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Oukuriella pesae, a new species of sponge-dwelling chironomid (Insecta: Diptera) from Amazonia, Brazil

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Abstract

The larva, pupa, male and female of a new Neotropical chironomid species, *Oukuriella pesae*, are described and illustrated. The larvae were found in freshwater sponge colonies of *Oncosclera navicella* (Carter, 1881) in Amazonian streams. The morphological characteristics of the larval head and the presence of fine particles in the larval gut contents suggest that the larvae probably feed on the sponge tissue or on other animals that live inside the sponges. *Oukuriella* Epler, 1986 is currently divided into three species groups, but *Oukuriella pesae* does not fit any of them.

Key words: Diptera, Chironomidae, *Oukuriella*, new species, freshwater sponges

Introduction

Chironomidae larvae in freshwater sponges have been studied by various authors (Steffan 1967; Roback 1968; Tokeshi, 1993, 1995; Matteson & Jacobi 1980; Melão & Rocha 1996; Roque *et al.* 2004). Although representatives of many chironomid genera have been found in sponges, obligatory associations are recognized only for *Xenochironomus* Kieffer, 1921, *Demeijerea* Kruseman, 1933 and *Oukuriella* Epler, 1986. Studies of the relationships between chironomids and sponges may contribute to phylogenetic and biogeographic knowledge of both groups.

The genus *Oukuriella* was established by Epler (1986). Since then taxonomic knowledge has been increased by successive studies (Epler 1996, Messias & Fittkau 1997, Messias 1998, Messias & Oliveira 1999, Messias 2000, Messias *et al.* 2000, Trivinho-Strixino & Messias 2005, Fusari *et al.* 2008).

Species of this genus have been divided into three species groups based on male adult morphology. In the first group the wings are without markings and abdominal tergites without setal tufts, in the second group the wings are without markings and the tergites carry setal tufts, in the third group the wings carry markings and the tergites setal tufts (Messias *et al.* 2000). Roque *et al.* (2007) described the larva of *Oukuriella epleri* Messias & Fittkau, 1997, and suggested that the species of the third group inhabit freshwater sponges. Fusari *et al.* (2008) described another *Oukuriella* species, placed it into the third species group and added more evidence to support the species-group diagnosis.

Since 2006 we have been collecting chironomids associated with freshwater sponges in Amazonian water bodies. During a survey in eastern Amazonia (Pará state, Brazil) in 2007 and 2008 we found an unusual larva that could not be placed into any previously described genus. After rearing pupae and obtaining associated adults, we could identify them as belonging to *Oukuriella*, but this new species does not fit into any of the recognized species groups. Here we describe this new species based on all life stages except eggs, and we discuss implications of our findings for phylogeny and for the *Oukuriella* species-group diagnosis.

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Methods and terminology

Collections were carried out in several rivers in Rurópolis municipality, Pará state, Brazil, in October 2007 and October 2008. Only one of these, the Tambor River, had Chironomidae larvae associated with freshwater sponges.

Freshwater sponges were collected on available substrates in the stream, such as decaying wood, rocks and macrophytes. Larvae and pupae were found on *Oncosclera navicella* (Carter, 1881) colonies attached to submerged rocks. Larvae were fixed in 100% ethanol and pupae were maintained alive until adult emergence in small plastic containers with stream water. Adults were collected using a black-light trap placed on the stream bank.

Body parts were slide-mounted using Euparal. Terminology and abbreviations used in the descriptions follow Sæther (1980), except that the term “taenia” is used for any broad, flattened seta on the pupa (Langton 1994). Larval head-capsule size is given as the 'ventral head length' from the tip of the mentum to the postoccipital margin. This measure is less susceptible to deformation during slide mounting than any measure of total head capsule length. Measurements are given as ranges, followed by the number of specimens measured in parentheses. Colour is described based on uncleared mounted specimens.

The holotype and paratypes are deposited in the Invertebrate Collection of Instituto Nacional de Pesquisas da Amazônia (INPA), Manaus, Amazonas, Brazil.

Results

*Oukuriell*a Epler, 1986

Emended diagnosis. The following additions to the generic description by Epler (1986) and subsequent emendments by Messias *et al*. (2000) and Roque *et al*. (2007) apply.

