus* Arrow, 1908, y su única especie, *Chiliphileurus tuberculatus* Endrödi, 1977, sigue como **nuevo sinónimo junior** de la especie asiática *Eophileurus cingalensis* Arrow, 1908.

Keywords: taxonomy, nomenclature, distribution, key, erroneous records, South America

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Introduction

In this paper, we synthesize and integrate data from museum specimens, personal collecting, and the literature to obtain a comprehensive biodiversity inventory of the eight scarab beetle species in the subfamily Dynastinae that occur in Chile. This work complements our biotic inventory reviews of the dynastines that occur in Mesoamerica, the West Indies, North America (Ratcliffe 2003; Ratcliffe and Cave 2006, 2015, 2017; Ratcliffe *et al.* 2013), and Ecuador (Ratcliffe *et al*. 2020). Perhaps just as important, we review and clarify the many erroneous records of dynastine species reported from Chile.

Catalogs or checklists that include Chilean specimens (some with incorrect nomenclature or inaccurate records) were published by Solier (1851), Germain (1911), Arrow (1937), Blackwelder (1944), Gutiérrez (1945, 1947, 1950), Krajcik (2005), and Ferrú and Elgueta (2011). Dynastinae were not included in the pictorial overview of the Coleoptera of Chile by Arias (2000).

Adult dynastines are small (4 mm) to very large (160 mm) beetles and are characterized by the following combination of characters: mandibles variably exposed in dorsal view; antenna with nine or ten antennomeres, insertion not visible from above; scutellum visible; base of pronotum and elytra subequal in width; pygidium exposed; abdominal sternites not constricted at midline; procoxae transverse; claws of meso- and metatarsi simple, not independently moveable, similar in size; apex of metatibia always with two spurs. The sexes are usually distinctly dimorphic except for the Phileurini and some Cyclocephalini and Pentodontini. Nearly all species of dynastines can be easily sexed because the last sternite in males is emarginate, whereas in females it is rounded. For some species, sexual dimorphism takes the form of the males having enlarged protarsi (as in species of *Cyclocephala* Dejean) or the presence or enlargement of cephalic or prothoracic tubercles or horns (as in Oryctini, Agaocephalini, and Dynastini).

The subfamily Dynastinae occurs in all major biogeographic areas of the world (except the polar regions), although most species are found in the tropics, specifically the New World tropics. There are now about 1,865 known species of dynastines, and Endrödi (1985) predicted that the world fauna will reach 2,000 species.

Larval dynastines are primarily saprophagous or phytophagous and live in composting plant debris, beneath the surface of the ground, or in decaying logs and stumps where they are important in nutrient recycling. The life cycle and immature stages for most dynastine species remain unknown, and this is a fertile field of research for future workers. Where the life cycle is known, larvae take from several months to three years in the larger species to develop, and the adults normally live for several weeks. The adults of nearly all species are nocturnal or crepuscular, and most are readily attracted to lights at night. Most adult dynastines are known to feed on ripe or rotting fruits, slime fluxes, and plant roots. Larval dynastines are primarily saprophagous or phytophagous and live in composting plant debris, beneath the surface of the ground, or in decaying logs and stumps where they are important in nutrient recycling.

Study Area

Encyclopedia Britannica (2020) and Biblioteca del Congreso Nacional de Chile (2020) characterize Chile as follows. Chile is a long, narrow country that extends along the Pacific coast for 4,300 km from its northern border with Peru and Bolivia to the southern tip of South America (Fig. 1). It is bordered on the east by Argentina. Northern Chile is dominated by the Atacama Desert, while the central part of the country has a Mediterranean temperate climate with distinct seasons: summer (December to February), autumn (March to May), winter (June to August), and spring (September to November). The southernmost third of the country is cold, wet, and windy.

The arid Andes of northern Chile (Figs. 3–6) are 5,000–7,000 m in elevation. The highest mountains are extinct volcanoes where the summits are capped by eternal snows (*e.g.*, Llullaillaco at 6,735 m and Ojos del Salado at 6,893 m). In central Chile (Figs. 7–9), mountain peaks reach 6,875 m (Cerro Tupungato) and 3,740 m (Volcán Maipo).

Annual precipitation varies remarkably from the xeric north to the humid south. North of 27° S latitude, there is virtually no rainfall. In the north-central region, winter rains account for increasing precipitation. For example, the annual rainfall at Copiapó is less than 21 mm and gradually increases southward to 330 mm in Santiago, 381 mm at Valparaíso, and 1,321 mm at Concepción.

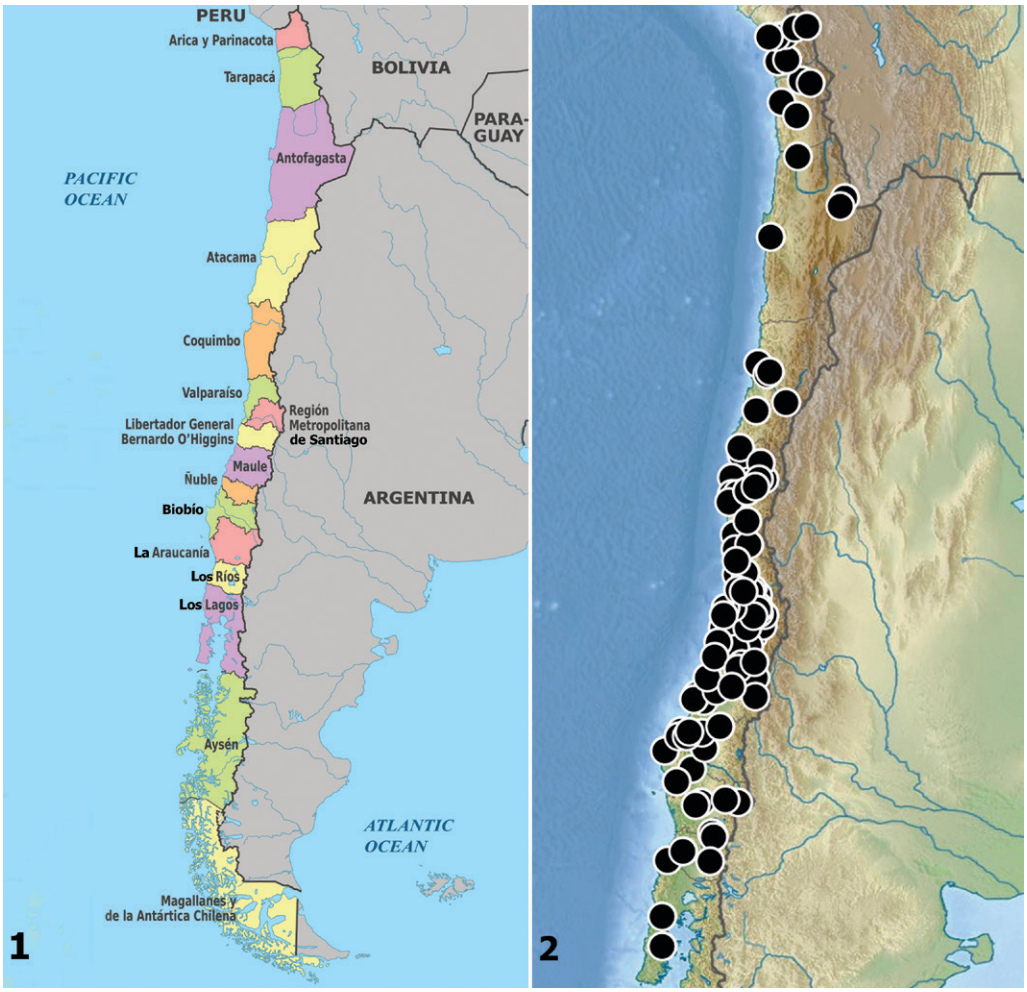
The northernmost coastal and central region are nearly barren of vegetation, while grasses and scattered tola desert brush are found on the slopes of the Andes. The central valley is characterized by several species of cacti, the Chilean pine (*Araucaria araucana* (Molina) K. Koch, Araucariaceae) and southern beeches (*Nothofagus* spp., Nothofagaceae).

In southern Chile, south of the Río Biobío, heavy precipitation favors dense forests of laurels, magnolias, and various species of conifers and beeches. Cold temperatures and winds of the extreme south preclude forestation. Grassland is found in Atlantic Chile (Patagonia).

Material and Methods

This study was based on the records of 674 specimens from Chile. This material came from three primary sources: (1) specimens from institutional and private collections; (2) the scientific literature; and (3) personal collecting by BCR and JM. Those collections and their codes (as given in Evenhuis 2013) follow below; we provide *ad hoc* codes for those not listed. The curators and/or collection managers who provided the material are indicated below.

ABCB	Alberto Ballerio Collection, Brescia, Italy
AMNH	American Museum of Natural History, New York, NY, USA (data courtesy of Andrew Smith)
BCRC	Brett C. Ratcliffe Collection, Lincoln, NE, USA
BYUC	Brigham Young University, Provo, UT, USA (data courtesy of Andrew Smith)
CASC	California Academy of Sciences, San Francisco, CA, USA (data courtesy of Andrew Smith)



Figs. 1–2. **1)** Map of Chile showing region names (used in the locality records); **2)** Distribution of all localities of dynastine records in Chile cited in this work.

CMNC	Canadian Museum of Nature, Ottawa, ON, Canada (data courtesy of Andrew Smith)
CMNH	Carnegie Museum of Natural History, Pittsburgh, PA, USA (Robert A. Androw)
CNCI	Canadian National Collection of Insects, Ottawa, ON, Canada (data courtesy of Andrew Smith)
DEBU	University of Guelph, Guelph, ON, Canada (data courtesy of Andrew Smith)
FMNH	Field Museum of Natural History, Chicago, IL, USA (data courtesy of Andrew Smith)
FSCA	Florida State Collection of Arthropods, Gainesville, FL, USA (Paul E. Skelley)
IEUMCE	Instituto de Entomología, Universidad Metropolitana de Ciencias de la Educación, Santiago, Chile (Patricia Estrada)
INHS	Illinois Natural History Survey, Champaign, IL, USA (data courtesy of Andrew Smith)
JMEC	José Mondaca E. Collection, Villa Alemana, Chile
LEMQ	Lyman Entomological Museum, McGill University, Ste. Anne de Bellevue, Québec, Canada (data courtesy of Andrew Smith)
MAHC	Martin Hardy Collection, Québec, QC, Canada
MLUH	Martin Luther Universität, Halle, Germany (Karla Schneider)

Figs. 3–4. Habitat of *Ancognatha aymara* in Región de Arica y Parinacota, Chile. **3)** Hills near Socoroma, 3,200 m; **4)** Sector Parinacota, 4,200 m.

Fig. 5. Habitat of *Golofa minutus* and *Ancognatha aymara* at Putre (cultivated terraces), Región de Arica y Parinacota, Chile, 3,500 m.

MNHN	Museum National d'Histoire Naturelle, Paris, France (Antoine Mantilleri)
MNNC	Museo Nacional de Historia Natural, Santiago, Chile (data courtesy of Andrew Smith)

Fig. 6. Two images of the habitat of *Tomarus maimon*, *T. rostratus*, and *Archophileurus chaconus* at Arica, Valle de Azapa, Región de Arica y Parinacota. Photographs by Héctor A. Vargas (University of Tarapacá, Arica, Chile).

RHMC	Ron H. McPeak Collection, Battleground, WA, USA
SAGC	Unidad de Entomología, Laboratorios y Estación Cuarentenaria Agrícola, Servicio Agrícola y Ganadero, Santiago, Chile (Sergio Rothmann)
SLTC	Stéphane Le Tirant Collection, Lachenaie, QC, Canada
SRTC	Sergio Rothmann Collection, Santiago, Chile
UMSP	University of Minnesota, St. Paul, MN, USA (data courtesy of Andrew Smith)
USNM	U. S. National Museum of Natural History, Washington, DC, USA (currently at University of Nebraska State Museum)
UTAC	Colección Universidad de Tarapacá, Arica, Chile (Héctor A. Vargas)

A conventional, artificial key, both in English and Spanish, to all Dynastinae found in Chile is presented. The key and descriptions are accompanied by illustrations to aid in correctly identifying specimens. Maps created by Benchmark Maps (Medford, OR) have dots that show distributions as exemplified by label data and literature records.

Figs. 7–9. Habitat of *Ligyrus villosus.* **7)** Navidad, Región del Libertador General Bernardo O'Higgins; **8)** Sandy plains of Los Vilos, Región de Coquimbo; **9)** Parque Nacional Tolhuaca, Región de La Araucanía.

Each genus and species is introduced with its chronological, nomenclatural history of synonyms, if any. An abbreviated description for each species then follows. This consists of length and width measurements, color (using transmitted light and not simply reflected light), and distinguishing characteristics of the head, pronotum, elytra, pygidium, legs, venter, and parameres.

Overall geographic distribution is then given, followed by locality records (alphabetical by place names within each region and province), temporal distribution of adult records, a brief diagnosis, and remarks on natural history, habitat preference, and elevational range when known. All of the collecting sites recorded in this work are shown in Fig. 2. For temporal distribution, records are for the study area only and not range-wide.

The phylogenetic species concept as outlined by Wheeler and Platnick (2000) was used in this work. This concept defines species as the smallest aggregation of populations diagnosable by a unique combination of character states.

Characters Used in the Keys and Descriptions

Measurements. Length measurements are from the clypeal apex to the elytral apex, and width measurements are across the humeri.

Clypeus. The surface sculpturing, presence of tubercles or horns, and form of the apex of the clypeus are important characters. Care should be taken when arriving at a conclusion about the form of the clypeal apex, because this area is subject to having its shape altered by abrasion from digging by the beetle. Fortunately, a worn clypeus can usually be recognized as such and so not be misinterpreted.

Mandibles. The form of the lobes or teeth of each mandible is of taxonomic significance in some groups. The mandibles are subject to considerable wearing, and, as with the clypeal apex, judicious care should be employed when ascertaining the shape of the lobes.

Interocular Width. Measured by the number of transverse eye diameters necessary to span the interocular gap (the frons), this character is usually consistently expressed with little variation among individuals.

