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SOME NEW RECORDS OF HYDROIDS FROM THE GULF OF AQABA WITH ZOOGEOGRAPHICAL REMARKS ON THE RED SEA AREA*

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ABSTRACT

During spring and summer 1970 hydroids were collected by diving in Eilat Bay, near Taba, Faroun (Coral Island) and Ras el Burka. In most cases live specimens were observed to get acquainted with the cultivation methods. A total of 16 species are listed. Two species, *Dynamena crisioides crisioides* (Billard, 1933) and *Dynamena cornicina* (Billard, 1933 and Vervoort, 1967), have already been recorded from the Gulf of Aqaba. Eight of them have not previously been found in the Red Sea (*Tubularia larynx, Tubularia mesembryanthemum, Hydractinia kaffraria, Laomedea dichotoma, Clytia hemisphaerica, Sertularella mediterranea, Kirchenpaueria pinnata, Halopteris glutinosa*). A checklist of all records from the Red Sea area, including the Gulf of Aden and the Suez Canal, is added and gives a total of 64 species of which seven or more are doubtful. Four (*Turritopsis nutricula. Eudendrium racemosum mucronatum, Campanularia lennoxensis, Laomedea geniculata*) are recorded from the Suez Canal only, three (*Podocoryne denhami, Calicella syringa, Halopteris catharina* var. *articulata*) from the Gulf of Aden and one (*Bougainvillia ramosa*) from both regions. From these it would appear that less than 50 species exist in the Red Sea. Of these only nine species (*Halocordyle disticha, Campanularia gravieri, Thyroscyphus fruticosus, Dynamena cornicina, D. crisioides crisioides, Ventromma halecioides, Gymnangium gracicaulis, G. eximium and Lytocarpus philippinus*) have been recorded more than three times. No definite conclusions can be drawn from these results.

The hydrographical and geographical conditions in the Red Sea are not responsible for the small number of species, this being brought about by lack of investigations and absence of records of hydroids below the 50 m. depth. No endemic hydroid has been found among the 64 species but they can be divided into three groups : Those which penetrated into the Red Sea from the Indian Ocean (Indo-Pacific species), those which probably came from the Mediterranean Sea (Atlantic and Mediterranean forms) and those which could have penetrated from both regions (cosmopolites). *Kirchenpaueria pinnata* belongs to the second group and has to the author's knowledge not previously been recorded from the Indo-Pacific Oceans.

INTRODUCTION

OUR knowledge of hydroids from the Red Sea is very poor. This fact was mentioned by Mergner (1966, 1966a). Vervoort (1967) and Billard (1933) both recorded four species of hydroids from the Gulf of Aqaba. During my stay at the Marine Biological Laboratory, Eilat, from February to July 1970, a total of sixteen species were collected in the field and from the fouling plates placed by H. Schuhmacher

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(Schuhmacher, in preparation). An attempt was made to cultivate hydroids so that live specimens could be observed. This experiment was running parallel to a plankton sampling programme for hydromedusae.

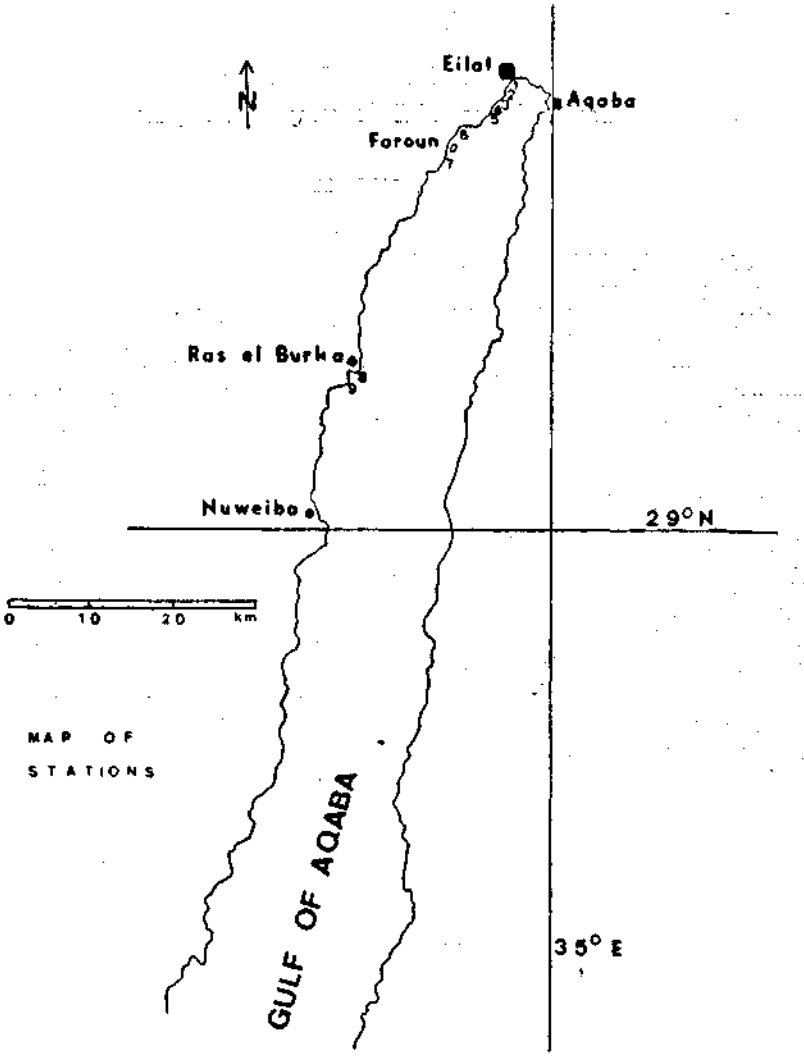

Fig. 1. Map of Gulf of Aqaba showing the collection centres.

Under the systematic account only the number of the station where a specimen was collected is given. Full bibliographies and detailed descriptions of the more common species are not given. In these cases only general remarks are made, especially when material is compared with that of Vervoort (1967). A checklist of all hydroids that have been recorded from the Red Sea area is provided and some geographical aspects of the region are discussed. The name 'Red Sea area' includes the Suez Canal and the Gulf of Aden which both do not belong to the Red Sea.

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List of Species

Family Halocordylidae

Halocordyle disticha (Goldfuss, 1820) var. *australis* (Bale, 1884).
Solanderia secunda (Inaba, 1892).

Family Tubulariidae

Tubularia larynx Ellis & Solander, 1786.
Tubularia mesembryanthemum Allman, 1870.

Family Hydractiniidae

Hydractinia kaffraria Millard, 1955.

Family Campanulariidae

Campanularia gravieri Billard, 1904.
Clytia hemisphaerica (Linné, 1767).
Laomedea (*Obelia*) *dichotoma* (Linné, 1767).

Family Sertulariidae

Thyroscyphus fruticosus (Esper, 1793).
Dynamena crisioides crisioides Lamouroux, 1824.
Dynamena cornicina McCrady, 1858.
Sertularella mediterranea Hartlaub, 1901.

Family Plumulariidae

Kirchenpaueria pinnata (Linné, 1767).
Halopteris glutinosa (Lamouroux, 1816).
Gymnangium exlmium (Allman, 1874).
Lytocarpus philippinus (Kirchenpauer, 1872).

List of Stations (Fig. 1)

1. New harbour, Eilat, concrete-pillars, 1-5 m depth.
2. Southern oil jetty, on stones, shallow water.
3. Glassbottom boat harbour, 0.5-2 m depth.
4. Nature reserve, 20-50 m, on dead corals.
5. Marine Biological Laboratory, 5-50 m depth, on dead corals.
6. Wadi Taaba, on corals, 1-5 m depth.
7. 1000 m south of Faroun (Coral Island), 1-5 m depth, on corals.
8. Ras el Burka, 0.5-10 m depth, on dead corals.
9. 1000 m south of Ras el Burka, 0.5-6 m depth.

