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FRESH-WATER CRUSTACEA COLLECTED BY DR. P. A. BUXTON
IN MESOPOTAMIA AND PERSIA.

By

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(With two plates and two text figures.)

The Crustacea recorded in the following report were collected by Dr. Buxton during 1917 and 1918, mainly in the neighbourhood of Amara in Mesopotamia but a few collections were also made in North Persia and are included in the list.

My expectation had been that the district of Amara would have been a very favourable one for Phyllopoda, and also that the Entomostraca would show a distinct mingling of eastern and western forms, but these expectations have not been realised. Only two species of Phyllopod are included in Dr. Buxton's collections, and the remaining Entomostraca recorded are, with the exception of *Daphnia lumholtzi* and *Moina dubia*, of a European type.

Between Basra and Amara there are immense areas of permanent shallow marsh on either side of the Tigris, generally some way from the river. The fauna of these marshes was sampled by Dr. Buxton at Azize, Kharaba (E. of Amara) and at Ezra's Tomb on the Tigris between Amara and Basra. Though 15 species were taken at the latter place the fauna seems to be surprisingly scanty. Dr. Buxton suggests that the scantiness of the fauna may be due to the intense sunlight and high temperature of the shallow water during the day-time in summer, or to the great daily fluctuation in temperature. With the exception of this marsh most of the collections were made in temporary pools where a varied fauna was not to be expected. In North Persia, on the other hand, the conditions seem to be much more favourable, and the collections from Resht and Enzeli contain a larger number of species than any of those from Mesopotamia, though their state of preservation makes the identification of some of them impossible.

I have not thought it necessary to give lists of the species included in the various collections since, for the most part, they were made in temporary pools and contained very few species. Two, however, seem to me of sufficient interest to record in full, namely, those taken in the permanent marsh at Ezra's Tomb near Amara and at Resht in North Persia.

Ezra's Tomb. 23.2.18.

A large swamp close to the Tigris with water from 2 to 4 feet deep. A broad belt of reeds, with submerged water plants and extensive open water.

Daphnia lumholtzi, Sars. Several young; few adults.

Daphnia longispina, O. F. M. Common, males present.

Simocephalus exspinosus, Koch. Common.

Scapholeberis mucronata (O. F. M.). Rare.

Bosmina longirostris, O. F. M. A few.

Ceriodaphnia reticulata (Jurine). Rare.

Alona rectangula, Sars.

Alona costata, Sars.

Chydorus sphaericus (O. F. M.). Common.

Diaptomus vulgaris, Schmeil. Common.

Cyclops vicinus, Uljanin. Rare.

Cyclops agilis, Fischer-Sars. Rare.

Canthocamptus staphylinus, Jurine.

Cypris pubera, Müller.

Rotifera—*Asplanchna* sp.

Dinocharis pocillum (Müller).

Ascomorpha sp.

Resht, N. W. Persia. Ponds and ditches. March 1919.

At sea level, in thick forest of a very wet type.

Daphnia longispina, O. F. M. Rare.

Daphnia pulex obtusa, Kurz. Rare.

Simocephalus vetulus (O.F.M.). Common.

Scapholeberis aurita (Fischer). Common.

Ceriodaphnia reticulata (Jurine). Rare.

Alonella excisa (Fischer). A few.

Chydorus sphaericus (O. F. M.). Abundant. Males and ephippial females present.

Cyclops viridis, Jurine. Common.

Cyclops vernalis, Fischer. Rare.

Diaptomus—three species unidentified.

Canthocamptus staphylinus, Jurine. Rare.

Cypris virens, Jurine.

Asellus aquaticus, Linn.-Sars.

LIST OF SPECIES.

I. MALACOSTRACA*

Sesarma bouleengeri, Calman. (Ann. Mag. Nat. Hist. (9) V. 1920).

Fao, Persian Gulf, in brackish water.

The specimens from which Dr. Calman's description was taken were collected at Basra, in fresh water.

