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Lectotypification of several species of *Cystoseira* (Cystoseiraceae, Fucales) described by Sauvageau

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Abstract — Lectotypes of *Cystoseira balearica* Sauvageau, *Cystoseira mauritanica* Sauvageau, *Cystoseira mediterranea* Sauvageau and *Cystoseira spinosa* Sauvageau were designated from the original collections of Sauvageau held in the Cryptogamic Herbarium of the Muséum national d'histoire naturelle of Paris (PC).

***Cystoseira* / marine brown algae / nomenclature / Sauvageau / typification**

Résumé — Désignation du lectotype de plusieurs espèces de *Cystoseira* (Cystoseiraceae, Fucales) décrites par Sauvageau. Les lectotypes de *Cystoseira balearica* Sauvageau, *Cystoseira mauritanica* Sauvageau, *Cystoseira mediterranea* Sauvageau et *Cystoseira spinosa* Sauvageau ont été designés à partir des collections originales de Sauvageau conservées dans l'Herbier cryptogamique du Muséum national d'histoire naturelle de Paris (PC).

algues brunes marines / *Cystoseira* / nomenclature / Sauvageau / typification

INTRODUCTION

The genus *Cystoseira* includes about fifty species, the majority occurring in the Mediterranean Sea and the Atlantic Ocean, with only a few in the Pacific and Indian Oceans. According to Ribera *et al.* (1992), the genus is represented in the Mediterranean Sea by 29 species, 9 varieties and 9 forms. The likelihood that *Cystoseira* is still in the process of speciation, its phenotypic variability, and also the possible occurrence of hybridization between closely related species, make the taxonomy of this genus quite difficult (Gómez Garreta *et al.*, 2001).

There have been two major studies concerning *Cystoseira* taxonomy, both based on morphology: the monograph of Sauvageau (1912), which focuses mainly on the species of the European Atlantic coasts (France and Spain) and the western Mediterranean shores (France, Spain and Algeria); and that of Ercegović (1952) on the species of the Adriatic Sea. Later, other authors have studied the taxonomy of this genus using, in addition to morphology, developmental, ecologi-

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cal and chemical characters (Giaccone & Bruni, 1973; Roberts, 1978; Amico *et al.*, 1985; Cormaci *et al.*, 1992; Gómez Garreta *et al.*, 2001). Concerning molecular biology, only a few species of *Cystoseira* have been treated in general studies about Fucales (Rousseau & Reviers, 1999).

Sauvageau described several species and varieties of *Cystoseira* (Sauvageau, 1912; Sauvageau *in* Hariot, 1911; Sauvageau, 1920) from a great amount of material collected between 1905 and 1920. All this material is conserved in Sauvageau's Herbarium, Thuret's Herbarium, the Herbarium of France and in the General Herbarium, at the Laboratoire de Cryptogamie of the Muséum national d'histoire naturelle of Paris (PC). Sauvageau designated no holotypes for the new taxa. Of them, only *Cystoseira elegans* was lectotypified by Furnari *et al.* (1999). In order to designate the lectotypes of *Cystoseira balearica* Sauvageau [= *C. brachycarpa* J. Agardh var. *balearica* (Sauvageau) Giaccone], *Cystoseira mauritanica* Sauvageau, *Cystoseira mediterranea* Sauvageau and *Cystoseira spinosa* Sauvageau we studied the Sauvageau material held in PC.

RESULTS

***Cystoseira balearica* Sauvageau [= *C. brachycarpa* J. Agardh var. *balearica* (Sauvageau) Giaccone**[1] ***in* Ribera *et al.*, 1992: 124]**

This species was described by Sauvageau (1912: 390-392, 528) as follows: creeping plants with numerous axes; apex of the axes not very protruding and smooth; primary branches with small spine-like appendages, which can give rise to secondary branches; receptacles at the apex of branchlets surrounded or not by spinose appendages. This species was collected by Sauvageau in Las Isletas (Majorca, Balearic Islands) on 24 Apr. 1912 near the surface in sheltered places. The species is distributed in the western and central Mediterranean and in the Atlantic coast of Cádiz (near the Straits of Gibraltar) (Gómez Garreta *et al.,* 2001).

