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Morphological Description of a Plankton-Based Megalopa *Thalamita* sp. (Crustacea: Brachyura: Portunidae) from the Obhur Creek, Red Sea, Saudi Arabia

Indra Effendy[1], **A. A. J. Kumar**[1] and **Mohsen M. El-Sherbiny**[1,2]

[1]Department of Marine Biology, Faculty of Marine Sciences, King Abdulaziz University, Jeddah, Saudi Arabia, and [2] Marine Sciences Department, Faculty of Science, Suez Canal University, Ismailia, Egypt

Abstract. Megalopae of a *Thalamita* sp. crab, collected from the Obhur Creek, Jeddah, Saudi Arabia, are morphologically described. The present specimens are compared with megalopae of two species of this genus: *Thalamita pelsarti* from Japan water and *Thalamita crenata* from Indian waters. Some morphological features are common for megalopae of *Thalamita*: 3-segmented antennal peduncle, 8-segmented antennal endopod, 2-segmented endopod of mandible, 5-segmented endopod of maxilliped III and 3 hooks in the endopod of pleopods I–IV. The morphological differences found between the megalopae of *Thalamita* spp. are found in various appendages of antennule, antenna, maxillule, maxilla, maxillipeds I–III and pleopods.

Keywords: Megalopa, Morphological description, *Thalamita,* The Red Sea.

1. Introduction

Thalamita species crabs are widely distributed in the Indo-West Pacific regions (Cannicci *et al*., 1996). Eighty-nine species of *Thalamita* Latreille, 1829 have been enlisted by Ng *et al*. (2008). Among those eighty-nine, eleven species are recorded in the Red Sea. The species are *Thalamita chaptalii* Audouin, 1826, *Thalamita mitsiensis* Crosnier, 1962, *Thalamita crenata* Rüppell, 1830, *Thalamita danae* Stimpson, 1858, *Thalamita iranica* Stephensen, 1946, *Thalamita murinae* Zarenkov, 1971, *Thalamita poissonii* Savigny, 1817, *Thalamita prymna* Herbst, 1803, *Thalamita quadrilobata* Miers, 1884, *Thalamita savignyi* A. Milne-Edwards, 1861, *Thalamita sexlobata* Miers, 1886 (Apel and Spiridonov, 1998; Spiridonov, 1999; Spiridonov and Neumann, 2008).

Megalopa shares the morphological features of both zoeal and post-larval stages as it is a transitional stage between them (Rice, 1980; Gore, 1985; Cházaro-Olvera, 1996; Cházaro-Olvera and Peterson, 2004). The morphological features of megalopae vary in relation to the differences in the feed and environmental conditions (McConnaughey, 1974; Barnes, 1980; Mc Laughlin, 1980).

Most megalopae described are laboratory-reared and descriptions of ocean-collected larvae are very scanty. Descriptions of the latter are important as their morphological features are shaped by natural environmental conditions unlike larvae reared in laboratories, where all such conditions are controlled (Cuesta *et al*., 2002). Therefore, to have a complete understanding of the larval morphological features, those collected from their natural habitats also ought to be described and such descriptions are very meagre. In the present study, ocean-collected *Thalamita* larvae are described.

Zoeal descriptions of *Thalamita* sp. are abundant: *T. admete* Herbst, 1803 (Greenwood and Fielder, 1979), *T. crenata* Rüppell, 1830 (Chhapgar, 1956; Thomas *et al*., 1980; Krishnan and Kannupandi, 1990); *T. danae* Stimpson, 1858 (Fielder and Greenwood, 1979; Jiang *et al.,* 2007); *T. pelsarti* Montgomery, 1931 (Islam *et al*., 2005). *T. poissoni* Auodouin, 1826 (Al-Kholy, 1963), *T. prymna* Herbst, 1803 (Terada, 1986) and, *T. sima* H. Milne Edwards, 1934 (Terada, 1979). Morphological descriptions of megalopa are limited to *T. crenata* Rüppell, 1830 (Thomas *et al*., 1980; Krishnan and Kannupandi, 1990), *T. danae* Stempson, 1858 (Fielder and Greenwood, 1979) and *T. pelsarti* Montgomery, 1931 (Islam *et al*., 2005). All these descriptions were made based on laboratory-reared specimens.

