

## Theme Session R

### Environmental and fisheries data management, access, and integration

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#### ICES CM 2008/R:01

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##### **OLFISH dynamic data logger: a complete solution for the recording, reporting, and transmission of commercial fishing data**

Amos Barkai, Karl Geggus, Fatima Felaar, Zahrah Dantie, Arno Hayes, and Daniel Glago

OLRAC ([www.olrac.com](http://www.olrac.com)) is a Cape Town-based company which specializes in the development of analytical and IT solutions for the commercial fishing industry. In 2005, OLRAC joined a consortium made up of a number of groups (academic institutions, governmental bodies, and commercial companies). The consortium was created and led by the EU Joint Research Committee (JRC) and was named CEDER (Catch, Effort and Discard Estimates in Real time). Its main objective was the development of a correlation model based on VMS data in order to improve estimates and shorten the reporting time of fishing effort, catch, and discard. As part of its obligations to the CEDER project, OLRAC took upon itself to modify elements of its OLFISH software, in order to make it compatible with some of the CEDER objectives. The outcome of OLRAC's efforts is a much simpler version of its OLFISH software which was named OLFISH-DDL (dynamic data logger). ~~OLFISH-DDL presents a simplified data capture front-end to the OLFISH suite of tools. The DDL can be customized to match the data collection requirements of any fishery or fishing authority.~~ As a matter of fact, the DDL can collect any type of data in any language for any vessel-based activity, fishing or otherwise. The DDL allows the user to specify the recipient(s) to be reported to and the field list is updated accordingly. Once data have been entered, the DDL intelligently generates reports for the authorized recipient, whether federal government, individual states, commercial companies, observer's company, scientific committees, etc. It also allows the user to display, save to disk, or e-mail the reports using any on-board satellite or cellular communication system. Data in the DDL can be entered in list form or logsheet-like form. All fields in both methods have predefined dropdown lists. Numeric input data can be constrained to certain maximum/minimum ranges and all input data can be reordered, made compulsory, remembered, made invisible, and validated. The OLFISH-DDL presents a simplified dynamic data-capture front-end to the OLFISH suite of tools. The DDL can be customized to match the data-collection requirements of any fishery or fishing authority. The DDL also provides a scheduling tool that continuously monitors the data entered by the user and generates reports on due dates. The DDL includes a GIS component for real-time tracking and presentation of vessel activities. Data from the DDL can also be transferred to the OLFISH "data centre" module for more in-depth analysis and presentation.

Keywords: elog, fishing data, electronic logbook, OLFISH, VMS

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#### ICES CM 2008/R:02

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##### **Discovery, access, interoperability, and visualization features of a web interface to oceanographic data**

Robert C. Groman, Cynthia L. Chandler, M. Dicky Allison, Peter H. Wiebe, and David M. Glover

The Biological and Chemical Oceanography Data Management Office (BCO-DMO) was created to serve investigators funded by the US National Science Foundation's Biological and Chemical Oceanography Sections as a location where marine biogeochemical and ecological data and information developed in the course of scientific research can easily be disseminated, protected, and stored on short and intermediate time-frames. Our main objective is to support the scientific community through improved access to ocean science data. Interdisciplinary scientific research, which is fundamental to fishery and environmental assessments, is easier when related data and information are made readily accessible. The BCO-DMO web-based interface to data collected during many large and small oceanographic research programmes, involving hundreds of scientific investigators, enhances the investigator's ability to discover, access, visualize, and integrate these data. Through the Internet, web browsers allow access to hundreds, if not many thousands of datasets of potential use to a researcher. We have made significant progress in developing a web-based, non-proprietary solution to access, display, and retrieval of oceanographic data and information. Our approach takes advantage of existing software, tools, and standards to ensure full data utilization for researchers, assessment managers, and the public.

Keywords: interoperability, web access, data discovery, data visualization.

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### ICES CM 2008/R:03

#### The IODE/JCOMM standards process

Robert Keeley

In January 2008, a jointly sponsored IODE and JCOMM meeting was held to begin the recommendation of standards to be used by both oceanographic and marine meteorological communities in the processing, management, and dissemination of marine data. The meeting was limited to about 20 participants to prevent overloading the meeting objectives with the large scope of such a project. This presentation will provide an overview of the topics discussed and for which initial agreement was reached as well as those for which agreement was not attainable. Most importantly, the meeting decided on a process to engage the wider community to validate the agreements reached at the meeting and to build the broad community support needed to establish a community standard. It is expected that by the time of the ICES meeting, the first test cases for the developed procedure will be working through the process. The author will report on progress and invite ideas to improve the procedures.

Keywords: standards IODE JCOMM.

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### ICES CM 2008/R:04

#### Evaluating ecosystem overfishing on a global scale using loss in secondary production

Marta Coll, Simone Libralato, Sergi Tudela, Isabel Palomera, and Fabio Pranovi

Fisheries have an impact both directly and indirectly on populations, communities, and habitats, and thus impinge on ecosystems, modifying their structure and functioning. The loss in secondary production caused by export of biomass and energy in the form of catches from exploited ecosystems has been theoretically quantified as an integrated proxy for evaluating the impact of fishing activity at the highest hierarchical level. This approach represents an integration of previous analyses designed to quantify the sustainability of fisheries at the ecosystem level and is here applied at a global scale. We use this proxy to quantify the historical and current impact of marine fishing activity by assessing the depletion of secondary production using the best available fisheries and ecological data for large marine ecosystems and open sea areas from 1950 to 2004. Results highlight a general negative trend of fishery sustainability from the 1950s to the 2000s, although disaggregated data are allowed to detect the different historical trends for specific areas. The analysis evidences the need to notably reduce current catches to achieve an acceptable level of sustainable exploitation and highlights that, at present, catch doubles the value assessed to ensure a moderate sustainability of fishing. [?Q1]

Keywords: fishing effects, ecosystem-based approach to fisheries, loss in production, LME, open sea.

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### ICES CM 2008/R:05

#### Cruise planning and reporting in FIMR—an integrated system for information and data

Pekka Alenius

Research cruises have been planned and managed by the Finnish Institute of Marine Research via a homemade system since the early 1980s. The system gives the chief scientist integrated tools for handling cruise information and data. The heart of the system is the cruise plan in XML, and the system includes cruise planning in text and map modes, an information channel on board RV “Aranda”, updates of the cruise plan on arrival and departure from a station, data exchange from the ship to the institute, semi-automatic cruise reporting with CSRs, and preliminary data analysis. The system collects information from the ship’s weather station, navigation system, database, and files generated by instruments. An outline for a cruise report with figures can be generated automatically. The on-board information channel has been in use since 1990. It delivers real-time information on the cruise through the video network of the ship according to a manuscript written by the chief scientist. The data exchange between the ship and the institute makes it possible to follow the ship’s route and weather conditions during the cruise on the Internet. CTD and nutrient profiles are also transmitted from the ship regularly. The system can be developed by a user for other users: a principle that may be a key to useful functionality.

