Species composition and structure of a photophilic algal community dominated by *Halopteris scoparia* (L.) Sauvageau from the North-Western Mediterranean

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Abstract

BALLESTEROS, E. (1993). Species composition and structure of photophilic algal community dominated by *Halopteris scoparia* (L.) Sauvage from the North-Western Mediterranean. Collect. Bot. (Barcelona) 22: 5-24.

A photophilic algal community dominated by *Halopteris scoparia* and other brown algae is described from sheltered environments from the North-Western Mediterranean rocky bottoms. This community is included in the *Padino-Cladostephetum hirsutae* previously described by FELDMANN (1937) for the same geographical area. This plant association is characterized by the lack of an upper erect stratum of Fucales and by the low degree of presence of thermophilic species which typify other similar communities described from other Mediterranean areas. Algal biomass ranges from 1100 to 2500 g dw m⁻² and coverage percentage ranges from 250 to 450 %. The great miniaturization and the extraordinary diversity and species richness of Mediterranean photophilic algal communities is assessed. Although there is not a clear seasonal change in biomass of the dominant species in the community, two structural stages can be discerned along an annual cycle: a developed community (summer) and a diversified community (winter). Finally, the community structure and the environmental factors that impinge upon it are compared with those found in other Mediterranean phytobenthic communities.

Keywords: Marine phytobenthos, community structure, photophilic algae, Mediterranean.

Resumen

BALLESTEROS, E. (1993). Composición específica y estructura de comunidades fotolíticas de algas dominadas por *Halopteris scoparia* (L.) Sauvage en el noroeste del Mediterráneo. Collect. Bot. (Barcelona) 22: 5-24.

Se describe una comunidad de algas fotófilas mediterráneas de modo calmado dominada por *Halopteris scoparia* y otros feófitos de porte mediano, la cual se adscribe a la asociación *Padino-Cladostephetum hirsutae* J. Feldmann 1937. Dicha asociación se caracteriza por la ausencia de un estrato elevado de Fucales y el escaso grado de presencia de especies termófilas propia de comunidades similares descritas de otras zonas del Mediterráneo. La biomasa algal oscila entre 1100 y 2500 g ps m⁻² mientras que el porcentaje de recubrimiento varía entre el 250 y el 450 %. Se pone de manifiesto la gran miniaturización de las comunidades de algas fotófitas mediterráneas y su extraordinaria diversidad y riqueza

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específicas. Pese a no existir un claro cambio estacional de biomasa en la especie dominante, es posible distinguir la existencia de dos estadios estructurales en la comunidad a lo largo del año: un estadio de comunidad desarrollada (verano) y un estadio de comunidad diversificada (invierno). Finalmente se compara la estructura de la comunidad y los factores ambientales a los que está sometida con los descritos para otras comunidades mediterráneas similares.

Palabras clave: Fitobentos marinos, estructura de comunidades, algas fotófilas, Mediterráneo.

INTRODUCTION

Although a large amount of Mediterranean benthic literature directly or indirectly refers to the photophilic algal communities, there is a lack of floristic studies dealing with this kind of seaweed-dominated communities. The previous studies made by FUNK (1927) and FELDMANN (1937) described some benthic associations, but it was not until the works of MOLINIER (1960), CINELLI (1969), BOUDOURESQUE (1971a) and GIACCONE (1973) that the sigmatist methodology was applied to the data sets. Moreover, the detailed studies about the structure of the photophilic algal communities from sheltered places made by COPPEJANS & BOUDOURESQUE (1975), COPPEJANS (1977) and DHONDT & COPPEJANS (1977), and summarized in COPPEJANS (1980), revealed the lack of rigour in sorting the samples by some authors, so partially invalidating the previously described associations. Afterwards, the exhaustive work done by BALLESTEROS (1984) and VERLAQUE (1987), reasserted Coppejans's conclusions and reexamined the syntaxonomy of the photophilic algal communities from calm waters and sheltered environments in the Western Mediterranean.

The existence of a particular association of photophilic algae dominated by some coarsely-branched Phaeophyceae but without an upper erect stratum of Fucales was already indicated by FELDMANN (1937) in the waters of the Gulf of Lions (NW Mediterranean). This association has been reported from different localities of the northern Spanish coasts from Cape Creus to Columbretes Islands (POLO & SEOANE, 1979; BALLESTEROS, 1982; BALLESTEROS *et al.*, 1984; GILI & ROS, 1985; GARCIA CARRASCOSA, 1987) but no inventories of these communities, nor a relation of the most representative species, have been published.

Our goal is to characterize, by means of quantified species lists and some structural parameters, the species composition and the seasonal changes of a photophilic algal community dominated by the brown alga *Halopteris scoparia*, representative of the *Padino-Cladostephetum hirsutae* described by FELDMANN (1937) from Banyuls (Eastern Pyrenees, France), in order to make comparisons with the other recently described Mediterranean communities of photophilic algae (BALLESTEROS, 1984, 1988a, 1988b, 1990a; VERLAQUE, 1987). Environmental factors have been also monitored along one year (1983) to account for monthly and yearly values of irradiance, nutrient concentration in seawater and temperature.

MATERIALS AND METHODS

The sampling area is located in Tossa de Mar (North-Western Mediterranean, 41°48' N-2°26' E). Biological and environmental characteristics are described in detail by BALLESTEROS (1984). The community of photophilic algae dominated by *Halopteris scoparia* appears in sheltered places below 1 meter depth or in open waters below 3 meters depth. It is always restricted to horizontal or subhorizontal shallow rocky bottoms (above 8 meters depth) with a moderate to low hydrodynamism and a certain amount of coarse sand or fine gravel which is

retained among the stipes and rhizoids of the larger seaweeds and the thalli of the turf-forming algae.

