



Copepoda of the Southern Iraqi Marshes 1. Calanoida

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Abstract

During a survey of the Copepoda of the southern Iraqi marshes, made between November 2005 – August 2008 , four calanoid copepods were identified which were not recorded before in the Marshes. These are: *Acanthodiptomus denticornis* (Wierzejski, 1887) (after Kiefer, 1978) , *Arctodiptomus (Rhabdodiptomus) salinus* (Daday, 1885) , *Eudiptomus vulgaris* (Schmeil, 1898) (after Kiefer, 1978) and *Phyllodiptomus irakiensis* Khalaf, 2008 . The present article is the first of a series of articles on the Copepoda of Iraqi marshes.

1- Introduction

The calanoid fauna of the Iraqi Marshes is not very well documented. Gurney (1921) had made records of *Canthocamptus staphylinus* Jurine and *Diptomus vulgaris* Schmeil from Ezra's Tomb , *Diptomus blanci* Guerne and Richard from irrigation runnels in Amara and *Diptomus 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 a new species viz, *Phyllodiptomus irakiensis* , from the River Shatt Al-Arab at Al-Fao town.

In the present article a report was made of some Calanoida of the southern Iraqi marshes which were not recorded there before. These specimens were collected during a survey of the diversity of biota of the marshes supported by the CIDA project (Canadian International Development Agency), University of

Waterloo in collaboration with Nature Iraq. This is intended to be the first report of a series of reports on the Copepoda of the

Marshes, in the hope that records of Cyclopoida and Harpacticoida will follow.

