



International Council for
the Exploration of the Sea
Conseil International pour
l'Exploration de la Mer

ICESCIEM

**HELCOM/BSRP/ICES and IOC/IODE Training
Workshop:
Baltic Sea Data Collection - Management,
Analysis & Synthesis**

Vilnius, Lithuania
October 24-28, 2005

TABLE OF CONTENTS

SUMMARY REPORT		Page
1.	INTRODUCTION & OBJECTIVES	1
2.	PARTICIPANTS	2
3.	COURSE PROGRAMMe	3
4.	RESULTS AND RECOMMENDATIONS*	4
 ANNEXES		
I.	Course Program and Timetable	6
II.	List of Participants	7
III.	OceanTeacher Digital Library Table of Contents	9
IV.	Acronym list	17

* This report represents a consolidation of many ideas which were discussed at the course. The organisations acknowledge but not necessarily agree with the proposals.

1. INTRODUCTION AND OBJECTIVES

Continued degradation of the Baltic Sea ecosystem has affected water quality, modified biodiversity, and impacted regional fisheries. The Baltic Sea is now an ecosystem under extreme stress. In response to this situation, the countries in the drainage basin initiated a Joint Comprehensive Environmental Action Program for the Baltic Sea (JCP). The JCP, as adopted in 1992, strengthened and updated in 1998, constitutes a “Strategic Action Plan” for the Baltic Sea region. To address the need for an ecosystem-based approach to resource management, the Baltic Sea Regional Project (BSRP) is designed within the principles of the Large Marine Ecosystem (LME¹) concept, focusing on land-based, coastal zone, and marine activities including activities for improving ecosystem health and productivity, social and economic development, and provision of ecosystem management tools for decision-makers to address transboundary issues for the Baltic Sea. The most important aspects of the Project are its linkages between land-based activities, coastal zones and marine environments.

With the support of the GEF, and the World Bank, project activities will assist the recipient countries in implementing elements of the JCP, and support Estonia, Latvia, Lithuania, Poland, and Russian Federation in meeting their obligations to the Helsinki Convention and other international agreements; and national policies and legislation. The development objective of the Baltic Sea Regional Project (BSRP) is to create some preconditions for application of the ecosystem approach in managing the Baltic Sea Large Marine ecosystem in order to achieve and maintain sustainable biological productivity of the Baltic Sea, improve coastal zone management and reduce agricultural non-point source pollution through the introduction of ecosystem-based approaches for land, coastal and marine environmental management. The Project’s long-term goal is to provide the three Baltic Sea cooperating international bodies and the recipient countries with management tools for sustainable agricultural, coastal and marine management, while improving the social and economic benefits of the farming, coastal and fishing communities.

The long-term objective of the Baltic Sea Regional Project (BSRP) is to introduce ecosystem-based assessments to strengthen the management of Baltic Sea coastal and marine environments through regional cooperation and targeted transboundary coastal, marine and watershed activities. To achieve this, the three international bodies and the cooperating countries in the region will utilize project-developed management tools for sustainable ecosystem management to contribute to the improvements in the social and economic benefits of the ecosystem for the coastal fishing and farming communities in the recipient countries. The aim is to reduce impacts from non-point sources of pollution and to increase sustainable biological production. The Project provides an environmental management framework for long-term restoration of the ecological balance of the Baltic Sea ecosystem through a series of preventive

¹ Sherman, K. (1991). The Large Marine Ecosystem concept: research and management strategy for living marine resources. *Ecological applications* 1(4):349-360.

and curative actions to be undertaken in a phased manner in the region. The Project provides a regional focus, involving local communities and stakeholders; its biodiversity considerations focus on “prevention of damage to threatened waters.

The Project has four inter-related components based on the Large Marine Ecosystem (LME) concept and includes integrated land, coastal and marine activities to strengthen the local and regional capacity to achieve sustainable ecosystem management of the Baltic Sea resources. Sustainable management will improve ecosystem health while providing social and economic benefits to farming, coastal and fishing communities and sectors such as businesses and tourism. Component 3, managed by the Project Implementation Team supervised by the Baltic Sea steering Group, aims to support local and regional capacity building and institutional strengthening.² The present training workshop was developed to meet this Component need.

The marine data management-training curriculum developed by the IOC’s International Oceanographic Data and Information Exchange Program (IODE) is based on an extensive collation of international public documents on marine data, formats, software, program and data management procedures, manuals, protocols, and associated tutorials. The main resource, entitled OceanTeacher, is a 1.7 gigabyte Digital Library of primary documents -- accompanied by various thematic Course Manuals -- that has been under development by the IOC training staff since 1997 (see outlines in Annex III). OceanTeacher is the principal training resource used during data management courses, currently available on the World Wide Web and soon to be published on DVD (digital versatile disk).

