environment
fisheries
aquaculture

sustainable resource management

Cefas capability statement

Cefas

Cefas capability statement contents

sustainable resource management

environmental management
strategic development

fisheries management
sustainable resources

aquaculture and food safety
productivity and health

sustainable resource management

sustainable resource management Cefas helps clients around the world to manage, protect and develop marine, coastal and freshwater environments and their resources

managing environmental resources

management for sustainability

Cefas is a multidisciplinary scientific research and consultancy centre promoting management practices that help communities around the world to benefit from their aquatic resources.

Our aim is to work with customers so that they can manage their environments and resources in a responsible, effective and sustainable manner. Our approach to resource management delivers valuable social, economic and political benefits to communities, through enabling them to:

- Optimise resource development and utilisation, and minimise environmental costs
- Understand, assess and develop opportunities in the short, medium and long-term
- Build capabilities and raise standards through new knowledge, skills and technologies
- Adopt sustainable, cost-effective management practices and policies
- Support sustainable livelihoods

institutional development

building capabilities

Our scientific research and practical experience are applied to build knowledge of the natural resources and environments managed by our customers, and to advise on the management tools for monitoring, controlling, assessing and regulating impacts of environmental developments.

We provide training and advice on infrastructure developments that build the capabilities of our customers. Our expertise includes advising on the transfer of skills and technology, and the development and implementation of legislation for managing and protecting aquatic environments.

developing marine resources and environments

Key outputs enable customers to:

- Understand environmental quality and resource potential
- Monitor, measure and interpret changes in the environment
- Predict the impact of current, future and proposed activities against a background of natural change
- Build management skills for policy development

an integrated approach

our expertise

Our expertise encompasses a wide range of fields, so we can offer a comprehensive portfolio of consultancy, research and training services.

We work in the following areas:

- Marine and freshwater fisheries management and science
- Marine and freshwater fish and shellfish health, productivity and safety
- Aquaculture development
- Environmental management, monitoring and quality assessment
- Evaluation of Environmental Impact Assessments
- Coastal Zone Management
- Integrated Data Management Systems

customer applications

We have expertise in freshwater, estuarine, inshore and offshore waters, coastal zones and river basins. Our services cover a wide range of activities, including:

- Fishing
- Fish and shellfish farming
- Seafood safety
- Coastal protection
- Aggregate extraction
- Dredging and disposal impact
- Oil and gas exploration and production
- Chemical and oil spills
- Waste disposal
- Port and harbour works and constructions
- Wind farm developments

We build the knowledge and capabilities of our customers through the application of our scientific, management, policy and legislative expertise.

capability

"we offer a comprehensive portfolio of multidisciplinary consultancy, research and training services used by governments, enforcement agencies, and policy-makers around the world."

extensive experience

Cefas provides a unique breadth of capabilities within one organisation, drawing from a large pool of experienced scientists and project managers. We have more than 500 staff based at 3 laboratories, our own ocean-going research vessel, over 100 years of experience, and a long and successful track record in delivering high quality services to clients around the world. The strength of our expertise, scientific skills, technical abilities and innovative approach is recognised worldwide.

We have a wealth of experience in multi-disciplinary projects, at both national and international levels. We work successfully in partnership with other organisations, frequently operating in international consortia for the delivery of large and complex projects. We have an extensive network of contacts, encompassing other policy, research, management and consultancy organisations. Many Cefas scientists are leaders in their field and advisors on international bodies such as the International Council for the Exploration of the Sea (ICES).

customer base

We work with a broad spectrum of customers with wide ranging interests and aims. Our clients include:

- International and UK government departments
- The World Bank
- The European Commission
- United Nations Food and Agriculture Organisation (FAO)
- National and multi-national industries: oil and energy, water, chemical and agro-chemical, pharmaceutical, aggregate and marine
- Non-governmental and environmental organisations
- Regulators and enforcement agencies
- Local authorities and other public bodies

project location map

Cefas has delivered a wide range of research and consultancy services in the fields of fisheries, aquaculture and environmental science to customers around the world over the past hundred years. Selected recent project locations are shown on the map above. Projects highlighted as Case Studies are featured within this document.

case studies

01 Georgia integrated coastal zone management
02 the role of the Arctic in global ocean processes and climate change
03 capacity building in environmental monitoring and protection
04 provision of expert scientific advice on licence applications and measures for regulating and controlling activities in the coastal zone
05 review of the environmental impact assessment of the kulevi oil terminal and railway access line

01 Caspian environment programme: fisheries conservation and management
02 fisheries management training courses
03 independent fisheries stock assessment reviews
04 provision of high level fisheries management advice
05 strengthening Latvia's fishery administration

01 Albania aquaculture and fisheries development
02 improving productivity in aquaculture by promoting natural disease resistance in fish
03 provision of shellfish safety services
04 establishing a fish health management system for regulatory authorities

environmental management strategic development

coastal zone management
environmental quality
environmental impact assessments
monitoring programmes
management tools and infrastructure
case studies
selected projects summary table

Cefas provides advice and practical solutions for assessing and managing the environmental effects of human activities in the coastal zone

coastal zone management

coastal zone activities

Many of our management programmes relate to the coastal zone, a crucial and complex area due to the resources the zone holds, the extreme pressures upon it, and its environmental importance and vulnerability.

We are active in developing knowledge of the coastal zone ecosystem, its processes and the impacts of human activities upon them, in order to develop and implement effective, integrated management strategies. We support policy makers and enforcement agencies with their development and enforcement of legislation to achieve a sustainable balance between conservation and resource utilisation.

comprehensive expertise

We advise on the activities impacting upon coastal zones, and their environmental effects. These include nutrient and pesticide run-off, discharges of radioactivity, sewage and other effluents from changing agricultural practices, urban growth, industrial activities and tourism. We also advise on the impacts of offshore activities exploiting or manipulating marine resources, such as dredging and dredge disposal, aggregate extraction, coastal defence works, oil and gas exploration and production and offshore wind energy developments. We assess further factors, such as disease and climate change, and we advise on the impact and interaction between natural and man-made factors.

Many of our management programmes relate to the protection and sustainable development of coastal zone resources.

environmental quality

We are a leading authority in determining environmental quality using knowledge and techniques developed through our scientific research programmes. We have a comprehensive range of expertise in measuring the environmental quality of complex marine ecosystems.

We offer field, laboratory and consultancy services assessing baseline and stressed or impacted ecosystems in a wide range of disciplines, including:

- Assessment of species composition and diversity
- Ecology of freshwater, estuarine and marine environments with particular expertise in benthic ecology
- Physical processes and ocean sediment dynamics
- Assessment of nutrient enrichment, eutrophication and sediment erosion
- Risk assessment and evaluation of radiation, pesticides and hazardous chemicals using behavioural, physiological reproductive and ecological studies
- Identification and diagnosis of toxicity in complex environmental samples
- Analysis of important contaminants and biological effects in biota, sediment and water
- Use and interpretation of bioassays and biomarkers for environmental quality assessment
- Identification of endocrine disrupters, their causal effects according to scale of exposure, and risk assessments on populations including molluscs, arthropods, fish and mammals.
- Risk assessment and management of introduced and pest species and diseases.

environmental impact assessments

We assess the impact and interaction of natural and made-made factors upon aquatic environments. Areas of expertise include:

- Distinguishing between natural and anthropogenic changes to the marine ecosystem
- Effects of climate change
- Assessing the impact of fishing activities
- Assessing the impact of dredging, aggregate extraction, coastal defence works, offshore wind farms, hydrocarbon exploration/exploitation, and effluent discharges
- Chemical and oil spill management
- Detecting environmental change
- Assessing and evaluating environmental impact statements

monitoring programmes

environmental monitoring programmes

Cefas chairs the UK group responsible for co-ordinating a national programme of marine monitoring. This programme aims to detect long-term trends in the chemical, physical and biological quality of the marine environment in a cost-effective way that meets national and international requirements. We advise on setting up and implementing monitoring schemes and their associated activities to measure and assess environmental quality and change.

monitoring equipment for measuring water quality

Deploying *in-situ* monitoring equipment provides cost effective, real-time data solutions for customers over the long time periods necessary to identify environmental conditions and define directions and rate of change. We have an established international reputation for our expertise in designing and operating autonomous monitoring equipment and supporting software systems.

