Coast Map News

Managing marine and coastal data and information

Issue 6/Spring 2004

iSEA - A new internet mapping server from CEFAS

CEFAS has released a new internet mapping server to provide public access to some of our key fisheries and environmental spatial data holdings. The system, knows as iSEA (interactive Spatial Explorer and Administrator), is available from the CEFAS website at:

www.cefas.co.uk/isea

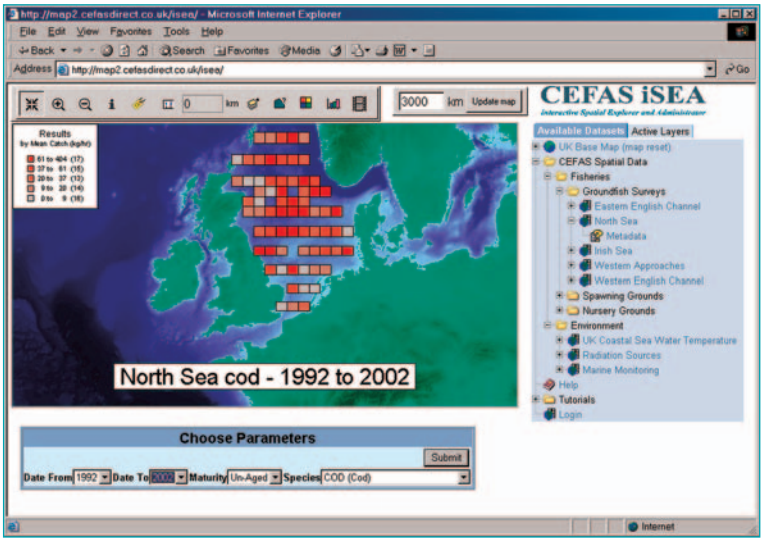
The iSEA system can also be accessed via a link under the 'Access CEFAS data' page. This page also contains links to our other spatial data servers, such as WaveNet.

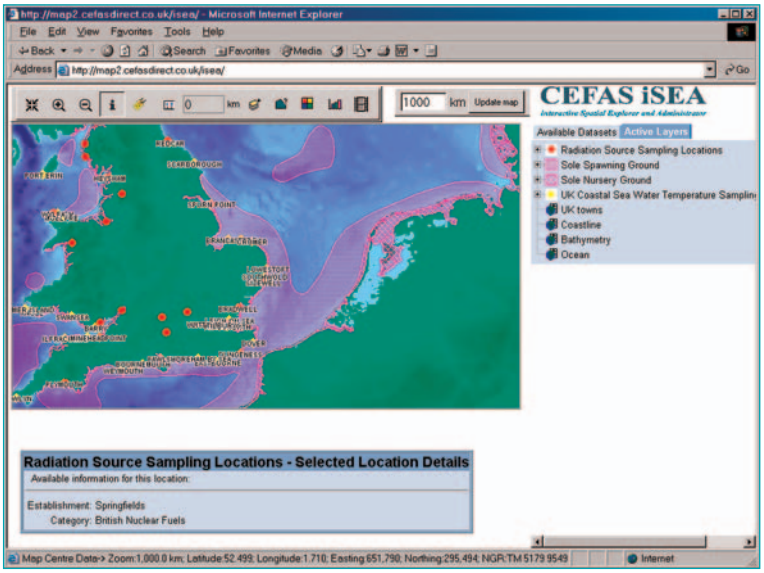
iSEA is more that just a system for plotting data layers. Instead, iSEA can be used to explore, interrogate, and analyse datasets through a series of intuitive dialogue interfaces. Datasets are extracted dynamically from a central database through a set of queries, some of which can be defined by the user. The dataset then becomes a layer in the map frame. The toolset provides a number of advanced level functions common to desktop Geographic Information Systems (GIS) but which are rarely featured in their web equivalents.

Current functionality includes:

- a **Layer Style** tool for modifying the style or symbology of extracted data

(continued overleaf)





CEFAS
The Centre for Environment, Fisheries & Aquaculture Science

Coast Map News is produced by the Centre for Environment, Fisheries and Aquaculture Science (CEFAS) with funding provided by Defra. If you have comments regarding any of the articles featured in this issue, require further copies of Coast Map News, or wish to submit an article of your own, please contact:

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Department for Environment Food and Rural Affairs

Copies of this issue (plus back issues) can be downloaded from the CEFAS website at www.cefas.co.uk/coastmap

(continued from page 1)

- a **Layer Style: Themes** tool which allows users to create themes from data (themes are symbols which vary according to the data values)
- a **Layer Position** tool, to alter the position of a layer in the map frame
- a **Chart** tool which creates dynamic *x, y* charts to aid the visualisation of time-series data
- an **Animation** tool to allow users to create simple animations from any number of data frames. This function is particularly helpful for visualising space-time trends.

All of our datasets come with metadata, and in time we plan to extend the list of metadata items to comply with internationally recognised standards. Some of our datasets are also available for download. Access permissions and download instructions are specified on the metadata sheets. A set of tutorials and a help page are included to make it easier for new users to quickly get up to speed with the system basics.

New tools and data will be added over time, so please keep visiting the site to keep up-to-date with all the latest developments.

Acknowledgements
Colin Kirk and Keith Winpenny from CEFAS Information Services take full credit for combining a high level of skill and innovation with sheer hard work in developing iSEA.

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Contents

Welcome to the Sixth issue of Coast Map News, which once again has evolved into something rather larger than expected!

Since the last issue in January, there have been a number of major marine and coastal related-events including the annual Coastal Futures conference in London and a Geographic Information (GI) conference organised by the Association for Geographic Information (AGI) at Oceanology International. As usual, Coastal Futures attracted a capacity audience with many familiar faces from the marine and coastal sectors, and presentations covered a range of topics including policy, renewable energy, Integrated Coastal Zone Management (ICZM), spatial planning and fisheries. Keynote speakers were John Goodlad, and Jon Lien from Canada.

The AGI's 'GIS in the Marine and Coastal Environment' conference, held alongside Oceanology International at the ExCel centre in Docklands, attracted over 200 delegates. Following an introduction by David Green, Chair of the AGI's Marine Special Interest Group, a total of 10 presentations were given describing variously how GIS is being used for a wide range of applications, from designing managed realignment schemes to mapping marine fish resources for spatial planning.

In addition to these, Defra held a GI Conference in Nottingham recently and used the occasion to launch the SPIRE (Spatial Information REpository) initiative, a major new programme to promote the use of geographic information within Defra and it's agencies. I hope to be able to report on this more fully in the next issue.

The final draft of the Cowling Report (Marine Data and Information – Where to now?) was presented at the Inter Agency for Marine Science and Technology (IACMST) plenary on May 6th. This strategy document, commissioned by Defra through the IACMST, is expected to strongly influence the way marine data is dealt with in the future, and includes recommendations from the Marine Data Expert Group to form a Marine Data Partnership to facilitate data exchange between organisations. I hope to provide an overview of this

development and an update on how it will be taken forward in the next issue.

CoastNET was relaunched in February and marked by a special evening event at the House of Commons. The events main aim was to raise the profile of the coast and is fully reported on page 19.

I am pleased to have been able to include a number of articles discussing generic data issues, including interoperability. Whilst there is a strong consensus of opinion in the UK that we desperately need to improve access to, and availability of marine and coastal data, there are clearly still many differing views on how this might ultimately be achieved (also see articles in Issue 4).

Finally, I have been to a number of meetings recently where it has been obvious that many people do not always understand some of the terminology used regularly in data and information management, or that the same words can often be interpreted in very different ways. One example is the word 'ontology', which on two separate occasions caused a variety of responses amongst attendees, ranging from vacant expressions to mild amusement. To help clarify the way we collectively think about data issues and to reduce misinterpretation, Kieran Millard and John Maslen have kindly agreed to write a series of articles explaining, in plain English, some of the terminology used frequently within data management and its related technology. In their first article they demystify 'Interoperability' and 'XML' which I hope will be helpful to many. We would be very glad of feedback and indeed, if there are issues you would like to see raised please get in touch (details right).

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ICES Study Group on Management of Integrated Data (SGMID)

The first full meeting of the ICES Study Group on Management of Integrated Data (SGMID) was held at the German Federal Research Agency for Fisheries, in Hamburg at the beginning of April. Fifteen delegates attended the 3-day meeting, which was chaired jointly by Peter Wiebe (Woods Hole Oceanographic Inst., USA) and Christopher Zimmerman (BFA Fischerei, Inst. Seefischerei, Germany). Countries represented were the USA, Canada, the UK, Germany, Denmark, Norway and Spain. The Group was set up by the Advisory Committee on the Environment (ACE) in 2002, but this is the first opportunity they have had to meet. The Study Group is intended to provide guidelines to ICES on how to integrate marine data already available or to be collected from other databases, and therefore the choice of delegates was aimed at reflecting the wide diversity of data types, ranging from oceanography to marine mammals.

An integrated data inventory available for the ICES community is a prerequisite for the development of, for example, fleet-based advice for the southern North Sea fisheries and in the longer term, for broader ecosystem-based advice.

The meeting started with a review of the current Terms of Reference. The Group met briefly in Tallinn in 2003 and the resulting report sets out the Groups objectives. This was modified and expanded during the course of the three days.

There followed a series of presentations by delegates to illustrate individual experiences with data management and integration and also to inform the group on data management projects of national and international importance. Discussion then took place to identify problem areas, key issues and ultimately to determine recommendations for the way forward. The last day was devoted to the drafting of a report, which will be submitted to the ICES Secretariat once finalised.

