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A REVISED KEY FOR THE IDENTIFICATION OF INTERTIDAL BRYOZOA (POLYZOA)

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THIS key is a revised version of that published in "Biology and identification of intertidal Polyzoa" (Ryland, 1962), which should still be consulted by students needing to familiarize themselves with the characteristics of the group. A much more comprehensive introduction will be found in my book *Bryozoans* (Ryland, 1970). The new key should facilitate the identification of almost any bryozoan collected on a British shore. Its greater coverage, however, necessitates more attention to detail and the parts of the key so indicated require the use of a binocular microscope.

An illustrated booklet describing the bryozoans of docks and "fouling" communities (Ryland, 1965) will frequently also help with intertidal species; but for serious workers the *British marine Polyzoa* (Hincks, 1880) remains the definitive monograph. Reference to this book will be aided by use of the specially prepared nomenclatural index (Ryland, 1969). Some other useful papers have also been included in the bibliography.

REVISED KEY TO SPECIES

(Figures in "Biology and identification of intertidal Polyzoa" are prefixed by "B. & I."; page numbers refer to the offprint.)

1	Colony forming a crust or adherent layer	2
	Colony not incrusting	5
2	Colony forming a firm gelatinous crust, particularly on *Fucus serratus* (B. & I., fig. 10A) or *Gigartina stellata*	3
	Colony calcified	24
3	Surface hispid (horny spines on the zooids); purplish-brown **Flustrellidra hispida** (B. & I., fig. 10B)	
	Not hispid; brown or pale brown	4
4	Surface covered with small tubercles (use lens) **Alcyonidium hirsutum** (B. & I., fig. 10C)	
	Surface smooth **Alcyonidium polyoum** (B. & I., fig. 10D)	
	(The apparently similar form found on stones is probably *A. mytili*)	
5	Colony of foliaceous fronds or gelatinous lobes	6
	Colony neither foliaceous nor gelatinous	9
6	Colony lobate	7
	Colony frondose	8
7	Surface smooth; colony reaching 15 cm. **Alcyonidium gelatinosum** (B. & I., fig. 14E)	
	Surface covered with small tubercles (use lens); colony smaller **Alcyonidium hirsutum**	

8 Fronds flexible; often found washed up; may smell of lemon
Flustra foliacea (B. & I., fig. 14A)
(A related species with narrower wedge-shaped fronds, *Securiflustra securifrons*, occurs in northern Britain)
Fronds hard and brittle; colony rather cabbage like; sublittoral only
Pentapora (formerly *Lepralia*) **foliacea** (Ryland, 1970, fig. 1H)

9 Zooids cylindrical, arising singly from a mainly creeping stolen (use lens)
Aetea spp. (Ryland, 1965, figs. 4–6)
Colony not as above, variously lobed, bushy or tufted 10

10 Branches white, rigid, brittle; jointed 11
Branches buff, brown or grey; brittle or flaccid; jointed or entire 15

11 Cheilostomata (B. & I., p. 3). Colony loosely bushy, growing to 10 cm. or more. Branches cylindrical, dividing dichotomously. Sublittoral
Cellaria spp. (B. & I., fig. 14F)
Cyclostomata (B. & I., p. 5). Colony tufted (occasionally straggling), not more than about 2 cm. high. (Family Crisiidae; for further indentification use a microscope) 12

12 Joints jet black; internodes (segments between joints) generally of 11 zooids or more **Crisia denticulata** (Fig. 1B)
Joints clear, yellowish or pale brown, internodes generally of 9 zooids or less 13

13 Internodes comprising a single zooid bearing a long filiform spine
Crisidia cornuta (Fig. 1C)
Internodes of several zooids; spines absent or few 14

14 Branches strongly incurved, resulting in dense bushy colonies; on *Flustra*, red algae, etc. Internodes predominantly of 5–7 zooids; spines absent
Crisia eburnea (Fig. 1A; B. & I., fig. 14G, H)
Branches straight, colony usually straggling; internodes often of more than 7 zooids in the distal part of branches; many zooids bear spines
Crisia aculeata

15 Colony brownish, diffuse or straggling, attached to the substratum at intervals by rootlets; branches jointed, well calcified (crunch when squeezed with forceps) 16
Colony a free-hanging bush or a non-calcified clump or tuft 17

