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**SOME LARVAL STAGES OF CALLIANASSA Sp.
and HIPPOLYTE SP.**

BY

A. A. AL KHOLY, Ph.D.

Institute of Oceanography and Fisheries and Marine Biological Station, Al-Ghardaa, Red Sea,

AND

M. FIKRY MAHMOUD, Ph.D.

Department of Zoology, Faculty of Science, Cairo University

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INTRODUCTION AND HISTORICAL (1)

The material of the present study was mainly obtained from plankton hauls in April and May. Some of the larvae moulted indoors, and so later stages were available. The post-larval stage of *Callianassa* was obtained from a fourth stage. Concerning the larvae of *Callianassa*, important studies were performed by Sars (1884), Cano (1891), Menon (1933), Gurney (1937 b), Lebour (1938) and Dakin and Calefax (1940). Cano (1891) described three stages in the life-history of *Callianassa laticauda*. The main characters of the different stages are ; Dorsal spines present on abdominal somites 2-4 ; spine on somite 2 not longer than the others ; spinal formula of telson 14+1+14 ; all legs present as large rudiments with rudimentary exopods in stage 2 ; large pleopods on abdominal somites 3-5 in second larval stage. Menon (1933) described in detail larval stages of the same genus, but the larvae are without dorsal spine on the second abdominal somite ; third to fifth abdominal somites with dorsal spines at their posterior ends ; three pairs of well developed biramous, not setose pleopods present on third to fifth abdominal segments, antennular peduncle unsegmented in the first larval stage, 3-segmented in the 2nd ; mandibular palp develops in the first stage. Gurney (1937 b) arranged the larvae of *Callianassa* into three types. Type I ; a large dorsal spine present on abdominal somite 2 ; antennal endopod produced into 2 setae terminally ; legs 1-4 provided with not setose exopods. Type II ; a large dorsal spine present on abdominal somite 2 ; first and second legs provided with setiferous exopods in stage III ; three pairs of pleopods present ; uropods free and setose in third stage. Type III ; the dorsal spine on the second abdominal segment absent ; antennal endopod produced into 2 small setae ; first to fourth legs provided with setiferous exopods ; three pairs of pleopods present from the first stage ; uropods not free. Larvae of *Callianassa* described in this manuscript fall under type II, but there are some differences which will be shown in the following description.

In addition to the five stages studied in the life-history of *Callianassa*, eighth stages of *Hippolyte* species were elucidated from the plankton and studied in detail. Concerning the studies made on the larvae of the family Hippolytidae we refer the reader to Lebour (1931, 1936, 1940 b) ; Gurney (1937 a) and Al-Kholy (1961).

(1) This research has been carried out at the Marine Biological Station of the Institute of Oceanography and Fisheries at Al-Ghardaqa.

CALLIANASSA Sp.**First larval Stage**

(Figs. 1-10)

Orange red chromatophores scattered on anterior region of cephalothorax. Rostrum long, extending up to end of antennular aesthetes, terminal end of rostrum thrown into lateral ridges. A dorsal spine present on second abdominal segment; posterior lateral spines on abdominal segments 2-5. Eyes sessile. Antennular exopod with 3 aesthetes and an inner plumose seta. Endopod in form of a bud with a long apical plumose seta. Antennal exopod with an outer long spine and 8 terminal and inner plumose setae; endopod with 3 apical setae. Incisor and molar processes of mandible well differentiated. Maxillular endopod with 6 terminal and inner setae + a hair; basis with 5 apical plumose spines, and coxa with 6 terminal setae. Maxillar scaphognathite with 3 distal plumose setae and a proximal plumose seta + hair, endopod produced into 4 lobules with 4 + 2 + 2 + 2 long setae, basis and coxa of two lobes, each with 3 + 3 and 4 + 8 setae respectively. Endopod of first maxillipede nearly as long as exopod with 4 + 2 + 2 + 4 plumose setae; basis as well as coxa with 6 plumose setae, exopod with 4 apical plumose setae. Exopod of 2nd. maxillipede, 2-jointed and produced into 4 terminal plumose setae, endopod with 10 terminal and inner setae, protopod with 4 + 1 setae. Exopod of 3rd. maxillipede, 2-jointed produced into 5 apical pilose setae, endopod 4-jointed with 2 outer, 4 terminal and 2 inner setae. Telson separated from sixth abdominal joint, spinal formula 5 + 1 + 5 (posterior-lateral spines and hairs excluded).

Second Larval Stage

(Figs. 11-22)

Rostrum tipped with a narrow pointed end, lateral spinules scattered all over rostrum. Antennular peduncle 2-jointed, exopod with 4 apical aesthetes + a plumose seta. Antennular scale with 9 long plumose setae, endopod with 2 apical plumose setae.

Mandible as in 1st. larval stage. Maxillular endopod with 7 setae, basis with 4 plumose spines + 2 hairs, and coxa with 8 setae. Scaphognathite produced into a proximal lobe with a long plumose seta, maxillar endopod with 5 + 2 + 2 + 2, basis with 2 + 2 and coxa with 2 + 8 setae. First maxillipede nearly same as in first larval stage. Terminal joint of exopod of 2nd. maxillipede produced into 5 apical plumose setae, endopod 5-jointed with 2 outer and 7 terminal and inner setae. Third maxillipede with unjointed exopod and 2-jointed endopod. Rudiments of first and 2nd. legs present, biramous but not setose. Uropods traceable, spinal formula of telson 6 + 1 + 6

Third Larval Stage

(Figs. 23—36)

Rostrum spinose. Antennular exopod with two terminal aesthetes and setae, endopod with a terminal plumose seta. Inner long plumose seta present on intersegmental region between first and second peduncular segment. Antennal scale with 9 apical and inner long plumose setae + a hair, endopod getting longer and 6—jointed but without setae. Mandibular palp developed. Maxillular endopod 2—jointed with 8 plumose setae, basis with 5 apical spines + hair and coxa with 7 setae. Nine plumose setae on scaphognathite, maxillar endopod 3—jointed with 12 setae, basis with 4+4 and coxa with 5+9 setae. Endopod of first maxillipede 3—jointed with 10 terminal and inner setae, exopod unjointed with 5 apical plumose setae. Second maxillipede with 5—jointed endopod and 2—jointed exopod. Endopod of third maxillipede 4—segmented, exopod 2—jointed with 5 apical plumose setae. Endopod of first leg 4—jointed and chelate, exopod 2—jointed with 5 apical plumose setae. Second leg similar to first. Third leg biramous but not setose, endopod 3—segmented. Fourth and fifth legs rudimentary, bilobed not setose. Three pairs of biramous not setose pleopods present on abdominal segments 3—5. Posterior edge of telson getting narrow posteriorly. Two spines and a hair moving to lateral sides, spinal formula 6 + 1 + 6. Uropods well developed, exopod setose.

Fourth Larval Stage

(Figs. 37—52)

Rostrum longer and broader at base than in third stage. Antennular peduncle 2—jointed, endopod longer than exopod, 3—jointed with 2 terminal setae, exopod 2—jointed with 6 terminal and inner aesthetes. Antennal endopod longer than scale, 11—segmented and not setose. Scale with 11 plumose terminal and inner plumose setae, + a hair + a spine. Spine on basis longer than in third stage. Mandibular palp longer but neither segmented nor setose. Maxillular endopod with 9 terminal and inner setae, basis with 10 plumose spines, coxa with 9 setae. Scaphognathite, maxillar endopod, coxa and basis much setose; exopod not jointed. Endopod of first maxillipede 2—jointed with 9 outer terminal and inner setae basis with 13 and coxa with 6 setae. Second and third maxillipedes nearly as in third stage. First and second legs chelate, exopod short with 5 apical setae. Endopod of third leg 5—jointed longer and broader than exopod, exopod 3—jointed with 5 apical setae. Endopod of 4th. leg 4—jointed. Exopod of 5th. leg absent, endopod 5—segmented with 2 apical long setae. Pleopods longer than in third stage but still not setose. Both exopods and endopods of uropods setose. Telson with 2 lateral plumose spines and a hair, spinal formula 6 + 1 + 6.