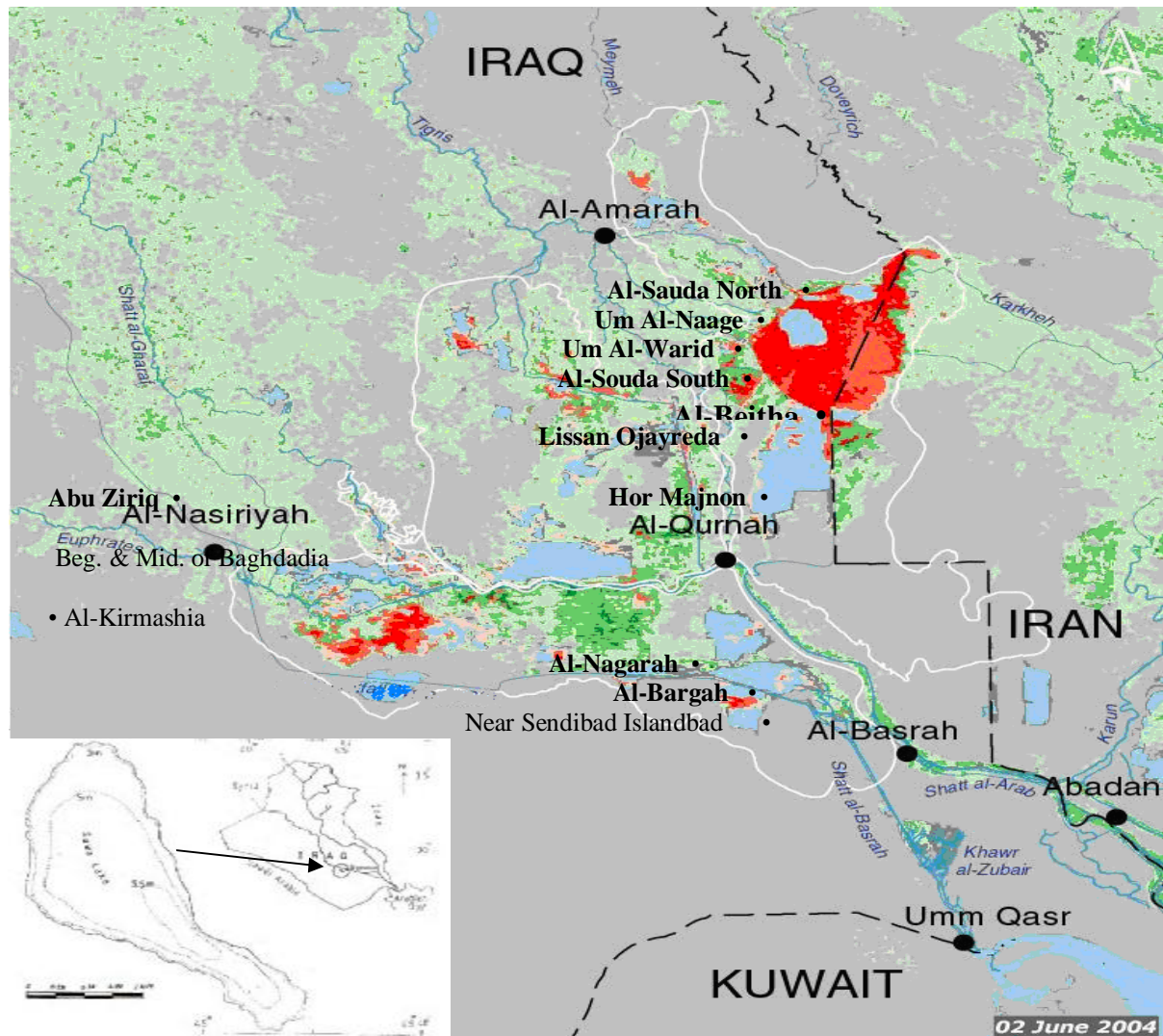


Fig. 1. Sampling stations in the present study.

2- Materials examined

Specimens were collected from the three major Marshes, Al-Hammar, Al-Huwaizah and Al-Chibayish Marshes

(Fig.1). Thirteen stations were sampled ,the location are given in Fig. 1 these are Al-Bargah , Al-Nagarah , Um Al-Warid , Um Al-Naage , Al-Baghdadia beginning ,Al-

Baghdadia center ,Al-Sauda North , Al-Souda South , Al-Beitha , Lissan Ojayreda , Hor Majnon ,Abu Ziriq , Al-Kirmashia and Near Sendibad Islandbad. Sampling was carried out by a 0.2 mm mesh size plankton net, with 40 cm mouth aperture. A flow meter was mounted to mouth of the net. Sampling was done on a monthly basis for the period November 2005–January 2007, February and August 2008. Plankton samples were fixed with 4% formaldehyde solution.

Specimens were examined under a Wild dissecting microscope and maintained on a slide with glycerine. Drawing was done with the aid of a camera lucida, under a zeiss compound microscope.

At least 20 specimens of each species were examined and total length of males and females were measured to the nearest 0.01 mm.

Freshwater Calanoida were tentatively identified by Wilson and Yeatman, 1959 and confirmed by Dussart and Defaye (2001).

Acanthodiaptomus

denticornis(Wierzejski,1887)(after Kiefer, 1978).. Fig. 2

Diaptomus denticornis Wierzejski, 1887 .

Diaptomus gracilis var. 'gama' Wierkejski , 1882.

Diagnosis

Right male A1 end in a small fang , segments 13 – 19 dilated, and with large spiniform process on segment 13. Right male P5 with Exp terminal segment ends in a long curved spiniform process and with long outer subapical spiniform process ; Enp very small, smaller than the first segment of Exp. Left male P5 with Enp longer than Exp1 , last Exp segment with a bulbous basal part covered with papillae and ends in a finger-like process plus outer subterminal process.

Female P5 with long, slender Enp , with 2 terminal setae and a tuft of minute setules on its inner apical surface, Exp with end claw, almost curved and tinny outer spine, Exp3 very small, with 2 spines the outermost long and ½ the length of the end claw (Fig.2G).

Female : total length 1.36 – 1.63 mm (mean 1.47 mm).

Male : total length 0.99 – 1.29 mm (mean 1.24 mm).

