Intergovernmental Oceanographic Commission
Reports of Meetings of Experts and Equivalent Bodies

IODE Group of Experts on Biological and Chemical Data Management and Exchange Practices (GE-BICH)

Fourth Session

IOC Project Office for IODE
Oostende, Belgium
27-30 January 2009

UNESCO

IOC/IODE-BICH-IV/3

Oostende, 22 April 2009

English only

For bibliographic purposes this document should be cited as follows:

IODE Group of Experts on Biological and Chemical Data Management and Exchange Practices (GE-BICH), Fourth Session, 27 – 30 January 2009.

Reports of Meetings of Experts and Equivalent Bodies, UNESCO 2009 (English), UNESCO, 54 pp

IOC/IODE-BICH-IV/3
Oostende, 30 January 2009
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Abstract

The fourth session of the IODE Group of Experts on Biological and Chemical Data Management and Exchange Practices was held at the IOC Project Office for IODE from 27 – 30 January 2009. The session was attended by 14 participants, including members of the Group and invited experts representing other IODE activities (MarineXML, OceanDataPortal, OceanDataStandards), CDIAC Ocean Carbon, ICES, FAO, ICSU's WDCs, SeaDataNet, EUR-OCEANS, OBIS and WoRMS.

The Group reviewed the implementation of the work plan for the previous inter-sessional period, and approved a plan for the period 2009 – 2011 focussing on three key areas: (i) Controlled vocabularies; (ii) Quality Assurance/Quality Control (QA/QC) of biological and chemical data; and (iii) Data reporting and exchange. The main activities under (i) will be the compilation of comprehensive specialised vocabulary lists relevant to the management of biological and chemical data, and submission of these lists to the combined SeaDataNet and MarineXML Vocabulary Content Governance Group (SeaVoX). The main activities under (ii) will be a proposed workshop focusing primarily on the QA/QC of oceanographic chemical data, leading to the writing up of a white technical paper on the subject, the revision of IOC Manual 26, and input to OceanTeacher. This area will also include some activities which will be useful to the QA/QC of taxonomic and non-taxonomic biological data. The main activities under (iii) will consist of identifying and promoting best practices for data reporting and exchange by contributing to existing initiatives and reviewing and cataloguing existing documents.

The group recommended the implementation of the GE-BICH web-portal idea initiated during GE-BICH III but in the form of a flexible web-based working environment such as a wiki. The group also reviewed its membership and adopted an action plan to seek additional short-term members and maintain its strong group of invited and contributing experts.

The Group also adopted recommendations on new Terms of Reference.

The Group re-elected Gwenaëlle Moncoiffé as the Chair for the next term.

TABLE OF CONTENTS.

1. ORGANIZATION OF THE SESSION.

1.1 Opening of the session.

The co-Chair of GE-BICH, Gwen Moncoiffé, opened the session at 14h00 on Tuesday 27 January 2009 and welcomed the participants. She informed them that the Head of the IOC Project Office for IODE, Peter Pissierssens, would not be able to attend the meeting, as he was unwell. She also informed the Group that Sergey Konovalov, who had been elected as co-Chair during the third session of GE-BICH was unable to attend due to other commitments and had requested to stand down as co-Chair of the Group. Apologies were also received from Humberto Gonzalez from Chile and member of GE-BICH, and from Anton Guentsch invited expert from Biodiversity Information Standards (TDWG).

The participants introduced themselves. The Chair noted that the participants in the session included a large number of invited experts from other organisations and programmes. While some of these (ICES, FAO, OBIS, WoRMS) represented the continuation of established collaborations, others (experts representing CDIAC Ocean Carbon, ICSU's WDCs, SeaDataNet, EUR-OCEANS, and the three IODE activities MarineXML, OceanDataPortal and OceanDataStandards) were new to the Group. She looked forward to their active participation in the sessions, and expressed the confidence that their contribution will enrich the work of the Group and will help it define its key strategic priorities for the next inter-sessional period.

Gwen Moncoiffé then presented a brief history of the GE-BICH. She informed the participants that GE-BICH was established in 2000 and had the following objectives:

- Improve the quantity and quality of oceanographic chemical and biological data available to the scientific community.
- Identify standards and recommend best practices for the management of these data.
- Collate information to promote their efficient management by data centres and scientists.
- Identify requirements, and foster synergy and collaboration between working groups, organisations and individuals – collectors, managers, users.
- Promote the integration of physical, chemical and biological data – from the data centre to regional and global databases.

It is one of three IODE Groups of Experts. It meets every two years to review and plan activities under its mandate. It started with a membership of 9 which was now down to 5 with additional expertise being contributed by external observers. The initial focus of the Group during the period 2000 – 2006 had been on biodiversity and biological taxonomy. In the past two years the Group has been going through a period of transition while re-focussing its activities on issues not well covered before and related to chemical and non-taxonomic biological data.

This session will review the activities that have been implemented, reflect on the need to address IODE priorities and the needs of other IOC programmes, and identify knowledge and information gaps that need to be addressed. The Group will also review and recommend amendments to the TORs in view of the proposed changes in focus, develop a strategic plan for the next four years, review the membership in line with the decisions of the IODE-XIX on the composition of Groups of Experts, and prepare a detailed work plan for the next inter-sessional period.

1.2 Adoption of the agenda

The Chair presented the Provisional timetable and Agenda for the meeting and invited comments. She pointed out that two new items had been added to the draft which was circulated earlier: a new item under section 6.2. "Chemical data types, instruments and methods at the US-NODC" and an item 7.4 dealing with Quality Control Procedures at the US-NODC. The Group adopted the agenda as given in Annex I.

2. REPORT ON INTERSESSIONAL ACTIVITIES

2.1 Issues remaining from GE-BICH-II

The Group reviewed outstanding issues from the second session of GE-BICH (22-24 March 2004, Liverpool, United Kingdom)

2.1.1 Pilot Project on Nomenclators (GE-BICH-II 4.6.7.)

GE-BICH-II had identified the need for a pilot project to test the different systems of distributed querying based on XML, in particular for distributed taxonomic name lists (or nomenclators).

Edward Vanden Berghe reported that the Encyclopaedia of Life had started looking at the issue of nomenclators. However an aspect that has not been covered is the synchronising of different taxonomic databases such as OBIS and WoRMS. Currently OBIS uses WoRMS intensively for checking taxonomy. Though WoRMS is not comprehensive, it is useful in sorting out mistakes and finding synonyms. ITIS is another standard which can be used in biological databases. However its coverage of regions outside the United States is not comprehensive.

The Group recommend the dynamic synchronisation of WoRMS with other databases. The issue is discussed further under the Agenda item on biological taxonomic standards (Agenda 6.1).

2.1.2 Document on need of Data Management (GE-BICH-II 4.1.1.)

GE-BICH-II had stressed the importance of identifying the socio-economic relevance of data management activities by placing them in a wider, possibly ecosystem framework, and highlighting the need for integrated data sets involving physical, chemical and biological data that enable monitoring and modelling of marine resources.

The Group recalled the action item of GEBICH-II to "identify or prepare a paper that describes the relevance of an integrated and end-to-end approach to physical, chemical, and biological data management to be used to create awareness amongst decision makers. The paper would explain how the Group and its related community is contributing to this approach at the national, regional and global scale."

The Group requested Hernan Garcia and Edward Vanden Berghe to check on the existence of such a paper and report back to the Group.

2.1.3 XML Registry (GE-BICH-II 4.6.3.)

The GE-BICH-II session had been informed that the EU-XML meeting at the Hague in December 2003 had proposed the establishment of a repository of XML structures at the IODE Project Office. GE-BICH-II stressed that an XML Registry was required and recommended that the IODE Project Office takes on the responsibility. The IODE Project Office would deal with the management of the repository and the IODE Group of Experts on Biological and Chemical Data Management and Exchange Practices would assist with content management.

Roy Lowry informed the Group that the need for the XML Registry is diminishing since a number of repositories which comply with ISO19135 have come up.

The Group decided to close the activity.

2.1.4 Contribution to Ocean Teacher

It was decided during GE-BICH-III that a special group was to be created within GE-BICH to deal with this issue and was to include Edward Vanden Berghe, Mark Costello, Gwen Moncoiffé, and Sergey Konovalov.

Sergey Konovalov and Gwen Moncoiffé investigated means of contributing more effectively to Ocean Teacher by proposing to create a GE-BICH portal where, among other things, material relevant to Ocean Teacher could be assembled and articles worked on. However time constraint did not enable them to see this project through.

The Group agreed that the contribution to Ocean Teacher should still be a very important outcome of the work of GE-BICH. The issue is discussed further under Agenda Item 8.

2.2 Status of implementation of the GE-BICH-III action plan (Recommendation IODE/GE-BICH-III.1)

2.2.1 Topics arising from the GE-BICH-III meeting

The second Ocean Biodiversity Informatics conference OBI'07

The second Ocean Biodiversity Informatics conference OBI'07 (the third in a series of conferences on biological or multidisciplinary oceanographic data management initiated and organised by IODE GE-BICH and OBIS Canada) was held on 2-4 October 2007 at the Bedford Institute of Oceanography in Dartmouth, Nova Scotia, Canada. The conference programme included sessions on: Visualization Tools; Habitat and Ecosystems; Species Names Management and Tools; Metadata Developments; Data Use and Analysis; New Data Systems; and Integrating Different Types of Data. The conference was attended by over 100 participants from all over the world and included researchers, data managers, and contractors from government, universities, and the private sector. Poster and presentations details are available from http://www.marinebiodiversity.ca/OBI07. Proceedings have been published by Canada DFO (DFO 2008. Proceedings of a Conference on Ocean Biodiversity Informatics; 2-4 October 2007. DFO Can. Sci. Advis. Sec. Proceed. Ser. 2008/024).

The Group noted that the organisation of this conference was a perfect example of the collaboration between GE-BICH, OBIS, and ICES.

Marine Habitats (GE-BICH-III 5.2.1.)

Background document: Marc Costello's paper "Towards a global classification of marine habitats for marine data and information exchange" (http://www.scor-int.org/Project_Summit_2/PC2-Habitats-1.pdf).

An article on marine habitats and ecosystems and some relevant links are also available from the Coastal Wiki on the Coastal Portal of the ENCORA project website (see http://www.encora.eu/coastalwiki/Marine_habitats_and_ecosystems).

Marc Taconet asked about the progress with work Mark Costello is engaged on, concerning the classification of marine habitats. He said FAO had provided comments to that work, and that he felt such work on a classification was relevant especially in the framework of the High Seas Deep Seas initiatives tackled by organizations like FAO, CBD, IUCN-WCMC, CoML and OBIS.

Edward Vanden Berghe confirmed that that these organizations are aware of this work, and that further developments will take place during 2009 as outlined in the document.

The Group requested Edward Vanden Berghe to provide an update on the classification of marine habitats by second week of February 2009.

Globally Unique Identifiers (GE-BICH-III 5.2.2.)

The following communication was provided by Anton Guentsch who was invited but could not attend GE-BICH-IV:

At the time of the GE-BICH-III session, it was clear that the new TDWG architecture would need something like globally unique identifiers for all sorts of "global" objects such as specimens, observations, names, references, etc.; all kinds of objects that data processors would like to re-use instead of re-creating them over and over again. However, it was rather unclear which "technology" to use for GUIs. Since then, the TDWG architecture group has decided to use Life Science Identifiers (LSIDs) as GUIDs and many institutions and initiatives have already started to implement LSIDs into their databases (see http://www.tdwg.org/activities/guid/). There is a TDWG-drive GUID and LSID Wiki which might be of interest to get some insight into the identifier issue at http://wiki.gbif.org/guidwiki/wikka.php?wakka=HomePage.

LSIDs are basically composed of three components which are i) some protocol related parts, ii) a namespace part belonging to the authority who issued the LSID and iii) a local identifier which has to be unique for the given authority. One of the important consequences of this syntax is that the local identifiers don't have to be globally unique. So if an initiative (say OBIS) has reliable unique identifiers for their observation records for example, they are ready to construct LSIDs from these identifiers automatically which will then be globally unique.

