

Seven species of *Pseudopecoeloides* Yamaguti, 1940 (Digenea, Opecoelidae) from temperate marine fishes of Australia, including five new species

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Abstract

Seven species of *Pseudopecoeloides* Yamaguti, 1940, including five new are described from marine fishes in the waters off the coasts of Queensland and both Western and South Australia. The new species are *Pseudopecoeloides hickmani* **sp. n.** from *Pseudocaranx wrighti*, *Pseudopecoeloides lesteri* **sp. n.** from *Pseudocaranx dentex* and *Pseudocaranx wrighti*, *Pseudopecoeloides arripi* **sp. n.** from *Arripis georgianus*, *Pseudopecoeloides atherinomori* **sp. n.** from *Atherinomorbus ogilbyi* and *Pseudopecoeloides hafeezullahi* **sp. n.** from *Trachurus novaezealandiae*. *Pseudopecoeloides scomberi* Hafeezullah, 1971, which was transferred to *Opecoeloides* Odhner, 1928 by Madhavi (1975), is reported from *Scomberoides lysan* and returned to *Pseudopecoeloides*. *Pseudopecoeloides tenuis* Yamaguti, 1940 is reported from a new host species, *Priacanthus macracanthus*. The Carangidae is the dominant host family for species of *Pseudopecoeloides*, followed by the Mullidae, Priacanthidae and Champsodontidae.

Keywords

Digenea, Opecoelidae, *Pseudopecoeloides*, *Pseudopecoeloides hickmani* sp. n., *Pseudopecoeloides lesteri* sp. n., *Pseudopecoeloides arripi* sp. n., *Pseudopecoeloides atherinomori* sp. n., *Pseudopecoeloides hafeezullahi* sp. n., South Australia, Western Australia, Queensland, fishes, Carangidae, Arripidae, Atherinidae, Priacanthidae

Introduction

In erecting *Pseudopecoeloides* Yamaguti, 1940 for *P. tenuis* Yamaguti, 1940 from the priacanthid *Pseudopriacanthus nipponicus* (Cuv. & Valenc.) [*sic* – ? *Pristigenys nipponius* Cuvier, Japanese bigeye], Yamaguti (1940) observed that the caecal ends were connected to the excretory vesicle (i.e. forming a uroproct). He re-examined the specimens of *Cymbephalus carangis* Yamaguti, 1938 and, finding a uroproct, transferred it to *Pseudopecoeloides*.

Pseudopecoeloides is a well established genus, containing elongate and slender worms with a pedunculate, non-papillate ventral sucker and a uroproct. All nominal species conform to this concept, except *Pseudopecoeloides equesi* Manter, 1947. *P. equesi* was described as bearing five distinct papillae on its ventral sucker and, in his original discussion, Manter (1947) thought that it could well represent a new genus. This species was transferred to *Dactylomyza* by Aken'Ova (2003).

Yamaguti (1971) listed ten species of *Pseudopecoeloides*, but later when Bartoli et al. (2003) devised a key to the species, they included 18 species. These are listed below in our discussion of our division of the genus into two groups.

The data presented below are for seven species recovered from temperate marine fishes in Australian waters. Fishes of four families are reported as hosts for these species, four from the Carangidae (trevallies, horse mackerel and queenfish) and one each from the Priacanthidae (big-eyes), Arripididae (ruff) and Atherinidae (hardyheads).

Materials and methods

Fish hosts discussed in this study were collected, mainly by angling or seining, from various sites in Moreton Bay in southeastern Queensland, around Fremantle, Coogee and Woodman Point in Western Australia and off Kangaroo Island, South Australia. Opacoelids were collected live from fish as soon as they had died or been anaesthetised. The worms were washed in cold saline, then fixed in hot saline and preserved in 5% formalin. Whole-mounts were prepared by staining in Mayer's acid haematoxylin, dehydrating in ethanol, clearing in methyl salicylate and then mounting in Canada balsam. Because of their pedunculate ventral sucker, the worms were mounted laterally or ventro-laterally. Measurements were taken using a computerised digitising system similar to that described by Roff and Hopcroft (1986) and recorded in micrometres as ranges followed by the means in parentheses. The length of the forebody was taken from the anterior extremity of the body to the lateral margin of the ventral sucker peduncle. In laterally mounted worms, the greatest dimension across the oral and ventral suckers was taken as the width and the depth as the length. The length of the ventral sucker peduncle was taken from the distal extremity to its point of attachment to the body. Figures were prepared with the aid of a drawing tube mounted on an Olympus BH2 microscope. Abbreviations: BMNH, the British Museum (Natural History) Collection at the Natural History Museum, London, UK; QM, Queensland Museum Collection, Brisbane, Australia.

Results

Family Opecoelidae Ozaki, 1925

Subfamily Opecoelinae Ozaki, 1925

Genus *Pseudopecoeloides* Yamaguti, 1940

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Species of *Pseudopecoeloides* can be divided into two morphological groups based on their sucker ratios, as follows:

Group A. Species with the oral sucker larger than the ventral sucker: *P. tenuis* Yamaguti, 1940 from Priacanthidae and Carangidae, in the Indo-West Pacific Region and Great Australian Bight; *P. tenuoides* Martin, 1960 from Priacanthidae and Acanthuridae, off Hawaii; *P. boops* Yamaguti, 1970 from Priacanthidae and Champsodontidae, off Hawaii and Mozambique; *P. opelu* Yamaguti, 1970 from the mackerel scad *Decapterus macarellus* (Cuvier), Carangidae, off Hawaii; *P. parviacetabulus* Yamaguti, 1970 from the bigeye scad *Selar crumenophthalmus* (Bloch), Carangidae, off Hawaii; *P. wekeula* Yamaguti, 1970 from Mullidae and Chaetodontidae, off Hawaii and the Seychelles; *P. chloroscombri* (Fischthal & Thomas, 1970) Bartoli, Gibson & Bray, 2003 from the Atlantic bumper *Chloroscombrus chrysurus* Girard and horse mackerels *Trachurus* spp., Carangidae, Western Mediterranean Sea, eastern Atlantic Ocean; *P. orientalis* Gupta & Ahmad, 1978 from the longbarbel goatfish *Parupeneus macronemus* (Lacepède), Mullidae, Bay of Bengal; *P. puriensis* Ahmad, 1978 from *Parupeneus macronemus*, Mullidae, Bay of Bengal; *P. psettodi* Parukhin, 1983 from the Indian spiny turbot *Psettodes erumei* (Bloch & Schneider), Psettodidae, Mozambique Channel; and *P. astrocongeneris* Shen, 1989 from the whitespotted conger *Conger myriaster* (Brevoort), Congridae, East China Sea; *P. dayawanensis* Shen & Tong, 1990 from the Malabar trevally *Carangoides malabaricus* (Bloch & Schneider), Carangidae, South China Sea; and *P. capucini* Toman, 1992 from *Pseudupeneus* sp., Mullidae, off Seychelles.

Group B. Species with the oral sucker the same size as or smaller than the ventral sucker: *P. carangis* (Yamaguti, 1938) mainly from Carangidae, but also recorded in Champsodontidae, Gempylidae, Mullidae, Polynemidae, Sciaenidae and Sphyracidae, widespread in tropical and subtropical warm waters of all oceans; *P. gracilis* Manton, 1947 from Carangidae (mainly) and Apogonidae, Gulf of Mexico and adjacent waters; *P. akule* Yamaguti, 1970 from Carangidae and Champsodontidae, off Hawaii and Mozambique; *P. scomberi* Hafeezullah, 1971 from *Scomberoides* spp., Carangidae, off India and Malaysia; and *P. mugilis* Shen, 1990 from the largescale mullet *Liza macrolepis* (Smith), Mugilidae, South China Sea.

Comment: In describing some new species, Yamaguti (1970) stated that the relative positions of the ovary and the testes were consistent and useful in the separation of species, except in contracted specimens. This view is followed here, and, in addition, the extent of the post-testicular area has been found to be a useful criterion.

***Pseudopecoeloides tenuis* Yamaguti, 1940**

Host: *Priacanthus macracanthus* Cuvier (Priacanthidae: Perciformes), red bigeye.

Localities: Moreton Bay: Off Tangalooma 27°14'S, 153°19'E; off Shorncliffe 27°21'S, 153°07'E.

Site: Pyloric caeca, intestine.

Material studied: 11 adults. Moreton Bay, Queensland: 6 off Tangalooma, February 1993; 5 off Shorncliffe, March and April 1995.

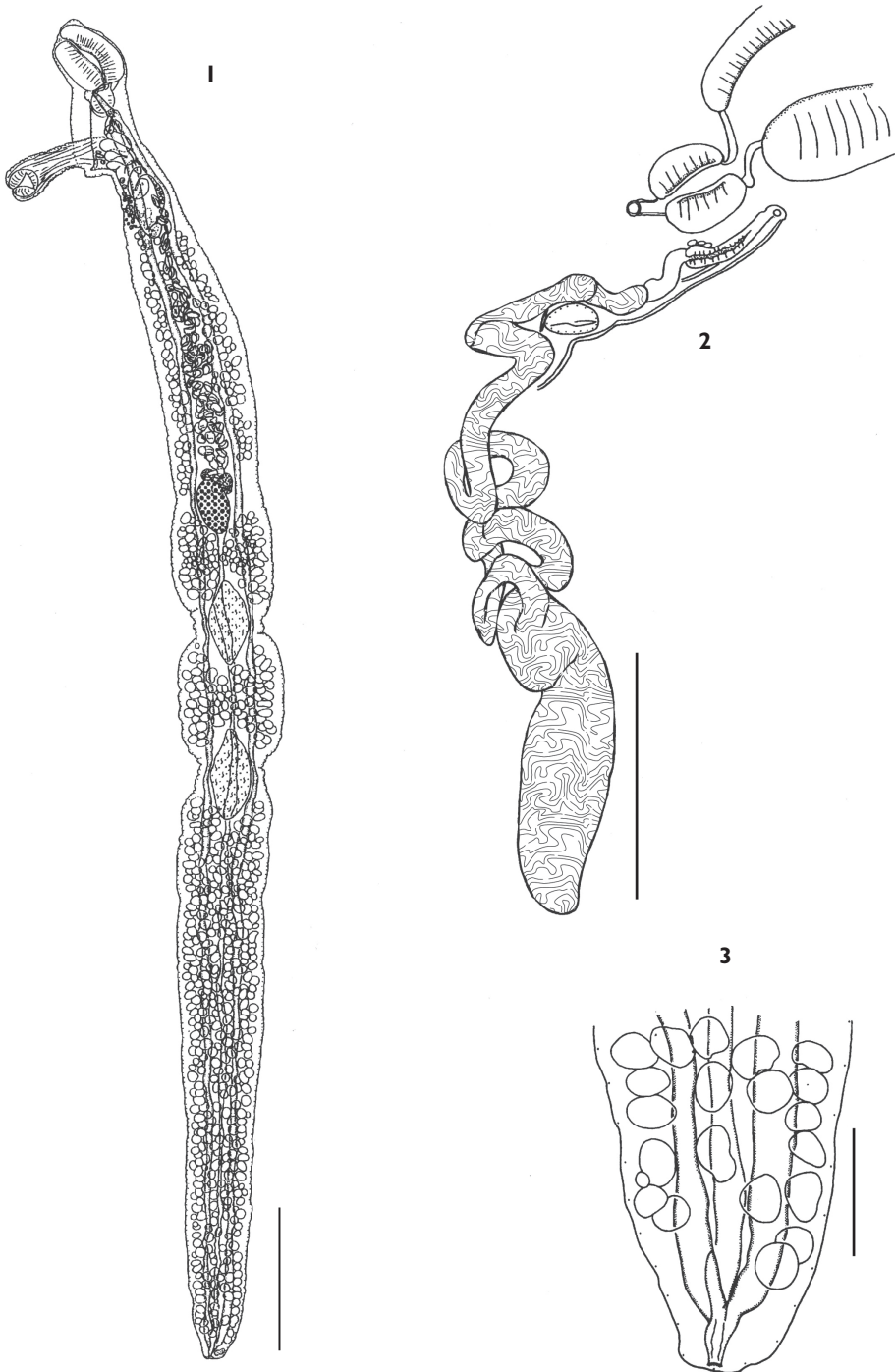
Voucher specimens: QM G230433- G230441; BMNH 2008.12.9.44-50.

Description (Figures 1-3): Based on 8 gravid whole-mounts and 3 sets of serial sections. Measurements are of 8 gravid, unflattened, laterally and dorso-ventrally mounted worms.

Body elongate, slender, more or less dorso-ventrally flattened, with 3 distinct constrictions adjacent to gonads; maximum width in region of gonads, 3,600-5,864 (4,468) × 225-450 (340); width to length ratio 1:10.9-17.7 (14.0). Oral sucker oblong, ventrally subterminal, 225-311 (257) × 135-214 (175). Ventral sucker pedunculate, spherical to subspherical, smaller than oral sucker, 91-113 (102) × 94-117 (104); sucker width ratio 1:0.5-0.8 (0.6). Ventral sucker peduncle moderately long, retractile, 238-454 (353) × 123-156 (137), 5.3-11.1 (8.0) % of body length. Forebody short, 331-425 (379), 6.6-10.4 (8.7) % of body length; peduncle to forebody length ratio 1:0.8-1.6 (1.1). Prepharynx distinct, very short. Pharynx distinct, spherical to subspherical, 75-110 (88) × 84-100 (90). Oesophagus very short, looped. Caeca long, narrow, clearly visible at body constrictions, unite with excretory vesicle close to posterior end of body to form uroproct.

Testes 2, entire, fusiform, tandem, separate, in middle third of body; anterior 250-428 (319) × 136-214 (166); posterior 275-408 (330) × 143-227 (174). Post-testicular area 1,044-2,057 (1,582) long, 29-40 (35) % of body length. Cirrus-sac absent. Seminal vesicle long, sinuous anteriorly; expanded posterior portion 227-402 (300) × 65-130 (93). Pars prostatica distinct, thick-walled, surrounded by gland-cells. Ejaculatory duct short, narrow. Genital atrium indistinct. Genital pore antero-sinistral to intestinal bifurcation, level with or anterior to posterior margin of oral sucker, 207-246 (224) from anterior extremity, 5.8-4.2 (5.0) % of body length.

Ovary oval, entire, directly anterior to anterior testis, 163-220 (192) × 100-156 (127). Mehlis' gland, anterior to ovary. Uterine seminal receptacle occupies posterior coils of uterus. Laurer's canal passes postero-ventrally and opens dorsally at level of anterior margin of ovary. Uterus usually coils intercaecally between anterior margin of ovary and posterior expanded portion of seminal vesicle, then passes to genital aperture with little or no coiling. Metraterm indistinct, thin-walled, with anterior extremity surrounded by gland cells. Eggs relatively small, numerous, oval, operculate, 39-54 (47) × 25-34 (28). Vitelline follicles restricted to area posterior to ventral sucker, extend from 700-925 (801) from anterior extremity, 14.7-25.7 (18) % of body length, to 18-72 (39) from posterior extremity, with bilateral in-



Figs 1-3. *Pseudopocoeloides tenuis* Yamaguti, 1940 ex *Priacanthus macracanthus*. 1. Whole-mount latero-ventral view. 2. Terminal genitalia. 3. Ventral view of posterior end showing uroproct. Scale bars: 1, 500 μ m; 2, 200 μ m; 3, 100 μ m.

terruptions at level of each gonad at points of constriction; follicles in 2 separate fields ventrally in uterine area; fields confluent dorsally in uterine, intergonadal and post-testicular regions, lateral, dorsal and ventral to caeca except in areas adjacent to gonads; anterior limit variously overlaps expanded posterior portion of seminal vesicle.

Excretory pore terminal. Excretory vesicle tubular, I-shaped, passes anteriorly to terminate at point just anterior to posterior margin of ovary.

Comments: Except for a few slight morphological differences, the present material is almost identical to *P. tenuis*, as originally described. The differences observed between the present material and that of Yamaguti (1940) include: a longer forebody relative to the body length (6.6-10.4 (8.7) versus 5.1%); smaller eggs measuring 39-54 × 25-34 (47 × 28) versus 54-60 × 33-39; and a genital pore which is more posteriorly situated, at 3.8-6.1 (5.1) % compared with 3.1% of the body length from the anterior extremity. Although the difference in egg size is significant, it is not surprising, since Yamaguti measured the eggs from live worms. The other differences are most likely as a result of fixation and may therefore not be taxonomically significant. Moreover, the present material and Yamaguti's are both from priacanthids.

Pseudopocoeloides tenuis is similar to *P. tenuoides* in almost every metrical feature and in the bilateral constrictions adjacent to the gonads observed in Yamaguti's material and the present material. This resemblance was also noted by Martin (1960), but he separated the species on the basis of egg size (smaller in *P. tenuoides*), the sizes of the suckers (smaller in *P. tenuoides*) and on the occurrence of pads on the ventral sucker in *P. tenuoides*. The present material is very similar to *P. tenuoides* and does not exhibit the differences observed by Martin (1960) between his worm and Yamaguti's *P. tenuis*. The difference in egg size probably resulted from the fact that Yamaguti measured the eggs of *P. tenuis* from live material, whereas the egg measurements of *P. tenuoides* were probably taken from permanent mounts. The only noticeable differences between the present material and *P. tenuoides* are that the latter has a larger oral sucker relative to the pharynx, reflected by a ratio of 1:2.8 versus 1:1.5-2.4 (1.9) [1.8], and it has pads in its ventral sucker. Yamaguti (1970) also observed the pads described by Martin (1960) in *P. tenuoides* in the material he examined from the glasseye *Heteropriacanthus cruentatus* (Lacepède) (Priacanthidae) (the type-host) and the bluelined surgeonfish *Acanthurus nigroris* Valenciennes (Acanthuridae) off Hawaii (type-locality). No similar pads were observed in the present material, although, if they occurred, it would have been difficult if not impossible to see them, since our worms were mostly mounted laterally. This feature needs to be investigated further before a decision regarding the status of *P. tenuoides* can be taken.

P. tenuis is widespread in the Indo-Pacific region and is reported in the Great Australian Bight (Lebedev, 1968), off New Zealand (Manter, 1954; Korotaeva, 1975) and off New Caledonia (Bray and Justine, 2008)

***Pseudopocoeloides hickmani* Aken'Ova, Cribb & Bray, sp. n.**

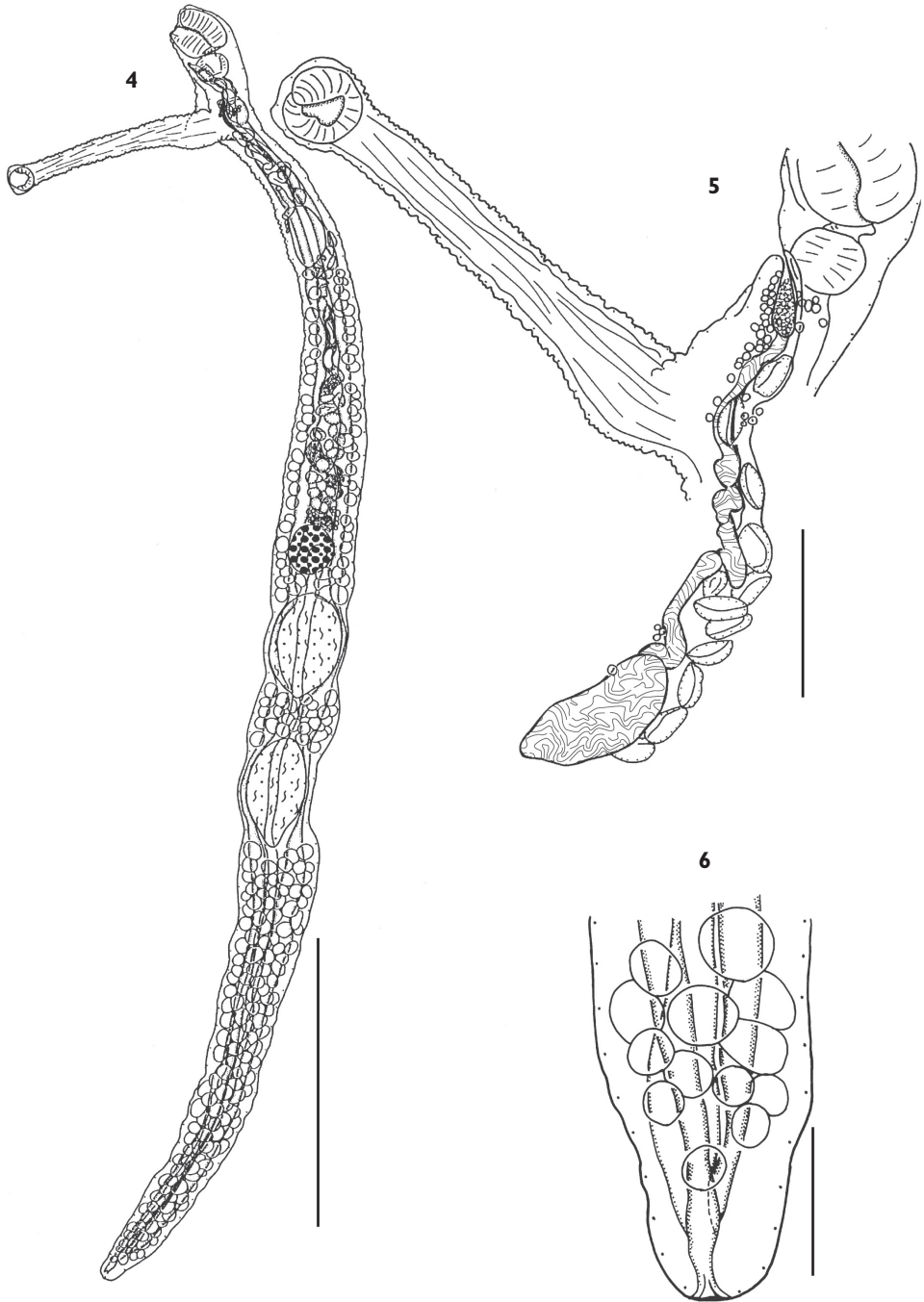
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Type-host: *Pseudocaranx wrighti* (Whitley) (Carangidae: Perciformes), skipjack trevally.**Type-locality:** Off North Mole, Fremantle, Western Australia, 32°03'S, 115°43'E, December 1994.**Site:** Intestine, pyloric caeca, rectum.**Material studied:** 8.**Type-material:** Holotype: Queensland Museum, Reg. No. QM G230442, paratypes: Queensland Museum, Reg. Nos QM G230443-230451, BMNH Reg. Nos 2008.12.9.1-6.**Description** (Figures 4-6): Based on 7 gravid, unflattened, laterally and dorso-ventrally mounted whole-mounts and 1 set of serial sagittal sections. Measurements are of the 7 gravid, unflattened, laterally and dorso-ventrally mounted worms.

Body elongate, slender, subcylindrical, tapers gradually to narrow point posteriorly, rounded at anterior end; maximum width in region of gonads, 3,204-4,929 (4,213) × 205-301 (249); width to length ratio 1:15.6-19.2 (17.0). Oral sucker subspherical, ventrally subterminal, 131-175 (159) × 112-155 (134). Ventral sucker pedunculate, close to anterior extremity, smaller than oral sucker, subspherical, 71-79 (73) × 78-92 (85); sucker width ratio 1:0.5-0.8 (0.6). Ventral sucker peduncle 425-863 (650) × 97-109 (102) wide, 13.3-17.5 (15.3) % of body length. Forebody short, containing numerous gland cells, 337-399 (362) long, 7.7-10.5 (8.7) % of body length; peduncle to forebody length ratio 1:0.4-0.8 (0.6). Prepharynx distinct, feebly developed, very short. Pharynx subspherical, wide, 66-89 (79) × 71-101 (87); pharynx to oral sucker width ratio 1:1.4-1.6 (1.5). Oesophagus relatively short, thick-walled. Intestinal bifurcation close to anterior end, dorsal to ventral sucker peduncle, 49-98 (68) posterior to anterior margin of ventral sucker peduncle. Caeca long, narrow, unite with excretory vesicle close to posterior extremity to form uroproct.

Testes 2, entire, may be subspherical or broadly fusiform, separate, tandem, in posterior half of body; anterior 273-396 (335) × 169-246 (210); posterior 298-383 (350) × 164-257 (203). Post-testicular area 1,005-1,639 (1,472) long, 31.4-37.1 (34.9) % of body length. Cirrus-sac absent. Seminal vesicle tubular, long and sinuous anteriorly, large and saccular posteriorly, extends from point level with, anterior to or posterior to anterior margin of ventral sucker peduncle to point variously between posterior margin of peduncle and anterior margin of ovary; posterior saccular portion 156-278 (202) × 54-106 (84). Pars prostatica distinct, large, elongate, with openings of numerous ducts, surrounded by gland cells. Ejaculatory duct short. Genital atrium large. Genital pore antero-sinistral to intestinal bifurcation, about half way between anterior and posterior margins of pharynx, 184-213 (197) from anterior end, 4.0-5.9 (4.7) % of body length.

Ovary pre-testicular, entire, subspherical, 116-197 (163) × 129-168 (142). Mehlis' gland distinct, anterior to ovary. Uterine seminal receptacle present. Laurer's canal present, thick-walled, opens slightly anterior to or posterior to anterior margin of ova-



Figs 4-6. *Pseudopocoeloides hickmani* sp. n. ex *Pseudocaranx wrighti*. 4. Whole-mount latero-ventral view. 5. Terminal genitalia. 6. Ventral view of posterior end showing uroproct. Scale bars: 4, 1mm; 5, 200 μ m; 6, 100 μ m.

ry, at point dorsally antero-sinistral to ovary, close to lateral margin of worm. Uterine coils occupy area between point anterior to anterior margin of ovary and various levels posterior to posterior tip of seminal vesicle, overlapping caeca ventrally, then following course of seminal vesicle to open into genital atrium. Metraterm indistinct. Eggs oval, operculate, 44-71 (55) × 20-42 (26). Vitelline follicles restricted to hindbody, extend from 793-1,137 (919) from anterior extremity, 20.4-24.8 (21.9) % of body length, to 33-64 (49) from posterior extremity; fields lateral, ventral and dorsal to caeca, confluent dorsally and ventrally in post-testicular and inter-testicular areas, and dorsally in pre-ovarian region, interrupted at level of anterior and posterior testes; anterior limit usually slightly overlaps seminal vesicle, sometimes slightly posterior to it (n=2), occasionally at level of posterior margin of seminal vesicle (n=1), or to point just posterior to anterior margin of large distended portion of seminal vesicle (n=1).

