Report of the Workshop on Fisheries Management in Marine Protected Areas (WKFMMPA)

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Extended Summary

Two EU Nature Directives have been the driving force for nature conservation and biodiversity protection in the EU: The Birds Directive, hereafter BD, and the Habitats Directive\(^1\), hereafter HD. The purpose of both Directives is to protect biodiversity on land and in the marine environment of the EU and to contribute to the implementation of the 1992 UN Convention on Biological Diversity. With the BD and HD it is obligatory for Member States to designate areas in their national waters to protect threatened and declining species and habitats. The Special Protection Areas (SPAs) of the BD and the Special Areas of Conservation (SACs) of the HD constitute the elements of the European coherent network of protected areas called Natura 2000\(^2\). According to the EU Action Plan on Biodiversity\(^3\), Member States should complete their Natura 2000 site designations by 2008 and the marine network of well managed marine Natura 2000 sites is to be in place by 2012.

In May 2004, Germany as the first EU Member State nominated a comprehensive set of ten marine Natura 2000 sites to the European Commission, covering 31.5 % of its offshore EEZs in the North Sea and Baltic Sea\(^4\). Each EU Member State is responsible for maintaining or, where appropriate restoring habitats and species protected under the Habitats and Birds Directives in marine environments of their EEZ, although the fisheries are regulated under EU Common Fishery Policy\(^5\).

In February 2006, the International Council for the Exploration of the Seas (ICES) in collaboration with the German Federal Agency for Nature Conservation (BiN) started the project “Environmentally Sound Fishery Management in Protected Areas [EM-PAS]\(^6\)” aimed at developing fisheries management plans for the Natura 2000 sites within the German EEZ of the North Sea and Baltic Sea. The EMPAS project serves as a pilot and guidance project for the development of the necessary management plans for Natura 2000 sites in the offshore EU waters.

This report of the third and final workshop in the EMPAS project provides project research results, their conclusions, options for fisheries management and information about their consequences.

The Workshop Terms of Reference (ToRs) were:

\(a\) consolidate all information on position, effort, and fishing activities in and around the Natura 2000 sites, and finalize maps and data tables of this information;

\(b\) review all Conservation Objectives that have been proposed by the German Nature Ministry for each Natura2000 site for clarity and specificity, and if necessary provide operational ecological interpretations of individual objectives;

\(^{1}\) European Commission: The Habitats Directive web-page:

\(^{2}\) European Commission: Natura 2000 in the Marine Environment, Guidelines:

\(^{3}\) European Commission: Biodiversity Communication 2006 & Action Plan:

\(^{4}\) For more information see: http://www.Habitatmare.de

\(^{5}\) European Commission: Intro. fisheries measures for marine Natura 2000 sites:

\(^{6}\) The EMPAS project web-page: http://www.ices.dk/projects/empas.asp
c) based on a) and b), identify all areas where fisheries activities may affect achievement of the Conservation Objectives, and to the extent possible describe and quantify the associated risks;

d) consolidate and report any other information on fisheries operations and goals that may be relevant to fisheries management plans in the Natura 2000 sites, including social and economic information;

e) review socio-economic aspects to be considered in fisheries management plans in the Natura 2000 sites;

f) develop options for managing fisheries in and around the German Natura 2000 sites, including consideration of co-management systems appropriate for management within an ecosystem approach. For each option report on the possible impacts of the management measure(s) on the fisheries, and the likelihood of achievement of the conservation objectives for the site.

Conclusions with regard to ToR a) and d):

The best available fisheries data:

VMS data combined with fisheries information to classify the VMS data – vessel type, gear type, rigging of gear, etc. were considered to be the best data available for exploring options for reducing potential conflicts. Nonetheless these data have several shortcomings, which are summarized:

- The coverage of available VMS data is only for one year (2006) and restricted to vessels >15 meters.
- Most fisheries data have been aggregated to 3x3 or 6x6 mile grids, while Conservation features (habitats and species) relevant to fishing activities are often distributed on smaller scales than 3x3 mile grids.
- Consequently, VMS data are best data available, but must be augmented by expert inputs on finer scale operations than 3x3 mile grids and the spatial pattern of fishing change from year to year (interannual variability).
- Differences between fishing gear types and their environmental impacts need to be known and specified. The fishing gear information should be connected to or included in the VMS. The latter to be able to separate and assess the impacts caused by for example different types of beam trawlers or otter trawlers.
- Fisheries data from smaller vessels (<15 meters) must be taken into consideration. In the offshore MPAs of the North Sea, the fishing effort of smaller vessels is relatively low. In the offshore MPAs of the Baltic Sea the fishing effort of smaller vessels is relatively high.
- The cumulative effects of the fleets of smaller vessels have not been assessed as part of this project but may not be small and need to be taking in to consideration in environmental impact assessments.

In the context of the workshop also fisheries objectives and activities have been discussed, to make best use of an early participation of stakeholders in the EMPAS process:

- Fishing fleets and gears are not distributed randomly, but are concentrated in specific areas.
- Spatial operation of fleets is inherently variable seasonally and between years.
- Fleet operations/technology are always evolving.
- Many TACs have been reduced in recent years so fleets already feel under pressure, with substantial reductions of some fleets already implemented.

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• The knowledge of fisheries about Natura 2000 sites has been substantially increased by the EMPAS project.
• Fisheries objectives include stable incomes, so they are seeking consistent harvests. Therefore the fishing industry is interested in sustainable and ecologically sound fisheries management.
• Any measures will not affect all fleets or individuals equally; there will be some local high impacts.

Conclusions with regard to ToR b):

Conservation Objectives:
• “Letters of the law” matters. Legal details, i.e. definitions of the legal texts, guidance given by the EU Commission, and decisions of the European Court of Justice, provide the baseline and the framework for the development of the conservation objectives for Natura 2000 sites. In some cases legal interpretation can override a biological interpretation for conservation decisions, in case the biological interpretation does not fit to the letter of the law.
• The German nature conservation agency (BfN) has responsibility and authority to define “favourable conservation status” (FCS) for species and habitats, within the framework mentioned above. This was accepted as a basis for further discussion.
• The group has sufficient information for the third workshop WKFMMPA to develop scenarios to make Natura 2000 MPAs operate effectively within the legal framework, where “operate effectively” means FCS can be achieved for each species or habitat.
• The group discussed and gave information on situations when a MPA cannot contribute effectively to FCS for a species or habitat without measures also being taken outside the MPA, or when effective management measures are not dependent on provisions of a MPA. However, the group concentrated on recommendations for Natura 2000 MPAs as their given terms of reference.

Conclusions with regard to ToR c):

Past ICES advice:
• ICES has already developed expert advice on for example:
  – Impacts of bottom trawl gears on benthic communities and habitats
  – Effectiveness/consequences of “pingers”
  – Strategies for identifying threats most in need of management intervention
  – Useful habitat and population status indicators
  – Appropriate buffer sizes around features being protected
• Past advice are the basis for discussion and conclusions in this case
• Non-fishery threats/risks are considered, but WKFMMPA has no mandate to consider specific measures for them.

Impacts of bottom trawl on benthic communities:
• A shift of the r/K-species ratio of communities towards a higher abundance of K-selected species can be an indicator that the conservation status of a marine habitat is improving.
• Current fishing effort with bottom contacting gear will not allow favourable conservation status to be achieved for sandbanks and reefs in Natura 2000 sites in the German EEZ of the North Sea (Sylter Outer Reef, Borkum Reefground, Doggerbank), where FCS characterized by a positive development of K-selected species.
• The ratio of r/K-species in an undisturbed community of sandbanks and reefs in the German North Sea is unknown, but the present fishing intensity has driven the benthic communities towards a dominance of r-selected species.
• The physical integrity of reefs in the SCI Sylter Outer reef is threatened by beam trawls equipped with extra heavy gear.
• Reef habitats are more vulnerable to the impact of bottom trawls than sandbanks. Nevertheless, the conservation target to reach a favourable conservation status is also impeded on sandbanks in the German EEZ, as the mortality of K-selected species by bottom trawl activity is too high.
• Impacts of bottom trawls on r- and K-selected typical species of marine habitats were estimated based on trawl paths, and not on total distribution of populations.

The results from modelling of trawling impacts on benthic populations were:
- The first trawling event has the greatest impact on a benthic community; measured as changes in standing stock with no density dependence in production;
- The next two trawling events also have a large impact;
- After about ~5 tows per year impacts of bottom trawling have nearly reached an asymptotically maximum mortality rate.

Therefore, it was concluded, that reducing trawling intensity in low impacted areas to zero gives the greatest conservation benefits for the benthic communities, and produce low costs for the fishing industry; whereas in areas of more than eight trawl events per year a reduction of for example 50% will not improve the conservation status of the benthic communities significantly, but may result in high costs for the fishing industry.

Impact of static gears on seabirds / Harbour porpoises:
Seabirds:
• A major conflict between conservation targets and fishing activities in the Baltic Sea is the bycatch of seabirds in set nets (mainly bottom set gill nets)
• Highest bycatch rates occur in areas where fishing grounds and feeding areas of seabirds spatially and temporally overlap.
• The highest conflict in the German EEZ of the Baltic Sea was identified in the SPA Pomeranian Bay.
• Especially high is the overlap between set net fisheries and seabird concentrations in the northern part of the SPA (Adler Ground area) during winter and in the Odra Bank area in late spring/early summer. Nevertheless due to the high concentration of relevant seabirds year round, any fishing activities with set net around the year will lead to conflicts according to the objectives of the Bird Directive in the SPA Pomeranian Bay.
• SPAs have been designated in 2004 in areas of highest concentration of seabirds.
• Areas lacking records of conflict in the MPAs are the result of no or low fishing effort, likely in response to designation of the SPAs, and not a consequence of low numbers of birds.
• Important concentrations of seabird exist also outside of the MPAs, and these are not protected by the MPAs.
Harbour porpoises:
• The bycatch of harbour porpoises is of great concern, regarding the obligations of the EU Habitat Directive. Harbour porpoise populations in German waters have all been assessed to be in an unfavourable conservation status. Therefore any human-induced mortality must be considered as a strong negative impact on the population.
• The harbour porpoise population in the Central Baltic Sea occurring east of Darss and Limhamn Ridge up to Finland is in an especially critical status with an estimate of fewer than 600 individuals, so even low bycatch is a serious threat.
• The population of the harbour porpoises in the western Baltic Sea is also in an unfavourable conservation status and increased dead stranding numbers in recent years indicate a high proportion of bycaught animals.
• In the North Sea analysis revealed an overlap of set net fishery and harbour porpoise distribution in summer (May-July), partly in the area of the SCI Sylt Outer Reef.
• The SCI Sylt Outer Reef has been found an especially important feeding ground and reproduction site for harbour porpoises and features highest porpoise densities in European waters during late spring and summer. Set net fisheries are associated with especially high bycatch risk in that area and should be considered with concern.

Annex II fish species:
In the German EEZ of the North and Baltic Sea no specific concentration areas of populations of Annex II fish species have been identified so far. This is largely attributed to the fact that most current Annex II fish species are rare or extirpated anadromous fish species, which migrate into the rivers for spawning and concentrate in the rivers themselves and in the estuaries. However, all Annex II fish species occurring in Natura 2000 MPAs are protected and in a bad conservation status; some species are close to or already extirpated. Therefore any anthropogenic caused mortality e.g. bycatch in the commercial fisheries especially inside the protected areas has to be avoided.

Conclusions with regard to ToR e):
ICES has traditionally not provided advice on social and economic aspects of management options. Also the WKFMMPA workshop did not attract experts with experience in socio-economic analyses, to undertake such evaluations during our meeting. Participants took full note that many management options will have consequences for the economics of individual fishers as well as fleets, and for employment opportunities in the fisheries. The workshop noted further that analyses of these consequences should be a component of the processes which follow on from this workshop. Results of such analyses may be very helpful in informing dialogue and consultation on the feasibility of the various options identified on ecological grounds at this workshop.

Development of options for managing fisheries ToR f):
Development of options for managing fisheries in cases of identified conflicts between fishing activities and nature conservation objectives/targets was the main goal for the workshop. In the EMPAS project process three main conflicting areas in the Natura 2000 sites had been identified:
f-1) Destructive impacts on Habitats Directive features, i.e. the reef and sandbank benthic habitats and on typical species by bottom contacting fishing gear in the North Sea.

f-2) Bycatch of protected seabirds in static gears, especially bottom set gill-nets in the Baltic Sea.

f-3) Bycatch of the protected harbour porpoise in static gears, mainly bottom set gill-nets in the North Sea and Baltic Sea.

**Conclusions from discussions and management options with regard to f-1:**

**Protecting the HD Annex I habitat ‘reefs’**

- Typical species of reef habitats are suggested to be more vulnerable to the impact of bottom trawls than those of sandbanks. Additionally heavy bottom trawls have the capacity to disintegrate the physical structure of reefs in the North Sea.

- The impacts of the first and the second passes of a bottom trawl exert the most severe effect on benthic communities and species. This suggests that the reef areas with the highest potential to recover soonest to favourable conservation status are those areas with low bottom trawling activity.

- For protected reefs in areas of high bottom trawling intensity complete closure may be additionally necessary to restore habitats and species to favourable conservation status. However, such closures may have high economic costs for the existing fisheries.

