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## A new genus and species of *Platyischnopidae* (Amphipoda: Gammaridea) from the Argentine Sea, South-West Atlantic Ocean

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### Abstract

The family *Platyischnopidae* is herein reported for the first time in the Argentine Sea, South-West Atlantic Ocean. A new genus and species, *Platyisao holodividum* **gen. et. sp. nov.**, collected off the coast of Buenos Aires and Río Negro provinces, is fully described and illustrated. *Platyisao* **gen. nov.** is distinguished from the eight other genera of *Platyischnopidae* by the gnathopods subchelate, and the telson elongate, completely cleft. In addition, the distribution of *Tiburonella viscana* (Barnard J.L., 1964), up to now known in the South-West Atlantic Ocean from Brazilian waters, is extended to the coast off Buenos Aires province, Argentina.

**Key words:** Amphipods, platyischnopids, Southwest Atlantic, Argentina, *Platyisao holodividum* **gen. et. sp. nov.**, *Tiburonella viscana* distribution

### Introduction

*Platyischnopidae* Barnard & Drummond, 1979 is a gammaridean benthic family with characteristics typical of fossorial amphipods, such as an elongate cephalothorax and antennae, pereopods and uropods with many setae and spines (Thomas & Barnard 1983). *Platyischnopids* are fast swimmers and efficient predators, abundant on soft bottoms of the continental shelves, and are also frequent in reef clasts and on seagrass beds, at depths ranging from intertidal to 175 m; most species inhabit warm and temperate waters (Thomas 1993; Hughes 2009; Souza-Filho & Serejo 2012; and Table 1).

The genus *Platyischnopus* Stebbing, 1888 was originally included in *Pontoporeiidae* by Stebbing (1888) and then alternatively assigned to *Phoxocephalidae* or *Haustoriidae* (Chilton 1922; Oliveira 1955; Bousfield 1970; Rabindranath 1971; Griffiths 1974a,b; Ledoyer 1979, among others). The family *Platyischnopidae* was erected by Barnard & Drummond (1979) with *Platyischnopus* as the type genus. *Platyischnopids* were distinguished from *haustoriids* and *phoxocephalids* principally by the shape of the rostrum, the mandibular molar and the pereopod 7 (Barnard & Drummond 1979), and can be easily distinguished from other amphipod families by the cone-shaped rostrum covered with apical sensory pits (Hughes 2009).

At present, the genus *Platyischnopus* includes two species: *P. mam* Barnard & Drummond, 1979 and *P. mirabilis* Stebbing, 1888, with both species distributed in Australian waters (Barnard & Drummond 1979; Hughes 2009).

Besides *Platyischnopus*, other four genera were also erected in *Platyischnopidae* by Barnard & Drummond (1979): *Indischnopus*, *Tittakunara*, *Tomituka*, and *Yurrokus*.

The genus *Indischnopus* was established to accommodate *I. herdmani* (Walker, 1904) distributed in the Indic Ocean and *I. capensis* (Barnard K.H., 1925) from South Africa, the two species being originally placed in *Platyischnopus* (Barnard & Drummond 1979). Othman & Morino (1996) reported *I. redangi* from Malaysian waters.

**TABLE 1.** Distribution, bathymetric range and habitat of the Platyischnopidae species. AO: Atlantic Ocean. PO: Pacific Ocean. IO: Indic Ocean. ?: unknown data.

Especies	Distribution	Bathymetric range	Habitat
<i>Eudevenopus capusiatus</i>	AO: Guanabara Bay (Rio de Janeiro), Pernambuco and Bahia, Brazil	0–40 m	?
<i>Eudevenopus gracilipes</i>	PO: Valparaíso, 35°–39°S and Magellan Straits, Chile	13–50 m	?
<i>Eudevenopus honduranus</i>	PO: From Costa Rica to Lobos de Afuera Islands (Peru). AO: South Carolina and Florida (USA); Belize and Venezuela (Caribbean Sea)	1–40 m	Fine sand
<i>Eudevenopus metagracilis</i>	PO: From north Baja California to Ecuador. AO: Florida (USA), Gulf of Mexico, Caribbean Sea	0–73 m	Sand and bottoms with the seagrass <i>Thalassia testudinum</i>
<i>Indischnopus capensis</i>	IO: South Africa, south and southeast coast	5–80 m	Sand, mud, shells and rocks
<i>Indischnopus herdmani</i>	IO: Madagascar, India and Sri Lanka	9–49 m	Patches of fine and coarse sand, reef sediments and coral reefs
<i>Indischnopus redangi</i>	PO: Pulau Redang, Malaysia (South of Meridional China Sea)	?	Sand and mud
<i>Platyischnopus mam</i>	Australia: Cronulla, Lizard Island, Fantome Island, Orpheus Island and One Tree Island	3–40 m	Sand, mud-sand, patches of <i>Udotea</i> sp., coral reefs and coarse sediments
<i>Platyischnopus mirabilis</i>	Australia: Port Phillip Bay, Western Port and Port Jackson	4–31 m	Sand, mud-sand, silt
<i>Skaptopus brychius</i>	North AO: from Georges Bank to Cape Henry (USA)	129–175 m	?
<i>Tiburonella morrocoyensis</i>	AO: Caribbean Sea, Venezuela (Morrocoy National Park)	1–2 m	Reef sediments and bottoms with the seagrass <i>T. testudinum</i>
<i>Tiburonella viscana</i>	PO: from La Jolla (California, USA) to Puerto Utria (Colombia). Caribbean Sea. AO: Bahia, and from 23,5°S to 25,03°S (Brazil) and new records in this paper	0–127 m	Coarse sand, sand, coral sand, mud-sand, coral reefs, sponges and bottoms with the seagrass <i>Halodule</i> sp.
<i>Tittakunara katoa</i>	Australia: Red Head Beach and Catherine Hill Bay	0 m	Sand
<i>Tomituka doowi</i>	Australia: Port Phillip Bay and Western Port	4–18 m	Sand, mud, gravels, and bottoms with seagrasses
<i>Tomituka eumilli</i>	Australia: Lizard Island, Fantome Island and Orpheus Island	3 m	Sand
<i>Yurrokus cooroo</i>	Australia: Port Philip Bay	4 m	Sand

*Tittakunara*, *Tomituka* and *Yurrokus* were first erected as monotypic genera. The species *Tittakunara katoa*, *Tomituka doowi* and *Yurrokus cooroo* were described based on material collected in the east Australian coast by Barnard & Drummond (1979). More recently, *Tomituka eumilli* Hughes, 2009, was described from a tropical reef in north-eastern Australia.

Three genera, *Eudevenopus*, *Skaptopus* and *Tiburonella*, which were established by Thomas & Barnard (1983), are distributed along the Atlantic and/or Pacific coasts of America.

*Eudevenopus* includes four species: *E. metagracilis* (Barnard J.L., 1964) and *E. gracilipes* (Schellenberg, 1931), originally placed in *Platyischnopus*; *E. capusiatus* (Oliveira 1955), previously in *Phoxocephalus*; and *E. honduranus* Thomas & Barnard, 1983.

The monotypic genus *Skaptopus* includes the species *S. brychius* Thomas & Barnard, 1983, described from material collected off the Atlantic coast of USA.

The genus *Tiburonella* was erected to include *Platyischnopus viscana* Barnard J.L., 1964. Until this work, *T. viscana* had been cited from the coast of California (USA) to Colombia in the Pacific Ocean, and from the Caribbean Sea to Brazil in the Atlantic Ocean. More recently, Ortiz *et al.* (2000) described *T. morrocoyensis*, from the Caribbean Sea (Venezuela).

Before the present description, Platyischnopidae comprised 16 species within the eight above-mentioned genera. Some platyischnopids have not yet identified at species level, i.e. specimens from Valdivia Bay (Ecuador) mentioned by Granda *et al.* (2004), from Cassino Beach (southern Brazil) by da Silva *et al.* (2008) and das Neves *et al.* (2008), and from Magellan Strait (southern Chile) by Ríos *et al.* (2003).

In the present contribution a new genus and species of Platyischnopidae, *Platysao holodividum* **gen. et. sp. nov.** from the Argentine Sea, is established. In addition, the distribution of *Tiburonella viscana* (Barnard J.L., 1964) is extended to off Buenos Aires province coast (Argentina), and a complete overview of the distribution, bathymetric range and habitat of all platyischnopid species is provided (Table 1).

## Material and methods

The specimens of *Platysao holodividum* **gen. et. sp. nov.** and *Tiburonella viscana* were collected during three surveys carried out along the Argentine continental shelf, in the South-West Atlantic Ocean.

In January 2005, four benthic samples were taken in San Antonio Oeste (Río Negro province, San Matías Gulf, north Patagonia), from 12 m to 19 m depth. Sampling was conducted aboard a small boat of the Instituto de Biología Marina y Pesquera “Almirante Storni”. Samples were collected with a van Veen grab (0.05 m<sup>2</sup>) and a Rauschert sledge (55x15 cm mouth opening, 1x1 mm mesh), from four stations located very close to each other (see Fig. 8 and Material examined).

During December 2005, one sample was collected in front of Puerto Quequén (Buenos Aires province) at 39.5 m depth using the Rauschert sledge, aboard a fishing boat.

Nine additional samples came from the “Mejillón II” expedition carried out by the B/O “Puerto Deseado” along the coast of Buenos Aires province (approximately between 35°47’S and 38°14’S) during September of 2009. These samples were taken from 15 m to 51 m depth, using the Rauschert sledge, and a small dredge (30x6 cm mouth opening, 1x1 mm mesh).

