THE FIRST THREE ZOEAL STAGES OF THE CRAB *METOPOGRAPSUS MESSOR* (FORSKÅL, 1775) [CRUSTACEA:BRACHYURA: GRAPSIDAE]

A. M. AI-Aidaroos

Faculty of Marine Sciences, King Abdulaziz University, P.O. Box 80207, Jeddah - 21589, Saudi Arabia.

ABSTRACT

Three zoeal stages of the crab *Metopograpsus messor* are described and illustrated from laboratory reared material. The description of the first zoea in the present study is compared with previous descriptions of four species of *Metopograpsus.* It is distinguished by the absence of carapace lateral spines.

Key-words: Red sea, Biological studies, Grapsidae; *Metopograpsus messor*; crab; reared larvae

INTRODUCTION

In the Red Sea the Grapsidae comprise 16 species of which *Metopograpsus* is represented by *Metopograpsus messor* (Forskål, 1775) and *M. thukuhar* (Owen, 1839; Vine, 1986). The larvae of only a few *Metopograpsus* species have been studied viz., *M. latifrons* (White, 1847) by Kakati (1982), *M. frontalis* (Miers, 1880) by Fielder and Greenwood (1983), *M. maculatus* (Edwards, 1853) by Pasupathi and Kannupandi (1986) and *M. messor* by Chhapgar (1956), Rajabai (1961), Hashmi (1971), and Al-Khyat and Jones (1996). These previous descriptions of the first zoeal stage of *M. messor* do not meet with modern standards. Consequently the aim of the present study is to describe the first three zoeal stages of *M. messor* and compare its development with earlier studies.

MATERIALS AND METHODS

Ovigerous *M. messor* crabs were collected from the mangrove area of Ras-Hatiba bay, Dahban (22° N, 39° E), on the eastern coast of the Red Sea, Saudi Arabia. The females were transported to the laboratory at Faculty of Marine Sciences, held in glass aquaria with filtered and aerated sea water at 29 °C and 39 ‰ salinity, under a natural day/night regime until the eggs hatched. Larvae were transferred and reared in a mass culture. Fresh plankton were provided daily as food because the brine shrimp, Artemia is too large for early zoeal stages of *M. messor*. However, these zoeas did not survive longer than 18 days and none moulted to the fourth stage.

Larvae were fixed at each stage in 4% formalin. Dissections and drawings of larvae were made using a WILD stereoscope and an OLYMPUS BH-2 with Normarski interference contrast and attached camera lucida. Measurements were based on the mean of 10 specimens from each stage. Carapace length was measured from the anterior border of the eyestalk to the posteromedial cleft of the carapace; spine to spine length was measured on a direct line between the tip of the rostral and dorsal spines. The long natatory setae on the distal exopod segment of the first and second maxillipeds are drawn truncated. The ovigerous crab and some larvae of *M. messor* were deposited in the museum of the Faculty of Marine Sciences, King Abdulaziz University.

Description:

Metopograpsus messor (Forskål, 1775)
(**Figs. 1-6**)

First zoea

Dimensions: TL: 1.17 mm; CL: 0.57 mm.

Carapace (Fig. **1**a,b): dorsal spine present and with 2 distal setae; rostral spine approximately equal in length to dorsal spine; lateral spines absent; 1pair of medialdorsal setae; eyes sessile. Antennule (Fig. **2**a): endopod absent; exopod unsegmented with 4 terminal aesthetascs of unequal length and 2 short setae.

Antenna (Fig. **2**b): spinous process distally spinulate; endopod and exopod absent.

Mandible: Palp absent.

Maxillule (Fig**. 2**c): coxal endite with 6 setae; basial endite with 5 setal processes, inner margin with 2 teeth; endopod 2-segmented, proximal segment with 1 distal seta; distal segment with 1 subterminal and 4 terminal setae; epipod and exopod seta absent.