Sauvageau's Herbarium (held in PC) contains ten specimens labelled as "*Cystoseira balearica* Sauv., Las Isletas (Majorque) 24 avril 1912" and numbered from SA5091 to SA5100. In the General Herbarium of PC, one specimen of *C. balearica* Sauvageau is kept in the case 156 and is labelled as "*Cystoseira balearica* Sauv., Las Isletas (Majorque) 24 avril 1912".

All of the specimens in Sauvageau's Herbarium and in the General Herbarium that are cited in the protologue belong to *C. balearica* (= *C. brachycarpa* var. *balearica*) and, since no holotype was indicated by Sauvageau (1912), they are syntypes according to the Art 9.4 of the ICBN (Greuter *et al.*, 2000). The specimen in Sauvageau's Herbarium SA5094 (Fig. 1), collected at Las Isletas (Majorca) on 24 Apr. 1912, is here designated as the lectotype, since it is a representative fertile specimen agreeing with all the information of the protologue. The remaining nine specimens (SA5091-SA5093, SA5095-SA5100) in Sauvageau's Herbarium and the specimen in the General Herbarium become isolectotypes.

1. According to Pizzuto (1998: 145) this variety is not distinct from the autonym *C. brachycarpa* var. *brachycarpa.*

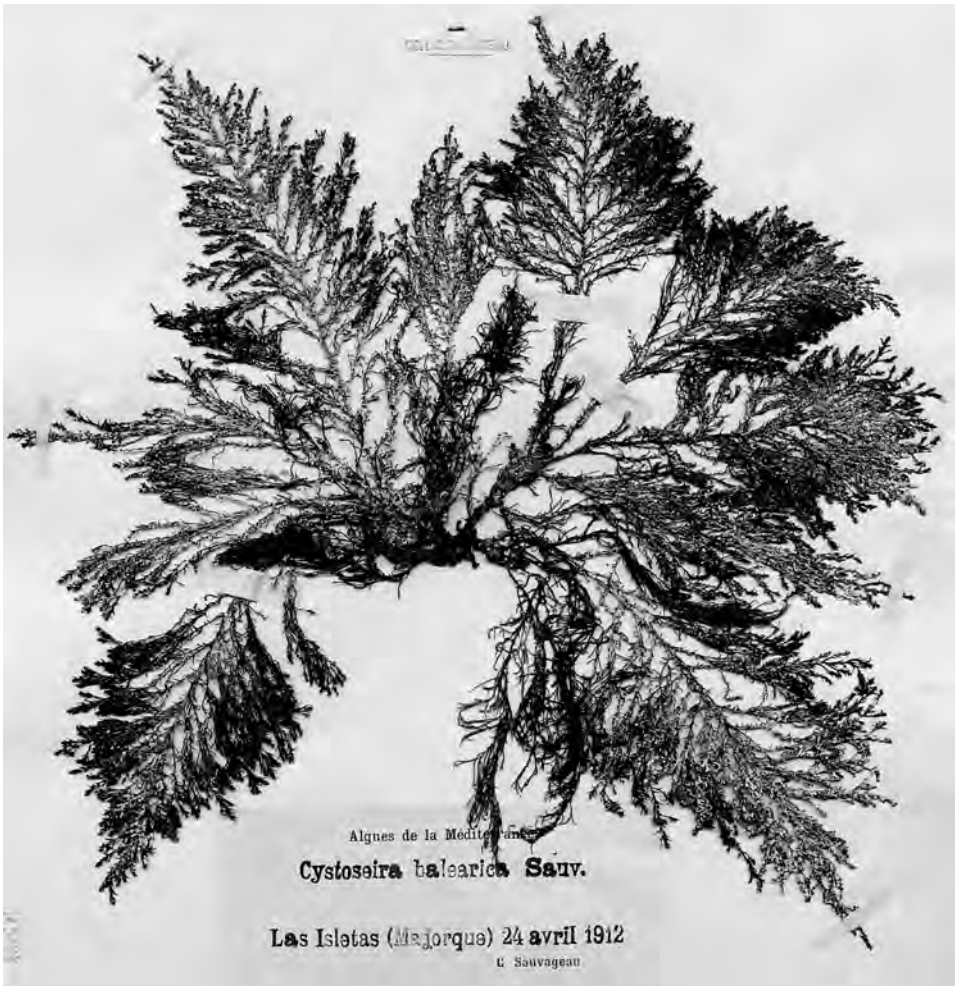

Fig. 1. Lectotype specimen of *Cystoseira balearica* Sauvageau

***Cystoseira mauritanica* Sauvageau *in* Hariot, 1911: 440-441**

Sauvageau *in* Hariot (1911: 440-441) described the new species *Cystoseira mauritanica* for two specimens collected by Chudeau in Mauritania (at Port Étienne and Baie du Cansado respectively), with the following main characters: plants rounded in appearance, to 15-20 cm high, with one or two axes attached to the substratum by a disc; tophules present at the bases of some primary branches; primary branches cylindrical except at the base with few spinose appendages; secondary branches similar to the primary; aerocysts present; receptacles at the apical zones of the branches, to 8 cm long; male and female conceptacles in distinct thalli (dioecious). The species is distributed in the Atlantic from Cádiz to Mauritania and in the Mediterranean in the zone close to the Straits of Gibraltar (Gómez Garreta *et al.,* 2001).