Pupa. Without pedes spurii B and armament on conjunctive IV/V.

Larva. Antenna with 5 segments. Lauterborn organs on apex of segment 2. Mandible without inner teeth. Mentum with a serrated median tooth and the fourth to sixth lateral teeth progressively receding to posterior.

Oukuriella pesae sp. n.

Type material. Holotype male with pupal and larval exuviae; BRAZIL: Pará State, Rurópolis, Tambor River, Cachoeira do Grin (04°05’35”S, 55°00’29”W) 28.x.2007. L. M. Fusari, N. Hamada. Paratypes: 2 males with pupal exuviae, 1 pharate female with larval exuviae, 2 last-instar larvae; same data as holotype, except 09.x.2008. L. M. Fusari, N. Hamada, J. O. Silva, A. M. O. Pes.

Etymology. Named in honour of Dr. Ana Maria de Oliveira Pes, for her contributions to the understanding of biodiversity patterns involving aquatic insects and freshwater sponges in Brazil, and in recognition of her help with our fieldwork.

Diagnosis. The male of *Oukuriella pesae* can be separated from other species in this genus by the following character combination: no setal tufts on anterior portions of abdominal tergites II–VII, T IX with two long projections posteriomedially; and superior volsella with slender digitus. The pupa without pedes spurii B and armament on conjunctive IV/V. The larva is distinguished by its head capsule conical, mandible strongly concave without inner teeth and mentum with a serrated median tooth and the fourth to sixth lateral teeth progressively receding to posterior.

Description. Male (n = 3, except where otherwise stated).

Total length 3.3–4.6 mm. Wing length 1.7–1.8 mm, width 0.5–0.6 mm. Total length/wing length ratio 1.9–2.4. Wing length/profemur length ratio, 1.5 (2). Colour: Head yellowish brown, antennae brownish. Abdomen

with tergites II, VII, VIII and IX brown, remainder yellowish brown. Legs with brownish rings on basal 3/5 and apex of femur, base and apex of tibia, ta_1 and ta_2.

