

PHYTOSOCIOLOGICAL STUDY OF THE *CYSTOSEIRA ABIES-MARINA* (GMELIN) C. AGARDH (CYSTOSEIRACEAE, PHAEOPHYCEAE) COMMUNITY IN THE CANARIAN ARCHIPELAGO

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with 1 figure and 1 table

ABSTRACT. A phytosociological study of the *Cystoseira abies-marina* (GMELIN) AGARDH community has been carried out in the Canary Islands. An exhaustive description of this *taxon* is done as the most abundant species of the subtidal benthic vegetation of the Canarian Archipelago. Field researchs were performed during the last twenty years along the most significant places of the Canarian littoral. As main results, a new community, *Stypopodio-Cystoseiretum abietis-marinae* MEDINA, HAROUN & WILDPRET, *ass. nov.*, is described for the first time. Besides, the order *Stypopodio-Cystoseiretalia abietis-marinae* MEDINA, HAROUN & WILDPRET *ord. nov.*, and the alliance *Stypopodio-Cystoseirion abietis-marinae* MEDINA, HAROUN & WILDPRET *all. nov.* are proposed with their characteristics species.

INTRODUCTION

The genus *Cystoseira* is well represented in the Mediterranean Sea, where it has the ideal conditions for the speciation process (29 species); while in the Atlantic Ocean only 12 species are reported (GIACCONE, 1989; AMICO, 1995). A study has been carried out in *Cystoseira abies-marina* (GMELIN) AGARDH, the most abundant species of the benthic vegetation of the Canarian Archipelago coast. An exhaustive description of this *taxon* is done, as well as a phenological, chorological and phytosociological survey. Field researchs were performed during the last twenty years along the most significant places of the Canarian littoral (GIL-RODRÍGUEZ, 1978; WILDPRET et al., 1987). Finally, a new community, *Stypopodio-Cystoseiretum abietis-marinae* MEDINA, HAROUN & WILDPRET, *ass. nov.* is described for the first time. In addition, the order *Stypopodio-Cystoseiretalia abietis-marinae*

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MEDINA, HAROUN & WILDPRET ord. nov. and the alliance *Styopodio-Cystoseirion abietis-marinae* MEDINA, HAROUN & WILDPRET all. nov. are proposed to include the atlantic communities.

MATERIAL AND METHODS

Nowadays we have a good knowledge of the benthic vegetation present in Canarian coast and a preliminary cartography of the intertidal and shallow subtidal zones is already done (WILDPRET et al., 1987). As result of this survey, there is a clear picture of the distributional pattern of *C. abies marina* populations along the canarian coasts. (Fig. 1). In Fuerteventura Island only very few and isolated especimens of *C. abies-marina* have been located, probably due to the scarcity of rocky substrate in that island, and without forming a real community.

During the last years, data about the ecology and floristic composition of *C. abies-marina* beds were taken in different localities of Lanzarote, Tenerife and Hierro Islands between the lower tidal level until twenty meters depth.

Samples to establish the community structure including epiphytic and incrusting algae were taken according with the methodology of the ZURICH-MONTPPELLIER sigmatistcs school (IZCO & DEL ARCO, 1988). Relevés were taken randomly in a 50x50 cm surface by using a PVC square. The samples were carefully sorted and clasified in the laboratory for taxonomic and biometrical analysis. The floristic catalogue is mainly based in WYNNE (1986).

RESULTS

Plant description

Cystoseira abies-marina (GMELIN) C. AGARDH, Sp. Alg. 1:54 (1820)

Bas.: *Fucus abies-marina* GMELIN, HIST. Fuc. 2 (1768).

Syn.: *Treptacantha gracillina* KÜTZING, Sp. Alg.: 594 (1849).

Treptacantha montagnei KÜTZING, Sp. Alg.: 594 (1849).

Phyllacantha moliniformis KÜTZING, Sp. Alg.: 597 (1849).

Thallus of 10-90 cm long, brown-yellowish and often iridescent in the youngest parts, arising form a basal crust of creeping haptera, fleshy and irregularly curved, bearing numerous primary axes which are usually formed and lost seasonally. Primary branches smooth or with a few spines, alternately branched, the laterals progressively shorter above; secondary branches bearing several branches with numerous spinous appendages, conical, curved, someones become fastigiata or divaricate. Upper branches flattened (2 mm, diameter), three-sided, more or less curved, densely arranged, triangular, single, rigid with curved apex.

At the end of the spring period, branches can grow until 90 cm long and are lost mainly during summer period.

