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A New Species of *Prionodiptomus* (Copepoda: Diaptomidae) from the Manu River, Peru

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(Accepted February 14, 2004)

Graciela Cicchino, Edinaldo N. dos Santos-Silva and Evelyn Zoppi de Roa (2004) A new species of *Prionodiptomus* (Copepoda: Diaptomidae) from the Manu River, Peru. *Zoological Studies* 43(2): 425-434. A new species which is proposed for inclusion in the monotypic genus *Prionodiptomus* Light, 1939, from the Manu River, Peru, is described and illustrated in detail. The new species, *Prionodiptomus incarum*, is defined by the structure of left leg 5 of the male, mainly in the pear-shaped basipodite with a prominent projection of the posterior inner corner and the 2nd exopod segment with a distal process, which is rounded but not digitiform. The spinulose seta of other Neotropical species is represented by a subapical triangular projection with a toothed inner margin. *Prionodiptomus incarum* sp. nov. shares certain characters with the type species, *P. colombiensis* (Thiébaud, 1912), in particular, right leg 5 of the male, which has a narrow and evenly curved claw, and a lateral spine which is denticulate and inserted in the middle of the segment. Females of both species have a narrow and elongate leg 5 and a semicircular fold on the ventroposterior region of the genital double-somite. <http://www.sinica.eud.tw/zool/zoolstud/43.2/425.pdf>

Key words: Taxonomy, New species, Diaptomidae, Freshwater, Peru.

Examination of samples in temporary aquatic environments from a reserve zone in Parque Manu, Madre de Dios, Peru, resulted in the discovery of a new species which we propose for inclusion in the monotypic genus *Prionodiptomus*. The new species resembles *P. colombiensis* (Thiébaud, 1912), which has been found in Mexico, (Gutierrez and Suarez Morales 2000), Guatemala at Colombia (Löffler 1972), Venezuela (Montiel and Zoppi de Roa 1979), and Peru (Dussart and Defaye 1983). The new species, *P. incarum*, is described and illustrated in detail and compared to *P. colombiensis*. However, we believe that a detailed study of the type species in its entire distributional area is necessary to carry out a more precise comparison between this species and the new species. These data will also

allow a determination of whether the new species should be included in a new genus.

MATERIALS AND METHODS

The specimens studied were collected in temporary black waters in the Manu River basin. The samples belong to the Museo de Historia Natural de la Univ. Nacional Mayor de San Marcos (Peru), form part of the BIOLAT program of the Smithsonian Institution, Washington, DC (USA), and were given to us for study by Prof. Florisa Zambrano (Univ. Nacional Mayor de San Marcos). Drawings were made using a Zeiss Lab. 16 microscope fitted with a drawing tube. Dissected and whole specimens were examined in lactophenol or

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glycerine. Additional preparations were made for SEM studies (Phillips XL-30), following the protocol used by Felgenhauer (1987) and Huys and Boxshall (1991).

Specimens were deposited at the Museo del Instituto de Zoología Agrícola de la Univ. Central de Venezuela (MIZA), at the Museo de Historia Natural de la Univ. Mayor de San Marcos (MUSM), and at the Museo Argentino de Ciencias Naturales (MACN).

SPECIES DESCRIPTION

Prionodiptomus incarum sp. nov.

(Figs. 1-6)

Material examined: Holotype ♀, entirely dissected on a slide (MIZA). Paratypes: 1 ♂, fully dissected on a slide (MIZA); 3 ♀♀ and 2 ♂♂ in ethanol (MIZA); 3 ♀♀ and 3 ♂♂ in ethanol (MUSM-Limnologia-02); 1 ♀ and 1 ♂ in ethanol (MACN-In 35751), all from temporary lagoons near the Manu River in the areas bordering the Pakitza Biological Station, located in the reserve area of Manu National Park, Madre de Dios, southeastern Peru (11°55'48''S, 71°15'18''W). F. Zambrano col., Feb.~ Mar. 1992.

Female (holotype): Length excluding caudal setae: 1420 µm; mean length of 7 paratypes 1328 (range, 1290~1381) µm. In dorsal view, body (Fig. 1a) widest at 1st free pedigerous somite. Rostrum (Fig. 1b) with paired rostral filaments, symmetrical, broader than in that of male, with 1 pair of sensillae. Cephalosome with visible suture dorsally and laterally (Fig. 1a, b). Fourth and 5th pedigerous somites completely fused. Fifth pedigerous somite with asymmetrical lateral wings, left wing (Fig. 1a, c) elongated, with 2 sensillae; right wing (Fig. 1d, e) with 2 sensillae, ventral one forked. Other sensillae distributed on 5th pedigerous somite as figured (Fig. 1c, d).

Urosome (Fig. 1a) 3-segmented. Genital double-somite (Figs. 1a, 6a, b) asymmetrical, longer than other somites combined; left lateral margin expanded at 1/2 of length and with strong sensilla directed posteriorly; right lateral margin with a rounded prominence followed by 2 depressions, proximal one situated dorsally and distal one ventrally; ventroposterior region with very conspicuous semicircular fold with adjacent wrinkled area medially, reaching posterior margin of genital double-somite (Fig. 6a, b). Genital operculum as long as

anterior extensive area and with short, posteriorly directed processes (Figs. 1f, 6a). Caudal rami symmetrical with setules along inner margin.

