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PROGRAM AND ABSTRACTS

Departamento de Biologia, Universidade dos Açores
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RESTORATION OF THE ESTUARINE GRADIENT ON THE ISLAND OF VLIELAND IN THE DUTCH WADDEN SEA.

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During the last century the majority of estuarine gradients in the Dutch Wadden Sea have been minimized due to the placement of embankments, dikes and sluices. There are plans for the restoration of natural gradients between fresh and sea water and between land and sea in the Dutch coastal zone. These fit within the framework of management plans to tackle the effects of sea level rise and the expected demands made on the fresh water carrying capacity of the coastal mainland. In the Dutch coastal zone there is a variety of large and small scale restoration projects. By studying these, more insight will be gained in the scale necessary to restore a brackish water habitat with main estuarine characteristics. Results of a small scale restoration project on the island of Vlieland are presented and evaluated.

NEW RECORDS OF BROWN ALGAE (PHAEOPHYTA) FROM THE AZORES

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During a programme of floristic studies in the Azores, the following five species of microscopic tufted or encrusting brown algae (Phaeophyta) have been newly recorded for the Island of São Miguel: *Nemoderma tingitana* Schousboe (after Kuckuck) (Nemodermataceae), *Pseudolithoderma roscoffensis* (Loiseaux) (Lithodemataceae), *Hecatonema maculans* (Collins) Sauvageae (Punctariaceae), *Compsonema saxicola* (Kuckuck) Kuckuck and *Microspongium gelatinosum* Reinke (Scytosiphonaceae). Information is presented on their distribution patterns and aspects of their ecology and structure. Results are also described of some preliminary studies on their development and life history in laboratory culture.

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Introduction

To date, very little attention has been given to studying the smaller, tufted and crustose brown algae (Phaeophyta) of the Azores. Only the cosmopolitan crust *Ralfsia verrucosa* has been listed for the islands of Pico and Faial by Tittley & Neto (1994). The present study was initiated, therefore, as part of the Biodiversity project, to provide a better understanding of this relatively neglected group of brown algae. An intensive programme of field studies was set up to search for the presence of these algae on the island of São Miguel and provide much needed data on aspects of their local and geographical distribution,seasonality and ecology. A complementary programme of culture studies was also set up to determine their taxonomic status. In view of the established connection between some of these algae and larger, macroscopic members of the families Scytosiphonales and Punctariales, when possible species of the latter families were also collected and investigated in laboratory culture.

The present poster describes five new records of small brown algae from São Miguel along with data on their distribution, seasonality and ecology. For some species, information is also given regarding their life cycle.

Results

The following 5 new records of brown algae were recorded during the survey (see Fletcher, 1987 for taxonomic grouping): *Pseudolithoderma roscoffense* *Nemoderma tingitana* (Ulothodermataceae); *Compsonema saxicolum*, *Microspongium gelatinosum* (Scytosiphonaceae); *Hecatonema maculans* (Punctariaceae).

Nemoderma tingitana ◆

Thallus epilithic, crustose, slightly gelatinous in texture, yellow in colour, irregularly spreading one or two meters in extent, firmly attached to the substractum by undersurface, usually without rizoids.

Plants with a monostromatic base giving rise to erect filaments up to 40 cells (1006µm long) and easily separable under pressure.

Central cells commonly rectangular (7.8-20.8*7.8-28.6µm) upper cells quadrate, elongate or slightly pyriforme in shape (10.4-18.2*10.4-26µm). Cells withseveral disciod plastids.

Hairs in grouped and abundant on the crusts. In the older crusts the lower cells contain few or no chromatophors and appear to serve for storage only.

The unilocular sporangia develop from intercalary cells (Fig.1b) in the upper parts of the threads, while the sex organs are borne laterally (Fig.1b) at about the same level but on different individuals.

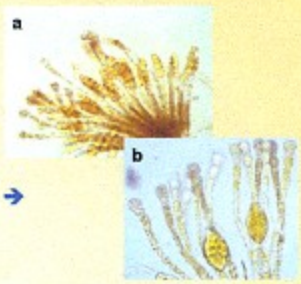


Fig.1 *Nemoderma tingitana*: a-gametophyte with male and female gametangia, b-esporophyte.

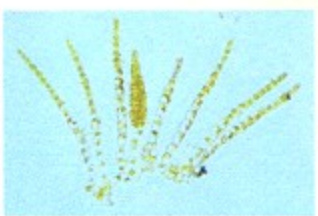


Fig.3 *Hecatonema maculans* with pluriocular sporangia.

