

NOTES ON TREMOGASTERINA CANU
AND TREMOGASTERINA ROBUSTA (HINCKS)
(POLYZOA, ASCOPHORA).

by

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Résumé

Les auteurs examinent le matériel-type de plusieurs espèces décrites par Smitt et par Canu et Bassler. Cinq espèces de *Tremogasterina* introduites par Canu et Bassler du Golfe du Mexique sont ici considérées comme entrant en synonymie avec *T. mucronata* (Smitt.). *Hiantopora spathulata* Canu et Bassler est rattachée au genre *Tremogasterina*. *Lepralia robusta* Hincks, de Mergui, Burma est redécrite à partir d'un matériel récemment rapporté de la Mer Rouge et rattachée à *Tremogasterina*. Le mode de développement du champ frontal a été étudié et amène à la conclusion que *Tremogasterina* montre d'étroites affinités avec quelques Cribrimorpha. Les auteurs considèrent également que les Ascophora Imperfecta comprennent des genres ayant au moins deux types distincts de développement.

Introduction

Examination of the type-material of some species described by Smitt and by Canu & Bassler has shown that the genus *Tremogasterina* may be considered to include a range of forms including those species in which there are several frontal foramina, and those in which the single foramen present may be completely occluded during growth.

A large number of specimens recently collected from the Red Sea has shown that *Lepralia robusta* Hincks is referable to *Tremogasterina*, and the early astogeny, and the development of the frontal shield, avicularia and ovicells has been studied. The mode of development of the frontal shield in periancestrular zoecia and in mature individuals at the growing edge of colonies, has revealed a striking resemblance to that found in some Cribrilinidae.

The following measurements (in mm.) were made:

Lz	length of zoecium	lz	width of zoecium
Lor	length of orifice	lor	width of orifice
Lov	length of ovicell	lov	width of ovicell
Lav	length of avicularium	Lm	length of mandible

Ascophora imperfecta Harmer, 1957:645.

Harmer instituted this division to accommodate the following families: Umbonulidae, Exechonellidae, Chlidiniopsidae, Arachnopo-diidae (doubtfully, see Harmer, p. 646), Celleporariidae, Petraliidae and Petraliellidae. All are characterised (see Harmer, p. 651) by possession of a simple type of compensation-sac "developed by the overarching of a calcareous frontal shield which originates at the margin of the frontal membrane". The frontal membrane in these families is continuous with the operculum. The true compensation-sac of the *Ascophora Vera* is distinct, in that it is formed as "a proximally directed invagination at the base of the operculum". One of the more important aspects of Harmer's classification is the (unstated by implied), distinction made between the mode of development of the frontal shield in the *Ascophora Imperfecta*, i.e. a calcareous fold derived from the lateral and proximal margins of the frontal membrane, and that exhibited in the *Cribrimorpha* (Division VI, *Anasca*, see Harmer, 1926:470). Here the frontal shield is formed by the fusion of numerous marginal spines borne on a peripheral gymnocyst. *Tremogasterina*, however, appears to be morphologically transitional between these major groups (see p. 16).

Tremogasterina Canu

Tremogasterina Canu, 1911:256. Harmer, 1957:659.

Type-species, *Tremogasterina problematica* Canu, 1911:256, pl. 7, figs. 12, 13.

T. problematica was described from the Eocene of the Argentine. The specimen was worn, but Canu's description and figures indicate a large, lepralioid orifice, a frontal shield with a single central foramen, and large avicularia beside the orifice, directed distally. Study of Recent specimens has amended and extended the definition of the genus.

Zooecia with distal pore-chambers, large septulae, and marginal pores.

Oral spines present.

Orifice lepralioid.

Operculum with a marginal sclerite, continuous with the frontal membrane.

Frontal shield overarching the frontal membrane, with open foramina.

Avicularia large, with a complete bar, or attenuated spinous condyles, interzoecial (see p. 16).

Ovicells hyperstomial, globose, imperforate, not closed by the operculum. Outer wall of the ectoecium tuberculate, inner wall membranous (see p. 000).

Ancestrula membraniporine.

Key to species described here.

- | | | |
|----|--|----------------------|
| 1. | Number of frontal foramina more than 6 in majority of zooecia | <i>T. spathulata</i> |
| 1. | Number of frontal foramina less than 6 in the majority of zooecia | 2 |
| | Orifice elongated, $Lz/lz=1.2$ or more | 3 |
| 2. | Orifice about as long as wide, $Lz/lz=1.1$, or less | <i>T. mucronata</i> |
| 3. | Zooecia elongated. Avicularia long, narrow, curved downward distally, the rostrum ending in a foramen in next frontal shield | <i>T. lanceolata</i> |
| | Zooecia not elongated. Avicularia slightly spatulate and asymmetrical. Frontal foramina frequently occluded | <i>T. robusta</i> |

Tremogasterina mucronata (Smitt) (Pl. I, a, b).

