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A revision of the southern South American genus *Bolborhinum* Boucomont (Coleoptera: Geotrupidae: Bolboceratinae)

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Abstract

The genus *Bolborhinum* Boucomont (Coleoptera: Geotrupidae: Bolboceratinae: Bolboceratini) is revised and now contains eight species: *B. geotrupoides* (Laporte), *B. laesicolle* (Fairmaire), *B. nasutum* (Fairmaire and Germain), *B. seai* (Martínez), *B. shajovskoyi* (Martínez), *B. tricorne* (Solier), *B. trilobulicorne* **new species**, and *B. tubericeps* (Fairmaire). The genus *Bolborhinum* is redescribed and a key to species in English and Spanish, a checklist, distributional and temporal data, and designation of lectotypes and neotypes are given. All species in the genus are diagnosed and illustrated, and distributional records with maps for all species are included. Additionally, some observations on the natural history of *Bolborhinum* species are presented.

One new synonym is proposed: *Bolboceras binasutum* Fairmaire and Germain is synonymized under *Bolborhinum geotrupoides*. Lectotypes are designated for the following species-group names: *Bolboceras binasutum* Fairmaire and Germain (a junior synonym of *Bolborhinum geotrupoides*), *Bolboceras distinguendum* Fairmaire and Germain (a junior synonym of *Bolborhinum geotrupoides*), *Bolboceras laesicolle* Fairmaire (now *Bolborhinum laesicolle*), *Bolboceras nasutum* Fairmaire and Germain (now *Bolborhinum nasutum*), *Bolboceras tetraodon* Redtenbacher (a junior synonym of *Bolborhinum tubericeps*), *Bolboceras tricorne* Solier (now *Bolborhinum tricorne*), and *Bolboceras tubericeps* Fairmaire (now *Bolborhinum tubericeps*). Neotypes are designated for the following species-group names: *Bolboceras andicola*

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Philippi (a junior synonym of *Bolborhinum nasutum*), *Bolboceras bicorne* Philippi (a junior synonym of *Bolborhinum tubericeps*), *Bolboceras excavatum* Philippi (a junior synonym of *Bolborhinum laesicolle*), and *Bolboceras geotrupoides* Laporte (now *Bolborhinum geotrupoides*).

Additionally, we here elevate the subgenera *Pereirabolbus* Martínez and *Zefevazia* Martínez to the generic level based on morphological comparisons with the genus *Bolborhinum*. As a result, the following combinations reflect this change in status: *Pereirabolbus castaneus* (Klug), *Pereirabolbus tucumanensis* (Boucomont), *Zefevazia cantisanii* (Martínez), *Zefevazia peruana* (Boucomont), *Zefevazia quinquedentata* (Felsche), and *Zefevazia rosascostai* Martínez. These changes are congruent with the generic concepts of Bolboceratinae from other parts of the world, and with the modern classification of the group.

Resumen

El género *Bolborhinum* Boucomont (Coleoptera: Geotrupidae: Bolboceratinae: Bolboceratini) es revisado y ahora contiene ocho especies: *B. geotrupoides* (Laporte), *B. laesicolle* (Fairmaire), *B. nasutum* (Fairmaire y Germain), *B. seai* (Martínez), *B. shajovskoyi* (Martínez), *B. tricorne* (Solier), *B. trilobulicorne* **nueva especie**, y *B. tubericeps* (Fairmaire). El género *Bolborhinum* es redescrito, se presentan claves en inglés y español para la identificación de todas las especies, se proveen caracteres diagnósticos, descripciones e ilustraciones. Además se incluye un listado taxonómico, registros de distribución con mapas y se designan lectotipos y neotipos cuando corresponda. Adicionalmente algunas observaciones biológicas del género *Bolborhinum* son presentadas.

Una nueva sinonimia es propuesta: *Bolboceras binasutum* Fairmaire y Germain es sinonimizado bajo *Bolborhinum geotrupoides*. Lectotipos son designados para los siguientes nombres: *Bolboceras binasutum* Fairmaire y Germain (sinónimo menor de *Bolborhinum geotrupoides*), *Bolboceras distinguendum* Fairmaire y Germain (sinónimo menor de *Bolborhinum geotrupoides*), *Bolboceras laesicolle* Fairmaire (ahora *Bolborhinum laesicolle*), *Bolboceras nasutum* Fairmaire y Germain (ahora *Bolborhinum nasutum*), *Bolboceras tetraodon* Redtenbacher (sinónimo menor de *Bolborhinum tubericeps*), *Bolboceras tricorne* Solier (ahora *Bolborhinum tricorne*), y *Bolboceras tubericeps* Fairmaire (ahora *Bolborhinum tubericeps*). Neotipos son designados para los siguientes nombres: *Bolboceras andicola* Philippi (sinónimo menor de *Bolborhinum nasutum*), *Bolboceras bicorne* Philippi (sinónimo menor *Bolborhinum tubericeps*), *Bolboceras excavatum* Philippi (sinónimo menor de *Bolborhinum laesicolle*), y *Bolboceras geotrupoides* Laporte (ahora *Bolborhinum geotrupoides*).

Adicionalmente, nosotros elevamos los subgéneros *Pereirabolbus* Martínez y *Zefevazia* Martínez a nivel genérico basado en la comparación morfológica con el género *Bolborhinum*. Como resultado, los siguientes combinaciones reflejan este cambio de estatus: *Pereirabolbus castaneus* (Klug), *Pereirabolbus tucumanensis* (Boucomont), *Zefevazia cantisanii* (Martínez), *Zefevazia peruana* (Boucomont), *Zefevazia quinquedentata* (Felsche), y *Zefevazia rosascostai* Martínez. Estos cambios son congruentes con los conceptos genéricos de Bolboceratinae de otras partes del mundo, y con la clasificación moderna del grupo.

Key words: Geotrupidae, Bolboceratinae, *Bolborhinum*, *Pereirabolbus*, *Zefevazia*, new species, southern South America, Argentina, Chile.

Introduction

Bolborhinum Boucomont is a small genus of bolboceratines endemic to southern South America that contains eight species distributed in Argentina and Chile. Of these species, four are endemic to Chile, three species are known from both countries, and one species is endemic to Argentina.

Species in the genus have been treated by few authors in the last 160 years, both in catalogs (Harold 1869, Reed 1876, Philippi 1887, Germain 1911, Boucomont 1912, Blackwelder 1944) and in scattered taxonomic works (Laporte 1840, Solier 1851, Fairmaire 1856, Fairmaire & Germain 1861, Philippi 1859, Philippi 1873, Redtenbacher 1868, Reed 1872, Kolbe 1907, Boucomont 1902, Boucomont 1911, Felsche 1909, Gutiérrez 1949, Gutiérrez 1950, Martínez 1951, Martínez 1952, Martínez 1976).

Martínez (1976) recognized three subgenera in the genus *Bolborhinum*: *Bolborhinum*, *Pereirabolbus* Martínez, and *Zefevazia* Martínez with a total of 14 species distributed from Brazil to Chile (Martínez 1976). *Bolborhinum* is characterized by the spherical body form and distinct male cephalic ornamentation. Most of

the species of this genus have obvious sexual dimorphism with females lacking horns or tubercles. This makes it difficult to identify the females of some species except by association with males collected in the same localities or burrows.

Similar to other taxa of Bolboceratinae (see Howden 1955, Howden *et al*. 2007), the adults of this group excavate deep vertical burrows in the ground, sometimes in the proximity of trees. Recent activity by these bolboceratines can be detected by the presence of a fresh mound of soil with a circular opening (Saíz *et al*. 1989).

This revision provides a redescription of the genus *Bolborhinum*, key to species, individual diagnoses, distributions and illustrations of each species. Some nomenclatural and classification changes are made, including the description of a new species, one new synonymy, lectotype designations for seven species names, and neotype designations for four species names.

Additionally, we here elevate the subgenera *Pereirabolbus* and *Zefevazia* to the generic level to bring this entire group into parity with classification and ranking systems used for Bolboceratinae from other parts of the world (Howden 1955, Howden and Cooper 1977, Gussmann & Scholtz 2000, Nikolajev 2003). These changes are made based on morphological characters and comparison with the intrageneric and intergeneric character differences of Bolboceratinae genera from other parts of the world.

Taxonomic history

Until 1976, almost all species of South American Bolboceratini were placed in the genus *Bolboceras* Kirby. Boucomont (1911) erected the subgenus *Bolborhinum* for several species from Chile, and this taxon was later elevated to the generic level (Martínez 1976). Martínez (1976) also modified the classification of the group so the genus *Bolborhinum* contained three subgenera: *Bolborhinum*, *Pereirabolbus*, and *Zefevazia*.

With the exception of scattered original descriptions and catalog listings, little research has been done on *Bolborhinum*. Species in the genus were briefly treated by Martínez (1951, 1952, 1976) and Gutiérrez (1949, 1950). Two Argentinean species, *B. seai* (Martínez) and *B. shajovskoyi* (Martínez) were described in the modern era. Martínez (1952) published a key to the species currently in *Bolborhinum* and later Martínez (1976) published the most recent catalog to the species in this genus. Howden & Cooper (1977) revamped the classification of the Australian Bolboceratinae and discussed some morphological similarities and possible relationships between Australian and Neotropical bolboceratines.

Materials and methods

Specimens were borrowed from and deposited in 23 institution and private collections listed below (curators listed in brackets). A total of 1,048 specimens were examined to form the basis of this revision.

ABTS Andrew B. T. Smith Collection, Ottawa, ON, Canada.
AUPC Alfredo Ugarte P. Collection, Santiago, Chile.
CDFA California Department of Food and Agriculture, Sacramento, CA (Chuck Bellamy)
CMNC Canadian Museum of Nature, Ottawa, Canada (Bob Anderson, François Génier).
CNCI Canadian National Collection of Insects, Ottawa, ON, Canada (Pat Bouchard).
FMNH Field Museum of Natural History, Chicago, IL, USA (Alfred Newton, Margaret Thayer).
GACC Guillermo Aceituno C. Collection, Santiago, Chile.
HAHC Henry & Anne Howden Collection, Ottawa, Canada (now deposited at CMNC).
IADIZA Instituto Argentino de Investigaciones de las Zonas Áridas, Mendoza, Argentina (Sergio Roig-Juñent).

JEBC Juan E. Barriga T. Collection, Curicó, Chile.
JMEC José Mondaca E. Collection, Santiago, Chile.
MGAC Manuel Gálvez A. Collection, Rancagua, Chile.
LACM Natural History Museum of Los Angeles County, CA, U.S.A. (Brian Brown).
MACN Museo Argentino de Ciencias Naturales "Bernardino Rivadavia," Buenos Aires, Argentina (Arturo Roig-Alsina).
MEUC Museo Entomológico Luís Peña, Departamento de Sanidad Vegetal de la Universidad de Chile, Santiago, Chile (Danilo Cepeda).
MNHN Muséum National d'Histoire Naturelle, Paris, France (Olivier Montreuil).
MNNC Museo Nacional de Historia Natural, Santiago, Chile (Mario Elgueta).
NMWH Naturhistorisches Museum Wien, Vienna, Austria (Heinrich Schönmann).
SRTC Sergio Rothmann T. Collection, Santiago, Chile.
UCCC Museo de Zoología de la Universidad de Concepción, Chile (Jorge Artigas).
UMCE Universidad Metropolitana de Ciencias de la Educación, Santiago, Chile (Jaime Solervicens).
UNSM University of Nebraska State Museum, Lincoln, NE, U.S.A. (Brett Ratcliffe).
VMDC V. Manuel Diéguez M. Collection, Santiago, Chile.

Species descriptions were made after analyzing external and internal morphological characters. All specimens were examined, dissected, and illustrated using a dissecting stereomicroscope (10 to 40 X) and reflected tungsten light. The internal sclerotized structures were dissected by relaxing the specimens in hot water, and they were cleaned in a dilute solution (about 10%) of potassium hydroxide, and neutralized in a dilute solution (about 10%) of acetic acid. For dissected specimens, the male genitalia was placed in a glycerin-filled vial or glued to a point for later study.

The descriptions are limited to diagnostic characters and are not intended to be complete descriptions of the species. Characters mentioned in the generic description that are shared by all the members of the respective genus are generally omitted in the species descriptions and diagnoses. Most characters (with the exception of the male genitalia) are visible in dorsal view. Photographs of adult male and female specimens of each species are also given. The male genitalia are illustrated for generic-level diagnoses but are of little use for identification between species of *Bolborhinum*.

The following definitions and standards were used in the descriptions and diagnoses: ***Color*** based on dried, pinned specimens. ***Body length*** was measured dorsally along the midline, from the apex of the mandibles to the elytral apex. ***Body width*** was measured at the widest point, typically at the middle of the elytra. ***Puncture density*** was defined as *dense* if punctures are nearly confluent to less than two puncture diameters apart, *moderately dense* if punctures are between two to six puncture diameters apart, and *sparse* if punctures are separated by more than six puncture diameters. ***Puncture size*** was defined as *small* if punctures were 0.02 mm or smaller, *moderate* if 0.02–0.07 mm, and *large* if 0.07 mm or larger. ***Setae*** were defined as *sparse* if there were few setae, *moderately dense* if the surface was visible but with many setae, and *dense* if the surface was obscured by setae.

The specimens examined from the study region are cited in "Specimens examined." All specimens examined were databased and these data are available at: www.museum.unl.edu/research/entomology/SSSA.html. The distribution records of the specimens we examined were used to create the maps (Figs. 56–63). The maps were generated using the *Online Map Creation* website (Weinelt 2007) and were further modified using Adobe Illustrator and Adobe Photoshop. The distribution of the species is based on collected specimens, specimens housed in entomological collections (see acronyms), and from literature records. The geographical distribution for each species is organized alphabetically by country; followed by the Argentinean provinces and Chilean regions (at the time of publication Chile is divided into 15 political regions), which are arranged from north to south, then alphabetically by locality.

The number of specimens recorded for each country and locality are given between parentheses. Temporal distribution is given chronologically by month with the number of specimens recorded for each month in parentheses.

Designation of lectotypes and neotypes

Lectotypes are designated for species names currently classified within *Bolborhinum* in order to preserve the stability of nomenclature by selecting one specimen as the sole, name-bearing type of the taxon. Many species of scarabs have been described based on mixed series of specimens later considered to represent multiple species. Lectotypes were selected for the following names (all given in their original combinations): *Bolboceras binasutum* Fairmaire and Germain, *Bolboceras distinguendum* Fairmaire and Germain, *Bolboceras laesicolle* Fairmaire, *Bolboceras nasutum* Fairmaire and Germain, *Bolboceras tetraodon* Redtenbacher, *Bolboceras tricorne* Solier, and *Bolboceras tubericeps* Fairmaire.

The rules of zoological nomenclature require that a neotype "is validly designated when there is an exceptional need and only when that need is stated expressly" (Article 75.3, International Commission on Zoological Nomenclature 1999). Four neotypes are designated in this work for names currently classified in the genus *Bolborhinum*: *Bolboceras andicola* Philippi, *Bolboceras bicorne* Philippi, *Bolboceras geotrupoides* Laporte, and *Bolboceras excavatum* Philippi, in order to preserve the stability of nomenclature by selecting one specimen as the sole, name-bearing type of the taxon when the original name-bearing type specimen(s) was lost or destroyed. The neotype specimen serves to tie the published name to an actual specimen and as a reference standard for the taxon. We feel that these neotypes are necessary because of the long history of taxonomic neglect for this genus. Until revisionary work is done on long-neglected groups such as *Bolborhinum*, the taxonomy and classification are "complex zoological problems" and there is doubt surrounding the identities of all species and names.

Genus *Bolborhinum* Boucomont, 1911

(Figs. 1–37, 47, 50, 53)

Bolborhinum Boucomont, 1911: 339 (as a subgenus of *Bolboceras*). Type species: *Bolboceras tubericeps* Fairmaire, 1861 by original designation. Gender: neuter.

Description. *Form* (Figs. 1–37): Color usually reddish-brown to black, the lighter brown coloration of some specimens is likely the incomplete sclerotization of newly emerged adults (teneral coloration); body spherical, strongly convex. Size moderate (length 7.5–22.0 mm; width 4.0–10.0 mm). *Head* in male: Subtriangular or trapezoidal, longer than wide. Mandible with outer margin rounded, weakly sinuate or almost straight, anteriorly with apex acute, curved inwards. Labrum with apex variably emarginated; dorsal surface rugose or rugopunctate. Clypeus and frons with variable ornamentation (Figs. 1–37). Some species have cephalic armature that is either comprised of 1 horn at midline of clypeal apex or of 2 horns. In the case of 2 cephalic horns, 1 is at the midline of clypeal apex and the other horn (depending on the species) is either located on the clypeus immediately behind the first or further back at the frontoclypeal margin or between the eyes. Another type of armature consists of a large anteriorly directed clypeal horn and 2 large horns that originate in the ocular margin. In some cases, the cephalic armature either consists of 1 anteriorly directed clypeal horn and 4–5 small horns situated behind the clypeal horn in different places on the head or with a prominent trapezoidal frontal tubercle formed by 4 tubercles joined laterally by a longitudinal carina. Frons impunctate to sparsely punctate, finely rugose. Vertex dorsally smooth, only with micropunctures, flat or depressed. Antenna with 11 antennomeres; antennomere 1 shorter than 2–8 combined. Antennal club ovoid, with 3 antennomeres (Fig. 47); outer antennomere usually more convex than the inner antennomere; dorsal surface completely setose; basal anten-

nomere weakly convex, often nearly flat; dorsal surface partially setose on outer distal margin. Eyes partially divided by canthus; eye canthus with outer lateral margin arcuate or straight, surface generally rugopunctate. *Pronotum*: Sexually dimorphic, males generally with deeper anteromedian excavations. Pronotum transverse, convex, without horns, generally with deep and wide anteromedian excavation (except in *B. tricorne*); dorsally either with posterior transverse ridge parallel to basal margin (not always present in *Bolborhinum*) or with a pair of prominent protuberances in the anterior margin of the pronotum and with the lateral border projected anteriorly (*B. trilobulicorne*). Dorsal surface sparsely punctate, sometimes with impressed medial furrow; lateral surface with moderately dense to dense punctation concentrated around the lateral fovea, on the anterior and posterior angles of pronotum, and along lateral margin. *Scutellum:* Triangular, length less than basal width (Fig. 50); surface with punctures small, variable in density; lateral margin curving inward at base; basal margin slightly arcuate or straight; apex of scutellum subacute or rounded. *Elytron:* Convex; anterior margin not upturned; surface with 7 variably impressed striae between suture and humeral umbone; punctures small to moderate, separated by 1 or more puncture diameters; intervals smooth, only with micropunctures; second stria almost reaching elytral base. *Venter:* Surface with setation yellowish-brown or tawny brown, long, moderately dense, partially covering thorax and abdomen; abdominal sternites densely punctate. Prosternum posteriorly with apical tooth, dorsally with median carina. Mesocoxae subcontiguous. Metasternum pyriform, bulbous, convex medially, with median long metasternal carina; dorsally with small, dense punctures, partially covered by moderately dense, long setae; metasternal process anteriorly truncate. *Legs:* Protibia with 5 to 6 teeth on outer margin; teeth with acute or rounded apex; protibial spur subparallel, straight, acuminate at apex, length equals or exceeds the apex of the second protarsomere. Protarsus with first tarsomere longer than fifth, second to fourth tarsomeres decreasing in length. Mesotibiae and metatibiae robust, variably shaped in lateral view, but always with unlobed subapical carina and with knob-like projections randomly spread over surface above subapical carina. *Male genitalia:* Symmetrical, weakly sclerotized; aedeagus small, simple in structure, subparallel-sided; parameres short, basally membranous, with apex narrow distally, obtuse (Fig. 53).

Female. As male except in the following respects. *Head*: trapezoidal; shorter than in male; dorsally without horns, but with a variably developed tubercle or tubercles on frontoclypeal region or frons; with a pair of short lateral carinae that converge distally. Clypeus truncate and elevated apically, dorsally rugulose. *Pronotum*: without anteromedian excavation, only with small concavity or depression located immediately behind of the apical margin of the pronotum. *Female genitalia*: not diagnostic.

Diagnosis. The following characters will separate *Bolborhinum* from all other South American Bolboceratini: head in the males with one to five horns of various forms and sizes (Figs. 1, 3, 4, 6, 7, 9, 11, 13); females without horns, only with a small tubercle situated near the frontoclypeal region or on the frons (Figs. 2, 5, 8, 10, 12, 14). Antennal club ovoid (Fig. 47). Pronotum in males generally with deep and wide anteromedian excavation, dorsally with basal transverse ridge parallel to basal margin; females with a small concavity or depression located immediately behind the apical margin of the pronotum. Scutellum triangular. Elytron without basal margin or with weak basal margin, with 7 striae between medial suture and humeral swelling. Prosternal process prominent. Mesocoxae subcontiguous. Metasternum pyriform, bulbous, with median metasternal carina; metasternal process anteriorly truncate, not distinctly convex between mesocoxae. Protibial spur extending to apex of protibia. Mesotibia and metatibia with transverse ridge well separated from the distal apex, not subapical. *Male genitalia:* aedeagus small, simple in structure, subparallel-sided; parameres short, basally membranous, with apex narrow distally, obtuse (Fig. 53).

