ASSESSMENT OF MEIOFAUNAL COMMUNITIES

by M.Schratzberger (CEFAS), J.M. Gee (PML), S.E. Boyd (CEFAS), H.L. Rees (CEFAS), C.M. Wall (CEFAS)

Introduction

The soft-bottom benthic infauna are frequently used to monitor the effects of man-made activities on the sea bed. They are largely sedentary and so must withstand the extremes of their local environment or perish. For reasons of convenience, most biological investigations have traditionally targeted the larger macroinfauna (i.e. animals living within sediments that are retained on 1000 or 500 μm) that can readily be counted and identified, whereas the smaller meiofauna (between 500 and 63 μm) has been largely neglected in applied sampling programmes (Figure 1).

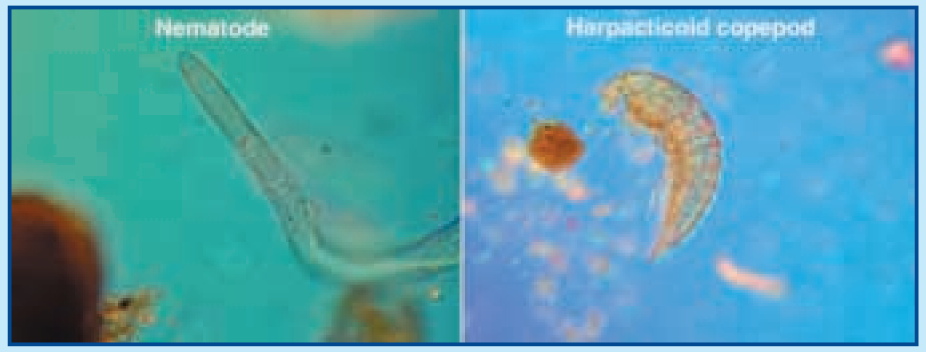

Figure 1: Dominant meiofaunal taxa

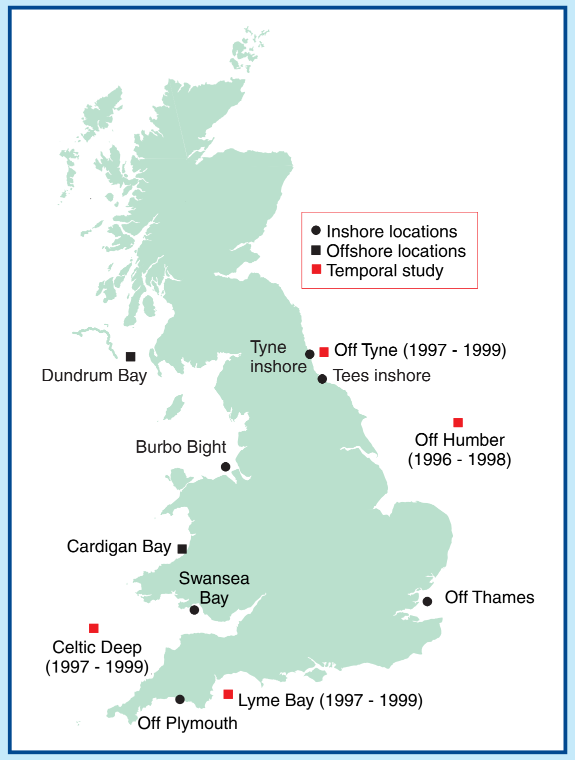

Figure 2: Inshore and offshore locations

A study was conducted to determine the potential value of meiofaunal assemblages as a monitoring tool in large-scale marine monitoring programmes such as the UK National Marine Monitoring Programme (NMMP). The main objectives of the investigation were:

- to assess the spatial trends in meiofauna collected at representative inshore (1998/99) and offshore (1997) sites around England and Wales (Figure 2)
- to determine the temporal stability of the spatial patterns (between 1997 and 1999)
- to relate the observed spatial and temporal patterns to environmental variables.

Sample collection and data analysis

Sediment samples were collected with the Bowers and Connelly Multiple Mini-Corer (Figure 3) and analysed for the meiofauna, particle size distributions and concentrations of trace metals.

