Oceanography Committee **ICES CM 2000/C:08**

REPORT OF THE

WORKING GROUP ON MARINE DATA MANAGEMENT

Hamburg, Germany
10–13 April 2000

International Council for the Exploration of the Sea

Conseil International pour l'Exploration de la Mer

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1. OPENING OF THE MEETING

The meeting was opened by R. Gelfeld, Chair, at 9:00am on 10 April, 2000, hosted by the DOD, Hamburg, Germany. Participants were welcomed to the meeting by F. Nast, Director of DOD. S. Wilhelms also welcomed participants and explained the local arrangements.

Members of the Working Group present were: P. Alenius, Finland, S. Almeida, Portugal, M. Danielsen, Iceland, S. Feistel, Germany, J. Gagnon, Canada, M. Garcia, Spain, R. Gelfeld, USA (Chair), D. Hartley, UK, A. Isenor, Canada, N. Kaaijk, the Netherlands, F. Nast, Germany, L. Rickards, UK, H. Sagen, Denmark, J. Szaron, Sweden, and S. Wilhelms, Germany. The ICES Oceanographer, H. Dooley was present. Apologies for absence were received from O. Ni Cheileachair, Ireland, M. Fichaut, France, K. Medler, UK, P. Nielsen, Denmark, T. O=Brien, USA, R. Olsonen, Finland, and G. Slesser, UK. A complete list of names and addresses and contact points of participants can be found in Annex 1.

2. ADOPTION OF THE AGENDA

The agenda for the WG meeting was adopted as a resolution of the 87th Statutory Meeting in Sweden (C.Res. 1999/2C08).

3. DATA CENTRE REPORTS

The participants provided activities at their own data centre/laboratory over the past year and looked to developments in the future. These reports received prior to the meeting were made available on the MDM Web pages; the remaining reports were added to the Web pages after the meeting. These can be found at:

http://www.ices.dk/committe/occ/mdm/

4. NEW TERMS OF REFERENCE

R. Gelfeld presented the results of the 1999 Oceanography Committee's meeting. A decision was made to add the following two mutual Terms of Reference to each working group:

- To consider, and where feasible, develop data products and summaries that can be provided on a routine and on-going basis to the ICES community via the Oceanography website;

- Examine 1999 Working Group reports to identify where inter-group input could be provided/required with the view of formulating key questions requiring interdisciplinary dialogue during concurrent meetings of all the Oceanography Committee Working Groups to be held in 2002. These can be found at:

www.ices.dk/reports/occ/1999

The schedule of the other Working Group meetings and their Terms of Reference can be found at:

www.ices.dk/reports/occ/2000

In addition it was discussed that:

- WGMDM will open dialogue with WGPE, WGHABD, WGZE, WGRP, and WGCCC to develop a workshop on the formation of a database of metadata information concerning the availability of biological oceanographic data in 2001 or 2002;

- The Working Groups will identify the types of time series data that would be useful in the interpretation of monitoring activities and refer to the appropriate Working Groups;

- WGMDM and WGOH will co-ordinate activities related to data archaeology in 2000;

- The Chair of the Oceanography Committee will co-ordinate an inter-sessional review of the objectives and purpose of all Working Groups with the goal of addressing the needs, benefits, and disadvantages of merging current Working Groups or forming new ones.

The Chair led discussions on these two new Terms of Reference.

The Group felt that interactions with other ICES Working Groups were very important and closer ties should be established and maintained in the future.

5. QUANTITATIVELY ASSESS THE LAST FIVE YEARS DATA (1995-1999) SENT TO ICES OCEANOGRAPHIC DATA CENTRE BY EACH MEMBER COUNTRY, IDENTIFY PROBLEMS AND SUGGEST SOLUTIONS.

H. Dooley (ICES Oceanographer) introduced this item. He reminded the group that this had been a standing item on the WG agenda for several years to stimulate the flow of oceanographic data into the Secretariat. He first provided some background relating to the Oceanographic Data Centre activities at ICES and the need for a good database to be able to provide the products required for ecosystem based fisheries advice. He reminded the group that the management of oceanographic data by ICES Oceanographic Data Centre was not an end in itself. Rather it was the means to an end - to satisfy the need of ICES and its expert groups for oceanographic products. In order to meet this requirement the Centre was very dependent on acquiring timely data sets from Member Countries, including the relevant National Data Centres.

He illustrated this by two examples of requests recently received for data products. The first, from the Study Group on Multispecies Prediction Models in the Baltic, required averages of temperature, salinity and dissolved oxygen concentration at 5m intervals by quarter and year for the period 1966 to the most recently available year. The second, also for the Baltic, was for gridded values of temperature, salinity, dissolved oxygen and hydrogen sulphide from 1978 onwards, by year, for two specified periods in the year, in specified ICES statistical squares. Mean (or median), maximum and minimum values for the bottom 7m of the water column for each parameter were required. In addition to the statistical square product, the requestor also wanted the above data as point values. These data were requested on behalf of the ISDBITS EU Study Group. Both of these requests hoped to receive recent data (i.e. from the last few years) in addition to older data.

He continued by discussing the IOC ROSCOP form (renamed Cruise Summary Reports in 1990, but the older name persists) which is in urgent need of revision. The recent IOC/IODE GE-TADE meeting had not shown a great deal in interest in updating the ROSCOP form, so he felt that ICES could go ahead and make appropriate revisions. The present ROSCOP codes are too instrument orientated, and he has been taking steps to expand the parameter list by continuing to add in codes from the BODC/JGOFS parameter dictionary. However, care is needed in any updating process to ensure compatibility with the old data type hierarchy. Increasingly, when data are supplied to ICES, there is a real problem in identifying exactly what they mean, as the data are poorly defined.

He went on to describe the status of ROSCOP returns to ICES. Tables 1 and 2 (Annex 3) summarise the status on a country by country basis. The most worrying aspect of this is the increase in the number of forms which are being generated at ICES, following receipt of data, cruise schedules or IOC's NOPs, rather than being completed by the Principle Scientist at the end of a cruise. In recent years, this has approached 50%, which makes maintaining this information source difficult. He felt that only the situation in Germany, Denmark, Norway, and Sweden was encouraging, whereas the UK (in particular NERC) has become very bad over the last 5 years.