Recommendation to data curators is to make sure that local IDs are a) stable (so keep the IDs when you migrate a database for example) and b) at least locally unique. If one is in the process of setting up a new data repository then UUID (Universally Unique Identifier) technology should be used. UUIDs are built already into many modern database management systems so that one only needs to choose it as a data type for the primary keys. Even if the DBMS does not have UUIDs, they are easy to implement (see http://en.wikipedia.org/wiki/UUID).

The Group noted that the Catalogue of Life had implemented LSIDs and queried whether these could be used in databases as permanent references to species names, similar to ITIS TSNs or WoRMS

AphiaIDs. However it was noted that LSIDs as used by the Catalogue of Life contain a version tag which would result in LSID to change, making them potentially unsuitable as stable identifiers. The Group decided to follow-up on the issue of identifiers and set-up a discussion on this through the GE-BICH wiki.

Quality Control flags (GE-BICH-III 4.5.2)

Gwen Moncoiffé was asked to identify the best contact within SeaDataNet to discuss the issue of quality control flags. She contacted Lesley Rickards who is co-ordinating this activity for SeaDataNet. Discussions were still at a very early stage when she was first contacted. However things moved quickly after that and a set of quality control flags had been adopted by SeaDataNet by the time the second communication on the subject took place.

This topic is discussed further under Agenda item 7.3

2.2.2 Other action items arising from GE-BICH-III

Representatives of PICES and CIESM to be invited to attend next meeting (GE-BICH-III 4.3)

The Group noted that no official invitation was sent to PICES and CIESM. There should be a follow-up on the invitations and the issue is discussed again under Agenda item 4.2 on membership of GE-BICH.

OBIS to contact NODCs (GE-BICH-III 4.2.2)

During GE-BICH-III the Chair of the International Committee of OBIS noted with appreciation the growing links between OBIS and IODE. It was recommended that contact should be made, inviting NODCs to make biogeographical and the relevant data available to OBIS. This flow of data could either go directly to the international OBIS portal, or through the regional OBIS nodes.

The Group requested Edward Vanden Berghe to follow-up on this and report before IODE-XX to be held in May 2009.

NeON (Marc Taconet) to contact with ICES and NODCs (GE-BICH-III 4.4.)

Marc Taconet reported on NeOn progress status, follow-up actions to GE-BICH-III, and future plans.

This 4-year project enters its last year (end in April 2010). The development of the NeOn toolkit is now well advanced; this toolkit is aimed at managing ontology life cycles (creation, updates, versioning, semi-automatic alignment of ontologies and cross-mapping of various domain ontologies) and to exploit ontology services (user interface for ontology exploration, documents and data mining and indexing, web services).

Regarding follow-up actions to GE-BICH-III:

- FAO has contacted ICES and a number of NODC nodes, including in particular NOAA, DFO, IFREMER, and others (as reported in the NeOn attached report made available to the meeting) as part of the inventory of Fisheries information systems worth earmarking from the NeOn toolkit. This inventory of selected sites provides the basis for content crawling and indexing against fishery ontology controlled vocabulary, with the goal to test NeOn toolkit performance in its ability to improve the access to relevant data sources.

- NeOn was presented at OBI07 Conference where the emerging need for ontologies and associated toolkits was established, and interest expressed from some participants (EoL, TDWG, Global Change Master Directory, ...) in attending training planned as part of NeOn project.

Future plans: such training is planned to occur during 3 days at the end of April 2009 in FAO premises. In May 2009, the project's 3rd annual review meeting will demonstrate what the NeOn toolkit has achieved based on a scenario and ontology provided by Fisheries. With the experience gained during the first training session, NeOn will consider organizing other training sessions including for external players during the last six months of the project (the project will end in April 2010).

This is discussed further under agenda item 3.7.

Relevance of GBIF's QC document of biogeographical data to the marine community (GE-BICH-III 4.5.3.)

Background documents: Chapman, 2005. Principles of Data Quality. http://www2.gbif.org/DataQuality.pdf; Chapman, 2005. Principles and methods of data cleaning. http://www2.gbif.org/DataCleaning.pdf

During GE-BICH-III, the Group was requested to read these papers and to comment on their applicability to marine biological data collections.

According to GBIF these are "A series of papers commissioned from Arthur Chapman in 2004 by the GBIF DIGIT programme to highlight the importance of data quality as it relates to primary species occurrence data. GBIF recognizes that the understanding of these topics and the tools available for facilitating error checking and cleaning is rapidly evolving and as a result, GBIF sees these papers as interim discussions of the issues as they stood in 2004. GBIF expects there will be future versions of these documents and would appreciate the data provider and user communities' input."

http://www.gbif.org/Stories/STORY1124274724

Mary Kennedy reported that the principles described in the papers can easily apply to marine, terrestrial, survey and museum collections. The first paper http://www.gbif.org/prog/digit/data_quality/DataQuality is a no-nonsense description of principles followed by most data managers and an excellent reference document to standard practices that should be followed and referenced by all data managers, marine or terrestrial.

The Group agreed that GE-BICH should set up a web presence where such data quality guidelines, and a list of similar useful references for biological and chemical data QC/QA can be accessed. The Group noted that these should be linked to OceanTeacher.

2.3 Issues arising from IODE-XIX

2.3.1 Revision of the Terms of Reference of GE-BICH (Recommendation IOC/IODE-XIX-3)

In their report to IODE-XIX, the co-chairs Sergey Konovalov and Gwen Moncoiffé proposed to extend GE-BICH terms of reference to reflect the need to make the results of GE-BICH work

available more widely via a web "portal", and also to emphasize the need to contribute material to Ocean Teacher. As a result, 2 new TORs (vi and vii) were recommended and adopted.

The full Terms of Reference of the GE-BICH thus became:

(i) To document the systems and taxonomic databases and inventories currently in use in various data centres;

(ii) To document the advantages and disadvantages of different methods and practices of compiling, managing and archiving biological and chemical data;

(iii) To develop standards and recommended practices for the management and exchange of biological and chemical data, including practices for operational biological data;

(iv) To encourage data centres to compile inventories of past and present biological and chemical data holdings;

(v) To encourage data holders to contribute data to data centres for the creation of regional and global integrated oceanographic databases incorporating physical, chemical and biological data;

(vi) To create and keep updated GE-BICH web "portal" making all results from the GE's work available to a wider community of data managers and data users;

(vii) To contribute results of GE-BICH activity to OceanTeacher making results from the GE and from other programmes available to education of data managers and data users.

The Group noted the approved Terms of Reference and discussed this further under Agenda item 4.1.

2.3.2 Cooperation with IOC/IPHAB on the development of the HAIS (Recommendation IOC/IODE-XIX-1)

The report of the meeting of the Joint IPHAB/IODE Task Team which was established to discuss the strategy to be adopted for the development of the Harmful Algal Information System (HAIS) was presented by Gwen Moncoiffé. The Task Team met at the IOC Project Office for IODE, 8-9 January 2008 to design the Harmful Algal Information System. The meeting was attended by representative of IODE (Tjess Hernandez, Sergey Konovalov, Gwen Moncoiffé, Peter Pissierssens), HAB (Catherine Belin, Zivana Gladan, Richard Gowen, Antoine Huguet, Seppo Kaitala, Jennifer Martin, Oejvind Moestrup, Vera Trainer, Adriana Zingone, Monica Lion, Henrik Enevoldsen), OBIS (Edward Vanden Berghe), and Encyclopaedia of Life (Paddy Patterson).

As a result of the meeting a document has been prepared that describes the vision, structure and partnerships for an international information system on the occurrence, impacts, identification, and monitoring of marine and brackish water planktonic and benthic microalgae perceived as harmful by humans.

The vision is to develop "An easy-to-navigate, dynamic, integrated, and distributed system with: visual and interactive quality-assured data and scientific information on harmful algae provided by experts, coupled with general information on authorities and institutions involved with sea food safety, statutory monitoring of harmful algae/toxins and institutions involved in HAB research." The Harmful Algal Information System (HAIS) will be an internet-based facility for "one-stop shopping" for a range of quality-assured data and information on HABs, toxin-producing algae and associated events

in the world oceans. The users will include scientists; managers and policy makers; the education sector; the industry and the general public. Existing elements will be managed as part of a distributed system integrating information on harmful algal bloom events (HAEDAT), harmful algae biogeographical information (HABMAP), descriptions of national monitoring programmes (MONDAT), the IOC taxonomic reference list for Toxic Algae, relevant literature and references (HABBIB), and list of experts (HABDIR). Details of the proposed strategy can be obtained from the document "An International Harmful Algal Information System – Vision, Design and Partnerships – (http://www.ioc-unesco.org/hab/index.php?option=com_oe&task=viewDoclistRecord&doclistID=64).

Some aspects of the projects are already on-going while others will require additional source of funding in order to be develop further. HAEDAT has already migrated to a new platform hosted by the IODE Project Office which will also be hosting MONDAT; HABMAP will be either hosted in an HAEDAT-like system at IODE PO or on the OBIS platform. The IOC taxonomic reference list is now a thematic species list within WoRMS (http://www.marinespecies.org/hab/), maintained by HAB experts. The content of HABBIB is now managed within ASFA and OceanDocs while HABDIR is managed via OceanExperts. Pending appropriate level of funding, the web interface will be provided by the Encyclopedia of Life and OBIS.

Future roles for IODE and GE-BICH could include advising on the re-design of HAEDAT and HABMAP, and in particular the use of controlled vocabularies and the handling of ancillary data; assisting with strengthening data provider network; and, in the longer term, assessing feasibility of greater involvement from NODCs and the Ocean Data Portal for data acquisition and access.

The Group endorsed the proposed work and noted that WoRMS now has a flag identifying harmful algal species.

3. NEW ISSUES OF RELEVANCE TO GE-BICH

3.1 Ocean Data Standards Pilot Project

Roy Lowry gave a presentation on the Ocean Data Standards Pilot project prepared by IODE co-chair Greg Reed. This focussed on: (i) developing a process of accepting submissions of proposed standards and following these through to recommendations, (ii) agreeing on some topics that appear ready for consideration as recommended standards, and (iii) agreeing on other topics that needed more work before submission of a proposal for a standard. The topics include marine metadata (discovery metadata), vocabularies, code lists and ontology, quality control of physical oceanographic parameters (including surface waves, sea level, currents, temperatures and salinity), and quality control flags. The standards process must meet the following criteria:

- Adopt standards only after testing
- Be open and transparent
- Create standards with broad support
- Provide free and easily accessible documentation
- Be simple and require limited resources to support

- Provide simple communication with the community
- Permit evolution

The process would involve five steps: (i) Proposal submission, (ii) Internal review, (iii) exert review, (iv) community review, (v) recommendation.

The Group welcomed the pilot project, as it would make information readily available to users. GE-BICH can contribute by:

- Identify areas where standards for the collection, management and exchange of data are required to improve interoperability;
- Encourage submission of standards;
- Participate in expert review of proposed standards;
- Contribute to community review of proposed standards;
- Adopt and promulgate recommended standards within GE-BICH's community.

GE-BICH highlighted the importance of this governance mechanism for ocean standards and welcomed the opportunity to contribute to the work of the Ocean Data Standards Pilot project.

The Group also discussed the situation when there may be more than one potential standard coexisting for topic such as, for example, taxonomic references (e.g. ITIS, WoRMS). This issue is discussed further under Agenda item 6.1.

3.2 OceanDataPortal Project

Sergey Belov gave a presentation on the Ocean Data Portal Project (ODP). The objective of the Ocean Data Portal is to facilitate and promote the exchange and dissemination of marine data and services. The ODP will deliver a standards-based infrastructure that allows the integration of marine data and information from a network of distributed NODCs in the IODE network, as well as the resources from other participating systems such as data centres of JCOMM and other projects.

