

# The First Record of *Manningis arabicum* (Jones & Clayton, 1983) (Decapoda: Camptandriidae) from Intertidal Mud Flats of Pakistan

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**Abstract:** Specimens of *Manningis arabicum* (Jones & Clayton, 1983) were collected from Sonmiani Bay Lagoon. The species was previously reported from the Arabian Gulf and Gulf of Oman as endemic. This is the first report of the monotypic genus *Manningis* from the west coast of Pakistan, which substantially widens the geographical range of the species eastwards.

**Key words:** *Manningis arabicum*, camptandriid crabs, Sonmiani Bay Lagoon, North Arabian Sea.

## Introduction

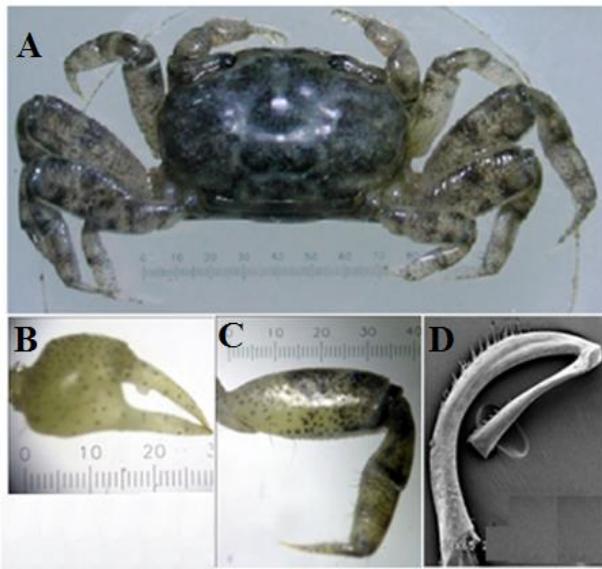
The ocypodoid crabs of the family Camptandriidae (NG et al. 2008) are characterised by extremely reflexed pleopod. They have been placed within the subfamily Macrophthalminae Dana, 1851, and later recognised as a distinct subfamily – Camptandriinae Serene, 1974. In the most recent classification, they are treated as a distinct family (NG et al. 2008). Two species of camptandriid crabs, i.e. *Opusia indica* (Alcock, 1900) and *Nasima dotilliformes* (Alcock, 1900), have been reported from intertidal mud flats of Pakistan (TIRMIZI & GHANI 1996). These numerically dominating deposit feeders are ecologically important and considered as bio-engineers (SAHER & QURESHI 2011). In the present study, we report another species, which belongs to the monotypic genus *Manningis* Al-Khayat & Jones, 1996 (see AL-KHAYAT & JONES 1996). This species was first reported by JONES & CLAYTON (1983) as *Paracleistostoma arabicum* Jones & Clayton, 1983 from Kuwait.

## Materials and Methods

The study site was Sonmiani Bay Lagoon. It occupies an area of 125.5 km<sup>2</sup> (24°44.183'N, 67°28'E)

and is a prominent topographical feature located in the eastern part of Balochistan. The area has an arid climate with less than 200 mm of rain per year (RASOOL et al. 2002). Three species of mangroves, i.e. *Avicennia marina*, *Rhizophora mucronata* and *Ceriops tagal*, have been reported from Sonmiani Bay Lagoon; they spread over an area of c. 2500 ha (42% of the mangrove forests in Balochistan). The Porali and Windor Rivers are seasonal rivers that drain in Sonmiani Bay and are the only freshwater source for the bay lagoon (RASOOL et al. 2002, SAIFULLAH et al. 2004, GONDAL et al. 2012).

Specimens were collected randomly by digging sediment and hand picking from the study site during low tide on 15.03.2013. The collected crabs were kept in a cool box with ice and later were frozen for morphological and quantitative analysis in the laboratory. Crabs were identified and deposited in the Marine Reference Collection Center (MRC&C) with catalogue No. BRAC-760, University of Karachi, Pakistan. All measurements provided are in millimetres ( $\pm 0.1$  mm). We examined in detail the external morphology of the mouthparts (3<sup>rd</sup> and 2<sup>nd</sup> maxillipeds) and male first gonopod (G1). The entire struc-



**Fig. 1.** *Manningis arabicum* (Jones & Clayton, 1983), adult, male: A. Dorsal view of carapace. B. Outer view of left male chela. C. Pereopod (P3). D. Gonopod (G1).

tures of the 2<sup>nd</sup> and 3<sup>rd</sup> maxillipeds and G1 of male specimens were removed carefully, fixed on metal stub, sputter-coated with gold and examined using JEOL JSM-6380 LV scanning electron microscope. The 3<sup>rd</sup> maxilliped was fixed with the outer side up, the 2<sup>nd</sup> maxilliped – with the inner surface up, as setae on this side manipulate sediment during feeding. G1 was fixed in abdominal view.

