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Seaweeds of the Greek coasts. I. Phaeophyceae

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Abstract

An updated checklist of the brown seaweeds (Phaeophyceae) of Greece is provided, based on both literature records and new collections. The total number of species and infraspecific taxa currently accepted is 107. The occurrence of each taxon in the North Aegean, South Aegean and Ionian Seas is given. In addition, 17 *taxa* pending confirmation of their presence, 11 *excludenda* and 8 *inquirenda* are briefly discussed.

Keywords: Aegean Sea, brown algae, checklist, Ionian Sea, seaweeds.

Introduction

With its vast coastline (16,000 km in length) and particular geographical position, Greece has attracted numerous naturalists. Greville (1827) and Bory (1832) were first to describe several new taxa from the Ionian and S. Aegean Seas, on the basis of collections made in the Ionian Islands and the Peloponnese. By the end of the 19th century other researchers, such as Mazziari (1851), Grunow (1861), Raulin (1869), Schmitz (1879), Reinbold (1898), and Candargy (1899) had also been studying seaweeds from the Ionian and Aegean Seas. From the early 20th century, Politis (1925, 1932, 1953), Katsikopoulos (1939) and Diannelidis (1935, 1950, 1953), also contributed to seaweed research along the Greek coasts. However, the most important studies have been carried out after the 1970s, mainly in the Aegean Sea (Anagnostidis, 1968; Nizamuddin & Lehnberg, 1970; Coppejans, 1974; Diannelidis *et al.*, 1977; Haritonidis, 1978; Tsekos *et al.*, 1982; Athanasiadis, 1987; Lazaridou, 1994; Chrysosovergis, 1995; Ctra & Giardina, 2009; Tsiamis *et al.*, 2010a), but less in the Ionian Sea (Haritonidis & Tsekos, 1976; Schnetter & Schnetter, 1981; Tsirika & Haritonidis, 2005).

The major part of these phycological studies provided checklists from the areas surveyed as well as scattered records, without any morphological descriptions or illustrations of the reported taxa, frequently resulting in taxonomic confusion. In addition, several studies dur-

ing the last decades have dealt either with physiological mechanisms or ecological aspects of marine vegetation, such as the use of seaweeds as biondicators (Orfanidis, 1992; Panayotidis *et al.*, 2004). A few reviews were also published, such as those by Diannelidis (1950), Gerloff & Geissler (1974) and finally Athanasiadis (1987, for the Aegean Sea). The annotated checklists of the Mediterranean seaweed flora by Ribera *et al.* (1992), Gallardo *et al.* (1993) and Gómez Garreta *et al.* (2001a) included seaweeds occurring in Greece.

Our scope is to update the knowledge of the Greek seaweed flora. This work is focused exclusively on the brown algae (Phaeophyceae) and is intended to be followed by separate works on the green and red algae (Chlorophyceae, part II, and Rhodophyceae, parts III and IV).

Materials and Methods

From the early 19th century until the present day 13 PhD theses and about 130 research papers have been published on seaweeds from Greece. Master and Bachelor Degree dissertations as well as conference contributions have not been taken into account. Brown algal taxa reported in all other publications have been critically reviewed from present-day taxonomic and nomenclatural aspects, taking also into account the on-line data provided by Silva (2012) and Guiry & Guiry (2012).

Taxa have been grouped in four categories: accepted, pending confirmation of their presence, *excludenda* and

inquirenda. Taxa are listed alphabetically, in order to make their detection easier. The distribution of each accepted taxon is given for the three major biogeographic regions: North Aegean, South Aegean and Ionian Sea (Fig. 1). Due to space limitation, only one reference is given for each region, giving priority to publications that include descriptions and/or illustrations. Additional references are available from the authors on request. New records are based on the collections of the senior author, as a part of his PhD thesis. Material relating to the new records has been deposited at the Athens University (Department of Botany) herbarium database.

Results

This checklist recognizes at least 107 brown algal taxa to occur in Greece (Table 1). *Cystoseira compressa* f. *plana* is reported for the first time (S. Aegean), while new regional records include *Cystoseira foeniculacea* f. *tenuiramosa* (in the N. Aegean and Ionian Seas), *Lobophora variegata* (in the N. Aegean Sea), *Padina di-tristromatica* (in the Ionian Sea), *Sporochnus pedunculatus* (in the S. Aegean and Ionian Seas) and *Taonia pseudociliata* (in the N. Aegean Sea). Information on these six new records follows:

Cystoseira compressa* f. *plana (Ercegovič) Cormaci, G. Furnari, Giaccone, Scammacca & Serio (Fucales, Sargassaceae)

DESCRIPTION: Thalli caespitose, erect, brown-blackish, rigid, to 10 cm high (Fig. 2A); 3-5 primary trunk-like axes, to 1 cm long, simple, attached to the substratum through a holdfast, 0,5-0,9 mm wide; apices of axes

slightly prominent and smooth; primary branches flattened, 3-4 mm wide; secondary branches distichous, flattened, 2-3 mm wide; all branches arranged in one plane, with inconspicuous midrib and 2 parallel rows of cryptostomata; spinose ramuli (leaves), tophules and aerocysts absent; terminal receptacles, to 1,5 mm long, fusiform-cylindrical, smooth, simple or occasionally branched. All measurements were taken from dried specimens.

HABITAT: A few thalli were collected at 2 m depth on rocky substratum of a semi-exposed shore.

LOCALITY: Tsigrado beach, Milos Island, S. Aegean Sea, June 2011, coll. K. Tsiamis.

DISTRIBUTION: Sicily, Adriatic Sea and Spain (Gómez Garreta *et al.*, 2001b; Taskin *et al.*, 2012).

NOTE: Despite being reported from deeper habitats (30-40 m depth, Gómez Garreta *et al.*, 2001b), our specimens were collected only in 2 m depth and exhibited slightly narrower primary branches.

Cystoseira foeniculacea* f. *tenuiramosa (Ercegovič) Gómez Garreta, Barceló, Ribera & Rull Lluch (Fucales, Sargassaceae)

DESCRIPTION: Thalli erect, caespitose, brown-blackish, rigid, to 18 cm high (Fig. 2B); 3-8 primary trunk-like axes, to 7 cm long, simple or branched, covered by spines and scars, attached to the substratum through a discoid holdfast, to 3 cm in diameter; apices of axes prominent and spiny; primary branches cylindrical, 1 mm in diameter, densely covered by spines (Fig. 2C); secondary and higher order branches filiform; spinose ramuli (leaves), tophules and aerocysts absent; terminal receptacles small, to 2 mm long, fusiform-cylindrical, simple or occasionally branched. All measurements were taken from dried specimens.

HABITAT: Several thalli were found at 0-1 m depth on small stones and pebbles of well protected shores.

LOCALITIES: Fava, Sithonia, N. Aegean Sea, August 2008, coll. K. Tsiamis; Keri, Laganas Bay, Zankintos Isl., Ionian Sea, April 2008, coll. K. Tsiamis.

DISTRIBUTION: Spain, Balearic Islands, Corsica, Sardinia, Sicily, Adriatic and Turkey (Gómez Garreta *et al.*, 2001b; Taskin *et al.*, 2012). Reported also by Giaccone (1968a, as *C. discors* f. *tenuiramosa*) from the S. Aegean Sea.

