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NOTES ON A COLLECTION OF CRUSTACEA DECAPODA FROM THE GREAT BITTER LAKE, EGYPT, WITH A LIST OF THE SPECIES OF DECAPODA KNOWN FROM THE SUEZ CANAL

by

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I. INTRODUCTION

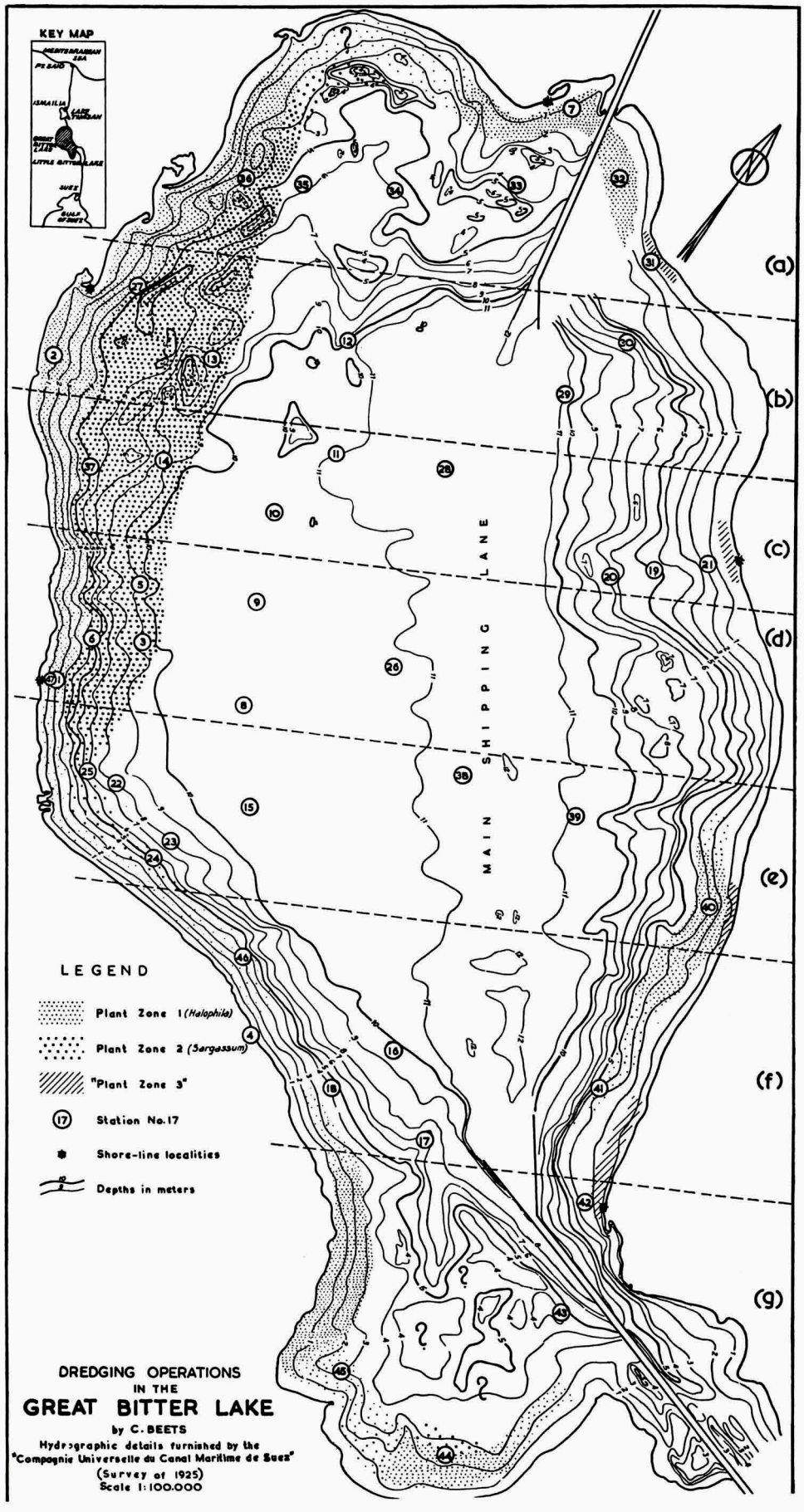
Between August 18 and September 5, 1950, Dr. C. Beets, geologist Royal Dutch Shell Oil Company, explored the aquatic fauna and flora of the Great Bitter Lake. In the course of this exploration dredge hauls were made at 47 stations, distributed all over the lake. An account of this work and a description of the stations were given by Dr. Beets in a previous volume of the present journal (1953).

The Decapod Crustacea collected by Dr. Beets belong to twelve species, three of which have not been reported from the Suez Canal before. Apart from these additions to our knowledge of the fauna of the Suez Canal, the present collection is of great interest because of the extensive data provided by Dr. Beets on the ecology of the localities from which the material originates. Decapoda were collected at the following stations:

Station 1. Depth 1 to 2.7 m, bottom muddy/sandy though fairly firm, thickly covered with *Halophila stipulacea* (Forsk.) Aschers., also yielding some *Sargassum* prob. *crispum* (Forsk.) Ag. and *Spirulina subsalsa* Oerst. Fauna rich. Decapoda: *Metapenaeus stebbingi, Periclimenes calmani, Diogenes pugilator, Ebalia granulata, Pilumnopeus vauquelini.*

Station 4. A shoal in a small embayment, 0.2 to 0.75 m deep, with patches of eel-grass and mussels, bottom consisting of somewhat muddy and sandy gravel deposits. Here and there a boulder beset with small sea anemones. Decapoda: *Paguristes jousseaumei, Ebalia granulata, Pilumnopeus vauquelini.*

Station 5. Depth 9 m, bottom on the whole muddy but with a good deal


KEY MAP
MEDITERRANEAN SEA
PORT SAID
ISMAILIA
LAKE TIMSAH
GREAT BITTER LAKE
LITTLE BITTER LAKE
SUEZ
GULF OF SUEZ
MAIN SHIPPING LANE
(a)
(b)
(c)
(d)
(e)
(f)
(g)
LEGEND
Plant Zone 1 (Halophila)
Plant Zone 2 (Sargassum)
"Plant Zone 3"
(17) Station No. 17
Shore-line localities
Depths in meters
DREDGING OPERATIONS
IN THE
GREAT BITTER LAKE
by C. BEETS
Hydrographic details furnished by the
"Compagnie Universelle du Canal Maritime de Suez"
(Survey of 1925)
Scale 1:100.000

of coarse sand and gravel, covered thickly by *Sargassum*. Decapoda: *Metapenaeus stebbingi, Trachypenaeus curvirostris, Periclimenes calmani, Diogenes pugilator,* and fragments of *Ebalia granulata, Pilumnopeus vauquelini,* and *Eucrate crenata.*

Station 6. Depth 5 to 5.5 m, bottom and vegetation as in station 5. Decapoda: *Metapenaeopsis vaillanti, Metapenaeus stebbingi, Trachypenaeus curvirostris, Periclimenes calmani, Diogenes pugilator,* and fragments of *Leucosia signata* and *Pilumnopeus vauquelini.*

Station 7. Depth 0.5 to 1.5 m, bottom composed of somewhat muddy and sandy gravel deposits, well covered with *Halophila stipulacea,* the alga *Falkenbergia rufolanosa* (Harv.) Schmitz also being present. The rather small catch may be due in part to the position near the Suez Canal entrance where the water was found to be somewhat fouled. In the whole embayment around station 7, below the bottom surface, occur deposits containing dead shells, etc., which when brought to the surface produce a strong smell of H_2S. Decapoda: *Metapenaeus stebbingi, Trachypenaeus curvirostris, Periclimenes calmani, Diogenes pugilator, Ebalia granulosa, Leucosia signata.*

Station 8. Depth 10.4 m, sediment mainly clayey, with a small amount of fine sand. No vegetation of any kind present. Decapoda: *Metapenaeopsis vaillanti, Trachypenaeus curvirostris,* and fragments of *Leucosia signata* and *Pilumnopeus vauquelini.*

Station 9. Depth 10.6 m, sediment as in station 8. No vegetation. Decapoda: Fragments of *Leucosia signata* and *Pilumnopeus vauquelini.*

Station 10. Depth 10.4 m, sediment as in stations 8 and 9. No vegetation. Decapoda: Fragments of *Macropipus corrugatus* and *Pilumnopeus vauquelini.*

Station 12. Depth about 10 m, sediment as in stations 8 to 10, but quite firm. No vegetation, but starfishes and holothurians present. Decapoda: *Trachypenaeus curvirostris.*

Station 13. Depth about 7 m, sediment finely to rather coarsely sandy with a thick cover of *Sargassum.* Decapoda: *Periclimenes calmani, Diogenes pugilator,* and fragments of *Leucosia signata, Macropipus corrugatus,* and *Pilumnopeus vauquelini.*

Station 14. Depth 8.5 m, sediment and vegetation like in station 13. Decapoda: *Periclimenes calmani,* and fragments of *Leucosia signata, Macropipus corrugatus,* and *Pilumnopeus vauquelini.*

Station 15. Depth 10.4 m, sediment consisting of sandy clay. No vegeta-

Fig. 1. Map of the Great Bitter Lake showing Dr. Beets's dredging stations.

