

**First report of *Microspongium globosum* Reinke
(Phaeophyceae, Myrionemataceae)
in the Mediterranean Sea**

by

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With 4 figures

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Abstract: *Microspongium globosum* Reinke (Phaeophyceae, Myrionemataceae) is reported for the first time in the Mediterranean Sea. This species was collected growing as an epiphyte from the Dardanelles (Sea of Marmara, Turkey) in the midlittoral zone (-1 m). Thalli formed small clumps, or tufts, 0.5-1.0 mm in diameter, consisting of branched erect filaments. Only plurilocular sporangia were observed. A key to the Mediterranean species of *Microspongium* is provided.

Introduction

The genus *Microspongium* was established by Reinke (1888), with two species described at that time: *M. globosum* Reinke and *M. gelatinosum* Reinke. *Microspongium gelatinosum* is the lectotype species of the genus (Reinke 1889b). *Microspongium* closely resembles *Myrionema* Greville (Fletcher 1987). Only plurilocular sporangia are known for *Microspongium*. At present, *Microspongium* contains six species: *M. alariae* (P.M.Pedersen) A.F.Peters, *M. gelatinosum* Reinke, *M. globosum* Reinke, *M. immersum* (Levring) P.M.Pedersen, *M. radians* (M.A. Howe) A.F.Peters, and *M. tenuissimum* (Hauck) A.F.Peters (Guiry & Nic Dhonncha

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2004). *Microspongiium globosum* has been recorded from the northeastern Atlantic (Børgesen 1902, Kylin 1947, Lund 1959, Jaasund 1965, Fletcher 1987, Pankow 1990, Bartsch & Kuhlenkamp 2000, Rindi & Guiry 2004), the northwestern Atlantic (South & Cardinal, 1970), Japan (Yoshida et al. 1995) and the Arctic Ocean (Lindstrom 2001). Two species have been reported to occur in the Mediterranean Sea: *M. gelatinosum* Reinke and *M. tenuissimum* (Hauck) A.F.Peters (Ribera et al., 1992, partly as *Streblonema tenuissimum*). In the present paper a third species, *Microspongiium globosum*, is reported from the Mediterranean Sea.

The “*Microspongiium gelatinosum*” depicted by Reinke in his Atlas (1889a, pls. 7 & 8) has been regarded to be taxonomically heterogeneous, only in part equivalent to his original (1888) description of this species. Kylin (1947) first expressed this opinion, stating that only Reinke’s (1889a) pl. 7 (the alga occurring on *Fucus serratus* and bearing uniseriate plurilocular sporangia) conforms to his earlier account of *M. gelatinosum* and that Reinke’s pl. 8 (of an alga occurring on *Mytilus*, with a single chloroplast per cell, and bearing unilocular sporangia) is taxonomically distinct. This concept was later reinforced by Kristiansen & Pedersen (1979) and Fletcher (1987). According to Fletcher (1987) there are three entities involved with Reinke’s concept of the two species, namely:

1. *Microspongiium globosum* (Reinke 1888), described as an epiphyte on *Cladophora*, *Polysiphonia*, *Bryopsis*, and old blades of *Zostera*. This alga is a globose cushion, to 1 mm in diameter, has a monostromatic base, branched erect filaments, plurilocular sporangia that are both terminal and lateral, 1-4 chloroplasts per cell, and lacks unilocular sporangia.
2. *Microspongiium gelatinosum* (Reinke 1888), a lens-shaped alga, 1-2 mm in breadth, held together by mucilage, an epiphyte of *Fucus*. This alga has a partly distromatic base, with commonly branched erect filaments, 1-4 plastids per cell, lateral uniseriate plurilocular sporangia, and also lacks unilocular sporangia.
3. *Microspongiium gelatinosum* (Reinke 1889a, pl. 8), epizoic on *Mytilus*. This alga has a monostromatic base, seldom-branched erect filaments with closely associated basal cells, a single chloroplast per cell, laterally produced unilocular sporangia, and lacks plurilocular sporangia. It is this entity that has been demonstrated to be a stage in the life history of *Scytosiphon lomentaria* (Lyngbye) Link (Kristiansen & Pedersen 1979, Fletcher 1987, Parente et al. 2003). So this entity, placed in the Scytosiphonaceae, can be eliminated from further discussion.

