

# STUDIES ON BRYOZOA (POLYZOA) OF THE BAY OF FUNDY REGION.

## II. - BRYOZOA FROM FIFTY FATHOMS, BAY OF FUNDY (I).

by

N.A. Powell

National Museum of Canada.

### Résumé

L'auteur cite 38 espèces et une variété de Bryozoaires associés à des bancs de Pectinidés (*Placopecten magellanicus*) à une profondeur de 90 à 100 m dans la Baie de Fundy (Est du Canada). Une espèce nouvelle : *Amphiblestrum osburni* est décrite. Les Bryozoaires incrustaient souvent en abondance la surface interne des valves de coquilles de Pectinidés dont beaucoup avaient été disloqués et retournés vers le fond, au cours des opérations de pêches commerciales. Plusieurs espèces, rencontrées sur les rochers et les cailloux dans la zone intertidale (citées dans la première partie de cette étude), ne se retrouvèrent pas en eau profonde. Nos données suggèrent que la partie septentrionale du Golfe du Maine, correspond à une limite sud pour plusieurs espèces arctiques.

### Introduction

As a result of the extensive studies by Osburn (1912a, 1912b, 1919, 1924, 1932, 1933, 1944), a substantial amount of information has been compiled on the composition of the sub-littoral bryozoan fauna over a wide area of the Canadian and New England coastline. The fauna of the Gulf of St. Lawrence is reasonably well known from the work of Hincks (1888, 1889, 1892). Except for the studies of Cornish (1907) and Stafford (1912), however, only meagre information is available about the species composition of the sub-littoral fauna in that part of the Acadian faunal province intermediate between the Gulf of St. Lawrence and the Mount Desert region (Osburn 1933). The purpose of the present report is to close the gap in our knowledge of the distribution of Bryozoa off the south-eastern coast of Canada with particular reference to the Bay of Fundy.

### Historical

Two workers have previously collected bryozoans from the sub-littoral zone in the Bay of Fundy. Stimpson (1853) described as new 11 of 16 species taken off Grand Manan Island. Only four of these are now recognised to be valid; the remainder have been merged in

---

(1) Pt. I. *Cah. Biol. Mar.* VIII, pp. 331-347.

synonymy (Osburn 1912a:205). During 1868, 1870 and 1872, Verrill also collected from the vicinity of Grand Manan Island and the results of this work were incorporated as distributional data in Verrill and Smith (1874). The combined results of Stimpson's and Verrill's work were summarized by Whiteaves (1901).

A day's dredging by the writer aboard a scallop-trawler during September 1965, revealed a moderately rich bryozoan fauna associated with the scallop beds (*Placopecten magellanicus* [Gmelin]) in 50-55 fathoms, off Digby, Nova Scotia. Bryozoans were particularly common encrusting the internal surfaces of disarticulated scallop valves, i.e. shells from which the meat had been previously removed by commercial fishing operations, then returned to the sea bottom. In very few instances were colonies observed encrusting live scallops (1).

The rocks and boulders which comprise the substrate also yielded a considerable amount of bryozoan material, but only a small number of the total of species collected.

This report is divided into two sections:

- A. Systematics.
- B. Discussion.

Abbreviations used in this report:

- USNM United States National Museum (Washington, D.C.).
- NMC National Museum of Canada (Ottawa).
- BM British Museum (Natural History).
- Lz = length of zooecium.
- ho = length of opesia.
- lz = width of zooecium.
- lo = width of opesia.

Unless otherwise stated, synonymies cited pertain to the Mount Desert region.

## A. SYSTEMATICS

### Order CYCLOSTOMATA Busk, 1852

*Diplosolen obelia* (Johnston, 1838), Pl. 1, 4.

1933 *Diplosolen obelium* (Johnston): Osburn, p. 14, pl. 1, fig. 7.

**Geographic distribution:** a common arctic and North Atlantic species.

*Idmonea atlantica* Johnston, 1847.

1933 *Idmonea atlantica* Johnston: Osburn, p. 17, pl. 1, figs. 5, 6.

**Distribution:** a common arctic and Trans-Atlantic species.

---

(1) Dr. T. Schopf informs me (pers. comm.) that a high incidence of *P. magellanicus* from Georges Bank, Gulf of Maine are encrusted on the upper valve by *Alcyonidium polyoum* (Hassall).

*Crisia eburnea* (Linnaeus, 1758).

1933 *Crisia eburnea* (Linnaeus): Osburn, p. 8, pl. 1, figs. 3, 4; pl. 4, fig. 3.

**Distribution:** (see part one of these studies).

*Lichenopora verrucaria* (Fabricius, 1780), Pl. 1, 1.

1933 *Lichenopora verrucaria* (Fabricius): Osburn, p. 17, pl. 1, fig. 8.

**Distribution:** (see part one of these studies).

*Lichenopora hispida* (Fleming, 1828), Pl. 1, 2, 3.

1933 *Lichenopora hispida* (Fleming): Osburn, p. 18.

**Distribution:** (see part one of these studies).

*Tubulipora* sp.

**Remarks:** specific determination was not possible as the material obtained was infertile.

## Order CTENOSTOMATA Busk, 1852

*Alcyonidium polyoum* (Hassall, 1841).

1933 *Alcyonidium polyoum* (Hassall) Osburn, p. 61, pl. 5, figs. 5-7.

**Remarks:** extremely common, often covering the entire internal surfaces of *Placopecten* valves. The species can be recognized macroscopically by its characteristic yellow or reddish-brown coloration.

**Distribution:** (see part one of these studies).

## Order CHEILOSTOMATA

## Sub-order ANASCA Levinsen, 1909.

*Eucratea loricata* (Linnaeus, 1758).

1933 *Gemellaria loricata* (Linnaeus) Osburn, p. 19, pl. 4, figs. 5, 6.

**Distribution:** a common arctic and Trans-Atlantic species.

*Electra crustulenta* (Pallas) var. *arctica* Borg, Pl. 2, 8.

1933 *Pyripora catenularia* (Jameson) Osburn, p. 21, pl. 14, figs. 3, 4.

**Remarks:** the zooecia always form branching uni- or biserial rows, in a manner closely resembling var. *catenularia-similis* of Kluge (1962:272). This type of growth appears, however, to merge into the multiserial type commonly exhibited by var. *arctica* (see Borg 1931, pl. 1, fig. 2). In the absence as yet of any firm ecological data correlating the occurrence of Kluge's variety, the latter is regarded here as a synonym of var. *arctica*.

**Distribution:** (see part one of these studies).

*Tegella armifera* (Hincks, 1880).