tion. Decapoda: *Metapenaeus stebbingi.*

Station 16. Depth 9.8 m, sediment as in station 15. No vegetation. Decapoda: *Metapenaeus stebbingi.*

Station 18. Depth 4.6 m, sediment consisting of sandy clay. No vegetation. Decapoda: *Diogenes pugilator.*

Station 19. Depth 5 to 5.5 m, sediment consisting of sand with some small gravel. No vegetation. Decapoda: *Metapenaeopsis vaillanti, Trachypenaeus curvirostris, Diogenes pugilator.*

Station 21. Depth 1.5 to 3 m, sediment consisting of slightly clayey sand. No vegetation. Decapoda: *Diogenes pugilator.*

Station 23. Depth about 8 m, sediment sandy clay. No vegetation. Decapoda: *Trachypenaeus curvirostris.*

Station 24. Depth 5.8 m, sediment sandy clay. Few specimens of *Sargassum,* some holothurians. Decapoda: *Metapenaeopsis vaillanti, Metapenaeus stebbingi, Diogenes pugilator,* and fragments of *Pilumnopeus vauquelini.*

Station 26. Depth 10.8 m, sediment consisting of sandy clay. No vegetation. Decapoda: *Metapenaeus stebbingi, Trachypenaeus curvirostris, Diogenes pugilator,* and fragments of *Leucosia signata, Pilumnopeus vauquelini,* and *Eucrate crenata.*

Station 27. Depth 4.2 m, sediment muddy sand. Mixed vegetation of *Halophila stipulacea, Sargassum,* and *Jania rubens* (L.) Lamour. Sea-horses and holothurians present. Decapoda: *Metapenaeus stebbingi, Diogenes pugilator,* and fragments of *Pilumnopeus vauquelini.*

Station 31. Depth 1.4 to 1.8 m, sediment consisting of sand with a little gravel. No vegetation. Holothurians present. Decapoda: *Metapenaeus stebbingi, Diogenes pugilator,* and fragments of *Leucosia signata.*

Station 32. Depth 2.6 m, sandy/muddy sediment. Vegetation (*Halophila stipulacea*) not very rich. Many holothurians, several sea-horses present. Decapoda: *Metapenaeus stebbingi, Diogenes pugilator.*

Station 33. Depth 3.85 m, sediment sand with a little gravel and clay. No vegetation. Decapoda: *Metapenaeopsis vaillanti, Trachypenaeus curvirostris, Diogenes pugilator.*

Station 34. Depth 6.2 m, sediment sandy clay. No vegetation. Holothurians present. Decapoda: *Metapenaeopsis vaillanti, Trachypenaeus curvirostris.*

Station 35. Depth 5.6 m, sediment sandy clay. No vegetation. Decapoda: *Diogenes pugilator.*

Station 36. Depth 4 m, sediment sandy clay. Rich vegetation of *Halophila* and *Sargassum,* and rich fauna (e.g., sea-horses and holothurians).

Decapoda: *Periclimenes calmani, Diogenes pugilator, Pilumnopeus vauquelini.*

Station 37. Depth 5.1 m, sediment sandy clay. Rich vegetation of *Sargassum.* Decapoda: *Metapenaeopsis vaillanti, Metapenaeus stebbingi, Trachypenaeus curvirostris, Diogenes pugilator,* and fragments of *Portunus pelagicus* and *Pilumnopeus vauquelini.*

Station 40. Depth 3.1 m, sandy sediment. Vegetation (*Halophila*) quite rich. Several holothurians present. Decapoda: *Pilumnopeus vauquelini.*

Station 42. Depth 2.5 m, sediment sand. Some vegetation. Decapoda: Shrimps (see Beets, 1953, p. 106), *Diogenes pugilator.* On a beach east of this station: *Eucrate crenata.*

Station 44. Depth 2.8 m, sediment muddy gritty sand. Rich vegetation of mixed kind (*Halophila* and *Sargassum*). Decapoda: *Metapenaeus stebbingi,* and fragments of *Pilumnopeus vauquelini.*

Station 45. Depth 2.65 m, sediment clayey sand. Vegetation (*Halophila*) poor. Decapoda: *Diogenes pugilator,* and fragments of *Ebalia granulata.*

The fauna of the Suez Canal has interested several zoologists and it has been dealt with in a fairly large number of papers. Unfortunately until 1924 the collecting and study of the Suez Canal fauna, at least as far as the Crustacea are concerned, was done in a more or less haphazard fashion. The first author to mention a Decapod Crustacean from the Suez Canal was Keller (1883), who reported that "von höheren Krebsen ist im Suez-Kanal ein einziger Repräsentant, eine kleine Krabbe, vorkommend. Ich fand dieselbe im Timsah-See häufig." According to Krukenberg (1888, p. 85) this crab probably is *Pilumnopeus vauquelini.* Krukenberg (1888) himself found two species of crabs (*Portunus pelagicus* and *Pilumnopeus vauquelini*) and one of Penaeid shrimps (*Metapenaeus stebbingi*) in the Canal. Fox (1924), from information received from various sources, compiled a picture of the speed with which the swimming crab *Portunus pelagicus* migrated through the Canal. The first intensive survey of the fauna of the Suez Canal was that undertaken in 1924 by the Cambridge Expedition to the Suez Canal. The results of this expedition, published as vol. 22 of the Transactions of the Zoological Society of London (1926-1929), still form the main source of information concerning the biology of the Canal, though several important contributions have been published later, e.g., by Gruvel (1936), Monod (1937, 1938) and Tortonese (1947, 1952).

A list of all the species of Decapoda reported from the Suez Canal is given at the end of the present paper. Excluded from this list are those Mediterranean and Red Sea species which have been found in the harbours

of Port Said and Port Taufiq respectively, but which have not been reported from the Canal proper.

Under each of the species dealt with here I have given all the references to the literature dealing with material from the Suez Canal that are known to me. Not included is the literature concerning the zoogeographic aspect of the Suez Canal problem in which no original records of Decapoda from the Canal are given, like the papers by Balss (1936), Monod (1932), Steinitz (1929) and Tortonese (1951).

I am most thankful to Dr. Beets for his kindness in allowing me to study his very interesting material, which now is deposited in the collection of the Rijksmuseum van Natuurlijke Historie at Leiden. Furthermore I wish to express my gratitude to Dr. Isabella Gordon, Crustacea Section, British Museum (Nat. Hist.), for the permission to examine some of the material collected by the 1924 Cambridge Expedition to the Suez Canal, which now is preserved in the British Museum.

II. LIST OF THE SPECIES COLLECTED BY DR. BEETS IN THE GREAT BITTER LAKE

Metapenaeopsis vaillanti (Nobili, 1904) (fig. 2)

Material examined: — Stations 6 (2 males), 8 (1 male), 19 (1 female), 24 (1 female), 33 (1 female), 34 (1 male), 37 (1 male and 1 female). The material from stations 33 and 34 is preserved dry. The present specimens vary in length between 27 and 48 mm. They were collected at depths between 3.85 and 10.4 m on a bottom consisting of sandy clay, sandy mud or sand, sometimes mixed with gravel. The vegetation in the localities where the animals were caught either consisted of *Sargassum* or was absent.

The present species was described for the first time by Nobili (1904, p. 230) under the name *Metapenaeus Vaillanti*. In 1906 the same author (Nobili, 1906, p. 18, pl. 1 fig. 4) gave a more extensive description and furthermore figured the thelycum and petasma. Tattersall (1921) refigured the thelycum of the species which he named *Penaeopsis vaillanti*. As pointed out by Burkenroad (1934, p. 33) Tattersall's figures 9 and 12 of pl. 27 have been interchanged: figure 9 and not fig. 12 representing the thelycum of *M. vaillanti*, fig. 12 depicting that organ of *Metapenaeus stebbingi*. Ramadan (1938, p. 70, fig. 14a-c) in order to show the variation in the shape of the thelycum of the present species figured that organ of three different specimens. Our largest female (48 mm long) has the thelycum (fig. 2) like in one of Ramadan's smaller specimens. Ramadan also refigured the petasma of the present species.

Metapenaeopsis vaillanti has been placed by most authors either in the genus *Metapenaeus* Wood-Mason, 1891, or in *Panaeopsis* Bate, 1881, but the presence of a pair of fixed subterminal spines on the telson, and the asymmetrical petasma at once show that it is a member of the genus *Metapenaeopsis* Bouvier, 1905, to which it was first referred by Burkenroad (1934, p. 8), who at that time considered *Metapenaeopsis* a subgenus of *Penaeopsis*.

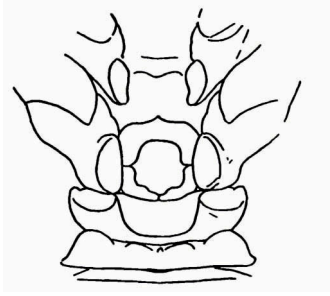


Fig. 2. *Metapenaeus vaillanti* (Nobili). Thelycum of female from station 37. × 7.

The present species is now reported for the first time from the Suez Canal; it was known from the Red Sea, the Gulf of Aden and from off the coast of South Arabia. The type localities are Suez and "Mer Rouge"; it seems best to consider Suez as the restricted type locality of the species.