- Closures of ecological important and regularly less fished areas within the Natura 2000 sites in the North Sea are the most efficient fisheries management measures to improve the conservation status of the HD Annex I habitat ‘reefs’. Closures of these areas would result in low costs for the fishing industry and low risk of displacing fishing effort to ecological sensitive areas outside the closures.

**Protecting the HD Annex I habitat ‘sandbanks’**

- In contrast to reefs, the physical integrity of sand banks is not challenged by bottom trawling activities but the ecological integrity may be impacted.

- Management measures to improve the conservation status of the HD Annex I habitat ‘sandbanks’ with low costs for the fishing industry are considerably more difficult to identify, as most sand banks are important fishing grounds. Additionally, hardly any not-fished sand bank exists in the North Sea and therefore scientific evidence for the ecological status and the impact of fishing on this habitat is very hard to obtain. The ecological impact of lighter gears such as used by the shrimp fisheries on benthic communities is unclear.

- Bottom trawling and especially large and heavy rigged beam trawling will increase total mortality on the benthic community. It is very likely that trawling will shift the species composition away from a mature community with lots of K-selected species towards a community with more r-selected species and fewer K-selected species. Nobody knows what a “climax sand bank community” would look like and at present we do not know how far from it we are right now. Therefore at present we do not know if there are enough sand bank areas with sand bank communities in favorable condition, but as noted in the previous bullet, there are doubts that any unimpacted sandbank communities exist.
• The impact of beam trawl activities targeting brown shrimps on sand banks and characteristic species was a controversial topic in the subgroup. Nevertheless, it was concluded that favourable conservation status of benthic communities of sand banks may be in general incompatible with bottom trawling, regardless of type of beam trawl and target species, because the mortality of K-selected species by bottom trawl activity probably is too high. As a step towards a solution [note – an experimental closure cannot be a solution - only a way to get information to find a solution] experimental closures of ecological representative areas of sandbanks sufficiently large enough to demonstrate effects of such closures are recommended as a management option and should be implemented as a research tool. The closures should be sufficient large and be kept in place for an adequate time to be able to produce scientific results.

Natura 2000 site Sylter Outer Reef

• With the current intensity of bottom trawling activity in some areas of this site, the target to achieve a favourable conservation status cannot be realized. A potential management option to achieve a favourable conservation status of the habitat type reef and the associated typical K-selected species is the exclusion of all types of bottom trawls in the less trawled reef areas. The closure of reef areas in the southwest and in the north of the site Sylter Outer Reef was recommended. These areas are of especially high ecological importance and the current fishing intensity with bottom contacting gears is relatively low.

• The main fishery on sandbanks (e.g. Amrum Bank) in the western part of the site Sylter Outer Reef is beam trawling targeting brown shrimps. Even though this fishery causes a decline of K-selected species, the level of impact is not clear. Therefore the workshop recommended experimental closures of sufficient size and duration to assess the impact of brown shrimp fisheries on K-selected benthic species.

Natura 2000 site Borkum Reef Ground

• In the site Borkum Reef Ground, reefs and sandbanks form complex systems of habitat types of high ecological value. Except for some otter trawling activities in the southern parts, the central reef complexes formed of boulders seem to be avoided by beam trawlers. The workshop recommended the exclusion of all types of bottom trawls in a portion the MPA which is build of biotope complexes of sandbanks and reefs.

Natura 2000 site Doggerbank

• The Doggerbank as a sandbank has high ecological importance because of its unique oceanography, biological productivity and ecological characteristics. It is also an important fishing ground. Bottom trawling has negative impact on the conservation status of the benthic community. Because of conflicting interests between nature conservation and fishing and the lack of evidence for conservation benefits due to the historical extent of impact, no concrete management measures for the Doggerbank was recommend. The introduction and mandatory use of alternative fishing gear (e.g. pulse trawl) and experimental closures were discussed with the aim of reducing the mortality of benthic K-selected species.
Conclusions from discussions and management options with regard to f-2 and f-3:

- The SPA Pomeranian Bay covers areas of ecological importance for resting, over wintering and moulting bird species, including several species listed on Annex I of the BD. Any “deliberate killing” of birds is forbidden, including mortality due to bycatch in set net fishery. Because of the high concentration of protected seabirds within the SPA, the highest conflicts were identified in the SPA Pomeranian Bay Because of the high concentration of protected seabirds in the SPA Pomeranian Bay. Any set net fishing activities throughout the year are conflicting with the BD. Even a reallocation of fishing effort to outside the area would result in a net benefit for the population status of seabirds. Highest bycatch rates occur in areas with spatially and temporally overlap between fishing grounds and feeding areas of seabirds. The overlaps between set net fisheries in the northern part of the SPA (Adler Ground area) during winter and in the Odra Bank area in late spring/early summer are especially high.

- The fishers representatives pointed out that this kind of measure would have significant socio-economic effects on the fishing industry. Alternative management measures could include a temporal closure for set net fisheries in the Adler Ground area in periods of high bird concentrations (November- April), when conflicts are greatest. This measure would have lower socio-economic effects, but the conservation objectives for the SPA would not be met ultimately as bycatch in large parts of the SPA (Odra Bank) would continue. Another management option is the use of alternative, ecologically sound gears (e.g. fish traps), which would reduce the bycatch of seabirds close to zero. The socio-economic effects regarding, for example, reduced catch efficiency and investment cost should be further evaluated. A management option to regulate the fishing effort of set nets by a maximum allowable bycatch mortality of seabirds is not suitable because of the problems related to control and compliance and because the BD does not allow any “deliberate killing”.

- The Harbour porpoise is a protected species according to the HD, Annexes II and IV. Bycatch mortality is a major threat to harbour porpoises in German waters. The conservation status of all harbour porpoise populations in German waters has been assessed to be in an unfavourable conservation status. Therefore any unnatural mortality must be considered to be a threat to these populations of the species.

- Two separate harbour porpoise populations are distinguished in the German Baltic Sea – the western Baltic Sea population and the Central Baltic population. The population of the Central Baltic, occurring east of Darss and Limhamn Ridge is seriously reduced in population size and the population has recently been estimated to less than 600 individuals. Even bycatch of a single individual of this population is considered to be a threat to the viability of this population.

- The workshop also expressed concern for the western Baltic Sea population of the harbour porpoise, which is assessed as being in an unfavourable conservation status. Increased numbers of “dead stranding” in recent years indicate high bycatch mortality.

- In the North Sea there is an overlap between set net fishery locations and harbour porpoise distribution in Sylter Outer Reef area. This area is an important feeding ground and reproduction area for harbour porpoise. The risk
of bycatch is high especially in set net fisheries and the bycatch mortality will increase should the set net fishery increase.

For the Baltic Sea marine protected areas the group identified a range of management options but did not attempt to or agree on any ranking among them. Rather, each has different likelihoods and expected timetables for achieving conservation objectives, and different social and economic costs for their implementation. The science workshop report clarifies those differences to the fullest extent that the information allows, but it is a policy choice, not a science issue to choose among the options. The planning process which establishes the Management Plans for the MPAs can use the information in this report to inform discussion during consultations with stakeholders, and with the competent (in the governance sense) Management Authority making the final policy choice among the options.

**Options for seabird protection:**

- Full spatial year-round exclusion of static gear from the SPA Pomeranian Bay.
- Temporal closures for static gear in the part of the SPA Pomeranian Bay, with the highest conflicts between set net fisheries and seabirds, e.g. from November to April.
- Use of alternative fishing gears, such as fish traps.
- Regulation of total fishing effort by bottom set gill-net gear in order to limit bycatch to less than 1% of the site specific numbers of every bird species. The effort limits may differ seasonally and spatially, and according to gear type.
- A monitoring scheme for the fishery should be implemented in the area as a supportive measure. An effective monitoring scheme for the fishery should be implemented in the SPA Pomeranian Bay to get a better data background about the spatial and temporal distribution of fishing effort, soak time, gear type, mesh size and bycatch mortality rates.
- Environmental Impact Assessment (EIA) before introducing new fisheries methods/gears including consideration, assessment and regulation of fisheries that are extending the effort spatially or temporarily in the area in the future.

**Options for harbour porpoise protection:**

It should be noted, that the terms of reference for the ICES workshop WKFMMPA stipulate the members to concentrate on management options in and around the German Natura 2000 sites within the German EEZ. As a consequence, measurement options for the Harbour porpoise population in the Central Baltic Sea have been discussed during WKFMMPA, and they are presented here for information purposes only and not as recommendations agreed upon by WKFMMPA.
Central Baltic population (Baltic Proper population):
- Urgent phasing out of the use of set nets by 2010.
- Mandatory use of acoustic deterrent devices (pingers) on all gill-nets nets and all vessel sizes. This measure has to be accompanied by an effective observer scheme to control its effectiveness.
- Modified gear (e.g. set nets marked with barium sulphate to enhance the perception for porpoise) or alternative gear, as fish traps and/or long lines.

Western Baltic population:
- Closure of the Fehmarn Belt area for gill-net fisheries during the abundance peak of harbour porpoises.

North Sea population:
- Immediate closure of set nets in the Sylt Outer Reef which has been identified as an especially important feeding and reproduction ground for harbour porpoises and features one of the highest porpoise densities in European waters during late spring and summer. Set net fisheries are associated with especially high bycatch risk in that area. The use of pingers in this site (different to Baltic conditions) would not be an option as pingers can also disturb harbour porpoises and could lead to habitat exclusion in an area, which is the most important reproduction area for harbour porpoises at least in Germany.

Additional general conclusions:
General protection measures should be implemented to protect vulnerable habitats and species even for sites where currently no conflicts exist.

E.g. currently, the reefs in the German Baltic Sea are not trawled and a relevant bottom trawl management plan is not necessary at present. It is recommended that before bottom trawl fishing may be allowed on presently undisturbed habitats an environmental impact assessment according to the HD should be conducted.

MPAs need monitoring programmes including pre-agreed response actions to allow rapid response when monitoring results detect new threatening activities.

There is a need to get scientific data and information on the environmental impact of brown shrimp (Crangon crangon) fisheries in the North Sea.

Monitoring schemes to analyze bycatch rates of marine mammals, seabirds and other protected species are needed. Additionally, fishing effort data and information on finer scales on soak time of gill-nets and length of nets are needed especially for smaller vessels below 15 m. The latter information is needed in order to be able to calculate actual mortality rates of harbour porpoise and seabirds in an area.

Fisheries management is not the only measure required to reach FCS in the German Natura 2000 MPAs as additional activities are conducted within the site, i.e. wind power parks and other energy projects, oil and mineral prospection and exploitation, geological survey, maritime traffic, military activities, ecotourism, etc, and any of these activities has the potential to impact species and habitats. These impacts have not been addressed in the EMPAS project and in this report.
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1 Opening of the meeting

The Chair, Jake Rice, opened the meeting and welcomed the participants. Supporting Secretary Vivian Piil and EMPAS Project Coordinator Søren Anker Pedersen gave a short introduction to the meeting, its participation (Annex 1), and the workshop Agenda (Annex 2).

Jake Rice explained that most of the presentations were planned for the first workshop day, providing a common ground for participants to address the issues of fisheries management in the German Natura 2000 marine protected areas. This workshop is the final workshop in the EMPAS project and our aim is to present our conclusions, providing options for management and information about their consequences. The remit of the workshop is to provide background and advice; decision-making lies in the hands of the German Government. Our role is therefore to provide information on available options and on the consequences of these options, both for the fishing industries which have historically operated within the areas and for the ability of the various options to achieve the conservation objectives of the Natura 2000 sites.

Our primary questions are therefore:

- what are the objectives for the conservation areas?
- what are the objectives for the fishing industry? – and
- what are the options which enable us to make the most progress towards the whole complexity of objectives?

Over the past 24 months since the first workshop two years ago things have changed so much that the final workshop can attract almost forty people from about a dozen countries. Today it is no longer a matter of whether spatially based conservation tools should be applied – they clearly are – it is a matter of how to use them to best effect. Naturally conservation is a primary issue, but at the same time we need also to accommodate as much fisheries as possible, not just to provide jobs but also to consider another issue which is now becoming part of the discussions, i.e. the issue of food security. The world is becoming aware that fish is one of the major sources of protein in the world and one of the few sources whose contribution might be increased if managed wisely. This meeting is therefore a really good opportunity to set up a model that not only Europe but also the rest world can learn from. Hence, we have a pretty exciting three days ahead of us. As mentioned most of the presentations are scheduled today so that all the information and all the different perspectives are tabled before discussion groups have been formed. Once all the information is there let us see what we can do to meet the very different objectives as wisely and clearly as possible.

1.1 Workshop participants, sub-group chairs and rapporteurs

The workshop participants were scientists from ICES Member countries nominated by their national ICES delegates; scientific experts in fisheries, fish, seabird, marine mammal, and benthic ecology; experts in nature conservation; fishers representatives; government representatives; and WWF representatives (Annex 1). In accordance to the ICES rules several of the participants were invited as observers. All participants are encouraged to speak freely because in the discussions everyone’s views are welcomed and important. If participants in the final conclusions are having real difficulties coming to agreement the Chair has to look at the ICES formal rules for decision making. At the past two EMPAS workshops the latter was not necessary.
Prior to the meeting Stuart Rogers, Christian von Dorrien, Thomas Kirk Sørensen, and Jan Geert Hiddink had accepted to chair sub-groups. Odette Paramor, Anne Sell, Jim Reid, Ursula Siebert accepted to assist the Chairs in drafting reports from the sub-group meetings. Workshop presenters were asked to give their presentations again in the sub-groups to clarify questions and stimulate discussions.