Fig. 2. Lectotype specimen of *Cystoseira mauritanica* Sauvageau

In the General Herbarium of PC are two unnumbered sheets labelled with Sauvageau's handwriting. Mounted on one is a male specimen labelled "*Cystoseira mauritanica* nov. sp. / échantillon mâle / C. Sauv. / Baie de Cansado (Mauritanie) / 3-4-1908 / Chudeau"; the other sheet has a female specimen and several fragments of branches labelled "*Cystoseira mauritanica* nov. sp. / échantillon femelle / C. Sauv. / Port Étienne (Mauritanie) / 23-3-1908 / Chudeau".

Only two specimens are cited in the protologue: "Port Étienne, 23 mars 1908; Baie de Cansado, 3 août 1908 (Chudeau)". Since the former is reported to be female and the latter male, they must correspond to the specimens held in the General Herbarium. Therefore, the date of collection of the male specimens, 3-8-1908, quoted in the protologue, should be considered as a typographical error for 3-4-1908.

Since no holotype was indicated by Sauvageau *in* Hariot (1911), the two specimens in the General Herbarium are syntypes according the Art 9.4 of the

ICBN. The complete fertile specimen (female) of Port Étienne on 23 Mar. 1908 (Fig. 2) is here designated as the lectotype.

***Cystoseira mediterranea* Sauvageau, 1912: 341-357**

This species was described by Sauvageau (1912: 341-357, 515) as follows: non-caespitose plants; axes attached to the substratum by a disc or by independent or partially fused haptera, apex of the axes spinose and not very prominent; primary branches more or less pyramidal in shape; branches with spine-like appendages, receptacles more compact and visible than in *Cystoseira ericoides* (Linnaeus) C. Agardh [C*ystoseira tamariscifolia* (Hudson) Papenfuss]. Sauvageau gave also the following distribution of the species in the Mediterranean Sea: Lion Gulf, Genoa Gulf, Balearic Islands and Naples Gulf always near the surface in moderately exposed places. In the protologue, Sauvageau referred to specimens collected in different months and years from Banyuls-sur-Mer (France), Port Vendres (France), Port Lligat (Spain), Roses (Spain) and from Porto Pi (Majorca). According to Ribera *et al.* (1992), the species is distributed in the western Mediterranean, Sicily, Tunisia and Greece.