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The Mapping of European Seabed Habitats goes online!

JNCC has been given the go-ahead to lead an EU Interreg-funded international marine habitat mapping programme. This three year project entitled 'Development of a Framework for Mapping European Seabed Habitats', or MESH for short, will start in spring 2004. MESH has 12 partners across the UK, Ireland, the Netherlands, Belgium and France, and aims to produce seabed habitat maps for north-west Europe, together with the development of international standards for seabed mapping.

Background

Our seas support an exceptionally wide range of habitats and a rich biodiversity. These provide important food resources (fish, shellfish) and yield valuable natural resources (oil, gas, and aggregates). In addition the seabed is subject to increasing pressures from new developments, such as for renewable energy (eg, windfarms) and coastal developments. These ever-growing pressures call for improved sea-use management and planning, which in turn places a substantial demand for information about intertidal and seabed habitats. This has been met by a burgeoning of seabed mapping studies in recent years, but poor co-ordination and a lack of agreed standards has resulted in an inability to provide regional, national and international perspectives on the seabed resource to aid our decision-making. MESH aims to address these key issues, as detailed below.

First seabed habitat maps for north-west Europe

MESH will compile available seabed habitat mapping information (see map for geographic scope) and harmonise it according to European habitat classification schemes (the European Environment Agency's EUNIS system and the EC Habitats Directive types), to provide the first seabed habitat maps for north-west Europe.

Because the available information will be of variable quality and patchy in nature, habitat modelling will be developed to predict habitat distribution for unsampled areas, from the more widely available geophysical and hydrographic data. The final maps will be presented with confidence ratings so that end-users can determine their adequacy for decision-making and future survey effort can be more strategically directed.

Rocky reef with Dead Man's Fingers Alcyonium digitatum and calcareous tube worm Pomatoceros spp. © JNCC

To improve standards for future mapping programmes and facilitate data exchange and aggregation, MESH will develop a set of internationally agreed protocols and standards for habitat mapping. This will draw upon best available expertise across Europe and elsewhere. The protocols will be tested through a range of field-testing scenarios involving trans-national co-operation to ensure they are robust.

Internet delivery and end-user involvement

Both the protocols and the habitat maps will be made available via state-of-the-art internet-based Geographic Information Systems (GIS), providing ready access to the information for a wide range of end-users at local, regional, national and international levels. A wide spectrum of end-users will be engaged from the outset to provide feedback, to encourage the supply of relevant data, and to encourage the use of the mapping information for spatial planning, management and environmental protection.

The MESH partnership

A strong partnership covering all five countries in the Interreg (IIIb) north-west Europe area, brings with it scientific and technical habitat mapping skills, national data collation and management expertise, and experience in the use of habitat mapping in management and regulatory frameworks. The UK partners are JNCC as lead agency, BGS, CEFAS, DARD, English Nature, Envision and the National Museum of Wales.

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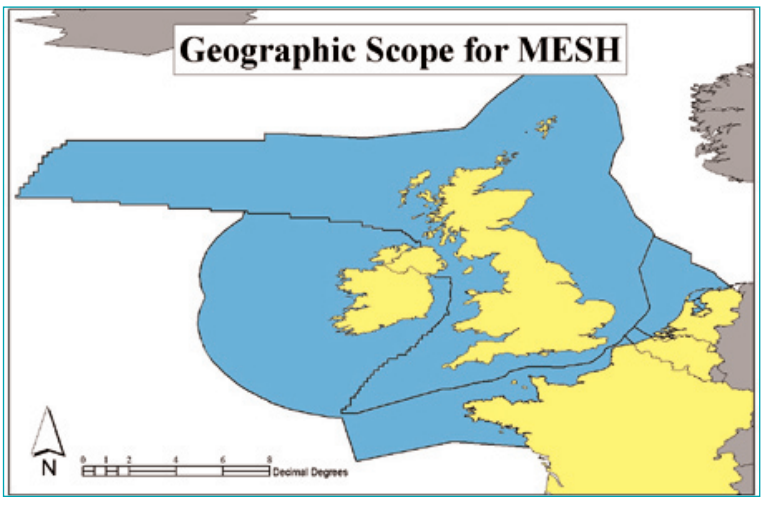
www.jncc.gov.uk/marine/mesh/default.htm



(This article first appeared in the JNCC publication Nature News)

A different way of seeing: sounding things out for marine managers

One of the big problems with managing our coastal marine environment is that we can't usually see the seabed, so it can be difficult to get a good idea of what it should look like and how our various marine industrial activities might, or might not, be affecting it.

Formulating policy on marine management has improved significantly over the last decade, leading to far greater public awareness and familiarity with policy principles such as 'marine stewardship', 'sustainable use' and 'the ecosystem approach'. Implementing management actions to deliver those policies is still developing. Without a clear view of the seabed it's difficult to judge what needs to be done or to critically assess the effects of anything we might try to do. The challenge for the scientist is to provide that vision. By some means, we must strive to supply managers with the information they require to make informed decisions about activities and actions that impact the seabed.

The CEFAS laboratory in Burnham-on-Crouch is currently leading a Defra funded project which aims to critically evaluate an array of 'state-of-the-art' seabed mapping techniques, to see how best they can be applied to environmental management and monitoring. The group also draws on expertise from the Lowestoft laboratory, the British Geological Survey and Envision Mapping (formerly the SeaMap research group of Newcastle University). The project is due to report its findings in March next year.

In principle the approach is simple. Sonar (rather than optical) techniques are used to survey a site of interest, building up an acoustic image of the seabed. That image is interpreted to map the salient features, which are then targeted for ground-truth sampling to discover their physical and biological properties.

By way of example, let's look at two contrasting studies, the first of a dredge disposal site off north-east England and the second an aggregate extraction site in the eastern English Channel.

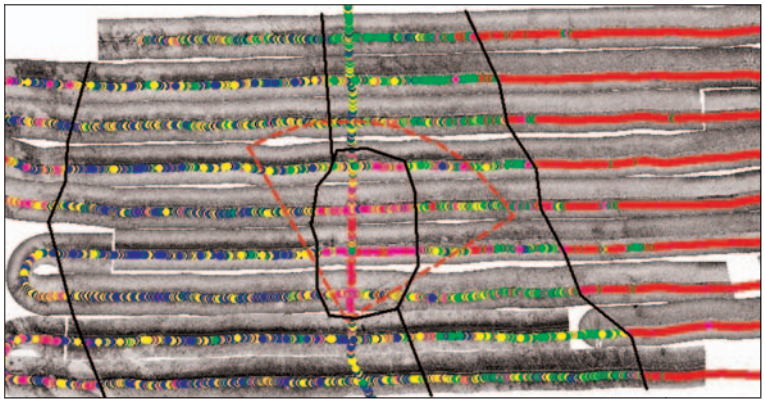


Figure 1. Sidescan mosaic around a dredge disposal area, overlain with AGDS (coloured dots). The dashed red line shows the sector licensed for disposal. Acoustically distinct areas are delineated in black

Dredge Disposal

This site comprises muddy substrates and contains an area licensed for the disposal of material dredged from harbours and estuaries. Currents here are moderately strong, so the material deposited on the seabed should disperse fairly rapidly. Figure 1 shows a mosaic of a sidescan survey (monochrome image) overlain by the output of an acoustic ground discrimination system (AGDS) where the different colours represent different characteristics of sediment hardness and roughness. These surveys are interpreted to pick out acoustically distinct areas that can then be characterised by various ground-truth sampling methods, as follows:

Sediment samples are collected by grabs (Figure 2) and small sub-samples used to determine the particle size structure of the sediment, while the remainder is sieved to collect and examine the infauna (animals living in the sediment). The epifauna (animals living on the sediment surface) are sampled using a small beam trawl (Figure 3). On soft substrates, a sediment profile imagery (SPI) camera can be used to take *in situ* photographs of the sediment layers (Figure 4).

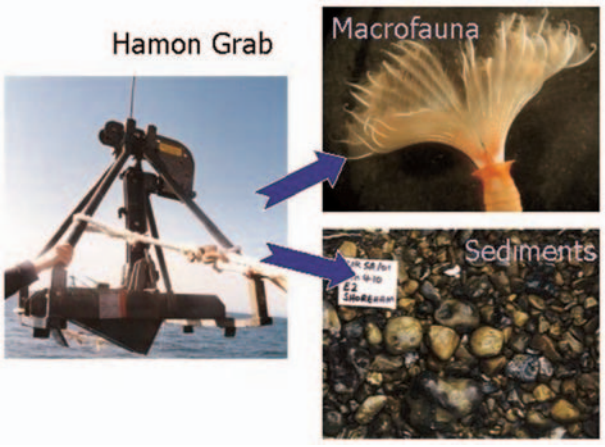


Figure 2. Hamon grab samples provide information on the biological components and particle structure of sediments

Figure 3. Beam trawls are used to sample epifauna.

