

First record of the Marine Calanoid Copepod *Pseudodiaptomus* c.f. *ardjuna* from Shatt Al-Arab River, Iraq

H.H. Mohamed

Marine Science Centre, University of Basra, Basrah - Iraq
E-mail: hanaah@mscbrasra.com

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Abstract - The marine calanoid copepod *Pseudodiaptomus* c.f. *ardjuna* (Brehm, 1953) was recorded from some freshwater habitats in some regions of the Shatt A-Arab River during March – July 2009. These regions include Al-Kurnish area, Al-Sindebad Island during April-August 2009 and at Al-Gurna city on March 2009 only. The species is briefly described in this work and its morphological characters are compared with earlier descriptions from Iraqi coastal water, like the total length of female and male, body shape, female genital segment, the shape of the male posterior prosomal segment and number of the setae of the furcal rami.

Key words: *Pseudodiaptomus ardjuna*, Marine calanoid, Shatt Al-Arab River.

Introduction

Freshwater calanoid Copepoda of southern Iraq have not been studied in detail since the time of the investigations of Gurney (1921) who had made records of *Canthocamptus staphylinus* Jurine and *Diaptomus vulgaris* Schmeil from Ezra's Tomb, *Diaptomus blanci* Guerne and Richard from irrigation runnels in Amara and *Diaptomus chevreuxi* Guerne and Richard from a dike beside an ancient causeway at Gantra Sarut on the left bank of the Tigris River between Amara and Ali Al-Gharbi. Most recently, Khalaf (2008) described *viz*, *Phyllodiaptomus irakiensis* as a new species of Calanoida from Shatt Al-Arab River and Mohammed and Salman (2009), recorded four species of freshwater calanoids from the southern Iraqi marshes. However, from the 1980s on, some scattered works on the zooplankton of Shatt Al-Arab River, in general and in copepods particular were carried out (Salman *et al.*, 1986; Al-Saboonchi *et al.*, 1986; Abdul-Hussein, 1989; Salman *et al.*, 1990; Ageel, 1997; Al-Zubaidi, 1998; Ageel *et al.*, 2006; Al-Jezani, 2005).

The genus *Pseudodiaptomus* Herrick, 1884 belongs to the Family Pseudodiaptomidae, predominantly occurs in estuarine and coastal marine waters, and presently comprised more than 78 species (Walter, 1986a, b, 1987, 1989; Soh *et al.*, 2001; Walter *et al.*, 2002; Nishida and Rumengan, 2005; Walter and Boxshall, 2009). With the sudden increase of salinity of Shatt Al-Arab River during 2009 (Dr. H.A. Hameed, personal communication) *P. ardjuna* started to appear in the Iraqi fresh water, as there was no previous records of the species or any related species in the region. Al-Yamani and Prusova (2003) did not record the species in the northwestern Arabian Gulf. However, *P. ardjuna* was recorded from Kuwait

waters in 2005 (Al-Yamani *et al.*, 2008); and the recent published guide by Al-Yamani and Skryabin (2011) described and documented the presence of this species from northern Kuwait waters. The nearest area from which *P. ardjuna* was recorded in the Indian coast, together with 22 other species of *Pseudodiaptomus*. However, the species in question is apparently restricted to this region of the world (Pillai, 1976).

The aim of the present study is to make records of *P. ardjuna*, a marine calanoid copepod in a freshwater habitat. It also includes some of the differences between the present species and the earlier description made by Ummerkutty, (1960), from India.