Potamon fluviatile var. *ibericum*, Marschall de Bieberstein.

Tula Rud (S. W. Caspian), Qazvin and Kermanshah (N. W. Persia).

Potamon fluviatile var ? Qalat Saleh, R. Tigris.

II. ENTOMOSTRACA.

1. Phyllopoda.

Artemia salina var. *arietina*, Fischer—Daday.

A large number of specimens of *Artemia* were taken in saline pools in the neighbourhood of Amara, but among them no males were found. The number of setae on the furcal rami is very variable, ranging between 12 and 2, the average being 8 on each ramus.

Apus asiaticus nom. nov.

Apus granarius, Sars. Ann. Mus. St. Petersb. VI. 1901, p. 4.

I have received from Dr. Annandale and from Dr. W. T. Calman specimens of *Apus* taken at Bagdad, and, though Dr. Annandale's specimens are small and immature, I have no doubt that all belong to the same species. The adults agree very closely with the species from Central Asia described by Prof. Sars under the name of *A. granarius*, Lucas, but I am not satisfied that that name is correctly applied. M. Simon's description (Ann. Soc. Entom. France VI. 1886, p. 446) is not very full and no figures are given, but he states that the flagellum of the first leg exceeds the length of the dorsal shield, which is far from being the case in Prof. Sars' species and my own. There are other differences also with regard to the length of the furcal rami, which M. Simon also states are "prope basin obtuse dentati haud setosi", and the denticles on the sulcus of the dorsal

* I am indebted to Dr. W. T. Calman for the identification of these Crabs.

shield which in *A. granarius* are few and very minute. In view of these differences I regard *A. granarius*, Sars, as distinct from *A. granarius*, Lucas, and for that reason I have reluctantly introduced a new name.

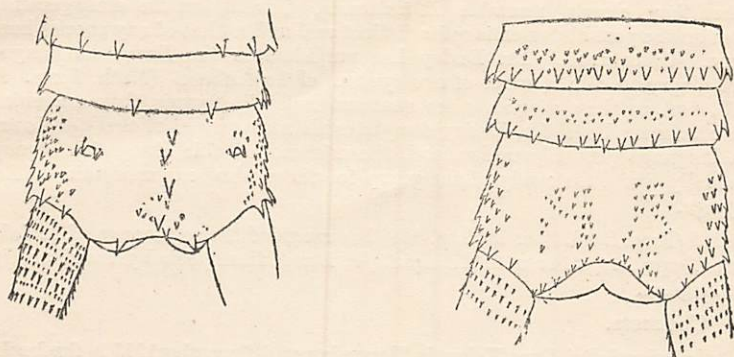


Fig. 1. Last Abdominal Segment of *Apus asiaticus* ♀. A=Dorsal view. B=Ventral view.

[Next Segments:—No. 3—11 spines, No. 4—9, No. 5—10, No. 6—9, No. 7—9, No. 8—11, No. 9—9, No. 10—9, No. 11—11, No. 12—11, No. 13—11.]

I was at first inclined to refer these specimens to *A. dukianus*, Day, but have had the opportunity of examining the type of that species, which proves to be entirely distinct. The following measurements, together with figures of the last abdominal segment, are given for purposes of comparison with the description and figures of Prof. Sars:—

		Length of dorsal shield (median).	Length of dorsal shield to post angle.	Width of dorsal shield.	Total length of animal (without furca).	Length of furcal rami.	Number of segments uncovered.	Number of limbless segments.	Number of dentides on sulcus of shield.	Length of 4th flagellum of first leg.
Male	..	15	18	13	35	20	28	12	44	10
Female	..	13	16	12	27	15	25	9	44	9
(Measurements in Millimetres.)										

The species is closely related to *Apus numidicus*, Grube which appears to range from South Africa to Central Asia, but I believe that two or more distinct

species have been confused under the name of *A. numidicus* and hope to be able to give reasons for this opinion on a future occasion.

