

Report of the

**TMAP Blue Mussel Workshop
Wilhelmshaven, 26 – 27 March 2003**

Final Version (22 May 2003)

**Common Wadden Sea Secretariat
Trilateral Monitoring and Assessment Group**

Contents

<i>Contents</i>	2
1. Opening and Adoption of the Agenda	3
2. Announcements	3
3 Follow up and results of Blue Mussel Workshop in 2002	3
3.1 <i>GIS data delivery</i>	4
3.2 <i>Aerial photographs</i>	4
3.3 <i>Dutch habitat model</i>	4
3.4 <i>Information exchange</i>	4
4 Presentations	5
4.2 <i>National Status Report</i>	5
4.2 <i>Demonstration Aerial Photographs</i>	6
5 Preparation QSR Update	7
5 Follow up work	8
Annex 1 List of Participants	10
Annex 2 Agenda	11
Annex 3 Terms of Reference	12

1. Opening and Adoption of the Agenda

Mr. A. Kellermann, the chairman of the workshop, welcomed the participants to the TMAP blue mussel workshop in Wilhelmshaven. The list of participants is in **Annex 1**. The agenda was adopted as in **Annex 2**.

The chairman explained that the preparation of the QSR would be the main TMAP work over the next two years, as described in the Terms of Reference of the workshop (in **Annex 3**).

He appreciated that Mr. de Vlas had taken over the task as lead author for the QSR chapter on blue mussels.

2. Announcements

Mr. Millat informed the meeting about a 3-year research project on the pacific oyster (*Crassostrea gigas*) which would be carried out by Mr. Achim Wehrmann of the Senckenberg Institute in Wilhelmshaven. It would address developments, dynamics and larvae settlement of the pacific oyster in the Wadden Sea. He offered to ask Mr. Wehrmann to distribute a summary of the project description.

Mr. Dankers informed about the activities to prepare an inventory of the pacific oyster in the Dutch Wadden Sea. A first rough overview resulted in about 3 – 4 ha of oyster beds often within existing blue mussel beds. In the Eastern Scheldt, the pacific oyster covers almost 600 ha. He suggested to also have a similar rough overview for Germany and Denmark.

3 Follow up and results of Blue Mussel Workshop in 2002

Since 2000, two TMAP Blue Mussel Workshops have been organized: the first one in Tönning in October 2000 and the second one on Ameland in April 2002:

The Tönning workshop in 2000 resulted in

- an inventory of the national blue mussel monitoring programs,
- a common definition of a blue mussel bed,
- an overview concerning the comparability of single monitoring parameters,
- a proposal for revised TMAP guidelines for blue mussel monitoring,

The Ameland workshop 2002 stated that:

- the calculation of location and area of intertidal mussel beds are comparable for trilateral purposes,
- biomass and coverage of mussel beds are comparable but only on a larger scale (results supported by an intercalibration exercise at the workshop),
- different experiences have been made by using aerial photographs in mussel monitoring depending on which methods have been used,
- several criteria can be used to describe a “stable mussel bed” but, also because of methodological limitations, it was not possible to define quantifiable criteria.

The Ameland workshop 2002 agreed on several activities to be carried out as follow-up work:

- status GIS data delivery (year 1999),
- cross check aerial photographs from different countries,
- interpretation of DK photos and transfer into GIS,
- test of different scales of aerial photographs,
- possible application of Dutch habitat model in Lister Deep;
- information exchange (national reports, publication list),

3.1 GIS data delivery

Mr. Lüerßen informed that the TMAP data units have technically been finalized. Currently, the available monitoring data are being filled in.

He explained the procedure of mussel data delivery to the TMAP data units via the secretariat. By now, data from Lower Saxony and Schleswig-Holstein have been received and the CWSS detected no technical difficulties to prepare a harmonized GIS shape file for the year 1999. The Lower Saxon GIS data can now be uploaded to the Lower Saxon TMAP data unit.

