

Taxonomic status of *Parapraocis*, a new genus of Praociini (Coleoptera: Tenebrionidae: Pimeliinae) from Peru

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Estatus taxonómico de *Parapraocis*, un nuevo género de Praociini (Coleoptera: Tenebrionidae: Pimeliinae) de Perú

RESUMEN. Se describe el nuevo género *Parapraocis* (Pimeliinae: Praociini) para ubicar tres especies de la costa norte del Perú previamente incluidas en el género *Praocis* Eschscholtz: *Parapraocis vagecostata* (Fairmaire, 1902) n. comb. (especie tipo), *Parapraocis rossi* (Kulzer, 1958) n. comb. y *Parapraocis fumaria* (Kulzer, 1966) n. comb. Se presentan el diagnóstico, la descripción e ilustraciones de la morfología externa, genitalia masculina y femenina, y fotografías de *habitus* para dos de sus especies. También se incluye una discusión sobre la designación de este nuevo género, así como homologías en la morfología de los genitales femeninos de Praociini.

PALABRAS CLAVE. Genitalia femenina. Nomenclatura. Praociini. Sistemática. Sudamérica.

ABSTRACT. The new genus *Parapraocis* (Pimeliinae: Praociini) is described to accommodate three species from the northern Peruvian coast previously placed in the genus *Praocis* Eschscholtz: *Parapraocis vagecostata* (Fairmaire, 1902) n. comb. (type species), *Parapraocis rossi* (Kulzer, 1958) n. comb., and *Parapraocis fumaria* (Kulzer, 1966) n. comb. Diagnosis, description and illustrations of external morphology, male and female genitalia, and habitus photographs for two of its species are presented. A discussion on the raising of this new genus as well as homological structures in the female genitalia of the Praociini are also included.

KEYWORDS. Female genitalia. Nomenclature. Praociini. South America. Systematics.

INTRODUCTION

Praociini is an endemic Neotropical tribe of Pimeliinae with 149 species arranged in 14 genera distributed in arid and semiarid environments of Peru, Bolivia, Argentina, and Chile (Kulzer, 1958; Flores & Pizarro-Araya, 2012). *Praocis* Eschscholtz is the most species-rich genus of the tribe with 77 species and eight subspecies arranged in nine subgenera, distributed from northern Peru to the southern part of Patagonia in Argentina and Chile (Flores & Pizarro-Araya, 2014).

Examination of species of all subgenera of *Praocis*

(*sensu* Kulzer, 1958) allowed Flores & Pizarro-Araya (2012) to define the genus *Praocis* on the basis of five constant character states. Additionally, Flores & Pizarro-Araya (2012) excluded from *Praocis* the subgenus "*Parapraocis*" proposed by Kulzer (1958), because at least six characters are not fitting with *Praocis*.

At that time, Flores & Pizarro-Araya (2012) suggested that the six subgenera of *Praocis* proposed by Kulzer (1958) were nomenclaturally available names, but Kulzer had failed because he did not characterize his new subgenera, nor designate type species. In a subsequent study, Flores & Pizarro-Araya (2014) were advised by

Patrice Bouchard (Editor) on this situation and they made available for the first time five subgenera of *Praocis* which were previously proposed in Kulzer (1958): *Mesopraocis* Flores & Pizarro-Araya, *Postpraocis* Flores & Pizarro-Araya, *Hemipraocis* Flores & Pizarro-Araya, *Praonoda* Flores & Pizarro-Araya, and *Praocida* Flores & Pizarro-Araya. However, the subgenus "Parapraocis" previously excluded from *Praocis* (Flores & Pizarro-Araya, 2012) was not treated by Flores & Pizarro Araya (2014) and therefore, is still in an uncertain nomenclatural status. Although Flores & Pizarro-Araya (2012) had selected a type species for "Parapraocis" they did not explicitly mention that they were establishing a new nominal taxon, a mandatory requirement for all new names published after 1999 (ICZN 1999: Article 16.1). Therefore, the name cannot be attributed to them and it is still a *nomen nudum*.

The objective of this study is formally to describe *Parapraocis* as a new genus within the tribe Praociini using characters from external morphology and genital features and to designate its type species in order to make available the name proposed by Kulzer (1958).