Antennae. The number of antennomeres (9 or 10) is diagnostic as is the relative length of the antennal club relative to the stem (antennomeres 1–6 or 1–7) or to antennomeres 2–7.

Pronotum. For convenience, the descriptions divide the pronotum into disc, sides, and anterior third or half (which includes the fovea). Pronotal sculpturing tends to decrease proportionately as the size and development of the horns increase and vice versa. The presence or absence of a basal bead is important for some genera.

Elytra. Surface sculpturing usually consists of punctate striae, and punctures vary in size, density, and form.

Genitalia. For most species of Dynastinae, it is necessary to examine the form of the parameres of the male genitalia because, with rare exceptions, they are diagnostic. Some species have very similar parameres, and so this character should be used in combination with other characters for an

accurate determination. The parameres may be easily extracted from dried, pinned specimens in either of two ways. The first, which is more time-consuming and labor intensive, is to immerse the specimen in hot water for several minutes in order to soften it and then extract the parameres through the genital opening. Great care is needed when attempting this because the parameres have also become softened and may tear easily. The second, and easier option in our opinion, is to gently "break" the "locked" position of the middle and hind legs so as to rotate them aside and away from the abdomen. Then, using fine-point forceps or an insect pin, insert the tip just behind the metacoxae at the extreme base of the first abdominal sternite and, while pushing down and toward the rear of the specimen, dislodge the entire abdomen. When this is done, simply remove the dried contents of the abdomen until you can grasp with forceps the parameres that are located just inside the pygidium. With a small drop of water-soluble glue, put the abdomen back in place. Clean away the debris from the extracted parameres and glue them onto an archival-quality mounting point that is placed beneath the specimen. Finally, gently push the middle and hind legs back into position.

Punctures. Punctures are considered irregular in distribution and simple unless otherwise noted. Ocellate punctures are ringed with a slightly different color tone, and umbilicate punctures are navel-shaped or have a convex bump at the bottom of the puncture. Minute punctures are generally not seen with 12.5× magnification but are easily seen with 50× magnification. Small punctures are easily seen with 12.5× magnification and can be seen with the naked eye. Large punctures are easily seen without the aid of instruments. Punctures are termed sparse if there are few of them or they are separated from one another by ten or more puncture diameters. Punctures that are moderate in density are separated by about three to five puncture diameters, and dense punctures are separated by less than one to three puncture diameters. Obviously, there are gradations in density, and the terms should be used as a general guide.

Taxonomy

Key to the Adult Dynastinae of Chile

(Male with apex of last abdominal sternite emarginate; female with apex rounded)

1. Mentum strongly expanded, covering bases of labial palpi. Body black, dorso-ventrally flattened. **Phileurini**..... ..... ***Archophileurus chaconus*** **(Kolbe)**

1′. Mentum narrow, not covering bases of labial palpi. Body variably colored, not dorsoventrally flattened 2

2. Head and pronotum lacking distinct tubercles, horns, carinae, or fovea. Claw with bisetose onychium. Male protarsal claws enlarged in many species, female protarsal claws simple. Tarsomeres cylindrical. **Cyclocephalini** 3

2′. Head and/or pronotum (whether males or females) with distinct tubercles, horns, carinae, or fovea. Claw with onychium bisetose or multisetose. Male protarsal claws enlarged or not. Tarsomeres cylindrical or subtriangular 4

3. Clypeal apex narrowly parabolic (Figs. 10–11). Apex of mentum distinctly emarginate, surface at center furrowed in apical third ..... ***Ancognatha aymara*** **Mondaca**

3′. Clypeal apex rounded (Figs. 14–15). Apex of mentum not emarginate or furrowed on apical third .... ***Cyclocephala modesta*** **Burmeister**

4. Metatarsomeres cylindrical, not triangularly expanded (although basal tarsomere with strong apical spine). Combined length of protibia and protarsus longer in males than in females. **Dynastini** 5

4′. Metatarsomeres (especially 1st or 2nd) triangularly expanded. Combined length of protibia and protarsus similar in both sexes. **Pentodontini** 6

5. Color uniform (Fig. 34). Sutural stria an impressed line. Propygidium lacking long, dense setae. Parameres as in Fig. 36 ...…….***Golofa inermis*** **Thomson**

5′. Color on pronotum dark or with diffuse, dark markings (Figs. 38, 41). Sutural stria a series of closely spaced punctures. Propygidium with long, dense setae. Parameres as in Fig. 40 ……..... ….***Golofa minutus*** **Sternberg**

6. Pronotum with a subapical fovea or shallow depression (Figs. 23, 26). ***Tomarus*** **Erichson** 7

6′. Pronotum lacking a subapical fovea or depression (Fig. 18) (in the Chilean species)..... .....…… ***Ligyrus villosus*** **(Burmeister)**

7. Pronotum with small, round fovea (Fig. 23). Clypeal apex narrowly bidentate. Protibia tridentate. Parameres in caudal view subtriangular with flared apices (Fig. 24) ..…….…… ***Tomarus maimon*** **Erichson**

7′. Pronotum with small (almost obsolete), narrowly elongate fovea (Fig. 26). Clypeal apex subtruncate. Protibia tridentate with basal swelling suggestive of 4th tooth. Parameres in caudal view extremely long and slender (Fig. 28) …..…… ***Tomarus rostratus*** **Dupuis**

Clave para los Adultos de Dynastinae de Chile

(Macho con el ápice del último esternito abdominal emarginado; hembra con el ápice redondeado)

1. Mentón fuertemente expandido, cubriendo la base de los palpos labiales. Cuerpo negro, aplanado. **Phileurini** ..... ***Archophileurus chaconus*** **(Kolbe)**
1′. Mentón angosto, sin cubrir la base de los palpos labiales. Cuerpo con coloración variable, no aplanado 2
2. Cabeza y pronoto sin tubérculos, cuernos, quillas o fóvea. Uña con oniquio bisetoso. Machos con las uñas anteriores más desarrolladas en muchas especies, hembra con uñas anteriores simples. Tarsos cilíndricos. **Cyclocephalini** 3
2′. Cabeza y/o pronoto (sea macho o hembra) con tubérculos, cuernos, quillas o fóvea. Uña con oniquio bisetoso o multisetoso. Macho con uñas anteriores más desarrolladas o no. Tarsos cilíndricos a triangulares 4
3. Ápice del clípeo angostamente parabólico (Figs. 10–11). Ápice del mentón distintamente emarginado, la superficie surcada en el centro del tercio apical ..... ***Ancognatha aymara*** **Mondaca**
3′. Ápice del clípeo redondeado (Figs. 14–15). Ápice del mentón no emarginado ni surcado en el tercio apical ..... ***Cyclocephala modesta*** **Burmeister**
4. Metatarsómeros cilíndricos, no expandidos en forma de triángulo (aunque el segmento basal con fuerte espina apical). Longitud de la protibia y el protarso combinados más larga en los machos que en las hembras. **Dynastini** 5
4′. Metatarsómeros (particularmente el 1º y 2º) expandidos en forma de triángulo. Longitud de la protibia y el protarso combinados similar en ambos sexos. **Pentodontini** 6
5. Color uniforme (Fig. 34). Estría sutural con una línea bien definida. Propigidio sin setas largas y densas. Parámeros como en la Fig. 36 ..... ***Golofa inermis*** **Thomson**
5′. Color del pronoto oscuro o con marcas oscuras difusas (Figs. 38, 41). Estría sutural con una serie de puntos densos. Propigidio con setas largas y densas. Parámeros como en la Fig. 40 ..... ***Golofa minutus*** **Sternberg**
6. Pronoto con fóvea subapical o una depresión no profunda (Figs. 23, 26). ***Tomarus*** **Erichson** 7
6′. Pronoto sin fóvea o depresión subapical (Fig. 18) (en las especies chilenas) ..... ***Ligyrus villosus*** **(Burmeister)**
7. Pronoto con fóvea pequeña redonda (Fig. 23). Ápice del clípeo bidentado. Protibia tridentada. Parámeros en vista caudal subtriangulares con apices expandidos (Fig. 24) ..... ***Tomarus maimon*** **Erichson**
7′. Pronoto con fóvea pequeña (casi ausente) y estrechamente elongada (Fig. 26). Ápice del clípeo subtruncado. Protibia tridentada con un ensanchamiento basal que sugiere un 4º diente. Parámeros en vista caudal extremadamente alargados y delgados (Fig. 28) .... ***Tomarus rostratus*** **Dupuis**

Tribe Cyclocephalini

The tribe Cyclocephalini contains 16 genera in the New World (except for one species of *Cyclocephala* introduced into Australia), one genus and two species in western Africa, and *Peltonotus* Burmeister with 25 species in Asia (Jameson and Jakl 2010; Moore *et al*. 2018). There are approximately 500 species in the New World, and Chile has two genera, each with a single species. Nearly all cyclocephalines are nocturnal as adults, and most are attracted to lights. The adults of some species are known to feed on the flowers of aroids, palms, magnolias, water lilies, and guava trees and so become inadvertent pollinators.

In general, members of the Cyclocephalini have been characterized by the absence of horns, tubercles, carinae, or foveae, although Paucar-Cabrera and Moore (2018) redefined the tribal circumscription to include *Parapucaya* Prell and *Pucaya* Ohaus that have small pronotal tubercles; no stridulatory area on the propygidium; simple mandibles that lack teeth; metatibial apex truncate and lacking non-articulated teeth; and metatarsus with basal joint simple and cylindrical and not subtriangular. Sexual dimorphism is not pronounced, although in those genera where the males have enlarged protarsi and protarsal claws, it is easy to distinguish the sexes.

Ancognatha Erichson, 1847

Ancognatha Erichson 1847: 97.
Barotheus Bates 1891: 30 (synonym).
Pseudancognatha Otoya 1945: 275 (synonym, described as subgenus).

Ancognatha is comprised of 23 species that are found from the southwestern USA (Arizona and New Mexico) to northern Argentina, Chile, and Bolivia (Endrödi 1966, 1985; Moore *et al.* 2018; Ratcliffe *et al.* 2020). One species occurs in Chile.

The elongate, generally acuminate or parabolic form of the clypeal apex in species of *Ancognatha* is a character state shared with many species of

Cyclocephala, but the emarginate form of the mentum in *Ancognatha* species (and their generally larger size) will separate them from *Cyclocephala* species. Bates (1888) noted that in *Ancognatha* species the labrum is detached and inclined from the roof of the mouth instead of being hidden as in *Cyclocephala*. The narrow, generally upwardly pointed mandibles are also characteristic of most species of *Ancognatha*. The form of the parameres of most species is not overly distinctive.

The larval stage is described for *Ancognatha manca* LeConte, *Ancognatha sellata* Arrow, *Ancognatha scarabaeoides* (Erichson), and *Ancognatha ustulata* Burmeister (Neita Moreno and Morón 2008; Ramírez-Salinas *et al*. 2004; Ritcher 1966; Vallejo and Morón 2008). Larvae of three *Ancognatha* species are reported as a human food source in Ecuador: *Ancognatha castanea* Erichson, *Ancognatha jamesoni* Murray, and *Ancognatha vulgaris* Arrow (Onore 1997, 2005).

Adults are attracted to lights at night, but little else is known of their life history and behavior. Most species occur only in highland areas (Figueroa and Ratcliffe 2016; Mondaca 2016; Pardo-Locarno *et al*. 2006). Endrödi (1966, 1985) provided the last comprehensive review of the species of *Ancognatha*, but several new species have been described since.

Ancognatha aymara Mondaca, 2016
(Figs. 10–13)

Ancognatha aymara Mondaca 2016: 60 (original combination).

Redescription. Length 13.0–20.1 mm; width across humeri 5.5–11.0 mm. Color dorsally and ventrally reddish brown to castaneous, shiny; head, scutellum, anterior and posterior margins of pronotum, and legs brown. **Head:** Surface with moderately large, dense, glabrous punctures. Clypeus semicircular, apex narrowly rounded, slightly reflexed. Frontoclypeal suture sinuous, obsolete medially. Ocular canthus wide basally, smooth, with sparse setae near apex. Interocular width equals 4.0 transverse eye diameters. Antenna with 10 antennomeres, club longer than antennomeres 2–7. Mandibles long, narrow, acute, protruding laterally from clypeus in dorsal view, extending past apex of clypeus. Mentum longer than wide, emarginate apically; surface convex, moderately setose. **Pronotum:** Surface with small, moderately dense punctures, posterior half weakly furrowed longitudinally. Apical angles subacute, basal angles rounded. Posterior margin lacking marginal bead. **Legs:** Protibia tridentate, basal tooth slightly removed. Male protarsus enlarged, medial claw enlarged, split at apex; protarsomere 5 long, internal border without teeth. Female protarsus simple. **Elytra:** Convex, widened in posterior third; surface punctate, glabrous; punctures small, ocellate; elytral suture dark. **Pygidium:** Surface with small, moderately dense punctures. In lateral view, convex in male, nearly flat in female. **Venter:** Prosternal process cylindrical, shorter than height of procoxae, apex truncate, covered with dense, long setae. Apex of last abdominal sternite with moderately dense fringe of long, pale yellow setae. **Parameres:** As in Fig. 12.

Distribution. *Ancognatha aymara* occurs in Parinacota Province (Región de Arica y Parinacota) in northern Chile. Specimens collected in northern Argentina, east of Chile's Región de Antofagasta, were recently reported by Mondaca (2020). The distribution of the species corresponds to the Puna biogeographic province that extends into eastern Bolivia, southern Peru, northern Argentina, and Chile (Morrone 2001).

Locality Records (Fig. 13). 13 specimens from Mondaca (2016).

REGIÓN DE ARICA Y PARINACOTA (13): PARINACOTA (13): Parinacota, Putre, Socoroma.