?*Lobophora variegata* (J.V. Lamouroux) Womersley ex E.C. Oliveira (Dictyotales, Dictyotaceae)

DESCRIPTION: Thalli were decumbent and partly erect, flabellate, brownish with yellowish margin, irregularly branched, narrow and stipose below, up to 2,5 cm long (Fig. 2D); margin without hairs, not curved, ending to a fringing line of darker cells (meristem); in cross section medullary cells rectangular, 30-50 µm thick, placed in ordinal rows, covered by smaller pigmented cortical cells, placed in pairs for each medullary cell; no reproductive

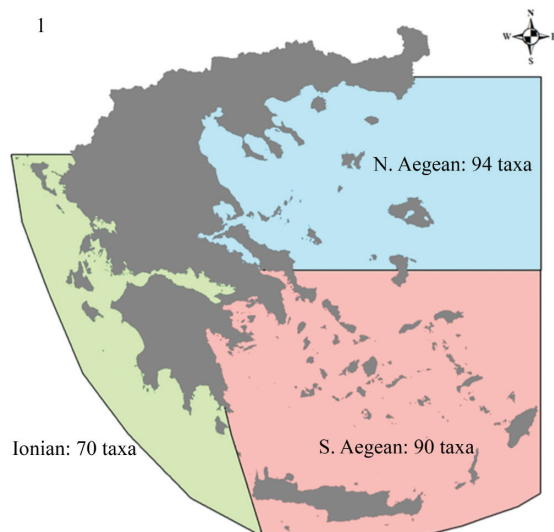


Fig. 1: Accepted brown algal taxa within each biogeographic region.

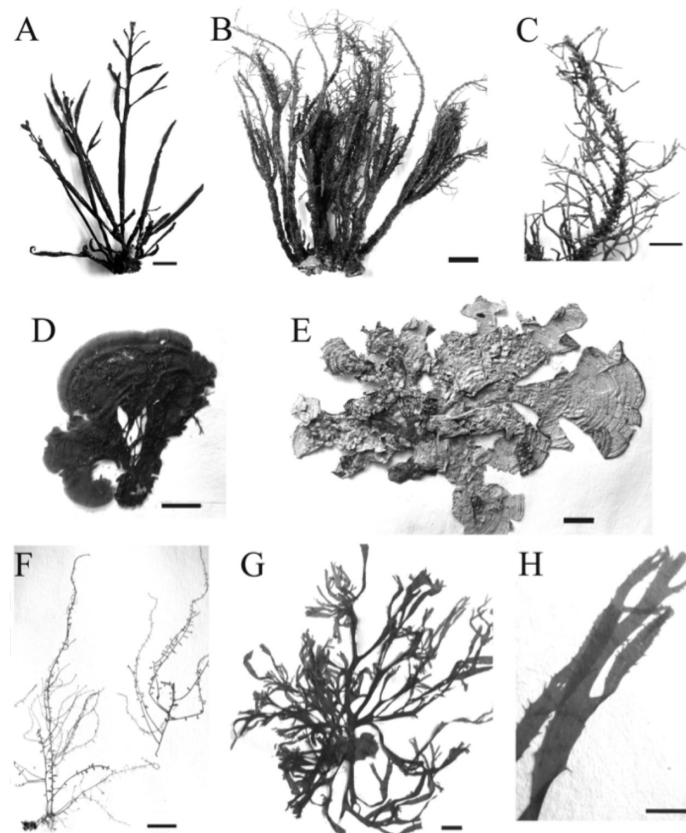


Fig. 2: Brown algae new to the North Aegean, South Aegean and/or Ionian Seas. Fig. A. *Cystoseira compressa* f. *plana* (herbarium habit). Figs B-C. *Cystoseira foeniculacea* f. *tenuiramosa* (B, herbarium habit; C, detail of primary spiny branch). Fig. D. *Lobophora variegata* (herbarium habit). Fig. E. *Padina di-tristromatica* (herbarium habit). Fig. F. *Sporochmus pedunculatus* (herbarium habit). Figs G-H. *Taonia pseudociliata* (G, herbarium habit; H, detail of upper branches bearing marginal spines). Scale bars: Figs A, B, E, F, G = 1 cm; Figs C, D, H = 5 mm.

structures observed. All measurements were taken from dried specimens.

HABITAT: A few thalli were collected from a rocky substratum in 15 m depth, at a semi-exposed shore.

LOCALITY: Porto Coufo, Sithonia, N. Aegean Sea, May 2012, coll. K. Tsiamis.

DISTRIBUTION: commonly met in the Mediterranean Sea (Ribera *et al.*, 1992) and widely reported from tropical and subtropical regions. In Greece, it has been reported previously from the S. Aegean Sea (Lazaridou, 1994) and the Ionian Sea (Schnetter & Schnetter, 1981).

NOTE: Due to the lack of reproductive structures and the small amount of material available, we report our record with reservations.

Padina di-tristromatica Ni-Ni-Win & H. Kawai (Dictyotales, Dictyotaceae)

DESCRIPTION: Thalli were erect, flabellate, brownish-whitish, to 8 cm high and 11 cm wide (Fig. 2E), arising from a small holdfast through a short stipe; thallus shal-

lowly to deeply split into fanshaped segments; calcification strong, particularly on the upper portions, alternation of calcified zones and uncalcified hair lines on both surfaces; margin entire; thallus composed of two cell layers at the margin, 40-70 μm thick, and a mixture of two and three cell layers in the lower portions, 75-120 μm thick; in the two layered parts cells of the upper side are twice as thick as those of the lower side, whereas in the three layered portions, all layers are equally thick; in surface view, cells rectangular, measuring 50-90 x 20-30 μm ; oogonial sori form either short lines or patches, adjacent to the hair lines, covered by a persistent indusium, clavate to obovate, measuring 130 x 85 μm . All measurements were taken from dried specimens.

HABITAT: A few thalli were found in the upper sublittoral zone on rocky substratum, of a semi-exposed shore.

LOCALITY: Vasiliki, Mesologhi, Ionian Sea, August 2012, coll. K. Tsiamis.

DISTRIBUTION: Italy and Turkey. In Greece, previously reported from Lesvos in the N. Aegean Sea (Ni-Ni-Win *et al.*, 2011).

Sporochnus pedunculatus (Hudson) C. Agardh (Sporochnales, Sporochnaceae)

DESCRIPTION: Thalli erect, slender, olive-brownish, rather soft in texture, terete, wiry, much branched, to 24 cm high, arising from a small holdfast (Fig. 2F); main axis distinct, 0,3 mm wide, branching spirally to irregularly to one order; axes with numerous lateral short branches of limited growth, clavate to pyriform, to 1 mm long and 0,1 mm wide, terminating to a dense tuft of pigmented hairs; hairs to 5 mm long, uniseriate, simple, each one 20-25 µm thick, with basal meristem; in cross section axis pseudoparenchymatous, consisting of large thick-walled colorless medullary cells, rounded or irregular, enclosed by 1-2 layers of small pigmented rounded cortical cells; in surface view cells longer than broad, rather rectangular, measuring 30-65 x 10-17 µm each and placed in longitudinal rows; no reproductive structures observed.

HABITAT: Thalli were commonly met in the sublittoral zone, in 10-30 m depth, epilithic to stones, pebbles and shells, during spring months.

LOCALITIES: Mavro Lithari, Saronikos Gulf, S. Aegean Sea, April 2011, coll. K. Tsiamis; Tsolis, Korinthiakos Gulf, April 2011, coll. K. Tsiamis.

DISTRIBUTION: commonly met in the Mediterranean Sea (Ribera *et al.*, 1992) and in the North Atlantic Ocean. In Greece, it has been previously reported only from the N. Aegean Sea (Athanasiadis, 1987).

Taonia pseudociliata (J.V. Lamouroux) Nizamuddin & Godeh (Dictyotales, Dictyotaceae)

DESCRIPTION: Thalli membranous, brownish-greenish, erect, to 15 cm high (Fig. 2G), arising from a basal holdfast, 1,5 cm wide; branches flattened, 4 mm wide and 200 µm thick at the lower parts, tapering at the upper parts and terminating to a marginal row of apical cells; branches subdichotomously ramified, with characteristic spines along their margin, particularly at the upper parts (Fig. 2H); spines short and slender, to 1 mm long; in cross section branches composed of 3-4 layers of colourless medullary cells, rectangular to irregular, surrounded by smaller pigmented cortical cells; no sharp difference in size between medullary and cortical cells; in surface view cells elongated, measuring 60-110 x 13-18 µm; phaeophycean hairs to 0,5 mm long and 16 µm wide, located on the upper thallus surfaces at rather regular concentric bands; tetrasporangia scattered on both surfaces, partially embedded on the thallus, rounded, to 100 µm in diameter.