Escharipora (?) *mucronata* Smitt, 1873:24, pl. 5, figs. 113-115.

Tremogasterina truncatorostris Canu & Bassler, 1923:244, pl. 47, fig. 6.

Tremogasterina granulata Canu & Bassler, 1928:45, pl. 13, figs. 3, 4, pl. 33, fig. 2, text-figs. 6B-F.

Tremogasterina ventricosa Canu & Bassler, 1928:47, pl. 13, figs. 1, 2.

Tremogasterina malleolus Canu & Bassler, 1928:48, pl. 13, figs. 5-8, pl. 33, fig. 8.

Tremogasterina sparsipora Canu & Bassler, 1928:50, pl. 33, fig. 3.

Material examined: Naturhistoriska Riksmuseet, Stockholm, Type of *T. mucronata*, Lå 272, W. of Tortugas, 36 fath.

United States National Museum, Cotype of *T. granulata*, 7603, Atlantic, Fowey Light, Florida, 40 fath.; and Minnitimmi Creek, Bocas Island, Panama, Pliocene. Holotype of *T. ventricosa*, 7601, Albatross St. 2672, Atlantic, E. of Georgia, 31°31'N, 79°05'W, 277 fath., sand. Cotype of *T. malleolus*, 7602, Albatross St. 2404, Gulf of Mexico, 28°44'N, 85°16'W, 60 fath., sand. Holotype of *T. sparsipora*, 70865, Minnitimmi Creek, Bocas Island, Panama, Pliocene.

British Museum, *T. mucronata*, 1840.10.23.82, St. Thomas, West Indies. 1911.10.1.1698, Blake St. 247, Grenada, 170 fath., Norman Coll. 1931.2.5.6, St. Vincent, Kingstown Harbour. 1961.11.2.41, Alacran Reef, Gulf of Mexico, Cheetham Coll. 1965.8.2.1, Discovery Bay, Jamaica, 200 feet. *T. granulata*, 1932.3.7.44, Albatross St. 2639, Straits of Florida, 25°4'50"N, 80°15'10"W, 56 fath., sand.

Zoarium encrusting or erect, foliaceous. Zooecia with 1-5 frontal foramina, occasionally 6 (in periancestrular zooecia). Orifice not elongated, with 4-7 oral spines. Sub-oral mucro simple or bifid, frequently absent. Avicularia expanded distally and truncate, or acute.

The variability of each character in this species is large. The most constant feature seems to be the form and size of the orifice. The number of oral spines decreases from 6, or occasionally 7, in the periancestrular region, to 3-4 in zooecia at the growing edge. The number of frontal foramina also decreases in the same way (see p. 16), and the foramina are often occluded by secondary calcification. The suboral mucro may be well-developed, simple or bifid distally, or completely absent, within a single specimen (see Pl. 1, I, b). The avicularia vary considerably in size, shape and orientation, also within one colony.

Examination of the type specimens and other material has shown conclusively that most of the species described by Canu & Bassler in 1923 and 1928 are referable to *T. mucronata* (Smitt).

In Smitt's type-specimen the frontal foramina are frequently trifoliate, but zooecia with 4 small foramina are also present. The avicularia are almost all more truncate than those figured by Smitt (see Pl. I, a), but more rounded rostra do occur infrequently. The suboral mucro may be well-developed, but is often absent. There are usually 4 oral spines. Specimens 1911.10.1.1698 and 1931.2.5.6 show the development of the frontal shield. It is essentially the same as that seen in *T. robusta* (see p. 10). Specimen 1961.11.2.41 consists of 2 small colonies, with very young zooecia. These are small, with 5-6 small frontal foramina, and 5-7 oral spines. The single avicularium present is raised distally, with a small rounded mandible.

T. granulata was originally described with few foramina and elongated, pointed avicularia. The specimens are much calcified and worn, and the frontal foramina have been occluded by secondary calcification. The avicularia vary from long and acute, to short and truncate forms.

T. ventricosa was originally described with a suboral mucro and elliptical avicularia. The specimens show a great deal of variation, the mucro being present or absent, and the avicularia vary in size and shape in the same manner as in the specimens of *T. mucronata* and *T. granulata*.

T. malleolus and *T. sparsipora* were distinguished by the shape of the suboral mucro, and the distribution of the frontal foramina. As in the previous specimens, the range of variation within the colony is large, and within that seen in the type of *T. mucronata*.

A well-preserved specimen from Jamaica (1965.8.2.1) shows, within one zoarium, zooecia without suboral mucros, and zooecia with extremely long, bifid mucros. The frontal foramina vary in number between 1 and 6, and are almost occluded in some zooecia. Most of the avicularian rostra are large and raised, and expanded and truncate distally. Others are smaller, immersed, and oval in shape. The number of spines varies from 2 to 5.

