REPORT ON A COLLECTION OF CRUSTACEA DECAPODA AND STOMATOPODA FROM TURKEY AND THE BALKANS

by

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Under the auspices of Leiden University and with the financial aid of various organisations and institutions, Messrs. E. Hennipman, P. Nijhoff, C. Swennen, A. S. Tulp, W. J. M. Vader, and W. J. J. O. de Wilde, most of whom are biological students of Leiden University, made a collecting trip to Turkey from March to July 1959. Extensive collections of plants and animals from Turkey were brought together, while moreover incidental collecting was done on the way home in Greece and Jugoslavia. A narrative of this trip will be published by Nijhoff & Swennen.

The Decapod and Stomatopod Crustacea brought home by the expedition form an extensive and well preserved collection, which contains many very interesting items. It is gratifying to see that notwithstanding the short duration of the expedition and the limited means available these important results could be obtained. Most of the material was collected either in fresh water or in littoral marine habitats (0-5 m depth); on two occasions a trip with a commercial fishing boat could be made, during these trips material from deeper water was obtained. The accompanying map (fig. 1) shows the localities whence Decapoda and Stomatopoda were taken by the expedition, and other Turkish localities mentioned in the present paper.

As extremely little is known about the Decapod fauna of Turkey, even the most common species in the present collection proved to be of interest. A number of Mediterranean species are now reported for the first time from Turkish waters. In addition, the Turkish south coast proved to lodge also several Indo-West Pacific species originating from the Red Sea which have entered the Mediterranean by way of the Suez Canal and went northward along the coasts of Egypt, Israel, the Lebanon and Syria. Several of such species are now reported for the first time from the Mediterranean. Interesting too is the presence of a North American immigrant, the blue crab *Callinectes sapidus* Rathbun, in Turkish and Greek waters.

The information on Turkish Crustacea is scattered over various publications, some of which are not easily accessible. However, in an appendix to their 1958 paper, Holthuis & Gottlieb (1958, pp. 111-120) listed all the Decapoda from the eastern Mediterranean known to them. In this list

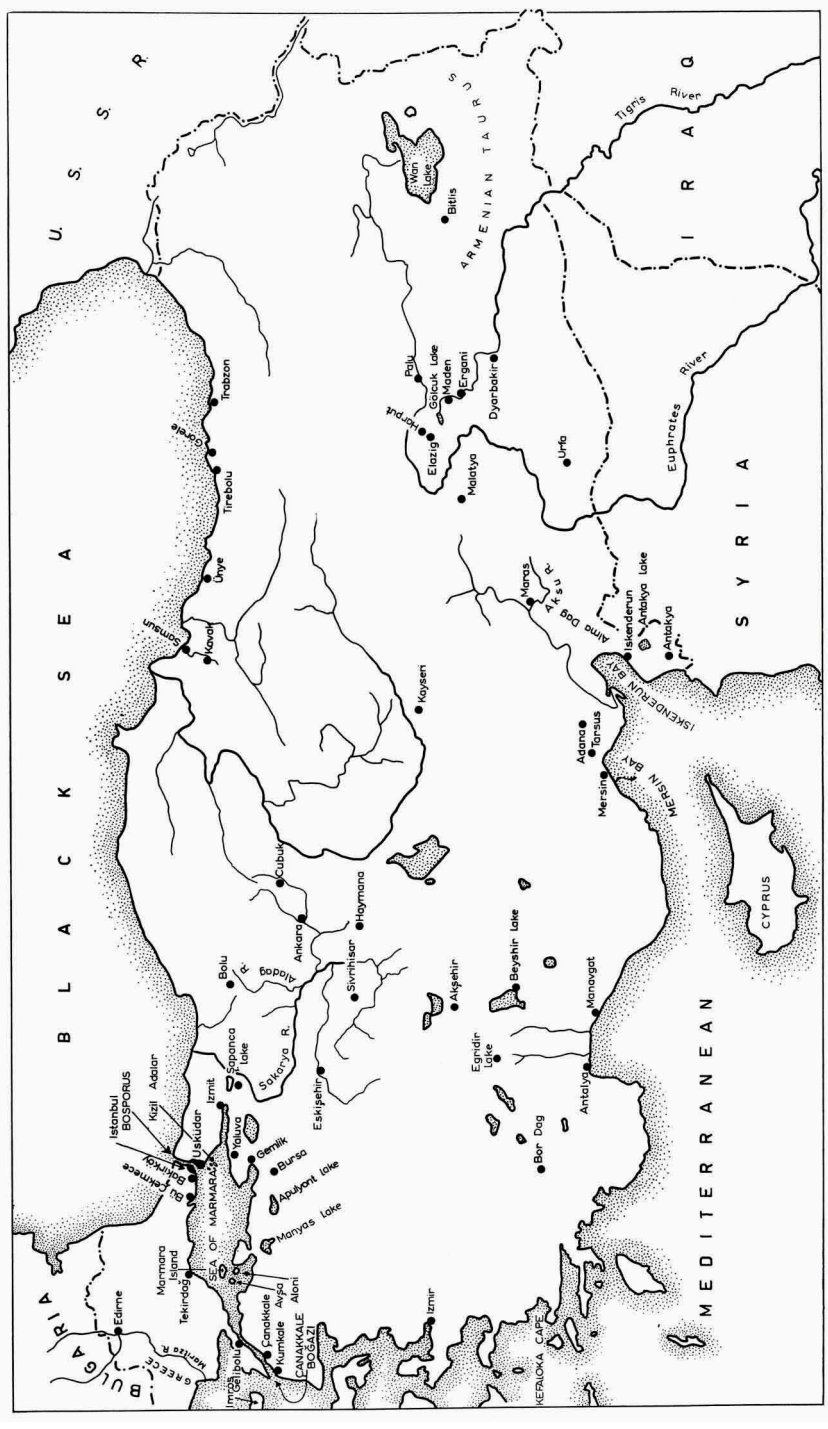

Fig. 1. Map of Turkey with localities mentioned in the text.

all the Turkish records of these species are given. Recently, I became acquainted with a paper dealing with Turkish marine Decapoda which had escaped my attention when compiling the above cited list. This paper, by Colombo (1885), mentions several Decapoda dredged in the S.W. part of the Çanakkale Boğazi (= Dardanelles) between Çanakkale and its S.W. mouth. Apart from species dealt with in the present paper, Colombo mentioned the following Decapoda from that area: *Periclimenes scriptus* (Risso) (as *Anchistia scripta*, p. 25), *Pontonia flavomaculata* Heller (as *P. Phallusiae*, p. 23), *Pontocaris cataphracta* (Olivi) (as *Crangon cataphractus*, p. 23), *Galathea squamifera* Leach (p. 25), *Pagurus cuanensis* Bell (as *Eupagurus Lucasii*, p. 25), *Pagurus alatus* Fabr. (as *Eupagurus angulatus*, p. 26), *Ebalia tuberosa* (Pennant) (as *E. Pennantii*, p. 26), *Macropipus corrugatus* (Pennant) (as *Portunus c.*, p. 23) *Lambrus massena* Roux (p. 26), *Pisa armata* (Latreille) (pp. 25, 26), *Eurynome aspera* (Pennant) (pp. 23, 26), and *Inachus thoracicus* Roux (pp. 23, 26). In 1959 Tortonese published a paper on the benthos of the Sea of Marmara and the Bosporus in which a few species of Crustacea are mentioned. Two of these species are not represented in the collections dealt with in the present paper, viz., *Herbstia condyliata* (Herbst) and *Lambrus massena* Roux, both of which were reported by Tortonese (1959, p. 21) from the Sea of Marmara between Faner bahçe (Anatolia) and the island Kinali (Proti) from a depth of 15 to 25 m. The paper by Demir (1952) unfortunately could not be consulted by me; it is said to contain important information on Decapod Crustacea. It is likely that there are other papers on Turkish Decapoda which I have not seen, but the information on that group contained in the present paper and in the one by Holthuis & Gottlieb (1958) may form a basis for further study on the Decapoda of Turkish waters.

All the material dealt with here is preserved in alcohol and forms part of the collection of the Rijksmuseum van Natuurlijke Historie at Leiden. The collection numbers indicated with each lot are those of Mr. C. Swennen, to whom during the expedition the care of the larger part of the Crustacean collections was entrusted.

Suborder Macrura
Supersection Natantia
Section Penaeidea
Family Penaeidae

Penaeus kerathurus (Forskål, 1775)

Aegean Sea near the harbour of Porto Lago, Thraki, Greece; 0-2 m deep; 29 June 1959; no. 160.— 1 male, 1 female.

The male is 135 mm long, the female 183 mm. The female is impregnated.

Though the species was not found by the expedition in Turkey, it has been reported from there by previous authors. Izmir (= Smyrna) even is one of the type localities of the species. Forskål (1775, p. 95), namely, at the end of the description of *Cancer kerathurus* gave the localities "*Smirnae* & *Alexandriae*". "Smirna" is now selected to be the restricted type locality of the species. The species has also been reported from the Iskenderun Bay (= Gulf of Alexandretta), namely by Monod (1931, p. 420; 1932, p. 67) and Gruvel (1936, p. 180).

Penaeus kerathurus is known from the entire Mediterranean and from the eastern Atlantic between S. England and Angola.

Penaeus japonicus Bate, 1888

1 to 2 km off the south coast of Turkey between Lara and Zincir, 10 to 18 km S.E. of Antalya; 15-20 m deep; bottom fine sand; fished with local fishing boat; 25 April 1959; no. 63.— 1 female.

The above specimen is an impregnated female of 180 mm. The spermatophore is butterfly-shaped and protrudes quite far out of the thelycum.

Penaeus japonicus is a species with a wide distribution in the Indo-West Pacific area. It has penetrated into the eastern Mediterranean by way of the Suez Canal, and has been reported from near Port Said, and from the coast of Israel, where it reportedly is very common. Monod (1930, p. 138; 1931, p. 420; 1932, p. 67) mentioned the occurrence of the species in Iskenderun Bay (= Gulf of Alexandretta). The present record thus extends the known Turkish range of the species a considerable distance to the west.

Penaeus semisulcatus De Haan, 1844

1 to 2 km off the south coast of Turkey between Lara and Zincir, 10 to 18 km S.E. of Antalya; 15-20 m deep; bottom fine sand; fished with local fishing boat; 25 April 1959; no. 63.— 3 males, 4 females.

5 km off the south-east coast of Turkey near Mersin; 10 m deep; bottom sand; fished with local fishing boat; 18 May 1959; no. 96.— 1 male.

The males are 139 to 185 mm long, the females 177 to 225 mm.

Just as *Penaeus japonicus*, the present species has a wide distribution in the Indo-West Pacific area, and has penetrated into the eastern Mediterranean by way of the Suez Canal. It is known from the Israel and

Syrian coasts, being even of economic importance there. It has also been reported from two localities in Turkey, viz., from the Iskenderun Bay (= Gulf of Alexandretta) by Monod (1930, p. 138; 1931, p. 420; 1932, p. 67) and Gruvel (1930, p. 478 as *Paenus monodon*; 1931, p. 118; 1936, p. 181) and from Mersin Bay by Holthuis & Gottlieb (1958, p. 18). The present material shows that the range of the species extends westwards along the Turkish south coast at least as far as Antalya. It proves to be more common than *P. japonicus*.

Metapenaeus monoceros (Fabricius, 1798)

5 km off the south-east coast of Turkey near Mersin; 10 m deep; bottom sand; fished with local fishing boat; 18 May 1959; no. 96.— 2 females.

The specimens are 115 and 170 mm long.

This too is an Indo-West Pacific species, which has entered the eastern Mediterranean by way of the Suez Canal. In the Indo-West Pacific area the range of the species extends from India to the Red Sea. The eastern Mediterranean records are from the Bay of Abukir near Alexandria, from Port Said, and from the Israel coast. The species is now for the first time reported from Turkey.

Metapenaeus monoceros, Penaeus semisulcatus, and *P. japonicus* if taken in sufficiently large quantities are sold on the local markets in Antalya, but there is no special fishery for these prawns. Aasen & Akyüz (1956, p. 15) showed that there is an important and growing shrimp fishery in Iskenderun Bay: 3.050 kg being exported in 1953, 37.255 kg in 1954. These shrimps (karides) are said by these authors (p. 10) to be *Penaeus* sp., but they probably include all Penaeids.

Sicyonia carinata (Brünnich, 1768)

Coast of the Adriatic Sea near Jadranovo, 30 km S. of Ryeka, Jugoslavia; 0-2 m deep; 5 July 1959; no. 166.— 1 specimen.

The specimen, a male, is 41 mm long.

Sicyonia carinata is known from the entire Mediterranean, from the Atlantic coast of Portugal and from West Africa; so far it has not been reported from Turkey.

Section Caridea
Family Atyidae

Atyaephyra desmarestii desmarestii (Millet, 1832) (figs. 2a, b, 3a, b)

Lago Koronia, E. of Thessaloniki, Greece; shallow littoral zone of large lake; fresh water; 29 June 1959; no. 162.— 1 specimen.

The single specimen obtained is a male of 21 mm length. The species proved to be rare in the above locality, as no other prawns were found there despite an intensive search for them.

Bouvier (1913, p. 72), when dealing with the variability of the various characters of this species, distinguished two "variétés régionales" which he named *orientalis* and *occidentalis*. These varieties as defined by Bouvier, have all the characteristics of subspecies and should be considered as such. Var. *occidentalis* includes the typical form of the species and therefore should be known as ssp. *desmarestii*.

The present Greek specimen belongs to Bouvier's western form, though it shows differences from specimens from France and the Netherlands with which it could be compared. However, since only one Greek specimen is at hand, very little positive information can be given concerning its status within the subspecies.

The rostrum of my specimen is rather shallow, being less deep than that of most specimens from western Europe. It is straight and its tooth formula is 24/4. The posterolateral angle of the fifth abdominal somite is not strongly produced. The telson bears six lateral spines, while the posterior margin bears 4 pairs of spines, viz., 1 external pair, 1 intermediate and 2 submedian pairs. In the western form there usually are 5 pairs of posterior spines, because of the presence of three instead of two submedian pairs. The endopod of the first male pleopod resembles very much Bouvier's (1913, fig. 2 I) figure of that organ of a male from near Thessaloniki, so that it is possible that this shape of endopod is characteristic for specimens of the region. As Bouvier remarked already, the endopod is heavier and more distinctly curved here than in the typical western form, forming more or less a transition to the shape of the endopod of the eastern form.

Atyaephyra desmarestii desmarestii is known from fresh waters of southern and western Europe (Spain, Portugal, France, Belgium, the Netherlands, western Germany, Italy, Jugoslavia, Albania, Greece) and from North Africa (Morocco, Algeria, Tunisia); it has also been reported from Madeira.

Atyaephyra desmarestii orientalis Bouvier, 1913 (figs. 2 c-e, 3 c-h)

Bileybi, 8 km S.W. of Antalya, S. Turkey; estuary of the Boga River; altitude 0-10 m; small streams in the river bed which for the larger part is dry, some of these streams reach the sea; 18 April 1959; no. 44.— 6 males, 9 ovigerous females.

Lake near Döşemealti, 25 km N.N.W. of Antalya; altitude 300 m; shallow lake with a rich aquatic vegetation, fed by small streams which bring cold fresh water from the mountains; 20 April 1959; no. 51.— 2 males, 12 females (4 ovigerous).

Aksu River, 3 km S. of Maras, S.E. Turkey; altitude about 700 m; small stream in upland plain with much aquatic vegetation; 24 May 1959; no. 106.— 19 males, 10 females.

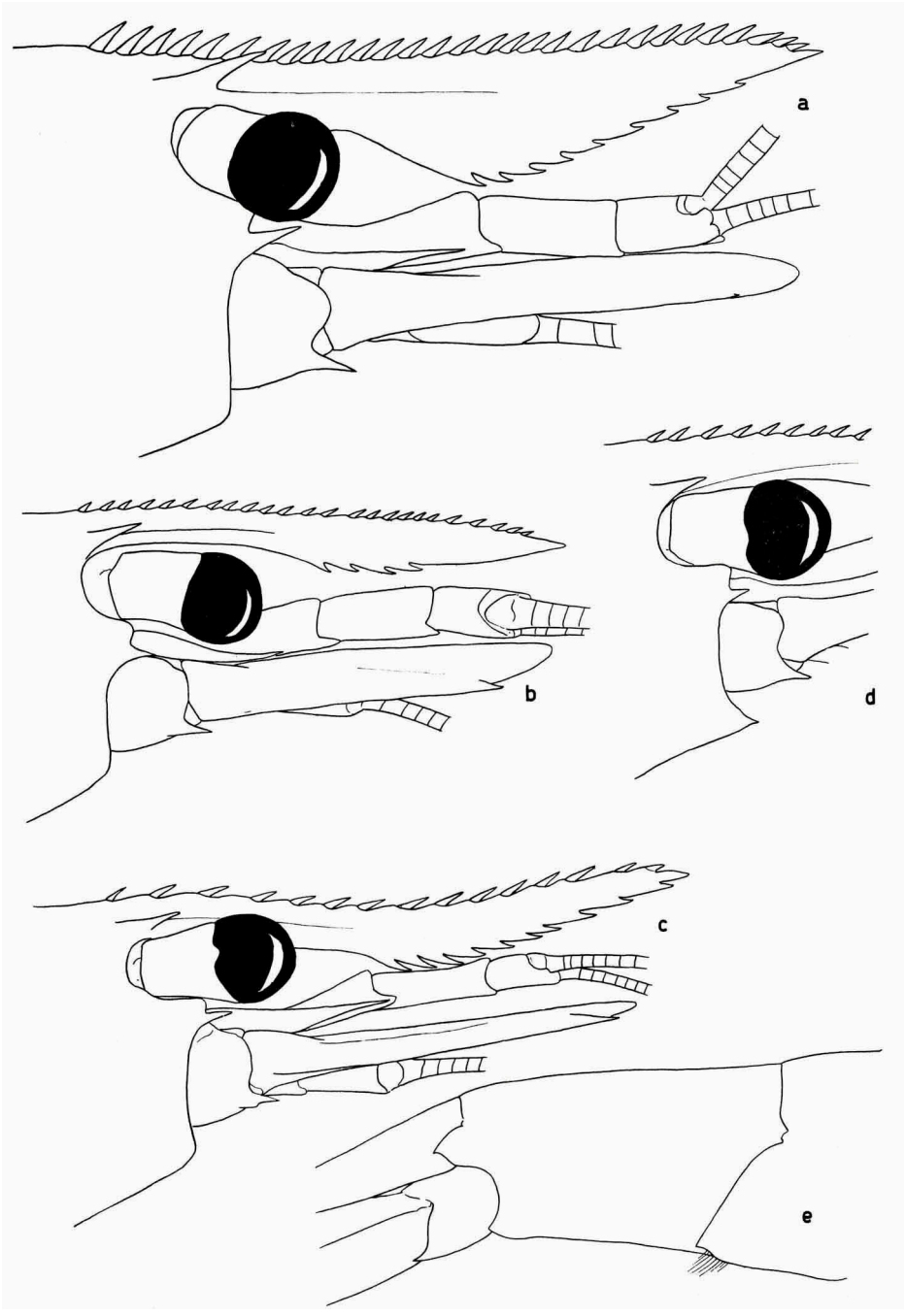

Fig. 2. a, b, *Atyaephyra desmarestii desmarestii* (Millet), cephalic region in lateral view. a, specimen from Canal du Midi near Toulouse, France; b, specimen from Lake Koronia, Greece (lot 162). c-e, *Atyaephyra desmarestii orientalis* Bouvier, specimens from Bileybi, Turkey (lot 44). c, cephalic region in lateral view; d, anterior part of carapace of specimen with pterygostomian tooth; e, posterior part of abdomen in lateral view. a-e, × 13.

The present material shows distinctly that the females of the species attain a greater size than the males. The males measure 17 to 21 mm, while the females range from 21 to 28 mm, the ovigerous specimens being 25 to 28 mm long.

As already pointed out under *Atyaephyra desmarestii desmarestii*, Bouvier's variety *orientalis* should be elevated to the rank of a subspecies. The present Turkish specimens clearly belong to this eastern subspecies. They show numerous differences from western European material, but many of the characters are subject to considerable variation, especially when one takes material from intermediate regions into account. The fact that such characters are often more or less constant within a population makes it quite difficult to evaluate their taxonomic value when no large series from many localities are at hand.

In the present Turkish specimens the rostrum is very narrow and slender with the tip curved upwards so that the upper margin is distinctly concave. In specimens from western Europe (France, the Netherlands) the rostrum is much higher and straighter with the upper margin not concave. Also the number of rostral teeth as a rule is higher in the western form, while they are furthermore placed closer together there. In my Turkish specimens the rostral formula is 15-25 (27)/3-10, the formula in western specimens according to Bouvier (1913) is 21-36/2-10, being in French specimens 25-30/3-10. There is a distinct local variation in the rostral formula of my Turkish specimens. In my material of lot 44 the formula in the females is 15-22/6-11, the average being 19/8; in the males of the same lot the formula is 16-20/8-10, average 19/9. In lot 51 the formula of the females is 17-23 (26)/6-11, average 20/8, of the males it is 20-22/7-8, average 21/7.5. In the material of lot 106 the formula of the females is 21-26/5-9, average 23/7, while in the males the formula is 17-25 (27)/3-7, average 21/5. While in lots 44 and 51 the formula of the females and the males are virtually the same, in lot 106 the males have distinctly less teeth than the females. The whole of lot 106 differs from the other two lots in having relatively more dorsal and less ventral teeth.

