



marbena

Electronic conference on 'Marine Biodiversity in the Baltic and the European context'

5 to 20 September 2002

Summary of discussions

An activity of:

MARS



Organized by:

NERI



NIOO - CEME



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:

Alf Josefson

National Environmental Research Institute: Department of Marine Ecology (NERI)
Frederiksborgvej 399
PO Box 358
DK-4000 Roskilde
Denmark

General co-ordinator:

Carlo Heip, co-ordinator

Herman Hummel and Pim van Avesaath, assistant co-ordinators

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

Website and practical organization:

Edward Vanden Berghe, Jan Mees, Francisco Hernandez, Klaas Deneudt

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

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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>

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TABLE OF CONTENTS

General Introduction to the Marbena Project

C.H.R. Heip and P.H. van Avesaath 2

Summary and conclusions

A.B. Josefson 4

Message titles 15

Organization and statistics

E. Vanden Berghe 20

List of participants 22

General Introduction to the Marbena Project

GENERAL INTRODUCTION TO THE MARBENA PROJECT

Carlo H.R. Heip and Pim H. van Avesaath

Centre for Estuarine and Marine Ecology/Netherlands Institute of Ecological Research,
Korringaweg 7, Postbus 140, NL-4400 AC Yerseke, The Netherlands

Objectives of MARBENA

The objectives of the MARBENA project are:

- To create the infrastructure for marine biodiversity research in Europe by creating a pan-European network of marine scientists, with strong links to the different stakeholders in Marine Biodiversity Issues, from the EU-EEA and the Newly Associated Nations, and that covers the European seas from the Arctic to the Atlantic, the Mediterranean and the Black Sea. This network must improve the science by cataloguing the existing expertise and infrastructure, by defining and prioritizing the issues at stake in terms of scientific knowledge, technological requirements and application to societal problems. It must provide an intellectually attractive environment for young scientists and a discussion forum for all. It must promote the European presence and the organization of international research programmes, and promote the discussion of their results and their application. It must provide the links between scientists and industrial companies willing to aid in technological development, between scientists and science managers and politicians and lead to better integration of research and a better insight in the 'market' of supply and demand of marine biodiversity information.
- To create awareness on the issues at stake and enlarge the visibility of marine biodiversity research in Europe, the network must make the issues – the scientific questions and the relevance of the outcome of the scientific research – clear to a non-scientific audience, it must communicate with EU policy makers and politicians (presentation of marine biodiversity issues at the European Platform for Biodiversity Research Strategy meetings, presentation to the European Commission and European Parliament when requested), with global organizations and programmes such as several IGBP programmes (GLOBEC, LOICZ, perhaps SOLAS), DIVERSITAS and the Census of Marine Life initiative, national and other EU biodiversity platforms (e.g. the BioPlatform thematic network) and dissemination of information to the public at large.

Hereby, the project contributes to the European Research Area (ERA) initiative. Special effort will be undertaken to involve the stakeholders from the Newly Associated States (NAS) in the network.

For more information on the project and for the partners involved see <http://www.vliz.be/marbena>.

The MARBENA electronic conferences

The MARBENA-project will organize a series of five e-conferences on selected themes.

Four electronic conferences will be held before each of four European Platform for Biodiversity Research Strategy (EPBRS - see the BioPlatform website at <http://www.bioplatform.info>) meetings with the following objectives:

- To raise a dialogue on the themes selected for the EPBRS meetings, involving a wide range of participants. These themes will be determined ad hoc in relation to the EU Minister Conference.
- To prepare for the EPBRS meetings through this dialogue, involving both the scientific community and policy makers, specifically:
 - A. To identify current understanding on the selected themes.
 - B. To identify areas of uncertainty ('biodiversity information needs') on the selected themes.
- To make provisional recommendations on research ('biodiversity research needs') on the selected themes for subsequent discussion at the EPBRS meetings.
- To provide background papers for the Platform meetings summarizing current understanding, areas of uncertainty and recommendations on research on the selected themes.

E-conference chairs are coupled with the EU presidency and organization of the EPBRS meeting: in order to reach participants from the nations that host the coming EPBRS meetings (Spain, Denmark, Greece, UK), the chair of the respective e-conferences is conveyed to a scientist resident of these countries. One additional e-conference on "The Future of Marine Biodiversity Research in Europe" will be organized independently of the platform meetings.

The first of these conferences ran for two weeks, from 22 April to 3 May 2002. The theme was "European heritage under threat: marine biodiversity in Mediterranean ecosystems". The results of the conference are presented at the European Platform for Biodiversity Research Strategy (EPBRS) meeting under the Spanish EU Presidency, which was held in Almería from 11 to 13 May 2002.

The second conference ran from 5 to 20 September 2002, with as theme 'Marine Biodiversity in the Baltic and the European context'. Results will be presented on the EPBRS meeting under Danish Presidency, taking place in Silkeborg from 4 to 6 October 2002.

Summary and conclusions

SUMMARY AND CONCLUSIONS

Conference chair:

Alf Josefson

National Environmental Research Institute: Department of Marine Ecology (NERI)
Frederiksborgvej 399
PO Box 358
DK-4000 Roskilde
Denmark

Co-chairs:

Jean-Pierre Féral

Observatoire Océanologique de Banyuls-Sur-Mer
BP 44
F-66651 Banyuls-sur-Mer
France

Ragnar Elmgren

Stockholm University: Department of Systems Ecology
SE-106 91 Stockholm
Sweden

Cees Hof

Universiteit van Amsterdam: Zoologisch Museum Amsterdam
P.O.Box 94766
Mauritskade 61
NL-Amsterdam
Nederland

Mark Costello

Huntsman Marine Science Center
1 Lower Campus Road
St Andrews, New Brunswick
E5B 2L7
Canada

Intoduction

Is a general methodology for biodiversity monitoring possible and do ecosystems with high and low diversity function in a similar way?

The Baltic Sea drainage basin is essentially an estuarine area encompassing estuaries of different sizes, from small bays and fjords to large water bodies like the Baltic Sea itself. The drainage area surrounding the Baltic Sea covers countries with intense land use from agriculture and forestry, and also heavy industrial activities. As a result there is a high pressure from both nutrients and contaminants on the water bodies of the region, and it is generally perceived that the biodiversity of these ecosystems is threatened by human activities. Biodiversity of the Baltic Sea is low to very low and even small changes in biodiversity may therefore have large impacts on ecosystem functioning. To assess whether biodiversity change is a serious problem in the Baltic, many problems of how to measure diversity, both in general and in particular in the Baltic, have to be solved. A discussion is therefore needed on what general methodologies for measurement and evaluation of biodiversity exist, which ones can be borrowed from terrestrial systems, which ones are specific for marine biodiversity and which ones can be applied to the Baltic situation.

Estuarine areas like the Baltic are transition zones between land and the sea where a number of important processes occur: biogeochemical (degradation, burial, gas exchange etc), production such as fish and shellfish yields, and also recreational activities. As mentioned, a typical feature of these environments is their relatively low biodiversity. It has been suggested that since the diversity of species is low but the system performs in the same way as other marine ecosystems, changes in species diversity are likely to have significant consequences for the ecosystems. The work on clarifying the links between biodiversity and ecosystem function should therefore have high priority in the future, because when we know these links is it possible to assess consequences of species loss and addition due to invasion of new species, and adopt appropriate management counteractions to stop negative trends or restore diversity.

The purpose of this e-conference is to provide a forum for discussions covering issues of Baltic Biodiversity that hopefully can be used in the future by managers and the scientific community.

The e-conference is scheduled around 3 topics of which the first one is general, including both terrestrial and aquatic systems, with the marine Baltic as example of a low diversity system.

Topic 1 - Monitoring approaches strategies and indicators

Introduction

The necessity to monitor marine biodiversity was recognised by all contributors to the discussion. There were however different opinions on how to monitor. The question whether a general methodology for biodiversity monitoring is possible for high and low diversity systems remained largely unanswered. Some participants emphasised that marine biodiversity studies, to a greater extent than before, should focus on functional aspects of diversity: knowledge of functional relationships enable us to assess effects on the ecosystem of species loss or invasion. It was also stressed that the work to identify indicators of diversity should continue and be intensified. After a slow start a fair number of contributions were posted from people with experience from the Mediterranean to the eastern Baltic area. In the following I will attempt to summarise contributions to the key questions asked by the chair.

1. Should we monitor at all even if we only can register a fraction of the total diversity?

Biodiversity in a broad sense includes different measures at several different levels of biological organisation: Total communities, functional groups, keystone species, species, genes. At the same time, changes can be measured on widely different spatial scales depending on the problem: from regions to the scale of the sample. Given this complexity, is it practically possible to measure biodiversity in a broad sense? Should we monitor at all even if we only can register a fraction of the total diversity?

The answer to this question was a clear yes. The reasons given for this yes varied between different contributors. Although one contributor suggested that existing monitoring programmes could take care also of biodiversity (Anda Ikauniece) most contributors suggested different new approaches. It was stressed by Ferruccio Maltagliati that diversity on several ecosystem levels should be monitored, not only species level but also on individual/population level, and he called for methods (i.e. statistical ones) to compare different levels of biodiversity. Herman Hummel stressed the importance of study coupling between diversity and ecosystem function, and so did the chair. He (HH) further emphasised the use of indicators to meet the needs of managers and politicians, even if they did not reflect total biodiversity. For the case when they do not reflect total diversity, the consequences for the ecosystem and society of the discrepancy should be investigated.

