

Field Studies Council Research Centre  
Fort Popton, Angle, Pembroke, Dyfed, SA71 5AD, U.K.

**Milford Haven  
Macrobenthic Survey  
October 1993**

*A report to MHWEMSG from the  
Field Studies Council Research Centre*

by

D Levell, J Smith & G Hobbs

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## **Acknowledgements**

Fieldwork	S J May, D Levell, R Fletcher
Biological sample sorting	R Fletcher, M Sivagnanam, D Reynolds
Biological identification	S J May, G Hobbs, D Levell, V Cass
Sediment grain size analysis	M Sivagnanam
Data analyses and graphics	R Elliott, G Hobbs
Report preparation	J Smith, D Levell
Secretarial	A M Barnard, S V Seaton



## Summary

- 1** This report presents the results of the Macrobenthic Survey of the Milford Haven Waterway carried out by the Field Studies Council Research Centre. This was performed as a contract for the Milford Haven Waterway Environmental Monitoring Steering Group in October 1993.
- 2** The objective of the survey was to provide information on the range of seabed sediment biology throughout the length of the waterway.
- 3** A total of forty sample stations, located from the lower reaches of both eastern and western Cleddau through the waterway to the entrance of Milford Haven off St Ann's Head, were sampled for biology and sediment composition. A 'reference' station was sampled adjacent to the offshore island of Skomer, for comparative purposes.
- 4** Three replicate quantitative biological samples were obtained from thirty six stations, by 0.1 m<sup>2</sup> Day grab. Qualitative samples were obtained from two stations and two stations were found to be unsuitable for grab sampling due to the presence of exposed bedrock or stones. Sediment samples were obtained at each location for faunal and sedimentological analyses and samples for sediment hydrocarbon content analyses were obtained and placed in storage for possible future analyses.
- 5** The processing of the biological samples was carried out separately on both 1.0 mm and 0.5 mm sieve mesh size fractions. This was to enable comparability of data with past macrobenthic surveys within the waterway. Biological sample processing involved over 1840 man hours of sorting and identification of more than 125,400 individual animals from 418 quantitative and 38 qualitative taxa.
- 6** The returns for the increased effort in processing time for the smaller size fraction is considered to be of value, in the increased community definition, particularly in the upper estuary. It is stressed however, that the two size fractions should continue to be processed independently, as this would retain the flexibility to process only a proportion of the samples in future surveys on the smaller size category, should costs become prohibitive. This would still enable overall comparison of trends through the waterway to be based upon 1.0 mm data.
- 7** Sediment samples were analysed for grain size characteristics and organic content.
- 8** Additional data concerning metal concentrations found in sediments were provided by the National Rivers Authority. These data were generated from sediment samples obtained at ninety three stations in March 1993 and analysed at the NRA Llanelli laboratories.
- 9** All raw data generated by the analyses of samples are included as appendices to this report and form an important information source for comparison with both past and future macrobenthic work within Milford Haven.
- 10** Biological data were subjected to a range of univariate and multivariate statistical procedures. Examples of species distributions and macrobenthic community parameters are presented in graphic and tabular summary form. Classification of stations on the basis of the similarity of their benthic communities was also performed and presented in summarised graphics.

- 11** An increase in species richness and community diversity was found in the progression from the upper estuary brackish region, through the system to the open sea, marine environment. This conforms to the expected trends widely described in the scientific literature. Several distinct communities, separated on the basis of multivariate ordination and classification of the biological data, are described and were found to be associated with different regions within the waterway.
- 12** Comparison with previous macrobenthic surveys, where possible, suggests that this survey describes some genuine changes in community richness in the lower estuary. However caution is expressed in interpreting some of these observed differences which are undoubtedly influenced by adequacy of sampling, worker analytical efficiency, differences in methodologies and accuracy of station positioning.
- 13** The sediments analysed from thirty eight stations within the waterway were mostly poorly sorted heterogeneous mixtures of mud, sand and gravel. Sheltered depositional areas, such lateral pills and deeper water in the lower estuary, possessed fine muddy sediments. The sediments of the mid-channel and outer estuary were generally coarser with a gravel fraction consisting of both lithic and biogenic particles.
- 14** Sediment organic matter contents were positively correlated with sediment mud content. Levels were generally less than 5% in the lower estuary (below the Cleddau Bridge) and greater than 5% in the upper estuary. High values at some stations were tentatively attributed to enrichment by sewage but there was no obvious pattern of organic enrichment which would be related to the presence of outfalls within the Haven.
- 15** Minimum sediment metal concentrations were found in the lower estuary, west of Stack Rock. In comparison with a world-wide standard argillaceous sediment, many elements had elevated concentrations; copper and zinc were enriched at all stations and lead at all but five stations. Anthropogenic inputs of these metals were considered to be responsible for at least part of this enrichment. However, copper in particular may also have a natural source within the waterway. Sewage, refinery effluents and road runoff were considered to be important anthropogenic sources for those metals exhibiting elevated concentrations.
- 16** Elemental concentrations within sediments of the Milford Haven Waterway were compared to those from 24 estuaries in south west Britain. All mean elemental concentrations except copper were equal to or lower than values from these estuaries. Maximum concentrations of all metals except cobalt were within the ranges of concentrations determined elsewhere.
- 17** Comparisons with previous sedimentological studies of the Milford Haven Waterway suggested that the sediments were essentially similar in 1993 to those analysed in previous years. Changes in sediments between 1982 and 1993 were attributed to differences in methodology between the two surveys. However, the distribution histograms showed the sediments to be essentially similar with regards to the presence of the fine sand mode which comprised the bulk of many sediments.
- 18** The importance of accurate sample station positioning was highlighted by one intentional and one unintentional relocation of sample stations, leading to significant differences in community composition and sediment characteristics over relatively short distances.