

**First Zoea of *Liomera bella* (Crustacea: Decapoda: Xanthidae)
Reared in the Laboratory**

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ABSTRACT

The first zoea of *Liomera bella* belonging to the subfamily Liomerinae is described and illustrated for the first time. Its morphological characteristics are compared with those of other known species of the Xanthidae. The general morphology of it corresponds well with zoeas of the Xanthidae. Based on the zoeal morphology, the zoea of *L. bella* shows a greatest affinity with those of *Xantho incisus* and *Pseudomedeus agassizii* by having the exopod of antenna with two setae, the terminal segment of the endopod of the second maxilliped with six setae, and the fork of telson with one stout and one smaller lateral spines.

Key words: Brachyura, Xanthidae, Liomerinae, *Liomera bella*, *Xantho incisus*, *Pseudomedeus agassizii*, zoea

INTRODUCTION

Liomera bella (Dana, 1852) lives in the coral reefs (Dai and Yang, 1991). This species widely ranges throughout the tropical regions of the Indo-Pacific from southern Japan and Hawaii to Red Sea and South Africa (Sakai, 1976).

The larval stages have been known in 20 species of seven subfamilies of the family Xanthidae s. str: eight species in the Xanthinae, four in the Euxanthinae, three in the Actaeinae, two in the

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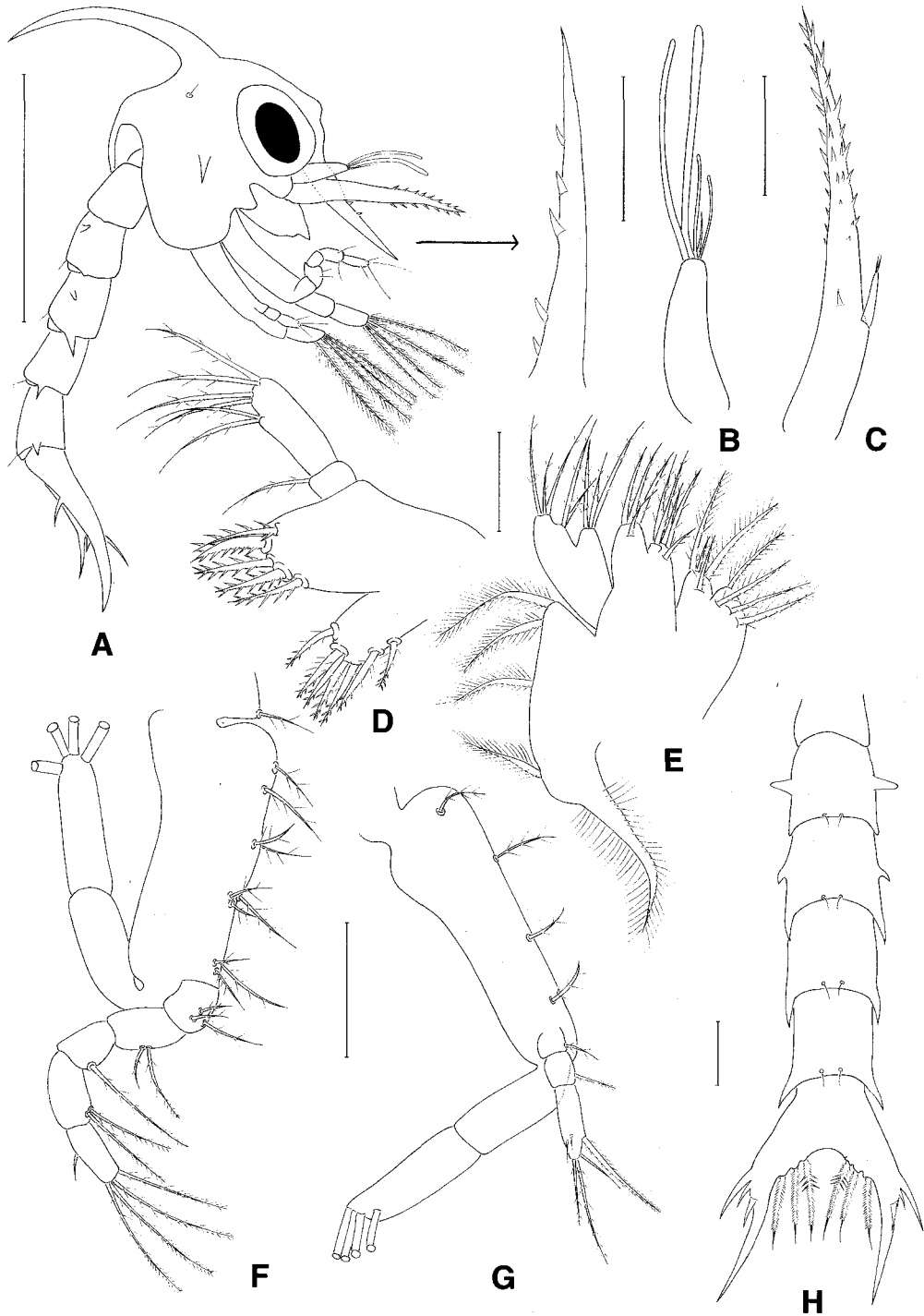


