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**The Genus *Cystoseira* of Turkey: First Report of
Cystoseira foeniculacea f. *latiramosa* (Ercegovic)
A. Gómez Garreta, M.C. Barceló, M.A. Ribera et J.R. Lluch**

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Abstract: A revised list of the genus *Cystoseira* occurring in Turkey is being reported in this study. Also, *Cystoseira foeniculacea* f. *latiramosa* (Ercegovic) A. Gómez Garreta, M.C. Barceló, M.A. Ribera et J.R. Lluch has been reported for the first time from Turkey. A total of 24 taxa (species and infraspecific) reported before from Turkey was listed.

Key words: Brown algae, *Cystoseira*, *Cystoseira foeniculacea* f. *latiramosa*, Phaeophyceae, Turkey

INTRODUCTION

The genus *Cystoseira* was established by Agardh (1820), *Cystoseira concatenata* (L.) C. Agardh (Bas.: *Fucus concatenatus* L.) is the lectotype species of this genus. This species was reported as a synonym of *Cystoseira foeniculacea* (L.) Greville by Guiry (2006) and Gómez Garreta *et al.* (2001). There are 44 species names as current in the AlgaeBase species database at present (Guiry, 2006). However, Gómez Garreta *et al.* (2001) stated that *Cystoseira* includes about fifty species, the majority occurring in the Mediterranean Sea or Atlantic-Mediterranean. Also, Gómez Garreta *et al.* (2001) reported 20 species (27 taxa) in the Iberian Peninsula, most of which are present in the Mediterranean Sea. Forty seven taxa reported to occur in the Mediterranean Sea (Ribera *et al.* 1992), including 19 are endemic (Amico, 1995). Several studies including or dealing only with genus *Cystoseira* of the Mediterranean Sea have been made by Sauvageau (1912), Hamel (1939), Ercegovic (1952a), Zinova and Kalugina (1974), Gerloff and Nizamuddin (1976), Athanasiadis (1987) and Gómez Garreta *et al.* (2001).

Several studies have been made on the genus *Cystoseira* of Turkey (Guner, 1974; Aysel *et al.*, 1993; Aysel, 1997; Öztürk, 1996; Öztürk and Taşkın, 1999). Twenty three taxa (species and infraspecific) have previously been reported to occur in the Turkish seas (Zeybek *et al.*, 1993; Taşkın *et al.*, 2003). This study reports the first record of a 24th species, viz., *Cystoseira foeniculacea* f. *latiramosa* (Ercegovic) A. Gómez Garreta, M.C. Barceló, M.A. Ribera and J.R. Lluch, in Turkey. This species is known from Italy, Sicily, Adriatic Sea, Greece and Balearic Islands (Ribera *et al.*, 1992).

In this study the aim was that to prepare a revised list of the taxa of the genus *Cystoseira* occurring in Turkey with first report of *Cystoseira foeniculacea* f. *latiramosa*.

MATERIALS AND METHODS

Sampling was made from different localities of Turkey in the years 1980 to 2005. Voucher specimens are deposited in personal herbarium. Also evaluated all taxa (species and infraspecific) reported from Turkey by other authors. Plant photograph was taken using Sea and Sea G8000. For

each species the phylogeographic element is given between brackets according to Furnari *et al.* (1999a), using the following abbreviations: Boreo-Atlantic (BA), Mediterranean (M) and Indo-Pacific (IP).

Cystoseira foeniculacea f. *latiramosa* was collected in the sublittoral zone, as an epilithic from Ayvalik (east Aegean Sea, Turkey) in March, 1983 by second author and was deposited in personal herbarium. The identification of *C. foeniculacea* f. *latiramosa* was made according to the account in Ercegovic (1952b) and Gómez Garreta *et al.* (2001).

RESULTS AND DISCUSSION

The genus *Cystoseira* is represented in Turkey by 23 taxa (species and infraspecific) and the new taxon *C. foeniculacea* f. *latiramosa* (Ercegovic) A. Gómez Garreta, M.C. Barceló, M.A. Ribera and J.R. Lluich and including nineteen taxa are Mediterranean endemic specimens.