Samples to establish the species composition and the structure of the community were taken seasonally (January, April, July and October) by scraping off all organisms (BOUDOURESQUE, 1971b), including encrusting algae. Samples were collected as 16 subsamples of $7 \times 7 \text{ cm}^2$ arranged in a reticulate manner (BALLESTEROS, 1986), which corresponds to a total sampling area of 784 cm^2 . Each subsample was carefully sorted in the laboratory. Abundance was quantified as coverage in cm^2 and biomass (g dw), using procedures described in BALLESTEROS (1986). Species/abundance matrices were obtained for each sample, with x_{ij} representing the biomass (or coverage) of the species i in the subsample j . Species/area curves, diversity (Shannon)/area curves, homogeneity (Kulczynsky)/area curves and the variation of the variance: mean ratio for the biomass distribution as a function of sampled area were computed from those matrices by means of the program MINAR (ROMERO & MILLET, in press). Afterwards, the following structural parameters, extensively described in BALLESTEROS (1986), were estimated:

- Biomass.
- Coverage.
- Species richness (R): the number of species corresponding to the Calleja point $5 \cdot 10^{-2}$ in the species/area curves.
- Specific distribution (k : value of k defined as

$$k = e^{-b/a}$$

where a and b correspond to the slope and the ordinate axis intersection in the species/area curve fitted to a semilogarithmic function

$$y = a \ln x + b$$

where y is the number of species and x the sampled area in cm^2 .

- Molinier point 20/5 (NEDELEC, 1979): the sampling area at which a 20 % increment in sampling area resulted in a 5 % increment in species number. It can be considered as a qualitative minimal area.

- Species diversity (A): asymptotic value of diversity when the diversity/area curve is fitted to a Michaelis-Menten function.

- Pattern diversity (S): surface corresponding to the Calleja point $1 \cdot 10^{-3}$ in the diversity/area curve fitted to a Michaelis-Menten function. This surface obviously corresponds to the area at which diversity is practically stabilized, so it is related to the structural minimal area.

Species were also qualified with respect to their ecological preferences. The relative abundances of the main ecological supergroups (BOUDOURESQUE, 1985) were considered in order to typify the community.

Species terminology follows criteria established by BALLESTEROS (1990b).

Irradiance at 3 meters depth was computed from weekly Secchi disk measurements according to the method proposed by WEINBERG & CORTEL BREEMAN (1978). Temperature was monitored weekly and water samples for determination of dissolved nutrients (nitrates and phosphates) were collected monthly. The methodology followed in dissolved nutrient analysis was the one recommended in GRASHOFF *et al.* (1983).

RESULTS

Quantified species lists are presented in table 1. Community structure corresponds to the structure of Mediterranean sublittoral communities dominated by frondose algae (ROS *et al.*,

1985). Despite the great seasonal variations detected, the erect stratum is always dominated by *Halopteris scoparia*, with *Padina pavonica* and *Cladostephus hirsutus* in summer and autumn. At a lower level, other erect, turf-forming algae, occupy the space, mainly *Cladophora prolifera*, *C. lehmanniana*, *C. rupestris*, *Corallina elongata*, *Amphiroa rigida*, *Jania* cf. *longifurca*, *Cordylecladia erecta* and *Gigartina acicularis*. The encrusting layer is mainly constituted by Corallinaceae (*Lithophyllum incrustans* and *Lithophyllum dentatum* as the main species). The thalli of the larger algae (*Halopteris*, *Cladostephus*) are usually epiphytized by small articulated corallines (*Jania corniculata*, *J. rubens*, *Corallina granifera*), *Titanoderma pustulatum*, *Dasya corymbifera*, *Falkenbergia rufolanosa*-stadium, *Sphacelaria cirrosa*, *Herposiphonia tenella* and a large number of Ceramiaceae, Delesseriaceae and Ectocarpaceae.

The community changes during the year, but no seasonal pattern can be described for *Halopteris scoparia* and its epiphytes because the development of *Halopteris* do not follow a clear annual cycle. In 1982 the biomass of *Halopteris* peaked in autumn (table 1) but one year later the biomass maxima was attained in spring (BALLESTEROS, 1984). Epiphytic biomass varies according to *Halopteris* biomass and so does the coverage. Despite the uncertain biomass cycle of *Halopteris scoparia* and its epiphytes, some species follow an annual cycle. Some sciaphilic species such as *Udotea petiolata*, *Sphaerococcus coronopifolius* and *Peyssonnelia squamaria* develop in winter-spring while others more opportunistic like *Corallina elongata*, *Falkenbergia rufolanosa*, and *Feldmannia globifera* grow in spring. The species that mostly characterize the community, being as they are photophilic, develop in summer: *Padina pavonica*, *Sphacelaria cirrosa*, *Cladostephus hirsutus*, *Dictyota dichotoma*, *Colpomenia sinuosa*, *Acetabularia acetabulum*, *Amphiroa rigida* and *Giffordia mitchelliae*. Nevertheless, the species of the genus *Cladophora*, so characteristic of this community, do not have any annual cycle.

Fig. 1.— Species/area curves in the *Halopteris scoparia* community. Different samples are figured with different symbols: winter (100182) (black circles), spring (90482) (white circles), summer (80782) (squares) and autumn (11082) (triangles).

Fig. 2.— Diversity (computed from biomass data)/area curves. Symbols as in figure 1.

Fig. 3.— Diversity (computed from coverage data)/area curves. Symbols as in figure 1.

Fig. 4.— Quantitative similarity (computed from biomass data)/area curves. Symbols as in figure 1.

Fig. 5.— Quantitative similarity (computed from coverage data)/area curves. Symbols as in figure 1.

Fig. 6.— Variation of the variance: mean ratio of the biomass distribution in relation with sampling area. Symbols as in figure 1.

Fig. 7.— Variation of temperature (solid line), irradiance (broken line), nitrate (dotted line) and phosphate (point and line) concentration in seawater at the community of *Halopteris scoparia* from Tossa de Mar along the year 1983.

Community biomass ranges between 1100 and 2500 g dw and percentage coverage between 250 and 450 %, with maximum values in summer and autumn and minimum values in winter (table 2). The species/area curves are shown in figure 1. Species richness is very high from winter to summer but suddenly decreases in autumn (table 2). Values of k are also rather high, with highest values in winter and lowest in summer. Molinier point 20/5 closely reflects the variations in the parameter k (table 2) and sampling areas of 400 cm² qualitatively represent the community all along the year.

