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The genus *Tomarus* Erichson (Coleoptera: Scarabaeidae: Dynastinae: Pentodontini) in Argentina, Chile, and Uruguay

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The genus *Tomarus* Erichson (Coleoptera: Scarabaeidae: Dynastinae: Pentodontini) in Argentina, Chile, and Uruguay

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Abstract. The eight species in the genus *Tomarus* Erichson (Coleoptera: Scarabaeidae) in Argentina, Chile, and Uruguay are reviewed. *Tomarus roigjunenti* **new species** and *Tomarus spinipenis* **new species** are described from Argentina. We include a key to species, representative habitus illustrations for all species, character illustrations, and distribution maps for each, as well as commentary about the natural history and distributions for each species. Diagnostic characters are discussed for each species, and species relationships are hypothesized based on the analysis of internal and external morphological characters. The male of *T. bidentulus* (Fairmaire) is described for first time. The following taxonomic changes are made: *Tomarus guianucai* Dechambre and Lumaret, 1985 is a **new junior synonym** of *Tomarus rubripes* (Boheman, 1858), which was formerly and incorrectly cited as occurring in Argentina.

Key words. New species, distributions.

Resumen. Las ochos especies en el género *Tomarus* Erichson (Coleoptera: Scarabaeidae) son revisadas para Argentina, Chile y Uruguay. *Tomarus roigjunenti* especie nueva y *Tomarus spinipenis* **especie nueva** de Argentina son descritas como nuevas. Una clave para las especies, se presentan habitus para todas las especies, ilustración de los caracteres para cada una de las especies, como también comentarios acerca de la historia natural y mapas de distribución para cada especie. Caracteres diagnostico son proveído para cada especie, y las relaciones entre las especies es discutida basado en el análisis de caracteres de la morfología interna y externa. Se describió por primera vez el macho de *T. bidentulus* (Fairmaire). El siguiente cambio taxonómico es realizado: *Tomarus guianucai* Dechambre and Lumaret, 1985 es una **nueva sinonimia junior** de *Tomarus rubripes* (Boheman, 1858).

Palabras claves. Nueva especie, distribuciones.

Introduction

The Pentodontini are the largest tribe of Dynastinae (with over 550 species) and are cosmopolitan in geographic distribution. There are 31 genera in the New World (Ratcliffe 1981, 2003; Ratcliffe and Paulsen 2008; Ratcliffe and Giraldo 2014; Morón and Grossi 2015), although one of these, *Heteronychus* Burmeister, was introduced into Brazil from Africa. About 110 species occur in the New World.

The genus *Tomarus* Erichson contains 30 species (Dechambre and Lumaret 1985; Endrödi 1985; Escalona and Joly 2006; Ratcliffe and Cave 2015; López-García et al. 2014, 2015; Morón and Grossi 2015). Species in the genus occur from Canada south to Argentina. Thirteen species are found exclusively in South America, and another ten species are found exclusively in North and Central America. Seven species are shared between Central and South America. There are five species in the West Indies.

The correct name for this genus has been discussed and debated for several years. Endrödi (1969a) proposed the use of *Ligyrus* Burmeister to refer to species most like *Scarabaeus cuniculus* Fabricius and designated *Scarabaeus gibbosus* De Geer as the type of the genus. Endrödi recognized the subgenera *Ligyrus*, *Ligyrodes* Casey, *Euligyrus* Casey, and *Tomarus*. Ratcliffe (2003) concluded that *Ligyrus* was a junior synonym of *Tomarus* because Burmeister's *Handbuch der Entomologie* (Volume 5) was dated February 1847 and was received in library of the Entomologischen Vereine zu Stettin in September 1847 while a paper **following** Erichson's in the Archiv für Naturgeschichte is dated January 1847, five months **before** Burmeister's book. Most recently, Morón and Grossi (2015), ignoring the principal

of priority and the International Code of Zoological Nomenclature (ICZN 1999), proposed a new classification resulting in *Tomarus* (12 species) and *Ligyrus* with 2 subgenera: *Ligyrus* (14 species) and *Ligyrodes* Casey (2 species). We believe that their justification (presence or absence of small versus large mandibular teeth) for resurrecting *Ligyrus* to generic status is insufficient to justify separate generic status. Accordingly, we maintain *Ligyrus* as a junior synonym of *Tomarus*.

The purpose of this contribution is to revise the Argentinean, Chilean, and Uruguayan species in the genus *Tomarus*, provide descriptions of two new species from Argentina, provide diagnostic characters and illustrations for each of the species, and discuss the internal and external characters of both sexes to better define the species.

Material and Methods

Internal and external morphological characters formed the basis of this work. Specimens were examined using a dissecting microscope (6.5–40.0 X) and fiber-optic lights. For measurements, we used an ocular micrometer. Internal sclerotized structures were dissected by relaxing the specimen in hot water. Heavily sclerotized parts were soaked in a dilute solution (15%) of potassium hydroxide and neutralized in a dilute solution (15%) of acetic acid. For dissected specimens, wings and genitalia were card-mounted or placed in a glycerin-filled vial beneath the specimen.

The following standards were used for characters:

Body length: Measured from the apex of the clypeus to the apex of the elytra.

Puncture density: Defined as dense if punctures are nearly confluent to less than two puncture diameters apart; moderately dense if punctures are between 2–6 puncture diameters apart; and sparse if punctures are separated by more than six puncture diameters.

Setae: Defined as "hair-like" if slender and erect; "thickened" if slightly thick and erect or partially decumbent; and "spine-like" if stout and short. Setae are subject to wear and may be abraded.

Color: Described based on dry specimens that are viewed with magnification and illumination. Nearly all species are black or piceous, some are dark reddish brown.

Material examined. All types were examined (Fig. 3a–m). The results of this study were based on 1,807 specimens from the following institutions and collections. The collections and their acronyms are:

BCRC	Brett C. Ratcliffe Collection, Lincoln, NE, USA
BMNH	The Natural History Museum, London, England (Beulah Garner)
CJME	Collection of José Mondaca E., Peñaflor, Chile
CMNC	Canadian Museum of Nature, Ottawa, Canada (Andrew Smith)
CUNM	Colección de Entomología, Universidad Nacional Agraria La Molina, Lima, Perú (Alfredo Giraldo)
EMEC	Essig Museum of Entomology, University of California, Berkeley, CA, USA (Cheryl Barr)
FSCA	Florida State Collection of Arthropods, Gainesville, FL, USA (courtesy of Margarita López García)
IADIZA	Instituto Argentino de Investigaciones de las Zonas Áridas, Mendoza, Argentina (Sergio Roig-Juñent)
IMLA	Fundación e Instituto Miguel Lillo, Universidad Nacional de Tucumán, Tucumán, Argentina (Susana Aranda)
LEULS	Laboratorio de Entomología Ecológica, Universidad de La Serena, La Serena, Chile (Jaime Pizarro)
MACN	Museo Argentino de Ciencias Naturales "Bernardino Rivadavia", Buenos Aires, Argentina (Arturo Roig Alsina)
MLPA	Departamento de Entomología, Museo de Ciencias Naturales, Universidad Nacional de La Plata, La Plata, Buenos Aires, Argentina (Nora Cabrera and Analía Lanteri)
MNHN	Muséum National d'Histoire Naturelle, Paris, France (Antoine Mantilleri)
MNNC	Museo Nacional de Historia Natural, Santiago, Chile (Mario Elgueta)
NHMB	Naturhistorisches Museum, Basel. Switzerland (Isabelle Zürcher)

NHRS	Naturhistoriska Riksmuseet, Stockholm, Sweden (Johannes Bergsten)
NMW	Naturhistorisches Museum Wien, Vienna, Austria (Heinrich Schönmann via Andrew Smith)
UCCC	Museo de Zoología, Universidad de Concepción, Concepción, Chile (Viviane Jerez)
UMSP	University of Minnesota, St. Paul, MN, USA (Ralph W. Holzenthal via Andrew Smith)
UNSM	University of Nebraska State Museum, Lincoln, NE, USA (Brett Ratcliffe)
URMU	Museo Nacional de Historia Natural, Montevideo (Enrique Morelli)
USNM	U. S. National Museum, currently at University of Nebraska State Museum, Lincoln, NE, USA (M. J. Paulsen, B. C. Ratcliffe)

For the distribution maps, each species was georeferenced according to the specimen labels and then converted into point polygon layers in ArcMap 10.0. (ESRI 2011). Some of the species in this work occur in countries adjacent to those in the study area, but the locality records for those specimens outside of the study area are not recorded.

Taxonomic Treatment

Species of *Tomarus* can be recognized by the following character states: **Head:** Clypeus attenuate to a bidentate apex; mandibles usually visible from above and each with two apicolateral teeth (Fig. 6a–p); labium densely setose with paraglossa developed or not and sides convergent or subparallel (Fig. 7a–h); frontoclypeal region with two tubercles or a transverse carina (Fig. 4a–h); maxilla with galea developed and with five or six teeth, lacinia not developed, maxillary palpus with four palpomeres, palpomere IV as long as palpomeres 1–2 combined (Fig. 5a–h); antenna with ten antennomeres, club subequal in length to antennomeres II–VII. **Pronotum:** Anterior margin with or without a small, median tubercle and small fovea (Fig. 8a–h). **Pygidium:** Surface sparsely punctate, punctures becoming denser in basal angles; punctures small to moderate in size, weakly ocellate, with minute and tawny setae. **Legs:** Protibia tridentate or quadridentate, distance between teeth subequal or variable; protarsus in male simple, not enlarged or slightly thickened; mesotibia with 2 transverse carinae, carinae with spine-like setae (Fig. 10a–p). **Venter:** Prosternal process tall, thick, apex small, suboval, often with slender, long setae; mesosternal surface sparsely setose or lacking setae, slightly concave at middle; metasternal surface densely punctate, punctures ocellate, setose, setae slender, long (Fig. 2e–f); abdominal ventrite VIII low at middle, with small membrane (Fig. 2e–2h). **Genitalia:** Parameres (Fig. 11a–h, 12a–h, 13a–h) and internal sac with flagellum of variable length, with or without speculum and copulatory lamellae (Fig. 15a–h). Female gonocoxite without dorsal wrinkle, gonocoxal sternite larger than gonocoxite (Fig. 14a–b, g and h) or gonocoxite with dorsal wrinkle, gonocoxal sternite smaller than gonocoxite (Fig. 14c–f).

The larvae of *Tomarus* species differ from other dynastine larvae by having the following character states: cranium without anterior frontal seta; haptomeral process of epipharynx notched, forming two teeth or entire; left lateral margin of labrum angulate posteriorly; spiracles of abdominal segments II–VIII similar in size; raster with septula or pallidia in *T. sallei* Bates, *T. nasutus* (Burmeister), *T. relictus* (Say) and without septula or pallidia in *T. gibbosus* (De Geer) and *T. rubripes* (Boheman). The larva of only one South American species, *T. rubripes*, is known.

The life history of *Tomarus* species is poorly known, except for those few that have occasionally been of economic importance. The adults are nocturnal and attracted to lights. The larvae of some species are associated with soils rich in organic matter (Dechambre and Lumaret 1985; Ramírez-Salinas et al. 2004, 2010). The larvae of some species are important pests of crops such as *T. fossor* (Latreille) attacking *Helianthus annuus* Linnaeus (Asteraceae), *T. cuniculus* attacking *Saccharum officinarum* Linnaeus (Poaceae), *T. ebenus* (De Geer) attacking *Colocasia esculenta* (Linnaeus) Schott (Araceae) (Andreazze and Fonseca 1998; Escalona and Joly 2006; Piedrahíta et al. 2007), *T. gibbosus* (De Geer) historically attacking sugar beets, carrots, potatoes, corn, cotton, and sunflowers (Davis 1916; Hayes 1917), and *T. subtropicus* (Blatchley) attacking sugarcane (*Saccharum* spp.) and turfgrasses such as St. Augustine grass (*Stentaphrum secundatum* [W. Kuntze)]) and Bermuda grass (*Cynodon dactylon* [Linnaeus]) in Florida, USA (Kostromytska and Buss 2008, 2011).

***Tomarus bidentulus* (Fairmaire, 1892)**
(Fig. 1a, 2g–h, 3a, 4a, 5a, 6a–b, 7a, 8a, 10a–b, 11a, 12a, 13a, 14a, 15a, 16a)

Ligyrus bidentulus Fairmaire 1892: 245 (original combination).

Redescription. **Male.** Length 12.2–16.7 mm; width 4.4–8.6 mm. Color light to dark reddish brown. **Head:** Frons mostly impunctate between eyes and coarsely rugopunctate just behind frontoclypeal carina. Frontoclypeal region with transverse carina slightly separated at middle (Fig. 4a). Clypeus strongly rugopunctate to transversely rugose, tapering to slightly emarginate, broad apex with 2 reflexed teeth. Mandibles with 2 teeth, apical tooth acute, subapical notch deep (Fig. 6a–b); labium densely setose, paraglossa undeveloped, apex convergent (Fig. 7a); maxilla with galea developed, with 5 teeth. **Pronotum:** Surface crazed, sparsely punctate; punctures moderately large, umbilicate. Anterior margin with small, median tubercle followed by small, shallow fovea (Fig. 8a). **Elytra:** Surface with micropunctures and large punctures mixed (large punctures moderately dense, ocellate) and with 3 distinct pairs of punctures. First broad interval with or without large punctures. **Pygidium:** Surface sparsely punctate, punctures becoming dense in basal angles; punctures small to moderate in size, weakly ocellate. In lateral view, surface of males regularly convex, surface in females weakly convex. **Legs:** Protibia tridentate, basal tooth slightly removed. Protarsus in male simple, not enlarged. Mesotibia with 1 basal and 1 medial transverse carina, each with spine-like setae (Fig. 10a–b). Metatibia with 1 basal, transverse carina interrupted at middle and with spine-like setae and 1 medial, complete, transverse carina; apex with about 29 spinules (Fig. 10b). First metatarsomere triangularly expanded, apex subtruncate. **Venter:** Prosternal process tall, thick; apex small, suboval, usually with long, slender setae. Mesosternal surface sparsely setose, slightly concave at middle. Metasternal surface densely punctate, punctures ocellate, setose; setae slender, long; lateral edge rugopunctate with long, slender setae. Abdominal ventrite VIII depressed at middle, (Fig. 1g–h). **Male Genitalia**: Parameres (Fig. 11a, 12a, 13a) subtriangular, rounded apices curving outwards. Internal sac (Fig. 15a) lacking copulatory lamellae.

Female. Length 16.9–19.6 mm; width 8.3–10.6 mm. Similar to male, but disc of pronotum smooth, pygidium slightly concave, and gonocoxite smaller than gonocoxal sternite and lacking a semicircular furrow (Fig. 14a).

Distribution. *Tomarus bidentulus* occurs in Argentina and Uruguay (Endrödi 1969a–b, 1985; Abadie et al. 2008).

Locality Records (Fig. 16a). 711 specimens examined from BCRC, CMNC, IADIZA, MACN, MLPA, URMU.

ARGENTINA (676). BUENOS AIRES (46): Bahía Blanca, Buenos Aires-Capital Federal, Necochea, San Blas, Villa Gessell, Villarica (30 km SW). CATAMARCA (5): Tinogasti-Fiambala. CHACO (1): Resistencia. CHUBUT (2): Dolavon. CHUBUT (2): Estación de Esquel, San Jorge. CÓRDOBA (1): No Data. JUJUY (3): Posta de Lozano, No Data. LA PAMPA (2): Chacharramendi. LA RIOJA (7): Jaguey, Mascasin, Patiquía, Tinogasta, Villa Union. MENDOZA (30): Bardas Blancas, Cerro Quadral, Las Heras, La Valle, Mendoza Capital, Ov. Balleza, Ranquil Norte, El Nihuil-San Rafael. MISIONES (2): Posadas. NEUQUÉN (72): Allere, Anelo, Bajada Marucho, Bajada Agrio, Collon-Curá, Covuco, Coyunca, Huncal, La Negra, La Pintada, Pampa Salado, Picun Leufu, Piedra del Agüila, Pilmatus, Planicie Banderita, Río Salado, Zalapa-Catuto. RÍO NEGRO (469): Allén, Catriel, Cipolletti, Conesal, Fray Luis Beltrán, General Gómez, General Roca, Paso Flores, Piedra Aguila, Río Negro-Capital, San Antonio Oeste, Valcheta, Villa Regina. SALTA (32): Cafayate-Norte 1 km., Los Lajitas, Salta-Capital. SAN LUIS (1): Paso Patria. SANTA CRUZ (1): Santa Cruz-Capital. TUCUMÁN (1): Tafi de Valle. **URUGUAY** (7). CANELONES (7): Banda Oriental. **NO DATA** (28).

Temporal Distribution. January (36), February (29), March (35), April (15), May (4) September (3), October (14), November (42), December (12).

Diagnosis. *Tomarus bidentulus* is distinctive because the apex of clypeus has the teeth distinctly separated (Fig. 4a); the pronotum has a small, subapical tubercle followed by a small fovea; and the

surface on the disc is moderately punctate with the sides and anterior angles densely punctate (Fig. 8a). *Tomarus bidentulus* also resembles *T. burmeisteri* but is easily distinguished by the presence of the pronotal tubercle, which is absent in *T. burmeisteri*.

Life History. Adults are nocturnal and are attracted to lights. This is an infrequently collected species. Adult emergence is during the summer, which is the rainy season in Argentina and Uruguay.

