

NEW RECORDS OF BENTHIC MARINE RED ALGAE (CERAMIALES: RHODOPHYTA) FROM THE AZORES.

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Sixteen new records of marine red algae (Ceramiales: Rhodophyta) are reported for the Azores islands: *Aglaothamnion gallicum*, *A. pseudobyssoides*, *Anotrichium barbatum*, *A. furcellatum*, *Ceramium botryocarpum*, *C. flaccidum*, *C. secundatum*, *Compsothamnion decompositum*, *Wrangelia penicillata* (Ceramiaceae); *Haraldiophyllum bonnemaisonii*, *Radicilingua thysanorhizans* (Delesseriaceae); *Dasya hutchinsiae* (Dasyaceae); *Brongniartella byssoides*, *Chondria coerulea*, *Polysiphonia foetidissima*, *P. furcellata* (Rhodomelaceae). Data concerning morphology, phenology, ecological conditions and geographical distribution of the species in the Atlantic are presented.

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INTRODUCTION

In contrast to the marine fauna of the Azores, which has been studied since the 18th century (ARRUDA 1998), research on the marine algae of the Azores began only in the middle of the last century when Guthnick and the two Hochstetters, father and son, visited the Azores. This expedition produced several publications on the vegetation of the Azores but the first mentioning marine algae was SEUBERT (1844), who included a list of 44 species. This work constitutes the starting point for the marine flora of these islands, although no indication of the locality on the islands where the seaweeds were collected, or their abundance, was given. Since then the taxonomic studies continued and SCHMIDT (1931) presented the first compilation of the Azorean marine algal flora. More recently, NETO (1994) brought together the existing published information on the marine plants of the Azorean islands and provided distributional records within the archipelago. Since then, TITTLE et al. (1998) have reported 9 new records, increasing the known seaweed flora to 307 species. In the present study 16 red algal species collected from

the island of São Miguel are reported as new for the Azores algal flora.

MATERIAL AND METHODS

Work was undertaken in several places of the island of São Miguel, since September 1993.

Qualitative collections were made monthly at both intertidal and subtidal levels, down to 15 m depth. Collections were made by walking, swimming or scuba-diving over the study-area.

In the laboratory, the algae were sorted into species. Whenever possible, the material was observed on the same day, otherwise the samples were refrigerated overnight. Samples that could not be examined alive were preserved in 5% buffered formaldehyde-sea water solution (NEZELOF et al. 1972).

All plants were examined microscopically, using stereo and compound microscopes, to detect the occurrence of reproductive structures. Cells and other structures were measured, using a calibrated micrometer eye piece. For the identification of some species, histological work was necessary. Transverse sections were made using a freezing microtome. While the material

was fresh, the sections were mounted in seawater and observed. With preserved material, the plants were washed and the sections were mounted in distilled or tap water.

Two kinds of permanent slides were made. In most cases the material was stained using the aniline blue method (SPARLING 1957; TSUDA & ABBOTT 1985). For a few species the glycerin method (CHEMIN 1929 *vide* TSUDA & ABBOTT 1985) was used.

Two other types of reference collections were established, one in liquid, the other on paper. In the liquid collection, specimens were preserved in 5% buffered formaldehyde-sea water solution. In the herbarium collection, the specimens were mounted on herbarium sheets, following the method described by GAYRAL & COSSON (1986). Both collections are deposited at the University of the Azores.

The systematic organization and nomenclatural synopsis of the species generally follows that adopted by SOUTH & TITTLE (1986) with later modifications, mainly by MAGGS & PUESCHEL (1989). Spelling and abbreviations of algal authorities follow BRUMMIT & POWELL (1992). New synonyms were given by SCHNETTER et al. (1987), GUIRY & GARBARY (1990), SILVA & DECEW (1992), WYNNE & HEINE (1992), HOMMERSAND et al. (1993), NAM et al. (1994) and PRUD'DOMME VAN REINE et al. (1994). For each family, species are listed alphabetically under each genus.

ANNOTATED LIST OF SPECIES

CERAMIACEAE

Aglaothamnion gallicum (Nägeli) Halos ex Ardré

DESCRIPTION AND ICONOGRAPHY: ARDRÉ (1970, p.306); MAGGS & HOMMERSAND (1993, p.99, Fig. 33).

