BRYOZOA (POLYZOA) FROM THE SOUTH RED SEA

by

N. A. Powell

National Museum of Canada, Ottawa.

Résumé

L'auteur étudie 30 espèces de Bryozoaires du sud de la Mer Rouge, au voisinage de Port Massawa. Une espèce nouvelle est décrite, *viz. Drepanophora birbira.* Les Bryozoaires ont été le plus souvent trouvés en association avec les récifs coralliens, à une profondeur de 5 à 40 mètres, encroûtant des coquilles de Mollusques et du corail. Les espèces suivantes sont nouvelles pour la faune de la Mer Rouge : *Membranipora tuberculata, Antropora marginella, Conopeum commensale, Steganoporella simplex, Schizomavella australis, Hippopodinella feegeensis, Hippaliosina acutirostris, Hippopodinella adpressa, Smittina malleolus, Parasmittina glomerata, Cleidochasma laterale, Rhynchozoon globosum.*

Des recherches bibliographiques ont montré que la détermination d'une grande partie des Bryozoaires de la Mer Rouge soudanaise (Waters 1909, 1910) a été vérifiée postérieurement par les auteurs. La distribution de ces espèces est indiquée dans ce travail. Les données montrent que la faune de Bryozoaires de la Mer Rouge 1) renferme peu d'espèces indigènes ; 2) n'est pas représentative des espèces méditerranéennes ; 3) est dominée par des espèces exclusivement indo-pacifiques. Les conclusions obtenues ici concordent parfaitement avec celles auxquelles on arrive pour d'autres groupes d'Invertébrés pour lesquels les données sont significatives.

INTRODUCTION

During April 1965, a small expedition lead by the writer under the auspices of the Biology Department, Haile Sellassie I University, Addis Ababa, Ethiopia, carried out a survey of the marine invertebrate fauna in the South Red Sea area. The actual area of study was confined to Massawa Harbour and immediate adjacent coastline, as well as a portion of the western coast of the Dahlac Archipelago (see text-fig. 1 a). The present report deals with the bryozoan fauna obtained.

Historical: The Red Sea bryozoan fauna has received considerable attention from earlier workers. The first paper appeared in 1826 under the joint authorship of J.V. Audouin and M.J.C. Savigny. Sixty-seven species were named in this work by Audouin from the plates of drawings provided by Savigny. Of these, 10 were taken from the Mediterranean, 17 from the Red Sea; no localities were

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given for the remaining 40 species. Five of the latter *viz.* "*Cellepora*" *parsevalii*, "C_1" *raigii*, "C_1" *descostilsii*, "C_1" *larreyi* and "*Flustra*" *thenardii* were later established by Harmer (1957) as having an Indo-Malayan distribution. Waters (1909, 1910) made an extensive study of the bryozoan fauna collected from the Sudanese Red Sea. Hastings (1927) reported 24 species from the Suez Canal Zone, collected by the Cambridge Expedition (1924). In 1934, Harmer visited the biological station at Ghardaqa, North Red Sea and collected a series of species. Twenty-eight of these were included in his "Siboga" Report (1957) in the form of useful distributional data.

Station List, South Red Sea, April 1965 (Text-fig. 1 b)

Station Nos.	Locality	Substrate	Depth
I	Massawa Harbour	Concrete blocks and wooden debris	Shallow water
II	Entrance, Massawa Harbour	Coral	8 fathoms
III	Off Sheikh Said Id.	Coral	7 fathoms
IV	Off Gorgussum	Sand and mud	8-10 fathoms
V	Off Ras Arb	Coral	15 fathoms
VI	Mugiunia Reef	Coral	3-5 fathoms
VII	South of Madote Id.	Coral	10-20 fathoms
VIII	Off Nocra Id.	Coral	3-18 fathoms
IX	Off Sciumma Id.	Coral	12 fathoms

Much of the sea floor in the vicinity of Massawa Harbour is composed of black mud, which, with the exception of worm tubes, infaunal pelecypods and sand dollars (principally *Laganum depressum* var. *delicatum* Mazzetti), does not support a macroscopic fauna. A relatively rich fauna, however, is concentrated around the localized coral reefs and thickets distributed throughout the area. In many instances, these were located at sufficiently shallow depths to be sampled by the modest dredging equipment that was available to the expedition.

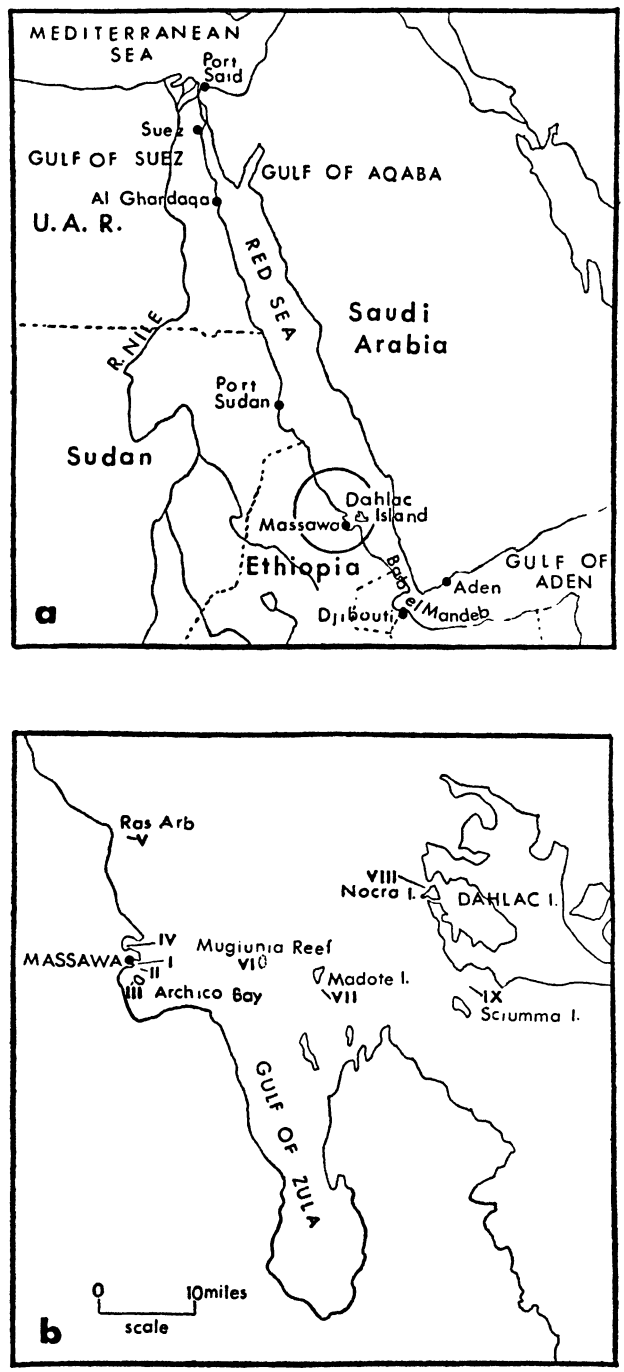
Results are presented under the following sections:

A. Systematics.
B. Faunal Analysis.
C. Discussion and Conclusions.

Abbreviations used in this report:

BM — British Museum (Natural History).
NMC — National Museum of Canada (Ottawa).
USNM — United States National Museum (Washington, D.C.).
Lz = length of zooecium lz = width of zooecium
hr = length of orifice lr = width of orifice

Synonymies cited apply mainly to Waters' (1909, 1910) Red Sea papers, or to Harmer's (1926, 1957) "Siboga" Reports.



TEXT-FIG. 1

a: sketch map of the Red Sea region. The general area of the present study is indicated.

b: outline map of the Massawa area. Stations visited are indicated.

A. SYSTEMATICS

Order *CHEILOSTOMATA* Busk, 1852

Sub-order *ANASCA* Levinsen, 1909

Electra bellula (Hincks, 1881).

1881 *Membranipora bellula* Hincks, p. 149, pl. 8, figs. 4, 4a, 4b.

Material examined. On seaweed; beach 5 miles south of Massawa; Archico Bay. Collected by P.L. Cook.

Distribution. Puerto Rico; Cape Verde Is; Red Sea; Madagascar; Indo-West Pacific.

Membranipora tuberculata (Bosc, 1802), Pl. I, 2.

1926 *Nichtina tuberculata* (Bosc) Harmer, p. 208, pl. 13, fig. 10.

Material examined. On *Sargassum;* beach North-east of Wachiro wadi mouth (BM cat. no. 1965.2.4.3). Collected by P.L. Cook.

Distribution. Circumtropical.

Membranipora savartii (Audouin, 1826), Pl. I, 3.

1909 *Membranipora savartii* (Audouin): Waters, p. 137, pl. 11, figs. 8-13.