Leptestheria sp.?

A number of specimens of *Leptestheria* were found in collections made at Amara, and these I believe represent a species hitherto undescribed. In shape of shell they closely resemble *L. ticinensis*, Crivelli, but the arrangement of spines on the post-abdomen is quite distinct and unlike that of any species known to me. Unfortunately Dr. Daday has published in the Hungarian language short diagnoses of a number of new species of *Leptestheria* (Math. Term. Ert. 1913), and, as these diagnoses are unaccompanied by figures, they are unintelligible to me. Until Dr. Daday completes his monograph of the *Conchostraca* in a language generally understood, the existence of this Hungarian synopsis effectually limits the study of the group to those who can read this difficult language.

Baird (Proc. Zool. Soc. 1862, p. 148) has recorded the occurrence of *L. dahalaensis*, Rupp., together with *Estheria lofti*, Baird, from pools by the river Tigris near Bagdad.

2. Cladocera.

Daphnia lumholtzi, Sars. Taken in November and December 1917 in fire buckets at Amara, and also in permanent marsh at Ezra's Tomb in February 1918. In the former locality the adults had extremely short head spines, and the posterior spine followed nearly the median line of the body, whereas in the young the head spine was long and the posterior spine dorsally directed. Specimens from Ezra's tomb were of typical form. The species is recorded from Australia, East Africa, Egypt and Palestine.

Daphnia magna, Strauss. In flood waters at Amara in January and March 1918. Though males were present no ephippial females were taken. Found also at Qazvin in N. W. Persia.

Daphnia pulex, De Geer. The obtusa form of this species was taken at Resht in N. W. Persia in March 1919.

Daphnia longispina. O. F. M.

Ezra's Tomb, Mesopotamia, and at Resht. N. W. Persia.

Simocephalus exspinosus, Koch.

Abundant at Amara in the moat of Fort Farm.

Simocephalus vetulus. O. F. M.

Amara—in a disused well. Azize, Mesopotamia; Enzeli and Resht, N. W. Persia.

Scapholeberis mucronata (O. F. M.)

The hornless form of this species was taken in small numbers at Ezra's Tomb (February 23rd, 1918).

Scapholeberis aurita (Fischer).

Common at Resht, N. W. Persia.

Ceriodaphnia reticulata, Jur.

Amara and Ezra's Tomb; Resht and Enzeli.

Moina rectirostris, Jur.

In flood pools at Amara. Common.

Moina dubia, Richard.

A few specimens of this species were found in a collection from the moat of Fort Farm, Amara.

In some respects these specimens are intermediate between *M. dubia* and *M. micrura*, Kurz, since for example the postanal part of the postabdomen is considerably shorter than that of typical *M. dubia*. On the other hand the comparative length of the antenna, the total length of the postabdomen as compared with the body, the presence of transverse rows of cilia on the postabdomen and

of a delicate comb on the claws sufficiently identify these specimens with *M. dubia*. The following table will make the comparison clear:—

			Proportion of 1st antenna and total length of body.	Proportion of 1st. postabdomen to total length of body.	Proportion of post-anal part to whole postabdomen.	Proportion of length of claws and postabdomen.	Number of teeth on postabdomen.
<i>M. dubia</i> —Amara	..	..	1 : 5	1 : 2·3	1·3·5	1 : 5·2	6-8
<i>M. dubia</i> —R. Nile	..	..	1 : 5·9	1 : 2·4	1·2·3	1 : 5·3	6-7
<i>M. micrura</i>	..	..	1 : 6·5	1 : 2·7	1·4	1 : 6	6-8

Moina dubia is a characteristic feature of the plankton of the Nile throughout its length, and is found in Victoria Nyanza, where it forms the bulk of the plankton (Daday) and in various places in the neighbourhood of Lake Nyassa. It was originally described from West Africa (Senegal) and is evidently a widely distributed African species. On the other hand I have seen specimens hatched from dried mud from Palestine, and its occurrence there is comparable to that of the Nilotic species of fish and other vertebrates. Its extension to the Tigris region is noteworthy, though the Cladocera are not a suitable group from which to draw evidence for zoogeographical problems.