The specimens of lots 44 and 51 are interesting in that they show a peculiar variability in the shape of the pterygostomian angle, which in some specimens is strongly produced and pointed, while in others it is rounded, either with or without a pterygostomian tooth. None of the specimens of lot 106 shows such a tooth, which I did not find in any specimen of the western form either. In the family Atyidae the presence or absence of a pterygostomian tooth generally is considered a character of generic importance (see Bouvier, 1925, p. 41) but recently a similar variation of the shape

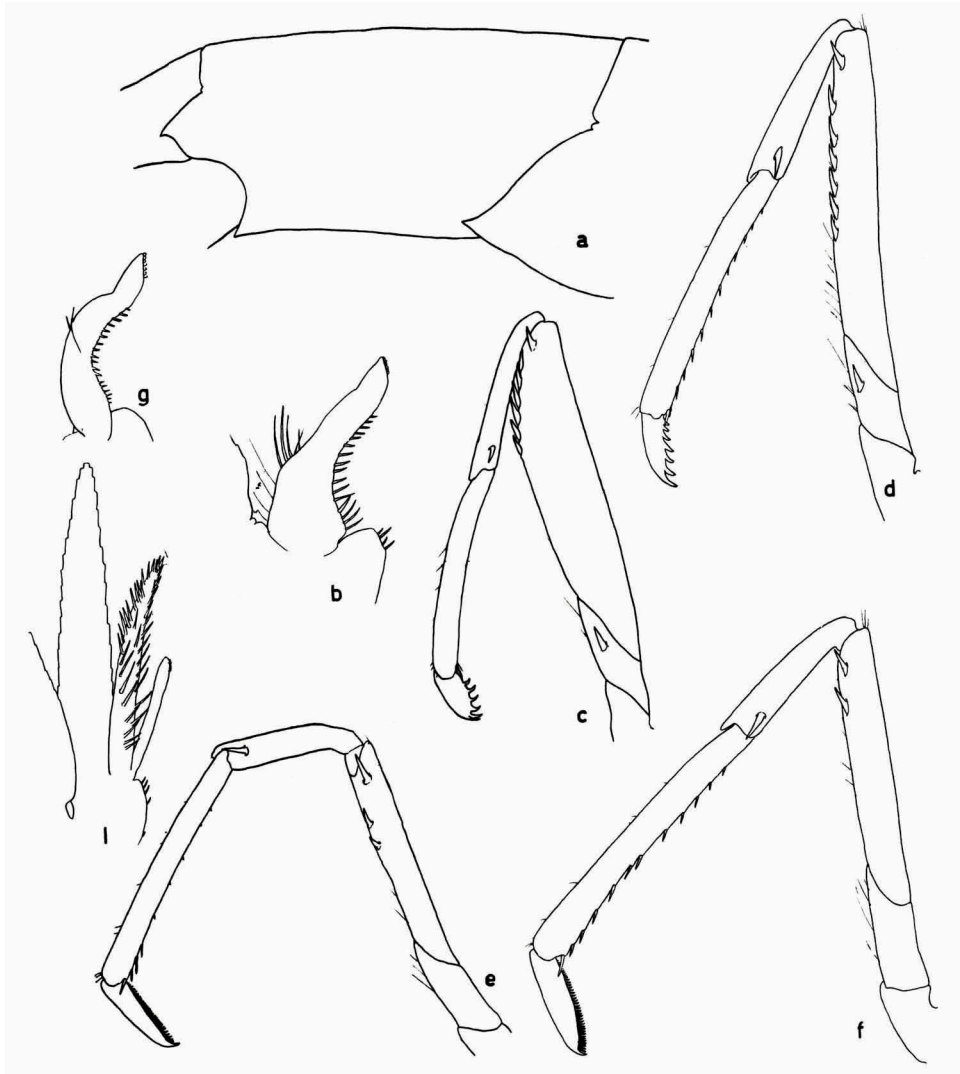

Fig. 3. a, b, *Atyaephyra desmarestii desmarestii* (Millet). a, posterior part of abdomen, specimen from Canal du Midi, Toulouse; b, endopod of first male pleopod, specimen from Lake Koronia, Greece (lot 162). c-h, *Atyaephyra desmarestii orientalis* Bouvier, specimens from Bileybi, Turkey (lot 44). c, third pereiopod of male; d, third pereiopod of female; e, fifth pereiopod of male; f, fifth pereiopod of female; g, endopod of first pleopod of male; l, endopod of second pleopod of male. a, c-f, × 13; b, g, l, × 28.

of the pterygostomian angle of the carapace was found by me in the blind troglobic Atyid from Australia, *Stygiocaris lancifera* Holthuis (vid. Holthuis, 1960, p. 51).

The posterolateral angle of the fifth abdominal somite is as a rule less acute than in the western form, being more rectangular. This character, however, is variable: in specimens of lot 106 the tip is more acute than in the other Turkish animals.

The spinulation of the lateral margins of the telson also is rather variable in my material. The number of spines ranges between 4 and 7; in lot 44 the average is 6 spines, in lots 51 and 106 this average is 5. On the posterior margin there are usually four pairs of spines: 1 very small outer pair, 1 strong intermediate and two pairs of setose submedian spines. In some specimens there are 5 or 6 submedian spines. In practically all specimens of lots 44 and 51 the number of submedian spines is 4; in these two lots I found only one specimen with 6 and one with 5 such spines. In lot 106, however, about 1/3 of the specimens possesses 6 submedian spines. In the western form the usual number of submedian spines seems to be 6.

The antennulae and antennae of the Turkish specimens do not seem to offer any differences from those of the typical form. The stylocerite in some specimens overreaches the anterior margin of the basal segment of the peduncle, in others it reaches to or beyond that margin. This variability was found in both the eastern and the western form.

The pereiopods in the two subspecies do not show any noticeable differences.

According to Bouvier (1913) the most important difference between the two forms is found in the shape of the endopod of the first male pleopod. In my Turkish specimens this endopod is strongly curved, and rather broad, and thus agrees well with Bouvier's description and figures of that organ of var. *orientalis*. In some of my specimens, however, the number of spinules on the inner margin of the endopod is smaller than in Bouvier's material. In my material of subsp. *orientalis* the appendix masculina of the second male pleopod as a rule bears many more spines than in the subsp. *desmarestii*.

Bouvier (1913) reported his var. *orientalis* from three localities in Syria: (1) the Oronte River near the place where it leaves Lake Homs, (2) Ataïbe, east of Damascus, and (3) a small stream near Kousseir, Damascus oasis. The specimens from the River Jordan near Lake Tiberias, from Lake Huleh and the surrounding region, and from the Oronte River east of Homs reported upon by Barrois (1893, p. 126; 1894, pp. 280, 281, 288, 299, 302, 312), and also those from in and near Lake Tiberias dealt with by Annandale & Kemp (1913, p. 242) evidently also belong to the present subspecies. *Atyaephyra desmarestii* is now reported for the first time from Turkey.

Family Palaemonidae
Subfamily Palaemoninae

Palaemon adspersus Rathke, 1837

Eastern shore of Akyatan Lake, 45 km S. of Adana, S.E. Turkey; 0-1 m deep; bottom clay; brackish water; a narrow effluence forms the connection between the lake and the sea; 18 May 1959; no. 97.— 2 specimens (1 ovigerous).

Black Sea coast of Turkey near the harbour of Trabzon; 0-5 m deep; 1-7 June 1959; no. 119.— 46 specimens (15 ovigerous).

Brackish marsh near Porto Lago, Thraki, Greece; 28 June 1959; no. 159.— 2 specimens (1 ovigerous).

Aegean coast of Greece near the harbour of Porto Lago; 0-2 m deep; 29 June 1959; no. 160.— 76 specimens (6 ovigerous).

The specimens measure 6 to 65 mm, the ovigerous females are 46 to 65 mm long. Two specimens of lot 119 carry a Bopyrid parasite in the branchial chamber.

The species inhabits the entire Mediterranean and the Black Sea, and moreover is known from the Atlantic coast of Europe from the Baltic Sea and S.W. Norway southwards. The only previous record from Turkey known to me is the one by Ninni (1923, p. 61) who reported the species under the name *Palaemon rectirostris* from Istanbul.

Palaemon serratus (Pennant, 1777) (fig. 4)

South coast of Turkey near Selimiye, about 62 km E. by S. of Antalya; 0-1 m deep; sandy bottom with stones and *Posidonia* vegetation; 4 May 1959; no. 71.— 1 specimen.

Breakwater of Mersin harbour, south-east coast of Turkey; 0-1 m deep; among algae growing on the breakwater; 10 May 1959; no. 82.— 10 specimens.

South-east coast of Turkey near Kizkalesi, about 58 km S.W. of Mersin; 0-1 m deep; from rocks with algae; 12 May 1959; no. 83.— 4 specimens.

South-east coast of Turkey near Kizkalesi; 1-2 m deep; bottom fine sand with loose algae; 12 May 1959; no. 84.— 20 specimens.

Mersin harbour, south-east coast of Turkey; 0.5-1.5 m deep; bottom fine sand; night collecting; 15 May 1959; no. 89.— 4 specimens.

Eastern shore of Akyatan Lake, 45 km S. of Adana, S.E. Turkey: 0-1 m deep; bottom clay; brackish water; a narrow effluence forms the connection between the lake and the sea; 18 May 1959; no. 97.— 26 specimens.

Most of the specimens are not full-grown, they measure 9 to 30 mm, only the one from lot 71 is adult, it is 77 mm long. No ovigerous females were found. In most specimens one or two broad concentric bands of dark pigment are visible on the cornea.

Palaemon serratus has been reported before from Turkey: Bosporus (Heller, 1863, p. 265; Ostroumoff, 1896, p. 92), Istanbul (Ninni, 1923, p. 61; Holthuis & Gottlieb, 1958, p. 25), Gelibolu (= Gallipoli) (Ostroumoff, 1896, p. 82 as *P. treillianus*). So far as known to me there are no

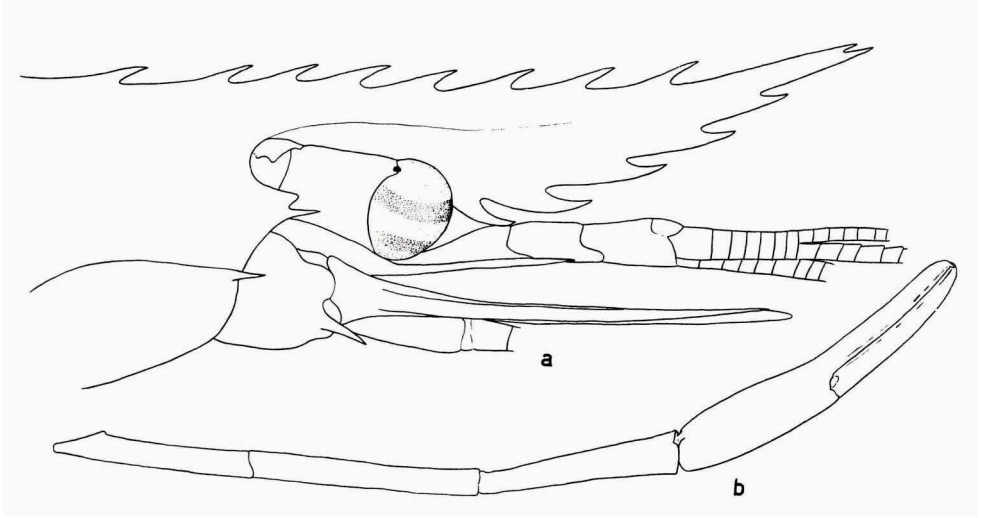

Fig. 4. *Palaemon serratus* (Pennant), juvenile from Akyatan Lake, Turkey (lot 97). a, anterior part of body in lateral view; b, second pereiopod. a, b, × 13.

previous records from the Turkish south coast. The species is known from the entire Mediterranean and from the eastern Atlantic (from Denmark to Mauritania). It has also been reported from the Black Sea.

Palaemon xiphias Risso, 1816

South coast of Turkey near Selimiye, about 6 km S.W. of Manavgat, and about 62 km E. by S. of Antalya; 0-1 m deep; among stones near the old roman harbour; 23 April 1959; no. 60.— 18 specimens (14 ovigerous).

South coast of Turkey near Selimiye; 0-1 m deep; sandy bottom with stones and *Posidonia* vegetation; 4 May 1959; no. 71.— 16 specimens (2 ovigerous).

Aegean coast of Greece near the harbour of Porto Lago, Thraki; 0-2 m deep; 29 June 1959; no. 160.— 1 specimen.

The specimens are 32 to 62 mm long, the ovigerous females measure 49 to 62 mm. Two of the specimens (36 and 55 mm long) from lot 71 had a Bopyrid parasite in one of the branchial chambers.

Palaemon xiphias inhabits the entire Mediterranean and has also been found at the Canary Islands. The only previous record of the species from Turkey known to me is the one by Colombo (1885, p. 25), who mentioned the species from the S.W. half of the Çanakkale Boğazi (= Dardanelles) between Çanakkale and Kumkale.

Palaemon elegans Rathke, 1837

South coast of Turkey near Lara, 10 km S.E. of Antalya; 0-0.5 m deep; among stones and algae; 8 April 1959; no. 16.— 1 specimen.

South coast of Turkey near Selimiye, about 6 km S.W. of Manavgat, and about 62 km E. by S. of Antalya; 0-1 m deep; among stones near the old roman harbour; 23 April 1959; no. 60.— 1 ovigerous female.

South coast of Turkey near Selimiye; 0-1 m deep; sandy bottom with stones and *Posidonia* vegetation; 4 May 1959; no. 71.— 23 specimens (13 ovigerous).

Breakwater of Mersin harbour, south-east coast of Turkey; 0-1 m deep; among algae growing on the breakwater; 10 May 1959; no. 82.— 2 specimens (1 ovigerous).

South-east coast of Turkey near Kizkalesi, about 58 km S.W. of Mersin; in brackish pool high on the sandy beach; about 2 m above sea level; 12 May 1959; no. 85.— 10 specimens (4 ovigerous).

Mersin harbour, south-east coast of Turkey; 0.5-1.5 m deep; bottom fine sand; night collecting; 15 May 1959; no. 89. —1 specimen.

Black Sea coast of Turkey near the harbour of Trabzon; 0-5 m deep; 1-7 June 1959; no. 119.— 22 specimens (5 ovigerous).

Black Sea coast of Turkey near Kilise Burun, 2 km W. of Tirebolu, and 80 km W. of Trabzon; 0-1 m deep; 10 June 1959; no. 134.— 8 specimens (4 ovigerous).

Black Sea coast of Turkey near Samsun; 0-2 m deep; among rocks; 12 June 1959; no. 141.— 5 specimens (2 ovigerous).

Sea of Marmara near Yaluva, about 50 km S.E. of Istanbul, Asiatic Turkey; 0-1 m deep; among stones and on piling; 22 June 1959; no. 154.— 2 specimens (1 ovigerous).

Aegean coast of Greece near the harbour of Porto Lago, Thraki; 0-2 m deep; 29 June 1959; no. 160.— 7 specimens (5 ovigerous).

Adriatic coast of Jugoslavia near Jadranovo, 30 km S. of Ryeka (= Fiume); 0-2 m deep; 5 July 1959; no. 166.— 49 specimens (22 ovigerous).

The specimens measure 19 to 48 mm, the ovigerous females are 23 to 48 mm long. It is evident that the specimens from the brackish pool near Kizkalesi (lot 85) did not live in optimal conditions; they are smaller than most other specimens (19 to 32 mm), while the ovigerous females of this lot measure 23 to 29 mm; the ovigerous females of the other lots are 31 to 48 mm long. Moreover the number of specimens of this lot with only two ventral rostral teeth is relatively high: 3 of the 4 ovigerous females, and one of the other specimen showed this low number of teeth.

Palaemon elegans is a quite common species in the Mediterranean and the Black Sea; in the eastern Atlantic it ranges from S.W. Norway to S.W. Africa. Previous records from Turkey are: Istanbul (Ninni, 1923, p. 61, as *P. squilla*), near the entrance of the Bosporus, near Kizil Adalar (= Princes Islands), near Bü Çekmece, and at the south coast of Marmara Island, Sea of Marmara (Ostroumoff, 1896, pp. 64, 71, 79, 92, as *P. squilla*), Imros Island (Forskål, 1775, p. 94, as *Cancer squilla* Var.). Forskål described his material as a variety of *Cancer squilla* "fasciis transversis, fuscis". The only Mediterranean Palaemonids showing a conspicuous pattern of transverse dark lines are *Palaemon elegans* and *P. serratus*. As *Palaemon elegans* is the commoner of the two and shows most resemblance to the true *Cancer squilla* (= *Palaemon adspersus*), chances are greatest that Forskål's material belongs to the present species.

Palaemonetes antennarius (H. Milne Edwards, 1837) (fig. 5)

Bileybi, 8 km S.W. of Antalya, S. Turkey; estuary of the Boga River; altitude 0-10 m; small stream in the river bed which for the larger part is dry, some of these streams reach the sea; 18 April 1959; no. 44.— 32 specimens (10 ovigerous).

Lake near Dösemealti, 25 km N.N.W. of Antalya, altitude 300 m; shallow lake with a rich aquatic vegetation, fed by small streams which bring cold fresh water from the mountains; 20 April 1959; no. 51.— 64 specimens (27 ovigerous).

The specimens measure 21 to 44 mm, the ovigerous females are 32 to 44 mm long, the largest male is 39 mm.

The animals agree well with Italian specimens of the species with which they could be compared. Only the rostrum of the Turkish specimens has the proximal upper teeth placed much closer together than the distals, while in my Italian specimens the teeth are more regularly divided over the upper margin of the rostrum.

The diameter of the eggs of the present specimens is 1.3-1.5 × 1.7-2.0 mm.

The status of the present species has been misunderstood for a long time, and the species has been the subject of the highly speculative biological theory of "poecilogonic polymorphism", which was finally shown to be untenable by the accurate systematic researches of Sollaud (1930, pp. 43-48; 1938, pp. 635-645), who proved beyond any doubt that the various "poecilogonic" forms are actually good species. Sollaud also showed that *Palaemonetes varians macrogenitor* Boas of the above theory has to bear the name *Palaemonetes antennarius* (H. Milne Edwards). The differences between *P. antennarius* (H. Milne Edwards) and *P. varians* (Leach) are of a specific nature and are not solely caused by environmental conditions. In 1938 Sollaud gave a review of the various Mediterranean species of *Palaemonetes*, formulating their differences and relations.

Palaemonetes antennarius is a fresh water species which at present is known from Italy, Jugoslavia, Greece (the Ionian Islands Korfu and Zanthe, and the Aegean Islands Kos and Rodhos). The Rijksmuseum van Natuurlijke Historie moreover possesses some specimens from Crete (Kourna Lake, 18 April 1955, K. Lindberg). So far the species was not known from Turkey.

Palaemonetes turcorum new species (figs. 6-8)

Sakarya River near the bridge of the highway from Ankara to Eskişehir, about halfway between Sivrihisar and Haymana, and about 95 km S.W. of Ankara, Turkey; altitude about 800 m; a fast flowing river of about 20 m wide and several meters deep fresh water with a vegetation of *Potamogeton, Myriophyllum,* green and red algae; 17 and 18 June 1959; no. 145.— 44 specimens (22 ovigerous).

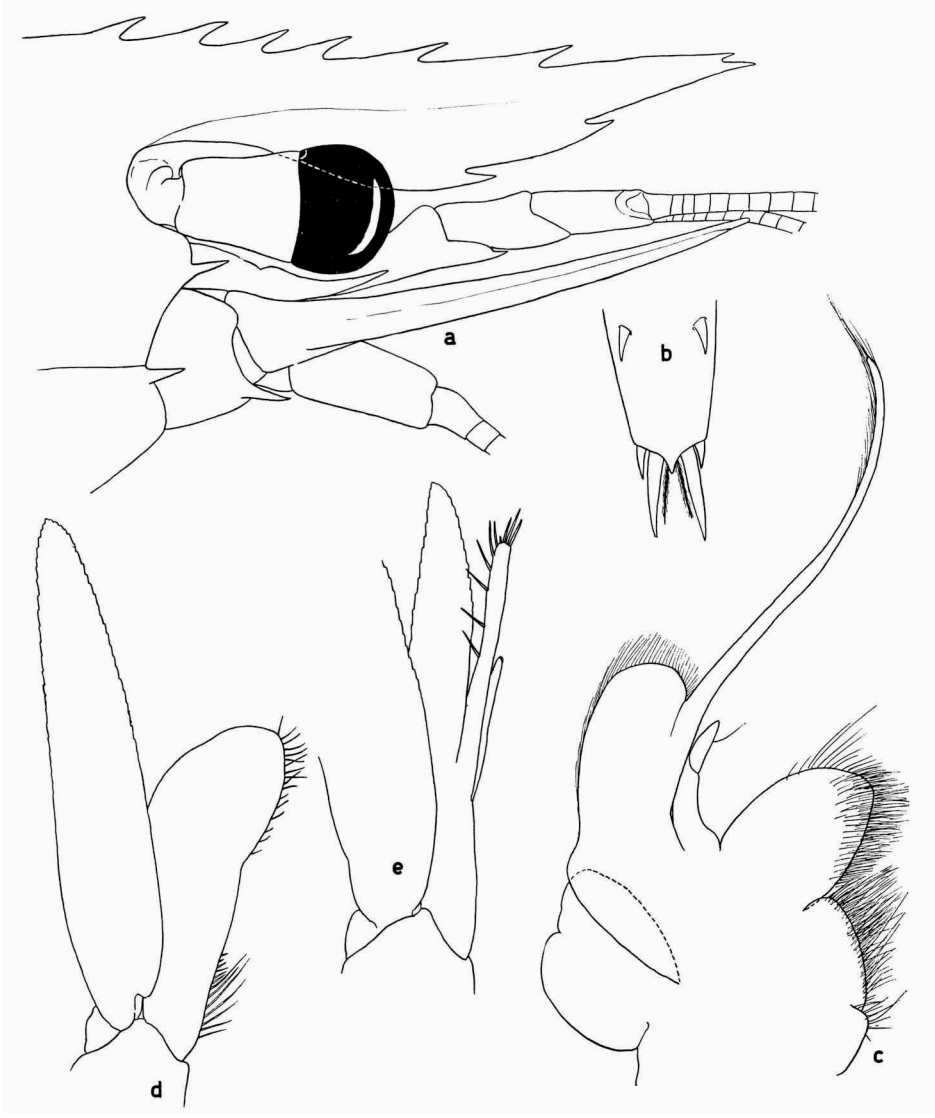

Fig. 5. *Palaemonetes antennarius* (H. Milne Edwards), specimens from Bileybi, Turkey (lot 44). a, anterior part of body in lateral view; b, tip of telson in dorsal view; c, first maxilliped; d, first pleopod of male; e, endopod of second pleopod of male. a × 13; b-e, × 20.

The specimens are 20 to 48 mm long, the ovigerous females measure 32 to 48 mm, the largest male of the lot is 28 mm in length.

The rostrum is straight, rather high and reaches almost to or slightly beyond the distal end of the scaphocerite. The upper margin bears 5 to 7,

seldom 4 teeth, the posterior of which is placed just before or just behind the posterior limit of the orbit. The ultimate dorsal tooth is sub-apical in position, and the distance between it and the preceding tooth is much greater than the distances separating the other dorsal teeth. The ventral margin of the rostrum bears two teeth; in one specimen one and in another three ventral teeth were observed. The antennal spine is placed some distance below the rounded lower orbital angle. The branchiostegal spine is placed on the anterior margin of the carapace, just below the branchiostegal groove.

The posterolateral angle of the pleuron of the fifth abdominal somite is about rectangular and does not end in a tooth. The pleuron of the sixth somite ends in an acute point, while the posterolateral process overhanging the base of the telson has a distinct sharp posteriorly directed tooth in the upper part of the posterior margin. The telson bears two pairs of dorsal spines; the anterior of these lies in the middle of the telson, the posterior is situated about halfway the anterior pair and the posterior margin of the telson, or somewhat closer to the anterior pair. The posterior margin of the telson is rather narrow and ends in a triangular median point. It bears the usual two pairs of spines, between the inner of which there is a single pair of plumose setae.

The eyes are large, with a well developed and pigmented cornea; an ocellus is present.

The stylocerite reaches to the middle of the basal segment of the antennular peduncle. The anterolateral tooth of the segment is large and reaches slightly beyond the middle of the second segment of the peduncle. The anterior margin of the first segment is rounded. The second segment is as long as or longer than the third; together the two are shorter than the basal segment. The outer flagellum has the shorter ramus fused with the longer for more than 4/5 of its length. The fused part consists of 14 to 18 articles, the free part of 3 or 4 articles.

The scaphocerite reaches distinctly beyond the antennular peduncle. It is about 2.5 to almost 3 times as long as broad. The outer margin is straight or slightly convex and ends in a strong sharp tooth which is greatly overreached by the lamella. The antennal peduncle fails to reach the middle of the scaphocerite. A strong spine is present on the antennal peduncle near the external side of the base of the scaphocerite.