1. *Cystoseira amentacea* (C. Agardh) Bory var. *amentacea* (= *Cystoseira ericoides* var. *amentacea* C. Agardh; *Cystoseira stricta* var. *amentacea* (Bory) Giaccone). (M). Aysel (1997), Aysel *et al.* (1998a, b), Aysel *et al.* (1997), Guner *et al.* (1985), Zeybek *et al.* (1993).
 2. *Cystoseira amentacea* var. *spicata* (Ercegovic) Giaccone (= *Cystoseira spicata* Ercegovic; *Cystoseira spicata* subsp. *elegans* Ercegovic). (M). Aysel *et al.* (1998) and Zeybek *et al.* (1993).
 3. *Cystoseira amentacea* var. *stricta* Montagne (= *Cystoseira stricta* (Montagne) Sauvageau). (M). Zeybek *et al.* (1993), Öztürk (1996), Taşkın and Öztürk (2005).
 4. *Cystoseira barbata* (Stackhouse) C. Agardh f. *barbata* (= *Abrotanifolia barbata* Stackhouse; *Cystoseira hoppii* C. Agardh). (IP). Aysel (1997), Aysel *et al.* (1993, 1996a, b, 1997 and 1998a, b), Öztürk (1996), Öztürk and Taşkın (1999), Zeybek *et al.* (1993), Guner *et al.* (1985), Taşkın and Öztürk (2005), Taşkın *et al.* (2003) and Aysel and Erdugan (1995).
 5. *Cystoseira barbata* f. *repens* Zinova et Kalugina (= *Cystoseira barbata* f. *aurantia* (Kützinger) Giaccone). (M). Aysel *et al.* (1996a, b) and Aysel and Erdugan (1995).
 6. *Cystoseira compressa* (Esper) Gerloff et Nizamuddin (= *Fucus compressus* Esper; *Cystoseira abrotanifolia* f. *fimbriata* Sauvageau; *Cystoseira fimbriata* Bory de Saint-Vincent; *Cystoseira compressa* subsp. *rosetta* Ercegovic). (BA). Aysel *et al.* (1993, 1996a, b, 1997 and 1998a, b), Aysel (1997), Guner *et al.* (1985), Zeybek *et al.* (1993), Öztürk and Taşkın (1999), Taşkın *et al.* (2003), Aysel and Erdugan (1995) and Taşkın and Öztürk (2005).
- Note: *Cystoseira abrotanifolia* (Stackh.) C. Agardh and *Cystoseira fimbriata* (Desf.) Bory were cited as synonyms of this species by John *et al.* (2004).
7. *Cystoseira corniculata* (Turner) Zanardini (= *Fucus ericoides* var. *corniculatus* Turner). (IP). Aysel (1997), Aysel *et al.* (1997 and 1998a, b), Guner *et al.* (1985), Zeybek *et al.* (1993), Öztürk and Taşkın (1999), Öztürk (1996), Taşkın *et al.* (2003) and Aysel and Erdugan (1995).
 8. *Cystoseira crinita* (Duby) Bory f. *crinita* (M). Aysel *et al.* (1993, 1997 and 1998), Aysel (1997), Guner *et al.* (1985), Zeybek *et al.* (1993), Aysel and Erdugan (1995), Öztürk and Taşkın (1999), Öztürk (1996) and Taşkın *et al.* (2003).
 9. *Cystoseira crinita* f. *bosphorica* (Sauvageau) Zinova et Kalugina (= *Cystoseira bosporica* Sauvageau). (M). Aysel *et al.* (1996a, b and 1998a, b) and Aysel and Erdugan (1995).

10. *Cystoseira crinitophylla* Ercegovic (M). Guven and Oztig (1971), Aysel (1997), Aysel *et al.* (1997 and 1998a, b), Guner *et al.* (1985) and Zeybek *et al.* (1993).

