

Systematics and phylogeny of the Neotropical genera *Pescolinus* Sharp and *Neopescolinus* gen.n. (Coleoptera: Staphylinidae)

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Abstract

A systematic revision and a phylogenetic analysis of the closely related Neotropical genera *Pescolinus* Sharp, 1885 and *Neopescolinus* gen.n. (Staphylininae: Staphylinini: Philonthina) are presented. Both genera are revised using characters of external morphology and male and female genitalia, with keys for identification, diagnoses, descriptions, illustrations, a phylogenetic analysis, and a distributional map. Eight valid species are recognized for *Pescolinus*: *P. palmatus* Sharp, *P. schmidti* Bierig and six new species, *P. aeneus*, *P. cartagensis*, *P. costaricensis*, *P. montanus*, *P. moyae* and *P. varablanquesis*. *Neopescolinus* gen.n., from Costa Rica, is described for one new species, *N. nevermanni*. Lectotype is designated for *Pescolinus palmatus* Sharp. The cladistic analysis shows *Pescolinus* as a monophyletic genus which forms together with *Linoderus* Sharp, *Odontolinus* Sharp and *Neopescolinus* a well supported clade that belongs to a natural group of Neotropical Philonthina.

Key words

Staphylininae, Philonthina, systematics, Neotropical, Central America, *Pescolinus*, *Neopescolinus*, new genus.

1. Introduction

The Neotropical genus *Pescolinus* Sharp and *Neopescolinus* gen.n. belong to Philonthina, the largest subtribe within Staphylinini, accounting for about 30% of the total of genera described for the tribe (HERMAN 2001; NEWTON & THAYER 2005). Among the 67 genera of Philonthina currently recorded, 17 are known to occur exclusively in the Neotropical region (CHANI-POSSE 2014). A recent phylogenetic analysis for the Neotropical genera of the subtribe showed that *Pescolinus* is nested within a monophyletic group of genera with Central American distribution and probable Caribbean origin (CHANI-POSSE 2013).

The genus *Pescolinus* was erected by SHARP (1885) for one species, *Pescolinus palmatus*, and it currently includes two species, *P. palmatus* Sharp, 1885 from

Panama and *P. schmidti* Bierig, 1937 from Costa Rica (HERMAN 2001). SHARP (1885) defined *Pescolinus* on the basis of “the slight separation of the intermediate coxae” and the “peculiar structure of the protarsi of the males”, which according to this author make this genus different “from its immediate allies amongst the *Philonthus* group of genera”. My examination of specimens from the Canadian National Collection, Ottawa (Canada), the Field Museum of Natural History, Chicago and the Snow Entomological Collection at University of Kansas, Lawrence (USA) led to the discovery of six new species belonging to *Pescolinus* and one additional new species, for which a new genus, *Neopescolinus*, is here established. About one half of the specimens here examined belong to the Bierig collection currently deposited at the Field Muse-

um of Natural History. These specimens were collected in Costa Rica during the late 1930s and early 1940s of the 20th century, many of them most probably by Alexander Bierig himself. During this period, Bierig became friends with Ferdinand Nevermann (SMETANA & HERMAN 2001), a well-known Costa Rican entomologist of German origin (HILJE 2013). In 1938, while in a collecting trip with Nevermann in Costa Rica, Bierig was seriously wounded in a hunting accident that was fatal to Nevermann. Soon afterwards, Bierig moved to Costa Rica from Cuba – where he was established since 1919 – and he became Professor of Entomology at the University of Costa Rica in San José (PUTHZ 1998; SMETANA & HERMAN 2001). Bierig was a man of various talents (painter, naturalist, collector and entomologist). He did his most important work as a teacher, artist and scientist, but it was only after he moved to Cuba that his interest turned to rove beetles (Staphylinidae) (SMETANA & HERMAN 2001). Between 1931 and 1940, he published 31 papers dealing with this family, describing over 159 new species and 34 genera (SMETANA & HERMAN 2001). The specimens studied here from his collection had been sorted into putative new species by Bierig, with provisional species names attached. However, they were never published. Three of these manuscript names were determined as belonging to *Linoderus* by Bierig, but recognized and described with *Pescolinus* in the present study (*P. aeneus*, *P. moyae* and *P. varablanquesis*).

The objectives of this study are to revise *Pescolinus* and to describe *Neopescolinus* using characters from external morphology and genitalia, to describe seven new species, to provide information about the distribution of species from both genera and to conduct a cladistic analysis in order to assess the phylogenetic relationships between *Pescolinus*, *Neopescolinus* and the other Neotropical genera of Philonthina.

2. Material and methods

The material studied was borrowed from the following collections: **BMNH** – The Natural History Museum, London, UK (Roger Booth); **CNC** – Canadian National Collection, Ottawa, USA (Anthony Davies); **FMNH** – Field Museum of Natural History, Chicago, USA (Alfred F. Newton, Margaret K. Thayer); **IADIZA** – Instituto Argentino de Investigaciones de las Zonas Áridas, Mendoza, Argentina (Sergio Roig Juárez); **MACN** – Museo Argentino de Ciencias Naturales Bernardino Rivadavia, Buenos Aires, Argentina (Arturo Roig Alsina); **SEMC** – Snow Entomological Collection, Natural History Museum/Biodiversity Research Center, University of Kansas, Lawrence, USA (Zachary H. Falin).

Beetle specimens were examined using a Leica MZ6 dissecting microscope. They were mostly examined as

pinned dry specimens, but a few were first relaxed in warm soapy water, rinsed, disarticulated and examined as wet preparations in glycerin. Techniques for the preparation and examination of male and female genitalia follow SMETANA (1982). Photographs were taken using a digital camera attached to the dissecting microscope. Line drawings were traced from digital photographs. Depositories of type material retain the copyright of the photographs. SEM pictures were obtained by using a JSM-6610 system. Measurements (given in millimeters) were made with an ocular micrometer. Overall body length was measured from the apex of the labrum to the apex of the abdomen.

Other measurements were taken and abbreviated as follows: **HW** – head capsule maximum width (measured at widest point); **HL** – length of head capsule, from anterior margin of frontoclypeus to neck constriction (along midline); **Lp2L**, **Lp3L** – length of 2nd or 3rd labial palpomere; **PW** – pronotum maximum width; **PL** – pronotum length along midline; **EL** – eye length (seen from above); **TL** – temple length (from the posterior margin of the eye to the nuchal groove; seen from above); **NW** – neck width; **S1** – length of 1st metatarsomere; **S5** – length of 5th metatarsomere (last); **EtL** – elytron length at side (straight line from humerus to apex; seen from above); **EtI** – elytron length along suture.

Terminology mainly follows BLACKWELDER (1936) and SCHILLHAMMER (2000) for the external morphology, SMETANA & DAVIES (2000) for the head capsule ridges and SMETANA (1995) for characters associated with male and female genitalia. Since SMETANA (1995) the term “styli” has been simultaneously used by authors working on the subtribe Philonthina for naming two non-homologous structures, i.e., the male and female lateral tergal sclerites 9 and the apical appendages of the female sternum 9 (e.g., SCHILLHAMMER 2000; LI et al. 2010; CHANI-POSSE 2013, 2014). The lateral tergal sclerites 9 have been described by SMETANA (1995) and the abovementioned authors as the “styli of tergum 9”. The general acceptance of the term “styli” is that referring to the apical appendages of the female sternum 9 (e.g., MATSUDA 1976; NAOMI 1989; THAYER 2005). Although using the term for two different structures appears inappropriate, I decide to keep this use (in parentheses) for the male and female lateral tergal sclerites 9 in order to facilitate future comparative studies across Philonthina.

Biogeographical provinces considered in the geographical distribution of the species follow the most recent regionalization of MORRONE (2014). All records and the general distribution given for each species are based strictly on specimens that I have examined. Handwritings on labels of type specimens were compared to the respective author’s handwriting as shown by HORN et al. (1990). All locality data were recorded from specimen labels. These data were georeferenced using Google Maps (Google Inc.) and mapped onto a relief map derived from a digital elevation model using ArcMap (ESRI Inc.). WinClada v. 1.00.08 (NIXON 1999) was used for character mapping.

3. Results

3.1. Recognition of *Pescolinus* and *Neopescolinus*

The genera *Pescolinus* and *Neopescolinus*, as well as *Linoderus* Sharp and *Odontolinus* Sharp, can be recognized among other genera of Philonthina by the lateral tergal sclerites 9 (styli) being dorsoventrally flattened, slightly (usually females) to distinctly dilated (males), and the male sternum 9 having the basal portion distinctly asymmetrical (CHANI-POSSE 2013, 2014). Other characters common to these four genera are: dorsal and ventral surface of head with rather rudimentary wave-like microsculpture, antenna with all antennomeres elongate, last one subtruncate and minutely emarginated apically, pubescence starting on antennomere 4; head with antero-lateral ridge, and postmandibular ridge bordering only laterally the mandibular base; mandibles moderately prominent and elongate, each with one tooth in addition to the apex; maxillary palpomere 2 distinctly longer than 3 and not wider than $1.5 \times$ its width, palpomere 4 (apical) subcylindrical and distinctly longer than 3; mentum and submentum each with one pair of macrosetae; gular sutures joined before neck; pronotum with anterior angles produced beyond the anterior margin of prosternum, disc with fine microsculpture of transverse and oblique waves and with large setiferous punctures arranged in longitudinal rows, lateral puncture with long seta at a distance from superior marginal line of hypomeron at least $3 \times$ as large as diameter of puncture; prosternum with faint microsculpture of transverse and oblique waves on both basisternum and furcasternum, basisternum with distinct transverse carina and one pair of macrosetae; disc of mesoventrite situated more or less in one plane with the mesoventral part of mesocoxal acetabula, with sternacostal carina and sternopleural (anapleural) suture distinctly oblique; profemora with lateroventral spines; abdominal terga 3–5 with anterior and posterior transverse basal carinae; aedeagus with parameres fused into a single lobe; ovipositor with second gonocoxites each with one long macroseta and a minute stylus.

Neopescolinus and *Pescolinus* share with *Odontolinus* the protarsi with tarsomeres 1–4 flattened dorsoventrally and widened distally more distinct in males, with long and curved pale (adhesive) setae on ventral surface (as opposed to *Linoderus* having the protarsi with tarsomeres 1–4 more or less cylindrical with only regular, unmodified marginal setae on ventral surface). Additionally, *Neopescolinus* and *Pescolinus* share the first antennomere not longer than half of the head length (as opposed to *Odontolinus*, whose first antennomere is longer than half of its head length), the anterior angles of pronotum distinctly produced beyond (anterior of) the anterior margin of prosternum and the lateral tergal sclerites 9 (styli) dorsoventrally flattened, slightly to distinctly

dilated (CHANI-POSSE 2014, see couplet 25). However, *Neopescolinus* differs from *Pescolinus* by the position of the antennal insertions which is at equal distance to both the anterior margin of frontoclypeus and the eyes in *Neopescolinus*, but closer to the anterior margin of frontoclypeus than to the eyes in *Pescolinus*. In this character *Neopescolinus* resembles *Linoderus* Sharp, from which it differs by characters specified below.