The mandible bears no palp. The incisor process ends in three teeth, the molar process in several blunt lobes. The lower lacinia of the maxillula is oval, it is slightly narrower than the upper lacinia which ends in several strong spines; the palp is deeply bilobed. The upper lacinia of the maxilla is deeply cleft, the palp is well developed and rather broad, the scaphognathite

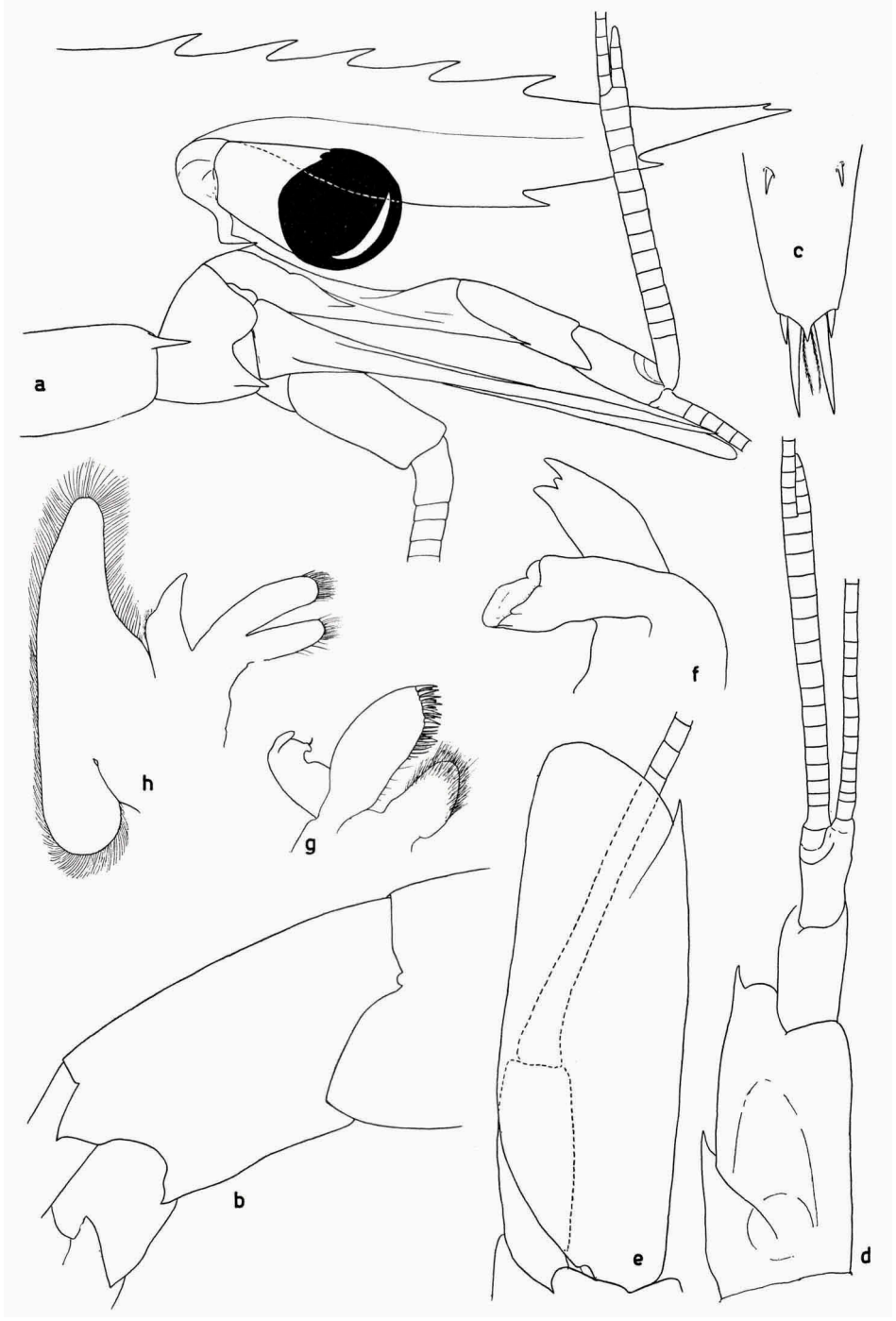

Fig. 6. *Palaemonetes turcorum* new species, paratypes. a, anterior part of body in lateral view; b, posterior part of abdomen in lateral view; c, tip of telson in dorsal view; d, antennula; e, antenna; f, mandible; g, maxillula; h, maxilla. a, b, d, e, × 13; c, f-h, × 20.

is large. All maxillipeds are provided with long exopods. The endites of the first maxilliped are separated by a distinct notch, but their inner edges lie almost in a single line, thereby being quite different from those of *P. antennarius*. The palp is slender. The exopod has a well developed caridean lobe; the epipod is large and is indistinctly bilobed. The second maxilliped is of the normal shape; it possesses an epipod and a distinct podobranch. The third maxilliped reaches slightly beyond the end of the antennal peduncle. Its last segment is distinctly shorter than the penultimate, while the antepenultimate segment is about 1.5 times as long as the ultimate. A large exopod, an epipod and a well developed arthrobranch are present; the pleurobranch is reduced to a single small lamella and is completely hidden by the arthrobranch. The pleurobranchs of the five pereiopods are large.

The first pereiopod reaches to or slightly beyond the end of the scaphocerite. The fingers are about as long as the palm. The carpus is somewhat less than twice as long as the chela, and is distinctly longer than the merus. The second pereiopod reaches with the fingers or with half the palm beyond the scaphocerite. The fingers measure 2/3 to 3/4 of the length of the palm; they gape slightly in the basal part and their cutting edges have no teeth. The carpus is about twice as long as the palm and is distinctly longer than the merus. The ischium is about as long as the merus. The second pereiopod of the females is more robust than that of the males. The third to fifth pereiopods all reach almost to the distal end of the scaphocerite. The dactylus of the third leg in the females is about half as long as the propodus, in the males it is almost 1/3 as long as the propodus. The posterior margin of the propodus bears 5 to 7 spinules. The carpus is somewhat more than 2/3 as long as the propodus in the males, somewhat less than 2/3 in the females. The merus is distinctly longer than the propodus, while the ischium is less than half as long as the merus. In the females the dactylus of the fifth pereiopod is about 2/5 as long as the propodus, in the males it is less than 1/3 of the length of the propodus. The posterior margin of the propodus bears several spinules, while in its distal part it is provided with some transverse rows of setae. The carpus is 0.6 to 0.7 times as long as the propodus, which is longer than the merus. The ischium is less than half as long as the merus.

The endopod of the first pleopod of the male is large, laminar, and oval, with the distal half directed inwards; it is almost as long as the exopod. In the second pleopod of the male the appendix masculina is excessively long and reaches with slightly less than half its length beyond the tip of the endopod. It bears several spinules in the distal part. The uropods are of the normal shape: the protopodite ends in an acute point, the exo- and endopod

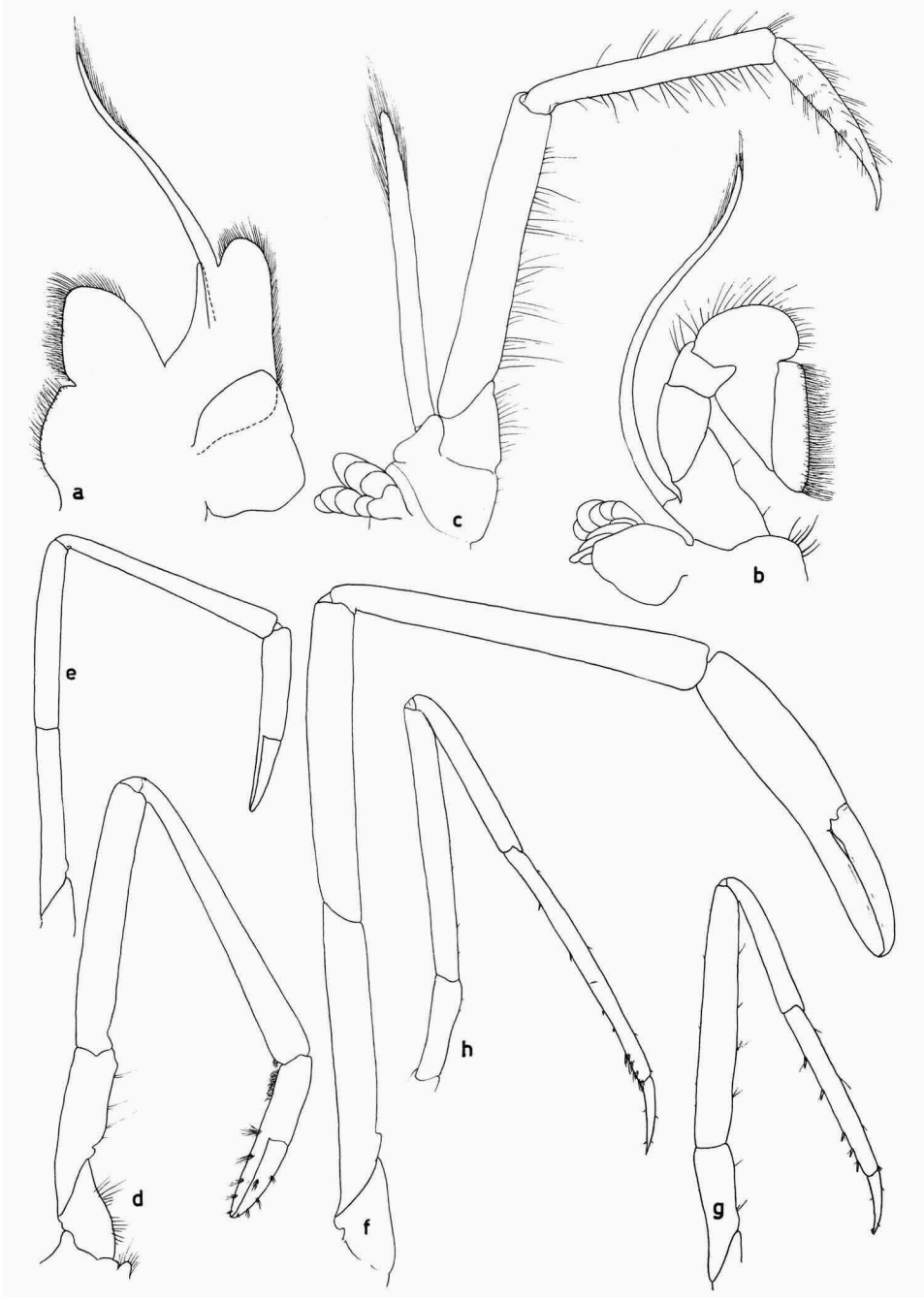

Fig. 7. *Palaemonetes turcorum* new species, paratypes. a, first maxilliped; b, second maxilliped; c, third maxilliped; d, first pereiopod of female; e, second pereiopod of male; f, second pereiopod of female; g, third pereiopod of male; h, fifth pereiopod of male. a, b, × 20; c-h, × 13.

are oval, the outer margin of the exopod is slightly convex and ends in an acute tooth which at its inner side is provided with a movable spinule.

The eggs are rather large and few, they measure 1.2-1.3 × 1.5-1.7 mm, being thus somewhat smaller than the eggs of *P. antennarius*.

The present new species differs from *P. antennarius*, as well as from *P. varians* (Leach), *P. zariquieyi* Sollaud, and *P. mesopotamicus* Pesta in having the endopod of the first male pleopod almost as large as the exopod and in the appendix masculina of the second male pleopod which is far longer than the endopod of that pleopod. In the shape of the male pleopods *P. turcorum* resembles *P. mesogenitor* Sollaud from Tunisia in which it finds its nearest relative. The new species may immediately be distinguished from *P. mesogenitor* in having only two plumose setae on the posterior margin of the telson, while *P. mesogenitor* has four to six setae there. Unfortunately no extensive description of *P. mesogenitor* has been published and the only figures of the species known to me concern details of embryonic stages. The eggs of *P. mesogenitor* are somewhat smaller than those of the present species, they measure 1.1 × 1.2 mm.

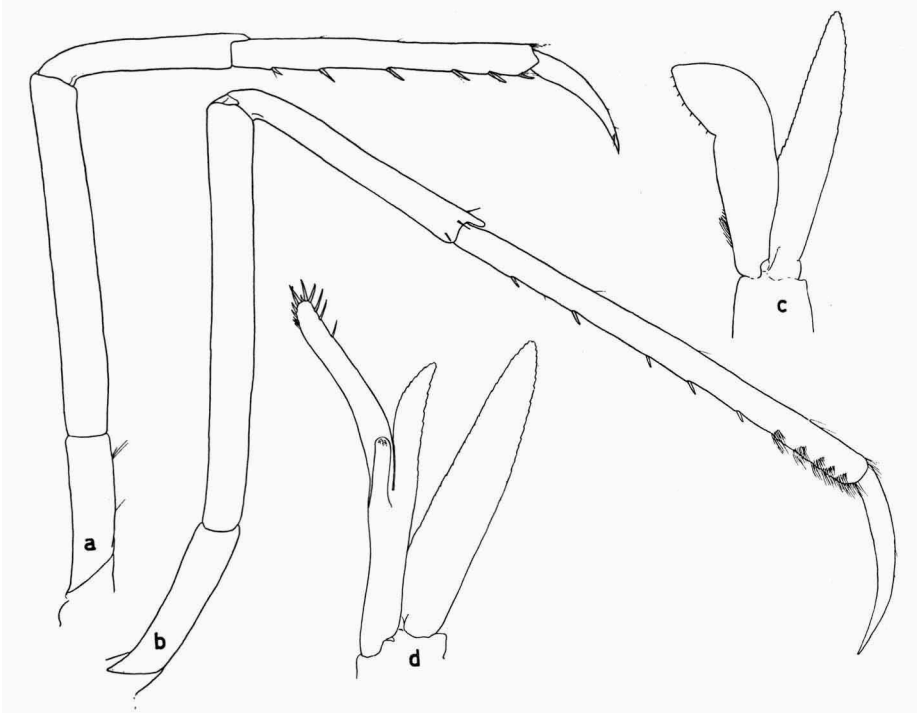

Fig. 8. *Palaemonetes turcorum* new species, paratypes. a, third pereiopod of female; b, fifth pereiopod of female; c, first pleopod of male; d, second pleopod of male. a-d, × 13.

Subfamily Pontoniinae

Periclimenes (Periclimenes) amethysteus (Risso, 1827)

Adriatic coast of Jugoslavia near Jadranovo, 30 km S. of Rijeka (= Fiume); 0-2 m deep; 5 July 1959; no. 166.— 3 specimens (1 ovigerous).

The specimens are 19 to 33 mm long, the largest specimen is an ovigerous female. The animals belong to the typical *Periclimenes amethysteus,* having the left and right second pereiopods distinctly unequal, with the fingers of the chelae longer than the palm.

Periclimenes amethysteus is known from the western Mediterranean and the Adriatic Sea; so far it has not been reported from the eastern Mediterranean.

Pontonia pinnophylax (Otto, 1821)

South coast of Turkey near Selimiye, about 6 km S.W. of Manavgat and about 62 km E. by S. of Antalya; 0-1 m deep; among stones near the old roman harbour; 23 April 1959; no. 60.— 1 specimen.

The specimen, which is 18 mm long, was found among other shrimps collected at this station and was not taken from a *Pinna*; no material of *Pinna* was collected here.

Pontonia pinnophylax is known from the entire Mediterranean and from West Africa as far south as northern Angola. The only previous record of this species from Turkey is the one by Hasselquist (1757, pp. 450, 572) from Izmir (= Smyrna). In the enumeration of the species collected by Hasselquist during his voyage to Palestine and Egypt the species is not dealt with under the "Insecta", but a reference to it is found on p. 450, in the text dealing with "Concha (Pinna)" (= *Pinna* spec.). Here Hasselquist mentioned an "Astacus minimus testa molli (Cancri species)" of which always one, sometimes more are found in *Pinna.* He continued to give the old and well known story that the shrimp acts as a kind of guard for the Pinna, warning it when enemies, in particular the Octopus, are approaching so that the Pinna can close its shells in time. In this part of the text Hasselquist did not give the locality whence he saw the animals, but this information is given in his letter to Linnaeus dated Smyrna (= Izmir) 16 December 1749 and published on pp. 569-574 of his book. In this letter, on p. 572, Hasselquist stated that a species of *Pinna* is found in great numbers in the sea near Smyrna and that these Pinna's always lodge a small shrimp which has a very thin shell. On p. 573, in the same letter, Hasselquist stated that he observed the Pinna's and the shrimps for the first time at the Greek island of Milo (= Milos).

Family Alpheidae

Athanas nitescens (Leach, 1814)

Harbour of Antalya, south coast of Turkey; 0-0.5 m deep; among algae; a layer of fresh water on top of the sea water; 19 April 1959; no. 47.— 3 specimens (1 ovigerous).

South coast of Turkey near Selimiye, about 62 km E. by S. of Antalya; 0-1 m deep; sandy bottom with stones and *Posidonia* vegetation; 4 May 1959; no. 71.— 7 specimens (2 ovigerous).

Adriatic coast of Jugoslavia near Jadranovo, 30 km S. of Rijeka (= Fiume); 0-2 m deep; 5 July 1959; no. 166.— 3 specimens (2 ovigerous).

The specimens are 10 to 15 mm long, the ovigerous females measuring 10 to 14 mm.

Athanas nitescens is known from the eastern Atlantic between S.W. Norway and the Cape Verde Islands, from the entire Mediterranean and from the Black Sea. There are several previous records of the species from Turkey: Ostroumoff (1896, pp. 65, 67) reported it from Istanbul, and from Bakirköy (= San Stefano) in the eastern part of the Sea of Marmara. It was moreover mentioned from the S.W. part of the Çanakkale Boğazi (= Dardanelles) between Çanakkale and Kumkale by Colombo (1885, p. 25).

Alpheus macrocheles (Hailstone, 1835)

South coast of Turkey near Selimiye, about 6 km S.W. of Manavgat, and about 62 km E. by S. of Antalya; 0-1 m deep; among stones near old roman harbour; 23 April 1959; no. 60.— 1 ovigerous female.

S.E. coast of Turkey near Mersin; 0-1 m deep; under stones on sandy bottom; 22 May 1959; no. 103.— 1 specimen.

The ovigerous female measured 27 mm, the other specimen 19 mm.

Alpheus macrocheles is known from the eastern Atlantic from the south coast of England to Angola, furthermore it is rather common in the western Mediterranean and the Adriatic Sea. So far it was not known from Turkey and had only once before been reported from the eastern Mediterranean, when Adensamer (1898, p. 29) mentioned a specimen from the Sporades (37°37'N 26°58'E).

Alpheus dentipes Guérin, 1832

Harbour of Antalya, south coast of Turkey; 0-0.5 m deep; among algae; sea covered by a layer of fresh water; 19 April 1959; no. 47.— 1 specimen.

1 to 2 km off the south coast of Turkey between Lara and Zincir, 10 to 18 km S.E. of Antalya; 15 to 20 m deep; bottom fine sand; fished with local fishing boat; 25 April 1959; no. 63.— 1 ovigerous female.

South coast of Turkey near Selimiye, about 62 km E. by S. of Antalya; 0-1 m deep; sandy bottom with stones and *Posidonia* vegetation; 4 May 1959; no. 71.— 10 specimens (4 ovigerous).

South-east coast of Turkey near Kizkalesi, about 58 km S.W. of Mersin; 1-2 m deep; bottom fine sand with loose algae; 12 May 1959; no. 84.— 6 specimens (2 ovigerous).

Adriatic coast of Jugoslavia near Jadranovo, 30 km S. of Rijeka (= Fiume); 0-2 m deep; 5 July 1959; no. 166.— 1 specimen.

The specimens measure 12 to 21 mm, the ovigerous females are 13 to 21 mm long.

Alpheus dentipes is a common species throughout the Mediterranean, it is also known from the Black Sea; in the eastern Atlantic its range extends from the Portuguese coast to the Gulf of Guinea. Previous records from Turkey are: Near Bakirköy (= San Stefano), eastern part of the Sea of Marmara (Ostroumoff, 1896, p. 67), S.W. part of the Çanakkale Boğazi (= Dardanelles) between Çanakkale and Kumkale (Colombo, 1885, p. 25).

Family Hippolytidae

Hippolyte inermis Leach, 1815

South coast of Turkey near Selimiye, about 6 km S.W. of Manavgat, and about 62 km E. by S. of Antalya; 0-1 m deep; among stones near the old roman harbour; 23 April 1959; no. 60.— 13 specimens (10 ovigerous).

South coast of Turkey near Selimiye; 0-1 m deep; sandy bottom with stones and *Posidonia* vegetation; 4 May 1959; no. 71.— 7 specimens (2 ovigerous).

The specimens are 13 to 31 mm long, the ovigerous females 23 to 29 mm. All the non-ovigerous specimens, except the juvenile of 13 mm carried a Bopyrid parasite in one of the branchial chambers.

The species is known from the entire Mediterranean, the Black Sea, and the Atlantic coast of Europe from the British Isles southward. It is now for the first time reported from Turkey.

Hippolyte longirostris (Czerniavsky, 1869)

Harbour of Antalya, south coast of Turkey; 0-0.5 m deep; among algae; sea covered by a layer of fresh water; 19 April 1959; no. 47.— 2 specimens (1 ovigerous, 1 with Bopyrid).

South coast of Turkey near Selimiye, about 6 km S.W. of Manavgat, and 62 km E. by S. of Antalya; 0-1 m deep; among stones near old roman harbour; 23 April 1959; no. 60.— 2 specimens.

South coast of Turkey near Selimiye; 0-1 m deep; sandy bottom with stones and *Posidonia* vegetation; 4 May 1959; no. 71.— 6 specimens (5 ovigerous).

Breakwater of Mersin harbour, south-east coast of Turkey; 0--1 m deep; among algae on stone breakwater; 10 May 1959; no. 82.— 2 ovigerous females.

Mersin harbour, south-east coast of Turkey; 0.5 to 1.5 m deep; bottom fine sand; night collecting; 15 May 1959; no. 89.— 1 ovigerous female.

Aegean coast of Greece near the harbour of Porto Lago, Thraki; 0-2 m deep; 29 June 1959; no. 160.— 49 specimens (8 ovigerous).

Adriatic coast of Jugoslavia near Jadranovo, 30 km S. of Rijeka (= Fiume); 0-2 m deep; 5 July 1959; no. 166.— 3 specimens (1 ovigerous).

The specimens are 7 to 19 mm long, the ovigerous females measure 11 to 19 mm.

The species is common in the Mediterranean and the Black Sea and has also been found on the south coast of England and the Atlantic coast of France; there is furthermore a doubtful record from W. Africa. The only previous record from Turkey known to me is the one by Ostroumoff (1896, p. 71 as *Virbius gracilis*) who reported it from Bü Çekmece in the Sea of Marmara.

Thoralus cranchii (Leach, 1817)

Harbour of Antalya, south coast of Turkey; 0-0.5 m deep; among algae; sea covered by a layer of fresh water; 19 April 1959; no. 47.— 1 specimen.

South coast of Turkey near Selimiye, about 62 km E. by S. of Antalya; 0-1 m deep; sandy bottom with stones and *Posidonia* vegetation; 4 May 1959; no. 71.— 2 ovigerous females.

Adriatic coast of Jugoslavia near Jadranovo, 30 km S. of Rijeka (= Fiume); 0-2 m deep; 5 July 1959; no. 166.— 23 specimens (5 ovigerous).

The specimens are 11 to 16 mm long, the ovigerous females measure 14 to 16 mm.

The species is known from the entire Mediterranean; in the eastern Atlantic it has been reported from the North Sea to the Gulf of Guinea. Ostroumoff (1896, p. 65) reported it under the name *Hippolyte Bunseni* from Istanbul, no other Turkish records of the species are known to me.

Lysmata seticaudata (Risso, 1816)

Adriatic coast of Jugoslavia near Jadranovo, 30 km S. of Rijeka (= Fiume); 0-2 m deep; 5 July 1959; no. 166.— 10 specimens (4 ovigerous).