First Post-larval Stage

(Figs. 53—69)

Position of chromatophores as in fourth larval stage. Antennular peduncle 3—jointed with two slender outer and inner flagellae, inner flagellum 3—jointed and slightly longer than outer, outer flagellum 4—jointed. Exopod of antenna short and not setose, endopod long slender and with 22 joints, basal 2 joints long and broad. Mandibular palp 2—jointed, apical joint with 5 apical short setae. Maxillular endopod 2—jointed with 2 apical setae, basis with 5 and coxa 4 terminal setae. Scaphognathite without long seta on proximal lobe, maxillar endopod slender neither segmented nor setose, coxa and basis still bilobed. Exopod and endopod of first maxillipede 2—jointed and shorter than in 4th stage. Endopod of second maxillipede 5—segmented. Endopod of third maxillipede larger than exopod, 4—jointed, exopod 3—jointed and not setose. Endopod of first or second leg slender, short and 2—jointed. Both appendages chelate.

Third leg chelate with a short unjointed exopod. Fourth leg with very short 2—jointed slender exopod. Endopod 5—jointed, terminal joint broad and setose. Fifth leg without exopod, endopod 5—jointed, terminal joint setose. Three pairs of pleopods present on abdominal segments 3—5. Exopod of pleopod setose, partially 4—segmented and longer than the unsegmented setose endopod. Telson nearly rectangular with 2 postero-lateral spines and 11+11 setae.

HIPPOLYTE SP.

Second Larval Stage

(Figs. 70—80)

Rostrum short, in form of short spine. A supraorbital and pterygostigal spines present on cephalothorax. A short dorsal spine present on third abdominal somite. Short postero-lateral spines present on 5th. abdominal somite. Eyes stalked. Antennule with a long plumose seta in place of endopod, exopod with 3 apical aesthetes. Antennular peduncle not segmented. Antennal endopod short with an apical serrated spine. Exopod with 9 outer apical and inner plumose setae. Mandibular masticatory part produced into incisor and molar processes, the groove in between provided with a forked spine. Maxillular endopod 2—jointed, terminal joint produced into 4 plumose setae, coxa with 6 apical setae and basis 7 apical spines. Proximal lobe of scaphognathite produced into a long spine ; scaphognathite provided with 6 plumose setae, maxillar endopod unsegmented with 6 plumose setae coxa and basis bilobed with 4+2 and 4+5 apical setae respectively. Protopod of first maxillipede produced into 2 setose lobes, endopod with 2 apical setae, exopod 2—jointed, apical joint with 6 plumose setae. Endopod of

second maxillipede 5—jointed, exopod 2—jointed with 6 plumose setae. Endopod of third maxillipede long 4—jointed, apical joint produced into 6 lateral and apical spines, terminal spine long, terminal part of exopod provided with 6 plumose setae. First and 2nd. legs well developed but shorter than maxillipedes. Endopod nearly equal in length to exopod, 5—jointed with 4 setae on terminal joint, exopod unjointed with 6 setae. Third to fifth legs rudimentary. Telson broad posteriorly, not separated from sixth abdominal segment, with 2 lateral plumose spines and 7+7 posterior ones. Uropods traceable.

Third Larval Stage

(Figs. 81—91)

Eye-stalks longer. Antennular peduncle 2—jointed, basal joint longer than terminal, a spine present on basal third of peduncle, endopod present with an inner basal long plumose seta and two terminal setae, exopod with 2 aesthetes and a plumose seta on its apex, inner long plumose seta present on exopod. Antennal endopod getting longer and broader, exopod with 12 inner apical and outer setae, an outer spine and a hair present on exopod. Mandible similar to that of first stage. Maxillular endopod with 5 terminal plumose setae, basis with 7 spines+ a hair, and coxa with 5 apical setae. Scaphognathite produced into 9 plumose setae + a spine on the proximal lobe. Maxillar endopod, basis and coxa with 10, 4+3, and 3+10 setae respectively. Exopod of first maxillipede 2—jointed, with 5 apical plumose setae, endopod still unjointed. Endopod of 2nd. maxillipede 5—jointed with 5 terminal setae, exopod 2—jointed with 5 terminal plumose setae, sixth seta present on inner terminal region of basal segment. Third maxillipede not different from that of second stage. First and second legs similar in form, exopod long 2—jointed with 6 plumose setae, endopod shorter than exopod with 2 terminal spines. Telson separated from sixth abdominal somite, lateral spines move slightly posteriorly, spinal formula (including lateral spines) 7+7. Uropods free with endopods shorter than exopods, 3 short setae present on endopod, exopod not setose.

Fourth Larval Stage

(Figs. 92—103)

Antennular peduncle 3—jointed, basal joint with an outer plumose seta, 2nd. joint with 3 outer and 2 inner plumose setae. Exopod with 2 apical aesthetes and one plumose seta, endopod with a terminal plumose seta and an outer basal one. Exopod of antenna with an outer terminal spine and 13 terminal and inner setae, endopod long and broad, terminal spine short and slender. Mandibular palp

absent. Maxillular endopod with 5 plumose setae, basis with 10 spines, and coxa with 5 terminal plumose setae. Scaphognathite with 12 plumose setae + spine on proximal lobe ; maxillar endopod, basis, and coxa with 5+2 hairs, 3+4 and 2+7 setae respectively. Exopod of first maxillipede with 6 terminal outer and inner plumose setae. Second and third maxillipedes as in third stage. Terminal joint of exopod of first or second leg produced into 4 apical, one outer and one inner plumose setae. An outer plumose seta present on tip of basal joint. Endopod longer than in 3rd. stage with one terminal, one inner and 2 outer spines. Third or fourth legs more developed, endopod 3-jointed, terminal joint broad and long. Exopod slender slightly shorter than endopod both not setose. Median posterior spine present on 6th. abdominal somite. Telson longer but less broad than in third stage with 5+5 posterior plumose spines, 2 lateral spines present on middle region of telson. Exopod of uropod with an outer terminal spine, both exopod and endopod of uropod setose and longer than in third stage.

Fifth Larval Stage

(Figs. 104—115)

Antennular peduncle 3-jointed, endopod with an apical and 2 outer plumose setae, exopod with 3 apical aesthetes+a seta. Terminal joint of peduncle with 2 inner and 3 outer setae, middle joint with 2 inner and one outer setae. Apical spine on antennal endopod absent, endopod 2-jointed, terminal joint longer and broader. Antennal exopod with outer terminal spine and 13 setae. Mandibular masticatory region as in 4th. stage. Maxillular palp, basis and coxa as in 4th. stage. Scaphognathite with 17 setae+ a spine on proximal lobe. Maxillar endopod, basis and coxa with 5, 4+7 and 3+8 setae. First maxillipede with 6 plumose setae on exopod ; endopod and protopod setose. Exopod of second maxillipede 3-jointed, with 5 plumose setae on its terminal part. Endopod of third maxillipede longer than exopod with 3 terminal spines, exopod 3-jointed with 5 apical, one outer and one inner plumose setae. First and 2nd. legs not different from those of fourth stage. Third and fourth legs similar, with a short 2-jointed exopod, terminal joint short with 5 apical plumose setae, endopod long 4-jointed with a terminal spine, outer and inner setae at base of terminal joint. Fifth leg, short, biramous not setose. Hind region of telson getting narrow with a short lateral spine and 5+5 posterior long plumose spines. Uropods long and setose.