Excretory pore terminal to slightly dorsally subterminal. Excretory vesicle I-shaped, long, tubular, reaches anteriorly to overlap posterior margin of ovary, terminates at point anterior to mid-body.

Etymology: This species is named for V. V. Hickman in recognition of his contribution to the systematics of marine digeneans in the Australian region.

Comments: Specimens of *Pseudopecoeloides hickmani* sp. n. have an oral sucker greater than the ventral sucker, placing the species in Group A. It can be distinguished from members of this group as follows: it has a greater length/width ratio than *P. tenuis*, *P. psettodi*, *P. capucini* and *P. wekeula*; and it has a smaller pharynx than *P. tenuis*, a larger pharynx than *P. psettodi*, *P. capucini* and *P. wekeula*, relative to the size of the oral sucker (Table 1). The ventral sucker peduncle in the new species is longer than that of *P. tenuis* relative to the length of the forebody; its forebody is shorter and its post-testicular area longer relative to the length of the body than those of *P. wekeula* and *P. capucini*. *P. hickmani* sp. n. closely resembles *P. opelu* in most of its metrical features and by the fact that they are both from carangids, but it can be distinguished from the latter by its more elongate form with a width to length ratio of 1:17 versus 1:11, a slightly larger pharynx with a pharynx to oral sucker width ratio of 1:1.5 versus 1:1.8 and a longer post-testicular area measuring 31.4-37.1 (34.9) versus 21.3% of the body length.

***Pseudopecoeloides lesteri* Aken'Ova, Cribb & Bray, sp. n.**

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Type-host: *Pseudocaranx dentex* (Bloch & Schneider) (Carangidae: Perciformes), white trevally.

Other host: *Pseudocaranx wrighti* (Whitley) (Carangidae: Perciformes), skipjack trevally.

Type-locality: Off Kingscote, Kangaroo Island, South Australia, 35°40'S, 137°39'E, December 1995.

Other locality: Off North Mole, Fremantle, Western Australia, 32°03'S, 115°43'E, December 1994.

Table 1. *Pseudopeccoeloides* species (not immediately distinguishable from the other species) in **Group A** – Species with oral sucker larger than ventral sucker.

Species	<i>P. psettodi</i>	<i>P. capucini</i>	<i>P. wekeula</i>	<i>P. opelu</i>	<i>P. chlorosombri</i>	<i>P. arripi</i> sp. n.	<i>P. bickmani</i>	<i>P. hafescullabi</i>
							sp. n.	sp. n.
No. examined	??	10?	42	25	20	10	7	10
Reference	Parukhin (1983)	Toman (1982)	Yamaguti (1970)	Yamaguti (1970)	Bartoli et al. (2003)	This study, from Western Australia	This study	This study
Length	3,100	5,250-6,780	1,500-4,800	1,400-3,600	2,907-7,060	2,161-4,152	3,204-4,929	2,452-3,564
Width	220	530-730	180-500	140-400	253-514	210-347	205-301	226-321
Mean					4,470 × 374	(3,361 × 280)	(4,213 × 249)	(3,026 × 274)
Length/Width	14.1*, 9.5*	8.6*	8.5*	11.0*	11.95*	9.3-14.0	15.6-19.2	8.9-12.6
Mean						(12)	(17.0)	(11.1)
Oral sucker length		180-200	100-210	60-190	163-266	129-221	131-175	128-163
Oral sucker width		170-210	100-200	60-200	173-262	114-179	112-155	110-169
Mean					(210 × 220)	(65 × 145)	(159 × 134)	(147 × 141)
Ventral sucker length		130-140	70-130		100-138 ×	73-94	71-79	85-111
Ventral sucker width		130-170	95-160	60-150	122-176	82-108	78-92	96-110
Mean					(124 × 154)	(84 × 91)	(73 × 85)	(96 × 105)
V.S./O.S. Width	0.6*	0.6*	0.7*	0.6*	0.54-0.86 (0.73)	0.5-0.7 (0.6)	0.5-0.8 (0.6)	0.6-0.9 (0.7)
Pharynx length		130-150	50-150	50-150	131-173	59-105	71-101	85-115
Pharynx width		110-140	50-140	50-140	106-166	70-109	116-197	99-122
Mean					(154 × 131)	(85 × 94)	(87 × 163)	(99 × 111)
O.S./pharynx W.	2.9*	1: 1.7*	2.0*	1.8*	*1.18	1.4-1.8 (1.5)	1.4-1.6 (1.5)	1.1-1.4 (1.3)
Forebody L.					270-616 (442)	288-409 (344)	337-399 (362)	299-465 (384)
Forebody% Body L.	7.3*	12.3*	14.6*	11.8*	8.9-14.6 (10.4)	7.7-10.5 (8.7)	11.0-15.3 (12.9)	

Species	<i>P. psettodi</i>	<i>P. capucini</i>	<i>P. wekeula</i>	<i>P. opelu</i>	<i>P. chloroscombri</i>	<i>P. arripi</i> sp. n.	<i>P. bickmani</i> sp. n.	<i>P. hafezullahi</i> sp. n.
Post-testicular region (PTR)					1,092-2,203 (1,618)	633-1323 (1054)	1005-1639 (1472)	797-1159 (971)
PTR % body L.	25.5*	28.4*	25.7*	21.3*	*36.2	27.8-35.2 (31.4)	31.4-37.1 (34.9)	28.0-34.2 (32.1)
Eggs	46-53 × 26	52-62 × 37-48	51-70 × 32-49	46-63 × 30-46	51-68 × 28-39 (61 × 30)	51-74 × 20-39 (59 × 28)	44-71 × 20-42 (55 × 26)	40-60 × 20-37 (52 × 26)
Genital pore from anterior extremity	5.18*					155-220 (190)	184-213 (197)	142-181 (166)
Above as % body L.	4.5*	8.2*	7.8*			4.5-7.2 (5.8)	4.0-5.9 (4.7)	4.6-6.7 (5.5)
Ventral sucker peduncle % body L.				8.3*		10.3-16.7 (14.4)	13.3-17.5 (15.3)	10.1-11.8 (10.9)
Forebody/Ventral sucker peduncle						0.6-0.96 (0.73)	0.4-0.8 (0.6)	1.0-1.3 (1.2)

* values derived from measuring published figures directly or calculated from published measurements.

Site: Intestine.

Material studied: Ex *Pseudocaranx dentex*: 4 off Kingscote; ex *Pseudocaranx wrighti*: 2 off North Mole.

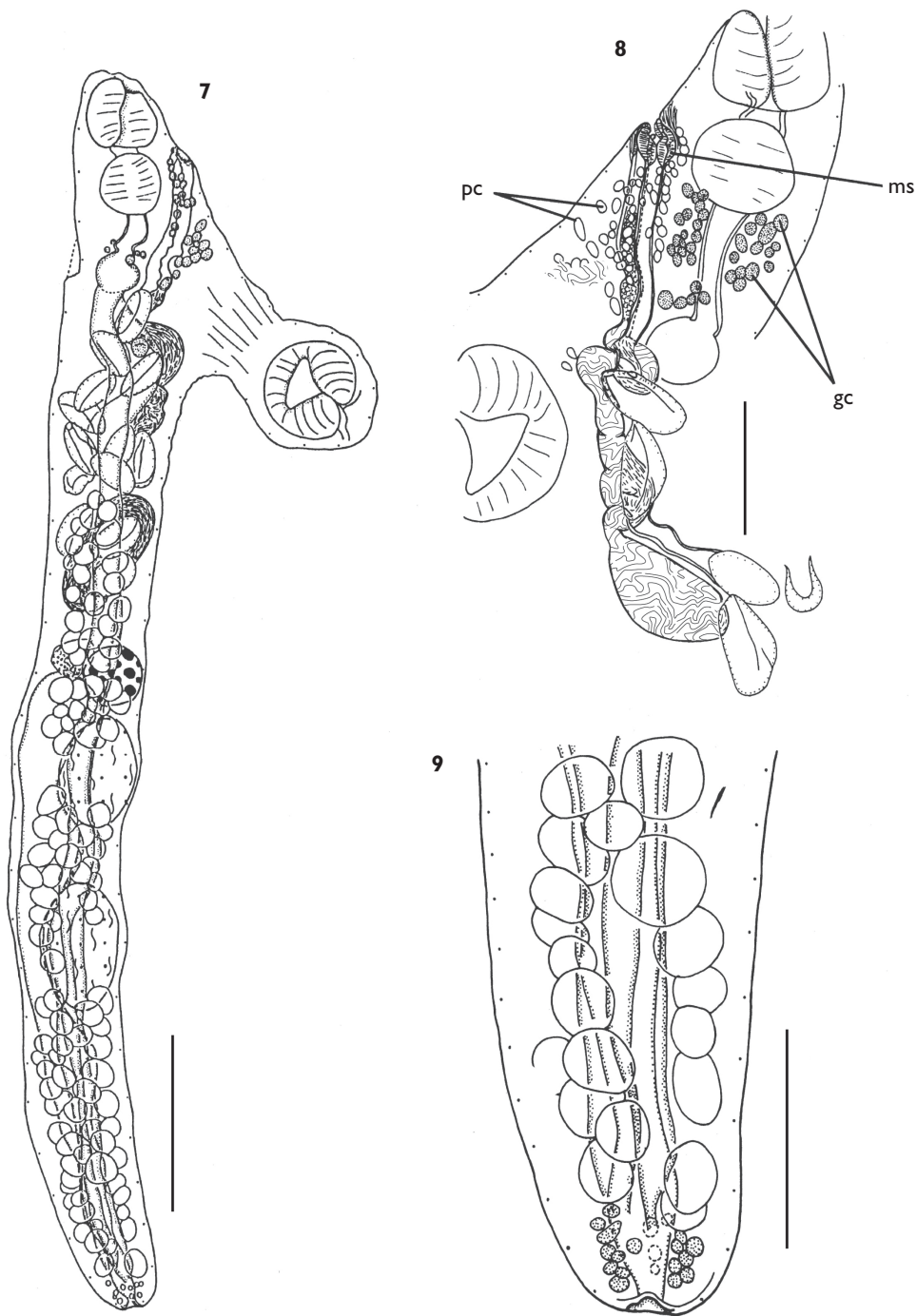
Type-material: Holotype: Queensland Museum, Reg. No. QM G230452, paratypes: Queensland Museum, Reg. Nos QM G230453-4, BMNH Reg. No 2008.12.9.7-8.

Description (Figures 7-11): Based on 6 gravid, unflattened, laterally mounted worms from *Pseudocaranx dentex* and *P. wrighti* and 1 set of sagittal serial sections. Measurements are based on 3 gravid, unflattened, laterally mounted specimens from *P. dentex*; measurements of worms from *P. wrighti* are given in Table 3.

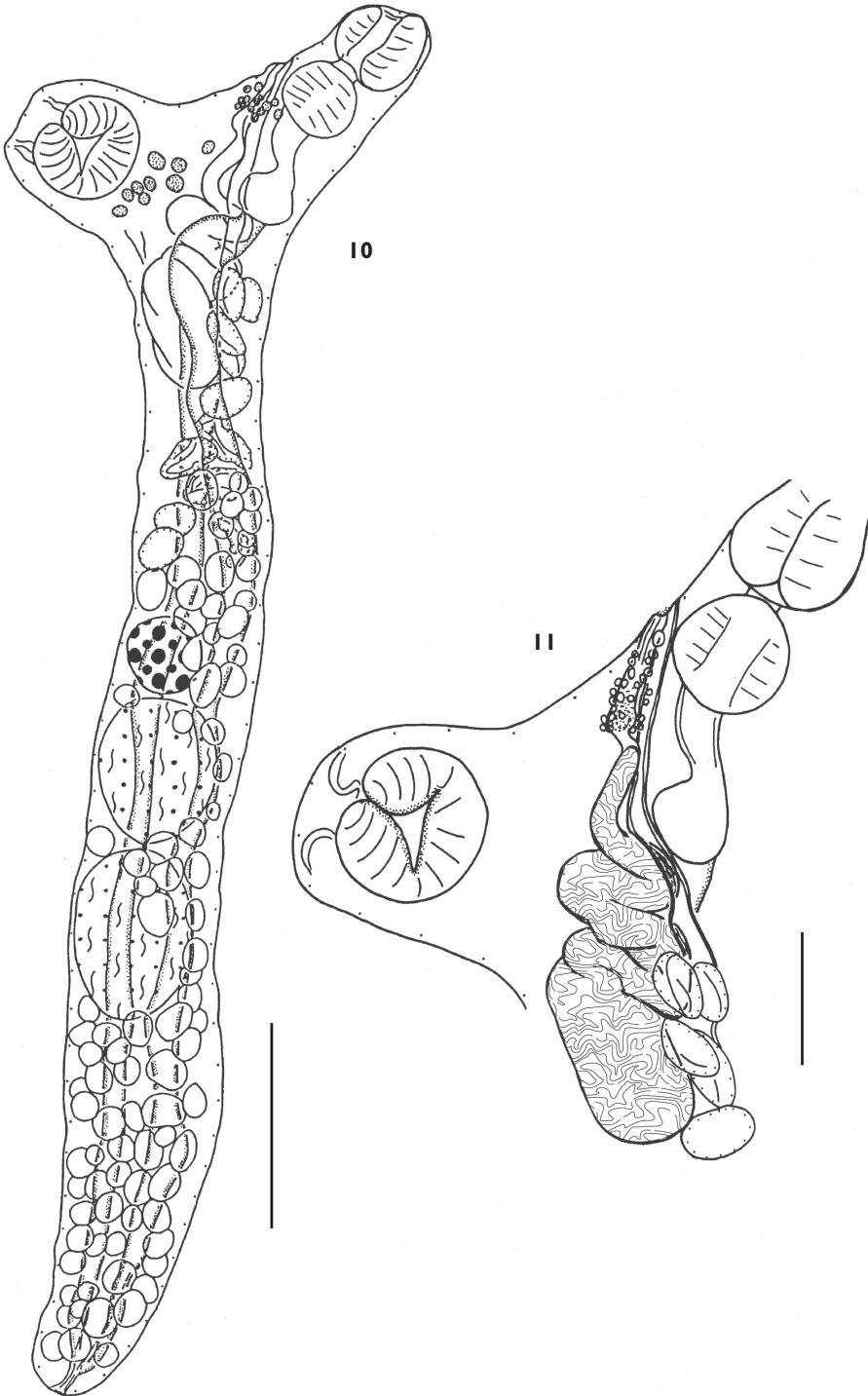
Body elongate, slender, subcylindrical; maximum width in region of gonads, 1,373-1,587 (1,482) × 158-170 (163); width to length ratio 1:8.5-10.0 (9.1). Oral sucker spherical to subspherical, opening nearly terminal, 85-95 (89) × 84-89 (86). Ventral sucker pedunculate, close to anterior end, larger than oral sucker, subspherical, 105-107 (106) × 119-125 (123); sucker width ratio 1:1.4-1.5 (1.4). Ventral sucker peduncle short, broad, 218-232 (225) × 132-158 (145), 14.6-15.9 (15.2) % of body length. Forebody relatively short, contains numerous gland cells, 261-323 (296) long, 19.0-21.7 (19.9) % of body length; peduncle to forebody length ratio 1:1.2-1.3 (1.3). Prepharynx distinct, short, feebly developed. Pharynx large, spherical to subspherical, 67-77 (72) × 76-77 (76); pharynx to oral sucker width ratio 1:1.1-1.2 (1.1). Oesophagus short, thin walled, surrounded by gland cells. Intestinal bifurcation dorsal to ventral sucker, 8-49 (28) posterior to anterior margin of ventral sucker peduncle. Caeca long, open into excretory vesicle close to posterior extremity to form uroproct (Figure 9).

Testes 2, entire, subspherical, usually separated, contiguous in one specimen, tandem, in posterior half of body; anterior 136-147 (141) × 94-125 (113); posterior 146-165 (159) × 104-129 (120). Post-testicular area 289-384 (325) long, 19.4-24.2 (21.9) % of body length. Cirrus-sac absent. Seminal vesicle long, tubular, narrow and convoluted anteriorly, large and vesicular posteriorly; posterior portion 100-107 (103) × 50-60 (55). Pars prostatica distinct, large, surrounded by gland cells. Ejaculatory duct thick-walled, with distinct sphincter at anterior extremity (see Figure 8), surrounded by gland cells. Genital atrium small. Genital pore antero-sinistral to intestinal bifurcation, close to anterior extremity, 124-133 (129) from anterior end, 8.4-9.0 (8.7) % of body length.

Ovary pre-testicular, entire, usually contiguous with anterior testis, separate in 1 specimen, spherical to subspherical, 71-77 (74) × 67-73 (69). Mehlis' gland distinct, anterior to antero-dorsal to ovary. Uterine seminal receptacle present. Laurer's canal present, thick-walled, opens dorso-sinistrally to ovary, at about level of its anterior margin. Metraterm distinct, thick-walled, with distinct sphincter at anterior extremity, surrounded by gland cells; thick-walled muscular structure appears to enclose anterior extremities of ejaculatory duct and metraterm (Figure 8). Eggs relatively large, operculate, 64-75 (69) × 27-44 (34). Vitelline follicles restricted to hindbody, extend from 499-623 (553) from anterior extremity, 33.8-41.9 (37.3) % of body length, to 26-40



Figs 7-9. *Pseudopecoeloides lesteri* sp. n. ex *Pseudocaranx dentex*. 7. Whole-mount latero-ventral view. 8. Terminal genitalia. 9. Ventral view of posterior end showing uroproct. Abbreviations: ms, muscular structure; pc, prostatic cells; gc, gland cells. Scale bars: 7, 250 μ m; 8, 9, 100 μ m.



Figs 10-11. *Pseudopecoeloides lesteri* sp. n. ex *Pseudocaranx wrighti*. 10. Whole-mount latero-ventral view. 11. Terminal genitalia. Scale bars: 10, 250 μ m; 11, 100 μ m.

(35) from posterior extremity; fields confluent dorsally and ventrally in post-testicular area, dorsally or not between posterior margin of posterior testis and anterior limit with interruptions in areas around gonads, separate ventrally, with follicles lying lateral, ventral and dorsal to caeca; anterior limit slightly posterior to posterior margin of seminal vesicle.

Excretory pore terminal. Excretory vesicle I-shaped, long; posterior extremity forms short narrow duct surrounded by gland cells; vesicle reaches to ovary.

Etymology: This species is named for Professor R. J. G. Lester for his contributions to marine parasitology.

Comments: The specimens from *Pseudocaranx wrighti* are almost identical to those from *P. dentex* in general appearance and in all metrical features (Tables 2, 3) and are considered to be conspecific.

Pseudopecoeloides lesteri sp. n. can be accommodated in Group B. *P. mugilis* and *P. gracilis* can immediately be distinguished from all the other worms in the group; *P. mugilis* has the shortest post-testicular area relative to the body length and *P. gracilis* is the least elongate and has the largest ventral sucker relative to the size of the oral sucker (Table 2). *P. lesteri* can be distinguished from the remaining species by its greater sucker ratio, larger pharynx relative to the oral sucker, longer forebody and shorter post-testicular area relative to the body length. It is more elongate than *P. akule* but less so than *P. scomberi*, as shown in their length/width ratios. The genital pore of the new species is more posteriorly situated than in *P. scomberi* (Table 2).

***Pseudopecoeloides arripi* Aken'Ova, Cribb & Bray, sp. n.**

urn:lsid:zoobank.org:act:1513E213-4963-4118-9277-245BBAD29E3C

Type-host: *Arripis georgianus* (Valenciennes) (Arripidae: Perciformes), Australian ruff.

Type-locality: Off Woodman Point; Western Australia, 32°08' S 115°45' E, November and December 1994.

Other localities: Off Coogee Beach, Western Australia, 32°07' S 115°46' E, November and December 1994; Off Kingscote, Kangaroo Island, South Australia 35°40' S 137°39' E, December 1995.

Site: Intestine.

Material studied: Ex *Arripis georgianus*: from W.A.: 8 from Coogee Beach; 9 from off Woodman Point; 6 from S.A.: off Kingscote, Kangaroo Is.

Type-material: Holotype: Queensland Museum, Reg. No. QM G230455, paratypes: Queensland Museum, Reg. Nos. QM G230456- G230488, BMNH Reg. Nos. 2008.12.9.9-27.

Description (Figures 12-14): Based on 15 gravid, unflattened, whole-mount specimens and 2 sets of serial sagittal sections from *Arripis georgianus* off W.A. Measurements are of 10 gravid, unflattened laterally and dorso-ventrally mounted worms. Measurements of worms off S.A. are given in Table 4.

Table 2. *Pseudopocoeloides* species (not immediately distinguishable from the other species) in Group B – Species with the oral sucker the same size as or smaller than the ventral sucker.

Species	<i>P. carangis</i>	<i>P. gracilis</i>	<i>P. akule</i>	<i>P. mugilis</i>	<i>P. scomberi</i>	<i>P. scomberi</i>	<i>P. atherinomor</i> sp. n.	<i>P. lesteri</i> sp. n.
No. examined	Numerous	10	21	??	2	1	6	3
Reference	Yamaguti (1938)	Manter (1947)	Yamaguti (1970)	Shen (1990)	Hafeezullah (1975)	This study	This study	This study in <i>Pseudocaranx dentex</i>
Length	1,250-2,540	1,296-1,989	3,500-7,500	2,397	6,828-7,056	3,088	1,312-2,155	1,373-1,587
Width	220-380	202-352	200-700	306	504-583	288	146-194	158-170
Mean					(6920 × 540)		(1677 × 176)	(1482 × 163)
Length/Width	8.4	5.3-6.7	7.7*	7.8		10.7	7.5-12.1	8.5-10
Mean					12.8*		9.6	9.1
Oral sucker length	125-188		150-340		212-221	154	84-130	85-95
Oral sucker width	140-200	97-122	160-360		206-221	141	84-120	84-89
Mean					(217 × 214)		(106 × 104)	(89 × 86)
Ventral sucker length	110-160		200-430		218-236	167	117-175	105-107
Ventral sucker width	125-188	210-260	200-370		215-225	148	117-149	119-125
Mean					(227 × 220)		(142 × 134)	(106 × 123)
V.S./O.S. Width	1	2.0-2.2	1.1	1.26	1	1	1.2-1.4 (1.3)	1.4-1.5 (1.4)
Pharynx L.	100-138	60-80	80-190	85	120-135	103	62-84	67-77
Pharynx W.	80-110	49-76	80-170	85	123-143	103	71-100	76-77
Mean					(128 × 133)		(70 × 85)	(72 × 76)
O.S./pharynx W.	2.4*	2.5*	3.2*		1.6*	1.4	1.2-1.4 (1.2)	1.1-1.2 (1.1)
Forebody L.		187-240				298	214-292 (258)	261-323 (296)
Forebody% Body L.	13.8*	11.1	15.6*		8.92*	9.7	13.2-0.7 (15.8)	19.0-21.7 (19.9)

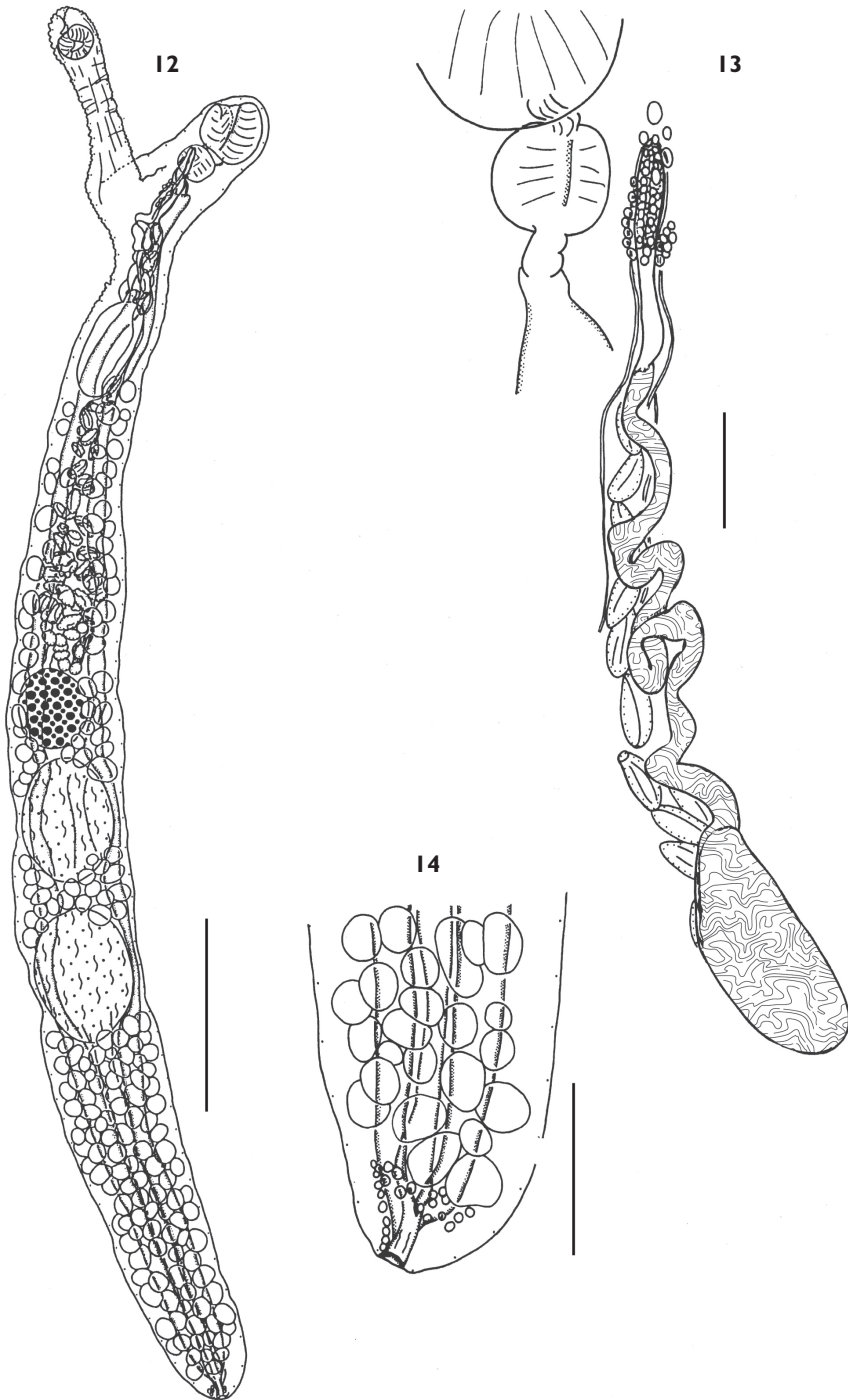
Species	<i>P. carangis</i>	<i>P. gracilis</i>	<i>P. akule</i>	<i>P. mugilis</i>	<i>P. scomberi</i>	<i>P. scomberi</i>	<i>P. atherinomori</i> sp. n.	<i>P. lesteri</i> sp. n.
Post-testicular region (PTR)		382-690		2,324-2,511	1,053	233-810 (431)	289-384 (325)	
PTR % body L.	32.8*	28-36	31.6*	13.5*	33.1*	17.8-37.6 (25)	19.4-24.2 (21.9)	
Eggs	60-72 × 33-35	53-70 × 29-39	49-60 × 32-42	56-66 × 33-36	54-72 × 30-42	52-72 × 26-46 (62 × 37)	64-75 × 27-44 (69 × 34)	
Mean					180	96-144 (121)	124-133 (129)	
Genital pore from anterior extremity								
Above as % body L.	6.7*	4.9*	7.8	4.8*	5.8	5.9-9.9 (7.3)	8.4-9.0 (8.7)	

NB. ♀, calculated from published values; * values obtained from measuring drawings directly.

