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PROJECT REEF 2000

FINAL REPORT

May 1998 – August 2000



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**Dunstaffnage
Marine
Laboratory**

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1 - EXECUTIVE SUMMARY

Artificial reefs are man made structures placed on the seabed in order to simulate a natural reef in some way. Artificial reefs are used world-wide for a variety of purposes including sea defence, habitat protection and for fisheries enhancement.

In 1996 the Marine Resource Initiative commissioned a preliminary study into artificial reefs (Wilding and Sayer 1996) which concluded that they have considerable potential on the west coast of Scotland, provided cost-effective construction materials can be sourced. Artificial reefs were also identified as having an unprecedented capacity to augment and complement the ongoing research, within the Dunstaffnage Marine Laboratory (DML), into the factors affecting the performance and behaviour of natural reefs.

Foster Yeoman Limited own the Glensanda Quarry, on the Morvern peninsular, which produces granite aggregates and has an annual production of ca. six million tonnes. Following aggregate crushing and processing contaminating dust is removed by washing. This produces a fine aggregate by-product that currently has negligible value. In 1997, Foster Yeoman Limited commissioned a further study to examine if granitic by-products could be used in the manufacture of concrete blocks suitable for use in artificial reef construction (Wilding and Sayer 1997). During this study contact was made with the Mallaig and North-West Fishermen's Association and a preliminary site, on the east side of Lismore, Argyll, was identified (August 1997) and surveyed. Aspects of the licensing procedure were also investigated and contacts made with both statutory authorities and Lismore fishermen.

During the current study (May 1998- July 2000) the proposed site has been characterised and appears ideal for the proposed reef. The proposal has been widely publicised, locally and nationally, via the press and internationally through conference presentations. During this phase a robust concrete block, which has been shown to be chemically inert, has been developed. The proposed reef complex, consisting of 24 reef modules with a total mass of approximately 42,000 tonnes, to be deployed on the east side of Lismore has the support of the Mallaig and North-west Fishermen's Association and the Local Community Councils.

The reef is now licensed for deployment; the purpose of this document is to update the interim report (Wilding and Sayer 1999b) and detail the whole licensing process (forming a model for future licence applications).

2 - INTRODUCTION

Artificial reefs are man made structures, placed on the seabed, in order to simulate a natural reef in some way. They are used world-wide for a variety of purposes including sea defence, habitat protection and to form the basis for sustainable aquaculture. Early artificial reef projects tended to use, amongst other materials, redundant cars, tyres, railway carriages and decommissioned oilrigs and platforms. The short life span of many of these materials, associated pollution problems and the perception of reef construction as an excuse for dumping (in contravention of international conventions) has limited their use within Europe. In the UK, the main construction materials used are natural aggregates and concrete and range from the 50 tonne experimental concrete block Poole Bay reef to the 210,000 tonne Torness sub-tidal sea defence system.

Foster Yeoman Limited operates a granite quarry on the Morvern Peninsular and produces a range of granitic aggregate products. Processing of the primary material (from the quarry face) generates considerable quantities of dust. Fractions of this material, which currently have a low value, pose a disposal problem. Research in 1996, funded by the Marine Resource Initiative (Wilding and Sayer 1996), identified cheap construction materials as an essential prerequisite for economically viable artificial reefs on the west coast of Scotland. In 1997 Foster Yeoman Limited funded further research which concluded that the quarry by-products could be used in the manufacture of concrete blocks suitable for use in the construction of an artificial reef (Wilding and Sayer 1997). During this phase of research contacts were initiated with the Mallaig and North-West Fishermen's Association and, following discussion, possible sites identified and subsequently surveyed. A site on the east side of Lismore appeared to meet the appropriate criteria and lines of communication were established with local static gear fishermen and Lismore residents.

Reefs are an essential and fundamental part of marine ecosystems and research into natural reefs and their associated flora and fauna has been conducted at the DML for many years. However, natural reefs are difficult to study because of their highly variable nature that results in difficulties relating cause to effect. Artificial reefs facilitate research by eliminating much of the variation associated with natural reefs. In addition, artificial reefs offer the potential for controlled and managed fishing and the proposed reef will demonstrate this potential at an experimental level that is relevant to the scale necessary for commercial ranching. The proposed reef modules have alternating block and reef designs that will show which reef design is superior for any given parameter under investigation including lobster production.