HABITAT: Several thalli were met in the upper sublittoral zone, down to 2 m depth, on rocky substratum, during spring months.

LOCALITIES: Geras Gulf, Lesvos Isl., N. Aegean Sea, March 2009, coll. K. Tsiamis; Kalamos Bay, Evvoia Isl., N. Aegean Sea, April 2012, coll. K. Tsiamis; Porto Cou-

fo, Sithonia, N. Aegean Sea, May 2012, coll. K. Tsiamis.

DISTRIBUTION: Balearic Islands, Italy, Tunisia, Morocco and Turkey [Ribera *et al.*, 1992, as *Taonia atomaria* f. *ciliata* (Kützing) Nizamuddin]. Reported previously from the S. Aegean Sea by Nizamuddin [1981, as *T. atomaria* f. *ciliata* (C. Agardh) Nizamuddin].

Taxa pending confirmation of their presence

Asperococcus fistulosus (Hudson) W.J. Hooker
= *Ulva fistulosa* Hudson
= *Asperococcus echinatus* (Mertens ex Roth) C. Agardh
= *Solenia fuscata* Bory de Saint-Vincent (*nom. illeg.*)

Anagnostidis (1968) reported 'A. *echinatus* (Mertens) Greville forma?' from the North Aegean, and Diapoulis (1983) 'A. *echinatus* (Mertens) Hooker' from Saronikos Gulf. Previously, Bory (1832) had described *Solenia fuscata* from several localities in Peloponnese, including *Ulva fistulosa* Hudson in the list of synonyms and rendering *S. fuscata* a nomenclatural synonym. On the other hand, *S. fuscata* was included as a taxonomic synonym of *Scytosiphon lomentaria* by later authors (Agardh, 1848; Ardissonne, 1886-1887; De Toni, 1895). Because the two other Greek records also lack sufficient documentation, the occurrence of *A. fistulosus* is pending confirmation taking into account its frequent report from the Turkish coasts during the 1990s (Taskin *et al.*, 2008).

Botrytella micromora Bory de Saint-Vincent
= *Sorocarpus micromorus* (Bory de Saint-Vincent) P.C. Silva
= *Sorocarpus uvaeformis* (Lyngbye) Pringsheim

Athanasiadis (1987) excluded the record of Politis (1936, as *Sorocarpus uvaeformis* Pringsheim) from Attica, since this cold-temperate alga was not known elsewhere in the Mediterranean. *Botrytella micromora* was previously reported in the Ionian Sea by Haritonidis & Tsekos (1976) and Tsekos & Haritonidis (1977, as *Sorocarpus micromorus*), but without descriptions or illustrations. Since then, this North Atlantic-Arctic species has been reported from the strait of Dardanelles (Taskin, 2008, Fig. 2), where a second apparently introduced species of the genus was also found recently (Taskin & Pedersen, 2012).

Corynophloea flaccida (C. Agardh) Kützing
= *Leathesia flaccida* (C. Agardh) Endlicher

Corynophloea umbellata (C. Agardh) Kützing

There is both uncertainty and confusion surrounding the identity of these two taxa, and their relationship to the NE Atlantic *Microcoryne ocellata* Strömfelt. According to Agardh (1882), Kützing who transferred the species to *Corynophloea* attributed the identities inversely (Kützing, 1843, pl. 18 fig. 4; 1858, pl. 4 fig. 2). More-

Table 1. Accepted brown algal taxa in the North and South Aegean, and the Ionian Seas. For each taxon a basic reference is provided together with previously applied synonyms.

Taxa	North Aegean	South Aegean	Ionian Sea
<i>Acinetopora crinita</i> (Carmichael) Sauvageau = <i>Acinetopora vidovichii</i> (Meneghini) Sauvageau	Athanasiadis, 1987	Diapoulis, 1983	Schnetter & Schnetter, 1981
<i>Arthrocladia villosa</i> (Hudson) Duby	Athanasiadis, 1987		
<i>Asperococcus bullosus</i> J.V. Lamouroux = <i>Asperococcus turneri</i> (Dillwyn ex J.E. Smith) W.J. Hooker	Athanasiadis, 1987	Sartoni & De Biasi, 1999	Schnetter & Schnetter, 1981
<i>Choristocarpus tenellus</i> Zanardini	Athanasiadis, 1987	Diapoulis, 1983	
<i>Cladostiphon cylindricus</i> (Sauvageau) Kylin = <i>Castagnea cylindrica</i> Sauvageau	Panayotidis, 1979	Diapoulis, 1983	
<i>Cladostiphon irregularis</i> (Sauvageau) Kylin = <i>Castagnea irregularis</i> Sauvageau	Panayotidis, 1979 (with reservations)	Diapoulis, 1983	
<i>Cladostiphon lubricus</i> (Sauvageau) Kylin = <i>Gontrantia lubrica</i> Sauvageau	Athanasiadis, 1987		
<i>Cladostiphon mediterraneus</i> Kützting = <i>Castagnea fistulosa</i> (Zanardini) Derbès & Solier	Athanasiadis, 1987	Gerloff & Geissler, 1974	Schnetter & Schnetter, 1981
<i>Cladostephus spongiosum</i> (Hudson) C. Agardh = <i>Cladostephus hedwigoides</i> Bory de Saint-Vincent, <i>Cladostephus verticillatum</i> Auktorum	Athanasiadis, 1987	Lazaridou, 1994	Schnetter & Schnetter, 1981
<i>Colpomenia peregrina</i> Sauvageau	Orfanidis, 1992	Catra & Giardina, 2009	Tsirika & Haritonidis, 2005
<i>Colpomenia sinuosa</i> (Mertens in Roth) Derbès & Solier	Athanasiadis, 1987	Diapoulis, 1983	Schnetter & Schnetter, 1981
<i>Cutleria adspersa</i> (Mertens in Roth) De Notaris = <i>Aglaozonia melanoidea</i> Sauvageau (<i>nom. inval.</i>)	Nikolaidis & Haritonidis, 1990	Diannelidis <i>et al.</i> , 1977	Schnetter & Schnetter, 1981
<i>Cutleria chilosa</i> (Falkenberg) P.C. Silva		Lazaridou, 1994	
<i>Cutleria multifida</i> (Turner) Greville = <i>Aglaozonia parvula</i> (Greville) Zanardini, <i>Dicyota multifida</i> (J.E. Smith) Bory de Saint-Vincent	Athanasiadis, 1987	Lazaridou, 1994	Schnetter & Schnetter, 1981
<i>Cystoseira amentacea</i> (C. Agardh) Bory de Saint-Vincent var. <i>amentacea</i>	Huvé, 1972	Lazaridou, 1994	Tsirika & Haritonidis, 2005
<i>Cystoseira amentacea</i> var. <i>stricta</i> Montagne = <i>Cystoseira spicata</i> Ereegovič, <i>C. stricta</i> (Montagne) Sauvageau	Tsekos <i>et al.</i> , 1982	Diannelidis <i>et al.</i> , 1977	Schnetter & Schnetter, 1981
<i>Cystoseira barbata</i> (Stackhouse) C. Agardh var. <i>barbata</i>	Athanasiadis, 1987	Diannelidis <i>et al.</i> , 1977	Schnetter & Schnetter, 1981
<i>Cystoseira barbattula</i> Kützting <i>emend.</i> Cormaci, G. Furnari & Giaccone = <i>Cystoseira graeca</i> Schiffner ex Gerloff & Nizamuddin	Gerloff & Nizamuddin, 1975	Gerloff & Nizamuddin, 1975	Tsirika & Haritonidis, 2005
<i>Cystoseira brachycarpa</i> J. Agardh <i>emend.</i> Giaccone var. <i>brachycarpa</i> = <i>Cystoseira brachycarpa</i> var. <i>balearica</i> (Sauvageau) Giaccone, <i>C. caespitosa</i> Sauvageau		Catra & Giardina, 2009	(continued)

(continued) Table 1.