16 Colony creeping, the branches frequently anchored by rootlets. Internodes of 5–7 zooids, with an antler-like projection (scutum) over the frontal membrane (use microscope); a single vibraculum (B. & I., p. 4) in the angle of each bifurcation (look from the basal side)
Scrupocellaria reptans (Fig. 2B)
Colony tufted, with the rootlets mainly confined to the lower part of the colony. Internodes of 7–11 zooids, without a scutum; two vibracula in the angle of each bifurcation
Scrupocellaria scruposa (Fig. 2A)

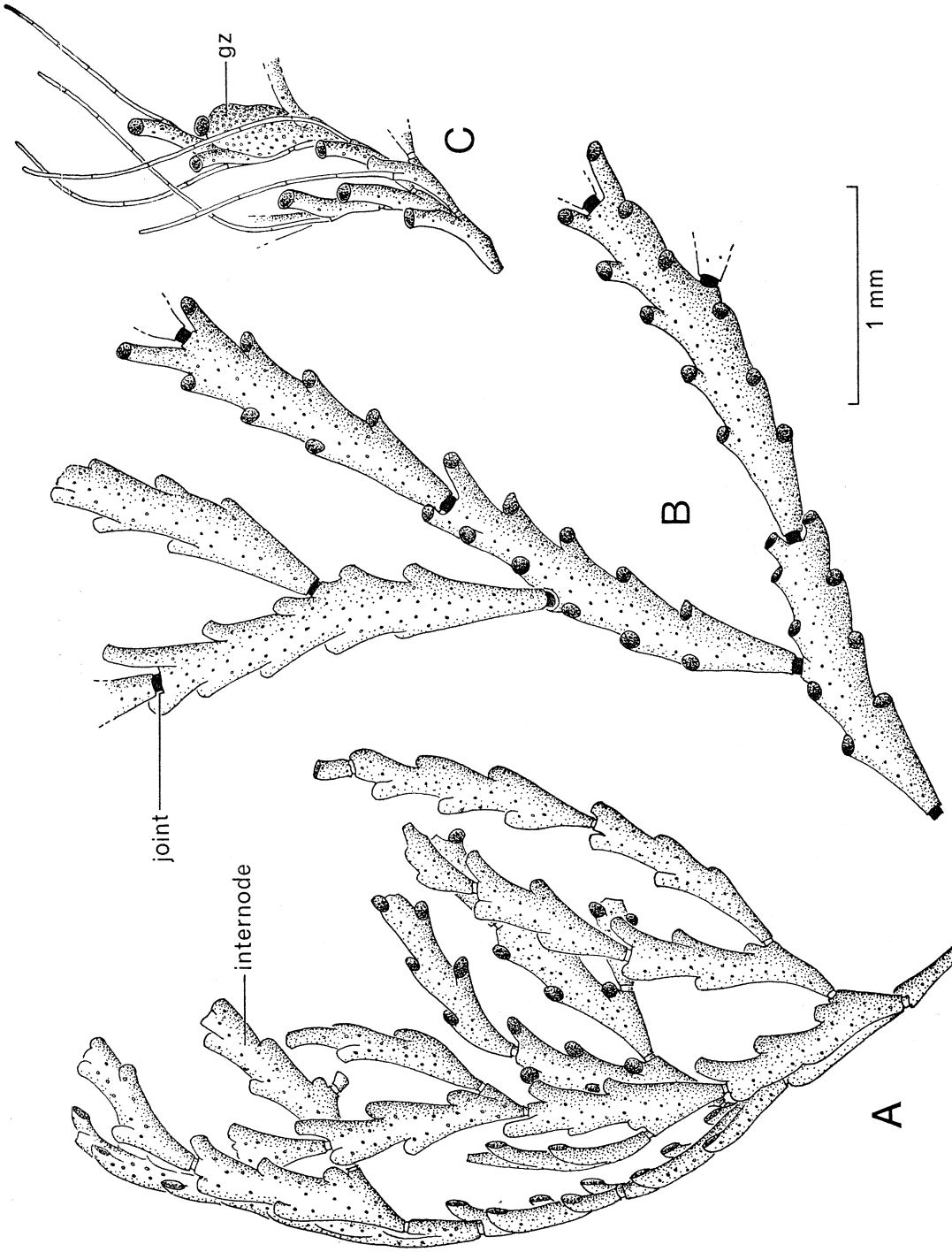

FIG. 1.
Some bryozoan colonies. Parts of (A) *Crisia eburnea*, (B) *C. denticulata*, (C) *Crisidia cornuta*. (*gz*, gonozooid.)