Bosmina longirostris, O. F. M.

Ezra's Tomb, Mesopotamia.

Alona costata, Sars.

Ezra's Tomb. One individual only.

Alona guttata, Sars.

Enzeli, North Persia. Rare.

Alona rectangula, Sars.

Ezra's Tomb, Mesopotamia and Enzeli, North Persia.

Alonella excisa (Fischer).

Resht and Enzeli, North Persia.

Pleuroxus aduncus (Jurine).

A single specimen taken at Amara (Bet Khodayer).

Alonella excisa (Fischer).

Resht and Enzeli, North Persia.

Chydorus sphaericus, O. F. M.

A very strongly reticulate form occurred at Ezra's Tomb. Abundant in a collection from Resht, males and ehippial females being present.

3. Copepoda.

Cyclops vicinus, Uljanin.

Ezra's Tomb, rare. The occurrence of this species in this locality is somewhat surprising, having regard to the extreme heat of the waters of the Amara district in summer, since it is a distinctly northern species, like its close ally *C. strenuus*. It has been recorded from Sweden, Central Asia, Turkestan, Kolguev, Volga Delta, Aral Sea and China. My specimens agree in every respect with the description given by Prof. Sars (Crustacea of Norway).

Cyclops viridis, Jurine.

Irrigation runnel at Amara. Resht and Enzeli, N. W. Persia.

Cyclops vernalis, Fischer.

Resht, N. W. Persia.

Cyclops bicuspidatus, Claus.

Amara. The variety with 14 joints in the Antenna (*C. lubbocki*, Brady) was taken in a disused well together with *Cyprinotus incongruens*, but the typical form was found in flood water near the Sheikh's house (Bet Khodayer) at Amara.

Cyclops leuckarti, Claus.

Amara. In small numbers in several collections.

Cyclops crassus, Fischer-Sars.

Amara. In the moat of Fort Farm.

Cyclops albidus, Jurine.

A single male was taken at Kharabah Marsh and two females at Azize, both these localities are in the great permanent marsh east of Amara.

Cyclops agilis, Fischer-Sars.

Ezra's Tomb, Mesopotamia, and Enzeli, N. W. Persia.

Cyclops affinis, Sars.

A single mature female taken at Azize, Amara.

Cyclops bicolor, Sars.

Enzeli, N. W. Persia.

Cyclops diaphanus, Fischer.

Amara, in flooded ditches, and at Gantra Sarut on the E. bank of the Tigris between Aligharbi and Amara. Prof. Sars (Crustacea of Norway) has identified *C. diaphanus*, Fischer, with *C. nanus*, Sars, but it seems to me that Fischer's description is so scanty and ambiguous that it is advisable to follow the interpretation placed upon it by Claus, Schmeil and others and to apply this name to the species of *Cyclops* fully described by Claus first as *Cyclops minutus* and later as *C. diaphanus*, Fischer. *Cyclops nanus*, Sars, is a very distinct form closely related to *C. languidus*, Sars, and a transfer of the name *diaphanus* to it will, in my opinion, only lead to confusion.

