PRELIMINARY DATA ON BATHYMETRIC AND TEMPORAL CHANGES IN THE MORPHOLOGY OF A MALTESE *POSIDONIA OCEANICA* (L.) DELILE MEADOW

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Preliminary data on the morphology of a local *Posidonia oceanica* meadow were obtained as part of an ongoing study on the community structure and composition of the vagile fauna associated with this seagrass. The values for Shoot Density, Leaf Standing Crop and Leaf Area Index obtained appear to be higher than those reported for meadows of this seagrass in other parts of the Mediterranean.

Data on the structure and composition of meadows of *Posidonia oceanica* and on morphological parameters of the plant itself are lacking for the Maltese Islands; the only published data are those of DREW & JUPP (1976). The aim of this study was to provide preliminary data on the morphological characteristics of a local *Posidonia* meadow situated off the White Tower headland, in the Malta-Comino Channel.

Shoot Density was estimated *in situ* by taking five 0.125m^2 quadrats at each of four stations located along a depth gradient at 6 m, 11 m, 16 m and 21 m. Estimates were made in August 1993, December 1993 and April 1994. Number of leaves per shoot, leaf length, and leaf width were measured in the laboratory for 25 shoots chosen at random from each sampling station. The dry weight of the leaf fraction excluding rhizomal weight and the leaf area index were also estimated.

The mean Shoot Density as measured over the whole sampling period showed an overall decrease with depth. Values recorded were: 782 - 807 shoots/m^2 at 6 m, 570 - 657 shoots/m^2 at 11 m, 464 - 530 shoots/m^2 at 16 m, and 357 - 420 shoots/m^2 at 21 m. The number of intermediate and adult leaves per shoot varied between a minimum of 3.9 leaves/shoot recorded at a depth of 16 m in August '93 and a maximum of 6.1 leaves/shoot recorded at a depth of 21 m in December '93. The number of leaves per shoot varied least with depth in December '93 (Fig. 1). The Leaf Area Index (L.A.I.) showed a general decrease with depth (Fig. 2). Maximum values for the Leaf Standing Crop (L.S.C.) were obtained in August '93 (Fig. 3).

In general, the Shoot Density values recorded during the present study are higher than those reported by DREW & JUPP (1976) for Malta and by other workers for different regions of the Mediterranean (for example, MAZZELLA *et al.*, 1989 and BUIA *et al.*, 1985). This is also true for the Leaf Area Index. Overall, values of number of leaves per shoot are similar to those reported for other localities (for example, MAZZELLA *et al.*, 1984) and to those of DREW & JUPP (1976) for Malta. The discontinuity in leaf morphological parameters recorded at depths of 10 to 15 m by other workers is most pronounced locally for the Leaf Area Index and this discontinuity probably represents a separation between shallow-water and deep-water meadows (MAZZELLA *et al.*, 1989; CINELLI *et al.*, 1984; MAZZELLA & OTT, 1984). The low L.A.I. and L.S.C. values at 6 m cannot be attributed to sea-urchin grazing as has been suggested by DREW & JUPP (1976) since echinoid density was close to zero in the study area following a sudden large decline in the *Paracentrous lividus* population some four to five years ago. Furthermore, no significant temperature differences were recorded in the 6 to 21 m depth range. We attribute the presence of this discontinuity to different growth patterns of *Posidonia* in response to the varying hydrodynamic regime at different depths in the study area, as has already been suggested for other parts of the Mediterranean (MAZZELLA & OTT, 1984; BUIA *et al.*, 1992).

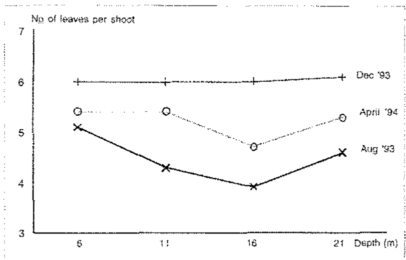

Fig. 1. Change in number of leaves per shoot of *Posidonia oceanica* with depth

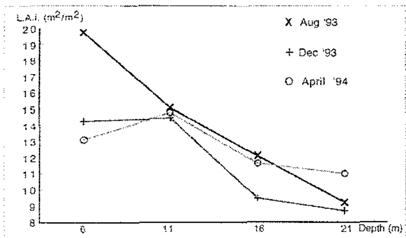

Fig. 2. Change in Leaf Area Index (L.A.I.) of *Posidonia oceanica* with depth

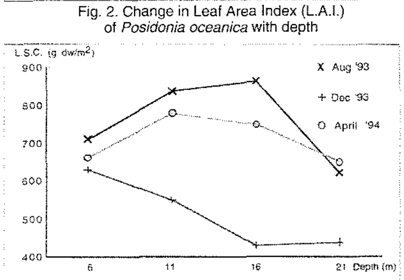

Fig. 3. Change in Leaf Standing Crop (L.S.C.) of *Posidonia oceanica* with depth

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EPIBENTHIC MACROFAUNAL ASSEMBLAGES AND BOTTOM HETEROGENEITY IN THE SHALLOW INFRALITTORAL OF THE MALTESE ISLANDS

