



ANIMAL SCIENCE

Taxonomic revision of the Peruvian genus *Pilobaloderes* Kulzer, 1958 (Coleoptera, Tenebrionidae, Pimeliinae, Praociini)

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Abstract: The monotypic genus *Pilobaloderes* Kulzer (Pimeliinae: Praociini), endemic to Peruvian Andes, is revised. Based on examination of recently collected specimens, we describe the female of the type species and a new species, *Pilobaloderes aquilonarius* sp. nov., emphasizing dimorphic and diagnostic characters of the protibiae. A redescription of the genus and its species, with remarks about sexual dimorphism are included. Habitus photographs, illustrations of protibiae, genital features, and a distribution map are also presented.

Key words: Andean taxa, darkling beetles, new species, Peru, *Pilobaloderes aquilonarius*, systematics.

INTRODUCTION

The monotypic genus *Pilobaloderes* was proposed by Kulzer (1958) for a new species *P. gebieni*, described from a single male specimen collected in the Northern Peruvian Andes, and placed within the tribe Nycteliini (Tenebrionidae: Pimeliinae). Flores (2001) transferred this genus and *Praocidia* Fairmaire from Nycteliini to Praociini on the basis of new, constant tribal level characters (e.g. base of mandible twice as thick as the apex, prothorax semi-mobile and distance between meso- and metacoxae exceeding half mesocoxal length).

Praociini is a Neotropical tribe of pimeliine tenebrionids with 149 species arranged in 15 genera endemic to arid and semiarid environments of southern South America (Flores & Pizarro-Araya 2014, Flores & Giraldo 2020). In Peru, Praociini is represented by the following genera: *Parapraocis* Flores & Giraldo, *Pilobaloderes* Kulzer, *Platyholmus* Solier, *Praocidia* Fairmaire and *Praocis* Eschscholtz

(Giraldo & Flores 2016). Of these five genera, *Parapraocis*, *Pilobaloderes* and *Praocidia* are Peruvian endemics (Giraldo & Flores 2016), while the remaining two are also present in Bolivia, Argentina and Chile (Kulzer 1952, Flores & Pizarro-Araya 2014). Species of *Pilobaloderes* are Andean insect taxa, inhabiting the western Andes range (1000–3800 m) and inter-Andean valleys (1500–3300 m) (Giraldo & Flores 2016).

In recent years, we found six additional specimens of *Pilobaloderes*: two males and a female assigned to a new species, recovered from pitfall trapping samples, and two males and a female of *P. gebieni*, housed in Peruvian entomological collections. The objectives of this paper are to describe and illustrate a new species of *Pilobaloderes*, to describe the female of *P. gebieni* and to illustrate its female genitalia. As a result of these findings, the generic diagnosis of the genus is updated.

The present publication is registered in the ZooBank Life Science Identifier with

the following LSID code: urn:lsid:zoobank.org:pub:21906DB3-3E8C-472D-8793-F9E243C078CF.

MATERIALS AND METHODS

Type specimens and material examined are deposited in the following collections:

IADIZA Instituto Argentino de Investigaciones de las Zonas Áridas, Mendoza, Argentina;

MEKRB Museo de Entomología Klaus Raven Büller, Universidad Nacional Agraria La Molina, Lima, Peru;

MUSM Museo Nacional de Historia Natural, Universidad Nacional Mayor de San Marcos, Lima, Peru;

NHMB Natural History Museum, Basel, Switzerland

Body length was measured dorsally, along the midline, from the anterior margin of the labrum to the apex of elytra. Terminology used in the descriptions follows Flores (2001) except that “frontal process” is replaced with epicanthus, “proepisternum” is replaced with hypomeron, and “mesosternum” with mesoventrite (Matthews et al. 2010); in protibiae “external process” is replaced with apical process (Doyen 1984: Fig. 41). Terminology and ratios of male genitalia were taken from Flores (1996), namely basal lamina of tegmen/lateral styles length (B/E) and median lobe/tegmen length (L/T). Terminology of female genitalia and ratio paraproct/coxite length (P/C) were those proposed by Doyen (1994). Following the suggestion of Kaminski et al. (2020) to assess homologies in the morphology of female genitalia, we used characters from a recent study of another genus of Praociini, *Parapraocis* (Flores & Giraldo 2020).