All specimens collected were fixed in 4% formalin and then transferred to 70% ethanol. Appendages were dissected, mounted in temporary slides using glycerine as mounting media, and drawn under a Carl Zeiss (Axioskop) compound microscope equipped with a camera lucida.

Pencil drawings were scanned and then digitally inked with a Wacom Intuos 3 tablet following Coleman (2003).

Article lengths and breadths were measured along the longest axes.

Material for scanning electron microscope (SEM) was dehydrated through a graded ethanol series, critical point dried, mounted on aluminium stubs and sputter coated with palladium. Coated material was examined under a Philips XL30 TMP microscope.

The description follows the style of Barnard & Drummond (1979), Thomas & Barnard (1983) and Hughes (2009). The setal classification follows Watling (1989).

The citations of *Tiburonella viscana* in ecological papers are indicated as “eco” in the synonymy section of this species.

Type and reference material have been deposited at the Museo Argentino de Ciencias Naturales “Bernardino Rivadavia” (MACN-In).

## Systematics

### Order Amphipoda Latreille, 1816

### Family Platyischnopidae Barnard & Drummond, 1979

**Type genus** *Platyischnopus* Stebbing, 1888

**Composition.** *Eudevenopus* Thomas & Barnard, 1983; *Indischnopus* Barnard & Drummond, 1979; *Platyischnopus* Stebbing, 1888; *Skaptopus* Thomas & Barnard, 1983; *Tiburionella* Thomas & Barnard, 1983; *Tittakunara* Barnard & Drummond, 1979; *Tomituka* Barnard & Drummond, 1979; and *Yurrokus* Barnard & Drummond, 1979.

### ***Platyisao* gen. nov.**

**Etymology.** The name *Platyisao* is a combination of the word “Platy”, root of the family Platyischnopidae, and “sao” stands for the abbreviation of San Antonio Oeste (Río Negro province, Argentine), one of the localities where the new genus was found. The gender is neuter.

**Diagnosis.** Eyes absent. Antenna 1, peduncular article 1 suboval, much wider than article 2, article 2 elongate, rectangular, with dorsal and ventral margins without setae; accessory flagellum short, biarticulate. Antenna 2, peduncular articles 4 and 5 without setae on ventral margin. Mandibles with both incisors of medium size, broad at the base and tapering towards the apex; right *lacinia mobilis* thin, weakly bidentate, left *lacinia mobilis* longer and wider, slightly flabellate and conical distally, with 4 teeth; without accessory setal rows. Maxilla 1, outer plate elongate, bearing 7 ungrouped robust setae; palp uniarticulate bearing 2 very long plumose setae apically. Maxilla 2, inner plate thin, apical margin subrounded, outer plate subrectangular, both plates bearing a few setae. Maxilliped, inner plate short, medium width and apically truncate, without facial setae; outer plate medium to elongate, broad, suboval, with 6 spaced robust setae mediolaterally; palp article 4 short, stout, apically rounded, with 1 long distal nail. Coxae 1–4 progressively longer and wider, ventral margins forming a near continuous line, strongly overlapping; coxa 3, anteroventral corner slightly expanded and concave, coxa 4 greatly covering coxa 3, very large, with posterior margin rounded medially and posterodorsal section oblique. Gnathopods subchelate, palms oblique; ischium short; carpus longer than propodus, carpus of gnathopod 2 twice as long as carpus of gnathopod 1. Pereopod 5, basis pear-shaped and of medium width, posteroventral margin slightly expanded, rounded, with 2 notches. Pereopod 7, coxa short and wide, subovoid; basis very large, with anterior and posterior margins divergent, posterior and ventral margins slightly undulated, with small notches. Uropod 3, peduncle very short, article 2 of outer ramus short, of medium width, inner and lateral margins without setae. Pleonites 1–3 smooth dorsally; epimeral plate 2 with posteroventral corner strongly produced and acute, posterior margin slightly sinuous; epimeral plate 3, ventral margin somewhat rounded and posteroventral corner with a very small tooth. Telson elongate, completely cleft, each apex produced into 2 small sharp teeth bearing 2 short dorsal setae.

**Type species.** *Platyisao holodivium* sp. nov. by monotypy.

### ***Platyisao holodivium* gen. et. sp. nov.**

(Figures 1–7)

**Material examined.** *Holotype:* Puerto Quequén, Sta. 2, 38°41.450'S, 58°42.101'W, 39.5 m, 15 Dec 2005, Rauschert sledge, colls B. Doti, D. Roccatagliata and I. Chiesa: 1 adult ♀, 2.5 mm (MACN-In 38293).

*Paratypes:* same locality as holotype: 7 adults ♀ (MACN-In 38294), MACN-In 38294a used for the description. San Antonio Oeste, San Matías Gulf, colls B. Doti, D. Roccatagliata and I. Chiesa, 3 Jan 2005; Sta. 2, 40°53.090'S, 65°04.434'W, 12 m, van Veen grab: 16 adults ♂, 19 adults ♀, 6 specimens sex indet. (MACN-In 38295), MACN-In 38295a used for SEM. Sta. 7, 40°53.634'S, 65°04.033'W, 19 m, van Veen grab: 11 ♂, 2 adults ♀, 2 specimens sex indet. (MACN-In 38296), MACN-In 38296a used for SEM. Sta. 4, 40°53.515'S, 65°04.166'W, 15 m, van Veen grab: 21 ♂, 26 ♀, 26 specimens sex indet. (MACN-In 38297). Sta. 12, 40°53.078'S, 65°04.337'W, 17 m, Rauschert sledge: 2 ♂, 50 ♀ (MACN-In 38298). “Mejillón II” expedition, colls P. Penchaszadeh, G. Pastorino, D. Urteaga, M. Martínez and I. Chiesa; Sta. 1, 38°09.597'S, 57°17.058'W, 35 m, 9 Sep 2009, small dredge: 1 ♀ (MACN-In 39112). Sta. 2, 38°14.349'S, 57°14.950'W, 38 m, 9 Sep 2009, Rauschert sledge: 7 ♀, 1 specimen sex indet. (MACN-In 39113). Sta. 18, 37°42.644'S, 56°33.409'W, 51 m, 14 Sep 2009, Rauschert sledge: 6 ♀, 5 specimens sex indet. (MACN-In 39114). Sta. 20, 37°09.091'S, 56°07.967'W, 44 m, 14 Sep 2009, small dredge: 7 ♀, 4 specimens sex indet. (MACN-In 39115). Sta. 21, 37°11.172'S, 56°09.270'W, 33 m, 14 Sep 2009,

Rauschert sledge: 3 ♀ (MACN-In 39116). Sta. 23, 36°07.662'S, 55°33.177'W, 27 m, 15 Sep 2009, small dredge: 14 ♀, 10 specimens sex indet. (MACN-In 39117). Sta. 24, 36°08.746'S, 55°51.937'W, 17 m, 15 Sep 2009, small dredge: 18 ♀ (MACN-In 39118). Sta. 25, 36°17.217'S, 56°29.867'W, 15 m, 15 Sep 2009, Rauschert sledge: 2 ♀ (MACN-In 39119).

**Diagnosis.** Same as for the genus.

**Description of the adult female** based on the holotype MACN-In 38293 (2.5 mm) and paratypes MACN-In 38294a (2.4 mm) and MACN-In 38295a (2.3 mm).

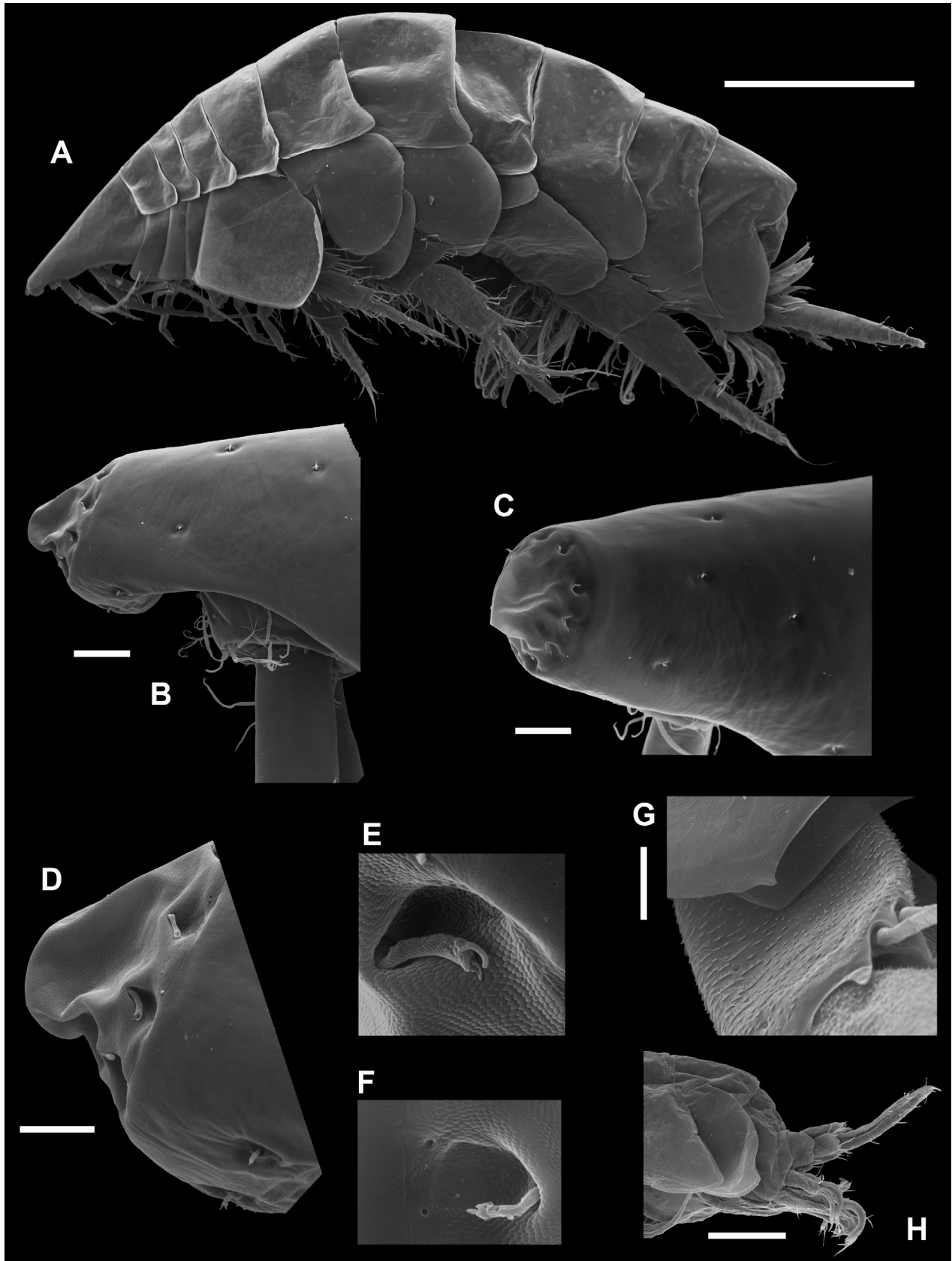
Head (Figs. 1A, B, C) 19.5% of total body length, all surface covered with sensorial setae almost equidistant from each other, proximal and medial sections broad laterally, ventral margin undulated and concave at insertion of antennae, with 2 pores bearing 1 seta each (Fig. 1D). Rostrum conical (Figs. 1A, C), distally wrinkled (in specimens preserved in alcohol), with equatorial constriction, surface distally with distinct subrounded scales (almost of hexagonal shape), surface proximally almost smooth (Figs. 1C, D, E). Each pit placed in a circular arrangement (Figs. 1B, C, D) bearing 1 seta of flat form and distally clip-shaped (Figs. 1C, E), some pits have 2 small pores near the equatorial constriction (Fig. 1F). Eyes absent.