The Dutch GIS data of RIVO have not yet been delivered because of administrative difficulties. The CWSS will check the current status and contact the Dutch TMAG members accordingly. The results of RIVO surveys are only available from reports and in this way cannot be used for a quasi synoptic survey.

In Denmark, the mussel beds identified on aerial photographs have not yet been transferred into GIS. With support of Gerald Millat the CWSS transferred mussel bed information from aerial photographs into GIS. The results were discussed with Per Sand Kristensen before the workshop. It was concluded that a transfer to the GIS would have a lot of advantages as the experiences in the other countries have shown. However, because of the complex interpretation procedure, it was concluded that the best way to handle the Danish data would be a direct transfer to the GIS of the Danish Fishery Research Institute (DFU) also with regard to a long-term storage, documentation and analysis of the monitoring data.

It was concluded that:

- available GIS data from Schleswig-Holstein and Lower Saxony up to 2002 can be delivered in 2003,
- delivery of Danish data would require some more time and additional effort on the national level to transfer the data to a GIS,
- GIS data are available in the Netherlands (RIVO) up to 2002, which can be provided after clarification of administrative matters by CWSS/TMAG. GIS data from Alterra for selected beds can be delivered on request.

3.2 Aerial photographs

A cross check of aerial photographs from different countries and a test of different scales of aerial photographs have not been carried out yet because of time constraints. It was agreed to address these topics during the demonstration of the Lower Saxon interpretation procedure (agenda item 4.2).

3.3 Dutch habitat model

The application of the Dutch habitat model to other areas in Germany or Denmark has not yet been explored in detail. The workshop underlined that a validation of the model with data from other areas would be of common interest. Mr. Brinkman offered to prepare a specification of data he would require. As a second step, the available field data could be screened for their suitability.

3.4 Information exchange.

As agreed at the last workshop, several reports on mussel monitoring have been distributed amongst the participants. The CWSS prepared a list of publications and reports which is attached as **Annex 4**. The list will be updated regularly and be placed on the CWSS homepage.

The workshop strongly recommended to also include an English summary in the national reports as it had already been done by Denmark.

4 Presentations

4.2 National Status Report

The Netherlands

Mr. Brinkman presented some results from the projects of EVA II, a scientific evaluation of the present mussel fishery policies. The final results were expected by the end of 2003.

He explained that there had been some criticism of the trilateral mussel bed definition because it was regarded as too unclear by the Dutch administration. He further reported about intercalibration exercises to define the contours of mussel beds and interpretation of aerial pictures. The results obviously depend on who and how the work has been done.

Ms. Baars presented the yearly development of mussel bed contours in the Dutch Wadden Sea for the period 1995 – 2002. The maps covered the beds which have been surveyed in the field (about 80-90% of all mussel beds). In 2002, the highest value of intertidal mussel bed area has been recorded since 1995: an area of 2580 ha plus an area of about 300 ha which have not been visited.

Based on the experiences of the last years, the total area of mussel beds will be recalculated for the period since 1995.

Mr. Dankers reported that detailed information on the development of mussel beds had been compiled for selected beds, e.g., indicating changes in biomass on a square meter basis. He pointed out that the selection of sampling sites was crucial to obtain comparable results.

He further informed about the recent interpretation of old aerial photographs of the Dutch Wadden Sea of 1976 and 1969 including also smaller areas of other years. Although identification of mussel beds was often difficult and sometimes with doubts, he calculated that 2 - 4 % of the tidal flats were covered by mussel beds at that time. It could also be shown that mussel beds were persistent in some areas over a long time. The concept of a "mussel bed site", as developed in Lowery Saxony, could be supported from this information.

Denmark

Mr. Kristensen presented the results of mussel and cockle surveys as documented in the Danish reports of 2002. The mean biomass of blue mussels (subtidal and intertidal area) decreased from 49,000 t in 2000 to 16,000 t in 2002. The average biomass per m² decreased by 84%.