In the present study, *Thalamita* sp. megalopae obtained from ocean-collected meroplankton are morphologically described.

2. Material and Methods

Meroplankton were collected at dusk using a plankton net with a mesh size of 150 µm. The net was kept at one meter depth in Obhur Creek for two hours soon after sun set. An Hollis LED 6 underwater torch light with 320 lumens were used to attract the zooplanktons. Altogether, 26 megalopae were obtained. Of those, 18 were portunid megalopae. Six of these were morphologically similar based on pigment distribution on carapace and ambulatories, rostral spine length and width of front and carapace. White dots were thickly distributed on the carapace and ambulatories in those larvae. Four of these larvae were preserved in 70% alcohol, whereas the other two successfully moulted into first crab and were found to belong to the genus *Thalamita*. The exuviae of the megalopae that moulted into first crab were preserved in 70% alcohol. The preserved megalopae and exuviae were dissected in polyvinyl lactophenol with a dissection microscope Leica M80 (Leica Camera AG, Germany). Using the same microscope, measurements of the larval appendages were made. Appendages of the larvae were drawn using a differential interference contrast microscope (Leica DM 6000B) equipped with a camera lucida and setal counts were made. The morphological features of the megalopae and exuviae were compared.

The cephalothorax width (CW, maximum distance across the carapace) and carapace length (CL, distance between the base of the rostral spine and posterior border of the carapace) were measured. Setal counts and morphological descriptions were made following Clark et al. (1998).

3. Results and Discussion

CL = 1.2 ± 0.02 mm; CW = 0.83 ± 0.015 mm.

Carapace. (Fig. 1A) Longer than wide; smooth, narrowing anteriorly. Rostrum ending in pointed tips projecting anteriorly; dorsal, lateral spines absent; 12–14 simple setae on posterolateral and 8–10 simple setae on posterior margins. Eyes well developed.

Antennule. (Fig. 1B) Peduncle 3-segmented, basal segment with simple seta. Endopod with 6 segments (0, 4 aesthetascs, 3 aesthetascs + 2 simple setae, 2 aesthetascs, simple seta, simple seta). Exopod unsegmented with 2 simple setae terminally.

Antenna. (Fig. 1C) Peduncle 3-segmented with 1, 2, 1 simple setae. Flagellum 8-segmented with 2, 0, 1, 2, 0, 2, 0, 3 setae.

Mandible. (Fig. 2A) Palp 2-segmented, proximal segment with seta, distal segment with 6 plumose setae, 2 simple setae.

Maxilulle. (Fig. 2B) Protopod with simple long seta. Coxal endite with 3 simple setae, 5 plumose setae, 5 cuspidate setae. Basal endite with 4 simple setae, 4 plumodenticulate, 25 cuspidate setae. Endopod 2-segmented, simple, plumose seta on proximal segment. The second segment with plumose seta, 2 simple terminal setae.

Maxilla. (Fig. 2C) Coxal endite bilobed with 5 + 3 plumose setae, basal endite bilobed with 6 + 6 plumose setae. Scaphognathite with 41 plumose setae.

First maxilliped. (Fig. 3A) Coxal endite with 7 plumose setae, basal endite with 13 simple + 16 plumose setae. Endopod unsegmented with 3 simple setae. Exopod 2-segmented with 0, 4 serrated setae. Epipod unsegmented with 4 long simple proximal setae, 3 long simple medial setae, 3 long simple terminal setae.

Second maxilliped. (Fig. 3B) Endopod 4-segmented with 2 simple, 2 simple, 2 simple + 1 plumose + 2 serrated, 5 simple + 3 serrated setae. Exopod 2-segmented with 0, 5 plumose setae.

Third maxilliped. (Fig. 3C) Protopod with 3 simple, 2 plumose, 2 serrated setae. Endopod 5-segmented: 5 simple + 1 plumose + 10 serrated setae, 7 simple + 3 serrated setae, 3 simple + 4 serrated setae, 1 simple + 6 serrated setae, 6 serrated setae.

Pereiopods. (Fig. 4A–C) Cheliped with simple setae on every segment. Dactyli of segments II–IV with plumose setae, propodi of segments II–IV with plumose, simple setae; other segments with simple setae. Distal segment of pereiopod V paddle-shaped with 3 long setae.