***Tomarus burmeisteri* (Steinheil, 1872)**
(Fig. 1b, 2d, 3b–f, 4b, 5b, 6c–d, 7b, 8b, 10c–d, 11b, 12b, 13b, 14b, 15b, 16b, 18)

Ligyrus burmeisteri Steinheil 1872: 560 (original combination).
Ligyrus distinctus Fairmaire 1892: 245 (synonym).

Redescription. **Male.** Length 10.9–13.6 mm; width 5.7–7.3 mm. Color light to dark reddish brown. **Head:** Frons mostly impunctate between eyes and coarsely rugopunctate just behind frontoclypeal carina. Frontoclypeal region with transverse carina slightly separated at middle (Fig. 4b). Clypeus strongly rugopunctate to transversely rugose, tapering to broad, slightly emarginate apex with 2 reflexed teeth. Mandibles with 2 teeth, apical tooth subacute, subapical notch moderately deep (Fig. 6c–d); labium densely setose, paraglossa undeveloped, converging to apex (Fig. 7b); maxilla with galea developed, with 5 teeth. **Pronotum:** Surface crazed, sparsely punctate; punctures moderately large, umbilicate. Anterior margin with small, median tubercle, fovea absent (Fig. 8b). **Elytra:** Surface with micropunctures and large punctures mixed, large punctures moderately dense, ocellate, and in 3 pairs of double rows. First broad interval with or without large punctures. **Pygidium:** Surface sparsely punctate, punctures becoming denser in basal angles; punctures small to moderate in size, weakly ocellate. In lateral view, surface in males convex, weakly convex in females. **Legs:** Protibia tridentate, basal tooth slightly removed. Protarsus in male simple, not enlarged. Mesotibia relatively short, transverse carinae with stout, dense spinules **(**Fig. 10c–d). Metatibia with 1 basal, transverse carina interrupted at middle and with spine-like setae and 1 medial, transverse carina; apex truncate with about 25 spinules (Fig. 10d). **Venter:** Prosternal process tall, thick; apex small, suboval, often with slender, long setae. Mesosternal surface sparsely setose, slightly concave at middle. Metasternal surface densely punctate, punctures ocellate, setose; setae slender and long. **Male Genitalia:** Parameres (Fig. 11b, 12b, 13b) subtriangular, rounded apices curving outwards, strong tooth projecting laterally at mid-shaft. Internal sac (Fig. 15b) lacking copulatory lamellae.

Female. Length 12.0–13.9 mm; width 7.0–7.3 mm. Similar to male, but pronotal disc smooth. Abdominal ventrite VIII entire as in Fig. 1h. Pygidium slightly concave. Gonocoxite smaller than gonocoxal sternite, lacking a semicircular furrow (Fig. 14b).

Distribution. *Tomarus burmeisteri* is known from Peru, Brazil, Bolivia, Paraguay, Argentina, Uruguay (Endrödi 1985).

Locality Records (Fig. 16b). 535 specimens examined from BCRC, CMNC, FSCA, IADIZA, MACN, MLPA, NMW, UMSP, USNM.

ARGENTINA (517). BUENOS AIRES (143): Algarrobo, Azul, La Plata, Mar del Plata, Capital Federal, Mercedes, Olivos, Quequén-Saladón, San Blas, San Isidro, Hogar Agrícola-San Cayetano, Puán, Seis de Septiembre, Tandil, Villa Iris (30 km SW). CATAMARCA (94): Catamarca-Capital, Guayamba, La Viña. CHACO (6): La Represa de los Indios, Resistencia. CHUBUT (6): Las Chapas, Puerto Madryn. CÓRDOBA (23): Alta Gracia, Alpa Corral, Campamento Balnea-San Javier, Córdoba, Cosquín, Cruz del Eje, Espinillo, Los Olmos, La Carlota, Mar Chiquita, Rió Primera, Santa Maria, Villa de Soto. CORRIENTES (3): Corrientes-Capital, San Roque, San Tolomé. ENTRE RÍOS (1): Concordia. FORMOSA (1): Clarinda (50 km NW), JUJUY (49): Jujuy-Capital, El Volcán, Ledesma, Parque Nacionla Calilegua, Santa Barabara, Volcán a Tilcara, Yuto. LA PAMPA (12): General Pico, Guatiache, Santa Rosa, Winfredo. LA RIOJA (13): Jaguey, La Rioja-Capital, La Rioja-Paquis, Patiquía, Pozo de Piedra. MENDOZA (36): Cerro Quadral, Chacras de Coria-Luján de Cuyo, Mendoza-Capital, Moliches, Rodeo de la Cruz-

Guaymallen, San Martín, Santa Rosa. MISIONES (10): Departamento de Concepción Santa María, Loreto, Posadas, San Pedro. SALTA (31): Cafayate-1 km Norte, Campo Quijano, El Carril (15 km S), El Corralito, El Naranjo, General Güemes, La Rioja, Rosario de Lerma, Salta-Capital, San Loenzo, San Martín. SAN JUAN (3): Desamparada, San Juan-Capital, Sarmiento. SAN LUIS (15): Arizona, Arizona (13 km S), San Luis-Capital. SANTA FÉ (8): Reconquista, Rosario, San Espiritu, San Javier, Santo Tomé. SANTIAGO DEL ESTERO (16): Río Salado, Robles, Santiago del Estero-Capital. TUCUMÁN (53): Lamadrid-Arboles-Gendarmes Camping, RN 38-Estación, Estación-Gendarmería, San Pedro de Colalao, Tucumán-Capital. **PARAGUAY** (1). CAAGUAZÚ (1): Estancia Primera. **URUGUAY** (17). MALDONADO (4): Punta Bellena. MONTEVIDEO (13): Colón, Montevideo-Capital, Río del Uruguay.

Temporal Distribution. January (58), February (151), March (19), April (5), July (5), August (2), October (16), November (37), December (35).

Diagnosis. *Tomarus burmeisteri* superficially resembles *T. spinipenis* because both species are similar in size, color, and lack a pronotal tubercle and fovea. *Tomarus burmeisteri* can be distinguished by a mentum that lacks slender, long setae at its base (Fig. 7b); metatibial surface on the external edge rugopunctate; and different parameres (compare Fig. 11a, 12a, 13a and 11g, 12g, 13g). The genital plate of the females is also different (compare Fig. 14a and 14g). This species has a broad distribution that is reflected in slight differences in the parameres; compare, for example, the parameres of the Guaymallen (Mendoza, Argentina) population with those from the Argentine provinces of Catamarca, Mendoza and La Pampa (Fig.18).

Tomarus burmeisteri also resembles *T. bidentulus* but is easily distinguished by the absence of the pronotal tubercle, which is present in *T. bidentulus*.

Life History. Adults are attracted to lights during the southern summer. This species occupies a wide diversity of habitats ranging from dry to wet.

***Tomarus gyas* Erichson, 1848**
(Fig. 1c, 2f, 3g, 4c, 5c, 6e–f, 7c, 8c, 9a, 10e–f, 11c, 12c, 13c, 14c, 15c, 16d)

Tomarus gyas Erichson 1848: 561 (original combination).
Ligyrus amazonicus Arrow 1914: 273 (synonym).

Redescription. Male. Length 21.3–28.8 mm; width 10.4–13.3. Color dark reddish brown to black. Head: Frons and clypeus coarsely rugose. Frontoclypeal region with 2 distinctly transverse tubercles; tubercles narrowly separated, usually about 2.5 tubercle diameters apart (Fig. 4c). Clypeus strongly rugopunctate to transversely rugose, tapering to slightly emarginate, broad apex with 2 reflexed teeth. Mandibles with 2 teeth, apical tooth subacute, subapical notch moderately deep and narrow (Fig. 6e–f); labium on lateral edge densely setose, paraglossa developed, apex slightly concave at center (Fig. 7c); maxilla with galea developed and with 6 teeth (Fig. 5c). Pronotum: Surface with disc moderately punctate, sides and anterior angles densely punctate to rugopunctate; punctures moderate in size on disc, becoming large laterally; fovea rugose within. Anterior margin with strong, median tubercle; fovea small, subequal to width between eyes (Fig. 8c). Elytra: Surface densely punctate; punctures mostly moderately in size with sparser, minute punctures between larger punctures; larger punctures usually ocellate and with 3 pairs of double rows. Pygidium: Surface densely punctate, punctures becoming denser in basal and lateral angles; punctures small to moderate in size, weakly ocellate. In lateral view, male with surface convex, females with weakly convex surface. Legs: Protibia tridentate and with weak basal convexity suggestive of 4th tooth, teeth subequally spaced from each other (Fig. 9a). Protarsus in males simple, not enlarged. Mesotibia on transverse carinae with long, slender spinules (Fig. 10e–f). Metatibia with 1 basal, transverse carina interrupted at middle (carina with spine-like setae) and 1 medial, transverse carina, metatibial apex with about 22 spinules (Fig. 10f). Venter: Prosternal process long, thick, apex longitudinally oval. Mesosternal surface glabrous, slightly concave at middle. Metasternal surface with

sparse, ocellate punctures (Fig. 2f). Male Genitalia: Parameres (Fig. 11c, 12c and 13c) subtriangular, rounded apices only weakly curving outwards. Internal sac with 5 copulatory lamellae (Fig. 15c).

Female. Length 22.6–25.3 mm; width 11.5–12.8 mm. Similar to male, but pronotal surface with punctures slightly less dense than those of males. Gonocoxite larger than gonocoxal sternite, with a semicircular furrow (Fig. 14c).

Distribution. *Tomarus gyas* occurs from southern Mexico to Argentina (Endrödi 1969a, 1985; Ratcliffe 2003). It is widely distributed in the lowlands in tropical rain forest in South America.

Locality Records (Fig. 16d). 173 specimens examined from CMNC, FSCA, IADIZA, MACN, MLPA. USNM.

ARGENTINA (118). BUENOS AIRES (1): Quilmes. CATAMARCA (1): Catamarca-Capital. CHACO (6): Resistencia. CORRIENTES (10): Bella Vista, Corrientes-Capital, Goya. ENTRE RÍOS (5): Concordia, Paraná. FORMOSA (1): Pilcomato. JUJUY (11): Jujuy-Capital,Parque Nacionla Calilegua. LA RIOJA (1): La Rioja. RIÓ NEGRO (1): General Roca. SALTA (52): Campinchuelo, General Güemes, Hypolito Irigoyen, Parque Nacional El Rey, Pocitos, Rosario de Lerma, Salta-Capital, Vespucio. SANTA FÉ (13): Santa fé-Capital, San Tomé. SANTIAGO DEL ESTERO (4): Amigo, Santiago del Estero-Capital, No Data. TUCUMÁN (7): Tucumán-Capital. NO DATA: (5). **URUGUAY** (55). COLONIA (8): La Floresta-Canelones, Colonia. MALDONADO (40): Maldonado-Capital, Punta Bellena. MONTEVIDEO (7): Banda Oriental, Colón, Montevideo.

Temporal Distribution. January (20), February (50), September (1), October (5), November (45), December (10).

Diagnosis. *Tomarus gyas* is externally similar to *T. roigjunenti*. The labial apex in *T. gyas* is narrowly notched at its center (Fig. 7c), but in *T. roigjunenti* the apex is subtruncate and slightly concave (Fig. 7e). The tubercles on the head of *T. gyas* are rounded and widely separated from each other (Fig. 4c), whereas the tubercles of *T. roigjunenti* are distinctly transverse and less separated from one another (Fig. 4e). In addition, the fovea of the pronotum in *T. gyas* is larger (usually as wide as the distance between the eyes, rarely less) than that of *T. roigjunenti*, which is only slightly indicated. The parameres are different between both species, and this is especially notable at the base on the ventral side (compare Fig. 11c, 12c, 13c and 11e, 12e, 13e). The internal sac of *T. gyas* has five copulatory lamellae (Fig. 15c), but in *T. roigjunenti* there are three copulatory lamellae (Fig. 15e).

Life History. Adults are attracted to lights at night.

Tomarus maimon Erichson, 1847

(Fig. 3h, 4d, 5d, 6g–h, 7d, 8d, 9b, 10g–h, 11d, 12d, 13d, 14d, 15d, 16c)

Tomarus maimon Erichson 1847: 96 (original combination).
Heteronychus fossator Burmeister 1847:101 (synonym).

Redescription. Male. Length 22.0–26.0 mm; width 11.0–12.0 mm. Color dark reddish brown to black. Head: Frons and clypeus coarsely rugose. Frontoclypeal region with 2 distinctly transverse tubercles; tubercles broadly separated, usually about 4 tubercle diameters apart (Fig. 4d). Clypeus strongly rugopunctate to transversely rugose, tapering to broad apex with 2 nearly contiguous, reflexed teeth. Mandibles with 2 teeth, apical tooth subtruncate or rounded, subapical notch relatively narrow (Fig. 6g–h); labium with lateral edge densely setose, base setose, paraglossa developed, apex slightly convex at center (Fig. 7d); maxilla with galea developed and with 6 teeth (Fig. 5d). Pronotum: Surface with disc moderately punctate, sides and anterior angles densely punctate to rugopunctate; punctures moderate in size on disc, becoming large laterally; fovea rugose within. Anterior margin with small, median tubercle and with small, narrow fovea (narrower than distance between eyes) (Fig. 8d). Elytra: Surface densely punctate; punctures mostly moderate in size with sparser, minute punctures between larger

punctures; larger punctures usually ocellate, and with 3 pairs of double rows. Pygidium: Surface densely punctate, punctures becoming denser in basal and lateral angles; punctures small to moderate in size, weakly ocellate. In lateral view, male with convex surface, females with weakly convex surface. Legs: Protibia tridentate, teeth subequally spaced from each other (Fig. 9b). Protarsus in male simple, not enlarged. Mesotibia on transverse carinae with long, slender spinules (Fig. 10g–h). Metatibia with 1 basal, transverse carina interrupted at middle (carina with spine-like setae) and 1 medial, transverse carina; apex truncate with about 21 spinules (Fig. 10h). Venter: Prosternal process long, thick, apex longitudinally oval. Mesosternal surface glabrous, slightly concave at middle. Metasternal surface with sparse, ocellate punctures (Fig. 2f). Male Genitalia: Parameres (Fig. 11d, 12d, 13d) subtriangular, but apical half of shaft parallel, apices blunt. Internal sac with 3 copulatory lamellae (Fig. 15d).

Female. Length 23.1–28.2 mm; width: 10.8–13.6 mm. Similar to male, but pronotal surface with punctures slightly less dense than in males. Gonocoxite larger than gonocoxal sternite, with a semicircular furrow (Fig. 14d).

Distribution. *Tomarus maimon* is widely distributed in the low, arid coastal areas of Peru and Chile.

Locality Records (Fig. 16c). 55 specimens examined from CJME, CMNC, IADIZA, MNNC.

CHILE (55). ARICA (39): Arica- Iquique, Valle de Zapala. (16): Tarapacá.

Temporal Distribution. January (2), February (3), October (5), November (10), December (36).

Diagnosis. *Tomarus maimon* is externally similar to *T. gyas*. The labial apex in *T. gyas* is narrowly notched at its center (Fig. 7c), while in *T. maimon* the apex of the labium is slightly convex (Fig. 7d). The tubercles on the head of *T. gyas* are rounded and widely separated from each other (Fig. 4c), whereas the tubercles of *T. maimon* are distinctly transverse and slightly less separated (Fig. 4d). In addition, the pronotal fovea (Fig. 8c) of *T. gyas* is larger than that of *T. maimon* (Fig. 8d). The parameres are different between both species (compare Fig. 11d, 12d, 13d and 11c, 12c, 13c). *Tomarus gyas* has five copulatory lamellae on the internal sac (Fig. 15c), but in *T. maimon* there are three copulatory lamellae (Fig. 15d).

Life History. Adults are attracted to lights at night. Some specimens have been taken in sand dunes adjacent to ocean beaches.

Tomarus roigjunenti Neita and Ratcliffe, New Species

(Fig. 1e–f, 4e, 5e, 6i–j, 7e, 8e, 10i–j, 11e, 12e, 13e, 14e, 15e, 17a)

Holotype male labeled: "VATRA LAUFQUEN / 14580 M.S.N.M/Neuquén-Arg. / 13-XI-69 / Leg. M. Gentili", and with our red holotype label [IADIZA]. **Allotype** female labeled: "R. A. Neuquén / 5 km. S de Lag. Blanca / 15/01/2007 / G. San Blas Col. / 39°06′56.1′′S/70°00′10.1′′W. / 1975 msnm", and with our red allotype label [IADIZA]. **Paratypes** labeled: "Buenos Aires: Prov. de / Buenos Aires / J. Boso Col." (3 males, 1 female) [MLPA]. "Buenos Aires" (5 males, 5 females) [MLPA]. "Chubut: Chubut" (1 male) [MACN]. "Mendoza: RA. Mendoza / Uspallata / Enero 1975 / S. Roig" (1 male) [IADIZA]. "Mendoza / Tunuyan / I-1940" (1 male) [MLPA]. "Neuquén: Neuquén / Covunco / 19-XII-1963" (1 male) [IADIZA]. "R. A. Neuquén / Barrancas / 5-1970 Col. A. Roig / CE 00283" (1 female) [IADIZA]. "Covunco / Neuquén-Arg. / 29-X-62 / Leg. M. Gentili" (1 male) [IADIZA]. "Neuquén / L. Victoria / Febr. 1958" (1 female) [IADIZA]. "Neuquén / Covunco / 19-XII-1963" (1 male) [IADIZA]. "8-XII-1955 / Collón Cura/ Pcio. Neuquén / Leg. S. Sochajovskoy" (2 females) [MLPA]. "Río Negro: Arg. Río Negro /Gral. Rocas / Cnia. Catriel 311 m / S. Roig / G. Flores /04/I/05 // 37°52′83′′ S/67°50′16′′W" (3 males, 1 female) [IADIZA]. "REP. ARGENTINA / Río Negro / H. Ritcher" (7 males, 1 female) [MLPA]. "III-5-1929 / S.O. / Río Negro" (1 female) [MACN]. "Río Negro / Allen" (1 female) [MACN]. No Data (3 females) [MACN]. "Col. Breyer" (1 male) [MACN]. "REP. ARGENTINA / A. BREYER / Col. Breyer" (1 male) [MACN]. "Neuquen / Capital / i.iii.961 // Argentina / 1968 colln. / J. Daguerre" (1 male, 1 female) [USNM]. "21-II-60 / Cipolletti / Prov Río Negro / lg. S. Schajovskoy / Howden coll. ex. / A. Martínez coll." (4 males, 2 females) [CMNC, BCRC]. "24-XI-1955 / Villa Regina / Pcia. Rio-Negro / Lg. E. Fleiss // Howden coll.

ex. / A. Martínez coll. // Lgyrus [sic] (T.) / gyas / niger / (Blanch.) / A. MARTÍNEZ-DET. 1990" (1 male) [CMNC]. Paratypes each with our yellow paratype label.

