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Preliminary Study on the Dynamics of *Cystoseira abies-marina* Populations in Tenerife (Canary Islands)

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4 Figures, 1 Table

The marine flora of the Canary Islands has received considerable attention from biologists. The main studies have been taxonomical, floristic and biogeographical researchs, whereas only very few works have been done with an eco-physiological approach (JOHNSTON 1969; HAROUN et al. 1984).

Only in recent years, the processes that affect the pattern and persistence of marine communities are receiving increasing attention (SCHIEL & FORSTER 1986). In the shallow sublittoral waters of the Canary Islands, the brown alga *Cystoseira abies-marina* (GMELIN) C. AGARDH (Fucales, Cystoseiraceae) is the dominant species in most phytobenthonic communities of rocky coasts (WILDPRET et al. 1987). These sublittoral forests play an important role as nursery grounds for local fisheries. The structure and dynamics of *C. abies-marina* populations are poorly known. This paper is a preliminary report on the variation of some biometrical parameters of this plant, as well as the biomass data of two populations in Tenerife Island.

Material and methods

C. abies-marina populations were studied at 5 m depth in two localities: Tacoronte (Northern station) and Güimar (Southern station) (Fig. 1 and Table 1). The former is an exposed coast, with extensive and deep *C. abies-marina* beds, whereas the latter is a more sheltered station, where *C. abies-marina* only appears at few meters depth, due to intensive grazing by sea urchins (*Diadema antillarum* PHILLIPPI).

Monthly five samples of 50 x 50 cm were randomly taken from homogeneous populations of *C. abies-marina* for the biomass study. All the plants present in the quadrant were listed, and *C. abies-marina* specimens were dried to constant weight (80°C, 48 h). The remaining species were underestimated as their contribution was minimal (less than 5% total biomass).

Besides, 5 plants (a plant defined as an isolated cluster of haptera with several erect axis) were carried to the laboratory for the biometrical study.

Table 1.

COMMUNITY STRUCTURE	
NORTHERN STATION	SOUTHERN STATION
Few cohort species	More cohort species
Without epiphytes	With epiphytes
Small open spaces	Large open spaces

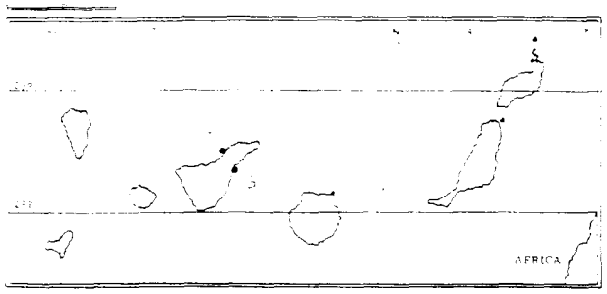

Fig. 1. Localization of study zones: T = Tacoronte (northern station) and G = Güimar (southern station).

Morphologically, *C. abies-marina* is an atypical member of the genus, without a holdfast and no main axis can be recognized within the numerous, thorny primary branches that arise from the basal haptera (GIL-RODRIGUEZ 1978). In every plant, a basal area of 3 x 3 cm was used as standard measure. The number and length of primary branches, as well as all secondary branches and the scars present along each primary branch were counted.

No samples were taken in Tacoronte during the winter months, because of the heavy surge conditions. Likewise, Güimar was not sampled in February.

Results

The monthly variation of biomass values is similar in both stations (Fig. 2). During almost all months the biomass was higher in the northern station. The minimal values were measured in December: 707,8 g dry wt./m^2 in Tacoronte and 479,7 g dry wt./m^2 in Güimar, then went up abruptly in late spring, and maximal values were recorded in May and July: 1346,2 g dry wt./m^2 at Güimar and 1760,0 g dry wt./m^2 in Tacoronte respectively. In the coasts, from May to September, an increasing amount of drift plants were found, specially after the sporadic storms.

The morphology of plants collected in Tacoronte and Güimar in the same month is different (Fig. 3). Plants from the northern station are stronger, larger and with numerous secondary branches along the primary branches, whereas southern plants are slender, shorter and less branched. The biometrical parameters of plants from Güimar showed a similar variation trend as its biomass values (Fig. 4). The great number of primary branches measured in May, with shorter length and less secondary branches than the preceding months, is explained by the presence of many growing-up primary branches almost unbranched in this month. During the following months, the length of the primary branches and the total number of secondary branches increased again.

The community structure of *C. abies-marina* stands is clearly dominated by *C. abies-marina* plants, with a patched distribution.