Metapenaeus stebbingi Nobili, 1904

Penaeus sp. prope *affinem* Krukenberg, 1888, p. 86.
Penaeopsis stebbingi Balss, 1927, pp. 221, 225; Fox, 1927a, p. 230; Gurney, 1927, p. 228; Gurney, 1927a, p. 233, figs. 49-56.
Metapenaeus stebbingi Burkenroad, 1934, p. 33.
Penaeopsis Stebbingi Monod, 1930, p. 140; Gruvel, 1936, pp. 96, 97, 181, fig. 58; Monod, 1937, p. 1, fig. 4 D, E.
?*Parapenaeus longirostris* Gruvel, 1936, p. 179.

Material examined: — Stations 1 (16 males, 20 females), 5 (2 males), 6 (1 male), 7 (13 males, 10 females), 15 (1 female), 16 (1 female), 24 (1 male), 26 (1 female), 27 (1 female), 31 (4 specimens), 32 (1 specimen), 37 (1 male), 44 (2 fragments). The material from stations 31, 32, and 44 is preserved dry. The specimens range in size between 18 and 80 mm, and have been collected at depths from 0.5 to 10.8 m on a bottom of sandy clay, sandy mud, pure or muddy sand, sometimes mixed with gravel. The vegetation in the localities where the specimens were collected consisted of various kinds of algae (*Halophila, Sargassum, Spirulina, Falkenbergia, Jania*), or, in some cases, was lacking.

Descriptions and figures of the present species have been given by Nobili (1906, p. 15, pl. 1 fig. 2), Tattersall (1921, p. 365, pl. 27 figs. 7, 8, 10, 12 (figures 9 and 12 are interchanged), pl. 28 fig. 13), Monod (1930, p. 140, fig. 5; 1937, p. 1, fig. 4 D, E), and Barnard (1950, p. 599, fig. 109 f-i).

Krukenberg (1888, p. 86) stated that "Bei meiner Anwesenheit in Ismailia fing man allabendlich im Timsahsee auch ansehnliche Mengen eines fingerlangen *Penaeus*; leider geriethen die mitgenommenen Exemplare mit den hartschaligen Conchylien zusammen in ein Glas und wurden durch diese während des Transportes so arg beschädigt, dass eine detaillirte Speciesdiagnose zu geben unmöglich wurde. Bezüglich dieses P e n a e u s schrieb mir Herr Dr. *Hilgendorf*, derselbe sei vielleicht eine unbeschriebene Art, die er aber schon nach einem schlechten Exemplare in *Peters'* Crustaceen geschildert habe, also etwa P e n a e u s sp. prope a f f i n e m Miers". Hilgendorf's specimen referred to by Krukenberg evidently is the damaged male of 70 mm from Mozambique in the Peters collection, which was described by Hilgendorf (1879, p. 845) under the name *Peneus monoceros*. In this description Hilgendorf mentioned that no median carina is present either on the posterior part of the carapace or on the fourth abdominal segment, and that the telson shows six minute teeth on either lateral margin. Though this description is rather short, it leaves very little doubt that Hilgendorf's specimen from Mozambique as well as Krukenberg's material from Lake Timsah actually belong to *Metapenaeus stebbingi*, which is the most common shrimp in the Suez Canal, and the only species found there which shows the characters mentioned by Hilgendorf.

Gruvel (1936, p. 179) mentioned the occurrence of *Parapenaeus longirostris* (Lucas, 1846) in Lake Timsah and in the Great Bitter Lake. Since there are no other records of this species from the Suez Canal, and since the species is not even mentioned by Monod (1937) in his study of Gruvel's material, while furthermore *Parapenaeus longirostris* as a rule inhabits waters that are far deeper than those of the Suez Canal, it seems quite probable that the specimens mentioned by Gruvel actually belong to *Metapenaeus stebbingi*, a species which is very common in the whole of the Canal and which shows some superficial resemblance to *Parapenaeus longirostris*.

From Krukenberg's account we see that *Metapenaeus stebbingi* in 1886 had already penetrated as far as Lake Timsah, where it was quite numerous at that time; at present the species is the most common of the entire Canal. The records in literature are: Suez Canal (Monod, 1937), Port Said (Balss, 1927; Fox, 1927a; Monod, 1930; Burkenroad, 1934; Gruvel, 1936), Kan-

tara (= Km. 46) (Fox, 1927a), Lake Timsah (Krukenberg, 1888; Balss, 1927; Fox, 1927a; Gurney, 1927; ? Gruvel, 1936), Bitter Lake (Gurney, 1927), Great Bitter Lake (?Gruvel, 1936), near Kabret (Balss, 1927; Fox, 1927a; Gurney, 1927a), Km. 146, between Little Bitter Lake and Suez (Balss, 1927; Fox, 1927a). Gurney (1927a) reported from Kabret eggs and larvae, which he thought to belong to the present species. According to Gurney (1927) the species is abundant on the shallow sandy shores, hiding there in the sand.

Metapenaeus stebbingi is known to inhabit the Red Sea, and also has been reported from Mozambique (Hilgendorf, 1879) and Delagoa Bay, S.E. Africa (Barnard, 1950). Through the Suez Canal the species has reached the Mediterranean, having been reported from Port Said and Alexandria, Egypt.

Trachypenaeus curvirostris (Stimpson, 1860)

Trachypenaeus anchoralis Balss, 1927, p. 221; Fox, 1927a, p. 230; Gruvel, 1936, pp. 54, 183; Monod, 1937, p. 1. (not *Penaeus anchoralis* Bate, 1881).

Material examined: — Stations 5 (1 male), 6 (1 male), 7 (1 male), 8 (1 male, 2 females), 12 (3 males), 19 (1 male, 1 female), 23 (2 females), 26 (1 female), 33 (1 male), 34 (1 female), 37 (1 male). The material from stations 33 and 34 is preserved dry. The length of the present specimens varies between 24 and 38 mm. The material was obtained from depths between 0.5 and 10.8 m, and found on a bottom consisting of sand, sandy clay or sandy mud, sometimes mixed with gravel, the vegetation in these localities being absent or consisting of *Sargassum, Halophila* and *Falkenbergia.*

A good description and figures of the species are given by Kubo (1949, p. 393).

A re-examination of the material dealt with by Balss (1927) and Fox (1927a) under the name *Trachypenaeus anchoralis* (Bate, 1881), showed that it actually belongs to *T. curvirostris.* A label in Dr. M. D. Burkenroad's handwriting found with this material, made it clear that Dr. Burkenroad had already established the correct identity of the material as early as 1938. Since *T. curvirostris* and *T. anchoralis* often have been confused, and since neither in the material collected by the 1924 Suez Canal Expedition, nor in that gathered by Dr. Beets *T. anchoralis* is represented, it seems most probable that the specimens reported upon by Gruvel (1936) and Monod (1937) as *T. anchoralis* likewise are *T. curvirostris.*

The previous records of the species from the Suez Canal area are: Suez

Canal (Monod, 1937), Lake Timsah (Balss, 1927; Fox, 1927a; Gruvel, 1936).

Trachypenaeus curvirostris is an inhabitant of the Indo-West Pacific region (from the Red Sea to Japan, the Malay Archipelago and Australia); through the Suez Canal it has penetrated into the eastern Mediterranean, where it has been found on the Israel coast.

Periclimenes (Harpilius) calmani Tattersall, 1921

?*Pontonia* Fox, 1926, pp. 49, 54.
Periclimenes calmani Balss, 1927, pp. 223, 225; Fox, 1927a, p. 230; Gurney, 1927, p. 229; Gurney, 1927a, p. 264, figs. 66-69.

Material examined: — Stations 1 (1 specimen), 5 (23 specimens), 6 (7 specimens), 7 (3 specimens), 13 (2 specimens), 14 (2 specimens), 36 (2 specimens). The specimens have a length varying between 7 and 15 mm. Ovigerous females were found in the material from stations 1, 5, 6, 7, and 36. The animals were taken from depths between 0.5 and 9 m, on a bottom of sandy clay, pure or muddy sand, or sandy mud, sometimes mixed with gravel, and which was covered by a dense vegetation of *Halophila* or *Sargassum*.

The species has been reported from the following localities in the Suez Canal area: Port Said (Balss, 1927; Fox, 1927a; Gurney, 1927a), Lake Timsah (Fox, 1926?; Balss, 1927; Fox, 1927a; Gurney, 1927, 1927a), near Kabret (Balss, 1927; Fox, 1927a; Gurney, 1927, 1927a). Fox (1926) reported *Pontonia* from Port Said (station P4) and Lake Timsah (Station T5); since according to Balss (1927) the only Pontonid collected by the 1924 Cambridge Suez Canal Expedition at those stations, or at any other station in the Suez Canal, is *Periclimenes calmani* Tattersall, it seems probable that Fox's reference actually is based on Tattersall's species.

Gurney (1927) reported the present species to be abundant among *Halophila* in water of about 2 m deep, and found that the breeding season just about ended in October. These observations check very well with those made by Dr. Beets. The large number of ovigerous females in our material shows that the breeding season of the species in the Suez Canal extends at least from August to October.

Periclimenes calmani was described by Tattersall (1921) after material from the Sudanese Red Sea. Later, some specimens from the Malay Archipelago were doubtfully referred to Tattersall's species. The only certain records, however, are the original and those from the Suez Canal. Though the species has reached Port Said, it has not been reported from other localities in the eastern Mediterranean.