Our integrated observational systems take frequent measurements of physical, chemical and biological variables from the sea surface to seabed. Meteorological sensors can also be added. Our robust and reliable monitoring systems are designed to operate during extreme weather conditions and for long periods of time without servicing. The application of autonomous monitoring equipment has been built on more than fifty years of designing and implementing ship-borne survey programmes.

data sampling surveys

Cefas advises on appropriate, cost-effective methods of observing, sampling and analysing the marine ecosystem through the design and execution of data collection surveys and their subsequent analysis and interpretation.

Our survey results are used for a range of applications, such as water quality assessment and forecasting, understanding coastal processes, contaminant behaviour, eutrophication and coastal protection studies through to developing policy and management approaches.

management tools and infrastructure

management measures

Cefas has extensive experience in the development and application of management measures, programmes and policies. We offer consultancy services for all aspects of marine environmental management strategies including:

- Developing, implementing and evaluating regulatory and control programmes
- Establishing licensing systems and enforcement regimes
- Regulatory and legislative compliance assessments
- Design and implementation of information systems, management frameworks and physical infrastructures
- Auditing for the effectiveness of environmental management strategies

"we advise on the impacts of potentially harmful substances and activities on the quality and integrity of marine, coastal and estuarine ecosystems."

integrated data management systems

We provide local and network distributed integrated databases and information systems for customers, making data readily accessible in an electronic format so that it can be manipulated, interpreted and used in formulating and implementing policy.

Our data collection and management systems can be combined with real-time transmission and interpretation tools, including Geographical Information Systems (GIS). These provide up-to-date access to data and reports on water quality and environmental conditions. These systems assist in data interpretation, improve national and international access to marine environmental information of common interest and relevance, and enhance data presentation.

We have experience in developing numerical models of physical, chemical, geochemical and biological processes for improved understanding and prediction of change in the marine environment. Such models are playing an increasingly key role in the prediction of environmental impact and change over long time periods.

case studies

The following case studies provide examples of the practical application of our scientific, technical, consultancy and management services in the marine environment.

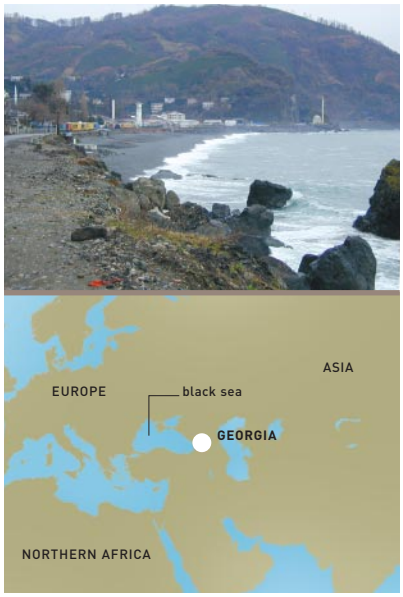
We have over fifty years experience of providing scientific and technical consultancy for national and international environmental monitoring programmes.

client Government of the Republic of Georgia

location Republic of Georgia

dates 2000 – 2005

01 Georgia integrated coastal zone management



skills and expertise employed

- institutional strengthening
- coastal zone management
- sustainable resource management
- provision of policy advice
- marine environmental quality
- data collection and analysis

project description and benefits

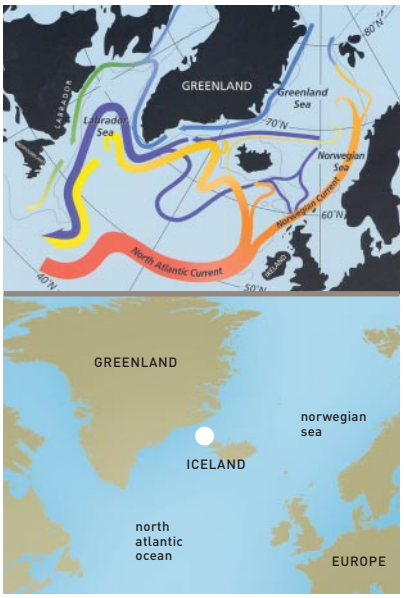
A World Bank funded project aimed at supporting the Georgian Government's participation in the Black Sea Environment Programme (BSEP). The project provided a strategic framework and concrete measures for the protection and sustainable development of Georgia's coastal environment. The primary objective of the project was the preservation of the coastal ecosystem and its biodiversity. This was supported by raising regional and local public opinion and assisting in the development of local institutional capacity to meet the environmental protection requirements.

services provided by Cefas

A Cefas led team conducted an initial review of the existing systems and institutional arrangements regarding water quality monitoring and assessment. This formed the basis for the design of a new biodiversity and water quality monitoring programme. The water quality component involved both near and offshore waters and included microbiological, chemical and physical effects monitoring with an emphasis on human health. Associated with the implementation of the monitoring programme was the provision of specifications for sampling and analytical equipment. Guidance on sustainable fisheries management on inland lakes in Georgian National Parks and marine fisheries were also provided. Public awareness and educational courses are to be initiated. A key component of the project was the design and running of training courses for staff of local environmental institutions. Disciplines covered include the establishment of environmental monitoring programmes, species identification techniques, data presentation and data interpretation.

client UK Government
location Arctic Ocean / UK
dates 1999 – 2004

02 the role of the Arctic in global ocean processes and climate change



skills and expertise employed

- climate change studies
- ocean processes
- environmental monitoring
- collaborative international research
- data collection and analysis
- innovative research

project description and benefits

The global ocean circulation system, often called the ocean conveyor, is responsible for distributing vast quantities of heat throughout the planet. In this capacity it has a profound influence on the global climate. The ocean conveyor is propelled to a large extent by the sinking of cold, salty (and therefore denser) waters in the North Atlantic and Arctic Ocean. This creates a void that pulls warm, surface waters northward. The North Atlantic and Arctic Ocean area is therefore a key region in driving this ocean conveyor process. Changes in the hydrology of this region could have a profound effect on the oceans' processes and consequently on climate. The objective of this project was, in association with other national and international agencies, to examine the oceanic changes currently underway in the Arctic Ocean.

services provided by Cefas

The project specifically dealt with monitoring the hydrology of the pivotal area of the Denmark Strait. This is a hostile environment in which to undertake fieldwork, but the successful deployment and collection of an array of moored instruments was achieved in collaboration with German and Finnish scientists. The data collected provided information on current flow and salinity. Collectively this data enabled measuring of the cold, dense flow of water descending the continental slope and of the freshwater flux along the east Greenland shelf. The results of this, and other work in the region, has shown significant recent changes in the hydrology of this system. This work has greatly contributed to our understanding of the variability of the ocean conveyor process and is therefore of fundamental climatic importance.

client Environment Public Authority (EPA), Kuwait

location Kuwait

dates ongoing since 2000

03 capacity building in environmental monitoring and protection

skills and expertise employed

- institutional strengthening
- information system development
- collaborative international research
- ecosystem quality
- marine environmental monitoring
- coastal zone management

project description and benefits

Cefas and the Kuwait Environment Public Authority (EPA) entered a long-term relationship under a Memorandum of Agreement in May 2000, to collaborate on issues of environmental pollution and management in the coastal zone. This was in response to a major fish kill event in Kuwait Bay in 1999.

