

First Zoeal Stage of *Camptandrium sexdentatum* (Crustacea: Decapoda: Camptandriidae)

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ABSTRACT

The first zoea of *Camptandrium sexdentatum* is described for the first time with a digital image of live zoeas. An ovigerous crab of *C. sexdentatum* was collected at the muddy sand flat in Namhaedo Island on 2 June 2012 and hatched in the laboratory on 6 June 2012. In Camptandriidae, the first zoea of *C. sexdentatum* is distinguished from the first zoeas of *Cleistostoma dilatatum* and *Deiratonotus cristatum* by having no dorsal and lateral carapace spines, an abdomen significantly broadened posteriorly, and a subvoid telson without forks. Especially, the finding of a subvoid telson without forks is the first report in brachyuran zoeas.

Keywords: zoea, *Camptandrium sexdentatum*, subvoidal telson, Camptandriidae, Korea

INTRODUCTION

Crabs of the Camptandriidae currently include 37 species of 19 genera in the world (Ng et al., 2008), of which, three species of three genera have been reported in Korea (Kim, 1973; Kim and Kim, 1997): *Cleistostoma dilatatum* (De Haan, 1833), *Deiratonotus cristatum* (De Man, 1895), and *Camptandrium sexdentatum* Stimpson, 1858. They inhabit mudflats between high and low tidal marks. The type genus *Camptandrium* contains only one species, *C. sexdentatum* and has a wide Indo-West Pacific distribution from India, Thailand, Indonesia, China, Japan, to Korea (Tan and Ng, 1999). Larvae of *C. dilatatum* and *D. cristatum* have been described by Kim and Lee (1982) and Terada (1979); however, those of *C. sexdentatum* are unknown.

In the present study, the first zoeal stage of *C. sexdentatum* is described and illustrated for the first time. Its characteristics are compared with those of other two species of the family.

MATERIALS AND METHODS

On 2 June 2012, an ovigerous crab of *C. sexdentatum* was collected at the muddy sand flat in Namhaedo Island, Gyeong-

sangnam-do, Korea (34° 49'44.55''N, 128° 02'12.28''E). Its zoeas hatched in the laboratory on 6 June 2012 and were preserved in 95% ethanol for examination. Zoeal specimens were dissected using a Leitz zoom stereomicroscope and appendages were examined under a Leitz Laborlux S microscope (Leica, Wetzlar, Germany). Drawings were made with the aid of *camera lucida*. Setal counts and measurements were based on ten specimens. The sequence of the zoeal description is based on the malacostracan somite plan and described from anterior to posterior. Setal armature of appendages was described from proximal to distal segments and in order of endopod to exopod (Clark et al., 1998). The long plumose natatory setae of the first and second maxillipeds were drawn truncated. A micrometer was used for zoeal measurements: carapace length (CL) was measured from the anterior margin of the eyes to the most posterior carapace margin. The brachyuran classification follows that of Ng et al. (2008). The remaining zoeas and the spent female were deposited at Silla University, Korea.