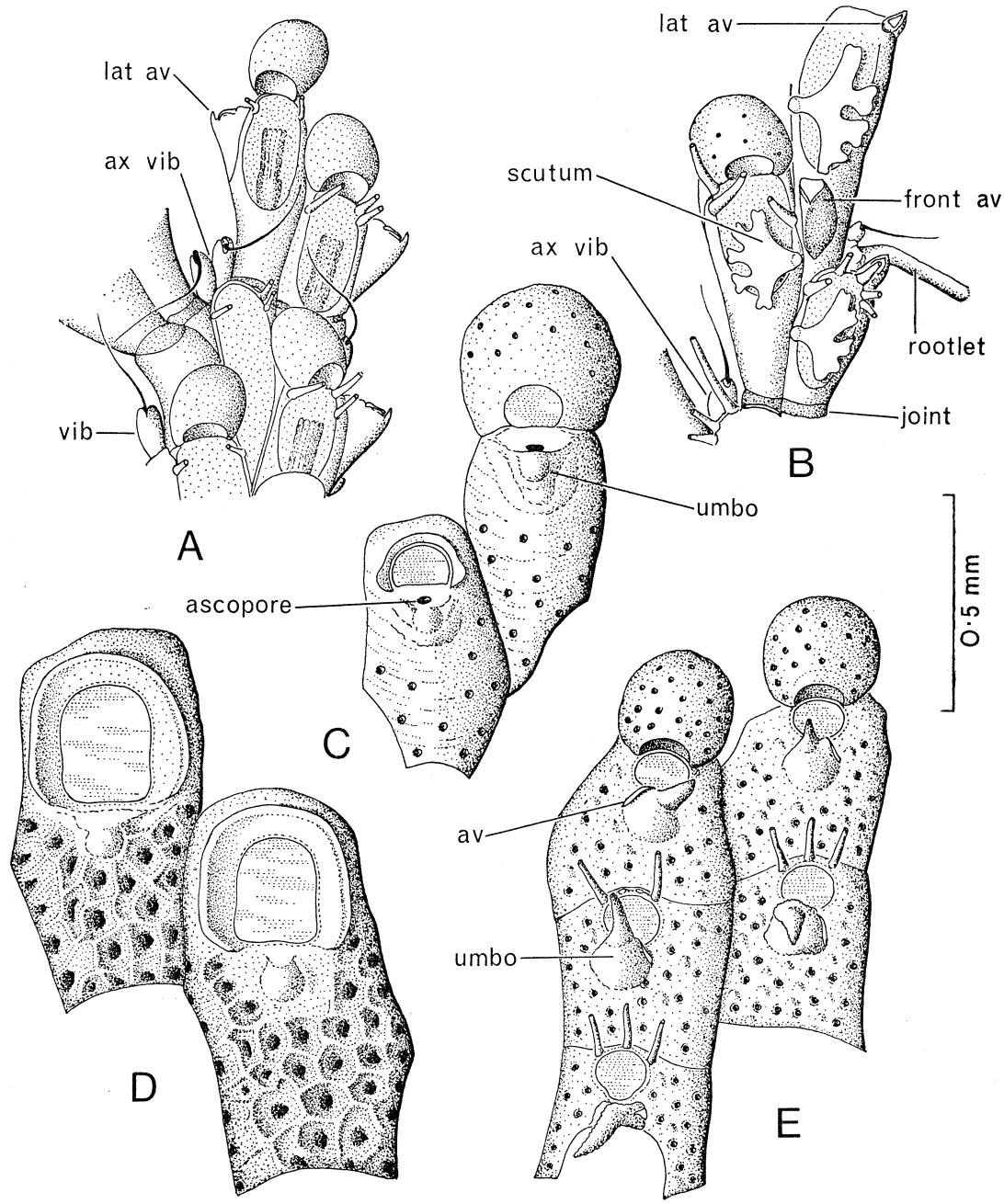

FIG. 2.

Bryozoan zooids. A. *Scrupocellaria scruposa*, frontal view at a bifurcation. B. *Scrupocellaria reptans*, frontal view at a bifurcation. C. *Haplopoma graniferum*. D. *Cryptosula pallasiana*. E. *Schizomavella linearis*. (*av*, avicularium; *ax vib*, axillary vibraculum (vibracula); *front av*, frontal avicularium; *lat av*, lateral avicularium; *vib*, vibraculum.)