Azorean plants are small and delicate filaments, with a cylindrical, pyramidal or flabellate outline; the branching is alternate and distichous, in one plane; the basal cell of the lateral branch bears an abaxial branchlet, the main axis is often densely corticated and is attached by a discoid holdfast.

Tetrasporic plants were seen in April and May. A female plant was observed in April.

LOCALITIES: São Vicente (SMG-95-92; SMG-95-114; SMG-96-29; SMG-98-106), São Roque (SMG-94-329; SMG-95-422b), Pópulo (SMG-98-27; SMG-98-81; SMG-98-83), Mosteiros (SMG-98-34), Feteiras (SMG-98-47a), Caloura (SMG-98-100), Maia (SMG-98-129).

ECOLOGY: Infrequently found, this species was present at intertidal and subtidal levels.

GEOGRAPHIC DISTRIBUTION: Eastern Atlantic from the British Isles to Morocco and the Canaries, also in Mediterranean (ARDRÉ 1970; Price et al. 1986; MAGGS & HOMMERSAND 1993). The Azores represent a western extension of the known distribution range.

Aglaothamnion pseudobyssoides (P. Crouan & H. Crouan) Halos

DESCRIPTION AND ICONOGRAPHY: ARDRÉ (1970, p.305); MAGGS & HOMMERSAND (1993, p.107, Fig. 36).

Plants examined are delicate and flaccid filaments; thalli consists of erect axes growing in tufts, up to 2 cm high; the main axis is very distinct and usually naked towards the basis. This species has been regarded as synonymous with *A. byssoides* but a sterility barrier exists (MAGGS & HOMMERSAND 1993). Azorean material can be differentiated from *A. byssoides* on the main axis width (up to 150 µm wide in *A. byssoides* versus 75 µm in *A. pseudobyssoides*).

One tetrasporangial plant was found in May.

LOCALITIES: São Vicente (SMG-95-37), São Roque (SMG-95-42; SMG-95-424; SMG-95-551; SMG-97-175)

ECOLOGY: A rare species, both intertidally and subtidally.

GEOGRAPHIC DISTRIBUTION: Eastern Atlantic from the British Isles to mainland Portugal (ARDRÉ 1970; MAGGS & HOMMERSAND 1993). The Azores represent a new southern limit of distribution.

Anotrichium barbatum (C. Agardh) Nägeli

DESCRIPTION AND ICONOGRAPHY: FELDMANN-MAZOYER (1940, p.408, Figs. 159-160); TAYLOR (1967); ATHANASIADIS (1987, p.81) LITTLER et

al. (1989, p.138); MAGGS & HOMMERSAND (1993, p.179, Fig. 58).

Azorean plants form tufts of numerous fastigiate dichotomously branched filaments comprising pyriform cells, which are swollen distally; axial cells less than 200 µm in diameter; apical cell, 50µm in diameter.

No reproductive structures were seen.

LOCALITIES: São Vicente (SMG-94-18), São Roque (SMG-94-26).

ECOLOGY: This species was collected at both intertidal and subtidal levels.

GEOGRAPHIC DISTRIBUTION: Eastern and western Atlantic, and the Mediterranean (FELDMANN-MAZOYER 1940; WYNNE 1985; PRICE et al. 1986; ATHANASIADIS 1987; MAGGS & HOMMERSAND 1993).

Anotrichium furcellatum (J. Agardh) Balldock

DESCRIPTION AND ICONOGRAPHY: ATHANASIADIS (1987, p.81); MAGGS & HOMMERSAND (1993, p.181, Fig. 59).

Distinguished from *A. barbatum* by having cylindrical cells and an apical cell less than 25 µm in diameter.

Tetraspores were observed in September and a spermatangia in May.

LOCALITIES: São Vicente (SMG-93-17; SMG-94-40; SMG-95-15; SMG-95-101; SMG-95-120; SMG-95-395; SMG-95-556; SMG-95-580; SMG-96-187; SMG-96-231; SMG-96-333), São Roque (SMG-94-215; SMG-94-403; SMG-95-424), Ponta Delgada marina (SMG-94-215; SMG-94-403), Maia (SMG-98-64).

ECOLOGY: Rather more frequent than *A. barbatum*, this species was epilithic in *Centroceras* turf at intertidal and subtidal levels.

GEOGRAPHIC DISTRIBUTION: Eastern Atlantic, from the British Isles to Africa, including the Canaries. Also recorded in the Mediterranean (STEGENGA & MOL 1983; PRICE et al. 1986; MAGGS & HOMMERSAND 1993). The Azores represent a western extension of the known distribution range.