Antenna 1 (Fig. 2A), peduncular article 1 suboval and broad, 0.56 x as long as wide, 2.93 x wider than peduncular article 2, ventral and dorsal margins without setae, ventrodiscal corner slightly expanded, with 4 short plumose setae (one longer), dorsodiscal corner with 3 short simple setae (one shorter) and 1 medium plumose setae, lateral margin with 1 short simple seta ventrodistally; peduncular article 2 elongate and rectangular, 2.46 x as long as wide, 1.48 x as long as peduncular article 1, ventral and dorsal margins straight, without setae, ventrodiscal corner weakly expanded, rounded, bearing 2 long simple setae and 4 short setae (one plumose), dorsodiscal corner weakly expanded, with 1 short simple seta and 1 setule; peduncular article 3 about as long as article 1, about 2.1 x as long as wide, ventral and dorsal margins straight, without setae, lateral margin with 1 short plumose seta proximally, ventrodiscal corner with 1 short simple setae and 1 setule, dorsodiscal corner slightly expanded, rounded, bearing 4 short simple setae (2 shorter and thinner). Primary flagellum with 5 articles of similar length, 1.42 x as long as peduncle, articles 1–4 bearing short simple setae distally, article 5 with a few medium and thin simple setae apically, articles 2–4 bearing 1 long distal *aesthetasc* each; accessory flagellum short, with 2 articles, 0.32 x as long as primary flagellum, article 1 with 2 short setae (one plumose) dorsodistally, article 2 with a few medium thin simple setae apically.

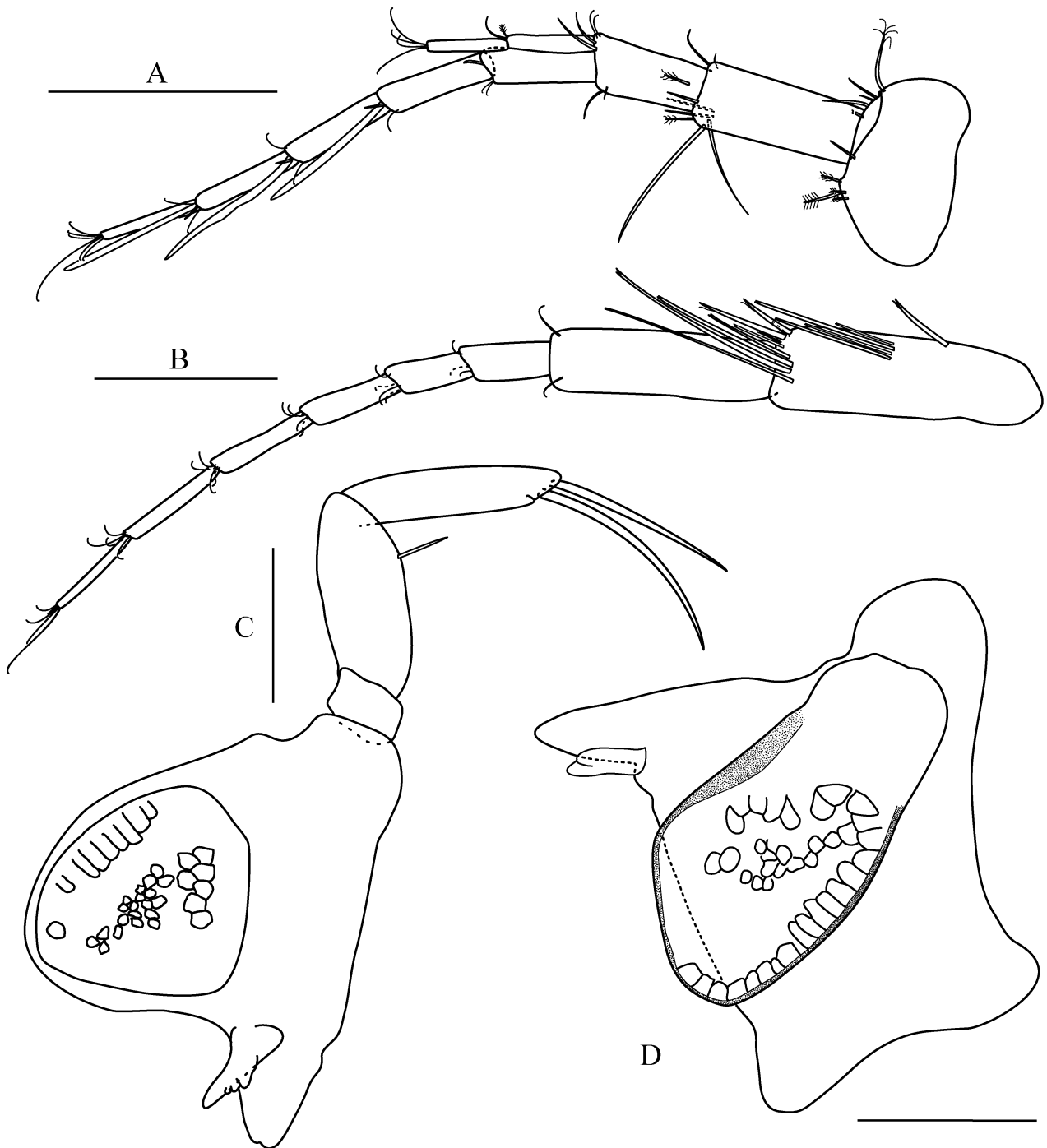
Antenna 2 (Fig. 2B), considerably longer than antenna 1; peduncular articles 1–3 damaged during dissection (not illustrated); peduncular article 4 elongate, 3.33 x as long as wide, ventral margin almost straight, without setae, ventrodiscal corner rounded, dorsal margin almost straight, with 1 medium simple seta proximally, and a subfacial medial row of 4 medium to long thin distally bifid setae, dorsodiscal corner with 2 medium stout simple setae and 2 small distally bifid setae, lateral margin with a subfacial distal row of 5 medium to long distally bifid setae; peduncular article 5, about 0.83 x as long as peduncular article 4 and a bit narrower, ventral, dorsal, and lateral margins almost straight, without setae, ventrodiscal and dorsodiscal corners with 1 short simple seta each; flagellum 1.15 x as long as peduncular articles 4 and 5 combined, with 6 articles (1 and 2 the shortest), all articles with some short to medium thin simple setae distally.

Mandibles (Figs. 2C, D), both incisors of medium size, broad at the base and tapering towards the apex, smooth, right incisor conical, left incisor shorter, with apex slightly blunt bearing medial weak notch; right *lacinia mobilis* thin, weakly bidentate, teeth rounded, inner one a bit longer, left *lacinia mobilis* wider and longer, slightly flabellate, with 4 teeth, distal one conical and the largest; accessory setal rows absent; both molars covering more than half of medial mandibular surface, weakly triturate, right molar elongate and suboval, left molar of medium size and subovoid; palpal humps broad and elongate. Palps opposite to molar, article 1 short, subquadrate, 1.38 x as wide as long, without setae; article 2 about 3.33 x as long as article 1, broad (1.71 x as long as wide), inner margin slightly convex, with 1 medium simple seta subdistally; article 3 thin, elongate, 4.41 x as long as wide, and 1.25 x as long and 0.56 x as wide as article 2, both margins almost straight, without setae, apex oblique, with inner feeble cleft and 2 long (about as long as palp article 3) simple setae.

