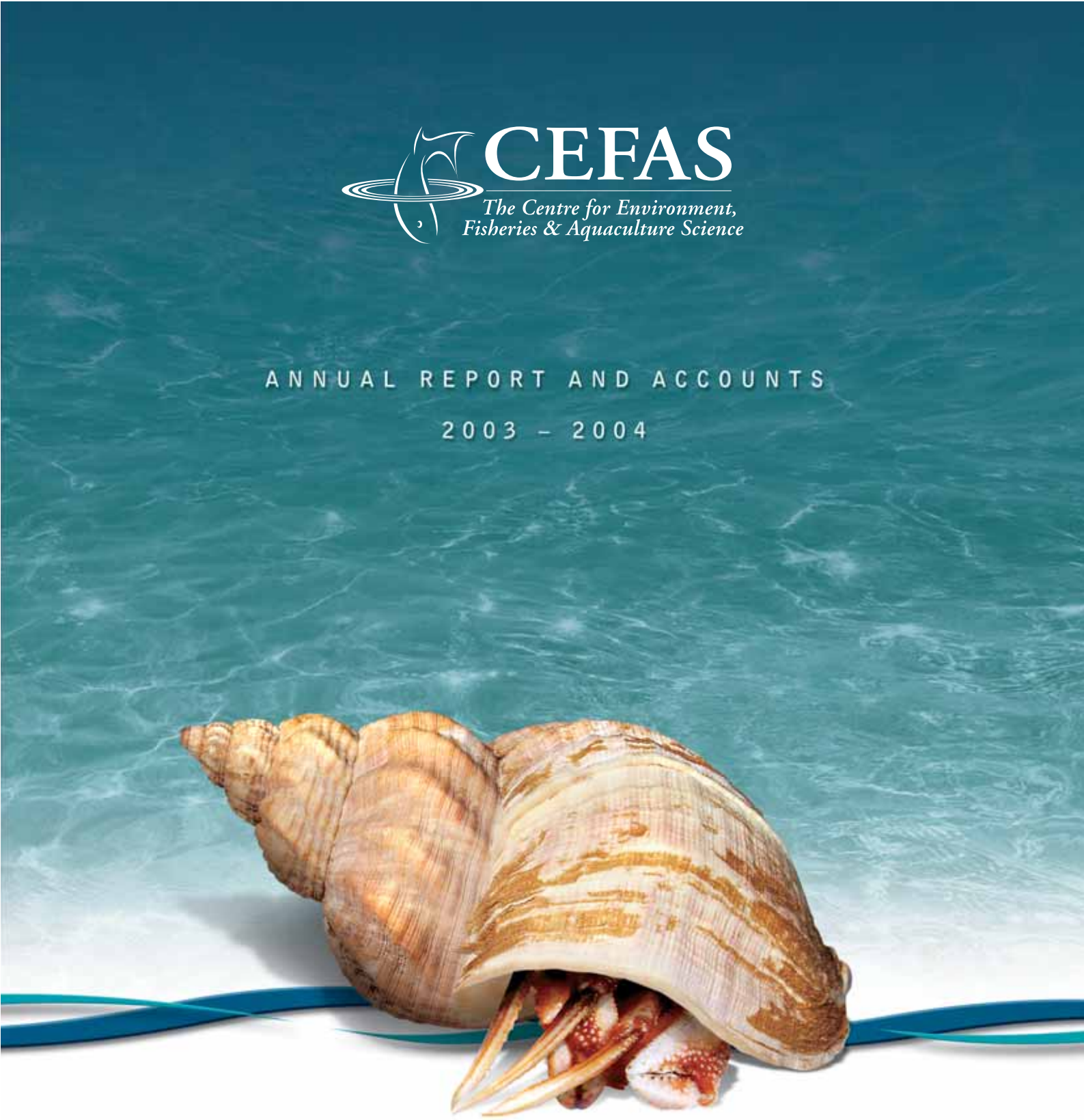
CEFAS

The Centre for Environment, Fisheries & Aquaculture Science

ANNUAL REPORT AND ACCOUNTS

2003 – 2004



defra

Department for Environment Food and Rural Affairs

CEFAS ANNUAL REPORT AND ACCOUNTS 2003-2004

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Above: *Neptunea antiqua*
Front Cover: Hermit crab (*Pagurus bernhardus*) inside a whelk shell (*Buccinum undatum*)

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CONTENTS

review

accounts

CHIEF EXECUTIVE'S Statement

Dr Peter Greig-Smith Chief Executive of CEFAS

CEFAS carries out a diverse range of activities in the aquatic sciences. Our purpose (see Box 1) is to provide high quality scientific support to help achieve UK Government objectives. We also strive to conduct research with wider implications than its immediate rationale, and ensure that opportunities for the commercial exploitation of skills and intellectual property are actively pursued. This report highlights a few of the areas in which we have made progress during the past year. It demonstrates how the excellence of CEFAS' staff adds value through partnerships of many kinds, and illustrates the high public profile of some areas of the science. I hope you enjoy reading about our work.

In fisheries science, CEFAS experts continue to play a leading role in efforts to manage marine fisheries sustainably. Nationally, we work closely with colleagues in the Department for Environment, Food and Rural Affairs (Defra); and internationally, CEFAS is at the forefront of developments in the International Council for the Exploration of the Sea (ICES). Growing acceptance of the need to adopt a more effective approach to management of north Atlantic fish stocks has led to reform of the Common Fisheries Policy, stronger engagement between fishermen and scientists to provide reliable information about the state of stocks, and a new analysis of the industry by the Prime Minister's Strategy Unit.

These developments have major implications for our work, and provide an urgent, topical context for CEFAS to help develop ever-better scientific evidence and advice.

The forthcoming UK Government's 'State of the Seas' report, due in January 2005, gives us a challenge to integrate the many aspects of information about the marine environment into a single assessment of the health of UK waters. For example, this year we contributed heavily to the evaluation of potential impacts on the coastal and marine environment, including proposals for the creation of offshore wind farms around the UK. The significant expansion of renewable energy production now being planned will demand an increasing level of advice and research, in collaboration with colleagues addressing these issues across Europe.

Our new research ship, *CEFAS Endeavour*, plays an important role enabling us to perform technically advanced studies in these areas. Since the ship was launched in the spring of 2003, she has undertaken 12 voyages amounting to 198 days at sea. *CEFAS Endeavour* has demonstrated her excellent capability, which will allow scientists greater opportunities to collect data of high quality and in large quantity.

Technology developments with our joint venture partners have borne fruit in several ways. We extended our existing offshore network of automated moorings for measuring water quality, to create a wider network of buoys able to provide 'real-time' data for prediction of flooding risks. Long-term expertise in the design of miniaturised electronic tags for tracking fish was used to advance the development of new generations of tags, smaller yet more powerful, which we are using ➲

Above: Data storage tags with Euro coin
Left: Dolphin photographed from *CEFAS Endeavour*

in our research studies. With our commercial partner, Lotek, we are making this technology available for researchers worldwide.

CEFAS is not only involved in marine science. Much of the work of our Fish Health Inspectorate, and the specialised work of the Weymouth Laboratory, is concerned with movements of freshwater fish within England and Wales, and imports into the country. We have been very active and successful this year in preventing risks of disease by controlling illegal imports, and by research to understand the implications of serious fish diseases. CEFAS was instrumental in the establishment of a new, Europe-wide network of expertise to advise the European Commission and national governments.

We also work in support of food safety policy. One aspect gained a high profile this year because of the discovery of unusual symptoms of possible toxicity in cockles, as part of the annual monitoring of shellfish performed on behalf of the Food Standards Agency (FSA). These findings have led to improved co-ordination among testing laboratories, and moves towards the introduction of improved methods for testing, as well as investigations to discover the cause of the symptoms in cockles.

In most areas of science, CEFAS collaborates actively with other scientific organisations. As well as the long-established networks of ICES, we are participating in a variety of projects within the EU Framework 6 research programme, and also with European fisheries research institutes through the European Fisheries and Aquaculture Research Organisation (EFARO). Within the UK, we have continued to work closely with our counterparts in Scotland and Northern Ireland. Collaboration with our sister science agencies in Defra (the Central Science Laboratory and the Veterinary Laboratories Agency) was enhanced by a series of inter-agency workshops, helping to identify synergies in areas such as molecular biology and geographic information systems.

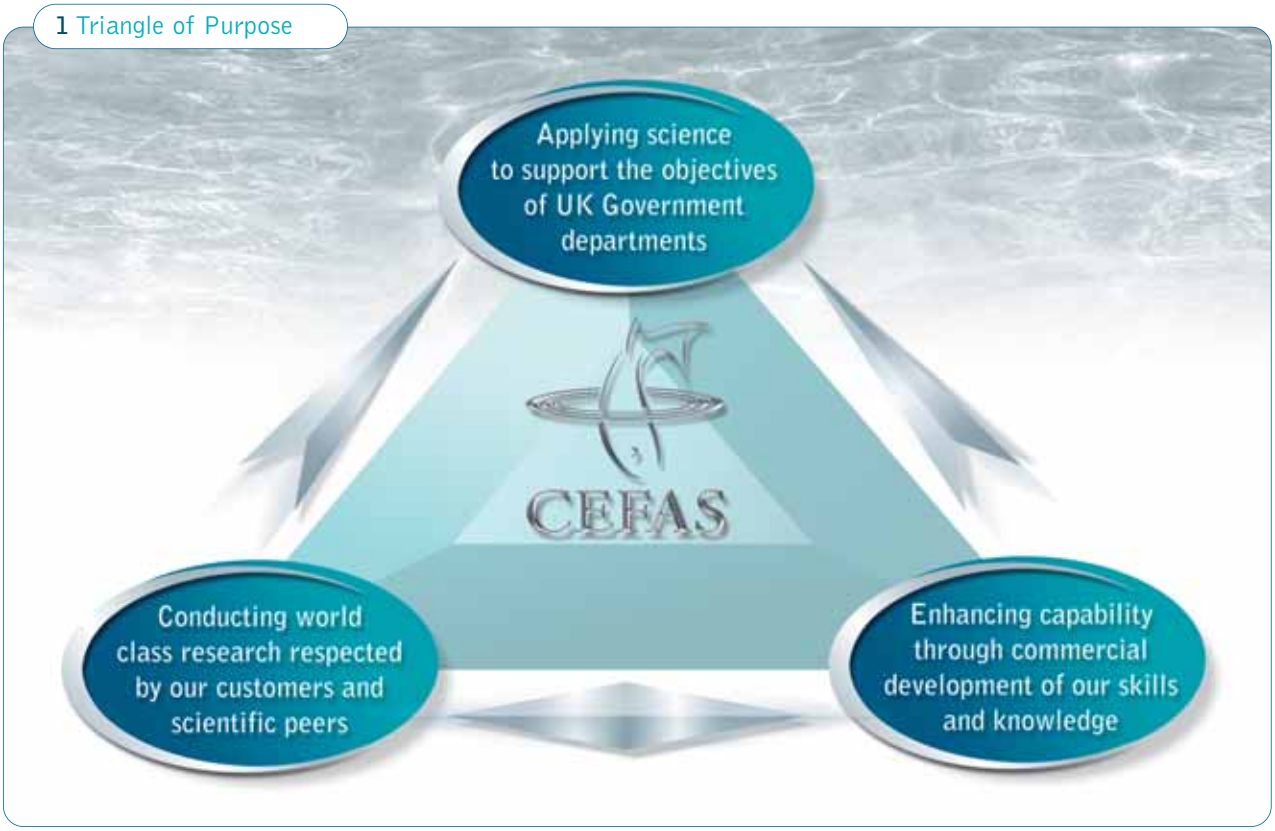
Following Defra's review of its Agencies in 2002, we consolidated our purpose and core values (Boxes 1 and 2) by refining the Agency's performance framework into a set of six strategic aims (Box 3), which will provide a stronger focus for setting targets and measuring progress. We also introduced firmer management of corporate initiatives, to ensure delivery of the top priorities, and welcomed two non-executive advisory directors to our Management Board. Fulfilling a long-recognised need, a Communications Manager was appointed this year, to work on a more proactive approach to making public the science done at CEFAS.

Following the centenary of fisheries science at CEFAS in 2002, last year marked the golden jubilee of the Burnham Laboratory. Founded on a small scale in 1953 to undertake studies of shellfish, the Burnham Laboratory has grown in size and changed in focus to become an internationally-known centre of expertise for marine environmental monitoring and impact assessment.

As ever, in a very busy year, the staff of CEFAS demonstrated their skills, dedication and flexibility. It is their commitment that enables CEFAS to continue to respond successfully to changing demands for the special mixture of scientific expertise that the Agency provides for our customers.

RV CEFAS Endeavour © M J Page

1 Triangle of Purpose



2 Core Values

INTEGRITY

CUSTOMER FOCUS

CONTINUOUS IMPROVEMENT

EXCELLENCE

CONCERN FOR PEOPLE

3 Strategic Aims

DELIVERY OF OUTPUTS
Fulfilling commitments on time, within budget and to agreed standards of quality

Headline Measure of Performance:
Proportion of agreed outputs achieved, weighted by value of contracts

CUSTOMER FOCUS
Providing a high standard of services to the satisfaction of customers

Headline Measure of Performance:
Customer satisfaction score

STRONG SCIENCE
Enhancing our scientific capability and reputation

Headline Measure of Performance:
Publications in peer-reviewed journals (weighted by number of scientists engaged in research)

FINANCIAL PERFORMANCE
Recovering the full cost of our services and investing for the future

Headline Measure of Performance:
Percentage difference between income and the costs of contracts

EFFICIENT, COST-EFFECTIVE OPERATION
Operating with simple, reliable and effective processes

Headline Measure of Performance:
No increase in the costs of support services relative to the growth of income

INVESTMENT IN PEOPLE
Respecting and helping the Agency's people to develop

Headline Measure of Performance:
Score for staff satisfaction from an annual survey of staff opinion


NAMING OF
CEFAS Endeavour


CEFAS ENDEAVOUR


ON THE OCCASION OF HER NAMING
PRESENTED
BY
BEN
BRADSHAW MP
20TH JUNE
2003

Left: A day of high winds and sunshine – (left to right) Bob Blizzard, Ben Bradshaw, Peter Greig-Smith, Lindsay Murray, Ross Jolliffe (CEFAS' Project Manager for the build)

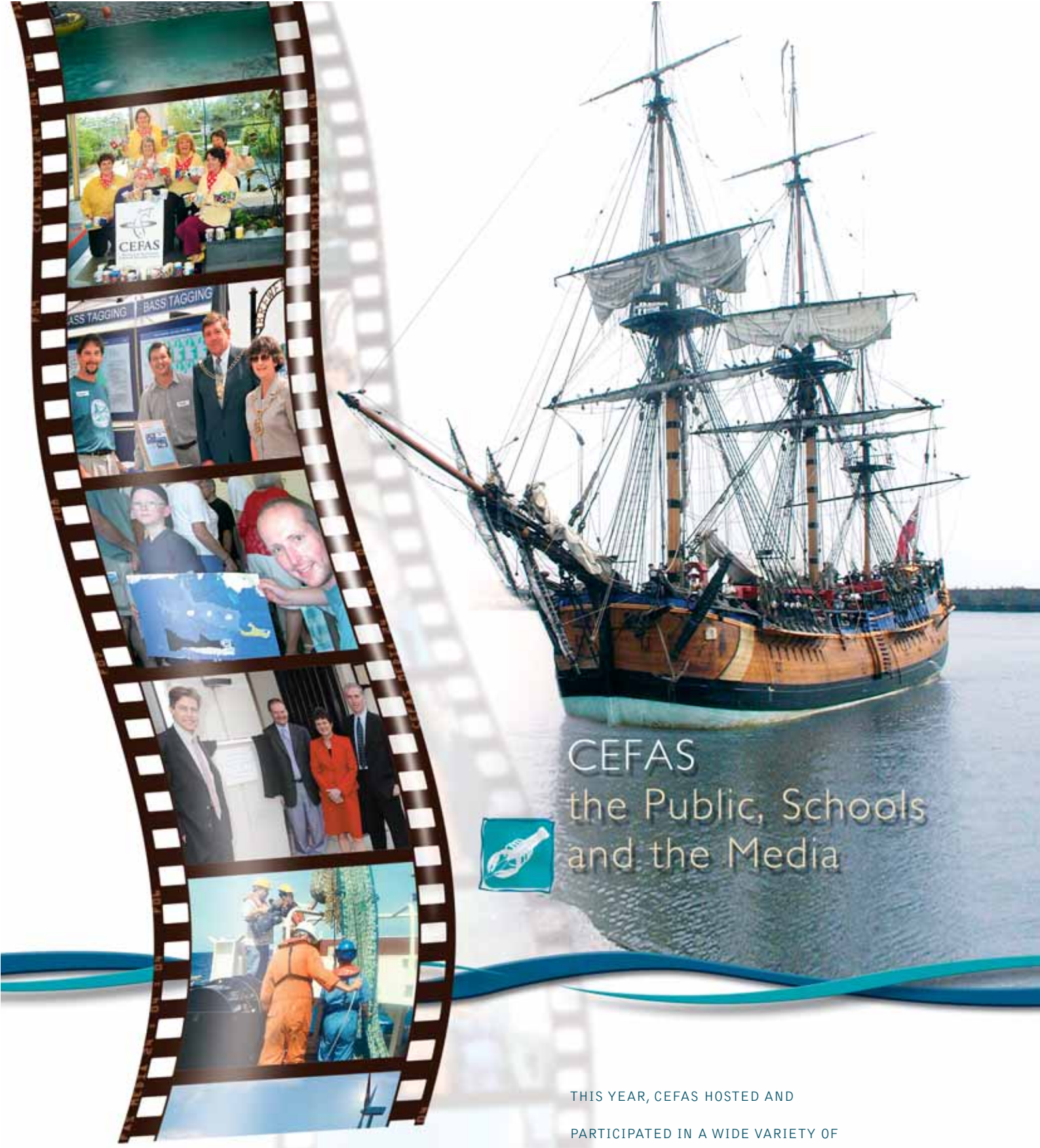
Below: A local jazz band gave the day an up-beat party feel

Left: Tradition demands a lady to name a ship, and when the Secretary of State was delayed in Luxembourg, our own Lindsay Murray stepped in to smash the bottle – watched by (front row, left to right) Bob Blizzard (Waveney MP), Ben Bradshaw (Parliamentary Under Secretary (Commons) Department for Environment, Food and Rural Affairs (Defra)), Peter Greig-Smith, and Tony Reading (Ship's Master)

Left bottom: Originally made by factory workers for their families to celebrate new beginnings and new journeys, Lowestoft Porcelain continued a 200 year-old local tradition when it hand-made birth tablets for *CEFAS Endeavour*

Right: Ben Bradshaw, on his first official engagement after appointment as Defra's Fisheries Minister, with crew, officers and ship management on the aft deck of *CEFAS Endeavour* – an area large enough to take four containerised laboratories

Below: staff entered a lottery to join other invited guests at the Naming Ceremony



CEFAS the Public, Schools and the Media

THIS YEAR, CEFAS HOSTED AND PARTICIPATED IN A WIDE VARIETY OF EVENTS DESIGNED TO ENGAGE THE PUBLIC IN TOPICAL MARINE SCIENCE ISSUES AND TO ENCOURAGE INTEREST IN SOME OF OUR RESEARCH.