Table 3. Measurements of two specimens of *Pseudopecoeloides lesteri* sp. n. from *Pseudocaranx wrighti* off North Mole, Western Australia.

	Min.	Max.	Mean
Length	1,563	1,728	1,646
Width	180	199	190
Length/Width	7.9	9.6	8.7
Pharynx length	75	83	79
Pharynx width	83	91	87
Ovary length	79	89	84
Ovary width	77	85	81
Anterior testis length	145	171	158
Anterior testis width	112	147	130
Posterior testis length	152	196	174
Posterior testis width	111	147	129
Forebody L.	267	340	304
Forebody % body L.	15.5	21.8	18.6
Oral sucker L.	89	100	95
Oral sucker W.	89	96	93
O.S. W/Ph. W.	1.1	1.1	1.1
Ventral sucker length	98	104	101
Ventral sucker width	125	127	126
VS width /OS width	1.3	1.4	1.4
Ventral sucker peduncle length	224	224	224
Ventral sucker peduncle width	170	170	170
Genital pore from anterior extremity	142	163	153
Above as % body L.	8.2	10.4	9.3
Seminal vesicle length	106	153	130
Seminal vesicle width	51	75	63
Intestinal bifurcation to ventral sucker	76	76	76
Post-testicular region	386	448	417
Above as % body L.	24.7	25.9	25.3
Vitellarium from anterior extremity	545	548	547
Above as % body L	31.7	34.9	33
Vitellarium from posterior extremity	17	27	22
Eggs 56-76 (67) × 25-42 (33) (n=8)			

Body elongate, broader and more rounded at posterior than anterior end; maximum width in region of gonads, 2,161-4,152 (3,361) × 210-347 (280); width to length ratio 1:9.3-14.0 (12.0). Oral sucker ventrally subterminal, subspherical, 129-221 (165) × 114-179 (145). Ventral sucker pedunculate, close to anterior end, smaller than oral sucker, 73-94 (84) × 82-108 (91); sucker width ratio 1:0.5-0.7 (0.6). Ventral sucker peduncle 302-657 (484) × 106-131 (120), 10.3-16.7 (14.4) % of body length. Forebody short, with numerous gland cells, 288-409 (344) long, 8.9-14.6 (10.4) % of body length; ventral sucker peduncle to forebody length ratio 1:0.60-0.96 (0.73). Prepharynx distinct, very short, with posterior end surrounded by gland cells. Pharynx



Figs 12-14. *Pseudopecoeloides arripi* sp. n. ex *Arripis georgiana*. 12. Whole-mount latero-ventral view. 13. Terminal genitalia. 14. Ventral view of posterior end showing uroproct. Scale bars: 12, 500 μ m; 13, 14, 100 μ m.

well developed, spherical to subspherical, with gland cells along posterior margin, 59-105 (85) 70-109 (94); pharynx to oral sucker width ratio 1:1.4-1.8 (1.5). Oesophagus short, well developed, usually curved or looped. Intestinal bifurcation usually dorsal to ventral sucker, occasionally level with anterior margin of ventral sucker peduncle (n=1), 25-67 (49) posterior to anterior margin of ventral sucker peduncle. Caeca long, thick-walled, unite with excretory vesicle to form uroproct.

Testes 2, entire, subspherical, always separate, tandem, in posterior half of body; anterior 199-367 (298) × 145-254 (203); posterior 235-426 (339) × 151-282 (214). Post-testicular region moderately long, 633-1,323 (1,054) long, 27.8-38.2 (31.4) % of body length. Cirrus-sac absent. Seminal vesicle long, naked, sinuous, tubular and narrow anteriorly, large and saccate posteriorly; posterior portion 112-332 (224) × 55-142 (95). Pars prostatica distinct, surrounded by gland cells. Ejaculatory duct indistinct. Genital atrium small. Genital pore close to anterior end, antero-sinistral to intestinal bifurcation, at point slightly posterior to pharynx, 155-220 (190) from anterior end, 4.5-7.2 (5.8) % of body length.

Ovary pre-testicular, entire, subspherical, usually separated from anterior testis, sometimes contiguous (n=6), 81-199 (153) × 75-180 (135). Mehlis' gland distinct, antero-dorsal and dorsal to ovary. Uterine seminal receptacle usually in posterior loops of uterus, with uterus sometimes almost completely full of sperm (n=3). Uterus coils between anterior margin of ovary and region of seminal vesicle, overlaps caeca ventrally then passes anteriorly dorsal to or alongside seminal vesicle to genital pore without coiling; anterior portion of uterus sometimes crammed with eggs and greatly distended (n=3); uterine coils more concentrated posteriorly. Metraterm distinct, short; anterior extremity surrounded by gland cells. Eggs oval, operculate, tanned, sometimes malformed (n=3), 51-74 (59) × 20-39 (28). Vitelline follicles entirely posterior to ventral sucker peduncle, extend from 554-1,018 (747) from anterior extremity, 18.8-25.8 (22.0) % of body length, to 14-70 (42) from posterior extremity, with bilateral interruptions in areas adjacent to testes and sometimes in area just anterior to ovary; fields confluent dorsally and ventrally in post-testicular area, confluent or almost so in inter-testicular area and dorsally in uterine area, separate ventrally; follicles lie lateral, dorsal and ventral to caeca with anterior extent usually variously between anterior and posterior margins of enlarged posterior portion of seminal vesicle, occasionally level with (n=1) or just posterior to seminal vesicle (n=1).

Excretory pore terminal. Excretory vesicle I-shaped, long; posterior end forms narrow duct surrounded by gland cells; broader anterior portion extends anteriorly to about mid-body overlapping posterior half of ovary dorsally.

Etymology: This species is named after *Arripis* Jenyns, 1840 the host genus.

Comments: The material off South Australia is similar to that off Western Australia; however, a few differences worth noting were observed. The specimens from Western Australia are generally larger than those from South Australia, with a slightly longer forebody, but the ventral sucker of the latter is larger relative to the oral sucker. The most significant of these difference is the difference in the size of the ventral sucker, which may relate to the allometric growth of the worms, although it is possible that different species are involved.

Pseudopocoeloides arripi sp. n. can be accommodated in Group A and distinguished from the other species in the group by being less elongate than *P. tenuis* and *P. hickmani* sp. n. but more elongate, as shown by the width to length ratio, with a longer post-testicular area than *P. psettodi*, *P. capucini* and *P. wekeula* (Table 1), and by having a shorter post-testicular region than *P. tenuis*, relative to the body length. The new species has a forebody shorter than *P. capuccini* and *P. wekeula* but longer than *P. tenuis*, *P.*

Table 4. Measurements of 6 specimens of *Pseudopocoeloides arripi* sp. n. from *Arripis georgianus* off Kingscote, South Australia.

	Min.	Max.	Mean
Length	1,596	2,798	2,138
Width	156	213	182
Length/Width	8.7	15	11.8
Pharynx length	59	82	68
Pharynx width	67	81	73
Ovary length	50	120	89
Ovary width	46	102	77
Anterior testis length	152	233	190
Anterior testis width	120	177	146
Posterior testis length	154	249	198
Posterior testis width	137	183	156
Forebody L.	248	337	285
Forebody % body L.	9.6	17	13.9
Oral sucker L.	91	143	112
Oral sucker W.	88	120	103
O.S. W/Ph. W.	1.3	1.6	1.4
Ventral sucker length	75	96	88
Ventral sucker width	83	108	98
VS width /OS width	0.7	1.1	1.0
Ventral sucker peduncle length	271	458	338
Ventral sucker peduncle width	98	156	124
Ventral sucker peduncle % body L.	12.2	18.2	15.6
Forebody/peduncle length ratio	0.59	1	0.87
Genital pore from anterior extremity	121	178	148
Above as % body L.	5.8	9.6	7.1
Seminal vesicle length	69	190	135
Seminal vesicle width	27	87	58
Intestinal bifurcation to ventral sucker	11	37	21
Post-testicular region	366	787	584
Above as % body L.	22.9	30.5	27.2
Vitellarium from anterior extremity	414	661	502
Above as % body L.	20.6	25.9	23.8
Vitellarium from posterior extremity	15	32	24
Eggs 47-67 (56) x 21-36 (28) (n=41)			

psettodi and *P. hickmani* sp. n. relative to the body length, and a larger pharynx relative to the oral sucker than *P. tenuis* and *P. psettodi*. Furthermore, *P. arripi* sp. n. has larger eggs than *P. hickmani* sp. n. and its body tapers only slightly and ends abruptly in a rounded posterior end, whereas in the latter it tapers gradually to a rather pointed extremity. *P. arripi* sp. n. is closest to *P. opelu* but can be distinguished from it by its slightly larger pharynx to oral sucker width ratio of 1:1.4-1.8 (1.5) versus 1:1.8 and its longer post-testicular region relative to the body length. These two species can further be separated by the more anterior position of the intestinal bifurcation in the new species, being at the level of the anterior margin of the ventral sucker peduncle rather than as it is in *P. opelu*.

Because the size of the pharynx of *Pseudopecoeloides arripi* sp. n. and *P. opelu* overlap, the main basis for separating these two species is the non-overlapping size of the post-testicular region, which we consider to be significant in species of *Pseudopecoeloides*. In addition, it is noteworthy that *P. opelu* is known only from a carangid, the mackerel scad *Decapterus macarellus*, off Hawaii (Yamaguti, 1970).

***Pseudopecoeloides atherinomori* Aken'Ova, Cribb & Bray, sp. n.**

urn:lsid:zoobank.org:act:F5CF0AD3-5D8E-4C2B-BD09-FBF75D31088B

Type-host: *Atherinomorus ogilbyi* (Whitley) (Atherinidae, Atheriniformes), Ogilby's hardyhead.

Type-locality: Moreton Bay, South-East Queensland, 27°20'S, 153°07'E, March 1989.

Other localities: Off Dunwich, Stradbroke Island; 27°30'S, 153°24'E, January and November 1994; Off Bribie Island, South-East Queensland 27°00'S, 153°05'E.

Site: Intestine.

Material studied: Ex *Atherinomorus ogilbyi*: 6 from Moreton Bay; 2 from off Dunwich, Stradbroke Island, (one of the specimens was unmounted and sectioned after measuring); 1 from off Bribie Island from a pooled gut-wash.

Type-material: Holotype: Queensland Museum, Reg. No. QM G230489, paratypes: Queensland Museum, Reg. Nos. QM G230490-230494, BMNH Reg. Nos 2008.12.9.28-29.

Description (Figures 15-18): Based on 6 gravid, 2 immature laterally mounted specimens, 1 dorso-ventrally mounted specimen and 1 set of sagittal serial sections. Measurements are of 6 gravid, unflattened, laterally mounted worms.

Body elongate, slender, subcylindrical; maximum width in region of gonads, 1,312-2,155 (1,677) × 146-194 (176); width to length ratio 1:7.5-12.1 (9.6). Oral sucker ventrally subterminal to nearly terminal, spherical to subspherical, 84-130 (106) × 84-120 (104). Ventral sucker larger than oral sucker, spherical to subspherical, on very short peduncle; peduncle forms wrinkles around ventral sucker in dorso-ventrally mounted worm, 117-175 (142) × 117-149 (134); sucker width ratio 1:1.2-1.4 (1.3). Forebody relatively short, contains numerous large and small gland cells, 214-292 (258) long, 13.3-20.7 (15.8) % of body length. Prepharynx distinct, short.

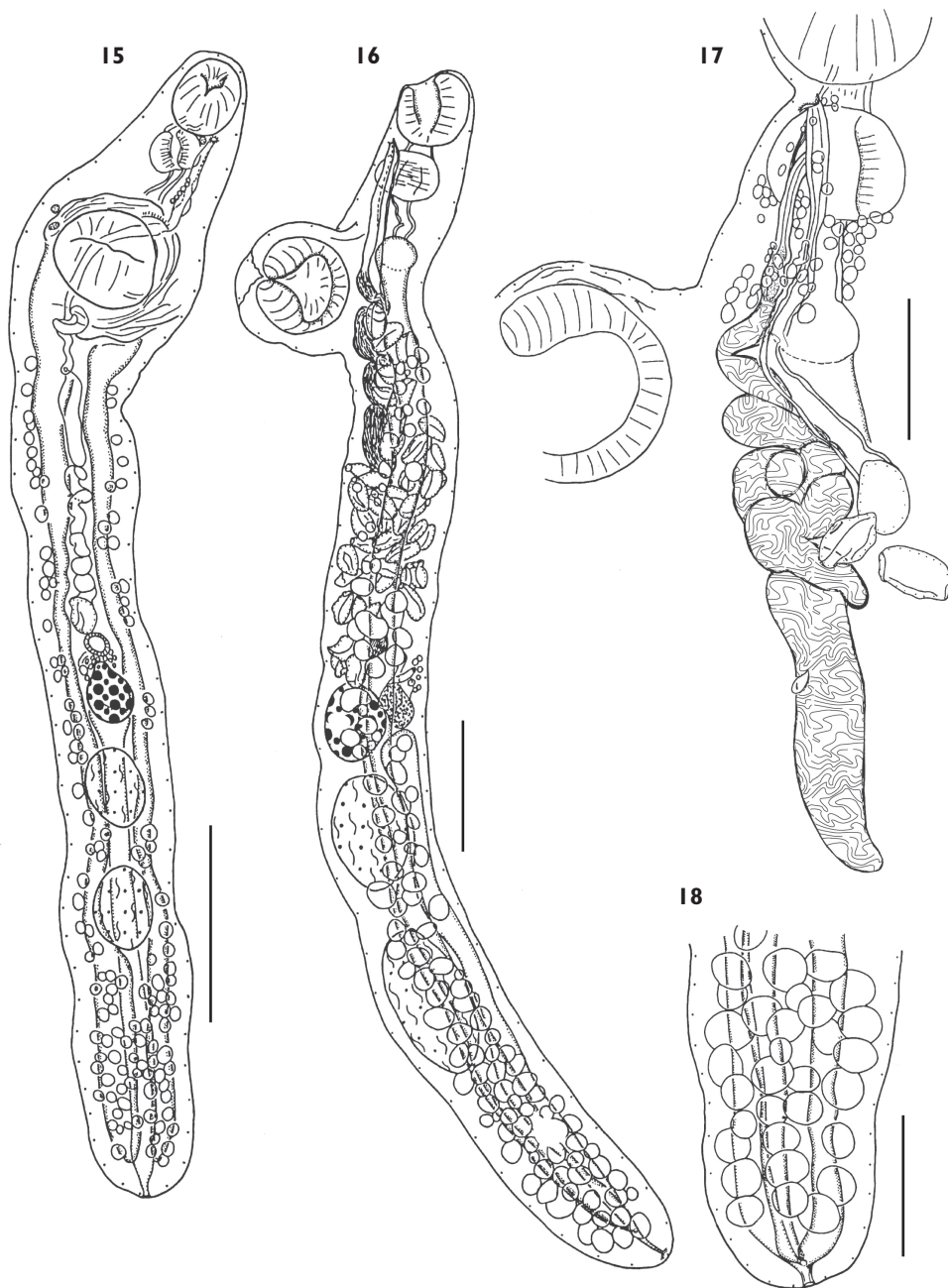


Fig. 15-18. *Pseudopocoeloides atherinomori* sp. n. ex *Atherinomorus ogilbyi*. 15. Whole-mount ventral view. 16. Whole-mount lateral view. 17. Terminal genitalia. 18. Ventral view of posterior end showing uroproct. Scale bars: 15, 16, 250 μ m; 17, 18, 100 μ m.

Pharynx large, subspherical, with numerous gland cells along posterior margin, 62-84 (70) × 71-100 (85); pharynx to oral sucker width ratio 1:1.2-1.4 (1.2). Oesophagus moderately long, surrounded by gland cells. Intestinal bifurcation, dorsal to ventral sucker, 13-48 (32) posterior to anterior margin of ventral sucker. Caeca long, open into excretory vesicle close to posterior extremity to form uroproct.

Testes 2, entire, elongate-oval, usually separate, occasionally contiguous (n=1), tandem, in posterior half of body; anterior 91-188 (142) × 61-143 (101); posterior 97-240 (162) × 71-123 (102). Post-testicular area 233-810 (431) long, 17.8-37.6 (25.0) % of body length. Cirrus-sac absent. Seminal vesicle naked, long, tubular, sinuous to convoluted at anterior end, elongate and saccular at posterior end, extends from region of intestinal bifurcation to point posterior to ventral sucker. Pars prostatica distinct, surrounded by gland cells. Ejaculatory duct moderately long, thick-walled, surrounded by gland cells. Genital atrium doliiform, thick-walled. Genital pore sinistrally submedian, anterior to intestinal bifurcation, level with or slightly anterior to anterior margin of pharynx, 96-144 (121) from anterior end, 5.9-9.9 (7.3) % of body length.

Ovary pre-testicular, entire, subspherical, 75-143 (100) × 65-113 (85). Mehlis' gland distinct, antero-dorsal to ovary. Uterine seminal receptacle present. Laurer's canal distinct, long, convoluted, thick-walled, opens at point dorso-sinistral to ovary. Uterus coils between anterior margin of ovary and region of posterior margin of ventral sucker, runs without coiling alongside anterior portion of seminal vesicle to unite with ejaculatory duct close to genital pore. Metraterm distinct. Eggs large, oval, operculate, 52-72 (62) × 26-46 (37). Vitelline follicles extend from 318-459 (389) from anterior extremity, 19.6-31.5 (23.7) % of body length, to 13-39 (28) from posterior extremity; fields confined to hindbody extending from about level of posterior margin of ventral sucker almost to posterior extremity, confluent dorsally and ventrally in post-testicular area, with follicles lateral, ventral, and dorsal to caeca.

Excretory pore terminal. Excretory vesicle I-shaped; narrow terminal portion surrounded by gland cells; vesicle widens and passes anteriorly to terminate at about mid-body.

Etymology: The species name is derived from *Atherinomorus* Fowler, 1903 the host genus.

Comments: The nature of the caecal ends in this species is very difficult to discern. The caeca appear to terminate blindly in the single dorso-ventrally mounted specimen, whereas they clearly open into the excretory vesicle in one of the eight laterally mounted specimens. Madhavi (1975) and Bray (1987) also had trouble in determining the relationship between the caeca and the excretory vesicle in a related species. This is discussed in the footnote attached to *P. scomberi*. Although Bray (1987) suggested that sectioning would solve the problem, it did not do so in the present material. However, we have concluded that the present species has a uroproct, based on observations on the single laterally mounted specimen (Figure 18).

Pseudopecoeloides atherinomori sp. n. can be accommodated in Group B (Table 2): *P. akule* has a smaller ventral sucker and pharynx relative to the oral sucker. *P. scomberi* is slightly more elongate, with a width to length ratio of 1:12.8 versus 1:7.5-12.1

(9.6); it also has a smaller ventral sucker and pharynx relative to the oral sucker and a shorter forebody relative to the body length (Table 2). *P. atherinomori* sp. n. resembles *P. lesteri* sp. n. in most metrical features but can be distinguished from the latter by its shorter forebody and slightly longer post-testicular area relative to the body length. Furthermore, the anterior limit of the vitelline follicles in *P. atherinomori* is about level with the posterior margin of the ventral sucker peduncle, whereas it is about half-way between the anterior margin of the ovary and the posterior margin of the ventral sucker peduncle in *P. lesteri* sp. n. *P. atherinomori* sp. n. also resembles *P. carangis* in its vitelline distribution and in some metrical features, but the latter has a smaller ventral sucker and a smaller pharynx relative to the oral sucker.

***Pseudopecoeloides hafeezullahi* Aken'Ova, Cribb & Bray, sp. n.**

urn:lsid:zoobank.org:act:082BE7F1-0E25-4406-B637-2173BBCB0BB8

Type-host: *Trachurus novaezealandiae* (Richardson) (Carangidae: Perciformes), yellowtail horse mackerel.

Type-locality: Off Coogee Beach Jetty, Western Australia, 32°07' S, 115°46'E, November 1994.

Other locality: Off Cockburn Breakwall (Shipyards), Fremantle, Western Australia, 32°11'S, 115°47'E, December 1994.

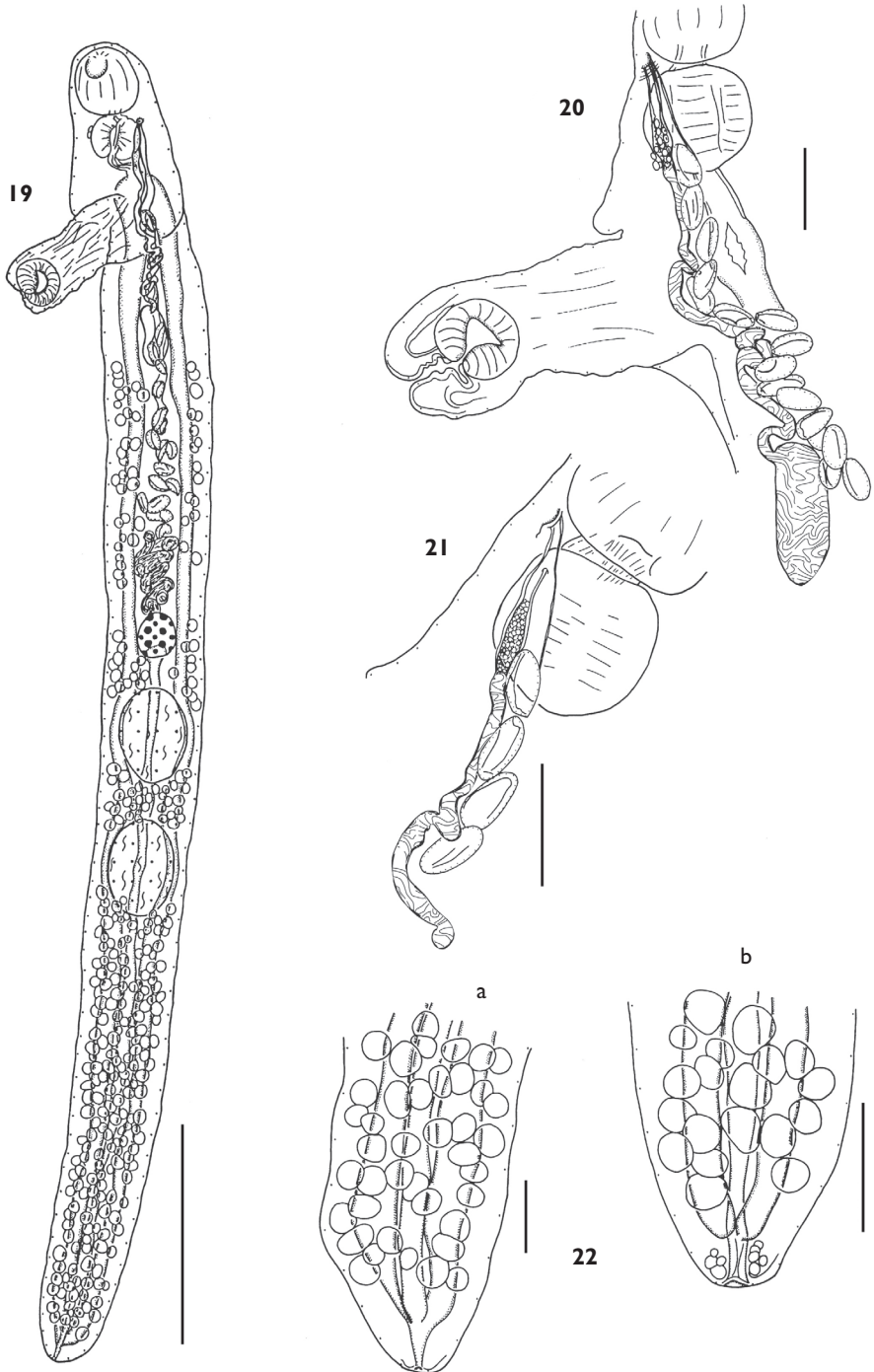
Site: Intestine.

Material studied: 7 off Coogee Beach Jetty; 5 off Cockburn Breakwall.

Type-material: Holotype: Queensland Museum, Reg. No. QM G230495, paratypes: Queensland Museum, Reg. Nos QM G230496-230515, BMNH Reg. Nos 2008.12.9.31-43.

