LARVAL DEVELOPMENT OF HEXAPANOPEUS SCHMITTI RATHBUN, 1930 (DECAPODA, BRACHYURA, XANTHIDAE) REARED IN THE LABORATORY

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ABSTRACT

Larvae of the South American mud crab species **Hexapanopeus schmitti** were reared in the laboratory from hatching to metamorphosis. Development consists of four zoeal stages and a megalopa. Duration of each of the zoeal stages at 25°C is 2-5 d, and in the megalopa 7-9 d, i.e. total larval development duration lasts approximately three weeks. The morphology of the larvae is described and compared with that of larvae of **H. angustifrons,** the only other species within the same genus for which a description of larval stages is available at present. The zoeae of **H. schmitti** differ from those of **H. angustifrons** mainly in the absence of lateral carapace spines and in the number of both internal and external lateral spines on the telson. The megalopa can be distinguished by the number of aesthetascs and setae on the antennule, the setation of the antennal flagellum, the mouth parts and maxillipeds, and by the presence of spines on the surface of the scaphognathite of the maxilla. The latter feature has not yet been observed in other xanthid species.

Key words: Brachyura, Xanthidae, development, Parana (Brazil)

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RESUMO

Larvas da espécie sulamericana **Hexapanopeus schmitti** foram cultivadas em laboratório desde a eclosão até a metamorfose. O desenvolvimento compreende 4 estadios de zoea e 1 de megalopa. A duração de cada um dos estadios de zoea a 25°C é de 2-5 dias, e da megalopa de 7-9 dias. A duração total do desenvolvimento larval é de aproximadamente 3 semanas. A morfologia das larvas é descrita e comparada com as de **H. angustifrons,** a única espécie do mesmo gênero que tem o desenvolvimento estudado. As zoeas de **H. schmitti** se diferenciam das de **H. angustifrons** principalmente pela ausência dos espinhos laterais da carapaça e pelo número de espinhos laterais internos e externos do telson. A megalopa pode ser diferenciada pelo número de estetascos e sedas da antênula, a setação do flagelo antenal, das partes bucais e maxilípedes e pela presença de espinhos sobre a superfície do escafognatito da maxila. Esta última característica não tem sido observada em outras espécies de Xanthidae.

Palavras-chave: Brachyura, Xanthidae, desenvolvimento, Paraná (Brasil).

INTRODUCTION

Hexapanopeus schmitti is a very common species in mussel and oyster banks in the Paranaguá estuary, southern Brazil. Very little is known about the biology of this mud crab and, according to Melo (1985), adult specimens may easily be confused with **Panopeus bermudensis.** It is considered an opportunistic species that feeds on small molluscs other benthic animals living in the same habitat (Melo, 1985).

Larval development of **Hexapanopeus** spp. has been described, to our knowledge, only in **H. angustifrons,** from North America (Hyman, 1925; Costlow and Bookhout, 1966). In the present study, **H. schmitti** from the Paranaguá estuary was reared in the laboratory from hatching to metamorphosis, and the larval stages are described.

MATERIAL AND METHODS

Ovigerous **Hexapanopeus schmitti** were collected in February 1988 from a mussel (**Perna perna**) bank located between Pontal do Poço and the Baguaçu river in the Paranaguá estuary (Paraná, Brazil). Their identity was later checked by Dr. G.A. de Melo in the Zoological Museum of the University of São Paulo (USP), São Paulo.

Larvae were reared in seawater diluted with tap water to 25‰S and maintained at constant 25 (±0.5) °C and a 12:12 L:D photoperiod Water and food (freshly hatched **Artemia** spec., San Francisco Bay Brand[TH] nauplii) were changed daily in both mass culture bowls (400 ml) and in vials (20 ml) with individual larvae. Individual cultivation was conducted in order to obtain information on mortality and variation in development duration of each larval stage.

Larvae and exuviae of all larval instars were collected from mass cultures and fixed in 4% seawater-formaldehyde. The samples were kept in a refrigerator, until larvae (10 of each stage) were dissected under stereo microscopes (Wild and Zeiss), and drawings were made with the aid of a camera lucida attached to a Leitz compound microscope.

RESULTS

Larval development of **Hexapanopeus schmitti** comprised 4 zoeal stages and a megalopa. A prezoea was not observed. It took, from hatching to metamorphosis (moult of megalopa to the first juvenile crab), on the average 22d. Development durations of the single larval instars are given in Table I.

In our description of the larval morphology of **Panopeus austrobesus**, the following abbreviations were used: CL: carapace length from orbit to the posterior carapace border; CW: carapace width, measured at the widest part of the carapace (only in the megalopa); TL: total length, from the tip of the rostrum to the posterior border of the telson, excluding the processes of the telson; DS: dorsal carapace spine, from base

to tip, RS: rostral carapace spine, from base to tip; DS-RS: distance from the tip of the DS to the tip of the RS. The same abbreviations will be used for **Hexapanopeus schmitti.**

Zoea I

Size — TL 1.23mm, CL 0.39mm, RS 0.84mm, DS 0.57mm, DS-RS 1.71mm.

Carapace (Fig. 1a) — Cephalothorax with lateral spines reduced to protuberances; DS upright, shorter than RS; eyes unstalked.

Antennule (Fig. 2a). — Conical and stout with 2 aesthetascs and 1 short seta.

Antenna (Fig. 3a). — Protopod long, smooth, tip rounded; without exopod.

Mandible (Fig. 4a). — Left and right symmetrical; incisive process with insinuated teeth; molar process well developed, indented.

Maxillule (Fig. 5a). — Endopod 2-segmented; proximal segment with 1 plumose seta, distal segment with 3 terminal and 2 subterminal plumose setae; basal endite with 4 serrate and 1 plumose seta; coxal endite with 6 serrate setae.

Maxilla (Fig. 6a). — Endopod bilobed with 5,3 plumose setae; basal endite bilobed with 4, 4 serrate setae; coxal endite bilobed with 3, 4 serrate setae; scaphognathite with 4 plumose setae and 1 plumose projection.

Maxilliped 1 (Fig. 7a). — Exopod with 4 natatory setae; endopod 5-segmented, with 3, 2, 1, 2, 5 setae; basis with 10 plumose setae distributed in groups of various numbers.

Maxilliped 2 (Fig. 8a) — Basis with 2 plumose setae; endopod 3-segmented with 1,0,4 plumose setae; exopod with 4 natatory setae.

Abdomen (Fig. 9a) — 5-segmented; somites 2,3 each with 1 pair of small lateral setae; somites 2-5 each with 1 pair of short simple dorsal setae.

