

AN UPDATED CHECKLIST OF MARINE FLORA ON THE CONTINENTAL SHELF OF GÖKÇEADA ISLAND (NORTHERN AEGEAN SEA, TURKEY)

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Abstract:

The present paper aims to describe the marine flora occurring on the continental shelf of Gökçeada Island (North Aegean) based on the review of the long-term researches (1973-2016) which provided qualitative information on many taxa including Cyanobacteria, Chlorophyta, Ochrophyta, Rhodophyta and Tracheophyta.

Eight species (*Polysiphonia brevearticulata*, *Ceramium codii*, *Gymnothamnion elegans*, *Spermothamnion repens*, *Lophosiphonia cristata*, *Hydrolithon cruciatum*, *Leathesia marina*, *Caulerpa racemosa*) and one variety (*Caulerpa racemosa* var. *cylindracea*) recorded during the present study are the new records for Gökçeada Island. The new recorded species belonging to Rhodophyta were found as opportunistic-filamentous and crustose epiphytic forms on *Posidonia oceanica* leaf blades during the years 2009-2016. The presence of *Caulerpa racemosa*, the Mediterranean invasive algae and its dispersal around the island proves the

ecological threat on the coastal ecosystem of the island due to the touristic boat anchorings and bottom trawling.

Rhodophyta had the highest number of species dominated the macroalgal composition with 178 species followed by the contributions of Ochrophyta and Chlorophyta and Cyanobacteria with 78, 64 and 25 species, respectively. As for the marine phanerogams (Tracheophyta) that contribute as key ecosystems to the biological diversity were recorded as 1% of the systematic groups in the region presenting three genus (*Cymodocea*, *Posidonia*, *Zostera*) but covering vast areas.

After all the future goals of this research are to develop a checklist of marine flora along the littoral zones of Gökçeada Island (North Aegean) presenting the last biodiversity situation and a detailed herbarium collection for the museum of Istanbul University Gökçeada Marine Research Department.

Keywords: Macroalgae, checklist, Gökçeada Island, North Aegean, Eastern Mediterranean

Introduction

The North Aegean Sea representing one of the main parts of the Eastern Mediterranean can be defined as the convergens zone, where colder Black Sea waters coming from the Dardanelles Strait encounter warmer waters of Mediterranean Sea coming to the basin (Uçkaç, 2005).

Gökçeada, the largest island of Turkey is situated in the North Aegean Region (40.150°N, 25.817° E) and has a coastline of 92 km and its surface area is 279 km². Due to the Turkish Straits System, the region is subjected to strong hydrodynamism such as currents and waves. Thus the ecologically important macroalgal communities vary forming new individuals according to the deviations of seasonal and hydrodynamic factors.

Considering Turkey's islands with their biogeographical features, these regions reserve significant biological diversity and have the potential of becoming specially protected areas (SPAMIs, MPAs) in the Mediterranean.

As a part of the Eastern Mediterranean that is characterized by low nutrient concentrations and primary production, the North Aegean Sea is comparatively more productive than the southern part (Siokou-Frangou *et al.* 2002) due to the intensive freshwater inputs from Nestos and Maritsa Rivers and Kavak River flowing into the Saros Gulf (North Aegean).

Representing the features of the North Aegean, Gökçeada Island is also affected by the increasing nutrient concentrations due to the antropogenic pressures on the freshwaters and coastal shelves. These high concentrations of nutrients deteriorate the water quality (Aktan & Gümüšoğlu 2010) and alter the species composition (Piazzì *et al.* 2004) in which the opportunistic species dominate. Since the island has subjected to touristic pressures in every summer months, cyanobacterial mattes that acts as quality elements indicating high levels of nutrients have dominated evidently on *Posidonia oceanica* seagrass leaves (Aktan & Gümüšoğlu, 2010, 2014). According to these phenomena, the species composition can be evaluated as an indicator in the assessment of ecosystem status.

North Aegean Region is also sensitive to pressures such as coastal recreational activities, discharges of domestic wastewaters, artisanal and commercial fishing, collection of rare species and invasion by alien species (Chintiroglou *et al.* 2005).

In the Aegean Coasts of Turkey, detailed studies on marine macrophytes had started after early 1970's (Zeybek and Güner, 1973; Öztürk and Güner, 1986; Cirik *et al.*, 1990).

