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Four New Species of the Genus *Panjakus* (Copepoda, Cyclopoida, Anchimolgidae) Associated with Scleractinian Corals (Cnidaria) from the Moluccas

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Abstract Four new species of the genus *Panjakus* (Copepoda, Cyclopoida, Anchimolgiae) are described as associates of scleractinian corals from the eastern Ceram, the Moluccas: *P. fastigatus* and *P. parvipes* from *Hydnophora microconos* (Lamarck), and *P. saccipes* and *P. iratus* from *Platygyra ryukyuensis* Yabe and Sugiyama. A key to 11 known species of *Panjakus* is provided.

Key words: *Panjakus*, association, Copepoda, Anchimolgidae, Scleractinia, Moluccas.

INTRODUCTION

The Moluccas is the geographical region located near the center of the Malay Archipelago. The late Dr. Arthur G. Humes made a trip to this region in July, 1975, to collect copepods associated with marine invertebrates. The results of his collecting trip have since been documented in various journals until his death in 1999. But he left a number of copepod specimens unexamined, including the copepods to be described in the following.

The genus *Panjakus* Humes and Stock, 1972, dealt with in this paper, consists of seven known species associated with the alcyonacean and scleractinian corals in the tropical seas. They are *A. auriculatus* Humes and Dojiri, 1979 known from the alcyonacean *Lobophytum crassum* Von Marenzeller from the Moluccas (Humes and Dojiri, 1979); *A. hydnophorae* and *A. platygyrae* both described by Humes and Stock (1973) from the scleractinians *Hydnophorae* spp. and *Platygyra* spp., respectively, from Madagascar; *A. directus* and *A. necopinus* both described by Humes (1995) from the scleractinian *Leptoria tenuis* (Dana) from New Caledonia; *A. eumeces* Humes, 1991, from the scleractinian *Hydnophora rigida* (Dana) from Australia (Humes, 1991); and *A. bidentis* Kim, 2004, from the scleractinian *Pocillopora verrucosa* (Ellis and Solander) from Australia (Kim, 2004).

In this paper four new species are added, two of them as associates of *Platygyra* and the remaining two as associates of *Hydnophora* from the Moluccas. All copepod specimens examined were collected by the late Arthur G. Humes in 1975, which were later transferred to the National Museum of Natural History, Smithsonian Institution. In the description of each species the source of specimens are followed from the Humes' collection note.

The copepod specimens were measured and dissected after soaking in lactic acid. The dissection was done using the reversed slide method. In the following descriptions, the body length does not include setae on the caudal rami. Roman and Arabic numerals represent spines and setae, respectively. All figures were drawn with the aid of a camera lucida.

DESCRIPTIONS

Order Cyclopoida Burmeister, 1834
Family Anchimolgidae Humes and Boxshall, 1996
Genus *Panjakus* Humes and Stock, 1972

Panjakus fastigatus n. sp.
(Figs. 1-3)

Material examined: Two ♀♀ collected from the scleractinian coral *Platygyra ryukyuensis* Yabe and Sugiyama, in 2 m, Parang Island, eastern Ceram (3° 17' 00" S, 130° 44' 48" E), collected by A. G. Humes, 23 May 1975. Holotype (♀, USNM 1081654) has been deposited in the National Museum of Natural History, Smithsonian Institution. Dissected paratype (♀) is kept in the collection of the author.

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Female. Body (Fig. 1A) distinctly tapering posteriorly. Body length of dissected specimen 1.40 mm. Prosome 760 μm long. Cephalothorax consisting of completely fused cephaosome and first pedigerous somite, 475 × 535 μm, distinctly wider than long, with rounded anterior and lateral margins. Urosome (Fig. 1B) 5-segmented. Fifth pedigerous somite 233 μm wide, with oblique lateral margins. Genital double-somite 205 × 220 μm, anteriorly expanded and posteriorly tapering; genital areas located dorsally near anterior 1/3 length of somite. Three abdominal somites 90 × 105, 65 × 85, and 88 × 78 μm, respectively. Caudal rami divergent, widely separated from each other; each ramus 138 × 22 μm (ratio 6.21 : 1), with 6 caudal setae, all these setae not exceeding half length of ramus.

Rostrum extending to anterior portion of labrum (Fig. 1D). Antennule (Fig. 1E) 353 μm long, slender, and 7-segmented, with armature formula 4, 13, 6, 3, 4 + 1 aesthetasc, 2 + 1 aesthetasc, and 7 + 1 aesthetasc; all setae naked. Antenna (Fig. 1F) 4-segmented; sizes of these segments (length measured along middle axis) 66 × 45, 100 × 39, 33 × 33, and 29 × 22 μm from proximal to distal; first and second segments with 1 small inner seta; third segment with 3 setae; fourth segment unarmed; terminal claw 42 μm long.

Labrum (Fig. 1G) with broadened posterior margin rimmed with membrane. Mandible (Fig. 1H) with deep proximal notch and distinctly bilobed and spinulated inner margin; convex outer margin with 1 small digitiform process; terminal lash thin and long, with crenulate margins. Maxillule (Fig. 2A) armed with 4 setae, one of them curved to medial direction. Outer process on maxilla (Fig. 2B) about twice as long as wide, its apex folded. Second segment of maxilla with 3 setae, inner one leaf-like, spinulated; terminal lash as usual as other species of same genus. Maxilliped (Fig. 2C) 3-segmented; inner setae on second segment unequal, 19 and 9 μm; third segment terminated by acute process bearing 3 denticles on both sides, with 2 small seta.

Legs 1-3 (Fig. 2D-F) with 3-segmented rami. Leg 4 (Fig. 2G) with 3-segmented exopod and 2-segmented endopod. Second endopodal segment of leg 4 75 × 19 μm, with parallel lateral margins and 2 slender terminal spines (each 28 and 20 μm long). All spines on leg 1-4 marginated by membranes rather than by spinules. Armature formula of legs 1-4 as follows:

Leg 1: coxa 0-1; basis 1-0; exp I-0; I-1; III,I,4; enp 0-1; 0-1; I,5

Leg 2: coxa 0-1; basis 1-0; exp I-0; I-1; III,I,5; enp 0-1; 0-2; I,II,3

Leg 3: coxa 0-1; basis 1-0; exp I-0; I-1; III,I,5; enp 0-1; 0-2; I,II,2

Leg 4: coxa 0-1; basis 1-0; exp I-0; I-1; II,I,5; enp 0-1; II.

Basal seta of leg 5 small (Fig. 1B); free segment (Fig. 2H) 83 × 18 μm (ratio 4.61 : 1), distally broadened and unornamented, with 2 terminal setae (each 43 and 34 μm). Leg 6 represented by 2 small setae in genital area (Fig. 2I).

Male: Unknown.

Etymology: The specific name *fastigatus* ("taper" in Latin) alludes to the distinctly tapering body of the species.

Remarks: Species of the genus *Panjakus* show variabilities in the setation of legs 3 and 4. *Panjakus fastigatus* n. sp. possesses four spines plus five setae (IV,5) on the third exopodal segment of leg 3 and three spines plus five setae (III,5) on the third exopodal segment of leg 4. Such combination of leg setation is revealed by three species, *P. directus* Humes, 1995, *P. platygyrae* Humes and Stock, 1973, and *P. bidentis* Kim, 2004. These three species differs from the new species as follows.

Panjakus directus has a narrow body, with dorsoventrally deep prosome. Its caudal rami is very slender, 12.4 times as long as wide, thus distinguished from all congeners.

Panjakus platygyrae posseses very small free segment of leg 5, only 22 μm long with the ratio length to width 1.57:1 (in contrast to 83 μm and the ratio 4.16 : 1 of *A. fastigatus*) in the female.

Panjakus bidentis has a larger body size (1.79 mm long in the female), two digitiform processes on the convex side of mandible (one in *P. fatigatus*), less expanded cephalothorax, and medially expanded free segment of female leg 5.

Panjakus parvipes n. sp.
(Figs. 3-5)

Material examined: Four ♀ ♀ and 3 ♂ ♂ collected from the scleractinian coral *Platygyra ryukyuensis* Yabe and Sugiyama, in 2 m, Parang Island, eastern Ceram (3° 17' 00" S, 130° 44' 48" E), collected by A. G. Humes, 23 May 1975. Holotype (♀, USNM 1081651), allotype (♂, USNM 1081652), and paratypes (2 ♀ ♀ and 1 ♂, USNM 1081653) have been deposited in the National Museum of Natural History, Smithsonian Institution. Dissected paratypes (1 ♀ and 1 ♂) are kept in the collection of the author.

