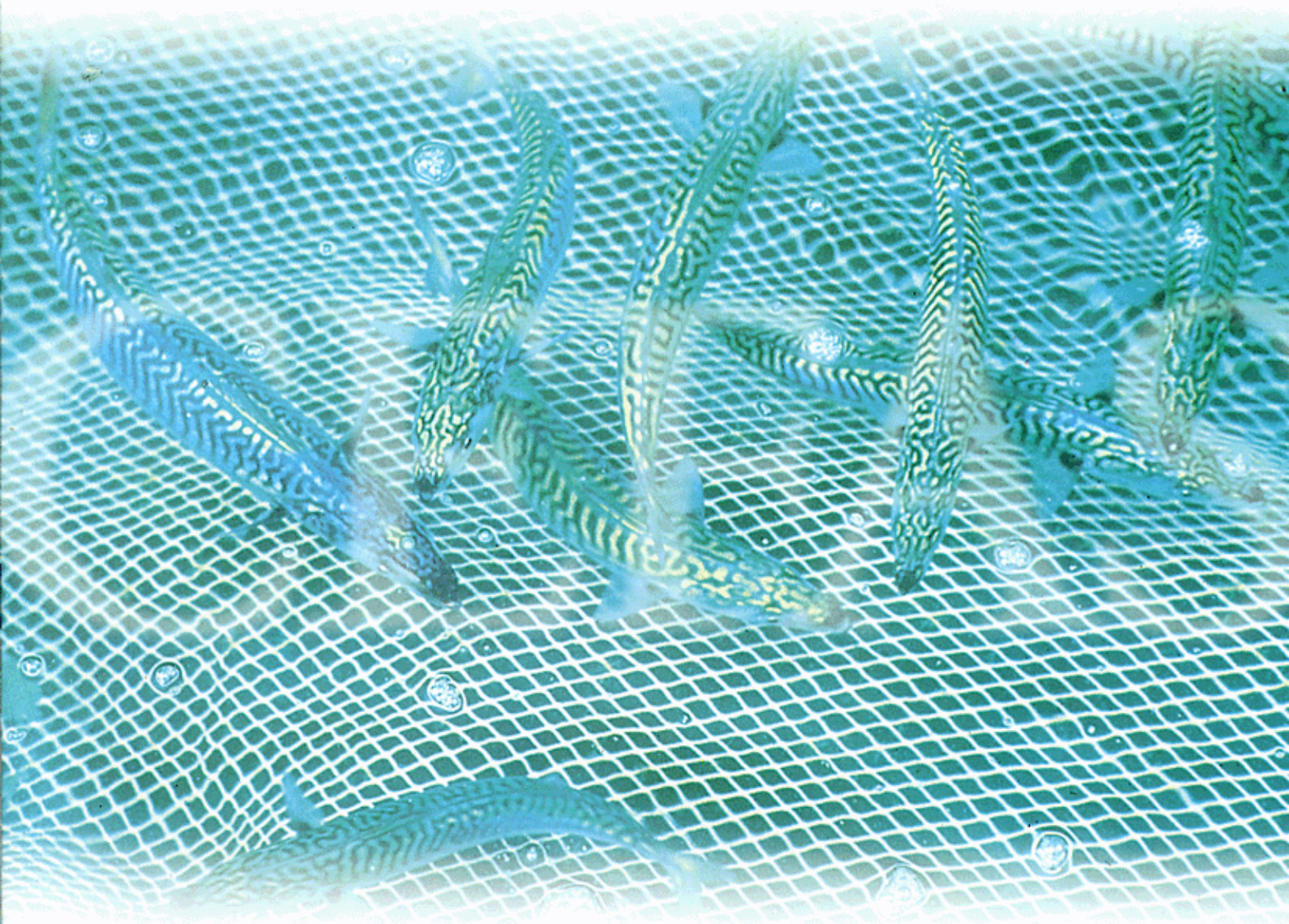


Fisheries Science and Management



Fisheries Science and Management

CEFAS has almost 100 years of fisheries research experience and, for the last 50 years, has provided reliable scientific assessments and objective advice for managing marine and freshwater fisheries. We combine comprehensive methods of stock assessment and monitoring with expert data analysis and interpretation.