Diogenes pugilator (Roux, 1829)

Diogenes pugilator Fox, 1926, p. 58; Balss, 1927, pp. 224, 225; Fox, 1927a, p. 229; Gurney, 1927, p. 229; Gurney, 1927a, p. 278, figs. 74, 75.

Material examined: — Stations 1 (2 specimens), 5 (2 specimens), 6 (1 specimen), 7 (7 specimens), 13 (7 specimens), 18 (1 specimen), 19 (57 specimens), 21 (6 specimens), 24 (1 specimen), 26 (1 specimen), 27 (44 specimens), 31 (8 specimens), 32 (6 specimens), 33 (13 specimens), 35 (1 specimen), 36 (2 specimens), 37 (15 specimens), 42 (1 specimen), 45 (2 specimens). The specimens from stations 31, 32, 33, 35, 42, and 45 are preserved dry. The animals have a carapace length which varies between 2 and 6 mm. They were collected at depths between 0.5 and 10.8 m, at a bottom of pure, muddy or clayey sand, sandy mud, or sandy clay, sometimes mixed with gravel, either without vegetation or with a cover of algae belonging to the genera *Halophila* or *Sargassum,* sometimes mixed with *Spirulina* and *Falkenbergia.* The animals were found to inhabit shells of the following species of Gastropod Mollusca, for the identification of which I have to thank Mr. A. C. van Bruggen of the Rijksmuseum van Natuurlijke Historie, Leiden: juvenile *Trochus erythraeus* (Brocchi), *Cleopatra bulimoides* (Ol.), *Melanoides tuberculata* (Müll.), juvenile *Cerithium clypeomorus* (Jouss.), juvenile *C. rüppelli* Phil., *C. scabridum* Phil., *Pirenella conica* (Blainv.), juvenile *Fusus marmoratus* Phil., juvenile *Murex anguliferus* Lam., juvenile *M. tribulus* L. It is interesting to note that *Cleopatra* and *Melanoides* are fresh-water molluscs. Ovigerous females of *Diogenes* were found in the material from stations 19, 27, and 37.

The present material distinctly illustrates the great variability in the shape of the large cheliped of the present species, which variability has already been commented upon by many authors. In some specimens the chela is long and slender, in others it is relatively short and broad. In practically all specimens traces of the original colour-pattern are still visible: the propodus, carpus and merus of the second and third legs show a distinct transverse reddish band in the middle.

The species has been reported from the following localities in the Suez Canal: Lake Timsah (Balss, 1927; Fox, 1927a), near Kabret (Fox, 1926, 1927a; Balls, 1927; Gurney, 1927, 1927a). The specimens collected by the Cambridge Suez Canal Expedition inhabited shells of a species of *Cerithium* and were found on a sandy shore; no ovigerous females were found in this material, which was collected in October and December (Gurney, 1927, 1927a).

Diogenes pugilator inhabits the eastern Atlantic from the south coast of England and the southern North Sea southward to Angola, it furthermore

is found throughout the Mediterranean and in the Black Sea, and has also been reported from the Red Sea and Singapore.

Paguristes jousseaumei Bouvier, 1892 (fig. 3)

Material examined: — Station 4 (1 ovigerous female). The only specimen collected, an ovigerous female with a carapace length of 7.3 mm, was found at a depth of 0.2 to 0.75 m on a muddy and sandy gravel bottom covered with patches of eel-grass.

The distance between the rostrum and the cervical groove is about 1.2 times the breadth of the carapace and 0.6 times its total length. A heavy growth of plumose hairs is present in the anterior part of the lateral regions of the carapace. The rostrum is very shallow and is broadly rounded at the top, which, however, bears a minute and inconspicuous tubercle. The lateral teeth of the anterior margin are not very prominent either, though they are more sharply pointed than the rostrum and end in an acute but small tooth. A few spinules are present just behind the extreme lateral part of the anterior margin of the carapace. A few more spinules, some of which are arranged in a transverse row, are placed in the antero-lateral part of the carapace; these spinules are largely obscured by the plumose setae. Some distance behind the anterior margin of the carapace there is a distinct and deep transverse groove which reaches almost to the lateral teeth. This groove is interrupted in the middle, and laterally curves backwards towards the cervical groove. The anterior margin of the carapace is somewhat raised. The cardiac region is narrow and is constricted in the middle.

The ophthalmic scales are longer than broad and are placed close together, their inner margins almost touching each other. They are rather wide at the base, narrowing rapidly in their proximal half, so that in their middle they are about half as broad as at the base. Distally they widen slightly and end in about six distinct teeth. Plumose setae are present near the top of these scales.

The eyes are long and slender. The eye-stalks are somewhat swollen at the base and narrow distally; the top is slightly inflated and bears a small cornea.

The antennula, when fully extended, reaches with about half the distal segment beyond the end of the eyes. The antennal peduncle reaches about to the base of the cornea. The basal segment of the peduncle has both the inner and the outer antero-lateral angle provided with a very small spinule. The second segment also possesses a small inner antero-lateral spinule, while at the outer antero-lateral angle three larger spinules are present; the

latter, however, are obscured by the presence of plumose hairs. The scaphocerite reaches about to the middle of the last segment of the antennal peduncle, it is triangular with about four teeth on the inner margin and two in the distal part of the outer. The antennal flagellum is less than half as long as the carapace.

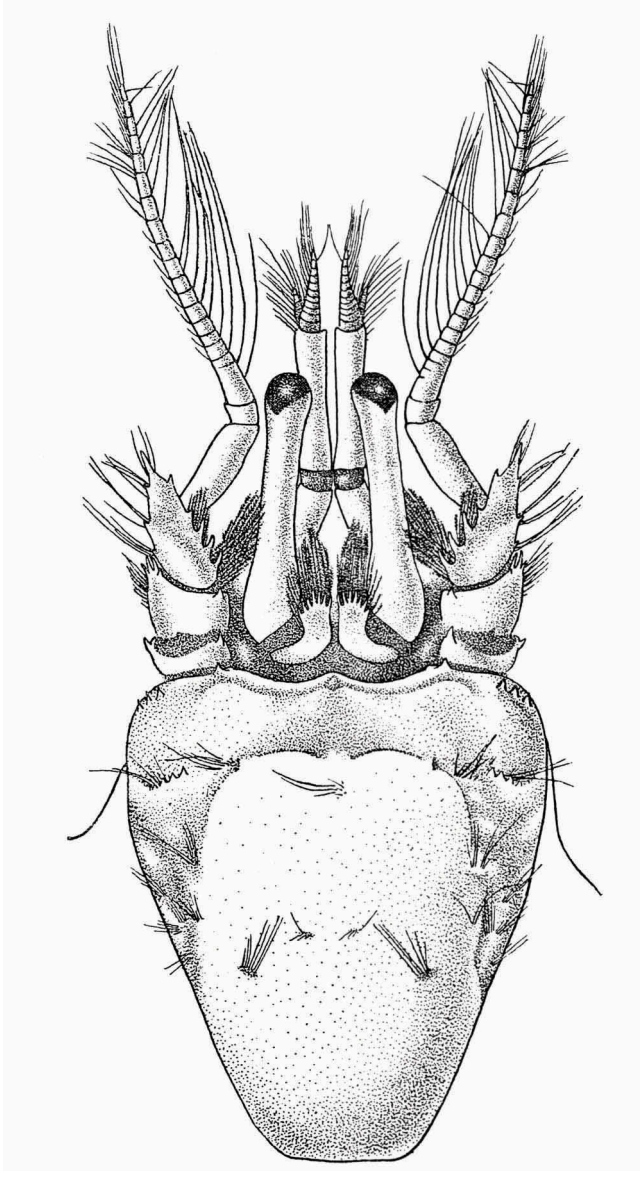


Fig. 3. *Paguristes jousseaumei* Bouvier. Anterior part of body in dorsal view (antennula not fully extended). × 15.

The chelipeds are equal in size and shape. The ischium is short and bears about four small spinules on the inner margin of the lower surface. The merus also has the inner margin of the lower surface with a number of spinules (about 5), which, however, are larger than those of the ischium and are dark-tipped. The outer margin of the lower surface of the merus bears no spinules at all, while the upper margin of this segment shows two spinules, one on the anterior margin and one just behind the depression which precedes the anterior margin. The carpus, when measured along the inner margin is distinctly shorter than the chela, being about as long as the palm and half the dactylus combined. The inner margin of the upper surface of the carpus bears four strong spines which have a dark tip. Some similar, but smaller spines are scattered over the upper surface. The outer surface bears some spinules in the dorsal part, one of these being placed on the anterior margin; the lower part of the outer surface bears some tubercles. The inner surface also bears some spinules in the dorsal part, here the anterior margin bears about three small teeth. The inner margin of the palm bears four distinct horn-tipped spines. On the upper surface similar but smaller spines are present, which are rather evenly distributed over this surface. The palm, when measured along the inner margin, is distinctly shorter than the dactylus. Both fingers bear several horn-tipped tubercles on the upper surface. The gap between the fingers is rather narrow and the cutting edges are distinctly denticulate except in the distal half, where they are hoof-shaped and have a dark colour. The lower surface of the chela is somewhat inflated and bears scattered tubercles. A very dense pubescence of plumose hairs covers the dorsal surface of the carpus, the palm and the basal part of the fingers. This pubescence entirely obscures the spinulation of these segments. The distal part of the fingers bears several tufts of simple hairs, but these leave the tuberculation well visible. Also the lower surface of the chela bears only simple and no plumose hairs. The merus possesses a plumose pubescence along the anterior and the dorsal margins, while plumose hairs also are present on the lower surface. The second legs reach with the dactylus beyond the chela. The dactylus is as long as the propodus. It ends in a dark corneous tip and has a row of about eight small but distinct corneous spines on the lower margin. Much smaller spinules are visible on the upper margin and are scattered over the inner surface. The propodus has a row of about eight strong dark-tipped spines on the upper margin. Spinules are present in the upper part of the anterior margin, the two upper of these spinules are larger than the rest and are placed close together. No spines are visible on the lower margin of the segment, neither are there any on the outer surface. The inner surface