1.2 Terms of Reference

The specific Terms of Reference (ToR) were as follows:

2007/2/MHC11 The Workshop on Fisheries Management in Marine Protected Areas [WKFMMPA] (Chair: Jake Rice, Canada) will meet at the ICES Headquarters in Copenhagen, Denmark, from 2–4 June 2008 to:

   a) consolidate all information on position, effort, and fishing activities in and around the Natura 2000 sites, and finalize maps and data tables of this information;

   b) review all Conservation Objectives that have been proposed by the German Nature Ministry for each Natura2000 site for clarity and specificity, and if necessary provide operational ecological interpretations of individual objectives;

   c) based on a) and b), identify all areas where fisheries activities may affect achievement of the Conservation Objectives, and to the extent possible describe and quantify the associated risks;

   d) consolidate and report any other information on fisheries operations and goals that may be relevant to fisheries management plans in the Natura 2000 sites, including social and economic information;

   e) review socio-economic aspects to be considered in fisheries management plans in the Natura 2000 sites;

   f) develop options for managing fisheries in and around the German Natura 2000 sites, including consideration of co-management systems appropriate for management within an ecosystem approach. For each option report on the possible impacts of the management measure(s) on the fisheries, and the likelihood of achievement of the conservation objectives for the site.

WKFMMPA will report by 15 August 2008 for the attention of an ICES review group.
Supporting Information

| PRIORITY: | High as an advisory request from the German government |
| SCIENTIFIC JUSTIFICATION AND RELATION TO ACTION PLAN: | Action Plan No: 2.2, 2.3, 2.11, 2.13, 3.2, 3.3, 5.2, 5.3  
Back to back meeting with WGECO has been highly appropriate to facilitate the progress and success of the workshop. This was not an option for 2008, however, WGECO will consider relevant questions that may arise in preparing 2008 WKFMPMA. ToRs e) and f) in particular should build upon existing work in ICES, particularly ACOM and WGECO, and the Guidelines for Implementation of the European Marine Strategy (CRR #273). |
| RESOURCE REQUIREMENTS: | There are ongoing research programmes in the North Sea and in the Baltic which may provide input to this group. The additional resource required to undertake additional activities in the framework of this group is negligible. |
| PARTICIPANTS: | The Group will be attended by German scientists and by participants from EU member states bordering the German EEZ, such as UK, The Netherlands, Denmark, Sweden, Poland, and other ICES member states that are able to contribute with their experience in similar or related cases. Participation of representatives for fishers and the fishing industry is important. |
| SECRETARIAT FACILITIES: | Meeting facilities as appropriate |
| FINANCIAL: | Costs including travel and per diem will be covered by a project sponsored by the German Federal Agency for Nature conservation, INA Vilm, Germany. |
| LINKAGES TO ADVISORY COMMITTEES: | ACOM, ACOM |
| LINKAGES TO OTHER COMMITTEES OR GROUPS: | There is a very close working relationship with the groups of the Fisheries Technology Committee. It also is of close relevance to the Working Group on Ecosystem Effects of Fisheries, and to the Living Resources Committee and the Resource Management Committee. |
| LINKAGES TO OTHER ORGANISATIONS: | none |

2 The EMPAS project and adoption of the agenda

The EMPAS project coordinator, Søren Anker Pedersen, presented the EMPAS project background, the work plan, and the work carried out prior to the third and final workshop in the EMPAS project.

In May 2004, Germany as the first EU Member State nominated a comprehensive set of ten marine Natura 2000 sites to the European Commission, covering 31.5 % of its offshore EEZs in the North Sea and Baltic Sea (Figure 2.1). In February 2006, the International Council for the Exploration of the Seas (ICES) in collaboration with the German Federal Agency for Nature Conservation (BiN) started the project “Environmentally Sound Fishery Management in Protected Areas [EMPAS]” aimed at developing fisheries management plans for the Natura 2000 sites within the German EEZ of the North Sea and Baltic Sea. The EMPAS project runs for three years and includes international workshops carried out in 2006, 2007, and 2008. (Reports and information at the EMPAS web-page: http://www.ices.dk/projects/empas.asp).
One of the main targets of the EMPAS project is conflict analysis between ongoing fishing activities and conservation targets in the marine Natura 2000 sites designated in the German EEZ. To fulfil this task fundamental data and information are required: a) habitat and species specific distribution data and conservation objectives for each site, b) fine scale and disaggregated spatial and temporal data describing fleet activity throughout the German EEZ, and c) impact of fishing activities on habitats and species in Natura 2000 sites.

For each of the ten designated German Natura 2000 sites these data and information will allow the following questions to be answered by the EMPAS project:

a) to what extent do specific fishing activities represent a significant threat against reaching the conservation objectives of the Natura 2000 sites?

b) for identified conflicts between fisheries and the conservation goals, which management measures would reduce these conflicts to acceptable levels?

The answers will be based on existing data from fisheries and environmental research and, where appropriate, newly collected data, in particular from cooperation with fishers and the fishing industry.

A detailed work plan to improve the availability of data and information for the final EMPAS workshop is presented in the EMPAS interim report 2007 (ICES, 2008a). The EMPAS work plan and time table for 2008:

1) A technical data analysing meeting held in ICES, 26-27 February (ICES, 2008b).

2) A BfN workshop entitled: “Effects of bottom trawling on typical species of sandbanks and reefs in the German EEZ of the North Sea”, to be held at Isle of Vilm 9-11 April (Annex 3).

3) A BfN workshop entitled: “Impact assessment of fisheries on marine mammals and seabirds in Natura 2000 sites within the German EEZ of the North and Baltic Seas”, to be held at Isle of Vilm 5-9 May (Annex 4).

4) The final WKFMMPA workshop in ICES, 2-4 June (This workshop).

5) A peer review of WKFMMPA reports and plans/advices for fisheries management.
6) A final EMPAS project report including the results of the EMPAS workshops and the peer review and advices to be submitted to German Federal Environment Ministry (the client).

The ICES meeting (1) and the two BfN workshops (2) and (3) have been planned in order to produce, collect, and forward scientific results of mainly ongoing German research projects to the final WKFMMPA workshop, 2–4 June 2008.

After the presentation, workshop participants were asked if there were any questions or need for clarifications about the EMPAS project and the work plan. There were no questions or requests for clarification and the agenda was agreed unanimously. The agenda is attached at Annex 2.

3 Information on fishing activities, socio-economics, and goals relevant to fisheries management plans in the Natura 2000 sites (ToR a and d)

3.1 Brief description of the major fisheries in the areas

Prior to the workshop all participants had received a working document entitled “Spatial data: a high resolution description of the fisheries in the German EEZ of the North Sea and the Baltic Sea in 2006” (Pedersen, 2008). The following short description of the major fisheries is from this working document.

3.1.1 North Sea

In the offshore areas of the German North Sea the landings by weight are dominated by the catches of Danish, Dutch, and UK vessels, whereas the landings from German and Belgian vessels are of less importance (ICES, 2007a). Inside the 12-nm zone the fishery is dominated by German and Dutch vessels targeting common shrimp (ICES, 2006). The fishery for sandeel and sprat (industrial fishery) is dominated by Danish vessels although Swedish and German vessels also take small parts. The gear types used in the German North Sea are mainly otter trawls, and large beam trawls, whereas landings from small beam trawls, gill-nets, demersal seines, and pelagic trawls are of minor importance. The most important target fish species (by weight) in 2006 are sandeel, sprat, plaice, herring, dab, common sole, cod, mackerel, turbot, whiting, and horse mackerel (Table 3.1.1). Of shellfish common shrimp, crabs, and whelks are important (Table 3.1.1). The catches by gear-type in 2006 are given in Table 3.1.2.

3.1.1.1 Natura 2000 site Doggerbank (ICES rectangles 40F3, 40F4, 39F4)

The international fisheries in and around SCI Doggerbank, 2000–2004, are conducted by vessels from Belgium, Denmark, Germany, Netherlands, Sweden, and UK (ICES, 2007a). **Mixed fisheries:** By weight (tonnes) the largest fisheries in this area is a mixed fishery targeting plaice, dab, turbot, cod, and other demersal species with beam trawls. This fishery is mainly conducted by large beam trawlers from UK and the Netherlands. The second largest fishery is mixed bottom trawl (otter trawl) fishery conducted by Danish, UK, and Dutch vessels. Finally there is mixed fisheries with demersal seines and gill-nets conducted by Danish vessel. The mixed fisheries with beam and bottom trawl are conducted in all four quarters, however, with smallest landings (effort) in the 1st quarter. The Danish mixed fisheries with demersal seines and gill-nets are mainly conducted in the 2nd and 3rd quarters. **Sandeel and sprat fisheries:** By weight (tonnes) the largest fishery in the area is a Danish and Swedish fishery with small meshed bottom trawl (<16 mm) targeting sandeel and sprat. The
Danish fisheries for sandeel and sprat are mainly conducted in the 2nd and 3rd quarters.

Table 3.1.1. Reported catches in tonnes by species and reporting country in the German EEZ of the North Sea in 2006. The catch data has been provided to ICES by the national fisheries research institutes of Denmark, Germany, Netherlands, Sweden, UK, and Belgium. (From Pedersen, 2008).

<table>
<thead>
<tr>
<th>SPECIES/COUNTRY</th>
<th>BELGIUM</th>
<th>DENMARK</th>
<th>GERMANY</th>
<th>NETHERLANDS</th>
<th>SWEDEN</th>
<th>UK</th>
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<td>2</td>
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Table 3.1.2. Reported catches in tonnes by species and fishing techniques (gear type) used by the international fisheries in the German EEZ of the North Sea in 2006. The catch data has been provided to ICES by the national fisheries research institutes of Denmark, Germany, Netherlands, Sweden, UK, and Belgium. (From Pedersen, 2008).

<table>
<thead>
<tr>
<th>Species</th>
<th>Demersal</th>
<th>Dredge</th>
<th>Gillnet</th>
<th>Large Beam Trawl</th>
<th>Otter Trawl</th>
<th>Pelagic Trawl</th>
<th>Small Beam Trawl</th>
<th>Longline</th>
<th>Pots</th>
<th>Trammel</th>
<th>Unknown</th>
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<tr>
<td>Anchovy</td>
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<td>Cockle</td>
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Total 839 1443 621 14605 77952 218 21734 2 763 379 51 118580

3.1.1.2 *Natura 2000* sites *Sylt Outer Reef* and *Eastern German Bight SPA* (ICES rectangles 38F6, 38F7, 39F7)

The international fisheries in and around SCI *Sylt Outer Reef* and *SPA, Eastern German Bight* 2000–2004, are conducted by vessels from Belgium, Denmark, Germany, Neth-
erlands, and UK (ICES, 2007a). **Mixed fisheries:** The dominating fisheries are mixed fisheries with beam trawl (both large and small beam trawlers) and bottom trawl. The beam trawl fisheries are mainly conducted by vessels from the Netherlands and UK, but German and Belgium vessels are also taking part in these fisheries. The bottom trawl fisheries are conducted mainly by Danish and German vessels. There are relatively small fisheries with demersal seiners and gill-nets conducted by Danish vessel. The fisheries with beam and bottom trawl are conducted in all four quarters of the year. The Danish fisheries with demersal seiners and gill-nets are also conducted in all four quarters. **Sandeel and sprat fisheries:** By weight (tonnes) the largest fishery in the area is a Danish fishery with small meshed bottom trawl (<16 mm) targeting sandeel and sprat. The Danish sandeel and sprat fishery is mainly conducted in the 2nd and 3rd quarters, but also in the 4th quarter.

### 3.1.1.3 Natura 2000 site Borkum Reef (ICES rectangles 36F6)

The international fisheries in and around SCI Borkum Reef, 2000-2004, are conducted by vessels from Belgium, Denmark, Germany, Netherlands, and UK (ICES, 2007a). **Mixed fisheries:** The dominating fisheries are mixed fisheries with beam trawl (both large and small beam trawlers) and bottom trawl. The beam trawl fisheries are mainly conducted by vessels from Germany and the Netherlands. The bottom trawl fisheries are conducted mainly by Danish vessels. There are smaller fisheries with demersal seiners and gill-nets conducted by Dutch and Danish vessels. The fisheries with beam and bottom trawl are conducted in all four quarters, but mainly in the 3rd quarter. The small Danish and Dutch fisheries with gill-nets and demersal seiners are also conducted in the 2nd and 3rd quarters. **Sandeel and sprat fisheries:** By weight (tonnes) the far largest fishery in the area is a Danish fishery with small meshed bottom trawl (<16 mm) targeting sandeel and sprat. The Danish sandeel and sprat fishery is mainly conducted in the 2nd quarter.

### 3.1.2 Baltic Sea

In the Baltic Sea the landings by weight are dominated by German, Danish, and Swedish vessels (Table 3.1.3). The dominating fish species landed are herring, cod, and sprat, mainly fished during 1st and 4th quarter of the year. The landings are mainly taken by otter trawl, pelagic trawl, and gill-nets, whereas seines, pots, long-lines, and trammel are less important (Table 3.1.4).