Systematic Account

Halocordyle disticha (Goldfuss, 1820) var. **australis** (Bale, 1884)

Pennaria symmetrica Thornely, 1908, p. 81.
Pennaria disticha var. *australis* Jarvis, 1922, p. 333 ; Millard, 1959, p. 300.
Pennaria disticha australis Billard, 1926, p. 91 ; 1933, p. 5.
Halocordyle disticha var. *australis* Vervoort, 1941, p. 192 ; 1959, p. 216 ; 1967, p. 19.

Material : Stat. 1 (February to July) ; 7 (March).

Remarks : Vervoort (1941, 1959) has discussed the taxonomic significance of this variety. Its characteristics are the annulations at the origin of the branches bearing the polyps. The primary branches show a few rings just above the axil of the peduncle of the hydranth. The small number of rings of the periderm varies. The hydranths arise from the secondary side branches. The primary branches are light brown and the secondaries mostly colourless.

Geographical Distribution : This species is widely distributed throughout the warmer waters of the world. It has been recorded from the Red Sea (Southern Red Sea, Gulf of Suez, Suez Canal). The variety *australis* seems to be restricted to Indo-Pacific waters.

Solanderia secunda (Inaba, 1892) (Plate I A)

Material : Stat. 7 (March) ; 8 (June) ; 9 (June).

Description : These colonies arise from thick hydrorhiza fibres, growing on dead ooral. Their colour is brownish, turning into whitish brown at the end of the branches. Separate main stems bear various fans which are placed in one plane. The main stems and primary ramifications normally have a diameter of 1.5-2.0 mm, becoming narrower apically. The skeletal structure is permeated by the coenosarc. The hydranths rise directly from the coenosarc along two opposite sides of the ramifications. When the ramifications are older the hydranths occur on all sides. The hydranths normally have 25 short, capitate tentacles of which some are arranged in an oral whorl. Each hydranth is flanked by two spines. The length and shape

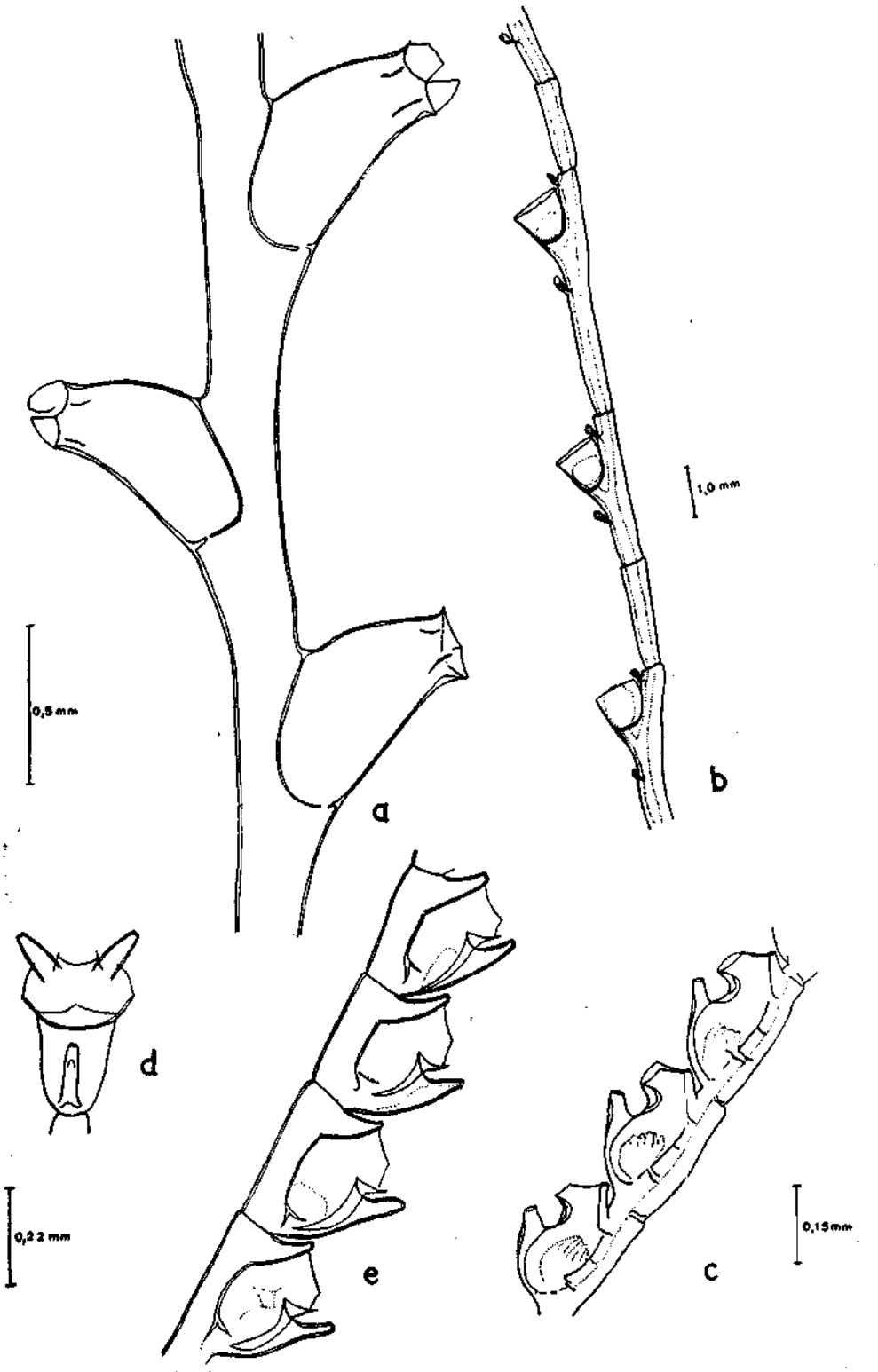

Fig. 2. *a. Sertularella mediterranea* Hartlaub, part of stem with three hydrothecae, lateral view; *b. Kichenpaueria pinnata* (Linné), part of side branch with hydrothecae and nematothecae, lateral view; *c. Gymnangium eximium* (Allman), part of a branch, lateral view; *d. Lytocarpus philippinus* (Kirchenpauer), frontal view of hydrotheca; and *e.* part of a side branch, lateral view of the same species.

of the spines varies and they sometimes show the reticulated structure of the skeleton.

Remarks : To become acquainted with the Solanderiidae it is helpful to read Vervoort (1966). The different species are distinguished by length and shape of their spines. Vervoort will publish a general morphological discussion and synonymy of *Solanderia secunda, S. crosslandi* (Thornely) and *S. minima* (Hickson). The last two species have been recorded from the Red Sea by Thornely (1908) and Vervoort (1967).

Tubularia larynx Ellis and Solander, 1786

Tubularia larynx Allman, 1870, p. 406, tab. 21 ; Fenchel, 1905, p. 507 (synonymy) ; Stechow, 1925, p. 406 ; Billard, 1926, p. 92; Fraser, 1944, p. 99, pl. 17, fig. 22 (synonymy) ; Pyefinch, Downing, 1949, p. 21 ; Naumov, 1960, p. 221 ; Rees, 1963, p. 1223 ; Redier, 1964, p. 128 ; Ralph, 1966, p. 162.

Material : Stat. 3 (March to June), from the glassbottom boats.