3.2. Genus *Pescolinus* Sharp, 1885

Figs. 1, 2, 4–9, 11–16, 18–65, 69, 70

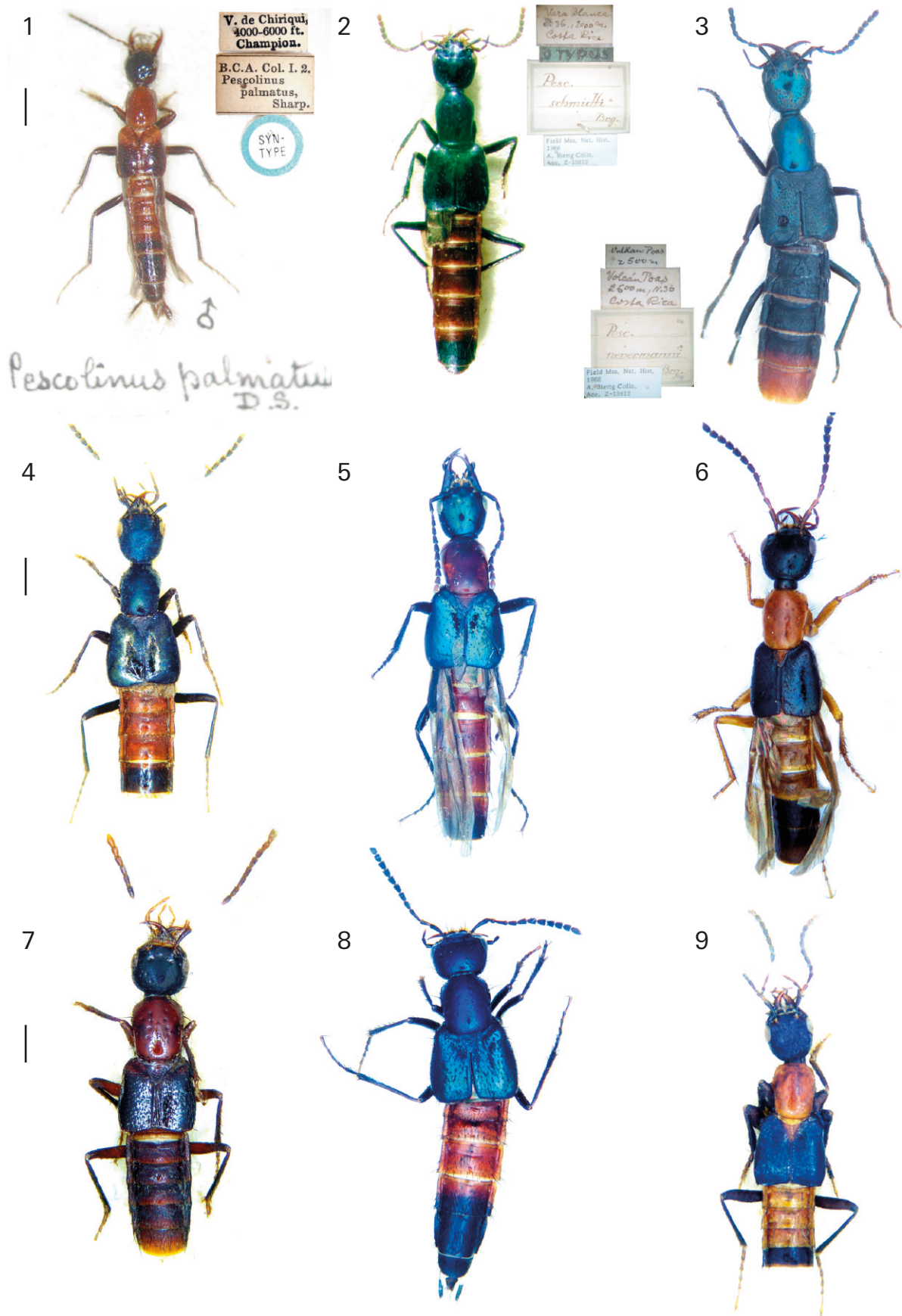
Pescolinus Sharp, 1885: 453; BERNHAUER & SCHUBERT 1914: 369 (catalog); BLACKWELDER 1944: 136 (checklist); BLACKWELDER 1952: 299 (type species); HERMAN 2001: 2728 (catalog); NEWTON et al. 2005: 19 (checklist, as “probable”); CHANI-POSSE 2013: 8, 10, 14 (phylogenetic placement); CHANI-POSSE 2014: 7, 10, 15–18, 21 (key).

Type species. *Pescolinus palmatus* Sharp, fixed by monotypy.

Diagnosis. *Pescolinus* differs from all other genera of Philonthina by the following combination of characters: antennomeres 1–6 with long setae, 1st antennomere not longer than half of head length, profemora densely setose and lateral tergal sclerites 9 (styli) sexually dimorphic, slightly dilated in the females and distinctly dilated in the males.

Redescription. Length 9.0–12.0 mm. **Colouration:** Head and thorax reddish brown to dark brown or metallic dark blue to greenish blue; elytra dark brown or metallic blue; abdomen entirely reddish brown or with first three to four abdominal segments reddish brown with apical segments distinctly darker, dark brown to black; antennae, palpi and legs reddish brown to dark brown.

Head of rounded-quadrangular shape with obtusely rounded hind angles (Figs. 4–9) and at basal third about as wide as distal third in both sexes; about as long as wide to moderately wider than long, slightly to moderately wider than pronotum at widest point. Eyes moderately convex, moderately shorter to distinctly longer than temples seen from above (Figs. 4–9). Antennae inserted closer to anterior margin of frontoclypeus than to eyes, separated from each other by no more than $2.5 \times$ the distance to eye (Fig. 12), 1st antennomere not longer than half of the head length, 2nd distinctly shorter than 3rd, 1st–6th with distinct long setae (Fig. 11). Labrum subrectangular, distinctly transverse (Fig. 12). Mentum with anterior margin straight to slightly emarginated and about as long as to distinctly longer than submentum (Fig. 13). Labial palpus moderately long, 2nd palpomere with 3–4 setae at medial basal half and 1.5 – $2 \times$ as long as 1st, 3rd medially inflated and moderately to slightly shorter than 2nd ($Lp3L/Lp2L = 0.8$ – 0.9) (Fig. 13).



Figs. 1–9. Type specimens of *Pescolinus* and *Neopescolinus*. All holotypes except for *Pescolinus palmatus* and *P. costaricensis*. (1) *P. palmatus*, lectotype [BMNH ©]. (2) *P. schmidti* [FMNH ©]. (3) *Neopescolinus nevermanni* [FMNH ©]. (4) *P. aeneus* [FMNH ©]. (5) *P. cartagensis* [SEMC ©]. (6) *P. costaricensis*, paratype [SEMC ©]. (7) *P. montanus* [FMNH ©]. (8) *P. moyae* [SEMC ©]. (9) *P. varablanquensis* [FMNH ©]. (Scale bar = 1.0 mm)

Prothorax: Pronotum slightly to distinctly longer than wide, slightly broadened anteriorly; front margin subtruncate, hind margin arcuate, anterior and posterior angles rounded (Figs. 4–9); disc with dorsal rows of punctures sub-parallel to each other, each with 2–5 punctures. Prosternum without distinct mid-longitudinal carina. **Legs:** Profemora slightly to moderately broadened at basal half, with dense setae (Fig. 16); protarsi with first four segments flattened dorsoventrally and widened distally more distinct in males, with long and curved pale (adhesive) setae underneath (Fig. 15); 1st metatarsomere as long as to moderately longer than 5th metatarsomere (last) (S1/S5 = 1.0–1.2). **Elytra** at suture moderately to slightly shorter than pronotum at midline (Figs. 4–9); punctuation fine, sparse to dense.

Abdomen: Abdominal terga 3–5 with posterior transverse basal carina complete and straight, punctuated (Fig. 18) or not. Hind margin of tergum 8 (sixth visible) arcuate in both sexes (Figs. 19, 20). **Male genitalia:** Sternum 8 emarginate medioapically (Fig. 38) or with a medially produced projection (Figs. 21, 30, 47, 51, 59). Genital segment with lateral tergal sclerites 9 (styli) dorsoventrally flattened and moderately to distinctly dilated (Figs. 19, 20); tergum 10 truncate at apex with four to ten apical setae (Figs. 23, 32, 40, 49, 53, 61); sternum 9 with basal portion distinctly asymmetrical, 1.5–2.4 × as long as the distal portion and deeply emarginate apically, with several fine and short setae at each side of emargination (Figs. 22, 31, 39, 48, 52, 60). Aedeagus with parameres fused to one short sclerite, completely fused to median lobe; median lobe elongate, with apical part narrowed into a rather acute apex (Figs. 24, 25, 33, 34, 41, 42, 50, 54, 55, 62, 63). **Female genitalia:** Sternum 8 hind margin projected medially (Figs. 26, 35, 56) or arcuate and not projected medially (Fig. 43). Genital segment with lateral tergal sclerites 9 (styli) dorsoventrally flattened and slightly dilated; tergum 10 concave to truncate apically (Figs. 28, 36, 46, 57, 64); second gonocoxites each with a long macroseta distally, with a minute stylus (Figs. 27, 29, 37, 44, 45, 58, 65) bearing one or two long apical macrosetae.

Immature stages. Unknown.

Bionomics. The species of *Pescolinus*, as those of other genera of Philonthina, are considered general predators. Adults have been collected both with Malaise and flight intercept traps. According to label data, this genus has been found in association with bromeliads in a primary forest (*P. schmidti*) and with small leathery polypores (*P. moyae* sp.n.).

Distribution and remarks. *Pescolinus* with its eight species known at present, is distributed in the biogeographical provinces of Puntarenas-Chiriqui and Guatuso-Talamanca (MORRONE 2014) at elevations of 1150–2200 m as indicated by trapping data (Fig. 70). MÉNDEZ-ROJAS et al. (2012) recognized one specimen as belonging to this genus from Colombia, where it was collected in open grasslands at 3000–3150 m at the western slope of the

Central Cordillera. Attempts to get loans from the collection where this and other material are deposited have not been successful up to this date.

3.2.1. Key to species of *Pescolinus*

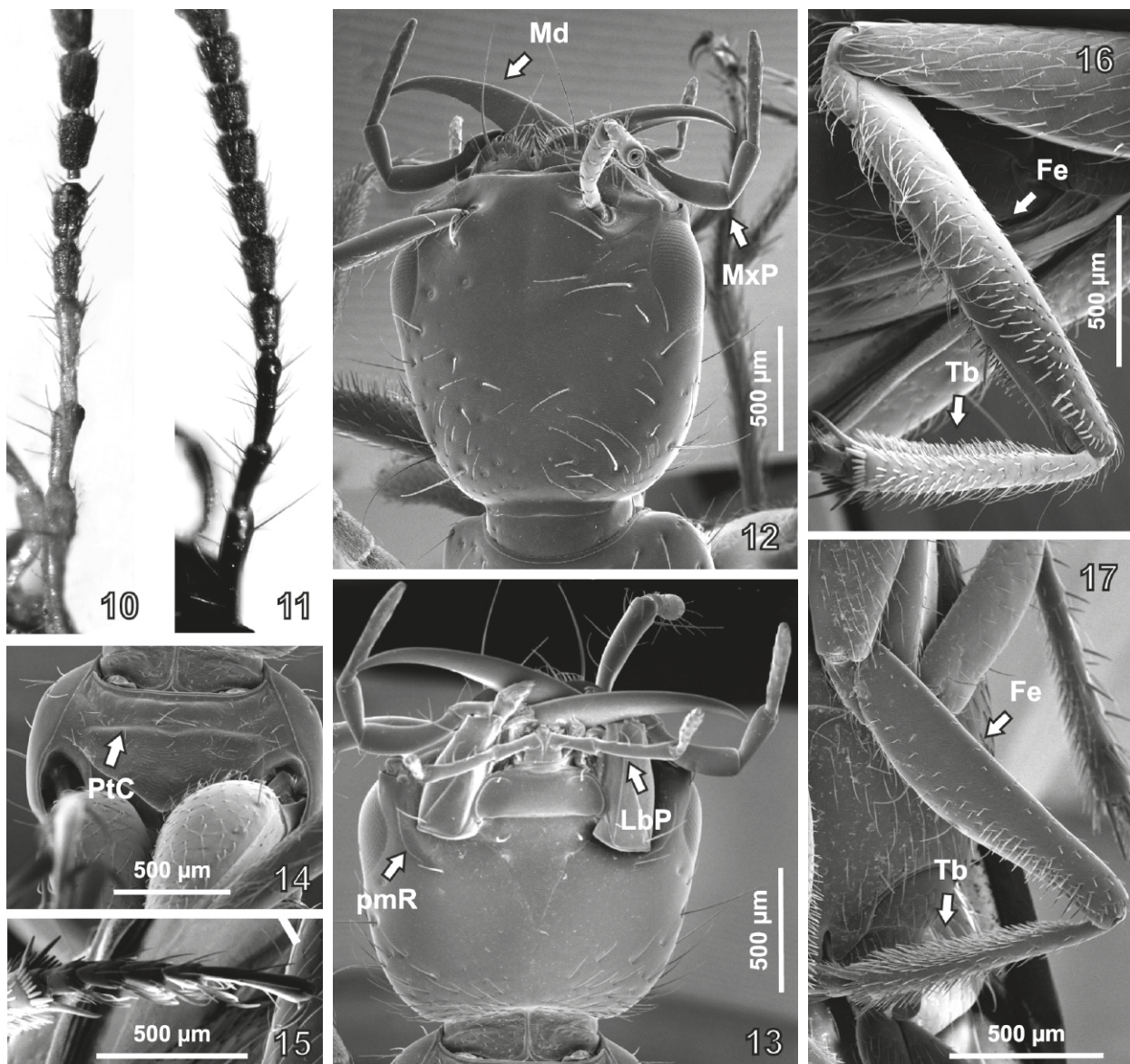
- 1 Male sternum 8 posterior margin emarginate medially (Fig. 38); female sternum 8 posterior margin arcuate (Fig. 43) *P. montanus* sp.n.
- 1' Male sternum 8 posterior margin with a median projection (Figs. 21, 30, 47, 51, 59); female sternum 8 posterior margin projected medially (Figs. 26, 35, 56) 2
- 2 Abdominal terga 3–5 with posterior line of basal transverse carinae distinctly punctuated (Fig. 18) *P. schmidti* Bierig
- 2' Abdominal terga 3–5 with posterior line of basal transverse carinae not punctuated 3
- 3 Antenna unicolorous, i.e. apical antennomeres the same color as or darker than basal antennomeres (Figs. 4, 6, 8) 4
- 3' Antenna bicolored, i.e. apical antennomeres lighter than basal antennomeres (Figs. 1, 5, 9) 6
- 4 Head and pronotum distinctly different in colour (Fig. 6) *P. costaricensis* sp.n.
- 4' Head and pronotum similar in colour (Figs. 4, 8) 5
- 5 Sternum 7 posterior margin slightly emarginated in both sexes; female tergum 10 posterior margin distinctly truncate (e.g., Fig. 23) *P. aeneus* sp.n.
- 5' Sternum 7 posterior margin straight*; female tergum 10 posterior margin arcuate (Fig. 46) *P. moyae* sp.n.*
- 6 Labial palpus with 2nd palpomere not longer than 1.5 × as long as 3rd (apical) *P. cartagensis* sp.n.
- 6' Labial palpus with 2nd palpomere about twice as long as 3rd (apical) 7
- 7 Male with lateral tergal sclerites 9 (styli) distinctly dilated; sternum 8 posterior margin with a medially produced emarginate projection (Fig. 47) *P. palmatus* Sharp
- 7' Male with lateral tergal sclerites 9 (styli) moderately dilated; sternum 8 posterior margin with a medially produced concave projection (Fig. 59) *P. varablanquesis* sp.n.