1933 *Tegella unicornis* (Fleming) var. *armifera* (Hincks): Osburn, p. 24, pl. 6, fig. 7.

**Distribution:** (see part one of these studies).

*Callopora craticula* (Alder, 1857).

1933 *Callopora craticula* (Alder): Osburn, p. 22, pl. 6, fig. 4.

**Distribution:** a common arctic and Trans-Atlantic species. On the east coast of America it occurs southward to Long Island Sound.

*Cauloramphus cymbaeformis* (Hincks, 1877).

1933 *Cauloramphus cymbaeformis* (Hincks): Osburn, p. 25.

**Distribution:** a common arctic and Trans-Atlantic species. On the east coast of North America it is distributed from Cape Cod to the Arctic Ocean.

*Amphiblestrum flemingii* (Busk, 1854), Pl. 2, 5.

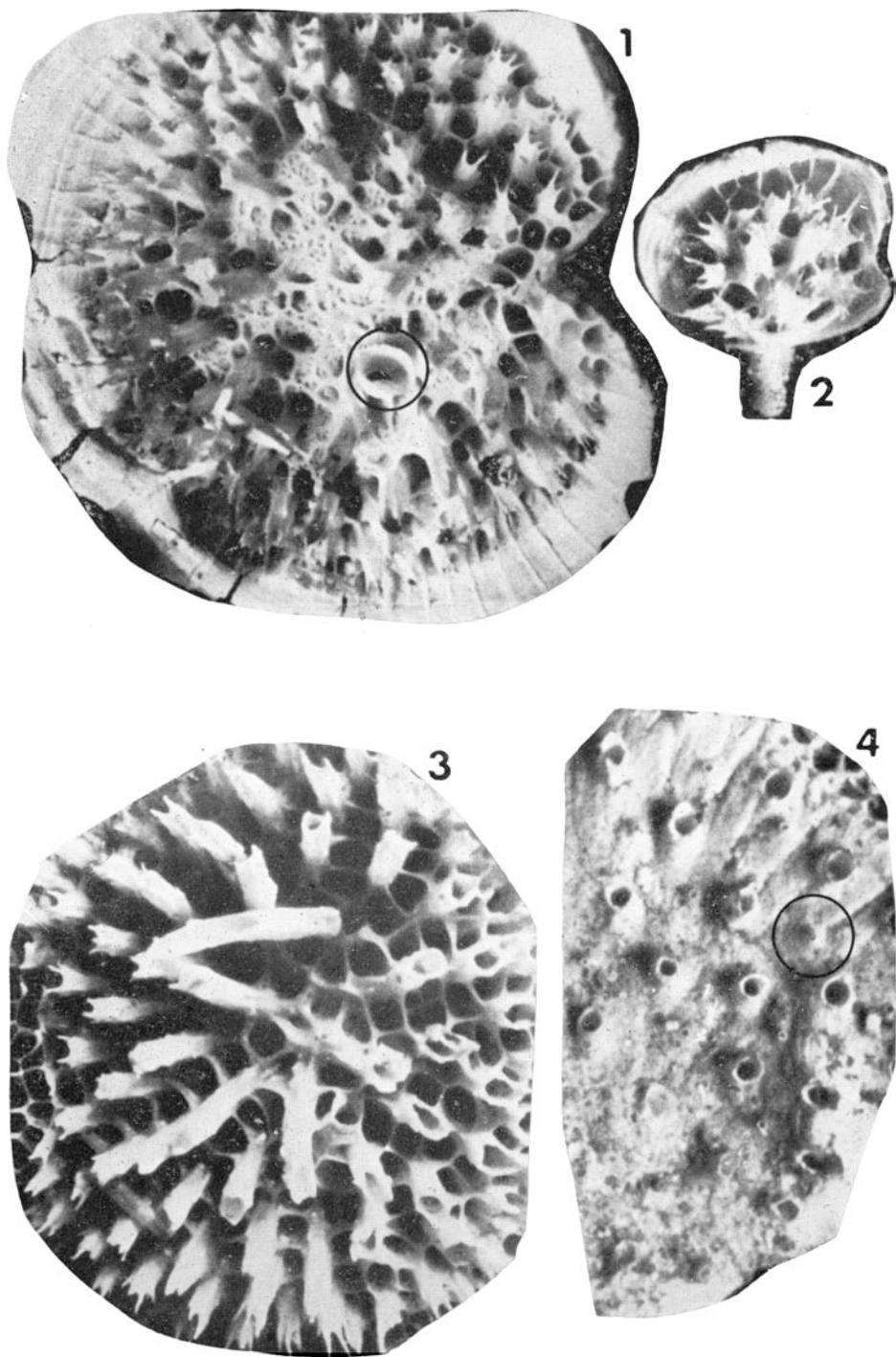
Synonymy for the New England Coast:

1912a *Membranipora flemingii* Busk, Osburn, p. 231, pl. 23, fig. 38.

Not 1933 *Amphiblestrum flemingii* (Busk) Osburn, p. 25, pl. 6, figs. 8, 9. (= *A. osburni* n. sp., see below).

**Remarks:** diagnostic features of the material at hand include a combination of characters among which are the strongly trifoliate opesia with a broad area of cryptocyst, depressed proximally. Four oral spines occur in both ordinary and fertile zooecia, in the latter they are positioned at the proximal corners of the ovicell; the posterior pair are especially well developed, usually one is extended upwards as a long spinose process (Pl. 2, 5). Ordinarily an avicularium is situated at the proximal extremity of each zooecium, pointing transversely, proximally or obliquely. In fertile zooecia, however, two avicularia occur, one at each corner of the ovicell distally; directed obliquely-distally. The ovicell always has a prominent median transverse keel (really the proximal extremity of the outer layer of ectooecium) which encloses the inner layer of ectooecium; the latter diminishes in width proximally.