Species diversity ranges from 1.5 to 2.7 bits (computed from biomass values) or 2.7 to 3.8 (computed from coverage values) (table 3). Differences among both measures of diversity are related to the high biomass of the encrusting corallines which substantially decrease the diversity estimates made with biomass data. Diversity is highest in winter and spring, when species richness is higher and evenness is greater because of the low biomass of *Halopteris* and the other photophilic species. Accordingly, diversity decreases in summer and autumn. Pattern diversity follows a similar annual pattern of both species diversity and the parameter k , being higher in winter-spring and lower in summer-autumn (table 3). Diversity spectra (figs. 2, 3) become stabilized for the areas equal to the values of pattern diversity reported in table 3, so areas of 200-250 cm² are large enough to structurally represent the community. Kulczynski's similarity index (figs. 4, 5) also becomes stabilized at sampling areas around 200-250 cm² and it attains a value higher than 0.7 at areas always lower than 200 cm². The performance of the biomass variance: mean ratio also reflects an homogenous distribution of biomass, although a patchy distribution, with a patch size around 200 cm², can be observed in the spring sample (fig. 6). In conclusion, sampling areas somewhat larger than 200 cm² are usually representative of the community complexity, although 400 cm² samples may be preferred to adequately sample the species composition of the community.

Photophilic algae from sheltered environments quantitatively dominate the community (table 4). Photophilic algae and infralittoral species are dominant in terms of coverage but there is a large amount of species of sciaphilic algae which develop under the upper stratum of photophilic species. However, these sciaphilic species do not attain, in any case, a significative coverage.

Mean annual irradiance at 3 meters depth amounts to 17891 cal g cm⁻² y⁻¹, which correspond to 23.7 W m⁻² or the 28.7 % of the surface irradiance (BALLESTEROS, 1989a). Yearly distribution of irradiance is represented in figure 7 and ranges from 15.2 cal g cm⁻² d⁻¹ (december) to 82,4 cal g cm⁻² d⁻¹ (august). Temperature ranges from 12.1 °C (march) to 23.5 °C (august) (fig. 7). Nitrate concentration in seawater is rather high (0,3 to 1 µmols l⁻¹) from november to april but it attains very low values between may and october (usually lower than 0.1 µmols l⁻¹). Phosphate concentration is always lower than 0.1 µmols l⁻¹ and detectable levels (> 0.03 µmols l⁻¹) are only found in june and july and in autumnal months (fig. 7).

DISCUSSION

Phytosociology

FELDMANN(1937) was the first author to describe some Mediterranean benthic algal associations with the minimum of accuracy to be recognized by other researchers. The association of *Padina pavonica* and *Cladostephus hirsutus* was described from the sunny, shallow and sheltered rocky biotopes with a certain amount of sand from the Alberes Coast (French Mediterranean). This community was characterized by some species (e.g. *Halopteris scoparia*—always epiphytized by *Jania corniculata*—, *Cladostephus hirsutus*, *Padina pavonica*, *Cladophora lehmanniana*, *Acetabularia acetabulum*, *Colpomenia sinuosa*) which are prevail-

ling in the community of *Halopteris scoparia* from Tossa de Mar. Even though FELDMANN (1937) did not present any inventory of the *Padina-Cladostephus* association, the list of characteristic and companion species was so extensive and the description about its distribution, ecology and annual cycle was so detailed that it is unequivocally described and, being so, it can be accepted as a plant association attending to the criteria established in BARKMAN *et al.* (1986) (article 7). It should be named *Padino-Cladostephetum hirsutae* J. Feldmann, 1937 and the inventories of the community of *Halopteris scoparia* from Tossa de Mar belong to it.

Although the excellent base line about the Mediterranean marine vegetation constituted by the work of FELDMANN (1937), the phytosociological study of the Mediterranean benthic communities had no continuity until the work of MOLINIER (1960) who described the *Cystoseiretum crinitae* association as representative of the communities of photophilic algae from sheltered environments in Corsica island. Since then, most authors working in Mediterranean photophilic algal communities from calm water assigned its inventories to the *Cystoseiretum crinitae*, either to the typical association or to one of the different facies or subassociations (e.g. GIACCONE, 1965, 1968, 1973; BOUDOURESQUE, 1971a; AUGIER & BOUDOURESQUE, 1974, 1976; FEOLI & GIACCONE, 1975; VERLAQUE & TINE, 1979; BOISSET & GARCIA CARRASCOSA, 1987). BALLESTEROS (1982) claimed the rank of association to the communities of photophilic algae not dominated by Fucales from the Costa Brava, and later (BALLESTEROS, 1984) segregated some photophilic algal associations from the *Cystoseiretum crinitae*, which, in his opinion, was restricted to the communities dominated by *Cystoseira crinita*, at least in the Gulf of Lions (NW Mediterranean).

More recently, VERLAQUE (1987) published a detailed study of the photophilic algal communities from calm waters from the island of Corsica and revised the *Cystoseiretum crinitae* described by MOLINIER (1960). He concluded that three different associations of photophilic algae can be distinguished from the photophilic sheltered environments in Corsica: the *Cystoseiretum balearicae* Molinier emend. Verlaque 1987 (= *Cystoseiretum crinitae* Molinier 1960), the *Anadyomeno-Padinetum pavonicae* Verlaque 1987, and the *Neogoniolitho-Pseudolithodermetum adriaticae* Verlaque 1987. These associations are characterized by some thermophilic algae distributed along the Central Mediterranean but absent from the North-Western Mediterranean and are respectively vicariants to the *Cystoseiretum caespitosae* (J. Feldmann) Ballesteros 1990, the *Padino-Cladostephetum hirsutae* J. Feldmann 1937, and the *Lithophyllo-Arbacietum lixulae* Augier & Boudouresque 1970, from the Gulf of Lions.

The structure of the *Padino-Cladostephetum hirsutae* and the *Anadyomeno-Padinetum pavonicae* is very similar (table 5) but there are great specific differences that justify the segregation of both associations. The *Padino-Cladostephetum hirsutae* do not shelter thermophilic species such as *Anadyomene stellata*, *Cystoseira balearica*, *Dipterosiphonia rigens*, *Polysiphonia fosliei*, *Pulvinaria giraudii*, *Polysiphonia sphaerocarpa*, *Sargassum flavifolium* and *Rytiphloea tinctoria*, or these are extremely rare (*Laurencia microcladia*, *Dasycladus vermicularis*, *Halopitys incurvus*, *Anotrichium tenue*, *Siphonocladus pusillus*, *Spyridia filamentosa*, *Sphacelaria tribuloides*). Also, the encrusting layer is dominated by species of the genus *Lithophyllum*, while *Jania corniculata* and *Jania rubens* are widespread in the epiphytic stratum. Other algae such as some *Cladophora* species growing in sandy areas of rocky shores (*C. lehmanniana*, *C. prolifera*, *C. nigrescens*, *C. rupestris*) and *Jania* cf. *longifurca* are also distinctive of the *Padino-Cladostephetum hirsutae*.