Sauvageau's Herbarium contains ninety-nine specimens labelled as "*Cystoseira mediterranea* Sauv." Specimens, grouped according to place and date of collection, are as follows: Banyuls-sur-Mer, 12-30 Dec. 1905 (SA4511), 20 Feb.-2 Mar. 1906 (SA4433, SA4435, SA4436, SA4438), 21-22 June 1906 (SA4466-SA4471, SA4480), 2 Sept. 1907 (SA4486, SA 4490), 7 Sept. 1907 (SA4481-SA4485, SA4487-SA4489), 31 Dec. 1907 (SA4512-SA4522), 24 Sept. 1909 (SA4491-SA4495), 16 Oct. 1909 (SA4498, SA4501-SA4503), 28 Mar. 1910 (SA4430, SA4439, SA4440), 20 June 1910 (SA4472-SA4475), 11 Mar. 1911 (SA4431, SA4432, SA4434), 27 Apr. 1911 (SA4448, SA4461); Banyuls-sur-Mer, droite de la Jetée, 22 Apr. 1907 (SA4458, SA4459); Banyuls-sur-Mer, gauche de la Jetée, 20 Oct. 1907 (SA4504-SA4506); Banyuls-sur-Mer, Baie du Troque, 26 Apr. 1907 (SA4449-SA4451), 19 Oct. 1907 (SA4496, SA4497, SA4499, SA4500); Banyuls-sur-Mer, Cap Doune, 23 Apr. 1907 (SA4452-SA4457, SA4460), 29 Oct. 1907 (SA4507-SA4510); Banyuls-sur-Mer, Musoir, 8 May 1910 (SA4462, SA4465); Port Vendres, 18 June 1906 (SA4476-SA4479), 10 Jan. 1907 (SA4437); Port Vendres, Lazaret, 11 May 1907 (SA4463, SA4464); Cette [current spelling: Sète], devant brise-lames, 6 May 1910 (SA4523-SA4526), 13 July 1910 (SA4527, SA4528); Porto Pi (Majorque), 18 Apr. 1912 (SA4529-SA4535).

Thuret's Herbarium contains twenty-nine specimens identified by Sauvageau as *Cystoseira mediterranea* Sauvageau. On the label of some of them is written *"C. amentacea* Bory corrigé*"*, and on others *"C. amentacea auct. pro parte non* Bory*"*. These specimens, grouped according to place and data of collection, are as follows: Banyuls-sur-Mer, 21 June 1906 (TA7630), 2 Sept. 1907 (TA7628, TA7653), 7 Sept. 1907 (TA7639, TA7641), 31 Dec. 1907 (TA7642), Jan. 1908 (TA7645), 24 Sept. 1909 (TA7643), 16 Oct. 1909 (TA7637), 11 Mar. 1911 (TA7638), 27 Apr. 1911 (TA7636); Banyuls-sur-Mer, le phare, June 1906 (TA7629), 30 Oct. 1907 (TA7654); Banyuls-sur-Mer, Cap Doune, 23 Apr. 1907 (TA7632, TA7633); Banyuls-sur-Mer, droite de la Jetée, 22 Apr. 1907 (TA7635), Banyuls-sur-Mer, Baie du Troque, 26 Apr. 1907 (TA7634); Banyuls-sur-Mer, Musoir, 8 May 1910 (TA7640, TA7644); Port Vendres, 18 June 1906 (TA7631), 10 Jan. 1907 (TA7646), Cette [Sète], brise-lames, 6 May 1910 (TA7651), 13 July 1910 (TA7650).

The General Herbarium contains six unnumbered specimens kept in the case 120: Banyuls-sur-Mer, 20 Feb.-2 Mar. 1906 (one specimen), 7 Sept. 1907 (two

Fig. 3. Lectotype specimen of *Cystoseira mediterranea* Sauvageau

specimens); Banyuls-sur-Mer, Baie du Troque, 26 Apr. 1907 (two specimens); Banyuls-sur-Mer, Cap Dosne, 29 Oct. 1907 (one specimen).

The France Herbarium contains two unnumbered specimens kept in the case 157: Porto Pi (Majorque), 18 Apr. 1912.

All the above specimens, identified by Sauvageau and examined by us, belong to this species. They predate the protologue and constitute original material (Art. 9.2, Note 2 of the ICBN). Since no holotype was indicated by Sauvageau (1912), they are considered eligible for selection as lectotype. The specimen from Sauvageau's Herbarium SA4480 (Fig. 3), collected at Banyuls-sur-Mer on 21-22 June 1906, is here designated as the lectotype, since it is a representative fertile specimen agreeing with the protologue. The six specimens SA4466-SA4471 from Sauvageau's Herbarium and the specimen TA7630 from the Thuret's Herbarium become isolectotypes.