[* character based only on the single (female) specimen available]

3.2.2. *Pescolinus aeneus* sp.n.

Figs. 4, 21–27, 69, 70

Diagnosis. *Pescolinus aeneus* differs from all other *Pescolinus* species by the sternum 7 slightly emarginated in both sexes and by the distinct body colour pattern: head, thorax and elytra dark brown to black; abdomen with first three segments reddish brown and apical segments distinctly darker, dark brown to black; antennae, palpi and legs dark brown.



Figs. 10–17. *Linoderus gracilipes*: (10) right antenna, *P. schmidti*: (11) right antenna, (12) head (dorsal view), (13) head (ventral view), (14) prosternum, (15) protarsus, (16) profemur and protibia. *Odontolinus fasciatus*: (17) profemur and protibia. – **Abbreviations:** Fe, femur; LbP, labial palpus; Md, mandibula; MxP, maxillary palpus; pmR, postmandibular ridge; PtC, prosternal transverse carina; Tb, tibia.

Description. Body length 8.0–8.5 mm. Colouration as in diagnosis.

Head about as wide as long to slightly wider than long (HW/HL = 1.0–1.1), slightly to moderately wider than pronotum (HW/PW = 1.1–1.2). Eyes moderately shorter than temples (EL/TL = 0.8) seen from above. Antennae with 1st antennomere distinctly shorter than 2nd and 3rd combined, 3rd about 1.2 × as long as 2nd. Labial palpus with 2nd palpomere about twice as long as 1st. Maxillary palpus with 4th palpomere (apical) 1.5 × as long as 3rd. Neck about 0.4–0.5 × as wide as head at widest point. **Pronotum** moderately longer than wide (PW/PL = 0.8), dorsal rows of punctures each with 4 punctures. **Legs:** Profemora moderately broad at basal half; protibia with moderately dense setation. **Elytra** at sides about 1.5 × as long as elytra along suture (EtL/Etl = 1.6–1.7).

Abdomen: Abdominal terga 3–5 with posterior transverse basal carina not punctuated. **Male genitalia:** Sternum 8 with medially produced emarginate projection (Fig. 21). Genital segment with lateral tergal sclerites 9 (styli) dorsoventrally flattened and distinctly dilated. Sternum 9 with longest apex of basal portion acute (Fig. 22). Tergum 10 truncate at apex with five apical setae (Fig. 23). Aedeagus with median lobe gradually narrowed from apical third (Figs. 24–25). **Female genitalia:** Sternum 8 projected medially and truncate medioapically (Fig. 26). Tergum 10 similar to that of male. Styli of second gonocoxites each with one long apical macroseta (Fig. 27).

Geographical distribution. Costa Rica: Vara Blanca (Fig. 70).

Bionomics. Unknown.

Etymology. The specific name keeps the original manuscript (specific) name given by Alexander Bierig, i.e. from Latin *aeneus*, “of bronze or copper”.

Type material (all examined). Holotype (Fig. 4), ♂, with labels: ‘Costa Rica | Vara Blanca VIII.38’, ‘Field Mus. Nat. Hist. | 1966 | A. Bierig Collection, Acc. Z. 13812’, ‘Holotype *Pescolinus* | *aeneus* | Chani Posse, 2014’ (FMNH). Paratypes, 1 ♂, 4 ♀ with same labels as the holotype (one of them, ♀, also with label: ‘*L.* | *aeneus* | Brg.’ in Bierig’s handwriting). All paratypes with additional label ‘Paratype *Pescolinus* | *aeneus* | Chani Posse, 2014’ (FMNH).

3.2.3. *Pescolinus cartagensis* sp.n.

Figs. 5, 28, 29, 70

Diagnosis. *Pescolinus cartagensis* differs from all other *Pescolinus* species by the labial palpomere 2 not longer than $1.5 \times$ as long as 3 (apical) and by the distinct body colour pattern: head, elytra and apical abdominal segments dark brown to black, thorax reddish brown, abdomen with first four abdominal segments reddish brown; antennae mostly dark brown with last two apical segments distinctly lighter, palpi and legs dark brown.

Description. Body length 10.5 mm. Colouration as in diagnosis.

Head moderately wider than long (HW/HL = 1.2), slightly wider than pronotum (HW/PW = 1.1). Eyes distinctly shorter than temples (EL/TL = 0.6) seen from above. Antennae with 1st antennomere distinctly shorter than 2nd and 3rd combined, 3rd about $1.3 \times$ as long as 2nd. Labial palpus with 2nd palpomere about $1.5 \times$ as long as 1st. Maxillary palpus with 4th palpomere (apical) $1.5 \times$ as long as 3rd. Neck about $0.4 \times$ as wide as head at widest point. **Pronotum** moderately longer than wide (PW/PL = 0.8), dorsal rows of punctures each with 2 punctures. **Legs:** Profemora slightly broadened at basal half; protibia with moderately dense setation. **Elytra** at sides about $1.5 \times$ as long as elytra along suture (EtL/Etl = 1.5).

Abdomen: Abdominal terga 3–5 with posterior transverse basal carina not punctuated. **Male genitalia:** Unknown. **Female genitalia:** Sternum 8 projected medially and truncate medioapically. Tergum 10 truncate at apex with eight to ten apical setae (Fig. 28). Styli of second gonocoxites each with two long apical macroseta, one shorter than the other (Fig. 29).

Geographical distribution. *Pescolinus cartagensis* has only been recorded from one collecting site in Costa Rica (Cartago) at 1150 m a.s.l. (Fig. 70).

Bionomics. Unknown.

Etymology. The specific name refers to Cartago (Costa Rica), where this species was found.

Type material. Holotype (Fig. 5), ♀, with labels: ‘Costa Rica: Cartago | P.N. Tapanti, 1150 m | 9°45’41”N 83°47’5”W | 17–20 JUL 2000, J. Ashe, R. Brooks | Z. Falin | ex. Flight intercept trap

CR1AFHO 199’, ‘Holotype *Pescolinus* | *cartagensis* | Chani Posse, 2014’ (SEMC).

3.2.4. *Pescolinus costaricensis* sp.n.

Figs. 6, 30–37, 69, 70

Diagnosis. *Pescolinus costaricensis* differs from all other *Pescolinus* species by its distinct body colour pattern: head, elytra and apical abdominal segments dark brown, thorax light brown to reddish brown, abdomen with first three abdominal segments brown to light brown; antennae, palpi and legs dark to light brown.

Description. Body length 9.0–10.0 mm. Colouration as in diagnosis.

Head about as wide as long to slightly wider than long (HW/HL = 1.0–1.1), slightly to distinctly wider than pronotum (HW/PW = 1.1–1.3). Eyes as long as to moderately shorter than temples (EL/TL = 0.8–1.0) seen from above. Antennae with 1st antennomere slightly shorter than 2nd and 3rd combined, 3rd about $1.5 \times$ as long as 2nd. Labial palpus with 2nd palpomere about $1.5 \times$ as long as 1st. Maxillary palpus with 4th palpomere (apical) $1.5 \times$ as long as 3rd. Neck about $0.4–0.5 \times$ as wide as head at widest point. **Pronotum** moderately to distinctly longer than wide (PW/PL = 0.7–0.8), dorsal rows of punctures each with 4 punctures. **Legs:** Profemora moderately broadened at basal half; protibia with moderately dense setation. **Elytra** at sides about $1.5 \times$ as long as elytra along suture (EtL/Etl = 1.4–1.6).

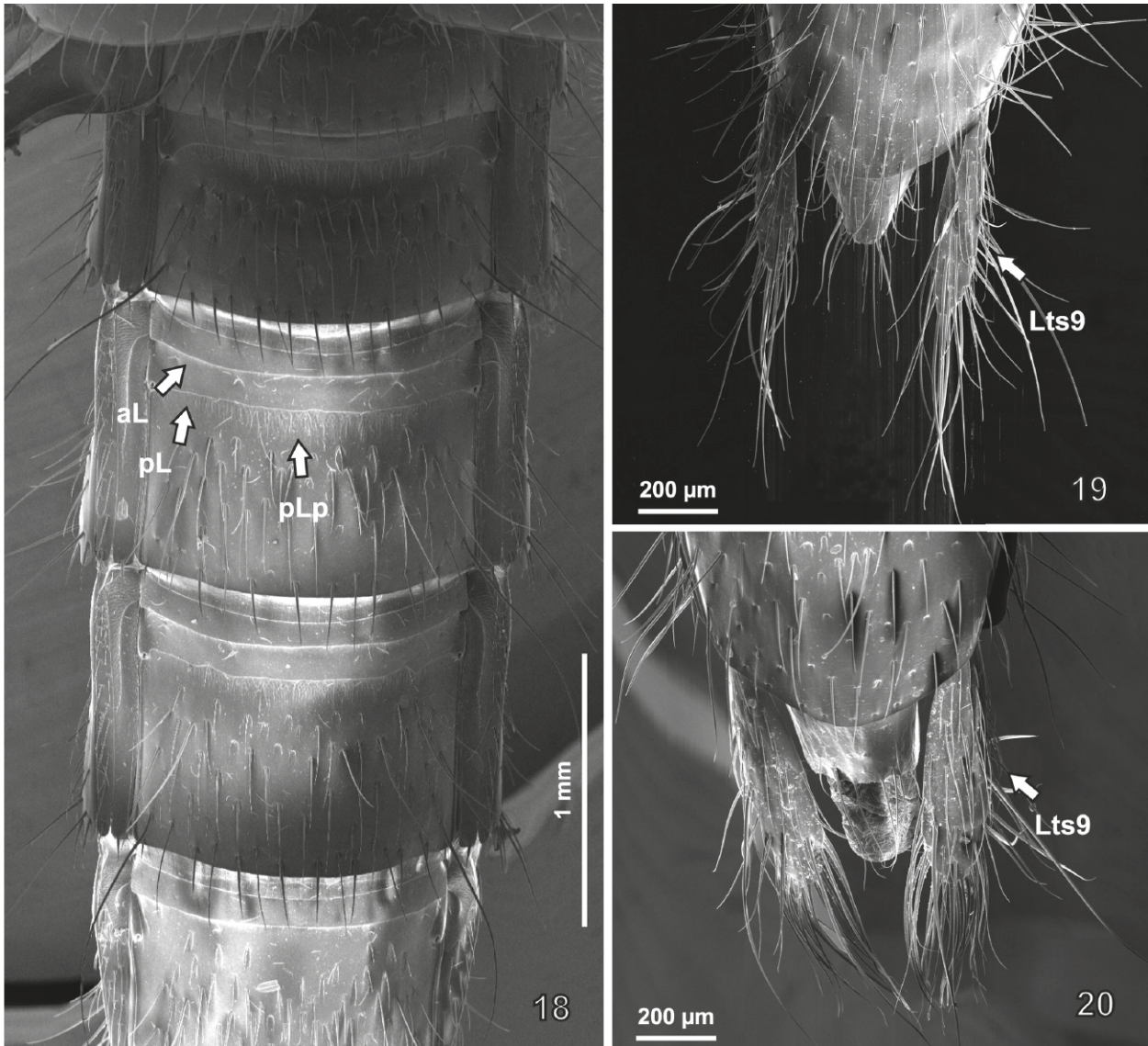
Abdomen: Abdominal terga 3–5 with posterior transverse basal carina not punctuated. **Male genitalia:** Sternum 8 with medially produced angulate projection (Fig. 30). Genital segment with lateral tergal sclerites 9 (styli) dorsoventrally flattened and moderately dilated. Sternum 9 with longest apex of basal portion subacute (Fig. 31). Tergum 10 truncate at apex with eight apical setae (Fig. 32). Aedeagus with median lobe gradually narrowed from the apical fifth (Figs. 33, 34). **Female genitalia:** Sternum 8 projected medially and truncate medioapically (Fig. 35). Tergum 10 similar to that of male (Fig. 36). Styli of second gonocoxites each with one long apical macroseta (Fig. 37).