The specimens are 30 to 38 mm long the ovigerous females being 30 to 38 mm.

Lysmata seticaudata is known from the Atlantic coast of Europe from the Channel Islands south; it is fairly common in the western Mediterranean and the Adriatic, and has also been reported from the Black Sea. So far it has not been found in the eastern Mediterranean, and no Turkish records are known to me.

Family Processidae

Processa edulis edulis (Risso, 1816)

South coast of Turkey near Selimiye, about 62 km E. by S. of Antalya; 0-1 m deep; sandy bottom with stones and *Posidonia* vegetation; 4 May 1959; no. 71.— 5 specimens (2 ovigerous).

Breakwater of Mersin harbour, south-east coast of Turkey; 0-1 m deep; among algae on the stone breakwater; 10 May 1959; no. 82.— 1 specimen.

South-east coast of Turkey near Kizkalesi, about 58 km S.W. of Mersin; 0-1 m deep; from rocks with algae; 12 May 1959; no. 83.— 1 specimen.

South-east coast of Turkey near Kizkalesi; 1-2 m deep; bottom fine sand with loose algae; 12 May 1959; no. 84.— 1 specimen.

Adriatic coast of Jugoslavia near Jadranovo, 30 km S. of Rijeka (= Fiume); 0-2 m deep; 5 July 1959; no. 166.— 10 specimens.

The specimens are 7 to 29 mm long, the two ovigerous females are 28 and 29 mm in length.

As shown by a recent revision of the European species of the genus *Processa* (Nouvel & Holthuis, 1957), several species of the genus have formerly been confused under the name *Processa* (or *Nika*) *edulis* and therefore most of the older records can not be relied upon. The species is known with certainty from the Mediterranean, where it is represented by the typical subspecies, and from the eastern Atlantic (British Isles, southern North Sea, Atlantic coast of France) where the two subspecies *crassipes* Nouvel & Holthuis and *arcassonensis* Nouvel & Holthuis are found. The occurrence of the species in the Black Sea is very probable. Ostroumoff (1896, pp. 79, 83, 86) reported "*Nika edulis*" from Marmara and Avşa (= Aphisia) Islands in the Sea of Marmara and from Gelibolu (= Gallipoli), while Santucci (1928, p. 349) mentioned the find of "*Processa canaliculata*" near Cape Kefaloka (= Kephalu), Anatolia. Without re-examination of the material of these two authors it is impossible to know to which of the various species of *Processa* their specimens belong.

Processa acutirostris Nouvel & Holthuis, 1957

Adriatic coast of Jugoslavia near Jadranovo, 30 km S. of Rijeka (= Fiume); 0-2 m deep; 5 July 1959; no. 166.— 1 ovigerous female.

The specimen is 35 mm long.

The species is quite common in the western basin of the Mediterranean, though it is scarcer there than *P. edulis*. As Nouvel & Holthuis (1957) pointed out, it is probable that the Adriatic material reported upon by previous authors like Nardo and Pesta contained specimens of the present species, but so far there were no certain records of the species from the Adriatic Sea. It is not known from Turkey.

Processa parva Holthuis, 1951

Harbour of Mersin, south-east coast of Turkey; 0.5 to 1.5 m deep; bottom fine sand; night collecting; 15 May 1959; no. 89.— 3 specimens.

The specimens are 16 to 22 mm long.

Processa parva is a species which seems to live preferably on a sandy bottom. It is now known from the entire Mediterranean, and from the east-

ern Atlantic (from the southern North Sea to the Gulf of Guinea). The present specimens are the first to be reported from the eastern Mediterranean.

Family Crangonidae

Crangon crangon (Linnaeus, 1758)

Black Sea coast of Turkey near the harbour of Trabzon; 0-5 m deep; 1 to 7 June 1959; no. 119.— 1 specimen.

Brackish marsh near Porto Lago, Thraki, Greece; 28 June 1959; no. 159.— 21 specimens.

The specimens measure 19 to 34 mm.

The species is known from the Atlantic coast of Europe from the White Sea south, furthermore it has been reported from the entire Mediterranean and the Black Sea. There is also a record of the species from Arakan, India. Ninni (1923, p. 61) reported the species, under the name *Crangon vulgaris,* from Istanbul; no other Turkish records are known to me.

Pontophilus monacanthus new species (fig. 9)

Harbour of Mersin, south-east coast of Turkey; 0.5-1.5 m deep; bottom fine sand; night collecting; 15 May 1959; no. 89.— 22 specimens (8 ovigerous).

Of the present species only a preliminary description is provided here. A full treatment will be given in a revision of the European species of the genus *Pontophilus* which will be published later.

Pontophilus monacanthus belongs to the group of *Pontophilus bispinosus* Westwood, 1835, *P. hendersoni* Kemp, 1915, *P. megalocheir* (Stebbing, 1915), and *P. wolffi* Holthuis, 1951, which are characterized by the fact that the thumb of the large chela is longitudinally incised. *Pontophilus mbizi* Holthuis, 1952, which also belongs to this group probably will fall as a synonym of *P. bispinosus* Westwood.

The present species is characterized by that only one spine is present in the median line of the carapace; there is never any trace of a second median spine, while in the other species of the group such a second spine usually is present. The rest of the carapace shows neither tubercles nor sharp carinae, apart from a short carina behind the pterygostomian spine.

Moreover, in *P. monacanthus* the dactylus of the second pereiopods is about 1.5 times as long as the fixed finger of the chela, while in all other species of the *P. bispinosus* group the fingers of this chela are of practically equal length. This character is constant in the large series at my disposal and proves an easy means for the recognition of the species.

The animals are mottled with brown, while a dark reddish brown trans-

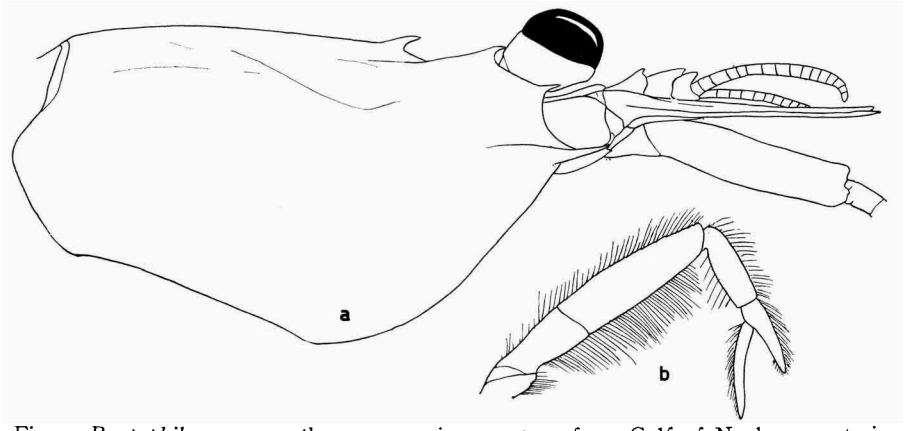

Fig. 9. *Pontophilus monacanthus* new species, paratype from Gulf of Naples. a, anterior part of body in lateral view; b, second pereiopod. a, b, × 12.

verse band occupies the greater part of the fourth abdominal somite.

The only other species of this group occurring in the Mediterranean is *Pontophilus bispinosus,* which as a rule is much smaller than *P. monacanthus.* The specimens of the former species seen by me do not exceed 15 mm, while specimens of the latter of up to 25 mm have been examined. The size of my Turkish specimens varies between 9 and 22 mm, the ovigerous females being 13 to 17 mm long. In material from other localities the ovigerous females range in length between 17 and 25 mm.

The species proves to occur throughout the Mediterranean. I have seen material from the following localities: Melilla, Spanish Morocco (June 1946, J. Rutllant. — 1 ovigerous female), Playa Major, Cadaqués, N.E. Spain (2 September 1954, R. Zariquiey Alvarez. — 1 ovigerous female), shore N. of Torregaveta, W. of Naples, Italy (flat sandy coast, in water of about 1 m deep, 18 May 1950, L. B. Holthuis. — 3 ovigerous females), Posillipo, Naples, Italy (8-10 m deep, 27 April 1959, L. B. Holthuis. — 3 ovigerous females; without further data. — 3 specimens, of which 2 ovigerous), Villa Rocca Romana, Naples, Italy (15 m deep, night collecting, 8 May 1959, L. B. Holthuis. — 5 specimens of which 3 ovigerous), Gulf of Naples, Italy (28 specimens, of which 14 ovigerous). The specimens from Melilla and Cadaqués form part of the private collection of Dr. R. Zariquiey Alvarez of Barcelona, part of the last lot from the Gulf of Naples belongs to the Zoological Station of Naples, the remaining material is preserved in the collection of the Rijksmuseum van Natuurlijke Historie at Leiden.

Holotype is the largest specimen from Turkey, a female of 22 mm long; it is inserted in the collection of the Leiden Museum under Reg. No. Crustacea D 13925. All the other specimens mentioned here are paratypes.

Supersection Macrura Reptantia
Section Palinuridea
Family Scyllaridae

Scyllarides latus (Latreille, 1803)

South coast of Turkey near Selimiye, about 6 km S.W. of Manavgat, and about 62 km E. by S. of Antalya; caught by fishermen at several tens of meters offshore in water of at most 10 m deep; 23 April 1959; no. 61.— 1 female.

The animal, a female of 220 mm length, is a beautiful well developed specimen of this species. It was bought for 2.5 Lira from the fishermen who had caught it.

Scyllarides latus is known from the entire Mediterranean, from the Atlantic coast of Portugal, from Madeira, the Azores and the Canary Islands; West African records of this species need confirmation as a confusion with *S. herklotsii* (Herklots) is possible. Though the species has been reported at various instances from the eastern Mediterranean, there are no previous records from Turkey.

Section Astacidea
Family Astacidae

Astacus colchicus Kessler, 1876 (fig. 10)

Cori köyü, about 7 km W. of Ünye, and about 73 km E. of Samsun, on the Black Sea coast of Turkey; at about sea level; in a river arm which recently has been cut off from the sea; 11 June 1959; no. 138.— 2 females.

The two specimens, both of which are females, are 83 and 136 mm long. They show the characters typical for the species. By their collectors the animals were thought to be *Astacus astacus* (L.), a species to which the present indeed is closely related. It differs, however, in several points: both of the post-orbital ridges end anteriorly in a spine, the rostrum is more slender and more evenly concave. In my specimens of *Astacus astacus* the median part of the rostrum is flat, the lateral parts being curved upwards and the lateral margins swollen, so that a cross-section through the rostrum shows a more or less trapezoid figure, in *A. colchicus* the lateral margins of the rostrum are not swollen and such a cross section has the shape of a circle segment. The median carina of the rostrum in my specimens is narrow and extends as far backwards as the posterior post-orbital ridge. The surface of the carapace is rougher than in *A. astacus*: the granules, especially those on the sides, are stronger. Many of these granules, both before and behind the cervical groove, end in anteriorly directed sharp tips. At each side one rather strong, dark coloured spine is placed immediately behind the cervical groove. In my female specimens the concave part of the cutting edge of the

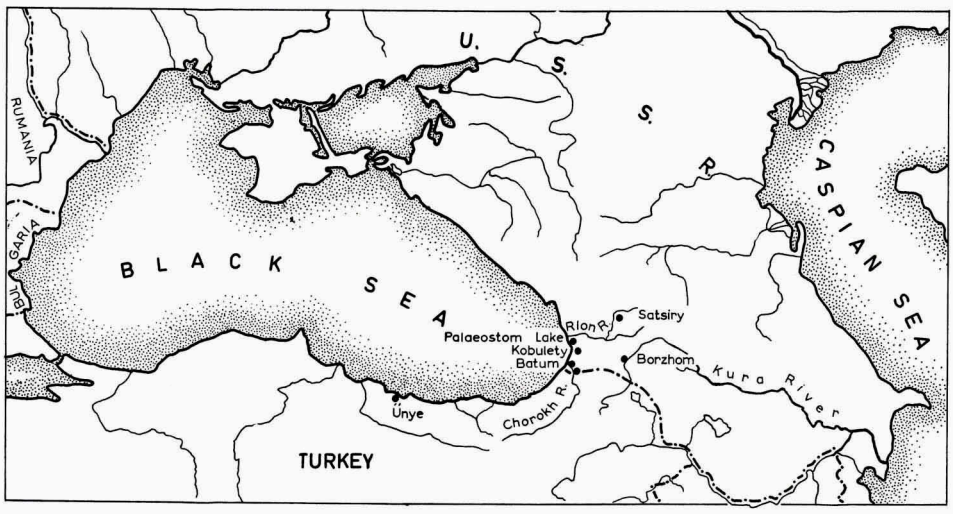

Fig. 10. Distribution of *Astacus colchicus* Kessler.

fixed finger of the large chelae is not very distinct, it lies closer to the base than to the tip of the edge. The upper part of the palm and of the dactylus show many soft short hairs.

Up to the present *Astacus colchicus* was only known from Transcaucasia, all published localities being in the Georgian S.S.R., U.S.S.R. The species was originally described by Kessler (1876, pp. 1-6) from the Upper Rion River and its tributaries which come down from the mountains; Kessler obtained his specimens in Kutais. Birstein & Vinogradov (1934, p. 49, fig. 9) give Satsiry in the Upper Rion basin as a locality for the species. Kessler further remarked that in Palaeostom Lake, just south of the mouth of the Rion River the presence of crayfish had been reported, but that since he had not been able to examine material from there he was not certain of its specific identity. Birstein & Vinogradov (1934, fig. 9) in their map of distribution of the present species marked Lake Palaeostom as a locality, so that they evidently had material from there. To the south of the Rion River basin Birstein & Vinogradov indicate Kobulety near the Black Sea coast as a third locality for the species, and still further south they give two localities on the Chorokh River between Batum and the Turco-Russian border. Bott (1950, pl. 1 fig. 2, pl. 3 fig. 5) figured a specimen of the present species from Batum. Kessler (1876, p. 6) already mentioned that the species was not only found in rivers emptying in the Black Sea, but that it had been artificially introduced by man in branches of the upper reaches of the Kura River, which flows to the Caspian Sea. Birstein & Vinogradov (1934, fig. 9) give Borzhom on the Kura River as a locality of the species. *Astacus*

colchicus is offered for sale on the markets of Kutais (specimens from the Upper Rion River basin), Tbilisi (= Tiflis) (specimens from the upper Rion River basin and from the Kura River), and of Batum (specimens from the Chorokh River). Kessler (1876, p. 6) already remarked that "die Frage zu entscheiden, ob der colchische Flusskrebs nicht auch in den Gebirgsflüssen Abchasiens und vielleicht auch Kleinasiens sich findet, muss zukünftigen Untersuchungen vorbehalten bleiben". Birstein & Vinogradov (1934, fig. 9) in their map of distribution of the species include, with a question mark, the entire Chorokh and the upper Kura basins in the range of the species. The present find of *Astacus colchicus* in northern Turkey greatly extends the known range of the species and confirms Kessler's supposition that this range extends into Asia Minor. According to Bott (1950, p. 12) the occurrence of the species in the Chorokh basin is said by Birstein & Vinogradov (1934) to be artificial, the species having been introduced there by man. I cannot find any statement to that effect in Birstein & Vinogradov's paper, and in view of our present knowledge of the distribution of the species its occurrence in the Chorokh would seem to be perfectly natural. The only locality where the species is found outside its natural range seems to be the Kura River.

Astacus leptodactylus Eschscholtz, 1823

The members of the expeditions saw this species offered for sale on the markets of Istanbul, but no specimens were obtained.

Astacus leptodactylus proves to be rather widely distributed in Turkey. Bott (1950, p. 15) reported it from three Turkish localities: near the Bosporus, near Bursa (= Brussa), and near Kayseri. Ninni (1923, p. 61) also reported the species from Istanbul, and Tortonese (1952, p. 84) mentioned it (as *Potamobius leptodactylus*) from Lake Şapanca. Whether the material from Lake Beysehir reported upon by Tortonese (1952, p. 92) as *Potamobius* also belongs here cannot be made out from Tortonese's account.

Bott (1950) brought his Turkish material to the subspecies *A. l. salinus* Nordmann, 1842.

Astacus leptodactylus inhabits the basins of several rivers in the southern and central part of European Russia (from the Wolga west to the Pruth), and is also found in the lower Danube basin, in Bulgaria, and in Turkey. The species has been introduced in the Baltic area and in western Siberia.

Two other species of the genus *Astacus* have been reported from Turkey. According to Bott's (1950) recent monograph of the European Astacidae, however, only *Astacus leptodactylus* is found in Turkey, and the following records must therefore be considered with some reserve:

Ninni (1923, p. 61) reported both *Astacus pallipes* Lereboullet, 1858, and *A. astacus* (Linnaeus, 1758) from Lake Apulyont (= Appoloni) and Lake Manyas (= Namias) which are situated just S. of the Sea of Marmara, the animals being sold on the Istanbul markets. Furthermore, Geldiay (1949, p. 173, pl. 11 fig. 3) reported *A. astacus* from near Cubuk (= Tchoubouk); his figure of the species is not such that a definite identification is possible.

It is quite certain that *A. pallipes* does not occur in Turkey, so that Ninni must be mistaken in bringing Turkish material to that species. Whether the records of *A. astacus* are correct, or that they are based on either *A. leptodactylus* or *A. colchicus* cannot be ascertained at the moment.

Astacus astacus (Linnaeus, 1758)

Branch river of the Vardar River near Vazarci, south of Skopje, Macedonia, Jugoslavia; 30 June 1959; no. 163.— 4 males, 2 females.

The males measure 59 to 73 mm, the females 63 to 69 mm.

The present specimens were collected in the Vardar River basin, the type locality of *Astacus astacus balcanicus* (Karaman). Bott (1950, p. 10, footnote 6), who examined an extensive material of *Astacus astacus* from all over Europe, was of the opinion that the Vardar form could not be maintained as a distinct subspecies. According to Bott, the characters mentioned by Karaman to separate his var. *balcanicus* from the typical *Astacus astacus* all fall within the range of variation of the latter. I agree with Bott as far as the characters of the rostrum are concerned. According to Karaman (1929, pp. 147, 148) the anterior part of the rostrum is longer in *Astacus astacus balcanicus* than in the typical subspecies. I could not find any difference in this respect when I compared the present Jugoslav material with specimens of *A. astacus* of about the same size collected in the Netherlands. In many instances the anterior part of the rostrum of the Jugoslav specimens even proved to be shorter than that in the Dutch material. Also the lateral spines of the rostrum are not stronger in my Vardar material than in most specimens from the eastern part of the Netherlands. However, in none of my Dutch specimens did I observe the number of 5 to 8 spines behind the cervical groove which is present in all my Jugoslav material; in the Dutch specimens as a rule only one such spine is found. According to Bott this character proved to be variable in his material. On the other hand, Bott mentioned a difference between his Vardar specimens and the other material at his disposal, not noted by Karaman. In the Vardar form, namely, the palm of the large chelae is more slender and the concave part of the cutting edge

of the fingers is less deep. These two characters are also more or less distinctly shown by my material. As my Vardar specimens are only six in number and as all of them are rather small, I feel not competent to give a definite opinion on the validity of Karaman's form and, for the time being at least, follow Bott in synonymizing var. *balcanicus* with the typical form.

Astacus astacus inhabits a large part of Europe. Its range extends from S. Norway, S. Sweden, and S. Finland to France, N. Italy and the N.W. Balkans. To the east the range of the species extends to Poland and western Russia. The artificial introduction of the species in waters in which it did not originally occur has considerably obscured its original distributional pattern. *Astacus astacus balcanicus* has been reported from the Vardar River basin and Ochrid Lake.

For the possible occurrence of *A. astacus* in Turkey see under *A. leptodactylus*.

Section Thalassinidea
Family Callianassidae

Upogebia pusilla (Petagna, 1792)

Aegean coast of Greece near the harbour of Porto Lago, Thraki; 0-2 m deep; 29 June 1959; no. 160.— 55 specimens.

The specimens are 30 to 53 mm long.

In Porto Lago the species was caught in large quantities with baited lines and used afterwards as bait for catching fishes.

Upogebia pusilla (Petagna, 1792), which perhaps is better known as *Upogebia littoralis* (Risso, 1816), inhabits the entire Mediterranean and the Black Sea. It has also been reported from S.W. France and Portugal. As the status of the various European species of the genus *Upogebia* is still far from clear, the exact range of *U. pusilla* is not known.

Suborder Anomura
Section Paguridea
Family Paguridae
Subfamily Diogeninae

Paguristes oculatus (Fabricius, 1775)

Aegean coast of Greece near the harbour of Porto Lago, Thraki; 0-2 m deep; 29 June 1959; no. 160.— 1 specimen.

Adriatic coast of Jugoslavia near Jadranovo, 30 km S. of Rijeka (= Fiume); 0-2 m deep; 5 July 1959; no. 166.— 1 specimen.

The specimens have the carapace length 8 and 19 mm.

The species is known from the entire Mediterranean and from the eastern Atlantic between N.W. Spain, Morocco and Madeira; more to the south (down to Angola) it is represented by a subspecies *rubropictus* A. Milne Edwards & Bouvier. It has been reported from Turkey by Ostroumoff (1896, pp. 60, 82, 88, 92): S. end of the Bosporus, near Kizil Adalar (= Princes Islands), near Aloni (= Pasha Liman) Island and near Gelibolu (= Gallipoli), Sea of Marmara. Colombo (1885, p. 25) reported the species from the S.W. part of the Çanakkale Boğazi (= Dardanelles) between Çanakkale and Kumkale. Both Ostroumoff and Colombo used the name *Paguristes maculatus* for the species.

Clibanarius erythropus (Latreille, 1818)

South coast of Turkey near Lara, 10 km S.E. of Antalya; 0-0.5 m deep; among stones and algae; 8 April 1959; no. 16.— 1 male.

South coast of Turkey near Selimiye, about 62 km E. by S. of Antalya; 0-1 m deep; bottom sandy with stones and *Posidonia* vegetation; 4 May 1959; no. 71.— 5 males.

Black Sea coast of Turkey near Samsun; rocky shore; 0-2 m deep; 12 June 1959; no. 141.— 1 female.

The specimens from lots 16 and 71 are males and have the carapace 5 to 12 mm long; the other specimen is a female with cl. 6 mm.

Clibanarius erythropus is a common species throughout the Mediterranean. It is also known from the Black Sea and from the eastern Atlantic between Brittany (France) and the Salvage Islands. The species has been reported several times from Turkish waters: Istanbul (Holthuis & Gottlieb, 1958, p. 68), S. end of the Bosporus, near Kizal Adalar (= Princes Islands), near Bakirköy (= San Stefano), Aloni (= Pasha Liman) Island, and Avşa (= Aphisia) Island, Sea of Marmara (Ostroumoff, 1896, pp. 64, 67, 87, 88, 92 as *C. misanthropus*). Ostroumoff (1896, p. 83) reported *Clibanarius Rouxii* Heller from Gelibolu (= Gallipoli); Heller's species is generally considered a synonym of *C. erythropus*.

Calcinus ornatus (P. Roux, 1830)

Harbour of Antalya, south coast of Turkey; 0-0.5 m deep; among algae; sea covered with a layer of fresh water; 19 April 1959; no. 47.— 2 juvenile specimens.

South coast of Turkey near Selimiye, about 62 km E. by S. of Antalya; 0-1 m deep; sandy bottom with stones and *Posidonia* vegetation; 4 May 1959; no. 71.— 1 male, 2 females.

The juveniles have the carapace length 2 and 3 mm, the females have this length 4 mm and the male 6 mm.