Description of Holotype. Length 26.8 mm; width 13.0 mm. Color dark reddish brown to black. Head: Frons and clypeus coarsely rugose. Frontoclypeal region with 2 distinctly transverse tubercles; tubercles broadly separated, usually about 3 tubercle diameters apart (Fig. 4e). Clypeus strongly rugopunctate to transversely rugose, tapering to slightly emarginate, broad apex with 2 reflexed teeth. Mandibles with 2 teeth, apical tooth subacute, subapical notch narrow (Fig. 6i–j); labium with lateral edge densely setose, paraglossa developed, apex slightly concave at center (Fig. 7e); maxilla with galea developed and with 6 teeth (Fig. 5e). Pronotum: Surface on disc moderately punctate, sides and anterior angles densely punctate to rugopunctate; punctures moderate in size on disc, becoming larger laterally; fovea rugose within. Anterior margin with a strong, median tubercle; fovea small, narrower than distance between eyes (Fig. 8e). Elytra: Surface densely punctate; punctures mostly moderately in size with sparser, minute punctures between larger punctures; larger punctures usually ocellate, some in double rows and with 3 pairs of double rows. Pygidium: Surface densely punctate, punctures becoming denser in basal and lateral angles; punctures small to moderate in size, weakly ocellate; in lateral view with convex surface. Legs: Protibia tridentate and with weak, basal convexity suggestive of 4th tooth, teeth subequally spaced from each other. Protarsus simple, not enlarged. Mesotibia on transverse carinae with spinules densely (subcontiguous) to broadly (separated by 1 spinule diameter) spaced (Fig. 10i–j). Metatibia with 1 basal, transverse carina interrupted at middle (carina with spine-like setae) and 1 medial, transverse carina at middle; apex with about 21 spinules (Fig. 10j). Venter: Prosternal process long, thick, apex longitudinally oval. Mesosternal surface glabrous, slightly concave at middle. Metasternal surface with sparse, ocellate punctures. Male Genitalia: Parameres (Fig. 11e, 12e, 13e) subtriangular, shaft strongly narrowed to apices, mid-shaft with large, curved tooth extending laterally. Internal sac with 3 copulatory lamellae (Fig. 15e).

Allotype Female. Length 27.5 mm; width 13.9 mm. Similar to male, but pronotal surface with punctures slightly less dense, pygidial surface weakly convex. Gonocoxite larger than gonocoxal sternite, with a semicircular furrow (14e).

Paratypes. Length 26.3–27.5 mm; width 12.9–13.9 mm. The 32 male and 20 female paratypes do not significantly differ from their respective primary type other than slight differences in size.

Etymology. This species is named in honor of Dr. Sergio Roig-Juñent in recognition of his invaluable entomological research in Argentina.

Distribution. *Tomarus roigjunenti* occurs in the provinces of Mendoza, Neuquén, and Río Negro in Argentina.

Locality Records (Fig. 17a). 52 specimens examined (see type information above).

Temporal Distribution. January (7), February (5), March (4), May (1), October (1), November (2), December (3).

Diagnosis. *Tomarus roigjunenti* is externally similar to *T. gyas* and *T. rosettae*. In *T. roigjunenti*, the apex of the labium is slightly concave (Fig. 7e), while in *T. gyas* the labium has a small notch (Fig. 7c) and in *T. rosettae* there is a small tooth (Fig. 7f). The clypeal teeth are distinctly separated in *T. rosettae* and *T. gyas* (Fig. 4c, f) but nearly contiguous in *T. roigjunenti* (Fig. 4e). The tubercles on the head are relatively close together in *T. maimon*, *T. rosettae*, and *T. roigjunenti* (Fig. 4d–f) but widely separated from each other in *T. gyas* (Fig. 4c). The pronotal fovea is narrow or nearly obsolete in *T. maimon*, *T. rosettae*, and *T. roigjunenti* (Fig. 8d–f) but nearly round and usally as wide as the distance between the eyes (rarely less) in *T. gyas* (Fig. 8c). The protibia has three teeth in *T. maimon* (Fig. 9b) and 4 teeth in *T. gyas*, *T. rosettae*, and *T. roigjunenti* (Fig. 9a). The parameres are different among the species (compare Fig. 11c, 12c, 13c; 11d, 12d, 13d; 11e, 12e, 13e, and 11f, 12f, 13f). The internal sac of *T. maimon*, *T. roigjunenti* and *T. rosettae* has three copulatory lamellae (Fig. 15d–f), but in *T. gyas* there are five lamellae (Fig. 15c).

Life History. Adults are attracted to lights at night. Some specimens have been taken in sand dunes.

***Tomarus rosettae* (Endrödi, 1968)**
(Fig. 1d, 2a, 3i, 4f, 5f, 6k–l, 7f, 8f, 10k–l, 11f, 12f, 13f, 14f, 15f, 17b)

Ligyrus rosettae Endrödi 1968: 168 (original combination).

Redescription. Male. Length 19.4–21.5 mm; width 9.4–10.8 mm. Color dark reddish brown to black. Head: Frons and clypeus coarsely rugose. Frontoclypeal region with 2 distinctly transverse tubercles; tubercles relatively narrowly separated, usually about 2.5 tubercle diameters apart (Fig. 4f). Clypeus strongly rugopunctate to transversely rugose, tapering to broad, slightly emarginate apex with 2 reflexed teeth. Mandibles with 2 teeth, apical tooth rounded, subapical notch shallow (Fig. 6k–l); labium densely setose on sides, paraglossa developed, apex with small tooth at center (Fig. 7f); maxilla with galea developed and with 6 teeth (Fig. 5f). Pronotum: Surface with disc moderately punctate, sides and anterior angles densely punctate to rugopunctate; punctures moderate in size on disc, becoming larger laterally; fovea rugose within. Anterior margin with strong, median tubercle; fovea small, as wide as width between eyes (Fig. 8f). Elytra: Surface densely punctate; punctures moderate in size with sparser, minute punctures between larger punctures; larger punctures usually ocellate, and with 3 pairs of double rows. Pygidium: Surface densely punctate, punctures becoming denser in basal and lateral angles; punctures small to moderate in size, weakly ocellate. In lateral view, male with convex surface, surface weakly convex in females. Legs: Protibia tridentate and with weak, basal convexity suggestive of 4th tooth, teeth subequally spaced from each other. Protarsus in male simple, not enlarged. Mesotibia relatively broad, transverse carinae arcuate, spinules long, stout (Fig. 10k–l). Metatibia with 1 basal, transverses carina interrupted at middle (carina with spine-like setae) and 1 medial, transverse carina; apex truncate with about 21 spinules (Fig. 10l). Venter: Prosternal process long, thick, apex longitudinally oval. Mesosternal surface glabrous, slightly concave at middle. Metasternal surface with sparse, ocellate punctures. Male Genitalia: Parameres (Fig. 11f, 12f, 13f) subtriangular, acute apices curving outwards. Internal sac with 3 copulatory lamellae (Fig. 15f).

Female. Length 20.0–21.6 mm; width 9.8–10.0 mm. Similar to male, but pronotal surface with punctures slightly less dense. Gonocoxite larger than gonocoxal sternite, with 2 semicircular furrows (Fig. 14f).

Distribution. *Tomarus rosettae* is known only from Argentina.

Locality Records. (Fig. 17b). 64 specimens examined from CMNC, IADIZA, MACN, MLPA, USNM.

ARGENTINA (56). BUENOS AIRES (6): Buenos Aires-Capital, Villa Gessell. CATAMARCA (2): Catamarca-Capital. MENDOZA (28): Mendoza-Capital, Potrerillos, Puente del Inca-Las Heras, Rodeo de la Cruz-Guaymallen, San Rafael, Telteca-La Valle. NEUQUÉN (2): Neuquén-Capital. RÍO NEGRO (5): Allen, Colonia Catriel-General Roca, General Roca. SAN JUAN (9): Jachal, San Juan-Capital. NO DATA: (12).

Temporal Distribution. January (12), March (4), November (1), December (7).

Diagnosis. *Tomarus rosettae* is externally similar to *T. roigjunenti*. The labium in *T. roigjunenti* lacks a small tooth at its center apex (Fig. 7e), whereas *T. rosettae* has a small tooth at the center apex (Fig. 7f). The clypeal teeth are nearly contiguous in *T. roigjunenti* (Fig. 4e), but the teeth in *T. rosettae* are distinctly separated (Fig. 4f). The parameres are also different between *T. roigjunenti* and *T. rosettae* (compare Fig. 11e, 12e, 13e and 11f, 12f, 13f).

Life History. Adults are attracted to lights at night.

***Tomarus rubripes* (Boheman, 1858)**
(Figures 19a–e)

Podalgus rubripes Boheman 1858: 57 (original combination).
Ligyrus guianucai Dechambre and Lumaret 1985: 107 **(New Synonymy)**.

Tomarus rubripes was described from, supposedly, Montivideo, Uruguay, although this simply may have been a port-of-call for the frigate *Eugenie* on which the specimens were transported back to Sweden. The male holotype is in NHRS, and we examined multiple images, including the parameres. In our examination of numerous collections holding *Tomarus* specimens from the study area, we have never seen specimens of *T. rubripes* from Uruguay or Argentina, although we have seen specimens from Brazil. We have no definitive evidence that *T. rubripes* occurs in the study area.

Tomarus guianucai was described by Dechambre and Lumaret (1985) from Cassino Beach, Rio Grande do Sul, Brazil; this locality is adjacent to Uruguay. Examination of the types of both species reveals that they are conspecific, and *T. guianucai* is here reduced to junior synonymy with *T. rubripes*. Dechambre and Lumaret made no mention of examining the type of *T. rubripes* when they described *T. guianucai* and so did not recognize the similarities between the two.

***Tomarus spinipenis* Neita and Ratcliffe, New Species**
(Fig. 2b–c, 4g, 5g, 6m–n, 7g, 8g, 10m–n, 11g, 12g, 13g, 14g, 15g, 17c)

Holotype male labeled: "Chaco/Parque Nacional del Copo/25°58′21.7′′S; 61°57′31.6′′W. 21-XII-2010. F. C. Ocampo, F. Campón, B. Maldonado" and with our red holotype label [IADIZA] . **Allotype** female labeled: "Santiago del Estero. Santiago del Estero/Weisburd/22.IX.47" and with our red allotype label [MACN]. **Paratypes** labeled**: "**La Rioja. RA. La Rioja 9 Km. S de la Ciudad/11 Dic 1993/S. Roig" (2 males) [IADIZA]. "R. Arg. San Luis/San Antonio/Diciembre 1974/S. Roig" (1 male) [IADIZA]. "Santiago del Estero. Santiago del Estero/Weisburd/22.IX.47" (4♂) [MACN]. Paratypes each with our yellow paratype label.

Description of Holotype. Length 14.7 mm; width 7.8 mm. Color light to dark reddish brown. **Head:** Frons mostly impunctate between eyes and coarsely rugopunctate just behind frontoclypeal carina. Frontoclypeal region with transverse carina slightly separated at middle (Fig. 4g). Clypeus strongly rugopunctate to transversely rugose, tapering to slightly emarginate, broad apex with 2 reflexed teeth. Mandibles with 2 teeth, apical tooth bluntly rounded, subapical notch shallow, broad (Fig. 6m–n); labium densely setose, paraglossa undeveloped, apex convergent (Fig. 7g); maxilla with galea developed and with 5 teeth (Fig. 5g). **Pronotum:** Surface moderately to moderately densely punctate; punctures large, umbilicate. Anterior margin lacking tubercle or fovea (Fig. 8g). **Elytra:** Surface with micropunctures and large punctures mixed; large punctures moderately dense, ocellate, and with 3 pairs of double rows. First broad interval with or without large punctures. **Pygidium:** Surface sparsely punctate, punctures becoming denser in basal angles; punctures small to moderate in size, weakly ocellate; in lateral view with convex surface. **Legs:** Protibia tridentate, basal tooth slightly removed. Protarsus in male simple, not enlarged. Mesotibia with relatively short transverse carinae **(**Fig. 10m–n). Metatibia with 1 basal, transverse carina interrupted at middle (carina with spine-like setae) and 1 medial, transverse carina; apex truncate with about 29 spinules (Fig. 10n). **Venter:** Prosternal process tall, thick, apex small and suboval, usually with slender, long setae. Mesosternal surface sparsely setose, slightly concave at middle. Metasternal surface densely punctate, punctures ocellate, setose; setae slender and long. **Male Genitalia:** Parameres (Fig. 11g, 12g, 13g) narrowly subtriangular, apices curving outwards and, in caudal view, with small spinules near the apices of each paramere. Internal sac (Fig. 15g) lacking copulatory lamellae.

Allotype. Length 14.1 mm; width 7.6 mm. Similar to male, but pronotal surface on disc smooth; pygidial surface weakly convex. Gonocoxite smaller than gonocoxal sternite and lacking a semicircular furrow (Fig. 14g).

Paratypes. Males. Length 12.9–15.5 mm; width 6.0–8.2 mm. The seven male paratypes do not differ significantly from the holotype.

Etymology. From the Latin *spine*, indicating a small process, and *penis*, in reference to the parameres. Used here to refer to the small spinules near the apices of the parameres (Fig 11g).

Distribution. *Tomarus spinipenis* is known only from Argentina.

Locality Records (Fig. 17c). 9 specimens examined (see type information above).

Temporal Distribution. November (5), December (4).

Diagnosis. *Tomarus spinipenis* superficially resembles *T. burmeisteri* because both species are similar in size, color, and with a pronotum that lacks a tubercle and fovea. But *T. spinipenis* can be distinguished by the long, slender setae at the base of the mentum (Fig. 7g), the metatibial surface smooth on its external edge (Fig. 10n), and the unique parameres (Fig. 11g, 12g, 13g). The parameres of *T. spinipenis* have several spinules on the apico-external edge (Fig. 11g). The genital plates of the females of both species are different in shape (compare Fig. 14g and 14b).

Life History. Adults of *T. spinipenis* are attracted to lights.

***Tomarus villosus* (Burmeister, 1847)**
(Fig. 2e, 3j–m, 4h, 5h, 6o–p, 7h, 8h, 10o–p, 11h, 12h, 13h, 14h, 15h, 17d)

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

Redescription: Male. Length 14.9–18.4 mm; width 7.8–9.9 mm. Color light to dark reddish brown. Head: Frons mostly impunctate between eyes and coarsely rugopunctate just behind frontoclypeal carina. Frontoclypeal region with transverse carina slightly separated at middle (Fig. 4h). Clypeus strongly rugopunctate to transversely rugose, tapering to slightly emarginate, broad apex with 2 reflexed teeth. Mandibles with 2 teeth, apical tooth subacute, subapical notch broad, deep (Fig. 6o–p); labium densely setose, paraglossa undeveloped, apex tapering to narrow apex (Fig. 7h); maxilla with galea developed and with 4 teeth (Fig. 5h). Pronotum: Surface smooth or with small, sparse punctures except for lateral margins where punctures small to moderate in size and density. Anterior margin with small, median tubercle, fovea absent (Fig. 8h). Elytra: Surface with micropunctures and large punctures mixed; large punctures moderately dense, ocellate, and with 3 pairs of double rows. First broad interval with or without large punctures. Pygidium: Surface densely punctate, punctures becoming denser in basal and lateral angles; punctures small to moderate in size, weakly ocellate, with minute and tawny setae. In lateral view, male with convex surface, females with weakly convex surface. Legs: Protibia tridentate, basal tooth slightly removed. Protarsus in male simple, not enlarged. Mesotibial transverse carinae vary from short to long, arcuate to nearly straight (Fig. 10o–p). Metatibia with 1 basal, transverse carina interrupted at middle (carina with spine-like setae) and 1 medial, transverse carina; apex with about 18 spinules (Fig. 10p). Venter: Prosternal process tall, thick, apex small, suboval, often with slender, long setae. Mesosternal surface sparsely setose, slightly concave at middle. Metasternal surface densely punctate, punctures ocellate, setose; setae slender, long (Fig. 2e). Male Genitalia: Parameres (Fig. 11h, 12h, 13h) subtriangular, apices curving outwards, mid-shaft with large tooth extending laterally. Internal sac (Fig. 15h) lacking copulatory lamellae.