Geographical distribution. Costa Rica: Cartago and Vara Blanca at 2100 m a.s.l. (Fig. 70).

Bionomics. Unknown.

Etymology. The specific name refers to the country where this species was found.

Type material (all examined). Holotype, ♂, with labels: ‘San Isidro Lebstrella | 16.X.41 | Costa Rica’, ‘Field Mus. Nat. Hist. | 1966 | A. Bierig Collection, Acc. Z. 13812’, ‘Holotype *Pescolinus costaricensis* Chani Posse, 2014’ (FMNH). One paratype, (Fig. 6), ♀, with labels: ‘Costa Rica: Heredia | Vara Blanca, Finca Georg | ina, 2100m, June–July 1990 | Paul Hanson’, ‘Paratype *Pescolinus* | *costaricensis* | Chani Posse, 2014’ (SEMC).



Figs. 18–20. *Pescolinus schmidtii*: (18) abdomen. Lateral tergal sclerites 9 (styli): (19) female, (20) male. – **Abbreviations:** aL, anterior line; Lts9; lateral tergal sclerites 9; pL, posterior line; pLp, posterior line punctuation.

3.2.5. *Pescolinus montanus* sp.n.

Figs. 7, 38–44, 69, 70

Diagnosis. *Pescolinus montanus* differs from all other *Pescolinus* species by the distinct shape of the sternum 8, emarginate medioapically in the males and rather arcuate in the females together with the distinct body colour pattern: head black, thorax reddish, elytra dark brown, abdomen entirely reddish brown; antennae mostly dark brown with last two apical segments distinctly lighter, palpi and legs reddish.

Description. Body length 9.4–10.0 mm. Colouration as in diagnosis.

Head slightly to moderately wider than long (HW/HL = 1.1–1.2), slightly to moderately wider than pronotum (HW/PW = 1.1–1.2). Eyes slightly to distinctly shorter than temples (EL/TL = 0.7–0.9) seen from above. Antennae with 1st antennomere about as long as 2nd and

3rd combined, 3rd about 1.3 × as long as 2nd. Labial palpus with 2nd palpomere about twice as long as 1st. Maxillary palpus with 4th palpomere (apical) 1.8 × as long as 3rd. Neck about 0.4–0.5 × as wide as head at widest point. **Pronotum** slightly longer than wide (PW/PL = 0.9), dorsal rows of punctures each with 5 punctures. **Legs:** Pro-femora moderately broadened at basal half; protibia with moderately dense setation. **Elytra** at sides about 1.5 × as long as elytra along suture (EtL/Etl = 1.7).

Abdomen: Abdominal terga 3–5 with posterior transverse basal carina not punctuated. **Male genitalia:** Sternum 8 emarginate medioapically (Fig. 38). Genital segment with lateral tergal sclerites 9 (styli) dorsoventrally flattened and moderately dilated. Sternum 9 with longest apex of basal portion subacute (Fig. 39). Tergum 10 truncate at apex with eight apical setae (Fig. 40). Aedeagus with median lobe gradually narrowed from the apical third (Figs. 41, 42). **Female genitalia:** Sternum 8 arcuate and not projected medially (Fig. 43). Tergum 10 similar

to that of male. Styli of second gonocoxites each with one long apical macroseta (Fig. 44).

Geographical distribution. Costa Rica: Carpintera, Cervantes and Vara Blanca (Fig. 70).

Bionomics. Unknown.

Etymology. The specific name keeps the original manuscript (specific) name given by Alexander Bierig, i.e. from Latin *montanus*, “mountainous, of mountains”.

Type material (all examined). Holotype (Fig. 7), ♂, with labels: ‘Vara Blanca | VIII.38 | Costa Rica’, ‘Field Mus. Nat. Hist. | 1966 | A. Bierig Collection, Acc. Z. 13812’, ‘Holotype *Pescolinus* | *montanus* | Chani Posse, 2014’ (FMNH). Paratypes: 1 ♂ with same labels as the holotype; 1 ♂, with labels ‘Cervantes | 8.IV.1940 | Costa Rica’, ‘Field Mus. Nat. Hist. | 1966 | A. Bierig Collection, Acc. Z. 13812’; 4 ♀ with labels ‘Carpintera | 1200 m, 26.II.39 | Costa Rica’, ‘Field Mus. Nat. Hist. | 1966 | A. Bierig Collection, Acc. Z. 13812’ (one of them also with label: ‘*P.* | *montanus* | Brg.’ in Bierig’s handwriting). All paratypes with additional label ‘Paratype *Pescolinus* | *montanus* | Chani Posse, 2014’ (FMNH).

3.2.6. *Pescolinus moyae* sp.n.

Figs. 8, 45, 46, 69, 70

Diagnosis. *Pescolinus moyae* differs from all other *Pescolinus* species by the distinct body colour pattern (head, thorax and elytra metallic dark blue to greenish dark blue; abdomen with first three abdominal segments reddish brown and apical segments distinctly darker, dark brown to black; antennae, palpi and legs dark brown) and the female with the posterior margins of sternum 7 straight and tergum 10 distinctly arcuate.

Description. Body length 9.5–10.0 mm. Colouration as in diagnosis.

Head slightly wider than long (HW/HL = 1.1), moderately wider than pronotum (HW/PW = 1.2). Eyes moderately shorter than temples (EL/TL = 0.8) seen from above. Antennae with 1st antennomere distinctly shorter than 2nd and 3rd combined, 3rd about 1.3 × as long as 2nd. Labial palpus with 2nd palpomere about twice as long as 1st. Maxillary palpus with 4th palpomere (apical) 1.5 × as long as 3rd. Neck about 0.4–0.5 × as wide as head at widest point. **Pronotum** slightly longer than wide (PW/PL = 0.9), dorsal rows of punctures each with 5 punctures. **Legs:** Profemora slightly broadened at basal half; protibia with moderately dense setation. **Elytra** at sides about 1.5 × as long as elytra along suture (EtL/Etl = 1.7).

Abdomen: Abdominal terga 3–5 with posterior transverse basal carina not punctuated. **Male genitalia:** Unknown. **Female genitalia:** Sternum 8 projected medially and truncate medioapically. Tergum 10 arcuate apically (Fig. 46). Styli of second gonocoxites each with one long apical macroseta (Fig. 45).

Geographical distribution. *Pescolinus moyae* has only been recorded from Costa Rica (Zarcero) (Fig. 70).

Bionomics. Unknown.

Etymology. The specific name keeps the original manuscript (specific) name given by Alexander Bierig, which is derived from “Moya”, a Spanish surname. Since “Moya leg.” appears in the material examined, I assume that Bierig wanted to dedicate this species to the owner of the legacy.

Type material (all examined). Holotype (Fig. 8), ♀, with labels: ‘Costa Rica: San José Prov. | 2.4km ENE Sn Gerardo de Rivas | Cloudbridge Reserve, River Trail | 2000–2200 m 9°28.07’ N | 83°33.88’ W, 10-VI.2004, J.S. | Ashe, Z. Falin, I. Hinojosa | ex. Flight intercept trap | Ex small leathery polypores | CRIAFOH4 183’, ‘Holotype *Pescolinus* | *moyae* | Chani Posse, 2014’ (SEMC). One paratype, ♀, with labels: ‘Zarcero | VII.39 (Moya leg.) | Costa Rica’, ‘*Linoderus* | *moyae* | Brg.’ in Bierig’s handwriting, ‘Field Mus. Nat. Hist. | 1966 | A. Bierig Collection, Acc. Z. 13812’, ‘Paratype *Pescolinus* | *moyae* | Chani Posse, 2014’ (FMNH).

3.2.7. *Pescolinus palmatus* Sharp, 1885

Figs. 1, 47–50, 69, 70

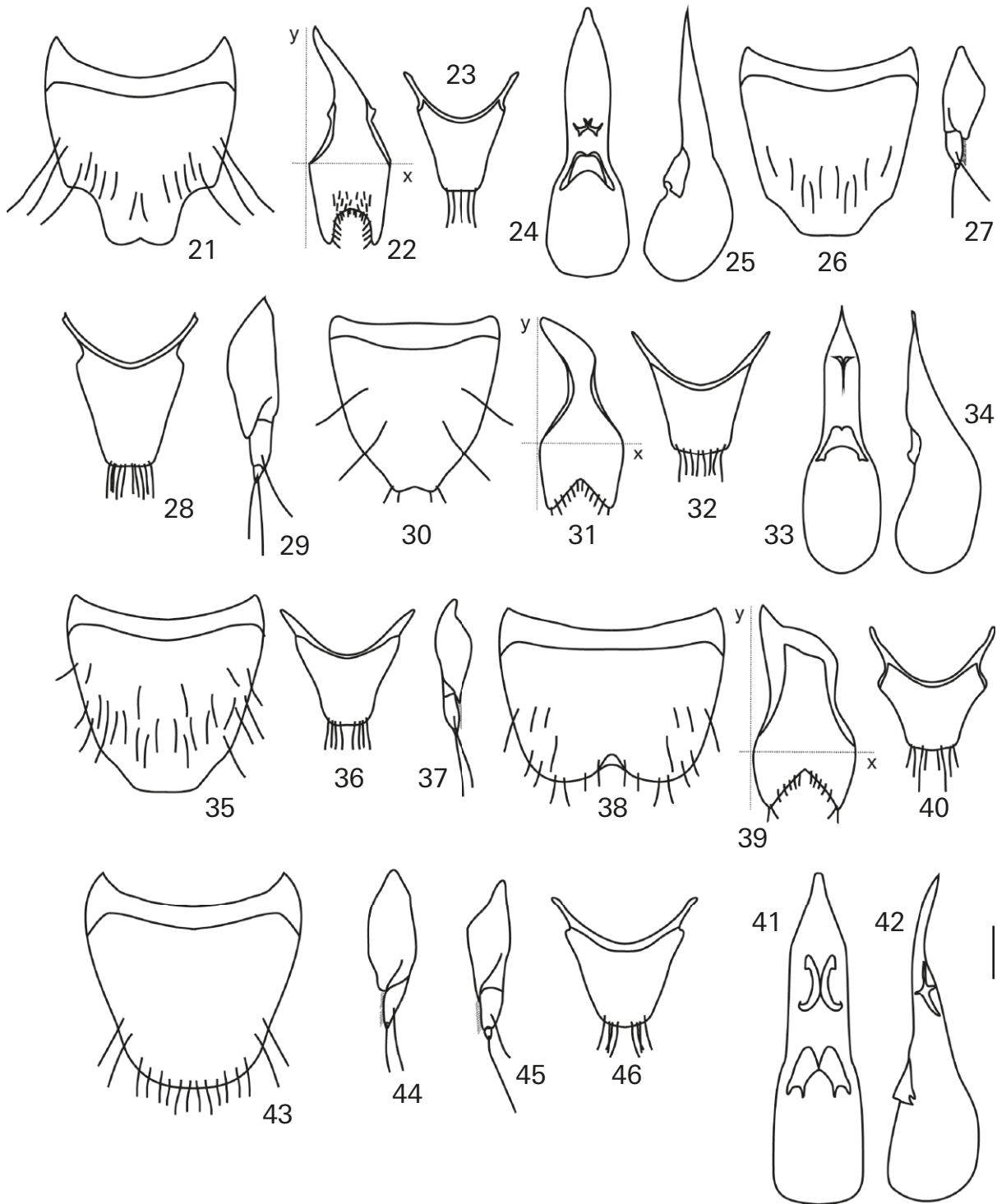
Pescolinus palmatus Sharp, 1885: 453; BERNHAUER & SCHUBERT 1914: 369 (catalog); HERMAN 2001: 2728 (catalog).