Canu & Bassler (1923) described several other forms, one of which, in view of the variability of the species, is probably referable to *T. mucronata*. This is *T. horrida* (1923:168, pl. 24, figs. 3, 4, Miocene, Florida). *Cribrilina miocenica* McGuirt (1941:67, pl. 2, figs. 10-11, Miocene, Louisiana) certainly belongs to *Tremogasterina*, probably to *T. mucronata*.

Tremogasterina lanceolata Canu & Bassler

Tremogasterina lanceolata Canu & Bassler, 1928:48, pl. 13, fig. 9, text-fig. 6A.

Material examined: United States National Museum, Holotype, 7836, Albatross St. 2320, N. of Cuba, 23°10'39"N, 82°18'48"W, 130 fath., fine coral.

British Museum, 1932.3.7.61, N. of Cuba, Canu & Bassler Coll. 1911.10.1.1713, Havana "Blake", Norman Coll.

Zoarium encrusting. Zooecia with elongated orifices and 4-5 oral spines. Avicularia very long, narrow, curved so that the tip of the rostrum protrudes into the frontal shield of the next distal zooecium, producing a foramen.

It is possible that *T. lanceolata* may prove to be an aberrant form of *T. mucronata*. A few avicularia showing characters similar to those of *T. lanceolata* have been seen in "*T. granulata*". The operculum of *T. lanceolata* figured by Canu & Bassler (Text-fig. 6A) differs from those given for *T. granulata*. The three specimens of *T. lanceolata* examined show little variation and the species is therefore treated here as distinct.

T. lanceolata is distinguished from *T. mucronata* by its very elongated orifices and its long, pointed avicularia, the rostra of which are not free distally. The rostra curve downward distally and in most cases, the tip has obstructed the development of the frontal shield of the succeeding zooecium. The large foramen thus caused may be part of the central complex of foramina, or may be entirely separated from them. Occasionally the direction of the rostra is such that the distal end of the palate lies in the groove between two zooecia. A deep cavity is then found beyond the avicularium.

Tremogasterina spathulata (Canu & Bassler).

Hiantopora spathulata Canu & Bassler, 1929:116, pl. 11, fig. 12.

Arachnopusia spathulata (Canu & Bassler) Harmer, 1957:657, pl. 68, figs. 22, 23, 25, 31.

Material examined: United States National Museum, Holotype, 7916, Tomblon, Philippines, 37 fath.

British Museum, 1961.10.30.8, Tiur Is, Siboga Coll., 0-54 m. 1961.10.30.9, Ghardaqa, Red Sea, Crossland Coll. 1939.2.4.1, Gt. Barrier Reef.

Tremogasterina with 7-12 open reniform foramina. Orifice as wide or wider than long, with 5-6 oral spines. Avicularia with mandible expanded and raised distally, frequently truncate.

Hiantopora spathulata was referred to *Arachnopusia* by Harmer, but the frontal shield appears to develop in the same manner as that of *T. celleporoides*, *T. mucronata* and *T. robusta* (see below). The frontal foramina are numerous, and usually reniform, the zooecia being strikingly similar in appearance to those of the periancestrular region of *T. mucronata* and *T. robusta*. The avicularia are expanded distally, and have a complete bar. The ovicells are not closed by the operculum, and oral spines are present. The characters of the species are therefore the same as those of the other species here referred to *Tremogasterina*. The specimen 1961.10.30.9 has a membraniporine ancestrula (see Harmer, 1957:658), like that of *T. robusta* (see below).

Tremogasterina robusta (Hincks) (Pl. I, c, d; Text-figs. 1-4).

Lepralia robusta Hincks, 1884:360, pl. 13, fig. 4, Mergui, Burma; 1887:131. Thornely, 1905:119, Gulf of Manaar. Waters, 1909:152, pl. 13, figs. 13, 14, Red Sea.

Material examined: Manchester Museum, 2 slides, Khor Dongola, Sudan, Waters Coll.