Digital images were taken with a Canon S50 adapted to a Leica MZ6 stereomicroscope. Final images (Figs. 1–9) were montaged with the

image stacking freeware CombineZM (Hadley 2006). Drawings were made with a camera lucida adapted to a stereoscopic microscope (Figs. 10–14).

Label data from separate labels are given verbatim within square brackets and new lines on the same label are separated by a diagonal slash (/). Distribution map (Fig. 15) was prepared using SimpleMappr (Shorthouse 2010). For distribution of the species we used the biogeographic classification of Morrone (2014) and the ecosystems map of MINAM (2018).

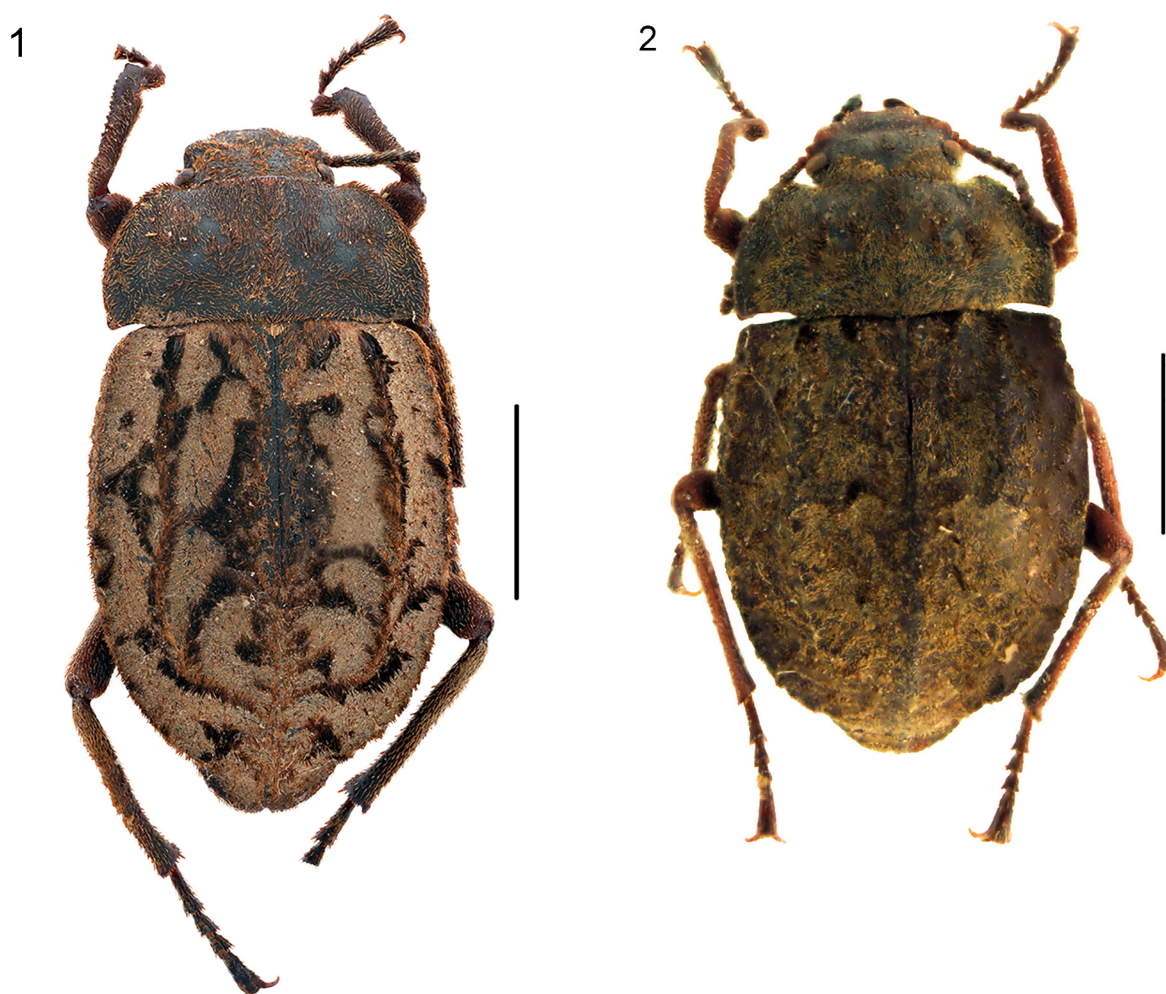
RESULTS

Genus *Pilobaloderes* Kulzer, 1958

Figures 1–15

Pilobaloderes Kulzer, 1958: 192; Flores 2001: 175; Smith *et al.* 2015: 221; Giraldo & Flores 2016: 503, 507. Type species: *Pilobaloderes gebieni* Kulzer, 1958 (by original designation).