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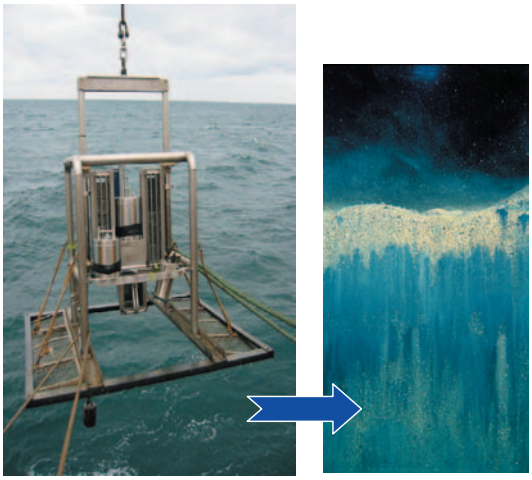

Figure 4. Sediment profile imagery (SPI) camera used to photograph sediment layers

Statistical analysis of results reveals what types of sediments and what types of animal communities are characteristic of each acoustically distinct area. Comparing the disposal area with those around it will show if the disposal activity is affecting the local environment.

Aggregate Extraction

Here, the study site includes an area licensed for the extraction of gravel aggregates (Figure 5). The sidescan mosaic shows a mottled pattern within the licensed area which, at greater magnification (inset) is seen to be the marks left by the dredging activity. The British Geological Survey has undertaken a specialist interpretation of the sidescan mosaic, resulting in the map of the seabed facies (characteristic bedforms such as sand waves or gravel ribbons). Grabs and trawls have again been used to ground-truth these facies and to see if the dredging is having any affect on the benthic communities. A video sledge (Fig. 6) also proved valuable in ground-truthing the bedforms and examining niche habitats such as the troughs of dredge tracks or sand waves.

Another acoustic surveying method available on CEFAS's new research vessel, Endeavour, is multibeam sonar. This is used for fine scale bathymetric surveys and can provide false-colour images of the seabed. Figure 7 shows such an image of the gravel extraction area.

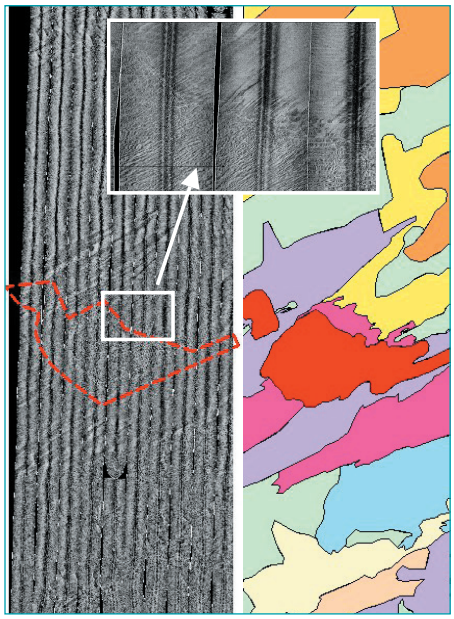

Figure 5. Sidescan mosaic and seabed facies map of an area licensed for aggregate extraction

Figure 6. Video camera sledge

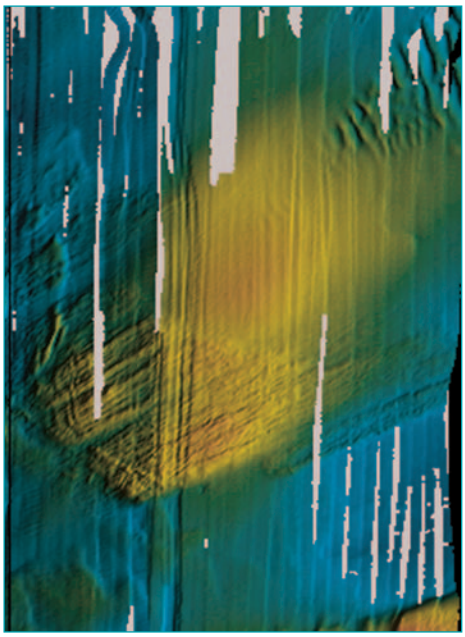

Figure 7. Multibeam mosaic image of the gravel extraction site (centre) showing dredge marks (North is upwards)

Piecing together the picture

Each of these acoustic, optical and sampling techniques provides a different type of information about the seabed over a range of spatial scales. Acoustic techniques can cover wide areas but only give information of the gross physical nature of the seabed; they cannot tell us anything about its biology. Optical techniques have a more limited coverage, but show more detail of the substrates (e.g. sand veneers over gravel) and reveal how the fauna utilise their living space (e.g. burrow holes or associations between fauna and boulder reefs). Grab samples have extremely limited coverage, sampling at single points, but provide a wealth of detailed information. Particle size analysis determines the precise composition of sediments in terms of the proportion of mud sand and gravel they contain, while chemical analyses measure levels of contaminants. Grabs and trawls allow us to asses the abundance and diversity of the infauna and epifauna, and determine which communities or indicator species are characteristic of certain sediment types.

Clearly, each of these seabed-mapping techniques has a different application and we must draw on a combination of techniques to provide the various elements of information required to assess the status of the seabed. Fortunately, analysis and interpretation of these multiple data layers has become more accessible with the advent of GIS systems, enabling the geo-spatial data to be presented as maps which can be interrogated. Elements of the current project are also exploring GIS applications for spatial analysis and predictive modelling.

The ability to visualise a virtual seabed in this way will be of great benefit to the process of managing and monitoring the environment, and the work undertaken in this project goes a long way to demonstrating how this can be done. The findings of the project will be compiled in a CEFAS Science Series Technical Report in the spring of 2005.

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Ten Questions on....Technology - *a regular feature aimed at giving plain English explanations to the latest buzzwords and technical issues of the day*

Ten Questions on....XML

1) **I've heard the term; isn't it something to do with the web?**
Yes, it's a specification for 'punctuating' data that enables them to be read my machines and humans.

2) **Punctuating??**
In normal writing we use capital letters, full stops, paragraphs and commas etc. to make things easy to read. XML uses a series of tags to do the same. The tags look like '<data>1.23</data>'

3) **How does it help me?**
Data tagged in the same way can be easily shared between computers, instruments and other devices - just like all documents that use the same punctuation rules can be read by humans.

4) **Exactly how does that help?**
There is less, or almost no, requirement for human intervention for tedious data reformatting to take data from collection to processing and then to display.

5) **But tagged data isn't exactly a user friendly form of display?**
You're right; XML separates the data itself from how the data is displayed. Additional XML documents called 'stylesheets' are used to convert XML to other formats for display, e.g. to HTML for display on a webpage or PDF for display in Adobe Acrobat. This conversion is often done 'on the fly'.

6) **Does XML do anything else?**
Yes, it can also provide error checking. The rules for tagging the data are defined in something called a 'schema'. The schema also defines things like which tags are optional and the values expected between the tags. Error checking is performed by comparing an XML document against its schema and is called 'validation'.

7) **So how do I get hold of a schema - who produces them?**
There are literally thousands of schema in existence. A good place to look is the Worldwide Web Consortium website (www.w3c.com/). The marineXML project (www.marinexml.net) is looking at the application of XML to marine users. It is due to complete its work in 2004.

8) **If I wish to use XML do I need to retrospectively tag my data?**
Yes, but if your data is already produced to a consistent format you simply need to write a programme to add the tags automatically.

9) **Sounds good, but is XML widely used?**
You bet, virtually all modern data exchange incorporates XML in some form.

10) Finally, what does XML stand for?
eXstensible Mark-up Language.

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Ten Questions on....Interoperability

1) How do you define "interoperability"?
It relates to issues of connectivity, effective communication, resource sharing and data transfer. A simple definition would be the ability to exchange and use information effectively. The Canadian Government offers a more comprehensive definition: "Interoperability is a condition that exists when the exchange of software, information and data between the software and hardware infrastructure is possible and complete within a specific computing environment. The degree of interoperability is influenced by environmental factors that include operational, product and functional considerations."

'Interoperability' is not black and white. Systems can be more or less interoperable as the Canadian definition makes clear. Indeed systems can be designed to share data in a highly interoperable manner without necessarily being able to, or needing to, share software.

2) Why is this important?
Interoperability is nothing new. Systems have been designed for many years that can communicate effectively with other systems and share data effectively. However this has tended to be done in a closed and bespoke way. In recent years open standards and technologies have emerged that mean systems can be designed to benefit as much as possible from sharing data and technology that's already available. Not only does this save costs from reducing duplication, it also means information and capabilities can be integrated from many different sources and presented to users in the way they need it.

As with other governments around the world, the UK Government is very supportive of methods for joining previously disparate technology systems together. The e-Government Inter-operability Framework (eGIF) produced by the Office of the e-Envoy (available on www.e-envoy.gov.uk) is now in version 5. This sets out how public sector bodies should be building their information systems around the principles of interoperability.

3) So why should I be interested in this?
There are significant benefits to building interoperable solutions. These are often considered to be greatest when a solution requires multiple organisations to 'team up' bringing their data and/or software capabilities to their user audience in a joined-up manner. Hence the significant appeal of interoperability to the public sector.

However there are also significant intra-organisational benefits to designing solutions in an inter-operable manner for ensuring internal systems can communicate effectively.

4) What are the key benefits?
The key benefits can be summarized as:-

- *Ability to collaborate effectively at an inter-organisational level*
- *Cost savings from widespread ability to re-use rather than re-invent.*
- *Cost savings from ability to develop once and serve up in multiple different ways depending on the business application*
- *Business processes are not duplicated by multiple organisations – distributed data and software services can support multiple customers*
- *Especially in the longer-term, development costs, system integration costs and data management costs can be lower*
- *Opportunity to design solutions around both the content managers (thereby retaining political and organisational control of data) and users*
- *At a user level, more effective decision-making due to ability to deliver a joined-up picture*
- *More flexible, scalable information and systems architectures based on deploying network solutions effectively using distributed resources*

It is fair to say that as of the current moment some of these benefits are limited. Within the UK public sector only a small number of organisations are presently in a position to interoperate – however, this should change dramatically over the next 2 years with organisations like UKHO and Ordnance Survey likely to start offering services.

