

Assessment of biological communities at Rame Head

Introduction

In response to concerns that disposal of material at Rame Head was causing mortality or a reduction in numbers of species, CEFAS have been able to assess the status of the fauna.

This has been done in three ways:

- Video footage to describe the encrusting and mobile fauna
- Surveys of the infauna to determine status and change over time
- Bioassays to evaluate the potential biological effects of contaminants in sediments

Encrusting and mobile fauna

Video footage has provided an indication of a number of examples of encrusting and mobile fauna seen at Rame Head, which are typical of western English Channel waters:

- The edible sea urchin *Echinus esculentus* (Figure 1)
- The cotton spinner holothurian *Holothuria forskali*
- The spiny starfish *Marthasterias glacialis*
- Clusters of ascidians (Figure 2)
- The Devonshire cup coral *Caryophyllia smithii*
- The sea fan *Eunicella verrucosa* (Figure 3)
- The spider crab *Maja squinado*



Figure 1: *Echinus esculentus*



Figure 2: Cluster of ascidians



Figure 3: *Eunicella verrucosa*

Infauna

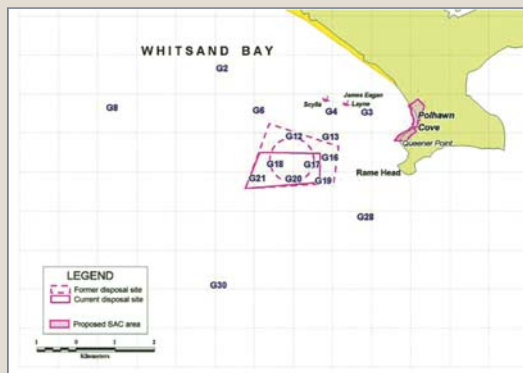


Figure 4: The location of fifty samples selected for benthic analyses.

Univariate analyses of selected benthic samples (Figure 4) shows that those within and in the vicinity of the disposal site (G16, G18, G19, G3 and G13) had reduced numbers of species and individuals (Figures 5a and 5b) compared to the two stations located at a greater distance from the disposal site (G8 and G28) in all years. Numbers of species and individuals were also generally higher in 2001 and 2003 compared to 2002 with the exception of numbers of species at G3.

Multivariate analysis was then employed to test for similarities between samples. Five major infaunal communities were determined (Figure 6) with four samples being classed as outliers. Further detail can be found in the Rame Head report (CEFAS, 2005).

To summarise, samples collected in 2001 appear more similar to each other than in other years. The dominant presence of the bivalve mollusc *Phaxas pellucidus* in all samples in 2001, distinguishes these samples from those collected in 2002 and 2003, which were characterised by a dominance of the polychaete species *Magelona filiformis*, *Mediomastus fragilis*, *Melinna palmata* and *Scalibregma inflatum*. It is unlikely that this change in dominance of species is related to disposal operations because such operations have been ongoing throughout the survey period. It is more likely a natural fluctuation driven by changing environmental conditions such as sea temperature (Hawkins et al., 2003).

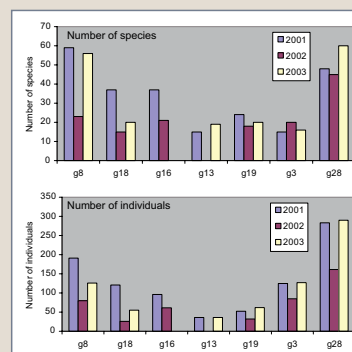


Figure 5: The number of (a) species and (b) individuals at stations selected for temporal analysis.

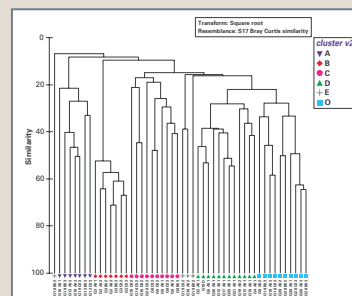


Figure 6: Grouping of samples collected from Rame Head 2001-2003.

Biological testing of sediments (Bioassays)

The potential biological effects of contaminants in sediments in the area were assessed for toxicity. Sediment bioassays were carried out with the amphipod *Corophium volutator* (Figure 7) and the polychaete *Arenicola marina* (figure 8). Their behaviour was observed over a 10-day test period. Sediments were collected from five stations, G2, G3, G13, G18 and G19 (see Figure 4 for locations). Survival of either organism was not significantly ($p > 0.05$) affected at any of the sites.

Additionally, correlation analyses showed no relationship between the diversity of biological communities and levels of trace contaminants measured in the sediments at Rame Head.



Figure 7: *Corophium volutator*.



Figure 8: *Arenicola marina*.

Main Conclusions

- There is evidence of temporal stability in community structure away from disposal operations. A more variable faunal community exists within and close to the disposal site, which can be ascribed, in part, by the disposal operation
- Correlation analyses have provided no evidence that elevated levels of trace contaminants are causing an impact on the benthic fauna. Station G28, which recorded some of the highest levels of trace contaminants, supports a diverse infaunal community.
- Biological testing of sediments in and around the Rame Head disposal site has shown that they are not acutely toxic to the two test organisms, indicating that any contaminants present are either not bioavailable or are present at levels that do not exert adverse effects.

References

- CEFAS, 2005. Environmental impacts resulting from disposal of dredged material at the Rame Head disposal site, S.W. England: An analysis of existing data and implications for environmental management. A CEFAS Multi-disciplinary Project Team. CEFAS, Lowestoft. pp: 120.
- Hawkins, S. J., Southward, A.J. and Genner, M.J. (2003). Detection of environmental change in a marine ecosystem – evidence from the western English Channel. *The Science of the Total Environment*, 310: 245-256.