Distribution. The species of this genus inhabit semiarid regions, including mixed Andean steppes with *Araucaria* trees and the *Nothofagus* forest habitats of southern South America (Argentina and Chile). *Bolborhinum* occurs from sea level to high altitudes in the Andes Mountains (from 50–2,500 m).

Taxonomic relations. *Bolborhinum* shares many characters with *Halffterobolbus* Martínez, *Pereirabolbus*, and *Zefevazia*; these four genera are obviously closely related. Phylogenetic analyses and taxonomic

revisions of the latter three genera are needed before the exact relationships and delimitations can be determined for all four of these Neotropical genera. *Bolborhinum* also appears to be closely related to the Australian genus *Bolborhachium* Boucomont. Both genera share a median anteriorly directed clypeal horn in some species, the outer segment of the antennal club usually more convex than the inner segment, the latter often nearly flat, the pronotum with a posterior transverse ridge, the scutellum with the lateral margin curving inward, the basal margin often sharply deflected downward, the sutural stria curving inward anteriorly and terminating near the apex of the scutellum, the prosternum posteriorly with an apical tooth, and the metasternal process often flat and anteriorly truncate (Howden & Cooper 1977).

Nomenclature. The generic names *Bolboceras* Kirby and *Bolborhinum* Boucomont are both neuter in gender. Many species that were described in the genus *Bolboceras* over the past almost two centuries were erroneously given a masculine ending. Since most species currently classified in the genus *Bolborhinum* were originally described in the genus *Bolboceras*, several specific names need to be emended to agree in gender with *Bolboceras* and *Bolborhinum*, the genera they were originally and currently combined with. Several examples of this can be seen in the species treatments below.

Natural History. Little is known of the natural history of *Bolborhinum* species, and the larvae and pupae have never been described. We hypothesize that the larvae are mycetophagous. This would be congruent with observations made for North American and Australian members of the tribe Bolboceratini (Howden 1955, Howden & Cooper 1977). The adults of the genus *Bolborhinum* appear mainly in early winter (July) and are active until autumn (May). Species of the genus *Bolborhinum* live in the proximity of forests and in clearings surrounded by low shrubs. The adults spend most of the time underground sheltered inside their burrows. At dusk, the males emerge to make circular flights at low height (10–30 cm) above the ground in search of females. Adults are largely nocturnal or crepuscular, and most species are moderately attracted to artificial light, especially to low intensity ultraviolet light (UV) (based on label data and personal observations). Some species of *Bolborhinum* concentrate many tunnels over a small surface area. They can construct galleries in sandy soil or sometimes can also be found in argillaceous, volcanic, or rocky soil. The adults dig a vertical tunnel of up to 1 m in depth, and sometimes the tunnel can be sinuous or otherwise not perfectly vertical. Lateral tunnels are constructed at the bottom of the main tunnels, presumably for larval burrows. The depth and direction of the tunnel seems to be influenced both by the type of soil and size of the beetle. Externally, the burrows are quite distinctive with small piles of fresh earth that are pushed to the surface and accumulate around the opening. Frequently it is possible to find more than one species of *Bolborhinum* sharing the same habitat.

Key to species of *Bolborhinum* (*B. seai* females are unknown)

Note: females, particularly smaller or worn individuals, are very difficult to identify past couplet 9 of this key. Distribution, association with males, and examination of long series will all increase the chances of positively identifying female specimens.

1 Head dorsomedially with 4 tubercles forming trapezoid (broadest basally) (Figs. 19–20). Clypeal margin reflexed with two tubercles or teeth. Well-developed individuals with longitudinal carinae between head tubercles and sometimes joining the clypeal tubercles. Males and females..... ..... *Bolborhinum laesicolle* (Fairmaire, 1856)

1' Head with prominent horns, with fewer than 4 tubercles, or with tubercles not forming trapezoid dorsomedially 2

2(1') Head with 5 distinct horns (Figs. 24–25); 1 horn at clypeal apex, 2 clypeal horns on either side of midline towards base of clypeus (not on lateral margin), 2 frontal horns on either side of midline slightly apical to eyes. Known only from northern Argentina (Catamarca) .... *Bolborhinum seai* (Martínez, 1951)

2' Head with different horn configuration. Known only from central and southern Argentina (Mendoza to Río Negro) and Chile 3

3(2') Clypeus with distinct horn or horns (horns rarely worn down to look like tubercles, if so, wearing evident); apex of clypeus never with parabolic, blade-like carina. Males 4

3' Clypeus without horns, with tubercles and carinae; apex of clypeus often with parabolic, blade-like carina (Figs. 23, 27, 29, 31, 33, 35, 37). Females 9

4(3') Head with a single, large clypeal horn (Fig. 22); frontal horn/tubercle absent ..... *Bolborhinum nasutum* (Fairmaire and Germain, 1861)

4' Head with multiple horns or tubercles 5

5(4') Head with 1 large apically projecting clypeal horn and 2 large horns originating from supraocular margin (Figs. 30, 32). Well-developed individuals with an additional pair of lateral processes on clypeal horn ..... *Bolborhinum tricorne* (Solier, 1851)

5' Head without large horns originating from supraocular margin 6

6(5') Head with 4 distinct horns; 3 clypeal horns and 1 frontal horn forming a diamond (Figs. 13, 36); 2 lateral clypeal horns not on margin ..... *Bolborhinum tubericeps* (Fairmaire, 1856)

6' Head with less than 4 horns, or with 4 horns but with 2 lateral clypeal horns on margin 7

7(6') Head laterally with distinct blade-like process or horn on margin (Figs. 26, 28) ..... *Bolborhinum shajovskoyi* (Martínez, 1952)

7' Head without distinct lateral processes or horns, all horns located on or next to midline 8

8(7') Head with two horns, basal horn located between eyes; apex of the clypeal horn trilobed, frontal horn bifurcate (Fig. 34) ..... *Bolborhinum trilobulicorne* sp. nov.

8' Head with either 1 or 2 horns, neither horn between or near eyes; 1 prominent horn at midline of clypeal apex and either 2 tubercles directly behind it or with a distinct clypeal horn directly behind it (rear clypeal horn sometimes bifurcate) (Figs. 15, 17, 18) ..... *Bolborhinum geotrupoides* (Laporte, 1840)

9(3') Pronotum with small, round depression at the apical margin; pronotum impunctate on medial third of disc ..... *Bolborhinum nasutum* (Fairmaire and Germain, 1861)

9' Pronotum without small, round depression at the apical margin; sometimes with longitudinal depression apically; pronotum punctate on medial third of disc; punctures small, sometimes concentrated near midline 10

10(9') Supraocular margin elevated, cariniform, arcuate in posterior half (lateral view) (Figs. 10, 31, 33) ..... *Bolborhinum tricorne* (Solier, 1851)

10' Supraocular margin weakly elevated or not elevated 11

11(10') Pronotum with thin, apical depression; pronotum with large punctures scattered unevenly across disc ..... *Bolborhinum tubericeps* (Fairmaire, 1856)

11' Pronotum with or without thin, apical depression at the apical margin; pronotal surface more evenly punctate; punctures typically small, dense 12

12(11') Head with clypeal tubercle elevated (Figs. 8, 27, 29), with prominent lateral cariniform processes. More common in Argentina, but also known from IX Región de La Araucanía, Chile ..... *Bolborhinum shajovskoyi* (Martínez, 1952)

12' Head with clypeal tubercle elevated or not elevated, without prominent lateral cariniform process. More common in Chile, but also known from Andean localities in Neuquén and Río Negro, Argentina 13

13(12') Pronotum anteromedially with furrow; dorsal surface with larger punctures concentrated laterally, at medial furrow, and on pronotal depression ..... *Bolborhinum trilobulicorne* sp. nov.

13' Pronotum medially without furrow, anteromedially with weak depression at apical margin…. ..... *Bolborhinum geotrupoides* (Laporte, 1840)

Clave para las especies de *Bolborhinum* Boucomont (la hembra de *B. seai* es desconocida)

Nota: las hembras, individuos particularmente más pequeños o gastados, son muy difíciles de identificar más allá del punto 9 de esta clave. La distribución, la asociación con los machos, y la revisión una serie numerosa aumenta las posibilidades de identificar positivamente los ejemplares femeninos

1 Cabeza dorsomedialmente con 4 tubérculos que forman un trapezoide (más amplio basalmente) (Figs. 19–20). Margen clipeal reflejado, con dos tubérculos o dientes. Individuos bien desarrollados con carenas longitudinales entre los tubérculos de la cabeza y el ápice clipeal. Machos y hembras .... *Bolborhinum laesicolle* (Fairmaire, 1856)

1' Cabeza con dos cuernos prominentes, con menos de 4 tubérculos, o con tubérculos que no forman un trapezoide 2

2(1') Cabeza con 5 cuernos distintos (Figs. 24–25); 1 cuerno en el ápice clipeal, 2 cuernos clipeales a ambos lados de la línea media en la base del clípeo (no en el margen), 2 cuernos frontales a ambos lados de la línea media y ligeramente apical de los ojos. Conocida sólo del norte de Argentina (Catamarca)..... *Bolborhinum seai* (Martínez, 1951)

2' Cabeza con diferente configuración de cuernos. Conocida sólo del centro y sur de Argentina (Mendoza a Río Negro) y en Chile 3

3(2') Clípeo con un cuerno o cuernos distintos (cuerno evidente, raramente bajo como tubérculo); ápice del clípeo nunca con carena laminar parabólica. Machos.....4

3' Clípeo sin cuernos, con tubérculos y carenas; ápice del clípeo a menudo con carena laminar parabólica (Figs. 23, 27, 29, 31, 33, 35, 37). Hembras 9

4(3') Cabeza con un único y largo cuerno clipeal (Fig. 22); cuerno frontal/tubérculo ausente .... *Bolborhinum nasutum* (Fairmaire y Germain, 1861)

4' Cabeza con múltiples cuernos o tubérculos 5

5(4') Cabeza con 1 cuerno clipeal largo apicalmente proyectado, y 2 cuernos largos que se originan en el margen supraocular (Fig. Figs. 30, 32). Individuos bien desarrollados con un par adicional de procesos laterales en la base del cuerno clipeal ..... *Bolborhinum tricorne* (Solier, 1851)

5' Cabeza sin cuernos largos originados en el margen supraocular.....6

6(5') Cabeza con 4 cuernos distintos; 3 cuernos clipeales y 1 cuerno frontal formando las esquinas de un diamante (Figs. 13, 36); 2 cuernos clipeales laterales no situados en el margen..... ..... *Bolborhinum tubericeps* (Fairmaire, 1856)

6' Cabeza con menos de 4 cuernos, o con 4 cuernos pero con 2 cuernos laterales en el margen.....7

7(6') Cabeza lateralmente con distinto proceso o cuerno en el margen (Figs. 26, 28)..... ..... *Bolborhinum shajovskoyi* (Martínez, 1952)

7' Cabeza sin proceso lateral o cuerno, todos los cuernos ubicados en o después de la línea media 8

8(7') Cabeza con 2 cuernos, cuerno basal ubicado entre los ojos; ápice del cuerno clipeal trilobulado, cuerno frontal bifurcado (Fig. 34)..... *Bolborhinum trilobulicorne* sp. nov.

8' Cabeza con 1 o 2 cuernos, ningún cuerno entre o cerca de los ojos; 1 cuerno prominente en la línea media del ápice clipeal y 2 tubérculos ubicados detrás de él o con un cuerno clipeal distinto ubicado detrás de él (cuerno clipeal posterior a veces bifurcado (Figs. 15, 17, 18) .... *Bolborhinum geotrupoides* (Laporte, 1840)

9(3') Pronoto con depresión pequeña y redondeada en el margen anterior; pronoto sin puntuación en el tercio medio del disco..... *Bolborhinum nasutum* (Fairmaire and Germain, 1861)

9' Pronoto sin depresión pequeña y redondeada en el margen apical; a veces con depresión apicalmente longitudinal; pronoto punteado en el tercio medio del disco; puntuación pequeña, a veces concentrada cerca de la línea media 10

10(9') Margen supraocular elevado, careniforme, arqueado en la mitad posterior (vista lateral) (Figs. 10, 31,

33) ..... *Bolborhinum tricorne* (Solier, 1851)

10' Margen supraocular débilmente elevado o no elevado 11

11(10') Pronoto con ligera depresión apical; pronoto con puntuación grande dispersa irregularmente alrededor del disco ..... *Bolborhinum tubericeps* (Fairmaire, 1856)

11' Pronoto con o sin depresión ligera en el margen apical; superficie pronotal completamente punteada, uniforme; puntuación tipicamente pequeña, densa. 12

12(11') Cabeza con tubérculo clipeal elevado (Figs. 8, 27, 29), con procesos laterales careniformes, prominentes. Más común en Argentina, pero también conocida de la IX Región de La Araucanía, Chile .... *Bolborhinum shajovskoyi* (Martínez, 1952)

12' Cabeza con tubérculo clipeal elevado o no elevado, sin procesos laterales careniformes. Común en Chile, pero también conocido de localidades andinas en Neuquén y Río Negro, Argentina.....13

13(12') Pronoto anteromedialmente con surco; superficie dorsal con puntuación gruesa concentrada lateralmente, en el surco, y en la depresión pronotal ..... *Bolborhinum trilobulicorne* sp. nov.

13' Pronoto medialmente sin surco, anteromedialmente con ligera depresión en el margen apical..... ..... *Bolborhinum geotrupoides* (Laporte, 1840)

Species treatments

***Bolborhinum geotrupoides* (Laporte, 1840)**
(Figs. 1, 2, 15–18)

Original combination. *Bolboceras geotrupoides* Laporte, 1840: 104. Type locality: "CHILE, Talca Prov., Alto Vilches, 1100 m" (original type locality: "Chili"). Type series: neotype at CMNC labeled: "CHILE, Talca Prov. / AltoVilches, 1100m. / ~~10~~–12.XII.1976 / H. F. Howden" (typeset), b) "H.&A. HOWDEN / COLLECTION / Ottawa, Canada" (typeset with black border), c) "BOLBOCERAS / GEOTRUPOIDES / LAPORTE ♂ / NEOTYPE / A.B.T. SMITH" (red label, handwritten and typeset), d) "Southern Neotropical Scarabs / database # AS2607270 / *Bolborhinum geotrupoides* / (Laporte, 1840) ♂ / DET: A.B.T.SMITH 2006" (typeset). **Neotype here designated**. See "Designation of lectotypes and neotypes" section for further statements of qualifying conditions for the designation of this neotype. All reasonable steps were exhausted to trace the original type material of this taxon. Many Laporte type specimens have been lost, but some are currently housed in the MNHN and in the Museum of Victoria in Abbotsford, Australia (MVMA). The second author searched for type material at the MNHN in May 2005 and Ken Walker (curator of entomology at the MVMA) searched for type material in the MVMA, both without success. We can only conclude that the type material has been lost. The specimen selected as the neotype matches the original description of Laporte (1840) and falls within the original type locality.

Synonym. *Bolboceras binasutum* Fairmaire and Germain, 1861: 2 (emended from *Bolboceras binasutus*). **New Synonymy**. Type locality: "Chilensia." Type series: lectotype at MNHN labeled a) "1683" (handwritten), b) "Bolboceras / binasutus" (handwritten by Fairmaire), c) "MUSEUM PARIS / Collection Léon Fairmaire / 1906" (typeset), d) "TYPE" (red label, typeset), e) "BOLBOCERAS / BINASUTUM / FAIRMAIRE & GERMAIN / LECTOTYPE ♂ / A.B.T. SMITH" (red label, handwritten and typeset), f) "Southern Neotropical Scarabs / database # AS2609492 / *Bolborhinum geotrupoides* / (Laporte, 1840) / DET: A.B.T.SMITH 2007" (typeset). **Lectotype here designated**.

Synonym: *Bolboceras distinguendum* Fairmaire and Germain, 1861: 2 (emended from *Bolboceras distinguendus*). Type locality: "Chilensia." Type series: lectotype male at MNHN labeled a) "1622" (handwritten), b) "Bolboceras / distinguendus" (handwritten by Fairmaire), c) "MUSEUM PARIS / Collection Léon

Fairmaire / 1906" (typeset), d) "TYPE" (red label, typeset), e) "BOLBOCERAS / DISTINGUENDUM / FAIRMAIRE & GERMAIN / LECTOTYPE ♂ / A.B.T. SMITH" (red label, handwritten and typeset), f) "Southern Neotropical Scarabs / database # AS2609493 / *Bolborhinum geotrupoides* / (Laporte, 1840) / DET: A.B.T.SMITH 2007" (typeset). **Lectotype here designated**.

Specimens examined. 343 specimens were examined from AUPC, CMNC, CNCI, FMNH, GACC, HAHC, INHS, JEBC, JMEC, MEUC, MGAC, MNHN, MNNC, SRTC, UCCC, UMCE, VMDC.

Diagnosis. Length 14.5–22.0 mm. Color generally reddish-brown. The number, shape, and placement of the male clypeal horns are diagnostic as follows: head dorsally with two medial horns that are connected by an elevated carina (Fig. 15); the apical horn is more robust and located at the clypeal apex, the basal horn is smaller and located immediately behind the first. The two horns could be interpreted as a single bifid horn (in small individuals the second clypeal horn is replaced by a pair of small tubercles located on each side of the midline). Male pronotum with deep and wide anterior excavation occupying almost two thirds of pronotum; surface smooth, generally impunctate; posterosuperior ridge transverse, slightly arcuate anteriorly, sometimes with lateral edge anteriorly projected in larger specimens.

Female similar to male, except in the trapezoidal shape and smaller length of the head in comparison with the male; dorsal surface medially with a small, weakly elevated tubercle and a pair of short lateral carinae that are convergent distally. Clypeus anteriorly truncate, elevated. Pronotum with weak depression located immediately behind the apical margin; disc with fine furrow and sparse punctures on the dorsal surface; laterally with punctures dense to sparse, distributed irregularly across the surface.

Distribution (Fig. 56): **ARGENTINA (2)**. **Neuquén (1)**: Lago Tromén (1). **Río Negro (1)**: Pilcaniyeu (1). **CHILE (341)**. **Región Metropolitana de Santiago (3)**: El Monte (1); Naltagua (2).**VI Región del General Bernardo O'Higgins (1)**: Alto Huemul, San Fernando (1). **VII Región del Maule (84)**: Curicó Maritimo (1); El Coigo (1); Fundo El Radal (2); Fundo Malcho (5); La Balsa (4); La Mina (17); Laguna del Maule (2); Lara Bullileo (4); Linares (7); Parque Inglés (2); Parral (1); Potrero Grande (2); Reserva Nacional Radal 7 Tazas (3); Vilches Alto (33). **VIII Región del Biobío (190)**: Abanico (2); Antuco (1); Atacalco (12); Chiguayante (50); Coihueco (1); Cordillera de Chillán (8); Fundo El Castillo (1); Fundo El Roble (1); La Invernada (10); Las Trancas (54); Los Angeles (5); Los Lleuques (10); Nonquén (1); Piedras Comadres (10); Puente Marchant (8); Puente Torrealba (1); Ralco (1); Recinto (4); Río Ñuble (1); Shangri-la (7); Yungai (1); region record only (1). **IX Región de La Araucanía (59)**: Angol (7); Cunco (1); Laguna Galletue (3); Liucura (1); Lonquimay (15); Malalcahuello (1); Marimenuco (7); Molco (1); Nahuelbuta (2); Parque Nacional Nahuelbuta, Pehuenco (1); Parque Nacional Villarrica, Puesco (5); Temuco (3); Traiguen (1); Villa Portales (10); Volcán Lonquimay (1). **XIV Región de Los Ríos (1)**: Valdivia (1). **Country record only (3).**

Temporal data: January (60), February (26), March (8), April (5), September (5), October (24), November (89), December (123).

Remarks: Identification of this species is complicated because of the variable head armature of males. The second clypeal horn can be either prominent or absent, and when present, this horn is either bifurcate or simple. In individuals where the second clypeal horn is absent, there is in its place a pair of distinctly separated tubercles behind the first clypeal horn (Figs. 17–18). This variation is not as extreme as the male dimorphism recognized by Howden (1979) in some species of the Australian genus *Blackburnium* Boucomont, but it is enough to cause confusion and probably lead to the failure to recognize *B. geotrupoides* and *B. binasutum* as synonyms until now. We examined over 200 male specimens of this species and found the male armature of *B. geotrupoides*, *B. binasutum*, and *B. distinguendum* to fall within our concept of this somewhat variable species. Therefore the latter two names are here synonymized under *B. geotrupoides*.