Description (Figures 19-22): Description based on 11 gravid, unflattened, laterally and dorso-ventrally mounted specimens and 1 immature specimen. Measurements are of 10 gravid, unflattened, laterally mounted worms.

Body elongate, subcylindrical, rounded at anterior and posterior ends, 2,452-3,564 (3,026) × 226-321 (274); width almost uniform; maximum width in area of uterus and gonads; width to length ratio 1:8.9-12.6 (11.1). Oral sucker spherical to subspherical, ventrally subterminal, 128-163 (147) × 110-169 (141). Ventral sucker pedunculate, close to anterior end, slightly smaller than oral sucker, subspherical, 85-111 (96) × 96-110 (105); sucker width ratio 1:0.6-0.9 (0.7). Ventral sucker peduncle long, broad, 289-382 (330) × 129-161 (140), length 10.1-11.8 (10.9) % of body length. Forebody short, containing gland cells, 299-465 (384) long, 11.0-15.3 (12.9) % of body length; peduncle to forebody length ratio 1:1.0-1.3 (1.2). Pre-pharynx distinct, short. Pharynx large, spherical to subspherical, 85-115 (99) × 99-122 (111); pharynx to oral sucker width ratio 1:1.1-1.4 (1.3). Oesophagus distinct, short, well developed. Intestinal bifurcation usually dorsal to ventral sucker peduncle, 15-40 (27) posterior to anterior margin of ventral sucker, occasionally level with anterior margin of ventral sucker peduncle (n=1). Caeca long, narrow, thick-walled,



Figs 19-22. *Pseudopecoeloides hafeezullahi* sp. n. ex *Trachurus novaezealandiae*. 19. Whole-mount latero-ventral view. 20. Terminal genitalia. 21. Anterior part of terminal genitalia. 22 (a,b) Ventral view of posterior end showing uroproct. Scale bars: 19, 500 μ m; 20, 21, 22, 100 μ m.

open into excretory vesicle close to posterior extremity to form uroproct. Excretory pore terminal. Excretory vesicle I-shaped, overlaps ovary dorsally to point just anterior to its posterior margin.

Testes 2, entire, subspherical, separate, tandem, in posterior half of body; anterior 183-284 (226) × 122-205 (162); posterior 197-295 (235) × 130-202 (160). Post-testicular area 797-1,159 (971) long, 28.0-34.2 (32.1) % of body length. Cirrus-sac absent. Seminal vesicle long, tubular, narrow and sinuous anteriorly, large and saccular posteriorly, extends from about level of posterior margin of pharynx to point variously posterior to ventral sucker peduncle; saccular posterior portion 107-213 (158) × 51-68 (59). Pars prostatica distinct, well developed, surrounded by gland cells. Ejaculatory duct short. Genital atrium large, tubular. Genital pore extracaecal, close to anterior extremity, antero-sinistral to intestinal bifurcation, may be level with, slightly anterior to or slightly posterior to anterior margin of pharynx, 142-181 (166) from anterior end, 4.6-6.7 (5.5) % of body length.

Ovary pre-testicular, entire, subspherical, 85-134 (104) × 76-123 (94). Mehlis' gland distinct, antero-dorsal to ovary. Uterine seminal receptacle present. Laurer's canal present, opens antero-sinistrally to ovary, dorsal to left caecum. Uterine coils extend between anterior margin of ovary and about level of posterior margin of seminal vesicle, overlapping caeca slightly, follows course of seminal vesicle, unites with ejaculatory duct close to its anterior extremity and leads to genital pore as single duct. Metraterm indistinct. Eggs oval, operculate, 40-60 (52) × 20-37 (26). Vitelline follicles restricted to hindbody, extend from 624-962 (788) from anterior extremity, 22.7-30.8 (26.1) % of body length, to 45-88 (60) from posterior extremity; fields confluent dorsally and ventrally in post-testicular and inter-testicular regions, more or less confluent between anterior margin of anterior testis and anterior limit dorsally, separate ventrally, with follicles lateral, dorsal and ventral to caeca, with few follicle-free patches especially in regions of gonads and uterus; anterior limit usually at various points posterior to seminal vesicle, occasionally level with (n=2) or just anterior to posterior margin of seminal vesicle (n=2).

Etymology: This species is named for M. Hafeezullah in recognition of his contribution to the taxonomy of opecoelids.

Comments: *Pseudopecoeloides hafeezullahi* sp. n. fits the concept of Group A. It can be distinguished immediately from other species in the group by having the largest pharynx relative to the oral sucker, but it can further be differentiated as follows (Table 1). *P. tenuis* and *P. hickmani* sp. n. are more elongate species with shorter forebodies and longer post-testicular areas relative to the length of the body; additionally, *P. hickmani* sp. n. has a longer forebody relative to the body length. *P. capucini* and *P. wekeula* are less elongate with slightly shorter forebodies, *P. psettodi* has a shorter forebody and post-testicular area relative to the body length and *P. wekeula* has a cirrus-sac whereas *P. hafeezullahi* sp. n. does not. The new species is quite similar to *P. opelu* and *P. arripi* n. sp, but it can be distinguished by the longer post-testicular area compared with *P. opelu*, the slightly longer forebody than *P. arripi* sp. n. and by the longer ventral sucker peduncle, all relative to the body length (Tables 1, 4).

***Pseudopecoeloides scomberi* Hafeezullah, 1971**

(Syn. *Pseudopecoelus scomberi* (Hafeezullah, 1971) Madhavi, 1975)

Host: *Scomberoides lysan* (Forsskål) (Carangidae: Perciformes), doublespotted queenfish.

Locality: off Dunwich, Stradbroke Island, Queensland, 27°30'S, 153°24'E, February 1994.

Site: Intestine.

Material studied: 1 specimen.

Voucher specimen: Queensland Museum, Reg. No. QM G230516.

Description (Figures 23-24): Based on single gravid, unflattened, laterally mounted worm.

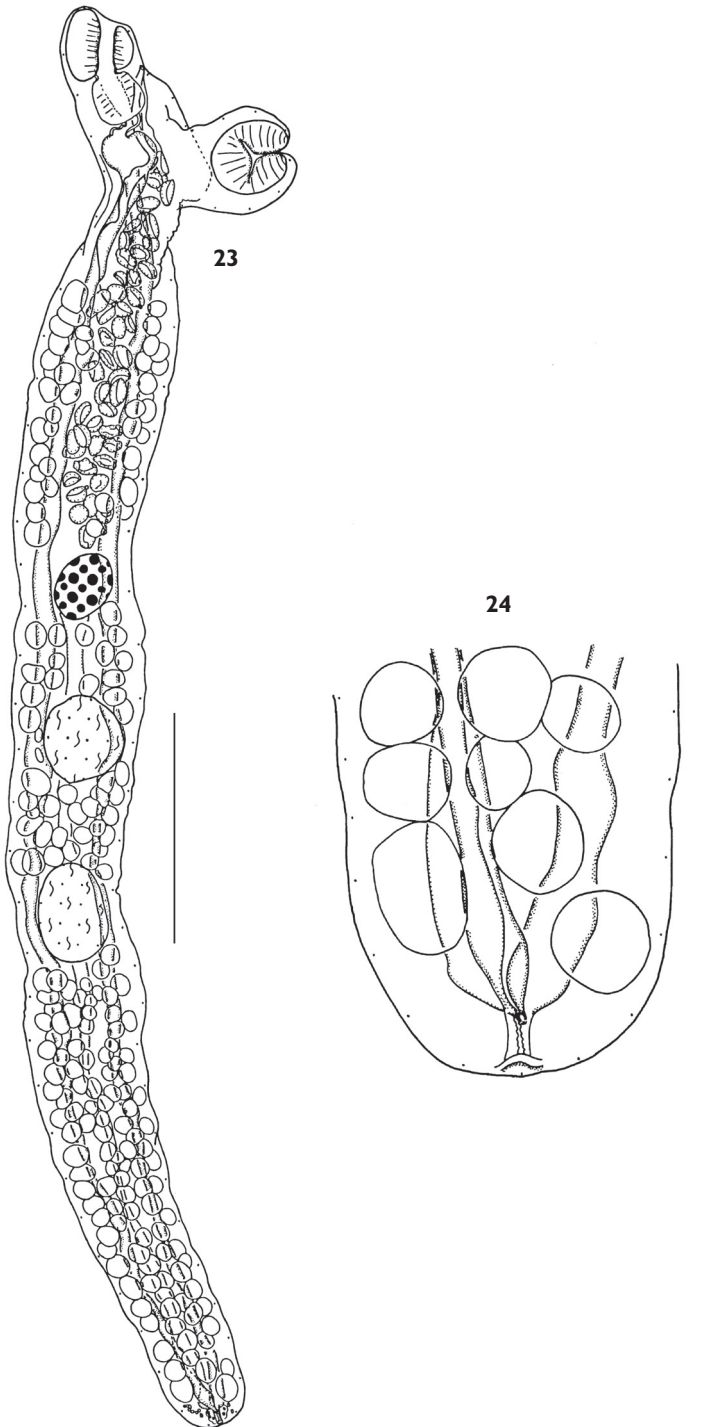
Body elongate, slender, subcylindrical; maximum width in region of gonads, 3,088 × 288; width to length ratio 1:10.7. Oral sucker ventrally subterminal, subspherical, 154 × 141. Ventral sucker close to anterior end, larger than oral sucker, subspherical, on very short peduncle, 167 × 148, sucker width ratio 1:1. Forebody short, contains gland cells, 298 long, 9.7% of body length. Pharynx large, spherical, 103 × 103; pharynx to oral sucker width ratio 1:1.4. Oesophagus distinct, short. Intestinal bifurcation, dorsal to ventral sucker. Caeca long, open into excretory vesicle close to posterior extremity to form uroproct (Figure 24).

Testes 2, entire, subspherical, separate, tandem, in anterior part of posterior half of body; anterior 193 × 167; posterior 135 × 298. Post-testicular area 1,053 long, 34.1% of body length. Prepharynx distinct, short. Cirrus-sac absent. Seminal vesicle naked, long, tubular, elongate and saccular at posterior end, extends from about level of intestinal bifurcation to level posterior to ventral sucker. Ejaculatory duct relatively short. Genital atrium small. Genital pore sinistrally submedian, anterior to intestinal bifurcation, level with posterior margin of pharynx, 180 from anterior end, 5.8% of body length.

Ovary pre-testicular, entire, subspherical, 141 × 116. Uterine seminal receptacle apparently present. Uterus coils between anterior margin of ovary and point dorsal to ventral sucker. Metraterm indistinct. Eggs large, oval, operculate, 51-58 (54) × 26-35 (32). Vitelline follicles extend from 578 from anterior extremity, 18.7% of body length, to 32 from posterior extremity; fields confined to hindbody, extending from level posterior to ventral sucker almost to posterior extremity, confluent dorsally and ventrally in post-testicular area; lateral, ventral and dorsal to caeca, with bilateral interruptions adjacent to testes and ovary.

Excretory pore terminal. Excretory vesicle I-shaped; narrow terminal portion surrounded by gland cells; vesicle widens and passes anteriorly to overlap posterior margin of ovary.

Comments: *Pseudopecoeloides scomberi* was described and figured, from the needlescaled queenfish *Scomberoides tol* (Cuvier) in the Gulf of Mannar, as having a uroproct (Hafeezullah, 1971). Madhavi (1975) examined worms from the same host and locality and concluded that the species belonged in *Pseudopecoelus* von Wicklen, 1946, in which the caeca end blindly, as she did not observe a uroproct in either whole-mounts



Figs 23-24. *Pseudopicoeloides scomberi* Hafeezullah, 1971 ex *Scomberoides lysan*. 23. Whole-mount latero-ventral view. 24. Ventral view of posterior end showing uroproct. Scale bars: 23, 500 μ m; 24, 100 μ m.

or sections. Bray (1987) also examined two whole-mounted museum specimens of this species from the barred queenfish *S. tala* (Cuvier) off India, and two specimens from *S. tol* off Malaysia, but could not detect a uroproct. Madhavi (1975) stated that “the ends of the caeca establish close contact with the bladder but apparently do not open into it”. We interpret Madhavi’s observation to mean that she was still not quite certain as to the presence or absence of a uroproct.

The specimen from *Scomberoides lysan* is almost identical in every metrical feature and in general appearance to those described by Hafeezullah (1971) from *S. tol*, except as follows. The vitelline follicles in the present material are interrupted bilaterally in areas adjacent to the gonads, whereas they are continuous in Hafeezullah’s material, although, in his figure of the worm, the vitelline follicles thin out around the gonads. Hafeezullah’s worms are also much larger than the present material, being 6,828-7,056 × 504-583 compared with 3,088 × 288 (Table 2). Since the present report is based on a single specimen, it was not possible to assess variation in the vitelline distribution or size in this species. The “inconspicuous cirrus-sac” observed by Hafeezullah (1971) in *P. scomberi* was not seen in the present material. Although the occurrence of a vestigial cirrus-sac is not characteristic of most species of *Pseudopecoeloides*, it does not preclude the inclusion of *P. scomberi* in the genus, since it was observed by Yamaguti (1970) in some specimens of *P. akule* and in *P. wekeula*. Madhavi (1975) considered Hafeezullah’s material to be a species of *Pseudopecoelus* but, because of the observations we have made regarding the caecal ends in the present material (Figure 24) and the fact that these worms are practically indistinguishable morphologically, we are treating the present material and Hafeezullah’s as conspecific. Moreover, their hosts are congeners. The presence of a uroproct necessitates the return of this species to *Pseudopecoeloides*.

Discussion

The above descriptions of five new species brings the total of species in this genus to 23 and creates the opportunity for some review of host-specificity within the genus. Firstly, it must be stated that it is unlikely that all the existing records in the literature are correct. It is striking that there are at least eight families and about 20 species of fishes reported as hosts for *Pseudopecoeloides carangis* and, although it is possible, this contrasts with the much narrower specificity reported for most other species. Most probably identification has been made several times on the basis of a broad similarity rather than a precise determination. Secondly, it is clear that the Carangidae is the dominant host family for species of *Pseudopecoeloides*; 11 of the species are reported from this family. The Mullidae (five species), Priacanthidae (three species) and Champsodontidae (three species) are also relatively rich. Finally, there are now five fish species that are reported to harbour at least two (and up to 3) species of *Pseudopecoeloides*: Carangidae – *Pseudocaranx wrighti* and *Selar crumenophthalmus*; Champsodontidae – *Champsodon capensis*; Mullidae – *Parupeneus macronema*; and Priacanthidae – *Cookeolus boops* and *Heteropriacanthus cruentatus*. In some cases these multiple infections may

be pointers to possible synonymy but also to a possible rapid evolutionary expansion among certain host groups.

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On the junior subjective synonyms of *Coullia* Hamond, 1973 (Copepoda, Harpacticoida, Laophontidae): an update and key to species and related genera

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Abstract

Morphological comparison of the genera *Coullia* Hamond, 1973 and *Phycolaophonte* Pallares, 1975 (Copepoda, Harpacticoida, Laophontidae) shows that the latter should be relegated to a junior synonym of the former. The forgotten generic name *Eolaophonte* Apostolov, 1990, introduced for two species displaying the plesiomorphic condition of P2–P4 endopodal segmentation, is also considered synonymous with *Coullia* since the taxon it denotes lacks a distinct apomorphy, rendering it paraphyletic exclusive of *Coullia*. Pesta's (1959) record of *Laophonte* sp. from Sorrento (Italy) pertains to *Coullia mediterranea* (Apostolov, 1990) **comb. nov.** Keys to the six species currently included in *Coullia* and to the laophontid genera displaying endopodal size discrepancy (P2 endopod smallest) are presented.

Keywords

Copepoda, Harpacticoida, Laophontidae, *Coullia*, *Phycolaophonte*, *Eolaophonte*, identification key

Introduction

A recent review of the outstanding nomenclatural problems in the Harpacticoida (Huys in press) resulted in the discovery of a new genus-group name proposed in 1990, which had escaped the attention of recent compilers (Bodin 1997, Boxshall and Halsey 2004, Wells 2007) and is not indexed in the *Zoological Record*. Apostolov (1990) established the genus *Eolaophonte* (family Laophontidae) for a new species, *E. mediterranea* Apostolov, 1990, based on two adult females recovered from algal washings in Monaco, and for *Laophonte* ? *platychelipusoides* Noodt, 1958, which was designated as the type species. Mor-

phological comparison provides compelling evidence that both *Eolaophonte* and *Phycolophonte* Pallares, 1975 are junior subjective synonyms of *Coullia* Hamond, 1973.

Results and discussion

Noodt (1958) described *Laophonte* ? *platychelipusoides* based on a single female from Tenerife. He suspected a relationship with Lang's (1948) *inopinata*-group in the genus *Laophonte* Philippi, 1840 but the lack of information on the male made him consider this assignment provisional and rank it instead as *species incertae sedis* in the Laophontiidae. Noodt also claimed similarities with *Hemilaophonte* Jakubisiak, 1932 and remarked on the convergent swimming leg morphology in the genus *Platychelipus* Brady, 1880 (hence his choice of the specific name). Conversely, Lang (1965) believed *L.* ? *platychelipusoides* could be assigned to either *Paralaophonte* Lang, 1948 or *Arenolaophonte* Lang, 1965 but this suggestion was based solely on (unspecified) female characters. Hamond (1973) proposed the genus *Coullia* for a new deepwater species from the North Carolina continental shelf, *C. heteropus* Hamond, 1973 (also known from one female only), and assigned *L.* ? *platychelipusoides* to this genus. He considered *Coullia* unique in its morphology of P2–P4, having no inner setae on the exopods and, more significantly, reduced endopods with that of P2 being smaller than the others (in virtually all other Laophontiidae with endopodal size discrepancy known at the time it was the P4 that was smallest). His claim that the absence of terminal setae on P2–P4 exp-3 is also a generic diagnostic is unfortunately based on an oversight; the inner apical setae are present but minute and often obscured by the large outer distal spines. It should be noted that the spelling *platychelipusoides*, first introduced by Lang (1965) and subsequently adopted by other authors (e.g. Hamond 1973, Fiers 1992a, Bodin 1997, Gómez and Boyko 2006), is to be considered an incorrect subsequent spelling (ICZN Art. 33.3).

Apostolov (1990) used the endopodal segmentation of P2–P4 to restrict the generic concept of *Coullia* (to species exhibiting 1-segmented endopods) and to justify the proposal of his new genus *Eolaophonte* (species with 2-segmented endopods). To the latter he removed *C. platychelipusoides*, which he designated as the type species, and a new species *E. mediterranea*, from Monaco. In the former he grouped *Coullia heteropus* and *Hemilaophonte clysmæ* Por & Marcus, 1973, originally described by Por and Marcus (1973) from the Suez Canal. Fiers (1992a), who, like other authors, was not aware of Apostolov's (1990) paper, also removed *H. clysmæ* to the genus *Coullia*. Comparison of Apostolov's (1990) diagnoses shows that the only notable difference between *Eolaophonte* and *Coullia* is the plesiomorphic expression of the small proximal endopod segment in P2–P4 in the former, thus rendering *Eolaophonte* a paraphyletic taxon. Pending the discovery of apomorphic character states which may characterize the taxon, *Eolaophonte* must be relegated to a junior subjective synonym of *Coullia*.

Pesta (1959) illustrated the P5 and caudal rami of a damaged female from a submarine cave near Sorrento (Italy), which he tentatively identified as *Laophonte* sp. Although he alluded to similarities with *Laophonte inopinata* T. Scott, 1892 in the caudal

ramus, and to *Heterolaophonte curvata* (Douwe, 1929) in the P5, it is now more than conceivable that he was dealing with *Eolaophonte* (= *Coullia*) *mediterranea*.

Gómez and Boyko (2006) admitted difficulties in maintaining *Coullia* and *Phycolao-phonte* as distinct genera, and the combination of characters (i.e. shape and armature of caudal ramus and female P5, 6-segmented antennule, armature and shape of P2–P4) used by these authors to place their new species *Phycolao-phonte tongariki* Gómez & Boyko, 2006 is not exclusive to the latter genus. Consequently, *Phycolao-phonte* is here subsumed into the synonymy of *Coullia* since there is no fundamental difference between its type species *P. insularis* (and *P. tongariki*) and species previously assigned to *Eolaophonte*. Pallares (1975a) herself had already hinted at a relationship with *Coullia heteropus*. The genera *Phycolao-phonte*, *Eolaophonte* and *Coullia* collectively represent a monophyletic lineage in which each of the three “genera” merely illustrate different stages in the gradual reduction in swimming leg setation and segmentation (Table 1).

Other, as yet undescribed, species of *Coullia* have been reported in washings of *Maja squinado* (Herbst, 1788) from the Mediterranean and of unidentified decapods from the Eastern Pacific (Fiers 1991, 1992a), in washings of the algae *Hypnea musci-formis* (Wulfen) and *Gracilaria foliifera* (Forsskål) in South Carolina (Coull et al. 1983) and in the ‘aufwuchs’ communities of marine macrophytes in New Zealand (Hicks 1977, Coull and Wells 1983).

***Coullia* Hamond, 1973**

Amended diagnosis. Laophontidae. Body fusiform. Integument of cephalothorax and body somites usually with minute spinules; posterior margins of somites spinulose. Rostrum partially delimited at base; broadly rounded, not prominent. Genital double-somite ♀ with ventrolateral internal chitinous ribs marking original segmentation. Pleural extensions of ♀ abdominal somites small. Caudal ramus cylindrical, subrectangular and elongate; with 7 setae; setae IV and V well developed, fused at base, and with fracture plane; seta VI reduced, setiform. Anal operculum spinulose.

Sexual dimorphism in antennule, P2–P3 exopod, P3 endopod, P5, P6 and in genital segmentation. Occasionally in P4 exopod.

Antennule moderately slender and 6- or 7-segmented in ♀; 7-segmented and subchirocer with 2 segments distal to geniculation in ♂; segment 1 occasionally with small blunt process; with aesthetasc on segment 4 (♀) or 5 (♂) and as part of acrothek on apical segment; all segments usually with spinular ornamentation along posterior margin. Antenna with 4 setae on exopod; allobasis with abexopodal seta. Mandibular palp relatively short, 1-segmented; with 1 basal, 1 exopodal and 3 endopodal setae. Maxillule with defined exopod bearing 2 setae. Maxilla with 3 endites on syncoxa; endopod represented by 3 setae. Maxilliped elongate; syncoxa with 2 setae; basis usually with few spinules along palmar and outer margins; endopodal claw long and curved, with 1 accessory seta.

P1 long, with very elongate coxa and basis; with 2-segmented exopod, exp-2 with 2–3 short and 2 geniculate setae; endopod stout, enp-1 without inner seta, enp-2 with minute seta and long strong claw. Swimming leg exopods 3-segmented; without inner setae in ♀ (except P2 exp-2 in *C. tongariki*); inner apical element of distal exopod segment vestigial (except P4 ♀ in *C. insularis/tongariki*). P2–P3 exopodal spines smooth or with minute ornamentation. P4 exopod smallest and squat; spines clearly pinnate. P2–P3 exp-2 (where known) with inner seta in ♂. P2–P4 endopods 1- or 2-segmented, occasionally absent in P2. P2 endopod smaller than those of P3–P4; if 2-segmented, inner distal corner of P2 enp-1 usually drawn out into tube-pore. P3 endopod ♂ 2-segmented with enp-2 extending into sharp, curved apophysis. Armature formula as follows:

	Exopod	Endopod
P2	0.0.023 [♂: 0.1.023]	0.020 or 010 or absent
P3	0.0.023 [♂: 0.1.023]	0.0(1-2)(0-1) or 021 [♂: 0.020]
P4	0.0.02(2-3) [♂: 0.1.022]	0.0(1-2)1 or 02(0-1)

P5 ♀ large, with separate rami; exopod elongate-oval, reaching far beyond endopodal lobe, with 6 setae; endopodal lobe moderately developed, with 3–5 setae. Fifth pair of legs in ♂ not fused medially; baseoendopod free at base; endopodal lobe minute, with 2 long setae; exopod longer than wide, with 5 setae.

P6 ♀ forming opercula closing off paired genital apertures, with 2 setae; P6 ♂ asymmetrical; membranous flaps with 2 setae.

Copepodids IV–V with modified P4 in ♀ (cf. Fiers 1998).

Marine; frequently on algae or decapods (Xanthidae, Majidae).

Type species. *Coullia heteropus* Hamond, 1973 [by original designation].

Other species. *Laophonte* ? *platychelipusoides* Noodt, 1958 = *C. platychelipusoides* (Noodt, 1958); *Hemilaophonte chysmae* Por & Marcus, 1973 = *C. chysmae* (Por & Marcus, 1973); *Phycolaophonte insularis* Pallares, 1975 = *C. insularis* (Pallares, 1975) comb. nov.; *Eolaophonte mediterranea* Apostolov, 1990 = *C. mediterranea* (Apostolov, 1990) comb. nov.; *Phycolaophonte tongariki* Gómez & Boyko, 2006 = *C. tongariki* (Gómez & Boyko, 2006) comb. nov.

Key to the species of *Coullia* Hamond, 1973

The key to species below should be used with caution since several, as yet undescribed, species are known to exist (Hicks 1977, Coull and Wells 1983, Coull et al. 1983, Fiers 1991, 1992a). Secondly, there is considerable confusion in the literature with regard to the exact setal formulae for the P2–P4 (particularly the endopods) as several minute elements have almost certainly been overlooked or tube-pores may have been misinterpreted as rudimentary setae. Finally, little is known about the sexual dimorphism

expressed in the swimming legs since only the male of *C. insularis* has been formally described (Table 1).

- 1 P2–P4 endopods 1-segmented or absent 2
- P2–P4 endopods 2-segmented 3
- 2 P2 endopod absent; P3 endopod ♀ quadrate; P5 ♀ baseoendopod with 4 setae; caudal ramus nearly 2.5 times as long as wide..... *C. clysmæ*
- P2 endopod 1-segmented; P3 endopod ♀ about 3 times as long as wide; P5 ♀ baseoendopod with 3 setae; caudal ramus 3 times as long as wide *C. heteropus*
- 3 P1 exp-2 with 5 setae/spines; P4 exp-3 ♀ with very long inner apical seta 4
- P1 exp-2 with 4 setae/spines; P4 exp-3 ♀ with minute (or without) inner apical seta 5
- 4 P2 exp-2 ♀ without inner seta, enp-2 as long as enp-1 *C. insularis* comb. nov.
- P2 exp-2 ♀ with inner seta, enp-2 distinctly smaller than enp-1 *C. tongariki* comb. nov.
- 5 Antennule ♀ 7-segmented; P5 ♀ baseoendopod with 5 setae *C. platychelipusoides*
- Antennule ♀ 6-segmented; P5 ♀ baseoendopod with 4 setae *C. mediterranea* comb. nov.