The key principle of ODP is interoperability with existing systems;

- Data centres will need to accept and implement a set of agreed interoperable arrangements including the technical specifications and web-services;
- Interoperability will be achieved through the use of internationally endorsed standards (such as ISO and OGC);

NODCs will not be required to change their internal (local) data management systems.

The following functionality is envisaged:

- Participating data centres generate discovery metadata about their datasets for distributed data search and retrieval;
- The Portal periodically harvests these metadata, monitors the accessibility of remote data sources and updates the portal metadata catalogue;
- Users can access the system via a web browser and search for single or multiple data types from a distributed set of sources;
- Data request sourced from the appropriate data centre and returned to the Portal.

The V1 services will comprise the following components:

- Data provider tools, able to register resources and provide access to their local data through ODP and create discovery metadata (for portal catalogue);
- Metadata components – discovery metadata catalogue. Provides services for harvesting metadata from distributed data providers and other portals. Includes common codes and dictionaries services.
- Search & browse tools and services.
- Data access components – providing access to the distributed data sources and data transportation using common protocol
- ODP web-site
- ODP user web-interface, including GIS-oriented user interface, metadata and data search interfaces, data download and visualization components;
- Connectivity mechanisms for interaction with other ocean portals and projects (SeaDataNet, WIS, etc.)

The Group noted that portals are a useful mechanism for making data available. It is therefore important to analyse who are the potential users of ODP, and how it will relate to other existing portals such as SeaDataNet. The challenges identified included: how to deal with duplicate data sets, standards and formats, and authentification and access control.

GE-BICH welcomes the opportunity to work closer with the OceanDataPortal project. Some of the potential areas for collaboration with GE-BICH include: identification of potential data providers, and encouraging the development and utilisation of a common set of codes and dictionaries.

3.3 Standards for chemical data and metadata exchange in SeaDataNet

Roy Lowry made a presentation on the SeaDataNet standards that can be adopted for specialist chemical data management. SeaDataNet takes pre-existing metadata formats and develops these into ISO19115 profiles. The profiles are then described by XML schemas which are extended to provide content validation.

Examples of metadata formats include:

- **EDMED:** This was inherited from SeaSearch and is designed to describe "datasets" such as those collected in a project or physical sample collections. It has been developed as an ISO19115 profile populated from controlled vocabularies.

- **Cruise Summary Reports (CSR):** This was inherited from IODE via ICES and SeaSearch and is designed to describe cruises. However it has been used for all types of activities with varying degrees of success. It has been developed as an ISO19115 profile populated from controlled vocabularies. Extensions include SeaDataNet lists as well as CSR.

- **EDIOS:** This was inherited from EuroGOOS and is designed to describe "observing systems" such as real-time data streams and repeatedly worked stations. Currently awaiting resources to develop the schema.

- **Common Data Index (CDI)**: this was inherited from Sea Search and is designed to describe a physical file of data. The current SeaDataNet model is very fine grained (e.g. one CTD cast per file). It has been developed as an ISO19115 profile populated from controlled vocabularies.

The following are the formats in use:

i). Modified ODV input format: a simple ASCII format able to manage profile, point time series or trajectory data. SeaDataNet has modified this by adding the URIs to BODC parameter usage vocabulary, and linking to the associated CDI record. These modifications introduce standardization of parameter semantics.

ii). Climate and Forecast (CF) NetCDF: This is a binary format used for well gridded data. SeaDataNet has modified this by adding the URIs to BODC parameter usage vocabulary, and an extra attribute for CDI record linkage.

iii). MEDATLAS format: This is an optional exchange currency for consenting data centres and is widely used by the Mediterranean countries. The parameter semantics issue is handled through a mapping between MEDATLAS amd BODC PUV.

SeaDataNet has three content governance authorities for vocabularies: BODC, SeaDataNet technical task Team members, and SeaVox. The NERC DataGrid Vocabulary Server developed by BODC for vocabulary Technical Governance is used. This serves lists of terms and the relationship between terms. The master versions of all vocabularies are always online at a well-known location.

Roy Lowry identified the development of fine-grained device catalogue and chemical nomenclature ontology as the priority needs that should be addressed.

The Group agreed that priority should be given to developing fine-grained device catalogue and this is discussed further under Agenda item 6 (particularly 6.2. and 6.4.); some elements are also included in GE-BICH intersessional work plan.

The Group recognised that the development of a chemical nomenclature ontology applicable to marine compounds would be a much needed resource. There are existing initiatives in the fields of chemistry and biochemistry. However there are obvious issues about linking up with propriatory and non-propriatory resources. The group will follow development in that domain and discuss the topic at the next GE-BICH meeting.

3.4 Presentation of the highlights of ICES data management activities, external interactions and the EcoSystemData online application

Neil Holdsworth highlighted the ICES data management activities.

The ICES Data Centre is a supporting structure for the science and advisory programmes in ICES. The centre, which hosts a number of large datasets, works with marine related organisations to manage their data and produce data products of relevance to the marine community. All data submitted to ICES are considered to be in the public domain unless otherwise explicitly specified and agreed. Data Users must respect any and all restrictions on the use or reproduction of data such as restrictions on use for commercial purposes [http://www.ices.dk/datacentre/datapolicy.asp].

The following activities are planned for 2009:

- GIS web applications (Geoserver, Openlayers) and providing services to marine community
- Exchange standards and vocabularies (ISO, SDN, IODE, Station dictionary)
- Data recovery (North Sea and Baltic Year of the Stomach)
- Oceanographic relational DB (all that comes with it. flagging, ODV, DIVA, CSR etc.)
- Automated uploading of data (Fisheries and then Chemical/Biological)
- Chemical, Biological, Fisheries data through one online interface
- Marine indicators for MSFD
- WISE-Marine
- EMODNET?
- WGDIM and other WG's
- QUASIMEME database
- Fish disease index WGPDMO
- OBIS data link-up

The centre publishes an e-newsletter, providing details on its activities. This is available at: http://www.ices.dk/datacentre/updates/DC_update.htm

ICES maintains an online warehouse for biological and chemical data – the EcoSystemData. The holdings currently include 210,225 samples, about 9 million measures covering biota, sediments, seawater and biological community.

The following are links to some of the ICES databases:

- Biological data [http://ecosystemdata.ices.dk/inventory/]
- Fisheries data [http://datras.ices.dk/]
- Reference codes [http://www.ices.dk/datacentre/reco/]
- Data Centre online news [http://www.ices.dk/datacentre/updates/DC_updates.htm]

Potential areas of collaboration are:

- GIS standards, meta-data discovery in the marine context
- Managed vocabularies (management, suggestions for standards etc.)
- Flagging (ICES databases are considering flagging standards and this could be greatly informed by the debate and collected standards within GE-BICH)
- Data provision to OBIS and use of WoRMS web services at ICES

The Group welcomed continued collaboration with ICES and noted that some of the issues identified above are discussed further under Agenda items 6 and 7.

3.5 CDIAC (Carbon Dioxide Information Analysis Centre) Ocean Carbon Dioxide Data Management and Data Synthesis Projects

The presentation on the Carbon Dioxide Information Centre was given by Alex Kozyr, CDIAC. The CDIAC Global Ocean CO_2.Database components are:

- WOCE Database
- GLODAP Database
- CLIVAR Repeat Hydrography and Carbon Database
- VOS Underway pCO2 Database
- Moorings and Time Series Database
- CARINA Database
- PICES Database
- LDEO (Takahashi) Global Surface pCO2 Database
- Global Coastal Program Data

The quality assurance and quality control procedures used include:

- Results of shipboard analysis of certified reference materials
- Replicate samples
- Consistency of deep carbon data at the locations where cruises cross or overlap
- Multiple linear regression analysis
- Isopycnal analyses
- Internal consistency of multiple carbon measurements
- Final evaluation of offsets and determination of correction to be applied

Three search engines were developed for visualizing the data. These are: WAVES, LAS, and MERCURY.

The Group identified areas of close co-operation with CDIAC Ocean CO2 in particular with regards to chemical data QA/QC procedures, and guidelines for data exchange and vocabularies. Members of the Group need to be aware of the CDIAC/CCHDO review of Procedure and Guidelines for the collection of hydrographic data and were invited to check progress at http://cdiac3.ornl.gov/hydrography/.

3.6 Plankton functional types (PFT) and the green ocean modelling initiative - report from the Eur-Oceans Cambridge meeting.

Stéphane Pesant, University of Bremen (and Assistant Scientific Director, EUR-OCEANS) presented the results of the EUR-OCEANS meeting of experts on the harmonisation of plankton data sets for Plankton Functional Types models (1-3 October 2008, Cambridge, United Kingdom). The objectives of the meeting were to: (i) bring together modellers, field scientist and data managers, (ii) discuss the needs of modellers for PFT data (Green Ocean Model), (iii) Discuss the various sources of PFT data, and (iv) Find ways to harmonise PFT data.

The meeting recommended setting up small communities for each source of PFT data. The goals of these communities composed of field/lab scientists, modellers and data managers would be as follows:

1. Facilitate the submission of biological data about PFT distribution, abundance and biomass into designated NODCs and/or to World Data Centers (WDCs), notably WDC-MARE in Europe;
2. Promote the extraction of data from NODCs and WDCs for use in information systems available to modellers, such as OBIS (biogeography), NMFS- COPEPOD (zooplankton), NASA bio-optical Marine Algorithm Data set (NOMAD; HPLC), EMBL- EBI (genetics), and PANGAEA (all types of marine data);

3. Develop/review standard vocabularies describing parameters, sampling methods, and analytical methods, building on existing initiatives such as those undertaken by the IODE, MMI, NERC DataGrid, SeaDataNet and WoRMS;

4. Recommend best practices to harmonize existing data through the comparison of sampling and analytical methods, including emerging techniques such as metagenomics, image analysis and new remote sensing algorithms;

5. Promote the collection of new PFT data using preferred sampling and analytical protocols, including complementary measurements required to compute carbon biomass (e.g., wet weight, size, biovolume, or carbon content).

European and international consortia such as IMBER, EUR-OCEANS, MarBEF, MGE and ESONET, and the FP7 Information and Communication Technologies (ICT) programme will be approached to support the development and networking of small communities around the different sources of PFT data, comprising field & lab scientists, modellers and data managers;

Sampling gear and analytical instruments that generate PFT data could be registered at eurocean.org or EUR-OCEANS' shared facility registry, and point to their users as a starting point for the PFT communities.

European and international research programmes (e.g. SESAME, EPOCA, CARBOOCEAN, HERMES, BASIN) could contribute scientifically and financially to support the development and networking of small communities around the different sources of PFT data or other types of data.

The Group noted that the small communities on PFTs established will contribute to the work of GE-BICH and recommended that close collaboration be developed with them in the development of non-taxonomic vocabularies.

3.7 Perspective on collaborative research environments offered by D4Science project

Marc Taconet made a presentation on the collaborative research environments offered by the "Distributed colLaboratories Infrastructure on Grid Enabled Technology for Science (D4Science - http://d4science.eu). His particular focus was on the Implementation of the Ecosystem Approach to Fisheries Management (EAF). This can be divided into three components of knowledge:

- Environment [physical and broader ecosystem]. This is the area of interest of IOC, IUCN, and CoML/OBIS.

- Biodiversity [Broader ecosystem and Resources of commercial interest]. This area of interest of IUCN, CoML/OBIS, GBIF and WFC.

- Fisheries [Resources of commercial interest and Production systems/Fleets]. This is the area of interest for WFC and FAO and RFBs.

The areas that are related to the GE-BICH objectives are: Communities of Practise (with e-infrastructures, using structured data), addressing of research needs of marine sciences (this enables data sharing beyond established communities of practise, and implementation of collaborative approaches), and generalizing solutions to interoperability. A number of institutions or programmes of

the GE-BICH sphere are already concerned since ICES fisheries data, Fishbase, Aquamaps, OBIS, and Seadatanet will be part of the infrastructure.