Sixth Larval Stage

(Figs. 116—127)

Antennular endopod long with a terminal plumose seta, exopod with 3 apical aesthetes + a plumose seta. In region between exopod and endopod 2 long plumose setae present. Terminal joint of antennular peduncle with 2 inner plumose setae, middle joint with 2 inner plumose setae + 2 outer hairs, and basal joint long with the usual spine and 2 inner hairs. Antennal endopod getting long being nearly half the length of exopod, still 2-jointed, basal joint shorter than terminal which is nearly three times as long as basal. Exopod with terminal outer spine and 13 terminal and inner setae. Mandible, not different from that of 5th. stage. Maxillular palp with 2+2 plumose setae, coxa with 6 setae and basis with 8 terminal spines. Scaphognathite with 17 plumose setae+spine on proximal lobe. First maxillipede similar to that of fifth stage. Exopod of second maxillipede with 8 plumose setae. Exopod of third maxillipede with 8 plumose setae. First and second legs nearly similar to those of fifth stage. Third leg similar to fourth leg, exopod shorter than endopod with 5 plumose setae on terminal short joint, endopod long and broad, 4-jointed, subterminal joint long and broad with 2 terminal setae.

Fifth leg in form of 5-jointed peduncle, exopod absent. Telson long round narrower than in fifth stage with 3 lateral short spines and 5+5 posterior long plumose spines. Uropods long and setose.

Seventh Larval Stage

(Figs. 128—141)

Antennular peduncle longer than in sixth stage, basal joint with 2 inner long plumose setae and 2 hairs and an outer short seta, middle joint with 2 inner plumose and 3 outer simple setae. Apical joint with 2 inner plumose setae+an outer simple one. Endopod with a long plumose seta+an outer and inner hairs. Exopod with 3 terminal aesthetes +long plumose seta. Antennal endopod slightly shorter than exopod. Exopod with an outer terminal spine and 16 setae. Mandibular palp still absent. Maxillular endopod with 5 setae, coxa and basis 7 spines. An inner spine present in addition to the normal spine on proximal lobe of scaphognathite. Scaphognathite with 19 plumose setae. Maxillar endopod with 5 plumose setae +a hair, coxa with 9+2 and basis 3+6 setae. Endopod of first maxillipede 2-jointed. Second maxillipede; exopod with 6 plumose setae, endopod 5-jointed with a terminal spine. Endopod of third maxillipede slightly longer than exopod, terminal joint with a strong spine and outer seta. First or second leg similar in construction, endopod 5-jointed, longer than exopod, terminal joint of endopod carrying long terminal spine, an outer and inner setae. Third leg shorter than

first and second legs, endopod 4—jointed, basal joint the longest. Terminal joint with a long spine and outer hair. Terminal region of exopod with 8 inner, apical and outer plumose setae+2 simple inner setae. Fourth leg similar to third leg but exopod shorter than in third leg. Exopod of fifth leg rudimentary, endopod well developed and 6—jointed. Fourthpairs of pleopods present but still uniramous slightly longer than those of sixth stage. Telson slightly shorter than in sixth stage, three pairs of lateral spines still present. Spinal formula 5+5.

Eighth Larval Stage

(Figs. 142—155)

Antennular endopod slightly longer than exopod, with an apical plumose seta and two outer hairs, exopod with an outer and inner plumose setae and 3 apical aesthetes. An inner and outer plumose setae present at base of endopod, basal segment of antennular peduncle provided with 4, 2nd. segment 3, and third segment one inner plumose setae. Antennal scale with a terminal outer spine and 16 apical and inner plumose setae. Terminal part of antennal endopod with 3 apical hairs. Mandibular palp not developed. Maxillular endopod with 3 terminal and two inner setae, basis with 12 spines and coxa 9 apical setae. Scaphognathite much setose with 2 basal spines. Maxillar endopod with 3+2+2 setae, basis 4+4 and coxa 2+10 setae. Exopod of first maxillipede 2—jointed with 4 terminal, an outer and inner plumose setae on terminal part, endopod 4— jointed with 3 terminal and 4 inner setae. Exopod of second maxillipede produced into 8 apical inner and outer plumose setae, endopod 5-jointed. Exopod of third maxillipede produced into 10 apical outer and inner plumose setae, endopod longer than exopod. First and second legs nearly similar to third maxillipede. Exopod of third leg slender, 2—jointed and carrying 8 inner and outer plumose setae at its apex, terminal joint of endopod provided with a long terminal spine. Exopod of 4th. leg shorter than endopod, 3—jointed and produced into 6 outer, inner and terminal plumose setae, endopod 5—jointed, long ending with a terminal long spine, one outer and one inner setae. Exopod of fifth leg absent, endopod 6—jointed. Four pairs of biramous pleopods present. Telson and uropods as in 7th. stage.

Ninth Larval Stage

(Figs. 156—170)

Antennular endopod 10—jointed with 3 apical hairs, exopod unjointed with three terminal setae+3 aesthetes. Terminal joint of antennular peduncle produced into 2 outer and one inner basal plumose setae. Second joint of peduncle produced into 2 outer plumose setae. Endopod of antenna long slender, basal segment

broad and long, 2nd., 3rd., 4th. and 5th. segments short and narrow, 6th. segment long. Exopod shorter than endopod and produced into 16 plumose setae + a hair. Mandible strong and mandibular palp still not developed. Maxillular endopod provided with 2+2 apical and inner plumose setae + 2 outer hairs. Coxa produced into 8 long setae and basis 11 spines. Scaphognathite thickly setose, its proximal lobe produced into 2 spines + 2 inner short setae. Maxillar exopod and protopod as in 8th. stage. Exopod of first maxillipede 2—jointed and produced into 7 terminal plumose setae. Exopod of 2nd. maxillipede long with a terminal joint provided with 6 plumose apical and inner plumose setae, at short distance below terminal segment an outer and inner plumose setae present. Third maxillipede longer and broader than in 8th stage, exopod 3—jointed with 7 plumose setae on terminal part. Exopod of first leg 3—jointed with 8 outer, apical and inner plumose setae on terminal part, endopod chelate. Endopod of second leg thinner and longer than in first leg and also chelate, exopod with 7 outer, inner and apical setae. Exopod of third leg very short with 4 apical setae endopod long 5—jointed with a terminal spine and 2 setae. Exopod of both fourth and fifth legs absent, endopod long and broad. Pleopod biramous, exopod longer than endopod and each produced into a short seta. Telson long and narrow, with 2 outer short spines and 5+5 long plumose spines.

SUMMARY

Four larval and one post larval stages of *Callianassa* sp. obtained from the plankton and eight larval stages of *Hippolyte* sp. are studied and characters for their identification in the plankton are given.