H. Dooley mentioned that he had good ROSCOP information (and data) from non-Danish cruises working in Danish waters - this includes waters around Greenland and the Faeroes, as the Danish Foreign Ministry required this information from ships wishing to work in their waters. He suggested that other countries might also require this information, which could be a useful additional source of information. MDM members should follow this up within their own countries.

Some discussion followed about the best approach to increase the number of correctly completed forms received by ICES. These forms have never been liked by the Principle Investigators (PI), who often do not understand why they are needed. The forms are often badly filled in, and require many corrections. But it is important that the PI completes the form at the end of the cruise, as they, together with the other scientists participating on the cruise, have the relevant information relating to methods, etc., readily available. Some education is required to show the value of ROSCOPs as a route to data, and also that the ROSCOP forms are just part of a larger information system available which provides access to data.

H. Dooley summarised the discussion by saying that there were two important issues to resolve, firstly to make the ROSCOP form better, and secondly, to create systems to make it easier to complete the forms. F. Nast noted the developments taking place within the EURONODIM project (Annex 4), one part of which is to create an on-line ROSCOP form, which can be sent off to the appropriate collating centre.

H. Dooley then summarised the data receipts by country (see Table 3, Annex 3). The most complete data set was from

Finland, as it had been in the previous year. The UK Fisheries Laboratories also have continued to maintain a very high standard. He also noted that he continued to have some problems with data receipts from France, as there were problems with the French parameter dictionary, which did not always define the parameters measured very accurately. He also felt that much better communication between data centres was needed, particularly if changes were made to data sets. If a data centre makes changes to a data set this information needs to be kept with the data, and passed on to ICES if the data have previously been submitted to ICES.

The WG noted that there were no MDM members from Belgium, Latvia, Lithuania, Poland or Russia. It was felt that members from these countries could improve data flow. Even if they could not attend meetings they could keep in contact by e-mail. R. Gelfeld agreed to follow this up.

H. Dooley also noted that he had included in the table surface underway observations. Many of the new observations have come from G. Reverdin and A. Dessier for the North Atlantic. He felt that this was a valuable data set and that as a lot of research vessels now run thermosalinographs, it would be valuable to stimulate submission of this type of data to ICES. It was a valuable data source for producing products - often requests are for surface data and products. L. Rickards noted that R. Keeley (MEDS) was investigating the possibility of setting up an international project to collate thermosalinograph data, and was looking for collaborators. She had suggested that he looked at the data available on the ICES web site and contact H. Dooley to discuss possible collaborative efforts. J. Gagnon mentioned that some thermosalinograph data are transmitted via the GTS in real-time. And these are probably mainly the same data that ICES receives in delayed mode.

Finally, H. Dooley expressed some concern over the fate of data collected as part of EU MAST projects. Although some projects have very good data management procedures he was concerned that not all of the data sets collected would be covered, and some data sets would not find their way to national data centres or to the ICES Oceanographic Data Centre. He also noted that ICES would be making available on-line the secchi disk data set compiled by Mr. T. Aarup, now at IOC.

The WG agreed that it was valuable to discuss data flow to ICES and that the term of reference should remain on the agenda for next year's meeting.

6. INVESTIGATE HOW ICES MEMBER COUNTRIES CAN CONTRIBUTE MOST EFFECTIVELY TO THE NEXT PHASE OF THE IOC GLOBAL OCEANOGRAPHIC DATA ARCHAEOLOGY AND RESCUE (GODAR) PROJECT.

R. Gelfeld introduced this item by saying that the updated version of the World Ocean Atlas, known as the World Ocean Database 1998, produced by the Ocean Climate Laboratory (OCL) at WDC-A, was now available. It comprises almost 5.5 million profiles. The GODAR project has led to the rescue of 190,000 CTDs, 1.5 million bottle stations and 21,000 profiles of biological data (zooplankton, phytoplankton, bacteria and some icthyoplankton). The biological data now includes counts, biomass and volume. T. O'Brien is maintaining the database.

The International GODAR conference was held July 12-14, 1999 in Silver Spring, Maryland to review the history the project has taken. The conference hosted 75 Representatives from 25 countries. Discussions at the conference recognised the success of GODAR Project. Member countries were encouraged to expand into rescue of sea level and other datasets. The six Regional Workshops that were held from 1993-1997 were very valuable in identifying data in jeopardy of being lost. The WG discussed at length the distinction between "data archaeology" and "data rescue". The WG felt the next phase of GODAR was in fact "data rescue".

During the course of GODAR, the WDC-A archive was compared with the ICES archive to remove duplicates. In addition, ICES has been a major force in getting GODAR off the ground. ICES also acts as a backup for the World Ocean Database. There is a need for long term, secure archives: ICES and WDC-A both perform this function.

The UK Hydrographic Office provided historical index cards comprising both a temperature and salinity profile data set and a surface temperature and salinity data set to NODC. As a result of this we were able to eliminate 25,500 cards which we determined were duplicated with data already archived at NODC. The remaining cards, 80,000 profile data cards and 90,000 surface data cards have now been digitised and will be available on CD-ROM in June 2000.

The emphasis is now moving towards nutrients, chlorophyll and biological parameters, although the best way of handling some of these data types has not yet been completely resolved. S. Almeida noted that for biological data, it is often difficult to identify exactly what is there. Header information, units and other qualifying information is needed more that ever. Mention was also made of contaminant data - these are useful for investigating trends.

M. Garcia next provided the Working Group at overview on the Mediterranean Data Archaeology and Rescue and

Mediterranean Atlas (MEDAR/MEDATLAS II). The overall objective of the MEDAR/MEDATLAS II project is to make available a comprehensive data product of multi-disciplinary in-situ data and information in the Mediterranean and Black Sea, through a wide co-operation of the Mediterranean countries. The specific project objectives are to:

- compile and safeguard historical data, with special attention to the East and South regions and the coastal areas, most of these data being regularly collected by the Mediterranean bordering countries in the frame of national, regional or international programs, and occasionally by a few other countries;

- make available comparable and compatible data sets of : temperature, salinity, oxygen, nitrate, nitrite, ammonia, total nitrogen, phosphate, total phosphorus, silicate, H2S, pH, alkalinity, chlorophyll-a profiles by using a common protocol for formatting and quality checking;

- prepare and disseminate qualified value added products by using efficient gridding and mapping methodology;

- enhance communication between data managers and scientists to improve data circulation.