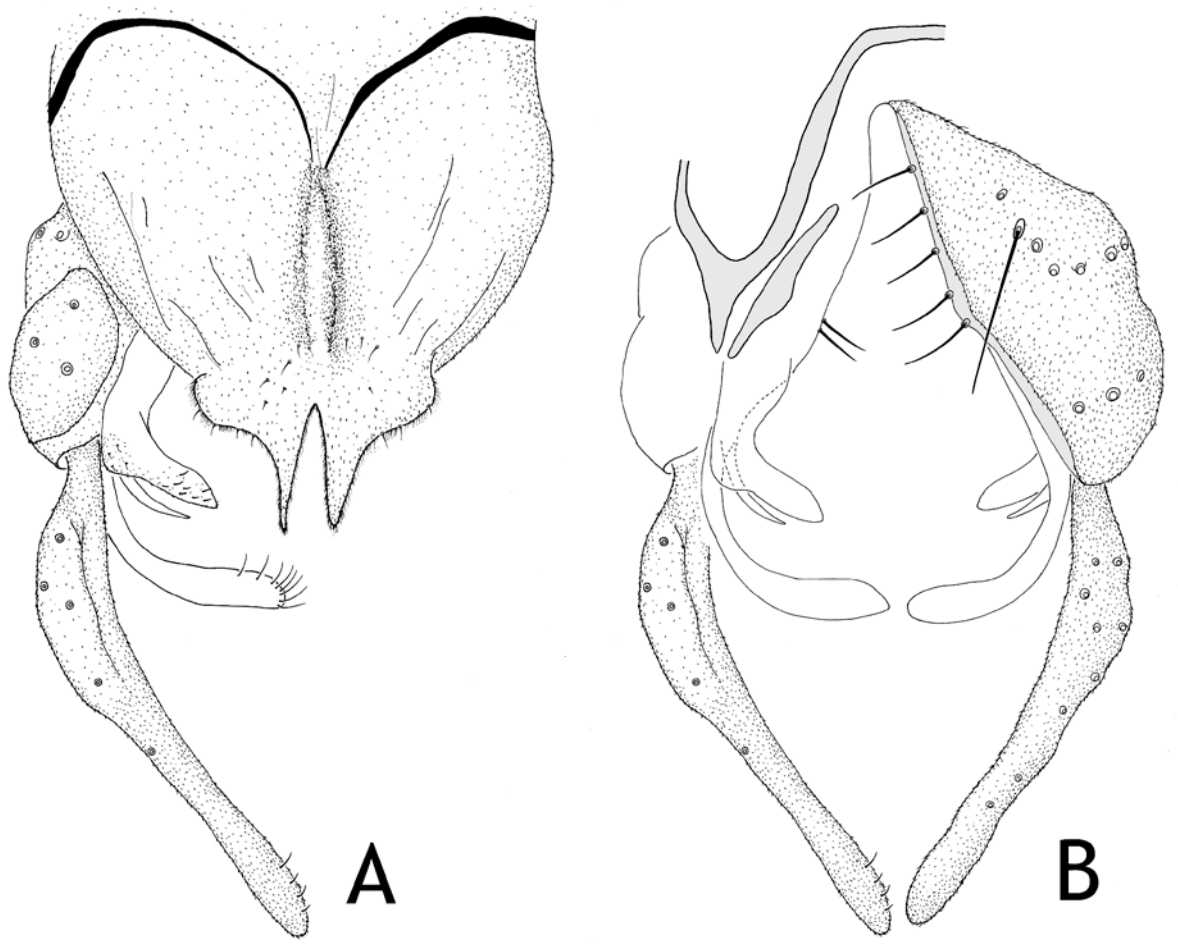

FIGURE 1. *Oukuriella pesae* **n. sp.** Male: A—hypopygium in dorsal view, B—hypopygium with tergite IX removed, left: dorsal view, right: ventral view.

Head (Fig. 2B) AR 1.31. Apical flagellomere 620 µm long. Temporals 3. Clypeus with 21–23 setae. Lengths of palpomeres 1–5 (in µm): 37–47; 35–42; 95–137 (2); 122 (1); 170 (1).

Thorax (Fig. 2C). Without scutal tubercle. Chaetotaxy: Ac 8–12, Dc 8–9, Pa 1, Scts 7–8.

Wing (Fig. 2A). Mostly infuscate, with contrasting light and dark markings in cells r_{4+5}, m_{1+2}, m_{3+4}, an, and cu. VR 1.2–1.5. Squama bare. Brachiolum with 2 setae. R with 11–12; R_1 with 12–15; R_{4+5} with 12–21 setae, remaining veins and cell membranes bare.

Lengths (in µm) and proportions of leg segments as in Table 1. Tibial spur lengths (in µm): fore 55 (1); middle 52–70, hind 52–70.

Abdomen. Tergites without setal tufts.

Hypopygium (Figs. 1A, 1B; 2D). T IX with two long projections posteriomedially. Phallapodeme 87.5–90 µm, transverse sternapodeme 50–55 µm long. Superior volsella 62.5–100 µm long, with 7–8 dorsal–distal setae and 7 setae near bend of upper arm, digitus slender, bare, 25–27.5 µm long. Inferior volsella 145–162.5 µm long, with 2 basal setae, 8 dorsal and 1 ventral setae. Gonocoxite 155–165 µm long. Gonostylus slender, 195–200 µm long. HR 0.80–0.82. HV 1.64–2.30.

TABLE 1. Lengths (in µm) and proportions of legs of *Oukuriella pesae* **n. sp.**, male (n = 3, unless otherwise stated).

	fe	ti	ta_1	ta_2	ta_3
p1	1280 (1)	620(1)	-	-	-
p2	1160–1200(3)	720 (2)	600–720(2)	300 (1)	220 (1)
p3	1160–1320 (3)	800–820 (3)	580–640 (2)	460 (1)	340 (1)

continued.

	ta_4	ta_5	LR	BV	SV
p1	-	-	-	-	3.38 (1)
p2	140 (1)	80 (1)	0.83 (1)	3.40 (1)	3.20 (1)
p3	220 (1)	120 (1)	0.72–0.80 (2)	2.40 (1)	3.31 (1)

Female (n = 1, pharate)

Similar to male, except as follows.

Total length about 6.4 mm. Colour: similar to male.

Head: AR = 0.29. Flagellomere lengths (in µm): 175, 125, 130, 100, 152. Clypeus with 11 setae. Palpomere lengths (µm): 50, 45, 120, 152, 162.