D4Science is funded by the European Union within the 7th Framework programme for Research and Technological Development. About 11 institutions working on informatics science, informatics engineering, and earth monitoring science are involved, and FAO's position in the project is to lead the user community of earth monitoring sciences. The project calls for the realization of scientific e-infrastructure that will: (i) remove all homogeneity, sustainability, variability, and other technical concerns from the minds of scientists; (ii) hide all related complexities from their perception, and (iii) enable them to focus on their science and collaborate on common research challenges. D4Science will create Virtual Research Environments through mechanisms allowing semi-automated import of distributed data sources; harmonization of heterogeneous sources; intensive data processing; support for query, output and annotation; work flow process definition; template generation tools; and catalog and discover data. The second phase (2010-11) will extend D4Science by introducing mechanisms for facilitating the use of data resources managed by different data infrastructures, and the programmatic exploitation of the D4Science capabilities. The main components of the initial ecosystem are: GENESI-DR, AquaMaps, INSPIRE and DRIVER. The major outcome would be more accurate country profiles and better catches reallocation.

The GE-BICH welcomed the offer of collaboration in developing interoperability with Ocean Data Portal, selection of common standards, and use of W3C compliant web services.

4. IODE ORGANIZATIONAL REFORM AND ITS IMPACT ON GE-BICH

4.1 Relationship between OBIS and IOC and its impact on GE-BICH

This agenda item was presented by Gwen Moncoiffé. She recalled that the Ocean Biogeographic Information System (OBIS) and GE-BICH have always had close connections. In its first 6 years of existence, GE-BICH's activities had largely focused on marine biodiversity data management issues under the leadership of Edward Vanden Berghe. In 2010, funding for OBIS is due to end. In order to investigate the possibility of OBIS continuing under the umbrella of the IOC, the IOC Executive Council requested the Executive Secretary and the IOC Data and Information Management Advisory Group (IODE) to work together with the OBIS Secretariat to develop a document for submission to the 25th Session of the IOC Assembly in 2009. In order to develop such document, an IOC-OBIS workshop on collaboration between IOC and OBIS towards the long-term management, archival and accessibility of ocean biogeographic data took place at the IOC Project Office for IODE, Ostende, Belgium, 24-26 November 2008. The workshop was attended by IOC, IODE and GE-BICH representatives (Geoff Holland, Peter Pissierssens, Greg Reed, Gwen Moncoiffé, Mary Kennedy), and by OBIS and GBIF representatives (Serge Garcia, Edward Vanden Berghe, Bob Branton, Ron O'Dor, and Vishwas Chavan). Workshop participants discussed three possible scenarios: a partnership between OBIS and IOC/IODE, OBIS as an IODE project and OBIS as an IOC programme.

The final decision was to recommend that OBIS becomes an IOC programme with strong connections with IODE. The Executive Director of OBIS, Edward Vanden Berghe, iswas to develop a business plan and a work plan for OBIS with details of financial and staffing issues to be reviewed by the IODE Officers.

The Group noted that the adoption of OBIS within the IOC structure does impact on GE-BICH TORs as issues related to biological taxonomies and biodiversity data would be looked after by the IOC-

IODE/OBIS group. This is also an opportunity to go a little further in the review of the TORs by emphasizing GE-BICH's role in promoting a better integration of biological, chemical and physical data within IODE's network of NODCs.

The Group agreed that it should continue to address issues related to both biological and chemical data management and this is because only a fraction of biological data in oceanography is related to a taxonomically resolved group of organisms (species, genus, family etc.). Indeed, a large fraction of biological data in oceanography is collected at the community level from measurements carried out on either bulk or size-fractionated samples. In order to avoid this type of data being left out, biology should remain a strong element of GE-BICH's TORs, side-by-side with chemical data.

Strong connections between GE-BICH and OBIS would be supported by the formation of the new joint GE IODE/OBIS.

The Group reviewed the TORs of GE-BICH in line with these developments to remove the reference to taxonomic data **and adopted Recommendation BICH-IV.1** on revision of the Terms of Reference of the IODE's Group of Experts on Biological and Chemical Data Management and Exchange Practices.

4.2 Implications of Recommendation IODE-XIX.2 (Strategy and Structure of IODE Groups of Experts) for GE-BICH

This agenda item was presented by Gwen Moncoiffe. She recalled that the IODE-XIX.2 recommendation for the Groups of Experts is as follows:

(i) Objectives:

a. IODE Groups of Experts will undertake detailed scientific and technical studies and/or co-ordination tasks, by subject or region, as identified by the IODE Committee;

b. IODE Groups of Experts, including the JCOMM/IODE ETDMP, will monitor scientific and technical developments, and identify needs to be addressed by IODE, as pertaining to their IODE subject area and propose a work programme with clear priorities, for consideration by the IODE Committee;

c. To facilitate implementation of the Groups of Experts work programme, the Groups of Experts will (i) seek cooperation from IODE national coordinators; (ii) develop and implement projects with clear objectives and deliverables, and take responsibility for the coordination and management of such projects.

(ii) Membership:

a. the total number of Members of IODE Groups of Experts should not exceed 8;

b. the Groups should be composed of not more than 4 long-term members; and not more than 4 short-term members;

c. The long-term members will be selected by the Executive Secretary, based upon nominations from Member States and further based upon individual expertise as relevant to the concerned IODE Group of Expert. Long-term members can remain a member of the Group during not more than 4 inter-sessional periods;

d. The short-term members shall be selected by the long-term members of the Group, based upon their specific expertise, documented in the OceanExpert system, related to specific tasks or projects and will remain a member during, preferably, not more than two inter-sessional periods;

Gwen Moncoiffe highlighted that the current membership of GE-BICH is of 5 members. Four members (G. Moncoiffé, M. Kennedy, A. Kouznetsov, and H. Gonzalez) have been part of the group since its first session. S. Konovalov joined the group at the beginning of GE-BICH-III. H. Gonzalez who was unable to come to this session, has offered to step down should GE-BICH's focus move away from his main area of expertise. Margarita Gregg (US-NODC) has expressed interest in joining the group but could not attend the fourth session of GE-BICH.

The Group noted that GE-BICH membership needs to be reviewed in line with these decisions of IODE-XIX, taking into account the group's new objectives, in particular it will need to be strengthened with experts from the field of marine chemistry. **The Group also took into account** geographic representation of the membership, and the need for succession planning as most of the current members will not qualify to continue as members beyond GE-BICH V.

Based on the work plan discussed under Agenda item 9, the following was proposed for the membership of the Group:

(i) Long term membership [4 experts]

The Group proposed the retention of the following experts as long-term members:

- Gwen Moncoiffé (United Kingdom)
- Mary Kennedy (Canada)
- Alexander Kouznetsov (Russia)
- Sergey Konavalov (Ukraine)

Gwen Moncoiffé , Alexander Kouznetsov and Mary Kennedy are only eligible for one more term as members of the Group. IODE member states will therefore be notified to nominate candidates in time for three new long-term members to be appointed prior to GE-BICH V.

The fifth member of the group, Humberto Gonzalez, is an expert in the field of biological oceanography and ocean productivity. Since these are areas which are still important for GE-BICH, his interest in contributing to the Group's new work plan as a short-term member should be checked by the Chair.

Action: Gwen Moncoiffé to contact Humberto Gonzalez.

(ii) Short term membership [4 experts]

The Group recommended that the places available for short term members be filled as follows:

- Margarita Gregg or Hernan Garcia, US-NODC, who both have expertise in chemical oceanography;
- A chemical expert from Japan or Pacific Ocean (in addition to the PICES representative mentioned below);

- An expert from SOLAS or GEOTRACES communities;
- An expert from the Southern hemisphere (e.g. Africa, New Zealand or South America); this expert could be Humberto Gonzalez.

The Group proposed the following reserve candidates should it not be possible to get experts from the groups outlined above by June 2009: Stéphane Pesant, Francisco Hernandez, Edward Vanden Berghe or Neil Holdsworth. All four are contributing to the GE-BICH work plan. Alternatively, they will be invited as external experts representing their respective programmes and organisations.

(iii) Invited experts

The Group proposed to maintain a strong network of "invited experts" who bring additional expertise in the field of biological and chemical data and enable GE-BICH to liaise more efficiently with other programmes or organisations, and who will cover their participation costs. These include:

- Stéphane Pesant, University of Bremen also representing WDC-MARE
- Francisco Hernandez, VLIZ also representing WoRMS
- Edward Vanden Berghe, Rutger University also representating OBIS
- Alex Kozyr, CDIAC, also representating IOC's Ocean Carbon programme;
- A representative from GOOS
- Marc Taconet, FAO
- Neil Holdsworth, ICES
- Representative from PICES and CIESM
- Other experts representing IODE activities and programmes: Roy Lowry (MarineXML/SeaVox), Sergey Belov (OceaDataPortal), OceanTeacher

The Group requested the Chair to liaise with the secretariat to constitute the revised membership of Group.

4.3 Implications of the IOC Strategic Plan for Oceanographic Data and Information Exchange on GE-BICH

The Chair of GE-BICH presented the IOC Strategic Plan for Oceanographic Data and Information Exchange for 2008-2011. The vision outlined was "A comprehensive and integrated ocean data and information system, serving the broad and diverse needs of IOC Member States, for both routine and scientific use". The objectives would be to (i) develop a system that can receive data collected by all IOC programmes and projects and deliver them in a uniform and transparent way to all users, and (ii) develop a system that can collect bibliographic and factual information from all IOC programmes and projects and deliver them in a uniform and transparent way to all users. The main challenge is the

"coordination and cooperation among partners and user communities". The following are the elements of the Strategy:

- Adherence to the IOC Oceanographic Data Exchange Policy;
- Acceptance and implementation of agreed interoperability arrangements including technical standards and specifications for processing, quality control, storing and disseminating shared data and information;
- A global network of data centres and related national distributed networks, and permanent long term data archiving centre(s) for all data, which operate to agreed standards, providing seamless access to data and information;
- Capacity building through continued development of Ocean Data and Information Networks (ODINs) whilst extending the OceanTeacher capacity building tool through cooperation with WMO, JCOMM and others as appropriate;
- Governance by an Advisory Group that brings together the various programme elements of IOC as well as of bodies and organizations collaborating closely with IOC.

The Group noted that close collaboration has been developed with HAB, CDIAC, ICSU's WDCs, ICES, FAO and OBIS. **The Group pointed out** that new collaboration should be explored with GOOS, PICES and CIESM.

5. STRATEGIC PRIORITIES FOR GE-BICH

This agenda item was presented by Gwen Moncoiffé. She highlighted that the strategic priorities for GE-BICH need to reflect and address:

1- IODE priorities, including needs identified by its network of NODCs and by projects and activities within the IODE;

2- Need from other IOC programmes such as e.g. HAB, IOCCP, etc.

3- Knowledge or resource gaps specific to biological and chemical oceanographic data management identified by the community of scientists and data managers involved in projects such as SeaDataNet but also large international programmes such as SOLAS, IMBER, GEOTRACES, etc.

4- Liaise with other multinational organisations and networks to promote synergy and avoid duplication.

The strategic priorities should reflect a long-term strategy covering the next two intersessional periods (i.e. 4 years) and a more detailed 2-year work plan with clear deliverables.

The work plan should: a) be realistic in what can be achieved considering the limited time that GE-BICH members can make available, b) engage with other working groups such as ICES WG-DIM, and established or emerging scientific working groups and activities (e.g. PFTs, working groups and initiatives within SOLAS, IMBER, etc.)

The Group proposed that in the next four years GE-BICH focuses its resources around these main areas of activities: (i) specialised vocabulary lists, and (ii) QA/QC of biological and chemical data, and (iii) best practices for data reporting and exchange. GE-BICH should build upon existing initiatives such as SeaDataNet. Small working groups should be established, based on the expertise of the GE-BICH membership to handle specific projects that have been identified.

GE-BICH can contribute to the international effort in developing, compiling or collating standardised vocabularies and QA/QC protocols in support of the management and exchange of chemical and non-taxonomic biological data.

