

Original Article

The genus *Cystoseira* of Algeria (southwestern Mediterranean): First report of *Cystoseira humilis* var. *myriophylloides* (Sauvageau) J.H.Price & D.M.John, 1978.

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Abstract: A revised list of *Cystoseira* species in Algerian coasts is established in this study. Eighteen taxa at specific and infraspecific levels accepted for Algeria are inventoried from updated literature and personal investigations. We report for the first time the presence of *Cystoseira humilis* var. *myriophylloides* (Sauvageau) J.H.Price & D.M.John on the Algerian coast.

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Introduction

Cystoseira species are important elements of the marine flora in the Mediterranean Sea (Taskin, 2012), playing a key role in structuring subtidal communities (Giaccone and Bruni, 1973). This genus colonizes the rocky substrates of many tropical and temperate regions (Nizamuddin, 1970). Most of its species in the Mediterranean Sea are endemic, distributed along the entire infralittoral and the upper circalittoral zone (Giaccone and Bruni, 1973). They are relatively large seaweeds in relation to the average size of Mediterranean algae, and their canopies provide suitable habitats for other algal and animal species (Sauvageau, 1912; Funk, 1927; Rull and Gomez Garreta, 1989; Ballesteros, 1992, 1998; Thibaut et al., 2005).

Many phycologists have taken an interest in the taxonomy of the genus *Cystoseira* (Agardh, 1820, 1896; Montagne, 1846; Bory de Saint-Vincent, 1846; Sauvageau, 1912; Ollivier, 1929; Hamel, 1931; Feldmann, 1937; Giaccone and Bruni, 1973; Gomez Garreta et al., 2001; Cormaci et al., 2012; Taskin et al., 2012; Ballesteros et al., 2013). With 46 recognized species, *Cystoseira* sensu lato is the second most diverse genus among fucalean macrophytes, after *Sargassum*, which includes 360 species (Guiry and

Guiry, 2018), that 36 of them are present in the Mediterranean Sea with 30 endemics (García-Fernández and Bárbara, 2016). Agardh (1820) described the genus *Cystoseira* as branched arborescent algae, characterized by having a basal disk that fixes them on the substrate. Species of this genus have a height of 1 m, presenting a single primary axis or several axes in caespitose species attached to the substrate. The apex of the smooth or spiny axis protruding or sunken between the base of the young primary branches. Axis smooth or with protuberances and scars left by old fallen branches, or with tofulas. Abundant ramification, radial or distichous. Primary branches repeatedly branched. Spiny branches are present or absent. Some species are provided with ovoid or elliptic-elongated aeriferous vesicles, isolated or in series, formed by expansion of the branches. Their presence/absence is variable also within the same species. On the branches of a superior order, the piliferous crypts are frequent. Receptacles are terminal at the end of the first-order branches (Cormaci et al., 2012).

Studies on the genus *Cystoseria* from Algeria are rare. The delimitation and distribution of several species are still not well-known. Up to now, 18 species

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have been reported from the Algerian coast. Here, we report 19th species i.e. *Cystoseira humilis* var. *myriophylloides* (Sauvageau) J.H. Price & D.M. John from Algeria. This species was recorded in several zones in the Mediterranean Sea, including Tunisia (Ben Maiz et al., 1987), Italy (Furnari et al., 2010), Britain (Guiry, 2012), France (Anon, 2017), Portugal (Bárbara et al., 2006), Cyprus (Taskin et al., 2013), and Spain (Gallardo et al., 2016). This study is aimed (i) to provide an updated list of the genus *Cystoseira* in Algerian Coast with their distribution and (ii) to report *Cystoseria humilis* var. *myriophylloides* for the first time from Algeria.

Materials and Methods

Sampling and observations were undertaken *in situ* by walking, snorkeling, and boat in the upper subtidal zone (0-5 m depth) at different localities on the Algerian coast. The study area is located in northern Algeria (South-Western Mediterranean), including the central region of the Algerian coast (it extends from Cap Djenet in the east (Boumerdes) to the Cap Tenes in the west (Chlef)), the eastern region (El Kala), and the western region (Oran). Sampling took place in the spring (2016, 2017, 2018, and 2019).