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Marine ecologists have dedicated much time and effort in attempts to distinguish and classify marine benthic communities. In the Mediterranean, the vertical zonation scheme of PÉRÈS & PICARD (1964), as subsequently revised by PÉRÈS (1967; 1982), has been extensively used in spite of a number of difficulties associated with it (BOUDOURESQUE & FRESI, 1976; GOLIKOV, 1985). PÉRÈS (1967, 1982) identifies seven vertical zones, one of which, the infralittoral, represents the vertical extent of occurrence of marine phanerogams and photophilic algae. This zone thus includes some of the most important shallow-water coastal ecosystems. PÉRÈS (1967, 1982) subdivides the infralittoral into a number of biocoenoses and facies. Malta lies in the centre of the Mediterranean, but in spite of its biogeographical interest, only scanty information on the ecology of its coastal benthic communities is available. From preliminary diving surveys, the authors noted that the Maltese infralittoral is very heterogeneous, both physically and biologically. For example, five or more different types of bottom are frequently present within an area of a few square metres. The aim of this study was to obtain information on the structure, composition and distribution of the epibenthic faunal assemblages in the Maltese shallow infralittoral, by studying a cove which is representative of such habitats. The study area, a cove known as Dahlet ix-Xmajjar, is a V-shaped, northwest-facing inlet situated on the northernmost tip of the island of Malta. The cove is moderately exposed, has unpolluted water and is little frequented. Depth varies from 1 m inshore to 15 m at the mouth of the cove. The bottom is very heterogeneous, especially in the innermost part where it consists of a short stretch of bedrock, patches of bare medium to coarse sand, boulders, accumulations of pebbles and cobbles, and meadows of the seagrasses *Cymodocea nodosa* and *Posidonia oceanica*. Along the outer parts of the cove's headlands, the bottom consists of a stretch of bedrock leading to dense *Posidonia* meadows and patches of medium to coarse sand. During the summer of 1990, three transects were laid perpendicular to the shore from mean sea-level to a depth of 25 m. Epibenthic fauna larger than 2 mm were collected by SCUBA divers from 500 cm^2 quadrats positioned along the transects; in all 141 quadrats were sampled. Samples containing one or more of the twenty most abundant species, chosen on the basis of their occurrence in at least 10% of the total samples collected, were analysed statistically by centroid clustering using the Bray-Curtis and the Jaccard coefficients. Collectively, Mollusca and Crustacea formed the bulk of the macrofauna collected (80%, Fig. 1). Both coefficients used gave principal clusters corresponding to the two main types of bottom present in the study area (Fig. 2) : soft sediment with *Posidonia* meadows, and hard substrata with photophilic algae. For the soft sediment/*Posidonia* assemblage, the characteristic species were the gastropods *Smaragdia viridis* and *Tricolia speciosa* whilst for the rock/photophilic algae assemblage, the characteristic species were the gastropods *Rissoa variabilis* and *Columbella rustica*. However, as shown by the number of sub-clusters of quadrats within each main cluster, both bottom types were very heterogeneous due to frequent overlap with other bottom types, namely : bare medium/coarse sand, medium/coarse sand covered with decomposing *Posidonia* debris, bedrock covered with a very thin layer of sand, and sediment with *Cymodocea nodosa*. As a result of the high degree of heterogeneity in bottom type, there was extensive overlap between putative faunal assemblages. A number of species assigned by PÉRÈS (1967, 1982) to particular assemblages were not found to be assemblage-specific in the area studied. These included the decapods *Pagurus chevreuxi*, *Pisa tetraodon* and *Galathea bolivari*, and the gastropods *Bittium latreillii*, *Alvania discors* and *Jujubinus striatus*, all of which were collected on both bedrock and *Posidonia*. In general, of the two most abundant taxa, molluscs were more assemblage specific than crustaceans. These results indicate that substratum type is the main determinant of the faunal composition in the study area and that communities were being assembled primarily on the basis of the substratum preference of their component species, and only secondarily in response to other factors, both biotic and abiotic. While the traditional bionomic schemes are useful in discussing the main infralittoral benthic assemblages which occur over wide areas, they are not as useful when applied at the local level where the bottom is very heterogeneous. Here, micro-edaphic factors seem to be the main ones controlling the structure and composition of faunal assemblages. This study shows that it is not always possible to distinguish discrete faunal assemblages within the shallow infralittoral zone. Rather than attempting to equate infralittoral assemblage types from different geographical areas, it may be more useful for workers to study the key factors which determine the structure of the infralittoral assemblages of a particular locality and how these differ from those important in other localities.

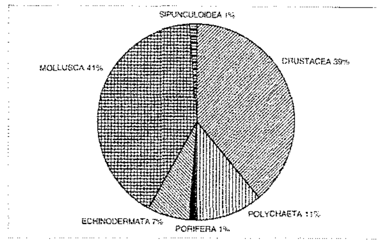

Fig. 1. Relative composition of the fauna calculated on the basis of number of individuals collected.

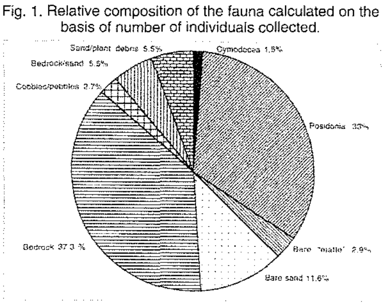

Fig. 2. Relative abundance of different bottom types along the transects

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