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A new species of the European freshwater bryozoan fauna: *Plumatella similirepens* WOOD, 2001 (Bryozoa, Phylactolaemata)

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A b s t r a c t : *Plumatella similirepens* WOOD, 2001 colonies were collected during May 2001 and June 2004 adhering to wooden barriers inside a farming tank and to stones inside sedimentation tank of a trout farm (Quinto, Treviso, Italy). Until now, this species is recorded only from two hatcheries of Illinois USA. In this study we describe *Plumatella similirepens* WOOD, 2001, which is a new species for Europe. At the same time we discuss on the differences between the American and the Italian specimens and also between this species and typical *Plumatella repens*.

K e y w o r d s : Freshwater bryozoans, Phylactolaemata, *Plumatella similirepens,* Fish farms, Italy.

Introduction

The freshwater bryozoan *Plumatella similirepens* WOOD, 2001 was recorded for the first time in Italy in 2004 (TATICCHI et al. 2004). The species was sampled from one of the thirteen trout farms inspected during a research project on PKD (Proliferative Kidney Disease) epidemiology in Italy (CAFFARA et al. 2002; TATICCHI et al. 2004). This is a new species for the European freshwater bryozoan fauna.

Previously *P. similirepens* was reported only from Illinois, USA by WOOD (2001). The Author found it in only two fish farms and so he concludes that "either the fish hatcheries offer conditions particularly suitable for this species, or else that the bryozoans were introduced to the sites along with received shipments of fish".

The aim of the present study was to describe the species *Plumatella similirepens* recorded from Italy. At the same time, we discuss on the differences between the floatoblasts of the American and Italian specimens and also the differences between *P. similirepens* and *P. repens* sampled from the same site and typical *P. repens*.

Material and methods

P. similirepens colonies were collected during May 2001 and June 2004 in only one fish farm, where PKD is enzootic along the course of Sile River (Quinto-Treviso). They were adhering to wooden barriers inside a farming tank and to stones inside the sedimentation tank.

Chemical and physical parameters were recorded during the inspections (air and water temperature, dissolved oxygen and conductivity) (Tab. 1).

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 sesso-blasts, were isolated in order to ensure sufficient material for both light microscope and Scanning Electron Microscope (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 calculated ratios were the following: L/W, l/w, F/f, A/a for both dorsal and ventral valves. Part of the 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 the floatoblast sutures, the nomenclature of BUSHNELL (1965) and REYNOLDS (2000) was followed.

The remaining statoblasts were used to perform the median section, according to the WIEBACH technique (1964) for the observation of the intercell pores by mean SEM.

Results

The colony is almost open, adhering to the substrate and is strictly intertwined with *Fredericella sultana*, the keel and the septa are absent. The long tubules show circular section with variable diameter and the ectocyst is encrusted with fine mineral material disposed in longitudinal striations (Fig. 1). In the same fish farm were also found *Paludicella articulata*, *Cristatella mucedo*, *Plumatella fruticosa*, *P. fungosa*, *P. emarginata*, *P. reticulata* and probably *P. repens*.

A peculiarity of *P. similirepens* floatoblast is that it is easily drawn out from the enveloping membrane after treatment with KOH.

The big oval floatoblast shows parallel lateral sides and tapering poles (Fig. 2); the mean dimensions (Tab. 2) are comprised between those of *P. repens* and *P. fungosa* (Tab. 3) from Luxembourg (GEIMER & MASSARD 1986).

The ventral valve is slightly more convex than the dorsal and the sutural line divides the width of annulus in two almost equal parts (Fig. 3). The annular intercell pores are notched as in *P. repens* (Fig. 4a, b).

The dorsal valve annulus, slightly larger at the poles, is paved showing abundant nodules. On the inner rim we can note three series of little regularly distributed tubercles. The shallow polar grooves extend for the entire polar region Fig (5a, b).

A lumpy cord divides the groove from the reticulated fenestra; minute nodules evidence the mesh crests; the interstitial tubercles are flattened in the fenestra central part (Fig. 6) and at the outer margin they are more evident in four or five series.

The ventral valve (Fig. 7a, b) shows a paved annulus with minute nodules, laterally the

annulus is slenderer than at the poles. The fenestra arises from the annulus sharply and the reticulum crests are thicker and the cells are smaller than those of dorsal fenestra.

The interstitial tubercles are larger than those on the dorsal valve and are arranged in three series on the fenestra and three on the annulus. In the central part of the fenestra a process, composed by overlapping reticulum cells, arises (Fig. 8).