Telson (Fig. 9a) — Bifurcated, with 1 small smooth lateral spine on outer surface and 1 longer spine on inner surface of each ramus; posterior margin with 3 pairs of spines.

Zoea II

Size — TL 1.74mm; CL 0.54mm; RS 1.11mm; DS 0.84mm; DS-RS 2.49mm.

Carapace (Fig. 1b) — In general as in zoea I; DS slightly recurved; 5 plumose setae in the postero-lateral region; eyes stalked.

Antennule (Fig. 2b) — As in zoea I, but with 4 aesthetascs and 2 setae of different size.

Antenna (Fig. 3b) — As in zoea I, but with small protuberance with 1 seta on basis of protopod.

Mandible (Fig. 4b) — As in zoea I, but with teeth on incisive and molar parts more conspicuous.

Maxillule (Fig. 5b) — Endopod 2-segmented with 1,6 plumose setae; basal endite with 7 serrate spines and 1 short plumose seta; coxal endite with 6 serrate and 1 smooth spine; protopod with 1 short plumose seta.

Maxilla (Fig. 6b) — Endopod bilobed with 5,3 plumose setae; basal endite bilobed with 4,5 plumose setae; coxal endite bilobed with 4,3 serrate setae; scaphognathite with 11 plumose setae.

Maxilliped 1 (Fig. 7b) — Basis with 11 plumose setae in groups of different size; endopod 5-segmented with 3,2,1,2,5 setae; exopod with 6 natatory setae.

Maxilliped 2 (Fig. 8b) — Basis with 3 or 4 short plumose setae; endopod 3-segmented with 1,1,5 plumose setae; exopod with 6 natatory setae.

Maxilliped 3 — Rudimentary.

Abdomen (Fig. 9b) — As in zoea I, but spines of somite 2 more developed.

Telson (Fig. 9d) — As in zoea I.

Zoea III

Size — TL 2.07mm; CL 0.66mm; RS 1.38mm; DS 0.96mm; DS-RS 3.21mm.

Carapace (Fig. 1c) — With 4 short lateral setae and 2 in the postero-lateral region.

Antennule (Fig. 2c) — As in previous stage, with 2 or 3 aesthetascs and 3 setae of different length.

Antenna (Fig. 3c) — As in previous stage, but with insinuation of endopod.

Mandible (Fig. 4c) — incisive part reduced to 2 external teeth; molar part as in previous stage.

Maxillule (Fig. 5c) — Endopod 2-segmented with 1, 6 plumose setae; basal endite with 6 serrate and 2 smooth spines; coxal endite with 5 serrate and 1 smooth seta; protopod with 1 stout plumose seta.

Maxilla (Fig. 6c) — Endopod bilobed with 5, 3 plumose setae; basal endite bilobed with 5, 5 setae; coxal endite bilobed with 3 or 4 setae; scaphognathite with 20 plumose setae.

Maxilliped 1 (Fig. 7c) — Basis with 8 plumose setae grouped in pairs; endopod 5-segmented with 3,2,1,2,6 setae; exopod with 8 natatory setae.

Maxilliped 2 (Fig. 8c) — Basis with 3 stout plumose setae; endopod 3-segmented with 1, 1, 5 plumose setae; exopod with 8 natatory setae.

Maxilliped 3 — Rudimentary.

Abdomen (Fig. 9c) — 6-segmented, somites 2, 3, 4 with postero-lateral spines overlapping the following segment; rudimentary pleopods in somites 2-6.

Telson (Fig. 9c) — As in previous stage, but with 1 pair of smooth setae in the medial sinus.

Zoea IV

Size — TL 2.94mm; CL 0.99mm; RS 1.74mm; DS 1.08mm; DS-RS 4.17mm.

Carapace (Fig. 1d). — As in previous stage, but with 10-12 fine setae on postero-lateral margin.

Antennule (Fig. 2d). — With 4 or 5 aesthetascs and 2 setae; endopod rudimentary.

Antenna (Fig. 3d). — Endopod more developed than in previous stage.

Mandible (Fig. 4d). — incisive part reduced to 2 teeth; molar part as in previous stage; rudimentary palp.

Maxillule (Fig. 5d). — Endopod 2-segmented with 1, 6 plumose setae; basal endite with 10 plumose spines; coxal endite with 11 plumose spines; protopod with 2 large plumose setae.

Maxilla (Fig. 6d). — Endopod bilobed with 5, 3 plumose setae; basal endite bilobed with 5, 6 plumose setae; coxal endite bilobed with 4, 6 serrate spines; scaphognathite with 30 plumose setae.

Maxilliped 1 (Fig. 7d). — Basis with 9 stout plumose setae, endopod 5-segmented with 3, 2, 1, 2, 6 plumose setae; exopod with 9 natatory setae.

Maxilliped 2 (Fig. 8d). — Basis with 4 stout plumose setae; endopod 3-segmented with 1, 1, 5 plumose setae; exopod with 11 natatory setae.

Maxilliped 3 (Fig. 8f). — Rudimentary, with segmentation insinuated.

Pereiopods — Developing; chelipeds with 1 segment (Fig. 8 g) non-functional.

Abdomen (Fig. 9d). — As in previous stage, but lateral spines and pleopods of somites 2-6 more developed.

Telson (Fig. 9d). — As in previous stage, but with 1 more pair of plumose spines on the medial sinus.

Megalopa

Size — TL 2.22mm; CL 0.93mm; CW 1.17mm.

Carapace (Fig. 10a). — Rectangular, covered with small setae of different size; rostrum rounded, frontal region with 1 depression and 2 lateral spines on each side, 4 setae above the border of the depressions and 1 pre-marginal seta on each side; short setae distributed along the postero-lateral margins.

Antennule (Fig. 2e). — 1 peduncle and 2 flagella (endopod and exopod); endopod unsegmented with 5 long smooth setae in the distal part; peduncle with 3 large terminal and 2 antero-inferior setae; exopod 5-segmented with 16 aesthetascs distributed in 3 rows on segments 2, 3, 4 very close to each other, so that their actual number is difficult to determine.

Antenna (Fig. 3e). — 10-segmented, with 3, 1, 1, 0, 2, 0, 4, 0, 4, 4 setae.

Mandible (Fig. 4e). — Asymmetrical, with mucronated medial tip; palp 2-segmented with 0,8 setae.

Maxillule (Fig. 5e). — Endopod 2-segmented with 2, 2 plumose setae and 1 terminal spine; basal endite with plumose setae and serrate spines (23 in total); coxal endite with plumose setae and spines (14 in total); protopod with 1 plumose seta.

