



MARBENA

**Electronic conference on
'Marine biodiversity research that
matters!'**

15 to 26 November 2004

Summary of discussions

An activity of:

The European
Marine Research
Stations Network
(MARS)



Organized by:

Centre for
Estuarine and
Marine Ecology
(NIOO-CEME)



Flanders Marine
Institute (VLIZ)



Supported by the European Commission under the Fifth Framework Programme and contributing to the implementation of the key action 'Sustainable Marine Ecosystems' within 'Energy, Environment and Sustainable Development'





MARBENA

**Electronic conference on
'Marine biodiversity research that
matters!'**

15 to 26 November 2004

Summary of discussions

An activity of:

The European
Marine Research
Stations Network
(MARS)



Organized by:

Centre for
Estuarine and
Marine Ecology
(NIOO-CEME)



Flanders Marine
Institute (VLIZ)



Supported by the European Commission under the Fifth Framework Programme and contributing to the implementation of the key action 'Sustainable Marine Ecosystems' within 'Energy, Environment and Sustainable Development'



Conference organization:

Carlo Heip, Chair

Centre for Estuarine and Marine Ecology/Netherlands Institute of Ecology
(CEME/NIOO), Korringaweg 7, PO Box 140
NL-4400 AC Yerseke, The Netherlands

General co-ordinators:

Carlo Heip, co-ordinator

Herman Hummel and Pim van Avesaath, assistant co-ordinators

Centre for Estuarine and Marine Ecology/Netherlands Institute of Ecology
(CEME/NIOO), Korringaweg 7, PO Box 140
NL-4400 AC Yerseke, The Netherlands

Website and practical organization:

Edward Vanden Berghe, Ward Appeltans, Jan Mees, Francisco Hernandez and Daphne Cuvelier

Flanders Marine Institute (VLIZ)
Vismijn, Pakhuizen 45-52
B-8400 Oostende, Belgium

The topics and issues raised in the electronic conference have been presented to the EPBRS meeting 'Biodiversity research that matters!' held on 10-13 December 2004 in Amsterdam (The Netherlands). This volume includes introductions and summaries of discussions. All the discussion points raised during the conference can be reviewed by registering onto <http://www.vliz.be/marbena>

This publication should be cited as follows:

Heip, C.H.R.; Vanden Berghe, E.; Appeltans, W.; Cuvelier, D.; van Avesaath, P.H.; Hummel, H.; Mees, J., eds (2004). Electronic conference on 'Biodiversity research that matters!' - Summary of discussions, 15 to 26 November 2004. Flanders Marine Institute (VLIZ): Oostende, Belgium. ix, 35 pp.

Vlaams Instituut voor de Zee (VLIZ)

Flanders Marine Institute
Vismijn, Pakhuizen 45-52
B-8400 Oostende, Belgium
Tel. +32-(0)59-34 21 30
Fax +32-(0)59-34 21 31
E-mail: info@vliz.be
<http://www.vliz.be>

The authors and editors are responsible for the contents of this publication; it does not represent the opinion of the European Community, and the European Community is not responsible for any use that might be made of the information appearing herein.

No part of this volume may be reproduced, stored in a retrieval system or transmitted in any form or by any means, electronic, mechanical, photographic or otherwise, without the prior permission of the original copyright owner.

Table of contents

Welcome and introduction.....	3
Introduction to Topic 1: Species Invasions - Marine bio-invasions and research policy - Ballast water as vehicle for exotic marine species invasions	5
Introduction to Topic 2a: Fisheries - Management of fish resources - The Baltic Sea .	7
Introduction to Topic 2b: Fisheries - Marine Protected Areas in the North Sea: To protect fisheries or biodiversity? - The Plaice Box.....	9
Introduction to Topic 3: Marine Protected Areas: Natura 2000 and beyond (OSPAR) - The Azores	10
Introduction to Topic 4: Exploitation - Exploitation of shellfish in the Wadden Sea, project EVA II.....	13
Summary of discussions on Topic 1: Species Invasions: Marine bio-invasions and research policy - Ballast water as vehicle for exotic marine species invasions.....	18
Summary of discussions on Topic 2a: Fisheries - Management of fish resources - The Baltic Sea	21
Summary of discussions on Topic 2b: Fisheries - Marine Protected Areas in the North Sea: To protect fisheries or biodiversity? - The Plaice Box	23
Summary of discussions on Topic 3: Marine Protected Areas: Natura 2000 and beyond (OSPAR) - The Azores	27
Summary of discussions on Topic 4: Exploitation - Exploitation of shellfish in the Wadden Sea, project EVA II	30
Practical organisation and statistics	33
List of contributors.....	35

**Report of the MARBENA e-conference on
'Biodiversity research that matters!'**

Conference chair:

Carlo Heip

Netherlands Institute of Ecology; Centre for Estuarine and Marine Ecology, The Netherlands
– (c.heip@nioo.knaw.nl)

Conference co-chairs:

Han Lindeboom

University of Wageningen; Alterra; Team Wad & Sea, Landscape Centre, The Netherlands
– (han.lindeboom@wur.nl)

Henn Ojaveer

University of Tartu; Estonian Marine Institute, Estonia – (henn@sea.ee)

Ricardo Serrao Santos

University of the Azores; Department of Oceanography and Fisheries, Portugal
– (ricardo@notes.horta.uac.pt)

Sergej Olenin

Klaipeda University; Coastal Research and Planning Institute, Lithuania – (serg@gmf.ku.lt)

Wim Wolff

University of Groningen, The Netherlands – (w.j.wolff@biol.rug.nl)

*Welcome and introduction

Carlo Heip

Netherlands Institute of Ecology; Centre for Estuarine and Marine Ecology (NIOO-CEME),
Corringaweg 7 Postbus 140 NL-4400 AC Yerseke, Netherlands – (c.heip@nioo.knaw.nl)

The interaction between scientists who discover, describe and explain things and politicians who could and should build on that knowledge to make decisions, is poor at best and often nearly non-existing. The gap between scientific knowledge and political decisions is huge, and therefore the role of administrations and agencies is crucial, as crucial as the role of the press and the ngo's for instance. The EPBRS has been designed to occupy such an intermediary role at the European level with the intention to organize the dialogue between research and policy making. One mechanism that has been chosen to serve the purpose is to formulate a series of recommendations and that has been the outcome of the previous meeting of EPBRS in Killarney and the subsequent stakeholder meeting in Malahide in Ireland in May 2004 (see <http://www.nbu.ac.uk/biota/e-conference.htm> for the documents from those meetings).

The message from Malahide sets ambitious goals for biodiversity research and management to reach the 2010 targets. It lists 18 objectives with 97 targets. Ambitious goals are more easily formulated than achieved, but the overarching target to halt biodiversity loss by 2010 requires an approach that is ambitious. It also has to be effective, since there are many hurdles to take before targets become practice. Identification of these hurdles and of the mechanisms to overcome them is one way to catalyse the process.

To do that, we can learn from past experience. In this, the eighth MARBENA e-conference, we want to draw lessons from concrete projects in the past that were either successful or not. Our areas of interest are the coastal waters and the open oceans, areas with special usage and special legal status and consequently special problems. We have chosen six different cases and asked colleagues that were closely involved in these cases to introduce and subsequently lead the discussion on them. These cases deal with invading species, eutrophication, marine protected areas in two different locations and shellfish and finfish exploitation. In each case a central question is in how far scientific knowledge and advice have been important in reaching decisions.

What we expect from you, the marine biodiversity community, is to react to the conclusions from these cases, to give new examples where things have gone either well or badly, to give your own opinion on what the road towards better protection and restoration of biodiversity should be, how to involve the public, how to convince local or national politicians and so on.

As usual there is a parallel e-conference from Bioplatform that focuses on five different problems (island biogeography, trade, tourism, transport and the Millenium Assessment). Please take a look at <http://www.nbu.ac.uk/biota/e-conference.htm> if you want to join that e-conference as well.

* Please refer to this section as:

Heip, C.H.R. (2004). Welcome and introduction. Pp 3-4 in Heip, C.H.R. *et al.* (eds): *Electronic conference on 'Biodiversity research that matters!' - Summary of discussions, 15 to 26 November 2004*. Flanders Marine Institute: Oostende, Belgium.

The results of both e-conferences will be presented at the EPBRS meeting in Amsterdam in December 2004 (see <http://www.netherlands.biodiv-chm.org/epbrs>) and the results will be part of the conclusions and recommendations from that meeting that should find their way to national and European authorities.

***Introduction to Topic 1: Species Invasions - Marine bio-invasions and research policy - Ballast water as vehicle for exotic marine species invasions**

Sergej Olenin

Klaipeda University; Coastal Research and Planning Institute, Lithuania – (serg@gmf.ku.lt)

Marine bioinvasions and research policy

The global scale of alien species invasions is becoming increasingly evident in the European seas (Reise *et al.*, 1999; Leppakoski *et al.*, 2002; Boudouresque & Verlaue, 2002; Occipinti-Ambrogi & Savini, 2003). Although the problem of biological invasions has now become the focus of a rapidly growing research area, there are still large gaps, both geographically and thematically, to be filled in within the near future. As it has repeatedly been stressed in the previous MARBENA e-conferences, the effects of invasive species on native ecosystems remain largely unknown. Indeed, the number of the documented impacts of aquatic bioinvasions, both ecological and economic, in the European waters is significantly smaller than in the North America and Australia. Although marine bioinvasions were addressed during several recent regional (North Sea, Baltic, Mediterranean) conferences, there has yet never been a single Pan-European scientific forum devoted to that problem. This makes a big contrast to the regularity and large number of international conferences on aquatic invasive species organized by Americans, with the most recent of them, the 13th, being in fact held in Ireland (September 2004).