RESULTS

Order Decapoda Latreille, 1803
Family Camptandriidae Stimpson, 1858

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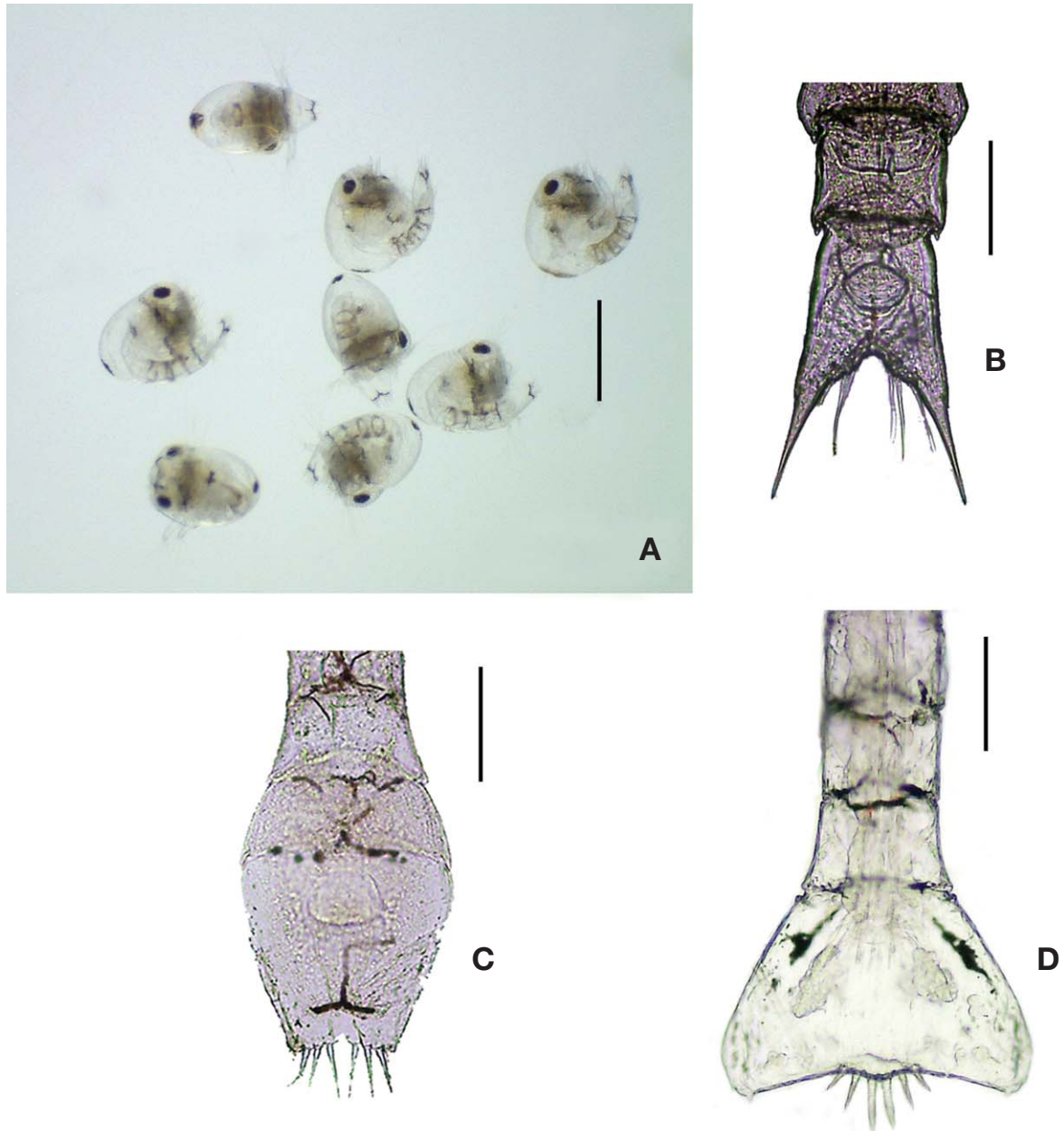


Fig. 1. A, Photograph of first zoeas of *Camptandrium sexdentatum*. Photographs of zoeal abdomen and telson: B, *Cleistostoma dilatatum*; C, *Camptandrium sexdentatum*; D, *Philyra pisum*. Scale bars: A=0.4 mm, B–D=0.1 mm.

Genus *Camptandrium* Stimpson, 1858

***Camptandrium sexdentatum* Stimpson, 1858**

First zoea (Figs. 1A, 2A–J)

Size: CL 0.35 ± 0.01 mm.

Carapace (Figs. 1A, 2A): Rostral spine extremely short, dorsal and lateral spines absent; 1 pair of posterodorsal setae present; each ventral margin with 1 plumose seta; eyes ses-

sile.

Antennule (Fig. 2B): Uniramous; with 2 long aesthetascs and 1 small seta distally.

Antenna (Fig. 2C): Protropod spinulate distally, longer than rostral carapace spine; exopod approximately equal length to protopod, simple distally, with 1 submedial seta.

Mandibles (Fig. 2D): Asymmetrical.