Female: Body (Fig. 3A) similar to preceding species, tapering posteriorly. Body length of dissected specimen 1.45 mm (other 3 specimens 1.48, 1.50, and 1.52 mm). Prosome 800 μm long. Cephalothorax 550 × 520 μm. Epimera of fourth pedigerous somite directed backward. Urosome (Fig. 3B) 5-segmented. Fifth pedigerous somite 195 μm wide. Genital double-somite 217 × 212 μm, anteriorly expanded and posteriorly tapering. Genital areas located dorsally. Three abdominal somites 87 × 90, 63 × 73, and 90 × 65 μm, respectively. Caudal ramus 143 × 22 μm (ratio 6.50 : 1); largest one of 6 caudal setae 100 μm long.

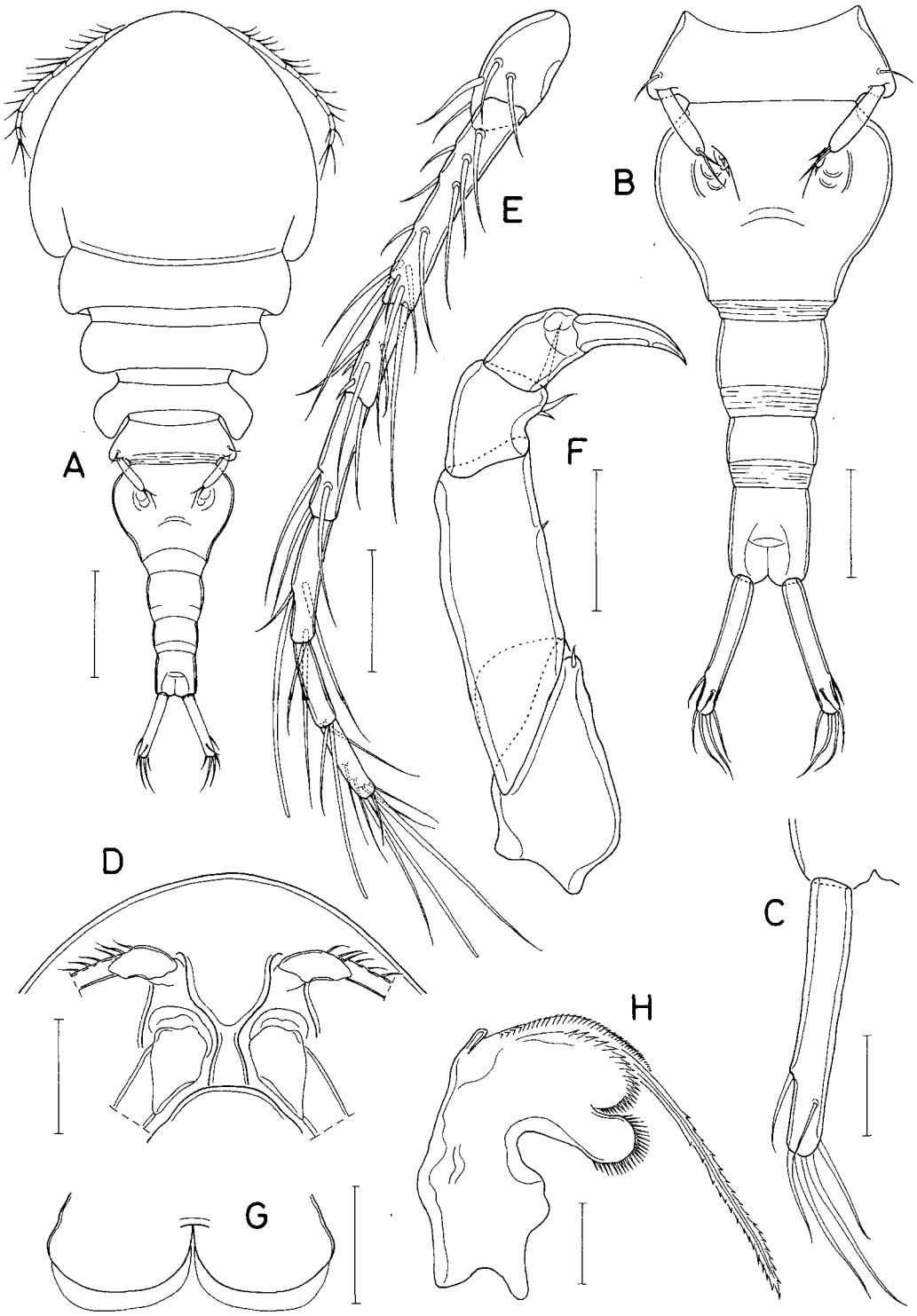

Fig. 1. *Panjakus fastigatus* n. sp., female. A, Habitus, dorsal. B, Urosome, dorsal. C, Left caudal ramus, dorsal. D, Rostral area, ventral. E, Antennule. F, Antenna. G, Labrum. H, Mandible. Scale bars = 0.2 mm (A), 0.1 mm (B, D), 0.05 mm (C, E-G) and 0.02 mm (H).

Rostrum continuing to labrum by ridge (Fig. 3D). Antennule (Fig. 3E) slender, 386 μm long, and 7-segmented, with armature formula 4, 13, 6, 3, 4 + 1 aesthetasc, 2 + 1 aesthetasc, and 7 + 1 aesthetasc. Antenna (Fig. 3F) 4-segmented, with 1 terminal claw. First segment 83 × 54 μm (length measured along middle axis), with 1 small inner distal seta. Second segment 95 × 42, with 1 inner seta. Third segment 33 × 33 μm, with 3 inner setae. Fourth