Material examined. Station no. V, encrusting *Pteria inquinata* Reeve.

Distribution. Circumtropical.

Antropora marginella (Hincks, 1884), Pl. I, 5.

1884 *Membranipora marginella* Hincks, p. 358 (sep. p. 114), pl. 13, fig. 1.

1887 *Membranipora marginella* Hincks: Hincks, p. 130.

1893 *Membranipora marginella* Hincks: Hincks, p. 181.

1898 *Membranipora marginata* Hincks: Waters, pp. 658, 669.

1905 *Amphiblestrum marginella* Hincks: Thornely, p. 110.

1926 *Antropora marginella* Hincks: Harmer, p. 234 (part), not. pl. 14, fig. 15.

1930 *Antropora marginella* (Hincks): Hastings, p. 714.

Remarks. Miss P.L. Cook, British Museum (Nat. Hist.) has provided the following notes: Pore chambers present. Small avicularia

occasionally paired, usually single, directed distally, replacing a pore chamber. Avicularia often absent from large areas of some colonies. Cryptocyst usually well-developed proximally, but variable. Ovicells inconspicuous. Large avicularia, which replace zooecia, occasionally present.

The "Siboga" specimens listed by Harmer (1926) do not possess pore chambers and the small avicularia reach the basal wall between the zooecia. Large avicularia, which replace the zooecia, are present. Ovicells are variable in character within a single colony, some being vestigal. They are unlike the ovicells found in *A. marginella.* Harmer's material from the "Siboga" stations is not referable to *A. marginella,* although one of his specimens from Torres Straits does belong to that species. Part of his material listed as *A. granulifera* also does not appear to be referable to *Antropora.* Both these groups of specimens show affinities with the genus *Crassimarginatella.*

Material examined. Stations I, VI, VIII.

Other material. (British Museum). Type 1885. 12.29.13.

Locality: Mergui, Burma. Anderson Collection.

1889. 5.1.602. Locality: Mergui, Burma. Hincks Collection.

Unregistered. Locality: Tizard Reef, 27 fath. Basset-Smith Collection.

1928 9.13.19. Locality: Torres Straits, Haddon Collection, No. 70.

1929 4.26.82. Locality: Balboa, Coiba, "St. George" Collection.

1936 12.30.6. Locality: Ceylon, Thornely Collection.

Distribution. Mergui Archipelago; Gulf of Manaar; Torres Straits; China Sea; Panama.

Conopeum commensale Kirkpatrick & Metzelaar 1922, Pl. I, 1.

1922 *Conopeum commensale* Kirkpatrick & Metzelaar, p. 985, pl. 1, figs. 1,4-7,9.

Remarks. Two small circular excavations which serve as articulation areas for the occlusor muscles of the operculum are visible on the basal wall (Pl. I, 1). This species was taken from one locality only, where it occurred very abundantly on *Strombus* (*Lentigo*) *fasciatus* Born.

Material examined. Station VI.

Distribution. North Carolina; North-west Florida; Gulf of Mexico; Santos Bay (Brazil); North-west Africa; "widely distributed in warm waters along the Pacific Coast from northern Mexico to Ecuador" (Osburn, 1952:31).

Steganoporella simplex Harmer, 1900, Pl. I, 4.

1900 *Steganoporella simplex* Harmer, p. 253, pl. 12, fig. 7; pl. 13, fig. 21.

1907 *Steganoporella simplex* Harmer: Thornely, p. 186.

Remarks. This species was frequently collected encrusting coral as massive colonies. "B zooecia" or avicularia were not found in the holotype (Harmer, p. 253), nor were they found in the Red Sea specimens.

Material examined. Stations VII, IX.

Distribution. Amirante Is; Ceylon.

Thalamoporella rozieri (Audouin, 1826).

1909 *Thalamoporella rozieri* (Audouin) Waters, p. 141, pl. 15, figs. 12-15.

1966 *Thalamoporella rozieri* (Audouin) Powell and Cook, p. 53, text-figs. a-f.

Remarks. All the material obtained was infertile. A discussion of the conditions inducing avicularial development in the Red Sea material is given in Powell and Cook (1966).

Material examined. Stations I, III, IV, V, VII, VIII, IX.

Distribution. South-west England; Cape Verde Is; Red Sea; Mergui Archipelago; Pedro Shoal (Indian Ocean); Indonesia; North-east Australia; Japan.

Sub-order *ASCOPHORA* Levinsen, 1909

DIVISION I *ASCOPHORA IMPERFECTA* Harmer, 1957

Tremogasterina robusta (Hincks, 1884).

1909 *Lepralia robusta* Hincks Waters, p. 152, pl. 13, figs. 13, 14.

Remarks. A redescription of this species, based partly on the Red Sea material is given in Powell and Cook (1966*a*).

Material examined. Stations I, III, IV, V, VII.

Distribution. Red Sea; Seychelles; Gulf of Manaar; Mergui Archipelago; Persian Gulf.

PLATE 1

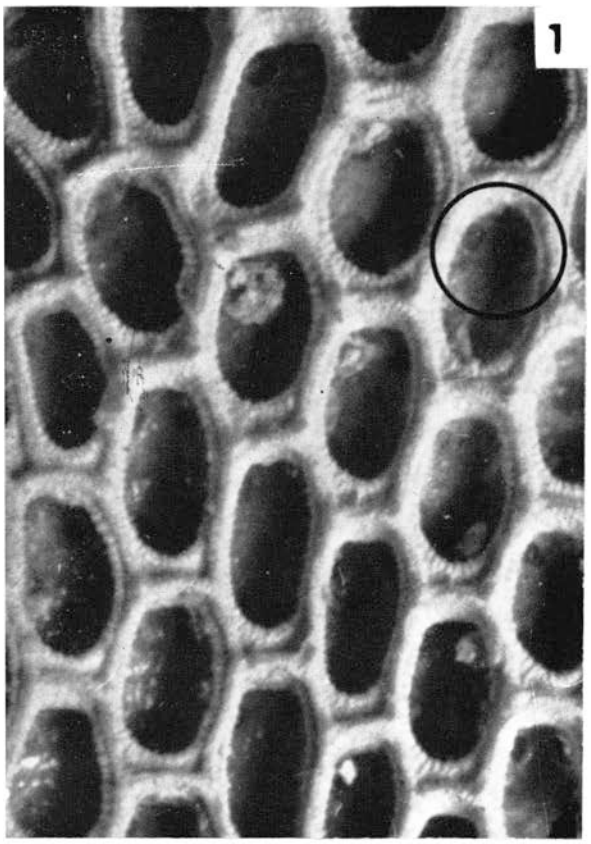
1 *Conopeum commensale* (Kirk. and Metz.). Locality: Station VI. Two distal occlusor muscle scars are indicated.

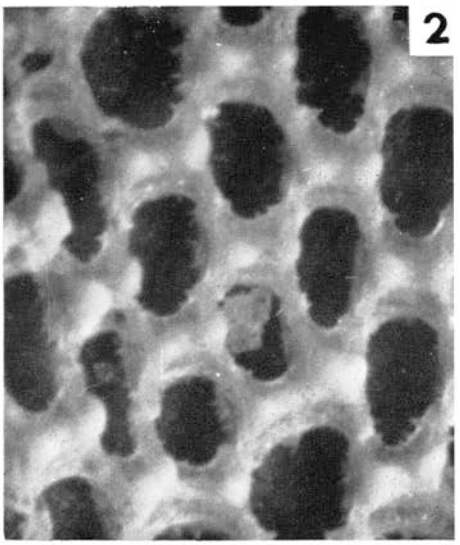
2 *Membranipora tuberculata* (Bosc.). BM No 1965.2.4.3. Locality: beach north-east of Wachiro wadi mouth.

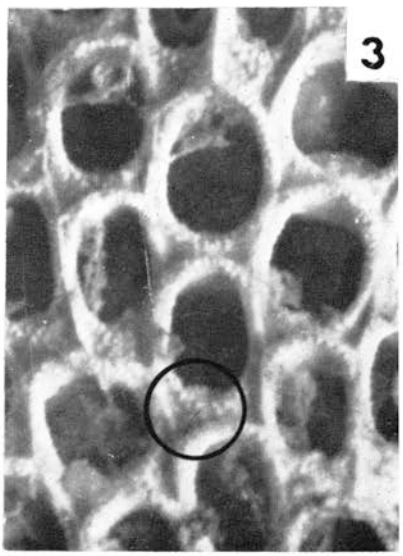
3 *Membranipora savartii* (Audouin). Locality: Station V. Note the dentate process projecting from the proximal cryptocyst.