As a result of the Memorandum of Agreement, the EPA and Cefas now have a developing co-operative relationship. Cefas provides specialist services, training courses and workshops to assist the development of the EPA's capacity in aquatic environmental monitoring and protection.

A number of activities have been undertaken with the EPA since contact was first established in 1999. Projects continue to be developed and a number of areas of work have been selected for co-operation over the next two years.

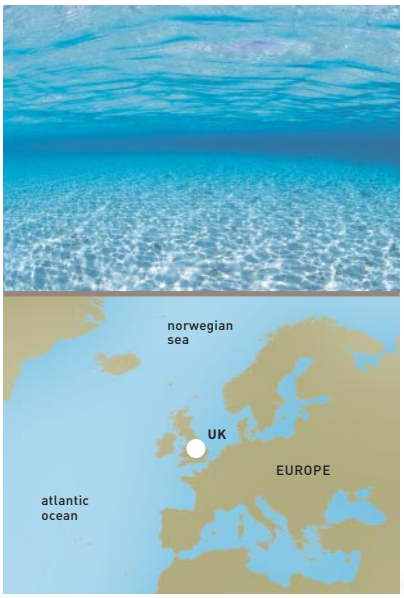
services provided by Cefas

Examples of specific activities undertaken by Cefas and the EPA are:

- Scoping study to assess the EPA's analytical and environmental information systems capability, with respect to monitoring pollution and aquatic life in Kuwait Bay.
- Investigation of a second fish kill episode in Kuwait Bay (2001). Sampling, preserving and analysis of fish samples to determine the cause of the fatalities.
- Laboratory based analytical testing of shellfish samples sent from Kuwait to the Cefas laboratories.
- Visit to Kuwait by Cefas staff, sampling of reference material and analysis of the results obtained from preliminary investigations into a fish kill episode. Followed by a full investigation (bacteriology, virology, histopathology, biotoxins, and trace metals, etc.) involving Cefas laboratory equipment.
- Training course for EPA scientists on fish post-mortem techniques at Cefas (2003).

client UK Government
location UK
dates ongoing annually

04 provision of expert scientific advice on licence applications and measures for regulating and controlling activities in the coastal zone



skills and expertise employed

- environmental impact assessment
- provision of policy advice
- ecosystem quality
- data collection and analysis
- independent consultancy
- practical application of scientific knowledge

project description and benefits

This ongoing project provides the UK Government's Department for Environment, Food and Rural Affairs (Defra) with expert scientific assessments regarding the environmental effects concerning licence applications and measures for regulating and controlling activities in the coastal zone. These activities include:

- Disposal of material at sea, including construction below the high water mark
- Discharges from pipelines, including polluting effluents and sewage

The project also monitors the impact of licensed activities, providing Defra with expert scientific and technical advice on all aspects of the impact of activities in the coastal zone, and providing scientific advice on developments in national and international policy.

services provided by Cefas

Cefas advises Defra on the view it should take with respect to approving individual licence applications. This advice centres on assessing the physical and biological impacts of disposal and deposition activities on the marine environment. This includes consideration of water quality, bio-diversity, fisheries and human health issues. In reviewing these issues Cefas considers the following:

- resources in the area, such as existing and potential fisheries, spawning and nursery grounds and food organisms
- toxicity of the effluent, including its potential for bioaccumulation
- chemical components of the effluent, especially materials which are carcinogenic, radioactive or liable to taint seafood
- hydrography of receiving waters, such as the likely rate of dilution and dispersion, and water movement
- relevant standards, national policy, international agreements, etc.

Cefas monitors the impacts of licensed activities by inspection visits and provides regular reports on deposition activities.

client Ministry of Environment, Georgia
location Republic of Georgia
dates 2002 – 2003

05 review of the environmental impact assessment of the Kulevi oil terminal and railway access line

skills and expertise employed

- independent consultancy
- environmental impact assessment
- provision of policy advice
- ecosystem quality
- risk analysis
- coastal zone management

project description and benefits

The project reviewed the Environmental Impact Assessment (EIA) for a marine access channel and railway access line to the Kulevi oil terminal in Georgia. The objective was to determine the comprehensiveness of the previously conducted studies and the measures proposed to mitigate environmental impacts. A private consortium had sought planning permission to construct an oil terminal and railway access line and some of these proposed activities would take place in the Kolkheti National Park. This necessitated a thorough and rigorous approach to the EIA.

services provided by Cefas

Site visits were conducted to ascertain the key environmental issues associated with the development. The EIAs were reviewed in accordance with Georgian legislation governing the EIA procedure. Comprehensiveness of data collection, public consultation and proposed mitigation measures were examined against the likely perceived environmental impacts as judged from the site visits, a review of the literature and information on natural resources and past experiences of such developments.

selected projects summary table

• Environment Public Authority • Kuwait • 2003 – 2005	**assessing the environmental status of Kuwait Bay** Evaluating the impact of sewage outputs on the ecology of the bay and assisting in the design of an integrated environmental monitoring programme. This work is being carried out in collaboration with the Environment Public Authority.
• European Commission • United Kingdom • 2004 – 2006	**european lifestyles in the marine environment** A study involving 28 institutions across Europe examining the changes within European seas in response to major economic, social and institutional changes. Cefas co-ordinated the pollution issues of the project.
• Saudi Company for Environmental Works • Saudi Arabia • 2002 – 2003	**assessment of marine environmental damage arising from Gulf War oil spills** Interpreting available regional data to assess the impacts of oil spills on the marine environment and on fisheries resources in the Persian Gulf.
• UK Government • United Kingdom • ongoing since 2002	**establishing a near shore wave monitoring network** Installing a network of buoys capable of telemetering wave data in real-time. This data is publicly available on the internet and used for flood and coastal defence planning purposes.
• UK Government • United Kingdom • ongoing since 1997	**national marine monitoring programme activities** Undertaking a comprehensive study of the health of the marine environment by monitoring the presence, concentration and effects of a wide range of chemical and other contaminants in the marine environment.
• World Wildlife Fund (WWF) • United Kingdom • 2000 – 2002	**reproductive anomalies in harbour porpoises** Researching the effects of endocrine disrupting chemicals on the reproductive functioning of the harbour porpoise. Analysis was carried out on a range of contaminants thought to have an effect.
• European Commission • United Kingdom • 2005 – 2010	**developing an integrated risk assessment model for aquatic ecosystems** Developing models for assessing and forecasting the impact of environmental key pollutants on marine and freshwater ecosystems and biodiversity.
• UK Government • United Kingdom • 2000 – 2007	**eutrophication and nutrient management advice** Provide advice on the threat posed to the marine environment by nutrients and on nutrient-reduction programmes to protect estuarine, coastal and marine waters from eutrophication.
• Department for International Development (DFID) • South East Asia • 1999	**effective and sustainable development of offshore aggregates** Providing advice on policy and licensing and promoting good practice for the environmentally sound exploitation of offshore aggregates in South East Asia.
• UK Government • United Kingdom • 1999 – 2000	**effect of pesticide run-off on streams** Developing and deploying methods for evaluating the nature and extent of pesticide impacts on the ecology of streams.
• UK Government • United Kingdom • ongoing	**maintain an emergency response facility for oil and chemical spills** Provision of an up to date response capability in relation to accidents involving the release of oil or chemicals into the marine environment. In such an eventuality Cefas provides environmental impact advice for the event and subsequent clean up operations.
• UK Government • United Kingdom • ongoing since 2000	**assessing the rehabilitation of the sea-bed following marine aggregate dredging** Researching the processes determining recovery of sea-bed habitat following dredging and applying this knowledge to the practical management of the marine aggregate dredging industry.