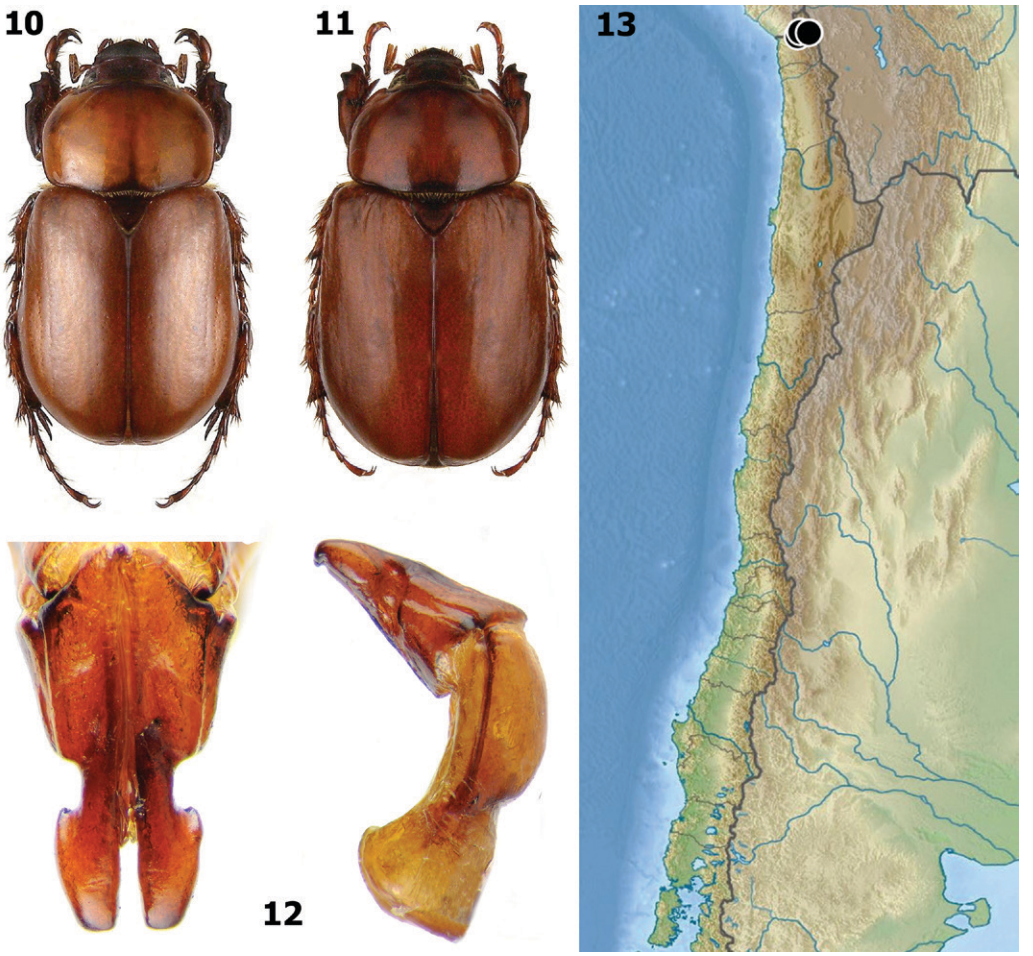
Temporal Distribution. February (4), March (7), April (2).

Diagnosis. The male of *A. aymara* is similar to the male of *Ancognatha erythrodera* Blanchard but differs from it by its smaller body size, unicolored body, clypeal apex narrowly parabolic, and form of the parameres. The female of *A. aymara* differs from the female of *A. erythrodera* by a unicolored body and not having dark spots or dark lines on the midline of the pronotum. Gutiérrez (1950) mistakenly referred to this species as *Ancognatha lutea* Erichson.

Natural History. Larvae of *A. aymara* were observed feeding on grass roots ("coiron", "paja brava") high in the altiplano steppe (4,200 m) (Mondaca 2016). The native vegetation at the type locality consists principally of resinous shrubs, herbaceous plants, cacti, and coarse grasses (Figs. 3–4). There are also terraces of some Andean subsistence crops (Fig. 5). Adults are active at night and often attracted to lights in an area of dry hills with grasses and small, sparse shrubs. Adults were collected at 3,000–3,650 m (Mondaca 2016).

Cyclocephala Dejean, 1821

Cyclocephala Dejean 1821: 51.
Mononidia Casey 1915: 110 (synonym).
Diapatalia Casey 1915: 111 (synonym).



Figs. 10–13. *Ancognatha aymara*. **10)** Male; **11)** Female; **12)** Parameres; **13)** Distribution.

Stigmalia Casey 1915: 111 (synonym).
Spilosota Casey 1915: 112 (synonym).
Ochrosidia Casey 1915: 112 (synonym).
Dichromina Casey 1915: 112 (synonym).
Homochromina Casey 1915: 113 (synonym).
Plagiosalia Casey 1915: 135 (synonym).
Isocoryna Casey 1915: 136 (synonym).
Graphalia Casey 1915: 159 (synonym).
Aclinidia Casey 1915: 113 (synonym).
Halotosia Casey 1915: 113 (synonym).
Aspidotites Höhne 1922: 374 (synonym).
Aspidolella Prell 1936: 146 (synonym).
Albridarollia Bolívar y Pieltain *et al.* 1963: 182 (synonym).
Paraclimidia Martínez 1965: 13 (synonym, described as subgenus).

Cyclocephala is a large genus that currently contains about 350 species, although new species are being described continuously. Endrödi (1985) provided the most recent synopsis of the genus, although 90 species have been described since this work. Consequently, the keys in his manual should be used with caution inasmuch as there now exist 44% more species than are in the keys. *Cyclocephala* species occur from extreme southeastern Canada south to Argentina and Chile and in the West Indies. Most of the species occur in the Neotropical realm. There is one adventive species in Chile.

Species in the genus may be recognized by a clypeus that is subparallel at its base and with the sides converging anteriorly to a rounded, parabolic,

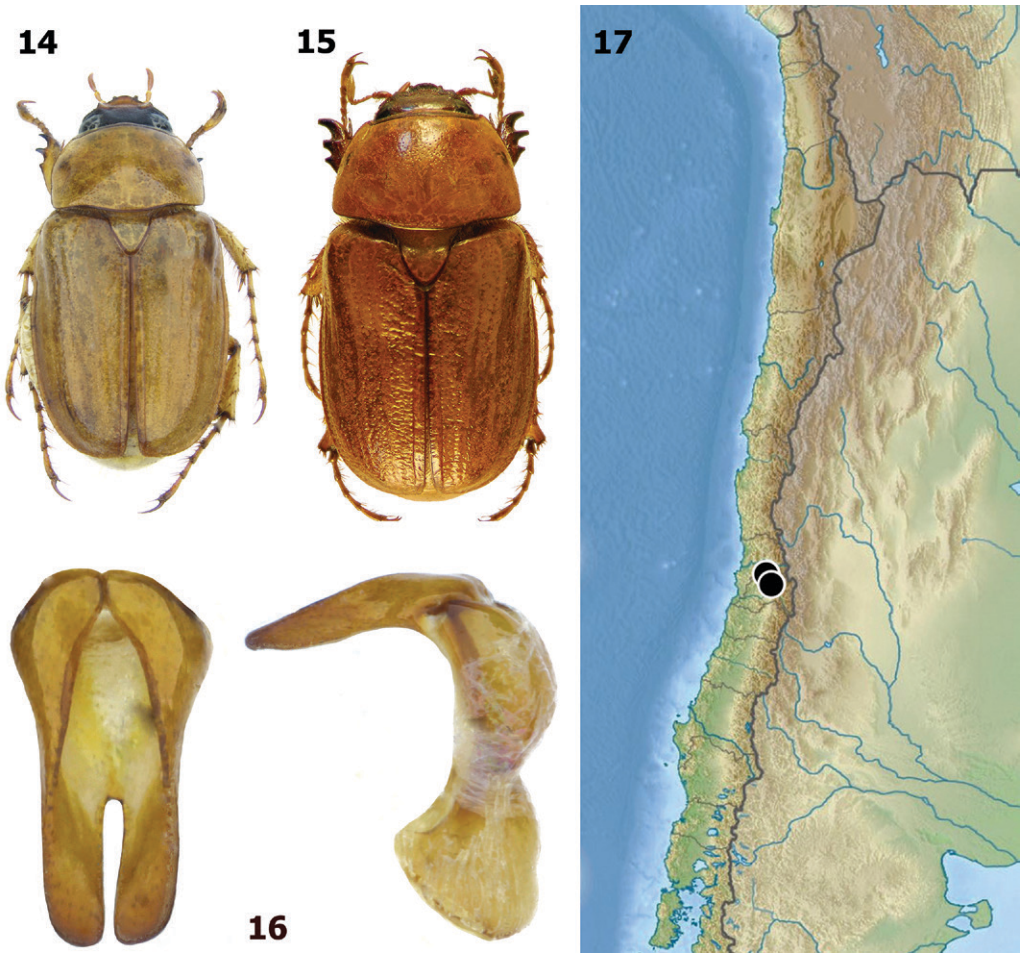
subtruncate, or emarginate apex; antenna with 8–10 antennomeres (nine in the Chilean species) and the club longer in the male of a few species; maxilla armed with distinct teeth; and protarsus in the male distinctly enlarged with the medial (or inner) claw much larger than the outer claw. The protarsus in females is simple and not enlarged. *Cyclocephala* species do not have the elongated mandible seen in most *Ancognatha* species, and they also have a more or less complete frontoclypeal suture that is obsolete medially in *Ancognatha* species. The form of the parameres of male *Cyclocephala* species is diagnostic.

Adult *Cyclocephala* species are nocturnal, and they are attracted to lights at night. Only a few larvae have been described, and those feed on the roots of grasses. Adults of some species are known to feed upon and pollinate the flowers of aroids and certain palms.

Cyclocephala modesta Burmeister, 1847
(Figs. 14–17)

Cyclocephala modesta Burmeister 1847: 38 (original combination).

Redescription. Length 10.0–11.8 mm; width 4.7–6.0 mm. Color of male testaceous except for dark reddish brown or piceous frons; female testaceous except for dark reddish brown head. **Head:** Frons with small, dense punctures or indistinctly roughened. Clypeus roughened, apex semicircularly rounded or narrowly rounded depending on degree of dorsal view. Interocular width equals 1.5 transverse eye diameters. Antenna with 9 antennomeres, club subequal in length to antennomeres 2–6 in male, shorter in female. **Pronotum:** Surface with small, moderately dense punctures. Base lacking marginal



Figs. 14–17. *Cyclocephala modesta*. **14)** Male; **15)** Female; **16)** Parameres; **17)** Distribution.

bead. **Elytra:** Surface shagreened, punctate-striate, punctures small, shallow. Female epipleuron (ventral view) simple. **Pygidium:** Surface of male glabrous, strongly shagreened, with minute, dense punctures; female similar but less shagreened. Surface of male convex, weakly convex in female. **Legs:** Protibia tridentate, all teeth subequally spaced. Male protarsus weakly enlarged; tarsomere 5 four times as long as tarsomere 4; median claw slender, elongate, apex cleft. Female protarsus simple. Metatarsus much longer than metatibia. **Venter:** Prosternal process minute, nearly obsolete. **Parameres:** As in Fig. 16.

Distribution. *Cyclocephala modesta* is broadly distributed in Brazil, Argentina, Paraguay, Uruguay, and Bolivia (Endrödi 1966). It was introduced into Chile from Argentina (Mondaca 2011).

Locality Records (Fig. 17). 10 specimens from SAGC and Mondaca (2011).

REGIÓN METROPOLITANA DE SANTIAGO (10): CHACABUCO (1): Colina; SANTIAGO (9): Las Condes.

Temporal Distribution. January (1), December (9).

Diagnosis. *Cyclocephala modesta* is distinguished by the presence of nine antennomeres and the form of the parameres. The larval stage remains undescribed but was incorporated into a key by Morelli and Alzugaray (1994).

Natural History. The specimens from Las Condes were collected at lights in a shopping center in the eastern part of Santiago. Larvae are known to host a thelastomatid parasitic nematode, *Leidynema saltense* Achinelly and Camino, in their alimentary canal (Achinelly and Camino 2008).

Tribe Pentodontini

The tribe Pentodontini is the largest tribe of dynastines (with about 100 genera and over 560 species), and it is cosmopolitan in its geographic distribution. There are 32 genera and more than 150 species in the New World (López-García *et al*. 2016); one of these, *Heteronychus arator* (Fabricius), was introduced into Brazil from Africa. López-García (2019) provided strong evidence based on a phylogenetic analysis that *Tomarus*, *Ligyrus* Burmeister, and *Euligyrus* Casey are distinct genera. Two genera and three species occur in Chile.

Adult pentodontines are distinguished by the presence of tubercles, a carina, or a fovea on the head and/or pronotum; mandibles with or without teeth; propygidium with or without a stridulatory structure; protibia usually tridentate; apex of the metatibia usually truncate and margined with short, spine-like setae or stout spinules; and protarsus occasionally enlarged in males. Dimorphism between males and females is slight or absent.

Most, if not all, adult pentodontines are nocturnal and so are rarely seen except at lights at night. Adults are known to feed on foliage, organic material in the soil, and plant roots. The larvae develop in the soil where they feed on roots, humus, decaying leaves, and large decaying roots.