Female: Length 17.1–19.1 mm; width 8.5–9.6 mm. Similar to males, but pronotal surface with punctures slightly less dense, and elytra with punctures slightly denser. Gonocoxite smaller than gonocoxal sternite and lacking a semicircular furrow (Fig. 14h).

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

Locality Records (Fig. 17d). 208 specimens examined from BCRC, CJME, CMNC, FSCA, LEULS, MACN, MNHN, MNNC, MLPA, UMSP, USNM.

ARGENTINA (17). NEQUÉN (17): Collón Cura, Quilquihue, Rinconada, Zapala.
CHILE (191). ANCONCAGUA (1): Los Molles. ANTOFAGASTA (1): San Pedro de Atacama. ARAUCANÍA (8): Cautín-Temuco. ARICA Y PARINACOTA (6): Luta-Molino, Arica. ATACAMA (6): Caldera, Copiapó, Río Pulida, San Pedro de Atacama, Totoral-Copiaco. BIOBIO (7): Quillón. CHOAPA (1): Los Vilos. CONCEPCIÓN (3): Concepción. COQUIMBO (42): Choapa, Diaguita-Valle Elqui, Guampulla, Guanaquero, Huanta-Elqui, Llano Compañía-La Serena, La Serena, Limarí, Los Choros, Monte Grande-Elqui, Pueblo Diaguitas-Elqui, Punta Teatinos-La Serena, Salamanca, Tongoy, Totoralillo, Vicuña-Elqui. HUASCO (1): Vallenar (15 km N). LOS RÍOS (1): Reserva Costera Valdiviana. MAULE (31): Chance, Cuaquemes, Curanipe, Curicó (12 km SW), El Coigo, Los Quenes (6 km S), Pelluhue, Potrero Grande (35 km SE), Río Teno, San Javier, Suazal. ÑUBLE (3): Recinto, Rio Pinto E. of Chilican. O'HIGGINS (10): Pichilemu, Rosario. REGIÓN METROPOLITANA (32): Alhue, Cordillera Reserva Río Clarillo, Cuerta lo Prado-Santiago, El Toyo, San Cristóbal, Santiago. SANTIAGO (3): Pilay, Renca. TARAPACÁ (3): Iquique, Refresco-Tomarugal. VALPARAISO (14): Canelo, El Convento, El Quisco-San Antonio, Mantagua. NO DATA (18).

Temporal Distribution. January (24), February (24), March (8), May (5), July (5), August (9), September (10), October (14), November (18), December (15).

Diagnosis. *Tomarus villosus* is easily recognized because the teeth of the clypeal apex are subcontiguous (Fig. 4h), and the pronotal surface is nearly smooth or with micropunctures and lacking a subapical tubercle (Fig. 8h).

Life History. Adults are attracted to lights at night. Some specimens have been taken in coastal sand dunes near the ocean.

Analysis of Genitalia

Male Genitalia. Due to the importance of the male genitalia as a source of characters for species identification and phylogenetic analysis, we described this structure in detail. The aedeagus of *Tomarus* species consists of a sclerotized outer tegmen and a membranous internal sac containing several sclerites that are folded in an inverted position within the tegmen. In Dynastinae, the basal part of the tegmen is called the basal piece or phallobase, which is separated from the apical part of the tegmen by a constriction (Fig. 12a–h). This constriction is present in derived groups of Scarabaeoidea.

At the apex of tegmen are the sclerotized parameres that reflect differences between species in both dorsal and ventral views. In caudal view, there is a short or long, spine-like tooth projecting laterally from the front of the shaft as seen in *T. gyas*, *T. roigjunenti*, and *T. rosettae* (Fig. 11c, e–f) or only a small tooth-like projection as seen in *T. maimon* (Fig. 11d). Other species (*T. bidentulus*, *T. burmeisteri*, *T. spinipenis*, and *T. villosus*) lack the large tooth on the front of the lateral edge (Fig. 11a–b, g–h) but have a smaller tooth on the back side of the lateral edge. In anterior view, the parameres are flared and expanded at the base as seen in *T. gyas*, *T. maimon, T. roigjunenti* and *T. rosettae* (Fig. 13c–f) but attenuate in *T. bidentulus*, *T. burmeisteri*, *T. spinipenis*, and *T. villosus* (Fig. 13a–b, g–h).
Another important structure is the internal sac, which is attached to the tegmen dorsally near its apex at the ostium (Lindroth 1957); this is the entrance into the internal sac from the exterior (Maddison 1993). During copulation, the internal sac (Fig. 15a–h) everts through the ostium. According to Zunino (2014), sclerites present on the internal sac are: accessory lamella (AL), copulatory lamella (CL), raspula (Ra), and spiculum (Esp). Apical to the accessory lamella is a complex, spike-like flagellum (Fg) that varies in length and thickness (Fig.15a–h) that may or may not have small accessory structures (Fig. 15a, g).

These structures fall into two groups in this study. The first group of species consisting of *T. gyas*, *T. maimon*, *T. roigjunenti,* and *T. rosettae* has a copulatory lamella (CL), a short and thick flagellum (Fg),

and lacks a raspula (Fig. 15c–f). The second group of species consisting of *T. bidentulus*, *T. burmeisteri*, *T. spinipenis,* and *T. villosus* lacks a copulatory lamella, has a long, slender, often spiraled flagellum (Fg), and a raspula (Ra) (15a–b, g–h).

Female Genitalia. There are few studies discussing the female genitalia in Scarabaeidae because the male genitalia have been more readily and easily used for identification. Recently, Martínez-Morales and Morón (2015) studied the anatomy of the female reproductive system in 12 species of Mexican scarabs that could be used for species identifications. They found that the female genital plates vary between species and could be used to identify some species. We found in the *Tomarus* species being studied here that the differences in the genital plates form two groups. In the first group (*T. bidentulus*, *T. burmeisteri, T. spinipenis,* and *T. villosus*), the dorsum of the gonocoxite (Gx) lacks a semicircular furrow (W), and the gonocoxal sternite (Gs) is larger than the gonocoxite (Fig. 14a–b, g–h). In the second group (*T. gyas*, *T. maimon*, *T. roigjunenti,* and *T. rosettae*), the dorsum of the gonocoxite has a semicircular furrow, and the gonocoxal sternite is smaller than the gonocoxite (Fig. 14c–f).

Key to the Species of Adult *Tomarus* Erichson of Argentina, Chile, and Uruguay

1. Metasternum on disc with dense setae (Fig. 2e). Mandibles with 2 teeth on lateral edge with apical tooth sharp and subapical notch broad (Fig. 6a–d, m–p). Galea with 5 teeth (Fig. 5a–b, g–h). Paraglossa undeveloped, labrum with apex attenuate (Fig. 7a–b, g–h). Female gonocoxite without semicircular furrow, gonocoxal sternite larger than gonocoxite (Fig. 14a–b, g–h) ... **2**

— Metasternum on disc lacking setae. Mandibles with 2 teeth on lateral edge with apical tooth subtruncate and subapical notch relatively shallow and narrow (Fig. 6e–l). Galea with 6 teeth (Fig. 5c–f). Paraglossa developed, labrum with apex subtruncate (Fig. 7c–f). Female gonocoxite with semicircular furrow, gonocoxal sternite smaller than gonocoxite (Fig. 14c–f) **5**

2(1). Pronotum with small (occasionally minute), subapical tubercle (Fig. 8a, h) **3**

— Pronotum lacking subapical tubercle (Fig. 8b, g) **4**

3(2). Pronotum lacking subapical fovea; surface almost smooth or with small, sparse punctures (Fig. 8h). Parameres with small tooth on external surface of mid-shaft, apices blunt, slightly curving away from each other (Fig. 11h, 12h, 13h) ..... ***T. villosus* (Burmeister)**

— Pronotum with small, shallow, subapical fovea; surface on disc moderately punctate with sides and anterior angles densely punctate (Fig. 8a). Parameres with small tooth on external surface just above mid-shaft, apices rounded and diverging from each other (Fig. 11a, 12a, 13a) .... ***T. bidentulus* (Fairmaire)**

4(2). Mentum near base lacking slender, long setae (Fig. 7b). Parameres with large, long tooth on external surface just above mid-shaft, apices inflated just before true apex (Fig. 11b, 12b, 13b) ..... ***T. burmeisteri* (Steinheil)**

— Mentum near base with slender, long setae (Fig. 7g). Parameres relatively short, stout, small tooth on external surface at mid-shaft, apices bluntly subquadrate and with pre-apical, small spinules (Fig. 11g, 12g, 13g) ..... ***T. spinipenis* Neita and Ratcliffe, new species**

5(1). Protibia with 3 teeth (Fig. 9b). Parameres broadly subquadrate in basal half with small tooth on external surface above middle, apices broadly rounded and slightly diverging (Fig. 11d, 12d, 13d) ..... ***T. maimon* Erichson**

— Protibia with 4 teeth (Fig. 9a) **6**

6(5). Pronotum with subapical fovea nearly round, usually as wide as distance between eyes, rarely less (Fig. 8c). Parameres with large, long, recurving tooth on external surface at about mid-shaft, shaft strongly narrowed to small, rounded apices (Fig. 11c, 12c, 13c) .... ***T. gyas* Erichson**

— Pronotum with subapical fovea nearly obsolete, longitudinally narrow (Fig. 8e–f). Parameres with large or small tooth on external surface at mid-shaft, shaft not strongly narrowed to rounded apices (Fig. 11e, 12e, 13e and 11f, 12f, 13f) **7**

7(6). Apex of clypeus with teeth distinctly separated (Fig. 4f). Labium with small tooth at center apex (Fig. 7f). Parameres with small tooth on external surface at mid-shaft, apices rounded and curving strongly away from each other (Fig. 11f, 12f, 13f) ..... ***T. rosettae* (Endrödi)**

— Apex of clypeus with teeth subcontiguous (Fig. 4e). Labium lacking small, apical tooth (Fig. 7e). Parameres with large, long tooth on external surface at mid-shaft, apices rounded and curving strongly away from each other (Fig. 11e, 12e, 13e) ..... ***T. roigjunenti* Neita and Ratcliffe, new species**

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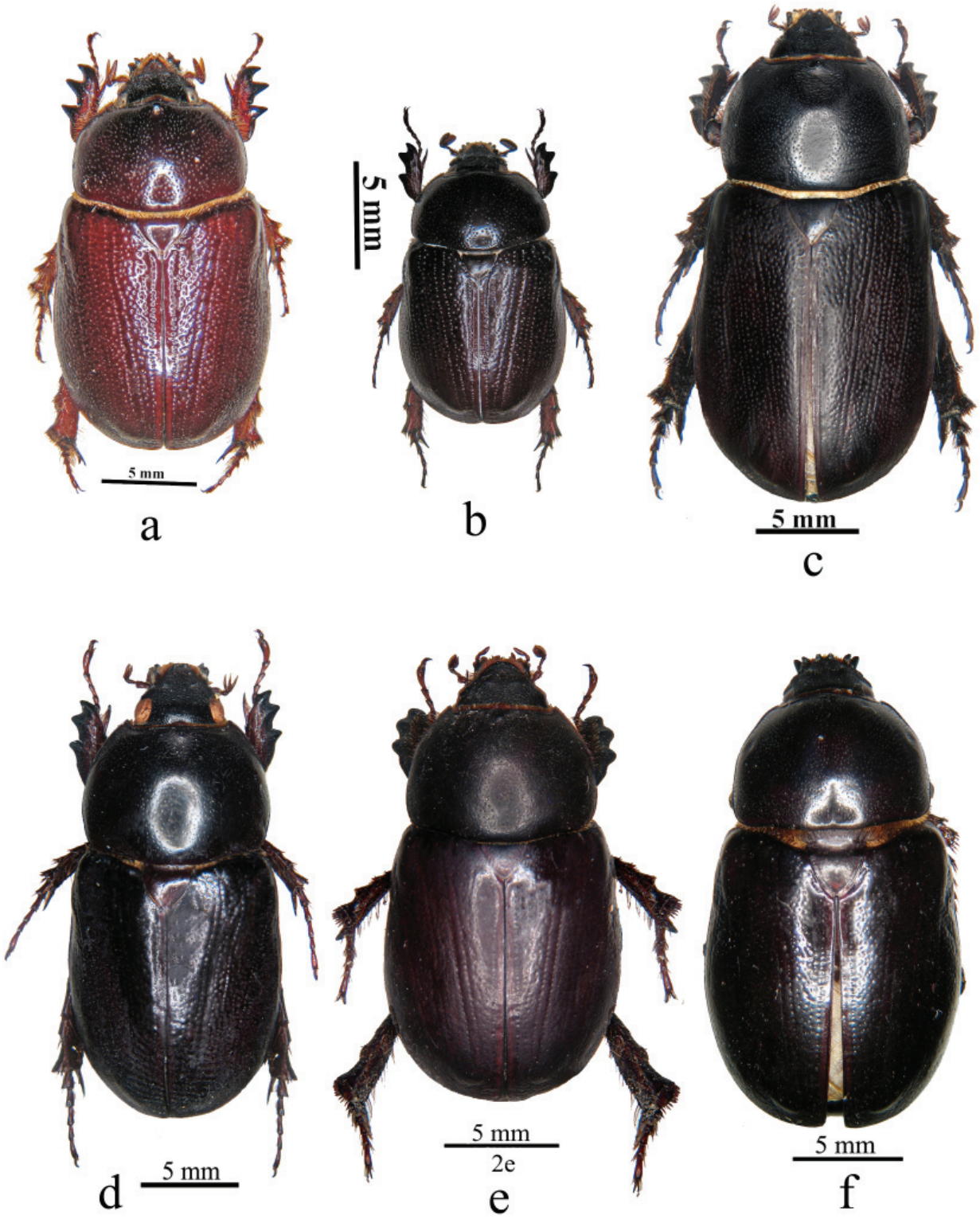

Figure 1. Habitus of *Tomarus* spp. **a)** *Tomarus bidentulus* (Fairmaire) dorsal view. **b)** *Tomarus burmeisteri* (Steinheil) dorsal view. **c)** *Tomarus gyas* Erichson dorsal view. **d)** *Tomarus rosettae* (Endrödi) dorsal view. **e)** *Tomarus roigjunenti* n. sp. dorsal view, holotype. **f)** *Tomarus roigjunenti* n. sp. dorsal view, allotype.

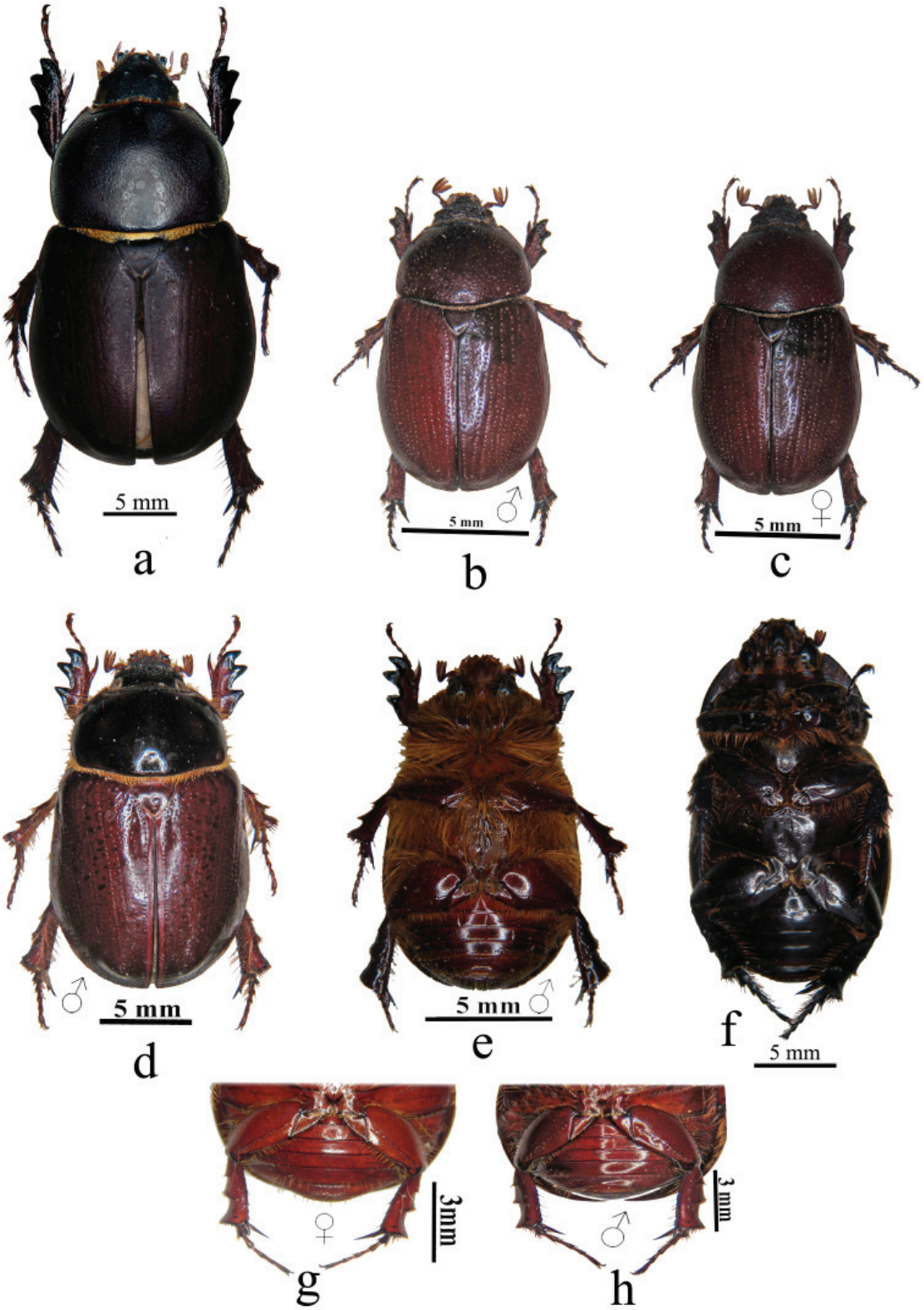

Figure 2. Habitus of *Tomarus* spp. **a)** *Tomarus rosettae* (Endrödi) dorsal view. **b)** *Tomarus spinipenis* n. sp. dorsal view, holotype. **c)** *Tomarus spinipenis* dorsal view, allotype. **d)** *Tomarus burmeisteri* (Steinheil) dorsal view. **e)** *Tomarus villosus* (Burmeister) ventral view. **f)** *Tomarus gyas* ventral view. **g)** *Tomarus bidentulus* (Fairmaire) abdomen segments, ventral view (female). **h)** *Tomarus bidentulus* abdomen segments, ventral view (male).