Taxa	North Aegean	South Aegean	Ionian Sea
<i>Cystoseira compressa</i> (Esper) Gerloff & Nizamuddin f. <i>compressa</i> = <i>Cystoseira filicina</i> Bory de Saint-Vincent, <i>Cystoseira fimbriata</i> Bory de Saint-Vincent	Athanasiadis, 1987	Diannelidis <i>et al.</i> , 1977 present study	Schmetter & Schmetter, 1981
<i>Cystoseira compressa</i> f. <i>plana</i> (Eregevič) Cormaci, G. Fumari, Giaccone, Scammacca & Serio			
<i>Cystoseira corniculata</i> (Turner) Zanardini = <i>Cystoseira corniculata</i> subsp. <i>laxior</i> Eregevič, <i>C. ericoides</i> var. <i>densa</i> C. Agardh	Athanasiadis, 1987	Diapoulis, 1983	Giaccone, 1968b
<i>Cystoseira crinita</i> Duby f. <i>crinita</i>	Anagnostidis, 1968	Huvé, 1972	Diapoulis & Haritonidis, 1987a
<i>Cystoseira crinitophylla</i> Eregevič	Athanasiadis, 1987	Lazaridou, 1994	
<i>Cystoseira dubia</i> Valante = <i>Cystoseira fucoides</i> Eregevič	Athanasiadis, 1987	Giaccone, 1968a	Giaccone, 1968b
<i>Cystoseira elegans</i> Sauvageau	Haritonidis & Tsekos, 1975	Catra & Giardina, 2009	Tsirika & Haritonidis, 2005
<i>Cystoseira foeniculacea</i> (Linnaeus) Greville f. <i>foeniculacea</i> = <i>Cystoseira abrotanifolia</i> (Linnaeus) C. Agardh, <i>C. discors</i> (Linnaeus) C. Agardh, <i>C. elata</i> Kützing, <i>C. eregevičii</i> Giaccone	Athanasiadis, 1987	Nizamuddin & Lehmberg, 1970	Tsirika & Haritonidis, 2005
<i>Cystoseira foeniculacea</i> f. <i>latiramosa</i> (Eregevič) Gómez Garreta, Barceló, Ribera & Rull Lluch = <i>Cystoseira discors</i> subsp. <i>latiramosa</i> Eregevič, <i>C. schiffneri</i> Hamel f. <i>latiramosa</i> (Eregevič) Giaccone	Chrysovergis, 1995	Sartoni & De Biasi, 1999	
<i>Cystoseira foeniculacea</i> f. <i>tenuiramosa</i> (Eregevič) Gómez Garreta, Barceló, Ribera & Rull Lluch = <i>Cystoseira discors</i> f. <i>tenuiramosa</i> Eregevič, <i>C. eregevičii</i> f. <i>tenuiramosa</i> (Eregevič) Giaccone, <i>C. schiffneri</i> f. <i>tenuiramosa</i> (Eregevič) Giaccone	present study	Giaccone, 1968a	present study
<i>Cystoseira humilis</i> Schousboe ex Kützing = <i>Cystoseira planiramea</i> Schiffner ex Gerloff & Nizamuddin*	Gerloff & Nizamuddin, 1975	Catra & Giardina, 2009	
<i>Cystoseira mediterranea</i> Sauvageau	Tsekos <i>et al.</i> , 1982	Diannelidis <i>et al.</i> , 1977	Diapoulis & Haritonidis, 1987a
<i>Cystoseira sauvageauana</i> Hamel	Diannelidis, 1953	Diannelidis, 1950	
<i>Cystoseira spinosa</i> Sauvageau var. <i>spinosa</i> = <i>Cystoseira adriatica</i> Sauvageau subsp. <i>adriatica</i>	Athanasiadis, 1987	Lazaridou, 1994	Tsirika & Haritonidis, 2005

(continued)

(continued) Table 1.

Taxa	North Aegean	South Aegean	Ionian Sea
<i>Cystoseira spinosa</i> var. <i>compressa</i> (Ercegović) Cormaci, G. Furnari, Giaccone, Scammacca & Serio	Huvé, 1972	Huvé, 1972	
= <i>Cystoseira platyramosa</i> Ercegović			
<i>Cystoseira spinosa</i> var. <i>tenuior</i> (Ercegović) Cormaci, G. Furnari, Giaccone, Scammacca & Serio	Gerloff & Nizamuddin, 1975	Gerloff & Nizamuddin, 1975	
= <i>Cystoseira rechingeri</i> Schiffner ex Gerloff & Nizamuddin			
<i>Cystoseira susanensis</i> Nizamuddin	Tsiamis <i>et al.</i> , 2010a		
<i>Cystoseira zosterooides</i> C. Agardh	Haritonidis & Tsekos, 1974	Huvé, 1972	Malea <i>et al.</i> , 1995
= <i>Cystoseira opuntiooides</i> Bory de Saint-Vincent ex Montagne			
<i>Dictyopteris lucida</i> Ribera Siguan, Gómez Garreta, Pérez Ruzafa, Barceló Martí & Rull Luch		Tsiamis <i>et al.</i> , 2010a	
<i>Dictyopteris polypodioides</i> (De Candolle) J.V. Lamouroux	Athanasiadis, 1987	Diapoulis, 1983	Schmetter & Schmetter, 1981
= <i>Dictyopteris membranacea</i> (Stackhouse) Batters,			
<i>Haliseris polypodioides</i> (De Candolle) C. Agardh	Athanasiadis, 1987	Diapoulis, 1983	Tsirika & Haritonidis, 2005
<i>Dictyota dichotoma</i> (Hudson) J.V. Lamouroux var. <i>dichotoma</i>			
<i>Dictyota dichotoma</i> var. <i>intricata</i> (C. Agardh) Greville,			
= <i>D. implexa</i> (Desfontaines) Lamouroux,			
<i>D. dichotoma</i> var. <i>implexa</i> (Desfontaines) S.F. Gray,	Athanasiadis, 1987	Lazaridou, 1994	Tsirika & Haritonidis, 2005
<i>D. dichotoma</i> f. <i>implexa</i> (Desfontaines) Hauck			
<i>Dictyota fasciola</i> (Roth) J.V. Lamouroux var. <i>fasciola</i>	Athanasiadis, 1987	Diapoulis, 1983	Schmetter & Schmetter, 1981
= <i>Dilophus fasciola</i> (Roth) M. Howe			
<i>Dictyota fasciola</i> var. <i>repens</i> (J. Agardh) Ardissonne			
= <i>Dilophus repens</i> (J. Agardh) J. Agardh		Lazaridou, 1994	Tsirika & Haritonidis, 2005
<i>Dictyota linearis</i> (C. Agardh) Greville	Athanasiadis, 1987	Diannelidis <i>et al.</i> , 1977	Bitis 1988
= <i>Dictyota linearis</i> f. <i>divaricata</i> Kützing (<i>nom. inval.</i>)			
<i>Dictyota mediterranea</i> (Schiffner) G. Furnari	Athanasiadis, 1987	Diapoulis, 1983	Schmetter & Schmetter, 1981
= <i>Dilophus mediterraneus</i> Schiffner			
<i>Dictyota spiralis</i> Montagne	Anagnostidis, 1968	Lazaridou, 1994	Schmetter & Schmetter, 1981
= <i>Dilophus ligulatus</i> (Kützing) J. Feldmann,			
<i>Dilophus spiralis</i> (Montagne) Hamel			
<i>Discosporangium mesarthrocarpum</i> (Meneghini) Hauck		Catra & Giardina, 2009	Tsirika & Haritonidis, 2005
<i>Ectocarpus fasciculatus</i> Harvey			Schmetter & Schmetter, 1981
<i>Ectocarpus siliculosus</i> (Dillwyn) Lyngbye var. <i>siliculosus</i>			
= <i>Ectocarpus confervoides</i> Le Jolis var. <i>confervoides</i> ,			
<i>E. confervoides</i> var. <i>siliculosus</i> (Dillwyn) Farlow	Anagnostidis, 1968	Diapoulis, 1983	Tsirika & Haritonidis, 2005

(continued)

(continued) Table 1.