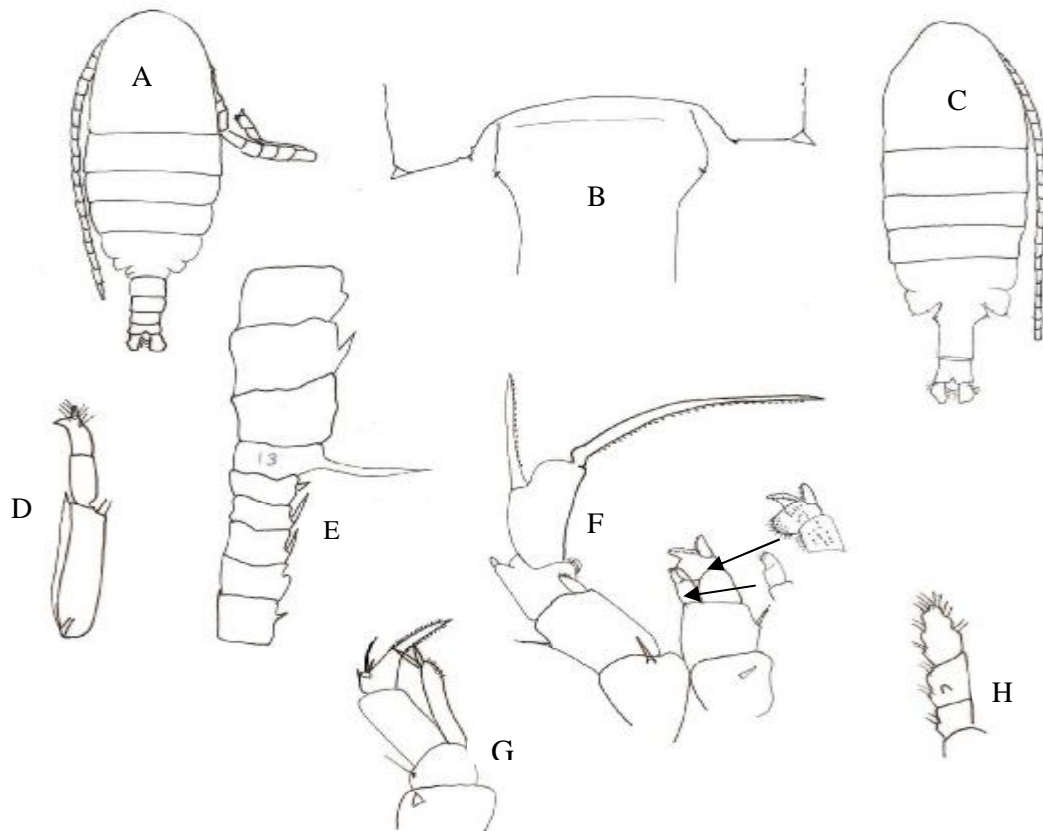


Fig. 2. *Acanthodiptomus denticornis* (Female 1.59 mm ; Male 1.29 mm) , A, adult male, dorsal; B, female posterior part of prosome and anterior urosome, dorsal ; C, adult female, dorsal ; D, right male A1, last 3 segments ; E, right male A1 segments 8-16; F, male P5 ; G, female P5; H, Enp2 of leg2.

Distribution

Specimens were found in Um Al-Warid station of Al-Huwaizah Marshes during December 2005 and January 2006 ; in Al-Bargah station of Al-Hammar Marshes during March 2006.

Remarks

Acanthodiptomus denticornis is a large calanoid copepod but less robust than *D. castor*. and *E. gracilis*. The specimens of *A. denticornis* collected here show slight variations from the originally described specimens in: antepenultimate segment of

right male A1 with a large hyaline membrane. The proportion of subapical spiniform processes of right male Exp of P5 in the present specimens is less than (1.8), while that of the original specimens (2.1) (from drawings only). The original specimens were larger than those from the marshes: 1.4–2.5 mm (males) and 1.5–3.0 mm (females) (www.nina.no). Spinules at the tip of Enp of left male P5, more rows of spinules in the outer surface of Exp 1 and 2 (Fig. 2F). The apical 2 spines in female Enp of P5 equal in length, whereas in the original specimens the inner spine is thinner and smaller than the outer one, female Enp of P5 extending well beyond tip of Exp1 (Fig. 2G), which were subequal in the original specimens (Dussart and Defaye, 2001). Lateral expansion of last thoracic segment form an outer angle (Fig. 2B), although it is somewhat less prominent. The Enp P5 of male is narrow and as long as or slightly longer than Exp1. This character easily distinguishes *A. denticornis* from *E. gracilis*. The female of *A. denticornis* has generally a bluish colour, while the male is reddish orange (www.nina.no).

***Arctodiaptomus (Rhabdodiaptomus) salinus* (Daday, 1885)..Fig. 3**

Diaptomus salinus Daday, 1885.

The genus *Arctodiaptomus* Kiefer, 1932 with nearly 50 species, is one of the

largest genus in the family Diaptomidae (Reddy, 1994). It has been divided into five subgenera :-

Arctodiaptomus s.str. Kiefer, 1932.

Arctodiaptomus (Stenodiaptomus) Kiefer, 1932.

Arctodiaptomus (Haplodiaptomus) Kiefer, 1935.

Arctodiaptomus (Rhabdodiaptomus) Kiefer, 1932.

Arctodiaptomus (Mesodiaptomus) Borutzky *et al.*, 1991.