Material and methods

Microspongiium globosum was collected in the midlittoral zone, as an epiphyte on *Petalonia fascia* (O.F.Müller) Kuntze Kilitbahir, from the Dardanelles (Sea of Marmara, Turkey) in March, 2003 and was preserved in 4% Formaldehyde in seawater. It was deposited in the Department of Biology of the Celal Bayar University of Manisa, Turkey. The identification of this alga was made according to the accounts in Reinke (1889a, as *Ascocyclus globosus*), Børgesen (1902, as *Myrionema globosum*), Fletcher (1987), and Russell & Pedersen (1994).

Results

Microspongium globosum Reinke 1888 p. 20.

Ascocyclus globosus (Reinke) Reinke 1889a, p. 20; *Myrionema globosum* (Reinke) Foslie 1894, p. 130; *Myrionema polycladum* Sauvageau 1897, p. 233; *Hecatonema globosum* (Reinke) Batters 1902, p. 41; *Myrionema subglobosum* Kylin 1907, p. 37; *Phycocelis globosa* (Reinke) De Toni 1895, p. 582; *Phycocelis alariae* Norum 1913, p. 150; *Myrionema alariae* (Norum) Printz 1926, p. 136.

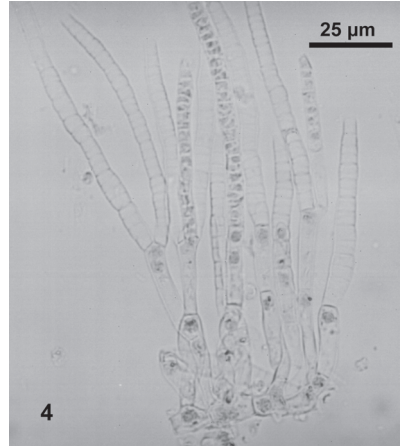
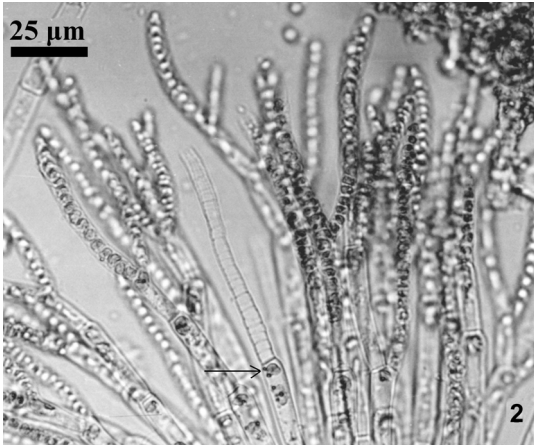
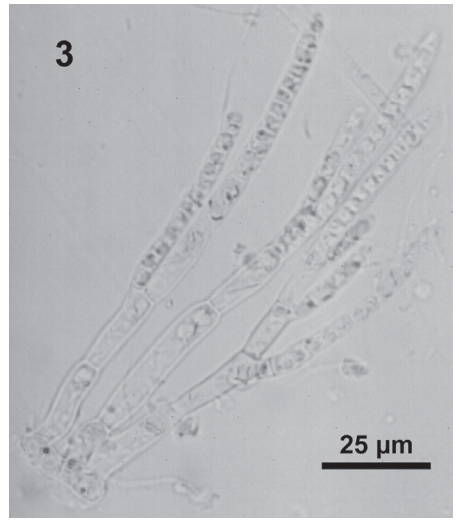
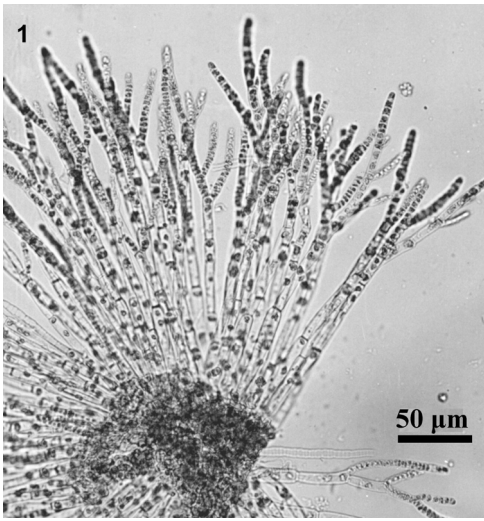
Thalli were epiphytic on *Petalonia fascia* (O.F.Müller) Kuntze, forming dark brown spots, 0.5-1.0 mm in diameter. Thalli (Figs 1 & 2) were composed of branched erect filaments arising from a monostromatic base (Figs 3 & 4). The plants were up to 250-300 µm high (Fig. 1). The erect filaments were uniseriate, the cells 50-60 µm long, 5-6 µm broad, and each cell contained one or two plate-like chloroplasts with pyrenoids (Fig. 2). Phaeophyceyan hairs were present. Plurilocular sporangia (Fig. 2) were common, uniseriate, cylindrical, terminal and lateral on erect filaments, 50-90 µm long and 5-6 µm broad. No unilocular sporangia were observed. This species was collected from the Kilitbahir shore of the Dardanelles (Sea of Marmara, Turkey) in March 2003 (water temperature of 5-6°C).