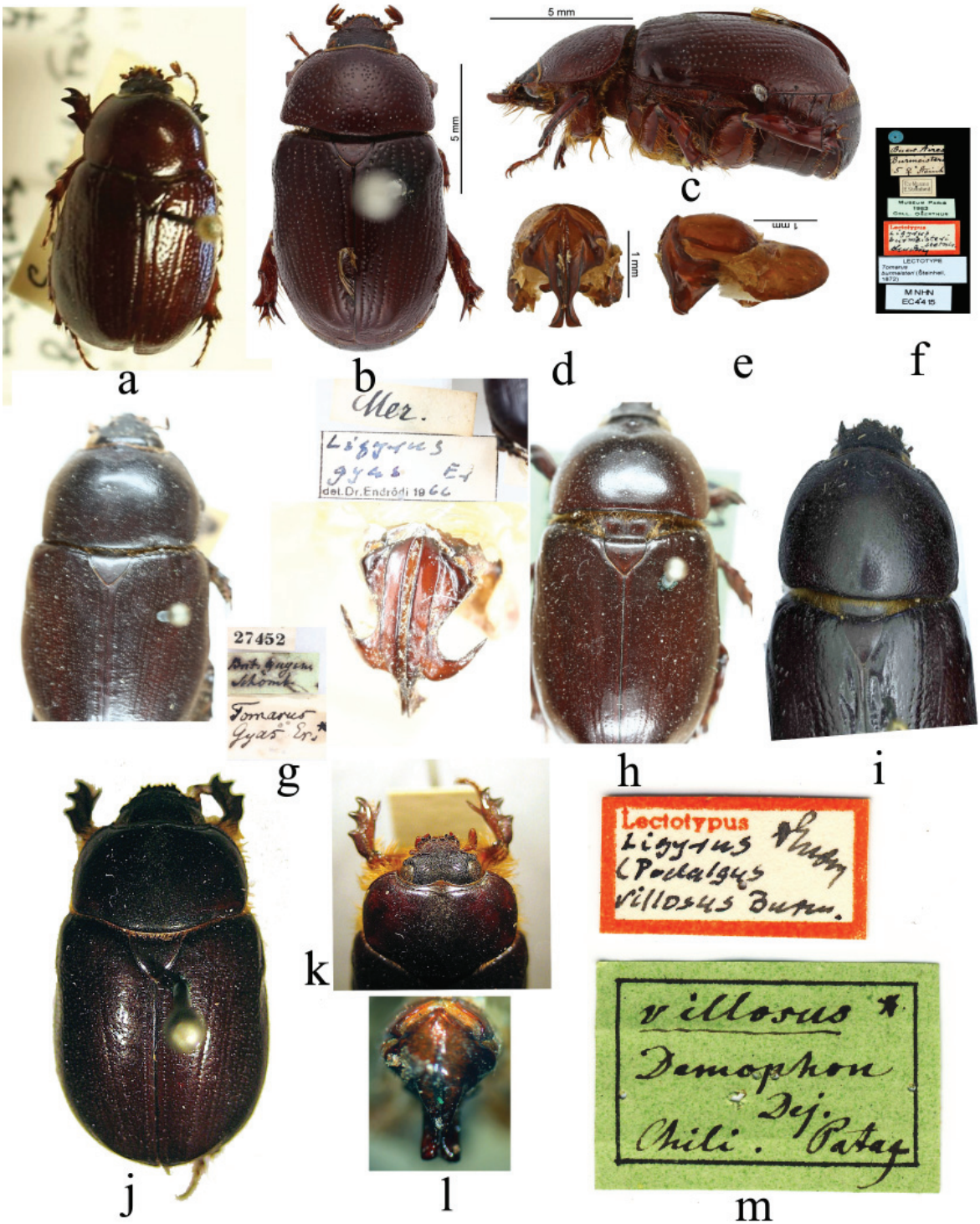

Figure 3. Types of *Tomarus* spp. **a)** *T. bidentulus* female holotype, dorsal view. **b)** *T. burmeisteri* male holotype, dorsal view. **c)** *T. burmeisteri* male holotype, lateral view. **d)** *T. burmeisteri* male holotype parameres, caudal view. **e)** *T. burmeisteri* male holotype parameres (lateral view). **f)** Label for *T. burmeisteri* holotype. **g)** *T. gyas* male holotype, dorsal view and labels and parameres, caudal view). **h)** *T. maimon* holotype, dorsal view. **i)** *T. rosettae* male holotype, dorsal view. **j)** *T. villosus* male holotype, dorsal view. **k)** *T. villosus* male holotype, dorsal view of head. **l)** *T. villosus* male holotype, parameres, caudal view. **m)** Label for *T. villosus* holotype.

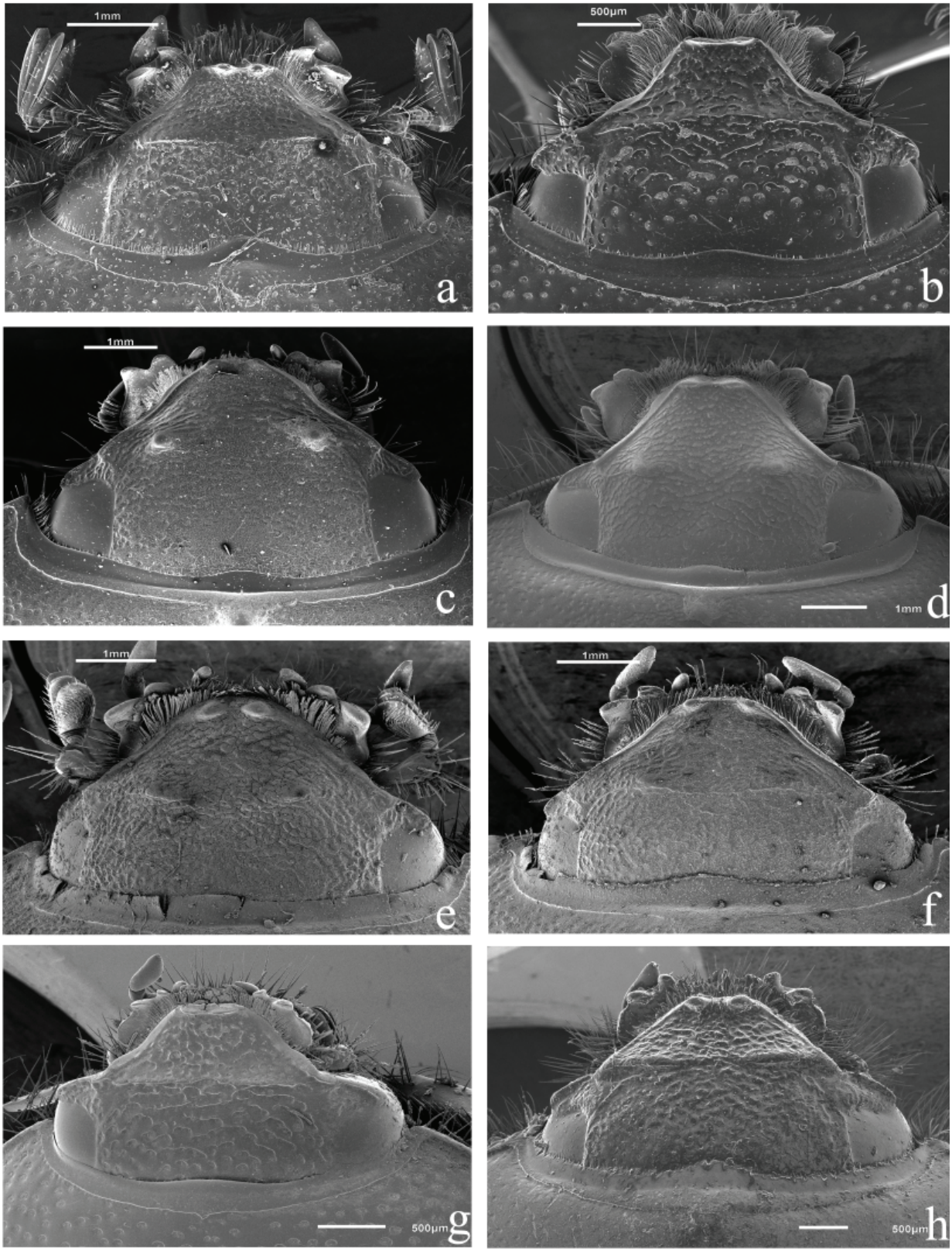

Figure 4. Head, dorsal view of *Tomarus* spp. **a)** *T. bidentulus*. **b)** *T. burmeisteri*. **c)** *T. gyas*. **d)** *T. maimon*. **e)** *T. roigjunenti* n. sp. **f)** *T. rosettae*. **g)** *T. spinipenis* n. sp. **h)** *T. villosus*.

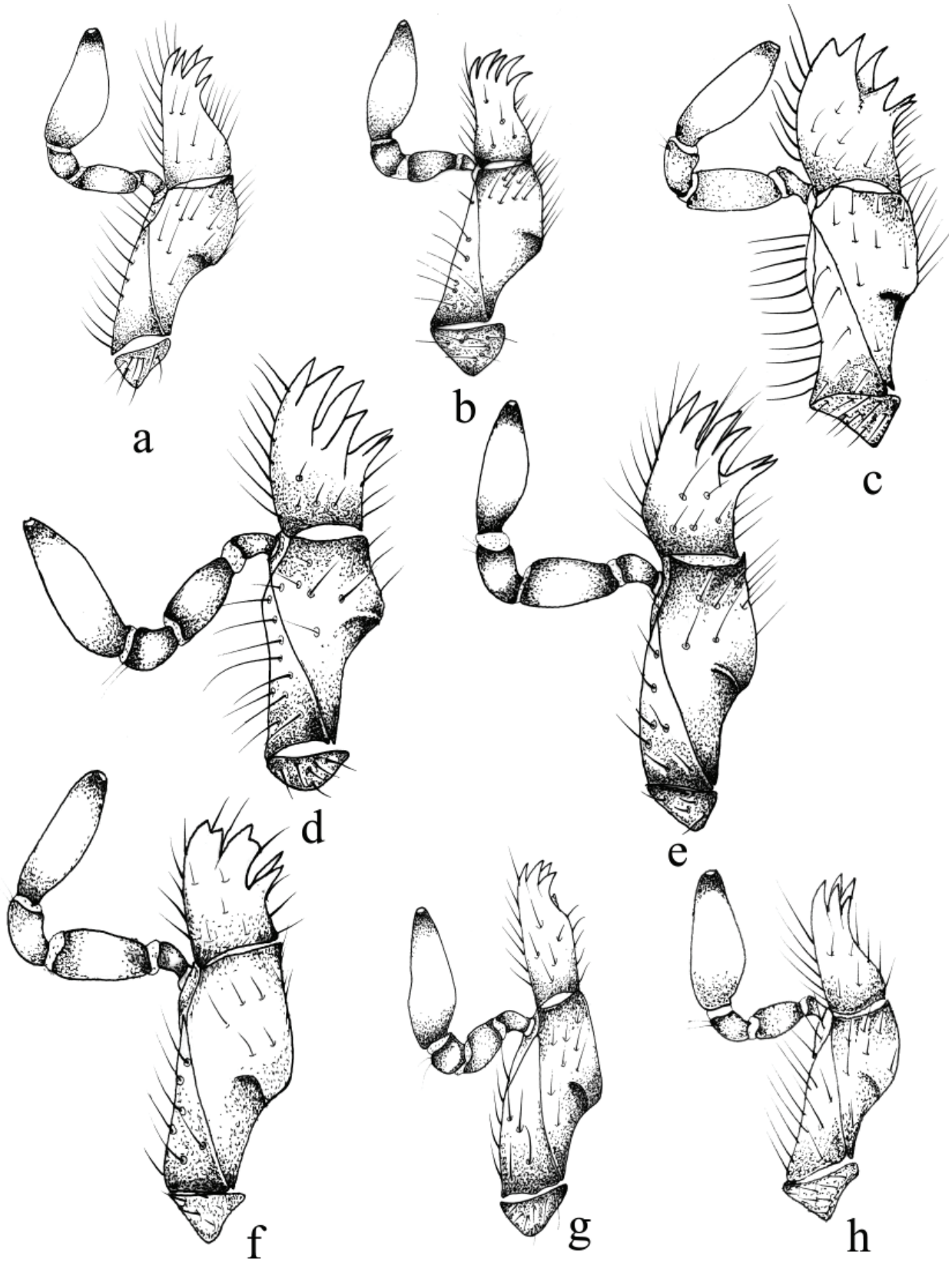

Figure 5. Maxilla, ventral view, of *Tomarus* spp. **a)** *T. bidentulus*. **b)** *T. burmeisteri*. **c)** *T. gyas*. **d)** *T. maimon*. **e)** *T. roigjunenti* n. sp. **f)** *T. rosettae*. **g)** *T. spinipenis* n. sp. **h)** *T. villosus*.

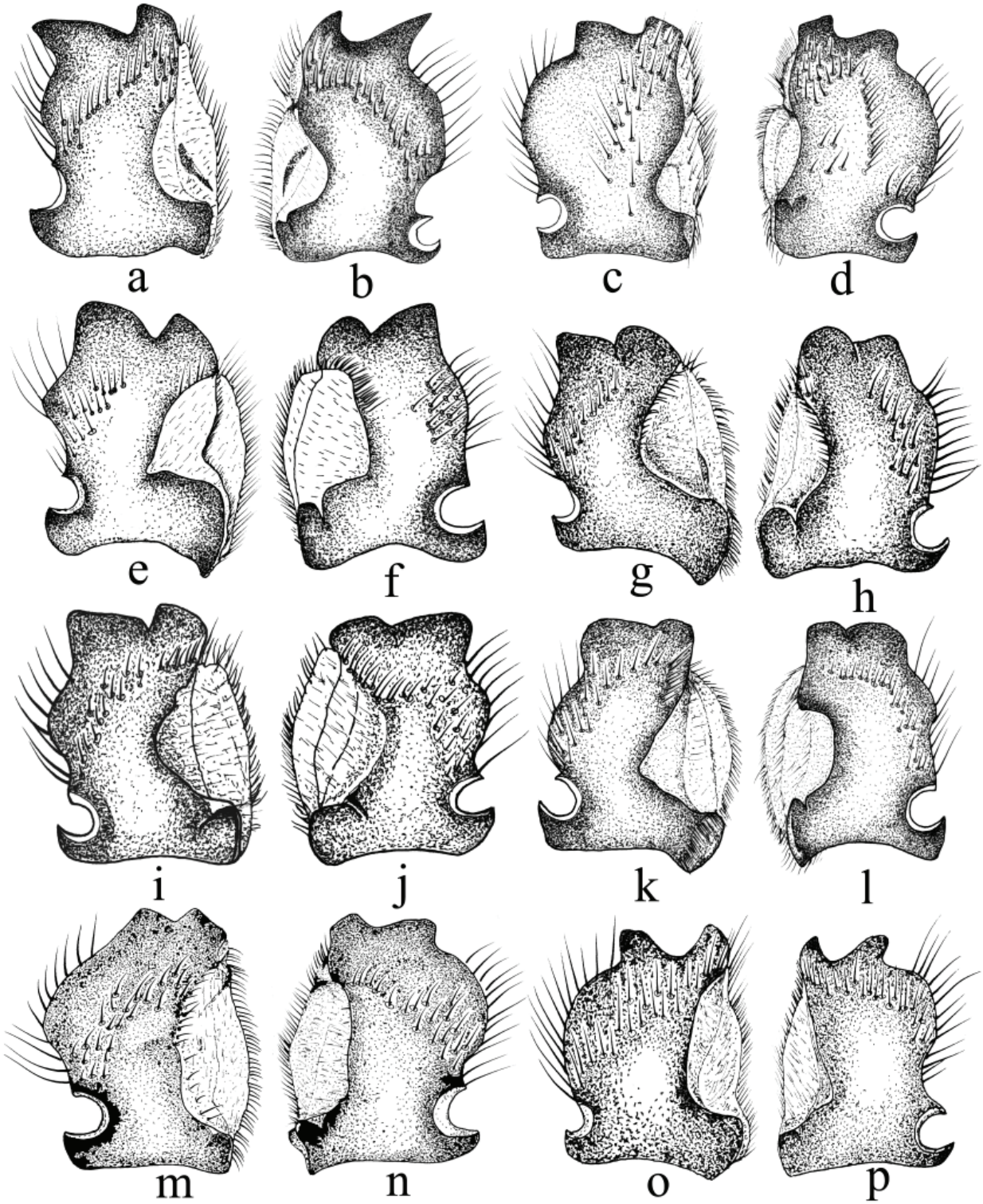

Figure 6. Mandibles, ventral view, of *Tomarus* spp. **a–b)** *T. bidentulus*. **c–d)** *T. burmeisteri*. **e–f)** *T. gyas*. **g–h)** *T. maimon*. **i–j.** *T. roigjunenti* n. sp. **k–l.** *T. rosettae*. **m–n.** *T. spinipenis* n. sp. **o–p.** *T. villosus*.