fisheries management sustainable resources

Cefas enjoys an outstanding reputation within the world community of fisheries science and management and has been at the forefront in these fields for many decades

management for sustainability

managing complex resources

Cefas is internationally recognised as a leading centre for consultancy and research on sustainable fisheries management and fisheries science. We advise on strategic plans and infrastructures delivering the management and policy aims of our customers.

Cefas has a proven track record in managing large and complex fisheries information and technology projects for a range of national and international scientific and regulatory bodies. We provide expert advice on fisheries assessment, monitoring and management programmes, and make impartial, independent reviews and recommendations.

international capacity building

Cefas has a long record of international collaboration with fisheries institutes around the world, sharing best practice in fisheries management. We play a leading role in international institutional development through advisory, consultancy and collaborative projects, by hosting a wide variety of study visits, workshops and conferences, and by organising training courses in the UK and overseas.

stock assessments

shared, straddling and migratory stocks

Many fish stocks are shared by more than a single regulatory regime, a situation that poses particular management challenges of international concern. We are experienced in dealing with the full range of regional and international fisheries management issues, including shared, straddling and migratory stocks and the development and operation of regional fisheries management bodies.

stock status

We apply stock assessments in the development of fisheries management plans, and in monitoring the results of fisheries policies. We advise on single and multispecies stock status, and we are experienced in all aspects of the work, from data collection, to interpretation, and application for management.

We design, implement, analyse and advise on the following for national and international clients:

- Evaluation of appropriate survey and sampling techniques and frequency
- Acoustic surveys
- Egg-production assessments using plankton survey results
- Biological, market and commercial fleet sampling
- Stock recruitment assessment
- Training in the application of stock assessment methodologies
- Training in the formulation of management advice

We have conducted research on ecosystem effects of fishing at sites throughout the world

fish behaviour, tracking and telemetry

Cefas has extensive experience in the development and use of tags in assessing fish behaviour, from traditional mark/re-capture methods to the application of state-of-the-art electronic tags.

Our in-house design team have an international reputation for their development and application of electronic tags (acoustic, radio, combined acoustic/radio and data storage tags) and high-resolution tracking systems. These are used in an increasing number of ways to provide valuable fish behavioural data to assist fisheries managers. Results are used to establish:

- Behaviour of tagged individuals through physical and physiological data
- Stock migration patterns
- Effects of human activities and obstructions on migrations
- Effect of fish behaviour on the efficiency of sampling methods (trawling and acoustic survey)
- Impact of specific patterns of behaviour on stock size and recruitment

ecosystem effects of fishing

No longer are fishing activities seen in isolation from the environment. Cefas has expertise in the assessment and wider implications of fishing related activities upon marine environments.

Areas of expertise include:

- Assessment of impact using fisheries and enforcement data (e.g. from aerial and VMS surveillance)
- Effects of fishing on non-target and vulnerable species and on habitats (including seabirds and turtles)
- Effects on biodiversity, ecosystem structure and function
- Habitat description and designation of biotopes
- Implications of international fisheries conservation legislation
- Working with the Marine Stewardship Council accreditation scheme for sustainable fisheries

monitoring, control and surveillance

measuring fishing effort

We have experience in Monitoring, Control and Surveillance (MCS) tools measuring fishing effort in marine and freshwater systems. These are crucial tools in effecting policies and plans for fisheries management. We advise on the approaches to collection of appropriate data, licensing and enforcing systems, and provision of management information systems. We can also identify opportunities to maximise the benefits of MCS from existing systems in order to make efficiency savings, without compromising the essential integrity of any of the MCS functions.

vessel monitoring systems

We are experienced in advising policy makers on the design and operational needs of Vessel Monitoring Systems (VMS), the use of VMS for policy enforcement, and exploring the wider application of VMS data in fisheries management. We have practical experience of the running of VMS systems for government.

determination of catches

A scientific basis for fisheries management requires accurate and reliable data, so designing and implementing the most appropriate data collection schemes is essential. We are experienced in all aspects of data definition and the methodologies and practicalities of collecting data from fleets, ports, markets and fishing enterprises. We advise on the approaches available for data collection, such as observer surveys, logbook recording of catches and fishing effort, discard monitoring, and biological and other sampling, both for quota-controlled and non-quota-controlled species. We also understand the complex issues of data misreporting and how to collect the data to make appropriate adjustments for stock assessment and management purposes.

Cefas has a wealth of experience in designing data collection schemes measuring fishing effort and catches in sustainable fisheries.

management tools and infrastructure

management policies

Cefas scientists are lead players in many fisheries management developments, with outstanding practical experience of the sustainable management of fisheries.

We advise on the best approaches to fisheries management, tailored to the specific political, economic, or social requirements of our customers. Our expertise covers all measures aimed at maintaining, increasing or recovering stocks for long-term viable fisheries, as well as developing under fished or previously unfished resources. Our experience includes:

- Setting quotas, quota management and sharing
- Conservation initiatives such as Marine Protected Areas (MPA's)
- No-take zones
- Approaches to ecosystem based management
- The Precautionary Approach to fisheries management
- Stock management and recovery plans
- Effort-based management

"we have monitoring systems in place containing fisheries data collected continuously over one hundred years."

integrated information systems

We advise on setting up integrated fisheries management information systems for customers, and re-engineering systems to improve access to information, to reduce running costs and to improve long-term maintainability by applying the most appropriate software.