Maxilla (Fig. **2**d): coxal endite bilobed with 5+4 setae; basial endite bilobed with 5+4 setae; endopod bilobed, with 2+2 terminal setae; exopod (scaphognathite) margin with 4 setae and 1 distal stout process.
First maxilliped (Fig. **2**e): coxal segment with 1 seta; basis with 8 setae arranged 2,2,2,2; endopod 5-segmented with 1,2,1,2,5 (1 subterminal, 4 terminal) setae respectively; exopod 2-segmented, distal segment with 4 terminal plumose natatory setae.
Second maxilliped (Fig. **2**f): coxal segment without setae; basis with 4 setae arrange 1,1,1,1; endopod 3-segmented, with 0,1,5 (2 subterminal, 3 terminal) setae respectively; exopod 2-segmented, distal segment with 4 terminal plumose natatory setae.
Third maxilliped: absent.
Pereiopods: absent.
Abdomen (Fig. **1**c): 5 somites; somite 2 and 3 with 1 pair of lateral processes; somites 1-4 with a simple posterolateral processes; somite 5 with large rounded lateral processes; somite 2-5 with 1 pair of posterodorsal setae; pleopod buds absent.
Telson (Fig. **1**c): each fork spinulate; posterior margin with 3 pairs of stout spinulate seta.

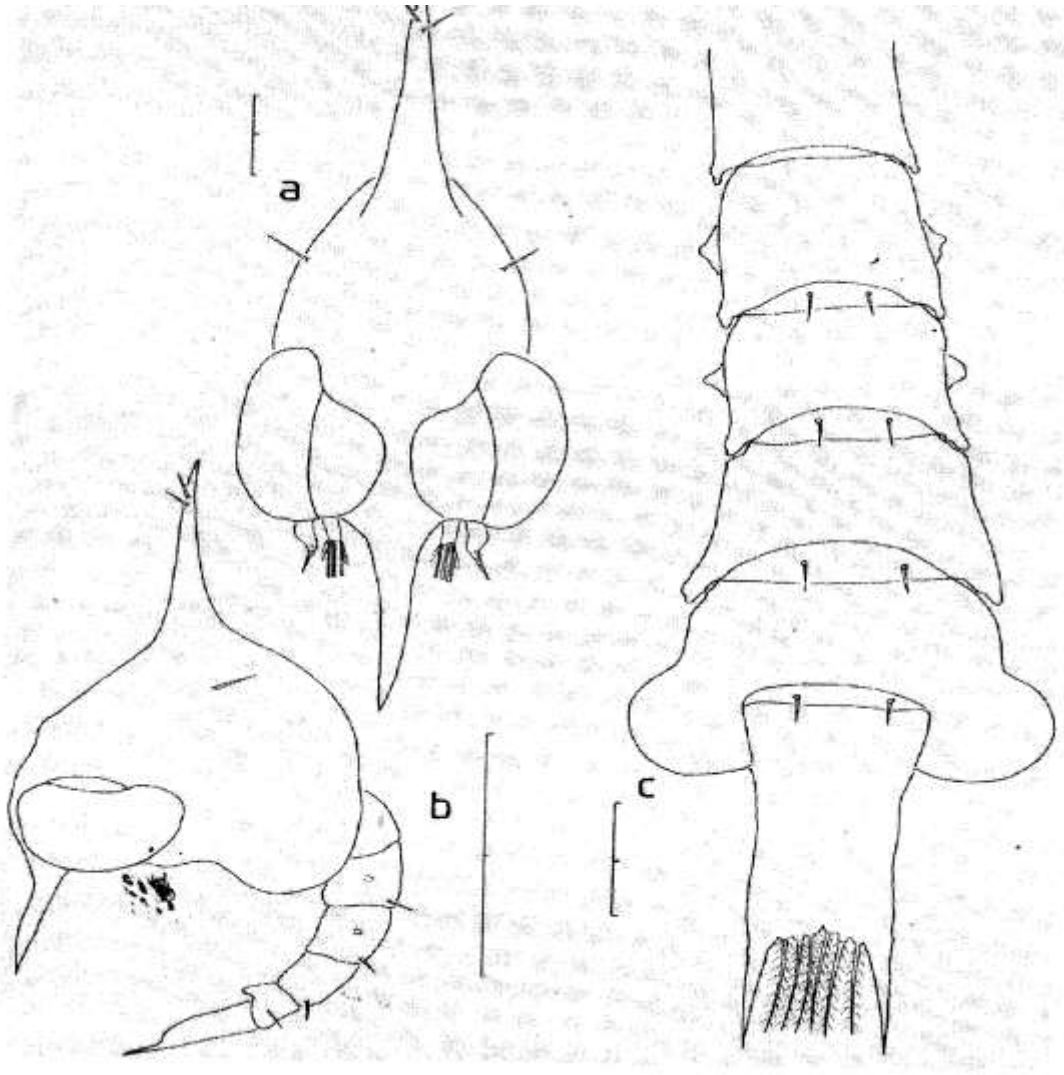

Fig.1. *Metopograpsus messor* (Forskål, 1775), first zoea. a, frontal view of carapace; b, Lateral view of carapace; c, frontal view of abdominal and telson. Scale bars: a= 0.1; mm; b= 0.5 mm; c= 0.1 mm.