Questions:

- Could it be that the marine ecosystems of Europe are more resistant to species introductions and hence the impacts of bioinvasions are 'simply' less visible in Europe than on other continents?
- Does the problem of biological invasions receive enough attention on the European marine biodiversity research agenda? What are the most urgent questions to be addressed?
- Is there a need for new EU legislative acts especially focused on prevention of bioinvasions, inter alia on the prevention of the marine introductions? How marine biodiversity science may assist in the development of such acts?

Ballast water as a vehicle for exotic marine species invasions

Presently, intentional introductions (e.g. for aquaculture and stocking) are controlled more effectively than before thanks to developed guidelines, national legislation and international conventions, while the unintentional ones seem to be on a steady increase as a result of the progressive globalisation of trade. It is most likely that the global nature of the shipping industry, with faster ships transporting large quantities of ballast between geographically separate areas, has

* Please refer to this section as:

Olenin, S. (2004). Introduction to Topic 1 : Species Invasions - Marine bio-invasions and research policy - Ballast water as vehicle for exotic marine species invasions. Pp 5-6 in Heip, C.H.R. *et al.* (eds): Electronic conference on 'Biodiversity research that matters!' - Summary of discussions, 15 to 26 November, 2004. Flanders Marine Institute: Oostende, Belgium.

an increasing potential to transfer exotic species to new areas. A historic step towards resolving the problem of shipping-mediated introductions was made at a Diplomatic Conference at the IMO, London, in February 2004, when the International Convention for the Control and Management of Ships Ballast Water & Sediments (BW) was adopted.

The successful implementation of the Convention depends on many factors: political, economical, technological, etc. The role of marine biodiversity science in that process is also very important. For instance, the Article 6 “Scientific and Technical Research and Monitoring” calls for Parties individually or jointly to promote and facilitate scientific and technical research on ballast water management; and monitor the effects of ballast water management in waters under their jurisdiction. There are opinions, however, that the BW Convention lacks clarity required to assess the commercial implications (see e.g. www.shipgaz.com/english/magazine/issues/2004/04/0404_editorial.asp) and therefore countries will interpret the convention differently to satisfy domestic requirements.

Questions:

- Is there a need in Europe for wider research cooperation in the ballast water management?
- What are the main directions of such research cooperation?
- How to make the recommendations and standards of the BW Convention more understandable to the shipping industry and, at the same time, more scientifically sound?

* Introduction to Topic 2a: Fisheries - Management of fish resources - The Baltic Sea

Henn Ojaveer

University of Tartu; Estonian Marine Institute, Estonia – (henn@sea.ee)

Resources of the four most important commercial species of the Baltic Sea – herring, cod, sprat and salmon – are managed at international level. The management advice is given by the International Council for the Exploration of the Sea (ICES) and the international management body is the International Baltic Sea Fishery Commission (IBSFC). Currently, several stocks of the above species are outside safe biological limits. Status of some stocks is uncertain. However, there exist some success stories for management of selected fish stocks. For instance, IBSFC has adopted ‘Salmon Action Plan 1997-2010’ and it has shown already success in the Main Basin of the Baltic Sea leading to an overall increase in the wild smolt production even up to three times. Recently, in order to protect cod spawning, IBSFC has adopted the ‘Resolution on the closure of the Gotland Deep and Gdansk Deep’.

All other commercial fish species, which are often named as ‘coastal fish’ but include a variety of species (e.g., perch, pikeperch, bream, vimba bream, smelt, eel, roach) are managed at national level. These fish make roughly 10% of the total fish catches in the Baltic Sea. Compared to the assessed fish species, there exist very limited amount of international scientific cooperation in the field of research and management for all other commercial fish. For this reason, the scope of both the ongoing fundamental research and monitoring, and quality of the management advice for ‘coastal fish’ resources is very variable between the Baltic countries.

Non-commercial fish often play decisive roles in marine food-webs at various trophic levels, incl. they may serve as essential prey for commercial species, act as intermediate hosts of parasites and/or compete for the same food resource with commercial species. However, these fish are not included into national fish monitoring programs. Therefore, data on non-commercial species is not collected on routine basis and are mostly dependent on ongoing fundamental research projects.

Mostly due to political changes, almost the whole eastern coast of the Baltic Sea has suffered under substantially increased fishing efforts during the last one and a half decades. As a common response, this has initially led in increased landings but followed by a decreased fish size in the sea and in landings (in some cases even the minimum official landing size!) and finally in decrease of landings to a very low levels (in some cases even to 1% of the levels in the late 1980s!). These developments undoubtedly point to severe non-compliance of fishermen to fishing rules.

Removal of large predatory fish has substantially changed fish communities in several sub-basins of the Baltic Sea. In addition, several other natural and anthropogenic factors (like several consecutive warm summers recently, increased abundance of fish-eating cormorants and seals,

* Please refer to this section as:

Ojaveer, H. (2004). Introduction to Topic 2a : Fisheries - Management of fish resources - The Baltic Sea. Pp 7-8 in Heip, C.H.R. *et al.* (eds): Electronic conference on ‘Biodiversity research that matters!’ - Summary of discussions, 15 to 26 November, 2004. Flanders Marine Institute: Oostende, Belgium.

bioinvasions) have further initiated substantial changes at various trophic levels. Impacts of some of the above-named factors may escalate the fisheries-induced changes.

Topics to be discussed during the e-conference

- Governmental decisions for management of fish resources reflect, at least partly, solving of socio-economic problems without considering seriously scientific advice from fishery biologists? Is that rather leading to postponing of problems and potentially leading to more serious challenges?
- Communication of scientists to public through various media is weak as there are very often voices heard that decrease of fish catches in the Baltic Sea are blamed to occur mainly due to other reasons than the main source – too intense exploitation.
- What are the main factors behind both of the success stories and failures of fish resources/stock management in the Baltic Sea?
- Why fish biodiversity in general is currently considered as an unimportant matter when managing fisheries?

***Introduction to Topic 2b: Fisheries - Marine Protected Areas in the North Sea: To protect fisheries or biodiversity? - The Plaice Box**

Han Lindeboom

University of Wageningen; Alterra; Team Wad & Sea, Landscape Centre, The Netherlands –
(han.lindeboom@wur.nl)

The EU has asked the memberstates to consider the establishment of Special Protected Zones (under the Habitat and/or Bird Directives) or Marine Protected Areas (in relation to OSPAR) in the open sea, in their EEZ, also outside the 12 miles zone. Germany has submitted its proposal for several areas, the other states are preparing their proposals.

At the moment there is a lot of debate about the criteria that should be used to establish these areas. What are sandbanks, reefs, or gasseeps? Do MPAs protect individual species? Are MPAs necessary to protect biodiversity, and do they protect biodiversity? Are MPAs, in an area like the North Sea suited as a managerial measure in fisheries? What size should an MPA have?

In the Netherlands, we recently calculated the amounts of benthos, fish and bird species per sampling point in our North Sea monitoring data. From the analyses we established the areas with the highest species densities. At the moment government employees are discussing which of these areas with high species densities will qualify as possible MPA. The Frisian Front, with its high benthos and bird values, is an example of such a qualifying area.

The North Sea flatfish fisheries generate considerable numbers of discards, especially of Plaice *Pleuronectes platessa* in coastal waters. Their survival is very low. To reduce discard mortality, a partially closed area was established (Plaice Box) in 1989 in the coastal waters along the continental coast. The beam trawl fishery in this area was prohibited for vessels larger than 300 HP. From 1989 to 1995 beam trawlers larger than 300 HP were prohibited for six months per year and since 1995 all year round. However, smaller beam trawlers (= 300 HP) were still allowed to fish in the area. Ever since, the plaice stocks have gone down, and fishermen claim that re-opening is justified, since it does not solve any problems.

Is the Plaice Box, with a reduced fishing effort, a representative example of a protected area?

* Please refer to this section as:

Lindeboom, H. (2004). Introduction to Topic 2b: Fisheries - Marine Protected Areas in the North Sea: To protect fisheries or biodiversity? - The Plaice Box. Pp 9 in Heip, C.H.R. *et al.* (eds): Electronic conference on 'Biodiversity research that matters!' - Summary of discussions, 15 to 26 November, 2004. Flanders Marine Institute: Oostende, Belgium.

*Introduction to Topic 3: Marine Protected Areas: Natura 2000 and beyond (OSPAR) - The Azores

Ricardo Serrao Santos

University of the Azores; Department of Oceanography and Fisheries, Portugal –
(ricardo@notes.horta.uac.pt)

The oceans represent the bulk of living space on Earth with a rich and incomparable diversity of species and ecosystems. They also play a major role on the regulation of climate and they are in many cases the ultimate geochemical sink for many of the contaminants that enter via coastal sea and the atmosphere.

The marine ecosystems that suffer the most are those situated in coastal zones. Roughly half of the shorelines of the continents are threatened by development. In some continents, the percentage of degraded coasts is much greater. In Europe, it is considered that 86% of the coastal perimeter is at risk (moderate and high risk), which also means that the habitats and the species to which they are associated are also at risk. Along with the occupation and destruction of habitats and that of pollution, one of the other major threats to marine biodiversity is the excessive exploitation of resources. Fish makes up 16% of the world's supply of proteins for human use.

