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First record of *Paralemanea catenata* (Rhodophyta) from Italian Peninsula

Abstract

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During the VI Iter Mediterraneum, held in Aspromonte (South Italy) in 1997, *Paralemanea catenata* (Kützinger) Vis & Sheath, type species of the genus, was recorded for the first time from Italian Peninsula. Samples were collected in the Listi stream, a not summer-drying torrent located below the Basilicò mountain at about 1400 m a.s.l. *Lemanea fluviatilis* (Linnaeus) C. Agardh was collected together with *Paralemanea catenata*, and that is the first record from Calabria. Comparative observations, both morphological and anatomical, were carried out on thalli of both species.

Introduction

The family *Lemaneaceae* (*Batrachospermales*, *Rhodophyta*) is characterized by a heteromorphic triphasic life cycle consisting of chlamydomonads, gametophyte and carposporophyte phases. A distinct cartilaginous, pseudoparenchymatous gametophytic thallus with nodes and internodes joined like bamboo stems and with internal carposporophytes allows to distinguish it from other related families.

Sirodot (1872), on the basis of anatomical and spermatangial features, recognized two genera within this family. He proposed the genus *Sacheria* to include species lacking axial cortication, leaving the genus *Lemanea* Bory for those with axial cortication. Ketel (1887) reduced both genera to the rank of subgenus. Later Hamel (1925) renamed subgenus *Lemanea* in *Eulemanea*. Recently, Silva (1959) proposed the name *Paralemanea* for *Eulemanea* Hamel. Greuter & al. (1988) considered the name *Sacheria* a nomenclatural (homotypic) synonym of *Lemanea*.

At present, three gametophyte morphologies exist within *Lemaneaceae*, which differ in their internal structure (Vis & Sheath 1992). The former two morphologies, originally included in the genus *Lemanea* by Bory (1808), had been recognized as distinct genera: *Lemanea* Bory and *Paralemanea* (P. C. Silva) Vis & Sheath, using anatomical and spermatangial features. The third structural type, *Psilosiphon*, was described only for Australian inland waters (Entwistle 1989).

The species belonging to the genera *Paralemanea* and *Lemanea* inhabit fresh-water streams, mostly in areas with turbulent and continuously flowing water. Although the members of the genus *Lemanea* require a higher current velocity compared to the members of the genus *Paralemanea*, very often the species *Paralemanea catenata* (Kützinger) Vis & Sheath and *Lemanea fluviatilis* (Linnaeus) C. Agardh are collected together.

During the VI Iter Mediterraneum, held in Aspromonte (South Italy) in 1997, *Paralemanea catenata*, type species of the genus, was recorded for the first time from Italian Peninsula. *Lemanea fluviatilis* was collected together with *Paralemanea catenata*, and that is the first record from Calabria.

Materials and Methods

Algal samples were collected in June 1997 in the Listi stream (Aspromonte, South Italy), a not summer-drying torrent located below the Basilicò mountain at about 1400 m a.l.s. (Fig. 1) The station was not particularly shaded and it was characterized by a continuous, but not very swift, flow of water. Specimens of both taxa collected by one of the authors (F. M. Raimondo) are deposited at the *Herbarium Mediterraneum* (PAL). The samples were observed fresh or preserved with 4% formaldeide solution. Permanent slides were prepared from fragments stained in fuchsine solution, dehydrated and embedded in paraffin. Then, sections were cut and mounted on slides using Canadian baume as a mounting medium. Comparative observations were carried out on gametophytic thalli of both species. Quantitative external morphological features, measured in accordance with Vis &