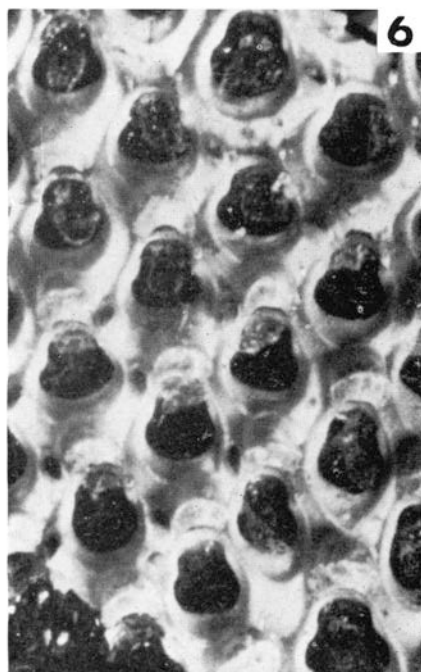
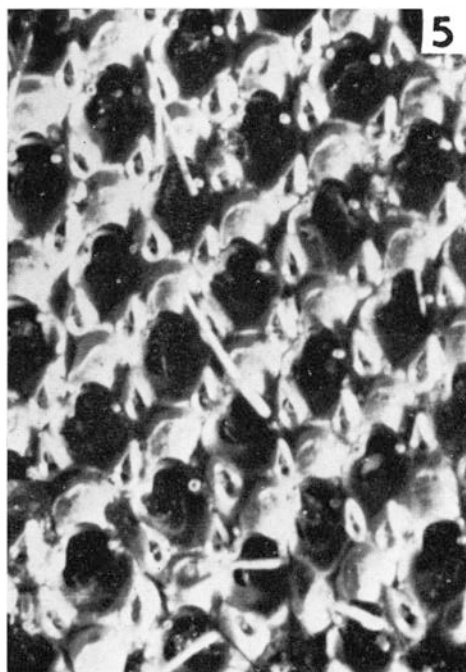
**Distribution:** a common Trans-Atlantic species.



N.A. POWELL.

PLATE 1

1. *Lichenopora verrucaria* (Fabricius). Oeciostome indicated.
  2. *Lichenopora hispida* (Fleming). Immature zoarium.
  3. *L. hispida* (Fleming). Mature zoarium.
  4. *Diplosolen obelia* (Johnston). Nannozoid indicated.
- Magnifications  $\times 33-35$ . (with the exception of Pl. 5, 17).  
Photography: N.A. Powell.



N.A. POWELL.

PLATE 2

5. *Amphiblestrum flemingi* (Busk). Fertile zoarium. Note the paired avicularia, one at each corner of the ovicell distally.
6. *Amphiblestrum trifolium* (S. Wood). Fertile zoarium.
7. *Amphiblestrum osburni* n.sp. Holotype NMC no. 23. Fertile zoarium. Note the proximal location of the median avicularia; also the non-carinate ovicells.
8. *Electra crustulenta* (Pallas) var. *arctica* Borg. Two zooecial rows, one with branches, the other without.

*Amphiblestrum trifolium* (S. Wood, 1844), Pl. 2, 6.

1933 *Amphiblestrum trifolium* (S. Wood): Osburn, p. 26, pl. 14, fig. 2.

**Remarks:** two oral spines occur in both ordinary and fertile zooecia. The cryptocyst is somewhat reduced and strongly denticulated around the border. One or two proximally directed avicularia are situated medially, at the zooecial margins. They may, however, be wanting altogether. The ovicell is strongly keeled, frequently with an avicularium at each side, pointing proximally (Pl. 2, 6).

**Distribution:** arctic; Trans-Atlantic.

*Amphiblestrum osburni* n. sp., Pl. 2, 7 (1).

1933 *Amphiblestrum flemingii* (Busk) Osburn, p. 25, pl. 6, figs. 8, 9 (not of Busk 1854).

**HOLOTYPE:** NMC No 23. Locality: 6½ miles off Gulliver's Cove, Digby Neck, Nova Scotia, 50 fathoms (mounted slide; Pl. 2, 7).

**Other material** (paratypic):

- (a) NMC No. 24. Locality: Bay of Fundy, 50 fathoms, encrusting *Placopecten magellanicus* (spirit material).
- (b) USNM No. 11908. Locality: Off Grand Manan Island, Bay of Fundy, 15 fathoms (mounted slide).
- (c) USNM No. 11909. Locality: "New England" (2 slides).
- (d) USNM No. 11910. Locality: off Mount Desert Island (mounted slide, figured Osburn 1933, pl. 6, figs. 8, 9).

**Diagnosis:** *Amphiblestrum* with a well developed cryptocyst surrounding a strongly trifoliate opesia. Aperture oval-shaped, delimited by a conspicuous peripheral ridge. Avicularia sessile, situated on the proximal gymnocyst, the rostra directed proximally or obliquely so. Ovicell non-carinate, outer layer of ectooecium vestigial; inner layer completely exposed, well calcified.

**Description:** *zoarium* encrusting.

*Zooecia* arranged alternately in diverging longitudinal rows, distinctly separated by deep furrows. *Opesia* strongly trifoliate in fully calcified zooecia, occupying slightly more than the distal half of the zooecium; proximal margin straight. *Cryptocyst* almost smooth, depressed; aperture ovate, bordered around the margins by a salient ridge. *Gymnocyst* well developed, smooth, tapering proximally. *Avicularia* small, acuminate, mounted on inflated chambers on the proximal gymnocyst, rostra directed upwards proximally or obliquely so. *Ovicell* hyperstomial, galeate, outer layer of ectooecium confined to the base as a salient rim, inner layer entirely exposed, well calcified, densely pitted. *Distal spines:* two pairs in both ordinary and fertile zooecia, the distal pair narrow, the proximal pair more robust; one frequently extending upwards as a long process.

---

(1) After the late Dr. R.C. Osburn, an authority on the marine Bryozoa of the North American area.

**Measurements:**

Lz = 0.45 - 0.51 mm    lz = 0.30 - 0.36 mm  
 ho = 0.24 - 0.27 mm    lo = 0.24 - 0.27 mm

**Remarks:** the avicularia occur with considerable frequency, in fertile zooecia they sometimes appear to be attached to the ovicell of the proximal zooecium. The location of the avicularia in *A. osburni* is the same as in *A. trifolium* var. *quadrata* (Hincks 1880:167) (those in *A. trifolium* are positioned between the zooecia), but the calcification of the ovicells is entirely different. Furthermore, the distinctive ridge which surrounds the aperture in the new species; separating the cryptocyst from the gymnocyst, is wanting in Hincks' variety where both layers merge proximally without a break (Miss P.L. Cook pers. comm.). Except for a well defined basal rim, the outer layer of ectooecium is not developed in *A. osburni*. Hence the median keel, as seen in *A. flemingii*, *A. trifolium* and *A. septentrionalis* (Kluge), is absent, and instead, the inner layer is entirely exposed, and strongly calcified (Pl. 2, 7).

Examination of the Mount Desert Island material which Osburn (1933:25) attributed to *A. flemingii* shows that it belongs to the present species instead. Unfortunately, Osburn's description does not agree with his figures. These were taken from incompletely calcified zooecia, near the growing margin, and for this reason the trifoliate opesia is not seen. The non-carinate ovicells and the characteristic positioning of the avicularia are clearly apparent however.