Events with the general public

Lowestoft Fish Fayre

CEFAS again sponsored the Lowestoft Fish Fayre, with a stand that included a live fish display. It was supported by the newly-named *CEFAS Endeavour*, open to the public for the first time.

Burnham golden jubilee

The Burnham Laboratory marked its 50th anniversary in 2003. Starting from a post-war Nissen hut with five scientific staff, the Laboratory is now home to 100 scientists and administrative staff. Fisheries Minister Ben Bradshaw cut a commemorative cake for all staff and unveiled a plaque marking the golden jubilee.

Weymouth and Portland Fish Festival

CEFAS Endeavour provided the backdrop to the Weymouth and Portland Fish Festival, sponsored by CEFAS in June 2003. The event included the grand draw for the bass tagging programme, which investigates bass behaviour (**www.cefas.co.uk/basstagging**). Doug Hollings, Mayor of Weymouth and Portland, drew the winning ticket.

Main: CEFAS sponsored the visit to Lowestoft of *HM Bark Endeavour*, a replica of Captain Cook's 18th Century sailing ship

Filmstrip from the top

1: CEFAS staff took Weymouth Laboratory's coffee mugs hostage to raise funds for Children In Need

2: Doug Hollings, Mayor of Weymouth and Portland, drew the winning ticket in the bass tagging programme grand draw

3: CEFAS' painting competition for children again proved popular at the Lowestoft Fish Fayre

4: Fisheries Minister Ben Bradshaw unveiled a golden jubilee plaque at CEFAS' Burnham-on-Crouch Laboratory ©Matt & Gloss

5: Cameramen filmed *CEFAS Endeavour* at work to produce video news report footage

Links with education

Professional development for science teachers

In May 2003, the Lowestoft Laboratory hosted a successful Professional Development day for the Suffolk Science Teachers' Network. The event was held at the request of local science teachers, after a similar event at CEFAS in 2002.

CEFAS Science Masterclass

Our first Science Masterclass, for 50 'A'-level science students from five local high schools, provided better learning and development opportunities to support talented young science students.

After presentations from CEFAS scientists, the students split into small groups to debate two real-life marine science issues with a sustainable development theme: coastal erosion and depleted fish stocks. Possible solutions were devised, and conclusions presented back to the Masterclass.

CEFAS Science Student Partnerships

An exciting new partnership programme for second-year 'A'-level students was launched, offering the opportunity to work alongside a CEFAS scientist on an extended placement. The inaugural Partnerships will begin in September 2004 at Lowestoft.

CEFAS at school

During the year CEFAS staff ran a variety of events at schools in Essex and Suffolk. These included marine science workshops for primary school children, science fairs as part of National Science Week, and career planning sessions for high school students.

CEFAS in the media

Media interest in CEFAS has grown significantly in the past year. Stories prompted by our scientists or the work of our laboratories range from climate change, pharmaceuticals in the aquatic environment, and fish management and quotas, and have appeared in outlets as diverse as *Nature*, the *Guardian*, the *Lowestoft Journal* and *Angling Times*.

Scientist Ewan Hunter's paper, published by the Royal Society, on North Sea plaice migration and spawning received widespread media attention in August 2003 from the *Daily Telegraph* and BBC TV's *Look East* news programmes.

A seminar for angling and other stakeholder groups about the potential of using artificial refuges to reduce the impact of cormorants on inland fish stocks and fisheries was covered by BBC Radio 5 and Radio 4's *Today* programme, as well as several national newspapers.

Scientists at the Lowestoft Laboratory devised and recorded their own radio programme to introduce the WaveNet project to the general public (see pages 40-41). The hour-long programme, Beneath the Waves, was broadcast on BBC Radio Suffolk in March 2004, at the start of National Science Week.

Video news report

We commissioned library footage to promote CEFAS' work, for use nationally and internationally for news reports.

DELIVERING the Science

CEFAS BEGAN DELIVERING SPECIALISED SCIENCE 100 YEARS AGO, AND CONTINUES TO DO SO FROM ITS SITES AT WHITEHAVEN, WEYMOUTH, BURNHAM-ON-CROUCH AND LOWESTOFT.

'Delivering science to time, budget and quality'

Dr Joe Horwood Deputy to the Chief Executive and Defra's Chief Fisheries Science Adviser

CEFAS applies its scientific capabilities to deliver for the Department for Environment, Food and Rural Affairs (Defra), other government departments and customers. We conduct our work through some 450 contracts annually, all of which specify standards of delivery. We are proud of our ability to deliver high quality products according to these contractual obligations.

CEFAS' high performance is due to our quality science and support staff, our infrastructure, and our long experience in applied research and monitoring.

CEFAS has over 300 scientific staff who provide expert services in a wide range of areas, as shown in this report. They are supported by specialist technical and management staff in areas such as electronics, animal husbandry, graphic design, contract management and IT.

CEFAS' specialist infrastructure includes three major laboratories, and two ocean-going, multi-purpose fishery research vessels. Our new vessel, *CEFAS Endeavour*, is one of the quietest civil research vessels, with a large array of electronic equipment. It is capable of taking on almost any marine task in shelf and ocean waters.

Left: Mooring rope on *CEFAS Endeavour* foredeck
Below: Filtering core samples from the River Orwell, Shotley

An important part of CEFAS' work for government is in monitoring and assessing the seas and life in those waters. In addition, our research and innovation are demonstrated in R&D contracts, some of which are described later.

We do much of this work in collaboration with national and international partners. This year, we worked with over 100 different specialist institutes in more than 20 countries on joint projects and working groups.

We are also increasingly engaged with the wider stakeholder community, so that our science is relevant and understood by those directly affected. Our work with the fishing industry on the Fisheries Science Partnership is an example of such engagement (see page 28).

Because CEFAS' work is so important, affecting the real lives of many stakeholders, our work is sometimes challenged. This has been the case over fishery survey methods and testing shellfish for toxins. We respond to all these challenges in an open and professional manner, and in so doing have given proof of the high quality of our science delivery.

ENVIRONMENTAL Management

CEFAS PROVIDES ADVICE AND TECHNICAL SERVICES FOR THE ASSESSMENT OF THE IMPACTS OF HUMAN ACTIVITIES ON THE AQUATIC ENVIRONMENT.

Our core work supports UK Government, advising on regulatory activities. We undertake research and development to underpin this advice, and conduct monitoring programmes to assess the effectiveness of government controls. The Department for Environment, Food and Rural Affairs' (Defra) aim of sustainable development provides the context for our work.

Dr Lindsay Murray Science Area Head Email: l.a.murray@cefas.co.uk

Wind farms

We continue to advise UK Government in assessing the impacts of offshore wind farms on the marine environment. The first round of offshore wind farm proposals involved 18 locations in near-shore areas on the east and west coasts of England and Wales. Of these, 12 have now received the necessary consents. One has been constructed (North Hoyle, off the North Wales coast) and one is under construction (Scroby Sands, off Great Yarmouth).

> " research to ensure that the future integrity of the coastline is not compromised "

To enhance understanding of the environmental impact of offshore wind farm developments, and to ensure that the future integrity of the coastline and sediment transport pathways is not compromised by them, CEFAS (with industry, other research institutes and the staff of Britannia Pier) has been undertaking research during the development on Scroby Sands. This used advanced measurement and analysis, including radar to measure waves over a large area. It is anticipated that results will be publicised and made available, to assist CEFAS and Defra in the Food and Environment Protection Act (FEPA) assessment of the second round of offshore wind farms.

CEFAS hosted a workshop on the Environmental Assessment of Renewable Energy in the Marine Environment on behalf of the Oslo and Paris Commission (OSPAR) in September 2003. This event brought together for the first time regulators, non-governmental organisations and other stakeholders with an interest in marine environmental impact assessment from around Europe, to share their experiences and discuss best practice for offshore renewable technologies. Recommendations from the workshop are being incorporated in OSPAR and national work programmes.

In December 2003, the UK Government announced the second round of offshore wind farm developments. These will be located in three strategic areas (Liverpool Bay, the outer Wash and the outer Thames). Developments are to be much larger than those in the first round, with plans for hundreds of turbines in each of 15 locations. The provision of guidance and advice to industry and government on the assessment of marine environmental impacts will be a major activity for CEFAS for at least the next few years.

Left and Below: Wind farm under construction at North Hoyle, off the North Wales coast

Booster biocides

The use of tributyltin (TBT) as an anti-fouling coating on ships' hulls has left a damaging environmental legacy. The most common reason for the refusal of a licence to dispose of dredged material from ports and harbours is the presence of significant residues of this chemical. With the introduction of a worldwide ban on TBT between 2003 and 2008, interest has returned to copper-based coatings. These are not as effective at preventing algal growth as the TBT-based paints, so herbicides are often added. CEFAS has been studying the fate, behaviour and effects of these 'booster biocides', to assess likely future contamination of sediments in navigational areas and the possibility that dredged materials will become significantly polluted with these compounds. The two compounds used initially and in the greatest quantities, Diuron and Irgarol 1051, have had their approvals revoked because of their persistence in the environment. Laboratory studies indicate that the currently approved alternatives will all degrade rapidly after release, so their continued use is unlikely to result in increasing concentrations in sediments and dredged materials.

Harbour maintenance dredging, Lowestoft

> " laboratory studies indicate continued use is unlikely to result in increasing concentrations "

Emergency response

An Emergency Response Team at CEFAS provides advice to Defra and other UK Government departments on how to deal with marine oil and chemical spillages. During the year, several incidents at sea required action from the team.

At the end of March, the cargo vessel *Mulheim* ran aground near Land's End, with 2 200 tonnes of plastic waste from car scrap yards in Ireland on its way to disposal in Germany. Low-level contamination from the cargo and the ship's fuel was detected in local mussels, but these were not harvested commercially and posed no threat to the human food chain.

In June, the cargo vessel *Jambo* ran aground near Ullapool with a cargo of zinc sulphide ore. The Fisheries Research Services Laboratory in Aberdeen gives advice on the likely impact of such incidents in Scotland, but CEFAS performed specialist toxicity testing on the cargo to aid the impact assessment of the incident.

In December, a container ship, the *Andinet*, lost three containers and 63 drums of a toxic wood preservative off the coast of Texel, in Dutch waters.

Left: Cargo vessel *Mulheim* aground near Land's End (reproduced with permission of Maritime and Coastguard Agency)

Because of our knowledge of water movements in the southern North Sea, we advised Defra that these drums would remain in Dutch and German waters and not affect UK waters.

> " CEFAS performed specialist toxicity testing to aid the impact assessment "

Brominated flame retardants in birds

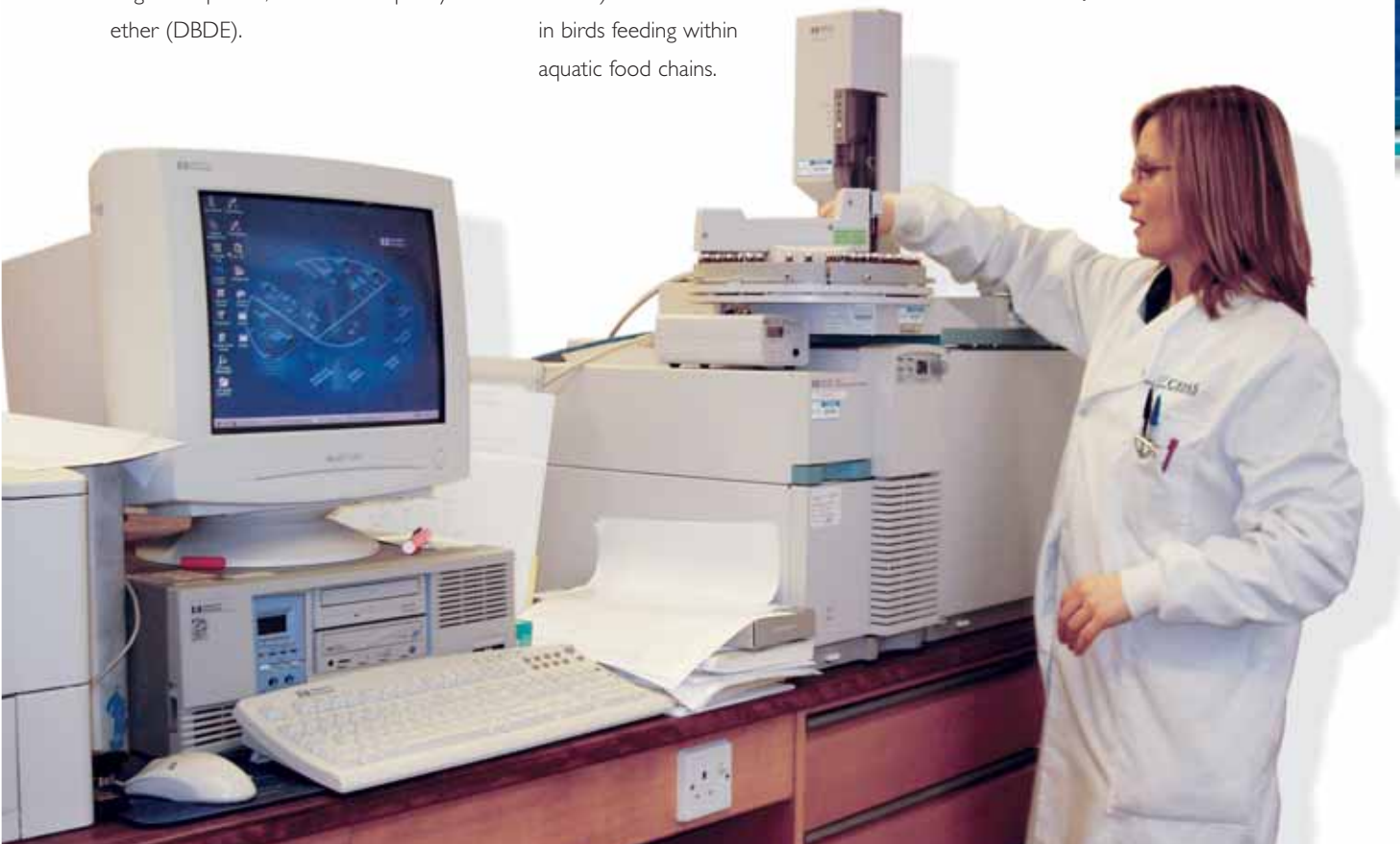
There is a continuing interest in the environmental occurrence and toxicology of brominated flame-retardants. Polybrominated diphenyl ethers (PBDEs) are a class of compound that have been subject to risk assessment by the European Union (EU), which has restricted the use of 'penta-' and 'octa-' mix formulations. The third class in this group is the 'deca-' mix, which largely comprises a single compound, decabromodiphenyl ether (DBDE).

DBDE is a large molecule. This, and its extremely low water solubility, restricts its accumulation in aquatic animals such as fish. The wider question of whether DBDE bioaccumulates in other animals was fundamental to the recent EU risk assessment.

In our earlier studies, we did not find DBDE in fish or marine mammals, although very high concentrations of DBDE occurred in some marine sediments. In an industry-funded programme performed jointly with the Netherlands Institute for Fisheries Research, CEFAS determined the concentrations of DBDE in muscle samples and eggs in a variety of bird species from both aquatic and terrestrial food chains. We took samples from an archive held by the Centre for Ecology and Hydrology, Monkswood. Our results indicated that, although the concentrations were low, DBDE does bioaccumulate in birds' tissues. DBDE was observed in birds feeding within a terrestrial food chain (most commonly in peregrine falcons) and was not found in birds feeding within aquatic food chains.

Peregrine falcon (*Falco peregrinus*)
(reproduced with permission of Ray Lowden)

Below: Gas chromatograph/mass spectrometer being used for the analysis of brominated flame retardants



ENVIRONMENT and Food Safety

CEFAS PROVIDES SURVEILLANCE, ASSESSMENT AND RESEARCH TO IMPROVE FOOD SAFETY, PARTICULARLY FOR SEAFOOD AND FRESHWATER FISHERIES AND THEIR CONTAMINATION WITH RADIONUCLIDES, MICRO-ORGANISMS AND CHEMICALS.

Our research aims to understand and model the behaviour of contamination in the environment, determining the risks of various sources of pollution, and improving methods of surveillance and analysis.

Bill Camplin Science Area Head Email: w.c.camplin@cefas.co.uk

Biotoxins in shellfish

CEFAS performs statutory monitoring in England and Wales, to detect whether harvested shellfish contain toxins that might be harmful to consumers.

This year, awareness of our work increased as a result of bans on harvesting of cockles in some areas of England, Wales and Northern Ireland, after unusual symptoms in tests for diarrhetic shellfish poisoning (DSP).

We became involved in detailed scrutiny of the methods used to detect toxins, the evidence that a toxin might be responsible for the atypical results, and the scope to introduce improved approaches across Europe. This culminated in our submitting evidence in January 2004 to the House of Commons Select Committee on Environment, Food and Rural Affairs, Inquiry into Food Information, Report into The Foods Standards Agency & Shellfish (5th Report, Session 2003-04). We continue to work with other testing laboratories and government regulatory bodies, to seek improvements in this public safety monitoring.

Left: Processing a lobster sample in the laboratory for radioanalysis
Below: Mobile contamination analysis equipment

Radiation harm to the environment

The UK has a provisional assessment system to establish whether authorisations for radioactive waste disposal are acceptable, so as to avoid harm to the environment. This system, and efforts to reach an international consensus, rely heavily on science produced by CEFAS. Our laboratories have experimental facilities found at only a few sites worldwide.

This year, with the University of Liverpool and the Centre for Environment and Hydrology, we supported the Environment Agency (EA) in the design of new experiments to reduce some of the uncertainties in predicting the effects of radiation on wild animals and plants. We are developing plans to begin experimentation in 2004-05 at the Lowestoft site.

> " Our laboratories have experimental facilities found at only a few sites worldwide "

Left: Seaweed (*Fucus vesiculosus*)

The nuclear watchdog role

Radiation emergencies are rare, but their potential impact requires not only minimising the likelihood of an accident, but also ensuring effective responses to the emergency.

Each year, CEFAS participates in emergency exercises involving nuclear operators, the police, the Nuclear Installations Inspectorate (NII), local authorities, the Food Standards Agency (FSA) and others. The role of CEFAS has been to act as advisor on the mitigation of effects of a nuclear incident in freshwater and marine systems. This year, we conceived a portable, modular system to allow instruments to be sent in vehicles to the scene of any incident. This will speed up the collection of food contamination and environmental data, which can be used by the FSA to make decisions on food bans. The response scheme now includes plans for dealing with terrorist incidents involving 'dirty bombs' and radiation.