As for the Gökçeada Island, the studies on marine flora carried out between 1973-1985 has been conducted by Yazıcı (1974) in Gökçeada Fisheries and Sponge-Fishing Research Department (former name of Gökçeada Marine Research Department) where sea sponges were cultivated under uncontrolled conditions. These studies were not published and can be found in the libraries of Gökçeada Marine Research Department and Istanbul University Fisheries Faculty as reports and herbariums.

Zeybek *et al.* (1986) listed marine algae of Turkey belonging to four seas (Black Sea, Marmara Sea, Aegean Sea and Mediterranean Sea) that has been evaluated as a new record and it had comprised the studies on Gökçeada Island.

In detailed Cirik *et al.*(1990) put forward the presence of 115 taxa systematically in Gökçeada Island and Aysel *et al.* (2001) published a checklist of marine flora in the island based on the researches conducted from 1973 to 2001. Afterwards Aktan & Gümüšoğlu (2014) and Güreşen *et al.* (2015) contributed new records to the marine flora of the island based on the epiphytic flora on *Posidonia oceanica* leaf blades and rhizomes.

In this manner the main purpose of this paper is to present an updated list of marine flora along the littoral zones of Gökçeada Island (North Aegean) with believing to assess the last situation and lead to the further ecological studies that will be conducted around the region and finally to develop a detailed herbarium collection with the samples collected for the museum of Istanbul University Gökçeada Marine Research Department.

This study was created on the basis of literature review before 2001 and additional field researches performed between 2009-2016 around Gökçeada Island by Gökçeada Marine Research Department, Istanbul University (Figure 1). The samples have been collected from the infralittoral zones by SCUBA diving and preserved in 4% formalin for the further taxonomic identifications. All samples were identified to species levels under the divisions of Cyanobacteria, Rhodophyta, Ochrophyta, Chlorophyta and Tracheophyta and for the nomenclature of the higher taxa we followed WoRMS and AlgaeBase (Guiry and Guiry, 2016)

List of the species are mainly based on literature review, a total of 349 species and 22 varieties belonging to five divisions are known from the Gökçeada Island. The species list of each division and classis are presented in Table 1. Among these 83 species had been firstly reported from the island by Yazıcı (1974) that contributed to the marine flora with two species from Cyanobacteria; 36 species from Rhodophyta; 26 species from Ochrophyta; 19 species from Chlorophyta and 2 species from Tracheophyta.

After, Aysel *et al* (2001) added 256 species and 25 varieties from the island. The remaining six species (*Polysiphonia brevearticulata* (Figure 3), *Ceramium codii* (Figure 4), *Gymnothamnion elegans* (Fig. 5), *Spermothamnion repens* (Figure 6), *Lophosiphonia cristata*, *Hydrolithon cruciatum* (Figure 7)) belonging to Rhodophyta; one species (*Leathesia marina*) belonging to Ochrophyta; one species (*Caulerpa racemosa* (Figure 8)) and one variety (*Caulerpa racemosa* var. *cylindracea*) belonging to Chlorophyta recorded during the present study are the new records for Gökçeada Island. The new recorded species belonging to Rhodophyta were found as filamentous and crustose epiphytic forms on *Posidonia oceanica* leaf blades during the years 2009-2015.

Rhodophyta had the highest number of species dominated the macroalgal composition with 178 species followed by the contributions of Ochrophyta and Chlorophyta, Cyanobacteria and Tracheophyta with 78, 64, 25 and four species, respectively (Figure 2).

Considering the percentages, Rhodophyta constitutes 51% of macroalgal flora in the island, followed by Ochrophyta, Chlorophyta and Cyanobacteria with 23%, 18% and 7%, respectively.