The suture (Fig. 9) presents two medial ribs with demarcations and beads, laterally the tubercles are lacking. The external walls of the annulus cells are strongly protuberant in the region where the floatoblast is more rounded.

The sessoblast is oval in shape (Fig. 10a, b); the lamella is large and irregularly reticulated. The frontal valve is tuberculated, and the tubercles are dense outwardly and at the centre they are very flattened or lacking.

Discussion

The general dimensions of the Italian *P. similirepens* floatoblast do not correspond to those of the American species; in fact the first shows bigger dimensions. It is interesting to note that Italian and American floatoblasts show the same ratios L/W, l/w, and these data confirm the floatoblast lengthened shape. Moreover, the Italian and the American specimens show the same longitudinal striations of the tubules.

Some floatoblast features of the Italian *P. similirepens* are very similar to those of other floatoblasts from colonies probably of *P. repens*, collected at the same site, substrate and sampling date (Fig. 11a, b): the dimensions, the lengthened shape of floatoblast and fenestra (dorsal and ventral), the tubercles more evident in the fenestra outer margin, the nodules on both annulus and fenestra and the suture constituted by beads and demarcations. Unlike *P. similirepens*, the so-called *P. repens* shows two series of alternate flattened tubercles, laterally (Fig 12a).

Moreover, considering the typical features of *P. repens* (Fig 11c, d) collected in a central Italy natural site we can notice that it is possible to discriminate *P. similirepens* from *P. repens*, in fact typical *P. repens* shows a roundish floatoblast with a round fenestra, *P. similirepens* is oval in shape; on the annulus of *P. repens* there are many nodules which constitute a rash like crust, in *P. similirepens* there are minute hardly visible nodules; typical *P. repens* shows two rows of large tubercles leaning against the suture (Fig 12b), according to GEIMER & MASSARD (1986), in *P. similirepens* they are lacking (Fig 9).

Generally we can assess that Italian *P. similirepens* in consequence of its morphological features almost corresponds to the description that WOOD made for American specimens (WOOD 2001), even if the floatoblasts of the Italian specimens are larger. The present research confirms that the hatcheries offer suitable environmental conditions for this species. Moreover, for the intercell pore structure, for the nodules presence on the annulus, *P. similirepens* belongs to the *P. repens* group, but we can distinguish *P. similirepens* from typical *P. repens* for two substantial differences: the lack of the two crooked rows of large tooth-like tubercles in the parasutural zone and the floatoblast dimensions and shape.

The traditional methods for the freshwater bryozoan species identification use essentially the morphological and biometric characteristics of colonies and statoblasts. Nevertheless,

some times it is impossible to distinguish between the single specie of Plumatellidae even if we use the SEM.

So, it would be very important to set up the molecular analysis for the characterization of both *P. similirepens*, typical *P. repens* and so called *P repens* species; particularly this latter seems to show intermediate features.

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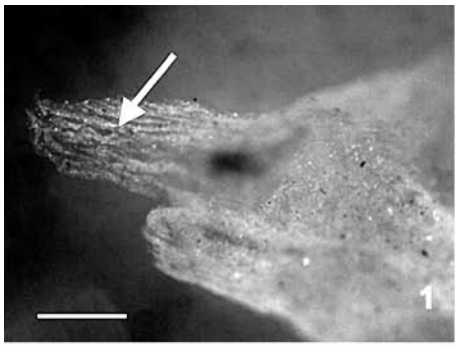


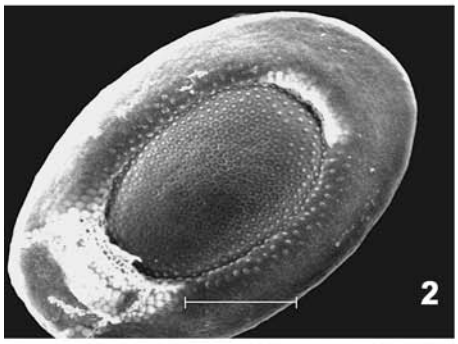
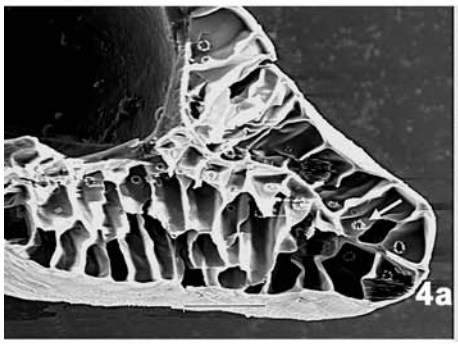