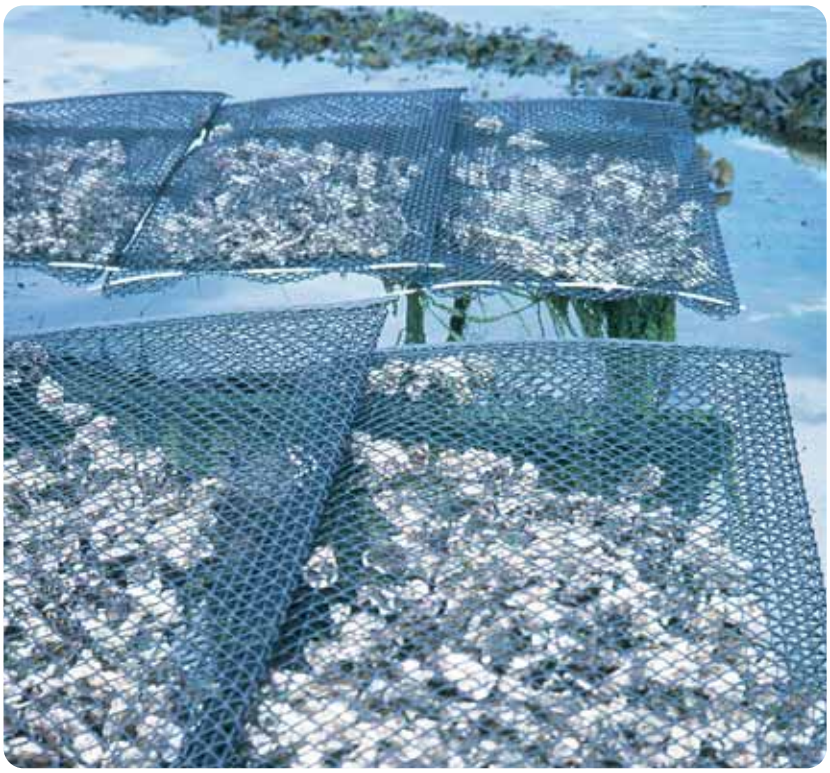
The routine surveillance of normal operations at nuclear installations in the UK has continued, with work by CEFAS forming the backbone of the assessments of impact on local communities and further afield. Assessment principles have been endorsed by a UK advisory body, the National Dose Assessment Working Group. The annual publication of *Radioactivity in Food and the Environment* now represents a complete analysis of all pathways of exposure of sensitive groups of people to the effects of discharges of radioactive waste (**www.sepa.org.uk/publications/rife**).

Our survey programme of nuclear installations is optimised to comprise a relatively low level of continuous surveillance of all sites, with occasional detailed studies of a few key locations. This year, we focused on a radiochemical manufacturer at Cardiff, on Sellafield and on Winfrith, a research site on the south coast of England. The data collected are used to reduce uncertainties in risk assessments for these sites and to adjust monitoring programmes to more properly reflect the risk for local people.

The application of waste from sewage works to farmland is increasing in the UK, with the potential for depositing radioactivity from discharges. At Cardiff, this pathway was investigated by the survey team because the bulk of radioactive discharge goes to sewers. At Sellafield, the main interest was in establishing the importance of the seabed inventory of technetium-99, which poses a continuing source of contamination in seafood. Other, more unusual pathways were investigated, including the use of seaweed as a soil

conditioner and the associated transfer of marine radioactivity to land, and the use of boreholes for domestic water supplies in the immediate vicinity of Sellafield. The results of these studies have been submitted to the FSA, the EA and the NII. They will be used in judging the need to amend authorisations for waste disposal.

" our survey programme is used to reduce uncertainties "



Right: Oyster cultivation (*Crassostrea gigas*)

Reducing risks due to viruses in shellfish

Filter-feeding shellfish such as oysters and mussels may become contaminated with human bacteria and viruses if grown in waters polluted with sewage. Outbreaks of infectious diseases such as viral gastroenteritis can occur when such shellfish are then consumed raw or lightly cooked.

CEFAS has undertaken six research projects in the past four years for the FSA as part of a programme to reduce the risk of viral exposure to shellfish consumers. The most significant outcomes from these projects are:

- development of improved methods for detecting viral pathogens in shellfish;
- development of procedures for removal of viruses during commercial purification of oysters; and
- identification and evaluation of a potential viral indicator organism.

These outcomes will reduce the risks to public health associated with consumption of shellfish, and assist the FSA in meeting its target of reducing the incidence of food-borne disease by 20% by April 2006.

" CEFAS has undertaken six research projects to reduce the risk of viral exposure "

Extraction of viruses from oysters

The hepatopancreas or digestive gland (A) is the major site of virus concentration in oysters and is used as the tissue of choice for virus detection. The hepatopancreas is dissected from the other tissues of the oyster (B). It is then finely chopped with a razor blade (C) and diluted in peptone water (D) before centrifugation.

ENVIRONMENTAL Quality

CEFAS' WORK ON ENVIRONMENTAL QUALITY UNDERPINS OUR ABILITY TO PROVIDE ADVICE FOR THE PROTECTION OF ECOSYSTEMS AND THE SUSTAINABLE MANAGEMENT OF NATURAL RESOURCES.

Our aim is the understanding of the physical, chemical and biological framework and processes of the marine ecosystem. We monitor the behaviour and fate of nutrients, contaminants and hazardous substances, and research their biological effects.

Dr David Morris Science Area Head Email: d.j.morris@cefas.co.uk

State of the Seas report

In its first report on marine stewardship, *Safeguarding Our Seas*, Department for Environment, Food and Rural Affairs (Defra) made a commitment to describe the current state of our seas and to produce an assessment of UK waters (the whole of the UK exclusive economic zone (EEZ)) as a 'State of the Seas' report by January 2005. CEFAS provides a significant component of the National Marine Monitoring Programme, which supports this assessment. This year, we focused much effort on contributing to the report.

To deliver this objective, CEFAS has worked closely with Defra and the Marine Environment Monitoring Group (MEMG). MEMG, chaired by CEFAS, prepared a monitoring strategy in 2003, which set out the present status and the future requirements for national marine monitoring. As a result, a steering group was established, with representatives from the four marine monitoring sectors (ocean climate, fisheries, environmental quality and biodiversity conservation). Collectively, the data and information holdings from these four sectors provide the cornerstones of the report.

> " CEFAS provides a significant component of the marine monitoring programme "

Left: CEFAS SmartBuoy deployment
Below: Oilrig with standby vessel

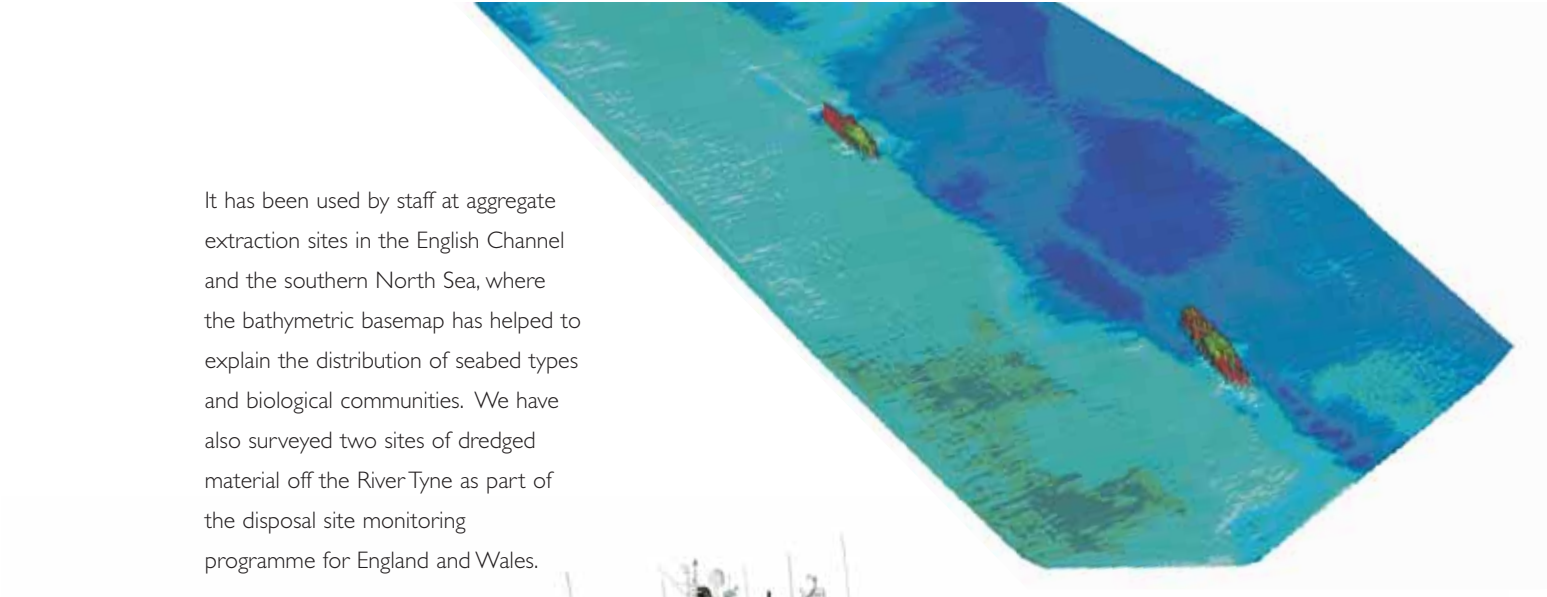
CEFAS co-ordinates the environmental quality contribution to the report describing 'Human Impacts', which includes indicator-based information on impacts on fisheries, nutrient inputs, hazardous substances, microbiological monitoring, oil, radioactive substances, construction, litter, relocation of dredged material, and impacts of shipping. Collectively, this information was compiled after a successful three-day workshop organised by CEFAS in February 2004.

Using *RV CEFAS Endeavour*

On 31 March 2003, the research vessel *CEFAS Endeavour* was delivered to Lowestoft, ahead of her first fully operational scientific cruise in May. The new vessel provides CEFAS with a modern ocean-going platform that will underpin our continued commitment to the protection of the marine ecosystem.

CEFAS Endeavour is fitted with several state-of-the-art acoustic tools that extend our capability for conducting multidisciplinary surveys, particularly for managing anthropogenic impacts. The Simrad EM3000 multibeam bathymetry system provides a significant advance in visualising the seabed and understanding the processes that act upon it.

It has been used by staff at aggregate extraction sites in the English Channel and the southern North Sea, where the bathymetric basemap has helped to explain the distribution of seabed types and biological communities. We have also surveyed two sites of dredged material off the River Tyne as part of the disposal site monitoring programme for England and Wales.



Above: Simrad EM3000 image of the seabed showing two wrecks in the North Sea

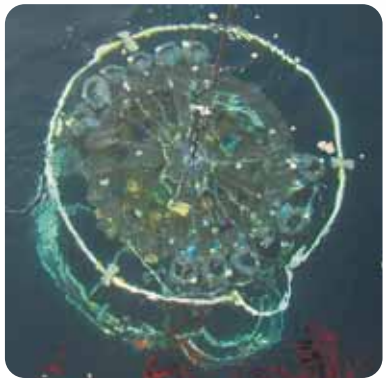
Left: *RV CEFAS Endeavour* © M J Page

Oyster ground cruise

In September 2003 CEFAS undertook a multidisciplinary cruise to investigate oceanographic and ecosystem processes in the area known as the Oyster Grounds, in the southern North Sea. This was performed with researchers from the Netherlands and from UK universities. We aimed to provide information to describe the current state of the waters in the area (an earlier international assessment had pointed to a number of problems, including low oxygen levels) and to begin to assess whether this was caused by, for example, nitrate and phosphate run-off from land.

We found the lowest concentrations of oxygen near the seabed ever recorded in the region. It appears that, during some warm and calm summers, water near the bed becomes trapped in the natural basin that forms the Oyster Grounds, and its oxygen content gradually decreases. The oxygen content increases again during winter when the water is mixed, by storms.

Work continues to complete the analysis of the samples collected during the cruise. There are plans to revisit the area to examine indicators of past natural history, and to discover if the low levels of oxygen are a recent development related to human activities, or just a phenomenon of the Oyster Grounds. Even in well studied sea areas there is scope for new discovery.



Below: CTD Rosette water sampler

" CEFAS found the lowest concentrations of oxygen near the seabed ever recorded in the region "

Coastal observatory

Liverpool Bay is an area of interest because of the high inputs of nutrients from land.

Traditionally, there have been insufficient data to draw conclusions about the status of the area and whether it is affected by those nutrient inputs. We therefore need better observations of the correct temporal and spatial parameters. Working with the Coastal Observatory of the Proudman Oceanographic Laboratory (POL), we are deploying our SmartBuoy technology, which provides the right type of observation. Using this and state-of-the-art models run by POL, we shall accurately assess the status of this water.

> " our SmartBuoy technology accurately assesses the status of Liverpool Bay "

SmartBuoy is a fixed-point sampling platform. It comprises a surface float beneath which a metal frame carries an instrument payload at a depth of 1–2 metres. The instruments measure physical, chemical and biological variables.

The instruments comprise systems developed by CEFAS with Defra funding. Above the sea surface, the metal tower carries a radar reflector, light, aerial and meteorological sensors. The buoy is anchored to the seabed and requires servicing by a survey vessel after 1–2 months' deployment, depending on location and time of year. These systems have survived winds up to Force 11.

High latitude ocean and climate

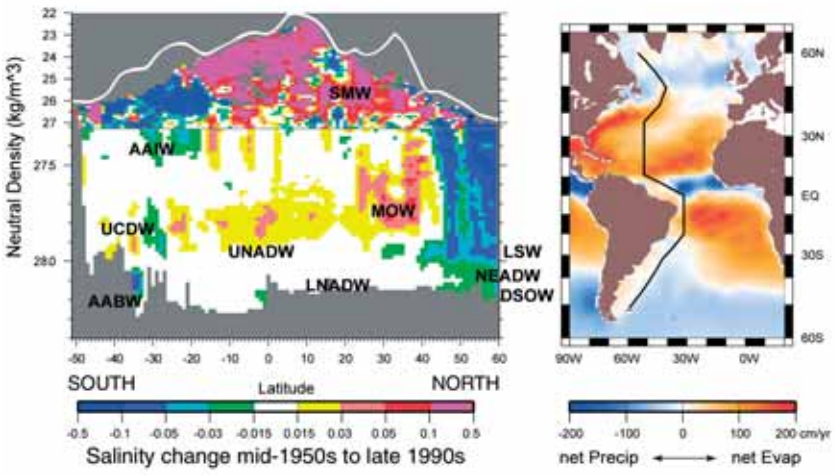
Since February 2003, in collaboration with German and Finnish colleagues, we have maintained two moored arrays of instruments off southeast Greenland. One array consists largely of current meters focusing on the causes of change in the cold, dense Denmark Strait Overflow, where it descends the Continental Slope off southeast Greenland. The other, comprising mainly salinity sensors, measures the freshwater flux that passes south along the east Greenland shelf close by. Because these flows are key components of the ocean's 'conveyor belt' circulation, measuring them and understanding their variability is of fundamental climatic importance.

We showed last year that the entire system of overflow and entrainment that ventilates the deep Atlantic has steadily changed over the past four decades, resulting in a sustained and widespread freshening of the deep and abyssal north Atlantic Ocean. In a follow-up study with the Woods Hole Oceanographic Institution, USA, and the Bedford Institute of Oceanography,

> " widespread freshening of the north Atlantic Ocean is part of a global shift in ocean salinity "

Canada, we have shown that this freshening is itself part of a global shift in ocean salinity and freshwater distributions, which we suggest has arisen through an intensification of the global hydrological cycle over recent decades.

Comparing salinity between 1956–64 and 1990–99 on a transect through the deep western basins of the north and south Atlantic, there is freshening over much of the water column poleward of latitudes 40° N and 25° S, and of a significantly more saline upper water column in the tropics and subtropics. Because a similar structure and period of change has been reported from the Pacific and Indian Oceans, this work appears to complete the evidence that these changes are of global extent.



Vertical section (left) on a line (right) through the western ocean showing salinity change. The upper tropics have become saltier (pink tones) while the ocean has become fresher at higher latitudes (blue tones). Curry, Dickson & Yashayaev, *Nature* 18-25 December 2003, interpret this as evidence of global water cycle acceleration

FISHERIES Management

CEFAS ADVISES GOVERNMENT ON THE MANAGEMENT OF EUROPEAN FISH AND SHELLFISH STOCKS. WE COLLECT AND ANALYSE POPULATION DATA, MODEL HOW STOCKS RESPOND TO MANAGEMENT MEASURES, AND PLAY A MAJOR ROLE IN INTERNATIONAL ASSESSMENT AND ADVICE.

In 2003 we implemented the new European Union (EU) Data Regulation. We also developed new fisheries studies on chartered commercial vessels under the Fisheries Science Partnership, and addressed a number of regional assessment issues raised by stakeholders.

Dr Andy Payne Science Area Head Email: a.i.l.payne@cefas.co.uk

Stock recovery

Some of our most important stocks are very low. They require EU Recovery Plans to return them to safe levels and to secure the fisheries. Most important are stocks of cod in the North Sea, Irish Sea and West of Scotland, but recovery plans are also needed for hake, Western Channel sole and Irish Sea whiting.

CEFAS has examined how long recovery will take under different management options, by modelling the stock dynamics into the future. For North Sea cod, the proportion killed needs to be reduced by 60–70% if the stock is to attain its target level within a decade.

Cod is taken with other fish, such as haddock and whiting. To enable the Recovery Plan fisheries managers have introduced direct control of effort by restricting the number of days at sea.

But fishermen can target different species, and CEFAS has helped managers and industry 'decouple' the mixed fisheries by retaining effective conservation measures for cod, yet allowing greater opportunities on the healthy stocks of haddock and prawns.

" CEFAS has examined how long recovery will take under different management options "

Left: Cod (*Gadus morhua*)
Below: Removal of otoliths (ear stones) from a cod for age determination by reading the growth rings

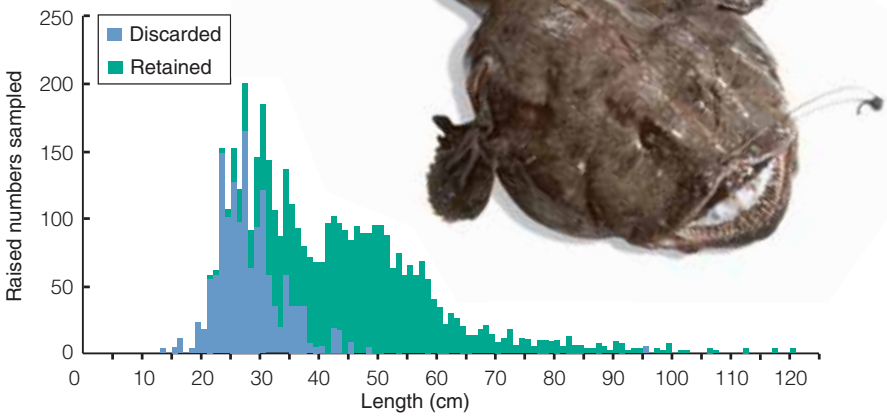
EU Data Regulation

Assessments of fishing rate and stock size made by the International Council for the Exploration of the Sea (ICES) require long-term data on the quantities of fish caught and landed, and on trends in the number and size of fish of different ages in the stock.

In 2003, these data were collected for the first time within the framework of the new EU Data Regulation, under which Member States must meet targets and criteria for the collection of fisheries and biological data, discard data, and research vessel survey data. The CEFAS biological sampling and research vessel programme already meets most EU criteria, so the main feature in 2003 was development of the discard monitoring programme.

In 2003, eight discard sampling officers were appointed. Despite some curtailment of the programme because of bad weather, they completed in excess of 500 days at sea, on a range of vessel types in coastal and offshore areas around the UK, sampling almost 1 400 hauls. The discard database records the number, weight and size composition of fish discarded and retained per hour fished, on a haul-by-haul and trip basis. Reports of discard officers also help scientists to understand fishing patterns and practices.