Fig. 1. *Liomera bella*, first zoeal stage. A, lateral view; B, antennule; C, antenna; D, maxillule; E, maxilla; F, first maxilliped; G, second maxilliped; H, dorsal view of abdomen and telson. Scale bars = 0.05 mm (D, E), 0.1 mm (B, C, F-H), 0.5 mm (A).

Trichiinae, and one in each of the Euxanthinae, the Zosiminae and the Chlorodiinae. However, the larval stage of *Liomera bella* belonging to the Liomerinae is unknown. The aims of this paper are to describe the first zoeal stage of this species and compare its morphology to the previously described zoeas of this family.

MATERIALS AND METHODS

An ovigerous female of *Liomera bella* was collected from Ishigaki Island (24° 20'N; 124° 12'E) of Japan in 13 June, 2003. The zoeas hatched in the laboratory were reared by using the methods described by Ko (1995), at a water temperature of $25 \pm 1^\circ\text{C}$. The zoeas were fixed and preserved in 10% neutral formalin for later use. Dissected appendages were examined using a microscope Leitz Laborlux S and drawings were made with the aid of a camera lucida. Setal counts on appendages and measurements were based on the mean of ten specimens. The remaining zoeas and the spent female were deposited at Silla University, Korea (SUZ Cr103242).

RESULTS

Zoea I

Size: Carapace length 0.42 ± 0.04 mm. Distance from tip of dorsal spine to tip of rostral spine 0.90 ± 0.02 mm.

Carapace (Fig. 1A): Dorsal spine distally curved, spinulate and slightly longer than rostral spine; rostral spine nearly straight, slightly shorter than antennal protopod and bearing 5 minute spines; lateral spines present and short; anterodorsal setae absent; 1 pair of posterodorsal setae present; eyes sessile.

Antennule (Fig. 1B): Uniramous; endopod absent; exopod unsegmented with 2 long and 2 shorter slender aesthetascs, and 1 shorter simple seta terminally.

Antenna (Fig. 1C): Protopod spinulate and with minute endopodal spine; exopod approximately 13% length of protopod, bearing 2 setae.

Maxillule (Fig. 1D): Coxal endite with 7 setae; basal endite with 5 setae; endopod 2-segmented, proximal segment with 1 seta, distal segment with 6 (2 subterminal+4 terminal) setae; exopod seta absent.

Maxilla (Fig. 1E): Coxal and basal endites bilobed, each with 5+4 setae, respectively; endopod bilobed with 3+5 (2 subterminal+3 terminal) setae; exopod (scaphognathite) margin with 4 plumose setae plus distal stout process.

First maxilliped (Fig. 1A, F): Coxa with 1 seta; basis with 10 setae arranged 2, 2, 3, 3; endopod 5-segmented with 3, 2, 1, 2, 5 (1 subterminal+4 terminal) setae, respectively; exopod 2-segmented, distal segment with 4 terminal plumose natatory setae.

Second maxilliped (Fig. 1A, G): Coxa without seta; basis with 4 setae; endopod 3-segmented, with 1, 1, 6 (3 subterminal+3 terminal) setae, respectively; exopod 2-segmented, distal segment with 4 terminal plumose natatory setae.

Abdomen (Fig. 1H): Of 5 somites; somite 2 with 1 pair of lateral processes directed laterally; somite 3 with 1 pair of lateral processes directed posteriorly; somites 2-5 with 1 pair of posterodorsal setae; pleopods absent.

Telson (Fig. 1H): Each fork long and not spinulate, with 1 stout lateral, 1 smaller lateral and 1 stout dorsomedial spines; posterior margin with 3 setae on each posterior margin.

DISCUSSION

Guinot (1978) elevated the Xanthidae *s. lat.* to superfamily level (the Xanthoidea) including the eight families: Carpiliidae, Menippidae, Platyxanthidae, Xanthidae, Pilmunidae, Trapeziidae,

Table 1. Comparison of the first zoeas in the family Xanthidae. SP = stout spine, T = seta, P = spine.