2. PARTICIPANTS

Participants included four countries on the southeastern margin of the Baltic Sea (Estonia, Latvia, Lithuania and Poland) and representatives of the International Council for the Exploration of the Seas (ICES). The students were selected on the basis of submitted resumes, with a particular view toward identifying young scientists responsible for data collections at the national level. Lectures were given by a trainer provided by the Intergovernmental Oceanographic Commission’s (IOC) Project Office for the International Oceanographic Data and Information Exchange Program (IODE) in Ostend, Belgium. The list of participants is provided as Annex II.

² Extracted and condensed from: BSRP Project Implementation and Procurement Plan, HELCOM et al, 2002. <http://www.ices.dk/projects/unzip/PIP-text20021106,Dec9.doc>

3. COURSE PROGRAMME

3.1 LECTURES AND PRACTICALS

3.1.1 Workshop Objectives

The IOC/IODE Marine Data Management training curriculum has been designed to provide participants with knowledge and skills in the following areas:

- The importance of marine data in general, and particularly within participants' national and regional environments
- How to set up an oceanographic data center within the IODE System
- The infrastructure requirements, including hardware and software tools
- How to manipulate and analyze the principal types and formats of marine data
- How to produce ocean data products and to disseminate these products, both over the Internet and by traditional methods

This special workshop was designed to address only the final three of these areas, in view of the advanced skill levels involved in the participating States, and in view of the mature nature of ocean data work there.

3.1.2 Workshop Technical Outline

The following is the outline of the relevant Course Manuals prepared and selected for use in the this workshop. [ID = Interdisciplinary; DM = Data Management] All of the following topics were covered in lectures and practicals, using basic reference materials contained in the IODE OceanTeacher Digital Library (outlined in [Annex III](#)).

DM 102: Ocean Data Collection Management

GOALS	To show students how to create a National Data Collection, using the World Ocean Database 2001, other published or unpublished data sources, and near real-time operational data To demonstrate some basic data analysis functions in popular ocean software programs
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CONTENTS	Area of Interest Creation of Data Collections Basic Data Analysis Collection Housekeeping Exporting ODV Products Adding Other Data Special Purpose Collections Methods for Operational Data
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DM 103 Ocean Data Products & Synthesis

GOALS	To demonstrate a broad suite of basic analysis methods for ocean data (including remote sensing data) using popular software systems To demonstrate basic methods for combining data products in Geographic Information Systems (GIS)
CONTENTS	Gridding & Contouring with Surfer Surfer Vector Charts Managing HDF Files Bathymetry and Topography Products Managing Image Files Synthesis in GIS

4. RESULTS AND RECOMMENDATIONS

The workshop schedule was successfully accomplished. This current group of students is among the most accomplished, in terms of individual skill levels, that the IODE instructors have encountered. They are fully informed in areas of ocean data technology, such that the workshop accomplished all of the scheduled lessons a bit ahead of time. A final half-day session was devoted to online downloading of valuable datasets and software programs for use in the student's home bases. As with previous workshop cycles, students will be presented with sequential projects to complete over the next year, and these will be publicized by a special website. IODE national coordinators will be kept informed of individual progress.

Because this venue provided the first general forum for discussions among the respective data managers, the floor was opened during the final session for comments and recommendations related to further work and activities directly related to the national data collection functions taught here. The following recommendations were developed and agreed upon within the training group:

Capacity Building Issues

- Communication lines need to be enhanced for data managers.
 - An email group needs to be established from the training group.

- Technical help forums are available at the BSRP GIS/Data Coordination Center (www.ekoi.lt/gis). The expertise covers GIS, SQL, Remote sensing, Linux, Database issues.
- Training is essential. Specific areas identified for possible future courses were: GIS, modeling, biodiversity and the ICES Data Reporting Formats. Many courses are available through Ocean Teacher.
- A common repository of standard GIS data layers and satellite images compiled from public domain sources will be further maintained on the Baltic GIS Portal (www.ekoi.lt/gis) and available as free downloads for registered users of the Portal.