REFERENCES

1. AL—KHOLY, A. A. 1961: The larvae of some Macruran Crustacea. Publ. Mar. Biol. Sta, Al Ghardaqa, No. 11, pp. 73-85.
2. CANO, G. 1891 : Quoted from R. Gurney (1937).
3. DAKIN, W. J. and COLEFAX, A. N. 1940 : The blankton of the Australian coastal waters of New South Wales. Part 1. Euphausiacea and Decapoda, pp. 143-190.
4. GURNEY, R. 1937 a : Larvae of Decapod Crustacea part IV : Hippolytidae «Discovery Reports », Cambridge XIV, pp. 351-404.
5. — —, R. 1937 b : Notes on some Decapod and Stomatopod Crustacea from the Red Sea. Proc. Zool. Soc. Lond., Vol. 107, ser. B, pp. 319-336.
6. LEBOUR, M. V. 1931 : The larvae of the Plymouth Caridae I -: The larvae of the Crangonidae. II : The larvae of the Hippolytidae. — — —, Ibid. pp. 1-9.

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7. — —, 1936 a : Notes on the Plymouth species of *Spirontocaris*. — — —
——, 1936, pp. 609-617.
 8. — —, 1938. The newly hatched larva of *Callinassa affinis*, Holmes. — — —
Lond., cviii, B, pp. 47-48.
 9. — —, 1940 : The larvae of the British species of *Spirontocaris* and their relation to
Thor (Crustacea Decapoda). J. Mar. Biol. Ass. U. K., XXIV, pp. 505-514.
 10. MENON, M. K. 1933 : The life histories of Decapod from Madras. Bull. Madras Govnt.
Mus., N. S. Nat. Hist. Soc., III, pp. 1—145, 10 pls.
 11. SARS, G. O. 1884 : Quoted from Gurney (1937 b).

EXPLANATION OF THE PLATES**PLATE I***Callianassa* sp.

Figs. 1—10 : first larval stage of *Callianassa* sp. : 1, whole ; 2, antennule ; 3, antenna ; 4, mandible ; 5, maxillule ; 6, maxilla ; 7, first maxillipede ; 8, second maxillipede ; 9, third maxillipede ; 10, telson.

Figs. 11—22 : second larval stage of *Callianassa* sp. : 11, whole ; 12, rostrum ; 13, antennule ; 14, antenna ; 15, mandible ; 16, maxillule ; 17, maxilla ; 18, first maxillipede ; 19, second maxillipede ; 20, third maxillipede ; 21, first leg ; 22, telson.

Figs. 23—26 : third larval stage of *Callianassa* sp. : 23, whole ; 24, antennule ; 25, antenna ; 26, mandible.

PLATE II*Callianassa* sp. (cont.)

Figs. 27—36 : third larval stage : 27, maxillule ; 28, maxilla ; 29, first maxillipede ; 30, second maxillipede ; 31, third maxillipede ; 32, first leg ; 33, third leg ; 34, fourth leg ; 35, uropod ; 36, telson.

Figs. 37—45 fourth larval stage : 37, whole ; 38, antennule ; 39, antenna ; 40, mandible ; 41, maxillule ; 42, maxilla ; 43, first maxillipede ; 44, second maxillipede ; 45, third maxillipede.

PLATE III*Callianassa* sp. (cont.)

Figs. 46—52 : fourth larval stage : 46, first leg ; 47, third leg ; 48, fourth leg ; 49, fifth leg ; 50, first pleopod ; 51, uropod ; 52, telson.

Figs. 53—69 : first post-larval stage ; 53, whole ; 54, antennule ; 55, antenna ; 56, mandible ; 57, maxillule ; 58, maxilla ; 59, first maxillipede ; 60, second maxillipede ; 61, third maxillipede ; 62, first leg ; 63, second leg ; 64, third leg ; 65, fourth leg ; 66, fifth leg ; 67, third pleopod ; 68, uropod ; 69, telson.

PLATE IV*Hippolyte* sp. (cont.)

Figs. 70—80 : second larval stage : 70, whole ; 71, antennule ; 72, antenna ; 73, mandible ; 74, maxillule ; 75, maxilla ; 76, first maxillipede ; 77, second maxillipede ; 78, third maxillipede ; 79, first leg ; 80, telson.

Figs. 81—91 : third larval stage : 81, whole ; 82, antennule ; 83, antenna ; 84, mandible ; 85, maxillule ; 86, maxilla ; 87, first maxillipede ; 88, second maxillipede ; 89, third maxillipede ; 90, first leg ; 91, telson.

Figs. 92—94 : fourth larval stage : 92, whole ; 93, antennule ; 94, antenna.

PLATE V*Hippolyte* sp. (cont.)

Figs. 59—103: fourth larval stage : 95, mandible ; 96, maxillule ; 97, maxilla ; 98, first maxillipede ; 99, second maxillipede ; 100, third maxillipede ; 101, first leg ; 102, third leg ; 103, telson.

Figs. 104—114: fifth larval stage: 104, whole lateral view; 105, whole dorsal view; 106, antennule; 107, antenna ; 108, mandible ; 109, maxillule ; 110, maxilla ; 111, first maxillipede ; 112, second maxillipede ; 113, third maxillipede , 114, third leg.

PLATE VI*Hippolyte* sp. (cont.)

Fig. 115 : telson of fifth larval stage.

Figs. 116—127 sixth larval stage : 116, whole ; 117, antennule ; 118, antenna ; 119, mandible ; 120, maxillule ; 121, maxilla ; 122, first maxilliped ; 123, second maxillipede ; 124, third maxillipede ; 125, fourth leg ; 126, sixth leg ; 127, telson.

Fig. 128 : seventh larval stage, whole.

PLATE VII*Hippolyte* sp. (cont.)

Figs. 129—141: seventh larval stage : 129, antennule ; 130, antenna ; 131, mandible ; 132, maxillule ; 133, maxilla ; 134, first maxillipede ; 135, second maxillipede ; 138, third maxillipede. 137, first leg ; 138, third leg ; 139, fourth leg ; 140, fifth leg ; 141. telson.

Fig. 142 : eighth larval stage, whole.

PLATE VIII*Hippolyte* sp. (cont.)

Figs. 143—155 : eighth larval stage : 143, antennule ; 144, antenna ; 145, mandible ; 146, maxillule ; 147, maxilla ; 148. first maxillipede ; 149, second maxillipede ; 150, third maxillipede ; 151, third leg ; 152, fourth leg ; 153, fifth leg ; 154, first pleopod ; 155, telson.

Fig. 156 : ninth larval stage, whole

PLATE IX*Hippolyte* sp. (cont.)

Figs. 157—170 : ninth larval stage : 157. antennule ; 158, antenna ; 159, mandible ; 150, maxillule ; 161, maxilla ; 162, first maxillipede ; 163, second maxillipede ; 164, third maxillipede ; 165, first leg ; 166, second leg ; 167, third leg ; 168, fourth leg ; 169, first pleopod ; 170 telson.