Ceramium botryocarpum Griffiths ex Harv.

DESCRIPTION AND ICONOGRAPHY: MAGGS & HOMMERSAND (1993, p.45, Fig. 13).

Plants growing in tufts with an extensive prostrate system of axes; main axis of mature thalli entirely corticated; branching irregular at intervals of 6 segments; no spines; periaxial cells typically 6. Tetrasporic plants were seen between February and June.

LOCALITIES: São Vicente (SMG-94-22; SMG-96-59; SMG-96-63), São Roque (SMG-94-12; SMG-95-367; SMG-95-552).

ECOLOGY: Both epilithic and epiphytic this species was strictly intertidal.

GEOGRAPHIC DISTRIBUTION: Recorded in the northeast Atlantic from the British Isles to North of Spain (MAGGS & HOMMERSAND 1993). The Azores represent the new southern limit of distribution.

Ceramium flaccidum (Kützting) Ardissonne

DESCRIPTION AND ICONOGRAPHY: SEOANE-CAMBA (1965, p.133, Fig. 37); ARDRÉ (1970, p.285, Pl. 15, Figs. 1-4); ATHANASIADIS (1987, p.76); MAGGS & HOMMERSAND (1993, p.59, Fig. 19).

Thalli flaccid, attached by prostrate axes and usually forming irregularly shaped tufts; main axes incompletely corticate, bearing alternate arrangements of densely branched laterals; no spines; unicellular rhizoids; apices obviously alternately branched every 5-6 segments.

No reproductive structures were seen.

LOCALITIES: São Roque (SMG-94-102; SMG-95-552; SMG-95-362; SMG-95-62), Caloura (SMG-98-96), Mosteiros (SMG-98-276).

ECOLOGY: Epilithic in the lower intertidal, both in pools and exposed rocks.

GEOGRAPHIC DISTRIBUTION: Western and eastern Atlantic and the Mediterranean (SEOANE-CAMBA 1965; WYNNE 1985; PRICE et al. 1986; ATHANASIADIS 1987; MAGGS & HOMMERSAND 1993).

Ceramium secundatum Lyngbye

DESCRIPTION AND ICONOGRAPHY: MAGGS & HOMMERSAND (1993, p. 70, Fig. 23); BOO & RUENESS (1994, p.114, Figs. 1-7).

Thalli of Azorean specimens consisting of fan-shaped or cylindrical tufts of several erect axes attached by a dense mass of multinucleate

rhizoidal filaments; main axis of mature thalli entirely corticate, branching at intervals of 10-18 segments; strongly inrolled apices; no spines; periaxial cells typically 8.

All the examined plants, except one collected in September, were tetrasporic.

LOCALITIES: São Vicente (SMG-96-314; 97-229), São Roque (SMG-94-113a; SMG-95-66; SMG-95-327; SMG-95-332), Mosteiros (SMG-98-32; SMG-98-247; SMG-98-277; SMG-98-286; SMG-98-302), Pópulo (SMG-98-25), Maia (SMG-98-122; SMG-98-137), Calhetas (SMG-98-59), Caloura (SMG-98-98).

ECOLOGY: Epilithic in intertidal pools.

GEOGRAPHIC DISTRIBUTION: Common in the British Isles (MAGGS & HOMMERSAND 1993). Because of the confusion with the former *C. rubrum* complex, the geographical distribution of this species cannot be assessed at present.

Compothamnion decompositum (J. Agardh) Maggs & L'Hardy-Halos

DESCRIPTION AND ICONOGRAPHY: MAGGS & HOMMERSAND (1993, p.159, Fig. 52).

Filamentous and delicate plant with a monosiphonous and ecorticate thalli; main axis wider than branches, bearing laterals in an alternate arrangement in one plane; cells multinucleate.

Tetrasporangia lateral and sessile were observed in September.

LOCALITIES: São Vicente (SMG-93-30), São Roque (SMG-95-406; SMG-95-424).

ECOLOGY: Strictly subtidal, this species was epiphytic on a range of other algae.

GEOGRAPHIC DISTRIBUTION: Common in the northeast Atlantic (MAGGS & HOMMERSAND 1993). The Azores represent the new southern limit of distribution.