Maxilla (Fig. 6e). — Endopod with 2 plumose setae; basal endite bilobed with 9, 6 setae; coxal endite with 5, 7 plumose setae; scaphognathite with 47 plumose setae and 11 smooth spines on the surface.

Maxilliped 1 (Fig. 7e). — Exopod 2-segmented with 2, 5 setae; endopod unsegmented with 3 plumose setae; basal endite with 19 setae; coxal endite with 13 setae; epipod with 7 very long smooth setae.

Maxilliped 2 (Fig. 8e). — Exopod 2-segmented with 0, 5 setae; endopod 4-segmented with 3, 1, 7, 9 setae; epipod insinuated.

Maxilliped 3 (Fig. 10j). — Exopod 2-segmented with 2, 7 setae; endopod 5-segmented with 21, 9, 8, 8, 6, setae; protopod with 13-15 plumose setae.

Pereiopods — Chelipeds (Fig. 10b) with 1 recurved ischial hook and 6 short setae; dactyl with 6 irregular teeth; dactyl of pereiopods 2-4 (Fig. 10c) with 1 terminal serrate and 3 ventral spines; dactyl of pereiopod 5 (Fig. 10d) with 1 very long smooth seta and 1 terminal spine; all pereiopods covered with shorter setae and small spines.

Abdomen (Fig. 9e). — 6-segmented, 5 pairs of well-developed pleopods.

Pleopods (Figs. 10e-i). — Exopods of pleopods 1-4 with 12, 12, 12, 11 long plumose setae, endopods with 2, 2, 3, 2 hooked setae; uropod without endopod, with 1 seta on proximal and 6 marginal setae on distal segment of exopod.

Telson (Figs. 9e-f). — Subquadrate with 4 short dorsal and 2 ventral setae.

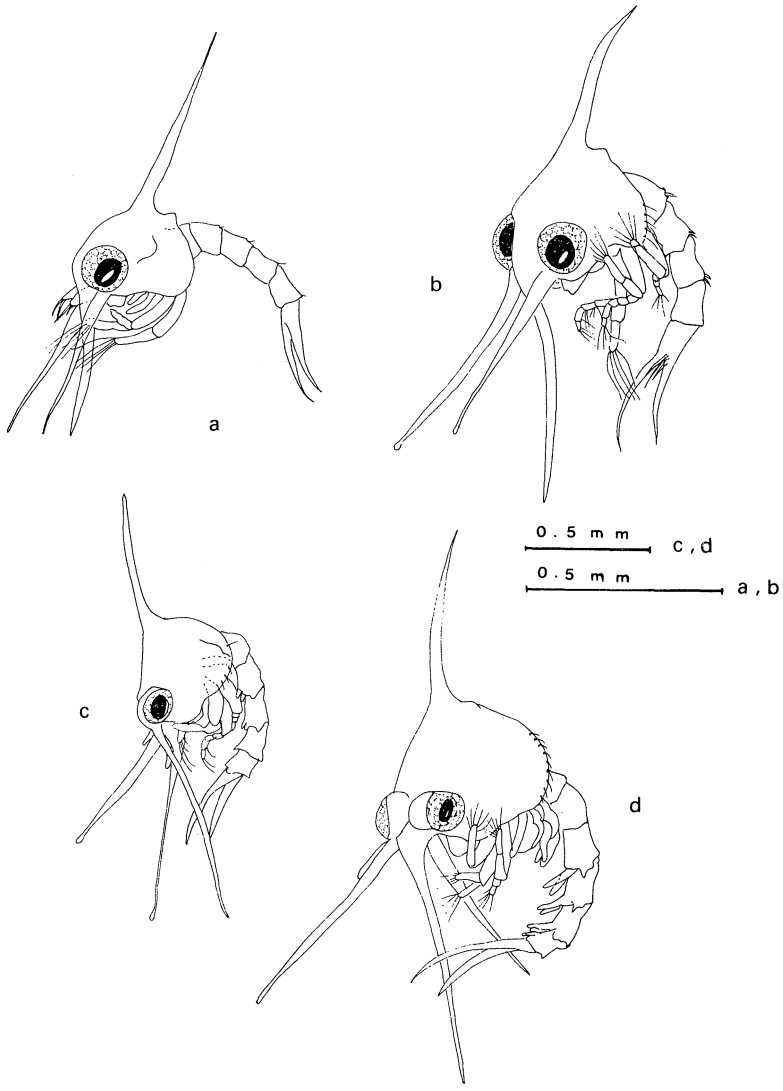

FIG. 1 — **Hexapanopeus schmitti**. General appearance of the zoeal stages a. Zoea I; b. Zoea II; c. Zoea III; d. Zoea IV.

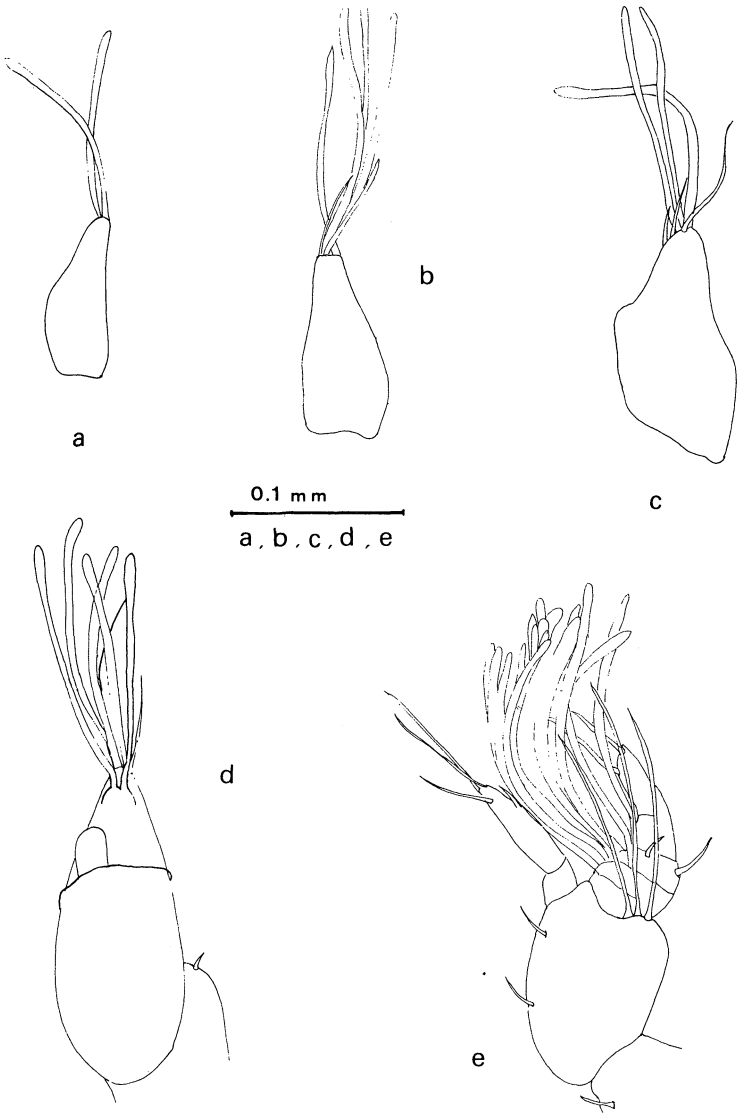

FIG. 2 — **Hexapanopeus schmitti**. Antennule.
a. Zoea I; b. Zoea II; c. Zoea III; d. Zoea IV; e. Megalopa.