5) How do I make my existing systems interoperable?
Most organisations will need to adopt the principles of interoperability at a fundamental enterprise level in their IT Strategy. eGIF outlines the range of areas that should be considered.

In order for systems to talk effectively to each other a large number of things need to be in place, in particular the widespread adoption of standards to define a common language of communication and interfaces that can understand this language. Adoption of XML as the primary standard for data exchange and integration is critical. In the geographic world, the Open GIS Consortium (OGC) is producing publicly accessible specifications that define a common language for describing geospatial data (Geographic Markup Language or GML) and geospatial data services.

Of course it is not simply a case of implementing the latest 'interoperable compliance toolkit' from your software vendor. You should consider how your current business processes in the widest sense could be improved in relation to your internal and external customers (and what they're doing). It may involve a complete re-assessment of how you manage and deliver geographic information to your customers internally and externally.

6) **How do Web Services fit into all this?**
Web services will be the subject of a future feature. Suffice to say they are intrinsically linked to delivery of interoperable solutions – Web Services will be the way that networked solutions are designed and delivered.

7) **How far down the interoperable path are we right now?**
The European spatial world, with a few obvious exceptions particularly in The Netherlands and Germany, is really just starting down this interoperable path. As with most things in this area, North America is leading the way and can offer real world examples of interoperable solutions (see for example the on-line mapping of the Canadian Dept for Fisheries & Oceans at http://www-heb.pac.dfo-mpo.gc.ca/).

8) **As the spatial world becomes more interoperable and based on open standards, what changes are likely to take place?**
We will hopefully no longer be talking about interoperability as this will just be assumed!

The vision is that spatial data management, analysis and delivery capabilities should become much more ubiquitous, often embedded completely in business or consumer applications to a degree that 'location' is taken for granted as a known dimension. It should become much easier to build up these potentially complex geographic data services on-the-fly from multiple organisations and deliver them across multiple platforms (web, PDA, mobile phone etc.).

As information and technology users we should expect applications designed to meet our needs that pull together the information and capabilities of multiple system and data providers. Applications will allow us to search, locate and integrate data from a range of diverse sources to meet our needs. We should be able to do this rapidly without having to go to multiple places and ask lots of questions. Instead of pulling together data from disparate sources into a centralized repository we simply subscribe to a data service and embed that into our application. This means we no longer get saddled with huge data management overheads – it is delivered on-line.

As information suppliers we need to think perhaps less about how we deliver robust web mapping applications and more about setting up these data services. In the UK, the JNCC have been at the leading edge of this type of work through the development of their National Biodiversity Network (NBN) Gateway for delivering spatial data on species and habitats. This service is being built into other web mapping applications like English Nature's Nature-on-the-Map (www.natureonthemap.org.uk). Others will be following suit soon.

9) **Where can I go to see spatial interoperability in action?**
In the spatial world many of the operational examples of interoperable systems are in North America. There are a number of major R&D initiatives happening in the UK which, over the course of this year, will be seeking to identify major challenges and demonstrate tangible benefits.

One UK example of a semi-open interoperable solution is the GIGateway Data Locator service (www.gigateway.org.uk) where users can enter a search string, a request will be issued to multiple distributed metadata nodes (distinct web servers managed by different organisations and linked to the Internet), relevant metadata will be retrieved, and then returned to the browser in a joined-up way. It is no coincidence that metadata systems are leading the way in these areas – major advances have been taking place in areas of knowledge management, information searching, classification and cataloguing, many of which derive from library-based systems.

10) **Where do I find out more?**
The best place to start is www.opengis.org. This is the site for the Open GIS Consortium, the body responsible for defining the emerging global specifications for geospatial interoperability. Most of the GIS vendors are embracing these interoperable specifications, some more pro-actively than others.

There is plenty more information on standards for geographic information on the AGI web site (www.agi.org.uk) under the Resources menu.

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Achieving Interoperability and Information Sharing

Introduction

This paper is presented as a summary of the Environment Agency's recent Data Partnership Forum, held on 11th February 2004, organised by the Data and Information Exploitation Unit (DIEU). The conference brought together public sector and not for profit organisations from the environmental sector to discuss issues relating to interoperability and information sharing; specifically the forum was intended as a practical session dealing with the issues of achieving interoperability ***now***. The event was purposely not limited to just environmental, or indeed geospatial, information but instead focussed on the wider issues relating to information sharing. Key speakers presented case studies of interoperable projects and thoughts on both the barriers and the solutions to achieving interoperability.

Many definitions of interoperability exist but in the context of information sharing it is fundamentally:

> *"The ability to exchange and use information across different hardware and software* ***without*** *special effort"*

The definition should also encompass the ability of users to find useable information, but the key facet is that information sharing should not require significant effort. The vast majority of information can be shared at one level or another, given greater or lesser degrees of complexity, but the time and effort involved in doing so, and the accuracy or fitness-for-purpose of the actual information to be shared, dictates whether or not the process is viable.

Interest in the concept of interoperability has grown significantly over the last few years, particularly at the European level and within the Geographic Information Systems (GIS) sector. The INSPIRE (Infrastructure for Spatial Information in Europe) initiative is possibly the foremost programme tackling interoperability at the European level and its principles, which help to elucidate some of the key principles of interoperability, include:

- data should be collected once and maintained at the level where this can be done most effectively
- it must be possible to combine seamlessly spatial data from different sources across the EU and share it between many users and applications
- it must be possible for spatial data collected at one level of government to be shared between all levels of government
- spatial data needed for good governance should be available on conditions that are not restricting its extensive use
- it should be easy to discover which spatial data is available, to evaluate its fitness for purpose and to know which conditions apply for its use

These interoperability principles are equally relevant to both the public and private sectors.

Within the GIS sector interoperability is being rigorously pursued in order to help further the growth of the sector through its evolution beyond its traditional core communities and toward integration into organisations' mainstream information infrastructures. The geography inherent within GIS is a mechanism for enabling relationships to be created between disparate information sources and the systems themselves are specifically designed for the display and analysis of integrated information. GIS is, therefore, a crucial technology for allowing the value of information to be realised for more effective decision making and is consequently a fundamental sector within the interoperability debate.

Currently, however, the vast majority of effort in this area has been spent on the development of aspects such as open standards and systems, interoperable data formats, metadata standards and web services through organisations such as ISO, OGC (Open GIS Consortium), W3C (World Wide Web Consortium), GSDI (Geospatial Data Infrastructure).

Whilst there is no argument that these aspects are fundamental to the reality of achieving interoperability the dominant technical focus of the GIS community has diverted attention away from the non-technical requirements that are also critical to its realisation.

The benefits of interoperability

As previously noted the primary benefit of achieving interoperability is the ability to share and use information easily. In order to quantify the potential value of interoperability it is prudent to question why it is believed that easier sharing of information is so critical.

Fundamentally it is the costs associated with *not* sharing information at an individual, organisational, national, European or even global level that provide the answer. The direct costs associated with not being able to easily source, share and use information can be significant even at an individual level. If these costs are scaled up to a corporate level, and broadened to include non-direct costs, it is easy to see why many organisations are developing, or have developed, proactive policies to centralise access to information, customer relationship management (CRM) tools, standards and so forth. If the costs, apparent at this level, are then scaled up to a national level or beyond it is clear that the costs of *in*operability are immense.

The costs of *in*operability are, naturally, incurred at multiple levels and from a variety of activities; reduced productivity due to time spent searching, accessing, translating, integrating and storing information, duplication of information collection and storage activities, inability to access and integrate information at the appropriate level of accuracy or temporal resolution, etc.

An analogy of the significance of interoperability could be the impacts of the World Wide Web and email on business processes and efficiencies.

It is difficult to now imagine how organisations, in particular, managed to produce effective work practices without instant access to information over the web and without the ability to share files instantly with colleagues, customers and clients. These systems are prime examples of interoperability in action and the furtherance of information interoperability is likely to provide similar cost benefits.

Although directly or indirectly related to the cost of *in*operability other general benefits of interoperability worth noting include increased productivity, accessibility (transparent, quick access to the same accurate, up-to-date information by all users), data security (through centralised geodatabase/database storage with the inherent stability and backup benefits), improved communication (both internal and external), reduced costs/risks of obsolescence and isolation and support for multiple applications (i.e. software independence).

Examples of specific benefits may include:

- timely compliance with statutory or non statutory obligations or deadlines
- more efficient business and project processes
- easier adherence to wider corporate, government or European initiatives (e.g. joined up government, freedom of access to public sector information)
- technically feasible cost effective solutions
- more intelligent solutions that provide increased accuracy and confidence for decision making/reporting
- simpler development and implementation of partnerships (private/private, private/public, public/public)

Many more general and specific benefits will be apparent to individuals and/or organisations both at a strategic and a detailed level.

The Barriers

Given the potential benefits of interoperability the rationale behind the current levels of implementation and the perceived obstacles need to be understood in order to be quantified and, if possible, overcome.

It is important to recognise that achieving interoperability is not generally a simple process, particularly when focus is broadened away from solely the technical requirements. In addition, the barriers to interoperability vary in magnitude depending on the degree to which interoperability is being attempted (e.g. making two teams interoperable may be significantly easier than making two organisations interoperable) and the level of interoperability being attempted (e.g. making one dataset interoperable or all information) and obviously the current level/degree of interoperability.