Antennule (Fig. 1g) symmetrical, 25-segmented; armature from proximal to distal as follows: segment 1, 1 seta (s) + 1 aesthetasc (ae); segment 2, 3 s + 1 ae + 1 vestigial seta (vs); segment 3, 1 s + 1 ae + 1 vs; segment 4, 1 s; segment 5, 1 s + 1 ae + 1 vs; segment 6, 1 s; segment 7, 1 s + 1 ae; segment 8, 1 s + 1 conical seta (cs); segment 9, 2 s + 1 ae; segment 10, 1 s; segment 11, 1 s; segment 12, 1 s + 1 ae + 1 cs; segment 13, 1 s; segment 14, 1 s + 1 ae; segment 15, 1 s; segment 16, 1 s + 1 ae; segment 17, 1 s; segment 18, 1 s; segment 19, 1 s + 1 ae; segment 20, 1 s; segment 21, 1 s; segment 22, 2 s; segment 23, 2 s; segment 24, 2 s; and segment 25, 5 s + 1 ae. Vestigial setae on segments 2, 3, and 5 comprising circle of thin cuticle and with minute seta at center of circle. Tips of large setae on segments 3, 7, 9, and 14 blunt.

Antenna biramous (Figs. 2a, b, 6c), segmentation and armature pattern as follows: coxa, 1 s; basis, 2 s; endopodal 1st segment, 2 s + row of spinules; endopodal 2nd segment bilobed, inner lobe, 8 distal s + 1 sub-marginal s, outer lobe, 6 distal s + 1 sub-marginal s + row of spinules; exopod 9-segmented, with 1, 2, 1, 1, 1, 1, 1, and 3 s, respectively. Endopodal 1st segment with pore between spinules and setae. Suture between exopodal segments 2 and 3 weakly developed.

Mandible (Figs. 2c, d) with strongly sclerotized coxal gnathobase carrying prominent lobe on caudal margin; cutting blade (Fig. 2d) with acute triangular caudal tooth, and group of 1 triangular and 6 multicuspid teeth, and 1 seta inserted on proximal margin adjacent to base of apicalmost tooth. Mandibular palp (Fig. 2c), segmentation, and armature pattern as follows: basis, 4 s; lobe of endopodal 1st segment, 4 s; endopodal 2nd segment, 9 s + 2 row of spinules; exopod 4-segmented, with 1, 1, 1, and 3 s, respectively.

Maxillule (Fig. 2e, f), praecoxal arthrite with 10 marginal spines, seven of them hirsute, plus row of 4 submarginal spines on top of a promontory and another submarginal on opposite surface of arthrite; coxal epipodite with 9 setae, two of them with constriction at 1/2 the length, from which setae thinned out; coxal endite with 4 highly ornamented setae; proximal basal endite with 4 setae; basal endite fused to 1st endopodal segment, with 4 setae; basal exite with 1 seta; endopod with 9 setae. Exopod with 6 setae and row of marginal spinules.