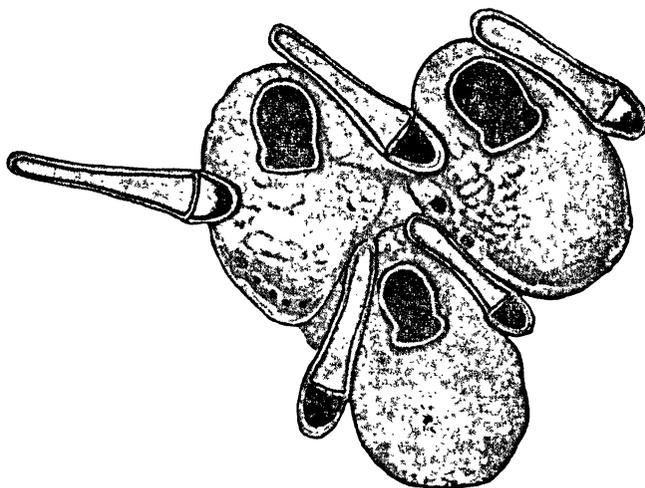
British Museum, 1882.10.18.34-41, Seychelles, 12 fath., on coral, "Alert" Coll. 1899.7.1.5338, 5348, Persian Gulf, Busk Coll. 1936.12.30.42, Ceylon, on coral, Thornely Coll. 1964.7.24.1, 21.1.51, Mersa Ar-Rakiyai, Red Sea, on coral, "Manihine" Coll. 1965.8.30.2, E57/640.3, Red Sea, on coral, Tel Aviv University Coll. 1965.2.4.9, 8 fath., off Massawa, on coral and 1965.2.4.9, 11-14, and 1965.8.8.6-9, shallow water off Massawa, May, on *Pinctada radiata* Leach, Powell & Cook Coll.

Zoarium encrusting, plurilaminar, orange-coloured in life. Zooecia with large marginal pores and 1-3 central frontal foramina which may be completely occluded. 2-3 distal pore chambers, and 2 distal and 4 lateral multiporous septulae present. Orifice lepralioid, elongated, constricted laterally, with a pair of small condyles; 2-5 oral spines present. Operculum with a well-developed marginal sclerite. Avicularia large, spathulate, often asymmetrical distally, with a complete bar, or with spinous condyles, usually directed distally or distal-laterally. Ovicells finely tuberculate, imperforate, prominent at first, later immersed, not closed by the operculum, the membranous inner wall exposed as a thin rimule. Ancestrula membraniporine, with 10-14 spines. Periancestrular zooecia cribriform, with several foramina. Distribution, Burma, Seychelles, Persian Gulf, Red Sea.

Dimensions: Lz 0.55-0.80 mm, lz 0.35-0.50 mm, Lor 0.20-0.23 mm, lor 0.15-0.17 mm, Lov 0.28-0.32 mm, lov 0.30-0.35 mm, Lav 0.35-0.60 mm, Lm 0.22-0.40 mm. Periancestrular zooecia: Lz 0.30-0.38 mm, lz 0.20-0.30 mm, Lor 0.11-0.13 mm, lor 0.10-0.12 mm.

Although the type-material of other species described by Hincks in 1884, from the Mergui Archipelago, Burma, is in the British Museum, neither of the 2 slides labelled "*Lepralia robusta*", belong to that species. One, 1899.5.1.828, is referable to *Hippopleurifera pulchra* (Manzoni), see Hastings (1949:521, 524). The other, 1885.12.29.4, is referable to *Emballotheca quadrata* (MacGillivray), see Harmer (1957:1087-8). All other specimens in the collection from Mergui have been examined, but no *T. robusta* is present. It must therefore be presumed that the type-material of *Lepralia robusta* is lost. The plentiful material now available for study has enabled amplification of Hincks's original description.

Hincks suspected the presence of a frontal pore, remarking "usually a small depression (? pore) in the centre", when describing the frontal shield (see Text-fig. 1). Waters' specimens from the Red



TEXT-FIG. 1

Tremogasterina robusta (Hincks). Reproduction of Hincks, 1884, pl. 13, fig. 4, of *Lepralia robusta*; by permission of the Editor, the Annals and Magazine of Natural History.

Sea also had no visible pore, but Thornely found it "quite evident" in her material from Ceylon. The present specimens show great variation, both in the number and size of frontal foramina, and in the degree of occlusion caused by secondary calcification.

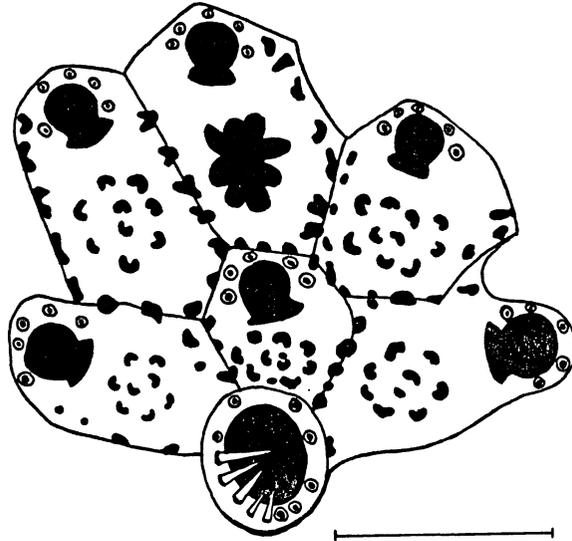
The orifice is more elongated than in other species, even than in *T. lanceolata*. The operculum is similar to those figured for *Tremogasterina* by Canu & Bassler (1928, text-fig. 6B-F, and 1929, text-fig. 26).