Diagnosis. *Pescolinus palmatus* differs from all other *Pescolinus* species by the lateral tergal sclerites 9 (styli) distinctly dilated in the male and by the distinct body colour pattern: head, distal half of the elytra and apical abdominal segments dark brown to black, thorax, base of elytra and first three abdominal segments reddish brown; antennae mostly dark brown with last two apical segments distinctly lighter, palpi and legs dark brown to black.

Redescription. Body length 7.6–8.5 mm. Colouration as in diagnosis.

Head slightly wider than long (HW/HL = 1.1), slightly wider than pronotum (HW/PW = 1.1). Eyes slightly shorter than temples (EL/TL = 0.9) seen from above. Antennae with 1st antennomere about as long as 2nd and 3rd combined, 3rd about 1.5 × as long as 2nd. Labial palpus with 2nd palpomere about twice as long as 1st. Maxillary palpus with 4th palpomere (apical) 1.5 × as long as 3rd. Neck about 0.5 × as wide as head at widest point. **Pronotum** moderately longer than wide (PW/PL = 0.8), dorsal rows of punctures each with four to 5 punctures. **Legs:** Profemora moderately broadened at basal half; protibia with moderately dense setation. **Elytra** at sides about 1.5 × as long as elytra along suture (EtL/Etl = 1.7).

Abdomen: Abdominal terga 3–5 with posterior transverse basal carina not punctuated. **Male genitalia:** Sternum 8 with medially produced emarginate projection (Fig. 47). Genital segment with lateral tergal sclerites 9 (styli) dorsoventrally flattened and distinctly dilated. Sternum 9 with longest apex of basal portion acute (Fig. 48). Tergum 10 truncate at apex with eight apical setae (Fig. 49). Aedeagus with median lobe gradually narrowed from the apical fourth (Fig. 50). **Female genitalia:** Unknown.



Figs. 21–46. *Pescolinus aeneus*: (21) male sternum 8, (22) male sternum 9, (23) male tergum 10, (24) aedeagus (dorsal view), (25) aedeagus (lateral view), (26) female sternum 8, (27) gonocoxites of female genital segment. *P. cartagensis*: (28) female tergum 10, (29) gonocoxites of female genital segment. *P. costaricensis*: (30) male sternum 8, (31) male sternum 9, (32) male tergum 10, (33) aedeagus (dorsal view), (34) aedeagus (lateral view), (35) female sternum 8, (36) female tergum 10, (37) gonocoxites of female genital segment. *P. montanus*: (38) male sternum 8, (39) male sternum 9, (40) male tergum 10, (41) aedeagus (dorsal view), (42) aedeagus (lateral view), (43) female sternum 8, (44) gonocoxites of female genital segment. *P. moyae*: (45) female tergum 10, (46) gonocoxites of female genital segment. (Scale bar = 0.4 mm)

Geographical distribution. *Pescolinus palmatus* has been recorded from Panama and Costa Rica (new country record) at 1200–1800 m a.s.l. in the biogeographic province of Puntarenas-Chiriqui (Fig. 70).

Bionomics. Unknown.

Type material (all examined). Lectotype (Fig. 1), ♂, here designated, specimen glued to white card with following Sharp's handwrit-

ing: '*Pescolinus palmatus* | D.S. V. de Chiriquí | 4–6,000ft. Champion' and three additional labels, 'V. de Chiriquí | 4,000–6,000 ft. | Champion', 'B.C.A. Col. I. 2. | *Pescolinus* | *palmatus* | Sharp.', 'SYNTYPE' (round white label with light blue margin), 'Lectotype *Pescolinus* | *palmatus* Sharp, 1885 | des. Chani Posse 2012' (BMNH). Paralectotype, 1 ♂ with same labels as lectotype and additional labels 'Chicago Nat. Hist. Mus. | (ex D. Sharp Colln. By exchange with Brit. Mus. Nat. Hist.)', 'Paralectotype *Pescolinus* | *palmatus* Sharp, 1885 | des. Chani Posse 2012' (FMNH).

Other material examined. Costa Rica: San José Prov. | 2.4km ENE Sn Gerardo de Rivas | Cloudbridge Reserve, River Trail, 1700m, 9°28.36'N 83°34.51'W, 8–11-VI.2004, J. Ashe, Z. Falin, I. Hinojosa | ex. Flight intercept trap, 1 ♂ (SEMC).

3.2.8. *Pescolinus schmidti* Bierig, 1937

Figs. 2, 11–16, 18–20, 51–58, 69, 70

Pescolinus schmidti Bierig, 1937: 193; HERMAN 2001: 2728 (catalog).

Diagnosis. *Pescolinus schmidti* differs from all other *Pescolinus* species by the abdominal terga 3–5 with posterior line of basal transverse carinae distinctly punctuated and by the distinct body colour pattern: head, thorax and elytra metallic dark blue to greenish blue; abdomen with first four abdominal segments reddish brown and apical segments distinctly darker, dark brown to black; antennae mostly dark brown with last two apical segments distinctly lighter, palpi and legs dark brown to black.

Redescription. Body length 9.5–12.0 mm. Colouration as in diagnosis.

Head about as wide as long to slightly wider than long (HW/HL = 1.0–1.1), moderately wider than pronotum (HW/PW = 1.2). Eyes slightly to moderately shorter than temples (EL/TL = 0.8–0.9) seen from above. Antennae with 1st antennomere about as long as 2nd and 3rd combined, 3rd about 1.5 × as long as 2nd (Fig. 11). Labial palpus with 2nd palpomere about twice as long as 1st (Fig. 13). Maxillary palpus with 4th palpomere (apical) 1.8 × as long as 3rd (Fig. 12). Neck about 0.4 × as wide as head at widest point. **Pronotum** slightly to moderately longer than wide (PW/PL = 0.8–0.9), dorsal rows of punctures each with four to five punctures. **Legs:** Profemora slightly broadened at basal half; protibia with distinctly dense setation. **Elytra** at sides about 1.5 × as long as elytra along suture (EtL/Etl = 1.5–1.6).

Abdomen: Abdominal terga 3–5 with posterior transverse basal carina punctuated (Fig. 18). **Male genitalia:** Sternum 8 with medially produced concave projection (Fig. 51). Genital segment with lateral tergal sclerites 9 (styli) dorsoventrally flattened and moderately dilated (Fig. 20). Sternum 9 with longest apex of basal portion acute (Fig. 52). Tergum 10 truncate at apex with eight apical setae (Fig. 53). Aedeagus with median lobe gradually narrowed from the apical fourth (Figs. 54, 55). **Female genitalia:** Sternum 8 projected medially and subtruncate medioapically (Fig. 56). Tergum 10 subangulate apically (Fig. 57). Styli of second gonocoxites each with one long apical macroseta (Fig. 58).

Geographical distribution. *Pescolinus schmidti* has been recorded from the biogeographical provinces of Puntarenas-Chiriqui and Guatuso-Talamanca in Costa Rica at 1600–2000 m a.s.l. (Fig. 70).

Bionomics. This species was found in association with bromeliads in a primary forest. Specimens have been collected both with Malaise and flight intercept traps.

Type material (all examined). Holotype (Fig. 2), ♀, specimen glued to white card with labels: 'Vara Blanca | II.36, 2000m | Costa Rica', 'TYPUS' (green label), '*Pesc.* | *schmidti* | Brg.' in Bierig's handwriting, 'Field Mus. Nat. Hist. | 1966 | A. Bierig Collection, Acc. Z. 13812', 'Holotype *Pescolinus* | *schmidti* Bierig, 1937 | des. Chani Posse 2012' (FMNH). **Notes:** In the original description BIERIG (1937) stated that he had a unique specimen (female) of *P. schmidti*. The specimen mentioned above agrees with the original description by BIERIG (1937), being the holotype fixed by monotypy (ICZN 1999, Article 73.1.2).

Other material examined. In total 18 specimens, including 4 ♂ and 13 ♀ and one without genitalia. Costa Rica: Carpintera: 17.I.30, Nevermann, in yellow label "METATYPUS", Field Mus. Nat. Hist. 1966 A. Bierig Collection, Acc. Z. 13812, 1 without genitalia (FMNH). Heredia: Camino San Rafael nr. Vara Blanca, 12.II.1994, V. Behan & E. E. Linquist, 1600m, primary forest ex. Bromeliads, 1 ♂, 1 ♀ (CNC). La Palma: XI.39, Marín leg., Field Mus. Nat. Hist. 1966 A. Bierig Collection, Acc. Z. 13812, "METATYPUS" printed in yellow label, 2 ♂, 1 ♀ (FMNH). San José: Cartago, km 45 Int. Amer. Hwy. 6 km N. E. El Empalme, 8–26 Jun 1997, S. & J. Peck, 1975m, 9°45'00"N 83°58'30"W, ex. Flight intercept trap CR1P7 019, 2 ♀ (SEMC); Zurqui de Moravia, June 1992/ July 1992/April–May 1993/VI 1993/Sept–Oct 1993/IV 1994/1–30 Sept 1995/1–30 Oct 1995, Paul Hanson, 1600m, Malaise, 1 ♂, 9 ♀ (SEMC).

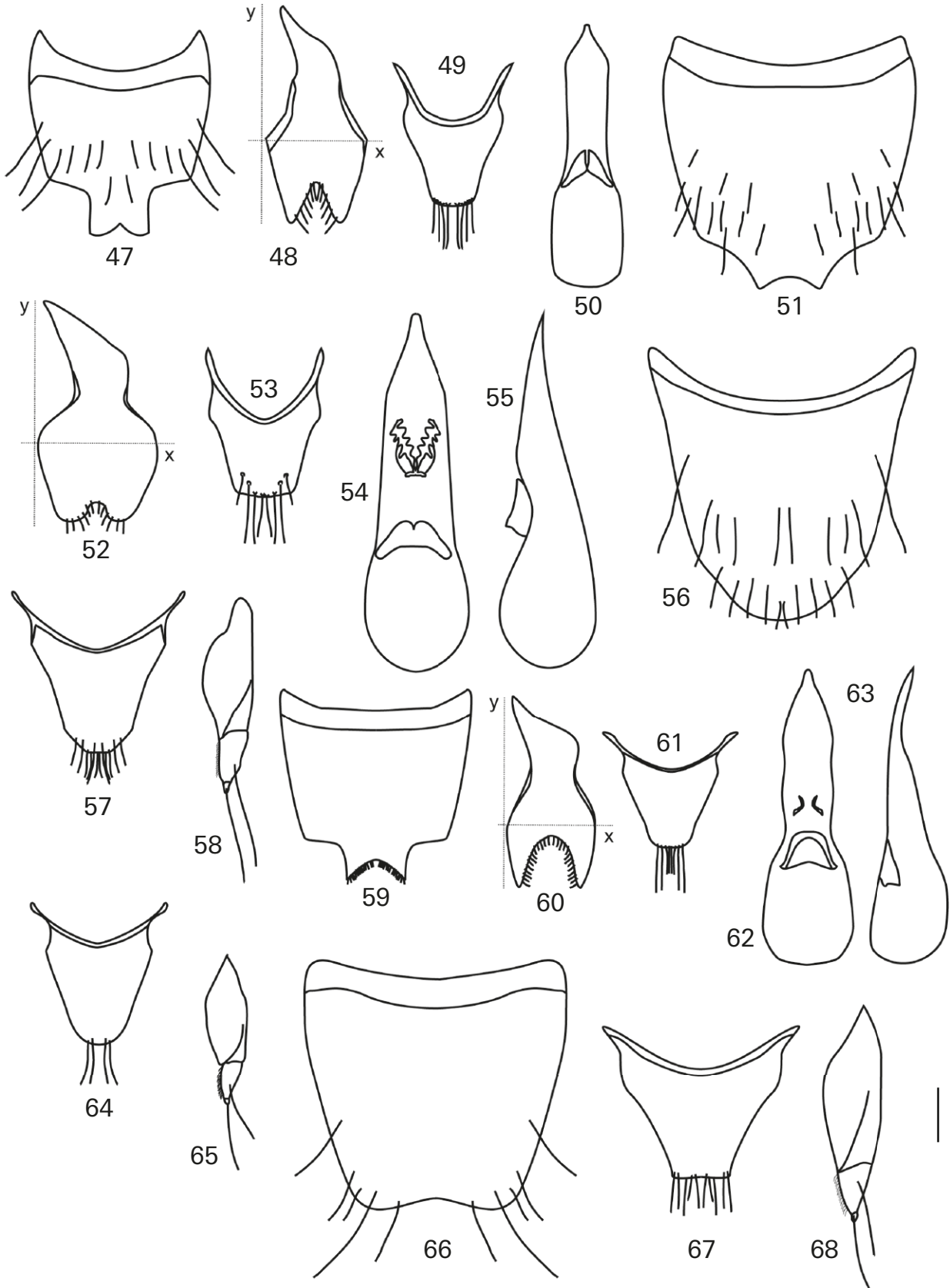
3.2.9. *Pescolinus varablanquesis* sp.n.

