Monitoring Specifications

Date: 2010-01-27

Zooplankton





ARGE BLMP - Working Group for the North Sea and Baltic Sea Monitoring Programme

At the 34th North German Environmental Ministerial Meeting held on 17 April 1997, the competent departments of the German Federal Government and of the federal states of Hamburg, Mecklenburg-Vorpommern, Lower Saxony and Schleswig-Holstein agreed to establish a joint working group co-ordinating the monitoring of the marine environment of the North and Baltic Seas (ARGE BLMP Nord- und Ostsee).

Members of ARGE BLMP are:

- Federal Ministry of Food, Agriculture and Consumer Protection
- Federal Ministry of Transport, Building and Urban Development
- Federal Ministry for the Environment, Nature Conservation and Nuclear Safety
- Federal Ministry of Education and Research
- Authority for Urban Development and Environment of the Free and Hanseatic City of Hamburg
- Mecklenburg-Vorpommern Ministry for Agriculture, the Environment and Consumer Protection
- Lower Saxony Ministry for the Environment and Climate Protection
- Schleswig-Holstein Ministry for Agriculture, the Environment and Rural Areas

The Monitoring Manual describes the current measuring programme implemented under BLMP. The monitoring requirements of the different EC Directives (Marine Strategy Framework Directive, Water Framework Directive, FFH, Birds Directive), marine protection conventions (OSPAR, HELCOM, Trilateral Monitoring and Assesment Program) and other bodies of regulations have been taken into account in the Manual. The Monitoring Manual is available free of charge on the BLMP website at www.blmp-online.de/Seiten/Monitoringhandbuch.htm

Editorial information

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Monitoring Specifications Zooplankton (Date: 2010-01-27)

1 General

1.1 Subject area

Biological Monitoring - Fauna - Zooplankton

1.2 Definition

Mesozooplankton (200 - 2000 µm) and macrozooplankton (2 - 20 mm)

1.3 Competent authority/ies

Federal Government:	BSH, UBA
Mecklenburg-Vorpommern:	LUNG
Lower Saxony:	NLWKN
Schleswig-Holstein:	LLUR

1.4 Working group

Ad Hoc Working Group on Nutrients and Plankton

2 Monitoring requirements

2.1 Necessity

MSFD

Article 10

Comments

(Establishment of environmental targets)

Article 11

Version: proposal of the Secretariat-General of 13 November 2006.

This also applies to transitional waters and coastal waters covered by Directive 2000/60/EC, where pertinent aspects of the protection of the marine environment not dealt with in Directive 2000/60/EC are at issue.

Comments

(Monitoring programmes)

Article 8(1) [1]

Comments

(Assessment)

A description of the biological communities associated with the predominant seabed and water column habitats. This would include information on the phytoplankton and zooplankton communities, including the species and seasonal and geographical variability. The results of the monitoring are required for the initial assessment of marine waters.

See MSFD, Annex III

Article 9

Comments

(Determination of good environmental status)

HELCOM

COMBINE

Comments

COMBINE programme for the monitoring of eutrophication and its effects: spatial and temporal variability of plankton:

- species composition,
- abundance and
- biomass of mesozooplankton as a secondary eutrophication effect and for the characterisation of water masses.

On the German side, investigations are carried out in the following areas: Eastern Gotland Basin, southern Central Baltic Sea, Arkona Basin and Mecklenburg Bight.

COMBINE manual: German contribution to the monitoring of eutrophication and its effects:

Fixed sampling stations in the open sea, at which the species composition and abundance of mesozooplankton are investigated.

OSPAR

JAMP Common Procedure

OSPAR acts as the regional co-ordination platform for implementation of the MSFD in the Northeast Atlantic Ocean.

Comments

Common Procedure for the Identification of the Eutrophication Status of the OSPAR Maritime Area.

The Comprehensive Procedure is to be applied in all areas that have been identified as (potential) problem areas with regard to eutrophication. It encompasses zooplankton grazing, which is included in the "checklist of qualitative parameters for a holistic assessment" as a supporting factor.

ICES

Working Group on Integrated Coastal Zone Management

Comments

Zooplankton are clearly affected by changes in temperature: "Zooplankton seems sensitive to environmental changes, and these could be used as an indicator for climate change or other impacts." (Working group on integrated coastal zone management - ICES, 2006)

Technical necessity

Zooplankton exhibit important interactions with other biological components, such as fish for example. The zooplankton data from the Heligoland-Reede Station allow clear correlations with the development of individual fish populations (e.g. sand eels) to be identified. This makes it possible to forecast the development of sand eel populations with a probability of 95 %.

