Aspects of freshwater bryozoan fauna in Italy

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Abstract: The geographic distribution and the variability of Italian freshwater bryozoan species, in relation to the different habitat, have been studied. This paper refers mainly to the distribution and variability of the three species recently discovered in Italy: *Plumatella rugosa* (WOOD, WOOD, GEIMER & MASSARD 1998), *P. geimermassardi* WOOD & OKAMURA 2004, *P. reticulata* WOOD 1988. These three species, which were also collected about forty-fifty years ago by Viganò, were present in the Italian freshwater bryozoan fauna, even if they were not classified properly. Only SEM analysis permitted to distinguish them from the other species of the genus *Plumatella*, to which were attributed, considering "variability", the differences evidenced in the colonies and in the statoblasts. Therefore, a comparison between the three species floatoblasts and those of the similar species have been performed in this study. In addition, *Lophopus crystallinus* is taken in consideration because this species is infrequently recorded. Furthermore, some ecological notes for each species are reported.

Key words: Phylactolaemata, *Plumatella rugosa*, *P. geimermassardi*, *P. reticulata*, *Lophopus crystallinus*, SEM analysis.

Introduction

The fauna of freshwater Bryozoa in Italy from 1963-1971 has been studied by VIGANÒ (1964a, b, 1965, 1966, 1968, 1969, VIGANÒ & TATICCHI 1974). Before this period only some authors referred to occasional findings of bryozoan species in our country: GARBINI 1895, DE MARCHI 1910, ZIRPOLO 1925, CANELLA 1954, CORBELLA et al. 1956, MORETTI 1958, CARRADA 1964, 1967, and JEBRAM 1976. Viganò's studies considerably increased the number of species and sites investigated. The complete list is reported as follows: *Fredericella sultana* (BLUMENBACH 1779), *Plumatella fruticosa* ALLMAN 1844, *P. emarginata* ALLMAN 1844, *P. casmiana* OKA 1907, *P. repens* (LINNÉ 1758), *P. fungosa* (PALLAS 1768), *Hyalinella punctata* (HANCOCK 1850), *Lophopus crystallinus* (PALLAS 1766), *Cristatella mucedo* CUVIER 1798, and *Paludicella articulata* (EHRENBERG 1831). From 1971 up today the studies conducted on these invertebrates regard essentially the feeding (TATICCHI 1989), the rearing (TATICCHI 1983), the enzymatic activities related to environmental conditions and to the vegetative cycle of *Lophopus crystallinus* (CECCAGNOLI et al. 1997; ELIA et al. 2001), the parasitosis related to PKD (CAFFARA et al. 2002; TATICCHI et al. 2004), the description of a new species (WOOD & OKAMURA 2004) and of three new species for the Italian freshwater bryozoan fauna (TATICCHI & PIERONI 2005), found during the revision of the samples in the Viganò collection; no one regarding the geographic distribution and the variability of species in relation to the different habitats. This paper refers particularly to the distribution and the variability of the three species recently discovered in Italy: *Plumatella rugosa*, *P. geimermassardi*, *P. reticulata* (Phylactolaemata), comparing them with similar species which were confused before with them, until the electronic microscopy (SEM) was used to evidence the characteristic microarchitecture of statoblasts. In addition to these three species also *Lophopus crystallinus* will be taken in consideration because this species is infrequently found.

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Materials and methods

The study on Italian freshwater bryozoans started in 2000 since it became necessary to know the most widespread species in fish-farms. In fact, recent studies evidenced that bryozoans are most likely alternate hosts of *Tetracapsuloides bryosalmonae* (CANNING, TOPS, CURRY, WOOD & OKAMURA 2002) (CANNING et al. 1999, 2002). The research was extended to natural biotope such as lakes, rivers, artificial channels, swamps, etc., which directly or indirectly are in communication with the same fish farms. The examined samples from 2000 came from 30 sites (Fig. 1). While in the farms samplings were repeated monthly through the period of bryozoan presence, in the other sites samplings were carried out only one time. The samples were in part fixed in the field in 70 % ethanol and in part transported to the laboratory still alive. From each colony, zoecial tubules, the richest in statoblasts, floato- and sessoblasts, were isolated in order to ensure sufficient material for both light microscope and SEM. In this way the observed statoblasts surely belong to the same species. Some statoblasts, after treatment with KOH, were observed with an Olympus CX 41 phase contrast microscope. The statoblasts were measured with image analysis Olympus DP soft system. The measures on the dorsal and ventral valves were: L = whole length; W = whole width; l = capsule length; w = capsule width; A = polar annulus width; a = lateral annulus width; F = fenestra length; f = fenestra width. Moreover, the ratios calculated are the following: L/W, l/w, F/f, A/a for both dorsal and ventral valves. The remaining statoblasts were treated with KOH for 30" and washed in deionized water, freeze-dried in a freezer (WOOD & WOOD 2000), fixed to aluminium stubs and sputter-coated with gold-palladium and viewed in a Philips XL 30 SEM. As to the classifications, the taxonomic key to freshwater Bryozoa of North America (WOOD 2001b) was also consulted and with regard to the description of floatoblast sutures, the nomenclature of REYNOLDS (2000) was followed.

Results

In Table 1 are reported the sites where *Plumatella rugosa*, *P. reticulata*, *P. geimermassardi*, and *Lophopus crystallinus* were collected during this research.

Plumatella rugosa (WOOD, WOOD, GEIMER & MASSARD 1998)

In the samples of the Viganò collection this species was recorded only for the lakes Candia, Alserio, Trasimeno and Cogolli (Fig. 1; TATICCHI & PIERONI 2005). With the increased number of the examined sites, the Italian areal of this species extended to whole Italy; in fact in addition to the recorded localities (TATICCHI & PIERONI 2005) now we can add also the sites 9, 15, 18, 25, 27, 28. The colonies can show different shapes according to the substrate: open if the support is made of stones (Fig. 2), a honeycomb-like cushion, or a bush if it grows on a wooden stick (Fig. 3). The tubules have the shape of a club (Fig. 4), or are fused together as in *P. fungosa* (Fig. 5); they are more or less encrusted and the keel and the emargination are not very clear; the septa are present at times. The statoblasts of the Italian material have already been described by TATICCHI & PIERONI (2005), however with the extended number of sampling sites, we can further add morphological characteristics linked to the variability of the species. The dorsal valve of the floatoblast is reticulated on both the annulus and the fenestra as in *P. fungosa*, but unlike this species the annulus lacks interstitial tubercles; the interstitial tubercles of the fenestra are more evident to the border with the annulus, in the central part they are completely missing (Fig. 6) or flattened (Fig. 7). The polar grooves are very evident (Fig. 8). The reticulum cells of the ventral valve are smaller, especially on the fenestra, and the interstitial tubercles are evident only at the border annulus-fenestra (Fig. 9). Nodules can be absent or scattered on the annulus (TATICCHI & PIERONI 2005), or abundant on the fenestra and the annulus, like in the specimens from the site 18 (Fig. 10). On the medial rib we can see beads, demarcations and lateral ribs, that are the prolongation of the reticulum, the cells delimitate the parasutural zone and contain each one an interstitial tubercle more or less evident (Fig. 11). Because of *P. rugosa* was often called *P. fungosa* or *P. repens*, in Table 2 we report the mean floatoblast dimensions (TATICCHI & PIERONI 2005) of these three species. The sessoblast corresponds to the previous description of TATICCHI & PIERONI (2005); it should be noticed, however, that on the lateral side it can be densely tuberculated (Fig. 12), or tuberculated and faintly reticulated like in the Sicilian specimens (Fig. 13).