2. What should we measure and where? Are there indicators of diversity?

If we agree that we should monitor, then what should we measure and where? In the marine domain a tradition is to register species of certain size fractions for example benthic macrofauna (invertebrates >1mm mostly). But does diversity of this faunal compartment relate positively to overall diversity. This brings us to the

question: Are there indicators of biodiversity, that is some property, easily measured, that reflects diversity of a greater part of the system, that will indicate environmental pressures on diversity? Do we have such examples in the Baltic or elsewhere?

It was thus agreed that we should monitor biodiversity, but clearly we cannot monitor every aspects of biodiversity. What parts of the ecosystems should be monitored? Johanna Wesnigk suggested to start with habitats where the threats were known, and to focus on key organisms. Anda Ikaunieca suggested monitoring of key organisms like the bladder wrack (*Fucus*) as an indicator in shallow areas of the Baltic. The chair gave further examples of possible habitat forming organisms in the Baltic area and raised the question if monitoring should be restricted to such organisms.

However, there was a general perception that determination of species was unavoidable when monitoring diversity. An example where species determination of species, both meio- and macrofauna, is necessary was given by Emil Olafsson, the effect on meiofauna diversity of the macrofauna invader *Marenzelleria*. There was some discussion about whether or not the diversity of a single group of organisms could reflect the overall biodiversity.

Emil Olafsson pointed to the fact that in some areas of the Baltic the macrofauna was extremely species poor, while meiofauna was rich in species, and suggested further studies of diversity in macro-, meio- and microbial communities, using T-RFLP genetic fingerprinting. In a message by Jean-Pierre Feral, the work in WP2 of BIOMARE on bioindicators of diversity changes was described. A detailed account of the bioindicator concept was given and it was proposed to use pressure indicators and response indicators as they stand in the literature and to link with national and European policies. The efforts were focused on the sorting of state indicators, indices and set of species.

3. What determines the appropriate scale of a monitoring program?

The high dispersal ability of marine organisms and the paucity of rigid physical barriers require that marine diversity is monitored as well as managed on a large scale. Maybe, the appropriate scale for monitoring is the scale of major water masses rather than the scale of individual biotopes on the sea floor. If so, this means that monitoring and management actions should be internationally coordinated.

The chair used the fact that many marine organisms have good dispersal abilities, and that marine environments have relatively small physical barriers to argue for monitoring on a large spatial scale. However, Emil Olafsson pointed out that certain groups of organisms in fact have rather restricted dispersal ability, for instance free-living marine nematodes, and suggested that monitoring only on a large scale could be misleading. In a general message, Jean-Pierre Feral gave information on the BIOMARE concerted action, where a large scale (and long term) approach have been taken to assess changes in biodiversity.

4. How do the target and the environmental pressures determine monitoring?

The monitoring approach is likely to depend on the target and the environmental pressure. The following two examples are encountered in the Baltic and elsewhere in coastal areas. 1) Hypoxia/anoxia in the bottom waters with negative effects on the biological system. Monitoring to document effects of hypoxia obviously requires high-frequency measurements in space and time and the target is likely to be whole communities of organisms. 2) In addition to eutrophication-derived threats, contaminants also threaten diversity in the Baltic area and elsewhere. In contrast to the effects of hypoxia, which have a patchy distribution, the effects of contaminants is more diffuse and only affect some organisms in the communities. Is it possible to design feasible monitoring programmes that can answer all (or most) questions?

The chair raised the question whether different monitoring approaches should be adopted depending on biodiversity compartment and environmental problem. Johanna Wesnigk pointed out that anoxia in the deep Baltic Sea was not a problem for diversity of microbial communities, while it could be a problem for macrofaunal diversity. This illustrates that the same environmental problem may affect target diversity differentially between different organism compartments.

5. How does diversity determine the monitoring approach?

Should we have different approaches for monitoring in high and low diversity systems? While in low diversity systems like the Baltic, where it not may make much sense to use indices of diversity, maybe monitoring should be concentrated on key organisms, while in high diversity systems use of conventional indices used on whole communities may be more appropriate?

One example raised by the chair, should we have different approaches for monitoring in high and low diversity systems? There was not really any direct response to this question, however Christian Altaba, in a general response suggested different approaches in the Baltic than in systems with higher diversity.

Topic 2 - Is there a coupling between diversity and ecosystem function in the Baltic Area?

The discussion was focussed on the following questions raised by Ragnar Elmgren:

1) The call to preserve biodiversity is partly based on the hypothesis that species richness is important for the functioning of ecosystems, by making them more efficient, less sensitive to perturbations and species extinction, and better at delivering the commercial goods and ecological services humans expect from them. This hypothesis has proven difficult to demonstrate convincingly. Only in the last decade has experimental and observational results in partial support of some of these assumptions started to accumulate, but as yet mostly from communities of

primary producers, mainly grasslands. Not all have found the hypothesised effects of increased species richness. Why have marine biologists largely missed this experimental opportunity?

2) Facilitation between species is a mechanism whereby biodiversity might influence ecosystem function, and has been described both from deposit-feeding and filter-feeding freshwater ecosystems. Are likely candidates found also in the Baltic Sea?

3) The naturally species-poor Baltic Sea is an ideal laboratory for comparative experiments on the coupling of biodiversity to system function. In the macrobenthos, functional types do not disappear from the Baltic benthos as quickly as species, as we move towards lower salinity. Species may be redundant, that is replaceable by a functionally similar species without changes in ecosystem function, but functional groups or higher taxa may not. Whether a species is considered redundant will partly depend on how we measure ecosystem function. Which measures of ecosystem function are most appropriate for the different habitat types represented in the Baltic Sea?

4) When we do comparative experiments with the Baltic Sea providing the low diversity treatments, we must also find medium and high diversity treatments that allow appropriate comparisons. Designing such comparative experiments would seem to provide excellent opportunities for joint EU research projects. Where can the best medium and high biodiversity habitats for comparison with the Baltic be found?

5) If high biodiversity is good, then why should we worry about species invasions in low-diversity systems with 'empty' niches, such as the Baltic Sea, which are thought to be particularly susceptible to invasions? Is high biodiversity positive for fisheries, by providing a larger number of target species, or negative, by making the fishery for each target species less efficient? Is maintenance of aquatic biodiversity important for tourism and recreational uses around the Baltic Sea? Should provision of ecosystem services, including catches for the fishery, be seen as an ecosystem function?

The activity under this topic was not overwhelming, which may reflect the fact that very few studies have been performed relating to these questions. Still, several valid points were discussed, and several questions raised in the introduction were followed by more questions. The issue of most concern was whether or not invasive species constitute a threat to low diversity systems in general, and the Baltic ecosystem in particular. The somewhat provocative question in the introduction – why worry about invasions in low diversity systems? – was followed by several remarks. Most arguments for the view that invasions was a negative feature were of ethical nature, and no firm evidence was presented that ecosystem function had changed as a consequence of past invasions in the Baltic area. Nor were there firm examples where the native species had been excluded (by competition or otherwise) by the invader. One example of a threat was the comb jelly *Mnemiopsis*, which recently invaded the Caspian Sea. Effects of this species, however, on the

Caspian system still seem limited. One reason for the paucity of negative evidence from invasions in the Baltic may however be due to the fact that very few scientific investigations have been made of the relationship between diversity and ecosystem function.

In reply to the question of which type or types of function were the most desirable to preserve or enhance one example was given: the oxygenation of bottom sediments through bioturbation, which affects the biogeochemistry in the sediment and the exchange with the bottom water.

Questions still open and to be answered in the future is, whether there is a relationship between diversity and ecosystem function, what types of function are affected, and what the mechanisms are – for instance, is facilitation in guilds of species such a mechanism?

Topic 3 - Marine Biodiversity in the framework of GBIF and ENBI

Also this topic did not cause excessive activity, but several important points were discussed.

Both GBIF and ENBI rely on existing databases and the willingness/possibilities of the custodians to make their data accessible. ENBI will provide guidelines, data protocols, and the digital infrastructure to optimise this accessibility. The contribution of marine biodiversity researchers to GBIF and ENBI depends on:

- *willingness to share data (considering IPR issues and economic and political interests)*
- *possibility to easily share data (digitised or not? budget available to digitise?)*
- *issues such as the completeness of the data, taxonomic gaps, geographical gaps, etc.*

In relation this point Hans du Buf informed about an Expression of Interest (IMAQUA - Introducing tomorrow's imaging technology for large-scale monitoring of microscopic, aquatic organisms) to the EC. After the small pilot projects DiCANN (dinoflagellates) and ADIAC (diatoms), which concerned automatic identification, and a similar project on coccoliths and foraminifera at ETHZ in Switzerland, already 50 biologists and specialists in pattern recognition teamed up to develop tools for automatic identification and for building databases that can be shared. These databases will contain images, validated taxonomy, as well as ecological information. The basic idea is that only a pan-European collaboration with many participants allows to cover enough taxa and habitats.