The avicularian mandibles vary, some being expanded distally, others being more rounded; many are asymmetrical distally, as figured by Waters (pl. 13, fig. 13; and see Pl. I, c).

The specimen from the Seychelles has oral spines and, even in the zoecia at the growing edge, the smallest development of the frontal foramen. A single, minute pore is present, visible only in

preparations cleared with clove oil. The material from the Persian Gulf is without chitinous parts. Approximately half the zoecia have no obvious frontal foramina, the remainder vary, having from one small, partially occluded pore, to a fairly large, trifoliate foramen (0.07 mm in diameter).

Thornely's specimen from Ceylon comprises approximately 1500 zoecia and of these, about 40 have a distinct, though small, frontal foramen (see Pl. I, d). Ovicells are present. One of Waters' slides from Khor Dongola contains 3 small fragments, growing on coral,



TEXT-FIG. 2

Tremogasterina robusta (Hincks). Massawa, 1965.8.8.8. Ancestrula, some of the spines complete, with 6 periancestrular zoecia. Note the cribriform frontal shield, with concentrically arranged pores. Costate growth has commenced in the median distal zoecium. (Scale = 0.50 mm).

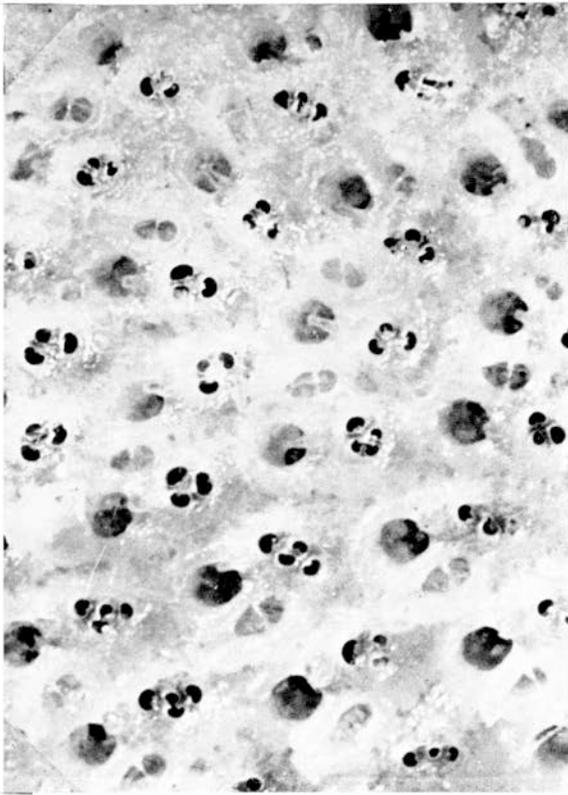
comprising 35 zoecia. The frontal shields are heavily calcified and granulated, but 2 zoecia show a minute, almost occluded, central pore. The avicularia are large, and the second slide, of chitinous parts, shows the asymmetrical mandibles.

The "Manihine" specimen from the Red Sea is a large one. Ovicells are present. The zoecia at the growing edge have a small trifoliate foramen, those developed earlier have occluded foramina,

