DISTRIBUTION AND STRUCTURE OF SEAGRASS MEADOWS IN LAS CANTERAS BEACH, LAS PALMAS, CANARY ISLAND (SPAIN)

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With 4 figures

ABSTRACT. The geological, climatic, and oceanographic characteristics of Las Canteras Beach (North of Gran Canaria Island), provided a special environment for the growth of different warm water species such as the seagrass *Gvmodocea nodosa* (Ucria) Ascherson.

The actual distribution and morphology of seagrass meadows observed in Las Canteras Beach are presented and compared with previous studies carried out in this area. In general, three different substrates were found: sandy, sand-rocky and rocky bottoms. About the structure on sandy bottoms, extensive seagrass meadows were observed, which are limited by clear-cut steps, and sometimes splashed by circular openings. In sand-rocky bottoms, the seagrass grows among rocks and algaes. In the rocky bottoms, the seagrass rhizomes are not buried, only the roots penetrates among the rocks and pebbles in some areas.

The comparison with previous studies shows the evolution of seagrass meadows: some areas shows an evident regression, whereas others have a new colonisation of *C. nodosa* plants. The meadows showed a high dynamics, which could be related to the relative fast growth of this plant.

RESUMO. As condições geológicas, climáticas e oceanográficas da Praia de Las Canteras (Norte da Ilha de Gran Canaria), proporcionam um ambiente propício ao estabelecimento e crescimento de diferentes espécies de águas temperadas como por exemplo fenerogâmica, *Cymodocea nodosa* (Ucria) Ascherson.

No presente trabalho, os autores descrevem a distribuição e morfologia actuais das pradarias de *C. nodosa* em Las Canteras comparando-as com estudos prévios desenvolvidos nesta área.

Foram definidos três tipos de substratos distintos: arenoso, areno-rochoso e

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rochoso. Do ponto de vista estrutural os fundos de areia apresentam pradarias extensas com limites bem definidos, no seio dos quais se observam algumas clareiras circulares bem delimitadas. Nos fundos areno-rochosos, a fenerogâmica estabelece-se entre as algas e as rochas. Nos fundos rochosos os rizomas não se enterram tendo-se observado penetração das raízes entre as rochas.

A comparação com estudos anteriores mostra uma evolução destas pradarias, na medida em que algumas áreas apontam uma regressão evidente enquanto noutras zonas se verifica a colonização.

Esta elevada dinâmica pode estar relacionada com o rápido crescimento típico de *C. nodosa*.

INTRODUCTION

The seagrass species present in the Canarian Archipelago are *Cymodocea nodosa* (Ucria) Ascherson (AFONSO-CARRILLO & GIL-RODRÍGUEZ, 1980), *Halophila decipiens* Ostenfeld (GIL-RODRÍGUEZ *et al.*, 1982) and *Zostera noltii* Hornemann (GIL-RODRÍGUEZ *et al.*, 1987). *C. nodosa* meadows are the most important in the shallow subtidal environments (PAVÓN-SALAS *et al.*, in press).

Seagrass meadows are characteristic elements in unconsolidated substrata of marine environments in tropical and temperate regions. Their pivotal role in many processes of the coastal ecosystems is actually well established (LARKUM *et al.*, 19891). These flowering plants are considered among the most productive in the biosphere, their meadows serve as nursery and breeding grounds for marine organisms (MCROY and MCMILLAN, 1977; BELL and WESTOBY, 1989), provide a suitable substratum for epiphytes and are a good source of food for marine herbivores (LARKUM *et al.*, 1989). Seagrasses also act as sediment stabilisers: anchor and filter sediments, breaking tidal and wave energy and contributing to sediment deposition and maintenance of the shoreline (ORTH, 1977; SHORT & WYLLIE-ECHEVERRIA, 1996).

This paper presents the distributional pattern of *C. nodosa* meadows in Las Canteras Beach, which is the only northern locality of the Canarian coast where this subtropical seagrass can be found (REYES *et al.*, 1995; PAVÓN-SALAS *et al.*, in press). Besides, a comparison with historical records is done, such as CANCAP-Report (1977-78) and GONZÁLEZ (1986). Another objective is to describe the structure of the seagrass meadows in different parts of the beach.

