Integrating data and models to better understand the consequences of changes in marine ecosystems for the services they deliver to society

MB0130: NERC Marine Ecosystems Research Programme

What's the problem?

Human activities and environmental change can have wide consequences for marine ecosystems and the benefits they provide such as supplying food and supporting leisure and recreation ('ecosystem services'). The significance of such consequences is difficult to predict because of our limited understanding of marine food webs, and in particular how interactions and changes in feeding relationships between organisms affect the delivery of ecosystem services.

What are the aims of the project?

The Marine Ecosystems Research Programme (MERP, www.marine-ecosystems.org.uk) is advancing our ability to predict impacts of change on the structure and function of marine food webs and the services they provide. The programme will:

1. Provide a more complete understanding of how food web components (e.g. plankton or seabirds), pressures (e.g. fisheries impacts) and the environment (e.g. temperature) interact, to underpin advice on the state of food webs and the environmental conditions required to maintain them;
2. Improve understanding of the effects of natural and anthropogenic change on the state of marine food webs to inform effective planning of human activities;
3. Develop scenarios reflecting future states of marine food webs and ecosystem service provision on different spatial and temporal scales that are relevant to management and policy. For example, scenarios that take account of impacts of climate change or different management regimes;
4. Investigate the trade-offs between economic and cultural services in the UK marine environment and examine how benefits from living natural capital can be optimised;
5. Research the ways in which multiple activities interact to affect marine ecosystems, to establish the cumulative effects of current and potential management actions on marine ecosystems and services.

Figure 1: Different sizes of starfish being sorted aboard the Prince Madog during the 2016 cruise programme.
Source: MERP

Which policy areas will the research inform?

The research supports an ecosystem approach to underpin policy development, regulatory and management initiatives in a rapidly changing world, with a focus on sustainability and human benefits. Outputs will inform the implementation of existing marine policy, such as the Marine Strategy Framework Directive (MSFD), the Marine and Coastal Access Act, Marine (Scotland) Act, Common Fisheries Policy and the OSPAR Joint Assessment and Monitoring Programme, as well as the Marine Protected Area network. Tools will aid and inform marine spatial planning.

NERC SCIENCE OF THE ENVIRONMENT

Marine Ecosystems Research Programme

Department for Environment Food & Rural Affairs

What are the results from the project and how will they be used?

Whilst considerable progress has been made in the programme, work is still ongoing. MERP has established a trial data portal and tools for remotely accessing key biodiversity datasets (e.g. seabird, marine mammal and fish surveys, habitat types) collected by various organisations around the UK for different purposes. The tools bring data together in new ways so we can develop a clearer vision of how ecosystems work, and outputs will allow us to develop new maps and other data products to aid decision making.

MERP has collected new observations and synthesised data from other studies to get a better understanding of how marine life responds to change, understanding which is being built into improved computer models. Key elements of the modelling work include understanding the certainty of model predictions, improving the performance of existing models and developing new models linking marine life (and how it changes) to the products and benefits humans derive from the sea. This will allow us to make better informed decisions in future.

Through a programme of stakeholder engagement activities and further model development MERP will: advance current understanding of natural capital valuation and cultural values to inform strategic decisions on the sustainable use of the marine environment. Through regional case studies in South West England, West Scotland and West Wales, MERP will demonstrate how empirical data, modelling and expert judgement can be translated into both context-specific guidance and general principles for marine management, accounting for trade-offs and cumulative effects.

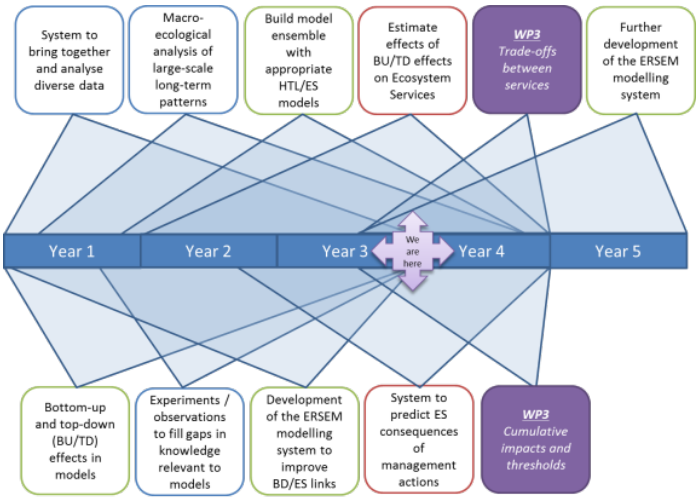

Figure 2: MERP Timeline and Progress

MERP Researcher Dr Queiros giving an interview at COP22

MERP engages proactively with the policy community at national and European levels through dedicated briefings, participation in workshops, sharing of scientific information and improving dialogue. Examples include:

- Joint MERP/Marine Management Organisation (MMO) workshop to develop a clear path between scientific research and management decisions, November 2015.
- MERP scientists met with Defra policy customers (MSFD, MCZ, fisheries, data) to highlight existing and planned policy-relevant MERP outputs, and to give policy-makers opportunities to discuss how our research can be more clearly directed towards issues that may influence policies, February 2016.
- A briefing for the Welsh Government and Natural Resources Wales was held to discuss relevant MERP activities and outputs, November 2016.
- Attendance and contributions by MERP scientists to various ICES working groups and activities.
- Attendance and participation at COP22 to share information about MERP and the role of the marine ecosystem in mitigating climate impacts through locking away carbon dioxide from the atmosphere.

Where can I find further information about this and related research?

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