A problem for the industry in 2003 was the high rate of discarding of anglerfish in the southwest, to keep within the total allowable catch (TAC). Because of their shape, small anglerfish are easily snared in nets of beam trawlers. The abundance of young anglers in the 2000 and 2001 yearclasses was difficult to estimate accurately when the original 2003 forecast was made, but they are now calculated by ICES to be significantly more abundant than their predecessors. Joint work by fishermen and CEFAS investigated this issue, and led to ICES and the EU granting an in-year increase of the TAC.



Anglerfish (*Lophius piscatorius*) discarded and retained by beam trawlers were sampled by CEFAS discard officers in the Western Channel in 2003

" joint work by fishermen and CEFAS led to an in-year increase of the TAC "

The Fisheries Science Partnership

In 2003, a new initiative brought scientists and industry together under the Department for Environment, Food and Rural Affairs (Defra) funded Fisheries Science Partnership. CEFAS has used commercial vessels to collect catch rate and biological data in 10 fisheries nominated by the industry: saithe, sandeel and pout in the northern North Sea; cod and *Nephrops* off the northeast coast; cod in the east and west Irish Sea and the Celtic Sea; and flatfish and monkfish in the English Channel and Western Approaches.

Sorting a *Nephrops* catch onboard a commercial vessel

These voyages provide information on the distribution, catch rate and size range of target species, and by-catch species in individual fisheries. Voyages to the Yorkshire coast in the autumn of 2003 compared the size distribution of cod caught when two otter trawlers each fished using 80 mm and 120 mm cod-ends on the same grounds. Contrary to expectation, the first vessel caught more medium and large cod with the larger mesh size, whereas on the second vessel the 120 mm mesh caught fewer small and medium cod and about the same numbers of larger cod.

The results of the Partnership voyages will be analysed at CEFAS before being discussed with the industry and published in summer 2004.

Wash bivalves under the weather

This year, CEFAS published a major report giving an historical perspective on the status of cockles and mussels in The Wash. Stocks of both species have been at very low levels in this area over recent years, and CEFAS and others continue to research the causes of the decline.

Analysis of records over the past century reveals that successful settlement of larvae of both species depends on a combination of weather and adult stock size. Easterly winds in early summer promote retention of larvae within The Wash; these

" a new initiative brought scientists and industry together "

Above: Mussels (*Mytilus edulis*)
Right: Collecting a cockle (*Cerastoderma edule*) sample in The Wash

conditions have become more rare in recent years. In cockles, this has been counterbalanced by reduced competition from adults, and it is reduced survival to adulthood rather than poor settlement that underlies their current low levels.

By contrast, the lack of established adult beds appears to be key to the sustained failure of mussel settlement. At current low stock levels, good settlement is highly unlikely except under exceptional weather conditions. Cold winters are important because they benefit the reproductive condition of adult mussels. However, the most crucial factor for the recovery of mussel stocks will be to increase availability of suitable surfaces for settlement.

Whale–fishery interactions

The interaction between whales and fisheries is a very contentious issue. Simple models of surplus production show that culling top predators such as whales might provide greater fishery yields, because whales and fisheries compete for food. However, this approach does not account for the complex interactions of marine food webs.

CEFAS was commissioned by the International Fund for Animal Welfare to investigate whether simulations of food webs can impact how marine mammals are believed to interact with fisheries and their prey. The popular modelling approach Ecopath with Ecosim (EwE) was used. It demonstrated that the complexity of the modelled food web, and some of the key assumptions made during the modelling process, can have a large effect on the resulting management recommendations.

Increased understanding of the EwE approach has placed CEFAS at the forefront of ecological and multispecies modelling. Further research will look at applications for investigating marine protected areas (for the EU) and for examining environmental drivers of the North Sea ecosystem (for Defra).

Species interactions

Assessment results depend partly on the assumptions made when using models. One example is the rate at which fish die from causes other than fishing, often assumed to be constant.

CEFAS recently took part in studies to test how the assessment results for North Sea cod change if the natural death rate is varied to account for trends in predation by adult cod on juveniles, and by seals on adult cod.

Our conclusion is that the biomass of mature North Sea cod is currently very low compared with the past, and is not affected by changing the values of natural mortality used in the model.

" the biomass of mature North Sea cod is very low "

FISHERIES Biology

CEFAS' RESEARCH ON THE IMPACTS OF HUMAN ACTIVITIES AND NATURAL FACTORS ON AQUATIC FAUNA AND ECOSYSTEMS UNDERPINS ADVICE GIVEN ON THE MANAGEMENT AND REGULATION OF FRESHWATER AND MARINE FISHERIES TO THE UK GOVERNMENT AND OTHER BODIES BOTH NATIONALLY AND INTERNATIONALLY.

The conservation and sustainable management of freshwater and marine fisheries and ecosystems depends upon understanding the biological processes that underlie the structure of ecosystems and the production of fish stocks, and determining the impacts of natural factors and human activities, including fishing, on these processes.

Ted Potter Science Area Head Email: e.c.e.potter@cefas.co.uk

Assessing the risks and impacts of non-native species

In keeping with its tradition in assessing the disease risks of fish and shellfish, CEFAS has taken a leading role in developing methods for assessing the risks and impacts of alien freshwater fish to our native fauna and aquatic ecosystems. During 2003, a study led by CEFAS identified a significant relationship between the distance of ponds from residential infrastructures (roads, footpaths, housing) and the incidence of non-native ornamental fishes. This collaborative study, with the Corporation of London and Bedwell Fisheries Services, highlighted the central role that humans play in the introduction and dispersal of alien species such as goldfish and topmouth gudgeon.

The processes that facilitate the establishment and dispersal of alien species are attracting increased international attention. CEFAS has taken the lead in North Atlantic Treaty Organisation (NATO) and European Union (EU) funded collaborations that examine how variations in life-history traits and migratory behaviour contribute to risk analysis. The risk assessment methods being tested at CEFAS are a central component in a Department for Environment, Food and Rural Affairs (Defra) funded consortium that is developing a risk assessment framework for all non-native plants and animals, to evaluate the impacts that non-native species have on native organisms.

Left: Ornamental fishes introduced to Goldings Pond, Epping Forest, by the general public: common koi carp (*Cyprinus carpio*); varieties of goldfish (*Carassius auratus*) and topmouth gudgeon (*Pseudoasbora parva*)
Below: David Sims of the MBA tagging a basking shark as part of a joint Defra- and MBA-funded project

Basking sharks phone home

CEFAS and the Marine Biological Association (MBA), Plymouth, have been working on a joint MBA- and Defra-funded project to provide a better understanding of the seasonal distribution and behaviour of plankton-eating basking sharks in UK waters (**www.cefas.co.uk/sharks**). To develop conservation strategies, we need information about the size and age structure of basking shark populations, and what factors affect their distribution and behaviour. Most information about the numbers of basking sharks comes from public sighting surveys, mainly close to land (**www.mcsuk.org**). To interpret the sighting data, we need to understand the seasonal behaviour and movements of the sharks in relation to the environment.

Twenty sharks have been tagged off Devon and Cornwall, and in the Clyde Sea off western Scotland, with state-of-the-art electronic tags designed and developed at CEFAS. The tags record depth, temperature and position. After a pre-determined time, the tags automatically detach from the shark, float to the surface and transmit data back to the laboratory by satellite, where the information is combined with satellite imagery of sea surface ➲

temperature and chlorophyll concentration. Contrary to previous hypotheses, we found that basking sharks do not hibernate during winter. Instead, they migrate up to 3 400 km and move vertically to more than 750 m depth to use productive continental shelf and shelf-edge habitats during summer, autumn and winter.

" CEFAS has been working to provide a better understanding of basking sharks "

Seabed

Application of Geographic Information Systems

CEFAS has continued to develop Geographic Information Systems (GIS) and to apply our skills to a broad range of advice and research. In particular, use of GIS-based spatial modelling has helped to improve our estimates of the pressures imposed by fishing in inshore and offshore waters, and contributed to our understanding of the behaviour, habitats and distribution of marine fish and shellfish. This in turn will help to improve models of marine ecosystems and the design of marine protected areas.

One important area of work this year has been to categorise estuaries and coastal waters, as one of the first stages in the implementation of the Water Framework Directive (WFD). The approach used a pre-defined set of nine physical descriptors to ensure that biological comparisons could be made between similar physical types of water body. A consortium of marine research organisations, led by CEFAS, defined preliminary categories of coastal and estuarine environment for England, Wales, Scotland and Ireland. The final set of categories provides a basis upon which reference conditions required by the WFD can be applied.

" use of GIS-based spatial modelling has helped to improve estimates of fishing pressures "

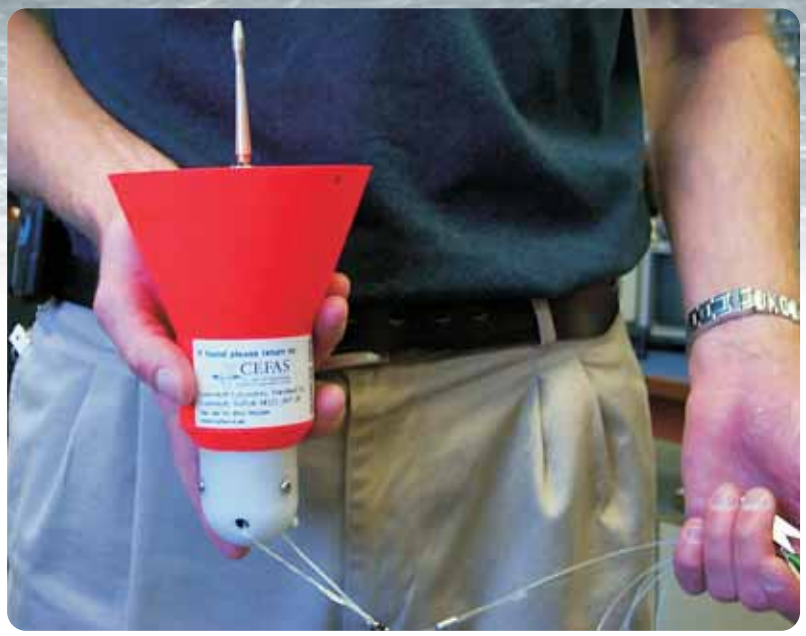
Ecosystem approach

The UK is committed to developing an ecosystem approach to fisheries management, and to the sustainable development of the oceans. CEFAS is leading two Defra-funded projects to develop suitable ecological indicators for commercially exploited fish, other non-targeted fish, bottom-living communities and vulnerable species.

These projects compare the impacts of fishing on nutrient recycling, productivity, diversity, community structure and size composition, and species vulnerability. This work is important because it contributes to UK commitments to conserve and manage the ecosystem, and to the development of indicators of ecosystem health.

" CEFAS is leading projects to develop ecological indicators "

Pop-up tag



The new pop-up telephone tag developed at CEFAS

We have designed and built a new 'pop-up' tag, which overcomes previous data transmission limitations. The new tag, which we will deploy in the summer of 2004, contains a cellular telephone that transmits data back to the laboratory, once the tag is washed close to shore by the prevailing southwesterly weather. 30% of the original tags have so far been returned to CEFAS.

Distribution of larval plaice

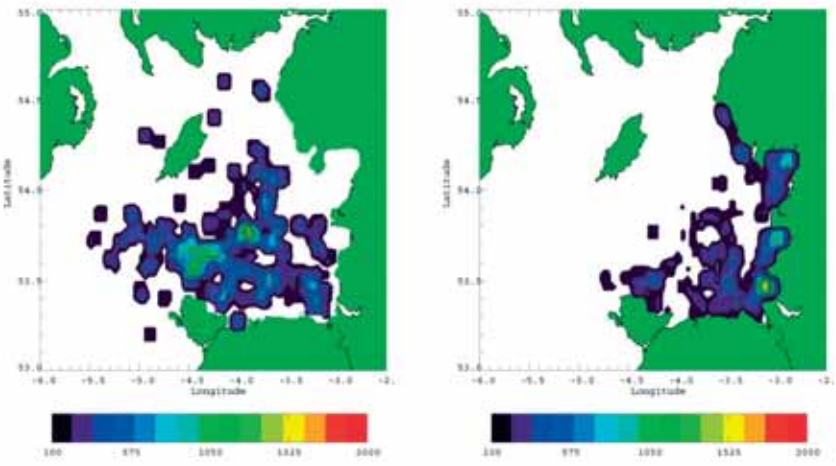
Explaining variations in the size of fish populations depends in part upon understanding the factors affecting the survival and distribution of the young stages (eggs and larvae).

CEFAS has developed a coupled physical–biological model for the Irish Sea to simulate the movement of the eggs and larvae of plaice. This type of model is based upon simulating the physical movements of the sea driven by the tides, meteorological factors and the inflow of freshwater from major rivers. We have refined the approach to incorporate the development and behaviour of the eggs and larvae.

Particles representing groups of eggs are placed in simulated flow-fields. The model predicts their movements. The simulation has shown the importance of the individual behaviour of larvae for ensuring that they are transported from the spawning grounds to their nursery habitat, close to beaches.

The next stage in this work will compare different years, look at the impact of changing weather conditions on transport, and develop a similar model for the southern North Sea.

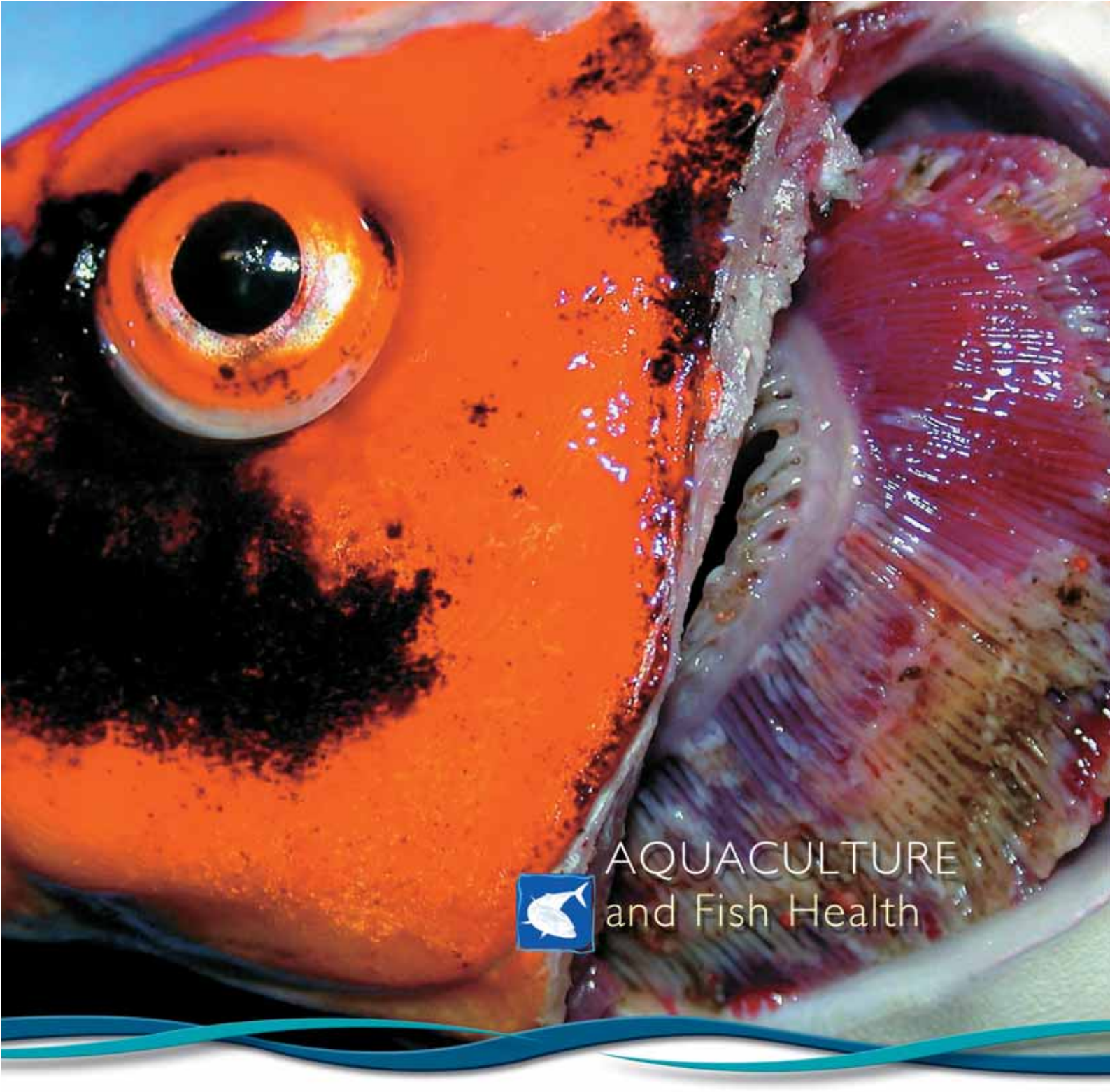
> " CEFAS has developed a coupled physical-biological model for the Irish Sea "



Simulation of movement of eggs and larval plaice in the Irish Sea

Left panel: The distribution of the particles towards the end of the larval stage if they are entirely passive (ie, they are only moved around by the water flow)

Right panel: The locations of the particles when tidally synchronised vertical swimming behaviour is turned on in the larvae



AQUACULTURE and Fish Health

CEFAS PROVIDES ADVICE AND SERVICES FOR THE DEVELOPMENT OF SUSTAINABLE AQUACULTURE, AND THE PROTECTION OF WILD AND CULTIVATED STOCKS FROM DISEASE.

The health of our fish stocks is vital for sustainable aquaculture and the well-being of our aquatic ecosystems. To identify potential risks, new diseases and pathologies are isolated. Associating our research with inspection and sampling provides a link from the laboratory to the field.

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Fish Health Inspectorate

The Fish Health Inspectorate (FHI), in its 2003 monitoring programme, confirmed that the last trout farm subject to controls for bacterial kidney disease (BKD) in England and Wales was clear of the disease. This serious disease of salmonid fish was made notifiable in 1978 after outbreaks in Scotland and England. Since then, the number of outbreaks has fluctuated annually, with a peak in 1993-94 when industry-wide testing revealed 26 new cases of the disease. With regular visits to farms necessary under the European Union (EU) fish health regime, and movements restricted from infected farms, the disease now appears to be under control.

Unfortunately, mortality investigations at two commercial coarse fisheries revealed the presence of spring viraemia of carp (SVC). This notifiable disease, for which Department for Environment, Food and Rural Affairs (Defra) operates movement controls, can kill more than 90% of native susceptible stock in new outbreaks. Although the disease is under control in the UK, the demand for large carp for fisheries and the price differentials with stocks on mainland Europe have resulted in illegal imports, which the FHI considers are likely to have resulted in these outbreaks.

To continuously improve and enhance clear and transparent procedures, the FHI has implemented a competency framework for inspectors, leading to formal accreditation of its core activities.

Links with commercial companies

CEFAS values its collaborations with the private sector in fish welfare. We have increased our emphasis on commercial contracts by the formation of a Product Evaluation Group, which is dedicated to research into key diseases of aquaculture and the evaluation of potential vaccines or medicines.