Thorax: Without scutal tubercle. Chaetotaxy: Ac 12, Dc 9, Scts 8.

Wing: not observable on pharate specimen.

Legs: not observable on pharate specimen.

Genitalia: Seminal capsule ovoid, about 85 µm long. Spermathecal duct straight. Notum 187 µm. Gonocoxapodeme 227 µm. Dorsomesal lobe, ventrolateral lobe and apodeme lobe as in Figure 3A. Gonocoxite IX 97 µm long, with 4 setae. Tergite IX with 31 setae. Cerci about 157 µm long.

Pupa (n = 3, except where otherwise stated)

Exuviae yellowish brown. Cephalothorax length 1.34–1.48 mm, abdomen length 3.78 mm.

Cephalothorax. Frontal apotome with low and rounded cephalic tubercles. Dorsal region granular. Two lateral antepronotals, two precorneals, and two separated pairs of dorsocentrals, distances Dc_1–Dc_2, Dc_2–Dc_3, Dc_3–Dc_4 (in µm): 17(1), 190(1), 27(1). Basal ring oval. Prealar tubercle absent.

Abdomen (Fig. 3B). Tergites II–VI with shagreen; T V, VI with extensive central shagreen; T I, VII and VIII without shagreen. Hook row continuous, occupying 2/3 width of segment. Pedes spurii B absent; vortex present on segment IV. All conjunctives unarmed. Anal comb with several small teeth on margin and ventral surface (Fig. 3C). Segments II–IV with 1 L seta, V–VIII with 4 lateral taeniae. Anal lobe well developed, with approximately 160 long taeniae (Fig. 3B).

4th-instar larva (n = 4, including 2 exuviae, unless otherwise stated)

Head (Fig. 2E, 2F). Width 230–290(3) µm, length 470– 500(3) µm. IC = 0.49–0.58(3) Antenna 28–55 µm long, with 5 segments; AR = 1.2; ring organ near antennal base; blade longer than flagellum, accessory blade short; Lauterborn organs on apex of segment 2 (Fig. 3F). Premandible distally bifid, with brush. Pecten epipharyngis with 3 scales. Mandible strongly concave, 65–90 µm long, without inner teeth, apex black; seta subdentalis slender (Fig. 3E). Mentum 47–62 µm with a light-coloured, serrated median tooth and 6 pairs of lateral teeth, the first smaller than the remaining lateral teeth, the first and second light-coloured and nearly level with the median tooth, the fourth to sixth lateral teeth dark and progressively receding to posterior; ventromental plates 42–55 µm wide, medially separated by no more than width of median tooth (Fig. 3D). Setae submenti simple, long and slender.

Abdomen 6.7–7.0(2) mm long, reddish, with short posterior parapods carrying strong claws. Anal tubules 25(2) µm long, without constriction. Procerci with 6 coarse anal setae (Fig. 2G).