The resulting data were analysed using a range of univariate and multivariate statistical techniques, including multi-dimensional scaling (MDS) ordination, which permits a visual judgement to be made of the degree of similarity between samples in terms of their species composition (Figure 4).

Figure 3: Bowers and Connelly Multiple Mini-Corer

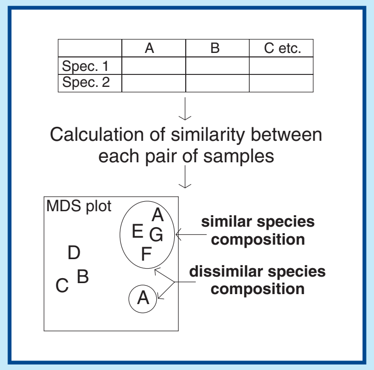

Figure 4: Multivariate statistical techniques

Spatial patterns

There was no clear separation of sediments collected inshore in 1998/99 and offshore in 1997 (Figure 5). In terms of particle size distributions, sediments cluster according to their median particle size and sand and mud content. In the plot based on results from the chemical analyses, stations where concentrations of most trace metals were highest, are separated from those with lowest and intermediate values.

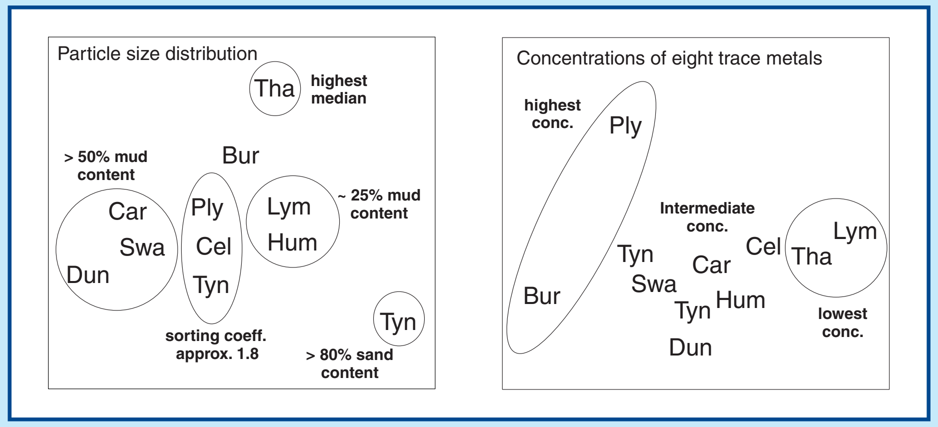

Figure 5: Sediment characteristics at inshore and offshore locations

The concentrations of most trace metals were highest in the Burbo Bight (Liverpool Bay) where the species diversity of meiofauna was lowest (Figure 6). This might indicate anthropogenic impact at this site although a causative relationship with the trace metal concentration cannot be assumed.

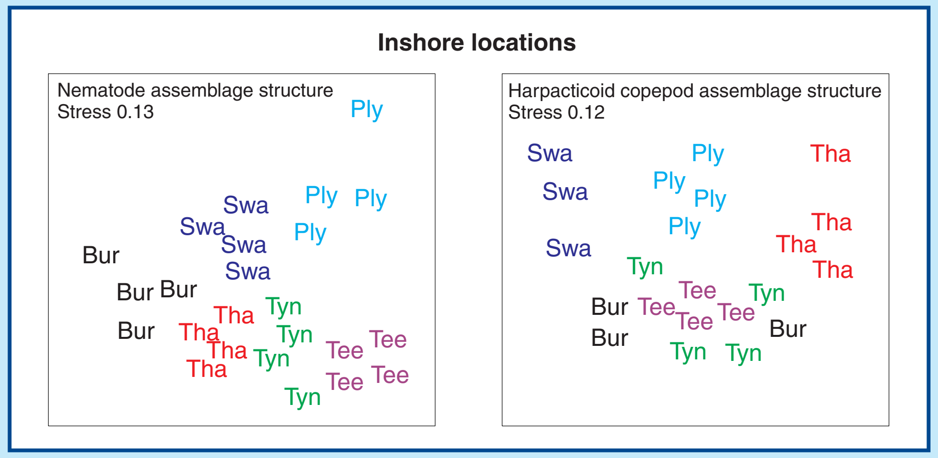

Figure 6: Meiofaunal assemblage structure at inshore locations

The correlations between nematode and harpacticoid copepod assemblage structure and measured environmental variables were higher at inshore locations than offshore, indicating that other unmeasured but correlated factors, such as inter- and intraspecific competition could be more important in determining meiofaunal assemblage structure in the offshore environment (Figure 7).

