

Larval Development of *Latreutes acicularis* Ortmann (Crustacea: Decapoda: Hippolytidae) Reared in the Laboratory

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Abstract: Eight zoeal stages and one decapodid of the hippolytid shrimp *Latreutes acicularis* Ortmann, 1890 are described from laboratory-reared material hatched from egg from ovigerous females collected from Shimoda, Japan. The presence of a minute dorsomedian protuberance on the third abdominal somite, the spinules on the dorsal margin of the fourth and fifth abdominal somites, and a pair of dorsolateral spines on the fourth and fifth abdominal somites readily distinguish the larvae of *L. acicularis* from those of *L. anoplonyx* Kemp, 1914 and *L. laminirostris* Ortmann, 1890, the other two known larvae of *Latreutes* from East Asia.

Key words: Larval development, *Latreutes acicularis*, Hippolytidae, Decapoda, Crustacea

Latreutes acicularis Ortmann, 1890 is known to occur from Hakodate, Honshu to the Amakusa Islands, Kyushu in Japan and southern part of Korea including Jeju Island (Yang and Kim, 2004). This shrimp is an important food for the fishes in eelgrass bed (Yasuda, 1957).

Of the four *Latreutes* species (*L. acicularis*, *L. anoplonyx* Kemp, 1914, *L. laminirostris* Ortmann, 1890, and *L. mucronatus* (Stimpson, 1860)) reported from Korea (Yang and Kim, 2004), three are known for larval description: *L. anoplonyx*, complete larval development reported by Yang (2005); *L. laminirostris*, complete larval development by Kim and Hong (1999) and first zoea by Yang and Park (2004); and *L. mucronatus*, possible sixth zoea by Gurney (1937) (see Kim and Hong, 1999). Among them, larva of *L. mucronatus* is known from Great Barrier Reef (Gurney, 1937), while those of *L. anoplonyx* and *L. laminirostris* are

reported from East Asia (Kim and Hong, 1999; Yang and Park, 2004; Yang, 2005).

In the present study, the eight zoeal stages and one decapodid of *L. acicularis* are described. The first zoea of *L. acicularis* is compared with those of *L. anoplonyx* and *L. laminirostris*, the other two known larvae of *Latreutes* from East Asia.

MATERIALS AND METHODS

On 19 May 2003, ovigerous females of *Latreutes acicularis* were collected from *Zostera* belt off Shimoda, Japan. They were transported to the Laboratory of Invertebrate Biology, Department of Applied Aquabiology, National Fisheries University, Shimonoseki, Japan, and subsequently kept in a plastic trough containing natural seawater. On 23 May 2003, one female released more than 200 first larvae. Two hundred larvae were reared individually at constant water temperature of 25°C, using methods described by Yang and Ko (2004). They were fed daily with freshly hatched *Artemia* nauplii. Larvae of each developmental stage were fixed and preserved in 7% neutral Formalin. Dissected appendages were examined using a microscope. Drawings were made with the aid of a camera lucida. Measurements and setal counts on appendages were based on ten specimens for each stage. Setal armature on appendage was described from proximal to distal segments. Body length (BL) and carapace length (CL) were measured from postorbital margin to the telson, excluding posterior setae, and from postorbital margin to posteromedian border of the carapace, respectively. The chromatophore pattern was determined by observing living larvae. The first zoeal stage is described in detail. Only the main differences from the previous stages are provided for the subsequent stages.

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RESULTS

Eight zoeal stages and one decapodid were obtained.

First Zoea (Fig. 1)

Duration. 3-5 days.

Size. BL. 1.30 (1.29-1.32) mm; CL. 0.31 (0.29-0.34) mm.

Carapace (Fig. 1A, B). Rostrum simple, tapering terminally, not reaching antennule; supraorbital and antennal spines absent; anterior and posterior dorsomedian papillae present; ventral margin of carapace with anterior, middle, and posterior denticles; eyes sessile, with dorsal papillae.

Antennule (Fig. 1C). Peduncle with long plumose seta; inner flagellum not differentiated; outer flagellum with 3 aesthetascs, simple seta, and short plumose seta.

Antenna (Fig. 1D). Peduncle without distolateral spine; endopod shorter than scale, with simple seta, distal half with 2 rows of denticles; scale 2-segmented, with 11 plumose setae and distolateral tooth.

Mandibles (Fig. 1E). Palps absent; left mandible with *lacinia mobilis* at base of incisor area; right mandible with cluster of several setae between molar and incisor processes.

Maxillule (Fig. 1F). Coxal endite with 6 plumodenticulate setae; basal endite with 5 cuspidate setae; endopod segmented, with 5 (2 subterminal + 3 terminal) plumodenticulate setae.

Maxilla (Fig. 1G). Coxal endite bilobed, with 7 and 2 plumodenticulate setae; basal endite bilobed, with 3 and 4 plumodenticulate setae; endopod with 8 plumodenticulate setae, arranged 3,2,3; scaphognathite margin with 5 plumose setae.

First maxilliped (Fig. 1H). Coxa with plumodenticulate seta; basis with 13 plumodenticulate setae, arranged 3,3,4,3; endopod 4-segmented, with 3 + 1,1,2,3 + 1 plumodenticulate setae; exopod with 5 (1 subterminal + 4 terminal) natatory setae, terminal setae disposed symmetrically in 2 pairs.

Second maxilliped (Fig. 1I). Coxa with plumose seta; basis with 8 plumodenticulate setae, arranged 1,2,2,3; endopod 4-segmented, with 3,1,2,4 + 1 plumodenticulate setae; exopod with 8 (4 subterminal + 4 terminal) natatory setae, terminal setae disposed symmetrically in 2 pairs.

Third maxilliped (Fig. 1J). Coxa unarmed; basis with 3 plumodenticulate setae; endopod 3-segmented, with 3 (2 middle + 1 subterminal), 2,3 + 1 plumodenticulate setae; exopod with 10 (6 subterminal + 4 terminal) natatory setae, terminal setae disposed symmetrically in 2 pairs.

Pereopods (Fig. 1A). Absent.

Abdomen and pleopods (Fig. 1A). Composed of 5 abdominal somites; sixth somite not differentiated; third somite humped dorsally, with dorsomedian protuberance and pair of dorsal setae; fourth somites with pair of dorsal setae; fourth and fifth somites with pair of dorsolateral spines, dorsolateral spine of fifth somite longer than that of

fourth somite; dorsal margins of fourth and fifth somites with minute spinules; anal spine absent; pleopods absent.

Telson (Fig. 1K). Telson triangular, with shallow median concavity; margin with 7 pairs of setae; outermost 2 pairs plumose only on inner side; base of all setae except outermost with row of minute spinules.

Chromatophores. Dark red interspersed with yellow chromatophores present on peduncles of antennule; base of rostrum; posterolateral margin of carapace; dorsomedially on carapace; bases of first, second, and third maxillipeds; dorsally on first abdominal somite; laterally on third abdominal somite; ventrally on fifth abdominal somite; and dorsally on telson. Blue chromatophores present on base of rostrum.

Second Zoea (Fig. 2)

Duration. 3-5 days.

Size. BL. 1.44 (1.43-1.45) mm; CL. 0.36 (0.35-0.37) mm.

Carapace (Fig. 2A). Ventral margin with 3 anterior denticles in front of middle denticle; eyes stalked.

Antennule (Fig. 2B). Peduncle with 2 plumose setae.

Mandibles (Fig. 2D). Left mandible with cluster of several setae between molar and incisor processes.

Maxilla (Fig. 2F). Distal coxal endite with 3 plumodenticulate setae; proximal basal endite with 4 plumodenticulate setae.

First maxilliped (Fig. 2G). Coxa with 3 plumodenticulate setae; basis with 14 plumodenticulate setae, arranged 3,3,5,3; endopod with 4 + 1,1,2,3 + 1 plumodenticulate setae.

Second maxilliped (Fig. 2H). Endopod 5-segmented, with 3,1,0,2,5 + 1 plumodenticulate setae.