A sixth subgenus *Paractodiaptomus* Hisiao, 1950, should be considered a junior synonym of the genus *Neurodiaptomus* Kiefer, 1937 (Dussart and Defaye, 2001)

Diagnosis

In both sexes, A1 25-segmented, extending to end of caudal setae. Female Enp of P5 short, reaching to about ½ length of Exp1, Genital segment with spine, on postro-lateral right side. Antepenultimate segment of right male A1 with rather large distal process staff-like. Exp1 of right male P5 with outer distal corner sharply produced. Bsp of P5 with a hyaline lamella on inner margin.

Exp2 of right male P5 with a large hyaline process near the base of lateral spine; lateral spine roughly as long as the segment and lying proximal to the mid-outer margin with sharp pointed ending.

Female: total length 1.16–1.59 mm (mean 1.38mm).

Male: total length 0.99–1.23mm (mean 1.11mm).

Distribution

In Al-Hammar Marshes (Al-Bargah in January, February 2006 and February 2008; in Al-Nagarah in January 2007). In Al-Huwaizah Marshes (Um Al-Warid in November, December 2006 and February 2008 ; and Um Al-Naage in January, April, December 2006 and January 2007). In Al-Chibayish Marshes (Baghdadia beginning in February 2006 and January 2007 ; in Al-Baghdadia Centre in February 2007). In Abu-Zurig in February 2008. In Al-Athem in February 2008. In Al-Sindibad Island (Shatt Al-Arab River) in February 2008.

It is important to note that *A. (Rh.) salinus* was found in Sawa Lake in both sampling occasions carried out by the MSC to the Lake in 2002 and 2007. The species was extremely dominant in both sampling dates and was the only copepod present in the Lake, although the water of Sawa Lake was dominated by sulphate salts (salinity 19‰ ; Sulfate 7703.6 mg/l Mohamed, 2005). Close examination of the specimens from Sawa Lake indicate no apparent difference from those of the Marshes (salinity 0.53–1.70 ‰, the chloride contents was 304.7–753.31 mg/l and the sulphate was 285.73–663.89 mg/l (Douable *et al.*, 2008). Moreover, the species was also recorded from Ras Al-Bisha, Al-Fao and Al-Seba (Al-Zubaidi, 1998) and Lakes Tharthar, Habbaniya and Razzazah (Poltorak *et al.*, 2001).