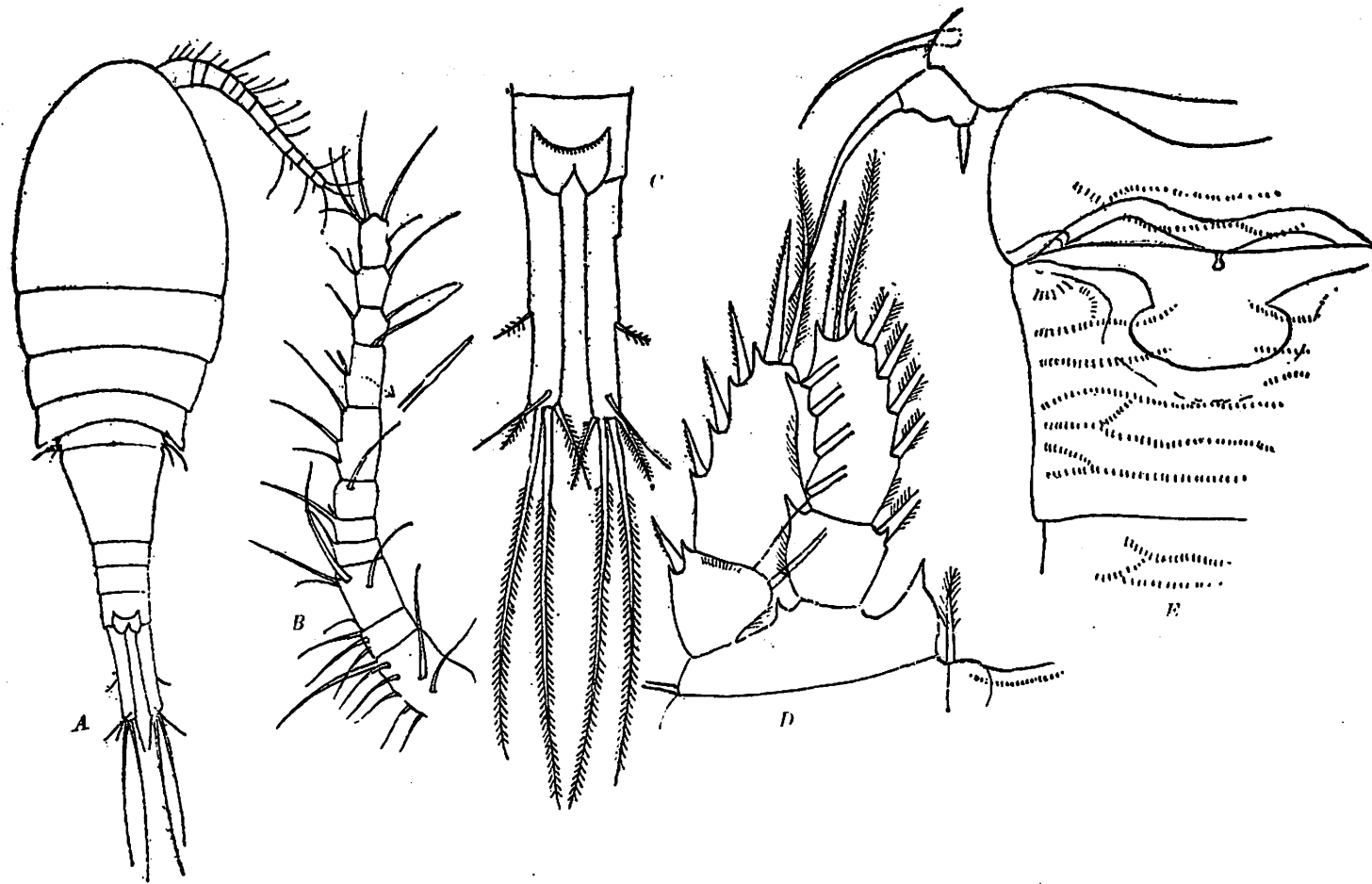
Cyclops luxtoni, n. sp.

Body robust, the cephalothorax slightly longer than the abdomen; epimera of the thoracic segments 1-3 not prominent. Segment 4 somewhat produced laterally. Genital segment of abdomen broad and slightly exceeding the length of the 3 following segments. Anal operculum fringed with minute denticles. Ventral surface of genital segment marked with lines of very minute cilia. Furcal rami long and slender, equal in length to the 3 preceding segments, and not divergent. Lateral seta inserted a little behind the middle of their length. The outermost apical seta slightly shorter than the innermost; the two inner setae of nearly equal length, the inner one less than twice the length of the furca. The first antennae consist of 11 joints and are considerably shorter than the first segment of the thorax. The eighth joint bears a sensory rod. Comparative length of joints as shown in following formula:—

20. 6. 13. 5. 4. 9. 15. 14. 8. 9. 11.