### 3.1.2.1 Natura 2000 site Fehmarn Belt (ICES rectangles 38G0, 38G1)

The international fisheries in and around SCI Fehmarn Belt, 2000-2004, are conducted by vessels from Denmark and Germany (ICES, 2007a). **Cod, herring, and flatfish fisheries:** The dominating fisheries are fisheries with bottom trawl targeting cod. There are smaller cod fisheries with gill-nets and demersal seiners. The bottom trawl and gill-net fisheries are conducted in all four quarters, but mainly in the 1st and 4th quarters. **Sprat fishery:** There is a relative small fishery with small meshed bottom trawl (16–31 mm, 32–54 mm) targeting sprat by German and Danish vessels. Sprat fishing is occurring during all four quarters.

### 3.1.2.2 Natura 2000 site Kadet Trench (ICES rectangles 37G2, 38G2)

The international fisheries in and around SCI Kadet Trench, 2000-2004, are conducted by vessels from Denmark, Germany, and Sweden (ICES, 2007a). **Cod, herring, and flatfish fisheries:** The dominating fisheries are fisheries with bottom trawl and pelagic trawl targeting cod or herring. There are smaller cod fisheries with demersal seine and gill-nets. The pelagic herring fisheries are conducted by German and
Swedish vessels. The cod and herring fisheries are conducted mainly in 1st and 4th quarter and to a lesser extent in the 2nd and 3rd quarter. **Sprat fishery:** There is a relative small sprat fishery conducted with mainly bottom trawl (mesh size 32–54 mm) by Danish vessels, but also a sprat fishery with pelagic trawl (mesh size 32–54 mm) by Swedish vessels. The sprat fishery is mainly conducted in the 2nd quarter.

Table 3.1.3. Reported catches in tonnes by species and reporting country in the German EEZ of the Baltic Sea in 2006. The catch data has been provided to ICES by the national fisheries research institutes of Denmark, Germany, Sweden, Poland, and Latvia. (From Pedersen, 2008).

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<th>Sweden</th>
<th>Latvia</th>
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Table 3.1.4. Reported catches in tonnes by species and fishing techniques (gear type) used by the international fisheries in the German EEZ of the Baltic Sea in 2006. The catch data has been provided to ICES by the national fisheries research institutes of Denmark, Germany, Sweden, Poland, and Latvia. (From Pedersen, 2008).

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3.1.2.3 Natura 2000 sites Western Rønne Bank, Adler Ground, Pommeranian Bay with Odra Bank, and Pommeranian Bay SPA (ICES rectangles 38G4, 37G4)

The international fisheries in and around SCI Western Rønne Bank, Adler Ground, Pommeranian Bay with Odra Bank, and Pommeranian Bay SPA, 2000–2004, are conducted by vessels from Denmark, Germany, Sweden, and Latvia (ICES, 2007a). Cod, herring, and flatfish fisheries: The dominating fisheries are fisheries with bottom trawl and pelagic trawl targeting herring or cod. There are smaller cod and herring fisheries with gill-nets and demersal seines. The bottom trawl fisheries for cod or herring are conducted by Danish and German vessels. The pelagic herring fisheries are conducted by Swedish and German vessels. The cod and herring fisheries are con-
ducted mainly in 1st and 4th quarters and to a lesser extent in the 2nd and 3rd quarters. **Sprat fishery:** There is a relative small sprat fishery conducted with mainly pelagic trawl (mesh size 32–54 mm) by Swedish vessels. The sprat fishery is mainly conducted in 1st, 2nd, and 4th quarter. The description of the international fisheries in and around SCI Western Rønne Bank, Adler Ground, Pommeranian Bay with Odra Bank, and Pommeranian Bay SPA has been combined. Correctly the description should have been given by site.

### 3.1.3 Bycatches, discards, and recreational fisheries

In addition to the reported catches in the German North Sea and Baltic Sea presented above one has to add bycatch and discards of undersized and unwanted fish and invertebrate species (e.g. Anon., 2007a) as well as the catches in the recreational fisheries (Anon., 2007b). The latter seems to be of minor importance for the German North Sea, however, in the German Baltic Sea the recreational fisheries catches of cod has been estimated to between 1900 and 3100 tonnes in 2006 (Anon., 2007b).

### 3.2 Danish fisheries in the German North Sea and Baltic Sea MPAs

The representative from the Danish Fishermen Association, Henrik Lund, gave a presentation of the Danish fisheries in the German EEZ. He explained that fishing in German waters and also in the designated Natura2000 areas is very important for the Danish commercial fishing fleet. It is very important that the Danish fleet has the ability to conduct fishing on top of and on the edges of sandbanks and close to reefs.

**The North Sea:** The fishing for industrial fish species such as sandeel and sprat is very important in the German Natura2000 areas in the North Sea.

![German Natura2000 areas in the North Sea](image)

**Figure 3.2.1** German Natura2000 areas in the North Sea.

The fleet fishing for these species consists of about 30–40 big vessels. The sandeel fishing is conducted from the 1 April to the 1st August and the fishing for sprat is conducted from August and the rest of the year. The Nephrops fisheries in area 2 (Sylt Outer Reef) is also very important and up to 50 vessels participate in this fishing throughout the year. There are also smaller fisheries targeting plaice, turbot and sole from smaller vessels. This fishing is conducted in the summertime using gill-net and Danish seines.

In area 2 and 4 (Figure 3.2.1) there has been a very big fishing for cod in gill-nets years ago, but today this fishing has almost disappeared. However there are signs
indicating that the cod is returning and then the fishing could develop into an important fishing again.

**The Baltic Sea:** Herring, sprat and cod are the main commercial fishing species in the Baltic Sea, caught by the Danish fleet.

The herring and sprat fishing is conducted in the spring and in the fall by a fleet consisting of about 20 vessels fishing with pelagic trawls. There is also a big combined fishing mainly targeting cod but also catching different species of flatfish. This fleet consists of about 50 vessels fishing with otter trawl and Danish seines from mid-November to June. In area 3 (Figure 3.2.2) there is also an important gill-net fishery after cod conducted by about 20 vessels from mid-November to May.

![Figure 3.2.2. German Natura2000 areas in the Baltic Sea.](image)

**Fishing from one year to another:** Fishing can change very much from one year to another. Sandeel grounds that were empty one year can be full of fish the next year as well as the opposite change may occur. All species of fish have good and bad years of recruiting so the stocks fluctuate much over time and so does the fishing. It is difficult to create a lasting picture of a fishing fleet and the fishing areas, because it can change very much. If the different species of fish dislocate so will the fleet! The fishers will always be where the fish are and follow them when they move.

If we look just five years ahead much more will probably change in the Danish fishing fleet because of political, biological and environmental changes. Due to the changes the ordinary fisherman must also change his fishing. Therefore it is very hard to predict where and how we will be fishing in the future and therefore the Natura2000 areas and coming rules are very important to all European fishers.

**A fisherman:** An ordinary fisherman has the same wishes as everybody else. He hopes that his job every year can provide him and his family with a stable income which is enough to live on. Therefore the fishers are very interested in nature care and well kept fish stocks, because this is what he earns his living from. If there is no fish there will be no fishers. Nature care and fishing can go hand in hand, but it is important to be aware that the people involved earn their living from the nature. The fishers will disappear if we close the seas for fishing or fishing gets too difficult. Is that what we want? Henrik asked.
3.3 Dutch fisheries in the German North Sea MPAs

Nathalie Steins-Oosterling and Cora Markensteijn, representing the Dutch Fish Board, gave an outline of the fishing activities of the Dutch fleet in the planned Marine Protected Areas (MPAs) in the German North Sea EEZ and their socio-economic importance (No Dutch fishery takes place in the Baltic Sea). There have been changes in the Dutch fleet and fishery since the EMPAS project started.

Fishing activities in the Plaice Box are very important for the Dutch brown shrimp fishery. This fishery takes place with smaller trawlers (<300HP). There is also an important fishing fleet targeting plaice, dab and sole. This fleet consist of beamers (eurocutters <300HP), twinriggers and fly-shooting/seines (>300HP). The German Bight is extremely important for beam trawling (mixed fishery, 80mm fishery) targeting sole and plaice. Now a day plaice is taken mainly as bycatch in the sole fishery. The German Bight is also important for twinriggers and fly-shooters. Soon it is expected that pulse-trawls (an adapted beam trawl that electrical pulses instead of thicker chains to startle the flatfish) will be used in the German Bight as well. The Dogger Bank is very important for a directed large mesh beam trawl fishery for plaice (mesh sizes over 100 mm). It is a very clean fishery which means that there is only little discard by the fishery in this area. Twinrigging and fly-shooting also takes place in the Doggerbank area. Species of importance is plaice, sole, turbot, dab, brill, Norway lobster, gurnard, and brown shrimp.

Socio-economic importance: Main fishing grounds for vessels from northern and central NL (e.g. Texel, Den Helder, Wieringen, Harlingen, Zoutkamp, Urk). Also main grounds for flag vessels are Dutch vessels fishing under UK and Germany flags. Auctions at Den Helder, Urk (flatfish), Den Oever (nephrops, brown shrimp, flatfish), Harlingen (flatfish, brown shrimp) and Zoutkamp (brown shrimp) depend significantly on landings from these areas.

Nathalie explained that fishing intensity figures could be misinterpreted as equal to economic importance which is incorrect (fishing intensity ≠ CPUE; fishing intensity ≠ value of catch). Low fished areas could have high value and some companies fully depend on low fished/high value fishing grounds.

Developments since start of the EMPAS project: Two decommissioning schemes have taken place. From 140 vessels there are today only 80 large Dutch beamers left. Hence, there has been a significant capacity reduction in the Dutch beam trawling fleet. In addition the fleet is in a crisis similar to other trawling fleets in Europe because of increasing fuel cost. The fuel cost in relation to grossings is now negative → solvency below zero. This means that the fishers cannot invest in new vessels etc. Also seen is a movement of the fishing effort towards the southern North Sea. This is partly due to reduction in the plaice TAC, days at sea scheme, and fuel prices. The plaice quota has dropped 50% from 2001. If a beam vessel do not have sufficient plaice quota it is not possible to go to the main plaice fishing ground in the north. Also seen is a shift from beam-trawl to other methods for plaice fishery. However, it is not possible in the economically most important Dover sole fishery, which can only take place with beam trawls.

Brown shrimp fleet is performing very well economically and it has recently entered a full MSC certification process. This is in cooperation with the German and Danish brown shrimp fishing fleets. North Sea plaice stock has been assessed as being ‘harvested sustainable (F < Fpa) for two consecutive years and the biomass has been go-
ing up. An EU long term flatfish management plan is in force and the mortality has dropped due to the plan.

Natura 2000 has become a very well-known subject for fleets. When the EMPAS project started fishers asked what is Natura 2000, but today they know about it. It is not about managing fish stocks but it is about managing biodiversity. The fishers better understand why it is important, when they know it is not a fisheries management tool. A Dutch High Court case revealed that all fisheries in Natura 2000 areas are classified as plans or projects it means that you have to do an assessment of the impact to get a license for fishing in a Natura 2000 site. The license given to the Dutch mussel industry was withdrawn by the High Court on basis of precautionary principle. This also means that it is not possible to do the necessary research to prove the effects of the fisheries on the habitats. Also now there are the first experiences with notification of Natura 2000 fisheries measures under CFP (Ireland, NL). West of Ireland areas with deep sea corals have been closed for fishing. In the Netherlands they have recently completed the notification process for fisheries management regulations which includes management regulations for the beam trawling and the shrimp fishery which is also relevant for vessels from Belgium, German and Denmark. It will be interesting to see what will happen at the European level over the next months.

**Future developments:** The flatfish fishing mortality (F) and effort will continue to go down as part of the EU multi-annual management plan. The idea is that the stock will go up and the quota should become higher in the longer term. If the TAC for plaice increases it should enable directed and clean plaice fishery in Dogger area. Current beam-trawl fleet in the Netherlands and also in other Member States will not survive. It is basically too expensive under increased fuel costs. 20% of the Dutch beam vessel fleet is laid up now and by the end of the year more will be so. Dutch European Fisheries Fund now targets the development of alternative beam-trawl gears (e.g. pulse trawl, SUM wing = floating beam trawl) which use much less fuel. A large part of the flatfish fleet will get MSC certification (particular scope in central and northern North Sea because you can have a clean catch with low bycatch in these areas). It is expected that the brown shrimp fishery will be MSC certified in 2009. There will be an EU discussion on implementation of the Natura 2000 measures under CFP.

### 3.4 Towards low impact fisheries techniques

Sabine Christiansen representing WWF Germany, presented a Technical Report produced for WWF Germany entitled: “Towards Low Impact Fishery Techniques” by Katja Broeg (Broeg, 2007). The report present a range of options now available to reduce or mitigate the currently exerted gear impacts on the biota, without necessarily jeopardizing the catchability of the target species, including (Broeg, 2007):

- **Restrict the spatial distribution of fishing effort – close to fishing the currently unfished and additional refuges**
- **Make use of behavioural differences between fish and crustacean species for better cleaner catches – placement of sieves or grids and escape doors into nets**
- **Place baited hooks on longlines outside the reach of birds and turtles**
- **Mark fishing gear in such a way that they can be recognized by cetaceans (Active and/or passive acoustic devices)**
- **Reduce the weight and penetration depth of towed gear**
- **Replace towed gear by pots**
• Use the funding possibilities of the European Fisheries Fond (EFF) for development, trial and application of environmentally friendly gear.