2.2 Environmental targets

MSFD

'On the basis of the initial assessment made pursuant to Article 8(1), Member States shall, in respect of each marine region or subregion, establish a comprehensive set of environmental targets and associated indicators for their marine waters […], taking into account the […] characteristics set out in Annex IV.' (Article 10)

HELCOM

HELCOM Ecological Quality Objectives:

'Thriving and balanced communities of plants and animals¿. Indicator: "Zooplankton community structure".

OSPAR

Eutrophication Strategy and Common Procedure

Assessment of the eutrophication status of the marine environment:

'The overall objective is the achievement in 2010 of a healthy marine environment where eutrophication does not occur'

Ecological Quality Objectives

Eutrophication status of the North Sea:

'All parts of the North Sea should have by 2010 the status of non-problem areas with regard to eutrophication, as assessed under the OSPAR Common Procedure for the Identification of the Eutrophication Status of the Ospar Maritime Area.'

2.3 Threats

Eutrophication

2.4 Spatial allocation

	EEZ	12- nm zone	Coastal waters 1)	Transitional waters
MSFD	x	x	-	-
Birds Directive	-	-	-	-
HD	-	-	-	-
WFD	-	-	-	-
HELCOM	x	x	x	-
OSPAR	x	x	x	x
TMAP	-	-	-	-

1) Under the WFD: baseline plus one nautical mile

3 Monitoring concept

3.1 Description of monitoring network

The monitoring network covers the open North Sea and the open Baltic Sea. The WFDdoes not provide for the monitoring of zooplankton. Nor has it been part of the monitoring programme in coastal waters to date. As far as coastal waters are concerned, the time series administered by AWI and IOW are available.