Discussion

The genus *Microspongium* has been assigned to various families, these different views reflecting the differing circumscriptions of the families. Fletcher (1987) has discussed in detail the problems related to past varying circumscriptions of the Myrionemataceae. Most authors (e.g., Kylin 1947, Papenfuss 1951, Fritsch 1959, Fletcher 1987, Yoshida 1998) have assigned *Microspongium* to the Myrionemataceae. Other familial assignments have been with the Ectocarpaceae (Pankow 1990), the Ralfsiaceae (Ribera et al. 1992), and the Chordariaceae (Guiry & Nic Dhonncha 2004). In accepting the description of Myrionemataceae given by Wynne (1982), we follow the majority of workers in placing *Microspongium* in that family.

The diagnostic features of *Microspongium*, separating it from such related genera as *Myrionema*, *Chilionema*, and *Ulonema*, include its uniseriate plurilocular sporangia (versus multiseriate in *Chilionema*), its lack of irregularly spreading basal filaments and downwardly produced rhizoids from the basal system (versus both present in *Ulonema*), and the production of erect filaments that are simple or pseudodichotomously branched (versus erect filaments that are either simple or secondarily branched in *Myrionema*). Other complicating factors in regard to the status of the genera *Myrionema* as well as *Compsinema* are that some species in those genera have been implicated as being stages in the life history of members of the Scytosiphonaceae (Loiseaux 1970, Fletcher 1981) and possibly the Chordariaceae and Giraudyaceae (Pedersen 1984, Fletcher 1987).

Turkish plants, here identified as *Microspongium globosum*, closely resemble the figures for this species provided by Reinke (1889a, as *Ascocyclus globosus*), Rosenvinge (1898, as *Phycocelis globosa*), Børgesen (1902, as *Myrionema globosum*),



Figs 1-4. *Microspongium globosum* [from Kilitbahir, the Dardanelles, Turkey]. Fig. 1. A tuft of the thallus, showing the erect filaments and consolidated base. Fig. 2. Erect branched filaments, with lateral and terminal plurilocular sporangia, and some pyrenoids detectable (arrow). Figs 3 & 4. Detail of erect filaments arising from monostromatic base.

and Russell & Pedersen (1994). The latter pair of authors made the first report of this species from Finland, and they established cultures from Finnish coastal waters and grew the cultures in their respective laboratories (in Liverpool and Copenhagen). Similar results were obtained under comparable growth conditions. Thalli reached 1-2 mm in diameter and consisted of erect branched filaments and hairs developed from basal creeping filaments. The only reproductive structures observed by Russell & Pedersen (1994) in their culture experiments were linear plurilocular sporangia, and asexual reproduction was reported.