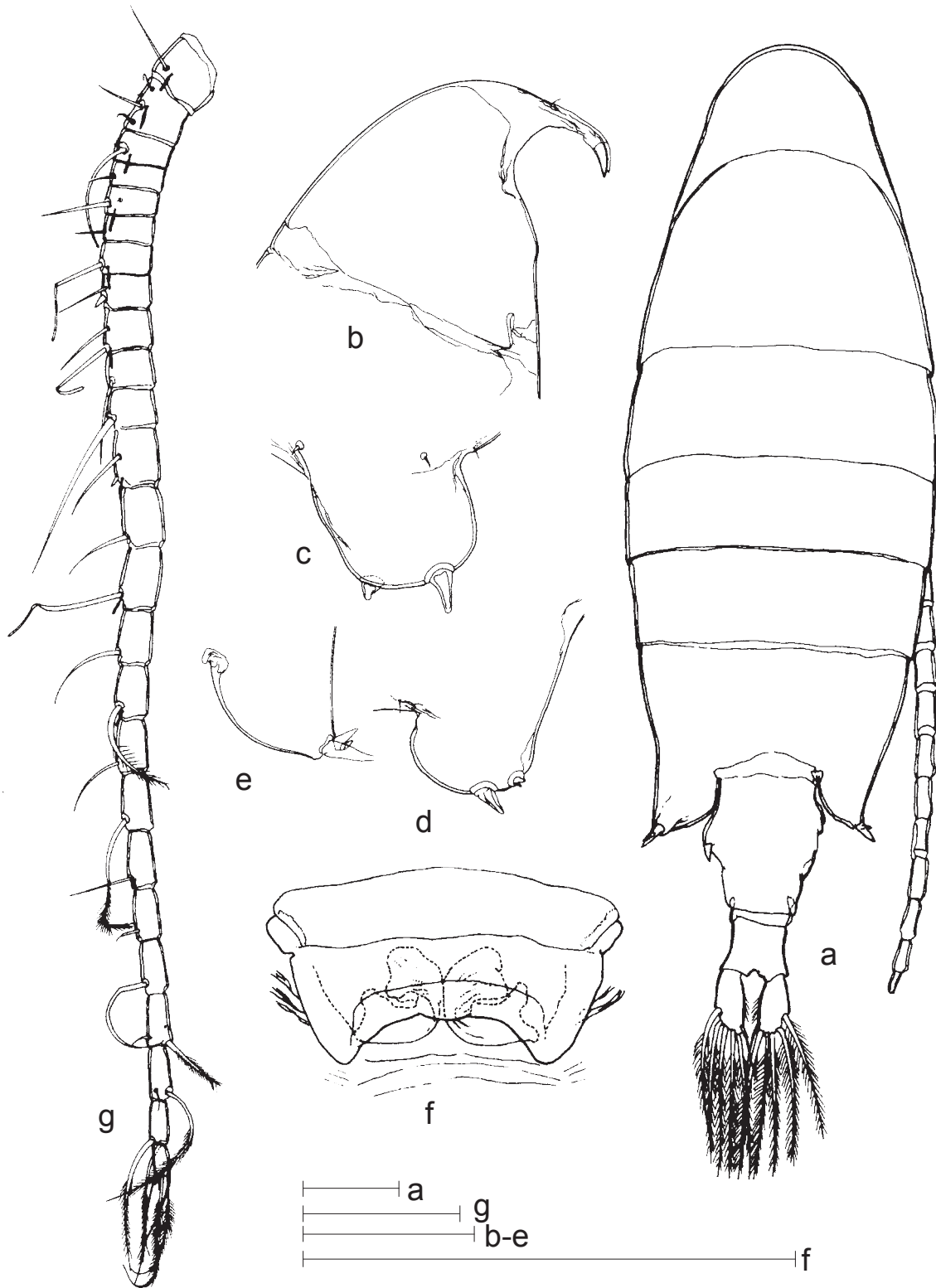


Fig. 1. *Prionodiaptomus incarum* sp. nov., female holotype. (a) Habitus, dorsal, (b) rostrum, lateral view, (c) 5th pedigerous somite left wing, lateral view, (d) 5th pedigerous somite right wing, lateral view (e) 5th pedigerous somite right wing, dorsal, (f) genital operculum, (g) antennule. Scale bars = 100 μ m.