17 Colony lightly calcified (test a piece with dilute HCl if in doubt), in the form of a bush. Zooids boat-shaped, the fronds having a definite front and back 18

Colony uncalcified, generally flaccid, making a tuft (often on seaweed), consisting of a tangle of stolons bearing groups of cylindrical zooids at intervals 21

18 Branches arranged spirally around a central axis 19

Branches not spirally arranged 20

19 Colony up to 7–8 cm. high, delicate, feathery, buff in colour. Common below tidemarks, sometimes on the shore. Avicularium (B. & I., p. 4) small, with downcurved beak (use microscope)

Bugula plumosa (Figs. 3B, C; 4E)

Colony up to 4–5 cm. high, not feathery, often orange in colour. Below overhangs on the shore. Avicularium plump, with a hooked beak

Bugula turbinata (Figs. 3D, E; B. & I., fig. 14C)

20 Branches wedge-shaped, widening distally; the zooids arranged in several parallel series. Avicularium (B. & I., p. 4) large, with a hooked beak (use microscope)

Bugula flabellata (Fig. 3A; B. & I., fig. 14D)

Branches linear; the zooids arranged in two series. Avicularium with a downcurved beak

Bugula fulva (Fig. 3F)

21 Colony free, forming a loose tuft on a wooden pile or below a boulder; groups of zooids spirally disposed

Bowerbankia pustulosa

(*B. citrina*, present in some localities, is similar to *B. pustulosa*, but has bright yellow polypides)

Colony forming a buffish clump or tuft on seaweed (usually *Ascophyllum* or *Halidrys*); groups of zooids not spirally arranged 22

22 Colony on *Ascophyllum nodosum* or *Fucus vesiculosus*

Bowerbankia imbricata (B. & I., fig. 15A)

(*B. gracilis* is very similar but is more likely to be found on other substrata and in brackish water)

Colony on *Halidrys siliquosa* 23

23 Colony tangled, the stolons stiff and wiry, greyish-buff in colour; branching dichotomous

Amathia lendigera (B. & I., fig. 15B)

Stolons very flaccid, yellowish-buff in colour; branching opposite

Walkeria uva (B. & I., fig. 15B)

(*W. uva*, in its less luxuriant growth form, is also found on *Corallina officinalis* in tide pools)

24 Colony a lacework on algae or stones. Zooids compartment-like, with the entire frontal surface membranous (and the retracted polypides visible with a microscope), delimited by white lateral walls. Ovicells never present 25

Colony, in most cases, not obviously lacelike. None, or only part (sometimes the greater part) of the frontal surface membranous. Ovicells sometimes present 26