Material and Methods

Figure (1) Includes the map of Shatt Al-Arab River in the southern of Iraq at about 31°00' 15" and 47°26' 35", at the point meeting of Tigris and Euphrates, Shatt Al-Arab extend to the Arabian Gulf Estuary, Zooplankton samples were collected from four stations at the northern Shatt Al-Arab River (Al-Gurna (S1), Al-Hartha (S2), Al-Sindebad Island (S3) and Al-Kornish (S4)) (Fig. 1). Monthly samples were collected during the period from September

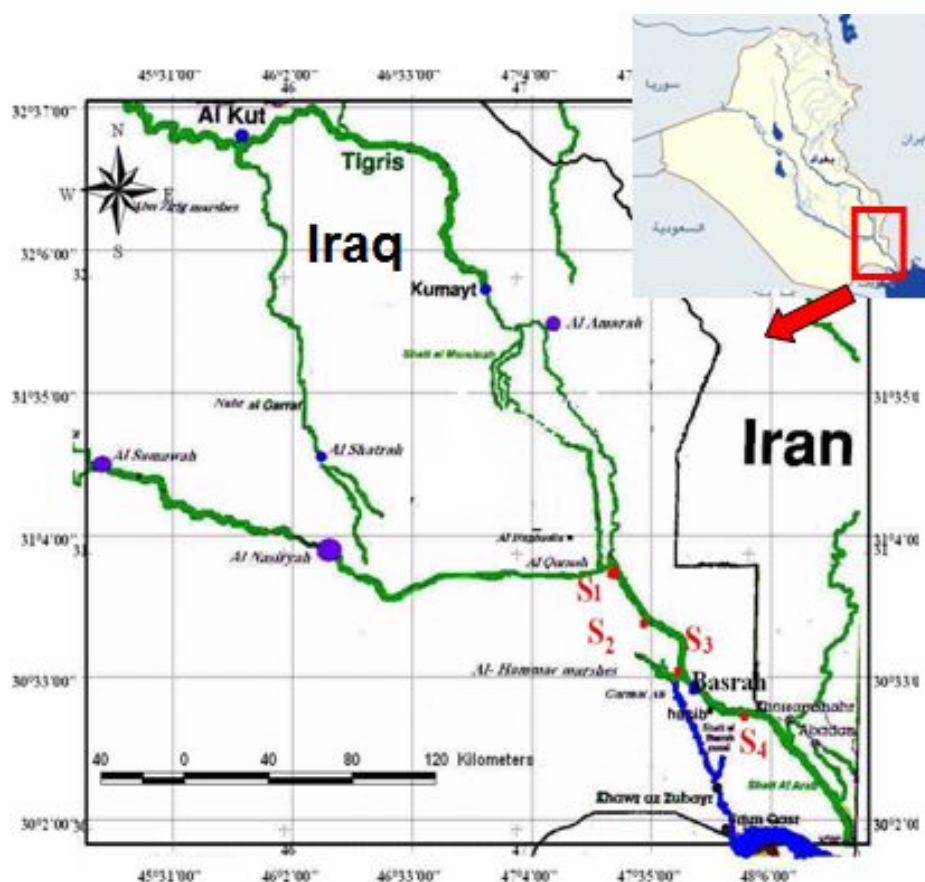


Figure 1. Map of the south of Iraq showing the sampling stations.

2008 to August 2009 by Mr. M.F. Abass. A plankton net of a mouth aperture of 40 cm and 120 μ m mesh size was used.

The materials collected were immediately preserved in 4 % formaldehyde solution. In the laboratory specimens of females and males were mounted and in glycerine and dissected out under a Wild dissecting microscope. Drawings were made by using a camera Lucida.

Pseudodiaptomus cf. ardjuna (Brehm):

Brehm (1953) provided a brief description of *P. ardjuna* as a new species from Salsette Island, Thana District, Bombay. This description is based on two male specimens, one of which was damaged, whereas the female was not described. Then Ummerkutty (1960) redescribed the male and female in some details with notes on the distribution of the species.

Diagnosis:

Total length of the female: 1.17 – 1.36 mm (n= 46) (Table 1).

Total length of the male: 1.03 – 1.12 mm (n= 38).

Female Th5 produced posteriorly into asymmetrical spine, right one slightly larger than left (Fig. 2). Urosome segments with small triangular spines on disto-dorsal margins, genital double somite barell shaped, with clusters of spinules on anterior half of lateral and dorsal margins.