In co-operation with EuroCat (Species 2000 Europa) ENBI shall create the pan-European taxon list. This list will accommodate marine taxa from ERMS (European

Register of Marine Species) higher plant taxa (Euro+Med Plantbase) and terrestrial macro-fauna (Fauna Europaea). Careful assessment of content will be needed here, both because of major gaps, because of a number of overlaps, and because of substantial differences in depth of treatment. Coverage of marine biodiversity by GBIF should/will be addressed by the GBIF representatives.

Ferdinando Boero acknowledged the importance of ENBI, GBIF, ERMS, but questioned the quality of the information in the databases. He essentially made two points; one about taxonomical confusion in some animal groups (Hydroids) and the other that the information was too scanty to be of great use to ecologists. The suggested remedy for the first point was more resources to good taxonomists.

Somewhat related to this issue were two points raised James Wilson 1) Any system is only as good as the information it contains. Although increasingly species lists are being held electronically, there is still a lot of data, including old data, in notebook or similar form, that is not yet electronically available 2) The second point was that the system should be easily accessible and encourage use. For instance, when met by messages like "your browser does not support the pages" does not encourage deeper exploration.

In response to point 1) Cees Hof informed that within ENBI there would be some trials on the digitisation of archived records. Methods, protocols, and standards will be developed for the (automatic) conversion of 'paper' information into on-line information and to point 2). Indeed essential. ENBI has a work package devoted to the 'user friendliness' of biodiversity services in Europe. This work package will also assess the special needs of specific groups of biodiversity information users.

Conclusions

Although the discussions in the two first sessions generated more questions than answers, there were several conclusions embraced by more than one person. There was a clear consensus on that biodiversity should be monitored, but there were different reasons given for monitoring and different views on what parts of biodiversity to monitor as well as what methods to use. It seemed clear that there were few, if any, monitoring programs running with the specific purpose to monitor changes in biodiversity in the Baltic marine area.

The question of the possibility of using indicators of biodiversity instead of monitoring the whole systems was discussed in several contributions. One issue raised was whether or not monitoring should be focussed on certain habitats formed by some key organisms, like the *Fucus* belt in the Baltic. Others argued forcefully for using indicators, even if their usefulness not were fully tested. It was suggested to adopt a common definition of biodiversity indicators, borrowed from the terrestrial domain, the so called Pressure-State-Response (PSR) model where measures of the systems should 1) identify the main causes of biodiversity changes, 2) detect the main effects, the rate and extent of biodiversity changes (loss) and 3)

evaluate the benefit of the implementation of protective or remedial actions. Implication for monitoring of this definition would be an ecosystem approach rather than species approach. It was stressed that the scientific work to identify useful indicators of biodiversity should be intensified and one way to go was through comparative work on high and low diversity environments coupled with experimental manipulations.

In relation to indicators, there was some discussion about whether or not the diversity of a single group of organisms could reflect the overall biodiversity. It was pointed out that in some areas of the Baltic the macrofauna was extremely species poor, while meiofauna was rich in species, and the traditionally used macrobenthos therefore was not the best general indicator of diversity. This issue certainly needs further studies of diversity in several faunal compartments. T-RFLP genetic fingerprinting was also suggested as a complimentary method to measure diversity in the species poor Baltic system.

Several contributors called upon more research to identify the eventual coupling between biodiversity and ecosystem function. The rationale for this efforts being the perception that part of the value of high diversity is due to positive effects on ecosystem functioning. It has been suggested that high diversity systems are more stable and uses resources more effectively than systems with lower diversity. There are however few scientific studies to support this suggestion. It was repeatedly suggested that the low diversity Baltic systems should be ideal for experiments in order to reveal such couplings.

In relation to this point the question was raised of which type, or types, of function were the most desirable to preserve or enhance. One example given was the oxygenation of bottom sediments through bioturbation, which affects the biogeochemistry in the sediment and the exchange with the bottom water.

There was great concern about effects of invasive species, and there were calls for investigations specifically assessing effects of invasive species on the native systems. One example was given such as the comb jelly *Mnemiopsis* in the Caspian Sea. There were however no examples of negative effects, like species loss, on the 'native' diversity in the Baltic, but rather the reverse, the diversity had increased as a consequence of these invasions. However, few if any, scientific investigations have assessed effects of invaders on the native fauna and such studies should have high priority in the future. One outstanding example in the Baltic is the large deep burrowing North American polychaete *Marenzelleria viridis*, which possibly affects sediment layers not hitherto affected by the native fauna. The consequences of this invasion for macro- as well as meio-fauna diversity and for sediment biogeochemistry should be investigated. It was emphasised that by some that the functional effects of both invasions and losses of species deserve further and intensified studies.

First part of the question in the title of the conference "Is a general methodology for biodiversity monitoring possible and do ecosystems with high and low diversity function in a similar way?" was answered with both yes and no. Yes because most

people felt that species determinations were necessary, and no because different approaches in terms of organism compartments could be necessary in high and low diversity systems. Whether or not high diversity systems function differently from low diversity systems is still an open question.

The questions of what contributions marine biodiversity researchers could make to international ventures such as GBIF and ENBI, and if marine biodiversity is adequately covered in these activities, were discussed in the third and fourth session. It was pointed out that fundamental issues were the willingness of researchers to share data, user friendly access to the data bases linked to GBIF and ENBI, and good taxonomic/systematic quality of data in the databases.

One main conclusion of this conference and the message to managers and authorities is to increase funding for work with consequences of species loss and species invasions on the function of marine ecosystems. This because only when we know these relationships can we fully evaluate the loss of value due to a deteriorating biodiversity.

Message titles

Monitoring approaches strategies and indicators?

Message	Date	Posted by
<u>Should we monitor biodiversity at all?</u>	05 Sep 02	Alf Josefson
<u>suggestion for monitoring in the Baltic ecological and evolutionary change</u>	05 Sep 02	Johanna Wesnigk
<u>Biodiversity monitoring is covered by regular monitoring</u>	05 Sep 02	Ferdinando Boero
<u>A synthesis is needed</u>	07 Sep 02	Anda Ikauniece
<u>Beside monitoring species we need to indicate the function o</u>	09 Sep 02	Ferruccio Maltagliati
<u>We also need knowledge of pressure factors</u>	09 Sep 02	Herman Hummel
<u>Yes, we should monitor biodiversity</u>	11 Sep 02	Alf Josefson
<u>What should we measure and where?</u>	16 Sep 02	Krzysztof Jazdzewski
<u>Latvian experiences with monitoring</u>	05 Sep 02	Alf Josefson
<u>Should we monitor extent of key organism habitats?</u>	07 Sep 02	Anda Ikauniece
<u>Polychaetes in soft-soft bottoms</u>	09 Sep 02	Alf Josefson
<u>Genetic fingerprinting?</u>	09 Sep 02	Emil Olafsson
<u>BIOMARE' WP2: bioindicators of diversity changes. Rationale</u>	09 Sep 02	Emil Olafsson
<u>Problems with taxonomy and identifications</u>	15 Sep 02	Alf Josefson
<u>Possible methodological pitfalls</u>	16 Sep 02	Krzysztof Jazdzewski
<u>What determines the appropriate scale of a monitoring progra</u>	17 Sep 02	Boris Winterhalter
<u>About scales.</u>	05 Sep 02	Alf Josefson
<u>How do the target and environmental pressures determine moni</u>	09 Sep 02	Emil Olafsson
<u>Comments to anoxic environments; link to pollutant monitori</u>	05 Sep 02	Alf Josefson
<u>How does diversity influence the monitoring approach?</u>	05 Sep 02	Johanna Wesnigk
<u>The need to understand what we are monitoring.</u>	05 Sep 02	Alf Josefson
<u>What is BIOMARE concerted action?</u>	11 Sep 02	Cristian Ruiz Altaba
	12 Sep 02	Jean-Pierre Féral

Is there a coupling between diversity and ecosystem function in the Baltic Area?

Message	Date	Posted by
<u>Why are there almost no marine studies of the relation betwe...</u>	10 Sep 02	Ragnar Elmgren
<u>Is facilitation a mechanism whereby biodiversity influences</u>	10 Sep 02	Ragnar Elmgren
<u>What measures of ecosystem function are most appropriate?</u>	10 Sep 02	Ragnar Elmgren
<u>A possible appropriate ecosystem function</u>	12 Sep 02	Alf Josefson
<u>Can we find comparable habitats with different biodiversity?</u>	10 Sep 02	Ragnar Elmgren
<u>Why worry about species invasions in low diversity systems?</u>	10 Sep 02	Ragnar Elmgren
<u>Ecosystem functioning and trophic level.</u>	11 Sep 02	Loreto Rossi
<u>Do empty niches exist?</u>	11 Sep 02	Ragnar Elmgren
<u>Reasons why to worry over species invasions</u>	16 Sep 02	Krzysztof Jazdzewski
<u>Alien invasive species is a major threat to marine biodiversity</u>	22 Sep 02	Vadim Panov
<u>High and low biodiversity: which importance for the function</u>	12 Sep 02	Jean-Pierre Féral
<u>How does a low species diversity sea reacts against invasive...</u>	12 Sep 02	Jean-Pierre Féral

Marine Biodiversity in the framework of GBIF and ENBI

Message	Date	Posted by
<u>What contribution can marine biodiversity researchers make t...</u>	13 Sep 02	Cees Hof
<u>Sharing data is the only way to go</u>	13 Sep 02	Hans du Buf
<u>Is marine biodiversity adequately covered in activities such...</u>	13 Sep 02	Cees Hof
<u>Are initiatives such as GBIF and ENBI the best way forward?</u>	13 Sep 02	James Wilson
<u>Digitization of</u>	18 Sep 02	Cees Hof

General discussion, loose ends and synthesis

Message

[Last chance to ...](#)

[what biodiversity?](#)

[Baltic red and brown algae. Diversity at infraspecific level](#)

Date Posted by

19 Sep 02 Alf Josefson

23 Sep 02 Ferdinando Boero

19 Sep 02 A. Athanasiadis

Organization and statistics

CONFERENCE ORGANISATION AND STATISTICS

Edward Vanden Berghe

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

The conference was organized as a moderated bulletin board. Both the introduction to the themes and topics, 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. Contributions by non-moderators were flagged as 'non-moderated', until a moderator released them. For this purpose, the moderators had access to a separate form, which allowed editing or deletion of messages.