We develop and manage the UK Government's fisheries management information system. Vessel registration, vessel licensing, commercial catch landings, quota management, surveillance, VMS and biological sampling data are combined in a state of the art, modular system. This system is in daily use by more than 150 staff at a large number of ports and offices around the UK. The system is interfaced to the systems of other governments and to the regional databases operated by the European Commission.

population and systems modelling

We provide assessments of single and multispecies dynamics through the use of powerful, state of the art computer-modelling techniques. Results are used to predict the effect of biological processes on fisheries management strategies, and to evaluate the impacts of management options in different scenarios, over varying timescales. This enables management advice to be formulated to deal with a wide variety of conditions including high levels of uncertainty.

case studies

The following case studies provide examples of the practical application of our scientific, technical, consultancy and management services in marine and freshwater fisheries.

client **European Commission (Europe Aid)**

location **Azerbaijan, Kazakhstan, Russia, Turkmenistan and Iran**

dates **2004 – 2006**

01 Caspian environment programme: fisheries conservation and management

skills and expertise employed

- sustainable resource management
- ecosystem management approach
- institutional strengthening
- stock assessment expertise
- provision of policy advice
- fisheries data collection and analysis

project description and benefits

The project is focusing on the recovery of fish stocks in the Caspian Sea. Recent years have seen significant declines in Caspian fish stocks. These declines have been primarily as a result of over fishing by the fisheries of the littoral states and infrastructural developments, and to a lesser extent, contamination and environmental issues. The sturgeon is a species of major commercial importance in the Caspian region and the recovery of this species will form an important component of the project. By seeking to strengthen the fisheries management activities within the littoral states and by promoting co-ordination between the states, the project aims to redress the decline in fish stocks and to establish the foundations for a sustainable and profitable Caspian fishery.

services provided by Cefas

Cefas staff, together with its consortium partners, are engaged in a number of activities aimed at strengthening research capacity in order to provide scientific background for the regional management of the Caspian fisheries. This has involved reviewing the present state of fisheries data, surveys and research methods. On the basis of this an assessment of training needs was conducted, and a series of regional training courses facilitated, covering topics such as population dynamics and stock assessment.

Collaboration between Caspian fisheries scientists from the various states is being developed through a range of workshops, discussion groups and research visits. The collaborative research will be further enhanced through the development of methodologies for determining a regional stock assessment. In addition, assistance is being provided to local scientists to undertake assessments of their own important fish stocks, such as sturgeon and kilka. Further tasks with Cefas involvement are developing an action plan of collating and sharing data in the region, performing pilot stock assessments, and developing scenarios for rational fishing based on these stocks.

client various public funding bodies

location UK and in country

dates since 2000

02 fisheries management training courses

skills and expertise employed

- institutional strengthening
- strategic fisheries management knowledge
- sustainable resource management
- stock assessment expertise
- practical application of scientific techniques
- fisheries data collection and analysis

project description and benefits

Cefas are periodically requested to run tailored fisheries management training courses for overseas fisheries officials. Most recently courses have been run for scientists from Spain, Bangladesh and Tristan da Cunha. The course content is based upon the particular requirements of the scientists and their level of technical experience. Course duration is typically between five and ten days, allowing a detailed and thorough covering of course content by tutor and individual scientist.

services provided by Cefas

Typical topics covered by Cefas include:

- Practical sampling of fish: measuring lengths, weights and taking of otoliths (for aging) from a variety of fish for input into stock assessments.
- Data recording and data raising: general techniques on working with fisheries data and the requirements for preparing data for stock assessments. Data covered can be region and species specific for added applicability.
- Stock assessment: the basic principles of stock assessments and population dynamics. Working with a number of stock assessment packages including CEDA, LFDA and FiSAT. The interpretation of assessment results and the applicability of biological reference point estimates.
- Gear and by-catch issues: consideration of current approaches used in fisheries and the regulations that support these.

client National Marine Fisheries Service (USA)

location USA

dates ongoing since 1995

03 independent fisheries stock assessment reviews

skills and expertise employed

- strategic fisheries management knowledge
- marine fisheries management knowledge
- independent consultancy services
- stock assessment expertise
- provision of management reports

project description and benefits

Cefas regularly provides scientific staff to serve as independent evaluators of fish stock assessments undertaken by the United States National Marine Fisheries Service (NMFS). The evaluation takes the form of a review procedure, the objective being to provide independent recommendations for associated research and fishery management. Cefas provides scientists to participate as both panel member reviewers and chairs of the review committee. The reviews are held for a wide variety of fish stocks from various regions of the United States.

services provided by Cefas

Each review committee is a formal, typically one-week long, meeting of independent stock assessment experts who serve as a peer-review panel for several stock assessments. The terms of reference for each stock typically consists of updating all relevant information (catch and landings data, survey data, and biological data), and evaluating stock status with respect to established target and threshold levels of over-fishing.

Prior to the meetings, the reviewers receive documents on the stock assessments. During the meeting reviewers consider critically the fishery assessments (including exploitation indices and estimates of total mortality) and discuss the assessment validity and results.

An advisory report is then drafted, drawing conclusions and making recommendations regarding fishery management and future research requirements to underpin the management process.

client UK Government

location european regional seas

dates ongoing since 1902

04 provision of high level fisheries management advice

skills and expertise employed

- strategic fisheries management knowledge
- sustainable resource management
- fisheries data collection and analysis
- ecosystem management approach
- provision of policy advice
- stock assessment skills

project description and benefits

The project concerns the provision of expert advice to assist senior fisheries administrators and Ministers involved with the development of fisheries policy at national and international level. For the many fin-fish stocks exploited by fishermen in European regional seas, the project provides the best scientific advice on the status of the stocks, and on their management. Advice is given on the results of international and national assessments for these stocks, likely future trends in stocks, and the costs and benefits of possible options for management. In addition to pure fisheries matters the advice includes the wider environmental issues with respect to bio-diversity and the ecosystem approach to fisheries.

services provided by Cefas

A number of activities are undertaken in the provision of services for this project:

- The collection and analysis of fisheries and biological data: this involves the sampling of the age and/or size structure of all commonly caught species and the at-sea discard rate of undersized fish.
- Analysis and assessment: Cefas analyses, interprets and inputs the biological data used to generate national and international stock assessments. This leads to management recommendations for total allowable catches, mesh sizes, minimum landing sizes, seasonal area closures, and related management measures.
- Advice: Cefas scientists advise senior officials and Ministers on the assessments and provide detailed technical support at industry briefings and at Council and Commission negotiations. Cefas gives similar support on relevant Councils and Commissions concerned with the growing interaction between fisheries and environmental issues (e.g. North Sea Ministerial Meetings, Oslo-Paris Commission). Cefas advises officials and Ministers during the development of longer-term policy on fisheries and environmental issues.
- Supporting scientific investigations: Cefas carries out supporting stock surveys, plankton surveys, tagging experiments and biological investigations using our own research vessel and chartered fishing vessels. We also participate in European-funded joint projects to improve data collection, biological knowledge, and assessment methodology
- Communication: against this background, Cefas has long experience of providing written and oral advice through senior officials to Ministers, as well as to fishing industry bodies and representatives, on all aspects of the biology, assessment, and management of the key stocks.

client Latvian Ministry of Agriculture

location Latvia

dates 2002

05 strengthening Latvia's fishery administration

skills and expertise employed

- strategic fisheries management knowledge
- information systems development
- monitoring, control and surveillance principles
- fisheries data collection and analysis
- institutional strengthening

project description and benefits

The Latvian government undertook an initiative to improve the structure and function of their national fisheries systems in order to improve their international standing and their competitiveness in the marketplace. To this end the Latvia National Programme for Adoption identified several priorities. Amongst these was the need to improve the administrative function of the Ministry of Agriculture, to develop the national fisheries policy and fisheries management system to bring it in line with EU requirements, to improve the monitoring capabilities of fish resources, to improve fish catch and landings information and fishing vessel activity.

services provided by Cefas

Cefas staff were responsible for advising on the development of the Latvian fisheries information system, ICIS (Integrated Control and Information System). This is a centralised database combining detailed fisheries information from log-books, landing-declarations, sales notes, fishing vessel registers and the Latvian Vessel Monitoring System. These sources of data collectively play a crucial role in informing fisheries management authorities on the levels of catch and fishing effort undertaken by the local fisheries.

