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ON THE GENUS *MEMBRANIPORA* (ANASCA: CHEILOSTOMATA: BRYOZOA) FROM SOUTH CHINESE SEAS

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ABSTRACT. - The bryozoan genus *Membranipora* Blainville, 1830, is an important group in Chinese waters. Fourteen species (including five new ones) are described and illustrated, their systematic features discussed and a key provided to all species recognised here. *Membranipora grandicella* has not been recorded beyond the Chinese waters since it was established in 1929 and may be considered to be endemic to China. The structure and pattern of the porechambers on transverse and lateral walls are useful characters in identifying the species of *Membranipora* and are discussed here.

INTRODUCTION

The genus *Membranipora* Blainville, 1830, is an important group of species in the superfamily Membraniporoidea (suborder Anasca, order Cheilostomata). The importance of membraniporid bryozoans is that they are usually members of marine fouling communities. Owing to the fact that there is often a considerable variability in their colony form, and that they lack such characters as avicularia or vibracula, ovicells and basal porechambers, which are of a considerable value in taxonomy, as well as the fact that membraniporid species are dispersed over coastal waters by means of their cyphonautes which have a free-living period of more than a month, many species show some morphological variation in their colonies and zooids. Therefore, for some marine fouling ecologists and inexperienced investigators, it is often difficult to recognise immediately a *Membranipora* species from its relatives. Misidentification of *Membranipora* species has occured in some fouling surveys, and in several taxonomic reports - Cai *et al.* (1983), Chang *et al.* (1981), Huang & Cai (1984), Huang *et al.* (1980, 1990), Li (1989), Li *et al.* (1964) and Wang & Cai (1977).

According to Robertson (1921), Canu & Bassler (1929), Tung & Wang (1960), Androsova (1963), Wang & Tung (1976), Wang & Cai (1977), Liu & Li (1987) and Liu & Wass (in press), the membraniporid bryozoans are represented by 10 species in Chinese waters - "*Membranipora. serrilamella*", *Membranipora tuberculata*, *M. savartii*, *M. grandicella*, *M. serrilamelloides*, *M.*

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lingdingensis, *M. limosa*, *M. amoyensis*, *M. annae* and *M. bifloris*. Apart from "*M. serrilamella*", *M. tuberculata*, *M. savartii*, *M. grandicella* and *M. amoyensis*, Tung & Wang (1960) and Wang & Cai (1977) also reported three species - *Membranipora hugliensis*, *Acanthodesia lamellosa* and *Acanthodesia quadrata* from the coast of Zhejiang Province, China. The form named "*Membranipora serrilamella*" by Osburn, 1950, as shown by Yoshioka (1982), is one of the three eco-phenotypic variants of *Membranipora membranacea* (Linnaeus). The Chinese species which has been identified as "*M. serrilamella*" is in fact, a distinct species from *M. membranacea* (Linnaeus) and is here described as *Membranipora similis*, new species. *M. hugliensis*, established by Robertson (1921) from Bengal Bay, should be referred to *Conopum* Gray, 1848 (cf. Mawatari, 1974: 31). The specimens of "*M. hugliensis*" reported by Tung & Wang (1960) and Wang & Cai (1977) is neither a species of *Membranipora* nor of *Conopeum*, but rather a member of the genus *Electra* Lamouroux, 1816. Wang & Cai's (1977) Figure 2 shows zooids with a developed proximal gymnocyst and a spine at each proxime-lateral corner beside the zooidal frontal membrane. I am sure that their "*M. hugliensis*" is not the species of Robertson (1921), but *Electra ballula* var. *bicornis* Hincks, 1881 instead. Their "*A. lamellosa*" and "*A. quadrata*" are not the species of Canu & Bassler (1929: 68, Pl. 2, Fig. 2; 69, Pl. 1, Figs. 2-5), but *Membranipora irregulata*, new species, and *M. limosa* (Waters, 1909) respectively (see below). These changes in names should also apply to the marine fouling reports of Chang *et al.* (1981), Huang *et al.* (1980, 1990) and Huang & Cai (1984) who reported "*A. lamellosa*" and "*A. quadrata*".

In identifying the Chinese species of *Membranipora*, it was found that the structure and pattern of the mural porechambers on transverse and lateral walls are very useful, with the former character being more reliable. According to the structure and pattern of the porechambers on the transverse wall, Chinese species of *Membranipora* may be divided into the three groups: the first in which the porechambers are exclusively uniporous; the second in which the porechambers are exclusively multiporous; and the third in which the transverse wall has both uniporous and multiporous porechambers. The first group has two porechamber patterns. One has many small porechambers irregularly dispersed on the wall, as shown in *M. similis*, new species, *M. lingdingensis*, etc.; and the other has porechambers regularly arranged in 1-3 curved lines with the curvature always directed basally, as shown in *Membranipora bispinosa*, new species, *M. limosa*, etc. The second group exhibits three porechambers patterns. In the first, the transverse wall has only a single central multiporous porechamber, which occurs only in *M. serrilamelloides*. The second pattern has two porechambers on the wall, arranged side-by-side near the side of the frontal membrane as in *Membranipora eriophoroidea*, new species, and *Membranipora irregulata*, new species, or near the side of the basement membrane as in *M. savartii* and *Membranipora falsitenuis*, new species, or at the position of the transverse median line of the wall. The third pattern consists of four multiporous porechambers on the transverse wall, two larger ones near the basal side and two smaller ones near the frontal side, as in *M. amoyensis*. The third group comprises only one species - *M. grandicella*, whose transverse wall has usually uniporous porechambers, or sometimes two large scattered multiporous porechambers. In this aspect, *M. grandicella* is intermediate between the first two groups of membraniporid species.

In all the known Chinese species of *Membranipora*, the porechambers on the lateral wall are multiporous and always arranged in a longitudinal row. According to the position of the longitudinal row of porechambers on the wall, the Chinese species of *Membranipora* may be divided into three groups: (1) the longitudinal row of porechambers is situated at the position of the longitudinal median line of the wall, as shown in *M. similis*, new species, *M. serrilamelloides*, *M. falsitenuis*, new species, etc.; (2) the longitudinal row of porechambers is near the side of the

frontal membrane, as shown in *M. savartii*, etc.; (3) intermediate between these two groups, 3-4 porechambers arranged in a longitudinal row near the frontal side and one at the position of the longitudinal median line of the wall, as in *M. eriophoroidea*, new species. Interestingly, this longitudinal row of multiporous porechambers is never found near the basal side of the Chinese species. The above-mentioned structure and pattern of the porechambers of transverse and lateral walls are summarised in Table 1.

This paper reports 14 species of *Membranipora* from south Chinese seas, five of which are new to science. The systematic features of each species are described and features important for identifying the Chinese species of *Membranipora* are emphasised. A key to all recognized species is also provided. The descriptions and key will also probably prove useful to investigators working on marine fouling communities in the Indian Ocean, and Southeast Asia.

Table 1. The mural porechambers on the transverse and lateral wall of the Chinese species of *Membranipora*.

species	porechambers on transverse wall	porechambers on lateral wall
M. similis, new species	many, very small, uniporous and irregularly dispersed on the wall	4, small, multiporous, and arranged in a row at the position of the longtitudinal median line of the wall
M. serrilamelloides	1, very large, multiporous, and situated at the central position of the wall	2-3, small, multiporous, and arranged in a row at the position of the longtitudinal median line of the wall
M. falsitenuis, new species	2, large, multiporous, and arranged side by side near the basal side	4, large, multiporous, and arranged in a row about at the position of the longtitudinal median line of the wall
M. tuberculata	several, small, uniporous, and irregularly dispersed on the wall	2-3, small, multiporous, and arranged in a row at the position of the longtitudinal median line of the wall
M. savartii	2, large, multiporous, and arranged side by side near the basal side	3-4, small, multiporous, and arranged in a longtitudinal row near the frontal side
M. gradicella	many, very small, uniporous and arranged in 2-3 lines aboutat the position of the transversemedian line, sometimes 2 large scattered multiporous porechambers present on the wall	3-4, small, multiporous, and arranged in a longtitudinal row near the frontal side

Table 1. (cont'd)

species	porechambers on transverse wall	porechambers on lateral wall
M. eriophoroidea, new species	2, large, multiporous, and arranged side by side near the frontal side	4-5, 3-4 of which arranged in a longtitudinal row near the frontal side, 1 situated about at the position of the longtitudinal median line of the wall
M. irregulata, new species	2, large, multiporous, and arranged side by side near the frontal side	2-3, small, multiporous, and arranged in a row at the position of the longtitudinal median line of the wall
M. bifloris	2, large, multiporous, and arranged side by side at the position of the transverse median line of the wall	4, small, multiporous, and arranged in a longtitudinal row near the frontal side
M. bispinosa, new species	many, very small, uniporous, and arranged in three curved series whose curvature is near the basal wall	3, small, multiporous, and arranged in a row at the position of the longtitudinal median line of the wall
M. lingdingensis	many, very small, uniporous, and irregularly dispersed on the wall	2-3, small, multiporous, and arranged in a row at the position of the longtitudinal median line of the wall
M. limosa	many, very small, uniporous, and arranged in 1-2 curved series whose curvature is directed basally	6-8, large, multiporous, and arranged in a longtitudinal row near the frontal side
M. amoyensis	multiporous; 2 smaller pore-chambers arranged side by side near the frontal side, 2 larger ones arranged side by side near the basal side	4, large, multiporous, and arranged in a row at the position of the longtitudinal median line of the wall
M. annae	many, very small, uniporous, and arranged in 1-2 curved series whose curvature is directed basally	6-8, large, multiporous, and arranged in a longtitudinal row near the frontal side

KEY TO CHINESE SPECIES OF *MEMBRANIPORA*

1. Colony encrusting, never erect 2
   Colony encrusting or erect, or mostly erect with a narrow encrusting base 11

2. Mural porechambers on transverse wall many, very small and uniporous 3
   Mural porechambers on transverse wall 1-4, large, and multiporous 6

3. Mural porechambers irregularly dispersed on the wall 4
   Mural porechambers regularly arranged in 1-3 curved lines on the wall 5

4. Zooids with a pair of completely calcified tubercles on proximal gymnocyst ..... *M. tuberculata*
   Zooids with a pair of spine-like processes which are uncalcified at their summit and formed by folding of the proximal marginal wall of the zooid ..... *M. similis*, new species

5. With 2 types of opercula: semicircular and duckbilled; 2 spines on each distal corner (gymnocyst) of a zooid; cryptocyst with long spinules on its inner margin; uniporous porechambers arranged in 1-2 curved series whose curvature is at the middle of the wall ..... *M. annae*
   Only semicircular operculum present; 2 spines on each distal corner of the mural rim of a zooid; uniporous porechamber arranged in 3 curved series whose curvature is near the basal side ..... *M. bispinosa*, new species

6. A central multiporous porechamber on transverse wall ..... *M. serrilamelloides*
   Two or 4 multiporous porechambers on transverse wall 7

7. Only 2 porechambers present, near the frontal side or near the basal side, or at the position of the transverse median line of the wall; only semicircular operculum present; no distal spines or distal spines globose 8
   Four porechambers present, 2 smaller ones near the frontal side, 2 larger ones near the basal side; 2 types of opercula: semicircular and duckbilled; distal spines trifurcated and branched ..... *M. amoyensis*

8. Two porechambers at the position of the transverse median line; distal spines globose and giving off several spine-like processes ..... *M. bifloris*
   Two porechambers near the frontal side; distal spines wanting 9

9. Two porechambers near the basal side; without chitinous spinules on the frontal membrane and operculum; zooids not outlined by brown chitinous lines ..... *M. falsitenuis*, new species
   Two porechambers near the frontal side; chitinous spinules present on the frontal membrane and operculum; zooids outlined by brown chitinous lines 10

10. Colony constantly unilaminar; zooids usually quadragular; grains on cryptocyst arranged in radiating costae; lateral mural porechambers 4-5, 3-4 of which arranged in a longitudinal row near the frontal side, 1 being at the position of the longitudinal median line of the wall ..... *M. eriophoroidea*, new species
Colony uni-, bi- or multilaminar; zooids usually hexangonal; grains on cryptocyst irregularly scattered; lateral mural porechambers 2-3, arranged in a row at the position of the longitudinal median line of the wall ..... *M. irregulata*, new species

11. Erect portion of colony vincularian 12
Erect portion of colony irregularly lobate or dichotomously branched 13

12. Many, small uniporous porechambers arranged in 2-3 lines at about the position of the transverse median line of transverse wall, sometimes 2 large scattered multiporous porechambers on transverse wall; cryptocyst uniformly serrated on its inner edge and without a median proximal process ..... *M. grandicella*
Two large multiporous porechambers arranged side by side near the basal side on transverse wall; cryptocyst serrated on its disto-lateral inner edge and with a median proximal process ..... *M. savartii*

13. Erect portion of colony dichotomously branched; cryptocyst with a median proximal process; many uniporous mural porechambers regularly arranged in curved series on transverse wall ..... *M. limosa*
Erect portion of colony irregularly lobate; cryptocyst without a median proximal process; many uniporous porechambers irregularly scattered on transverse wall .....
..... *M. lingdingensis*

SYSTEMATIC ACCOUNT

Membranipora similis, new species
(Fig. 1)

Membranipora serrilamella - Wang & Cai, 1977: 17, Fig. 3 (nec Osburn, 1950); Li, 1989: 107.

Material. - Holotype - No. 84BTE540, Xiamen, Fujian Province, 4.vii.1984; colony on a mussel shell.

Paratype - No. 85BBY580, off Beihungcheng Island (Pohai Strait), 5.viii.1985, depth 31 m, colony on a scallop shell.

Other specimens - No. 83BTY670, Qingdao, Shandong Province, 25.xii.1983; several colonies on fronds of economic algae such as *Laminaria japonica* and *Undaria pinnatifera*. — No. 58BET079, Jinjiang, Fujian Province, 4.iii.1958; colony on a shell of *Polynices didyma*. — No. 60BET055, Changtu Habour, Fujian Province, 13.vi.1960; broken colony on a woody panel. — No. 85BTS275, Daya Bay, Guangdong Province, 14.vii.1985; colony on shell of *Pinctada martensi*. — No. 88BTE175, 19.vii.1988, Dachen Island, Zhejiang Province; colony on an oyster shell.

