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A Comparative Study of the First Zoeal Stage of *Uca urvillei* and *Uca annulipes* (Crustacea: Brachyura: Ocypodidae) Reared in the Laboratory

Farhana Shafiq GHORY*, Feroz Akhtar SIDDIQUI
Marine Reference Collection and Resource Centre, University of Karachi, Karachi, 75270 - PAKISTAN

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Abstract: The present information is based on the study of the first zoeal stages of *Uca urvillei* and *Uca annulipes*. The ovigerous females of *Uca urvillei* and *Uca annulipes* were collected from Sandspit on 13 July 2002. Larvae were hatched on 20 July 2002 and 24 July 2002 respectively, at room temperature 30-32 °C, in filtered seawater of a salinity of 35‰-37‰ and pH 7.8.

The first zoeae of 2 species from the Pakistan coast are described and illustrated, and a comparison is made between these 2 species of *Uca* obtained from the Pakistan coast and *Uca tangeri* studied by Paula from the Portuguese coast.

Key Words: Brachyura, Ocypodidae, comparative study of *Uca urvillei* and *Uca annulipes*, Pakistan

Introduction

Seven species of the genus *Uca* are reported by Tirmizi and Kazmi (1996) from Pakistan; 5 species are previously described (not seen by the authors), 2 by Hashmi in 1963 and 3 by Alcock in 1900. Of these 2 species, *Uca urvillei* (H.Milne Edwards, 1852) and *Uca annulipes* (H.Milne Edwards, 1837) are very common on our muddy shores, particularly in mangrove areas, where they live in large, deep burrows. When undisturbed they come out in groups from their burrows, and especially the males make a very beautiful display by waving their large chelae (first pereopod).

Fragmentary information on the larvae of these 2 species of the genus *Uca* Leach, 1814 from Pakistan were previously given by Hashmi (1970) under the names *Gelasimus annulipes* and *G. marionis*. There is, however, considerable information available about the larvae from other regions such as the first larvae of *Uca tangeri* (Eydoux, 1835) from Portugal described by Paula (1985), and Litulo (2004) has discussed the reproductive aspects of a tropical population of *Uca annulipes* from southern Mozambique.

The present study describes and illustrates the early developmental stages of the *Uca* species *U. urvillei* and *U. annulipes* found on the Pakistan coast, and compares them with *Uca tangeri* studied by Paula (1985). The present study will be helpful in the identification of planktonic brachyuran larvae found in Pakistan's waters.

Materials and Methods

Ovigerous females of *U. urvillei* and *U. annulipes* were obtained from Sandspit (long. 66° 54' 42" E, lat. 24° 50' 24" N) on 13 July 2002. The ovigerous females were kept in the laboratory in unfiltered seawater with a salinity of 35‰-37‰ and pH 7.8 at room temperature (30-32 °C) until hatching. Hatching occurred on 20 July 2002 and 24 July 2002, respectively. Newly hatched larvae were segregated and placed, 10 larvae per beaker (500 ml) containing filtered seawater of the same salinity and temperature as quoted above. *Artemia* nauplii were offered as food. Temporary slides were made by using glycerine plus 5% formalin (3:1). The specimens were dissected with a tungsten needle under a binocular microscope (Ogawa Seiki) with 4 x 10 magnification. The illustrations were made with the help of an Olympus BH2 microscope (magnifications 1.25 x 10, 20 and 40) with Nomarski interference contrast and *camera lucida* attachment. Measurements (in millimetres) of the

*E-mails: farhanaghory@yahoo.com

illustrated specimens were obtained with a stage micrometer. The total length (TL) was determined by adding the carapace length (CL), measured from the tip of the rostral spine to the posterior midpoint of the carapace (CL), and abdominal length, measured from the centre of the abdominal somit-2 to the midposterior margin of the telson. The spent females and the remaining larvae were preserved and housed in the Marine Reference Collection and Resource Centre, University of Karachi. (Cat. No. BRAC. 711 and 712).