Maxillule (Fig. 2E): Coxal endite with 4 setae; basal endite with 5 setae (4 plumodenticulate); endopod 2-segmented,

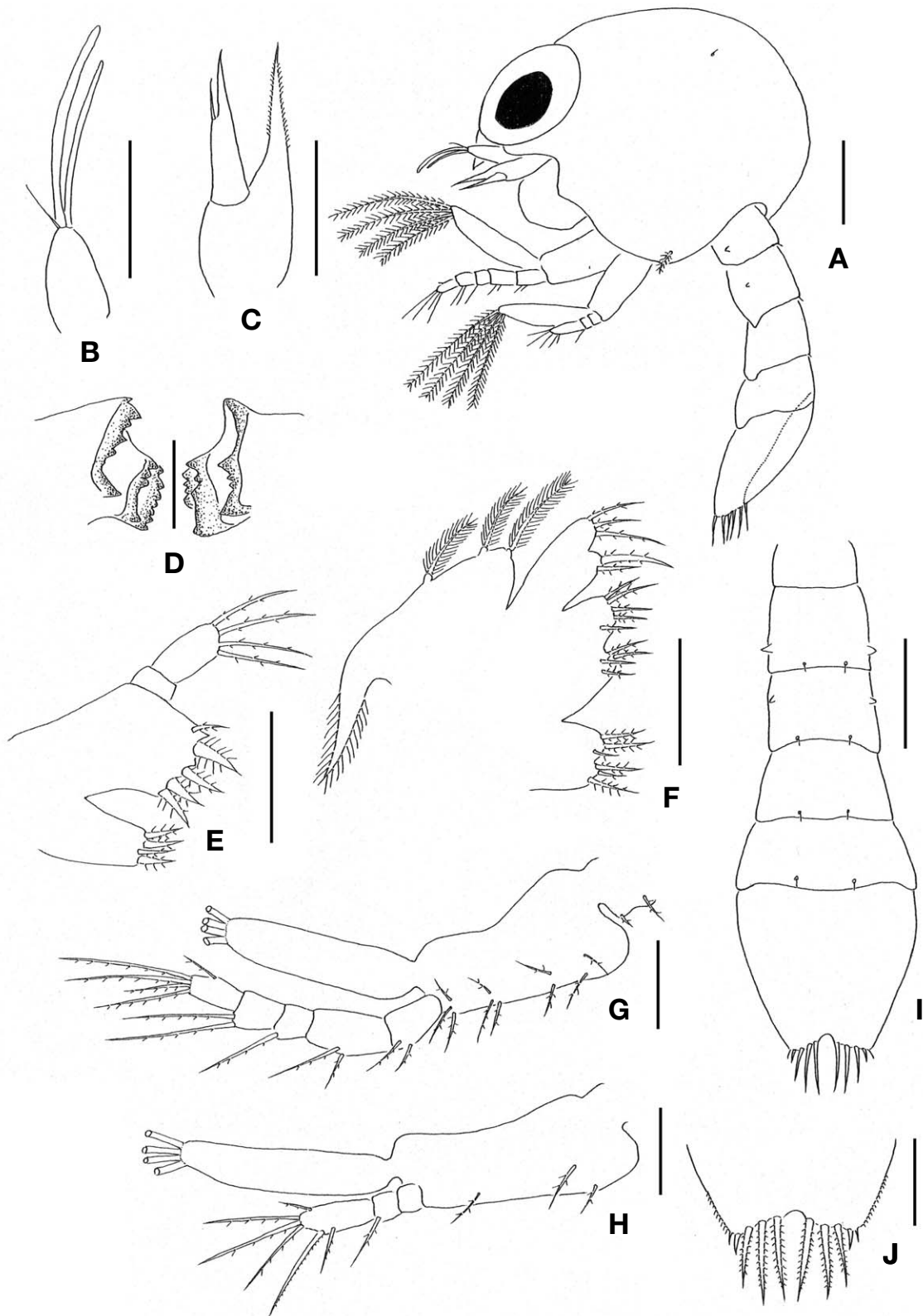


Fig. 2. *Camptandrium sexdentatum*, first zoeal stage. A, Lateral view; B, Antennule; C, Antenna; D, Mandibles; E, Maxillule; F, Maxilla; G, First maxilliped; H, Second maxilliped; I, Dorsal view of abdomen and telson; J, Posterior region of telson. Scale bars: A, I=0.1 mm, B-H, J=0.05 mm.