During the last 4 years, the mussel landing also showed a clear decline. In 2002, the landings were about 2,387 t which is a little less than half of the allocated TAC.

In August 2002, about 116 t blue mussels (mean shell length 17.0 mm) were fished near Horns Rev and transplanted to a subtidal area near Jørgen Lo to reestablish mussel beds in this area. The results of this transplantation will be followed during the next years.

Germany

Schleswig-Holstein

Mr. Ruth presented figures on the yearly amount of fished seed mussel and mussel landings in Schleswig-Holstein for the period 1985 – 2002. In contrast to other Wadden Sea areas, fishery for seed mussels starts in Schleswig-Holstein as soon as technically possible after the settlement of a new year class, at mean mussel length of about 5 mm.

GIS data on the distribution and size of subtidal mussel beds have been calculated from 1997 onwards by using black box data from each of the eight vessels. He pointed out that, although some overestimation in area may occur, these were currently the most reliable data for the mussel stocks in the subtidal area.

Mr. Nehls reported that the area of intertidal mussel beds decreased to 650 ha in 2002. Based on the data of Maarten Ruth from the period 1984-1994, a potential area of 3000 ha would be realistic, resulting in a mean coverage of 2.5 – 3% of the tidal flats (only Nordfriesland).

A comparison of aerial photos and ground truth data showed that correlation decreased from 88% to 76% over the last years when the bed coverage also decreased from 45% to 25% indicating methodological difficulties. The mean biomass in patches remained almost constant (11-12 kg/m²). He

underlined that determination of biomass by corer sampling may involve a strong bias depending on the selection of the sampling locations within a bed. He recommended a randomized sampling strategy which should be comparable between the countries.

Ms. Stoddard reported preliminary results of a comparison of aerial photographs of 1989 (black and white 1:15,000) and 2002 (color 1:25,000). Although some technical problems existed (quality of photo, no coordinates in 1989, interpretation problems, morphological changes of tidal flats) the development of mussel bed areas in the different sub-regions could be documented. However, some methodological adjustments would be necessary, e.g. combination of different methods, before a final conclusion could be drawn.

Lower Saxony

Mr. Herlyn presented the results of the spring survey for the period 1999 – 2002. The area of mussel beds declined from about 2300 to 1700 ha, the proportion (patches) from 80% to 52%, and the coverage (mussel bed) from 42% to 30%. In the same period, the biomass varied between 9 – 12 kg/m². The total biomass showed constant decline of 75% from 110,000 t in 1999 to 25,000 t in 2002. The developments were comparable to the Danish situation.

Three phases can be distinguished since 1989: A decline up to 1996, an increase from 1997 to 1999, and another decline from 1999 to 2002.

A large spatfall like in the Netherlands in 2001 could not be reported in Lower Saxony. The 1996 spatfall was still the dominant cohort until some local spatfall occurred, especially in 2000 and 2001.

4.2 Demonstration Aerial Photographs

Mr. Millat presented the method of stereoscopic interpretation of aerial photographs, the transfer of the results to the GIS and the GIS analysis procedures used in Lower Saxony during the last year. GIS data on mussel beds were available from 1994 onwards and have been analyzed with regard to the development of bed contours and location of beds.

He explained the advantages and limitations of the use of aerial photographs for blue mussel monitoring mainly depending on the scale and the used film material. The experiences in Lower Saxony, which can be supported by literature, revealed that a use of black and white photos with a scale of 1:15,000 gave the most reliable results taking into account the typical structure and texture of mussel beds settled by mussels of different age (e.g. young beds after recruitment). He stressed that a stereoscopic interpretation is absolutely essential to be able to also identify beds under difficult circumstances. This would not be possible by using only a simple magnifying glass; furthermore, photographs with a scale smaller than 1:25:000 would not be detailed enough.

During the practical part of the demonstration, the workshop participants compared different types of aerial photographs from different regions in detail by stereoscopic interpretation. It was obvious that interpretation was more accurate by adding a third dimension because structure and pattern of a bed can then be identified.