Database Issues

- National Data Centers are encouraged to send their quality controlled data to ICES.
- ICES sends oceanography data to the World Ocean Data Center for Oceanography, Silver Spring.
- Duplicate reporting must be avoided and errors in data identified. Synchronization procedures may need to be established with the WOD program. Synchronization between National Data Centers and ICES is necessary.
- Distributed databases were mentioned but any decision was found to be out of the scope of this training group.

Data Export Issues

- ICES should continue to make oceanographic data available in the established Ocean Data View (ODV) file format including all oceanographic parameters.
- Standard coordinates set for the Baltic have been discussed at the course. This group agreed to define the Baltic area of interest (AOI) as the following coordinates (53-66N; 9-31E).
- A common coastline for mapping products should be used.
- The heterogeneity of the Baltic requires breaking the data into spatial and temporal regions.
- To help in interpretation of data, “figures of merit” should be identified for data products.

ANNEX I

Lesson Schedule for HELCOM Data Management Class:
Baltic Sea Data Collection - Management, Analysis & Synthesis
Vilnius, Lithuania; October 24-28, 2005

Course	Lesson Title	Date
Opening Activities	TBA	First hour; 24
<u>DM 104 Baltic Sea Data Collection.</u> Lessons based on DM 102 Ocean Data Collection Management	1. Area of Interest - All workshop participants are requested to read through these lessons before the workshop. You will receive a copy of GEBCO.	N/A
	2. Creation of Data Collections	24
	3. Basic Data Analyses	24
	4. Collection Housekeeping	24
	5. Exporting ODV Products	25
	6. Adding Other Data	25
	7. Special Purpose Collections	26
	8. Methods for Argo Data	26
<u>DM 104 Baltic Sea Data Collection.</u> Lessons based on DM 103 Ocean Data Products & Synthesis	1. Gridding & Contouring with Surfer	26
	2. Surfer Vector Charts	27
	3. Managing HDF Files	27
	4. Bathy/Topo Products	27
	5. Managing Images	27
	6. Managing NetCDF Files	28
	7. GIS Synthesis	28
Final Activities and Workshop Close	TBA	Last Hour; 28

ANNEX II

LIST OF PARTICIPANTS

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LECTURER

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ANNEX III

**IODE OceanTeacher Digital Library
Table of Contents**

[NOTE: Underlines indicate materials currently present, at least in draft form. Otherwise, no material is yet provided.]

1. Global Oceanography Today
 1. Sciences of Oceanography
 1. Biological Oceanography
 2. Chemical Oceanography
 3. Geological Oceanography
 4. Physical Oceanography
 5. Remote Sensing
 6. Ancillary & Applied Sciences
 7. Oceanography Glossary
 2. Collecting Data
 1. Introduction to Ocean Datasets
 2. Oceanography Data Fundamentals
 1. Oceanographic Parameters
 2. Oceanographic Measurement Units
 3. Temperature and Salinity Scales
 3. Ocean Measurement Technology
 1. Sampling Devices
 1. Tools of Oceanography
 2. Biology
 3. Chemistry
 4. Geology
 2. Platforms
 1. Vessels
 1. Boats & Ships
 2. Submersibles
 2. Fixed Platforms
 1. Piers
 2. Moored Buoys
 3. Offshore Structures
 3. Drifting Buoys & Floats
 4. Autonomous Underwater Vehicles
 5. Benthic Observatory Nodes
 6. Animals
 3. Instruments & Sensors
 1. Biology
 2. Chemistry
 3. Geology
 4. Physics
 4. Instrument Data Processes
 1. Within Instruments
 2. On Vessels
 3. Post-Processing
 1. Seabird Training Class Handouts
 4. Remote Sensing Technology
 1. Parameters & Sensors
 2. Sensors & Missions
 3. Missions & Data
 5. Manuals & Guides
 3. Geopolitics of Oceanography

4. Research Oceanography
 1. General & Introductory
 2. Biological Oceanography
 3. Chemical Oceanography
 4. Geological Oceanography
 5. Physical Oceanography
 6. Remote Sensing
5. Survey Oceanography
 1. Resource Surveys
 2. Long Time-Series
6. Operational Oceanography
 1. Overview
 2. Economics of Ocean Observations
 3. Data & Information Infrastructure
 4. Global Ocean Observing System
 1. Local Systems
 1. Rutgers
 2. Oregon
 3. ICON
 4. NYHOPS
 5. PORTS
 6. REINAS
 7. SDCOOS
 8. SCMI
 2. Medium-Scale Systems
 1. Black Sea GOOS
 2. BOOS
 3. EuroGOOS
 4. GCOOS
 5. GoMOOS
 6. GOOS-Africa
 7. IOCARIBE-GOOS
 8. IOGOOS
 9. IOOS
 10. MedGOOS
 11. NEAR-GOOS
 12. NOOS
 13. PI-GOOS
 14. SEACAMP
 15. SEACOOS
 16. WAGOOS
 3. Observatories
 1. ESONET
 2. HAWAII-2
 3. LEO-15
 4. MARS
 5. MVCO
 6. NEMO
 7. NEPTUNE
 8. OOI
 9. ORION/GEOSTAR
 4. Global Systems
 1. ARGO
 2. GDP
 3. GLOSS
 4. GOS

