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Ericaria giaccone sp. nov.
(Sargassaceae, Fucophyceae), the species
to which the invalidly published
Cystoseira hyblaea Giaccone should be referred

Donatella SERIO & Giovanni FURNARI



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***Ericaria giaccone* sp. nov. (Sargassaceae, Fucophyceae), the species to which the invalidly published *Cystoseira hyblaea* Giaccone should be referred**

**Donatella SERIO
Giovanni FURNARI**

Department of Biological, Geological and Environmental Sciences, Section Vegetal Biology,
University of Catania, via Empedocle 58, 95128 Catania (Italy)
d.serio@unict.it (corresponding author)

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ABSTRACT

In this paper, a new species of the *Cystoseira* complex from Porto Palo di Capo Passero (Sicily, Italy) is described. The species, which shows the same characters as *Cystoseira hyblaea* Giaccone as described by Giaccone (1986) and Bouaffif *et al.* (2016), from its morpho-anatomical characters, is assigned to the genus *Ericaria* Stackhouse. Because of “*Cystoseira hyblaea*” was not validly published name, *Ericaria giaccone* sp. nov. is here described. The main characteristics of the species are: 1) a caespitose habit; 2) large axes rugged with apices smooth, not prominent; 3) vegetative branches without spinose appendages; 4) primary branches with a cupressoid outline, especially when they are fertile; and 5) receptacles terminal, compact, cylindrical-oval, verrucose, with deciduous spinose appendages. *Ericaria giaccone* sp. nov. is related to both *E. crinita* (Duby) Molinari & Guiry and *E. barbatula* (Kützinger) Molinari & Guiry, but it differs from them mainly in the basal system consisting of a robust and compact basal disc and in apex of cauloids smooth and not prominent, never surrounded by spiniform appendages. A critical re-examination of herbarium specimens from Isola delle Correnti (eastern Sicily, Italy) attributed to *E. crinita* (as *C. crinita*) demonstrated that they actually belong to our new species.

KEY WORDS
Sargassaceae,
Cystoseira complex,
Sicily,
Mediterranean Sea.

RÉSUMÉ

Ericaria giaccone sp. nov. (Sargassaceae, Fucophyceae), l'espèce à laquelle il faut renvoyer la *Cystoseira hyblaea* Giaccone, publiée de manière invalide.

Dans cet article, une nouvelle espèce du complexe *Cystoseira* de Porto Palo di Capo Passero (Sicile, Italie) est décrite. L'espèce, qui montre les mêmes caractéristiques que *Cystoseira hyblaea* Giaccone comme décrit par Giaccone (1986) et Bouaffif *et al.* (2016), est attribuée au genre *Ericaria* Stackhouse sur la base de ses caractéristiques morpho-anatomiques. «*Cystoseira hyblaea*» étant un nom publié de façon invalide, nous décrivons ici *Ericaria giaccone* sp. nov. Les principales caractéristiques de l'espèce sont: 1) un port cespitieux; 2) des axes robustes avec des apex lisses, non proéminents; 3) des branches végétatives sans appendices épineux; 4) des branches primaires à contour cupressoïde, surtout quand elles sont fertiles; et 5) des réceptacles terminaux, compacts, cylindriques-ovales, verruqueux, à appendices épineux caduques. *Ericaria giaccone* sp. nov. est apparenté à *E. crinita* (Duby) Molinari & Guiry et à *E. barbatula* (Kützinger) Molinari & Guiry, mais il est bien caractérisé par le système basal consistant en un disque basal robuste et compact et à l'apex des cauloides lisses et non proéminents, jamais entourés d'appendices spiniformes. Un réexamen critique des spécimens de l'herbier de l'Isola delle Correnti (Sicile orientale, Italie) attribués à *E. crinita* (comme *C. crinita*) a démontré qu'ils appartiennent en réalité à l'espèce ici décrite.

MOTS CLÉS
Sargassaceae,
complexe *Cystoseira*,
Sicile,
mer Méditerranée.

INTRODUCTION

The genus *Cystoseira* s.l. (the *Cystoseira* complex) is represented by 45 currently accepted species, mostly distributed in the Mediterranean Sea (Guiry & Guiry 2021) with many of them endemic to that Sea. They are considered the most important marine ecosystem-engineers in the Mediterranean Sea, where they form extensive marine forests on rocky substrata from the littoral fringe to the lower euphotic sublittoral zone (Giaccone & Bruni 1973; Ballesteros 1988, 1990a, b; Blanfuné *et al.* 2016a, b; Boudouresque *et al.* 2016). They play an important functional role in Mediterranean coastal ecosystems, sustaining complex food webs and maintaining a high biodiversity. The decline of Mediterranean fucoid macroalgae has been reported throughout the Mediterranean due to habitat destruction, eutrophication, increased turbidity levels (Munda 1974, 1982; Arévalo *et al.* 2007), climate change (Thibaut *et al.* 2005; Serio *et al.* 2006) and overgrazing by herbivores (Vergés *et al.* 2014). The above factors led to a shift to reduced structural complexity of communities characterized by turf-forming, filamentous or other ephemeral seaweeds where sea urchin density is a driver of habitat homogenization (Thibaut *et al.* 2005, 2015, 2016; Sala *et al.* 2012; Tsiamis *et al.* 2013; Templado 2014).