Fishing has reduced numerous fish populations to very low levels. Those affected are to be found in the most varied marine ecosystems: fish that live on continental platforms such as halibuts and cod, submarine seamount fish, such as some species of redfish, including the orange roughy, and fish of vast pelagic distribution such as swordfish, albacore, and bluefin tuna. In some regions of the oceans, over-fishing has reduced stocks to half of their original maximum amount. It seems difficult to find refuge for marine life. The North-Atlantic Ocean, with its long time tradition of fishing, is now a threaten sea in need of urgent ideas and good practices in view of a return to a sustainable future¹.

The Azores

The Archipelago of the Azores consists of nine volcanic islands and several small islets, forming three groups along a tectonic zone running WNW-ESE between 37° and 40°N latitude, 25° and 32° W longitude, in the middle of the Atlantic. The marine environment of the Azorean Archipelago and its surrounding Economic Exclusion Zone (EEZ), close to 1 million square kilometres, is of considerable conservation and marine biological interest - in large part because of its isolated position in the middle of the north-eastern Atlantic and the recent age of the Archipelago. There are also various seamounts including subsided islands.

* Santos, S.R. (2004). Introduction to Topic 3: Marine Protected Areas: Natura 2000 and beyond (OSPAR) - The Azores. Pp 10-12 in Heip, C.H.R. *et al.* (eds): Electronic conference on 'Biodiversity research that matters!' - Summary of discussions, 15 to 26 November, 2004. Flanders Marine Institute: Oostende, Belgium.

¹ I strongly recommend the following book: D. Pauly & J Maclean 2003. In a Perfect Ocean: The State of Fisheries and Ecosystems in the North Atlantic Ocean.

The Azores were inhabited until colonized by the Portuguese in the 15th Century. Since early colonization population has exploited littoral, near shore and, latter on, offshore living resources. In recent years pressures on littoral and offshore resources have grown with the switch from essentially subsistence or artisanal exploitation to more commercial operations². Meanwhile the reduced CPUE and greater environmental awareness, both at an international, national and regional level, has increased the pressure to protect marine life and habitats.

Pre-Natura 2000

There is a pre-Natura 2000 tradition in marine protect areas in the Azores. Before 1992 (EU-Habitat Directive) nine MPA were already designated in the Azores, distributed on four islands and one isolated group of islets, which include marine environments: seven were designated as Marine Reserves (MR), one as a Protected landscape; and another as a Special Ecological Area. Six are located in the Eastern group and three in the Central group.

These MPAs and other disperse legislation on the regulation of individual species suffered from integrated perspective and background thus resulting in the absence of management of the activities taking place in the protected areas and/or deficient enforcement of the legislation. With the application of the EC "Birds" and "Habitats" Directives in the Archipelago (the list of SCI and SPA for Macaronesia was published in the Official Journal of the EC in 2001), conservation benefited from a new strategic perspective by the designation of 18 Sites of Community Interest (SCIs) and 13 Special Protection Areas (SPAs) on coastal and marine habitats. With a view to prevent what has happened with previous scattered measures, it became evident the need to implement an integrated program of management planning and an enforcement of the measures taken. The success of this strategy would depend on the integration, in terms of ecology and management, of the different components of the coastal environment, but also, and equally important on the capacity of governmental bodies to reach appropriate enforcement of the law through monitoring, vigilance and education.

Natura 2000

In 1998, under the frame of an EU-LIFE project (NAT/P/5275: MARE - Integrated management of coastal and marine areas in the Azores)³ it was possible to initiate the elaboration and implementation of a set of management plans for a complex of areas and species that were already favoured by disperse legal measures. Three different levels of approach were considered for integration: littoral habitats, marine bird populations and populations of cetaceans and marine turtles.

The program followed a course of action that included (1) scientific inventory of ecological and socio-economical features, (2) elaboration of regulation plans, (3) public inquiry, (4) preparation of management plans and finally (5) the implementation of specific management measures.

At the same time it was established an earnest program of environmental education with the perspective of alerting the different sectors of society and their active involvement in management measures. Only through this strategy would it be possible to create favourable conditions to implement successfully the Network Natura 2000 in the Azores.

Special emphasis has to be given given to environmental education (EE) of local communities. EE sessions for students, teachers, stakeholders and public in general have to be regularly prepared,

² Interestingly is that some long-liners are now returning to hand-line fishing.

³ <http://www.macmar.info>

promotion material produced, and field tours in SACs organised. This component is essential for the success of the whole program. Without the understanding, involvement and support of the public, nowhere in the world can we guarantee the continuity of the efforts to establish MPAs.

However important also is that these new areas become economically important for the communities.

Beyond Natura 2000

It could also be argued that there is also a case for designating at least one or two seamounts as reserves. In effect the Formigas (already a MPA and a Site of Conservation Importance), which barely jut above the surface, fulfil, only partially, this need. Other suitable seamounts needed to be proposed as potential submarine reserves - although given their commercial importance there is a need of a close involvement of the fishing community. However, this measure could contribute to the conservation of exploited demersal species, and be of primary interest for the future of the demersal fisheries in the region. Also of interest is the designation of MPA in deep sea hydrothermal vent fields.

This work is now being continued in view to promote the conservation of deep sea habitats and species, through the implementation management plans for new MPAs in two selected deep sea hydrothermal vent sites (Lucky Strike and Menez Gwen) and, hopefully in the near future, one or two seamounts (possibly Sedlo and Princess Alice).

The World Wide Fund for Nature (WWF) has proposed a potential MPA at Lucky Strike, under OSPAR (the Convention for the Protection of the Marine Environment of the North-East Atlantic). Annex V of OSPAR contains provisions with regard to the protection and conservation of the ecosystems and biological diversity in the marine area.

Due to this fact the Regional Government of the Azores, is looking forward to establish Menez Gwen and Lucky Strike as MPAs and foster at the same time development of research activities. But conflicting legislative background of regional, national, European and international law is retarding and inhibiting the process of designation.

* Introduction to Topic 4: Exploitation - Exploitation of shellfish in the Wadden Sea, project EVA II

Wim Wolff

University of Groningen, The Netherlands – (w.j.wolff@biol.rug.nl)

The Wadden Sea is a shallow estuarine area between the North Sea and the coasts of Denmark, Germany and the Netherlands. About 50% of this area consists of tidal flats harbouring rich stocks of shellfish and very large numbers of shorebirds. Shellfish have been exploited in this area since times immemorial. This included periwinkles, whelks, flat oysters, blue mussels, and cockles. Oysters have disappeared from the Wadden Sea due to overexploitation and the fisheries for periwinkles and whelks have gradually ended (overexploitation also contributed to the demise of whelks). Nowadays, commercial exploitation of shellfish focuses on blue mussels (*Mytilus edulis*) and cockles (*Cerastoderma edule*). Shellfish exploitation in the Dutch part of the Wadden Sea is far more intensive than in the German or Danish part.

Mussel culture in the Dutch Wadden Sea started in 1950. In the 1980s on average 100,000 tons fresh weight (which is the weight of the live animals, including the shell) could be produced annually by about 70-80 mussel farms in Dutch coastal waters (*i.e.* including the Oosterschelde estuary in the SW Netherlands). Since 1990 the production has declined considerably and a value of 100,000 tons fresh weight was reached only twice. The Dutch mussel culture is a bottom culture based on the collection of seed mussels from wild mussel beds. These seed mussels are re-laid on culture plots where they are allowed to grow and fatten during 1-2 years.

Cockles traditionally were collected manually on the tidal flats. In the 1960s the fishermen started to use mechanical dredges. During the 1970s these dredges became more efficient and since the 1980s a highly efficient fleet of 20-30 cockle fishing boats fished all over the Dutch Wadden Sea in autumn.

In the mean time the Dutch Wadden Sea had got protected status as a conservation area in 1980. Existing human uses could be continued, however. During the first ten years it seemed as if shellfish exploitation and nature conservation could be both accommodated in the Wadden Sea. However, while the number of fishing licenses was limited, there were no limits on the total catch of the fishermen. Finally this system led to the disappearance of some of the more important natural values of the Wadden Sea around 1990. After a series of years without recruitment of young cockles and mussels, and with continued fishing, almost all cockle and mussel beds had disappeared. Although recruitment failure and continued fishing were the main causes of the decline, it cannot be excluded that storms also played a role in the demise of the shellfish beds. Shellfish feeding birds showed a strongly increased mortality. The Dutch government decided to develop a new fisheries policy for the exploitation of the Dutch Wadden Sea. A research programme EVA I and EVA II (EVALuation phase I and phase II) was started in 1993 to determine

* Please refer to this section as:

Wolff, W.J. (2004). Introduction to Topic 4: Exploitation - Exploitation of shellfish in the Wadden Sea, project EVA II. Pp 13-16 in Heip, C.H.R. *et al.* (eds): Electronic conference on 'Biodiversity research that matters!' - Summary of discussions, 15 to 26 November, 2004. Flanders Marine Institute: Oostende, Belgium.

if the new management measures enabled commercial shellfish exploitation in a nature conservation area without causing significant damage to the area.

Item for discussion: Responsibilities for shellfishery policy and for scientific evaluation of the success of the policy were strictly separated. The new management measures were set by civil servants (although several of them were trained as ecologists). Scientists had only an advisory role in the formulation of the new rules; The strict separation of responsibilities gave room for a political decision process but also gave some practical problems. For instance, some areas were permanently closed for fishery, but the selection of these areas was not based on criteria for a proper scientific experiment. This impeded the subsequent evaluation. Furthermore, the effectiveness of the new rules were disputed from the start by at least part of the scientific community. We propose to discuss what role science and scientists have to play in such a political setting. Also, it would be interesting to have examples of cases where the role of science in policy-making differed.

Under the new rules for fishing shellfish, three main objectives were formulated, viz.