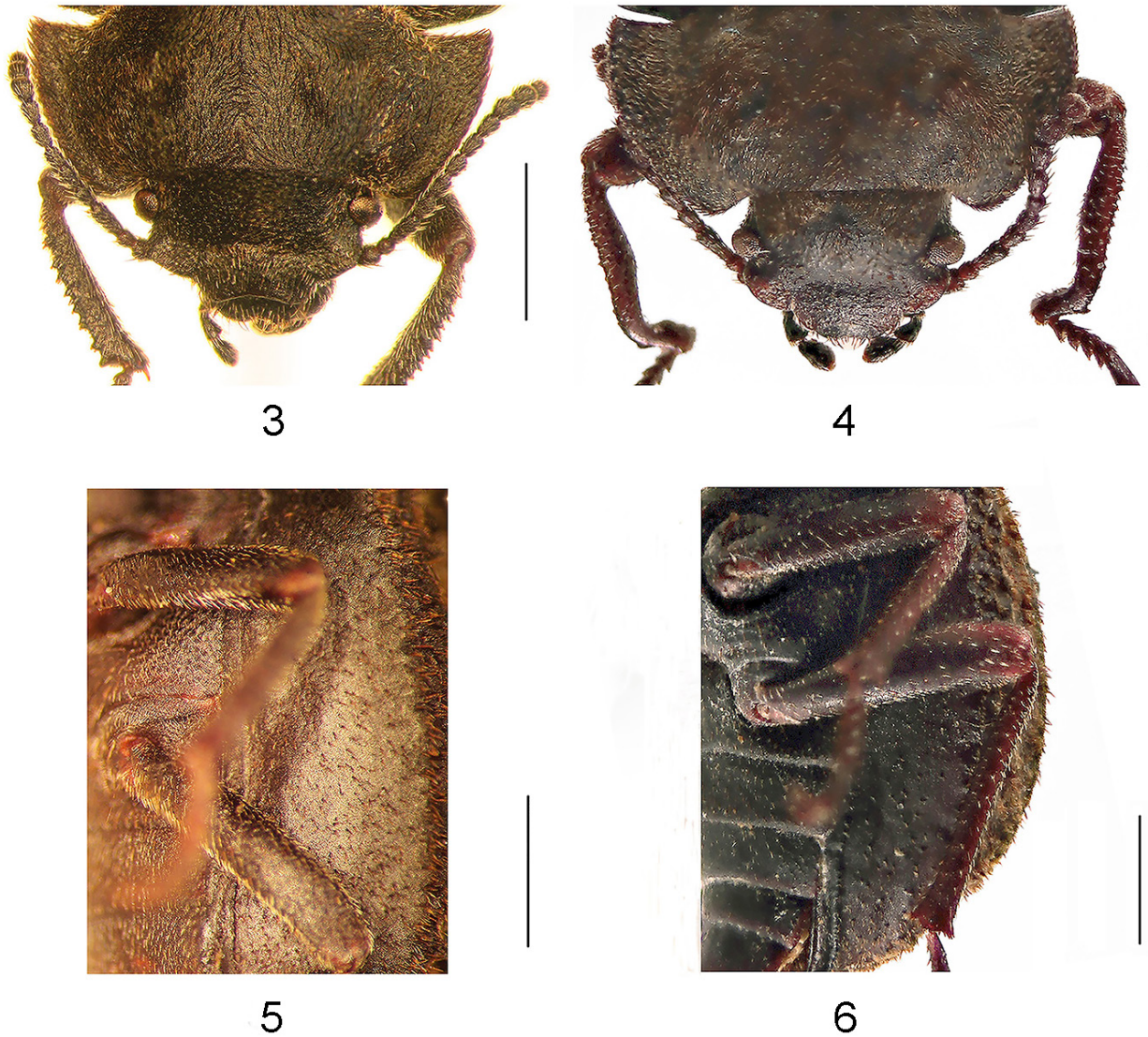
Redescription. Length 7–11 mm. Body black to dark brown, pronotum with black and brown stout setae, elytra with black and brown tomentose patches of erected stout setae and finer decumbent yellowish setae covering all surface (Figs. 1–2). **Head** prognathus; labrum with anterior margin not broadened; clypeal anterior margin extended beyond epicanthus; clypeal suture present as a vertical depression, clypeus and frons at same level (Figs. 3–4); clypeus and frons densely setose; ligula subtrapezoidal, sclerotized and ventrally exposed, exceeding half of mentum area, subequal in width and size to mentum; labial palps inserted at middle of ventral surface of ligula; mentum subtrapezoidal, with long, umbilicate setae; base of mandible twice as thick as the apex; maxillary palps with last segment axe-shaped; eyes oval, prominent, not emarginate near epicanthus; antennae filiform, slightly capitate, reaching posterior margin of pronotum, antennomere