The taxonomy of *Cystoseira* s.l. and the diacritical characters proposed for the distinction at the specific level have been revised several times over the past century (Sauvageau 1912; Ercegović 1952; Roberts 1967; Giaccone & Bruni 1971; Amico *et al.* 1986). Recently, Draisma *et al.* (2010), Bruno de Sousa *et al.* (2019) and Orellana *et al.* (2019) showed that *Cystoseira* s.l., based on phylogenetic analyses, have resolved into three evolutionarily independent clades. On the basis of morpho-anatomical characters, Orellana *et al.* (2019) proposed restricting *Cystoseira* s.s. C. Agardh to *C. foeniculacea* (Linnaeus) Greville and related species, and those authors resurrected *Carpodesmia* Greville and *Treptacantha* Kützinger for the other two clades. More recently, Molinari Novoa & Guiry (2020) proposed re-instating *Ericaria* Stackhouse and *Gongolaria* Boehmer for *Carpodesmia* and *Treptacantha*, respectively, based on name priority. In the Mediterranean Sea, the above genera are represented by four accepted species belonging to *Cystoseira* s.s., eight to *Ericaria* and twelve to *Gongolaria* (Guiry & Guiry 2021), whereas many other species in this complex have not yet been conclusively assigned (based on genetics or morphological analyses) to any of these genera and are conservatively retained within *Cystoseira* s.l.

During a recent study of species of the “*Cystoseira* complex” from the Sicily coast, several thalli showing the same characters as “*C. hyblaea*” Giaccone described by Bouaffif *et al.* (2016) from Tunisia and partially as those reported in the protologue of that species (Giaccone 1986), were found on shallow infralittoral bottoms near “Isola delle Correnti” (Syracuse) on the south-eastern coast of Sicily (Italy). They were associated with biogenic crusts of the reef-building worm *Sabellaria alveolata* (Linnaeus, 1767) (Polychaeta: Sabellariidae) (Sanfilippo *et al.* 2020).

From the morpho-anatomical study of all studied specimens, it resulted that they should be referred to as the genus

Ericaria. Because “*C. hyblaea*” is an invalidly published binary designation (see Discussion), *Ericaria giacconei* sp. nov. is here described.

MATERIAL AND METHODS

Investigations were carried out on fertile thalli collected by snorkeling along a tract of south-eastern coast of Sicily near “Isola delle Correnti” (Portopalo di Capo Passero) (Fig. 1) at 0.50 m depth, in August and November 2019, January, July and October 2020. Morpho-anatomical observations, performed by Zeiss Axioplan (Göttingen, Germany), were also made on Giaccone’s both *exsiccata* and preserved in glycerine specimens (labelled *C. hyblaea*) held in CAT (Herbarium of the Department of Biological, Geological and Environmental Science – Plant Biology Section of the University of Catania) (Fig. 2). For microscopical observations, some *exsiccata* specimens were rehydrated. Sections were made by razor blade. Photographs were made by Nikon D2X digital camera (Nikon Corporation 2004–2006), and underwater photographs were made by GoPro Hero8 black (San Mateo, California, United States). Herbarium specimens are held in CAT. Herbarium abbreviations follow Thiers (2021).

SPECIMENS EXAMINED

CAT 2716, CAT 2717, CAT 2718, fertile specimens collected by Serio on 11.I.2020 at Contrada Guardiana (36°39’03”N, 15°04’37”E), Porto Palo di Capo Passero (Straits of Sicily, Italy), at 0.50 m depth.

CAT 2719, fertile specimen collected by Serio on 30.XI.2019 at Contrada Guardiana (36°39’03”N, 15°04’37”E), Porto Palo di Capo Passero (Sicily, Italy) (Straits of Sicily, Italy), at 0.50 m depth.

CAT 2720, fertile specimen collected by Serio on 2.VII.2020 at Contrada Guardiana (36°39’03”N, 15°04’37”E), Porto Palo di Capo Passero (Straits of Sicily, Italy), at 0.50 m depth.

Giaccone’s specimens of “*Cystoseira hyblaea*”

CAT 2322, CAT 3462 (ex Herbarium Giaccone labelled as *C. hyblaea*), collected by Amico in X.1981 at Punta d’Aliga (Ragusa) (Straits of Sicily).

CAT 2652 (ex Herbarium Giaccone labelled as *C. hyblaea*), collected by Giaccone in VIII.1984 at Punta d’Aliga (Ragusa) (Straits of Sicily).

CAT 2235 (ex Herbarium Giaccone labelled as *C. hyblaea*), collected by Giaccone in X.1985 at Punta d’Aliga (Ragusa) (Straits of Sicily).

CAT 74 (preserved in glycerine) (ex Herbarium Giaccone labelled as *C. hyblaea*), collected by Giaccone in IX.1988 at Punta d’Aliga (Ragusa) (Straits of Sicily).