Additionally, Cefas staff were involved in a range of project activities including the planning of the administrative infrastructure to run the system, the technical specifications of the necessary equipment and the training required on the system.

selected projects summary table

• World Bank • Republic of Georgia • 2004	**advising on inland fisheries management issues** Meeting with stakeholders and conducting site visits to Lake Paliastomi, Kolkheti National Park. A report was generated recommending additional areas for inclusion, development and strengthening for future fisheries management plans in the park.
• Irish Government • Ireland • 2004	**review of the Irish inland fisheries sector** Review the management structures and general governance of inland fisheries in Ireland and make recommendations for change to the relevant Minister.
• Global Environment Facility (GEF) • Namibia / South Africa • 2004	**maximising the socio-economic return from fish resources** Co-ordinating assessment models which show the optimal harvesting ratio between the bottom trawl and longline hake fisheries in Namibia. The two fisheries have dissimilar labour requirements and produce different valued products.
• Nederlands Instituut Voor Visserijonderzoek • Netherlands / UK • 2002 - 2003	**delivering a fisheries research database** The delivered database holds the experimental results from trials on the efficiency and selectivity of fishing gear. Included in the shared database were a management system, a data entry program and secure user logon and authentication system.
• US National Marine Fisheries Service • United States • 2002	**developing an estimation system for longline discards** Review the existing methodology and data utilised to estimate bycatch of non target species in the pelagic longline fishery. Develop specific models and methodologies to improve the estimates and the calculation of uncertainty about the estimates.
• European Commission • North Sea, Baltic Sea, Barents Sea • 2002 - 2005	**cod behavioural study – implications for management** Using electronic tags to monitor the movement of cod from different stocks in relation to seasonal and environmental changes. The insight gained into fish behaviour will enhance the information available to fisheries management.
• Marine Stewardship Council (MSC) • South Africa • 2003	**assessing South Africa's Hake Trawl Fishery** Forming part of an independent panel of certifiers assessing the South African Hake Trawl Fishery's application for the MSC international standard for well managed, sustainable fisheries.
• European Commission • North Sea • 1999 - 2001	**monitoring discards in demersal fisheries** Researching the levels of fish discards in the North Sea fishing industry and recommending stock assessments making best use of these discard levels.
• European Commission • Southern and Western Europe • 1999 - 2001	**collection of biological data for fish stock assessment in support of the European Common Fisheries Policy** Engaging in collaborative international research to establish a co-ordinated approach to develop standard sampling protocols of stock assessments for commercially important fish stocks.
• UK Government • UK and European waters • ongoing annually	**management of wider environmental conservation issues in the sustainable management of fisheries** Providing scientific advice on technical conservation measures and species interaction with respect to by-catch of non target species and the impacts of fishing on the marine environment.
• International Fund for Animal Welfare (IFAW), • United Kingdom • 2000 - 2002	**competition between cetaceans (dolphins and whales) and fisheries** Cetaceans are increasingly being identified as potential competitors to human fisheries for common prey resources. This study investigated this claim using a modelling approach on a specific system, the Barents Sea.
• Polish Ministry of Environment and Agriculture • Poland • 2003	**Implementation of a fishing vessel activity monitoring system** This contract formed part of the project designing and constructing the IT system supporting the sea fisheries management in Poland, according to the requirements of the Common Fisheries Policy of the European Union.

aquaculture and food safety productivity and health

sustainable aquaculture
fish cultivation
fish health
food safety
management tools and infrastructure
case studies
selected projects summary table

we provide consultancy and research services to organisations worldwide on the safe and sustainable management of farmed fish and shellfish for human consumption

sustainable aquaculture

management and development

Our services cover farmed fish and shellfish in both marine and freshwater applications. We advise on the management and development of these resources for the production of safe, healthy foods at sustainable levels.

We use our scientific knowledge to assist with approaches to increasing productivity and yields through better fish health and welfare, and to ensuring products are fit for consumption. We advise on the environmental impact of fish farming operations, and the interactions between farmed and wild fish stocks.

institutional strengthening

We play a strong role in international institutional development in the subject of seafood safety by hosting a wide variety of study visits, studentships, visiting scientists, collaborative projects and by organising training courses and workshops in the UK and overseas.

We advise enforcement agencies, policy makers and governments on legislation development and implementing control and enforcement measures to manage new and expanding aquaculture industries. We review existing public health measures and make recommendations for reform to meet international trading standards and create trading opportunities.

fish cultivation

productivity

We have experience in marine and freshwater brood and seed stock improvement aimed at increasing the productivity and profitability of aquaculture by the management of aspects of the biology and life cycle of the farmed species. We undertake research to produce benefits such as higher growth rates, improved disease resistance, and greater temperature and stress tolerance. We research diets and feed strategies, feed palatability and feeding attractants for producing optimum growth rates.

environmental impact studies

We advise on environmental impacts of existing and proposed fish farming facilities. We utilise our expertise in a wide range of assessment techniques including bioassays, fish disease surveys and benthic studies. Our services include:

- Assessments of habitat degradation and effects on biodiversity within ecosystems
- Potential impact of escaped farmed fish on the ecology and genetic pollution of native fish populations
- Measurement of contaminants in waste products from aquaculture operations
- Monitoring nutrient status and water column quality
- Benthos characterisation and ecotoxicological evaluation
- Detection and identification of toxic algal blooms, and toxin identification

fish health

fish kills

Cefas advises on a wide range of health and disease related issues in both farmed and wild stocks. We have experience in investigating unexplained mortalities in commercial and non-commercial wild fish and farmed fish populations, dealing with both small and large-scale problems. We help establish the cause of fish kills, whether through disease, pollution, toxins or other factors and provide advice on future management and prevention.

disease management

We advise on the establishment of disease control programmes for aquaculture operations. Our expertise includes implementing and managing regular monitoring programmes of fish farms and sites to assess the incidence, prevalence and significance of diseases. We advise on contingency planning for disease outbreaks, and we are leaders in risk assessment and mathematical modelling techniques to predict the spread and transmission of disease between farmed and wild species.

We offer advice on disease prevention and eradication measures and the application of controls to stop disease import and spread.