***Dendrobeatia murrayana* (Johnston, 1847).**

1933 *Dendrobeatia murrayana* (Johnston): Osburn, p. 29, pl. 4, fig. 8; pl. 8, fig. 3.

**Distribution:** a common arctic and Trans-Atlantic species. Cape Cod is its southern limit on the Atlantic Coast of America.

***Bugula turrita* (Desor, 1848).**

**Distribution:** Woods Hole; Long Island Sound; North Carolina; Bay of Santos, Brazil.

***Tricellaria ternata* (Ellis and Solander, 1786).**

1933 *Tricellaria ternata* (Solander): Osburn, p. 27, pl. 7, fig. 3.

**Distribution:** a common arctic and Trans-Atlantic species; occurring southward to Long Island Sound on the American Coast.

***Scrupocellaria scabra* (Van Beneden, 1848).**

1933 *Scrupocellaria scabra* (Van Beneden): Osburn, p. 26, pl. 7, fig. 4.

**Remarks:** a variable species which is represented in the present collection by var. *paenulata* Norman. The frontal scute in this form attains a considerable size, almost concealing the ovicell.

**Distribution:** common in arctic and North Atlantic waters. On the American Coast it occurs southward to Cape Cod.



*Caberea ellisii* (Fleming, 1828).

1933 *Caberea ellisii* (Fleming): Osburn, p. 28, pl. 4, fig. 7; pl. 8, figs. 1, 2.

**Distribution:** arctic, Trans-Atlantic; on the American Coast it ranges from the Arctic Ocean southward to Cape Cod.

## Sub-order ASCOPHORA Levinsen, 1909.

## Division I ASCOPHORA IMPERFECTA Harmer, 1957.

*Umbonula arctica* (M. Sars, 1851).

**Remarks:** all the zoaria examined comprise flattened, encrusting, discoidal colonies. The mode of colony-formation is very close to that seen in some lunulitiform bryozoa i.e. the ancestrula becomes encircled by secondary zooecia each of which initiates a radial row.

**Distribution:** a common arctic and North Atlantic species, occurring southward to Cape Cod on the American Coast.

## Division II ASCOPHORA VERA Harmer, 1957.

*Hippothoa hyalina* (Linnaeus, 1767).

1933 *Hippothoa hyalina* (Linnaeus): Osburn, p. 33, pl. 9, figs. 1-3.

**Remarks:** encrusting *Placopecten* as weakly calcified, dendritic colonies.

**Distribution:** (see part one of these studies).

*Stomachetosella sinuosa* (Busk, 1860).

1933 *Stomachetosella sinuosa* (Busk): Osburn, p. 36, pl. 11, figs. 1, 2 (not. pl. 2 as indicated).

**Distribution:** arctic; North Atlantic; extending southward to Cape Cod on the east coast of America.

*Schizomavella auriculata* (Hassall, 1842).

1933 *Schizomavella auriculata* (Hassall): Osburn, p. 39, pl. 9, fig. 5.

**Distribution:** arctic; North Atlantic; Cape Cod is its most southerly limit on the American Coast.

*Schizomavella porifera* (Smitt, 1867), Pl. 3, 9.

Synonymy for the Gulf of St. Lawrence:

1903 "*Smittia*" *porifera* (Smitt) Norman, pp. 121-122.

**Remarks:** the shape of the orifice and the position of the sub-oral avicularium is strikingly close to *Smittina majuscula* (Smitt) (see below). These two species have frequently been confused in the literature and unless specific mention was made regarding the "lyrula" (which occurs in *S. majuscula*), it is impossible to ascertain with any certainty the correct identity of the material recorded. The present record comprises the most southerly latitudinal range documented to date for the species.

**Distribution:** "It is a high northern species" Osburn (1952:333).

*Hippoporina reticulatopunctata* (Hincks, 1877), Pl. 3, 10.

1933 *Hippodiplosia reticulato-punctata* (Hincks) Osburn, p. 41, Pl. 10, fig. 2; Pl. 13, fig. 6.

**Remarks:** the oval-shaped frontal avicularia which are commonly found in this species are completely wanting in the Bay of Fundy specimens. These structures are also lacking in the Mount Desert Island material. I quote from Kluge (1962:495) in this regard: "Although sub-oral avicularia occur quite frequently on the zooecia, there are instances when entire zoaria are almost or completely devoid of them".

**Distribution:** a common arctic species. Cape Anne (Massachusetts) is the most southerly range recorded for this species on the American Coast.

*Hippoporina propinqua* (Smitt, 1867), Pl. 3, 11.

Synonymy for the east coast of North America:

1877 *Lepralia propinqua* (Smitt) Hincks, p. 103, Pl. 10, figs. 5-7.

Not 1901 *Porella propinqua* (Smitt) Whiteaves, p. 105 (= *P. smitti* [Kluge] see below).

1912a *Porella propinqua* (Smitt): Osburn, p. 248, Pl. 27, figs. 70, 70a.

1912b *Porella propinqua* (Smitt): Osburn, p. 285.

1933 *Porella propinqua* (Smitt): Osburn, p. 57, Pl. 12, figs. 3, 4.

1964 *Porella propinqua* (Smitt): Rogick, p. 178.