***Bolborhinum laesicolle* (Fairmaire, 1856)**
(Figs. 3, 19, 20)

Original combination. *Bolboceras laesicolle* Fairmaire, 1856: 483 (emended from *Bolboceras laesicollis*). Type locality: "Chilensia." Type series: lectotype at MNHN labeled a) "488" (handwritten), b) "Bolboceras / laesicollis / n. sp. Chili" (handwritten by Fairmaire), c) "TYPE" (red label, typeset), d) "BOLBOCERAS / LAESICOLLE / FAIRMAIRE / LECTOTYPE / A.B.T. SMITH" (red label, handwritten and typeset), e) "Southern Neotropical Scarabs / database # AS2609501 / *Bolborhinum laesicolle* / (Fairmaire, 1856) / DET: A.B.T.SMITH 2007" (typeset). **Lectotype here designated**.

Synonym. *Bolboceras excavatum* R. A. Philippi in F. Philippi, 1859: 660 (emended from *Bolboceras excavatus*). Type locality: "CHILE: Valdivia, 34 km WNW La Union" (original type locality: "cerca de Corral"). Type series: neotype at CMNC labeled: "CHILE: Valdivia / 34kmWNWLaUnion / 17.XII.84–7.II.85 / S&JPeck, 700m, FIT / mixedevergr. forest" (typeset), b) "H.&A. HOWDEN / COLLECTION / Ottawa, Canada" (typeset with black border), c) "BOLBOCERAS / EXCAVATUM / PHILIPPI ♂ / NEOTYPE / A.B.T. SMITH" (red label, handwritten and typeset), d) "Southern Neotropical Scarabs / database # AS2607337 / *Bolborhinum laesicolle* / (Fairmaire, 1856) / DET: A.B.T. SMITH 2006" (typeset). **Neotype here designated**. See "Designation of lectotypes and neotypes" section for further statements of qualifying conditions for the designation of this neotype. All reasonable steps were exhausted to trace the original type material of this taxon. Philippi (1859) did not specify where the type series was deposited. The vast majority of Philippi type specimens are housed in the MNNC. We have unsuccessfully searched for type material at the MNNC on several occasions for type material of this taxon. We can only conclude that the type material has been lost. The specimen selected as the neotype matches the original description of Philippi (1859) and was collected reasonably close to original type locality.

Synonym. *Bolboceras mundum* Redtenbacher, 1868: 60. Type locality: "Chili." Type series: holotype at NMWH labeled a) "Zelebor / Novara" (typeset), b) "Z" (typeset), c) "Mundus / Chili. Redt." (handwritten), d) "laesicolle / det. Felsche" (handwritten and typeset), e) "laesicollis / Fairm / ♀ / mundus." (handwritten), f) "Bolboceras / mundus / Typ. Redtb." (handwritten), g) "BOLBOCERAS / MUNDUM / REDTENBACHER / HOLOTYPE" (handwritten and typeset), h) "Southern Neotropical Scarabs / database # AS2607073 / *Bolborhinum laesicolle* / (Fairmaire, 1856) / DET: A.B.T. SMITH 2006" (typeset). Redtenbacher's (1868) statement "Ein Männchen ebenfalls von Chile" indicates that the original description was based on a single specimen. This specimen is therefore the holotype.

Specimens examined. 305 specimens were examined from ABTS, AUPC, CDFA, CMNC, CNCI, FMNH, GACC, HAHC, JEBC, JMEC, MEUC, MGAC, MNHN, MNNC, SRTC, UCCC, UMCE, VMDC.

Diagnosis. Length 7.5–14.0 mm. Color usually brown dark or black. This species exhibits some sexual dimorphism but much overlap in characters making it difficult to distinguish males from females externally. This species is separated from other *Bolborhinum* by the shape and placement of the clypeal armature. Head dorsally without horns, but with a large trapezoid formed by 4 tubercles at the corners joined laterally, apically, and basally by carina; larger specimens with longitudinal carinae between head trapezoid and the clypeal apex; frons with deep and wide depression (Figs. 19–20). Pronotum with central anterior excavation deep, narrow, located immediately behind of the anterior border of the pronotum; pronotal declivity widened superiorly, and depressed laterally under of the anterior margin of the pronotum; dorsal surface divided occasionally by a furrow; posterosuperior ridge transverse, arcuate posteriorly.

Distribution (Fig. 57): **ARGENTINA (24)**. **Neuquén (23)**: San Martín de Los Andes (1); Lago Hermoso (1); Pucará (21). **Río Negro (1)**: El Bolsón (1). **CHILE (281)**. **VIII Región del Biobío (23)**: Chillán (2); Contulmo (1); Hualqui (1); Monumento Natural Contulmo (18); Recinto (1). **IX Región de La Araucanía (125)**: Bellavista (7); Carillanca (1); Cherquenco (2); Cunco (5); Curacautín (1); Flor del Lago (46); Lago Caburgua (41); Loncoche, Catrimaiten (1); Malalcahuello (1); Molco (6); Nahuelbuta, Tolpán (1); Parque Nacional

Huerquehue (2); Pemehue (2); Pucón, Fundo El Volcán (1); Río Blanco (2); Termas de Río Blanco (1); Victoria (3); Villarrica (2). **X Región de Los Lagos (66)**: Dalcahue (1); Lago Puyehue (5); Lago Chapo (6); Maullín (1); Mehuin (3); Osorno (1); Parque Nacional Puyehue (36); Puaucho (3); Pucatrihue (3); Puntra (1); Puyehue (4); Todos Los Santos (1); Parque Nacional Vicente Pérez Rosales (1). **XIV Región de Los Ríos (61)**: Calafquen (6); Coñaripe (17); La Unión (10); Llancahue (16); Pancul (2); Panguipulli (3); Rincón de la Piedra Turnoff, SE Valdivia (3); Riñihue (1); Santo Domingo (1); Valdivia (2). **Country record only (6).**

Temporal data. January (54), February (16), March (6), April (1), May (4), September (2), October (5), November (33), December (173).

Remarks: This is the smallest known species of *Bolborhinum* and the only known species in the genus where the males and females are difficult to distinguish externally. It is notable that Howden (1985) made the same general observations on sexual dimorphism for the smaller species of *Bolborhachium* and other Australian Bolboceratini. These Australian taxa and *Bolborhinum* were hypothesized to be close relatives (Howden & Cooper 1977).

Primary types for *B. laesicolle* and its two synonyms were examined and found to be conspecific according to our concept of this species. These synonymies are here confirmed.

***Bolborhinum nasutum* (Fairmaire and Germain, 1861)**
(Figs. 4, 5, 21–23)

Original combination. *Bolboceras nasutum* Fairmaire and Germain, 1861: 2 (emended from *Bolboceras nasutus*). Type locality: "Chilensia." Type series: lectotype at MNHN labeled a) "1620" (handwritten), b) "Bolboceras / nasutus" (handwritten by Fairmaire), c) "TYPE" (red label, typeset), d) "BOLBOCERAS / NASUTUM / FAIRMAIRE & GERMAIN / LECTOTYPE ♂ / A.B.T. SMITH" (red label, handwritten and typeset), e) "Southern Neotropical Scarabs / database # AS2609500 / *Bolborhinum nasutum* / (Fairmaire & Germain, 1861) / DET: A.B.T.SMITH 2007" (typeset). **Lectotype here designated**.

Synonym. *Bolboceras andicola* Philippi, 1873: 312. Type locality: "La Leonera, Cord. Rancagua" Chile (original type locality: "Andibus prov. Santiago"). Type series: neotype at FMNH labeled: "LA LEONERA / Cord. Rancagua / 26,30-Dic-1954" (typeset), b) "1750 m / Coll:L.E. Pena" (typeset with black border), c) "Bolbocera / geotrupoides / Lap. / det. L.E.Pena 1956" (handwritten and typeset), d) "Bolborhinum / nasutum / Fairmaire / DET. / H.F. HOWDEN 61" (handwritten and typeset), e) "FMNH1986 / L.PeñaColl. / Acc#17-422" (typeset), f) "BOLBOCERAS / ANDICOLA / PHILIPPI ♂ / NEOTYPE / A.B.T. SMITH" (red label, handwritten and typeset), d) "Southern Neotropical Scarabs / database # AS2607237 / *Bolborhinum nasutum* / (Fairmaire & Germain, 1861) ♂ / DET: A.B.T.SMITH 2006" (typeset). **Neotype here designated**. See "Designation of lectotypes and neotypes" section for further statements of qualifying conditions for the designation of this neotype. All reasonable steps were exhausted to trace the original type material of this taxon. Philippi (1873) did not specify where the type series was deposited. The vast majority of Philippi type specimens are housed in the MNNC. We have unsuccessfully searched for type material at the MNNC on several occasions for type material of this taxon. We can only conclude that the type material has been lost. The specimen selected as the neotype matches the original description of Philippi (1873) and was collected reasonably close to original type locality.

Specimens examined. 53 specimens were examined from AUPC, FMNH, HAHC, JEBC, JMEC, MEUC, MGAC, MNHN, MNNC, SRTC, UCCC, UMCE, VMDC.

Diagnosis. Length 13.0–17.0 mm. Color usually reddish-brown. This species is distinguished from other *Bolborhinum* by the shape and placement of the cephalic armature in the males. The clypeal horn is located at midline of clypeal apex, directed anteriorly or vertically; horn robust, slightly curved, with apex truncate or rounded. Dorsal surface of the head flat, laterally with two carinae that converge distally at base of clypeal

horn; vertex impunctate, not depressed. Pronotum with a small, deep anterior excavation located transversally behind of the apical margin; pronotal declivity widened and flattened broadly behind declivity; posterosuperior ridge transverse, sinuate medially; pronotal surface dorsally impunctate, laterally with puncture scarce, moderately sparse.

Female similar to male, except in the shape and ornamentation of the head; dorsal surface with a weakly elevated tubercle situated on the frontoclypeal line. Pronotum with a small depression located immediately behind the apical margin; disc impunctate, laterally with moderately sparse to dense punctures; punctures moderate in size.

Distribution (Fig. 58). **CHILE (53)**. **V Región de Valparaíso (2)**: Piscicultura (2). **Región Metropolitana de Santiago (12)**: Cerro El Roble (6); El Canelo (4); Quebrada San Ramón (1); Río Clarillo (1). **VI Región del General Bernardo O'Higgins (6)**: Alto Huemul (5); La Leonera (1). **VII Región del Maule (27)**: Cajón del Teno (1); La Mina (1); Reserva Nacional Altos del Lircay (1); Talca (1); Vilches Alto (23). **VIII Región del Biobío (5)**: Las Trancas (1); Piedras Comadres (2); Recinto (1); Shangri-la (1). **Country record only (1).**

Temporal data: January (9), February (1), October (8), November (10), December (24).

Remarks: Primary types for *B. nasutum* and its synonym were examined and found to be conspecific according to our concept of this species. This synonymy is here confirmed.

***Bolborhinum seai* (Martínez, 1951)**
(Figs. 6, 24, 25)

Original combination: *Bolboceras seai* Martínez, 1951:113. Type locality: "Argentina, Catamarca, Dep. Ambato, Los Angeles." Type series: holotype male at MACN labeled a) Argentina / Catamarca / Dep. de Ambato / Los Angeles / II-1946 / B. Schafer leg. (handwritten), b) "HOLOTYPUS (typeset, faded red label), c) "Bolboceras / seai sp. n. ♂" (handwritten by Martínez, red label), d) "Southern Neotropical Scarabs / database # JM2000594 / *Bolborhinum seai* / (Martínez, 1951) ♂ / DET: J. MONDACA E. 2007" (typeset)

Specimens examined. 1 specimen was examined from MACN.

Diagnosis. Length 16.0 mm, width 9.9 mm. Color yellowish-brown. This species is distinguished from other *Bolborhinum* by the number and placement of the cephalic horns and carinae in the male. Clypeal horn located at midline of clypeal apex, directed anteriorly, slightly curved, posteriorly after clypeal horn with two small vertical horns basal to clypeal horn on either side of midline at base of clypeus (not on lateral margin), and two frontal horns and carinae on either side of midline; frontoclypeal line from the antero-internal angle of the ocular canthus carinate, tuberculate. Clypeal surface between horns slightly depressed; vertex dorsally impunctate, laterally with border elevated into distally obtuse triangular teeth. Pronotum with deep, wide anterior excavation; pronotal declivity impunctate; posterosuperior ridge transverse, slightly projected in the middle, with a short and shallow furrow not reaching the basal border of the pronotum. Female unknown.

Distribution (Fig. 59). **ARGENTINA (1)**: Catamarca (1): Ambato, Los Angeles (1).

Temporal data. February (1).

Remarks: It is notable that this is the only species in the genus that occurs north of the southern South American biogeographical region. More collecting is needed from Catamarca to Mendoza in Argentina to determine if the distribution of this genus is disjunct or continuous. *Bolborhinum seai* is known only from a single specimen.

***Bolborhinum shajovskoyi* (Martínez, 1952)**
(Figs. 7, 8, 26–29)

Original combination: *Bolboceras shajovskoyi* Martínez, 1952: 318. Type locality: "Argentina, territorio nacional de Neuquén, San Martín de los Andes." Type series: holotype male at MACN labeled a) S.M.Andes / P. Nac. Lanín / L. Swaryczewski (typeset), b) "HOLOTYPUS" (typeset, faded red label), c) "Bolboceras / shajovskoyi sp. n. ♂" (handwritten by Martínez, red label), d) "Southern Neotropical Scarabs / database # JM2000595 / *Bolborhinum shajovskoyi* / (Martínez, 1951) ♂ / DET: J. MONDACA E. 2007" (typeset). One female allotype at MACN labeled a) "Enero 1950 / S.M. Andes / I.Schajovskoi" (typeset), b) "ALLOTYPUS" (typeset, faded red label), c) "Bolboceras / shajovskoyi sp. n. ♀" (handwritten by Martínez, red label), d) "Southern Neotropical Scarabs / database # JM2000596 / *Bolborhinum shajovskoyi* / (Martínez, 1951) / DET: J. MONDACA E. 2007" (typeset). One male paratype at HAHC labeled a) "II-1951 / S.M.Andes / P.Nac.Lanín / I.Schajovskoi" (typeset), b) "PARATIPO" (typeset), c) "Bolboceras (Bolborh.) / shajovskoyi / sp. n. ♂ / A. MARTINEZ-DET.1952" (handwritten and typeset), d) "H. & A. HOWDEN / COLLECTION / *ex*. A. Martínez coll." (typeset), e) "Southern Neotropical Scarabs / database # AS2607380 / *Bolborhinum shajovskoyi* / (Martínez, 1952) ♂ / DET: A.B.T.SMITH 2006" (typeset). One male paratype at HAHC labeled a) "I-1952 / S.M.Andes / P.Nac.Lanín / I.Schajovskoi" (typeset), b) "PARATIPO" (typeset), c) "Bolboceras (Bolborh.) / shajovskoyi / sp. n. ♀ / A. MARTINEZ-DET.1952" (handwritten and typeset), d) "H. & A. HOWDEN / COLLECTION / *ex*. A. Martínez coll." (typeset), e) "Southern Neotropical Scarabs / database # AS2607381/ *Bolborhinum shajovskoyi* / (Martínez, 1952) ♂ / DET: A.B.T.SMITH 2006" (typeset). One male paratype at HAHC labeled a) "S.M.Andes / P.Nac.Lanín / I.Schajovskoi" (typeset), b) "PARATIPO" (typeset), c) "Bolboceras (Bolborh.) / shajovskoyi ♂ / sp. n. / A. MARTINEZ-DET.1952" (handwritten and typeset), d) "H. & A. HOWDEN / COLLECTION / *ex*. A. Martínez coll." (typeset), e) "Southern Neotropical Scarabs / database # AS2607382/ *Bolborhinum shajovskoyi* / (Martínez, 1952) ♂ / DET: A.B.T.SMITH 2006" (typeset). One male paratype at HAHC labeled a) "Enero 1950 / S.M. Andes / I.Schajovskoi" (typeset), b) "H. & A. Howden / Collection" (typeset), c) "PARATIPO" (typeset), d) "Bolboceras (Bolborh.) / shajovskoyi ♂ / sp. n. / A. MARTINEZ-DET.19" (handwritten and typeset), d) "H. & A. HOWDEN / COLLECTION / *ex*. A. Martínez coll." (typeset), e) "Southern Neotropical Scarabs / database # AS2607383 / *Bolborhinum shajovskoyi* / (Martínez, 1952) ♂ / DET: A.B.T.SMITH 2006" (typeset). One female paratype at HAHC labeled a) "I-1951 / S.M.Andes / P.Nac.Lanín / I.Schajovskoi" (typeset), b) "PARATIPO" (typeset), c) "Bolboceras (Bolborh.) / shajovskoyi ♀ / sp. n. / A. MARTINEZ-DET.1952" (handwritten and typeset), d) "H. & A. HOWDEN / COLLECTION / *ex*. A. Martínez coll." (typeset), e) "Southern Neotropical Scarabs / database # AS2607390 / *Bolborhinum shajovskoyi*/ (Martínez, 1952) ♀ / DET: A.B.T.SMITH 2006" (typeset). One female paratype at HAHC labeled a) "I-1951 / S.M.Andes / P.Nac.Lanín / I.Schajovskoi" (typeset), b) "PARATIPO" (typeset), c) "Bolboceras (Bolborh.) / shajovskoyi ♀ / sp. n. / A. MARTINEZ-DET.1952" (handwritten and typeset), d) "H. & A. HOWDEN / COLLECTION / *ex*. A. Martínez coll." (typeset), e) "Southern Neotropical Scarabs / database # AS2607391 / *Bolborhinum shajovskoyi* / (Martínez, 1952) ♀ / DET: A.B.T.SMITH 2006" (typeset).

Specimens examined: 25 specimens were examined from FMNH, HAHC, IADIZA, JEBC, JMEC, LACM, MACN.

Diagnosis. Length 17.0–19.0 mm. Color dark brown in males and reddish-brown in females. This species is distinguished from other *Bolborhinum* by the shape and placement of the male cephalic horns. Head dorsally rugulose, with two clypeal horns and two lateral, triangular processes; first clypeal horn directed anteriorly, slightly curved, situated at midline of clypeal apex, less developed than the second; second horn located immediately behind the first, robust, slightly declivous anteriorly, with apex obtuse, widened distally. Frontoclypeal surface laterally with two strongly elevated cariniform processes that converge distally; vertex depressed, impunctate (Figs. 26, 28). Pronotum with deep, wide anterior excavation; pronotal declivity straight, perfectly parallel at posterolateral margin of the pronotum (lateral view); posterosuperior ridge transverse, subrectum, slightly sinuate medially.

Females similar to males, except in the trapezoidal shape of the head and total absence of horns; dorsal surface with an elevated tubercle and two lateral processes on the frontoclypeus. Pronotum with weak depression located immediately behind of the anterior margin; dorsal surface densely covered with small punctures, laterally densely rugopunctate.

Distribution (Fig. 60): **ARGENTINA (23)**. **Mendoza (1)**: Laguna Diamantes (1). **Neuquén (20)**: Auca Pan (2), Collón Curá (1), Junín de los Andes (1), Las Taguas (2), Parque Nacional Lanín; San Martín de los Andes (7), Tipilinka (1), Río Alumine (1), San Martín de Los Andes (5). **Río Negro (2)**: Bariloche (1), El Bolsón (1). **CHILE (2)**. **IX Región de La Araucanía (2)**: Liucura, Pino Hachado (2).

Temporal data. January (10), February (1), November (7), December (5).

Remarks: The specimen of this species collected in Mendoza represents a northern range extension of approximately 400 km. More collecting is obviously needed in the montane regions of Mendoza and Neuquén to fill in the gaps and get a complete picture of the distribution of this species.

***Bolborhinum tricorne* (Solier, 1851)**
(Figs. 9, 10, 30–33)

Original combination. *Bolboceras tricorne* Solier, 1851: 67 (emended from *Bolboceras tricornis*). Type locality: "la provincia de Santiago." Type series: lectotype male at MNHN labeled a) "Stago" (handwritten), b) "15 / 43" (handwritten on white underside of round, green label), c) "Bolboceras / tricornis Sol / Santiago." (handwritten), d) "MUSEUM PARIS / CHILI / Gay 15-43" (typeset), e) "TYPE" (red label, typeset), "BOLBOCERAS / TRICORNE / SOLIER / LECTOTYPE ♂ / A.B.T. SMITH" (red label, handwritten and typeset), f) "Southern Neotropical Scarabs / database # AS2609489 / *Bolborhinum tricorne* / (Solier, 1851) ♂ / DET: A.B.T.SMITH 2007" (typeset). **Lectotype here designated**. One paralectotype (actually a specimen of *Bolborhinum laesicolle*, not *B. tricorne*) at MNHN labeled: a) "15 / 43" (handwritten on white underside of round, green label), b) "Bolboceras / tricornis Sol" (handwritten), c) "MUSEUM PARIS / CHILI / Gay 15-43" (typeset), d) "Bolboceras / laesicolle Fairm." (handwritten), "BOLBOCERAS / TRICORNE / SOLIER / PARALECTOTYPE / A.B.T. SMITH" (yellow label, handwritten and typeset), e) "Southern Neotropical Scarabs / database # AS2609502 / *Bolborhinum laesicolle* / (Fairmaire, 1856) / DET: A.B.T.SMITH 2007" (typeset).