Ligyrus Burmeister, 1847

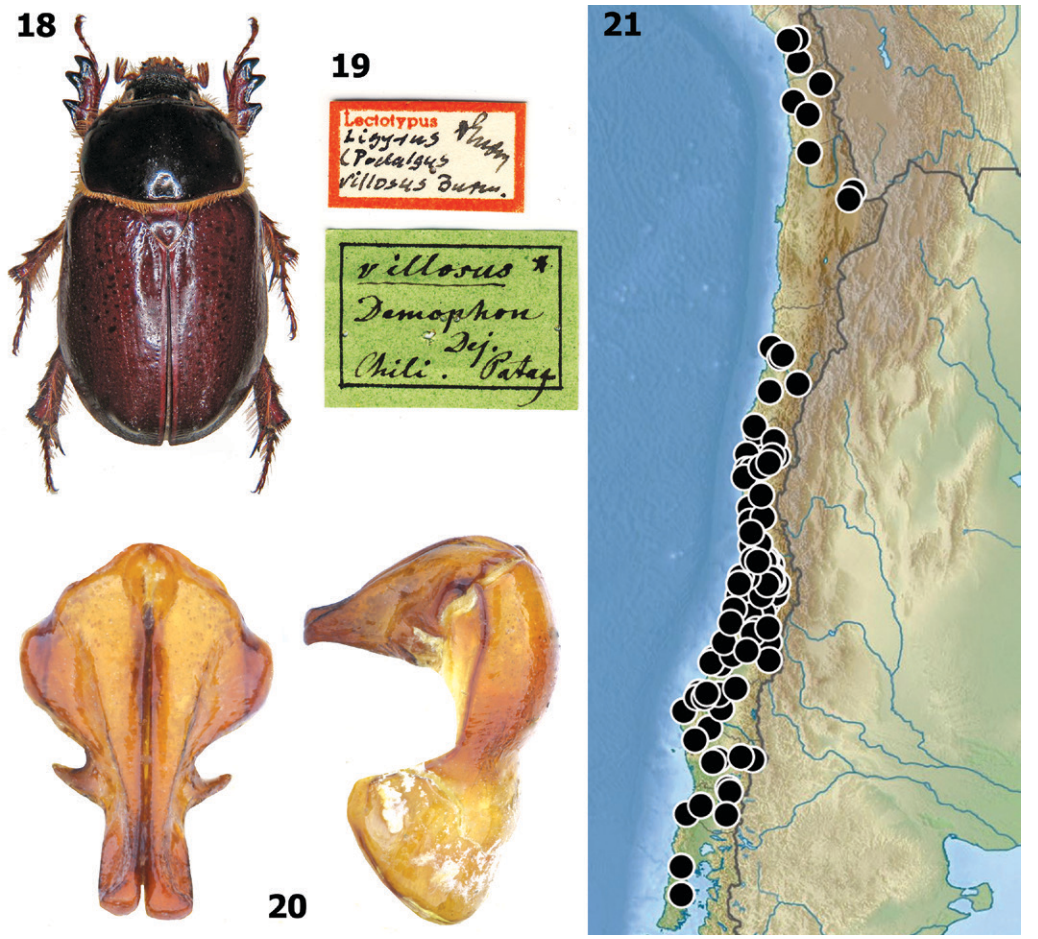
Ligyrus Burmeister 1847: 542.
Ligyrodes Casey 1915: 178 (in part, subgenus).
Anagrylius Casey 1915: 204 (subgenus).
Ligyrellus Casey 1915: 206 (synonym).

Ligyrus is distinguished by the presence of a frontoclypeal carina or two small tubercles; clypeus in the Chilean species tapering to narrow, with 2 reflexed teeth on the emarginate apex; mandibles distinctly bidentate with a small, rounded basal lobe; pronotum in the Chilean species with a small subapical tubercle and lacking a subapical fovea; protibia tridentate; and male inner protarsal claw simple in the Chilean species. The genus *Ligyrus* is comprised of 18 species that occur from southern Canada to Argentina and in the West Indies (López-García 2019). One species occurs in Chile. Adults are nocturnal and attracted to lights. In general, larvae are found in soil rich in organic matter where they often feed on the roots of living plants.

Ligyrus villosus (Burmeister, 1847)
(Figs. 18–22)

Podalgus villosus Burmeister 1847: 120 (original combination).
Oryctes nitidicollis Solier 1851: 79 (synonym).
Ligyrus patagonus Steinheil 1872: 560 (synonym).

Redescription. Length 13.0–19.2 mm; width 6.6–9.9 mm. Color light to dark reddish brown (Fig. 22). **Head:** Frons coarsely rugopunctate. Frontoclypeal carina arcuate, slightly depressed at middle, not reaching sides of head. Clypeus rugopunctate to transversely rugose, tapering to narrow, emarginate apex with 2 reflexed teeth. Mandibles with broadly rounded basal lobe and 2 teeth, apical tooth acute. Interocular width equals 5.0 transverse eye diameters. **Pronotum:** Surface with small, sparse punctures, punctures denser on lateral margins. Anterior margin with small, median tubercle (may be obsolete in small specimens), fovea absent. **Elytra:** Surface punctate-striate, punctures small to moderately large, dense, ocellate. **Pygidium:** Surface with punctures small to moderate in size, dense, weakly ocellate, with minute and



Figs. 18–21. *Ligyrus villosus*. **18)** Lectotype at MLUH; **19)** Lectotype labels; **20)** Parameres; **21)** Distribution. Images in Figs. 18–19 courtesy of Karla Schneider (Zentralmagazin Naturwissenschaftlicher Sammlungen der Martin-Luther-Universität Halle, Germany).

tawny setae. In lateral view, convex in male, weakly convex in female. **Legs:** Protibia tridentate, basal tooth slightly removed. Male protarsus simple. Metatibial apex with about 18–22 spinules. **Venter:** Prosternal process tall, thick, apex rounded with long, dense, reddish brown setae. **Parameres:** As in Fig. 20.

Distribution. *Ligyrus villosus* occurs in southern Peru, Chile, and Argentina.

Locality Records (Fig. 21). 490 specimens from ABCB, AMNH, BYUC, CASC, CMNC, CMNH, CNCI, DEBU, FMNH, FSCA, INHS, JMEC, LEMQ, MAHC, MNNC, RHMC, SAGC, SLTC, UMSP, USNM, Ferrú and Elgueta (2011), and Neita-Moreno and Ratcliffe (2017).

REGIÓN DE ANTOFAGASTA (31): EL LOA (2): Guatín, San Pedro de Atacama; TOCOPILLA (29): Quillagua. REGIÓN DE LA ARAUCANÍA (14): CAUTÍN (4): INIA Carrillanca, Licán Ray, Temuco, Termas de Río Blanco; MALLECO (10): Angol, Reserva Nacional Lago Galletué; REGIÓN DE ARICA Y PARINACOTA (32): ARICA (32): Camarones, Molinos, Río Lluta, Valle de Azapa. REGIÓN DE ATACAMA (6): COPIAPÓ (5): Caldera, Copiapó, Río Pulido, Totoral; HUASCO (1): Vallenar (15 km N). REGIÓN DEL BIOBÍO (66): ARAUCO (9): Cerro La Gloria, Contulmo; BIOBÍO (2): Salto del Laja; CONCEPCIÓN (55): Concepción, Estación de Ferrocarril Escuadrón, Fundo Pinares, Hualqui, Reserva Nacional Nonguén,

Río Andalién, Talcahuano. REGIÓN DE COQUIMBO (136): CHOAPA (84): Agua Dulce, Los Vilos (7 km N), Playa El Ñague, Salamanca; ELQUI (34): El Molle, Hacienda El Tangue, La Serena, Los Choros, Monte Grande, Playa Totoralillo, Playa Guanaqueros, Río Los Choros, Tongoy, Valle del Elqui, Vicuña (8.5 km S, 11 km S); LIMARÍ (18): Altos de Talinay, Caleta El Toro, Combarbalá, Corral de Julio, Guampulla, La Ternera, Punitaqui, Punta Teatinos, Quebrada Seca, Valle de Limarí. REGIÓN DEL LIBERTADOR GENERAL BERNARDO O'HIGGINS (30): CACHAPOAL (18): Doñihue, El Manzano, Rosario, San Francisco de Mostazal, San Vicente de Tagua Tagua (6 km SW). CARDENAL CARO (8): Las Cruces, Matanzas, Pichilemu; COLCHAGUA (4): Los Maquis. REGIÓN DE LOS LAGOS (2): CHILOÉ (1): Reserva Natural Río Bravo Lodge; LLANQUIHUE (1): Maullín. REGIÓN DE LOS RÍOS (5): RANCO (2): Coñaripe, Fundo Chollinco Lodge; VALDIVIA (3): Reserva Costera Valdiviana, Rincón de la Piedra. REGIÓN DEL MAULE (51): CAUQUENES (5): Cauquenes, Chanco, Curanipe, Pelluhue, Sauzal; CURICÓ (35): Curicó (4, km E, 12 km SW), El Colgo, Los Niches (2 km W), Los Queñes (6 km E), Potrero Grande (35 km SE), Reserva Nacional Laguna Torca, Río Claro at Ruta 5, Río Teno; LINARES (2): San Javier, Villalobos; TALCA (9): Carrizalillo, La Mina. REGIÓN DE ÑUBLE (27): DIGUILLÍN (27): Quillón, Recinto, Río Pinto (E of Chillán). REGIÓN METROPOLITANA DE SANTIAGO (50): CHACABUCO (6): Caleu, Colina, Cuesta La Dormida, Portezuelo Hondo, Tiltil; CORDILLERA (7): El Canelo, El Toyo, Puente El Yeso, Reserva Nacional Río Clarillo, San Alfonso; MAIPO (2): San Bernardo, Túnel Angostura; MELIPILLA (8): Alhué, Pallocabe; SANTIAGO (26): Cerro San Cristóbal, La Cisterna, La Florida, Lampa, Las Condes, Lo Prado, Macul, Pilay, Pudahuel, Quebrada de la Plata, Renca, Santiago; TALAGANTE (1): Talagante. REGIÓN DE TARAPACÁ (4): IQUIQUE (1): Iquique; TAMARUGAL (3): Campamento Refresco, Quebrada de Tarapacá, Reserva Nacional Pampa del Tamarugal. REGIÓN DE VALPARAÍSO (36): MARGA MARGA (4): Limache, Villa Alemana; PETORCA (9): Catapilco, Cuesta El Melón, Los Molles, Los Perales, Zapallar; QUILLOTA (2): Parque Nacional La Campana, Quillota; SAN ANTONIO (16): El Convento, El Quisco, El Tabo, Las Cruces, Playa El Canelo, Punta de Tralca, San Antonio, San Sebastián; VALPARAÍSO (5): Caleta Horcón, Mantagua Village, Valparaíso.

Temporal Distribution. January (23), February (108), March (57), April (5), May (3), July (3), August (20), September (50), October (96), November (32), December (36).

Fig. 22. *Ligyrus villosus*. Photograph by Patrich Cerpa, Santiago, Chile.

Diagnosis. *Ligyrus villosus* is easily recognized by the nearly smooth pronotal surface or with micropunctures only (Fig. 18); presence of long, dense setae on the metaventrite and margins of the metatibiae; and form of the parameres (Fig. 20).

Natural History. Adults are attracted to lights at night. Some specimens have been taken in coastal sand dunes near the ocean. Gutiérrez (1945) observed the mating behavior of *L. villosus* in Chile in which the males flew searching for females and copulation occurred below the soil surface in the same hole from where the females emerged.

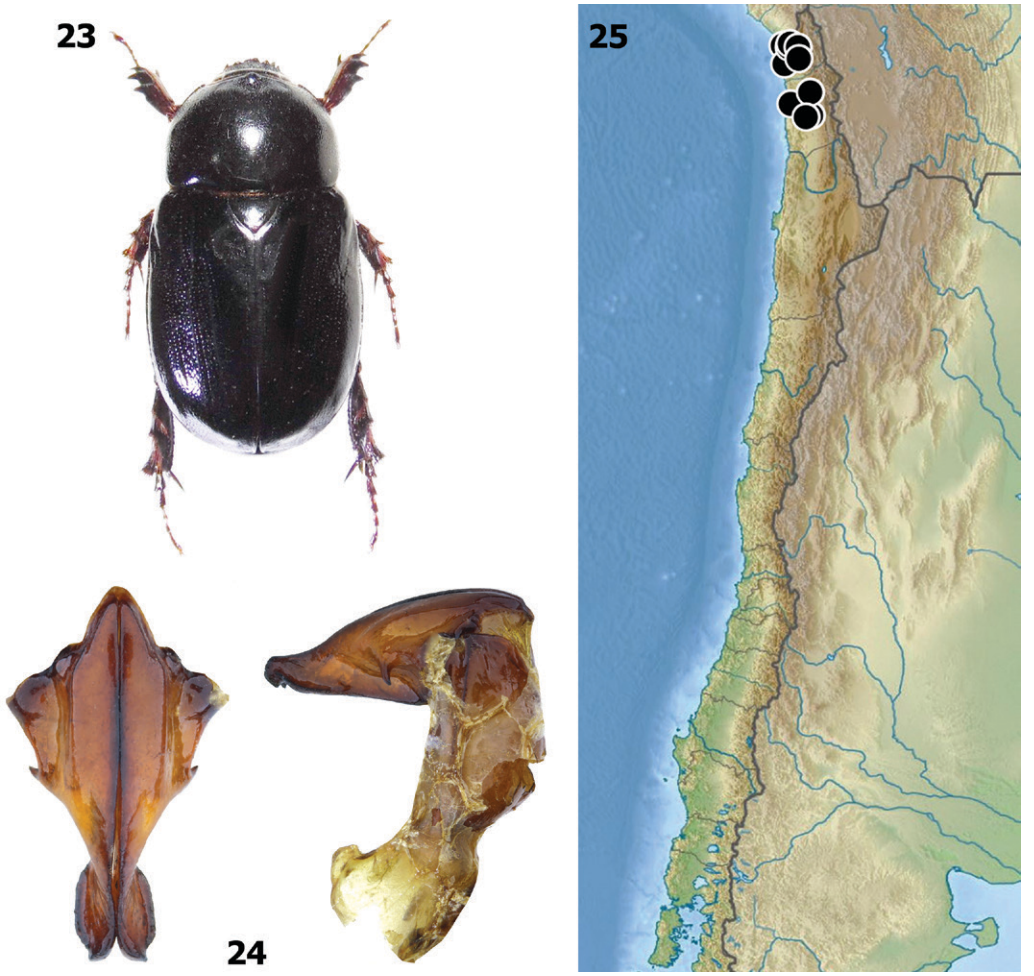
Genus *Tomarus* Erichson, 1847

Tomarus Erichson 1847: 95.
Ligyrus Burmeister 1847: 542 (in part).
Grylius Casey 1915: 189 (synonym).

Species of *Tomarus* are recognized by a subtrapezoidal to subtriangular, attenuate clypeus that is bidentate and relatively narrow at the apex; frontoclypeal region with two tubercles; mandibles visible from above and with two apical teeth; pronotum with an apical tubercle and with a weak, subapical fovea in the Chilean species; and inner claw of the male protarsus simple, not enlarged.