**Comment:** Gears are no interchangeable. Changing from one gear to another is very likely to have the result that the costs fall heavily on one part of the fishery and the opportunities fall to others.

### 3.5 Key Aspects of Fishery Operations to Consider when Developing Options for management

a) The various fleets and gears are not interchangeable. The industry cannot be expected to just switch one gear for another or one type of fishery for another without changes in employment opportunities and costs for acquiring new gears and sometimes altering vessels. These impacts may be greater than local in scale.

b) The spatial operation of fishing fleets inherently variable seasonally and between years. The causes of the variation is spatial operations complex and include responses to changes in:

- distribution of the target species due to environment conditions, recruitment events, etc.
- market conditions for various species.
- regulatory measures that constrain operations in different ways.
- [other factors].

c) Fleet operations and fishing technology are always evolving. When planning mitigation measures for impacts the detailed characteristics of fishing practices should not be considered fixed in time.

d) Many TACs are already low and have been reduced several times in recent years. Consequently fleets already feel under pressure, and several have already undergone substantial reductions in numbers of vessels. Proposals for further reductions in fishing opportunities should be expected to be received in this context.

e) Fisheries know about Natura 2000 sites now. They are aware of general objectives and are prepared to discuss details.

f) The main objectives of participants in the fisheries are stable incomes in the medium to long term, and they understand the need for sustainable harvests.

g) Any measures to address possible conflicts will not affect all fleets or individuals equally. There are likely to be some local impacts that are high, even if the impacts at the scale of “North Sea fisheries” are expected to be small.

### 3.6 VMS data in combination with information and data from logbooks

To analyse the potential conflict between fishing activities and nature conservation targets in marine Natura 2000 sites data and information about the fishing activities of the international commercial fishing fleets need to be available on appropriate temporal and spatial scales. The EMPAS project has found that VMS data in combination with logbook data are the most appropriate data to assess fishing activities in the offshore areas of North Sea and Baltic Sea (Fock, 2008; Pedersen et al., 2008; ICES, 2008b).

The following presentation of the international fisheries in and around the German Natura 2000 sites in the North Sea and the Baltic Sea in 2006 is based on analysis of all VMS data from fishing vessels in the German EEZ and reported catches by ICES rectangles, country, gear type, mesh size, and species in 2006 (Pedersen, 2008). The catch data has been provided to ICES by the national fisheries research institutes of Denmark, Germany, Netherlands, Sweden, UK, Belgium, Poland, and Latvia. The pre-
sented international fishing effort data (hours fishing) by fishing gear, month, and 3x3 nautical mile squares have been provide to the EMPAS project by Heino Fock, Johann Heinrich von Thünen-Institut (vTI), Institute for Sea Fisheries, Palmaille 9, D-22767, Hamburg, Germany. The methods used to calculate the fishing efforts from VMS data are outlined in Fock (2008) and Pedersen et al. (2008).

Figure 3.5.1. Fishing effort: Fine scale distributions of the total international fishing effort by fishing gear, 3x3 nautical mile (nm) squares in 2006 in the German exclusive economic zone of the North Sea. The methods used for estimating the international fishing efforts are described in Fock (2008) and Pedersen et al. (2008).
Figure 3.5.2. Otter trawl: Distribution of estimated otter trawl catches in tonnes by species in the German EEZ of the North Sea in 2006. The catches have been allocated to 3x3 nm squares by the following method: Reported total catch by gear-type and ICES rectangle divided by total calculated fishing effort by gear-type and ICES rectangle, multiplied by calculated fishing effort in 3x3 nautical squares in ICES rectangle.
Figure 3.5.3. Small beam trawl: Distribution of estimated small beam trawl catches in tonnes by species in the German EEZ of the North Sea in 2006. The catches have been allocated to 3x3 nm squares by the following method: Reported total catch by gear-type and ICES rectangle divided by total calculated fishing effort by gear-type and ICES rectangle, multiplied by calculated fishing effort in 3x3 nautical squares in ICES rectangle.
Figure 3.5.4. Large beam trawl: Distribution of estimated large beam trawl catches in tonnes by species in the German EEZ of the North Sea in 2006. The catches have been allocated to 3x3 nm squares by the following method: Reported total catch by gear-type and ICES rectangle divided by total calculated fishing effort by gear-type and ICES rectangle, multiplied by calculated fishing effort in 3x3 nautical squares in ICES rectangle.
Figure 3.5.5 Seiners: Distribution of estimated seiners catches in tonnes by species in the German EEZ of the North Sea in 2006. The catches have been allocated to 3x3 nm squares by the following method: Reported total catch by gear-type and ICES rectangle divided by total calculated fishing effort by gear-type and ICES rectangle, multiplied by calculated fishing effort in 3x3 nautical squares in ICES rectangle.

Figure 3.5.6. Gill-nets: Distribution of estimated gill-net catches in tonnes by species in the German EEZ of the North Sea in 2006. The catches have been allocated to 3x3 nm squares by the following method: Reported total catch by gear-type and ICES rectangle divided by total calculated fishing effort by gear-type and ICES rectangle, multiplied by calculated fishing effort in 3x3 nautical squares in ICES rectangle.
3.6.1 Natura 2000 site Doggerbank (ICES rectangles 40F3, 40F4, 39F4)

Table 3.5.1. Estimated catches in tonnes by species and fishing techniques (gear type) in Natura 2000 site Doggerbank of the North Sea in 2006. The catches have been allocated to the site based on the estimated fishing effort distributions from analysing VMS data and the following method: Reported total catch by gear-type and ICES rectangles divided by total calculated fishing effort by gear-type and ICES rectangles, multiplied by calculated fishing effort in 3x3 nautical squares from VMS data in the site.

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<td>182</td>
<td>3540</td>
<td>3140</td>
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<td>7186</td>
</tr>
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</table>
### 3.6.2 Natura 2000 sites Sylt Outer Reef and SPA Eastern German Bight (ICES rectangles 38F6, 38F7, 39F7)

Table 3.5.2. Estimated catches in tonnes by species and fishing techniques (gear type) in Natura 2000 sites Sylt Outer Reef and SPA Eastern German Bight of the North Sea in 2006. The catches have been allocated to the site based on the estimated fishing effort distributions from analysing VMS data and the following method: Reported total catch by gear-type and ICES rectangles divided by total calculated fishing effort by gear-type and ICES rectangles, multiplied by calculated fishing effort in 3x3 nautical squares from VMS data in the site.

<table>
<thead>
<tr>
<th>Species/Gear type</th>
<th>Demersal seine</th>
<th>Gill net</th>
<th>Large beam trawl</th>
<th>Otter trawl</th>
<th>Small beam trawl</th>
<th>Pots</th>
<th>Total</th>
</tr>
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<tbody>
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<td>5</td>
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<td>20</td>
</tr>
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<td>9</td>
<td>11</td>
<td>1</td>
<td>0</td>
<td>25</td>
</tr>
<tr>
<td>Edible Crab</td>
<td>0</td>
<td>0</td>
<td>21</td>
<td>15</td>
<td>7</td>
<td>450</td>
<td>794</td>
</tr>
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<td>0</td>
<td>32</td>
<td>0</td>
<td>450</td>
<td>0</td>
<td>482</td>
</tr>
<tr>
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<td>27</td>
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<td>79</td>
<td>82</td>
<td>13</td>
<td>0</td>
<td>202</td>
</tr>
<tr>
<td>European Flounder</td>
<td>4</td>
<td>0</td>
<td>9</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>17</td>
</tr>
<tr>
<td>Grey Gurnard</td>
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<td>0</td>
<td>1</td>
<td>16</td>
<td>0</td>
<td>0</td>
<td>19</td>
</tr>
<tr>
<td>Tub Gurnard</td>
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<td>656</td>
<td>0</td>
<td>0</td>
<td>656</td>
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<td>81</td>
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<td>7</td>
<td>2</td>
<td>0</td>
<td>9</td>
</tr>
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<td>46</td>
<td>0</td>
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<td>59</td>
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<td>202</td>
<td>52</td>
<td>0</td>
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</tr>
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<td>0</td>
<td>5541</td>
<td>0</td>
<td>0</td>
<td>5541</td>
</tr>
<tr>
<td>Common Sole</td>
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<td>55</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>58</td>
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<td>0</td>
<td>3360</td>
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<td>30</td>
<td>18</td>
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<td>0</td>
<td>53</td>
</tr>
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<td>0</td>
<td>0</td>
<td>22</td>
<td>0</td>
<td>0</td>
<td>22</td>
</tr>
<tr>
<td>Other species</td>
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<td>0</td>
<td>11</td>
<td>28</td>
<td>5</td>
<td>0</td>
<td>47</td>
</tr>
<tr>
<td>Total</td>
<td>255</td>
<td>17</td>
<td>741</td>
<td>10131</td>
<td>534</td>
<td>750</td>
<td>12428</td>
</tr>
<tr>
<td>Fishing effort (hours)</td>
<td>1632</td>
<td>136</td>
<td>5842</td>
<td>5254</td>
<td>25105</td>
<td>2394</td>
<td>40363</td>
</tr>
</tbody>
</table>

The catches have been allocated to the site based on the estimated fishing effort distributions from analysing VMS data and the following method: Reported total catch by gear-type and ICES rectangles divided by total calculated fishing effort by gear-type and ICES rectangles, multiplied by calculated fishing effort in 3x3 nautical squares from VMS data in the site.
### 3.6.3 Natura 2000 site Borkum Reef (ICES rectangles 36F6)

Table 3.5.3. Estimated catches in tonnes by species and fishing techniques (gear type) in Natura 2000 site Borkum Reef of the North Sea in 2006. The catches have been allocated to the site based on the estimated fishing effort distributions from analysing VMS data and the following method: Reported total catch by gear-type and ICES rectangles divided by total calculated fishing effort by gear-type and ICES rectangles, multiplied by calculated fishing effort in 3x3 nautical squares from VMS data in the site.

<table>
<thead>
<tr>
<th>SPECIES</th>
<th>GEAR TYPE</th>
<th>DEMERSAL SEINE</th>
<th>DREDGE</th>
<th>GILL NET</th>
<th>LARGE BEAM TRAWL</th>
<th>OTTER TRAWL</th>
<th>SMALL BEAM TRAWL</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
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<td>0</td>
<td>0</td>
<td>16</td>
<td>16</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Common Dab</td>
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<td>2</td>
<td>3</td>
<td>0</td>
<td>9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>European Flounder</td>
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<td>2</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
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<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Atlantic Herring</td>
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<td>0</td>
<td>0</td>
<td>11</td>
<td>0</td>
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<td>0</td>
<td>1</td>
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<td>0</td>
<td>264</td>
<td></td>
<td></td>
</tr>
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<td>0</td>
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<td>0</td>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
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<td>4</td>
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<td>2</td>
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</tr>
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<td>1721</td>
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</tr>
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<td>0</td>
<td>0</td>
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<td></td>
</tr>
<tr>
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<td>1</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Whiting</td>
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<td></td>
<td></td>
</tr>
<tr>
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<td>2</td>
<td>14</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>14</td>
<td>?</td>
<td>13</td>
<td>283</td>
<td>2016</td>
<td>16</td>
<td>2343</td>
<td></td>
</tr>
<tr>
<td>Fishing effort (hours)</td>
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<td>?</td>
<td>121</td>
<td>518</td>
<td>354</td>
<td>32</td>
<td>1342</td>
<td></td>
</tr>
</tbody>
</table>
Figure 3.5.7. Fishing effort: Fine scale distributions of the total international fishing effort by fishing gear, 3x3 nautical mile squares in 2006 in the German exclusive economic zone of the Baltic Sea. The methods used for estimating the international fishing efforts are described in Fock (2008) and Pedersen et al. (2008).
Figure 3.5.8. Otter trawl: Distribution of estimated otter trawl catches in tonnes by species in the German EEZ of the Baltic Sea in 2006. The catches have been allocated to 3x3 nm squares by the following method: Reported total catch by gear-type and ICES rectangle divided by total calculated fishing effort by gear-type and ICES rectangle, multiplied by calculated fishing effort in 3x3 nautical squares in ICES rectangle.
Figure 3.5.9 Gill-net: Distribution of estimated gill-net catches in tonnes by species in the German EEZ of the Baltic Sea in 2006. The catches have been allocated to 3x3 nm squares by the following method: Reported total catch by gear-type and ICES rectangle divided by total calculated fishing effort by gear-type and ICES rectangle, multiplied by calculated fishing effort in 3x3 nautical squares in ICES rectangle.
Figure 3.5.10. Pelagic trawl: Distribution of estimated pelagic trawl catches in tonnes by species in the German EEZ of the Baltic Sea in 2006. The catches have been allocated to 3x3 nm squares by the following method: Reported total catch by gear-type and ICES rectangle divided by total calculated fishing effort by gear-type and ICES rectangle, multiplied by calculated fishing effort in 3x3 nautical squares in ICES rectangle.
Figure 3.5.11. Seiners: Distribution of estimated seiners catches in tonnes by species in the German EEZ of the Baltic Sea in 2006. The catches have been allocated to 3x3 nm squares by the following method: Reported total catch by gear-type and ICES rectangle divided by total calculated fishing effort by gear-type and ICES rectangle, multiplied by calculated fishing effort in 3x3 nautical squares in ICES rectangle.
### 3.6.4 Natura 2000 site Fehmarn Belt (ICES rectangles 38G0, 38G1)

Table 3.5.4 Estimated catches in tonnes by species and fishing techniques (gear type) in Natura 2000 site Fehmarn Belt of the Baltic Sea in 2006. The catches have been allocated to the site based on the estimated fishing effort distributions from analysing VMS data and the following method: Reported total catch by gear-type and ICES rectangles divided by total calculated fishing effort by gear-type and ICES rectangles, multiplied by calculated fishing effort in 3x3 nautical squares from VMS data in the site.