Third maxilliped (Fig. 2I). Endopod 4-segmented, with 3,0,2,4 + 1 plumodenticulate setae.

Pereopods (Fig. 2A). First and second pereopods present as uniramous buds.

Telson and uropod (Fig. 2J). Telson with 8 pairs of marginal setae; outermost pair plumose only on inner side. Uropods visible as rudiments.

Third Zoea (Fig. 3)

Duration. 3-5 days.

Size. BL. 1.69 (1.55-1.73) mm; CL. 0.40 (0.39-0.41) mm.

Carapace (Fig. 3A). Ventral margin with 6 anterior denticles in front of middle denticle.

Antennule (Fig. 3B). Peduncle swollen basally, 2-segmented, with 3 and 5 (1 subterminal + 4 terminal) plumose setae; inner flagellum differentiated, with long plumose seta.

Antenna (Fig. 3C). Peduncle with distomedian spine; endopod without simple seta, distal one-fifth length with 2 rows of denticles; scale segmented, with 13 plumose setae and distolateral tooth.

Mandibles (Fig. 3D). Right mandible with 2 clusters of

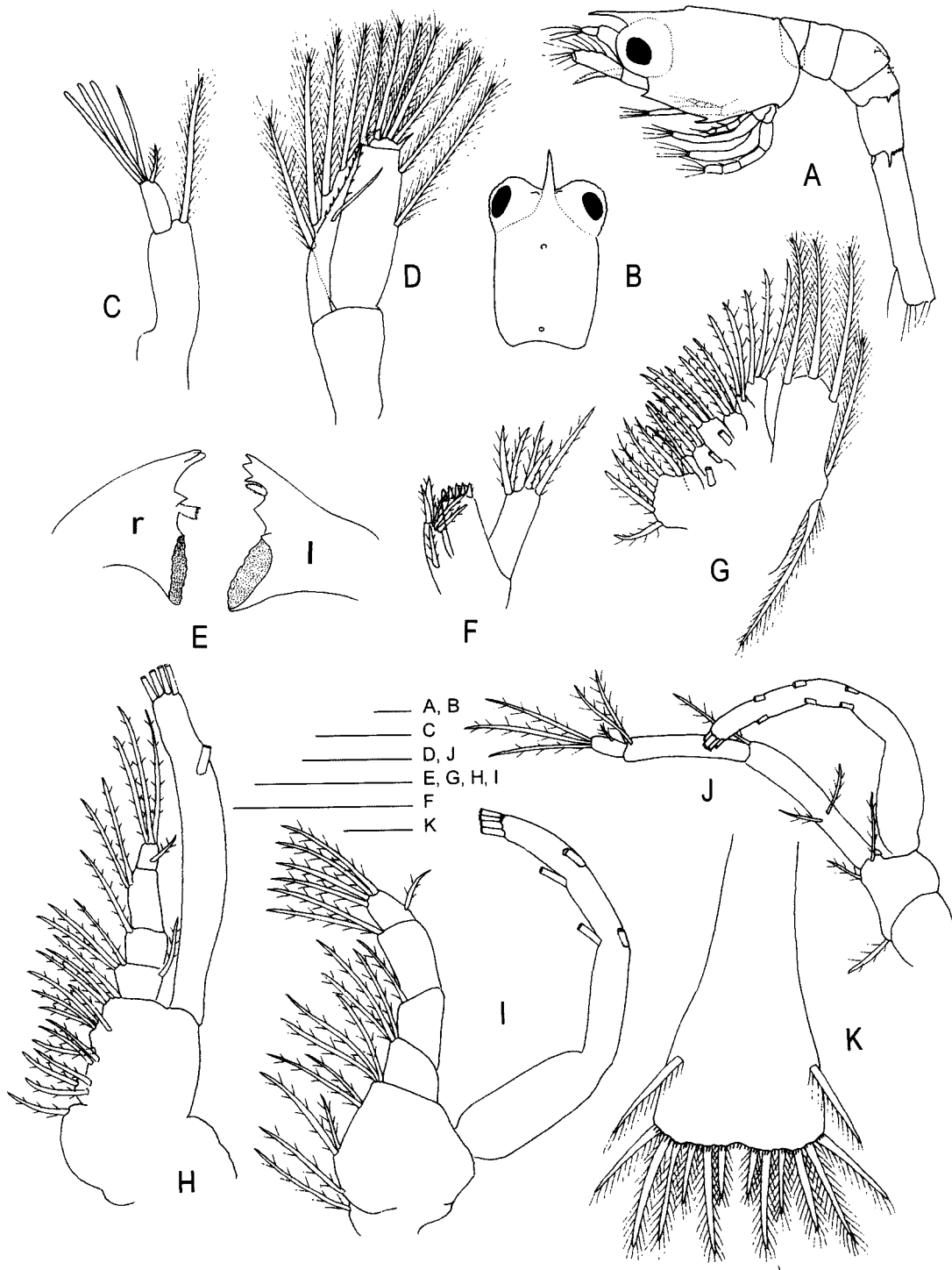


Fig. 1. First zoea of *Latreutes acicularis* Ortmann, 1890. A, habitus, lateral view; B, eyes and carapace, dorsal view; C, antennule; D, antenna; E, mandibles (r, right; l, left); F, maxillule; G, maxilla; H, first maxilliped; I, second maxilliped; J, third maxilliped; K, telson, dorsal view. Scale bars = 0.1 mm (A-K).

several setae between molar and incisor processes.

Maxillule (Fig. 3E). Basal endite with 6 cuspidate setae.

Maxilla (Fig. 3F). Distal coxal endite with 4 plumo-denticulate setae; proximal basal endite with 5 plumo-denticulate setae; scaphognathite with 9 plumose setae.

First maxilliped (Fig. 3G). Basis with 18 plumodenticulate setae, arranged 4,4,5,5; epipod developed.

Second maxilliped (Fig. 3H). Endopod with 3,1,0,2 + 1, 5 + 1 setae.

Pereopods (Fig. 3A). First to fifth pereopods present:

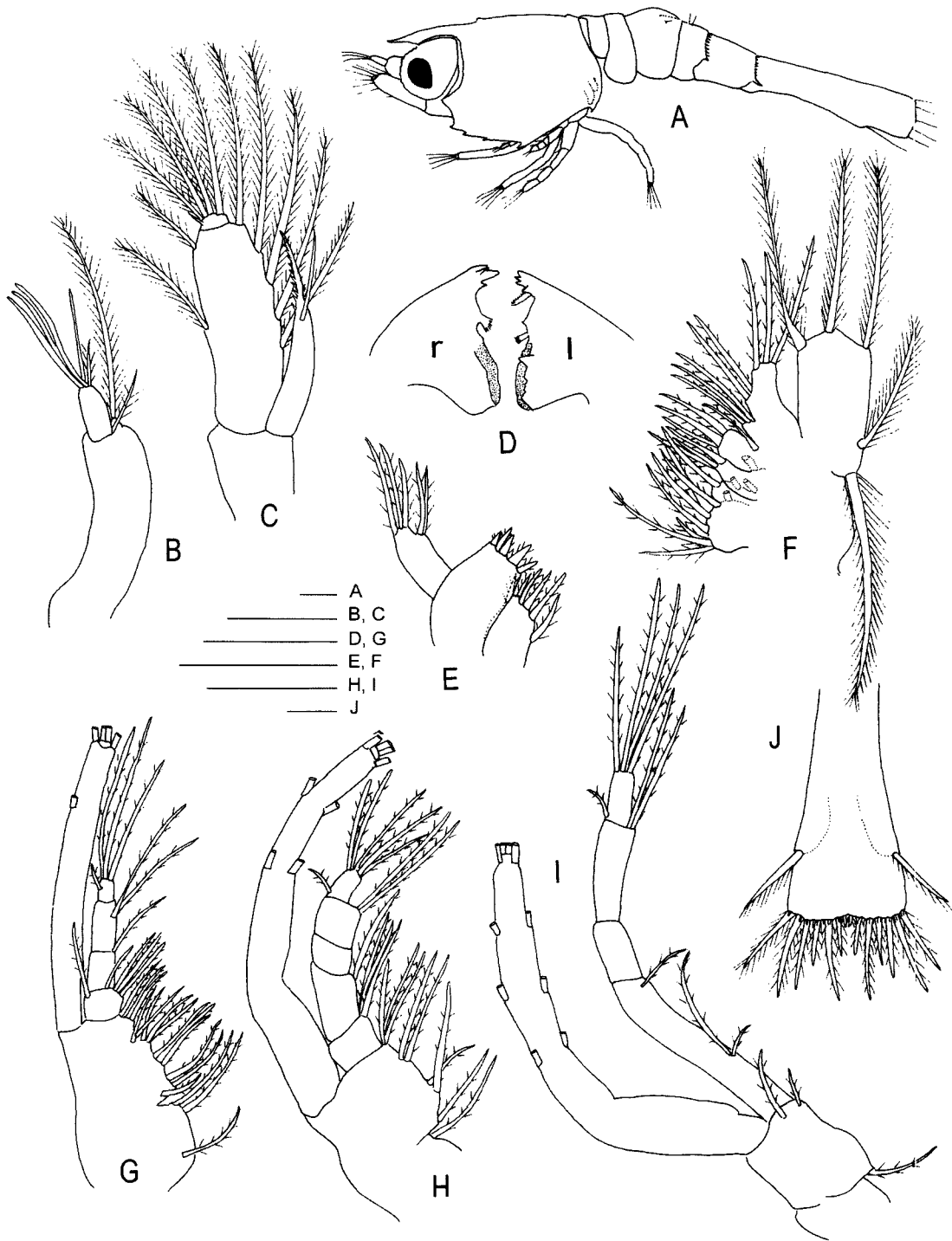


Fig. 2. Second zoea of *Latreutes acicularis* Ortmann, 1890. A, habitus, lateral view; B, antennule; C, antenna; D, mandibles (r, right; l, left); E, maxillule; F, maxilla; G, first maxilliped; H, second maxilliped; I, third maxilliped; J, telson and uropods, dorsal view. Scale bars = 0.1 mm (A-J).

first pereopod present as biramous bud; second to fifth pereopods present as uniramous buds.

Abdomen and pleopods (Fig. 3A). Sixth somite now differentiated from telson; posterolateral margin acute.

Telson and uropod (Fig. 3J). Telson with 7 pairs of

posterior setae; lateral margin with pair of spines; posterior width slightly greater than anterior width. Uropod biramous; protopod developed; endopod budlike; exopod with 6 plumose setae.

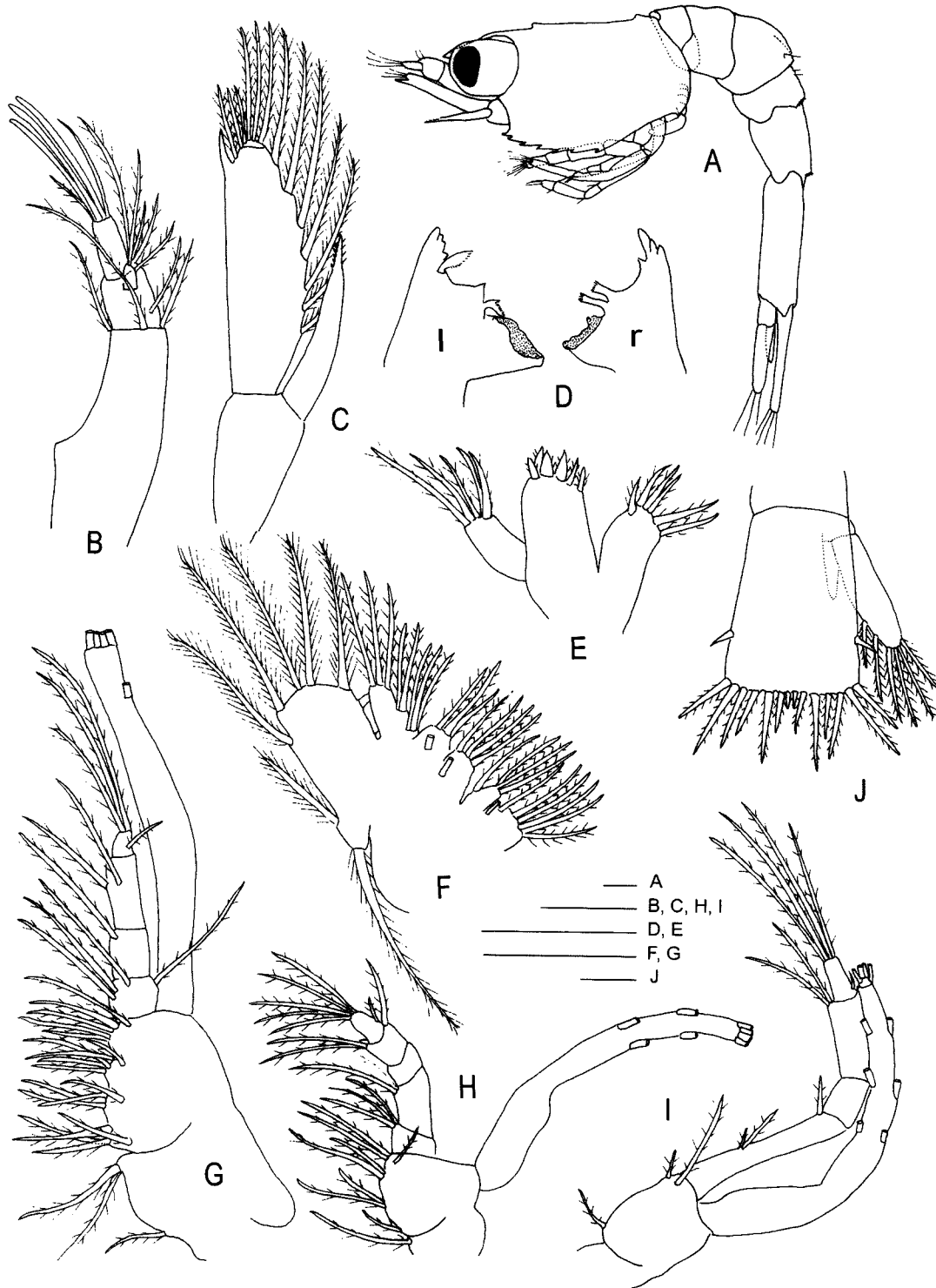


Fig. 3. Third zoea of *Latreutes acicularis* Ortmann, 1890. A, habitus, lateral view; B, antennule; C, antenna; D, mandibles (r, right; l, left); E, maxillule; F, maxilla; G, first maxilliped; H, second maxilliped; I, third maxilliped; J, telson and uropod, dorsal view. Scale bars = 0.1 mm (A-J).

Fourth Zoea (Fig. 4)

Duration. 3-5 days.

Size. BL. 1.92 (1.91-1.95) mm; CL. 0.49 (0.48-0.51) mm.

Carapace (Fig. 4A). Ventral margin with minute denticle in front of posterior denticle.

Antennule (Fig. 4B). Peduncle with 5 (1 subterminal + 2 middle + 2 terminal) and 6 plumose setae.