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, was open to everyone. To be able to post messages and also to view posted messages, registration through a form on the web site was needed. Requests for registration were handled individually; applicants were informed of successful registration in an e-mail. On the registration form, participants could choose to receive the summaries of the discussions, as drafted by the chairman, by e-mail. This was done by the vast majority of the participants.

Statistics

Registered participants (includes 'marble' participants): 539

Registered participants to first marbena conference: 438

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Participants requesting summaries through e-mail: 272

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List of participants

LIST OF PARTICIPANTS

Aanderaa, Rune. Cooperative Council for Biological Diversity, Oslo: Norway
Abbiati, Marco. University of Bologna: Scienze Ambientali: Italy
Aberg, Per. Goteborg University, Department of Marine Botany: Sweden
Ahlrichs, Wilko. University of Bielefeld: Germany
Airoldi, Laura. Centro Interdipartimentale di Ricerca per le Scienze Ambientali di Ravenna: Italy
Alagador, Diogo. Faculty of Sciences, Lisbon: Portugal
Alberto, Filipe. Universidade do Algarve: Portugal
Alcaraz, Miquel. Institut de Ciències del Mar (CSIC): Spain
Alemany, Francisco. Centre Oceanogràfic de Balears/Instituto Español de Oceanografía: Spain
Alexandrov, Boris. Institute of Biology of Southern Seas, Odessa Branch: Ukraine
Alonso, Carolina. Ecologia, Formentera: Spain
Al-Suwailem, Abdulaziz. Marine Studies Section, Center for Environment & Water, Research Institute, King Fahd University of Petroleum & Minerals: Saudi Arabia
Andaloro, Franco. ICRAM: Italy
Andersen, Ole G. Norden. Roskilde University, Department of Life Sciences and Chemistry: Danmark
Andre, Carl. Tjärnö Marine Biological Lab, Strömstad: Sweden
Andrushaitis, Andris. Institute of Aquatic Ecology, University of Latvia: Latvia
Angel, Martin. Dep. Ethology, Ecology, Evolution, Pisa: Italy
Aniol, Esteban. WWF Mediterranean Programme, Barcelona: Spain
Anna, OCCHIPINTI. Ecology Section, dept. of Genetics & Microbiology: Italy
Arko-Pijevac, Milvana. Natural History Museum Rijeka: Croatia
Armonies, Werner. AWI Wattenmeerstation Sylt: Germany
Arronte, Juan Carlos. Universidad de Oviedo, Dpto de B.O.S: Spain
Arvanitidis, Christos. Department of Environmental Technology and Management of Marine Resources: Greece
Athanasiadis, Athanasios. Marine Botany, Goteborg University: Sweden
Atikkan, Esat. MC - Biology: USA
Attrill, Martin. University of Plymouth, Dept Biological Sciences: UK
Auffret, Gerard
Austen, Melanie. Plymouth Marine Lab: UK
Azevedo, José Manuel N. Universidade dos Açores, Departamento de Biologia: Portugal
Balduzzi, Andrea. Università di Genova, Dip.Te.Ris.: Italy
Balestri, Elena. Dipartimento di Scienze dell'Uomo e dell'Ambiente: Italy
Balode, Maija. Institut of Aquatic Ecology: Latvia
Banks, Andy. Institute of Marine Biology of Crete: Greece
Barbara Mikac, Barbara. Institute, Center for Marine Research, Rovinj Division: Croatia
Barth, Hartmut. European Commission, DG Research, Unit I-3: Belgium
Bartsch, Inka. Alfred-Wegener Institute for Polar- and Marine Research: Germany

Basset, Alberto. Dipartimento di Scienze e Tecnologie Biologiche ed Ambientali: Italy

Bayle, Just. Marine Biology Lab: Spain

Beatriz, Morales-Nin. IMEDEA: Spain

Becker, Stephan. McGill University, Montreal: Canada

Bedulli, Daniele. Dep. Functional and Evolutiv Biology: Italy

Beenaerts, Natalie. Ecology and Marine Management, Free University Brussels: Belgium

Bellan-Santini, Denise. Centre d 'Océanologie de Marseille: France

Belluscio, Andrea. Univerità di Roma, La Sapienza, Dipartimento di biologia animale e dell 'uomo: Italy

Beltrano, Anna Maria. IRMA CNR (Istituto di ricerca sulle Risorse Marine e l 'Ambiente-Consiglio Nazionale delle Ricerche), Sicilia: Italy

Ben Mustapha, Karim. Institut National Sciences de la Mer INSTM; Laboratoire Ressources Marines Vivantes: Tunisia

Benedetti-Cecchi, Lisandro. Dipartimento di Scienze dell 'Uomo e dell' Ambiente, Pisa: Italy

Bentley, Matt. Dept. Marine Sciences & Costal Management, Newcastle Univ.: UK

Bergamasco, Alessandro. CNR - Istituto Sperimentale Talassografico: Italy

Berggren, Matz. Marine Ecology - Göteborg University: Sweden

Berglund, Johnny. Dept. of ecology and environmental sciences, UMEÅ UNIVERSITY:

Bergström, Lena. Department of Ecology and Environmental Science; Umeå University: Sweden

Bergström, Ulf

Bianchi, Carlo Nike. Marine Environment Research Centre, ENEA Santa Teresa: Italy

Bianchini, Marco L. CNR, Rome: Italy

Billett, David. Southampton Oceanography Centre: UK

Blaxter, Mark. ICAPB, Univ Edinburgh: UK

Boero, Ferdinando. DiSTeBA, University of Lecce: Italy

Boglione, Clara. University of Rome 'Tor Vergata' - Experimental Ecology and Aquaculture Laboratory: Italy

Boisset, Fernando. Dpto. Biología Vegetal. Universidad de Valencia: Spain

Bojariu, Roxana. Institutul National de Meteorologie si Hidrologie, Bucharest: Romania

Bolger, Thomas. Dept of Zoology, University College Dublin: Ireland

Bongard, Terje. Norwegian Institute for Nature Research: Norway

Bonne, Wendy. Marine Biology Section, Biology Department, University of Gent: Belgium

Bonsdorff, Erik. Environmental and Marine Biology, Abo Akademi University: Finland

Boström, Minna. Environmental and Marine Biology, Åbo Akademi University: Finland

Bothelo, Andrea Zito. Martinoli S.A.M.: Italy

Boudouresque, Charles. Centre d'Océanologie de Marseille: France

Bramanti, Lorenzo. Evoluzione Università di Pisa, Dep. Etologia, Ecologia: Italy

Brandt, Angelika. Zoological Museum, Hamburg: Germany

Bratos, Ana. Collegium Ragusinum: Croatia

Brattegard, Torleiv. Univ. of Bergen, Dept. of Fisheries and Marine Biology:
Norway

Breber, Paolo. Istituto per lo Studio degli Ecosistemi Costieri, C.N.R., Lesina:
Italy

Brey, Tom. Alfred Wegener Institute, Bremerhaven: Germany

Brown, Janet. Winfrith Technology Centre, Centre for Ecology and Hydrology,
Dorchester: UK

Brown, Sue. UK

Buchholz, Friedrich. Biological Institute Helgoland - AWI: Germany

Burns, William C.G. American Society of International Law - Wildlife Interest
Group: USA

Buschbaum, Christian. Alfred Wegener Institute for Polar and Marine Research,
Wattenmeerstation Sylt: Germany

Cabral, Henrique. DZA, FCUL, Lisboa: Portugal

Callaway, Ruth. University of Wales Swansea: United Kingdom

Caltavuturo, Giovanni. Italy

Candeias Soares, Marta. Universidade dos Açores: Portugal

Cannizzaro, Leonardo. Istituto di ricerche sulle Risorse Marine e l'Ambiente
IRMA-CNR: Italy

Carbonell Quetglas, Ana. Instituto Español de Oceanografía. Recursos
pesqueros: Spain

Cardigos, Frederico. DOP - University of the Azores: Portugal

Cardoso, Ana Cristina. Joint Research Center Institute for Environment and
Sustainability, Ispra: Italy

Carlos, Montero. Spain

Cartes, Joan. Instituto de Ciencias del Mar (CMIMA-CSIC): Spain

Cattaneo-Vietti, Riccardo. DIPTERIS - Dipartimento per lo Studio della Terra e
delle sue Risorse: Italy

Cattrijsse, Andre. Flanders Marine Institute: Belgium

Ceccherelli, Giulia. Italy

Ceccherelli, Victor Ugo. Centro Interdipartimentale Ricerca Scienze Ambientali,
Ravenna: Italy

Clare, Anthony. Newcastle University, Marine Sciences & Coastal
Management: UK

Closas Garcia, Pilar.