Description. - Colony encrusting, thin, usually circular or irregularly lobate. Zooids quadrate or elliptical, arranged in radiating lines, distinct, and separated by fine grooves. Opesia elongate quadrangular, slightly smaller than the frontal membrane. Frontal membrane large, nearly occupying the whole of the frontal area. Proximal gymnocyst vestigial. Cryptocyst marginal,

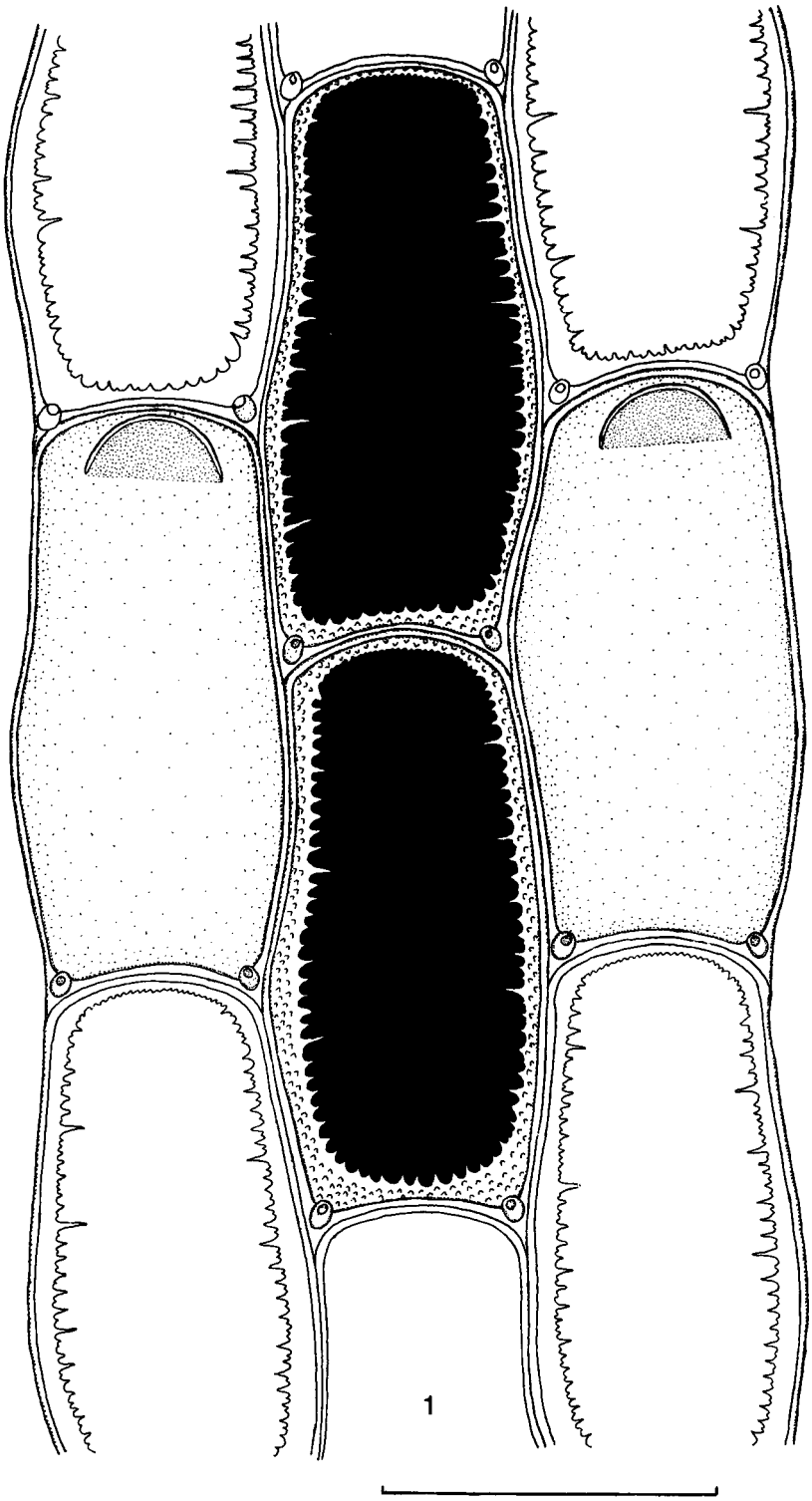


Fig. 1. *Membranipora similis*, new species (scale: 0.2mm). Zooids with smooth mural rim, granulated spinous marginal cryptocyst, and a pair of protuberances with a small terminal pore at the proximal corners. (locality: Xiamen, Province Fujiang).

narrow, granular on its surface and with spinules on its inner border. A hollow protuberance at each proximal corner of the marginal wall. Many mural porechambers on transverse wall, small and uniporous. Four mural porechambers on lateral wall, multiporous, and arranged in a row at the longitudinal median line.

Remarks. - This membraniporid form is a common fouling bryozoan, encrusting the fronds of economic algae such as *Laminaria japonica* and *Undaria pinnatifera*, and on some mariculture shells such as oysters and scallops. It also occurs on aquaculture cages for economic fishes and on the hull of ships, and commonly on underwater constructions such as piers, buoys and cables (see Huang *et al.*, 1980; Li, 1989, *M. serrilammella* in their reports on fouling organisms).

Some Chinese authors, including this author had previously reported samples of the present new species as "*Membranipora serrilamella* Osburn, 1950". Yoshioka (1982), however, pointed out that "the three described species of the bryozoan genus *Membranipora, M. membranacea* (L.), *M. serrilamella* Osburn, and *Membranipora villosa* Hincks, occurring together on brown macroalgae off the west coast of North America are eco-phenotypic variants." "The three forms represent eco-phenotypic variants and can be placed in a developmental sequence; *M. membranacea* has the simplest zooid structure, *M. villosa* the most complex, and *M. serrilamella* is in an intermediate position. The three forms should be synonymized and called *M. membranacea* based solely on the principles of taxonomic priority" (Yoshioka, 1982: 233, 240).

The materials presently available for establishing the new species are similar to one of three eco-phenotypic variants, "*M. serrilamella*", of *M. membranacea* (Linnaeus), in the presence of a hollow protuberance at each proximal corner of the marginal wall of each zooid. Like *M. membranacea*, the protuberances are not entirely calcified, and a small pore at the summit is covered by a chitinous membrane. The structure is not formed by the development of the proximal gymnocyst, but by the folding of the proximal marginal wall itself, later becoming closed at its summit.

The new species is different from "*M. serrilamella*" in its zooidal cryptocyst being narrower and in its cryptocystal spinules being usually slender and shorter. One of the distinct characters of this new species from *M. membranacea* is the structure and pattern of the mural porechambers on the transverse and lateral walls. In the three eco-phenotypic variants of *M. membranacea*, there are two multiporous porechambers on the transverse wall and the lateral wall respectively, while in the new species, many small uniporous porechambers occur on the transverse wall and four multiporous porechambers on the lateral wall.

Early astogeny is very useful in identifying bryozoan species, especially those of *Membranipora*. Unfortunately, the author has not obtained any complete young colonies and further investigation involving collection of complete young colonies is required.

Localities. - Shandong Province: Baihungcheng Island (Pohai Straits), Qingdao (Jiaozhou Bay); Zhejiang Province: Dachen Island; Fujian Province: Changto Habour, Jianjian, Xiamen; Guangdong Province: Daya Bay. Wang & Cai (1977) reported this species from Putou Island (Zhejiang Province).

Distribution. - China.

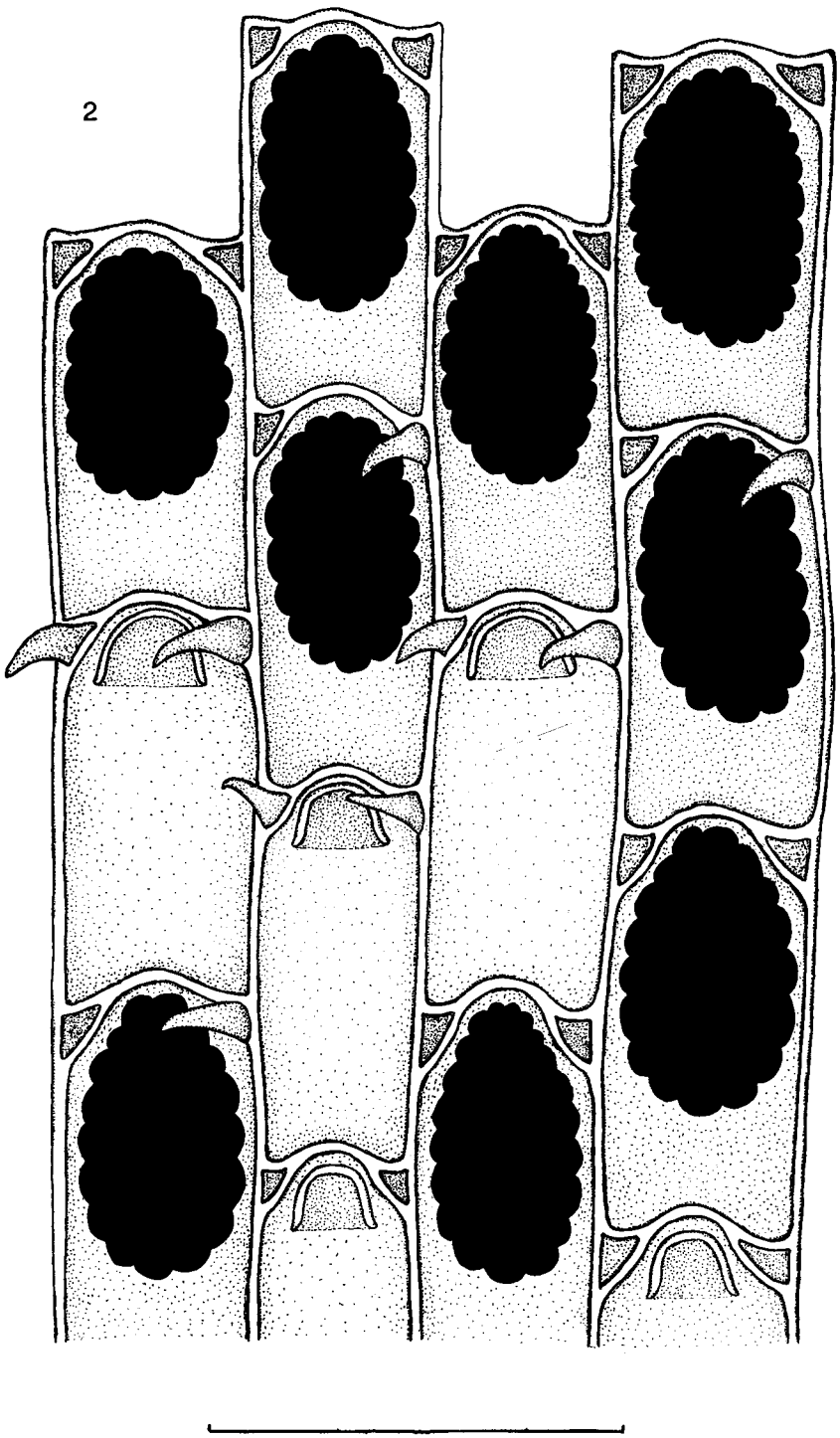


Fig. 2. *Membranipora serrilamelloides* Liu & Li. (scale: 0.5mm). Zooids with smooth mural rim, smooth developed serrated marginal cryptocyst, and a pair of entirely calcified spines at the distal corners. (locality: Lingdingyan, near the mouth of Zhujiang River).

Membranipora serrilamelloides Liu & Li, 1987
(Fig. 2)

Membranipora serrilamelloides Liu & Li, 1987: 53, Pl. 1, Fig. 1; Li, 1989: 107.

Material. - HK111-c, several colonies on culture cages for fishes in Dapeng Bay; S-20015, several colonies on buoys in Lingdingyan, the mouth of Zhujiang River.

Description. - Colony encrusting, yellow-white, forming a unilaminar sheet spreading over the substratum. Zooids rectangular, arranged in quincuncial series, distinct, and separated by fine groves. Mural rim narrow and raised. No gymnocyst. Frontal membrane occupying the entire frontal area. Cryptocyst marginal, smooth on its surface and serrated on its inner border. Opesia small, oval or elliptical and occupying two-thirds of frontal area. A short hollow spine at each distal corner of the zooid, curved towards the zooidal proximal end at its free end. A central mural porechamber on transverse wall, large and multiporous. Two or three mural porechambers on lateral wall, small and multiporous, arranged in a row at the longitudinal median line of the wall.

Remarks. - This species was found on aquaculture cages for economic fishes, on buoys, and is a fouling bryozoan in the southern waters of China. It is somewhat similar to the eco-phenotypic variant name "*M. serrilamella*" of *M. membranacea* (Linnaeus) in the general form of its zooids, but is easily distinguished from the latter by its distal spines, which are entirely calcified with no membranous area at their summit; by its cryptocyst which is wider than in the latter, and is smooth instead of tuberculate on its surface; by the simple serration instead of spinulation on the inner margin of its cryptocyst; and by its opesia being small and only occupying two-thirds of the frontal area.

Localities. - Guangdong Province: Lingdingyan, the mouth of Zhujiang River and its neighbouring districts, Daya Bay, Dapeng Bay.

Distribution. - Southern China.

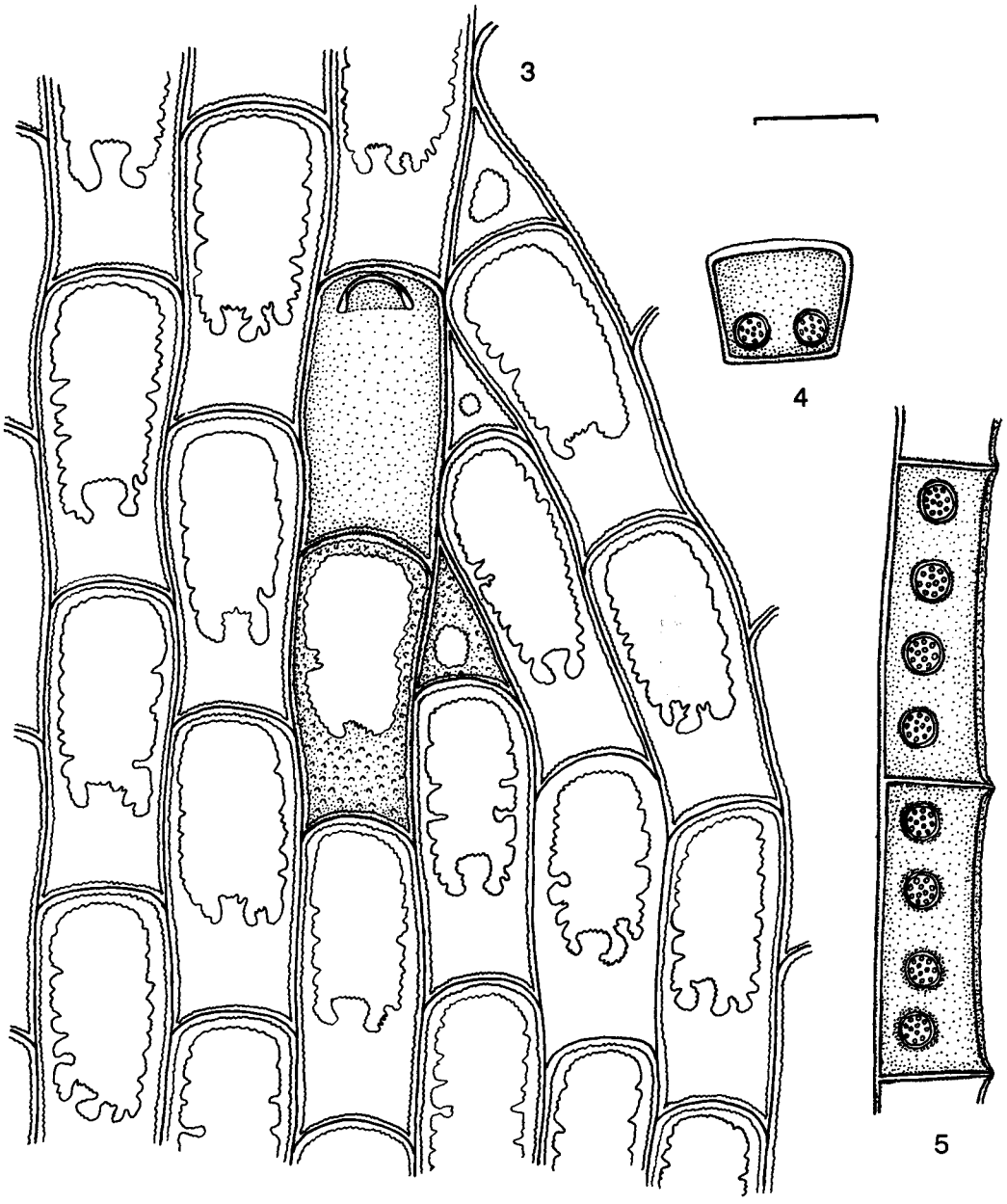
Membranipora falsitenuis, new species
(Figs. 3-6)

Material. - Holotype - No. 59BBS150, South China Sea (21°30'N, 113°45'E), depth 45 m, sand-muddy bottom with shells, 17.vii.1959; colony on shell.

Paratype - No. 76BBE160, East China Sea (31°30'N, 125°00'E), depth 47 m, mud-sandy bottom with shells, 4.vii.1976; colony on shell.

Other specimens - No. 59BBS151, South China Sea (20°00'N, 111°15'E), depth 52 m, mud-sandy bottom with shells and corals, 25.iv.1959; young colony on shell.