Other specimens of “*Cystoseira hyblaea*”

CAT 283 (preserved in glycerine), collected by Pizzuto (as *Cystoseira crinita*) in II.1993 at Isola delle Correnti, Porto Palo di Capo Passero (Straits of Sicily), at 0.50 m depth.

CAT 284 (preserved in glycerine), collected by Pizzuto (as *C. crinita*) in IV.1993 at Isola delle Correnti, Porto Palo di Capo Passero (Straits of Sicily), at 0.30 m depth.

OTHER SPECIMENS EXAMINED

Ericaria crinita (Duby) Molinari & Guiry

SPECIMENS EXAMINED. — **Italy**, Alicudi Island (Tyrrhenian Sea), 1.VII.1991, collected by Catra, 0 m depth, preserved in glycerine, as *C. crinita*, CAT[CAT 14]. — Vulcano Island (Tyrrhenian Sea), 23.IV.1991, collected by Scammacca, 0 m depth, preserved in glycerine, as *C. crinita*, CAT[CAT 259]. — Salina Island (Tyrrhenian sea), 30.V.1990, collected by Catra, 2 m depth, preserved in glycerine as *C. crinita*, CAT[CAT 9].

E. barbatula (Kützinger) Molinari & Guiry

SPECIMENS EXAMINED. — **Italy**, Straits of Sicily, Pantelleria Island, 29.V.1999, collected by Catra, at the infralittoral fringe, (preserved in glycerine, as *C. barbatula*) in an infralittoral pool, CAT[CAT 244]. — Lampedusa Island, 4.V.1992, collected by Giaccone (as *C. barbatula*), CAT[CAT 3489].

RESULTS

Family SARGASSACEAE Kützinger Genus *Ericaria* Stackhouse

Ericaria giacconeii

Serio & G.Furnari, sp. nov.
(Figs 2-5)

Thalli caespitose, attached to the substrate by a robust and compact basal disc (3-5 cm in diameter) from which 4-20 cauloids, cylindrical, up to 30 cm high and 3-5 mm in diameter, arise; apex of cauloids smooth, not prominent, never surrounded by spiniform appendages, sometimes surrounded by short cylindrical non-spiny young primary branches; primary branches cylindrical, bearing branches of higher order cylindrical, and with subequal development that give the thallus a cupressoid habit; tophules and aerocysts absent; in cross section, medulla formed by small rounded cells, cortex made of roundish cells with thin walls and meristoderm formed by a layer of rectangular cells twice longer than wide; receptacles terminal, cylindrical-ovoid to clavate, 0.5-1 cm long and 1-2 mm wide, with grouped conceptacles; conceptacles bisexual, subspherical, located at the base of spinous deciduous appendages; oogonia occupying the floor of the conceptacle and antheridia on branched hairs.

HOLOTYPE. — **Italy**, Straits of Sicily, Porto Palo di Capo Passero, Contrada Guardiania, 36°39'03"N, 15°04'37"E, 0.50 m depth, 11.I.2020, fertile specimen, coll. Serio, (CAT[CAT 2716] (Figs 3, 4).

ISOTYPE. — Same data of the holotype; CAT[CAT2717, CAT2718]].

ETYMOLOGY. — The specific epithet honours Professor Giuseppe Giaccone, who first found this species, for his significant contributions to the study of the *Cystoseira* complex.

TYPE LOCALITY. — Porto Palo di Capo Passero (Sicily, Italy), 36°39'03"N, 15°04'37"E.

DISTRIBUTION. — Type locality; Punta D'Aliga (Sicily, Italy) (Giaccone 1986 as *C. hyblaea*); Isola delle Correnti (Sicily, Italy) (Pizzuto 1999 as *C. crinita*); Kelibia (Tunisia) (Bouafif *et al.* 2016 as *C. hyblaea*) (Fig. 1).

HABITAT. — Plants living on semi-exposed rocky shores at 0.2-1.0 m depth. Species vicariant of *E. amentacea* (Giaccone, 1986 as *C. amentacea*).

REMARKS

Other figures (as "*C. hyblaea*"): Giaccone (1986, figs 1, 2), Cormaci *et al.* (2012, pl. 111, figs 1-3), Bouafif *et al.* (2016, figs 21-24).

VEGETATIVE MORPHOLOGY

Plants are caespitose (Fig. 3A), attached to the substrate by a robust and compact basal disc (Fig. 3B), 3-5 cm in diameter from which 4-20 cauloids up to 30 cm high and 3-5 mm in diameter, arise. Apex of cauloids smooth, not prominent, never surrounded by spiniform appendages, sometimes surrounded by short cylindrical non-spiny young primary branches (Fig. 3C). Primary branches cylindrical, bearing branches of higher order cylindrical, and with subequal development that gives the thallus a cupressoid habit (Fig. 2). Tophules and aerocysts absent. In cross section, primary branches show a medulla formed by small rounded cells, a cortex made of roundish cells with thin walls that decrease in size towards the medullameristodermal direction (Fig. 4A). Meristoderm formed by a layer of rectangular cells twice longer than wide (Fig. 4A).