PLATE I

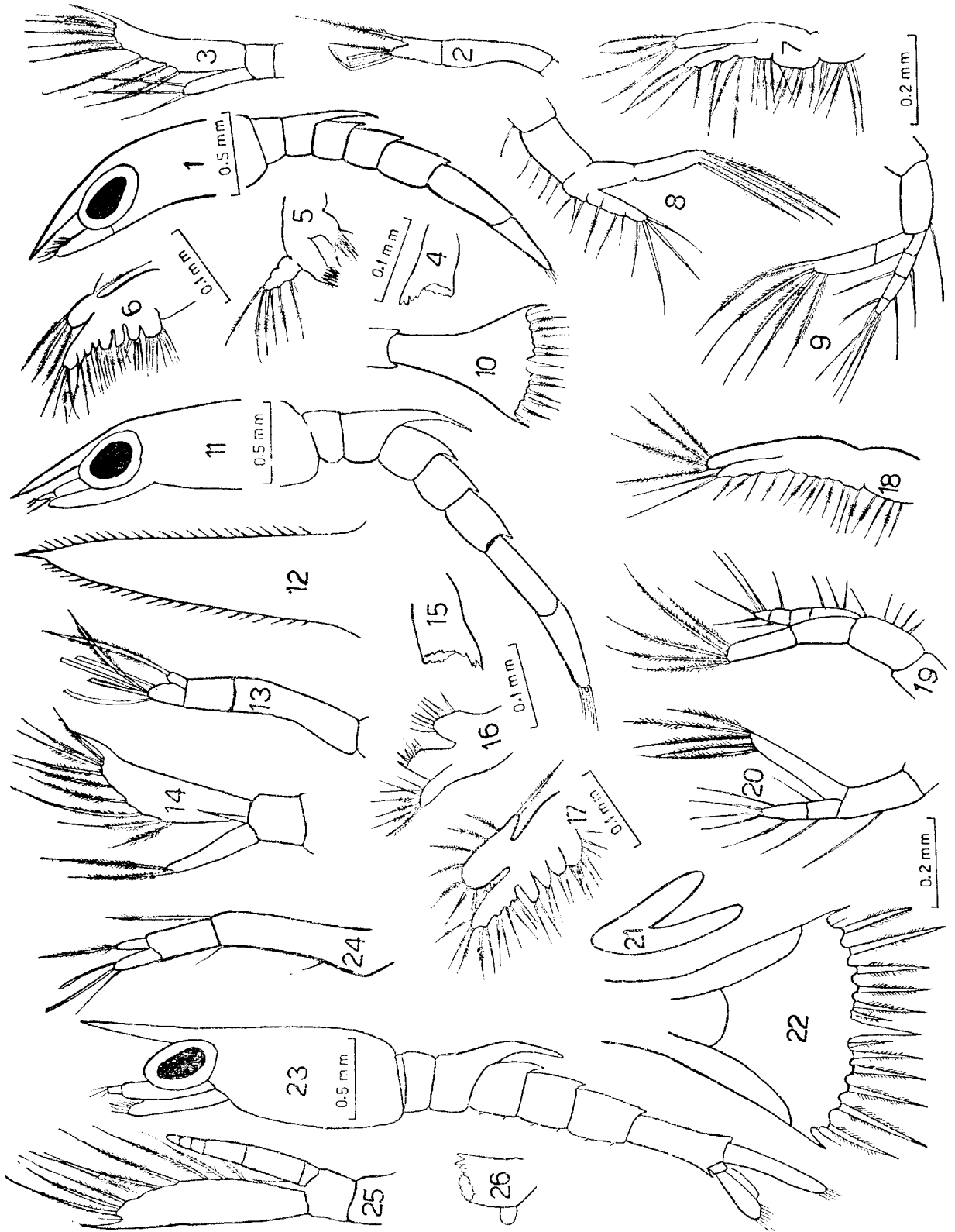


PLATE II

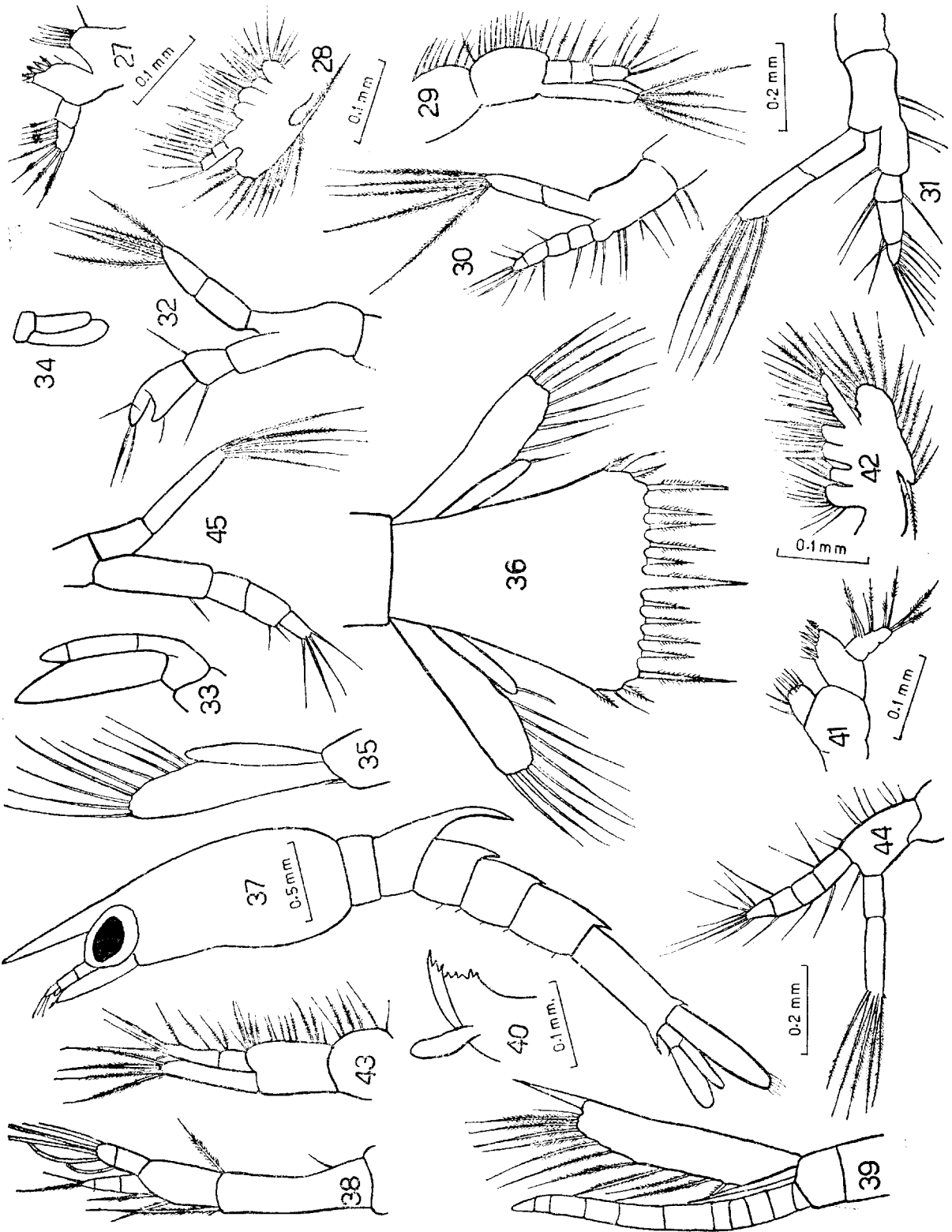