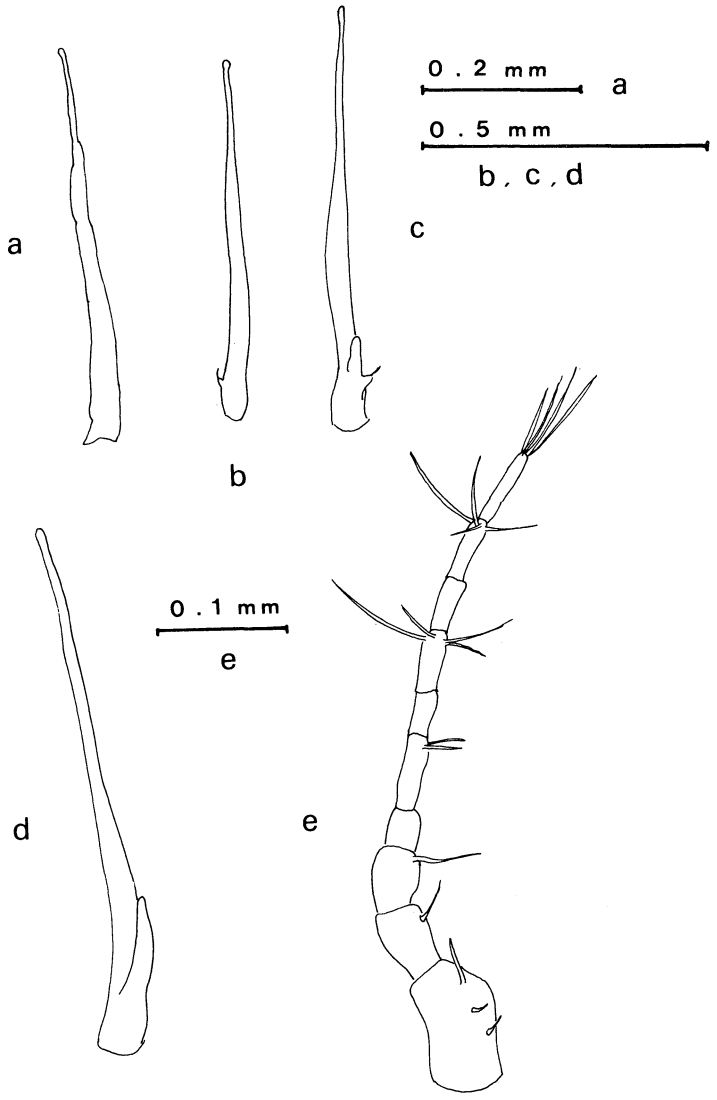

FIG. 3 — **Hexapanopeus schmitti**. Antenna.
a. Zoea I; b. Zoea II; c. Zoea III; d. Zoea IV; e. Megalopa.

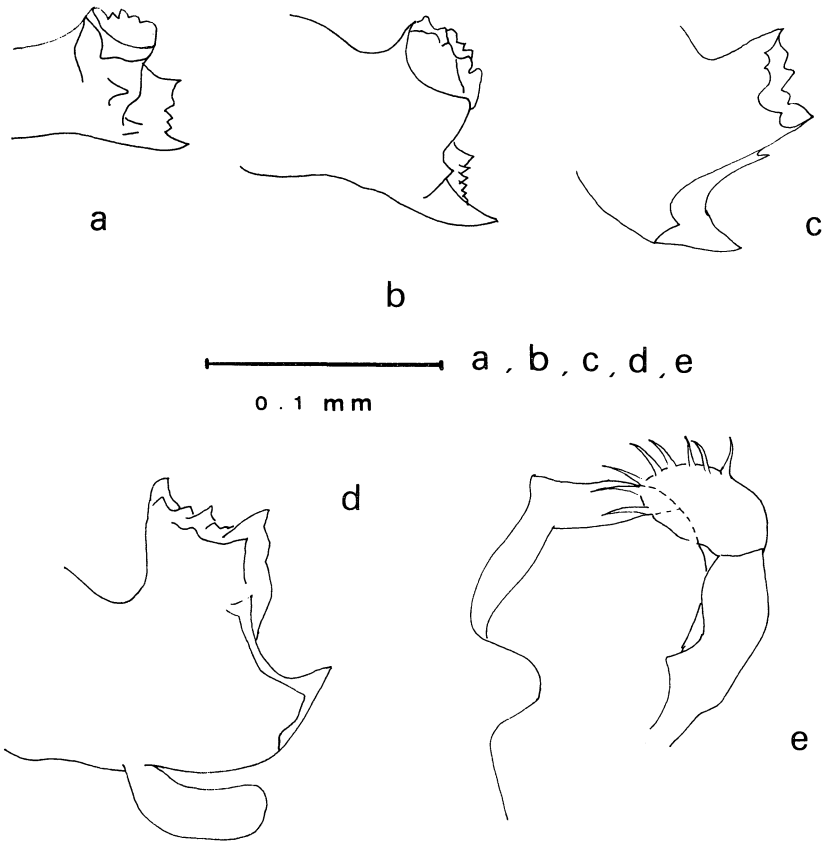

FIG. 4 — **Hexapanopeus schmitti**. Mandible.
a. Zoea I; b. Zoea II; c. Zoea III; d. Zoea IV; e. Megalopa.