Abdomen. (Fig. 5A) Abdomen with 6 somites, each with 2 pairs of simple setae on dorsal surface. Telson broader than long.

Pleopods. (Fig. 5B–F) Pleopods I–IV with 16, 15, 12, 8 plumose setae on exopod, respectively; endopods with three cincinnuli each. Uropod with 9 plumose setae.

The length of the megalopae of *Thalamita* sp. ranged between 1.08 and 1.68 cm and the size was within 1.36 cm.

The first crabs obtained from the two megalopae belonged to *Thalamita* sp. All the morphological features of the dissected larvae were found to be concordant with those of the exuviae of the megalopae and this shows that all the dissected larvae are of the same species of *Thalamita*. The first crabs were not morphologically described as the number of specimens are too low for taxonomic descriptions.

The morphological features of crustacean larvae are shaped by varying prey abundance (Welch and Epifano, 1995). The features of laboratory-reared larvae and those collected from their natural habitats vary considerably as the abiotic and biotic factors, viz. food, salinity and temperature, are not stable in the ocean as in laboratories (Marco-Herrero *et al*., 2014). Therefore, ocean-collected megalopae are highly needed for taxonomic studies.

Bookhout and Costlow (1974) remarked that the zoeal stages of different species of *Thalamita* are difficult to be distinguished as their morphological features are highly similar. However, the present study revealed that megalopae of different species of *Thalamita* exhibit remarkable morphological variations. The number of segments of the peduncle, exopod and endopod of antennule, peduncle and flagellum of antenna and endopod of maxilliped II varied. Similarly, the setations of the various appendages of antennule, antenna, maxillule, maxilla, maxillipeds I–III and pleopods varied (Table I). Based on these variations, the megalopae of *Thalamita* sp. can be identified from meroplankton.

Morphological variations have also been recorded between megalopae of conspecific *Thalamita* collected from two different regions (Table I): *T. crenata* I collected by Krishnan and Kannupandi (1990) from east coast of India and *T. crenata* II collected by Thomas *et al.* (1980) from the west coast of India. Differences appeared in segmentation: endopod of antennule, 2-segmented and unsegmented for *T. crenata* I and II, respectively; exopod of antennule, 4- and 5-segmented for *T. crenata* I and II, respectively. Differences were also recorded in setation of *T. crenata* I and II.

Table 1. Morphological differences between megalopae of 3 species of *Thalamita* Latreille, 1829. Abbreviations: A, aesthetascs; CL, carapace length; CW, carapace width; Lss, lateral setae; Sch, scaphognathite; S, setae; Unseg, unsegmented.

Characters		Present	*T. pelsarti* (Islam et al, 2005)	*T. crenata* (Krishnan and Kannupandi, 1990)	*T. crenata* (Thomas *et al*, 1980)
Carapace	CL in mm	1.36	1.08	1.68	1.52
	CW in mm		1.91	1.26	
Antennule	Peduncle	3 (1S, 0, 0)	3 (3S, 4S, 1S)	3 (5S, 4S, 2S)	3 (0, 0, 0)
	Endopod	2 (0, 2S)	Unseg (5S)	2 (0, 4S)	Unseg (5S)
	Exopod Ae+S	6 (0, 4A, 3A2S, 2A, 1S, 2S)	5 (0, 4A, 5A, 4A2S, 2S2S)	4 (1S, 4A, 3A2S, 2A2S)	5 (0, 4A, 4A, 4A, 4S)
Antenna	Peduncle	3 (0, 1S, 1S)	3 (3S, 2S, 3S)	4 (1S, 2S, 2S, 1S)	4 (0, 0, 0, 0)
	Endopod	8 (2S, 0, 1S, 2S, 0, 2S, 0, 3S)	8 (0, 0, 3S, 2S, 4S, 2S, 3S, S)	8 (0, 0, 3S, 2S, 4S, 2S, 3S, 2S)	8 (0, 0, 0, 0, 2S, 0, 0, 3S)
Mandible	Palp	2 (1S, 8S)	2 (0, 9S)	2 (0, 7S)	2 (0, 7S)
Maxillule	Coxa	Unseg (13S)	Unseg (16S)	Unseg (11S)	Unseg (23S)
	Basis	Unseg (33S)	Unseg (24S)	Unseg (20S)	Unseg (13S)
	Endopod	2 (2S, 3S)	2 (2S, 2S)	Unseg (3S)	Unseg (5S)
	Protopod	Unseg (1S)	Unseg (2S)		
Maxilla	Coxa	(5 + 3)S	(7 + 7)S	(4 + 6)S	(5+6)S
	Basis	(6 + 6)S	(8 + 10)S	(7 + 9)S	(6+6)S
	Endopod		Unseg (4)		
	Sch	41S	50S	67S	46S
	Lss				
Maxilliped I	Coxa	7S	14S	13S	12S
	Basis	29S	27S	30S	27S
	Endopod	3S	4S	7S	4S
	Exopod	2(0, 4S)	2 (1S, 3S)	2 (1S, 5S)	2 (0, 4S)
	Epipod	9S	15S	12S	4S
Maxilliped II	Coxa & Basis				
	Endopod	4 (2S, 2S, 5S, 9S)	4 (3S, 1S, 8S, 9S)	4 (6S, 2S, 5S, 9S)	5 (1S, 2S, 0, 8S, 8S)
	Exopod	2 (0, 4S)	2 (1S, 5S)	2 (1S, 5S)	2 (0, 5S)
	Epipod				9S
Maxilliped III	Coxa & Basis		Fused (3S)		
	Endopod	5 (16S, 10S, 7S, 7S, 6S)	5 (23S, 15S, 9S, 9S, 10S)	5 (23S, 15S, 10S, 14S, 11S)	5 (15S, 12S, 6S, 7S, 9S)