The specimens from Selimiye inhabited worm tubes which were attached to a very large stone. The juveniles were found in Gastropod shells.

Calcinus ornatus is known from the Azores, the Canary Islands, and from the entire Mediterranean. It is nowhere common, and has not been reported from Turkey before.

Diogenes pugilator (P. Roux, 1829)

Black Sea coast of Turkey near the harbour of Trabzon; 0-5 m deep; 1-7 June 1959; no. 119. —11 specimens.

South coast of the Sea of Marmara near Gemlik, about 25 km N. of Bursa, Asiatic Turkey; 21 June 1959; no. 150.— 1 specimen.

Aegean coast of Greece near the harbour of Porto Lago, Thraki; 0-2 m deep; 29 June 1959; no. 160.— 14 specimens.

The carapace length of the specimens varies between 4 and 7 mm.

Diogenes pugilator is known from the eastern Atlantic from the southern North Sea south to Angola, from the entire Mediterranean, and from the Black Sea; it has also been reported from the Red Sea and Singapore. The previously published records of the species from Turkey are: near Bü Çekmece, near Bakirköy (= San Stefano), and east coast of Avşa (= Aphisia) Island, Sea of Marmara (Ostroumoff, 1896, pp. 67, 71, 87, as *D. varians*), S.W. end of the Çanakkale Boğazi (= Dardanelles) just E. of Kumkale (Colombo, 1885, p. 23 as *D. varians*).

Subfamily Pagurinae

Pagurus anachoretus Risso, 1827

South coast of Turkey near Selimiye, about 62 km E. by S. of Antalya; 0-1 m deep; sandy bottom with stones and *Posidonia* vegetation; 4 May 1959; no. 71.— 1 male, 1 ovigerous female.

Adriatic coast of Jugoslavia near Jadranovo, 30 km S. of Rijeka (= Fiume); 0-2 m deep; 5 July 1959; no. 166.— 19 specimens (4 ovigerous).

The carapace length of these specimens varies between 3 and 10 mm; in the ovigerous females it is 6 to 8 mm.

Pagurus anachoretus is known from the Atlantic coast of Portugal, and from the entire Mediterranean. The only previous record of the species from Turkey known to me is that by Colombo (1885, p. 25) who mentioned it (as *Eupagurus anachoretus*) from the S.W. part of the Çanakkale Boğazi (= Dardanelles) between Çanakkale and Kumkale.

Catapaguroides timidus (P. Roux, 1830)

Harbour of Antalya, south coast of Turkey; 0-0.5 m deep; among algae; sea covered by a layer of fresh water; 19 April 1959; no. 47.— 22 specimens (3 ovigerous).

The carapace length of the specimens is about 2 to 2.5 mm.

Catapaguroides timidus is known from the eastern Atlantic between Brit-

tany (France) and the Canary Islands, and from the entire Mediterranean. It was not known from Turkey, Israel being the only locality in the eastern Mediterranean whence it has so far been reported.

Section Galatheidea
Family Galatheidae

Galathea bolivari Zariquiey, 1950 (fig. 11a)

South coast of Turkey near Selimiye, about 62 km E. by S. of Antalya; 0-1 m deep; sandy bottom with stones and *Posidonia* vegetation; 4 May 1959; no. 71.— 1 male, 1 ovigerous female.

The male has the carapace 6 mm long, the female 7 mm.

Zariquiey (1950, pp. 311-314) showed that the Mediterranean material that until that time was commonly assigned to *Galathea intermedia* included two species, viz., the true *Galathea intermedia* Lilljeborg, and an at that time undescribed species, for which Zariquiey introduced the name *G. bolivari*. In his paper Zariquiey enumerated the differences between the two species. Examination of the present Turkish material showed that both *Galathea intermedia* and *G. bolivari* are represented. In *Galathea bolivari* the rostrum is wider than in *G. intermedia*, where it is elongate triangular. The rostral teeth in the present species are larger and less appressed. The first transverse ridge on the carapace behind the rostrum is hardly produced forwards in the median part, and there is no short transverse median ridge immediately behind it. Two strong submedian setae are implanted on the long ridge. In *Galathea intermedia* the first transverse ridge of the carapace behind the rostrum is forwards produced in the middle and a short transverse ridge is placed immediately behind it. It is on this short and not on the longer ridge that two very strong submedian setae are implanted. The number of lateral spines of the carapace situated between the antero-lateral spine and the spine immediately behind the cervical groove is usually two in *Galathea bolivari*, three in *Galathea intermedia*. The number of complete transverse ridges on the carapace behind the cervical groove is two in *G. bolivari*, three or four in *G. intermedia* (the ridge of the posterior margin of the carapace not included).

Apart from several small hairs in the distal part of the ophthalmic peduncle there are two strong setae on the line separating the peduncle from the cornea. These setae are not found in *G. intermedia*.

The fresh colour of the present specimens was not noted.

As already indicated by Zariquiey, *Galathea bolivari* is a species of rather shallow coastal waters, while in the Mediterranean Sea, *G. intermedia* is usually found at greater depths and obtained by dredging, etc.

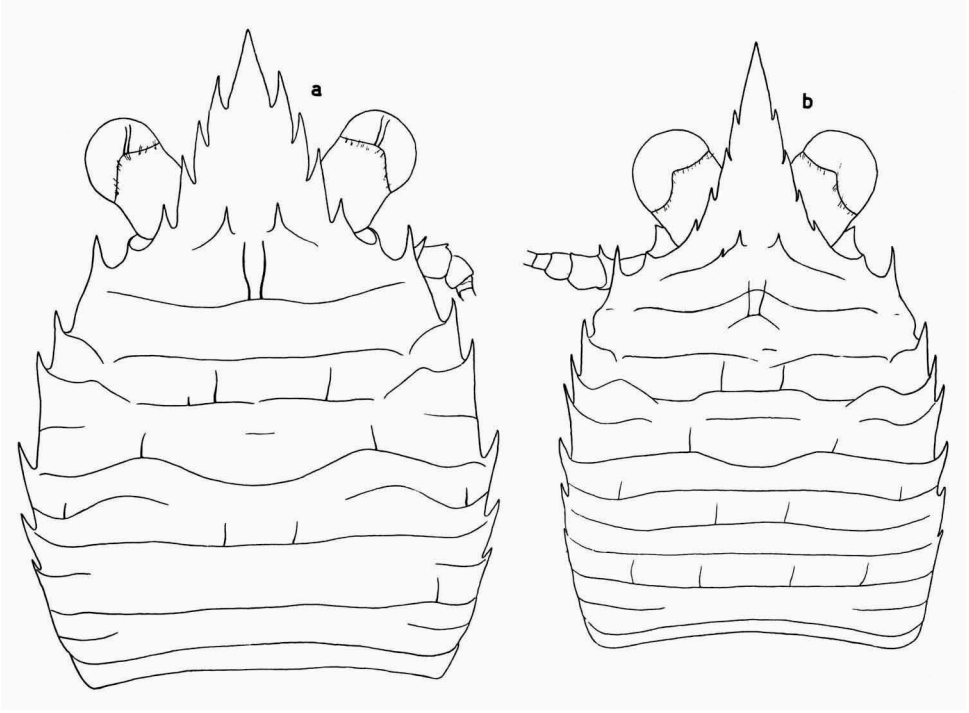

Fig. 11. a, *Galathea bolivari* Zariquiey, specimen from Selimiye, Turkey (lot 71), carapace in dorsal view. b, *Galathea intermedia* Lilljeborg, specimen from S.E. of Antalya, Turkey (lot 63), carapace in dorsal view. a, b, × 12.

Until now *Galathea bolivari* was only known from the region of Cadaqués, N.E. Spain and from the Baleares.

Galathea intermedia Lilljeborg, 1851 (fig. 11b)

1 to 2 km off the south coast of Turkey between Lara and Zincir, 10 to 18 km S.E. of Antalya; 15 to 20 m deep; bottom fine sand; fished with local fishing boat; 25 April 1959; no. 63.— 1 ovigerous female.

The specimen has a carapace length of 6 mm. It agrees perfectly with Zariquiey's (1950) account of the species and shows the differences from *G. bolivari* indicated by that author, the most important of which are enumerated above under *G. bolivari*.

Galathea intermedia has been reported from the eastern Atlantic between S.W. Norway and Angola and from the entire Mediterranean. It has not been reported before from Turkey and the only previous records from the eastern Mediterranean are both from Israel.

Family Porcellanidae

Pisidia Leach, 1820

In a recent monograph of the West American Porcellanidae Haig (1960, pp. 197, 207, 208) has shown that the genera *Porcellana* Lamarck, 1801, and *Pisidia* Leach, 1820, which were synonymized by most authors, actually are distinct. The consequence of this is that of the European species, that are generally placed in the genus *Porcellana,* only the type species of that genus, *Porcellana platycheles* (Pennant), keeps the generic name *Porcellana,* while the other species, viz., *P. longicornis* (L.) and the forms related to it, have to be placed in the genus *Pisidia.*

In the present collection the genus *Pisidia* is represented by two species: *P. bluteli* (Risso) and *P. longimana* (Risso).

Pisidia bluteli (Risso, 1816) (figs. 12a, d, 13a)

South coast of Turkey near Kizkalesi, about 58 km S.W. of Mersin; 0-1 m deep; from algae covered stones; 12 May 1959; no. 83.— 2 specimens (1 ovigerous).

Adriatic coast of Jugoslavia near Jadranovo, 30 km S. of Rijeka (= Fiume); 0-2 m deep; 5 July 1959; no. 166.— 1 specimen.

The specimens have a carapace breadth ranging from 3.5 to 5 mm; in the ovigerous female it is 4.5 mm.

Until recently is was generally accepted that two species of the genus *Porcellana* (s.l.) are found in the Mediterranean: *P. platycheles* (Pennant) and *P. longicornis* (L.). R. Zariquiey Alvarez (1951, pp. 131-139) was the first modern author to show that a third species occurs in this sea, viz., *P. bluteli* Risso, a species which generally was considered to be synonymous with *P. longicornis.* In his paper Zariquiey listed the differences between the two species.

Examination of the present specimens and comparison with other material from the Mediterranean, showed that apart from some specimens which agree excellently with Zariquiey's account of *P. bluteli,* there are several others which differ quite conspicuously from *Pisidia bluteli,* but which can not be assigned to *P. longicornis* either; these specimens show several intermediate characters. At first I was inclined, therefore, to reunite *P. bluteli* and *P. longicornis* again and to consider them as a single variable species, but had to abandon that idea as a study of material of *P. longicornis* from the Atlantic coast of Europe showed the various characters to be quite constant in that material. A renewed study of the Mediterranean and Atlantic material of the *longicornis* complex then convinced me that not two but three species have been confused under the name *Porcellana longicornis* and that all three occur in the Mediterranean. In the Mediterranean the true *Pisidia longi-*

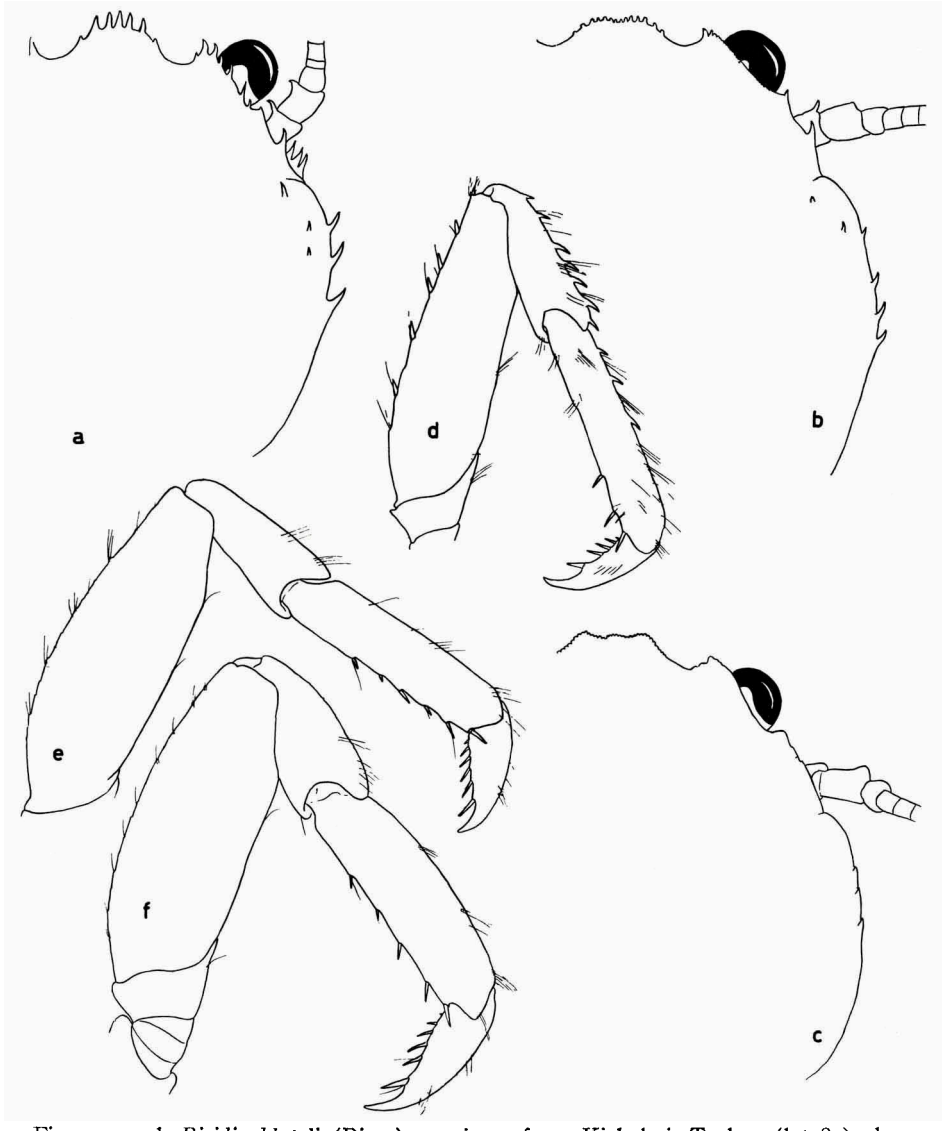

Fig. 12. a, d, *Pisidia bluteli* (Risso), specimen from Kizkalesi, Turkey (lot 83); b, e, *Pisidia longimana* (Risso), specimen from Florya, Turkey (lot 7); c, f, *Pisidia longicornis* (Linnaeus), specimen from North Sea, 52°45'N 3°47'E (15-18 April 1952, J. A. G. Delfos). a-c, right half of carapace in dorsal view; d-f, second pereiopod. a-f, × 13.

cornis inhabits deeper water (10 m or more) and is usually obtained only by dredging, etc. The two other species are usually found in shallow water close to the waterline. These last two species, *Pisidia bluteli* (Risso) and *P. longimana* (Risso), both are represented in the collection brought home by the Turkey Expedition.

Pisidia bluteli has been well described and figured by Zariquiey. It is far more spiniferous than either of the other species. The spinulation of the front is well shown in Zariquiey's figure, it usually consists of well developed spines. The orbital margin shows a row of spines. There are several distinct spines on the upper surface of the carapace. The antennal peduncle has the one but last and the antepenultimate segments with a distinct spine at the distal end of the inner margin. The ischium of the cheliped bears one fairly large and some small spinules on the inner margin. The inner lobe of the merus ends in one strong and one or more small spines; a strong spine is present in the middle of the ventral part of the distal margin of the merus. Apart from three to five strong spines on the inner margin of the carpus there are numerous slender spinules there. Numerous spinules, arranged in more or less distinct longitudinal rows are found on the upper surface of the carpus and the palm. A row of slender spinules usually is present along the outer margin of the carpus and chela. Numerous strong dorsal spines are present on the merus of the second to fourth, on the carpus of the second and third, and on the propodus of the second pereiopod.

In large specimens of *P. bluteli* various of the characters which in medium-sized specimens are distinct disappear. These characters which are excellent for distinguishing such medium-sized specimens of *P. bluteli* from similar specimens of the other two species, often are hardly noticeable in the very large specimens. In this way the frontal teeth of very large *P. bluteli* are similar to those of *P. longimana* and also the spines on the orbital margin are small or reduced to mere serrations. The spines on the upper surface of the carapace remain far more distinct than those in *P. longimana.* Sometimes the antennal peduncle has the spines somewhat reduced, but in some large specimens they remain well developed. The spinules on the upper surface of the carpus and the palm of the chelipeds are reduced to granules and sometimes hardly visible at all, especially in the large cheliped. The inner margin of the carpus of the chelipeds usually still bears 4 or 5 teeth, but sometimes (especially in the large chela) these are reduced to shallow lobes. The posterior margin of the carpus, even in very large specimens still shows a row of spinules, though these may be blunt; the posterior margin of the large chela may be smooth. The walking legs retain the dorsal spinulation even in the largest specimens.

Pisidia bluteli was originally described by Risso (1816, p. 67, pl. 1 fig. 7). This description is rather short but gives enough details to make sure that the present species is meant. Risso, namely, mentioned that the front bears seven small spines, that six spines are found on each of the lateral margins

of the carapace, that the chelipeds are "granuleuses, hérissées de chaque côté de pointes aiguës" and that the walking legs bear a row of spines dorsally. Risso's figure is very crude but shows that numerous spinules are present on both margins of the carpus of the chelipeds.

Czerniavsky (1884, p. 112) renamed the species *Porcellanides Rissoi* but the specimens which he assigned to this species, at least for the larger part, belong to *P. longimana*.

Pisidia bluteli is known from the region of Cadaqués, N.E. Spain (Zariquiey, 1951), from the Bay of Marseilles, France (Bourdillon-Casanova, 1956), Nice, France (Risso, 1816), Corsica, France (Bourdillon-Casanova, 1956), the Bay of Naples (Costa, 1840), and Bizerta, Tunisia (Bourdillon-Casanova, 1956). The Rijksmuseum van Natuurlijke Historie possesses material of the species from N.E. Spain (region of Cadaqués), from S. France (Banyuls and near Collioure, both dépt. Pyrenées orientales), from the Gulf of Naples, and from the Adriatic Sea (coast of Jugoslavia near Split). The species is now reported for the first time from the eastern Mediterranean. It is probable that some of the published records of *Pisidia longicornis* from the Mediterranean actually are based on specimens of the present species.

Pisidia longimana (Risso, 1816) (figs. 11b, e, 13b)

Sea of Marmara near Florya, about 15 km W. of Istanbul, European Turkey; 0-0.2 m deep, under stones; 2 April 1959; no. 7.— 17 specimens (1 ovigerous).

Harbour of Antalya, south coast of Turkey; 0-0.5 m deep; among algae; sea covered by a layer of fresh water; 19 April 1959; no. 47.— 2 specimens (1 ovigerous).

South coast of Turkey near Selimiye, about 62 km E. by S. of Antalya; 0-1 m deep; under stones near Roman harbour; 23 April 1959; no. 60.— 3 specimens.

South coast of Turkey near Selimiye; 0-1 m deep; sandy bottom with stones and *Posidonia* vegetation; 4 May 1959; no. 71.— 5 specimens (3 ovigerous).

Harbour of Mersin, south-east coast of Turkey; 0-1 m deep; among algae on stone breakwater; 10 May 1959; no. 82.— 5 specimens.

Harbour of Mersin; about 10 m deep; on stones brought up by diver; 16 May 1959; no. 91.— 5 specimens.

South-east coast of Turkey near Mersin; 0-1 m deep; under stones on a sandy bottom; 22 May 1959; no. 103.— 1 specimen.

Black Sea coast of Turkey near Samsun; 0-2 m deep; on rocks; 12 June 1959; no. 141.— 1 specimen.

Bosporus near Rumeli Hisar, European Turkey; 0-1 m deep; 26 June 1959; no. 157.— 1 specimen.

Aegean coast of Greece near the harbour of Porto Lago, Thraki; 0-2 m deep; 29 June 1959; no. 160.— 1 ovigerous female.

The present specimens have the carapace breadth ranging between 2 and 6.5 mm, in the ovigerous females it is 4 to 6 mm.

Pisidia longimana differs from *P. bluteli* in several respects: The spines

of the front are much shorter and blunter. The orbital margins are never spinous, they are usually crenulate or minutely serrate. The spines on the upper surface of the carapace are smaller, they are usually only one or two in number and in larger specimens they are hardly visible. The spines on the lateral margin of the carapace are smaller and less sharply pointed. The penultimate segment of the antennal peduncle bears no spine, though a distinct spine is present on the antepenultimate segment of medium sized animals, in the large specimens it is less sharp.

The ischium of the chelipeds, as in *P. bluteli,* bears a distinct spine in the distal part of the inner margin. The merus possesses a distinct lobe

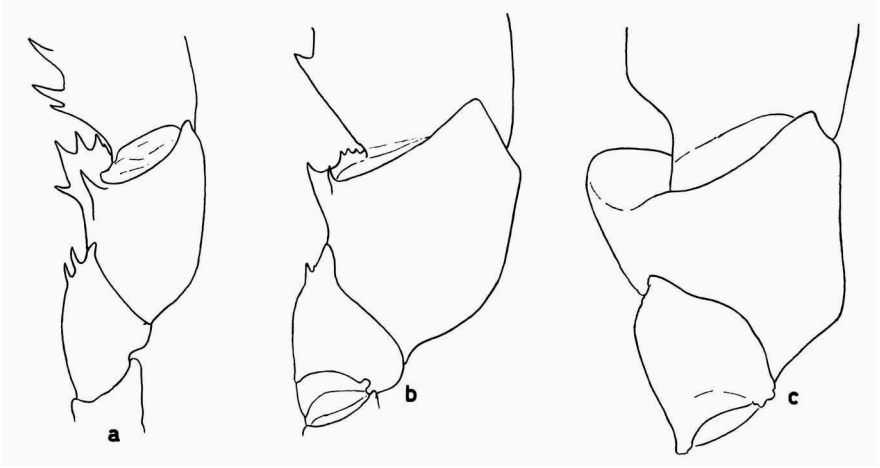

Fig. 13. Ischium and merus of cheliped in ventral view. a, *Pisidia bluteli* (Risso), specimen from Kizkalesi, Turkey (lot 83); b, *Pisidia longimana* (Risso), specimen from Florya, Turkey (lot 7); c, *Pisidia longicornis* (L.), specimen from North Sea, 52°45'N 3°47'E (15-18 April 1952, J. A. G. Delfos). a-c, × 13.

which ends, even in the large specimens, in a distinct acute tooth and sometimes a few spinules. The lower part of the distal margin of the merus, as in *P. bluteli,* is provided with a strong spine in the middle. The inner margin of the carpus bears two or three teeth, which are very acute in juveniles, being more blunt in the adults and reduced to shallow lobes in some very large specimens; there are no additional spinules on this margin. The outer margin of the carpus is smooth in the adults, but may be provided with spinules in the juveniles. The upper surface of the carpus and palm are smooth, but in the juveniles they may be provided with a median longitudinal row of granules or spinules. A row of spinules also is present on the outer margin of the smaller chela of all except the very large specimens, and on the same margin of the larger chela in juveniles. The carpus and

merus of the walking legs do not show a row of spinules on the upper margin, though very few short and blunt granules or spinules may sometimes be observed on the merus.