***Cystoseira spinosa* Sauvageau, 1912: 201-220**

This species was described by Sauvageau (1912: 201-220, 519) as follows: non-caespitose plants; axes attached to the substratum by a disc; apex of the axes spinose and not prominent; tophules spherical or oblong, spinose; primary branches cylindrical at the base and slightly flattened in the apical parts; branches of all orders with triangular and corniculate spinose appendages; conceptacles at the base of the spinose appendages, initially scattered but become grouped in receptacles at the apices of the branches.

Sauvageau gave the distribution of this species as Mediterranean Sea: Lion Gulf, Genoa Gulf, Sardinia, Balearic Islands, Naples Gulf, Algeria, Greece and Syria. In the protologue, Sauvageau referred to specimens collected in different months and different years from Banyuls-sur-Mer (France), Cap Matifou (Algeria) and from Corp Mari (Majorca). The species is widely distributed in the Mediterranean Sea (Ribera *et al.*, 1992).

Sauvageau (1912) noted some differences in deeper plants with respect to the shallower plants, but he did not describe any new taxon for them. At present the deeper specimens are considered as a variety of this species: *C. spinosa* var. *compressa* (Ercegović) Cormaci, Furnari, Giaccone, Scammacca & Serio. For this reason, we have not considered Sauvageau's deeper specimens in the typification of this species.

Sauvageau's Herbarium contains seventy-one specimens. Specimens, grouped according to place and data of collection, are as follows: Banyuls-sur-Mer, 20 Feb.-2 Mar. 1906 (SA4742-SA4745, SA4747-SA4752, SA4754), 28 Mar. 1906 (SA4753), 18 June 1906 (SA4770, SA4771), 22 June 1906 (SA4775-SA4779), 10-20 Jan. 1907 (SA4733-SA4741), 21 Oct. 1907 (SA4796-SA4805), 1 Apr. 1908 (SA4784, SA4785), 6-18 June 1908 (SA4772-SA4774), 20 June 1910 (SA4769); Banyuls-sur-Mer, Île Grosse, 16 Feb. 1908 (SA4755-SA4761), 6 May 1907 (SA4764, SA4765, SA4767, SA4768); Banyuls-sur-Mer, Le Troque, 4 May 1907 (SA4782, SA4783); Port Lligat (Espagne), 15 May 1907 (SA4762, SA4763, SA4766); La Pérouse, Cap Matifou (Algérie), 16 Mar. 1910 (SA4806-SA4810), 26 Apr. 1910 (SA4811, SA4812); Corp Mari (Majorque), 21 Apr. 1912 (SA4813- SA4816).

Thuret's Herbarium contains eleven specimens. These, grouped according to place and data of collection, are as follows: Banyuls-sur-Mer, 18 June 1906 (TA7991), 18-20 Jan. 1907 (TA7992-TA7994), 17 Feb. 1908 (TA7996), 20 June 1910 (TA7988); Banyuls-sur-Mer, Île Grosse, 6 May 1907 (TA7985); Banyuls-sur-Mer, Le Troque, 4 May 1907 (TA7984); Port Lligat (Espagne), 3 Jan. 1907 (TA7995), 15 May 1907 (TA7986); La Pérouse, Cap Matifou (Algérie), 16 Mar. 1910 (TA7987).

Fig. 4. Lectotype specimen of *Cystoseira spinosa* Sauvageau

All the above specimens, identified by Sauvageau and examined by us, belong to this species. They predate the protologue and constitute original material (Art. 9.2, Note 2 of the ICBN). Since no holotype was indicated by Sauvageau (1912), they must be considered syntypes and they are eligible for selection as lectotype. The specimen from Sauvageau's Herbarium SA4767 (Fig. 4), collected at Banyuls-sur-Mer, Île Grosse, on 6 May 1907, is here designated as the lectotype since it is a representative fertile specimen agreeing with the protologue. Therefore, the three specimens SA4764, SA4765, SA4768 from Sauvageau's Herbarium and the specimen TA7985 from the Thuret's Herbarium become isolectotypes.

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