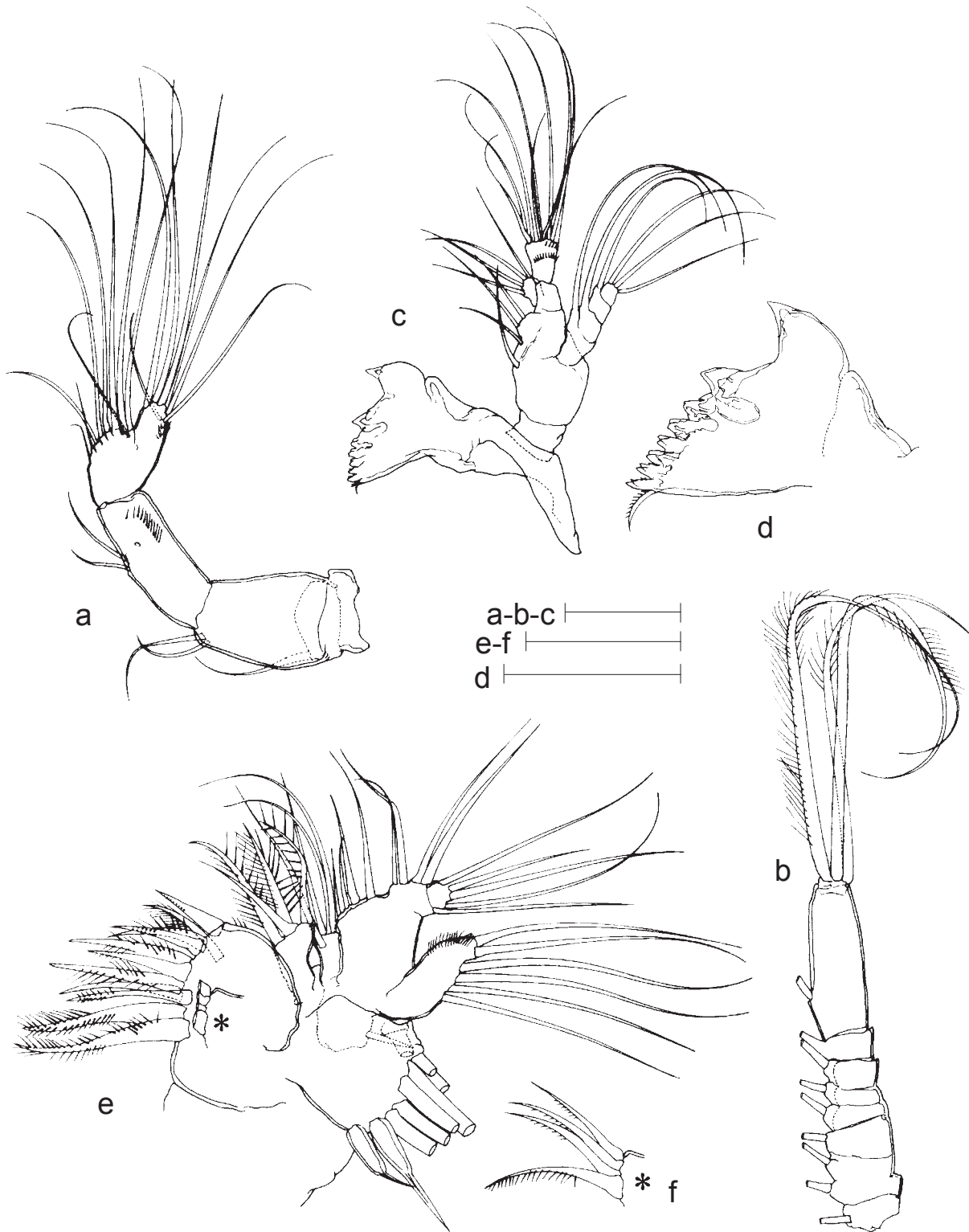


Fig. 2. *Prionodiptomus incarum* sp. nov., female holotype. (a) Antenna endopod, (b) antenna exopod, (c) mandible, (d) detail of mandibular gnathobase, (e) maxillule, insertion of 4 submarginal spines indicated by an asterisk, (f) 4 submarginal spines from the praecoxal arthrite. Scale bars = 50 μ m.

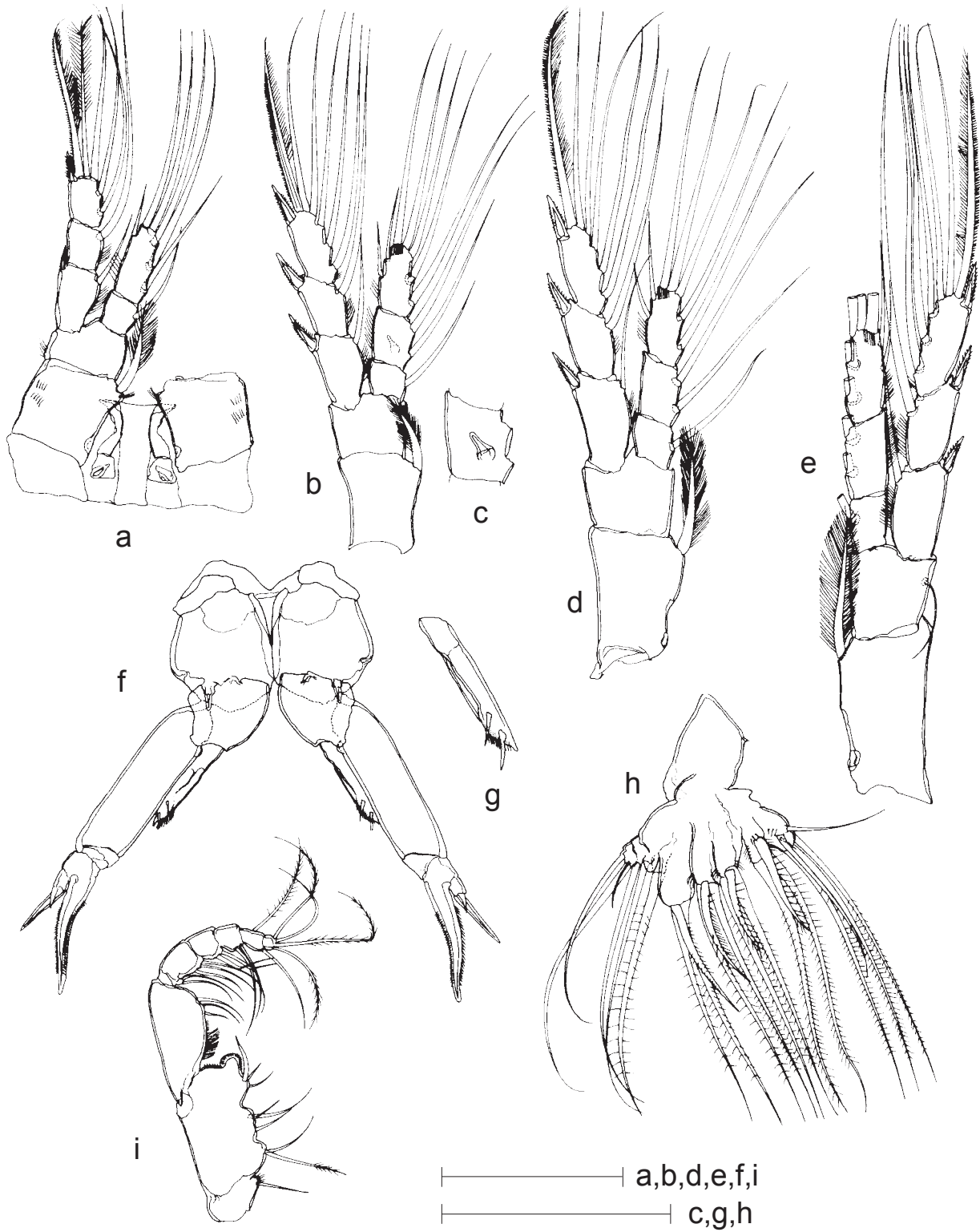


Fig. 3. *Prionodiaptomus incarum* sp. nov., female holotype. (a) First leg, anterior, (b) 2nd leg, anterior, (c) 2nd segment of 2nd leg showing Schmeil's organ, posterior, (d) 3rd leg, anterior, (e) 4th leg, anterior, (f) 5th leg, posterior, (g) 5th leg, endopod, (h) maxilla, (i) maxilliped. Scale bars = 100 μ m.