of the propodus, however, shows two longitudinal rows of small spinules. The carpus is slightly shorter than the propodus. Its upper margin bears a row of about seven strong spines; to the outside of the distal part of this row there is a parallel row of about three or four smaller spines, the distal of which sometimes is quite strong. To the inside of the distal part of the upper row of spines one or two additional spines are present. An oblique groove extends on the outer surface of the carpus, starting from the posterior margin in an upward direction, and reaching somewhat beyond the middle of the segment. The merus is somewhat longer than the propodus and is rather high. The lower margin bears some small tubercles, the upper is unarmed. Long plumose setae are present on the upper and lower margins of the merus, on the lower margin and the upper half of the outer surface of the carpus, propodus and dactylus, and on the larger part of the inner surface of the propodus and the basal part of the dactylus. The third leg strongly resembles the second. The propodus, however, does not possess the row of strong spines on the upper margin, though the inner surface of this segment bears minute spinules like in the second leg. There is a distinct but not very large antero-dorsal spine. Also the carpus differs from that of the second leg in lacking the dorsal spines, except for the antero-dorsal, which is well developed. The merus is like in the previous leg. In my female specimen only one sexual aperture is present, namely that on the left third pereiopod, no trace of such an aperture is visible in the right leg.

Colour. The carapace is whitish to pinkish in colour, with a somewhat darker longitudinal pink streak behind the rostrum and indistinct darker pink streaks over the lateral regions. The eye-stalks, antennulae, and antennae have a bluish colour, which is quite distinct in the flagella, being hardly more than a bluish shine in the peduncles. The cornea is black. In the chelae the fingers are whitish with dark tips, the palm is pale reddish with a white spot near the base. The lower surface of the chela is whitish. The upper surface of the carpus is reddish with a longitudinal whitish streak over the middle. The upper part of both the inner and outer surface of the merus shows a pale reddish colour, the rest of this segment is whitish. The dactyli of the second and third legs have the proximal half reddish, the distal half whitish with a dark tip. The propodus is reddish, with a distinct whitish spot both in the distal and in the proximal parts of the inner and outer surfaces. These spots reach down to the lower margin of the segment, but fail to attain the upper margin. The carpus is reddish with a whitish distal ring. The meri have a faint reddish coloration on the upper surface. The reddish coloration on the legs is not homogeneous, but is more of a reticular kind.

The present specimen agrees quite well with Bouvier's (1892) original description of the species; the only major discrepancy that I could find is that Bouvier stated that the second and third legs in his material are "inermes", which certainly does not fit for the specimen from the Great Bitter Lake. Nobili (1906a, p. 87) described a variety *perspicax* of *Paguristes jousseaumei,* which variety was raised by Forest (1954, p. 190) to the rank of a full species. The present specimen, by its short eyes, differs from *P. perspicax* and agrees with *P. jousseaumei.* In a later publication Nobili (1906, p. 114) dealt with two lots of material of *P. jousseaumei,* one originating from Suez, the other labelled "Mer Rouge". These two lots evidently form the type material of the species, though the type localities were given by Bouvier (1892) as Suez and Aden. Nobili noted that Bouvier (in MS) had distinguished two varieties in this material: var. *glabra* from "Mer Rouge" (= Aden?), and var. *intermedia* from Suez. The names *glabra* and *intermedia* for these varieties have never been published by Bouvier himself, and consequently Nobili (1906), who was the first to use them in print, must be considered their author, as he gave descriptions of both forms. It seems well possible, judging by Nobili's account, that the two varieties actually may prove to be good species. The present Suez Canal specimen, by its heavy pubescence, by the presence of denticles on the propodus and the carpus of the second pereiopod, and by the spiniform teeth on the inner margin of the carpus of the chelipeds, evidently belongs to var. *intermedia* Nobili from Suez. If Nobili's material of *P. jousseaumei* var. *glabra* and *P. j.* var. *intermedia* indeed proves to be the type material of *P. jousseaumei,* and if the two forms really are distinct species, then the specific name *jousseaumei* should be assigned to one of them. Consequently either the name *glabra* or that of *intermedia* has to fall as an objective junior synonym of *jousseaumei.* The problem of the correct name of the present species and the related Red Sea forms can only be solved when the taxonomic status of the various specimens in the type material of *Paguristes jousseaumei* Bouv. is made clear. To this end a re-examination of these types is essential. How great the confusion is that exists here, is best illustrated by the fact that though Nobili stated the Suez material to belong to the pubescent form, Bouvier indicated these specimens as being less pubescent than the Aden material.

For the time being I will use the specific name *jousseaumei* Bouvier for the Suez Canal specimen. It is hoped that the description given here will enable future workers to decide the identity of the present specimen when the confusion concerning Bouvier's type material is finally cleared away.

Ebalia granulata (Rüppell, 1830)

Ebalia granulata Calman, 1927, p. 212; Fox, 1927, pp. 218, 219; Monod, 1937, p. 2; Monod, 1938, p. 100.

Material examined: — Stations 1 (1 ovigerous female), 4 (1 male, 1 ovigerous female), 5 (1 fragment), 7 (1 male), 45 (1 fragment). The fragments from stations 5 and 45 were found in the bottom deposits, they are preserved dry. The living specimens, which had a carapace length of 5 to 9 mm, were collected at depths between 0.2 and 2.7 m, on a bottom of mud and sand sometimes mixed with gravel, and covered with eel-grass or algae (mostly *Halophila,* but also some *Sargassum, Spirulina* and *Falkenbergia*).

In the ovigerous female from station 1 the three tubercles on the posterior margin of the carapace are far more distinct than in the ovigerous female from station 4. In the males the cutting edges of the fingers are dentate practically over the entire length as is shown in Paulson's (1875, pl. 10 fig. 2d) figure; in the females the proximal gap between the fingers shows no teeth, these latter being confined to a small portion of the cutting edge just before the tip.

The colour-pattern of the carapace is very variable: in the male from station 4 an elongate triangle of white extends backwards from the front, while in both this specimen and the female from the same station the postero-lateral and postero-median areas of the carapace show a larger or smaller white spot. In the other animals these white colour marks were not noted. In all specimens the walking legs are banded: the merus bears three dark bands, the carpus and propodus each one which is situated in their basal half. In the cheliped the distal part of the merus, carpus and palm is paler than the rest of these segments. The paler area either includes the whole of the distal part of the segments or only the upper portion of it; a narrow dark brown band is visible on the line separating the paler and the darker parts of each segment.

The fragments obtained at stations 5 (the merus of a cheliped) and 45 (a cheliped minus the dactylus) are assigned to the present species since they agree perfectly with the corresponding parts of *Ebalia granulata* and differ from all the other species known from the Suez Canal; a fully certain identification, however, is not possible.

Ebalia granulata has been reported from the following localities in the Suez Canal area: Suez Canal (Monod, 1937), Lake Timsah (Calman, 1927; Fox, 1927; Monod, 1938), S. part of Great Bitter Lake (Calman, 1927; Fox, 1927), near Kabret (Calman, 1927; Fox, 1927). According to Gurney (in Calman, 1927, p. 212) the species in the Suez Canal is very

common in shallow water on a sandy bottom. Outside the Suez Canal the present species is known only from the Red Sea.

Leucosia signata Paulson, 1875

Leucosia signata Fox, 1926, p. 53; Calman, 1927, p. 212; Fox, 1927, pp. 218, 219; Gurney, 1927a, p. 284, fig. 76; Gruvel, 1936, pp. 46, 50 (*Leuconia signata*), 51 (*Lemonia signata*), 87; Monod, 1937, p. 2; Monod, 1938, p. 100.

Material examined: — Stations 6 (1 damaged female, 1 fragment), 7 (2 males), 8 (1 fragment), 9 (3 fragments), 13 (4 fragments), 14 (1 fragment), 26 (1 fragment), 31 (1 fragment). All the material is preserved dry. The three specimens of stations 6 and 7 have a carapace length between 25 and 27 mm. The various fragments enumerated above, apart from an incomplete sternum in the material of station 9, consist of larger or smaller parts of chelipeds. These fragments, all of which were found in bottom deposits, agree so well with the corresponding parts of the complete specimens, that there can be little doubt that they belong to the same species. The complete specimens were collected at a depth of 0.5 to 1.5 m on a muddy and sandy gravel bottom well covered with *Halophila* and *Falkenbergia*.