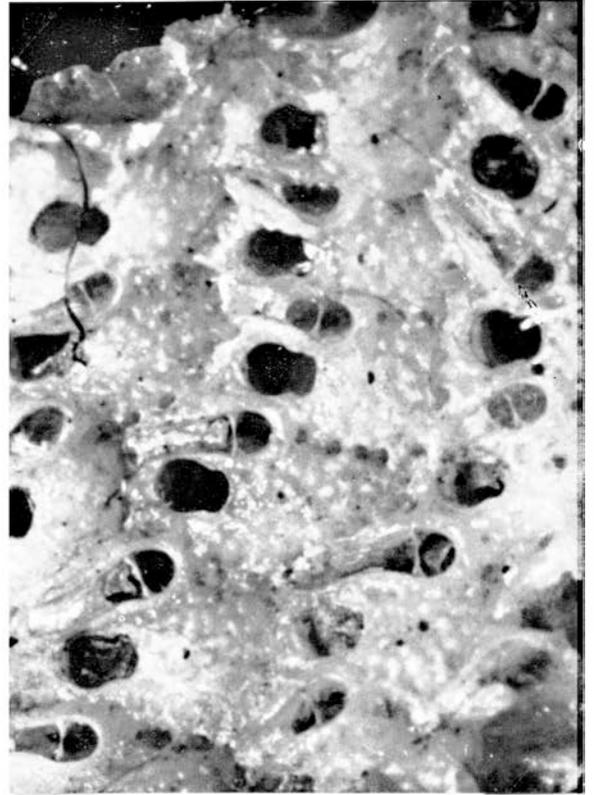
PLATE I

- a. *Tremogasterina mucronata* (Smitt). Type, W. of Tortugas. Note the truncate, expanded avicularian rostra, and the partially occluded frontal foramina. ($\times 75$).
- b. *T. mucronata*. Jamaica, 1965.8.2.1. Note the ovicells, the large frontal foramina, and long sub-oral mucros. ($\times 35$).
- c. *T. robusta* (Hincks). Massawa. Note the large frontal foramina, oral spines, and asymmetrical avicularian rostra ($\times 35$).
- d. *T. robusta*. Ceylon, 1936.12.30.42. Note the small, partially occluded frontal foramina. ($\times 35$).

Figure a, photographed by P. Green, B.M.N.H.; figures b-d, photographed by N.A. Powell.



b



d

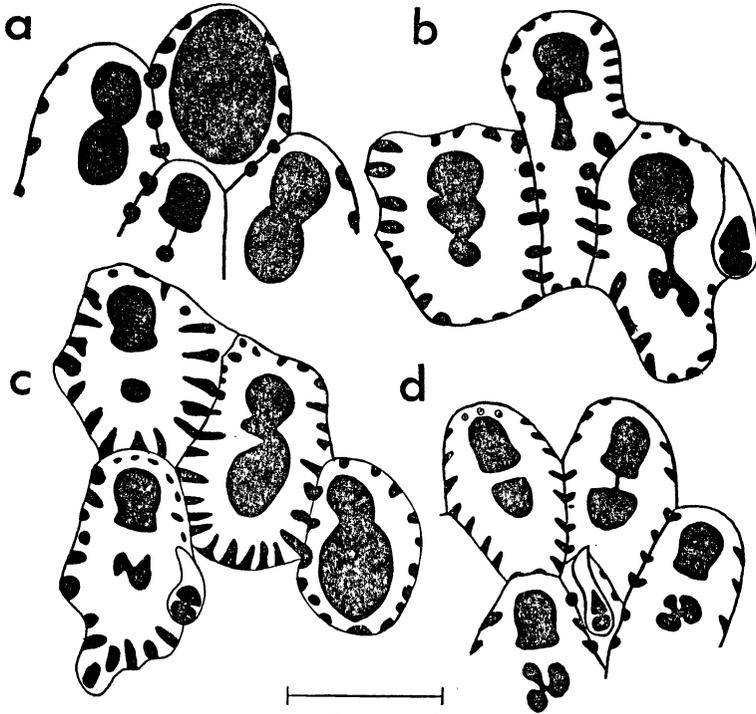


e



c

or appear to be imperforate. The coral upon which the colony grows is inhabited by an Acrothoracid Cirripede, the oral slit of which is surrounded by the zooecia of the Polyzoan. The Tel Aviv University specimen, from the Red Sea, is a young colony of approximately 80 zooecia. The frontal shield is slightly tuberculate, with ridges converging towards the centre from between the marginal pores. The frontal foramina are commonly paired, and quite widely separated. Some zooecia have only one foramen, but a few with 3 and even 4 foramina occur. One zooecium has 7 small foramina.



TEXT-FIG. 3

Tremogasterina robusta (Hincks). a and d, Massawa, 1965.2.4.11. b, Massawa, 1965.8.8.9. c, Massawa, 1965.8.8.6. Immature zooecia near the growing edge of the colony. a and c, note the youngest stages, zooecia with areolated walls surrounding a large membraniporine aperture. b and d, note the transverse growth of the costate processes, which fuse, in d, to form the apertural bar. c and d, note the rounded central foramina, becoming trifoliate by the growth of spinous processes. (Scale = 0.50 mm).

Recent collections by the authors from the Massawa area of the Red Sea have greatly increased the amount of material available for study, with the result that the ancestrula, early astogeny, and the development of the frontal shield, avicularia and ovicells can now be described. The numerous specimens encrusted the shells of the oyster, *Pinctada radiata* Leach, taken from beds off Gorgussum and Sheikh Said, Massawa, during April and early May, 1965. All stages of growth were present, and the colonies were breeding when collected, dark red embryos being present in the ovicells. Settlement of larvae had also occurred, ancestrulae and very young colonies being found under the prominent scutes at the edge of the oyster shells.

Early astogeny and development of *Tremogasterina robusta*.

The interzoecial furrows separating the young zoecia at the growing edge of the colony are very distinct, but soon become obscured by progressive calcification, the older zoecia assuming a uniform appearance from frontal view.