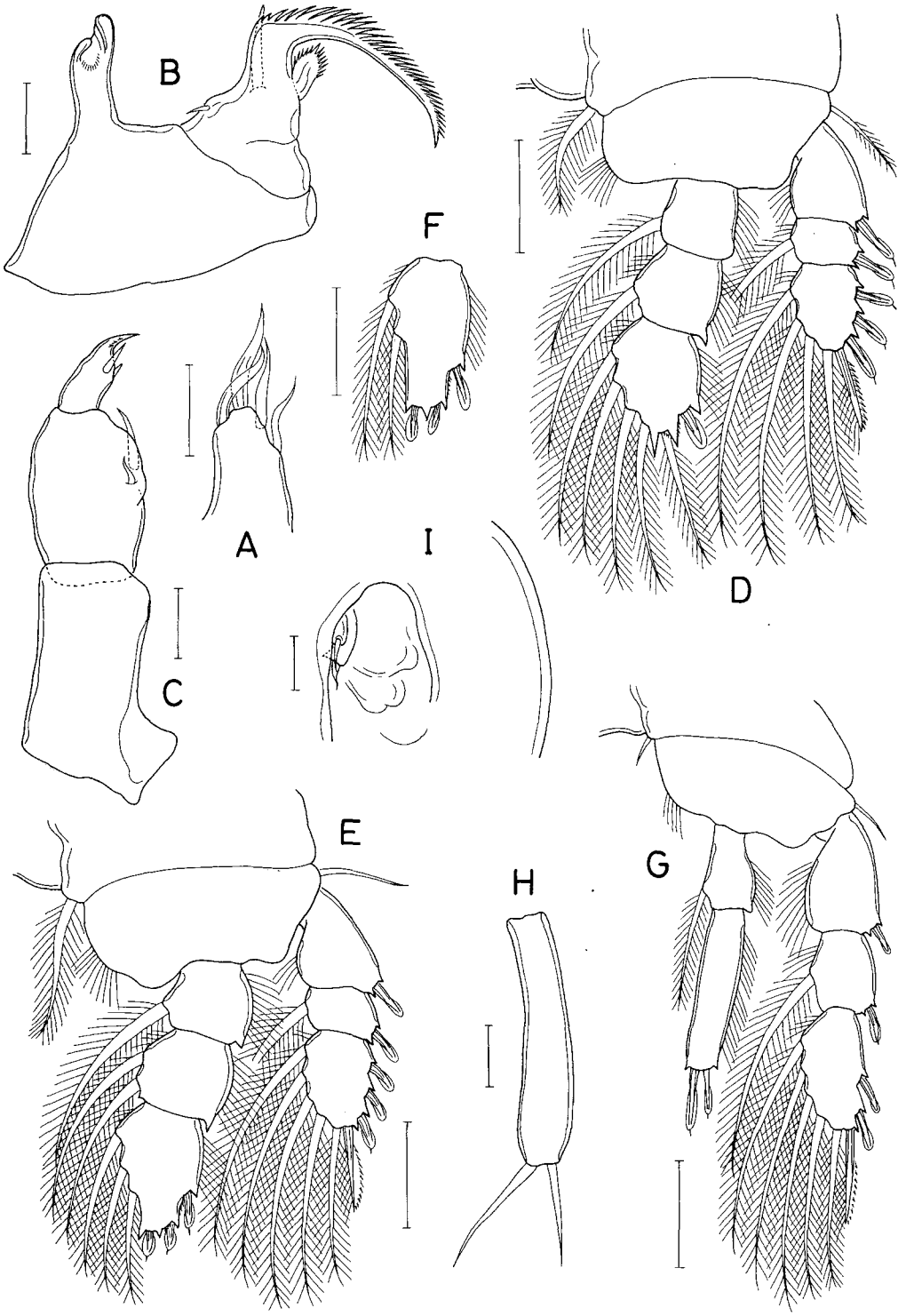

Fig. 2. *Panjakus fastigatus* n. sp., female. A, Maxillule. B, Maxilla. C, Maxilliped. D, Leg 1. E, Leg 2. F, Third endopodal segment of leg 3. G, Leg 4. H, Free segment of leg 5. I, Right genital area. Scale bars = 0.02 mm (A-C, H, I) and 0.05 mm (D-G).

segment unarmed, 33 × 25 μm. Terminal claw 39 μm long.

Labrum (Fig. 3G) with broad membrane along posterior margin. Mandible (Fig. 3H) with deep proximal notch. Inner margin distinctly bilobed, each lobe densely spinulated; proximal lobe distinctly protruded. Outer convex area slightly projected with 1 digitiform process followed by 2 small spinules. Terminal lash slender and long, both margins serrate. Maxillule (Fig. 3I) armed with 4 relatively

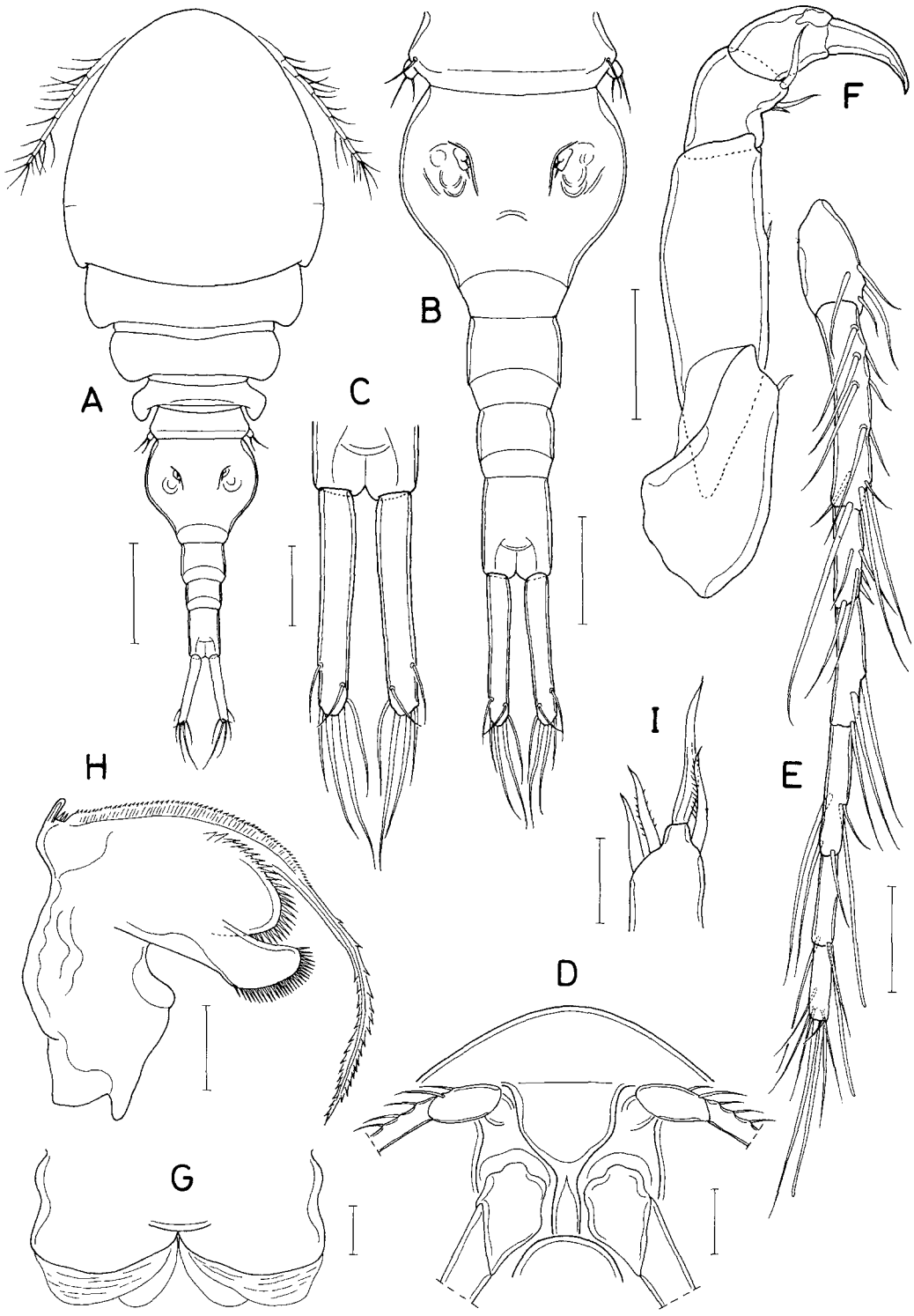

Fig. 3. *Panjakus parvipes* n. sp., female. A, Habitus, dorsal. B, Urosome, dorsal. C, Caudal rami, dorsal. D, Rostral area, ventral. E, Antennule. F, Antenna. G, Labrum. H, Mandible. I, Maxillule. Scale bars = 0.2 mm (A), 0.1 mm (B), 0.05 mm (C-F) and 0.02 mm (G-I).

thick setae. Maxilla (Fig. 4A) with large outer process, this process about 3 times as long as wide, slightly curved. Second segment armed with small outer proximal seta, leaf-like, broad and spinulated inner seta, and unornamented anterior seta. Terminal lash strongly curved proximally, with row of dense spinules along outer convex margin. Maxilliped (Fig. 4B) 3-segmented. Inner 2 setae on second segment 15 and 9 μm. Third segment terminated by curved