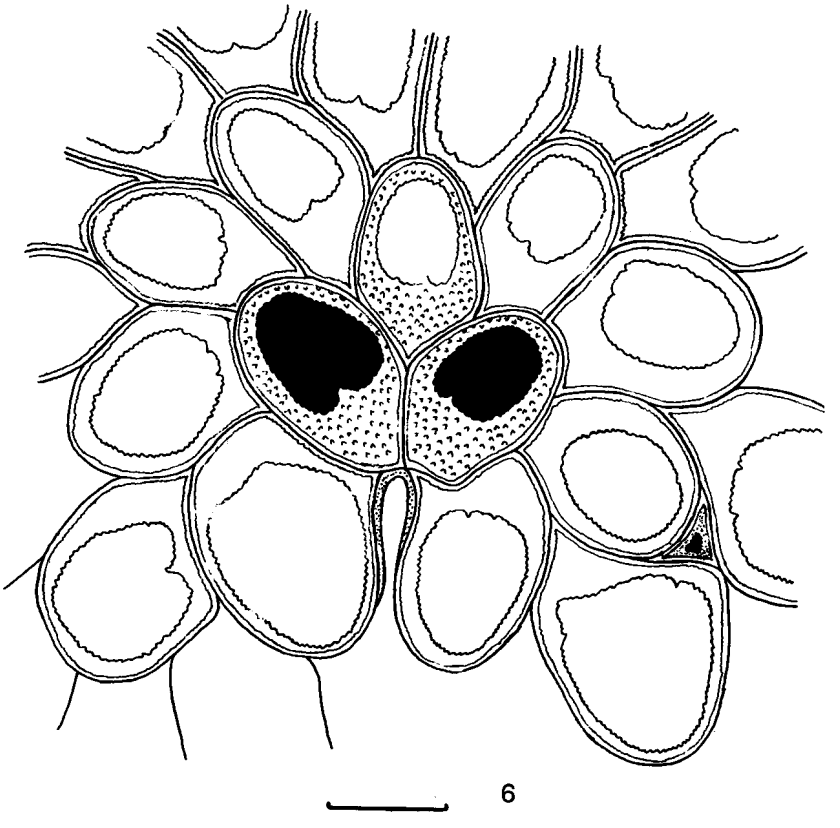
Description. - Colony encrusting, yellow-white or yellowish, forming a unilaminar sheet on the substratum. Zooids rectangular, round distally, angular at the two proximal corners, arranged quincuncially, distinct, and separated by raised ridge. No gymnocyst. Frontal membrane large, occupying the whole of the frontal area. Mural rim salient, serrated on its inner edge. Opesia elongate, slightly smaller than the frontal membrane, nearly occupying two-thirds of the



Figs. 3-5. *Membranipora falsitenuis*, new species (Scale 0.2mm). 3, zooids with finely serrated mural rim, granulated developed marginal cryptocyst. Kenozooids among autozooids and strong spinous processes in the inner disto-lateral border of the cryptocyst can be seen. 4, two multiporous mural porechambers of the transverse wall of a zooid near the side of the basement membrane. 5, multiporous mural porechambers of the lateral wall of two zooids. (locality: the South China Sea, 21° 45′ N, 113° 45′ E).

frontal area. Cryptocyst developed, marginal, granular on its surface, serrated coarsely on its inner margin, and with a broad proximal portion equal to a third of the frontal area. Distal spinules on the cryptocyst slender and shorter, lateral ones coarse and long, and proximal one largest and strongest. Operculum semicircular, straight at its proximal border, much wider than long, and with a narrow sclerite along its arched margin. Kenozooids irregular in shape and size, intercalated among autozooids, with a cryptocyst serrated on its inner border and granular on its surface. Two mural porechambers on transverse wall, multiporous, and near the side of the basement membrane. Four mural porechambers on lateral wall, multiporous and arranged in a row at the position of the longitudinal median line of the wall. Twin ancestrula producing seven periancestrulae, with an extensive marginal cryptocyst serrated on its inner edge and granular on its surface.

Remarks. - This new species bears a resemblance to the unilaminar colony of *M. tenuis* Desor, 1848, especially in having no spherical tubercles at the proximal corner of some zooids. It is easily distinguished from that species by its mural aim being finely serrated instead of coarsely bead-like, and by the absence of brown chitinous lines between neighbouring zooids. The new species is similar to the encrusting unilaminar colony of *M. savartii* in some zooidal characters, especially the structure and pattern of porechambers on transverse and lateral walls, but different from that species in other zooidal characters. In the encrusting colony of *M. savartii*, the zooids are separated by deep grooves and arranged radially in distinct longitudinal rows, while in the new species, the zooids are separated by raised ridges formed by the salient mural rims of



Figs. 6. *Membranipora falsitenuis*, new species (Scale 0.2mm). Twin ancestrula and periancestrulae of a young colony. (locality: the East China Sea, 31° 30′ N, 125° 00′).

neighbouring zooids. In *M. savartii*, the zooids have a median descending or horizontal process from the proximal cryptocyst, and the denticles (spinules) from the distal and lateral cryptocyst are always minute, often descending downward into the zooidal cavity and difficult to see. In the new species, the zooidal cryptocyst is always horizontal, the denticles from the distal and lateral cryptocyst are much coarser than those in *M. savartii*, and the robust process from the proximal cryptocyst is not always at a median position and not always single.

Localities. - The continental shelf of the East China Sea (31°30'N, 125°00'E), 47m; the shallow waters off Guangdong Province (21°30'N, 113°45'E) 45m; the shallow waters off Northern Hainan Island (20°00'N, 111°15'E) 52m.

Distribution. - Southern China.

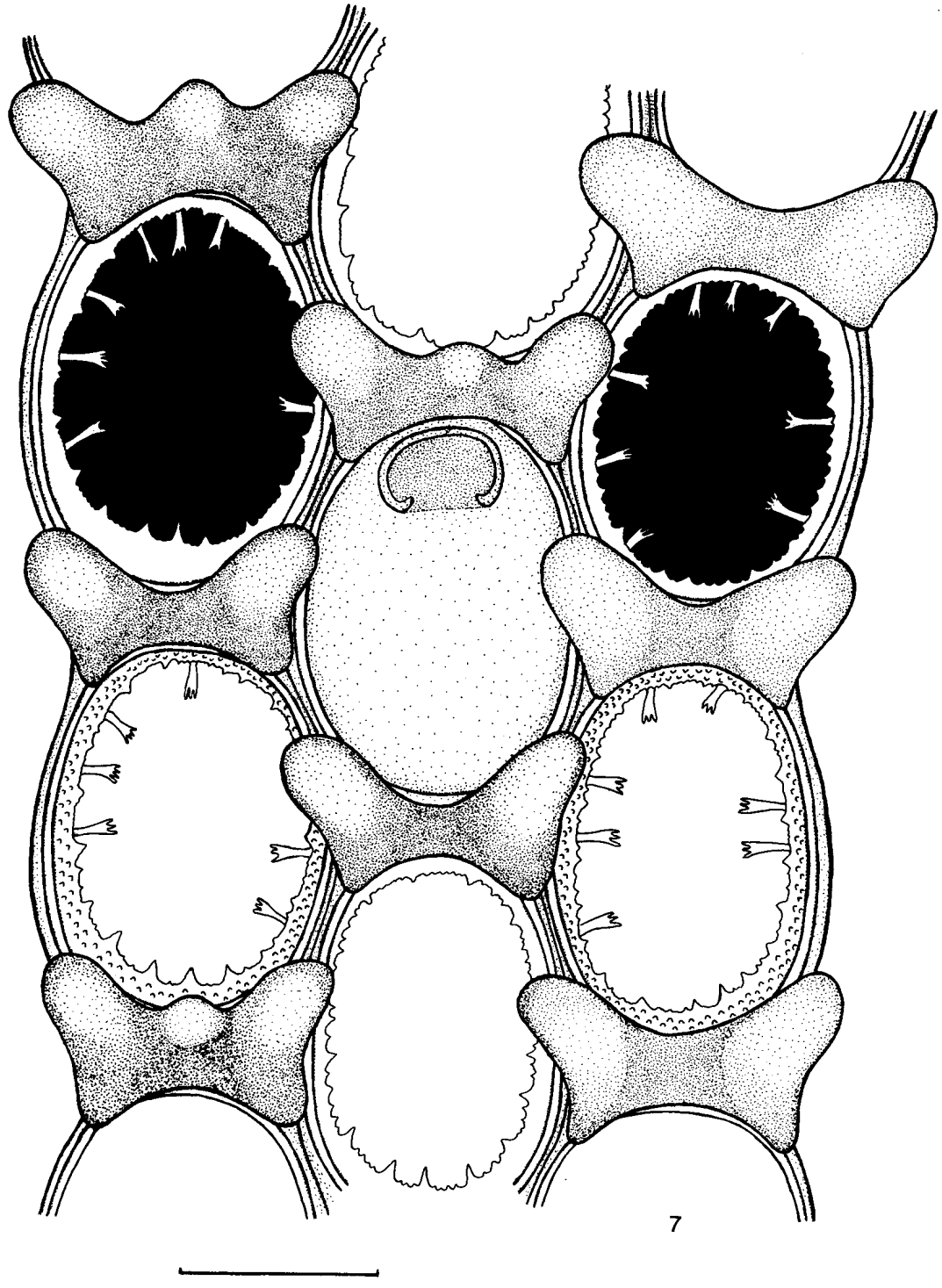
Membranipora tuberculata (Boss, 1802)
(Fig. 7)

Flustra tuberculata Bosc, 1802 (fide Mawatari, 1974)
Flustra tehuelcha d'Orbigny, 1839-46: 17, Pl. 8, Figs. 10-14 (fide Robertson, 1921).
Membranipora tuberculata - Busk, 1858: 126, Pl. 18, Fig. 4; Thornely, 1907: 185, Fig. 3; Canu & Bassler, 1923: 22, Pl. 33, Figs. 3-5; Osburn, 1950: 23, Pl.1, Figs. 4, 5; Silen, 1941: 17, Text-figs. 12, 13, Pl. 1, Fig. 1; Mawatari, 1952: 262; 1974: 23, Text-figs. 1-4; Maturo, 1957: 33, Figs. 25-27; Androsova, 1963: 22, Pl. 1, Fig. 1; Cook, 1968: 120, Text-fig. 1, Pl.2, Figs. C, D; Li, 1989: 107.
Nitchina tuberculata - Harmer, 1926: 208, Pl. 13, Fig. 10; Hastings, 1930: 706, Pl. 3, Figs. 9, 10; Okada, 1934: 3, Pl. 1, Fig. 1; Okada & Mawatari, 1938: 449.
Membranipora techuelcha - Waters, 1898: 674, Pl. 48, Figs. 6-8; Robertson, 1908: 205, Pl. 15, Figs. 16, 17, Pl. 16, Fig. 18; 1921: 47.
Nitacherina tuberculata - Canu & Bassler, 1929: 80, Pl. 5, Figs. 6-8; Sakakura, 1935: 107; Mawatari, 1948: 3; Tung & Wang, 1960: 191,Fig. 3.
Membranipora bituberculatum Ortmann, 1890: 29, Pl. 1, Fig. 25.
Acanthodeisa tuberculata - Wang & Cai, 1977: 17, Fig. 8.

Material. - No.84BET7585, No.84BET7586, No.82BET3715, No.60BET0175, No.73BST0179, No.73BST0200, No.85BST0154, No.84BST156, No.86BST1755.

Description. - Colony encrusting, white, forming a subcircular lobate or irregularly shaped unilaminar sheet on the substratum. Zooids oblong, arranged in quincuncial series, distinct, and separated by grooves. Mural rim raised and smooth on its edge. Frontal membrane large, occupying four-fifths of the frontal area. Cryptocyst developed distally and proximally, tuberculate on its surface, and serrated on its inner border. Branched or comb-like denticles sometimes protruding into the cavity from the cryptocyst. A pair of globose tubercles on the proximal gymnocyst. Several uniporous mural porechambers on the transverse wall, and two or three multiporous mural porechambers on the lateral wall.

Remarks. - According to Japanese and American authors, the colonies of this species usually encrust seaweeds, especially *Sargassum*, to form a lacework. Apart from seaweeds, this membraniporid bryozoan in Chinese waters is also often found on shells, gorgonians, buoys or other objects such as plastic articles, forming circular, lobate or irregularly shaped white encrustations.



Figs. 7. *Membranipora tuberculata* (Bosc). (Scale 0.2mm). Zooids with smooth mural rim, granulated coarsely serrated marginal cryptocyst. A pair of globose tubercles on the proximal gymnocyst, and comb-like denticles can be seen protruding into the body-cavity. (locality: Hong Kong).

A pair of well developed tubercles are present on nearly all the zooids of a colony. Their true position is on the proximal corners of the zooid, though the structure appears to rise from the distal corners of the proximal zooid. In Chinese materials, the two tubercles are often fused into a large plate-like projection; between the two tubercles is sometimes a third tubercle, similar to the case in materials from Japanese, European and North American waters. The tubercles may in some instances be divided into two, as reported by Mawatari (1974: 24), but this is never seen in Chinese materials.

The cryptocyst is usually developed both distally and proximally, though it does not always completely enclose the opesia. Sometimes the cryptocyst is marginal, i.e., it entirely surrounds the opesia. When marginal, it is often narrow. In this aspect, Chinese materials are similar to Japanese materials described by Mawatari. When the cryptocyst is much developed and the proximal gymnocyst is vestigial, the zooidal morphology of the present species is somewhat similar to that in *M. tenuis* Desor, 1848, but is easily distinguished from that species by its smooth instead of bead-like mural rim, and by the absence of red chitinous lines between neighbouring zooids, which are always present in that species. When the proximal tubercles are less developed and the cryptocyst is of a marginal type, *M. tuberculata* is easily confused with younger colonies of *Conopeum reticulum* (Linnaeus, 1767), but is different from that species in the absence of brown chitinous lines between neighbouring zooids.

Chinese specimens bear a resemblance to those described by Osburn (1950) and Mawatari (1974), representively from North America and Japan, in that branched or comb-like spinules sometimes protrude into the body-cavity from the cryptocyst. Not every zooid of a colony has such spinules, which are irregularly projecting and usually placed distally and/or laterally to the cryptocyst.

Generally speaking, colonies are unilaminar, but a colony collected from the buoy near the mouth of Zhujiang River is peculiar in its growth nature. The colony consists of a unilaminar encrusting portion and an erect bilaminar portion. The bilaminar portion is formed from the encrusting portion by the upright growth of adjacent zooids detaching from the substratum. This is an individual variation probably caused by the uneven surface of the substratum.

Localities. - Zhejiang Province: Dachen Island, Nanjin Island; Fujiang Province: Jinjiang, Dongshan; Guangdong Province: Yantian, Hong Kong and its neighbouring districts, Xisha Islands; Guangxi Province: Dongxing and Beibu Bay. Androsova (1963) reported the species from Sanya (Hainan Province), and Wang & Cai (1977) reported the species from Dongtou (Zhejiang Province) and Xiamen (Amoy) (Fujian Province). 0-35 m.

Distribution. - Indian Ocean; Pacific Ocean: from Indonesia to China and Japan, from Peru, Galapagos Islands to California and Vancouver; Atlantic Ocean: from Patagonia to North America, Azores, Madeira, and African coast, Europe from Spain to Norway.

Membranipora savartii (Audouin, 1826)
(Fig. 8)

Flustra savartii Audouin, 1826: 240 (fide Mawatari, 1974).

Membranipora savartii - Waters, 1887: 181; 1909: 132, Pl. 11, Figs. 8-13; 1913: 486, Pl. 71, Figs. 1-4; Thornely, 1912: 143; Osburn, 1950: 27, Pl. 2, Fig. 7; Maturo, 1957: 35, Fig. 27; Soule, 1959: 6; Powell,

1967: 164; Mawatari, 1974: 26, Text-figs. 3A-E, Pl. 1, Figs. 3-5; Wang & Cai, 1977: 17, Fig. 4; Li, 1989: 107.

Acanthodesia savartii - Canu & Bassler, 1923: 31, Text-figs. 8, 9, Pl. 2, Figs. 2, 3.

Membranipora crenulata Okada, 1923: 224.

Amphiblestrum perfragile Ortmann, 1890: 29, Pl. 2, Fig. 5.

Material. - No.62BYT1767, No.63BYT0156, No.66BYT0250, No.62BET0356, No.62BET0357, No.62BET0358, No.84BET7588, No.84BET7589, No.84BET7590, No.84BET7592, No.84BET7593, No.84BET7599, No.86BST7474, No.86BST7475, No.84BST7576, No.66BST9195, No.63BST7037, No.83BET7676.

Description. - Colony encrusting-erect, unilaminar or bilaminar, yellow-white, brownish or yellow-brown. Zooids quadrate or rectangular, arranged in regular radiating lines, distinct, and separated by fine grooves. Mural rim raised, bead-like on its edge. No gymnocyst. Frontal membrane occupying whole of frontal area. Cryptocyst marginal, narrower latero-distally than proximally, granular on its surface, serrated on its disto-lateral inner border and with a median proximal process varying in size and serrated at its free edge. Two large, multiporous porechambers arranged side by side near the basal side of the transverse wall. Three or four small, multiporous porechambers on lateral wall arranged in a longitudinal row near the frontal side.

Remarks. - *Membranipora savartii* is one of the commonest fouling bryozoans from the coastal waters of China. It can attach to any underwater object such as marine algae (for example, *Laminaria japonica*, *Undaria pinnatifida*, *Sargassum* spp.), hydroids, gorgonians, corals, stones, gravels, glass fragments, plastic articles, shells of molluscans and crustaceans, brachiopod valves, and other more calcified bryozoans (for example, species of the genera *Steginoporella, Adeonella, Adeonellopsis, Sertella, Reteporellina*, etc.). It also often occurs on such marine constructions as vessels, buoys, piers and aquaculture cages.

