

MACROFAUNAL DIVERSITY OF INFRA-LITTORAL COBBLE BEDS IN THE MALTESE ISLANDS

J. Evans ^{1*}, M. J. Attrill ¹, J. A. Borg ², P. A. Cotton ¹ and P. J. Schembri ²¹ Marine Biology and Ecology Research Centre, University of Plymouth, Plymouth PL4 8AA, UK - julian.evans@um.edu.mt² Department of Biology, University of Malta, Msida MSD2080, Malta**Abstract**

The Mediterranean “biocoenosis of infralittoral pebbles” has been poorly studied, but is generally considered to be impoverished. Systematic sampling of cobble beds at 17 sites around the Maltese Islands yielded a total of 35,687 individuals belonging to 310 different taxa. Very shallow sites (<2 m depth) had a slightly poorer faunal assemblage than deeper ones (2-12 m depth), but still included 152 taxa. These results suggest that infralittoral cobble beds may not be as impoverished as previously thought, probably due to the high structural complexity of these habitats.

Keywords: Biodiversity, Infralittoral, Zoobenthos, Sicily Channel

Introduction

In shallow waters of the Mediterranean Sea, accumulations of pebbles and cobbles (particles between 4 mm – 256 mm) occurring in wave-exposed rocky coasts support a distinct biotic community known as the “biocoenosis of infralittoral pebbles” [1]. No detailed ecological studies on this biocoenosis appear to have been carried out, but it is generally considered to be impoverished [2]. However, databases of Mediterranean marine fauna list “under stones” as the microhabitat of quite a number of species, and this habitat can be important recruitment ground for decapod Crustacea [3,4], indicating that infralittoral pebbles may be more species diverse than previously thought. In addition, coarse gravel sediments do not only occur in indentations along rocky coasts, but also in slightly deeper waters such as within inter-matte regions of reticulate *Posidonia oceanica* beds where a different suite of species could potentially be present. The present study was carried out to assess the macrofaunal diversity of infralittoral cobble beds in the Maltese Islands, in order to determine whether they are indeed impoverished habitats.

Material and Methods

Seventeen study sites having a continuous cover of pebbles and cobbles of at least 25 m² were selected from around the Maltese Islands; these included sites with cobble beds in both very shallow (<2 m) and deeper (2-12 m) waters. In 2011, four random samples were collected from each site by SCUBA divers. The pebbles within a 0.1 m² corer were carefully removed by hand and the basal layer of finer granules was scooped out separately. An air-lift suction sampler was simultaneously employed to reduce the risk of missing highly motile organisms, thus ensuring that quantitative samples of the total benthic fauna were collected. Samples were sorted in the laboratory and fauna retained by a 0.5 mm mesh were identified to the lowest possible taxon. Statistical analyses of the resulting species X site matrix were carried out using PRIMER v6 (Plymouth Routines In Multivariate Ecological Research, PRIMER-E Ltd.).

Results and Discussion

A total of 35,687 individuals, belonging to 310 separate taxa were recorded from a total sampling area of 6.8 m². The most common groups were Mollusca (118 taxa), Crustacea (89 taxa) and Polychaeta (74 taxa). Spirorbinae spp. accounted for 52.4% of all individuals and 90.3% of the polychaetes; thus Polychaeta was the most abundant faunal group overall, but non-spirorbid polychaetes comprised only 5.6% of the total fauna (Fig. 1). When sessile fauna are excluded, crustaceans were the dominant group; this agrees with studies of cobble sites in Norway, England and Italy [3]. The most ubiquitous species included the tanaid *Leptochelia savignyi*, the decapods *Athanas nitescens* and *Xantho piliipes*, numerous amphipods (of which *Ampithoe ramondi*, *Gammarella fucicola*, *Maera grossimana*, *Melita hergensis* and *Microdeutopus* spp. were the most abundant), the chiton *Ischnochiton rissoi*, the gastropod *Gibbula varia*, the polychaetes *Nereis rava*, Ophelidae spp. and Spirorbinae spp., and the ophiuroid *Amphipholis squamata*.

Cluster analysis indicated that the cobble bed assemblage composition varied with depth, with the very shallow (<2m) sites generally grouping separately from the deeper ones (Fig. 2). The deeper sites (Cluster B) included 278 different taxa, versus the 152 taxa of ‘Cluster A’ sites, while 120 taxa were common to sites in both clusters. These results suggest that the biocoenosis of infralittoral cobbles and pebbles may not be as impoverished as previously

thought, even if only the very shallow beds described in [1] are considered. This is probably due to the high structural complexity of the cobble habitats, which are characterised by vertical stratification: upper cobble layers can provide numerous interstitial spaces affording shelter to fauna [3,4] while the basal layer of finer sediment supports an infaunal assemblage.

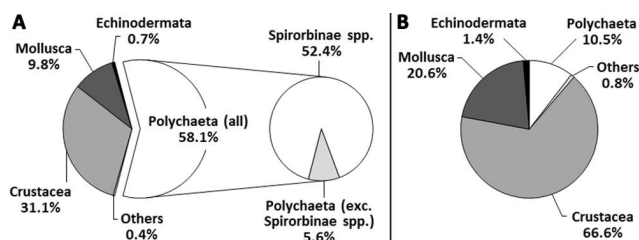


Fig. 1. Percentage abundance of major faunal groups from infralittoral cobble beds at 17 sites when considering (A) all macrofauna, and (B) non-sessile macrofauna only.

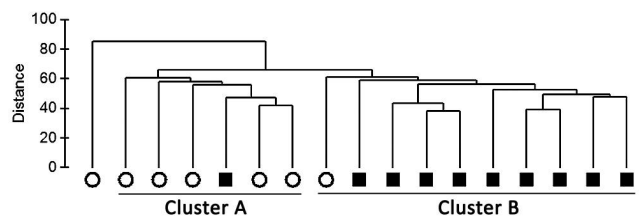


Fig. 2. Dendrogram from group-average hierarchical cluster analysis based on Bray-Curtis resemblances, produced using square root-transformed abundance data for macrofauna from infralittoral cobble beds at 17 sites (Empty circle: Depth <2 m; Filled square: Depth 2-12 m).

Acknowledgements: This research work was partially funded through the European Social Fund under a STEPS scheme grant awarded to JE.

References

- 1 - Pérès J.M., 1967. The Mediterranean benthos. *Oceanog. Mar. Biol. Annu. Rev.*, 5: 449–533
- 2 - Bellan-Santini D., 1985. The Mediterranean benthos: reflections and problems raised by a classification of the benthic assemblages. In: Moraitou-Apostolopoulou, M. and Kiortsis, V. (eds.). *Mediterranean marine ecosystems. NATO Conference Series I: Ecology*, 8: 19–48
- 3 - Linnane A., Ball B., Mercer J.P., Browne R., Van der Meer G., Ringvold H., Bannister C., Mazzoni D. and Munday B., 2001. Searching for the early benthic phase (EBP) of the European lobster: a trans-European study of cobble fauna. *Hydrobiologia*, 465: 63–72
- 4 - Robinson M. and Tully O., 2000. Seasonal variation in community structure and recruitment of benthic decapods in a sub-tidal cobble habitat. *Mar. Ecol. Prog. Ser.*, 206: 181–191