	Exopod	2 (0, 3S)	2 (3S, 6S)	2 (3S, 6S)	2 (5S, 0)
	Epipod	4S	24S	17S	15S
	Protopod	5S		10S	
Pleopod I	Endopodal Hook	3	3	3	3
	Exopod	16S	19S	20S	15S
Pleopod II	Endopodal Hook	3	3	3	3
	Exopod	15S	22S	19S	15S
Pleopod III	Endopodal Hook	3	3	3	3
	Exopod	12S	20S	19S	15S
Pleopod IV	Endopodal Hook	3	3	3	3
	Exopod	8S	19S	18S	15S
Pleopod V	Endopodal Hook	Absent	Absent	Absent	Absent
	Exopod	9S	11S	11S	14S
	protopod			1S	1S

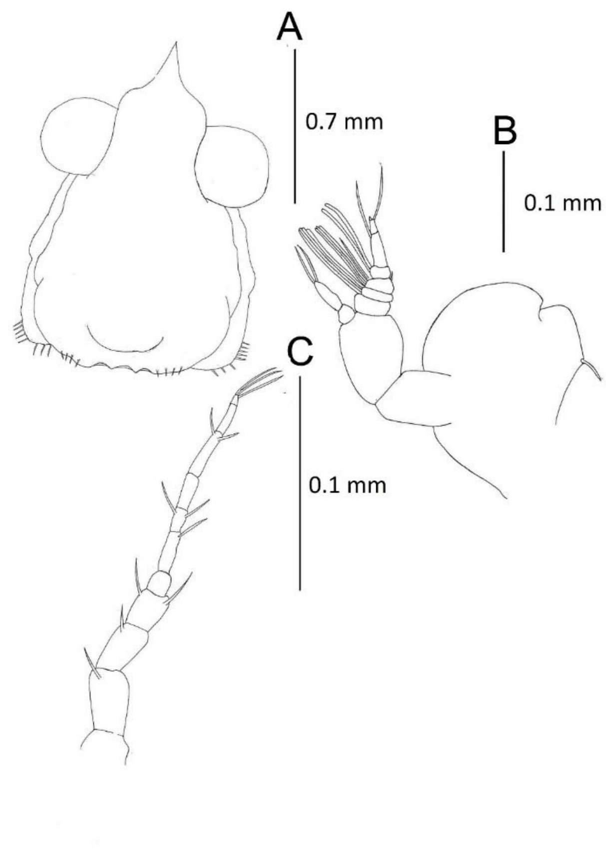