MATERIAL AND METHODS

This study is based on examination of specimens borrowed from the following collections and curators: Field Museum of Natural History, Chicago, USA (FMNH, Alfred Newton, Margaret Thayer), Instituto Argentino de Investigaciones de las Zonas Áridas, Mendoza, Argentina (IADIZA, Sergio Roig-Juñent), Natural History Museum, Basel, Switzerland (NHMB, Eva Sprecher), Museo de Entomología Klaus Raven Büssler – Universidad Nacional Agraria La Molina, Lima, Peru (MEKRB, Clorinda Vergara), Museo Nacional de Historia Natural – Universidad Nacional Mayor de San Marcos, Lima, Peru (MUSM, Luis Figueroa) and Servicio Nacional de Sanidad Agraria, Lima, Peru (SENASA, Graciano Tejada).

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 recent papers dealing with Praociini genera (Flores & Pizarro-Araya, 2012, 2014) except that "lateral expansion of frons" is replaced with "epicanthus", "proepisternum" is replaced with hypomeron and "mesosternum" with mesoventrite (Matthews et al., 2010). Dissection methods are those used by Tschinkel & Doyen (1980) for genital structures. Terminology of male genitalia was taken from Flores (1996). For basal lamina of tegmen/lateral styles length (B/E), and median lobe/tegmen length (L/T) we used the ratios proposed by Flores (1996). Terminology and ratios of female genitalia are those proposed by Tschinkel & Doyen (1980) and Doyen (1994). Following the suggestion of Kaminski et al. (2020) to assess homologies in the morphology of female genitalia, we compared the female genitalia of this new genus with previous studies

in other genera of Praociini (Flores, 2000a, 2000b, 2004; Flores & Chani-Posse, 2005; Flores & Vidal, 2009; Flores & Pizarro-Araya, 2012).

Digital images were taken with a Canon S50 adapted to a Leica MZ6 stereomicroscope. Final images (Figs. 1-5) were montaged with the image stacking freeware CombineZM (Hadley, 2006).

RESULTS

Parapraocis Flores & Giraldo gen. nov. (Figs. 1-8)

Type species

Praocis vagecostata Fairmaire, 1902, present designation.

Etymology

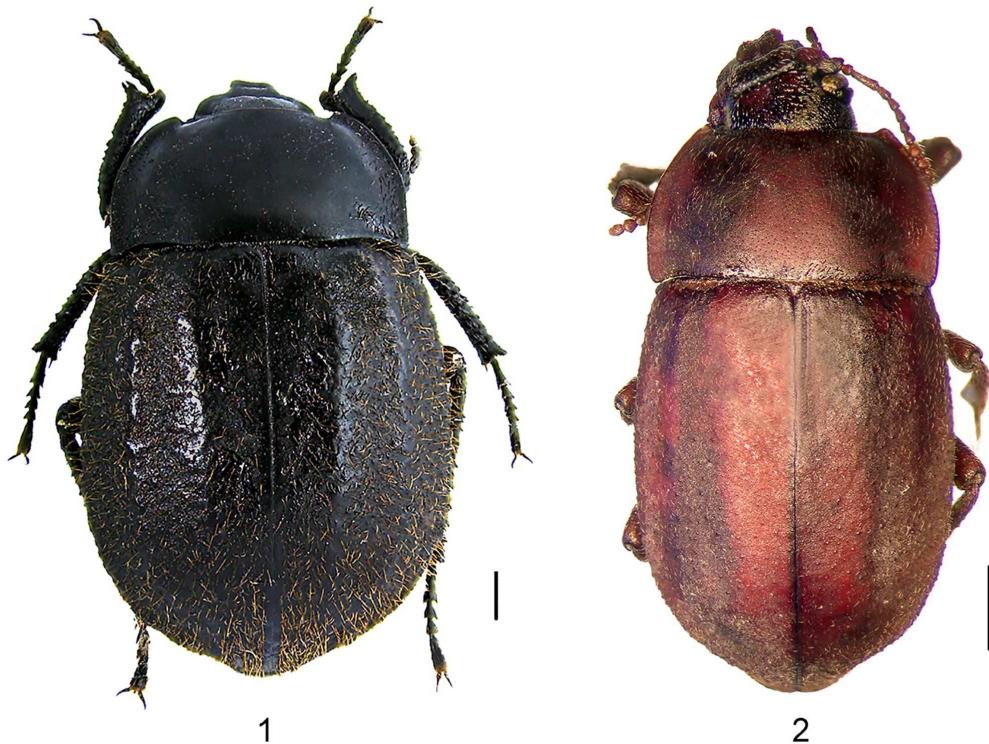
The name refers to morphological affinity, *Para* = close, nearby and from *Praocis*, pertaining to the tribe Praociini; gender masculine.