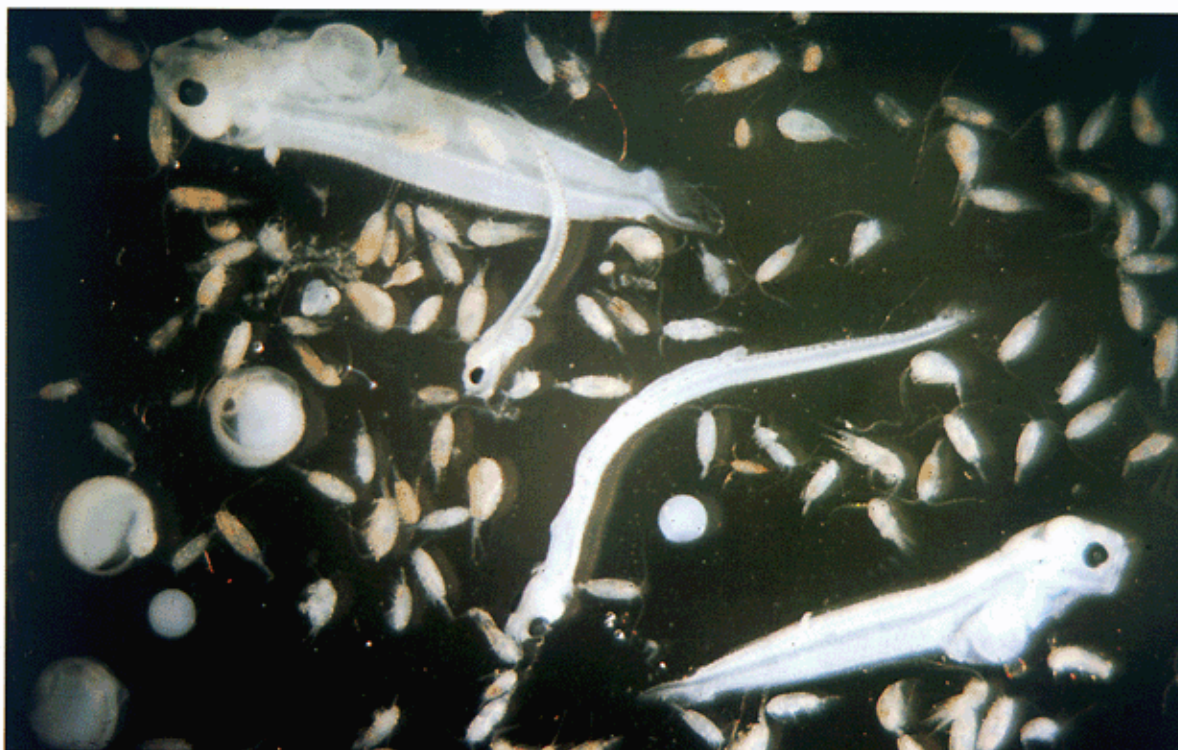
CEFAS scientists are leading participants in the International Council for the Exploration of the Seas (ICES), whose scientific working groups are the cornerstone of advice on North Atlantic fisheries assessment and management. CEFAS provides advice to UK and EU legislators and managers to enable them to achieve national and international fisheries policy objectives.



CEFAS has an international standing. We are well-placed to advise policy makers and governments throughout the world on the development of regulations and the implementation of control measures to manage new and expanding fisheries.

For collaborative projects we have long-standing and well-established relationships with key organisations involved in fisheries management and research world-wide.





Consultancy, Research and Training

CEFAS undertakes a wide range of short- and long-term research projects, training programmes and consultancies for a variety of customers.

For Sustainable Fisheries Management and Conservation, we can:

- Devise and implement stock assessment studies.
- Design sampling programmes for data collection and conduct surveys of aquatic resources.
- Devise and undertake research to provide fisheries management solutions over the short and long term.
- Advise on management strategies for oceanic and inshore fisheries and the coastal zone.
- Advise on the development and implementation of schemes controlling fishing activity.
- Advise on technical measures to manage fisheries and methods to implement them.

For Marine and Freshwater Ecosystems, we can:

- Conduct research into biological processes and interactions in ecosystems.
- Develop models of complex fisheries systems for improved stock assessment.
- Advise on effects of disturbances to aquatic ecosystems.

For Training and Supervision, CEFAS can:

- Create training programmes on any aspect of our work, tailored to customers' needs and delivered from our own laboratories or at a customer's site.
- Provide project management or supervisory expertise.



Sustainable Fisheries Management and Conservation

The fishing industries of many nations harvest a renewable resource of fish and shellfish. Exploitation requires careful management so that controls meet the needs of conservation and provide social and economic benefits to people that rely upon these stocks.