5. GTSP
6. OceanSITES
7. SOOP
8. Tropical Moored Buoys
9. TSUNAMI
10. VOS
11. WWW

5. Future Technological Needs

7. International Programs, Agencies & Organizations

1. CEOS
2. CLIVAR
3. DBCP
4. DIVERSITAS
5. FAO Fisheries
6. GAIM
7. GCOS
8. GEWEX
9. GLOBEC
10. GODAE
11. GODAR
12. GOSIC
13. GTOS
14. IAPSO
15. ICES
16. ICSU
17. IGBP
18. IGOS
19. IHDP
20. IHO
21. IMBER
22. IOC
23. IOCCG
24. IODP
25. IPCC
26. IUGG
27. JCOMM
28. JGOFS
29. LOICZ
30. OOPC
31. PAGES
32. PICES
33. POGO
34. SCOR
35. SOLAS
36. START
37. UNEP
38. WCRP
39. WMO
40. WOCE
41. Societies & Associations

2. Information Technology & Scientific Communication

1. Computer Technology

1. Computer Systems
 1. Storage Media
 2. Hardware
 3. Operating Systems

1. Windows
 2. UNIX
 4. An Educator's Guide to School Networks
 5. Maintenance
 6. Viruses
 2. Databases & Database Management Systems
 1. MS Access
 2. Other Systems
 3. GIS
 1. UNESCO GIS Modules
 2. Marine GIS
 3. GSDI
 4. General Applications Software
 1. Excel
 2. ASCII Editors
 5. Oceanographic Software
 1. IOC Software Toolbox
 1. Adobe Reader
 2. ArcExplorer
 3. Apache Tomcat
 4. Argo Data Explorer
 5. CuteFTP
 6. Data Thief
 7. DXF2XYZ
 8. GeoTIFF Examiner
 9. GRADS
 10. HDF Browser
 11. HDFView
 12. IrfanView
 13. Java/JRE
 14. Java OceanAtlas
 15. MEDI
 16. ncBrowse
 17. Ocean Data View
 18. Ocean Sneaker Tool
 19. Oceanic Calculator
 20. OPeNDAP Collector
 21. PFE
 22. SpreadsheetApps
 23. Surfer
 24. USGS VPV
 25. WinZip
 2. IOC Software Catalog
 3. Format Conversion Software
 6. The Internet
 1. World Wide Web
 2. Internet Service Providers
 3. Electronic Mail
 4. Websites
 7. Other Telecommunications
 8. Markup Languages
 1. HTML
 2. XML
 9. Client-Server Concepts
 10. Electronic Navigation Systems
2. Metadata

1. Formal Descriptions of Resources
2. Classifications, Taxonomies, Ontologies
3. Thesaurus Systems
4. Discovery & Descriptive Metadata
5. Metadata Standards & Formats
6. Crosswalks
3. Information Seeking in Electronic Environments
 1. Searching Information
 2. Text Retrieval
 3. Saving Information
4. Document Production
 1. Internal Reports
 2. Production
 3. Distribution & Sales
 4. Document Imaging
 5. Full Text
 6. Graphics & Images
 7. Animation & Video
 8. Charts & Graphs
 9. Scientist Support
 10. Copyright
 11. Bibliographic Citation Standards
 12. Publishers' Requirements
5. Information & Technology Programs & Organizations
 1. BIOCASE
 2. CENDI
 3. CODATA
 4. DGIR
 5. DMAC
 6. ESIP
 7. GSDI
 8. ICSTI
 9. IEEE
 10. IETF
 11. ISO
 12. MarineXML
 13. MMI
 14. OAI
 15. OCLC
 16. OIT
 17. OPeNDAP
 18. OpenGIS
 19. OpenIOOS
 20. THREDDS
 21. UNICODE
 22. W3C
 23. Societies & Associations
3. Information Management Principles - Under construction
4. Ocean Information Management - Under construction
5. Data Management Principles
 1. Data Formats
 1. ASCII
 2. Binary
 3. Format Types
 1. Document
 2. Geo-Referenced Image