Diagnosis

Length 7.2-13.6 mm; habitus oval, convex; dorsal surface with short setae. Body, antennae and legs black, dark brown to reddish (Figs. 1-2). Recognized among other Praociini by the following combination of characters: maxillary palps with last segment subcylindrical (apex 1.5 times as wide as base), clypeal suture as a horizontal groove covered by frons, antennomere 3 longer than 4 + 5 combined (Figs. 2-3), tomentose sensory patches on antennomere 9 in two areas, on antennomere 10 in a semicircle dorsally continuous, on antennomere 11 on distal half (Fig. 3); pronotum with lateral margin double, not expanded, contiguous with disc (Fig. 3), and anterior angles acute; prosternum with edge on anterior margin; hypomeron smooth (Fig. 3).

Description

Head. Prognathus (Fig. 4); labrum with anterior margin concave, not broadened; clypeal anterior margin concave, extended beyond epicanthus, width of anterior margin not exceeding half the interocular width; clypeal suture as a horizontal groove covered by frons, clypeus lower than frons; clypeus with large and small punctures, with setae arising only from large ones, frons with large punctures bearing umbilicate setae; 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 umbilicate setae; base of mandible twice as thick as the apex; maxillary palps with last segment subcylindrical; eyes oval, not emarginate near epicanthus (Figs. 2-3), postgenal margin well developed, covering posterior margin of eye (Fig. 2); antennae filiform, slightly capitate, antennomere 3 longer than 4 + 5 combined, antennomeres 3-9 and 11 longer than broad,



Figs. 1-2. Dorsal habitus of *Parapraocis* species. 1. *Parapraocis vagecostata* (Fairmaire) habitus. 2. *Parapraocis rossi* (Kulzer) habitus, paratype NHMB. Scale bars: 1 mm.

antennomere 10 broader than long (Figs. 2-3), apical tomentose sensory patches on antennomere 9 in two areas, internal larger than external, on antennomere 10 in a semicircle dorsally continuous, on antennomere 11 on distal half (Fig. 3).

Thorax. Prothorax semi-mobile; pronotum lacking wrinkles, with small punctures from which arise finer setae; anterior angles acute, anterior margin concave, lacking edge (Figs. 1-2) lateral margin double with a row of setae between both margins (Fig. 3), not expanded, contiguous with disc, width of posterior margin exceeding width of anterior margin, posterior margin of equal width to base of elytra, posterior angles not overlapping elytral humeri (Figs. 1-2); disc slightly convex; prosternum horizontal, with a narrow, well defined edge on anterior margin (Fig. 5), broadened below gula, prosternal process rounded forming a straight angle, not produced backwards (Fig. 5); hypomeron lacking punctures, protuberances or grooves, with normal setae (Fig. 3); mesoventrite subtrapezoidal, inclined anteriorly, separated from prosternum; mesepisternum and metepisternum with protuberances and setae arising on protuberances; scutellum triangular.



Fig. 3. *Parapraocis vagecostata*, left antenna and lateral margin of pronotum. Scale bar: 1 mm.

Elytron convex, lacking punctures, with protuberances (Figs. 1-2), dorsal surface clothed with two kinds of sparse, golden setae, one stout, arising on protuberances, the other finer, arising on the surface; with two slightly elevated carinae equidistant between elytral suture and lateral margin, intervals wider than carinae (Figs. 1-2); suture not elevated, higher than lateral carina; lateral margin single, broad, conspicuous throughout elytron; epipleuron conspicuous throughout, with edge, wider in anterior quarter, anterior margin reaching elytral humeri and posterior angle of pronotum (Figs. 4-5); pseudopleuron and epipleuron lacking punctures, with protuberances, pilosity and texture similar to that of elytra (Figs. 4-5).

Legs. Mesocoxal and metacoxal separations not exceeding mesocoxal and metacoxal width; distance between meso- and metacoxae exceeding half mesocoxal length (Fig. 5); metacoxal cavity closed laterally by metasternum and abdominal sternum 3; ventral surface of trochanters with sparse setae; femora with sparse setae on all surfaces, ventral surface of femora smooth and glabrous (Fig. 5); protibiae explanate (Fig. 1), all tibiae with sparse setae and outer margin with stout setae, all femora longer than tibiae (Fig. 5); ventral surface of tarsi bearing abundant setae.