Results

Uca urvillei (H.Milne Edwards, 1852)

Zoea I (Figures 1a- j).

Size - CL = 0.48-0.59 mm, TL = 0.97- 1.27 mm (5 specimens examined) Duration - 5 days (died).

Carapace (Figure 1a and b) - Carapace pubescence, dorsal and rostral spine distinctly with pointed tips; eyes sessile.

Antennule (Figure 1c) - Uniramous with 2 terminal aesthetascs and 1 seta.

Antenna (Figure 1d) - Protopod developed, distally produced as style and bears small spinules on either side; exopod with 2 terminal unequal setae.

Mandible (Figure 1e) - Well developed, palp absent.

Maxillule (Figure 1f) - Coxal and basial endites each with 3 cuspidate and 2 plumodenticulate setae; endopod 2-segmented, proximal segment, terminally with 4 plumodenticulate setae; exopod seta absent but a fringe of thin setae present.

Maxilla (Figure 1g) - Coxal and basial endite bilobed with 3 + 3 and 5 + 4 plumodenticulate setae from proximal to distal lobes respectively; endopod with 3 plumodenticulate setae; scaphognathite with 3 marginal plumose setae and terminates posteriorly in a plumose process.

Maxilliped I (Figure 1h) - Coxa without setae; basis with 9 plumodenticulate setae on median margin; endopod 5-segmented with 2,2,1,2,1+4 plumodenticulate setae from proximal to distal segments respectively; exopod with 4 terminal natatory plumose setae.

Maxilliped II (Figure 1i) - Coxa without setae; basis with 4 plumodenticulate setae on median margin; endopod 3-segmented with 0,0,2+2 plumodenticulate setae from proximal to distal segments respectively; exopod with 4 terminal natatory plumose setae.

Abdomen (Figure 1j) - Five somites each somite with a pair of fine setae on its middorsal surface; somite 2 with a pair of dorsolateral processes directed anteriorly; somite 3 with a pair of dorsolaterl processes directed posteriorly; somite 3-5 with slightly produced posterolateral angles.

Telson (Figure 1j) - Bifurcated by a shallow notch; more than half of the furca covered with fine spinules; inner posterior margin with 3 pairs of spinulate setae.

Uca annulipes (H.Milne Edwards, 1837)

Zoea I (Figures 2a- j).

Size - CL = 0.56-0.75 mm, TL = 1.06-1.09 mm (5 specimens examined) Duration.- 3 days (died).

Carapace (Figure 2a and b) - Carapace pubescence, dorsal and rostral spine distinctly with pointed tips; eyes sessile.

Antennule (Figure 2c) - Uniramous, terminally with 2 aesthetascs and 1 seta.

Antenna (Figure 2d) - Protopod developed, distally produced as style and bears small spinules on either side; exopod with 2 terminal unequal setae.

Mandible (Figure 2e) - Well developed, palp absent.

Maxillule (Figure 2f) - Coxal endite with 4 cuspidate setae; basial endite with 4 cuspidate and 1 plumodenticulate setae; endopod 2-segmented, proximal segment with 4 plumodenticulate setae; exopod seta absent but a fringe of thin setae present.

Maxilla (Figure 2g) - Coxal and basial endite bilobed with 3 + 3 and 5 + 3 plumodenticulate setae from proximal to distal lobes respectively; endopod with 3 plumodenticulate setae; scaphognathite with 3 marginal plumose setae and terminates posteriorly in a plumose process.

Maxilliped I (Figure 2h) - Coxa without setae; basis with 8 plumodenticulate setae on median margin; endopod 5-segmented with 2,2,1,2,1+4 plumodenticulate setae from proximal to distal segments respectively; exopod with 4 terminal natatory plumose setae.