Fig. 1. ***Thalamita*** **sp. megalopa A) Carapace; B) Antennule; C) Antenna.**

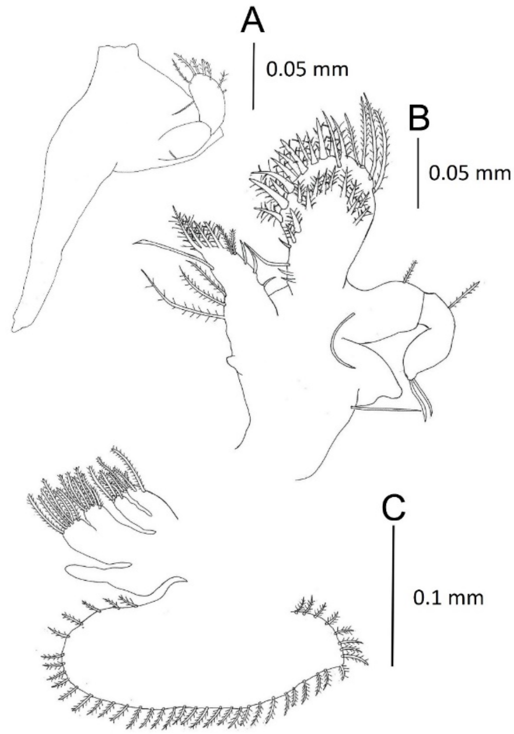

Fig. 2. *Thalamita* sp. megalopa A) Mandible; B) Maxillule; C) Maxilla.

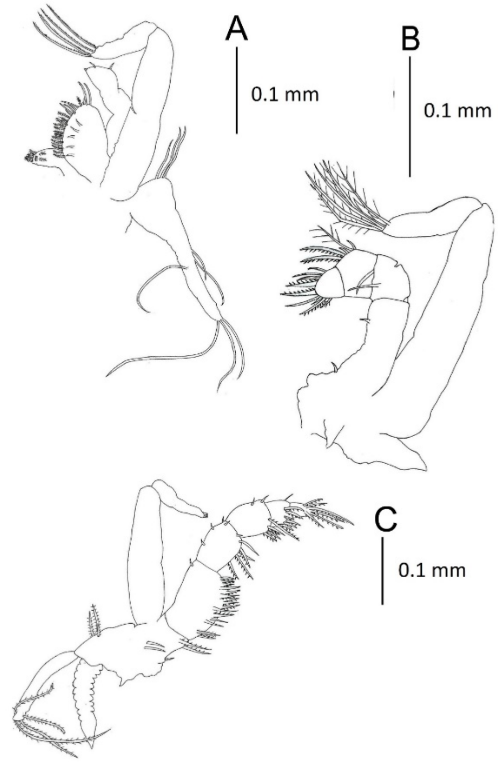

Fig. 3. *Thalamita* sp. megalopa A) Maxilliped I; B) Maxilliped II; C) Maxilliped III.

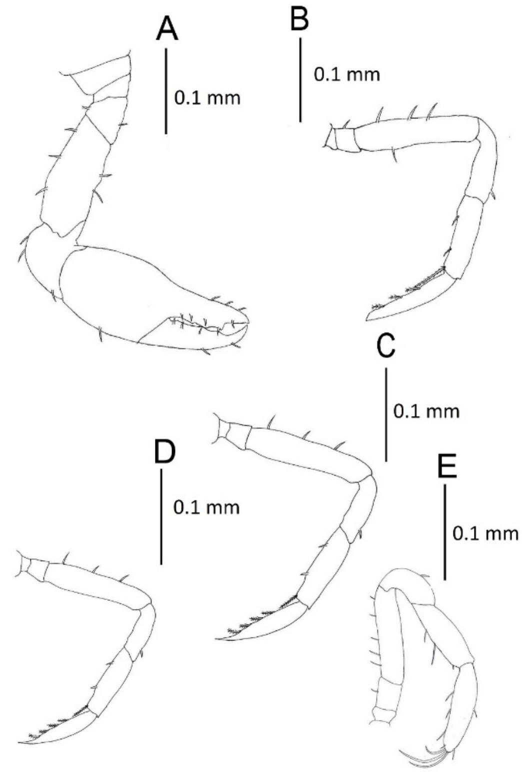

Fig. 4. *Thalamita* sp. megalopa A) Pereiopod I; B) Pereiopod II; C) Pereiopod III; D) Pereiopod IV; E) Pereiopod V.