Figs. 9, 59–65, 69, 70

Diagnosis. *Pescolinus varablanquesis* can be recognized among the other species of *Pescolinus* by the labial palpomere 2 about 2 × as long as 3 (apical), by the lateral tergal sclerites 9 (styli) moderately dilated in males and by the distinct body colour pattern: head, elytra and apical abdominal segments dark brown, thorax and first three abdominal segments reddish brown to light brown; antennae mostly dark brown with last two apical segments distinctly lighter, palpi and legs brown.

Description. Body length 8.0–9.0 mm. Colouration as in diagnosis.

Head slightly wider than long (HW/HL = 1.1), slightly wider than pronotum (HW/PW = 1.1). Eyes moderately shorter than temples (EL/TL = 0.8) seen from above. Antennae with 1st antennomere distinctly shorter than 2nd and 3rd combined, 3rd about 1.3 × as long as 2nd. Labial palpus with 2nd palpomere about twice as long as 1st. Maxillary palpus with 4th palpomere (apical) 1.5 × as long as 3rd. Neck about 0.4 × as wide as head at widest point. **Pronotum** moderately longer than wide (PW/PL = 0.8–0.9), dorsal rows of punctures each with four to five punctures. **Legs:** Profemora moderately broadened at basal half; protibia with moderately dense setation. **Elytra**



Figs. 47–68. *Pescolinus palmatus*: (47) male sternum 8, (48) male sternum 9, (49) male tergum 10, (50) aedeagus (dorsal view). *P. schmidti*: (51) male sternum 8, (52) male sternum 9, (53) male tergum 10, (54) aedeagus (dorsal view), (55) aedeagus (lateral view), (56) female sternum 8, (57) female tergum 10, (58) gonocoxites of female genital segment. *P. varablanquesis*: (59) male sternum 8, (60) male sternum 9, (61) male tergum 10, (62) aedeagus (dorsal view), (63) aedeagus (lateral view), (64) female tergum 10, (65) gonocoxites of female genital segment. *Neopescolinus nevermanni*: (66) female sternum 8, (67) female tergum 10, (68) gonocoxites of female genital segment. (Scale bar = 0.4 mm)

at sides more than $1.5 \times$ as long as elytra along suture (EtL/EtI = 1.7–1.8).

Abdomen: Abdominal terga 3–5 with posterior transverse basal carina not punctuated. **Male genitalia:** Sternum 8 with medially produced concave projection (Fig. 59). Genital segment with lateral tergal sclerites 9 (styli) dorsoventrally flattened and distinctly dilated. Sternum 9 with longest apex of basal portion acute (Fig. 60). Tergum 10 concave at apex with eight apical setae (Fig. 61). Aedeagus with median lobe gradually narrowed from the apical third (Figs. 62, 63). **Female genitalia:** Sternum 8 projected medially and truncate medioapically. Tergum 10 arcuate medioapically (Fig. 64). Styli of second gonocoxites each with one long apical macroseta (Fig. 65).

Geographical distribution. Costa Rica: Vara Blanca (Fig. 70).

Bionomics. Unknown.

Etymology. The specific name keeps the original manuscript (specific) name given by Alexander Bierig, i.e. from Latin *varablanquesis*, “of Vara Blanca”.

Type material (all examined). Holotype (Fig. 9), ♂, with labels: ‘Vara Blanca | VIII.38 | Costa Rica’, ‘*Linoderus* | *varablanquesis* | Brg.’ in Bierig’s handwriting, ‘Field Mus. Nat. Hist. | 1966 | A. Bierig Collection, Acc. Z. 13812’, ‘Holotype *Pescolinus* | *varablanquesis* | Chani Posse, 2014’ (FMNH). Paratypes: 2 ♀ with same labels as the holotype and additional label ‘Paratype *Pescolinus* | *varablanquesis* | Chani Posse, 2014’ (FMNH).

3.3. Genus *Neopescolinus* gen.n.

Figs. 3, 66–70

Type species. *Neopescolinus nevermanni* sp.n., here designated.

Etymology. The name of the genus is a combination of the genus name *Pescolinus* and the prefix “neo” derived from the Greek “néos”, meaning “new”. The name is masculine.

Diagnosis. Adults of *Neopescolinus* differ from all other genera of Philonthina by the following combination of characters: the antennal insertions at equal distance to both the anterior margin of frontoclypeus and the eyes, separated from each other by distinctly less than $2.5 \times$ the distance to the eye, the antennomeres 1–5 with long setae, the labial palpomeres 2 and 3 about equal in length and the protarsomeres 1–4 more or less flattened dorsoventrally and widened distally.

Description. Length 12.5 mm. **Colouration:** Head and thorax dark metallic blue; elytra and first three abdominal segments piceous to dark brown, apical segments dis-

tinctly lighter, reddish brown to light brown; antennae, palpi and legs dark brown to black.

Head of rounded-quadrangular shape with obtusely rounded hind angles (Fig. 3) and at basal third about as wide as distal third; about as long as wide, moderately wider than pronotum at widest point; dorsal and ventral surface of head with rather rudimentary wave-like microsculpture. Eyes moderately convex, one half as long as temples seen from above. Antennae inserted at equal distance to both the anterior margin of frontoclypeus and the eyes, separated from each other by distinctly less than $2.5 \times$ the distance to the eye, 1st antennomere not longer than half of the head length, 2nd distinctly shorter than 3rd, 1st–5th with distinct long setae. Labrum subrectangular, distinctly transverse. Mentum with anterior margin straight and about as long as submentum. Labial palpus moderately long, 2nd palpomere with 3–4 setae at medial basal half and about $1.3 \times$ as long as 1st, 3rd medially inflated and moderately longer than 2nd (Lp3L/Lp2L = 1.3).

Prothorax: Pronotum moderately longer than wide, slightly broadened anteriorly; front margin subtruncate, hind margin arcuate, anterior and posterior angles rounded (Fig. 3); disc with dorsal rows of punctures sub-parallel to each other, each with 4 punctures. Prosternum without distinct mid-longitudinal carina. **Legs:** Profemora slightly broadened at basal half with rather scarce setae; protibia with moderately dense setation; protarsi with first four segments flattened dorsoventrally and widened distally, with rather short and straight pale (adhesive) setae underneath; 1st metatarsomere distinctly longer than 5th metatarsomere (last) (S1/S5 = 1.5). **Elytra** at suture distinctly shorter than pronotum at midline (Fig. 3); punctuation coarse, dense.

Abdomen: Abdominal terga 3–5 with posterior transverse basal carina complete, straight and punctuated. Hind margin of tergum 8 (sixth visible) arcuate. **Male genitalia:** Unknown. **Female genitalia:** Sternum 8 hind margin emarginate medioapically (Fig. 66). Genital segment with lateral tergal sclerites 9 (styli) dorsoventrally flattened and slightly dilated; tergum 10 truncate apically (Fig. 67); second gonocoxites each with a long macroseta distally, with a minute stylus bearing one long apical macroseta (Fig. 68).

Immature stages. Unknown.

Bionomics. Unknown.

Distribution. The only known specimen was collected in Volcan Poas (Costa Rica) at 2600 m a.s.l., belonging to the biogeographical province of Puntarenas-Chiriqui (MORRONE 2014) (Fig. 70).

3.3.1. *Neopescolinus nevermanni* sp.n.

Figs. 3, 66–70

Diagnosis. As for the genus (see above).**Description.** Body length 12.8 mm. Colouration as for genus.

Head about as wide as long (HW/HL = 1.0), moderately wider than pronotum (HW/PW = 1.2). Eyes 0.5 × as long as temples seen from above. Antennae with 1st antennomere slightly shorter than 2nd and 3rd combined, 3rd about 1.2 × as long as 2nd. Labial palpus with 2nd palpomere about 1.3 × as long as 1st. Maxillary palpus with 4th palpomere (apical) 1.8 × as long as 3rd. Neck about 0.4 × as wide as head at widest point. **Pronotum** moderately longer than wide (PW/PL = 0.8), dorsal rows of punctures each with 4 punctures. **Elytra** at sides more than 1.5 × as long as elytra along suture (EtL/Etl = 1.8).

Male genitalia: Unknown. **Female genitalia:** Sternum 8 moderately emarginate medioapically (Fig. 66). Tergum 10 truncate at apex with eight to ten apical setae (Fig. 67). Styli of second gonocoxites each with one long apical macroseta (Fig. 68).

Geographical distribution. As for the genus.**Etymology.** The specific name keeps the original manuscript (specific) name given by Alexander Bierig, who dedicated it to his friend and colleague, Ferdinand Nevermann.

Type material. Holotype (Fig. 3), ♀, with labels: 'Vulkan Poas | 2500m', 'Volcán Poas | 2600m, IV.36 | Costa Rica', 'Pesc. | nevermanni | Brg.' in Bierig's handwriting, 'Field Mus. Nat. Hist. | 1966 | A. Bierig Collection, Acc. Z. 13812', 'Holotype *Neopescolinus* | nevermanni | Chani Posse, 2014' (FMNH).

4. Cladistic analysis

4.1. Methods

4.1.1. Outgroup taxa

The chosen outgroup taxa include eight species, each representing a genus of the subtribe Philonthina: *Philonthus* Stephens, 1829 (*P. flavolimbatus* Erichson), *Leptopeltus* Bernhauer, 1906 (*L. flavipennis* (Erichson)), *Belonuchus* Nordmann, 1837 (*B. haemorrhoidalis* (Fabricius)), *Ophionthus* Bernhauer, 1908 (*O. serpentinus* Bernhauer), *Paederomimus* Sharp, 1885 (*P. difformiceps* Sharp), *Xanthodermus* Bernhauer, 1912 (*X. vestitus* (Sahlberg)), *Linoderus* Sharp, 1885 (*Linoderus gracilipes* Sharp) and *Odontolinus* Sharp, 1885 (*Odontolinus fasciatus* Sharp). Nine ingroup terminal units were included in the cladistic analysis: *Neopescolinus nevermanni* and the eight

species of *Pescolinus* in accordance with the present revision. My recent morphology-based phylogeny of the Neotropical Philonthina (CHANI-POSSE 2013) shows all but one of the Neotropical endemic genera forming a natural group which would also include the genus *Holilus* Erichson (at present in a different and monotypic subtribe, Hyptiomina), while several representatives of the genus *Philonthus* (including *P. flavolimbatus*) appear in a group far from the one including the Neotropical endemic genera. Based on this evidence, the analysis was rooted with the outgroup taxon *Philonthus flavolimbatus*. The 64 morphological characters for the outgroup taxa were coded from the examination of specimens.