	Antenna exopod seta	Maxilliped 2 endopod setation	Telson lateral spine	Sources
XANTHINAE				
<i>Paraxanthias elegans</i>	3	1, 1, 5	1SP+1T	Terada, 1990
<i>Leptodius exaratus</i>	1	1, 1, 5	1SP+1T	Terada, 1980
<i>Cycloxanthops truncatus</i>	2	1, 1, 5	1SP+1P	Suzuki, 1979
<i>Macromedaeus distinguendus</i>	1	1, 1, 5	1SP+1T	Lee, 1993
<i>Nanocassiope granulipes</i>	1	1, 1, 5	1SP+1T	Ko and Clark, 2002
<i>Xantho poressa</i>	2	1, 1, 6	1SP+1T	Rodriguez and Martin, 1997
<i>Xantho incisus</i>	2	1, 1, 6	1SP+1P	Ingle, 1983
<i>Pseudomedaeus agassizii</i>	2	1, 1, 6	1SP+1P	Terada, 1990
TRICHIINAE				
<i>Banareia odhneri</i>	2	1, 1, 5	1SP+1T	Terada, 1987
<i>Calvactaea tumida</i>	2	1, 1, 5	1SP+1P	Terada, 1988
ZOSIMINAE				
<i>Atergatis reticulatus</i>	3	1, 1, 5	1SP	Terada, 1980
EUXANTHINAE				
<i>Medaeops granulosis</i>	3	1, 1, 5	1SP	Terada, 1990
<i>Paramedaeus noelensis</i>	3	1, 1, 5	1SP+1P	Suzuki, 1979
<i>Monodaeus couchi</i>	3	1, 1, 5	1SP+1P	Ingle, 1983
<i>Epixanthus dentatus</i>	3	1, 1, 6	1SP	Saba et al., 1978
KRAUSIINAE				
<i>Palapedia integra</i>	2	1, 1, 6	1SP+1T	Ko et al., 2004
ACTAEINAE				
<i>Actaea semblata</i>	1	1, 1, 6	1T+1T	Ko et al., 2002
<i>Gaillardiiellus orientalis</i>	3	1, 1, 6	1T+1T	Ko, 1999
<i>Novactaea pulchella</i>	3	1, 1, 6	1SP+1T	Terada, 1990
CHLORODIINAE				
<i>Pilodius nigrocrinitus</i>	2	1, 1, 6	1SP+1T	Terada, 1982
LIOMERINAE				
<i>Liomera bella</i>	2	1, 1, 6	1SP+1P	Present study

Panopeidae, and Geryonidae. However, Serène (1984) recognized Guinot's classification to be incomplete. He divided the superfamily Xanthoidea into five families: Xanthidae, Trapeziidae, Pilumnidae, Carpiliidae and Menippidae. He described the family Xanthidae s. str. including ten subfamilies: Polydectinae, Cymoinae, Trichiinae, Liomerinae, Euxanthinae, Actaeinae, Zosiminae, Xanthinae, Etisinae, and Chlorodiinae. Recently, Ng (1993) established the Krausiinae within the family, therefore, the Xanthidae consists of 11 subfamilies at present. According to Table 1, the larval stages have been known in 20 species of seven subfamilies of the family Xanthidae, however, any larvae of the Liomerinae have not known yet. Thus, *Liomera bella* is the first species whose zoeal stage is known in the subfamily.

It was reported that the general morphology of the zoeas of the Xanthidae as follows: carapace with all spines; endopod of maxillule with 1, 2+4 setae; endopod of maxilla with 3+2+3 (5+3) setae; endopod of first maxilliped with 3, 2, 1, 2, 5 setae (Martin, 1984; Ko et al., 2002). The first zoea of *L. bella* corresponds well with other xanthid zoeas with the respect to the four characteristics ever mentioned.

In Table 1, the first zoea of *L. bella* appears to be similar to those of *Xantho incisus*, *X. poressa*, *Pseudomedeus agassizii*, *Pilodius nigrocrinitus*, and *Palapedia integra* by having the exopod of an antenna with two setae and the terminal segment of the endopod of the second maxilliped with six setae. With the respect to the fork of a telson bearing one stout and one smaller lateral spines, the zoea of *L. bella* shows the greatest affinity with those of *X. incisus* and *P. agassizii* in the Xanthidae. However, they can be separated by the characteristic of the rostral carapace spine, i. e. bearing 5 minute spines in *L. bella* and no minute spine in *X. incisus* and *P. agassizii*.

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실험실에서 부화된 *Liomera bella* (갑각강: 십각목: 부채게과)의
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요 약

*Liomerinae*아과에 속하는 *Liomera bella* 제1조애아 유생을 처음으로 기재 및 도시하였다. 이 유생의 형태적 특징들을 부채게과의 다른 종들의 유생들과 비교하였다. 일반적인 형태면에서 본 유생은 부채게과 유생들과 잘 일치하였다. 또한 제2촉각 외지에 2개의 강모를 가지고, 제2악지 내지 말단 강모수가 6개이며, 미절에 1개의 센 촉가시와 1개의 작은 촉가시를 가짐으로서 *Xantho incisus*와 *Pseudomedeus agassizii* 유생들과 더 큰 유사성을 보여주었다