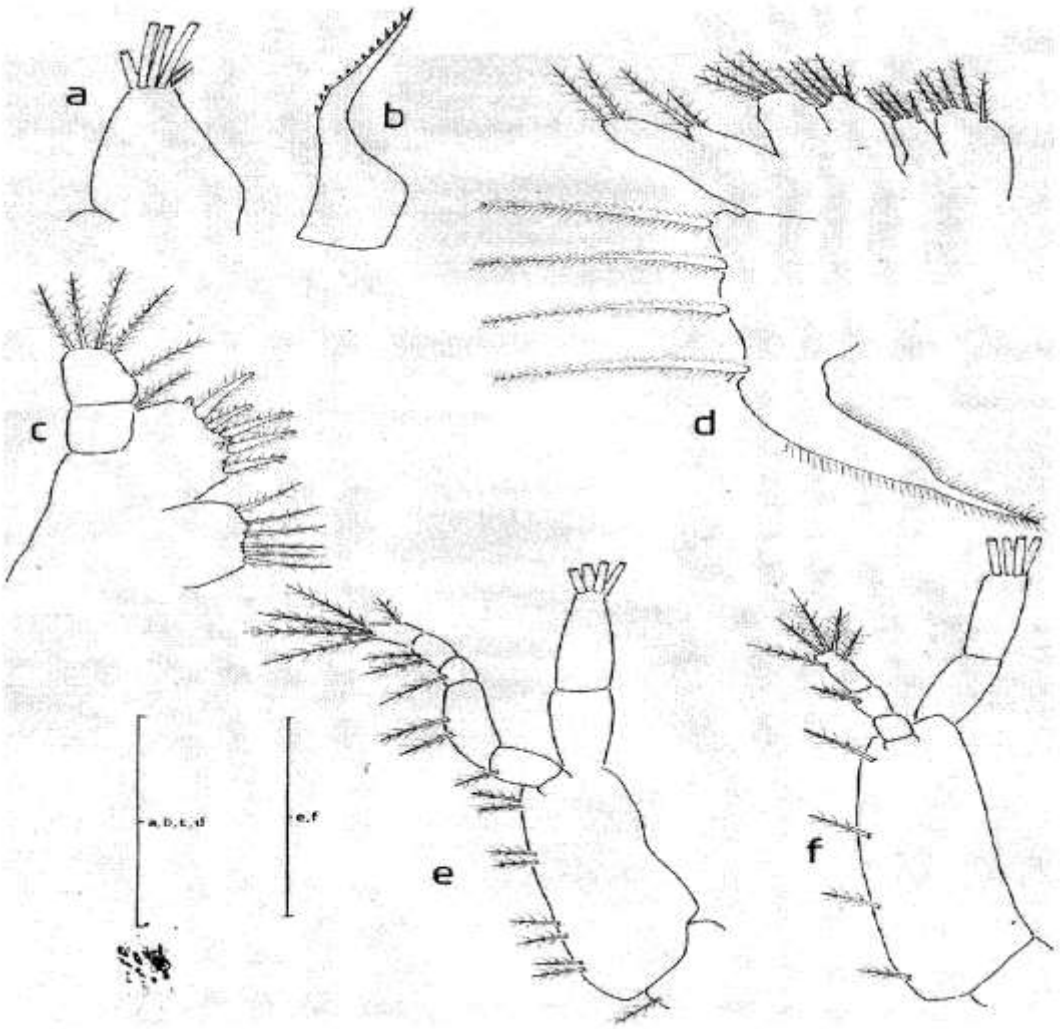

Fig.2. *Metopograpsus messor* (Forskål, 1775), first zoea. a, antennule; b, antenna; c, maxillule; d, maxilla; e, first maxilliped; f, second maxilliped. Scale bars: a,b,c,d= 0.1 mm; e,f= 0.2 mm.