Keywords: cruise, information, data, integrated system.

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**ICES CM 2008/R:06****Pacific-wide marine metadata discovery, management, and delivery: the PICES Metadata Federation**

Bernard A. Megrey and S. Allen Macklin

The Member Countries of the North Pacific Marine Science Organization (PICES) separately maintain vast quantities of marine ecosystem data. To support the detection and prediction of ecosystem change in the North Pacific Ocean, it is beneficial to discover data holdings with a single search, rather than having to access each country's records, perhaps stored in different languages and formats. We report on the creation of a PICES "metadata federation" of Member Countries (Canada, People's Republic of China, Japan, Republic of Korea, Russian Federation, and USA). Through English-language coding of metadata using the Federal Geographic Data Committee standard, acquisition, installation, and configuration of ANSI Z39.50-1995 (ISO 10163-1995) open-source communications software on a public-access server, and registration with a clearinghouse, it is possible for any metadata-serving agency to become part of the PICES Metadata Federation. The Federation allows an Internet user to search the collected metadata holdings of any or all members, thus providing access to information across national holdings in a single search. To date, metadata collections from Japan, the Russian Federation, Republic of Korea, USA, and China are federated. This activity supports PICES' goals: (i) to promote and coordinate marine scientific research in the northern North Pacific and adjacent marginal seas; (ii) to advance scientific knowledge of the ocean environment, global weather and climate change, living resources and their ecosystems, and the impact of human activities on them; and (iii) to promote the collection and rapid exchange of scientific information on these issues.

Keywords: metadata, data sharing, ecosystems.

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**ICES CM 2008/R:07      Poster****A system for rapid data discovery, display, integration, and download**

Richard Franks, Nicholas Wolff, Bruce MacLeod, David Briggs, and Lewis Incze

Research into the diversity of species that populate the Gulf of Maine and the physical conditions that may affect species distribution and abundance is urgently needed in order to manage and conserve the ecosystem. Our primary goal has been to develop a general, dynamic system that facilitates the discovery, display, and integration of physical and biological data from multiple sources, each having independent spatial and temporal components. The culmination of our work is a computational mechanism that allows researchers to efficiently explore relationships among the data over the internet and download the selected, integrated data for further analysis in the investigator's own environment. The web-based application allows the user to dynamically select desired combinations of data and customize the display. The system is based on a data mediator that supports a set of data translators and facilitates integration from multiple sources. These include model output, Web Feature Service (WFS) products, shapefiles, and data from other spatially enabled database management systems (DBMSs).

Keywords: data integration, internet mapping, Ocean Biogeographic Information System, species distribution, ocean observing.

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**ICES CM 2008/R:09****An integrated database system for the management of large volumes of tagging data**

J. Hartog, P. Jumpanen, S. Cooper, R. Bradford, T. Patterson, and K. Hartmann

Recent advances in tag technology have resulted in an explosion of data for fishery scientists. Effective handling of this volume of data is a major challenge, and is an essential step before data analysis can be performed. Tag specifications also change with product development, and so data handling must be flexible to these changes. An extendable relational database system has been developed to store data from a variety of tags (conventional and electronic) from different manufacturers, including archival tags, satellite tags, and acoustic tags. This system is maintained with limited human intervention: the data are downloaded,

processed, and stored using automatic computer processes wherever possible. The design of the system allows us to incorporate new methods of analysis, such as geolocation refinements, when they become available. Tagging data is expensive and needs to be managed with care, and the systems described ensure that these data are available for researchers' use in real time and that the data are backed up in numerous ways, permitting data recovery. Deployment information can be entered into the system remotely via the Internet and data can be retrieved from local servers or via the Internet. Environmental data from a variety of sources are also managed by the system and are made available for tasks such as geolocation refinement and behavioural studies. Data access standards such as ODBC allow the data to be analysed in software packages such as R and MATLAB. In order to visualize spatial data, open-source solutions are employed to stream location data into MapServer and Google Earth. Centralizing the data storage has allowed flexibility in data access, quality control, exploration, and analysis.

Keywords: electronic tags, relational database, information management, open source technology, environmental data.

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#### ICES CM 2008/R:10

### Quantifying the effect of quality control of taxonomic names in OBIS

Edward Vanden Berghe, Tony Rees, Nicolas Bailly, and Mike Knazek

Often environmental data are the result of projects with a limited temporal and spatial cover. Taken in isolation, datasets resulting from these projects are only of limited use in the interpretation of large-scale phenomena. More specifically, they fail to inform on a scale commensurate with the problems we are confronted with: global change, invasive species, harmful algal blooms and the loss of biodiversity. Individual studies are restricted in the amount of data they can generate, but by combining the results from many studies, massive databases can be created that make possible analyses on a different scale. The Ocean Biogeographic Information System (OBIS, <http://www.iobis.org>) integrates data from a vast number of individual databases/datasets. This integration necessitates the strict application of controlled vocabularies to assure that content from the different sources is properly interpreted. For taxonomy, two databases have recently attained sufficient completeness to be usefully deployed in such quality control: the World Register of Marine Species (WoRMS, <http://www.marinespecies.org>) and the Interim Register of Marine and Non-Marine Genera (IRMNG, <http://www.obis.org.au/irmng/>). Both automated and manual clean-up was done on the OBIS taxonomic names as they were supplied to the system by its data providers; the manual method was only performed on a relatively small group (rays and sharks). Statistics were calculated on the number of name strings that ultimately resolved to the same correctly spelled name and to the currently accepted name. General trends of diversity were calculated on the raw names, the cleaned-up names, and the accepted names, and the resulting maps compared with each other.

Keywords: biodiversity, biogeography, data management.