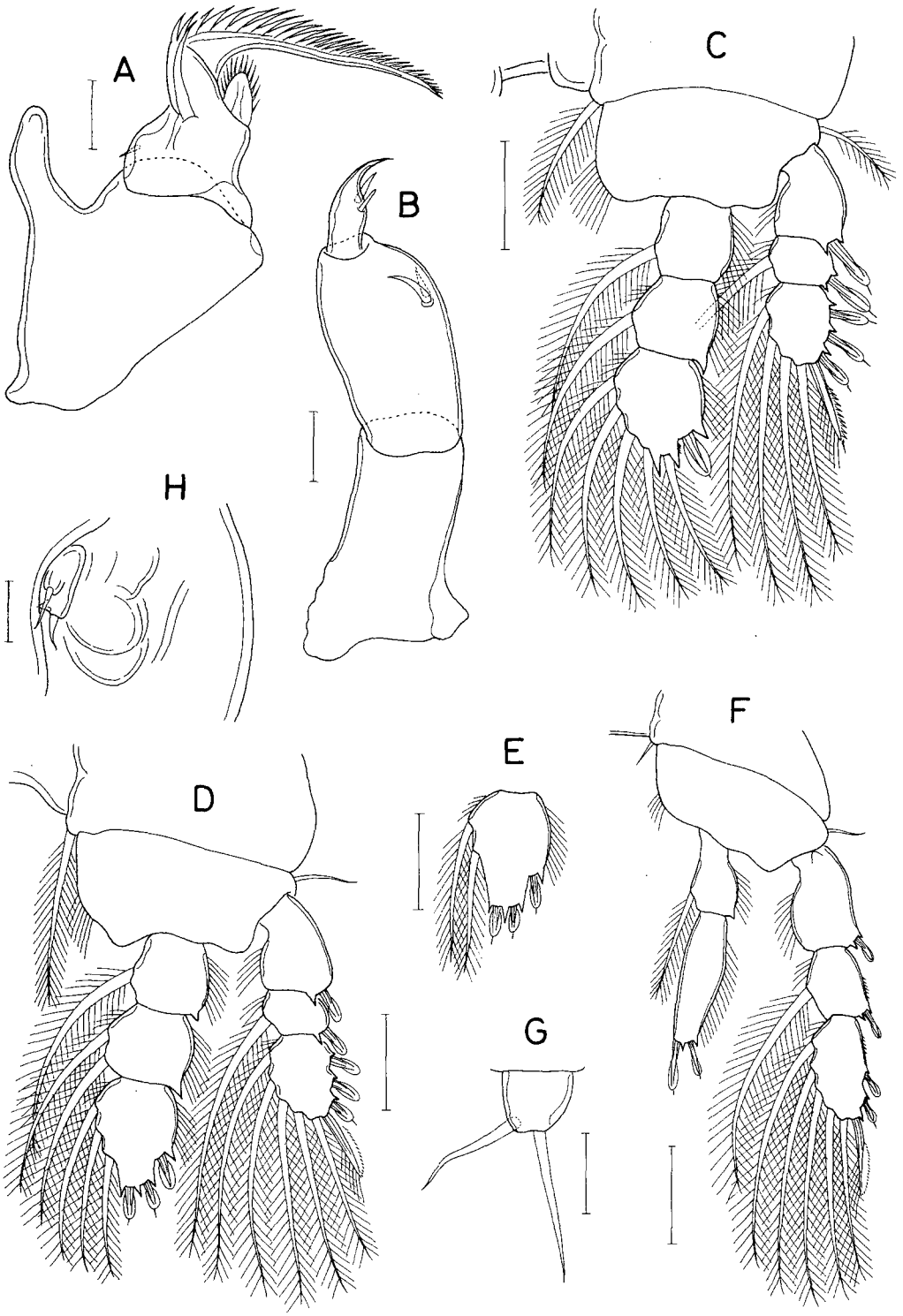

Fig. 4. *Panjakus parvipes* n. sp., female. A, Maxilla. B, Maxilliped. C, Leg 1. D, Leg 2. E, Third endopodal segment of leg 3. F, Leg 4. G, Free segment of leg 5. H, Right genital area. Scale bars = 0.02 mm (A, B, G, H) and 0.05 mm (C-F).

acute process, with 2 setae.

Legs 1-3 (Fig. 4C-E) with 3-segmented exopod and endopod. Leg 4 (Fig. 4F) with 3-segmented exopod and 2-segmented endopod. Armature formula of legs 1-4 as follows:

Leg 1: coxa 0-1; basis 1-0; exp I-0; I-1; III,I,4; enp 0-1; 0-1; I,5

Leg 2: coxa 0-1; basis 1-0; exp I-0; I-1; III,I,5; enp 0-1;

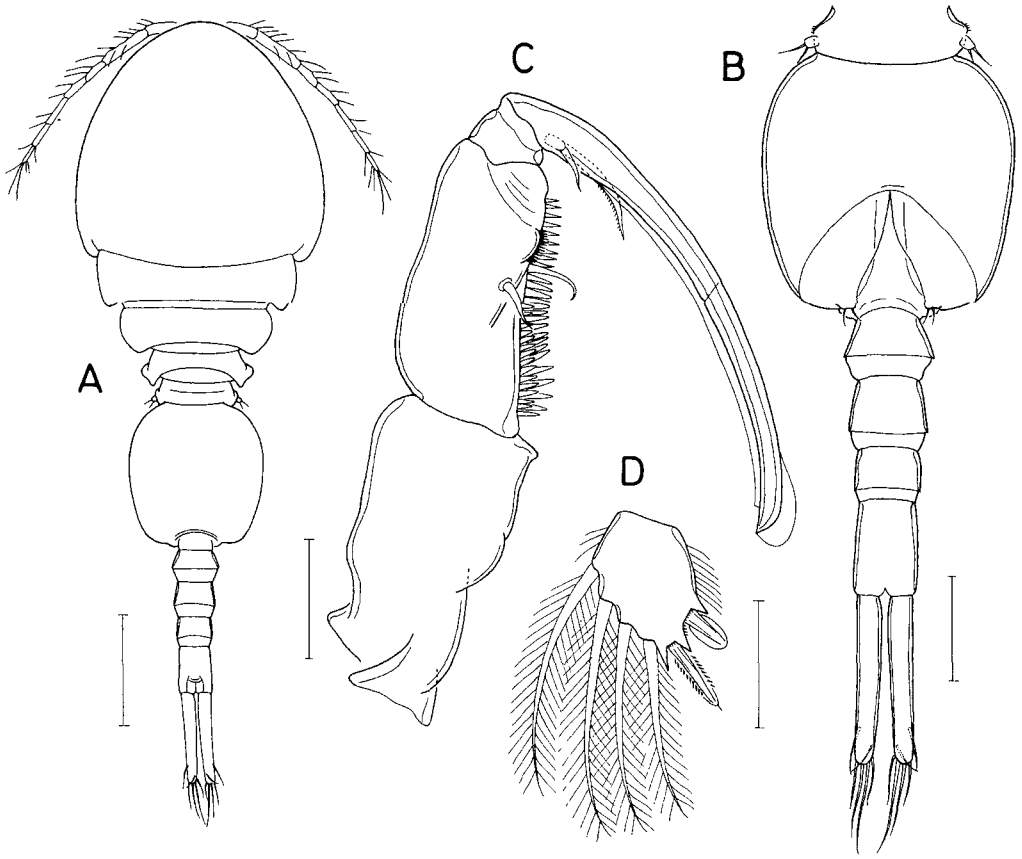

Fig. 5. *Panjakus parvipes* n. sp., male. A, Habitus, dorsal. B, Urosome, ventral. C, Maxilliped. D, Third endopodal segment of leg 1. Scale bars = 0.2 mm (A), 0.1 mm (B) and 0.05 mm (C, D).

0-2; I,II,3

Leg 3: coxa 0-1; basis 1-0; exp I-0; I-1; III,I,5; enp 0-1; 0-2; I,II,2

Leg 4: coxa 0-1; basis 1-0; exp I-0; I-1; II,I,5; enp 0-1; II.

Second endopodal segment of leg 4 70 × 22 μm; two terminal spines small, 23 and 17 μm respectively. Free segment of leg 5 (Fig. 4G) characteristically small, wider than long, 15 × 17 μm; two terminal setae naked, 38 and 31 μm long, respectively. Leg 6 represented by 2 small setae in genital area (Fig. 4H).

Male: Body (Fig. 5A) similar to that of female. Body length of dissected specimen 1.39 mm. Prosome 658 μm long. Cephalothorax 437 × 446 μm. Urosome (Fig. 5B) 6-segmented. Fifth pedigerous somite 145 μm wide. Genital somite 250 × 235 μm, with rounded anterior and posterior corners. Four abdomianl somites 55 × 85, 65 × 75, 50 × 63, and 88 × 60 μm, respectively. Caudal ramus 162 × 24 μm (ratio 6.75 : 1); largest one of 6 caudal setae 88 μm long.

Rostrum, antenna, mandible, maxillule, and maxilla as in female. Antennule added by 3 aesthetascs, 2 on second and 1 on fouth segments. Maxilliped (Fig. 5C) consisting of 3 segments and terminal claw. First segment gradually broadened distally, with angular inner distal corner. Second segment with 2 similar inner setae, 1 small pecten, and 2 rows of spinules on inner margin. Small third segment unarmed. Terminal claw 211 μm long, weakly curved, proximally with 2 unequal setae.

Third endopodal segment of leg 1 (Fig. 5D) with 2 spines and 4 setae (II,4). Legs 2-4 as in female. Free segment of leg 5 very small as in female. Leg 6 represented by 2 small setae on posterior portion of genital flap.

Etymology: The name *parvipes* is derived from the Latin *parvus* (= small) and *pes* (= foot). It alludes to the small leg 5.