Receptacles developed in apical parts of the branches, which are of similar morphology to vegetative ones, but with closer and thicker appendages. Receptacles in the basal parts of the spinous appendages, usually bisexual, more common in summer.

World Distribution: Canarias, Azores, Madeira, Salvajes, Marruecos, Sahara, Senegal, Cabo Verde, Italia, Libia.

Community description

Styopodio-Cystoseiretum abietis-marinae MEDINA, HAROUN & WILDPRET *ass. nov.* (table 1; *holotypus* inv. n° 7) is widespread along the Canarian littoral; sometimes it forms very dense photophilic and oligoespecific populations on rocky bottoms mainly in the NW coasts of the islands. It appears inhabiting the exposed areas affected by intense hydrodynamical conditions; specially between 0-10 m depth, where is affected to a bidirectional movement of water masses.

Dense, large and extended populations, where the dominant species occupies the whole inventoried surface, are formed in the N and NW stations. In the S-SE stations; these populations are characterized by an open structure, occupying smaller surfaces and presenting a caespitosa disposition constituted by shorter exemplars with sulky morphology.

From a floristic point of view, the community is characterized by a small diversity. Few macroalgal species can be considered as characteristic of this community, compared with other *Cystoseira* communities, specially of the mediterranean basin (COPPEJANS, 1980; RULL-LLUCH & GOMEZ-GARRETA, 1990; BALLESTEROS, 1990a & b). According to the batymetrical distribution and exposition, two variants can be clearly differentiated in the community. *Gelidium arbuscula* BORY ex BØRGESEN is the differential species in the N-NW coast, whereas in S-SE other accompanying species are much common, as *Dictyota spp.*, *Lophocladia trichocladus* (C. AGARDH) Schmitz, *Hypnea musciformis* (WULFEN) LAMOROUX., etc.

The poor epiphytism observed on the axes and branches of this *Cystoseira* species, contrasts with the richness in epiphytes reported in other species of the same genus present in the Canarian Archipelago (i.e., *C. tamariscifolia* (HUDSON) PAPENFUSS; MORALES-AYALA y VIERA-RODRIGUEZ, 1989-).

This community constitutes a nursery for numerous species of the coastal marine fauna. The increasing effect of different industrial and urban overflows, together with the growth of the long-spined seurchin (*Diadema antillarum* PHILLIPPI 1845) populations seems to be the direct responsables of the observed regression of several *C. abies-marina* communities during the lasts years.

This association must be included in the following new order and alliance:

Styopodio-Cystoseiretalia abietis-marinae MEDINA, HAROUN & WILDPRET, *ord.*

nov. (*Typus*: *Styopodio-Cystoseirion abietis-marinae* MEDINA, HAROUN & WILDPRET).

Styopodio-Cystoseirion abietis-marinae MEDINA, HAROUN & WILDPRET, *all. nov.* (*Typus*: *Styopodio-Cystoseiretum abietis-marinae* MEDINA, HAROUN & WILDPRET).

This order and its only alliance have an atlantic distribution along the "Macaronesian archipelagos": Azores, Madeira and Canaries; presenting as characteristic species: *Cystoseira abies-marina* (GMELIN) C. AGARDH, *Styopodium zonale* (LAMOUREUX) PAPENFUSS and *Gelidium arbuscula* BORY ex BØRGESSEN. Besides, the characteristic species of the order *Cystoseiretalia* MOLINIER 1958 are not observed as cohort species in the atlantic communities (GIACCONE, 1965).

In an annual basis, the communities of *Cystoseira* spp. in the mediterranean coasts are subjected to an ample temperature range (12,5-26° C) compared with the atlantic communities, which are influenced by narrower temperature variations (15-23° C). Such difference in teperature may explain the low number of *Cystoseira* species in the atlantic area.

Cystoseira spp. forms photophilic communities mainly in areas with high hydrodynamism. These plants are adapted to obtain nutrients in oligotrophic waters such that of the Mediterranean Sea and many regions of the Atlantic Ocean. The replacement of the water masses in the surroundings of the thalli may satisfy the growth requirements of these brown algae in almost nutrient-depleted waters (BALLESTEROS, 1990). As result of their differential adaptation to hydrodynamic forces, diverse *Cystoseira* communities can be recognized along the mediterranean and atlantic littoral. In the Mediterranean, the main phytosociological communities are those of *Cystoseiretum strictae* MOLINIER 1988, *Cystoseiretum crinitae* MOLINIER 1958 and *Cystoseiretum sauvageauanae* GIACCONE 1972, which occupied the following hydodynamic zones: multi-directional water movements, bi-directional water movements and uni-directional water movements respectively (GIACCONE & GERACI, 1989). In the "macaronesian archipelagos", *Styopodio-Cystoseiretum abietis-marinae* *ass. nov.* develops in the multi-directional and bi-directional water movements zones.