PLATE III

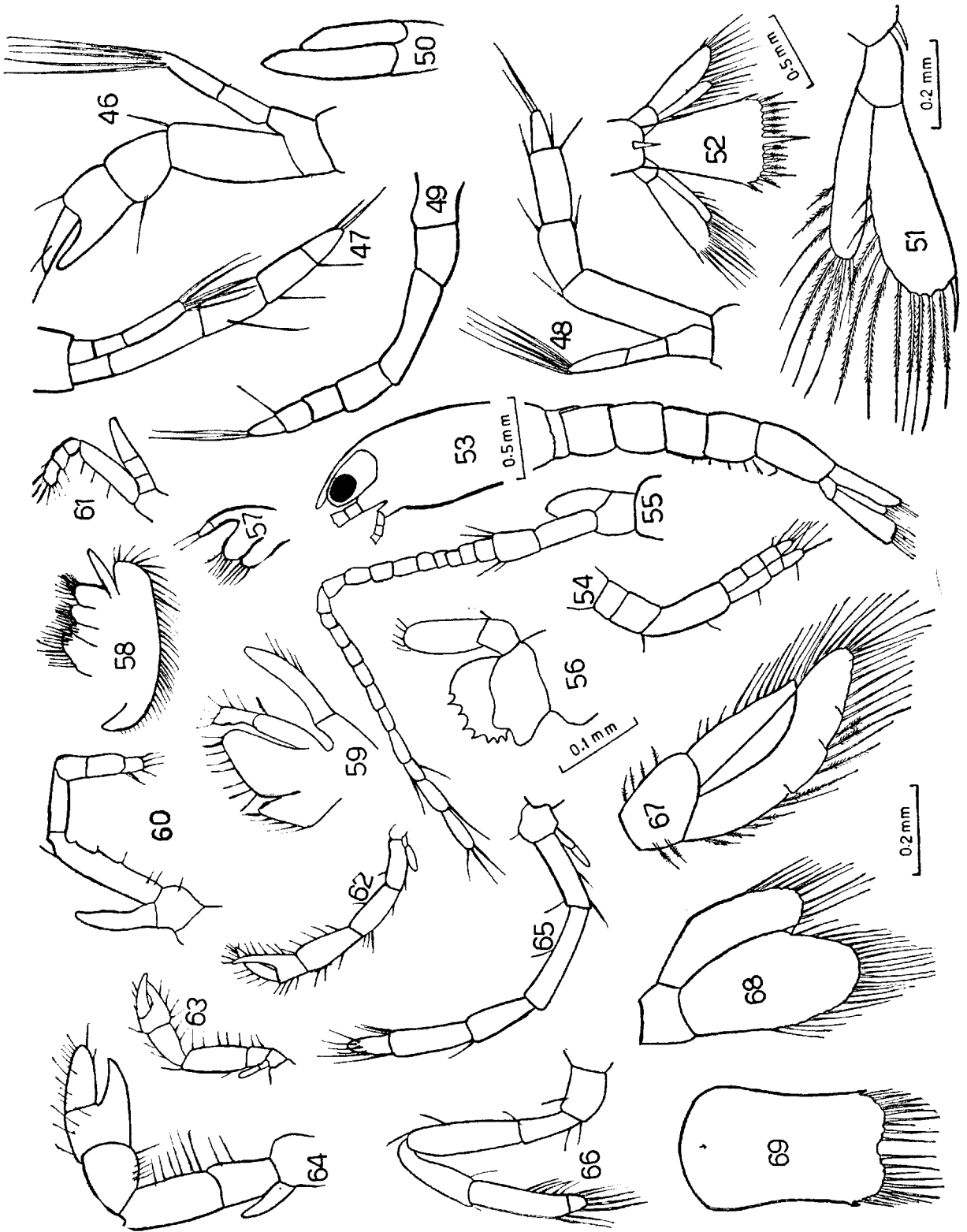


PLATE IV

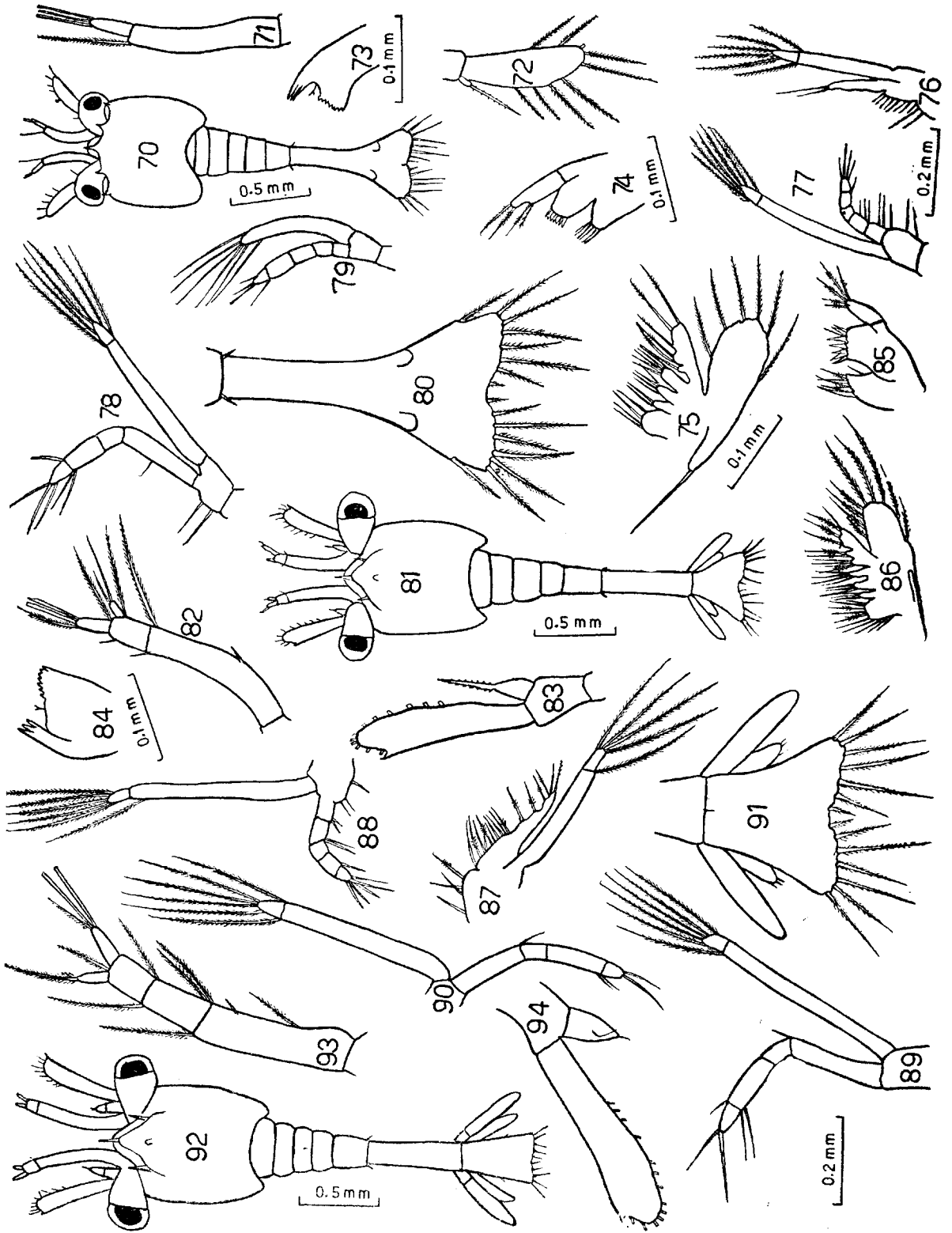


PLATE V