Tomarus is comprised of 18 species that occur from southern Florida in the USA to the West Indies and Central and South America (López-García 2019). Two species occur in Chile.

Life history information for most species is fragmentary. Adults are nocturnal and attracted to lights. In general, larvae are found in soil rich in organic matter where they often feed on the roots of living



Figs. 23–25. *Tomarus maimon*. **23)** Habitus; **24)** Parameres; **25)** Distribution.

plants. Some species are known to cause economic damage to crops. They have been collected from sea level to 3,640 m elevation in habitats that include temperate and tropical forests, prairies, and deserts (López-García and Deloya 2019).

Considerable reliance must be placed on the form of the male parameres for identification. The parameres are particularly fragile (almost parchment-like), and they break or tear easily. Great care should be taken when extracting the parameres from the abdomen for study.

***Tomarus maimon* Erichson, 1847**
(Figs. 23–25)

Tomarus maimon Erichson 1847: 96 (original combination).

Heteronychus fossator Burmeister 1847: 101 = *Tomarus maimon fossator* (Burmeister) (subspecies; Dupuis 2016).

Redescription. Length 22.0–31.9 mm; width 10.9–15.7 mm. Color black or piceous. **Head:** Frons and clypeus transversely rugose. Frontoclypeal region with 2 broadly separated tubercles (laterad of each respective clypeal tooth). Clypeal apex with 2 small, nearly contiguous, reflexed teeth. Mandibles with 2 teeth and a rounded basal lobe. Interocular width equals 3.0–3.3 transverse eye diameters. Antenna with 10 antennomeres, club subequal in length to antennomeres 2–7. **Pronotum:** Surface with moderately large, dense punctures, anterior angles rugopunctate. Anterior margin with small, median tubercle followed by a small, oval fovea (fovea

narrower than distance between eyes). **Elytra:** Surface punctate-striate; punctures moderate in size with sparser, minute punctures between larger punctures; larger punctures ocellate. **Pygidium:** Surface on disc with small, sparse punctures, punctures becoming dense on base and in lateral angles. In lateral view, convex in male, weakly convex in female. **Legs:** Protibia tridentate, teeth subequally spaced from each other. Male protarsus simple, not enlarged. Metatibial apex with about 16 spinules. **Venter:** Prosternal process long, columnar, thick, apex longitudinally oval. **Parameres:** As in Fig. 24.

Distribution. *Tomarus maimon* is widely distributed in the arid coastal areas of Peru and Chile (Neita-Moreno and Ratcliffe 2017), Brazil (Endrödi 1969, 1985), the Guianas (Dupuis 2016; Hielkema and Hielkema 2019), and Ecuador (Ratcliffe *et al*. 2020).

Locality Records (Fig. 25). 96 specimens from CMNC, FSCA, JMEC, MNNC, USNM, Ferrú and Elgueta (2011), López-García and Deloya (2018), and Neita-Moreno and Ratcliffe (2017).

REGIÓN DE ARICA Y PARINACOTA (37): ARICA (37): Arica (50 km S), Cuya, Poconchile, Quebrada de Azapa, Río Lluta, San Miguel de Azapa, Taltape. REGIÓN DE TARAPACÁ (59): IQUIQUE (39): Iquique; TAMARUGAL (3): Pica, Quillaguasa, Reserva Nacional Pampa del Tamarugal; NO DATA (17).

Temporal Distribution. January (2), February (14), October (1), November (17), December (4).

Diagnosis. The pronotum of *T. maimon* has a small, round, subapical fovea, whereas the fovea of *T. rostratus* is small and narrowly elongate. The clypeal apex of *T. maimon* is narrowly bidentate but more broadly subtruncate in *T. rostratus*. The protibia is tridentate in *T. maimon*, yet tridentate with a basal swelling suggestive of a fourth tooth in *T. rostratus*. Lastly, the parameres are different (compare Figs. 24 and 28).

Natural History. Adults are attracted to lights at night. Some specimens have been taken in sand dunes adjacent to ocean beaches. *Tomarus maimon* has been implicated as a pest of sugarcane (Ayquipa and Cueva 1979) and sweet potato (Daza and Rincón 1993) in Peru.

Tomarus rostratus Dupuis, 2014
(Figs. 26–29)

Tomarus rostratus Dupuis 2014: 1 (original combination).

Redescription. Length 17.4–27.5 mm; width 8.3–10.1 mm. Color dark reddish brown. **Head:** Frons rugose. Frontoclypeal region with 2 transverse tubercles separated by about 3 tubercle diameters. Clypeus subtrapezoidal, apex subtruncate and with 2 nearly contiguous, triangular teeth. Mandibles with rounded basal lobe and 2 rounded teeth. Antennal club subequal in length to antennomeres 2–7. Interocular width equals 4.7 transverse eye diameters. **Pronotum:** Surface with moderately large, moderately dense punctures, punctures becoming denser on apical and lateral margins. Apical margin with small tubercle (best seen in lateral view) followed by nearly obsolete, elongate, shallow fovea. Base lacking marginal bead. **Elytra:** Surface punctate-striate in 3 double rows, punctures moderately large, ocellate. **Legs:** Protibia tridentate with small, basal swelling suggestive of fourth tooth. Protarsus simple, not enlarged. Metatibial apex with 8–15 spinules. **Pygidium:** Disc glabrous, with small, sparse punctures. Base transversely rugopunctate. In lateral view convex in male, nearly flat in female. **Venter:** Prosternal process long, thick, apex transversely oval or round and with long, testaceous setae. **Parameres:** As in Fig. 28.

Distribution. *Tomarus rostratus* occurs in the coastal deserts of Peru and northern Chile (Dupuis 2014; López-García and Deloya 2018).

Locality Records (Fig. 29). 15 specimens from FSCA and JMEC.

REGIÓN DE ARICA Y PARINACOTA (15): ARICA (15): Cuya, Poconchile, Taltape, Valle Azapa (6 km E Arica).

Temporal Distribution. February (13), March (2).

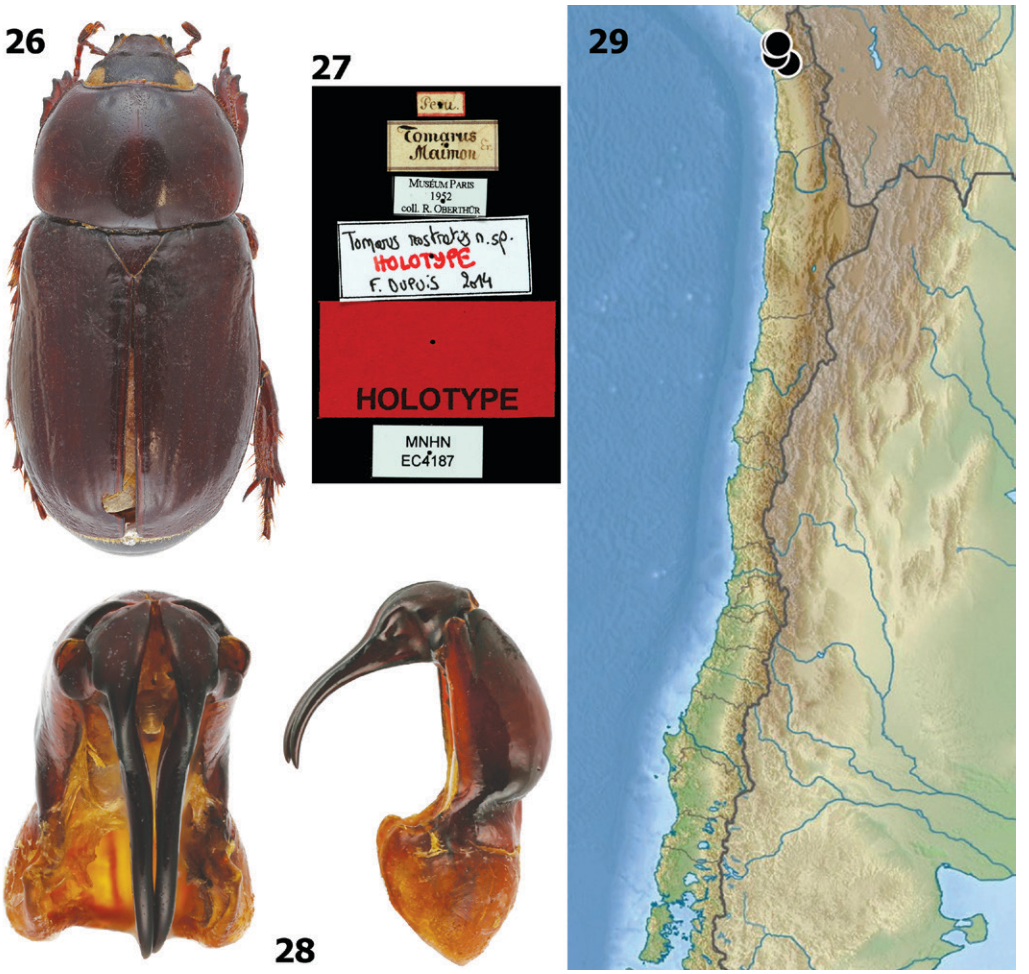
Diagnosis. The pronotal fovea of *T. rostratus* is narrowly elongate, whereas the fovea of *T. maimon* is round. The clypeal apex in *T. rostratus* is more broadly subtruncate but narrowly bidentate in *T. maimon*. The protibia is tridentate with a basal swelling suggestive of a fourth tooth in *T. rostratus* but tridentate in *T. maimon*. Lastly, the parameres are unique (compare Figs. 28 and 24).

Natural History. Nothing is known of the natural history of this rare species. Specimens have been taken at 12–1,036 m elevation.

Tribe Phileurini

The Phileurini are comprised of 36 genera and about 225 species, and they occur in all biogeographic regions except the poles. There are 22 genera in the New World, with about 130 species. Chile has one genus and one species.

Adult phileurines are recognized by a large mentum that covers the bases of the labial palpi; a usually acuminate clypeus; frons usually with two tubercles or horns; pronotum usually with a longitudinal, median furrow; elytra usually flattened; protibia with three or four teeth; and apex of the metatibia truncate or armed with 1–3 teeth. In some species, the concavity of the vertex differs between the sexes, with the males having a deeply hollowed



Figs. 26–29. *Tomarus rostratus*. **26)** Holotype, MNHN-EC-2378-EC4187; **27)** Holotype labels; **28)** Parameres; **29)** Distribution. Images in Figs. 26–27 courtesy of Antoine Mantilleri (Muséum National d'Histoire Naturelle, Paris, France).

pit, while the females do not. Most species are passalid-like in overall appearance because of their glossy, black coloration, flattened bodies, and usually furrowed elytra.

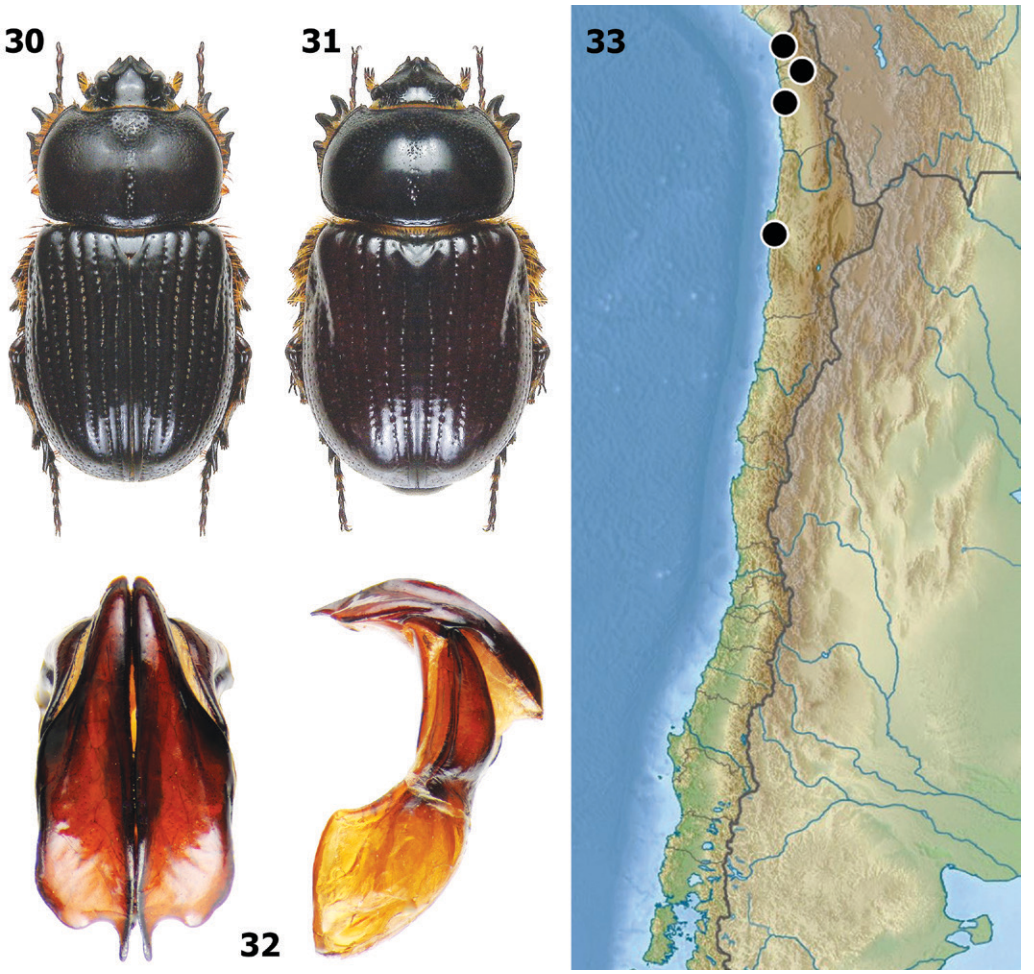
Adult phileurines are nocturnal, and apparently only some are attracted to lights. Some species are inquilines with ants or termites (Ratcliffe and Skelley 2011; Vanin *et al*. 1983) while others live in decaying wood in a fashion similar to that of passalids, although without the subsociality. There is little information on larval stages, life history, and larval development. A few larvae are known that were collected from rotting wood or termite or ant nests.

