

BANQUETTE FAUNAL ASSEMBLAGES FROM GROOMED AND UNGROOMED BEACHES ON THE MALTESE ISLANDS

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Abstract

The macrofauna associated with beached seagrass wrack on three regularly cleaned (groomed) Maltese beaches and three that are not cleaned (ungroomed) was sampled over a two year period by taking cores and by using pitfall traps. Overall, 40 species were collected from both types of beaches. Coleoptera had the highest species richness (20 species) but the most abundant individual species were the gastropod *Truncatella subcylindrica* and the amphipod *Orchestia stephensi*. Species richness and individual abundance were highest in the winter months for all beaches. The ungroomed beaches had more species (34) than the groomed ones (9) as well as a higher Shannon-Wiener diversity index, Pielou's evenness, and individual abundance for all species collectively. Thick and long-standing wrack accumulations support higher species richness and abundance and a more taxonomically and trophically diverse biota than thin, freshly deposited layers of wrack.

Keywords : Beach, Biodiversity, Coastal Systems, Posidonia.

Introduction

Extensive meadows of *Posidonia oceanica* together with some *Cymodocea nodosa* occur adjacent to the gently sloping north-eastern coastline of the Maltese Islands [1,2]. Most beaches along this coast receive substantial annual inputs of seagrass debris during the autumn and winter months [3]. However, this wrack is regularly cleared away in the summer months from beaches of importance to the tourism industry and it is only on a few relatively inaccessible beaches that this debris is left undisturbed. On such beaches, 'banquettes' [4] of beached dried seagrass (wrack), as high as 2m, can accumulate over a number of years.

Material and Methods

The beaches at Salina, Xatt l-Ahmar and Selmun (ungroomed beaches), and those at White Tower Bay, Fomm ir-Rih, and Qarraba Bay (groomed beaches) were sampled in winter and summer of 2002 and 2003 by collecting wrack from a 20cm x 20cm quadrat until a 1 litre container was filled (in effect collecting a 0.001m³ core sample), and repeating the procedure at 10cm depth intervals until the bottom of the wrack accumulation was reached. The material was then washed over a 1mm-mesh and sorted for macrofauna. Nocturnally active motile macrofauna were sampled with pitfall traps laid in the wrack at the surface and left overnight using a standardised protocol for all beaches.

Results and Discussion

On the ungroomed beaches, the volume of wrack on the beaches ranged from 120m³ (Xatt l-Ahmar, winter) to 15m³ (Selmun, summer), whilst on the groomed beaches, the volume of wrack ranged from 273m³ (White Tower Bay, winter) to 6m³ (White Tower Bay, summer). On all the beaches, the longest decomposing *Posidonia* leaves were at the surface of the banquette, and leaf length became progressively shorter deeper down in the accumulation suggesting more trituration of leaf material in the thicker and more aged banquettes relative to freshly deposited ones. Considering all beaches collectively, 36 species were recorded from the quadrats and 29 species from the pitfall traps; 14 and 6 species were collected exclusively from the quadrats and pitfall traps respectively, therefore, the total species richness for both collecting techniques together was 40 species. A total of 15 species from quadrats and 8 species from pitfall traps were collected on the ungroomed beaches only, whilst a total of 9 species from quadrats and 3 species from pitfall traps were collected on the groomed beaches only. For the pitfall trap collections, Arachnida was the most species-rich taxon (6 species), whilst for quadrats, Isopoda and Arachnida were the most species-rich (3 species each). As estimated from the quadrat samples, Gastropoda had the highest individual abundance (73,646 individuals/m³), whilst the most abundant individual species were the gastropod *Truncatella subcylindrica* and the amphipod *Orchestia stephensi*, which reached maximum densities of 68,070 individuals/m³ at Salini and 708 individuals/m³ at Selmun (winter 2003 for both species), respectively. Interestingly, whilst in the quadrat samples a mean density of 6,384 individuals/m³ was recorded for *T. subcylindrica* from the three ungroomed beaches, no individuals of this gastropod were recorded from the quadrat samples from the three groomed beaches. Considering the quadrat samples only, for all the beaches sampled, the 0-10cm wrack layer was the most species-rich, whilst the lowermost layers (30-40cm and 40-50cm, where the wrack accumulated to these thicknesses) had the least

number of species. Species richness (quadrat and pitfall samples together) and individual abundance (quadrat samples only) were highest in the winter months for all beaches, including the ungroomed ones. Multivariate classification (group average linkage hierarchical cluster analysis and non-metric multidimensional scaling ordination) of the species-abundance data for the quadrat samples only (absolute densities cannot be estimated from pitfall trap data and fauna collected by pitfall traps is not necessarily resident in the wrack) showed the assemblages from Xatt l-Ahmar and Salini as distinct from those of the other beaches. This may be related to Xatt l-Ahmar being the most isolated beach of those studied and Salini to being the only one with a muddy substratum beneath the beached wrack. SIMPER analysis showed *Truncatella subcylindrica* and the endemic isopod *Spelaeoniscus vallettai* to account for 71.6% of the observed dissimilarity between the ungroomed beach at Xatt l-Ahmar (to which both species were exclusive) and the groomed beach at White Tower Bay. Overall, the wrack assemblages from the different beaches were relatively distinct, suggesting compartmentalisation of the fauna. Considering both sampling techniques together, a higher macrofaunal species diversity (34 species compared to just 9 species from groomed beaches) was recorded from the ungroomed beaches. Considering the quadrat data alone, a higher individual abundance (a total of 317,200 individuals/m³ from ungroomed beaches compared to 84,400 individuals/m³ from the groomed beaches, all species considered together), the highest Shannon-Wiener diversity index value (1.475 in 2002 and 2.100 in 2003, from Selmun in both cases) and the highest Pielou's evenness value (0.823 in 2002 and 0.818 in 2003, from Selmun in both cases) were recorded for the ungroomed beaches. In addition, Arachnida and Staphylinidae were only recorded from aged wrack from the ungroomed beaches of Xatt l-Ahmar, Selmun and Salina. Thick and long-standing wrack accumulations support higher individual abundances, higher species richness, and a more taxonomically and trophically diverse biota than thin, freshly deposited layers of wrack, while breakdown of seagrass litter is more complete in the former than in the latter. These results suggest that ungroomed beaches with thick banquettes contribute more to beach biodiversity and to carbon cycling than groomed beaches.

References

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