P. longimana shows a close resemblance to *P. longicornis* (figs. 12c, f, 13c), but has the various spines better developed; in many respects it forms a transition between *P. longicornis* and *P. bluteli.* Since in juveniles of *P. longicornis* the spines are better developed than in the adults it is especially difficult to distinguish juvenile *P. longicornis* from adult *P. longimana.* In the juvenile *P. longicornis* the front differs hardly at all from that of the adult *P. longimana*; in both the three lobes end in short spinules and the emarginations between the lobes are about semicircular. Also the upper margin of the orbit in both shows no teeth, it is practically entire in *P. longicornis,* crenulate or minutely serrate in *P. longimana.* There is a spine on the lateral margin of the carapace above the base of the antenna in both the adult *P. longimana* and the juvenile *P. longicornis,* but in the latter there are no spines on the upper surface of the carapace behind the cervical groove, while such spines are present in *P. longimana,* be it that they are small in very large specimens. There is hardly any difference in the shape of the third maxilliped of both forms; the tooth of the inner margin of the penultimate segment is somewhat more acute in *P. longimana.* The antennal peduncle of *P. longicornis* shows no spines on any of the segments, but the penultimate segment is slightly triangularly produced in the distal part of the inner margin, while a similar but far smaller process is visible on the antepenultimate segment. In *P. longimana* the proximal of these two segments has a sharp distal inner spine, while the penultimate segment has a blunt or somewhat acute process there. The ischium of the chelipeds, even in large specimens of *P. longimana* bears a distinct spine on the inner margin, while the merus possesses a strong spine in the middle of the lower part of its distal margin (in very large specimens this spine is smaller and blunter). Even small specimens of *P. longicornis* do not show either the spine on the inner margin of the ischium, or the one on the disto-ventral margin of the merus. The lobe at the inner margin of the merus in *P. longimana* ends in a spine, which in large specimens is rather blunt. The inner margin of the carpus of this species bears two or three sharp teeth or acute lobes, which in very large specimens may be reduced to very shallow lobes. In *P. longicornis* the inner lobes of the merus and carpus are usually blunt, only in the juveniles they may be acute, but usually are not in the form of pointed teeth. In neither species an additional row of spinules, as is present in *P. bluteli,* is found on the inner margin of the carpus. Especially the character of the presence of a spine on the inner margin of the ischium

and on the ventro-distal margin of the merus of the chelipeds proves to be excellent for distinguishing the present species from *P. longicornis.*

Risso (1816, pp. 68, 69) in his original description of *P. longimana* stated that the merus (= second article) of the cheliped is "bidenté en dedans". The two teeth meant by Risso evidently are the inner lobe and the antero-ventral spine. This proves that Risso's species is not identical with *P. longicornis,* but is either *P. bluteli* or the present species. The fact that he described the other segments of the cheliped to be smooth makes it clear that his specimens were not *P. bluteli,* a species which he himself already recognized as distinct. So far as I know no earlier name has ever been proposed for the species, so that *Pisidia longimana* (Risso, 1816) is the valid name for it.

As *P. longimana* has practically always been synonymized with *P. longicornis,* very few reliable data are known about the distribution of the species. The type locality is Nice, France. The specimens from the Black Sea reported upon by Czerniavsky (1884, pp. 112-120, pl. 3 fig. 9 — pl. 6 fig. 19) as *Porcellanides Rissoi* (with the vars. *armata, picta, simplicior,* and *typica,* and the formae *biserrata, intermedia, semiserrata, serrata, spinimana, subbiserrata,* and *transitans*) as well as his *Porcellanides longimana* (with the vars. *aberrans, armata,* and *typica* and the formae *gracilis* and *nicaeensis*), evidently are for the larger part based on material of the present species. The specimens from Israel, reported upon by Holthuis & Gottlieb (1958, p. 76) as *Porcellana longicornis* on examination proved to belong to *Pisidia longimana.* Other material of *P. longimana* examined by me originates from S. France (Port Vendres and Collioure, both in dépt. Pyrenées orientales) and from the Gulf of Naples. The species thus inhabits the entire Mediterranean and the Black Sea.

The typical *Pisidia longicornis* inhabits the Atlantic coast of Europe from S.W. Norway south and has also been found in the western Mediterranean (I examined several samples from the region of Cadaqués, N.E. Spain, and of Port Vendres, S. France, where the species is found in much deeper water than the two other forms). Neither *P. longicornis,* nor *P. longimana,* nor *P. bluteli* has been mentioned in the literature from Turkey.

Porcellana platycheles (Pennant, 1777)

South coast of Turkey near Selimiye, about 62 km E. by S. of Antalya; 0-1 m deep; under stones near old Roman harbour; 23 April 1959; no. 60.— 1 specimen.

South coast of Turkey near Selimiye; 0-1 m deep; sandy bottom with stones and *Posidonia* vegetation; 4 May 1959; no. 71.— 3 specimens.

South coast of Turkey near Kizkalesi, about 58 km S.W. of Mersin; 0-1 m deep; from rocks with algae; 12 May 1959; no. 83.— 2 specimens.

South coast of Turkey near Mersin; 0-1 m deep; under stones on a sandy bottom; 22 May 1959; no. 103.— 2 specimens.

The specimens have a carapace length ranging between 4 and 9 mm.

Porcellana platycheles is known from the eastern Atlantic between the British Isles and Mauritania, and from the entire Mediterranean. Ostroumoff (1896, pp. 62, 65, 67, 76, 82, 87) reported it from Istanbul, from near the Kizil Adalar (= Princes Islands), from near Bakirköy (= San Stefano), from near Tekirdag (= Rodosto), from near Avşa (= Aphisia) Island and from near Gelibolu (= Gallipoli). No other Turkish records of the species are known to me.

Suborder Brachyura
Section Oxystomata
Family Dorippidae

Dorippe lanata (Linnaeus, 1767)

Aegean coast of Greece near the harbour of Porto Lago, Thraki; 0-2 m deep; 29 June 1959; no. 160.— 1 male, 2 females (1 ovigerous).

The specimens have the carapace 31 to 34 mm broad, the largest specimen is ovigerous.

The species inhabits the entire Mediterranean and the eastern Atlantic from Portugal to S. Africa. Monod (1931, p. 427) reported it from Iskenderun Bay (= Gulf of Alexandretta). No other Turkish records are known to me.

Family Leucosiidae
Subfamily Iliinae

Ilia nucleus (Linnaeus, 1758)

Aegean coast of Greece near the harbour of Porto Lago, Thraki; 0-2 m deep; 29 June 1959; no. 160.— 1 ovigerous female.

Adriatic coast of Jugoslavia near Jadranovo, 30 km S. of Rijeka (= Fiume); 0-2 m deep; 5 July 1959; no. 166.— 1 male.

The male specimen has the carapace 11 mm long, the ovigerous female 24 mm. The female misses all but two legs. The surface of the carapace bears numerous widely spaced granules.

Ilia nucleus is known from the entire Mediterranean; in the eastern Atlantic it has been reported from the west coast of Africa between Morocco and the Cape Verde Islands. The only Turkish record of the species known to me is the one by Ostroumoff (1896, pp. 64, 76) who reported it under the name *Ilia rugulosa* from near Kizil Adalar (= Princes Islands) and from near Tekirdag (= Rodosto) in the Sea of Marmara.

Section Brachyrhyncha
Family Pirimelidae

Pirimela denticulata (Montagu, 1808)

South coast of Turkey near Kizkalesi, about 58 km S.W. of Mersin; 1-2 m deep; bottom fine sand with loose algae; 12 May 1959; no. 84.— 1 specimen.

The specimen is a juvenile with the carapace 5 mm long.

Pirimela denticulata is known from the eastern Atlantic between the west coast of Norway and the Cape Verde Islands; it inhabits the entire Mediterranean. I know of no previous record from Turkey.

Family Portunidae

Carcinus mediterraneus Czerniavsky, 1884

Sea of Marmara near Florya, about 15 km W. of Istanbul, European Turkey; 0-2 m deep; under stones; 2 April 1959; no. 7.— 2 females.

Eastern shore of Akyatan Lake, 45 km S. of Adana, S.E. Turkey; 0-1 m deep; bottom clay; brackish water; a narrow effluence forms the connection between the lake and the sea; 18 May 1959; no. 97.— 4 males, 6 females.

Black Sea coast of Turkey near the harbour of Trabzon; 0-5 m deep; 1-7 June 1959; no. 119.— 1 male, 3 females (2 ovigerous).

Sea of Marmara near Gemlik, about 25 km N. of Bursa, Asiatic Turkey; 21 June 1959; no. 150.— 2 juveniles.

Aegean coast of Greece, near the harbour of Porto Lago, Thraki; 0-2 m deep; 29 June 1959; no. 160.— 8 males, 4 females.

The carapace breadth of the specimens varies between 4 and 66 mm. The females from the Black Sea are unusually large, their carapace breadth being 65 and 66 mm, while that of the other females lies between 22 and 52 mm. The male from the Black Sea is small (carapace breadth 12 mm). According to the collectors, the females of *C. mediterraneus* were far more numerous on the Black Sea coast of Turkey than the males, and it was only after a long search that finally a male specimen was found.

All male specimens have the shape of the first pleopod characteristic for the present species, namely with the distal part straight, and not curved outwards as in *Carcinus maenas* (L.).

Carcinus mediterraneus is known from the entire Mediterranean and from the Black Sea. It has not been distinguished from *Carcinus maenas* by most previous authors, and the records of the latter species from the Mediterranean as a rule pertain to the present species. Previous records of *Carcinus* from Turkey are: Istanbul (= Constantinople) (Ninni, 1923, p. 62; Rathbun, 1930, p. 18; Holthuis & Gottlieb, 1958, p. 85), Bü Çekmece, Sea of Marmara (Ostroumoff, 1896, p. 71).

Portumnus latipes (Pennant, 1777)

South coast of Turkey near Kiremithaneler, 12 km S.W. of Antalya; sandy bottom; 22 April 1959; no. 58.— 1 female.

Harbour of Mersin, south-east coast of Turkey; 0.5-1.5 m deep; bottom fine sand; night collecting; 15 May 1959; no. 89.— 1 juvenile.

Black Sea coast of Turkey near Samsun; 0-0.5 m deep; sandy bottom; 12 June 1959; no. 142.— 1 male, 2 females.

The carapace length of the juvenile specimen is 5 mm, that of the others varies between 17 and 20 mm.

Portumnus latipes inhabits the eastern Atlantic between the North Sea and Morocco; it is also known from the entire Mediterranean and the Black Sea. It is now reported for the first time from Turkey.

Xaiva biguttata (Risso, 1816)

South coast of Turkey near Kizkalesi, about 58 km S.W. of Mersin; 1-2 m deep; fine sand with loose algae; 12 May 1959; no. 84.— 13 juveniles.

The carapace breadth of the above specimen is 7 mm.

The material agrees very well with Lebour's (1928, pl. 8 fig. 3) figure of the juvenile of this species, only in the present specimens the rostrum is not three-lobed but triangular, more like in the adults. It is possible that Lebour's figure shows the rostrum in oblique view, or perhaps the depth of the emargination between the teeth is somewhat exaggerated there.

Xaiva biguttata is known from the eastern Atlantic between the south coast of England and South Africa; it inhabits the entire Mediterranean, but so far had not been reported from Turkey.

Macropipus arcuatus (Leach, 1814)

Adriatic coast of Jugoslavia near Jadranovo, 30 km S. of Rijeka (= Fiume); 0-2 m deep; 5 July 1959; no. 166.— 1 juvenile.

The carapace breadth of the above specimen is 7 mm.

Macropipus arcuatus is known from the western Atlantic between Norway and Mauritania; it inhabits also the Mediterranean and the Black Sea. Previous Turkish records known to me are: eastern end of the Bosporus, near Kizil Adalar (= Princes Islands), and near Gelibolu (= Gallipoli) (Ostroumoff, 1896, pp. 62, 64, 82, 92, as *Portunus arcuatus*), S.W. end of Çanakkale Boğazi (= Dardanelles) between Çanakkale and Kumkale (Colombo, 1885, p. 25, as *Portunus arcuatus*).

Macropipus vernalis (Risso, 1816)

Harbour of Mersin, south-east coast of Turkey; 0.5-1.5 m deep; bottom fine sand; night collecting; 15 May 1959; no. 89.— 9 juveniles.

Black Sea coast of Turkey near the harbour of Trabzon; 0-5 m deep; 1-7 June 1959; no. 119.— 8 males, 14 females (4 ovigerous).

Aegean coast of Greece near the harbour of Porto Lago, Thraki; 0-2 m deep; 29 June 1959; no. 160.— 1 male, 2 females (1 ovigerous), 1 juvenile.

The carapace breadth of the specimens varies between 4 and 32 mm; in the ovigerous females it ranges between 21 and 29 mm.

Macropipus vernalis is known from the entire Mediterranean and from the Black Sea; it has also been found on the west coast of Africa in Rio de Oro. The species has been confused by most authors with either *M. holsatus* (Fabr.) or *M. depurator* (L.) and therefore its exact range is not known with certainty. It is highly probable that the material from near Marmara Island, Sea of Marmara, which Ostroumoff (1896, p. 79) listed under the name *Liocarcinus holsatus* actually belongs to the present species.

Macropipus depurator (Linnaeus, 1758)

1 to 2 km off the south coast of Turkey between Lara and Zincir, 10-18 km S.E. of Antalya; 15 to 20 m deep; bottom fine sand; fished with local fishing boat; 25 April 1959; no. 63.— 1 male.

Aegean coast of Greece near the harbour of Porto Lago, Thraki; 0-2 m deep; 29 June 1959; no. 160.— 3 males.

The carapace breadth of the examined specimens varies between 18 and 31 mm.

The species inhabits the eastern Atlantic between W. Norway and Rio de Oro (W. Africa), it is known from the entire Mediterranean and has also been reported from the Black Sea. Ostroumoff (1896, pp. 60, 62, 75, 79) reported the species as *Portunus depurator* from near Kizil Adalar (= Princes Islands), from Tekirdag (= Rodosto) and from near the south-coast of Marmara Island, all localities situated in the Sea of Marmara. Tortonese (1959, p. 25) dealt with material from a depth of 30 m taken in the Bosporus between Besiktaş (a suburb of Istanbul) and Usküdar (= Scutari).

Charybdis (Goniohellenus) longicollis Leene, 1938 (figs. 14, 15)

1 to 2 km off the south coast of Turkey between Lara and Zincir, 10 to 18 km S.E. of Antalya; depth 15-20 m; bottom fine sand; fished with local fishing boat; 25 April 1959; no. 63.— 11 males, 8 females (6 ovigerous).

5 km off the south-east coast of Turkey near Mersin; 10 m deep; bottom sand; fished with local fishing boat; 18 May 1959; no. 96.— 2 males, 1 ovigerous female.

The carapace breadths of the males range from 30 to 41 mm, the carapace length from 19 to 25 mm. In the females the carapace breadths are 18 to 37 mm (26 to 37 mm in the ovigerous specimens) while the carapace lengths are 11 to 23 mm (16 to 23 mm in the ovigerous).

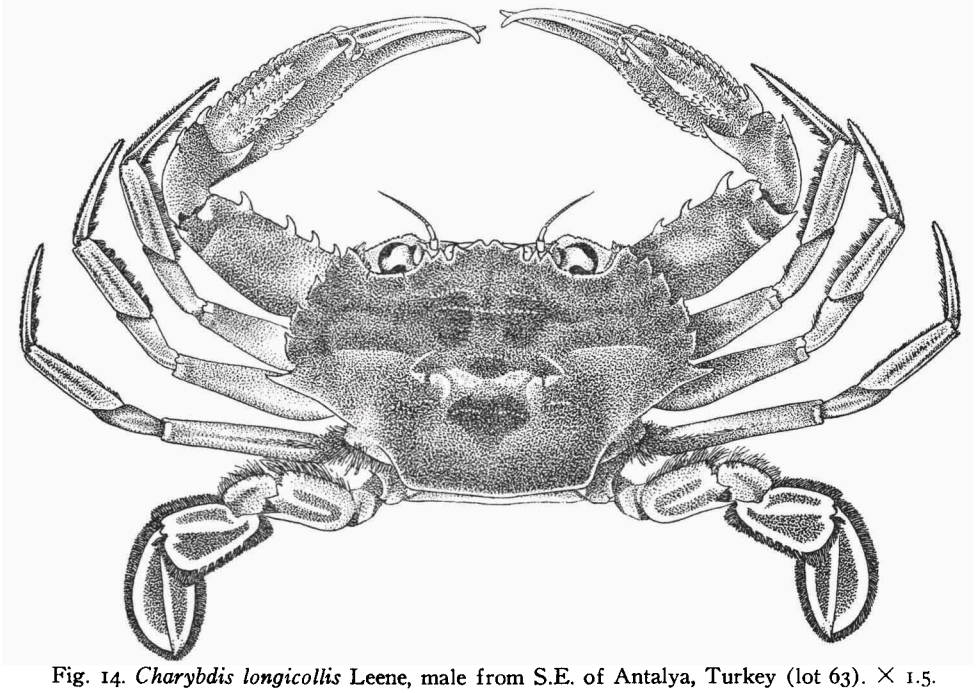

Fig. 14. *Charybdis longicollis* Leene, male from S.E. of Antalya, Turkey (lot 63). × 1.5. H. Heijn del.

The present species belongs to the group of *Charybdis hoplites* (Wood-Mason) and was originally described by Leene (1938, p. 107, figs. 59, 60) as *Charybdis* (*Goniohellenus*) *hoplites* var. *longicollis*. The differences between the present form and the typical *C. hoplites*, however, are such that in my opinion the two must be considered distinct species.

All of the present specimens have the narrow form of the carapace described and figured by Leene for her type material of var. *longicollis*, while also the last antero-lateral tooth of the carapace, though spiniform, is less than twice as long as the preceding tooth. In the typical *C. hoplites*, of which unfortunately no material is at hand, the carapace is much wider, and the last antero-lateral tooth is distinctly more than twice as long as the preceding tooth.

In the Turkish specimens a transverse line of granules extends over the mesobranchial and cardiac regions; this line is three times interrupted, once in the middle and once in each of the lateral halves. A similar arrangement of the granules is very clearly shown in Leene's (1938) figure 59. Judging by the published figures of *Charybdis hoplites* and by Leene's (1938, pp. 99, 100) account of the arrangement of the granules in that species, this transverse row seems to be entirely lacking there.

In *Charybdis longicollis* the distal part of the fused third to fifth segments of the male abdomen is strongly constricted, while the lateral margins of the sixth segment are straight or slightly concave. This shape of the abdomen is found in all my male specimens and it agrees excellently with the figure provided by Leene. The name *longicollis* evidently is derived from the long-necked shape of the male abdomen, which indeed is characteristic for the species.

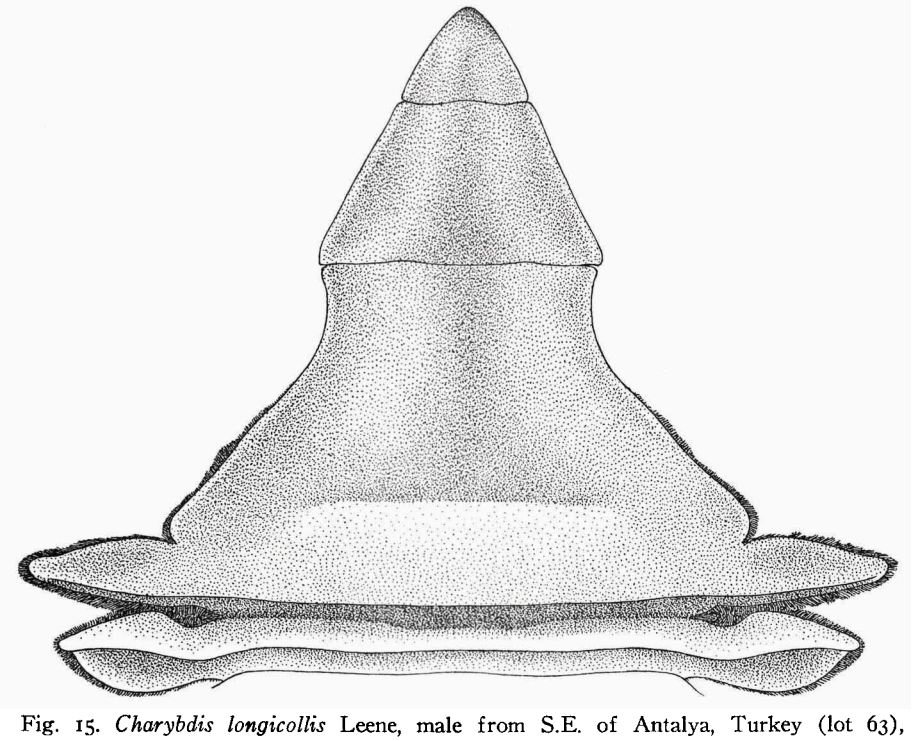

Fig. 15. *Charybdis longicollis* Leene, male from S.E. of Antalya, Turkey (lot 63), abdomen. × 7. H. Heijn del.

The first male pleopod of my specimens agrees well with Leene's figure 60 of that organ. It seems to differ from the pleopod of *C. hoplites* (see Gordon, 1931, fig. 12b, b′, and Leene, 1938, fig. 54) in that the spinules on the inner margin of the top are strong; in *C. hoplites* they are very minute. Furthermore Leene (1938, fig. 60a) figured a woolly pubescent area in the basal half of the inner margin of the pleopod of *C. longicollis,* while no such hairs were figured by her for *C. hoplites,* neither was this done by Gordon (1931). In my specimens these woolly hairs are present.

Charybdis longicollis was described after three specimens from Ras Abu Somer in the northern part of the Red Sea. It is probable that the Red Sea

specimens which in the literature were reported upon under the name *Charybdis hoplites* actually belong to the present species. This is especially true for the female specimen from Great Bitter Lake which Monod (1938, p. 115) identified as *C. hoplites*. Apart from the Red Sea and the Suez Canal, *C. hoplites* has been reported from E. Africa, the Persian Gulf and India. Whether and how far the range of *C. longicollis* extends into the Indo-West Pacific area outside the Red Sea, can only be decided by a re-examination of all the material reported upon as *C. hoplites*.

Charybdis longicollis was not known from the Mediterranean, neither was *C. hoplites*. The only two species of the genus that have been reported from that area are *C. hellerii* (A. Milne Edwards) (= *C. merguiensis* (De Man)), and *C. sexdentata* (Herbst). The first of these species has been found on the Israel and Egypt coasts. The identity of the Israel material on which the record of the second species is based is doubtful, but it is quite certain that it is not *C. longicollis*.

The fact that *C. longicollis* is found to be quite frequent on the Turkish south coast, makes it hard to explain why the species so far has not been reported from Israel, since the Israel Mediterranean fauna has been quite intensively explored.

Thalamita poissonii (Audouin, 1826)

South coast of Turkey near Selimiye, about 62 km E. by S. from Antalya; 0-1 m deep; under stones near old roman harbour; 23 April 1959; no. 60.— 2 males.

South coast of Turkey near Selimiye; 0-1 m deep; sandy bottom with stones and *Posidonia* vegetation; 4 May 1959; no. 71.— 1 male.

The carapace breadth of the specimens varies between 13 and 21 mm.

These specimens agree very well with those from Israel dealt with by Holthuis & Gottlieb (1958, p. 89, pl. 2 fig. 10). In the Turkish specimens the four transverse ridges in the meta-branchial region of the carapace are present.

Thalamita poissonii is a species which originally inhabited the Indo-West Pacific region (Red Sea, Iranian Gulf, western Indian Ocean, Formosa), but which has penetrated into the eastern Mediterranean by way of the Suez Canal. The only previous record of the species from the Mediterranean is the one by Holthuis & Gottlieb (1958) who reported upon material from Israel.