S. Feistel gave the WG a presentation on the "Baltic Sea Atlas". This project will attempt to develop a Baltic Atlas of long-time series. This will include an inventory and climatology. The initial position is to identify and answer the following questions:

what do we have?;
what do we want?;
what do we finally provide?;
what do we expect from our partners?

The WG felt that this first five year phase of GODAR had been most important, and had uncovered substantial non-digital (mainly temperature and salinity) data not previously available to the community. They commended the work of the OCL. The WG noted with interest the outcome of the discussions by the WG on Oceanic Hydrography on data archaeology. With this in mind, it was agreed that this should be considered at the next MDM meeting, when R. Gelfeld would update the WG on these discussions and other progress. Plans could then be developed for maximum contributions to the next phase of the project. The WGMDM would continue over the year to investigate and search out all relevant data sets.

7. CRITICALLY EVALUATE THE GUIDELINES FOR DATA MANAGEMENT AND EXCHANGE DEVELOPED INTER-SESSIONALLY FOR THE FOLLOWING DATA TYPES: MOORED CURRENT METER DATA, SHIPBOARD AND MOORED ADCP, CTD, XBT/XCTD, SEA LEVEL, SURFACE UNDERWAY MEASUREMENTS, NUTRIENTS, OXYGEN AND CHLOROPHYLL.

A. Isenor gave a brief introduction to the guideline development. The WG then proceeded over the course of the next 10 hours to review all nine guidelines.

Numerous problems were identified in the guidelines. These problems focused on both content and intended audience. The overall conclusion of the review was that the guidelines must become more consistent, while maintaining those parts that make them unique to the data type under consideration.

At the end of the review, a general discussion was started on the next phase of guideline development. The group discussed passing the guidelines on to our parent Oceanography Committee. This committee meets in September 2000. We recognised that a complete set of guidelines may not be ready for the September meeting. However, L. Rickards suggested we complete as many as possible and send these to the September meeting of the Committee. The general consensus of the group was to plan for the September 2000 meeting, as a means of continuing the momentum already established.

Action: A. Isenor will work on seven of the nine guidelines and make these consistent. This task should be completed by the end of May 2000. The seven guidelines will then be made available to the MDM and other selected experts in the various fields for comment. Comments will be received by end of June. A. Isenor will then make any further revisions to the set of seven guidelines. These will be made available to the Oceanography Committee by the end of July 2000. The official request for the Oceanography Committee to review the guidelines will pass through R. Gelfeld.

Action: Two guidelines, water level and oxygen, nutrients and chlorophyll (ONC) will be passed back to the subgroups for revisions. We expect the subgroup to pass the revised documents back to A. Isenor by December 2000. For the ONC subgroup, L. Rickards suggested looking at the phytoplankton ecology working group (1999 report, Annex 4).

Action: At the September 2000 meeting of the working group chairs, R. Gelfeld will offer to the other working groups, to complete similar guidelines for other data types. J. Szaron mentioned in particular, the harmful algae bloom working group.

Action: Two additional guideline developments will be initiated. The groups are as follows:

Drifting buoys - J. Gagnon, M. Danielsen, M. J. Garcia
Profiling Floats - A. Isenor, L. Rickards, D. Hartley

The float subgroup will also call on the expertise of MEDS for review of the float guideline, as MEDS is the recognised RNODC for float data.

The WG will continue to work on the guidelines during the inter-sessional year and this Term of Reference will continue on next year'' agenda.

8. REPORT ON THE COMPARISON OF THE BODC (JGOFS/OMEX) PARAMETER DICTIONARY WITH OTHER SIMILAR DICTIONARIES IN USE IN ICES MEMBER COUNTRIES.

R. Gelfeld introduced this Term of Reference by asking the question do we need a glossary and/or code system. He said that U.S. NODC/WDCA was investigating the glossary currently in use at Texas A&M University (www.stommel.tamu.edu/~baum/paleo/paleogloss.node1.html) and were also looking at the parameter dictionary maintained at BODC. Views were sought round the table as to whether MDM members used code tables, abbreviated names or some other system. There was a fairly even split between codes and abbreviated names.

R. Gelfeld then provided a demonstration of the Texas A&M system. This system comprises a glossary of terms and concepts used in oceanography and related fields. It includes the words, phrases, acronyms and other abbreviations that make up the technical vocabulary used in the field of oceanographic sciences. The glossary was last updated in 1997, and is no longer maintained, although there is provision for users to add in new definitions.

R. Gelfeld and L. Rickards demonstrated the BODC parameter dictionary. For historical reasons, the BODC parameter dictionary is based on 8-byte codes, and took as its starting point the GF3 parameter code tables. The first four bytes specify the parameter name, and additional information about how the parameter was measured is contained in the other four bytes. In many cases, these four bytes have been have been used as two 2-byte fields describing the analytical technique, the phase that was measured (particulate or dissolved) and the type of filter used. For example, consider the code 'CPHLHPP1'. The 'CPHL' specifies chlorophyll-a, the 'HP' specifies HPLC assay on an acetone extract and the 'P1' specifies that it is a measurement on the particulate phase separated out by GF/F filtration.

The parameter dictionary is implemented in the Oracle relational database management system and comprises four tables. The first contains the definitions of the four-byte parameter names - one field within this table specifies the storage units, which are held as codes held in the second table. Note that the linkage of unit codes at this level ensures that parameters are always stored in the same units, no matter how they are measured. The full 8-byte parameter code definitions are contained in a third table. Finally a fourth table classifies the parameter names given in the first table into logical groups to make the assignment of codes easier.

The BODC Parameter Dictionary is currently in use within BODC's National Oceanographic database and its project databases. The system is also in use for the German JGOFS database and at the ICES Oceanographic Data Centre. A paper describing the BODC parameter dictionary by Roy Lowry, presented at the Ocean Data Symposium, Dublin 1997, is available from BODC. The parameter dictionary itself may be downloaded from ftp (ftp.pol.ac.uk, cd /pub/bodc/jgofs/datadict) and will shortly be available from the BODC web pages.