Microspongium gelatinosum Phase of *Scytosiphon lomentaria* □

Thallus epilithic, crustose to, slightly pulvinate sponge-like and gelatinous in texture, brown-dark in colour, circular or more commonly irregularly spreading over several centimeters in extent, firmly attached to the substratum by undersurface, usually without rizoids.

Thallus with a monostromatic base giving rise to erect coherent filaments up to 140µm long (approximately 12 cells), and easily separable under pressure (Fig.5) Basal cells, commonly rectangular (13-33.8*7.8-13µm), central cells also rectangular but slightly smaller (7.8-15.6*10.4-23.4µm), upper cells either quadrate, elongate or slightly pyriform in shape (7.8-15.6*10.4-44.2µm). Cells with a single, parietal, plate-like plastid, located on the upper cell region, with pyrenoid.

Unilocular sporangia elongate-pyriform or elongate-cilindrical (18.2-41.6*59.8-132.6µm), commonly sessile or on 1 celled pedicells arising from the basal layer.

Hecatonema maculans (Colins) Sauvageau ⬭

Thallus epilithic, forming small, light brown tufts, discrete or more commonly confluent, spreading to approximately 2 to 4 centimeters in diameter.

In squash preparations, plants reveal a pseudodiscoid base comprising cells variable in shape (15.6-31.2*7.8-23.4µm). These give rise to erect filaments up to 100 cells (963µm) long, that are linear and loosely associated in a gelatinous matrix. Erect filaments, slightly branched, comprising cells mainly rectangular (13-23.4*10.4-44.8µm) with several discoid plastids or 1-3 plate-like, with pyrenoids and occasionally with longitudinal divisions; hairs common arising from the basal layer on terminal cells of erect filaments.

Pluriocular sporangia (Fig.3) common, ovate or elongate in shape biseriate or more commonly multiseriate, to 30 loculi in lenght; usually borne on the basal layer. Unilocular sporangia not observed.

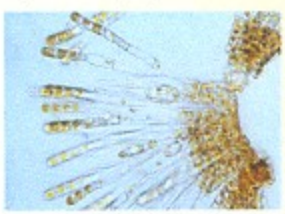


Fig.5 *Microspongium gelatinosum* with empty pluriocular sporangia.

Mapping and seasonality

Distribution of the new records are shown in Figure 6.

Nemoderma tingitana was the only species present at all the sites visited, occuring quite commonly all year round on exposed rocks in the mid intertidal region. However, in general, the other species were also widely distributed and not uncommon at each locality throughout the year. Unlike *Nemoderma tingitana*, they usually occurred on stones and rocks at low tide level or in pools. Only *Microspongium gelatinosum* exibited some seasonality, being apparently absent in the winter months. Maia, Caloura and Feteiras appeared to be the best sites for these algae.

Fig. 6 Location of the sampling sites on the island of São Miguel, and distribution of the new records.
Nemoderma tingitana ◆ ; *Pseudolithoderma roscoffense* ▲ ; *Hecatonema maculans* ⬭ ;
Compsonema saxicolum ▯ ; *Microspongium gelatinosum* □ .

References

Fletcher, R. L.1987. *Seaweeds of the British Isles Vol7. Fucophyceae (Phaeophyceae)* Part I. Natural History British Museum, London.IX + 959.

Tittley, I. & A. I. Neto, 1994. Benthic marine algae (seaweeds) recorded from Faial and Pico. *Arquipelago. Life and Marine Sciences*, 12A: 1-13.

Van Stosch,H. A. 1964. Wirkungen von Jod und Arsenit auf Meeresalgen in Kultur. In: Proc. 4th *Int. Seaweed Symp.* eds. D. De Virville and J. Feldmann Oxford: Pergamon Press: 142-150.

Material and Methods

Work was undertaken in the period May 1998 to May 1999 at seven sites distributed around the island of São Miguel (see Fig. 6).

Sampling was undertaken monthly, in the intertidal, by walking around the study areas and collecting stones, plastics and other materials with attached crusts and small tufts. When found, material was also collected of the larger Scytosiphonacean species *Colpomenia peregrina*, *Endarachne binghamiae* and *Scytosiphon lomentaria* known to be present on the island.

In the laboratory, the material was examined and identified using a combination of stereo and compound microscopes. Where appropriate, measurements were made of cells and other structures using a calibrated micrometer eye piece. Permanent slides were made of all collections, after staining the material in either fast green or crystal violet. A reference collection was also made by storing the algae in 5% buffered formaldehyde-sea water solution. All collections are deposited at the University of Azores.

A representative collection of colour slides was also made using an OLYMPUS- PM 10- 35 AD- 1 microphotographic system.