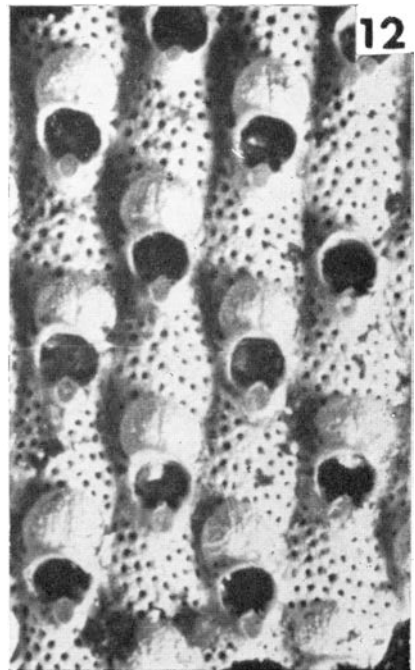
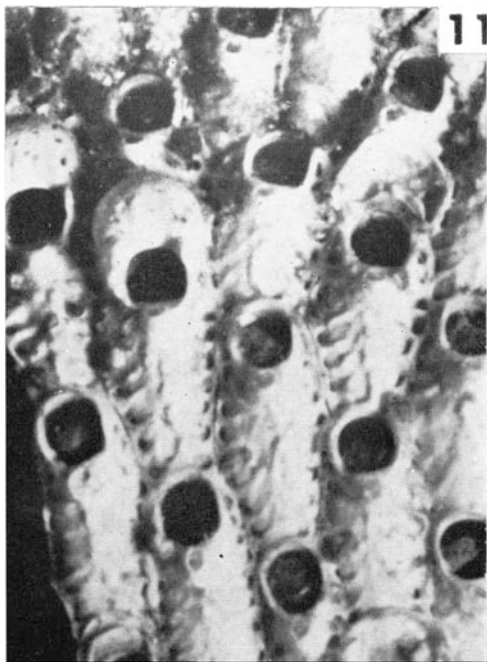
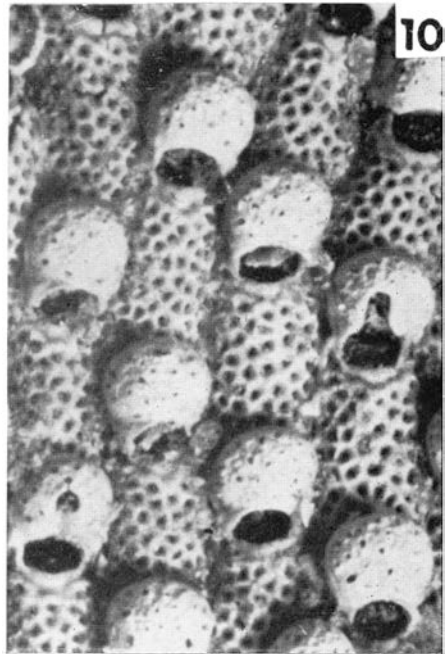
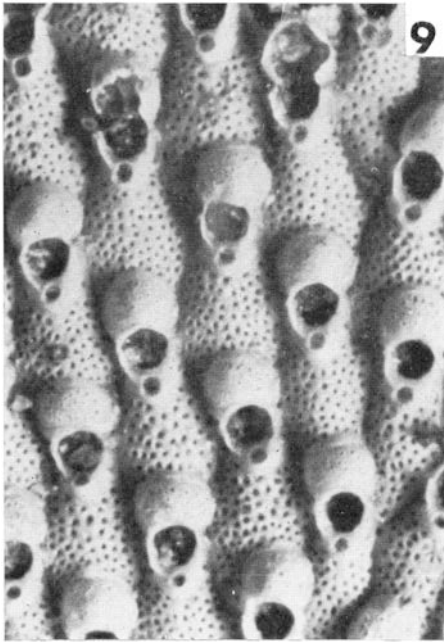
**Remarks:** although the frontal wall in this species is not coarsely perforated as in *H. pertusa* (Esper), the type, the shape of the orifice and the median position of the sub-oral avicularium as well as the perforated ovicell are important features which otherwise agree and support its inclusion in the present genus.

**Distribution:** an arctic species which extends southward to Cape Cod on the American Coast.

*Escharella immersa* (Fleming, 1828).

1933 *Mucronella immersa* (Fleming) Osburn, p. 51, Pl. 11, fig. 8; Pl. 15, fig. 9a.

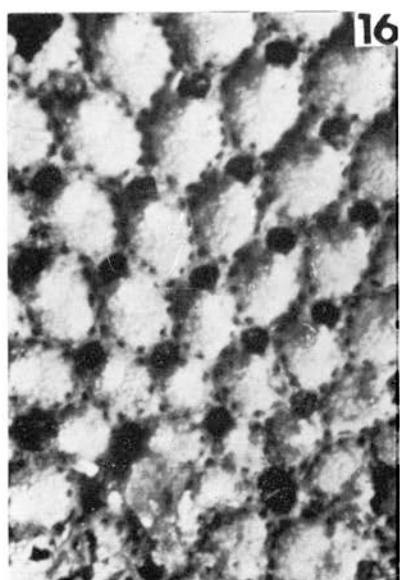
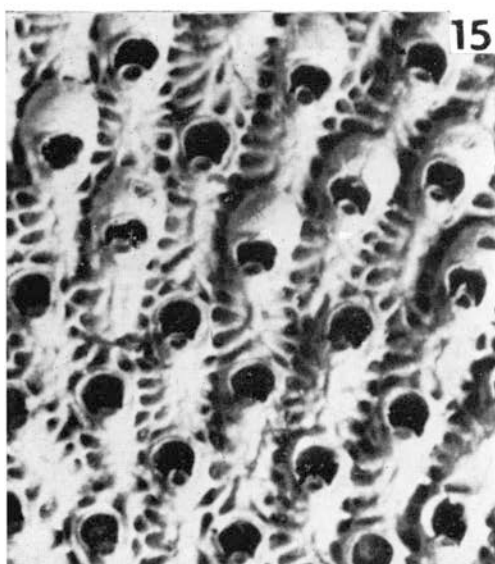
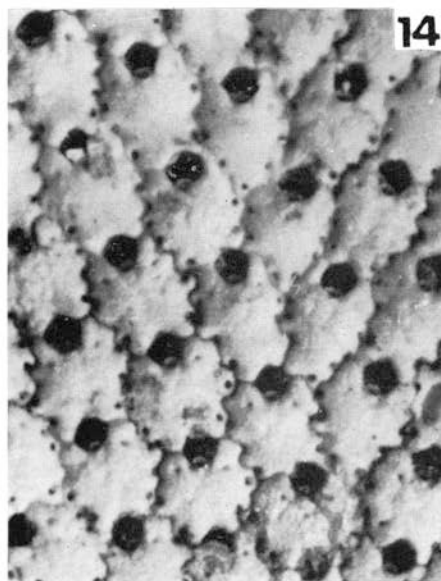
**Distribution:** (see part one of these studies).



N.A. POWELL.

PLATE 3

9. *Schizomavella porifera* (Smitt). Fertile zoarium.
10. *Hippoporina reticulatopunctata* (Hincks). Fertile zoarium: Two ovicells are shown approaching final stages of development.
11. *Hippoporina propinqua* (Smitt). Fertile zoarium.
12. *Smittina majuscula* (Smitt). Fertile zoarium: Note the imperforate ovicells.



N.A. POWELL.

PLATE 4

13. *Porella acutirostris* Smitt. Fertile zoarium.
14. *Porella concinna* (Busk).
15. *Porella smitti* Kluge. Fertile zoarium.
16. *Porella reduplicata* (Osburn).

*Escharella ventricosa* (Hassall, 1842).

1933 *Mucronella ventricosa* (Hassall) Osburn, p. 52, Pl. 15, figs. 7, 9b.

**Distribution:** a common arctic and North Atlantic species. Cape Cod is its southern limit on the West Atlantic Coast.

*Porella concinna* (Busk, 1852), Pl. 4, 14.

1933 *Smittina concinna* (Busk) Osburn, p. 45, Pl. 10, fig. 5.