Fisheries management strategies

CEFAS has the expertise to inform and advise policy makers, fishery managers and industry on the effects of fishing on biological resources. We provide practical advice on appropriate management strategies, on the direct controls and technical measures needed to maintain productive resources, and how to implement them. CEFAS can also provide comprehensive training in the science and technology underpinning fisheries management.

Scientists at CEFAS have a comprehensive knowledge of the biology of marine and fresh water species, at both the individual organism and population level, and of their ecological role. A particular strength is our ability to design and implement sampling programmes and investigations to collect and improve this information with respect to stock assessment and management requirements. CEFAS has a recognised track record in carrying out field investigations, for example on the migration patterns of fish or how crustacean behaviour affects trap catches, and is at the forefront of studies to evaluate the biological and fisheries benefits of enhancing stocks using hatchery-reared juveniles.



Stock assessment studies

Stock assessment involves analysis of many different types of fisheries and biological data to provide independent, verifiable and complementary information. CEFAS has considerable experience of analysing and interpreting these type of data on local, national, and international scales. Our scientists employ conventional and fishery-specific variants of mathematical models and statistical techniques to develop a comprehensive understanding of the inter-relationships between fishing activity, stock abundance and population structure, and how they relate to the marine ecosystem.

Aquatic resource survey design and data collection

In any stock assessment study, the data to be collected will depend upon the type of fishery and what is already known about it. CEFAS has extensive experience of designing and conducting sampling programmes and fishery surveys in order to obtain representative samples of populations of fish and shellfish with which to estimate biological parameters.

Sources include catch and effort data recorded by fishermen themselves, and data from biological samples collected at fish markets or commercial fishing vessels at sea. CEFAS also carries out a variety of research vessel and charter surveys. These include otter- and





Coastal zone management

The demands of industrial, commercial and leisure activities on the coastal zone are increasingly in conflict with the interests of fish and shellfish stocks, fisheries and the coastal environment. CEFAS has the multi-disciplinary knowledge and expertise required to provide assessments of the impact of fishing and other human activities on marine and estuarine ecosystems, and advise on management strategies encompassing all uses of the coastal zone.

Advice on Marine and Freshwater Ecosystems

CEFAS can advise on the conservation of exploitable populations and the effect of environmental impacts on aquatic communities. CEFAS scientists have an in-depth knowledge of the biology of many important aquatic species, and an understanding of the interrelationships between them. They conduct research and have experience in freshwater, estuaries and a wide range of marine environments from sheltered coastal waters to oceanic deeps beyond the edge of the continental shelf.

Biological interactions

CEFAS is investigating ways to improve the quality of stock assessments and hence the predictions that underpin advice on management measures. CEFAS scientists are studying predation in order to better understand biological interactions between species, and how changes in the environment and climate influence the distribution and production of commercial stocks. The results have been used to develop mathematical models of the relationships between predators, their prey and the environment.



beam-trawl surveys, dredge, grab and under-water TV surveys in offshore waters, beach seine surveys, aerial surveys, transect sampling, recording of fish abundance at power station intake screens in the coastal zone, and electro-fishing and fish trapping in fresh-water environments.

CEFAS has developed and maintains a leading expertise in fish and shellfish ageing techniques and plankton identification. Large scale plankton surveys and quantitative studies of reproductive biology are used to give fishery-independent assessments of stock abundance.





Modelling Complex Fisheries Systems

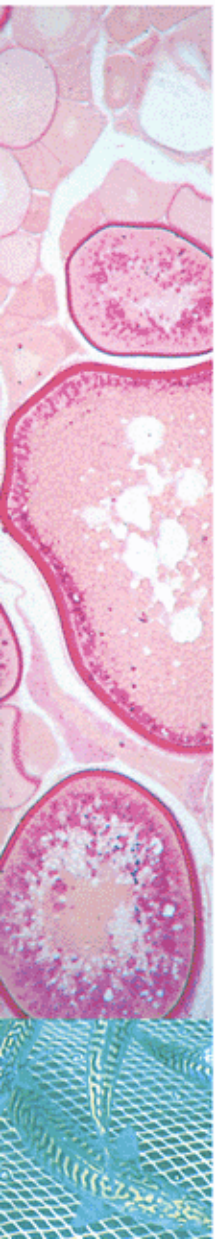
Just as fish stocks interact biologically at all life history stages, interaction between fishing fleets can be complex in space and time. In addition to biological sustainability, a fisheries manager's objectives may embrace other factors such as stability, revenue and employment. CEFAS scientists collaborate with managers, administrators and other scientists to evaluate a range of management options, and to assess and predict their medium-term impact. We can also undertake detailed analyses that reveal the short-term consequences of a particular action on individual fisheries sectors. To model multispecies, multifleet systems requires large sets of data from fishing surveys and laboratory work, economic and other non-biological information. CEFAS has well-developed statistical skills and computing facilities to model these complex fisheries systems.