Remarks: *Panjakus parvipes* n. sp. may be distinguished from all congeners by an outstanding feature, i.e., the small free segment of leg 5 which is shorter than wide. The smallest record of the free segment in the genus is for *P. platygyrae* where the ratio of length to width is 1.57 : 1, a figure different from 0.88 : 1 of *P. parvipes*.

Panjakus saccipes n. sp.
(Figs. 6, 7)

Material examined. Two ♀ ♀ collected from the scleractinian

coral *Hydnophora microconos* (Lamarck), in 2 m, Parang Island, eastern Ceram (3° 17' 00" S, 130° 44' 48" E), collected by A. G. Humes, 23 May 1975. Holotype (♀, USNM 1081650) has been deposited in the National Museum of Natural History, Smithsonian Institution. Dissected paratype (♀) is kept in the collection of the author.

Female: Body (Fig. 6A) moderately broad. Body length of dissected specimen 1.55 mm. Maximum width 500 μm. Prosome 805 μm long. Cephalothorax as long as wide, divided into cephalosome and first pedigerous somite by faint dorsal suture line. Urosome (Fig. 6B) tapering, 6-segmented. Genital double-somite 185 × 233 μm, anteriorly expanded and posteriorly tapering; genital areas located dorsally. Three abdominal somites 105 × 125, 95 × 110, and 80 × 97 μm, respectively. Caudal ramus slightly tapering, 180 × 42 μm (ratio 4.29 : 1); terminal one of 6 caudal setae distinctly longer than other 5 setae, longer than caudal ramus, 247 μm long.

Rostrum as in Fig. 6C. Antennule 7-segmented, with armature formula 4, 13, 6, 3, 4 + 1 aesthetasc, 2 + 1 aesthetasc, and 7 + 1 aesthetasc. Antenna (Fig. 6E) 4-segmented; each segment 62 × 54, 118 × 41, 35 × 29, and 35 × 22 μm respectively (lengths measured along middle axis) from proximal to distal; first and second segments with 1 small inner seta; third segment with 3 inner setae; fourth segment unarmed. Terminal claw 38 μm long.

Labrum as Fig. 6F. Mandible (Fig. 6G) with distinct proximal notch. Inner margin distinctly bilobed; proximal lobe projected. Outer covex margin with 1 distinct digitiform process. Terminal lash very thin. Maxillule (Fig. 7A) armed with 1 subterminal seta and 3 broad terminal setae. Maxilla (Fig 7B) with thick, straight outer process on first segment, this process about twice as long as wide. Second segment with 3 setae, inner one leaf-like. Terminal lash curved proximally, with row of spinules along outer margin. Maxilliped (Fig. 7C) 3-segmented. Second segment slightly expanded, with 2 very unequal setae, each 27 and 4 μm long. Third segment with spine, small seta, and spiniform terminal process.

Legs 1-3 (Fig. 7D-F) with 3-segmented exopod and endopod. Leg 4 (Fig. 7G) with 3-segmented exopod and 2-segmented endopod. Outer seta on basis of legs 1-4 naked and relatively small. Second endopodal segment of leg 4 80 × 25 μm (ratio 3.20 : 1), its 2 terminal spine 89 and 39 μm. Armature formula of legs 1-4 as follows.

Leg 1: coxa 0-1; basis 1-0; exp I-0; I-1; III,I,4; enp 0-1; 0-1; I,5

Leg 2: coxa 0-1; basis 1-0; exp I-0; I-1; III,I,5; enp 0-1; 0-2; I,II,3

Leg 3: coxa 0-1; basis 1-0; exp I-0; I-1; III,I,5; enp 0-1; 0-2; I,II,2

Leg 4: coxa 0-1; basis 1-0; exp I-0; I-1; III,I,5; enp 0-1; II.

Free segment of leg 5 (Fig. 7H) distinctly expanded distally, sack-like, 150 × 86 μm (ratio 1.74 : 1), its 2 terminal setae 56 and 39 μm long. Leg 6 represented by 2 spiniform setae in genital area (Fig. 7I).

Male: Unknown.

Etymology: The specific name *saccipes*, a combination of the Latin *saccus* (= sack) and *pes* (= foot), alludes to the sack-like free segment of female leg 5.

Remarks: Two congeners, *Panjakus eumeces* Humes, 1991 and *P. hydnophorae* Humes and Stock, 1973, share with *P. saccipes* n. sp. the identical setations of legs 3 and 4, that is, four spines plus five setae (III,I,5) on the third exopodal segment of legs 3 and 4. All of these three species are the associates of the coral genus *Hydnophora*. *Panjakus saccipes* can be distinguished from the two congeners by the following features of the latters.

Panjakus eumeces: the terminal setae on the maxillule is not expanded (according to the illustration in the original description); the process on the first segment of maxilla is wider than long; the free segment of female leg 5 is not so expanded, with the ratio of length to width 3.25 : 1; and the caudal ramus is more slender, 5.79 times as long as wide.

Panjakus hydnophorae: the caudal ramus is distinctly longer, more than 210 μm, with the ratio 8.58 : 1; the free segment of female leg 5 is not so expanded as much as in *P. saccipes*.

Panjakus iratus n. sp.
(Figs. 8-10)

Material examined: Seven ♀♀ and 5 ♂♂ collected from the scleractinian coral *Hydnophora microconos* (Lamarck), in 2 m, Parang Island, eastern Ceram (3° 17' 00" S, 130° 44' 48" E), collected by A. G. Humes, 23 May 1975. Holotype (♀, USNM 1081647), allotype (♂, USNM 1081648), and paratypes (5 ♀♀ and 3 ♂♂, USNM 1081649) have been deposited in the National Museum of Natural History, Smithsonian Institution. Dissected paratypes (1 ♀ and 1 ♂) are kept in the collection of the author.

Female: Body (Fig. 8A) moderately broad. Body length 1.29 mm (1.22-1.38 mm), based on 6 specimens. Maximum width 440 μm. Prosome 700 μm long. Cephalothorax slightly longer than wide, divided by faint dorsal suture line into cephalosome and first pedigerous somite. Urosome (Fig. 8B) tapering and 5-segmented. Genital double-somite 154 × 194 μm, anteriorly expanded and posteriorly tapering; genital areas located dorsally. Three abdominal somites 85 × 104, 73 × 92, and 81 × 81 μm, respectively. Caudal ramus 156 × 31 μm (ratio 5.03 : 1); largest one of 6 caudal setae 281 μm long, distinctly longer than caudal ramus.