Figures 1-2. Dorsal habitus of *Pilobaloderes* species: 1) *Pilobaloderes gebieni* Kulzer, 1958, holotype (NHMB); 2) *Pilobaloderes aquilonarius* sp. nov., holotype (MEKRB). Scale bars: 2 mm.

3 shorter than 4 + 5 combined, antennomeres 3–9 and 11 longer than wide, antennomere 10 wider than long (Figs. 3–4), apical tomentose sensory patches on antennomere 9 in two areas subequal in size, on antennomere 10 in a semicircle dorsally continuous. **Thorax.** Prothorax semi-mobile; pronotal surface without wrinkles, with very small punctures bearing fine setae, anterior angles rounded, anterior margin concave, lacking carinate edge (Figs. 3–4), lateral margin single, broad, remote from disc, widest behind midpoint, posterior angles acute, width of posterior margin exceeding width of anterior margin, posterior margin of equal width to base of elytra, posterior angles not in

contact with elytra; disc convex; prosternum convex, with carinate edge on anterior margin, not extended over mesoventrite; hypomeron and prosternum with tubercles, hypomeron smooth, lacking grooves; mesoventrite subtrapezoidal, inclined anteriorly, separated from prosternum; mesoventrite, metasternum, mesepisternum and metepisternum with tubercles; scutellar shield triangular, setose; mesocoxal and metacoxal separations not exceeding mesocoxal and metacoxal width; distance between meso- and metacoxae exceeding half mesocoxal length; metacoxal cavity closed laterally by metasternum and abdominal ventrite I. **Elytra** convex; with a single, straight, sinuate, and thick carina, close to



Figures 3-6. Body details of *Pilobaloderes* species: 3-4) head and pronotum, frontal view of *P. gebieni*, female (3) and *P. aquilonarius* sp. nov., holotype male (MEKRB) (4). 5-6) lateral view of elytron, showing pseudopleuron and epipleuron: *P. gebieni* (5) and *P. aquilonarius* sp. nov. (6). Scale bars: 1 mm.

lateral margin, densely covered by setae; suture not raised, higher than carina; lateral margin double, rounded, thick, conspicuous along elytron; pseudopleuron with setae arising from tubercles; epipleuron conspicuous throughout, with carinate edge (Figs. 5-6), anterior margin reaching elytral humeri and posterior angle of pronotum, anterior quarter four times as wide as posterior half; epipleuron and pseudopleuron of similar texture and different to that of dorsal surface. **Abdomen.** Ventrites with tubercles. **Legs.**

Ventral surface of trochanters setose; setae on ventral femoral surface arising from tubercles.

Sexual dimorphism. Male protibiae with distal part curved inward, distal margin equal to 1/3 protibial length, with one spur, without apical process, distal part of inner margin concave, slender than proximal part, inner margin with fine setae, outer margin with short, stout setae, protarsomeres 2-4 as long as wide, tarsi with numerous setae on ventral surface (Figs. 7-8). Female protibiae straight throughout, with two



Figures 7-9. Protibiae of *Pilobaloderes* species, oblique view: 7) *Pilobaloderes gebieni* male, 8) *Pilobaloderes aquilonarius* sp. nov. male, 9) *Pilobaloderes gebieni* female. Abbreviation: s, spur. Scale bars: 1 mm.

spurs longer than in male, without apical process, distal part of inner margin straight, with fine and stout setae, outer margin with stout setae longer than in male, protarsomeres 2–4 wider than long; tarsi with sparse setae on ventral surface (Fig. 9).

Male genitalia (Figs. 10–13). Rods of abdominal sternum IX close at basal third, not inclined dorsally at base. Dorsal membrane of proctiger concave, with two sclerotized areas. Basal lamina of tegmen long ($B/E > 1.0$). Lateral styles of tegmen distally close, apex narrow, widest at base, with setae on lateral margin and with a subapical tuft of setae on ventral surface. Median lobe moderate ($0.75 < L/T \leq 1.00$), sheath-shaped, a half width of lateral styles of tegmen.