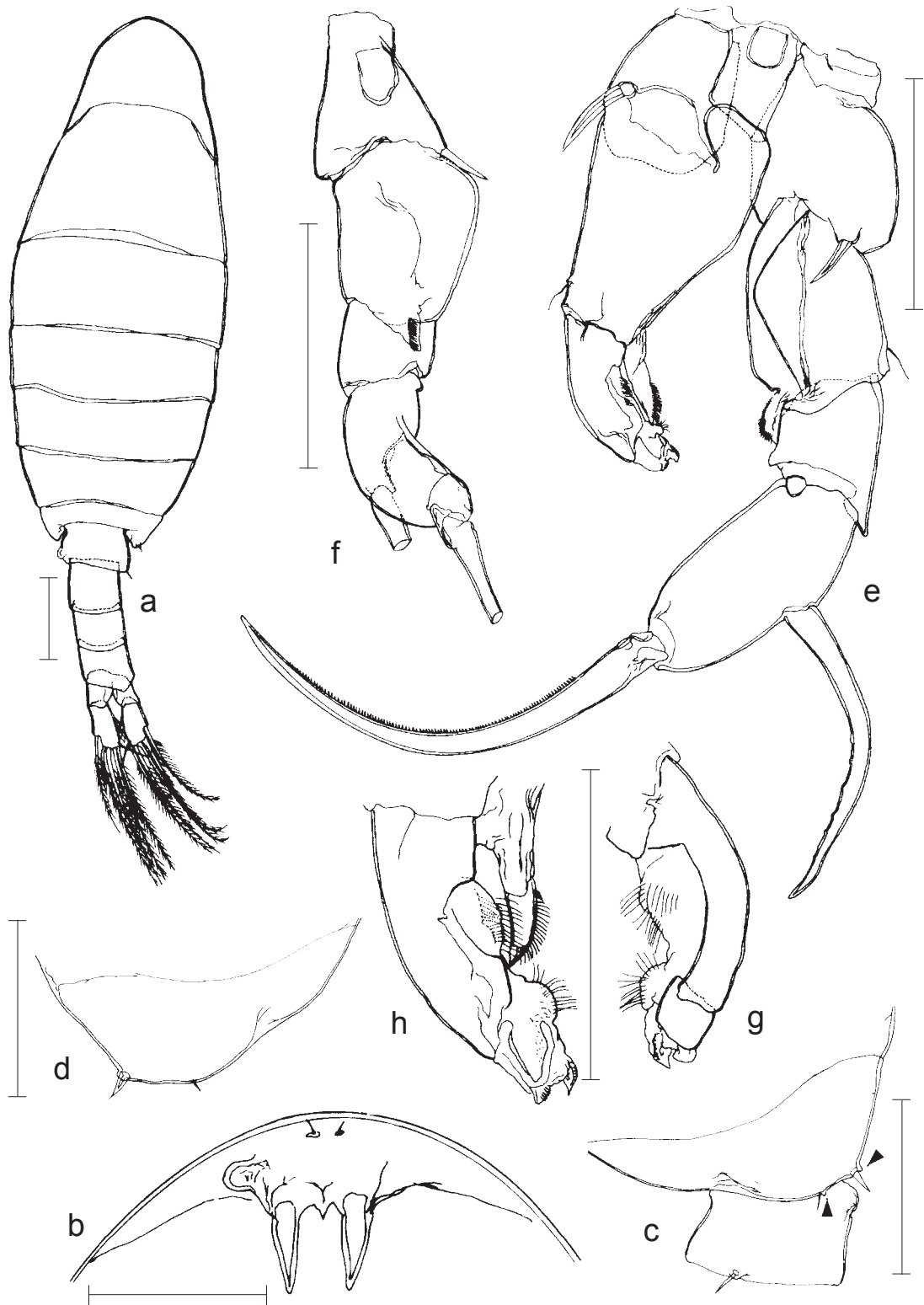


Fig. 4. *Prionodiptomus incarum* sp. nov., male. (a) Habitus, (b) rostrum, ventral, (c) 5th pedigerous somite, right wing and genital somite, lateral view, lobule-sensilla indicated by arrow, (d) 5th pedigerous somite left wing, (e) 5th leg, posterior, (f) right 5th leg, lateral view, (g) left 5th leg, exopod, anterior, (h) left 5th leg, exopod, posterior. Scale bars = 100 μ m.