Second zoea

Dimensions: TL: 1.62 mm; CL: 0.75 mm.
Carapace (Figs. **3**a, b): 2 pairs of anterior setae; each ventral margin with one plumose seta and one simple seta; eyes stalked; otherwise unchanged.
Antennule (Fig. **4**a): exopod now with 5 unequal terminal aesthetascs and 3 small setae; otherwise unchanged.
Antenna: unchanged.
Mandible: unchanged.
Maxillule (Fig. **4**b): basial endite with 7 setal processes, exopod seta present;
otherwise unchanged.
Maxilla (Fig. 4c): exopod (scaphognathite) margin with 10 setae, stout process absent, otherwise unchanged.
First maxilliped (Fig. **4**d): exopod with 6 terminal plumose natatory setae; otherwise unchanged.
Second maxilliped (Fig. **4**e): exopod with 6 terminal plumose natatory setae; otherwise unchanged.
Third maxilliped: absent.
Pereiopods: absent.
Abdomen: unchanged.
Telson: unchanged.

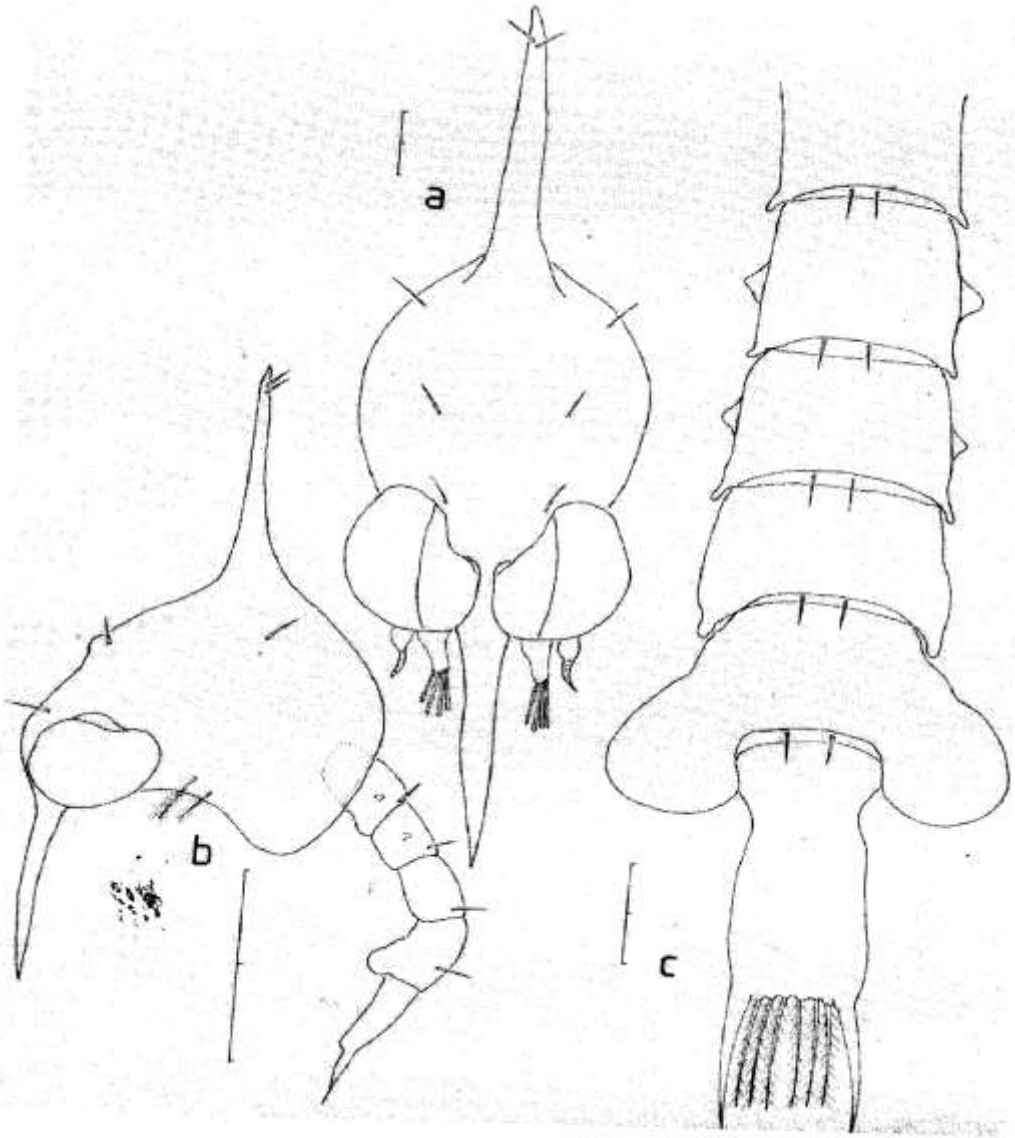

Fig.3. *Metopograpsus messor* (Forskål, 1775), second zoea. a, frontal view of carapace; b, Lateral view of carapace; c, frontal view of abdominal and telson. Scale bars: a= 0.1 mm; b= 0.5 mm; c= 0.1 mm.

Third zoea

Dimensions: TL: 2.01 mm; CL: 0.87 mm

Carapace (Figs. **5**a, b): dorsal spine with 2 distal setae and 4 pairs setae, 2 pairs of anterior setae; each ventral margin with 2 pairs plumose setae and 2 pairs simple setae; otherwise unchanged.

Antennule: unchanged.

Antenna: unchanged.

Mandible: unchanged.

Maxillule: unchanged.

Maxilla (Fig. **6**a): exopod (scaphognathite) margin with 16 setae; otherwise unchanged.

First maxilliped (Fig. **6**b): exopod with 8 terminal plumose natatory setae; otherwise unchanged.

Second maxilliped (Fig. **6**c): exopod with 8 terminal plumose natatory setae; otherwise unchanged.

Third maxilliped: absent.

Pereiopods: absent.

Abdomen: unchanged.

Telson: unchanged.