Maxilla 1 (Fig. 3A), inner plate of medium length, subrectangular, slightly thin, weakly concave on inner margin, rather blunt apically and with 1 medium stout simple seta; outer plate elongate, apical margin distinctly straight, with 7 ungrouped robust setae: 2 medium and bifid (with sharp branches) setae, 2 medium simple apically acute setae, and the 3 outermost setae larger, stout, and slightly curved (2 apically rounded and 1 denticulate); palp unarticulate, 2.36 x as long as wide, reaching half of outer plate, apex blunt bearing 2 very long plumose setae.



**FIGURE 1.** SEM photographs. *Platyisao holodividum* **gen. et. sp. nov.** Paratype (MACN-In 38295a), adult female, 2.3 mm: A, habitus; B, C, rostrum detail; D, E, detail of sensorial setae; F, detail of hole with sensorial seta; G, comb-shape flakes on peduncle of uropod 2. Paratype (MACN-In 38296a), adult male, 1.9 mm: H, detail of epimeral plates 2, 3 and urosome. Scales, A: 500  $\mu\text{m}$ ; B, C, G: 20  $\mu\text{m}$ ; D: 10  $\mu\text{m}$ ; H: 200  $\mu\text{m}$ .



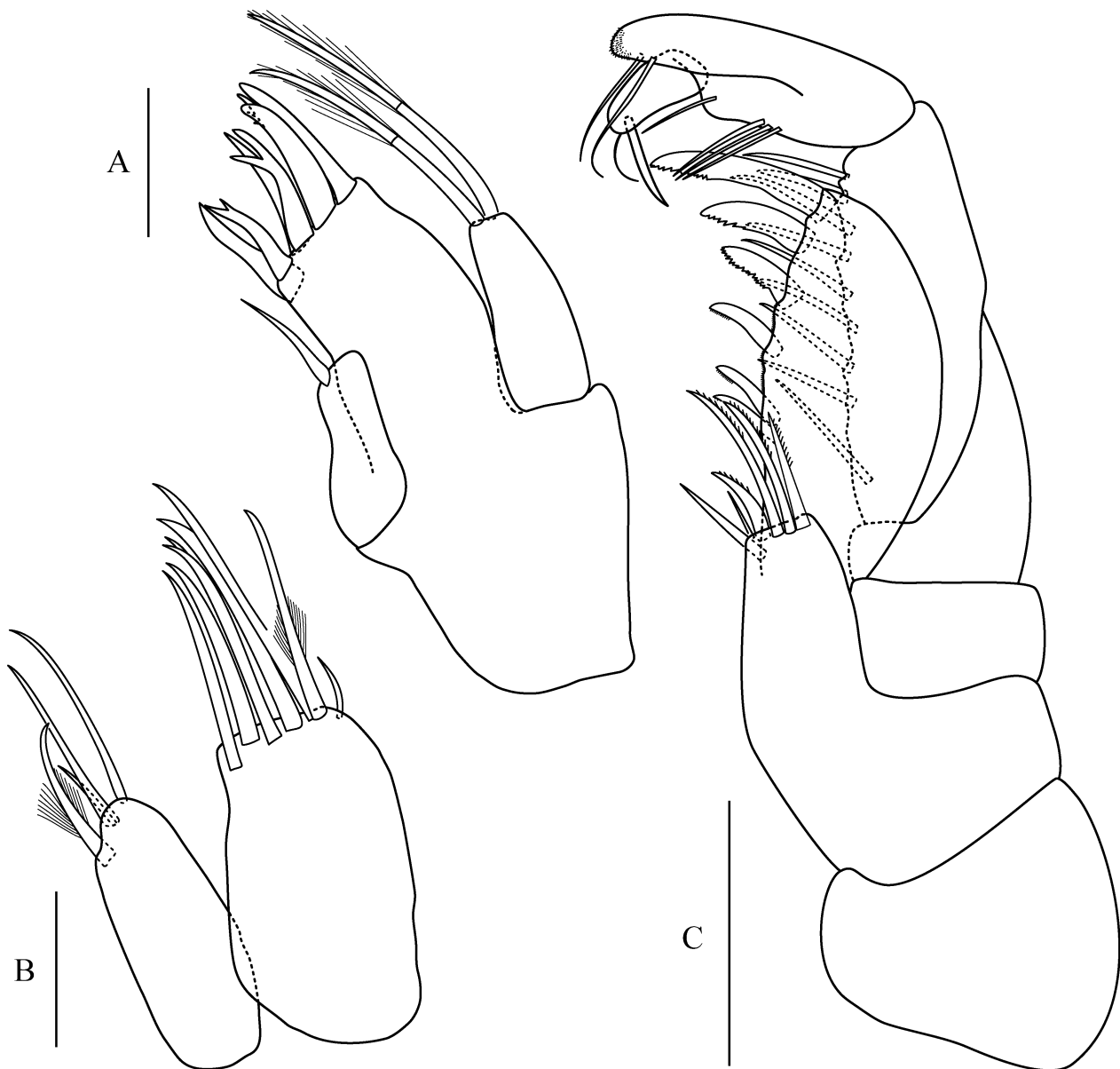
**FIGURE 2.** *Platyisao holodividum* **gen. et. sp. nov.** Paratype (MACN-In 38294a), adult female, 2.4 mm: A, antenna 1; B, antenna 2; C, left mandible; D, right mandible. Scales, A and B: 0.1 mm; C and D: 0.05 mm.

Maxilla 2 (Fig. 3B), both plates extending subequally; inner plate thin, apical margin subrounded, with 4 setae: 2 long and slender simple setae, 1 short simple seta, and 1 medium plumose seta almost placed on inner margin; outer plate subrectangular, much wider than inner plate, apical margin straight, with 8 setae: 6 stout and long simple setae, 1 long plumose seta, and 1 short simple seta almost placed on lateral margin.

Maxilliped (Fig. 3C), inner plate short, of medium width, subrectangular, truncate apically, with 4 medium to long stout plumose setae distally (inner one the shortest); outer plate medium to elongate (almost reaching palp article 3), broad, suboval, lateral margin smooth, medial margin slightly undulated, with 2 short to medium simple setae proximally and 6 spaced robust setae mediolaterally: three proximal medium and bearing a comb-like hairs on inner margin, and three distal stouter, increasing in length and strongly serrated on inner margin. Palp 4-articulate,

large, broad basally, article 1 without setae; article 2 elongate, of medium width, subrectangular, medial margin undulated, with 9 long simple setae; article 3 of medium length, 0.81 x as long as article 2, medial margin with strong excavation subdistally and expanded into a rounded lobe overreaching the base of article 4, bearing 4 long simple setae (3 subproximally and 1 medially), and 2 long simple setae subdistally, outer margin without setae; article 4 short, stout, 0.36 x as long as article 3, apically rounded with 1 thin medium simple seta and 1 long (0.84 x as long as article 4) straight nail.

Coxae 1–4 (Fig. 1A) progressively longer and wider, ventral margins forming a near continuous line, strongly overlapping; coxa 4 greatly covering coxa 3.



**FIGURE 3.** *Platyisao holodividum* **gen. et. sp. nov.** Paratype (MACN-In 38294a), adult female, 2.4 mm: A, maxilla 1; B, maxilla 2; C, maxilliped. Scales: 0.05 mm.

Gnathopod 1 (Figs. 4A, B), subchelate, coxa elongate, subrectangular, 2.1 x as long as wide, anterior margin almost straight, anteroventral corner slightly expanded and subacute, ventral margin somewhat convex, with 1 setule, posteroventral corner slightly rounded, with 1 long simple seta and 1 setule, posterior margin almost straight, with 2 subsurface medium simple setae; width ratio of basis-ischium-merus-carpus-propodus = 19:19:17:25:32, length ratio = 110:19:27:52:34; basis very thin and elongate (5.78 x as long as wide), somewhat expanded distally, anterior margin slightly concave medially, posterior margin slightly convex, with 1 long simple seta on distal third and 1 medium simple seta on posterodistal corner; ischium short, subquadrate, with 1 long



simple seta on posterior margin; merus subtriangular, posterior margin convex and much longer than anterior margin, with 1 medium simple seta on posterodistal corner; carpus pear-shaped, of medium length, 2 x as long as wide and 1.53 x as long as propodus, posterior margin with 1 medium simple seta medially, posterodistal corner expanded and rounded, with 5 medium to long simple setae, anterior margin slightly convex, almost straight distally; propodus subchelate, suboval, somewhat longer than wide, 1.28 x as wide as carpus, with some facials short to medium simple setae, anterior margin slightly convex, anterodistal corner with a group of medium simple setae, posterior margin rounded, shorter than anterior margin, with 6 short to medium simple setae distally, palmar corner subacute, with 2 stout setae, palm oblique, slightly shorter than anterior margin, sinuous and denticulate proximally, with 1 stout seta near palmar corner and 2 groups of facial and subfacial short to medium simple setae (proximal group on a protuberance); dactylus of medium length and curved, reaching palmar corner, with 1 short simple seta anteromedially, and 2 short simple setae on inner margin.