- permanently closing for fisheries of 26% of the total area of tidal flats in the Wadden Sea in order to restore lost types of ecosystems, such as seagrass beds and mussel beds
- reservation of a sufficient amount of food for shellfish-feeding birds in years with low stocks of shellfish
- introduction of a system of co-management in the fisheries in order to create awareness by the fishermen and to avoid control problems.

The restoration of lost types of ecosystems was achieved by the combination of natural processes, closure of fishery on existing mussel beds and seagrass meadows and closure for fisheries of promising locations. Scientists were asked to determine the best places for re-colonization of the tidal flats by mussel beds and seagrass meadows. These areas were closed for shellfish fisheries. Natural settlement then was expected to result in new beds. No attempts were made to create mussel beds or seagrass meadows artificially by dumping mussels or planting seagrass on the flats, except for a few small-scale experiments.

The food reservation policy was achieved by calculating the amount of food needed by shellfish-feeding birds during the winter season. This amount of food had to remain on the tidal flats after fisheries had taken place. The consequence of this rule is that in some years shellfish fishing was not possible.

Item for discussion: How do you value the system of closed areas and food reservation? Which alternative measures can be applied for restoring biodiversity in a tidal flat area deteriorated by exploitation of shellfish? Of course, the maximum option for conservation was a complete closure of all fisheries. In this case, however, the Dutch government wanted to retain both the fisheries and the conservation values of the area.

The research project to evaluate this policy was entrusted to a consortium of three Dutch research institutes specialized in applied ecological research in the Dutch coastal waters. Academic institutions did not take part.

Each of the three institutes appointed a project leader and one of these had the final responsibility for the entire project. The chief project leader reported to a steering committee chaired by a high-ranking government official and made up by civil servants representing the Ministries involved, and by representatives of nature conservation organizations and fisheries organizations.

As a first step, the steering committee formulated the policy questions that needed to be answered. The next step was that the consortium of research institutes translated these policy questions into research questions that could be answered by scientific investigations. This resulted in a research plan containing a series of project proposals. Each year it was decided which of these project proposals should be funded.

All research reports had to be submitted to this steering committee. All committee members could make comments on these reports after which the scientists were asked to consider these comments. The scientists were not obliged to change their writings but they had to make clear why they accepted some comments and rejected others. After two or three rounds of discussion the steering committee accepted the reports formally after which these reports were submitted to an audit committee for peer review. This audit committee consisted of three independent university professors. In the final printed version of the report, the comments of the audit committee were added as an appendix and the scientists had to explain what had been done with these comments. This particular form of peer review was chosen because it was supposed to be faster than peer review and publication by scientific journals and also because the nature of part of the reports made it unlikely that they could be published in scientific journals. However, it is intended that finally all suitable information will be published in the scientific literature; drafting of manuscripts is underway.

All research reports of the EVA project were freely available to the public, both in print and on a website. The scientific results were also explained in a number of meetings with stakeholders in different locations along the coast. Unfortunately for this e-conference, all research reports are in Dutch. The final report of the project, however, is in English. It can be downloaded from <http://www.alterra.wur.nl/UK/prodpubl/rapporten/> (the report number is 1011).

Item for discussion: What do you think of the organization of the EVA study with respect to the role of science? What role, if any, can stakeholders be given in an objective scientific project? What is your opinion of the scientific quality assurance in the EVA II process?

The EVA project concluded that the goal of restoring the area of stable intertidal mussel beds to between 2000 and 4000 ha had been achieved, if mussel beds aged one year or older were classified as stable. Restoration of seagrass beds could have reached its objectives, but in practice fishermen were not always aware of the existence of new seagrass beds. So, newly developing beds were fished away in some cases.

It was concluded that the food reservation policy did not work. This was mainly due to the fact that the physiological food demand of shorebirds was reserved, i.e. the amount of food the birds needed to consume to stay alive. However, it appeared that shorebirds need a much larger amount of potential food to harvest from; this has been termed the ecological food demand.

The EVA project also was able to draw conclusions on other items, for example the time needed for restoration of sediments disturbed by cockle dredges. It was concluded that cockle-dredging resulted in coarser sediments, although the time for returning to original conditions could not be ascertained exactly.

In the final report all relevant information from the EVA study as well as from studies published elsewhere, were brought together. The EVA team did not draw any policy conclusions; this was the domain of the policy makers.

At the end of the day the Dutch government decide to terminate the cockle fisheries as per 1 January 2005 since it was concluded that cockle dredging could not be transformed into a

sustainable fishery without damage to the conservation values of the Wadden Sea. For the mussel culture it was concluded that for this fishery prospects for sustainability existed. The industry is given 15 years for its further transformation into a more environmentally friendly activity.

Item for discussion: The EVA project has been a major research project to support a policy to combine shellfish fishery and protection of biodiversity. The government spent about 3.5 million Euros on it and a lot of effort in translating policy issues into scientific questions. Commercial research institutes had the lead in the project. The aim of the government was to create maximum societal support for the outcome of the studies and therefore stakeholders were involved in the process. Academic science played a minor role in the EVA process. Furthermore, as with the drafting of the first shellfish fishery policy in 1993, scientists played almost no role in the drafting of the new shellfish fishery policy in 2004. This might cause problems for future scientific evaluations. Given this information, how do you appreciate the scientific and policy results of this process?

How does this case of exploitation of living resources compare to other cases of exploitation of marine living resources? The Dutch approach was based on three pillars: areas closed for fisheries (MPAs), catch limitations, and co-management of the fishery by the government and the fishermen.

The closed areas demonstrated well how tidal flats habitats could develop without fisheries but they were not needed as source areas for recolonization of the fished flats. There is also no indication that they enhanced the harvest of the shellfish fisheries in the areas open for fisheries.

Catch limitations did not serve to protect the stock of the harvested species of shellfish but rather to protect other organisms, such as shellfish-feeding birds.

The system of co-management in general worked well. The fishermen, in their fishing plans, took care to obey all measures set by the government and in general complied with these rules. However, in the end it appeared that part of the rules were wrong.

Item for discussion: What experiences exist elsewhere with these three approaches for managing marine biodiversity?

Summaries of the discussions

***Summary of discussions on Topic 1: Species Invasions: Marine bio-invasions and research policy - Ballast water as vehicle for exotic marine species invasions**

Sergej Olenin

Klaipeda University; Coastal Research and Planning Institute, Lithuania – (serg@gmf.ku.lt)

The invasive species problem, directly or indirectly, was addressed in several previous MARBENA conferences; probably that is why the number of participants in this particular session was not too high. In total, ten scientists (Fernando Boero, Emil Olafsson, Vadim Panov, Henn Ojaveer, Anna Occhipinti, Donatella Del Piero, Ahmet Kideys, Ferruccio Maltagliati, Bella Galil and Sergej Olenin) contributed with twenty messages. The importance of bioinvasion studies was not challenged in any of the messages, in opposite, the practical significance of this field of marine biodiversity research repeatedly has been stressed. A variety of expressed opinions and raised questions may be grouped conventionally into three main themes: 1) ecological and economic impacts of marine bioinvasions, 2) vectors of introductions, and 3) “difficult questions” in marine bioinvasion research.

Ecological and economic impacts of marine bioinvasions. A. Occhipinti, E. Olafsson and H. Ojaveer indicated that there is the obvious lack of studies that convincingly demonstrate ecological and economic impacts of marine bioinvasions. H. Ojaveer stated that invasive species are of greater concern in the US because the Americans got “some very bad exotics”. Anna Occhipinti stressed that she does not “believe Europe is more resistant to species introduction”, but she agreed that, possibly, bioinvasion “impacts are less visible as they are unknown, while biodiversity alterations and ecosystem impairment has usually been associated to other environmental issues, such as eutrophication, pollution etc”. A. Kideys, F. Boero and B. Galil gave several examples of detrimental and rather “convincing” effects of biological invasions in the Black and Caspian Seas as well as in the Mediterranean. E. Olafsson pointed out that “the effects of an invader on native communities using correlative data alone must be taken with utmost caution”. Natural environmental oscillations and other anthropogenic factors such as overfishing or eutrophication may cause detrimental effect on native biota and coincide in time with species invasions.

The invasion biology has now become a rapidly growing research area, but yet there are large gaps in our knowledge on bioinvasion impacts, especially in marine environment. The ecological and economic consequences of bioinvasions may be of interest not only from purely practical, but also from theoretical point of view helping to understand mechanisms of functioning of natural ecosystems and their interaction with socio-economic factors. In this respect it is worth to mention that MarBEF (Marine Biodiversity and Ecosystem Functioning, an EU Network of Excellence, www.marbef.org) is organizing a special workshop “Aquatic invasive species and the functioning of European coastal ecosystems” to be held in the end of January, 2005 at Alfred Wegener Institute (AWI), Island of Sylt in Germany (see “Events” at the MarBEF sites for more information). V. Panov mentioned also several other recent European initiatives, one of them being the new

* Please refer to this section as:

Olenin, S. (2004). Summary of discussions on Topic 1: Species Invasions: Marine bio-invasions and research policy - Ballast water as vehicle for exotic marine species invasions. Pp 18-20 in Heip, C.H.R. *et al.* (eds): Electronic conference on ‘Biodiversity research that matters!’ - Summary of discussions, 15 to 26 November, 2004. Flanders Marine Institute: Oostende, Belgium.

Strategic Targeted Research Project DAISIE (Delivering Alien Invasive Species Inventories for Europe), which will start next year.