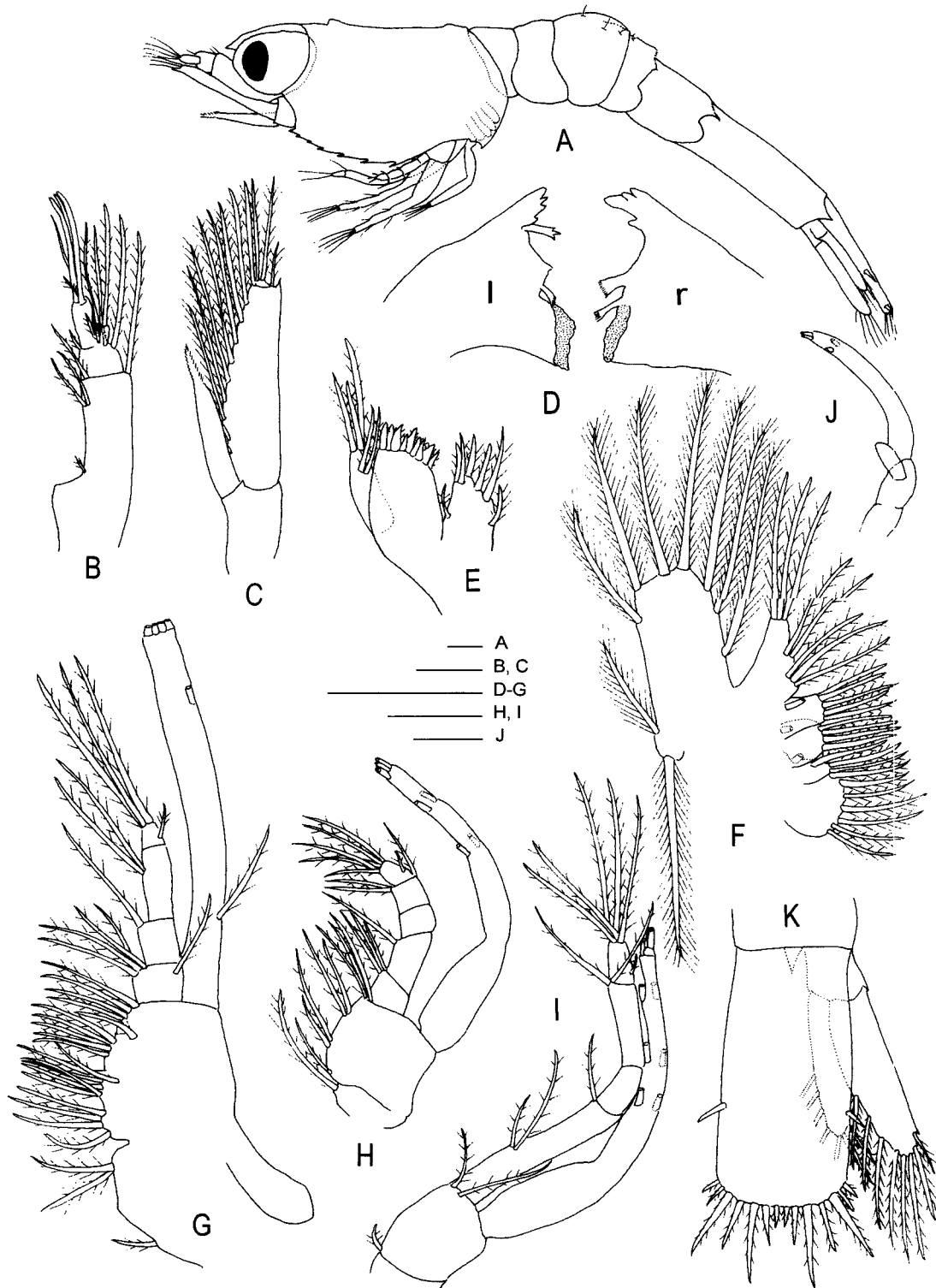


Fig. 4. Fourth zoea of *Latreutes acicularis* Ortmann, 1890. A, habitus, lateral view; B, antennule; C, antenna; D, mandibles (r, right; l, left); E, maxillule; F, maxilla; G, first maxilliped; H, second maxilliped; I, third maxilliped; J, first pereopod; K, telson and uropod, dorsal view. Scale bars = 0.1 mm (A-K).

Maxillule (Fig. 4E). Coxal endite with 7 plumodenticulate setae; basal endites with 9 cuspidate setae.

Maxilla (Fig. 4F). Distal basal endite with 6 plumodenticulate setae.

First maxilliped (Fig. 4G). Basis with 20 plumodenticulate setae, arranged 4,6,5,5; endopod with 4 + 1,1,2,3 + 1 setae; exopod with 6 (1 basal + 1 subterminal + 4 terminal) plumose natatory setae; epipod longer.

Third maxilliped (Fig. 4I). Endopod with 3 + 1,0,2,5 + 1 plumodenticulate setae.

Pereopods (Fig. 4A, J). First pereopod biramous; coxa and basis unarmed; endopod budlike; exopod with 2 short subterminal setae and 4 terminal natatory setae.

Abdomen and pleopods (Fig. 4A). Third somite with 3 pairs of dorsal setae.

Telson and uropod (Fig. 4K). Telson with short outermost 2 pairs of setae on posterior margin; posterior width almost same as anterior width; ventromedian spine present. Uropod with endopod bearing 7 marginal plumose setae; exopod with 8 marginal plumose setae and distolateral tooth.

Fifth Zoea (Fig. 5)

Duration. 3-5 days.

Size. BL. 2.28 (2.27-2.29) mm; CL. 0.55 (0.52-0.57) mm.

Antennule (Fig. 5B). Peduncle with swollen margin acute, distal segment with 7 terminal setae; outer flagellum with 3 aesthetascs and plumose seta.

Antenna (Fig. 5C). About distal one-tenth length of endopod with 2 rows of denticles; scale segmented, with 15 plumose setae and distolateral tooth.

Maxillule (Fig. 5E). Basal endite with 11 cuspidate setae.

Maxilla (Fig. 5F). Distal coxal and proximal basal endites with 5 and 6 plumodenticulate setae, respectively; scaphognathite with 10 plumose setae.

First maxilliped (Fig. 5G). Coxa with 6 plumodenticulate setae; basis with 23 plumodenticulate setae, arranged 4,7,6,6; endopod with 5 + 1,1,2,3 + 1 plumodenticulate setae.

Third maxilliped (Fig. 5I). Endopod with 3 + 1,0,2,5 + 1 plumodenticulate setae.

Pereopods (Fig. 5A, J). First pereopod longer; endopod forming rudimentary chela.

Abdomen and pleopods (Fig. 5A). Abdomen unchanged. Pleopods developed as uniramous buds.

Telson and uropod (Fig. 5K). Telson almost parallel sided, with 6 pairs of posterior setae; lateral margin with 2 pairs of spines. Uropod, endopod bearing 9 plumose setae; exopod with 12 setae and distolateral tooth.

Sixth Zoea (Fig. 6)

Duration. 3-5 days.

Size. BL. 2.50 (2.49-2.52) mm; CL. 0.59 (0.58-0.60) mm.

Antennule (Fig. 6B). Peduncle with 8 (1 basal + 4 subterminal + 3 terminal) and 8 plumose setae.

Antenna (Fig. 6C). Peduncle with distolateral spine; endopod with 2 rows of denticles terminally; scale with 16 plumose setae and distolateral tooth.

Maxilla (Fig. 6F). Distal basal endite with 8 plumodenticulate setae; scaphognathite with 12 plumose setae.

First maxilliped (Fig. 6G). Coxa with 7 plumodenticulate setae.

Pereopods (Fig. 6A, J). First pereopod longer; basis with

2 plumose setae; endopod with 2 plumose setae. Second to fifth pereopods longer.

Abdomen and pleopods (Fig. 6A). Abdomen unchanged. Pleopods developed as biramous buds.

Telson and uropod (Fig. 6K). Telson unchanged. Uropod, exopod with 14 plumose setae and distolateral tooth.

Seventh Zoea (Fig. 7)

Duration. 3-5 days.

Size. BL. 2.75 (2.74-2.76) mm; CL. 0.62 (0.61-0.63) mm.

Antenna (Fig. 7C). Endopod longer than scale, 2-segmented, without denticles; scale with 17 plumose setae and distolateral tooth.

Maxillule (Fig. 7E). Coxal endite with 8 plumodenticulate setae; basal endite with 13 cuspidate setae.

Maxilla (Fig. 7F). Proximal coxal endite with 10 plumodenticulate setae; scaphognathite with 13 plumose setae, proximal blade longer.

First maxilliped (Fig. 7G). Basis with 24 plumodenticulate setae, arranged 4,8,6,6.