4.1.2. Characters

Selection and definition of characters and character states mainly followed the character system developed by SMETANA & DAVIES (2000), SOLODOVNIKOV & NEWTON (2005) and LI & ZHOU (2011). Sixty-four characters were used, from which 48 were derived from external morphology, 11 from male genitalia, and 5 from female genitalia. Among these, 18 characters (in parentheses) are parsimoniously uninformative. They were excluded from the analysis for the calculation of tree statistics but retained in the matrix to make them traceable in the tree as potential autapomorphic characters. All characters were treated as unordered (non-additive) and given equal weight. Following SERENO (2007, 2009), neomorphic (presence/absence) and transformational (transformation from one state to another) characters referring to the same structure were coded separately. Twenty-nine characters from this list (*) were already used and most of them illustrated in previous studies (CHANI-POSSE & ASEÑO 2013; CHANI-POSSE 2013, 2014).

1. Colour pattern, antenna: [0] antennomeres 4–7 or 4–9 reddish brown to dark brown, antennomeres 1–3 and 8–11 or only 10 and 11 distinctly lighter, [1] antennomeres 1–9 reddish brown to dark brown, 10 and 11 distinctly lighter (Figs. 1, 2, 5, 7, 9); [2] absent (or only antennomeres 1–3 distinctly lighter) (Figs. 4, 6, 8).
2. Colouration, head and pronotum: [0] equal (Figs. 2–3, 8); [1] different (Figs. 1, 5–7, 9).
3. Colouration, elytra: [0] uniform; [1] distinctly darker apically; [2] distinctly lighter apically.
4. Colouration, abdomen: [0] uniform (i.e., all segments of about the same colour); [1] two-colour pattern (i.e., colour of first three to five segments differs from that of the most apical ones); [2] three-colour pattern (i.e., colour of first three segments differs from that of the following two segments, most apical segment also different).
5. Colour pattern, abdominal segments, colour: [0] mostly dark (dark brown to black) (Fig. 3); [1] mostly light (yellowish to reddish brown) (Figs. 1, 2, 4–9).

- 6*. Antennae, antennomere 1, apical spine-like seta: [0] absent; [1] present (CHANI-POSSE 2014: fig. 3F).
7. Antennal insertions, distance to frontoclypeus relative to distance to eye (AF/AE): [0] closer to frontoclypeus; [1] at equal distance or closer to eye.
- (8)*. Antennal insertions, distance between left and right one relative to distance to eye (AA/AE), male: [0] ≤ 2.5 ; [1] $\gg 2.5$.
- 9*. Antennae, antennomere 3, length relative to length of antennomere 2 (AL3/AL2): [0] ≤ 1.0 ; [1] 1.2–1.5; [2] $\gg 1.5$.
- (10). Antennae, long setae: [0] absent to scarce; [1] present and distinct.
11. Antennae, long setae (if present and distinct), from antennomere 1: [0] up to 3rd antennomere; [1] up to 4th antennomere; [2] up to 5th antennomere (Fig. 10); [3] up to 6th antennomere (Fig. 11).
- (12). Antennae, antennomere 6 (proportions): [0] elongate; [1] quadrate; [2] transverse.
13. Antennae, antennomere 7 (proportions): [0] elongate; [1] quadrate; [2] transverse.
14. Antennae, antennomere 8 (proportions): [0] elongate; [1] transverse.
15. Antennae, antennomere 9 (proportions): [0] elongate; [1] transverse.
16. Antennae, antennomere 10 (proportions): [0] elongate; [1] transverse.
- 17*. Head, postmandibular ridge: [0] absent; [1] present (Fig. 13; CHANI-POSSE 2013: fig. 3A–C,F).
- 18*. Head, infraorbital ridge: [0] absent; [1] present (CHANI-POSSE 2013: fig. 3C,F).
- 19*. Maxillary palpus, 4th palpomere (apical), shape: [0] fusiform (CHANI-POSSE 2013: fig. 1J); [1] subcylindrical (parallel-sided) (Figs. 12, 13; CHANI-POSSE 2013: fig. 1A).
- (20)*. Maxillary palpus, 4th palpomere (apical) length relative to length of 3rd (Mp4L/Mp3L): [0] ≤ 1.8 ; [1] ≥ 2.0 .
21. Labial palpus, 3rd palpomere (apical) length relative to length of 2nd (Lp3L/Lp2L): [0] moderately shorter (ca. 1.2); [1] subequal; [2] distinctly longer.
- (22). Labial palpus, 3rd palpomere (apical), shape: [0] subcylindrical; [1] fusiform or medially inflated (Fig. 13).
- 23*. Neck, transverse carina: [0] absent; [1] present (CHANI-POSSE 2013: fig. 1A).
- 24*. Pronotum, anterior angles relative to anterior margin of prosternum: [0] not produced beyond (CHANI-POSSE 2013: figs. 1J, 2B,C); [1] produced beyond (CHANI-POSSE 2013: figs. 1N, 2A,D).
- (25). Pronotum, punctuation of disc: [0] absent; [1] present.
- (26)*. Pronotum, punctuation of disc (if present): [0] not arranged in two medial longitudinal rows; [1] arranged in two medial longitudinal rows (e.g., Figs. 6, 7).
- 27*. Prosternum, mid-longitudinal carina: [0] absent (only medial prominence, not carinate, not longitudinal) (CHANI-POSSE 2013: fig. 2B); [1] developed only along furcasternum (CHANI-POSSE 2013: fig. 2A); [2] developed along furcasternum and at least part of basisternum.
- (28). Prosternum, microsculpture of oblique and transverse wavelines: [0] faint on both basisternum and furcasternum (Fig. 14); [1] faint on basisternum, distinct on furcasternum.
- 29*. Prosternum, basisternum transverse carina: [0] absent; [1] present (Fig. 14; CHANI-POSSE 2013: figs. 1N, 2D).
- 30*. Sternopleural (anapleural) suture: [0] transverse, or nearly transverse (very slightly oblique) (CHANI-POSSE 2013: fig. 2E); [1] distinctly oblique (medial end of suture anterior to its lateral end) (CHANI-POSSE 2013: fig. 2B).
31. Profemur, maximum width at basal half relative to minimum width at apex (Pfmw/Pfmw): [0] ≤ 1.0 ; [1] 1.3–1.6 (Figs. 16, 17); [2] $\gg 1.6$.
32. Profemur, setae: [0] scarce (Fig. 17); [1] dense (Fig. 16).
- (33)*. Protibia, setae: [0] distinctly dense; [1] moderately dense (Figs. 16, 17); [2] sparse.
- 34*. Protarsi, shape: [0] tarsomeres 1–4 more or less cylindrical, not widened distally and not flattened dorsoventrally (CHANI-POSSE 2014: fig. 6C); [1] tarsomeres 1–4 more or less flattened dorsoventrally and widened distally (CHANI-POSSE 2014: fig. 6D).
- 35*. Protarsi, sexual dimorphism: [0] present (tarsomeres 1–4 flattened dorsoventrally and widened distally, with modified pale (adhesive) setae on ventral surface, both conditions more distinct in males than in females); [1] absent (both sexes with tarsomeres 1–4 more or less cylindrical with only regular, unmodified marginal setae on ventral surface).
36. Protarsi (if dimorphic), pale setae, shape: [0] straight and short (CHANI-POSSE 2014: fig. 6A); [1] long and curved (Fig. 15).
37. Mesotibia, setae: [0] dense; [1] sparse.
- (38). Male metatrochanter, spines: [0] absent; [1] present.
39. Male metafemur, spines: [0] absent; [1] present.
40. Elytra, punctuation of disc, size: [0] fine; [1] coarse.
41. Abdomen, terga 3–5, basal transverse carinae, posterior line punctuation: [0] absent; [1] present (Fig. 18; CHANI-POSSE & ASENJO 2013: fig. 2M).
- 42*. Abdomen, tergum 3, basal transverse carinae, posterior line: [0] absent (CHANI-POSSE 2013: fig. 2N); [1] present (CHANI-POSSE 2013: fig. 2K–M).
- (43)*. Abdomen, tergum 3, posterior basal transverse carina, medial part: [0] straight, rounded, or slightly pointed; [1] sinuate.
- 44*. Abdomen, tergum 4, basal transverse carinae, posterior line: [0] absent (CHANI-POSSE 2013: fig. 2M); [1] present (CHANI-POSSE 2013: fig. 2K,L).

Table 1. Data matrix of species of *Pescolinus* and *Neopescolinus* plus various staphylinid outgroup taxa [O], all from Philonthina.

	000000001	111111112	222222223	333333334	444444445	555555556	6666
	1234567890	1234567890	1234567890	1234567890	1234567890	1234567890	1234
<i>Philonthus flavolimbatus</i> [O]	2020000011	0011111100	2100110000	2011001000	0101101?00	121001?100	1000
<i>Leptopeltus flavipennis</i> [O]	2020000011	1012221000	2100112011	20001?0000	0101101?00	111001?321	1012
<i>Belonuchus haemorrhoidalis</i> [O]	2001000011	0221120100	2100110000	20101?1010	0101101?00	122001?111	1012
<i>Ophionthus serpentinus</i> [O]	1001000011	1000001011	2001111011	1021?01000	1101111??0	0???1?0?1	2???
<i>Paederomimus difformiceps</i> [O]	0001100011	1000220000	2111111111	10101?1001	10?00?1?00	110001?0?1	1???
<i>Xanthodermus vestitus</i> [O]	2000110001	1121111010	21000?1011	20101?100?	00?00?0??0	122001?211	0012
<i>Linoderus gracilipes</i> [O]	0101101111	2000001010	0101110011	00101?1000	0101102111	1020101211	0011
<i>Odontolinus fasciatus</i> [O]	0012110000	?000001010	2111110011	1011010110	0101100?00	1000100211	1112
<i>Pescolinus aeneus</i>	2001100011	3000001010	0101110011	2111010000	0101102212	1000101221	0011
<i>Pescolinus cartagensis</i>	1101100011	3000001010	0101110011	1111010000	010110??1?	?????0??2?	?011
<i>Pescolinus costaricensis</i>	2101100011	3000001010	0101110011	2111010000	0101102112	1010101221	0011
<i>Pescolinus montanus</i>	1100100011	3000001010	0101110011	2?11010000	0101101?02	1010101221	0011
<i>Pescolinus moyae</i>	2001100011	3000001010	0101110011	111101000?	010110??1?	?????0??1?	?011
<i>Pescolinus palmatus</i>	1101100011	3000001010	0101110011	2111010000	01011022?2	10001012?1	0???
<i>Pescolinus schmidti</i>	1001100011	3000001010	0101110011	1111010000	1101102012	1000101211	0011
<i>Pescolinus varablanquesis</i>	1101100011	3000001010	0101110011	2111010000	0101102012	1000101211	0011
<i>Neopescolinus nevermanni</i>	2001001011	2000001010	1101110011	1011000001	110110??0?	?????0??1?	?012