Vectors of introductions. Bella Galil indicated that the increase in shipping-related invasions in the Mediterranean, documented in a recent series of CIESM Atlases on 'Exotic species' (www.ciesm.org/atlas/), may be attributed to the increase in shipping volume throughout the region, changing trade patterns that result in new shipping routes, improved water quality in port environments, augmented opportunities for overlap with other introduction vectors, and ... rising awareness and research effort. She also stressed that "with the IMO ban on organotin compounds in antifouling systems in force for close to 2 years, it is timely to check whether by concentrating our efforts on ballast transfer we are not missing on the fouling transport". Emil Olafsson, however, pointed out that man made rafting rubbish may be of much more importance than ballast water in transfer of especially smaller invertebrates and microorganisms. It was indicated (S. Olenin) that in spite of several recent comprehensive accounts the role of inland waterways in species transfer remains largely unknown, also much more attention should be paid to such vectors as aquarium and live food trade. Assembling various opinions Anna Occhipinti formulated the most urgent research questions as: 1) consideration of alternative transfer vectors, other than ballast waters, and 2) spreading dynamics from the inoculation point, incl. secondary transfer and vectors involved.

"Difficult questions" in marine bioinvasion research. Donatella Del Piero and Ferruccio Maltagliati pointed out that we should distinguish between "accidental invasions" and intentional species introductions, which are beneficial (some of them, e.g. supporting our food industry). In general, the problem of bioinvasions should not be politicized and by no means should parallels be made between xenophobia in human world and attempts to control unwanted species invasions.

Also, F. Boero raised a very important ethical question of "how to convince the politicians of the usefulness of what we are doing in a serious way". In other words, how to show the importance of bioinvasion research without succumbing to "publicity rising hysteria" about "killing algae", "fish-eating comb jellies" and other mass media clichés. Fernando's "difficult" question was supported by Ferruccio Maltagliati, who ironically stated that "scientists' efforts are directed to extrapolate catastrophic predictions resulting from the introduction of a tiny worm in order to get funds for research..." To a certain extent this topic ("Importance of serious and honest dialog between science and policy makers, between scientists and general public") relates to all themes touched on in the present and previous MARBENA e-conferences, and, probably, it is worth a special discussion.

Messages that were posted on this topic:

<u>Introduction</u>	14 Nov 04	Forum Admin
└─ <u>ciesm and aliens</u>	15 Nov 04	Ferdinando Boero
└─ <u>riding tigers for politicians</u>	15 Nov 04	Ferdinando Boero
└─ <u>little green men and aliens</u>	15 Nov 04	Ferdinando Boero
└─ <u>Mediterranean-wide program using standardized protocols</u>	26 Nov 04	bella galil
└─ <u>50 years and 30 seconds</u>	15 Nov 04	Emil Olafsson
└─ <u>Internet-based information systems as tool to convince polit</u>	16 Nov 04	Vadim Panov
└─ <u>Risks, predictions and impacts</u>	16 Nov 04	Henn Ojaveer
└─ <u>Marine bioinvasions and research policy</u>	16 Nov 04	Anna Occhipinti
└─ <u>Ballast water and rubbish</u>	26 Nov 04	Emil Olafsson
└─ <u>invasions data</u>	26 Nov 04	bella galil
└─ <u>Red Sea aliens and the (in)ability of checking their entry</u>	26 Nov 04	bella galil
└─ <u>exotic</u>	15 Nov 04	Donatella Del Piero
└─ <u>European cooperation on aquatic invasive species research an</u>	15 Nov 04	Vadim Panov
└─ <u>Lack of demonstrating studies on marine bioinvasions</u>	18 Nov 04	Sergej Olenin
└─ <u>Invasive spp impact on European waters...</u>	24 Nov 04	Ahmet Kideys
└─ <u>Mnemiopsis</u>	24 Nov 04	Ferdinando Boero
└─ <u>Mnemiopsis impact</u>	25 Nov 04	Ahmet Kideys
└─ <u>“Difficult questions” in marine bioinvasion research</u>	18 Nov 04	Sergej Olenin
└─ <u>good bioinvasions</u>	23 Nov 04	Ferdinando Boero
└─ <u>Let's have a look to freshwater and terrestrial aliens</u>	23 Nov 04	Ferruccio Maltagliati

* Summary of discussions on Topic 2a: Fisheries - Management of fish resources - The Baltic Sea

Henn Ojaveer

University of Tartu; Estonian Marine Institute, Estonia – (henn@sea.ee)

As stated in the introduction to the topic, one of the most important commercial fish species in the Baltic Sea is cod. Management of the Baltic cod hasn't been successful and this was discussed during the current e-conference. Henrik Sparholt stated that the most important problem for managing the Baltic cod stock is lack of enforcement of TACs and other management measures. The estimated illegal landings in 2000-2003 were 20-30% of the officially reported catch and independently of constant attempts to reduce fishing mortality at least over the last decade, fishing mortality has been not affected. He suggested that in order to build up the cod stock (the fishers are actually loosing around 100 million Euro per year due to the reduced productivity) a possible way forward could be a system of closed areas. This will take the focus from the control and the fleet capacity reduction, both issues which have politically proven difficult to achieve. The system of closed areas of about 30-50% of the Baltic Sea was suggested where hot spot juvenile areas and major parts of spawning grounds should be included. Arguments in favour of the proposed system: (1) easy to control; (2) easy for fishers to follow; (3) simple to explain; (4) transparent; (5) fair; (6) the fishers do not have to stop fishing right away, because 50-70% of the Baltic will still be open; (7) possibly even larger TAC's allowed (as discards and illegal landings are reduced); (8) safeguard benthos/ecosystem at the same time for the closed areas.

Arguments against the proposed system: (1) low catches if fish learn and move into the closed areas; (2) difficult to justify precisely which areas and how much in total should be protected; (3) probably impossible to maximize yield and economic profit (the same can be said for the current situation) but the new system has the big advantage that the stocks will not suffer.

Discussion from the MARBENA earlier e-conference 'Sustainable Livelihoods and Biodiversity' held in April 2004 on 'European biodiversity action plan for fisheries: issues for non-target species' concluded that only the combination adequately designated and managed closed areas in combination with reduced fishing effort will achieve a sustainable ecosystem approach to management. This was reminded by Henn Ojaveer who further mentioned that, therefore, implementation of closed areas in the Baltic Sea may help cod to build up its stock, but is not necessarily sufficient to ensure sustainable management of marine living resources.

The proposed discussion topic on 'Why fish biodiversity in general is currently considered as an unimportant matter when managing fisheries?' was addressed by Pascal Lorange. It was stated that for the assessed stocks relationships between catches, effort and state of the stock are well understood. The effect of biomass removal is quantified and the effect of measures to change the level of exploitation can be forecasted. But there is nothing comparable for fish biodiversity. Considering biodiversity consisting of three components (i) diversity of sizes, age, genes,

* Please refer to this section as:

Ojaveer, H. (2004). Summary of discussions on Topic 2a: Fisheries - Management of fish resources - The Baltic Sea. Pp 21-22 in Heip, C.H.R. *et al.* (eds): Electronic conference on 'Biodiversity research that matters!' - Summary of discussions, 15 to 26 November, 2004. Flanders Marine Institute: Oostende, Belgium.

populations within a species; (ii) taxonomic diversity; (iii) diversity between ecosystems, we have little assessment of the fish biodiversity at local regional and global scales. Relatively more is known for taxonomic diversity of fish assemblages, number of fish species and their relative abundance, but even on this there is very little operational and only some general rules are understood. On the other hand our knowledge on the relationship between local fishing effort, type of fishing gear used and fish species diversity is rather limited. These relationships seem to be very complex. Finally, P. Lorance concluded that fish biodiversity is considered as an unimportant matter when managing fisheries because we have too little to offer to managers in terms of: (1) which changes have occurred in fish communities; (2) what are the reasons behind; (3) which further changes can be predicted; and (4) which measure are appropriate to prevent further changes (if necessary).

Messages that were posted on this topic:

<u>Introduction</u>	15 Nov 04	Forum Admin
Re: <u>Introduction</u>	16 Nov 04	Henrik Sparholt
<u>closed areas and fishing effort</u>	16 Nov 04	Henn Ojaveer
4. <u>Why fish biodiversity in general is currently considered</u>	22 Nov 04	Pascal Lorance

* Summary of discussions on Topic 2b: Fisheries - Marine Protected Areas in the North Sea: To protect fisheries or biodiversity? - The Plaice Box

Han Lindeboom

University of Wageningen; Alterra; Team Wad & Sea, Landscape Centre, The Netherlands –
(han.lindeboom@wur.nl)

The EU has asked the member states to consider the establishment of Special Protected Zones (under the Habitat and/or Bird Directives) or Marine Protected Areas (in relation to OSPAR) in the open sea, in their EEZ, also outside the 12 miles zone. Germany has submitted its proposal for several areas, the other states are preparing their proposals. At the moment there is a lot of debate about the criteria which should be used to establish these areas. What are sandbanks, reefs, or gasseeps? Do MPAs protect individual species? Are MPAs necessary to protect biodiversity, and do they protect biodiversity?

The Plaice Box as example of an MPA? What is the Plaice Box? The North Sea flatfish fisheries generate considerable numbers of discards, especially of Plaice *Pleuronectes platessa* in coastal waters. To reduce discard mortality, a partially closed area was established (Plaice Box) in 1989 in the coastal waters along the continental coast. Since 1995, beam trawl fishery in this area was prohibited for vessels larger than 300 HP. Ever since, the plaice stocks have gone down, and fishermen claim that re-opening is justified, since it does not solve any problems.