Besides, the high hydrodynamism affecting the *Styopodio-Cystoseiretum abietis-marinae* *ass. nov.* seems to simplify its floristic composition compared with other *Cystoseira* communities from the Mediterranean (BALLESTEROS, 1990; RULL LLUCH & GÓMEZ GARRETA, 1990).

Styopodio-Cystoseiretum abietis-marinae MEDINA, HAROUN & WILDPRET *ass. nov.* (t. 1; *holotypus* inv. n° 7) has been partially reported elsewhere. GIL-RODRÍGUEZ & WILDPRET, 1980: 91, t.25 remarked the need of a throughout study of a similar community, provisionally denominated by those authors as "*Cystoseiretum abies-marinae*". The publication of that provissional name (*nom. prov.*) is not valid following the Art. 2b of I.C.P.N (IZCO & DEL ARCO, 1988). Later, VIERA-RODRÍGUEZ & WILDPRET, 1986: 218, t.7 proposed the same name, *Cystoseiretum abies-marinae*, based in an incomplete releve, corresponding to a monospecific population of *C. abies-marina*. Taking in account the Art.

37 of I.C.P.N. that *sintaxon* is considered as *nomem dubium*. Despite our interest to recover that association name, already rooted in the canarian phytosociological bibliography, the prescriptions of the Art. 39, paragraph 2 of I.C.P.N., forced us to define a new *sintaxon*, *Stypopodio-Cystoseiretum abietis-marinae* ass. nov., which describe more accurately its floristic diversity.

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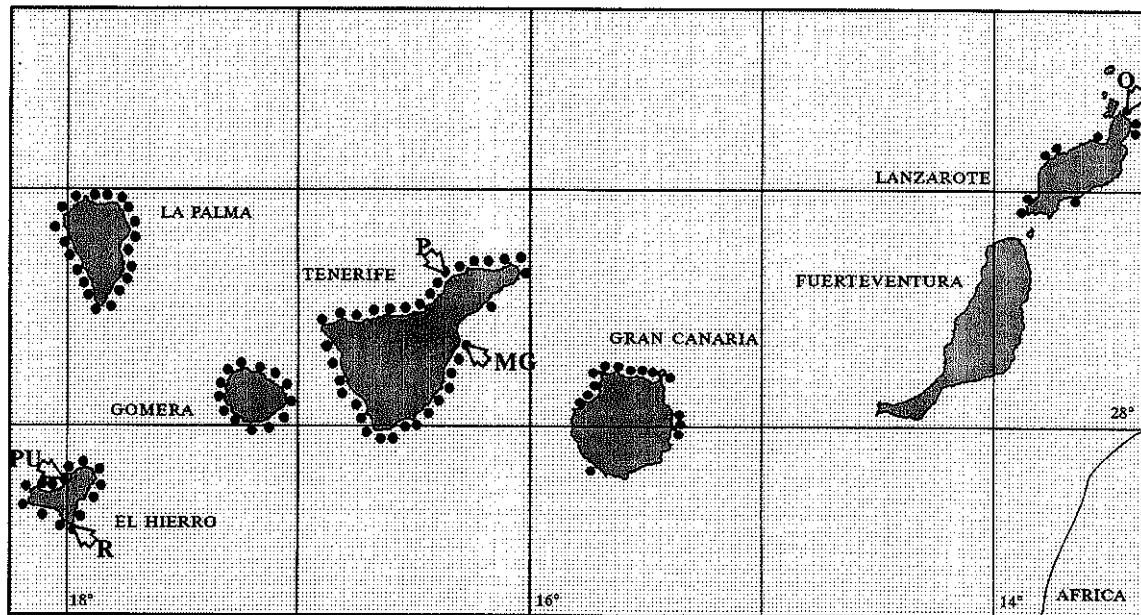


Figure 1 - Distribution map of *Cystoseira abies-marina* beds on the canarian coasts. Sampled stations: O, Orzola (Lanzarote); P, El Prix (Tenerife); MG, Malpaís de Güimar (Tenerife); PU, Las Puntas (El Hierro); R: La Restinga (El Hierro).