Photophilic species quantitatively dominate inside the *Padino-Cladostephetum hirsutae* but the sciaphilic species are qualitatively dominant. This paradox can be explained because there is a large number of sciaphilic species, which are also r-strategists, that can develop under the thalli of the dominant photophilic species, where relative dim light conditions prevail. Nevertheless, coverage of such sciaphilic species is always very low because they are no competitive over large photophilic species. Therefore, their high degree of presence do not increase the total biomass, nor the coverage of the community, but largely contributes to the

outstanding floristic richness of the Mediterranean photophilic algal communities (BALLESTEROS, 1987).

Community structure

The structure of the *Padino-Cladostephetum hirsutae* corresponds to the structure already described for other seaweed-dominated benthic Mediterranean communities without an upper stratum of Fucales (ROS *et al.*, 1985). The mean biomass is similar to other photophilic communities (table 5) and its coverage is somewhat lower than coverage usually measured in shallow water communities of *Cystoseira*, but higher than communities developing at greater depths (e.g. *Rhodomenio-Codietum vermilarae*) (table 5). The mean number of species and the species diversity are very high, higher than values found in exposed benthic communities, but similar to values reported from other photophilic communities from sheltered places (table 5; COPPEJANS & BOUDOURESQUE, 1975). The homogeneity is also very high, similar to that reported by COPPEJANS (1977) from other photophilic communities from the French Mediterranean coasts. Our result reassert the extraordinary specific diversity of the photophilic Mediterranean phytobenthos (COPPEJANS, 1980; VERLAQUE, 1987; BALLESTEROS, 1987).

The miniaturization of the photophilic algal communities is also evident. Sampling areas of 200 to 250 cm² structurally represent the community, while areas around 400 cm² are large enough to describe their specific composition. Although these areas are very small, they are larger than those reported by COPPEJANS (1977) and DHONDT & COPPEJANS (1977) and used by VERLAQUE (1987), so it is always necessary to assess the minimal area before any structural study of a community should be undertaken.

Changes in biomass of *Halopteris scoparia* do not follow a clear annual pattern, which is rather unusual in the frame of benthic temperate communities (BALLESTEROS, 1991). Although no experimental studies have been made, changes in biomass of the main species seem to be determined by catastrophic events (storms) or by extensive grazing by sea urchins (*Paracentrotus lividus*). Even though a biomass regular cycle is lacking for *Halopteris scoparia*, two community stages can be discerned along the year. A developed community, with a high homogeneity and low species and pattern diversities, is characteristic of summer, while a diversified community, with a high heterogeneity and high diversity and species richness, characterizes the winter time (tables 2, 3). The developed community coincides with both a high temperature and irradiance and a low nutrient availability. The diversified community takes place at low irradiances and temperatures and at a relatively high nitrate availability (fig. 7).

In conclusion, the photophilic algal community dominated by *Halopteris scoparia* from Tossa de Mar phytosociologically belongs to the *Padino-Cladostephetum hirsutae* J. Feldmann 1937, an algal association which is restricted to the coldest areas of the Western Mediterranean (Gulf of Lions). This association is devoid of an erect upper stratum of Fucales and includes a rather large number of photophilic algal facies developing in calm waters, always over horizontal or subhorizontal rocky bottoms receiving a mean annual irradiance around 20-25 W m⁻². The species richness and the species diversity is very high as correspond to a photophilic Mediterranean algal community; this fact is enhanced by the high miniaturization of this kind of communities which allows the coexistence of more than 100 algal species in a reduced area smaller than 800 cm². The seasonal cycle of the community is not determined by the biomass changes of the dominant species as this seems to be dependent of grazing or catastrophic events. A developed community (summer) and a diversified community (winter) are two stages that can be discerned attending to the changes in structural parameters such as community homogeneity, species richness, species diversity and pattern-diversity.

Table I.—Seasonal variation in the species composition of the *Halopteris scoparia* community. Species abundance is expressed in coverage percentage (first quantity) and g dw m⁻² (second quantity). Inventory 1 correspond to 100182, 2 to 90482, 3 to 80782 and 4 to 11082.

Species	1	2	3	4
<i>Halopteris scoparia</i> (Linné) Sauvageau	58,93 157,97	32,50 67,42	145,11 262,42	202,27 427,37
<i>Lithophyllum incrustans</i> Philippi	36,59 622,10	61,81 1288,47	93,72 1849,40	88,24 1512,55
<i>Cladophora prolifera</i> (Roth) Kützinger	32,22 93,48	19,38 38,71	14,99 25,19	7,45 16,52
<i>Jania corniculata</i> (Linné) Lamouroux	21,95 45,01	35,24 68,79	32,14 62,30	11,48 18,04
<i>Corallina granifera</i> Ellis & Solander	21,65 48,57	14,86 32,63	12,41 25,10	31,44 47,83
<i>Jania rubens</i> (Linné) Lamouroux	18,79 53,84	27,82 58,71	17,53 33,02	7,28 10,28
<i>Corallina elongata</i> Ellis & Solander	6,01 20,71	92,77 320,92	6,07 22,50	3,49 17,90
<i>Cladophora lehmanniana</i> (Lindenberg) Kützinger	5,87 11,35	4,95 7,96	3,04 4,41	6,65 19,96
<i>Amphiroa rigida</i> Lamouroux	0,26 2,18	6,30 43,14	2,18 11,51	11,65 77,28
<i>Jania</i> cf. <i>longifurca</i> Zanardini	0,05 0,15	5,54 13,44	6,06 16,15	2,27 5,68
<i>Lithophyllum dentatum</i> (Kützinger) Foslie sensu Hamel & Lemoine	1,68 48,44	3,00 138,30	0,13 3,47	2,49 69,96
<i>Dasya corymbifera</i> J. Agardh	2,79 2,79	9,31 18,48	0,65 0,65	0,26 0,26
<i>Titanoderma pustulatum</i> (Lamouroux) Nägeli	0,60 0,60	0,14 0,14	0,27 0,27	50,28 58,89
<i>Falkenbergia rufolanosa</i> (Harvey) Schmitz stadium	2,33 2,39	2,31 2,26	0,24 0,24	0,15 0,15
<i>Callithamnion byssoides</i> Arnott ex Harvey in Hooker	0,97 0,88	1,16 1,16	0,27 0,27	0,23 0,23
<i>Cordylecladia erecta</i> (Greville) J. Agardh	1,29 2,07	0,97 1,30	0,63 0,62	0,19 0,24
<i>Sphacelaria cirrosa</i> (Roth) C. Agardh	0,91 0,91	1,63 2,22	6,80 8,32	0,60 0,60
<i>Herposiphonia tenella</i> (C. Agardh) Ambronn v. <i>secunda</i> (C. Agardh) Hollenberg	1,07 1,07	0,29 0,29	3,11 3,24	3,44 3,44
<i>Lophosiphonia scopulorum</i> (Harvey) Womersley	1,29 1,42	,084 0,84	0,32 0,32	0,19 0,19
<i>Gigartina acicularis</i> (Roth) Lamouroux	0,93 2,82	0,05 0,05	1,22 2,23	0,03 0,03
<i>Colpomenia sinuosa</i> (Mertens ex Roth) Derbes & Solier	0,15 0,15	0,83 1,42	1,48 2,02	0,05 0,05
<i>Champia parvula</i> (C. Agardh) Harvey	0,69 0,85	0,15 0,15	0,59 0,059	0,13 0,13
<i>Cladophora rupestris</i> (Linné) Kützinger	0,24 0,28	0,59 0,78	0,05 0,05	0,18 0,22
<i>Enteromorpha multiramosa</i> Bliding	0,09 0,09	0,13 0,13	1,54 1,54	0,04 0,04
<i>Ceramium circinatum</i> (Kützinger) J. Agardh	0,20 0,20	0,03 0,03	0,66 0,66	0,04 0,04