For work on specialised vocabulary lists, it is proposed to adopt the following strategy: 1) use the framework put in place in the frame of the NERC Data Grid, the SeaDataNet, and the Marine XML projects (i.e. BODC Vocab server and SeaVox); identify existing lists within GE-BICH remit which are not yet in the system; identify partners and form small working groups to build up a comprehensive list of existing vocabularies and link them to the existing SeadataNet hierarchies; submit completed lists to SeaVox; respond to any queries from SeaVox. Once the process is complete the list can be made publicly available via the BODC Vocab server.

6. STANDARDS AND VOCABULARIES FOR THE MANAGEMENT OF BIOLOGICAL AND CHEMICAL DATA

6.1 Biological taxonomic standards

This agenda item was introduced by Mary Kennedy.

One of the key issue to enabling interoperability of biological databases is to have reliable taxonomic identifiers. One way of enabling this is to use a reference or master taxonomic code list such as ITIS. By doing this one can then rely on the adoption of a common spelling and linkage to valid synonyms and taxonomic hierarchy.

In previous GE-BICH's sessions, ITIS stood as the only viable recommendation with regards to linking databases to authoritative species lists. However, there was an awareness of the problems which started to emerge. The increasing demand for taxonomic QC of species names from all parts of the world, for all kingdoms and for organisms from all possible habitats, resulted in ITIS becoming a bottleneck for many activities reliant on checking the validity of a taxonomic identifier. This was particularly acute in the marine domain and for smaller organisms such as planktonic organisms.

During GE-BICH-III a proposal was presented to use the existing European Register of Marine Species (ERMS) as the basis for developing the World Register of Marine Species (WoRMS). Soon after GE-BICH-III, WoRMS received funding and started setting up a community of taxonomists to develop and maintain authoritative lists and taxonomic hierarchies for all marine species. WoRMS started from a combination of ERMS with several other species registers maintained at the Flanders Marine Institute (VLIZ).

While WoRMS activities would enable marine biological databases to strengthen the quality of their taxonomic information by linking their record to a WoRMS identifier (AphiaID), one needs to be aware that WoRMS on its own might not be sufficient for many databases. Two limitations spring to mind:

- Low-salinity estuarine or freshwater species will not be present in WoRMS unless also present in marine waters;

- Non-taxonomically valid groupings often found in datasets from planktonic or benthic samples cannot be linked to a taxonomic reference list such as WoRMS or ITIS. These might require a separate reference list.

Another issue of concern is related to the quality control of taxonomic nomenclature assignment. One strategy to quality control species identification is to check new species lists against regional registers of species. If such lists were developed to cover most coastal and oceanic area then linking local databases to authoritative lists would become a powerful tool to improve the QC of species related information in oceanographic databases.

Canadian Regional Registers of Marine Species

Mary Kennedy gave a presentation on the creation of a regional register of species.

During the development stage of WoRMS known list of species were gathered. In Atlantic Canada, the Atlantic Reference Centre (ARC) had compiled reference material and had built 4 registers: one for the Bay of Fundy, one for the Gulf of Maine, one for the NW Atlantic (NWARMS) and finally one for the Canadian Atlantic.

In January 2008, a workshop was held in Canada to discuss the creation of species registers for other areas in Canada. One of the results of this workshop was that in September of 2008 the Canadian Department of Fisheries and Oceans (DFO) obtained copies of the ARC's registers with the agreement that these registers would be archived in a database that would be maintained and made accessible to others.

DFO is currently documenting the database design and to fully describe what content is essential in order to create regional registers of species. This database will house both marine and fresh water registers.

Taxonomic names listed in these registers will be mapped to both ITIS and WoRMS identifiers. These registers will be used to quality control the spelling, synonymy, hierarchy and geographical distribution of species in Canadian data collections.

The World Register of Marines Species – www.marinespecies.org (WoRMS)

Francisco (Tjess) Hernandez gave a presentation on the World Register of Marines Species (WoRMS). The aim of the register is to provide an authoritative and comprehensive list of names of marine organisms, including information on synonymy. While highest priority goes to valid names, other names in use are included so that this register can serve as a guide to interpret taxonomic literature.

The content of WoRMS is controlled by taxonomic experts, not by database managers. WoRMS has an editorial management system where each taxonomic group is represented by an expert who has the authority over the content, and is responsible to control the quality of the information. Each of these main taxonomic editors can invite several specialists of smaller groups within their area of responsibility.

This register of marine species grew from the European Register of Marine Species (ERMS), and its combination with several other species registers maintained at the Flanders Marine Institute (VLIZ).

Rather than building separate registers for all projects, and to make sure taxonomy used in these different projects is consistent, we developed a consolidated database called 'Aphia'. A list of marine species registers included in Aphia is available below. MarineSpecies.org is the web interface to this database. The WoRMS is an idea that is being developed, and will combine information from Aphia with other authoritative marine species lists which are maintained by others (e.g. AlgaeBase, FishBase, Hexacorallia, NeMys).

Resources to build MarineSpecies.org and Aphia were provided mainly by the EU Network of Excellence 'Marine Biodiversity and Ecosystem Functioning' (MarBEF), VLIZ, and the many benevolent contributions from the editors. Intellectual property rights for WoRMS are managed through the Society for the Management of European Biodiversity Data (SMEBD).

Aphia contains valid species names, synonym and vernacular names, and extra information such as literature and biogeographic data. Besides species names, Aphia also contains the higher classification in which each scientific name is linked to its parent taxon. The classification used is a 'compromise' between established systems and recent changes. Its aim is to aid data management, rather than suggest any taxonomic or phylogenetic opinion on species relationships.

Keeping WoRMS up-to-date is a continuous process. New information is entered daily by the taxonomic editors and by our members of the data management team. Often data also come in from contributions of large datasets, such as global or regional species lists.

The current statistics for the register include: 136,010 valid species; of which 75,742 checked (56%); 198,610 species names including synonyms; 247,945 taxa (species to phyla); and 8,669 images.

The Group commended the WoRMS team for their achievements and recommended that WoRMS be a first contact point for reporting species that are not yet described in registers of marine species. WoRMS would double check that species are indeed not yet described in any Regional and Global registers such as WoRMS, ITIS, AlgaeBase and FishBase, and would forward the request for adding the species to the relevant register.

The Group pointed out that each database has its relative strengths and weaknesses. For example ITIS focuses on North America, and its records for Europe and other regions are incomplete; WoRMS covers the world ocean but its record is incomplete for microbes and it only contains some bacteria. Users should therefore select database depending on their requirements. The Group strongly encouraged CoL to include all WoRMS records in its catalogue.

The following issues were raised:

(i) Need to develop a mechanism for accessing different geographic area maps [LMEs, EEZs, IHO regional seas, FAO fishing zones. It was noted that, WoRMS are currently developing polygons which are an intersection between regional seas and EEZ.

(ii) Establishment of regional registers that will assist with quality control of databases

The Group proposed that OBIS and WoRMS work together to produce finer-grained regional lists, which could be used by data managers.

6.2 Controlled vocabulary for data types and gears

One important task for a group like GE-BICH is to identify requirements to improve or facilitate the management of biological and chemical data. One of these requirements is the need for greater standardisation of the terminology used for labelling biological and chemical data types, sampling gears and methods, and analytical instrumentation.

Work on controlled vocabularies and ontologies for the marine sciences is taking place in the frame of SeaDataNet, MarineXML, NERCDataGrid and the Marine Metadata Interoperability initiative. Thanks to these initiatives, there is now a solid framework and a dedicated community of experts to help build and maintain vocabulary lists.

With SeaVox, there exists a mechanism by which one can submit a list to scrutiny and, if or once accepted, a mechanism by which one can make this list publicly available.

GE-BICH should start identifying existing lists of vocabularies relevant to its domain of expertise and select a few which could be easily prepared for submission to SeaVox.

6.2.1 Controlled vocabulary for biological/chemical sampling gears.

A good starting point to determine what lists may be currently available is to browse through the Marine Metadata Information web site at http://www.marinemetadata.org/ and search for vocabularies. A power point presentation walked through this web page and show the links to both the US-NODC and BODC vocabularies.

The US-NODC gear code table was downloaded and its content was examined. The Canadian plankton gear codes and the BODC plankton gear codes are not accessible on the web but portions of the respective tables were displayed for demonstration purposes. These source tables should open the floor for discussion regarding what is required to properly describe our collection gear.

It was proposed that the first vocabulary list to be reviewed during the inter-sessional period be the list of plankton samplers. In building the draft list, it is proposed to follow the SeaDataNet's hierarchy for gears and other data production tools as follows:

Device Category Types > Device Categories > Device Catalogue

where Device Catalogue contains the definition of gears at the highest possible degree of granularity; Device Categories represent intermediate groupings; and Device Category Types represent the upper level categories.

There are five Device Category Types: In-situ sensor and instrument package categories; Remote sensor categories; Sample collector categories; Sample measurer categories; Sample processor categories.

The Group agreed that GE-BICH should set up a group to look at DEVICE CATALOGUE and prepare comprehensive lists (starting with plankton nets) to be circulated through SeaVox for consideration. The work should include documentation of available resources, and be looking at definitions. Existing classification should be used to organise the work flow. The different types of gear in use should be catalogued in a wiki. Mary Kennedy will lead this initiative.

The Group noted that regular changes in gear types and designs will continue to be a challenge.

6.2.2 Chemical data types, instruments and methods at the US-NODC

Hernan Garcia presented a brief introduction on aspects of chemical data management at US-NODC relevant to the discussion including what chemical data they archive, available data products, metadata for chemical data types, instruments, methods, and scales and standards.

Hernan Garcia presented a summary of controlled vocabulary tables for physical, chemical, and biological (plankton) data available at the U.S. NODC World Ocean Database (WOD) project and the Ocean Archive System (AMS) available at http://www.nodc.noaa.gov. The U.S. NODC includes a comprehensive list of metadata descriptors for use with both the originator's data in the AMS and WOD ocean data product (code tables).

The WODselect retrieval system allows a user to search World Ocean Database online using user-specified search criteria). The AMS holds the originators' datasets and metadata in their original format. Metadata in the AMS can be retrieved in XML format (http://data.nodc.noaa.gov/nodc/archive/metadata/fgdc/xml/).

Metadata information in WOD is made available by means of code tables for primary investigators, country, platforms code list including NODC codes, institute code list including NODC codes, and a series of secondary, variable specific, biological and taxa code tables (Boyer et al., 2006, Johnson et al., 2006). These code tables facilitate the use of WOD and are updated to reflect additional metadata information. When possible, WOD also maintains cruise data reports in the public domain. A brief description of the secondary, variable specific, biological and taxa code tables is given below:

(1) Secondary headers (metadata about meteorological, ocean state, including accessions, project, platform, institute, weather station, cast direction, water color, wave direction, wave height, sea state, wind force, wave period, wind direction, weather condition, cloud type, cloud cover, probe type, recorder, digitization method, digitization interval, data storage, reference instrument, visibility, needs depth fix, ocean vehicle, argos fix, database ID, ukho reference, depth unit, originator flags, water samplers)

2) Variable-specific codes (metadata specific to measured variables including: Accessions, projects, scale of measurement, institutes, instruments, methods, originator units, equilibrator types, filter types and size, incubation time, seawater standards)

(3) Biological codes (biological metadata about including type of plankton tow, gears and flowmeters, preservation methods, weight methods, count methods, flowmeter calibration, volume methods, etc)

(4) Taxa specific codes (metadata and descriptive codes for individual taxa including taxa list, taxon lifestage, taxon sex, taxon presence abundance, taxon trophic level, taxon realm, taxon feature, taxon modifier, size min, size max, units, count method, cbv value, cbv calculation method, biological group).

6.2.3 Controlled vocabulary for biological/chemical data types

Although this is a new topic for GE-BICH this is certainly not a new topic to our community. See for example:

http://www.iode.org/marinexml/files/SGXML_final.pdf

http://www.bodc.ac.uk/projects/european/seadatanet/

http://marinemetadata.org/conventions/vocabularies

http://mmisw.org/or

The Group recommended that a survey of existing lists must be completed first before a controlled vocabulary for data types can be recommended. There were issues in particular concerning the terminology used in the definition of some parameter codes. The next step in the process is therefore to review the content of these lists and share results with the vocabulary lists' owners. Once this review process has been completed, a controlled vocabulary can be proposed for adoption by the community.