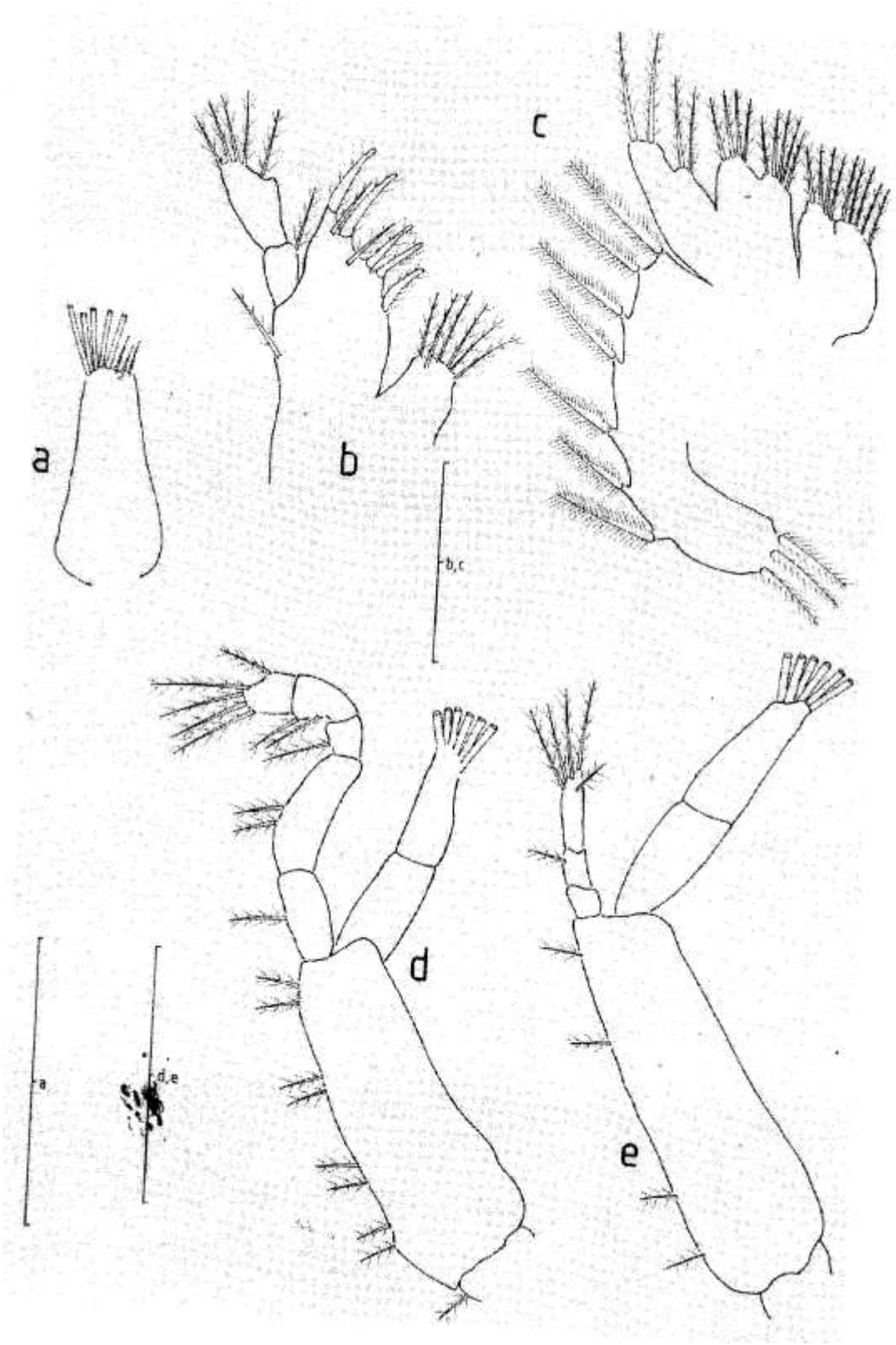

Fig.4. *Metopograpsus messor* (Forskål, 1775), second zoea. a, antennule; b, maxillule; c, maxilla; d, first maxilliped; e, second maxilliped. Scale bars: a= 0.1 mm; b,c= 0.1 mm; d,e= 0.2 mm.