Wrangelia penicillata (C. Agardh) C. Agardh

DESCRIPTION AND ICONOGRAPHY: FELDMANN-MAZOYER (1940, p.425); TAYLOR (1967, p.503, Pl. 66, Figs. 5-6; Pl. 74, Fig. 5); LEVRING (1974, p.88); LAWSON & JOHN (1982, p.301, Pl. 48, Figs. 4-5); ATHANASIADIS (1987, p.84); LITTLER et al. (1989, p.148); BOUDOURESQUE et al. (1992, p.184, Fig. 200).

Plants usually solitary, stiff and erect; branching alternate and distichous, with well-developed cortication; branchlets terminating in an acute spine.

Tetrasporic plants were seen in December.

LOCALITIES: São Vicente (SMG-94-360; SMG-97-144), São Roque (SMG-95-351; SMG-95-372; SMG-97-168), Lagoa (SMG-97-193), Pópulo (SMG-98-92), Caloura (SMG-97-221).

ECOLOGY: Only seen at subtidal levels, where it was rare.

GEOGRAPHIC DISTRIBUTION: Western and eastern Atlantic and the Mediterranean (FELDMANN-MAZOYER 1940; TAYLOR 1967; LEVRING 1974; LAWSON & JOHN 1982; WYNNE 1985; ATHANASIADIS 1987; BOUDOURESQUE et al. 1992).

Haraldiophyllum bonnemaisonii (Kylín) A. Zinova

DESCRIPTION AND ICONOGRAPHY: MAGGS & HOMMERSAND (1993, p.242, Fig. 76).

Plants examined are membranous and translucent without a conspicuous midrib or microscopic veins; thalli consists of one or more blades attached by small solid holdfast with prostrate rhizoidal outgrowths; blades fan-shaped, dichotomously divided into overlapping lobes with rounded or obtuse apices and entire or dentate margins; plastids numerous, small, plate-like to bacilloid; cystocarps subspherical, with a non-protruding ostiole, tetrasporangial sori numerous, round to oval, occasionally coalescing. Most plants were reproductive, with the tetrasporophyte generation observed in January, May and June, and a female plant observed in June.

LOCALITIES: São Vicente (SMG-93-113; SMG-93-147; SMG-94-341; SMG-94-355; SMG-94-384; SMG-95-104; SMG-96-95; SMG-96-241; SMG-96-268; SMG-97-95; SMG-97-259; SMG-97-261), São Roque (SMG-95-64; SMG-95-349), Mosteiros (SMG-98-240).

ECOLOGY: Present at intertidal and subtidal levels.

GEOGRAPHIC DISTRIBUTION: Eastern Atlantic (PRICE et al. 1992; MAGGS & HOMMERSAND 1993), the Azores represent a western extension of the known distribution range.

Radicilingua thysanorhizans (Holmes)
Papenfuss

DESCRIPTION AND ICONOGRAPHY: ARDRÉ (1970, p.316); MAGGS & HOMMERSAND (1993, p.263, Fig. 82).

Plants largely prostrate, membranous and translucent, attached by small marginal projections that develop at irregular intervals; blades monostromatic, with 40 µm in thickness; microscopic veins mostly parallel and forming a network. Although originally considered conspecific with *Acrosorium venulosum* (see WYNNE 1989), even sterile specimens can be easily separated by such features as plastid shape and attachment structures.

Only one reproductive plant with mature cystocarps was found, in September.

LOCALITIES: São Vicente (SMG-94-340; SMG-94-341; SMG-95-36; SMG-95-37; SMG-97-41), São Roque (SMG-93-64; SMG-94-15; SMG-94-46; SMG-94-246a; SMG-95-40; SMG-95-374).

ECOLOGY: Mainly epiphytic, this species was present from the intertidal to subtidal levels.

GEOGRAPHIC DISTRIBUTION: Eastern Atlantic from the British Isles to mainland Portugal and also the Mediterranean (ARDRÉ 1970; MAGGS & HOMMERSAND 1993). The Azores represent a new southern limit of distribution.

DASYACEAE

Dasya hutchinsiae Harv. in Hook.

DESCRIPTION AND ICONOGRAPHY: ARDRÉ (1970, p.321); LEVRING (1974, p.97); MAGGS & HOMMERSAND (1993, p.272, Fig. 84).