Abdomen. Ventrites I-IV: central area with small and dense protuberances lacking setae giving rough appearance, lateral areas with small punctures each bearing a fine seta; ventrite V: central-anterior area with small and dense protuberances lacking setae, lateral and posterior marginal areas with large punctures each bearing a stout seta.

Male genitalia (Figs. 6-7). Rods of abdominal sternum IX close at basal third, not inclined dorsally at base. Basal lamina of tegmen short ($B/E \leq 1.0$), base concave (Fig. 6). Lateral styles of tegmen distally separated, apex wider, widest at base, with proximal margin slightly bisinuate, with setae on distal 1/4 of ventral surface, and with two apical tomentose patches of short setae (Fig. 7). Median lobe moderate ($0.75 \leq L/T \leq 1.00$), sheath-shaped, a half width of lateral styles of tegmen, with apex rounded, proximally widened (Fig. 6).

Female genitalia (Fig. 8). Spiculum with arms "V"-shaped. Paraprocts with setae; coxites with long setae, basal lobe of coxite not extended over paraproct, midventral sclerite distally broadened, gonostyli present, in lateral position. Paraprocts moderate ($1.2 \leq P/C \leq 2.0$); baculi of coxite oblique; proctiger baculus longer than paraproct baculus; apicodorsal lobe of proctiger extending about 1/4 length of coxite. Vagina saccate, expanded. Spermathecal accessory gland longer than vagina, with duct not annulate. Spermatheca with basal tubes shorter than vagina, all similar in length.

Species included. *Parapraocis* includes three species inhabiting northern Peru previously placed in

the genus *Praocis*: *Parapraocis vagecostata* (Fairmaire, 1902) n. comb. (type species), *Parapraocis rossi* (Kulzer, 1958) n. comb., and *Parapraocis fumaria* (Kulzer, 1966) n. comb.

Material examined

Parapraocis vagecostata (Fairmaire, 1902): Peru: La Libertad, Pacasmayo, Jequetepeque, Hacienda Talambo, 18-III-1935, J. Lamas (2 SENASA), Llama Chota, 07-III-1935, J. Lamas (1 SENASA). Lambayeque, Chiclayo, Hacienda Pomalca, 01-IV-1967, S. Paz Lamas (2 MEKRB), Oyotun, 16-IX-2009, L. Huerto (1 MUSM); Lambayeque, South of Motupe, 11-12-VIII-1977, L.E. Peña (15 FMNH, 3 IADIZA). *Parapraocis rossi* (Kulzer, 1958): Paratype: Peru: Ancash, Santa, Samanco, 22 miles North of Casma, 24-III-1951, Ross & Michelbacher (1 NHMB); La Libertad, Pacasmayo, Jequetepeque, Hacienda Talambo, 06-III-1935, J. Lamas (3 SENASA).