Specimens examined. 132 specimens were examined from AUPC, FMNH, GACC, HAHC, JEBC, JMEC, MEUC, MGAC, MNNC, SRTC, UCCC, UMCE, VMDC.

Diagnosis. Length 11.3–15.0 mm. Color reddish-brown or dark brown. This species is distinguished from other *Bolborhinum* by the shape, number, and placement of the male cephalic horns. Head dorsally with three horns; a large horizontal clypeal horn directed anteriorly and 2 large horns that originate at the ocular margin; first horn large, distally acute, basally widened or with two small horns situated on each side of the midline; second and third horns compressed, widened and truncate distally; dorsal surface with deep, large concavity occupying part of the frons and vertex (Figs. 30, 32). Pronotum convex, depressed medially, divided by furrow, without anteromedial excavation; pronotal disc impunctate medially, laterally with moderate-sized punctures, punctures moderately dense.

Females similar to males, except in the trapezoidal shape of the head and cephalic ornamentation; dorsal surface with a simple or bifid frontal tubercle variably developed, elevated, or obsolete; supraocular margin elevated, cariniform, arcuate posteriorly. Pronotum slightly depressed immediately behind of the apical margin, dorsally with medial furrow. Pronotal disc sparsely punctate with small punctures except near midline where punctures are moderately dense.

Distribution (Fig. 61). **CHILE (132)**. **IV Región de Coquimbo (1)**: Los Vilos, El Ñague (1). **V Región de Valparaíso (8)**: Escuela Naval (1); Jardín Botánico (1); Limache (1); Marga Marga (1); Ocoa (1); Palmas

de Ocoa (1); Punta de Tralca (1); Viña del Mar (1). **Región Metropolitana de Santiago (97)**: Alhue (1); Cajón del Maipo (6); Caleu (12); Cerro El Roble (5); Curacaví, Lingues de Miraflores (2); El Canelo (17); El Manzano (17); El Peñón (8); El Peumo (1); La Obra (5); Melipilla (2); Pallocabe (1); Quebrada de Macul (1); Rangue, Aculeo (11); Río Clarillo (1); Río Maipo (2); Santiago (1); Santiago, 27 km SE (4). **VI Región del General Bernardo O'Higgins (6)**: Doñihue, El Rulo (1); Las Cabras (1); Pichilemu (1); Reserva Nacional Río de Los Cipreses (3). **VII Región del Maule (12)**: Linares (1); Llico (1); Parral (1); Potrero Grande (7); Radal (1); Vilches Alto (1). **VIII Región del Biobío (7)**: Chiguayante (3); Concepción (1); Las Trancas (3). **Country record only (1).**

Temporal data. January (3), February (1), March (1), July (1), August (2), September (22), October (31), November (53), December (17).

Remarks: By examination of the type series of *B. tricorne*, it was discovered that this taxon was described from a mixed series. The lectotype was selected because it fits the prevailing usage concept of this species through the past century. The paralectotype is a specimen of *B. laesicolle*.

***Bolborhinum trilobulicorne* Mondaca & Smith, sp. nov.**
(Figs. 11, 12, 34, 35)

Type specimens. Holotype male and 43 paratypes (41 males, 2 females) deposited in 14 institutions and private collections. Holotype male at MNNC labeled: a) "Chile, VII Reg., Maule / R.N. Los Queules / 35º59'16''S 72º41'44.6''W / 30-XI-2004, J. Mondaca & M.J. Paulsen col." (typeset), b) "Southern Neotropical Scarabs/ database #JM2000486 ♂ / *Bolborhinum trilobulicorne* Mondaca & Smith / DET: J. Mondaca E. 2007" (typeset), c) "*Bolborhinum trilobulicorne* Mondaca & Smith / HOLOTYPE ♂ (red label, typeset). One male paratype at MNNC labeled: a) "Chile, VII Reg., Curanipe / R.N. Los Queules / 13/25-XI-2001, A. Fierro col." (typeset), b) "Southern Neotropical Scarabs / database #JM2000490 ♂ / *Bolborhinum trilobulicorne* Mondaca & Smith / DET: J. Mondaca E. 2007" (typeset), c) "*Bolborhinum trilobulicorne* Mondaca & Smith / PARATYPE ♂ (red label, typeset). Eleven male paratypes (two at FMNH, two at UMCE, four at MNNC, two at UCCC, one at UNSM) labeled: a) "Chile, VII Reg., Maule / R.N. Los Queules / 35º59'16''S 72º41'44.6''W / 30-XI-2004, J. Mondaca & M.J. Paulsen col." (typeset), b) "Southern Neotropical Scarabs / database [#JM2000470-#JM2000472 (FMNH); #JM2000473-#JM2000474 (UMCE); #JM2000475, #JM2000477-#JM2000478-#JM2000479 (MNNC); JM2000487-#JM2000488 (UCCC); #JM2000489 (UNSM)] ♂ / *Bolborhinum trilobulicorne* Mondaca & Smith / DET: J. Mondaca E. 2007" (typeset), c) "*Bolborhinum trilobulicorne* Mondaca & Smith / PARATYPE ♂ (red label, typeset). Fourteen male and one female paratypes (five at CMNC, two at CNCI, two at IADIZA, two at LACM, two at MACN, one at UNSM, one MNNC) labeled: a) "Chile, VII Reg., Maule / R.N. Los Queules / 35º59'16''S 72º41'44.6''W / 30-XI-2004, M.J. Paulsen & J. Mondaca col." (typeset), b) "Southern Neotropical Scarabs/ database [#JM2000466-#JM2000467, AS2609509, #AS2610458-#AS2610459 (CMNC); #JM2000468-#JM2000469 (CNCI); #JM2000471, #JM2000480 (IADIZA); #JM2000481-#JM2000482 (LACM); #JM2000483-#JM2000484 (MACN); #JM2000485 (UNSM); #JM2000491 (MNNC)] [♂ or ♀] / *Bolborhinum trilobulicorne* Mondaca & Smith / DET: J. Mondaca E. 2007" (typeset), c) "*Bolborhinum trilobulicorne* Mondaca & Smith / PARATYPE [♂ or ♀] (red label, typeset). Fifteen male and one female paratypes (two at ABTS, one at JEBC, twelve at JMEC, one at MEUC) labeled: a) "Chile, VII Reg., Maule / R.N. Los Queules/ 1/2-XII-2003, J. Mondaca col." (typeset), b) "Southern Neotropical Scarabs / database [#JM2000492-#JM2000493 (ABTS); #JM2000494 (JEBC); #JM2000495-#JM2000505, #JM2000507 (JMEC); #JM2000506 ♂ (MEUC)] [♂ or ♀] / *Bolborhinum trilobulicorne* Mondaca & Smith / DET: J. Mondaca E. 2007" (typeset), c) "*Bolborhinum trilobulicorne* Mondaca & Smith/ PARATYPE [♂ or ♀] (red label, typeset).

Holotype. Male. *Length*: 15.0 mm. *Width*: 8.0 mm. *Color*: Dorsally shiny black, legs and venter dark brown. *Head*: With two horns; clypeal horn long, very robust, inclined anteriorly; apex widened, trilobed,

with basal face excavated; frontal horn vertical, slightly curved basally at apex; apex bifurcate in "Y" shape. Frons and vertex smooth, impunctate. Labrum widely emarginated; dorsal surface punctate to rugose. *Pronotum*: With deep, narrow anterior excavation that surrounds apical margin of the pronotum. Behind this excavation are a pair of prominent protuberances on each side of midline divided vertically by a furrow in the pronotal declivity; lateral edge of pronotum projected anteriorly in well-developed individuals; posterosuperior ridge transverse, arcuate posteriorly, dorsomedially with longitudinal furrow that reaches the basal margin; dorsal surface with sparse punctures, more concentrated behind pronotal protuberances. Laterally with large, dense punctures concentrated around the lateral fovea, at the apical and basal angles, and along the lateral margin. *Scutellum*: Triangular in shape, wider than long, surface with fine punctures. *Elytron:* Apically with impressed striae; punctures small, separated by one puncture diameter; sutural interstriae wide, dorsally smooth, impunctate. *Venter*: Surface covered by long, yellowish-brown, moderately dense setae; abdominal sternites moderately setose, covered with dense punctures. Metasternum densely punctate, with median longitudinal carina; metasternal process anteriorly truncate, sparsely setose. *Legs*: Protibia wide, with six teeth on outer margin; protibial spur long, subparallel, acuminate at apex, protruding slightly past the second protarsomere. Mesocoxae contiguous. Mesotibia strongly thickened; subapical transverse carina well developed, surrounded by acute spines; apex with two apical spurs; spurs long, asymmetrical. Metatibia with subapical carina as in mesotibia, surrounded by long, acute spines. *Male genitalia*: Aedeagus as in Fig. 53.

Variation. 41 male and 2 female paratypes. Length 12.0–14.8 mm, width 6.9–8.0 mm. Variation in the specimens examined is mainly in size. Some male paratypes differ from the holotype in the weaker development of the cephalic horns, pronotal protuberances, and pronotal excavation, all of which are sexually dimorphic characters present only in the males of this species.

Female**.** *Length:* 14.5 mm. *Width*: 8.0 mm. Similar to male holotype except in the following respects: *Head*: Surface rugulose and rugopunctate, anteriorly on the clypeal region with a pair of short carinae that converge distally. Clypeus truncate, elevated apically. Frons with an obsolete, bifid tubercle. *Pronotum*: Without anteromedian excavation, only with small depression located immediately behind the apical margin; surface with larger punctures concentrated laterally, at medial furrow, and on pronotal depression. *Female genitalia*: Not diagnostic.

Etymology. The name "*trilobulicorne*" refers to the three lobes on the apex of the clypeal horn in the male of this species, which is a unique character in this genus.

Diagnosis. *Bolborhinum trilobulicorne* is distinguished from other species of *Bolborhinum* by the following combination of characters: Head with two robust cephalic horns; clypeal horn directed anteriorly, with apex trilobed; frontal horn vertical, bifurcate distally, slightly curved posteriorly. Pronotum with deep, narrow, apical excavation expanded laterally to the apical angle; excavation with a pair of prominent protuberances and the lateral border projected apically; posterosuperior ridge transverse, medially with weakly depressed longitudinal furrow that reaches the basal margin.

Distribution (Fig. 62). **CHILE (44). VII Región del Maule (44)**: Reserva Nacional Los Queules (44).

Specimens examined. 44 specimens were examined from CMNC, JMEC, MNNC.

Temporal data. November (28), December (16).

Natural History. Specimens were collected at dusk (20:30 and 21:00 hrs) flying near or excavated from their burrows, which ranged in depth from 40 to 60 cm and were located in forest gaps such as trails and roadsides. The forest that surrounds the open areas with burrows consists mainly of non-native pine plantations (*Pinus radiata* D. Don, Pinaceae), mixed with fragments of relictual coastal Maulino forest restricted to the coastal zone of Maule in Region VII. This new species is sympatric with *B. tubericeps*.

Remarks. The known distribution of this species is restricted to the type locality, which is in the mountain range near the coast of Maule Region. This geographic distribution corresponds to the biogeographic region of Central Chile and Maule used by Morrone *et al*. (1997) and Morrone (1999). This new species is only known from specimens that were collected after the year 2000. This highlights the need for continued survey

work in poorly collected coastal areas of central Chile, especially since natural habitats these areas are under intensive pressure from human development.

***Bolborhinum tubericeps* (Fairmaire, 1856)**
(Figs. 13, 14, 36, 37)

Original combination. *Bolboceras tubericeps* Fairmaire, 1856: 483. Type locality: "Chilensia." Type series: lectotype at MNHN labeled a) "Bolboceras / tubericeps / n.sp. Chili" (handwritten by Fairmaire), b) "MUSEUM PARIS / Collection Léon Fairmaire / 1906" (typeset), c) "TYPE" (red label, typeset), d) "BOLBOCERAS / TUBERICEPS / FAIRMAIRE / LECTOTYPE ♂ / A.B.T. SMITH" (red label, handwritten and typeset), e) "Southern Neotropical Scarabs / database # AS2609498 / *Bolborhinum tubericeps* / (Fairmaire, 1856) / DET: A.B.T.SMITH 2007" (typeset). **Lectotype here designated**.

Synonym. *Bolboceras bicorne* Philippi, 1859: 659 (emended from *Bolboceras bicornis*). Type locality: "CHILE, Malleco, Prov., 15 km W Victoria, 200 m" (original type locality: "en nuestro potrero de San-Juan," Valdivia). Type series: neotype at CMNC labeled: "CHILE, MallecoProv. / 15km W Victoria / 200m 28-30.xii.76 / H. F. Howden" (typeset), b) "H.&A. HOWDEN / COLLECTION / Ottawa, Canada" (typeset with black border), c) "BOLBOCERAS / BICORNE / PHILIPPI ♂ / NEOTYPE / A.B.T. SMITH" (red label, handwritten and typeset), d) "Southern Neotropical Scarabs / database # AS2607412 / *Bolborhinum tubericeps* / (Fairmaire, 1856) ♂ / DET: A.B.T.SMITH 2006" (typeset). **Neotype here designated**. See "Designation of lectotypes and neotypes" section for further statements of qualifying conditions for the designation of this neotype. All reasonable steps were exhausted to trace the original type material of this taxon. Philippi (1859) did not specify where the type series was deposited. The vast majority of Philippi type specimens are housed in the MNNC. We have unsuccessfully searched for type material at the MNNC on several occasions for type material of this taxon. We can only conclude that the type material has been lost. The specimen selected as the neotype matches the original description by Philippi (1859) and from the specimens we have available, it was collected as close as possible to the original type locality. We have not seen any specimens from the vicinity of Valdivia or anywhere south of IX Región de La Araucanía and suspect that the original type locality was based on erroneous locality data.

Synonym. *Bolboceras tetraodon* Redtenbacher, 1868: 59. Type locality: "Chili." Type series: lectotype at NMWH labeled a) "Zelebor / Novara" (typeset), b) "Z" (typeset), c) "Tetraodon / det. Felsche" (handwritten and typeset), d) "Bolboceras / tetraodon / Typ. Redtb." (handwritten), e) "Tetraodon / Chili. Redt." (handwritten), f) "BOLBOCERAS / TETRAODON / REDTENBACHER / LECTOTYPE ♂ / A.B.T. SMITH" (handwritten and typeset), g) "Southern Neotropical Scarabs / database # AS2607216 / *Bolborhinum tubericeps* / (Fairmaire, 1856) ♂ / DET: A.B.T.SMITH 2006" (typeset). **Lectotype here designated**.

Specimens examined. 121 specimens were examined from AUPC, CNCI, FMNH, GACC, HAHC, JEBC, JMEC, MGAC, MNHN, MNNC, NMW, SRTC, UCCC, VMDC.

Diagnosis. Length 13.0–16.3 mm. Color dark brown to black. This species is distinguished from other *Bolborhinum* by the number and placement of the male cephalic horns. Head with four distinct horns; clypeal horn curved, directed anteriorly, located at midline of clypeal apex; two smaller horns located immediately behind the previous horn on either side of clypeal border; the fourth horn is located near the frontoclypeal line; vertex depressed medially, with surface smooth, impunctate. Pronotum with deep, wide apical excavation; posterosuperior ridge transverse, slightly sinuate medially; pronotal disc impunctate, with short, shallow longitudinal furrow; lateral surface with moderately dense to dense punctures concentrated around the lateral fovea, the apical and basal angles, and along the lateral margin.

Females similar to males, except in the shape of the head and cephalic ornamentation; dorsal surface of head with frontal tubercle variably developed; supraocular margin laterally with straight ridge. Pronotum

slightly depressed immediately behind of the apical margin, dorsally with medial furrow; pronotal disc sparsely punctate with small, moderately dense punctures concentrated near midline.

Distribution (Fig. 63). **CHILE (121)**. **VII Región del Maule (68)**: Constitución, Fundo El Rosal (1); Estero Leiva (3); Fundo Malcho (2); Linares (1); Palos Negros (2); Parral (1); Potrero Grande (1); Puchubureo, Curicó Maritimo (2); Reserva Nacional Altos del Lircay (8); Reserva Nacional Los Queules (4); Reserva Nacional Radal 7 Tazas (2); Río Teno (1); Vilches Alto (40). **VIII Región del Biobío (40)**: Atacalco (3); Cerro Cayumanqui (7); Chillán (2); Coelemú (1); Concepción (1); Contulmo (3); Hualqui (2); Las Trancas (5); Los Lleuques (4); Piedras Comadres (11); Puente Marchant (1). **IX Región de La Araucanía (10)**: Angol (1); Flor del Lago (1); Victoria (8). **Country record only (2). No Data (1).**

Temporal data. January (20), February (3), March (1), April (1), May (1), September (4), October (10), November (24), December (56).

Remarks. Primary types for *B. tubericeps* and its two synonyms were examined and found to be conspecific according to our concept of this species. These synonymies are here confirmed.

Checklist of the species of *Bolborhinum*

Genus ***Bolborhinum*** Boucomont, 1911
Bolborhinum Boucomont, 1911: 339 (as subgenus)

Bolborhinum geotrupoides (Laporte, 1840)
Bolboceras geotrupoides Laporte, 1840: 104 (original combination)
Bolboceras binasutum Fairmaire and Germain, 1861: 2 (junior synonym)
Bolboceras distinguendum Fairmaire and Germain, 1861: 2 (junior synonym)
Distribution: Chile, Región Metropolitana de Santiago to XIV Región de Los Ríos; Argentina, Provinces of Neuquén and Río Negro.

Bolborhinum laesicolle (Fairmaire, 1856)
Bolboceras laesicolle Fairmaire, 1856: 483 (original combination)
Bolboceras excavatum Philippi, 1859: 660 (junior synonym)
Bolboceras mundum Redtenbacher, 1868: 60 (junior synonym)
Distribution: Chile, VIII Región del Biobío to X Región de Los Lagos; Argentina, Provinces of Neuquén and Río Negro.

Bolborhinum nasutum (Fairmaire and Germain, 1861)
Bolboceras nasutum Fairmaire and Germain, 1861: 2 (original combination)
Bolboceras andicola Philippi, 1873: 312 (junior synonym)
Distribution: Chile, V Región de Valparaíso to VIII Región del Biobío.

Bolborhinum seai (Martínez, 1951)
Bolboceras seai Martínez, 1951: 113 (original combination)
Distribution: Argentina, Province of Catamarca.

Bolborhinum shajovskoyi (Martínez, 1952)
Bolboceras shajovskoyi Martínez, 1952: 318 (original combination)
Distribution: Chile, IX Región de La Araucanía; Argentina, Provinces of Mendoza, Neuquén, and Río Negro.

Bolborhinum tricorne (Solier, 1851)
Bolboceras tricorne Solier, 1851: 67 (original combination)
Distribution: Chile, IV Región de Coquimbo to VIII Región del Biobío.

Bolborhinum trilobulicorne Mondaca & Smith sp. nov.
Distribution: Chile, VII Región del Maule.

Bolborhinum tubericeps (Fairmaire, 1856)
Bolboceras tubericeps Fairmaire, 1856: 483 (original combination)
Bolboceras bicorne Philippi, 1859: 659 (junior synonym)
Bolboceras tetraodon Redtenbacher, 1868: 59 (junior synonym)
Distribution: Chile, VII Región del Maule to IX Región de La Araucanía.

Genus *Pereirabolbus* Martínez, 1976

(Figs. 38–42, 49, 51, 54)

Pereirabolbus Martínez, 1976: 539 (as a subgenus of *Bolborhinum*). Type species: *Bolboceras castaneum* Klug, 1845 by original designation. Gender: masculine.

Diagnosis. The following characters will separate *Pereirabolbus* from all other South American Bolboceratini: head in the males and females without horns or tubercles (Figs. 38–42). Antennal club circular (Fig. 49). Pronotum evenly rounded or with weak carinae and depressions. Scutellum triangular. Elytron with basal margin, with 7 striae between medial suture and humeral swelling. Prosternal process absent. Mesocoxae subcontiguous. Metasternum pyriform, bulbous, with long, median metasternal carina; metasternal anteriorly truncate, not distinctly convex between mesocoxae. Protibial spur not extending to apex of protibia. Mesotibia and metatibia with transverse ridge well separated from the distal apex, not subapical. *Male genitalia:* similar to *Bolborhinum*; aedeagus small, simple in structure, arcuate; parameres short, basally membranous, with apex narrow distally, obtuse (Fig. 54).

Remark. The elevation of *Pereirabolbus* to the generic level creates the following new combinations: *Pereirabolbus castaneus* (Klug) and *Pereirabolbus tucumanensis* (Boucomont).

Genus *Zefevazia* Martínez, 1954

(Figs. 43–46, 48, 52, 55)

Zefevazia Martínez, 1954: 193. Type species: *Zefevazia rosascostai* Martínez, 1954 by original designation. Gender: feminine.