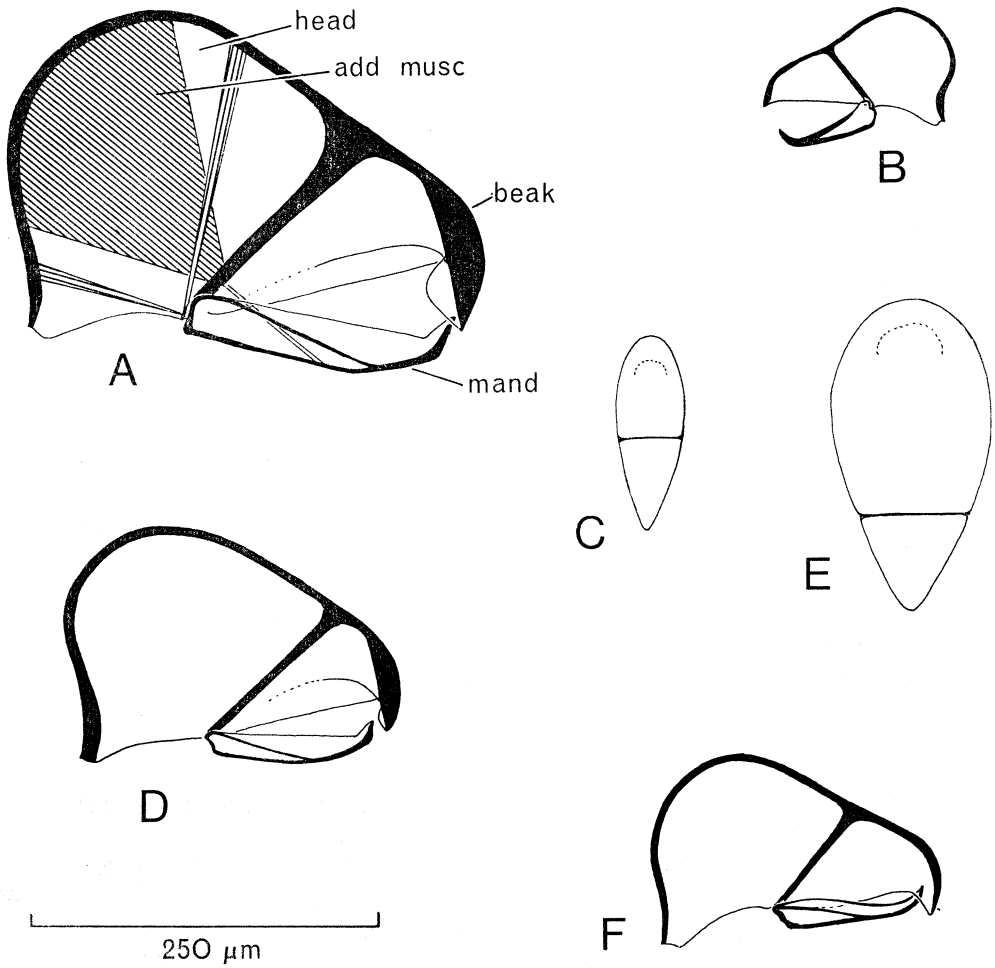

FIG. 3.

Bugula avicularia in profile. A. *B. flabellata*, from a marginal zooid, with musculature schematically indicated. B. *B. plumosa*. C. *B. plumosa*, top view. D. *B. turbinata*, from a marginal zooid. E. *B. turbinata*, top view. F. *B. fulva*. (*add musc*, adductor muscle; *mand*, mandible. After Ryland, 1960.)

25 Colonies incrusting stones or shells.

Conopeum reticulum

(A second species, *C. seurati*, may occur in brackish water)

Colonies incrusting algae, particularly *Laminaria*, often forming large patches **Membranipora membranacea** (B. & I., figs. 11A, 12B)

26 Found on algal fronds 27

Found on stones, shells, rock faces or in *Laminaria* holdfasts. (The inexperienced worker is advised to wash such specimens in fresh water. After drying, proceed using a binocular microscope) 32

27 Anasca (B. & I., p. 3). Zooids with much of the frontal surface membranous, delimited by clearly visible lateral walls (use lens) 28

Ascophora (B. & I., p. 4). Frontal surface calcified, the side walls not visible 29

28 Colonies forming stellate or irregular patches on algae of all kinds, but especially on *Fucus serratus* which may be extensively covered with a whitish lacework or grey felt. Frontal surface of zooid partially calcified; sometimes with a horny bristle arising from the proximal end of the membrane. Ovicells never present
Electra pilosa (Fig. 4H; B. & I., fig. 12B)
(A similar species, *E. crustulenta*, may occur in areas of reduced salinity)

Colonies forming small whitish patches on *Laminaria* fronds (usually in the company of various ascophoran species). Frontal surface partly calcified; the frontal membrane surrounded by a ring of finger-like (not denticle- or thorn-like) spines. Ovicells, which may contain pink embryos, occur **Callopora lineata** (Fig. 4A)

29 Colonies forming small, glistening white patches on *Laminaria* fronds. (Microscope now needed) 30

Colonies often pinkish or greyish, on other algae. (Microscope now needed) 31

30 Frontal wall imperforate; ovicells porous; developing embryos yellow. Avicularia (B. & I., p. 4) absent.
Hippothoa hyalina (Fig. 4G)

Frontal wall finely perforate and with a medium pore (opening of the ascus) proximal to the orifice; ovicells imperforate; developing embryos red. One laterally situated avicularium normally present on each zooid **Microporella ciliata**

31 An articulated spine usually present just proximal to the orifice. Sometimes found on *Furcellaria fastigiata*
Escharina spinifera

A small knob (umbo) may be present just proximal to the orifice. Sometimes on *Fucus serratus* on very sheltered shores
Schizoporella unicornis (Fig. 4I)
(*Cryptosula pallasiana* has on occasion been similarly found: see 41–44)