The mode of development of the frontal shield is clearly demonstrated in several zoaria. The earliest stage shows prominent areolated walls surrounding the broad aperture, which is covered by a membranous lamina (see Text-fig. 3 a, c and cf. umbonuloid development of Harmer, 1902:331-2). Development is continued by the protrusion of two costate processes from the sides of the proximal margin at the level of the future orifice (see Text-figs. 3 a-d). These grow across the aperture, fusing at the mid-line to form a wide bar; which is comparable with the apertural bar of the Cribrilinidae. Fusion of the bar (see Text-figs. c and d), together with the advancement of the calcareous shield from the lateral and proximal margins, finally encloses a large median foramen (1). The subsequent division of the foramen into 2 or 3 lobes takes place by the proliferation of small rounded or spinous processes from the margins of the foramen. Fusion of the processes produces the discrete pores seen in older zoecia.

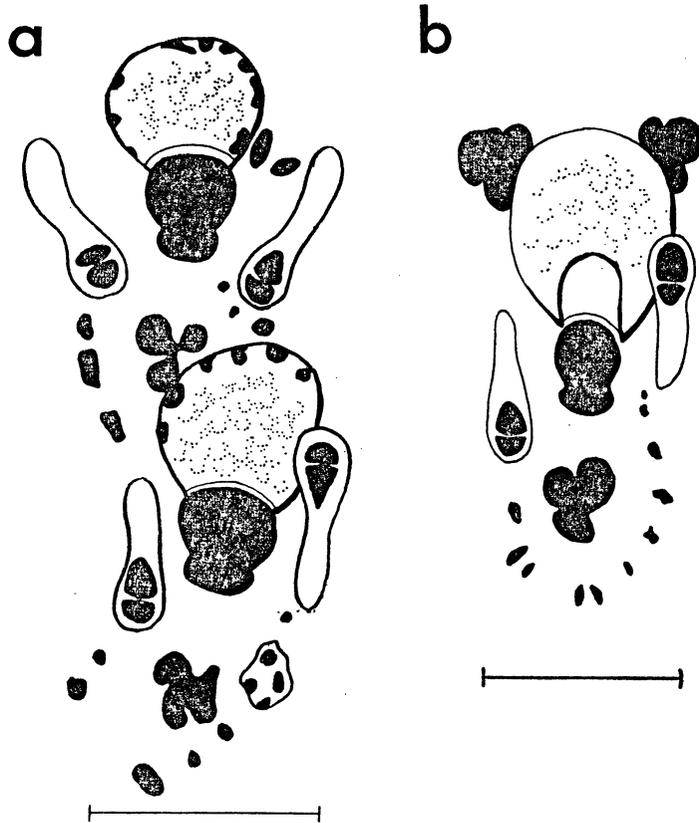
The structure of the frontal shield in periancestrular zoecia differs quite significantly from that seen in later developed individuals. A median foramen is wanting; instead the central area of the shield is regularly perforated by numerous semi-lunar pores (cf. *T. spathulata* above). These resemble the lacunae or intercostal spaces of some Cribrilinidae (see Larwood, 1962:47), being similarly formed by numerous costate processes (see Text-fig. 2). The evidence suggests that the frontal foramen of the later zoecia may be a relict structure, representing, in a much reduced form, the cribriform frontal shield of the periancestrular zoecia.

It therefore seems reasonable to postulate that *Tremogasterina* was derived from Cribrimorph stock, a conclusion which is not necessarily opposed by the possession of a membraniporine ancestrula. A similar ancestrula is known, for example, in *Cribrilaria radiata* (Moll) (see 1903.1.29.17, Falefatu, 80 fath.).

Avicularia are always situated between zoecia, above the interzoecial furrows. Their chambers can be seen to develop above the marginal pores and do not reach the basal lamina of the colony. Even though the avicularia may be very large, they are therefore not vicarious, but as their position is between adjacent zoecia, both of which contribute to their chamber walls, they are not adventitious either. It is proposed to use the term *interzoecial* for this type of avicularium, following the definition given by Larwood (1962:41) for similar structures which occur in Cretaceous cribrimorph Polyzoa. According to Larwood these are "usually much smaller than the zoecia which they accompany and they do not occupy positions which would usually contain normal zoecia". This definition would not include the

(1) The term *ascopore* is avoided, despite Harmer's usage, as the cavity, or hypostegia (see Jullien, 1882:276), into which the foramen opens, is not a true compensation-sac, as is found in the Ascophora Vera.

type of avicularium described as interzooecial by Hastings (1963:181, footnote), for individuals which replace pore-chambers, and therefore reach the basal lamina (1); the appearance of these avicularia frontally is similar to adventitious avicularia. The avicularia in *Tremogasterina* also appear to be associated in position with the distal pore-chambers, although they do not replace them. Occasionally, very large individuals have been seen in *T. mucronata*, *T. celleporoides* and *T. robusta*. The cavity of these avicularia does reach the basal lamina, and they appear to be in communication proximally with one of the pore chambers of the previous zooecium.