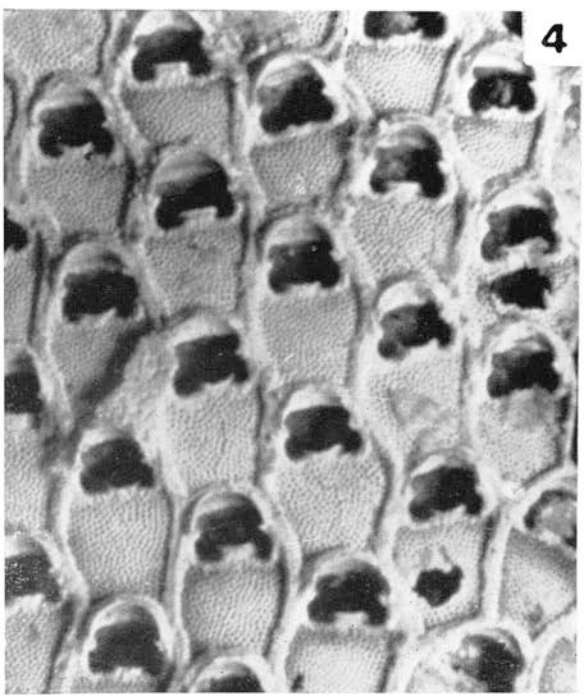
4 *Steganoporella simplex* Harmer. Locality: Station VII. ×17.

5 *Antropora marginella* (Hincks). Locality: Station VIII.









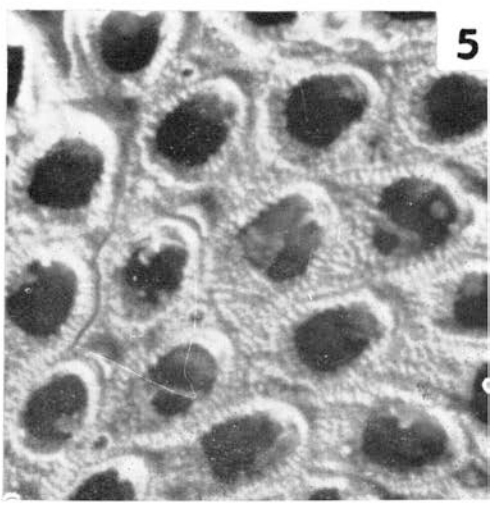


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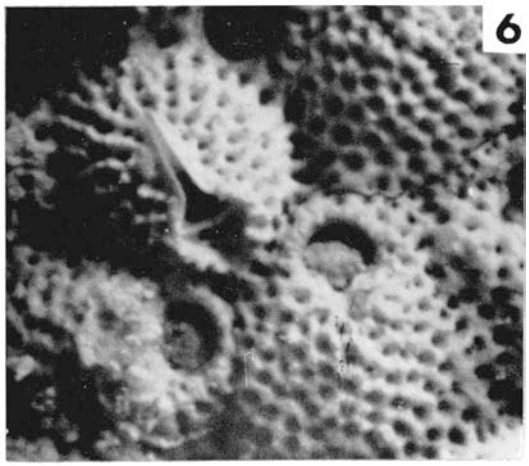
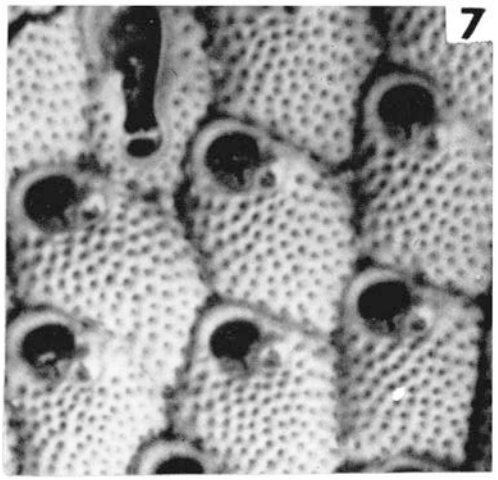
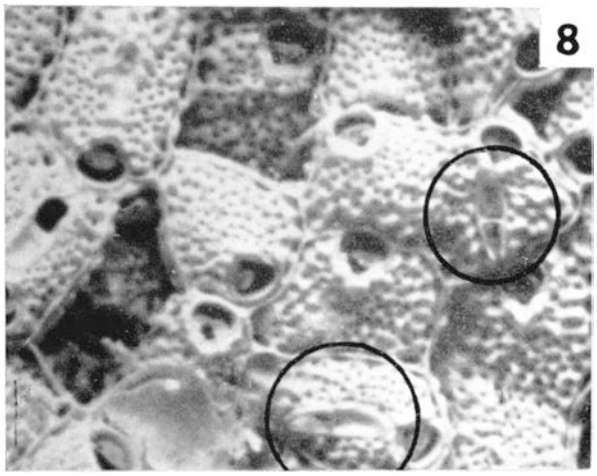
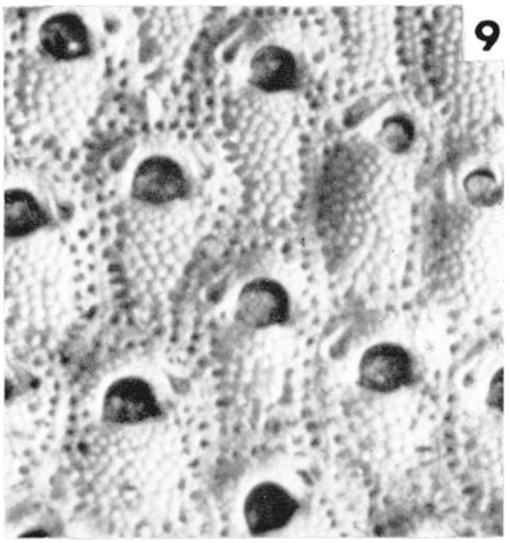
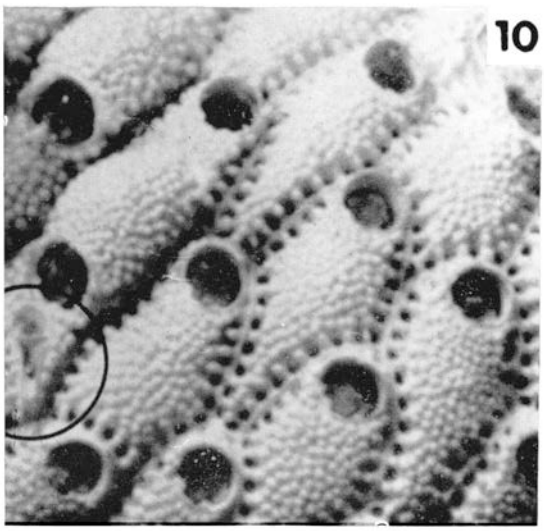
Plate I











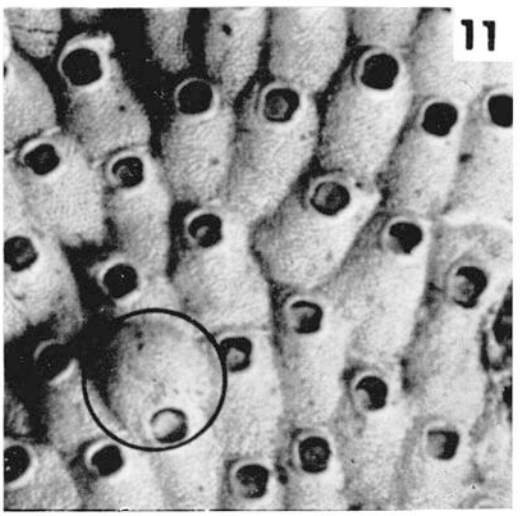


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Plate II

Celleporaria aperta (Hincks, 1882).

1909 *Holoporella aperta* (Hincks) Waters, p. 161, pl. 18, figs. 20-23.

1957 *Celleporaria aperta* (Hincks) Harmer, p. 673, pl. 42, figs. 11-13; text-fig. 66.

Material examined. Stations I, III, VIII, IX.

Distribution. Suez Canal; Red Sea; Zanzibar; Gulf of Manaar; Mergui Archipelago; Singapore; Indonesia; Torres Straits; North-east Australia; Japan.

Celleporaria labelligera Harmer, 1957.

1909 *Holoporella descostilsii* Waters, p. 162, pl. 16, figs. 1-3 (not *Cellepora descostilsii* Audouin 1826).

1957 *Celleporaria labelligera* Harmer, p. 676, pl. 42, figs. 14-17, 22, 24.

Material examined. Stations I, IV.

Distribution. Red Sea; Indonesia.

Celleporaria pigmentaria (Waters, 1909).

1909 *Holoporella pigmentaria* Waters, p. 163, pl. 15, figs. 16, 17; pl. 16, figs. 9-16; pl. 17, figs. 22, 23.