Male: posterior corners of Th5 pointed, urosome segment 1 short and U2 longest, antennule 21-segmented, 4 large spines on each of segments 10-13, the spine on segment 10 with recurved tip and a small secondary spine (Fig. 3). P5 right leg with 2nd basal segment very large, slightly longer than wide and inner margin carried V- shaped spinous process of unequal arms, one of which with a bifid tip and with a small hairy projection. This process represents a vestigial endopod. Exopod 3 - segmented, Exp1 with a cluster of small blunt teeth along inner distal margin and a long 'Y'- shaped process with an inner arm short, and a long outer one, latter with bifid tip, a small spine present at base. Exp 2 much longer than Exp 1, but distinctly narrower, with a smaller spine at about middle of segment, and a long outer subapical spine distally, and a few teeth on distal margin. Exp 3 sickle- shaped, with a blunt tooth and a bristle on proximal inner margin and a small seta on mid-outer margin. Left leg, with 2nd segment produced, a digitiform inwardly curved process at inner distal corner repressing an Endopod, Exp 1 with outer apical seta, Exp 2 plate-like, twice as long as broad with outer subapical, minute hairs on apex of segment, with one short hooked spine and a short inner marginal one, and 2 hairs on inner margin.

Distribution:

Specimens were found at Al-Kornish station in good numbers during March-July 2009; near Al-Sindebad Island during April- August 2009, at Al-Gurna in very low abundance numbers in March 2009 only and it was totally absent from Al-Hartha station.

Remarks:

There are some morphological differences in the structure of the fifth leg of the male between the specimens described by Brehm (1953) from Bombay waters and those described by Ummerkutty (1960) from the south-east coast of India. These differences are probably due to locality variations.

Table 1. A comparison of the diagnostic features of *Pseudodiaptomus ardjuna* from the Shatt Al-Arab with those from India.

Characters		Ummerkutty described	Pillai described	Present specimens
Total length (mm)	Female	1.31	1.20-1.23	1.17-1.36
	male	1.1	1.03-1.10	1.03-1.12
Shape body		Rounded anteriorly	-	Pointed anteriorly
Female genital segment		Genital operculum without spines	Provided with clusters of spinules on anterior half of lateral and dorsal margins.	Provided with rows of spinules on the antero-ventral surface, and have a clusters of spinules on the antero-lateral margin. Paired gonopors covered by operculum bearing a pair of unequal process.
The spines of the male th5		less pronounced	Pronounced pointed	Various ; either both spines present or both spines absent or either spine may be present
Male and female urosomal segments		-	Female urosomal segments I-III with triangular spines on disto-dorsal margin, whereas in the male they are found on segments II-IV.	In the female these spines present on dorso-lateral surface. But in the male, they are around the margin of each segment, the spinules, in the female U III and in the male U IV are much longer than those on the other segments.
Furcal setae		Each ramus 5 setae, 4 of apical and 1 outer subapical	-	Each ramus bears 6 setae, 4 apical, 1 outer subapical and 1 small dorsal