Diagnosis. The following characters will separate *Zefevazia* from all other South American Bolboceratini: head in the males with only one horn (Figs. 43, 44, 46); females without horns, only with a tubercle situated near of the frontoclypeal region or in the frons and with an elevated ridge basal to clypeal apex (Fig. 45). Antennal club semicircular (Fig. 48). Pronotum in males with paired anteromedian excavations on either side of midline, dorsally with basal transverse ridge parallel to basal margin; females with a small concavity or depression located immediately behind of the apical margin of the pronotum. Scutellum triangular. Elytron with basal margin, with 7 striae between medial suture and humeral swelling. Prosternal process greatly reduced or absent. Mesocoxae distinctly separated. Metasternum pyriform, bulbous, with long, median metasternal carina; metasternal process wide, convex between mesocoxae. Protibial spur not extending to apex of protibia. Mesotibia and metatibia of variable shape in lateral view, with lobed transverse carina located subapically. *Male genitalia:* aedeagus subcylindrical, parallel-sided; parameres short, subrectangular, basally not membranous, with apex wide distally, truncate (Fig. 55).

Remark. The elevation of *Zefevazia* to the generic level creates the following new combinations: *Zefevazia cantisanii* (Martínez), *Zefevazia peruana* (Boucomont), and *Zefevazia quinquedentata* (Felsche). The species *Zefevazia rosascostai* Martínez is a revised combination.

Acknowledgments

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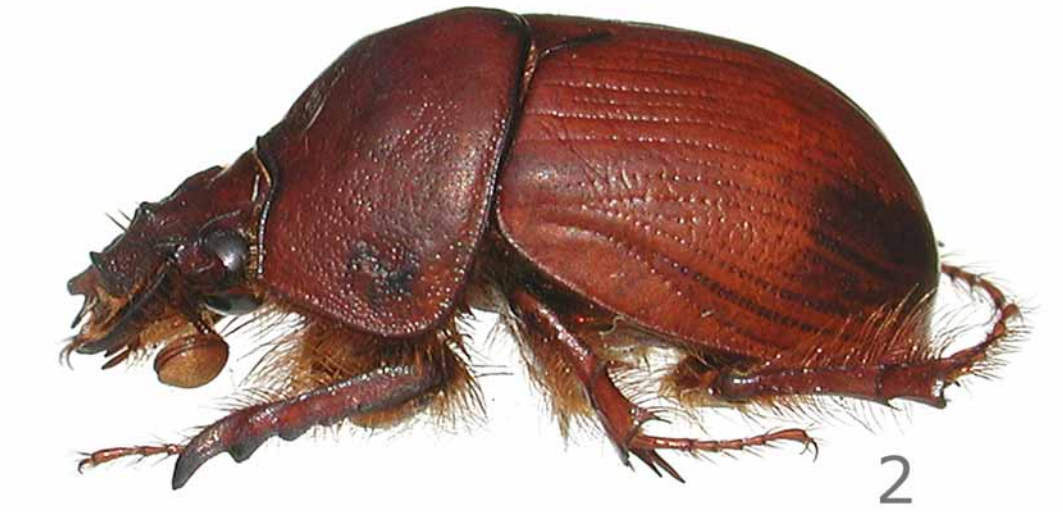

FIGURE 1. *Bolborhinum geotrupoides* male in lateral view.
FIGURE 2. *Bolborhinum geotrupoides* female in lateral view.
FIGURE 3. *Bolborhinum laesicolle* in lateral view.

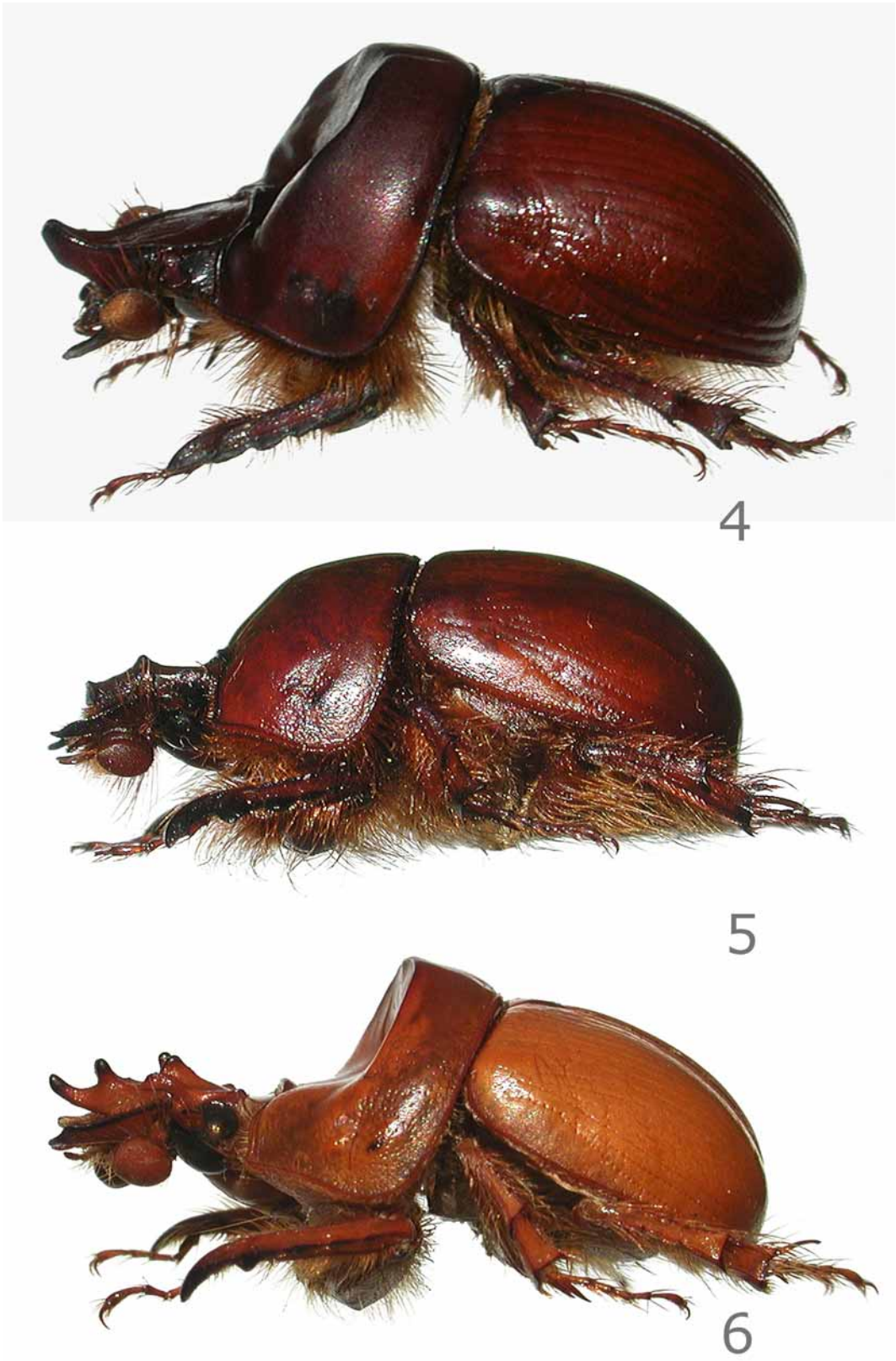

FIGURE 4. *Bolborhinum nasutum* male in lateral view.
FIGURE 5. *Bolborhinum nasutum* female in lateral view.
FIGURE 6. *Bolborhinum seai* male (holotype) in lateral view.

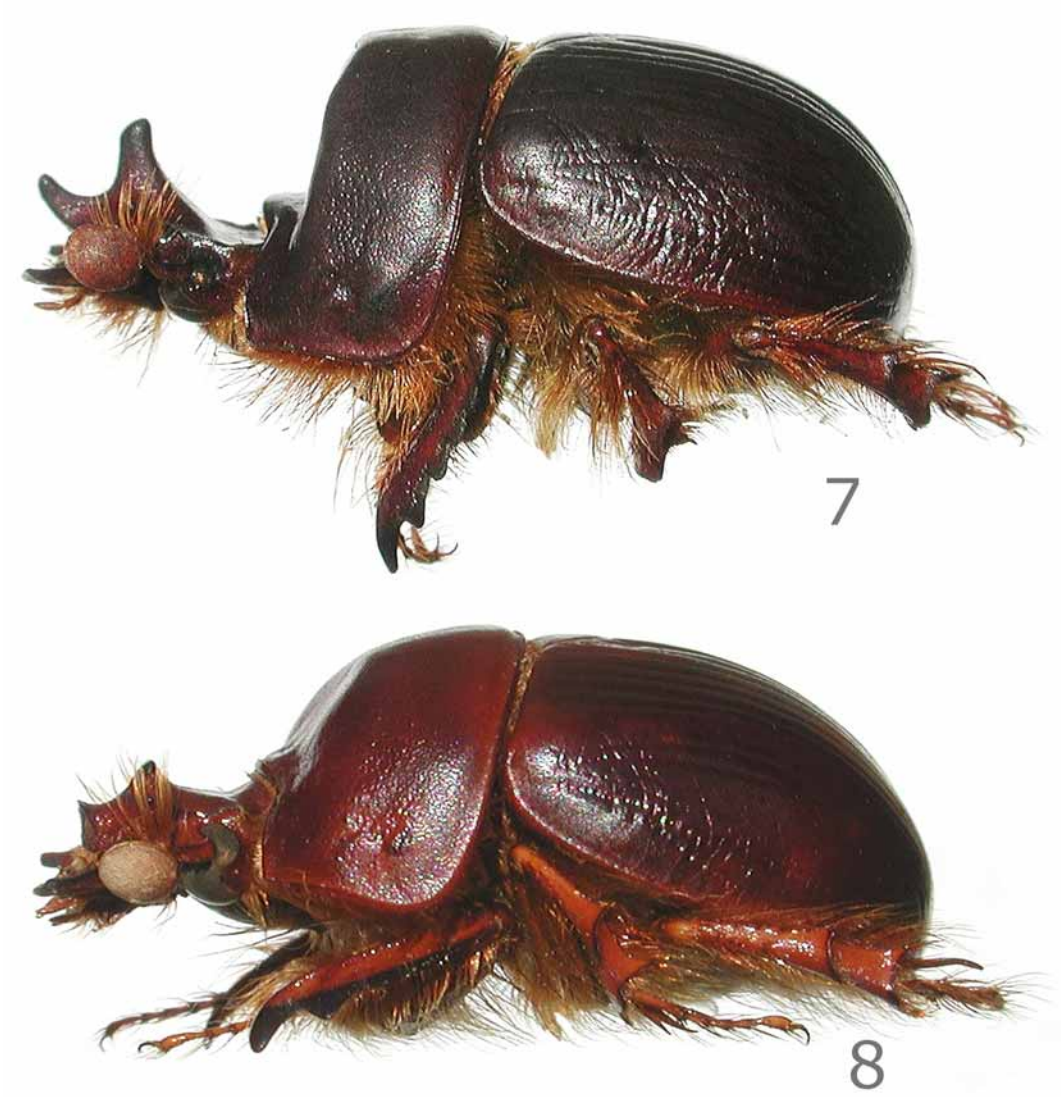

FIGURE 7. *Bolborhinum shajovskoyi* male in lateral view.
FIGURE 8. *Bolborhinum shajovskoyi* female in lateral view.

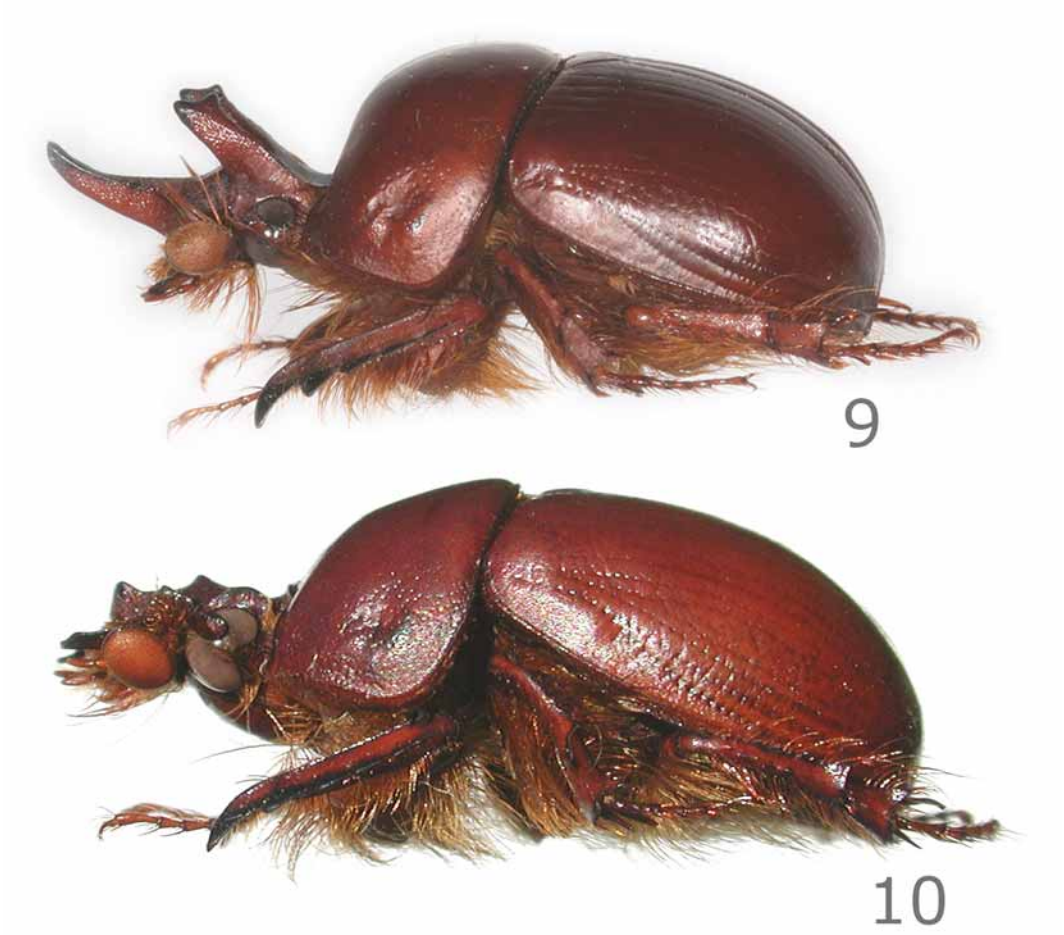

FIGURE 9. *Bolborhinum tricorne* male in lateral view.
FIGURE 10. *Bolborhinum tricorne* female in lateral view.

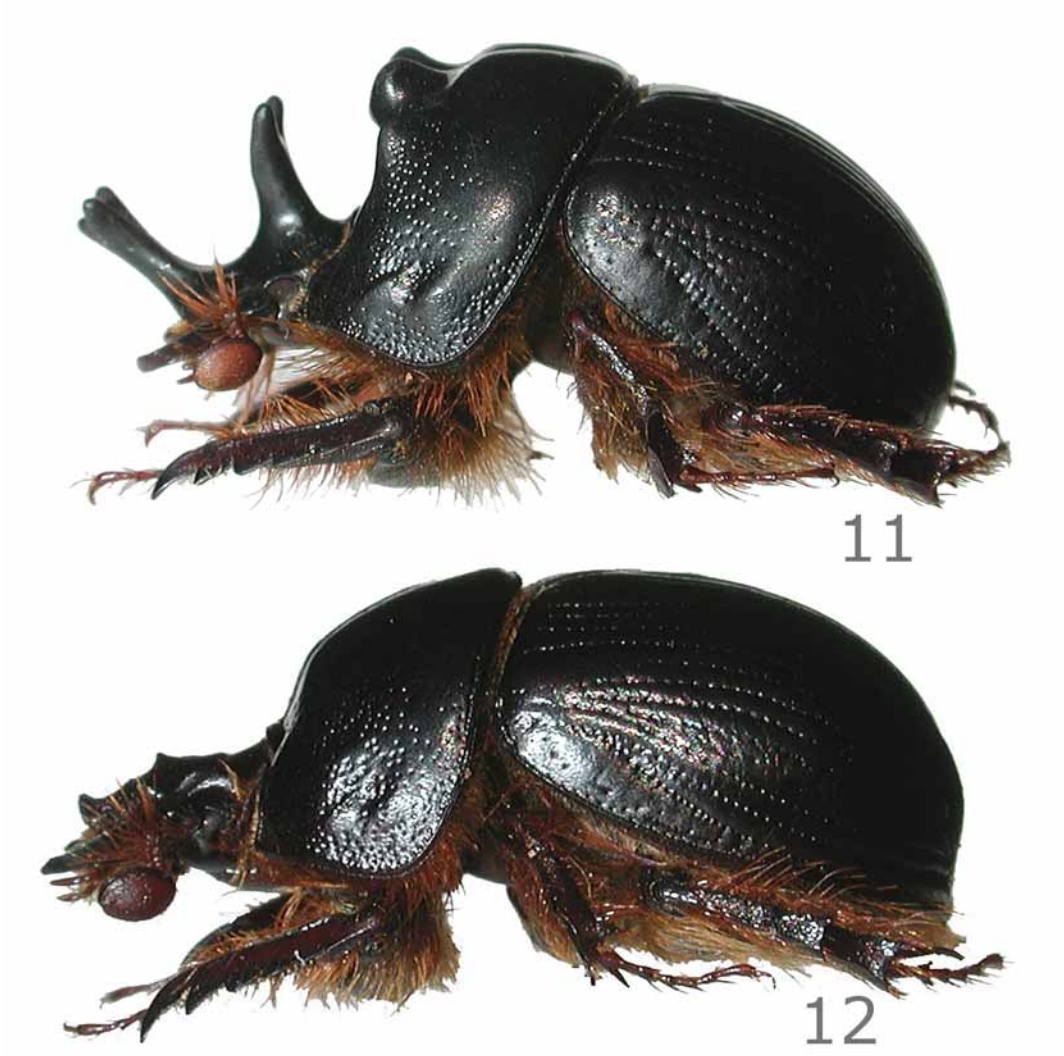

FIGURE 11. *Bolborhinum trilobulicorne* male in lateral view.
FIGURE 12. *Bolborhinum trilobulicorne* female in lateral view.

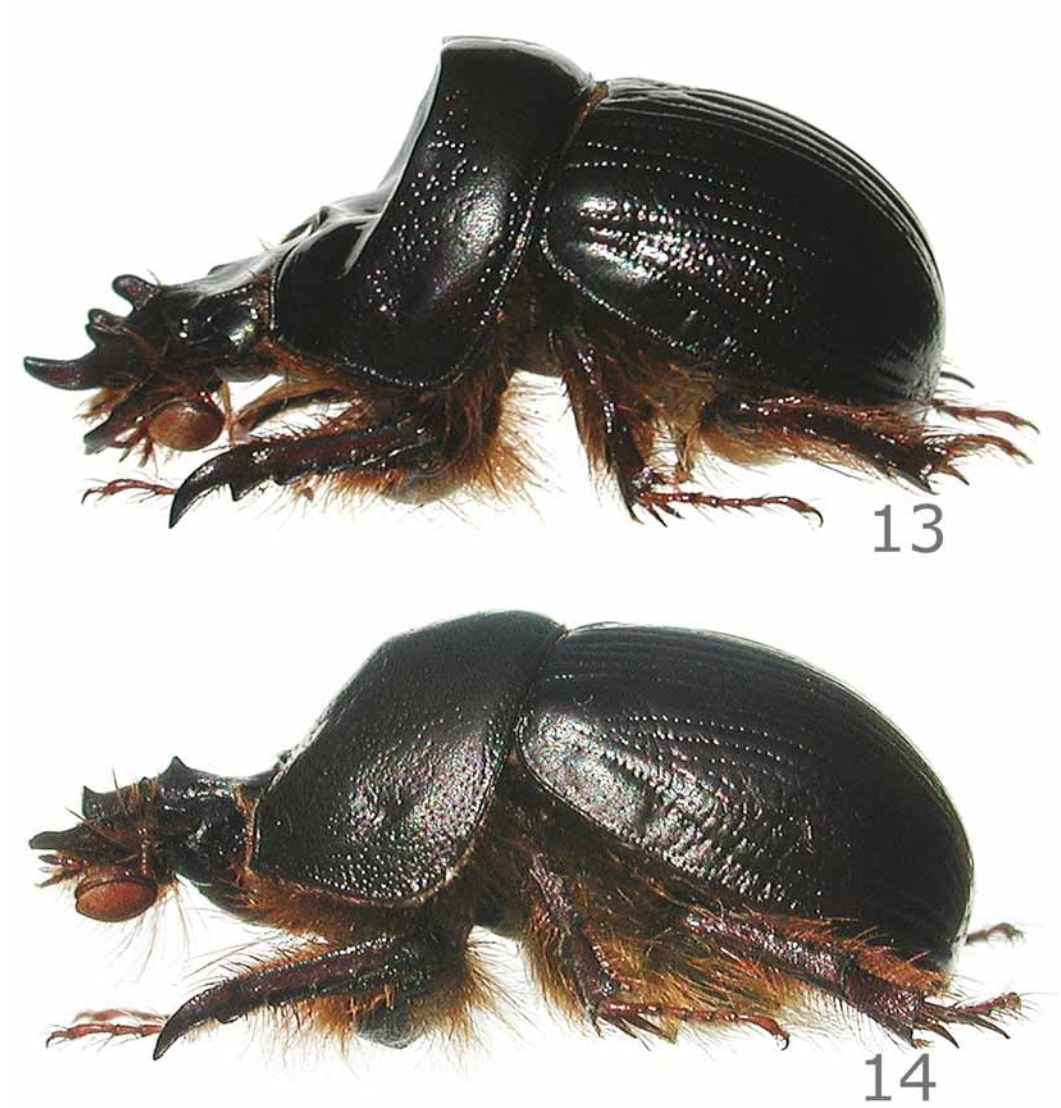

FIGURE 13. *Bolborhinum tubericeps* male in lateral view.
FIGURE 14. *Bolborhinum tubericeps* female in lateral view.