1957 *Celleporaria pigmentaria* (Waters) Harmer, p. 684, pl. 43, fig. 8; text-fig. 58.

Remarks. This species forms massive black colonies which often encrust coral.

Material examined. Stations I, II, III, VII, VIII.

Distribution. Red Sea; Indonesia.

Hippopetraliella magna (d'Orbigny, 1852).

1909 *Lepralia japonica* Busk, Waters, p. 149, pl. 13, figs. 10-12.

1952 *Petralia japonica* (Busk) Osburn, p. 290, pl. 31, fig. 5.

PLATE 2

6 *Stylopoma viride* (Thornely). Locality: Station II. Note the vicarious avicularium.

7 *Stylopoma duboisii* (Audouin). Locality: Station VII. Note the vicarious avicularium; adventitious avicularia are also clearly shown.

8 *Schizomavella australis* (Hassall). Locality: Station VIII. Two frontal avicularia are indicated. Note their distal furrow-like projections.

9 *Hippaliosina acutirostris* (C. & B.). Locality: Station VIII.

10 *Robertsonidia argentea* (Hincks). Locality: Station IX. Note the two ovicelled zooecia, one with a frontal avicularium (indicated).

11 *Hippopodina feegeensis* (Busk). Locality: Station I. Ovicell indicated. ×17.

1957 *Hippopetraliella magna* (d'Orbigny) Harmer, p. 701, pl. 45, figs. 5, 6.

Material examined. Stations IV, V, VII, VIII, IX.

Distribution. Red Sea; "widely distributed in the western Pacific and Indian Oceans..." (Osburn 1952:290); Costa Rica (East Pacific).

DIVISION II *ASCOPHORA VERA* Harmer, 1957

Schizomavella australis (Haswell, 1880) Pl. II, 8.

1957 *Schizomavella australis* (Haswell): Harmer, p. 1031, pl. 66, figs. 5, 9.

Remarks. The frontal avicularium in this species is distinguished by having a prominent distal furrow-like process (Pl. II, 8). *Schizomavella australis* was previously known from the East Indian Ocean and West-Pacific region. The present record extends the longitudinal range of the species substantially westward.

Material examined. Stations VIII, IX.

Distribution. Singapore; Indonesia; New Guinea; Torres Straits; North-east Australia; Japan.

Stylopoma duboisii (Audouin, 1826) Pl. II, 7.

1957 *Stylopoma duboisii* (Audouin): Harmer, p. 1033, pl. 74, figs. 1-7.

Material examined. Stations VII, VIII, IX.

Distribution. Red Sea; Gulf of Manaar; Singapore; Indonesia; North-east Australia; Torres Straits.

Stylopoma viride (Thornely, 1905) Pl. II, 6.

1909 *Schizoporella viridis* Thornely, Waters, p. 147, pl. 13, figs. 1-8.

1957 *Stylopoma viride* (Thornely) Harmer, p. 1036, pl. 74, figs. 8-13.

Remarks. Commonly found encrusting coral as large greenish-coloured, multilaminate colonies.

Material examined. Stations II, VII, VIII.

Distribution. Red Sea; Gulf of Manaar; North-east Australia; Philippine Is.

Scorpiodinipora bernardii (Audouin, 1826).

1909 *Schizoporella bernardii* (Savigny & Audouin) Waters, p. 169, pl. 17, figs. 7-9.

1957 *Stephanosella bernardii* (Audouin) Harmer, p. 1051, pl. 74, figs. 21-23.

1959 *Scorpiodinipora bernardii* (Audouin) Balavoine, p. 269, pl. 6, fig. 7.

Material examined. Stations VIII, IX.

Distribution. Red Sea; Mauritius; Gulf of Manaar; Bass Strait; Great Barrier Reef; China Sea; Gilbert Is; Loyalty Is.

Robertsonidra argentea (Hincks, 1881) Pl. II, 10.

1909 *Schizoporella argentea* Hincks, Waters, p. 146, pl. 12, figs. 17, 18; pl. 13, figs. 16, 17.

1952 *Robertsonidra oligopus* (Robertson) Osburn, p. 295, pl. 34, figs. 9-11; pl. 35, fig. 1.

1957 *Rhamphostomella argentea* (Hincks) Harmer, p. 1102, pl. 66, figs. 19-22, 24-29; text-fig. 116.

1962 *Rhamphostomella argentea* (Hincks): Gautier, p. 160.

Remarks. Oral avicularia are absent in the South Red Sea material (cf. Harmer 1957), but large obliquely-oriented frontal avicularia sometimes occur (pl. 2, fig. 10). The similarities of *argentea* with *Rhamphostomella,* a predominantly arctic-boreal genus are of a superficial nature. The writer has therefore transferred *argentea* to *Robertsonidra* (Osburn 1952:294), a monotypic genus, until its relationship with other Ascophora can be properly ascertained. The type of *Robertsonidra, R. oligopus* has been shown to be a synonym of *argentea* by Harmer (1957:1103).

Material examined. Station IX.

Distribution. Cape Verde Is; Mediterranean; Red Sea; Gulf of Manaar; Indonesia; Lord Howe Id; Japan; Tahiti; Southern California.

Microporella orientalis Harmer, 1957.

1957 *Microporella orientalis* Harmer, p. 962, pl. 62, figs. 25-28, 38.

Remarks. In fertile colonies the peristome is extended proximally over the frontal surface and fused below the ascopore.

In the absence of ovicells and avicularian mandibles it is difficult to distinguish *M. orientalis* from *M. ciliata* (Pallas), see Harmer (1957, p. 960-962). None of the material in this collection had mandibles, but as some personate ovicells were present, the specimens have therefore been referred to *M. orientalis.*

Material examined. Stations VI, IX.

Distribution. Common in tropical waters.

Hippopodina feegeensis (Busk, 1884) Pl. II, 11.

1909 *Lepralia* sp. Waters, p. 172, pl. 17, fig. 21.

1957 *Hippopodina feegeensis* (Busk) Harmer, p. 974, pl. 67, figs. 7-9.

Remarks. The unique tetrad structure of the early-formed colony in this species, is described elsewhere in detail from the South Red Sea material (Powell 1966).

Material examined. Stations I, VIII, IX.

Distribution. Caribbean; Brazil; Red Sea; Zanzibar; Gulf of Manaar; Cargados; Singapore; Indonesia; Torres Straits; North-east and North-west Australia; Loyalty Is.; Philippine Is.; Panama.

Hippaliosina acutirostris Canu and Bassler, 1929, Pl. II, 9.

1957 *Hippaliosina acutirostris* Canu & Bassler: Harmer, p. 1091, pl. 72, figs. 1-5.

Material examined. Station VIII.

Distribution. Gulf of Manaar; Bay of Bengal; Indonesia; New Guinea; Torres Straits; Philippine Is.

Hippopodinella adpressa (Busk, 1854).

1854 *Lepralia adpressa* Busk, p. 82, pl. 102, figs. 3, 4.

Remarks. In this species the frontal wall is corrugated by radially arranged ribs. A row of pores occur around the margins. *Hippopodinella lata* (Busk, 1856) is a closely allied species, but has a densely perforated frontal wall which may become reticulated, owing to secondary calcification. The status of these two species is discussed more fully elsewhere (Powell, in press).

Material examined. Stations I, IX.

Distribution. Cargados, Salomon (Indian Ocean); New Caledonia; New Zealand; Chiloe Id.; Falkland Is.

Smittina malleolus (Hincks) Pl. III, 12.

1884 *Porella malleolus* Hincks, p. 361, pl. 13, fig. 5.

1952 *Smittina smittiella* Osburn: Osburn, p. 404, pl. 47, figs. 11-12.

1957 *Smittina malleolus* (Hincks): Harmer, p. 921, pl. 63, figs. 7-10.

Remarks. Both Hincks and Harmer described long, frontal avicularia as occasionally present in their specimens from Burma and the East Indies. No such avicularia have been reported in the material described by Osburn, and none occur in the specimens from the Red Sea. The small zooecia, and small avicularium with a serrated rostrum, situated within the peristomial sinus, and the secondary reticulation of the frontal wall around groups of pores, are characteristic of both *S. malleolus* and *S. smittiella*. The Red Sea material has one or two zooecia in which small avicularia are present on the lateral margins of the peristome. In fully calcified colonies, the median avicularium becomes orientated perpendicularly to the plane of the secondary orifice.

Material examined. Stations VI, VIII.

Other material. USNM cat. no. 11176. Locality: Albatross Station 2409, 26 fathoms, Gulf of Mexico.

Distribution. Indian Ocean; China Sea; Florida; West Indies; Bay of Santos (Brazil); Galapagos Is ; Ecuador.