Species	1	2	3	4
<i>Crouania attenuata</i> (C. Agardh) J. Agardh	0,18	0,68	0,18	0,10
	0,18	0,75	0,18	0,10
<i>Ceramium codii</i> (Richards) Mazoyer	0,13	0,15	0,18	0,18
	0,13	0,15	0,18	0,18
<i>Rhodophyllis divaricata</i> (Stackhouse) Papenfuss	0,24	0,40	0,13	0,06
	0,15	0,26	0,13	0,06
<i>Cladophora echinus</i> (Biaosoletto) Kützing	0,29	0,06	0,17	0,06
	0,37	0,06	0,17	0,06
<i>Ceramium flaccidum</i> (Kützing) Ardissonne	0,17	0,11	0,26	0,10
	0,11	0,34	0,32	0,10
<i>Ceramium strictum</i> Harvey	0,11	0,34	0,32	0,10
	0,11	0,34	0,32	0,10
<i>Plocamium cartilagineum</i> (Linné) Dixon	0,24	0,32	0,13	0,11
	0,24	0,32	0,13	0,11
<i>Ceramium echionotum</i> J. Agardh	0,17	0,10	0,40	0,03
	0,17	0,10	0,40	0,03
<i>Chaetomorpha aerea</i> (Dillwyn) Kützing	0,10	0,06	0,08	0,15
	0,10	0,06	0,08	0,15
<i>Gelidium pusillum</i> (Stackhouse) Le Jolis	0,19	0,01	0,14	0,01
	0,19	0,01	0,14	0,01
<i>Cladophora nigrescens</i> Zanardini ex Frauenfeld	0,14	0,03	0,05	0,04
	0,14	0,03	0,05	0,04
<i>Antithamnion cruciatum</i> (C. Agardh) Nägeli	0,09	0,23	0,19	0,08
	0,09	0,23	0,19	0,08
<i>Ulva rigida</i> C. Agardh	0,03	0,15	0,42	0,01
	0,03	0,15	0,46	0,01
<i>Polysiphonia furcellata</i> (C. Agardh) Harvey in Hooker	0,01	0,15	0,23	0,05
	0,01	0,15	0,23	0,05
<i>Monosporus pedicellatus</i> (Smith) Solier in Castagne	0,04	0,07	0,03	0,04
	0,04	0,09	0,03	0,04
<i>Laurencia obtusa</i> (Hudson) Lamouroux	0,06	0,01	0,26	0,10
	0,06	0,01	0,26	0,10
<i>Herposiphonia tenella</i> (C. Agardh) Ambronn	0,03	0,09	0,04	0,10
	0,03	0,09	0,04	0,10
<i>Hypoglossum hypoglossoides</i> (Stackhouse) Collins & Harvey	0,03	0,22	0,01	0,01
	0,03	0,22	0,01	0,01
<i>Radicilingua reptans</i> (Kylin) Papenfuss	0,01	0,01	0,01	0,05
	0,01	0,01	0,01	0,03
<i>Derbesia tenuissima</i> (De Notaris) Crouan & Crouan	0,03	0,01	0,01	0,01
	0,03	0,01	0,01	0,01
<i>Padina pavonica</i> (Linné) Thivy	.	0,27	59,52	1,34
	.	0,33	63,00	2,39
<i>Fosliella farinosa</i> (Lamouroux) Howe	1,54	.	0,05	0,14
	0,52	.	0,05	0,14
<i>Feldmannia globifera</i> (Kützing) Hamel	.	0,75	0,14	0,01
	.	0,92	0,14	0,01
<i>Lyngbya sordida</i> (Zanardini) Gomont	0,01	.	0,04	0,52
	0,01	.	0,04	0,52
<i>Lyngbya meneghiniana</i> Gomont	0,01	.	0,20	0,20
	0,01	.	0,20	0,20
<i>Lomentaria ercegovicii</i> Verlaque, Boudouresque, Marcot-Coqueugniot & Giraud	.	0,33	0,10	0,05
	.	0,33	0,10	0,05
<i>Aphanocladia stichidiosa</i> (Funk) Ardré	.	0,15	0,24	0,03
	.	0,15	0,24	0,03