Freshwater Fisheries

CEFAS has a wealth of experience in the international assessment and management of mixed stock salmon fisheries. In particular, our scientists have expertise in planning, organising and running field research studies and in developing models for the assessment of fisheries in rivers and still-water. We apply our expertise in fish tracking techniques to understand salmonid movements and to evaluate the impacts of human activities on migratory fish. We are also investigating interactions between fish and the freshwater environment, including the sub-lethal effects of water contaminants and the impacts of habitat degradation.

Managing effects of physical disturbances on marine ecosystems

Physical disturbances to the marine environment can be far-reaching and subtle. These disturbances include mineral extraction, dredging and deposition of spoil, harbour works and constructions, laying pipelines and cables, commercial fishing activity, shellfish cultivation, and marine accidents such as oil spills. CEFAS has experience in assessing the impact of such disturbances on biological populations and advising on strategies to manage them. We employ a variety of seabed investigation techniques such as benthic sampling and acoustic surveys, direct observations and remote monitoring. CEFAS also has experience in experimental designs for trials of trawling gear and shellfish harvesting methods.



CEFAS's expertise in research techniques includes:

Plankton and planktonic egg surveys

Plankton form the basis of marine food-webs. Changes in plankton production will ultimately affect the abundance of fish, marine birds and mammals. CEFAS has considerable experience in investigating and understanding the factors which control plankton production in coastal and shelf seas in North-west Europe. CEFAS has developed a leading expertise in the design and implementation of large-scale and small-scale plankton surveys, and in the identification of fish eggs, larvae, phytoplankton and zooplankton. Techniques such as optical and scanning electron microscopy, computerised data-processing and image analysis are used to study the early life stages of fish.

Age determination

CEFAS has expertise in assessing age composition and growth rates of a wide range of temperate species by interpreting the growth patterns on scales and otoliths of finfish, and shells and statoliths of shellfish. CEFAS is at the forefront of developing techniques for improving the efficiency and reliability of population age estimates, and offers training in ageing techniques.

Benthic surveys

CEFAS assesses the impact of physical activities on marine ecosystems by studying the flora and fauna of the benthic communities. Specialised equipment used includes

- Benthic grabs, dredges, trawls and corers
- Side-scan sonar, Roxann and Digital Geographic Positioning Systems
- Diver observations, underwater video, and remote monitoring with towed vehicles

CEFAS's Roxann acoustic seabed discrimination data resource is used to establish relationships between the distributions of biota and sediments, and can be used to assess the impact of trawling or aggregate extraction on the structure of the seabed.

Tag telemetry

CEFAS has developed sophisticated high-resolution tracking systems for juvenile and adult fish and shellfish in marine and freshwater environments, which utilise an innovative range of radio, acoustic and archival tags.

As well as offering technological expertise in the development of data storage tags and telemetry for free-swimming fish, CEFAS has pioneered tag attachment techniques and active sonar and acoustic buoy tracking equipment. CEFAS has been at the leading edge of developing miniature devices suitable for tracking and monitoring the behaviour of animals in extreme and demanding environments.