The growth form of the colony is so remarkably variable that a number of names were proposed for this species (Mawatari, 1974: 28). A unilaminar colony is usually an irregularly-shaped sheet sometimes with a waved and slightly raised margin. A large-sized colony always consists of a narrow unilaminar encrusting base and an overgrowing, bilaminar, erect vincularian portion formed by the upright growth of adjacent zooids. A large-sized colony collected from a buoy near Qiongzhou Strait, Guangdong Province, has a size of 60 cm wide, 80 cm high, but generally colonies have a size of 20-30 cm wide and 30-40 cm high. This type of colony is usually called peony moss by some Chinese as the erect portion resembles a peony flower. Mawatari (1974) described cellariform colonies in Japanese samples of this species, but this has never been found in Chinese materials. Among our materials there are some fenestral bilaminar fragments which are similar to those of some reteporiform colonies consisting of a number of "trabeculae", separated by fenestrulae, and formed by two layers of back-to-back zooids. They have the same zooidal characters as those of encrusting unilaminar colonies and erect bilaminar vincularian colonies, except for the fact that there are red-brown chitinous lines passing through the zooidal grooves between neighbouring zooids. Unfortunately, an entire reteporiform colony has not obtained up to now and the details of the colony growth mode are not known at present.

In Chinese specimens there is a median proximal process projecting into the opesia from the proximal cryptocyst. The structure, as pointed out by Mawatari (1974), is variable in size and shape, and always serrated at its free edge. In Chinese materials, the two mural porechambers on the transverse wall are multiporous instead of uniporous, as described by Mawatari (1974),

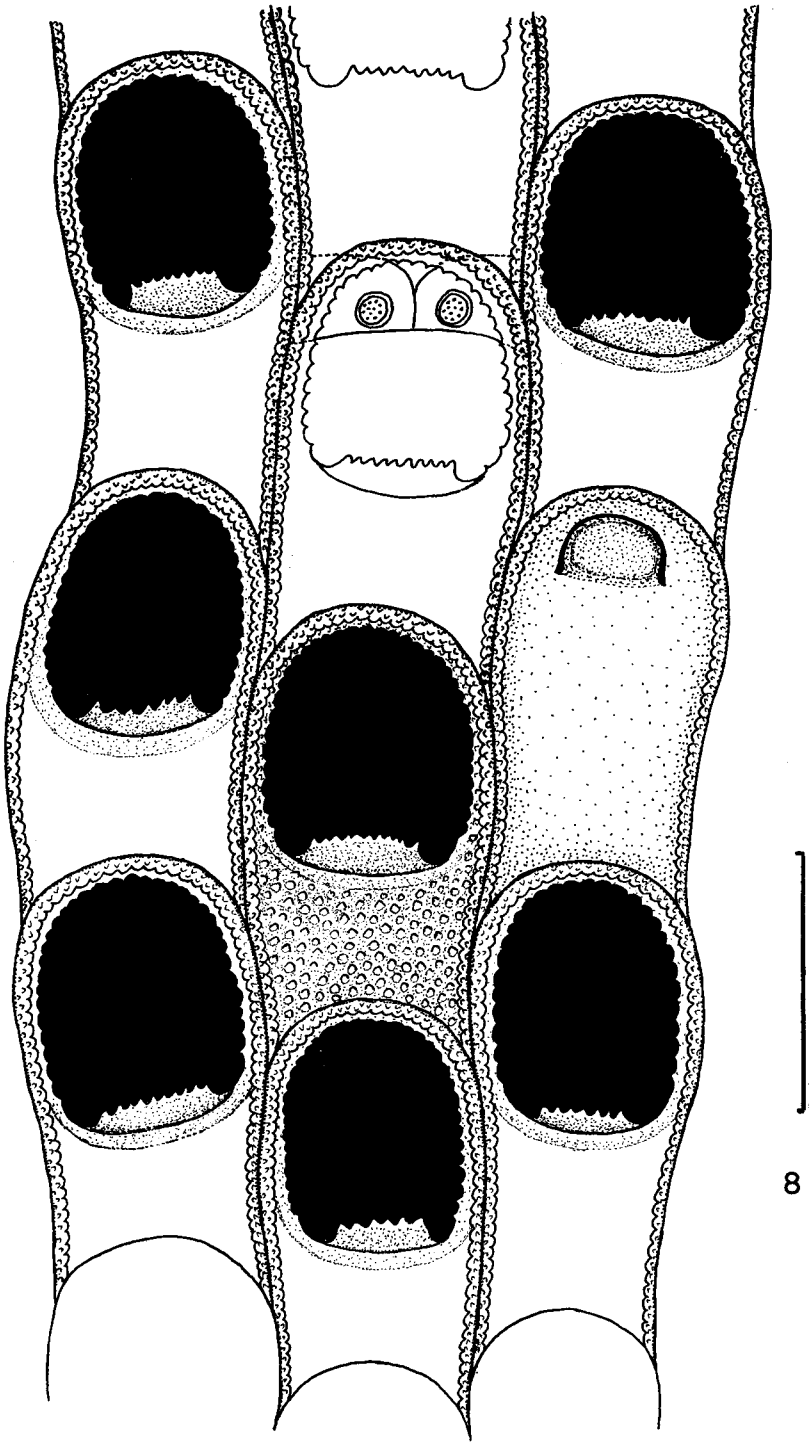


Fig. 8. *Membranipora savartii* (Audouin). (scale: 0.5mm). Zooids with bead-like mural rim, granulated marginal cryptocyst, and a pair of multiporous mural porechambers on the transverse wall. Fine disto-lateral serration a nd a median proximal process can be seen on the cryptocyst. (locality: the South China Sea, 21° 30′ N, 116° 00′ E).

and the mural porechambers on the lateral wall are three or four in number instead of two (see Mawatari, 1974: 26). The lateral mural porechambers are not placed on the distal half of the lateral wall, but uniformly arranged in a longitudinal row near the frontal side.

Localities. - Shandong Province: Yantao, Qingdao; Jiangsu Province: Lianyonggun Harbour; Zhejiang Province: Haimen, Zhahai, Dachen Island, Nanji Island, Pingyan; Fujian Province: Shachen Habour, Pintan, Changtu Harbour, Huiyan, Xiamen (Amoy), Dongshen Island, Jinjiang; Guangdong Province: Hong Kong, the mouth of Zhujiang River and its districts, Qiongzhou Strait; Hainan Province: Xisha Islands, Nansha Island (Spratly Archipelago), Yinggehai. Androsova (1963) reported the species from Haikou (Hainan Province), Wang & Cai (1977) reported species from Zhoushan Islands (Zhejiang Province) and Xiamen (Fujiang Province). 0-120 m.

Distribution. - Red Sea, Zanzibar, Sri Lanka, Philippines, New Guinea, Australia, California, Atlantic Morocco, Brazil, Puerto Rico, Japan and China.

Membranipora grandicella (Canu & Bassler, 1929)
(Figs. 9 & 10)

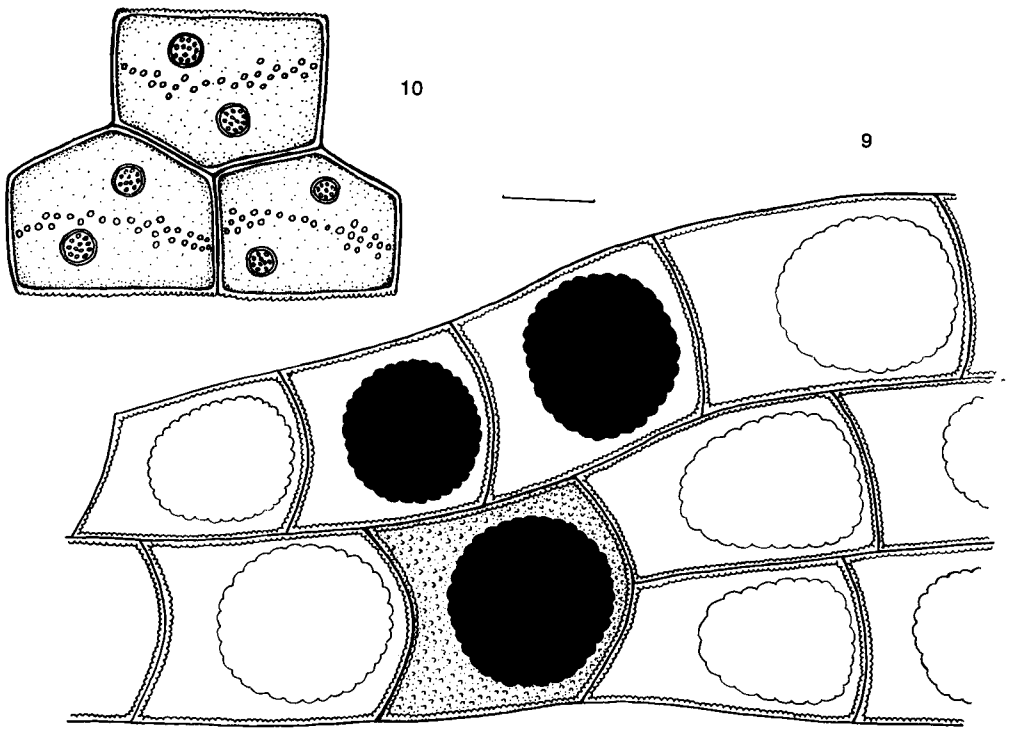
Acanthodesia grandicella Canu & Bassler, 1929: 68, Pl. 1, Figs. 9-11; Tung & Wang, 1960: 192; Wang & Cai, 1977: 17, Fig. 5.

Membranipora lamellosa (*pars*) - Huang *et al.*, 1990: 741, Fig. 4C; Li, 1989: 107 (not of Canu & Bassler, 1929).

Material. - No.84BYT1897, No.63BYT0205, No.84BET6959, No.67BET0541, No.65BET0757, No.84BET1454, No.84BET5355, No.84BET5357, No.84BET5360, No.87BST0757, No.86BST4691, No.86BST4697, No.86BST4698, No.63BST4677, No.63BST4679, No.66BST7075, No.66BST7077, No.62BBS7075, No.59BBS7077, No.62BST4145, No.62BST4153.

Description. - Colony encrusting-erect, uni- or bilaminar, yellowish or yellow-brown. Zooids rectangular or quadrangular, arranged quincuncially, distinct, and separated by fine grooves. Mural rim raised, and denticulate on its free edge. No gymnocyst. Frontal membrane large, occupying the whole of the frontal area. Cryptocyst marginal, smooth or granular on its surface, and serrated on its inner border. Mural porechambers on transverse wall small, uniporous, and arranged in 2-3 transverse lines on the distal half of the wall. A longitudinal row of 3-4 multiporous mural porechambers on lateral wall, near the side of the frontal membrane.

Remarks. - This species is also one of the commonest fouling bryozoans from the north to the south of China. Like *M. savartii*, it can encrust any underwater object. Unilaminar colonies are like a circular dish, with a raised and undulating border. The raised border is different from the central portion of the colony in that it consists of two layers of zooids. Large-sized vincularian colonies of this species cannot be distinguished from those of *M. savartii* by their colonial form. Only by its zooidal features can the present species be distinguished from *M. savartii*. Besides the zooidal size (*M. grandicella* being always larger than *M. savartii*), *M. grandicella* is obviously distinct from *M. savartii* in its cryptocyst, which is serrated along the whole of its inner edge. In *M. savartii*, the cryptocyst is serrated disto-laterally, and smooth proximally, with a coarsely toothed median proximal process. Another zooidal feature by which the present species can be distinguished from *M. savartii* is the mural porechambers on the transverse wall. They



Figs. 9-10. *Membranipora grandicella* (Canu & Bassler) (scale: 0.2mm). 9, part of a uniaminar colony showing zooids with serrated mural rim and granulated cryptocyst. (locality: the South China Sea, 21° 00′ N, 114° 30′ E). 10, uniporous and multiporous mural porechambers on the transverse walls of three zooids in a bilaminar peony flower-shaped colony. (locality: Qingdao, Shangdomg Province).

are generally small and uniporous, and arranged in transverse lines on its distal half (i.e., at the position of the transverse median line of the wall); although there may sometimes be two multiporous mural porechambers on the wall, they are irregularly scattered and never have the side-by-side arrangement occurring in *M. savartii.*

In their original description, Canu & Bassler (1929) described the cryptocyst as smooth on its surface. However, the cryptocyst in our specimens is usually granular (sometimes densely granular, sometimes much less so), though there are some colonies (uni- or bilaminar) in which zooids have a smooth cryptocyst. There is variation in the size of zooids even in the same colony. As a rule, the most distal zooid of a row is the largest, as much as 1.5 - 2.0 times the length of the most proximal zooid of the row. Opesiae also vary in size depending on the development of the cryptocyst: the more developed the cryptocyst, the smaller the opesiae. Canu & Bassler (1929) described the opesia as elongate ellptical, but it is not true for our specimens, in which the opesiae are elongate elliptical, oblong, oval or circular. This also depends on the development of the cryptocyst.

Since 1929 when it was established by Canu & Bassler from the vicinity of Hong Kong (21°33'N, 116°15'E), it has not been recorded beyond Chinese waters and is probably endemic to China.

Localities. - Shandong Province: Changshan Islands, Qingdao; Jiansu Province: Lianyungon Habour; Zhejiang Province: Chengsi Island, Zhenhai, Haimen Habour, Dachen Island, Nanji Island; Fujian Province: Pingtao, Nishan Island, Xiamen (Amoy), Dongshan Island; Guangdong Province: Daya Bay, Hong Kong, the mouth of Zhunjian River and its neighbouring districts, Qiongzhou Strait, Zhangjian; Guangxi Province: Faungchen Habour, Dongxing, Beipu Bay; Hainan Province: Yulin Habour, and Yinggehai. Wang & Cai (1977) reported the species from Dachen Island, Qingbin Island, Dongtou (Zhejiang Province) and Xiamen (Fujian Province). 0-80 m.

Distribution. - China.

Membranipora eriophoroidea, new species
(Figs. 11-13)

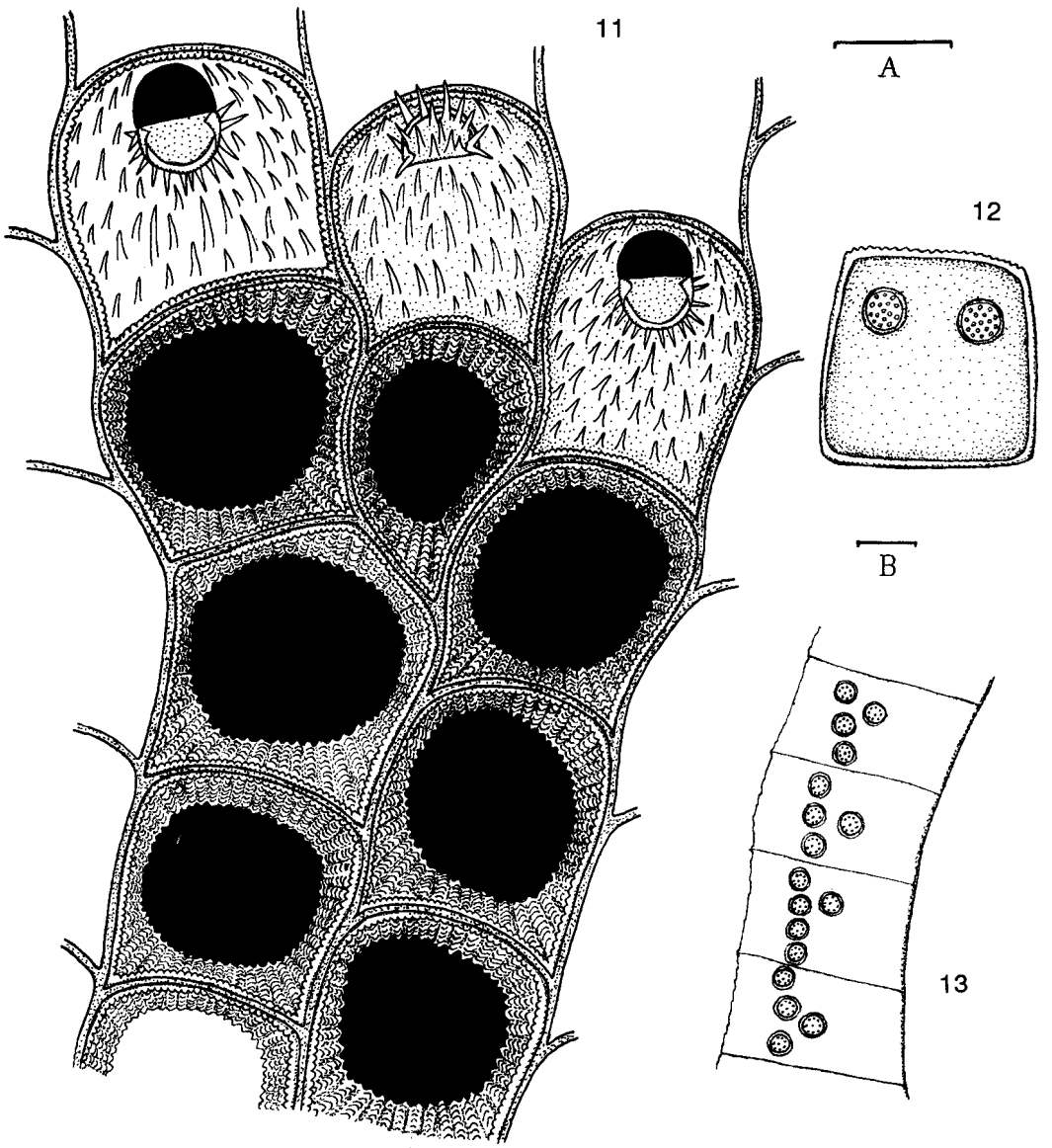
Material. - Holotype - No.59BBS160, South China Sea (21°30'N, 116°00'E) depth 250 m, mud-sandy bottom with shells and gorgonians, 21.xi.1959; colony on dead gorgonian.