1 2 3 4 5 6 7 8 9 10 11

Swimming legs with all rami two-jointed. The second joint of the exopodite of the first leg bears 3 spines, while that of each of the three following pairs bears four. The endopodite of the fourth leg bears at its apex a single long spine and a seta. The first joint of the fifth leg is not distinct, its seta being apparently borne on the outer dorsal edge of the segment. The second joint is of peculiar shape, short and broad, bearing a long seta on its outer angle and a short spine on the inner side. This inner spine is longer in the male than in the female. Length 1.1 mm.



CYCLOPS BUXTONI, n. sp. ♀.

A.—Dorsal view. B.—First antenna. C.—Furcal rami. Right ramus slightly abnormal. D.—Leg of fourth pair.
E.—Genital segment and fifth leg.

A few specimens of this species were taken in the river Tigris at Amara. It is evidently closely allied to *C. diaphanus*, Fischer-Claus, but is readily distinguished from it and from other species by the form of the fifth feet and of the furca and receptaculum seminis. It resembles most nearly *Cyclops panamensis*, Marsh, the fifth feet of which have an almost identical shape, but it differs in size, general form of body and other details.

Canthocamptus staphylinus, Jurine.

A few specimens of this species, agreeing in all respects with the typical form, were taken at Ezra's Tomb, Mesopotamia, and at Resht, N. W. Persia. The collections were made in February and March respectively. This is a northern cold-water form, which largely disappears in summer in Europe, and its occurrence under the climatic conditions of Mesopotamia is somewhat unexpected and remarkable.

Diaptomus vulgaris, Schmeil.

Common at Ezra's Tomb: a single male taken at Enzeli, N. Persia. The specimens from Ezra's Tomb agree in every detail with the typical form as described by Schmeil with the following exceptions: the antennae slightly exceed the length of the body; the second basal joint of the left fifth foot of the male bears a single narrow hyaline process; the last thoracic segment of the female is slightly asymmetrical. The species is distributed almost all over Europe, and a number of races or elementary species have been described from south-east Europe. Its occurrence in Mesopotamia and N. W. Persia is of interest as considerably extending its known range.

Diaptomus blanci, Guerne & Richard.

Amara, in irrigation runnels.

Originally described from Turkestan, this species has since been recorded from Central Asia, Aral Sea and from India.

Diaptomus chevreuxi, Guerne and Richard.

Female:—Cephalothorax almost parallel-sided, the width about one-third of the length. Last segment incompletely separated, with rather large, symmetrical, posterior lobes. Rostral filaments rudimentary. Abdomen slightly exceeding half the length of the cephalothorax and consisting of four segments; the first, or genital, segment very short and scarcely dilated, without any trace of lateral spines, but with a large flattened, dorsal expansion on the right side. Furcal rami rather long and narrow, the width less than half the length, the inner side without cilia.

First antennae reaching, when fully reflexed, to the posterior edge of the first abdominal segment.

Fifth pair of legs without hyaline processes on basal segments or on first segment of exopodite. Endopodite one jointed, about two-thirds of the length of the first joint of the exopodite, bearing two short spines of unequal length at its apex. Second joint of exopodite short and broad, with an unusually short strong claw, denticulate on the side. Third joint absent, its place being taken by a thick, bent, spine, at the base of which is a short denticle.

Length. 3.3 mm.

Four females of this species were found in a collection from a dike beside an ancient causeway at Cantra Sarut on the left bank of the R. Tigris between Amara and Ali Gharbi.