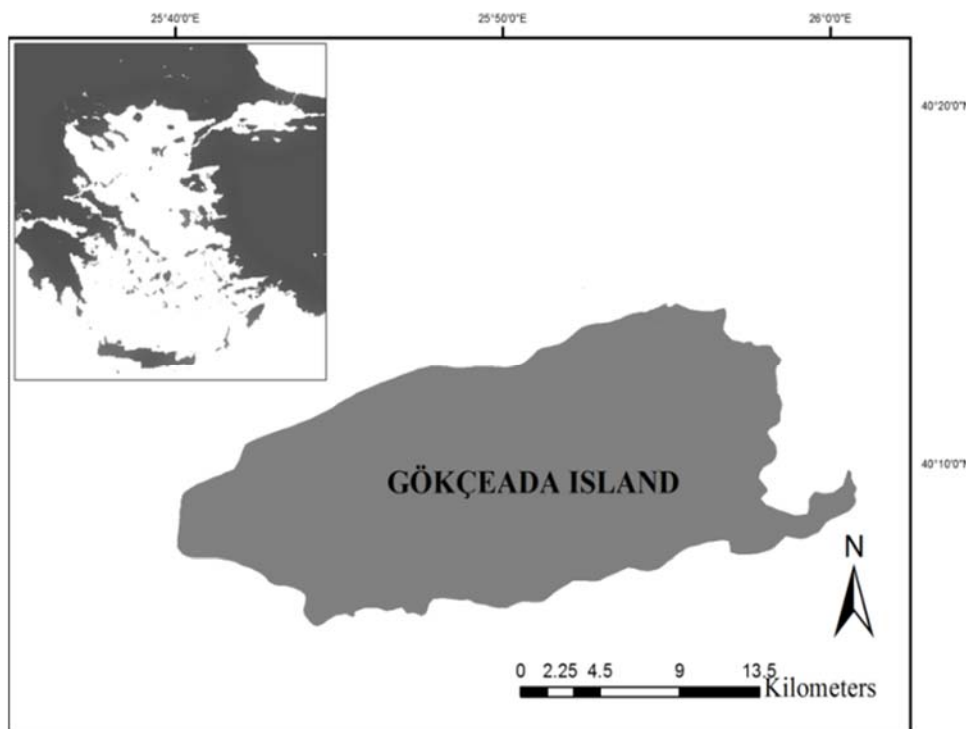


Figure 1. The study area - the infralittoral zones of Gökçeada Island.

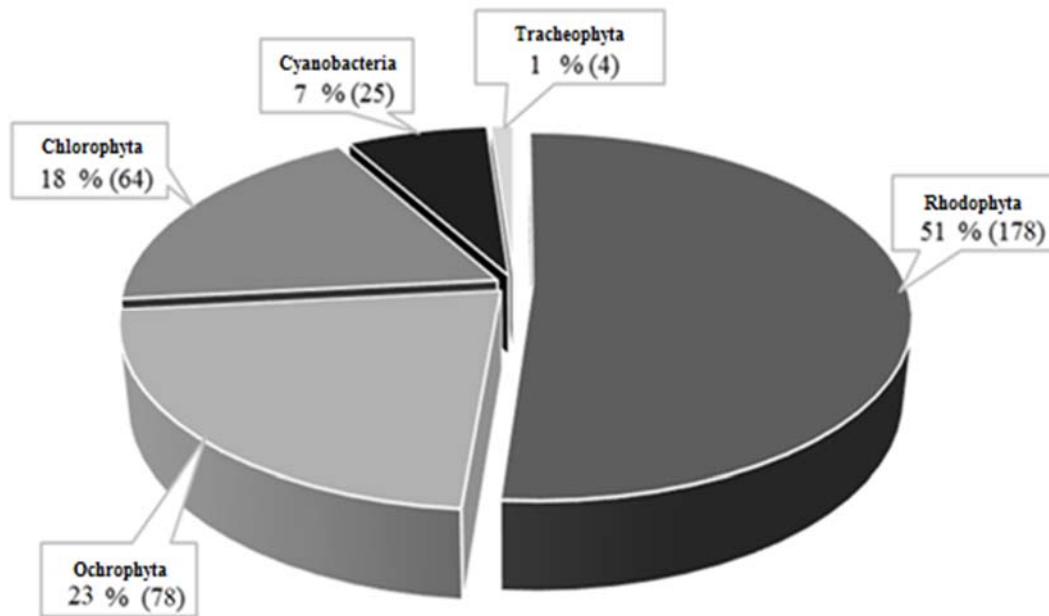


Figure 2. The percentages of five divisions reported from Gökçeada Island with the species numbers in parentheses.

Exotic Species

The present paper also reports a total of 11 exotic species (*Acanthophora nayadiformis*, *Asparagopsis armata*, *Asparagopsis taxiformis*, *Bonnemaisonia hamifera*, *Colaconema codioides*, *Polysiphonia fucooides* belonging to Rhodophyta; *Cladosiphon zosterae*, *Ectocarpus siliculosus* var. *hiemalis*, *Pylaiella littoralis* belonging to Ochrophyta; *Caulerpa racemosa* var. *cylindracea* and *Codium fragile* subs. *fragile* belonging to Chlorophyta) distributed around the continental shelf of Gökçeada Island.