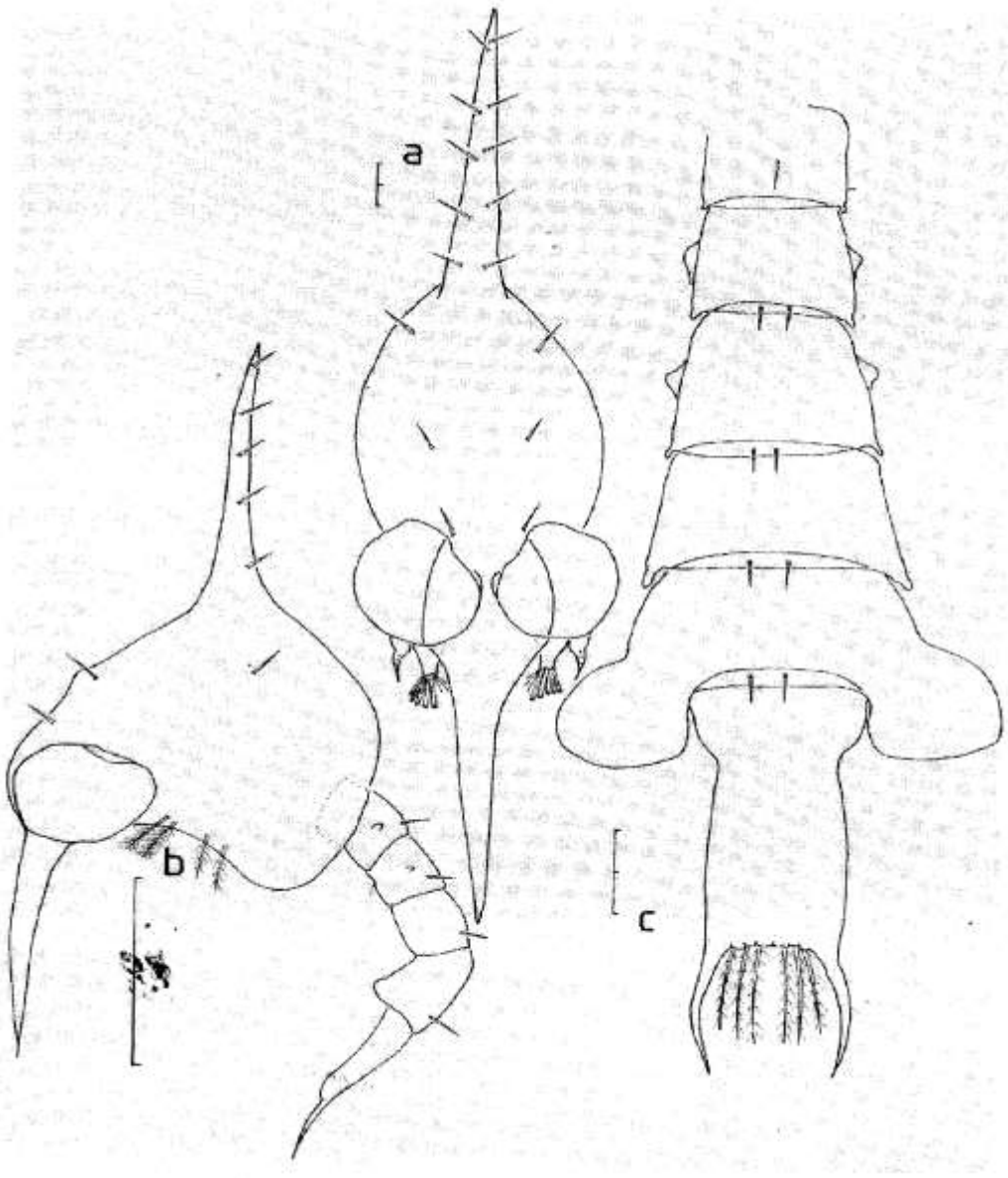

Fig.5. *Metopograpsus messor* (Forskål, 1775), third zoea. a, frontal view of carapace; b, Lateral view of carapace; c, frontal view of abdominal and telson. Scale bars: a= 0.1 mm; b= 0.5 mm; c= 0.1 mm.

DISCUSSTION

Chhapgar (1956), Rajabai (1961), Hashmi (1971), Al-Khyat and Jones (1996) had described only the first zoea stage of *M. messor* but their descriptions were not sufficient for a standard description. All previous descriptions overlooked two small setae on the dorsal carapace spine, the seta on the coxal somite of the first maxilliped, one pair of the medial-dorsal setae in the carapace and one pair of posterodorsal setae on the abdominal somite 2-5. *Metopograpsus messor* zoeae as described by Hashmi (1971) mat be considered the best descriptions with illustrations compared with the other workers, nevertheless several differences appear in their characteristics as compared with those reared in this study (Table 1). *Metopograpsus messor* and *M. frontalis* have similar characteristics in all appendages, while differences are in the numbers of antennual aesthetascs and the carapace lateral spine which is absent in *M. messor* and appears in the *M. frontalis* (Table 1) Differences in the appendages of *M. messor* and both *M. latifrons* and *M. maculate* are tabulated (Table 1).