Plumatella geimermassardi WOOD & OKAMURA 2004

The species described for the first time by WOOD & OKAMURA (2004), is reported for Ireland, England, Belgium, southern Norway, northern Germany; in Italy it is recorded only for Lombardia (Lake Alserio, Lanca del Chiappo) and for Umbria (Lake Piediluco). TATICCHI & PIERONI (2005) found this species also in Piemonte (Lake Candia) and in Lombardia (River Staffora, only floatoblasts). In this research we can add the sites 12, 13, 18. Therefore the geographical distribution of this species is limited to North Italy with exception of Lake Piediluco in Umbria. The shape of the colony varies with the substrate: under the leaves surface of *Nuphar luteum* shows open ramifications, with intervals of 1,9 mm in juvenile colonies (Fig. 14), in the older ones the translucid tubules amass until they get a whitish aspect (Fig. 15). When the substrate has a limited surface, like a wooden stick, the colony has the aspect of a bush with parallel tubules which are not fused and less branched (Fig. 16). In Lake Piediluco, *P. geimermassardi* was also found inside a massive colony (Ø 10 cm) of *P. fungosa*, then the tubules are straight, not branched and very transparent (Fig. 17). The septa are occasionally present in the older colonies (Fig. 18). From July to September in Lake Piediluco some colonies were parasitized by *Buddenbrockia plumatellae* (Myxozoa, Malacosporea; Fig. 19, 20). In mature colonies tubules are packed with floatoblasts, which may open in July in the tubules which produced them (Fig. 16). In July through the ectocyst big testicles are well visible together with mature statoblasts. With respect to the description of the floatoblast from WOOD & OKAMURA (2004) we can add some morphological features which fit in the variability of the species. The dorsal valve is more flattened than the ventral valve (Fig. 21). The annulus is paved and the cells are evident as in the samples from site 7 (Fig. 22), or flattened as in the samples from site 13 (Fig. 23). The tubercles of the dorsal fenestra have the same dimensions, but those of the ventral fenestra are more flattened in the central part; in the centre is always present an isolated tubercle (Fig. 24). The sessoblast is oval in shape (Fig. 25) or roundish (Fig. 26). In Lake Alserio we have found sessoblasts which present features of both sesso- and floatoblast (Fig. 27); in this case the papillae of the frontal valve in the central part were very flattened. The lamella is smooth, as previously described by WOOD & OKAMURA (2004) for the material from Italy (Fig. 28), or shows more evident tubercles on the inner edge (Fig. 29). In Table 3 are reported the mean dimensions of the floatoblasts from the Italian specimens. They correspond to those indicated by WOOD & OKAMURA (2004).

Plumatella reticulata WOOD 1988

The species is common in North America and in Panama (WOOD 1988, 2001), and it is also known for Israel (MASSARD et al. 1992). TATICCHI & PIERONI (2005) record this species in central Italy (Lake Trasimeno). Now the Italian areale of distribution is extended to Lombardia (sites 4, 5, 9, 15, 18, 20). Like the previous species, it is thus distributed in the north and in the centre of Italy. The species was described by WOOD (1988) and, for Italian specimens by TATICCHI & PIERONI (2005); so we just confirm the main features for its classification, because it does not show any variability from one site to the other. The colony is always intertwined with *P. emarginata*, but only in the lakes of Mergozzo and Maggiore the species lives alone. The colony only partially adheres to the substrate, generally the long branches open as a fountain (Fig. 30). The tubules are generally long and covered with fine mineral material, the older part can assume a dark coloration (Fig. 31). The keel and the septa are not always evident (Fig. 32). The dorsal valve of the floatoblast (Fig. 33, 34) shows a roundish and smooth fenestra, the annulus is paved and covers the major part of the valve; its width at the poles is greater than the length of the fenestra (Tab. 4). The ventral fenestra is bigger than the dorsal one (Fig. 35, 36) and is covered with a sort of polygonal scales from which a tubercle arises (TATICCHI & PIERONI 2005). The sessoblast is unmistakable for its reticulation on the frontal valve (Fig. 37); the Figure 38 shows a sessoblast with features even of the floatoblast. The specimens recorded from Italy do not show morphological variability, only the pigmentation of the tubules can vary, more light or more dark in relation to the environmental conditions. In Table 4 are indicated the mean dimensions of floatoblasts of this species, from America (WOOD 1988), Israel (MASSARD et al. 1992), Italy (TATICCHI & PIERONI 2005) together with those of *P. emarginata* (Fig. 39, 40; GEIMER & MASSARD 1986), because they can be confused together.

Lophopus crystallinus (PALLAS 1766)

In Italy it is a wintry species for its exigencies of temperature between 0 and 17 °C. Further the reports of ZIRPOLO (1925) for lake Astroni (Napoli) and those of Viganò for the sites 21 and 22, where it has been imported from the same author, in the last years the species was recorded as very abundant in Lake Piediluco by one of us (Taticchi in CECCAGNOLI et al. 1997). In this lake the species is attached to the roots of *Phragmites* near the influent, where the current speed is high or under the stones of the shore or on roots of amassed floating hydrophytes, in the more eutrophic stations where the current flow is absent. *Lophopus crystallinus* has a vegetative cycle which starts in November and ends in April (ELIA et al. 2001). During studies of enzymatic activities it showed a certain sensibility to variations of dissolved oxygen and to some heavy metals (in preparation). It is likely that its rarity is more linked to the difficulty of sampling during summer than to its absence. The statoblast is big and has the shape of a lemon, with two peeks at the extremities (Fig. 41; ODA & MUKAI 1985), those peeks can be also forked (Fig. 42) or lack at all. At the SEM the surface of the statoblast appears covered by crowded crests either on the fenestra and on the annulus (Fig. 43); the longitudinal cut of the annulus (Fig. 44) shows, along the suture line between the two valves, a series of circular holes for the transit of air between the cells of the floating (Fig. 45).

Conclusion

When the sampling sites will be spread over the whole national territory, then we will be able to understand better the ecology of every single species.