Species	1	2	3	4
<i>Spermothamnion repens</i> (Dillwyn) Rosenvinge v.	.	0,34	0,01	0,04
<i>turneri</i> (Mertens) Rosenvinge	.	0,34	0,01	0,04
Ectocarpaceae unidentified	0,05	0,23	0,01	.
	0,05	0,23	0,01	.
<i>Ceramium ciliatum</i> (Ellis) Ducluzeau v. <i>robustum</i>	0,01	0,09	0,23	.
(J. Agardh) Mazoyer	0,01	0,09	0,23	.
<i>Wrangelia penicillata</i> C. Agardh	0,19	.	0,01	0,04
	0,19	.	0,01	0,04
<i>Compsothamnion thuyoides</i> (Smith) Schmitz	0,08	0,17	.	0,01
	0,08	0,17	.	0,01
<i>Audouinella daviesii</i> (Dillwyn) Woelkerling	0,04	0,17	0,03	.
	0,04	0,17	0,03	.
<i>Codium vermilara</i> (Olivi) Delle Chiaje	0,05	0,17	0,01	.
	0,05	0,38	0,01	.
<i>Audouinella caespitosa</i> (J. Agardh) Dixon	0,15	0,10	0,04	.
	0,15	0,10	0,04	.
<i>Cladophora albida</i> (Hudson) Kützinger	.	0,04	0,17	0,01
	.	0,04	0,17	0,01
<i>Halodictyon mirabile</i> Zanardini	0,01	0,01	0,13	.
	0,01	0,01	0,13	.
<i>Stylonema alsidii</i> (Zanardini) Drew	0,09	0,09	0,09	.
	0,09	0,09	0,09	.
<i>Ceramium rubrum</i> (Hudson) C. Agardh	0,04	0,10	.	0,01
	0,04	0,10	.	0,01
<i>Callithamnion decompositum</i> J. Agardh	0,08	0,05	.	0,01
	0,08	0,05	.	0,01
<i>Spermothamnion flabellatum</i> Bornet	0,01	0,09	0,01	.
	0,01	0,09	0,01	.
<i>Callithamniella tingitana</i> (Schousboe ex Bornet)	0,03	0,03	0,04	.
G. Feldmann	0,03	0,03	0,04	.
<i>Halicystis parvula</i> Schmitz stadium	.	0,05	0,03	0,05
	.	0,05	0,03	0,05
<i>Halopteris filicina</i> (Grateloup) Kützinger	0,03	0,01	.	0,03
	0,03	0,01	.	0,03
<i>Cladostephus hirsutus</i> (Linné) Prud'homme van Reine	.	.	0,42	16,17
	.	.	0,61	53,56
<i>Cladophora vagabunda</i> (Linné) Hoek	.	.	13,76	0,01
	.	.	14,57	0,01
<i>Aglaozonia melanoidea</i> Schousboe ex Sauvageau	3,55	3,75	.	.
stadium	6,38	6,75	.	.
<i>Mesophyllum lichenoides</i> (Ellis) Lemoine	0,10	3,78	.	.
	1,02	37,76	.	.
Florideae (encrusting) unidentified	2,68	0,89	.	.
	2,68	0,89	.	.
<i>Dictyota dichotoma</i> (Hudson) Lamouroux	.	.	5,14	0,26
	.	.	3,33	0,18
<i>Aglaozonia parvula</i> (Greville) Zanardini stadium	.	.	1,01	1,79
	.	.	1,72	1,79
<i>Cutleria adspersa</i> (Mertens ex Roth) De Notaris	0,03	1,70	.	.
	0,03	2,45	.	.
<i>Myriogramme minuta</i> Kylin	0,04	0,36	.	.
	0,04	0,18	.	.
<i>Seirospora interrupta</i> (Smith) Schmitz	0,01	0,42	.	.
	0,01	0,42	.	.

Species	1	2	3	4
<i>Polysiphonia</i> sp.	0,04 0,04	.	0,24 0,24	.
<i>Erythrotrichia carnea</i> (Dillwyn) J. Agardh	0,11 0,11	0,20 0,20	.	.
<i>Callithamnion</i> sp.	0,20 0,20	0,06 0,06	.	.
<i>Stylonema cornu-cervi</i> Reinsch	0,10 0,02	0,17 0,17	.	.
<i>Lomentaria clavellosa</i> (Turner) Gaillon	0,15 0,15	0,15 0,15	.	.
<i>Antithamnion tenuissimum</i> (Hauck) Schiffner	0,01 0,01	0,15 0,15	.	.
<i>Bryopsis duplex</i> De Notaris	0,15 0,15	0,01 0,01	.	.
<i>Enteromorpha clathrata</i> (Roth) Greville	0,05 0,05	0,09 0,05	.	.
<i>Valonia utricularis</i> (Roth) C. Agardh	0,04 0,04	.	.	.
<i>Vickersia baccata</i> (J. Agardh) Karsakoff emend. Boergesen	0,11 0,11	0,01 0,01	.	.
<i>Myriactula gracilis</i> Van der Ben	.	0,08 0,08	0,09 0,09	.
<i>Acrosorium uncinatum</i> (Turner) Kylin v. <i>reptans</i> (Crouan & Crouan) Boudouresque et al.	.	0,10 0,10	0,10 0,01	.
<i>Giffordia sandriana</i> (Zanardini) Hamel	0,03 0,03	0,10 0,10	.	.
Dictyotaceae unidentified	0,09 0,09	0,01 0,01	.	.
<i>Daysa hutchinsiae</i> Harvey in Hooker	.	0,08 0,08	0,03 0,03	.
<i>Pedobesia lamourouxii</i> (J. Agardh) J. Feldmann, Loreau, Codomier & Couté	0,05 0,05	.	0,04 0,04	.
<i>Halopitys incurvus</i> (Hudson) Batters	0,08 0,08	0,01 0,01	.	.
<i>Trailliella intricata</i> Batters stadium	0,04 0,04	.	0,01 0,01	.
<i>Polysiphonia fruticulosa</i> (Wulfen) Sprengel	.	0,05 0,05	0,01 0,01	.
<i>Giraudia sphacelarioides</i> Derbès & Solier	.	0,01 0,01	0,11 0,11	.
<i>Dictyopteris membranacea</i> (Stackhouse) Batters	.	0,05 0,03	0,01 0,01	.
<i>Anotrichium barbatum</i> (Smith) Nägeli	.	0,03 0,03	0,05 0,05	.
<i>Enteromorpha prolifera</i> (Müller) J. Agardh	.	0,04 0,04	0,01 0,01	.
<i>Enteromorpha compressa</i> (Linné) Greville	.	0,01 0,01	0,04 0,04	.
<i>Chondria tenuissima</i> (Goodenough & Woodward) C. Agardh	.	0,01 0,01	0,03 0,03	.
<i>Heterosiphonia crispella</i> (C. Agardh) Wynne	0,03 0,03	.	0,01 0,01	.
<i>Antithamnion heterocladum</i> Funk	0,04 0,04	0,01 0,01	.	.