Fresh samples were transported to the laboratory in plastic bags with seawater. *Cystoseira* species were immediately cleaned, and preserved in 4% buffered formalin/seawater. All *Cystoseira* species reported in the literature from Algeria have been searched and revised, including localisations and indicating the author's citations. The nomenclature and taxonomy follow Guiry and Guiry (2020) and WoRMS Editorial Board (2020).

Results and Discussions

The genus *Cystoseira* is presented in Algeria by 19 taxa (species and intraspecific) arranged alphabetically below. *Cystoseira humilis* var. *myriophylloides* (Sauvageau) is a new record.

1. *Cystoseira algeriensis* Feldmann

Feldmann (1944, 1947): Cherchel; Cap Carbon; Perret-boudouresque and Seridi (1989); Seridi (1990); Ould-Ahmed (2013): Ain El Benian.

2. *Cystoseira amentacea* (C.Agardh) Bory de Saint-Vincent, 1832

Perret-boudouresque and Seridi (1989) and Seridi (1990) in *excludenda*: Oran, Cherchel, Tenes, Tipaza, Cap Caxine, Bologhine, Alger; Seridi (2007): Cherchel, Tamentfoust; Taounza (2011): Sidi Fredj.

3. *Cystoseira amentacea* var. *stricta* Montagne

Perret-boudouresque and Seridi (1989); Seridi (1990); Kadari-Méziane, (1994): Bou-Ismaïl; Ould-Ahmed (1994): Mers el Hadjadj; Benali (2010): Tipaza; Hashem khalil (2010): Ain Defla, Bousfer; Taounza (2011): Sidi Fredj as *Cystoseira stricta* (Montagne) Sauvageau; Seridi et al. (2007); Cherchel, Tamentfoust; Belmokhtar (2012): Ain defla, Sidi Mejdoub; Ould-Ahmed (2013): Iles Habibas, Arzew, Cherchel, Chenoua, Ain Tagourait, Ain Benian, Boumerdes, Gouraya, Taza); Chabane (2018): Ilot Agueli, Surcouf, Sidi Fredj, Bahbah (2017, 2018): Bordj El Bahri, Algiers, Ain Benian, Tipaza, Tenes, Beni haoua, El Kala, Oran.

4. *Cystoseira barbata* (Stackhouse) C.Agardh

Perret-Boudouresque and Seridi (1989) as *excludenda* taxa; Benali (2010): Anse de Kouali; Bahbah (2017-2018): Bordj El Bahri, Tipaza, Cherchel, Tenes, Beni Haoua, Kala.

5. *Cystoseira brachycarpa* J.Agardh

Perret-Boudouresque and Seridi, (1989) and Seridi (1990) as *Cystoseira caespitosa*: El Marsa; Ould Ahmed (2013) as *Cystoseira caespitosa*. bahbah (2017.2018) Algiers.

6. *Cystoseira compressa* (Esper) Gerloff & Nizamuddin

Perret-Boudouresque and Seridi, (1989) and Seridi (1990): El Marsa, Surcouf, Boudouaou, Tipaza; Kadari Meziane (1994): Bou Ismaïl; Ould-Ahmed (1994): Mers El Hadjadj; Seridi et al (2007): Cherchel, Alger plage, Bordj El Kiffan; Hashem Khalil (2010): Oran; Benali (2010): Tipaza; Taounza (2011): Sidi Fredj; Belmokhtar (2012): Oran; Chabane (2018): Surcouf, Lidou, Bab El Oued, Ain El Benian; Bahbah (2017,2018): Algiers, Ain Benian, Tipaza, Tenes, Cherchel, , Beni haoua, El Kala, Oran.