At the time we can observe that:

- *Plumatella rugosa* is recorded for calm, eutrophic, rich in organic substance waters with a conductivity ≥ 500 µs and a temperature range between 19 and 27 °C during summer.
- *P. geimermassardi* prefers eutrophic habitats, with a temperature range between 18 and 21 °C, the statoblasts transported by rivers can colonize many environments of North Italy.
- For *P. reticulata* the definition of the habitat is difficult, it could be found either in eutrophic (Lake Trasimeno) and in oligotrophic environments (Lake Mergozzo); in fish farms it could be found mostly in the outlet channels. It seems that the species grows well in oligotrophic water on its one, but can colonize also waters rich in organic substances, together with *P. emarginata*, if there is a certain water renewal.

The three species described, recently recorded from Italy, were included in the freshwater bryozoan fauna of our country also forty-fifty years ago when they were sampled by Viganò. Only SEM analysis permitted to distinguish them from the other species of the genus *Plumatella*, to which were attributed, considering "variability", the differences evidenced in the colonies and in the statoblasts. WOOD & OKAMURA (2004) evidenced some distinctive characters for *P. geimermassardi* and WOOD (1988) explains why *P. reticulata* can not be taken for *P. emarginata*. In spite of the SEM analysis, it is still difficult, using only the morphology, to distinguish the different species or variety. It is still premature to define as variety the different forms recorded in our country until now; in fact on the basis of the morphological features indicated by various authors (WOOD 2001; GEIMER & MASSARD

1986; LACOURT 1968; TORIUMI 1970) either the specimens of Figures 46A, B and the one of Figures 47A, B must be classified as *P. fungosa*, as like the specimen of Figure 48A, B and the one of Figures 49A, B must be classified as *P. repens*.

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Tab. 1: Description of the sites in which *Plumatella rugosa (P. ru.)*, *P. reticulata (P. re.)*, *P. geimermassardi* (P. g.) and *Lophopus crystallinus* (*L. c.*) have been founded.

Site	Description	*P. ru.*	*P. re.*	*P. g.*	*L. c.*
4	glacial origin; altitude 194 m above sea level; surface area 1,8 km²; average depth 45,4 m; oligotrophic		X		
5	glacial origin; altitude 194 m above sea level; average depth 177 m; surface area 212 km²; mesotrophic		X		
9	trout farm, fed by River Mincio, left affluent of River Po	X	X		
12	two small communicating glacial lakes; altitude 234 m above sea level; anoxic on the ground; eutrophic			X	
13				X	
15	trout farm, fed by River Sile	X	X		
18	*Carassius auratus* farm, fed by River Reno	X	X	X	
19	torrent-like river			X	
20	right affluent of River Reno		X		
24	eutrophic lake originated by a natural calcareous dam; low water renewal time; maximum depth 18 m			X	X
25	landslide origin; altitude 992 m above sea level; average depth 32 m; perimeter 6,65 km	X			
27	trout farm, fed by River Canopo	X			
28	artificial dam lake on River Irminio; altitude 350 m above sea level; depth about 30 m	X			

Tab. 2: Critical dimensions of floatoblasts of *P. rugosa* (dorsal valve), *P. repens* (GEIMER & MASSARD 1986) and *P. fungosa* (dorsal valve). Measurements are expressed in micrometers. L = whole length; W = whole width; l = capsule length; w = capsule width; A = polar annulus width; a = lateral annulus width; F = fenestra length; f = fenestra width.

Species	L	W	L/W	l	w	l/w	F	f	A	a	F/f	A/a
P. rugosa	359	262	1.37	254	216	1.17	150	149	106	57		1.84
P. repens	354	263	1.34									
P. fungosa	397	302	1.32	297	258	1.15	185	164	107	70	1.13	1.54

Tab. 3: Dimensions of floatoblasts (dorsal and ventral valve) of *Plumatella geimermassardi*. Measurements are expressed in micrometers. L = whole length; W = whole width; l = capsule length; w = capsule width; A = polar annulus width; a = lateral annulus width; F = fenestra length; f = fenestra width.

	dorsal					ventral					WOOD & OKAMURA 2004
	mean	max	min	s. d.	n°	mean	max	min	s. d.	n°	
L	307	335	283	9.2	74	310	340	281	9.2	86	322 ± 4
l	257	274	237	7.5	73	259	275	237	7.8	86	
W	223	240	211	5.9	73	235	250	215	6.8	86	245 ± 3
w	198	210	183	5.9	73	201	217	187	5.7	86	
F	197	222	177	11.4	71	242	261	224	8.2	82	
f	153	169	137	6.8	71	193	206	179	5.4	82	
A	56	70	46	5.7	71	35	52	18	4.7	82	
a	36	55	27	4.9	71	21	40	17	3.3	82	
L/W	1.38	1.51	1.23	0.05	73	1.32	1.49	1.14	0.06	86	1.32 ± 0.02
l/w	1.30	1.44	1.19	0.06	72	1.29	1.46	1.11	0.06	86	
F/f	1.29	1.45	1.11	0.08	71	1.25	1.44	1.10	0.06	82	
A/a	1.59	2.15	0.87	0.19	71	1.68	2.18	0.46	0.23	82	

Tab. 4: Critical dimensions of *Plumatella reticulata* (WOOD 1988, MASSARD et al. 1992, TATICCHI & PIERONI 2005) compared with those of *P. emarginata* (GEIMER & MASSARD 1986). Measurements are expressed in micrometers. L = whole length; W = whole width; l = capsule length; w = capsule width; A = polar annulus width; a = lateral annulus width; F = fenestra length; f = fenestra width.

P. reticulata							*P. emarginata*
	WOOD		MASSARD et al.		TATICCHI & PIERONI		GEIMER & MASSARD
	dorsal	ventral	dorsal	ventral	dorsal	ventral	
L	401		403		393	382	449
W	236		232		227	241	262
L/W	1.7		1.73		1.73	1.58	1.71
F	123	194	119	196	119	155	
f	84	164	109	165	90	141	
A			134	94	139	115	
a			66	29	69	51	
l	271				251	241	
w	199				188	201	
l/w	1.4				1.33	1.20	

Fig. 1: Map of Italy with 30 sampling sites, the black triangles indicate the sampling sites since 1963, the red triangles indicate the sampling site of this research.

1	Lake Candia - Torino	11	Fish farm - Verona	21	Canale della Chiana - Siena
2	Fish farm - Novara	12	Lake Lago - Treviso	22	Lake Trasimeno - Perugia
3	Lake Alserio - Como	13	Lake S.Maria - Treviso	23	Fish farm - Terni
4	Lake Mergozzo - Verbania	14	Fish farm - Treviso	24	Lake Piediluco - Terni
5	Lake Maggiore - Verbania	15	Fish farm - Treviso	25	Lake Scanno - L'Aquila
6	Lanca del Chiappo - Pavia	16	River Rio Piavesella - Treviso	26	River Sinni - Matera
7	River Staffora - Pavia	17	Canale Ausa - Udine	27	Fish farm - Siracusa
8	Fish farm - Bergamo	18	Fish farm - Bologna	28	Lake S.Rosalia - Siracusa
9	Fish farm - Mantova	19	River Reno - Bologna	29	River Anopo - Siracusa
10	River Serca di Storo - Trento	20	River Sillaro - Bologna	30	River Minghisi - Siracusa

Fig. 2: *Plumatella rugosa*. Portion of a colony grown under a stone from Lake S. Rosalia (Sicily). Scale bar 1 mm.