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#### ICES CM 2008/R:11

### The Ocean Biogeographic Information System: past, present, and future

Fred Grassle, Edward Vanden Berghe, Mark J. Costello, and Fabio Lang da Silveira

The Ocean Biogeographic Information System (OBIS), established by the Census of Marine Life programme, is an online, freely accessible system for absorbing, integrating, and assessing data on life in the oceans. OBIS aims to stimulate taxonomic and systematic research, and generate new hypotheses concerning evolutionary processes, maintenance of species distributions, and roles of marine organisms in marine ecosystems. Today, OBIS contains more than 13.7 million records of 80 000 species from 280 databases. Analysis shows geographic gaps in data for the mid-oceans and deep sea, and taxonomic gaps for invertebrates; a significant part of the bias is the result of real differences in observer effort between countries. However, the present content makes it possible to start analysing the data so as to reveal global biodiversity patterns. Several biodiversity measurements are calculated and presented. Care was taken in interpreting such metrics because of sampling bias. The present infrastructure supporting the OBIS database and website is being remodelled to allow better interoperability with other systems. Service orientated architecture (SOA) will facilitate dynamic exchange of data with other databases and enhance use of the OBIS database.

Keywords: biodiversity, biogeography, data management, data integration.

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**ICES CM 2008/R:12****Powerful integration and visualization of complex fishery and environmental data using Eonfusion**

T. Pauly, J. Hemer, M. Wilson, W. Gillespie, and J. Corbett

Fisheries scientists are faced with the challenge of integrating fisheries with oceanographic and other marine and atmospheric environmental data. Typically, the temporal, visual, and analytical components of data integration are not handled well within a single software application. Eonfusion is four-dimensional (4D) visualization and analysis software, which significantly enhances the ease with which scientists can integrate complex ecological and environmental data, and share methods across disciplines. It handles large volumes of data in a variety of formats, and supports the fusion of different data types. Eonfusion bridges specialist domains such as physical oceanography and fishery biology, and allows the analyst to rapidly visualize trends and patterns and pose novel questions regarding feature relationships in an integrated context. By supporting coincident visualization and analysis of, for example time- and geo-referenced sensor data, bathymetry, spatial management, and oceanographic data, Eonfusion facilitates the detection of species' responses to management regimes and patterns of movement with oceanic events. Multiple datasets can be fused into a single set with shared coordinates, allowing the discovery of topological relationships between coincident data items. These relationships also allow data attributes to be directly compared and transferred between datasets. Eonfusion's development was undertaken with the support of leading researchers around the world to meet the demands of the latest ecological research tools and technology. In this paper we present real-world examples of fishery, oceanographic, and environmental data which are integrated and visualized in Eonfusion to reveal relationships about marine species and their environment, and inform management decisions.

Keywords: data integration, visualization, analysis, four-dimensional, fisheries, oceanography, environmental, software.

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**ICES ASC 2008/R:13****A GIS interface to the French fisheries information system of Ifremer**

Valérie Harscoat, Emilie Leblond, Mickael Treguer, and Patrick Berthou

The Fisheries Information System of Ifremer aims to build an operational and multidisciplinary monitoring network for scientific purposes, allowing a comprehensive view of fishery systems including their biological, technical, environmental, and economical components. One of its objectives is to elaborate and provide data and indicators for a widespread public (researchers, fishers, administration, the general public), including bioeconomic diagnostics and assessment of the short- and long-term impacts of fishery management scenarios and measures. To further an integrated analysis of the fishery systems, a wide range of types of data (landings, efforts, biological or environmental observations, economic data) are managed in a single data management system, based on an integrated relational database with geographical facilities. A recent Ifremer development has been the design and set-up of a geographic information system (GIS) interfaced with the Fisheries Information System (FIS) integrated database. Several data sources are combined together in the GIS, including the FIS fishery data, but also complementary data such as regulation and administrative information, environmental, physical, and climatology layers. For the fishery data, the GIS is interfaced to the data warehouse-like part of the database, made up of aggregates generated regularly on the "raw" data (as collected within the FIS system). With the GIS interface, the FIS gives stakeholders a comprehensive, integrated, and readable overview of fishery activity. This GIS will be available online by the end of 2008 on the FIS website (<http://www.ifremer.fr/sih>), by controlled access (login/password) and in a public version (restricted data access).

Keywords: geographic information system, fisheries, indicators, integrated database.

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**ICES CM 2008/R:14****Integrating historical naturalists' descriptions and statistical-scientific data to describe changes in fish assemblages over the last two centuries in the northern Adriatic Sea (Mediterranean)**

Tomaso Fortibuoni, Otello Giovanardi, Simone Libralato, Saša Raicevich, and Cosimo Solidoro

Setting a clear baseline of what lived in the oceans at a particular time is a prerequisite for the calibration of sustainable use policies that do not ignore the fact that men have exploited marine resources since ancient times. This is why the integration and comparison of ancient and modern data is unavoidable. The main challenge, however, is the lack of quantitative data prior to the twentieth century (and sometimes even after). This is particularly true in the Mediterranean region, where monitoring programmes for assessing the status of alien resources cover at most the last 30 years. Therefore it is necessary to consider other sources of information, such as qualitative or semi-quantitative descriptions of marine animal populations or proxy data. In the framework of the History of Marine Animal Populations programme we have collected historical information on northern Adriatic fish fauna from libraries and archives of Trieste, Venice, Chioggia, Split, and Rome. A database was compiled with the information reported by 36 Italian and Austro-Hungarian naturalists between 1818 and 1956, including descriptions and information for 396 fish species concerning their presence/absence, frequency, habitat preferences, seasonality, catchability, size, etc. The occurrence of species was attributed, according to naturalists' descriptions, over a semi-quantitative scale allowing us to reconstruct temporal trends of species, group of species, and ecological and biological indicators. Furthermore the naturalists' database has been integrated and compared with modern statistical data (landings statistics and trawl surveys) to assess the potential of this approach for reconstructing long-term changes of fish communities.

Keywords: fishing impact, shifting the baseline, naturalists, historical data, Adriatic Sea.

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#### ICES CM 2008/R:15

### **Visualization of the clustering of acoustic echotraces using topology-preserving mapping. Application to juvenile anchovy in the Bay of Biscay**

M. Peña, S. Georgakarakos, and G. Boyra

Species allocation to acoustic echotraces is still nowadays the weak point of fishery acoustics. The expertise of the acoustician in combination with ground-truth samples is the only source of knowledge for this task. Different procedures have been investigated in order to make the allocation of species automatic by considering a school's descriptors (shape, energy, and spatial distribution), but the limited successes are in general restricted to the area and species applied. In this paper we use self-organizing maps (SOMs), neural networks with preservation of the topology, in order to visualize the projection of the data in a two-dimensional grid. These are unsupervised techniques, i.e. classes are not included in the clustering, but just used to colour the projection of the different classes. We applied SOMs to data from two acoustic juveniles surveys focused on anchovy carried out in the Bay of Biscay and then used simple principal component analysis (PCA) to compare the projections. Although PCA shows a projection with overlap of the clusters, SOM is able to provide a more accurate separation, also giving general measures of clustering and topology preservation errors, several visualization tools for the mapping, and individual allocation to a neuron with its corresponding error. This is a first approach for the clustering of school echotraces in a case where there is spatial separation of anchovy (by latitude, longitude, and depth); future work will be done in areas where pure schools of anchovy are surrounded by other species.