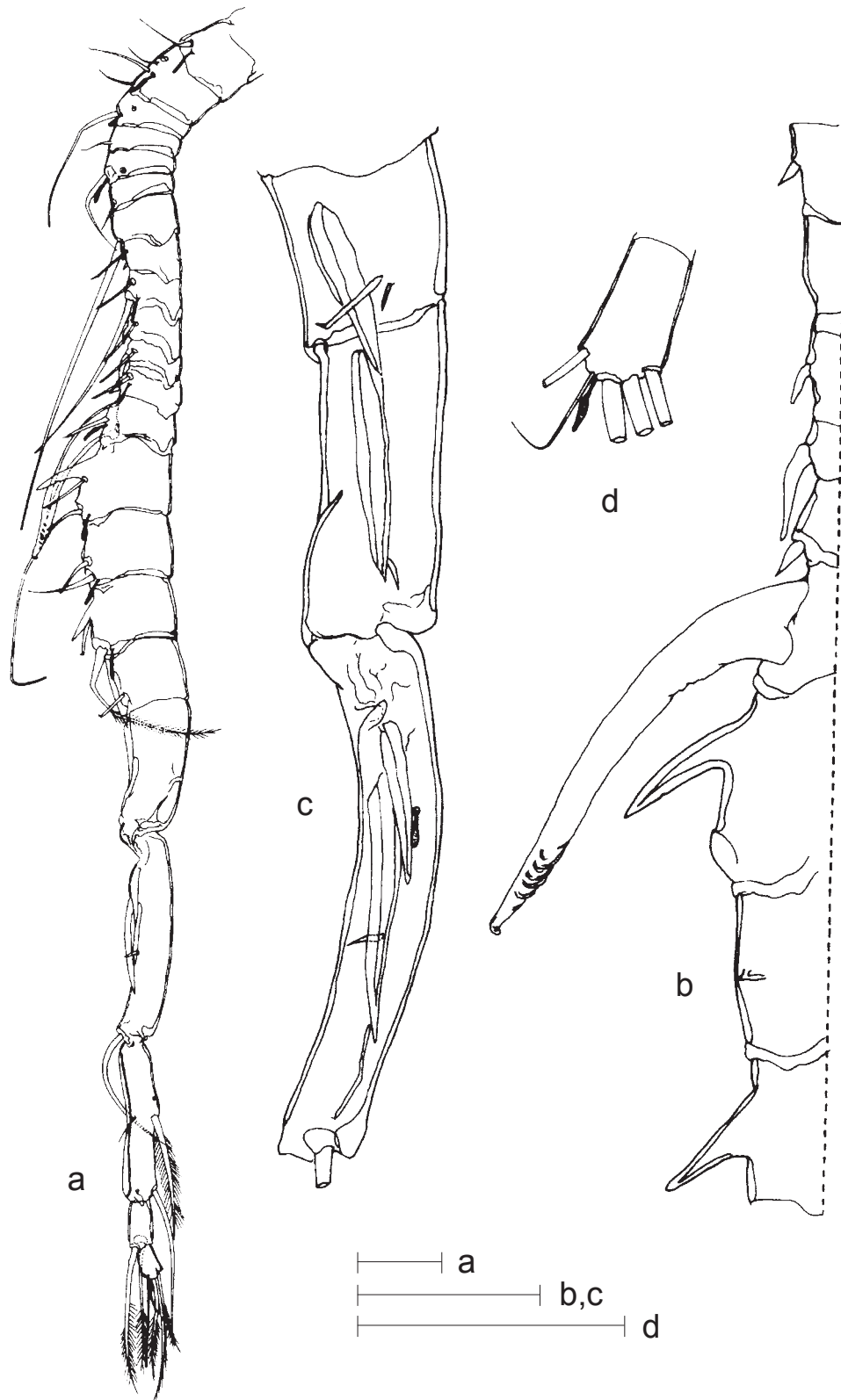


Fig. 5. *Prionodiaptomus incarum* sp. nov., male right antennule. (a) Right antennule, (b) detail of segments 8~16, (c) detail of segments 17~19, (d) detail of last segment. Scale bars = 50 μ m.

Maxilla (Fig. 3h), proximal praecoxal endite with 6 setae and row of spinules on anterior surface; distal praecoxal endite with 3 setae and row of setules on proximal and distal margins and row of

spinules on anterior surface; proximal and distal coxal endites with 3 setae and row of setules on distal and proximal margins; allobasis protruding into endite with 3 setae. Endopod incompletely 4-