Whereas *Codium fragile* subs. *fragile* that is widely distributed in the Mediterranean Basin was introduced accidentally via shipping (ballast waters) or current systems from the Northern Pacific into the Mediterranean (Verlaque *et al.*, 2015); Indo-West Pacific originated *Acanthophora nayadiformis*, *Asparagopsis armata* and *Caulerpa racemosa* and its variety *Caulerpa racemosa* var. *cylindracea* were introduced into the Mediterranean by the Suez Canal. Accordingly in the recent years, the dispersal of *C. racemosa* with invasive distinctions can be seen around the coasts of

Gökçeada Island and it spread on the mobile sediments around the island; especially covering vast areas in the southern coasts. Regarding the northern coasts *C. racemosa* can be usually seen as wrapped around the rhizomes of the seagrass meadows and in the gaps between the meadows that were developed due to the boat anchorings and bottom trawlings (Piazzi *et al.* 1994). Its new variety *Caulerpa racemosa* var. *cylindracea* was also recorded in the southern coasts during the present study.

Regarding the marine phanerogams (Tracheophyta) that are the key ecosystems in the Mediterranean representing the hotspots of the biological diversity were recorded as 1% of the systematic groups in the region presenting three genus (*Cymodocea*, *Posidonia*, *Zostera*).

Especially *Posidonia oceanica* (Figure 9) meadows covers vast areas on the seafloor forming continuous belts and sometimes patches around the island.

In the species list (Tab. 1), *Mesophyllum lichenoides*, *Cystoseira amentacea*, *C. mediterranea*, *C. spinosa*, *Dictyopteris polypoides* fascieses, coralligenous bio-constructions, *Posidonia oceanica*, *Zostera marina*, *Z. noltei*

seagrass meadows have been included in the action plans for conserving marine phanerogams and establishing marine protected areas in the scope of the Marine Coastal Areas Conservation Systems Project conducted by the cooperations of Ministry of Environment and Ministry of Agriculture and Rural Affairs and

Turkey Legation of United Nations Development Programme (UNDP Turkey), the Regional Activity Centre/Specially Protected Areas (RAC/SPA) (UNEP MAP RAC/SPA, 1999). *Posidonia oceanica* is also protected by the national legal framework; Turkish Circular on Water Products (2012).