Is the Plaice Box, with a reduced fishing effort, a representative example of a protected area?
The following reactions were ventilated in the discussion:

Christian von Dorrien: I don't think that the Plaice Box has been a representative example for a protected area. The reason for this is mainly that the objective – to protect juvenile plaice – was not achievable, as long as small vessels are allowed in this area. And in addition, the fishing effort of the small vessels has increased substantially during that time, as far as I know. Although I personally think that MPAs could be a valuable measure to protect species and ecosystems (like, f. ex. deep sea coral reefs), it could be misleading to sell them as a panacea. At least, in temperate seas and for mobile species, like cod.

Michel Kaiser: Clearly the main problem with the plaice box was that it was a compromise to meet both Governmental and industry objectives. What it achieved was to exclude larger vessels from an area of the seabed leaving smaller vessels to fish without effort control (we know little about this effort as these vessels did not qualify for the vessel monitoring system). As long as chronic disturbance occurs on the seabed the system is likely to remain in an altered state with no opportunity to recover.

* Please refer to this section as:

Lindeboom, H. (2004). Summary of discussions on Topic 2b: Fisheries - Marine Protected Areas in the North Sea: To protect fisheries or biodiversity? - The Plaice Box. Pp 23-26 in Heip, C.H.R. *et al.* (eds): Electronic conference on 'Biodiversity research that matters!' - Summary of discussions, 15 to 26 November, 2004. Flanders Marine Institute: Oostende, Belgium.

Mark Costello: There is an extensive literature on the effects of MPA on fish stocks. Where protection is complete. *i.e.* no fishing of any kind (including angling), numbers and size of individuals of the fished stocks always increase (seems obvious). However, most MPAs are not sufficiently protected or are far too small to produce measurable benefits to fisheries. My guess is that there has not been sufficient protection of the population, or the plaice box is too small in relation to the population and its mobility, or both.

Rob Witbaard: The Plaice Box was introduced as example of a proposed protected area in the south eastern North Sea, an area intended to protect juvenile plaice in the life stage before recruitment to the commercial exploitable stock. The support for this idea would never have been obtained if it did not contain the promise that such a measure, on the long term, would lead to a greater spawning stock and a sustainable yield. But is the economic perspective the only justified argument to designate a protected area?

Jan Geert Hiddink: Our studies in the North Sea show that the effect of the first ever bottom trawling disturbance in a pristine habitat on benthic biomass and species numbers is larger than the effect of trawling once in an area that is already heavily trawled. This means that a reduction in trawling intensity in the plaice box will only have a significant positive effect on benthic communities if this means that trawling intensity is reduced to a low level (e.g. a trawling intensity of less than once every two years). If bottom trawling was reduced from a high to an intermediate level, no positive effect of the plaice box on benthic communities can be expected.

Paolo Guidetti: The main problem is that most of the expected benefits of MPAs are always defined as 'potential' since robust data are still lacking, except for the well known evidence (but there are exceptions) that within MPAs there is a substantial recovery (eg in terms of density, biomass and size) of those fish species that elsewhere are strongly impacted by fishing. Scientific data about spillover are lacking for many regions, and very little is known about the potential benefits of an enhanced egg/larval dispersal due to the increased number and size of spawners within the MPAs. With regard to the benefits for fisheries, moreover, there are two points that would deserve to be considered: 1) e.g. in the Mediterranean fishing is exerted since long (centuries), so, why do we expect that recovery happens in a few years after having protected a negligible area compared to the areas open to fishing? 2) There are species, like the dusky groupers, which disappeared from many areas. They can live for decades, so that recovery needs decades, while many of the MPAs in the Mediterranean are far younger. All the above issues demonstrate the importance to include some (apparently obvious) life history traits (besides proper experimental designs) before drawing any conclusion about the potential effects of protection on species impacted by fishing.

Erika Washburn: I support the comment about life histories and also point out the importance of potentially extending the baseline back in time with historical and archaeological information. This can dramatically affect our understanding of a healthy ecosystem. Please see the following link for the Census of Marine Life's History of Marine Animal Populations program, which includes work in the North Sea: <http://www.cmrs.dk/Default.asp?ID=1>
Or for social science tools for marine protected areas:
<http://www.noanews.noaa.gov/stories2004/s2340.htm>

Filip Volckaert: It is clear that man has a hard time to exploit rather complex ecosystems in a sustainable way. With our poor understanding of the marine ecosystem we thought that monitoring (poorly defined!) target species stocks one-by-one and year-by-year would suffice to control the fish resource. Alas that regime has failed. The food web has shrunk in size through the elimination of the top predators, the microbial loop has benefited from the modified ecosystem, populations of fish have disappeared all together, the sediment surface has been modified by trawling and the

enhanced input of organic matter, eutrofication has modified coastal ecosystems and on top of that a shifting climate has shaken the ecosystem. At the moment, multi-year ecosystem-based multi-species management seems an alternative. Fairly large sized MPAs with a "natural delimitation" have to be implemented for long periods to come. Amongst others, the Southern Bight of the North Sea (the major spawning ground of the North Sea), the Friesian Front, the Shetland Islands, the Doggerbank and all estuaries represent ecologically logical choices.

Sabine Christiansen: Experimental areas (as for example also proposed by ICES in 1995) are urgently required to improve our understanding of ecosystem processes with and without human pressure - in this sense, MPAs (which by definition serve the conservation of marine life, not one group in particular) will serve a double purpose: the immediate release of pressure in the areas concerned, and a test field for learning about whether and what alterations occur after removing direct impacts, about the time scales involved and the size and connectivity of areas needed. In 2003, the governments of the North East Atlantic states, as contracting parties to OSPAR, signed up for "establishing an ecologically coherent network of well-managed MPAs " by 2010. So far there is not a single MPA in the NE Atlantic offshore, which is managed sufficiently to reduce human impacts. Time is running out.

Rob Witbaard: The necessity of marine protected areas to protect macrobenthic organisms/communities is without doubt because it is evident that they suffer from the side effects of marine resource exploitation. The function of an MPA as tool to protect marine biodiversity in the sense of keeping species richness high may be somewhat controversial because we not really know what the meaning of such biodiversity is. Does biodiversity have a functional role. We neither know whether designation of MPA's really lead to a conservation of biodiversity. But if they do protect biodiversity, one may ask the question whether a unique habitat with only a few, locally rare, species is of less value than a habitat with a manifold of species. In other words the habitat uniqueness may be important as well. But would we be willing to protect such habitat? Could we make a separation between conserving habitats and conserving species or is the linkage between both so strong that we cannot separate between them? Is it anyhow necessary to make such a separation?

Han Lindeboom: In the case of the southern North Sea, we know a lot about the direct effects of beam trawling. It is huge and the short-term effects are easy to prove. We do not know enough about the long-term effects, but if one catches or kills large parts of the population continuously, it must have an effect.

Now, an argument can be, that we do not want these effects in all places at all times. Maybe we should want to create areas that develop as they can develop without a huge damaging fishing pressure. If that becomes a goal, managerial it is easy to set aside an area and let it do its own developing. In that case we only have to monitor the fishing pressure. As long as that is zero we have reached our goals.

In the North Sea local biodiversity has decreased due to human activities like fisheries. If we do not create proper Marine Protected Areas and implement a rigid regime of protection, the deterioration of the North Sea ecosystem will continue and local biodiversity will further decrease.

Major Plaice Box reference:

Grift, R.E.; Tulp, I.Y.M.; Clarke, L.; Damm, U.; McLay, A.; Reeves, S.; Vigneau, J.; Weber, W. 2004. Assessment of the ecological effects of the Plaice Box: report of the European Commission Expert Working Group to evaluate the Shetland and Plaice boxes. Brussels.

Can be downloaded from website;

http://www.rivo.wag-ur.nl/FTP_DIR/Report_evaluation_plaice_box.pdf

Messages that were posted on this topic:

<u>Introduction</u>	16 Nov 04	Forum Admin
<u>Don</u>	17 Nov 04	Christian von Dorrien
<u>The non-MPA</u>	23 Nov 04	Michel Kaiser
<u>Most MPAs are not sufficiently protected or are far too small re: introduction</u>	17 Nov 04	Mark J. Costello
<u>PDF report evaluation Plaice Box</u>	18 Nov 04	Rob Witbaard
<u>Summary on Plaice box</u>	17 Nov 04	Ingrid Tulp
<u>Trawling frequency and benthos species interactions</u>	17 Nov 04	Forum Admin
<u>history and new web site</u>	17 Nov 04	Jan Hiddink
<u>The complexity of managing wounded natural ecosystems data and the ecosystem approach</u>	17 Nov 04	Paolo Guidetti
<u>today's statement</u>	17 Nov 04	Erika Washburn
<u>Should an MPA in the North Sea be 40% of the total North Sea</u>	17 Nov 04	Filip VOLCKAERT
<u>Some thoughts about MPA</u>	18 Nov 04	Sabine Christiansen
<u>MPAs to protect against impact</u>	18 Nov 04	Han Lindeboom
<u>Today's statement</u>	18 Nov 04	Rob Witbaard
<u>protection of the Frisian front</u>	19 Nov 04	Rob Witbaard
<u>Without MPAs, biodiversity will further decrease</u>	19 Nov 04	Han Lindeboom
<u>The Plaice Box proves: reduction of fisheries effort is not</u>	19 Nov 04	Han Lindeboom
	21 Nov 04	Han Lindeboom
	22 Nov 04	Rob Witbaard
	23 Nov 04	Han Lindeboom
	24 Nov 04	Han Lindeboom

*Summary of discussions on Topic 3: Marine Protected Areas: Natura 2000 and beyond (OSPAR) - The Azores

Ricardo Serrao Santos

University of the Azores; Department of Oceanography and Fisheries, Portugal –
(ricardo@notes.horta.uac.pt)

Introduction

The marine ecosystems most threaten are those situated in coastal zones. Roughly half of the shorelines of the continents are threatened by development. In some continents, the percentage of degraded coasts is much greater. In Europe, it is considered that 86% of the coastal perimeter is at risk (moderate and high risk), which also means that the habitats and the species to which they are associated are also at risk. Along with the occupation and destruction of habitats and that of pollution, one of the other major threats to marine biodiversity is the excessive exploitation of resources. Fish makes up 16% of the world's supply of proteins for human use.