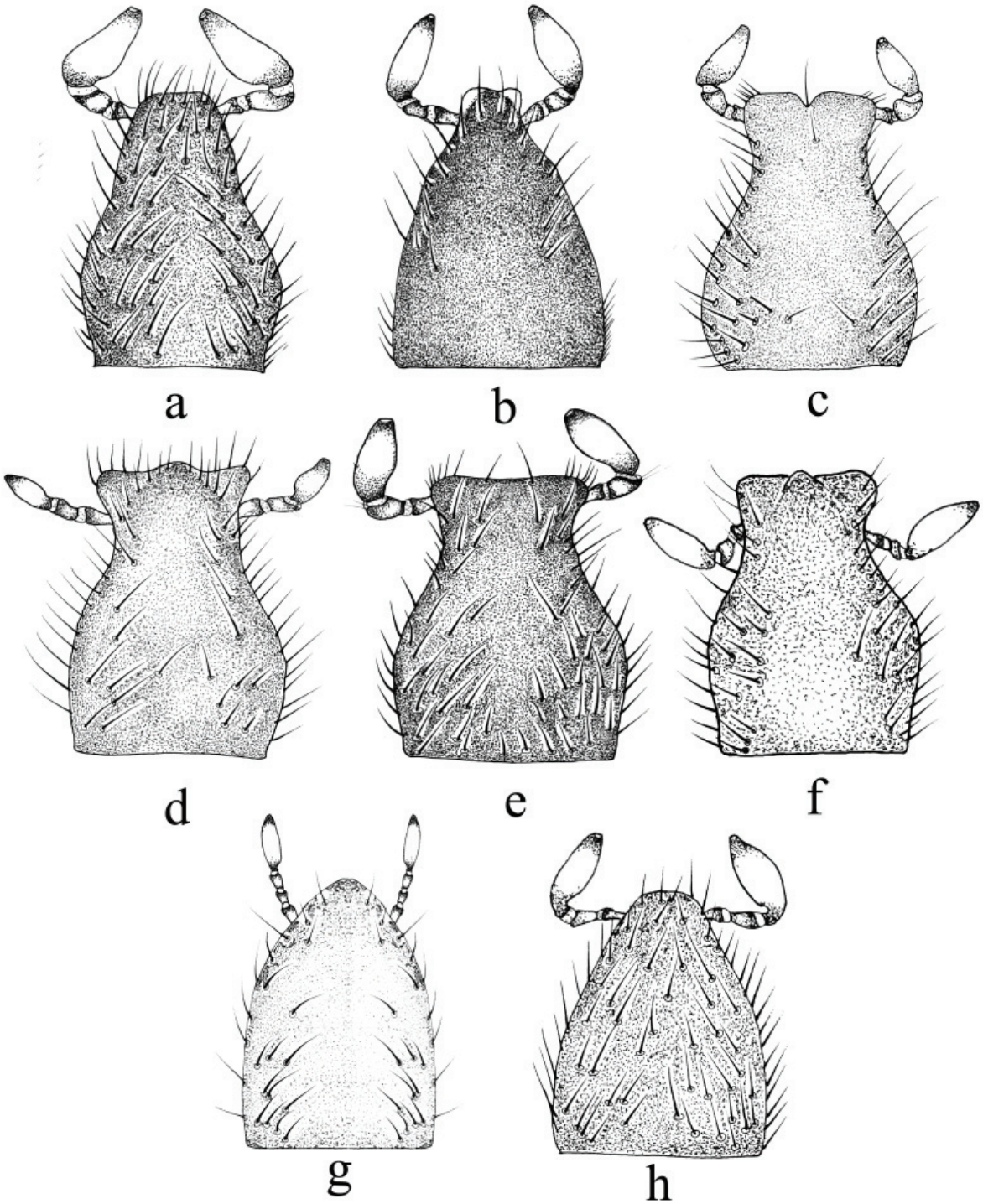

Figure 7. Labium, dorsal view, of *Tomarus* spp. **a)** *T. bidentulus*. **b)** *T. burmeisteri*. **c)** *T. gyas*. **d)** *T. maimon*. **e)** *T. roigjunenti* n. sp. **f)** *T. rosettae*. **g)** *T. spinipenis* n. sp. **h)** *T. villosus*.

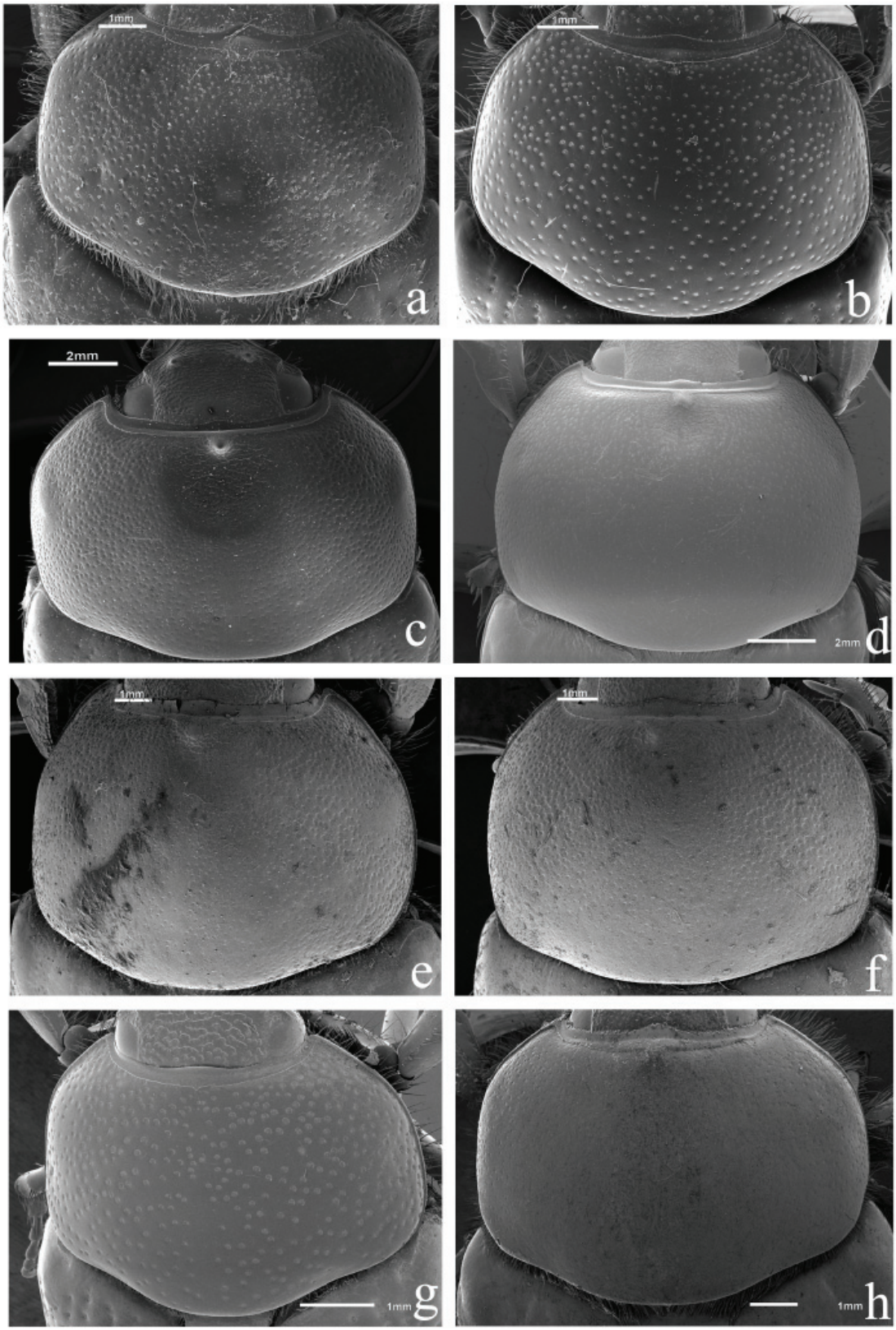

Figure 8. Pronotum, dorsal view, of *Tomarus* spp. **a)** *T. bidentulus*. **b)** *T. burmeisteri*. **c)** *T. gyas*. **d)** *T. maimon*. **e)** *T. roigjunenti* n. sp. **f)** *T. rosettae*. **g)** *T. spinipenis* n. sp. **h)** *T. villosus*.

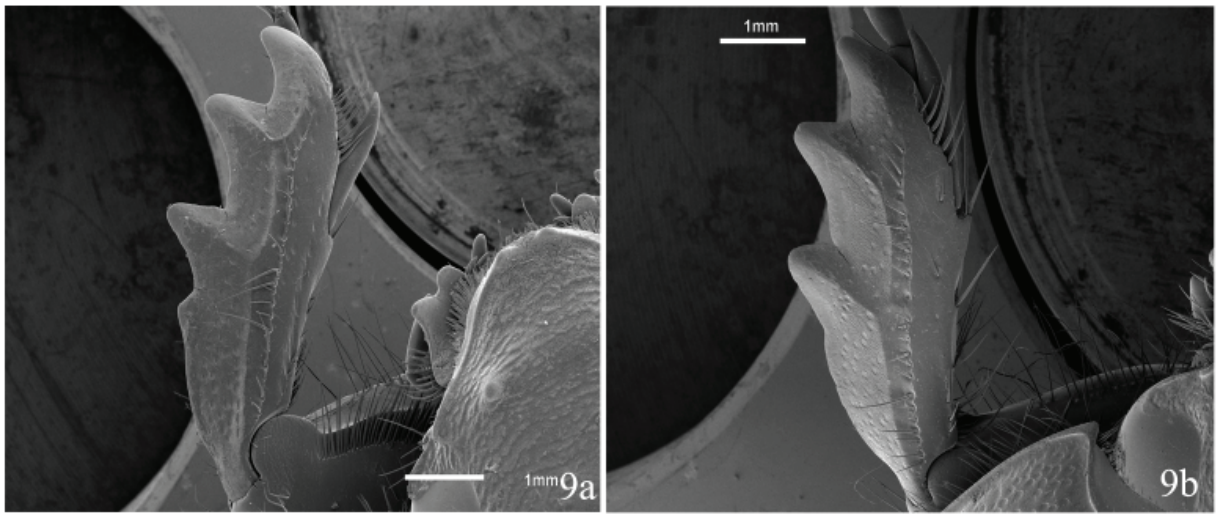

Figure 9. Protibia, dorsal view, of *Tomarus* spp. **a)** *T. gyas* and **b)** *T. maimon*.

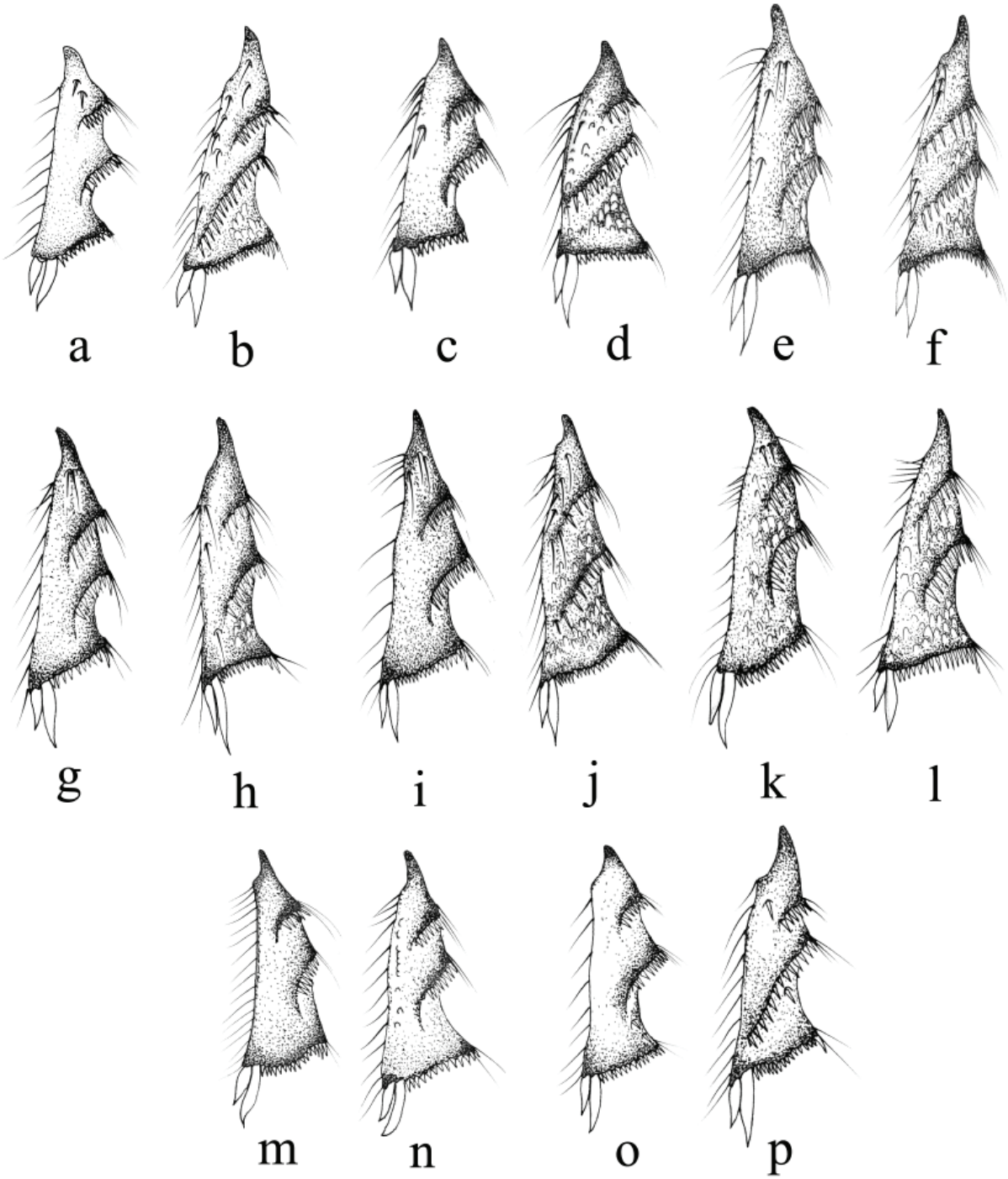

Figure 10. Meso- and metatibia, dorsal view, of *Tomarus* spp. **a–b)** *T. bidentulus*. **c–d)** *T. burmeisteri*. **e–f)** *T. gyas*. **g–h)** *T. maimon*. **i–j.** *T. roigjunenti* n. sp. **k–l.** *T. rosettae*. **m–n.** *T. spinipenis* n. sp. **o–p.** *T. villosus*.

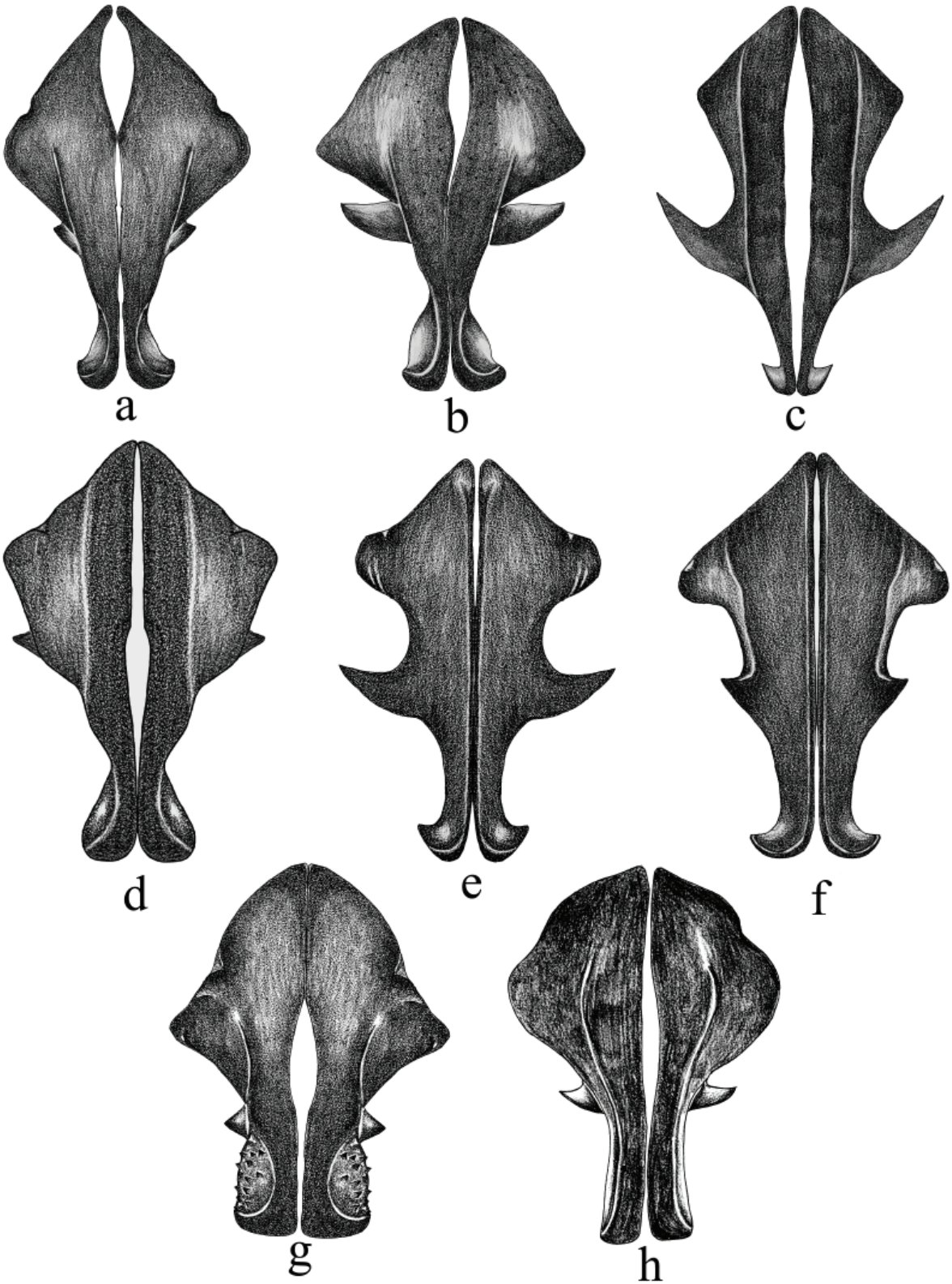

Figure 11. Parameres, caudal view, of *Tomarus* spp. **a)** *T. bidentulus*. **b)** *T. burmeisteri*. **c)** *T. gyas*. **d)** *T. maimon*. **e)** *T. roigjunenti* n. sp. **f)** *T. rosettae*. **g)** *T. spinipenis* n. sp. **h)** *T. villosus*.