Archophileurus Kolbe, 1910

Archophileurus Kolbe 1910: 334.
Amblyophileurus Kolbe 1910: 334 (synonym).
Periphileurus Kolbe 1910: 334 (synonym).
Anisophileurus Prell 1912: 182 (described as subgenus of *Amblyphileurus*; synonym).

Archophileurus currently contains 32 species (Di Iorio *et al*. 2017; Endrödi 1977a, 1985; Ratcliffe and Cave 2015; Ratcliffe *et al*. 2020). The species are widely distributed, mostly in southern South America. Many species are rarely collected, often as singletons, and a female not associated with a male at the time of collection is virtually impossible to identify. Specimens in older collections are frequently misidentified, especially if the parameres have not been examined to determine their form, and so the distributional data based on undissected museum specimens is questionable.

The genus is easily distinguished by the truncate metatibial apex with numerous small spinules



Figs. 30–33. *Archophileurus chaconus*. **30)** Male; **31)** Female; **32)** Parameres; **33)** Distribution.

instead of large, distinct teeth. Nearly all species of *Archophileurus* have a distinctive fringe of reddish brown setae arising from beneath the lateral margins of the pronotum. The immature stages and life history are unknown for all of the species. Di Iorio *et al*. (2017) and Endrödi (1977a, 1985) provided the most recent synopses of *Archophileurus*.

***Archophileurus chaconus* (Kolbe, 1910)**
(Figs. 30–33)

Phileurus chaconus Kolbe 1910: 154 (original combination).

Redescription. Length 18.0–25.0 mm; width 8.5–11.5 mm. Color black, weakly shiny. **Head:** Surface of male majors (Fig. 30) smooth or smooth with a transverse rugopunctate band between eyes; male minors rugose or rugopunctate (usually less so in central, longitudinal depression between tubercles); females usually entirely rugose. Frons with 2 stout, vertical horns in majors; horns subequal in length to width between eyes, slightly recurved, apices bluntly rounded; male minors and females (Fig. 31) with stout tubercle instead of horns. Clypeus triangular, apex acute, reflexed; slender carina extends from clypeal apex to base of each horn/tubercle. Interocular width equals about 5.0 transverse eye diameters. Antennal club slightly longer than antennomeres 2–7. **Pronotum:** Males with small, moderately dense punctures everywhere except in longitudinal furrow, anterior margin, and anterior angles where punctures moderate in size and density; females similar except punctures larger, denser. Median, longitudinal furrow deep, narrow, extending from apex to base and expanded into large, round fovea on anterior half

in majors. Base with complete marginal bead. **Elytra:** Surface with deeply furrowed, uniserially punctate striae; each puncture moderately large to large, ocellate, separated by about 1 puncture diameter or less between punctures. Intervals convex, all subequal in height. **Pygidium:** Surface moderately densely punctate; punctures moderate and large mixed, deep. Surface of male strongly convex in lateral view; female strongly, transversely protuberant on middle of disc. **Legs:** Protibia tridentate, teeth long, slender, equally spaced. **Venter:** Prosternal process very short, subtriangular, laminate. **Parameres:** As in Fig. 32.

Distribution. *Archophileurus chaconus* occurs in southern South America (Brazil, Argentina, Uruguay, Paraguay, Bolivia, and Chile) (Endrödi 1977a). The no-data records for French Guiana and Ecuador in Endrödi (1977a) cannot be verified and seem unlikely to us.

Locality Records (Fig. 33). 10 specimens from IEUMCE, JMEC, MNNC, SRTC, and Endrödi (1977a).

REGIÓN DE ANTOFAGASTA (5): ANTOFAGASTA (5): Antofagasta, Puerto de Antofagasta. REGIÓN DE ARICA Y PARINACOTA (1): ARICA (1): San Miguel de Azapa. REGIÓN DE TARAPACÁ (4): IQUIQUE (3): Iquique; TAMARUGAL (1): Camiña.

Temporal Distribution. January (2), July (1), October (2), November (1), December (3).

Diagnosis. *Archophileurus chaconus* is recognized by the tribal characteristics for Phileurini, the fringe of reddish brown setae on the lateral margins of the pronotum, and the distinct form of the parameres (Fig. 32).

Natural History. Nothing is known of the life history for *A. chaconus*. In Antofagasta, adults come to the lights in urban parks located in the city. This species is probably not native to Chile but may occur as an ancient introduction to the country, possibly from Bolivia, since the natural populations of this species are located east of the Andes.

Tribe Dynastini

The tribe Dynastini has 11 genera with about 70 species that occur worldwide. Most taxa occur in the New World where there are three genera and about 47 species. One genus and two species occur in Chile. Sexual dimorphism is well developed in most species, with the males of most species possessing a short to long, curving horn, whereas the females lack horns. In the Chilean species, both sexes lack pronotal armature. All of the New World Dynastini are nocturnal or crepuscular, although some *Golofa* species have been observed active during the day (Howden and Campbell 1974).

Larvae are saprophagous and develop in rotting logs or possibly in rich organic soil. Larvae are characterized by the presence of 2–4 setae on the tarsungulus, contiguous lobes of the respiratory plate of the spiracle, well defined ocelli, and acanthoparia usually with 9–10 spiniform setae (Morón 1987).

Golofa Hope, 1837

Golofa Hope 1837: 42.
Asserador Maunder 1848: 40 (synonym).
Mixagenus Thomson 1859: 7 (synonym).
Praogolofa Bates 1891: 34 (synonym).

There are about 30 species in the Neotropical genus *Golofa*, depending on the authority (Arnaud and Joly 2006; Dechambre 1983; Endrödi 1985; Lachaume 1985; Morón 1995). *Golofa* species are found from central Mexico to northern Argentina and Chile. About 16 species are found in South America, and two species, the smallest in the genus, occur in Chile.

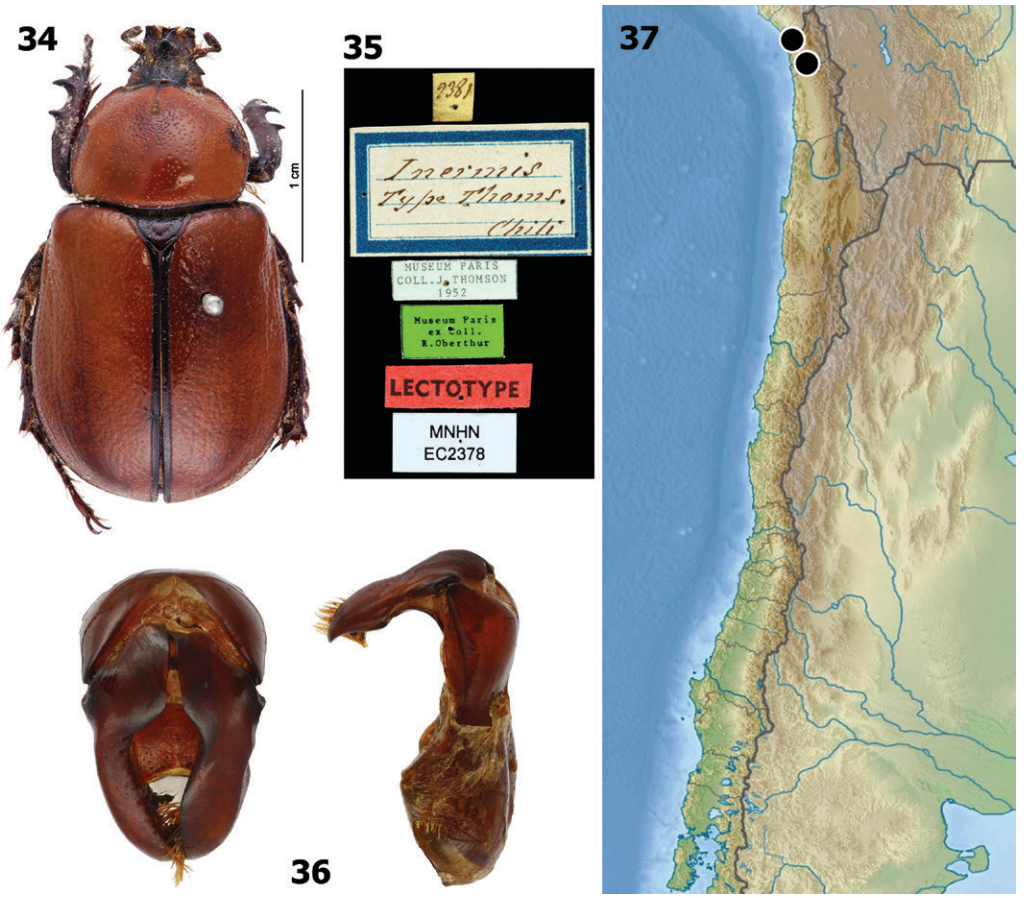
Most species are crepuscular or nocturnal, and they are sometimes, but not always, attracted to lights. Howden and Campbell (1974) observed *Golofa porteri* Hope in Colombia during the day on bamboo or a bamboo-like grass; males were actively feeding, and some were engaged in fighting one another on the bamboo stalks. A few specimens, particularly females, were taken at lights. We know almost nothing about the biology of these beetles.

Dechambre (1983) explained that "golofa" is a Venezuelan vernacular name meaning "sawyer" and is neither masculine or feminine. When Hope (1837) created the genus, he included the species *Golofa claviger* (Linnaeus) and *Golofa hastatus* (Fabricius) (now a synonym of *G. claviger*), both masculine, thus affirming the generic name as masculine. Burmeister (1847), Prell (1934), and Sternberg (1910) all used masculine names for the *Golofa* species they described. Later, Arrow (1911) and Endrödi (1977b) incorrectly used feminine names for the species they named. *Golofa* should be considered masculine since that was the clear intent of Hope (1837).

Golofa inermis Thomson, 1859
(Figs. 34–37)

Golofa inermis Thomson 1859: 11 (original combination).

Redescription. Length 20.0–25.0 mm; width 8.6–13.0 mm. Color uniformly dark yellowish brown or reddish brown except for black head, scutellum, sutural striae, tibiae, tarsi, pygidium, and venter. **Head:** Frons with moderately large, sparse punctures. Clypeus with erect, sharply acuminate



Figs. 34–37. *Golofa inermis*. **34)** Lectotype, MNHN-EC-2378; **35)** Lectotype labels; **36)** Parameres; **37)** Distribution. Images in Figs. 34–35 courtesy of Antoine Mantilleri (Muséum National d'Histoire Naturelle, Paris, France).

tubercle; apex strongly narrowed, emarginate. Interocular width equals 2.7 transverse eye diameters. Antenna with 10 antennomeres, club slightly longer than antennomeres 2–7. **Pronotum:** Surface with punctures moderate in size and density. A shallow, short, longitudinal sulcus present just behind anterior margin. Base with marginal bead. **Elytra:** Surface with punctures moderate in size and density, shallow. Sutural stria a completely impressed line. **Pygidium:** Surface with punctures moderate in size and density. Propygidium lacking long, dense setae. **Legs:** Protibia tridentate, basal tooth removed from other teeth. **Parameres:** As in Fig. 36.

Distribution. *Golofa inermis* occurs in Chile (the lectotype and three paralectotypes in MNHN) and Bolivia (two paralectotypes in MNHN).

Locality Records (Fig. 37). 5 specimens from MNHN, Gutiérrez (1950), and Ferrú and Elgueta (2011).

REGIÓN DE ARICA Y PARINACOTA (1): ARICA (1): Arica. REGIÓN DE TARAPACÁ (1): IQUIQUE (1): Miñita. NO DATA (3).

Temporal Distribution. No data.

Diagnosis. The pronotum and elytra of *G. inermis* are monochromatic dark yellowish brown or reddish brown (except for the black elytral suture); the elytral suture is a complete, impressed stria; and the propygidium lacks long, dense setae. Conversely, *G. minutus* has dark areas on the pronotum, and the elytral margins are black; the elytral sutural stria is a row of closely spaced punctures; and the propygidium has long, dense setae. The parameres of the two species differ, with those of *G. inermis* being thicker and more robust (compare Figs. 36 and 40).

Nomenclature. Thomson (1859) indicated a size range when he described *G. inermis*, which clearly indicates he had at least two specimens. Endrödi (1977b) said the type of *G. inermis* was unknown

to him, but Dechambre (1975) discovered the Thomson specimens in the MNHN and designated a lectotype (Figs. 34–35) and five paralectotypes (three from Chile, two from Bolivia). We were unable to directly examine these specimens.

Natural History. Adults are attracted to lights, but we know nothing else of the species' natural history.

Golofa minutus Sternberg, 1910
(Figs. 38–44)

Golofa minutus Sternberg 1910: 37 (original combination).

Redescription [based on original description and images in Lachaume (1985)]. Length 22.0–30.0 mm; width 12.0–15.3 mm. Color dark yellowish brown or reddish brown except for black head, black or piceous markings on pronotum, scutellum, elytral margins, tibiae, tarsi, pygidium, and venter (Fig. 44). **Head:** Frons with moderately large, dense punctures. Clypeus with erect, sharply acuminate tubercle; apex strongly narrowed, emarginate. Interocular width equals 2.7 transverse eye diameters. Antenna with 10 antennomeres, club subequal in length to antennomeres 2–7. **Pronotum:** Surface with punctures moderately large (largest on disc), moderately dense. Base with marginal bead. **Elytra:** Surface punctate-striate, punctures moderately large, moderately dense. Sutural stria a series of closely spaced punctures. **Pygidium:** Surface finely rugulopunctate. Propygidium with long, dense setae projecting over base of pygidium. **Legs:** Protibia tridentate (with additional small swelling suggestive of a 4th tooth), basal tooth removed from other teeth. **Parameres:** As in Fig. 40.

Distribution. *Golofa minutus* occurs in the border area of Chile and Peru.

Locality Records (Fig. 43). 35 specimens from BCRC, FSCA, JMEC, MAHC, MNNC, SLTC, and UTAC.