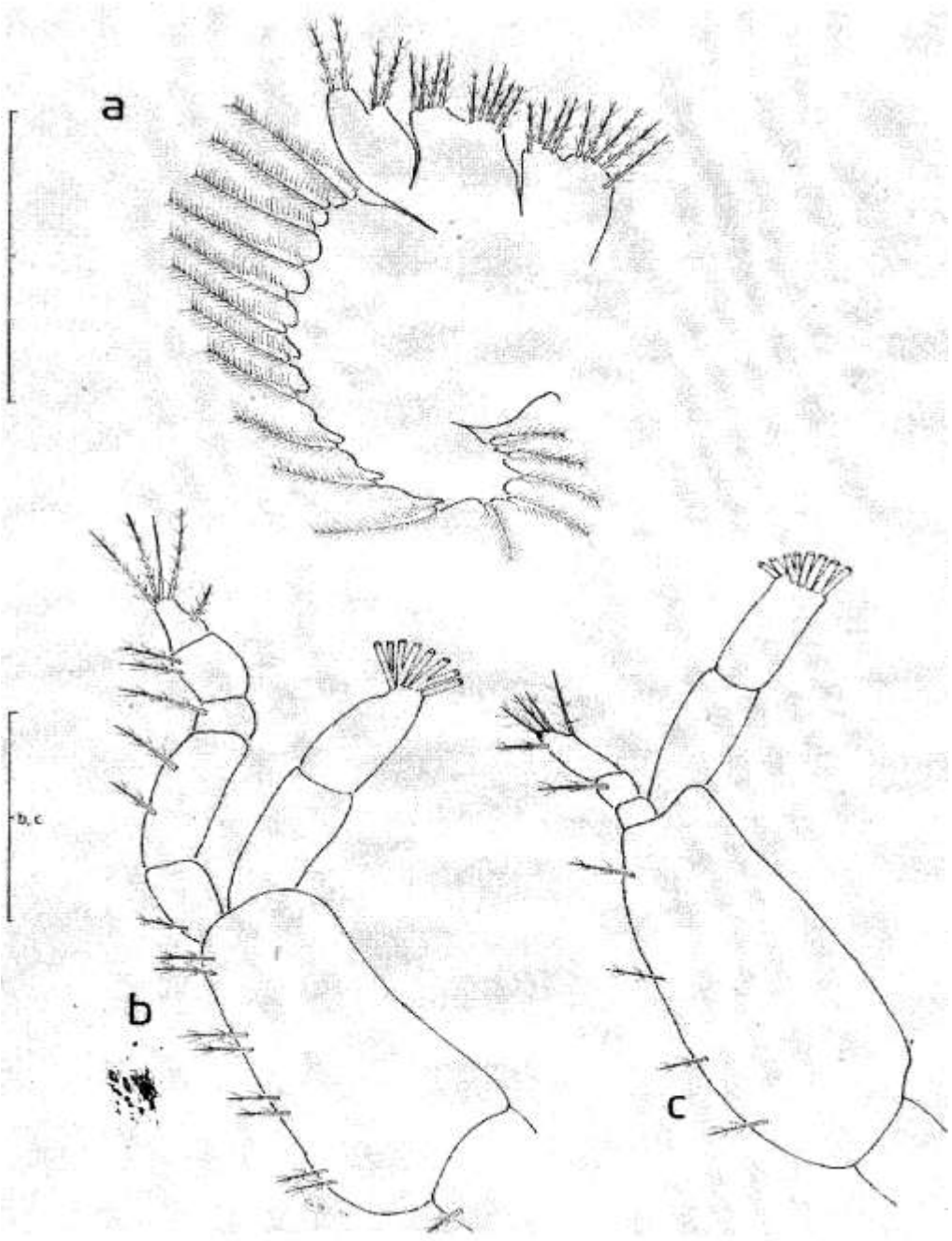

Fig.6. *Metopograpsus messor* (Forskål, 1775), third zoea. a, maxilla; b, first maxilliped; c, second maxilliped. Scale bars: a= 0.2 mm; b,c= 0.2 mm.

The present study of *M. messor* not only gives a detailed description of the first zoeal stage but also describes three zoeal stages of its life cycle which is incomplete. The other three described species of *Metopograpsus* have five zoeal stages preceding the megalopa stage. Wear (1970) divided grapsid zoeal into four groups depending on the lateral carapace spines and the antennal exopod. *Metopograpsus messor* can be placed in the first group of Wear classification, which has no lateral carapace spine and a rudimentary antennal exopod. Wear's four groups do not cover all species that have been described and some of the species are difficult to place in any of his groups. *Metopograpsus messor* is the only one among the three species already described, which does not have a carapace lateral spines in all zoeal stages. *Metopograpsus maculata* and *M. latifrons* have no lateral carapace spine in the first