MATERIAL AND METHOD

Study site

Las Canteras is a sandy beach located on the northeastern coast of Gran Canaria Island (Canary Islands, Spain), with a total length of about 3 km long (Fig. l). Northward,

the beach is bounded to La Islet Peninsula, a headland that shields it from the Alisios Winds (the prevailing northeastern winds), southward it is limited by a groyne. About 200 m from the shoreline and parallel to it, a volcanic and sedimentary bar is present, which emerges during low tide periods, known as La Barra; despite this structure is partially thrown, it shelters the beach from the swells, forming a lagoon during low tide periods, and divides it in more or less protected areas. Due to its sheltered condition, the sea water temperature is a bit higher than in the surrounding waters. In the recent years, there is a steady decrease in the depth of the sheltered area due to the inflow of sand (ALONSO, 1993). The water and sediment exchanges is done through four main channels, each of them at the extremes of La Barra. In the lagoon there are different types of substrata; sandy bottoms, which are the most representative); stony and rocky bottoms, which are restricted to certain areas, such as near the channels.

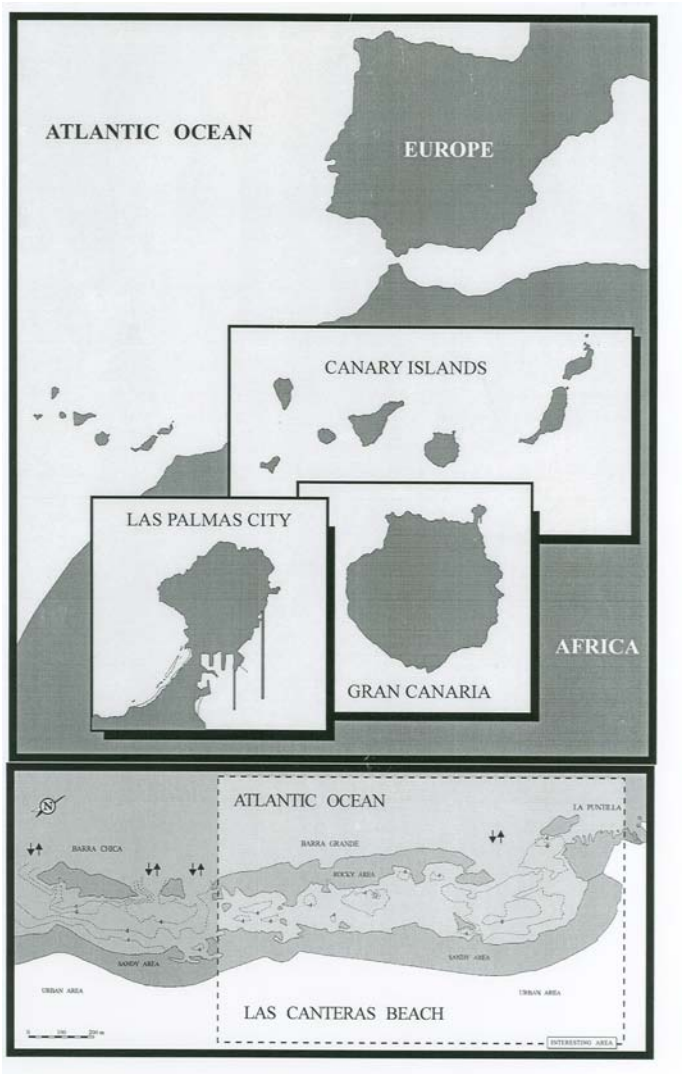


Fig. l - Localization of the studied area: Las Canteras Beach (Canary Islands, Spain).

The distributional data and structural characteristics of *C. nodosa* meadows were mainly taken in Las Canteras Beach on July 1995 by transect method. Due to the length of the beach (3 km), it has been necessary a large number of transects (19). In each transect, several data such as type of substrate, community structure, seagrass extension and shoot density (sampling area of 0.25 x 0.25 cm, i.e. 0.625 m^2) were taken by SCUBA diving. *C. nodosa* meadows grow in northern part of beach, the most protected area, where the average depth is 2 m. The present work is focused in this part of the beach and includes 12 transects, which are compared with previous studies carried out in Las Canteras by CANCAP-Report (1977-78) and GONZÁLEZ (1986). The CANCAP-project was made in the Confital Bay, which included four transects, one of them is located inside the studied area, and showed the presence of the seagrass meadows. The research of González was included in her Doctoral Thesis, which was mainly devoted to the florula of this beach.

RESULTS AND DISCUSSION

The distributional pattem of the *C. nodosa* meadows is plotted in the Figure 2. This chart shows the historical data (1985) as well as those obtained in this study (1995).