Gnathopod 2 (Figs. 4C, D) similar but longer than gnathopod 1, subchelate; coxa elongate (approximately as long as coxa 1), subrectangular, 2.1 x as long as wide, anterior margin slightly concave, anteroventral corner somewhat expanded and subacute, ventral margin almost straight, with 2 proximal setules, posteroventral corner almost rounded, with 1 medium to long simple seta and 1 setule, posterior margin slightly convex, with 3 subfacial medium simple setae; width ratio of basis-ischium-merus-carpus-propodus = 25:18:19:20:31, length ratio = 144:23:25:101:45; basis very thin and elongate, 1.13 x as long as coxa 2 and 5.76 x as long as wide, distally somewhat expanded, anterior margin slightly concave medially, posterior margin slightly convex, with 1 very long simple seta on distal third and 1 long simple seta on posterodistal corner; ischium short, subrectangular, with 1 long simple seta on posterior margin; merus subtriangular, posterior margin slightly convex and much longer than anterior margin, with 1 short simple seta on posterodistal corner; carpus elongate, thin, subrectangular, 1.94 x longer than carpus of gnathopod 1, about 5.05 x as long as wide and 2.24 x as long as propodus, posterodistal corner expanded and subrounded, with 5 small to medium simple setae, anterodistal corner with 1 medium simple seta; propodus subchelate, suboval, 1.45 x as long as wide, slightly larger than that of gnathopod 1, anterior margin more straight than in gnathopod 1, with 3 subfacial medium simple setae, anterodistal corner with a group of medium simple setae, posterior margin convex, somewhat shorter than anterior margin, with 4 medium simple setae subdistally, palm oblique, shorter than anterior margin, sinuous and denticulate proximally, with 2 groups of a few subfacial short to medium simple setae, palmar corner subacute, with 2 medium stout setae (one larger); dactylus medium length and curved, almost reaching palmar corner, with 1 short simple seta anteromedially and 2 short simple setae on inner margin.

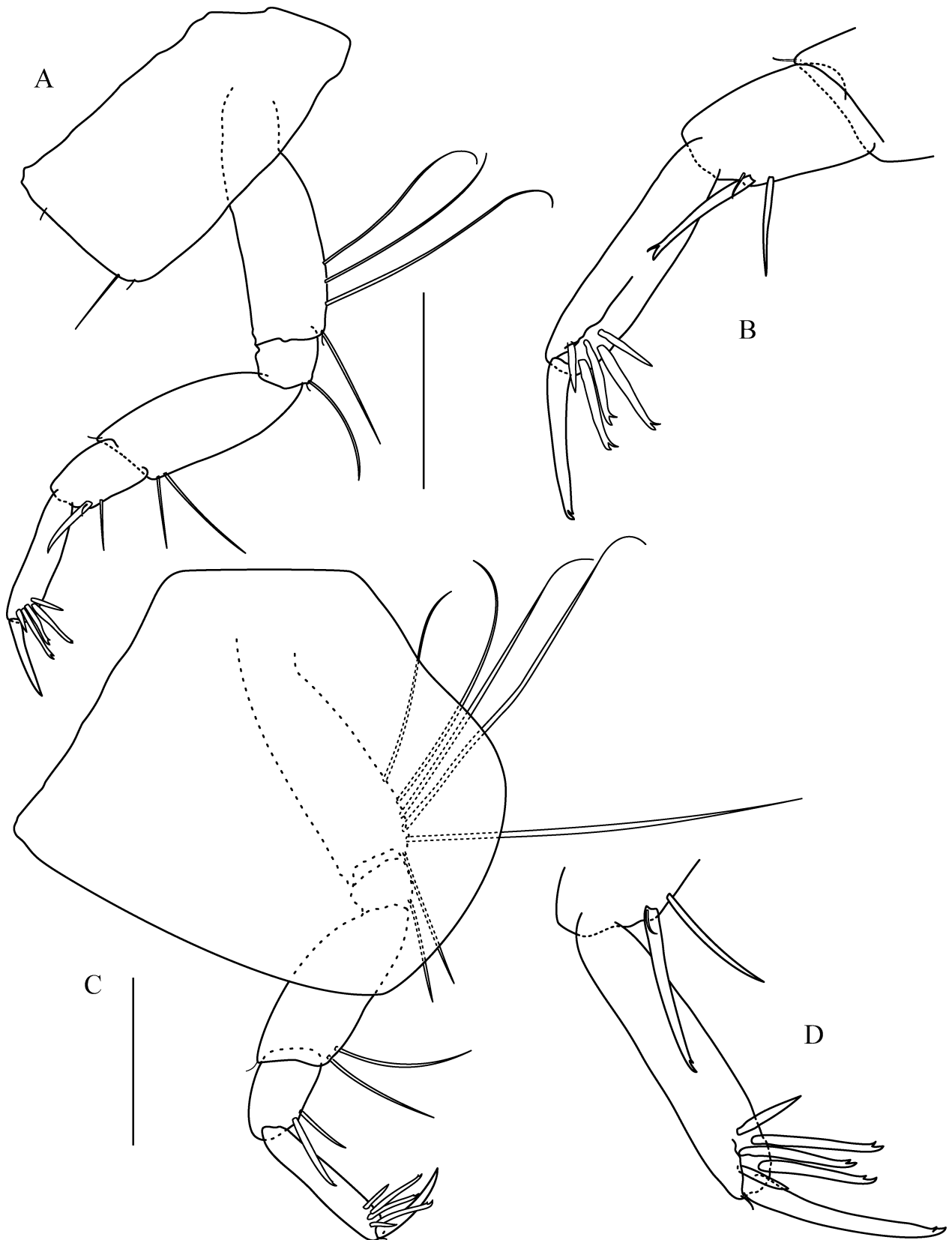
Pereopods 3 and 4 of similar shape, except for coxae.

Pereopod 3 (Figs. 5A, B), coxa subrectangular, 2 x as long as wide, anterior and posterior margins almost straight, subparallel, anteroventral corner slightly expanded and concave, ventral margin straight, with 1 setule anteriorly, posteroventral corner subrounded, with 1 setule and 1 medium simple seta, posterior margin without setae; length ratio of basis-ischium-merus-carpus-propodus-dactylus = 75:14:50:24:40:24; basis of medium length, 3.26 x as long as wide, subrectangular, 0.79 x as long as coxa, posterior margin slightly convex, with 3 long simple setae, posterodistal corner with 1 medium to long simple seta; ischium subquadrate, posterodistal corner with 1 medium to long simple seta; merus of medium width, 2.27 x as long as wide, anterior margin convex, with 1 setule distally, posterior margin with 2 medium to long simple setae distally; carpus short, of medium width, 1.5 x as long as wide and 0.6 x as long as propodus, ventral margin subrounded, posterior margin with 1 setule and 1 medium simple seta subdistally, main apical robust seta (0.78 as long as carpus) strongly bifid distally and extending to 47% length of propodus; propodus rectangular, thinner than carpus, 4.4 x as long as wide, with 5 robust setae on posterodistal surface (3 medium length bifid and 2 shorter simple); dactylus almost straight, thin, elongate, 0.6 x as long as propodus, medial face without setae and with weak notch distally.

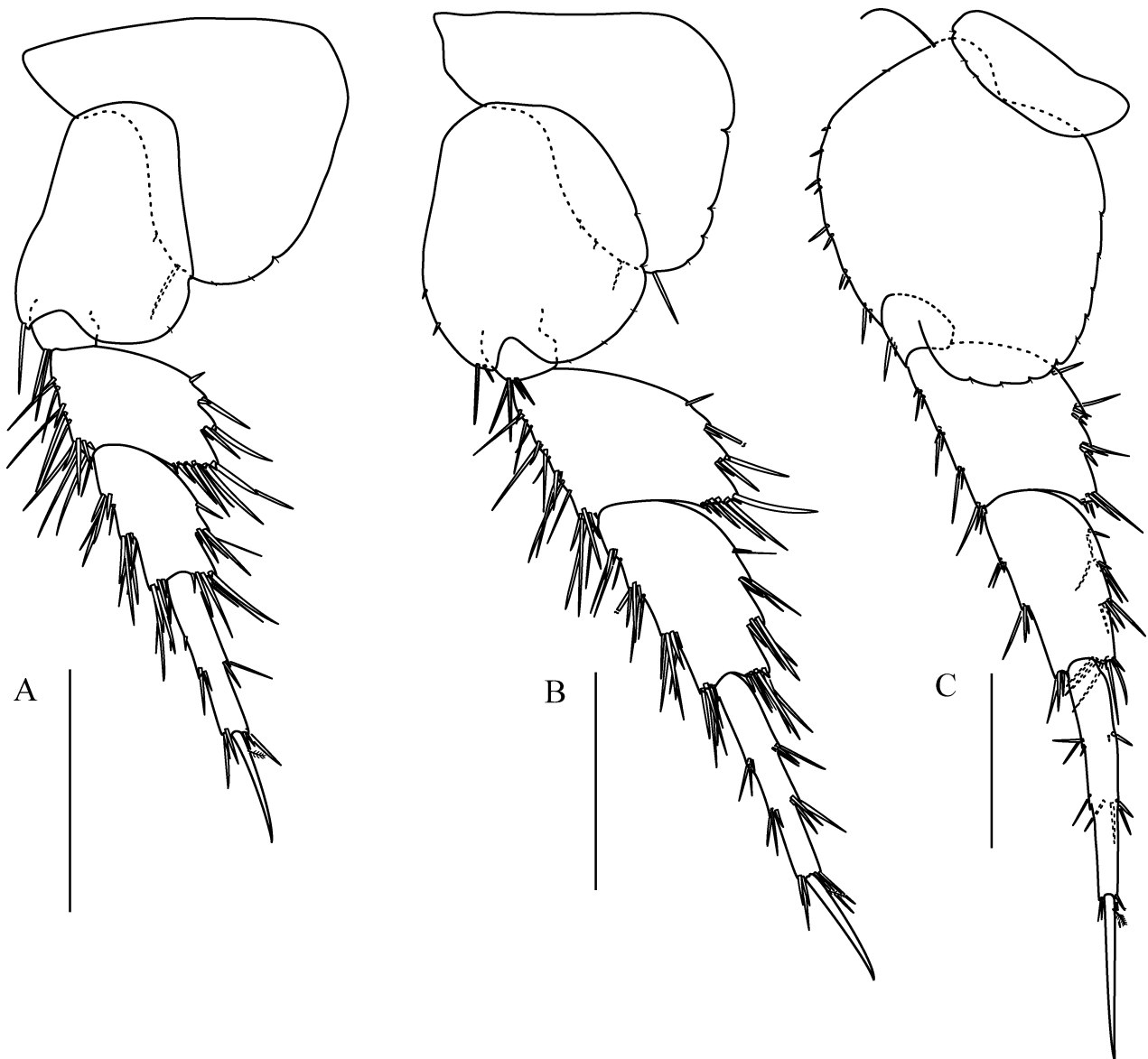
Pereopod 4 (Figs. 5C, D), coxa greatly enlarged, 1.1 x as wide as long, anterior and posterior margins subparallel, anterior margin almost straight, anteroventral corner somewhat expanded, ventral margin very long and slightly convex, posterior margin medially rounded, posterodorsal section oblique and posteroventral section slightly rounded, posteroventral corner almost rounded; length ratio of basis-ischium-merus-carpus-propodus-dactylus = 75:15:50:25:43:25; basis of medium length, 3.13 x as long as wide, subrectangular, 0.68 x as long as coxa, posterior margin slightly convex, with 6 long simple setae (distal one the shortest); ischium subquadrate, posterodistal corner with 1 medium to long simple seta; merus of medium width, 2.17 x as long as wide, anterior margin convex, with 1 setule distally, posterior margin with 2 medium to long simple setae distally; carpus short,