Within the UK the current position is extremely inconsistent, with different levels of interoperability existing and with varying requirements, degrees of belief and levels of understanding. However, the barriers to interoperability can be divided into 3 main areas:

- standards and technology (the focus of much debate, effort and success)
- policy and education
- partnerships and co-ordination

Much of the existing focus and documentation is in the standards and technology area, therefore this paper concentrates on the policy and education and partnerships and coordination requirements for interoperability.

Although policy and educational barriers to interoperability are less well quantified or understood than the technical issues, they are now potentially more restrictive to the achievement of wider levels of interoperability. These barriers occur across both the public and private sectors and are indeed organisational issues, not sector specific issues. Some of the most significant barriers are:

- continuing domain silos that result in inoperable, propriety information being produced and lower than desirable levels of external communication, integration and quality. Examples of historical inoperability can often be seen in organisations and highlight a continuing discipline oriented approach to delivery. This continuation occurs at a time when it is increasingly apparent that 'the real world' is integrated and complex multi-disciplinary solutions are required to appropriately resolve issues and mitigate against situations
- the continuing lack of awareness of the relevance of broader information issues that results in the persistence of traditional approaches to delivery and a failure to recognise new best practices and the efficiencies they can bring (for example continuing belief within particular scientific disciplines that they are somehow different to other disciplines when dealing with information)
- a lack of awareness of the wider benefits of interoperability such as the medium to long term cost savings, the integration benefits and potential wider use of information use for other relevant initiatives and policies
- a lack of overarching information management policies within organisations and across sectors that results in areas with little awareness of the importance of information management which leads to having no will to implement intelligent solutions. In these scenarios information managers may be seen as hindering the process by highlighting the complexities of issues such as information availability, fitness-for-purpose and licensing requirements and the importance of issues such as standards, metadata, information sharing, future proofed solutions, updatability, etc
- the perceived complexity of the freedom of information and copyright laws currently hinders the sharing of information due to uncertainty and variety in the application of the law

As with policy and educational barriers, partnership and coordination barriers have not previously been well researched but are, again, fundamental to achieving wider levels of interoperability. Partnerships include inter-governmental/corporate partnerships within and across departments, intra-governmental/corporate partnerships between government agencies or corporations and also public/private partnerships:

- agreements and partnerships are

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essential for achieving interoperability but there are currently a lack of specific drivers, and a lack of understanding of inferred drivers, underpinning their formation. Many agreements and partnerships are in place but very few are specifically designed to fulfil the goals of interoperability and their relevance in this context may need to be raised, particularly where understanding is failing to filter down to all levels (examples include the Ordnance Survey's Pan Governmental Agreement or the purpose of initiatives such as S-CAT). It appears that current examples of interoperable partnerships and projects are due in large to the forward thinking and drive of specific individuals or groups of individuals

- differing 'commercial' drivers between organisations and the restrictions this creates (both actual and perceived) may hinder the development of partnering opportunities. In turn a lack of understanding of these differences can breed suspicion of motives that further limit collaborations. A specific example is evident across government executive agencies, trading funds and public corporations which has seen, due to differing remits, varied 'interpretation' of initiatives such as the Aarhus Convention and Directive 2003/4/EC on the Public Access to Environmental Information
- copyright and intellectual property rights (IPR) issues are deemed by many to be too complex and are dealt with in vastly different ways. This leads to them being widely misunderstood by information users, which results in a risk that issues remain unresolved. Often these issues are simply ignored or the conclusion is drawn that information sharing is either not possible or requires too much effort
- the current fragmented approach to interoperability is due in part to a lack of central coordination and is currently being achieved from the bottom up where interested parties work towards making themselves interoperable. Whilst this can work on a 'local' or 'discipline' level (examples of good practice include MAGIC, National Biodiversity Network and the Integrated Coastal Zone Map pilot) unless international standards and conventions are enforced and used there is no assurance of a more holistic interoperability at a wider or higher level, or interoperability being possible between these initiatives

The result of the above barriers appears to be continued lack of information on interoperability in the context of ever growing information volumes due, in part, to the increasing European/ national amount of time spent managing information growing by only 1.7% per year (*John Seely Brown and Paul Duguid, The Social Life of Information, 2002*)).

The Solutions

In order to achieve increasing levels of interoperability and realise the benefits offered, it is crucial that the barriers within a specific situation are identified and overcome. With regards to the barriers highlighted in this paper the following steps are recommended:

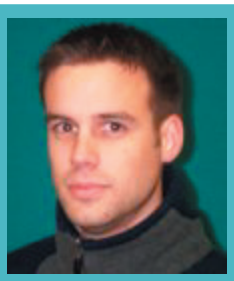
- begin to dissolve the domain orientation to delivery and where necessary start to restructure and redevelop policies to break down the silos that do exist. This is a process that has already been undertaken by some organisations but further restructuring could bring further benefits to organisations. An example where this approach may prove beneficial would be where specific domain groups are undertaking similar analysis from similar information sources separately. It may be more efficient to consolidate certain resources to allow increasing interoperability of both process and information. In this scenario domains could be consolidated into policy and delivery teams, where the domain experts retain control of the quality and relevance of the process but a cross cutting delivery team actually undertakes much of the work. Fundamentally the shift is away from a domain led approach and towards an integrated information approach which would allow interoperability across domains (e.g. air quality, noise, marine, flood defence, etc) and sectors (environmental, land use planning, transport, agriculture, etc)
- improve awareness of broader information issues which, whilst growing, is not changing rapidly enough or, necessarily, in all of the right places and at all of the right levels. There currently appears to be significant enthusiasm and ability at the technical level and evidence of a certain degree of understanding, certainly of the benefits, at the higher levels. However, what appears to be missing is knowledge management (generating value from knowledge based assets through sharing to devise best practice) at the middle tier and incomplete understanding (of the financial benefits) or buy-in at senior management/ministerial level. Within both the public and private sector it is generally the middle management that implements change, manages projects and adheres to cross cutting policies and it is senior management that generates these policies and defines the direction of an organisation. It is therefore critical that at these levels the education and support is available to implement interoperability; - improve education and understanding of the wider benefits of interoperability. Both the GI/information management industry and government should take responsibility for raising awareness of the medium to long term cost savings that can be attained. Examples of the rapid investment return cycles, efficiencies and operational business benefits could be provided as case studies across all domains and sectors
- the complex nature of, and interaction between, the freedom of information, copyright and IPR could be reviewed, and where possible, simplified or additional guidance provided. In addition, resource could be made available to assist organisations, within a relevant time frame, to understand the implications of the above requirements and how to adhere to them
- the importance of agreements and partnerships should be made explicit throughout government and the ability to create them needs to be appreciated. These agreements may

be at the information sharing level to fulfil issues raised in initiatives, but also at a managerial level between government teams, departments, agencies and the private sector. These types of partnerships and agreements have proved their value but could be significantly improved with more structured management and detailed objective setting

- a centralised information management policy and culture needs to be developed that permeates all other relevant policies and activities. The current fragmented nature of interoperability within the UK highlights the requirement for an overarching framework to support and direct efforts and provide a top-down framework to help coordinate the bottom-up approaches currently being implemented. Whilst identification of interoperability requirements from the ground level is desirable and should not be stifled, the framework to achieving it should be available at a higher level and the drivers to every-day interoperability may benefit from being top-down in order to ensure greater take-up and more holistic commonality. The framework should endeavour to drive the interoperability agenda through government (perhaps via an information champion at ministerial level), provide case studies of benefits and best practice, provide assistance (for example a cross cutting information management function with the remit and budget to assist projects/teams, to provide guidance and act as a resource to help alleviate the duplicity of effort currently ongoing) and project management support, provide technical/policy resource for involvement in aspects such as policy development, project specification drafting, tender evaluation, develop longer term vision, etc. This framework could provide the structure for a common and consistent approach to interoperability, which would ensure wider and higher level interoperability is inherent even within bottom up approaches.

Conclusion

The final, and most significant, recommendation listed above would provide a platform from which the other recommendations can be delivered. The improved awareness and capability provided would ensure significantly improved interoperability through reduced redundancy and duplicity, increased communication, improved reporting, management, use and sharing of an ever increasing volume of information. Fundamentally the goal of the whole process of interoperability is simply to deliver better, more efficient and holistic decision making. Should it really be that difficult?



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ICZMap® - The Way Forward

Building on the success of the initial The ICZMap® pilot project, further aims have been identified. A three dimensional height model will be created. Interfacing United Kingdom Hydrographic Office (UKHO) data with the Ordnance Survey (OS) MasterMap Mean High Water (MHW) line will create foreshore representation for Great Britain. An offshore vertical datum reference model will be developed for the UK with the potential to link in with a European reference system based on alternative technologies, such as altimetry.

In order to progress to the provision of complete interoperable datasets for Great Britain, the collaborating partners are developing a viable business model. Priority geographic roll-out areas will be defined. Production capability at the UKHO will be developed. Ordnance Survey have already achieved the definitive MHW line through their Quality Improvement Flowline programme.

Interoperable datasets for the UK, comprising UKHO, Ordnance Survey and British Geological Survey data, are on track to be produced from 2005 onwards, and will greatly assist Government and commercial planning and management of the coastal zone.