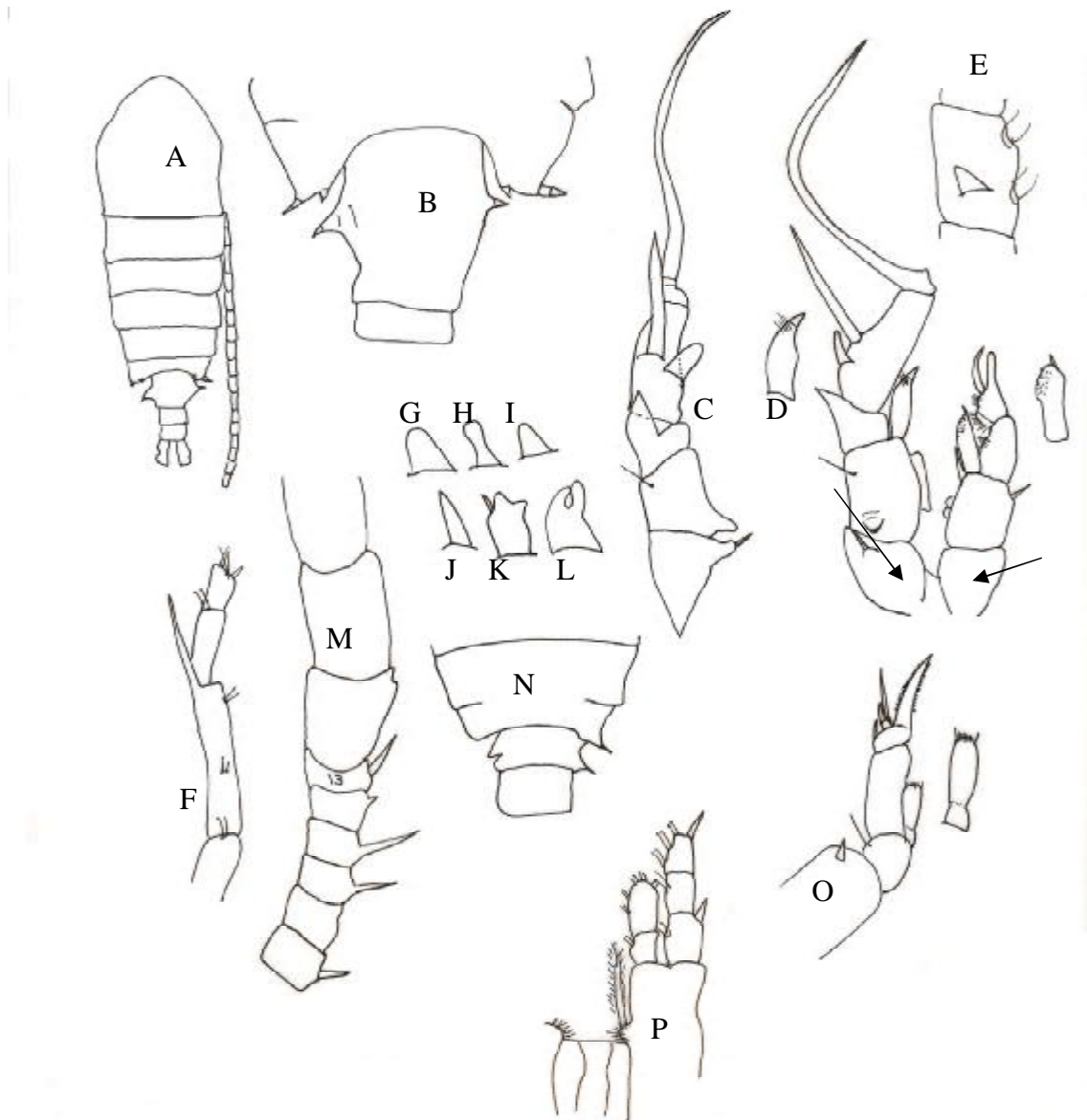


Fig. 3 . *Arctodiaptomus (Rh.) salinus* (Female 1.59 mm ; Male 1.20 mm) A, adult female, dorsal ; B, posterior part of prosome and genital segment , female dorsal; C, right male P5, lateral view ; D, P5 male ; E, segment 2 of End of P2; F, male right A1, last 3 segments ; G-L, different shapes of large hyaline process ; M, right male A1 segments 13-16; N, posterior part of prosome and genital segment , male dorsal; O, female P5; P, P1.

Remarks

The spinouse process on antepenultimate segment of right male antennule staff-like reaching to mid and often to beginning of the terminal segment (Fig.3F), whereas in the original specimens, this process is longer than antepenultimate segment and often reaching even to the tip of the antepenultimate segment. Enp of female P5, from Tiselit, Maroc, nearly as long as Exp1 (Dussart, 1967), whereas the original *A. (Rh.) salinus* by Kiefer (1978) and that from Turda, Cluj Province, Romania are having the Enp about 2/3 the length of Exp1 (Daday, 1885, after Reddy, 1994), so as the specimens from Iraq. Moreover, the male specimens from Romania were 1.0 – 1.7 mm in length and the females were 1.0 – 1.8 mm (Reddy, op.cit.) which are longer than those collected from Iraq.

Exp2 of right male P5, the large hyaline process take a different shapes (Fig. 3G-L), but in the original specimens this process takes only one shape. Enp of left male P5 with subapical little spine and rows of spinules in the inner part of the peak (Fig. 3D) which are absent in the original specimens. In the left P5 of male, the distal corner of basopod with a hyaline process extending to the middle of Enp (Fig. 3D), this process is absent in the original specimens.

***Eudiaptomus vulgaris* (Schmeil, 1898) (after Kiefer, 1978).. Fig. 4**

Diaptomus vulgaris Schmeil, 1898

Diagnosis

Th4 with lateral wings well developed, usually symmetrical (Fig. 4A). Right male A1 with a spine on segment 10, 11, 13–16; antepenultimate segment with peak. Right male P5 with Enp truncate, slightly longer than Exp1. Exp1 with a long, curved, sharp outer apical finger (Fig. 4d). Left male P5 with Enp longer than Exp1 with rounded end. Exp terminal segment ending with a small finger-like process, covered on its proximal end with rows of small setules, and with 1 long curved spiniform process (Fig. 4d).

Female A1 with setae on segments 10-14. Enp of female P5 with 2 subequal slightly long setae and a small transverse brush of setules.

Female: total length 1.63 – 1.73 mm (mean 1.70 mm).

Male: total length 1.49 – 1.66 mm (mean 1.58mm).