Cocheret de la Morinière, Elroy. University of Nijmegen, Animal Ecology: The
Netherlands

Cochrane, Sabine J. Akvaplan-niva: Norway

Coenjaerts, Johan. Belgian Biodiversity Platform: Belgium

Colangelo, Marina A. Centro Interdipartimentale Ricerca Scienze Ambientali,
Ravenna: Italy

Colloca, Francesco. Università di Roma, La Sapienza, Dipartimento di biologia
animale e dell'uomo: Italy

Colson, Isabelle. University of Wales Bangor, School of Biological Sciences:
United Kingdom

Coma, Rafel. Centre d'Estudis Avançats de Blanes (CEAB-CSIC): Spain

CONAN, Pascal. Laboratoire Arago: France
 Condé, Sophie. European Topic Centre/Nature and Biodiversity: France
 Conxita, Avila. Centre d'Estudis Avançats de Blanes (CSIC): Spain
 Cooper, Andrew. University of Ulster, Environmental Studies: UK
 Costa, Esmeralda. University of Algarve (FCMA): Portugal
 Costello, Mark J. Ecoserve: Ireland
 Creasey, Simon. Institute of Biological Sciences, University of Wales: UK
 Crescenzo, Violante. Istituto di Ricerca "Geomare sud" CNR, Napoli: Italy
 Crise, Alessandro. OGS - Dipartimento di Ocenografia, Sgonico: Italy
 Crowe, Tasman Peter. Zoology Department, University College Dublin: Ireland
 Cruzado, Antonio. CEAB/Oceanography: Spain
 Culverhouse, Phil. Univ. of Plymouth, Centre for intelligent systems, DCEE: UK
 Cunha, Maria Emília. IPIMAR/DAA, Lisboa: Portugal
 Dabalà, Caterina. CO.RI.LA.: Italy
 Dahlgren, Thomas. Goteborg University, Department of Zoology: Sweden
 Dahl-Tacconi, Nancy. Indonesia
 Dando, Paul. School of Ocean Sciences, University of Wales-Bangor: UK
 Danielsen, Jóhannis. Food and Environmental Agency
 Danovaro, Roberto. Institute of Marine Science, Faculty of Science, University
 of Ancona: Italy
 Dashfield, Sarah. Plymouth Marine Laboratory: UK
 de Brouwer, Jody. NIOO-CEMO: The Netherlands
 De Broyer, Claude. Institut Royal des Sciences Naturelles de Belgique: Belgium
 de Cheveigné, Suzanne. CNRS Lab. Communication et Politique: France
 De Clerck, Olivier. University Gent, Laboratory of Protistology and Aquatic
 Ecology: Belgium
 De Kluijver, Mario. ETI/IBED, Amsterdam: The Netherlands
 De la Broise, Denis. Université de Bretagne Occidentale/ LUMAQ, Quimper:
 France
 De Pablo, María Jesús. Directorate General of Nature Conservation: Spain
 De Troch, Marleen. University Gent, Marine Biology Section: Belgium
 Dehghani, G. Ali. University of Hamburg, Institute of Geophysics: Germany
 Deneudt, Klaas. Vlaams Instituut voor de Zee: Belgium
 Deprez, Tim. Ghent University - Marine Biology Section: Belgium
 Di Carlo, Guiseppe. IRMA-CNR: Italy
 Di Natale, Antonio. Acquario di Genova: Italy
 Dippner, Joachim. Baltic Sea Research Institute Warnemuende, Rostock:
 Germany
 Dmitrieva, Evgenija. Institute of Biology of the Southern Seas/Ecological
 parasitology: Ukraine
 Dobbelaere, Ingrid. Flanders Marine Institute: Belgium
 Dolan, John Richard. Marine Microbial Ecology Group, LOV- CNRS: Italy
 Domingo, Lloris.
 Dr. Boethling, Maria. Federal Maritime and Hydrographic Agency: Germany
 du Buf, Hans. University of Algarve - Electronics Computer Sc., Faro: Portugal
 Duarte, Carlos. Universitat de les Illes Balears, Instituto Mediterraneo de
 Estudios Avanzados: Spain
 Dubelaar, George. CytoBuoy b.v., Bodegraven: The Netherlands

Dubois, Philippe. Laboratoire de Biologie marine; Université Libre de Bruxelles: Belgium

Duchi, Antonino. Italy

Ducrottoy, Jean-Paul. Institute of Estuarine and Coastal Studies - University of Hull: UK

Dulcic, Jakov. Institute of Oceanography and Fisheries, Laboratory for ichthyology and coastal fisheries:

Dupont, Sam. Université catholique de Louvain: Belgium

Dyatlov, Sergey. Odessa Branch Institute of Biology of Southern Seas: Ukraine

Edwards, Cassian. Queen Mary - University of London: UK

Edwards, Martin. Queen Mary - University of London, Biological Sciences: UK

Ekeboom, Jan . Finnish Environment Institute: Finland

Ellingsen, Kari Elsa. University of Oslo, Dept. of Biology, section of Marine Zoology and Marine Chemistry: Norway

Elmgren, Ragnar. Stockholm University, Dept Systems Ecology: Sweden

Emanuel Gonçalves, Emanuel. Eco-Ethology Research Unit - ISPA, Lisboa: Portugal

Emblow, Chris. Ecoserve: Ireland

Emig, Christian. CNRS-Centre d'Océanologie: France

Enric, Massuti. IEO-Centre Oceanogràfic de les Balears: Spain

Estrada, Marta. Institut de Ciències del Mar. CMIMA.CSIC: Spain

Fairoz, Mohamed. Universty of Ruhuhna: Department of Fisheries Biology: Sri Lanka

Fanelli, Giovanni. ISTTA-CNR: Italy

Farrell, Paul. University of Portsmouth, Institute of Marine Sciences: United Kingdom

Fautin, Daphne. University of Kansas, Dept. Ecology & Evol. Biology: USA

Fenske, Christiane.

Féral, Jean-Pierre. Observatoire Océanologique: France

Fernandes, Leslie. University of Vigo, Faculty of Science: Spain

Ferrando, Paola.

Ferraz, Rogério. IMAR - Institute of Marine Research: Portugal

Feuerpfeil, Peter. University of Rostock, Institut for Aquatic Ecology: Germany

Flach, Elsin. Systems Ecology, Stockholm University: Sweden

Florin, Ann-Britt. National Board of Fisheries/Institute of Coastal Research: Sweden

Fockedey, Nancy. Flanders Marine Institute: Belgium

Foggo, Andrew. University of Plymouth, Department of Biological Science: UK

FORBES, KIM. EUROPEAN OCCUPATIONAL HEALTH AND SAFETY LAW RESEARCH CENTRE: United Kingdom

Fornahl, Michael. Ministry for Economic Affairs, Technology and Traffic: Germany

Fourt, Maïa. CNRS/Banyuls: France

Franzosini, Carlo. Shoreline s.c.a.r.l., Trieste: Italy

Fresi, Eugenio. University of Rome "Tor Vergata", Dep. Biology: Italy

Frid, Chris. Dove Marine Laboratory, University of Newcastle: UK

Funkquist, Lennart. Swedish Meteorological and Hydrological Institute, Norrköping: Sweden

Furnari, Giovanni. Dipartimento di Botanica dell'Università: Italy

Gaevskaya, Albina. Institute of Biology of the southern Seas, Department of Ecological Parasitology: Ukraine

Galil, Bella. National Institute of Oceanography: Israel

Gambi, Maria Cristina. Stazione Zoologica "A. Dohrn"- Laboratorio Ecologia del Benthos (Napoli): Italy

Ganning, Bjorn. Stockholm Marine Research Centre: Sweden

Garcia, Serge Michel. FAO Fisheries Resources Division: Italy

Garcia-Meunier, Pascale. Laboratoire de Biologie et Environnement marins - Institut de la Mer et du Littoral: France

Garrabou, Joaquim. Centre d'Océanologie de Marseille: France

Gattuso, Jean-Pierre. CNRS- Observatoire Océanologique: France

Gaudron, Sylvie-Marylene. Department of Marine Sciences and Coastal management, University of Newcastle: UK

Gektidis, Marcos. Dep. of Geology, Paleontology: Germany

Gentil, Franck. Observatoire Océanologique de Roscoff: France

George, Kai Horst. Forschungsinstitut Senckenberg/DZMB: Germany

Gernez, Caroline. Ifremer/CLORA, Bruxelles: Belgium

Gheskiere, Tom.