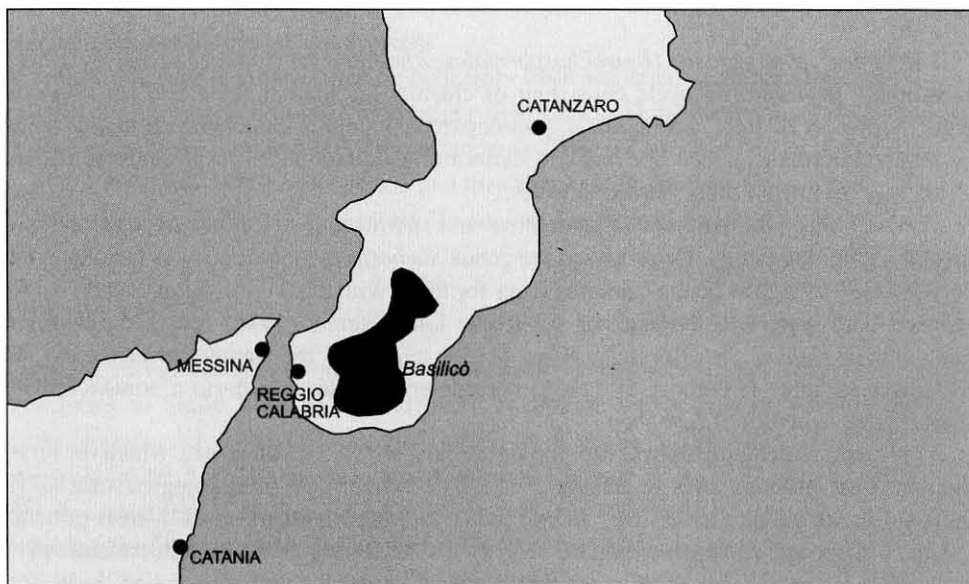


Fig. 1. Studied area showing sampling site (▲).

Sheath (1992), and qualitative internal features were examined. The following morphological features were measured on 25 specimens: length (L); internodal diameter (ID), just above the lowermost node, as measure of width; nodal diameter (ND), measured using the largest node; stalk diameter (STD, just below the lowermost node, and the number of branches. The ratio ID/STD was used to indicate stalked or unstalked thalli, the ratio ND/ID shows whether the thallus is slightly undulate or distinctly protruded at the nodes.

Only intact and mature gametophytes with internal carposporophytes were considered. Internal features were examined to determine the presence of axial cortical filaments, the type of ray cell and the ray cell's relationship to the outer cortex.

Results and Discussion

Paralemanea catenata (Kützinger) Vis & Sheath (Basionym: *Lemanea catenata* Kützinger) was the dominant species, while *Lemanea fluviatilis* (Linnaeus) C. Agardh (Basionym: *Conferva fluviatilis* Linnaeus) was less abundant.

Comparative observations, both morphological and anatomical, carried out on thalli of both species, show the gametophytic phase with carposporophytes, mostly affected by the temperature, as reported in literature (Thirb & Benson-Evans 1985). The thalli occur in clumps of 5-15 and exhibit rhizoidal filaments strengthening the fixation to the substratum (Fig. 2).

The specimens of *Paralemanea catenata*, dark green or violet and slightly arcuate, have a mean length of 7 cm and a mean width of 0.6 mm (Figs 3-4). Thalli are unstalked (ID/STD=1.2) and unbranched, and show a central axis with cortical filaments and simple ray cells, not abutting the outer cortex (Table 1, Figs 5-7). The individuals are subtended by an encrusting basal cushion of uniseriate filaments sparingly branched (chantransia phase), perennial in the genus *Paralemanea*.

Table 1. Morphometric features of examined taxa.

Taxa	stalked	branched	mean length (cm)	mean width (mm)	ND/ID
<i>Paralemanea catenata</i>	no	no	7	0.6	1.85
<i>Lemanea fluviatilis</i>	yes	rarely	5	0.48	1.50

The specimens of *Lemanea fluviatilis*, dark green, have a mean length of 5 cm and a mean width of 0.48 mm, and are straight (Figs 8-9). Thalli are stalked (ID/STD=1.6), rarely branched, and characterized by an internal structure of a central axis without cortical filaments and T-shaped ray cells closely applied to the outer cortex (Table 1, Figs 10-11).

The observed morphological, anatomical and ecological features of the two collected taxa, are in accordance with the data previously reported (Sirodot 1872; Atkinson 1890; Vis & Sheath 1992; Barone & al. 1995). The morphometric differences observed between the two gametophyte morphologies represent a further validation of the recent arising of them to the genus level.

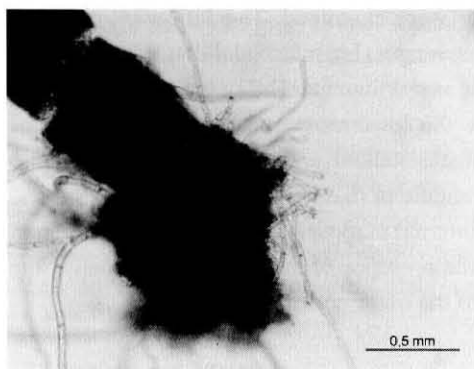


Fig. 2. Thallus of *Paralemanea catenata* (Kützinger) Vis & Sheath showing rhizoidal filaments.