Parasmittina egyptiaca (Waters, 1909) Pl. III, 13.

1909 *Smittia egyptiaca* Waters, p. 157, pl. 15, figs. 6, 9.

1909 *Smittia egyptiaca* var. *heroopolita* Waters, p. 158, pl. 15, figs. 7, 8.

1957 *Smittina egyptiaca* (Waters) Harmer, p. 937, pl. 64, figs. 21, 22, 29-31.

Remarks. Occasionally one or two small acute, avicularia are situated within the distal cusps of the peristome. The frontal avicularia are frequently spatulate and somewhat variable in length, ranging in ordinary zooecia from small appendages to long structures which extend almost the entire length of the zooecia. In fertile zooecia, large spatulate as well as acuminate avicularia occur in profusion (Pl. III, 13). The ovicell is inflated, the outer layer of ectooecium being densely perforated. This species was found to be particularly common at Sheikh Said Island (Station III), encrusting *Pinctada radiata* Leach; together with *Celleporaria pigmentaria, C. aperta* and *Tremogasterina robusta.*

Material examined. Stations I, II, III, V, VI, VII, VIII.

Distribution. Suez; Red Sea; Indonesia; New Guinea.

Parasmittina glomerata (Thornely, 1912).

1912 *Smittia glomerata* Thornely, p. 152, pl. 18, fig. 12.

1957 *Smittina glomerata* (Thornely) Harmer, p. 933, pl. 64, figs. 18-20.

Remarks. The South Red Sea material exhibits the diagnostic characters described by Thornely (1912) for the Indian Ocean specimens, including the serrations along the distal margin of the primary orifice, the sub-triangular secondary orifice (rounded distally, narrowing proximally), and the laterally alate peristome; one of the cusps of which is frequently occupied by a tiny avicularium. The acute rostrum being directed upwards and proximally. As with *P. egyptiaca,* the frontal avicularia vary considerably in size, from small spatulate appendages to elongate structures extending almost to the proximal margin of the zooecium. In fertile zooecia the proximal margin of the ovicell becomes enveloped by the peristome and projects downwards into the secondary orifice as a salient lip.

Material examined. Stations IV, VI, VII, VIII, IX.

Distribution. Cargados; Ceylon; Singapore; Indonesia; Torres Straits.

Parasmittina parsevalii (Audouin, 1826) Pl. III, 15.

1957 *Smittina parsevalii* (Audouin) Harmer, p. 941, pl. 65, figs. 5-7.

Material examined. Stations VI, IX.

Distribution. Red Sea; Ceylon; Mergui Archipelago; Malay Peninsula; Indonesia; Torres Straits; North-east Australia.

Parasmittina tropica (Waters, 1909) Pl. III, 14.

1909 *Smittia tropica* Waters, p. 174, pl. 17, figs. 10-14.

1957 *Smittina tropica* (Waters) Harmer, p. 934, pl. 64, figs. 23-28.

Remarks. Harmer (1957:935) gave the diagnostic characters of this species but omitted the tubular peristome, which was mentioned by Waters (1909:174) in his description. This structure is also very prominent in the present material as well (pl. III, 14). The ovicell is recumbent on the next distal zooecium and opens into the secondary orifice at a low level. *Parasmittina tropica* differs from other recorded species of the genus in that the frontal avicularia are not always confined to the lateral margins, but frequently extend onto the median area of the frontal wall as well. Occasionally the avicularia may even be oriented transversely below the secondary orifice.

Material examined. Stations I, II, VI, VIII, IX.

Distribution. Red Sea; South Africa; Gulf of Manaar; Philippine Is; Torres Straits; North-east Australia; China Sea; Japan.

Drepanophora longiuscula Harmer, 1957, Pl. III, 16.

1909 *Rhynchozoon corrugatum* (Thornely) Waters, p. 158, pl. 12, figs. 14-16 (not *Drepanophora corrugata* (Thornely 1905)).

1957 *Drepanophora longiuscula* Harmer, p. 1081.

PLATE 3

12 *Smittina malleolus* (Hincks). Locality: Station VI. Fertile zoarium.

13 *Parasmittina egyptiaca* (Waters). Locality: Station III. Ovicelled zoarium; note the abundance of avicularia.

14 *Parasmittina tropica* (Waters). Locality: Station VI. Ovicelled zoarium. An obliquely oriented frontal avicularium is indicated.

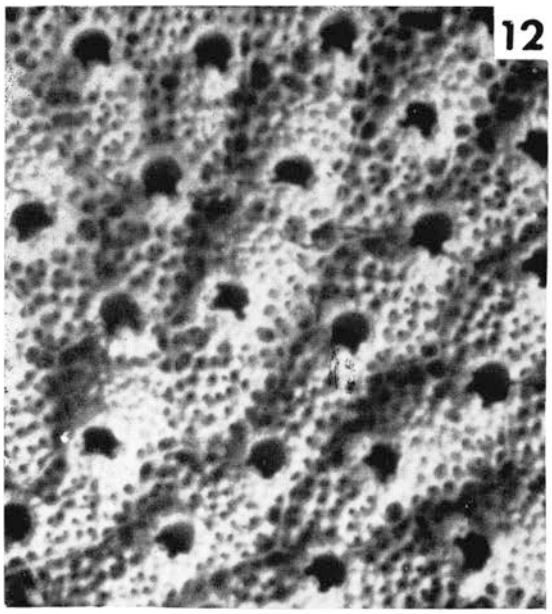
15 *Parasmittina parsevalii* (Audouin). Locality: Station VI. Fertile zoarium, to show the tuberculate surface of the ovicells, on which are located tiny pores. Note the profusion of avicularia.

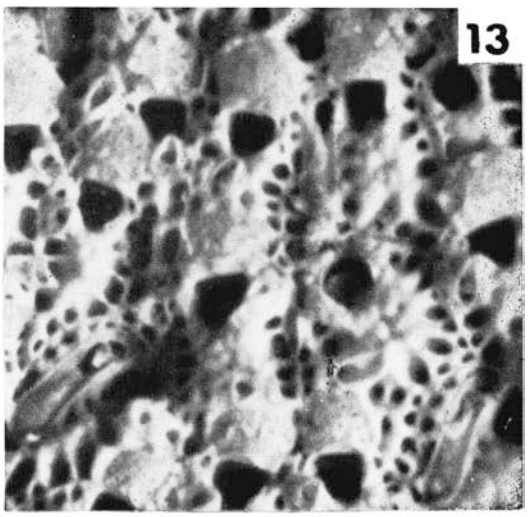
16 *Drepanophora longiuscula* Harmer. Locality: Station VI. Ovicelled zoarium. To show the strongly tuberculate condition of the frontal walls. In some instances the fenestrae on the lateral margins of the ovicell are discernable.

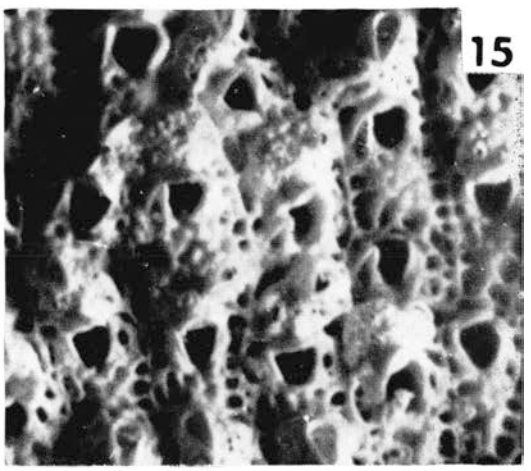
17 *Rhynchozoon globosum* Harmer. Locality: Station VII. Portion of the growing margin of a colony, showing the outline of the primary orifice.

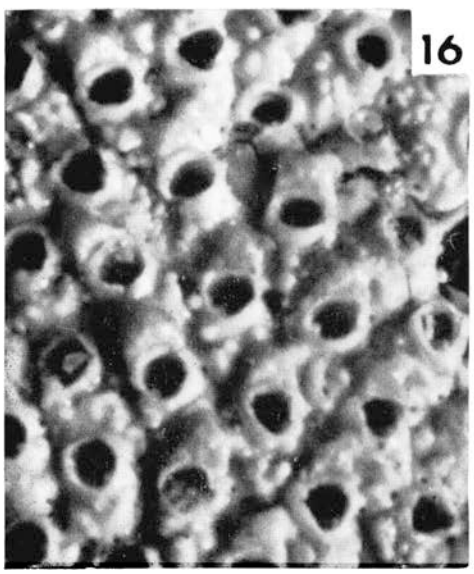
18 *R. globosum*. Fertile portion of the same colony, note the abundance of frontal avicularia.