Distribution

E. vulgaris was collected from Um Al-Naage (Al-Huwaizah Marshes), Majnon and Lesan Ojardah during February 2008.

Remarks

Right male A1 with the spine of segment 10 nearly ½ the length of that of

segment 11, the spine of the latter is subequal to, but very much thinner than that of segment 13 (Fig. 4B), in the original specimens the spine in segment 10 is very small about $\frac{1}{4}$ the length of spine of segment 11. Antepenultimate segment of right male A1 without hyaline membrane (Fig. 4E). Apical spines of Enp of female P5 are subequal in length (Fig. 4G), whereas in the original specimens, the second seta is very small (Schmeil, 1898) (after Kiefer, 1978). The Enp of right male P5 reaching nearly the tip of inner edge of Exp1 (Fig. 4D), while in the original specimens it is extending to end of outer edge of Exp1.

***Phyllodiptomus irakiensis* Khalaf , 2008... Fig. 5**
Diagnosis

The species can be distinguished by the presence of a left metasomal wing in the female (Fig. 5A). The second and third urosomal somites each having a conspicuous hyaline lobe on the dorsal side, the presence of fine hairs at the outer and inner margins of the furcal rami, and the structure of the fifth pairs of legs in both sexes (Khalaf, 2008). Moreover, the anal segment along with the furcal rami in the male are curved to the right inner side of the main axis of the urosome, in addition to the shape of the right A1 (Khalaf, op.cit.).

Female: total length 1.13 – 1.36 mm (mean 1.30mm.).

Male: total length 1.06 – 1.16 mm. (mean 1.12mm.).