Recent advances in the development of new *in vivo* models of fish disease have yielded laboratory challenge systems for infectious pancreatic necrosis (IPN), saprolegnia and piscirickettsia, allowing the evaluation of potential vaccines against these diseases.

We are also developing our capabilities to test fish feed and feed additives.

Left: KHV infected carp © W H Wildgoose
Below: Inspecting a consignment of imported fish
Below right: Commercial fish farm

Illegal fish movements

Efforts by the FHI to prevent illegal imports of live fish have led to improved co-operation and support from other government agencies, the angling press and angling bodies. The finding of a rare strain of the SVC virus in a consignment of 262 smuggled carp further illustrated the need for such preventative action.

Successful operations and investigations during the year have resulted in more prosecutions and increased sentences for various offences under the fish health regulations. This has served to discourage others and to inform the public of the importance of protecting our native fish against disease.

Close relations with the English Carp Heritage Organisation (ECHO), an organisation set up by concerned anglers and those involved in the operation of carp fisheries, have led to proposals for joint Defra- and ECHO-funded research projects.

These close links are a positive step, bringing together CEFAS, the Environment Agency (EA), industry and anglers to combat disease and address control issues facing the industry.

Cheque presentation to CEFAS by ECHO at the National Carp Show to assist further research into koi herpes virus

> " successful operations and investigations resulted in more prosecutions "

The internal clock of fish

Controlling the timing of reproduction is important in aquaculture. Fish breed seasonally and rely on environmental cues to time reproduction. Seasonal changes in day length affect the cycle of melatonin, a hormone that mainly circulates in the blood during darkness. Changes to the day–night melatonin cycle are thought to provide fish with daily, and set internal, clocks. We have discovered that fish release melatonin into the water (through their gills). This has two advantages. Firstly, the amounts in water are much easier to measure than in blood. Secondly, the fish do not have to be handled. This is the second 'non-invasive' procedure that we have developed and applied, the first being for cortisol, the stress hormone.

Fish disease network

CEFAS is leading an EU fish health project, the Permanent Advisory Network for Diseases in Aquaculture (PANDA), which will develop a permanent network to strengthen EU expertise on infectious diseases in aquatic animals and provide advice to develop EU policy.

Left: Virology laboratory at CEFAS, Weymouth

The most important constraint to the development and sustainability of European aquaculture is infectious diseases, as direct losses but also indirectly as trade restrictions. The network will provide the EU with a scientific foundation for the development of EU policy and legislation for the management of aquatic animal health.

Koi herpes virus: an important disease of carp

Koi herpes virus (KHV), a fatal disease of carp, has now spread to wild carp in the UK. It has also been detected in Europe, North America and Asia, including Japan where it is devastating the koi carp industry. In February 2004 Defra sponsored a two-day workshop on the disease to determine the status of research and to consider control measures. Non-destructive methods of KHV detection are being developed at CEFAS, which will allow identification of infected individuals as well as providing data for epidemiological models. Work at CEFAS on the genetic basis of KHV has identified similarities with another fish herpes virus, thus providing confirmation that the disease has been correctly identified.

Dangers from non-native crabs?

We are studying Chinese mitten crabs from the Thames Estuary. This alien species has become established in some UK estuaries, where it causes damage (bank erosion, displacement of native species). In the Far East, mitten crabs are hosts to a larval stage of parasitic lung fluke (*Paragonimus westermani*). When uncooked crabs are eaten, the parasite can be transmitted to its warm-blooded final host (including humans) where it migrates to the lung. Continuing studies on mitten crabs from the Thames will establish whether this parasite is present in the UK.

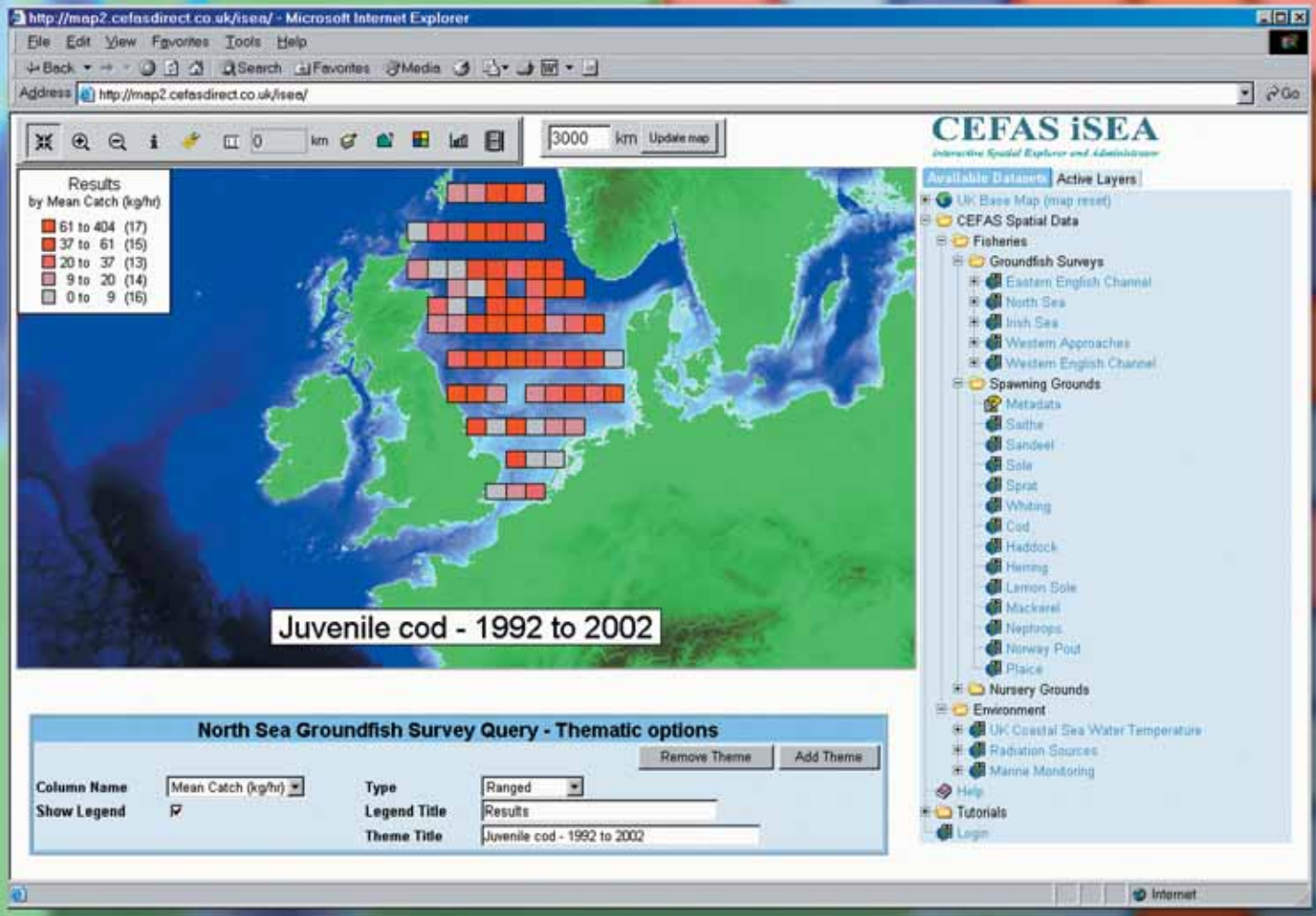
Above: Chinese mitten crab (*Eriocheir sinensis*)
Below: Bream and carp

Effects of disease on fish populations

Important regulators of fish populations include water temperature and flow dynamics. Coarse fish fry collected over a 10-year period by CEFAS and the EA have been examined for their disease status. One of the parasites identified as a major factor in reducing population success is *Myxobolus buckei* (Myxozoa), which causes lethal deformities to vertebrae in juvenile chub, roach and bream. Assessment of pathological changes seen in individual fish revealed that disease is a highly significant factor affecting coarse population success in river systems in the UK.

This work has major implications for models that predict populations in other ecosystems. CEFAS is collaborating with the EA and Hull International Fisheries Institute to develop new models incorporating disease as a component.

> " disease is a highly significant factor affecting coarse fish populations "



INFORMATION Systems

CEFAS PROVIDES AND DEVELOPS SPECIALIST SOFTWARE APPLICATIONS FOR ITS OWN USE, FOR ITS CUSTOMERS AND FOR ORGANISATIONS WORKING IN AREAS OF MUTUAL INTEREST.

There is continuing pressure on any information services operation to increase the number and value of the services it offers and to lower its costs. Over the year, the introduction of a new operating environment and of server-based computing will lead to improvements in efficiency in the services offered to customers in the future.

John Bumpus Information Systems Head Email: j.f.m.bumpus@cefas.co.uk

Users increasingly ask for improved remote access to e-mail and other functions. Access through the Internet to all CEFAS systems has been initiated during the year, and is already meeting the needs of several customers. To achieve this, a user only needs a computer with Internet access.

Systems integration

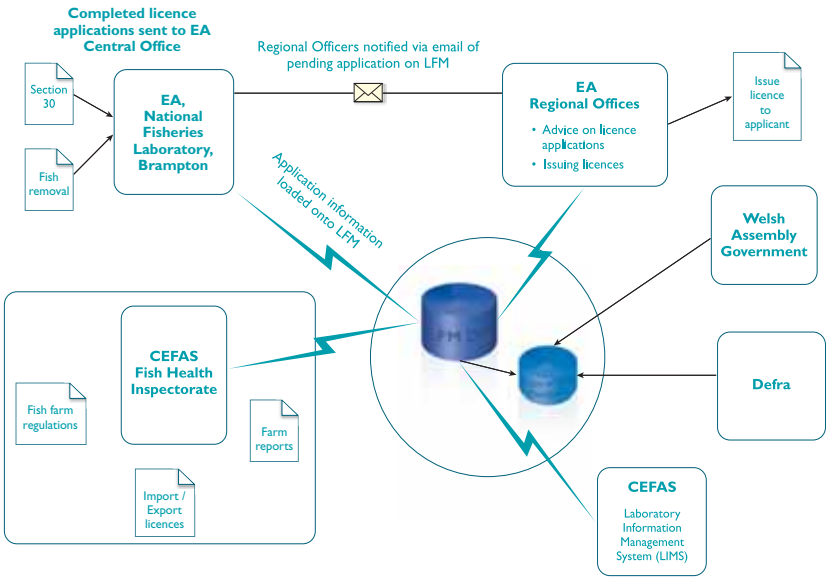
The support of successful fisheries management requires that all information sources and user requirements are integrated into one system. For the past 15 years, CEFAS has been responsible for the development and operation of the integrated fisheries management information system for the Department for Environment, Food and Rural Affairs (Defra) and CEFAS.

This system has been extensively redeveloped and is now running on modern low-cost systems. It combines:

- vessel registration and licensing;
- fishing catch; and
- monitoring and surveillance of vessels.

> " recently redeveloped systems enable compliance with EU data collection regulations "

Left: CEFAS web-based GIS
Below: Live Fish Movements System



Other recently redeveloped systems support CEFAS' work in stock assessment. These link with the fishing activity, vessel and licensing systems. With the other systems, they enable compliance with European Union (EU) data collection regulations. The main data held and processed by the system relate to age, length and other biological data of catches collected at local ports.

Beam trawler

Government of Latvia

Riga, Latvia

The expertise of CEFAS developers on sea fisheries management software has also been used to advise the Government of Latvia on a successful project to build the systems it needs to comply with the Common Fisheries Policy.

ELLIOT MORLEY MP (MINISTER OF STATE, DEPARTMENT FOR ENVIRONMENT, FOOD AND RURAL AFFAIRS) FORMALLY LAUNCHED WAVENET AT THE OCEANOLOGY INTERNATIONAL EXHIBITION IN LONDON ON 17 MARCH 2004.

CEFAS has successfully developed, tested and implemented a network of wave monitoring buoys around the coasts of England and Wales. The WaveNet programme, funded by Defra, provides real-time coastal wave data for flood and coastal managers, and other stakeholders.

Developing business with foreign governments and international agencies

During the year, CEFAS built upon past successes in this area and, in line with our strategy, continued to expand our provision of services to international clients.

Our continuing relationship with the Kuwait Environment Public Authority resulted in CEFAS winning a significant project for the assessment of the environmental quality of Kuwait Bay, which will form the basis for setting a monitoring strategy for Kuwait coastal waters. The project combines field studies involving CEFAS scientists visiting Kuwait, with the training of Kuwaiti scientists at CEFAS laboratories and in Kuwait itself.

In the same region, CEFAS analysed oil and contaminated sediment samples for toxicity. The samples were collected from Ras Subiyah (northeast of Kuwait Bay) where, during the 1991 Gulf War, Iraqi forces had built a defensive trench several kilometres long and filled it with crude oil to ignite as a deterrent to the Allied Forces. The trench was never used, but the oil has been left to seep into the surrounding environment.

Further afield, CEFAS has been advising on a pre-environmental impact assessment for a proposed gas pipeline between Sakhalin Island and Japan. CEFAS scientists have identified and provided an initial assessment of potential interactions between the proposed gas pipeline and the fish and fisheries in the area of impact.

Success with European Union funding

The new European Union Framework 6 programme began in earnest during 2003. During the year, CEFAS demonstrated its wide-ranging capability and expertise, and bid for research funding under several themes. CEFAS is a member of several international consortia that have been successful in winning research funding against fierce competition. From the first round of awards, CEFAS is leading two projects and participating in another 11, further enhancing our reputation in co-operative international research.

Kuwaiti scientists on a training course at CEFAS, Burnham-on-Crouch

Exhibitions

To develop new business contacts and maintain links with a wide range of customers, CEFAS exhibited at several trade shows and scientific events during the year. The programme included the 3rd International Symposium on Fish Vaccinology (Bergen, April 2003), Offshore Europe (Aberdeen, September 2003) and GeoSolutions (London, September 2003).

Commercialisation of intellectual property

In line with our continuing strategy to commercialise our intellectual property, a programme of activity was developed and delivered during the year using CEFAS Technology Limited (CTL) as a platform to market our information systems, supported by a new website (**www.cefastechnology.co.uk**). CTL is a wholly owned subsidiary of CEFAS, specialising in the application of CEFAS technology to meet specific customer needs.

Left: Elliot Morley (centre) launches WaveNet at Oceanology International 2004

CUSTOMER Focus

Ben Bradshaw (right), Fisheries Minister, with Ross Jolliffe, Project Manager for the *CEFAS Endeavour* build

CEFAS provides advisory and R&D services to an increasingly diverse customer base in the UK and abroad. As an Agency of the Department for Environment, Food and Rural Affairs (Defra), our income is largely from the UK Government sector, but we have successfully increased the range of customers we serve both from government organisations abroad and from the commercial sector. Each of our customers has unique needs. Providing a high standard of services to their satisfaction requires that our staff liaise closely and tailor their work to add the value that CEFAS has to offer.

Our service for customers is developed in a special way. CEFAS adds value by anticipating the problems and priorities arising from policy initiatives and developing legislation. We advise customers on scientific aspects of implementation and the efficacy of management actions. Our innovative research programme establishes priorities and methods to promote efficiency and our customers' interests.

We continuously improve our customer services through staff training in project management, the quality of our science through the introduction of the Code of Practice for quality assurance, and the strategic development of our science base through our Science Framework. The Science Framework was developed with customers, to provide a view of science needs in the next five to ten years, and to ensure that the staff and services that customers will need in that time are in place.

Assessing customer satisfaction

The work of CEFAS is complex bespoke science, so customer liaison is an integral part of our project management. In addition, formal performance measurement takes place annually and at project completion to make sure that customer requirements have been met. The feedback we receive is used for service development. Over several years the trend shows that CEFAS has continued to provide a very high value of customer satisfaction while developing and expanding our customer base.

This customer feedback is also the basis for a measure of our performance against the key Ministerial targets for throughput (see page 54).

Below: Jon Rees (CEFAS) lecturing on coastal erosion

'Providing a high standard of services to the satisfaction of customers'

Dr Michael Waldock Science Director

Strengthening Customer Relations

We are now taking further steps to improve customer satisfaction, by ensuring that each major customer is supported by an experienced Customer Relations Manager (CRM).

The CRMs will address ways of enhancing existing services, and will explore additional opportunities for CEFAS to provide its expertise for new customers.

Peter Greig-Smith led a CEFAS team to the Food Standards Agency to build closer links with the customer

CEFAS Charter

The CEFAS Charter sets out our aims and standards of service and seeks feedback from the public (**www.cefas.co.uk/charter**).

During 2003–04, the following Charter standards were achieved: 98% of letters were replied to within 15 working days of receipt, and 99.9% of visitors were seen within 10 minutes of the appointment time at CEFAS laboratories. No complaints were received.

CEFAS conforms to the Code of Practice on Access to Government Information and the Environmental Information Regulations.

Improving communications

A new Communications Manager, Anne McClarnon, was appointed in November 2003. Anne will oversee the development and operation of CEFAS' internal and external communications. Building on existing channels and practices, we have adopted a more focused approach to our communication activities.

Enhanced media coverage since November 2003 shows the positive movement already made on one of the key priorities, that of raising our public profile. For example, the work done to promote activities in fish import prosecutions and disease control has resulted in positive media coverage and closer links with the angling trade and the general public.

Right: Examination of fish tissue samples using light microscopy

STRONG Science

Effective scientific support for government and other customers depends on the strength of our research and our ability to apply science to meet their needs. We have an annual action plan that focuses on maintaining and improving our capability. The action plan is based on the outcome of periodic external audits of our science. A significant step this year has been to develop a coherent framework for all of CEFAS' science (**www.cefas.co.uk/science/framework**) which maps out the future direction to meet government requirements.

Demonstrating the strength and vitality of our science and making the outcomes accessible to a wide audience is key to assuring our national and international reputation. In 2003, CEFAS research scientists published 132 articles in the peer-reviewed scientific press – a 10% increase over the previous year. They also participated in many UK and international conferences to present papers and posters describing aspects of our work. CEFAS has also organised several conferences and training workshops, and produced publications in printed and electronic formats, including *Trout News* and *Shellfish News*, which are available via **www.cefas.co.uk/publications** or direct from CEFAS Lowestoft library.

Right: The Kelvin Medal 2003, awarded to Bob Dickson
Below: Bacteria testing

As well as our outputs, the vitality of our science can be shown through the provision of advice at a high level in UK Government and, increasingly, through the influence we bring to bear in international science and regulatory fora. CEFAS, and key senior members of staff, are regularly

invited to lead and chair international committees, for example, we presently chair the International Council for the Exploration of the Sea (ICES) Advisory Committee for the Ecosystem (ACE) and the European Commission Scientific, Technical and Economic Committee for Fisheries (STECF).

We lead and contribute to significant science networks. These networks feature many universities in the UK and farther afield, they may be specific to our professional interests in Europe such as the European Fisheries and Aquaculture Research Organisation (EFARO), or they are communities set up for specific programmes of work. Last, but by no means least, we point to the high quality of CEFAS staff and their personal achievements. Some examples of individual success are described on the next page.