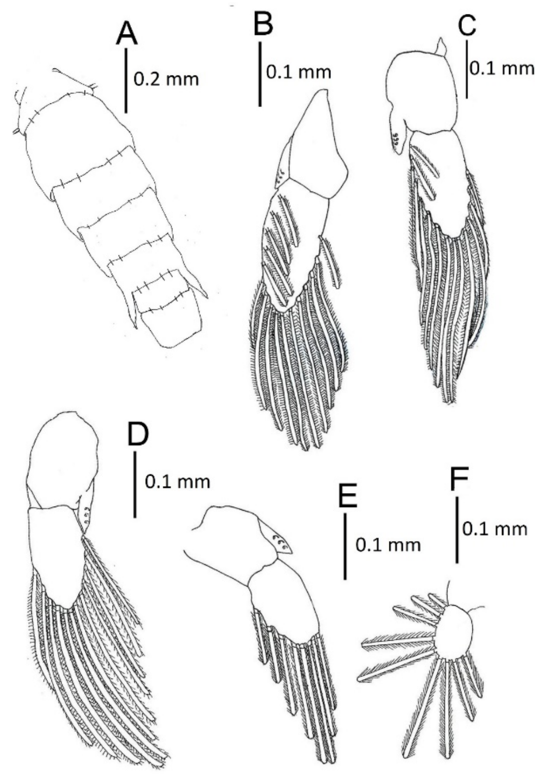

Fig. 5. *Thalamita* sp. megalopa A) Abdomen; B) Pleopod I C) Pleopod II; D) Pleopod III; E) Pleopod IV; F) Uropod.

4. Conclusions

Morphological similarities between *Thalamita* sp. megalopae are very few: 3-segmented antennal peduncle, 8-segmented antennal endopod, 2-segmented endopod of mandible, 5-segmented endopods of maxilliped III, and the number of hooks in the endopod of pleopods I–IV (3). Reiger (1998) pointed out that more morphological data of brachyuran larvae are needed to establish generic and specific characters. Therefore, these similar larval morphological features cannot be considered as generic characters at present.

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الوصف الظاهري ليرقة الميجالوبا لنوع *Thalamita* sp. (القشريات، قصيرات الذنب، السلطعونات السابحة) من خور أبحر، البحر الأحمر، المملكة العربية السعودية

إندرا أفندي[1]، وأناند جيو كومار[1]، ومحسن الشربيني[1،2]

[1] قسم الأحياء البحرية، كلية علوم البحار، جدة، المملكة العربية السعودية، و[2]قسم علوم البحار، كلية العلوم، جامعة قناة السويس، مصر

المستخلص. في هذه الدراسة، تم وصف يرقة الميجالوبا للسلطعون البحري من نوع *Thalamita* sp. والتي تم جمعها من خور أبحر، جدة، المملكة العربية السعودية. وتمت مقارنة يرقات الميجالوبا من البحر الأحمر مع نفس اليرقات لنوعين من هذا الجنس، وهما *Thalamita pelsarti* من مياه اليابان و*Thalamita crenata* من المياه الهندية. وظهرت بعض الصفات المورفولوجية الشائعة في يرقات الميجالوبا لهذا الجنس في عينات البحر الأحمر، مثل: الساق المعقلة لقرون الاستشعار، والشدفة الإنسية (endopod) لقرن الاستشعار مكونة من 8 عقل، والشدفة الإنسية في اللحى (mandible) مكونة من عقلتين، والشدفة الإنسية للرجل الفكية الثالثة (maxilliped III) مكونة من خمسة عقل، وكذلك الشدفة الإنسية لأرجل العوم (1–4) وتحتوي علي ثلاثة خطافات. تم العثور على بعض الاختلافات المورفولوجية بين يرقة الميجالوبا لنوع *Thalamita* sp. والأنواع الأخرى في عدد الزوائد المختلفة، مثل قرن الاستشعار الأول والثاني، الفكيك (maxillule)، والفك (maxilla)، والأرجل الفكية الأولى حتي الثالثة (maxilliped I-III) وأرجل العوم.

الكلمات المفتاحية: يرقة الميجالوبا، الوصف الشكلى، *Thalamita*، البحر الأحمر.