7. *Cystoseira crinita* Duby

Perret-Boudouresque and Seridi, (1989) and Seridi

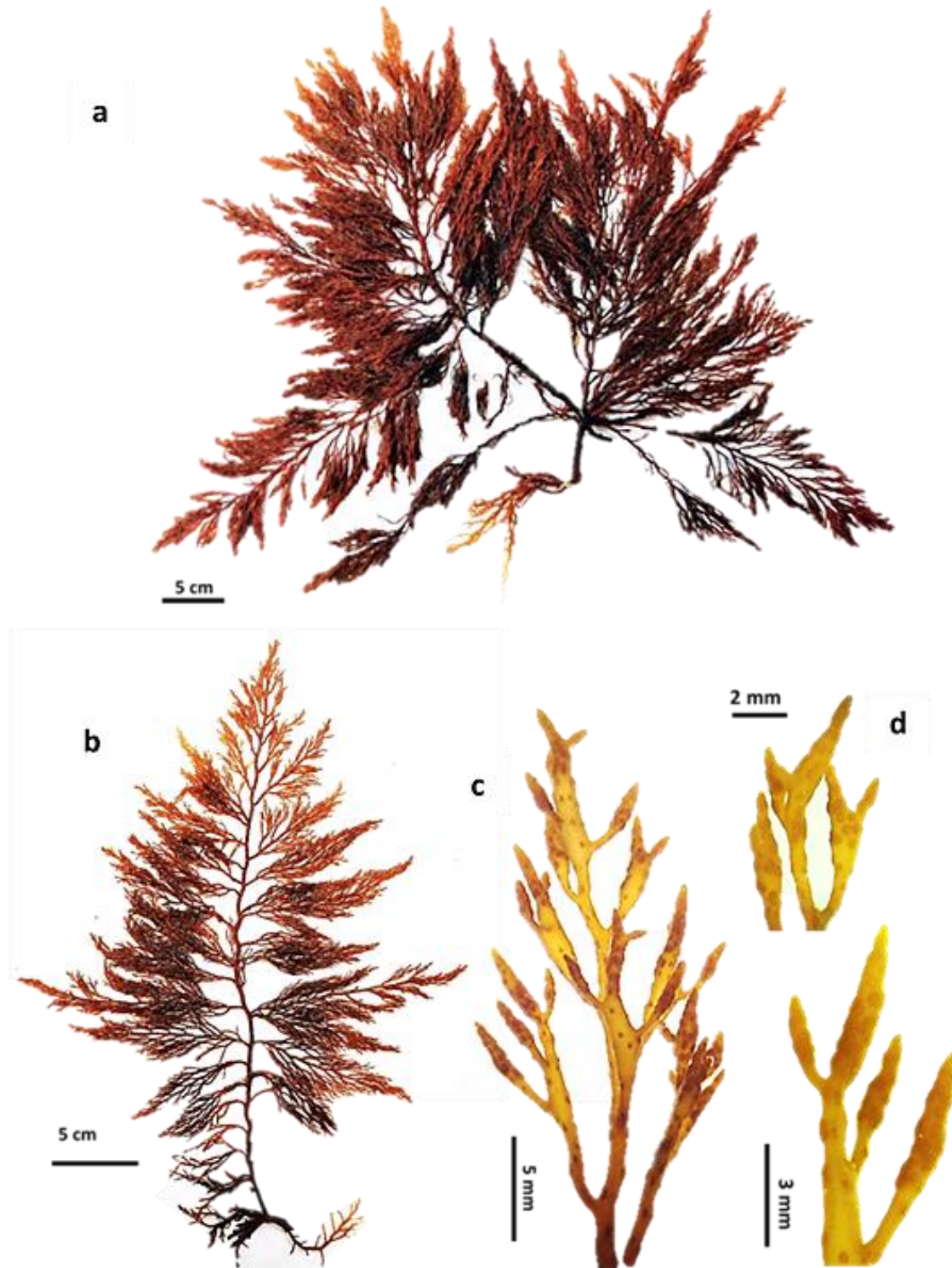


Figure 1. *Cystoseira humilis* var. *myriophylloides*. a-b: thallus, c: Part of a branch with aerocysts, d-e: Receptacles carried in the terminal part on the aerocysts.

(1990): Oran, Cherchel, Tipaza, Sidi Fredj, Alger, Skikda, El Kala; Ould Ahmed (1994): Mers El Hadjadj; Taounza (2011): Sidi Fredj; Ould Ahmed

(2013): Iles Habibas, Arzew, Cherchel, Sidi Fredj, Taza); Chabane (2018): Agueli Islet, Surcouf, Sidi Fredj; Bahbah (2017,2018): Algiers, Tipaza,

Cherchel, Tenes, Beni haoua, El Kala.