REPRODUCTIVE MORPHOLOGY

Receptacles terminal, cylindrical-ovoid to clavate, 0.5-1 cm long and 1-2 mm wide, with deciduous spinous appendages (Fig. 4B); conceptacles are bisexual, subspherical (Fig. 4C), located at the base of spinous deciduous appendages. Oogonia occupying the floor of the conceptacle and antheridia, on branched hairs (Fig. 4D), forming a ring above them. Our thalli show the maximum vegetative and reproductive development in winter.

HABITAT AND DISTRIBUTION

Ericaria giacconeii sp. nov. was collected in the upper sublittoral zone on semiexposed rocky shores at 0.2-1.0 m depth at Porto Palo di Capo Passero (Sicily). The species is vicariant of *E. amentacea* according to Giaccone (1986 as *C. amentacea*). The species was found in association with a bioconstruction of *Sabellaria alveolata* (Fig. 5A, B). The species is also distributed at Punta D'Aliga (Sicily, Italy) (Giaccone 1986, as *C. hyblaea*); Isola delle Correnti (Sicily, Italy) (Pizzuto 1999, as *C. crinita*), Kelibia (Tunisia) (Bouafif *et al.* 2016, as *C. hyblaea*).

DISCUSSION

Morpho-anatomical characters agree with those proposed by Orellana *et al.* (2019) for the genus *Ericaria* (as *Carpodesmia*) and firmly place our species in that genus. In fact, on cross section, our species shows a cortex made of

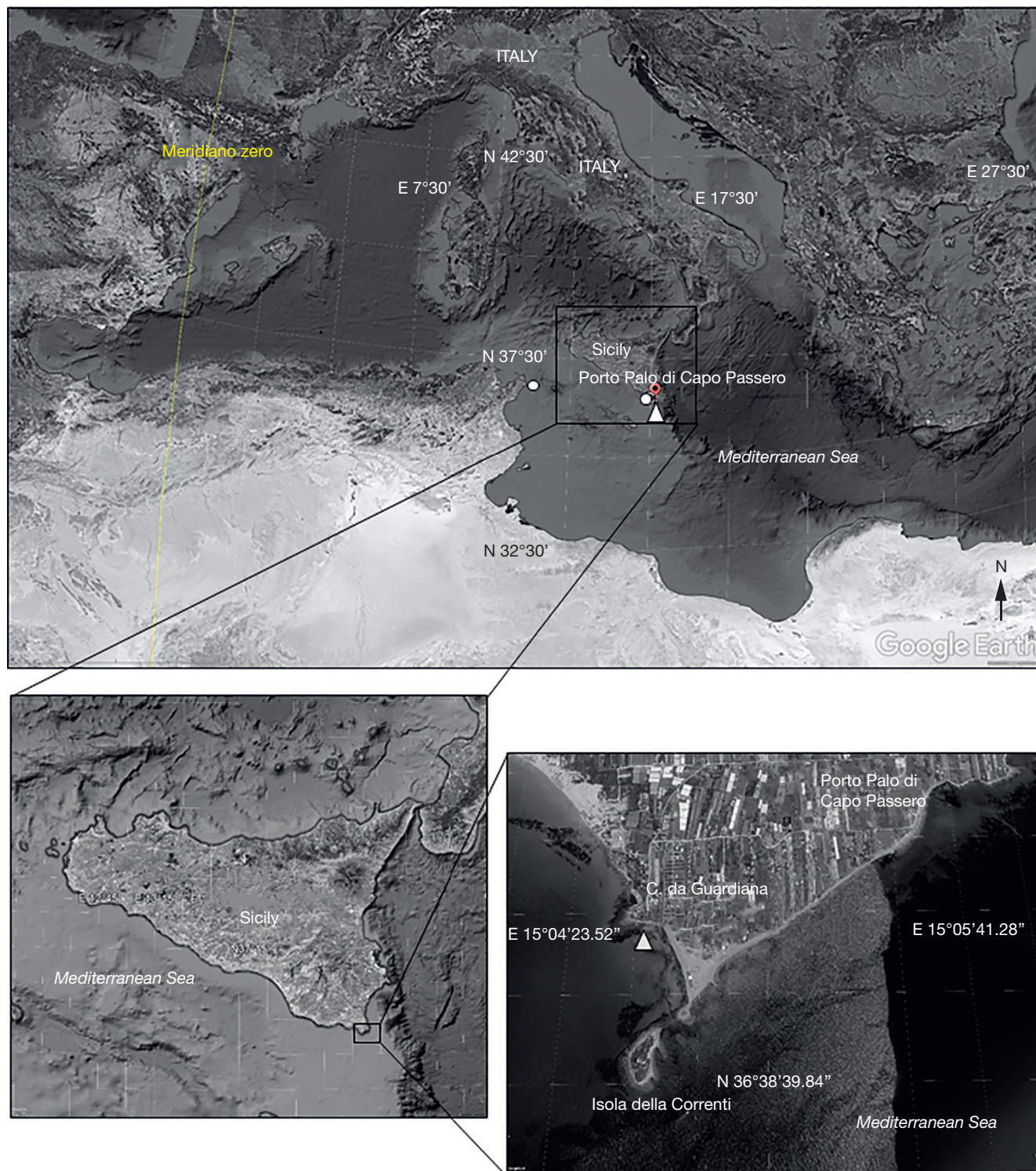


Fig. 1. — Distribution of *Ericaria giacconei* sp. nov. **white circles** indicate stations in which the species was previously recorded as *Cystoseira hyblaea* Giaccone. The **white triangle** shows the type locality.

roundish cells with thin walls that decrease in size towards the medulla-meristodermal direction and a well-developed meristoderm formed by a layer of rectangular cells twice longer than wide (Fig. 3A).