Toxic algal monitoring

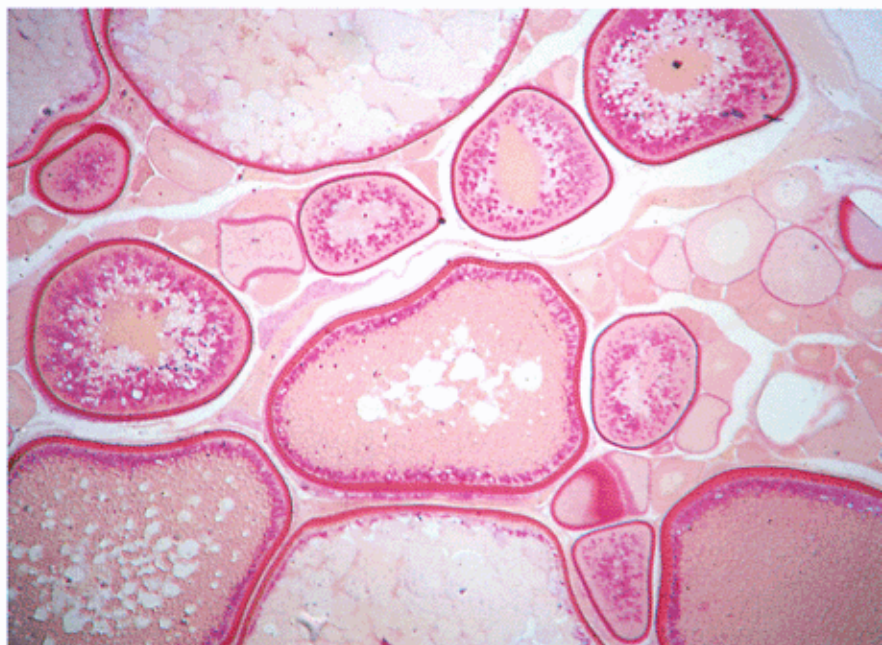
Regulators need to know when numbers of potentially toxic algae in water samples exceed a certain threshold in order to impose public health restrictions on the shellfish industry. CEFAS has designed an early-warning system for potential outbreaks of diarrhetic or paralytic shellfish poisoning using our expertise in identifying and enumerating algal species in marine water samples.

Temperature-controlled aquaria

CEFAS has high quality freshwater and seawater temperature-controlled aquaria. These house experimental populations of fish and shellfish for laboratory studies on physiology, development and behaviour.

Radioimmunoassay and high pressure liquid chromatography (HPLC)

CEFAS scientists apply these techniques in sophisticated studies of fish physiology to understand reproductive development and effects of pollutants on reproduction.





CEFAS

SOLVING PROBLEMS IN FISHERIES
AND THE ENVIRONMENT



CEFAS's resources and expertise

Solving your problems with leading experts and facilities

- CEFAS offers in-depth expertise from over 450 staff, many of whom are leaders in their field and advisors on international bodies.
- CEFAS has comprehensive in-house facilities, including four well-equipped specialist laboratories backed up by dedicated scientists, technicians and other professionals.
- CEFAS's Lowestoft laboratory provides most of our fisheries science and management services. Facilities there include aquaria, raceways, acoustic and annular tanks, radioimmunoassay, HPLC, optical and scanning electron microscopy, plankton identification and a comprehensive electronic data management system.
- CEFAS operates two sophisticated ocean-going research vessels with accreditation to ISO 9000 and IMO's International Safety Management Code providing an effective and economic platform for data acquisition.

A reliable, tailored service delivered efficiently, to time and within budget

- With a unique breadth of expertise and facilities in environmental and fisheries management, we can rapidly put together a multi-disciplinary team of experienced specialists, fully supported by our comprehensive in-house resources, to help our clients - whatever their size - achieve successful solutions to their problems.
- Extensive national and international links mean we can build cost-effective consortia to meet the most challenging of customer requirements.

Helping you through the regulatory maze

- CEFAS is directly involved in formulating, implementing and interpreting UK and EU legislation. Our knowledge of the regulatory process ensures that your business can adapt to the demands and impacts of changing legislation in the most cost effective and efficient way.

Successful track record

- CEFAS has a successful track record in delivering a highly focused, confidential service in a reliable and responsive way.
- CEFAS's existing customers are drawn from a broad spectrum with wide ranging interests. They include UK and international government departments, the EU, industry (oil, water, chemical, pharmaceutical, agro-chemical, aggregate, marine), non-governmental and environmental organisations, regulators and enforcement agencies, local authorities and other public bodies.

Further expertise

CEFAS has complementary expertise in aquaculture, aquatic animal health, fish and shellfish hygiene, and in environmental research, monitoring, status and impact assessments of the aquatic and terrestrial environment. For further information about any of our services, or more information about CEFAS's other activities please contact



CEFAS is an Executive Agency of DEFRA

Commercial Unit
CEFAS
Pakefield Road
Lowestoft
Suffolk
UK NR33 0HT

Tel: +44 (0) 1502 524590
Fax: +44 (0) 1502 524569/513865
Email: marketing@cefass.co.uk