Table 1. Comparison of the first zoeal characteristics in three species of the Camptandriidae

Species	Carapace spines			Telson forks	References
	Rostral	Dorsal	Lateral		
<i>Cleistostoma dilatatum</i>	Present	Short	Present	Present	Kim and Lee (1982)
<i>Deiratonotus cristatum</i>	Present	1/2 CL	Present	Present	Terada (1979)
<i>Camptandrium sexdentatum</i>	Short	Absent	Absent	Absent	Present study

CL, carapace length.

proximal segment without seta, distal segment with 4 setae.

Maxilla (Fig. 2F): Coxal endite bilobed, with 3+3 setae; basal endite bilobed, with 4+5 setae; endopod bilobed, with 2+3 setae; scaphognathite with 3 marginal plumose setae and 1 distal stout process.

First maxilliped (Fig. 2G): Coxa with 2 setae; basis with 10 setae arranged 2+2+3+3; endopod 5-segmented, with 2, 2, 1, 2, 5 (1 subterminal+4 terminal) setae; exopod with 4 long plumose natatory setae distally.

Second maxilliped (Fig. 2H): Coxa without seta; basis with 3 setae arranged 1+1+1; endopod 3-segmented, with 0, 1, 6 (3 subterminal+3 terminal) setae; exopod as in first maxilliped.

Abdomen (Figs. 1A, C, 2A, I): With 5 somites, significantly broadened posteriorly; somites 2, 3 each with 1 pair of lateral processes; somites 2–5 each with 1 pair of posterodorsal setae; pleopod buds absent.

Telson (Figs. 1A, C, 2I, J): Subovoidal, narrowing posteriorly; fork absent; posterior margin with shallow median cleft and 5+5 processes, which increasing its length towards inside.

Color (Fig. 1A, C): Black chromatophores on posterodorsal region of carapace, around mouthparts, on base of each maxilliped, on each abdominal somite, and on posterior region of telson.

DISCUSSION

Based on zoeal descriptions of two species, *Cleistostoma dilatatum* by Kim and Lee (1982) and *Deiratonotus cristatum* by Terada (1979), Ko and Lee (2012) reported that the zoeas of Camptandriidae could be distinguished from other Korean brachyurans by having the following characteristics: 1) endopods of the maxillule and maxilla each with 0, 4 and 2+3 setae, respectively, 2) basis of the first and second maxillipeds each with 2+2+3+3, 1+1+1 setae, respectively, and 3) short rostral and dorsal carapace spines. In the present study, the zoea of *C. sexdentatum* agrees with their description, except dorsal carapace spine. In respect to other characteristics, such as no lateral carapace spines and a telson

without forks, it is significantly different from those of the other two species having lateral carapace spines and telson forks (Table 1).

A subquadrate telson with forks (Fig. 1B), as seen in zoeas of *C. dilatatum* and *D. cristatum*, is usually found in brachyuran zoeas. A subovoid telson without forks (Fig. 1C) in *C. sexdentatum* is reported for the first time, although, a triangular telson without forks (Fig. 1D) is reported in a pinnotherid, *Arcotheres sinensis* (Shen, 1932) by Ko (1991) and a leucosiid, *Philyra pisum* De Haan, 1841 by Ko (1996).

Long larval spines which increase the surface area are considered to be morphological adaptations to enhance buoyancy (Calado, 2009). So, zoeas of the above three species (*C. sexdentatum*, *A. sinensis*, and *P. pisum*) without dorsal and lateral carapace spines might be difficult to stay stationary in turbulent sea water. Therefore, it is considered that zoea of *C. sexdentatum* should be equipped with an abdomen broadened posteriorly and a subovoidal telson for the purpose of buoyancy and swimming.

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