Description. - Colony encrusting, yellow, forming an irregularly shaped tubular coat, investing the peripheries of gorgonian branches. Zooids nearly quadrate or pentagonal, arranged in radiating lines, distinct, and separated by deep grooves. Mural rim very raised and bead-like on its edge. No gymnocyst. Frontal membrane large, occupying the whole of the frontal area. Frontal membrane and operculum covered by many chitinous spinules; operculum small, semicircular, wider than long, and with a fine sclerite along its semicircular margin. Cryptocyst well developed, marginal, serrated on its inner border; marked with many radial costae directed toward the centre of the zooid, formed by regular arrangement of cryptocystal granules in radiating lines. A radial furrow present between neighbouring coastae. Two large multiporous mural porechambers on transverse wall. Four or five small and multiporous mural porechambers on lateral wall, three or four arranged in a longitudinal row near the side of the frontal membrane, one at the median position of the longitudinal median line of the wall.

Remarks. - In each zooidal row, except for the distalmost zooid, which is pentagonal and whose distal border is curved distally at a curvature of about 120°, the rest of zooids are quadrate, parallel laterally and disto-laterally, and angular at the proximal corners of every zooid. The distalmost zooid gives rise to two daughter zooids, one of which is smaller than its successor, pointed proximally and wedged between its two adjacent zooids; the other is similar to its successor in shape and size.

This new species is similar to *Conopeum eriophora* (Lamouroux, 1816) in most of its zooids being quadrate, and in its frontal membrane and operculum bearing chitinous spinules. Apart from their colony growth nature being distinct, the new species differs from Lamouroux's species in its spinules being variable in number and irregular in their arrangement on the membrane and operculum. It also differs in the absence of long lateral spinules at the proximal corners of the operculum, which are characteristic of Lamouroux's species. The characteristic radiating arrangement of the granules on the cryptocyst is never found in Lamouroux's species.

Membranipora eriophoroidea is also similar to a tubular colony of *M. arborescens* (Canu & Bassler, 1928) in its colony form, but is easily distinguished from the latter species by its



Figs. 11-13. *Membranipora eriophoroidea*, new species (scale: A for 11-12, scale: B for 13; both 0.2mm). 11, part of a colony showing zooids with bead-like mural rim, and granulated marginal cryptocyst. Deep interzooidal grooves can be seen between neighbouring zooids, and also chitinous spinules on the frontal membrane and operculum, and radiating arrangement of the grains on the cryptocyst. 12, two multiporous mural porechambers on the transverse wall of a zooid near the side of the frontal membrane in the same colony. 13, mural porechambers on the lateral walls of four zooids in the same colony. (locality: the South China Sea, 21° 30′ N, 116° 00′ E).

characteristic radiating arrangement of granules on the cryptocyst, and by the inner margin of its cryptocyst having only a simple serration without any obvious denticles (cryptocystal spinules).

Locality. - The coastal waters off Guangdong Province (21°30'N, 116°00'E), 250m.

Distribution. - Southern China.

Membranipora irregulata, new species
(Figs. 14-18)

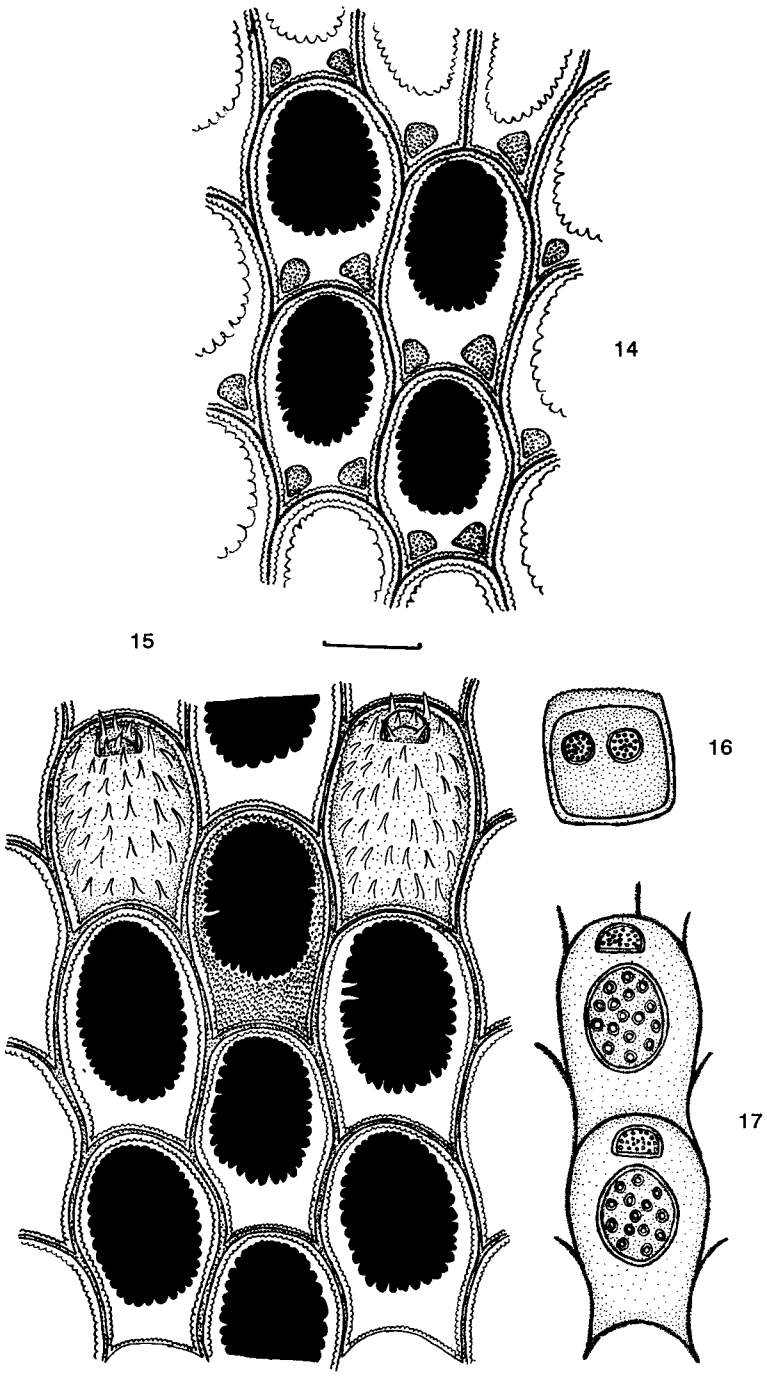
Acanthodesia lamellosa - Tung & Wang, 1960: 191, 193, 200; Wang & Cai, 1977: 17, 24, Fig. 6 (not of Canu & Bassler, 1929).
Membranipora lamellosa - Li, 1989: 107 and some Chinese authors (not of Canu & Bassler, 1929).

Material. - Holotype - No. 84BBE020, off Niushan Island (26°25'N, 120°20'E), depth 20 m, mud-sandy bottom with corals, gravel, shells and gorgonians, 11.iv.1984; multilaminar colony on a shell.

Paratype - No. 85BBT025, Daya Bay, Guangdong Province, 25.iv.1985; unilaminar colony on a shell of *Pinctada martensi*.

Other specimens - No. 87BBS750, Nansha (Spratly) Archipelago (2°43'87"N, 110°45'14"E), depth 46 m, sandy bottom with shells, 11.v.1987; unilaminar colony on a shell of *Natica spadicea*. — No.85BBS915, northwest of Macclesfield Bank (16°12'N, 114°39'E), depth 100 m, coral reefs, 14.ix.1985; unilaminar colony on the base of a dead gorgonian. — No. 60BBS050, South China Sea (18°15'N, 111°00'E), depth 22 m, mud-sandy bottom with shells, 12.iii.1960; young colony on a shell. — No. 85BBT025, Daya Bay, Guangdong Province, 25.iv.1985; unilaminar colony on a shell of *Pintada martensi*. — No. 84BBE021, off Niushan Island (26°25'N, 120°20'E), depth 20 m, mud-sandy bottom with corals, gravel, shells and gorgonians, 11.iv.1984; many uni-, bi- and multilaminar colonies on corals, stones, gravel, shells and plastic articles. — No. 59BBS152, South China Sea (20°00'N, 111°15'E), depth 52 m, sand-muddy bottom with corals and shells, 14.i.1959; 2 multilaminar colonies on a dead gorgonian. — No. 84BBT015, Xiamen (Amoy), Fujian Province, 31.iii.1984; 3 unilaminar colonies on a shell and a gravel piece.

Description. - Colony encrusting, yellowish, yellow-brown or dark-brown, forming a unilaminar or bilaminar encrustation or a multilaminar and irregularly-shaped mass on the substratum. Zooids hexagonal, elliptical or oval, round distally, angular at their proximal corners, arranged quicuncially or radially, distinct, and separated by interzooidal grooves through which run red-brown chitinous lines. No gymnocyst. Frontal membrane large, occupying whole of frontal area. Chitinous spinules on surface of membrane and operculum, variable in number and located irregularly on surface. Cryptocyst well developed, marginal, wider proximally than disto-laterally, spinulated on its inner border, granular on its surface. Operculum small, semicircular, wider than long, with a sclerite along its semicircular margin. Two multiporous mural porechambers on transverse wall near the frontal side. Two or three multiporous mural porechambers on lateral wall, at medio-longitudinal line of the wall. A semicircular distal multiporous porechamber and much larger oval central multiporous porechambers present on the basement membrane of the zooid in a multilaminar colony. Kenozooids irregular in size and shape, intercalated among autozooids. Ancestrula twins



Figs. 14-17. *Membranipora irregulata*, new species (scale: 0.2mm). 14, part of a multilaminar colony showing zooids with bead-like mural rim and two globose turbercles on the proximal corners of the cryptocyst. 15, another part of the same colony showing zooids with bead-like mural rim and granulated spinose marginal cryptocyst. Chitinous spinules can be seen on the frontal membrane and operculum. 16, two multiporous mural porechambers on the tranverse wall of the zooid in the same colony. 17, Multiporous mural porechambers on the basal walls of the two zooids in the same colony. (locality: Niushan Island, 26°25′N, 120°20′E, Province Fujian).

unequal in size, with a granular cryptocyst and a granular gymnocyst. One or two spherical tubercles sometimes present on the proximal cryptocyst of some zooids.

Remarks. - Features characteristic of this new species are as follows: (1) unilaminar or multilaminar nature of the colony depends on the dimension of the attachment area provided by the substratum; (2) chitinous spinules not constant in number nor regular in their position on the frontal membrane and operculum; (3) presence of red-brown chitinous lines through the grooves between neighbouring zooids; (4) salient mural rim bead-like; (5) cryptocyst well-developed, coarsely serrated (i.e. spinulated) on its inner margin, and densely granular; (6) form of zooids and their arrangement within a colony determined by the area available for attachment. On substrata such as flattened shells and stones, which have a large attachment area, the zooids are usually regularly hexagonal and arranged quincuncially, while on substrata such as gorgonian branches and plastic threads, which provide only a small attachment area, zooids are oval, irregularly-quadrangular,-pentagonal, or-hexagonal and arranged irregularly in radiating lines.

The kenozooids intercalated among autozooids are surrounded by red-brown chitinous lines. Some of the kenozooids have a frontal membrane and an extensive cryptocyst with granular surface and serrated inner border while others have no opesia, the cavity under the frontal membrane being fully covered by the granular cryptocyst. Some zooids in a uni-, bi-, or multi-laminar colony have two granular spherical tubercles on the proximal cryptocyst.

The "*A. lamellosa*" reported by Tung & Wang (1960) and Wang & Cai (1977) from the coast of Zhejiang Province is not the species of Canu & Bassler (1929), but is similar to the multilaminar colonies of *M. irregulata* (No.84BBE020, No.84BBE021) in our collection from Zhejiang and Fujian Provinces. Careful examination of a fragment split from a multi-laminar colony, sent to the author by Associate Professor Wang Fu-Tsing, showed that their specimens from Zhejiang Province bear a resemblance to our holotype, and to other multilaminar samples, in both colony and zooidal characters. In *Membranipora (Acanthodesia* in Canu & Bassler, 1929) *lamellosa*, the colony "is a globose plurilamellar mass. ....The mural rim is thin, finely denticulated." From their Plate I, Figure 2, the species of Canu & Bassler has a narrow cryptocyst finely serrated on its inner border and a large elongate opesia. These features characteristic of *M. lamellosa* are distinct from those peculiar to this new species. Also, "*A. lamellosa*" reported by some marine fouling surveys (for example, Huang & Cai, 1984) is certainly not the species of Canu & Bassler. Some records may be of *M. grandicella* (if the fouling samples are unilaminar) while others may be referred to the new species (if the samples are multilaminar).

This new species (if its colony is unilaminar) is somewhat similar to M. *eriophroidea*, new species, in the chitinous spinules on its frontal membrane and operculum, but differs from the latter in having red-brown chitinous lines running through the interzooidal grooves, and in its cryptocyst granules being displayed irregularly.

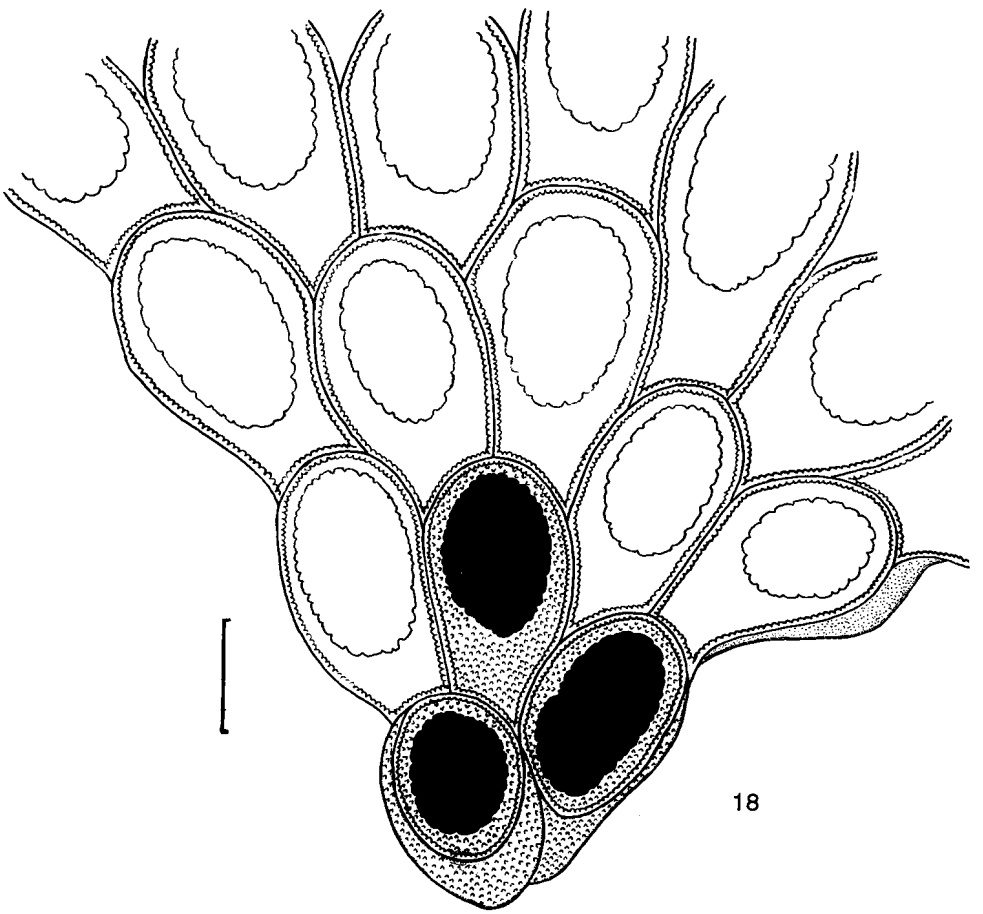
In cases where the proximal spherical tubercles are wanting, a multilaminar colony of *M. irregulata* may resemble *Conopeum commensale* Kirkpatrick & Matzelaar, 1922, but may be distinguished from *C. commensale* by its zooids having no gymnocyst which is present with paired, coalscent tubercles in *C. commensale*, and by the abundance of chitinous spinules on the frontal membrane in *C. commensale*.