32 Cyclostomata (B. & I., p. 5). Small, fan-shaped colony of cylindrical zooids arranged in series like organ pipes
Tubulipora phalangea

Cheilostomata (B. & I., p. 3). Irregular patches of box-like zooids 33

33 Colony silvery, white or (when old) buff, but not reddish. 34

Colony pink, red or orange, at least when young (i.e. near the edge) 40

34 Anasca (B. & I., p. 3). Zooids with an oval frontal membrane surrounded by a ring of spines or overarched by ribs 35

Ascophora (B. & I., p. 4) or superficially like them. Frontal surface calcified, with or without perforations 36

35 Zooids with oval frontal membrane surrounded by a ring of upright spines **Callopora lineata** (Fig. 4A)
(*Cauloramphus spiniferum* is superficially similar; but it never has ovicells, and careful examination shows that some of the "spines" are really avicularia)

Zooids with oval frontal membrane spanned by ribs
Callopora rylandi (Fig. 4B)
(Also see Ryland and Stebbing, 1971a)

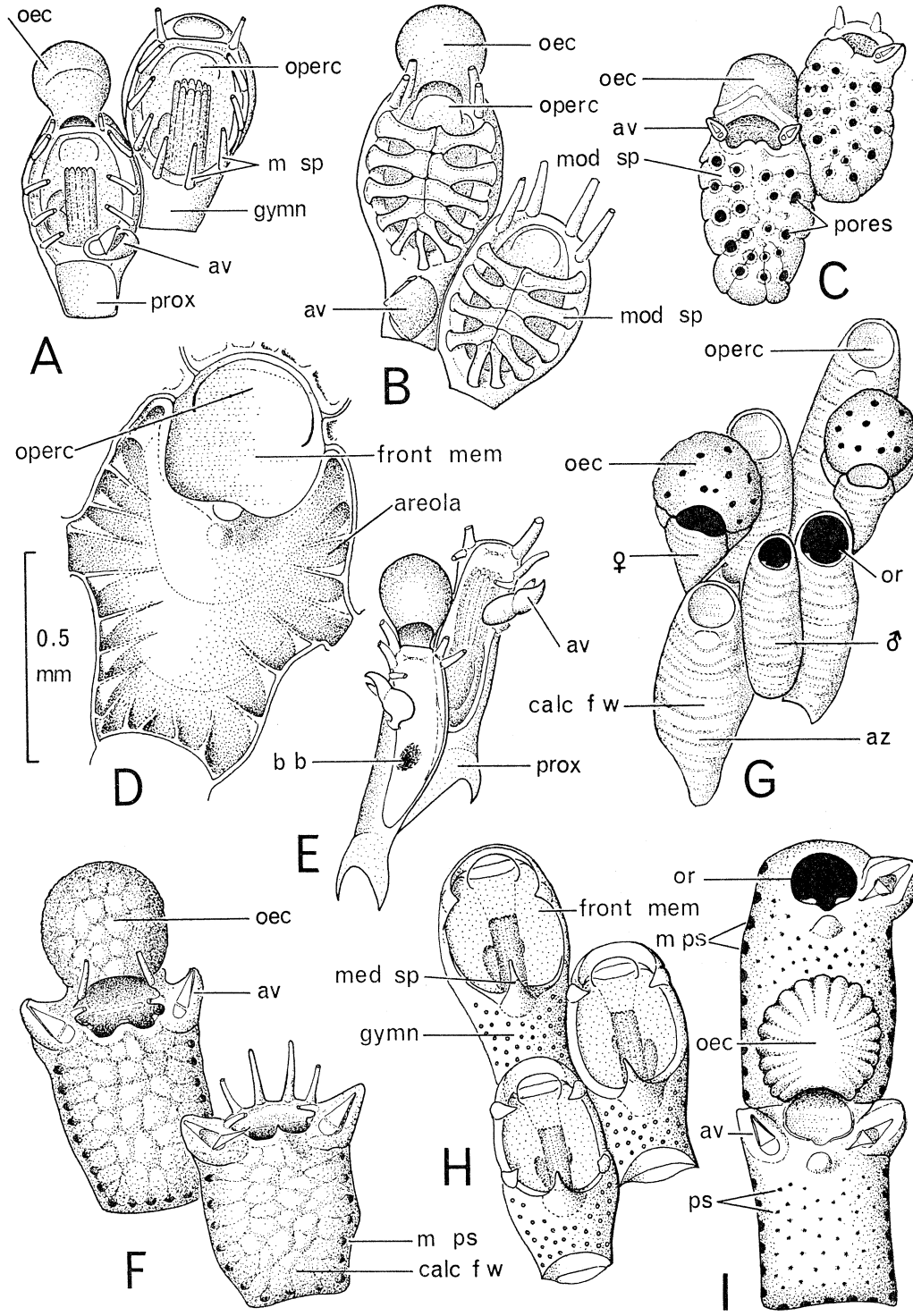

FIG. 4.
Bryozoan zooids. A. *Callopora lineata*. B. *Callopora rylandi*. C. *Cribrilina cryptooecium*. D. *Umbonula littoralis*. E. *Bugula plumosa*. F. *Escharoides coccineus*. G. *Hippothoa hyalina*. H. *Electra pilosa*. I. *Schizoporella unicornis*. (*av*, avicularium; *az*, autozooid, i.e. normal feeding zooid; *b b*, brown body; *calc f w*, calcified frontal wall; *front mem*, frontal membrane; *gymn*, gymnocyst, i.e. calcified part of frontal surface in an anascan; *m ps*, marginal pseudopore; i.e. spaces in calcification; *m sp*, marginal spine; *med sp*, median spine; *mod sp*, modified spine; *oec*, ovicell *operc*, operculum; *or*, orifice, drawn black when operculum removed; *prox*, proximal part of zooid covered in life (in A) by the ovicell of the next proximal zooid or (in E) by the distal end of that zooid; *ps*, pseudopore, i.e. space in calcification; ♀, female zooid; ♂, male zooid. All except D and H from Ryland, 1970.)

36 Proximal edge of orifice notched. An articulated spine usually situated near this notch. **Escharina spinifera**

Proximal edge of orifice concave, straight or mucronate; not notched. No articulated spine 37

37 Frontal wall imperforate (ovicells porous). Avicularia absent
Hippothoa hyalina (Fig. 4G)

Frontal wall apparently porous. Avicularia present or absent 38