From both description and illustrations published by Bouaffif *et al.* (2016), specimens from Tunisia (as *C. hyblaea*) undoubtedly belong to our species. Giaccone's Herbarium specimens held in CAT, labelled *C. hyblaea*, show the same characters



FIG. 2. — *Ericaria giaccone* sp. nov.: Giaccone's specimen labelled as *Cystoseira hyblaea* Giaccone (CAT 74, preserved in glycerine) showing primary branches with a cupressoid outline. Scale bar: 2 cm.

as our species, a smooth apex included. However, it should be noted that Giaccone (1986: 432) in the diagnosis of his species stated that apex was “*densis spinulis ornato...*” (provided with spines), whereas in all his Herbarium specimens apices were smooth. This diagnosis misleads Cormaci *et al.* (2012: 300, 347) who attributed thalli showing axes with spiny apices to this “species”.

The new species *Ericaria giaccone* sp. nov. is here described because the transfer of *C. hyblaea* to the genus *Ericaria* is not possible in that the name of that species was not validly published.

In fact, in the paper in which *C. hyblaea* was described (Giaccone 1986) the author quoted a thallus collected by Amico, as well as specimens collected in “agosto” (August)

and in “primavera” (Spring). After the diagnosis, he wrote: “*Typus ad littora 'Punta d'Aliga' in Sicilia meridionali vegetat et specimina in herbario PAL (Palermo, Italia) sunt collecta*” [Type lives at the coast of “Punta d'Aliga” in southern Sicily and specimens are held in herbarium PAL (Orto Botanico dell'Università degli Studi di Palermo) (now held in CAT)]. Such a statement simply indicates the locality where the species was found, but it does not indicate a single specimen or a single gathering collected in one place at one time, and thus it does not constitute an indication of a type [see Art. 40.3, Note 2 of ICN (“Mere citation of a locality does not constitute mention of a single specimen or gathering. Concrete reference to some detail relating to the actual type is required, such as the collector's name, collecting number or date, or unique



FIG. 3. — *Ericaria giacconeii* sp. nov., holotype: CAT 2716, 11.I.2020, Contrada Guardiana (36°39'03"N, 15°04'37"E), Porto Palo di Capo Passero (Straits of Sicily, Italy), 0.50 m depth: **A**, habit; **B**, detail of basal crust; **C**, detail of apex of cauloid. Scale bars: A, 2 cm; B, C, 1 cm.

specimen identifier.”) (Turland *et al.* 2018)]. Consequently, under Art. 40.1 (“Publication on or after 1 January 1958 of the name of a new taxon at the rank of genus or below is valid only when the type of the name is indicated”) and 40.3 Note 2 of ICN (Turland *et al.* 2018), *Cystoseira hyblaea* is not a validly published name.

In CAT there are a number of sheets of *C. hyblaea* collected from along 1 km of coast of Punta d’Aliga, near Ragusa (see Giaccone 1986: 430), but on different dates. Among them there is one herbarium sheet containing a single thallus with the label Holotypus and the word “Typus” handwritten by the same Giaccone. But the Giaccone annotation “Typus” on a herbarium sheet does not constitute the designation of a nomenclatural type because that herbarium sheet was not mentioned in the Giaccone’s (1986) paper, and thus it is not effectively published [see Art. 7.10 of ICN (Turland *et al.* 2018)].

Ericaria giacconeii sp. nov. looks morphologically similar to both *E. crinita* (Duby) Molinari & Guiry (as widely described as *C. crinita* Duby, by Sauvageau 1912, Gómez Garreta *et al.* 2001, Rodríguez-Prieto *et al.* 2013), and *E. barbatula* (Kütz- ing) Molinari & Guiry (as widely described by Cormaci *et al.* 1992, as *C. barbatula* Kütz- ing). However, it differs from them in the basal system consisting in a robust and compact

basal disc (basal system consisting of thin prostrate axes never assembled into a compact disc, and irregular discoid holdfasts in *E. crinita* and in *E. barbatula*, respectively) and in the apex of cauloids smooth and not prominent, never surrounded by spiniform appendages (prominent and surrounded by spiniform appendages and smooth and very prominent in *E. crinita* and in *E. barbatula*, respectively) (Table 1).

At “Isola delle Correnti”, an area close to our collection station, a community with *E. crinita* (as *C. crinita*) was studied by Pizzuto (1999). Because of, unfortunately, that community no longer occurs there, we re-examined Herbarium specimens collected in 1993 by Pizzuto during his study. Unexpectedly, we found that all Pizzuto’s specimens show a smooth apex never surrounded by spiniform appendages and a basal system consisting of a compact basal disc. Therefore, we believe that they should be referred to as *E. giacconeii*. Consequently, because Pizzuto’s (1999) paper was based on specimens collected in 1993, the occurrence of *E. giacconeii* in Sicily, outside its type locality, is confirmed since that year.