Keywords: anchovy, Bay of Biscay, juveniles, self-organizing map, principal component analysis, unsupervised.

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#### ICES CM 2008/R:16

### **The Recopesca project: a new example of participative approach to collect *in situ* environmental and fishery data using fishery vessels of opportunity**

Emilie Leblond, Patrick Berthou, Martial Laurans, Patrice Woerther, Loïc Quemener, and Thomas Loubrieu

Faced with a lack of data available to assess precisely the spatial distribution of catches and fishing effort and the environmental characteristics of a fishing area, Ifremer implemented a new project in 2005 called Recopesca. It involves a sample of voluntary fishing vessels fitted with sensors recording data on fishing effort (and mid-term catches) and physical parameters such as temperature or salinity. Recopesca aims to set up a network of sensors to collect the data needed for improved resource assessment and diagnostics on fisheries, and environmental data required for ecosystem-based management initiatives. The challenge was to develop sensors which were no trouble for the fishers, tough enough to be fixed to fishing gears, self-powered and autonomous. Insofar as the sample of targeted vessels intends to be representative of all the métiers and fleets, the sensors are modular and scalable to collect new data. Different sensors have been tried:

(i) a temperature–salinity sensor, able to record physical parameters, depth and duration of immersion, for passive and active gears, and (ii) a specific sensor to record the number or length of passive gears. A GPS monitors the position of the vessel. Each sensor is equipped with a radio device that transfers the data to a receiver on board called a “concentrator”, which sends the data to Ifremer central databases by general packet radio service (GPRS). An anti-rolling weighing scale is currently in development to record catches per species and fishing operation. This presentation shows the first data and results of this participative approach.

Keywords: fishing vessels, participative approach, fishing effort, catches, environmental parameters, temperature, salinity, ecosystem-based approach.

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## ICES CM 2008/R:17

### **Towards interoperability and cooperation for the sustainable management of the St Lawrence ecosystem**

J. Hamel, S. Hurtubise, and B. Pelchat

Large amounts of data are regularly collected by various organizations carrying out their monitoring or research activities on the St Lawrence ecosystem in response to a common need to better understand, model, or predict changes that occur in the environment. However, access to such a wealth of information is often proven inefficient owing to the lack of a common framework ensuring interconnections between organizations, data registries, systems, and user interfaces and fostering the use of recognized standards. The vision behind the St Lawrence Global Observatory (SLGO) initiative launched in 2005 is to provide efficient web access to timely and accurate data and information from a network of federal, provincial, academic, and community organizations for the sustainable management of the St Lawrence ecosystem. The synergy created by clustering the means and expertise of the member organizations results in optimizing information dissemination, reducing duplicated efforts and identifying data gaps. It also helps to support planning and decision-making processes in areas such as public safety, climate change, resource management, and conservation. This multidisciplinary and innovative approach is based on web service development in a service-oriented architecture (SOA) and on access to distributed data assets including a broad range of real-time and archived data as well as modelling, forecasting, and operational services. Pilot and demonstration projects led by Fisheries and Oceans Canada have allowed a team of programmers and scientists to develop the concept of web data services (WDS), to implement several WDS, and to successfully deploy web-based client applications that exploit them.

Keywords: interoperability, web data services, data access, observatory.

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## ICES CM 2008/R:18

### **A system for online assessment of fish welfare in aquaculture**

Lars H. Stien, Trygve Gytte, Thomas Torgersen, Helge Sagen, and Tore Kristiansen

Aquaculture sea cages can now be more than 30 m deep. It has therefore become next to impossible for fish farmers to form a complete picture of the welfare of the fish. It is consequently important to develop an automatic system for continuous assessment of fish welfare in sea cages. One such system under development is the Welfaremeter. The Welfaremeter consists of a profiling probe (CTD), a control unit, a database, an expert software program, and an Internet webpage. The probe measures temperature, oxygen, salinity, fluorescence, and turbidity for each half meter downwards in the cage. The control unit directs how often the probe performs a profiling and sends the measurement data via the mobile phone network (GPRS) to a database at the Norwegian Marine Data Centre, Institute of Marine Research. These data are then analysed by expert software which gives an evaluation of the environmental conditions in the cage as either very good, good, or potentially harmful for the fish. Future versions of the expert software will also give possible reasons for poor environmental conditions and advice, if possible, on how the farmers can remedy the situation or at least diminish harm to the fish. The large numbers of fish farms in many coastal zones means that the Welfaremeter has potential as a future source of data for environmental and fishery research. The purpose of this paper is to give an insight into different lessons learned so far in creating the Welfaremeter and how we plan to improve the system further.

Keywords: fish welfare, CTD, GPRS, expert software.

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**ICES CM 2008/R:19**

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**Three oceans of data management and beyond, a Centre for Marine Biodiversity view**

Bob Branton, Dan Ricard, and Peter Lawton

The Centre for Marine Biodiversity (CMB) ([www.marinebiodiversity.ca](http://www.marinebiodiversity.ca)) is a virtual organization aiming to focus scientific research on marine biodiversity in the North Atlantic (including the Gulf of St Lawrence). The CMB has also been a sponsor of Canadian national level discussion on research agendas resulting in a plan titled “Three Oceans of Biodiversity—Development of a Science Plan for Marine Biodiversity in Canada”. Since its inception, the CMB has recognized the importance of publishing marine data via international standards as a basis for creating Canadian ocean biogeographic informatics expertise. Having been engaged in international capacity-building initiatives such as the Gulf of Maine Ocean Data Partnership (GoMODP) and the Ocean Biogeographic Information System (OBIS), the CMB now has considerable expertise in areas of scientific collaboration, ontology, and knowledge management and data visualization. The Census of Marine Life research projects currently benefiting from this include: Future of Marine Population (FMAP), Natural Geography of Inshore Areas (NAGISA), and the Gulf of Maine Area Program (GoMA). In addition, two new research networks: Ocean Tracking Network (OTN), and the Coastal and Ocean Information Network for the Atlantic (COINAtlantic) have selected the eoinformatics model being developed by CMB as a basis for their own cyber infrastructure. In this presentation we give a timeline of events leading to the present situation, a description of our present technical infrastructure, examples of current products and services, and, finally, a look into the future of collaborative data management as it might relate to the newly emerging Canadian Healthy Ocean Network (CHONE) project.