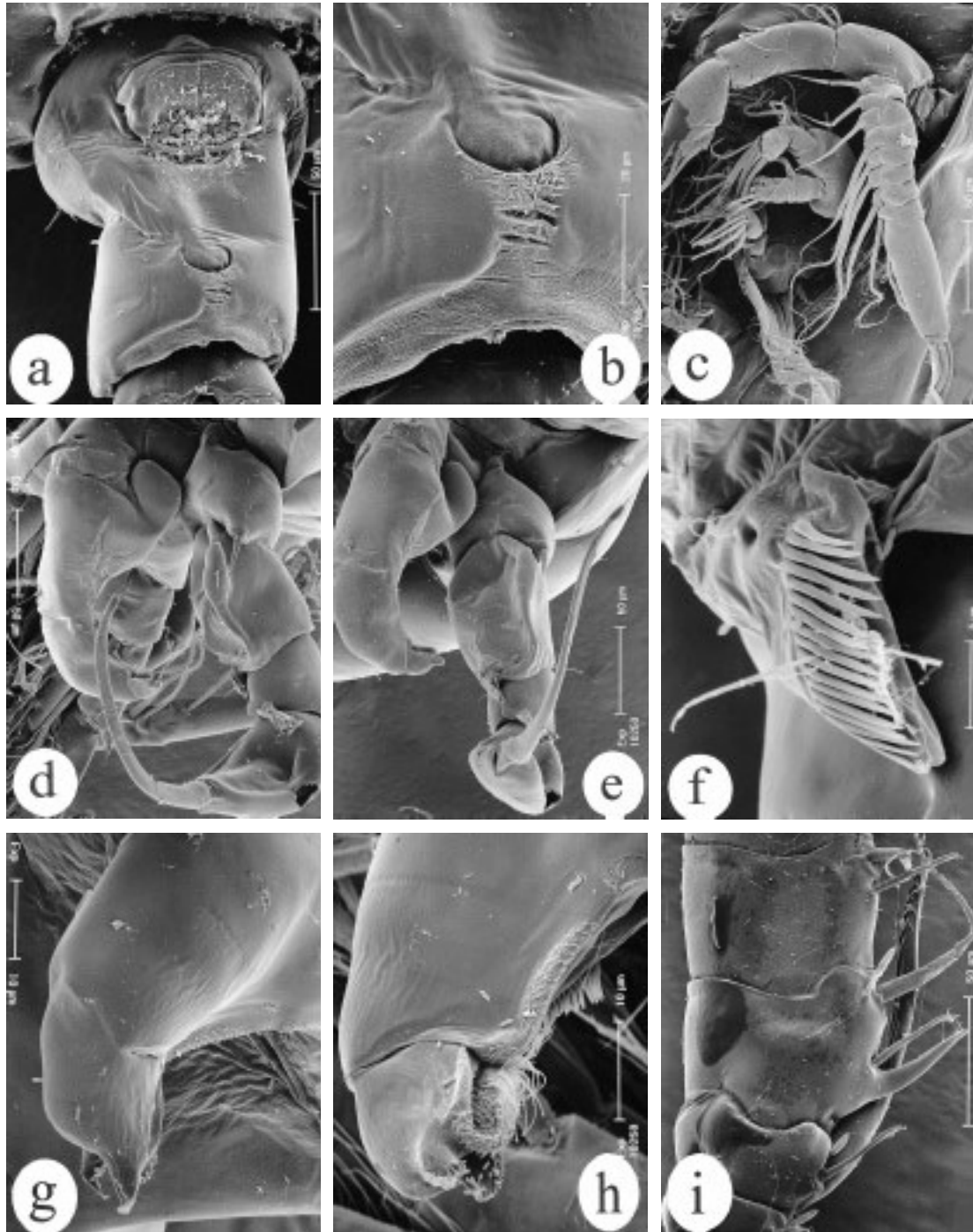


Fig. 6. *Prionodiptomus incarum* sp. nov., scanning electron micrographs. (a) Female genital double-somite, ventral, (b) detail of semi-circular fold on the ventroposterior region from female genital double-somite, (c) antenna, (d) male 5th leg, posterior, (e) male 5th leg lateral view, (f) male right leg, endopodal lobe, (g) male left 5th leg, 1st and 2nd exopod, outer marginal view, (h) male left 5th leg, 1st and 2nd exopod, posterior, (i) male right antennule, segments 13~15, detail of modified seta of segment 13.

segmented, setal formula: 1, 1, 1, 3.

Maxilliped (Fig. 3i), praecoxal endite with seta and row of spinules. Coxa with 3 endites, proximal endite bearing 2 setae, middle and distal endites with 3 setae each. Distal inner angle of coxa produced into rounded lobe with marginal spinules running to distal margin of segment. Basis with 3 setae on medial margin and rows of spinules and setules proximally. Endopod 6-segmented; setal formula: 2, 3, 2, 2, 1 + 1, 4.

Swimming legs (Figs. 3a-e) biramous with 3-segmented rami, except for 2-segmented endopod of leg 1. Legs 2~4 with distal row of spinules on anterior surface of 3rd endopodal segment. Schmeil's organ (Fig. 3c) present on posterior surface of 2nd endopodal segment of leg 2, consisting of digitiform process arising from rounded base.

P5 (Figs. 3f, g), symmetrical, large, and slender. Coxa with small posterior lobule with triangular sensilla at tip; basis with convex inner margin; 1st exopodal segment almost 3 times longer than wide; 2nd exopodal segment expanded into claw with both margins serrate; distinct 3rd exopodal segment with 2 terminal spines, anterior spine strong and 3 times longer than posterior one. Endopod 2-segmented bearing 2 spines on posterior surface and row of spinules on anterior surface of oblique tip.

Male: Mean length ($n = 6$) excluding caudal setae, 1154 (range, 1181-1236) μm . Body (Fig. 4a) smaller than female's. Rostrum (Fig. 4b) with symmetrical paired rostral filaments, margin between filaments forming a minute triangular projection; basal region with rounded process on right side, ornamented with pair of sensillae. Cephalosome with complete suture dorsally and laterally. Fourth pedigerous somite with 2 dorsal sensillae. Fifth pedigerous somite free, with small asymmetrical lateral wings; right one (Fig. 4c) with 2 small lobules, each with an adjacent sensilla, ventral lobule-sensilla larger than dorsal; left wing (Fig. 4d) also bearing 2 unequal sensillae, more separately placed than sensillae of right wing.

Urosome (Fig. 4a) 5-segmented. Genital somite (Figs. 4a, c) asymmetrical, with 1 sensilla at right distal corner. Fourth urosomite with dorsal margin partially expanded concealing anal somite. Caudal rami symmetrical, longer than wide, with 6 setae, and setules along medial margin.