Description : This colony is very similar to *Tubularia mesembryanthemum* Allman but the stems are a little shorter. The female gonophores are crowned with four conical tentaculiform tubercles ; the male also has these characteristic apical ridges but they are smaller.

Remarks : From Allman's (1870) descriptions, *Tubularia larynx* Ellis & Solander and *T. mesembryanthemum* Allman can be clearly distinguished so that it is necessary to record these two species separately. Fenchel (1905) indicated that the number of the apical ridges in *T. larynx* varies from one to eight. Ewer (1953) indicated that Fenchel's views have not met with general acceptance. In this connection it is interesting to note that Rees (1963) distinguishes between *T. larynx* and *T. crocea* because the gonophores of the latter possesses six to eight laterally compressed ridges Rees (1963) does not exclude the possibility that *T. mesembryanthemum* may be identical with *T. crocea.* When we know more about the development of these Tubulariidae we may find that the three species are identical.

Geographical Distribution : This species occurs throughout the Atlantic Ocean and adjacent seas and along the West-coast of America. There is one doubtful record from the Suez Canal (Billard, 1926) and no records from the Red Sea or Indian Ocean.

Tubularia mesembryanthemum Allman, 1870 (Plate II B)

Tubularia mesembryanthemum Allman, 1870, p. 418 ; Inaba, 1892, figs. 92-95 ; Stechow, 1913, p. 52 ; Hargitt, 1927, p. 494 ; Tuzet, 1929, pp. 747-749 ; Perrier, 1936, p. 14 ; Ling, 1938, p. 178 ; Hiro, 1939, p. 172 ; Ewer, 1953, p. 351 ; Luther/Fiedler, 1961, p. 219 ; Rees, 1963, p. 1223.

Material : Stat. 3 (January), fouling plate.

Description : This colony is large and complexly connected by a reticulated rhizocaulus. The hydrocaulus consists mainly of a cluster of simple slender stems attaining a height of about 5 cm and bearing a large flask-shaped polyp at the top. The large hydranths have the usual double series of tentacles, 20-25 in each series. Basal tentacles are large and filiform, distal ones somewhat shorter. Medusoids grow in erect dense clusters from the body of the hydranth just above the circle of basal tentacles. They are barrel-shaped and twice as long as they are wide. The female gonophore has eight compressed apical processes and a finger-shaped process arising from the base of the spadix, the male only four rounded tubercles. Actinulae may be clearly seen in the sporosac.

Remarks : Significant for this species is the finger-shaped process on the female gonophore. Billard (1926) recorded a *T. larynx* and wrote 'ces gonophores montrent un tentacule distal ou bien n'en possèdent pas'. It is possible that he described *T. mesembryanthemum* and not *T. larynx* (see remarks under *T. larynx*).

Geographical Distribution : Tubularia mesembryanthemum Allman is distributed throughout the Northern Atlantic Ocean and the Mediterranean Sea. In the Indo-Pacific waters it is recorded from Japan and China.

Hydractinia kaffraria Millard, 1955 (Plate 1 C)

Hydractinia kaffraria Millard, 1955, p. 217, fig. 2 ; 1959, p. 307 ; 1966, p. 457, fig. 6.

Material : Stat. 3 (March), on small stones in shallow water.

Description : Millard (1955) gives a good description therefore, I have very little to add. Zooids arise directly from hydrorhiza ; this species has no spines. The gastrozooid has 8-12 tentacles which are arranged in two close set alternating verticils. Contracted manubrium conical, more clubbed when expanded. Gonozooids are somewhat smaller than gastrozooids with the same arrangement of the tentacles. The spherical sporosac arise below the tentacles on a short stalk. Male and female sporosacs have four radial canals and one circular canal. Male sporosacs with indications of rudimentary tentacles on inner edge of umbrellar margin, female containing ova around a central spadix.

Remarks : This species is closely related to *H. pacifica* Hartlaub but it only has one ovum in the female sporosac and no radial canals. *H. kaffraria* differs from *H. parvispina* Hartlaub in the absence of spines.

Geographical Distribution : This is the first record from the northern hemisphere. This species was found in South Africa in the Atlantic and Indian Oceans.

Campanularia gravieri Billard, 1904

Campanularia gravieri Billard, 1904a, p. 482, fig. 1.
Campanularia (*Clytia*) *gravieri* Vervoort, 1967, p. 50, fig. 16.
Laomedea gravieri Billard, 1933, p. 9, fig. 3.
Clytia gravieri Billard, 1938, p. 429, figs. 1-3.
Clytia alternata Hargitt, 1924, p. 483, pl. 2, fig. 7.
Laomedea bistriata Leloup, 1931, p. 4, figs. 8-11 ; 1937, p. 22, fig. 12.

Material : Stat. 3 (March), fouling plate ; 4 (April) ; 5 (April) ; 8 (June) ; 9 (June).

Remarks : The synonymy of this species has been discussed by Billard (1938). The number of synonyms increases with a critical study of the Indo-Pacific Campanulariidae. *C. gravieri* was originally described by Billard (1904) from the Gulf of Aden. Vervoort (1967) provides a good description of this species.

Geographical Distribution : This species is well distributed throughout the Indian Ocean and is present in some parts of the Pacific Ocean. It has been recorded from the Gulf of Aden, the southern Red Sea, the Gulf of Suez and now from the Gulf of Aqaba.

Clytia hemisphaerica (Linné, 1767) (Plate I D)

Clytia hemisphaerica Millard, 1966, p. 478, fig. 14.

Laomedea gracilis M. Sars, 1857, p. 160, pl. 2, figs. 1-3, 5.

Clytia compressa Totton, 1930, p. 146, fig. 6.

Clytia johnstoni Hincks, 1868, p. 183, pl. 36, fig. 1 ; Hartlaub, 1901, p. 364 ; Bale, 1924, p. 232 ; Billard, 1931, p. 246 ; Fraser, 1944, p. 138, pl. 24, fig. 111, (synonymy) ; Hamond, 1957, pp. 295, 312 ; Ralph, 1957, pp. 820, 823, figs. 1 h-u, 2, 3 a-f ; Millard, 1958, p. 172, figs. 3 A, D, F.

Campanularia johnstoni Alder, 1856, p. 359, pl. 13, fig. 8 ; Broch, 1918, p. 163 ; 1933, p. 94, fig. 40 ; Kramp, 1935, p. 99, fig. 45a ; Leloup, 1937, pp. 97, 116, 117, fig. 3 ; 1937a, pp. 4, 19 ; Vervoort, 1942, p. 308 ; 1946, p. 342 ; 1949, p. 155 ; 1959, p. 312.

Material : Stat. 1 (March) ; 2 (July).

Description : Stems are solitary, never branched, annulated at top and bottom and often in between. Size of the hydrotheca is variable, with 12-14 marginal teeth. These are always rounded, sometimes a little asymmetrical, their size being nearly equal to the area between them. Diaphragma clearly marked from the hydrothecal wall. No gonothecae present.

Remarks : Ralph (1957) has discussed the variability in size, shape of the marginal teeth and degree of annulation on the gonotheca of *Clytia johnstoni* Hincks from New Zealand. The range in variation covers forms known as *C. gracilis* Stechow and *C. raridentata* Vanhöffen. Millard (1966a) compared Ralph's results with her own from South Africa. The genus *Clytia* was established by Lamouroux (1812). Linné (1767) had named the medusa *Medusa hemisphaerica* so that the name of this species becomes *Clytia hemisphaerica* (Linné). See Millard (1966).