38 Orifice D-shaped; proximal to it a median pore (opening of the ascus); frontal wall rather finely porous 39

Orifice not D-shaped; no ascopore; frontal wall often coarsely porous 45

39 A lateral avicularium present on many zooids; spines present (in the absence of an ovicell) around the orifice
Microporella ciliata

No avicularia; no spines
Haplopoma graniferum (Fig. 2C)
(Also see Ryland, 1963)

40 Colony a nodular crust; zooids jumbled. (A columnar avicularium present each side of the orifice)
Celleporina hassallii
(*Celleporaria pumicosa* is superficially similar, but the avicularium is borne on a single, median, acuminate process. Rather similar to *C. pumicosa* is a species of *Turbicellepora* which forms thick orange crusts under boulders on shores in the Scilly Isles)

Colony a flat crust; zooids regularly arranged 41

41 Proximal edge of orifice concave or notched 42

Proximal edge of orifice straight or mucronate 43

42 Lateral avicularia directed inwards; periphery of ovicell entire, its surface porous. (Sometimes a single, median avicularium associated with a tall umbo, as in Fig. 2E)
Schizomavella linearis

Lateral avicularia directed outwards; periphery of ovicell fluted, its surface imperforate. (A short umbo often present, but not supporting an avicularium) **Schizoporella unicornis** (Fig. 4I)

43 Orifice with proximal edge mucronate, flanked by avicularia. Ovicells occur. Frontal surface granular
Escharoides coccineus (Fig. 4F)

Orifice with proximal edge straight; flanking avicularia absent, a small, median avicularium often present. Ovicells absent 44

44 Frontal surface flat, porous all over
Cryptosula pallasiana (Fig. 2D)

Frontal surface convex, sculptured with radii diverging to marginal pores
Umbonula littoralis (Fig. 4D)

45 Frontal pores large; ovicells occur (though immersed in calcification); 1–2 avicularia may be present beside the orifice
Cribrilina cryptooecium (Fig. 4C)
(A similar species, *C. punctata*, appears to be mainly sublittoral. For these two species also see Ryland and Stebbing, 1971a.)

Frontal pores not large; ovicells never present; a small median avicularium may be present just proximal to the orifice
Cryptosula pallasiana (Fig. 2D)

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