Keywords: data integration, scientific collaboration, ontology management, knowledge management, data visualization, cyber infrastructure.

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**ICES - CM 2008/R:20**

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**Fisheries data qualification: a procedure in progress at Ifremer**

Vincent Badts and Stéphanie Mahévas

Advice on fishery management is a product of a fishery's data quality (market landings samplings, catch samplings on-board, biological samplings). The Planning Group on Commercial Catches, Discards and Biological Sampling (PGCCDBS) recommended in its 2007 report, a quality insurance framework such that each Member State could achieve a minimum quality control of collected data for stock assessment purposes. In order to coordinate French fishery data collection and to store the data (biological data and economic data, fishing calendars) in a common database, Ifremer has developed a Fisheries Information System (FIS) since 2000. Before 2004, few checking procedures were available to detect outliers, and stored data were assumed to be reliable without any procedure to ensure the conformity with sampling protocols. Since 2006, we have developed a data quality management approach within the context of this FIS. This approach addresses the issues of both data validation and data quality. Validating the data requires a control of the data life cycle from the collection purpose, through the sampling, to the storage: available sampling protocols and designs should be complied with, common measurement tools should be available and their use registered, and checks should be performed at the data capture. Once the data are available in the database and validated by scientists and experts, statistical analyses can be carried out to assess data quality and to deliver indicators of quality for each dataset. Supported by a pilot national working group, we applied this approach to on-board data collection. The objective was to validate the procedure in order to generalize it to others FIS activities. First we conducted an audit to assess the current of state of on-board sampling activities. Next, we (i) provided some procedures to harmonize sampling routines taking into account regional constraints, (ii) improved sampling manuals, (iii) developed appropriate forms, and (iv) recommended the use of specific measurement tools and the training of scientists to species identification. For each information input in the database, we provided an identity card containing the following items: data definition, its origin, a description, its use, some validation methods, some qualification procedures. All French scientists involved in this quality approach are spatially dispersed over the French coasts, making exchanges more difficult. Consequently, we developed a website to ensure a dynamic link between participants and a continuous update of available tools.

Keywords: quality, database, data history, fishery data.

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**ICES CM 2008/R:21**

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**Methods for the preparation and validation of groundfish population indices based on Fisheries and Oceans Canada research vessel trawl survey data accessible from the Ocean Biogeographic Information System**

Daniel Ricard, Robert M. Branton, Don W. Clark, Stephen J. Smith, and Peter Hurley

Scientific trawl surveys have been conducted in different regions of the world and by a variety of countries and agencies since the mid-1900s. Although these data are collected in a scientifically and statistically appropriate context and represent an important source of fishery-independent information for agency-specific stock assessments, their use and dissemination has often been limited to the agencies conducting the surveys. In recent years, internet data portals such as the Ocean Biogeographic Information System (OBIS) have provided an arena for the wider distribution and use of marine fish data. Despite the increased accessibility of such data, their scientific acceptability has been limited by a lack of reproducibility in data analyses. We present a methodology for the computation of time-series of groundfish stock indices using publicly available trawl survey data from the Canadian Department of Fisheries and Oceans (DFO) Maritimes region. We discuss the computational details of the analysis and provide stratified random estimates of abundance and biomass temporal trends for selected subsets of species, families, and order. The computed results compare favourably with stock indices obtained from analytical tools developed at DFO and used for stock assessments. We finally discuss the wider applicability of our methods for datasets collected under similar sampling designs and demonstrate the reproducibility of our analyses and results.

Keywords: temporal stock dynamics, trawl surveys, stratified random design, OBIS.

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**ICES CM 2008/R:22**

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**A data management strategy for multi-instrument cruises**

Pierre Clement

The collection and management of metadata at sea has become a complex exercise, with a variety of collections going on during the cruise, sometimes simultaneously. Proper at-sea collection is essential to ensuring that the descriptive metadata are accurate and preserved for future use. The Habitat Ecology Data Management Group was faced with the daunting task of developing a system to manage a complex, multi-instrument, laboratory and interdepartmental project spanning several years. We were required to provide an at-sea metadata collection and planning environment as well as act as a resource for metadata from a variety of sources over a four-year period. The intent of the project was to study if there were preferential substrates where juvenile haddock were found in a region of the Scotian Shelf. Researchers used a variety of acoustic systems to define substrate. These data were verified using images and grab samples. Species occurrence was determined using imagery, acoustics, and traditional trawl survey data. The data management challenge was to provide the resources to compile and be able to provide access to the data throughout the duration of the project. This paper describes the data management approach taken and value-added benefits of a strong data management programme. The lessons learned have been adopted for several other projects and spawned new developments in support of aspects of the approach where we found deficiencies.

Keywords: data management, digital logbook, navigation data, video, images.

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**ICES CM 2008/R:23**

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**GeoFish—visualization and analysis of particle tracking model output for fish and shellfish larvae**

Tiffany C. Vance, Scott Cross, Bernard Megrey, Sharon Mesick, and Christopher Moore

The spatial and temporal patterns of the dispersion of larvae provide insights into the interplay between physical and biological processes in the ocean. These insights can both guide our understanding of the early life history of a species and can become part of plans to manage and preserve the habitat of a fishery. Tracks for the dispersion of larvae are calculated by running a particle-tracking model on top of an ocean circulation model. The resulting spatial (x, y, and z) and temporal (t) data for tens to thousands of larvae are a rich and complex dataset. Visualizing these datasets interactively in three dimensions allows scientists to see patterns in the motions and to explore the vertical and horizontal dispersion of organisms. The tracks of the organisms can be integrated with supporting datasets including water temperature, salinity, and nutrients. A geographic information system (GIS) is an excellent tool for displaying and analysing these disparate datasets. A GIS can allow the viewer to integrate datasets and to rotate the view through three dimensions. GeoFish is an

application for setting parameters for models, running the particle-tracking model, and analysing and displaying the results. It uses GIS-based tools to create a visual interface for setting parameters to run a particle-tracking model. The output of the particle-tracking model is stored as a netCDF file, which is then analysed and visualized. GIS-based tools provide analysis capabilities such as a temperature history of the track and Java-based tools provide interactive three-dimensional visualizations.