Geographical Distribution : C. hemisphaerica is widely distributed throughout the world along the coasts of Europe, North and South America, Africa, Asia, Arctic, Antarctic and New Zealand. It was not previously recorded from the Red Sea.

Laomedea (Obelia) dichotoma (Linné, 1767)

Obelia dubia Nutting, 1901, p. 174 ; Stechow, 1925, p. 435.

Obelia dichotoma Hincks, 1868, p. 156 ; Torrey, 1904, p. 57 ; Mayer, 1910, II, p. 248 (synonymy) ; Fraser, 1911, p. 39 ; Billard. 1926, p. 94 ; Millard, 1957, p. 198 ; 1958, p. 174 ; 1959, p. 250 ; 1966, p. 483.

Laomedea dichotoma Broch, 1933, p. 105, fig. 46 ; Kramp, 1935, p. 110, figs. 48a, 49a ; Leloup, 1937, pp. 100, 116 ; 1937a, pp. 4, 22, fig. 13; Vervoort, 1942, p. 309 ; 1946, p. 292, fig. 128 ; Hamond, 1957, pp. 295, 312 ; Vervoort, 1959, p. 315.

Material : Stat. 1 (July) ; 3 (March), fouling plate ; 4 (April) ; 5 (March, April) ; 8 (June).

Remarks and Geographical Distribution : This species is often described and is widely distributed in the Atlantic Ocean and Mediterranean Sea. It is also recorded from the coasts of Alaska (Nutting, 1901) and California (Torrey, 1902). Millard (1966) considered *Obelia dubia* to be a synonym of *L. dichotoma*. Billard (1926) recorded the latter from the Suez Canal mentioning that it probably immigrated from the Mediterranean Sea. This could be right although we have some previous records from the east coast of South Africa (Millard, 1958).

Thyroscyphus fruticosus (Esper, 1793) (Plate II A)

Thyroscyphus fruticosus Ritchie, 1910, p. 7 ; 1910a, p. 812 ; Stechow & Müller, 1923 ; Splettstösser, 1929, pp. 7-30, figs. 1-27 ; Billard, 1933, p. 11 ; Vervoort, 1967, p. 35, figs. 8, 9.

Thyroscyphus vitiensis Marktanner, 1890, p. 210, pl. III, fig. 10 ; Jarvis, 1922, p. 338 ; Billard, 1926, p. 96.

Campanularia juncea Thornely, 1904, p. 113, fig. 1-3, pl. 1, figs. 1, 1b.

Material : Stat. 1 (July) ; 5 (March).

Remarks : This species was fully described by Stechow and Müller (1923) and Splettstösser (1929). Vervoort (1941) provided another good description with two figures (1967).

Geographical Distribution : This species is well distributed throughout the Indian and the western Pacific Ocean. It was also found in the Adriatic Sea (Marktanner, 1890). In the Red Sea it is recorded from the Gulf of Suez, the Bitter Lakes, the southern Red Sea and now from the Gulf of Aqaba. Billard's opinion (1933) that this species is common in the Red Sea is confirmed.

Dynamena crisioides crisioides Lamouroux, 1824

Dynamena crisioides crisioides Millard, 1964, p. 31 ; Vervoort, 1967, p. 38, fig. 10.

Dynamena tubuliformis Marktanner, 1890, p. 238.

Dynamena crisioides Billard, 1925, p. 181, fig. 36, pl. 7, fig. 21 ; 1926, p. 97 ; Briggs and Gardner, 1931, p. 190 ; Billard, 1933, p. 14 ; Leloup, 1934, p. 13 ; 1937, pp. 107, 117 ; 1937a, pp. 5, 36 ; Vervoort, 1941, p. 209 ; Millard, 1958, p. 183 ; Vervoort, 1959, p. 260, fig. 27a, b ; Van Gemerden-Hoogeveen, 1965, p. 20, fig. 6.

Thuiaria crisioides Fraser, 1944, p. 296, (synonymy).

Material : Stat. 7 (March) ; 9 (June).

Remarks : Fraser (1944) gives a number of synonymies of this species as *Thuiaria crisioides*. The same author and Vervoort (1967) give descriptions and the latter a figure.

Geographical Distribution : This species is widely distributed in the tropical and subtropical parts of the Atlantic, Pacific and Indian Oceans. It is distributed throughout the Red Sea : the Gulf of Suez (Thornely, 1908 and Billard, 1933), the southern Red Sea (Vervoort, 1967), Djidda (Marktanner, 1890), the Gulf of Aden (Billard, 1904), and the Gulf of Aqaba (Billard, 1933).

Dynamena cornicina McCrady, 1858

Dynamena cornicina McCrady, 1858, p. 204 ; Billard, 1925, p. 188 ; fig. 40, pl. 7, fig. 25 ; 1926, p. 97 ; 1933, p. 14, fig. 5, pl. 1, fig. 3 ; Vervoort, 1941, p. 206, fig. 3 ; Millard, 1964, p. 29, fig. 9 ; Van Gemerden-Hoogeveen, 1965, p. 24 ; Vervoort, 1967, p. 40, fig. 11.

Demoscyphus palkensis Thornely, 1904, p. 119, pl. II, figs. 7A, B.

Sertularia densa Stechow, 1919, p. 93, fig. J.

Sertularia cornicina Jarvis, 1922, p. 338.

Sertularia cornicina var. *pinnata* Jarvis, 1922, p. 339.

Material : Stat. 1 (March to July) ; 2 (July) ; 3 (January) ; 4 (April) ; 5 (April to June) ; 7 (March) ; 8 (June) ; 9 (June).

Remarks : The present species does not differ from that described by Vervoort (1967). Vervoort (1941) and Billard (1925) provide synonymies.

Geographical Distribution : This species is widely distributed throughout the tropical parts of the Atlantic, Pacific and Indian Oceans. Vervoort (1941) discussed the geographical distribution at length. In the Red Sea it occurs in the southern area, the Gulf of Suez, the Suez Canal and the Gulf of Aqaba (Billard, 1933 and