For the cultures studies, small, cleaned, fertile portions of the algae were removed and placed into hanging drop cultures until spore release had been obtained. Spores were then cultured in von Stosch culture medium (von Stosch, 1964) in growth cabinets maintained at 15ºC, 8:16h light:dark photoperiod, and 22ºC, 16:8h light:dark photoperiod. Cultures were examined regularly and their development recorded.

Pseudolithoderma roscoffense Loiseau △

Thallus encrusting, thin to moderately thick, light brown to black in colour, adhering firmly to the substratum, commonly without rizoids, irregular and confluent 5cm or more in extent. Comprising a monostromatic discoid base giving rise strongly united filaments, to 22 cells (195µm) long enclosed by a thick surface cuticle.

The superficial cells up to 13-15.6*13-20.8µm have a polygonal arrangement and contain several peripherally placed discoid plastids.

The cells of the erect filaments measure 7.8-26*7.8-18.2µm,and contain 3-6 or more discoid plastids; hairs not observed.

The pluriocular sporangia are terminally positioned in sori (Fig.2), and covered by thick surface cuticle, in vertical section the sporangia are clavate to slightly pyriform in shape, 10.4-23.4*26-62µm, have straight dividing walls and without paraphyses; unilocular sporangia unknown.

Fig.2 *Pseudolithoderma roscoffense* with pluriocular sporangia.

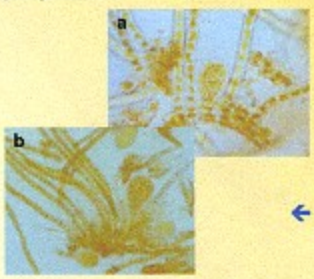


Fig.4 *Compsonema saxicolum*: **a**- cells with plate-like plastids, **b**-general view with unilocular sporangia.

Compsonema saxicolum Phase of *Scytosiphon* or *Petalonia* ▯

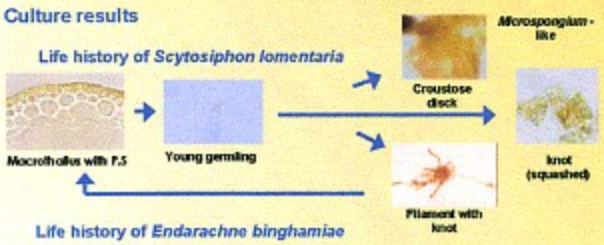
Thallus epilithic, solitary or confluent, spreading to approximately 1 to 2mm in diameter. Developing from a basal layer of branched, outwardly spreading and loosely associated filaments (pseudodiscoid), the thallus forms small tufts of light brown yellow, erect filaments.

Cells of the basal layer mainly rectangular (17.8-15.6*10.4-20.8µm), frequently longitudinally divided. Erect filaments linear to 44 cells long (up to 492µm) free, unbranched, loosely associated in a gelatinous matrix and easily separable under pressure, comprising cells mainly quadrate (7.8-13µm), sometimes rectangular (10.4-18.2*13-23.4µm). Each cell with a single plate-live plastid (Fig.4a) with a conspicuous pyrenoid. Longitudinal divisions sometimes present in the central region of some filaments. Hairs common, arising from the basal layer or terminal cells of erect filaments.

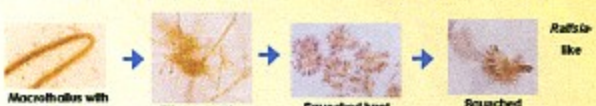
Unilocular sporangia (Fig.4b) common pyriform or elongate pyriform in shape, sessile or stalked on basal layer, or in some cases, terminal or lateral on erect filaments. Pluriocular sporangia unknown.

Culture results

Life history of *Scytosiphon lomentaria*



Life history of *Endarachne binghamiae*



Life history of *Colpomenia sinuosa*

Discussion

The present study has considerably extended the known distribution of these small algae in the North Atlantic. The Azores now represent the southern limit of distribution for *Pseudolithoderma roscoffense*, *Hecatonema maculans*, *Compsonema saxicolum* and *Microspongium gelatinosum*, and the northern limit for *Nemoderma tingitana*. These also represent new published records for Portugal. It is unlikely that they represent new introductions but have merely been overlooked in the past because of their small size. It is surprising, however, that *Nemoderma* has not previously been reported in the Azores in view of its abundance on intertidal rocks.

The results from the culture studies have, to date, revealed direct type life histories are occuring in all four species investigated with no evidence of a sexual process or of a heteromorphic type life history. However, it was interesting that both *Scytosiphon* and *Endarachne* developed knot-filaments.