

STUDY OF THE PHYTOBENTHOS FROM THE ARTIFICIAL REEF OF ARGUINEGUIN (GRAN CANARIA, CANARY ISLANDS)

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With 2 figures and 1 table

ABSTRACT. In the framework of an Artificial Reef Pluriannual Program promoted by the Autonomous Government of the Canary Island, in October 1991 an Artificial Reef was settled in Santa Agueda Bay (Arguineguín, Gran Canaria). Before its construction a study of the phytobenthonic communities was done in the selected reef zone and nearby areas.

The artificial reef complex is located on a sandy platform about 20m depth and 2.5 miles distance from the coast. The reef is defined by 85 concrete modules of different morphology in 5 groups.

The present study show the floristic catalogue of the species observed on the concrete modules. Besides, general data about the dynamic of the phytobenthonic communities are presented from Nov 91 to Jun 93, with a comparison with nearby areas.

INTRODUCTION

An artificial reef complex was constructed in the southern coast of Gran Canaria Island (Fig. 1). This artificial reef is composed of 85 modular concrete blocks, grouped in 5 separate units, each of them with different types of modules. The reef is deployed at 20 m depth and 2.2 miles from coastline.

Before the deposition of the concrete blocks, a preliminary assessment of the selected area was carried out between November 1990 and March 1991, in order to obtain the baseline level of the overall area. The study included oceanographic and SCUBA samplings in the artificial reef area, in the coastal rocky bottom and in a nearby sublittoral natural reef. The results obtained allowed us to make a bionomical chart of that coast and to characterize the reef area as a sandy platform between 17 to 21 m, with isolated natural reefs (16 - 20 m depth) closed to the artificial reef spot. The substrate is organic white sand, rich in detritus of

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mollusc shells, echinoderm skeletons and coralline calcareous boulders. The topographic profile remains almost unchanged up to several miles (5 miles) from the coast, where an underwater cliff reveals the end of the coastal island platform. The waters are oligotrophic, nutrient concentrations are low, sometimes with undetectable values. Benthonic communities are mainly composed of different species of green algae and a rich community of invertebrates were observed (HAROUN *et al.*, 1993).

This contribution show the floristic catalogue of the macroalgal species observed on the concrete modules from Nov 1991 to June 1993. Besides, general data about the dynamic of the phytobenthonic communities are presented, with a comparison of nearby areas.

MATERIAL AND METHODS

Samplings were done with a periodicity of 2-3 months between November 1991 and June 1993, in the intertidal and subtidal zones. The conditions of the different modules were prospected using SCUBA equipments. The samples were fixed in formalin 4 % in sea water for later examination in the laboratory.

The collected specimens were stored, as microscopic slides and herbarium sheets in the Biology Department Herbarium (BCM) of the University of Las Palmas de Gran Canaria. In general, the name of the taxa are according to WYNNE (1986) and GALLARDO *et al.* (1985).

RESULTS AND DISCUSSION

A total of 143 species have been assessed in the all area, form which 1 (0.7 %) belongs to Magnoliophyta and the rest are macroalgae: 4 (2.7 %) Cyanophyta, 30 (20.8 %) Chlorophyta, 35 (24,3 %) Phaeophyta and 74 (51,4 %) Rhodophyta (see Table 1).

The evolution of the marine plant diversity along the period of sampling in the three areas: coastline, artificial reef and natural reef are presented in the pie charts obtained for each of the foresaid area per year (Fig. 2). Regarding the artificial reef area, there is an important increase in the number of species according to the number established prior to the installation of the artificial reef. This fact can be explained as result of the low diversity encountered on sandy bottoms compared to that of more stable substrates.

At the same time, it is necessary to point out to other phenomena:

On one side, a differential establishment of macroalgal species on the modules surfaces. The phytobenthonic cover is far more important in places further off the sand, probably due to the abrasion effect of the sand grains against the modules surfaces, that prevents the settlement of spores and germlings and their later development.

On the other, it is also interesting to mention that during the first period of study (November 1991 - April 1992, perennial species were not observed, only annual macroalgae were found (*Dictyota* spp.), although latter on some perennial species were also presented,

like *Sargassum* spp., *Stypocaulon scoparium*, among others.