Figure 3. *Polysiphonia brevearticulata*



Figure 4. *Ceramium codii*



Figure 5. *Gymnothamnion elegans*



Figure 6. *Spermiothamnion repens*

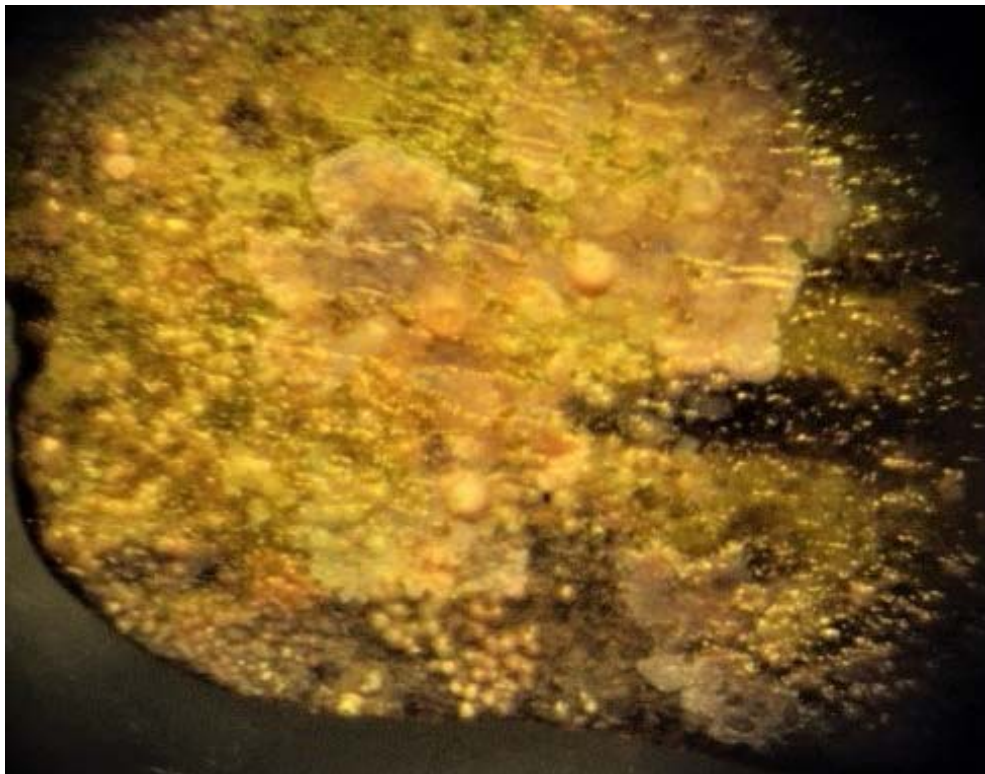


Figure 7. *Hydrolithon cruciatum*



Figure 8. *Caulerpa racemosa*

Figure 9. *Posidonia oceanica*

Table 1. The species list of each divisio and classis with references from the Gökçeada

Taxa	Species
CYANOBACTERIA	
Cyanophyceae	<p><i>Aphanocapsa litoralis</i> Hansgirg, 1892</p> <p><i>Aphanocapsa marina</i> Hansgirg in Foslie, 1890</p> <p><i>Blennothrix lyngbyacea</i> (Kützing ex Gomont) Anagnos. & Komárek, 1988</p> <p><i>Calothrix confervicola</i> C.Agardh ex Bornet & Flahault 1886</p> <p><i>Calothrix contarenii</i> Bornet & Flahault, 1886</p> <p><i>Calothrix parasitica</i> Thuret ex Bornet & Flahault, 1886</p> <p><i>Gloeocapsopsis crepidinum</i> (Thuret) Geitler ex Komárek, 1993</p> <p><i>Gomphosphaeria aponina</i> Kützing, 1836</p> <p><i>Heteroleibleinia infixa</i> (Frémy) Anagnostidis & Komárek, 1988</p> <p><i>Leibleinia gracilis</i> (Rabenhorst ex Gomont) Anagnos. & Komárek, 1988</p> <p><i>Leptolyngbya tenuis</i> (Gomont) Anagnostidis & Komárek, 1988</p> <p><i>Lyngbya adriae</i> Ercegovic, 1957</p> <p><i>Lyngbya aestuarii</i> Liebman ex Gomont, 1892</p> <p><i>Lyngbya confervoides</i> C.Agardh ex Gomont, 1892</p> <p><i>Lyngbya lutea</i> Gomont ex Gomont, 1892</p> <p><i>Lyngbya majuscula</i> Harvey ex Gomont, 1892</p> <p><i>Microcoleus codii</i> Frémy, 1932</p> <p><i>Microcystis zanardini</i> (Hauck) P. Silva in P.C.Silva, Basson & Moe, 1996</p> <p><i>Rivularia atra</i> Roth ex Bornet & Flahault, 1886</p> <p><i>Rivularia polyotis</i> Roth ex Bornet & Flahault, 1886</p> <p><i>Schizothrix tenerrima</i> (Gomont) F.E.Drouet 1968</p> <p><i>Spirocoleus fragilis</i> (Meneghini) in P.C.Silva, Basson & Moe, 1996</p> <p><i>Spirulina subsalsa</i> Oersted ex Gomont, 1892</p> <p><i>Symploca hydroides</i> Kützing ex Gomont, 1892</p> <p><i>Trichocoleus wuimeri</i> (Frémy) Anagnostidis, 2001</p>