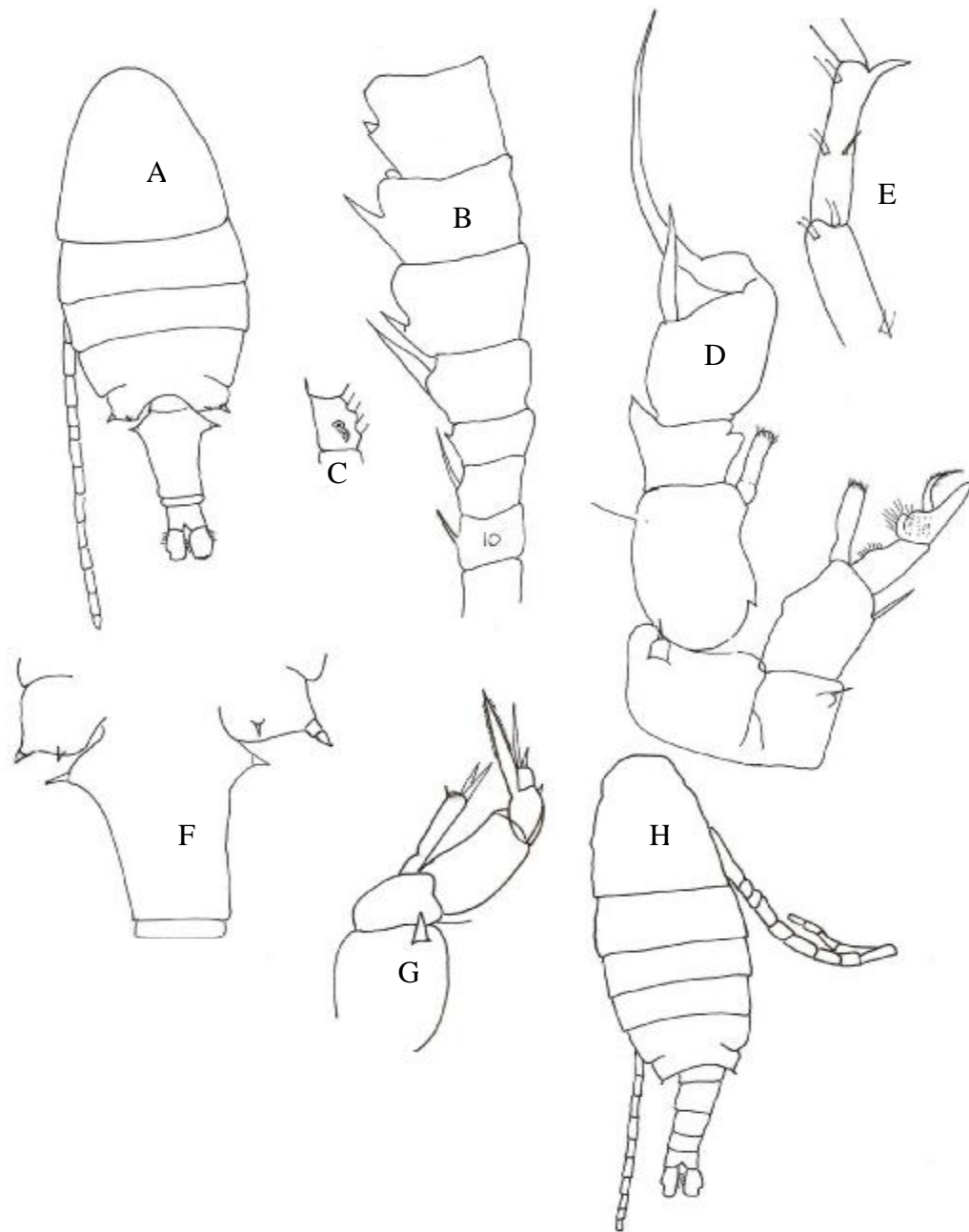


Fig. 4. *Eudiaptomus vulgaris* (Female 1.70 mm ; Male 1.63 mm) A, adult female, dorsal; B, right male A1; C, Enp2 of P2; D, male P5; E, Antepenultimate segment of right male A1; F, female posterior part of prosome and genital segment , dorsal; G, female P5; H, adult male, dorsal.

Distribution

Species of *P. irakiensis* were first described from Al-Fao town, south of the River Shatt Al-Arab (Khalaf, 2008). In this survey, the species was recorded from Al-Hammar Marshes: Al-Bargah during May, September and November 2006, in Al-Nagarah during May, June, August, September and December 2006. From Al-Huwaizah Marshes: Um Al-Warid during August 2006 and 2008, from Um Al-Naage during May 2006 and August 2008. From Lesan Ojardah during February 2008. From Majnon and Al-Souda South during August 2008.

Remarks

The specimens collected from the southern Iraqi Marshes were smaller than those of the originally described species (Shatt Al-Arab River) at Al-Fao town (Khalaf, 2008).

From the 30 males examined there are 10 with furcal rami not curved to the right

inner side of the main axis of the urosome (Fig. 5a). Female genital segment asymmetrical, and with small hump at the beginning of urosome (Fig. 5B, C,D), coxae of female P5 with large hyaline spine at outer distal corner, this spine is small in the original specimens.

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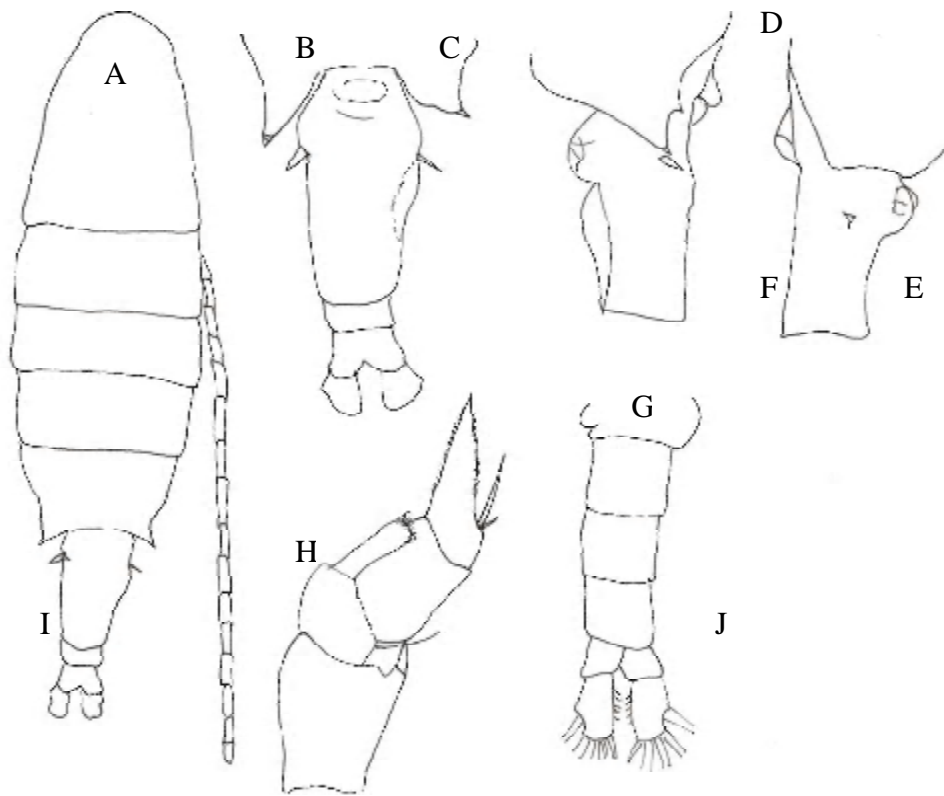