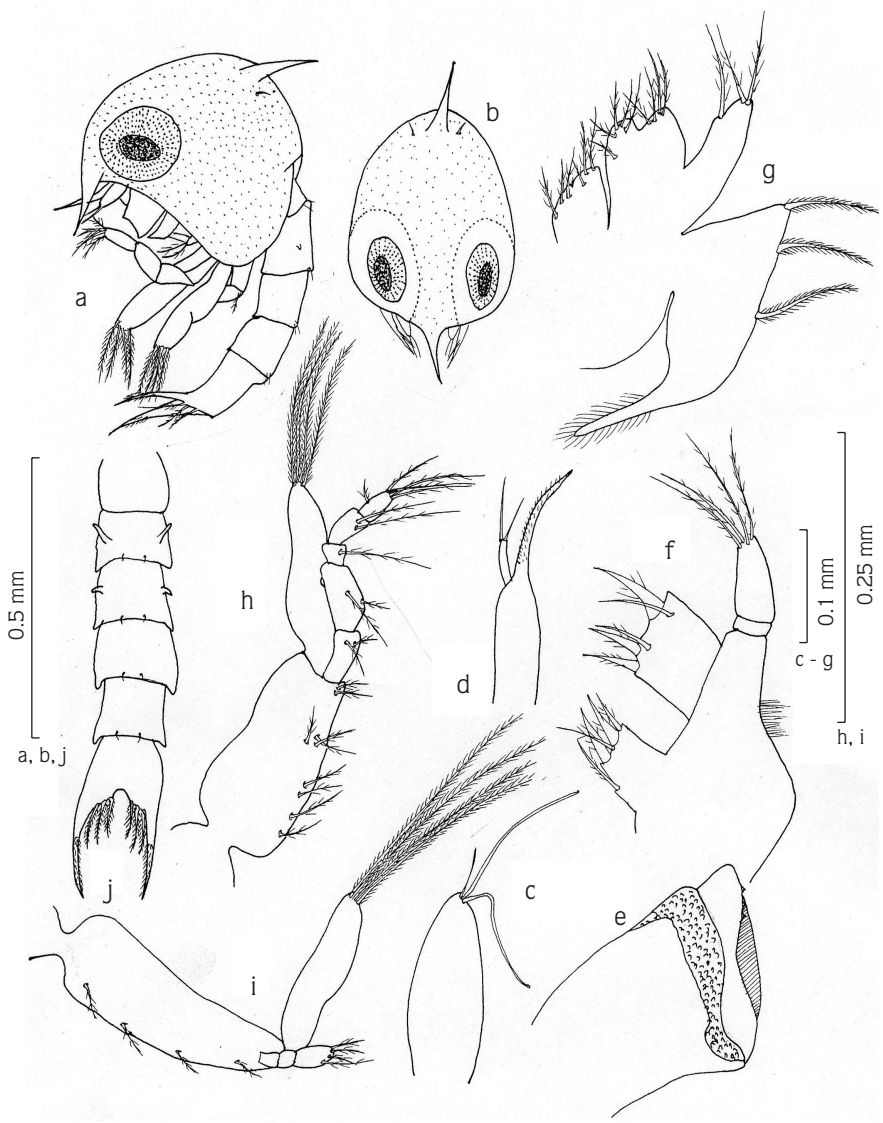

Figure 1. *Uca urvillei* (H.Milne Edwards, 1852). Zoea I: a, lateral view; b, dorsofrontal view; c, antennule; d, antenna; e, mandible; f, maxillule; g, maxilla; h & I, maxillipeds I & II; j, abdomen with telson, dorsal view.

Maxilliped II (Figure 2i) - Coxa without setae; basis with 4 plumodenticulate setae on median margin; endopod 3-segmented with 0,0,2+2 plumodenticulate setae from proximal to distal segments respectively; exopod with 4 terminal natatory plumose setae.

Abdomen (Figure 2j) - Five somites each somite with a pair of fine setae on its middorsal surface; somite 2 with a pair of dorsolateral processes directed anteriorly; somite 3 with a pair of dorsolateral processes directed posteriorly; somite 3-5 with slightly developed posterolateral angles.