**FIGURE 4.** *Platyisao holodividum* **gen. et. sp. nov.** Paratype (MACN-In 38294a), adult female, 2.4 mm: A, gnathopod 1; B, detail of propodus and dactylus of gnathopod 1; C, gnathopod 2; D, detail of propodus and dactylus of gnathopod 2. Scales: 0.1mm.



**FIGURE 5.** *Platyisao holodividum* **gen. et. sp. nov.** Paratype (MACN-In 38294a), adult female, 2.4 mm: A, pereopod 3; B, detail of carpus, propodus and dactylus of pereopod 3; C, pereopod 4; D, detail of propodus and dactylus of pereopod 4. Scales: 0.15 mm.



**FIGURE 6.** *Platyisao holodividum* gen. et. sp. nov. Paratype (MACN-In 38294a), adult female, 2.4 mm: A, pereopod 5; B, pereopod 6; C, pereopod 7. Scales: 0.3 mm.

1.56 x as long as wide and 0.58 x as long as propodus, ventral margin subrounded, posterior margin with 1 medium simple seta and 1 setule subdistally, main apical robust seta (0.81 x as long as carpus) distally bifid and extending to 56% length of propodus; propodus rectangular, thinner than carpus, 4.7 x as long as wide, with 5 robust setae on posterodistal surface (3 of medium length bifid and 2 shorter simple); dactylus slightly curved, thin, elongate, 0.58 x as long as propodus, medial face without setae and with weak notch distally.

Pereopods 5–7 (Figs. 1A; 6A, B, C) of similar shape, increasing in length from 5 to 7. Coxa and basis of pereopod 5 covering those of pereopod 6, and the latter those of pereopod 7.

Pereopod 5 (Fig. 6A), coxa with anterodorsal corner greatly expanded, anteromedial margin concave, ventral margin rounded, reaching to 70% length of basis, with 3 notches (one very weak) bearing 1 setule each, anteroventral margin with 1 medium simple seta and 1 setule, posterior margin slightly convex, 3 x longer than anterodorsal margin; width ratio of basis-merus-carpus-propodus-dactylus = 40:34:20:7:1, length ratio = 59:25:35:41:29; basis pear-shaped, 1.47 x as long as wide, without facial ridge, of medium width basally and distal corners slightly expanded, posteroventral margin rounded and with 2 notches, anteroventral corner subacute, with 1 medium simple seta; merus and carpus of medium width, anterior, posterior and ventral margins with notches and several small, medium and large robust setae; merus 1.36 x as long as wide, anterior margin almost straight and

posterior margin expanded and rounded; carpus subrectangular and thinner, 1.75 x as long as wide than merus, with 2 notches on both margins; propodus narrow, 5.85 x as long as wide, with 1 medial notch on both margins, bearing small to medium robust setae; dactylus elongate and thin, 0.7 x as long as propodus, bearing 1 proximal plumose setule on posterior margin.

Pereopod 6 (Fig. 6B), coxa similar to that of pereopod 5 but slightly larger, reaching to 64% length of basis, posterior margin 2.7 x longer than anterodorsal margin, with 4 notches bearing setules, ventral margin with 1 medium and 3 short (one longer) simple setae; width ratio of basis-merus-carpus-propodus-dactylus = 60:45:28:8:2, length ratio = 70:41:53:59:34; basis subovoid, 1.16 x as long as wide, without facial ridge, posterior margin with tiny notches bearing setules, anterior margin with 2 short setae, anteroventral corner subacute and bearing 1 short and 1 medium simple setae; merus and carpus considerably wider and longer than in pereopod 5 but with robust setae of similar size and arrangement; merus 0.91 x as long as wide, anterior margin slightly undulated and posterior margin with 2 notches; carpus 1.89 x as long as wide, with 3 notches on both margins; propodus narrow, 7.37 x as long as wide, longer than in pereopod 5 (1.44 x), with 2 notches on both margins, bearing short to medium robust setae; dactylus elongate and thin, 0.57 x as long as propodus, bearing 1 proximal plumose setule on posterior margin.

Pereopod 7 (Fig. 6C), coxa short and wide, subovoid, 2.61 x as wide as long, ventral margin slightly convex, with 3 notches bearing setules; width ratio of basis-merus-carpus-propodus-dactylus = 73:36:23:8:2, length ratio = 71:39:46:61:43; basis very large, subovoid, 1.03 x as wide as long, without facial ridge, anterior and posterior margins divergent, lacking posterodistal tooth or deep notch, anterior margin convex, slightly undulated, bearing short and medium setae, posterior and ventral margins slightly rounded and undulated (with distinct small notches bearing setules), posteroventral corner slightly expanded and rounded, reaching to 28% length of merus; merus and carpus large but smaller than in pereopod 6, bearing fewer and shorter robust setae; merus 1.08 x as long as wide; carpus 2 x as long as wide; propodus longer than in pereopod 6, very narrow, 7.63 x as long as wide, both margins with 2 weak notches bearing shorter robust setae; dactylus very long and thin, straight, 0.7 x as long as propodus, and 1.26 x as long as dactylus of pereopod 6, bearing 1 proximal plumose setule on posterior margin.

Pereon and pleon (Fig. 1A), surface with small pits bearing a setule each.

Pleonites 1–3 (Fig. 1A) smooth dorsally.

Epimeral plate 1 (Fig. 1A) shorter than epimeral plates 2 and 3, anterior margin oblique, anteroventral corner rounded, ventral margin slightly convex, posteroventral corner distinctly rounded, posterior margin concave medially and with 2 very weak notches bearing setules.

Epimeral plate 2 (Fig. 1A) with anteroventral corner rounded, ventral margin almost straight and without setae, posteroventral corner strongly produced and acute, posterior margin oblique, slightly sinuous and without setae.

Epimeral plate 3 (Fig. 1A) subequal in length to epimeral plate 2, dorsolateral margin smooth, anterior margin slightly convex, ventral margin somewhat rounded, posteroventral corner rounded and produced into a very small tooth, posterior margin slightly concave distally and with a strong constriction proximally.

Urosomite 1 elongate, with 1 medium robust setae near to the base of uropod 1.

Urosomite 2 longer than broad, dorsal margin short, ventral margin oblique.

Urosomite 3 as broad as long, posterior margin undulated and posteroventral corner with 1 medium robust seta.

Uropods, surface of peduncles and rami covered with comb-shaped flakes of tiny hairs arranged in rows (Fig. 1G). Uropod 1 longer than uropod 2, uropod 3 very elongate; telson longer than peduncle of uropod 3.