zoeal stage, but it starts to appear in the second stage. These characteristics also appear in *Pachygrapsus crassipes* as described by Schlotterbecks (1976).

Table 1. Appendages setation of the first zoeal stages of four species of *Metopoagrapsus*.

Characters	*M. messor* (present)	*M. messor* (Hshmi)	*M. latifrons* (Kakati)	*M. frontalis* (Fielder)	*M.maculata* (Pasopati)
Antennule	4+2 setae	2+1 seta	2+1 seta	2+2 setae	2+1 seta
Maxillule					
Coxal endite	6	6	5	6	5
Basal endite	5	5	5	5	5
Endopod	1+5	1+5	0+5	1+5	1+5
Maxilla					
Coxal endite	9 (5+4)	5 (3+2)	7 (4+3)	9 (5+4)	6
Basal endite	9 (5+4)	7 (4+3)	4 (2+2)	9 (5+4)	7 (3+4)
Endopod	4 (2+2)	5 (2+3)	4 (2+2)	4 (2+2)	4 (2+2)
First maxilliped					
Basis	8	10	7	8	8
Endopod	(1+2+1+2+5)	(1+2+1+2+5)	(1+2+1+2+5)	(1+21+2+5)	(1+2+1+2+5)
Second maxillipod					
Basis	4	4	4	4	4
Endopod	(0,1,5)	(0,4,5)	(0,1,4)	(0,1,5)	(0,1,4)
Carpace					
Lateral spine	absent	present 3 pairs of Lateral procrsses	present as rounded humps, but in second zoea fully developed	present	present as rounded processes but in second zoea fully developed

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(*Accepted for publication 17 October 2004*)