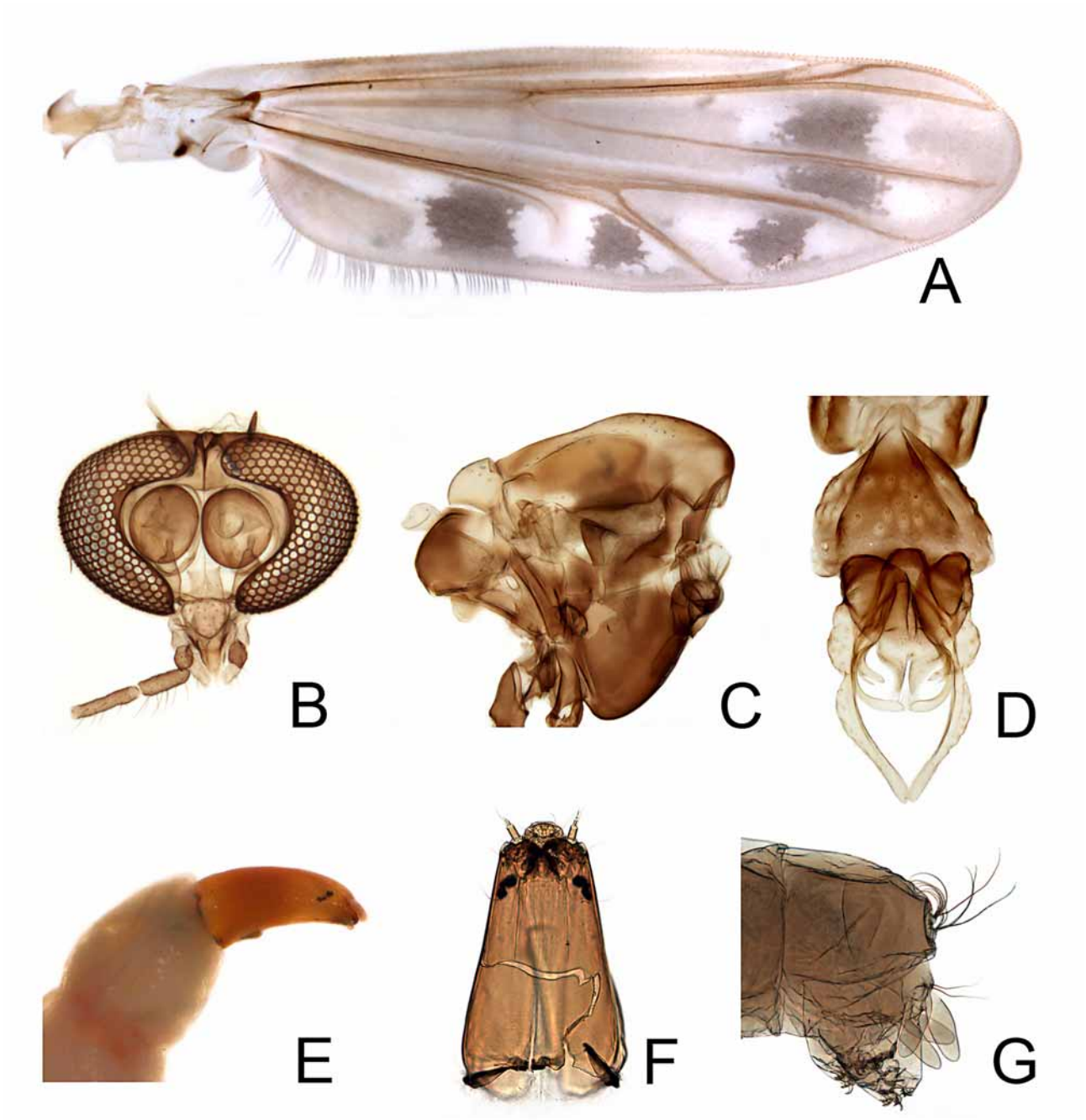

FIGURE 2. *Oukuriella pesae* **n. sp.** Male: A—wing, B—head, C—thorax, D—posterior part of abdomen. Larva: E—head in lateral view, F—head in ventral view, G—posterior part of abdomen.

Discussion

Morphological characteristics of the adults of *Oukuriella pesae* do not agree with any of the three species groups defined by Messias (2000); see the introduction above. Larvae of *Oukuriella pesae* are found in freshwater sponges as are those of *O. epleri*, a species placed in the third group by Roque *et al.* (2004, 2007). However, the larval characteristics of the two species differ, as in *O. epleri* the antenna has 6 segments, the mandible carries inner teeth, the mentum a serrated median tooth and 6 pairs of lateral teeth arranged in a concave pattern, and the anal tubules a median constriction. Larvae in the second species group also differ

from those of *O. pesae*, as in *O. intermedia* Messias, 2000 and *O. jatai* Trivinho-Strixino & Messias, 2005 the antenna has 6 segments, the mandible carries inner teeth, and the mentum a bifid median tooth. For species in the first species group no larva has been associated.