## Results

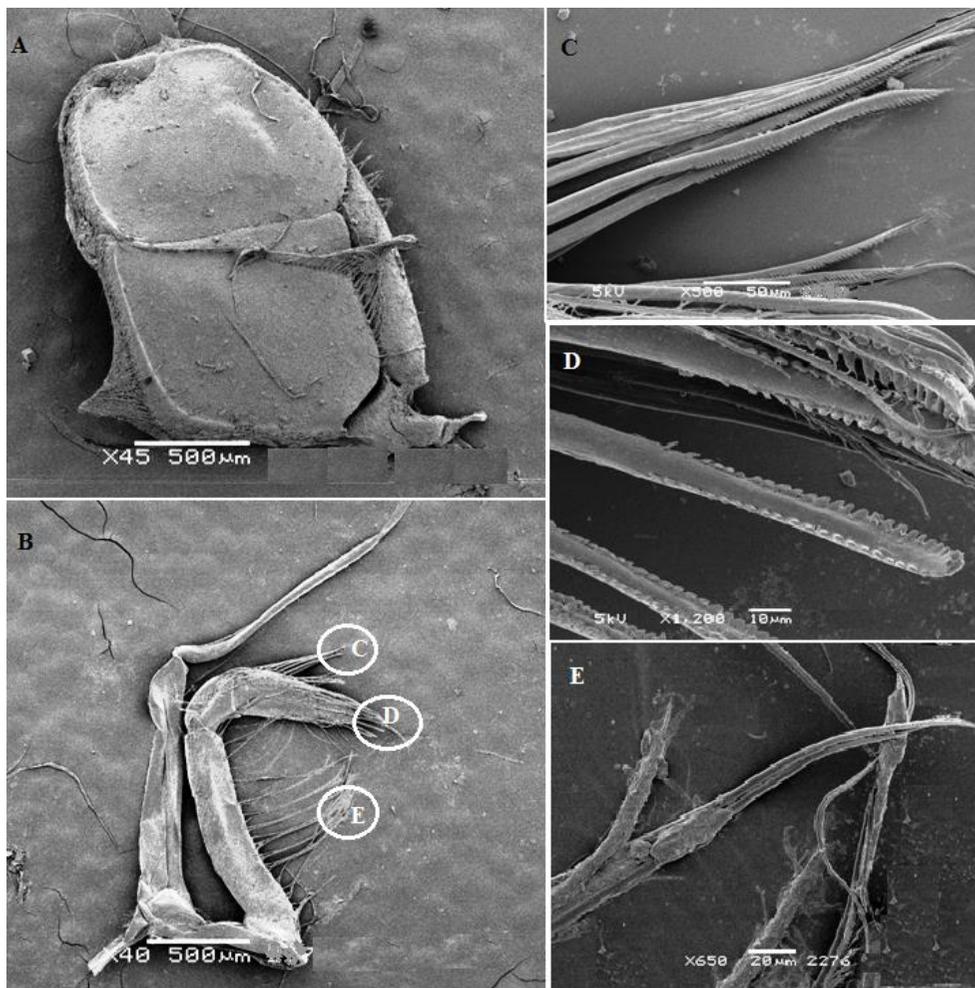
Family Camptandriidae Stimpson, 1858

Genus *Manningis* Al-Khayat & Jones, 1996

*Manningis arabicum* (Jones & Clayton, 1983) Al-Khayat & Jones, 1996

Synonym: *Paracleistostoma arabicum* Jones & Clayton, 1983

A total of 28 individuals of *Manningis arabicum* were collected (19 male and 9 females). The size of males and females ranged 3.5–4.5 mm and 3.7–4.0 mm, respectively.



**Fig. 2.** *Manningis arabicum* (Jones & Clayton, 1983): A. Dorsal surface of 3<sup>rd</sup> maxilliped. B. Ventral surface of 2<sup>nd</sup> maxilliped. C. Serrated setae near proximal margin of ultimate segment. D. Spatulated setae near distal margin of 2<sup>nd</sup> maxilliped. E. Pointed setae on merus of 2<sup>nd</sup> maxilliped.



**Fig. 3.** Distribution of *Manningis arabicum* (Jones & Clayton, 1983) along the Arabian Gulf, Gulf of Oman and North Arabian Sea.

**Description of diagnostic characters:**

Carapace (Fig. 1A) smooth, glabrous, ovaloid, about  $1.54 \pm 0.067$  times wider than long ( $n = 7$ ). Dorsal surface of carapace convergent; regions defined, epigastric region raised from a frontal view, progastric and mesogastric regions prominent. Gastro-cardiac groove defined; ex-orbital angle pointed, directed outward; antero-lateral angle behind exorbital tooth composed of two weak lobes, postero-lateral angle rounded.