Lochaber Limited, Argyll and the Islands Enterprise, Foster Yeoman Limited and DML with matching funds from PESCA, funded the research for the period May 1998 – May 2000. The objectives of this phase were to:

- develop and maintain dialogue with local site users and people;
- characterise the proposed deployment area;
- demonstrate the physical and chemical integrity of the proposed construction materials; and
- obtain the necessary licences and consents.

The Loch Linnhe Artificial Reef will be one of the largest experimental artificial reefs in the world and will be a unique facility likely to attract international scientific and commercial interest. It will assist in our understanding of fundamental issues relating to the development and maintenance of biological communities and marine biodiversity. In addition it will address the scientific and socio-economic issues associated with sustainable fisheries management and the environmental effects of marine construction projects. This document details how the project has been managed and publicised and includes all the data that has been required in order to gain the FEPA licence. The Loch Linnhe Artificial Reef has been licensed under the new Oslo – Paris Commission (OSPAR) guidelines for reef deployment (Anon 1997; Anon 1998). The international significance of the proposed reef, both within Europe and further afield, should not be underestimated and it has been recognised by the Marine Laboratory, Aberdeen (the licensing authority) as a model artificial reef licence application and is being put forward to the OSPAR as a demonstration project.

3 - DELIVERABLES (MAY 1998 – MAY 1999)

The key achievements during the period May 1998 – May 1999 were:

1. The establishment of a reporting/ information dissemination framework to assess and monitor project progress. Local user groups and fishermen's representatives were included on reporting committees.
2. The demonstration that Glensanda quarry by-products can be used in the manufacture of concrete blocks and that they are sufficiently robust and chemically inert to be used in the construction of an artificial reef.
3. Demonstrating that the proposed deployment site on the east side of Lismore was suitable for the reef
4. Publicising the reef proposal and answering concerns generated and promoting dialogue between the licensing authority, local people and DML.

5. Initiating the licensing process, addressing some of the preliminary concerns raised by local people and the licensing authority (Marine Laboratory, Aberdeen).
6. The initiation of site characterisation (biotic and abiotic), consideration of the experimental design (reef matrix layout) that would optimise the value (in terms of scientific research) of the investment in this facility.

4 - DELIVERABLES (MAY 1999 – JULY 2000)

The key achievements of the period May 1999 – July 2000 are listed below.

4.1 Publications

Three papers were presented at the Seventh international conference on artificial reefs and related aquatic habitats (San Remo, Italy, October 1999). These generated a considerable amount of interest from both European and non-European audiences. Copies of the two papers submitted for the conference proceedings publication (in a special addition of the ICES Journal of Marine Science) are shown in appendix 8.1 together with the abstract of the oral presentation made at the above conference.

4.2 Site characterisation

The methodologies used in characterising the site have been described (Wilding and Sayer 1999a) and this work is ongoing. In particular progress has been made in gathering further data on the current regime in the area, oxygenation status of the sediments, seasonal fluctuations and within site variability in the abundance of epibenthic megafauna and further research into benthic macrofauna. This work, underpinning the proposed scientific programme, is of fundamental importance and is one factor distinguishing the Loch Linnhe Artificial Reef from many other artificial reef programmes. These pre-deployment data are an essential part of the licence application and are reported in the documentation submitted to the MLA in support of the licence (appendix 8.2).

4.3 Demonstration of removal

Under the new Oslo Paris Commission (OSPAR) guidelines on the construction of artificial reefs the technical feasibility of reef removal must be demonstrated. This was achieved by the deployment of approximately eight tonnes of concrete blocks of a similar size and weight as those proposed for the reef. These blocks were deployed in two locations 1. Dunstaffnage Bay (to allow the development of the removal technique) and 2. The proposed reef site (to demonstrate removal at the site). The blocks were successfully removed. Details of the removal procedure are given in appendix 8.2.4.

4.4 Finalisation of reef matrix design

Careful consideration was given to the experimental design of the proposed reef matrix. Inherent variability within biological systems means that each design combination must be repeated (replicated) a number of times to allow conclusions to be drawn as to why different reef units perform differently. The proposed design consists of four combinations (two block types and two reef shapes) replicated six times. The chosen (and licensed) layout is shown in appendix).