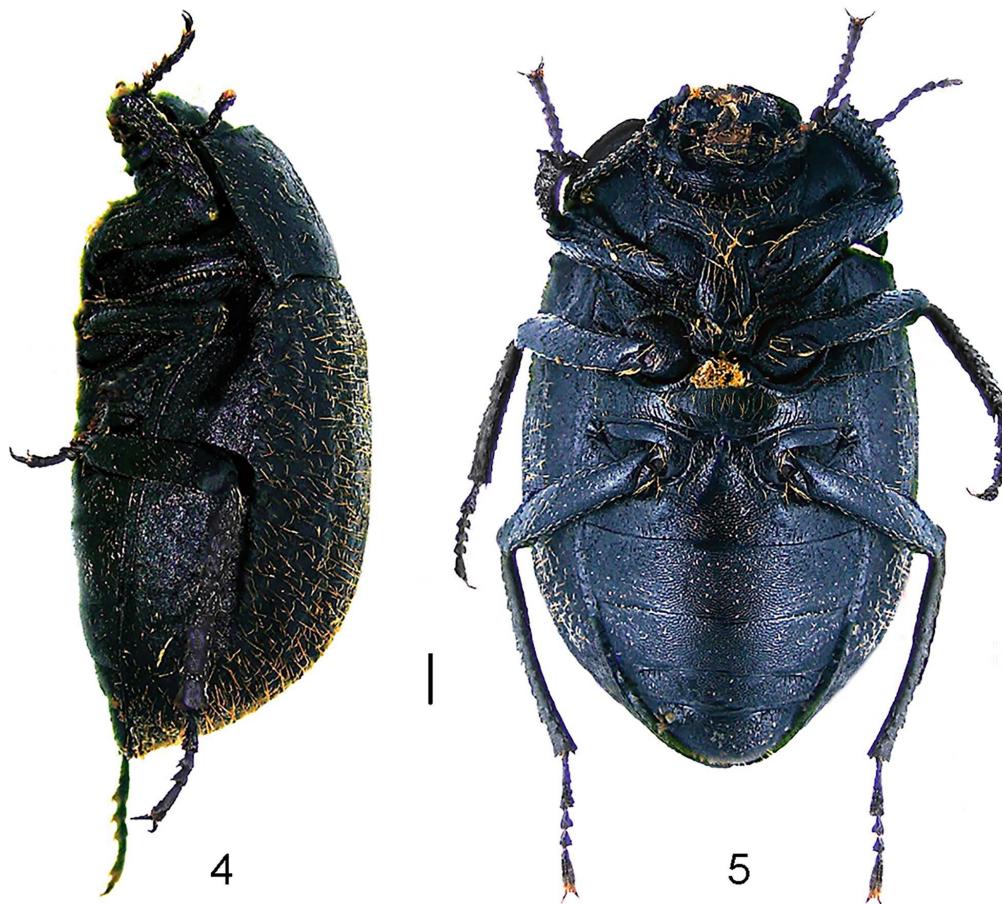
This article has been registered in the Official Register of Zoological Nomenclature (ZooBank) as [urn:lsid:zoobank.org:pub:95F2F54A-4439-4FED-94CA-6DE2874A5725

DISCUSSION

The genus *Praocis* was defined by Flores & Pizarro-Araya (2012) on the basis of five constant character states: maxillary palps with last segment axe-shaped (apex twice as wide as base), antennomere 3 shorter than 4 + 5 combined, pronotum with single lateral margin slender, expanded, remote from disc, and anterior angles rounded. These character states are shared by species of the nine current subgenera of *Praocis* (*sensu* Flores & Pizarro-Araya, 2012) and some of them were mentioned in previous revisions (Solier, 1840; Kulzer, 1958).

We could not study specimens of *P. fumaria*. The present examination of *P. vagecostata* and *P. rossi* specimens as well as the study of the description of *P. fumaria* (Kulzer, 1966) led us to conclude that these species must be excluded from *Praocis* because the following character states are not fitting with the current definition of this genus (*sensu* Flores & Pizarro-Araya, 2012): maxillary palps with last segment subcylindrical (apex 1.5 times as wide as base), antennomere 3 longer than 4 + 5 combined, pronotum with lateral margin double, not expanded, contiguous with disc, and anterior angles acute. Because the second- and third-character states are unique within Praociini genera, we have recognized *Parapraocis* as a separate genus including the aforementioned three species. Taking into account the new status of *Parapraocis*, the Praociini tribe currently includes 15 genera.

Comparison of female genitalia of *Parapraocis* with other genera of Praociini (Flores, 2000a, 2000b, 2004; Flores & Chani-Posse, 2005; Flores & Vidal, 2009; Flores & Pizarro-Araya, 2012), deserves two



Figs. 4-5. *Parapraocis vagecostata* (Fairmaire). 4. Lateral view. 5. Ventral view. Scale bar: 1 mm.