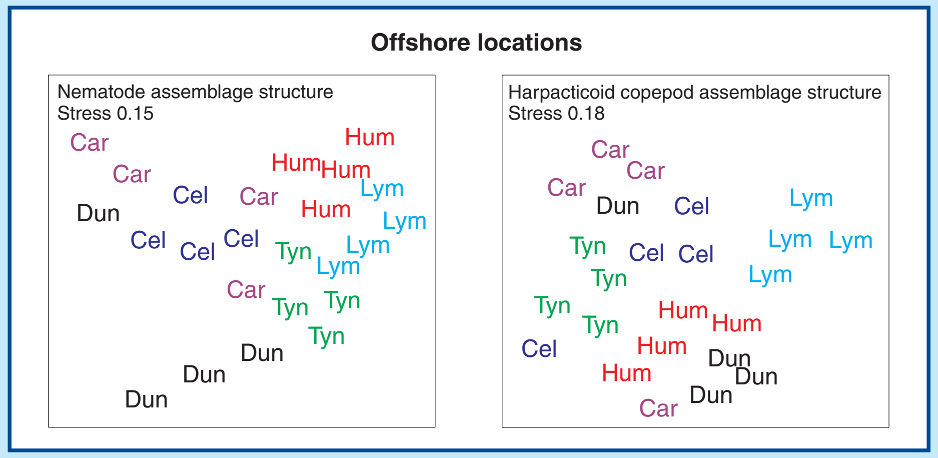

Figure 7: Meiofaunal assemblage structure at offshore locations

Acknowledgements

The work was supported by the Department for Environment, Food and Rural Affairs (Contract no. CSG AE 1103 and CWO824).

Temporal patterns

The spatial variability at all offshore locations in terms of sediment characteristics and nematode assemblage structure was more pronounced than temporal differences (Figure 8).