'Enhancing our scientific capability and reputation'

Dr Stephen Malcolm Science Director

Workshops on fish disease

Members of the Food Control Authority, Norway being shown round the radio analysis department at CEFAS

CEFAS hosted a workshop on carp diseases for 41 delegates representing all European Union (EU) Member States and accession countries. Lectures on the state of the art, followed by practical sessions, were presented by laboratory staff and invited speakers. Diseases threatening the industry were covered: spring viraemia of carp, koi herpes virus, and epizootic ulcerative syndrome.

Members of CEFAS spent two weeks in the United States running a training workshop for US Government agencies and universities on spring viraemia of carp, sponsored by the US Animal and Plant Health Inspection Service and the Fish and Wildlife Service after the first detection of the disease in 2002.

The course equipped scientists with the knowledge and tools to diagnose this virulent disease and monitor its distribution in the US.

EFARO

CEFAS participates in EFARO, a network of fisheries and aquaculture research organisations within the EU. This year, directors and other scientists from laboratories in 22 countries met in four workshops to discuss matters such as: EU research priorities; sharing access to research vessels; improved provision of fisheries advice to the European Commissions (EC); and the ecosystem approach to management of the seas. Through EFARO, CEFAS has also helped the establishment of a network of science programme managers in EU countries with significant interests in marine fisheries.

Representation

CEFAS scientists participate in many expert groups. We also represent the UK in national and international fora, and provide science support to national delegations. Internationally, we continue to work with ICES, the Oslo and Paris Commission (OSPAR), several other bodies and, increasingly, with the EC. This European dimension is likely to strengthen in the coming years. Nationally, we work with the Department for Environment, Food and Rural Affairs (Defra) to support the co-ordination of national activities, for example the National Marine Monitoring Programme. We are also developing ways of working with other members of the Defra family, such as English Nature and the Environment Agency.

Individual Success - some examples of esteem for CEFAS scientists

- Brett Lyons and Grant Stentiford beat academic and research council rivals to win the inaugural Prince Madog prize – a free research trip on the *RV Prince Madog,* and delivering a lecture to the Challenger Society
- Julian Addison accepted the Buckland Foundation's invitation to become its Buckland Professor for 2004
- Andy Payne was appointed Editor-in-Chief of the *ICES Journal of Marine Science*
- Nicola Lower was selected for a Winston Churchill Travelling Fellowship to investigate the potential for pheromone technology to improve the sustainability of aquaculture
- Bob Dickson was awarded the 2003 Kelvin Medal by the Royal Philosophical Society of Glasgow
- Gordon Copp was elected to the Council of the Fisheries Society for the British Isles

EFFICIENT, Cost-effective Operation

Continuously improving value for money for our customers and increasingly exposed to competition from other organisations, we have to operate with simple, reliable and effective processes to develop our business.

After efficiency improvements over the past year, we are pleased to record that the Ministerial target (no increase in the costs of support services relative to the growth of income) has again been met. Several important initiatives have contributed to this, including rationalisation of energy sources and other key procurements. Development of e-procurement systems and restructuring of facilities will further improve efficiency at CEFAS.

It is no longer sufficient for public sector plans to ignore the unexpected. As an extension to CEFAS' risk management plan, CEFAS developed a disaster recovery plan designed to ensure continuity of work after any major disruption.

In the coming year, CEFAS will implement a bespoke project management system, to give better monitoring and control of all projects.

Sorting samples at sea on *CEFAS Endeavour*

Quality management

CEFAS recognises the importance of quality management of our science, and operates several certifying standards to this end. After assessment by inspectors from the United Kingdom Accreditation Service (UKAS) we maintained our accredited laboratory status for scientific operations related to:

- radioanalytical testing on environmental samples to ISO 17025 at Lowestoft Laboratory; and
- algal biotoxin and microbiological tests on fish and shellfish to ISO 17025 at Weymouth Laboratory, which also functions both as the European Community Reference Laboratory and the UK National Reference Laboratory for monitoring bacteriological and viral contamination of bivalve molluscs.

In both cases, we extended the scope of the accredited services, and the new tests were approved by UKAS.

At our Weymouth Laboratory, we continued to provide safety testing services for veterinary medicines under the 1999 Good Laboratory Practice Regulations. The service is regulated by inspectors from the Department of Health.

'Operating with simple, reliable and effective processes'

Brian Robinson Commercial Director

Above: Auto-analyser used to analyse water samples collected using CTD Rosette or Aquamonitors
Bottom left: Sizewell nuclear power station, Suffolk
Bottom right: Lowering Searider from *CEFAS Endeavour*

As part of a wider initiative to improve and make visible our quality assurance processes associated with all of our research, we have embarked on a project to implement a research Joint Code of Practice set by the Department for Environment, Food and Rural Affairs (Defra), the Food Standards Agency (FSA), the Biotechnology and Biological Sciences Research Council (BBSRC), and the Natural Environment Research Council (NERC).

Health and safety

Our Health and Safety Policy arrangements were reviewed during the year. The review included composition and terms of reference for the Health and Safety Committee and Local Health and Safety Panels. The Committee and Panels continued to review safety performance. Most accidents were minor and only two, necessitating time off work, were reported to the Health and Safety Executive.

Environmental policy

Newly negotiated arrangements for electricity and gas supplies at Lowestoft and Burnham will increase energy efficiency and thereby reduce costs and carbon dioxide emissions.

CEFAS is committed to improving its environmental performance plan to become accredited to Environmental Management System ISO 14001.

Efficiency

We have updated our accounting system, and introduced a new time recording system to improve staff planning. New purchasing arrangements have optimised supplies of energy, goods and services.

INVESTMENT in People

CEFAS aims to provide a working environment where staff can reach their maximum potential. Investing in staff development, valuing diversity and operating high standards of people management are important to us, so that staff are content, productive and committed to the organisation.

Our annual staff survey measures levels of staff satisfaction and provides us with feedback to steer improvements on a range of issues. Management also work with local Trades Unions representatives on staff issues. This year, a new staff development and appraisal framework was introduced to encourage good management practice and support performance management and development throughout CEFAS.

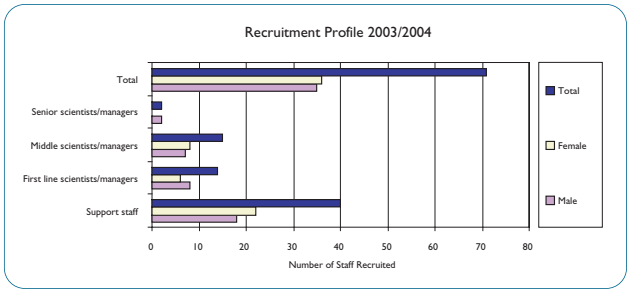
NVQs for support staff

We have supported participation in NVQs to meet specific development needs of staff, in support of government targets for Modern Apprenticeships. CEFAS was set a target of 28% of the relevant staff working towards a minimum of NVQ Level 2. We have exceeded this target and have been asked by the Cabinet Office to share our experience and good practice with other similarly-sized departments and agencies.

Notably, a total of eight staff in our Human Resources (HR) team have completed, or are working towards, a range of NVQs at Levels 2–4 in personnel, business administration, and learning and development. HR and Training manager, Kimberley Croucher, commented on the positive impact: 'The knowledge and confidence individuals have gained through CEFAS investing in our staff's development, has greatly assisted our team's capability to deliver internal services to CEFAS.'

Fair and open recruitment

CEFAS ensures recruitment is based upon fair and open competition, with selection on merit.



Questionnaires about ethnic origin were returned by 94% of new staff (including short-term appointments), comprising 92.2% white origin and 7.8% minority origin.

Valuing diversity

CEFAS is committed to building and maintaining a diverse workforce, and as an equal opportunities employer we welcome job applications from all sections of the community.

CEFAS has recently been awarded the Positive About Disabled People symbol (the 'two ticks' scheme). As a result, we are introducing the guaranteed interview programme to cover our internal and external recruitment. Vacancies are advertised on our website (**www.cefas.co.uk/vacancies**).

'Respecting and helping the Agency's people to develop'

Diane Carter Staff Development Director

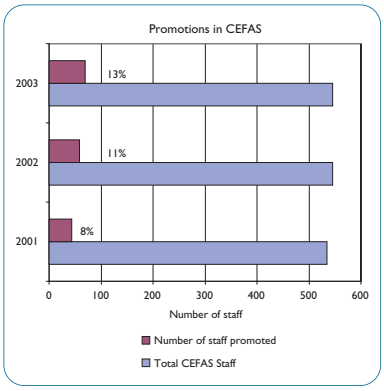
Training and development

CEFAS has continued to develop corporate training to meet our business needs, offering a total of 1 300 training days this year. Specific areas for further development have been identified as project management, stress awareness and people management, where we are working towards nationally-recognised accreditation.

The first cycle of the new staff development and appraisal process was completed successfully, with the competence framework underpinning corporate training. This was supported with courses for managers and staff, which have been well received.

Below: Day grab being deployed from *CEFAS Endeavour*

Training in equality and diversity awareness remains high on our list of priorities. In addition to our established workshops, we have introduced an interactive version of the Department for Environment, Food and Rural Affairs (Defra) training package, 'Diversity - Looking Beyond the Difference', to provide another resource for staff.



Above: CEFAS' Julian Metcalfe (right) and an old university friend took 11 days to cycle the 950 miles from John O'Groats to Land's End, raising £3 000 for the Cystic Fibrosis Trust
Far left: CEFAS' Elodie Barron travelled to the Palace of Westminster to receive her NVQ Modern Apprenticeship Award from Charles Clark MP

Supporting PhD students

Participants at CEFAS PhD Student Day

CEFAS scientists currently supervise PhD students, including 10 staff working towards their PhDs, and a further 21 external PhD students.

Building on a successful event in 2003, a CEFAS-wide PhD student day was held in March 2004, involving the students and their university and CEFAS supervisors. The day consisted of 14 platform and five poster presentations by students, covering a diverse range of research topics including benthic (bottom living) ecology, fish behaviour, and sediment transport.

Event organiser Michaela Schratzberger (CEFAS) highlighted the importance of the student day: 'The event demonstrated that our PhD students have an impressive breadth of research knowledge, and we recognise the value of our strong links to universities. The involvement with PhD students has an invariably positive impact on CEFAS.'

FINANCIAL Performance

'Recovering the full cost of our services and investing for the future'

Mark Farrar Finance and Resources Director

For the year ended 31 March 2004, CEFAS achieved the key Ministerial targets set for cost recovery and efficiency improvements, prior to costs relating to a voluntary early retirement scheme which we completed during the year.

The overall net loss of £661,000 (2002-03: surplus of £286,000) generated a total cost recovery position of 98%, falling within the tolerances allowed.

Turnover for the year of £35,365,000 was 8% above 2002-03. Income from the Department for Environment, Food and Rural Affairs (Defra) grew by £3,039,000 (12%) and was primarily applied to increased running costs associated with our new research vessel and growth in scientific sub-contractor costs associated with increased collaborative working with other research bodies. Success in securing European Union funding also contributed to income growth.

Income from Defra of £29,037,000 accounted for 82% turnover (2002-03: 80%) with a further 9% (2002-03: 12%) sourced from other UK Government departments and Agencies.

Expenditure remains under tight control and improvements to energy management systems, centralised procurement initiatives and a review of support unit processes have all contributed to the overall result. Indexation applied to buildings to reflect modified historic cost accounting principles increased by 16% during the year, although the consequent increase in capital charges was mitigated by HM Treasury reducing the interest cost of capital to 3.5% (previously 6%), effective from 1 April 2003.

Overall capital spend of £1,823,000 was primarily attributable to scientific equipment, with other notable items including improvements to laboratory facilities and residual spend relating to the new research vessel.

Capital charges remain notional, giving CEFAS the ability to accumulate cash balances. Having reviewed the cash funding requirements of the Agency, Defra has requested payment of £8,410,000 which has been reflected in the Accounts (see Note 13).

Prompt payment of suppliers is the subject of a separate UK Government target requiring CEFAS to ensure that settlement is made within 30 days of receipt of goods and services. During the year 98% (2002-03: 98%) of supplier invoices were paid within the stipulated time frames.

Left: *Nephrops* haul from *CEFAS Endeavour*

SENIOR Management

CEFAS Management Board. Left to right.

Dr Joe Horwood
Deputy Chief Executive, and Defra Chief Fisheries Science Adviser

Dr Michael Waldock
Science Director

Mr Alex Tweedie
Non-executive Advisory Director

Mrs Diane Carter
Staff Development Director

Dr Peter Greig-Smith
Chief Executive (Chair)

Dr Stephen Malcolm
Science Director

Mr Brian Robinson
Commercial Director

Mr Mark Farrar
Finance and Resources Director

Captain Ross Jolliffe
Head of Corporate Affairs
(Secretary to the Management Board)

The Agency's governance involves a Defra Laboratory Strategy Committee, chaired by Lynton Barker, which was set up in response to the recommendations of the Review of Defra's Agencies in 2002. The Committee oversees the Veterinary Laboratories Agency and the Central Science Laboratory, as well as CEFAS.

Mr Hugh Walker
Non-executive Advisory Director

FUTURE STRATEGY and Challenges

IN THE COMING YEAR, CEFAS WILL BE FACED WITH SEVERAL CHALLENGES, REQUIRING US TO PLAN FOR NEW OPPORTUNITIES AND DIRECTIONS, WHILE CONTINUING TO FULFIL THE NEEDS OF OUR CUSTOMERS FOR EXCELLENT SCIENTIFIC SUPPORT.

The science that CEFAS provides in support of government objectives is increasingly in demand. The importance of expert, impartial evidence for policies, and a move towards holistic evaluation of environmental issues, point to a continuing strong role for CEFAS. Unfortunately, corresponding increases in funding from government departments are less certain. We will therefore face a need to prioritise our main activities in collaboration with the Department for Environment, Food and Rural Affairs (Defra) and other major government customers. There is also increased pressure to reduce costs and improve value for money, and we have plans that will streamline our operations. At the same time, this provides opportunities to expand our work for other customers who require our skills. We shall invest to significantly increase our capacity to undertake work of this kind.

The following examples illustrate the changing environment in which we will be operating:

- Defra will undertake a further review of its three science agencies, including CEFAS. This will build on a review conducted in 2002, to identify what additional freedoms, organisational changes, and other improvements could be introduced to help establish long-term sustainability of the science that the three agencies provide.
- A new Code of Practice for science will be implemented by Defra, the Food Standards Agency and the UK Research Councils. This will require all bodies carrying out research on their behalf to comply with good practice. CEFAS already operates to appropriate standards, and will use this driver to further enhance our quality systems and management.
- We shall establish co-operative arrangements with other marine institutes that will allow mutual access to other research vessels, and joint planning of sea-going scientific programmes. This will optimise the size and usage of the national and European fisheries research fleets.
- The recent report by the Prime Minister's Strategy Unit on the fishing industry, and implementation of reform of the Common Fisheries Policy, have potentially significant implications for fisheries science. We will need to develop plans to organise our future work.
- The 'State of the Seas' report will be published in January 2005. CEFAS is already heavily involved in contributing to the information on which this important report will be based, and it will generate the agenda for our future work on marine environment issues.
- The recent appointment of a Communications Manager will allow us to develop a proactive strategy to ensure that the science performed, and our achievements, are made known to appropriate audiences.
- Expansion of the European Union (EU) by inclusion of 10 new Member States, many of which have fisheries, aquaculture and marine environment interests, has implications for CEFAS. We will become engaged with a wider group of scientific colleagues, including collaboration in expert networks and research studies.
- Planning will be required to prepare for the EU Framework 7 programme of research, which is likely to entail different mechanisms by which CEFAS can become involved in Europe-wide science.

Left: Shooting the net from *CEFAS Endeavour*

PERFORMANCE
Against Key Ministerial Targets

1. Throughput

To give satisfaction to customers in the way that outputs are provided, taking account of the relevance, timeliness and value for money of outputs and the achievements of Rationale, Objectives, Appraisal, Monitoring and Evaluation (ROAME) milestones.

1999-2000	Target achieved
2000-2001	Target achieved
2001-2002	Target achieved
2002-2003	Target achieved
2003-2004	Target: To give satisfaction to customers in the way that outputs are provided, as measured by the CEFAS Customer Satisfaction Survey. Outturn: Target achieved. Responses to the customer satisfaction survey were received from 35 customers on 134 contracts, representing 87% by value of CEFAS' programme. The weighted average score, based on seven aspects of service quality, was 80 out of a maximum of 100.

2. Quality

To maintain a high standard of excellence, based on indicators of scientific and technical quality.

1999-2000	Target achieved
2000-2001	Target achieved
2001-2002	Target achieved
2002-2003	Target achieved
2003-2004	Target: To make satisfactory progress with the Action Plan resulting from the 1999-2000 Science Audit. Outturn: Target achieved.

3. Efficiency

To achieve the savings forecast in the Business Plan.

1999-2000	Target achieved
2000-2001	Target achieved
2001-2002	Target achieved
2002-2003	Target achieved
2003-2004	Target: Percentage increases in support function costs to be no greater than the percentage increase in revenue. Outturn: Target achieved.

4. Financial Performance

To recover from UK Government Departments and Agencies and external customers the full economic costs of the Agency's services.

1999-2000	Target achieved
2000-2001	Target achieved
2001-2002	Target achieved
2002-2003	Target fully achieved
2003-2004	Target: Achieve full cost recovery of 100%. Fully achieved if cost recovery is 100% or greater, and partially achieved for recovery between 98% and 100%. Outturn: Partially achieved. Overall cost recovery was 98%.

5. Effective Management

(New target 2001-2002)

2001-2002	Target achieved
2002-2003	Target achieved
2003-2004	Target: To manage the Agency in an effective manner including pursuit of commercial exploitation of research outputs. Outturn: Target achieved.

FOREWORD TO THE ACCOUNTS FOR

THE YEAR ENDING 31 MARCH 2004

CEFAS was established on 1 April 1997 as an Executive Agency of MAFF (now Defra). It is fully accountable to Parliament through Ministers. CEFAS currently operates from four sites: Lowestoft, Weymouth, Burnham-on-Crouch and Whitehaven.

Strategic Aims

CEFAS' strategic aims are given on page 7 of the Annual Report.

Principal Activities

The Agency's principal activities are to deliver an efficient service of specialist scientific and technical support, consultancy and advice in the fields of fisheries management, environment protection and aquaculture. The Chief Executive's Statement on pages 4 to 6 of the Annual Report, and the sections on delivering science on pages 12 to 39, contain further information on the business activities of CEFAS.

Pension Liabilities

Pension liabilities arising from early retirement or other enhancements are accrued in total in the year in which the liability arises.

Pension benefits are provided through the Civil Service Pension arrangements. From 1 October 2002, Civil Servants may be in one of the three statutory based 'final salary' defined benefit schemes (Classic, Premium and Classic Plus). New entrants after 1 October 2002 may choose between membership of Premium or joining a good quality 'money purchase' stakeholder-based arrangement with a significant employer contribution (the Partnership Pension Account). Details are provided in Note 4 to the Accounts.

Accounts Direction

The Accounts have been prepared under a direction issued by HM Treasury in accordance with section 7(2) of the Government Resources and Accounts Act 2000.

Result for the Year

The net deficit for the year is £661,000 (2002/03: surplus of £286,000).