<table>
<thead>
<tr>
<th>Species\Gear type</th>
<th>Demersal seine</th>
<th>Gill net</th>
<th>Longline</th>
<th>Otter trawl</th>
<th>Pelagic trawl</th>
<th>Trammel</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brill</td>
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<td>?</td>
<td>10</td>
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<td>?</td>
<td>16</td>
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<td>?</td>
<td>705</td>
<td>?</td>
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<td>869</td>
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<td>?</td>
<td>67</td>
<td>?</td>
<td>?</td>
<td>78</td>
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<td>Eel</td>
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<td>16</td>
<td>?</td>
<td>0</td>
<td>?</td>
<td>?</td>
<td>16</td>
</tr>
<tr>
<td>E. Flounder</td>
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<td>8</td>
<td>?</td>
<td>10</td>
<td>?</td>
<td>?</td>
<td>18</td>
</tr>
<tr>
<td>Flatfish</td>
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<td>3</td>
<td>?</td>
<td>7</td>
<td>?</td>
<td>?</td>
<td>9</td>
</tr>
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<td>532</td>
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<td>?</td>
<td>?</td>
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<td>114</td>
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<td>6</td>
<td>?</td>
<td>9</td>
<td>?</td>
<td>?</td>
<td>14</td>
</tr>
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<td>2566</td>
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<td>?</td>
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</tr>
<tr>
<td>Turbot</td>
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<td>?</td>
<td>2</td>
<td>?</td>
<td>?</td>
<td>4</td>
</tr>
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<td>346</td>
<td>?</td>
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<td>?</td>
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<td>?</td>
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<td>38</td>
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<td>?</td>
<td>4422</td>
<td>?</td>
<td>?</td>
<td>4649</td>
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<tr>
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<td>83</td>
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<td></td>
<td></td>
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<td>1560</td>
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</tbody>
</table>
3.6.5 Natura 2000 site Kadet Trench (ICES rectangles 37G2, 38G2)

Table 3.5.5 Estimated catches in tonnes by species and fishing techniques (gear type) in Natura 2000 site Kadet Trench of the Baltic Sea in 2006. The catches have been allocated to the site based on the estimated fishing effort distributions from analysing VMS data and the following method: Reported total catch by gear-type and ICES rectangles divided by total calculated fishing effort by gear-type and ICES rectangles, multiplied by calculated fishing effort in 3x3 nautical squares from VMS data in the site.

<table>
<thead>
<tr>
<th>Species</th>
<th>Gear type</th>
<th>Demersal seine</th>
<th>Gill net</th>
<th>Longline</th>
<th>Otter trawl</th>
<th>Pelagic trawl</th>
<th>Pots</th>
<th>Total</th>
</tr>
</thead>
<tbody>
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<td>?</td>
<td>2</td>
</tr>
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<td>23</td>
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<td>?</td>
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<td>0</td>
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<td>3</td>
<td>3</td>
<td>4</td>
<td>?</td>
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<td></td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>11</td>
<td>16</td>
<td>?</td>
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<td>10</td>
<td>?</td>
<td>86</td>
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<td>65</td>
<td>56</td>
<td>?</td>
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</table>

3.6.6 Natura 2000 sites Western Rønne Bank, Adler Ground, Pomeranian Bay with Odra Bank, and Pommeranian Bay SPA (ICES rectangles 38G4, 37G4)

Table 3.5.6 Estimated catches in tonnes by species and fishing techniques (gear type) in Natura 2000 site Western Rønne Bank of the Baltic Sea in 2006. The catches have been allocated to the site based on the estimated fishing effort distributions from analysing VMS data and the following method: Reported total catch by gear-type and ICES rectangles divided by total calculated fishing effort by gear-type and ICES rectangles, multiplied by calculated fishing effort in 3x3 nautical squares from VMS data.

<table>
<thead>
<tr>
<th>Species</th>
<th>Gear type</th>
<th>Gill net</th>
<th>Longline</th>
<th>Otter trawl</th>
<th>Pelagic trawl</th>
<th>Total</th>
</tr>
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<td>?</td>
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<td>37</td>
</tr>
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<td>6</td>
<td>0</td>
<td>8</td>
</tr>
<tr>
<td>Sprat</td>
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<td>7</td>
</tr>
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<td>Other</td>
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<td>11</td>
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<td>497</td>
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<td></td>
<td>92</td>
<td>?</td>
<td>805</td>
<td>304</td>
<td>1201</td>
</tr>
</tbody>
</table>
Table 3.5.7 Estimated catches in tonnes by species and fishing techniques (gear type) in Natura 2000 site Adler Ground of the Baltic Sea in 2006. The catches have been allocated to the site based on the estimated fishing effort distributions from analysing VMS data and the following method: Reported total catch by gear-type and ICES rectangles divided by total calculated fishing effort by gear-type and ICES rectangles, multiplied by calculated fishing effort in 3x3 nautical squares from VMS data.

<table>
<thead>
<tr>
<th>Species</th>
<th>Demersal seine</th>
<th>Gill net</th>
<th>Longline</th>
<th>Otter trawl</th>
<th>Pelagic trawl</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brill</td>
<td>0</td>
<td>1</td>
<td>?</td>
<td>9</td>
<td>0</td>
<td>10</td>
</tr>
<tr>
<td>Cod</td>
<td>0</td>
<td>33</td>
<td>?</td>
<td>85</td>
<td>2</td>
<td>121</td>
</tr>
<tr>
<td>E. Flounder</td>
<td>0</td>
<td>8</td>
<td>?</td>
<td>14</td>
<td>0</td>
<td>22</td>
</tr>
<tr>
<td>Herring</td>
<td>0</td>
<td>0</td>
<td>18</td>
<td>147</td>
<td>165</td>
<td></td>
</tr>
<tr>
<td>Plaice</td>
<td>0</td>
<td>1</td>
<td>?</td>
<td>4</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>Sandeel</td>
<td>0</td>
<td>0</td>
<td>5</td>
<td>0</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Sprat</td>
<td>0</td>
<td>0</td>
<td>5</td>
<td>1</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>Turbot</td>
<td>0</td>
<td>5</td>
<td>?</td>
<td>0</td>
<td>0</td>
<td>5</td>
</tr>
<tr>
<td>Other</td>
<td>0</td>
<td>2</td>
<td>?</td>
<td>4</td>
<td>1</td>
<td>6</td>
</tr>
<tr>
<td>Total</td>
<td>1</td>
<td>49</td>
<td>?</td>
<td>145</td>
<td>151</td>
<td>346</td>
</tr>
<tr>
<td>Fishing effort (hours)</td>
<td>9</td>
<td>1343</td>
<td>?</td>
<td>335</td>
<td>314</td>
<td>2001</td>
</tr>
</tbody>
</table>

Table 3.5.8. Estimated catches in tonnes by species and fishing techniques (gear type) in Natura 2000 site SPA Pomeranian Bay of the Baltic Sea in 2006. The catches have been allocated to the site based on the estimated fishing effort distributions from analysing VMS data and the following method: Reported total catch by gear-type and ICES rectangles divided by total calculated fishing effort by gear-type and ICES rectangles, multiplied by calculated fishing effort in 3x3 nautical squares from VMS data.

<table>
<thead>
<tr>
<th>Species</th>
<th>Demersal seine</th>
<th>Gill net</th>
<th>Longline</th>
<th>Otter trawl</th>
<th>Pelagic trawl</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cod</td>
<td>3</td>
<td>62</td>
<td>?</td>
<td>719</td>
<td>18</td>
<td>802</td>
</tr>
<tr>
<td>E. Flounder</td>
<td>1</td>
<td>13</td>
<td>?</td>
<td>153</td>
<td>1</td>
<td>168</td>
</tr>
<tr>
<td>Flatfish</td>
<td>0</td>
<td>2</td>
<td>?</td>
<td>18</td>
<td>0</td>
<td>20</td>
</tr>
<tr>
<td>E. Perch</td>
<td>0</td>
<td>11</td>
<td>?</td>
<td>2</td>
<td>0</td>
<td>13</td>
</tr>
<tr>
<td>Roach</td>
<td>0</td>
<td>9</td>
<td>?</td>
<td>1</td>
<td>0</td>
<td>10</td>
</tr>
<tr>
<td>Herring</td>
<td>1</td>
<td>334</td>
<td>146</td>
<td>1200</td>
<td>1681</td>
<td></td>
</tr>
<tr>
<td>Plaice</td>
<td>0</td>
<td>1</td>
<td>?</td>
<td>32</td>
<td>0</td>
<td>33</td>
</tr>
<tr>
<td>Sandeel</td>
<td>0</td>
<td>0</td>
<td>38</td>
<td>0</td>
<td>38</td>
<td></td>
</tr>
<tr>
<td>Sprat</td>
<td>0</td>
<td>0</td>
<td>42</td>
<td>11</td>
<td>53</td>
<td></td>
</tr>
<tr>
<td>Turbot</td>
<td>0</td>
<td>11</td>
<td>?</td>
<td>2</td>
<td>0</td>
<td>13</td>
</tr>
<tr>
<td>Whiting</td>
<td>0</td>
<td>0</td>
<td>?</td>
<td>2</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>Other</td>
<td>0</td>
<td>2</td>
<td>?</td>
<td>85</td>
<td>0</td>
<td>87</td>
</tr>
<tr>
<td>Total</td>
<td>4</td>
<td>446</td>
<td>?</td>
<td>1240</td>
<td>1234</td>
<td>2924</td>
</tr>
<tr>
<td>Fishing effort (hours)</td>
<td>81</td>
<td>1763</td>
<td>?</td>
<td>4122</td>
<td>2671</td>
<td>8637</td>
</tr>
</tbody>
</table>
3.7 The best available fisheries data

Heino Fock, Johann Heinrich von Thünen-Institut, Hamburg, Germany, gave a presentation of the best available fisheries data: VMS data combined with information to classify the VMS data – vessel type, gear type, rigging of gear, etc. The availability of the VMS data is based on the Commission Regulation (EC) no 2244/2003. The regulation gives Member States the opportunities to use these data not only for the original purposes but also for scientific purposes if this is of superior interest for a Member State. This interpretation has been used in Germany because it is of superior interest to know where the fisheries are taking place. During the last two years and under workshops in the EMPAS project classification information has been collected from different sources. The most straightforward source is from logbook information. However, this source is only possible for German vessels, but in addition there have been input from fisheries organizations. Also there are surveillance reports from the fishery control agency and from inspectors knowing the areas. Lastly the European vessel register give some information about the vessels. Another possibility is to compare VMS data with satellite pictures of vessel locations.

The VMS data has been analysed as described in two papers Fock (2008) and Pedersen et al. (2008). The VMS data analysed and presented in these papers is the best VMS data available which is the data from 2006. “Best available” means that a complete VMS data set of all the international fleets (vessels larger than 15 m total length) fishing in the North Sea and Baltic Sea MPAs are only available for 2006.

3.8 Fishing industry observations on 2006 VMS data

Nathalie Steins/Cora Markensteijn (Dutch Fish Product Board)
Michael Andersen/Henrik Lund/Jesper Larsen (Danish Fishermen’s Association)

The VMS data for all >15m international fleets fishing in the North Sea and Baltic Sea MPAs are only available for 2006. We understand that for the discussions in EMPAS a picture of the whole fleet rather than for individual fleets are needed. It should however be noted that for some fleets VMS data are available for much longer periods.

The 2006 data in general give a good picture of the activities of the >15m fleets using mobile gears in this year. It must be noted that in the MPAs closer to shore there are vessels that do not have VMS (shrimpers < 15m, static gears). For the North Sea shrimp fleet the VMS data is likely to give a representative picture. For the Baltic representativeness may be an issue of concern. Some of the maps can be misinterpreted because not all maps showed target species fisheries, but species caught in mixed fisheries.

The 2006 VMS data should not be considered as a blue print map for fishing activities. Fishing activities change on a yearly basis depending on TAC allocation, effort allocation, market prices, fuel prices, catchability, etc. For the beam-trawl fleet it is fair to say that this is a stable fishery in terms of the annual return to the same fishing grounds. Areas of high fishing intensity may therefore be considered as ‘hot spots’. In this respect, it should however be noted that the effort of the beam-trawl fleet in the North Sea MPAs has been reduced significantly over the past years because of TAC restrictions (evidence available from IMARES).