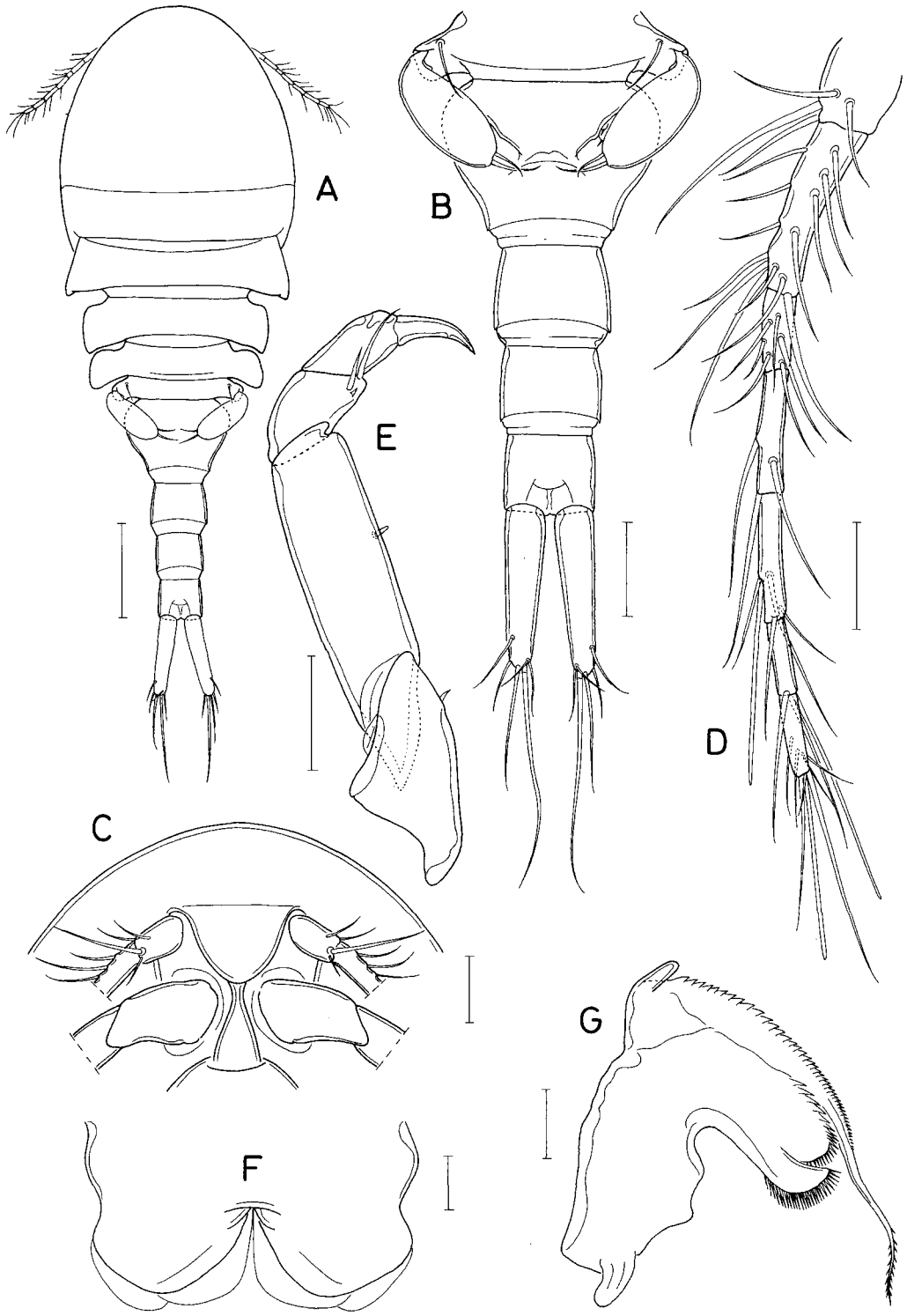

Fig. 6. *Panjakus saccipes* n. sp., female. A, Habitus, dorsal. B, Urosome, dorsal. C, Rostral area, ventral. D, Antennule. E, Antenna. F, Labrum. G, Mandible. Scale bars = 0.2 mm (A), 0.1 mm (B), 0.05 mm (C-E) and 0.02 mm (F, G).

Rostrum as in Fig. 8D. Antennule (Fig. 8E) slender, 300 μm long, 7-segmented, with armature formula 4, 13, 6, 3, 4 + 1 aesthetasc, 2 + 1 aesthetasc, and 7 + 1 aesthetasc; setae relatively long. Antenna (Fig. 8F) 4-segmented. Length of segments 58 × 46, 100 × 35, 30 × 25, and 29 × 18 μm from proximal to distal (measured along median axis). First 2 segment each with small inner seta. Third segment with 3 setae, proximal of them minute. Fourth

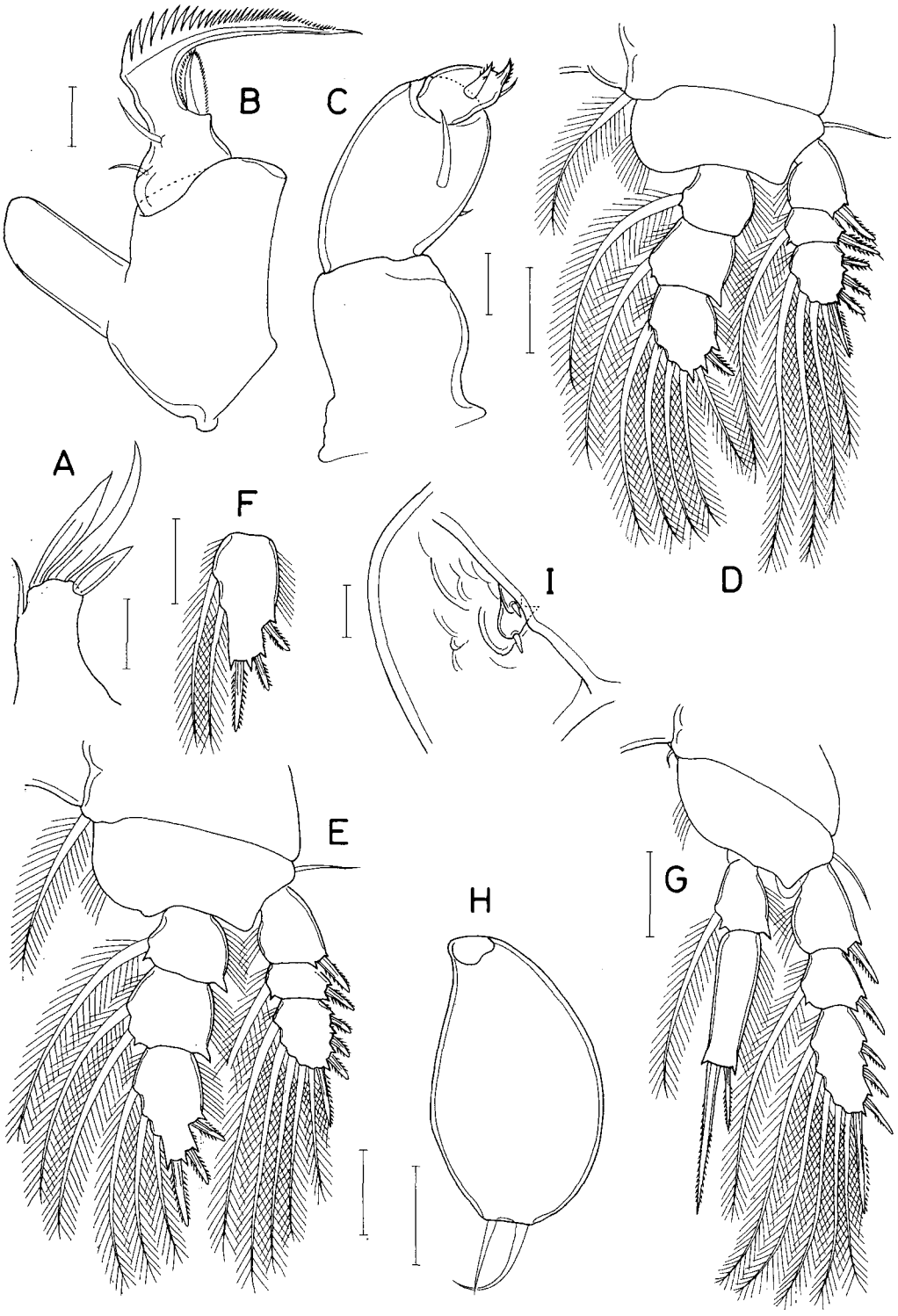

Fig. 7. *Panjakus saccipes* n. sp., female. A, Maxillule. B, Maxilla. C, Maxilliped. D, Leg 1. E, Leg 2. F, Third endopodal segment of leg 3. G, Leg 4. H, Free segment of leg 5. I, Left genital area. Scale bars = 0.02 mm (A-C, I) and 0.05 mm (D-H).

segment unarmed. Terminal claw 33 μm long.

Labrum as Fig. 8G. Mandible (Fig. 8H) identical to that of preceding species. Maxillule (Fig. 8I) with 1 subterminal seta, 2 smaller and 1 larger terminal setae. Maxilla (Fig. 9A) with large, slightly curved outer process on first segment, this process about 2.5 times as long as wide and distally tapering. Second segment of Maxilliped (Fig. 9B) slightly expanded in middle, with 2 very unequal setae