Finally, it should be pointed out several macroalgal species that were observed only in the artificial reef area as:

Rhodophyta:

Anotrichium furcellatum
Ceramium flaccidum
Chrysimenia sp.
Dasya corymbifera
Helminthocladia calvadosii
Jania capillacea
Polysiphonia flexella
Scinaia complanata

Phaeophyta:

Arthrocladia villosa
Sauvageaugloia divaricata
Sporochnus bolleanus

Chlorophyta:

Acetabularia calyculus
Avrainvillea canariensis
Chaetomorpha capillaris
Microdictyon tenuis
Siphonocladus tropicus

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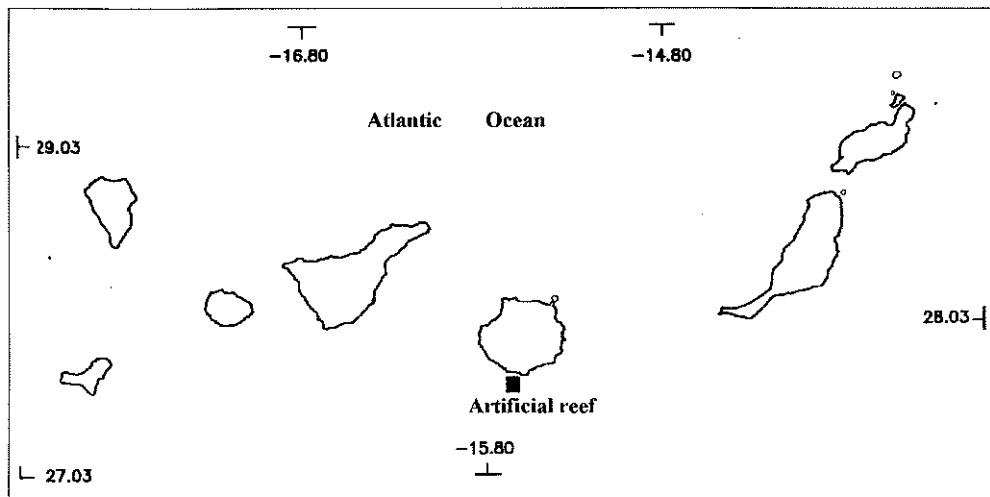


Figure 1 - Location of the Artificial reef (black spot) in the southern part of Gran Canaria Island.

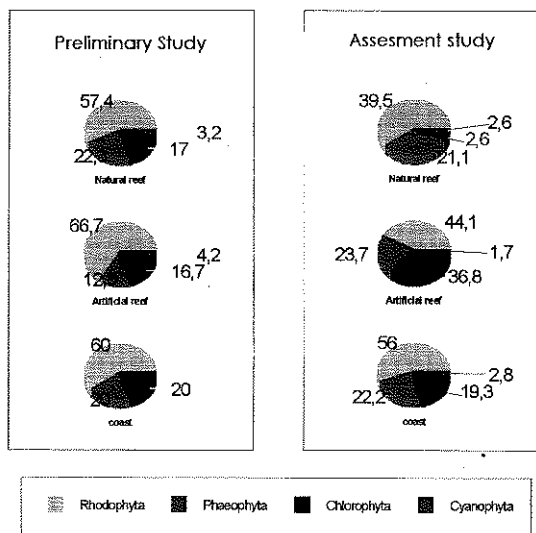


Figure 2 - The evolution of the marine plant diversity along the period of sampling in the three areas: coastline, artificial reef and natural reef obtained for each of the foresaid area per year.