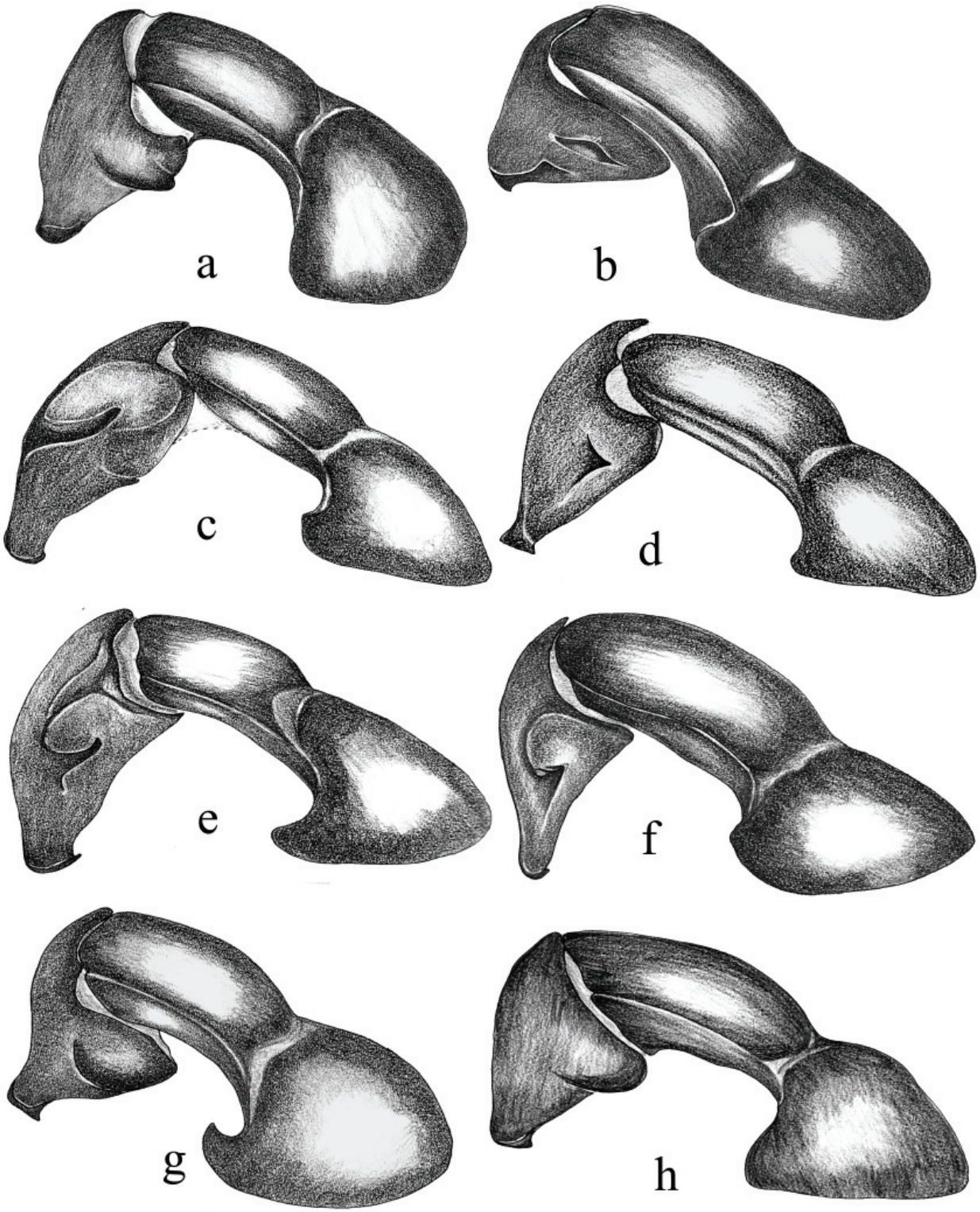

Figure 12. Parameres, lateral view, of: **a)** *T. bidentulus*. **b)** *T. burmeisteri*. **c)** *T. gyas*. **d)** *T. maimon*. **e)** *T. roigjunenti* n. sp. **f)** *T. rosettae*. **g)** *T. spinipenis* n. sp. **h)** *T. villosus*.

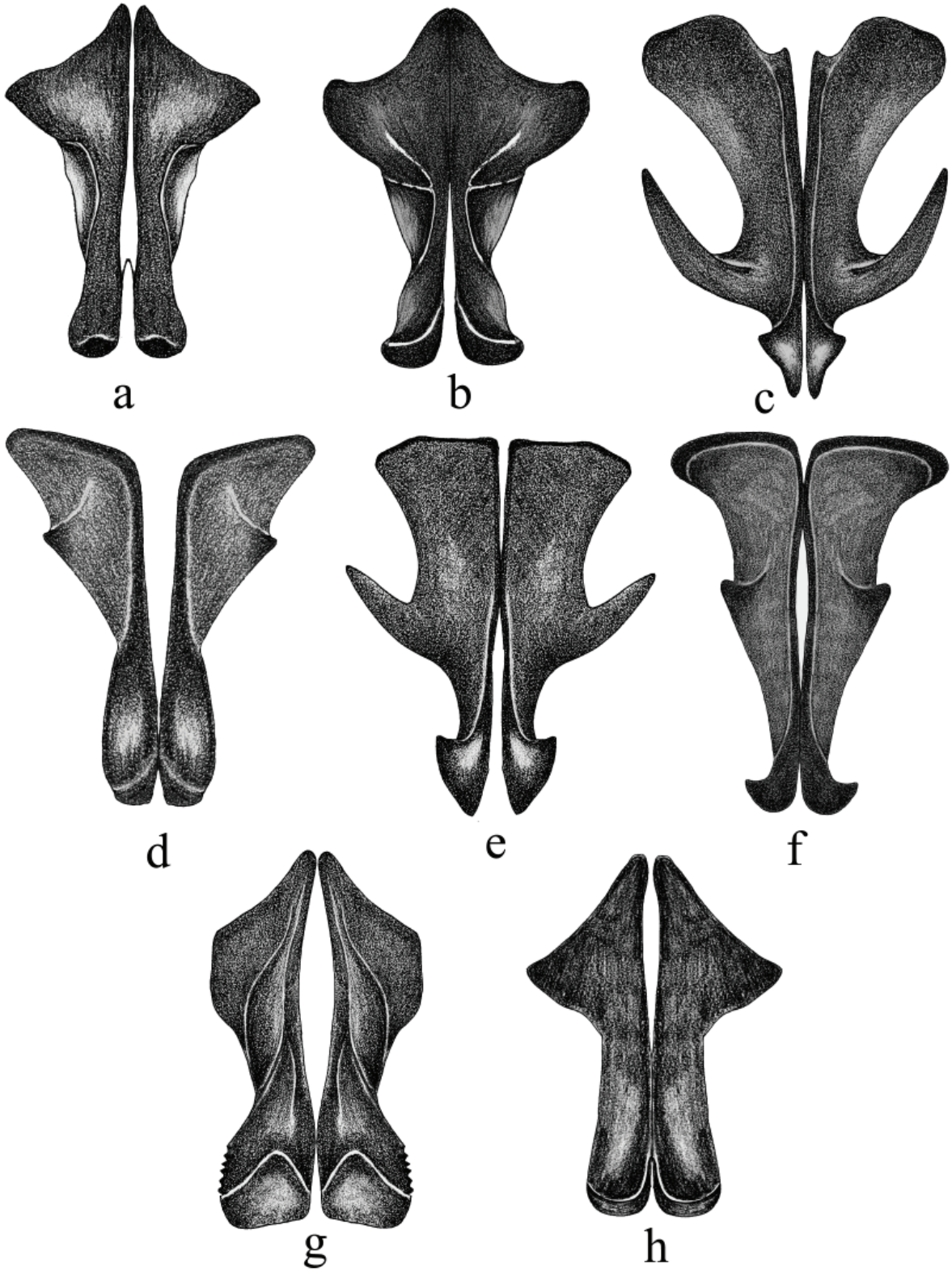

Figure 13. Parameres, anterior view, of *Tomarus* spp. **a)** *T. bidentulus*. **b)** *T. burmeisteri*. **c)** *T. gyas*. **d)** *T. maimon*. **e)** *T. roigjunenti* n. sp. **f)** *T. rosettae*. **g)** *T. spinipenis* n. sp. **h)** *T. villosus*.

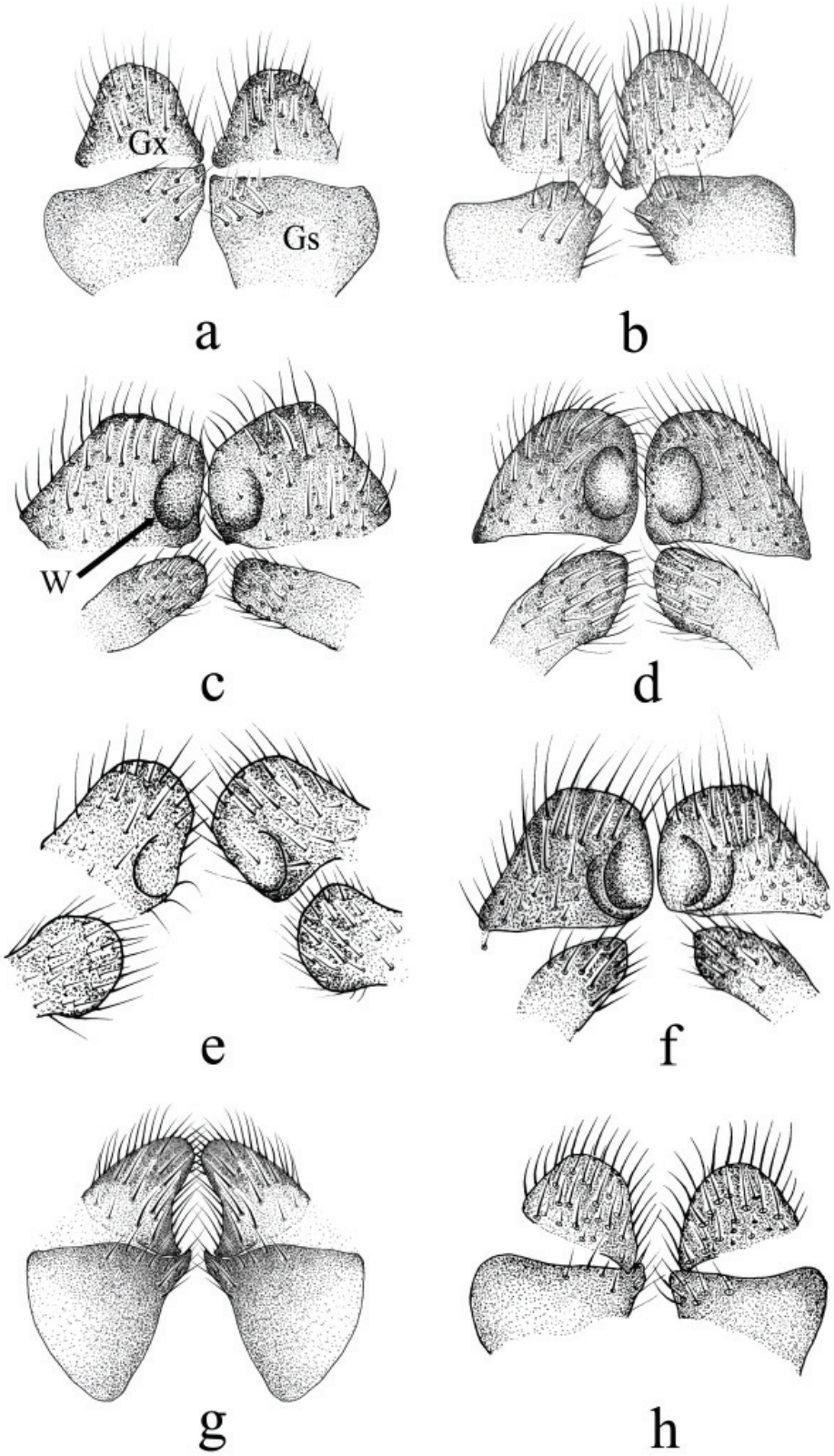

Figure 14. Gonocoxite, ventral view, of *Tomarus* spp. **a)** *T. bidentulus*. **b)** *T. burmeisteri*. **c)** *T. gyas*. **d)** *T. maimon*. **e)** *T. roigjunenti* n. sp. **f)** *T. rosettae*. **g)** *T. spinipenis* n. sp. **h)** *T. villosus*. Components are: (Gx) gonocoxite), (Gs) gonocoxal sternite.

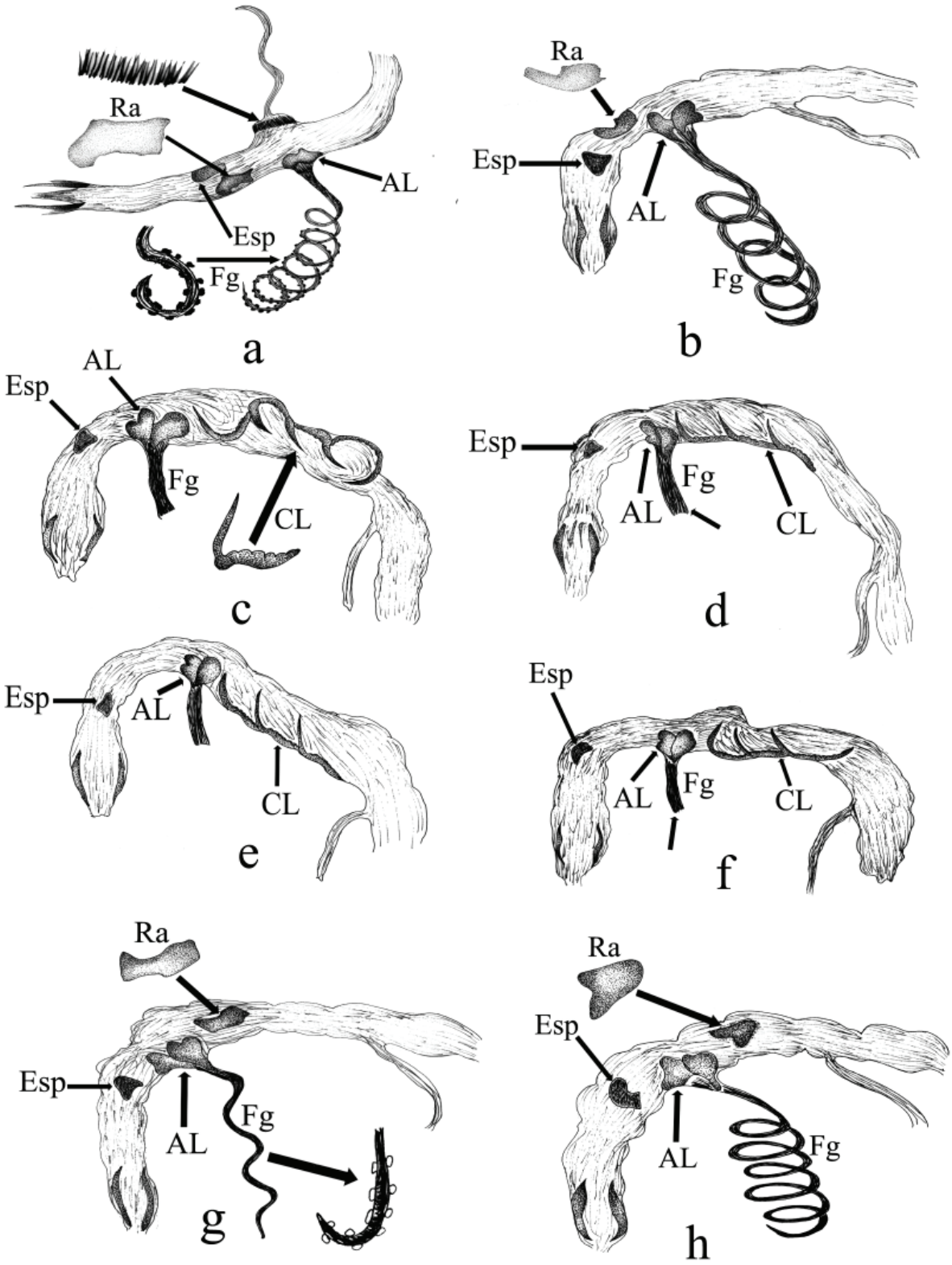

Figure 15. Internal sac of *Tomarus* spp. **a)** *T. bidentulus*. **b)** *T. burmeisteri*. **c)** *T. gyas*. **d)** *T. maimon*. **e)** *T. roigjunenti* n. sp. **f)** *T. rosettae*. **g)** *T. spinipenis* n. sp. **h)** *T. villosus*. Components are: (AL) accessory lamella, (CL) copulatory lamella (CL), (Ra) raspula, (Esp) speculum, and (Fg) a complex, spike-like flagellum that varies in length and thickness.