We are improving the performance in both intensive and extensive aquaculture operations through research into nutrition, behaviour, genetics and disease.

disease diagnosis

We have an extensive disease diagnosis capability and a wide range of resources for use in diagnostic testing and technique development. We have expertise in the isolation, cultivation and identification of a wide range of fish pathogens with specialists in virology, bacteriology, parasitology and histopathology. Our state-of-the-art experimental aquarium facilities allows the impact of any pathogen from anywhere in the world to be studied in safety.

food safety

aquaculture operations

Cefas advises on public health issues arising from the consumption of fish and shellfish. We assess issues arising from fish farming operations including the contamination of water and consumption of aquaculture products. Our expertise covers food poisoning micro-organisms, human enteric viruses, bacteria, algal toxins, and organic and inorganic contaminants. We carry out evaluations of products, such as feeds, for safety in order to assist governments in their regulation of aquaculture practices. We provide, and can advise on the setting up of rapid response emergency monitoring and evaluation teams to deal with emergencies such as contamination due to oil spills.

shellfish

Contamination of shellfish with micro-organisms and toxins harmful to human health is a major concern for farmers and consumers. We have developed shellfish contamination detection techniques and management strategies to monitor and manage the occurrence of harmful algae, bacteria, viruses and toxins. Cefas is the European Reference Laboratory for monitoring bacteriological and viral contamination of bivalve molluscs, and can advise on the development and operation of the sanitary requirements demanded by the European Commission.

management tools and infrastructure

developing trade

For any country intending to expand its fish and shellfish farming industry through increased trade with neighbouring countries, import and export standards have to be met and controls put in place to manage the risks to human health from consumption of aquaculture products. Cefas is directly involved in developing policy and formulating and implementing UK and EU legislation to control aquaculture and fish diseases. We provide assessments of compliance with international regulations, and advise on undertaking health certification analysis and other measures to meet import and export standards. We can also provide specific advice on EU quality and safety import requirements.

control programmes

Cefas is responsible for undertaking the UK statutory programme of annual investigation, monitoring and enforcement of controls in fish and shellfish operations. We use our long-standing and well-established expertise in fish inspection and health certification systems to advise on implementing statutory and mandatory control programmes in wild and farmed stocks in both marine and freshwater environments.

"Over the last 25 years Cefas has achieved worldwide recognition as a leading authority in the diagnosis and control of the diseases of fish and shellfish."

information systems

We develop flexible Information Technology data management systems to improve the ability of all parties to support aquaculture industries, enforce legislation and control unregulated or inappropriate fish movements and help to manage disease outbreaks, pollution incidents, etc.

The UK Live Fish Movements database and website is an award winning example of an integrated system that gives different regulatory bodies' multi-site access to a shared database covering live fish transfers, fish health and fish farm registration. This system was designed and implemented by Cefas for a consortium of UK government bodies. The system also provides access to information on regulations for fish movements and access to applications for fish transfers, imports and farm registration for fishery owners, fish farmers and importers.

case studies

The following case studies provide examples of the practical application of our scientific, technical, consultancy and management services in aquaculture and food safety.

Cefas is experienced in policy development for the management and control of sustainable aquaculture operations.

client The World Bank
location Albania
dates 2000 and 2002

01 Albania aquaculture and fisheries development

skills and expertise employed

- strategic aquaculture knowledge
- freshwater fishery management principles
- public health management
- institutional strengthening
- shellfish production techniques
- practical application of scientific techniques

project description and benefits

A World Bank project aiming to enhance the economic and environmental sustainability of aquaculture and fisheries activities in Albania. To assist with the project development and implementation the World Bank employs a range of external technical experts.

The work supported the Albanian Government's efforts to re-develop the aquaculture sector and to explore the potential for new, high value aquaculture species through demonstration programmes. On the fisheries side the project provided technical assistance and institutional strengthening to the relevant fishery management organisations in Albania.

services provided by Cefas

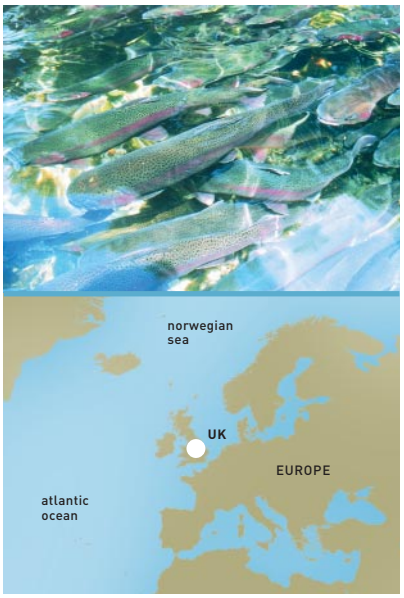
Cefas provided independent consulting advice to World Bank staff on two separate occasions. Both inputs were at the early project development stage and involved providing specialist expertise to assist in defining the scope of project.

Cefas staff initially conducted a wide ranging strategic appraisal of possible aquaculture pilot projects. These included both freshwater and marine systems and covered a range of potential species with aquaculture potential. The appraisals covered a number of aspects including addressing infra-structural, scientific, economic and environmental issues.

Subsequent Cefas participation involved a review of fresh water hatchery management and the associated capture fishery. Expansion of mussel cultivation in Butrinti Lagoon was also assessed. The timescales and costs associated with the renewal of mussel cultivation at this, and other sites on the Albanian coast were reported, including the use of the best modern practices of mussel cultivation. The public health measures in place for mussel production in Albania were reviewed with respect to gaining certification to export mussels to the European Union.

client UK Government
location UK
dates 2000 – 2005

02 improving productivity in aquaculture by promoting natural disease resistance in fish



skills and expertise employed

- innovative research and development
- strategic aquaculture knowledge
- fish health and welfare
- practical application of scientific techniques
- environmental management approach
- productivity enhancement

project description and benefits

The reduction of incidents of disease in aquaculture is a primary concern of the industry. Disease defence strategies have in the past focused largely on hygiene regimes and the use of pharmaceuticals. An increasingly important area of prevention lies in the natural ability of the fish itself to resist disease. Different species and strains of fish vary significantly in their susceptibility to disease and a major factor in this variation is the genetic make up of the fish. This project seeks to establish reliable indicators for selecting fish, on the basis of their genetic constitution, that are naturally resistant to disease. These genetic 'markers' would facilitate selective breeding programmes and assist aquaculture producers develop stocks of robust fish with enhanced disease resistance.

services provided by Cefas

The project methodology involved seeking a genetic marker associated with disease resistance. Rainbow trout and viral haemorrhagic septicaemia (VHS) were used as the model species and disease. The interrelationship between disease susceptibility and response of the fish to stress, measured by the concentration of the hormone cortisol in the blood, was also investigated. The project made use of Cefas state of the art aquarium facilities.

The process of identifying suitable genetic markers was undertaken by:

- Identifying strains of rainbow trout that show natural resistance to VHS.
- Screening the genomes of selected resistant and susceptible fish strains using a DNA pooling strategy and published microsatellite markers for rainbow trout.
- Using broad-scale quantitative trait locus (QTL) mapping to enable identification of linkage of markers to disease resistance.

By following on from this work with high-resolution QTL mapping, genes associated with disease resistance may be identified and used in future selective breeding programmes.

client UK Government Food Standards Agency

location UK

dates ongoing since 1997

03 provision of shellfish safety services

skills and expertise employed

- public health management
- risk analysis
- practical application of scientific techniques
- innovative research
- provision of policy advice
- ecosystem management approach

project description and benefits

Filter feeding bivalve shellfish, such as mussels and oysters, tend to accumulate toxins that may be present in the marine environment. This poses a food safety hazard and requires monitoring and control by the relevant authorities. Cefas has undertaken a number of research projects and maintains an on-going monitoring and inspection schedule to reduce the risk of viral and bacteriological exposure to shellfish consumers.