The following are the published records of the species from the Suez Canal: Suez Canal (Monod, 1937), Km. 4-5, just S. of Port Said (Monod, 1938), Ballah, Km. 54 (Calman, 1927; Fox, 1927), Lake Timsah (Fox, 1926, 1927; Calman, 1927; Gruvel, 1936; Monod, 1938), Bitter Lakes (Gurney, 1927a), Great Bitter Lake (Monod, 1938), Km. 146-150, just N. of Suez (Gruvel, 1936). Gurney's 1927a record is based on larvae. Gurney (in Calman, 1927, p. 212) reported the species to live on a muddy bottom in relatively deep water, while Fox (1926) mentioned it from a depth of 2 m.

The species inhabits the Red Sea and has also been reported from Zanzibar. Through the Suez Canal it has reached the Mediterranean, one specimen having been found on the Israel coast.

Portunus pelagicus (Linnaeus, 1758)

Lupa pelagica Krukenberg, 1888, pp. 81, 84.
Neptunus (*Portunus*) *pelagicus* Fox, 1924, p. 714.
Neptunus pelagicus Fox, 1926, pp. 4, 14, 28; Calman, 1927, pp. 213, 216; Fox, 1927, pp. 217, 218, 219; Gruvel, 1936, pp. 50, 51, 71, 86, 94, 177, 192, 195, 207, 215, fig. 53; Monod, 1937, p. 3; Monod, 1938, p. 116; Tortonese, 1947, pp. 44, 46; Tortonese, 1952, p. 3.

Material examined: — Station 37 (1 fragment). This fragment, which was found in bottom deposits, is preserved dry. It represents a part of the

fixed finger of a large Portunid crab, presumably *Portunus pelagicus*.

The earliest record of the species from the Suez Canal is that by Krukenberg (1888), who reported upon a large specimen captured alive in 1886 in the Great Bitter Lake at Fayed. Fox (1924, 1926, 1927) mentioned that in 1893 the species was common near Kabret and in the same year was observed for the first time at Toussoum, between the Great Bitter Lake and Lake Timsah; the same author mentioned that the species in 1898 was found for the first time in Port Said harbour and that in 1902 it had become quite common there. The records of the species from the Suez Canal are: Suez Canal (Monod, 1937), Port Said (Fox, 1924, 1926, 1927; Calman, 1927; Gruvel, 1936), Lake Timsah (Gruvel, 1936; Tortonese, 1947, 1952), Toussoum, Km. 87 (Fox, 1924, 1927), Great Bitter Lake (Krukenberg, 1888; Gruvel, 1936; Monod, 1938), near Kabret (Fox, 1924, 1926, 1927), S. end of Little Bitter Lake, Km. 133 (Fox, 1924, 1927), between Little Bitter Lake and Suez, Km. 142 (Gruvel, 1936). The species is so common in the Suez Canal area that it is sold on the fish markets in Suez, Ismailia, Cairo, Port Said and Alexandria (Fox, 1924, 1926, 1927; Gruvel, 1936).

Portunus pelagicus inhabits the Indo-West Pacific area (from the Red Sea and S.E. Africa to Japan, Polynesia, and Australia). Through the Suez Canal it entered the eastern Mediterranean and now is quite common along the coasts of Egypt, Israel, the Lebanon, Syria, and S.E. Turkey. Giordani Soika (1951) reported the present species from the northern Adriatic; however, as is clearly shown by Soika's description and figure, the specimens on which his report is based do not belong to *Portunus pelagicus* but to the American *Callinectes sapidus* Rathbun, a species which on several occasions has been introduced in European waters and which even seems to have become permanently established on the Israel coast.

Macropipus corrugatus (Pennant, 1777)

Material examined: — Stations 10 (1 fragment), 13 (1 fragment), 14 (1 fragment). The fragments were found in bottom deposits and are preserved dry. They consist of the propodus of one of the walking legs (station 10), the dactylus of a cheliped (station 13), and the fixed finger and part of the palm of a cheliped (station 14). These fragments agree perfectly with the corresponding parts of *Macropipus corrugatus* and differ from those of all other Portunids with which I compared them, so that I have very little doubt that they belong to the former species, which therefore is now reported for the first time from the Suez Canal.

Macropipus corrugatus is known from both the East Atlantic and the Indo-West Pacific regions. In the former its range extends from the British Isles to West Africa (Sierra Leone), the Mediterranean and the Black Sea, while in the Indo-West Pacific area it has been reported from the Red Sea, Japan, Australia and New Zealand.

Pilumnopeus vauquelini (Audouin, 1826)

?"eine kleine Krabbe" Keller, 1883, p. 22.
Pilumnus Vauquelii Krukenberg, 1888, pp. 81, 85, 86, 88.
Heteropanope vauquelini Calman, 1927, p. 214; Fox, 1927, pp. 218, 219.
Pilumnopeus Vauquelini Monod, 1937, p. 3; Monod, 1938, p. 141.

Material examined: — Stations 1 (2 males, 2 females, 4 fragments), 4 (3 females, 2 of which ovigerous), 5 (4 fragments), 6 (3 fragments), 8 (2 fragments), 9 (3 fragments), 10 (2 fragments), 13 (2 fragments), 14 (1 fragment), 24 (1 fragment), 26 (1 fragment), 27 (6 fragments), 36 (2 males, 2 females of which one ovigerous, 7 fragments), 37 (2 fragments), 40 (1 male), 44 (1 fragment), without station number (1 male). The fragments, consisting mostly of the entire cheliped or part of it, were found in the bottom sediments and are preserved dry. The specimens captured alive have the carapace breadth varying between 5 and 16 mm. Three ovigerous females, in which the carapace breadth varies between 7 and 11 mm, were found in the samples of stations 4 and 36. The living specimens were taken at depths between 0.2 and 4 m, on a bottom of sandy clay, sand or mud, sometimes mixed with gravel, and covered by a rich vegetation of *Halophila* or *Sargassum,* or by patches of eel-grass.

Pilumnopeus vauquelini at present is one of the most, if not the most common crab of the Suez Canal and probably was the first Decapod to be recorded from the Canal: Krukenberg's (1888) supposition that Keller's (1883) "kleine Krabbe" from Lake Timsah might be the present species seems quite acceptable. The records of the species from the Suez Canal are: Suez Canal (Monod, 1937), Port Said (Calman, 1927; Fox, 1927), Lake Timsah (Keller, 1883?; Calman, 1927; Fox, 1927; Monod, 1938), Great Bitter Lake (Krukenberg, 1888; Calman, 1927; Fox, 1927; Monod, 1938), Little Bitter Lake (Calman, 1927; Fox, 1927), Kubri, Km. 149 (Calman, 1927; Fox, 1927), between Little Bitter Lake and Suez, Km. 152 (Calman, 1927; Fox, 1927). Calman reports the capture of ovigerous females in November (and perhaps also in October).

Pilumnopeus vauquelini is a species which originally inhabited the Red Sea and the Persian Gulf, but now has extended its range via the Suez

Canal into the eastern Mediterranean, where it has been found on the coasts of Egypt and Israel.

Eucrate crenata (De Haan, 1835)

Eucrate crenata Calman, 1927, p. 214; Fox, 1927, pp. 218, 219; Monod, 1937, p. 4; Monod, 1938, p. 144; Tortonese, 1947, p. 44; Tortonese, 1952, p. 4.

Material examined: — Stations 5 (1 fragment), 26 (2 fragments); beach east of station 42 in the S.E. corner of the lake (3 males). All the material is preserved dry. The fragments, consisting of two dactyli and one fixed finger of the cheliped, were found in bottom deposits. The three male specimens have a carapace breadth ranging between 29 and 31 mm.

Eucrate crenata has been reported from the following localities in the Suez Canal area: Suez Canal (Monod, 1937), Port Said (Calman, 1927; Fox, 1927), Km. 4-5, just south of Port Said (Monod, 1938), Ras-el-Ech, Km. 14 (Calman, 1927; Fox, 1927), Lake Timsah (Calman, 1927; Fox, 1927; Monod, 1938; Tortonese, 1947, 1952), Great Bitter Lake (Calman, 1927; Fox, 1927; Monod, 1938). Gurney (in Calman, 1927, p. 214) found the species burrowing in mud at a depth of 45 cm, and also obtained specimens from under stones at the edge of the water. Tortonese (1952) found ovigerous females in Lake Timsah in September.

The species inhabits the Indo-West Pacific area from the Red Sea and S. Africa to Japan, Hawaii and Australia. Through the Suez Canal it has penetrated into the eastern Mediterranean, where it has been found on the Egyptian coast near Port Said and Alexandria.

III. LIST OF THE DECAPODA KNOWN AT PRESENT FROM THE SUEZ CANAL

Suborder MACRURA

Family SERGESTIDAE

1. *Lucifer hanseni* Nobili, 1905.

Lucifer Fox, 1926, p. 52.

Lucifer hanseni Balss, 1927, pp. 222, 225; Fox, 1927a, p. 230; Gurney, 1927, p. 228; Gurney, 1927a, p. 246, figs. 58, 59.

Suez Canal records: Port Said (Balss, 1927; Fox, 1927a; Gurney, 1927), Ballah, Km. 54 (Gurney, 1927), Lake Timsah (Fox, 1926, 1927a; Gurney, 1927), Toussoum, Km. 87 (Gurney, 1927), Great Bitter Lake (Fox, 1927a), Kabret (Balss, 1927; Fox, 1927a; Gurney, 1927), Km. 146, N. of Suez (Fox, 1927a).

Range: Indo-West Pacific area (Red Sea to Malay Archipelago and Australia), Suez Canal.