**Distribution:** arctic; South Atlantic; it occurs southward to Cape Cod on the West Atlantic Coast.

*Porella acutirostris* Smitt, 1867, Pl. 4, 13.

1933 *Porella acutirostris* Smitt: Osburn, p. 57, Pl. 12, figs. 5, 6.

**Distribution:** arctic; North Atlantic; it occurs southward to Cape southern limit on the West Atlantic Coast.

*Porella smitti* Kluge, 1907, Pl. 4, 15.

Synonymy for the North New England Coast and east coast of Canada:

1901 *Porella propinqua* (Smitt) Whiteaves, p. 105 (not of Smitt 1867).

1912a *Porella proboscidea* Hincks, Osburn, p. 249, Pl. 27, figs. 71a-g; Pl. 31, fig. 101 (not of Hincks 1888).

1933 *Porella proboscidea* Hincks: Osburn, p. 58, Pl. 10, fig. 9.

1964 *Porella proboscidea* Hincks: Rogick, p. 178.

**Remarks:** some confusion regarding the correct identity of this species persists in the North American literature. A small amount of material in the NMC bryozoan collection labelled "*Porella propinqua* (Smitt), Gaspé Bay, Whiteaves" is probably the basis for Whiteaves' (1901:105) identification, referred now to Kluge's species instead.

**Distribution:** common in arctic waters, extending southward to Nantucket Island on the West Atlantic Coast.

*Porella reduplicata* (Osburn, 1933), Pl. 4, 16.

1933 *Smittina reduplicata* Osburn, p. 47, Pl. 11, fig. 9; Pl. 13, figs. 2, 3; Pl. 14, figs. 9, 10.

**Remarks:** the broad lyrula as well as the imperforate ovicell are important features which suggest that this species is more appropriately contained in *Porella*.

**Distribution:** Gulf of Maine.

*Smittina majuscula* (Smitt, 1867), Pl. 3, 12.

Synonymy for the New England area and east coast of Canada:

1888 *Smittia landsborovii* (Johnston) form *porifera* (Smitt) Hincks, p. 225, Pl. 14, fig. 2.

1901 *Smittia landsborovii* (Johnston) var. *porifera* (Smitt): Whiteaves, p. 105.

1912a *Smittia porifera* (Smitt): Osburn, p. 245, Pl. 26, fig. 64.

1912b *Smittia porifera* (Smitt): Osburn, p. 285.

1932 *Smittina porifera* (Smitt): Osburn, p. 13.

1964 *Smittina majuscula* Nordgaard: Rogick, p. 178.

**Remarks:** the narrow process which protrudes down into the primary orifice is not a true lyrula but merely a distal tooth-like extension of the sub-oral avicularium (Pl. 3, 12). The ovicell in this species is not perforated (cf. Osburn 1912a:246). In view of the above characters, the present generic position of Smitt's species should be regarded as provisional.

**Distribution:** an arctic species, occurring southward to Cape Cod on the American Coast.

*Smittina bella* (Busk, 1860), Pl. 5, 20.

1933 *Smittina bella* (Busk): Osburn, p. 49, Pl. 9, fig. 7; Pl. 13, fig. 9; Pl. 14, fig. 11.

**Remarks:** the ovicell is typically perforated by a median pore and often traversed by two suture lines which are really the extensions of the septal walls from adjoining zooecia.

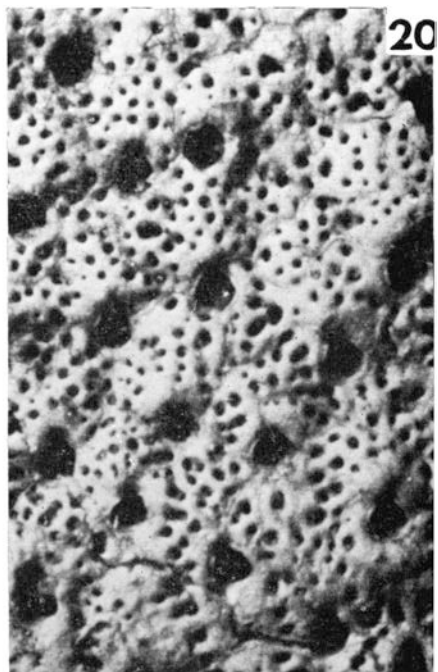
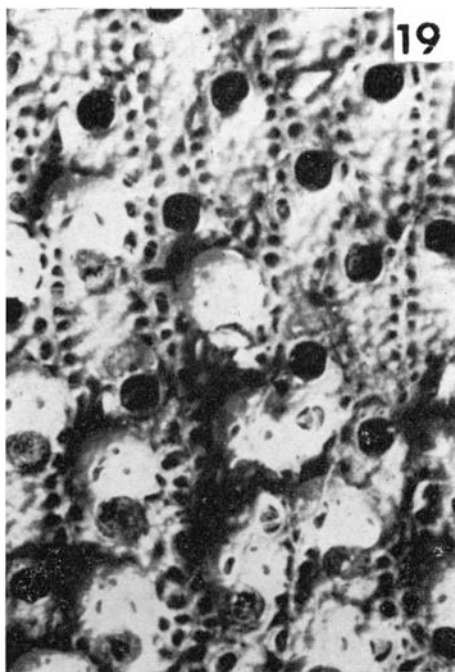
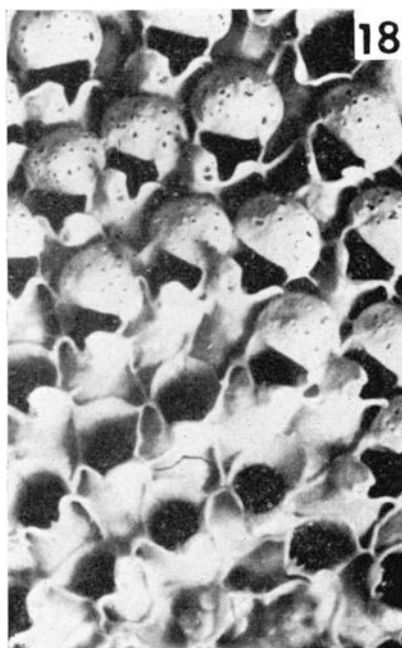
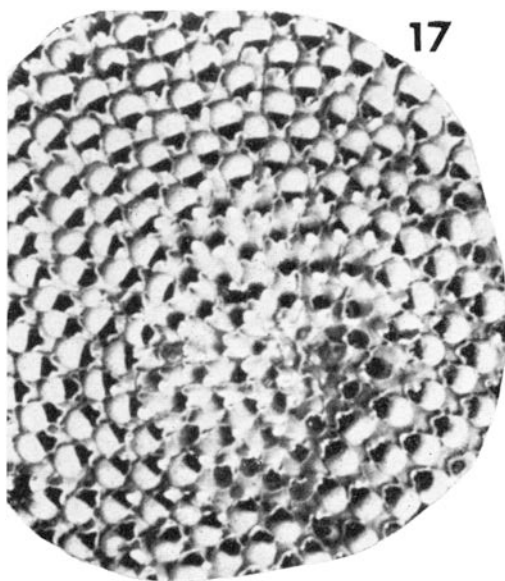
**Distribution:** "This is an arctic and northern species, on the Atlantic coast occurring as far south as Mount Desert Island, Maine" (Osburn 1952:404).