North Sea

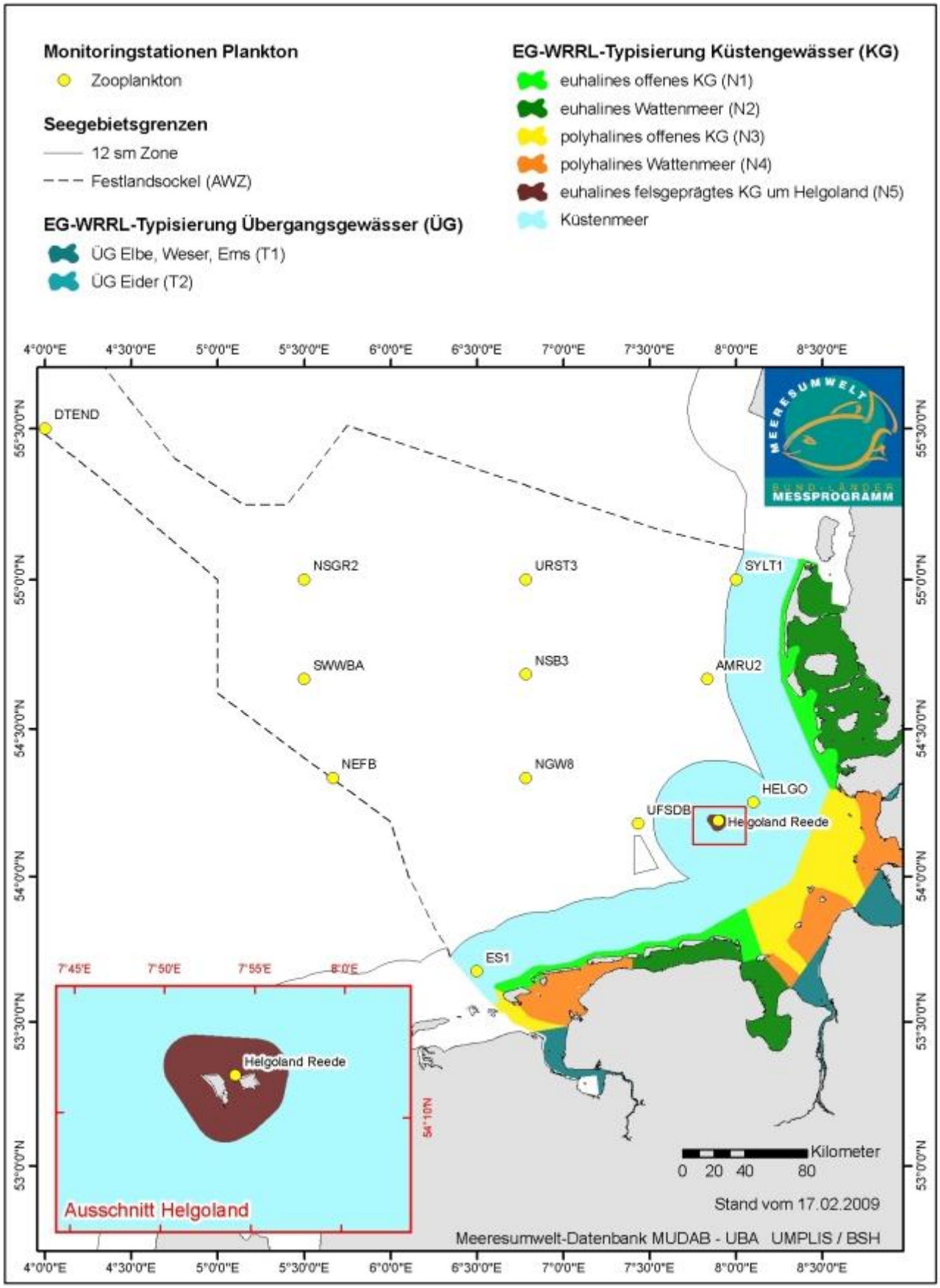

Figure 1: Map showing the stations intended for zooplankton monitoring in the North Sea