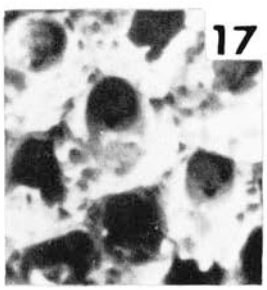
Photography by the writer.
Magnifications ×48-×50 (with the exception of figs. 4, 11).











N.A. POWELL PLATE III

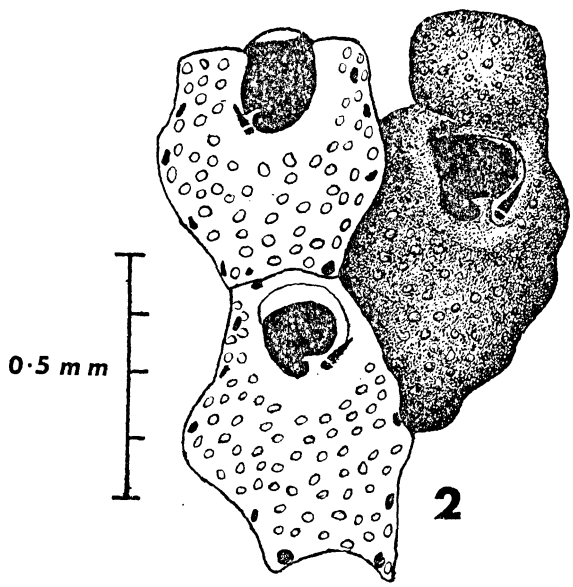
Remarks. One small colony was taken encrusting *Malleus regula* Forskål. The frontal wall of each zooecium is studded with numerous stout tubercles, together with the large fenestrae on the margins of the ovicell, make this an easily recognizable species (pl. III, 16). This comprises the first subsequent record of the species, since Waters' (1909) account of the Suez material.

Material examined. Station VI.

Distribution. Suez.

Drepanophora birbira (1) n.sp. Text-fig. 2.

HOLOTYPE: NMC cat. no. 25. Locality: South of Madote Id., 10-20 fathoms (Station VII). South Red Sea (mounted slide; Text-fig. 2).



TEXT-FIG. 2
Drepanophora birbira n.sp. Holotype, NMC no. 25.
Three zooecia, one with an ovicell.

Diagnosis. Small encrusting *Drepanophora* with a moderately raised peristome supporting a tiny acuminate avicularium, directed at an oblique angle distally. Orifice pyriform, constricted proximally by one or rarely, two small denticles, forming an asymmetrical sinus. Ovicell non-fenestrate.

Description. *Zoarium* encrusting. *Zooecia* roundly hexagonal, arranged alternately in longitudinal rows separated by shallow furrows. *Orifice* pyriform, expanded distally, constricted at the

(1) Named for R.F.B. "Birbira," a motorised show-type fishing craft, loaned to the Expedition by the permission of the Fisheries Dept., Addis Ababa.

proximal third by an acute, slightly curved denticle (two denticles occur in one zooecium), forming a deep, rounded, somewhat asymmetrical sinus. *Peristome* laterally alate. No oral spines. *Frontal wall* convex, covered by stout tubercles; a few widely separated pores occur around the margin. *Avicularium,* acutely triangular, located on the peristome proximally, adjacent to the sinus, the rostrum acuminate, directed obliquely distally. *Ovicell* hyperstomial, convex, non-fenestrate, studded with tubercles; the peristome being partly extended around the proximal margin.

Measurements.

L_z 0.40 - 0.45 mm	l_z 0.30 - 0.36 mm
hr 0.10 - 0.15 mm	lr 0.09 - 0.12 mm

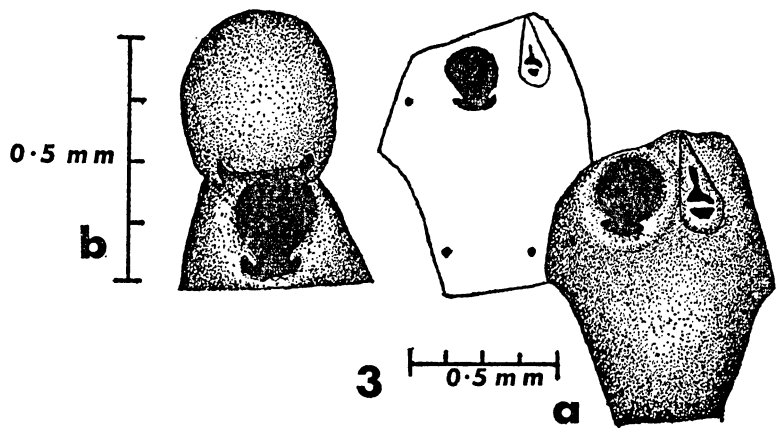
Remarks. *Drepanophora birbira* is represented by a single specimen only. This is, however, sufficiently distinct from the three other recorded species of the genus *viz. D. incisor* (Thornely), *D. corrugata* (*Thornely*) and *D. longiuscula* Harmer to warrant its recognition as a new species. It appears to be closely allied to *D. incisor* with regard to the shape of the orifice and the position of the oral denticle, but the tubular peristome which is characteristic of Thornely's species is wanting in *D. birbira.* The absence of membranous fenestrae on the ovicell is the most important feature distinguishing *D. birbira* from *D. corrugata* and *D. longiuscula.*

Cleidochasma laterale Harmer, 1957, Text-figs. 3 a, b.

1957 *Cleidochasma laterale* Harmer, p. 1044, pl. 71, figs. 9-11.

Remarks. This species differs from other members of the genus in that the ovicell is extended proximally as a broad, plate-like labellum, flanked by lateral sinuses.

Material examined. Station IV.



TEXT-FIG. 3

Cleidochasma laterale Harmer. BM No 1899.7.1.5354.

Locality: Persian Gulf.

a: two zooecia each with a marginal avicularium. — b: ovicelled zooecium, showing the broad labellum and lateral sinuses.

Other material. BM Cat. no. 99.7.1.5354. Locality: Persian Gulf.

Distribution. Persian Gulf; Amirante Is; Indonesia; New Guinea. Indonesia; New Guinea.

Rhynchozoon globosum Harmer, 1957, Pl. III, 17, 18.

1957 *Rhynchozoon globosum* Harmer, p. 1072, pl. 70, figs. 1-5.

Material examined. Stations VI, VII, VIII, IX.

Distribution. Indonesia; Torres Straits; Japan.

B. FAUNAL ANALYSIS

Bryozoans were frequently found encrusting *Sargassum* (especially *Membranipora tuberculata*) and certain molluscs, including *Pteria marmorata* Reeve, *Malleus regula* Forskål, *Pinctada radiata* Leach and *Strombus (Lentigo) fasciatus* Born (particularly *Conopeum commensale*); otherwise they were taken from concrete blocks and wooden debris (Massawa Harbour) and coral.

Of the 29 previously named species dealt above, 11 are new to the Red Sea area. These are: *Membranipora tuberculata, Antropora marginella, Conopeum commensale, Steganoporella simplex, Schizomavella australis, Hippaliosina acutirostris, Hippopodinella adpressa, Smittina malleolus, Parasmittina glomerata, Cleidochasma laterale, Rhynchozoon globosum.*

One species, *viz. Drepanophora longiuscula* appears to be indigenous to the Red Sea. On a percentage basis, 64% of the present fauna is distributed exclusively in the Indo-Pacific region, 36% occurring in the Atlantic region as well.

Waters (1909, 1910) documented 98 species and varieties of Bryozoa from the Sudanese Red Sea. From their geographic distribution Waters (1910:231) deduced that the number of species with affinities in the Atlantic, Mediterranean, Indian Ocean and Australian regions was closely similar. In both the Cyclostomata and Ctenostomata Waters demonstrated a strong Mediterranean relationship.

There is evidence to suggest, however, that in several instances Waters' synonymies were based on inadequate material and superficial resemblances, with the result that the distribution of certain species is erroneously broadened. Examination of the literature dealing with bryozoan faunas from other tropical areas (i.e. mainly Harmer 1915, 1926, 1934, 1957; Hastings 1927, 1930, 1932) shows that only 58 of Waters' identifications have been adequately verified, another four (mainly varieties) being synonyms (see Table A). The proper identity of the unverified species (36) should therefore be regarded as uncertain (see appendix).

Analysis of Waters' verified species, in terms of their currently

known distribution (Table A) shows that they may be conveniently grouped into four principal categories:

N.B. Species are listed in the same order of sequence as they appear in Table A.