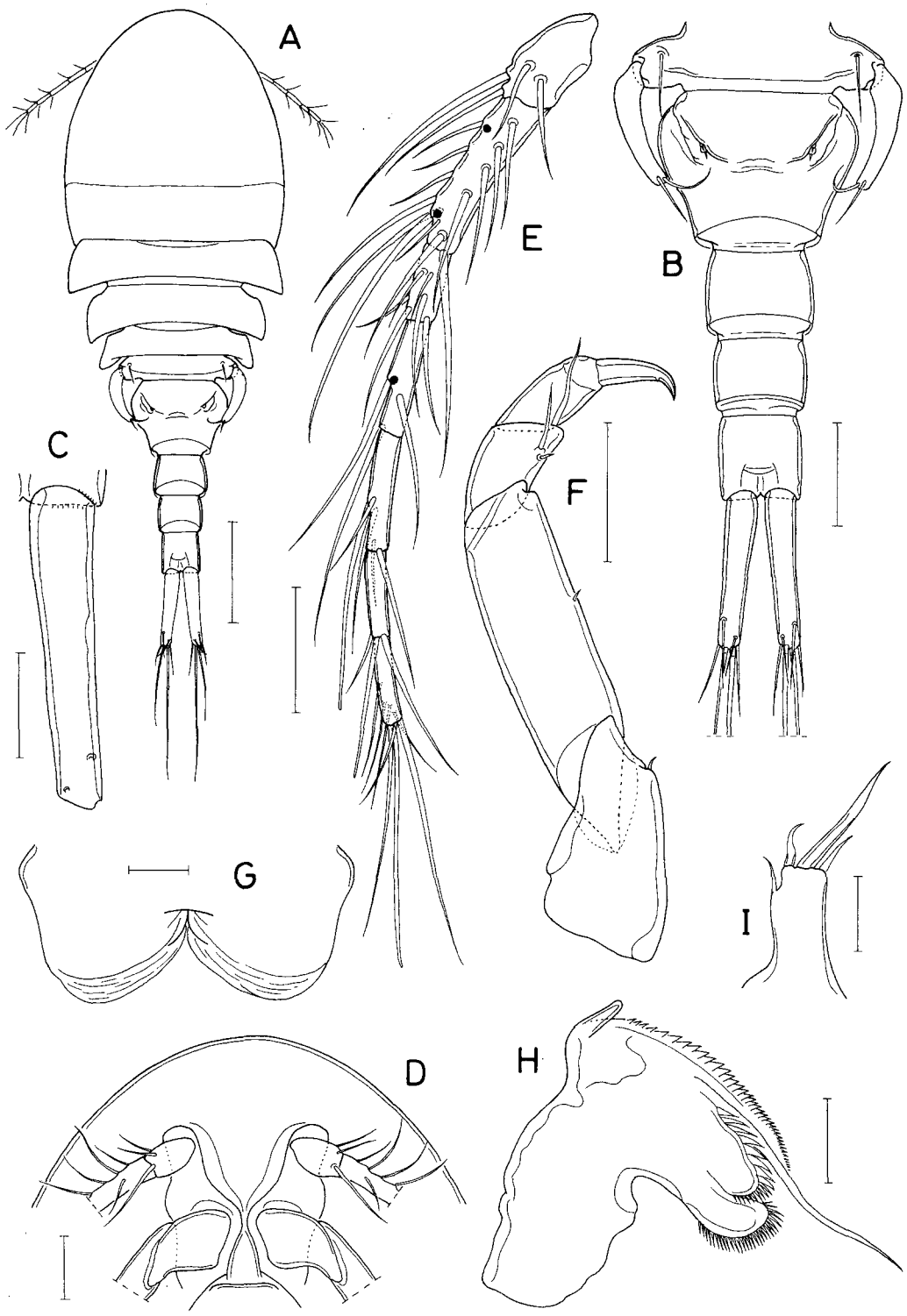

Fig. 8. *Panjakus iratus* n. sp., female. A, Habitus, dorsal. B, Urosome, dorsal. C, Right caudal ramus, dorsal. D, Rostral area, ventral. E, Antennule. F, Antenna. G, Labrum. H, Mandible. I, Maxillule. Scale bars = 0.2 mm (A), 0.1 mm (B), 0.05 mm (C-F) and 0.02 mm (G-I).

measured 19 and 5 μm, respectively. Third segment tapering, with 1 spine and 1 seta, and terminated by tapering process bearing 3 spinules on both sides.

Legs 1-3 (Fig. 9C-E) with 3-segmented exopod and endopod. Leg 4 (Fig. 9F) with 3-segmented exopod and 2-segmented endopod. Outer seta on basis of these legs naked and relatively small. Second endopodal segment of leg 4 55 × 22 μm; its 2 terminal spines very unequal in length, 66

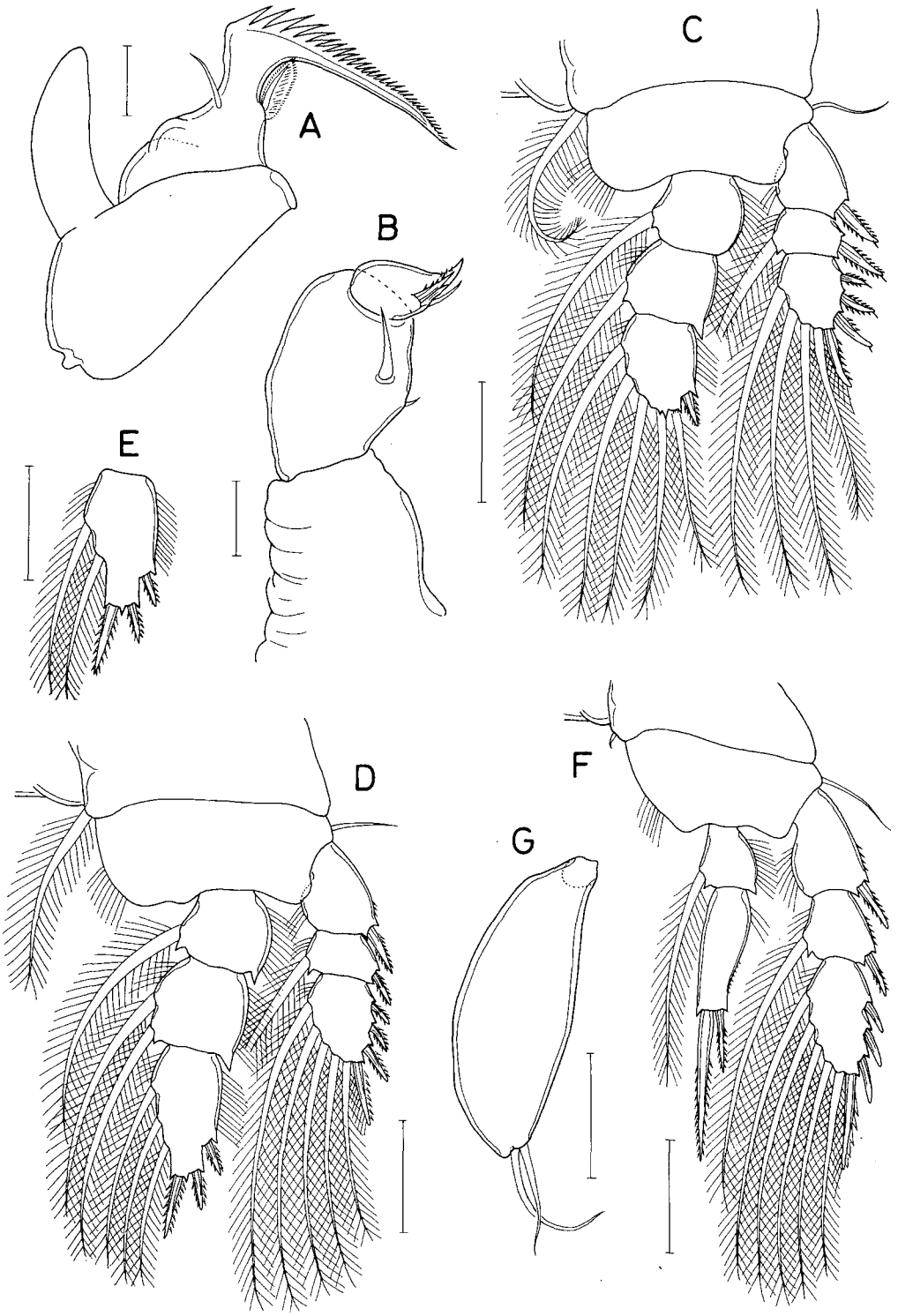

Fig. 9. *Panjakus iratus* n. sp., female. A, Maxilla. B, Maxilliped. C, Leg 1. D, Leg 2. E, Third endopodal segment of leg 3. F, Leg 4. G, Free segment of leg 5. Scale bars = 0.02 mm (A, B) and 0.05 mm (C-F).

and 29 μm, both spines with spinules. Armature formula of legs 1-4 as follows.