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Digitisation of historic Scottish trawl data reveals changes in North Sea species composition

Fisheries Research Services (FRS), Aberdeen are an agency of the Scottish Executive. They are responsible for managing Scottish commercial fisheries and have been collecting trawl data on fish distribution and abundance in the seas around Scotland since the late nineteenth century. The information collected was originally stored in the form of paper notebooks built up over time on a cruise by cruise basis. This made them difficult to interrogate. Over the last few years, however, all the available trawl survey data have been organised into a single computer database, which can be searched and summarised very quickly. The database represents an extremely rich ecological resource and contains information on the long-term spatial and seasonal distributions of over 300 different fish species, extending back to 3rd March 1925. Simple time-series plots of catch per hour are starting to reveal fascinating changes that have taken place over the last 80 years. Long-term trends in the abundance of four pelagic fish species with warm-water bio-geographic affinities are plotted in Figure 1 for ICES Fishing Area 4A, which covers the northern half of the North Sea. According to the data the more coastal species, anchovy and sardine, were each almost totally absent from the northern North Sea until the mid-1990s. Horse mackerel abundance has also increased steadily since 1925, whereas mackerel abundance had two main peaks: the first during the late 1950s and early 1960s the second since 1990 (Figure 1).

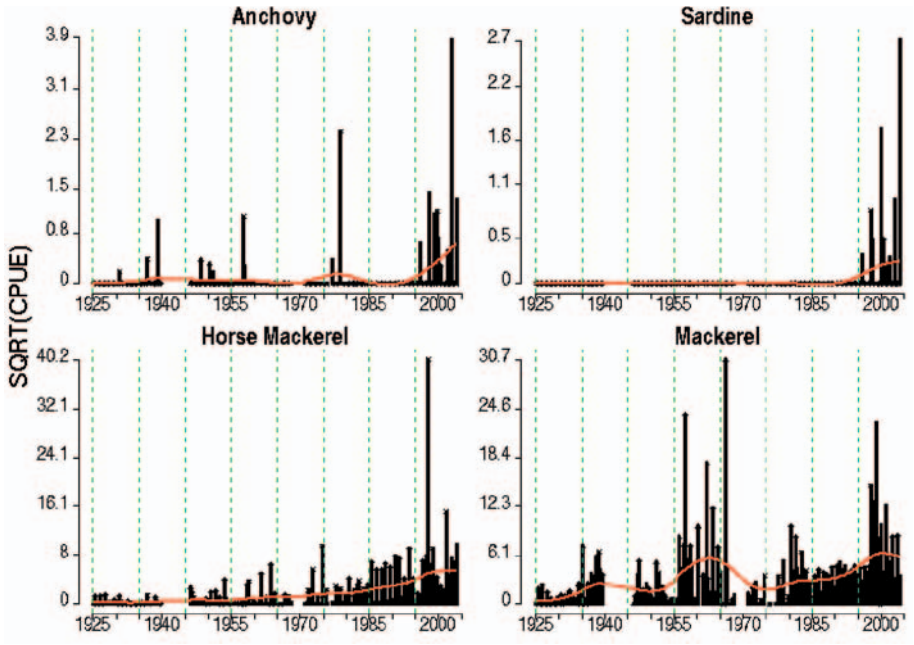

Figure 1. Numbers of anchovy, sardine, mackerel and horse mackerel caught per hour in ICES 4A between 1925 and 2004. Estimates were made using FRS (Fisheries Research Services) data only and are square root transformed.

Demersal species with warm-water affinities show similar long-term patterns. Bluemouth were largely absent from the northern North Sea between 1925 and 1990, although a few were noted in 1955 (Figure 2). Bib, John Dory, poor cod, red gurnard, red mullet, lesser weever and tub-gurnard have all increased since 1990 (Figure 3). Some of the lesser peaks in the time-series are also consistent between species. Bluemouth, John Dory, red gurnard and red mullet abundance, for example, also peaked during the mid 1950s which is similar to the mackerel.

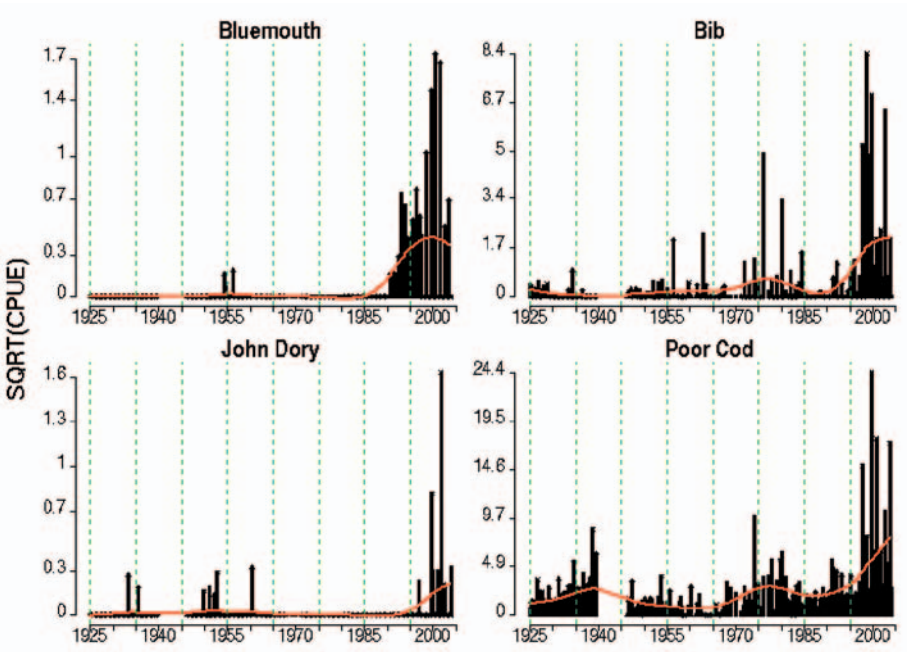

Figure 2. Numbers of bluemouth, bib, john dory and poor cod caught per hour in ICES fishing area 4B between 1925 and 2004. Estimates were made using FRS data only and are square-root transformed.

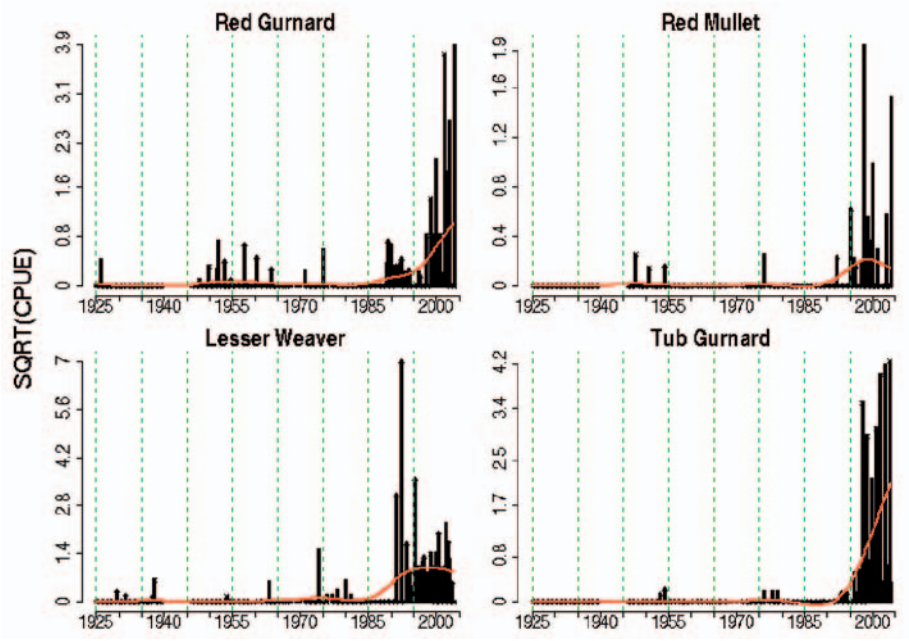

Figure 3. Numbers of red gurnard, red mullet, lesser weever and tub gurnard caught per hour in ICES fishing area 4B between 1925 and 2004. Estimates were made using FRS data only and are square-root transformed

It has been well documented that air and sea temperatures are increasing and it is likely that these rises are related to the population increases of the fish species examined here. Unfortunately no significant correlations between fish abundance and temperature could be detected. It is known that season, depth, time of day, type of fishing gear and research vessel used can all affect or bias the results of trawl surveys. The FRS data series begins in 1925 and encompasses a large range of gear and vessel changes which clearly affects interpretation of long-term trends. Nevertheless, since 1983 all FRS trawls have been done using a standard otter trawl design known as the GOV (Grand Ouverture Verticale) and the data show that most of the interesting features discovered have occurred since 1990. This implies that the long-term changes are genuine and not caused, for example, by a sudden increase in fishing efficiency since the mid-1990s. In conclusion, profound changes are taking place within the piscean ecosystem of the North Sea, perhaps in response to fishing pressure, climate change or a combination of both.

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NERC uses remote sensing to monitor the changing coastal zone at the Wash Banks Managed Re-alignment Site, Boston, Lincolnshire

Airborne remote sensing offers the opportunity for cost effective monitoring of dynamic environments such as coastal zones. It provides synoptic, wide area measurements of surface properties either at regular intervals or in response to unforeseen events. The systems are flexible and can be flown to suit tidal and weather conditions. We report below how airborne remote sensing is being used to compliment ground survey and visualize the changes induced by coastal management practices.