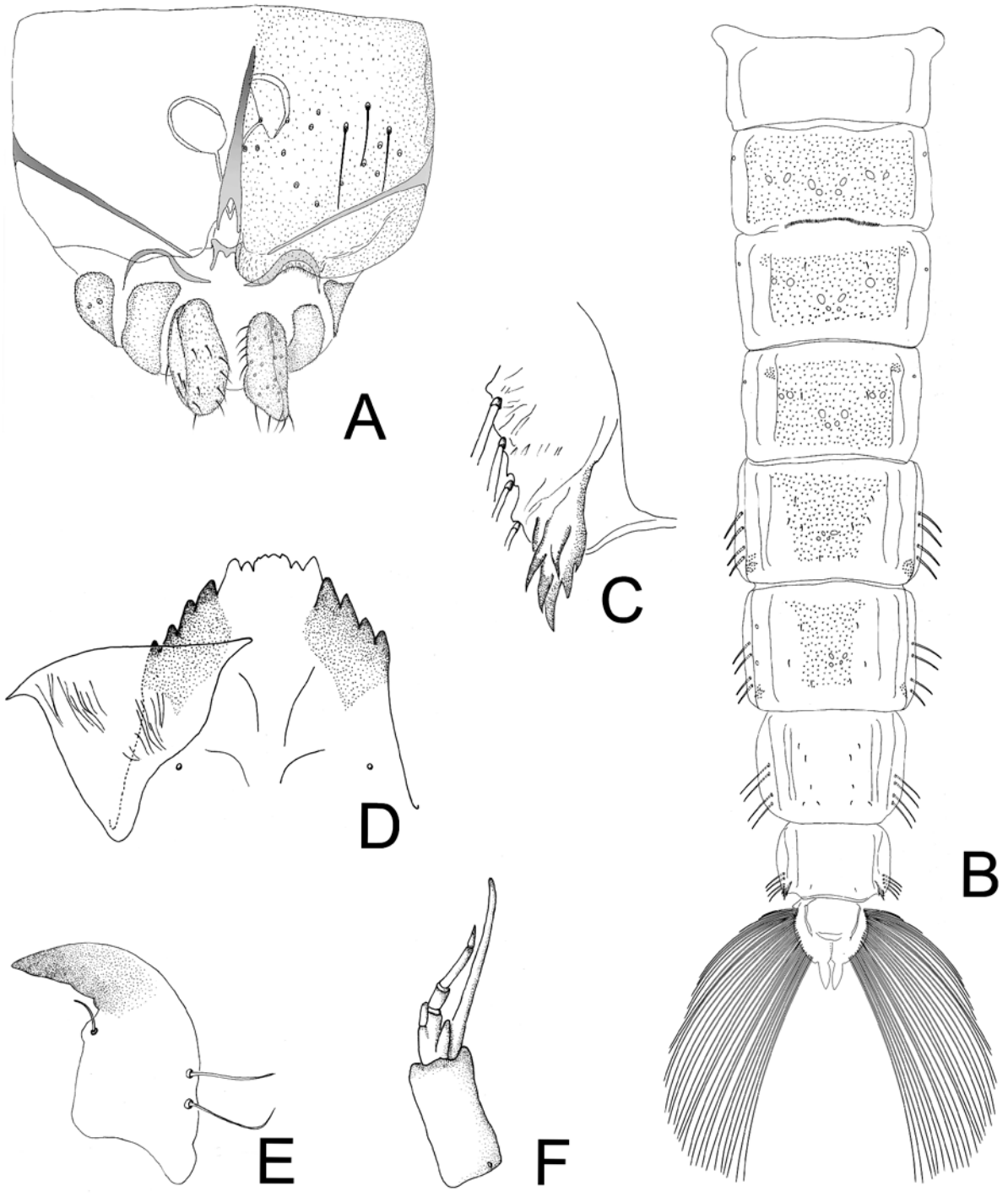

FIGURE 3. *Oukuriella pesae* **n. sp.** Female: A—genitalia in ventral view. Pupa: B—abdomen in dorsal view, C—anal comb. Larva: D—mentum and ventromental plate, E—mandible, F—antenna.

The larvae of *Oukuriella pesae* have very slender head capsules, as do the larvae of the sponge-feeding trichopteran *Taraxitrichia* sp. (Pes & Hamada 2003). This suggests a convergence pattern related to feeding on the fine particles found inside freshwater sponge canal systems.

We concluded above that *Oukuriella pesae* does not fit into any of the species groups proposed in the genus. The larvae of most *Oukuriella* species have not been described. Data on these larvae would be especially needed for a comprehensive phylogenetic study of the genus, in order to determine whether the species that inhabit freshwater sponges form a monophyletic grouping as suggested by Roque *et al.* (2004, 2007).

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