Seaweeds of the Greek coasts. I. Phaeophyceae

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http://dx.doi.org/10.12681/mms.315

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To cite this article:

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Handling Editor: Athanasios Athanasiadis

Received: 25 October 2012; Accepted: 4 January 2013; Published on line: 12 March 2013

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 excluded 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 Peloponnesse. By the end of the 19th century other researchers, such as Mazzari (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; Chryssovergis, 1995; Catra & 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 during 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, excluded and inquirenda.
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-tris* tectiformes *f. plumosa* (in the Ionian Sea), *Sporochus 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** (Ercegović) 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** (Ercegović) 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.


**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 stubby 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...
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,

**Distribution:** commonly met in the Mediterranean
Sea (Ribera *et al.*, 1992) and widely reported from tropi-
cal and subtropical regions. In Greece, it has been report-
red 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 (Dictyot-
ales, 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; calcifica-
tion strong, particularly on the upper portions, alternation
of calcified zones and uncalcified hair lines on both sur-
faces; 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; oo-
gonial 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 sub-
littoral zone on rocky substratum, of a semi-exposed shore.

**Locality:** Vasiliki, Mesologhi, Ionian Sea, August

**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, wavy, 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.


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 (Anagnostidis, 1987).

Taonia pseudociliata (J.V. Lamouroux) Nizamuddin & Goded (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.


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 Peloponese, 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; Ardissone, 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

Anagnostidis (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.

<table>
<thead>
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<th>South Aegean</th>
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(continued)
North Aegean | South Aegean | Ionian Sea
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**Ectocarpus siliculosus** var. arctus (Kützing) Gallardo = Ectocarpus arctus Kützing, *E. confervoides* f. arctus (Kützing) Kjellman
Anagnostidis, 1968 (with reservations)
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**Ectocarpus siliculosus** var. penicillatus C. Agardh = Ectocarpus penicillatus (C. Agardh) Kjellman
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**Elachista intermedia** P.L. Crouan & H.M. Crouan
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Schnetter & Schnetter, 1981
**Elachista jabukae** Ercogović var. *mediterranea* (G. Furnari) Cormaci & G. Furnari = Elachista neglecta Kuckuck (nom. illeg.)
Diapoulis, 1983
Schnetter & Schnetter, 1981
**Feldmannia irregularis** (Kützing) Hamel
Athanasiadis, 1987
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Schnetter & Schnetter, 1981
**Feldmannia paradoxa** (Montagne) Hamel var. *paradoxa* = Ectocarpus paradoxus Montagne,
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**Feldmannia globifera** (Kützing) Hamel
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**Feldmannia paradoxa** var. caespitula (J. Agardh) Cormaci & G. Furnari
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Lazaridou, 1994
Schnetter & Schnetter, 1981
**Giraudia sphacelarioides** Derbès & Solier
Athanasiadis, 1987
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Schnetter & Schnetter, 1981
**Halopteris filicina** (Grateloup) Kützing
Athanasiadis, 1987
Diapoulis, 1983
Schnetter & Schnetter, 1981
**Halopteris scoparia** (Linnaeus) Sauvageau = Stypocaulon scoparium (Linnaeus) Kützing
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Diapoulis, 1983
Schnetter & Schnetter, 1981
**Herponema graniferum** Kuckuck
Kuckuck, 1956
Diapoulis, 1983
Schnetter & Schnetter, 1981
**Hinckia mixtillæsea** (Harvey) P.C. Silva = Giffordia mixtillæsea (Harvey) Hamel
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Diapoulis, 1983
Schnetter & Schnetter, 1981
**Hinckia sandriana** (Zanardini) P.C. Silva = Giffordia sandriana (Zanardini) Hamel
Chryssovergis, 1995
Lazaridou, 1994
Schnetter & Schnetter, 1981
**Hydroclathrus clathratus** (Bory ex C. Agardh) M. Howe
Athanasiadis, 1987
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**Kuckuckia spinosa** (Kützing) Kornmann
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Diapoulis, 1983
Schnetter & Schnetter, 1981
**Kuetzingiella battersii** (Born ex Sauvageau) Kornmann
Chryssovergis, 1995
Lazaridou, 1994
Schnetter & Schnetter, 1981
**Lobophora variegata** (J.V. Lamouroux) Womersley ex E.C. Oliveira = Liebmannia variegata (J.V. Lamouroux) Sauvageau
Athanasiadis, 1987
Diapoulis, 1983
Schnetter & Schnetter, 1981
**Mesogloia lanosa** P.L. Crouan & H.M. Crouan
Athanasiadis, 1987
Diapoulis, 1983
Schnetter & Schnetter, 1981
**Mesogloia leveillei** (J. Agardh) Meneghini = Liebmannia leveillei J. Agardh
Athanasiadis, 1987
Schiffner & Schussnig, 1943
Schnetter & Schnetter, 1981
**Myriactula rigidula** (Sauvageau) Hamel
Athanasiadis, 1987
Diapoulis, 1983
Schnetter & Schnetter, 1981
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This table lists species identified in the North Aegean, South Aegean, and Ionian Sea:

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<th>South Aegean</th>
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<td>Ralfísta clavata (Carmichael ex Harvey) P.L. Crouan &amp; H.M. Crouan **</td>
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<td>Nizanuddin &amp; Lehnberg, 1970 (with reservations)</td>
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### Table 1.

<table>
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<td>Spatoglossum solieri (Chanvin ex Montagne) Kützing</td>
<td>Sartoni &amp; De Biasi, 1999</td>
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<td>Giaccone, 1968a</td>
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<td>Stylopodium schimpert (Buacheer ex Kützing) M. Verlaque &amp; Boudouresque</td>
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</table>


** Sporophyte of Petalonia fascia (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 Schiffer & 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 Maliaos in the N. Aegean (Chryssovergis, 1995), while C. umbellata was reported both from Maliaos (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 & Dul Lluch = Cystoseira schiffneri Hamel

This rather rare infraspecific taxon has been reported in Greece only by Chryssovergis (1995) from Maliaos 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 misidentifications, 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. corinculata. 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* Al-lender & 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* Kützing

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.

*Spongomonema tomentosum* (Hudson) Kützing = *Ectocarpus tomentosus* (Hudson) Lyngbye

The single record of this cold-temperate species from Pagasitikos in the North Aegean (Diannelidís 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, Diannelidís’s record should be treated as debatable.

Taxa Excludenda

*Chaetopteris plumosa* (Lyngbye) Kützing

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 molus 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 Diannelidís (1953) was excluded by Athanasiadis (1987) based on the description provided, which let to suppose a misidentification. It could be noted that thalli resembling *E. reptans* are involved in the life history of species of *Asperococcus* Lamouroux.
Cystoseira erica-marina (Prud'homme van Reine) is probably a misidentification, from various localities in the Mediterranean Sea, but a type element remains to be selected. (Wulf.)

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

Ishmplea 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 Lesvos 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.

Sphacelorbus 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 Tenar-on 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 (Haritondidis & Tsekos, 1974; Diannelidis et al., 1977; Haritondidis, 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
Haritondidis & 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 Phylacantha 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 Phylacantha 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.

Phylacantha 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 Peloponnesse. 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 *Focus 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 Peloponnesse (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), Diañelidis (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 Peloponnesse with the latter taxon (e.g. Agardh, 1842). The identity of Diañelidis’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, where-as 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.

**Acknowledgements**

We are grateful to A. Athanasiadis for his valuable comments. We also wish to thank F.C. Kuepper, V. Ger-
akaris, M. Salomidi, A. Zulevic, H. Kawai, D. Mueller and S. Martin for sampling assistance as well as the editor and the anonymous reviewers for their corrections. We are also indebted to the Total Foundation for supporting this study.

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