This new species bears a resemblance to *M. arborencens* (Canu & Bassler, 1928: 15-16, Pl. 1, Figs. 2-5; Cook, 1968: 121-125, Pl. 1, Figs. B,C,D, Pl. 2, Fig. E, Text-fig. 2) in having uni-

, bi-, and multilaminar colonies, in the abundance of chitinous spinules on the frontal membrane, and in the presence of simple cryptocystal spinules on the cryptocystal inner margin, but may be distinguished from *M. arborencens* by the absence of the proximal gymnocyst which is remarkable with paired tubercles in *M. arborencens*, by its two multiporous porechambers on the basal wall of the zooids in a multilaminar colony, which are never found in the multilaminar encrusting colonies of *M. arborencens*, by its ancestrula twins being unequal in size, and by the spherical tubercles (if present) being on the proximal cryptocyst, rather than occurring on the proximal gymnocyst in *M. arborencens*.

Localities. - Pohai Bay (the waters off Hebei and Liaoning Provinces); Zhejiang Province: Dachen Island; Fujian Province: Niushan Island, Xiamen; Guangdong Province: Daya Bay; Hainan Province: northwest and southeast waters off Hainan Island, Macclesfield Bank and Nansha (Spratly) Archipelago. Tung & Wang (1960) and Wang & Cai (1977) reported this species from Dongtou, Xingsha Habour, Putuo Island and Hulu Island (Zhejiang Province). 0-100m.

Distribution. - China.



Figs.18. *Membranipora irregulata*, new species (scale: 0.2mm). Part of a young colony showing twin ancestrula and periancestrulae. (locality: the South China Sea, 18°15′N, 110°00′E).

Membranipora bifloris (Wang & Tung, 1976)

(Figs. 19-22)

Acanthodesia bifloris Wang & Tung, 1976: 302-310, Figs. 1, 2; Wang & Cai, 1977: 17, Fig. 25.
Membranipora serrilammella, Huang *et al.*, 1990: 741, Fig. 4E (not of Osburn, 1950).

Material. - No.59BYT1015, No.84BYT1072, No.59BYT1051, No.58BYT3536, No.86BST1639, No.85BST1642.

Description. - Colony encrusting-erect, uni-bilaminar, white or yellowish. Zooids rectangular or elliptical, arranged in radiating lines, distinct, and separated by fine grooves. Mural rim thin, finely serrated and raised. Gymnocyst absent or vestigial. Frontal membrane large, nearly occupying the whole of the frontal area. Cryptocyst descending, serrated on its inner border, and granular on its surface. Operculum with the same size and shape as the orifice, longer than wide, and with an arched chitinous sclerite along its semicircular margin. A hollow globose spine present on each distal corner of the zooid. Two large, multiporous mural porechambers on transverse wall. Four multiporous mural porechambers on lateral wall, arranged in a longitudinal row near the side of the frontal membrane.

Remarks. - The hollow spine at each distal corner is a constant feature of this species. It is actually a hollow, expanded, spherical structure. Its base, by which it is attached to the distal gymnocyst beside the orifice, is a fine stalk and its free globose portion gives rise to several spine-like processes, so that the entire structure takes the shape of a flower. Another constant feature of this species is the granular ornament on the cryptocyst. However, the granular ornament in older colonies is distinct from that in younger colonies. In the latter case the grains are irregularly scattered on the cryptocyst while in the former they are regularly arranged in radiating costae directed towards the centre of the zooid.

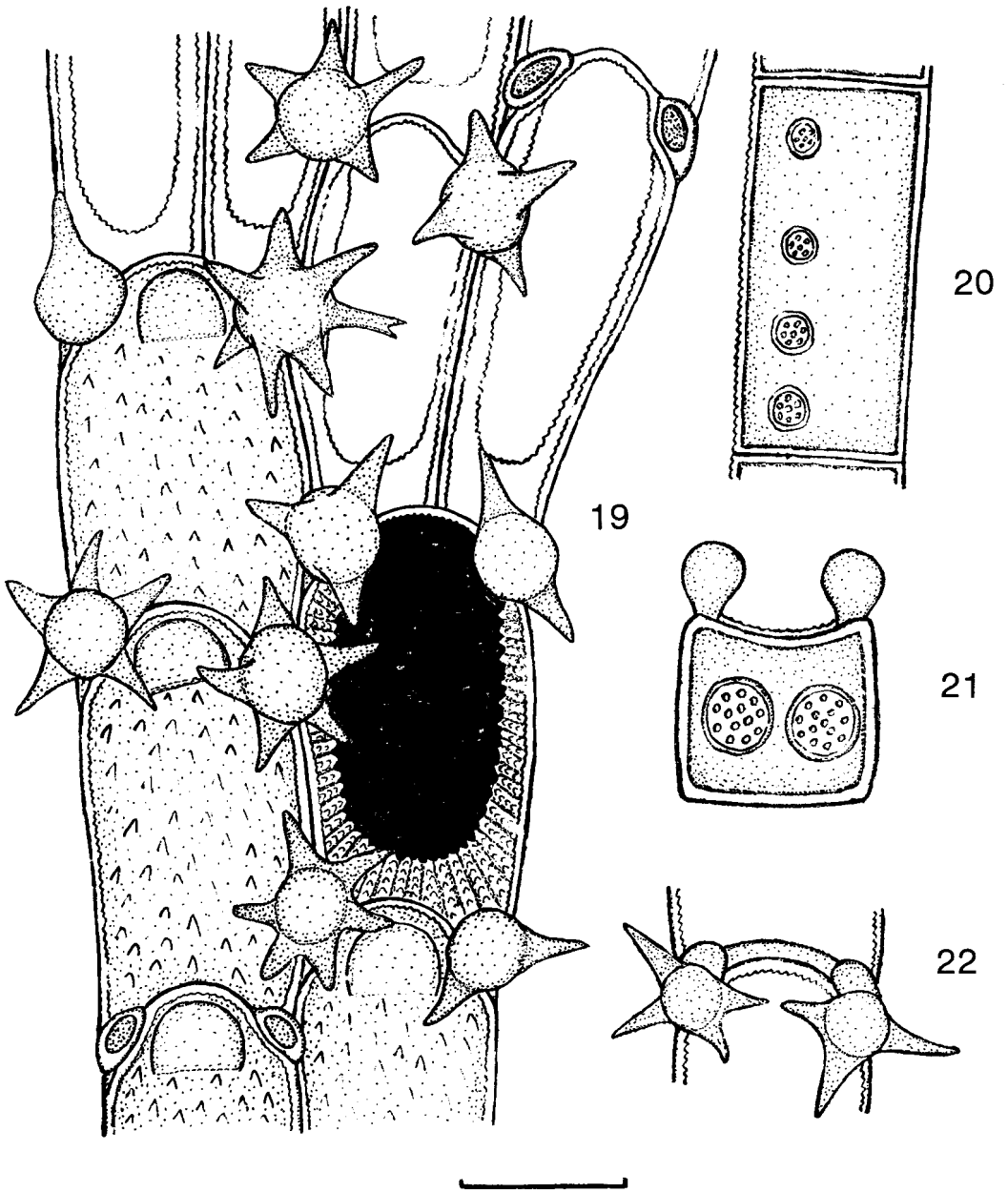
According to the original description given by Wang & Tung (1976), there are many fine chitinous spinules on the frontal membrane and the operculum. However, we found that the chitinous spinules are not always present. Even in colonies collected from the same locality, for example from Qingdao, some have such chitinous spinules and others have not. Moreover, in most of our specimens no spinules are found.

Most of the colonies in our collection are composed of one layer of zooids. However, a colony from the south of the Yellow Sea (30°00'N, 121°00'E) consists of two portions: a narrow encrusting base and an irregularly shaped lobate portion. The encrusting base consists of unilaminar zooids while the lobate portion is composed of bilaminar zooids and is formed from the encrusting base by the upright growth of adjacent zooids.

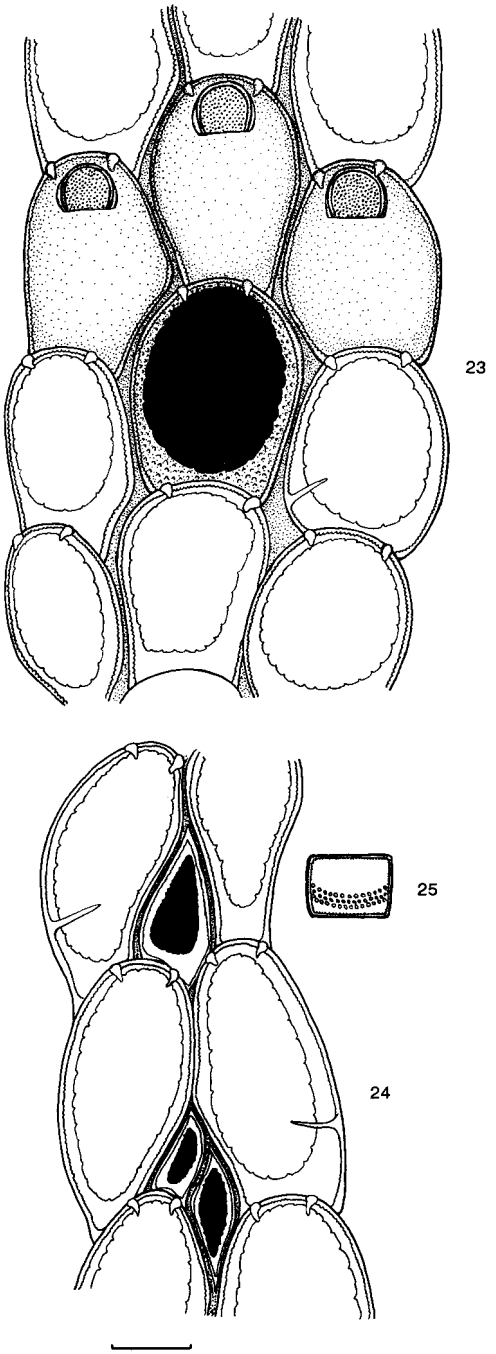
"*M. serrilamella*" reported by Huang *et al.* (1990), after re-examination, is certainly not the species of Osburn (1950), but some fragments of a young bilaminar frond of *M. bifloris*.

Localities. - Hebei Province: Pohai Strait; Shandong Province: Changshan Island, Zhifu Bay (off Yantai Habour), Jiaozhou Bay (off Qingdao), southern coast of Shandong Peninsula; Guangdong Province: off Shawei Habour. Wang & Tung (1976) and Wang & Cai (1977) reported the species from Hulu Island and Lu Island (Liaoning Province) and Dongtou (Zhejiang Province).

Distribution. - China.



Figs. 19-22. *Membranipora bifloris* (Wang & Tung). (scale: 0.2mm). 19, part of bilaminar frond showing zooids with serrated mural rim, granulated, serrated descending cryptocyst, and short chitinous spinules on the frontal membrane, can be seen. 20, multiporous mural porechambers on the lateral wall of a zooid in the same form. 21, two multiporous mural porechambers on the transverse wall of a zooid in the same frond. 22, two flower-shaped distal spines and their stalk attaching on the disto-lateral gymnocyst of a zooid in the same frond. (locality: the South Yellow Sea, 36°00′N, 121°00′E).



Figs. 23-25. *Membranipora bispinosa*, new species (scale: 0.2mm). 23, part of a colony showing zooids with serrated mural rim, granulated, serrated marginal cryptocyst, two distal and one lateral spines, derived from the mural rim. Calcareous deposit can be seen on the operculum, and also wide interzooidal grooves between neighbouring. 24, another part of the same colony showing zooids with distal and lateral spines on the mural rim, and irregulary-shaped kenozooids intercalated among autozooids. 25, three curved series of uniporous mural porechambers on a transverse wall of a zooids in the same colony. (locality: Lianyungon Harbour, Province Jiansu).

Membranipora bispinosa, new species
(Figs. 23-25)

Material. - Holotype - No.63BBT010, Liangyung Habour, Jiangsu Province, 11.xi.1963; colony on an oyster shell.

Description. - Colony encrusting, yellowish, and forming a subcircular sheet on the substratum. Zooids hexagonal or oblong, rounded distally, angular at the proximal corners, arranged in radiating lines, distinct, and separated by deep grooves. Mural rim thin, well raised, and denticulated on its inner margin. No gymnocyst. Frontal membrane large, occupying the whole of the frontal area. Operculum semicircular, longer than wide, marked with many calcareous grains on its surface and with a narrow chitinous sclerite along its semicircular margin. A conical spine, unjointed at its base, present on each distal corner of the mural rim. A lateral spine, unjointed at its base, sometimes present on proximo-lateral mural rim, and extending over the frontal membrane. Opesia oval or oblong, smaller than the membrane. Cryptocyst broader proximally than disto-laterally, serrated on its inner border, and granular on its surface. Kenozooids irregular in size and shape, often present among the autozooids. Uniporous mural porechambers on transverse wall, arranged in three curved series whose curvature is near the basal side. Three multiporous mural porechambers on lateral wall, arranged in a row at the longitudinal median line of the wall.

Remarks. - In this species, a mother zooid gives rise to two daughter zooids at the bifurcation of a zooidal row. One is similar to successive zooids in size and shape, the other is smaller, pointed proximally and wedged between the two neighbouring zooids.

A conical spine at each distal corner of the zooid is placed at the mural rim and is actually a spine-like process of the mural rim. It is nearly perpendicular to the zooidal plane at its base. The proximo-lateral spine on the mural rim of some zooids is a slender spine-like process of the mural rim, and directed inwards over the frontal membrane. Both distal and lateral spines are calcareous.

This new species is somewhat similar to *M. membranacea* (Linnaeus, 1767) in the shape of its zooids, but differs from that species in its distal spines, which are at each distal corner of the mural rim of each zooid, and in having an extensive cryptocyst. The position of the distal spines on the mural rim is a distinct feature from other membraniporid species and can be used to recognise the species from any other known species of *Membranipora*.

Locality. - Lianyung Habour, Jiangsu Province.

Distribution. - Northern China.

Membranipora lingdingensis Liu & Li, 1987
(Fig. 26)

Membranipora lingdingensis Liu & Li, 1987: 54, Pl. 1, Figs. 2, 3

Material. - S200-9, many colonies on buoys in Lingdingyan and Humen, the mouth of Zhuijiang River.