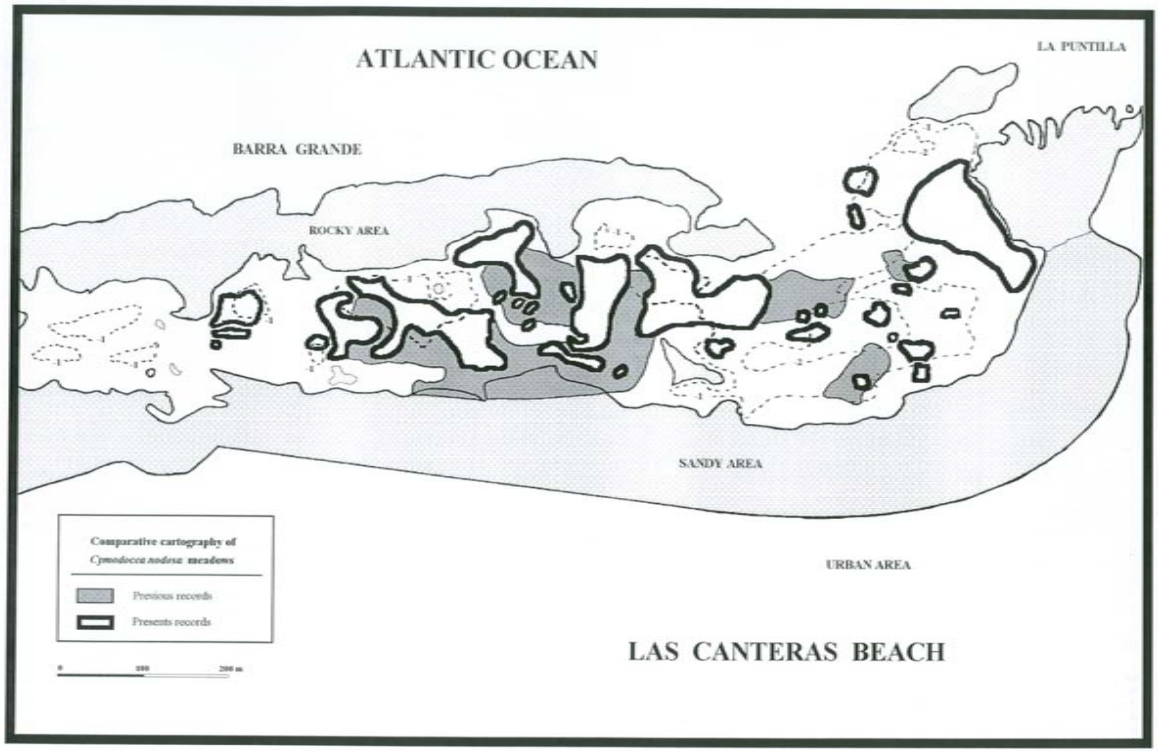


Fig. 2 - Distributional pattern of the *Cymodocea nodosa* meadows in Las Canteras Beach: previous and actual sizes of the medows in the studied area.

There are some important changes in the community which are worthy to point out. The most important is the fact that areas that were sumerged and with seagrass meadows more than ten years ago, at present time, this areas are emerged and consequently the seagrass had disappear. The large central meadows described by GONZÁLEZ has been fragmented in isolate patches.

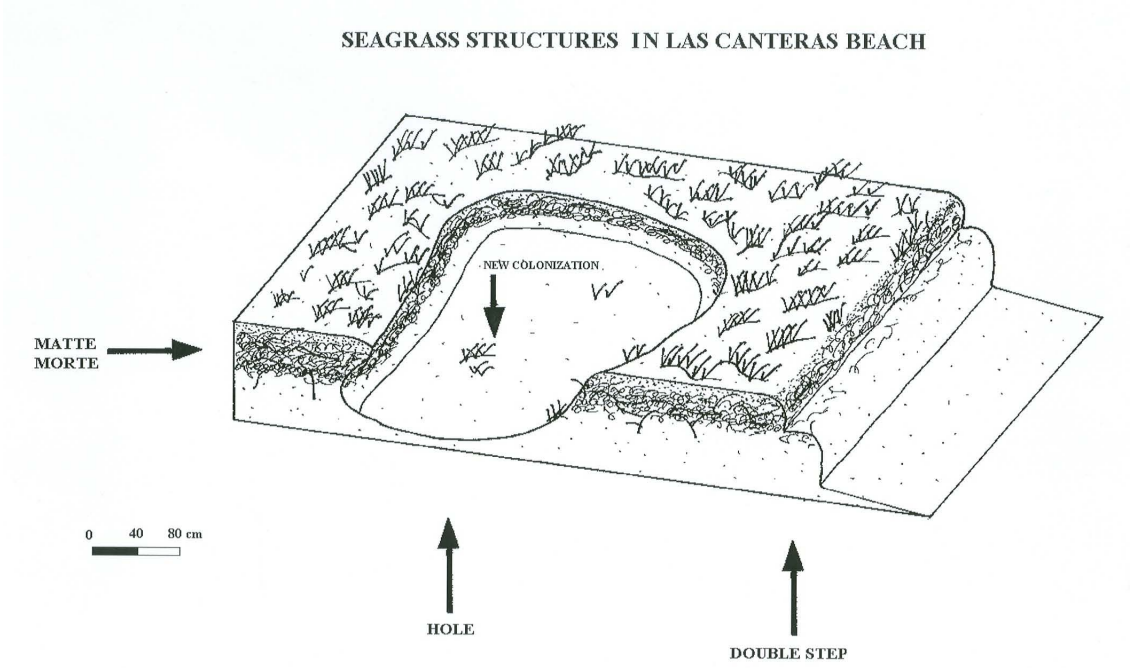
Besides, at present time, it is possible to find new seagrass patches on zones that have been transformed by the sedimentary process, from stony to mixed bottom (stony-sandy substrate), as for example near the northern extreme as well as nearby La Barra.