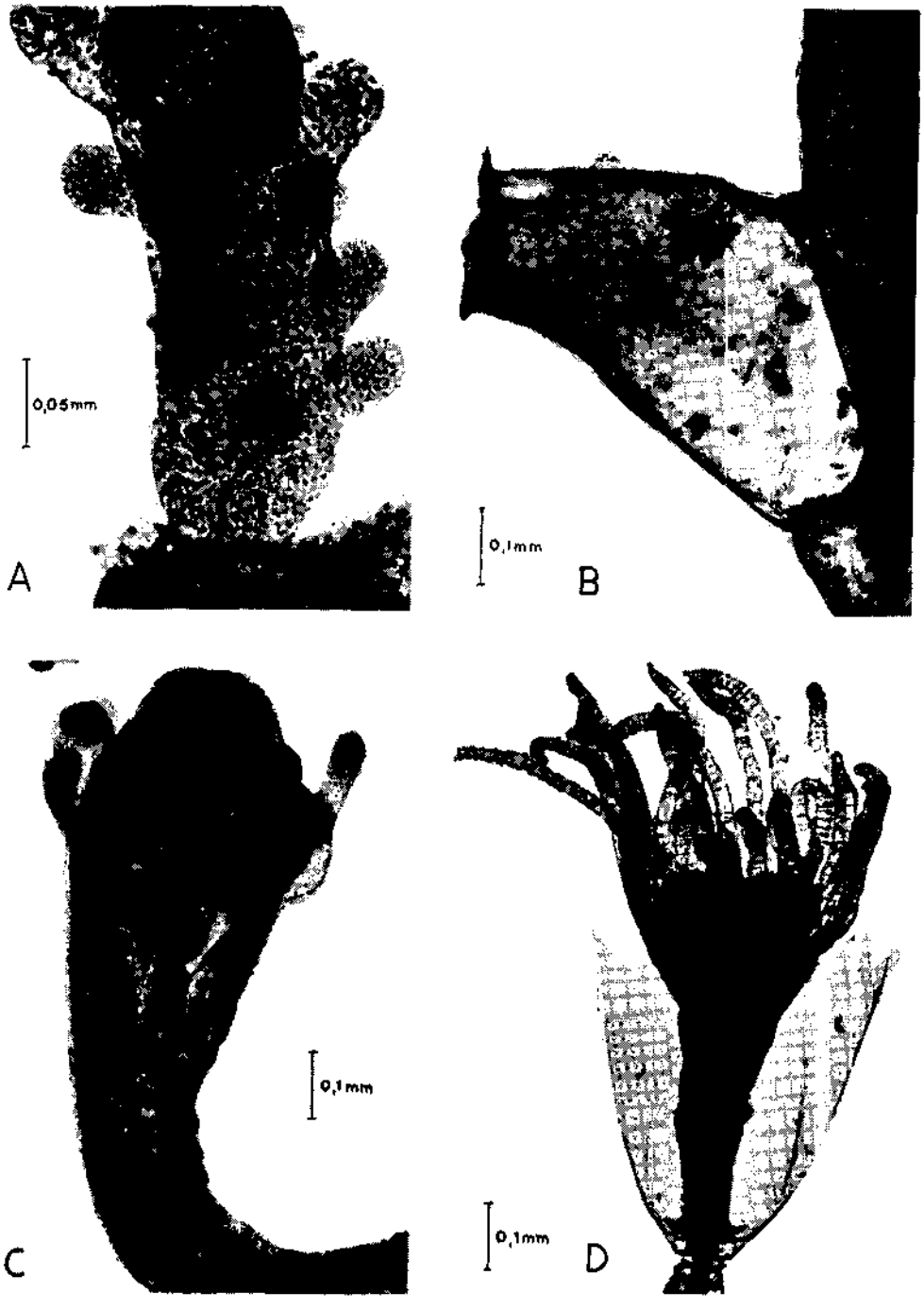

Plate I. A. *Solanderia secunda* (Inaba), hydranth with one of the spines, lateral view; B. *Sertularella mediterranea* Hartlaub, hydrotheca with inner teeth; C. *Hydractinia kaffraria* Millard, gastrozooid; and D. *Clytia hemisphaerica* (Linne), hydrotheca with expanded hydranth.

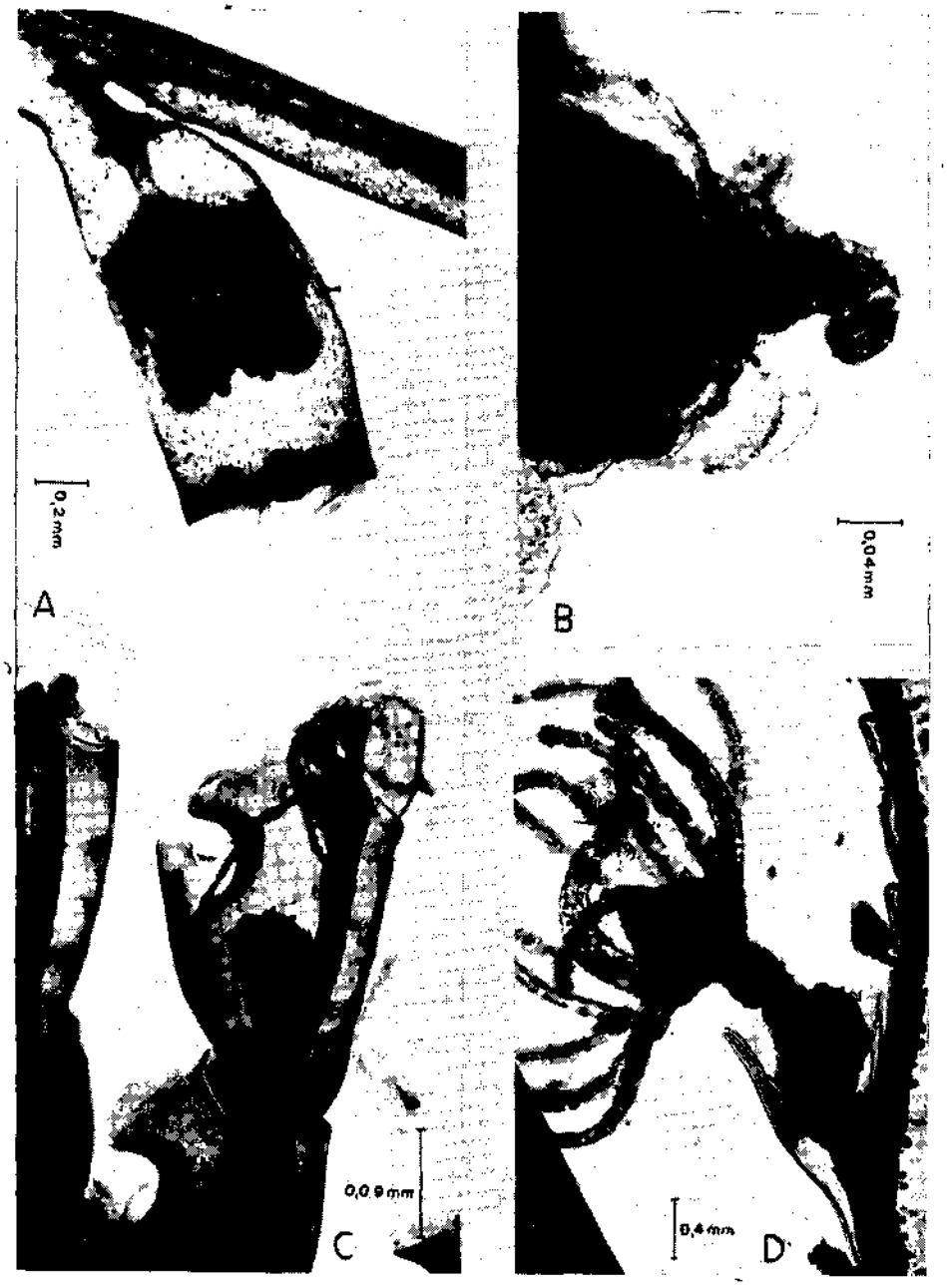

Plate II. A. *Thyroscyphus fruticosus* (Esper), hydrothcea, lateral view; B. *Tubularia mesembryanthemum* Allman, female gonophore with apical ridges and the finger-shaped process; C. *Gymnangium eximium* (Allman), end of a side branch; and D. *Kirchenpaueria pinnata* (Linne), hydrotheca with expanded hydranth and part of branch, lateral view.

Vervoort, 1967). According to Vervoort (1967) this species undoubtedly penetrated the Red Sea area from the Indian Ocean. This may be correct but we must also note that *D. cornicina* is very common in the Mediterranean Sea.

Sertularella mediterranea Hartlaub, 1901 (Fig. 2a ; Plate I B)

Sertularella mediterranea Billard, 1931a, p. 675 ; Broch, 1933, p. 76, fig. 31 ; Vervoort, 1946, p. 312 ; 1949, p. 150, fig. 5 ; Hamond, 1957, pp. 296, 316, fig. 24 ; Millard, 1957, p. 215, figs. 10 E, 11 B ; 1958, p. 190 ; Vervoort, 1959, p. 272, fig. 33 ; Millard, 1966a, p. 492 ; 1967, p. 180.