Callinectes sapidus Rathbun, 1896 (pl. I fig. 2, pl. II fig. 2)

Eastern shore of Akyatan Lake, 45 km S. of Adana, S.E. Turkey; 0-1 m deep; clay bottom; brackish water; a narrow effluence forms the connection between the lake and the sea; 18 May 1959; no. 97.— 4 males, 2 females.

Aegean coast of Greece near the harbour of Porto Lago, Thraki; 0-2 m deep; 29 June 1959; no. 160.— 2 females.

The males from Turkey have the carapace 63 to 142 mm broad and 33 to 66 mm long, the females of that lot have the carapace breadth 47 and 49 mm, the carapace length 25 and 27 mm. One of the females from Porto Lago is full grown (carapace breadth 144 mm), the other is juvenile (cb. 96 mm).

One of the most surprising discoveries of the present expedition is that of the occurrence of *Callinectes sapidus* both in Turkey and Greece. In the two places the species proved to be perfectly acclimatized and in both it formed the subject of a fishery, be it on a small scale. When this American species has been introduced there will probably remain an unsolved problem.

Callinectes was also observed, but not collected, in the brackish marsh near Porto Lago.

Callinectes sapidus is originally an East American species, the range of which extends from Nova Scotia to Uruguay, being most common on the coast of the U.S.A. where at various places (e.g., Chesapeake Bay) it forms the subject of an economically important fishery. In 1900 the species was for the first time reported from the eastern Atlantic when Bouvier (1901, p. 16) reported upon a specimen which was caught alive in the harbour of Rochefort (S.W. France). Later the species was found alive at several occasions in Holland: in 1932 in the Zaan River near Zaandam, N.W. of Amsterdam, in 1934 in Amsterdam harbour, and in 1951 in the Noordzee-kanaal, the large shipping canal which connects Amsterdam with the sea (Den Hartog & Holthuis, 1951; Wolff, 1954, pp. 19, 20; Wolff, 1954a, p. 188), the next record came from Denmark, where a specimen was found alive in 1951 in the Sound, N.E. of Copenhagen (Wolff, 1954, p. 19; 1954a, p. 188). The first record of the species from the Mediterranean was the one by Giordani Soika (1951, pp. 18-20) who reported upon two specimens which he thought to belong to *Portunus pelagicus* (L.), but which from his description and figure clearly prove to be *Callinectes sapidus*; the first of these specimens was caught in December 1949 in sea near Caorle, N. of Venice, the other in October 1950 near Fusina in the lagoon of Venice. All these European records deal with incidental specimens caught near important harbours. Recently, however, Holthuis & Gottlieb (1955, pp. 154-156; 1958, p. 91, pl. 3 fig. 11) showed that *Callinectes* also occurs in Israel waters and is well established there at several localities along the northern half of the Israel coast. The present collection proves that similar well established colonies are found in Turkey and Greece and that *Callinectes sapidus* at present must be ranged among the indigenous Crustacea of Europe.

Portunus pelagicus (Linnaeus, 1758) (pl. I fig. 1, pl. II fig. 1)

South coast of Turkey near Selimiye, about 62 km E. by S. of Antalya; 0-1 m deep; sandy bottom with stones and *Posidonia* vegetation; 4 May 1959; no. 71.— 1 male, 1 female.

Harbour of Mersin, south-east coast of Turkey; 0.5-1.5 m deep; bottom fine sand; night collecting; 15 May 1959; no. 89.— 2 males, 1 female.

The carapace breadth of the males varies from 41 to 100 mm, the carapace length from 19 to 46 mm, in the two females the carapace breadth is 60 and 115 mm, the carapace length 28 and 54 mm.

The specimens are quite typical for the species. In order to show the differences between the present species and *Callinectes sapidus* photographs of each are provided (pls. I, II).

Portunus pelagicus, also known as *Neptunus pelagicus,* is an Indo-West Pacific species (range: Red Sea and S.E. Africa to Japan, Australia and Polynesia) which has entered the eastern Mediterranean through the Suez Canal. It has been reported from the Suez Canal and several localities in Egypt, Israel, the Lebanon, Syria and Turkey. The previous Turkish records are from Iskenderun Bay (= Gulf of Alexandretta) (Gruvel, 1928, p. 46; 1929, p. 1699; 1930a, p. 39; 1931, p. 121; Monod, 1930, p. 140; 1931, p. 429; 1932, p. 67), Hatay, Iskenderun (Holthuis & Gottlieb, 1958, p. 92).

Family Xanthidae

Xantho poressa (Olivi, 1792)

Sea of Marmara near Florya, about 15 km W. of Istanbul, European Turkey; 0-0.2 m deep; under stones; 2 April 1959; no. 7.— 8 males, 8 females.

Harbour of Antalya, south coast of Turkey; 0-0.5 m deep; among algae; sea covered by a layer of fresh water; 19 April 1959; no. 47.— 1 female.

South coast of Turkey near Selimiye, about 62 km E. by S. of Antalya; 0-1 m deep; under stones near old roman harbour; 23 April 1959; no. 60.— 2 females.

South coast of Turkey near Selimiye; 0-1 m deep; sandy bottom with stones and *Posidonia* vegetation; 4 May 1959; no. 71.— 2 males.

South-east coast of Turkey near Mersin; 0-1 m deep; under stones on sand bottom; 22 May 1959; no. 103.— 14 males, 14 females (5 ovigerous).

Black Sea coast of Turkey near Trabzon harbour; 0-5 m deep; 1 to 7 June 1959; no. 119.— 1 male.

The carapace breadth of the specimens varies between 4 and 21 mm (4 and 21 in the males, 5 and 19 in the females), in the ovigerous females the carapace is 15 to 19 mm broad.

The species is known from the Canary Islands, the Mediterranean and the Black Sea. Previous records from Turkey are as follows: Bosporus (Heller, 1863, p. 67 as *X. rivulosus*), Istanbul (Ninni, 1923, as *X. rivulosus*; Holthuis & Gottlieb, 1958, p. 93), near Gelibolu (= Gallipoli) (Ostroumoff, 1896, p. 83, as *X. rivulosa*).

Xantho granulicarpus Forest, 1953

South coast of Turkey near Selimiye, about 62 km E. by S. of Antalya; 0-1 m deep; under stones near old roman harbour; 23 April 1959; no. 60.— 2 males, 2 females.

South coast of Turkey near Selimiye; 0-1 m deep; sandy bottom with stones and *Posidonia* vegetation; 4 May 1959; no. 71.— 12 males, 11 females (3 ovigerous).

South-east coast of Turkey near Kizkalesi, about 58 km S.W. of Mersin; 0-1 m deep; from algae covered rocks; 12 May 1959; no. 83.— 3 males, 4 females (3 ovigerous).

The carapace breadth of the males varies between 6 and 16 mm, that of the females between 7 and 16 mm; in the ovigerous females it lies between 9 and 15 mm.

Xantho granulicarpus is known from the entire Mediterranean. The only previous record from Turkey known to me is the one by Ninni (1923) who reported it under the name *Xantho floridus* from Istanbul.

Pilumnus hirtellus (Linnaeus, 1758)

South coast of Turkey near Lara, 10 km S.E. of Antalya; 0-0.5 m deep; under stones; sea covered with a layer of fresh water; 8 April 1959; no. 12.— 2 specimens.

Harbour of Antalya, south coast of Turkey; 0-0.5 m deep; among algae; sea covered with a layer of fresh water; 19 April 1959; no. 47.— 12 specimens.

South coast of Turkey near Selimiye, about 62 km E. by S. of Antalya; 0-1 m deep; under stones near old roman harbour; 23 April 1959; no. 60.— 1 specimen.

South coast of Turkey near Selimiye; 0-1 m deep; bottom sand with stones and *Posidonia* vegetation; 4 May 1959; no. 71.— 12 specimens.

Harbour of Mersin, south-east coast of Turkey; 0-1 m deep; among algae on stone breakwater; 10 May 1959; no. 82.— 1 specimen.

South-east coast of Turkey near Kizkalesi, about 58 km S.W. of Mersin; 0-1 m deep; from rocks covered with algae; 12 May 1959; no. 83.— 8 specimens.

Black Sea coast of Turkey near Trabzon harbour; 0-5 m deep; 1-7 June 1959; no. 119.— 4 specimens.

Bosporus near Rumeli Hisar, European Turkey; 0-1 m deep; 26 June 1959; no. 157.— 2 specimens.

All specimens are rather small, their carapace breadth varies between 3 and 11 mm.

The animals show the characters of the typical *Pilumnus hirtellus* as these have been enumerated by Holthuis & Gottlieb (1958, p. 96), only the front sometimes shows some small denticles in the median region. There is no doubt in my mind that *P. hirtellus* (L.) and *P. spinifer* H. Milne Edwards are distinct species. Whether a third species, *P. villosus* Risso should be recognized as distinct or should be considered a synonym of *P. spinifer* can only be decided after the study of an extensive material of the various European forms of the genus.

As is confirmed by the present material, *P. hirtellus* is a species from the shallow littoral zone, while *P. spinifer* inhabits deeper waters.

Pilumnus hirtellus inhabits the Atlantic coast of Europe from the North Sea

south. It occurs in the entire Mediterranean and is also known from the Black Sea. Previous records from Turkey are: near Istanbul (= Constantinople), near Bakirköy (= San Stefano), near Avşa (= Aphisia) Island, and near Gelibolu (= Gallipoli) (Ostroumoff, 1896, pp. 65, 67, 82, 83, 87, 92), Çanakkale Boğazi (= Dardanelles) just S. of Çanakkale, and near Urla (= Vurlah) near Izmir (Colombo, 1885, pp. 23, 26), Iskenderun Bay (= Gulf of Alexandretta) (Monod, 1931, p. 429).

Pilumnus spinifer H. Milne Edwards, 1834

1 to 2 km off the south coast of Turkey between Lara and Zincir, 10-18 km S.E. of Antalya; 15-20 m deep; bottom fine sand; fished with local fishing boat; 25 April 1959; no. 63.— 5 specimens.

The carapace breadth of the specimens varies between 5 and 10 mm.

The most important characters of this species have already been dealt with by Holthuis & Gottlieb (1958, p. 97). The present specimens agree very well with that account.

The species has been reported from the eastern Atlantic between Portugal and Mauritania, from the Mediterranean and the Black Sea. Previous records from Turkey are: S.W. part of Çanakkale Boğazi (= Dardanelles) between Çanakkale and Kumkale (Colombo, 1885, p. 25), Mersin Bay (Holthuis & Gottlieb, 1958, p. 98). Tortonese's (1959, p. 25) record of *Pilumnus hirtellus* from the Bosporus between Besiktaş (a suburb of Istanbul) and Usküdar (= Scutari) at a depth of 30 m probably is based on material of the present species.

Eriphia verrucosa (Forskål, 1775)

Sea of Marmara near Florya, about 15 km W. of Istanbul, European Turkey; 0-0.2 m deep; under stones; 2 April 1959; no. 7.— 2 males.

Harbour of Antalya, south coast of Turkey; 0.05-0.20 m deep; among algae and under stones; sea water covered by a layer of fresh water; 10 April 1959; no. 21.— 2 males, 2 ovigerous females.

South coast of Turkey near Selimiye, about 62 km E. by S. of Antalya; 0-1 m deep; under stones near old roman harbour; 23 April 1959; no. 60.— 1 male, 1 female.

South coast of Turkey near Selimiye; 0-1 m deep; sandy bottom with stones and *Posidonia* vegetation; 4 May 1959; no. 71.— 1 male.

South-east coast of Turkey near Mersin; 0-1 m deep; under stones on sandy bottom; 22 May 1959; no. 103.— 1 ovigerous female, 1 juvenile.

Black Sea coast near Samsun, N. Turkey; 0-2 m deep; from the rocks; 12 June 1959; no. 141.— 4 males, 2 females.

The carapace breadth of the specimens varies between 10 and 79 mm. The ovigerous females are 43 to 70 mm broad, the largest specimen is a male.

The species is used as food, and was offered for sale on the markets of Istanbul, Antalya and Samsun.

Eriphia verrucosa is known from the eastern Atlantic between Brittany (France) and Mauritania (W. Africa), it inhabits the entire Mediterranean and the Black Sea. Previous records from Turkey are the following: Istanbul (= Constantinople) (Forskål, 1775, p. 93; Ninni, 1923; Holthuis & Gottlieb, 1958, p. 99), Sea of Marmara (Pesta, 1918, p. 430). Istanbul is the type locality of the species.

Family Potamonidae

Potamon potamios (Olivier, 1804)

Düdenbasi. the spot where the Düden River emerges from the rocks, 9 km N. of Antalya; altitude about 100 m; under stones of the river bank in the water and on the shore, and on dry land 25 to 30 m above water level; 15 April 1959; no. 35.— 21 males, 23 females, 4 juveniles.

Lake near Döşemealti, 25 km N.N.W. of Antalya; altitude 300 m; shallow lake with a rich aquatic vegetation, fed by small streams which bring cold fresh water from the mountains; 20 April 1959; no. 51.— 4 males, 5 females.

4 km S.W. of Tarsus, S.E. Turkey; altitude about 10 m; clay bottom with reed vegetation and several pools; 10 May 1959; no. 81.— 1 female.

Findikpinariköy, about 25 km W.N.W. of Mersin, S.E. Turkey; altitude about 1000 m; in small stream; 14 May 1959; no. 88.— 1 female, 1 juvenile.

4 km east of Mersin, S.E. Turkey; in holes of the clayish bank of a small stream; 15 May 1959; no. 94.— 2 males.

3 km S. of Haruniye, about 102 km N.E. of Adana, S.E. Turkey; altitude about 300 m; in small stream in pine forest; bottom clay with rocks; 24 May 1959; no. 105.— 3 females, 1 juvenile.

Aksu River, 3 km S. of Maras, S.E. Turkey; altitude about 700 m; small stream with rich aquatic vegetation, in upland plain; 24 May 1959; no. 106.— 1 female, 2 juveniles.

140 km S.W. of Malatya, along the highway from Maras to Malatya; altitude about 700 m; swampy region with small streams; 25 May 1959; no. 107.— 2 males.

15 km S.E. of Elazig, E. Turkey; altitude about 1100 m; in poplar grove with a small stream; 26 May 1959; no. 109.— 2 males, 1 female.

Hasar Gölü, about 25 km S.E. of Elazig; altitude about 1155 m; 26 May 1959; no. 110.— 1 female.

Between Maden and Ergani, E. Turkey; altitude about 1200 m; rocky bottom, practically without vegetation; near a small stream; 27 May 1959; no. 111.— 1 female.

Branch river of the Tigris River between Ergani and Diyarbakir, E. Turkey; altitude about 700 m; a river with sand and mud flats which are covered with vegetation; 27 May 1959; no. 112.— 1 female.

Gilida Dere River, 32 km W. of Trabzon, north coast of Turkey; at sea level; in river and on humid river bank; 10 June 1959; no. 131.— 2 juveniles.

Görele, about 63 km W. of Trabzon; altitude about 20 m; in ditch along highway; 10 June 1959; no. 133.— 1 female.

Kavak, 34 km S.W. of Samsun, north coast of Turkey; altitude about 500 m; in the bank of a small stream about 2 m above water level; 12 June 1959; no. 143.— 1 male.

Sakarya River near the bridge of the highway from Ankara to Eskişehir, about halfway between Sivrihisar and Haymana, and about 95 km S.W. of Ankara, Turkey; altitude about 800 m; a fast flowing river of about 20 m wide and several meters deep, fresh water, with a vegetation of *Potamogeton, Myriophyllum,* green and red algae; 17 and 18 June 1959; no. 145.— 4 females.

Gemlik, about 25 km N. of Bursa, N.W. Turkey; altitude about 50 m; in small stream; 21 June 1959; no. 149.— 1 male.

Bahçekoy, in Belgrade Forest, 19 km N. of Istanbul, European Turkey; altitude about 50-100 m; in small stream in forest of beech, oak, and hornbeam; 26 June 1959; no. 156.— 2 males, 3 females.

10 km S. of Souflion in a branch river of the Maritza River, near the Turkish frontier, eastern part of Greece; shallow river with a bottom of gravel and coarse sand; 27 June 1959; no. 158.— 1 male.

The carapace breadths of the present specimens vary between 6 and 74 mm and the carapace lengths between 5 and 59 mm. The largest specimen (cb. 74 mm, cl. 59 mm) is a male, the largest female has cb. 62 mm and cl. 49 mm. No ovigerous females are represented in this collection.

The specimens belong to the typical *Potamon potamios* as defined by Pesta (1926, pp. 619-639; 1937, pp. 93-176; 1937a, pp. 237-241; 1946, pp. 1-6; 1951, pp. 349-354) in his studies concerning this species and the closely related *Potamon edule* (Latreille).

In Europe *Potamon potamios* is known from the Balkans (S.E. Jugoslavia and eastern Greece, both east of the Vardar River; Rumania; Bulgaria; European Turkey; southern Greece: Peloponnesus, the Aegean Islands and Crete), from Russia (Crimea and Caucasus). In Asia the species inhabits the whole of Turkey, Cyprus, Syria, the Lebanon, Israel, Egypt (Sinai Peninsula), Iraq, Persia, Turkestan, Afghanistan, Baluchistan, and Kashmir.

It has repeatedly been mentioned from Turkey, sometimes under the names *P. fluviatilis* or *P. setiger*: Turkey (Heller, 1863, p. 98; A. Milne Edwards, 1869, p. 165), European Turkey (Pesta, 1926, p. 630), Maritza River between Edirne (= Adrianople) and its mouth (Pesta, 1937, p. 94), Istanbul (= Constantinople) (Thallwitz, 1892, p. 53; Pesta, 1926, p. 630; Balss, 1928, p. 122; Bott, 1944, p. 136), Belgrade Forest near Istanbul (Pesta, 1926, p. 630), Bursa (= Brussa) (Pesta, 1937, p. 94), Sapança (=Sabandja) Lake near Izmit (= Ismid) (Pesta, 1926, p. 625; Tortonese, 1952, p. 84), western Karadere River near Bolu (Pesta, 1937, p. 95), Aladag River, S. of Bolu (Pesta, 1937, p. 95), Ankara (= Angora) (Pesta, 1926, p. 626; Pesta, 1937, p. 95), Izmir (= Smyrna) (Pesta, 1926, p. 624), Develi Kioi, Youruk-tzai near Izmir (Pesta, 1926, p. 624), Bor Dag near Birgit (Pesta, 1926, p. 625), Aksehir (= Ak-Chehir) (Balss, 1914, p. 402; Pesta, 1937, p. 95), Egridir (= Egerdir) Lake (Pesta, 1937, p. 95), Beysehir Lake (Tortonese, 1952, p. 92), Kalatak Mt. near Trabzon (= Trapezunt) (Pesta, 1926, p. 629), Alma Dag (= Amanus Range),? near Iskenderun Bay (Pesta, 1926, p. 626), Antakya (= Antiocha) Lake (Rathbun, 1904, p.259; Pesta, 1926, p. 625), Upper Euphrates River (Pesta, 1926, p. 627), Palu and Harput (= Kharput), Upper Euphrates River (Pesta, 1926, p. 627), Euphrates River between

Harput and Urfa (Pesta, 1926, p. 627), Urfa (Pesta, 1926, p. 628), Euphrates near Tschingusch (Pesta, 1926, p. 626), Tschaget-Tichai, Armenian Taurus? (Pesta, 1926, p. 625), Wadi Mehmedian, source area of the Tigris River (Pesta, 1926, p. 627), Hasarbaba Dag, south of Gölcuk (= Göldschik) Lake (Pesta, 1926, p. 628), Bitlis, and Ziâre near Bitlis (Pesta, 1926, p. 631), Hyny west of Bitlis (Pesta, 1926, p. 631), Wan Lake (Balss, 1914, p. 402; Pesta, 1926, p. 628; Pesta, 1937, p. 95). Pesta (1946, p. 2) reported upon material from "Berg Ida, Turkei"; no such locality in Turkey is known to me, perhaps Mt. Ida, Crete, is meant. It is probable that several other Turkish records of *Potamon potamios* have been overlooked by me. Coifmann (1938, pp. 223-226), whose paper is not available to me, dealt with material of *Potamon* from Anatolia, the exact locality or localities of which are unknown to me. She identified her material with *Potamon edule* (Latr.), but I do not know whether she considered this species different from *P. potamios*.

Family Goneplacidae

Goneplax rhomboides (Linnaeus, 1758)

1 to 2 km off the south coast of Turkey between Lara and Zincir, 10 to 18 km S.E. of Antalya; 15-20 m deep; bottom fine sand; fished with local fishing boat; 25 April 1959; no. 63.— 1 juvenile male, 1 female.

Aegean coast of Greece near the harbour of Porto Lago, Thraki; 0-2 m deep; 29 June 1959; no. 160.— 6 males, 2 females.

The carapace breadth of the larger males varies between 31 and 34 mm, that of the females between 15 and 20 mm, in the juvenile it is 14 mm. In the females and the juvenile there is no spine on the lateral margin of the carapace behind the outer angle of the orbit. In the males an indistinct elevation is visible on the lateral margin, while in one of the specimens (cb. 32 mm) a small but distinct acute spinule is present on the right side of the carapace, on the left side there is only the vague hump similar to that found in the other specimens.

The colour of the anterior part of the carapace is violet and is separated from the greyish white posterior part by a sharp three-lobed transverse line. In the males the dactylus of the chelae is black with a light top and a light base; there is a black spot immediately behind the white tip of the fixed finger. In the females the dactylus of the chelae shows a red spot in the middle.

Goneplax rhomboides inhabits the eastern Atlantic between the British Isles and South Africa; it is known from the entire Mediterranean. Monod (1931, p. 429) reported the species, under the name *Goneplax angulata* (Pennant), from Iskenderun Bay (= Gulf of Alexandretta). No other Turkish records of the species are known to me.

Family Ocypodidae

Ocypode cursor (Linnaeus, 1758)

South-east coast of Turkey near Mersin; sandy beach; 14 May 1959; no. 95.— 4 males, 4 females.

The carapace breadth of the males varies between 10 and 27 mm, that of the females between 32 and 35 mm.

The specimens were dug out of their holes in the sandy beach at about 1 m above the water line. These holes are about 50 cm deep and have one or two abrupt angular turns, which makes it quite hard to reach the animals. The crabs remain in their holes during the daytime, and leave them at night. They run very fast when disturbed and it was noted that all the old specimens fled to the sea, while the juveniles invariably went higher up the beach.

Ocypode cursor inhabits the coasts of West and North Africa, from Angola north. Furthermore it is known from the coast of Israel, the Lebanon and Syria, but had not been reported before from Turkey. There is only one record of the species from Europe, namely from near Megara, S. Greece (Guérin, 1832).

Family Grapsidae

Pachygrapsus marmoratus (Fabricius, 1787)

Coast of the Sea of Marmara near Florya, about 15 km W. of Istanbul, European Turkey; 0-0.2 m deep; under stones; 2 April 1959; no. 7. —1 juvenile.

South coast of Turkey near Lara, 10 km S.E. of Antalya; 0-0.5 m deep; under stones along the coast; sea covered by a layer of fresh water; 8 April 1959; no. 12.— 1 juvenile.

South coast of Turkey near Selimiye, about 6 km S.W. of Manavgat, and about 62 km E. by S. of Antalya; 0-1 m deep; under stones near old roman harbour; 23 April 1959; no. 60.— 1 male, 1 ovigerous female.

South coast of Turkey near Selimiye; 0-1 m deep; sandy bottom with stones and *Posidonia* vegetation; 4 May 1959; no. 71.— 1 male, 2 ovigerous females.

South-east coast of Turkey near Mersin; among stones on the sandy beach; 14 May 1959; no. 95. —4 males, 6 females (5 ovigerous).