6.3 Standards and vocabularies for the management of ocean acidification data

Stéphane Pesant presented a new initiative from the Ocean Acidification community to create a "Guide for Best Practices in Ocean Acidification Research and Data Reporting". This is a joint initiative from the EU FP7 Integrated Project EPOCA (European Project on OCean Acidification), International Ocean Carbon Coordination Project (IOCCP), and the US Ocean Carbon and Biogeochemistry Program (OCB).

The guide is one of the main outcomes from an international research workshop on best practices for ocean acidification research that took place on 19-21 November 2008 in Kiel, Germany. For more details see:

http://www.epoca-project.eu/index.php?option=com_content&task=section&id=22&Itemid=190

The contents of the guideline will include the following:

Chapter 1 Seawater carbonate chemistry
- Carbonate system measurements
- Approaches and tools to manipulate the carbonate chemistry

Chapter 2 Experimental design of perturbation experiments
- Choice of *p*CO2 levels in perturbation experiments
- Designing experiments and sampling to maximize statistical power
- Bioassays, batch culture and chemostat experimentation
- Pelagic mesocosms
- Benthic mesocosms
- In situ perturbation systems and natural CO2 venting site

Chapter 3 Measurements of CO2 sensitive processes
- Metabolism, pH enantiostasis
- Organic and export production, elemental ratios
- Pelagic calcification
- Benthic calcification

Chapter 4 Safeguarding, sharing and using OA knowledge
- Needs of modellers for OA data and metadata
- Safeguarding and sharing OA data and metadata

The section on Safeguarding and sharing OA data and metadata is particularly relevant to GE-BICH. The items included are: **Sharing** (intellectual property rights and trust issues, persistent unique

identifiers for citation, e-journal for data publication, keeping track of data usage); **Safeguarding** (NODCs and WDCs); **Harmonising** (3 groups of experts to review standard vocabularies); **Disseminating** (Information systems at OCB, CDIAC and PANGAEA; static collection of files vs. relational databases; Data portals vs. Data warehouses); and **Reporting** (Description of core metadata and specific metadata) .

The Group was invited to contribute to reviewing the relevant section of the guidelines. Stéphane Pesant will send the draft to members of GE-BICH when ready for comments.

The Group drew attention to the issue of how to handle data collected during perturbation experiments (Fe-enrichment, mesocosms …..). Many users can mass-download data collected under such modified environmental conditions without knowing it and thus consider these data as natural values. GE-BICH should share this concern with other groups during IODE-XX and find out how they have been addressing the issue.

6.4 Action plan including recommendations and possible input to Ocean Data Standards Pilot Project.

GE-BICH-IV should discuss amend and complete the proposed action plan for vocabularies and taxonomic standards to be included in GE-BICH intersessional work plan.

The Group was informed that Tony Rees. is creating a list for handling non taxonomic defined groups for OBIS. It would be a good idea to have it in WORMS also. They should not be in the same list with taxonomy, but it should be indicated that these are recognised terms. The list should be served with URI access. OBIS is also handling information on life cycles (larval stages)

The Group agreed that the OBIS secretariat would coordinate the efforts of Tony Rees, OBIS Canada and Todd O'Brien. ICES and Roy Lowry would also provide their lists on life stages and non taxonomic groups to the teams.

The Group recognise Catalogue of Life, ITIS and WoRMS as taxonomic standards. And GE-BICH recommends WoRMS as a taxonomic standard for marine databases. WoRMS was also recognised as a source of finer grained regional lists, which could be used by data managers as QC tools.

7. QUALITY CONTROL/ QUALITY ASSESSMENT PROCEDURES

7.1 Review of numerical criteria used in different data centres for chemical parameters QC

The discussion item was introduced by Alexander Kouznetsov. At the last GE-BICH meeting (Ostende, 2006) Sergey Konovalov presented a review of QC methods applicable for chemical parameters. Most of the QC algorithms are based on comparison of the observed variable with climatological range values, or on comparison of parameter rate of change with depth (time, distance) against some numerical criteria and so on.

The simplest and widely used QC method is comparison of the observed variable with climatologically range values. And we can find the published issues for the range values of some

chemical parameters. More difficult is to find published numerical criteria used within other algorithms (vertical gradients, spikes).

The assurance of the error identification in the data set is greatly depends on the reliability and sensitivity of the used numerical criteria. The quality of the data control will be higher if the numerical criteria are related to space (geographic region), time (season) and depth. The mentioned three points of criteria functionality (sensitivity) will be taken into account in the review.

The following issues relevant to chemical data QC were found and reviewed:

- IOC. Manuals and Guides 26. Manual of quality control procedures for validation of oceanographic data. 1993.
- NOAA technical report NESDIS 81. Quality control and processing of historical oceanographic temperature, salinity, and oxygen data. 1994.
- World Ocean Database 1998, Documentation and Quality Control. OCL, NODC, 1998
- World Ocean Database 2005, Documentation. OCL, NODC, 2006
- MEDAR/MEDATLAS II. Final report for the period 01/01/1998-31/12/2001

The tables for the range values from a few above mentioned issues are presented in Ocean Teacher (see **http://tinyurl.com/8ka95s)**.

The range values prepared by Russian oceanographic data centre for some of the sea seas around the Russia also will be considered.

The purpose of the review is to identify merits and demerits of criteria being used in the data centres and to find a way to interoperability of QC methods and consistency of the data sets.

7.2 Methods of quality control of biogeochemical data submitted to the MHI database

Alexander Kouznetsov gave the presentation "MHI Biogeochemical data quality control / quality assessment" prepared by Sergey Konovalov who was unable to attend the meeting.

There are two major parts of the Quality Assurance system currently applied in Marine Hydrophysical Institute (Sevastopol, Ukraine). They are Quality Control and Quality Assessment. Yet, as any system, this one is further improved, extracting appropriate methods from other data centers and/or resulting from current studies of the Black Sea biogeochemical structure and its evolution.

"Quality assurance" means the system by which an outside user can be assured that the analytical results are of proven and known quality (J.P. Dux Handbook of quality assurance for the analytical chemistry laboratory. 2nd edn. Van Nostrand Reinhold , New York, 1990, 203p.).

"Quality control" is the system of activities that is aimed to control the quality of measurements so that it meets the needs of users. It is aimed to provide data of known accuracy and quality.

"Quality assessment" is the system of quality checks and verifications of existing observational data. This system includes various quality checks and it results in quality flagging and general information of the structure and quality of observational data.

The currently utilized Quality Control system comprises of the next elements:

- Utilization of internationally approved analytical procedures;
- Control that the announced analytical accuracy and reproducibility is routinely achievable (self- and cross-analytical checks);
- Periodic control of analytical methods and analysts by authorized external bodies;
- Calibration and standardization;
- Periodical analysis of Reference materials;
- Periodic analysis of parallel samples (10% of the total number of samples)
- Inter-calibration exercises.

The currently utilized Quality Assessment system consists of the well-known checks widely utilized for quality assessment of CTD and other physical data, but it also includes checks specific for the nature of biogeochemical data.

Thus, for discrete water sample data, the Quality Assessment system includes:

- Check header details (station numbers, date/time, latitude/longitude, instrument type, data type/no. of data points, platform identifier)
- Plot station positions to check not on land
- Automatic range checking of each parameter (e.g., WOD 1998, Maillard 2000)
- Check units of parameters supplied
- Check no data points below bottom depth
- Check calibration information available
- Plot profiles (individually, in groups, etc)
- Check for spikes (these could be very real because local extremes are real and BGC profiles are rarely well vertically resolved)
- Check profiles vs. regional climatology (what is “regional climatology” and is it “stable”?)
- Compare parameters for predictable relationships (e.g., parameter ratios) (relationships may be predicted or not, but certain relationships always exist, and this is most important)
- Flag data accordingly

Some of these checks and several others are joined to form “Oceanographic Control or Processes & Properties Fitting”. This part of the Quality Assessment system comprises of the next elements:

- Plot profiles (individually, in groups, etc)
- Check for spikes
- Check for vertical stability/inversions
- Plot spatial distributions
- Check for “artificial” irregularities (“bullseyes”)
- Check parameters for predictable relationships (e.g., parameter ratios)

Oceanographic control is the most sophisticated method for Quality Assessment of BGC data. This method is possible software provides an expert with the possibility to assess data and chose the

structure of data subsets for analysis, to view/plot data in different ways using different scales, to flag and/or correct data.

Unlike for CTD data with high vertical resolution, all these checks can be hardly converted to an automatic system. There are many examples of the very real spikes, vertical instabilities, and spatial irregularities in the Black Sea biogeochemical structure. By now, only an expert can recognize and qualify some specific cases. The most powerful part of this oceanographic control is analysis of multiple relationships of individual properties.

There are two major draw backs: (a) the effectiveness and possibility of these checks depends on the experience of a person performing the checks, and (b) these checks are less developed and manually performed, making the process of data quality control slow and expensive.

7.3 Recommendations for the QC of chemical data: priorities, existing procedures/expert groups for given compounds, applicability of existing QC flags

Alexander Kouznetsov pointed out that the major weaknesses are:

- There is no special manual dedicated to chemical data QC;.
- The list of procedures applied to chemical data QC in the published manuals [1-3] is not comprehensive and could be extended;
- Numerical criteria used in QC procedures (range values, spikes, gradients) are not standardized and could be improved; different centres use different criteria
- New types of chemical measurements, the vertical soundings of pH, O2 with short sampling intervals like CTD for example, require to test and to adjust the numerical criteria for gradients, spikes being used for the bottle samples;
- There are different definitions of "quality flags". Some represent an overall assessment of the quality of the data and some explain the tests conducted on the data [4].

The Group agreed on the following actions to address these issues:

- Revision of table A.4.4 “Refined limiting values of hydrochemical parameters” in the Manual of quality control procedures for validation of oceanographic data; manual and guides 26 (IOC, 1993). The chemical parameter terminology and units used in this table are unclear.
- Develop QC/QA procedures and guidelines for *in situ* oceanographic chemical data and data exchange as part of a collaborative approach. These procedures and guidelines could be developed using U.S. NODC world ocean database reports as starting points available at http://www.nodc.noaa.gov/OC5/indpub.html (*e.g.*, Conkright *et al*. 1994; Boyer and Levitus, 1994, Boyer *et al.*, 2006, Garcia *et al.* 2006a,b). The development of such procedures and guidelines could be part of other programs such as CDIAC Hydrographic Manual available at http://cdiac3.ornl.gov/hydrography and SeaDataNet (http://www.seadatanet.org/). These procedures and guidelines should include chemical data exchange practices and data unit conversion methods used by different data centres and programmes.
- Mapping of the relationship between quality control flag scales used by different programmes and data centres, such as SeaDataNet and U.S. NODC/WDC (World Ocean Database).

Prepare a table of climatological dissolved inorganic nutrient (phosphate, nitrate and Nitrite, Silicate) ranges to update the correspondent section of the OceanTeacher (http://tinyurl.com/8ka95s).

7.4 Quality control procedures at NODC/Ocean Climate Laboratory for chemical data and new WOD/WOA09 ocean data products

Hernan Garcia described quality control procedures for chemical data used in the World Ocean Database (WOD); an ocean data product of the U.S. NODC. The U.S. NODC is a permanent repository and dissemination facility for global oceanographic data used in operational applications and ocean climate research.

Among other functions, the Ocean Climate Laboratory (OCL), a division of the NODC, develops WOD. WOD is a global, comprehensive, integrated, scientifically quality controlled database product in one well documented digital format based on data submitted to NODC/WDC by individual scientists and scientific teams as well as institutional, national, and regional data centres.