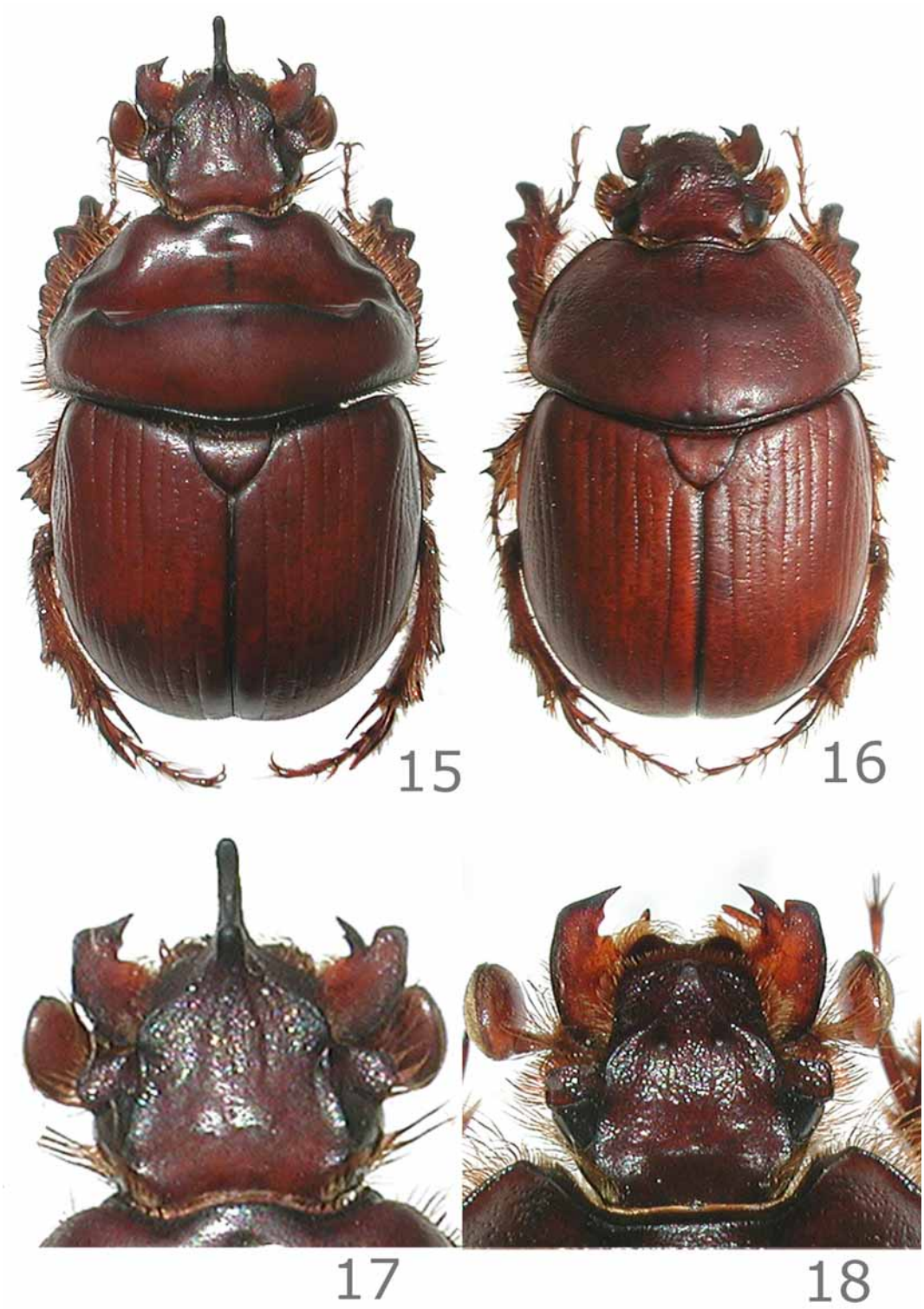

FIGURE 15. *Bolborhinum geotrupoides* male in dorsal view.
FIGURE 16. *Bolborhinum geotrupoides* female in dorsal view.
FIGURE 17. *Bolborhinum geotrupoides* male head.
FIGURE 18. *Bolborhinum geotrupoides* male head.

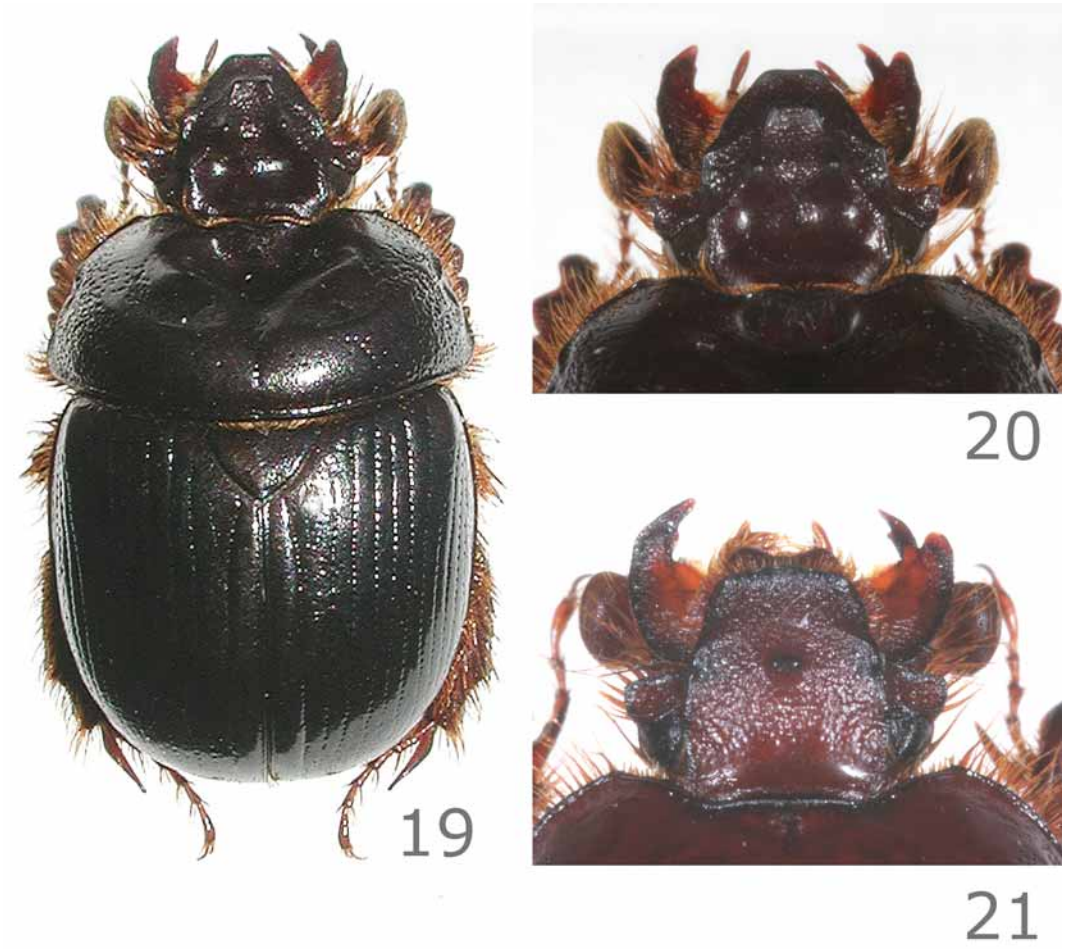

FIGURE 19. *Bolborhinum laesicolle* in dorsal view.
FIGURE 20. *Bolborhinum laesicolle* head.
FIGURE 21. *Bolborhinum nasutum* female head.

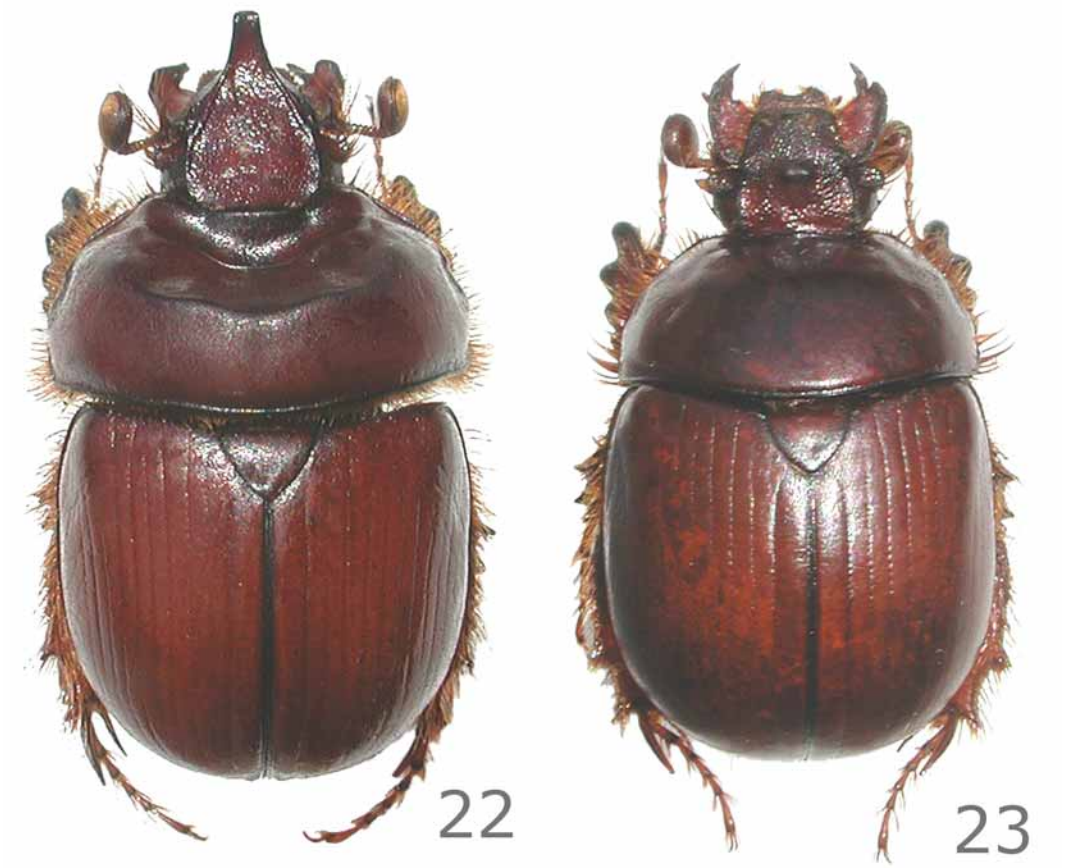

FIGURE 22. *Bolborhinum nasutum* male in dorsal view.
FIGURE 23. *Bolborhinum nasutum* female in dorsal view.

FIGURE 24. *Bolborhinum seai* male (holotype) in dorsal view.
FIGURE 25. *Bolborhinum seai* male (holotype) head.

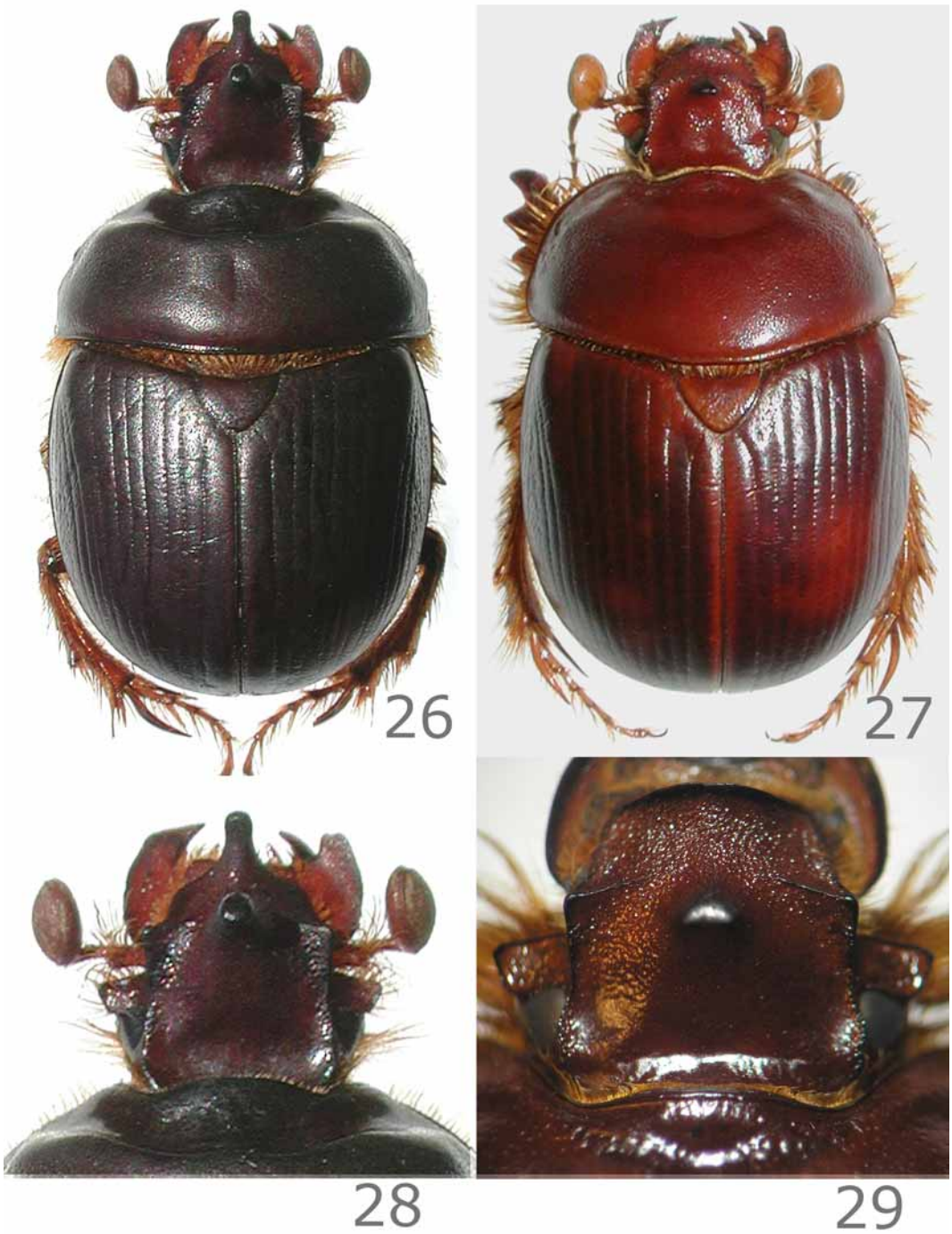

FIGURE 26. *Bolborhinum shajovskoyi* male in dorsal view.
FIGURE 27. *Bolborhinum shajovskoyi* female in dorsal view.
FIGURE 28. *Bolborhinum shajovskoyi* male head.
FIGURE 29. *Bolborhinum shajovskoyi* female head.

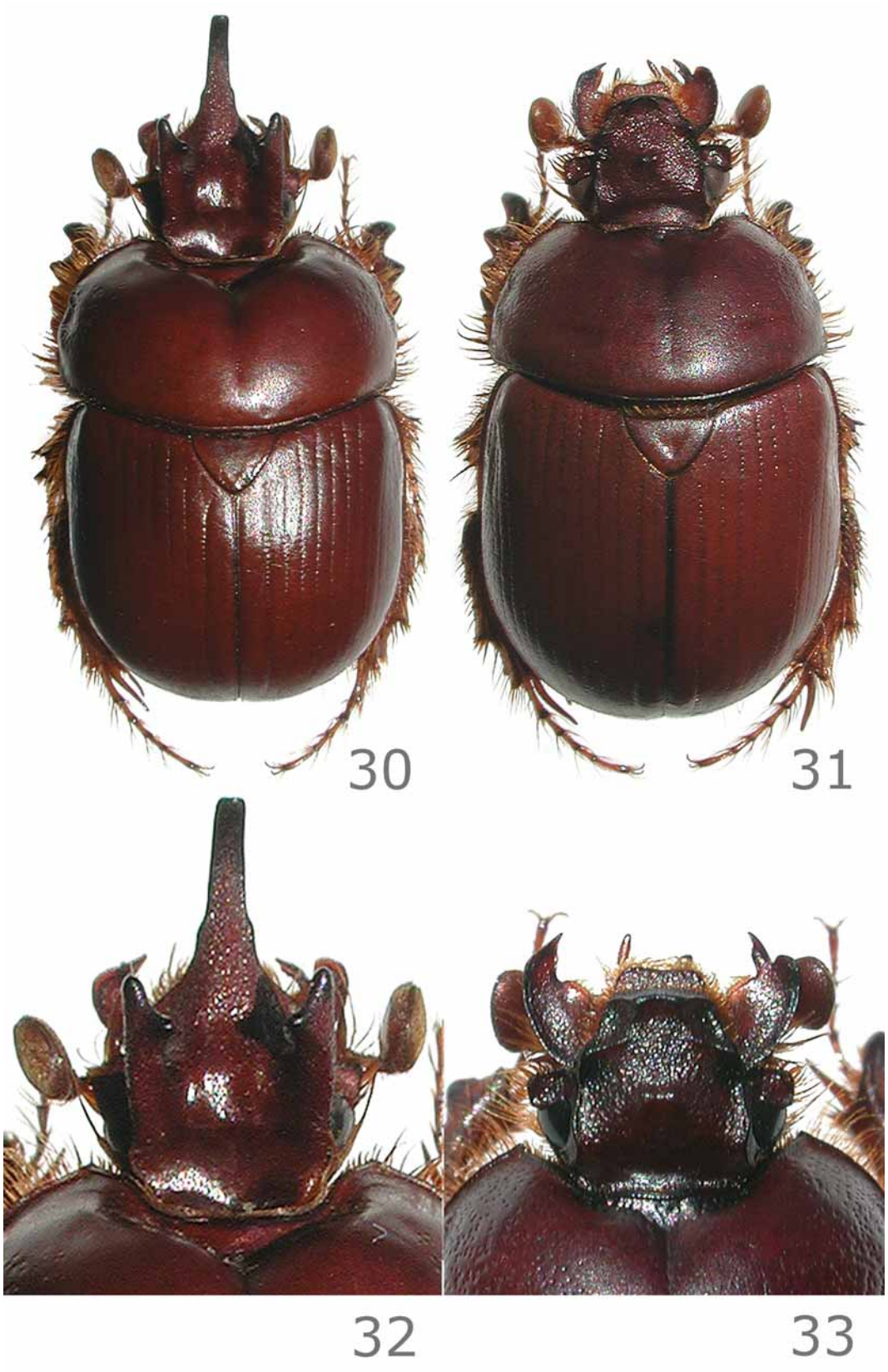

FIGURE 30. *Bolborhinum tricorne* male in dorsal view.
FIGURE 31. *Bolborhinum tricorne* female in dorsal view.
FIGURE 32. *Bolborhinum tricorne* male head.
FIGURE 33. *Bolborhinum tricorne* female head.