An intensive discussion on the pro and cons of the different methods in use, however, revealed that there is still a need to exchange experiences and information on this issues. It was agreed to intensify practical exercises in the future, e.g. by carrying out bilateral interpretation exercises and cross checks of photographs from different regions.

After the workshops, a first start was made by having a detailed look at the Schleswig-Holstein and Dutch photographs with stereoscopic interpretation by Gerald Millat, Norbert Dankers, Devira Baars, Georg Nehls and Penny Stoddard. It is intended to continue such exercises in the future.

Conclusion

The workshop concluded that:

- comparable data are available on area and location of mussel beds, coverage and biomass (total and per m²) from all countries for the QSR update,
- more or less consistent changes of temporal abundance patterns of persistent mussel sites have been detected in the different Wadden Sea regions by using different methods,
- the methodological error may not be constant but can vary over the years depending on the development stage of the mussel beds (e.g. higher variance when monitoring old beds with low coverage and less distinct border),

- interpretation of historic aerial photographs can give valuable information on previous distributions of mussel beds, but interpretation without ground truth data should be carried out with care because of an over or underestimation or false negative/false positive interpretation,
- a more detailed analysis concerning methodological aspects of interpretation of aerial photographs should be done preferably in bilateral practical exercises and cross checks.

5 Preparation QSR Update

The meeting discussed the contents of the QSR chapter „Intertidal Mussel beds” based on a document prepared by the secretariat.

The workshop agreed on the overall structure of the chapter. During the discussion, the following agreements were made:

a. Role of blue mussel beds in the Wadden Sea

New results and more detailed information are now available on mussel beds as food source for birds, e.g. from the EVA II project or other relevant publications in Germany and Denmark, which should be mentioned in the introduction; furthermore new data on sedimentation and mussel beds.

b. Assessment of method

The conclusions of the previous blue mussel workshops should be summarized stating that the methods have continuously improved during the last years and that results can be compared for most purposes. Although different methods are in use the results are well comparable in most cases, taking into account the methodological limitations and the different objectives of the running national blue mussel monitoring programs.

c. Assessment criteria

The term “stable beds” will be used in the sense of the QSR 1999. Because more detailed data are available the development of mussel beds can be documented very well for the last 5 – 8 years. This can also be used to assess whether single mussel beds and/or locations have been stable for a number of years.

d. Long-term development

The tables on total area and biomass per region should be checked and updated by each country. Data from 1991 onward were regarded as comparable. Earlier data must be interpreted with care because methods and data sources were not well documented or not comparable.

The data on mussel bed area will be presented in a map, preferably by using sub-areas (e.g. 2 –3 per region). Different types of maps should be tested (a.o. location of beds, classification of beds by size, or density maps as % mussel beds on tidal flats, e.g. between < 0.5% and > 5%). Examples will be prepared to the next meeting with data of 1999 and 2001.

It should be explored whether the sub-division of the EU Water Framework Directive (WFD) by water body classes would be suitable.

e. Regional developments

For each region, a short description of the blue mussel bed development should be given by the countries as has been done in the QSR 99. This concerns especially:

- Development in spatfall in the different areas (e.g. good, few, none),
- Weather conditions (e.g. effects of storm in December 1999 and 2001, October 2002, ice winter 2002/03)
- Developments of pacific oysters (quantitative data?),
- Fisheries (results of EVA II, impact of no fisheries in SH, long-lasting effects versus short-term effects).
- Predation by birds (results of EVA II and from other publications),

For the drafting of the QSR chapter the workshop agreed that based on a conceptual draft to be prepared by the end of June, national contributions and the necessary data will be delivered by mid September 2003. At the next meeting on 29 October 2003, the results will be discussed to be able to prepare a first draft in November 2003.

5 Follow up work

The meeting endorsed the following activities:

1. Workshop minutes

The CWSS will prepare an overview on the main conclusions and agreements of the workshop within two weeks.