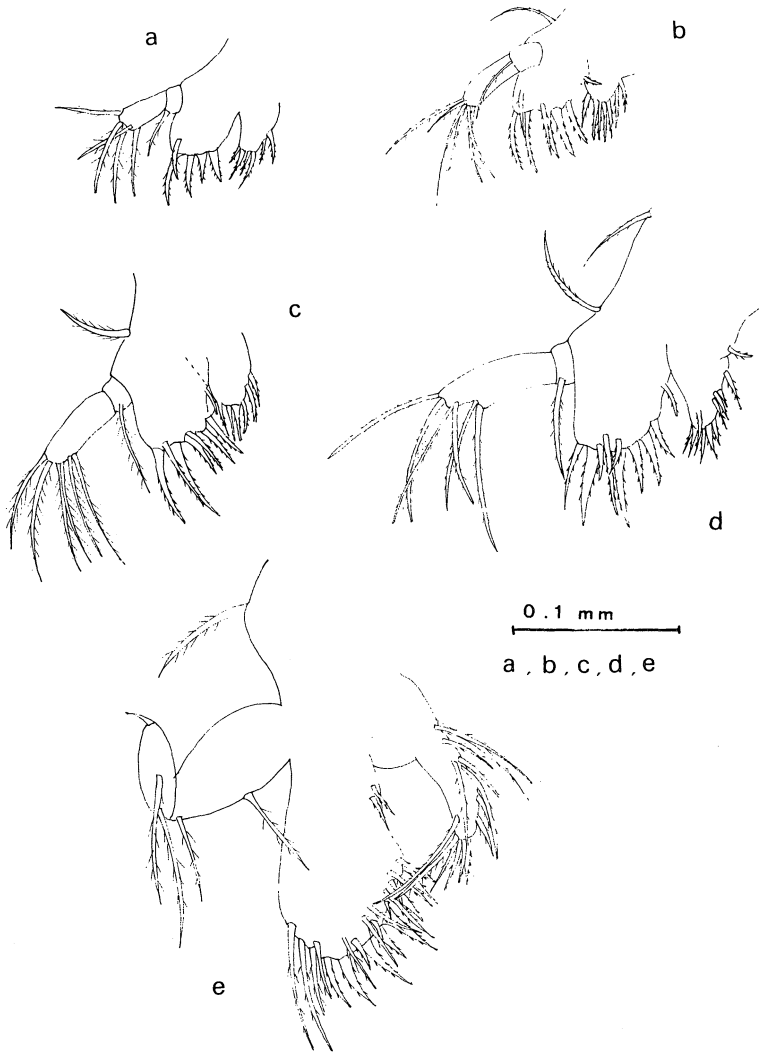

FIG. 5 — **Hexapanopeus schmitti**. Maxillule.
a. Zoea I; b. Zoea II; c. Zoea III; d. Zoea IV; e. Megalopa.

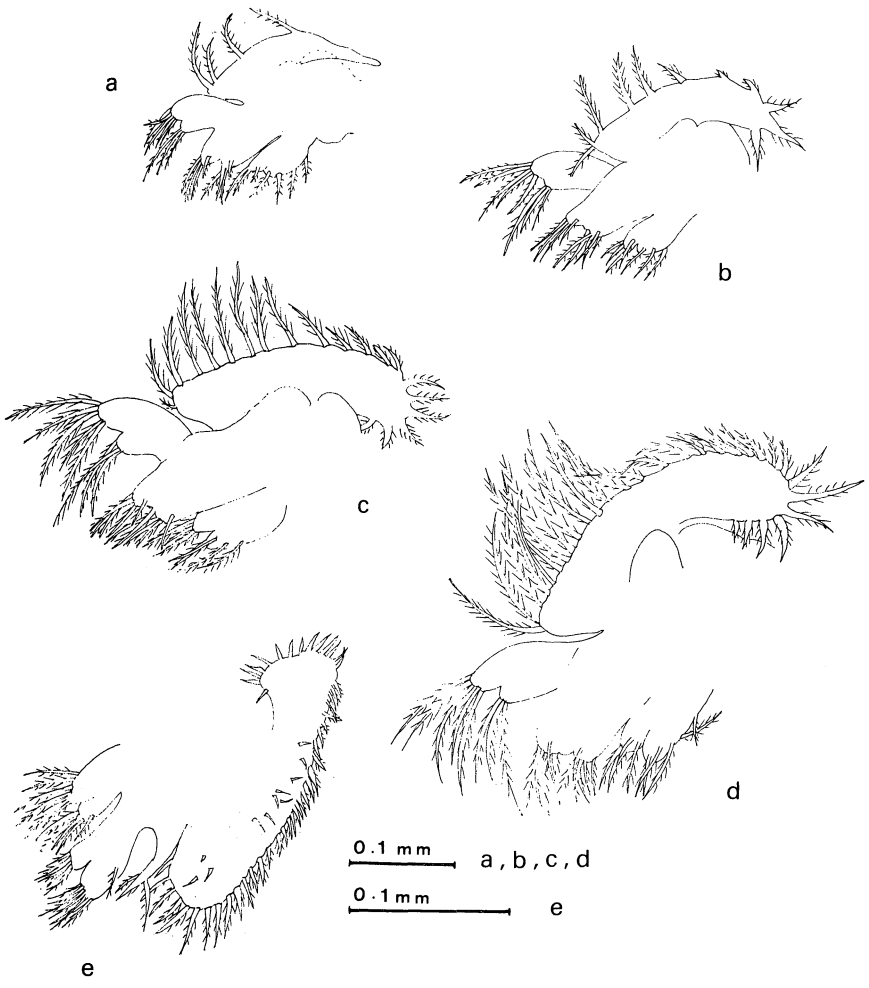

FIG. 6 — **Hexapanopeus schmitti**. Maxila.
a. Zoea I; b. Zoea II; c. Zoea III; d. Zoea IV; e. Megalopa.