RHODOPHYTA

- Stylonematophyceae** *Chroodactylon ornatum* (C.Agardh) Basson, 1979
Stylonema alsidii (Zanardini) Drew, 1956
- Compsogonophyceae** *Erythrotrichia carnea* (Dillwyn) J. Agardh, 1883
Erythrotrichia vexillaris (Montagne) Hamel, 1929
Sahlingia subintegra (Rosenvinge) Kornmann, 1989
- Bangiophyceae** *Bangia atropurpurea* (Mertens ex Roth) C.Agardh, 1824
Pyropia leucosticta (Thuret) Neefus & Brodie, 2011
Porphyra umbilicalis Kützing, 1843
- Florideophyceae** *Acanthophora nayadiformis* (Delile) Papenfuss, 1968
Acrochaetium kyllinii Hamel, 1927
Acrochaetium mediterraneum (Levring) Athanasiadis, 2002
Acrochaetium microscopicum (Nägeli ex Kützing) Nägeli, 1858
Acrochaetium moniliforme (Rosenvinge) Børgesen, 1915
Acrochaetium savianum (Meneghini) Nägeli, 1862
Acrochaetium secundatum (Lyngbye) Nägeli, 1858
Acrosorium ciliolatum (Harvey) Kylin, 1924
Acrosymphyton purpuriferum (J. Agardh) Sjöstedt, 1926
Aglaothamnion cordatum (Børgesen) Feldm.-Mazoyer, 1941
Aglaothamnion hookeri (Dillwyn) Maggs & Hommersand, 1993
Aglaothamnion tenuissimum (Bonnemaison) Feldm.-Mazoyer, 1941
Ahnfeltiopsis furcellata (C.Agardh) P. Silva & DeCew, 1992
Alsidium corallinum C.Agardh, 1827
Alsidium helminthochorton (Schwendimann) Kützing, 1843
Amphiroa beauvoisii Lamouroux, 1816
Amphiroa cryptarthrodia Zanardini, 1844
Amphiroa rigida Lamouroux, 1816
Anotrichium barbatum (C.Agardh) Nägeli, 1862
Anotrichium furcellatum (J. Agardh) Baldock, 1976
Anotrichium furcellatum var. *profundum* Feldm. Mazoyer
Anotrichium furcellatum var. *radiacans* (J. Agardh) Collins
Anotrichum tenue (C.Agardh) Naegeli, 1862
Antithamnion cruciatum (C.Agardh) Nageli, 1847
Antithamnion tenuissimum (Hauck) Schiffner, 1916
Apoglossum ruscifolium (Turner) J. Agardh, 1898
Asparagopsis armata Harvey, 1855
Asparagopsis taxiformis (Delile) Trevisan, 1845
Boergeseniella fruticulosa (Wulfen) Kylin, 1956
Bonnemaisonia asparagoides (Woodward) C.Agardh, 1822
Bonnemaisonia hamifera Hariot, 1891
Botryocladia botryoides (Wulfen) Feldmann, 1941
Callithamnion corymbosum (Smith) Lyngbye, 1819
Callithamnion granulatum (Ducluzeau) C.Agardh, 1828
Catenella caespitosa (Withering) Irvine, 1976
Centroceras clavulatum (C.Agardh) Montagne, 1846
Ceramium ciliatum (Ellis) Ducluzeau, 1806
Ceramium ciliatum var. *robustum* (J. Agardh) Mazoyer
Ceramium circinatum (Kützing) J. Agardh, 1851
Ceramium codii (Richards) Mazoyer, 1938
Ceramium deslongchampsii Chauvin ex Duby, 1830