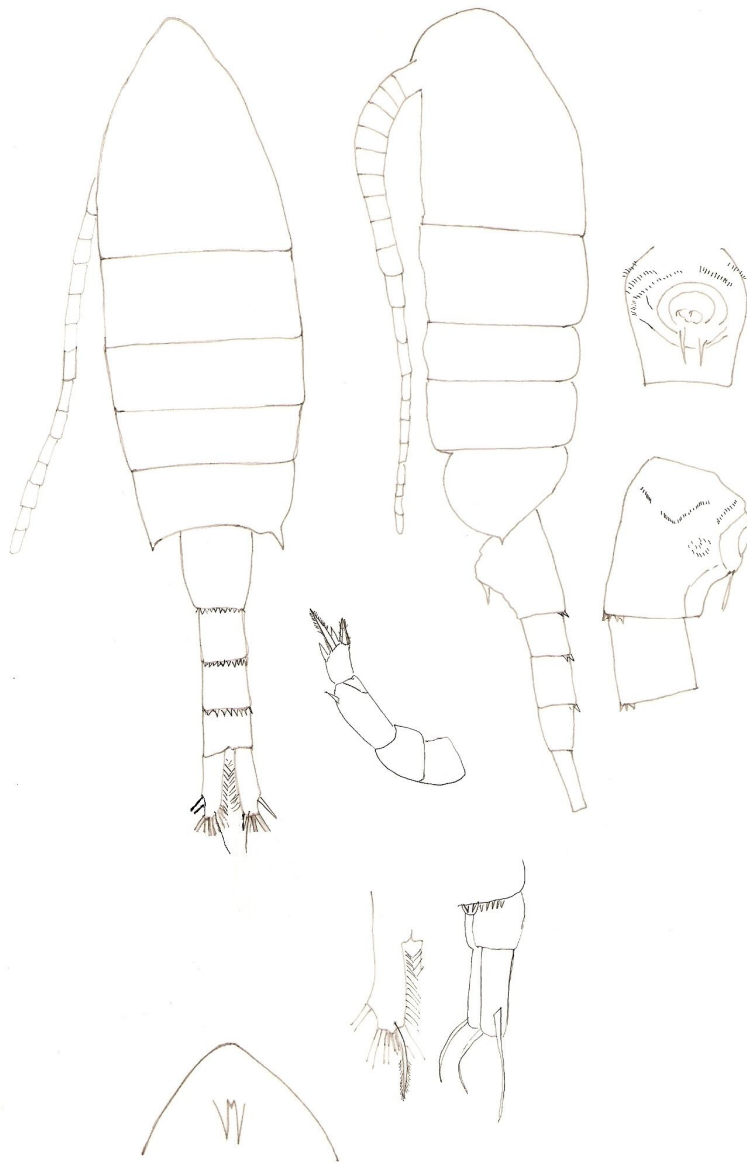


Figure 2. *Pseudodiaptomus* c.f. *ardjuna* Female. A, adult female dorsal; B, adult female ventral; C, genital double-somite. Ventral view; D, genital double-somite. lateral view; E, leg 5; F, furcal rami. dorsal view; G, furcal rami. Lateral view; H, rostrum.