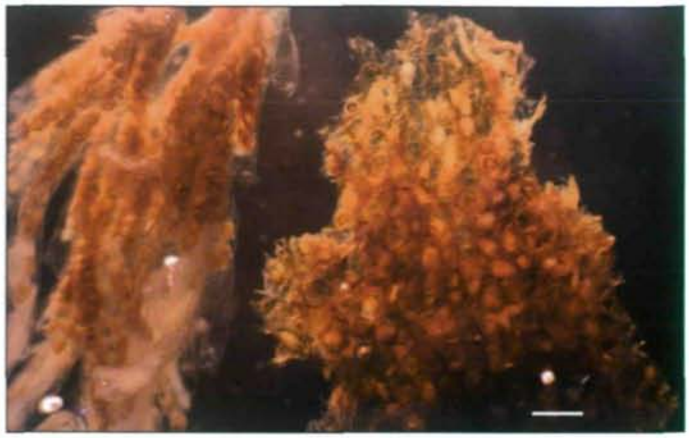


Fig. 3: *Plumatella rugosa*. Bush (on the left) or honeycomb-like (on the right) colony shape grown on a wooden stick from lake Alserio. Scale bar 1 mm.

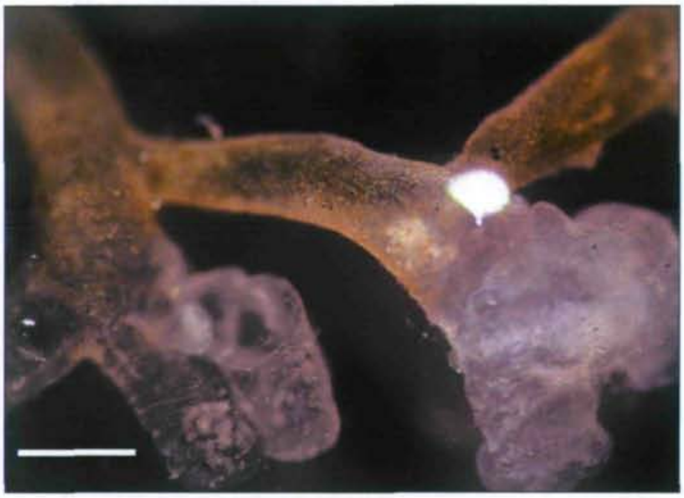


Fig. 4: *Plumatella rugosa*. A club-like tubule. Scale bar 0,5 mm.

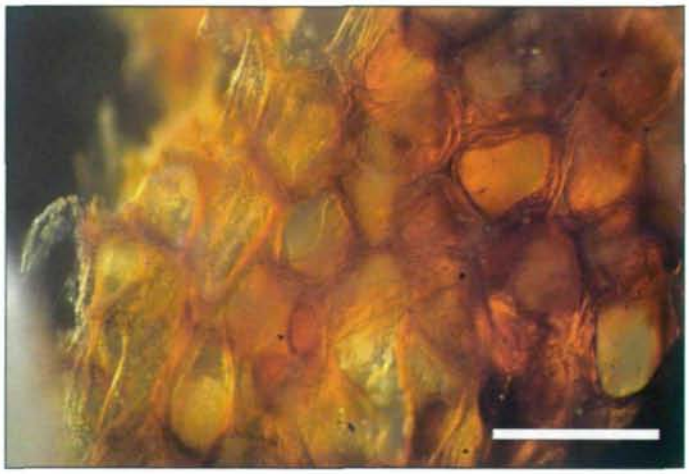


Fig. 5: *Plumatella rugosa*. Portion of a honeycomb-like shape colony showing the tubules fused together. Scale bar 0,5 mm.

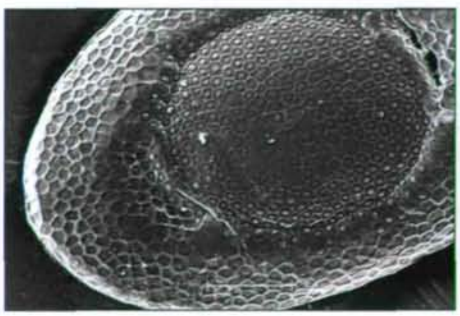


Fig. 6: *Plumatella rugosa*. Scanning electron micrograph of a floatoblast dorsal valve showing the central part of the fenestra without the tubercles.

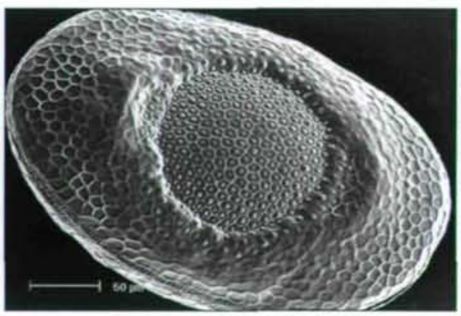


Fig. 7: *Plumatella rugosa*. Scanning electron micrograph of a floatoblast dorsal valve with fenestra interstitial tubercles flattened in the central part.

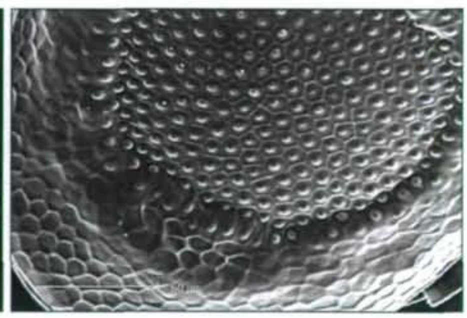


Fig. 8: *Plumatella rugosa*. Scanning electron micrograph of a particular of a floatoblast dorsal valve showing a very evident polar groove.

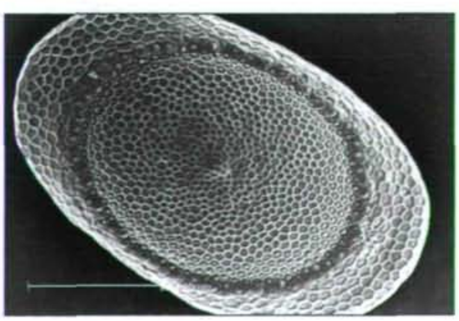


Fig. 9: *Plumatella rugosa*. Scanning electron micrograph of a floatoblast ventral valve showing a very evident reticulum and interstitial tubercles only between fenestra and annulus.

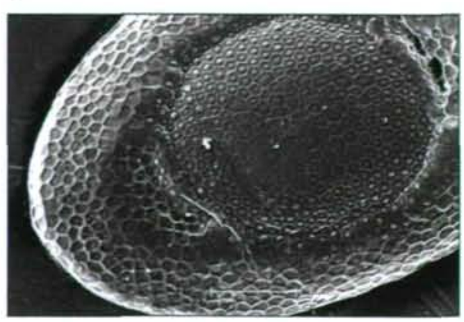


Fig. 10: *Plumatella rugosa*, specimens collected from site 18. Scanning electron micrograph of a particular of a floatoblast dorsal valve showing the nodules on the annulus and the fenestra.