In some meadows there is a conspicuous step in the border of the community, which sometimes can reachs 1.20 m of height. This is a typical characteristic of *C. nodosa* meadows in the canarian population, although it has been mentioned in one Mediterranean population with a much shorter height (around 20 cm, BUIA *et al.*, 1985). Besides, in some places, borders with double steps can be observed. These characteristic steps allow to study the buried parts of the plant: roots and rhizomes, as well as some characteristic organisms of this microhabitats. This feature is due to the erosive action to the waves on the sediment. If the erosive action is too strong, the step collapses and it is possible a recolonization of the seagrass in the lowest part (Fig. 3a). In some areas, large patches may present clearings which are bounded by internal steps. These internal steps collapse and the rhizome tend to slightly recolonize the bare area.

Some features are remarkable in the buried part of the meadow: the presence of ‘matte morte’ (dead roots and rhizomes) and the stepped growth of the rhizomes (horizontal rhizome that changes to grow vertically). The ‘matte morte’ is not only buried but also it appears forming isolated patches, and eventually may appears among some areas of the alive meadow.

Besides, the effects of the exchange current, mainly in the vicinity of the channels, are evident by large ripple marks, some of which are colonised by *C. nodosa* (Fig. 3b). In theses small meadows the plant presents a development adapted to the strong currents: large roots and small rhizomes.

With regard to the shoot density (Fig. 4), the seagrass meadows present slight differences. It seems that the new seagrass meadows present higher shoot density compared with already stablished ones. Nevertheless, other factors, such as substrate type or direct human impact (walking on the meadows) may affect this parameter. This point needs further research.