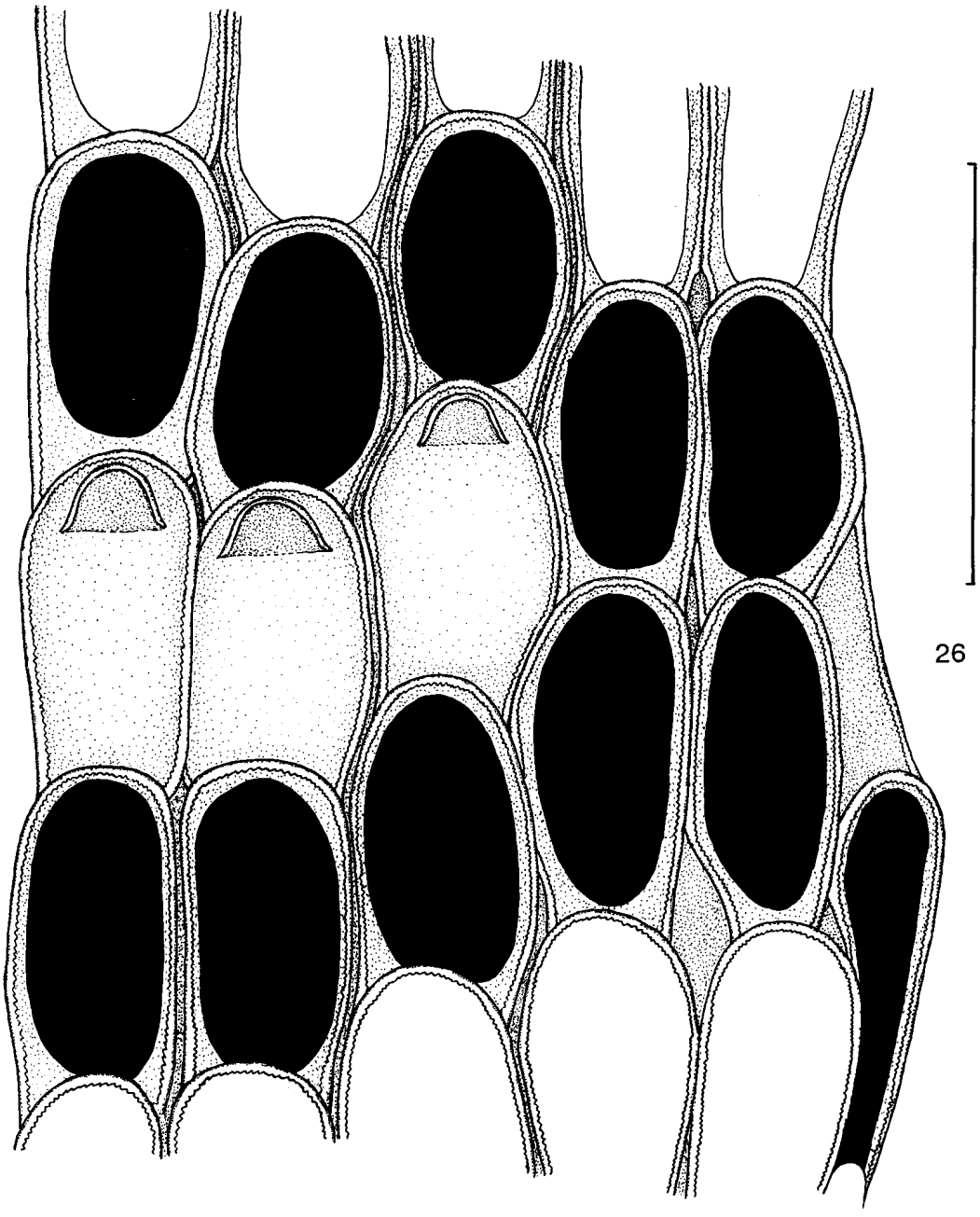


Fig. 26. *Membranipora lingdingensis* Liu & Li. (scale: 0.5mm). Part of an irregulary-branched frond showing zooids with serrated mural rim, and smooth marginal cryptocyst without serration in its inner border. Side-by-side arrangement, four marginal zooids, irregularly-shaped spaces and a kenozooid can be seen. (locality: Lingdingyan, near the mouth of Zhujian river).

Description. - Colony encrusting on the substratum by means of its proximal zooids, its major portion growing up detached from the substratum and erect. Erect portion consisting of irregularly branched bilaminar fronds of varying width. Zooids distinct, separated by fine grooves, and usually rectangular or hexagonal except for the margin of the frond where they are irregular in length and width. Zooids in the centre of the frond arranged quincuncially, those in its marginal and submarginal portion having a side-by-side arrangement. Kenozooids, lacking orifice and polypide, sometimes present on the edge of the frond, with irregular spaces sometimes intercalated among neighbouring zooids. Mural rim narrow, well raised and finely serrated on its edge. No gymnocyst. Frontal membrane occupying whole of frontal area. Cryptocyst marginal, varying in width even in different zooids of the same frond, smooth on its surface and without serration on its inner border. Operculum semicircular, with a fine chitinous sclerite along its arched margin. Many small, uniporous mural porechambers on transverse wall. Two or three large, multiporous mural porechambers on lateral wall, arranged in a row at the position of the longitudinal median line of the wall.

Remarks. - This species is a rare fouling bryozoan collected from Nos.9-16 buoys at Lingdingyan and No.1 buoy off Humen, the mouth of Zhujiang River. It has not been discovered beyond these areas up to now. It differs from other known species of *Membranipora* in the erect portion of its colony consisting of irregularly branched bilaminar fronds, varying in width, and in zooids of some fronds having different arrangement patterns: those in the centre of the frond arranged in quincuncial series while those of its marginal and submarginal portion have a side-by-side arrangement.

Localities. - Lingdingyan and Humen, the mouth of Zhujiang River.

Distribution. - Southern China.

Membranipora limosa (Waters, 1909)
(Figs. 27 & 28)

Membranipora limosa Waters, 1909: 140, Pl. 12, Figs. 1-5; Lavinsen, 1909: 145, Pl. 22, Figs. 5a-c (*Electra normani* n. sp. on the plate); Marcus, 1921: 7; Mawatari, 1974: 29, Text-figs. 4A, 4B.

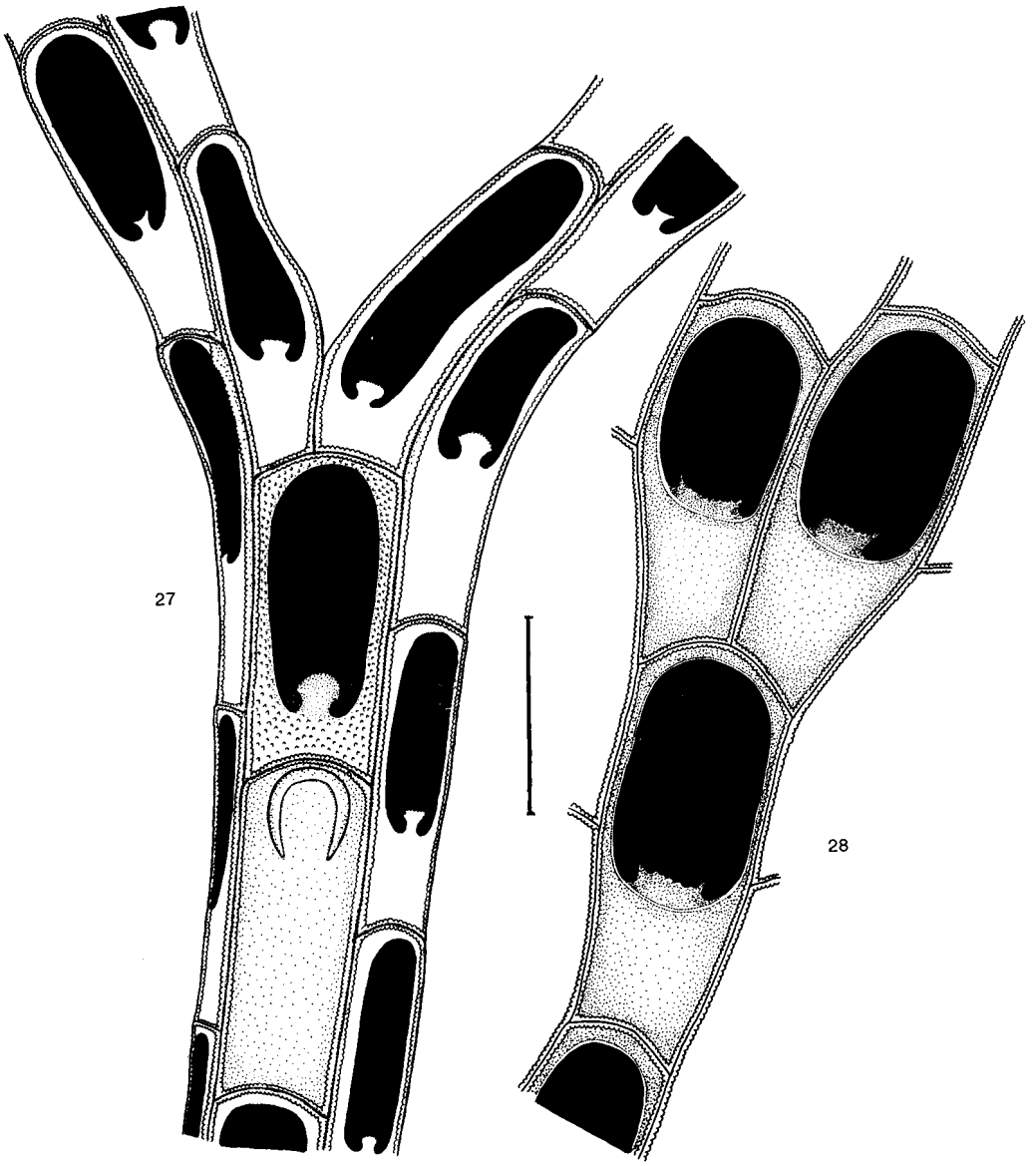
Acanthodesia limosa - Canu & Bassler, 1919: 79; 1923: 30, Text-figs. 2F-2L; Harmer, 1926: 217, Pl. 13, Fig. 17; Silen, 1941: 19, Pl. 1, Fig. 3, Pl. 2, Fig. 4.

Acanthodesia quadrata - Wang & Cai, 1977: 17, Fig. 7 (not of Canu & Bassler, 1929).

Membranipora quadrata - Li, 1989: 107 (not of Canu & Bassler, 1929).

Material. - No.66BST1335, No.86BST1515, Nos.59BBE9170-9180, Nos.629109-9115, Nos.58BBS10010-10024, Nos.59BBS1013-1019, Nos.62BBS10010-10048.

Description. - Colony encrusting-erect, white or yellowish, consisting of a unilaminar encrusting base and erect dichotomous branches, never jointed. Branches quadrilateral, each surface with a single row of zooids, usually six rows of zooids before a bifurcation. Zooids elongate-rectangular, arranged in radiating lines in the encrusting base, and displaying alternating arrangement around the axis of the branch in the erect portions; distinct, separated by deep grooves. Mural rim raised, wider laterally than distally and proximally, and bead-like on its edge. No gymnocyst. Frontal membrane large, and occupying the whole of the frontal area. Cryptocyst marginal, larger proximally than distally or laterally, flattened except for the raised



Figs. 27-28. *Membranipora limosa* (Waters). (scale: 0.5mm). 28, part of an erect branch showing mode of colonial bifurcation and zooids with bead-like mural rim, granulated marginal cryptocyst. A median proximal process varying in size and shape, and a large-sized elongate operculum can be seen. (locality: the South China Sea, 19°15′N, 111°00′E).

peripheral area of the opesia, smooth or granular on its surface; without any serration along the inner border except for the median proximal denticles protruding into the opesia. The opesia elongate-elliptical, occupying about three quarters of the frontal area. Operculum of two types: smaller-sized and larger-sized, with a robust sclerite along the arched margin. Transverse wall descending so obliquely to the narrowed base that it is the shape of a reverse round triangule, provided with two or three curved series of uniporous mural porechambers and marked with two or three hooked processes projecting into the body-cavity. Two to four multiporous mural porechambers on the lateral wall, usually arranged in a row at the position of the longitudinal median line of the wall.

Remarks. - This species has been usually collected from muddy bottoms of the East China Sea and the South China Sea, and is one of the main bryozoans occurring in benthic communities, but sometimes may be present in fouling communities in coastal waters of Southern China. It is a large species; "a complete colony attains rather bushy cellaria-like mass of 5-10 cm in length" (Mawatari, 1974: 29), even exceeding 15 cm in length for the Chinese material. In Chinese specimens, zooids in the encrusting colony base are similar to those in its erect branches in form, and usually larger than the latter, both being elongate-rectangular. However, the transverse wall of a zooid in the encrusting base is transversely rectangular while the transverse wall of a zooid in the erect branches is in the shape of a reverse rounded triangule. The surface ornament on the cryptocyst is very variable. Generally, the cryptocyst has a granular ornament on its surface, but sometimes the ornament is smooth, especially for the encrusting base and for the younger erect branches. The two or three calcareous hooked processes on the transverse wall, which were described by Levinsen (1909), are seen in many Chinese samples and they are in a developed state in these specimens. The multiporous mural porechambers on the lateral wall range from two to four in number in our materials. When there are two, as shown by Levinsen (1909) and Harmer (1926) as well as Mawatari (1974), they are in the distal half of the lateral wall; when three, they are in the distal two-thirds of the wall; when four, they are uniformly arranged in a row at the position of the longitudinal median line of the wall. All three mural porechamber arrangements on the lateral wall may be discovered in the same colony.

"*Acanthodesia quadrata*" reported by Wang & Cai (1977) and recorded by some Chinese marine ecologists in papers (Huang & Cai, 1984; Li, 1989) on fouling organisms, is certainly not the species of Canu & Bassler (1929: 69, Pl. 1, Figs. 6, 7). According to Canu & Bassler's original description, the colony of *M. quadrata* is "free and formed of small, quadrangular rods". "The four faces of the colony are not always identical" (Canu & Bassler, 1929: 69). The colony of *M. limosa* consists of an encrusting unilaminar base and dichotomous branches, each face (i.e., every longitudinal row of zooids) of the branch is identical. Besides the differences in the colonial features of *M. limosa* and *M. quarata*, the two species are distinct from each other in their zooidal features; for example, the cryptocyst in *M. quadrata* is always smooth while the cryptocyst is usually granular in *M. limosa*.

Localities. - Fouling samples from buoys off Shanwe Habour and the buoys on Qiongzhou Strait, Guangdong Province. Most of our samples were collected from coastal waters of the East China Sea and the South China Sea, including 85 sampling stations (from 16°30'N to 28°30'N, from 107°00'E to 126°00'E), with depth range of 25-120 m. The species is usually associated with cellularine bryozoans such as *Scrupocellaria diadema*, *Scrupocellaria maderensis*, and *Nellia oculata*, and with enclostome bryozoans such as species of *Crisia*, or with hydroids, or attached on gorgonians.

Distribution. - Sudane Red Sea, Malay Archipelago, Japan and China (the East China Sea and the South China Sea, including the waters off Nansha Islands).

Membranipora amoyensis Robertson, 1921
(Figs. 29-32).

Membranipora amoyensis Robertson, 1921: 50, Fig. 6; Tung & Wang, 1960: 194, 200; Menon & Nair, 1975: 554, Fig. 1d-f; Wang & Cai, 1977: 16, 24, Fig. 1; Liu & Wass (in press).
Membranipora ? hastingsae (pars) - Li, 1989: 107 and some Chinese authors (not of Osburn, 1950).

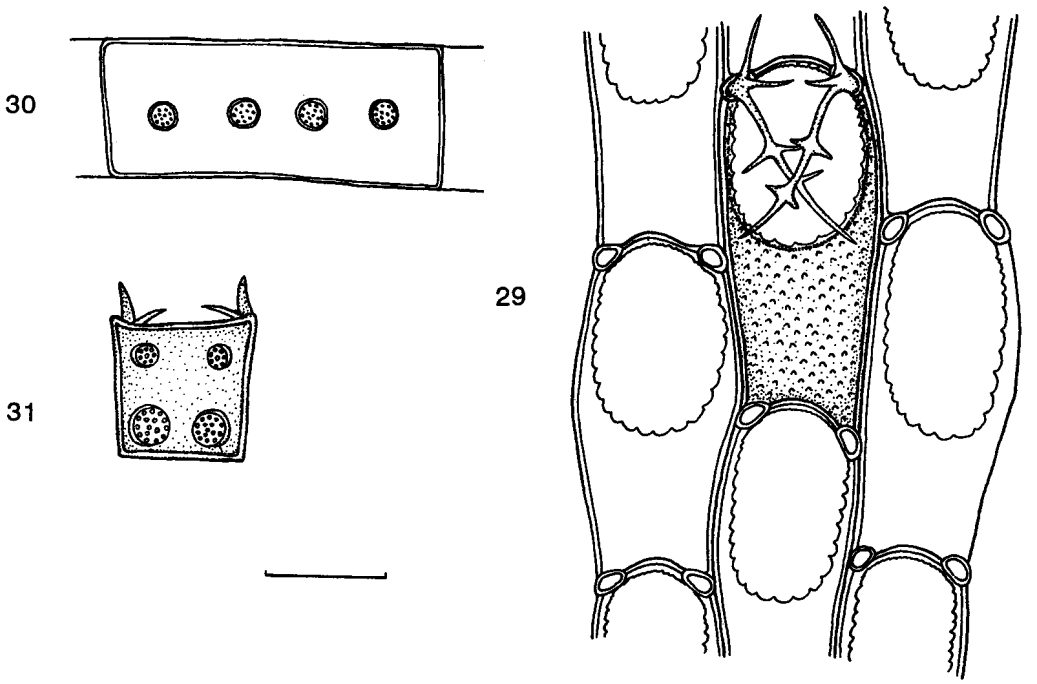
Material. - No.63BST1517, No.63BST1619, No.66BBE0258, No.85BST3036, No.84BET6038, No.85BET7273, No.85BET7274, No.84BET7078, No.84BET7118, No.84BET7119, No.BST0701, No.86BST0818, No.86BST0819.