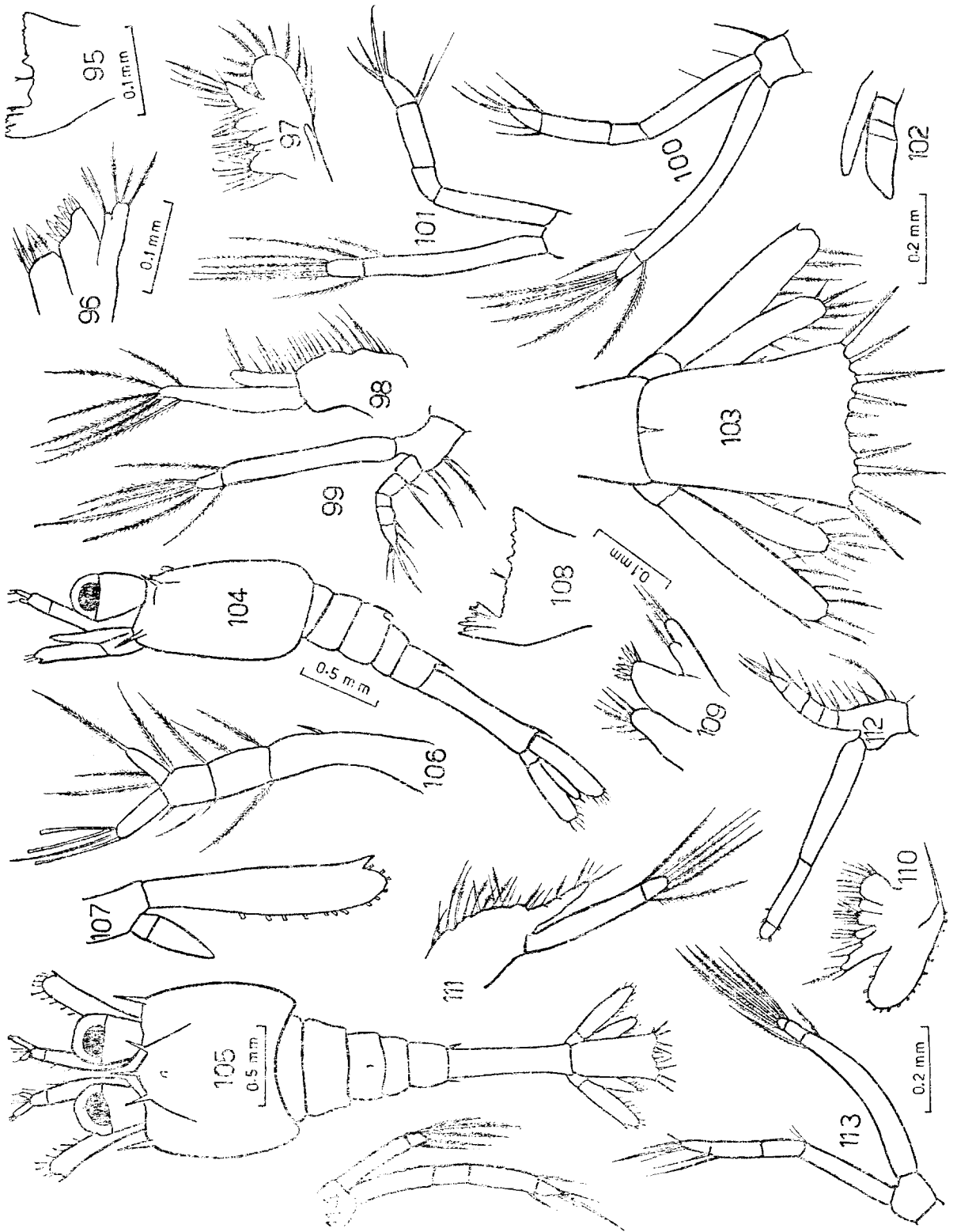


PLATE VI

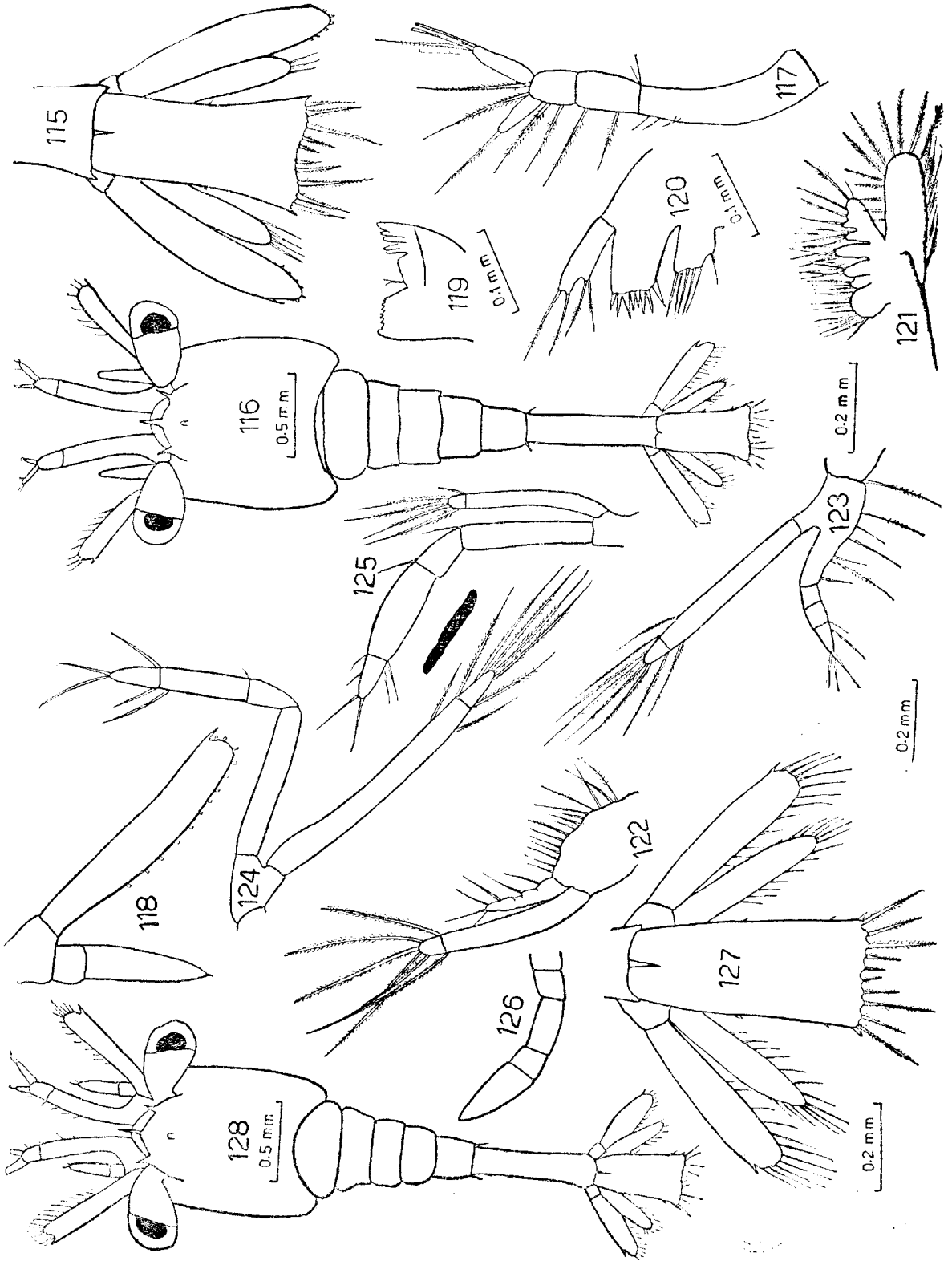


PLATE VII