TEXT-FIG. 4

Tremogasterina robusta (Hincks). a and b, Massawa, 1965.8.8.7. Development of the ovicell. a, fully developed ovicell. Note the exposure of the inner wall of the ectooecium around the distal lip of the orifice. b, ovicell in an earlier stage of development. Note the uncalcified area distal to the orifice. (Scales = 0.50 mm).

The development of the ovicells can be seen close to the growing edge of the colony. They first arise as a depression in the frontal shield of the next distal zooecium. Growth of the two ectooecial layers (see Powell, in press) soon commences, extending around the periphery of the depression, continuing proximally. The last-formed portion always comprises a median, crescentic area at the proximal edge (see Text-fig. 4, b).

(1) See Powell, 1966, p. 157.

Note on classification.

The classifications of the Ascophora introduced by Silén (1942) and by Harmer (1957), have yet to be compared and correlated. Silén's definition of his section Gymnocystidea, includes the "umbonuloid" form of development of the frontal shield considered typical of the Ascophora Imperfecta by Harmer. Silén's section Spinocystidea was introduced for forms in which the frontal shield was postulated to have been derived from the fusion of spines arising from the gymnocyst. This type of development approaches Harmer's theoretical derivation (1926) of a frontal shield from forms represented by the Cribrimorph, *Figularia*.

Tremogasterina would appear to be representative of the Spinocystidea, and, as now defined, the frontal shield of the Ascophora Imperfecta may be considered to be formed dimorphically. The first form is by the growth of a distally directed calcareous shield; the second by the fusion of marginal spinous processes.

The origins and relationships of the frontal wall in the Ascophora Vera have yet to be investigated fully.

Summary

The type-material of several species described by Smitt, and by Canu & Bassler, has been examined. Five species of *Tremogasterina* introduced by Canu & Bassler from the Gulf of Mexico are here considered to be synonymous with *T. mucronata* (Smitt). *Hiantopora spathulata* Canu & Bassler is referred to *Tremogasterina*. *Lepralia robusta* Hincks, from Mergui, Burma, is re-described from material recently taken from the Red Sea, and referred to *Tremogasterina*. The mode of development of the frontal shield has been studied, and it is concluded that *Tremogasterina* shows close affinities with some Cribrimorpha. It is also considered that the Ascophora Imperfecta comprises genera having at least two distinct types of development.

Zusammenfassung

Das Typusmaterial welches von Smitt & von Canu & Bassler beschrieben wurde, ist hier wieder untersucht. Fünf Arten der *Tremogasterina* die von Canu & Bassler aus dem Golf von Mexico eingeführt wurden werden hier als synonym der *T. mucronata* betrachtet. *Hiantopora spathulata* Canu & Bassler wurde *Tremogasterina* zugewiesen. *Lepralia robusta* Hincks, von Mergui, Burma, ist hier mit Hilfe von neuem Material vom Roten Meer wieder beschrieben, und *Tremogasterina* zugewiesen. Die Entwicklung des frontalen Schildes wurde eingehend studiert, und der Schluss davon gezogen, dass *Tremogasterina* grosse Ähnlichkeit zu manchen Cribrimorpha zeigt. Es wurde auch als möglich betrachtet, dass Ascophora Imperfecta Genera enthält welche zwei unterschiedliche Entwicklungszüge folgen.

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ERRATA

CONDITIONS INDUCING POLYMORPHISM IN *THALAMOPORELLA ROZIERI* (AUDOUIN) (POLYZOA, ANASCA)

by

N.A. Powell and P.L. Cook

(Cah. Biol. Mar. VII - 1966 - pp. 53-59).

- Page 54 - caption to Text-Fig. 1a; for "diagnolly" read diagonally.
- Page 55 - line 3; for "attribued", read attributed.
- line 21; for "*Kenozoocia*", read *Kenozooecia*.
- caption to Text-fig. 1c; for "distal-laveral", read distal-lateral.
- caption to Text-fig. 1d; for "distal-laveral", read distal-lateral.
- bottom of page (italics); for "littoral", read sub-littoral.
- Page 56 - line 3; for "Excempel", read Exempel
- line 51; for "deformed Kenozooecia", read deformed as Kenozooecia.
- line 52; for "Auffalend", read Auffallend.
- Page 57 - line 2; for "Quincunanordnung", read Quincunxanordnung.
- line 4; for "einhergeben", read einhergehen.
- lines 7-8; for "Kenozoida", read Kenozoids.
- line 39; for "as well a the", read as well as the.
- Page 58 - line 1; for "presents", read prevents.