11. *Cystoseira dubia* Valiante (= *Cystoseira fucoides* Ercegovic). (M). Aysel (1997), Aysel *et al.* (1998), Guner *et al.* (1985) and Zeybek *et al.* (1993).

12. *Cystoseira elegans* Sauvageau (M). Aysel (1997), Aysel *et al.* (1993, 1997 and 1998a, b), Guner *et al.* (1985), Zeybek *et al.* (1993) and Öztürk (1996).

Note: Since no holotype was indicated by Sauvageau (1912), Fumari *et al.* (1999b) designated as lectotype one species from Sauvageau Herbarium.

13. *Cystoseira foeniculacea* (L.) Greville f. *foeniculacea* (= *Fucus foeniculaceus* L.; *Cystoseira concatenata* (L.) C. Agardh; *Cystoseira discors* (L.) C. Agardh; *Cystoseira abrotanifolia* (L.) C. Agardh; *Cystoseira ercegovicii* Giaccone). (BA). Guven and Oztig (1971), Aysel *et al.* (1993a, b, 1996, 1997 and 1998a, b), Aysel (1997), Guner *et al.* (1985), Zeybek *et al.* (1993), Öztürk (1996), Taşkın and Öztürk (2005), Öztürk and Taşkın (1999), Taşkın *et al.* (2003) and Aysel and Erdugan (1995).

14. *Cystoseira foeniculacea* f. *latiramosa* (Ercegovic) A. Gómez Garreta, M.C. Barceló, M.A. Ribera and J.R. Lluch (= *Cystoseira discors* subsp. *latiramosa* Ercegovic 1952a; *Cystoseira ercegovicii* f. *latiramosa* (Ercegovic) Giaccone; *Cystoseira ercegovicii* f. *latiramosa* (Ercegovic) Giaccone in Amico *et al.*, *Cystoseira schiffneri* f. *latiramosa* (Ercegovic) Giaccone in Gallardo). (M).

Turkish plants to 25 cm long, caespitose, axes surrounded by spines, tophules absent, primary and secondary branches compressed, 3-4 mm wide. This species differs from other varieties by its all branches flattened (Fig. 1). Plants were collected in the sublittoral zone from Ayvalık (Aegean Sea, Turkey).



Fig. 1: Habit of *Cystoseira foeniculacea* f. *latiramosa*

Note: *Cystoseira foeniculacea* f. *latiramosa* (Ercegovic) A. Gómez Garreta, M.C. Barceló, M.A. Ribera and J.R. Lluch was first described by Ercegovic (1952a) as *Cystoseira discors* subsp. *latiramosa* from the Adriatic Sea. Later this species was recognized as *Cystoseira ercegovicii* f. *latiramosa* (Ercegovic) Giaccone in Amico *et al.* (1985) and recently *Cystoseira schiffneri* f. *latiramosa* (Ercegovic) Giaccone in Gallardo (1992) by Giaccone. This species recorded only from the Mediterranean Sea (Ribera *et al.*, 1992).

15. *Cystoseira foeniculacea* f. *tenuiramosa* A. Gómez Garreta, M.C. Barceló, M.A. Ribera and J.R. Lluch (= *Cystoseira discors* f. *tenuiramosa* Ercegovic; *Cystoseira ercegovicii* f. *tenuiramosa* (Ercegovic) Giaccone; *Cystoseira schiffneri* f. *tenuiramosa* (Ercegovic) Giaccone). (M). Guner *et al.* (1985), Zeybek *et al.* (1993), Aysel (1997).

Note: *Cystoseira discors* and *Cystoseira ercegovicii* are currently treated as synonyms of *C. schiffneri* (Ribera *et al.*, 1992), it is very unlikely that the numerous Mediterranean records of these entities refer to the autonym *C. schiffneri* var. *schiffneri*; for Italy the only confirmed record of *C. schiffneri* var. *schiffneri* are those from Sicily (Furnari *et al.*, 1999). Very probably most Mediterranean records of *C. discors* and *C. ercegovicii* must be referred to the widespread form *tenuiramosa* (Guiry, 2006). Although *C. discors* was reported from Izmir, Turkey by Guner (1974), it is probably form *tenuiramosa*. Also, *C. ercegovicii* was reported from the Aegean Sea by Sukatar (1992), it is *C. foeniculacea*. Both *C. discors* and *C. ercegovicii* were cited as synonyms of *C. schiffneri* in Turkey.