REGIÓN DE ARICA Y PARINACOTA (33): ARICA (31): Arica, Azapa Grande, Camarones, San Miguel de Azapa, Valle de Azapa. PARINACOTA (2): Putre, Parinacota. REGIÓN DE TARAPACÁ (2): TAMARUGAL (2): No data.

Temporal Distribution. January (3), March (1), August (1), September (2), October (5), November (11), December (12).

Diagnosis. The pronotum of *G. minutus* has dark areas or is nearly completely dark reddish brown, while the lateral and sutural elytral margins are black (Figs. 38–39, 41–42, 44); the sutural stria consists of closely spaced punctures; and the propygidium has long, dense setae. Conversely, the pronotum and elytra of *G. inermis* are monochromatic yellowish brown or reddish brown (except for the black elytral suture); the elytral suture is a completely impressed line; and the propygidium lacks long, dense setae. The parameres of the two species differ, with those of *G. minutus* more slender (compare Figs. 40 and 36).

Nomenclature. In spite of Endrödi (1985), Lachaume (1985), and most catalogs that list two species in Chile, there has long been doubt about the validity of *G. minutus* since it shares most characters with *G. inermis*. The line drawing of the parameres of both species in Endrödi (1985) appear different, while the line drawings of the parameres in Lachaume (1985) are nearly identical. Endrödi (1985) characterized *G. inermis* as being "normally" setose on the venter and propygidium, while *G. minutus* is densely setose on the venter and propygidium. Our study of the types of *G. inermis* and specimens of *G. minutus* confirm that there are two distinct species of *Golofa* in Chile.

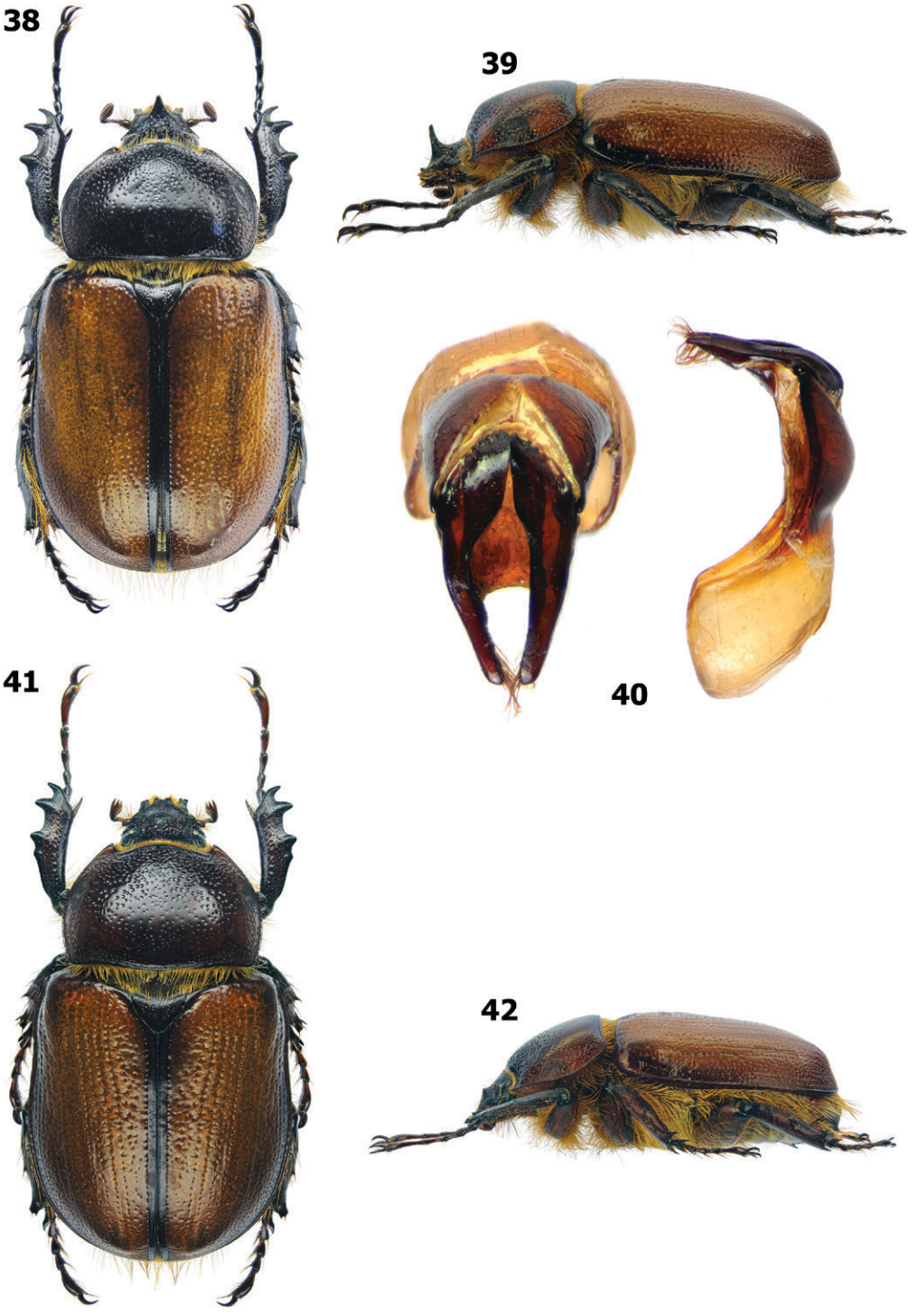
Natural History. Adults are attracted to lights in rural sectors near the city of Arica (border with Peru) and are also common in a sector called Valle de Azapa that has a path with abundant public lighting. Larvae feed on decomposing organic matter and are easy to breed in a substrate prepared with peat, milled wood, and rice husks (JME, personal observation).

General Remarks

Chile has the lowest dynastine species richness among all South American countries. Ecology and geography are the two factors that explain why only eight species inhabitat the country. The tropical and subtropical northern zones are dominated by the xeric, poorly vegetated rain shadows created by the high Andes. Soil that is dry and low in organic content is not favorable habitat for dynastine larvae. The few forested habitats and the species that live in them are restricted in this harsh habitat to widely separated riverine areas. The southern temperate zone of Chile is cold and windy most of the year. This type of weather is not propitious for dynastines as a whole as shown by the low species richness at the same northern latitudes of the USA and Canada (Ratcliffe and Cave 2017).

Erroneous Records

The following species have been cited in the literature or found in a collection and labeled as being from Chile. We believe these records are erroneous because singletons residing in collections are either likely mislabeled, misidentified, or represent inadvertent transport to the study area (by ship, trucks, buses, cars, or import of merchandise into Chile) and have no established population. Nevertheless, catalogers (*e.g.*, Blackwelder 1944; Krajcik 2005), simply repeating the literature without vetting, continued to list them from Chile, thus promulgating incorrect distributions. The only exception is



Figs. 38–42. *Golofa minutus*. **38)** Male, dorsal view; **39)** Male, lateral view; **40)** Parameres; **41)** Female, dorsal view; **42)** Female, lateral view. Photographs by Marcelo Guerrero (Santiago, Chile).

Fig. 43. *Golofa minutus*, distribution. Red dot indicates provincial record with no specific locality data.

C. modesta that successfully became established in the gardens of a shopping center in the city of Santiago. Junior synonyms, if any, for each species are not listed.

Cyclocephalini

Ancognatha castanea Erichson, 1847
(Fig. 45)

Ancognatha castanea Erichson 1847: 98 (original combination).

Ancognatha castanea occurs in Colombia, Ecuador, and Peru (Endrödi 1985; Figueroa and Ratcliffe 2016; Pardo-Locarno *et al*. 2006). One specimen in the CASC is labeled with the locality

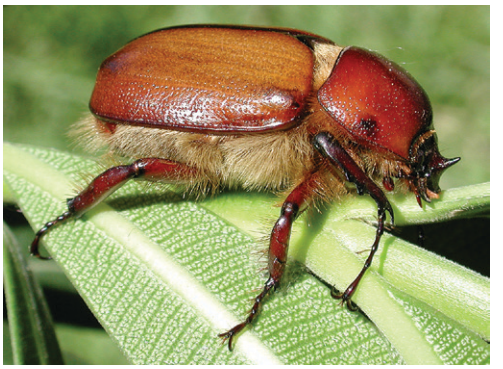


Fig. 44. *Golofa minutus* at Valle de Azapa, Arica, Región Arica y Parinacota, Chile. Photograph by Marcelo Guerrero (Santiago, Chile).

11 km W of Lumaco in Malleco Province in central Chile. The specimen might have been transported to Chile from Peru via international trade. *Ancognatha castanea* does not occur in Chile.

Ancognatha humeralis Burmeister, 1847
(Fig. 46)

Ancognatha humeralis Burmeister 1847: 40 (original combination).

Ancognatha humeralis occurs in Colombia, Ecuador, and Peru (Endrödi 1966). Endrödi (1966) recorded a no-data specimen from Chile, and this was simply repeated by Abadie *et al.* (2008) and Moore *et al*. (2018). *Ancognatha humeralis* does not occur in Chile.

Ancognatha lutea Erichson, 1847
(Fig. 47)

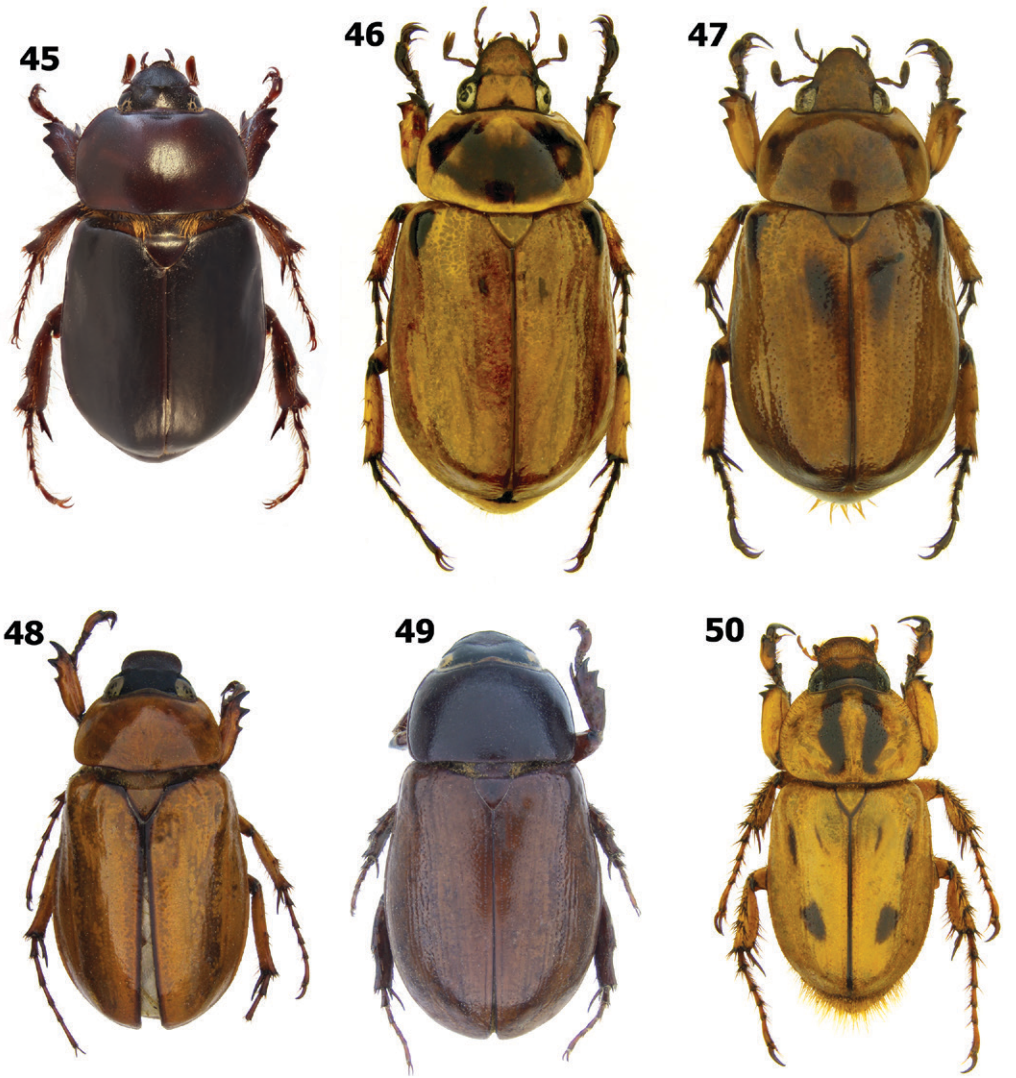
Ancognatha lutea Erichson 1847: 97 (original combination).

Gutiérrez (1950), repeated by Ferrú and Elgueta (2011), listed three specimens collected in Putre (Parinacota Province) and indicated they were close in size and form to *A. erythrodera*. *Ancognatha lutea* is recorded from Bolivia, Colombia, Peru (Endrödi 1966, 1985), and Ecuador (Paucar-Cabrera and Ratcliffe 2018), but no populations are known to exist in Chile.

Aspidolea suturalis Höhne, 1922
(Fig. 48)

Aspidolea suturalis Höhne 1922: 91 (original combination).

There is one female in the USNM correctly identified and labeled "Pto. Varas, Llanquihue, May 1959". However, the genus *Aspidolea* is not established in Chile.



Figs. 45–50. 45) *Ancognatha castanea*; **46)** *Ancognatha humeralis*; **47)** *Ancognatha lutea*; **48)** *Aspidolea suturalis*; **49)** *Chalepides fuliginosus*; **50)** *Cyclocephala amazona*.

***Chalepides fuliginosus* (Burmeister, 1847)**
(Fig. 49)

Chalepus fuliginosus Burmeister 1847: 78 (original combination).

Moore *et al*. (2018) recorded a specimen from Santiago, Chile, but this species does not currently occur in Chile.