The data present a generic picture over the whole year. Within a year there are differences in seasonal patterns.
It is important to realize that the scale of the VMS data as presented (3x3nm/6x6nm) may be in conflict with the actual scale of the activity. For example, it is possible that a VMS dot shows that a fishing activity is taking place on top of a reef, while the actual activity is taking place on the sand between the reefs.

The fishing intensity doesn’t necessarily reflect the economic importance of the area. You can have fishing areas with low fishing intensity with a very valuable catch composition and vice versa. Equally VMS fishing intensity is not a measure for CPUE.

3.9 Discussion and conclusions regarding the VMS data

The VMS data were considered to be the best data available for exploring options for reducing potential conflicts. Nonetheless these data have several shortcomings. The coverage is for only one year, and VMS is not required on vessels less than 15 meters. Particularly for the static gears, a large fraction of the fleet may be less than that minimum length. Hence although the 2006 VMS data are the best data available, for our purposes they must be augmented by inputs on finer scale operations, interannual variability, and other operational factors. Much of this information will have to come from expert narrative input. The fact that there are no VMS records in an area does not mean that the area is unimportant to the fishery and that the fishers don’t want to come there in the future.

Differences between gear types and their environmental impacts need to be known and specified. Detailed gear type information should be connected to or included in the VMS data.

Fisheries data from smaller vessels (<15 meters) must be taken into consideration in the development of fisheries management plans. In the offshore MPAs of the North Sea, the fishing effort of smaller vessels is relatively low. In the offshore MPAs of the Baltic Sea the fishing effort of smaller vessels is relatively high. In order to do fisheries assessments of the small vessel fleet, it is necessary with fine scale/high resolution fisheries data by individual boats gear and effort deployed. Exact fishing positions and time together with number, length and soak times of nets. The cumulative effects of the fleet of smaller vessels have not been assessed as part of this project but may not be small and needs to be taking in to consideration in environmental impact assessments.

For the analyses supporting this investigation most data were aggregated to 3x3 or 6x6 nautical mile grids. This gave a density of observations adequate to support many types of analyses. However both key features of habitat features and species distributions have patterns on smaller scales and fisheries operate on spatial scales smaller than 3x3 nm as well. This information, too, will have to be contributed from knowledge external to the database.

An important issue is the questions of scale. How do fisheries operate? What needs to be done from a biological/ecological point of view? What is feasible for management? We need solutions to fisheries versus conservation conflicts/problems that make sense to managers and can be implemented by management regulations.
4 Conservation Objectives (ToR b)

4.1 Natura 2000 Conservation Objectives in the German EEZ

Jochen Krause and Christian Pusch, German Federal Agency for Nature Conservation (BfN) presented the legal and policy framework and the specific nature conservation objectives for the Natura 2000 sites.

In the German Exclusive Economic Zone (EEZ) the Federal Agency for Nature Conservation (BfN) is responsible for the selection and management of all Natura 2000 sites. Nature conservation obligations follow European and national jurisdiction according to the requirements of the EU Birds- (79/409/EEC) and the Habitats (92/43/EEC) Directives.

4.2 EU BIRDS Directive (79/409/EEC)

In the German Exclusive Economic Zone (EEZ) two Special Protected Areas (SPA) have been designated: one in the North Sea, SPA Eastern German Bight; and one in the Baltic Sea, SPA Pomeranian Bay.

The conservation objectives for the SPAs include the avoidance of pollution and deterioration of bird habitats, as described in Article 4.4 of the BD for the, which says, ‘In respect of the protection areas referred to in paragraphs 1 and 2 above, Member States shall take appropriate steps to avoid pollution or deterioration of habitats or any disturbances affecting the birds, in so far as these would be significant having regard to the objectives of this Article.’ (Underlining added.)

Inter alia, according to the case-law of the ECJ, economic and recreational considerations are not valid derogations from the system of protection (C57/89, Commission v. Germany - “Leybucht”).

Article 5 requires the establishment of a general system of protection for all species of birds referred to in Article 1 and prohibits in particular deliberate killing or capture of birds by any method and a deliberate disturbance of these birds in so far as disturbance would be significant with regard to the objectives of the Birds Directive ( ‘…without prejudice to Articles 7 and 9, Member States shall take the requisite measures to establish a general system of protection for all species of birds referred to in Article 1, prohibiting in particular: (a) deliberate killing or capture by any method; (b) …, (c) …(d) deliberate disturbance of these birds particularly during the period of breeding and rearing, in so far as disturbance would be significant having regard to the objectives of this Directive’ – underlining added.)

The European Court of Justice specified the importance of complete and effective protection of migratory species and that any national legislation which delimits the protection of wild birds by reference to the concept of national heritage is incompatible with the Birds Directive (C-252/85, Commission v. France) and that provisions which constitute derogation from the prohibition laid down in Article 5 can only be taken into consideration in case the criteria laid down in Article 9 are met (‘Member States may derogate from the provisions of Articles 5, 6, 7 and 8, where there is no other satisfactory solution, for the following reasons: in the interests of public, health and safety, in the interests of air safety, to prevent serious damage to crops, livestock, forests, fisheries and water, for the protection of flora and fauna; research and teaching, of re-population, keeping or other judicious use of certain birds in small numbers …’). It is important to note that the rules of
normal use of the land or the sea for agricultural, forestry and fishery purposes are not included by these derogations (C_412/85, Commission v. Germany).

When in September 2005 the two SPA sites in the German EEZ achieved the national legal status of a nature reserve these criteria were specified in a specific Article of the regulations (Table 4.1.1). Necessary background information for the species-specific interpretation of each criterion has recently been compiled in a comprehensive book by Mendel et al. (2008) which will shortly be available in English, as well (Table 4.1.2).
Table 4.1.1. Nature Conservation Objectives according to § 3 of the German ordinances for the designation of (a) SPA "Eastern German Bight" and (b) SPA "Pomeranian Bay" as nature conservation site (Pedersen et al., 2008).

<table>
<thead>
<tr>
<th>BIRD SPECIES</th>
<th>OVERALL OBJECTIVES</th>
</tr>
</thead>
<tbody>
<tr>
<td>(a) SPA Eastern German Bight</td>
<td>… are the conservation and/or recovery of</td>
</tr>
<tr>
<td>(b) SPA Pomeranian</td>
<td>- the direct and indirect feeding basis of the occurring bird species</td>
</tr>
<tr>
<td>Red-throated Diver, Black-throated Diver, Slavonian grebe, Red-necked Grebe, Great Crested Grebe, Common eider, Long-tailed duck, Common scoter, Velvet scoter, Cormorant, Black-headed gull, Little gull, Common gull, Herring gull, Lesser Black backed gull, Great Black backed gull, Guillemot, Razorbill, Black Guillemot</td>
<td>- the characteristic features of the area, on particular salinity and geo-and hydro-morphological factors contiguous habitats within the site with their specific ecological functions and interactions</td>
</tr>
<tr>
<td></td>
<td>- the natural quality of the habitats, in particular their protection from pollution and disturbance.</td>
</tr>
</tbody>
</table>

Table 4.1.2. Individual numbers of relevant bird species protected by the BD in the SPA Eastern German Bight in the German EEZ of the North Sea. All data according to Mendel et al. (2008). STA = stable, INC = increasing, DEC = declining. Question mark = uncertain or unknown, Sp = spring, Su = summer, A = autumn, W = winter.

<table>
<thead>
<tr>
<th>COMMON NAME</th>
<th>SCIENTIFIC NAME</th>
<th>MAX. POPULATION</th>
<th>MAX. POPULATION</th>
<th>POPULATION TREND</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>German North Sea</td>
<td>SPA Eastern Bight</td>
<td></td>
</tr>
<tr>
<td>Red-throated Diver</td>
<td>Gavia stellata</td>
<td>16500 (Sp)</td>
<td>3300 (Sp)</td>
<td>STA</td>
</tr>
<tr>
<td>Black-throated Diver</td>
<td>Gavia arctica</td>
<td>20000 (Sp)</td>
<td>280 (Sp)</td>
<td>DEC</td>
</tr>
<tr>
<td>Fulmar</td>
<td>Fulmarus glacialis</td>
<td>40000 (Su)</td>
<td>100 (Su)</td>
<td>?</td>
</tr>
<tr>
<td>Gannet</td>
<td>Sula bassana</td>
<td>2700 (A)</td>
<td>230 (Sp)</td>
<td>STA</td>
</tr>
<tr>
<td>Common Scoter</td>
<td>Melanitta nigra</td>
<td>135000 (W)</td>
<td>550 (Su)</td>
<td>STA</td>
</tr>
<tr>
<td>Little Gull</td>
<td>Larus minutus</td>
<td>4600 (Sp)</td>
<td>330 (W)</td>
<td>INC</td>
</tr>
<tr>
<td>Black-headed Gull</td>
<td>Larus ridibundus</td>
<td>170000 (A)</td>
<td>1200 (Sp)</td>
<td>DEC</td>
</tr>
<tr>
<td>Common Gull</td>
<td>Larus canus</td>
<td>65000 (A)</td>
<td>7800 (W)</td>
<td>DEC?</td>
</tr>
<tr>
<td>Herring Gull</td>
<td>Larus argentatus</td>
<td>70000 (W)</td>
<td>1000 (A)</td>
<td>*</td>
</tr>
<tr>
<td>Lesser Black-backed Gull</td>
<td>Larus fuscus</td>
<td>76000 (Su)</td>
<td>1600 (Su)</td>
<td>**</td>
</tr>
<tr>
<td>Great Black-backed Gull</td>
<td>Larus marinus</td>
<td>16500 (A)</td>
<td>390 (Sp)</td>
<td>INC</td>
</tr>
<tr>
<td>Black-legged Kittiwake</td>
<td>Rissa tridactyla</td>
<td>20000 (Su)</td>
<td>3500 (Su)</td>
<td>?</td>
</tr>
<tr>
<td>Sandwich Tern</td>
<td>Sterna sandvicensis</td>
<td>21000 (Su)</td>
<td>140 (Su)</td>
<td>STA</td>
</tr>
<tr>
<td>Common Tern</td>
<td>Sterna hirundo</td>
<td>19500 (Su)</td>
<td>900 (A)</td>
<td>STA</td>
</tr>
<tr>
<td>Arctic Tern</td>
<td>Sterna paradisaea</td>
<td>15500 (Su)</td>
<td>650 (A)</td>
<td>?</td>
</tr>
<tr>
<td>Guillemot</td>
<td>Uria aalge</td>
<td>33000 (W)</td>
<td>2600 (Sp)</td>
<td>?</td>
</tr>
<tr>
<td>Razorbill</td>
<td>Alca torda</td>
<td>7500 (W)</td>
<td>700 (W)</td>
<td>?</td>
</tr>
</tbody>
</table>

*Subspecies: argentatus INC / argentus DEC
**Subspecies: intermedius INC / fuscus DEC
4.3 EU Habitats Directive (92/43/EEC)

4.3.1 Habitats and Species

In the offshore waters of the German EEZ only two habitats exist, sandbanks slightly covered by seawater all the time (code 1110), and reefs (code 1170) as defined and explained in the Guidelines for the establishment of the Natura 2000 network in the marine environment of the European Commission from May 2007. Three marine mammal species and six anadromous fish species listed in Annex II HD occur regularly: Harbour porpoises (Phocoena phocoena), Grey seals (Halichoerus grypus), and the Harbour sea (Phoca vitulina); River lampreys (Lampetra fluviatilis), Sea lampreys (Petromyzon marinus), Baltic/Atlantic sturgeons (Acipenser sturio, Acipenser oxyrinchus), Allis shad (Alosa alosa), and Twaite shad (Alosa fallax) (Table 4.1.3 and Table 4.1.4).

Three Sites of Community Importance (SCI) have been designated in the German Exclusive Economic Zone (EEZ) of the North Sea: Sylt Outer Reef, Borkum Reefground and Doggerbank. Five SCIs are in the EEZ of the Baltic Sea: Fehmarn Belt, Kadet Trench, Western Ronnebank, Adler Ground and Pomeranian Bay with Odra Bank.

Table 4.1.3. Habitat size, relevant species and habitats protected by the Habitats Directive in SCIs in the German EEZ of the North Sea. “i” = estimated population size; number ranges given after “i” represent the estimated population size range (class); “P” = means the species is present in the area (occurrence verified, but no estimated numbers). An empty cell for a species means that the population size is unknown.