Telson (Figure 2j) - Bifurcated; more than half of the furca covered with fine spinules; inner posterior margin with 3 pairs of spinulate setae on either side of shallow notch.

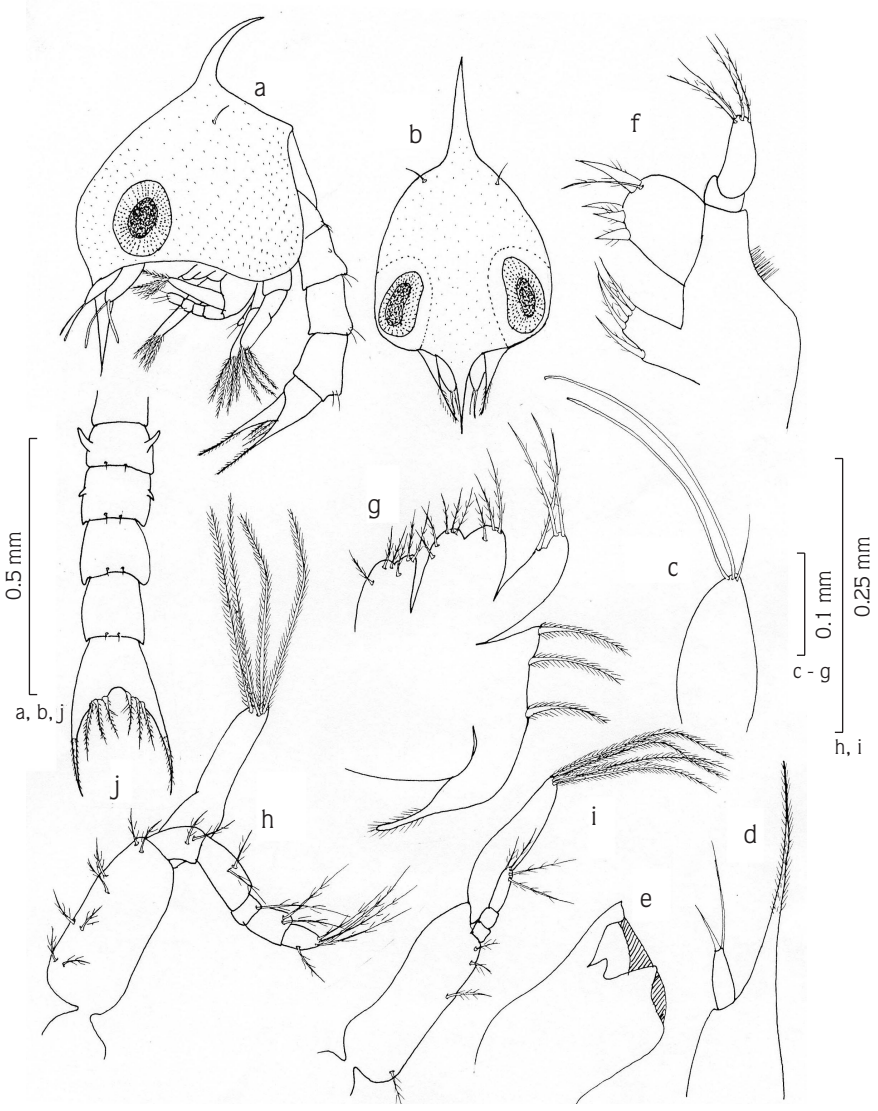

Figure 2. *Uca annulipes* (H.Milne Edwards, 1837). Zoea I: a, lateral view; b, dorsofrontal view; c, antennule; d, antenna; e, mandible; f, maxillule; g, maxilla; h & I, maxillipeds I & II; j, abdomen with telson, dorsal view.