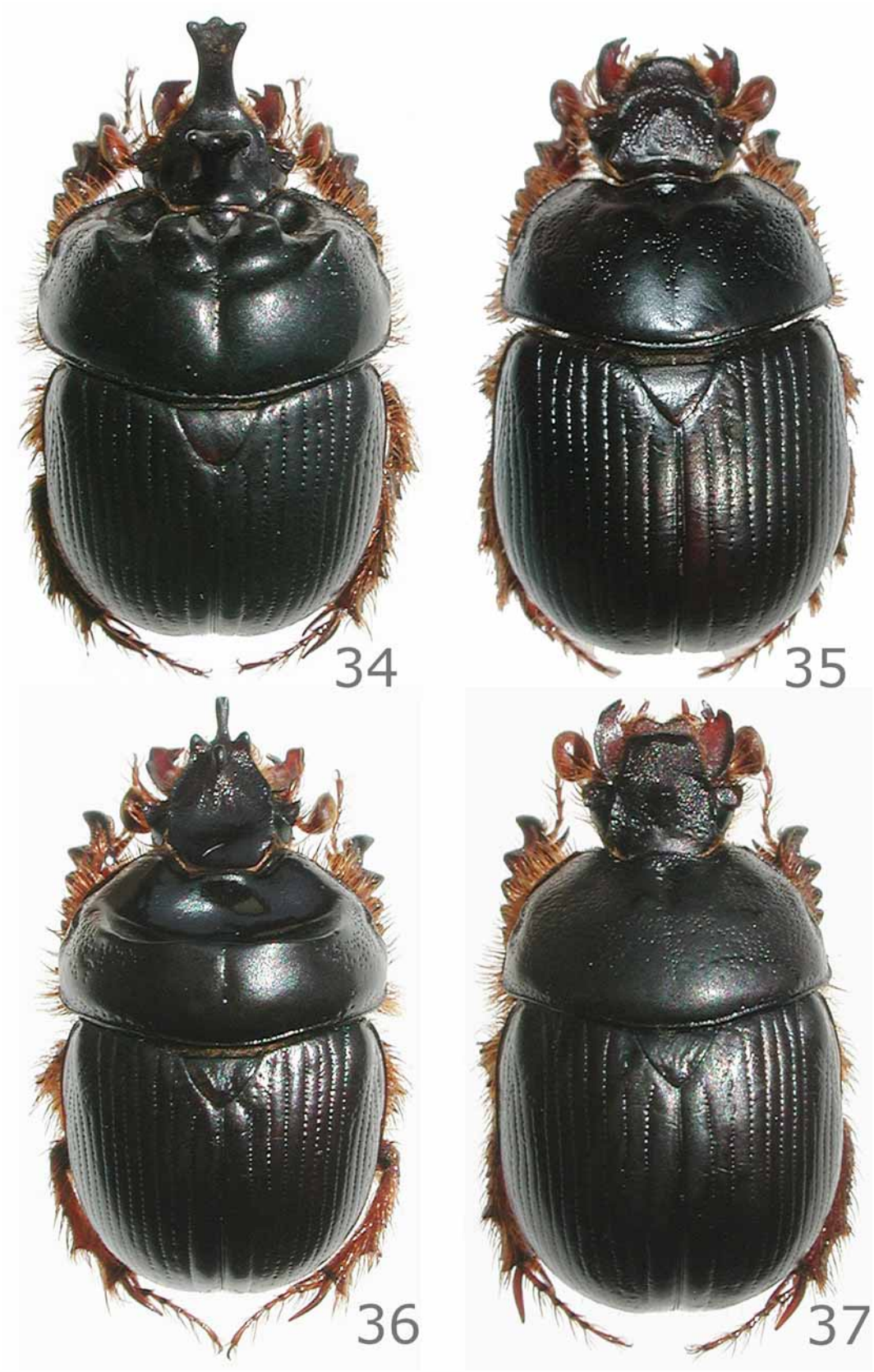

FIGURE 34. *Bolborhinum trilobulicorne* male in dorsal view.
FIGURE 35. *Bolborhinum trilobulicorne* female in dorsal view.
FIGURE 36. *Bolborhinum tubericeps* male in dorsal view.
FIGURE 37. *Bolborhinum tubericeps* female in dorsal view.

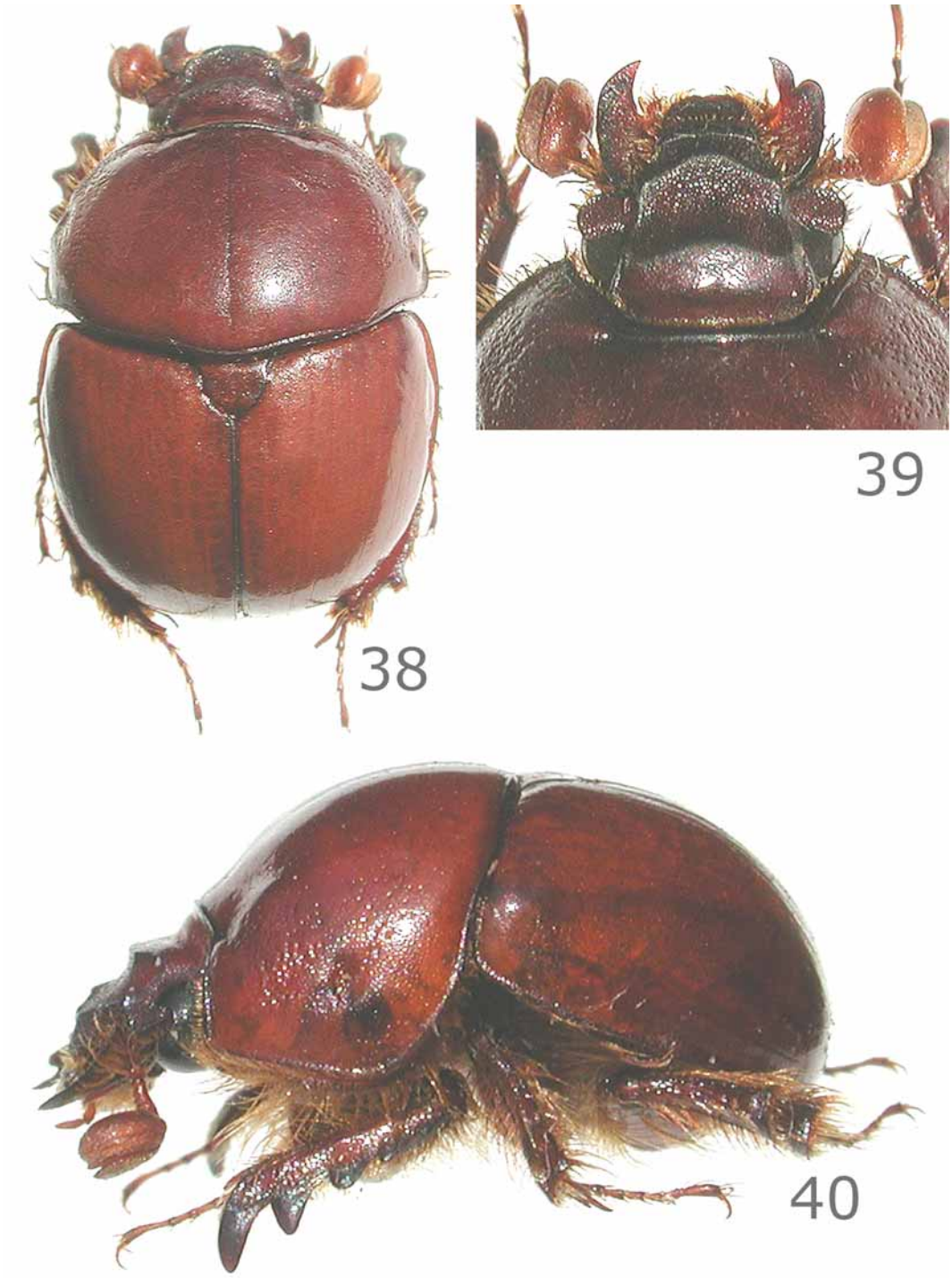

FIGURE 38. *Pereirabolbus castaneus* in dorsal view.
FIGURE 39. *Pereirabolbus castaneus* head.
FIGURE 40. *Pereirabolbus castaneus* in lateral view.

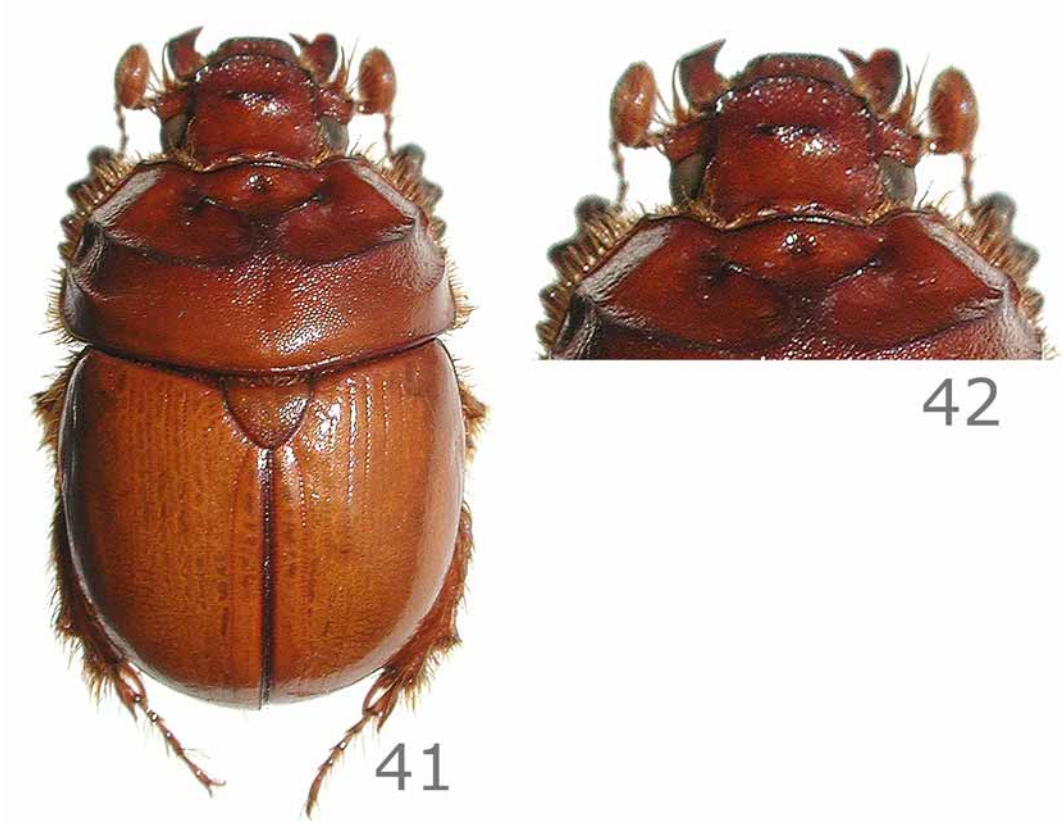

FIGURE 41. *Pereirabolbus tucumanensis* in dorsal view.
FIGURE 42. *Pereirabolbus tucumanensis* head.

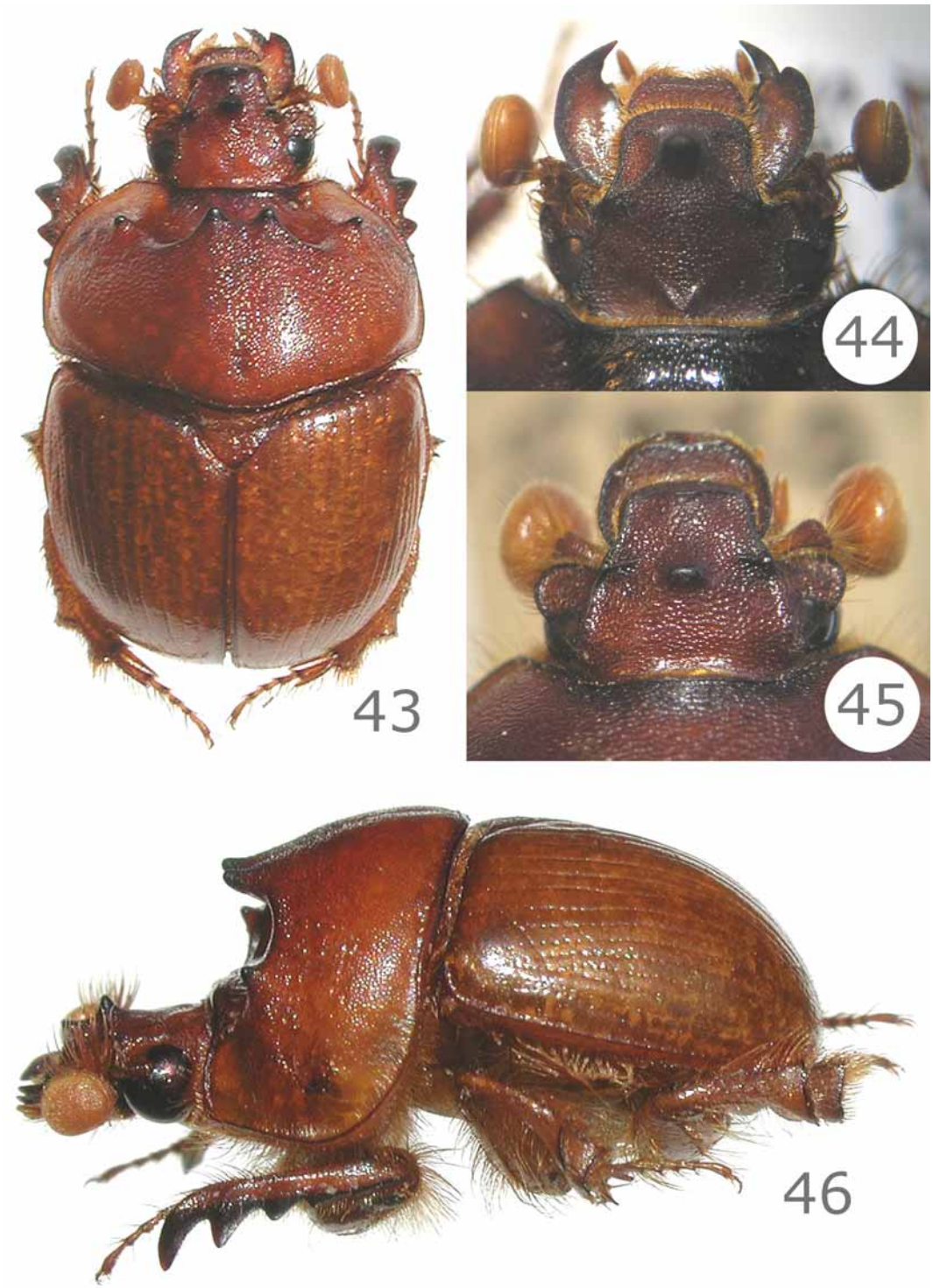

FIGURE 43. *Zefevazia quinquedentata* male in dorsal view.
FIGURE 44. *Zefevazia quinquedentata* male head.
FIGURE 45. *Zefevazia quinquedentata* female head.
FIGURE 46. *Zefevazia quinquedentata* male in lateral view.

FIGURE 47. *Bolborhinum* antennal club.
FIGURE 48. *Zefevazia* antennal club.
FIGURE 49. *Pereirabolbus* antennal club.

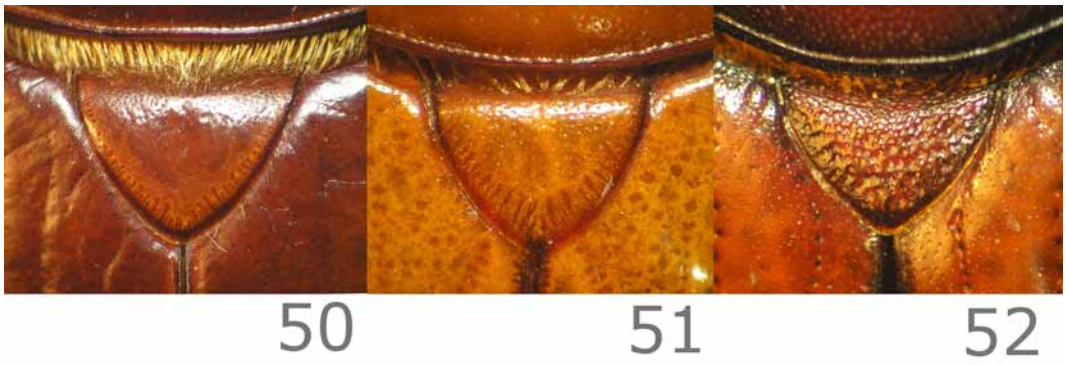

FIGURE 50. *Bolborhinum* scutellum.
FIGURE 51. *Pereirabolbus* scutellum.
FIGURE 52. *Zefevazia* scutellum.

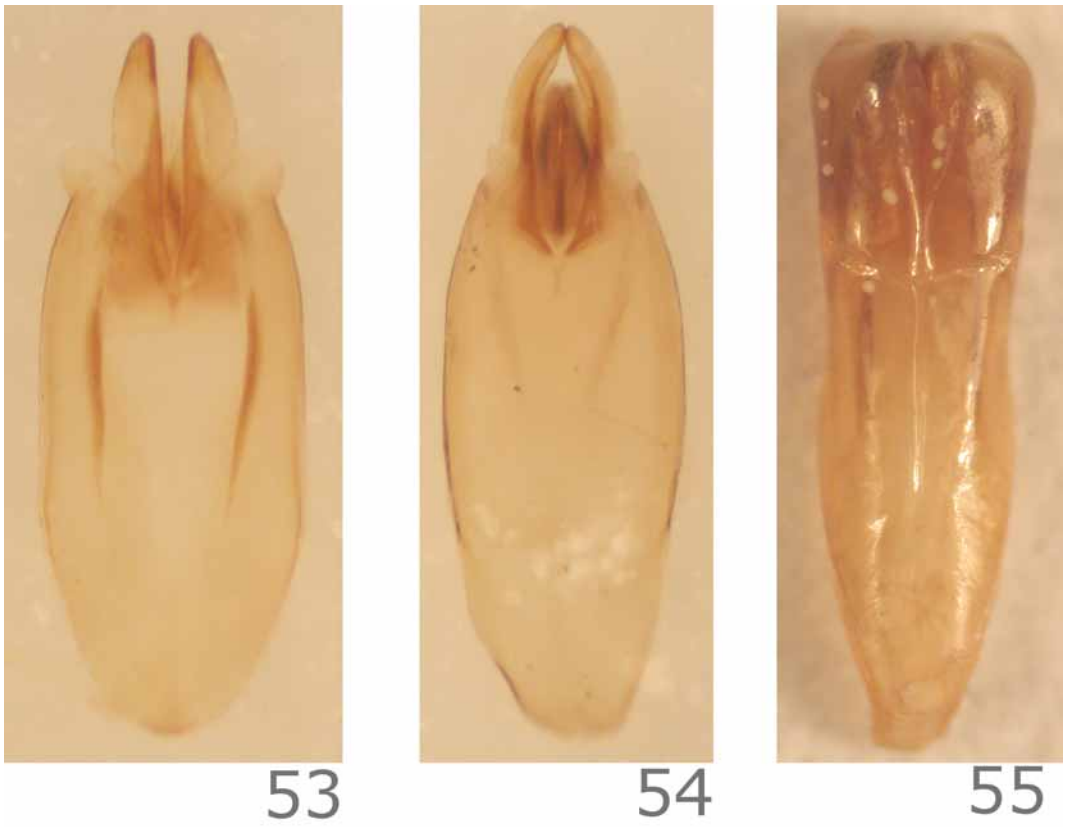

FIGURE 53. *Bolborhinum* male genitalia.
FIGURE 54. *Pereirabolbus* male genitalia.
FIGURE 55. *Zefevazia* male genitalia.

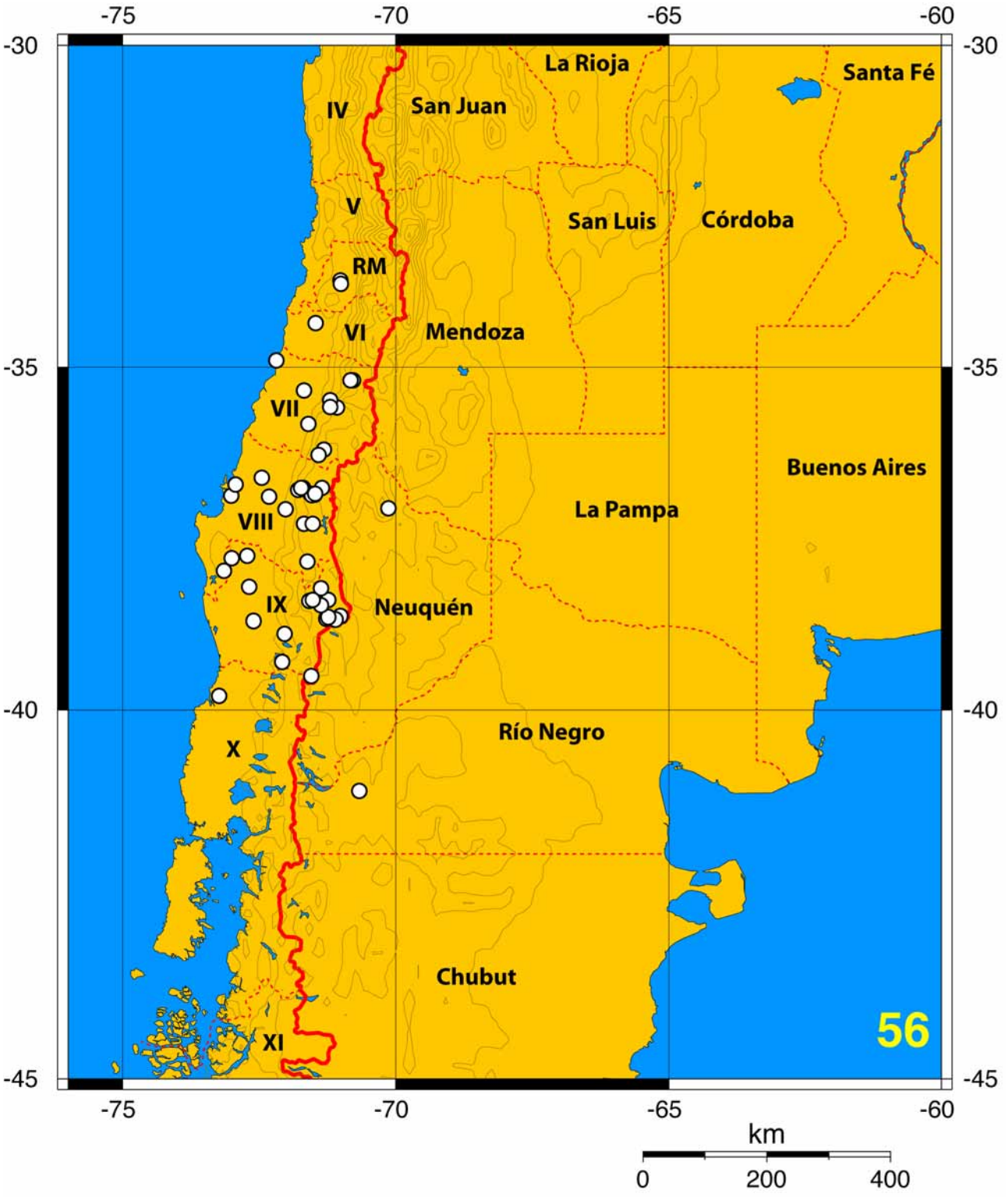

FIGURE 56. *Bolborhinum geotrupoides* distribution.