2. GIS data to TMAP data units via CWSS

Available recent GIS data should be delivered to the secretariat for trilateral harmonization as soon as possible. The situation with regard to the RIVO data will be checked by the TMAG/CWSS.

3. Habitat Model

Bert Brinkman will prepare a data specification. The secretariat will find out whether the specified data is available in other regions or not.

4. Publications

The workshop member will update the publication list and send relevant publications or report to the CWSS. The publication list will be maintained on the CWSS homepage.

5. Aerial photographs

Cross check of aerial photographs will be coordinated by the chair/CWSS. As a first step, the workshop members should submit a selection of photographs to the CWSS, which they would like to discuss within this exercise.

6. QSR

6.1 Check of tables and filling in of missing data in the proposed QSR chapter (Excel file to be send around by CWSS)

6.2 Definition of WFD sub-areas and possible assignment of mussel bed areas to be explored by CWSS as soon as possible.

6.3 Proposal of a density map of mussel beds to be prepared by the workshop participants for their region by September 2003, classes from <0.5% to > 5% of tidal flat area (about 2-3 classes in between, depending on data).

6.4. Conceptual draft of QSR chapter by Jaap de Vlas with support of chair/CWSS by 1 July 2003.

6.5. National contribution to Jaap de Vlas as soon as possible, but latest until 15 September 2003.

6.6. Next meeting to discuss mussel chapter in Wilhelmshaven on 29 October 2003 (starting at around 10:00h, and ending at around 16:00h).

6 Any other business

Mr. Kristensen informed the meeting that a project proposal to the EU on the effects of closed areas on birds in Danish water had been rejected.

Mr. Dankers suggested to include a chapter on reference areas in the QSR update.

7 Closing

The chairman closed the meeting by thanking all participants for the excellent collaboration and wished a safe trip home. On behalf of the meeting, he thanked the colleagues at the secretariat for hosting the workshop and for the pleasant stay.

Annex 1 List of Participants

Mr. Adolf Kellermann (chairman)

Landesamt für den Nationalpark
Schl.-Holst. Wattenmeer
Schloßgarten 1
D 25829 Tönning
phone +49(0)4861 616 44
Fax +49(0)4861 459
Kellermann@nationalparkamt.de

Mr. Per Sand Kristensen
Danmarks Fiskeriundersøgelse
Afd. for Havfiskeri
Charlottenlund Slot
DK - 2920 Charlottenlund
phone: +45 33 96 33 71
fax: +45 33 96 33 33
e-mail: Psk@dfu.min.dk

Mr. Norbert Dankers
ALTERRA
Postbus 167
NL - 1790 AD Den Burg/Texel
phone: +31(0)222 369 702
fax: +31(0)222 319 235
e-mail: n.dankers@alterra.wag-ur.nl

Mr. Bert Brinkman
ALTERRA
Postbus 167
NL - 1790 AD Den Burg/Texel
phone: +31(0)222 369 728
fax: +31(0)222 319 235
e-mail: a.g.brinkman@alterra.wag-ur.nl

Ms. Divera Baars
RIVO CSO Yerseke
Postbus 77
NL - 4400 AB Yerseke
phone: +31 (0)113 672304
fax: +31 (0)113 573477
e-mail: Divera.Baars@wur.nl

Mr. Jaap de Vlas
RIKZ
Postbus 207
NL - 9750 AE Haren
phone office: +31 (0)505 331370
fax: +31 (0)50 534 07 72
e-mail: J.dVlas@rikz.rws.minvenw.nl

Mr. Georg Nehls
Alte Landstrasse 2
D - 2585 Hockensbüll
phone: +49 (0) 4841 - 71754
e-mail: georg.nehls@t-online.de

Mr. Penny Stoddard
Bioconsult SH
Alte Landstrasse 2
D - 2585 Hockensbüll
phone: +49 (0) 4841 7709958
P.Stoddard@bioconsultsh.de