Thalli radially organized, terete and polysiphonous arising from a discoid rhizoidal holdfast; erect axes growing in tufts; spirally branched main axes, lightly to heavy corticated; pseudo-laterals branched from immersed basal cell, appearing to arise in pairs, and also from all of the next few cells; each stichidial segment containing 5 tetrasporangia.

Plants bearing stichidia with tetrasporangia were found in September, May and October.

LOCALITIES: São Vicente (SMG-94-297; SMG-94-301; SMG-94-405; SMG-95-94; SMG-95-562), São Roque (SMG-94-404; SMG-94-407;

SMG-95-559), Maia (SMG-98-136), Mosteiros (SMG-98-269; SMG-98-271).

ECOLOGY: Mainly epiphytic, this species was present in the intertidal and at subtidal levels.

GEOGRAPHIC DISTRIBUTION: The eastern Atlantic including Madeira and the Canaries (ARDRÉ 1970; LEVRING 1974; PRICE et al. 1986; MAGGS & HOMMERSAND 1993) and the Mediterranean (ATHANASIADIS 1987). The Azores represent a western extension of the known distribution range.

RHODOMELACEAE

Brongniartella byssoides (Gooden. & Woodw.)

DESCRIPTION AND ICONOGRAPHY: GAYRAL (1966, p.575, Pl. CLXXVIII); ARDRÉ (1970, p.333); ATHANASIADIS (1987, p.91); MAGGS & HOMMERSAND (1993, p.302, Fig. 92); COPPEJANS (1995, p.340, Pl. 135).

Thalli radially organized, terete and polysiphonous, composed of dense cylindrical to irregularly pyramidal tufts of erect axes attached by tangled prostrate axes. Distinguished from *Dasya* by the absence of cortication.

No reproductive structures were seen.

LOCALITIES: São Vicente (SMG-93-32).

ECOLOGY: Epiphytic on other subtidal species.

GEOGRAPHIC DISTRIBUTION: The eastern Atlantic, and the Mediterranean (GAYRAL 1966; ARDRÉ 1970; MAGGS & HOMMERSAND 1993). The Azores represent a new southern limit of distribution.

Chondria coerulescens (J. Agardh) Falkenberg.

DESCRIPTION AND ICONOGRAPHY: GAYRAL (1958, p.476, Pl. CXLII); SEOANE-CAMBA (1965, p.153); GAYRAL (1966, p.562, Pl. CLXXII); ARDRÉ (1970, p.355); LEVRING (1974, p.105); ATHANASIADIS (1987, p.91); MAGGS & HOMMERSAND (1993, p.388, Fig. 122).

Thalli flexible and cartilaginous in texture, consisting of cylindrical erect axes arising in erect or decumbent tufts from a solid lobed holdfast; erect thalli with distinct main axes, branching sparsely at irregular intervals in a spiral pattern to 1-3 orders of branching; branches curving and

reattaching by secondary holdfasts that may form stolon-like outgrowths; apices obtuse, terminating in a shallow depression, sometimes with protruding trichoblast; erect axes with 5 periaxial cells readily distinguishable from other medullary cells; young plants showing a vivid, metallic blue iridescence when alive; wart-like aborted branch initials spirally borne on the axes.

Tetrasporic plants were found in June, October and December. One cystocarpic plant was collected in July.

LOCALITIES: São Vicente (SMG-94-315; SMG-95-107; SMG-95-128), São Roque (SMG-94-89; SMG-94-326; SMG-94-399; SMG-95-60; SMG-95-342; SMG-95-423), Caloura (SMG-98-5), Feteiras (SMG-98-45), Pópulo (SMG-98-85), Calhetas (SMG-98-156), Mosteiros (SMG-98-205).

ECOLOGY: Strictly intertidal, this plant was found in pools, cervices and exposed rocks.

GEOGRAPHIC DISTRIBUTION: The eastern Atlantic, including Madeira and the Canaries (GAYRAL 1958, 1966; SEOANE-CAMBA 1965; ARDRÉ 1970; PRICE et al. 1986; MAGGS & HOMMERSAND 1993). Also recorded in the Mediterranean (ATHANASIADIS 1987). The Azores represent a western extension of the known distribution range.

Polysiphonia foetidissima Cocks ex Bornet

DESCRIPTION AND ICONOGRAPHY: TAYLOR (1967, p.581); ARDRÉ (1970, p.340); MAGGS & HOMMERSAND (1993, p.336, Fig. 103).