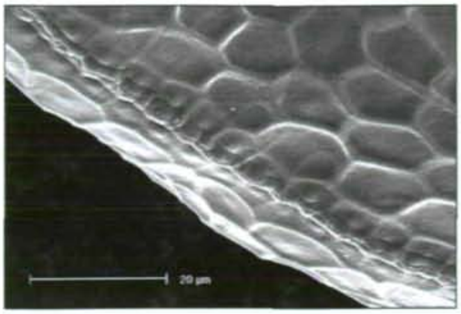


Fig. 11: *Plumatella rugosa*. Scanning electron micrograph of a particular of the floatoblast suture.

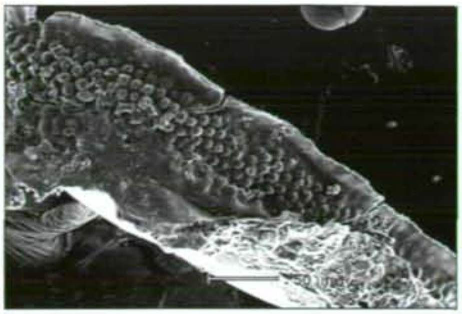


Fig. 12: *Plumatella rugosa*, specimen collected from site 27. Scanning electron micrograph of the sessoblast lateral side.

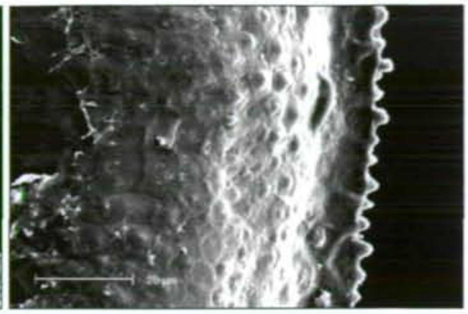


Fig. 13: *Plumatella rugosa*. Scanning electron micrograph of the sessoblast lateral side faintly tuberculated and reticulated.

Fig. 14: *Plumatella geimermassardi*. Portion of a young open colony adhering on a leaf. Scale bar 1 mm.

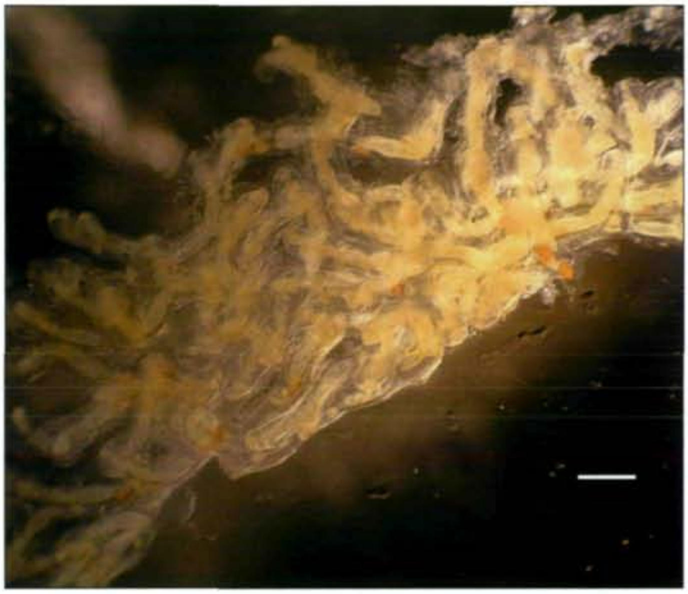


Fig. 15: *Plumatella geimermassardi*. Portion of a whitish colony grown on a wooden fragment. Scale bar 1 mm.

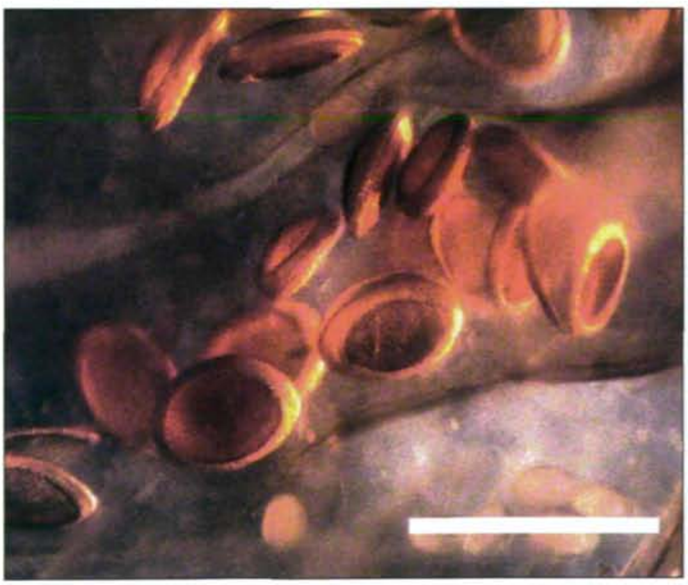


Fig. 16: *Plumatella geimermassardi*. Tubules not fused and open floatoblasts inside of them. Scale bar 0,5 mm

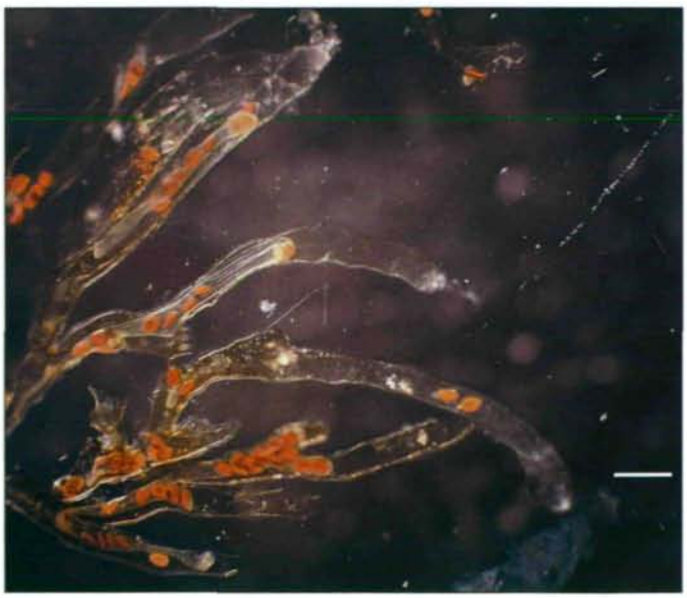


Fig. 17: *Plumatella geimermassardi*. Straight tubules grown inside a *P. fungosa* colony. Scale bar 1 mm.

Fig. 18: *Plumatella geimermassardi.* Older tubules with evident septa (arrow). Scale bar 0,5 mm.