Family PENAEIDAE

2. *Penaeus japonicus* Bate, 1888.

Penaeus canaliculatus Balss, 1927, pp. 221, 225; Fox, 1927a, p. 230; Gurney, 1927, p. 228.

Penaeus japonicus Gruvel, 1936, pp. 180, 208, 215, fig. 56[1]; Monod, 1937, p. 1.

Examination in the British Museum (Nat. Hist.) of the material of the Cambridge Suez Canal Expedition, 1924, identified by Balss (1927) as *Penaeus canaliculatus,* proved that it belongs to *Penaeus japonicus,* as was already indicated on a label in the handwriting of Mr. M. D. Burkenroad, found with this material.

Suez Canal records: Suez Canal (Monod, 1937), Port Said (Balss, 1927; Fox, 1927a), Lake Timsah (Gruvel, 1936), Great Bitter Lake (Gruvel, 1936), near Kabret (Balss, 1927; Fox, 1927a; Gurney, 1927), Little Bitter Lake (Gruvel, 1936).

Range: Indo-West Pacific area (from the Red Sea and S. Africa to Japan and the Malay Archipelago), Suez Canal, eastern Mediterranean (Egypt, Israel, Syria, Turkey).

3. *Penaeus kerathurus* (Forskål, 1775).

Penaeus trisulcatus Gruvel, 1936, pp. 179, 180, figs. 55, 56[2].

Suez Canal records: Northern part of Suez Canal (Gruvel, 1936), Lake Timsah (Gruvel, 1936).

Range: Eastern Atlantic (S. England to Angola; Mediterranean), Suez Canal.

4. *Penaeus semisulcatus* De Haan, 1844.

Penaeus semisulcatus Gruvel, 1936, pp. 84, 181, 215; Monod, 1937, p. 1.

Suez Canal records: Suez Canal (Monod, 1937), "tout le Canal" (Gruvel, 1936), Little Bitter Lake (Gruvel, 1936).

Range: Indo-West Pacific area (from the Red Sea and S. Africa to Japan, the Malay Archipelago and Australia), Suez Canal, eastern Mediterranean (Israel, Syria, Turkey).

— *Parapenaeus longirostris* (Lucas, 1846). See p. 308.

5. *Metapenaeopsis vaillanti* (Nobili, 1904). See p. 306.

6. *Metapenaeus monoceros* (Fabricius, 1798).

Penaeopsis monoceros Balss, 1927, pp. 221, 225; Fox, 1927a, p. 230; Gurney, 1927, p. 228; Monod, 1930, p. 140; Gruvel, 1936, p. 181, fig. 57; Monod, 1937, p. 1.

Metapenaeus monoceros Burkenroad, 1934, p. 32.

Suez Canal records: Suez Canal (Monod, 1937), Port Said (Balss, 1927; Fox, 1927a; Gurney, 1927; Monod, 1930; Burkenroad, 1934; Gruvel, 1936), Great Bitter Lake (Balss, 1927; Fox, 1927a; Gurney, 1927).

Range: Indo-West Pacific area (Red Sea, India), Suez Canal, eastern Mediterranean (Egypt, Israel).

7. *Metapenaeus stebbingi* (Nobili, 1904). See p. 307.

8. *Trachypenaeus curvirostris* (Stimpson, 1860). See p. 309.

Family ATYIDAE

9. *Caridina nilotica* (P. Roux, 1833).

Caridina nilotica Fox, 1926, p. 53; Balss, 1927, p. 222; Gurney, 1927, p. 228.
Caridina nilotica typica Gurney, 1927a, p. 252, figs. 60-62.

Suez Canal records: fresh water of Lake Timsah (Fox, 1926; Balss, 1927; Gurney, 1927, 1927a), fresh water canal at Kabret (Gurney, 1927).

Range: Indo-West Pacific area (from eastern Africa to the Malay Archipelago, Australia and Fiji). In fresh water.

Family PALAEMONIDAE

10. *Palaemon elegans* Rathke, 1837.

Leander squilla elegans Balss, 1927, p. 222; Fox, 1927a, p. 230; Gurney, 1927a, p. 278, fig. 73.

Suez Canal records: Lake Timsah (Balss, 1927; Fox, 1927a; Gurney, 1927a).

Range: Eastern Atlantic (S.W. Norway to S.W. Africa; Mediterranean; Black Sea), Suez Canal, once reported from the Red Sea.

11. *Palaemon pacificus* (Stimpson, 1860).

Leander pacificus Balss, 1927, p. 223; Fox, 1927a, p. 230; Gurney, 1927, p. 229.

Suez Canal records: Near Kabret (Balss, 1927; Fox, 1927a; Gurney, 1927).

Range: Indo-West Pacific area (from the Red Sea and S. Africa to Japan and Hawaii), Suez Canal.

12. *Periclimenes* (*Harpilius*) *calmani* Tattersall, 1921, See p. 310.

Family ALPHEIDAE

13. *Alpheus audouini* Coutière, 1905.

Alphaeus Fox, 1926, p. 49.
Alpheus audouini Balss, 1927, pp. 222, 225; Fox, 1927a, p. 230 (*A. andouini*); Gurney, 1927a, p. 263, fig. 65; Tortonese, 1947, p. 44; Tortonese, 1952, p. 4.

Suez Canal records: Port Said (Fox, 1926, 1927a; Balss, 1927; Gurney, 1927a), Ras-el-Ech, Km. 14 (Gurney, 1927a), Le Cap, Km. 34 (Gurney, 1927a), Lake Timsah (Gurney, 1927a; Tortonese, 1947, 1952), Kabret (Gurney, 1927a). Gurney's (1927a) records are based on larvae, which he

provisionally identified with the present species. Fox's (1926) *Alphaeus* from station P4 evidently belongs to the present species since no other Alpheid species was taken by the Cambridge Expedition in this or any of the other stations in the Canal.

Range: Indo-West Pacific area (Red Sea to New Zealand and Hawaii), Suez Canal, eastern Mediterranean (Egypt, Israel).

14. *Alpheus crassimanus* Heller, 1862.

?*Alpheus* Gruvel, 1936, p. 84.
Alpheus crassimanus Gruvel, 1936, pp. 46, 101; Monod, 1937, p. 1.

Suez Canal records: Suez Canal (Monod, 1937), Lake Timsah (Gruvel, 1936), Little Bitter Lake (?Gruvel, 1936). Since the only Alpheid in the Gruvel collection from the Suez Canal reported upon by Monod (1937) is *A. crassimanus,* it seems most probable that the specimen from the Little Bitter Lake mentioned by Gruvel (1936) as *Alpheus* belongs to that species.

Range: Indo-West Pacific area (Red Sea and S. Africa to Hawaii and Australia), Suez Canal, eastern Mediterranean (Egypt).

Family Hippolytidae

15. *Hippolyte proteus* (Paulson, 1875).

Hippolyte Fox, 1926, pp. 54, 56, 58.
Hippolyte orientalis p.p. Balss, 1927, p. 223.
Hippolyte orientalis Fox, 1927a, p. 230; Gurney, 1927, p. 229; Gurney, 1927a, p. 272, figs. 70-72.
Hippolyte proteus Gurney, 1927b, p. 392, figs. 96-100.

Suez Canal records: Lake Timsah (Fox, 1926, 1927a; Balss, 1927; Gurney, 1927, 1927a, 1927b), Kabret (Fox, 1926, 1927a; Balss, 1927; Gurney, 1927, 1927a, 1927b).

Range: Red Sea, Suez Canal.

16. *Hippolyte ventricosa* H. Milne Edwards, 1837.

Hippolyte orientalis p.p. Balss, 1927, p. 223.
Hippolyte ventricosus Gurney, 1927b, p. 391, figs. 94, 95.

Suez Canal records: Little Bitter Lake (Balss, 1927; Gurney, 1927b).

Range. Indo-West Pacific area (Red Sea to Malay Archipelago and Australia), Suez Canal.

Family Processidae

17. *Processa* species.

Processa sp.? Gurney, 1927a, p. 259.

Suez Canal record: A larva of a species of the genus *Processa* was reported by Gurney from the southern part of the Suez Canal. On p. 259

Gurney indicated the locality as Km. 142, on p. 260 as Km. 152. Since the Cambridge expedition had a collecting station at Km. 152 and not at Km. 142 the former locality probably is the one whence the *Processa* larva originates.

Range: The genus is distributed practically throughout the tropical, subtropical and temperate seas of the world.

Family Callianassidae

18. *Upogebia pusilla* (Petagna, 1792).

Upogebia littoralis Monod, 1937, p. 2.

Suez Canal record: Suez Canal (Monod, 1937).

Range: East Atlantic area (S.W. France, Portugal, Mediterranean, Black Sea), Suez Canal.

Suborder Anomura

Family Paguridae

19. *Diogenes pugilator* (P. Roux, 1829), See p. 311.

20. *Paguristes jousseaumei* Bouvier, 1892. See p. 312.

Suborder Brachyura

Family Dorippidae

21. *Dorippe dorsipes* (Linnaeus, 1758).

Dorippe dorsipes Monod, 1937, p. 2; Monod, 1938, p. 96.

Suez Canal records: Suez Canal (Monod, 1937), Lake Timsah (Monod, 1938).

Range: Indo-West Pacific area (Red Sea and E. Africa to Japan, the Malay Archipelago and Australia), Suez Canal.