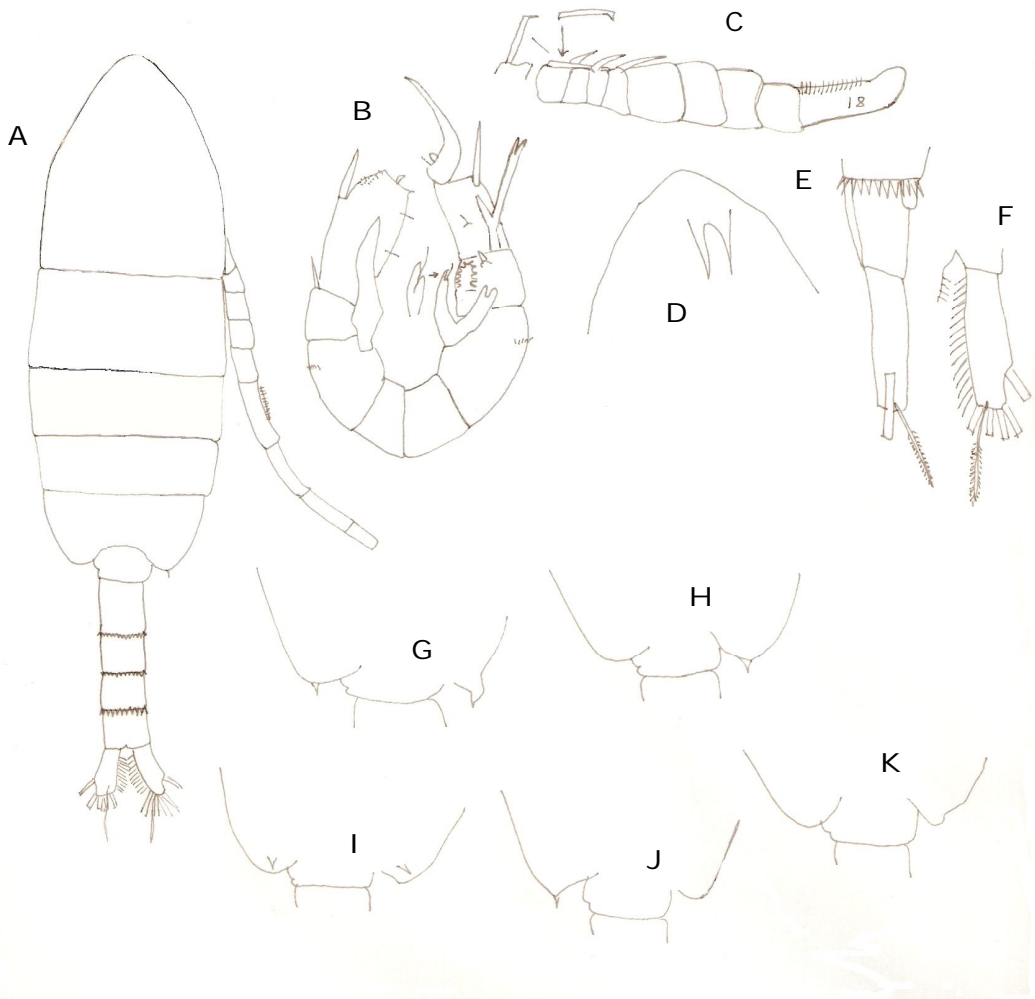


Figure 3. *Pseudodiaptomus* c.f. *ardjuna* Male. A, adult male. dorsal view; B, leg 5; C, antennule; D, rostrum; E, furcal rami. lateral view; F, furcal rami. Dorsal view; G-K, different shapes of posterior part of prosome.

In the present specimens there are some individual differences between them, and with those described by Ummerkutty (1960) and Pillai (1976). In the present specimens (Figs. 2 and 3) the cephalosome is pointed anteriorly whereas; it is rounded in those specimens described by Ummerkutty. The genital segment with rows of spinules on the antero-ventral surface and have a cluster of spinules on the antero-lateral margin,

paired gonopors covered by genital operculum bearing a pair of short posterior process (Plate 1). While in Pillai's (1976) specimens the genital segment is provided with cluster of spinules on the anterior half of the dorsal and lateral margins.



Plate 1. *Pseudodiaptomus* c f. *ardjuna* lateral view, A: Female; B: Male

In the present specimens the triangular spines on the dorsoposterior margin of the abdominal segments of the male are found around the margin of each segment but in the female they are present only on the dorso-lateral surface, and the spinules on the second abdominal segment are much longer than those of the other segments.

Caudal rami, each bears 6 setae, four of which are subequal in length and apical; one outer subapical and one small dorsal, whereas, in Ummerkutty's materials there were 5 setae, four apical and one outer subapical.

In the male the posterior prosomal segment is asymmetrical, and of different shape:

A spine is present on each corner; the left one is larger than the right. This has occurred in 30% of the specimen examined.

A spine is present on the left corner only and the right corner is rounded (23 % of the specimens).

A spine is present on the right corner only (4 % of the specimens). The spine is absent from both corners (43 % of the specimens).

In the right male P5, the branches of the endopod are nearly equal in length, but in Ummerkutty's specimens the branches are of unequal length.

All these variations are possibly due to locality differences.

The calanoid copepod *Pseudodiaptomus* c.f. *ardjuna* is thought to be a ship-born invasive species to the Shatt Al-Arab River, as there are a number of ports along the Iraqi coastal waters, like Al-Fao, the place that believed to be the second step in the invasion process of the release of the species into the Arabian Gulf. The port of Al-Ummaya, which is an oil tanker station, is the probable place of the first release of the species.

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