WOD includes physical, chemical, and biological measurements of temperature, salinity, oxygen, phosphate, nitrate+nitrite, nitrate, silicate, chlorophyll, alkalinity, pH, pCO_2, TCO_2, Tritium, Δ^{13}Carbon, Δ^{14}Carbon, Δ^{18}Oxygen, Freons (11, 12, and 113), Helium, Δ^{3}Helium, Neon, and plankton. WOD is extensively used by the research and operational oceanography community to develop ocean climatologies and examination of interannual-to-decadal ocean climate variability. WOD is made available without restriction, in electronic form along with ancillary metadata and quality control flags.

Definition of quality control flags and quality control procedures performed on the data in WOD were described. These procedures include preliminary and automatic quality control checks and subjective checks performed in evaluating the quality of the data at observed (measured) and standard depth levels (Boyer *et al.*, 2005; Johnson *et al.*, 2006).

During this presentation, a proposal was made to develop a protocol on quality control of and data exchange and reporting of oceanographic chemical data in an international collaborative approach; a series of chapters dealing with selected variables.

The Group recommended:

- A review of existing QC flags definitions.
- A syntax for unequivocal representation of units: per meter, m^{-1} , /m etc be recommended

The Group recommended the organization of a workshop on Quality Control/Quality Assurance procedures before the next session of GE-BICH. This could be organized as a special session in another meeting (e.g. IMDIS, March 2010 Paris, France), or back-to-back with another meeting such as EGU or AGU, or on its own. Possible venues if the meeting is not held as a special session or back-to-back with another meeting could be Canada, or the IOC Project Office for IODE in Ostende, Belgium. The Chair was requested to discuss the possibility of holding the workshop, and the potential venue with the IODE Secretariat.

8. TRAINING AND EDUCATION RELATED TO GE-BICH: CONTRIBUTION TO OCEANTEACHER

The Group recognised the importance of providing materials for OceanTeacher. The main problem is the difficulty of freeing sufficient time to identify gaps in current Ocean Teacher material and write and/or review material suitable for OceanTeacher.

The Group requested the guidance from the SG for OceanTeacher on the types of materials required, that they can develop without too much extra demand on individual members.

Below are a few contributions whose suitability for Ocean Teacher could also be considered, either as submission from or link to the external resources:

- IMBER Data Management cookbook and workshop presentations: in the frame of the IMBER Programme, its Data Management Committee (of which Gwen Moncoiffé is a member) has initiated two types of activities aimed at research scientists. The main objectives are to 1) demystify data management and 2) help scientists adopt sound data management practices when collecting and assembling data. The first initiative is the compilation of a Data Management Cookbook and the second initiative is the organisation of a short data management workshop which took place during IMBER's IMBIZO in Miami in November 2008.

- GBIF's Data Quality Control documents (Chapman 2005).

GE-BICH can also recommend readings materials to include in OceanTeacher. If a wiki is developed it can be made available to OceanTeacher

GE-BICH web portal. The Group noted the following comments from Sergey Konovalov: "GE-BICH web portal, as a part of the IODE web site, would be definitely the most efficient tool to make information of GE-BICH, its activities and major results available to the oceanographic communities. Yet, this activity has not been implemented by now.) Either its technical part should be maintained by the IODE office or a project is needed to at least make a start of this portal."

The Group requested the IODE Project Office to assist in the creations of the website where members of the Group would have write permission.

The Group will work on the structures of the different sections for the website.

9. WORK PLAN AND REQUIRED RESOURCES FOR THE NEXT INTER-SESSIONAL PERIOD

The Group approved a work plan for the inter-sessional period, focussing on three main areas and assigned lead experts for the areas as follows:

(i) Development of Wiki [overall lead by Gwen Moncoiffé]

The IOC Project Office for IODE will be requested to set-up and administer the technical side of the Wiki. Gwen Moncoiffé would coordinate the development of content.

The wiki will be divided into sections which reflect the GE-BICH work plan plus other areas of interest which could include interaction with other initiatives. The themes leaders would coordinate the sections dedicated to the themes that they are responsible for. The wiki will be edited by GE-BICH members and invited experts.

Content will be readable by public. However provision should be made for a private area (preferably within the wiki, or else use existing GroupHub on IODE server, where members will be able to discuss issues among themselves).

The wiki should be designed and populated in time for presentation at IODE-XX in May 2009. In this regard the following timeline was proposed: Design specifications ready end February 2009; template ready end March 2009; content population stabilised by end April 2009).

The initiative should be advertised through relevant mailing lists when ready.

(ii) Vocabularies [overall lead Mary Kennedy]

- Comprehensive vocabulary lists will be prepared for submission to SeaVox by January 2010 focussing on the following:

  (1) Sampling gears and instrumentation and specifically (with named co-ordinator):

  - Plankton nets (M. Kennedy)
  - Trawl sampling gear (N. Holdsworth)
  - Water samplers (H. Garcia)
  - Sediment samplers (N. Holdsworth)
  - Chemical sensors/analysers (e.g. CO2 analysers, nutrient autoanalysers, O2 analysers, …) (A. Kozyr)
  - In-situ imaging systems (S. Pesant)
  - Biological analytical instruments (S. Pesant)

  (2) Non-taxonomic plankton groupings (E. Vanden Berghe + M. Kennedy)

  (3) Life cycles/Life history (E. Vanden Berghe)

- The review of chemical and biological parameter definitions will be commenced (G. Moncoiffé to coordinate).

(iii) QA/QC [overall lead Hernan Garcia]

The group identified the following tasks

- Delivery of a white technical report on standard QC procedures for in situ oceanographic chemical data (H. Garcia)
  - Review and collation of QC guidelines for chemical data
  - Update table for chemical ranges in Manual 26
  - Collation and mapping of QC flags to each others (G. Moncoiffé to contact Dr Lesley Rickards for report from SeaDataNet)
- Organisation of a QC workshop (GE-BICH chair, IODE PO)

- Collation of URLs/refererences for best recommended practices for data reporting (S. Pesant)
- Creation of regional species lists in support of QC of biogeographical data (F. Hernandez + E. Vanden Berghe)
- Improve accessibility and discoverability of defined map layers to help with generating QA/QC tools (F. Hernandez + N Holdsworth)
- Correction/update to OceanTeacher's table (range/units/consistency) (A. Kouznetsov)

In addition the following actions were identified during the discussions:

- Exchange of taxonomic information (F. Hernandez)
- Contribute to the EPOCA/IOCCP/ODB document on Ocean Acidification (All)
- Contribute to the CDIAC/CCHDO update of Procedure and Guidelines for the collection of hydrographic data (All)
- Comments on IMBER data management cookbook (All)
- Identify contact with GOOS (IODE Secretariat, GE-BICH chair)
- Identify additional chemical experts from Pacific area (both PICES and non-PICES members) and (other) southern hemisphere countries – Hernan Garcia to initiate
- Contact the chair of PICES TCODE (Hernan Garcia to present GE-BICH at next meeting and report back to GE-BICH chair)
- Stéphane Pesant to enquire about contact for CIESM and report back to group.

10. ANY OTHER BUSINESS

There was no other business raised for discussion.

11. ELECTION OF CHAIR

The fourth Session of the GE-BICH re-elected Gwenaëlle Moncoiffé as the Chair. The Group felt that there was no need for a co-Chair since the Group is small. It was agreed that the Chair would where possible/advisable delegate participation in meetings to a member of the Group based at a location close to the venue of the meeting, so as to reduce her travel commitments.

12. DATE AND PLACE OF NEXT SESSION

The Group recommended that the Fifth Session of the Group be held in the last week of January 2011 at the IOC Project Office for IODE, Ostende, Belgium.

13. ADOPTION OF THE SUMMARY REPORT

The Group adopted the draft summary report, with some amendments and requested the Secretariat in consultation with the Chair to finalise the report and circulate to all participants.

14. CLOSURE

The GE-BICH Chair thanked all the participants for their active contributions to the proceedings of the meeting, and the IOC Project Office for IODE for the excellent arrangements for the meeting.

The Chair closed the meeting at 13h00 on Friday 30 January 2009.

ANNEX I

AGENDA

1. OPENING OF THE SESSION

1.1 WELCOME

1.2 ADOPTION OF THE AGENDA

2. REPORT ON INTERSESSIONAL ACTIVITIES

2.1 ISSUES REMAINING FROM GE-BICH-II

2.2 STATUS OF IMPLEMENTATION OF THE GE-BICH-III ACTION PLAN (Recommendation IODE/GE-BICH-III.1)

2.3 ISSUES ARISING FROM IODE-XIX

2.3.1 Revision of the Terms of Reference of GE-BICH (Recommendation IOC/IODE-XIX-3)

2.3.2 Cooperation with IPHAB on the development of HAIS

3. NEW ISSUES OF RELEVANCE TO GE-BICH

3.1 OCEAN DATA STANDARDS PILOT PROJECT

3.2 OCEANDATAPORTAL PROJECT

3.3 STANDARDS FOR CHEMICAL DATA AND METADATA EXCHANGE IN SEADATANET – Roy Lowry

3.4 PRESENTATION OF THE HIGHLIGHTS OF ICES DATA MANAGEMENT ACTIVITIES, EXTERNAL INTERACTIONS, AND THE ECOSYSTEMDATA ONLINE APPLICATION – Neil Holdsworth

3.5 CDIAC (CARBON DIOXIDE INFORMATION CENTRE) OCEAN CARBON DIOXIDE DATA MANAGEMENT AND DATA SYNTHESIS PROJECTS – Alex Kozyr

3.6 PLANKTON FUNCTIONAL TYPES AND THE GREEN OCEAN MODELLING INITIATIVE – REPORT FROM THE EUR-OCEANS CAMBRIDGE MEETING – Stéphane Pesant

3.7 PERSPECTIVE ON COLLABORATIVE RESEARCH ENVIRONMENTS OFFERED BY D4SCIENCE PROJECT – Marc Taconet

4. IODE ORGANIZATIONAL REFORM AND ITS IMPACT ON GE-BICH

4.1 RELATIONSHIP BETWEEN OBIS AND IOC AND ITS IMPACT ON GE-BICH

4.2 IMPLICATIONS OF RECOMMENDATION IODE-XIX.2 (STRATEGY AND STRUCTURE OF IODE GROUPS OF EXPERTS) FOR GE-BICH

4.3 IMPLICATIONS OF THE IOC STRATEGIC PLAN FOR OCEANOGRAPHIC DATA AND INFORMATION EXCHANGE ON GE-BICH

5. STRATEGIC PRIORITIES FOR GE-BICH (based upon revised TORs)

6. STANDARDS & VOCABULARIES FOR THE MANAGEMENT OF BIOLOGICAL AND CHEMICAL DATA

6.1 BIOLOGICAL TAXONOMIC STANDARDS – Mary Kennedy and Francisco Hernandez

6.2 CONTROLLED VOCABULARIES FOR DATA TYPES AND GEARS – Mary Kennedy

6.3 STANDARDS & VOCABULARIES FOR THE MANAGEMENT OF OCEAN ACIDIFICATION DATA – Stéphane Pesant

6.4 ACTION PLAN INCLUDING RECOMMENDATIONS AND POSSIBLE INPUT TO OCEAN DATA STANDARD PROJECT

7. QUALITY CONTROL/ QUALITY ASSESSMENT PROCEDURES

7.1 REVIEW OF NUMERICAL CRITERIA USED IN DIFFERENT ATA CENTRES FOR CHEMICAL PARAMETERS QC – Alexander Kouznetsov

7.2 METHODS OF QUALITY CONTROL OF BIOGEOCHEMICAL DATA SUBMITTED TO MHI DATABASE – Sergey Konovalov

7.3 RECOMMENDATIONS FOR THE QC OF CHEMICAL DATA: PRIORITIES, EXISTING PROCEDURES/EXPERT GROUPS FOR GIVEN COMPOUNDS, APPLICABILITY OF EXISTING QC FLAGS – Alexander Kouznetsov