Taxa	North Aegean	South Aegean	Ionian Sea
<i>Ectocarpus siliculosus</i> var. <i>arctus</i> (Kützing) Gallardo = <i>Ectocarpus arctus</i> Kützing.	Athanasiadis, 1987	Diannelidis <i>et al.</i> , 1977	Schnetter & Schnetter, 1981
<i>E. confervoides</i> f. <i>arctus</i> (Kützing) Kjellman			
<i>Ectocarpus siliculosus</i> var. <i>penicillatus</i> C. Agardh = <i>Ectocarpus penicillatus</i> (C. Agardh) Kjellman	Anagnostidis, 1968 (with reservations) Athanasiadis, 1987		
<i>Elachista intermedia</i> P.L. Crouan & H.M. Crouan			
<i>Elachista jabukae</i> Ercegović var. <i>mediterranea</i> (G. Furnari) Cormaci & G. Furnari = <i>Elachista neglecta</i> Kueckek (<i>nom. illeg.</i>)	Athanasiadis, 1987	Diapoulis, 1983	Tsirika & Haritonidis, 2005
<i>Feldmannia irregularis</i> (Kützing) Hamel			Schnetter & Schnetter, 1981
<i>Feldmannia paradoxa</i> (Montagne) Hamel var. <i>paradoxa</i> = <i>Ectocarpus paradoxus</i> Montagne.	Chrysovergis, 1995	Diapoulis, 1983	Schnetter & Schnetter, 1981
<i>Feldmannia globifera</i> (Kützing) Hamel			
<i>Feldmannia paradoxa</i> var. <i>caespitula</i> (J. Agardh) Cormaci & G. Furnari = <i>Feldmannia caespitula</i> (J. Agardh) Knoepffler-Péguy	Chrysovergis, 1995	Lazaridou, 1994	Schnetter & Schnetter, 1981
<i>Giraudia sphaelarioides</i> Derbès & Solier	Athanasiadis, 1987		
<i>Halopteris filicina</i> (Grateloup) Kützing	Athanasiadis, 1987	Diapoulis, 1983	Schnetter & Schnetter, 1981
<i>Halopteris scoparia</i> (Linnaeus) Sauvageau = <i>Sypocaulon scoparium</i> (Linnaeus) Kützing	Athanasiadis, 1987	Diapoulis, 1983	Schnetter & Schnetter, 1981
<i>Herponema graniferum</i> Kueckek	Kueckek, 1956		
<i>Hinckia mitchelliae</i> (Harvey) P.C. Silva = <i>Giffordia mitchelliae</i> (Harvey) Hamel	Haritonidis, 1978	Diapoulis, 1983	Schnetter & Schnetter, 1981
<i>Hinckia sandriana</i> (Zanardini) P.C. Silva = <i>Giffordia sandriana</i> (Zanardini) Hamel	Chrysovergis, 1995	Lazaridou, 1994	Schnetter & Schnetter, 1981
<i>Hydroclathrus clathratus</i> (Bory ex C. Agardh) M. Howe	Athanasiadis, 1987	Diapoulis, 1983	Bitsis 1988
<i>Kuckuckia spinosa</i> (Kützing) Kormann	Kueckek, 1958	Diapoulis, 1983	Diapoulis & Haritonidis, 1987a
<i>Kuetzingiella battersii</i> (Bornet ex Sauvageau) Kormann			
<i>Lobophora variegata</i> (J.V. Lamouroux) Womersley ex E.C. Oliveira	present study (with reservations, see Annex 1)	Catra & Giardina, 2009	Schnetter & Schnetter, 1981
<i>Mesogloia lanosa</i> P.L. Crouan & H.M. Crouan	Athanasiadis, 1987	Lazaridou, 1994	
<i>Mesogloia levelleii</i> (J. Agardh) Meneghini = <i>Liebmannia levelleii</i> J. Agardh	Athanasiadis, 1987	Schiffner & Schussnig, 1943	Schnetter & Schnetter, 1981
<i>Myriactula rigida</i> (Sauvageau) Hamel	Athanasiadis, 1987		(continued)

(continued) Table 1.

Taxa	North Aegean	South Aegean	Ionian Sea
<i>Myriactula rivulariae</i> (Suhr) J. Feldmann = <i>Elachista pulvinata</i> (Kützling) Harvey	Athanasiadis, 1987	Giacccone, 1968a	Haritonidis & Tsekos, 1976
<i>Myriactula stellulata</i> (Harvey) Levring		Catra & Giardina, 2009	
<i>Myrionema liechtenstermii</i> Hauck	Athanasiadis, 1987	Catra & Giardina, 2009	
<i>Myrionema orbiculare</i> J. Agardh	Chryssosvegis, 1995	Catra & Giardina, 2009	
<i>Myrionema strangulans</i> Greville = <i>Myrionema vulgare</i> Thuret	Anagnostidis, 1968	Catra & Giardina, 2009	
<i>Myriotrichia adriatica</i> Hauck	Athanasiadis, 1987		
<i>Myriotrichia claviformis</i> Harvey = <i>Sireblonema sphaerium</i> (Derbès & Solier) Thuret	Athanasiadis, 1987		
<i>Myriotrichia protasperococcus</i> Berthold ex Kuckuck	Athanasiadis, 1987		
<i>Myriotrichia repens</i> Hauck	Athanasiadis, 1987		
<i>Nemacystus flexuosus</i> (C. Agardh) Kylin var. <i>giraudyi</i> (J. Agardh) De Jong = <i>Nemacystus ramulosus</i> Derbès & Solier	Athanasiadis, 1987	Lazaridou, 1994	Schnetter & Schnetter, 1981
<i>Nereia filiformis</i> (J. Agardh) Zarnardini	Athanasiadis, 1987	Lazaridou, 1994	Schnetter & Schnetter, 1981 present study
<i>Padina di-tristromatica</i> Ni-Ni-Win & Kawai	Ni-Ni-Win <i>et al.</i> , 2011		
<i>Padina pavonica</i> (Linnaeus) Thivy = <i>Padina mediterranea</i> Bory de Saint-Vincent, <i>Padina pavonia</i> (Linnaeus) J.V. Lamouroux	Athanasiadis, 1987	Lazaridou, 1994	Tsirika & Haritonidis, 2005
<i>Petalonia fascia</i> (O.F. Müller) Kuntze = <i>Ralfsia clavata</i> (Carmichael ex Harvey) P.L. Crouan & H.M. Crouan **	Athanasiadis, 1987	Politis, 1932	
<i>Pseudolithoderma adriaticum</i> (Hauck) M. Verlaque = <i>Lithoderma adriaticum</i> Hauck	Athanasiadis, 1987	Diapoulis, 1983	
<i>Punctaria tenuissima</i> (C. Agardh) Greville = <i>Punctaria latifolia</i> Greville ***	Athanasiadis, 1987		Schnetter & Schnetter, 1981
<i>Ralfsia verrucosa</i> (Areschoug) Areschoug	Athanasiadis, 1987	Catra & Giardina, 2009	Schnetter & Schnetter, 1981
<i>Sargassum acinarium</i> (Linnaeus) Setchell = <i>Sargassum linifolium</i> C. Agardh	Athanasiadis, 1987	Diannelidis <i>et al.</i> , 1977	Schnetter & Schnetter, 1981
<i>Sargassum hornschurchii</i> C. Agardh = <i>Sargassum amigdalifolium</i> Bory	Haritonidis, 1978	Diannelidis <i>et al.</i> , 1977	Haritonidis & Tsekos, 1976
<i>Sargassum trichocarpum</i> J. Agardh = <i>Sargassum boryanum</i> Montagne	Athanasiadis, 1987	Nizamuddin & Lehnberg, 1970 (with reservations)	(continued)

(continued) Table 1.