4.5 Licensing

Three licences are a prerequisite to reef deployment. These are the FEPA (as amended) (1985) licence, granted by the Marine Laboratory, Aberdeen (MLA) (see appendix 8.2) a consent under Coast Protection Act (1949), as amended by the Merchant Shipping Act (1988) and issued by the Scottish Executive (see appendix 8.3) and finally the seabed occupied by the reef must be leased from the Crown Estate. At the time of writing the Crown Estate lease is still under negotiation but the corner co-ordinates of the area to be licensed have been agreed. Licensing issues have been discussed, in generic form in Wilding and Sayer 1996.

4.6 Public consultation

A consultative procedure was established under the Programme Monitoring Committee and Project Working Groups (see appendix 8.2.1) which included a Lismore based fishermen who reported to the Lismore Community Council in addition to a representative from the Mallaig and North-West Fishermen's Association. Further publicity was ensured by frequent articles in the local press (appendix 8.2.1); this process is ongoing. In general, the culture of openness that has characterised Project Reef 2000 has engendered a feeling of trust within a majority of the local community that has greatly assisted the project.

4.7 Voluntary management agreement

One of the concerns expressed by the MLA concerned the possible interaction between fishing gear and the reef blocks resulting in reef blocks being relocated outside the licensed area. In order to ascertain whether such a scenario was likely a meeting was held, at DML, with local fishermen. The DML was informed that no fishermen would risk trawl gear fishing over the reef and it was acknowledged that very few fishermen use the proposed area. A voluntary management agreement was circulated to local fishermen and fishermen's organisations. This is shown in appendix 8.2.3.

4.8 Research programme

A detailed programme of research to monitor the impact of the reef, in terms of hydrographical impact, chemical and physical performance and effects on biological communities has been formulated. Some of these research programmes are part of the licence conditions and the research timetable is shown in appendix 8.2.3. The biological impacts of the reef will be monitored, in the first instance, as described in appendix 8.2.3.

5 - CONCLUSIONS

The project objectives, identified in (Wilding and Sayer 1999b) were:

- To publicise the project (locally and nationally) and maintain an open dialogue with the public
- To obtain the backing of local fishermen, the Mallaig and North-west Fishermen's Association and the Lismore Community Council
- To demonstrate the physical and chemical stability of the proposed construction materials
- To characterise and demonstrate the suitability of the site
- To apply for the appropriate licences

All these objectives have been met and the reef is now licensed for deployment. Deployment is expected to start in October 2000 and last for 2 years.

6 - ACKNOWLEDGEMENTS

The DML would like to express it's gratitude to the ongoing and considerable commitment to the Loch Linnhe Artificial Reef project from Foster Yeoman Limited. In addition, our thanks to HIE/ PESCA, Lochaber Limited and Argyll and the Islands Enterprise for funding much of the two year pre-deployment phase.

7 - REFERENCES

- Anon. 1997. Draft revised guidelines for the construction of artificial reefs in relation to the provisions of the OSPAR (1992) convention Working group on sea-based activities (SEBA). Report No. SEBA 97/12/1-E
- Anon. 1998. Aspects recommended by the workshop to be taken into account for a proposal of draft OSPAR Guidelines on Artificial Reefs Report No. AR 98/5/1, Annex 4 (Ref 3.7)
- Wilding, T.A. and Sayer, M.D.J. 1996. Artificial reefs on the west coast of Scotland: A feasibility study Dunstaffnage Marine Laboratory. Report No. 203
- Wilding, T.A. and Sayer, M.D.J. 1997. The potential for artificial reefs based on aggregate by-products Dunstaffnage Marine Laboratory. Report No. 207
- Wilding, T.A. and Sayer, M.D.J. 1999a. Evaluating artificial reef performance: approaches to pre-deployment research. Seventh international conference on artificial reefs and related aquatic habitats, pp. 685 - 693. Edited by Relini, G., Ferrara, G. and Massaro, E. San Remo, Italy. 7 - 11 October 1999.
- Wilding, T.A. and Sayer, M.D.J. 1999b. Project Reef 2000 - Interim Report (May 1998 - May 1999) Dunstaffnage Marine Laboratory. Report No. SAMS/ DML Internal Report No. 212

8 - APPENDICES