Female genitalia (*P. gebieni*; Fig. 14). Spiculum with arms “V”-shaped. Paraprocts glabrous; coxites with setae, divided into two visible lobes: the basal lobe bears oblique baculi and the apical lobe is composed of the fully fused second, third and fourth lobes, which bears lateral gonostyli,

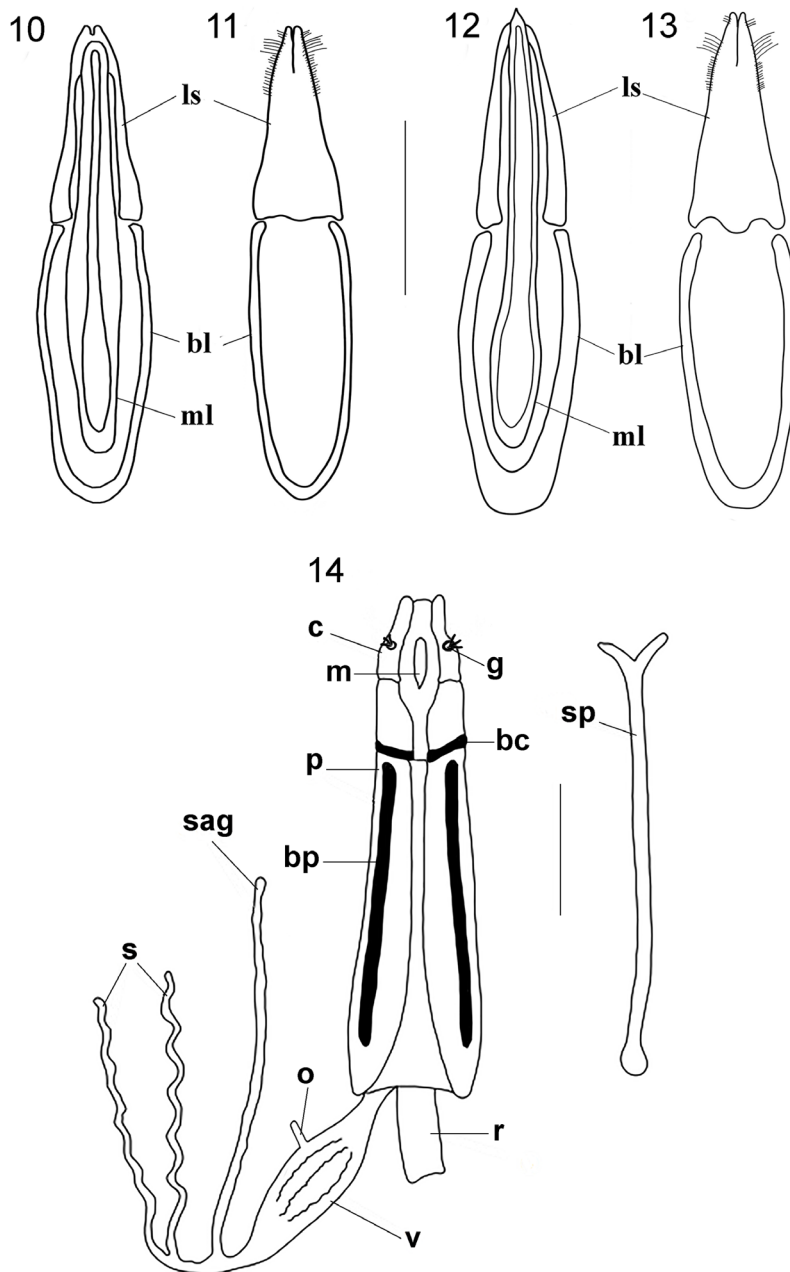
basal lobe of coxite not extended over paraproct, separated from the apical lobe by a transverse pleat and shorter than the apical lobe; midventral sclerite distally broadened. Paraprocts long ($2.0 < P/C \leq 3.0$); proctigeral baculus shorter than paraproct baculus; apicodorsal lobe of proctiger extending about $\frac{1}{2}$ length of coxite. Vagina saccate. Spermathecal accessory gland longer than vagina, with duct not annulate. Spermatheca with two basal tubes as long as vagina, all similar in length, and unbranched.