TABLE 1 - Phytosociological data of the *Stypopodio-Cystoseiretum abietis-marinae* Medina, Haroun & Wildpret *ass. nov.* (tabal 1; *holotypus* inv. n° 7) in different localities of the Canarian Archipelago.

Nº Relevé	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28		
Exposure	N	N	N	N	N	N	N	SE	SE	SE	SE	SE	N	N	N	N	S	S	S	S	S	S	S	S	N	N	N	N		
Slope	5	5	5	5	5	5	5	10	10	10	15	10	5	5	5	5	10	10	15	10	12	10	10	10	7	10	5	10		
Depth	5	5	5	5	5	5	4	3.5	4	5	3	5	5	5	5	3	4	4	5	4	3	5	4	5	5	4	5	5		
Species number	3	3	5	6	4	7	6	8	6	6	9	3	3	7	9	4	7	5	8	9	5	9	8	7	8	10	10	8		
Characteristic species																														
<i>Cystoseira abies-marina</i>	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	
<i>Stypopodium zonale</i>	.	.	.	.	.	2	2	.	2	2	2	2	2	2	2	2	2	2	2	2	2	2	3	2	2	2	2	2	2
<i>Gelidium arbuscula</i>	1	1	+	+	1	+	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Cohort species																														
<i>Lobophora variegata</i>	.	.	.	.	.	2	2	2	2	2	2	.	.	3	3	.	2	2	2	2	.	3	2	2	2	2	2	2	2
<i>Litophyllum lobatum</i>	2	2	.	.	2	1	1	1	1	1	+	.	.	1	1	.	1	.	1	+	.	.	.	+	+	.	.	.	.
<i>Lophocladia trichoclados</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	1	1	1	1	1	1	1	2	2	2	2	1	1
<i>Dyctiota spp.</i>	.	.	.	.	2	2	.	2	2	.	.	.	.	+	3	2	.	.	2	2	+	2	+	2	.	.	.	2	.
<i>Asparagopsis taxiformis</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2	.	.	2	2	.	+	2	+	+	1	1	+	1	.
<i>Sargassum vulgare</i>	.	.	1	1	.	.	.	.	.	.	2	.	.	1	1	.	.	.	.	.	.	.	.	2	.	.	.	.	.
<i>Cladophora prolifera</i>	.	.	.	.	.	.	.	.	+	+	+	+	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.
<i>Colpomenia sinuosa</i>	.	.	.	3-4	.	.	.	.	.	.	.	.	.	.	3	.	(4)	.	.	.	.	(4)	.	.	.	.	.	.	.
<i>Sargassum desfontainesii</i>	.	.	.	+	.	.	.	.	.	.	.	.	.	.	2	.	.	.	.	.	2	.	+	.	.	.	.	.	.
<i>Bryopsis plumosa</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	+	.	.	.	+	+
<i>Zonaria tournefortii</i>	.	.	.	.	.	.	+	.	.	.	.	.	.	2	1	.	.	.	.	.	.	.	.	.	.	.	.	+	+
<i>Caulerpa webbiana</i>	.	.	.	+	2	2	.
Epiphytes (*)																														
<i>Hypnea musciformis</i>	+	.	+	+	+	.	+	.	.	+	+	+	.
<i>Jania rubens</i>	.	.	.	+	+	+	+	+	+	+	.
<i>Metobesia membranacea</i>	.	.	.	+	+	+	.
<i>Acrosorium venulosum</i>	+	+	+
<i>Sphacellaria cirrosa</i>	+

(*) Epiphytes are indicated as presence/absence. MG: Malpais de Güimar (Tenerife); P: El Prix (Tenerife); PU: Las Puntas (El Hierro); R: Restinga (El Hierro); O: Orzola (Lanzarote). Localities and date of relevé: 1:P. 06.89; 2:P. 08.89; 3:P. 04.91; 4:PU. 04.91; 5:P. 11.89; 6:PU. 06.89; 7:PU. 06.90; 8:MG. 10.88; 9:MG. 11.88; 10:MG. 01.89; 11:MG. 07.89; 12:MG. 10.89; 13:P. 10.89; 14:PU. 06.91; 15:PU. 08.91; 16:PU. 10.91; 17:R. 06.89; 18:R. 08.89; 19:R. 10.89; 20:R. 06.90; 21:R. 04.91; 22:R. 06.91; 23:R. 08.91; 24:R. 10.91; 25:O. 10.89; 26:O. 12.90; 27:O. 03.91; 28:O. 08.91.