R. Gelfeld and H. Dooley noted that IODE/GE-TADE wanted to use the Global Change Master Directory (GCMD) data themes as a starting point for both IOC Marine Environmental Data Inventory (MEDI) and more generally for developing a marine XML. They were thinking of combining the higher levels of the GCMD themes for oceans with the BODC parameter dictionary. H. Dooley drew the attention of the WG to the report of the recent GE-TADE meeting, which suggested setting up a joint GCMD/GE-TADE working group for maintenance of a parameter dictionary. L. Rickards said that she had looked at mapping the general category BODC codes across to GCMD and it did not look as if it would be a straightforward task. One problem with the GCMD codes at present is that all of the biological information is in the biosphere category, and there is no reference to biology under the oceans theme.

After some discussion, there was general agreement that, although the Texas A&M glossary was undoubtedly very useful, what was required was a parameter dictionary which specified precisely what had been measured.

H. Dooley noted that he had adopted the BODC parameter dictionary, as it was the most complete, although it has some weaknesses. The MEDAR system, developed by SISMER, was not very clear in places as to what was being measured and also used different parameter codes where different units were used. He felt that the GF3 element of the parameter dictionary should be developed consistently, extra methods included consistently, and technical experts (e.g. other WGs) should be invited to peer review the parameter codes. A. Isenor agreed that the collective knowledge of ICES WGs could be used to assist with parameter definitions.

H. Dooley noted that he had collated all of the codes relating to chlorophyll from the BODC parameter dictionary and passed them on for review to the authors of the new ICES publication 'A procedure for the measurement of chlorophyll-a in seawater samples'. They felt the parameters described in the BODC parameter dictionary were complete and matched up. This exercise could be broadened by asking various working groups (e.g. Zooplankton Ecology, Phytoplankton Ecology, Marine Chemistry, etc.) to review groups of parameters for which they had expertise. It was agreed to ask BODC to extract the relevant groups of codes for peer review.

H. Dooley suggested that it was essential for chemical and biological parameters to have a well-defined system, which defined accurately the parameter being determined. J. Gagnon agreed that it is necessary to define parameters sufficiently and accurately. He was interested in participating in updating the GF3 codes. He described the parameter code system in use at MEDS as 'GF3-plus' (i.e. based on GF3 and added to as needed). This updating could take place under the remit of RNODC (Formats).

One major problem with adopting a particular coding system was the maintenance of the system. It cannot be a job for data centres alone, as good access is needed to scientific advice for proper definitions. A. Isenor suggested that the WG could act as a coordinating body for updating codes, with appropriate technical assistance from experts.

It was considered urgent that a comparison between the BODC parameter dictionary, the 'GF3-plus' codes in use at MEDS and the MEDAR system in use at SISMER/IFREMER took place. L. Rickards agreed to distribute a copy of the BODC parameter dictionary to WG members, and to chase them up regularly to check on progress in comparing different coding systems.

The parameter dictionary discussions linked through to the term of reference relating to XML (See Section 10 - Data Formats). If a marine XML were to be developed, then a centrally maintained parameter dictionary would be an essential part of the system.

The WG felt this Term of Reference should be combined with the Term of Reference on commonly used oceanographic data formats on next year's agenda.

9. FORMULATE A MODEL OF HOW THE INTEGRATED TAXONOMIC INFORMATION SYSTEM (ITIS) MIGHT BE EXPANDED INTERNATIONALLY.

R. Gelfeld introduced this Term of Reference in the absence of T. O'Brien. The application and use of the Integrated Taxonomic Information System (ITIS) was discussed, and many concerns were voiced:

The ITIS web page clearly www.itis.usda.gov states that it is "focused on the biota of North America", which concerns the ICES institutes which fall outside of this coverage area. Will ITIS store their species, and does ITIS have the expertise to manage and review them?

The accessibility and utilisation of the ITIS database and taxonomic serial number's (TSN) is a major problem. All operations to/from TSN codes require accessing the ITIS database (currently only available online), especially since the TSN number itself provides no information about the taxa (unlike the old NODC code). These operations are additionally hindered by slow Internet speeds (especially from Europe).

For those ICES institutes that had already adopted the old NODC taxonomic code, the ITIS system does not provide any translation tools from the old NODC code to ITIS code. For these institutions, switching to ITIS would require considerable effort, only to experience the problems already mentioned above.

In summary, for those ICES institutes regularly handling taxonomic data, the majority are keeping local (institute-specific) taxonomic code systems, and have no interest in switching to ITIS. Some will even continue using the old NODC taxonomic code, adding to and maintaining it (within their institute) as needed.

N. Kaiijk demonstrated an ITIS-like system designed in the Netherlands (see Annex 6).

The WG felt this Term of Reference should be combined into a Term of Reference for formats, and data dictionaries on next year's agenda.

10. EXAMINE COMMONLY-USED OCEANOGRAPHIC DATA FORMATS (E.G. NODC'S P3, ICES, NETCDF, BUFR, MEDATLAS), TOGETHER WITH THE RECENTLY DEVELOPED XML FORMAT, WITH A VIEW TO RECOMMENDING A SMALL NUMBER OF FORMATS TO BE USED WITHIN THE ICES COMMUNITY FOR DATA EXCHANGE.

L. Rickards introduced this Term of Reference. The background was that the Study Group on Baltic Acoustic Data were looking for the most effective way of exchanging data, and had suggested the use of XML. They had developed a set of tags that were described in their 1999 report. In addition to looking at the potential of XML, other formats were also briefly considered to provide a comparison of the benefits and difficulties of each.

L. Rickards reported that she had carried out a short survey of the formats and data storage methods in use by MDM members to assess which were the most used, and whether problems had been encountered with them. This had showed that most organisations are using a combination of relational databases and ASCII files. However, some have used the WOCE Hydrographic Programme (WHP) format, both for sending and receiving data. ICES oceanographic data format was also quite widely used. In addition, one or two WG members knew of colleagues using netCDF.

L. Rickards also noted that the WOCE Data Products Committee (DPC) was to produce a new set of CD-ROMs for the WOCE data set and had been investigating putting the data into netCDF as a way of providing more integration between the different data streams. One supporting argument for choosing netCDF for WOCE was that it is already widely used by many researchers in the climate and modelling communities.