Description. - Colony encrusting, unilaminar, brown or dark-brown, forming a circular patch or irregularly shaped sheet on the substratum. Zooids with larger-sized and smaller-sized types, elongate-rectangular, arranged in quincuncial series, distinct, and separated by fine grooves. Mural rim thin, slightly raised and smooth on its edge. No gymnocyst. Frontal membrane large, and occupying whole of frontal area. Cryptocyst marginal, narrowest distal to the opesia, developed laterally and proximally, smooth and granular in younger colonies, and granular on its surface in older colonies, with strong cryptocystal spinules. Opesia oval or oblong in younger colonies and gradually reduced with the development of the cryptocyst and its spinules. Operculum in larger-sized zooids duckbilled, with a robust brown chitinous sclerite at either side. A strong tri-forked spine on each distal corner of the zooid. Operculum in smaller-sized (ordinary) zooids semicircular, with a fine sclerite along its semicircular margin. Mural porechambers on the transverse wall four in number, multiporous, two smaller ones near the frontal side, and two larger ones near the basement membrane. Four multiporous mural porechambers on the lateral wall, small, arranged in a row at the position of the longitudinal median line of the wall.

Remarks. - One of the most obvious features of this species is its strong triforked spine which is situated at each distal corner of every ordinary zooid. The spine has three branches: a distal branch extending upwards and sometimes producing several branchlets, a middle branch directing inwards and never re-branching, and a proximal branch which is always descending and crossing over the frontal membrane. The proximal branch is always forked two to three even four times when it is descending. Another remarkable feature is that there are two types of zooids: smaller-sized zooids with an ordinary semicircular operculum, and larger-sized zooids with an enlarged duckbilled operculum. The larger-sized zooids have no distal spines and are intercalated among the ordinary zooids. Sometimes a larger-sized zooid may be successive to one or two larger-sized zooids. The disto-lateral wall, equivalent to about one-third the length of such an enlarged zooid, is thickened and raised, especially proximally where it provides a hinge for the duckbilled operculum. Such a structure has been found in other Membraniporoidean bryozoans, for example *Nelliella nelliformis* (see Harmer, 1926: 218, Pl. 8, Fig. 21) and *Membranipora annae* (see below). The duckbilled operculum has a robust chitinous sclerite at each side, which is extended distally, and connected proximally to the opposite sclerite by a faint chitinous bar along the proximal border of the operculum.

Robertson (1921) considered that this species was a membraniporid form living in estuarine waters with lowered salinity because of its soft colony with light calcification. Our samples were collected not only from coastal waters (including estuaries) with lowered salinity, but also from offshore waters of much higher salinity. Although some colonies from coastal waters are soft, the other colonies are much more calcified, like those collected from offshore waters. Therefore, calcification of the zooids of this species is closely associated with its surroundings and is not related to the growth nature of the species.

As shown by Robertson (1921), the colonies of the species have an undulating and folded margin. However, in our specimens undulating and folded margins of colonies were never found to consist of bilaminar sheets. Therefore, the bilaminar nature of the undulating and folded margin of the colony described by Robertson may be an exception.



Figs. 29-31. *Membranipora amoyensis* Robertson. (scale: 0.2mm) (locality: Shanwei Harbour, Guangdong Province). 29, part of a young colony showing zooids with smooth mural rim, developed granulated marginal cryptocyst, and a pair of trifurcated distal spines. 30, multiporous mural porechambers on the lateral wall of a zooid in the same colony. 31, multiporous mural porechambers on the transverse wall of a zooid in the same colony.

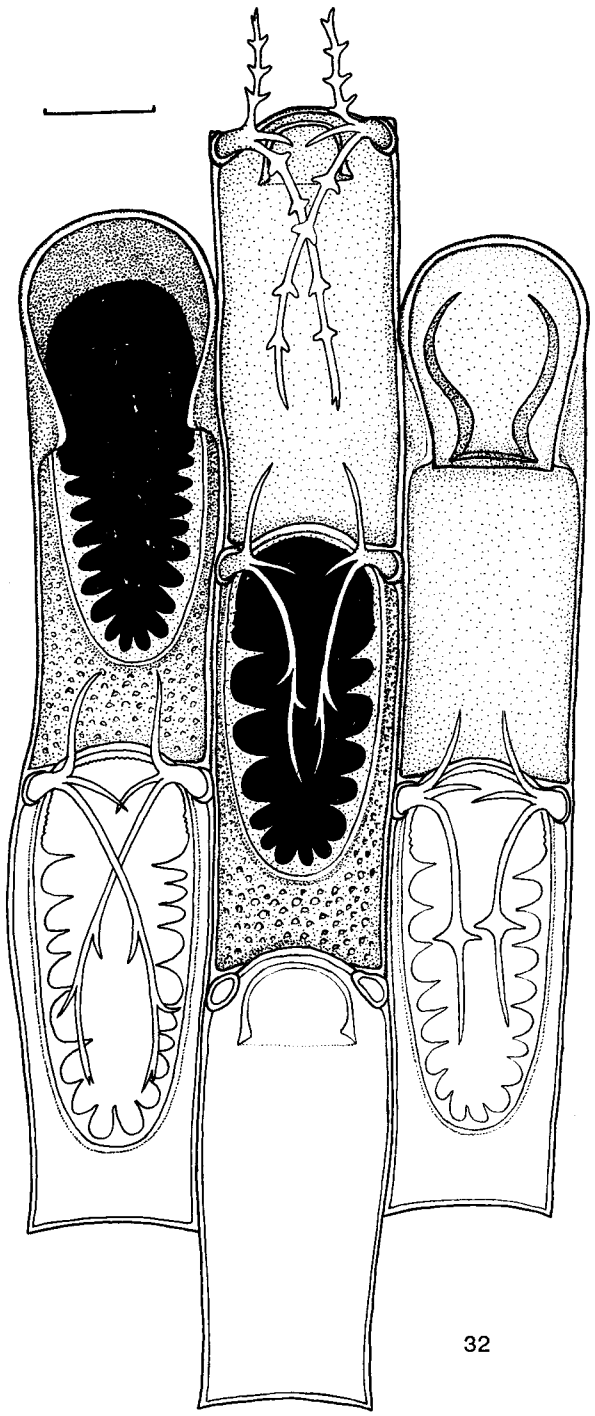


Fig. 32. *Membranipora amoyensis* Robertson. (scale: 0.2mm). Part of a colony showing ordinary zooids with distal spines and semicircular operculum, and an enlarged zooid without distal spine and with an enlarged duckbilled operculum. Strong cryptocystal spinules and granulated ornament can be seen on the cryptocyst. (locality: Boan, Province Guangdong).

This species was reported from Indian waters by N. R. Menon & N. B. Nair (1975). In the same paper they described a new species named *Alderina arabiensis* whose zooidal morphology is similar to that of *M. amoyensis*. According to their figures "*A. arabiensis*" has ovicells and has a tatiform ancestrula which has two re-biforked spines at each distal corner. It seems to me that "*A. arabiensis*" is not a member of *Membranipora*, though it looks like *M. amoyensis* in the zooidal morphology. Ovicells have never been found in *M. amoyensis* and up to now the author has no information of the early astogeny of *M. amoyensis*. For this reason, the author cannot do a detailed comparison of *M. amoyensis* with "*A. arabiensis*" at present.

Localities. - Zhejiang Province: Nanji Island, Pingyan, Zhenhai; Fujian Province: Pingtao, Niushan Island, Xihu Habour, Xiamen (Amoy), Dongshan Island; Guangdong Province: Shawei Habour, Daya Bay, Baoan, Hong Kong, the mouth of Zhujiang River and its neighbouring districts, Qiongzhou Strait and Zhangjiang Habour. 0-25 m.

Distribution.- Southern China and Indian waters (Menon & Nair, 1975).

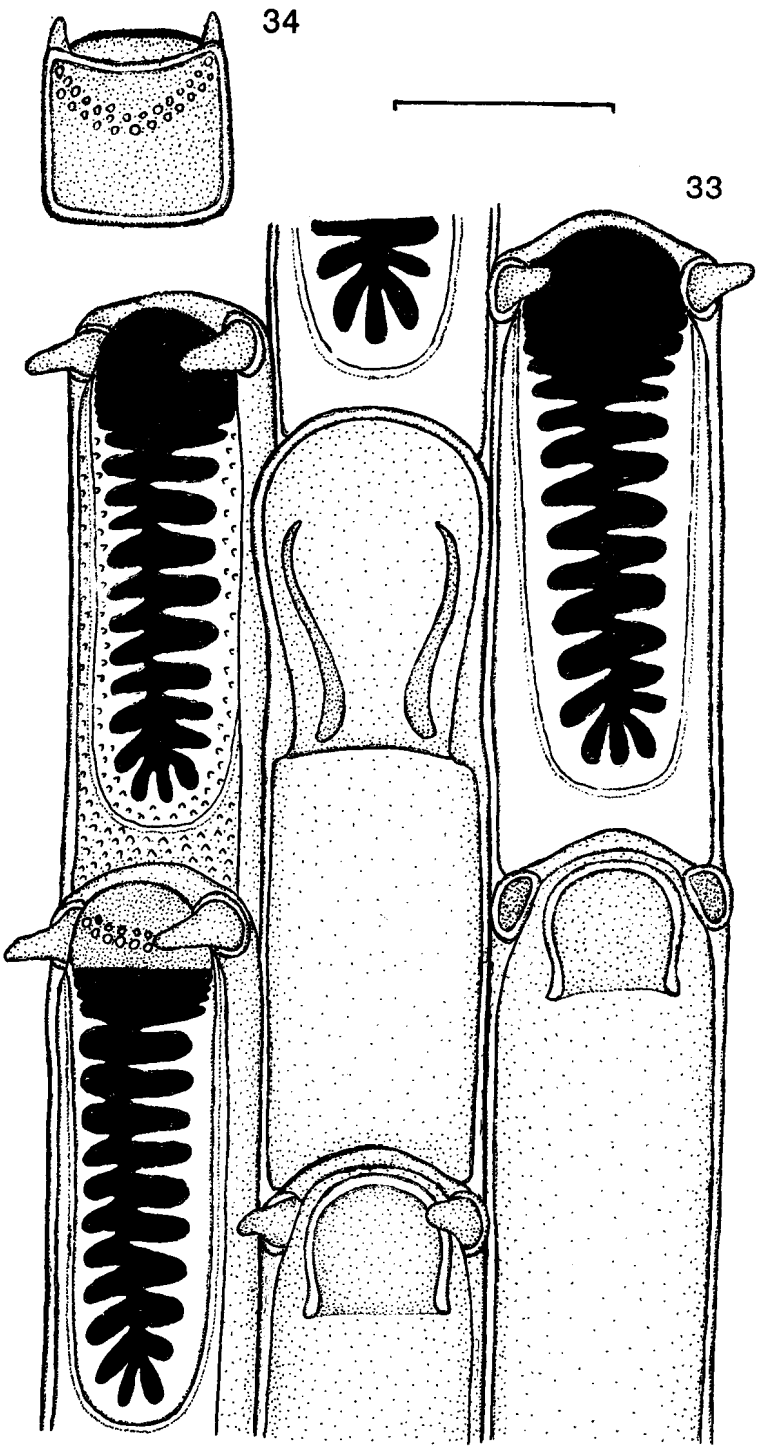
Membranipora annae Osburn, 1953
(Figs. 33-34)

Acanthodesia serrata (Hincks) - Hastings, 1930: 707, Pl. 4, Figs. 13, 14 (not of *M. membranacea* form *serrata* Hincks, 1882).
Membranipora hastigsae Osburn, 1950: 29, Pl. 2, Fig. 1 (preo. by *M. (Electra) hastingsae* Marcus, 1940).
Membranipora annae Osburn, 1953: 747; Cook, 1968: 128.
Membranipora ? *amoyensis* (*pars*) - Li, 1989: 107 and some Chinese authors (not of Robertson, 1921).

Material. - No.66BET0257, No.66BST4543, No.66BST4549, No.84BET6037, No.60BET0138, No.84BET7077, No.63BET1331, No.84BET7078, No.85BST7676.

Description. - Colony encrusting, unilaminar or bilaminar, yellowish or dark brown, forming a subcircular patch or an irregularly shaped bilaminar frond. Zooids of two types: smaller-sized zooids with an ordinary semicircular operculum and larger-sized with an enlarged duckbilled operculum. Zooids elongate-rectangular, arranged in radiating lines, distinct, and separated by fine grooves. Mural rim thin, raised and smooth on its edge. No gymnocyst. Frontal membrane large, occupying the whole of the frontal area. Cryptocyst marginal, narrowest distally, widest proximally, flattened and granular on its surface, finely serrated on its inner border disto-lateral to the orifice, and with many strong cryptocystal spinules on its inner border proximal to the orifice. Opesia elongate and reduced by the cryptocystal spinules. A strong conical spine present on each distal corner of every ordinary zooid. Ordinary operculum semicircular, longer than wide, and with a narrow chitinous sclerite along its semicircular margin. Enlarged operculum duckbilled, and with a robust chitinous sclerite at each side. Many small, uniporous mural porechambers on the transverse wall, arranged in one or two curved series; sometimes another group of small uniporous mural porechambers present on the arched area between the first series and the boundary line of the transverse wall with the frontal membrane. Six to eight large, multiporous mural porechambers on the lateral wall, arranged in a longitudinal row near the side of the frontal membrane.

Remarks. - This species is one of the main bryozoan foulers along the coastal waters of South China. Owing to the fact that this species has similar cryptocystal features to those of *M. amoyensis*,



Figs. 33-34. *Membranipora annae* Osburn. (scale: 0.2mm). 33. part of a unilaminar colony showing two kinds of zooids: ordinary zooids with two distal spines and semicircular operculum, and an enlarged zooid without distal spines and with an enlarged duckbilled operculum. Strong cryptocystal spinules and uniporous mural porechambers on the tranverse wall can be seen. 34, two curved series of uniporous mural porechambers on the transverse wall of a zooid in the same colony. (locality: Pingyan, Province Zhejiang).

especially in the strong cryptocystal spinules and the granular ornament on the cryptocyst, and that the larger-sized zooids are similar in shape in both species, and because both live in almost the same habitats, some Chinese researchers on marine fouling organisms easily confuse the present species with *M. amoyensis*, particularly when the distal spines of both species are evanescent. It is only by the curved series of uniporous mural porechambers on the transverse wall that *M. annae* can be easily distinguished from *M. amoyensis* when the distal spines of the zooids are lost; the mural porechambers on the transverse wall of *M. amoyensis* are multiporous.

Hastings (1930) described zooids with an enlarged operculum in older colonies and called such zooids incipient avicularia. They were considered to be of the same size as ordinary zooids with a semicircular operculum. According to our examinations, such zooids are always larger (i.e. longer) than the ordinary zooids, as in *M. amoyensis*. The enlarged zooids have a functional polypide and may be considered to be an intermediate between autozooids and avicularia, or may be called incipient avicularia. Usually, the enlarged zooids are intercalated among neighbouring zooids, and sometimes an enlarged zooid may be successive to one or two enlarged zooids.

Hastings' (1930) samples from Balboa in Panama Canal Zone were unilaminar, while her samples from Perles Island were mostly multilaminar (six or even more layers of zooids). In our materials, only a sample from Xihu, Fujian Province, is an irregularly shaped bilaminar frond attached to a hydroid, and the rest are unilaminar colonies. 0-15 m.

Localities. - Zhejiang Province: Zhehai, Pingyang, Shepu; Fujian Province: Xihu, Xiamen (Amoy), Dongshan Island; Guangdong Province: Shantou, Qiongzhou Strait, Zhangjiang Habour.

Distribution. - Balboa, Canal Zone (Osburn, 1950), Gulf of Panama (Hastings, 1930), East Coast of Africa (Cook, 1968), and southern China.

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