Taxa	North Aegean	South Aegean	Ionian Sea
<i>Sargassum vulgare</i> C. Agardh (<i>nom. illeg.</i>) = <i>Sargassum vulgare</i> var. <i>megalocephalum</i> (Montagne) Grunow ex Bornet	Athanasiadis, 1987	Catra & Giardina, 2009	Schmetter & Schmetter, 1981
<i>Scytosiphon lomentaria</i> (Lyngbye) Link = <i>Scytosiphon simplicissimus</i> (Clemente) Cremades, <i>Microspongium gelatinosum</i> Reinke	Athanasiadis, 1987	Diapoulis, 1983	Schmetter & Schmetter, 1981
<i>Spatoglossum solieri</i> (Chauvin ex Montagne) Kützing <i>Spermatocohnus paradoxus</i> (Roth) Kützing		Sartoni & De Biasi, 1999 Giaccone, 1968a	Giaccone, 1968b
<i>Sphacelaria cirrosa</i> (Roth) C. Agardh = <i>Sphacelaria cirrosa</i> var. <i>irregularis</i> (Kützing) Hauck, <i>Sphacelaria hystrix</i> Suhr ex Reinke	Athanasiadis, 1987	Diapoulis, 1983	Tsirika & Haritonidis, 2005
<i>Sphacelaria fusca</i> (Hudson) S.F. Gray	Chrysovergis, 1995	Lazaridou, 1994	Tsirika & Haritonidis, 2005
<i>Sphacelaria plumula</i> Zanardini	Athanasiadis, 1987	Lazaridou, 1994	Tsirika & Haritonidis, 2005
<i>Sphacelaria rigida</i> Kützing = <i>Sphacelaria furcigera</i> Kützing	Chrysovergis, 1995	Diapoulis & Haritonidis, 1987b	Schmetter and Schmetter, 1981
<i>Sphacelaria tribuloides</i> Meneghini	Athanasiadis, 1987	Diapoulis, 1983	Schmetter and Schmetter, 1981
<i>Sporocohnus pedunculatus</i> (Hudson) C. Agardh	Athanasiadis, 1987	present study	present study
<i>Stictosiphon adriaticus</i> Kützing	Tsekos <i>et al.</i> , 1982		
<i>Stilophora tenella</i> (Esper) P.C. Silva = <i>Stilophora rhizodes</i> (Turner) J. Agardh (<i>nom. illeg.</i>), <i>S. rhizodes</i> var. <i>adriatica</i> J. Agardh***	Athanasiadis, 1987	Diapoulis, 1983	Schmetter & Schmetter, 1981
<i>Striaria attenuata</i> (Greville) Greville	Haritonidis, 1978	Giaccone, 1968a	Schmetter & Schmetter, 1981
<i>Styopodium schimperi</i> (Buchinger ex Kützing) M. Verlaque & Boudouresque	Katsanavakis & Tsiamis, 2009	Sartoni & De Biasi, 1999	Tsiamis <i>et al.</i> , 2010b
<i>Taonia atomaria</i> (Woodward) J. Agardh = <i>Padina phasiana</i> Bory de Saint-Vincent (<i>nom. illeg.</i>)	Athanasiadis, 1987	Lazaridou, 1994	Schmetter & Schmetter, 1981
<i>Taonia pseudociliata</i> (J.V. Lamouroux) Nizamuddin & Godeh = <i>Taonia atomaria</i> f. <i>ciliata</i> (C. Agardh) Nizamuddin	present study	Nizamuddin, 1981	
<i>Zanardinia typus</i> (Nardo) P.C. Silva = <i>Zanardinia collaris</i> Auktorum, <i>Z. prototypus</i> (Nardo) Zanardini (<i>nom. illeg.</i>)	Athanasiadis, 1987	Sartoni & De Biasi, 1999	Schmetter & Schmetter, 1981
<i>Zonaria tournefortii</i> (J.V. Lamouroux) Montagne = <i>Zonaria flava</i> C. Agardh		Lazaridou, 1994	Giaccone, 1968b

* Synonymy follows Taskin *et al.* (2012), Cormaci *et al.* (2012) consider *C. planiramea* as a *taxon inquirendum*.

** Sporophyte of *Petalonia fasciata* (see Cormaci *et al.*, 2012).

*** Synonymy follows Cormaci *et al.* (2012).

over, Agardh (1882) recognized *C. flaccida* (= *C. umbellata sensu* Kützing) as a species of *Elachista* Duby. De Toni (1895) accepted Agardh's correction, but further transferred the species to the genus *Myriactis* Kützing (= *Myriactula* Kuntze). Regarding *C. umbellata*, Agardh (1882) proposed an emended description (including Kützing's concept of *C. flaccida*), and this opinion was also accepted by De Toni (1895). Kuckuck (1929) and Hamel (1935) reversed the situation again (favoring Kützing), maintaining the name *C. flaccida* for the alga with long assimilatory filaments and the name *C. umbellata* for the alga with short ones. Clarification must await re-examination of Agardh's original material from the Adriatic Sea. It could be added that further confusion was generated with the illustration of *Microcoryne ocellata* in Kuckuck (1929, fig. 53) - correctly identified by both Nienburg and Kylin. This illustration was cited by Hamel (1935) as representative of *C. flaccida*, but the material was apparently collected on the Swedish west coast (Kylin 1947, fig. 45) where neither Kylin nor later authors ever reported *C. flaccida* (or *C. umbellata*).

In Greece, *C. flaccida* was reported from Naxos Island by Schiffner & Schussnig (1943, as *Leathesia flaccida*). Athanasiadis (1987) excluded the species from the Aegean flora, due to its obscure status. Subsequently, *C. flaccida* was reported from Maliakos in the N. Aegean (Chryssovergis, 1995), while *C. umbellata* was reported both from Maliakos (Chryssovergis, 1995) and Karpathos (Catra & Giardina, 2009). Since, no taxonomic descriptions or illustrations were given in the latter studies; we maintain *C. flaccida* and *C. umbellata* as taxa pending documented records that should include a study of type material.

***Cystoseira abies-marina* (S.G. Gmelin) C. Agardh**

The single record from the Ionian Islands (Greville 1827) is pending confirmation, like other sporadic records of this species in the Mediterranean Sea (Ribera *et al.*, 1992, note 34).

***Cystoseira foeniculacea* f. *schiffneri* (Hamel) Gómez Garreta, Barceló, Ribera & Rull Lluch**

= *Cystoseira schiffneri* Hamel

This rather rare infraspecific taxon has been reported in Greece only by Chryssovergis (1995) from Maliakos Gulf (as *C. schiffneri* Hamel). Since neither a description nor illustrations were provided, the occurrence of this entity in Greece needs to be confirmed.

***Cystoseira humilis* var. *myriophylloides* (Sauvageau)**

J.H. Price & D.M. John

= *Cystoseira myriophylloides* Sauvageau

The records of *C. myriophylloides* from the Ionian and N. Aegean Seas (Tsekos & Haritonidis, 1977; Tsekos *et al.*, 1982) were considered as probable misidentifica-

tions, since this taxon occurs only in the Atlantic Ocean (Athanasiadis, 1987). Similarly, Ribera *et al.* (1992) pointed out that the presence of this entity in the Mediterranean Sea is uncertain. More recently, Taskin *et al.* (2012) recorded *C. humilis* var. *myriophylloides* from the Adriatic, Tunisia and Italy. In our opinion, the Greek records should be treated as debatable, pending documentation.

***Cystoseira nodicaulis* (Withering) M. Roberts**

= *Cystoseira granulata* Auktorum

The single record from the Ionian Islands (Greville 1827, as *C. granulata* C. Ag.) is pending confirmation, as there are no other reports of this species from the eastern Mediterranean Sea (Ribera *et al.*, 1992; Gómez Garreta *et al.*, 2001b).

***Cystoseira squarrosa* De Notaris**

This rare Mediterranean endemic has been reported from various localities in the Aegean and Ionian Seas (Gerloff & Geissler, 1974; Haritonidis & Tsekos, 1976; Tsekos *et al.*, 1982). Nevertheless, Alongi *et al.* (2002) reported that the only herbarium specimens from Greece (Attica), located at the Riksherbarium in Stockholm and labelled as *C. squarrosa*, belonged to *C. corniculata*. As the above records lack sufficient documentation, they are debatable pending new information. It could be added that *C. squarrosa* has been considered as a variety of *C. spinosa* in the past (Giaccone & Bruni, 1973).