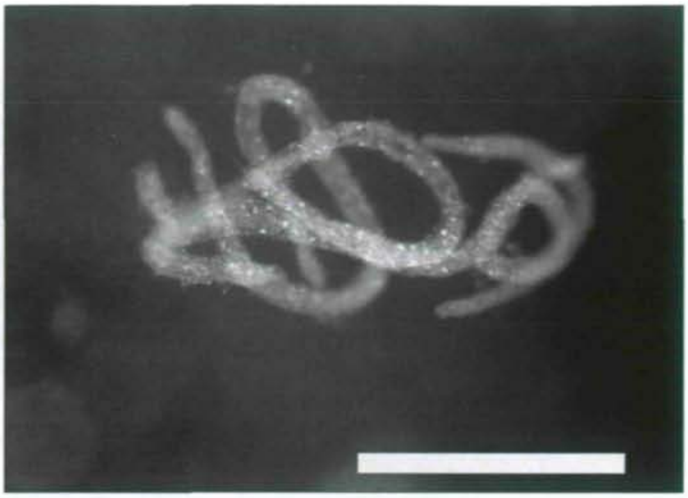


Fig. 19: *Buddenbrockia plumatellae* taken out from tubules of *Plumatella geimermassardi.* Scale bar 0,5 mm.

Fig. 20: *Buddenbrockia plumatellae* inside the tubules of *Plumatella geimermassardi.* Scale bar 0,5 mm.

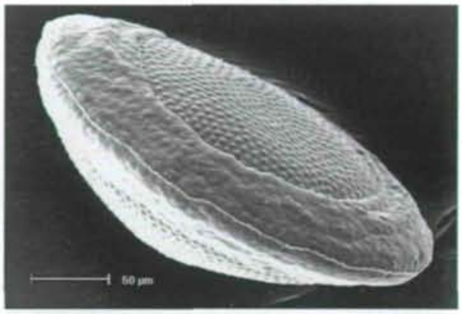


Fig. 21: *Plumatella geimermassardi.* Scanning electron micrograph of floatoblast, lateral view showing flattened dorsal valve.

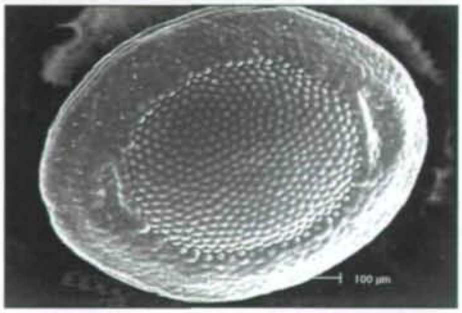


Fig. 22: *Plumatella geimermassardi* collected from site 7. Scanning electron micrograph of floatoblast dorsal valve showing evident annulus cells.

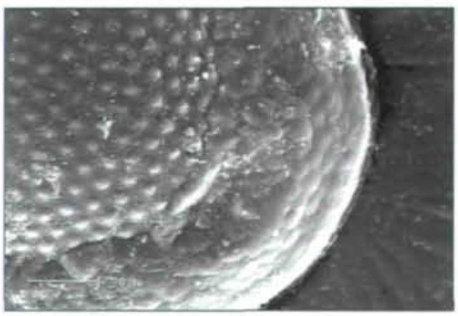


Fig. 23: *Plumatella geimermassardi* collected from site 13. Scanning electron micrograph of a particular of floatoblast dorsal valve showing flattened annulus cells.

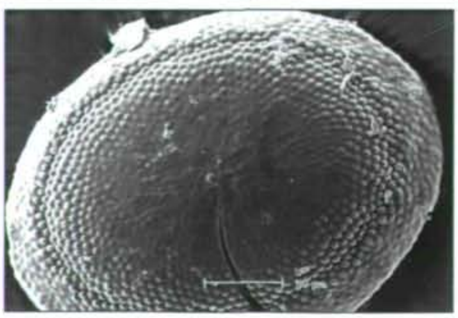


Fig. 24: *Plumatella geimermassardi.* Scanning electron micrograph of floatoblast ventral valve showing central process.

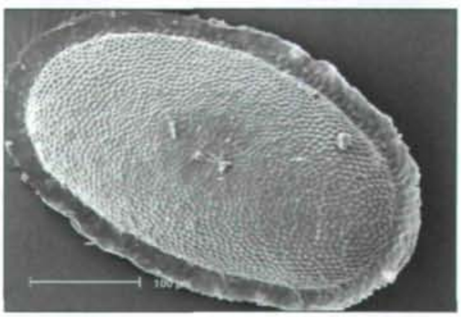


Fig. 25: *Plumatella geimermassardi.* Scanning electron micrograph of an oval-shaped sessoblast.

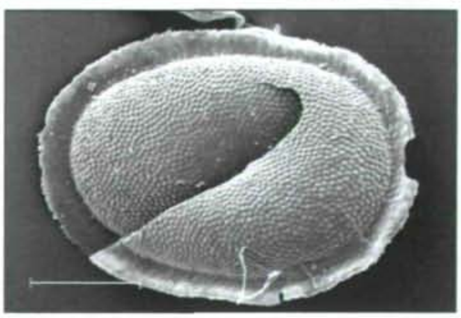


Fig. 26: *Plumatella geimermassardi.* Scanning electron micrograph of a round-shaped sessoblast.

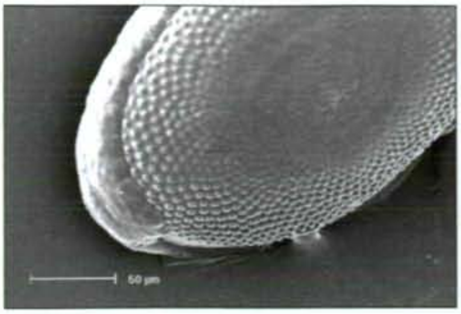


Fig. 27: *Plumatella geimermassardi*. Scanning electron micrograph of an irregular sessoblast.

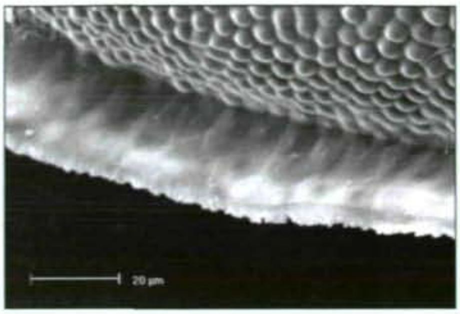


Fig. 28: *Plumatella geimermassardi*. Scanning electron micrograph of a smooth sessoblast lamella (particular).

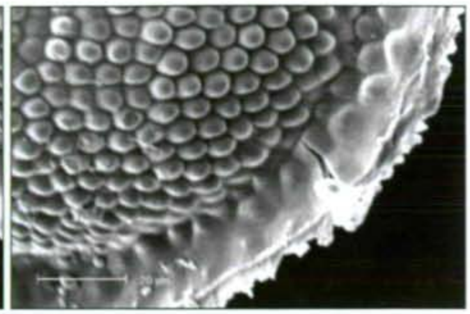


Fig. 29: *Plumatella geimermassardi*. Scanning electron micrograph of a tuberculated sessoblast lamella (particular).