The Wash Banks Flood Defence Scheme (WBFDS) is managed by the Environment Agency with the Royal Society for the Protection of Birds, Her Majesty's Prison North Sea Camp and English Nature. The Scheme is funded by the Department for Environment, Food and Rural Affairs and the Lincolnshire Flood Defence Committee. In August 2002, three breaches through the outer sea bank were made enabling tides to enter 78 ha of formerly arable land. It is intended that this area will gradually revert to salt marsh and inter-tidal mudflat. This process is known as managed realignment and the WBFDS is one of the largest examples of such a project in the UK (http://www.thebostonwashbanks.com).

An aircraft operated by the Natural Environment Research Council (NERC) Airborne Remote Sensing Facility (ARSF) has been collecting digital remotely sensed images of the site since before the breaches were made. The Centre for Ecology and Hydrology (CEH), a component of NERC, is undertaking a field-based monitoring programme for vegetation assessment and the CEH Section for Earth Observation is analysing the ARSF images.

The images are acquired by an Airborne Thematic Mapper (ATM) which records reflected and emitted radiation from

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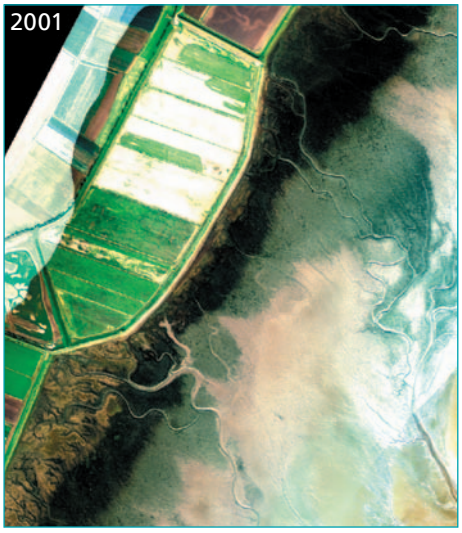
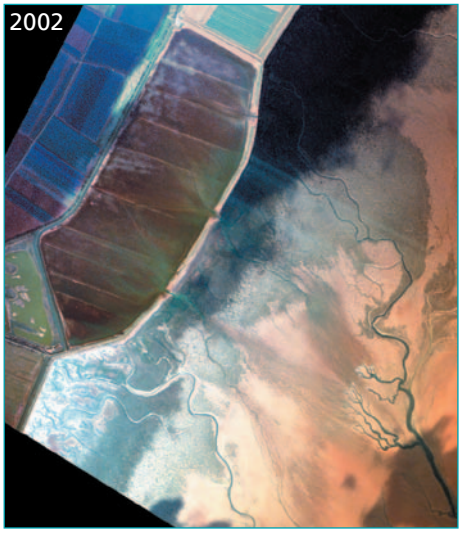
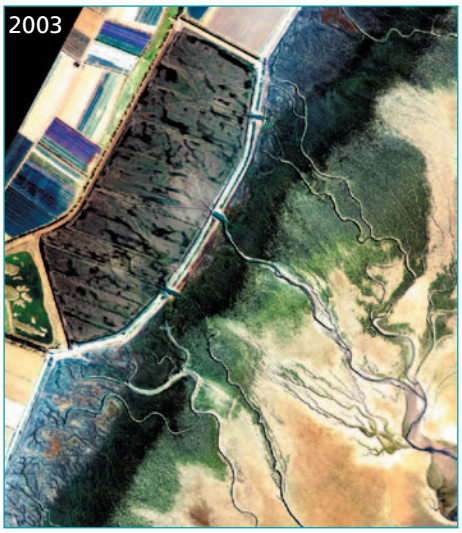
the surface in visible wavelengths and beyond. These images are precisely registered to the British National Grid and contain detailed information about the amount radiation reflected from the vegetation and intertidal mudflats. The amount of radiation reflected can tell us about the amount of vegetation, it's type and properties of the sediment.

The ATM images of the Wash Banks site shown here were taken at annual intervals, in 2001, 2002 and 2003. The first image shows the original agricultural fields within the site which were reclaimed in the 1970s and used for pasture in 2001. The seawall is fronted by a thin band of saltmarsh drained by only a few creeks. The second image, taken a month after the seawall was breached in September 2002, shows the rapid appearance of new creeks and the deposition of plumes of agricultural material on the sandflats. The inundation of seawater has killed almost all the terrestrial vegetation within the site and covered it with sediment. The final picture, taken just over a year after breaching, (September 2003)shows the first signs of salt marsh vegetation becoming established within the site; quite vigorous stands of the annual species, Salicornia europaea and Suaeda maritima, were growing but on the image they do not appear as dense as the equivalent vegetation outside the sea wall. The pattern of creeks that drain the intertidal zone continued to be altered by the water draining from the three breaches in the sea wall and have deepened and widened.

The salt marsh vegetation outside the site has changed little between 2001 and 2003, some visual differences on the images are due to seasonal changes. The 2001 image was taken in October when the lower salt marsh species were dying back at the end of the growing season. The September 2003 image shows these species as still vigorous but the perennial upper/middle salt marsh species were suffering from the effects of a hot dry summer.







Future airborne monitoring will continue to follow the progress of saltmarsh establishment within the Wash Banks site and to detect any changes the scheme has induced on the nearby intertidal area. Will the existing salt marsh remain unaffected? How will the pattern of creeks develop with the large quantity of seawater entering and leaving through the breached seawall at high tides? Will sediment from agricultural soil continue to be deposited on intertidal mudflats and sand banks? These questions can only be fully answered with the type of monitoring that can be provided by airborne remote sensing.

Acknowledgements

This work has only been possible through the support of Peter Purcell of ARSF and Andrew Wilson of SEO.

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CoastNET Relaunch – House of Commons 10th February 2004

Following a strategic review CoastNET has entered a new phase in its development, signalled with a relaunch event in the House of Commons on 10th February this year. Its purpose was to introduce coastal issues to a new audience of senior decision-makers: MPs, peers, and Chief Executives from key sectors on the coast.

The event, sponsored by Powergen, drew an audience of over 50. Opening the event, our host, David Leper (MP for Brighton Pavillion) commented, "I think the important thing about our coast is its huge variety……It is a resource that we should treasure."

A key objective of the event was, in fact, to raise the profile of the coast, and to do that CoastNET compiled a coastal fact file. We pulled together nine high impact facts (pieces of contextual information, if you like) about the UK coast. Did you know for example that the shoreline of Britain (England, Scotland and Wales) is 19,000 miles long?

A coastal landscape in Essex (photo: Alex Midlen)

Facts like these can have a big impact, but it was a surprisingly difficult task to compile them, and one which highlighted both the difficulty in finding information and the inconsistency regarding what information is available for different parts of the UK.

CoastNET have recently submitted a bid for funds to establish an information portal for the coast. The portal will provide a single point of access for coastal news, management information, and analytical information. Using state of the art semantic web technology this will be a much more powerful web-based tool that has previously been seen, and with it we hope to revolutionise the use of information for coastal policy and decision-making at all levels. A further announcement will be made at the end of June when the outcome of the bid is known.

L to R: Alex Midlen (Chair, CoastNet), Mark Duffy (Maritime Team Manager, English Nature), Lord Cranbrook (former Chair, English Nature)

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The NBN:
Sharing Information about Wildlife

The National Biodiversity Network (NBN) is a UK co-operative which aims to revolutionise the dissemination of wildlife information in the UK. It is estimated that there are more than 60,000 biological recorders at work in the UK, filing data with local record centres (LRCs), national societies and/or recording schemes. The NBN is taking the lead in making this national, regional and local biodiversity information accessible to all. By establishing agreed standards for data collection and collation, the Network facilitates the sharing of data between organisations and also allows the public to access biodiversity information from a single, reliable source, as well as by more traditional routes.

The NBN Trust

The NBN Trust is the organisation that promotes and facilitates the Network. Through seminars, steering groups, email groups and field-based projects, the NBN Trust encourages participation in the Network by volunteers and organisations at every level.

The NBN Trust is able to offer advice and support on issues central to recording and keeping data, including:

- Standards and protocols for recording
- Improving access to data
- Model data use agreements
- Laws affecting ownership
- Financial security

The NBN Trust has been working closely with recorders and data managers from National Schemes and Societies to investigate how to overcome some of the practical problems of collecting and managing data. The NBN has developed a series of standards and protocols for recorders and custodians, all of which are available as documents to download from the NBN website.

The NBN Data Model has provided the basis for the *Recorder 2002* software, which can be ordered via the website. The software can be used by recorders to manage their data in a way which enables them to easily mobilise it through the NBN Gateway (see below), or to share it with others using compatible systems. *Recorder 2002* also provides users with high quality mapping tools, which include the marine/coastal zone. A recent addition to this has been the Watsonian Vice-county boundaries, which were specifically digitised at 1:10,000 scale and are available as MIF (MapInfo) and SHP (ArcView) files. The original boundaries have been projected into the sea to MLW, 3 nautical mile and 12 nautical mile limits. You can get a free copy of the Watsonian Vice-county Boundaries from the NBN Trust Secretariat, or order through the web site.

The NBN Website

(www.nbn.org.uk)

The NBN website is designed to be used by a wide audience, from environmental managers and conservationists to members of the public. It is a source of information about current NBN projects, biodiversity news and conferences and events. On the website you can download our quarterly newsletter, view minutes of steering group meetings or order products available to conservationists (eg. OS Map tiles, *Recorder 2002*, Information leaflets etc.).