CEFAS History and Statutory Background

CEFAS is an Executive Agency of the Department for Environment, Food and Rural Affairs (Defra) that was created on 1 April 1997 from the former Directorate of Fisheries Research (DFR) under the Next Steps programme. The status and legal framework is laid out in the CEFAS Framework Document. Its origins date from 1902 when a research station was established to investigate declining fish stocks as part of the UK contribution to the newly created International Council for the Exploration of the Sea (ICES).

Management

The Parliamentary Under-Secretary (Commons) Minister for Nature, Conservation and Fisheries, with overall responsibility for CEFAS for the period ending 13 June 2003 was the Right Honourable Elliot Morley MP. From that date, the Right Honourable Ben Bradshaw MP assumed responsibility.

Mark Addison (Defra Director General, Operations and Service Delivery) was responsible for overseeing the Agency's operational activities.

The Chief Executive of CEFAS is Dr Peter Greig-Smith. The composition of the CEFAS Management Board is shown on page 51 of the Annual Report. The Chief Executive was appointed in 1997 by the Minister of Agriculture, Fisheries and Food (now Secretary of State for Defra) via open competition, for a five-year term, extended until 30 September 2004. Members of the Management Board are appointed directly by the Chief Executive on an open-ended basis.

The salaries of the Management Board are determined by the CEFAS Performance Related Pay Scheme. The salary of the Chief Executive is performance related and reviewed against the key Ministerial targets as agreed at the beginning of the year. Details of the remuneration are provided in Note 4 to the Accounts.

Employment of Disabled Persons

CEFAS follows the Civil Service Code of Practice on the Employment of Disabled People. The Agency's policy is to recruit, train and provide career development facilities for disabled persons on the same basis as for other staff, and to make every effort to retrain and assist any individuals disabled in the course of their employment.

Equal Opportunities and Employee Involvement

CEFAS follows an equal opportunities policy for fair and open recruitment of permanent staff. Regular exchanges of information with staff take place through formal and informal consultative arrangements at Agency and local level. Such exchanges include Agency objectives, plans, progress and matters relating to the interests of staff.

Payment of Suppliers

CEFAS' prompt payment policy is described in Note 24 to the Accounts.

Auditors

Comptroller and Auditor General,
National Audit Office,
157-197 Buckingham Palace Road,
Victoria, London SW1W 9SP

The cost of work performed by the auditors is shown in Note 5 to the Accounts.

Signed:

Peter Greig-Smith
Chief Executive

Date: 10 June 2004

Left: Fish refuge - bird predation in water

Statement of Accounting Officer's Responsibilities

1. Under the Government Resources and Accounts Act 2000 the Agency is required to prepare resource accounts for each financial year, in conformity with a Treasury direction, detailing the resources acquired, held or disposed of during the year, and the use of resources by the Agency during the year.

2. The resource accounts are prepared on an accruals basis and must give a true and fair view of the state of affairs of the Agency, the net resource outturn, resources applied to objectives, recognised gains and losses and cash flows for the financial year.

3. The Department for Environment, Food and Rural Affairs (Defra) has appointed the Permanent Head of the Agency as Accounting Officer of the Agency with overall responsibility for preparing the Agency's accounts and for transmitting them to the Comptroller and Auditor General.

4. In preparing the accounts the principal Accounting Officer is required to comply with the Resource Accounting Manual prepared by HM Treasury, and in particular to:

- observe the relevant accounting and disclosure requirements, and apply suitable accounting policies on a consistent basis;
- make judgements and estimates on a reasonable basis;
- state whether applicable accounting standards, as set out in the Resource Accounting Manual, have been followed and disclose and explain any material departures in the accounts; and
- prepare the accounts on a going concern basis.

5. The responsibilities of an Accounting Officer, including responsibility for the propriety and regularity of the public finances for which an Accounting Officer is answerable, for keeping proper accounting records and for safeguarding the Agency's assets, are set out in the Accounting Officers' Memorandum issued by HM Treasury and published in Government Accounting.

6. The maintenance and integrity of the CEFAS website is the responsibility of the Accounting Officer.

Statement on Internal Control

Scope of responsibility

As Accounting Officer, I have responsibility for maintaining a sound system of internal control which supports the achievement of CEFAS' policies, aims and objectives, set by Ministers of the Department for Environment, Food and Rural Affairs (Defra), whilst safeguarding the public funds and departmental assets for which I am personally responsible, in accordance with the responsibilities assigned to me in Government Accounting.

I ensure that the Defra Permanent Secretary, the principal Accounting Officer for the Department, is aware of the main risks managed by the Agency through regular reporting of the 10 highest risks. Additionally:

- I ensure the Agency's business plans that are submitted to, and approved by, Ministers include sections on risk; and
- I am accountable to the Department's principal Accounting Officer to ensure that the Agency, as part of Defra, has adequate financial systems and procedures in place.

The purpose of the system of internal control

The system of internal control is designed to manage risk to a reasonable level rather than to eliminate all risk of failure to achieve policies, aims and objectives; it can therefore only provide reasonable and not absolute assurance of effectiveness. The system of internal control is based on an ongoing process designed to identify and prioritise the risks to the achievement of Departmental policies, aims and objectives, to evaluate the likelihood of those risks being realised (and the impact should they be realised) and to manage them efficiently, effectively and economically. The system of internal control has been in place for the year ended 31 March 2004 and up to the date of approval of the Annual Report and Accounts, and accords with HM Treasury guidance.

Capacity to handle risk

The CEFAS Management Board oversees the Agency's level of preparedness to deal with operational risks. Individual CEFAS Management Board members lead on each of six strategic aims and own the associated risks. These aims are cascaded through the organisation in action plans, so that Science Area Heads and Heads of Support Units carry responsibility for more specific activities within their areas of operation. The Audit and Risk Committee is a sub-committee of the CEFAS Management Board, constituted to give advice on the adequacy of internal and external audit arrangements, and on the implications of the assurances provided in respect of internal control and risk management.

Staff guidance is available in the CEFAS Risk Management Plan, provided on the local intranet. Risk assessment is a requirement of the standard contract tendering procedure to manage the risk inherent in this activity. Training for project managers includes advice on risk management. CEFAS staff take advantage of the training and sharing of best practice provided by the Defra Risk Forum and by local risk and project reviews.

The risk environment

In CEFAS the main processes we have in place for identifying, evaluating and managing risk are:

- Regular risk reviews undertaken by the Management Board to identify, evaluate and update the risks facing CEFAS. The Board sets the priorities for risk in key business areas by prioritising and delegating specific activity and requiring feedback as necessary before authorising consequent actions.
- A documented risk management plan containing the register of top CEFAS risks assigned to and managed by individual Management Board members, together with summaries of risk management by Science Area and Support Unit Heads.
- Written statements from managers on the steps they are taking to manage risk in their areas of responsibility.
- Discussion at meetings in all levels of CEFAS management.
- A system of internal financial control based on a framework of regular management information, administrative procedures, management supervision and a system of delegation and accountability.

- Regular reviews of alliances and partnership ventures by a sub-committee of the Management Board.

- Documented risk assessment procedures in support of tender activity for new business.

- Reporting CEFAS' top risks to Defra for inclusion in the Department's risk register.

Our management of risk is embedded in policymaking, planning and delivery by:

- An appointed risk co-ordinator who meets all members of senior management individually to discuss and embed risk management.

- Managers who promote risk management at team meetings.

- Corporate risk management documentation that is available to staff via an intranet site.

- Embedding risk management in mandatory business planning and tendering procedures.

- The induction course for new entrants that includes a section on risk management.

The top risk priorities currently identified in the CEFAS Risk Register concern: overload on key staff, skills, pay and working conditions; Defra income risks, CEFAS running costs; infrastructure and investment restrictions; reputation management and ability to respond to new opportunities and change.

Review of effectiveness

As Accounting Officer, I also have responsibility for reviewing the effectiveness of the system of internal control. My review of the effectiveness of the system of internal control is informed by the work of the internal auditors and the executive managers within the Agency who have responsibility for the development and maintenance of the internal control framework, and by comments made by the external auditors in their management letter and other reports.

The Management Board meets bi-monthly to consider the plans and strategic direction of the Agency. The Management Board reviews the CEFAS Risk Register twice annually and corporate risks are delegated to Board members to manage.

The Audit and Risk Committee, which is a formally constituted sub-committee of the Management Board, is chaired by an external member and includes two further external independent members together with three members of the management team. The purpose of the Audit and Risk Committee is to give advice on the adequacy of internal and external audit arrangements, and on the implications of the assurances provided in respect of internal control and risk management within CEFAS.

CEFAS receives regular reports by internal audit, to Government Audit Standards, which includes the Head of Internal Audit's independent opinion on the adequacy and effectiveness of the Agency's system of internal control, together with recommendations for improvement. The internal audit service has been provided by PricewaterhouseCoopers. The work of internal audit is informed by an analysis of the risks to which CEFAS is exposed and annual audit plans are based on this analysis.

Significant internal control problems

CEFAS has a Disaster Recovery Plan (DRP) test, and which includes business critical areas. However, full implementation of the DRP has taken longer than planned. Full implementation is expected by June 2004 including an external challenge to the DRP.

I have been advised on the implications of the result of my review of effectiveness of the system of internal control by the CEFAS Management Board, the Audit and Risk Committee and a plan to ensure continuous improvement of the system is in place.

Signed:

Peter Greig-Smith
Chief Executive

Date: 10 June 2004

The Certificate and Report of the Comptroller and Auditor General to the House of Commons

I certify that I have audited the financial statements on pages 62 to 80 under the Government Resources and Accounts Act 2000. These financial statements have been prepared under the historical cost convention as modified by the revaluation of certain fixed assets and the accounting policies set out on pages 65 and 66.

Respective responsibilities of the Agency, the Chief Executive and Auditor

As described on page 58, the Agency and Chief Executive are responsible for the preparation of the financial statements in accordance with the Government Resources and Accounts Act 2000 and HM Treasury directions made thereunder and for ensuring the regularity of financial transactions. The Agency and Chief Executive are also responsible for the preparation of the other contents of the Annual Report. My responsibilities, as independent auditor, are established by statute and I have regard to the standards and guidance issued by the Auditing Practices Board and the ethical guidance applicable to the auditing profession.

I report my opinion as to whether the financial statements give a true and fair view and are properly prepared in accordance with the Government Resources and Accounts Act 2000 and HM Treasury directions made thereunder, and whether in all material respects the expenditure and income have been applied to the purposes intended by Parliament and the financial transactions conform to the authorities which govern them. I also report if, in my opinion, the Foreword is not consistent with the financial statements, if the Agency has not kept proper accounting records, or if I have not received all the information and explanations I require for my audit. I read the other information contained in the Annual Report and consider whether it is consistent with the audited financial statements. I consider the implications for my certificate if I become aware of any apparent mis-statements or material inconsistencies with the financial statements.

I review whether the statement on pages 59 and 60 reflects the Agency's compliance with HM Treasury's guidance entitled Corporate Governance: Statement on Internal Control. I report if it does not meet the requirements specified by HM Treasury, or if the statement is misleading or inconsistent with other information I am aware of from my audit of the financial statements. I am not required to consider, nor have I considered, whether the Accounting Officer's Statement on Internal Control covers all risks and controls. I am also not required to form an opinion on the effectiveness of the Agency's corporate governance procedures or its risk and control procedures.

Basis of audit opinion

I conducted my audit in accordance with United Kingdom Auditing Standards issued by the Auditing Practices Board. An audit includes examination, on a test basis, of evidence relevant to the amounts, disclosures and regularity of financial transactions included in the financial statements. It also includes an assessment of the significant estimates and judgements made by the Agency and Chief Executive in the preparation of the financial statements, and of whether the accounting policies are appropriate to the Agency's circumstances, consistently applied and adequately disclosed.

I planned and performed my audit so as to obtain all the information and explanations which I considered necessary in order to provide me with sufficient evidence to give reasonable assurance that the financial statements are free from material mis-statement, whether caused by error, or by fraud or other irregularity, and that, in all material respects, the expenditure and income have been applied to the purposes intended by Parliament and the financial transactions conform to the authorities which govern them. In forming my opinion I have also evaluated the overall adequacy of the presentation of information in the financial statements.

Opinion

In my opinion:

- the financial statements give a true and fair view of the state of affairs of CEFAS at 31 March 2004, and of the deficit, recognised gains and losses and cash flows for the year then ended, and have been properly prepared in accordance with the Government Resources and Accounts Act 2000 and directions made thereunder by HM Treasury; and
- in all material respects, the expenditure and income have been applied to the purposes intended by Parliament and the financial transactions conform to the authorities which govern them.

I have no observations to make on these financial statements.

John Bourn

Comptroller and Auditor General,
National Audit Office,
157-197 Buckingham Palace Road,
Victoria, London SW1W 9SP

Date: 15 June 2004

Income and Expenditure Account

For the year ended 31 March 2004

	Notes	2003/04 £'000	2002/03 £'000
Turnover	**2 & 3**	**35,365**	**32,700**
Cost of Sales	**4 & 5**	(33,989)	(29,420)
Operating Surplus		**1,376**	**3,280**
Loss on Disposal of Fixed Assets		(7)	(22)
Notional Interest Payable	**25**	(2,030)	(2,972)
Net (Loss)/Surplus		**(661)**	**286**
Percentage Total Cost Recovery		**98**	**101**

Statement of Recognised Gains and Losses

For the year ended 31 March 2004

	2003/04 £'000	2002/03 £'000
(Loss)/Surplus for the Year	(661)	286
Net Gain on Revaluation of Fixed Assets	4,651	704
Total Gains Recognised in Year	**3,990**	**990**

Balance Sheet

As at 31 March 2004

	Notes	£'000	2003/04 £'000	2002/03 £'000
Fixed Assets				
Tangible Fixed Assets	7		58,470	55,639
Investments	8		150	150
Total Fixed Assets			**58,620**	**55,789**
Current Assets				
Stock		0		55
Work in Progress	9	801		901
Debtors	10	3,772		5,764
Cash at Bank and in Hand	18	9,209		5,916
Total Current Assets		**13,782**		**12,636**
Creditors:				
Amounts falling due within one year	11	(10,123)		(4,254)
Net Current Assets			**3,659**	**8,382**
Total Assets Less Current Liabilities			**62,279**	**64,171**
Creditors:				
Amounts falling due after one year	11		(241)	(381)
Provisions for Liabilities & Charges	12		**(977)**	**(905)**
TOTAL ASSETS LESS LIABILITIES			**61,061**	**62,885**
RESERVES				
General Fund	13		50,650	56,838
Revaluation Reserve	13		10,411	6,047
Total Reserves as at 31 March 2004			**61,061**	**62,885**

Signed:

Peter Greig-Smith

Chief Executive and Agency Accounting Officer

Date: 10 June 2004

Cash Flow Statement

For the year ended 31 March 2004

	Notes	2003/04 £'000	2002/03 £'000
Net cash inflow from operating activities	14	5,826	6,836
Capital expenditure and financial investment	15	(2,533)	(10,255)
Financing	16	0	5,400
Net cash inflow		**3,293**	**1,981**

Notes to the Accounts

Note 1. Statement of Accounting Policies

1.1 Statement of Accounting Policies

These financial statements have been prepared in accordance with the Resource Accounting Manual issued by HM Treasury.

The particular accounting policies adopted by CEFAS are described below. They have been applied consistently in dealing with items that are considered material in relation to the accounts.

1.2 Accounting Convention

These accounts have been prepared under the historical cost convention, modified to include the revaluation of fixed assets at their value to CEFAS by reference to their current costs.

1.3 Tangible Fixed Assets

Asset values are modified annually by the use of indices for current cost accounting as supplied by the Office for National Statistics.

1.3.1 Land and Buildings

Land and buildings are professionally valued at intervals of no greater than 5 years. The lives given to the buildings fall in the range of 4-41 years.

The title to the freehold land and buildings occupied by CEFAS is held by Defra.

1.3.2 Other Fixed Assets

The capitalisation threshold for fixed assets is £3,000. Asset pools exist for items of IT equipment with individual values ranging from £500 to £3,000. As from September 2003, computers costing less than £3,000 have not been capitalised.

1.3.3 Depreciation of Tangible Fixed Assets

Depreciation is provided on all fixed assets, with the exception of land, at rates calculated to write off the valuation of each asset on a straight-line basis over its expected useful economic life.

Asset lives are as follows:

Buildings	**4 - 41 years**
Information Technology	**3 - 6 years**
Scientific and General Equipment	**5 - 10 years**
Vessels	**1 - 30 years**
Vehicles	**6 – 8 years**

1.3.4 Donated Assets

CEFAS holds no donated assets.

1.4 Investments

Investments are reported at market value or at cost where market value cannot be readily ascertained. In accordance with the Resource Accounting Manual, the fixed asset investment has not been consolidated as it is outside the Departmental boundary.

1.5 Stocks and Work in Progress

Stocks and work in progress are valued at the lower of cost or net realisable value.

1.6 Research and Development

Expenditure on research and development (Seedcorn Projects) is treated as an operating cost in the year in which it is incurred and taken to the Income and Expenditure Account. Fixed assets, which are acquired for use in research and development, are depreciated over their useful economic life.

1.7 Government Grants

Grants are recognised in the same period as their related expenditure. Grants towards fixed asset purchases are treated as a deferred creditor and recognised as income over the useful life of the asset.

1.8 Operating Income

Operating income is shown net of Value Added Tax (VAT) and comprises fees and charges for services provided to core Defra, external customers, other government agencies and public sector repayment work receipts from the European Union.

Turnover is recognised over the term of the individual contract.

1.9 Capital Charge

A notional charge, reflecting the cost of capital used by CEFAS, is included in the Income and Expenditure Account. The charge is calculated at the Government standard rate on the average value of all assets excluding cash held at the Office of the Paymaster General, less liabilities and excluding donated assets.

1.10 Taxation

No taxation is payable on the surplus generated by CEFAS.

CEFAS is included under the VAT registration of Defra. Irrecoverable VAT, excluding that on capital purchases, is charged to the Income and Expenditure Account in the year in which it is incurred.

1.11 Foreign Exchange

Monetary assets and liabilities denominated in foreign currencies are translated using the rate of exchange at the balance sheet date. Transactions in foreign currencies are translated using the rate of exchange at the date of each transaction, all differences are charged/(credited) to the Income and Expenditure Account.

1.12 Notional Charges

In addition to the capital charge, the following notional costs borne on the Income and Expenditure Account are charged to the General Fund:

Defra Maintenance Charges
Defra Central Overhead Charges
Redundancy and Early Retirement
Interest

1.13 Insurance

CEFAS, in common with other Government bodies, does not insure the majority of its assets. Losses and compensations are charged to the Income and Expenditure Account.

1.14 Pensions

Pension benefits are provided through the Civil Service Pension arrangements. From 1 October 2002, Civil Servants may be in one of three statutory based 'final salary' defined benefit schemes (Classic, Premium and Classic Plus). The schemes are unfunded with the cost of benefits met by monies voted by Parliament each year. Pensions payable under Classic, Premium, and Classic Plus are increased annually in line with changes in the Retail Prices Index. The provisions of the Principal Civil Service Pension Scheme (PCSPS) cover present and past employees, which is non-contributory and unfunded. Although the scheme is a defined benefit scheme, liability for payment of future benefits is a liability of the PCSPS. CEFAS meets the cost of pension cover provided for the staff they employ by payment of charges calculated on an accruing basis. There is a separate scheme statement for the PCSPS as a whole.