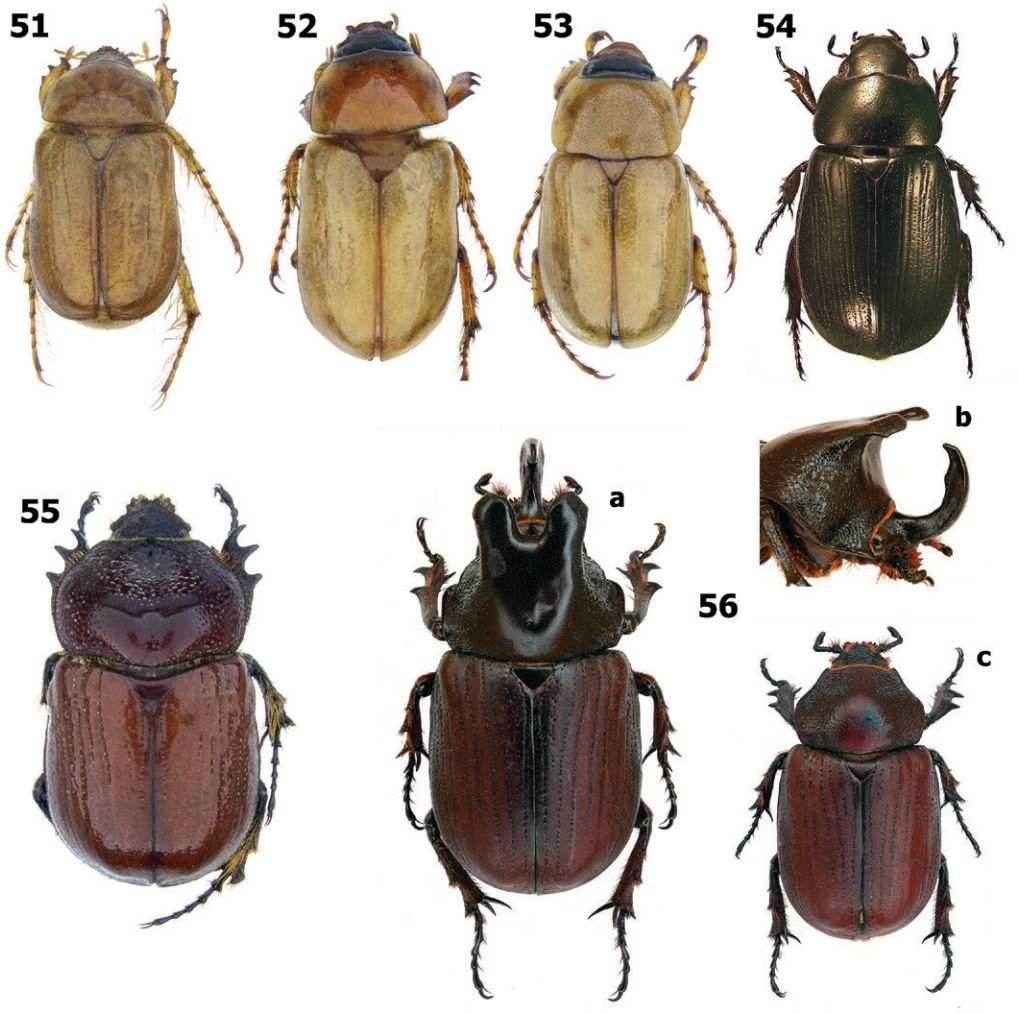
***Cyclocephala amazona* (Linnaeus, 1767)**
(Fig. 50)

Scarabaeus amazonus Linnaeus 1767: 551 (original combination).

Cyclocephala amazona is distributed from Costa Rica (Ratcliffe 2003) south to Paraguay and in the Antilles (Ratcliffe and Cave 2015). Endrödi (1966) recorded a specimen labeled "Pac. Coast". Although one of the most abundant and broadly distributed species of *Cyclocephala*, it does not occur in Chile.

***Cyclocephala crepuscularis* Martínez, 1954**
(Fig. 51)

Cyclocephala crepuscularis Martínez 1954: 19 (original combination).



Figs. 51–56. **51)** *Cyclocephala crepuscularis*; **52)** *Cyclocephala lutea*; **53)** *Cyclocephala putrida*; **54)** *Dyscinetus dubius*; **55)** *Bothynus cylindricus*; **56)** *Coelosis biloba*, a) Male, b) Lateral view of male head, c) Female (Images courtesy of Jean-Louis Giuglaris, French Guiana).

This uncommon species occurs in Argentina, and Endrödi (1966) listed two no-data specimens from Chile.

Cyclocephala lutea Endrödi, 1966
(Fig. 52)

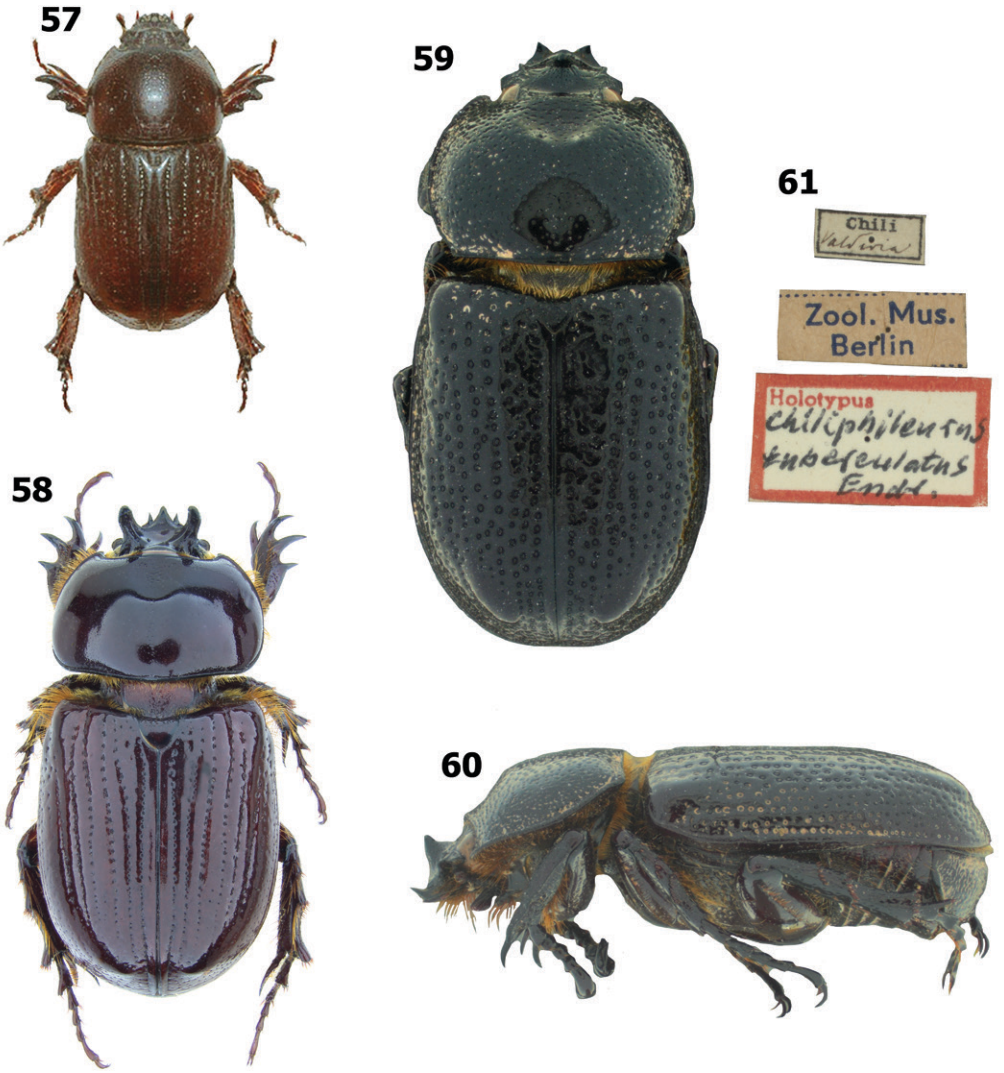
Cyclocephala lutea Endrödi 1966: 244 (original combination).

Cyclocephala lutea was described from Chile (two paratypes), Argentina, and Bolivia (Endrödi 1966). The Chile locality cited by Endrödi is "Patrerillos [=Potrerillos] oberhalb [above] Mendoza [Argentina]". Potrerillos in Chile is a ghost town in the interior of the Atacama Desert and an unlikely habitat for *Cyclocephala* species, whereas Potrerillos in Argentina is near Mendoza from whence came other paratypes. We believe Endrödi mistakenly listed this locality in Chile when it should have been Argentina.

Cyclocephala putrida Burmeister, 1847
(Fig. 53)

Cyclocephala putrida Burmeister 1847: 51 (original combination).

Endrödi (1966) recorded one no-data specimen from Chile and two specimens from "Conception". Moore *et al*. (2018) listed a specimen from Biobío. The lectotype for *C. putrida* (MNHN, #EC10259) is



Figs. 57–61. **57)** *Archophileurus fodiens*; **58)** *A. vervex*. *Chiliphileurus tuberculatus*: **59–60)** Holotype, dorsal and lateral views, respectively; **61)** Holotype labels (images courtesy of Juares Fuhrmann, Museu de Zoologia da Universidade de São Paulo, São Paulo, Brazil).

from "Chili", and it was either mislabeled, transported, or collected at a time when the border between Chile and Argentina was imprecisely known by collectors. *Cyclocephala putrida* is broadly distributed in South America, but it does not occur in Chile.

***Dyscinetus dubius* Olivier, 1789**
(Fig. 54)

Dyscinetus dubius Olivier 1789: 32 (original combination).

Dyscinetus dubius is an abundant species that occurs from Mexico (Ratcliffe *et al*. 2013) to Argentina, but it is not established in Chile. Endrödi (1966), repeated by Moore *et al*. (2018), listed a no-data specimen from Chile.

Pentodontini

***Bothynus cylindricus* Arrow, 1937**
(Fig. 55)

Bothynus cylindricus Arrow 1937: 44 (original combination).

This species is recorded from southern Brazil and central Argentina (Córdoba) (Endrödi 1969).

Figs. 62–63. Male *Golofa pelagon*, dorsal and dorsolateral views, respectively.

We have a single male from the MNNC, which is labeled "CHILE: Región IV (Coquimbo) / Elqui Prov., Pisco Elqui / January 2005; G. Castillo". The route through Pisco Elqui is an international road that goes to the border with Argentina, and there it is common to find records of Argentine insects that are not established in Chile. The possibility remains that the specimens arrived in the area of Pisco Elqui as a result of inadvertent international trade.

Oryctini

***Coelosis biloba* (Linnaeus, 1767)**
(Fig. 56)

Scarabaeus biloba Linnaeus 1767: 544 (original combination).

This species is found from Mexico (Ratcliffe *et al.* 2013) to Argentina. Endrödi (1976) listed a no-data specimen from Chile. No precisely labeled specimens of this common species are known from Chile.

Phileurini

***Archophileurus fodiens* (Kolbe, 1910)**
(Fig. 57)

Amblyphileurus fodiens Kolbe 1910: 345 (original combination).
Oxyligyrus larssoni Endrödi 1969: 1 (synonym).

Archophileurus fodiens occurs in southern South America but is not established in Chile. Endrödi (1977a) recorded a no-data specimen from Chile, and Dupuis (2020) recorded a specimen from the environs of Arica collected in 2005. Both records may represent spurious transport via commerce.

***Archophileurus vervex* (Burmeister, 1847)**
(Fig. 58)

Phileurus vervex Burmeister 1847: 154 (original combination).

This species is found in southern South America but is not established in Chile. Gutiérrez (1945, 1947, 1950) referred to a specimen from northern Chile, but Di Iorio *et al.* (2017) suggested this was probably *A. chaconus*.

***Chiliphileurus tuberculatus* Endrödi, 1977**
(Figs. 59–61)

Chiliphileurus tuberculatus Endrödi 1977a: 19 (original combination).

Chiliphileurus tuberculatus is a **new junior synonym** of the Asian *Eophileurus cingalensis* Arrow, 1908. Since *Chiliphileurus* Endrödi, 1977 is a monotypic genus, it becomes a **new junior synonym** of *Eophileurus* Arrow, 1908. The male holotype of *C. tuberculatus* is labeled "Valdivia, Chile" and, if correctly labeled, is a result of inadvertent commercial transport from Asia to Chile. The specimen from the Museum fur Naturkunde (Berlin, Germany) is currently at the Museu de Zoologia at

Fig. 64. Team Scarab lab members at Parque Nacional Tolhuaca, Chile in November 2003. Left to right: Federico Ocampo, Shauna Hawkins, M. J. Paulsen, Brett Ratcliffe, Mary Liz Jameson.

the Universidade de São Paulo (São Paulo, Brazil) on a long-overdue loan.

Dynastini

Golofa pelagon Burmeister, 1847
(Figs. 62–63)

Golofa pelagon Burmeister 1847: 254 (original combination).

Endrödi (1977b) recorded *G. pelagon* from Colombia, Brazil, Bolivia, and Argentina. Blackwelder (1944) erroneously included Chile (evidently repeating older literature), while Fauré (1953), in his necrology for Gutiérrez, pointed out that Gutiérrez had previously demonstrated that *G. pelagon* did not occur in Chile.

Incertae Sedis

Scarabaeus punctatostriatus Solier, 1851

Scarabaeus punctatostriatus Solier 1851: 78 (original combination).

The brief description and simple illustration (plate 16, figure 3) in Solier (1851), as well as placement in the text next to *Oryctes* (= *Ligyrus*), seems consistent with a *Ligyrus* or *Tomarus* species except for the longitudinal furrow on the pronotum that extends from the anterior to the posterior margin. There is no Chilean pentodontine with a pronotal furrow of this length. We are unable to place this species.

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Our companions in the field who assisted with collecting and data gathering during the 2003 excursion to Chile (Fig. 64) were Mary Liz Jameson (now Wichita State University, Wichita, KS, USA), M. J. Paulsen (University of Nebraska State Museum, Lincoln, NE, USA), Federico Ocampo (AgIdea, Pergamino, Argentina), and Shauna Hawkins (now Tunisia).

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