Right antennule (Figs. 5a-e, 6i) 22-segmented; armature from proximal to distal as follows: segment 1, 1 s + 1 ae; segment 2, 3 s + 1 ae + 1 vs; segment 3, 1 s + 1 ae + 1 vs; segment 4, 1 s; segment 5, 1 s + 1 ae + 1 vs; segment 6, 1 s; seg-

ment 7, 1 s + 1 ae; segment 8, 1 s + 1 cs; segment 9, 2 s + 1 ae; segment 10, 1 s + 1 modified seta (ms); segment 11, 1 s + 1 ms; segment 12, 1 s + 1 cs + 1 ae; segment 13, 1 s + 1 ms + 1 ae; segment 14, 2 s + 1 process (p) + 1 ae; segment 15, 2 s + 1 ae; segment 16, 2 s + 1 ae + 1 p; segment 17, 2 s + 1 ms; segment 18, 1 s + 1 ms; segment 19, 1 s + 1 ae + 2 ms; segment 20, 4 s; segment 21, 2 s; and segment 22, 5 s + 1 ae. Segments 8~14 with short cylindrical setae pointed only at tip; segments 15~17 also with short cylindrical setae, pointed at tip but curved 90°; modified setae on segments 10 and 11 similar; modified seta of segment 13 strong and with row of ridges on distal quarter, tip forming a crochet; segments 14 and 16 with spinous process; setae on segments 17~19 similarly modified.

Left antennule, antenna, mouthparts, and swimming legs as in female.

Right 5th leg (Figs. 4e, f, 6d-f) with coxa bearing short conical posterior process, with strong sensilla at tip. Basis with seta on outer margin; inner side of both anterior and posterior surfaces projecting medially and delimiting inner margin of segment; proximal 1/2 of inner side of posterior surface thickened and progressively tapering in distal 1/2 (Fig. 6d); distal posterior corner produced into triangular outgrowth, perpendicular to inner posterior side; distal anterior inner corner bearing endopodal lobe; inner margin concave in proximal 1/3 and with wrinkle and outgrowth in distal 1/3 (Fig. 6e), reaching endopodal lobe and triangular outgrowth. Exopod 2-segmented; 1st exopod segment with distal outer corner produced into triangular outgrowth projecting over 2nd exopod segment; distal inner corner produced into rounded outgrowth; 2nd exopod segment with concave posterior surface; lateral spine large and curved, implanted at 1/2 length of segment, with tubercles along distal middle of inner margin. Claw inserted distally, slender and regularly curved, with spinules along inner margin. Endopodal lobe with row of spinules on anterior surface and with pore adjacent to row of spinules.

Left 5th leg (Figs. 4e, g, h, 6d, e, g, h) bearing coxa with small posterior process having strong sensilla, longer than sensilla on right margin. Basis pyriform, gradually narrowing distally, with prominent rounded posterior outgrowth at inner corner, possessing seta on outer margin; inner margin wrinkled on distal 1/2. Exopod 2-segmented; 1st segment elongate, with convex outer margin, inner margin with extensive semicircular outgrowth on anterior and posterior surfaces, both

confluent on middle line of inner margin and bearing both short and long setules (Fig. 6g). Second exopodal segment ending in distal process which is rounded but non-digitiform, with row of denticles on inner and distal margins; proximal process triangular inserted on turgescient anterior surface with inner toothed margin (Fig. 4h); inner margin projected forming cavity covered with setules, and with proximal semicircular outgrowth bearing long setules. Endopod 2-segmented, conical, with row of spinules along distal 1/2 of inner margin of 2nd segment.

Etymology: The name of the species is dedicated to the ancient inhabitants of Peru, where the type locality is situated.

DISCUSSION

The male of *Prionodiptomus incarum* differs from that of *P. colombiensis* in the form of the basipods of leg 5; the peculiar form of the 2nd segment of the left exopod and its distal and proximal processes; and by the shape of the modified setae of the right antennule. The female is differentiated by the shape of the genital double-somite and by the forked sensilla on the right wing of the 5th pedigerous somite.

Prionodiptomus incarum is morphologically closest to *P. colombiensis* in leg 5 of the male and female. In the male, the coxa has a short conical process, with strong sensilla at its tip; and the right 2nd exopodal segment possesses a large lateral spine with tubercles on the inner margin. The 1st segment of the left exopod is large and has an outer convex margin and an inner margin with an extensive semicircular process bearing setules.

Females of both species have a narrow and elongate leg 5 with the 2nd exopodal segment without lateral spine. Thiébaud (1912) and Gaviria (1989) describe the 2nd exopodal segment of *P. colombiensis* with a small lateral spine. Gutierrez and Morales Suarez (2000) they describe specimens of Mexico without this lateral spine. We

have observed this segment with no armature, so much in the Venezuelan specimens of *P. colombiensis* (not published data) like in the new species. In addition, the female of both species possesses a genital double-somite with a very conspicuous semicircular fold on the ventroposterior region.

Acknowledgments: We are grateful to Prof. Florisa Zambrano (Univ. Nacional Mayor de San Marcos, Peru) for sorting the copepod samples and for entrusting us with the data referring to the geographical area. Three anonymous reviewers are greatly appreciated for their efforts in improving this paper. The 1st author was supported by a grant from the Fondo de Investigación Univ. Pedagógica Libertador, and by grant PEM2001002151 from the Fondo Nacional de Investigaciones Científicas y Técnicas, Venezuela.

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