Mr. Maarten Ruth
Amt f. ländliche Räume Kiel
Ast. 6 Fischerei
Postfach 24028
D – 24148 Kiel
Phone: +49 (0)431 720 80 16
Fax: +49 (0)431 720 80 26
e-mail : Maarten.Ruth@Fischerei.ALR-Kiel.landsh.de

Mr. Gerald Millat
Nationalparkverwaltung Nds. Wattenmeer
Virchowstr. 1
D - 26382 Wilhelmshaven
phone: +49(0)4421 911295
fax: +49 (0)4421 911280
e-mail: gerald.millat@br-we-whv.niedersachsen.de

Mr. Marc Herlyn
Uni Oldenburg – ICBM Wilhelmshaven
Schleusenstr. 16
D - 26382 Wilhelmshaven
phone: +49 (0)4421 944 215
fax: +49 (0)4421 944 299
e-mail: marc.herlyn@icbm.terramare.de

Mr. Harald Marencic
Mr. Gerold Luerßen
Common Wadden Sea Secretariat
Virchowstr. 1
D – 26382 Wilhelmshaven
Phone: +49 (0)4421 9108 0
Fax: +49 (0)4421 9108 30
marencic@waddensea-secretariat.org
luerssen@ waddensea-secretariat.org

Annex 2 Agenda

- 1 Opening and adoption of the agenda**
- 2 Announcements**
- 3 Follow up TMAP Workshop 2002**
- 4 Presentations**
- 5 Preparation QSR Update**
- 6 Follow up work**
- 7 Any other business**
- 8 Closing**

Annex 3 Terms of Reference

TMAP Blue Mussel Workshop 2003 Terms of Reference 1.11.2002

1. Introduction

The two TMAP blue mussel workshops in Tönning (October 2000) and on Ameland (April 2002) focussed on the comparability of the existing blue mussel monitoring program, monitoring techniques (field sampling, remote sensing) and update of the TMAP guideline. A first discussion on classification of mussel beds (criteria stable beds) was carried out at the last workshop. Furthermore, a data management procedure was agreed on (specification of GIS data and related attribute data according to the TMAP data model).

2. Tasks

The blue mussel workshop 2003 should carry out the following tasks:

a. Outcome follow-up activities of last workshop:

- status GIS data delivery (year 1999),
- cross check aerial photographs from different countries,
- interpretation of DK photos and transfer into GIS,
- test of different scales of aerial photographs,
- possible application of Dutch habitat model in Lister Deep;

b. Preparation QSR update:

- data compilation intertidal mussel beds (GIS data) and other relevant data (co-variables),
- inclusion of recent research results (e.g. Dutch EVA II project)
- classification of mussel beds ("stable beds / stable sites"),
- assessment of the spatial and temporal distribution of mussel beds,

c. Organizational aspects QSR update

- contents of sub-chapters (according TMAG decisions),
- appointment lead authors and co-authors,
- time schedule (according overall QSR time schedule) and financial implications.

The results of the QSR work will also give input to the implementation of the Esbjerg Declaration (evaluation mussel fishery, protection of sites with stable beds):

"... To stress that the implementation of the Targets on geomorphology, eelgrass beds and mussel beds still deserves attention and, therefore, to evaluate before the end of 2004 the mussel fishery with special attention to stable mussel beds" (§ 9 ED).

"to base the conservation and management of mussel beds on the protection of sites where stable beds occur and areas with a high potential for the development of stable mussel beds" (§ 10 ED).

3. Participation

The workshop will be attended by persons who are in charge of the national blue mussel monitoring in organizational and technical aspects (Annex 1). The TMAG will nominate participants of the workshop and appoint a chairman. The CWSS will be responsible for the secretarial work.

4. Mandate

The workshop will be held as a TMAP expert workshop under the responsibility of the TMAG to carry out the tasks given above. The workshop will report to the TMAG on the results.