Additional notes. In addition to the type locality, Por and Marcus (1973) found *C. clysmæ* also in algal washings at Port Taufiq, outside the Suez Canal (Gulf of Suez).

Table 1. Armature formulae of *Coullia* species. The setal formulae of P2–P4 exp-3 have been corrected for the minute inner apical setae which may have been overlooked in some species [they are consistently present in detailed species descriptions (e.g. Mielke 1985, Gómez and Boyko 2006)]; it is possible that they are genuinely absent on P4 exp-3.

		P1	P2		P3		P4		P5	
		exp-2	exp	enp	exp	enp	exp	enp	exp	benp
<i>C. clysmæ</i>	♀	4	0.0.023	absent	0.0.023	021 ^a	0.0.022	021 ^a	6	4
<i>C. heteropus</i>	♀	4	0.0.023	010	0.0.023	021	0.0.022	020	6	3
<i>C. platychelipusoides</i>	♀	4	0.0.023	0.020	0.0.023	0.021	0.0.022	0.011	6	5
<i>C. mediterranea</i>	♀	4	0.0.023	0.020	0.0.023	0.010	0.0.022	0.021	6	4
<i>C. insularis</i>	♀	5	0.0.023	0.020	0.0.023	0.021	0.0.023 ^b	0.021	6	5
	♂	5	0.1.023	0.020	0.1.023	0.020	0.0.022	0.021	5	2
<i>C. tongariki</i>	♀	5	0.1.023	0.020	0.0.023	0.021	0.0.023	0.021	6	5

^a Por and Marcus (1973) claimed P3–P4 endopods have 3 setae; their figure of the P3 (Fig. 39) is inconclusive in this respect and requires confirmation; the tiny element between the 2 setae in both P3 and P4 may represent the apical tube-pore found in most other species (see e.g. Mielke (1985) for P4).

^b According to Pallares (1975a) some specimens have only 2 outer spines (as in the ♂).

Fiers (1992a) noted that the text and figures describing the P2 and P3 are contradictory; Fig. 40 in reality illustrates the P2, not the P3, and *vice versa*. *Coullia clysmiae* differs from its congeners in the complete absence of the P2 endopod; this character, and the loss of the outer spine on P1 exp-1 require confirmation.

Pallares (1975a) described *C. insularis* from washings of *Macrocystis pyrifera* (L.) and Delesseriaceae (red algae) collected in Bahía Vancouver, Isla de los Estados (Argentina). In a subsequent paper, Pallares (1975b) recorded the species from the plankton surrounding *Macrocystis* beds and washings of various algae including *Durvillea* and Delesseriaceae. Mielke (1985) added a second record from Maiquillahue, central Chile, and updated the description of the male. The only notable difference between the two populations is found in the caudal ramus which appears more slender, having concave margins and a shorter seta II (as long as seta I) in the Argentinian material. Mielke remarked that Pallares (1975a) had reversed the outer and inner margin of the caudal ramus in her text description. Pallares noted variability in the number of outer spines on P4 exp-3 in the ♀ (2 or 3) but not in the ♂ (2); if 3 spines is the normal condition it implies that the P4 exopod is sexually dimorphic in those species that have retained that number in the female. The sexual dimorphism on the exopods of P2–P3 (exp-2 with inner seta) is probably diagnostic for all species of the genus since it is also expressed to a certain extent in the related genera *Robustunguis* and *Psammoplatypus* (Lee and Huys 1999).

Coullia mediterranea shares with *C. clysmiae* the minute and unarmed proximal exopod segment of P1. It is unclear whether this indicates common ancestry or is merely the result of imperfect observation. Pesta's (1959) record of this species is based on a single female abdomen found in a submarine cave in the Gulf of Sorrento (Italy). Pesta gave illustrations of the P5 and caudal rami. Based on the apically recurved caudal seta V he claimed a certain similarity with *L. inopinata*, a species not yet recorded from the Mediterranean, but also admitted that the difference in leg 5 setation probably indicated that the specimen collected was juvenile.

The remaining three species (*platychelipusoides*, *heteropus*, *tongariki*) are known from their respective type localities (Tenerife, North Carolina, Easter Island) only. Noodt (1958) described the female antennule of *C. platychelipusoides* as indistinctly 8-segmented with a partial suture subdividing the apical segment, however, Lee and Huys (1999) reinterpreted or re-examined the 8-segmented condition reported for some species of *Paralaophonte* and *Heteronychocamptus* Lee & Huys, 1999 and concluded that the ancestral state for the family Laophontidae is 7-segmented. *Coullia heteropus* is thus far unique within the genus by the presence of only three elements on the female P5 baseopod. Hamond (1973) overlooked the minute inner distal seta on P2–P3 (and possibly P4) exp-3, and the pinnate ornamentation on the exopodal spines of P4.

Key to laophontid genera with reduced P2 endopod

There are no published descriptions of male *Coullia* [*sensu* Hamond (1973)], but referring to personal observations of several undescribed species of *Coullia*, Fiers

(1992a) confirmed that the sexual dimorphism in the P3 endopod and the armature pattern in the male P5 are exactly the same as in *Hemilaophonte* and *Phycolaophonte*. Fiers (1992a–b), Lee and Huys (1999) and, more recently, Gómez and Boyko (2006), recognized a close relationship between *Coullia*, *Phycolaophonte*, *Hemilaophonte*, *Robustunguis* Fiers, 1992 and *Psammoplatypus* Lee & Huys, 1999, based on the reduced P2 endopod (smaller than P3 endopod), the swimming leg sexual dimorphism (P3 endopod ♂) and the ovate shape of the female P5 exopod. McCormack (2006) added a new genus *Carraroenia* McCormack, 2006 which appears to be most basal in this lineage. The five genera currently recognized in this lineage can be differentiated as follows:

- | | | |
|---|---|------------------------------|
| 1 | P1 excessively enlarged with arched claw; reaching to posterior end of caudal rami; equivalent to about two-thirds of body length | <i>Robustunguis</i> |
| – | P1 not excessively enlarged | 2 |
| 2 | P4 exp-2 with inner seta in both sexes; ♂ P3 endopod 3-segmented | 3 |
| | P4 exp-2 without inner seta in both sexes; ♂ P3 endopod 2-segmented | 4 |
| 3 | P2 exp-2 with inner seta; P3 exp-3 with 6 setae/spines; P5 exopod ♀ with 6 elements | <i>Carraroenia</i> |
| – | P2 exp-2 without inner seta; P3 exp-3 with 5 setae/spines; P5 exopod ♀ with 4 elements | <i>Psammoplatypus</i> |
| 4 | P4 exopod 2-segmented | <i>Hemilaophonte</i> |
| – | P4 exopod 3-segmented | <i>Coullia</i> |

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A new species of *Oligoxystre* Vellard 1924 (Araneae, Theraphosidae) from Brazil

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Abstract

A new species of *Oligoxystre*, *Oligoxystre diamantinensis* **sp. n.**, is described from Brazil. Male can be distinguished from all other *Oligoxystre* species by the male palpal bulb lacking a small subapical keel on the embolus in conjunction with the embolus length (less than 2.5 times the tegulum length) and by the tibial spur being inserted in a perpendicular angle in relation to the tibia axis. Female can be distinguished by the spermathecae being much more longer than wide, lacking lateral lobes and having a large terminal lobe with five smaller lobes around it. Additionally, males and females can be distinguished by the general blue metallic color pattern contrasting with the reddish setae on the abdomen. A key for all described *Oligoxystre* species is presented. The cladistic relationship of *O. diamantinensis* **sp. n.** with the other *Oligoxystre* species is discussed and data on its habitat is provided.

Keywords

Iscnocolinae, Campo Rupestre, Diamantina, Minas Gerais, Neotropical, Spider taxonomy

Introduction

The genus *Oligoxystre* Vellard, 1924 comprises six species of small theraphosids recorded in Brazil and Bolivia. The type species, *Oligoxystre auratum* Vellard, 1924, was described

from Catalão, State of Goiás, Brazil based on a single male and several juveniles (Vellard 1924). Raven (1985) synonymized the genus *Cenobiopelma* Mello-Letão & Arlé, 1934 with *Oligoxystre* thus adding two species to the genus, *Oligoxystre mimeticum* (Mello-Leitão & Arlé, 1934) and *Oligoxystre argentinense* (Mello-Leitão & Arlé 1934). Guadanucci (2004) transferred *O. argentinense* to his new genus *Catumiri* Guadanucci, 2004. Later, the same author revised the genus *Oligoxystre*, described four new species, synonymized *Pseudoligoxystre* Vol, 2001 with *Oligoxystre* and considered *Cenobiopelma mimeticum* a nomen nudum (Guadanucci 2007). In his Catalog, Platnick (2008) disagreed with this interpretation and considered *C. mimeticum* a nomen dubium.

In a recent herpetological survey carried out in the city of Diamantina, State of Minas Gerais, Brazil, a new species of *Oligoxystre* was discovered and is herein described.

Material and methods

All measurements are in mm.

A Nikon SMZ1500 dissecting microscope was used for illustrations (with a camera lucida attachment).

Leg spines terminology follows Petrunkevitch (1925) with modifications proposed by Bertani (2001).

Specimens are deposited in the Museu de Zoologia da Universidade de São Paulo, São Paulo, Brazil (MZSP) and Instituto Butantan, São Paulo, Brazil (IBSP).

Abbreviations:

ALE = anterior lateral eyes, AME = anterior median eyes, PLE = posterior lateral eyes, PLS = posterior lateral spinnerets, PME = posterior median eyes, PMS = posterior median spinnerets, STC = superior tarsal claws.

Taxonomy

Oligoxystre Vellard 1924

Oligoxystre Vellard, 1924:151, pl. 10, fig. 38, type species *Oligoxystre auratum* Vellard, 1924 by original designation, type should be in Instituto Vital Brazil, Niterói, Brazil, supposed lost (Raven 1985; Guadanucci 2007); Roewer 1942: 235; Raven 1985: 119-120; Guadanucci 2007: 2; Platnick 2008.

Pseudoligoxystre Vol, 2001: 4-6, 7 figs (type-species *Pseudoligoxystre bolivianum* Vol, 2001). First synonymized by Guadanucci 2007: 4.

Diagnosis. See Guadanucci (2007).

Species included. *Oligoxystre auratum* Vellard, 1924, *Oligoxystre bolivianum* (Vol, 2001), *Oligoxystre caatinga* Guadanucci, 2007, *Oligoxystre dominguense* Guadanucci,

2007, *Oligoxystre tucuruense* Guadanucci, 2007, *Oligoxystre rufoniger* Guadanucci, 2007 and *O. diamantinensis* sp. n.

Identification key for *Oligoxystre*. Modified from Guadanucci (2007). Female of *Oligoxystre auratum* is undescribed.

Males

- 1 Male palpal bulb embolus with small subapical keel (Guadanucci 2007: Figs 2-5, 26-28) 2
- Embolus without keel (Figs 1-3; Guadanucci 2007: Figs 22-23, 31-32, 35-36)..... 3
- 2 Embolus long and thin, slightly bent distally (Guadanucci 2007: Figs 26-28)..... ***O. dominguense***
- Embolus short, strongly bent medially (Guadanucci 2007: Figs 2-5) ***O. bolivianum***
- 3 Bulb twisted on itself, prolonged by long collar, depressed at base and thin apical end, curved (Vellard 1924: 152, pl. 10 Fig. 38)..... ***O. auratum***
- Bulb not as above..... 4
- 4 Embolus more than 3 times longer than tegulum (Guadanucci 2007: Figs 22-23); spiders with cephalothorax and abdomen dark ventrally; white setae over dorsal region of cephalothorax (Guadanucci 2007: Fig. 38) ***O. caatinga***
- Embolus less than 2.5 times tegulum length (Figs 1-3, Guadanucci 2007: Figs 31-23, 35-36); spiders with coloration on ventral portion brownish or yellowish; without white setae on body 5
- 5 Leg I tibial spur positioned in a perpendicular angle in relation to the tibia axis (Figs 4-5); spiders with carapace, chelicerae, abdomen and legs covered dorsally and ventrally with metallic blue setae (Fig. 7)..... ***O. diamantinensis* sp. n.**
- Leg I tibial spur with branches positioned in an inclined angle in relation to the tibia axis (Guadanucci 2007: Figs 30, 34); spiders with carapace and legs brownish or reddish 6
- 6 Embolus slightly bent distally (Guadanucci 2007: Figs 31 32); carapace and legs brown ***O. tucuruense***
- Embolus slightly curved distally (Guadanucci 2007: Figs 35-36); carapace and basal portion of legs reddish and distal portions of legs dark (Guadanucci 2007: Fig. 39)..... ***O. rufoniger***

Females

- 1 Spermatheca receptacula as long as wide (Guadanucci 2007: Fig. 6) ***O. bolivianum***
- Spermatheca receptacula longer than wide (Figs 6; Guadanucci 2007: Figs 24, 29, 33, 37)..... 2
- 2 Spermatheca receptacula without lateral lobes (Figs 6; Guadanucci 2007: Figs 24, 29)..... 3

- Spermathecae receptacula with at least one lateral lobe (Guadanucci 2007: Figs 29, 33, 37)..... 4
- 3 Spermatheca receptacula long, with small apical lobes of roughly the same size (Guadanucci 2007: Fig. 24); white setae over dorsal region of cephalothorax, ventral cephalothorax and abdomen very dark ***O. caatinga***
- Spermatheca receptacula with a large lobe surrounded by other smaller lobes (Fig. 6); spiders with carapace, chelicerae, abdomen and legs covered dorsally and ventrally with metallic blue setae (Fig. 8) ***O. diamantinensis* sp. n.**
- 4 Spermatheca receptacula very long and thin, with small lobes over entire length (Guadanucci 2007: Fig. 29) ***O. dominguense***
- Spermatheca receptacula long, with wide base, bearing lateral lobe towards outside (Guadanucci 2007: Figs 33, 37) 5
- 5 Lateral lobe bifurcated (or partly bifurcated) (Guadanucci 2007: Fig. 33); carapace and legs brown..... ***O. tucuruense***
- Lateral lobe not bifurcated (Guadanucci 2007: Fig. 37); carapace and basal region of legs reddish, apical region of legs dark..... ***O. rufoniger***

***Oligoxystre diamantinensis* sp. n.**

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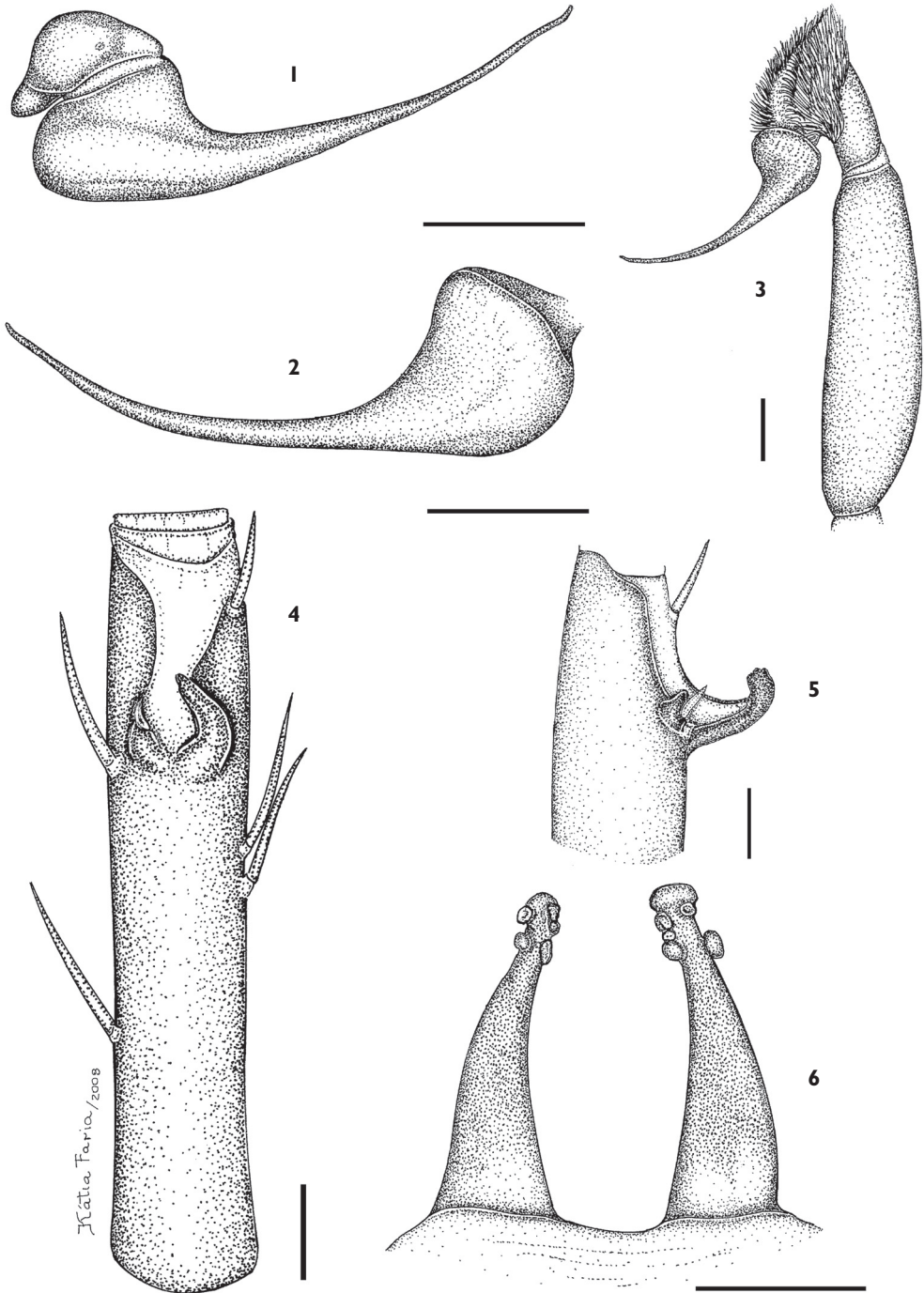
Figures 1-9

Type material. Holotype: male: Brazil, Minas Gerais, Diamantina, 18°13'57.2"S 43°35'14.9"W, 04.XII.2005, T. dos Santos & A. F. Righi (MZSP 29071).

Paratypes: male (MZSP 29072) and female (MZSP 29073) same data and collectors.

Other material examined. *Oligoxystre bolivianum*, 1 male, Brazil, State of Mato Grosso, Chapada dos Guimarães 15°27'S 55°44'W, 19 March 1992, D. Pinz (IBSP 9495), 1 female, February 1991, S.M. Lucas (IBSP 9504); *O. caatinga*, 1 male, Brazil, State of Piauí, Parnaíba 2°54'S 4°45'W, November 1994, R. Bertani (IBSP 9499), 1 female, same data (IBSP 9473); *O. dominguense*, 1 male (holotype), Brazil, state of Goiás, São Domingos 13°23'S 46°19'W, April 2000, A. Chagas Junior & M.G. Bichuette (IBSP 8625), 1 female (paratype) Minaçu, Serra da Mesa 13°49'S 48°18'W (IBSP 9467); *O. rufoniger*, 1 male, Brazil, state of Bahia, Palmeiras, Parque Nacional da Chapada Diamantina, 12°28'070"S 41°25'175"W, inside bromeliads, 15 February 2008, R. Bertani, C.S. Fukushima e R.H. Nagahama (MZSP 29101), 1 female (paratype), Central, Toca da Esperança 11°08'S 42°06'W, July 2000, A.D. Brescovit et al. (IBSP 8553); *O. tucuruense*, 1 male (holotype), Brazil, State of Pará, Tucuruí 3°45'S 49°40'W (IBSP 9459), 1 female (paratype), 01 July 1984, C. Pantoja & R.S. Pereira (IBSP 7936).

Diagnosis. Male of *O. diamantinensis* sp. n. can be distinguished from *O. bolivianum* and *O. dominguense* by the absence of a small subapical keel on the male palpal bulb embolus (Figs 1-3); from *O. caatinga* by the embolus being shorter than 2.5 times the tegulum length (Figs 1-3); from *O. tucuruense*, *O. rufoniger* and *O. auratum* by the tibial spur being inserted in a perpendicular angle in relation to the tibia axis (Figs.



Figs 1-6. *Oligoxystre diamantinensis* sp. n. holotype male 1. left male palpal bulb, proteral view; 2. left male palpal bulb, retrolateral view; 3. left palp, retrolateral view; 4. left leg I spur, ventral view; 5. Left leg I spur, proteral view; Paratype female 6. spermathecae, dorsal view. Scale bar: 1 mm.

4-5). Female can be distinguished from *O. bolivianum* by the spermathecae being much more longer than wide; from *O. dominguense*, *O. rufoniger* and *O. tucuruense* by the absence of lateral lobes in the spermathecae; and from *O. caatinga* by the spermathecae having a large terminal lobe with five smaller lobes around it (Fig. 6), instead of several small lobes. Additionally, males and females can be distinguished by the general blue metallic color pattern and the reddish setae on the abdomen (Figs 7-8), instead of the general brownish to reddish pattern shown by the other species. The metallic blue color is not lost in specimens preserved in alcohol, indicating its origin to be structural instead of due to the presence of biological pigments.

Etymology. Named after the type-locality, the city of Diamantina, in the state of Minas Gerais, Brazil.

Description. Male (holotype)(Figs 1-5, 7): Total length with chelicerae: 25.5. Carapace: length 9.3, width 8.6. Abdomen: length 11.2, width 6.4. Eye tubercle low, length 1.1, width 2.0. Labium: length 0.8, width 1.5. Sternum: length 4.6, width: 3.7. Cephalic region low, hardly distinct. Thoracic striae undistinguishable. Fovea short, deep, straight. Chelicerae without rastellum, basal segments with 9 teeth. Clypeus absent. Anterior eye row procurved, posterior slightly recurved. AME round, diameter 0.35, 0.39 apart; ALE elliptical, 0.44 x 0.26, 1.07 apart. Posterior eye row slightly recurved; PME ovoid, 0.28 x 0.23, 0.78 apart; PLE ovoid, 0.39 x 0.18, 1.39 apart. Labium with 8 cuspules. Maxilla subrectangular, anterior lobe distinctly produced into conical process, inner angle bearing 25 cuspules. Sigilla on sternum undistinguishable. PMS one-segmented, 1.0 in length; PLS three-segmented, basal segment 2.28, median 1.87, apical 2.54. Claw tufts present; STC without teeth. Tarsi I-IV scopulate, IV with sparse row of setae; metatarsus I scopulate along a third of segment length, II 4/5 of its length, III 3/5 and IV 2/5 of their lengths. Femur IV without retrolateral scopula. Stridulatory setae absent. Length of legs and palp in Table 1. Spines: tarsi lacking spines. Palpal femur p0-0-1, patella 0, tibia p1-2-1; legs I femur p0-0-1, patella 0, tibia v 2-2-2(1ap), metatarsus v1-0-0; II femur p0-0-1, patella 0, tibia v1-2-3(2ap), p1-0-1, metatarsus v1-0-0; III femur p0-1-1, r0-2-2, patella 0; tibia v3-3-2ap, p1-0-1, r1-0-1, metatarsus v0-2-3ap, p1-0-1, r1-0-1; IV femur p0-0-1, r0-1-2, patella 0, tibia v3-3-2ap, p1-0-1, r2-0-1, metatarsus v1-3-3ap, p1-0-1, r0-1-1. Male tibial spur small, with two branches slightly curved, originating from common, raised base (Figs 4-5). Retrolateral branch longer than prolateral. Spur branches inserted in a perpendicular

Table 1. *Oligoxystre diamantinensis* sp. n. Male Holotype. Length of left legs and palpal segments.

	Palp	I	II	III	IV
Tarsi	1.9	4.4	4.3	4.0	4.5
Metatarsi	---	7.6	7.3	7.1	10.2
Tibiae	4.8	7.7	6.9	6.3	8.5
Patellae	3.8	5.1	5.0	4.1	4.5
Femora	5.9	9.4	9.0	8.1	9.9
Total	16.4	34.2	32.5	29.6	37.6

angle in relation to the tibia axis (Fig. 5). Distance from tibia apex and the spur basis a quarter of the tibia length (Fig. 4). Metatarsus I slightly bent at basal portion, passing laterally the retrolateral branch of tibial spur when flexed. Male palpal bulb with short subtegulum, not extending down bulb. Bulb globose, embolus long, 2.4 times longer than the tegulum, tapering to the tip and with a slight curvature on its distal quarter region (Figs 1-3). Male palpal bulb keels absent. Urticating hairs absent. General color pattern of tegument golden-brown. Carapace, chelicerae, abdomen and legs covered dorsally and ventrally with metallic blue setae. Leg rings and longitudinal stripes on the patellae and tibiae hardly distinct. Abdomen covered with abundant long red setae and some short metallic blue setae. Anterior region with a stripe of red setae (Fig. 7).