Sertularella mediterranea mediterranea Millard, 1964, p. 45.

Sertularella polyzonias f. *mediterranea* Leloup, 1934, pp. 13, 14 ; 1937, pp. 104, 116, fig. 7 ; 1937a, pp. 5, 39, fig. 26 ; Picard, 1956, p. 264, fig. 3b.

Material : Stat. 1 (March).

Description : Stem unfascicled, monosiphonical with no side-branches, broken up into indistinct internodes by oblique nodes. Hydrothecae are arranged in one plane, alternating on the left and the right side. They insert just above the nodes and are connected from the internodes for 1/3 of their length. Hydrothecae slightly ventricose in the basal part and narrow at the neck, four marginal teeth, separated by slightly curved incisions, into which the triangular plates of the closing apparatus are attached. The hydrothecae have four strong inner teeth just under the aperture. No gonothecae are present.

Remarks : This form is variable as it is shown by Picard (1956) and Vervoort (1959), especially in the development of the marginal and intrathecal teeth, the angle of the hydrothecal axis and the shape of the colony. Vervoort's opinion differs from that of Leloup (1934) and Picard (1956) who both believe that *S. mediterrenea* is a form of *S. polyzonias.* I do not have enough material to check this so I am presenting this species as *S. mediterranea.*

Geographical Distribution : This species was described from the Mediterranean Sea and occurs along the whole west coast of Africa. This is the first record from the Red Sea ; in the Indian Ocean *S. mediterranea* was recorded several times from South Africa.

Kirchenpaueria pinnata (Linné, 1758) (Fig. 2b ; Plate II D)

Sertularia pinnata Linné, 1758.

Plumularia pinnata Lamarck, 1816 ; Marktanner, 1890, p. 253.

Plumularia echinulata Lamarck, 1816.

Antisocalyx setaceus Heller, 1868.

Plumularia helleri Hincks, 1872.

Plumularia elegantula G. O. Sars, 1874.

Plumularia hians Marktanner, 1890, p. 253.

Kirchenpaueria pinnata Bedot, 1916, p. 645 ; Broch, 1918, pp. 53-55 ; Millard, 1957, p. 233 ; 1959, p. 252 ; 1962, p. 292.

Material : Stat. 1 (March to July).

Description : This species forms a short feathery growth reaching a maximum height of about two cm. Each stem internode bears one hydrocladium. On the hydrocladia athecate internodes are occasionally present between two thecate ones especially at the end. The thecate internodes generally have one, sometimes two nematothecae. The gonothecae are born on the stem or on hydrorhiza ; they are of various shapes.

Remarks : A list of synonyms is given above and Millard (1957) discussed the synonymy of this species with *K. unilateralis* (Ritchie). The number of hydrocladia borne by one internode, the sequence of thecate and athecate internodes in the hydrocladium, the number of the nemathothecae and the size and shape of the gonophores varies.

Geographical Distribution : The species is widely distributed throughout the Mediterranean Sea and along the whole Atlantic coast from Norway to South Africa. This is, to my knowledge, the first record from the Indo-Pacific waters. *K. pinnata* was only found in the new harbour of Eilat. It may be possible that it was brought to this place by growing on a ship.

Halopteris glutinosa (Lamouroux, 1816)

Aglaophenia glutinosa Lamouroux, 1816, p. 171.

Heteroplon pluma Allman, 1883, pl. VIII figs. 1-3, p. 32 ; Billard, 1908, p. 939 ; Stechow, 1912, p. 368.

Plumularia alternata Nutting, 1900, pp. 49, 50, 55, 56, 62, pl. IV ; Jarvis, 1922, p. 345, pl. 25, fig. 16.

Plumularia glutinosa Billard, 1909, p. 327 ; 1910, p. 36, fig. 16 ; Stechow, 1925, p. 502.

Halopteris glutinosa Millard, 1958, p. 200, figs. 10 A-D ; 1962, pp. 285, 286.

Material : Stat. 1 (March to July) ; 4 (April) ; 5 (April).

Description : The colonies reach a height of about 3 - 3.5 cm. In the lower regions of the stems the nodes sometimes seem to disappear and there are usually no hydrocladia and only a few deformed hydrothecae. Hydrocladia bear a variable number

of hydrothecae and the intervals between the hydrothecae differ greatly. Nodes are usually oblique, internodes bearing four nematothecae. Gonothecae are present.

Remarks : Millard (1962) discussed the synonymy of this species with *Plumularia alternata*. An additional list of synonymies is given above.

Geographical Distribution : This species seems to be very common in the Indian Ocean and also occurs in the Atlantic Ocean. This first record from the Red Sea fits nicely into the known pattern of distribution.

Gymnangium eximium (Allman, 1874) (Fig. 2c ; Plate II C)

Taxella eximia Allman, 1874, p. 179.

Halicornaria bipinnata Allman, 1876, p. 276, pl. 22, fig. 5, and 23, fig. 2.

Halicornaria flabellata Marktanner, 1890, p. 278, pl. 6, fig. 14.

Halicornaria copiosa Jarvis, 1922, p. 356, pl. 26, fig. 23, fig. 6.

Gymnangium eximium Stechow, 1924, p. 236.

Material : Stat. 6 (June) ; 7 (April) ; 8 (June) ; 9 (June).

Description : The colonies reach a height of 30 cm and a spread of 25 cm. The following description is partly taken from Jarvis (1922). The main stems and branches are fascicled almost to their ends. Branches mostly in the same plane, sending off along their whole length rather closely set, short, alternate pinnae. The primary branches arise from the main stem, give rise to secondary and tertiary ones while all bear pinnae similar to those carried by the main stem. The pinnae are divided by constricted nodes, just below the gonothecae. Those are tubular with forwardly directed aperture ; the margin is provided with a large triangular tooth. The adnate portion of the infra-mesial sarcotheca reaches to about half the height of the hydrotheca, while the divergent portion is very short, with terminal and lateral apertures and a third aperture into the hydrotheca. The lateral sarcothecae are tubular, directed upwards and slightly overtopping the hydrotheca. The internodes are provided with two or three internal thickenings, also a thickening below the base of the hydrotheca on abaxial side. Gonothecae arise just above the base of the proximal hydrotheca of a pinnae, they are oval in shape, with distinct peduncles passing imperceptivly into the body of the gonotheca.

Remarks : This species was described by Allman (1874) as *Taxella eximia*. There is no doubt that the same species was described again by the same author (1876) as *Halicornaria bipinnata*, by Marktanner (1890) as *Halicornaria flabellata* and by Jarvis (1922) as *Halicornaria copiosa*. The descriptions and the figures given for this species support this opinion. Stechow (1924) placed the genus *Gymnangium* in synonymy with *Halicornaria* and *Taxella*. He indicated that the right name for *Taxella eximia* Allman and *Halicornaria bipinnata* Allman is *Gymnangium eximium* (Allman).

Geographical Distribution : Gymnangium eximium is recorded from the Indian Ocean ; Ceylon (Allman, 1876), Amirante and Wasin (Jarvis, 1922). It occurs also in the Red Sea (Marktanner, 1890, no exact locality being given) and is now recorded from the Gulf of Aqaba.

Lytocarpus philippinus (Kirchenpauer, 1872) (Fig. 2d, e)

Aglaophenia philippina Kirchenpauer, 1872, pp. 29, 45, pls. 1, 2, 7, fig. 26.

Macrorhynchia philippina Stechow, 1924, p. 241 ; Mammen, 1965, pp. 314, 315.

Macrorhynchia philippinus Vannucci, 1946, p. 587, pl. 6, fig. 71, pl. 7, fig. 65.