The NBN website also includes:

- Guidance on the standards and principles needed to participate in the Network
- A link to a comprehensive species dictionary with over 122,167 names listed
- A habitat dictionary which allows data handlers to compare and evaluate different systems of habitat classification
- A link to 'Nature Navigator' - an illustrated guide to British wildlife produced for the general public

The Gateway

(www.searchnbn.net)

The Gateway is the internet portal to the store of information held by the NBN. Building on existing links with LRCs and contributors, the Gateway is an easily accessed resource of local, regional and national data and receives around 10,000 hits per month. Currently, the main areas of functionality are:

- Search across hand-selected biodiversity web sites for relevant information
- Ten kilometre dot mapping of species records. It can also be used to only show records for a particular time period
- Select a particular protected site (for example an SSSI or SAC) and get a list of the species that have been recorded within that site, including how many times they have been recorded there and when they were last seen

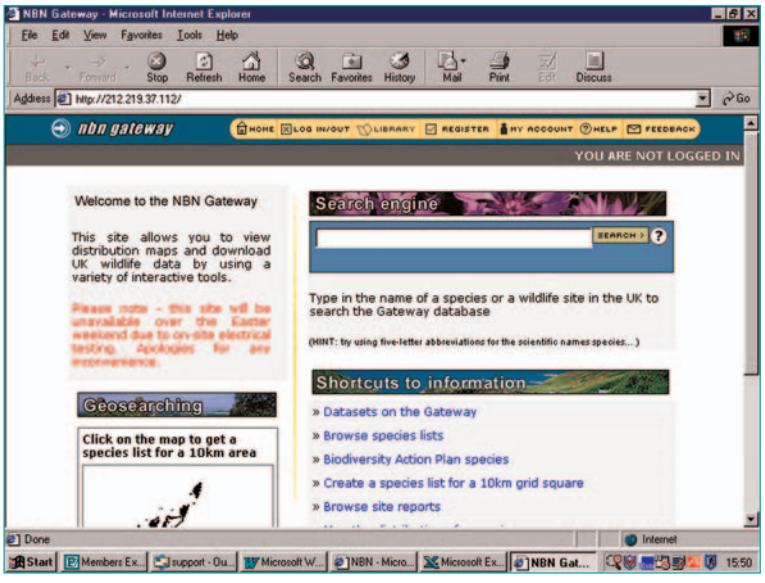

Figure 1. The Gateway website

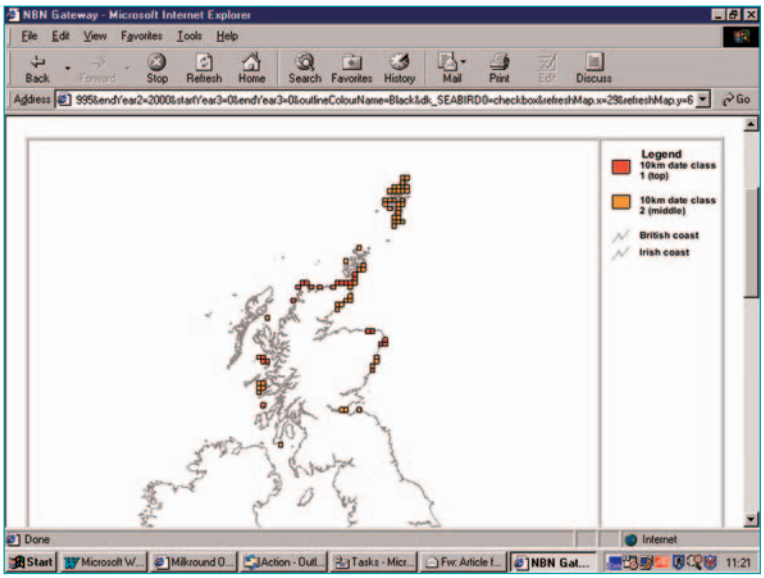

Figure 2. Species distribution mapping on the Gateway

- Select a species and get a list of the protected sites that it has been recorded in
- Use interactive mapping to plot the recorded distribution of a species. It is then possible to zoom in and select individual points to get more information on what was recorded there. It includes map backdrops, including OS 1:50 000 tiles, to provide context

This year the priority of the NBN is to increase the number of datasets held on the Gateway, so it is ready for operational use. The rate of uploads has increased dramatically this year, with over 250,000 new records added in March alone. The Gateway team hope to load all the marine data held by JNCC and country agencies, data collected by the Environment Agency and datasets from *Mar*LIN in the near future. This will ensure that a large proportion of the data held is from marine recorders, though currently the Gateway has the majority of inshore marine data.

Marine NBN

*Mar*LIN (www.marlin.ac.uk) is the marine node of the Network. The NBN Trust began a major project with *Mar*LIN in 2001 to allow them to participate fully in NBN development by contributing data and providing a focus for marine recording.

*Mar*LIN is an Internet initiative of the Marine Biological Association of the UK to provide information to support marine environmental management, protection and education. *Mar*LIN achieves this with the NBN through three programmes:

- **Data Access** - Providing marine life survey data that can be accessed through the Internet. It is possible to search and view datasets by species or by location using the maps. The data displayed shows species counts, abundance or presence/absence as well as any physical data (e.g. depth or substratum, where provided). The *Mar*LIN team import data from professional surveys and amateur recording into a standard database structure. All data are validated then displayed on the Web site, and also fed into the NBN Gateway. The Gateway allows data collated by *Mar*LIN to be viewed against other surveys and mapped
- **Biology and Sensitivity Key information** - Reviews on marine species and habitats targeting information required to support marine environmental management, protection and education, and to assess the sensitivity of species or biotopes to environmental perturbation. The key information reviews use defined categories to present large amounts of information in a short, concise manner. Pages can be accessed through the NBN Gateway
- **Recording and education** - This project aims to increase awareness of the marine environment by presenting species information in a simple format. *Mar*LIN is keen to encourage data recording and the NBN intends to provide the means for training new marine recorders through existing links with LRCs and national societies

Marine recorders, as with other voluntary sector personnel, have had sponsored attendance provided for NBN Trust meetings, including the annual conference, through funds provided largely by the Heritage Lottery Fund. The NBN Trust is also sponsoring this year's Marine Life Recording Conference in July, being organised by the Marine Biological Association as an NBN Trust member, which will enable voluntary marine recorders to attend and receive the published report of the meeting.

The NBN is about making biodiversity information available to all potential users. The Network is able to support data recorders and custodians and ensure they have all the tools needed to evaluate biodiversity information effectively. By providing a standardised method of recording and presenting data, it offers the opportunity for all organisations involved in nature recording to be able to share their information. The NBN is also a 'shop window' for information, and the functionality of the Gateway could be used to present information from a number of sources via individual websites, as well as enabling access to other data.

It is vital that data collectors and nature organisations are able to compare and exchange data effectively in order to evaluate and consolidate their conservation efforts. It is only through the participation of individual recorders and societies that we can mobilise biodiversity information and ensure it is available to all who need it.

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With thanks to Jon Parr, MarLIN

Data!

This article has been prompted by my recent involvement with a number of people from a wide variety of organisations, all talking about data, or even worse, metadata! Specifically, we have been talking about ways people and organisations can get together to share this expensive stuff we call marine data, 'for the public good'. Whatever the result of these deliberations, it will not be a holy grail of marine data access. This could be every data point seamlessly integrated, geographically referenced and thoroughly documented with metadata, all navigable using map-based tools and sophisticated search engines, and only limited by Heisenberg's Uncertainty Principle. He summarised this with prophetic clarity, well before GIS superseded the word "map" and GPS gave everyone and everything a position, as:

The more precisely the position is determined, the less precisely the momentum is known in this instant, and vice versa.

(Uncertainty paper, 1927)

The search for The Holy Grail consumed time, resources and ultimately failed, containing a lesson methinks. Better, I suggest, to remember Vilfredo Pareto and his famous 80:20 rule, expressed more eloquently as:

'A minority of input produces the majority of results'

This will work, even for so precise a thing as data. I am seeking a rapid and reasonably complete solution, now, rather than a search for perfection later, however theoretically desirable and universally applicable.

Even a partial system would allow us to overcome one of the main obstacles that exists now, that is a more rapid internal and external access to more standardised data with collaborative use, through pre-established, simple, processes. Co-ordinated local solutions along established, active links would provide a Pareto version to meet most needs. This would promote and enhance the existing interchange of knowledge which is, after all, the whole point. Focussing solely on the interchange of data would miss that point.

There is a tendency to mistake data for wisdom, just as there has always been a tendency to confuse logic with values, intelligence with insight. Unobstructed access to facts can produce unlimited good only if it is matched by the desire and ability to find out what they mean and where they lead. Facts are terrible things if left sprawling and unattended. They are too easily regarded as evaluated certainties rather than as the rawest of raw materials crying to be processed into the texture of logic. It requires a very unusual mind, Whitehead said, to undertake the analysis of fact. The computer can provide a correct number, but it may be an irrelevant number until judgement is pronounced.

Norman Cousins (1912-1990).

I note that this was written in 1981. This was before Google and the Internet, and all the other paraphernalia of distraction and infinite possibilities of doing neat things, abounded as a reality, rather than the hope that stemmed from the toys of the age. When Cousins wrote this I owned a Sinclair ZX81 personal computer, so named after the year, 1981. It had 1 kilobyte of core memory. The memory in my laptop has increased by several orders of magnitude and yet the problems outlined above are still here, why? Because they are people problems and need people solutions; the data and the technology will follow but it cannot lead. We are the problem. Lets get the data issues out of the way and start thinking about using it; far more interesting and, with all due apologies to data and IT people, far more useful.

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