Distribution. The two known species of the genus *Pilobaloderes* inhabit the northern and central Andean range of Peru (06° – 10° S) (Fig. 15), between 2000 to 4000 m, in the Puna biogeographic province (Morrone 2014).

***Pilobaloderes gebieni* Kulzer, 1958**

Figures 1, 3, 5, 7, 9, 10, 11, 14, 15

Pilobaloderes gebieni Kulzer, 1958: 193 (rev.); Flores 2001: 176 (rev.); Smith *et al.* 2015: 226.



Figures 10-14. Genitalia of *Pilobaloderes* species. Male genitalia, dorsal and ventral views: 10-11) *Pilobaloderes gebieni*; 12-13) *Pilobaloderes aquilonarius* sp. nov. Abbreviations: bl, basal lamina of tegmen, ls, lateral styles of tegmen, ml, median lobe. 14) Female genitalia of *Pilobaloderes gebieni*, ventral view. Abbreviations: bc, baculi of coxite, bp, baculi of paraproct, c, coxite, g, gonostyli, m, midventral sclerite, o, oviduct, p, paraproct, r, rectum, s, spermatheca, sag, spermathecal accessory gland, sp, spiculum, v, vagina. Scale bars: 1 mm.

Redescription. Length 7-11 mm. Body black, antennae and legs dark brown, trochanters light brown (Fig. 1); clypeus with anterior margin concave, lateral margins subparallel, epicanthus subquadrate (Fig. 3); antennae: ratio length antennomeres 4 + 5 combined / length antennomere 3 = 1.23-1.26 (Fig. 3); apical tomentose sensory patch on antennomere 11 on distal third; prosternum with short apophysis; epipleuron

setose; pseudopleuron with setae arising from small tubercles the same size as the diameter of each seta (Fig. 5); ventral femoral surface densely setose (Fig. 5); tibiae with all surfaces densely setose, male protibiae with distal third of inner margin concave and internal surface velvet-like (Fig. 7); female protibiae straight throughout, with two spurs longer than in male (Fig. 9). **Male genitalia.** Lateral styles of tegmen with proximal