3. Gridded
 4. Hard Copy
 5. Header
 6. Mapping-List
 7. Mapping-XY
 8. Mapping-GIS
 9. Message
 10. Relational Database
 11. Self-Describing (SDS)
 12. Simple Image
 13. Spreadsheet
 14. Stratified
4. Complexity Progression
2. Scientific Metadata & Systems
 3. Quality Control Strategies
 4. Data Availability & Access
 5. Physical Storage & Safekeeping
 6. Data Searching Strategies
6. Oceanographic Data Management Processes
 1. Data Operations
 1. Planning Documents
 2. Data Management Policies & Guidelines
 3. Oceanographic Metadata
 4. Taxonomic Complexities of Biological Data
 1. Taxonomy
 2. Data Systems
 5. Quality Control
 1. Programmatic Aspects
 2. Technical Aspects
 1. Standards & Comparisons
 2. Research & Survey Data
 3. Operational Oceanography Data
 4. Remote Sensing Data
 5. Meteorological Data
 6. Oceanographic Formats
 1. Marine Data Format Fundamentals
 1. Codes
 2. Geography
 1. Geographic Location
 2. Geographic Direction
 3. Ocean Squares & Mapsheets
 4. Charting
 3. Dates & Time
 2. Integration Among Major Formats
 1. BLN
 2. BMP
 3. DXF
 4. GeoTIF
 5. GIF
 6. HDF
 7. JOS
 8. JPG
 9. NetCDF
 10. SHP
 11. TSV-O
 12. WOD01

13. XYZ
3. Format Integration Schematics
4. Format Conversion
2. Data Centers & Systems
 1. Ocean Data Centers
 1. Intergovernmental Centers
 1. IODE Data Center System
 1. NODCs and DNAs
 1. Establishing an NODC
 2. NODC Business Functions
 2. RNODCs
 3. NODC Websites
 2. Hydrographic Service (ICES)
 3. Data Standardization
 2. Research Project Centers
 3. Topical & Operational Data Activities
 2. World Data Center System
 3. Other Centers & Systems
3. Data Catalogs & Gateways
 1. MetOcean Data
 1. CSR
 2. MEDI
 3. EDMED
 4. GCMD
 2. Remote Sensing Data
 3. Ancillary & Applied Data
4. Virtual Centers & Distributed System
5. Data Analyses & Products
 1. Working with Biological Data
 2. Working with Chemical Data
 3. Working with Geological Data
 4. Working with Physical Data
 5. Working with Remote Sensing Data
 6. Working with Meteorological Data
 7. Working with Ancillary & GIS Data
 1. Preparing Atlases
 8. Catalog of Selected Data Analyses & Products
6. Earth System Modeling
 1. Modeling the Ocean
 2. Modeling Ecosystem Processes
 1. Hydrochemical Processes
 2. Biological Processes
 3. Sedimentation & Erosion
 4. Fates & Effects Modeling
 3. Operational Modeling
 1. FOAM
 2. HYCOM
 3. MERCATOR
 4. MFSTEP
 5. NCEP
 6. NLOM
 7. TOPAZ
 8. UK Shelf Seas
 9. UK Wave
 4. Climate Modeling
7. Operational GIS

7. Examples

8. Exercises

1. Information Technology Exercises

2. Information Exercises

3. Data Management Exercises

1. Instructor Whiteboards

1. Africa Whiteboard

2. South America Whiteboard

2. Hand Contouring

3. Data Roadmaps

4. Data Processing with Excel

5. Processing Seabird CTD Data with Seabird Software

ANNEX IV

Acronym list

AOI	Area of Interest
BSRP	Baltic Sea Regional Project
CDF	Channel Definition Format
DM	Data Management
DVD	Digital versatile disk
GEBCO	General Bathymetric Chart of the Oceans
GEF	Global Environment Facility
GIS	Geographic Information Systems
HDF	Hierarchical Data Format
ICES	International Council for the Exploration of the Sea
ID	Interdisciplinary
IOC	Intergovernmental Oceanographic Commission (of UNESCO)
IODE	International Oceanographic Data and Information Exchange Program
JCP	Joint Comprehensive Environmental Action Program for the Baltic Sea
LME	Large Marine Ecosystem
ODINCINDIO	Ocean Data and Information Network for the Central Indian Ocean Region
ODV	Ocean Data View
WOD	World Ocean Data