Thalli of *Microspongium gelatinosum* with plurilocular sporangia are very closely related to other species in the genus, viz., *M. globosum* and *M. tenuissimum* (Peters 2003). According to Fletcher (1987), the only important difference between *M. globosum* and *M. gelatinosum* is the reported absence of a partly distromatic base in the former species. But he went on to say that both Kylin (1947) and Rautenberg (1960) described *M. gelatinosum* with a monostromatic base and that possibly Reinke (1888) was mistaken in alleging this distinction for this pair of species. In that case, the only criterion for distinguishing these two species would disappear.

Microspongium gelatinosum was reported for the first time from the Mediterranean Sea by Fletcher et al. (1988), but because the material was sterile it might represent the unilocular sporangia-bearing microthalli of *Scytosiphon lomentaria*. *Microspongium gelatinosum* was also recorded from Corsica, Greece, and the Black Sea (Ribera et al. 1992). In a recent paper using molecular methods to identify some endophytic species of brown algae, Peters (2003) transferred three known species to *Microspongium*. One of these species, *M. tenuissimum* (Hauck) A.F.Peters, includes a Mediterranean range. It was first described by Hauck (1884, as *Streblonema tenuissimum*) from the Adriatic Sea and has also been recorded from the Black Sea (Ribera et al. 1992), Kiel, Germany (Baltic Sea) (Burkhardt & Peters 1998, as *Streblonema* sp.), the Canary Islands, Chile, and South Africa (Peters 2003).

Microspongium kuckuckianum, which has been described from the Adriatic Sea by Schiffner (1916), has been recorded (with a query) from the same region by Giaccone (1978). Fletcher et al. (1988) discussed *M. kuckuckianum*, which has a number of features in common with the unilocular sporangia-bearing microthalli as described above, and thus it seems to be another entity occurring in the life history of a member of the Scytosiphonaceae. It was treated by Ribera et al. (1992) as a taxon inquirendum in their checklist of brown algae occurring in the Mediterranean Sea.

The following key serves to distinguish those species of *Microspongium* now thought to be present in the Mediterranean:

Key to the Mediterranean species of *Microspongium*:

- 1. Thalli epiphytic, with a discrete (mono- or distromatic) basal system on the surface of the host..... 2
- 1. Thalli endophytic, lacking a discrete basal system on the surface of the host..... *M. tenuissimum*
- 2. Thallus a spherical cushion, to 1 mm diam.; basal system consisting of a consolidated monostromatic disc; mucus not conspicuously present among the erect filaments..... *M. globosum*
- 2. Thallus a lens-shaped expanse, to 2 mm in breadth; basal system consisting of a consolidated mono- or distromatic disc; conspicuous presence of mucus among the erect filaments.....
..... *M. gelatinosum*

In conclusion, it is pointed out that one of the taxa recognized by Peters (2003) is *Microspongium alariae* (P.M.Pedersen) A.F.Peters, based on *Gononema alariae* (Pedersen 1981). Peters (2003) cited populations used in his study from Maine (USA) and Finland, the material occurring on species of *Alaria*, *Laminaria*, and *Fucus*. In his validation of the basionym *Gononema alariae*, Pedersen (1981) indicated that his cultured material was “probably identical with *Entonema alariae*”, a provisional

name appearing in Jaasund (1965). An accepted taxonomic synonym (Guiry & Nic Dhonncha 2004) of *Microspongium globosum* is *Myrionema alariae* (Norum) Printz (1926), based on *Phycocelis alariae*, the basionym described by Norum (1913) from Haugesund, southwestern Norway, as an endo-epiphyte on the stipes of *Alaria esculenta*. Norum (1913, pl. II, figs 1-10) depicted this species as producing uniseriate plurilocular sporangia most often arising laterally (rarely terminally) off branched erect filaments of this alga. It also produced colourless hairs. Attention is called to the several similarities between *Microspongium alariae* (P.M.Pedersen) A.F.Peters and *Phycocelis alariae* Norum, the latter conspecific with *M. globosum*.

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