

## **Cefas capability to contribute to the NERC/Defra Marine Ecosystems Call**

The Centre for Environment, Fisheries and Aquaculture Science (Cefas) is an executive agency of the Department for Environment, Food and Rural Affairs (Defra). We employ over 500 people, with staff offering a broad range of expertise in marine science, technology and policy, supported by ecosystem modellers, economic and social scientists.

As a result of our association with Defra and the support we provide to other customers, our major strengths are a thorough understanding of regulatory processes and policy needs and a capacity to develop and maintain scientific programmes that provide a rigorous evidence base for decision-makers. Our work bridges the scientific, business, public and Non-Governmental Organisation (NGO) communities, including nationally through the UK Marine Monitoring and Assessment Strategy (UKMMAS) and internationally through the European Union (EU), the International Council for the Exploration of the Sea (ICES) and the Oslo and Paris Convention (OSPAR).

Cefas' contribution to the NERC/Defra Biodiversity Call is to provide collaborative research opportunities and access to our resources.

### **Our science**

Our science covers marine biodiversity and habitats, marine spatial planning and environmental licensing, marine nutrient and contaminant monitoring, sustainable fisheries management, fish and shellfish health and hygiene, climate change impacts and adaptation, emergency response etc. Our research, monitoring and assessments provide an evidence base that helps managers to achieve sustainable use and societal benefits from the sea. Our data and models are used to describe and predict human and environmental impacts – from local to wider ecosystem scales, depending on the questions to be addressed. Our work underpins status assessments and provides early warning of ecosystem and environmental change. Our science is therefore strongly applied in nature with practical outcomes.

Our ***biodiversity-related applied science*** focuses on assessing, modelling and predicting the individual and collective effects of environmental change on ecosystems and biodiversity. Specific examples include:

- Coastal and offshore surveying and monitoring of invertebrate and fish biodiversity.
- Identifying and mapping marine habitats and seabed communities, and assessing their sensitivity to human impacts and environmental change.
- Investigating ecosystem responses to natural and man-made pressures and assessing social and economic costs and benefits of management.
- Assessing vulnerability of species, communities and food-webs to human and environmental impacts, and developing indicators to report and advise on conservation status.
- Developing and linking models to identify processes that regulate the population size, community and food web structure.
- Theoretical and empirical analyses of links between biodiversity and ecosystem function.

Research on fish life histories and their links to sensitivity has provided tools for identifying, monitoring, assessing and managing species of conservation concern and has contributed to the development of indicators, sensitivity assessments and management advice for the UK, the EU, ICES, International Union for Conservation of Nature, and International Commission for the Conservation of Atlantic Tunas.

Research on size-based processes in communities and ecosystems has underpinned the development of indicators now used by the UK, European Commission and OSPAR to report on biodiversity and the status of food webs and communities.

Research on the distribution and dynamics of fishing fleets and the sensitivity of habitats and species has underpinned assessments of fishery-habitat interactions, contributing to advice on the effects of fishing and the predicted performance of MPA in management systems.

In these and other areas our applied science has been influential nationally and internationally in providing the scientific evidence to support decisions on marine biodiversity conservation, marine spatial planning and the implementation of the EU's Marine Strategy Framework Directive. Our expertise in interpreting survey results, defining the relevance to legislation and determining the implications for marine planning and management is key to the aims of this call.

Leading and collaborating in world-class research is critical to ensure that scientific advice is underpinned by the best available evidence. We therefore work with a wide range of universities and research institutes from around the world. Cefas scientists endeavour to publish their research findings in the primary literature with, for example, 867 ISI publications between 2006 and 2011.

### **Our resources**

Cefas have **two well-equipped specialist laboratories**, comprehensive IT facilities and controlled environment aquaria and fish rearing facilities.

Our purpose-built **research vessel**, RV Cefas Endeavour, is the main resource supporting our seagoing activities throughout the UK's shelf seas. RV Cefas Endeavour enables the delivery of multidisciplinary projects, and provides a cost-effective platform for researchers especially when research is undertaken in conjunction with on-going Cefas monitoring cruises. Whilst some of this work is highly prescribed in nature with fixed point sampling (e.g. fish stock evaluation), other programmes are more flexible and provide opportunities for scientists to undertake discrete work packages alongside monitoring effort. Cefas is also developing inshore and deep sea survey capacity, and is working with other agencies to develop capability in the operation of underwater remotely operated vehicles (ROVs).

Our past and current research programmes provide opportunities for data mining either as baselines for new research or to address biodiversity trends by adding new data. We have **unique fisheries and environmental data** archives and specialist systems for interrogating and integrating data for numerical modelling and formal assessments. Cefas also works closely with NERC Data Centres through its participation as a MEDIN Data Archive Centre (FishDAC – a joint operation with Marine Scotland).

Modelling has a key role in supporting management decisions, and is more important as policy questions become more complex. We have a broad range of **modelling skills** that use hydrodynamic, biogeochemical, ecosystem, fisheries and epidemiological models. The breadth of these skills and integration of modelling with theory, data collection and advice are unique.