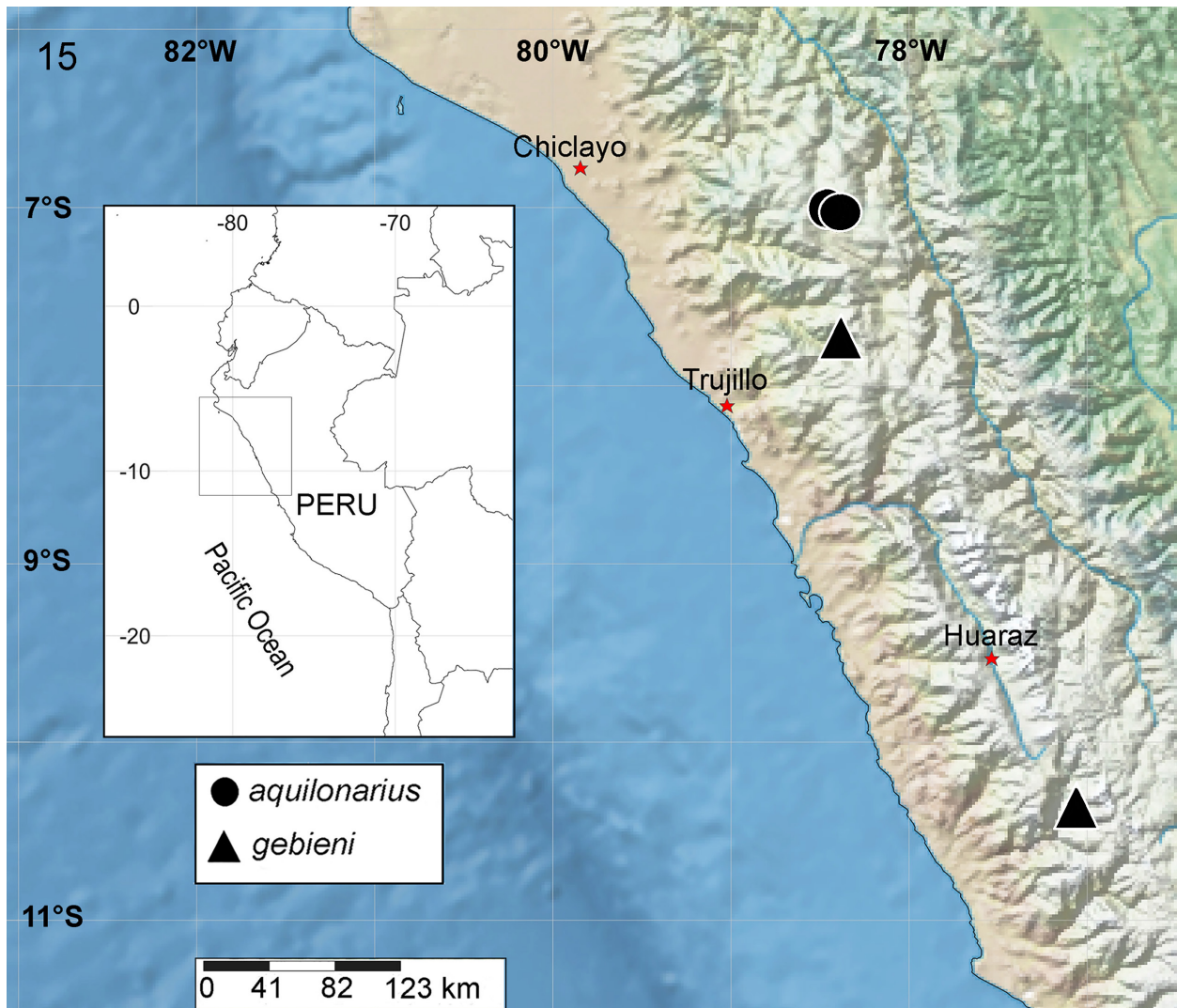


Figure 15. Distribution map of *Pilobaloderes* species.

margin slightly bisinuate; median lobe with apex rounded (Figs. 10–11). **Female genitalia:** see generic description.

Type material. Holotype, male: [PERU/ Prov. Otuzco/ Choquisongó/ 2100 m/ G.A. Baer, III-1900] [Holotypus/ *Praocidia* (Sic)/ *gebieni* nov./ det. H. Kulzer 1957] (NHMB) (Fig. 1). Note: the correct spelling of the locality is Chuquisongó.

Other material examined. Peru: Lima, Cajatambo, Copa Puquián, 10°24'41.65"S, 77°04'9.05"W, 2254 m, 31-III-2015, P. Ancajima (1 male, 1 female MUSM, 1 male IADIZA).

Distribution. Known from the type locality at Otuzco province (2100 m) and also from Cajatambo province (2254 m), in Andean scrub of the northern and central Peruvian Andes (MINAM 2018) (Fig. 15).

***Pilobaloderes aquilonarius* sp. nov.**

Figures 2, 4, 6, 8, 12, 13, 15

ZooBank Life Science Identifier (LSID) - urn:lsid:zoobank.org:act:F5F3D6C6-1FE0-4958-9460-33EF019D76DC

Diagnosis. This new species may be distinguished within *Pilobaloderes* by the

following combination of characters: clypeus with anterior margin U-shaped, epicanthus rounded (Fig. 4); apical tomentose sensory patch on antennomere 11 on distal half; pseudopleuron with setae arising from large tubercles twice than diameter of each seta (Fig. 6).

Description. Length 7–9 mm. Pronotum and anterior half of elytra black, antennae, femora, and posterior half of elytra dark brown, tibiae and trochanters light brown (Fig. 2); clypeus with anterior margin U-shaped, lateral margins concave, epicanthus rounded (Fig. 4); antennae: ratio length antennomeres 4 + 5 combined / length antennomere 3 = 1.45 (Fig. 4); apical tomentose sensory patch on antennomere 11 on distal half; prosternum without apophysis; epipleuron glabrous; pseudopleuron with setae arising from large tubercles twice than diameter of each seta (Fig. 6); ventral femoral surface with sparse setae (Fig. 6); tibiae with sparse setae, male protibiae with distal half of inner margin concave, with a row of setae on dorsal margin and remaining surface glabrous (Fig. 8); female protibiae straight throughout, with two spurs longer than in male. **Male genitalia.** Lateral styles of tegmen with proximal margin strongly bisinuate; median lobe with apex pointed (Figs. 12–13).