***Cystoseira tamariscifolia* (Hudson) Papenfuss**

= *C. ericoides* (Linnaeus) C. Agardh

= *C. selaginoides* Auktorum

This species was excluded from the Aegean flora (Athanasiadis, 1987), since its distribution was documented only in the eastern Atlantic Ocean and the western Mediterranean basin (Roberts, 1970). There are only some old records of the species from Crete (Raulin, 1869, as *C. ericoides* Turner; Diannelidis, 1950), the N. Aegean (Anagnostidis, 1968, as *C. ericoides*, with reservations) and Peloponnese (Bory, 1832, as *C. selaginoides* Bory) – the last record ‘...believed by Sauvageau... to refer either to *C. stricta*... or to *C. mediterranea*...’ (Roberts, 1970). Nevertheless, *Cystoseira tamariscifolia* has been recently reported from the Sea of Marmara (Taskin *et al.*, 2008). Therefore, in our opinion, the Greek records should be treated as debatable, pending new documented reports.

***Leathesia mucosa* J. Feldmann**

The single record by Athanasiadis (1987) from Sithonia was provided with reservations. Pending confirmation, *L. mucosa* should be referred as debatable for the Greek flora.

Padina tenuis Bory de Saint-Vincent

Nizamuddin (1981) reported *P. tenuis* from several localities in the South Aegean Sea and other Mediterranean regions, providing a description and illustrations. Yet, on the basis of this information, Ni-Ni-Win *et al.* (2011) questioned the presence of this Indo-Pacific species in the Mediterranean suggesting that Nizamuddin's records might be misidentifications of *P. boergesenii* Alender & Kraft from the Central Atlantic. As we have not re-examined the Greek material of Nizamuddin, we consider his records as debatable, pending confirmation.

Pylaiella littoralis (Linnaeus) Kjellman

This species has been reported from Chalkidiki by Anagnostidis (1968, with reservations) and from Cephalonia Island by Schnetter & Schnetter (1981), but without a description or illustrations. Thus, the occurrence of *P. littoralis* in Greece needs to be confirmed.

Saccorhiza polyschides (Lightfoot) Batters

This large brown alga has been reported only once from Greece, collected by Chaubard & Bory (1838) in Chios Island. Whether it was dredged or found in the drift is unknown (Athanasiadis, 1987). Since *S. polyschides* has been found in Italy (Ribera *et al.*, 1992) its occurrence in Greece should not be ruled out.

Sargassum flavifolium Kützting

This Atlantic species has been sporadically recorded in the Mediterranean, from Tunisia, Corsica, and Sicily (Gómez Garreta *et al.*, 2001b). It has also been reported from two sites in Chios Island (Tsekos *et al.*, 1982) but without a description or illustrations and hence its occurrence in the Aegean needs to be confirmed.

Sauvageaugloia griffithsiana (Greville *ex* W.J. Hooker) Hamel *ex* Kylin

This species was also reported once from the Island of Skiros (Tsekos *et al.*, 1982), but without a description or illustrations and hence its occurrence in the North Aegean needs to be confirmed.

Spongonema tomentosum (Hudson) Kützting
= *Ectocarpus tomentosus* (Hudson) Lyngbye

The single record of this cold-temperate species from Pagasitikos in the North Aegean (Diannelidis 1935, as *Ectocarpus tomentosus*) lacks documentation and was excluded by Athanasiadis (1987), who noted the absence of other Mediterranean records. Since then *S. tomentosum* was reported from Italy and Turkey (Taskin *et al.*, 2008; Cormaci *et al.*, 2012) and hence, Diannelidis's record should be treated as debatable.

Taxa Excludenda

Chaetopteris plumosa (Lyngbye) Kützting

The scarce Mediterranean records of this boreal species from Naples by Berthold, Dalmatia by Meneghini and the North Aegean (Haritonidis & Tsekos, 1974; Haritonidis, 1978) were treated either as misidentifications of *Sphacelaria plumula* (Funk, 1927, 1955; Prud'homme van Reine, 1982) or doubtful (Athanasiadis, 1987). Hence the species has been formally excluded from the Mediterranean flora (Ribera *et al.* 1992; Cormaci *et al.* 2012).

Chorda filum (Linnaeus) Stackhouse

Candargy (1899) reported this boreal species from the Island of Lesvos in the North Aegean. Hamel (1938) mentioned a specimen in herbarium Thuret, collected at Nice (France) during the 19th century, but did not include this material in the distribution of the species accepting the find as 'accidentelle'. More recently, *C. filum* was found by Ben Maiz *et al.* (1988) at Thau lagoon (France), where it was considered as an introduction through mollusc culture (Cormaci *et al.*, 2004). Since there are no later records of this species from the eastern Mediterranean, we agree with Athanasiadis (1987) that the single record from Lesvos should be considered as a misidentification and hence the species should be excluded from the Greek flora.

Cystoseira baccata (S.G. Gmelin) P.C. Silva

The only Mediterranean records of *C. baccata* originate from Greece, reported by Haritonidis & Tsekos (1976), Tsekos & Haritonidis (1977) and Tsekos *et al.* (1982) from localities both in the Ionian and the Aegean Seas. In our opinion, these records are misidentifications, since this species is restricted to the Atlantic Ocean (Ribera *et al.*, 1992; Gómez Garreta *et al.*, 2001b).

Dictyosiphon foeniculaceus (Hudson) Greville
= *Scytosiphon foeniculaceus* (Hudson) C. Agardh

The records from the Ionian Islands (Greville 1827, as *Scytosiphon foeniculaceus*) and the North Aegean Sea (Petkoff, 1943) should be excluded from the Greek flora since this species does not occur elsewhere in the Mediterranean Sea.

Ectocarpus reptans P.L. & H.M. Crouan

The single record of this taxon by Diannelidis (1953) was excluded by Athanasiadis (1987) based on the description provided, which led to suppose a misidentification. It could be noted that thalli resembling *E. reptans* are involved in the life history of species of *Asperococcus* Lamouroux.

Halidrys siliquosa (Linnaeus) Lyngbye

This North Atlantic brown alga does not occur in the Mediterranean Sea and the Aegean records by Haritonidis & Tsekos (1974) and Diannelidis *et al.* (1977) are probably misidentifications of large thalli of *Cystoseira compressa*.

Isthmoplea sphaerophora (Carmichael *ex* Harvey) Kjellman *ex* Gobi

This cold-temperate species does not occur in the Mediterranean Sea and the single record by Anagnostidis (1968) should be considered as doubtful probably based on a misidentification (Athanasiadis, 1987).

Protohalopteris radicans (Dillwyn) Draisma, Prud'homme & Kawai

The single record by Giaccone (1968a, as *Sphacelaria radicans* Harvey) is probably a misidentification, since this cold-temperate species does not occur in the Mediterranean Sea (Athanasiadis, 1987).

Sargassum ilicifolium (Turner) C. Agardh

The single record by Candargy (1899) from Lesbos Island is probably a misidentification as this Indo-Pacific species does not occur in the Mediterranean Sea (Athanasiadis, 1987).

Sargassum pallidum (Turner) C. Agardh

The single record from the Ionian Islands (Greville, 1827) should be considered as a misidentification, as this Pacific species is not known to occur in the Mediterranean Sea.

Sphacelorbis nanus (Nägeli *ex* Kützing) Draisma, Prud'homme & Kawai
= *Sphacelaria saxatilis* (Kuckuck) Sauvageau

The single record of this boreal species from the North Aegean by Anagnostidis (1968, as *S. saxatilis*) is doubtful and probably based on a misidentification (Athanasiadis, 1987), like previous Mediterranean records from the Adriatic Sea (Prud'homme van Reine, 1982). It could be added that sterile specimens of *S. nanus* are similar in morphology to *Sphacelaria rigidula* (Prud'homme van Reine, 1982) and the older Mediterranean records could instead refer to the latter species (Cormaci *et al.*, 2012), which occurs in Greece.