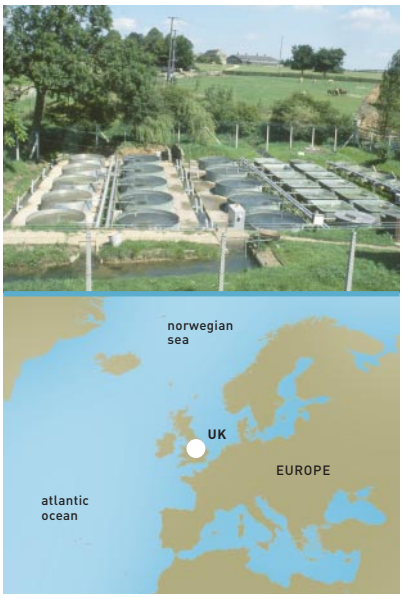
services provided by Cefas

Monitoring activities carried out by Cefas involve testing in excess of 1,000 samples per annum for the presence of Paralytic shellfish poisoning (PSP) and Diarrhetic shellfish poisoning (DSP) by bioassay methods. Amnesic shellfish poisoning (ASP) is tested by chemical methods, with all testing being conducted at an accredited Cefas laboratory. Cefas also conduct inspection and approval activities of shellfish purification plants and co-ordinate the role of local authorities on the microbiological classification of shellfish harvesting areas according to pollution risk.

Cefas research programmes in this area have produced improved methods for detecting viral pathogens in shellfish and new procedures for the removal of viruses during the commercial purification of oysters. Further research is being carried out on the underlying relationship between water quality and shellfish health issues.

client UK Government
location UK
dates ongoing

04 establishing a fish health management system for regulatory authorities



skills and expertise employed

- fish health and welfare
- strategic aquaculture knowledge
- practical application of scientific techniques
- institutional strengthening
- public health management
- risk analysis

project description and benefits

The impact of disease on aquaculture and wild fish stocks is considerable. It is a risk that is persistently present and which can devastate industries and ecosystems within a very short period of time. It is vital that the relevant authorities have the necessary checks, controls and contingency plans in place to provide a robust safeguard to combat the outbreak and spread of disease. Cefas currently operates a system comprising a monitoring, research and administrative component. Collectively these activities interact to effectively provide the backbone of fish disease protection and prevention services in England and Wales.

services provided by Cefas

The provision of the fish health management system for aquaculture starts with a targeted monitoring and analysis programme that involves site visits by Cefas fish health inspectors. These inspections are backed up with the support of Cefas laboratory analytical services. The planning and coordination of these activities is assisted by a specialist planning software system, developed by Cefas. This system incorporates the position of aquaculture production sites, the movements of fish and the required inspection schedule of fish health inspectors. This serves to automate many levels of the planning and administration of the health monitoring regime and is open to colleagues in the Environment Agency (EA) who monitor the movement of wild fish into fisheries and water courses. All fish movements are licensed and registered by Cefas using this system. In addition, any disease outbreaks discovered by the EA in wild fisheries or water courses are alerted to Cefas who investigates the incident and attempts to provide a diagnosis.

Underpinning the monitoring regime and administration service is a parallel programme of Cefas research and risk analysis. These activities identify areas of particular risk and develop contingency plans and countermeasures for a range of possible scenarios. Continual feedback between the monitoring, research and administrative components provide an ongoing evolution of the system which responds and adapts to the dynamic conditions prevalent within the aquaculture industry.

selected projects summary table

• United States Fish & Wildlife Service • United States of America • 2003	**training course for fish disease identification** The provision of a one week training course for 30 officials of the US Fish & Wildlife Service. The training course concentrated on techniques used to identify the disease Spring Viraemia of Carp (SVC) following a recent outbreak in the United States.
• European Commission • Ukraine • 2001	**investigating fish kills in a Ukrainian fresh water fishery** Collating biological and environmental data on large scale fish kill episodes and establishing the causes and environmental parameters responsible for the fish kills.
• UK Government • United Kingdom • ongoing	**fish health inspectorate services** Undertaking statutory inspection duties in keeping with the EU Fish Health regime and national legislation. Associated activities involve field inspections, licensing, enforcement programmes and import control.
• Falkland Islands Government • United Kingdom • 1998 - 2004	**health certification of squid and fish imports** Analysis of squid and fish samples from the Falklands for contaminants including heavy metals, pesticides and hydrocarbons.
• UK Government • United Kingdom • ongoing	**fish movements and management information system** The design, installation and running of a specialist planning software system which serves to automate the many levels of the management and administration of a fish health monitoring regime.
• Environmental Public Authority (EPA) of Kuwait • Kuwait • 2003	**management of fish disease outbreaks; training course** Hosting and running a training course for 3 EPA staff members. The course concentrated on laboratory techniques for post mortem analysis and contingency planning for disease outbreak.
• European Commission • Turkey • 2004	**advice on the implementation of EU aquaculture health legislation** Providing a series of presentations to Turkish authorities on EU legislation relating to aquaculture and fish and shellfish health and the practical requirements of that legislation, from infrastructure to implementation.
• European Commission • United Kingdom • 2004 - 2006	**strengthening European expertise on infectious diseases in aquaculture** Assisting in the development of a permanent network of laboratories to improve and standardise methods for diagnosis and surveillance of diseases in European aquaculture and to identify training needs and opportunities for research and diagnostic personnel.
• European Commission • United Kingdom • 2004 - 2006	**exchange of pathogens between farmed and wild aquatic populations; providing scientific advise to EU policy** As part of a consortium of 5 European organisations Cefas will assist in integrating all current knowledge on the transfer of pathogens between wild and cultured aquatic animal populations.
• European Commission • Greece / United Kingdom • 1999 - 2002	**developing commercial cultivation and production methods for farmed sole** Developing intensive methods of sole cultivation and production and investigating the transferral of these techniques to commercial aquaculture units.
• UK Government • United Kingdom • 1998 - 2001	**linking occurrences of fish disease with levels of organic pollutants in the environment** Conducting research to provide a fuller understanding of the effects of organic pollutants on aquatic organisms.
• Various pharmaceutical companies • United Kingdom • 1997 - 2003	**aquaculture vaccine trials** Evaluating, testing and developing protocols for vaccines used on various fish species.

acknowledgements:
page 5 Panos
page 15 Mike McCartney WHOI
page 17 Jurgen Freund
page 24 Corbis
page 37 Corbis

Printed in compliance with the ISO 14001 environmental standard

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about us

Cefas is a multi-disciplinary scientific research and consultancy centre providing a comprehensive range of services in fisheries management, environmental monitoring and assessment, and aquaculture to a large number of clients worldwide.

We have more than 500 staff based in 3 laboratories, our own ocean-going research vessel, and over 100 years of fisheries experience.

We have a long and successful track record in delivering high quality services to clients in a confidential and impartial manner. (www.cefas.co.uk)

Cefas Technology Limited (CTL) is a wholly owned subsidiary of Cefas specialising in the application of Cefas technology to specific customer needs in a cost effective and focussed manner.

CTL systems and services are developed by teams that are experienced in fisheries, environmental management and aquaculture, and in working closely with clients to ensure that their needs are fully met (www.cefastechnology.co.uk).

customer focus

With our unique facilities and our breadth of expertise 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.

Our existing customers are drawn from a broad spectrum with wide ranging interests. Clients include:

- international and UK government departments
- the European Commission
- the World Bank
- Food and Agriculture Organisation of the United Nations (FAO)
- oil, water, chemical, pharmaceutical, agro-chemical, aggregate and marine industries
- non-governmental and environmental organisations
- regulators and enforcement agencies
- local authorities and other public bodies

We also work successfully in partnership with other organisations, operate in international consortia and have several joint ventures commercialising our intellectual property.