Giaccone, Giuseppe. Università di Catania, Dipartimento di Botanica: Italy

Giangrande, Adriana. Departement of Biological and Environmental Sciences and Technologies, Lecce: Italy

Giere, Olav. Zoological Institute and Zoological Museum, Hamburg: Germany

Gini, Giuseppina. DEI, Politecnico di Milano: Italy

Giuliano, Laura. Istituto Talassografico - CNR: Italy

giuseppe, di carlo. IRMA-CNR: Italy

Gobert, Sylvie. University of Liège, Oceanology: Belgium

Godinho, Cecile. University of Algarve: Portugal

Gol'din, Pavel. Zoology Dept, Taurida National Univ

Gonçalves, Jorge. CCMAR: Portugal

Goñi, Raquel. Centro Oceanográfico de Baleares (IEO): Spain

Gonzalez-Wanguemert, Mercedes. University of Murcia, Fac. Biology, Department of Ecology and Hydrology: Spain

Gordon, Jonathan . SMRU, Gatty Lab, St Andrews: UK

gorsky, gabriel. CNRS/LOV: France

Grall, Jacques. LEMAR Institut Universitaire Européen de la Mer: France

Gray, John. Biological Institute/University of Oslo: Norway

Grémare, Antoine. Observatoire Océanologique de Banyuls: France

Greve, Wulf. German Centre for Marine Biodiversity: Germany

Guillaumont, Brigitte. IFREMER DEL/AO: France

Hagström, Åke. Marine sciences Kalmar University: Sweden

HAMZA, WALEED. Director M.Sc. Program Environmental Science, United Arab Emirates University: United Arab Emirates

Hänninen, Jari. University of Turku, Archipelago Research Institute: Finland

Hansen, Flemming Thorbjørn. DHI - Water & Environment, Ecological Modelling Centre: Danmark

Hansen, Jørgen. NERI: Denmark

Hawkins, Anthony. Plymouth Marine Laboratory: UK

Heip, Carlo. Centre for Estuarine and Marine Ecology/Netherlands Institute of Ecological Research: The Netherlands

Heiskanen, Anna-Stiina. EC-Joint Research Centre, Institute for Environment and Sustainability, Inland and Marine Waters Unit: Italy

Helgason, Gudmundur Vidir. Institute of Biology, University of Iceland: Iceland

Helminen, Ulla. University of Turku/Archipelago Research Institute: Finland

Henocque, Yves. IFREMER: France

Heral, Maurice. IFREMER, Scientific Director: France

Herman, Peter. Centre for Estuarine and Marine Ecology/Netherlands Institute of Ecological Research: The Netherlands

Herman, Rudy. Science and Innovation Administration: Belgium

Hernandez, Francisco. Flanders Marine Institute: Belgium

Hernandez, Tinerfe.

Herraez, M. Paz. University of León, Fac Biología: Spain

Hill, Cathy. Stockholm County Administrative Council: Sweden

Hillewaert, Hans. Sea Fisheries Department: Belgium

Hiscock, Keith. Marine Biological Association: UK

Hof, Cees.

Horton, Tammy. Southampton Oceanography Centre: United Kingdom

Howe, Vicki. Cardiff University, Earth Sciences Department, Marine Institute: UK

Huchzermeyer, Bernhard. Institute:Universitaet Hannover / Institut fuer Botanik: Germany

Hudson, Ian. DEEPSEAS Benthic Biology Group, George Deacon Divison.: United Kingdom

Hummel, Herman. Netherlands Institute of Ecology: The Netherlands

Hyvönen, Jaakko. University of Helsinki, Division of Systematic Biology: Finland

Ifada, Jacob Edaghese. Fadoz Farms Limited, Hamburg: Germany

Iglesias-Rodriguez, Maria Debora. School of Biological Sciences, University of Bristol: UK

Ikaunieca, Anda. University of Latvia, Institute of Aquatic Ecology, Marine Monitoring Centre: Latvia

Jaklin, Andrej. Rudger Boskovic Institute, Center for Marine Research:

Janas, Urszula. Gdańsk University, Department of Marine Biology and Ecology: Poland

Jansson, Ingrid. Swedish Protectional Environment Agency, Stockholm: Sweden

Jazdzewski, Krzysztof. Dept.Invertebrate Zoology & Hydrobiology, University of Lodz: Poland

Jermakovs, Vadims. Institute of Quatic Ecology, University of Latvia: Latvia

Jimenez, Juan. Consellería de Medi Ambient. Valencia: Spain

Johns, David. Sir Alister Hardy Foundation for Ocean Studies, Plymouth: UK

Jonathan, Michael. Information Technology, Ikeja: Nigeria

Joncheere, Hilde. European Aquaculture Society: Belgium

Jordi, Gonzalez. Port of Barcelona: Spain

Jorge Gonçalves, Jorge . CCMAR - Universidade do Algarve: Portugal

Juan Eduardo, Guillén Nieto. Institut d'Ecologia Litoral: Spain

Juan Pablo, CAMBLOR ALVAREZ. ZOEa, Difusión e Investigación del Medio Marino: Spain

Kallstrom, Bjorn. Gothenburg University: Sweden

Kamburska, Lyudmila. University of Trieste, Marine Biology Laboratory: Italy
 Kamel, Omneya. Faculty of science, Biology sector, Alexandria university
 Karakiri, Maria. Federal Maritime and Hydrographic Agency German
 Oceanographic Datacentre, Hamburg: Germany
 Kautsky, Nils. Systems ecology, Stockholm University: Sweden
 Kendall, Mike. Plymouth Marine Laboratory: UK
 Kennedy, Robert. Martin Ryan Marine Science Institute: Ireland
 Kerckhof, Francis. MUMM, Marine Environmental Management Section Royal
 Belgian Institute of Natural Sciences: Belgium
 Kholodkovska, Elena. Institute of Biology of Southern Seas, Odessa Branch:
 Ukraine
 Kideys, Ahmet. Institute of Marine Sciences: Turkey
 Kostylev, Vladimir. EcoVector: Canada
 Kotwicki, Lech. Institute of Ecology PAS: Poland
 Koutrakis, Emanuil. Institute: Fisheries Research Institute, National Agricultural
 Research Foundation: Greece
 Kovačević, Marcelo. Natural History Museum Rijeka: Croatia
 Kuijper, Maarten. IOC/WESTPAC - Intergovernmental Oceanographic
 Commission of UNESCO: Thailand
 Kuklinski, Piotr. Institute of Oceanology: Poland
 Labropoulou, Mary. National Centre for Marine Research: Greece
 Lage, Olga Maria. European Commission, DG-Research, Bruxelles: Belgium
 LAGUNA, Emilio. Generalitat Valenciana - Conselleria Medio Ambiente: Spain
 Lampadariou, Nikolaos. Institute of Marine Biology of Crete: Greece
 Lancelot, Christiane. Université Libre de Bruxelles/Ecologie des Systèmes
 Aquatiques: Belgium
 Laptikhovskiy, Vladimir. Atlantic Research Institute of Fisheries and
 Oceanography: Russia
 Lardicci, Claudio. Dipartimento di Scienze dell 'Uomo e dell 'Ambiente: Italy
 Larsen, Gitte. Danish Forest and Nature Agency: Denmark
 Lasserre, Pierre. UNESCO-ROSTE: Italy
 Lastra, Mariano. University of Vigo, Faculty of Science, Ecology Department:
 Spain
 Laugier, Thierry. Ifremer/Direction of coastal environment: France
 Laura, Airoldi. Scienze Ambientali, University of Bologna: Italy
 Laura, Entrambasaguas. Dirección General del Medio Natural/Servicio de
 Protección y Conservación de la Naturaleza: Spain
 LAURENT, Luc . BIOINSIGHT: France
 Lavery, Melina. American Museum of Natural History: USA
 Le Hir, Maryvonne. I.U.E.M./Université de Bretagne Occidentale: France
 Leah, Rick. University of Liverpool: UK
 Leandro, Sérgio. University of Aveiro, Department of Biology: Portugal
 Lebaron, Philippe. University Paris VI - CNRS UMR7621: France
 Leeney, Ruth. University College Dublin, Zoology Department: Ireland
 Legrand, Jacques . Ifremer: France
 Lekve, Kyrre. University of Oslo, Dep. Biology: Norway
 Lepoint, Gilles. University of Liège, Oceanology: Belgium

Leppakoski, Erkki. Aabo Akademi University/Environmental and Marine Biology: Finland

Lindgarth, Mats. Göteborg University, Dept. of Marine Ecology: Sweden

Lovric, Josip. Collegium Ragusinum: Croatia

Lueter, Carsten. Museum of Natural History, Humboldt-University: Germany

Luis, Gil de Sola. Instituto Español de Oceanografía/Fisheries: Spain

Luque, Angel. Laboratorio de Biología Marina, Departamento de Biología, Madrid: Spain

Machkevsky, Vladimir. Institute of Biology of the Southern Seas (IBSS), Department of Ecological Parasitology: Ukraine

Macpherson, Enrique. Centro de Estudios Avanzados de Blanes (CSIC): Spain

Maggiore, Francesca. Istituto per lo Studio della Dinamica delle Grandi Masse- CNR, Venezia: Italy

Magoulas, Antonios. Department of Genetics and Molecular Biotechnology, Institute of Marine Biology of Crete (IMBC): Greece

Malm, Torleif. Department of Botany - University of Stockholm: Sweden

Malone, Tom. Horn Point Laboratory: USA

Maltagliati, Ferruccio. University of Pisa - Dipartimento di Scienze dell'Uomo e dell'Ambiente: Italy

Maravelias, Christos. National Centre for Marine Research/Institute of Marine Biological Resources: Greece