Fig. 30: *Plumatella reticulata*. Portion of a fountain-shaped colony with symbiontic Rotatoria. Scale bar 1 mm.

Fig. 31: *Plumatella reticulata*. Long tubules encrusted with fine material. Scale bar 1 mm.

Fig. 32: *Plumatella reticulata*. Tubules with septa (arrow) and keel (arrow). Scale bar 0,5 mm.

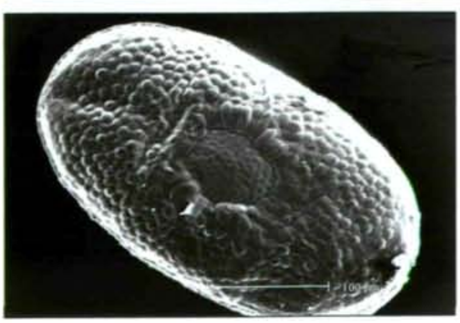


Fig. 33: *Plumatella reticulata*. Scanning electron micrograph of floatoblast dorsal valve.

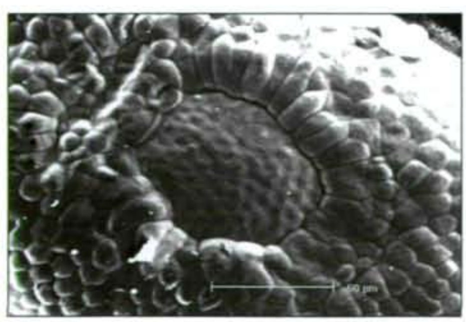


Fig. 34: *Plumatella reticulata*. Scanning electron micrograph of the roundish and smooth dorsal fenestra.

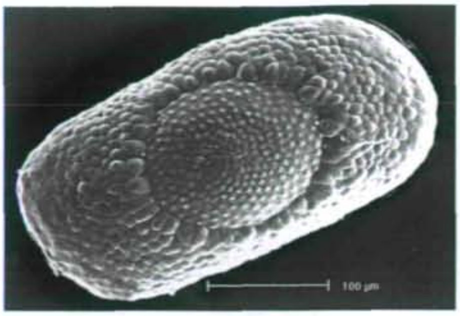


Fig. 35: *Plumatella reticulata*. Scanning electron micrograph of floatoblast ventral valve.

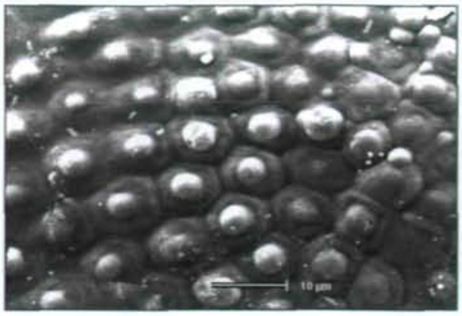


Fig. 36: *Plumatella reticulata*. Scanning electron micrograph of ventral fenestra scales and tubercles.

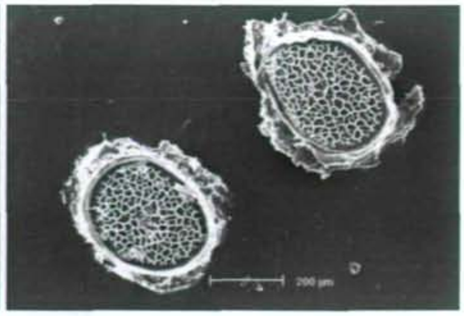
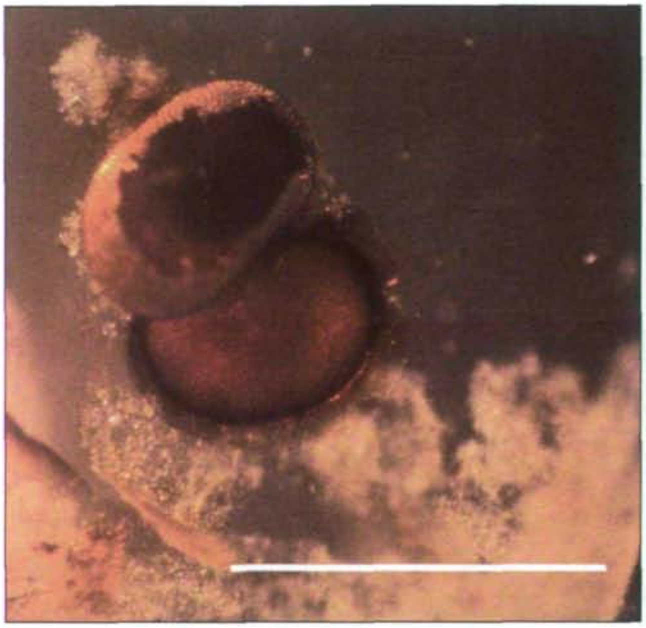


Fig. 37: *Plumatella reticulata*. Scanning electron micrograph of reticulated sessoblasts.



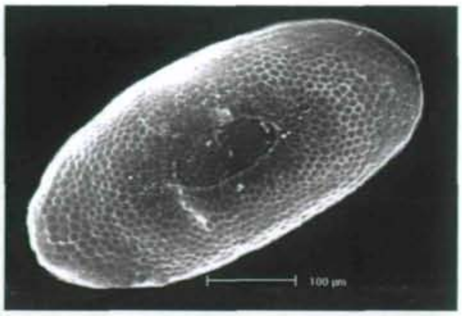


Fig. 39: *Plumatella. emarginata*. Scanning electron micrograph of floatoblast dorsal valve.

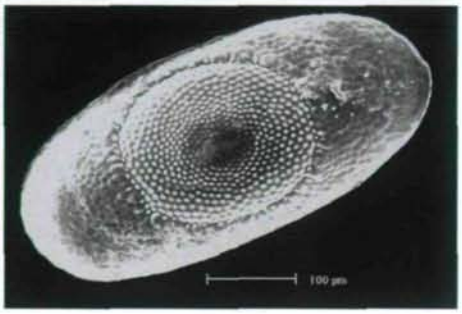


Fig. 40: *Plumatella emarginata*. Scanning electron micrograph of floatoblast ventral valve.

Fig. 38: *Plumatella reticulata*. Irregular sessoblast. Scale bar 0,5 mm.

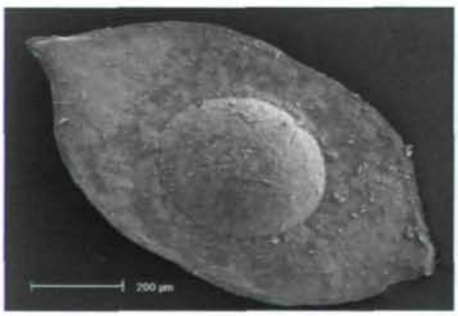


Fig. 41: *Lophopus crystallinus*. Scanning electron micrograph of lemon-shaped floatoblast.