Pereopods (Fig. 7A, J). First pereopod, endopod with 3 plumose setae; exopod with 8 (4 subterminal + 4 terminal) natatory setae. Second to fifth pereopods longer.

Abdomen and pleopods (Fig. 7A). Abdomen unchanged. Pleopods longer.

Telson and uropod (Fig. 7K). Posterior width of telson slightly narrower than anterior width, ventromedian spine absent. Uropod, endopod with 11 marginal plumose setae.

Eighth Zoea (Fig. 8)

Duration. 3-5 days.

Size. BL. 2.94 (2.93-2.95) mm; CL. 0.68 (0.67-0.69) mm.

Carapace (Fig. 8A). Ventral margin without minute denticle in front of posterior denticle; epigastric spine present in front of anterior dorsomedian papilla.

Antennule (Fig. 8B). Proximal segment of peduncle with 9 (1 middle + 4 subterminal + 4 terminal) plumose setae; outer flagellum with 2 (1 middle + 1 terminal) plumose setae and 3 subterminal aesthetascs.

Antenna (Fig. 8C). Endopod 13-segmented.

Maxillule (Fig. 8E). Coxal endite with 10 plumodenticulate setae; basal endite with 15 cuspidate setae.

Maxilla (Fig. 8F). Proximal coxal endite with 11 plumodenticulate setae; Basal endite with 7 and 9 plumodenticulate setae; scaphognathite with 13-15 plumose setae.

First maxilliped (Fig. 8G). Basis with 26-28 plumodenticulate setae.

Pereopods (Fig. 8A, J). First pereopod, endopod 3-segmented, with incomplete chela. Second pereopod present as biramous rudiment. Third to fifth pereopods longer.

Telson and uropod (Fig. 8K). Telson, posterior width narrower than anterior width. Uropod, endopod with 18-22

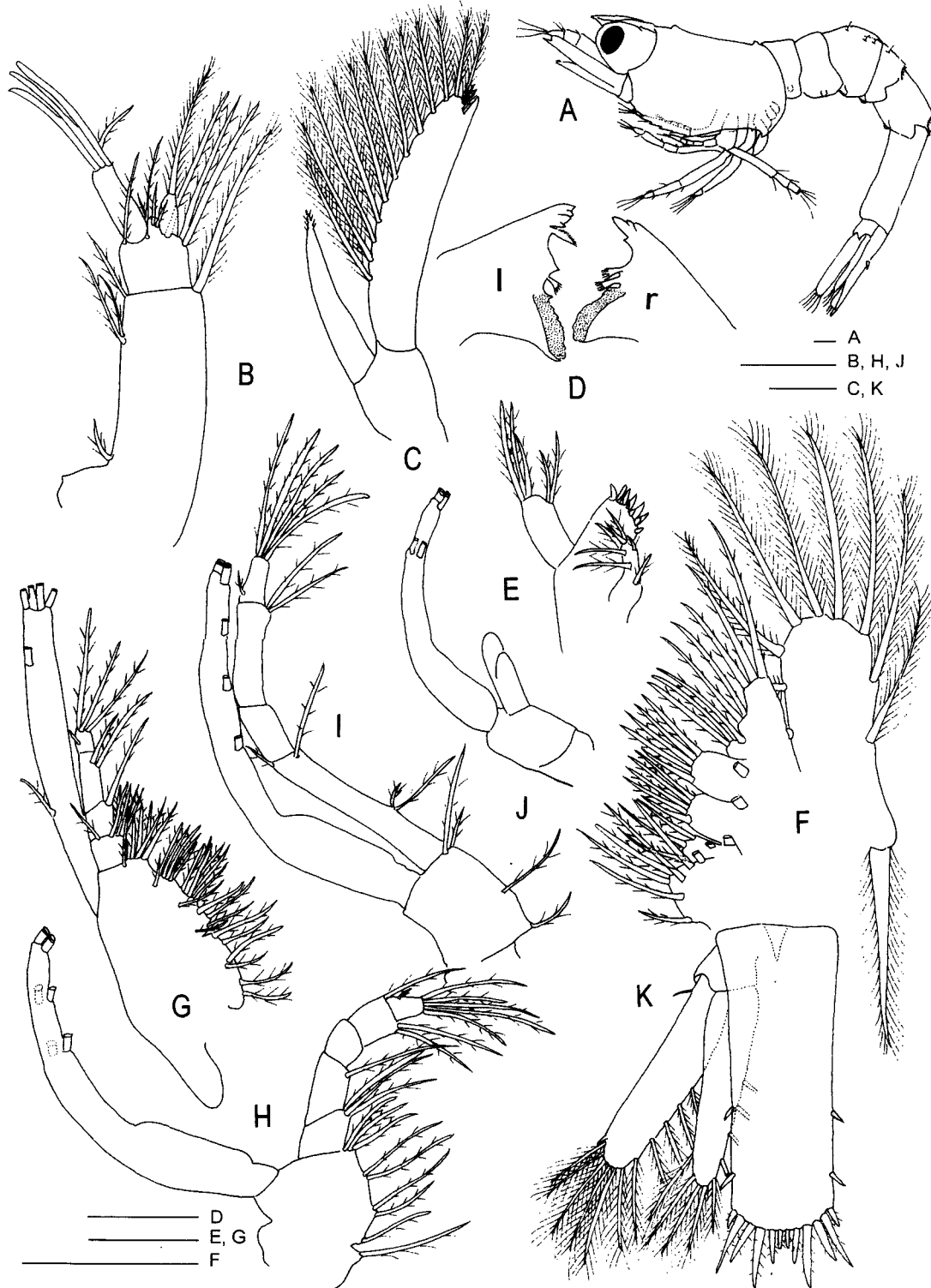


Fig. 5. Fifth zoea of *Latreutes acicularis* Ortmann, 1890. A, habitus, lateral view; B, antennule; C, antenna; D, mandibles (r, right; l, left); E, maxillule; F, maxilla; G, first maxilliped; H, second maxilliped; I, third maxilliped; J, first pereopod; K, telson and uropod, dorsal view. Scale bars = 0.1 mm (A-K).