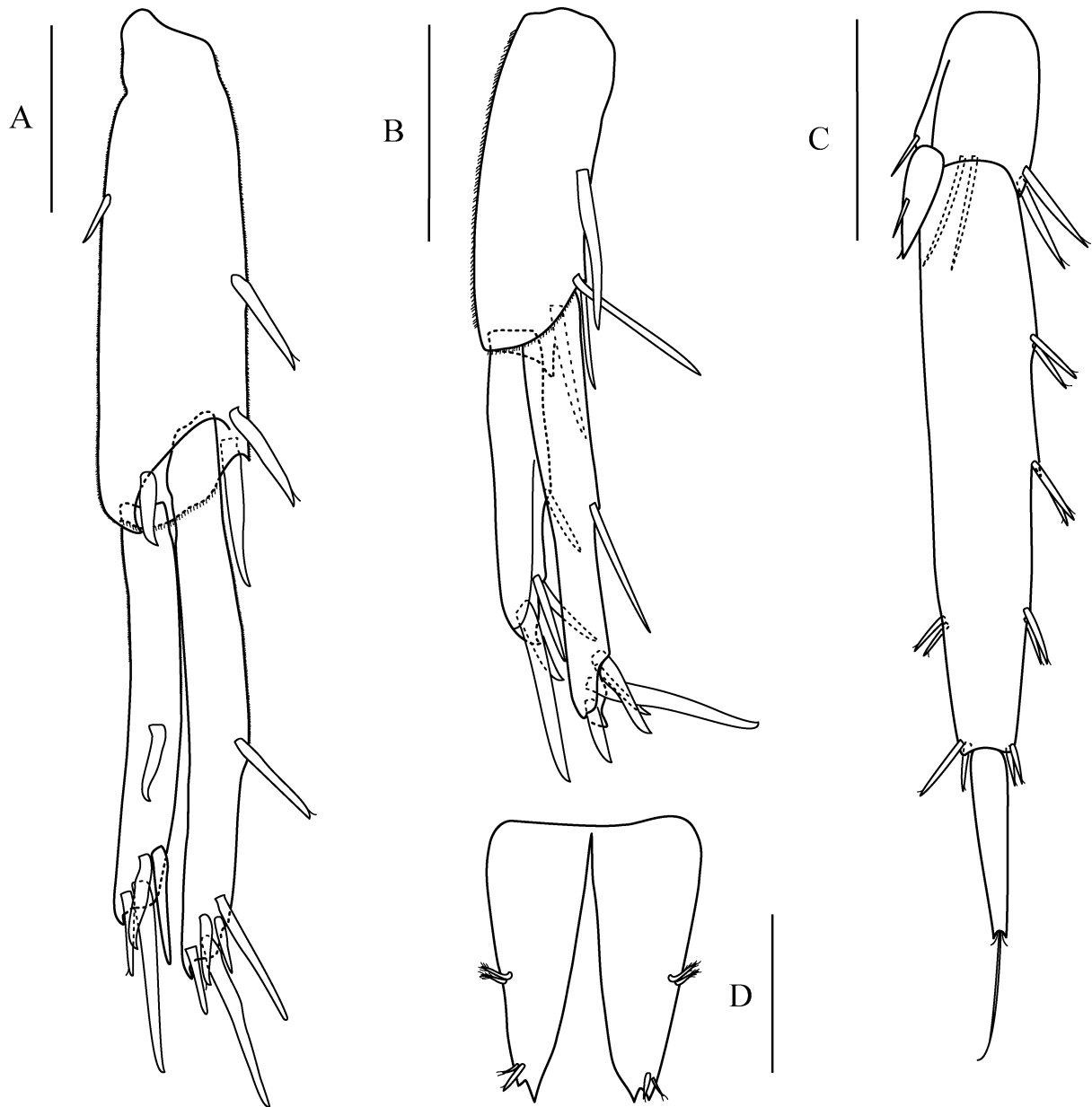
Uropod 1 (Fig. 7A), peduncle elongate, 3.33 x longer than broad, dorsomedial margin with 3 long robust setae, ventral margin with 1 short proximal robust seta, distolateral corner expanded into a curved tooth, with 1 subfacial medium and stout robust seta; outer ramus slightly shorter (0.85 x) and inner ramus somewhat longer (1.13 x) than peduncle, both rami expanded into a small and curved distal tooth; outer ramus with 1 dorsolateral medium robust seta and 4 subapical robust setae: 3 medium (one slightly curved distally) and 1 long; inner ramus 1.32 x as long as outer ramus, with 1 dorsomedial robust seta and 5 subapical robust setae: 3 short (one slightly curved distally), 1 medium and 1 long.

Uropod 2 (Fig. 7B), peduncle 0.57 x as long as peduncle of uropod 1, distolateral margin produced into a triangular flap, dorsomedial margin with 3 long robust setae (1 placed medially and 2 on distal corner), apicolateral corner with 1 long robust seta dorsally, ventral margin pilose, without robust setae; outer ramus somewhat shorter (0.94 x) and inner ramus longer (1.31 x) than peduncle, both rami expanded into a small and curved distal tooth; outer ramus with 1 medium robust seta in notch on dorsomedial margin and 4 subapical robust setae: 3 medium (1

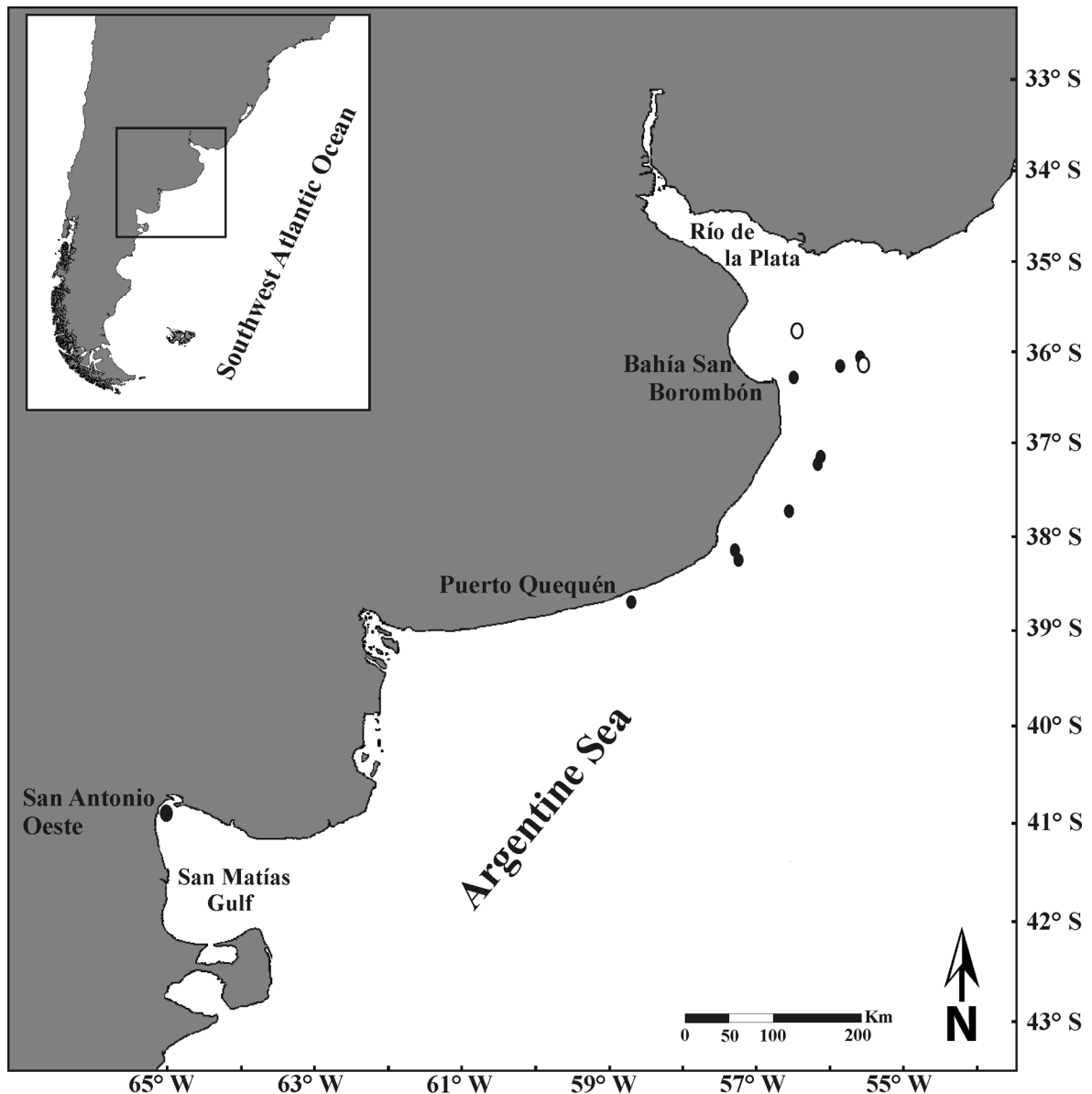
slightly curved distally) and 1 long; inner ramus 1.4 x as long as outer ramus, with 1 long robust seta in notch on dorsomedial margin and 4 subapical robust setae: 3 medium and 1 long.

Uropod 3 (Fig. 7C), peduncle very short, 0.38 x as long as peduncle of uropod 1, with 2 long distolateral robust setae, 2 long distoventral robust setae, and 1 subdistal short robust seta on inner weak protuberance; inner ramus very short, 0.75 x as long as peduncle, subtriangular, with 1 medial short simple seta on inner margin and 1 setule distally; outer ramus very elongate and broad, biarticulated, 5.2 x as long as peduncle and 1.77 x as long as inner ramus of uropod 1, article one with 3 notches on lateral margin, each one bearing 2 medium robust setae, and 2 short robust setae on distal corner, inner margin with 2 subdistal short robust setae and 2 robust setae (1 short and 1 medium) on distal corner; article 2 of medium width, short, 0.32 x as long as article 1, without setae on inner and lateral margins, distal corners expanded and pointed, with 2 setules, and 1 long and thin simple seta apically.

Telson (Fig. 7D) about 1.47 x as long as broad, completely cleft, margins almost straight, both lobes bearing 2 short penicillate setae on dorsomedial outer margin; apex of each lobe produced into 2 small sharp teeth (medial tooth the longest), with 2 short robust setae dorsally (medial seta the longest).



**FIGURE 7.** *Platyisao holodividum* gen. et. sp. nov. Paratype (MACN-In 38294a), adult female, 2.4 mm: A, uropod 1; B, uropod 2; C, uropodo 3; D, telson. Scales, A and B: 0.1 mm; C: 0.15 mm; D: 0.1 mm.



**FIGURE 8.** Map showing the distribution of *Platyisao holodividum* gen. et. sp. nov. (●) and *Tiburonella viscana* (Barnard J.L., 1964) (○) in the Argentine Sea. The four stations in front of San Antonio Oeste are indicated by a single dark circle.

**Male observations.** In males of *Platyisao holodividum* gen. et. sp. nov., the posteroventral corner of the epimeral plate 2 is expanded but slightly rounded and the urosome (Fig. 1H) resembles that of females [based on the male paratypes MACN-In 38295b (2.2 mm) and MACN-In 38296a (1.9 mm)].

**Etimology.** The specific name *holodividum*, is combined from the Greek *holos* meaning totality and the Latin *dividum* meaning divided, alluding to the completely cleft telson.