NetCDF is more than a data format and includes software for storing and retrieving data. It was developed at the Unidata Program Center in Boulder, Colorado, and more information is available from their web site (www.unidata.ucar.edu/packages/netcdf/). The format is self-describing and netCDF files are portable (i.e. machine independent). The software is available for download free of charge. NetCDF files can also be loaded into Matlab, GMT, and other packages.

The first set of WOCE CD-ROMs had been produced using a variety of ASCII formats. Each WOCE Data Assembly Centre (DAC) has now produced sample netCDF files, which have been reviewed by the WOCE DPC. Now revised versions of the files have been produced where the date/time and other key fields were rationalised. The CD-ROM set with netCDF data files is due out in mid-September. The use of netCDF has really been an experiment for the WOCE DPC and they await with interest the reaction from users. The WOCE Data Information Unit has set up a page with many links about netCDF. This is can be found at www.cms.udel.edu/woce/dpc/netcdf/ .

XML stands for eXtensible Markup Language, which has been by developed by a group of Internet experts as a meta-language for exchanging data over the Internet. This is rapidly becoming the standard for exchanging information over the Internet. Useful references to XML can be found at, for example, www.w3.org/XML and www.xml.com/pub. XML is similar to HTML, but where as for HTML the tags have been predefined, XML allows anyone to design a new custom-built language. To do this agreement must be reached on the definition of the tags how they should nest and how they should be processed.

L. Rickards noted that the IOC/IODE Group of Experts on Technical Aspects of Data Exchange (GE-TADE), which had met in March 2000, had lengthy discussions relating to XML. They have set up a demonstration project to be completed in time for IODE XVI (scheduled for October/November 2000). This project will attempt to put GTSPP, ICES surface observations and Russian XBT data into XML. Mr. Ben Searle, Chair of IODE, was also keen to set up a consortium to develop a marine XML to ensure that we all agree on the tags to be used. Further information from the GE-TADE meeting can be found at www.ioc.unesco.org/iode/structure/getade/getade8 . One crucial factor in the development of XML for marine science is the development of an agreed parameter dictionary.

P. Alenius noted that at his institute the use of XML has recently been discussed and some of the IT people were supporting the idea of moving towards XML. N. Kaaijk also mentioned that his institute has set up a taxonomic coding system, available on the web, which uses XML. He was asked to provide the WGMDM with the technical specification for this XML system. H. Dooley suggested that we should use the resources and expertise available at the larger institutes like BSH and RIKZ, where XML developments may be occurring.

The WG looked briefly at a sample of XML code produced by Mr. Greg Reed from AODC for the GE-TADE meeting. This led to a discussion of what was the tag and what was the tagged value. The code in the document appeared to be somewhat ambiguous on this point, and clarification will be sought on this.

The WG felt the need to keep up with developments with regard to XML. They would await with interest the outcome of the GE-TADE demonstration project and perhaps get involved at that stage. As H. Dooley is taking part in this project, he agreed to report back from the GE-TADE demonstration at IODE XVI. He recommended that MDM should do something soon - and get in near the beginning where we could have an influence.

The WG felt it was too early to recommend XML as an exchange mechanism, although it obviously has great potential. For next year's agenda, a term of reference relating to XML developments will be linked in with the next stage of the parameter dictionary and taxonomy considerations.

11. DEVELOP THE MDM WEB SITE TO FORM A BASIS ON WHICH TO BUILD AN AMERO-EUROPEAN ICES-WIDE VIRTUAL DATA SYSTEM

J. Gagnon introduced this Term of Reference. Participants reviewed a prototype web form developed by the DOD (Germany) as part of the EURONODIM Project (Annex 4) to complete Cruise Summary Reports (ROSCOPs) interactively via the Internet. This feature removed the requirement for knowledge of code tables and standardised all data entry. By making it easier for the chief scientist to provide such information it was felt that there would be better participation in the programme and submission of these information in a more timely manner. The group encouraged its ongoing development and recommended it be made available via the ICES web site once completed.

The DOD also demonstrated its capability to disseminate operational model forecasts of water levels, currents and water temperature/salinity via its web site and making these information available directly to ship captains.

The Netherlands demonstrated its capability to interact directly with the biological community to update and maintain a central reference system for taxonomic information via the web (see Annex 6). Canada demonstrated its capability to provide operational data and products on global and regional scales via its web site, particularly the data collected at fixed stations under its new National Atlantic Zone Monitoring program.

The above uses of the Internet demonstrated that the old communications problems of access and exchange of quality controlled physical, chemical, and biological data and information have effectively been eliminated. The group then held an open discussion on the implications of such free access to information and concluded that the ICES Data Management Policy was in conflict with several major global and regional marine projects as well as with individual National policies. The group felt that no more work on this term of reference could proceed until this Policy issue was addressed by the Oceanography Committee. R. Gelfeld will report back to the WG on discussions held by the Oceanography Committee at the Statutory meeting in September 2000.

The WG noted that the development of web sites has become almost routine and discussions for this Term of Reference has been completed.

12. PROMOTE THE VALUE OF DATA MANAGEMENT WITHIN THE OCEANOGRAPHY COMMITTEE.

R. Gelfeld introduced this Term of Reference noting that H. Loeng has been succeeded on the WG by H. Sagen. The time schedule for developing the ICES Strategic Plan seems to change all of the time. After considerable discussion on what the Working Group should and could do, it was decided that this is a top-down process from the Oceanography Committee in regard to the MDM and the ICES Strategic Plan.