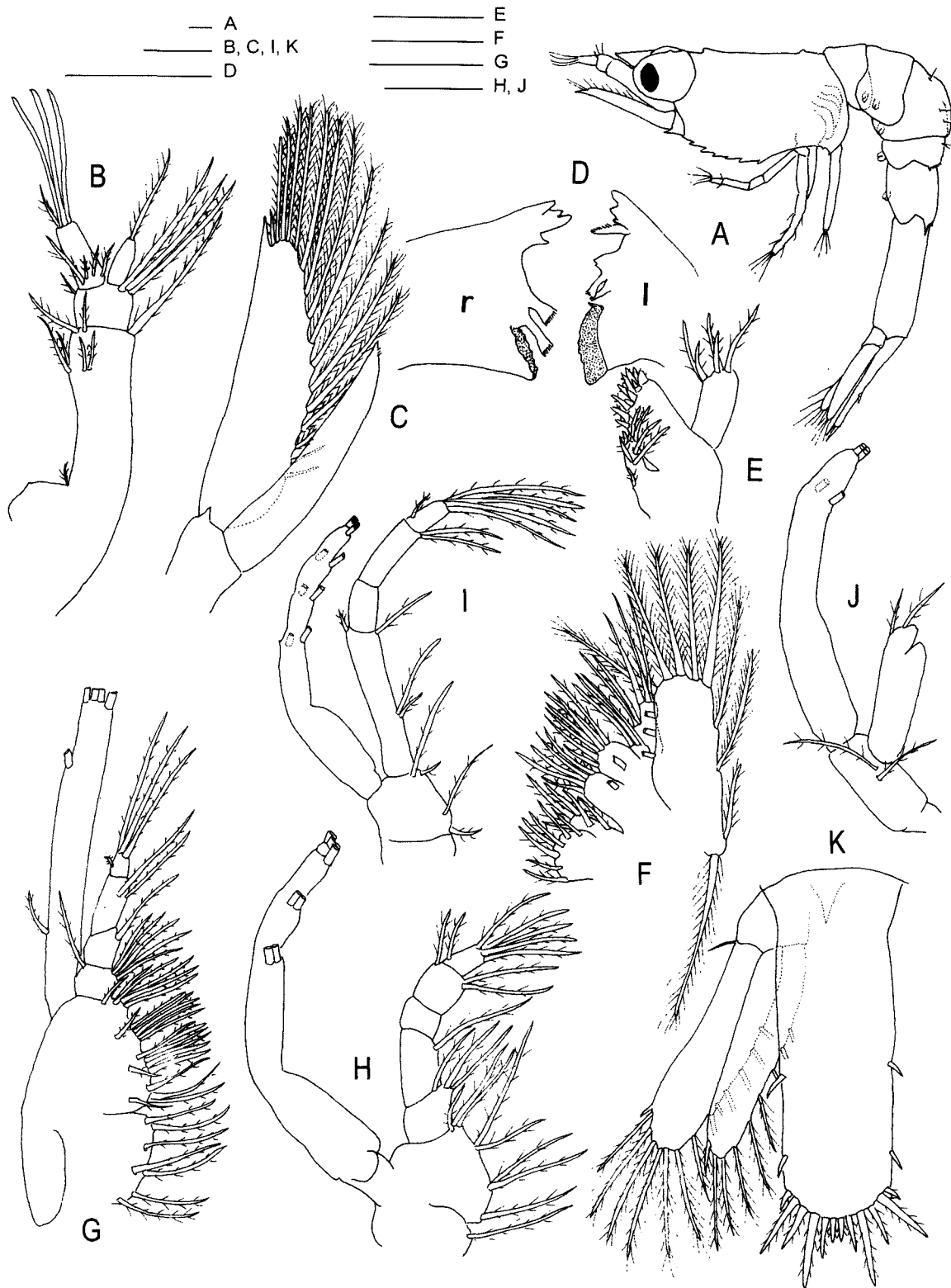


Fig. 6. Sixth zoea of *Latreutes acicularis* Ortmann, 1890. A, habitus, lateral view; B, antennule; C, antenna; D, mandibles (r, right; l, left); E, maxillule; F, maxilla; G, first maxilliped; H, second maxilliped; I, third maxilliped; J, first pereopod; K, telson and uropod, dorsal view. Scale bars = 0.1 mm (A-K).

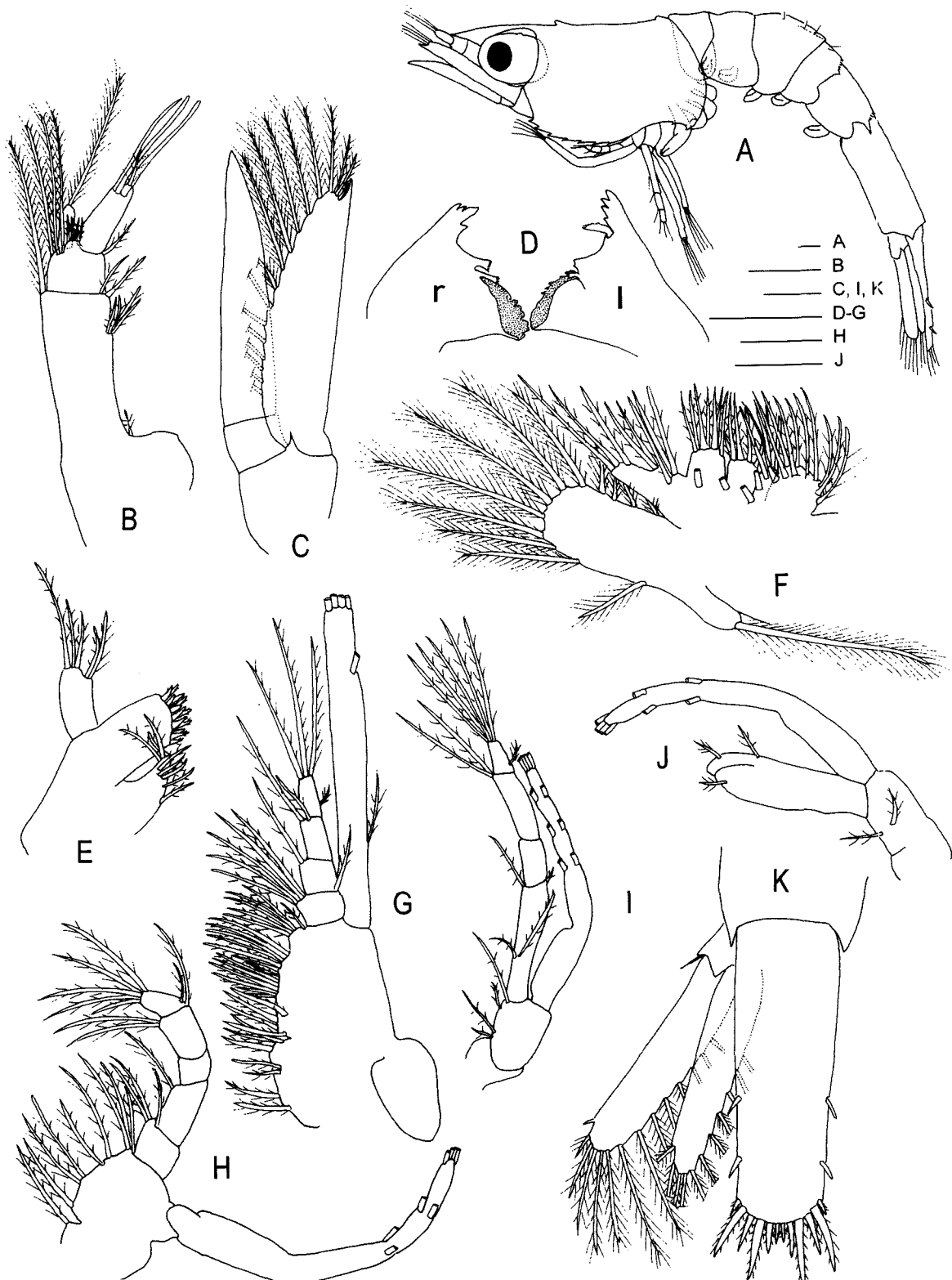


Fig. 7. Seventh zoea of *Latreutes acicularis* Ortmann, 1890. A, habitus, lateral view; B, antennule; C, antenna; D, mandibles (r, right; l, left); E, maxillule; F, maxilla; G, first maxilliped; H, second maxilliped; I, third maxilliped; J, first pereopod; K, telson and uropod, dorsal view. Scale bars = 0.1 mm (A-K).