8. *Cystoseira foeniculacea* (Linnaeus) Greville

Perret-Boudouresque and Seridi, (1989) and Seridi (1990) as *Cystoseira ercegovicii* Giaccone (= *Cystoseira discors* Linnaeus): Cherchel, Sidi Fredj, Skikda; Ould-Ahmed (1994) as *Cystoseira ercegovicii* Giaccone: Mers El Hadjadj. Bahbah (2017,2018) Kala.

9. *Cystoseira humilis* Schousboe ex Kützing, 1860

Ould-Ahmed (2013): Gouraya. Bahbah (2019): Oran.

10. *Cystoseira humilis* var. *myriophylloides* (Sauvageau) J.H.Price & D.M.John, 1978

(= *Cystoseira myriophylloides* Sauvageau, 1912) This species is found for the first time in the Ouest of Algeria: Arzew (Oran; 35°52'56.82"N 0°18'17.47"O) in spring 2018 in 1 m of depth; it reaches 40 cm; It is caespitous; with smooth apex and pyramid-shaped thallus (Fig. 1a, b); both cylindrical and slightly compressed; the aerocysts are present and abundant (Fig. 1c) with the presence of delicate, compact and lanceolate receptacles carried in terminal part on aerocysts (Fig. 1d, e).

11. *Cystoseira mediterranea* Sauvageau, 1912

Seridi (1990): Sidi Fredj, Bordj El Kiffan, Bouharoun; Bahbah (2017, 2018): Algiers, Tipaza, Tenes.

12. *Cystoseira micheleae* Verlaque, Blanfuné, Boudouresque, Thibaut & Sellam, 2017

Montagne (1838): Algiers as *Cystoseira granulata* C. Agardh var. *turneri* Montagne in Perret-Boudouresque and Seridi (1989); Sellam (2017): Algiers, Bahbah (2017, 2018) : Algiers.

13. *Cystoseira montagnei* J. Agardh, 1842

Perret-Boudouresque and Seridi (1989) as *Cystoseira montagnei* J.Agardh: Cherchel, Bologhine, Alger, Bordj El Bahri; and as *Cystoseira spinosa* Sauvageau: Cherchel, Cap Caxine, Alger, Bordj El Bahri; Ould Ahmed (2013): Taza, as *inquirenda*, Taza and Gouraya as *Cystoseira spinosa* sauvageau; Sellam et al (2017): Algiers.

14. *Cystoseira platyclada* Sauvageau, 1912

Perret-Boudouresque and Seridi (1989): Algiers; Ould-Ahmed (2013): placed as *inquirenda*.

15. *Cystoseira sauvageauana* Hamel, 1939

Perret-Boudouresque and Seridi (1989): Cap Tizirine,

Cherchel, El Marsa, Sidi Fredj, Tamentfoust; as *Cystoseira sauvageauana* var *polyoedematis* (Sauvageau) Hamel, 1939 and as *Cystoseira sauvageauana* var *sauvageauana*; Ould-Ahmed (2013): Cherchel, Kouali.

16. *Cystoseira sedoides* (Desfontaines) C.Agardh, 1820

Perret-Boudouresque and Seridi (1989) and Seridi (1990): Surcouf; Ould-Ahmed (2013): Cherchel, Chenoua, Kouali, Gouraya; Bahbah (2017.2018): Anse de Kouali, Tenes, Cherchel, Jijel, El Kala, Oran.

17. *Cystoseira tamariscifolia* (Hudson) Papenfuss, 1950

Perret-Boudouresque and Seridi (1989): Oran, Tamenfoust, Bologhine, Annaba as *Cystoseira ericoides* (Linnaeus) C.Agardh; Ould-Ahmed (2013): Iles Habibas, Arzew, Cherchel, Ain Tagourait, Kouali, Sidi fredj, Ain Benian, Boumerdes, Gouraya, Taza; Bahbah (2017, 2018): Cherchel, Tipaza, Boumerdes, Beni Haoua, Tenes.

18. *Cystoseira usneoides* (Linnaeus) M.Roberts, 1968

Perret-Boudouresque and Seridi (1989): Cherchel, Rais Hamidou, Algiers, Bordj El Bahri; Ould-Ahmed (2013): Gouraya.

19. *Cystoseira zosteroides* (Turner) C.Agardh, 1821

Perret-Boudouresque and Seridi (1989): Cherchel, Bou-Ismaïl, Bologhine, Cap Caxine, Bordj El Bahri,

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