Taxa inquirenda

Cystoseira erica-marina Lamouroux *ex* Bory de Saint-Vincent (*nom. illeg.*)

Bory (1832) described this species from Cape Tenaron in Peloponnese and 'quelques points de l'Archipel',

creating simultaneously a later homonym of *Cystoseira erica-marina* (S.G. Gmelin) Naccari. Sauvageau associated Bory's material with *Cystoseira spinosa* (Athanasiadis, 1987) but a type element has not been selected. It should be added that '*Cystoseira erica-marina* (Wulf.) Zan.' also exists in the older Greek literature (e.g. Diannelidis, 1950) and this record has been referred to *C. corniculata* by Gerloff & Geissler (1974).

Cystoseira montagnei J. Agardh

The taxonomic status of this species remains unclarified (Cormaci *et al.*, 2012; Taskin *et al.*, 2012), and hence no type element has been selected. There are several records of *C. montagnei* from various localities in the Aegean and the Ionian Seas (Haritonidis & Tsekos, 1974; Diannelidis *et al.*, 1977; Haritonidis, 1978; Tsekos *et al.*, 1982), but in the absence of descriptions or illustrations the identity of the material is unknown.

Cystoseira montagnei* var. *moniliformis (Kützing) Hauck

Haritonidis & Tsekos (1974) reported from Thasos Island '*Cystoseira montagnei* var. *moniliformis* J. Agardh' presumably referring to *C. montagnei* var. *moniliformis* (Kützing) Hauck. The latter taxon is based on *Phyllacantha moniliformis* Kützing, which is described from Tenerife and according to the older literature is a synonym of *C. abies-marina* (S.G. Gmelin) C. Agardh (Agardh, 1848; De Toni, 1895). Because a type of *Phyllacantha moniliformis* has not been selected and the occurrence of *C. abies-marina* in the Mediterranean 'needs to be confirmed' (Ribera *et al.* 1992, note 34), we maintain the Greek record of *C. montagnei* var. *moniliformis* within the list of *taxa inquirenda*.

Dictyopteris tripolitana Nizamuddin

Nizamuddin (1981) described this species from collections from various locations in the Mediterranean Sea, including Attica, Crete and Egina Island in the South Aegean Sea. The taxonomic status of *D. tripolitana* was, however, questioned by subsequent authors (Athanasiadis, 1987; Ribera *et al.*, 1992; Cormaci *et al.*, 2012) based on the lack of sufficient documentation. Since no further evidence of this species has been provided until today, we consider it as a *taxon inquirendum* for the Mediterranean flora.

Phyllacantha affinis Kützing

Grunow (1861) reported this taxon from Kithira in the Ionian Sea, and Gerloff & Geissler (1974) treated the record as uncertain, pending correct identification. In the older literature (Agardh, 1848; De Toni, 1895), *P. affinis* is considered to be a synonym of *C. montagnei*, but a type element remains to be selected.

Sargassum diversifolium (Turner) C. Agardh

This taxon was reported by Bory (1832) from the Island of Sapience and Cape Tenaron in southern Peloponnese. Later Grunow (1916) recognized Bory's material to belong to a distinct entity, which he described as *S. salicifolium* f. *diversifolium* Grunow - citing Turner's *Fucus diversifolius* (with questionmark) within the form range of *S. vulgare*. None of these taxa is typified, while the provenance of *F. diversifolius* Turner ('Shores of Egypt') has not been clarified.

Sargassum obtusatum Bory de Saint-Vincent

Originally described from Modon and Navarino in the western Peloponnese (Bory, 1832), this taxon was most recently recognized as a variety of *Sargassum salicifolium* (J. Agardh) J. Agardh by Grunow (1916). Its taxonomic status is pending typification.

Sargassum salicifolium Auktorum

This binomial was reported by Bory (1832, as *S. salicifolium* Bory), Diannelidis (1950, as *S. salicifolium* Lamouroux) and Anagnostidis (1968, with reservations). Bory included in the synonymy of his species *S. vulgare*, and later authors associated Bory's material from the Peloponnese with the latter taxon (e.g. Agardh, 1842). The identity of Diannelidis's and Anagnostidis's material from Crete and North Aegean, respectively, is unknown. It should be added that '*Sargassum salicifolium* (J. Agardh) J. Agardh' has been most recently reported from the Adriatic Sea by Špan (2005), who included in the synonymy *Sargassum coarctatum* Kützing - a species referred to *S. vulgare* by Gómez Garreta *et al.* (2001b). Apart from the nomenclatural problems - *Sargassum coarctatum* Kützing being the only legitimate name in the above species complex, none of these taxa is typified.

Professor Mazziari's list

Professor A. D. Mazziari collected extensively material from the Ionian Islands and also prepared a list of seaweeds from Corfu as a part of his manuscript "Flora Septinsularis". This work was never published but existed in the Corfu Public Library, which sadly was destroyed during World War II. Algal material from the Ionian Islands collected by Mazziari was identified and published by Grunow (1861), while fragments of Mazziari's manuscript were saved by Dr. Th. Stefanides and published as extracts (Stefanides, 1948). Later on, the remaining of Mazziari's seaweed list was kindly delivered to J. Sordina who published it (Sordina, 1951). In this latter work, there are several taxa that have never been reported elsewhere in Greece, such as *Sphacelaria racemosa* Greville, *Fucus ceranoides* Linnaeus, *Laminaria digitata* (Hudson) Lamouroux and *L. saccharina* (Linnaeus) Lamouroux. We believe that these records

are misidentifications, as also stated by Sordina (1951). None of these taxa is included in the collections studied by Grunow (1861), but it is interesting that Mazziari mentioned frequently finds of *Laminaria* specimens, cast ashore by the waves. Sordina himself visited some of the sites mentioned by Mazziari, but he never encountered any specimens of *Laminaria* or *Fucus*.

Discussion

In the first review of the Greek seaweeds (Diannelidis, 1950) only 31 taxa of Phaeophyceae had been listed. Later on, Gerloff & Geissler (1974) listed 63, while Athanasiadis (1987) listed 80 taxa for the Aegean Sea only. Lastly, in a survey of 265 Mediterranean brown algae, Ribera *et al.* (1992) included 93 taxa from Greece. The 107 confirmed taxa reported in this study reflect a further increase of our knowledge, and it should be attributed to the several new studies carried out during the last decades (e.g. Sartoni & De Biasi, 1999; Catra & Giardina, 2009; Tsiamis *et al.*, 2010a, b).

The distribution of these 107 brown seaweeds along the coasts is as follows: 94 taxa have been found in the N. Aegean, 90 taxa in the S. Aegean and only 70 taxa in the Ionian Sea (Fig. 1). This pattern may relate to the number (or extent of detail) of the studies conducted within each region (42 in the N. Aegean, 70 in the S. Aegean and 26 in the Ionian Sea), but may also reflect the particular environmental conditions of each region (e.g. the lower salinity and temperature values in the North Aegean).

Greek marine flora seems to host far less brown algae compared to the neighboring Italian coasts, where 214 taxa have been recorded (Furnari *et al.*, 2010). This difference definitely reflects the smaller number of phylogenetic studies that have been conducted in Greece, and generally in the Eastern Mediterranean Sea, with several coastal regions and islands still remaining poorly surveyed, particularly in the sublittoral and circalittoral zones.

Finally, many taxa are pending confirmation, whereas several others are treated as *taxa excludenda* or *inquirenda* (17, 11 and 8 taxa respectively). This is partly due to taxonomic difficulties but also to the scarcity of Greek specimens deposited in public herbaria.

To conclude, the continuous increase in the number of brown algae reported in Greece indicates that there are still major gaps in our knowledge of the marine flora of the Aegean and Ionian Seas, and that the number of species is expected to increase with additional surveys in unexplored areas and particularly in deeper habitats.

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