Lytocarpus philippinus Bale, 1888, p. 786 ; Marktanner, 1890, p. 274 ; Nutting, 1900, p. 122 ; Congdon, 1907, p. 484, fig. 37 ; Thornely, 1908, p. 84 ; Stechow, 1909, p. 97 ; Ritchie, 1910, p. 20 ; 1910a, p. 822 ; Billard, 1913, p. 78 ; Thornely, 1916, p. 150 ; Jarvis, 1922, p. 354 ; Billard, 1926, pp. 99, 100 ; Gravely, 1927, p. 236 ; Briggs and Gardner, 1931, p. 193 ; Billard, 1933, pp. 25, 26 ; Vervoort, 1941, p. 225 ; Fraser, 1944, p. 419, pl. 93, fig. 410 ; Vervoort, 1946, p. 329 ; Millard, 1958, p. 220 ; Mammen, 1965, pp. 314, 315 ; Millard, 1968, p. 284 ; Vervoort, 1968, pp. 88-90, fig. 41.

Material : Stat. 6 (June) ; 7 (March) ; 8 (June) ; 9 (June).

Remarks and Geographical Distribution : This species is very common in the tropical parts of the Atlantic, Pacific, and Indian Oceans. It is recorded from the Mediterranean Sea, the Suez Canal, the Gulf of Suez, and from the Red Sea (Marktanner, 1890, no exact locality being given). Through an error of Stechow (1924) the name *Macrorhynchia* sometimes can be found in the literature, but it is clear that *Lytocarpus philippinus* is the right name. There are enough good descriptions so that it is not necessary to add a new one.

Total List of Records

To my knowledge there are five papers dealing with Red Sea hydroids namely, Billard, 1904 (Ba), 1926 (Bb), 1933 (Bc) ; Thornely, 1908 (T) ; and Vervoort, 1967 (V). In some revisions and museum collections hydroids of Red Sea origin are mentioned. The more important are : Jäderholm, 1920 (J) ; Marktanner-Turneretscher, 1890 (M) ; and Stechow, 1912, (Sa). Together with this paper (Sb) we have the following list of hydroids from the Red Sea area, being divided into the Red Sea proper, the Gulf of Suez, the Gulf of Aqaba, the Gulf of Aden and the Suez Canal.

Red Sea proper :

Family Halocordylidae

Halocordyle disticha (Goldfuss) var. *australis* (Bale).
(T) as *Pennaria symmetrica* Clark and (V)

Solanderia crosslandi (Thornely)
(T) as *Ceratella crosslandi* Thornely and (V)

Solanderia minima (Hickson) (V)

Family Cytaeidae

Cytaeis nassa (Millard) (V)

Family Bougainvilliidae
Bougainvillia vagans (Thornely)
(T) as *Perigonimus vagans* Thornely

Family Eudendriidae
Eudendrium ramosum Linné (T)

Family Haleciidae
Halecium labiatum Billard (V)

Family Campanulariidae
Campanularia cheloniae Allman (T)
Campanularia denticulata Clark (T)
Campanularia (*Clytia*) *gravieri* Billard (V)
Laomedea (*Obelia*) *bifurcata* (Hincks)
(T) as *Obelia bifurcata* Hincks

Family Campanulinidae
Cuspidella sp.
(T) as *Calycella* sp.
Lovenella corrugata Thornely (T)

Family Lafoeidae
Hebella dyssymmetra Billard (V)
Hebella scandens (Bale) (V)

Family Sertulariidae
Thyroscyphus fruticosus (Esper) (V)
Thyroscyphus junceus (Allman)
(T) as *Campanularia juncea* Allman
Dynamena cornicina McCrady (V)
Dynamena crisioides crisioides Lamouroux
(M) as *Dynamena tubuliformis* Marktanner and (V)

Family Plumulariidae
Ventromma halecioides (Alder)
(V) as *Plumularia halecioides* Alder
Antenella secundaria (Gmelin) (V)
Gymnangium gracicaulis (Jäderholm)
(V) as *Halicornaria gracicaulis* (Jäderholm)
Plumularia setacea Ellis (T)
Halopteris diaphana (Heller)
(T) as *Plumularia alternata* Nutting
Gymnangium eximium (Allman)
(M) as *Halicornaria flabellata* Marktanner
Gymnangium hians (Busk) var. *balei* (Marktanner)
(M) as *Aglaophenia balei* Marktanner
Lytocarpus philippinus Kirchenpauer (M) and (T)

Gulf of Suez :

Family Halocordylidae

Halocordyle disticha (Goldfuss) var. *australis* (Bale)
(Bc) as *Pennaria disticha* Goldfuss var. *australis* Bale

Family Clavidae

Corydendrium parasiticum (Linné) (Bc)

Family Haleciidae

(?) *Halecium beani* (Johnston) (Bc)
Halecium labiatum Billard (Bc)
Halecium sessile Norman (Bc)

Family Campanulariidae

Campanularia (?) *foxi* (Billard)
(Bb) as *Clytia* (?) *foxi*
Campanularia gravieri Billard
(Bc) as *Laomedea gravieri* (Billard)
Clytia arborescens Pictet (Bc)

Family Campanulinidae

(?) *Campomma hincksi* (Hartlaub)
(Bc) as (?) *Campanulina hincksi* Hartlaub
Cuspidiella grandis Hincks (Bb)

Family Lafoeidae

Hebella calcarata (L. Agassiz) (Bc)
Hebella dyssymmetra Billard (Bc)
Filellum serratum (Clarke) (Bc)

Family Syntheciidae

Synthecium maldivense Borradaile (T)

Family Sertulariidae

Thyroscyphus fruticosus (Esper)
(Bb) as *Thyroscyphus vitiensis* (Marktanner) and (Bc)
Diphasia heurteli Billard var. *simplex* Billard (Bc)
Diphasia mutulata (Busk) (T) and (Bc)
Dynamena cornicina McCrady (Bc)
Dynamena crisioides crisioides Lamouroux
(T) as *Thuiaria tubuliformis* (Marktanner) and (Bb) ; (Bc)
Sertularella diaphana (Allman) (Bc)
Sertularia distans Lamouroux var. *gracilis* Hassall (Bc)
Sertularia minima Thompson (T)

Family Plumulariidae

Ventromma halecioides (Alder)
(T) as *Plumularia halecioides* Alder

Plumularia seteca (Ellis) (Bc)
Plumularia strobilifera Billard (Bc)
Halopteris campanula (Busk)
(Bc) as *Theocaulus campanula* (Busk)
Gymnangium eximium (Allman)
(M) as *Halicornaria flabellata* Marktanner
Gymnangium gracicaulis (Jäderholm)
(Sa) and (Bc) as *Halicornaria gracicaulis*
Lytocarpus (?) *hornelli* Thornely (T)
Lytocarpus philippinus (Kirchenpauer) (Bc)

Gulf of Aqaba :

Family Halocordylidae
Halocordyle disticha (Goldfuss) var. *australis* (Bale) (Sb)
Solanderia secunda Inaba (Sb)

Family Tubulariidae
Tubularia larynx Ellis & Solander (Sb)
Tubularia mesembryanthemum Allman (Sb)

Family Hydractiniidae
Hydractinia kaffraria Millard (Sb)

Family Cytaeidae
Cytaeis nassa (Millard) (V)

Family Campanulariidae
Campanularia gravieri Billard (Sb)
Clytia hemisphaerica (Linné) (Sb)
Laomedea (*Obelia*) *dichotoma* (Linné) (Sb)