Fig. 5. *Phyllodiapomus irakiensis* (Female 1.32mm ; Male 1.13 mm) A, adult, female dorsal ; B, female last thoracic segment and urosome, dorsal; C-D, genital segment and left, right wing ; E, male right P5, lateral view ; F, male P5 ; G, male urosome , dorsal ; H, female P5 ; I, right male A1, segments 8-16 ; J, right male A1 ,last 3 segments.

References

Al-Zubaidi, A. M. H. (1998). Distribution and abundance of the zooplankton in the Shatt Al-Arab Estuary and North West

Arabian Gulf .Ph.D. Thesis , University of Basrah 125 p.

DouAbul, A. A. Z. , Al-Saad, H. T. , Al-Hellow, M. A. and Kareem, S. M.

- (2008) . Water Quality of Iraqi Southern Marshes. Final Report, Marine Science Centre, Univ. Basrah , Basrah, Iraq. 28 p.
- Dussart, B. H. (1967). Les Copepodes des eaux continentales d' Europe occidentale. 1. Calanoides et Harpacticoides Ed. Boubêe and Cie, Paris , 500 p.
- Dussart, B. H. and Defaye, D. (2001). Introduction to the Copepoda .2nd ed. Guides to the identification of the Microinvertebrates of the continental Waters of the World. Vol. 16 , Backhuys Publishers, Leiden, 344p.
- Gurney, R. (1921). Fresh-water crustacean collected by Dr. P. A. Buxton in Mesopotamia and (Persia). J. Bombay Natural History Society, 27(4) : 835-844.
- Khalaf, T. A. (2008). A new species of *Phyllodiaptomus* Kiefer (Copepoda : Calanoida) from the Shatt Al-Arab River, Southern Iraq. Crustaceana, 81(3): 257-269.
- Kiefer, F. (1978). Das Zooplankton der Binnengewässer, Freilebende Copepoda. Die Binnengewässer, Stuttgart., 26: 1 – 343.
- Poltrak, T , Bartel, R. and Szczerboowski, J. A. (2001). Horizontal Distribution of zooplankton in Lakes Tharthar, Habbaniya and Razzazah . Arch. Pol. Fish. 9:(1) 111 – 126.
- Reddy, Y. R. (1994). Copepoda : Calanoida Diaptomidae. Guides to the Identification of the Microinvertebrates of the Continental Waters of the World, vol.5 , SPB. Publ. The Hague, 221 pp.
- Schmeil, O. (1889). Deutschlands freilebende süßwasser- Copepoden . Nachtrag zur den Familien der Cyclopoiden und Centropagiden. Zoologica Stuttg., 8(21): 548-549.
- Wilson, M. S. and Yeatman, H. C. (1959). Free living Copepoda . In : H. B. Word and G. C. Whipple . Fresh- Water Biology . 2nd ed. (ed. W. T. Edmondson). John Wiley and Sons New York, pp : 735-861.
- www.nina.no. *Acanthodiaptomus denticornis* (Wierzejski, 1887).

مجذافية الاقدام في احوار جنوب العراق 1. الكالونويدا

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الخلاصة

اجريت دراسة مسحية لمجموعة مجذافية الاقدام في احوار جنوب العراق خلال الفترة من تشرين الثاني 2005 ولغاية آب 2008 ، تم التعرف على اربعة انواع من رتبة الكالونويدا التابعة لمجذافية الاقدام والتي لم تسجل سابقا في احوار جنوب العراق وهذه الانواع هي:-

Arctodiptomus و *Acanthodiptomus denticornis* (Wierzejski,1887)(after Kiefer,1978)
Eudiptomus vulgaris (Schmeil,1898) (after و *(Rhabdodiptomus) salinus* (Daday,1885
Kiefer, 1978) و *Phyllodiptomus irakiensis* Khalaf,2007 . يعتبر هذا المقال هو الاول ضمن سلسلة الابحاث الخاصة بتصنيف مجذافية الاقدام في احوار جنوب العراق.