Figure 1 as PDF-document

Baltic Sea

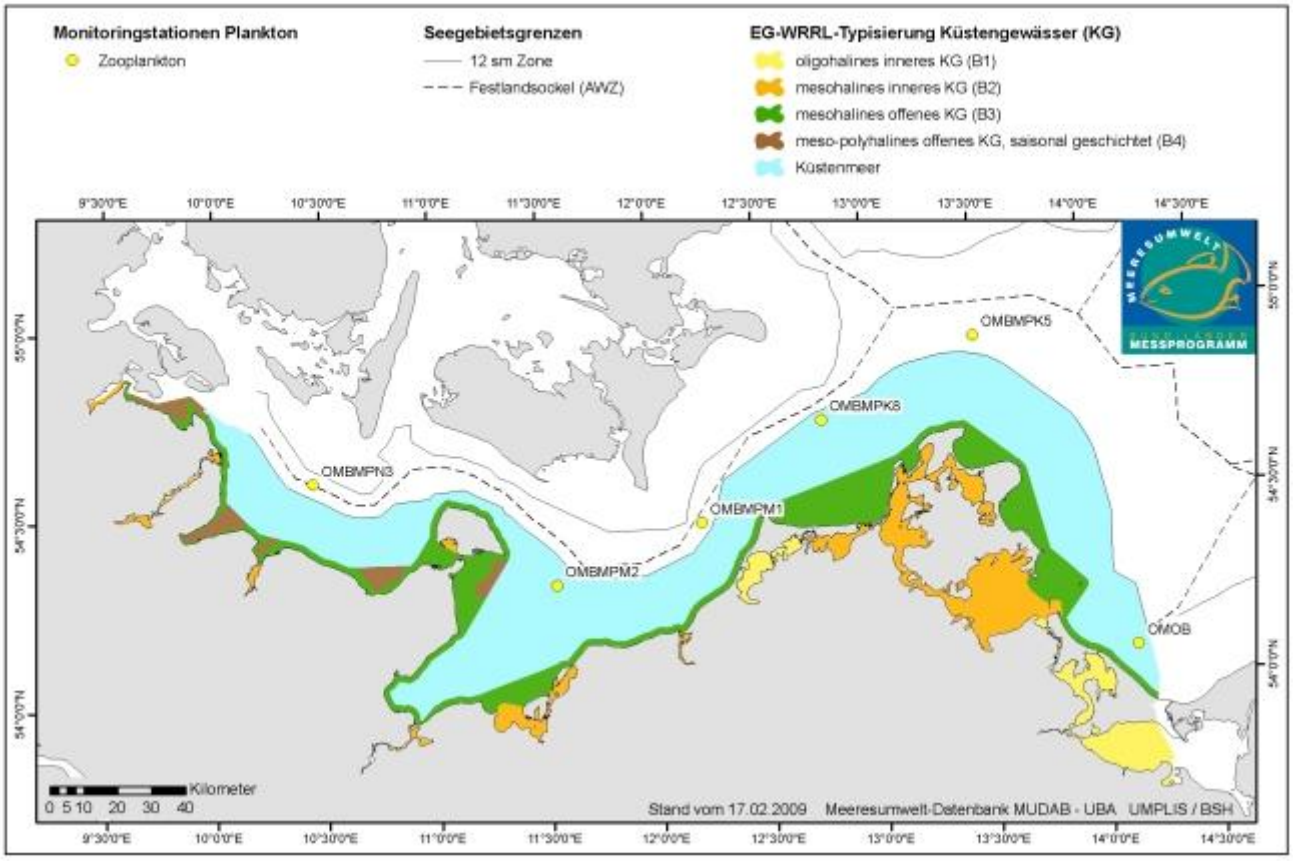

Figure 2: Map showing the stations intended for zooplankton monitoring in the Baltic Sea

Figure 2 as PDF-Document

3.2 Monitoring activities

North Sea and Baltic Sea

Zooplankton - North Sea and Baltic Sea

Methods:

The analysis of zooplankton samples has to be undertaken in accordance with the sample standard operating procedure for laboratories involved in the German Marine Monitoring Programme (BLMP), which has been coordinated within the Programme: Testing Procedure SOP: Mesozooplankton Surveying in Marine Waters (Not including Inner Coastal Waters).

Current methods should only be retained in justified exceptional cases where they are used for ongoing long-term monitoring series.

Frequency:

Under the COMBINE programme, zooplankton are monitored five times a year as a core variable in the Baltic Sea. In addition to this, HELCOM recommends a monitoring frequency of at least 12 measurements a year for high-frequency measurements, while measurements should be taken weekly during the vegetation period.

However, this frequency is not sufficient because the development of zooplankton displays very strong seasonal and, in particular, interannual fluctuations. Monitoring series with frequencies of more than 52 samples a year are required for any valid interpretation. In this respect, a few stations operating at high frequencies should be preferred to many stations operating at low monitoring frequencies.

Zooplankton are monitored five times a year in the North Sea under the auspices of the BSH-IOW monitoring programme. AWI provides its data (when available). AWI takes samples weekly in the North Frisian Wadden Sea, and three times a week at Heligoland.

Parameter:

- Abundance (fauna)
- Biomass
- Species spectrum

Zone:

Sublittoral

3.3 Additional parameters

The following parameters are required additionally for the assessments::

- Nutrients
- Phytoplankton (biomass, species composition)
- Salinity
- Temperature

4 Assessment

4.1 Assessment procedures

North Sea and Baltic Sea

Title

Zooplankton

Guideline:

Various directives

Comments:

No assessment procedure is available. Evaluations of time series show a strong temperature effect, above all.

5 Quality assurance

- HELCOM (ZEN training courses and intercalibration exercises)
- Quality Assurance Panel (at the UBA (research projects for the validation of methods, intercalibration exercises, standardisation with DIN, CEN and ISO, support for the establishment of QM systems, drafting of sample SOPs, performance of audits))

Comments

The Quality Assurance Panel at the Federal Environment Agency is responsible for the coordination of quality assurance under the BLMP. Each of the monitoring institutions bears responsibility for establishing and administering its own DIN EN ISO/IEC 17025 quality management systems. The institutions involved in the BLMP coordinate their activities within the framework of the Working Group on Quality Assurance and its sub-working groups.

5.1 Monitoring institutions

- AWI
- FTZ
- IOW
- Senckenberg

5.2 Guidance documents

- *AQS-Merkblatt zu den Rahmenempfehlungen der Länderarbeitsgemeinschaft Wasser (LAWA) für die Qualitätssicherung bei Wasser-, Abwasser-, und Schlammuntersuchungen, 2004:* 'Kontrollkarten (A-2)'.
- *DEV zur Wasseruntersuchung, 1997: 39. und 45. Lieferung: I: Strategien für die Wasseranalytik: Verfahrensentwicklung, Validierung und Qualitätssicherung in der Routine;* 74 pp.
- BLMP Quality Assurance Panel at the UBA, 2008: *Muster-Qualitätsmanagementhandbuch für Laboratorien des Bund/Länder-Messprogramms nach DIN EN ISO/IEC 17025 (BLMP Sample Quality Management Manual)*; Version: 01 of 1 February 2008; Federal Environment Agency.
- HELCOM, *COMBINE Manual*, 'Annex C-7: Mesozooplankton'.
- JAMP, 2004: *Guidelines on quality assurance for biological monitoring in the OSPAR area.*; ICES Techniques in Marine Environment Sciences; 32; 2004.

