BRYOZOA (POLYZOA) FROM THE SOUTH RED SEA

by

N. A. Powell

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, Stegano-porella simplex, Schizomavella australis, Hippodinella feegeensis, Hippaliosina neutirostris, Hippodinella 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
given for the remaining 40 species. Five of the latter viz. "Cellepora" parsevalii, "C." raigii, "C." descostilisi, "C." 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)**

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

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).
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 (Bose, 1802), Pl. I, 2.

1926 Nichtina tuberculata (Bose) 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.


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.


1905 Amphiblestrum marginella Hincks: Thornely, p. 110.

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


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. Har-
mer’s material from the “Siboga” stations is not referable to A. mar-
ginella, 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.
Unregistered. Locality: Tizard Reef, 27 fath. Basset-Smith Col-
lection.

**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 articu-
lation 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) fasci-
catus* 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).

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 (1966a).

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. X17.
5 Antropora marginella (Hincks). Locality: Station VIII.
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**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.

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**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 *Hippopsiosina 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.


**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.


**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.


**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 fegeensis* (Busk, 1884) Pl. II, 11.

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

1957 *Hippopodina fegeensis* (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.


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 ectoecium 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.


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 ovi cell 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).
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).

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**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 acuminated 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

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(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.**

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</tbody>
</table>

**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](image)

**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.


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 serratata
   - Bugula robusta
   - Acanthodesia limosa
   - Stylopona uride
   - Hippopetraliella magna
   - Tremogasterina robusta
   - Cgelisula ocelusa
   - parasmittina egyptiaca
   - Celletoparia aperta
   - Celletoparia labelligera
   - Celletoparia pigmentaria

4) Species of wide distribution which occur in the Mediterranean or Atlantic region, or both:
   - Synnotum aegyptiacum
   - Vittaticella contei
   - Savignyella lafontii
   - Scrupocellaria maderensis
   - Bagula avicularia
   - Bagula neritina
   - Irenia intermedia
   - Membranipora savartii
   - Thamaporrella roxieri
   - Microporella umbraula
   - Microporella citata
   - Schizoporella unicornis
   - Robertsonidra argentea
   - Watersipora subovoidea
   - Parasmittina signata
   - Membraniporella aragoi
   - 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 bryozoon 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
BRYOZOA FROM THE SOUTH RED SEA

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 Bryoza 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 Bryoza.

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 *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:**

<table>
<thead>
<tr>
<th>Species</th>
<th>Species</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aetea recta</td>
<td>Lepralia marceli</td>
</tr>
<tr>
<td>Bicellaria ciliata</td>
<td>Smittia ophidiana</td>
</tr>
<tr>
<td>Membranipora? bursaria</td>
<td>&quot;Retepora fissilabris Busk mss&quot;</td>
</tr>
<tr>
<td>Tubucellaria cereoides</td>
<td>Retepora? plana</td>
</tr>
<tr>
<td>Schizoporella unicornis var. ansata</td>
<td>Retepora cellulosa</td>
</tr>
<tr>
<td>Smittia spathulata</td>
<td>Holoporella pertusa</td>
</tr>
<tr>
<td>Lagenipora costazii var. spathulata</td>
<td>Crisia producta</td>
</tr>
<tr>
<td>Canda arachnoides</td>
<td>Crisia ramosa</td>
</tr>
<tr>
<td>Schizoporella mucronata</td>
<td>Crisia cylindrica</td>
</tr>
<tr>
<td>Gigantopora fenestrata</td>
<td>Filisparsa tubulosa</td>
</tr>
<tr>
<td>Smittia nitida</td>
<td>Lichenopora radiata</td>
</tr>
<tr>
<td>Lagenipora costazii</td>
<td>Bowerbankia imbricata</td>
</tr>
<tr>
<td>Thaikropora mamillarisis</td>
<td>Valeria uwa</td>
</tr>
<tr>
<td>Microporella personata</td>
<td>Cylindroecium dilatatum</td>
</tr>
<tr>
<td>Schizoporella leperei</td>
<td>Cylindroecium giganteum</td>
</tr>
<tr>
<td>Lepralia quadra</td>
<td>Entoprocta:</td>
</tr>
<tr>
<td></td>
<td>Loxosoma kefersteinii</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Species</th>
</tr>
</thead>
<tbody>
<tr>
<td>Holoporella vermiciformis</td>
</tr>
<tr>
<td>Chaperia tropica</td>
</tr>
</tbody>
</table>

**Acknowledgments**

This study was principally supported by a research grant awarded to the writer by Haile Sellasse I University, Addis Ababa, Ethiopia. I should also like to thank Ato Wolde-Aregaye Redda, Director of Fisheries, Addis Ababa, who placed the R.F.B. “Birbira” at the disposal of the Expedition and kindly made available the facilities of the Fisheries Department at Port Massawa. The assistance and advice given me by the Imperial Ethiopian Navy, Massawa Naval Base, is greatly appreciated. The following people also participated in the 1965 Massawa Expedition and significantly contributed to the Expedition's success: Miss P.L. Cook (British Museum, Natural History); Dr. J. Birket-Smith, Natural History Museum H.S.I.U. Addis Ababa, Ato Haile Mariam, Biology Dept., H.S.I.U. I am grateful to Miss Cook for examining relevant comparative material in the Zoology Department, British Museum (Natural History) and to Dr. H.B. Fell, Curator of Invertebrate Zoology, Museum of Comparative Zoology, Cambridge, Massachusetts, for helpful discussion generally.