Dr. Buxton noted that the species, when alive, was of a scarlet colour,

This species has only been recorded hitherto from Algeria and its occurrence in Mesopotamia is a matter of some interest as it is apparently absent from intermediate countries such as Egypt where it might be expected to occur. In Algeria it is found in ditches and other temporary waters, and the conditions in Egypt would seem to be entirely suitable. Three of the specimens

bear on the *dorsal* surface of the second and third segments of the abdomen a cluster of enormous spermatophores, the adhesive material of which almost covers and obscures the segments themselves.

Diaptomus, sp.

A collection from Resht contains three species of *Diaptomus*, but unfortunately every specimen is badly damaged and I am unable to name any of them. Of one species there are two male specimens of enormous size which resemble *Hemidiaptomus ignatovi*, Sars, but both of them lack the prehensile antenna and the fifth pair of legs.

4. Ostracoda.

Notodromas persica, n. sp.

A few specimens of a small species of *Notodromas* were found in a collection from Resht (N. W. Persia) but the shells are so soft and distorted that a satisfactory description of their shape cannot be given. Neither valve shows any sign of spines. The outline figure given is taken from a mature female which was comparatively undistorted, but, having regard to the softness of the shell, too much reliance must not be placed upon it. The two sexes seem to be alike in shape.

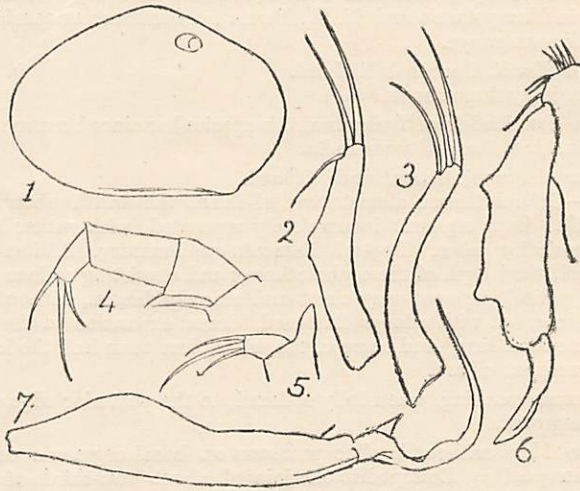


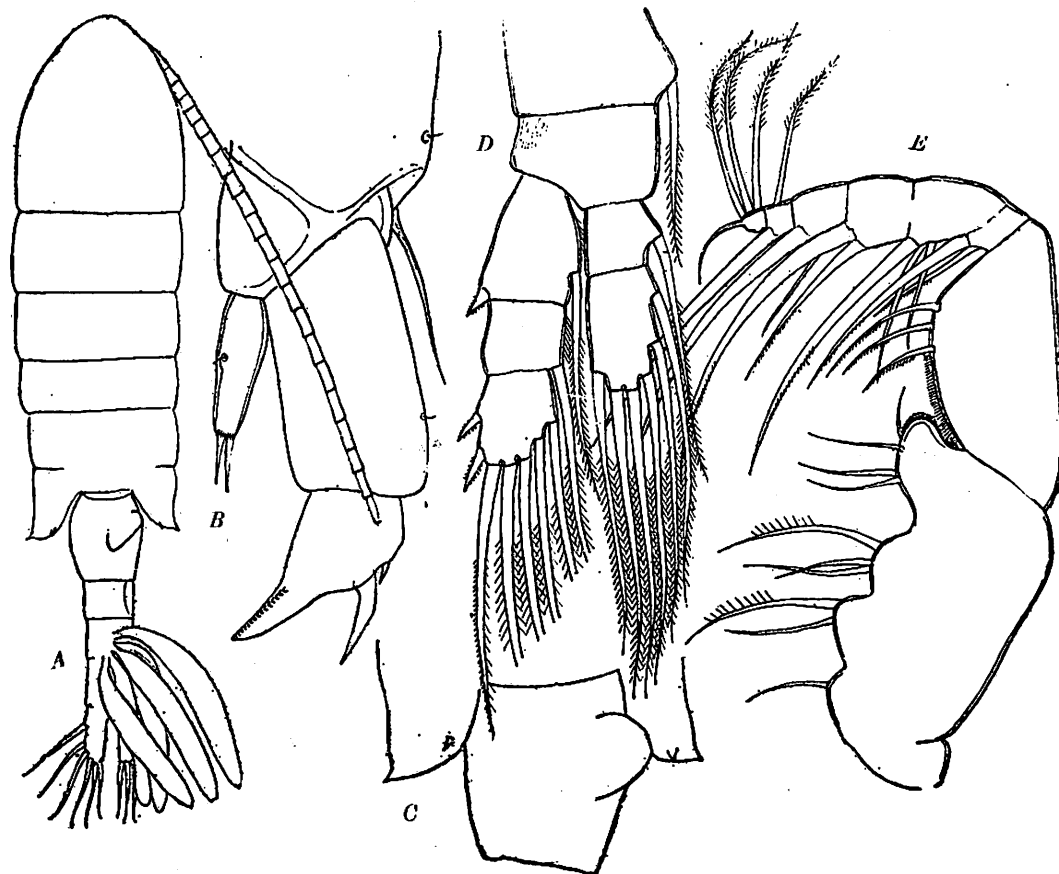
Fig. 2. *Notodromas persica*, n. sp.