1) **Species indigenous to the Red Sea:**

Drepanophora longiuscula
Sertella praetenuis

2) **Species confined to the Mediterranean and Red Sea:**

Schizotheca serratimargo

3) **Species distributed in the Red Sea as well as the Indian Ocean or Indo-Pacific region:**

Scrupocellaria jolloisii
Scrupocellaria serrata
Bugula robusta
Acanthodesia limosa
Stylopoma viride
Hippopetraliella magna
Tremogasterina robusta
Cigclisula occlusa
Parasmittina egyptiaca
Celleporaria aperta
Celleporaria labelligera
Celleporaria pigmentaria
Scrupocellaria obtecta
Dacryonella minor
Calyptotheca wasinensis
Scorpiodinipora bernardii
Codonellina montferrandii
Cosciniopsis lonchaea
Exechonella tuberculata
Parasmittina protecta
Parasmittina tropica
Triphyllozoon hirsutum
Reteporellina denticulata

4) **Species of wide distribution which occur in the Mediterranean or Atlantic region, or both:**

Synnotum aegyptiacum
Vittaticella contei
Savignyella lafontii
Scrupocellaria bertholletii
Scrupocellaria maderensis
Bugula avicularia
Bugula neritina
Beania intermedia
Membranipora savartii
Thalamoporella rozieri
Microporella umbracula
Microporella ciliata
Schizoporella unicornis
Robertsonidra argentea
Watersipora subovoidea
Parasmittina signata
Membraniporella aragoi
Nellia oculata
Fenestrulina malusii
Escharina pesanseris
Hippopodina feegeensis
Electra bellula
Micropora coriacea
Haplopoma impressum
Cribrilaria radiata
Puellina gattyae
Escharina dutertrei
Cryptosula pallasiana
Crisia elongata
Amathia brasiliensis
Zoobotryon pellucidum

Entoprocta

Barentsia gracilis

C. DISCUSSION AND CONCLUSIONS

The Red Sea is a relatively large water mass occupying a long narrow basin between latitudes 13°N and 30°N. Apart from the Suez Canal to the north and the narrow Bab-el-Mandeb Strait to the south, the Red Sea is completely landlocked and is characterized by a combination of two physical phenomena *viz.* high temperatures and high salinities.

A substantial number of indigenous bryozoan species might reasonably be expected to occur within such an unusual environment, as found for example in the decapod Macrura, of which 35% of the Red Sea fauna is indigenous (Tattersall 1921:347); as well as the

brachyuran fauna, 33% of which is indigenous to the Red Sea (Laurie 1915:409-416). Nevertheless, only two of the 58 bryozoan species from the Sudanese Red Sea, listed above, can be considered indigenous to the area.

One possible explanation for the paucity of an indigenous element may be due to the fact that the Bryozoa are a relatively conservative group, 20-30% of Miocene species or 60-80% of Pliocene species, occur in Recent seas (Stach 1937:80). Since evidence suggests that the Red Sea came into existence sometime between the Middle Pliocene and Pleistocene (Fox 1926:10) i.e. approximately one million years ago; this period may have been too brief to permit any substantial indigenous speciation among the Bryozoa.

The second point to be noted from the above list of species is the absence of a significant Mediterranean element in the Red Sea; only one species *viz. Schizotheca serratimargo* being shared exclusively between these two water masses. The numerous other species which are shared by the Mediterranean and Red Seas exhibit a wide distribution in the equatorial waters of the Atlantic or Indo-Pacific regions as well. Thus whatever the extent of Mediterranean species that invaded the faulted depression of what is now the Gulf of Suez and the Red Sea, during the Miocene connection between the two areas (Fox 1926:10); existing evidence for this mid-Cainozoic faunal incursion, to judge from the Recent fauna, is negligible. Recent migration between the Mediterranean and Red Seas via the Suez Canal appears to be uni-directional, as shown by Hastings' (1927) study of the bryozoan fauna of the Canal Zone. Of the 24 species listed, 13 have a wide distribution, 2 are distributed in the Atlantic, Mediterranean and Red Seas; 1 species occurs in the Mediterranean, 7 are derived from the Indian Ocean. Colonization of the hyperthermal and hypersaline waters of the Canal Zone has apparently been achieved more successfully by the Indian Ocean species than by East Mediterranean species.

The third feature of the above list, is the presence of a significant exclusively Indo-Pacific element (23 species) in the Red Sea fauna. This closely compares with results obtained from studies of other Red Sea invertebrate groups. Row (1911:382) considered that the sponge fauna (non-Calcarea) of the Red Sea "shows a very considerable affinity to the other parts of the Indian Ocean..." Laurie (1915:408) concluded that: "The Red Sea Brachyuran fauna forms an integral part of the Brachyuran fauna of the Indo-Pacific region", a conclusion reiterated by Tattersall (1921:348) for the macrurous Decapoda. A significant Indo-Pacific element is evident in the Red Sea gephyrean fauna (Wesenberg-Lund 1957). An Indo-Pacific affinity is also exhibited by the Cephalopoda (Hoyle 1907), the Nudibranchiata (O'Donoghue 1929) and the Amphineura (Leloup 1960). The Red Sea nudibranch fauna (82 species) is of special interest in that it revealed a complete dissimilarity with that of the Mediterranean (150 species); only one widely distributed pelagic species was found to occur in both areas (O'Donoghue 1929:779).

The Indo-Pacific affinity of the Red Sea echinoid fauna is implicit in Mortenson (1951). The same affinity is also exhibited by other

echinoderm groups (Dr. H.B. Fell pers. comm.). As far as the corals are concerned, Wells (1957:625) states "coral-reef communities remain remarkably constant in their composition, even to species, within the limits of the tropical Indo-Pacific from the Red Sea and east coast of Africa and Madagascar eastward across the Indian Ocean..."

Appendix: The following list of Red Sea material has been compiled from Waters (1909, 1910) and comprises those species and varieties which have not been verified by later workers.

Bryozoa:
- *Aetea recta*
- *Bicellaria ciliata*
- *Membranipora? bursaria*
- *Tubucellaria cereoides*
- *Schizoporella unicornis* var. *ansata*
- *Smittia spathulata*
- *Lagenipora costazii var. spathulata*
- *Canda arachnoides*
- *Schizoporella mucronata*
- *Gigantopora fenestrata*
- *Smittia nitida*
- *Lagenipora costazii*
- *Thairopora mamillaris*
- *Microporella personata*
- *Schizoporella leperei*
- *Lepralia quadrata*
- *Lepralia marceli*
- *Smittia ophidiana*
- *"Retepora fissilabris* Busk mss"
- *Retepora? plana*
- *Retepora cellulosa*
- *Holoporella pertusa*
- *Crisia producta*
- *Crisia ramosa*
- *Crisia cylindrica*
- *Filisparsa tubulosa*
- *Lichenopora radiata*
- *Bowerbankia imbricata*
- *Valkeria uva*
- *Cylindroecium dilatatum*
- *Cylindroecium giganteum*

Entoprocta:
- *Loxosoma kefersteinii*

The following species were described by Waters (1909, 1910) as new, but have not been verified as such by later workers:

- *Holoporella vermiformis*
- *Chaperia tropica*
- *Retepora jermanensis*
- *Aetea crosslandi*

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Abstract

Thirty species of Bryozoa are documented here from the vicinity of Port Massawa, South Red Sea. One species *viz. Drepanophora birbira* is described as new. Bryozoans were more commonly found associated with coral reefs from three to twenty fathoms, encrusting molluscan shells and coral. The following species are new to the Red Sea fauna: *Membranipora tuberculata, Antropora marginella, Conopeum commensale, Steganoporella simplex, Schizomavella australis, Hippopodinella feegeensis, Hippaliosina acutirostris, Hippopodinella adpressa, Smittina malleolus, Parasmittina glomerata, Cleidochasma laterale, Rhynchozoon globosum.* Scrutiny of the literature shows that a substantial portion of the Sudanese Red Sea bryozoan material (Waters 1909, 1910) has been verified specifically by subsequent workers. The distribution of those species is given here. These data indicate that the Red Sea bryozoan fauna 1) contains few indigenous

species, 2) lacks a significant representation of Mediterranean species, 3) is dominated by exclusively Indo-Pacific species. The conclusions reached here are in close agreement with the evidence obtained from some other Red Sea invertebrate groups for which significant data are available.