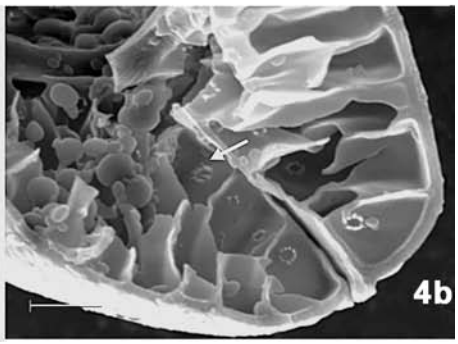
Fig. 1: *Plumatella similirepens.* Longitudinal striations (arrow) of a fragment of the encrusted ectocyst. Scale bar = 100 µm

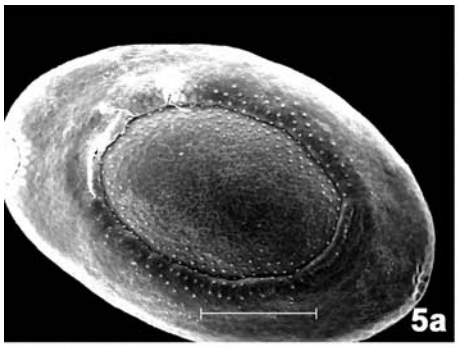
Fig. 2: *Plumatella similirepens.* Scanning electron micrograph of the oval floatoblast showing parallel lateral sides and tapering poles. Scale bar = 100 µm.

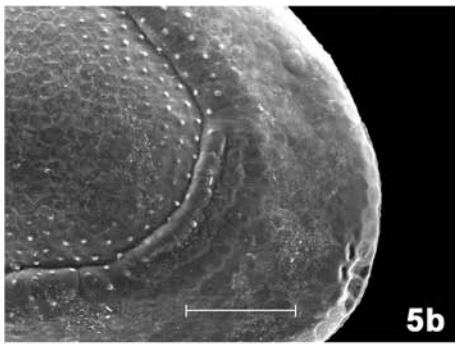
Fig. 3: *Plumatella similirepens.* Scanning electron micrograph of the median section with sutural line (arrows). Scale bar = 100 µm.

Fig. 4: Scanning electron micrograph of the annular notched intercells pores (arrows). **a)** *Plumatella similirepens*. Scale bar = 20 µm. **b)** *Plumatella repens*. Scale bar = 10 µm.









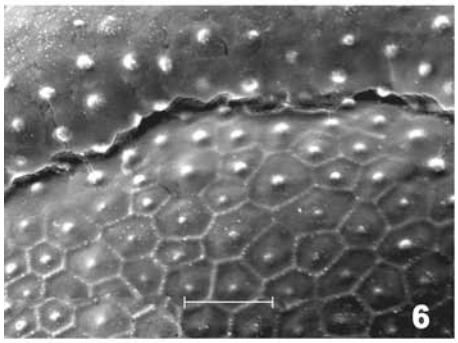
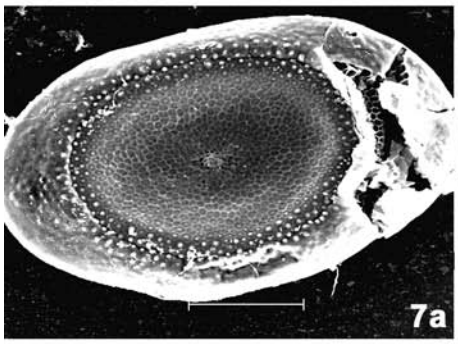
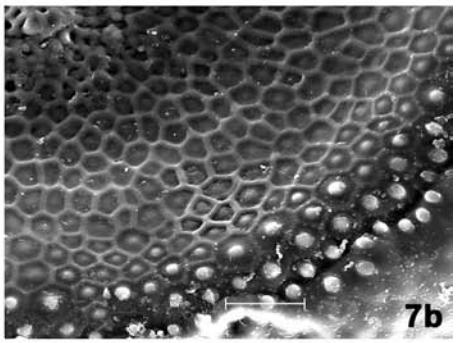


Fig. 5: *Plumatella similirepens*. Scanning electron micrograph of dorsal valve. **a)** Paved annulus with three series of regularly distributed tubercles. Scale bar = 100 µm. **b)** Detail of a) showing nodules on both annulus and fenestra and polar region. Scale bar = 50 µm.