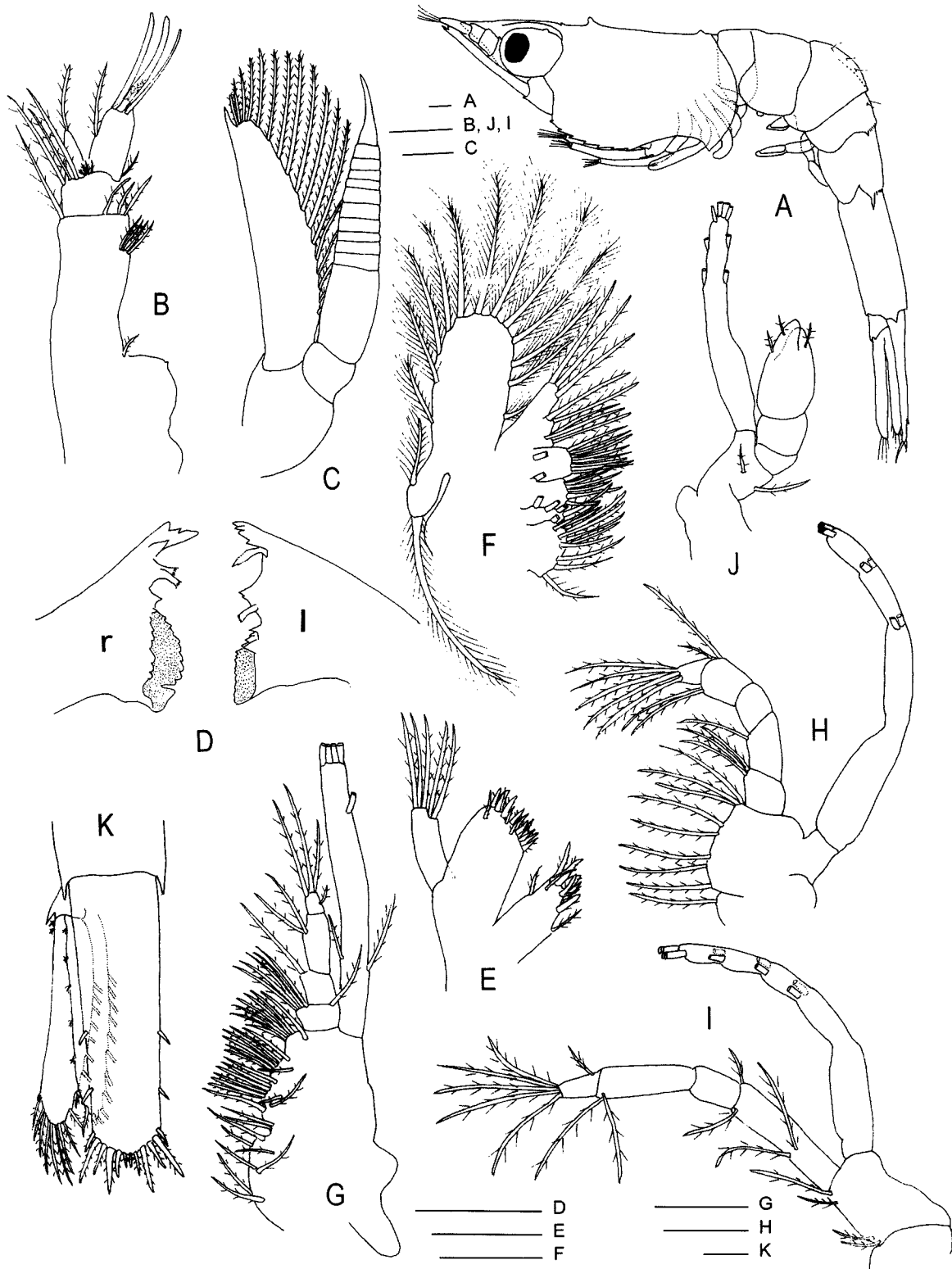


Fig. 8. Eight zoea of *Latreutes acicularis* Ortmann, 1890. A, habitus, lateral view; B, antennule; C, antenna; D, mandibles (r, right; l, left); E, maxillule; F, maxilla; G, first maxilliped; H, second maxilliped; I, third maxilliped; J, first pereopod; K, telson and uropod, dorsal view. Scale bars = 0.1 mm (A-K).

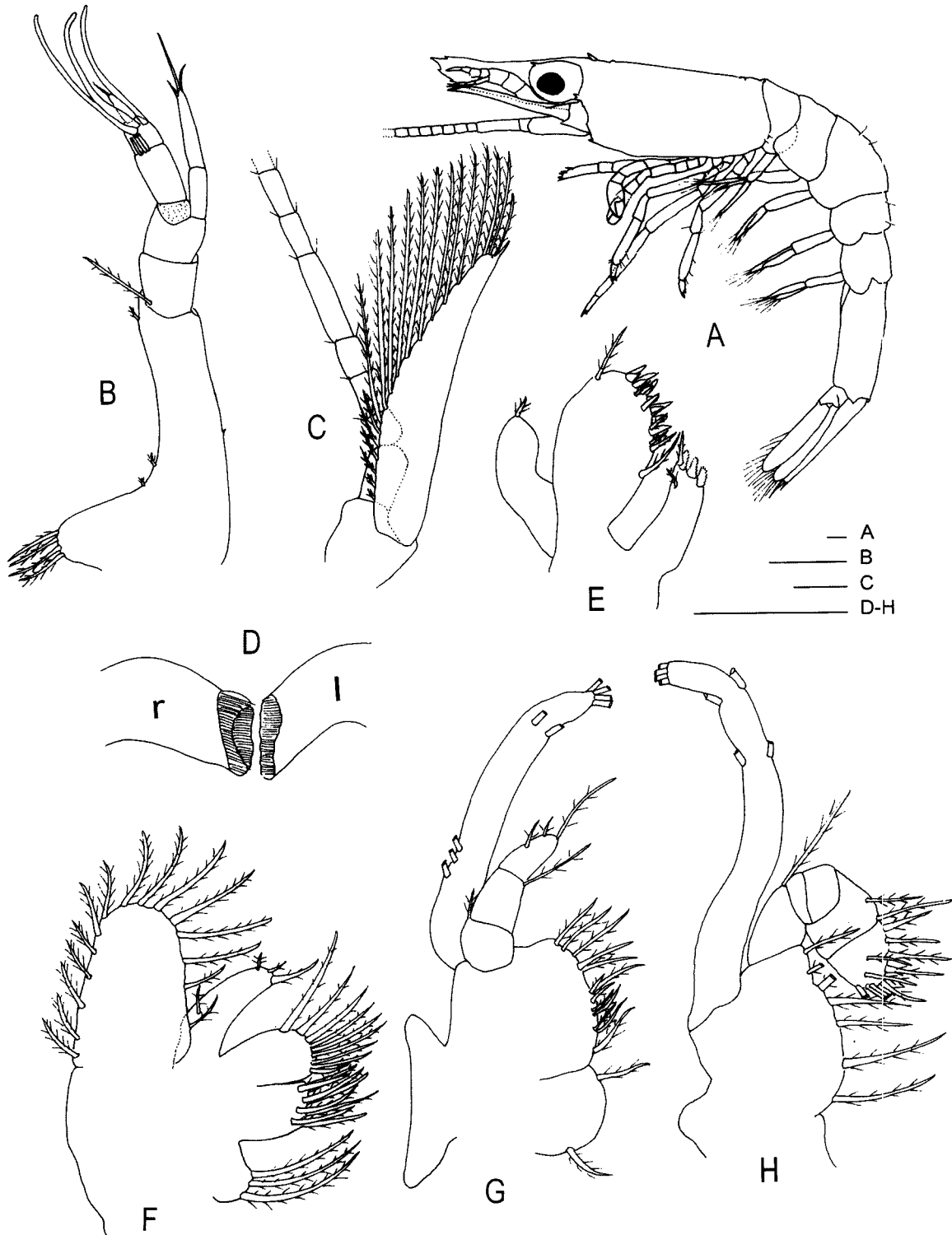


Fig. 9. Decapodid of *Latreutes acicularis* Ortmann, 1890. A, habitus, lateral view; B, antennule; C, antenna; D, mandibles (r, right; l, left); E, maxillule; F, maxilla; G, first maxilliped; H, second maxilliped. Scale bars = 0.1 mm (A-H).

plumose setae; exopod with 19-24 plumose setae and distolateral tooth.

Decapodid (Figs. 9, 10)

Duration. 3-5 days.

Size. BL. 3.35 (3.29-3.43) mm; CL. 0.89 (0.87-0.94) mm.