Female (Paratype)(Figs 6, 8): Total length with chelicerae: 37.6. Carapace: length 10.9, width 9.9. Abdomen: length 19.8, width: 11.9. Eye tubercle: length 1.4, width 2.0. Labium: length 1.1, width 1.9. Sternum: length 5.2, width: 4.6. Cephalic region slightly elevated. AME round, diameter 0.36, 0.29 apart; ALE elliptical, 0.52 x 0.32, 1.23 apart. Posterior eye row slightly recurved; PME ovoid, 0.46 x 0.32, 0.92 apart; PLE ovoid, 0.41 x 0.24, 1.43 apart. Labium with 6 cuspules. PMS one-segmented, 1.52 in length; PLS three-segmented, basal segment 2.89, median 1.89, apical 2.99. All other characters as in male, except: metatarsi I and II scopulate along the full length of the segment, III 7/10 and IV 2/5 of their lengths. Length of legs and palp in Table 2. Spines: tarsi lacking spines. Palpal femur p0-0-1, patella 0, tibia v2-1-4ap, p0-1-0; legs I femur p0-0-1, patella 0, tibia v1-1-2ap, p1-0-1, metatarsus 0; II femur p0-0-2, patella 0, tibia v2-0-1ap, p1-1-0, metatarsus v1-0-0; III femur p0-0-2, r0-0-1, patella 0; tibia v1-2-2ap, p1-1-0, r1-1-0, metatarsus v2-0-4ap, p1-0-1, r1-0-1; IV femur r0-0-1, patella 0, tibia v1-3-3(2ap), p1-0-0, r1-0-1, metatarsus v0-4-3ap, p1-0-1, r1-0-1. Two spermathecae weakly sclerotized, long, ending in a large terminal lobe, two smaller lobes on the external region and three tiny lobes on the internal region, all them closely positioned (Fig. 6). Color pattern as in male (Fig. 8).

Variation (Male paratype). Length of legs and palp in Table 3. Spines: tarsi lacking spines. Palpal femur p0-1-1, patella 0, tibia p0-2-2; legs I femur p0-0-1, patella 0, tibia v 1-1-1ap, p 1-1-0, r 1-1-0, metatarsus v1-0-0; II femur p0-1-1, patella 0, tibia v1-1-2ap, p1-1-0, metatarsus v1-0-0; III femur p1-1-1, r0-2-1, patella 0; tibia v1-3-2ap, p1-1-0, r1-1-0, metatarsus v3-0-4ap, p1-1-1, r0-1-1; IV femur p0-0-1, r0-2-1, patella 0, tibia v2-3-2ap, p1-1-0, r1-1-0, metatarsus v1-2-4ap, p1-0-1, r1-0-1.

Table 2. *Oligoxystre diamantinensis* sp. n. Female Paratype. Length of left legs and palpal segments.

	Palp	I	II	III	IV
Tarsi	4.3	3.8	3.2	3.1	3.8
Metatarsi	---	5.9	5.6	6.0	8.1
Tibiae	3.8	6.2	5.8	5.1	7.3
Patellae	4.0	5.6	5.0	4.3	4.5
Femora	6.3	8.5	7.7	7.2	9.1
Total	18.4	30.0	27.3	25.7	32.8



Figs 7-8. *Oligoxystre diamantinensis* sp. n. 7. holotype male; 8. paratype female. Photos: 7 Alexandre Righi; 8 Rogério Bertani.

Relationship. The cladogram proposed by Guadanucci (2003) and partially reproduced in Fig.9 shows *Oligoxystre* as a monophyletic genus sister to the clade *Pterinochilus* sp. (*Avicularia avicularia* (Linnaeus, 1758) (*Euathlus vulpinus* (Karsch, 1880) + *Vitalius vellutinus* (Mello-Leitão, 1923)) united by three non-exclusive synapomorphies (node A): few cuspules on the maxillae (character 1) (homoplasy shared with *Catumiri* spp.), few cuspules on the labium (character 2) (homoplasy shared with *Ischnocolus algericus* Thorell, 1875 + *Catumiri* spp. and *Euathlus vulpinus*), and the labium wider than long (character 3) (homoplasy shared with *Ischnocolus algericus* + *Catumiri* spp.). *Oligoxystre* is divided into two fully dichotomous clades. One of the clades (node B) has the monophyletic group *O. tucuruense* + *O. rufoniger* defined by a homoplasious apomorphy, the presence of lateral lobes in the spermatheca (character 4) (shared with *Euathlus vulpinus*). The other clade has the monophyletic group *O. bolivianum* + *O. dominguense* (node D) sharing the presence of keels in the male palpal bulb embolus (character 6) as a synapomorphy. The sister-group of this clade (node C) is *O. caatinga* which shares with *O. bolivianum* + *O. dominguense* and other external taxa (*Sickius longibulbi* Soares & Camargo, 1948 (*Ischnocolus algericus* + *Catumiri* spp.)) the presence of a short clypeus (character 5). *Oligoxystre diamantinensis* sp. n. exhibits the three generic synapomorphies (characters 1-3), but the female lacks the lateral lobe in the spermatheca (character 4) and the male does not have keels in the embolus (character

Table 3. *Oligoxystre diamantinensis* sp. n. Male Paratype. Length of left legs and palpal segments.

	Palp	I	II	III	IV
Tarsi	1.9	4.0	4.2	3.8	4.3
Metatarsi	---	7.2	6.9	7.2	9.8
Tibiae	4.4	7.2	6.6	6.1	8.3
Patellae	3.7	5.2	4.8	3.7	4.4
Femora	5.5	9.0	8.5	7.6	9.4
Total	15.5	32.6	31.0	28.4	36.2

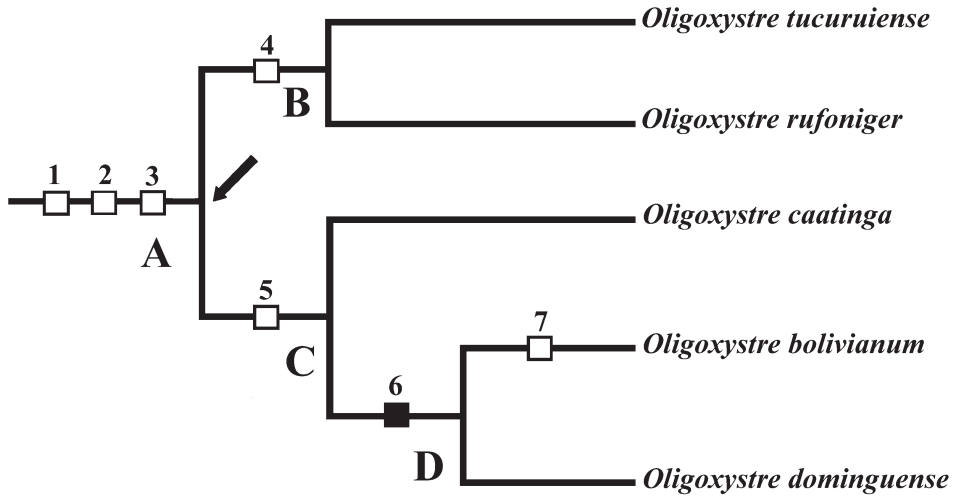


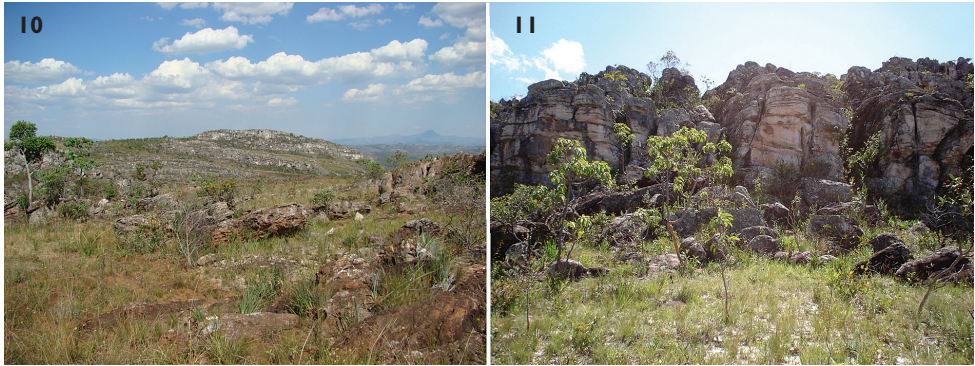
Fig. 9. Part of Guadanucci's (2003) cladogram showing *Oligoxystre* species relationship. Characters: 1 few cuspules on the maxillae; 2 few cuspules on labium; 3 labium wider than long; 4 spermathecal lateral lobe present; 5 clypeus narrow; 6 keel on male palpal bulb embolus present; 6 spermatheca as long as wide. Black square = synapomorphy. White square = homoplasy. The arrow indicates the probable position of *Oligoxystre diamantinensis* sp. n. in the cladogram.

6). Furthermore, both male and female lack a clypeus (plesiomorphic state for character 5). Thus, the new species lack all the apomorphies for the two clades and possibly would be in a basal trichotomy in that cladogram (indicated by an arrow in Fig. 9).

Concerning *O. auratum*, Vellard (1924) presented a detailed description of the species which allows to distinguish it from *O. diamantinensis* sp. n. *Oligoxystre auratum* has an overall brownish pattern whereas the new species has a blue metallic color (Figs 7-8). The *O. auratum* tibial spur illustration (Vellard 1924: 152, pl. 10 Fig. 38d) shows the branches in a parallel position with the tibia axis whereas in *O. diamantinensis* sp. n. the tibial spur branch axis is perpendicular in relation to the tibia axis (Fig. 5).

Distribution. Only known from type locality.

Habitat description. The specimens were found in "campo rupestre" areas (Figs 10-11), characterized by its height above sea level – above 900m, in association with a high degree of outcropping and consequent reduction of soil depth (Giulietti and Pirani 1988). The vegetation in the area of occurrence of *O. diamantinensis* sp. n. have predominantly specimens of the families Asteraceae, Melastomataceae, Gramineae, Cyperaceae, Cactaceae, Eicaceae, Leguminosaceae, Velloziaceae, Eriocaulaceae and Xyridaceae (Silva et al. 2005). The climate is tropical – temperature ranging from 18 to 20°C, minimum 4°C in June/July reaching 35°C by December/January (Silva et al. 2005). The rainy season extends from November to March (precipitation mean 223.19 mm). In the dry season from June to August the pluviosity mean falls to about 8.25 mm (Silva et al. 2005). The relative humidity varies between 72.33% and 89.75% (for



Figs 10-11. Campo Rupestre area in Diamantina, Minas Gerais, Brazil. Photos: Alexandre Righi.

2001 and 1995, respectively) (Silva, et al. 2005). The three collected specimens were found in altitudes about 1.250m a.s.l, always in rocky places, either inside crevices or under large stones where they normally build silky tunnels.

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Caupolicana in Central America (Hymenoptera, Colletidae, Diphaglossinae)

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Abstract

Caupolicana (Zikanapis) wileyi sp. n. from Guatemala is described. New locality records are noted for other species, and the hitherto unknown female of *C. (Z.) rozenorum* Michener, Engel, and Ayala from Guatemala is described. A key for the identification of Central American *Caupolicana* is provided.

Keywords

Hymenoptera, Apoidea, Colletidae, Diphaglossinae, *Caupolicana*, *Zikanapis*, *C. wileyi*, *C. rozenorum*, taxonomy, new species, identification key

Introduction

The large and conspicuous bees of the genus *Caupolicana*, subgenus *Zikanapis*, that occur in tropical America are probably all crepuscular or nocturnal and are therefore rather rarely taken by bee collectors. Revisional studies of this group of about a dozen species are those of Moure (1964) for South America and Michener et al. (2003) for Central America. Below we describe another species from Central America (Guatemala), *Caupolicana (Zikanapis) wileyi* sp. n., raising the number of species known from the region to four, and record new data for certain other species.

All Central American species of *Caupolicana* belong to the subgenus (or genus, depending on the classification) *Zikanapis* Moure, 1945. Distinctive features of *Zikanapis*

were described by Moure (1945) and Michener (1966), and summarized by Michener (2007). Minor modifications of these characterizations are noted in the present study, as follows: In *C. (Z.) wileyi*, the broad median apical projection of the sixth metasomal sternum of the male has an apical concavity that is rounded, not V-shaped. Furthermore, the dense, minute setae of the broad areas of the ventrolateral parts of the second through the fourth metasomal terga (and to a lesser extent, the fifth metasomal tergum) are not erect but are decumbent and directed upward and slightly posteriorly.

Our present work was stimulated by Dr. James R. Wiley who sent us for study a small collection of mostly Guatemalan *Caupolicana* from the Entomology Museum, Florida State Collection of Arthropods, Gainesville, Florida. The collector of much of this material, Dr. J.B. Heppner, has reported to Dr. Wiley that these bees were abundant at a black light (UV) trap. Many moth scales are on the specimens, no doubt transferred to the bees when struggling together with moths in the trap. These findings support the view that these bees are nocturnal or crepuscular. Additional Guatemalan material was received from Dr. Enio Cano of the Universidad del Valle de Guatemala. Labels on some of the specimens of *C. (Z.) rozenorum* Michener, Engel & Ayala indicate that they were taken at lights.

Abbreviations used below are T and S for terga(um) and sterna(um), such that, for example, T1 is the first metasomal tergum. The abbreviation OD is the horizontal diameter of the anterior ocellus, used to measure various other cephalic structures or distances between them. Collections in which specimens are housed are abbreviated as follows: KSEM, Division of Entomology, Natural History Museum, University of Kansas, Lawrence, Kansas, USA; FSCA, Florida State Collection of Arthropods, Florida Department of Agriculture, Gainesville, Florida, USA; UVGC, Universidad del Valle de Guatemala, Guatemala City, Guatemala. Photomicrographs were prepared using a Nikon D1x digital camera attached to an Infinity® K2 long-distance microscopic lens.

Key to species of Central American *Caupolicana*

The key to species of Central American *Caupolicana*, below, is based on that of Michener et al. (2003), which contains references to figures that are useful in interpreting the key but are not duplicated here. Accordingly, we encourage use of the key in conjunction with our earlier contribution (Michener et al., 2003). The key below differs from the 2003 version primarily in that *C. wileyi* is included, as is the female of *C. rozenorum*.

1. Males..... 2
- Females..... 5
2. Clypeus largely brownish yellow, densely punctate except near lower margin (Guatemala, Mexico) ***C. clypeata* (Smith)**
- Clypeus brown or black, concolorous with remainder of head, at least lower half of clypeus with areas having punctures separated by about a puncture width or more of shiny integument..... 3

3. T2 and T3, and to some degree T4, covered with suberect black setae (Guatemala)..... ***C. wileyi* sp. n.**
 – T2 to T4 covered with pale brown setae..... 4
4. Metatibia little over three times as long as wide, upper and lower margins both convex; legs brownish black (Costa Rica, El Salvador, Guatemala).....
 ***C. rozenorum* Michener, Engel & Ayala**
 – Metatibia nearly 4.5 times as long as wide, lower margin straight, upper margin convex; legs reddish brown, metabasitarsi yellowish dark testaceous (Costa Rica)..... ***C. inbio* Michener, Engel & Ayala**
5. Clypeus densely punctate, with erect brown setae, some of them bent at tips, surface of clypeus nearly flat (Guatemala, Mexico)..... ***C. clypeata* (Smith)**
 – Clypeus with lower two thirds medially shining, with scattered coarse punctures and other irregularities (Figs. 2, 3), setae not erect, not bent at tips 6
6. Pile of mesoscutum and mesoscutellum black or nearly so (Figs. 3, 13); setae of posterior half of dorsal surface of T1 dusky or blackish, unlike white or ochraceous hairs of anterior half (Guatemala) ***C. wileyi* sp. n.**
 – Pile of mesoscutum and mesoscutellum ochraceous (Figs. 1, 2), tips of setae usually brown or blackish; setae of T1 uniformly whitish or ochraceous or dusky setae intermixed on posterior part 7
7. Distance between posterior ocelli distinctly less than 1 OD (Costa Rica).....
 ***C. inbio* Michener, Engel & Ayala**
 – Distance between posterior ocelli subequal to 1 OD (Costa Rica, El Salvador, Guatemala) ***C. rozenorum* Michener, Engel & Ayala**

Systematics

***Caupolicana (Zikanapis) inbio* Michener, Engel & Ayala**

Caupolicana (Zikanapis) inbio Michener et al., 2003: 164.

New record. One male from COSTA RICA: Cartago Province, Tuís, VII-16-29-1997 (H.L. Dozier) [FSCA].

***Caupolicana (Zikanapis) rozenorum* Michener, Engel & Ayala**

(Figs. 1-2)

Caupolicana (Zikanapis) rozenorum Michener et al., 2003: 169.

New records. One male, one female from GUATEMALA: Guatemala Province: Puerta Parada, IX-5-8-2001 (J. Schuster) [FSCA]; two males, same locality and collector, 1900 m, VII-16-2002 and XI-6-13-2003 [UVGC]; one female, same locality and collector, 1860 m, IV-11-18-2004 [UVGC]; two females from same locality and collector,



Fig. 1. Lateral (above) and dorsal (below) views of female of *Caupolicana (Zikanapis) rozenorum* Michener, Engel, and Ayala.

in malaise trap, VIII-25 to IX-1, 2007 [KSEM]. Two females, Suchitupéquez Province: Los Tamales, Volcán Atitlán, 800-1000 m, IX-24-26-2006 (J.B. Heppner) [KSEM]. One male, same province, Santa Barbara, Res. Refugio Quetzal, 1600 m, VI-27-2007 [UVGC]. One male, Baja Verapaz Province: Salama, camino Pantina Santa Rosa, 1700 m, VI-10-15-2007 (Monzón y Camposecu) [UVGC]. One male, San Marcos Province: San Rafael Pie de la Cuesta, camino a aldea El Bojonal, 1600 m, V-24-2005 (J.M. Sierra) [UVGC]; one male, same but camino de Frater-Bojonal, 1600 m, V-26-2006 [UVGC]. One female, Quetzaltenango Province: Palmar Viejo, finca El Faro, 1400 m, III-16-17-1997 (Rodríguez y Taracena) [UVGC]. One female, EL SALVADOR: San Vicente: Volcán San Vicente, finca El Carmen, 1400 m, IX-14-2006, at mercury vapor light (E. Cano and J. Schuster) [UVGC]. One female, COSTA RICA: Guanacaste Province: Estación Cacao, 2 km SW of Cerro Cacao, 1100 m, II-7-18-1995 (M. Chinchilla) [FSCA]. One female, same locality, southwest side of Cerro Cacao, 1000-1400 m, March 1988 [KSEM].

Comments. This species was originally described (Michener et al., 2003) on the basis of four males from three different localities in Costa Rica. Two females from one of these localities were considered possibly *C. rozenorum* and their characters were noted. We now have males and females from a locality in Guatemala as listed above. These females appear to be the same species as the females noted in 2003, supporting the tentative association of sexes. Additional females from localities in Guatemala, San Salvador, and Costa Rica were not taken with males. The data for these specimens are listed above.

Comparisons. The following paragraphs list differences between *C. rozenorum* and *C. inbio*.

Male: *Caupolicana rozenorum* and *C. inbio* are noteworthy because of the very striking difference in the metatibial shape and setation (see above key and figures 21 and 22 in Michener et al., 2003) but near absence of other differences. The differentiating characters other than the metatibia listed in the original description of the male of *C. rozenorum* are not reliable. The middle flagellar segments of *C. inbio* are sometimes about 1.5 times as long as broad as described for *C. rozenorum*. The punctures on the shining central part of the lower half of the clypeus are more widely scattered in *C. rozenorum* than in the available specimens of *C. inbio*, but the difference is not impressive and intergradation is probable. The integument is generally paler in *C. inbio* than in *C. rozenorum*; thus the flagellum is brown to blackish, darker above than below, in *C. inbio* whereas it is blackish, dark brown below, in *C. rozenorum*. Moreover, the legs are brown with the metabasitarsus yellowish in *C. inbio*, whereas the legs including the metabasitarsus are dark brown in *C. rozenorum*. The setae on the outer surfaces of the meso- and metatibiae are mostly pale in *C. inbio*, mostly somewhat dusky in *C. rozenorum*, the darkness varying with the angle of illumination. The supposed difference in dark apices of the mesosomal pile does not exist. An additional apparent difference is in the ocellocular distance, which, although given as 0.15 OD for both species in the original descriptions, seems to be less in *C. rozenorum*; this apparently does not apply to all specimens.

Female: Length 17-21 mm (averaging slightly smaller than *C. inbio*); forewing length 11-13 mm. Upper interorbital distance about 3 OD; lower interorbital distance

about 5 OD; interocellar distance about 1 OD; ocellocular distance about 0.5 OD; other measurements approximately as recorded for *C. inbio*. Clypeus broadly convex without weak longitudinal depression on each side of weak median longitudinal area as found in *C. inbio*. Inner metatibial spur with 17 or 18 large teeth (not counting small basal teeth and preapical tooth sometimes present). Integument including metatarsus largely black but pro- and mesofemora and tibiae with brownish areas; pygidial plate medially dark brown. Setae of tarsi largely fuscous although with yellowish reflections. Pile of mesosomal dorsum and T1 usually darker than in *C. inbio* because of black or dusky apical parts of setae.

***Caupolicana (Zikanapis) wileyi* Michener & Engel, sp. n.**

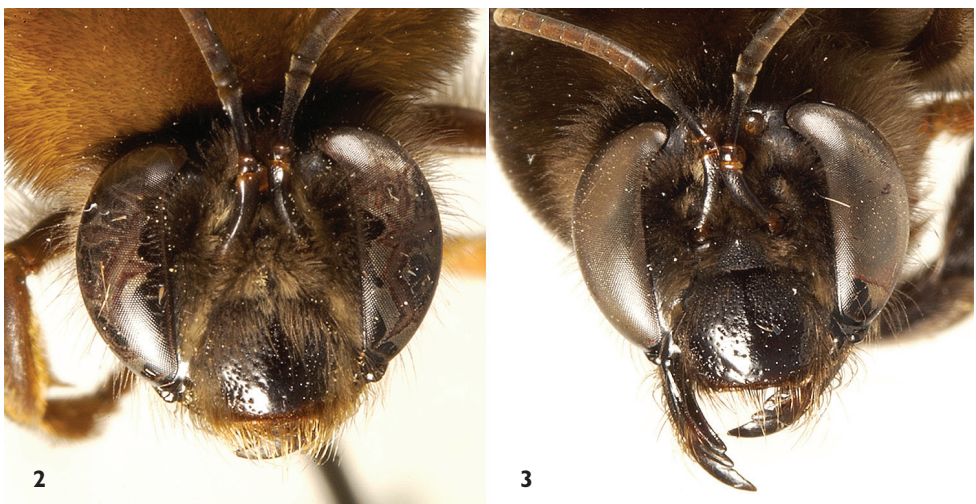
urn:lsid:zoobank.org:act:37C65F37-FFBC-4A19-B744-4D15B4CC9EB1

(Figs. 3-13)

Type material. Holotype male and three male paratypes, GUATEMALA: Baja Verapáz Province: Quetzal Res., “Los Ranchitos”, 1680-1750 m, 10-15 June, 2007 (J.B. Hepner) [KSEM, one paratype at FSCA].

Additional material. Two females, same data as holotype [KSEM]. Two females, same but “Los Rancheros”, 1650 m, 21-23 September, 2006 [KSEM, FSCA]. One female, Guatemala: Escuintla Province: La Gomera, V-13-2001 (A. Gomez) [UVGC].

Diagnosis. Among similar species of the subgenus *Zikanapis*, such as *C. inbio* and *C. rozenorum*, the male of *C. wileyi* differs by the dense suberect black setae of T2 and T3 and to some degree of T4, while the female differs from the others by the black or



Figs. 2-3. Facial aspects of Guatemalan *Caupolicana* females (not to same scale). **2** *Caupolicana (Zikanapis) rozenorum* Michener, Engel & Ayala. **3** *C. (Z.) wileyi* sp. n.



Fig. 4. Lateral (above, right) and dorsal (below, left) views of male of *Caupolicana (Zikanapis) wileyi* sp. n.

in some areas blackish pile of the mesosomal dorsum and T1. Metatibia of male about 4.8 times as long as greatest breadth, distal half parallel sided. S8 of male with midapical process nearly parallel sided, not slender basally as in *C. inbio*.

Description. Male: Length 18 mm (17 mm in some paratypes); forewing length (including tegula) 15 mm. Upper interorbital distance 2.17 OD; lower interorbital distance 4.3 OD; interocellar distance 0.5 OD; ocellocular distance 0.15 OD; ocellocipital distance 1.5 OD (Fig. 5); length of scape 2.2 OD. Otherwise agreeing with description of *C. inbio* (Michener et al., 2003) except as follows: First flagellar segment markedly longer than scape (Fig. 7); second flagellar segment broader than long; metatibia in lateral (broadest) view about 4.8 times as long as greatest breadth (Fig. 8), distal half parallel sided, lower margin gently convex medially but distal half straight, upper margin nearly straight but proximal and distal parts feebly convex; genitalia and S7 (Figs. 9, 11, 12) essentially as in *C. inbio* (Michener et al., 2003: figs. 13, 15, 16); S8 with midapical process nearly parallel sided (Fig. 10), not so slender basally as in *C. inbio* (Michener et al., 2003: fig. 14).