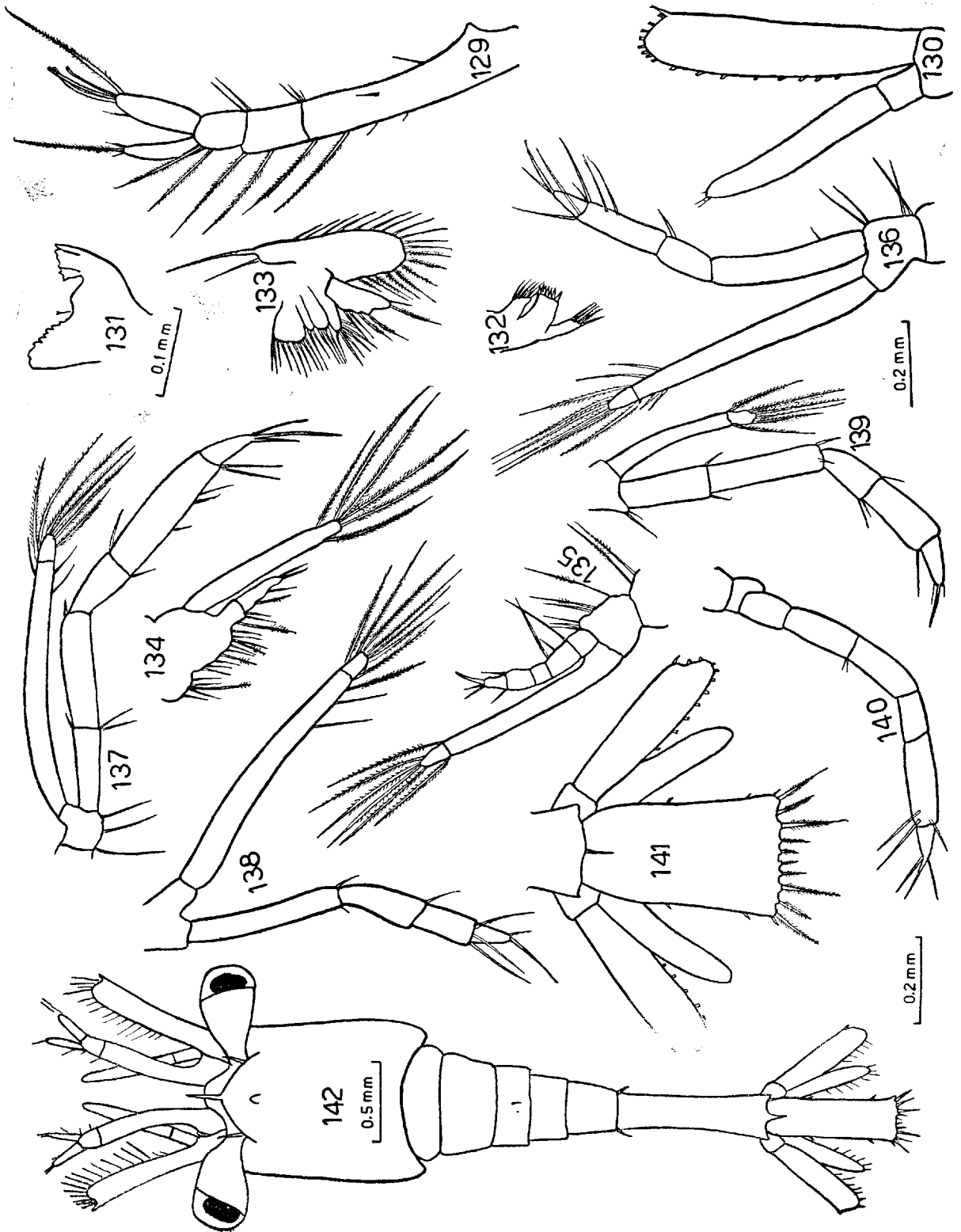


PLATE VIII

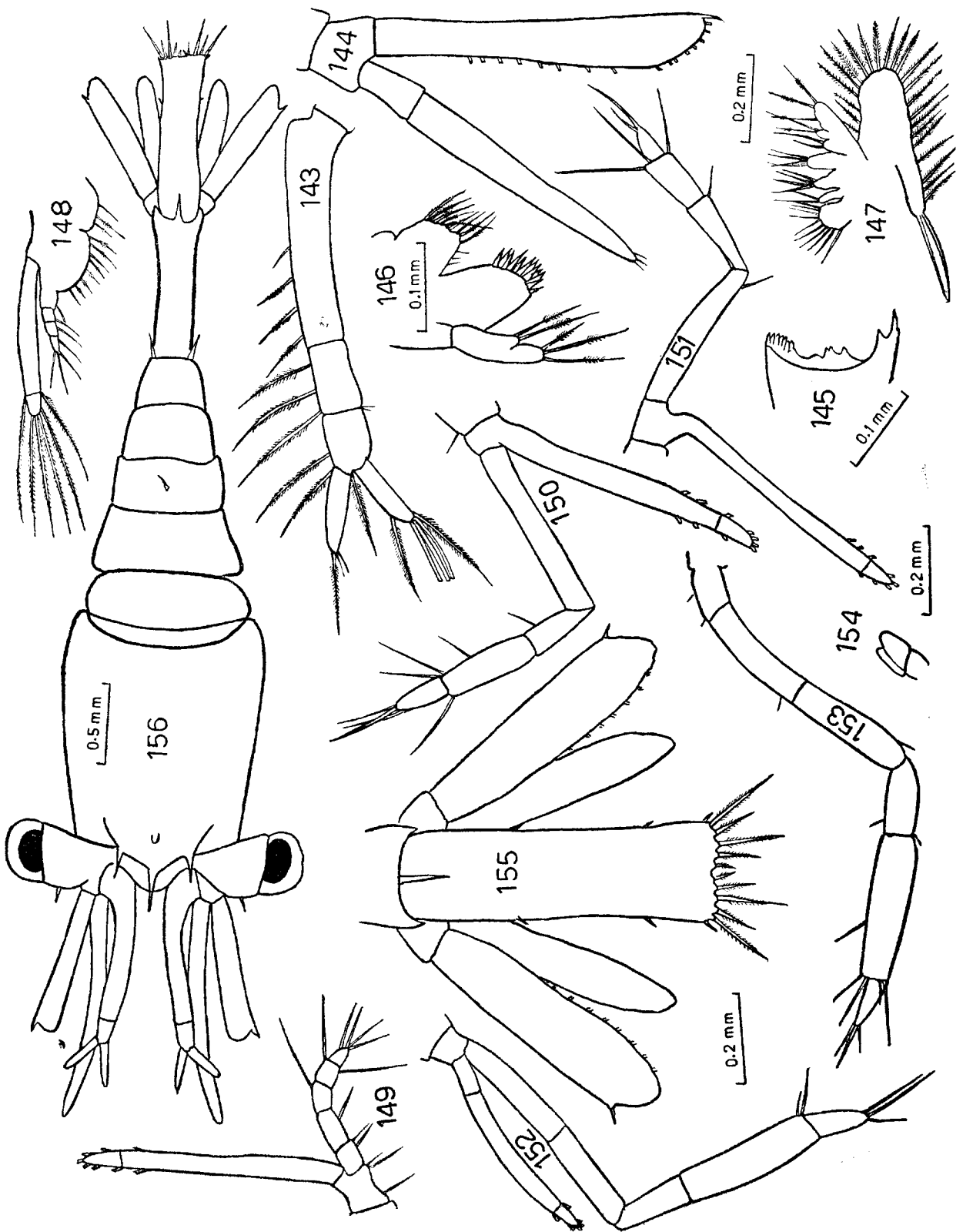


PLATE IX