Plants extremely soft and flaccid in texture forming dense tufts; thalli polysiphonous, radially organized, with 7-8 pericentral cells; ecorticate main axes, less than 40 µm wide, with straight apices and spiral branching; rhizoids cut off from periaxial cells; trichoblasts numerous.

One male gametophyte was observed in December.

LOCALITIES: São Vicente (SMG-93-119).

ECOLOGY: Epiphytic on several species in the subtidal.

GEOGRAPHIC DISTRIBUTION: Western and eastern Atlantic and the Mediterranean (BATTEN 1922; TAYLOR 1967; ARDRÉ 1970; WYNNE 1985; PRICE et al. 1986; MAGGS & HOMMERSAND 1993; LAWSON et al. 1995).

Polysiphonia furcellata (C. Agardh) Harv. in Hook.

DESCRIPTION AND ICONOGRAPHY: ARDRÉ (1970, p.341); ATHANASIADIS (1987, p.100); MAGGS & HOMMERSAND (1993, p.341; Fig. 105).

Distinguished from *P. foetidissima* by having dichotomous branching and young branches with apices paired and incurved, resembling *Ceramium*.

Only sterile plants were found.

LOCALITIES: São Vicente (SMG-94-37; SMG-94-38).

ECOLOGY: Epiphytic on the algal turf in the lower intertidal.

GEOGRAPHIC DISTRIBUTION: The eastern Atlantic, and the Mediterranean (FELDMANN 1954; ARDRÉ 1970; LAURET 1970; ATHANASIADIS 1987; MAGGS & HOMMERSAND 1993; LAWSON et al. 1995). The Azores represent a western extension of the known distribution range.

DISCUSSION

Some of the new recorded species were restricted to the intertidal level, either on the exposed rocks (*Chondria coerulescens*) or lower on the shore (*Ceramium botryocarpum*, *C. flaccidum*, *C. secundatum*, *Polysiphonia furcellata*). Others were exclusively found in the subtidal zone (*Anotrichium barbatum*, *Brongniartella byssoides*, *Compsothamnion decompositum*, *Polysiphonia foetidissima*, *Wrangelia penicillata*).

Some of the studied species had a seasonal occurrence. Those occurring only in summer include *Brongniartella byssoides* and *Compsothamnion decompositum*. *Polysiphonia foetidissima* was only present in autumn and *P. furcellata* occurred only in winter. Other taxa had a larger period of occurrence: *Anotrichium barbatum* was present in autumn and winter, *Ceramium flaccidum* in winter and spring, and *Chondria coerulescens* was found throughout the year.

The absence of some species at different times of the year can be related to their life cycle, and/or to errors associated to the sampling method. In

fact, many species are small plants and occur in low densities making them easy to miss in the collections.

Most of the species reported in this work belong to the cold flora of the northeastern Atlantic. *Aglaothamnion pseudobyssoides*, *Anotrichium furcellatum*, *Ceramium botryocarpum*, *C. secundatum*, *Compsothamnion decompositum* and *Haraldiophyllum bouneimaisonii* are only known from the eastern Atlantic, most of them having their southern limit of distribution in the Azores. Other seven species (*Aglaothamnion gallicum*, *Brongniartella byssoides*, *Ceramium flaccidum*, *Chondria coeruleascens*, *Dasya hutchinsiae*, *Radicilingua thysanorhizans* and *Polysiphonia furcellata*) are also only present in the eastern Atlantic, but extend into the Mediterranean. Among these, *B. byssoides* and *R. thysanorhizans* have their southern limit of distribution in the Azores. Only *Anotrichium barbatum*, *Polysiphonia foetidissima* and *Wrangelia penicillata* are amphi-Atlantic species. None of the species in the present list has a distribution range previously limited to the western Atlantic.

This is in agreement with previous biogeographical studies (SCHMIDT 1931; VAN DEN HOEK 1984, 1987; PRUD'HOMME VAN REINE 1988; PRUD'HOMME VAN REINE & VAN DEN HOEK 1990; NETO 1997), which emphasize the affinities of the Azorean flora with those from the northeastern Atlantic. In fact, few species exclusively from the western Atlantic are known to occur in the Azores. This pattern is also reflected in the present list of species.

Most of the present new records are small plants. This is probably related to the special attention that was given to the epiphytes and small plants when doing the collections and the laboratory determinations. Similar work in the future is likely to continue to expand the known algal flora of the Azores.

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