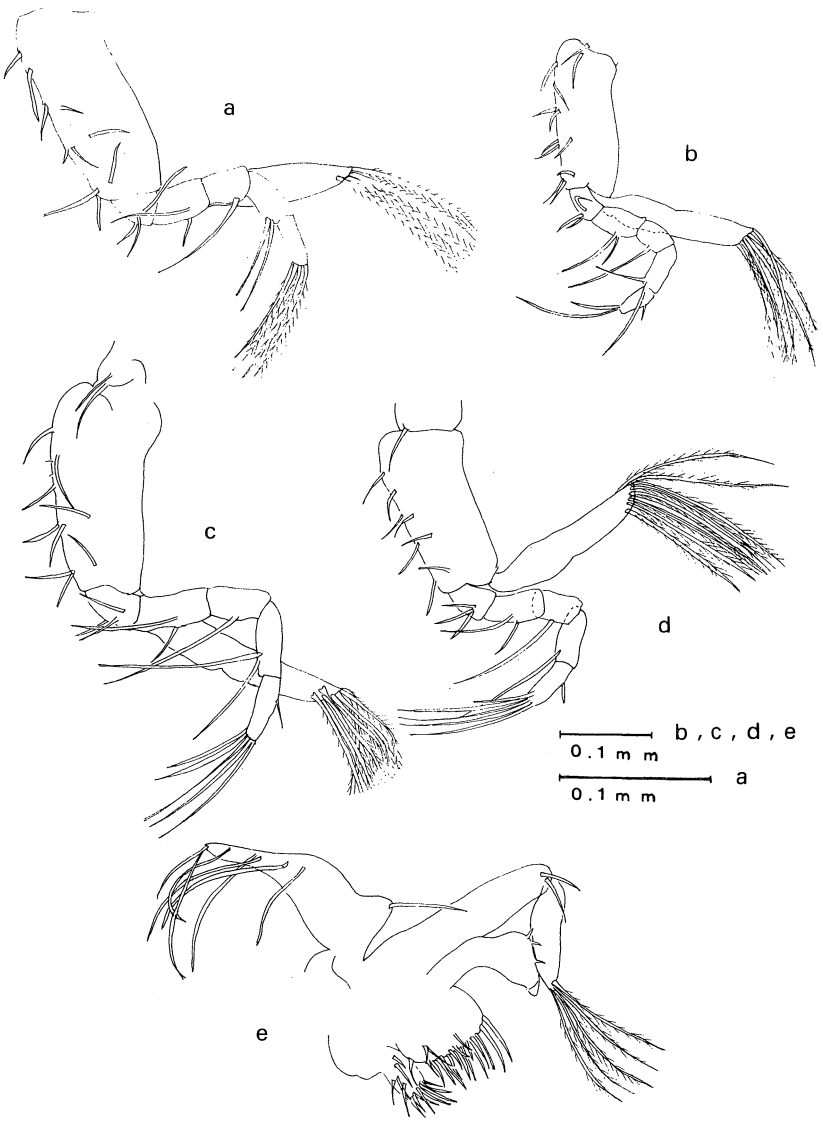

FIG. 7 — **Hexapanopeus schmitti**. Maxilliped 1.
a. Zoea I; b. Zoea II; c. Zoea III; d. Zoea IV; e. Megalopa.

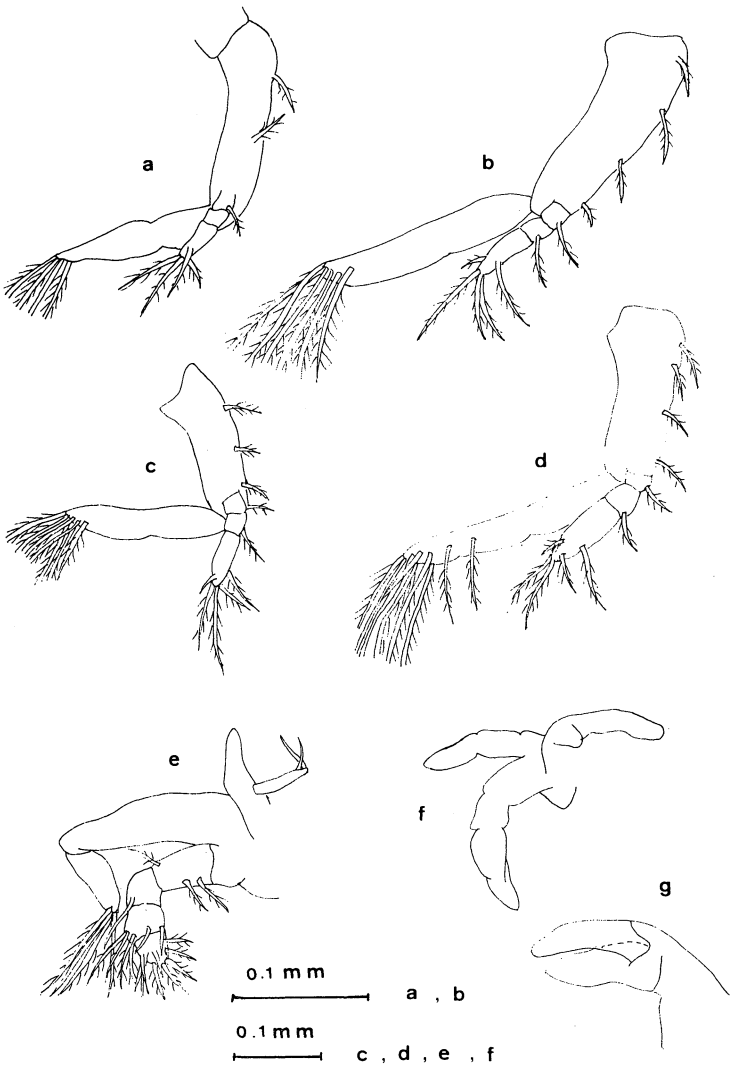

FIG. 8 — **Hexapanopeus schmitti**. Maxilliped 2.
a. Zoea I; b. Zoea II; c. Zoea III; d. Zoea IV; e. Megalopa; f. Maxilliped 3 Zoea IV; g. Cheliped.