Fishing has reduced numerous fish populations to very low levels. Those affected are to be found in the most varied marine ecosystems: fish that live on continental platforms such as halibuts and cod, submarine seamount fish, such as some species of redfish, including the orange roughy, and fish of vast pelagic distribution such as swordfish, albacore, and bluefin tuna. In some regions of the oceans, over-fishing has reduced stocks to half of their original maximum amount. It seems difficult to find refuge for marine life. The North-Atlantic Ocean, with its long time tradition of fishing, is now a threaten sea in need of urgent ideas and good practices in view of a return to a sustainable state.

The Azores case

The Azores, the most isolated archipelago of the North Atlantic, consists of nine volcanic islands and several small islets, forming three groups along a tectonic zone in the middle of the Atlantic, is of considerable conservation and marine biological interest with an interesting experience on conservation of marine habitats and species related with regional, national and European instruments, the most relevant being the Habitats Directive for the Natura 2000 network.

Natura 2000 and beyond

The Habitats Directive has led to large numbers of Marine Protected Areas being established by EU Member States and over a relatively short period of time (compared to progress with MPAs before the Directive came into force).

This has required considerable effort in the areas such as data collection, developing supporting legal regimes, provision of information and opening up opportunities for stakeholder participation. In the EU, the Natura 2000 network is likely to be where those working on MPAs are most likely to concentrate their effort for at least the next decade. This raises some important questions.

* Please refer to this section as:

Santos, R.S. (2004). Summary of discussions on Topic 3 : Marine Protected Areas: Natura 2000 and beyond (OSPAR) - The Azores. Pp 27-29 in Heip, C.H.R. *et al.* (eds): Electronic conference on 'Biodiversity research that matters!' - Summary of discussions, 15 to 26 November, 2004. Flanders Marine Institute: Oostende, Belgium.

Will the Natura 2000 network provide what we want from a European MPA network?
Is our concentration on Natura 2000 distorting/limiting what we might achieve from MPAs?
Are we losing sight of other equally important marine conservation objectives by concentration on Natura 2000?

Will decision-makers get enough from the science being done at these sites, to enable them to implement the marine conservation agenda required by international frameworks such as the Biodiversity Convention?

Certainly, there is lots of good management activity marine SACs (e.g in the UK, Azores, Madeira, Canaries, etc) - so they have been (mainly) worth it. However, the effort may be now blindly pursuing Habitats Directive sites without considering if the categories of habitat in the Directive are meaningful or if the Directive can identify threatened and declining marine habitats and species comprehensively for MPA's - especially now that it is being applied offshore.

The definition of biogeographic boundaries is an exercise that is not complete here in Europe. An operational network of MPAs might serve to define a biogeographic network of MPAs, reaching then a goal that is relevant for management. The identification of discontinuities in the distribution of species and habitat types is essential to properly manage biodiversity.

The Habitats Directive was designed, with recognised insufficiencies, for inshore marine and, in fact, never intended for offshore. At the same time it is partially distorted in terms of habitat (and species) covered. There is a need to go beyond Natura 2000, OSPAR has done some good thinking - let's use it.

Natura 2000 in the Azores: strengths and weaknesses

So far, the conservation of the resources and habitats inside the Azorean waters has certainly benefited from the precautionary policy of exploitation and maintenance of the artisanal character in many fisheries and small capacity of the one with a more industrial character. Regarding coastal conservation, however, the establishment of the first MPAs (previous to the implementation of the Habitats or Birds Directives) hasn't done much for crediting them near the fishermen as a management tool. The detailed regulations were never issued for most of the areas and the few measures set by their designation acts have been poorly and insufficiently enforced. Implementation of Natura 2000 improved, but did not solve the issue.

A wider and more thorough habitat surveys were and are still are required if a region wants to ensure that they focus their conservation efforts on the sites that are really important due to their dimensions, representativeness or major role in maintaining ecosystem functioning. However nature conservation has also an aspect of opportunism and that has been used to designate sites in the absence of broader assessments. Even when broader surveys find out new sites that turn out to be more relevant, the initial ones will still have a role to play on the conservation network. This is because from the time when they were designated, some of them have become flagship sites for certain features (e.g., either because they are more easily accessible to the public or because certain features have been studied more deeply in that particular location) and societal support for conservation efforts could be affected if they appear to be dropped.

The transformation of the "paper MPAs" into a living, practical, credible and successful management tool (be their goals driven by fishery resource management, conservation of particular feature or preservation of recreational seascape values). With more or less depth, management plan proposals have already been elaborated for all of the Natura 2000 sites in the Azores. They mustn't be forgotten on a shelf or be used just as papers to flaunt before the European Commission.

Logistics are not even too complicate for enforcing most of the Natura 2000 marine sites and previously existing MPAs in the Azores provided their coastal nature and easy access from neighbouring towns and villages. Management bodies need now to work close enough to their scientific partners, but also to main other stakeholders.

Conclusions

I could relish on what has been achieved so far in the Azores with all the planning documents for Natura 2000 already finished and a good practice of collaboration between administration and scientific institutions. However in practical terms the work to provide a robust protection to the SACs still lies head.

Three very important steps are missing for the correct implementation of MPAs in the Azores, and should be concluded until 2006 for the case of Natura 2000 sites:

- Public discussion
- Active management
- Enforcement and management.

Public discussion, enforcement and management are certainly key to making progress in the Azores with MPAs. The responsibility for the latter two can fairly easily be allocated to relevant government departments. What is not clear is who will support, encourage and guide the public involvement and discussion in MPAs. Should this be the task of Government departments, local authorities, NGOs, research organisations, local communities etc.? All these sorts of bodies will need to have public involvement as part of their approach to establishing and managing MPAs.

Participants

Based on the contributions made by the participants at the at this section of the MARBENA e-conference: Ferdinando Boero, Fernando Tempera, Frederico Cardigos, Jorge Fontes, Keith Hiscock, Ricardo Serrão Santos, Simon Claus and Susan Gubbay.

Messages that were posted on this topic:

<u>Introduction</u>	17 Nov 04	Forum Admin
<u>Sue Gubbay</u>	17 Nov 04	Susan Gubbay
<u>The Habitats Directive - Think again</u>	21 Nov 04	Keith Hiscock
<u>networks</u>	22 Nov 04	Ferdinando Boero
<u>Azores fisheries and Common Fisheries Policy</u>	18 Nov 04	Ricardo Serrao Santos
<u>targets for MPAs</u>	18 Nov 04	Ferdinando Boero
<u>Trawling ban on seamounts on the High Seas</u>	19 Nov 04	Susan Gubbay
<u>Implementation of MPAs in the Azores</u>	19 Nov 04	Fernando Tempera
<u>The urge for consequences</u>	20 Nov 04	Frederico Cardigos
<u>Public involvement in MPAs</u>	23 Nov 04	Susan Gubbay
<u>commitment to the implementation of MPAs in the Azores requi</u>	26 Nov 04	Fernando Tempera
<u>The chalange for the conservation and management of the Azor</u>	19 Nov 04	jorge fontes
<u>Databases of marine protected areas</u>	26 Nov 04	Simon Claus

* Summary of discussions on Topic 4: Exploitation - Exploitation of shellfish in the Wadden Sea, project EVA II

Wim Wolff

University of Groningen, The Netherlands – (w.j.wolff@biol.rug.nl)

The Wadden Sea is a shallow estuarine area between the North Sea and the coasts of Denmark, Germany and the Netherlands. About 50% of this area consists of tidal flats harbouring rich stocks of shellfish and very large numbers of shorebirds. Commercial exploitation of shellfish focuses on blue mussels (*Mytilus edulis*) and cockles (*Cerastoderma edule*). The exploitation of shellfish led to the disappearance of some of the more important natural values of the Dutch Wadden Sea around 1990. After a series of years without recruitment of young cockles and mussels, and with continued fishing, almost all cockle and mussel beds had disappeared. Shellfish feeding birds showed a strongly increased mortality. Therefore, the Dutch government decided to develop a new fisheries policy for the exploitation of the Dutch Wadden Sea. A research programme EVA I and EVA II was started in 1993 to determine if the new management measures enabled commercial shellfish exploitation in a nature conservation area without causing significant damage to the area.

Under the new rules for fishing shellfish, three main objectives were formulated, viz.

- permanently closing for fisheries of 26% of the total area of tidal flats in the Wadden Sea in order to restore lost types of ecosystems, such as seagrass beds and mussel beds
- reservation of a sufficient amount of food for shellfish-feeding birds in years with low stocks of shellfish
- introduction of a system of co-management in the fisheries in order to create awareness by the fishermen and to avoid control problems.