**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, Schizomusella australis, Hippopodinella fegeensis, Hippopodinella acutirostris, Hippopodinella adpressa, Smittina malleolus, Paramusitina 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
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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


REFERENCES


Table A


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

a) Grossland Collection (Cheilostomata)

<table>
<thead>
<tr>
<th>Waters' Identification</th>
<th>Emended Identification</th>
<th>Distribution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Synnotum aviculariae (Pieper)</td>
<td>Synnotum aegyptiacum (Audouin)</td>
<td>Equatorial</td>
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<td>Vittaticella contei (Audouin)</td>
<td>Savignyella lafontii (Audouin)</td>
<td>Mediterranean; Red Sea; Indonesia.</td>
</tr>
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<td>Catenaria lafontii (Audouin and Savigny)</td>
<td>Savignyella lafontii (Audouin)</td>
<td>Equatorial</td>
</tr>
<tr>
<td>Scrupocellaria jolloisii (Sav. &amp; Aud.)</td>
<td>Scrupocellaria jolloisii (Audouin)</td>
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</tr>
<tr>
<td>Scrupocellaria mansueta Waters n.sp.</td>
<td></td>
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</tr>
<tr>
<td>Scrupocellaria bertholletii (Audouin)</td>
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<td>Scrupocellaria maderensis Busk</td>
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<td>Bugula robusta MacGillivray</td>
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</tr>
<tr>
<td>Bugula neritina (Linnaeus)</td>
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</tr>
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<tr>
<td>Beania intermedia (Hincks)</td>
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<td>Membranipora savartii (Audouin)</td>
<td>Acanthodesia limosa (Waters)</td>
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</tr>
<tr>
<td>Leprolia robusta Hincks</td>
<td>Tremogasterina robusta (Hincks)</td>
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</table>
### Waters’ Identification

<table>
<thead>
<tr>
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<th>Emended Identification</th>
<th>Distribution</th>
</tr>
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<td><em>Parasmittina egyptiaca</em> (Waters)</td>
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</tr>
<tr>
<td>Waters n.sp.</td>
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<td><em>Drepanophora longiuscula</em> Harmer</td>
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<td><em>Holoporella descostilsii</em> (Audouin)</td>
<td><em>Celleporaria labelligera</em> Harmer</td>
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<td><em>Holoporella pigmentaria</em> Waters n.sp.</td>
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#### b) Berlin Collection

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<td><em>Scrupocellaria obecta</em> Haswell</td>
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<td><em>Membranipora trifolium</em> form minor Hincks</td>
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<tr>
<td><em>Retepora hirsuta</em> Busk</td>
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<td><em>Retepora abyssinica</em> Waters n.sp.</td>
<td><em>Reteporellina denticulata</em> (Busk)</td>
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#### c) Miscellaneous Collections

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**BRYOZOA FROM THE SOUTH RED SEA**

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<th>Waters' Identification</th>
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<td><strong>Microporella impressa</strong> <em>(Audouin)</em></td>
<td><strong>Haplopora impressum</strong> <em>(Audouin)</em></td>
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<td><strong>Cribrilina radiata</strong> <em>(Moll)</em></td>
<td><strong>Cribrilaria radiata</strong> <em>(Moll)</em></td>
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<td><strong>Cribrilina gattyae</strong> <em>(Busk)</em></td>
<td><strong>Puella gattyae</strong> <em>(Busk)</em></td>
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<td><strong>Schizoporella dutertrei</strong> <em>(Audouin)</em></td>
<td><strong>Escharina dutertrei</strong> <em>(Audouin)</em></td>
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<tr>
<td><strong>Schizotheca serratimargo</strong> <em>(Hincks)</em></td>
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<td>Mediterranean; Suez; Red Sea.</td>
</tr>
<tr>
<td><strong>Lepralia pallasiana</strong> <em>(Moll)</em></td>
<td><strong>Cryptosula pallasiana</strong> <em>(Moll)</em></td>
<td>Atlantic; Mediterranean; Red Sea; Pacific.</td>
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<td><strong>Retepora? praetenuis</strong> <em>(Hincks)</em></td>
<td><strong>Sertella praetenuis</strong> <em>(Hincks)</em></td>
<td>Red Sea.</td>
</tr>
</tbody>
</table>

*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. |