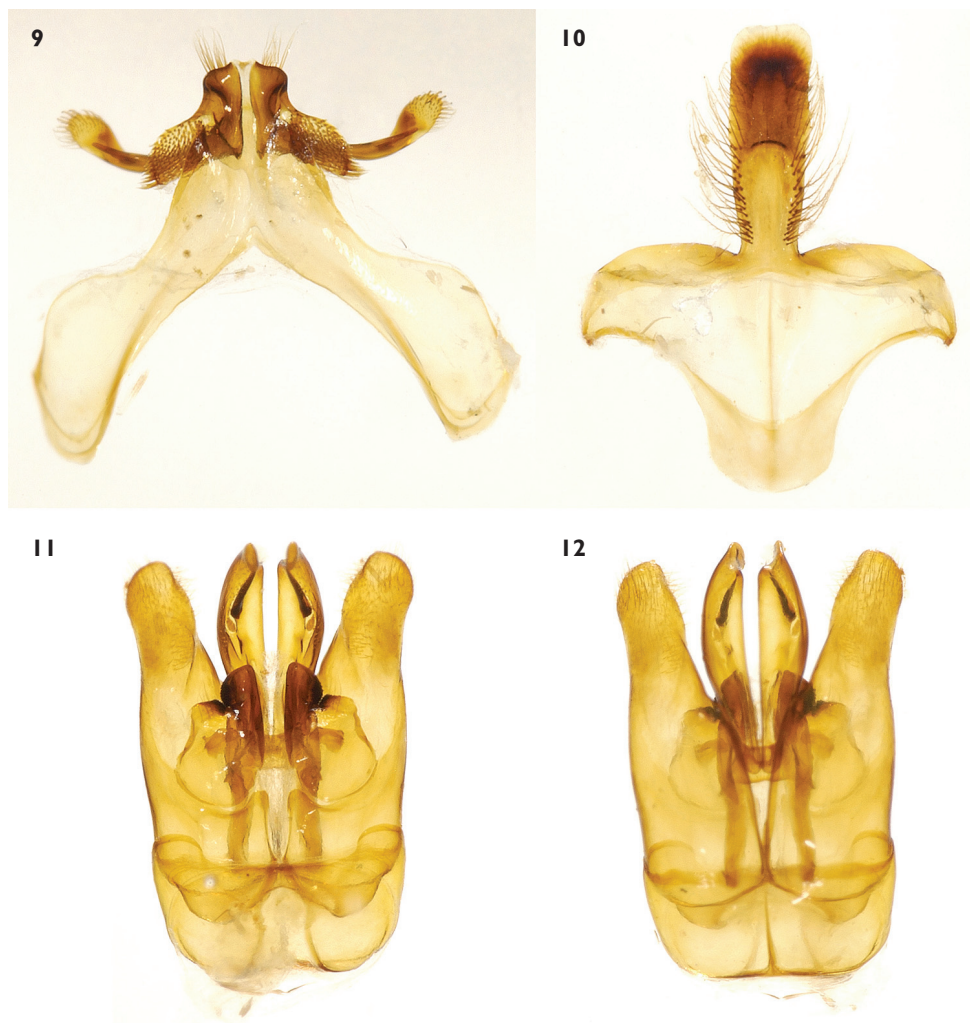
Punctuation as in *C. inbio*, lower midapical part of shiny area of clypeus with a few, scattered, large punctures (true also for some *C. inbio*, contrary to description). Base of



Figs. 5-8. Male of *Caupolicana (Zikanapis) wileyi* sp. n. 5) Ocellar view. 6) Facial view. 7) Lateral aspect of head. 8) Hind leg.

labrum with minor irregularities, not punctures. T5 and T6, except for smooth apical marginal zones, coarsely and rather closely punctate in contrast to preceding terga.

Integument black, under surface of flagellum dark brownish, particularly distally; small segments of tarsi brownish; pro- and mesofemora partly brown (note that the metabasitarsus is black, not yellowish as in *C. inbio*); posterior marginal zones of T5 and T6 translucent brown; ventrolateral dull areas of T2 to T5, and all sterna, largely brown.



Figs. 9-12. Male terminalia of *Caupolicana (Zikanapis) wileyi* sp. n. **9)** Seventh metasomal sternum. **10)** Eighth metasomal sternum. **11)** Genital capsule, ventral view. **12)** Genital capsule, dorsal view.

Facial setae mixed ochraceous and black, mostly ochraceous on clypeus and lower supraclypeal area, which support long dense setae (Fig. 6); setae of vertex black, some black setae extending down along posterior orbit to middle or lower part of compound eye. Dense pile on mesosomal dorsum, uppermost mesepisternum, and T1 fulvous, often with irregular darker areas on posterior part of mesoscutum, apices of setae not blackish; setae of genal areas, ventral parts of head, sides (except above) and venter of mesosoma pale ochraceous, sometimes dusky in lower lateral and posterior parts of mesepisternum and blackish on anterior lateral parts of propodeum; pale ochraceous whitish on lower lateral and posterior parts of propodeum; setae of coxae to femora ochraceous and partly dusky; setae of meso- and metatibiae and tarsi dusky, partly

ochraceous on under surface of midleg; setae of protibia and protarsus dusky to ochraceous. Setae of T1 whitish below laterally, but on dorsal surface fulvous as on mesosomal dorsum; setae of T2, T3, and intermixed on T4 black, dense, suberect (most nearly erect on T2), black or blackish setae continuing onto ventrolateral parts of terga and blackish on lateral extremities of sterna; otherwise sternal setae ochraceous; T4



Fig. 13. Lateral (above) and dorsal (below) views of female of *Caupolicana (Zikanapis) wileyi* sp. n.

with long setae mixed ochraceous and dusky; T5 to T7 with setae long, especially long on T5, ochraceous, slightly dusky especially laterally.

Female: Length 19 mm; forewing length (including tegula) 15 mm. Upper interorbital distance 3.2 OD; lower interorbital distance 4.9 OD; interocellar distance 0.7 OD; ocellocular distance 0.5 OD; ocelloccipital distance 0.5 OD; length of scape 2.2 OD. Structure otherwise as described for female *C. inbio* (Michener et al., 2003).

Densely punctate, dull part of clypeus occupying nearly upper third of clypeus except usually divided medially by extension of smooth surface upward from lower part of clypeus (Fig. 3); lower two thirds of clypeus except laterally smooth, shining, with few scattered large punctures.

Integument black, under side of flagellum brownish, especially distally, last flagellar segment brown beneath; tegula translucent infuscated testaceous; small segments of tarsi, especially distitarsi, brown; under surfaces of pro- and mesofemora and tibiae and sometimes metatibia and metabasitarsus partly brownish.

Setae of face dusky to blackish, areas of short dense pallid setae on frons and lower paraocular areas, longer setae of paraocular areas and setae of vertex black, black to dusky setae extending from vertex down along outer orbit to half or entire compound eye length, otherwise setae of gena and venter of head whitish. Pile of mesosomal dorsum, uppermost mesepiternum, and upper lateral surface of propodeum black or blackish, bases of setae often dusky; setae of mesepiternum laterally dusky, grading to pale dusky ventrally and on pro- and mesocoxae to femora, white or whitish on lower lateral surface and posterior surface of propodeum and on metacoxa to femur and under surface of metatibia; setae on outer surfaces of tibiae and basitarsi black, glistening pallid in some lightings; T1 with long setae whitish basally and laterally, dusky on posterior part of dorsal surface; dorsal surfaces of T2 and T3 with setae short, decumbent, dusky but glistening pallid in oblique light; T4 with similar setae but also scattered, long, erect whitish setae; T5 and T6 with abundant long pallid to coppery setae, a few of them dusky; lateral parts of terga with dusky to blackish setae, grading to yellowish white on ventrolateral extremities; sterna with setae yellowish white, whiter laterally.

Etymology. *Caupolicana wileyi* is so named in recognition of Dr. James R. Wiley of the Florida State Collection of Arthropods, who made possible this study by providing many of the specimens used.

Acknowledgements

We are grateful to James R. Wiley, Florida State Collection of Arthropods, for sending us over the years many interesting bee specimens, including *Caupolicana*. We are also grateful to Enio Cano for making available to us the *Caupolicana* from the collection at the Universidad del Valle de Guatemala, and to Jack C. Schuster for helping with this material. Partial support for this work was provided by US National Science Foundation grant EF-0341724 (to M.S.E.).

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Mexican species of *Labena* Cresson (Hymenoptera, Ichneumonidae) with description of a new species

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Abstract

Nine species of the genus *Labena* Cresson are recorded from México. One species, *Labena acerba* **sp. n.**, is described as new. Two species, *L. eremica* Gauld and *L. marginata* Szépl., are recorded from México for the first time. New data on distribution of *Labena* in México are provided. A key to Mexican species of *Labena* is given.

Keywords

México, Hymenoptera, Ichneumonidae, Labeninae, *Labena*, new species, taxonomy

Introduction

Labena Cresson, 1864 is a large, predominantly Australian and Neotropical genus with 37 described species (Yu et al. 2005). Seven species are known from Australia (Gauld and Holloway 1986), two species occur in the U.S.A. and Canada (Townes and Townes 1960), 21 in Costa Rica (Gauld 2000), and 11 in South America, including Bermuda and Grenada (Townes and Townes 1966, Yu et al. 2005). The real number of Neotropical species is much greater, Gauld (2000) mentioned at least 50 species for this region.

Townes and Townes (1966) in their Catalogue of Neotropic Ichneumonidae listed two species of *Labena* for México, *L. gloriosa* Cresson and *L. grillator* (Say); the first

one was described from México. Gauld (2000), in his study of Ichneumonidae of Costa Rica, recorded for México two species of this genus, *L. gloriosa* and *L. schausi* Cushman, among 21 Costa Rican species. In a paper on Mexican Labeninae and Brachycyrtinae (Hernández et al. 2000), *L. espinita* Gauld, *L. schausi*, *L. tarsata* Gauld, *L. zerita* Gauld and one species mentioned as "*Labena* sp. n." were listed (the last species is considered to be a variation of *L. tarsata* in this paper). The latest paper on Mexican Ichneumonidae with data on the genus *Labena* (Ruíz-Cancino et al. 2002) includes 5 species of this genus, four species from the preceding paper and *L. gloriosa*.

One species, *Labena acerba* sp. n., is described in this paper as new. This species is similar to the Costa Rican *L. guanacasteca* Gauld as both have the first sternite with distinct transverse ridge centrally (Fig. 4), a notable synapomorphy unknown in other species, but differs in its black flagellum (Fig. 3), area superomedia + petiolaris shorter (Fig. 5), and body entirely yellow without black markings. Two more species, *L. eremica* Gauld and *L. marginata* Szépl., are recorded for the first time for México. A variation of *L. tarsata* with a darker metasoma and propodeum partly carinate is discussed. A key to nine Mexican species of *Labena* is provided and new data on distribution are presented. All of the species were examined from Mexican material with the exception of *L. gloriosa* and *L. grallator*, for which material was not available.

Species of *Labena* are known as ectoparasitoids of various wood-boring Coleoptera. Among the Mexican species, only *L. grallator* has host records.

Methods

This work is based on the material of the Universidad Autónoma de Tamaulipas in Cd. Victoria, México. Taxonomy is accepted as in the software program TaxaPad (Yu et al. 2005). Morphological terminology follows Gauld (2000). Photos were taken with a Leica MZ16 stereomicroscope with integrated Leica photo camera in the Zoological Institute of the Russian Academy of Sciences (St. Petersburg, Russia). The captured images were assembled with Helicon Focus software and edited in Adobe Photoshop CS2. The holotype of the new species was obtained from Dr A. González Hernández (Universidad Autónoma de Nuevo León, Monterrey, México) and is deposited at the Universidad Autónoma de Tamaulipas, Cd. Victoria, México.

Taxonomy

Key to Mexican species of *Labena*

1. Thorax coarsely punctate; punctures on mesopleuron separated by about their diameter. [Head with blackish band through ocelli. Wings usually more or less infuscate] *L. grallator* (Say), ♀♂
- Thorax smooth or finely punctate; mesopleuron usually polished, impunctate or very finely and sparsely punctate..... 2

2. Fore wing hyaline with a distinct blackish spot near distal end of marginal cell (Fig. 8). Metasoma in female sometimes very slender, 2.0-3.7 times as long as posteriorly broad..... 3
- Fore wing hyaline or yellowish, without an apical blackish spot. Metasoma in female quite stout, first tergite 1.6-2.0 times as long as posteriorly broad ... 14
3. Female 4
- Male 9
4. Flagellum, in dorsal view, with either a very pale median band, or with basal 0.7 pale yellowish brown, with distal apex black. Metasoma bicolored, tergites 2-7 widely black anteriorly, with yellow band posteriorly. [Mid tibia with a row of stout dark flattened bristles on outer surface] ***L. espinita* Gauld**
- Flagellum, in dorsal view, more or less uniformly black. Metasoma more or less unicolourous, sometimes with median longitudinal stripes on first tergite 5
5. Head, in dorsal view, with a transverse black mark immediately in front of occipital carina. [Propodeum with area basalis half as long as wide. Legs yellow, hind coxa with a dorsal black spot (in material from Costa Rica) or without (in specimens from México)] ***L. zerita* Gauld**
- Head, in dorsal view, yellow to brownish (Fig. 7), at most slightly darker brown close to occipital carina 6
6. Clypeus with lower margin truncate, with a very strong transverse raised crest parallel and close to lower margin ***L. gloriosa* Cresson**
- Clypeus with lower margin strongly convex, with lower region flat, without transverse crest near lower margin 7
7. First tergite yellow with a median longitudinal black stripe. Ovipositor extending beyond apex of metasoma by about 2.6 times length of hind tibia. Propodeum with lateral end of posterior transverse carina quite strongly raised into a low, rounded flange, displaced forwards, slightly overhanging the area lateralis ***L. schausi* Cushman**
- First tergite without longitudinal black stripe, more or less uniformly yellow to brown. Ovipositor extending beyond apex of metasoma by 1.5-1.9 times length of hind tibia. Propodeum with lateral end of posterior transverse carina raised or not raised into rounded flange 8
8. Propodeum with area lateralis small, of subequal area to area coxalis. Basal area usually slightly transverse. Mesoscutum yellow with three distinct brown longitudinal marks ***L. tarsata* Gauld**
- Propodeum with area lateralis large, of much greater area than area coxalis. Basal area usually elongate, rarely almost as long as wide. Mesoscutum yellow to brown, without distinct longitudinal marks ***L. eremica* Gauld**
9. Flagellum, in dorsal view, yellowish with distal apex black 10
- Flagellum, in dorsal view, more or less entirely black or blackish brown.... 11
10. Tergite 3 with hind margin transverse or very weakly concave. Outer surface of mid tibia with 4-5 large conspicuous dark bristles. Head, in dorsal view,

- with a transverse black mark immediately in front of occipital carina. Mesopleuron yellow with black marks near anterior and posterior margins. Propodeum widely black anteriorly and laterally***L. espinita* Gauld**
- Tergite 3 with hind margin strongly concave. Outer surface of mid tibia with weak inconspicuous bristles. Mesopleuron yellow, without black marks. Propodeum yellow, sometimes brownish near anterior margin***L. tarsata* Gauld**
- 11. Tergites 3-5 with hind margins more or less straight. Posterior transverse carina of propodeum laterally very strongly raised 12
- At least some of tergites 3-5 with hind margins concave. Posterior transverse carina of propodeum laterally not noticeably strongly raised 13
- 12. Clypeus with lower margin truncate, with a very strong transverse raised crest parallel and close to lower margin. First tergite more or less entirely yellowish brown ***L. gloriosa* Cresson**
- Clypeus with lower margin strongly convex, with lower region flat, without transverse crest near lower margin. First tergite yellow with a median longitudinal black stripe..... ***L. schausi* Cushman**
- 13. Propodeum with area dentipara open posteriorly. Mesoscutum more or less brownish yellow to yellowish, sometimes infuscate centrally... ***L. eremica* Gauld**
- Propodeum with area dentipara completely enclosed. Mesoscutum yellow with three black longitudinal marks ***L. zerita* Gauld**
- 14. First sternite without a central transverse ridge. Propodeum with area superomedia closed by a carina posteriorly, thus discrete from area petiolaris which is usually replaced by a single median longitudinal carina. Head in dorsal view with gena moderately narrowed behind eyes. Mid leg in female with second tarsomere transverse, about as long as third and fourth tarsomeres together. Tergites 3-5 in male slightly transverse with hind margin straight...
..... ***L. marginata* Szépl., ♀♂**
- First sternite with a distinct central transverse ridge (Fig. 4). Propodeum with area superomedia open posteriorly, broadly confluent with area petiolaris (Fig. 5). Head in dorsal view with gena strongly narrowed behind eyes (Fig. 2). Mid leg in female with second tarsomere longer than broad, longer than third and fourth tarsomeres together. Tergites 3-5 in male strongly transverse, with hind margin conspicuously concave (male of *L. acerba* sp. n. unknown) ... 15
- 15. Flagellum almost entirely black, narrowly yellowish basally and apically, without a pale median band (Fig. 3). Propodeal area which is comprised by the confluent areas superomedia and petiolaris slightly transverse, 0.9 times as long as maximally broad (Fig. 5). Body yellow except for three brownish longitudinal marks on mesoscutum ***L. acerba* sp. n., ♀**
- Flagellum blackish with a central yellowish band in female, and with proximal 0.7 or more yellowish orange and distal apex black in male. Propodeal area which is comprised by the confluent areas superomedia and petiolaris distinctly elongate, almost 1.5 times as long as maximally broad. Body yellow with black marks on occiput along occipital carina, around ocelli, on mesoscutum,

on peripheries of mesoscutum, scutellum and mesopleuron, and on carinae bordering area lateralis of propodeum..... *L. guanacasteca* Gauld, ♀♂

***Labena acerba* Khalaim & Ruíz-Cancino, sp. n.**

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(Figs 1-5)

Diagnosis. The new species is very similar to the Costa Rican *L. guanacasteca* Gauld as both have a fore wing without an apical black spot, a propodeum with area superomedial open posteriorly and broadly confluent with area petiolaris (Fig. 5), and a first sternite with distinct transverse ridge centrally (Fig. 4). Unlike this species *L. acerba* sp. n. has a black flagellum, without a pale median band (Fig. 3), a shorter area superomedial + petiolaris of propodeum (Fig. 5), and a yellow body without any black marks. The new species can be distinguished from all Mexican species of *Labena* by the following characters in combination: 1) mesopleuron polished, impunctate, 2) fore wing without an apical spot, 3) first sternite with a transverse ridge, 4) flagellum extensively black, without a central yellowish band.



Figs 1-4. *Labena acerba* sp. n., ♀, holotype: 1 – head, anterior view; 2 – head, dorsal view; 3 – head with antenna, lateral view; 4 – first metasomal segment, lateral view.

Description. Female. Fore wing length 9.3 mm. Mandible evenly tapered towards distal end, upper tooth much longer than lower tooth. Clypeus almost flat, twice as broad as high, with lower margin distinctly convex centrally. Malar space 0.3 times as long as basal width of mandible. Face with median vertical ridge (also reaching between antennal sockets) which has radiating, parallel rugae, and with a pair of lateral vertical carinae (along eye margins). Frons flat, dull, with scattered fine punctures. Vertex and temple smooth. Head in dorsal view with gena short, abruptly rounded behind eyes (Fig. 2); lower part of gena very broad. Posterior ocellus separated from eye by 1.4 times its own maximum diameter. Inner margin of eye with a strong concavity opposite antennal insertion (Fig. 1). Occipital carina complete, reaching hypostomal carina far from base of mandible, strongly raised between base of mandible and its junction with hypostomal carina. Flagellum of antenna with 42 segments; subbasal flagellomeres more or less elongate, median and subapical ones transverse, apical flagellomere subtriangular with apex truncate.

Mesosoma, excepting mesopleuron, metapleuron and dorsal areas of propodeum, bearing yellow hairs. Pronotum and mesoscutum finely punctate, smooth between punctures. Epomiae present. Notauli absent. Scutellum flat, without lateral carinae. Mesopleuron polished, impunctate. Metapleuron convex, polished and impunctate, confluent with area spiracularis of propodeum (pleural carina absent anteriorly). Submetapleural carina raised anteriorly. Propodeum smooth and shining, partly finely punctate, in profile abruptly declivous, in dorsal view with area superomedia delineated anteriorly, posteriorly confluent with area petiolaris, very slightly transverse, 0.92 times as long as maximally broad (Fig. 5), and with area basalis very short, almost 0.1 as long as wide (Fig. 5); area dentipara confluent with area posteroexterna; area externa short, transverse, fully enclosed; area lateralis large, transverse, subequal to area coxalis.

Mid leg with tibia inflated in distal 0.7, with slender bristles on outer surface, second tarsomere about twice as long as broad, longer than following two tarsomeres. Hind coxa about twice as long as deep.

Fore wing with areolet transverse, with $2rs-m$ longer than $3rs-m$.

First tergite 1.6 times as long as posteriorly broad, depressed, without dorsolateral carina behind spiracle; sternite short, reaching 0.3 of length of tergite, with transverse ridge centrally (Fig. 4). Second tergite strongly transverse, 0.56 times as long as posteriorly broad. Ovipositor straight, compressed, almost twice as long as hind tibia.

Coloration: Yellow species. Mandible black apically. Antenna black, with base and apex yellowish (Fig. 3). Head slightly darkened around ocelli. Face and metasomal tergites with scattered reddish specks (more dense on face). Mesoscutum with three brownish longitudinal marks. Hind leg with tibia apically and tarsus posteriorly fuscous. Pterostigma yellow-brown. Ovipositor dark red, its sheath yellowish brown basally to fuscous apically.

Male unknown.

Type material. Holotype female: México, Jalisco, La Huerta, Estacion Biologica Chamela UNAM Vereda Tejon, 19°29.941' N, 105°02.591' W, CIB 00-0029, 25.VII.2000, coll. Y. Castillo O.

Distribution. México (Jalisco).

Etymology. From Latin “*acerbus*” (bitter, gloomy, dark) on account of the black coloration of flagellum.

Labena eremica Gauld, 2000

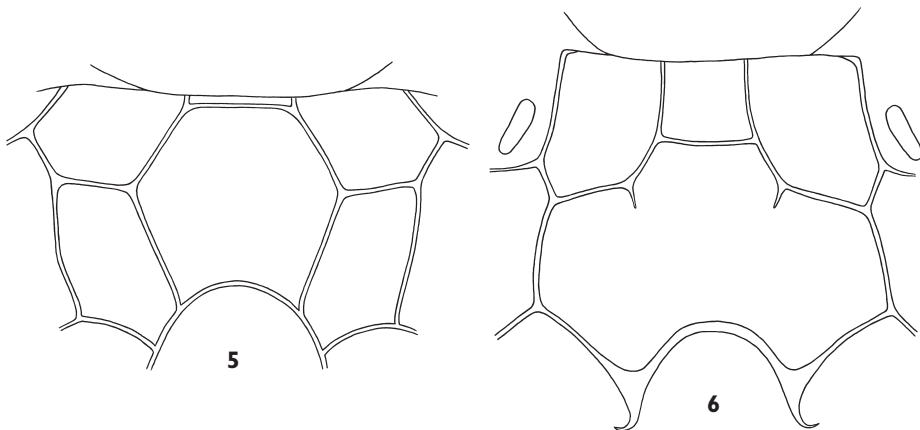
Material examined. México, Tamaulipas, Gómez Farías, Los Cedros and Alta Cima, Malaise trap, coll. S. Hernández A., C.A. Covarrubias D., D.R. Kasparyan, 1999: 16-23.I (2 ♂♂), 30.I-27.II (2 ♀♀), 6-27.III (6 ♀♀, 2 ♂♂), 3-24.IV (1 ♀, 1 ♂), 8.V-12.VI (2 ♀♀, 4 ♂♂), 31.VII-7.VIII (1 ♀); 4-26.VIII.2000 (2 ♂♂). Cd. Victoria, Cañón del Novillo, 27.VIII.1985, coll. H. Serna T., 1 ♂. Same locality, 21.VIII.2004, coll. J. Ramírez Pech, 1 ♀. Same locality, 28.IX.1964, coll. Hierbos, 1 ♂. Cd. Victoria, 31.V.1981, coll. E. Ruíz-Cancino C., 1 ♂. Same locality, Malaise trap, 19-26.VIII.2000, coll. Kasparyan, 1 ♀. 44 km S Cd. Victoria, Llera de Canales, matorral, Malaise trap, 2-30.IX.2000, coll. Kasparyan, 1 ♀, 2 ♂♂. 15 km N Llera de Canales, Tropicó de Cancun, Malaise trap, 28.X-4.XI.2000, coll. Kasparyan, 1 ♂. G. Magaña, Abasolo, 24.09.1992, coll. M. Lara, 1 ♂.

Distribution. Costa Rica, México (Tamaulipas). First record for México.

Labena espinita Gauld, 2000

Material examined. México, Tamaulipas, Gómez Farías, Los Cedros and Alta Cima, Malaise trap, 24.IV-29.V, 31.VII-21.VIII.1999, 12-19.VIII.2000, coll. S. Hernández A., D.R. Kasparyan, 2 ♀♀, 4 ♂♂. Cd. Victoria, Cañón del Novillo, 27.IV, 19.VII, 19.VIII.1985, coll. H. Serna T., 2 ♀♀, 1 ♂. Yucatán, Sudzal Chico (SMSP) and Corral (SMSC), February and July 1999, coll. Hugo Delfin, 3 ♂♂.

Distribution. North Brazil, Costa Rica, México (Tamaulipas).



Figs 5-6. *Labena* spp., areolation of propodeum, dorsoposterior view: 5 – *L. acerba* sp. n., ♀ (holotype); 6 – *L. tarsata* Gauld, ♀, var. (Cañón del Novillo, 27.IV.1985).

Labena gloriosa Cresson, 1874

Distribution. Brazil, Peru, Costa Rica, South México (Veracruz: “Mirador”, Cresson 1874).

Labena grallator (Say, 1835)

Distribution. Canada, U.S.A., North México (“northern Sonora”, Cameron 1886, Townes and Townes 1966).

Biology. Reared in the U.S.A. from species of *Knulliana* Linsley, *Megacyllene* Casey, *Psyrrasa* Pascoe, *Rhopalophora* Audinet-Serville, *Saperda* F., *Stenosphenus* Dejean (Cerambycidae), *Agrilus* Dahl, *Chrysobothris* Solier, *Thrincopyge* LeConte (Buprestidae), *Lixus* F. and *Pissodes* German (Curculionidae) (Gauld 2000, Yu et al. 2005).

Labena marginata Szépligeti, 1914

Material examined. México, Tamaulipas, Gómez Farías, Alta Cima, Malaise trap, 1-22.V.1999, coll. S. Hernández A., 2 ♂♂.

Distribution. Brazil, Paraguay, Costa Rica, México (Tamaulipas). First record for México.

Labena schausi Cushman, 1922

Material examined. México, Tamaulipas, Gómez Farías, Los Cedros, Malaise trap, 20.III-12.VI.1999, coll. S. Hernández A., 4 ♀♀, 1 ♂. Cd. Victoria, Cañón del Novillo, 13.VIII.1985, coll. H. Serna T., 1 ♀. Yucatán, Corral (SMSC), June 1999, Hugo Delfin, 1 ♀.

Distribution. Panama, Costa Rica, Guatemala, México (Tamaulipas, Yucatán).

Labena tarsata Gauld, 2000

Material examined. México, Tamaulipas, Gómez Farías, Los Cedros and Alta Cima, Malaise trap, 20.III-12.VI.1999, coll. S. Hernández A., 3 ♀♀, 8 ♂♂. Cd. Victoria, Cañón del Novillo, 27.IV, 13.VIII.1985, 2 ♀♀. Jalisco, Est. Biol. Chamela, Malaise trap, 4-5.VII.1993, coll. Wharton and Sharkey, 1 ♀.