Keywords: GIS, visualization, data integration, particle tracking, circulation model, Bering Sea, larvae.

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#### ICES CM 2008/R:24

### Developing a surface and near-bed temperature and salinity climatology for the northwest European Shelf seas

Barbara Berx, Sarah Hughes, and Hjalte Parner

A 30-year (1971–2000) temperature and salinity climatology is presented for surface and near-bed regions of the northwest European shelf seas. Data from both the ICES Data Centre and the World Ocean Database were merged to create the product. The methodology used to calculate the mean monthly distribution and the climatic mean annual cycle is discussed. This climatology will be archived at the ICES Data Centre and made freely available to all users in the marine community. We hope that the product can be updated on at least a decadal time-scale. The next steps will be to use the climatology data to provide maps of surface and nearbed temperature and salinity anomalies, on an annual and perhaps seasonal resolution. The difficulties that arise from developing such a product, such relatively slow submission of data to the data centres, and the scarcity of data on both spatial and temporal scales are discussed.

Keywords: temperature, salinity, data products, climatology.

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#### ICES CM 2008/R:25

### A proposal for a consistent use of the North Sea IBTS data

R. ter Hofstede and N. Daan

The ICES DATAbase for TRAWL Surveys (DATRAS) stores data from several international groundfish surveys in the northeastern Atlantic area and is used as a major data source for many studies assessing the status of stocks and changes in the structure, functioning, and diversity of commercial and non-target fish species and assemblages. Hence, it is essential that the data are of high quality and fully reliable for studies of the wider fish community. However, it has been highlighted before that DATRAS suffers from many problems associated with input errors, the misidentification of specific taxa, and inconsistent reporting at a range of taxonomic levels (species, genus, or family). Besides correcting identified errors, the only way to improve the consistent use of the database among subsequent analyses is to develop a protocol for a standard correction procedure of problematic records that should be followed by all users. We provide a first proposal for a standard correction procedure of one component of DATRAS, namely the data from the International Bottom Trawl Survey covering the North Sea, Skagerrak, and Kattegat (North Sea IBTS).

Keywords: data quality, misreporting, biodiversity, DATRAS, IBTS, North Sea.

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#### ICES CM 2008/R:26

### FishFrame 5.0: a web-based data warehouse application for management, access, and integration of fishery and stock assessment data

Teunis Jansen, Henrik Degel, Brian Cowan, Mads Dueholm, Ole Skov, Kirsten Håkansson, Josephine Egekvist, and Jørgen Dalskov

Present collection and processing of fish and fishery data carried out by multiple countries must be coordinated between the involved players. Collected data must have common quality standards, data handling transparency and documentation are essential, and data have to be shared in an easily accessible way among the players. In addition to the fishery institutes' access, the public needs controlled access to parts of data in the interest of public debate and stakeholder participation on policy development, and for general scientific

use. FishFrame is a web-based data warehouse application, which offers such facilities and can be accessed on [www.FishFrame.org](http://www.FishFrame.org). FishFrame is the link between nationally stored raw data and the processed aggregated data used in fisheries and stock advice and management as well as data sources for research and presentation. After seven years of experience with FishFrame versions 1.0–4.3 it was decided to work towards a new major release: FishFrame 5.0. FishFrame is being completely recoded to updated specifications, introducing many new features, with the focus on data processing (raising, data extrapolation, stock split) and output (diagrams, maps, reports, analysis, data exchange). Data confidentiality and access to data manipulation tools are handled under tight role-based security. Furthermore, it will support interfaces to external applications and data sources. The main workflow brings data through checking, raising, and data extrapolation to output. Data status is tracked to provide full documentation of data processing schemes. FishFrame is open source. FishFrame 5.0 prototype is presented here. The planned paths forward to ensure international steering, development, teaching, and funding are discussed.

Keywords: FishFrame, fisheries, stock, acoustics, assessment, data warehouse, web application, data management, data processing, data documentation, data quality control, data source, DCR.

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ICES CM 2008/R:27

Poster

### Quality control of bottle data at Institut Maurice-Lamontagne (Department of Fisheries and Oceans Canada)

Laure Devine and Caroline Lafleur

This poster outlines the quality control (QC) tests that we apply to analyses of discrete seawater samples before the data are distributed and archived. Whereas standardized quality control tests are routinely run on water column data (conductivity–temperature–depth profiles), they are less well-defined for discrete measurements and not widely applied. Our QC includes the validation of temperature, salinity, chlorophyll, dissolved oxygen, nitrate, nitrite, phosphate, and silicate data from discrete samples. The QC procedure is composed of a set of tests that can be divided into five steps: (i) tests validating the important metadata such as the time and position, (ii) tests comparing data values within a profile, (iii) comparison of the profile with a climatology, (iv) comparison of all profiles from the same mission, and (v) visual inspections of station data (ratios and profiles) and of data from the entire mission (replicates, bottle vs. CTD measurements, ratios and profiles, variable patterns with time). We describe the individual tests, give examples of data identified as questionable during the QC procedure, and discuss how we flag data points to indicate their quality.

Keywords: quality control, bottle data, nutrients, dissolved oxygen, chlorophyll.

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ICES CM 2008/R:28

Poster

### COPEPOD-QC: a visualization technique for the quality control of plankton data

Todd D. O'Brien

The Coastal and Oceanic Plankton Ecology, Production and Observation Database (COPEPOD) is an online collection of zooplankton and phytoplankton biomass, abundance, and composition data from around the world. COPEPOD's data content ranges from historical cruises and projects to results from ongoing time-series and monitoring programmes. The database is available online (<http://www.st.nmfs.noaa.gov/plankton>), accessed via searchable indices and graphical content and metadata summaries. One of the biggest challenges in compiling a database of such a broad range of historical methods and varying data types is the quality control of these data. COPEPOD has developed an advanced quality control review and flagging system to accomplish this task (COPEPOD-QC). Each observation going into COPEPOD is categorized by measurement type (i.e. a whole sample biomass vs. a species count vs. a combined group count), by net mesh size, by sampling time-of-day, and by month or season. These categorized observations are then compared with the thousands of other same-category observations already present in the full database. Through a process of statistical checks and graphical visualizations, anomalous values are quickly identified, verified against the original data source, and then assigned one of nine incremental quality ranking flags (indicating the extent of that value's anomaly). This presentation summarizes the categorization and visualization methods of this technique, showing actual examples of common translation and keying errors that can occur during plankton data digitization and database population, and how they are detected by this technique.