The Working Group supports the following general goals:

- provide ICES with data management tools (i.e. formatting concepts, multi-disciplinary codes, etc) in order to meet its global and interdisciplinary objectives
- develop ICES data management activities in a de facto standard for use in ICES and global programs
- maximise the resources available for ICES to implement and meet its advisory and scientific objectives by developing and implementing an ICES virtual data system

The WG felt that several ways to achieve these goals might be:

- MDM to expand and embrace the needs of all ICES science and advisory groups
- encourage MDM members to attend other ICES WG meetings to cross-fertilise ideas and help develop workshops
- develop links and co-operative activities with other groups (global perspective) to create relevant standards and guidelines

The WG then turned its attention to whether an MDM Working Group was necessary and, if so, how it could contribute to the Oceanography Committee remit. The WGMDM is not a scientific or assessment WG, but data management activities should form an important part of any scientific program which involves data, whether it be data collection, compiling data sets, quality assurance, data products or final archiving. Within the WG there is an existing infrastructure for data management. A pilot project could be developed, building on this, using perhaps an operational/monitoring approach for data types that are common to the data centres. This would provide a focus for activities. Whereas the WGMDM should not define the scientific programs of the Oceanography Committee, it should ensure that data management is part of any program. For example, MDM can contribute expertise in the areas of data exchange, formats, quality control, data products, data dissemination, and data archiving. The expertise of the WG is not confined to a particular data type; several WG members are involved in data management for multi-disciplinary projects, which include many different parameters (e.g. physical, chemical, biological, fisheries, meteorology, and geology/geophysics).

L. Rickards initiated a brief round table discussion related to GOOS to find out which institutions were participating in GOOS, and how this related to ICES plans for involvement in GOOS. In 1997, ICES established a Steering Group on the Global Ocean Observing System (SGGOOS). Its term of reference was to 'prepare an action plan for how ICES should take an active and leading role in the further development and implementation of GOOS at a North-Atlantic regional level, with special emphasis on operational fisheries oceanography".

Following on from this, a workshop on 'The Global Ocean Observing System - GOOS' was held in Bergen in March 1999. This workshop recommended that ICES offers its expertise to GOOS and be willing to become involved in the planning of GOOS, especially in bringing its fisheries and oceanography expertise into the Living Marine Resources (LMR) module. It was also recommended that the design of an ICES-GOOS needed to be discussed with the potential partners in the development of the system and ICES should especially liase with EuroGOOS to seek common grounds and exploit developments.

A. Isenor informed the WG that the ICES Annual International Bottom Trawl Survey (IBTS) has now been accepted as part of GOOS. He also noted that the Canadian Atlantic Monitoring Programme is part of the Living Marine Resources part of GOOS. But, research laboratories like the Bedford Institute of Oceanography (BIO) may have problems providing operational data, but data centres, such as MEDS are in a good position. J. Gagnon agreed that MEDS can contribute sea level data, and have also had a long involvement with GTSPP. He also noted that data centres often have long historical time series of data and are in a good position to offer to ICES-GOOS climatology, comparisons of previous year vs. historical data, etc. In general though, at present, the WGMDM is not so strong on the operational side.

Most of the European countries represented were involved in EuroGOOS. EuroGOOS is a consortium of 17 organisations from European countries. N. Kaaijk had been part of the group developing the EuroGOOS data policy, which some countries have now signed. This is an important aspect of EuroGOOS as data will be routinely exchanged in real-time. It is also important to ensure that the data gets safely to the archives.

There are various EuroGOOS projects in which MDM members organisations are participating. These include Baltic Operational Oceanographic System (BOOS), European Hydrographic Grid (EHYGRID), SeaNET, and the EuroGOOS Directory of the Initial Observing System (EDIOS). EDIOS is a proposal to the EU Framework V - and will set up an inventory of the initial observing system for EuroGOOS, building on the information available in BOOS, SeaNet and any other relevant directories. EHYGRID will be another bid to the EU to produce a high-resolution bathymetric data set for the NW European shelf. BOOS is a key demonstration project within EuroGOOS. Web pages can be found at www.boos.org and there is a document available describing the project ('The BOOS PlanBaltic Operational Oceanographic System 1999-2003' edited by Erik Buch and Hans Dahlin). This is available as an Adobe Acrobat file from the Web site.

Several participants also noted that there are national programmes relating to GOOS in some countries (e.g. Canada, Germany, UK, USA).

The WG believed that this Term of Reference was imbedded in every ICES Working Group. This will be a continuing part of the WGMDM and no specific Term of Reference is needed.

13. TIME AND PLACE OF NEXT MEETING

The WG expressed its wish that the next meeting should be held at the British Oceanographic Data Centre (BODC) in Birkenhead, United Kingdom between 2 and 5 April 2001. The terms of reference for this meeting are listed in Annex 2.

The Chair closed the meeting by thanking the participants for their hard work, enthusiasm and valuable contributions. He also thanked F. Nast and S. Wilhelms for the excellent arrangements made for the meeting and for presenting an interesting overview of DOD and its databases, which is described in Annex 5.

ANNEX 1 - LIST OF PARTICIPANTS

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ANNEX 2 – TERMS OF REFERENCE FOR 2001 MEETING

a) Quantitatively assess the last 5 years data (1996-2000) sent to the ICES Oceanographic Data Center by each Member Country, identify problems and suggest solutions.
Although the amount of oceanographic data received by ICES has increased significantly over the last few years, the year to March 2000 saw a decrease. This item will provide the impetus to encourage an increased data flow to the ICES Oceanographic Data Center from Member Countries.

b) Investigate how ICES Member Countries can contribute most effectively to the next phase of the IOC Global Oceanographic Data Archaeology and Rescue (GODAR) project.
The GODAR project has been running for 7 years, and the International Conference held in July 1999 noted the success of the project and planned future developments. ICES has played a major role in GODAR, and this will allow further significant contributions to be planned and made.

c) Continue to critically evaluate the guidelines for data management and exchange developed inter-sessionally for the following data types: moored current meter data, shipboard and moored ADCP, CTD, XBT/XCTD, sea level, surface underway measurements, nutrients, oxygen and chlorophyll.
There is a need for simple guidelines for those processing, quality assuring and managing data. The existence of written guidelines has distinct advantages. It shows laboratories reporting data to the ICES Oceanographic Data Center how important it is to apply quality control procedures on the data, and it will provide ICES with data sets which are easier to handle and have a properly documented quality control history behind them. This leads to an improved data set being available to the ICES community.

d) Report on the parameter dictionaries, common taxonomic coding systems, and XML formats use in ICES Member Countries.
A number of parameter dictionaries, taxonomic coding systems, and XML formats for oceanographic data have been developed by the oceanographic community. Many institutes are maintaining their own systems, and there is concern over the lack of coordination.
These will be investigated with a view to recommending use with ICES, if appropriate.