Carapace (Fig. 9A). Rostrum oblong, elongate, straight, with 2 distal dorsal and 2 ventral teeth; anterior and

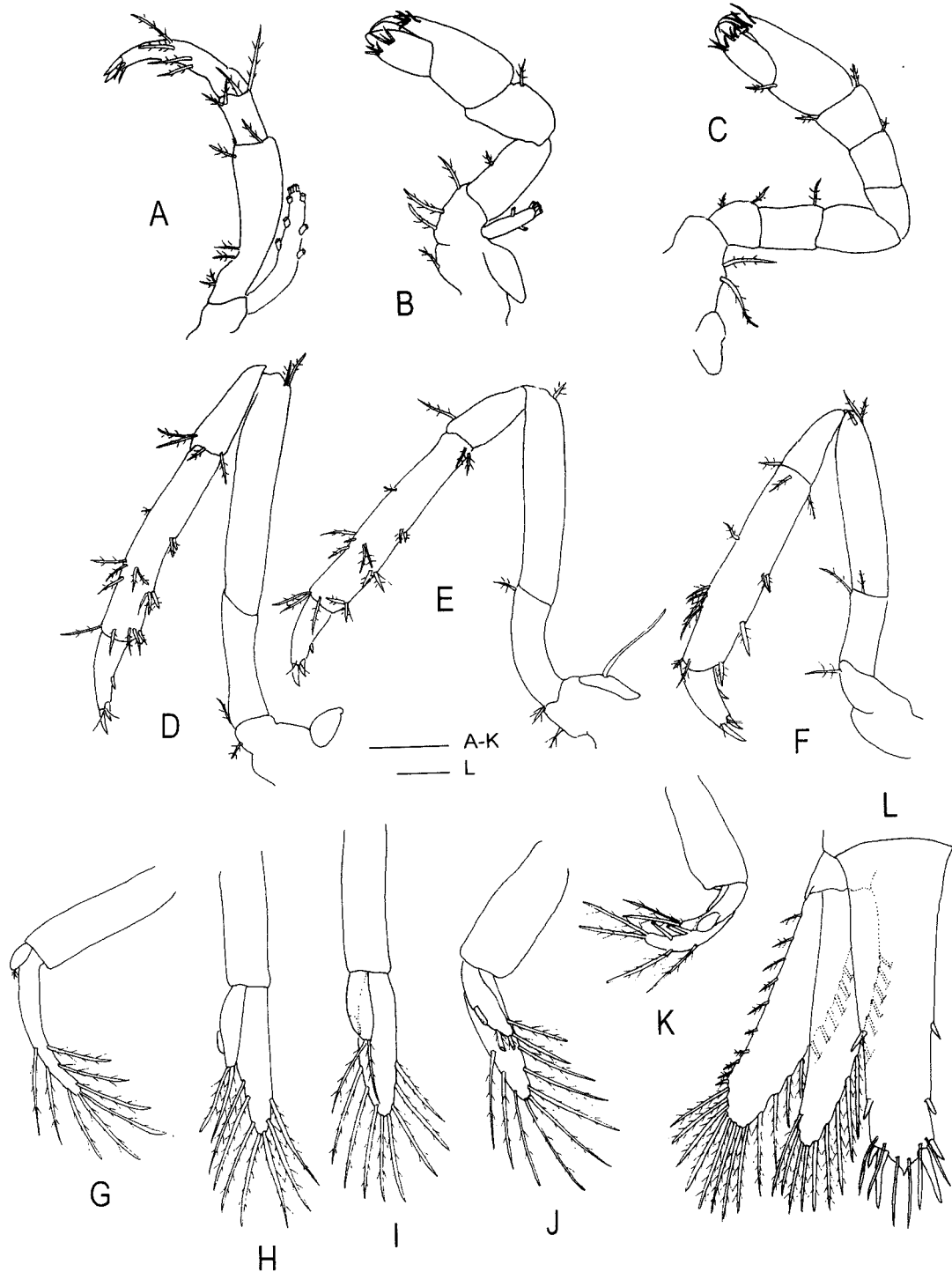


Fig. 10. Decapodid of *Latreutes acicularis* Ortmann, 1890. A, third maxilliped; B, first pereopod; C, second pereopod; D, third pereopod; E, fourth pereopod; F, fifth pereopod; G, first pleopod; H, second pleopod; I, third pleopod; J, fourth pleopod; K, fifth pleopod; L, telson and uropod, dorsal view. Scale bars = 0.1 mm (A-L).

posterior dorsomedian papillae present; ventral margin of carapace with anterior denticle only.

Antennule (Fig. 9B). Stylocerite subtriangular, rounded, with 4 marginal setae. Peduncle 3-segmented: first segment

with 3 setae and spine near midlength of ventral surface; second segment with plumose seta; third segment unarmed. Inner flagellum 2-segmented, with 0,3 setae. Outer flagellum 3-segmented: first segment with 3 terminal aesthetascs;

second segment with 3 subterminal aesthetascs; third segment with simple terminal seta.

Antenna (Fig. 9C). Flagellum markedly elongated; scale with 19-22 inner marginal plumose setae and distolateral tooth.

Mandibles (Fig. 9D). Palps absent; incisor process absent; molar process present.

Maxillule (Fig. 9E). Coxal endite with 5 setae; basal endite with 6 plumodenticulate and 13 cuspidate setae; endopod with plumodenticulate seta.

Maxilla (Fig. 9F). Coxal endite reduced, unilobate, with 3 plumodenticulate setae; basal endite with 8 and 9 plumodenticulate setae; endopod with 4 setae (3 short and 1 long); scaphognathite with 15-25 plumose setae.

First maxilliped (Fig. 9G). Coxa with 2 plumodenticulate setae; basis with 13-20 plumodenticulate setae; endopod 3-segmented, with 0 + 1,1,3 plumodenticulate setae; exopod with 9 (3 basal + 2 subterminal + 4 terminal) natatory setae; epipod large, bilobate.

Second maxilliped (Fig. 9H). Coxa unarmed; basis with 6 setae; endopod with 0 + 1,0,0,0 + 2,10 setae.

Third maxilliped (Fig. 10A). Coxa unarmed; endopod 3-segmented, with numerous setae, terminal segment with 2 distal teeth.

Pereopods (Fig. 10B-F). First and second pereopods chelate. Second pereopod with carpus 3-segmented. First to fourth pereopods each with coxa bearing epipod and several setae. Third to fifth pereopods each with dactylus biunguiculate.

Abdomen and pleopods (Figs. 9A, 10G-K). Third and fourth somites with dorsal setae. First to fifth pleopods well developed, each with setose exopod and endopod; second to fifth pleopods with appendices internae.

Telson and uropod (Fig. 10L). Telson with 2 pairs of dorsolateral spines; posterior margin not rounded, with 2 spines on each side of median tooth and 3 pairs of setae. Uropod, endopod with 15 plumose setae; exopod with 28 plumose setae.

DISCUSSION

Kim and Hong (1999) and Yang (2005) summarized the larval characters of *Latreutes* as follows: rostrum prominent, slender, and tapering in early stages, deep and most oblong in later stages; carapace with anterior and posterior dorsomedian papillae; ventral margin of carapace with anterior, middle, and posterior denticles in first zoea and series of anterior and strong posterior denticles in late zoea; segmentation of scale of antenna almost lost in first zoea; endopod of maxillule segmented, with three terminal setae; endopod of maxilla with eight setae, arranged 3, 2, 3; proximal segment of endopod of first maxilliped with four setae (three setae on inner margin and one seta on outer margin) in first zoea; endopod of second maxilliped 4-

segmented in first zoea; basis of second maxilliped with eight setae, arranged 1, 2, 2, 3; endopod of third maxilliped 3-segmented in first zoea, exopod of third maxilliped with four terminal setae in first zoea; and exopod of first pereopod only after fourth zoea. The larvae of *Latreutes acicularis* readily fit into this scheme.

Gurney (1937) described the zoea of *L. mucronatus* from Great Barrier Reef. According to Kim and Hong (1999), his zoea may be the sixth stage zoea. Meaningful comparison of the first zoea of *L. acicularis*, thus, is limited into those of *L. anoplonyx* described by Yang (2005) and *L. laminirostris* by Yang and Park (2004). The first zoea of *L. acicularis* is most similar to that of *L. laminirostris* by having a minute dorsomedian protuberance on the third abdominal somite and a pair of dorsolateral spines on the fourth and fifth abdominal somites. In the first zoea of *L. anoplonyx*, the third abdominal somite lacks a dorsomedian protuberance, and the fifth abdominal somite only has a pair of dorsolateral spines. However, the first zoeas of *L. acicularis* and *L. laminirostris* are readily distinguished from each other by the presence or absence of the spinules on the dorsal margin of the fourth and fifth abdominal somites. In the first zoea of *L. acicularis*, the spinules are present, while in those of *L. laminirostris*, they are absent.

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