Fig. 6: *Plumatella similirepens.* Scanning electron micrograph of the dorsal fenestra and interstitial tubercles. Scale bar = 20 µm





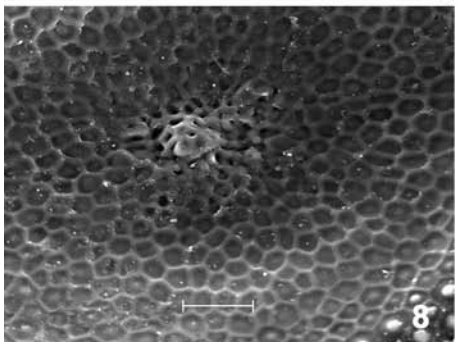


Fig. 7: *Plumatella similirepens.* **a)** Scanning electron micrograph of the ventral valve with paved annulus and minute nodules. Scale bar = 100 µm. **b)** Detail of a). Scale bar = 20 µm.

Fig. 8: *Plumatella similirepens.* Scanning electron micrograph of the ventral fenestra central process. Scale bar = 20 µm.

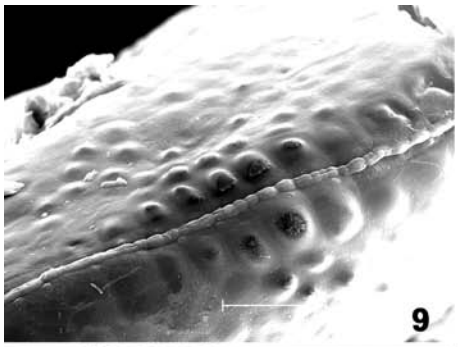
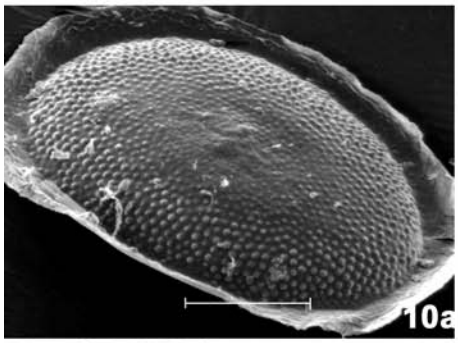
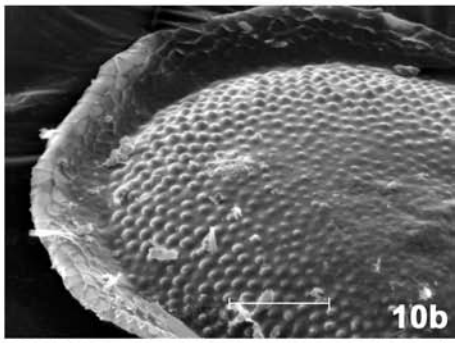
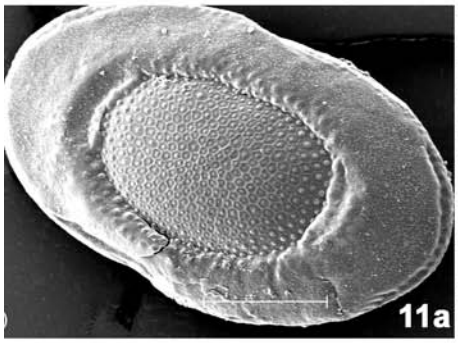
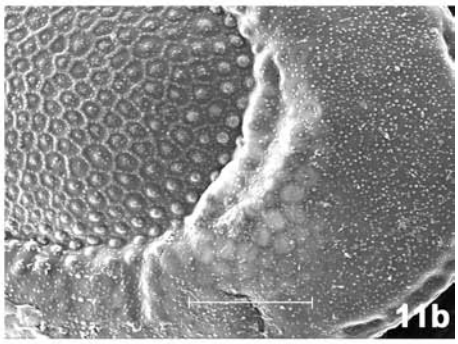