ANNEX 3 - REPORT FROM ICES OCEANOGRAPHIC DATA CENTRE

1. This brief report updates MDM on the (lack of) progress since the last meeting of the Group. Due to various factors in the ICES Secretariat hardly any new developments have taken place, but routine work has been kept very much up-to-date by Susanne & Else. The position of oceanographic data scientist (manager) has been vacant since December 1999 and it is currently not known when and how this position will be advertised.

2. Roscop/Cruise Summary Report. This topic was discussed at the recent GETADE meeting. A review of this can be given at the meeting, if required. In terms of development of the use of Roscop, the evolution of on internet based product has continued, with relevant hyperlinks being included in the database. The incorporation of additional codes, matching the BODC/JGOFS dictionary codes, has continued. The Data Centre is more-or-less committed to the main features of this coding system for non-standard (exotic) data types for both data and information products.

Tables 1 and 2 summarise the position with regard to the submission or non-submission of ROSCOP. Since 1990, of the 9254 cruise summaries in the database, almost a quarter of these were created from information sources, including actual data submissions, cruise schedules and IOC's NOPs (Table 1). In recent years, this figure approaches 50% which reflects the growing and continuing difficulty in maintaining this information source.

Of the forms submitted to the Secretariat, only the situation with regard to Germany, Denmark, Norway and Sweden can be regarded as encouraging. Input from Poland and Latvia is also improving, mainly because of the Data Centres involvement with the HELCOM/BMP database. UK is a disaster area, accumulating huge deficits since ca 1996.

ROSCOP is definitely in need of revision, and the Data Centre has been taking its own initiatives in expanding its parameter list, and paralleling it with the Data Dictionary. ROSCOP is an IOC system, but following discussion at the GETADE meeting, I believe ICES has *carte blanche* to do what it likes with the system.

3. Movements by Country:

A precise picture of data submissions by country cannot be given at the present time because of a variety of reasons. Amongst these is the backlog that has built up in the Secretariat due in part to general workload. There are also a number of delays due to incorrect submissions, and reactions from submitters can be extremely slow. Nevertheless Table 3 probably gives a fair summary of the current position, but sincere apologies if I have inadvertently got something wrong.

Overall submissions are becoming more complex due to range of template exports from databases etc. In addition parameters codes, flagging systems, authority lists are in a ate of anarchy.

One long term problem persists, i.e., the process of producing "bottle" equivalent profiles. *The modus operandi* various from institute to institute, and no clear guidelines to research groups/data centres has attempted to be given. Somehow WOCE seems to have managed to get it right.

4. Project data sets:

ESOP (MAST) - This project has now concluded, and the project CDROM has now been issued. Most of the work was done by contracting in labour which means that there may be no long term benefit from working with this project. Certainly there is no evidence that the increase in data sources will me maintained, nor was there any evidence that the Project users made use of the compiled data sets. The project involved managing the data and information from 53 research cruises, 44 of which collected some 3336 CTD measurements. Parameters suites extended to some 30 parameters beyond the classical ones, and included a number of geochemical tracers.

VEINS (MAST) This project is due for completion during the course of this year. The above comments under ESOP are equally relevant. So far the project has involved managing data and information from 78 Research cruises which have compiled some 5688 CTD stations. The range of parameters is similar to ESOP. In addition, the project has involved the management of some 100 Current meter and ADCP time series. These include data from moorings in the Denmark Strait, the Svinoy Section , and NE boundaries.

MEDAR (MAST): Hardly any involvement has been possible in this important project to develop an operational data centre network in the Mediterranean region. In particular letting down the director of SISMER, Catherine Maillard, is very much regretted.

OSPAR: The data centre is responsible for maintaining nutrient data sets for the OSPAR monitoring programme. Their has been little activity specifically related to this in the past year. The forthcoming work programme also specifies the development of a number of products in support of their NMP.

HELCOM (COMBINE/BMP). The Data Centre is under contract to maintain the oceanographic component of the BMP /COMBINE data set for the period 1999-2001. Our tactics are to try and make use of economies of scale by regarding this data set a subset. This requires rigorous use of the HELCOM/COMBINE station grid, and the majority of HELCOM countries are now in accord with this. The web site now includes access to data sets from each of the 300 or so COMBINE station positions worked since 1980. Recent data that has not been assessed by relevant HELCOM assessment groups are accessible only by password.

Table 1- ICES ROSCOP submissions as of 31/03/00 (Forms Created by ICES)

Country/Year	90	91	92	93	94	95	96	97	98	99	Total
Belgium	2	1	2	2	4	2	3	3	11	0	30
Canada	22	20	23	23	17	5	1	0	0	0	111
Denmark	30	22	25	16	19	21	20	18	14	6	191
Estonia	0	0	0	0	1	3	0	0	0	0	4
Finland	7	18	15	14	20	24	20	15	17	14	164
France	1	1	1	2	1	1	0	0	50	0	57
FRG	4	0	0	0	0	0	0	0	0	0	4
Germany	0	6	5	17	114	31	37	33	31	48	322
GDR	4	0	0	0	0	0	0	0	0	0	4
Iceland	0	0	0	0	0	0	0	1	0	0	1
Ireland	0	0	1	2	4	4	38	3	30	0	82
Latvia	0	0	0	0	0	0	2	5	0	7	14
Norway	50	36	27	26	33	7	0	2	2	2	185
Netherlands	3	7	21	34	29	21	22	18	3	24	182
Poland	4	4	8	12	6	11	0	1	0	8	54
Portugal	1	0	0	0	1	0	0	0	0	0	2
Spain	1	1	1	2	6	17	10	13	12	12	75
Sweden	28	1	5	3	9	1	2	6	3	0	58
UK	6	3	0	2	45	40	61	95	109	167	528
USA	6	1	0	1	0	0	0	2	1	0	11
USSR	22	8	1	0	0	0	0	0	0	0	31
Russia	0	0	0	1	1	0	0	0	1	0	3
Other	2	1	3	0	1	3	4	12	8	3	37
Total	193	130	138	157	311	191	220	227	292	291	2150