Front deflexed downward, concave dorsally, about 0.36 times distance between exorbital angle ( $n=7$ ), diverging near the base of ocular peduncle. Upper orbital border sloping, sinuous; lower orbital border without any projecting lobe, fringe with setae.

Cheliped (Fig. 1B) of male equal, strongly robust; palm quadratic, about 2.11 times longer than high, dactylus bear monaliform sub proximal tooth, index curved inward from the base. Female cheliped weaker, smaller and cylindrical, fingers longer than palm; abdomen broader than long, 2-6 segments fixed, sutures visible.

Second pair of ambulatory leg (Fig. 1C) longest (P3), fifth pair shortest (P5), meri of walking legs with anterior margin microscopically serrated, posterior margin with peg-like teeth (denticulate), hairy-edged pouch (brush of hairs) present between the base of P2 and P3.

Male pleon seven-segmented, visible from dorsal view, 2-6 fixed, 2-3 fused, remaining suture visible; G1 (Fig. 1D) strongly reflexed, apex truncate, distal recurved portion with spine, laterally larger hook shaped spines. Sexually dimorphic species.

Third maxilliped (Fig. 2A) forms an operculum over 2<sup>nd</sup> maxilliped, do not completely closing buccal caravan. Merus sub equal to ischium, outer surface with sparse setae; ischium longer than broad, with oblique rows of setae subdistally; exopod with long flagellum partially concealed.

Second maxilliped (Figs. 2B-E): Merus not expended, with serrated setae; carpus heavily setose with similar type of setae. Penultimate segment of second maxilliped not expended, ultimate segment

**Table 1.** Summary of descriptive statistics (CL= carapace length, CW= carapace width, ChL = chela length, ChH = chela height, AbL = abdominal length, AbW = abdominal width, SD = standard deviation, Min = minimum, Max = maximum) for male and female crabs of *Manningis arabicum* collected from the Sonmiani Bay Lagoon, Pakistan.

Variable	Sex	N	Mean	SD	Min	Max
CL (mm)	M	16	4.31	0.27	3.5	4.5
	F	8	3.89	0.10	3.7	4.0
CW (mm)	M	16	6.47	0.32	5.8	6.8
	F	9	6.08	0.26	5.6	6.4
Ch. L (mm)	M	16	2.65	0.48	2.0	3.0
	F	9	2.12	0.13	1.9	2.3
Ch. H (mm)	M	16	1.30	0.47	0.7	2.0
	F	9	0.68	0.08	0.6	0.8
Ab. L (mm)	M	14	4.70	0.61	4.0	5.6
	F	7	4.45	0.13	4.3	4.7
Ab. W (mm)	M	14	1.40	0.11	1.2	1.6
	F	7	4.00	0.25	3.8	4.4
Front (mm)	M	16	2.06	0.10	2.0	2.3
	F	9	2.00	0.05	1.9	2.1
G1 (mm)	M	14	2.01	0.03	2.0	2.1

attached distally; posterior median tooth of epistome broadly triangular. Three types of setae found on the inner surface of the 2<sup>nd</sup> maxilliped; proximal margin of ultimate segment with pointed but serrated setae; distal margin of ultimate segment with spatulate serrated setae, merus with pointed setae without serration; pterygostomial region setose, smooth and plumose posterior median tooth of epistome broadly triangular.

Carapace grayish black with off-white spots, colour pattern of cheliped and walking legs off white with dense brown pigmentation.

**Observations on ecology and habitat:**

Individuals of *Manningis arabicum* were observed inhabiting the muddy, soft silty clay of intertidal areas associated with *Avicennia marina*. These small deposit feeder crabs dug burrows during low tide, transport sediment to the surface by carrying it in the legs, rolling it into small balls as a pile at the entrance of the burrow. Burrows have a single opening.

**Discussion**

This is the first record of *Manningis arabicum* from Pakistan. The species was previously known from Kuwait, Qatar, Saudi Arabia, Iraq and Iran (Fig. 3). APEL & TURKEY (1999) discussed the distributional pattern of ocy podoid crabs, including *M. arabicum*, and reported it as an endemic to the Arabian Gulf. Our study suggests a potentially wider geographical distribution, especially further eastward than previously known.

The observations of crabs in natural conditions are in agreement with information on other deposit feeder ocypodid crabs (MICHANTOST 1988). *M. arabicum* separates organic food particles from surface sediment by using a floating mechanism. The adaptation of feeding appendages (3<sup>rd</sup> and 2<sup>nd</sup> maxilliped) of *M. arabicum* can correlate with the substrate composition, which is nutritionally richer in organic content as compared to the sandy substrate. They have

serrate setae on the 2<sup>nd</sup> maxilliped, which provide larger surface area to remove (dislodge) fine substrate particles and efficiently obtain food from fine and muddy sediments (MACINTOSH 1988, MAITLAND 1990, COLPO & NEGREIROS-FRANZOZO 2012).

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