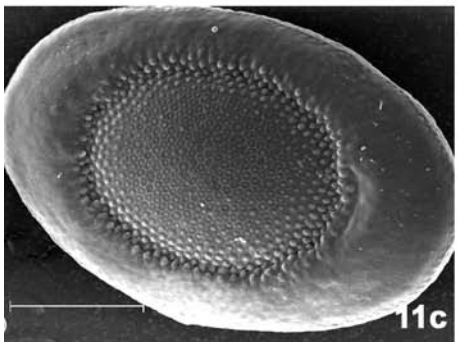
Fig. 9: *Plumatella similirepens.* Scanning electron micrograph of the suture. Scale bar = 20 µm. **Fig. 10**: *Plumatella similirepens.* Scanning electron micrograph of the sessoblast. **a)** Frontal valve. Scale bar = 100 µm. **b)** Detail of a). Scale bar = 50 µm. **Fig. 11**: Scanning electron micrograph of dorsal valve. **a)** *Plumatella repens* from the same hatchery. Scale bar = 100 µm. **b)** Detail of a). Scale bar = 50 µm. **c)** Typical *Plumatella repens* from an Italian natural site. Scale bar = 100 µm. **d)** Detail of c). Scale bar = 20 µm.

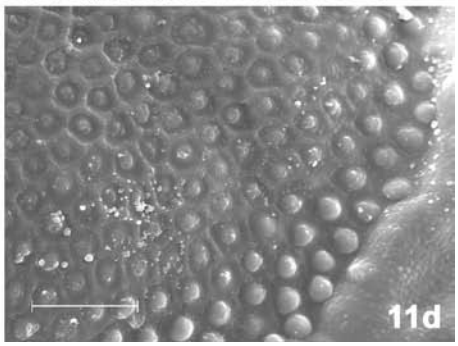












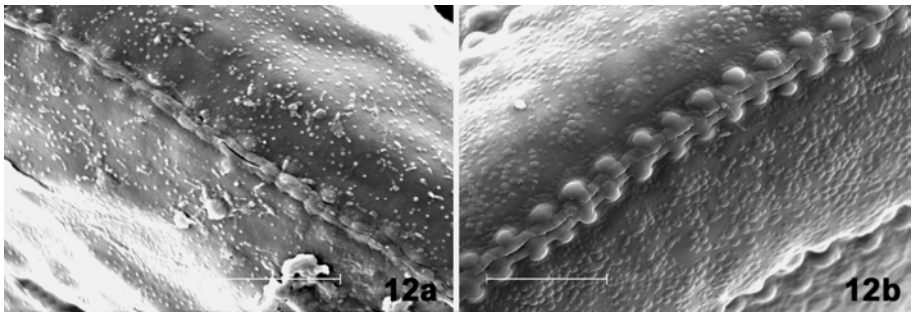


Fig. 12: Scanning electron micrograph of the suture. **a)** *Plumatella repens* from the same hatchery. **b)** Typical *Plumatella repens* from an Italian natural site. Scale bars = 20 µm.

Tab. 1: Chemical and physical parameters recorded in May 2001 and June 2004.

	2001	**2004**
Air temperature (T °C)	28	28
Water temperature (T °C)	17,6	18,5
Dissolved oxygen (mg/L)	6,67	7,77
Dissolved oxygen %	74	82
Conductivity (25°C) µS	599	607
pH	7,51	7,8

Tab. 2: Dimensions (µm) of dorsal and ventral valves of Italian *P. similirepens*.

Dorsal						**Ventral**					
	mean	max	min	sd	n		mean	max	min	sd	n
L	398	429	369	13,98	57	L	405	450	372	15,44	46
l	285	315	271	9,09	42	l	277	318	252	11,50	41
W	278	312	258	10,38	57	W	296	317	260	11,49	46
w	226	249	210	8,81	41	w	231	251	210	8,31	41
F	203	234	180	9,87	56	F	256	301	236	11,85	46
f	161	174	150	4,97	56	f	210	229	168	9,15	46
A	100	117	76	8,15	56	A	76	90	62	6,22	46
a	60	76	49	5,17	56	a	44	54	33	4,70	46
L/W	1,44	1,58	1,28	0,07	57	L/W	1,37	1,54	1,26	0,06	46
l/w	1,26	1,39	1,17	0,06	41	l/w	1,20	1,35	1,08	0,07	41
F/f	1,26	1,51	1,13	0,08	56	F/f	1,22	1,48	1,08	0,07	46
A/a	1,69	2,09	1,15	0,16	56	A/a	1,76	2,57	1,48	0,21	46

Tab. 3: Dorsal valve overall length and width (µm) of *P. similirepens* compared with those of *P. repens* and *P. fungosa* from Luxembourg.

		L	**W**	**L/W**
P. repens	Luxembourg values	354	263	1,34
P. similirepens	Italian values	398	278	1,44
	Illinois values	339	241	1,40
P. fungosa	Luxembourg values	423	316	1,34