Species	1	2	3	4
<i>Pterothamnion crispum</i> (Ducluzeau) Nägeli	0,01	0,03	.	.
	0,01	0,03	.	.
<i>Cladophora dalmatica</i> Kützinger	0,01	0,01	.	.
	0,01	0,01	.	.
<i>Antithamnionella elegans</i> (Berthold) Price & John	0,01	0,01	.	.
	0,01	0,01	.	.
<i>Compsothamnion gracillimum</i> De Toni	0,01	0,01	.	.
	0,01	0,01	.	.
Cladophoraceae unidentified	.	0,01	0,01	.
	.	0,01	0,01	.
Ceramiaceae unidentified	.	0,01	.	0,01
	.	0,01	.	0,01
<i>Udotea petiolata</i> (Turra) Boergesen	18,98	.	.	.
	89,91	.	.	.
<i>Melobesia membranacea</i> (Esper) Lamouroux	1,40	.	.	.
	0,50	.	.	.
<i>Spermothamnion repens</i> (Dillwyn) Rosenvinge v.	0,59	.	.	.
<i>flagelliferum</i> (De Notaris) G. Feldmann	0,59	.	.	.
<i>Pseudolithoderma adriaticum</i> (Hauck) Verlaque	0,26	.	.	.
	0,38	.	.	.
<i>Laurencia</i> aff. <i>pinnatifida</i> (Hudson) Lamouroux	0,18	.	.	.
	0,18	.	.	.
<i>Ptilothamnion pluma</i> (Dillwyn) Thuret in Le Jolis	0,13	.	.	.
	0,13	.	.	.
<i>Gymnogongrus griffithsiae</i> (Turner) Martens	0,06	.	.	.
	0,06	.	.	.
<i>Gelidium latifolium</i> (Greville) Bornet & Thuret	0,06	.	.	0,01
	0,06	.	.	0,01
<i>Sphaerococcus coronopifolius</i> Stackhouse	0,05	.	.	.
	0,05	.	.	.
<i>Erythrotrichia obscura</i> Berthold	0,04	.	.	.
	0,04	.	.	.
<i>Feldmannia irregularis</i> (Kützinger) Hamel	0,04	.	.	.
	0,04	.	.	.
<i>Audouinella</i> sp.	0,04	.	.	.
	0,04	.	.	.
<i>Audouinella trifila</i> (Buffham) Dixon	0,03	.	.	.
	0,03	.	.	.
<i>Lyngbya aestuarii</i> (Mertens) Liebmann ex Gomont	0,01	.	.	.
	0,01	.	.	.
<i>Ectocarpus siliculosus</i> (Dillwyn) Lyngbye v.	0,01	.	.	.
<i>confervoides</i> (Roth) Kjellman	0,01	.	.	.
<i>Polysiphonia denudata</i> (Dillwyn) Greville ex Harvey	0,01	.	.	.
	0,01	.	.	.
<i>Chaetomorpha capillaris</i> (Kützinger) Boergesen	0,01	.	.	.
	0,01	.	.	.
<i>Pringsheimiella scutata</i> (Reinke) Marchewianka	0,01	.	.	.
	0,01	.	.	.
<i>Calosiphonia vermicularis</i> (J. Agardh) Schmitz	0,01	.	.	.
	0,01	.	.	.
Melobesiae unidentified	.	26,73	.	.
	.	267,35	.	.
<i>Dilophus ligulatus</i> (Kützinger) J. Feldmann	.	1,80	.	.
	.	0,89	.	.

Species	1	2	3	4
<i>Acetabularia acetabulum</i> (Linné) Silva	.	.	0,70	.
	.	.	1,30	.
<i>Peyssonnelia squamaria</i> (Gmelin) Decaisne	.	0,61	.	.
	.	1,79	.	.
<i>Sphondylothamnion multifidum</i> (Hudson) Nägeli	.	0,50	.	.
	.	4,72	.	.
<i>Taonia atomaria</i> (Woodward) J. Agardh	.	0,09	.	.
	.	0,09	.	.
<i>Erythrotrichia investiens</i> (Zanardini) Bornet	.	0,09	.	.
	.	0,09	.	.
<i>Griffithsia schousboei</i> Montagne	.	0,08	.	.
	.	0,08	.	.
<i>Apoglossum ruscifolium</i> (Turner) J. Agardh	.	0,05	.	.
	.	0,05	.	.
<i>Porphyra</i> sp.	.	0,05	.	.
	.	0,05	.	.
<i>Ceramium cinnabarinum</i> (J. Agardh) Hauck	.	0,04	.	.
	.	0,04	.	.
<i>Cryptonemia lomation</i> (Bertoloni) J. Agardh	.	0,03	.	.
	.	0,03	.	.
<i>Polysiphonia mottei</i> Lauret	.	0,03	.	.
	.	0,03	.	.
<i>Enteromorpha aragöensis</i> Bliding	.	0,03	.	.
	.	0,03	.	.
<i>Bonnemaisonia asparagoides</i> (Woodward) C. Agardh	.	0,03	.	.
	.	0,03	.	.
<i>Pleonosporium borneri</i> (Smith) Nägeli ex Hauck	.	0,03	.	.
	.	0,03	.	.
<i>Antithamnionella spirographidis</i> Schiffner	.	0,03	.	.
	.	0,03	.	.
Gigartinal unidentified	.	0,03	.	.
	.	0,03	.	.
<i>Pterosiphonia parasitica</i> (Hudson) Falkenberg	.	0,01	.	.
	.	0,01	.	.
<i>Dasyopsis spinella</i> (C. Agardh) Zanardini	.	0,01	.	.
	.	0,01	.	.
<i>Callithamnion corymbosum</i> (Smith) Lyngbye	.	0,01	.	.
	.	0,01	.	.
<i>Bryopsis cupressoides</i> Kützinger	.	0,01	.	.
	.	0,01	.	.
<i>Chondria coerulescens</i> (J. Agardh) Falkenberg	.	0,01	.	.
	.	0,01	.	.
<i>Audouinella codii</i> (Crouan & Crouan) Garbary	.	0,01	.	.
	.	0,01	.	.
<i>Bryopsis plumosa</i> (Hudson) C. Agardh	.	0,01	.	.
	.	0,01	.	.
<i>Choreonema thuretii</i> (Bornet) Schmitz	.	0,01	.	.
	.	0,01	.	.
<i>Callithamnion</i> sp. 2	.	0,01	.	.
	.	0,01	.	.
<i>Callithamnion tetragonum</i> (Withering) S.F. Gray	.	0,01	.	.
	.	0,01	.	.
<i>Giffordia mitchelliae</i> (Harvey) Hamel	.	.	0,33	.
	.	.	0,33	.