South-east coast of Turkey near Mersin; 0-1 m deep; under stones on a sandy bottom; 22 May 1959; no. 103.— 1 ovigerous female.

Black Sea coast of Turkey near the harbour of Trabzon; 0-5 m deep; 1-7 June 1959; no. 119.— 5 males, 2 females.

Black Sea coast of Turkey near Samsun; rocky coast; 0-2 m deep; 12 June 1959; no. 141.— 2 males, 5 females (2 ovigerous).

Bosporus near Rumeli Hisar, European Turkey; 0-1 m deep; 26 June 1959; no. 157.— 2 males, 4 females (2 ovigerous).

Aegean coast of Greece near the harbour of Porto Lago, Thraki; 0-2 m deep; 29 June 1959; no. 160.— 3 males, 2 ovigerous females.

Adriatic coast of Jugoslavia near Jadranovo, 30 km S. of Rijeka (= Fiume); 0-2 m deep; 5 July 1959; no. 166.— 3 males, 2 ovigerous females.

The carapace breadth of the specimens varies between 8 and 42 mm, the largest specimen being a male; in the ovigerous females the carapace breadth is 13 to 35 mm.

Pachygrapsus marmoratus is known from the eastern Atlantic (Normandy, France to Morocco,the Canary Islands, Madeira and the Azores), the entire Mediterranean, and the Black Sea. Previous Turkish records are: Istanbul (= Constantinople) (Stimpson, 1861, p. 373; Holthuis & Gottlieb, 1958, p. 101), Gelibolu (= Gallipoli) (Ostroumoff, 1896, p. 85).

Pachygrapsus transversus (Gibbes, 1850)

Harbour of Antalya, south coast of Turkey; 0-0.5 m deep; among algae; sea covered by a layer of fresh water; 19 April 1959; no. 47.— 1 female.

South coast of Turkey near Selimiye, about 62 km E. by S. of Antalya; 0-1 m deep; sandy bottom with stones and *Posidonia* vegetation; 4 May 1959; no. 71. —1 male.

South-east coast of Turkey near Mersin; 0-1 m deep; under stones on sandy bottom; 22 May 1959; no. 103.— 1 female.

The carapace breadths of the females are 8 and 12.5 mm, that of the male is 19 mm.

The species has a wide distribution, it is known from the eastern Atlantic (Mediterranean, Mauritania to Angola, Canary Islands, Madeira), the western Atlantic (Massachusetts, North Carolina to Uruguay, Bermuda), and the eastern Pacific (California to Peru). In the Mediterranean the species has been introduced in Marseilles, where it was found on a ship,but has not established itself there, and is neither known from anywhere else in Europe. It is indigenous, however, on the Egyptian and Israel shores of the Mediterranean, where it proves to be quite common. The present material shows that the area of the species in the eastern Mediterranean includes the larger part of the south coast of Turkey.

Brachynotus sexdentatus (Risso, 1827) ssp.

Aegean coast of Greece near the harbour of Porto Lago, Thraki; 0-2 m deep; 29 June 1959; no. 160.— 1 ovigerous female.

The ovigerous female, which has the carapace breadth 9 mm, differs from the typical *Brachynotus sexdentatus* in the same characters as do the Israel specimens dealt with by Holthuis & Gottlieb (1958, pp. 102, 103). Consequently it belongs to the second Mediterranean form of the species as recognized by Zariquiey.

The present form is known from N.E. Spain, S. France, and Israel; the typical form from N.E. Spain, S. France, Italy, Algeria and Great Britain. The present find of the species in Greece is an interesting addition to our knowledge of its range of distribution.

Family Majidae

Maja verrucosa H. Milne Edwards, 1834

South coast of Turkey near Selimiye, about 62 km E. by S. of Antalya; 0-1 m deep; sandy bottom with stones and *Posidonia* vegetation; 4 May 1959; no. 71.— 1 male.

The carapace length of this male is 73 mm.

The species inhabits the entire Mediterranean and the eastern Atlantic from Portugal to the Cape Verde Islands. Previous records from Turkey are: Bosporus (Ninni, 1923), S. end of the Bosporus, near Kizil Adalar (= Princes Islands), and near Bakirköy (= San Stefano), eastern Sea of Marmara (Ostroumoff, 1896, pp. 62, 67, 92), S.W. part of the Çanakkale Boğazi (= Dardanelles), just S. of Çanakkale (Colombo, 1885, p. 26).

Pisa tetraodon (Pennant, 1777)

South coast of Turkey near Selimiye, about 6 km S.W. of Manavgat, and 62 km E. by S. of Antalya; 0-1 m deep; among stones near old roman harbour; 23 April 1959; no. 60.— 1 ovigerous female.

South coast of Turkey near Selimiye; 0-1 m deep; sandy bottom with stones and *Posidonia* vegetation; 4 May 1959; no. 71.— 1 male, 1 ovigerous female.

Adriatic coast of Jugoslavia near Jadranovo, 30 km S. of Rijeka (= Fiume); 0-2 m deep; 5 July 1959; no. 166.— 3 juveniles.

The carapace of the male specimen is 28 mm long, that of the two ovigerous females 27 and 28 mm; in the juveniles it measures 9 to 17 mm.

Pisa tetraodon inhabits the eastern Atlantic from the British Isles to Mauritania and the entire Mediterranean. It has been reported from Tekirdag (= Rodosto) and from near the south coast of Marmara Island, both localities in the Sea of Marmara (Ostroumoff, 1896, pp. 76, 79).

Pisa nodipes Leach, 1815

South coast of Turkey near Selimiye, about 62 km E. by S. of Antalya; 0-1 m deep; sandy bottom with stones and *Posidonia* vegetation; 4 May 1959; no. 71.— 1 female.

The specimen is small, the carapace is 18 mm long.

Pisa nodipes inhabits the entire Mediterranean, and the eastern Atlantic between Portugal and the Cape Verde Islands. It had not previously been reported from Turkey.

Acanthonyx lunulatus (Risso, 1816)

Harbour of Antalya, south coast of Turkey; 0-0.5 m deep; among algae; sea covered by a layer of fresh water; 19 April 1959; no. 47.— 4 males, 9 females (1 ovigerous).

South coast of Turkey near Kiremithaneler, 12 km S.W. of Antalya; 0-1 m deep; on calcareous rock with few algae; sea covered by a layer of fresh water; 22 April 1959; no. 56.— 1 male, 8 females (2 ovigerous).

South coast of Turkey near Selimiye, about 6 km S.W. of Manavgat, and 62 km E. by S. of Antalya; 0-1 m deep; among stones near old roman harbour; 23 April 1959; no. 60.— 3 males, 2 females.

South coast of Turkey near Selimiye; 0-1 m deep; sandy bottom with stones and *Posidonia* vegetation; 4 May 1959; no. 71.— 14 males, 27 females (11 ovigerous).

Harbour of Mersin, south-east coast of Turkey; 0-1 m deep; among algae on stone breakwater; 10 May 1959; no. 82.— 2 males, 2 females (1 ovigerous).

South-east coast of Turkey near Kizkalesi, about 58 km S.W. of Mersin; 0-1 m deep; from algae covered rocks; 12 May 1959; no. 83.— 8 males, 10 females (5 ovigerous).

South-east coast of Turkey near Kizkalesi; 1-2 m deep; fine sand with loose algae; 12 May 1959; no. 84.— 1 female.

Harbour of Mersin, south-east coast of Turkey; 10 m deep; on stones brought up by diver; 16 May 1959; no. 91.— 1 male.

The specimens have the carapace 5 to 17 mm long, in the ovigerous females the carapace length varies between 9 and 14 mm.

Acanthonyx lunulatus is known from the entire Mediterranean, where it is commonly found among algae belonging to the genus *Cystoseira*. It is also known from the eastern Atlantic between Portugal and Cameroons. So far as I know it has not been reported before from Turkey.

Achaeus gordonae Forest & Zariquiey, 1955

South coast of Turkey near Selimiye, about 62 km E. by S. of Antalya; 0-1 m deep; sandy bottom with stones and *Posidonia* vegetation; 4 May 1959; no. 71.— 5 males, 3 females (2 ovigerous).

Adriatic coast of Jugoslavia near Jadranovo, 30 km S. of Rijeka (= Fiume); 0-2 m deep; 5 July 1959; no. 166.— 3 males, 1 ovigerous female.

The carapace length of the specimens varies between 4 and 9 mm, in the ovigerous females it is 6 to 7 mm.

In 1955 Forest & Zariquiey showed that there are two species of *Achaeus* in the Mediterranean which usually had been indicated with incorrect names. *A. cursor* A. Milne Edwards & Bouvier proved to be identical with the typical *A. cranchii* Leach, while the Mediterranean form usually indicated with the name *A. cranchii* needed a new name for which they proposed *A. gordonae*. The latter species is represented in our material which agrees very well with Forest & Zariquiey's account of the species.

Achaeus gordonae until now was known only from the types which originated from Spanish Morocco, from the Baleares and from N.E. Spain. The species certainly has a wider distribution as shown by the present material, but due to the confusion regarding the identity of the Mediterranean species, no reliable records are available. The Rijksmuseum van Natuurlijke Historie possesses material of *Achaeus gordonae* from the following localities: N.E. Spain (Barcelona, Cadaqués), S. France (Banyuls, Port Vendres), Algeria (Guyotville, W. of Algiers). Colombo (1885, p. 26)

reported *Achaeus cranchii* from the S.W. part of Çanakkale Boğazi (= Dardanelles), S. of Çanakkale.

Inachus dorsettensis (Pennant, 1777)

Aegean coast of Greece near the harbour of Porto Lago, Thraki; 0-2 m deep; 29 June 1959; no. 160.— 1 male, 1 ovigerous female.

The carapace breadth of the male is 21 mm, that of the female 20 mm. Both specimens belong to the broad form which sometimes has been indicated with the name *Inachus dorsettensis mauritanicus* Lucas. A revision of the European species of the genus, which will be published by Mr. J. Forest of the Paris Museum will definitely settle the status of the present form.

The species (s.l.) inhabits the eastern Atlantic between Norway and South Africa, it is also found in the entire Mediterranean. Ostroumoff (1896, p. 92) reported it, under the name *Inachus scorpio,* from near the south end of the Bosporus in the Sea of Marmara, Colombo (1885, pp. 25, 26, also as *I. scorpio*) from the S.W. part of the Çanakkale Boğazi (= Dardanelles) between Çanakkale and Kumkale, while Monod (1931, p. 428) mentioned the occurrence in Iskenderun Bay (= Gulf of Alexandretta).

Macropodia rostrata (Linnaeus, 1761)

1 to 2 km off the south coast of Turkey between Lara and Zincir, 10 to 18 km S.E. of Antalya; 15 to 20 m deep; bottom fine sand; fished with local fishing boat; 25 April 1959; no. 63.— 7 males, 3 females (2 ovigerous).

5 km off the south-east coast of Turkey near Mersin; 10 m deep; sandy bottom; fished with local fishing boat; 18 May 1959; no. 96.— 3 males, 1 ovigerous female.

Aegean coast of Greece near the harbour of Porto Lago, Thraki; 0-2 m deep; 29 June 1959; no. 160.— 7 males.

Adriatic coast of Jugoslavia near Jadranovo, 30 km S. of Rijeka (= Fiume); 0-2 m deep; 5 July 1959; no. 166.— 1 juvenile.

The carapace length of the males varies between 9 and 23 mm, that of the females between 10 and 14 mm; the juvenile has the carapace 5 mm long. In the males the rostrum is distinctly longer than in the females, it often reaches beyond the middle of the last segment of the antennular peduncle.

A male and a female of lot 63 are infested with a sacculinid parasite.

Macropodia rostrata is known from the entire eastern Atlantic (Murman coast to S. Africa) and inhabits both the Mediterranean and the Black Sea. Ostroumoff (1896, pp. 60, 92) reported it, under the name *Stenorhynchus phalangium* from the eastern part of the Sea of Marmara, viz., from the southern end of the Bosporus, and from near Kizil Adalar (= Princes Islands). Colombo (1885, pp. 23, 25) mentioned the species, likewise under

the name *Stenorhynchus phalangium,* from the S.W. part of Çanakkale Boğazi (= Dardanelles) between Çanakkale and Kumkale, and from near Urla (= Vurlah) near Izmir (= Smyrna).

Macropodia longirostris (Fabricius, 1775)

South coast of Turkey near Selimiye, about 6 km S.W. of Manavgat, and about 62 km E. by S. of Antalya; 0-1 m deep; among stones near old roman harbour; 23 April 1959; no. 60.— 1 male.

Adriatic coast of Jugoslavia near Jadranovo, 30 km S. of Rijeka (= Fiume); 0-2 m deep; 5 July 1959; no. 166.— 1 male.

The carapace length of the specimens is 8 and 14 mm.

Macropodia longirostris inhabits the eastern Atlantic from the Faeroes to Senegal. It has been reported from the entire Mediterranean and from the Black Sea. Ostroumoff (1896, pp. 64, 71, 76, 87) reported it under the name *Stenorhynchus longirostris* from Kizil Adalar (= Princes Islands), near Kalikratia (near Bü Çekmece), near Tekirdag (= Rodosto), and near Avşa (= Aphisia) Island, all localities situated in the Sea of Marmara; the same author (Ostroumoff, 1896, p. 67) reported *Stenorhynchus aegyptius* which is synonymous with *Macropodia longirostris* from Bakirköy (= San Stefano), eastern Sea of Marmara. Colombo (1885, p. 25) mentioned *Stenorhynchus longirostris* from the S.W. part of Çanakkale Boğazi (= Dardanelles) between Çanakkale and Kumkale.

Ordo Stomatopoda
Family Squillidae

Squilla mantis (Linnaeus, 1758)

Aegean coast of Greece near the harbour of Porto Lago, Thraki; 0-2 m deep; 29 June 1959; no. 160.— 4 males, 2 females.

The males are 140 to 170 mm long, the females measure 142 and 195 mm.

Squilla mantis is a common species in the entire Mediterranean; in the eastern Atlantic it is known from the south coast of England to the Gulf of Guinea. So far as I know the species has not yet been reported from Turkey.

Squilla massavensis Kossmann, 1880

1 to 2 km off the south coast of Turkey between Lara and Zincir, 10 to 18 km S.E. of Antalya; 15-20 m deep; bottom fine sand; fished with local fishing boat; 25 April 1959; no. 63.— 12 males, 7 females.

5 km off the south-east coast of Turkey near Mersin; 10 m deep; sandy bottom; fished with local fishing boat; 18 May 1959; no. 96.— 2 males.

The males are 56 to 143 mm long, the females 62 to 133 mm. In freshly preserved specimens the body is rather uniformly grey. The carinae and the posterior margins of the free thoracic and abdominal somites are marked by a darker colour. In large specimens the carinae and tubercles of the sixth abdominal somite and the telson are greenish blue, the tips of the spines are often pink. The distal part of the penultimate, and the inner half of the ultimate segment of the uropodal exopod, as well as the distal part of the endopod are of a blackish colour. In some specimens the carinae of the various somites are reddish. A very vague dark median spot may sometimes be seen in the anteromedian part of the second abdominal somite.

The present species may immediately be distinguished from *Squilla mantis,* even in the field, by the absence of the conspicuous dark spots at either side of the base of the median carina of the telson. In the larger specimens the presence of rows of tubercles on the dorsal surface of the telson on either side of the median line distinguishes this species at once from related forms. In the small specimens, however, these tubercles are absent.

Squilla massavensis inhabits the Red Sea and the Persian Gulf, and has also been reported from Viet-Nam. Through the Suez Canal it has entered the eastern Mediterranean, being reported from Egypt and Israel. So far the species was not known from Turkey. In the collection of the Rijksmuseum van Natuurlijke Historie there is a sample from Beyrut, Lebanon (1952, don. R. Zariquiey Alvarez).

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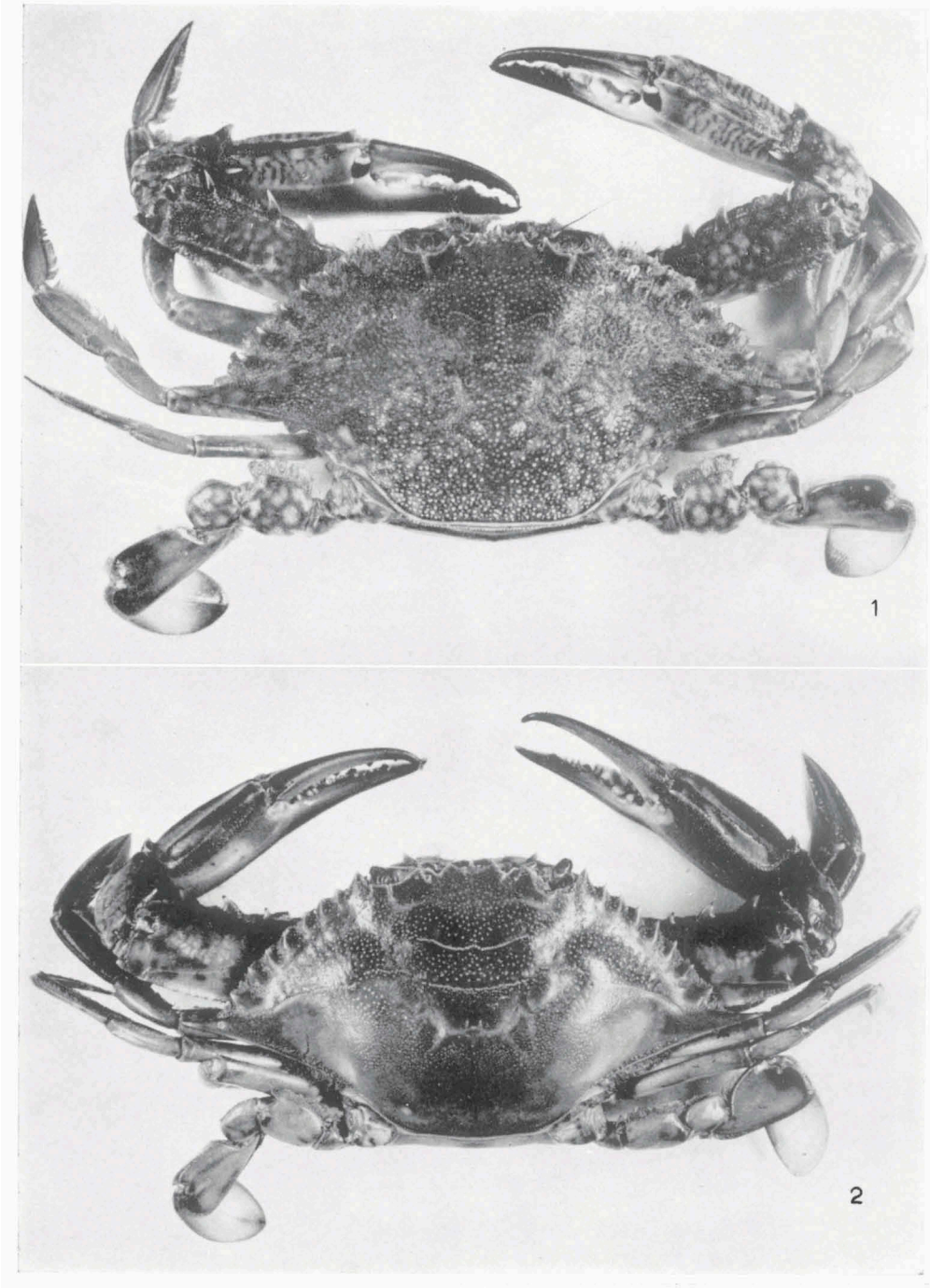

Fig. 1. *Portunus pelagicus* (L.), female from Selimiye (lot 71), in dorsal view. × 0.8.
Fig. 2. *Callinectes sapidus* Rathbun, male from Akyatan Lake (lot 97), in dorsal view, × 0.6.

phot. H. F. Roman

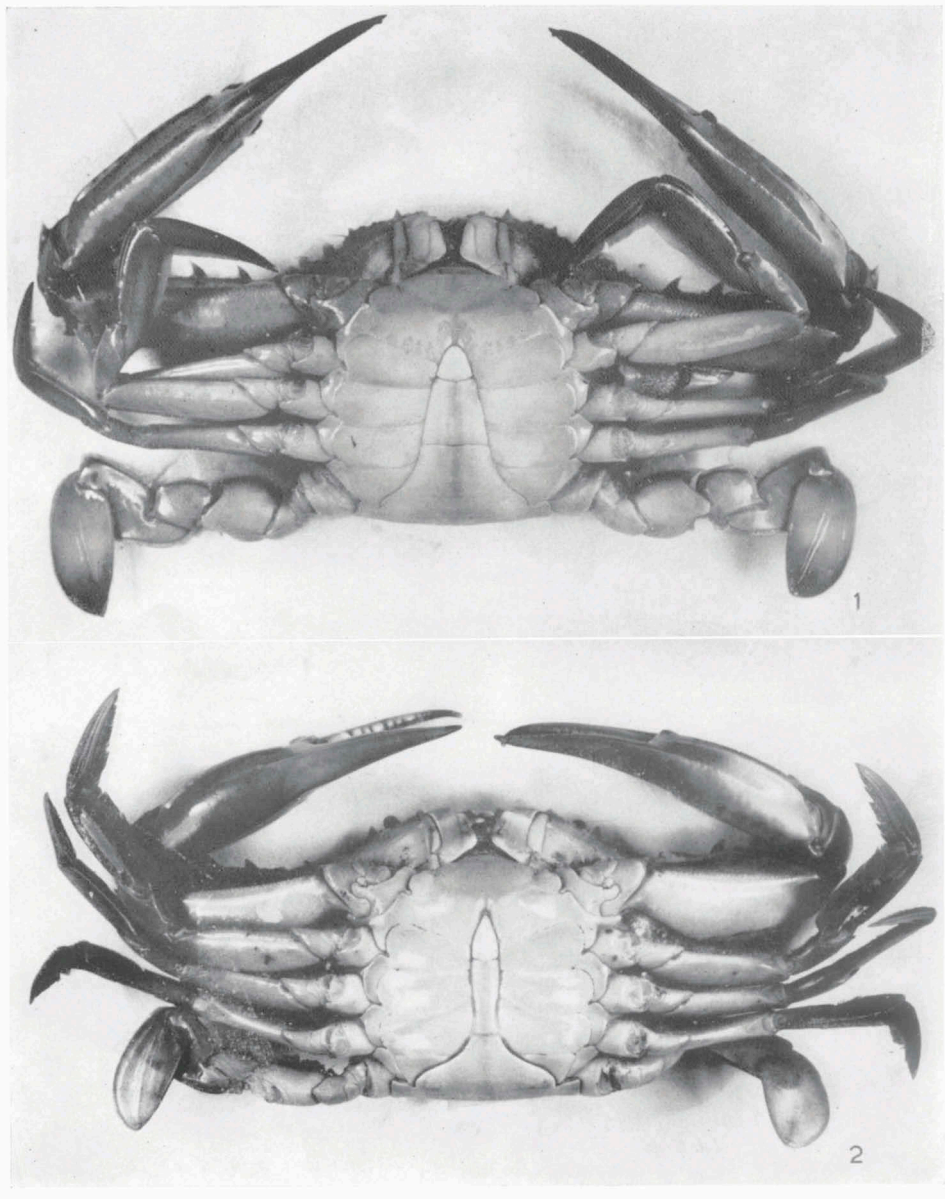

Fig. 1. *Portunus pelagicus* (L.), male from Selimiye (lot 71), in ventral view. × 0.8.
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