- Ceramium diaphanum* var. *elegans* (R.) Roth, 1806
Ceramium diaphanum (Lightfoot) Roth, 1806
Ceramium gaditanum (Clemente) Cremades, 1990
Ceramium gaditanum var. *mediterraneum* (Debray) Cremades, 1990
Ceramium rubrum var. *barbatum* Feldmann-Mazoyer, 1941
Ceramium tenerrimum (Martens) Okamura, 1921
Ceramium virgatum Roth, 1797
Champia parvula (C.Agardh) Harvey, 1853
Chondria capillaris var. *patens* (Schiffner) Aysel V.
Chondria capillaris var. *subtilis* (Hauck) Aysel V.
Chondria capillaris (Hudson) Wynne, 1991
Chondria dasyphylla (Woodward) C.Agardh, 1817
Chondria mairei G.Feldm., 1949
Choreonema thuretii (Bornet) Schmitz, 1889
Chylocladia verticillata (Lightfoot) Bliding, 1928
Coccolytus truncatus (Pallas) Wynne & Heine, 1992
Colaconema codicola (Børgesen) Stegenga, Bolton & Anderson, 1997
Colaconema daviesii (Dillwyn) Stegenga, 1985
Compsothamnion thuyoides (Smith) Nägeli, 1862
Corallina officinalis Linnaeus, 1758
Corallophilla cinnabarina (Grateloup ex Bory) Norris, 1993
Crouania attenuata (C.Agardh) J. Agardh, 1842
Cryptonemia lomation (Bertoloni) J. Agardh, 1851
Cryptopleura ramosa (Hudson) Newton, 1931
Dasya baillouviana (Gmelin) Montagne, 1841
Dasya corymbifera J. Agardh, 1841
Dasya hutchinsiae Harvey, 1833
Dasya ocellata (Grateloup) Harvey, 1833
Dasya punicea (Zanardini) Meneghini ex Zanardini, 1841
Dasya rigidula (Kützing) Ardissonne, 1878
Dasya sinicola (Setchell & Gardner) Dawson, 1959
Dermocorynus dichotomus (J.Agardh) Gargiulo, Morabito & Manghisi, 2013
Dipterosiphonia rigens (Shousboe ex C.Agardh) Falkenberg, 1901
Ellisolandia elongata (Ellis & Solander) Hind & Saunders, 2013
Erythrocytis montagnei (Derbes & Solier) P.Silva, 1952
Gayliella flaccida (Harvey ex Kützing) Cho & McIvor, 2008
Gayliella mazoyerae Cho, Fredericq & Hommersand, 2008
Gayliella taylorii (Dawson) Cho & Boo, 2008
Gayliella transversalis (Collins & Hervey) Cho & Fredericq, 2008
Gelidiella nigrescens (Feldm.) Feldm. & Hamel, 1934
Gelidiella ramellosa (Kützing) Feldm. & Hamel, 1934
Gelidium crinale (Hare ex Turner) Gaillon, 1828
Gelidium crinale var. *polycladum* (Kützing) Hauck
Gelidium pulchellum (Turner) Kützing, 1868
Gelidium pusillum (Stackhous) Le Jolis, 1863
Gelidium spathulatum (Kützing) Bornet, 1892
Gelidium spinosum (Gmelin) P.Silva, 1996
Gracilaria bursa-pastoris (Gmelin) Silva, 1952
Gracilariopsis longissima (Gmelin) Steentoft, Irvine & Farnham, 1995
Grateloupia filicina (Lamouroux) C.Agardh, 1822

Griffithsia opuntioides J. Agardh, 1842
Gymnogongrus griffithsiae (Turner) Martius, 1833
Gymnothamnion elegans (Schousboe ex C. Agardh) J. Agardh, 1892
Halopithys incurva (Hudson) Batters, 1902
Halurus flosculosus (Ellis) Maggs & Hommersand, 1993
Halymenia floresii (Clemente) C. Agardh, 1817
Herposiphonia secunda f. *tenella* (C. Agardh) Wynne, 1985
Herposiphonia secunda (C. Agardh) Ambronn, 1880
Heterosiphonia crispella (C. Agardh) Wynne, 1985
Hydrolithon cruciatum (Bressan) Chamberlain, 1994
Hydrolithon farinosum (Lamouroux) Penrose & Chamberlain, 1993
Hypnea musciformis (Wulfen) Lamouroux, 1813
Hypoglossum hypoglossoides (Stackhouse) Collins & Hervey, 1917
Jania longifurca Zanardini, 1844
Jania rosea (Lamarck) Decaisne, 1842
Jania rubens (L.) Lamouroux, 1816
Jania rubens var. *corniculata* (Linnaeus) Yendo, 1905
Jania squamata (L.) Kim, Guiry & Choi, 2007
Jania virgata (Zanardini) Montagne, 1846
Laurencia obtusa (Hudson) Lamouroux, 1813
Laurencia obtusa var. *gracilis* (C. Agardh) Zanardini, 1847
Laurencia pyramidalis Bory ex Kützing, 1849
Lejolisia mediterranea Bornet, 1859
Liagora viscida (Forsskål) C. Agardh, 1822
Lithophyllum corallinae (P. Crouan & H. Crouan) Heydrich, 1897
Lithophyllum cystoseirae (Hauck) Heydrich, 1897
Lithophyllum racemus (Lamarck) Foslie, 1901
Lithothamnion glaciale Kjellman, 1883
Lomentaria articulata (Hudson) Lyngbye, 1819
Lomentaria clavellosa (Lightfoot ex Turner) Gaillon, 1828
Lomentaria compressa (Kützing) Kylin, 1931
Lomentaria uncinata Meneghini, 1840
Lomentaria verticillata Funk, 1955
Lophosiphonia cristata Falkenberg, 1901
Lophosiphonia obscura (C. Agardh) Falkenberg, 1897
Melobesia membranacea (Esper) Lamouroux, 1812
Mesophyllum expansum (Philippi) Cabioch & Mendoza, 2003
Mesophyllum lichenoides (Ellis) Lemoine, 1928
Monosporus pedicellatus (Smith) Solier, 1845
Nemalion elminthoides (Velley) Batters, 1902
Neosiphonia sertularioides (Grateloup) Nam & Kang, 2012
Nitophyllum punctatum (Stackhouse) Greville, 1830
Osmundaria volubilis (Linnaeus) Norris, 1991
Osmundea pinnatifida (Hudson) Stackhouse, 1809
Palisada perforata (Bory) Nam, 2007
Palisada thuyoides (Kützing) Cassano, Senties, Gil-Rodríguez & Fujii, 2009
Peyssonnelia bornetii Boudour. & Denizot, 1973
Peyssonnelia coriacea Feldmann, 1941
Peyssonnelia dubyi P. Crouan & H. Crouan, 1844
Peyssonnelia rubra (Greville) C. Ag., 1851