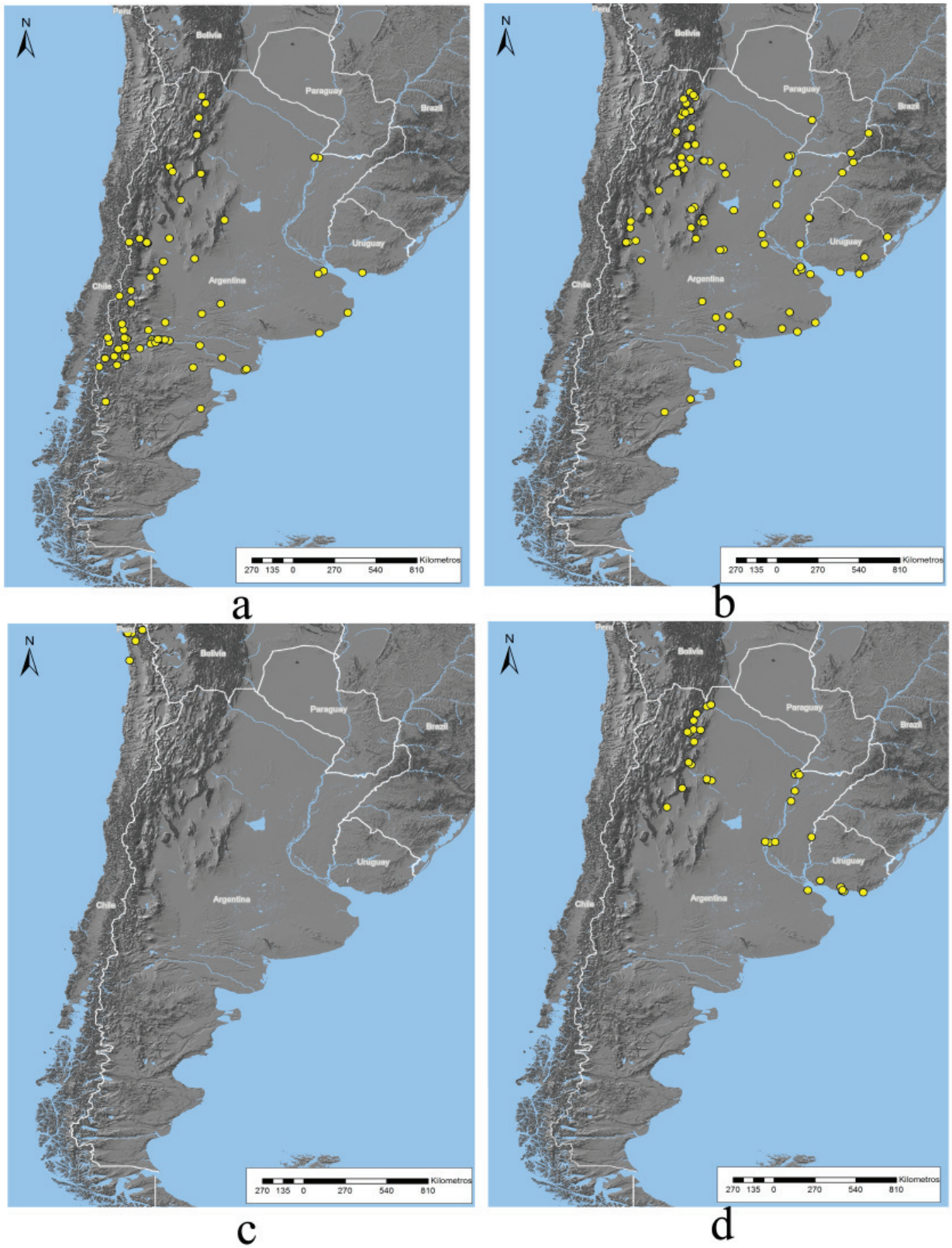

Figure 16. Distribution of *Tomarus* spp. **a)** *T. bidentulus*. **b)** *T. burmeisteri*. **c)** *T. maimon*. **d)** *T. gyas*.

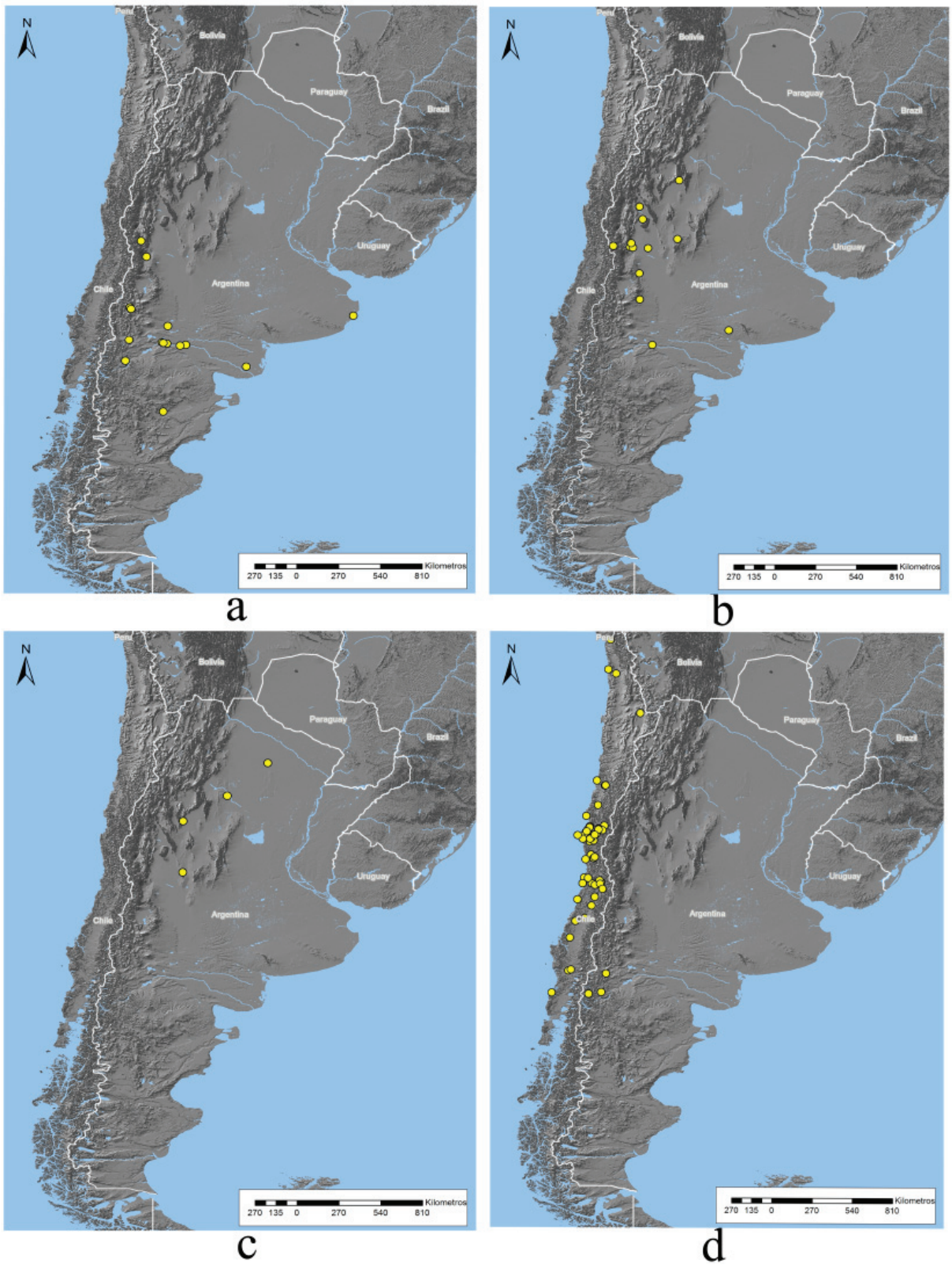

Figure 17. Distribution of *Tomarus* spp. **a)** *T. roigjunenti* n. sp. **b)** *T. rosettae*. **c)** *T. spinipenis* n. sp. **d)** *T. villosus*.

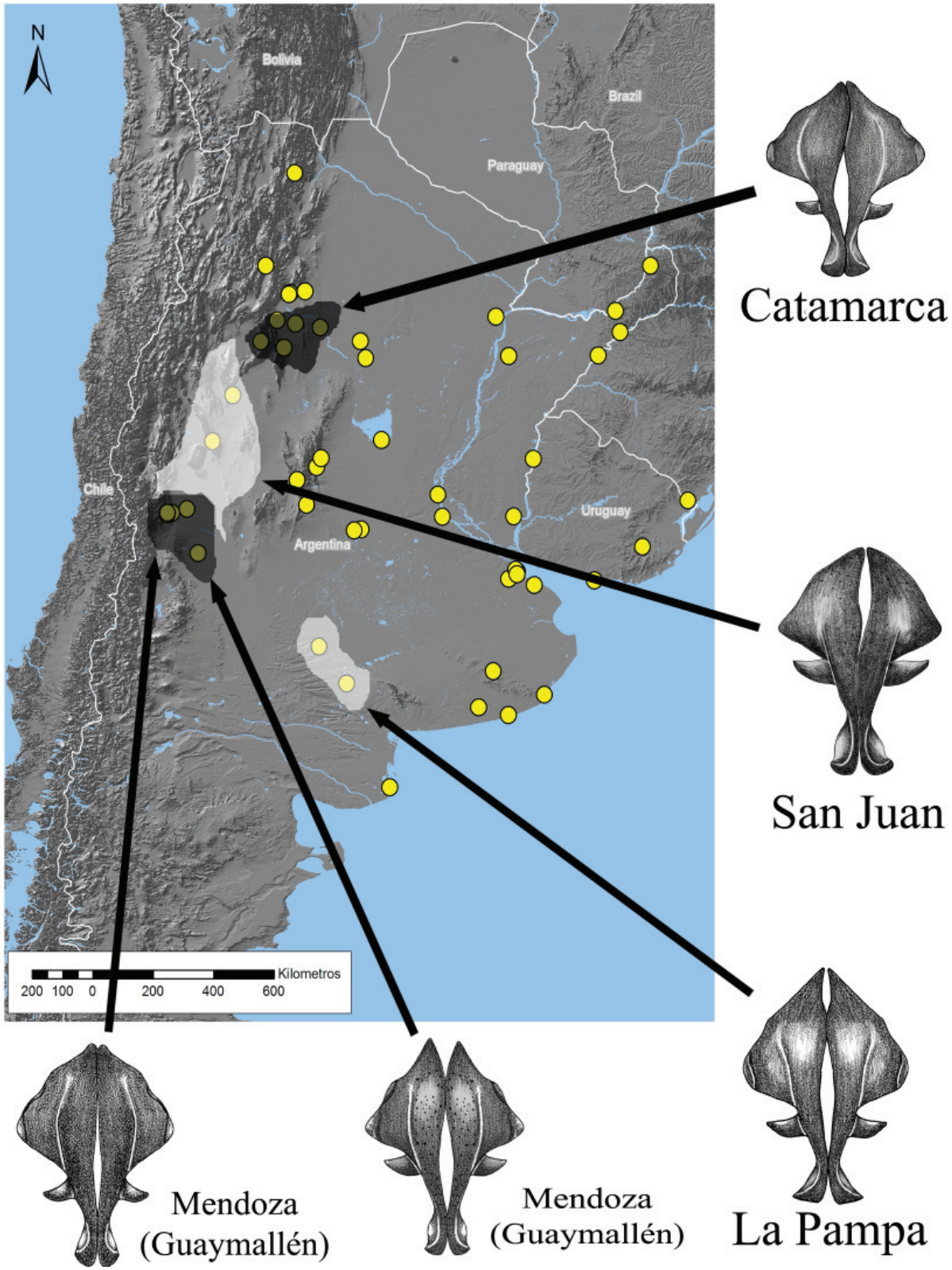

Figure 18. Variation of the parameres, anterior view, of *T. burmeisteri* in Argentina.

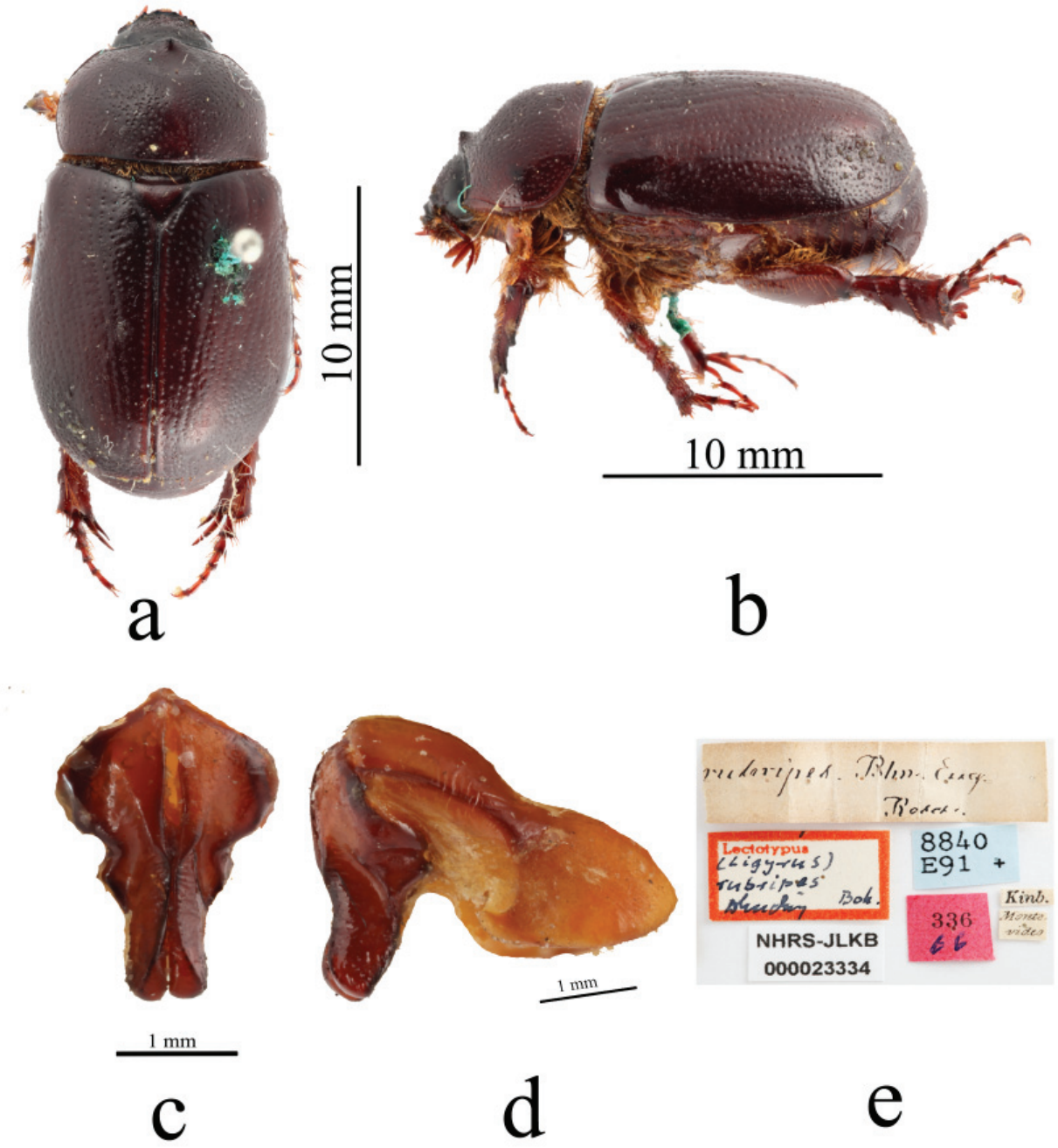

Figure 19. Holotype of *T. rubripes* (Boheman). **a)** Dorsal view. **b)** Lateral view. **c)** Parameres, caudal view. **d)** Parameres, lateral view. **e)** Labels. Photographs courtesy of Johannes Bergsten, NHRS. Made available by NHRS under Creative Commons Attribution 4.0 International Public License (CC-BY 4.0).