- 45*. Abdomen, tergum 5, basal transverse carinae, posterior line: [0] absent (CHANI-POSSE 2013: fig. 2M,N); [1] present (Fig. 18; CHANI-POSSE 2013: fig. 2K,L).
- (46)*. Abdomen, tergum 5, basal transverse carinae, posterior line (if present): [0] complete (Fig. 18); [1] uncomplete (i.e., median part not distinct).
47. Male sternum 8, apical margin: [0] not produced, medially straight to very slightly concave; [1] not produced, with single, variably developed median emargination (Fig. 38); [2] with a medially produced projection (Figs. 21, 30, 47, 51, 59).
48. Male sternum 8, apical margin of projection (if medially produced): [0] concave (Figs. 51, 59); [1] angulate (Fig. 30); [2] emarginate (Figs. 21, 47).
49. Female sternum 8, apical margin: [0] straight to slightly projected medially (Fig. 43, 66); [1] distinctly projected medially (Figs. 26, 35, 56).
- 50*. Male sternum 9, basal portion, length relative to length of distal portion (S9b/S9d): [0] ≤ 1.0; [1] 1.2–1.4; [2] ≥ 1.6 (Figs. 22, 31, 39, 48, 52, 60). — Note: measured along the longitudinal line (y) joining the most basal and distal ends of sternum 9, the limit between the two portions is given by a transverse line (x) at the maximum width of sternum 9.
- (51)*. Male sternum 9, basal portion: [0] more or less symmetrical (i.e., both lateral ends similarly produced, not extending far from each other) (CHANI-POSSE 2011: fig. 20); [1] asymmetrical (i.e., one lateral end distinctly produced, extending far from the other) (Figs. 22, 31, 39, 48, 52, 60).
52. Male sternum 9, basal portion, asymmetry: [0] distinct (Figs. 22, 31, 39, 48, 52, 60); [1] moderate (CHANI-POSSE & ASENJO 2013: fig. 3F); [2] slight (CHANI-POSSE 2010: fig. 66).
53. Male sternum 9, longest apex of basal portion if asymmetrical: [0] acute (Figs. 22, 48, 52, 60); [1] subacute (Figs. 31, 39); [2] rounded.
- (54). Male sternum 9, distal portion, median emargination: [0] distinct; [1] not distinct.
55. Male sternum 9, distal portion, emargination (if distinct): [0] acute; [1] subangulate to concave; [2] slightly arcuate.
56. Lateral tergal sclerites 9 (styli): [0] dorsoventrally flattened; [1] not dorsoventrally flattened.
- (57). Lateral tergal sclerites 9 (styli) (if dorsoventrally flattened), sexual dimorphism: [0] absent; [1] present (Figs. 19, 20). — Note: lateral tergal sclerites 9 are distinctly wider in males than those in females when they are sexually dimorphic.
- 58*. Male tergum 10, apex: [0] emarginate medio-apically; [1] subtruncate apically to wide and subangulate or arcuate apically; [2] concave medio-apically to truncate (e.g., Figs. 23, 40, 61); [3] acute.
- 59*. Female tergum 10, apex: [0] subacute; [1] subtruncate apically to wide and subangulate or arcuate apically (Figs. 46, 57, 64); [2] truncate (Figs. 28, 36, 40).
- (60)*. Male genitalia, median lobe, attachment of parameres: [0] at base, parameres mainly separate; [1] along entire length, parameres mainly fused to median lobe (e.g., Figs. 24, 25, 41, 42, 62, 63).
- 61*. Male genitalia, median lobe, apex shape: [0] acute (e.g., Figs. 24, 25, 41, 42, 62, 63); [1] subacute to rounded; [2] truncate.
- (62). Ovipositor, styli on second gonocoxites: [0] present (e.g. Figs. 27, 37, 45, 68); [1] absent.
- (63)*. Ovipositor, each second gonocoxite, macrosetae, number: [0] 2–5; [1] 1 (e.g. Figs. 27, 37, 45, 68).
- 64*. Ovipositor, second gonocoxite, macrosetae, location: [0] along the outer margin (CHANI-POSSE 2010: figs. 36, 80); [1] at midline, distal (e.g. Figs. 27, 45); [2] at midline, basal (Fig. 68).

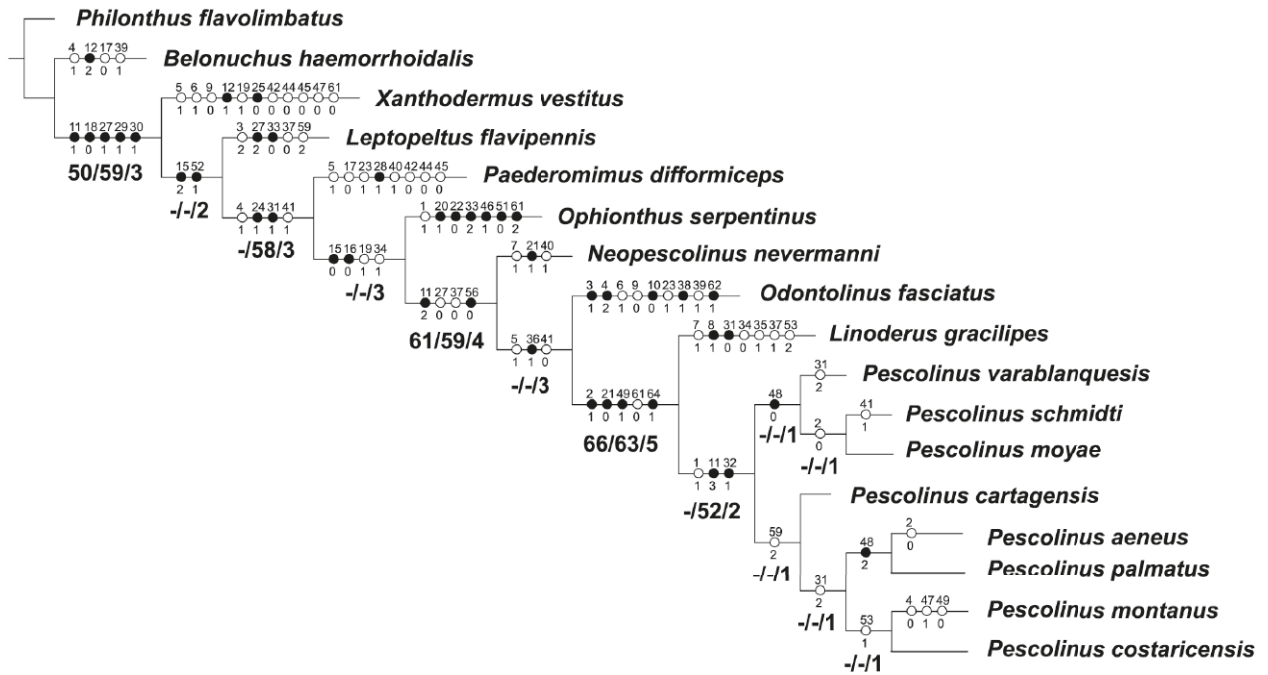


Fig. 69. Most parsimonious tree showing relationships between – and within – *Pescolinus* and *Neopescolinus nevermanni* (section 4.1.2.). Black circles: non-homoplastic apomorphies; white circles: homoplastic apomorphies. Numbers in bold below the branches are support values (Standard Bootstrap / Jackknife / Bremer).

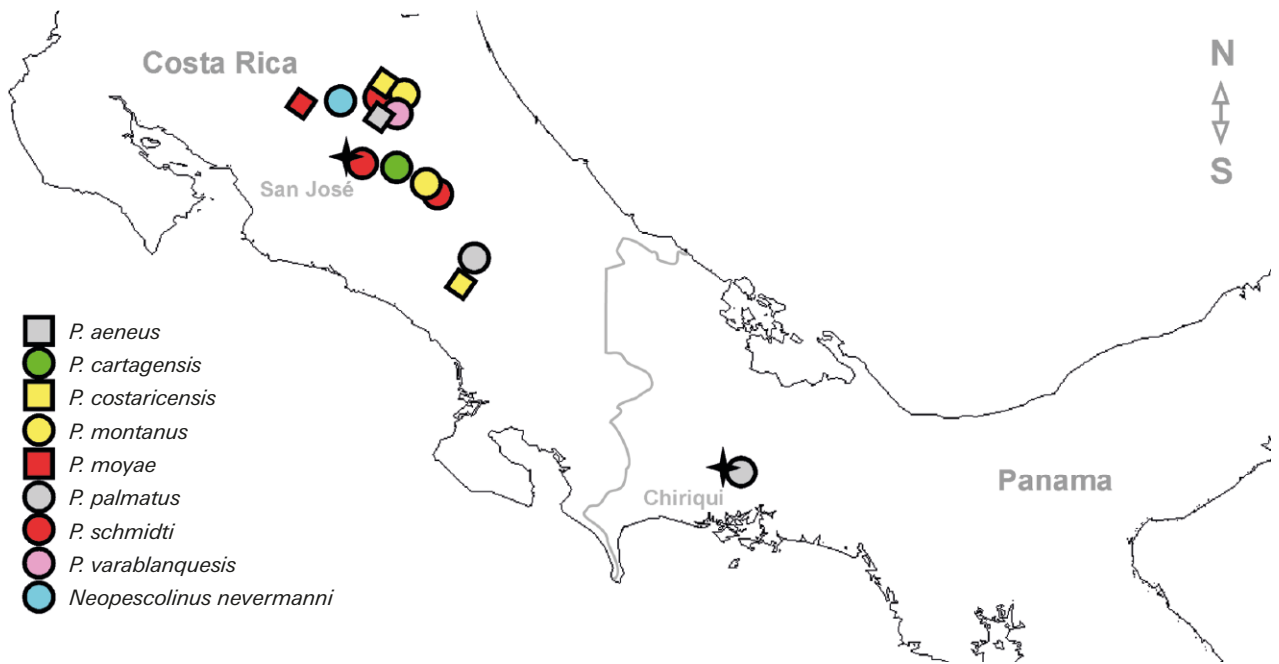


Fig. 70. Geographical distribution of *Pescolinus* species and *Neopescolinus nevermanni*.

4.1.3. Procedure

The matrix (Table 1) was prepared using Mesquite version 2.74 (MADDISON & MADDISON 2010) and analyzed by exact search (Analyze/Implicit enumeration) in TNT (GOLOBOFF et al. 2008). Space for 99999 trees was set in the memory. Only unambiguously optimized synapomorphies were considered. Clade support was assessed

by means of standard bootstrap analysis with frequency differences as implemented in TNT with 100 replications of heuristic searches with 100 interactions of random addition of taxa and holding 10 trees per interaction. The same parameters were used to perform a jackknife analysis. Bremer support values were calculated using the TNT Bremer function with suboptimal trees up to 10 steps longer.

4.2. Results and discussion

The analysis of the data matrix (Table 1) produced one cladogram with 108 steps, a consistency index (CI) of 0.620 and a retention index (RI) of 0.701. This most parsimonious tree (MPT) shows both *Pescolinus* and *Neopescolinus* within a well-supported monophyletic group together with *Linoderus* and *Odontolinus* (Fig. 69). The monophyly of this four-genera clade is established by two synapomorphies: antennae with long setae up to the fifth antennomere (11.2) and lateral tergal sclerites 9 (styli) dorsoventrally flattened (56.0). Additionally, *Odontolinus*, *Linoderus* and *Pescolinus* form a clade with a good support value and one synapomorphy: the protarsi with long and curved setae (36.1). *Linoderus* and *Pescolinus* form a clade supported by the following synapomorphies: head and pronotum of different colour (2.1); apical labial palpomere moderately shorter than preceding one (ratio ca. 1.2) (21.0); apical margin of female sternum 8 distinctly projected medially (49.1) and each second gonocoxite with one macroseta situated distally at midline (64.1).

The monophyly of *Pescolinus* is defined by two synapomorphies: antennae with long setae up to the sixth antennomere (11.3) and profemora with dense setation (32.1). The relationships within *Pescolinus* appear fully resolved but they show low support values. Three of its species (*P. varablanquesis* + (*P. moyae* + *P. schmidti*)) form a monophyletic group supported by one synapomorphy (48.0) and being the sister to a clade that includes the other five species of the genus. Within this second group, only the clade (*P. palmatus* + *P. aeneus*) appears supported by one synapomorphy (48.2).

The present study does not refute previous results (CHANI-POSSE 2014) regarding the monophyly of a clade composed by *Odontolinus*, *Linoderus* and *Pescolinus*. However, the present analysis yielded different sister-relationships for within this group, with (*Linoderus* + *Pescolinus*) + *Odontolinus* instead of *Linoderus* + (*Pescolinus* + *Odontolinus*). Characters supporting the sister-relationship between *Linoderus* and *Pescolinus* herein appear as “true” synapomorphies (unique within the range of taxa considered) contrasting with those that have formerly supported *Pescolinus* and *Odontolinus* as sister groups, which were all homoplastic characters related to the sexual dimorphism of the protarsi (CHANI-POSSE 2014: characters 68–71). Protarsal sexual dimorphism (see character 35, state 0 herein) is common within Philonthina (NEWTON et al. 2000; CHANI-POSSE 2013, 2014) and caution is advised to define a group based on widespread characters. Two of the four “true” synapomorphies defining the sister relationship here between *Linoderus* and *Pescolinus* (2.1 and 21.0) are also known as homoplastic traits. Additionally, a single macroseta occurring distally at the midline of each second gonocoxite (64.1) has been also recognized within Philonthina in a few species of *Paederomimus* Sharp and *Neobisnius* Ganglbauer, also in *Chroaptomus flagrans*

(Erichson), *Xenobius rotundiceps* Borgmeier and *Hesperopalpus venustus* Shibata, and also in *Heterothops exilis* Erichson (Staphylinini: Amblyopinina) (CHANI-POSSE 2014). However, among the Neotropical genera of Philonthina, *Linoderus* and *Pescolinus* are unique in having a unique and newly detected character of the apical margin of the female sternum 8 with a distinct medial projection (49.1).

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