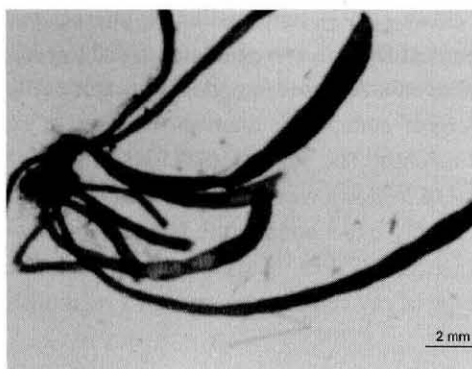


Fig. 3. Habit of *Paralemanea catenata* (Kützinger) Vis & Sheath.

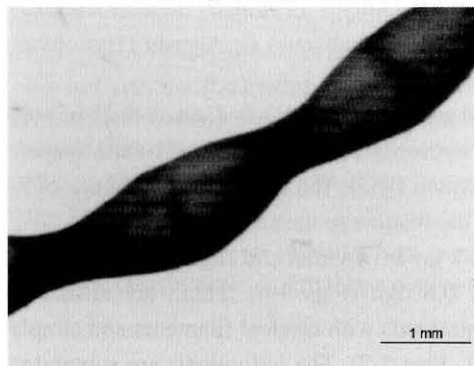


Fig. 4. Thallus of *Paralemanea catenata* (Kützinger) Vis & Sheath showing spermatangial sori in rings around nodes.



Fig. 5. *Paralemanea catenata* (Kützinger) Vis & Sheath: longitudinal section showing the central axis covered by cortical filaments and carposporophytes.



Fig. 6. *Paralemanea catenata* (Kützinger) Vis & Sheath: longitudinal section showing the central axis covered by cortical filaments and carposporophytes (stained in fuchsine solution).



Fig. 7. *Paralemanea catenata* (Kützinger) Vis & Sheath: transversal section showing the central axis covered by cortical filaments.

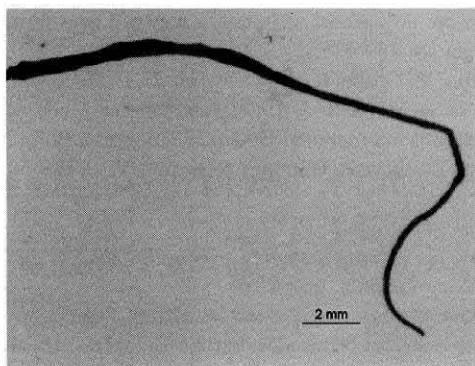


Fig. 8. Thallus of *Lemanea fluviatilis* (Linnaeus) C. Agardh showing stalked region.

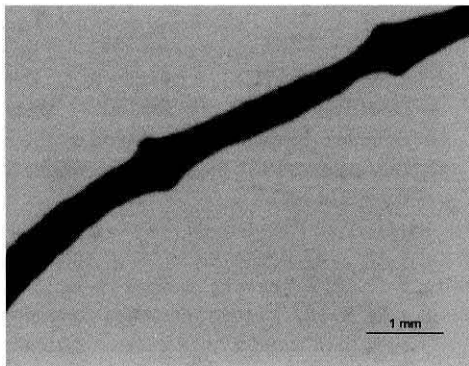


Fig. 9. Thallus of *Lemanea fluviatilis* (Linnaeus) C. Agardh showing spermatangial sori in patches.

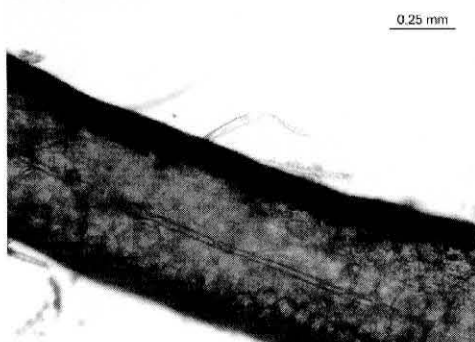


Fig. 10. *Lemanea fluviatilis* (Linnaeus) C. Agardh: longitudinal section showing the naked central axis.

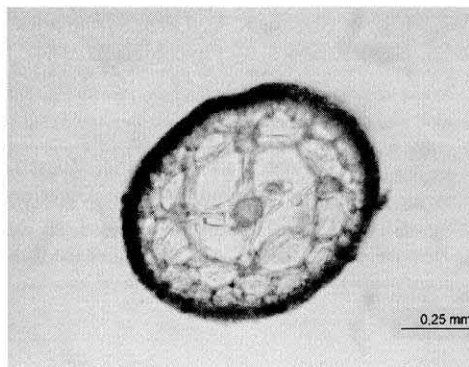


Fig. 11. *Lemanea fluviatilis* (Linnaeus) C. Agardh: transversal section showing the naked central axis.

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