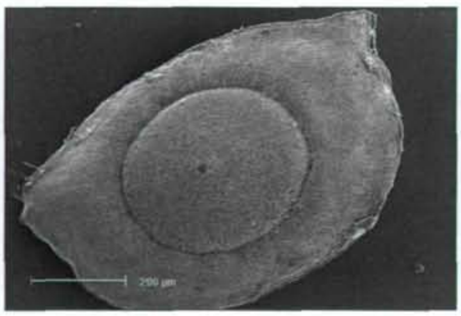


Fig. 42: *Lophopus crystallinus*. Scanning electron micrograph of forked peek of irregular floatoblast.

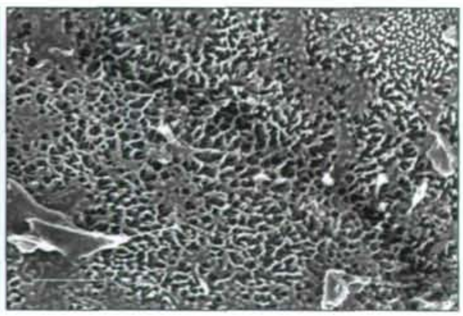


Fig. 43: *Lophopus crystallinus*. Scanning electron micrograph of crests on both fenestra and annulus.

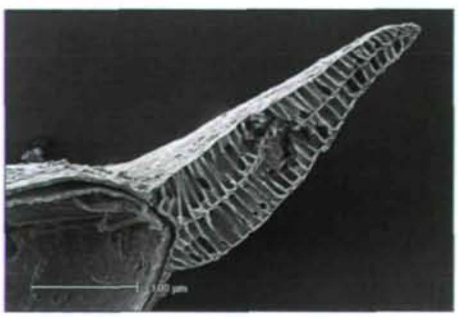


Fig. 44: *Lophopus crystallinus*. Scanning electron micrograph of longitudinal cut of the annulus.

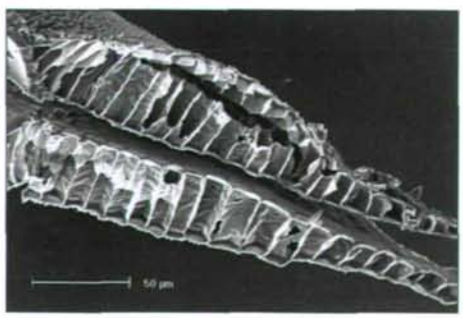


Fig. 45: *Lophopus crystallinus*. Scanning electron micrograph of the annulus showing circular holes between the cells of the floating.

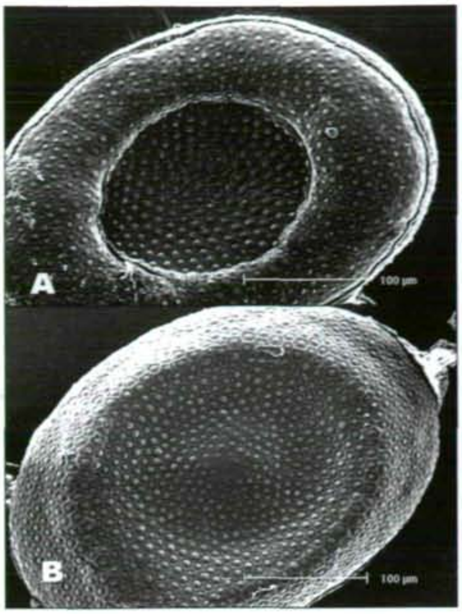


Fig. 46: *Plumatella fungosa* from site15. **A**: Scanning electron micrograph of floatoblast dorsal valve; **B**: ventral valve.

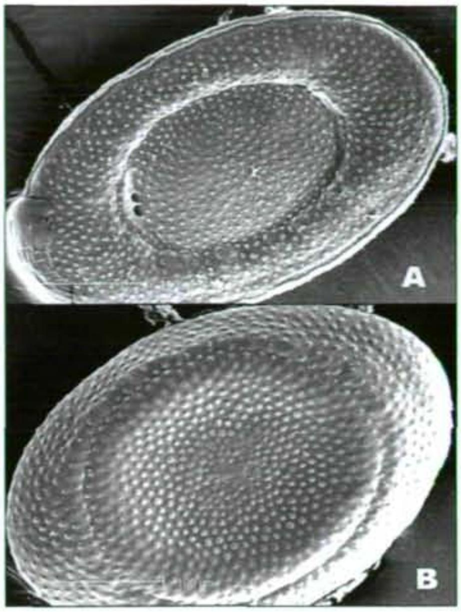


Fig. 47: *Plumatella fungosa* from site 28. **A**: Scanning electron micrograph of floatoblast dorsal valve; **B**: ventral valve.

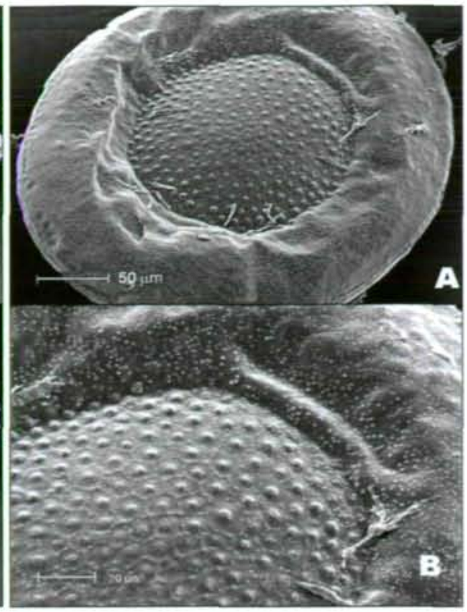


Fig. 48: *Plumatella repens* from site 15. **A**: Scanning electron micrograph of floatoblast dorsal valve; **B**: particular showing the nodules.

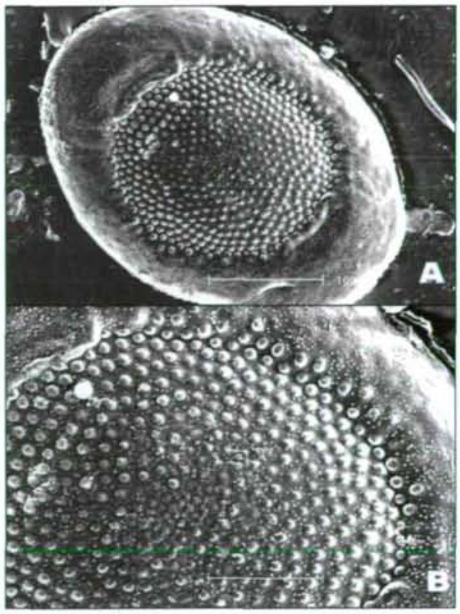


Fig. 49: *Plumatella repens* from site 25. **A**: Scanning electron micrograph of floatoblast dorsal valve; **B**: particular of dorsal fenestra.