*Parasmittina jeffreysi* (Norman, 1876), Pl. 5, 19.

1933 *Smittina trispinosa* (Johnston) Osburn, p. 45, Pl. 10, fig. 6, (not of Johnston 1838).

**Remarks:** variation in the shape of the orifice is very marked in the Bay of Fundy specimens. Within a single colony for example, the orifice may be sub-quadrate (i.e. rounded distally, sides and proximal lip almost straight) to ovate, owing to the growth of a spout like peristome around the proximal lip. Usually a triangular avicularium, situated adjacent to the peristome and directed obliquely-distally is the more usual condition in non-fertile zooecia, but small, oval-shaped avicularia associated with the areolae are very common, particularly on ovicelled zooecia in older regions of the zoarium. In such instances the triangular avicularium frequently becomes adherent to the ovicell (Pl. 5, 19). The ovicell is characteristically inflated, the outer layer of ectooecium being perforated by two or three large pores. Through the courtesy of Dr. Frank Mauro, I was able to examine a photograph of Norman's type material from Greenland "Valorous" Expedition; BM Cat. no. 1911.10.1.1477). It is evident from this that the ovicells in the type likewise have two or three pores. Osburn (1952:412) used the latter character as a primary criterion for distinguishing Alaskan material of *jeffreysi* from other arctic species of *Parasmittina*. Based on the same feature, Osburn's material from Mount Desert Island is referable to *P. jeffreysi* as well.

**Distribution:** "a common arctic species known from Spitsbergen to Greenland and south to Labrador" (Osburn 1952:414).



N.A. POWELL.

PLATE 5

17. *Rhamphostomella bilaminata* (Hincks). Zoarium, low power. Note the pseudo-spiral arrangement of the zooecia  $\times 12$ .
18. *R. bilaminata*: Part of zoarium shown Fig. 17, high power  $\times 35$ .
19. *Parasmittina jeffreysi* (Norman). Fertile zoarium.
20. *Smittina bella* (Busk).

*Rhamphostomella ovata* (Smitt, 1867).

1933 *Rhamphostomella ovata* (Smitt): Osburn, p. 54, Pl. 11, figs. 5, 6.

**Distribution:** common in arctic and northern seas, ranging southward to Cape Cod on the West Atlantic Coast.

*Rhamphostomella costata* Lorenz, 1886.

1933 *Rhamphostomella costata* Lorenz: Osburn, p. 55, Pl. 10, fig. 7.

**Distribution:** a common arctic and North Atlantic species extending southward to Cape Cod on the American Coast.

*Rhamphostomella bilaminata* (Hincks, 1877), Pl. 5, 17, 18.

1933 *Rhamphostomella bilaminata* (Hincks): Osburn, p. 55, Pl. 10, fig. 8.

**Remarks:** zoarial growth in some specimens appears at first sight to have proceeded by means of a spiral series of zooecia (Pl. 5, 17). Closer examination, however, shows this to be illusory.

**Distribution:** arctic; North Atlantic; ranging southward to Cape Cod on the American Coast.

*Hippoporella hippopus* (Smitt, 1867).

1933 *Hippoporella hippopus* (Smitt) Osburn, p. 44, Pl. 10, fig. 3; Pl. 11, figs. 3, 4.

**Distribution:** a common arctic and North Atlantic species. Cape Cod is its southern limit on the West Atlantic Coast.

## B. DISCUSSION

The following cheilostomes were found to be most abundant on *Placopecten*: *Tegella armifera*, *Amphiblestrum osburni* n. sp., *Schizomavella auriculata*, *Schizomavella porifera*, *Porella acutirostris*, *Porella smitti*, *Parasmittina jeffreysi*. Their dominance can probably be attributed to the fact that breeding and larval settlement appear to be taking place concurrently to judge from the high incidence of older colonies with ovicells as well as immature colonies in each of the species cited. Although all of the species dealt with in this report were taken from *Placopecten*, several were also taken from the rocks and boulders which comprise the substrate, namely: *Electra crustulenta* var. *arctica*, *Amphiblestrum osburni* n. sp., *Schizomavella auriculata*, *Schizomavella porifera*, *Escharella ventricosa*, *Porella acutirostris*, *Smittina majuscula*, *Parasmittina jeffreysi*.

With the exception of *Schizomavella porifera*, all of the deeper-water species in the Bay of Fundy reported here, are known elsewhere in the Gulf of Maine (Osburn 1912a, 1933).



Two aspects of the intertidal (see part one of these studies) and deep-water fauna in the Bay of Fundy deserve special mention. Most conspicuous is the absence in the deeper water of several species which occur in tide pools in the littoral zone, particularly *Electra monostachys*, both 3-spined and multispinous forms, *Conopeum reticulum*, *Callopora whiteavesii*, *Callopora aurita*, *Flustra foliacea*, *Cribrilina punctata*, *Cribrilina cryptoecium*, *Porella minuta*, *Cryptosula pallasiana*.

Secondly, existing evidence would strongly suggest that the northern area of the Gulf of Maine comprises a natural southern boundary for several predominately arctic species (see also Bousfield 1962:60). The following, for example, have not been reported south of the Bay of Fundy: *Callopora whiteavesii*, *Cribrilina cryptoecium*, *Schizomavella porifera*, *Porella minuta*, *Diplosolen obelia*, *Amphiblestrum trifolium*, *Hippoporina reticulatopunctata*, *Smittina bella*, *Parasmittina jeffreysi*, are known to extend southward to Mount Desert Island. Other predominately arctic species, recorded from the northern area of the Gulf of Maine i.e. Bay of Fundy (Stimpson 1853), off Cape Sable, Nova Scotia (Osburn 1912*b*) and Mount Desert Island (Osburn 1933) which have not been taken from the southern part of the Gulf of Maine, i.e. Cape Cod, include: *Alcyonidium mamillatum* Alder, *Hippothoa expansa* Dawson, *Pseudoflustra solida* (Stimpson), *Escharrella abyssicola* (Norman), *Porella skenei* (Ellis and Solander), *Porella struma* (Norman), *Rhamphostomella radiatula* (Hincks), *Posterula sarsi* (Smitt), *Celleporina surcularis* (Packard).