In a recent paper, Sadogurska *et al.* (2021) inferred from two mitochondrial markers (Cox1 and mt-spacer) a very close relationship among *E. crinita*, *E. barbatula* and “*C. bosporica*” [as *E. crinita* f. *bosporica* (Sauvageau) Sadogurska *et al.*]. In particular, they stated that “...genetic data suggest that *E. bar-*

TABLE 1. — Comparison of characters among *E. giacconeae* sp. nov. and its closest *Ericaria* species.

	<i>E. giacconeae</i> Serio & G. Furnari sp. nov.	<i>E. crinita</i> (Duby) Molinari & Guiry	<i>E. bosphorica</i> (Sauvageau) Serio & G. Furnari comb. nov.	<i>E. barbatula</i> (Kützinger) Molinari & Guiry
Height	10-30 cm	25-30 cm	30-100 (120cm)	30-40 cm
Plants	caespitose	caespitose	caespitose	caespitose
Anchoring system	strong and compact discoid holdfast	thin prostrate axes never assembled in a compact disc	irregular discoid holdfast	irregular discoid holdfast
Axes (number and sizes)	4-20, 3-5 mm in diameter, 5-25 cm long	up to 20, 2-5 mm in diameter, 10-30 cm long	up to 20, 2-4mm in diameter, 5-90 cm long	3-7 (-11), 2-3 mm in diameter, 3-30 cm long
Apex of cauloid	smooth surrounded by some young primary branches	spinose and prominent	smooth and prominent	smooth, very prominent
Primary branches	not spinose; with a cupressoid outline in tufts on cauloid	lower part spinose	not spinose	not spinose
Adventitious branches		in short tufts on stumps of primary branches	few, on the base of dropped primary branches	on the base of dropped primary branches
Ultimate branchlets	cylindrical	cylindrical	cylindrical	cylindrical-filiform
Cryptostomates	prominent	numerous and prominent	numerous and slightly prominent	spaced and prominent
Aerocysts	absent	usually absent, but, if present, occur isolated near or included in the receptacles, 4-5 x 2-3 mm	very abundant in plants growing in sheltered locations, less frequent and smaller in size in plants from open shores; oval to subconical, broader at the apex, inflated, with 2 or more outgrowths, which might bear other aerocysts, 4-8x 2-5 mm; most abundant in spring and decrease in number in summer	absent
Receptacles	cylindrical-ovoid to clavate, 5-10 x 1-2 mm provided with deciduous spinose appendages	compact, usually simple, rarely bifid, cylindrical-oval, 2-15 mm x 1-2 mm, tuberculate, non mucronate, with few to no short spine-like appendages	compact, cylindrical, simple to bifid, tuberculate with an apex blunt, 2-10 mm x 1 mm, sometimes with one short lateral subapical spine-like appendage	compact, simple, humpy and subulate, 2-4 mm x 1 mm, sometimes with 1-2 long lateral spine-like appendages
Conceptacles	slightly prominent	slightly prominent	slightly prominent	prominent
Habitat	upper sublittoral zone, 0.2-1.0 m depth, on semi-exposed rocky shores	upper sublittoral zone, near the surface, 0-0.5m depth, on open and sheltered to semiexposed rocky shores and in littoral pools	upper sublittoral zone, 0.5-10 m depth, on open and exposed rocky shores and in semi-sheltered inlets	upper sublittoral zone, 1-1.5 m depth, on open and exposed rocky shores
Distribution	Sicily, Tunisia	Mediterranean Sea	Black Sea	Mediterranean Sea
References	this study; Giaccone (1986, as <i>C. hyblaea</i>); Bouafif <i>et al.</i> (2016, as <i>C. hyblaea</i>)	Sauvageau (1912, as <i>C. crinita</i>); Rodríguez-Prieto <i>et al.</i> (2013, as <i>C. crinita</i>); Berov <i>et al.</i> (2015, as <i>C. crinita</i>)	Berov <i>et al.</i> (2015, as <i>C. bosphorica</i>)	Cormaci <i>et al.</i> (1992 and 2012, as <i>C. barbatula</i>); Bouafif <i>et al.</i> (2014, as <i>C. barbatula</i>); Berov <i>et al.</i> (2015, as <i>C. barbatula</i>)

batula and *E. crinita* are more likely to be conspecific". But, waiting for further molecular analysis on thalli of those species as well of *E. giacconeae*, based on additional genetic markers like *psbA* and *nad1*, we agree with both Eric Ballesteros and Marc Verlaque (personal communications) that Cox1 sequences and mt sequences alone are not sufficient molecular data to support the conspecificity between species differing from each other in important and consistent morpho-anatomical characters that makes it easy to distinguish them (see above and Table 1).