Remarks

The genus *Uca* Leach, 1814 is well represented by *Uca urvillei* and *Uca annulipes* in the mangrove forests along the Pakistan coast (northern Arabian Sea). The larval study of the species is very helpful when distinguishing them from each other. In external appearance the larvae of *U. annulipes* are larger in size and have a large rostral and dorsal spine as compared to *U. urvillei*. The detailed study shows very few differences between these 2 species; the protopod of the antenna of *U. urvillei* is slim whereas it is broad in *U. annulipes*. The setation of the basial endite of the maxilla is 5 + 4 in *U. urvillei* and 5 + 3 in *U. annulipes*. The first maxilliped also has a difference of one seta in the setal count between *U. urvillei* and *U. annulipes*, as shown in Table 1.

A comparison has also been made between *U. urvillei* and *U. annulipes* from Pakistan and *U. tangeri* from Portugal. The basic morphological difference is the

Table 1. Morphological characters of zoea I of *Uca urvillei* (H.Milne Edwards, 1852) and *Uca annulipes* (H.Milne Edwards, 1837).

Characters	*Uca urvillei* Duration- 5 days	*Uca annulipes* Duration- 3 days (died)
Size	CL = 0.48- 0.59 mm TL = 0.97-1.27 mm	CL = 0.56-0.75 mm TL = 1.06-1.09 mm
Carapace:	pubescence	pubescence
dorsal spine	small	large
Rostrum:	small	large
Eyes:	sessile	sessile
Antennule:		
aesthetascs	2	2
setae	1	1
Antenna:		
protopod	well developed, slim, distally bears small spinules on either side	well developed, broad, distally bears small spinules on either side
exopod	with 2 unequal setae	with 2 unequal setae
Mandible:	well developed	well developed
Maxillule:		
setae:		
coxal endite	5	4
basial endite	5	5
endopod	4	4
Maxilla:		
setae:		
coxal endite	3+3	3+3
basial endite	5+4	5+3
endopod	3	3
scaphognathite	3	3
Maxilliped I:		
setae:		
coxa	absent	absent
basis	9 (2,2,3,2)	8 (2,2,2,2)
endopod	12(2,2,1,2,1+4)	12(2,2,1,2,1+4)
exopod	4	4
Maxilliped II:		
setae:		
coxa	absent	absent
basis	4 (1,1,1,1)	4 (1,1,1,1)
endopod	4(0,0,2+2)	4(0,0,2+2)
exopod	4	4
Abdomen:		
somites	5 + telson	5 + telson
dorsolateral knobs on somites 2 and 3	well developed	well developed
posterolateral angles of somite 3-5	produced, deleted	rounded deleted
Telson:		
furca:		
posterior processes	3+3	3+3

presence of a lateral spine in *U. tangeri*, whereas it is absent in both Pakistani species. Setal count differences are also observed in the coxal endite of the maxillule, the coxal endite, basial endite and scaphognathite of the maxilla, and the setae of maxilliped I and II, and differences in the dorsal spine in the telson are noted (Table 2).

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Table 2. Comparison between the number of setae in zoea I of *Uca urvillei* (H.Milne Edwards, 1852), *Uca annulipes* (H.Milne Edwards, 1837) from Pakistan and *Uca tangeri* (Eydoux, 1835) from Portugal.

Zoea I:

Characters	*Uca urvillei* Present study	*Uca annulipes* Present study	*Uca tangeri* Paula, 1985
Carapace			
lateral spine	absent	absent	present
Maxillule:			
setae:			
coxal endite	5	4	5
Maxilla:			
setae:			
coxal endite	3+3	3+3	4+3
basial endite	5+4	5+3	5+4
scaphognathite	3	3	4
Maxilliped I:			
setae:			
basis	2,2,3,2	2,2,2,2	2,2,3,3
Maxilliped II:			
setae:			
endopod	0,0,4	0,0,4	0,0,5
Telson:			
furca with			
dorsal spine	absent	absent	present

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