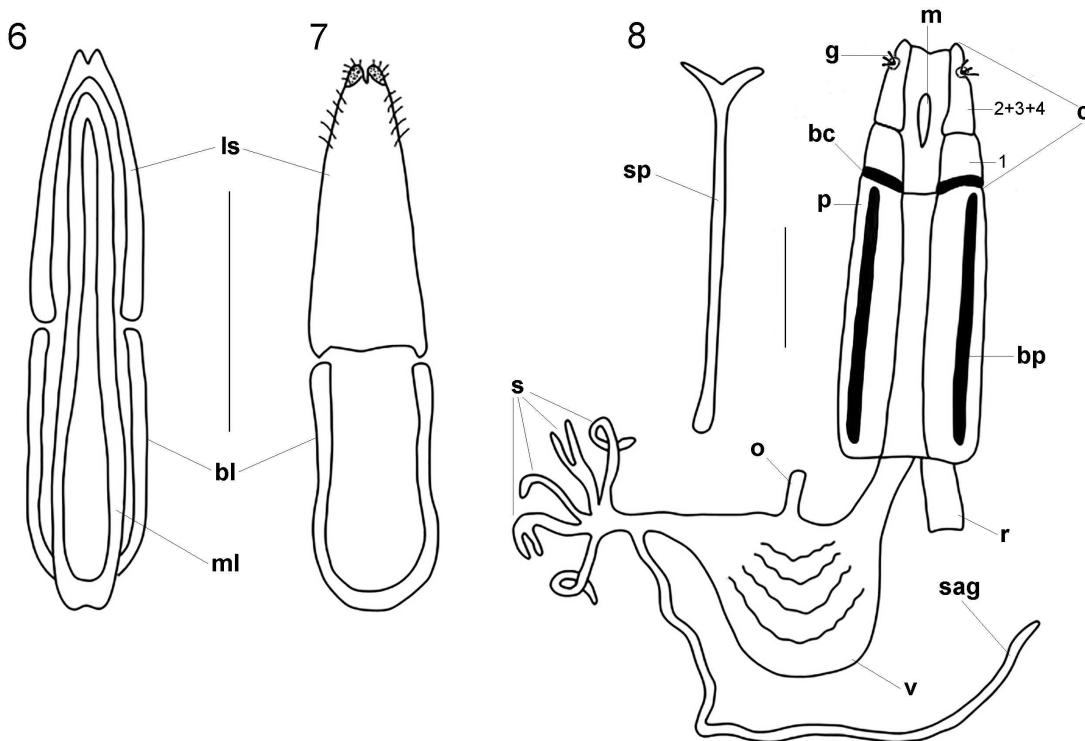
morphological remarks: (1) Praociini species possess ovipositors largely different from the plesiomorphic Eschscholtz (Flores & Pizarro-Araya, 2012). Conversely, arrangement described for Tenebrionidae, *i.e.* coxites in a recent study of the African representatives of the divided into four lobes (Tschinkel & Doyen, 1980). Pimeliinae, tribe Sepidiini, Kaminski et al. (2020) found Coxites of all known Praociini genera are divided into diagnostic characters in the coxite configuration two visible lobes (Fig. 8): the basal lobe bears oblique (ovipositor) at the generic level while morphology of baculi and the apical lobe is composed of the fully fused genital tubes seems to be stable across the tribe.

second, third and fourth lobes, which bears lateral gonostyli. The basal lobes are always separated from the apical lobes by a transverse pleat and always the basal lobe is shorter than the apical lobe. This configuration is also shared by genera of the South American related tribes within Pimeliinae: Nycteliini and Physogasterini (Doyen, 1994; Flores, 1996: Fig. 1); (2) the female tube offer diagnostic characters at generic level within Praociini in vagina shape, spermathecal accessory gland length, branching pattern and length of spermathecal tubes and relation to vagina length as it

has been described for the following genera: *Antofagapraocis* Flores and *Falsopraocis* Kulzer (Flores, 2000a), *Thylacoderes* Solier (Flores, 2000b), *Platesthes* Waterhouse (Flores, 2004), *Patagonopraocis* Flores & Chani-Posse (Flores & Chani-Posse, 2005), *Gyrasida*

The name *Parapraocis* is made available for the first time in this article. To fix its current interpretation and to ensure stability as the name was used in previous works (Kulzer, 1958; Flores & Pizarro-Araya, 2012; Smith et al., 2015; Giraldo & Flores, 2016; Juárez-Noé & González-Coronado, 2018, 2019), we use the same name as proposed by Kulzer (1958). Additionally, we offer a diagnosis, designate the type species, and explicitly mention that we are establishing a new nominal taxon (Articles 13.1, 16.1 and 67.4.1 ICZN 1999).

Parapraocis includes also several unnamed species that will be treated in a forthcoming publication dealing with the whole genus, comprising redescriptions, descriptions, taxonomic key, and accurate distributional data for species.



Figs. 6–8. Genitalia of *Parapraocis vagecostata* (Fairmaire). 6. Male genitalia, dorsal view. 7. Male genitalia, ventral view. 8. Female genitalia, ventral view. bc, baculi of coxite; bl, basal lamina of tegmen; bp, baculi of paraproct; c, coxite; g, gonostyli; ls, lateral styles of tegmen; ml, median lobe; o, oviduct; p, paraproct; r, rectum; s, spermatheca; sag, spermathecal accessory gland; sp, spiculum; v, vagina; 1, 2, 3, 4, coxite lobes. Scale bars: 1 mm.

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