Moreover, it should be noted that Sadogurska *et al.* (2021) proposed the new combination *Ericaria crinita* f.

bosphorica (Sauvageau) Sadogurska *et al.* having concluded that *E. crinita* was clearly conspecific with "*C. bosphorica*" [once more giving little importance to significant morphological differences between the two species (see Berov *et al.* 2015)]. However, due to its unique morphology and endemic distribution, they recognized to it the infraspecific rank leaving Sauvageau's species in the genus *Cystoseira*. Therefore, because we agree with Berov *et al.* (2015) in considering "*C. bosphorica*" a clearly distinct species from *E. crinita*, a formal transfer of *C. bosphorica* to the genus *Ericaria* is here proposed:

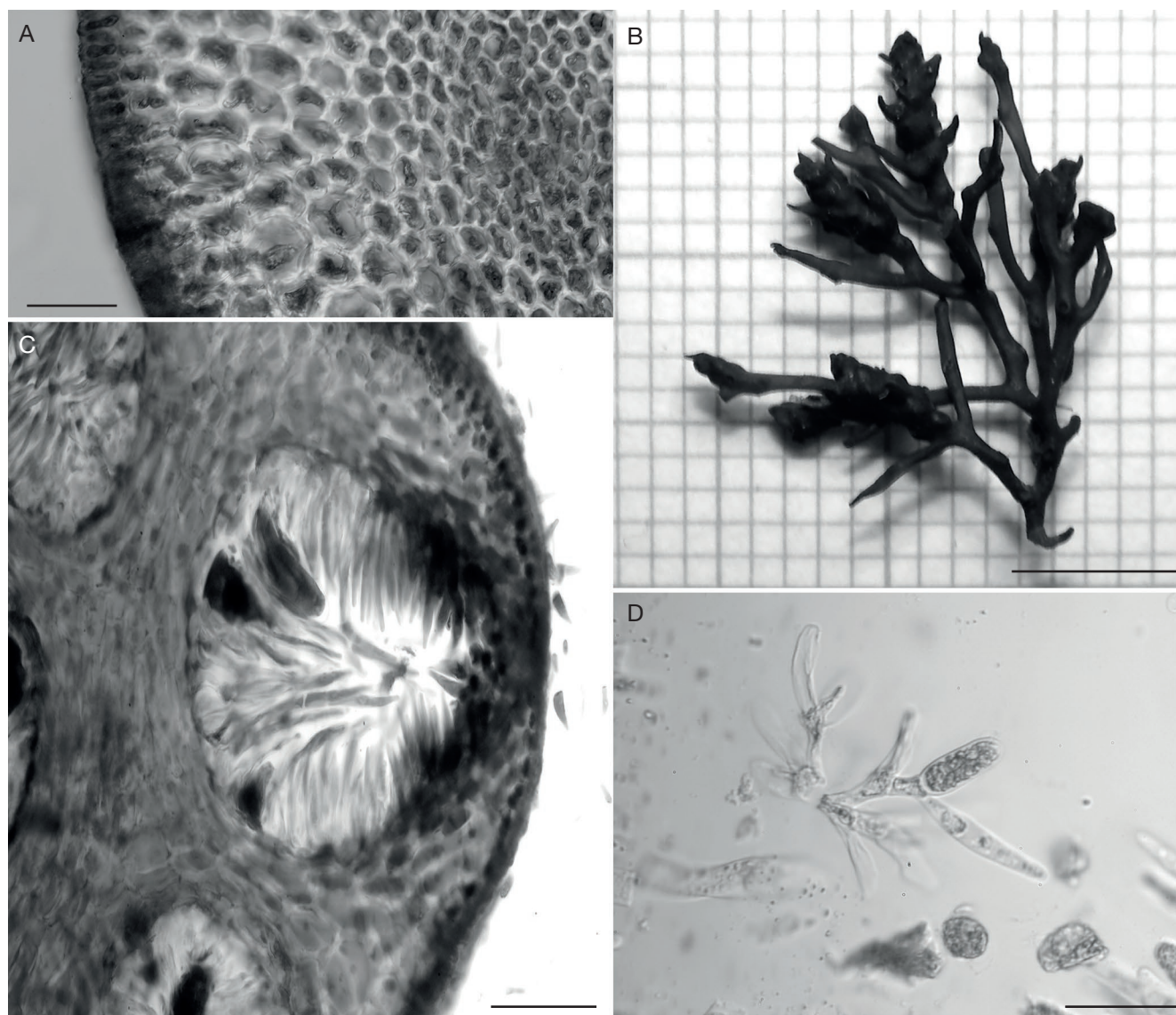


FIG. 4. — *Ericaria giacconeii* sp. nov., holotype: CAT 2716: **A**, cross section showing a medulla formed by small rounded cells, a cortex made of roundish cells with thin walls and a meristoderm formed by a layer of rectangular cells twice longer than wide; **B**, mature receptacles terminal, with deciduous spinous appendages, conceptacles located at the base of spinous deciduous appendages; **C**, cross section showing a conceptacle with oogonia occupying the floor of the conceptacle and antheridia forming a ring above them; **D**, detail of antheridia on branched hairs. Scale bars: A, D, 50 μ m; B, 0.5 cm; C, 100 μ m.

Ericaria bosporica

(Sauvageau) Serio & G. Furnari comb. nov.