Keywords: zooplankton database, phytoplankton database, data quality control, data visualization, plankton data rescue.

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ICES CM 2008/R:29      Poster

**NMFS-ECHO: a synthesis of baseline ecosystem conditions to facilitate ecological analyses and fishery management**

Todd D. O'Brien and Ned Cyr

The Ecosystem Climatologies and Historical Observations project (ECHO) is an initiative of the National Marine Fisheries Service (NMFS) to document baseline ecosystem conditions in support of ecological analyses and fishery management. In marine ecosystems, environmental drivers such as water temperature, salinity, and primary production affect the growth, fecundity, and recruitment of larval and adult fish. Global change could mean changing environmental drivers and habitats for these populations. To better understand these changes and the natural variation, researchers first need to know the long-term average character of these environments. Although over 50 years of sampling and monitoring data exist for many of these areas, they are not always available in a form that can be easily or immediately applied. Using NMFS survey data coupled with the millions of historical hydrographic records archived at the National Oceanographic Data Center, ECHO presents satellite-like, high-resolution oceanographic mean fields of common hydrographic variables (e.g. temperature, salinity, dissolved oxygen, nutrients) and NMFS survey variables (e.g. zooplankton biomass, fish egg and larvae abundance) created from over 50 years of sampling and monitoring cruises. Available online (<http://www.st.nmfs.noaa.gov/echo>), ECHO's long-term (climatological) and short-term (pentadal/decadal) mean fields summarize surface to depth environmental conditions to help scientists understand the current and long-term trends in these environments over space and time.

Keywords: marine ecosystems, environmental conditions, climatologies, fishery management, ecosystems assessments.

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ICES CM 2008/R:30      Poster

**An assessment of sampling protocols, data assembly, and data integration in the northeast**

Glenn Chamberlain

The current system of managing fisheries through days at sea has been criticized for encouraging discards while decreasing available fishing days to the point where it is not economically feasible to go fishing. Meanwhile, sector management has moved to the forefront as a proposed new tool in managing fisheries. To achieve success in the transition from days-at-sea management to sector management, the data assembly and integration process must be overhauled. Streamlining this process would ensure that scientists make timely and correct recommendations to managers and councils. At-sea sampling conducted during fishing operations in the northeast region of the USA is completed by certified National Marine Fisheries Service observers. Estimation of bycatch, discards, and fishing regulations in general are heavily dependent upon data gathered as a result of observer coverage, so it is critical that the best possible methods are being used to gather these data. A review of the equipment currently being used to conduct this sampling and suggestions for improvements in this area are included in this study. The equipment review includes but is not limited to use of scales, calipers, and net mensuration gear. Improvements to age-structure gathering methods and catch estimation are also explored. Monitoring systems that expedite the dissemination of data collected will be experimented with to ensure that managers and scientists receive accurate data to make decisions as quickly as possible. We plan to investigate these ideas further with collection of relevant data through field experiments in 2008 and 2009.

Keywords: sector management, at sea sampling, monitoring systems, observer coverage.

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ICES CM 2008/R:31      Poster

**A user-friendly web interface to marine data**

Riitta Olsonen, Riikka Hietala, Kimmo Tikka, Pekka Alenius, Juha-Markku Leppänen, and Mikko Virkkunen

Simultaneous examination of observations on the same display of time-series, seasonal variation, and vertical profiles is now permitted by a new technique. This service is available at two public websites and is also used internally at the Finnish Institute of Marine Research (FIMR). The FIMR's Data Portal Havaintohaavi

([http://www.fimr.fi/en/tietoa/helcom\\_seuranta/en\\_GB/bmp\\_data/](http://www.fimr.fi/en/tietoa/helcom_seuranta/en_GB/bmp_data/)) enables users to view essential monitoring data from 16 stations that cover the whole Baltic Sea and to download the data freely for their own use. With the HELCOM system (<http://www.helcom.fi>) the user is, in addition, able to link observations to Cruise Summary Reports on ICES and SeaDataNet (BSH) websites. It is also possible automatically to upload restricted data for internal use by HELCOM workgroups. A similar interface is in use with the new FIMR Sumpu database, which includes miscellaneous tools for data searches. The interface is based on innovative integration of rich Internet applications (RIA) to powerful relational database technology and state-of-the-art *n*-tier client-server architecture. The system is implemented with the Adobe® Flex 2 cross-platform development framework, MySQL® relational databases, and Simsoft Tammi® application framework supporting dynamic generation and configuration of object/relational services.

Keywords: data access, user friendly, web, Adobe Flex.

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## ICES CM 2008/R:32      Poster

### Visualizing fishery research programmes in Europe

Christian von Dorrien and Harry V. Strehlow

The aim of the EU-funded ERA-Net project MariFish is to bring together the national funders of marine fishery research in Europe to jointly develop and fund important marine fishery research. Altogether the 18 MariFish partners in 16 European countries fund 22 national research programmes that grant over 190 million euros to marine fishery research. Within MariFish, a database was developed (<http://www.marfish.net>) to provide an overview of the existing national research programmes in the field of marine fishery research. The data can be viewed by funders, collaborations, sea areas, research fields, or funding mechanisms. It was created to assist the decision-making processes of MariFish partners on possible collaborative research projects. As an additional and more innovative tool, a “browsable map” was designed to visualize the database content and to allow for more intuitive ways to “search” the database. Thus, links between different levels of information were made available. In conclusion, the evaluation of national research programmes by means of the database helped to identify and prioritize new research areas within MariFish. To include data on national fishery research projects, work has started on linking the MariFish, MarinERA, and eurOcean databases on marine fishery science research projects, including the development of a common search tool. This is an excellent example of practical cooperation between ERA-Nets and an important political signal for the new integrated European Maritime Policy.