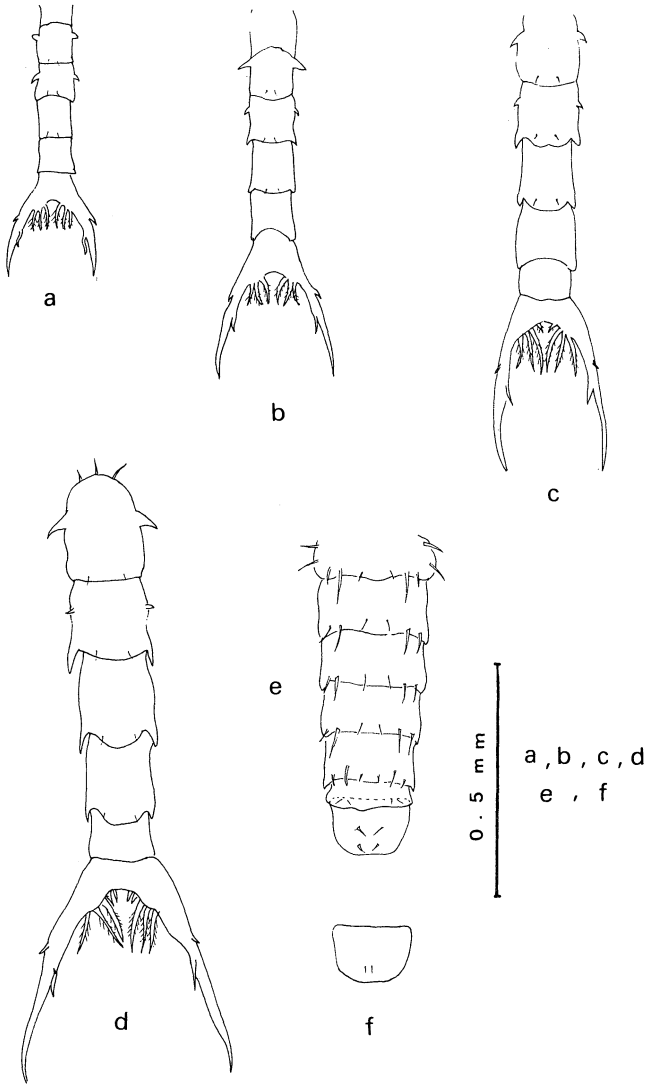

FIG. 9 — **Hexapanopeus schmitti**. Abdomen and telson.
a. Zoea I; b. Zoea II; c. Zoea III; d. Zoea IV; e. Megalopa dorsal; Telson ventral.

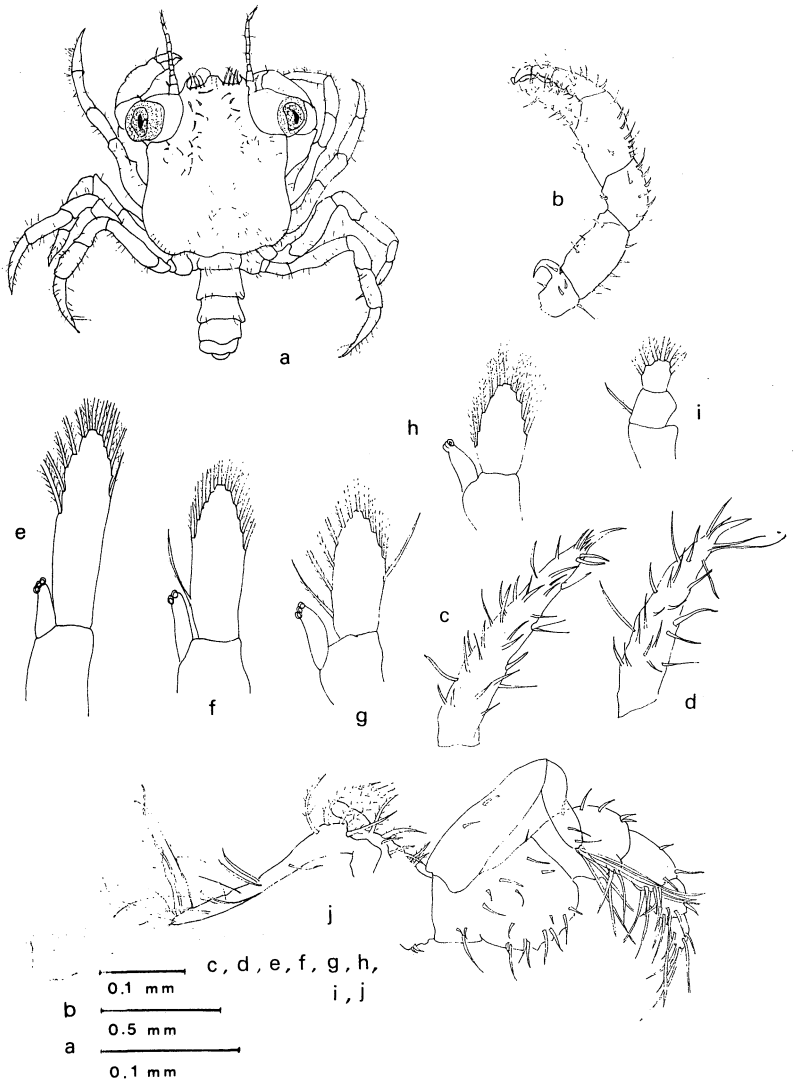

FIG. 10 — **Hexapanopeus schmitti**. Megalopa.
a. General appearance; b. Cheliped; c. Pereiopods 2 to 4; d. Pereiopod 5; e. Pleopod 1; f. Pleopod 2; g. Pleopod 3; h. Pleopod 4; i. Pleopod 5; j. Maxilliped 3.

DISCUSSION

Larval development of **Hexapanopeus schmitti** comprised four zoeal stages and a megalopa, which is the normal case in the Xanthidae (Martin, 1984). Duration of development in the zoea I instar was significantly longer than in the zoea II (Table I). This delay in the initial stage suggests that the zoea I larvae, due to their small size, had some difficulties to capture and ingest **Artemia** nauplii, since normally under constant and optimum conditions the first stage tends to develop in somewhat shorter time than the zoea II (see e.g. Anger et al., 1981). Thus, with optimum food, development at 25°C may be ca. 1 d shorter than found in this study. Mortality was highest in the megalopa. This is quite common, and it may also suggest some deficiency in food quality, possibly appearing as a cumulative effect in the final larval instar.

Hexapanopeus schmitti differs from **H. angustifrons** (see Costlow & Bookhout, 1966) in its lack of lateral carapace spines. In that sense, **H. schmitti** rather resembles **Panopeus bermudensis** (Martin et al., 1985). It shares also further characters with **P. bermudensis,** such as its unarmed antenna and only one pair of lateral spines on the interior side of the telson rami.

Martin (1984) put the genus **Hexapanopeus** in his "group I" that is characterized by reduction of the antennal endopod, whereas **Panopeus bermudensis** was grouped in VI, because it lacks lateral spines and an antennal exopod. In a later paper (Martin et al., 1985), however, **P. bermudensis** was assigned to group I. The similarity between this species and **H. schmitti** supports the latter grouping.

The larvae of the two **Hexapanopeus** species are similar to each other in their unarmed antenna, the number of setae on the scaphognathite of the maxilla (only until zoea III), and the number of setae on the endopod of maxilliped 1. Costlow & Bookhout (1966) found variation in the number of setae on the basal and coxal endite of the maxillule and maxilla of **H.**

angustifrons, although these characters are often considered having diagnostic value in other species. In **H. schmitti,** in contrast, these numbers were almost constant in the material examined.