**Type locality.** Puerto Quequén, 38°41.450'S, 58°42.101'W, 39.5 m.

**Geographical distribution.** *Platyisao holodividum* gen. et. sp. nov. is distributed from off Bahía San Borombón (Buenos Aires province) to San Antonio Oeste (San Matías Gulf, Patagonia), along the northern Argentine Sea (see Fig. 8).

**Bathymetric range.** 12 to 51 m.

**Habitat.** In San Antonio Oeste *Platyisao holodividum* gen. et. sp. nov. was found on fine and coarse sand bottoms; at Puerto Quequén in fine sand mixed with mud; and at the stations of the “Mejillón II” expedition (Buenos Aires province coast) in fine and coarse sand often containing shell fragments.

**Remarks.** *Platyisao* gen. nov. conforms to the diagnostic characters defining the family Platyischnopidae, including: a cone-shaped rostrum; a large and weakly triturative molar; fossorial pereopods, with the posterior ones

being elongate and pereopod 7 the longest; the uropod 3 has an elongate and biarticulate outer ramus and a very short inner ramus (Barnard & Drummond 1979; Barnard & Karaman 1991).

In addition to the above-mentioned family features, *Platyisao* **gen. nov.** shares: the absence of eyes with *Indischnopus*; the article 2 of antenna 1 elongate with *Platyischnopus*; the accessory flagellum of antenna 1 short with *Indischnopus* and *Platyischnopus*; the mandibles without accessory setal row with *Skaptopus*; the palp of maxilla 1 uniaarticulate with *Skaptopus* and *Tiburonella*; the coxa 1 rectangular with *Eudevenopus*, *Indischnopus*, *Skaptopus* and *Tiburonella*; the uropod 3 outer ramus article 2 without setae on inner and lateral margins with *Indischnopus*, *Skaptopus* and *Tomituka* (unknown for *Yurrokus*); and the posteroventral corner of the epimeral plate 2 strongly produced and acute with *Indischnopus* and *Skaptopus*.

*Platyisao* **gen. nov.** differs from *Eudevenopus* by: outer plate of maxillipeds broad and with 6 robust setae (thin and with less setae in *Eudevenopus*); carpus of gnathopods longer than propodus (subequal or shorter); basis of pereopod 5 of medium width (narrow).

*Platyisao* **gen. nov.** differs from *Indischnopus* by: pleonite 3 dorsolaterally smooth and posteroventrally rounded (with dorsolateral teeth and posteroventral upturned tooth in *Indischnopus*).

*Platyisao* **gen. nov.** differs from *Platyischnopus* by: peduncle article 2 of antenna 1 without setae (with rows of ventral and dorsal setae in *Platyischnopus*); ischium of gnathopods short (elongate); merus and carpus of pereopod 7 of medium width (very broad); epimeral plate 2 posteroventral corner strongly produced and acute (slightly extended).

*Skaptopus* is the unique genus of Platyischnopidae without the cone-shaped rostrum, and the pleon is toothed instead of dorsally smooth.

*Platyisao* **gen. nov.** differs from *Tiburonella* by: peduncle article 2 of antenna 1 elongate and narrow (short and broad in *Tiburonella*); peduncle article 4 of antenna 2 without ventral setae (with several setae); outer plate of maxilliped broad and with 6 robust setae (thin and with less setae); carpus of gnathopods longer than propodus (slightly shorter).

*Platyisao* **gen. nov.** differs from *Tittakunara* by: accessory flagellum of antenna 1 biarticulated (12-articulated in *Tittakunara*); peduncular article 4 of antenna 2 without ventral setae (with several ventral groups of dense long setae); coxa 1 elongate and rectangular (very short and with expanded anteroventral margin); inner ramus of uropod 3 very short (of medium length).

*Platyisao* **gen. nov.** differs from *Tomituka* by: peduncle article 2 of antenna 1 elongate and narrow (shorter and wider in *Tomituka*); peduncular article 4 of antenna 2 without ventral setae (with several groups of long ventral setae); coxa 1 rectangular (strongly expanded anteroventrally).

*Platyisao* **gen. nov.** differs from *Yurrokus* by: peduncle article 2 of antenna 1 elongate and narrow (shorter and wider in *Yurrokus*); peduncular article 4 of antenna 2 without ventral setae (with some groups of long ventral setae); coxa 1 elongate and rectangular (short and with anteroventral margin expanded); carpus of gnathopod 2 much longer than propodus (somewhat longer).

The new genus *Platyisao* exhibits unique features that clearly distinguish it from the remaining genera of Platyischnopidae, as follows: the gnathopods subchelate; the coxa 4 with posterior margin medially rounded (not tapering) and distal section oblique; the pereopod 7 with basis very large, anterior and posterior margins divergent, posteroventral margin slightly rounded and undulated (with small notches); and telson elongate, completely cleft, with each apex produced into to 2 small sharp teeth.

## Distribution of *Tiburonella viscana* (Barnard J.L., 1964)

### *Tiburonella viscana* (Barnard J.L., 1964)

*Platyischnopus gracilipes*—Schellenberg, 1931: p. 63, fig. 33 [Female Only].—Shoemaker, 1942: p. 9 [? In part].—Wakabara, 1969: p. 6, figs. 3–4.

*Platyischnopus viscana* Barnard J.L., 1964: p. 226, fig. 4 [Original description].

*Tiburonella viscana*—Thomas & Barnard, 1983: pp. 1, 9, 12, 21–26, figs. 7–9.—Barnard & Karaman, 1991: p. 643.—Wakabara *et al.*, 1991: table 2, 3 and 4.—Abessa *et al.*, 1998: pp. 225–229 [eco].—Wakabara & Serejo, 1998: p. 580.—Atienza & Martín, 2001: p. 1270.—Abessa & Sousa, 2003: pp. 53–54 [eco].—Abessa *et al.*, 2005: pp. 877–879, 883 [eco].—Young & Serejo, 2005: p. 94.—Melo & Nipper, 2007: pp. 412–418, Table 1 [eco].—Ortiz *et al.*, 2007: p.



**Material examined.** “Mejillón II” expedition, 15 sep 2009, Sta. 24, 36°08.746'S, 55°51.937'W, 17 m, small dredge: 39 specimens (MACN-In 39120). 16 sep 2009, Sta. 27, 35°47.110'S 56°26.697'W, 16 m, Rauschert sledge: 1 specimen (MACN-In 39121).

*Tiburonella viscana* is a benthic amphipod commonly used for ecotoxicological tests, assessment of contamination in marine sediments and environmental monitoring in Brazilian waters (see among others, Abessa *et al.* 1998; Abessa & Sousa 2003; Melo & Nipper 2007; Torres *et al.* 2009).

*Tiburonella viscana* is widely distributed along western and eastern coasts of the American continent. In the Pacific Ocean, it has been reported from La Jolla (California, USA) to Puerto Utria (Colombia), living in coarse sand between 3–127 m depth (Thomas & Barnard 1983). It is also present in the Caribbean Sea (Belize, Aruba, Grenadines Islands, Costa Rica and Venezuela) where it has been found in patches of sand, coarse coral sand, coral reefs and sponges, between 1–41 m depth (Thomas & Barnard 1983; Atienza & Martín 2001; Ortiz *et al.* 2007). In the Atlantic Ocean, it was recorded in Brazil, off the coasts of Bahia and São Paulo states (from 23.5°S to 25.03°S), inhabiting principally patches of muddy sand, close to banks of the seagrass *Halodule* sp., between intertidal to 4 m depth (Wakabara *et al.* 1991; Melo & Nipper 2007).

The distribution of *Tiburonella viscana* is herein extended in the South-West Atlantic Ocean, where it is reported for the first time from the Argentine Sea. The species was collected at two stations off San Borombón Bay (Buenos Aires province), near Río de la Plata, at 16–17 m depth (see Fig. 1). The bottom at both stations was mainly composed of sand and shell, and the presence of abundant molluscs (gastropods and bivalves) and the sea cucumber *Thandarum hernandezii* Martínez & Brogger, 2012 (see Martínez & Brogger 2012).

## Discussion

Two morphological characters of *Platyisao holodivium* should be added to the diagnosis of Platyischnopidae given by Barnard & Drummond (1979): gnathopods 1 and 2 subchelate, and telson elongate and completely cleft.

The few number of morphological characters shared between *Platyisao* **gen. nov.** and the eight known genera of the family, make it difficult to ascertain which genera are the most closely related with the new genus herein described.

The records of *Platyisao holodivium* **gen. et. sp. nov.** and *Tiburonella viscana* represent the first ones of the family Platyischnopidae in the Argentine Sea. In addition, the finding of *Platyisao holodivium* in San Antonio Oeste (40°53.634'S, 65°04.033'W) is the southernmost record for this family in the Atlantic Ocean.

*Tiburonella viscana* and *Platyisao holodivium* **gen. et. sp. nov.** were found in localities (see Fig. 1) belonging to the Argentine Biogeographic Province (see López Gappa *et al.* 2006). In these localities water temperatures are warmer than those off the southern coasts of the Argentine Sea, within the Magellanic Biogeographic Province (see Guerrero & Piola 1997; Piola & Rivas 1997; Balech & Ehrlich 2008; Roccatagliata *et al.* 2010). This is consistent with the distribution of most platyischnopid species, which are mainly found in warm and/or temperate waters (see Table 1).

The wide extension of the Río de la Plata plume may act as a biogeographic barrier for many warm-temperate species, turning the southernmost district of the Argentine Biogeographic Province, in an area of very low diversity for benthic amphipods (Lopez Gappa *et al.* 2006). The presence of *Tiburonella viscana*, as well as other warm-temperate amphipods (Chiesa pers. obs.), southern to this plume, could suggest that the low diversity reported, would also be the result of a poor sampling effort conducted in this area.

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