Keywords: fishery research, programmes, funding, database, visualization, integration, browsable map

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## ICES CM 2008/R:33      Poster

### ODV—a tool to visualize and analyse fishing activities in the Baltic German EEZ

Uwe Böttcher and Christian von Dorrien

Knowledge about spatial and temporal distribution of fishing effort is an important basis for fishery management. Since 2005, EU fishing vessels over 15 m length have been requested to send their vessel number, date, time, position and, since 2006, also heading and speed every two hours to National Data Centres, where data are checked in real time and stored. These data from the Vessel Monitoring System (VMS), originally intended to be used for compliance purposes, have the potential to enhance our scientific knowledge of fishing activities. It should be noted, however, that the speed of a fishing vessel is only a proxy for its current activity, in a sense that data showing values around “usual” trawling speeds are interpreted as fishing activity. Therefore, VMS data need to be analysed carefully together with other related information, such as logbooks and landing data. Ocean Data View (ODV) is a freely available software package developed by R. Schlitzer from the Alfred Wegener Institute for Polar and Marine Research (Bremerhaven), for the interactive analysis and visualization of geo-referenced data (<http://odv.awi.de>). ODV visualizes and presents the numerous datasets of VMS records in a two-dimensional geographic coordinate system (GIS), making it possible to detect the temporal changes and seasonal patterns of a fishery. Example VMS data from the Baltic German are used to demonstrate their usability in spatial planning processes or fishery management in Natura 2000 sites.

Keywords: Ocean Data View, ODV, vessel monitoring data, VMS, fishery activities, visualization, spatial analysis.

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**ICES CM 2008/R:34**      **Poster**

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**Data management development plan for the Ocean Tracking Network**

Bob Branton and Michael Murray

The Ocean Tracking Network (OTN) [www.oceantrackingnetwork.org] is conducting the world's most comprehensive and revolutionary examination of marine life and ocean conditions, and how they are changing as the earth warms. On this poster we provide an early look at the cyber infrastructure currently being developed to support this project, including network, context, data flow and entity relationship diagrams, and an overview of the project schedule.

Keywords: cyber infrastructure, network diagram, context diagram, data flow diagram, entity relationship diagram, project schedule.

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**ICES CM 2008/R:35**      **Poster**

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**An integrated system for marine data management and analysis**

Kimmo Tikka, Riitta Olsonen, Riikka Hietala, and Pekka Alenius

Present oceanography is increasingly based on an ecosystem approach, which needs an integrated system of all kind of marine data and information. At the Finnish Institute of Marine Research (FIMR) we have chosen to develop simultaneously oceanographic databases, laboratory information systems, cruise management system, and a desktop for oceanographers under the project PULSSI (refers to salinity pulses in the Baltic Sea). The objective of the PULSSI system is to deliver an open system with easy access to marine data from the FIMR and other institutes, a common analysis toolbox, web search capabilities, and a defined standard interface to other web services. Small, slow development steps are being taken, emphasizing face-to-face communication. As a first step two oceanographic databases have been implemented: "Sumppu" for bottle data and "Algabase" for continuous ship-of-opportunity Alg@line-data. Both databases allow interactive and batch process data upload and download, miscellaneous search capabilities, and a web interface to view data. The Sumppu database automatically synchronizes data with the RV "Arandas" laboratory information management system (LIMS). The idea behind the oceanographers' desktop is to bring selected open-source and other generally available analysis and reporting tools (e.g. Ocean Data View) into common usage.

Keywords: integrated, web access, open source, analysis tools.

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**ICES CM 2008/R:39**      **Poster**

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**ICES EcoSystemData—an integrated solution for ecosystem data**

Carlos Pinto, Hans Mose Jensen, and Marilynn Sørensen

Ecosystem assessment and management are becoming prevalent approaches in dynamic decision support systems for the marine environment. In the ICES strategic plan (2001) the ecosystem approach was given a high priority as a direct response to the challenges faced by client commissions when assessing and advising on the marine environment. At the EU level, the forthcoming Marine Strategy directive requires an ecosystem approach for marine management in order to ensure "good ecological status" of EU marine waters by 2021. For ICES to be able to manage and meet client needs for integrated data, several initiatives within the ICES Data Centre have been initiated over the last 5–10 years. With the development of an integrated environmental reporting format and a common vocabulary system, the basic integrated data structures have been implemented. Because of the variety of data types stored in the database system, the schema design has to deal with diverse metadata needs. Combining a simple core data structure with complex metadata demands has been one of the key challenges of the system. One of the goals of the system is to hide the complexity from the client while providing access to the data in a simple and flexible way. With the development of EcoSystemData and the related integrated reporting format, the ICES Data Centre manages data from a variety of scientific areas into one common data structure, facilitating the management procedures and resulting in better services for ICES Data Centre clients.

Keywords: ecosystem data, data integration, reporting format, databases, data management.

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**ICES CM 2008/R:40      Poster**

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**Minimalistic surveys—an answer to the ecosystem approach?**

Olav Rune Godø

Standardized surveys are an integral part of stock assessment and management of the commercially most important fish stocks. Ship time is expensive and new demands related to the requirements of the ecosystem approach challenge present strategies to cover stocks and ecosystems. Survey effort is normally set to ascertain proper geographic coverage and an acceptable precision of the estimates. Taking ecosystem considerations means more attention to non-commercial species and ecosystem processes, including predator–prey interactions and biophysical interactions. In this paper we explore alternatives for efficient use of survey effort. We compare effects of reduced effort on precision of indices as well as on trends in mortalities. The main questions are: (i) what are the effects of drastically reduced effort on survey indices and mortality estimates and (ii) is it feasible to develop integrated survey strategies for the physical environment and fish along standard hydrographical sections as a response to the ecosystem approach? Our analysis is based on data from the annual Barents Sea bottom-trawl winter survey. Uncertainty of indices increases according to reduced number of hauls, whereas trends in fishing mortality seem to be more robust to reduced effort. A distribution of trawls along hydrographical sections reflects the standard survey well. Various strategies for distribution of effort and the potential for this approach in relation to ecosystem monitoring are discussed.

Keywords: biophysical interaction, survey strategy, ecosystem approach, effort minimization.

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**ICES CM 2008/R:41**

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**DATRAS ver 2: Improving on the data management and data workflows of co-ordinated trawl surveys**

The DATAbase on TRAWl Surveys (DATRAS) has been in operation in the ICES community for a number of years. The aim of this application is to combine trawl survey data from different countries and surveys into one data warehouse, from which various data products, such as CPUE by area, are calculated and delivered to end users.

The leap forward in version 2 is to put the whole process on-line. This means enabling data submitters to have full control of the data workflow. In the data input flow, from quality control, to outliers and uploading, to checking what has been delivered is all now at the fingertips of the data originators. Data output is now all online and the user rights, and building data output is all in the hands of the user community. The resulting solution is faster and more efficient as procedures reflect the workflow of data providers and give them greater ownership of the product.

To put an existing application dealing with complex, multi-national and sensitive data online, and therefore very close to the public users, has taught us many lessons. In this presentation we will elaborate on some of the technical and political issues that may be valuable for others embarking on such solutions.

Keywords: DATRAS, trawl survey, online data

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