1. Right shell of female. 2. Furcal ramus of young male. 3. Furcal ramus of adult male. 4. First leg of adult male. 5. First leg of young male. 6. Prehensile appendage of left side of male. 7. Prehensile appendage of right side of male.

The second antennæ consist of five joints only, the third and fourth being fused. The arrangement of setæ is as in *N. monacha*. The large seta borne on the anterior lower corner of the second joint is as long as the next two joints combined, extending to the apex of the limb.

The first maxilla of the male bears very large prehensile organs. That of the right side consists of an elongated stem, somewhat swollen at its base, and a large sickle-shaped hook, denticulate at its extremity and bearing a broad

MESOPOTAMIAN CRUSTACEA.



DIAPTOMUS CHEVERUXI ♀.

A.—Dorsal view. B.—Fifth foot. C.—Dorsal view of last Thoracic and first abdominal segments. D.—First leg. E.—Maxilliped.

triangular spine at its base. The appendage of the left side is shorter and stouter, with two conspicuous knobs along its lower margin and with a slightly curved, somewhat lamellar, hook.

The first leg, in immature specimens, has a large protuberance at the angle of the penultimate joint, and a trace of this protuberance remains in the adult. The furcal rami of one male examined are similar to those of *N. monacha*, having a much curved shaft and three subequal setæ at the end, but in all other specimens, male or female, they are shorter and stouter, and remarkable for the presence on the dorsal margin of a double tubercle about the middle of its length. Probably, this, as also the form of the first leg, is a mark of immaturity.

Length of shell .75 mm.

Height „ .38 mm.

The description given above is, owing to the nature of the material, very incomplete; but the species appears to me to be clearly distinct. It resembles *N. entzi*, Daday, in some respects, but differs strikingly in the form of the prehensile appendages of the male and the form of the furcal rami.

Cyprinotus dentatmarginatus, Baird-Sars.

Amara—Fort Farm moat.

Cyprinotus incongruens, Ramd.

Kharabah Marsh near Amara.

The specimens examined differ from the type in having rather more conspicuous tubercles on the shell margin, but agree so closely in other respects that I consider they should be referred to this species.

Eucypris virens, Jurine-G. W. Muller.

Resht, N. W. Persia.

The identification of this species is rather doubtful, since the specimens were so damaged that only a single shell valve was found intact.

Cypris pubera, G. W. Muller.

Amara and Ezra's Tomb, Mesopotamia. Enzeli, N. W. Persia.

Herpetocypris reptans (Baird).

Enzeli, N. W. Persia.

Potamocypris variegata (Brady & Norman).

Enzeli, N. W. Persia.

Ilyocypris bradyi, G. O. Sars.

Amara.