TABLE 1 - Check-list of macrophytes of the artificial reef and adjacent areas.**Cyanophyta**

- Brachytrichia quoyi* (C. AG.) BORN. ET FLAH.
Calothrix crustacea THURET EX BORN. ET FLAH.
Oscillatoria lutea C. AGARDH EX GOMONT
Schizothrix calcicola (C. AGARDH) GOMONT

Rhodophyta

- Alsidium corallinum* C. AGARDH
Anotrichium furcellatum (J. AG.) BALDOCK
Asparagopsis taxiformis (DELILE) TREVISAN
Callithamnion byssoides ARNOTT EX HARVEY IN HOOK.
Callithamnion hookeri (DILLWYN) S. F. GRAY
Caulacanthus ustulatus (MERTENS) KÜTZ.
Centroceras clavulatum (C. AG.) MONT.
Ceramium ciliatum (ELLIS) DUCLUZ.
Ceramium circinatum J. AG.
Ceramium codii (KÜTZING) MAZOYER
Ceramium diaphanum (LIGHT.) ROTH.
Ceramium flaccidum (KÜTZ.) ARDISS.
Ceramium gracillimum (KÜTZ.) GRIFF. ET HARVEY IN HARVEY
Ceramium tenerrimum (MARTENS) OKAMURA
Champia intricata (CLEMENTE) CREMADES
Chondria dasyphylla (WOODW.) C. AG.
Chrysimenia sp.
Corallina elongata ELLIS ET SOL.
Cottoniella filamentosa (HOWE) BOERGESEN
Crouania attenuata (C. AG.) J. AG.
Dasya baillouviana (S. GMEL.) MONTAGNE
Dasya corymbifera J. AGARDH
Dasya crouaniana J. AGARDH
Dasya hutchinsiae HARVEY IN HOOK.
Dasya ocellata (GRAT.) HARVEY IN HOOK.
Dasya rigidula (KÜTZ.) ARDISSONE
Dipterosiphonia dendritica (C. AG.) SCHMITZ
Dipterosiphonia rigens (SCHOUSB.) FALKENB.

- Erythrocytis montagnei* (DERB. ET SOLIER) SILVA
Galaxaura rugosa (ELLIS ET SOL.) LAMOUR.
Gigartina acicularis (ROTH) LAMOUR.
Gracilaria verrucosa (HUDS.) PAPENF.
Griffithsia corallinoides (L.) BATT.
Griffithsia phyllamphora J. AG.
Haliptilon virgatum (ZANARDINI) GARBARY ET JOHANSEN
Halopitys incurvus (HUDS.) BATT.
Helmintocladia calvadosii (LAMOUR. EX DUBY) SETCHELL
Heterosiphonia crispella (C. AG.) WYNNE
Hypnea musciformis (WULF.) LAMOUR.
Hypnea spinella (C. AG.) KÜTZ.
Jania adhaerens LAMOUR.
Jania capillacea HARVEY
Jania rubens (L.) LAMOUR.
Laurencia hybrida (D. C.) LENORM. EX DUBY
Laurencia obtusa (HUDS.) LAMOUR.
Laurencia perforata (BORY) MONT.
Leptosiphonia schousboei (THUR.) KYLIN
Liagora canariensis BOERGENSEN
Liagora distenta (MERTENS) C. AGARDH
Liagora farinosa LAMOUR.
Lithothamnion corallioides CROUAN FRAT.
Lophocladia trichoclados (C. AG.) SCHIMTZ
Lophosiphonia obscura (J. AG.) FALKENB.
Ophidocladus simpliciusculus (P & H CROUAN) FALKENB.
Polysiphonia atlantica KAPRAUN & J. NORRIS
Polysiphonia breviararticulata (C. AG.) ZANARD.
Polysiphonia cf. brodiaei (DILLWYN) SPRENG.
Polysiphonia denudata (DILLWYN) GREVILLE EX HARV. IN HOOK.
Polysiphonia flexella (C. AG.) J. AG.
Polysiphonia flocculosa (C. AG.) KÜTZ.
Polysiphonia fruticulosa (WULF.) SPRENG.
Polysiphonia myriococca MONT.
Polysiphonia opaca (C. AG.) MOR. ET DE NOT.
Polysiphonia sertularioides (GRATELOUP) J. AG.
Polysiphonia tripinnata J. AG.
Polysiphonia urceolata (LIGHFOOT EX DILLW.) GREV.
Pterocladia capillacea (GMELIN) BORNEY ET THURET
Pterosiphonia pennata (C. AG.) FALKENB.