Type material. Holotype, male: [Peru: Cajamarca, Cajamarca/ La Encañada 3640 m/ 07°00'58.68"S 78°23'56.13"W / A. Giraldo leg. III-2012] [*Pilobaloderes/ aquilonarius* n. sp./ HOLOTYPUS male / det. G. Flores and/ A. Giraldo 2020] (MEKRB) (Fig. 2). Allotype, female (MEKRB) and one paratype male (IADIZA): [Peru: Cajamarca, Cajamarca/ La Encañada 4009 m/ 06°59'34.59"S 78°28'37.63"W/ C. Fuentes leg. VII-2015].

Etymology. The specific epithet is a Latin adjective meaning northern, referring to the fact that this species represents the northernmost distribution of the genus.

Distribution. Only known from La Encañada district, Cajamarca province (3640–4000 m), covered with Andean scrub (MINAM 2018) (Fig. 15).

DISCUSSION

The genus *Pilobaloderes* is an interesting Peruvian endemic, whose scarce number of known specimens stems from both apparently small populations and scarce collection efforts in Andean ecosystems. Together with *Pilobaloderes*, the genera *Platyholmus* and *Praocidia* and subgenera *Filotarsus* Gay & Solier, *Orthogonoderes* Gay & Solier and *Praocida* Flores & Pizarro-Araya comprise the Peruvian Andean Praociini fauna, inhabiting grasslands and scrubs in Western Andes range (1000 m – 3800 m), inter-Andean valleys (1500 m – 3300 m), and high plateaus or “Puna” (3800 m – 5000 m) (Smith et al. 2015, Giraldo & Flores 2016). Patterns of species distribution and endemism for these taxa are becoming better known with recent published works (Flores 2001, Flores & Pizarro-Araya 2014; this paper).

Kulzer (1958) noted the remarkable distally inward-curved protibiae in the holotype male of *Pilobaloderes gebieni* and the lack of an apical process, with only one apical spur (Flores 2001: Fig. 6). These features are unique among genera of Praociini (Flores 2001) and are also confirmed in the males examined here, the holotype of the new species *P. aquilonarius* (Fig. 8) and two males of *P. gebieni* (Fig. 7).

In this study we examined for the first time female specimens of *Pilobaloderes* and we found that there are many features in protibiae indicating sexual dimorphism (Figs. 7–9). In females the protibia has two apical spurs as well as in males and females of remaining genera of Praociini; curvature and fine setae on internal surface in protibiae are exclusive

to males (Figs. 7–8) while female specimens have protibiae straight with fine and stout setae (Fig. 9). Additionally, there are also differences between both sexes in protarsomeres 2–4 and setae on ventral surface of all tarsi: male with protarsomeres 2–4 as long as wide, tarsi with numerous setae on ventral surface (Figs. 7–8); female with protarsomeres 2–4 wider than long, tarsi with sparse setae on ventral surface (Fig. 9).

Pilobaloderes aquilonarius sp. nov. differs from *P. gebieni* by having the clypeus with a U-shaped anterior margin, epicanthus rounded (Fig. 4), epipleuron glabrous, pseudopleuron with setae arising from large tubercles twice than diameter of each seta, ventral femoral surface with sparse setae (Fig. 6), male protibiae with distal half of inner margin concave, with a row of setae on dorsal margin and remaining internal surface glabrous (Fig. 8), while *Pilobaloderes gebieni* has the clypeus with a concave anterior margin, epicanthus subquadrate (Fig. 3), epipleuron setose, pseudopleuron with setae arising from small tubercles the same size as the diameter of each seta, ventral femoral surface densely setose (Fig. 5), male protibiae with distal third of inner margin concave and internal surface velvet-like (Fig. 7).

Acknowledgments

We gratefully acknowledge Eva Sprecher (NHMB) and Diana Silva (MUSM) for loaning specimens and two anonymous reviewers for suggestions improving this paper. Research by GEF was supported by CONICET, Argentina and NSF DEB-1754630. We are indebted to Victor M. Diéguez M. to make the arrangement for the specimens loan of *P. gebieni* from Museo Nacional de Historia Natural (Lima).

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How to cite

FLORES GE & GIRALDO-MENDOZA AE. 2023. Taxonomic revision of the Peruvian genus *Pilobaloderes* Kulzer, 1958 (Coleoptera, Tenebrionidae, Pimeliinae, Praociini). *An Acad Bras Cienc* 95: e20201262. DOI 10.1590/0001-3765202320201262.

*Manuscript received on August 7, 2020;
accepted for publication on January 6, 2021*

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Author contributions

GEF and AEGM performed morphological studies on adult specimens, were in charge of illustrations and took part on the preparation of the manuscript.