The research project to evaluate this policy was entrusted to a consortium of three Dutch research institutes specialized in applied ecological research in the Dutch coastal waters. As a first step, a steering committee formulated the policy questions that needed to be answered. The next step was that the consortium of research institutes translated these policy questions into research questions that could be answered by scientific investigations. All research reports had to be submitted to the steering committee. All committee members could make comments on these reports after which the scientists were asked to consider these comments. The scientists were not obliged to change their writings but they had to make clear why they accepted some comments and rejected others. Afterwards the steering committee accepted the reports formally after which these reports were submitted to an audit committee for peer review. In the final printed version of the report, the comments of the audit committee were added as an appendix and the scientists had to explain what had been done with these comments. This particular form of peer review was chosen because it was supposed to be faster than peer review and publication by scientific journals and also because the nature of part of the reports made it unlikely that they could be published in scientific journals.

* Please refer to this section as:

Wolff, W.J. (2004). Summary of discussions on Topic 4: Exploitation - Exploitation of shellfish in the Wadden Sea, project EVA II. Pp 30-31 in Heip, C.H.R. *et al.* (eds): Electronic conference on 'Biodiversity research that matters!' - Summary of discussions, 15 to 26 November, 2004. Flanders Marine Institute: Oostende, Belgium.

The EVA project concluded that the goal of restoring the area of stable intertidal mussel beds to between 2000 and 4000 ha had been achieved. Restoration of seagrass beds could have reached its objectives, but in practice new seagrass beds sometimes were fished away accidentally. It was concluded that the food reservation policy failed to provide sufficient guarantees against food shortages due to fishery, in part because food reservation levels were not set high enough.

In the final report all relevant information from the EVA study as well as from studies published elsewhere, were brought together. The EVA team did not draw any policy conclusions; this was considered the domain of the policy makers.

At the end of the day the Dutch government decided to terminate the cockle fisheries as per 1 January 2005 since it was concluded that cockle dredging could not be transformed into a sustainable fishery without damage to the conservation values of the Wadden Sea. For the mussel culture it was concluded that for this fishery prospects for sustainability existed. The industry is given 15 years for its further transformation into a more environmentally friendly activity.

The Dutch approach was based on three pillars: areas closed for fisheries (MPAs), catch limitations, and co-management of the fishery by the government and the fishermen. The closed areas demonstrated well how tidal flats habitats could develop without fisheries but they were not needed as source areas for recolonization of the fished flats. There is also no indication that they enhanced the harvest of the shellfish fisheries in the areas open for fisheries. Catch limitations on cockles did not serve to protect the stock of cockles but rather to protect other organisms, such as shellfish-feeding birds. The system of co-management in general worked well. The fishermen, in their fishing plans, took care to obey all measures set by the government and in general complied with these rules. However, in the end it appeared that part of the rules were wrong.

The EVA studies showed that the Dutch government was willing to invest heavily (€ 3.5 million) in scientific research to solve the societal problem of conflicting interests between shellfish exploitation and biodiversity conservation. It also showed a willingness to organize these investigations in such a way that the general scientific requirements of transparency, peer review and publication were met. In the end far-reaching decisions on the future of the shellfish industry were based on the EVA studies. However, the role of science was minimized in the design of the new policy, which is up for evaluation in 2010.

Organisation and Statistics

* Practical organisation and statistics

Edward Vanden Berghe

Flanders Marine Data and Information Centre. Flanders Marine Institute (VLIZ). Vismijn,
Pakhuizen 45-52, B-8400 Ostend, Belgium - (wardvdb@vliz.be)

The conference was organized as a moderated bulletin board. Both the introduction to the topics, the contributions and summaries of the discussions, were available on the Internet, (www.vliz.be/marbena). Contributions to the conference were posted through a form on the web site.

A total of 5 topics, of which one has been cancelled due to illness of the chair, were discussed in two weeks (table 1).

The co-chairs were responsible to open the discussion by making their opening statements and to follow up the discussion. They were also responsible to provide a general summary and synthesis of the discussions.

Topic	Starting date	Title	Introduced by
	15 November	Introduction	Carlo Heip
1	15 November	Species Invasions: Marine bio-invasions and research policy - Ballast water as vehicle for exotic marine species invasions	Sergej Olenin
2a	16 November	Fisheries - Management of fish resources - The Baltic Sea	Henn Ojaveer
2b	17 November	Fisheries - Marine Protected Areas in the North Sea: To protect fisheries or biodiversity? - The Plaice Box	Han Lindeboom
3	18 November	Marine Protected Areas: Natura 2000 and beyond (OSPAR) - The Azores	Ricardo Serrão Santos
cancelled	19 November	Eutrophication - Nitrogen input in coastal waters	Ies de Vries
4	22 November	Exploitation - Exploitation of shellfish in the Wadden Sea, project EVA II	Wim Wolff
	25-26 November	General discussions and synthesis	Carlo Heip

Table 1. Time table including schedule, titles of topics and chairs

The basic flow of information of the conference was through the WWW. This was done to stimulate 'external' parties to participate in the discussion. To make sure the conference was widely known, mailing lists of several organizations and activities were used to invite all interested parties to register. Access to the general pages of the conference, and to the summaries, is open to everyone. To be able to post messages and also to view posted messages, registration through a form on the web site was necessary. The requests for registration were handled individually;

* Please refer to this section as:

Vanden Berghe, E. (2004). Practical organisation and statistics. Pp 33-34 in Heip, C.H.R. *et al.* (eds): Electronic conference on 'Biodiversity research that matters!' - Summary of discussions, 15 to 26 November, 2004. Flanders Marine Institute: Oostende, Belgium.

applicants were informed of successful registration in an e-mail. Once registered, access to the forum was possible by logging-in with user-defined username. The obliged login username aids in referring to the authors' details by linking to IMIS (Integrated Marine Information System), and in addition enables us to score participation during the course of the conference.

Statistics

Registered participants: 1330

Participants requesting summaries through e-mail: 1054

Numbers of addresses on the general circulation list: 2940

Number of messages: 66

Number of contributors: 33

Hits on marbena web site: 25,693 (from 1 November to 1 December 2004)

Hits on /cgi-bin/marbena.exe: 9641

Hits on /marbena: 16052 or 3751 html pages

Total number of pages requested: 13,392

*List of contributors

- **Boero, Ferdinando.** Consorzio Nazionale Interuniversitario per le Scienze del Mare; University of Lecce; Dipartimento di Scienze e Tecnologie Biologiche e Ambientali; Laboratory of Zoology and Marine Biology. Italy
- **Cardigos, Federico.** University of the Azores; Department of Oceanography and Fisheries. Portugal
- **Christiansen, Sabine.** WWF North East Atlantic Programme. Germany
- **Claus, Simon.** Flanders Marine Institute (VLIZ). Belgium
- **Costello, Mark.** University of Auckland; Leigh Marine Laboratory. New Zealand
- **Del Piero, Donatella.** University of Trieste; Department of Biology. Italy
- **Fontes, Jorge.** University of the Azores; Department of Oceanography and Fisheries. Portugal
- **Galil, Bella.** Israel Oceanographic and Limnological Research Ltd. Israel
- **Gubbay, Susan.** Independent. UK
- **Guidetti, Paolo.** Consorzio Nazionale Interuniversitario per le Scienze del Mare; University of Lecce; Dipartimento di Scienze e Tecnologie Biologiche e Ambientali. Italy
- **Heip, Carlo.** Netherlands Institute of Ecology; Centre for Estuarine and Marine Ecology. Netherlands
- **Hiddink, Jan Geert.** University of Wales Bangor; School of Ocean Sciences. UK
- **Hiscock, Keith.** Marine Biological Association; The Laboratory. UK
- **Kaiser, Michel.** University of Wales Bangor; School of Ocean Sciences. UK
- **Kideys, Ahmet.** Middle East Technical University; Institute of Marine Sciences. Turkey
- **Lindeboom, Han.** University of Wageningen; Alterra; Team Wad & Sea, Landscape Centre. Netherlands
- **Lorance, Pascal.** Institut Français de Recherche pour l'Exploitation de la Mer; Centre Brest. France
- **Maltagliati, Ferruccio.** Università di Pisa; Dipartimento di Scienze dell 'Uomo e dell 'Ambiente. Italy
- **Mergen, Patricia.** Belgian Biodiversity Information Facility. Belgium
- **Occhipinti, Anna.** Università degli Studi di Pavia; Laboratorio di Ecologia. Italy
- **Ojaveer, Henn.** University of Tartu; Estonian Marine Institute. Estonia
- **Olafsson, Emil.** Stockholm University; Department of zoology. Sweden
- **Olenin, Sergej.** Klaipeda University; Coastal Research and Planning Institute. Lithuania
- **Panov, Vadim.** Russian Academy of Sciences; Zoological Institute. Russia
- **Serrao Santos, Ricardo.** University of the Azores; Department of Oceanography and Fisheries. Portugal
- **Sparholt, Henrik.** International Council for the Exploration of the Sea. Denmark
- **Tempera, Fernando.** University of the Azores; Department of Oceanography and Fisheries. Portugal
- **Tulp, Ingrid.** University of Wageningen; Animal Sciences Group; Netherlands Institute for Fisheries Research; ASG Fisheries Research. Netherlands
- **Volckaert, Filip.** Katholieke Universiteit Leuven; Departement Biologie; Laboratorium voor Aquatische Ecologie. Belgium
- **von Dorrien, Christian.** Federal Research Centre for Fisheries; Institute for Baltic Sea Fisheries. Germany
- **Washburn, Erika.** University of Southern Denmark; Centre for Maritime and Regional Studies. Denmark
- **Witbaard, Rob.** Royal Netherlands Institute for Sea Research. Netherlands
- **Wolff, Wim.** University of Groningen; Marine Biology research group. Netherlands

* For the sake of saving paper, the complete list of MARBENA subscribers is omitted and reduced to those who have contributed to the discussions.