Pterosiphonia thuyoides (HARV. IN MACKAY) F. SCHIMITZ
Rhodymenia pseudopalmata (LAMOUR.) SILVA
Rytiphlaea tinctoria (CLEM.) C. AG.
Scinaia complanata (COLLINS) COTTON
Spyridia filamentosa (WULF.) HARVEY IN HOOK.
Wrangelia penicillata (C. AG.) C. AG.

Phaeophyta

Arthrocladia villosa (HUDSON) DUBY
Asperococcus compressus A. GRIFF. EX HOOK.
Asperococcus turnerii (SM.) HOOK.
Colpomenia sinuosa (ROTH) DERB. ET SOL.
Cystoseira abies-marina C. AG.
Cystoseira compressa (ESPER) GERLOFF ET NIZAM.
Cystoseira humilis SCHOUSB. IN KÜTZ.
Cystoseira mauritanica SAUVAGEAU
Dictyota dichotoma (HUDS.) LAMOUR.
Dictyota linearis (C. AG.) GREV.
Dictyota volubilis KÜTZ. SCUSU VICKERS
Discosporangium mesarthrocarpum (MENEHINI) HAUCK
Ectocarpus rhodochortonoides BOERGESEN
Feldmania globifera (KÜTZ.) HAMEL
Halopteris filicina (GRAT.) KÜTZ.
Hincksia mitchelliae (HARVEY) P.C. SILVA
Hincksia onslowensis (AMSLER & KAPRAUM) P. C. SILVA
Hydroclathrus clathratus (C. AG.) HOWE
Lobophora variegata (LAMOUR.) WOMERSLEY
Nereia filiformis (J. AG.) ZANAR.
Padina pavonica (L.) THIVY IN W. TAYLOR
Sargassum desfontainesii (TUR.) C. AG.
Sargassum filipendula C. AG.
Sargassum furcatum KÜTZING
Sargassum vulgare C. AG.
Sauvageaugloia divaricata (CROUAN) KYLIN
Scytosiphon lomentaria (LYNGB.) LINK
Sphacelaria cirrosa (ROTH) C. AGARDH
Sphacelaria fusca (HUDS.) S. F. GRAY
Sphacelaria rigidula KÜTZING
Sporochnus bolleanus MONTAGNE

Sporochmus pedunculatus (HUDS.) C. AG.
Stypocaulum scoparium (L.) KÜTZ.
Taonia atomaria (WOODW.) J. AG.
Zonaria tournefortii (LAMOUR.) MONTAGNE

Chlorophyta

Acetabularia acetabulum (L.) SILVA
Acetabularia calyculus QUOY & GAIMARD
Anadyomene stellata (WULF.) C. AG.
Avrainvillea canariensis A. ET E. S. GEPP.
Caulerpa prolifera (FORSK.) LAMOUR.
Caulerpa racemosa (FORSK.) J. AG.
Caulerpa webbiana MONTAGNE
Chaetomorpha capillaris (KÜTZ.) BOERG.
Chaetomorpha pachynema (MONT.) MONT. IN KÜTZ.
Cladophora coelothrix KÜTZ.
Cladophora cymopoliae BOERGESEN
Cladophora inclusa BOERGESEN
Cladophora prolifera (ROTH) KÜTZ.
Cladophoropsis membranacea (C. AG.) BOERG.
Codium taylorii SILVA
Cymopolia barbata (L.) LAMOUR.
Dasycladus vermicularis (SCOPOLI) KRASSER
Derbesia marina (LYNGBYE) KJELLMAN
Enteromorpha compressa (L.) GREV.
Enteromorpha intestinalis (L.) LINK
Enteromorpha prolifera (O. F. MÜLL.) J. AG.
Enteromorpha muscoides (CLEMENTE) CREMADES
Halimeda discoidea DECAISNE
Microdictyon boergesonii SETCHELL
Microdictyon temis (J. AG.) DECNE.
Polyphysa polyphysoides (P & H CROUAN) SCHNETTER
Siphonocladus tropicus (CROUAN FRAT.) J. AGARDH
Ulva rotundata BLIDING
Valonia utricularis (ROTH.) C. AGARDH

Magnoliophyta

Cymodocea nodosa (UCRIA) ASCHERSON