Marchini, Agnese. Sezione di Ecologia, University of Pavia: Italy

Margherita, Luzi. Italy

Marija, Crncevic. Collegium Ragusinum: Croatia

Markham, John. Arch Cape Marine Laboratory: USA

martin, wahl. Institute for Marine Sciences, Kiel: Germany

Martin, Yvan. Institut Océanographique Paul Ricard: France

Masó, Mercedes. Inst. Ciencias del Mar: Spain

Mathieson, Scot. Scottish Environment Protection Agency: UK

McQuoid, Melissa. Goteborgs University, Marine Botany: Sweden

Medinets, Vladimir. Odessa National University/Centre for Environmental Monitoring: Ukraine

Mees, Jan. Flanders Marine Institute: Belgium

Meire, Patrick. University of Antwerp, Dept. of Biology, ecosystem management research group: Belgium

Meisterfeld, Ralf. Institut fuer Biologie II, Aachen: Germany

Melo, Ricardo. Faculdade de Ciencias de Lisboa, Instituto de Oceanografia: Portugal

Mert, Mert Gokalp. Rosenstiel School of Marine and Atmospheric Studies

Micheli, Fiorenza. Hopkins Marine Station, Stanford University: USA

Mifsud, Carmen. Biodiversity Protection Unit- Environment Protection Directorate

Mihneva, Vesselina. Institute of Fisheries and Aquaculture: Bulgaria

Milchakova, Nataliya. Institute of Biology of the Southern Seas (IBSS), Dept. Biotekhnologies and Phytoresources: Ukraine

Mill, Peter. School of Biology, University of Leeds: UK

Mirto, Simone. University of Ancona, Marine Science Institute: Italy

Mo, Kerstin. Fiskeriverket: Sweden

Modica, Alfonso. Centro Oceanologico Mediterraneo - CEOM: Italy
 Moncheva, Snejana. Institute of Oceanology, BAS: Bulgaria
 Morato, Telmo. DOP, University of the Azores: Portugal
 Morigi, Caterina. Università di Ancona, Istituto di Scienze del Mare: Italy
 Mostarda, Edoardo. ICRAM: Italy
 Muessner, Rainer. CIMAR - Centre for Marine and Environmental Research
 Mukhanov, Vladimir. Inst. of Biology of the Southern Seas, Dept. of Plankton:
 UKRAINE
 Muller, Sophie. IM (UiB)
 Munaf, Herman. Université de La Rochelle, Laboratoire de Biologie et d
 'Environnement Marins (LBEM): France
 Mura, Marco. Dip. Biologia Animale ed Ecologia, Cagliari: Italy
 Murenu, Matteo. Dipartimento di Biologia Animale ed Ecologia, Cagliari: Italy
 Murray, Nicholas. Institute for Environment and Sustainability: Italy
 Muylaert, Koenraad. University Gent, Laboratory of Protistology and Aquatic
 Ecology: Belgium
 Nash, Richard. University of Liverpool, Port Erin Marine Laboratory: UK
 Neubert, Hanns-J. ScienceCom, Hamburg: Germany
 Neunlist, Serge. ENSCMu: France
 Nic Dhonncha, Eilís. AlgaeBase Centre, Galway: Ireland
 Nicoletti, Luisa. Istituto centrale per la ricerca applicata al mare ICRAM, Roma:
 Italy
 Nijkamp, Hugo. Argo Sea Use and Wildlife Consultancy
 Nilsson, Per. Göteborg university, Dept of marine ecology: Sweden
 Norkko, Alf. National Inst. of Water & Atmospheric Research: New Zealand
 Norling, Karl. Marine Ekology: Sweden
 Nuria, Navarro. Instituto Mediterráneo de Estudios Avanzados (CSIC-UIB):
 Spain
 O'Connor, Nessa. University College Dublin, Zoology Department: Ireland
 Ojaveer, Henn. Estonian Marine Institute, Tallinn: Estonia
 Olafsson, Emil. Department of Zoology, University of Stockholm: Sweden
 Olenin, Sergei. Coastal Research and Planning Institute: Lithuania
 Olim, Sonia Maria de Sousa. University of Algarve: Portugal
 Olivar, M. Pilar. Institut de Ciències del Mar/ Recursos Renovables: Spain
 Oliver, Pere. Spanish Institute of Oceanography: Spain
 Olsgard, Frode. Univ. of Oslo, Biological Institute, Dept. Marine Zoology:
 Norway
 Oquiñena, Begoña. Institut Menorquí d'Estudis, IME
 Orfanidis, Sotiris. National Agricultural Research Foundation, Fisheries
 Research Institute: Greece
 Ott, Jörg. University Vienna, Institute of Ecology: Austria
 Pablo, Sanchez-Jerez. Unidad de Biología Marina. Dep. Ciencias Ambientales:
 Spain
 Pagès, Francesc. Institut de Ciències del Mar (CSIC): Spain
 palmisani, francesca . ifremer: France
 Pannacciulli, Federica G. ENEA - Marine Environment Research Centre - S.
 Teresa: Italy
 Panov, Vadim. Zoological Institute of the Russian Academy of Sciences: Russia

Panov, Vadim. Zoological Institute, Russian Academy of Sciences: Russia

Pantoja, Javier. General Directorate for Nature Conservation-Ministry of Environment: Spain

Parr, Jon. Marine Biological Association: UK

Parry, Dave. Institute of Marine Studies, University of Plymouth: UK

Pascoal, Antonio . Institute for Systems and Robotics, Lisbon: Portugal

Paskauskas, Ricardas. Institute of Botany, Laboratory of Hydrobotany:

Pedersen, Poul Møller. Botanical Institute, Department of Phycology: Damark

Peréz Botella, Joan. Conselleria Medi Ambient: Spain

PEREZ, Thierry. Centre d'Océanologie de Marseille: France

Perez-Llorens, Jose Lucas. Facultad de Ciencias del Mar y Ambientales/Area de Ecologia: Spain

Perus, Jens. Abo Academi University: Finland

Pestarino, Mario. Università - DIBISAA: Italy

Piatkowski, Uwe. University of Kiel, Institute of Marine Research: Germany

Pietro, Pitruzzello. Corallium: Italy

Pim, van Avesaath. Centre for Estuarine and Marine Ecology/Netherlands Institute of Ecological Research: The Netherlands

Pipitone, Carlo. CNR-IRMA, Laboratorio di Biologia Marina: Italy

Pleijel, Fredrik. Muséum national d'Histoire naturelle, Cuvier: France

Poertner, Hans. Alfred Wegener Institute: Germany

Porteiro, Filipe. Department of Oceanography and Fisheries, University of the Azores: Portugal

Portig, Alex. The Queen's University of Belfast: UK

Potin, Philippe. UMR 1931 CNRS-GOEMAR, Roscoff: France

Prins, Theo. National Institute for Coastal and Marine Management: The Netherlands

Proy, Dominique. DECOS: France

Puddu, Alberto. Water Research Institute - Italian National Research Council, Rome: Italy

Quinteiro, Javier. Universidade de Santiago de Compostela, Facultade de Biología, Depto. Bioquímica e Biología Molecular: Spain

Quintela, Adriano. University of the Azores, Ponta Delgada: Portugal

Quintino, Victor. Universidade de Aveiro, Dep. de Biologia: Portugal

Radziejewska, Teresa. Agricultural University of Szczecin, Dept. Oceanography: Poland

Rafael, Sarda. Centre d'Estudis Avançats de Blanes (CSIC): Spain

Raga, Juan Antonio. University of Valencia: Spain

Ramunas, Zydalis. Institute of Ecology

Relini, Giulio. DIP.TE.RIS. - Genoa University: Italy

Ribariè, Darja. Vivamar-Society for sustainable development of the sea: Slovenia

Ribera, Maria. Universitat de Barcelona, Facultat Farmacia: Spain

Robertson, Don. National Institute of Water and Atmospheric Research Ltd: New Zealand

Rodrigues, Ana Maria de Jesús. Universidade de Aveiro, Dep. Biologia: Portugal

Ros, Joandomènec. Departament d'Ecologia, Universitat de Barcelona: Spain

Rosenberg, Rutger. Marine Ecology: Sweden

Rossi, Loreto. Dept of genetics & molecular biology -ecology area- Roma: Italy

Rowden, Ashley. University of Otago, Department of Marine Science: New Zealand

Rubino, Fernando. C.N.R. ISTTA, Roma: Italy

Rufino, Marta Mega. CMIMA-icm-csic and SOS-university of wales: UK

Ruiz Altaba, Cristian. Conselleria de Medi Ambient, Govern de les Illes Balears (Balearic Islands, Spain): Spain

Rumohr, Heye. Institut fuer Meereskunde Kiel: Germany

Ryland, John S. School of Biological Sciences, University of Wales Swansea: UK

Saenz de Pipaon Sinclair, Javier. Farleigh-Dickinson University: USA

Sagan, Slawomir. Institute of Oceanology PAS: Poland

Sakshaug, Egil. Biological Station, NTNU, Trondheim: Norway

Salud, Deudero. Laboratorio de biologia marina UIB: Spain

Samson, O'Omolo. Kenya Marine and Fisheries Research institute-Research: Kenya

Samyn, Yves. Free University Brussels: Belgium

Sanchez Jerez, Pablo. Marine Biology Laboratory. Univ. Alicante: Spain

Sanchez-Mata, Adoración. Departamento de Ecología y Biología Animal, Universidad de Vigo: Spain