16. *Cystoseira funkii* Schiffner ex Gerloff et Nizamuddin (M). Öztürk (1996).

Note: Giaccone (1985) proposed the synonymy of tophulous and nontophulous forms of *C. funkii* with *C. jabukae* Ercegovic and *C. mediterranea* var. *valiantei* Sauvageau. But Verlaque *et al.* (1999) reported that *C. funkii* and *C. jabukae* should not be conspecific. However, Gómez Garreta *et al.* (2001) cited these two species are synonym. *C. funkii* was reported from Turkey by Öztürk (1996).

17. *Cystoseira humilis* Kützing (= *Cystoseira compressa* var. *pustulata* Ercegovic; *Cystoseira pumila* Kützing; *Cystoseira canariensis* Sauvageau; *Cystoseira abrotanifolia* subsp. *pustulata* Ercegovic). (BA). Aysel (1997a, b) and Aysel *et al.* (1998a, b).

Note: *C. humilis* was reported in the Eastern Mediterranean Sea only from Turkey by Aysel (1997), Aysel *et al.* (1998). *Cystoseira epiphytica* Schiffner ex Gerloff et Nizamuddin was described from Adriatic Sea by Gerloff and Nizamuddin (1976) but Giaccone (1985) wrote that this species is a juvenile form of *C. humilis*. And this species was recorded as a *taxon inquirendum* by Ribera *et al.* (1992). *C. compressa* var. *pustulata* Ercegovic was not cited as a synonyms of *C. humilis* by Gómez Garreta *et al.* (2001).

18. *Cystoseira mediterranea* Sauvageau var. *mediterranea* (M). Aysel *et al.* (1993), Aysel (1997), Aysel *et al.* (1997), Zeybek *et al.* (1993), Öztürk and Taşkın (1999) and Taşkın *et al.* (2003).

19. *Cystoseira mediterranea* var. *valiantei* Sauvageau (M). Aysel (1997 and Aysel *et al.* (1998a, b).

Note: This species was reported from France and Italy in the Mediterranean Sea (Ribera *et al.*, 1992). Lectotype locality (Baynuls-sur-mer, France) and lectotype were given by Gómez Garreta and Ribera (2005).

20. *Cystoseira sauvageauana* G. Hamel (= *Cystoseira selaginooides* var. *polyoedematis* Sauvageau). (M). Aysel *et al.* (1993).

21. *Cystoseira spinosa* Sauvageau (= *Cystoseira erica-marina* (S.G. Gmelin) Naccari; *Cystoseira adriatica* Sauvageau). (M). Guven and Oztig (1971) and Aysel *et al.* (1993).

22. *Cystoseira squarrosa* De Notaris (= *Cystoseira spinosa* var. *squarrosa* (De Notaris) Giaccone). (M). Aysel (1997) and Aysel *et al.* (1998a, b).

Note: *C. squarrosa* was cited as rare and little known species in the Mediterranean Sea by Alongi *et al.* (2002). This species was reported from France, Adriatic Sea, Sicily, Greece and Maltese (Ribera *et al.*, 1992; Alongi *et al.*, 2002). However, plants of Greece belong to *Cystoseira corniculata* (Alongi *et al.*, 2002).

23. *Cystoseira tamariscifolia* (Hudson) Papenfuss (= *Cystoseira selaginooides* (L.) Zanardini; *Cystoseira ericoides* (L.) C. Agardh). (BA). Aysel *et al.* (1993).

Note: This species was reported in the Eastern Mediterranean Sea only from Turkey by Aysel *et al.* (1993).

24. *Cystoseira zosteroides* (C. Agardh) Greville (= *Cystoseira opuntiooides* Bory de Saint-Vincent ex Montagne). (M). Aysel *et al.* (1993).

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