Leg 1: coxa 0-1; basis 1-0; exp I-0; I-1; III,I,4; enp 0-1; 0-1; I,5

Leg 2: coxa 0-1; basis 1-0; exp I-0; I-1; III,I,5; enp 0-1; 0-2; I,II,3

Leg 3: coxa 0-1; basis 1-0; exp I-0; I-1; III,I,5; enp 0-1; 0-2; I,II,2

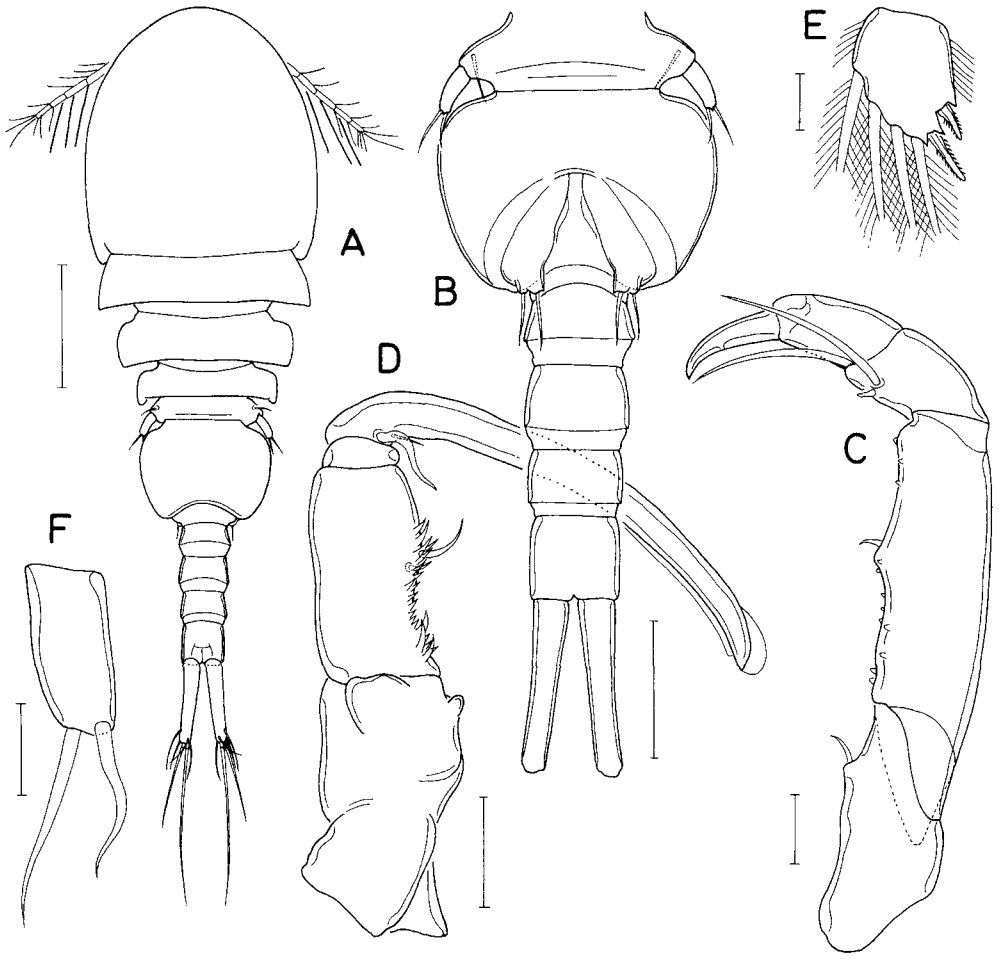

Fig. 10. *Panjakus irtus* n. sp., male. A, Habitus, dorsal. B, Urosome, ventral. C, Antenna. D, Maxilliped. E, Third endopodal segment of leg 1. F, Free segment of leg 5. Scale bars = 0.2 mm (A), 0.1 mm (B), 0.02 mm (C, E, F) and 0.05 mm (D).

Leg 4: coxa 0-1; basis 1-0; exp I-0; I-1; III,I,5; enp 0-1; II.

Free segment of leg 5 (Fig. 9G) spindle-shaped. 125 × 47 μm (ratio 2.66 : 1); its 2 terminal setae 56 and 46 μm long. Leg 6 represented by 2 small spiniform setae in genital area.

Male: Body (Fig. 10A) similar to that of female. Body length 1.15 mm (1.12-1.18 mm) based on 5 specimens. Maximum width 363 μm. Cephalothorax 392 μm long, without dorsal suture line delimiting cephalosome and first pedigerous somite. Urosome (Fig. 10B) 6-segmented. Genital somite 150 × 206 μm, distinctly wider than long, wider than fifth pedigerous somite, slightly narrowed posteriorly. Four abdominal somites 48 × 83, 62 × 77, 48 × 71, and 60 × 66 μm, respectively. Caudal ramus 131 × 27 μm (ratio 4.85 : 1), slightly tapering.

Rostrum, labrum, mandible, maxillule, and maxilla as in female. Antennule added by 3 aesthetascs (at dots in Fig. 8E). Second segment of antenna (Fig. 10C) with slight projection at middle of inner margin near base of seta and granular spinules on inner margin. Maxilliped (Fig. 10D) with small lobular process near inner distal corner. Second segment with 2 setae (one of them small) and spinules of irregular sizes. Terminal claw 217 μm long, proximally with seta and setule.

Third endopodal segment of leg 1 (Fig. 10E) armed with 2 spines and 4 setae (II,4). Legs 2-4 identical to those of female. Free segment of leg 5 (Fig. 10F) 37 × 17 μm, its 2 terminal setae 47 and 37 μm long. Leg 6 represented by 2 similar setae on posterior portion of genital flap.

Etymology: The name *iratus* is a Latin meaning "angry". It alludes to the cat-eyed appearance of the female genital double-somite.

Remarks: *Panjakus iratus* n. sp. has setation of legs 3 and 4 identidcal to that of *P. eumeces*, *P. hydnophorae*, and *P. saccipes*. With a smaller body size (1.22-1.38 mm long), *P. iratus* differs from the three relatives (at least 1.55 mm long). Other ways to distinguish *P. iratus* from the three

species are as follows.

Panjakus iratus differs from *P. eumeces* in having the maxilla in which the outer process on the first segment is more larger and the proximal two abdominal somites each of which is wider than long; from *A. hydnophorae* by having the caudal rami where the ratio of the length to width is smaller, the free segment of male leg 5 which is distinctly broader, the smaller basal seta of female leg 5, and the third segment of antenna in which the inner setae are distinctly more larger; and from *P. saccipes* by the less expanded free segment of female leg 5, the slender terminal setae on maxillule, and the narrower caudal rami.

A key to species of the genus *Panjakus*

1. Leg 3 with third exopodal segment armed with 3 spines and 5 setae (II,I,5) ----------2
- Leg 3 with third exopodal segment armed with 4 spines and 5 setae (III,I,5) ---------- 3
2. Caudal ramus more than 4 times as long as wide; mandible with 1 digitiform process on convex side ---------- *P. necopinus*
- Caudal ramus less than 1.5 times as long as wide; mandible without digitiform process on convex side ---------- *P. auriculatus*
3. Leg 4 with third exopodal segment armed with 4 spines and 5 setae (III,I,5) ---------- 4
- Leg 4 with third exopodal segment armed with 3 spines and 5 setae (II,I,5) ---------- 7
4. Free segment of female leg 5 expanded, less than twice as long as wide ---------- *P. saccipes* n. sp.
- Free segment of female leg 5 not expanded, more than 2.5 times as long as wide ---------- 5
5. Process on first segment of maxilla shorter than wide; first two abdominal somites each longer than wide ---------- *P. eumeces*
- Process on first segment of maxilla longer than wide; first two abdominal somites each shorter than wide --- 6
6. Caudal ramus about 5 times as long as wide; basal seta on female leg 5 not extending over middle of free segment ---------- *P. iratus* n. sp.
- Caudal ramus more than 8 times as long as wide; basal seta of female leg 5 extending over middle of free segment ---------- *P. hydnophorae*
7. Caudal ramus about 12 times as long as wide ---------- *P. directus*
- Caudal ramus less than 8 times as long as wide --------- 8
8. Free segment of female leg 5 very small, not extending to genital area ---------- 9
- Free segment of female leg 5 extending to genital area -- ---------- 10
9. Free segment of female leg 5 longer than wide ---------- *P. platygyrae*
- Free segment of female leg 5 shorter than wide ---------- *P. parvipes* n. sp.
10. Free segment of female leg 5 distally broadened; cepahothorax wider than long --------- *P. fastigatus* n. sp.
- Free segment of female leg 5 distally narrowed; cephalothorax longer than wide ---------- *P. bidentis*

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