New entrants after 1 October 2002 may choose between membership of Premium or joining a good quality 'money purchase' stakeholder arrangement with a significant employer contribution (the Partnership Pension Account).

1.15 Provisions

1.15.1 Early Departure Costs

CEFAS is required to meet the additional cost of benefits beyond the normal PCSPS benefits in respect of employees who retire early. CEFAS provides in full for this cost when the early retirement programme has been announced and is binding on CEFAS. CEFAS may, in certain circumstances, settle some or all of its liability in advance by making a payment to the Paymaster General's Account at the Bank of England for the credit of the Civil Superannuation Vote. The amount provided is shown net of any such payments and is discounted using the Government standard rate of 3.5%.

1.15.2 Pay Award and Legal Claims

CEFAS will provide for an annual corporate staff bonus based on a successful financial performance and for any outstanding or expected litigation. Details are provided in Note 12 to the Accounts.

1.15.3 Bad Debt Provision

A general provision is held against the debtor balance. During the year, the method of calculating the provision was brought into line with Defra.

1.16 Leases

CEFAS holds no leases where substantially all the risks and rewards of the leased asset are borne by CEFAS. Other leases are regarded as operating leases and the rentals are charged to the Income and Expenditure Account on a straight-line basis over the terms of the lease.

1.17 Going Concern

These accounts have been prepared on the basis that CEFAS is a going concern.

Note 2. UK Government Income

	2003/04 £'000	2002/03 £'000
Defra	29,037	25,998
Defra Agencies	28	8
Other Government Depts	3,261	3,791
Total UK Government Income	**32,326**	**29,797**

Note 3. Non-UK Government Income

	2003/04 £'000	2002/03 £'000
UK Public Sector	183	157
UK Private Sector	730	653
European Union	1,351	1,048
Other	775	1,045
Total Non-UK Government Income	**3,039**	**2,903**

Note 4. Staff Related Expenditure

(a) Staff Costs

	2003/04 £'000	2002/03 £'000
Wages and Salaries	12,833	12,076
Social Security Costs	1,009	789
Superannuation	1,666	1,538
Sub Total	**15,508**	**14,403**
Agency and Advisory Staff	112	0
Total Staff Expenditure	**15,620**	**14,403**

Agency and advisory staff expenditure of £66,400 was included within Other Expenditure in Note 5 in 2002/03.

Note 4. Staff Related Expenditure (continued)

(b) The average number of persons employed by CEFAS during the year was:

	2003/04 No.	2002/03 No.
Scientific Research & Development	400	395
Management/Administration	125	128
Marketing	8	6
Total	**533**	**529**

(c) Board Remuneration

The salary and pension entitlements of the most senior managers of the Agency were as follows:

	Column 1 Salary banding including performance pay 2003/04 (prior year comparatives)	Column 2 Real increase in pension and related lump sum at age 60	Column 3 Total accrued pension at age 60 at 31/3/04 and related lump sum	Column 4 CETV at 31/3/03 (nearest £'000)	Column 5 CETV at 31/3/04 (nearest £'000)	Column 6 Real increase in CETV after adjustment for inflation and changes in market investment factors (nearest £'000)
	£'000	£'000	£'000	£'000	£'000	£'000
Management Board Member						
Chief Executive						
Dr P Greig-Smith	80-85 (75-80)	0-2.5 plus 0-2.5 lump sum	20-25 plus 65-70 lump sum	302	332	11
Deputy to the Chief Executive						
Dr J Horwood	70-75 (60-65)	0-2.5 plus 5-7.5 lump sum	30-35 plus 90-95 lump sum	419	477	35

(c) Board Remuneration (continued)

	£'000	£'000	£'000	£'000	£'000	£'000
Management Board Member						
Science Director						
Dr M Waldock	50-55 (45-50)	0-2.5 plus 0-2.5 lump sum	15-20 plus 45-50 lump sum	229	253	10
Science Director						
Dr S Malcolm	45-50 (40-45)	0-2.5 plus 0-2.5 lump sum	10-15 plus 40-45 lump sum	198	219	9
Finance and Resources Director						
M Farrar	55-60 (50-55)	0-2.5 plus 0-2.5 lump sum	0-5 plus 5-10 lump sum	21	31	9
Commercial Director						
B Robinson	55-60 (50-55)	0-2.5 plus 0-2.5 lump sum	15-20 plus 55-60 lump sum	282	310	11
Director of Staff Development						
D Carter	30-35 (30-35)	0-2.5 plus 0-2.5 lump sum	5-10 plus 20-25 lump sum	90	106	5

Salaries include gross salaries, performance pay or bonuses, overtime, reserved rights to London weighting or London allowances, recruitment and retention allowances, private office allowances and any other allowance to the extent that it is subject to UK taxation.

No board members were in receipt of any benefits in kind (2002/03: £NIL).

Non-Executive Directors	Fees (£'000)
H Walker	0-5
A Tweedie	0-5

Note 4. Staff Related Expenditure (continued)

(d) Pension benefits

Pension benefits are provided through the Civil Service Pension (CSP) arrangements. From 1 October 2002, Civil Servants may be in one of three statutory based 'final salary' defined benefit schemes (Classic, Premium and Classic Plus). The schemes are unfunded with the cost of benefits met by monies voted by Parliament each year. Pensions payable under Classic, Premium, and Classic Plus are increased annually in line with changes in the Retail Prices Index. New entrants after 1 October 2002 may choose between membership of Premium or joining a good quality 'money purchase' stakeholder arrangement with a significant employer contribution (the Partnership Pension Account).

Employee contributions are set at the rate of 1.5% of pensionable earnings for Classic and 3.5% for Premium and Classic Plus. Benefits in Classic accrue at the rate of 1/80th of pensionable salary for each year of service. In addition, a lump sum equivalent to three years' pension is payable on retirement. For Premium, benefits accrue at the rate of 1/60th of final pensionable earnings for each year of service. Unlike Classic, there is no automatic lump sum (but members may give up (commute) some of their pension to provide a lump sum). Classic Plus is essentially a variation of Premium, but with benefits in respect of service before 1 October 2002 calculated broadly as per Classic.

The Partnership Pension Account is a stakeholder pension arrangement. The employer makes a basic contribution of between 3% and 12.5% (depending on the age of the member) into a stakeholder pension product chosen by the employee. The employee does not have to contribute but where they do make contributions, the employer will match these up to a limit of 3% of pensionable salary (in addition to the employer's basic contribution). Employers also contribute a further 0.8% of pensionable salary to cover the cost of centrally-provided risk benefit cover (death in service and ill health retirement).

Further details about the CSP arrangements can be found at the website www.civilservice-pensions.gov.uk

Columns 4 & 5 of the above table show the member's cash equivalent transfer value (CETV) accrued at the beginning and the end of the reporting period. Column 6 reflects the increase in CETV effectively funded by the employer. It takes account of the increase in accrued pension due to inflation, contributions paid by the employee (including the value of any benefits transferred from another pension scheme or arrangement) and uses common market valuation factors for the start and end of the period.

A CETV is the actuarially assessed capitalised value of the pension scheme benefits accrued by a member at a particular point in time. The benefits are the member's accrued benefits and any contingent spouse's pension payable from the scheme. A CETV is a payment made by a pension scheme or arrangement to secure pension benefits in another pension scheme or arrangement when the member leaves a scheme and chooses to transfer the benefits accrued in their former scheme. The pension figures shown relate to the benefits that the individual has accrued as a consequence of their total membership of the pension scheme, not just their service in a senior capacity to which disclosure applies. The CETV figures, and from 2003/04 the other pension details, include the value of any pension benefit in another scheme or arrangement which the individual has transferred to the CSP arrangements and for which the CS Vote has received a transfer payment commensurate to the additional pension liabilities being assumed. They also include any additional pension benefit accrued to the member as a result of their purchasing additional years of pension service in the scheme at the own cost. CETVs are calculated within the guidelines and framework prescribed by the Institute and Faculty of Actuaries.

(e) Early departure costs

Early departure costs in 2003/04 amounted to £677,659 (2002/03: £159,623), exclusive of employer's contributions to national insurance and superannuation, for lieu of notice and compensation for loss of pension.

Note 5. Other Expenditure

	2003/04 £'000	2002/03 £'000
Laboratory Consumables	4,539	3,529
Depreciation	3,565	2,428
Vessels & Charters	2,891	2,470
Accommodation	2,799	2,677
Rent & Rates	248	277
Vehicles	185	181
Audit	27	27
External Auditors Other Payments	1	1
Hospitality	31	14
Travel & Subsistence	911	924
Training	275	317
IT Costs	941	617
Lease Charges - IT	242	171
Lease Charges - Other	156	157
Insurance/Losses	29	54
Defra Management Overheads	246	219
Telecommunications	181	149
Bad Debt Provision	(42)	0
Exchange Losses/(Gains)	16	(11)
Early Departure Costs	678	160
Other Expenditure	450	656
Total Expenditure	**18,369**	**15,017**

Agency and advisory staff expenditure of £111,510 has been included in Note 4 (a) Staff Costs in 2003/04.

Note 6. Segmental Report

	2003/04			2002/03		
	Governmental Bodies £'000	Other £'000	Total £'000	Governmental Bodies £'000	Other £'000	Total £'000
Turnover	32,326	3,039	35,365	29,797	2,903	32,700
Cost of Sales	(30,987)	(3,002)	(33,989)	(26,926)	(2,494)	(29,420)
Surplus for the Year	**1,339**	**37**	**1,376**	**2,871**	**409**	**3,280**
Return on capital employed	**2.7%**	**0.8%**	**2.5%**	**5.9%**	**8.6%**	**6.1%**

CEFAS is required to make a 3.5% (2002/03: 6%) return on all Government income as part of its financial performance targets. These figures are produced in accordance with HM Treasury Fees and Charges Guidance.

Note 7. Tangible Fixed Assets

Cost or Valuation	Land £'000	Buildings £'000	Vessels £'000	Information Technology £'000	Scientific Equipment £'000	General Equipment £'000	Vehicles £'000	Assets In Course of Construction £'000	Total £'000
As at 1 April 2003	1,120	28,193	25,826	3,222	7,811	307	288	389	67,156
Indexation	190	4,568	550	(23)	(76)	(2)	9	0	5,216
Additions	0	32	266	239	742	9	34	501	1,823
Transfers	(1)	6	138	399	53	0	0	(595)	0
Disposals	0	(45)	(51)	(131)	(198)	0	(5)	0	(430)
As at 31 March 2004	**1,309**	**32,754**	**26,729**	**3,706**	**8,332**	**314**	**326**	**295**	**73,765**
Depreciation									
As at 1 April 2003	0	(3,715)	(201)	(2,377)	(4,777)	(221)	(226)	0	(11,517)
Indexation	0	(602)	(4)	6	37	1	(3)	0	(565)
Disposals	0	45	32	121	149	0	5	0	352
Provided in Year	0	(1,580)	(998)	(278)	(655)	(31)	(23)	0	(3,565)
As at 31 March 2004	**0**	**(5,852)**	**(1,171)**	**(2,528)**	**(5,246)**	**(251)**	**(247)**	**0**	**(15,295)**
Net Book Value									
At 31 March 2004	**1,309**	**26,902**	**25,558**	**1,178**	**3,086**	**63**	**79**	**295**	**58,470**
At 31 March 2003	**1,120**	**24,478**	**25,625**	**845**	**3,034**	**86**	**62**	**389**	**55,639**

The research vessel Corystes was subject to an impairment review and professionally valued on 30 November 2001 by E A Gibson Shipbrokers Ltd, PO Box 278, Audrey House, 16-20 Ely Place, London, EC1P 1HP. The research vessel CEFAS Endeavour was brought into service on 31 March 2003 at cost.

Land and buildings were revalued on 30 June 2000 by the Valuation Office Agency, 50 Frederick Street, Edinburgh. The assets were revalued on an existing use basis.

Included within the cost of Information Technology transfers are capitalised staff costs of £285,000.

Note 8. Fixed Asset Investments

	£'000
Cost	
As at 1 April 2003	150
Additions	0
Disposals	0
As at 31 March 2004	150
Provisions	
As at 1 April 2003	0
Movement	0
As at 31 March 2004	0
Net Book Value	
At 31 March 2004	**150**
At 31 March 2003	**150**

In 2001, CEFAS purchased the entire share capital of CEFAS Technology Limited for £150,000.

The Management Board has considered the value of the investment and has recorded the investment at cost. This will be reviewed on a regular basis and provision made for any impairment in value.

Note 9. Work In Progress

	2003/04 £'000	2002/03 £'000
United Kingdom	510	698
European Union	229	168
Other	62	35
Total Work In Progress	**801**	**901**

Note 10. Debtors

	2003/04 £'000	2002/03 £'000
Amounts falling due within one year:		
Trade Debtors	1,988	1,588
Provision for Bad Debts	(80)	(122)
VAT	298	304
Defra	752	3,638
Prepayments and Accrued Income	803	329
Sundry Debtors	11	27
Total Debtors	**3,772**	**5,764**

Of the amounts falling due from Defra, £3,010,000 has been written off to the general fund in year (see Note 13).

Note 11. Creditors

	2003/04 £'000	2002/03 £'000
Amounts falling due within one year:		
Trade Creditors	1,042	1,037
Other Taxation and Social Security	494	445
Accruals	736	1,200
Defra	5,400	92
Other Creditors	150	254
Deferred Income	2,301	1,226
Total under one year creditors	**10,123**	**4,254**
Amounts falling due after more than one year:		
Grants not yet credited to income	7	19
Deferred Income	234	131
Accruals	0	231
Total Creditors	**10,364**	**4,635**

The Defra creditor balance of £5,400,000 relates to funding received in the prior year, which has now become repayable (see Note 13).

Note 12. Provisions for Liabilities and Charges

	Early Retirement and Pension Commitments £'000	Pay Award £'000	Legal Claims £'000	Total £'000
Balance as at 1 April 2003	576	308	21	905
Provided in the year	675	0	0	675
Provisions not required written back	0	(107)	0	(107)
Utilised in the year	(293)	(185)	(21)	(499)
Revalued in year	3	0	0	3
Balance as at 31 March 2004	**961**	**16**	**0**	**977**

The early retirement and pension commitment provision is to provide for the cost of future pension payments to staff who have retired before their 60th birthday. The timing and amounts payable are reviewed annually by the Pay and Personnel Agency (previously Defra Pensions Section, Exeter).

The pay award provision as at 1 April 2003 was to provide for a corporate staff bonus based on the successful performance in 2002/03. No such provision has been made for 2003/04. The pay award provision as at 31 March 2004 relates to Senior Civil Servants' bonus.

No reimbursement is expected in relation to any of the amounts provided for.

Note 13. Movement on Reserves

	General Fund £'000	Revaluation Reserve £'000	Total £'000
As at 1 April 2003	56,838	6,047	62,885
Notional Charges	273	0	273
Notional Interest	2,030	0	2,030
Revaluation	0	4,651	4,651
Realised Element of Revaluation Reserve	287	(287)	0
Income & Expenditure Account	(661)	0	(661)
Provision for Early Departure Costs	293	0	293
Excess Cash Funding Repayable to Defra	(8,410)	0	(8,410)
Balance as at 31 March 2004	**50,650**	**10,411**	**61,061**

The amounts repayable to Defra in respect of excess cash funding comprise a debtor balance of £3,010,000 (see Note 10), which relates to monies owed by Defra in prior years but written off to the general fund in year and a further £5,400,000 (see Note 11) which represents funding received in the prior year, which has now become repayable

Note 14. Reconciliation of Net Operating Cost to Net Cash Flow from Operating Activities

	2003/04		2002/03	
	£'000	£'000	£'000	£'000
Net (deficit)/surplus		(661)		286
Adjustments for non-cash transactions				
Depreciation charges	3,565		2,428	
Notional charges	2,303		3,236	
Loss on disposal	7		22	
Provisions	864		169	
Total		**6,739**		**5,855**
Adjustments for movements in working capital other than cash				
Decrease/(increase) in stock and work in progress	155		(67)	
(Increase)/decrease in debtors	(1,018)		1,271	
Increase/(decrease) in creditors	1,110		(578)	
		247		626
Use of provisions		**(499)**		**69**
Net cash inflow from operating activities		**5,826**		**6,836**

Note 15. Capital Expenditure and Financial Investment

	2003/04	2002/03
	£'000	£'000
Payments to acquire tangible fixed assets	(2,604)	(10,257)
Receipts from sale of tangible fixed assets	71	2
	(2,533)	**(10,255)**

Note 16. Financing

	2003/04	2002/03
	£'000	£'000
Capital introduced by Defra	0	5,400
	0	**5,400**

Notes to the Accounts

Note 17. Analysis of Changes in Cash During the Year

	2003/04 £'000	2002/03 £'000
Balance as at 1 April 2003	5,916	3,935
Net Cash Flow	3,293	1,981
Balance as at 31 March 2004	**9,209**	**5,916**

Note 18. Cash at Bank and in Hand

	2003/04 £'000	2002/03 £'000
Commercial Banks	98	178
Office of Paymaster General	9,108	5,716
Cash in Hand	3	22
Total Cash at bank and in hand	**9,209**	**5,916**

The balance as at 31 March comprises amounts issued from the Consolidated Fund for supply but not spent at year end.

Note 19. Capital Commitments

CEFAS has capital commitments totalling £63,600 (2002/03: £10,841).

Note 20. Post Balance Sheet Events

There are no post balance sheet events to report.

Note 21. Contingent Liabilities

There are no material contingent liabilities.

Note 22. Operating Leases

Rentals under operating leases are charged to the Income and Expenditure Account on a straight-line basis over the terms of the lease. At 31 March 2004, the Agency was committed to making the following payments during the next financial year in respect of operating leases:

	2003/04 £'000 Vehicles	2003/04 £'000 Land	2003/04 £'000 IT Equipment	2002/03 £'000 Vehicles	2002/03 £'000 Land	2002/03 £'000 IT Equipment
Operating Leases which expire:						
Within 1 Year	0	4	4	0	4	35
Between 2 to 5 Years	65	73	125	36	73	139
After 5 Years	0	15	0	0	15	0
Total	**65**	**92**	**129**	**36**	**92**	**174**

Note 23. Related Party Transactions

CEFAS has dealings with the Department for Environment, Food and Rural Affairs and its sponsored bodies, notably the Veterinary Medicine Directorate and the Central Science Laboratory.

CEFAS Technology Limited is a fixed asset investment (see Note 8). The shares are held by Dr P W Greig-Smith as nominee of and trustee for CEFAS.

No Board Member, members of key management staff or other related parties have undertaken any material transactions with CEFAS, CEFAS Technology Limited or other related parties during the year.

Note 24. Prompt Payment Policy

CEFAS has a duty to meet the CBI 30 day payment policy. During the year, the percentage of invoices that met the policy is as below:

	2003/04 %	2002/03 %
Quarter 1	98	98
Quarter 2	98	97
Quarter 3	98	98
Quarter 4	99	97
Average percentage of invoices paid within 30 days	**98**	**98**

No interest was paid in respect of late payment of commercial debt (2002/03: £NIL).

Note 25. Notional Interest

	2003/04 £'000	2002/03 £'000
Fixed Assets	1,979	2,972
Working Capital	51	0
Total Notional Interest	**2,030**	**2,972**

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