5.3 Standards

- DIN EN ISO/IEC 17025, 2005: General requirements for the competence of testing and calibration laboratories.
- DIN EN 14996, 2006: Water quality - Guidance on assuring the quality of biological and ecological assessments in the aquatic environment.

- DIN EN ISO 5667-3, 2004-05: Water quality - Sampling - Guidance on the preservation and handling of water samples (ISO 5667-3: 2003).
- ISO 5667-9, 1992-10: Water quality - Sampling - Part 9: Guidance on sampling from marine waters.

5.4 Current status

A BLMP Study Group decision (2006) obliged the BLMP laboratories to establish DIN EN ISO/IEC 17025 quality management systems. For this purpose, a Sample Quality Management Manual was drawn up in 2006/2007 as part of the BLMP process. This manual has been available for subscription from the Quality Assurance Panel at the UBA since mid-2008 and is to be used as the basis for internal QM documentation at laboratories. The manual is designed as a loose-leaf collection, so that regular updates can be added as required. The intention is for it to be gradually supplemented with sample SOPs coordinated within the BLMP. As far as zooplankton are concerned, SOP: Mesozooplankton Surveying in Marine Waters (Not including Inner Coastal Waters) is currently in preparation.

Intercalibration exercises

- UBA/HELCOM/BLMP-RV: Zooplankton Analysis 2007/2008 (number of participating laboratories: 22, report: 2009)
- Baltic Sea Mesozooplankton Ring Test (number of participating laboratories: 10, report: 2004)

Workshops

- ICES/HELCOM: Workshop on QA of Biological Measurements in the Baltic (1996)
- HELCOM Working Group on Zooplankton: Third Biological Intercalibration Workshop (1990)
- HELCOM Working Group on Mesozooplankton: Second Biological Intercalibration (1982)
- First Biological Workshop, Baltic Marine Environment Protection Commission (1979)

6 Literature

- Telesh, I., Postel, L., Heerkloss, R., Mironova, E., Skarlato, S.;2008;Zooplankton of the Open Baltic Sea: Atlas. BMB Publication No. 20. - Meerswiss. Ber., Warnemünde, 73, 1 - 251.

7 Activities required to implement the concept

7.1 Changes to the current monitoring programme

Action should be taken to ensure that the long-term series at Heligoland-Reede is continued and anchored as an important component of German marine monitoring.

Long-term series for the surveying of zooplankton with a monitoring frequency of >= 52/year should be established in the following areas:

- Lower Saxon Wadden Sea

- Schleswig-Holstein Baltic Sea coast

The frequency quoted is necessary if it is to be possible to record the interannual and seasonal variability of zooplankton in the data analysis and take account of it in the evaluation.

With regard to the data collected to date, a comprehensive evaluation that examines correlations with the development of fish populations is necessary. Apart from this, the influence of the inflow from the Elbe on the variability of zooplankton at the Heligoland-Reede station should be given greater attention.

7.2 Working steps required

Priorities

There is still no assessment of ecological status for zooplankton. This is necessary, in particular, for the assessment required by the MSFD.

An appropriate assessment concept that includes zooplankton as a 'supporting parameter' is required for the assessment of the eutrophication status of the North Sea under the Common Procedure (see also Phytoplankton, Macrophytes und Macrozoobenthos).

Upgrading of monitoring stations to take high-frequency measurements.

The data series from Heligoland-Reede should have been evaluated more comprehensively, in particular as regards correlations with the development of fish populations. Another deficiency of this time series is the inadequacy of the evaluation as far as water bodies and salinity are concerned.

The high-frequency, long-term zooplankton series at Heligoland-Reede (>= 52 measurements a year) should definitely be continued, and its methodological and personnel continuity secured.