Peyssonnelia squamaria (Gmelin) Decaisne, 1842
Phycodrys rubens (Linnaeus) Batters, 1902
Phyllophora crispa (Hudson) Dixon, 1964
Phyllophora pseudoceranoioides (S.G.Gmelin) Newroth & A.R.A.Taylor, 1971
Phymatolithon calcareum (Pallas) Adey & McKibbin, 1970
Phymatolithon lenormandii (Aresch.) Adey, 1966
Pleonosporium borneri (Smith) Naegeli, 1862
Plocamium cartilagineum (Linnaeus) Dixon, 1967
Pneophyllum confervicola (Kützing) Chamberlain, 1983
Polysiphonia breviarticulata (C.Agardh) Zanardini, 1840
Polysiphonia brodiei (Dillwyn) Sprengel, 1827
Polysiphonia denudata (Dillwyn) Greville ex Harvey, 1833
Polysiphonia deusta (Roth) Sprengel, 1827
Polysiphonia dichotoma Kützing, 1843
Polysiphonia elongata (Hudson) Sprengel, 1827
Polysiphonia flocculosa (C.Agardh) Endlicher, 1843
Polysiphonia fucoidea (Hudson) Greville, 1824
Polysiphonia furcellata (C.Agardh) Harvey, 1833
Polysiphonia opaca (C.Agardh) Moris & De Notaris, 1839
Polysiphonia scopulorum Harvey, 1855
Polysiphonia stuposa Zanardini ex Kützing, 1864
Polysiphonia tenerrima Kützing, 1843
Polysiphonia tripinnata J. Agardh, 1842
Pterocladia capillacea (Gmelin) Santelices & Hommersand, 1997
Pterocladia melanoidea (Schousboe ex Bornet) Santelices & Hommersand, 1997
Pterosiphonia pennata (C.Agardh) Sauvageau, 1897
Pterothamnion crispum (Ducluzeau) Nägeli, 1862
Pterothamnion plumula (Ellis) Nägeli, 1855
Ptilothamnion pluma (Dillwyn) Thuret, 1863
Rhodophyllis divaricata (Stackhous) Papenfuss, 1950
Rhodymenia ardissoni var. *robustior* (Ercegovic) Antolic & Span, 2013
Rhodymenia ardissoni (Kuntze) Feldmann, 1937
Rhodymenia pseudopalmata (Lamouroux) P.Silva, 1952
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Conclusion

According to the results that reported 349 species and 22 varieties have been related to the rather good coastal ecosystem health around the study region.

The coastal zone of Gökçeada Island hasn't degraded due to the irregular water-front constructions and industrial facilities. Furthermore a rich fauna and flora can be seen around the island due to the island and the Saros Gulf is on the way of the migration path of the marine species between the Black Sea and Mediterranean and act as a habitat for spawning and breeding. In the view of that a marine protected area named "Gökçeada Underwater Marine Park" was established in 1999 for the first time on the Turkish coasts to protect this characteristic marine site and to conserve the habitats of the endangered and endemic species. Therefore non-sustainable fishing, night spear fishing and tourism pressures have been prevented.

Despite these conditions, all the alien species that recorded in this study continue to be regarded as a biogeographical threat for the Mediterranean Region and their effects have to be monitored around the island as a biodiversity hotspot area in the North Aegean.

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