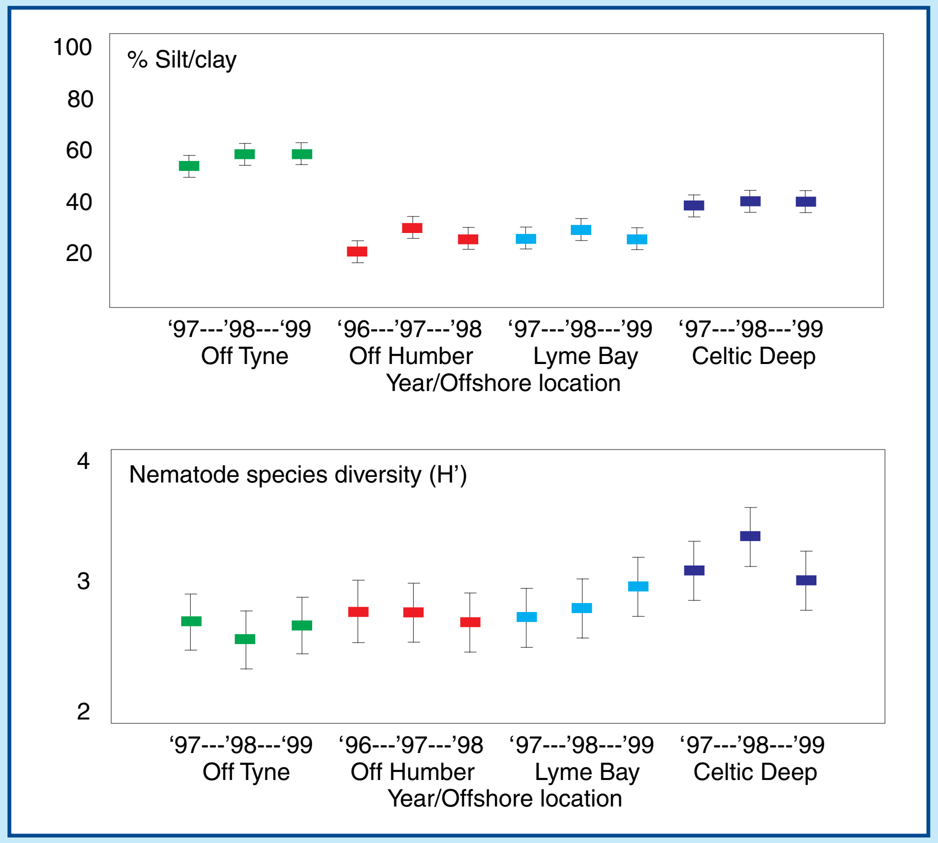

Figure 8: Selected sediment characteristics and nematode species diversity at four offshore locations over a three-year period

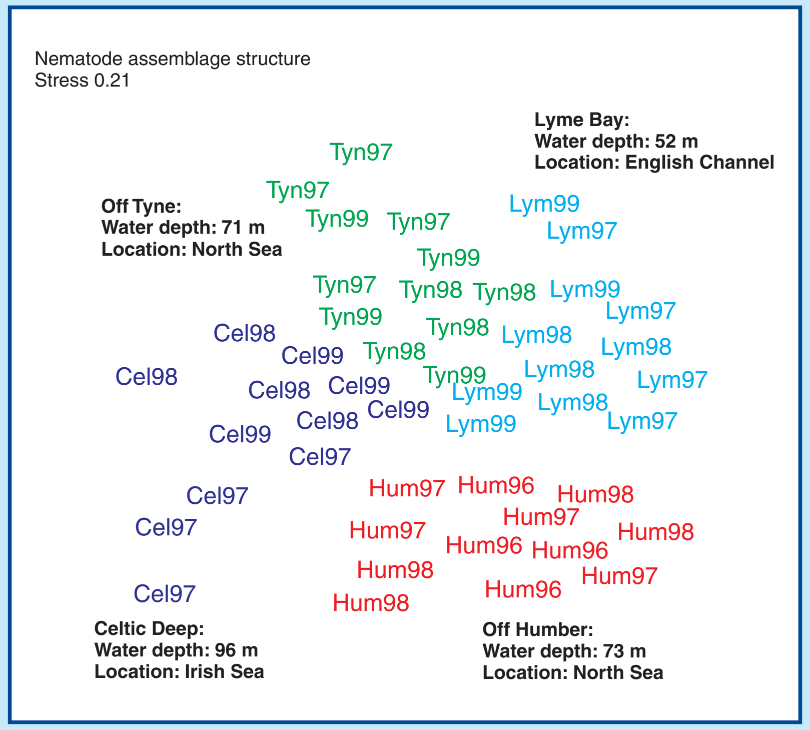

Figure 9: Nematode assemblage structure at four offshore locations over a three-year period

The geographical location of sampling sites and the water depth were major factors contributing to the establishment and maintenance of nematode distribution patterns. In contrast, the correlations between nematode assemblage structure and the concentrations of trace metals and sediment particle sizes were low (Figure 9).

Conclusions

This study confirms that:

- meiofauna techniques can be usefully employed in large-scale monitoring programmes
- meiofaunal monitoring should be considered in impoverished areas when only a few macrofauna species are present
- meiofauna might also be a useful monitoring tool to identify subtle changes in the ecosystem in response to contaminant inputs.

The use of both macrofauna and meiofauna techniques in routine monitoring

- provides complementary information on environmental conditions and greater flexibility to meet site-specific study requirements
- widens the scope for evaluation of the status of the benthic ecosystem as a whole.

The Centre for Environment, Fisheries and Aquaculture Science (CEFAS), Burnham Laboratory, Remembrance Avenue, Burnham on Crouch, Essex CM0 8HA, UK. http://www.cefas.co.uk