Family Sertulariidae
Thyroscyphus fruticosus (Esper) (Sb)
Dynamena cornicina McCrady (Bc) ; (V) ; (Sb)
Dynamena crisioides crisioides Lamouroux (Bc) ; (Sb)
Sertularella mediterranea Hartlaub (Sb)

Family Plumulariidae
Kirchenpaueria pinnata (Linné) (Sb)
Ventromma halecioides (Alder)
(V) as *Plumularia halecioides* Alder
Halopteris glutinosa (Lamouroux) (Sb)
Gymnangium eximium (Allman) (Sb)
Lytocarpus philippinus (Kirchenpauer) (Sb)

Gulf of Aden :

Family Bougainvilliidae
Podocoryne denhami Thornely (Sa)

Bougainvillia ramosa (Van Beneden)
(Ba) as *Bougainvillia muscus*

Family Campanulariidae
Campanularia gravieri Billard (Ba)
Laomedea (?) longissima (Pallas) (Ba)

Family Campanulinidae
Calicella syringa (Linné) (Ba)
Lovenella corrugata Thornely (J)

Family Lafoeidae
Hebella calcarata (A. Agassiz)
(Ba) as *Lafoea calcarata* A. Agassiz

Family Sertulariidae
Dynamena crisioides crisioides Lamouroux
(Ba) as *Thuiaria tubuliformis* (Marktanner)

Family Plumulariidae
Gymnangium gracicaulis (Jäderholm)
(J) as *Halicornaria gracicaulis* (Jäderholm)
Halopteris catharina (Johnston) var. *articulata* Billard
(Ba) as *Plumularia catharina* (Johnston) var. *articulata* Billard
Halopteris diaphana (Nutting)
(Ba) as *Plumularia alternata* Nutting

Suez Canal :

Family Halocordylidae
Halocordyle disticha (Goldfuss) var. *australis* (Bale)
(Bb) as *Pennaria disticha* Goldfuss *australis* Bale

Family Tubulariidae
Tubularia larynx Ellis & Solander (Bb)

Family Clavidae
Turritopsis nutricula (McCrady)
(Bb) as *Dendroclava dohrni* Weism.
Corydendrium parasiticum (Linné) (Bb)

Family Bougainvilliidae
Bougainvillia ramosa muscus (Allman)

Family Eudendriidae
(?) Eudendrium capillare Alder (Bb)
Eudendrium racemosum mucronatum Billard (Bb)
[18]

Family Campanulariidae

Campanularia lennoxensis (Jäderholm)

(Bb) as *Orthopyxis lennoxensis* (Jäderholm)

Laomedea (*Obelia*) *dichotoma* (Linné) (Bb)

Laomedea (*Obelia*) *geniculata* (Linné) (Bb)

Family Sertulariidae

Thyroscyphus fruticosus (Esper)

(Bb) as *Thyroscyphus vitiensis* (Marktanner)

Dynamena cornicina McCrady (Bb)

Family Plumulariidae

Ventromma halecioides (Alder)

(Bb) as *Kirchenpaueria halecioides* Alder

Lytocarpus philippinus (Kirchenpauer) (Bb)

Remarks and Discussion

From the 16 species recorded by the author only two already have been found in the Gulf of Aqaba. These are *Dynamena crisioides crisioides* (Billard, 1933) and *Dynamena cornicina* (Billard, 1933 and Vervoort, 1967). *Tubularia larynx, Tubularia mesembryanthemum, Hydractinia kaffraria, Laomedea dichotoma, Clytia hemisphaerica, Sertularella mediterranea, Kirchenpaueria pinnata* and *Halopteris glutinosa* have not previously been found in the Red Sea (without Suez Canal).

The total list contains 112 records with 64 species of hydroids of which seven are doubtful. Four (*Turritopsis nutricula, Eudendrium racemosum mucronatum, Campanularia lennoxensis, Laomedea geniculata*) are recorded from the Suez Canal only, three (*Podocoryne denhami, Calicella syringa, Halopteris catharina* var. *articulata*) from the Gulf of Aden and one (*Bougainvillia ramosa*) from both regions. This means that we know of less than 50 species from the Red Sea. Some of these probably are synonyms: such synonyms for example could be *Hebella scandens*/*H. calcarata* ; *Thyroscyphus fruticosus*/*T. junceus* ; *Dynamena cornicina*/*Sertularia minima* ; and *Gymnangium gracicaulis*/*Lytocarpus hornelli*. In addition, this list shows that 45 species occur in only one of the regions, 11 in two regions and 9 (*Halocordyle disticha, Campanularia gravieri, Thyroscyphus fruticosus, Dynamena cornicina, D. crisioides crisioides, Ventromma halecioides, Gymnangium gracicaulis, Gymnangium eximium* and *Lytocarpus philippinus*) in more than two regions. These nine hydroids can be considered as being well distributed throughout the Red Sea. Out of this poor material no certain conclusions can be drawn and it is at present impossible to divide the Red Sea into faunistic regions on the known distribution of hydroids. The results of the John-Murray-Expedition (Vervoort, in preparation) and of the ' Meteor '-Expedition in 1964 (Mergner, in preparation) may change the present situation.

The low density of animals is sometimes interpreted as resulting from high salinity water but it becomes more and more clear that the salinity has no important influence on the development of hydroids (Werner, 1968). The only reason that we know so little is that not enough research has been carried out and that all the material has been collected by diving, so that no hydroids below 50 m. depth have been found.

Some scientists (Klausewitz, 1964 ; Mergner, 1966, 1966a) expect an endemic fauna in the Red Sea because they feel the hydrographical and geographical conditions demand it. In the checklist no endemic hydroids are present.

The known species of the Red Sea could be divided into three groups : those which penetrated from the Indian Ocean into the Red Sea, those which probably came in from the Mediterranean Sea and those which theoretically could have penetrated from both regions. All the cosmopolitan species (*Halocordyle disticha*, *Halecium sessile*, *Clytia hemisphaerica*, *Hebella calcarata* and *Plumularia setacea* for example) and those which occur in tropical and subtropical waters around the world (*Dynamena cornicina*, *D. crisioides crisioides*, *Ventromma halecioides*, *Antenella secundaria*, *Lytocarpus philippinus* for example) belong to the third group. In the first group we find the representatives of the Indo-Pacific fauna (*Campanularia gravieri*, *Hebella dyssymmetra*, *Thyroscyphus fruticosus*, *Sertularella diaphana* and *Gymnangium gracicaulis* for example). In this connection we have to consider that *Thyroscyphus fruticosus* has been previously recorded from the Adriatic Sea. It could have passed the Suez Canal into the Mediterranean Sea. It was indeed found in the Bitter Lakes by Billard (1926).

The second group is the smallest and most interesting, containing hydroids of Mediterranean and Atlantic waters. These are *Tubularia larynx* and *T. mesembryanthemum* which have only been found a few times in the western Pacific Ocean. *Sertularella mediterranea* and *Laomedea dichotoma* are also typical for the Mediterranean Sea fauna but they are recorded also from the Natal coast. *Kirchenpaueria pinnata* has to my knowledge not previously been recorded from the Indo-Pacific Oceans.

The origin of the second group is doubtful as we have not enough information from the Indian Ocean. It may be, that some of these species will be found in this region and it may never become clear from which region they penetrated into the Red Sea. Typical of this is that two of the five species are recorded from South Africa, a region, which is better investigated by Millard than the other parts of the Indian Ocean. On the other hand these species could have migrated around Cape of Good Hope from the Atlantic waters. They could have penetrated into the Red Sea from the south or/and through the Suez Canal. It may be that they are common in the Indian Ocean but have not been recorded to date.

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