Hexapanopeus schmitti and **H. angustifrons** zoeae differ mainly in the absence or presence of lateral carapace spines and in the number of internal and external lateral telson spines (Table 2). The zoea I stage of the two species differs also in the number of setae and spines on the coxal endite of the maxilla, the number of setae on the endopod of maxilliped 2, and the number of aesthetascs and setae on the antennule. The latter difference is found also in all other zoeal stages. The zoea II and IV are in these species different also in the number of setae and spines on the basal and coxal endites of the maxillule and maxilla. In the zoea III, the number of setae and spines on the endites of the maxillule, and the number of setae on the scaphognathite of the maxilla are slightly different. The zoea IV shows, besides the above mentioned differences, different numbers of setae on the medial sinus of the telson.

The megalopa of the **Hexapanopeus schmitti** is different from **H. angustifrons** in: the number of aesthetascs and setae on the antennule, the setation of the antennal flagellum, number of setae on the endopod and on the basal and coxal endite of the maxillule and maxilla, the presence of spines on the surface of the scaphognathite of the maxilla, the number of setae on the endopod and exopod of maxillipeds 2 and 3, and in the number of setae on the epipod of maxilliped 3.

These comparisons show that the diagnostic characters are basically the same throughout zoeal development, complemented by some further distinctive features in the megalopa.

Recent controversial discussion on the systematics of the Xanthidae (Guinot, 1978; Martin 1984; Martin et al., 1985) shows that further descriptions of larval morphology will be necessary to better understand the relationships within this highly diverse brachyuran group.

Table 1: **Hexapanopeus schmitti:** development duration (days; $\bar{X} \pm SD$) and survival (individuals, n; initial n=25) of larval stages reared at 25°C.

Stage	Development (days) $\bar{X}$	$\pm$ SD	Survival n
Zoea I	3.7	0.5	22
Zoea II	2.8	0.6	21
Zoea III	3.4	0.7	15
Zoea IV	4.1	0.6	15
Megalopa	8.0	1.0	5

Table 2(a): Morphological differences in the larval stages of **Hexapanopeus schmitti** (present study) and **H. angustifrons** (COSTLOW & BOOKHOUT, 1966). Abbreviations: S or s = setae; Sp or sp = spines; A or a = aesthetascs; pl = plumose

	H. schmitti	**H. angustifrons**
Zoea I		
Carapace: lateral sp:	absent	present
Antennule: a, s:	2, 1	4, 1
Antenna	unarmed	1 sp.
Maxillule: s + sp on basal, coxal endite:	5, 6	5, 6
Maxilla s + sp on basal, coxal endite:	8, 7	8, 8
s (pl) + projections on scaphognathite:	4, 1	4, 1
Maxilliped 1: s on exopod:	3, 2, 1, 2, 5	3, 2, 1, 2, 5
on endopod:	4	4
Maxilliped 2: s on endopod:	1, 0, 4	1, 1, 5
Telson: lateral sp on outer, inner surface of ramus:	1, 1	0, 0

Table 2 (b)

	H. schmitti	**H. angustifrons**
Zoea II		
Antennule: a, s	4, 2	4, 1
Antenna:	unarmed	1 sp.
Maxillule: sp/s on basal, coxal endite:	8, 7	7, 7
Maxilla: sp/s on basal, coxal endite:	9, 7	9, 8
sp (pl) on scaphognathite:	11	11
Maxilliped 1: s on exopod:	6	6
on endopod:	3, 2, 1, 2, 5	3, 2, 1, 2, 5 ?
Maxilliped 2: s on endopod:	1, 1, 5	1, 1, 5 ?
s on exopod:	6	7
Telson: lateral sp on outer, inner surface of ramus:	1, 1	0, 0

Table 2 (c)

	H. schmitti	**H. angustifrons**
Zoea III		
Antennule: a, s	3 3	4, 2
Antenna: endopod		
bud:	present	present
basal sp.	**0**	**1**
Maxillule: sp + s on basal,		
coxal endite:	8, 6 (7)	8, 9
Maxilla: sp + s on basal,		
coxal endite:	10, 8	10, 8
s on scaphognathite	20	19
Maxilliped 1: s on endopod:	3, 2, 1, 2, 6	3, 2, 1, 2, 6
s on exopod:	8	8
Maxilliped 2: s on endopod	1, 1, 5	1, 1, 5
s on exopod:	8	8
Telson: s on surface near		
medial sinus:	2	2

Table 2 (d)

	H. schmitti	**H. angustifrons**
Zoea IV		
Antenulle: a, s	4, 2	11 (2, 5, 4), 1
Antenna: endopod bud:	more developed	more developed
basal sp.	0	?
Maxillule: sp + s on basal, coxal endite:	10, 11	12, 12
Maxilla: sp + s on basal, coxal endite:	11, 10	13, 9
s (pl) in scaphognathite	30	28
Maxilliped 1: s on endopod:	3, 2, 1, 1, 6	?
s on exopod:	9	9
Maxilliped 2: s on endopod:	1, 1, 5	?
s on exopod:	11	10
Telson: s on surface near medial sinus:	4	3

Table 2 (e)

	H. schmitti	**H. angustifrons**
Megalopa		
Antennule: a	16	18
s on endopod:	5	3
Antenna: flagellum setation:	3, 1, 1, 0, 2, 0, 4, 0, 4, 4	2, 1, 1, 0, 3, 4, 0, 4, 4
Maxillule:		
s on endopod:	5	7
sp + s on basal endite:	23	22
sp + s on coxal endite:	14	12
s on protopod:	1	3
Maxilla		
sp + s on basal endite:	15	20-21
sp + s on coxal endite:	12	13
s on endopod:	2	7
s on scaphognathite:	47	46
Maxilliped 1:		
sp + s on basal endite:	19	19
sp + s on coxal endite:	13	12
s on endopod:	3	6
s on exopod:	2, 5	2, 6
s on epipod:	7	7
Maxilliped 2:		
s on endopod:	3, 1, 7, 9	3, 1, 8, 11
s on exopod:	0, 5	1, 6
s on epipod:	bud	?

Table 2 (f)

	H. schmitti	**H. angustifrons**
Megalopa (cntd.)		
Maxilliped 3:		
s on endopod:	21, 9, 8, 8, 6	19, 12, 7 (8), 9, 9
s on exopod:	2, 7	0, 7
s on protopod:	13-15	16
s on epipod:	15	12
Pereiopods:		
Chelipeds:	spinous	apparently few short s
Dactyl of P2-4:	3 ventral sp, 1 terminal sp	?
Dactyl of P5:	1 long s, 1 terminal sp	?
Pleopods: s on exopod		
Pl1-Pl5:	12, 12, 12, 11, 6 + 1	?
Hooks on endopod:	2, 2, 3, 2, 0	?
Telson: shape:	subquadrate	?
s.	4 dorsal, 2 ventral	?

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