General

Judged in the light of their great ecological significance (see Necessity), the role played by zooplankton as a component of the marine environment has been accorded a very low priority to date in the context of marine monitoring. It is therefore important that zooplankton are also investigated intensively over the long term using methods that go beyond the requirements of the relevant directives. A concept is therefore being proposed in which zooplankton monitoring would be expanded with further high-frequency monitoring stations (see 3, Monitoring concept).

Assessment

Until now, there has been no assessment of zooplankton as an environmental indicator. Such an assessment is required under OSPAR, HELCOM and the MSFD. In certain circumstances, the monitoring concept will have to be amended in response to this assessment.

Quality assurance

The establishment of DIN EN ISO/IEC 17025 quality management systems under the BLMP should be concluded by 1 January 2012.

In this context, apart from the development of uniform quality standards (QM system), efforts should also be made to ensure that the participating institutions work largely in accordance with shared guidelines when the SOPs are being drafted. To this end, the current Sample Quality Management Manual is to be adapted and the following SOP for zooplankton investigations drawn up:

- SOP: Mesozooplankton Surveying in Marine Waters (Not including Inner Coastal Waters) - completion planned for first six months of 2010

The DIN EN ISO/IEC 17025 quality management system includes the following elements:

- documented validation/verification of the investigation methods deployed for the determination of performance characteristics,
- ongoing validation of the accuracy and precision of each procedure for the specific intended use, e.g. by means of the use of control charts and the deployment of (certified) reference materials, as far as possible,
- the qualification and regular training of personnel for the procedures deployed,
- the regular performance of internal and external audits,
- regular participation in national and international interlaboratory comparisons, intercalibration exercises, training courses and workshops, and their evaluation.

The laboratories must guarantee the prompt and complete communication of the investigation results to MUDAB on the basis of the MUDAB data formats, including the QA data that have been defined as a minimum, which meet international standards (ICES).

Further steps to be taken as of 2009:

- Provision of the uniform species list including synonyms via the QA information system
- Drawing up of agreements on taxa that cannot be identified to species level
- List of independent experts for cases where identification is problematic
- Alternating workshops on taxonomic questions, methodology and evaluation procedures (to guarantee uniform minimum quality standards at all laboratories) and intercalibration exercises to ensure that, if possible, some form of external QA can be offered once a year (in this connection, of course, international workshops and intercalibration exercises that allow the UBA Quality Assurance Panel to hold events less frequently have to be taken into consideration). These activities are to be documented adequately and promptly.
- Establishment of a data management system for all participating institutions within the framework of the work of the Working Group on Data Management

Since workshops and intercalibration exercises cannot be offered annually by the Quality Assurance Panel (Biology Section) and, like those for phytoplankton, the long-term zooplankton series display effects that depend on the individuals who process the samples, regular interlaboratory comparison analyses should be organised bilaterally and independently between the laboratories that carry out zooplankton investigations, the results of which should

be presented and discussed in the Working Group on Quality Assurance. As a matter of principle, attention is to be paid to continuity among the staff involved in the processing of long-term monitoring series, as well as steps to ensure they are appropriately qualified. Staff should make active use of the HELCOM MONAS Zooplankton Expert Network as a forum for the discussion of technical issues.

Methodology

Methods with which additional information can be used to address 'undersampling' (deployment of sediment traps and acoustic procedures) should definitely be tested. Processing capacities will be required temporarily for the evaluation of the present test series.

Long-term data series

The high-frequency, long-term zooplankton series at Heligoland-Reede (>= 52 measurements a year) should definitely be continued, and its methodological and personnel continuity ensured. As an alternative, it is to be recommended that the series be continued in close cooperation with BSH and the Federal Research Centre for Fisheries. This would establish close links with the work being done in the field of fisheries.

As yet, the data series has still not been comprehensively evaluated, in particular with regard to correlations with the development of fish populations. Another deficiency of this time series is the inadequacy of the evaluation as far as water bodies and salinity levels are concerned.

Data management

Decisive progress in this direction is achievable, in particular if the data are made available to the wider research community. It should be guaranteed as a matter of course that the data producers will be involved when these data are used in order to rule out erroneous inferences during the interpretation of the figures. A future data management system that reflects concerns specific to zooplankton could support this development.

Footnotes

(1) Version: proposal of the General-Secretariat of 13 November 2006.

This also applies to transitional waters and coastal waters covered by Directive 2000/60/EC, where pertinent aspects of the protection of the marine environment not dealt with in Directive 2000/60/EC are at issue.