Species	1	2	3	4
<i>Symploca hydroides</i> Kützing	.	.	0,27	.
	.	.	0,27	.
<i>Calothrix confervicola</i> (Roth) C. Agardh	.	.	0,20	.
	.	.	0,20	.
<i>Castagnea cylindrica</i> Sauvageau	.	.	0,10	.
	.	.	0,10	.
<i>Lophosiphonia reptabunda</i> (Suhr in Kützing) Kylin	.	.	0,09	.
	.	.	0,09	.
<i>Peyssonnelia bornetii</i> Boudouresque & Denizot	.	.	0,08	.
	.	.	0,08	.
<i>Monosporus pedicellatus</i> (Smith) Solier in Castagne	.	.	0,06	.
v. <i>tenuis</i> G. Feldmann	.	.	0,06	.
<i>Cystoseira caespitosa</i> Sauvageau	.	.	0,06	.
	.	.	0,06	.
<i>Nithophyllum micropunctatum</i> Funk	.	.	0,05	.
	.	.	0,05	.
<i>Siphonocladus pusillus</i> (Kützing) Hauck	.	.	0,03	.
	.	.	0,03	.
<i>Myriactula rivulariae</i> (Suhr) J. Feldmann	.	.	0,03	.
	.	.	0,03	.
<i>Rhodymenia ardissoni</i> J. Feldmann	.	.	0,01	.
	.	.	0,01	.
<i>Phaeophila viridis</i> (Reinke) Parke & Burrows	.	.	0,01	.
	.	.	0,01	.
<i>Seirospora sphaerospora</i> J. Feldmann	.	.	0,01	.
	.	.	0,01	.
<i>Sphacelaria tribuloides</i> Meneghini	.	.	0,01	.
	.	.	0,01	.
<i>Blidingia minima</i> (Nägeli ex Kützing) Kylin	.	.	0,01	.
	.	.	0,01	.
<i>Elachista</i> sp.	.	.	0,01	.
	.	.	0,01	.
Nithophyllae unidentified	.	.	0,01	.
	.	.	0,01	.
<i>Cladophora laetevirens</i> (Dillwyn) Kützing	.	.	.	0,14
	.	.	.	0,14
<i>Lophosiphonia cristata</i> Falkenberg	.	.	.	0,06
	.	.	.	0,06
<i>Pterothamnion plumula</i> (Ellis) Nägeli v. <i>bebbii</i>	.	.	.	0,03
(Reinsch) J. Feldmann	.	.	.	0,03
<i>Gelidiella lubrica</i> (Kützing) J. Feldmann & Hamel	.	.	.	0,03
	.	.	.	0,03
<i>Bryopsis</i> sp.	.	.	.	0,03
	.	.	.	0,03
<i>Dilophus fasciola</i> (Roth) Howe	.	.	.	0,01
	.	.	.	0,01
<i>Aphanocapsa sescianensis</i> Frémy	.	.	.	0,01
	.	.	.	0,01
<i>Acinetospora vidovichii</i> (Meneghini) Sauvageau	.	.	.	0,01
	.	.	.	0,01

Table II.—Seasonal variation in biomass (g dw m⁻²) percentage coverage, species distribution (*k*), species richness (*R*) and qualitative minimal area (M20/5) for the different samples.

Sample	Date	Biomass	% cover	K	R	M20/5
1	100182	1127.7	252.0	10.2	95.7	392
2	090482	2436.1	372.2	8.4	114.9	323
3	080782	2428.1	426.0	4.5	90.3	174
4	011082	2348.7	453.1	8.7	59.6	334

Table III.—Seasonal variation in species diversity (*A*) and pattern diversity (*S*) calculated from biomass data (b) or coverage values (r). Correlation coefficients between experimental and adjusted curves fitted to a Michaelis-Menten function are also indicated.

Sample	Data	A _b	S _b	r _b ²	A _r	S _r	r _r ²
1	100182	2.68	164	0.996	3.77	184	0.988
2	090482	2.60	178	0.986	3.82	204	0.990
3	080782	1.49	81	0.865	3.19	153	0.956
4	011082	1.78	117	0.706	2.66	153	0.924

Table IV.—Quantitative and qualitative dominance of the main ecological supergroups.

Ecological group	Quantitative dominance	Qualitative dominance
Photophilic, sheltered	42,06	12,97
Photophilic	18,70	10,27
Photophilic, wave washed	0,17	3,24
Infralittoral rocky bottoms	31,46	9,73
Sciaphilic	4,76	35,66
Thionitrophilic	0,23	5,41
<i>Posidonia</i> leaves	0,02	1,62
Mediolittoral	—	5,41
Others	2,55	15,68

Table V.—Structural parameters of some infralittoral communities from the North-Western Mediterranean. Sampling area in cm² (*S*), number of species per sample (*N*), species diversity (*A_r*, in bits), pattern diversity (*S_r*, in cm²), biomass (*B*, in g dw m⁻²) and percentage coverage (% c) are indicated.

Community	S	N	A _r	S _r	B	% c	reference
<i>Padino-Cladostephetum hirsutae</i>	784	104	3,4	177	2085	376	this paper
<i>Anadyomeno-Padinetum pavonicae</i>	250	86	3,9	—	—	199	VERLAQUE (1987)
<i>Cystoseiretum caespitosae</i>	784	105	3,5	186	1439	499	BALLESTEROS (1990)
<i>Cystoseiretum balearicae</i>	250	84	3,6	—	—	247	VERLAQUE (1987)
<i>Cystoseiretum crinitae</i>	400	62	3,0	128	2142	534	BALLESTEROS (1984)
<i>Neogoniolitho-Pseudolithodermetum</i>	250	50	2,5	—	—	72	VERLAQUE (1987)
<i>Herposiphonio-Corallinetum elongatae</i>	225	35	1,2	38	2852	790	BALLESTEROS (1988a)
<i>Cystoseiretum strictae</i>	250	36	2,5	—	—	200	VERLAQUE (1987)
<i>Cystoseiretum mediterraneae</i>	784	51	2,3	110	1699	431	BALLESTEROS (1988b)
<i>Rhodymenio-Codietum vermilarae</i>	1024	123	3,9	246	1810	305	BALLESTEROS (1989)

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