### Acknowledgements

I am grateful to Miss P.L. Cook, British Museum (Natural History) for supplying details of certain material in the Hincks' collection; to Dr. F.J.S. Mauro, visiting scientist USNM for access to a photograph of the type material of *Parasmittina jeffreysi*; Dr. D.L. Pawson, Curator in Charge, Division of Echinoderms USNM for permission to examine the Osburn collection of bryozoa from Mount Desert Island and Dr. T.J.M. Schopf, Marine Biological Laboratory, Woods Hole for helpful discussion generally. Mr. T. Pidhayny, Translation Bureau, Secretary of State, Ottawa translated selected portions of Kluge's work from the Russian. Finally I would like to express my appreciation to Mr. Reg Hazelton, Digby, N.S. owner of the "Olwen" for his generous hospitality.

### Abstract

Thirty-eight species and one variety of Bryozoa are reported here associated with the scallop beds (*Placopecten magellanicus*) at a depth of 50-55 fathoms in the Bay of Fundy, eastern Canada. One species, viz. *Amphiblestrum osburni* is described as new. Bryozoans were found to be particularly abundant encrusting the internal surfaces of scallop valves, many of which had been disarticulated and returned to the sea-floor during commercial fishing operations. Several species which occur on rocks and stones in the intertidal zone (see part one of these studies) were not found in deeper water. Existing evidence suggests that the northern area of the Gulf of Maine comprises a natural southern boundary for several predominately arctic species.

## Zusammenfassung

Es werden hier 38 Arten und eine Varietät von Bryozoen publiziert, die mit Pectenbänken assoziiert sind (*Placopecten magellanicus*) und sich in einer Tiefe von 90 bis 100 m in der Bucht von Fundy im östlichen Kanada befinden. Es wird eine neue Art beschrieben: *Amphiblestrum osburni*. Die Bryozoen verkrusten besonders häufig die innere Oberfläche der Pectenschalen, von denen viele im Verlaufe kommerzieller Fischereioperationen disloziert und in den Meeresschlamm umgedreht wurden. Mehrere Arten, die auf Felsen und Steinen der Gezeitenzone gefunden wurden (siehe den ersten Teil dieser Studien) wurden im tiefen Wasser nicht gefunden. Die aufgeführten Daten sind ein Hinweis dafür, dass die nördliche Zone des Mainegolfes für mehrere arktische Arten die Südgrenze der Verbreitzone darstellt.

## REFERENCES

- BORG, F., 1931. — On some species of *Membranipora*. *Ark. Zool.*, 22 A, pp. 1-35.
- BOUSFIELD, E.L., 1962. — Studies on littoral marine arthropods from the Bay of Fundy region. *Bull. Nat. Mus. Canada*, 183, pp. 42-62.
- CORNISH, G.A., 1907. — Report of the marine Polyzoa of Canso, Nova Scotia. *Mar. and Fish. Rept. of Canada*, sessional paper 22, pp. 75-80, Ottawa.
- HINCKS, T., 1880. — A History of the British marine Polyzoa cxli + 601; atlas, 83 pls. London.
- HINCKS, T., 1888. — The Polyzoa of the St. Lawrence: a study of arctic forms. *Ann. Mag. Nat. Hist.*, 1, pp. 214-27.
- HINCKS, T., 1889. — The Polyzoa of the St. Lawrence... *Ann. Mag. Nat. Hist.*, 3, pp. 424-435.
- HINCKS, T., 1892. — The Polyzoa of the St. Lawrence... *Ann. Mag. Nat. Hist.*, 9, pp. 149-157.
- KLUGE, G.A., 1962. — Bryozoa of the northern seas of the U.S.S.R. *Akad. Nauk. U.S.S.R. Zool. Inst.*, 76, pp. 1-584 Leningrad (in Russian).
- OSBURN, R.C., 1912a. — The Bryozoa of the Woods Hole Region. *Bull. U.S. Bur. Fish.*, 30, pp. 205-66.
- OSBURN, R.C., 1912b. — Bryozoa from Labrador, Newfoundland and Nova Scotia, collected by Dr. Owen Bryant. *Proc. U.S. Nat. Mus.*, 43, pp. 275-289.
- OSBURN, R.C., 1919. — Bryozoa of the Crocker Land Expedition. *Bull. Am. Mus. Nat. Hist.*, 40, pp. 603-24.
- OSBURN, R.C., 1923. — Bryozoa. *Rep. Canadian Arctic Expedition 1913-18*, 8, pp. 1-13, Ottawa.
- OSBURN, R.C., 1932. — Bryozoa from Hudson Bay and Strait. Biological and oceanographic conditions in Hudson Bay 6. *Contrib. Canadian Biol. Fish.*, 7, pp. 363-76.
- OSBURN, R.C., 1933. — Bryozoa of the Mount Desert Region. *Rep. from the Biol. Surv. of the Mount Desert Region*, pp. 1-67, Philadelphia.
- OSBURN, R.C., 1944. — A survey of the Bryozoa of Chesapeake Bay. *Maryland Dept. Res. and Educ. Publ.*, 63, pp. 1-59.
- OSBURN, R.C., 1952. — Bryozoa of the Pacific Coast of America pt. 2, Cheilostomata - Ascophora. Allan Hancock Pac. Exped., 14, pp. 271-611. *Univ. South. Calif. Press*, Los Angeles.
- STAFFORD, J., 1912. — On the fauna of the Atlantic coast of Canada Repts. 3, 4 in *Contrib. to Canadian Biol.* 1906-10. Polyzoa, 54, pp. 74-75; Ottawa.
- STIMPSON, W., 1853. — Synopsis of the marine Invertebrata of Grand Manan or the region about the mouth of the Bay of Fundy, New Brunswick. *Smith. Contrib. to Knowledge*, 6, Bryozoa, pp. 17-19.
- VERRILL, A.E. and SMITH, S.I., 1874. — Report upon the invertebrate animals of Vineyard Sound and the adjacent waters, with an account of the physical characters of the region (extracted from the report of Prof. S.F. Baird 1873) vi + 474; 38 pls. *Bryozoa*, pp. 707-714, 747; pls. 33, 34. Washington.
- WHITEAVES, J., 1901. — Catalogue of the marine invertebrates of eastern Canada. *Geol. Surv. Canada*, pp. 1-271. Ottawa.