Table 2 - ICES ROSCOP submissions as of 31/03/00 - Forms provided to ICES

Country/Year	90	91	92	93	94	95	96	97	98	99	Total
Belgium	26	24	25	30	31	26	29	33	29	1	254
Canada	16	17	28	45	31	3	27	1	1	59	228
Denmark	19	24	20	20	26	22	22	42	26	32	253
Estonia	0	0	0	0	0	0	0	0	0	0	0
Finland	0	0	0	0	0	0	0	1	3	0	4
France	127	108	82	86	134	99	155	132	121	1	1045
FRG	174	0	0	0	0	0	0	0	0	0	174
Germany	0	172	142	193	201	195	159	145	125	59	1391
GDR	15	0	0	0	0	0	0	0	0	0	15
Iceland	9	11	8	16	16	13	4	27	8	5	117
Ireland	9	2	10	11	3	2	0	0	0	0	37
Latvia	0	0	1	3	2	8	4	2	11	0	31
Norway	40	42	71	56	63	70	85	102	89	50	668
Netherlands	82	81	13	10	17	23	14	6	4	2	252
Poland	14	15	7	4	10	6	20	17	12	1	106
Portugal	1	0	0	2	5	4	2	2	2	0	18
Spain	4	25	34	28	27	27	22	18	0	0	185
Sweden	17	14	14	20	19	19	19	20	19	19	180
UK	132	136	120	134	81	82	64	27	29	2	807
USA	120	143	112	115	81	44	33	44	40	15	747
USSR	8	2	0	0	0	0	0	0	0	0	10
Russia	0	0	0	1	0	0	0	0	0	0	1
Other	1	9	117	110	110	48	62	59	63	1	580
Total	814	825	804	884	857	691	721	678	582	247	7103

Table 3 - Summary of Movements by Country

Country	Status	Other Remarks
Belgium	127 all parameters Stations via OSPAR/JMP programme for 1998.	Roscops do not match data submissions particularly well. Huge shortfall against known data.
Canada	2000 CTD stations worked in 1999 received 140300 (NB no data yet for 1997/1998, nor non-ts)	MEDS wish discussion on exchange arrangements
Denmark	Many and varied submissions – Greenland, Faroe, and Baltic to 1998.	Faeroese data sets a major triumph! But only for recent years. DFH (Dana) overdue, but coming.
Estonia	No movements	In spite of HELCOM contract, no new Estonian data has been received. Indeed no Est9onian data at all in database
Finland	Data from FIMR up to 1999 has been received and processed	Revision of the data since 1990 now complete, in co-operation with FIMR. Probably the best co-operation we have.
France	Mutil-parameter data sets up to early 1999 provided by SISMER, and by IBTS participants	Missing much of the data from Fisheries Institutes, apart from IBTS hydrographic data. Some of remainder are exotic data from exotic regions.
Germany	Data from DOD and other sources up to 1999. Submissions at a very high level. Many backlogged CTDs sone the 1980s submitted and cleared	Quite a number of outstanding issues. German data also contributes significantly to HELCOM/OSPAR/ESOP/VEINS. Alkor (Kiel) and German navy (Koop) are in the pipeline.
Iceland	Data up to early 1999. Mainly ESOP/VEINS submissions.	Not sure about non-project datasets.
Ireland	No Movements	1994 is the last Irish data to be received (joint Irish/Russian). Small data set acquired via OMEX in 1998. Compiling this reminds me of the Profile data set copied from Orlas' lap in Ottawa - this has not been dealt with yet.
Latvia	Helcom only (ca 12 stations/year to 1998)	
Netherlands	Backlog of WOCE data sets provided, 1995-1998, IBTS data. No OSPAR data received	Only OK flagged WOCE data archived on request.
Norway	Already 3952 stations for 1999! Dearth of nutrients remains, though some are archived at DOD! (Norwegian chief scientist to DOD direct)	Many Veins/ESOP data
Poland	HELCOM and VEINS projects data sets only, up to 1999.	Attempts to encourage submission of non-project baltic data sets have failed again.
Portugal	No movements	Data up to 1998 has been submitted, including OMEX
Russia	Professor Multanovsky GSP cruise	As a result of an exchange request for GSP data

Spain	Submissions average ca 80 stations/year from RADSAN cruises. 1999 processed	Mode of nutrient data delivery so far defeated us.
UK	Much of UK WOCE material provided. The very high standard of the two fisheries laboratories persists	There remain known large gaps in data holdings of NERC and the universities.
USA	No movements	Some 'US' data were taken from WOA, but these were not US
International (underway)	Reverdin and Dessier provide updates to underway data for North Atlantic	Data of this type remains that largest single source of data via thermo-salinograph measurements. What can be done to stimulate submissions?

ANNEX 4 – THE EURONODIM PROJECT

The EURONODIM project, better known as "Sea-Search", has been set up to organise a European cooperative network for oceanographic data & information management and to strengthen the quality, services and overall user awareness of ocean and marine data & information management and provision in Europe. This is being accomplished by a concerted action of 14 national oceanographic data centres and marine information services from 14 European countries plus the Marine Environment Unit of the EC-Joint Research Centre. Together these 15 partners cooperate in the development of a network of local websites and a joint European website (www.sea-search.net), that will provide overview of, access to and archiving capabilities for ocean and marine information & data resources in Europe.

The general objectives of the concerted action are as follows:

* to develop, maintain and electronically publish jointly 4 meta-data products/directories to keep track of ocean and marine data & information and to improve the overall awareness, overview and access to ocean and marine data & information in Europe.
* to exchange experience and to cooperate in development, promotion and implementation of data & information management practices and methods.
* to develop and organize an overall capability for handling, processing, quality-controlling and archiving a variety of oceanographic and marine data types, anticipating differences in capabilities of individual centres and the evolvement of new data types.

The EURONODIM project receives support from the MAST programme of the European Commission's DG XII.

ANNEX 5 - DOD AND MARINE ENVIRONMENTAL DATA BASE

This Annex is a Powerpoint ® presentation which can be viewed from:

http://www.ices.dk/committe/occ/mdm/annex5-2000.ppt

ANNEX 6 - TAXONOMIC CODING IN THE NETHERLANDS

This Annex is a Powerpoint ® presentation which can be viewed from:

http://www.ices.dk/committe/occ/mdm/annex6-2000.ppt