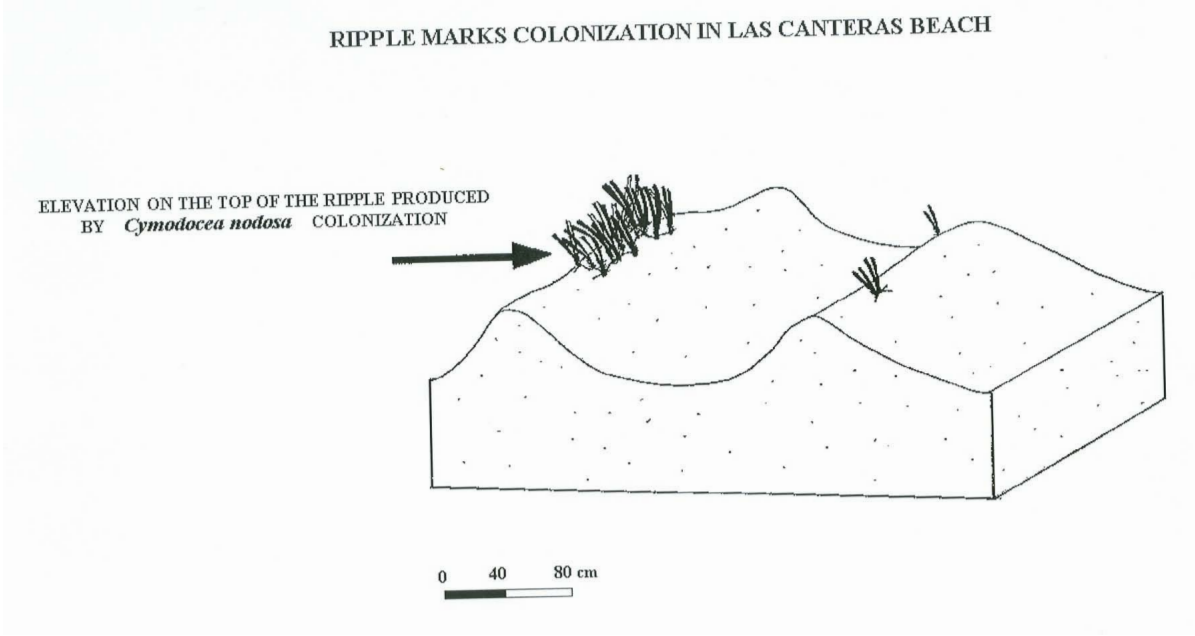


Fig. 3 - Drawings of some features of *C. nodosa* meadows in Las Canteras Beach: a) steps (single and double) in the meadow's border; and b) potential colonization on ripple-marks.

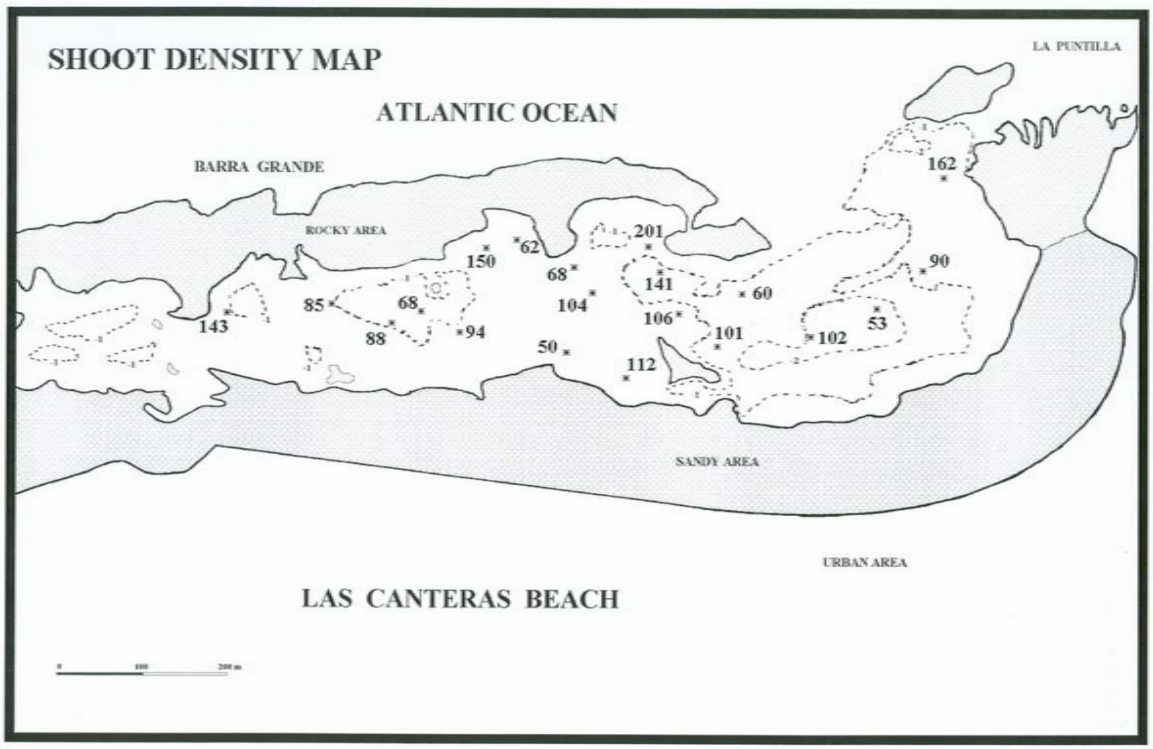


Fig. 4 - Distribution map of shoot density of *C. nodosa* meadows in Las Canteras Beach.

CONCLUSIONS

This study show the evolution of the seagrass meadows in Las Canteras Beach by comparison with the previous studies carried out 10 years ago and the actual records. The actual bathymetry of the area is mainly attributed to the increase of sediments, which contribute to a steady decrease of depth and a change in the types of substrate of some areas (from rocky to sandy-rocky bottoms). The large central meadow quoted in 1986 is actually fragmented in isolate patches. These results suggested that this meadow is disappearing in relation to the high sedimentation rate of that area. In the smaller meadows a conspicuous step in the border of the community (sometimes even border with double steps) and bare areas limited by internal steps can be observed.

Besides, new seagrass meadows are present in areas transformed by the sedimentary process. These areas present higher shoot density than other areas. Small meadows also start to develop on rippled-marks. It is worthy to mention the high dynamics of *C. nodosa* meadows in this locality which seems to reach a compromise between the high rate of sedimentation and the fast growth of this plant.

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