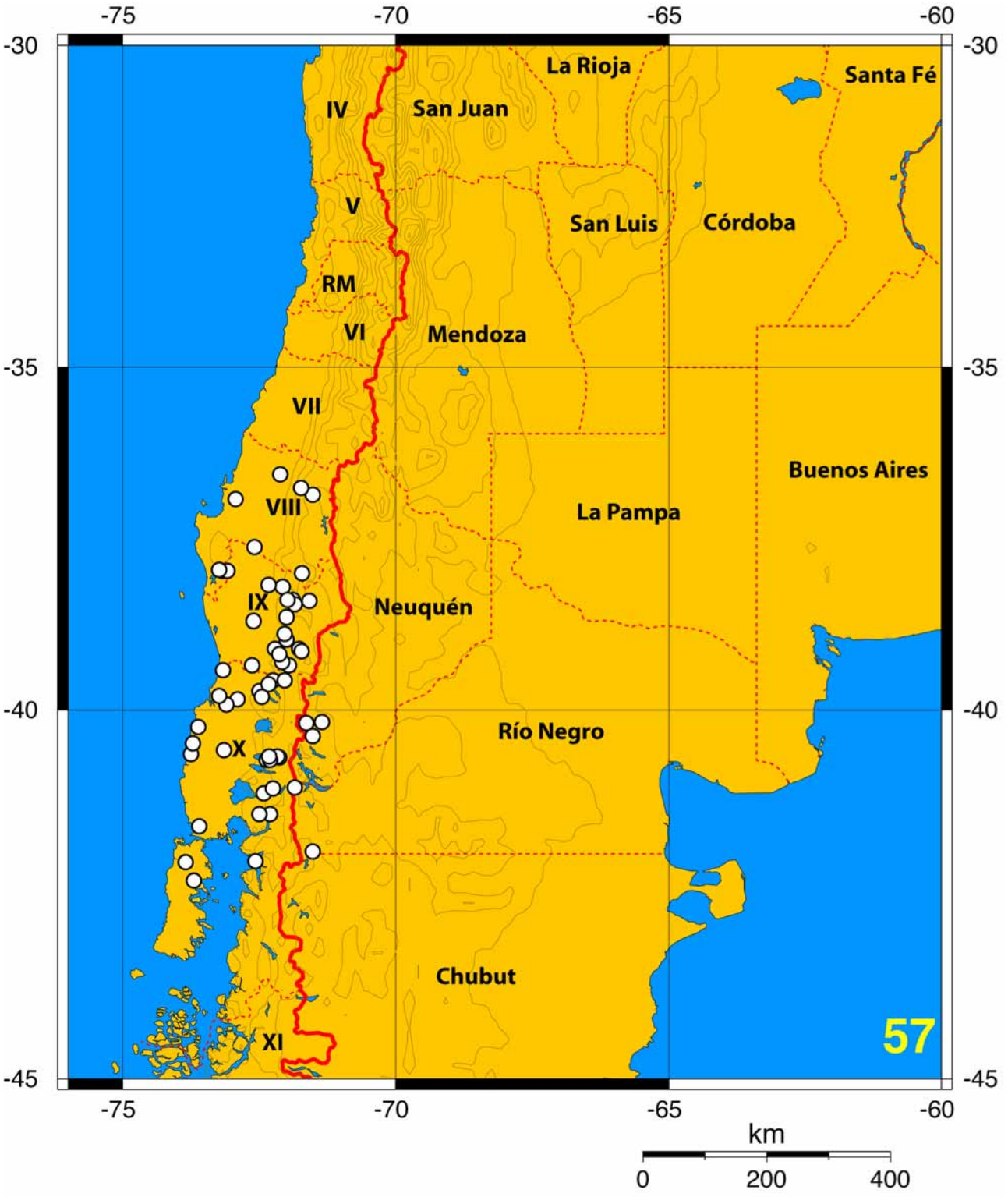

FIGURE 57. *Bolborhinum laesicolle* distribution.

FIGURE 58. *Bolborhinum nasutum* distribution.

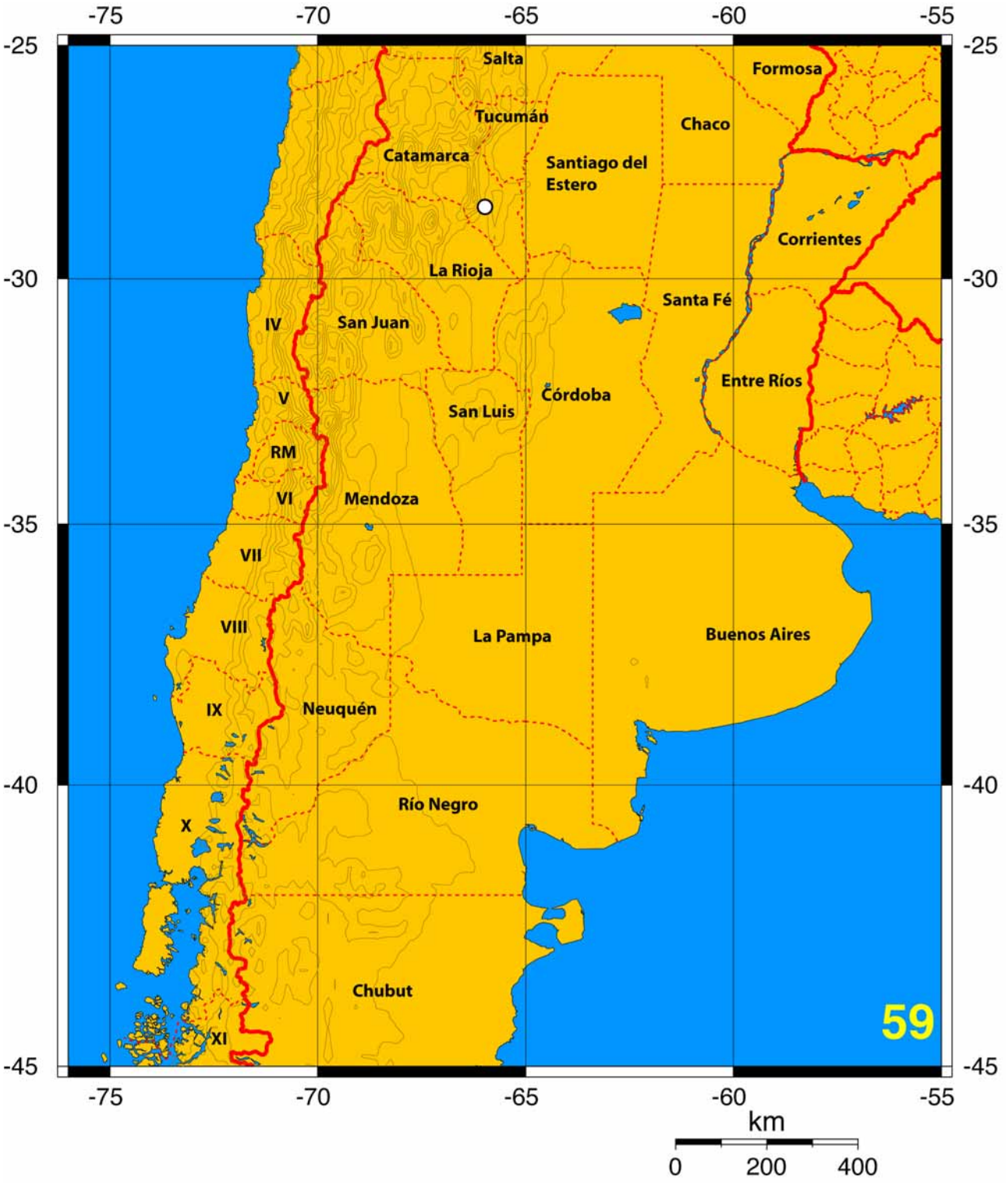

FIGURE 59. *Bolborhinum seai* distribution.

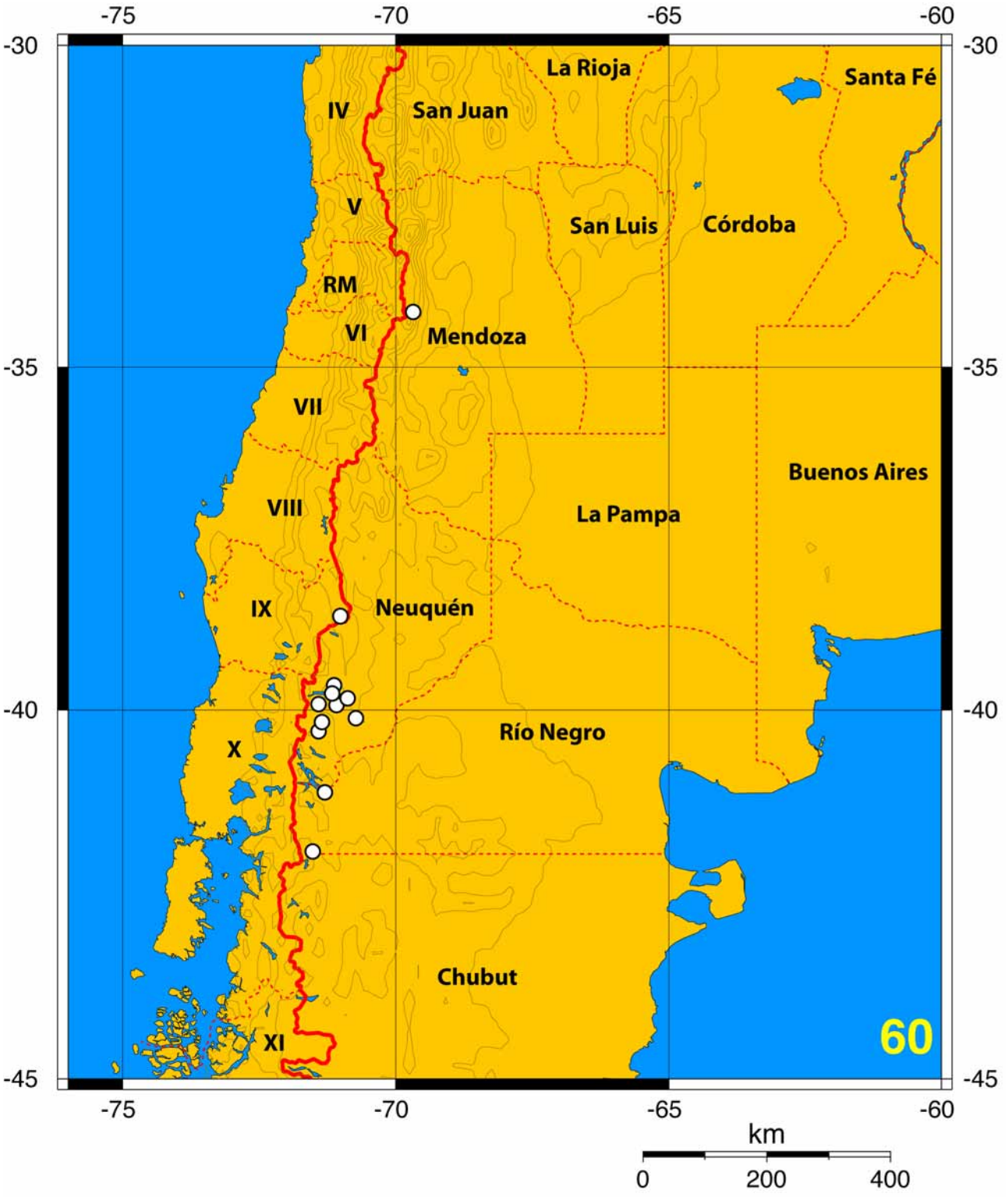

FIGURE 60. *Bolborhinum shajovskoyi* distribution.

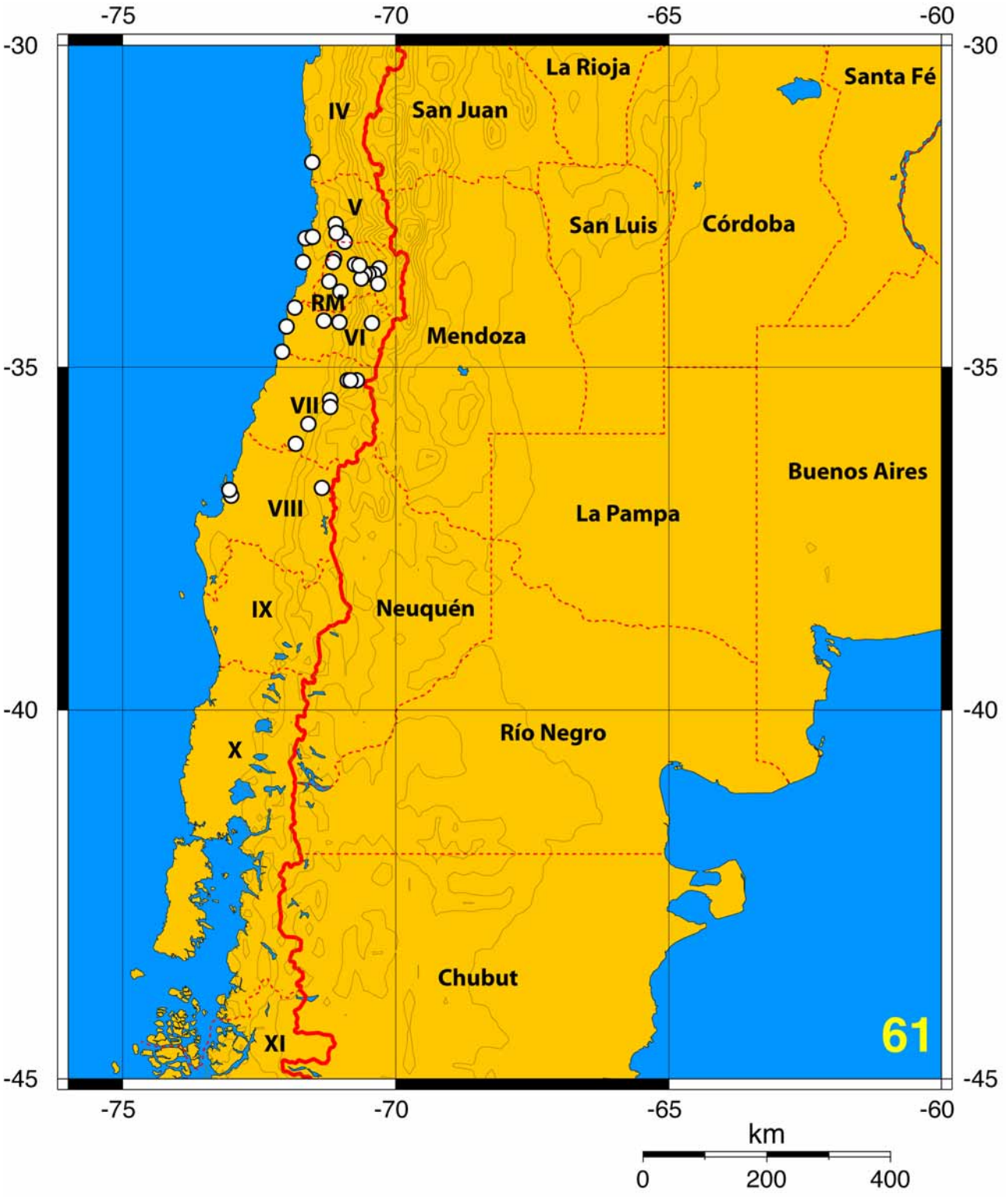

FIGURE 61. *Bolborhinum tricorne* distribution.

FIGURE 62. *Bolborhinum trilobulicorne* distribution.

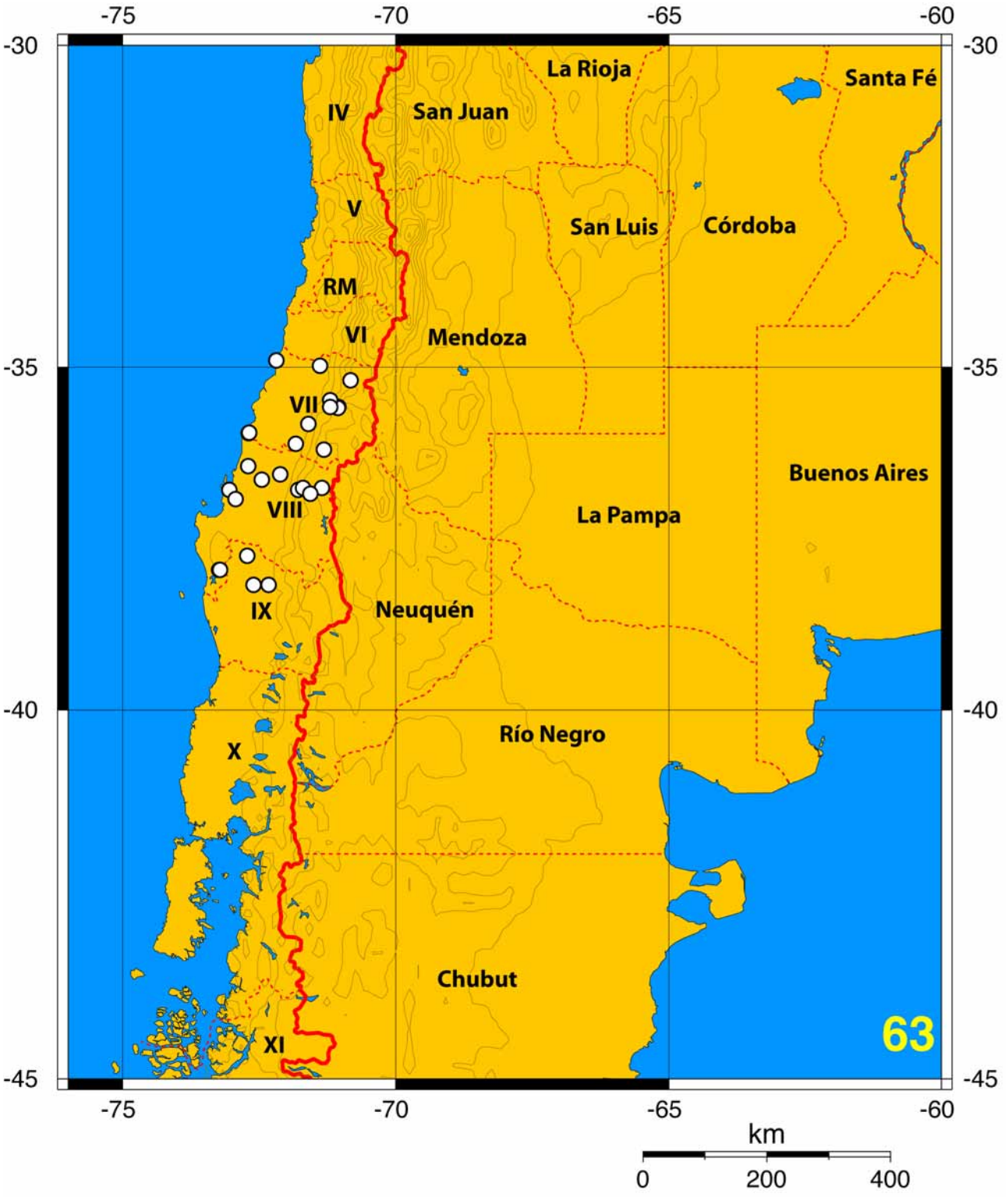

FIGURE 63. *Bolborhinum tubericeps* distribution.