Family Leucosiidae

22. *Ebalia granulata* (Rüppell, 1830). See p. 317.

23. *Myra fugax* (Fabricius, 1798).

Myra fugax Calman, 1927, p. 212; Fox, 1927, pp. 218, 219; Monod, 1937, p. 2; Monod, 1938, p. 99.

Suez Canal records: Suez Canal (Monod, 1937), Ballah, Km. 54 (Calman, 1927; Fox, 1927), Lake Timsah (Monod, 1938), Great Bitter Lake (Monod, 1938).

Range: Indo-West Pacific area (from the Red Sea and S. E. Africa to Japan, the Malay Archipelago and New Caledonia), Suez Canal, eastern Mediterranean (Egypt, Israel, Turkey).

24. *Leucosia signata* Paulson, 1875. See p. 318.

Family PORTUNIDAE

25. *Carcinus maenas* (Linnaeus, 1758).

Carcinus maenas Calman, 1927, p. 212; Fox, 1927, pp. 217, 218, 219.
Carcinus (Carcinides) maenas Gruvel, 1936, p. 179.
Carcinides maenas Monod, 1937, p. 2; Monod, 1938, p. 113.

Suez Canal records: Suez Canal (Monod, 1937), northern entrance of Suez Canal, Km. 4-5 (Gruvel, 1936; Monod, 1938), northern entrance of Suez Canal, Km. 5 (Calman, 1927; Fox, 1927).

Range: East Atlantic area (from N. Norway to Mauritania; Mediterranean; Black Sea), Suez Canal, Indo-West Pacific area (Red Sea, Ceylon, Australia, Hawaii), East Pacific area (Panama), West Atlantic area (from Nova Scotia to Virginia; Brazil).

26. *Macropipus corrugatus* (Pennant, 1777). See p. 319.

27. *Portunus pelagicus* (Linnaeus, 1758). See p. 318.

28. *Charybdis hoplites* (Wood-Mason, 1877).

Charybdis (Goniohellenus) hoplites Monod, 1937, p. 3; Monod, 1938, p. 114.

Suez Canal records: Suez Canal (Monod, 1937), Great Bitter Lake (Monod, 1938).

Range: Indo-West Pacific area (Red Sea, Iranian Gulf, Arabian Sea, India, E. Africa), Suez Canal.

29. *Thalamita poissonii* (Audouin, 1826).

Thalamita poissonii Calman, 1927, p. 213.

Suez Canal records: Little Bitter Lake (Calman, 1927), Km. 152 and Km. 157, southern part of Suez Canal (Calman, 1927).

Range: Indo-West Pacific area (Red Sea, Iranian Gulf, Western Indian Ocean, Ceylon, Formosa), Suez Canal, eastern Mediterranean (Israel).

Family XANTHIDAE

30. *Actaea hirsutissima* (Rüppell, 1830).

Actaea hirsutissima Calman, 1927, p. 213; Fox, 1927, pp. 218, 219.

Suez Canal records: Little Bitter Lake (Calman, 1927; Fox, 1927).

Range: Indo-West Pacific area (from the Red Sea and E. Africa to the Bonin Islands and Polynesia), Suez Canal.

31. *Actaea savignyi* (H. Milne Edwards, 1834).

Actaea savignyi Calman, 1927, p. 213; Fox, 1927, pp. 218, 219; Monod, 1937, p. 3 (*A. Savignyi*); Monod, 1938, p. 129; Tortonese, 1952, p. 4.

Suez Canal records: Suez Canal (Monod, 1937), Kantara (= Km. 46), Ballah (= Km. 54), and El Ferdan (= Km. 64) (Calman, 1927; Fox, 1927), Lake Timsah (Calman, 1927; Fox, 1927; Monod, 1938; Tortonese, 1952),

Toussoum (= Km. 87), and northern part of Great Bitter Lake (Calman, 1927; Fox, 1927).

Range: Indo-West Pacific area (from the Red Sea and S. Africa to Japan, Polynesia and Australia), Suez Canal.

32. *Heteropanope laevis* (Dana, 1852).

Heteropanope laevis Calman, 1927, p. 214; Fox, 1927, pp. 218, 219; Gruvel, 1936, p. 84.
Pilumnopeus laevis Monod, 1937, p. 3; Monod, 1938, p. 140.

Suez Canal records: Suez Canal (Monod, 1937), Port Said (Calman, 1927; Fox, 1927), northern entrance of Suez Canal, Km. 4-5 (Monod, 1938), just south of El Tineh (= Km. 25), Kantara (= Km. 46), El Guisr (= Km. 72), and Ferry Post (= Km. 76) (Calman, 1927; Fox, 1927), Lake Timsah (Monod, 1938), Little Bitter Lake (Gruvel, 1936).

Range: Indo-West Pacific area (Red Sea, India), Suez Canal, eastern Mediterranean (Egypt).

33. *Pilumnopeus vauquelini* (Audouin, 1826). See p. 320.

34. *Pilumnus savignyi* Heller, 1861.

Pilumnus savignyi Calman, 1927, p. 214; Fox, 1927, pp. 218, 219; Gruvel, 1936, p. 90 (*P. Savignyi*).

Suez Canal records: Kubri (= Km. 149), and El Shatt (= Km. 157), southern part of Suez Canal (Calman, 1927; Fox, 1927), southern entrance of Suez Canal (Gruvel, 1936).

Range: Indo-West Pacific area (Red Sea, Iranian Gulf, E. Africa), Suez Canal.

35. *Eriphia spinifrons* (Herbst, 1785).

Eriphia spinifrons Monod, 1937, p. 3; Monod, 1938, p. 127.

Suez Canal records: Suez Canal (Monod, 1937), northern entrance of the Canal, Km. 4-5 (Monod, 1938).

Range: East Atlantic area (from S. Brittany, France to Mauritania; Mediterranean; Black Sea), Suez Canal.

Family GONEPLACIDAE

36. *Eucrate crenata* (De Haan, 1835). See p. 321.

Family GRAPSIDAE

37. *Metopograpsus messor* (Forskål, 1775).

Metopograpsus messor Calman, 1927, p. 215; Fox, 1927, pp. 218, 219.

Suez Canal records: Kubri (= Km. 149), and El Shatt (= Km. 157), southern part of Canal (Calman, 1927; Fox, 1927).

Range: Indo-West Pacific area (Red Sea, Iranian Gulf), Suez Canal.

38. *Brachynotus sexdentatus* (Risso, 1826).

Brachynotus sexdentatus Calman, 1927, pp. 215, 217; Fox, 1927, pp. 217, 218, 219; ? Tortonese, 1952, p. 5.

Suez Canal records: Lake Timsah (Calman, 1927; Fox, 1927; ?Tortonese, 1952). According to Tortonese the identification of his material is not fully certain.

Range: East Atlantic area (west coast of Morocco, Mediterranean, Black ea), Suez Canal.

Family Ocypodidae

39. *Dotilla sulcata* (Forskål, 1775).

Dotilla sulcata Calman, 1927, p. 215; Fox, 1927, pp. 218, 219.
Paraclistostoma leachii Calman, 1927, p. 215; Fox, 1927, pp. 218, 219.

Suez Canal records: N. of Suez, Km. 146 (Calman, 1927; Fox, 1927).

Range: Indo-West Pacific area (Red Sea, Aden, Baluchistan), Suez Canal.

40. *Paracleistostoma leachii* (Audouin, 1826).

Suez Canal records: Near Kabret (Calman, 1927; Fox, 1927).

Range: Red Sea, Suez Canal.

41. *Ocypode aegyptiaca* Gerstaecker, 1856.

Ocypode aegyptiaca Monod, 1937, p. 5 (*Ocypoda a.*); Monod, 1938, p. 146.

Suez Canal records: Suez Canal (Monod, 1937), northern entrance of Canal, Km. 4-5 (Monod, 1938).

Range: Indo-West Pacific area (Red Sea, Madagascar), Suez Canal.

42. *Macrophthalmus depressus* Rüppell, 1830.

Macrophthalmus depressus Fox, 1926, p. 57; Calman, 1927, p. 215; Fox, 1927, pp. 217, 218, 219.

Suez Canal records: Near Kabret (Fox, 1926, 1927; Calman, 1927).

Range: Indo-West Pacific area (Red Sea, Iranian Gulf, India), Suez Canal.

Family Majidae

43. *Hyastenus hilgendorfi* De Man, 1887.

Hyastenus hilgendorfi Calman, 1927, p. 212; Fox, 1927, pp. 218, 219; Gruvel, 1936, pp. 50, 51 (*Hyasterus Hilgendorfi*); Monod, 1937, p. 2 (*H.Hilgendorfi*); Monod, 1938, p. 105, fig. 4 J; ? Tortonese, 1952, p. 4.

Suez Canal records: Suez Canal (Monod, 1937), northern entrance of Canal, Km. 4-5 (Monod, 1938), Kantara (= Km. 46), El Ferdan (= Km. 64), and El Guisr (= Km. 72) (Calman, 1927; Fox, 1927), Lake Timsah (Gruvel, 1936; Monod, 1938; ?Tortonese, 1952), Great Bitter

Lake (Calman, 1927; Fox, 1927; Monod, 1938). According to Tortonese the identification of his material is not fully certain.

Range: Indo-West Pacific area (Red Sea to Malay Archipelago), Suez Canal.

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