In Tacoronte, *C. abies-marina* plants are rarely epiphyted and occupy almost all the available substrate, leaving small open spaces. The main cohort plants are *Lithophyllum lobatum* LEMOINE, that covers the substrate and sometimes small plants of *Gelidium arbuscula* BORY and *Dictyota* sp. are observed. On the other hand, the populations of *C. abies-marina* of Güimar supports some epiphytes as *Hypnea musciformis* (WULFEN) LAMOUROUX, *Sphacelaria cirrosa* (ROTH) C. AGARDH and *Jania rubens* (L.) LAMOUROUX. The community patchiness is more evident and presents a higher number of cohort species: *Lithophyllum lobatum* LEMOINE, *Stypopodium zonale* (LAMOUROUX) PAPENFUSS, *Cladophora prolifera* (ROTH) KÜTZING, *Rhodymenia pseudopalmata* (LAMOUROUX) SILVA, *Lobophora variegata* (LAMOUROUX) WOMERESLEY and *Sargassum vulgare* C. AGARDH.

Discussion

The seasonal variation of biomass in *C. abies-marina* communities at both stations is quite similar to that encountered in other *Cystoseira*-communities (GONZALEZ-RODRIGUEZ 1987; BALLESTEROS 1988). The increase in biomass can be explained by the great number of primary branches growing up during spring together with an increase in the number of secondary branches.

Probably, there is a better availability of nutrients in the surrounding water, which affect the productivity of the algal stands, specially in the northern station.

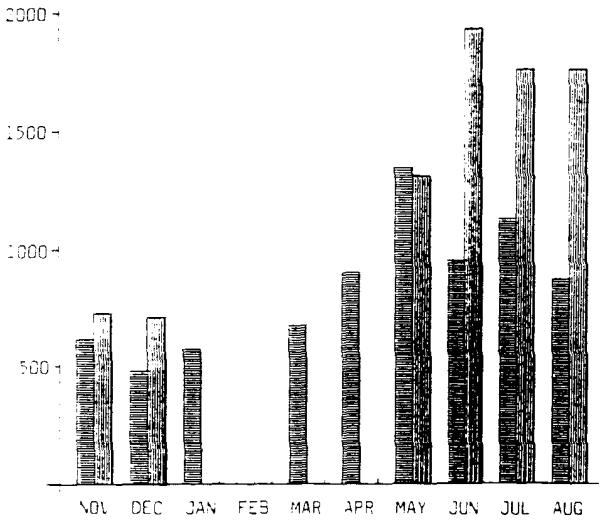

Fig. 2. Biomass values. Northern station: second column; Southern station: first column.

Fig. 3. Length and morphology of plants from the southern (a) and northern (b) station.

The sweeping action of thorny *Cystoseira* plants prevents the growth of other species and provides protection against herbivory (VELIMIROV & GRIFFITHS 1979). This action is more evident in the exposed station, where sea urchins are very rare in shallow waters. According to JOHNSTON (1969), the *C. abies-marina* stands never appeared below 15 m depth in Lanzarote due to the intense herbivorous grazing.

Water motion has been correlated with differences in the species abundance and morphology between localities (SCHIEL & FOSTER 1986). *C. abies-marina* plants from Güimar are smaller, less thorny and branched than Tacoronte plants.

Furthermore, the number of cohort species in the community is correlated with hydrodynamism. More species were found in the southern community compared to the northern one. In the Canary Islands, the morphology of *C. abies-marina* plants seems to be better adapted to stand in exposed or semiexposed conditions compared with other species. Further studies are needed to understand the eco-physiological processes occurring in this community.

Summary

The brown alga *Cystoseira abies-marina* (GMELIN) C. AGARDH is the dominant species in most rocky coasts of shallow waters in the Canary Islands. The growth pattern as well as the structure and dynamics of the community are described. Monthly, samples were taken in two localities at 5 m depth in two stations. In both stations, the biomass is minimal in late autumn, increasing along spring months to maximal values in summer. The growth process follows a similar trend, with numerous secondary branches arising in spring. The strong hydrodynamism of the northern station in relation to the southern one is reflected in the differences of the communities structure, as well as in the morphology of the plants.

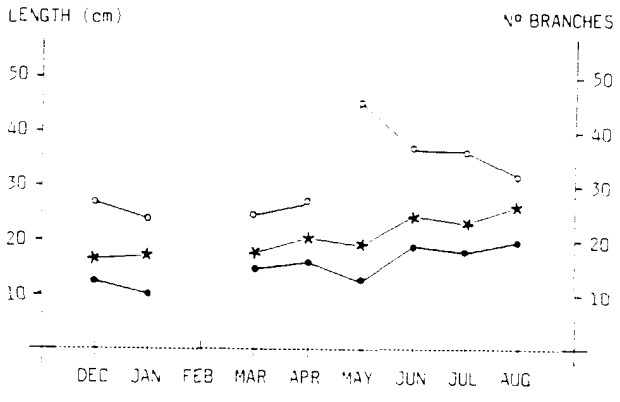

Fig. 4. Nº primary branches: ○—○; Length primary branches: ★—★; Total Nº secondary branches: ●—●.

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