Sandulli, Roberto. University of Bari, Zoology department: Italy

Santangelo, Giovanni. Dep. Ethology, Ecology, Evolution, Pisa: Italy

Santiago, Cerviño. Instituto de Investigaciones Marinas - Marine Resources: Spain

Santos, Paulo. University of Porto, Dep. Zoology: Portugal

Santos, Ricardo. University of the Azores: Department of Oceanography and Fisheries: Portugal

Sarda, Francesc. Institut Ciencies del Mar (CMIMA-CSIC): Spain

Sauriau, Pierre. CREMA (UMR10 CNRS-IFREMER): France

Sbardella, Paolo. Datasiel, Genova: Italy

Scetarcic, Vlatka. NGO "Eleonora": Croatia

Schalk, Peter. ETI Biodiversity Center, Amsterdam: The Netherlands

Schembri, Patrick. Department of Biology, University of Malta: Malta

Schiedek, Doris. Baltic Sea Research Institute Warnemuende: Germany

Schils, Tom. Ghent University, Dept. of Biology, Research Group Phycology: Belgium

Schminke, Horst Kurt. Universitaet Oldenburg: Germany

Schmitz, Fred. The Netherlands

Schrader, Hans. Department of Geology, University of Bergen: Norway

Schubert, Hendrik. EMA-University Greifswald - Biology: Germany

scilipoti, dominique. Centro Oceanologico Mediterraneo - CEOM: Italy

Seferlis, Miltiadis. Greek Biotope/Wetland Centre: Greece

Seifried, Sybille. FB 7, Universität Oldenburg: Germany

Serena, Fabrizio. ARPAT-GEA: Italy

Sergeeva, Nelly. Inst.of Biol. South.Seas, Dep.of Shelf Ecosystems, Sevastopol: Ukraine

Serrao, Ester. Univ. Algarve, CCMAR: Portugal

Seys, Jan. Flanders Marine Institute: Belgium

Shadrin, Nikolai. Institute of Biology of Southern Seas, Marine Ecosystem Functioning, Sevastopol: Ukraine

Sharman, Martin. European Commission Research DG: Belgium

Siakavara, Kaith. MEB/IMBC: Greece

Signoret, Martha. Universidad Autonoma Metropolitana Xochimilco: Mexico

Simonetta, Fraschetti. Department Biological and Environmental Sciences and Technology, Lab. Zoology, Lecce: Italy

siorat, françois. Réserve naturelle sept îles, station LPO, Pleumeur Bodou: France

Skinner, Jamie. IUCN: Spain

Smirnov, Igor S. Zoological Institute of RAS: Russia

Smith, Susan. FISKERIVERKET: Sweden

Soerensen, Lise Lotte. Risoe National Laboratory/Wind Energy

Somerfield, Paul. Plymouth Marine Laboratory: UK

Sosa, Pedro. Dept. Biología. Universidad de Las Palmas de Gran Canaria: Spain

Sousa Pinto, Isabel. University of Porto, CIMAR: Portugal

Spanu, Efsio. SIBM, Galliate L.do: Italy

Spoto, Maurizio. Marine reserve of Miramare, Trieste: Italy

Sprung, Martin.

Stamatakis, Michael. National & Kapodistrian University of Athens, Department of Geology: Greece

Steven, Jenny. Foundation for Research, Science and Technology: New Zealand

Stocks, Karen. Scripps Institution of Oceanography: USA

Strand, Jakob. National Environmental Research Institute: Denmark

Sturm, Michael

Michael. Swiss Academy of Science, Commission for Oceanography and Limnology: Switzerland

Sundback, Kristina. Marine Botany, Botanical Institute, Goteborg: Sweden

Susanto, ABe. University Bremen, Marine Botany: Germany

Svavarsson, Jorundur. Institute of Biology, University of Iceland: Iceland

Tack, Jurgen. Belgian Biodiversity Platform/Instituut voor Natuurbehoud: Belgium

Tallon, Reen. Free University Brussels: Belgium

Tankere-Muller, Sophie. IM: Norway

Taroudakis, Michael. Foundation for Research and Technology-hellas, Crete: Greece

Terlizzi, Antonio. Department Biological and Environmental Sciences and Technology, Lab. Zoology, Lecce: Italy

Terrados, Jorge. Centro de Estudios Avanzados de Blanes: Spain

Thieltges, David. Foundation Alfred-Wegener-Institute - Wadden Sea Station Sylt: Germany

Thingstad, Frede. Univ of Bergen, Department of Microbiology: Norway

Thornley, Vittoria. Bristol University: United Kingdom

T'Jampens, Roeland. VLIZ: Belgium

Todaro, M. Antonio. University of Modena, Dept. Animal Biology: Italy

Todorova, Valentina. Institute of Oceanology: Bulgaria

Tomás, Jesús. Cavanilles Research Institute of Biodiversity and Evolutionary Biology, University of Valencia: Spain

Tomascik, Tomas. Parks Canada Agency: Canada

Trusewich, Bill. New Zealand Ministry of Fisheries: New Zealand

Tuerkay, Michael. Forschungsinstitut Senckenberg: Germany

Tuomisto, Piia. EC, DG RTD, Marine research & Infrastructure, Bruxelles: Belgium

Uiblein, Franz. University of Salzburg: Institute of Zoology: Austria

Umgiesser, Georg. ISDGM-CNR: Italy

Unal, Ebru. Middle East Technical University, Institute of Marine Sciences: Turkey

Vacelet, Jean. Centre d'Océanologie de Marseille: France

Valavanis, Vasilis. Institute of Marine Biology of Crete/Sonar and Marine Information Systems: Greece

Valero, Myriam. Equipe "EGPM", Station Biologique de Roscoff, UPR-CNRS 9042: France

Van Avesaath, pim. Netherlands Institute of Ecology, Centre for Estuarine and Coastal Ecology: Netherlands

van Dalftsen, Jan A. TNO-MEP/Ecological Risk studies: The Netherlands

van der Meulen, Arnoud. EUCC - The Coastal Union

van Duren, Luca Ancel. NIOO-CEMO: Nederland

van Hulzen, Han. Centre for Estuarine and Marine Ecology/Netherlands Institute of Ecological Research: The Netherlands

Van Soest, Rob. ZMA-IBED, University of Amsterdam: The Netherlands

Vanaverbeke, Jan. Ghent University, Marine Biology Section: Belgium

Vanden Berghe, Edward. Flanders Marine Institute: Belgium

Vanderklift, Mat. Department of Botany, University of Western Australia: Australia

Vanreusel, Ann. Ghent University, Marine Biology Section: Belgium

Vecera, Zbynek. Inst. of anal. Chem. Academy of Sciences of Czech Republic, Dpt. Environmental analytical Chemistry: Czech Republic

Viard, Frédérique. Station Biologique de Roscoff: France

Virgilio, Massimiliano. Scienze Ambientali - University of Bologna: Italy

Volckaert, Filip. Katholieke Universiteit Leuven; Laboratory of Aquatic Ecology: Belgium

Voss, Maren. Baltic Sea Research Institute: Germany

Vyverman, Wim. University Gent, Laboratory of Protistology and Aquatic Ecology: Belgium

Waegele, Wolfgang. University Bochum, Faculty of Biology: Germany

Warwick, Richard. Plymouth Marine Laboratory: UK

Warzocha, Jan. Sea Fisheries Institute/Fisheries Oceanography and Marine Ecology Department: Poland

Watt, Allen. Centre for Ecology and Hydrology: UK

Wenne, Roman. Marine Biology Center, Polish Academy of Sciences: Poland

Weslawski, Jan Marcin. Institute of Oceanology Polish Academy of Sciences: Poland

Wesnigk, Johanna. Max Planck Institute for Marine Microbiology:

Widdicombe, Stephen. Plymouth marine laboratory: UK

Wigham, Benjamin. George Deacon Division for Ocean Processes: United Kingdom

Wikström, Sofia. Department of Botany, Stockholm University:

Wilson, James. Zoology Dept, TCD: Ireland

Wiltshire, Karen Helen. Biological Oceanography, Helgoland: Germany

Windhorst, Wilhelm. Ecology Center, Kiel University: Germany

Winterhalter, Boris. Geological Survey of Finland: Finland

Włodarska-Kowalczyk, Maria. Institute of Oceanology PAS: Poland

Wolff, Wim. Groningen University: The Netherlands

Wollenburg, Jutta. Alfred-Wegener-Institute for Polar and Marine Research, Bremerhaven: Germany

Xavier, Joana. Universidade dos Açores, Departamento de Biologia: Portugal

Young, Juliette. CEH: UK

Zableckis, Sarunas. The World Bank: USA

Zapevalin, Alexey. Institute of Biology of the Southern Seas: Ukraine

Zoheir, Sabeur. BMT Marine Information Systems Limited: United Kingdom

Zolotarev, Valentin. Institute of Biology of Southern Seas, Odessa Branch: Ukraine

Zupo, Valerio. Stazione Zoologica "A. Dohrn" - Benthic Ecology Laboratory, Ischia: Italy