Zusammenfassung

Es werden dreissig Arten von Bryozoen aus der Umgebung von Port Massawa im Süden des Roten Meers beschrieben. Eine Art, nämlich *Drepanophora birbira* wird neu beschrieben. Man findet die Bryozoen vor allem als Kruste auf Schalen von Mollusken und auf Korallen in Gemeinschaft von Korallenriffen in einer Tiefe von drei bis zwanzig Fuss. Die folgenden Arten sind neu für die Fauna des Roten Meers : *Membranipora tubercula, Antropora marginella, Conopeum commensale, Steganoporella simplex, Schizomavella australis, Hippopodinella feegeensis, Hippaliosina acutirostris, Hippopodinella adpressa, Smittina malleolus, Parasmittina glomerata, Cleidochasma laterale, Rhynchozoon globosum.* Das Studium der Literatur zeigt dass ein grosser Teil des Bryozoenmaterials des sudanesischen Roten Meers (Waters 1909, 1910) von späteren Autoren spezifisch nachgeprüft worden ist. Die Verbreitung dieser Arten wird hier gegeben. Diese Daten zeigen, dass die Bryozoenfauna des Roten Meers 1° wenige einheimische Arten enthält, 2° keine eindeutig mediterrane Arten aufweist und 3° von ausschliesslich indopazifischen Arten dominiert wird. Diese Schlussfolgerungen stimmen gut überein mit den Ergebnissen, die für einige andere Invertebratengruppen des Roten Meers erhalten wurden, für die signifikante Resultate erhältlich sind.

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TABLE A

Revised List of A. W. Waters' (1909, 1910) Identifications of Red Sea Bryozoa.

N.B. Species are listed in the same sequence as given by Waters.

a) Crossland Collection (Cheilostomata)

Waters' Identification	Emended Identification	Distribution
Synnotum aviculaire (Pieper)	*Synnotum aegyptiacum* (Audouin)	Equatorial
Vittaticella contei (Audouin)		Mediterranean; Red Sea ; Indonesia.
Catenaria lafontii (Audouin and Savigny)	*Savignyella lafontii* (Audouin)	Equatorial
Scrupocellaria jolloisii (Sav. & Aud.)	*Scrupocellaria jolloisii* (Audouin)	Suez; Red Sea; Indian Ocean.
Scrupocellaria mansueta Waters n.sp.		
Scrupocellaria bertholletii (Audouin)		East Atlantic ; Mediterranean; Red Sea.
Scrupocellaria serrata Waters n.sp.		Suez; New Guinea.
Scrupocellaria scrupea Busk var. *dongolensis* Waters n.var.	*Scrupocellaria maderensis* Busk	East Atlantic; Red Sea; Indo-west Pacific.
Bugula avicularia (Linnaeus)		Arctic; Atlantic; Mediterranean; Red Sea; Indo-west Pacific.
Bugula neritina (Linnaeus)		Atlantic ; Mediterranean ; Red Sea; Indo-Pacific.
Bugula neritina var. *minima* Waters n.var.	*Bugula robusta* MacGillivray	Red Sea; Indo-west Pacific.
Beania intermedia (Hincks)		Atlantic; Suez; Red Sea; Indo-west Pacific.
Membranipora savartii (Audouin)		Equatorial
Membranipora limosa Waters n.sp.	*Acanthodesia limosa* (Waters)	Red Sea; Indo-west Pacific.
Thalamoporella rozieri (Audouin)		North Atlantic; Red Sea; Indo-west Pacific.
Microporella coronata (Audouin)	*Microporella umbracula* (Audouin)	East Atlantic; Mediterranean; Suez; Red Sea; Gulf of California; Panama.
Microporella ciliata (Pallas)		Cosmopolitan
Schizoporella unicornis Johnston		Arctic; Atlantic; Mediterranean; Red Sea; Indo-Pacific.
S. unicornis var.		
Schizoporella argentea Hincks	*Robertsonidra argentea* (Hincks)	East Atlantic; Mediterranean; Red Sea; Indo-Pacific.
Schizoporella viridis Thornely	*Stylopoma viride* (Thornely)	Red Sea; Indo-west Pacific.
Lepralia japonica Busk	*Hippopetraliella magna* (d'Orbigny)	Red Sea; Indo-Pacific.
Lepralia? cucullata Busk	*Watersipora subovoidea* (d'Orbigny)	Equatorial
Lepralia robusta Hincks	*Tremogasterina robusta* (Hincks)	Red Sea; Indian Ocean.

Waters' Identification	Emended Identification	Distribution
Lepralia occlusa (Busk)	*Cigclisula occlusa* (Busk)	Red Sea; Indo-west Pacific.
Smittia marmorea (Hincks)	*Parasmittina signata* (Waters)	Atlantic; Red Sea; Indo-Pacific.
Smittia egyptiaca Waters n.sp. *S. egyptiaca* var. *heroopolita* Waters n. var.	*Parasmittina egyptiaca* (Waters)	Suez; Red Sea; Indian Ocean.
Rhynchozoon corrugatum (Thornely)	*Drepanophora longiuscula* Harmer	Suez; Red Sea.
Holoporella aperta (Hincks)	*Celleporaria aperta* (Hincks)	Suez; Red Sea; Indo-west Pacific.
Holoporella descostilsii (Audouin)	*Celleporaria labelligera* Harmer	Suez; Red Sea; Indonesia.
Holoporella pigmentaria Waters n.sp.	*Celleporaria pigmentaria* (Waters)	Red Sea; Indonesia.

b) Berlin Collection

Scrupocellaria cervicornis Busk	*Scrupocellaria obtecta* Haswell	Red Sea; Indian Ocean; South-west Pacific.
Membranipora trifolium form *minor* Hincks	*Dacryonella minor* (Hincks)	Suez; Red Sea; Indo-west Pacific.
Membranipora aragoi (Audouin)	*Membraniporella aragoi* (Audouin)	Atlantic; Red Sea; Indo-Pacific.
Farcimia oculata (Busk)	*Nellia oculata* Busk	Equatorial
Microporella malusii (Audouin)	*Fenestrulina malusii* (Audouin)	Cosmopolitan
Schizoporella nivea Busk	*Calyptotheca wasinensis* (Waters)	Red Sea; Indo-west Pacific.
Schizoporella pesanseris (Smitt)	*Escharina pesanseris* (Smitt)	Equatorial
Schizoporella bernardii (Savigny & Audouin)	*Scorpiodinipora bernardii* (Audouin)	Red Sea; Indo-west Pacific.
Lepralia montferrandi (Audouin)	*Codonellina montferrandii* (Audouin)	Red Sea; Indo-Pacific.
Lepralia lonchaea Busk	*Cosciniopsis lonchaea* (Busk)	Red Sea; Indo-west Pacific.
Lepralia sp.	*Hippopodina feegeensis* (Busk)	West Atlantic; Red Sea; Indo-Pacific.
Lagenipora? tuberculata MacGillivray	*Exechonella tuberculata* (MacGillivray)	Red Sea; Indo-west Pacific.
Smittia trispinosa var. *protecta* Thornely	*Parasmittina protecta* (Thornely)	Red Sea; Indian Ocean.
Smittia tropica Waters	*Parasmittina tropica* (Waters)	Red Sea; Indo-west Pacific.
Retepora hirsuta Busk	*Triphyllozoon hirsutum* (Busk)	Red Sea; Indo-west Pacific.
Retepora abyssinica Waters n.sp. *R. abyssinica* var. *expansa* Waters n.var.	*Reteporellina denticulata* (Busk)	Red Sea; Indo-west Pacific.

c) Miscellaneous Collections

Membranipora bellula Hincks	*Electra bellula* (Hincks)	Atlantic; Red Sea; Indo-west Pacific.
Micropora coriacea Esper		Atlantic; Mediterranean; Red Sea; Indo-Pacific.

Waters' Identification	Emended Identification	Distribution
Microporella impressa (Audouin)	*Haplopoma impressum* (Audouin)	North Atlantic; Mediterranean; Red Sea.
Cribrilina radiata Moll	*Cribrilaria radiata* (Moll)	Cosmopolitan
Cribrilina gattyae Busk	*Puellina gattyae* (Busk)	Atlantic; Mediterranean; Red Sea.
Schizoporella dutertrei (Audouin)	*Escharina dutertrei* (Audouin)	Atlantic; Mediterranean; Red Sea; Japan; Chile.
Schizotheca serratimargo Hincks		Mediterranean; Suez; Red Sea.
Lepralia pallasiana Moll	*Cryptosula pallasiana* (Moll)	Atlantic; Mediterranean; Red Sea; Pacific.
Retepora? praetenuis Hincks	*Sertella praetenuis* (Hincks)	Red Sea.

d) Crossland Collection (Cyclostomata, Ctenostomata)

Crisia denticula (Lamarck)	*Crisia elongata* Milne-Edwards	West Indies; Mediterranean; Red Sea; Indo-Pacific.
Amathia tortuosa T. Woods	*Amathia brasiliensis* Busk	Atlantic; Red Sea.
Zoobotryon pellucidum Ehrenberg		Atlantic; Mediterranean; Red Sea; Indo-Pacific.
Phylum Entoprocta *Barentsia gracilis* (Sars)		Arctic and Northern Seas; Mediterranean; Red Sea; Indo-Pacific.