Distribution. Costa Rica, México (Tamaulipas, Jalisco).

Variation. Two females from Cañón del Novillo have a conspicuously darker metasoma. In the specimen from 13.VIII, tergite 1 is yellow and tergites 2-4 are reddish brown. In the specimen from 27.IV, tergites 1-6 (tergite 1 blackish in anterior 0.4) are dark reddish brown (Fig. 8), and in both specimens the metasoma is yellowish posteriorly (Fig. 8). The specimen from 27.IV, mentioned as “*Labena* sp. n.” by Hernández et al.



Figs 7-9. *Labena tarsata* Gauld, ♀, var. (Cañón del Novillo, 27.IV.1985): 7 – head, dorsal view; 8 – forewing; 9 – hind legs and metasoma with ovipositor, dorsolateral view.

(2000), also has the propodeum with the area superomedia widely open posteriorly (Fig. 6). This area is more or less defined in the other Mexican specimens, but is very variable in the Costa Rican material, in which sometimes the posterior carina is only very faintly present (G. Broad, pers. comm.). Both specimens are structurally similar to *L. tarsata* and have no other differences from typical specimens of this species in our material, excepting this one very variable character (area superomedia open posteriorly in female from 27.IV). Thus we consider these specimens to be a darker variation of *L. tarsata*.

Labena zerita Gauld, 2000

Material examined. México, Tamaulipas, Gómez Farías, Los Cedros and Alta Cima, Malaise trap, 10.IV-5.VI.1999, coll. S. Hernández A., 1 ♀, 3 ♂♂.

Distribution. Costa Rica, México (Tamaulipas).

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We are thankful to Dr D.R. Kasparyan (Zoological Institute of the Russian Academy of Sciences, St. Petersburg) for his help with the preparation of this paper. We also acknowledge the hard work and important comments provided by Ivailo Stoyanov and two reviewers. This work was supported by the Russian Foundation for Basic Research (no. 07-04-00454), the Presidium of the Russian Academy of Sciences Program "Origin and evolution of Biosphere, Subprogram II", the CONACYT Project "Ichneumonidae y Aphelinidae (Hymenoptera) en bosques y matorrales de Tamaulipas, México" and the PROMEP Project "Avances en el conocimiento de la Entomofauna de México".

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Xanthopygoides niger Cameron, 1951 (Xanthopygina) belongs to the genus *Philonthus* Stephens, 1829 (Philonthina): systematic and nomenclatural changes for the African Staphylinini (Coleoptera, Staphylinidae, Staphylininae, Staphylinini)

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Abstract

A poorly known African species *Xanthopygoides niger* (Cameron, 1951), hitherto a member of a monotypic genus of the subtribe Xanthopygina, is transferred to the subgenus *Raucalius* Tottenham, 1949 of the genus *Philonthus* Stephens, 1829, subtribe Philonthina, and redescribed. The new genus-group synonymy, *Raucalius* Tottenham, 1951 = *Xanthopygoides* Verdcourt, 1952, is established. A new combination *Philonthus niger* (Cameron, 1951), preoccupied by *Philonthus niger* (O. Müller, 1764) which is a synonym of *Philonthus splendens* (Fabricius, 1793), is replaced by a new name *Philonthus neoniger* Solodovnikov **nom. nov.** Diagnostic characters of the genus *Philonthus*, and the Staphylinini subtribes Xanthopygina and Philonthina are discussed.

Keywords

Staphylinini, Xanthopygina, Philonthina, *Xanthopygoides*, *Philonthus*, Africa, systematics, nomenclature

Introduction

Cameron (1951) described a new genus and species, *Heterogaster niger* from Kenya. The preoccupied genus name *Heterogaster* Cameron, 1951 was replaced by *Xanthopygoides* (Verdcourt 1952). In the original description, *Xanthopygoides niger* was affiliated with *Dysanellus* Bernhauer, 1911 and *Xanthopygus* Kraatz, 1857, genera from the

subtribe Xanthopygina Sharp, 1884 (Cameron 1951). *Xanthopygoides niger* was never re-examined after its original description, and it is listed as a member of Xanthopygina in the most recent catalogues (e.g., Herman 2001b; Newton and Thayer 2005). My examination of the holotype of *Xanthopygoides niger* revealed that it is just another member of the African group of species from the genus *Philonthus* Stephens, 1829, for which Tottenham (1949) proposed a subgenus *Raucalius* Tottenham, 1949, and which was recently revised by Hromádka (2008). Transfer of *Xanthopygoides niger* to *Philonthus* (*Raucalius*) led to a new synonymy, *Raucalius* Tottenham, 1949 = *Xanthopygoides* Verdcourt, 1952. The new combination *Philonthus niger* (Cameron, 1951), preoccupied by *Philonthus niger* (O. Müller, 1764), a synonym of *Philonthus splendens* (Fabricius, 1793) (Herman 2001a), had to be replaced by a new name *Philonthus neoniger* Solodovnikov.

Although necessarily causing nomenclatural changes, the correct identification of *Philonthus neoniger* Solodovnikov, nom. nov. brings some more consistency in the current concept of the subtribe Xanthopygina. Composition of this primarily Neotropical subtribe of Staphylinini has not been a subject of an adequate phylogenetic study yet. But those few non-Neotropical Xanthopygina which have been recently examined do not belong to the same group as the species-rich Neotropical “core” of xanthopygines (Solodovnikov and Schomann, in press). This new finding about *Philonthus neoniger* is congruent with the hypothesis that the monophyletic Xanthopygina, when rigorously defined, will be a strictly Neotropical group.

Methods

Redescription, comparison and discussion of the taxonomic position of *Philonthus neoniger* (Figs 1-4) are here provided. Its holotype (under the original name *Heterogaster niger* Cameron), which is hitherto the only available specimen of this taxon, is kept at the Natural History Museum in London. Measurements of the body parts of this holotype specimen were made with an ocular linear micrometer as follows: head length (from apex of clypeus to neck constriction); head width (maximal, including eyes); pronotum length (along median line); pronotum width (maximal); elytral length (from humerus to most distal apical margin; best taken from lateral view of the elytron); combined width of both elytra (maximal, elytra closed along suture). Total length of the body was measured from the tip of the labrum to the tip of the abdomen.

Philonthus neoniger Solodovnikov, nom. nov. Taxonomy

Philonthus neoniger (the original combination *Xanthopygoides niger*) is here moved from the subtribe Xanthopygina to *Philonthus*, the type genus of the subtribe Philonthina. This transfer is based on the following complex of character states shared by *P. neoniger* with other members of *Philonthus*: lack of empodial setae; pronotal hypomeron with

superior marginal line deflexed under anterior angle of pronotum, and inferior marginal line becoming obsolete near lateral margin of procoxal cavity, both lines not joining each other (Fig. 2); prosternum fused to pronotum, notosternal sutures indistinct (Fig. 2); no translucent postcoxal process of pronotal hypomeron (Fig. 2); entire ligula; no infraorbital and mandibular ridges on head capsule. Such features of *Philonthus neoniger* as smooth pronotal disk with only one puncture in each of two dorsal "rows", dense and rugose punctation of elytra and abdomen, and, especially, a rather peculiar shape of the aedeagus (Figs 3,4) allow it to be unambiguously placed in the subgenus *Raucalius* Tottenham, 1949.

Members of the subtribe Xanthopygina, instead, are usually characterized by a complete postmandibular ridge; the inferior marginal line of pronotal hypomeron well separated from the superior marginal line, both lines continuing uninterrupted and separated along the prosternal margin. Also, unlike *Philonthina*, all members of Xanthopygina have a pair of empodial setae (Smetana and Davies 2000).

Genus *Philonthus* Stephens, 1829

(type species *Philonthus splendens* (Fabricius, 1793))

Subgenus *Raucalius* Tottenham, 1949

(type species *Philonthus peripateticus* Tottenham, 1949)

= *Xanthopygoides* Verdcourt 1952 (nom. nov. for *Heterogaster* Cameron, 1951), **syn. nov.** (type species *Heterogaster niger* Cameron, 1951)

***Philonthus neoniger* Solodovnikov, nom. nov.**

= *Philonthus niger* (Cameron, 1948), **comb. nov.** for *Xanthopygoides niger* (Cameron, 1951), secondary homonym of *Philonthus niger* (O. Müller, 1764); the latter is a non-valid senior synonym of *Philonthus splendens* (Fabricius, 1793).

Type material examined. Male: Holotype: "[red margined circle]/ Emali Range Sultan Hamud 4900-5900 ft. 3-40/ *Heterogaster niger* Type Cam. [handwritten label]/ Pres. by Com. Inst. Ent. BM 1952-575" (Natural History Museum in London).

Redescription. Body dark blackish brown (piceous). Mouthparts, tarsi, two basal segments of antennae paler, variously brownish. Bases of elytra from shoulder to base of scutellum (part mostly hidden under base of pronotum) yellowish. Head and pronotum smooth and glossy, elytra and abdomen dull, with rugose punctation. Body length 12 mm. Habitus as in Fig. 1.

Head slightly transverse (width to length ratio 1.14), parallel-sided behind eyes, with broadly rounded but still distinct posterior angles. Eyes slightly shorter than temporae which, measured from posterior margin of eye to neck constriction, 1.32 times as long as eye. Surface of head glossy; transverse wavy microsculpture very distinct on frons only, hardly visible elsewhere. Tempora covered by numerous smaller and few large setiferous punctures. Two setiferous punctures on frons between eyes. Antennae (not entirely preserved in the holotype): antennomere I slightly longer than antenno-



Fig. 1. *Philonthus neoniger* Solodovnikov, nom. nov. Holotype. Habitus. Scale bar 1 mm.

mere II, antennomeres II and III about the same length; antennomeres IV-VII about as long as wide; antennomeres I-III with setae only, IV-VII (and presumably IV-XI) – with setae and dense pubescence.

Pronotum slightly longer than wide (length to width ratio 1.08) and slightly wider than head (pronotum width to head width ratio 1.08), with very distinct anterior angles and distinct but more rounded posterior angles, widest in the anterior third of its length; pronotal sides slightly converging and feebly sinuate in front and behind the maximal width of pronotum. Surface of pronotum smooth and glossy with hardly visible irregular microsculpture and micropunctuation. Disk of pronotum with only one puncture in each dorsal “row”.

Scutellum closely, moderately roughly punctate.

Elytra longer and distinctly wider than pronotum, diverging posteriad (elytral width to length ratio 1.05). Their surface closely, strongly and coarsely punctate; interstices very narrow with visible irregular microsculpture. Pubescence of elytra short, close, brownish.

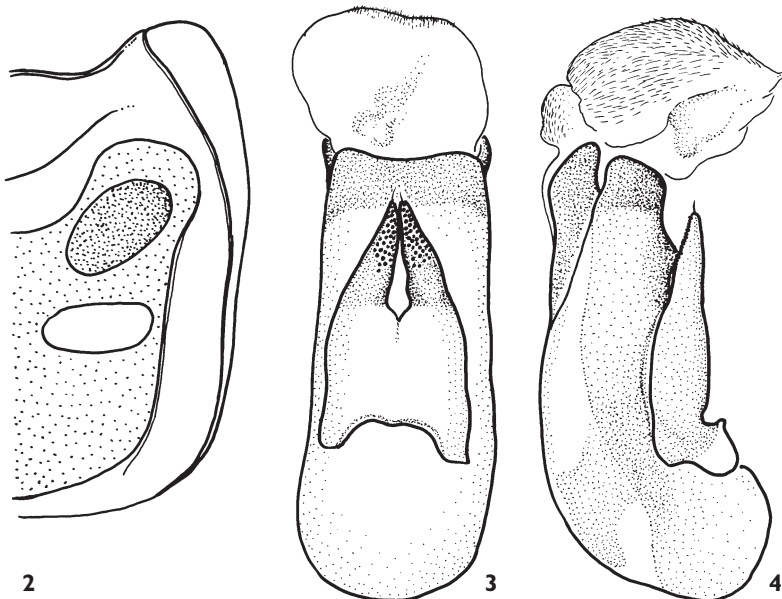
Abdomen very closely, evenly and rather finely punctate, its pubescence as on elytra. Abdominal tergites III-V with two (basal and subbasal) straight carinae; tergites VI-VII only with one (basal) straight carina. Apical margin of tergite VII with whitish seam.

Legs with tibiae pubescent and spinose. Anterior tarsi of male dilated (female unknown), dorsally setose, ventrally with dense cover of whitish adhesive setae. Middle and posterior tarsi simple, as long as middle and posterior tibiae, respectively.

Aedeagus robust, short and wide, with broad blunt apex, with pair of sclerotized lobes of characteristic shape dorso-laterally; paramere deeply divided into two pointed branches which converge apico-medially, each of them apically with irregular group of sensory peg setae on the underside. Internal sac weakly sclerotized, bulb-like when everted (Figs 3, 4).

Female unknown.

Comparison. Among the seven other species belonging to the subgenus *Raucalius* (Hromádka 2008) *Philonthus neoniger* Solodovnikov, nom. nov. is most similar with *P. peripateticus* Tottenham, 1949. Both species however can be very easily distinguished by shape of the aedeagi (cf. with Figs 14, 15 in Tottenham (1949), Figs 29-32 in Hromádka (2008), and with Figs 3, 4 here). The aedeagus of *P. neoniger* is more robust (relatively shorter and wider) than in *P. peripateticus*. Also the peg setae on the paramere are arranged differently in both species: they are irregularly grouped near the apex of each parameral branch in *P. neoniger*, but arranged in two longitudinal rows at the apex of each parameral branch in *P. peripateticus*.



Figs 2-4. *Philonthus neoniger* Solodovnikov, nom. nov. Details of structure: 2, prothorax (in ventral view, only left side illustrated, anterior leg removed); 3, aedeagus in dorsal (parameral) view (internal sac everted); 4, aedeagus in lateral view (internal sac everted). Scale bar 1 mm.

Distribution and bionomics. The species is known only from the holotype, from the type locality in Kenya, Eastern Africa. It was collected at an elevation of 1500-1800 m.

Etymology. The new name is derived from the original name "*Philonthus niger*" by adding the prefix "neo" [new] which refers to its new name. It is an adjective of masculine gender.

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I would like to sincerely acknowledge Roger Booth and Maxwell Barclay for their constant cooperation in providing access to type material on Staphylinidae from the Natural History Museum in London. Daniela Cimpoias (Copenhagen) made the digital photograph of the holotype. Harald Schillhammer (Vienna) brought my attention to a newly published paper by Lubomír Hromádka relevant for this project. The paper is a contribution supported by the grant US NSF DEB-0715705.

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About the enigmatic *Dichotrachelus valesiacus* Stierlin, 1878 (Coleoptera, Curculionidae, Cyclominae)

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Abstract

The status of *Dichotrachelus valesiacus* Stierlin, 1878 is revised. The holotype was examined and the following synonymy is proposed: *D. verrucosus* (Kiesenwetter, 1852) = *D. valesiacus* Stierlin, 1878 **syn. nov.**

Keywords

Coleoptera, Curculionidae, Cyclominae, *Dichotrachelus valesiacus*, *D. verrucosus*, new synonym, Switzerland, Valais

Introduction

In Switzerland, the European and North African genus *Dichotrachelus* Stierlin, 1853 is represented with nine taxa (seven species and two subspecies of *D. sulcipennis* Stierlin, 1853). Three additional species (*D. muscorum tournieri* Stierlin, 1878, *D. valesiacus* Stierlin, 1878 and *D. seminudus* Tournier, 1879) are problematic, since they are known only in type specimens. One additional species is probably new to science, unfortunately only a single specimen is known till now.

With the present contribution I focus on *Dichotrachelus valesiacus*. The species was based on material from the Valesian Alps (pass of Grand St. Bernhard), but since the time of its description, it was never found again. Therefore it was suggested that it may be restricted to a small refuge area (Osella 1970, Scherler 1995), similarly to many other *Dichotrachelus*-species, whose distribution area is often very small. However, the status of the species was not altered since the first description and in the revision of the

genus (Osella 1970) *D. valesiacus* was treated as a valid species. The only type specimen of *D. valesiacus* known, has never been thoroughly examined. Its study indicates that *D. valesiacus* is not a valid species, but a synonym of *D. verrucosus*. In the following note the holotype of *D. valesiacus* is depicted and the new synonymy is established.

Material and methods

The male genital structures were extracted and stored in a glycerine containing glass vial, pinned under the mounted specimen. The genital structures were photographed beneath glycerine with a 4-megapixel digital camera (JVC) under a stereomicroscope. The same camera was used for depicting the habitus and tarsi. The images were modified with the program Auto-Montage (Synoptics) for best results in depth of sharpness and then reworked using Adobe Photoshop version 10.0.1 (Adobe Systems Incorporated). The body length was measured dorsally from the apex of the elytra to the front margin of the thorax. The following acronyms are used: DEI – Deutsches Entomologisches Institut, Müncheberg; NMBE – Natural History Museum, Bern.

Results and discussion

Material examined: 1 male with the following indications: “Val Entremont St. Bernhard *D. valesiacus* Stierl.” (Fig. 1) From the Stierlin collection, deposited in the collection of the DEI.

Body length (c.r.e.): 2.9 mm, maximal width: 1.4 mm.

The most conspicuous traits providing evidence for the synonymy are depicted.

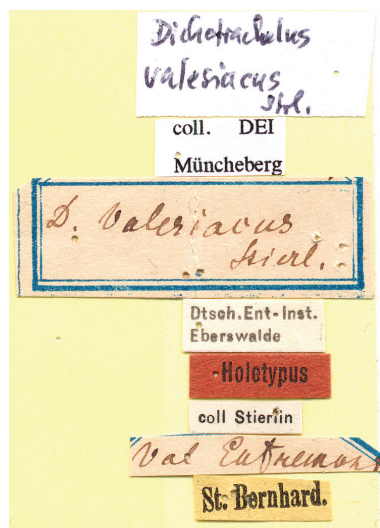


Fig. 1. Original labels of the holotype of *Dichotrachelus valesiacus* Stierlin, 1878 syn. nov. (DEI).

Habitus: Fig. 2a

Right protarsus: Fig. 3a

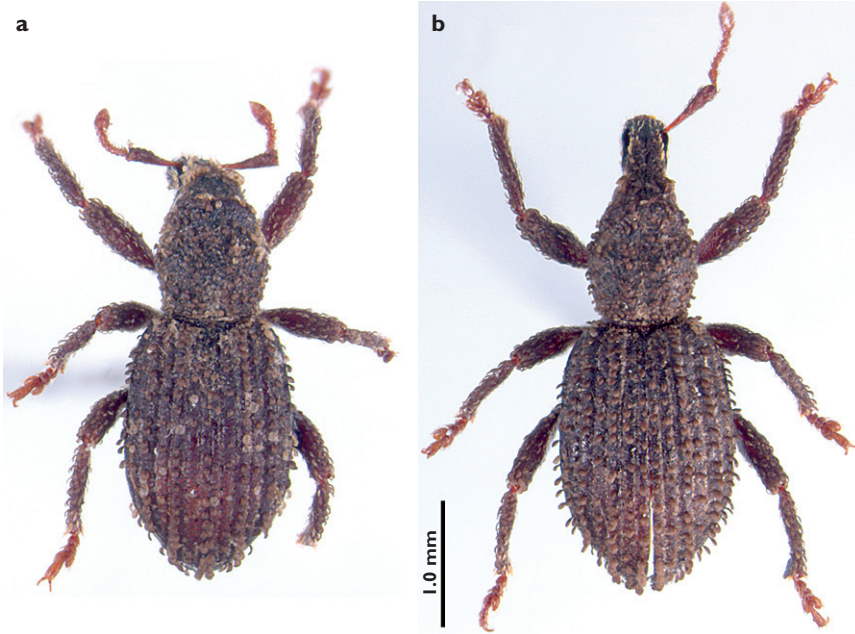


Fig. 2. Habitus of (a) *Dichotrachelus valesiacus* Stierlin, 1878 syn. nov., holotype (DEI) and (b) *D. verrucosus* (Kiesenwetter, 1852) (NMBE).

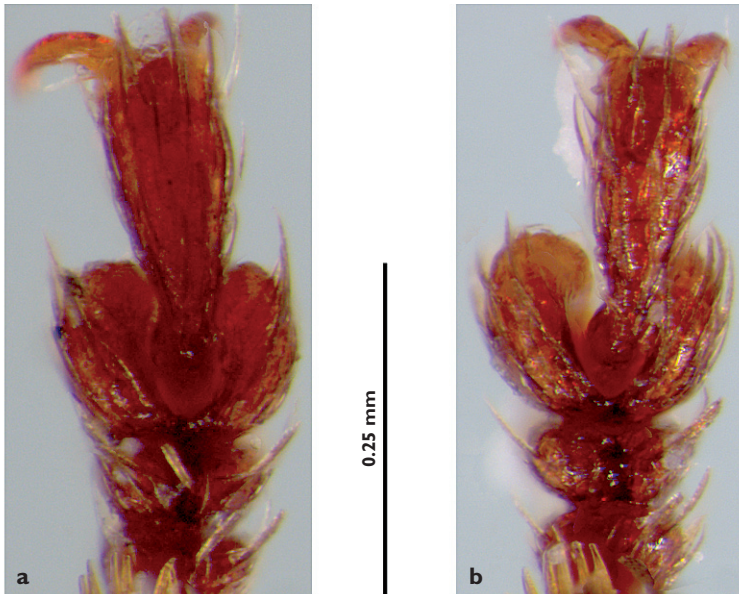


Fig. 3. Right protarsus of (a) *Dichotrachelus valesiacus* Stierlin, 1878 syn. nov., holotype (DEI) and (b) *D. verrucosus* (Kiesenwetter, 1852) (NMBE).

Aedeagus: Fig. 4a, c

Internal sac: Fig. 5a

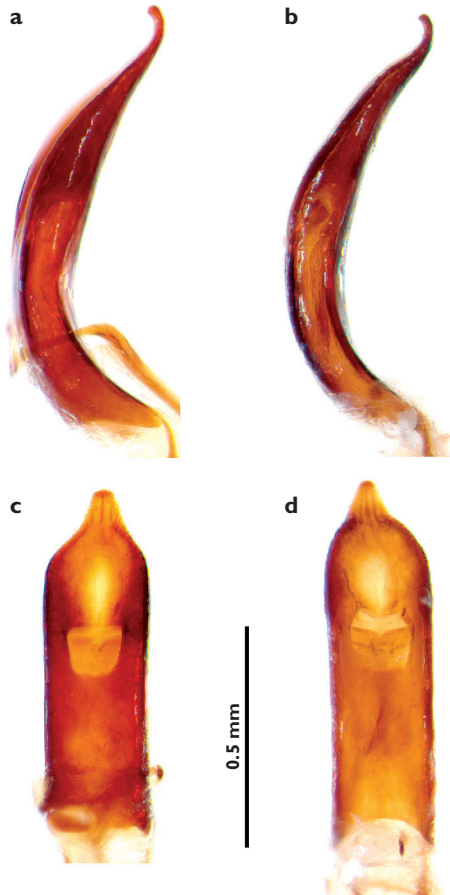


Fig. 4. Aedeagus dorsal and lateral of (a, c) *Dichotrachelus valesiacus* Stierlin, 1878 syn. nov., holotype (DEI) and (b, d) *D. verrucosus* (Kiesenwetter, 1852) (NMBE).

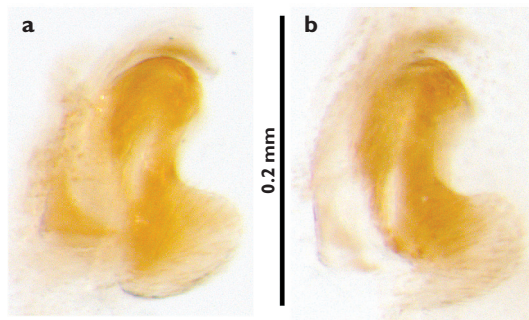


Fig. 5. Internal sac lateral of (a) *Dichotrachelus valesiacus* Stierlin, 1878 syn. nov., holotype (DEI) and (b) *D. verrucosus* (Kiesenwetter, 1852) (NMBE).

Remarks: The specimen is in a comparable good condition, the following parts of the body are missing: right hind tarsus, right middle tarsus (from the third tarsal segment on), left fore tarsus, claw segment.

The single male specimen of *D. valesiacus* is the only one present in the Stierlin collection. The specimen fits in every detail the description of Stierlin (1878: 416–417). Stierlin did not mention any typical exemplars in the first description. Only later in his “Fauna coleopterorum helvetica”, he mentioned in a footnote “Bei dem einzigen Exemplare, das ich kenne...” which shows that only a single specimen was known to him (Stierlin 1898: 271). According to articles 72.4.1.1 and 73.1.2 of ICZN (2000) this specifies unambiguously the holotype by monotypy. Hence, the use of the recommendation 73F with the designation of a lectotype is not necessary. However, it should be mentioned that the only specimen of *D. valesiacus* was thought to be a female since the revision of the genus (Osella 1970). The examination of the type revealed that it is a male specimen belonging to *D. verrucosus* (Kiesenwetter, 1852), distributed in the eastern and central Pyrenean Mountains in France (Kiesenwetter 1852, Osella 1970) and Spain (Meregalli 1987). One male specimen of *D. verrucosus* with the following indications was used for comparison: “Pyrénées Or. *Dichotrach. verrucosus*” from the Rätzer collection (NMBE) (Figs 2b, 3b, 4b, d, 5b).

The new synonymy is established: *D. verrucosus* (Kiesenwetter, 1852) = *Dichotrachelus valesiacus* Stierlin, 1878 syn. nov.

As shown, the unraveled *D. valesiacus* is in fact *D. verrucosus*. Since *D. verrucosus* is exclusive to the eastern and central Pyrenean Mountains, the type of *D. valesiacus* was evidently wrongly labeled. This mistake confused Stierlin (1878) when he referred it to a new species, although *D. verrucosus* was included in his revision.

The Swiss weevil fauna has lost with the present established synonymy the only species named after the most popular region for zoologists, the Valais.

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