Cystoseira bosporica Sauvageau, *Bulletin de la Station biologique d'Arcachon* 14: 413, 529 (Sauvageau 1912).

Finally, the particular habitat of the Porto Palo population of *E. giacconeii* is noteworthy. As stated, that species was found in association with a bioconstruction of *Sabellaria alveolata* (Linnaeus, 1767) (Annelida, Polychaeta) (Fig. 5A, B), first observed in 2018 (Sanfilippo *et al.* 2020).

Periodic observations conducted in the last few years showed that the *E. giacconeii* community is expanding (it currently covers an area of about 100 m² with a specific coverage of 80%). The relationship between *S. alveolata* and *E. giac-*

coneii seems to be not casual but synergistic, and the two species intergrow, with the perennial portion of *E. giacconeii* thalli seemingly protected by the surrounding permeable agglutinated worm structure (Fig. 5B). Further studies are underway to follow the evolution of the bioconstruction and *E. giacconeii* population, ascertain the nature of main species relationships and assess the biodiversity of this distinctive association.

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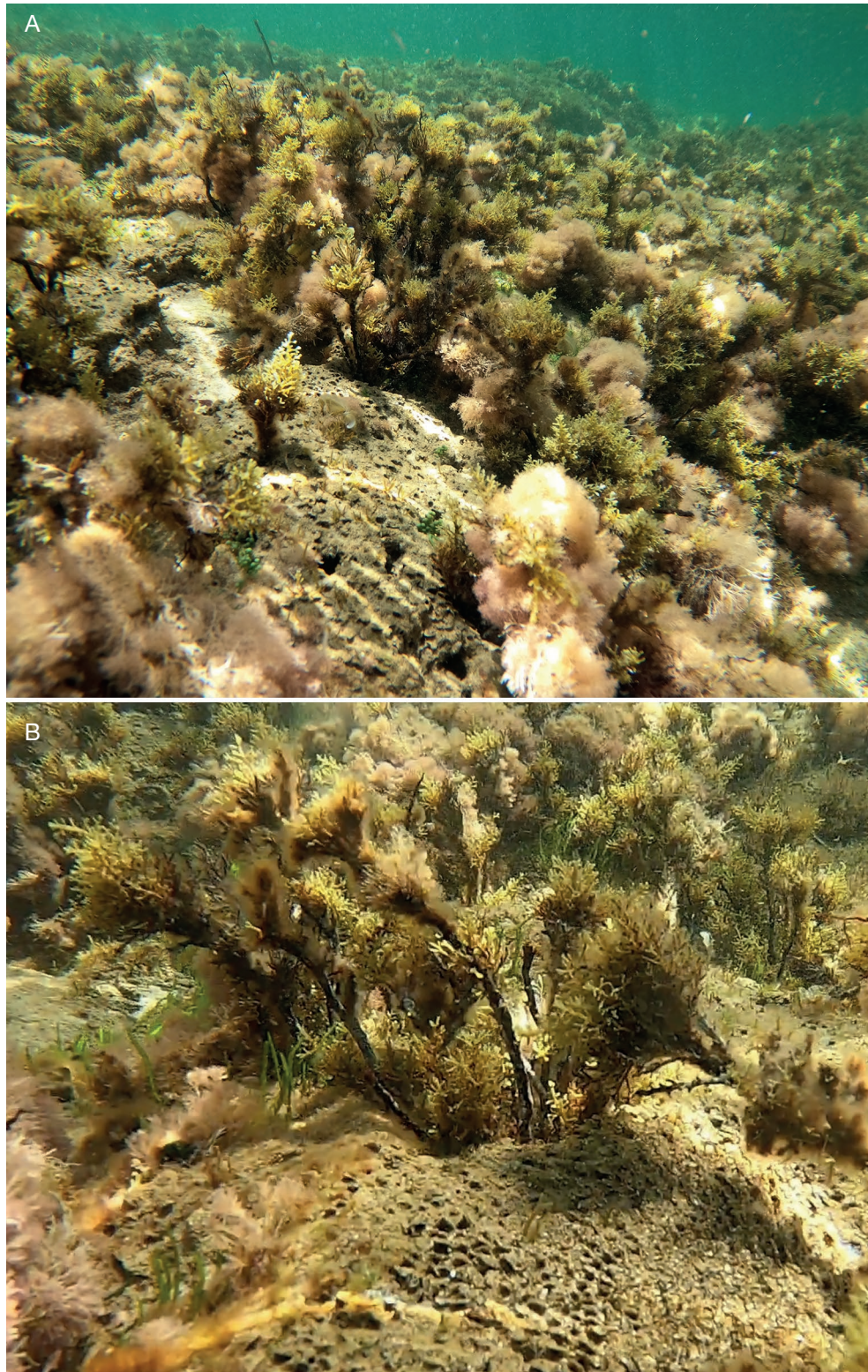


FIG. 5. — *Ericaria giaccone* sp. nov. and *Sabellaria alveolata* (Linnaeus, 1767) from “Porto Palo di Capo Passero” (Sicily): **A**, overview of the bottom covered by a *E. giaccone* and *S. alveolata* biocostructions; **B**, A thallus of *E. giaccone* encircled by *S. alveolata*.

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