7.4 QUALITY CONTROL PROCEDURES AT NODC/OCEAN CLIMATE LABORATORY FOR CHEMICAL DATA AND NEW WOD/WOA09 OCEAN DATA PRODUCTS – Hernan Garcia

8. TRAINING AND EDUCATION RELATED TO GE-BICH: CONTRIBUTION TO OCEANTEACHER

9. WORK PLAN AND REQUIRED RESOURCES FOR THE NEXT INTER-SESSIONAL PERIOD

10. ANY OTHER BUSINESS

11. ELECTION OF CHAIR

12. DATE AND PLACE OF NEXT SESSION

13. ADOPTION OF THE SUMMARY REPORT

14. CLOSURE

ANNEX II

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ANNEX III

RECOMMENDATIONS

Recommendation BICH-IV.1: TERMS OF REFERENCE OF THE IODE GROUP OF EXPERTS ON BIOLOGICAL AND CHEMICAL DATA MANAGEMENT AND EXCHANGE PRACTICES (GE-BICH)

Recommendation BICH-IV.2: GE-BICH-IV ACTION PLAN FOR 2009-2011

Recommendation BICH-IV.1

TERMS OF REFERENCE OF THE IODE GROUP OF EXPERTS ON BIOLOGICAL AND CHEMICAL DATA MANAGEMENT AND EXCHANGE PRACTICES (GE-BICH)

The IODE Group of Experts on Biological and Chemical Data Management and Exchange Practices,

Recognizing that the work of the Group of Experts has evolved from the initial focus on biodiversity to a coverage of a broader range of chemical and biological data which were not well covered before,

Taking into account the decision of the IOC Executive Council on the possibility of continuation of the Ocean Biogeographic Information System (OBIS) under the umbrella of IOC,

Noting that the 19th session of IOC Committee on International Oceanographic Data and Information Exchange (IODE-XIX) had extended the Terms of Reference to include communication of the results of the work of GE-BICH to the wider community of data managers and data users through a web portal and through the Ocean Teacher for education of data managers and data users,

Recommends that the GE-BICH adopts the following Mission Statement: "***To promote greater integration of biological, chemical, and physical data within IODE's network of national data centres in support of biogeochemical research, and ecosystem studies and management."***

Further recommends that the revised Terms of Reference be as follows:

i). To provide an international forum, raising awareness about new initiatives, best practices, and emerging standards for biological and chemical data management and exchange practices;

ii). To collate and compile guidelines, supporting the integrated management and quality control of biological and chemical data in IODE's network of national oceanographic data centres;

iii). To contribute to the development of standards, controlled vocabularies, and recommended practices for the management, interoperability and exchange of biological and chemical data, supporting the scientific and operational requirements of the community;

iv). To encourage data centres to compile inventories of past and present biological and chemical data holdings, and make data available to global databases and specialised data portals;

v). To encourage data holders to contribute data to data centres for the creation of regional and global integrated oceanographic databases incorporating physical, chemical and biological data;

vi). To communicate the results from the GE to the wider community of data managers, providers and users.

Encourages IOC Member States to nominate experts having expertise in biological and chemical data management and exchange practices to the Group of Experts

Stresses the importance of:

- Continuing the close collaboration developed with OBIS within the new arrangements that will be decided on,
- Maintaining close relations with relevant IOC programmes such as HAB, CDIAC and GOOS, as well as other organizations and programmes including FAO, ICES, PICES, CIESM, ICSU, SeaDataNet.

Recommendation BICH-IV.2

GE-BICH-IV ACTION PLAN FOR 2009-2011

The IODE Group of Experts on Biological and Chemical Data Management and Exchange Practices,

Having reviewed its completed and on-going activities,

Being aware of the resource constraints under which IOC and its IODE are operating,

Taking into consideration the ongoing discussions on Collaboration Between IOC and OBIS Towards the Long-term Management, Archival and Accessibility of Ocean Biogeographic Data,

Stressing the importance of Biological and Chemical Data Management,

Adopts a plan of action for the inter-sessional period 2009-2011, focussing on three main areas of activities: (i) Preparation of specialised controlled vocabulary lists relevant to the management of biological and chemical data, and submission to SeaVox for governance, (ii) Quality Control/Quality Assessment of biological and chemical data, and (iii) Best practices for data reporting and exchange.

Requests technical support from IODE project office to develop a GE-BICH wiki. The wiki will be used to facilitate the sharing of workload and ideas, improve communication between contributors, and track progress. By having large part of the wiki publicly available, it will also enable GE-BICH to increase its visibility, promote its work, and encourage collaboration. In particular the wiki will be used as a central location to prepare the lists of specialised vocabularies.

Details of the activities to be implemented are in the Annex to this Recommendation.

Annex to Recommendation IODE/GE-BICH-IV.2

Details of the activities associated with GE-BICH work plan 2009-2011

1- Set up of a GE-BICH wiki

This work will require assistance from the IODE IPO. The following tasks have been identified:

a. Discuss implementation with IODE Project Office (G. Moncoiffé)
b. Draft specification for Wiki structure (G. Moncoiffé)
c. Initial design and text completed by May 2009 (G. Moncoiffé and other group members)

2- Finalise GE-BICH membership and identify new contacts for collaborations

The membership of GE-BICH will need to be finalised by June 2009. Prior to this the following actions will need to be taken:

a. Identify contact with GOOS (IODE Secretariat, GE-BICH chair)
b. Identify additional chemical experts from Pacific area (both PICES and non-PICES members) and (other) southern hemisphere countries (H. Garcia, GE-BICH chair to initiate and report back to group)
c. Contact the chair of PICES TCODE (H. Garcia to present GE-BICH at next meeting and report back to GE-BICH chair)
d. Identify contact with CIESM (S. Pesant to initiate and report back to group).

3- Controlled vocabularies submitted to SeaVox

This activity will be carried out mainly by email and via the new GE-BICH wiki. It should have no cost implication for IODE. GE-BICH's work on controlled vocabularies will build upon and complement on-going work within the SeaDataNet community. GE-BICH will use existing expertise within the group to initiate work on a selected subset of vocabulary lists, inviting contribution from a wider community of relevant experts prior to submission to SeaVox. The group will prepare comprehensive vocabulary lists for the following categories (with named co-ordinator):

a. Sampling gears and instrumentations and specifically:

- Plankton nets (M. Kennedy)
- Trawl sampling gear (N. Holdsworth)
- Water samplers (H. Garcia)
- Sediment samplers (N. Holdsworth)
- Chemical sensors/analysers (A. Kozyr)
- In-situ imaging systems (S. Pesant)
- Biological analytical instruments (S. Pesant)

b. Non-taxonomic organisms groupings (E. Vanden Berghe and M. Kennedy)

c. Life cycles/life history vocabularies (E. Vanden Berghe)

Under this activity, a review of biological and chemical parameter definitions will also be started (G. Moncoiffé)

4- QA/QC of biological and chemical data

a. Organisation of a QA/QC workshop on chemical oceanographic data

GE-BICH IV recommended the organisation of a workshop on QA/QC procedures in about a 12 to 18 months time. This could be organized as a special session in another meeting (e.g. IMDIS, March 2010 Paris, France), or back to back with another meeting such as EGU or AGU, or on its own at the IODE Project Office in Ostend, Belgium or in Canada. The workshop would require some financial support to enable the payment of travelling costs and expenses for 4 invited speakers.

b. Delivery of a white technical report on standard QC procedures for in situ chemical data (H. Garcia)

    i. Review and collation of QC guidelines for chemical data
    ii. Update table for chemical ranges in Manual 26
    iii. Collation and mapping of QC flags to each other (G. Moncoiffé/H. Garcia)

c. Collation of URLs/references for best recommended practices for data reporting (S. Pesant)

d. Creation of regional species lists in support of QC of biogeographical data (F. Hernandez/E. Vanden Berghe)

e. Improve accessibility and discoverability of defined map layers to help with generating QA/QC tools (F. Hernandez/N. Holdsworth)

f. Correction/update to Ocean Teacher's tables (range/units/consistency) (A. Kouznetsov)

5- Best practices for data reporting and data exchange

This section includes work on the exchange of taxonomic information which could be transferred to an IOC/OBIS working group once the future of OBIS is decided and also review of material compiled in the frame of other programmes and international activities. Detailed activities are as follows:

a. Agree on exchange protocol for taxonomic information (F. Hernandez)
b. Contribute to the EPOCA/IOCCP/ODB document on Ocean Acidification (All)
c. Contribute to or link with the CDIAC/CCHDO review of Procedure and Guidelines for the collection of hydrographic data (All)
d. Comment on IMBER data management cookbook (All)

6- GE-BICH V

The fifth session of GE-BICH will take place in Ostend during the last week of January 2011.

ANNEX IV

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ANNEX V

List of acronyms

AGU	American Geophysical Union
ARC	Atlantic Reference Centre
BODC	British Oceanographic Data Centre
CDIAC	Carbon Dioxide Information Analysis Centre
CIESM	International Commission for the Scientific Exploration of the Mediterranean Sea
CLIVAR	Climate Variability and Predictability
CoML	Census of Marine Life
CSR	Cruise Summary Report
CTD	Conductivity-Temperature-Depth recorder
DBMS	Database management system
EAF	Ecosystem Approach to Fisheries management
EEZ	Exclusive Economic Zone
EGU	European Geophysical Union
EPOCA	European Project on OCean Acidification
ERMS	European Register of Marine Species
EU	European Union
FP7	European Framework Programme 7
GBIF	Global biodiversity information Facility http://www.gbif.org/
GCMD	Global Change Master Directory http://gcmd.nasa.gov/
GE-BICH	Group of Experts
GOOS	Global Ocean Observing System
GUI	Graphical User Interface
GUID	Globally Unique Identifier
HAB	Harmful Algal Blooms
HAIS	Harmful Algal Information System
ICES	International Council for the Exploration of the Sea
ICSU	International Council for Science
IFREMER	Institut Français de Recherche pour l'Exploitation de la MER
IHO	International Hydrographic Organization
IMBER	Integrated Marine Biogeochemistry and Ecosystem Research
IMDIS	International Conference on Marine Data and Information Systems
IOC	Intergovernmental Oceanographic Commission http://ioc-unesco.org/
IOCCP	International Ocean Carbon Coordination Project
IODE	International Oceanographic Data and Information Exchange
IPHAB	Intergovernmental Panel on Harmful Algal Blooms
ISO	International Organization for Standardization
ITIS	Integrated Taxonomic Information System
IUCN	International Union for Conservation of Nature
JCOMM	Joint WMO-IOC Technical Commission for Oceanography and Marine Meteorology
LME	Large Marine Ecosystems
LSID	Life Science Identifier
MarBEF	Marine Biodiversity and Ecosystem Functioning
ICT	FP7 Information and Communication Technologies
MHI	Marine Hydrophysical Institute (Sevastopol, Ukraine).
MMI	Marine Metadata Interoperability initiative

NDG	NERC DataGrid (http://ndg.nerc.ac.uk/)
NOAA	National Oceanic and Atmospheric Administration
NODC	National Oceanographic Data Center
NWARMS	Northwest atlantic register of marine species
OA	Ocean Acidification
OBIS	Ocean Biogeographic Information system
OCB	US Ocean Carbon and Biogeochemistry Program
ODIN	Ocean Data and Information Networks
ODP	Ocean Data Portal
ODV	Ocean Data View
OGC	Open Geospatial Consortium
PFT	Plankton Functional Types
PICES	North Pacific Marine Science Organization
QUASIMEME	Quality Assurance of Information for Marine Environmental Monitoring in Europe
SG	Steering Group
SMEBD	Society for the Management of European Biodiversity Data
SOLAS	Surface Ocean Lower Atmosphere Study
TDWG	Biodiversity Information Standards
TOR	Terms of Reference
UNESCO	United Nations Educational, Scientific and Cultural Organization
UUID	Universally Unique IDentifier
VLIZ	Flanders Marine Institute
WDC	World Data Centers
WG	Working group
WOD	World Ocean Database
WoRMS	World Register of Marine Species