<table>
<thead>
<tr>
<th>Common Name</th>
<th>Scientific Name</th>
<th>Borkum Reef Ground</th>
<th>Doggerbank</th>
<th>Sylter Outer Reef</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reef types, listed in Annex I of the HD 92/43/EEC</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reefs (Code 1170) [ha]</td>
<td>2277</td>
<td>0</td>
<td>15351</td>
<td></td>
</tr>
<tr>
<td>Sandbanks (Code 1110) [ha]</td>
<td>52104</td>
<td>162370</td>
<td>8716</td>
<td></td>
</tr>
<tr>
<td>Fishes, listed in Annex II of the HD 92/43/EEC</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grey seal</td>
<td>Halichoerus grypus</td>
<td>i = P</td>
<td>i = 11-50</td>
<td></td>
</tr>
<tr>
<td>Harbour porpoise</td>
<td>Phocoena phocoena</td>
<td>i = 51-100</td>
<td>i = 501-1000</td>
<td>i = 1001-10000</td>
</tr>
<tr>
<td>Harbour seal</td>
<td>Phoca vitulina</td>
<td>i = 251-500</td>
<td>i = P</td>
<td>i = 1001-10000</td>
</tr>
<tr>
<td>Twaite shad</td>
<td>Alosa fallax</td>
<td>i = P</td>
<td></td>
<td>i = P</td>
</tr>
<tr>
<td>River lamprey</td>
<td>Lampetra fluviatilis</td>
<td></td>
<td></td>
<td>i = P</td>
</tr>
<tr>
<td>European sturgeon</td>
<td>Acipenser sturio</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The selection and designation process for German Natura 2000 sites followed the Commission decision 97/266/EC and are thoroughly explained by von Nordheim et al. (2006). Additional information is available on www.habitatmare.de.

Management objectives for these sites are principally determined in Article 4 (3) of the Habitats Directive (92/43/EEC), ‘… Member State concerned shall designate that site as

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a special area of conservation as soon as possible and within six years at most, establishing priorities in the light of the importance of the sites for the maintenance or restoration, at a favourable conservation status, of a natural habitat type in Annex I or a species in Annex II and for the coherence of Natura 2000, and in the light of the threats of degradation or destruction to which those sites are exposed.'

Additional guidance for a specific understanding of the specific values of ‘favourable conservation status’ defined in Article 1(e) and (i) HD is given by a communication of the European Commission for the assessment, monitoring and reporting of the conservation status (DocHab -04-03/03 rev. 3): ‘...In simple words it can be described as a situation where a habitat type or species is prospering (in both quality and extent/population) and with good prospects to do so in future as well. The fact that a habitat or species is not threatened (i.e. not faced by any direct extinction risk) does not mean that it is in favourable conservation status. The target of the directive is defined in positive terms, oriented towards a favourable situation, which needs to be defined, reached and maintained. It is therefore more than avoiding extinctions. Member States are expected to take all requisite measures to reach and maintain the objective of FCS.’

The German proposed sites were accepted by the Commission in 2007 and conceived therefore the legal status of an SCI according to Article 4 (5) ('... As soon as a site is placed on the list referred to in the third subparagraph of paragraph 2 it shall be subject to Article 6 (2), (3) and (4)...'). Therefore the German Federal Agency for Nature Conservation developed preliminary conservation objectives for the habitats and the species occurring within the SCIs (Table 4.1.5). Those conservation objectives will be further specified when national legal regulations will be implemented.
Table 4.1.4. Habitat size, relevant species and habitats protected by the Habitats Directive in SCIs in the German EEZ of the Baltic Sea. “i” = estimated population size; number ranges given after “i” represent the estimated population size range (class); “P” = means the species is present in the area (occurrence verified, but no estimated numbers). An empty cell for a species means that the population size is unknown.

<table>
<thead>
<tr>
<th>COMMON NAME</th>
<th>SCIENTIFIC NAME</th>
<th>ADLER GROUND</th>
<th>FEHMARN BELT</th>
<th>KADET TRENCH</th>
<th>POMERANIAN BIGHT WITH ODRA BANK</th>
<th>WESTERN RÖNNE BANK</th>
</tr>
</thead>
<tbody>
<tr>
<td>Habitat types, listed in Annex I of the HD 92/43/EEC</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reefs (Code 1170) [ha]</td>
<td></td>
<td>11046</td>
<td>5701</td>
<td>2344</td>
<td>0</td>
<td>6531</td>
</tr>
<tr>
<td>Sandbanks (Code 1110) [ha]</td>
<td></td>
<td>8657</td>
<td>446</td>
<td>0</td>
<td>47992</td>
<td>0</td>
</tr>
<tr>
<td>Marine mammals, listed in Annex II of the HD 92/43/EEC</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grey seal</td>
<td><em>Halichoerus grypus</em></td>
<td>i = P</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Harbour porpoise</td>
<td><em>Phocoena phocoena</em></td>
<td>i &gt; 10</td>
<td>i &gt; 100</td>
<td>i &gt; 10</td>
<td>i = 251-500</td>
<td>i = 11-50</td>
</tr>
<tr>
<td>Harbour seal</td>
<td><em>Phoca vitulina</em></td>
<td>i = P</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fishes, listed in Annex II of the HD 92/43/EEC</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Twaite shad</td>
<td><em>Alosa fallax</em></td>
<td>i = P</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>River lamprey</td>
<td><em>Lampetra fluviatilis</em></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>European sturgeon*</td>
<td><em>Acipenser sturio</em></td>
<td>i = P</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* The sturgeon species last recorded in the Baltic in the 1990s was the Atlantic sturgeon *A. oxyrinchus* (Thiel and Backhausen, 2006).
Table 4.1.5. Preliminary nature conservation objectives for the two habitat types (a) refs, (b) sandbanks, and (c) Harbour porpoises in the German EEZ provided by the German Federal Agency for Nature Conservation (Pedersen et al., 2008).

<table>
<thead>
<tr>
<th>FEATURE/SPECIES</th>
<th>PRINCIPLE CONSERVATION OBJECTIVES</th>
</tr>
</thead>
<tbody>
<tr>
<td>(a) Reefs</td>
<td>... are the conservation and/or recovery of</td>
</tr>
<tr>
<td></td>
<td>• the specific ecological functions, the characteristic habitat structure and its extent (area)</td>
</tr>
<tr>
<td></td>
<td>• the characteristic morpho-dynamic and general local currents together with its characteristic and endangered communities and species</td>
</tr>
<tr>
<td></td>
<td>• Conservation of the characteristic benthic communities and species within their natural occurrence and abundance, e.g. anemones, tunicates, bryozoans and fishes</td>
</tr>
<tr>
<td>(b) Sandbanks</td>
<td>... are the conservation and/or recovery of</td>
</tr>
<tr>
<td></td>
<td>• the current ecological quality, habitat structure and surface area of the habitat type</td>
</tr>
<tr>
<td></td>
<td>• the characteristic morphological and hydrological dynamics and the typical species and communities in their largely natural population dynamics</td>
</tr>
<tr>
<td></td>
<td>• the characteristic benthic communities of habitat 1110 and its characteristic species</td>
</tr>
<tr>
<td>(c) Harbour porpoises</td>
<td>... are the conservation and/or recovery of</td>
</tr>
<tr>
<td></td>
<td>• the existing stock recognising their natural population dynamic and fluctuations</td>
</tr>
<tr>
<td></td>
<td>• their feeding, migration and reproduction habitats with preservation of their functional integrity within the site and the possibility to migrate to other sites outside</td>
</tr>
<tr>
<td></td>
<td>• the natural genetic diversity</td>
</tr>
<tr>
<td></td>
<td>• the occurrence and abundance in space and time of their food chain</td>
</tr>
</tbody>
</table>

4.3.2 Conservation objectives of Annex IV species

Harbour porpoises are additionally listed in Annex IV of the Habitats Directive. For these species, according to Article 12 HD Member States are obliged to take the requisite measures to establish a system of strict protection which includes prohibition of deliberate capture or killing the species in the wild, deliberate disturbance, particularly during the life periods where the species are more sensitive to impacts or where impacts have a more negative effect on their population, i.e. of during breeding, rearing, hibernation and migration. Deterioration or destruction of breeding sites or resting places is included in this obligation (‘...Member States shall take the requisite measures to establish a system of strict protection for the animal species listed in Annex IV (a) in their natural range, prohibiting: (a) all forms of deliberate capture or killing of specimens of these species in the wild; (b) deliberate disturbance of these species, particularly during the period of breeding, rearing, hibernation and migration; (c) deliberate destruction or taking of eggs from the wild; (d) deterioration or destruction of breeding sites or resting places...’).

Additionally, Member states have to monitor bycatch of Annex IV species to improve their management measures according to Article 12 (4) (‘...Member States shall establish a system to monitor the incidental capture and killing of the animal species listed in Annex IV (a). In the light of the information gathered, Member States shall take further research or con-

servation measures as required to ensure that incidental capture and killing does not have a significant negative impact on the species concerned…”).

4.3.3 Application of ‘Favourable Conservation Status’

Three specific procedures for the assessment of the ‘Favourable conservation status’ of habitats and species are distinguished by the Habitat Directive:

(a) an environmental impact assessment (EIA) of a plan or project as proscribed under Article 6 (3) and (4) HD (‘…Any plan or project not directly connected with or necessary to the management of the site but likely to have a significant effect thereon, either individually or in combination with other plans or projects, shall be subject to appropriate assessment of its implications for the site in view of the site’s conservation objectives …’). As described above, in the German EEZ site specific criteria are required that guarantee maintaining or improving the current conservation status and which are building the framework for the assessment of existing SPAs (§ 3 of the Ordinances, table 4.3.1.) and in a preliminary form for SCIs.

(b) the assessment of the monitoring results regularly reported by Member States to the Commission on the conservation status of the protected habitats and their typical species and the species and their specific habitat, as proscribed under Article 11 and Article 17 HD (‘…This report shall include in particular information concerning the conservation measures referred to in Article 6 (1) as well as evaluation of the impact of those measures on the conservation status of the natural habitat types of Annex I and the species in Annex II and the main results of the surveillance referred to in Article 11…’); and

(c) in the consideration of possible derogations from the system of strict protection of Annex IV species (Article 12) according to Article 16 HD (‘…Provided that there is no satisfactory alternative and the derogation is not detrimental to the maintenance of the populations of the species concerned at a favourable conservation status in their natural range, Member States may derogate from the provisions of Articles 12, 13, 14 and 15 (a) and (b): …’).

Derogations from the strict protection of birds in Article 5 - 8 BD are only allowed under the conditions described in Article 9 BD.

The favourable status of both species and habitats have to be evaluated for the total area within each biogeographic region of the Member State. Germany has sent in 2007 a national report for the years 2000 - 2006 on the conservation status of the species and habitats following the specific guidance of the Commission (Assessment, monitoring and reporting of conservation status – Preparing the 2001-2007 report under Article 17 of the Habitats Directive (DocHab-04-03/03 rev.3)).

For species and habitats specific national criteria for the assessment have been developed (Species: Schnitter et al., 2006; Habitats: Krause et al., 2008).

For the German North Sea and Baltic Sea the results of the national report are summarised in the following tables (FV: Favourable; U1: Unfavourable - Inadequate; U2: Unfavourable- Bad; XX: Unknown):
### I) German Marine Natura 2000 Habitats North Sea (Continental Biogeographic Region)

<table>
<thead>
<tr>
<th>Code</th>
<th>Name</th>
<th>Range</th>
<th>Area</th>
<th>Structure</th>
<th>Future Prospect</th>
<th>Overall Assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1110</td>
<td>Sandbanks</td>
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<td>FV</td>
<td>XX</td>
<td>XX</td>
<td>XX</td>
</tr>
<tr>
<td>1130</td>
<td>Estuaries</td>
<td>FV</td>
<td>FV</td>
<td>U2</td>
<td>U2</td>
<td>U2</td>
</tr>
<tr>
<td>1140</td>
<td>Mudflats</td>
<td>FV</td>
<td>FV</td>
<td>FV</td>
<td>XX</td>
<td>FV</td>
</tr>
<tr>
<td>1150</td>
<td>Lagoons</td>
<td>FV</td>
<td>XX</td>
<td>U2</td>
<td>U2</td>
<td>U2</td>
</tr>
<tr>
<td>1160</td>
<td>Bights</td>
<td>FV</td>
<td>FV</td>
<td>XX</td>
<td>XX</td>
<td>XX</td>
</tr>
<tr>
<td>1170</td>
<td>Reefs</td>
<td>FV</td>
<td>XX</td>
<td>XX</td>
<td>U1</td>
<td>U1</td>
</tr>
</tbody>
</table>

### II) German Marine Natura 2000 Species North Sea (Atlantic Biogeographic Region)

<table>
<thead>
<tr>
<th>Code</th>
<th>Species</th>
<th>Range</th>
<th>Population</th>
<th>Habitat</th>
<th>Future Prospect</th>
<th>Overall Assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>LAMPFLUV</td>
<td>River lamprey</td>
<td>FV</td>
<td>FV</td>
<td>U1</td>
<td>FV</td>
<td>U1</td>
</tr>
<tr>
<td>PETRMARI</td>
<td>Sea lamprey</td>
<td>XX</td>
<td>U2</td>
<td>U1</td>
<td>U1</td>
<td>U2</td>
</tr>
<tr>
<td>ALOSALOS</td>
<td>Allis shad</td>
<td>XX</td>
<td>U2</td>
<td>U2</td>
<td>XX</td>
<td>U2</td>
</tr>
<tr>
<td>ALOSFALL</td>
<td>Twaiate shad</td>
<td>FV</td>
<td>U1</td>
<td>U1</td>
<td>FV</td>
<td>U1</td>
</tr>
<tr>
<td>HALOCRYP</td>
<td>Grey seal</td>
<td>FV</td>
<td>U1</td>
<td>FV</td>
<td>FV</td>
<td>U1</td>
</tr>
<tr>
<td>PHOCPHOC</td>
<td>Harbour porpoise</td>
<td>FV</td>
<td>U1</td>
<td>U1</td>
<td>XX</td>
<td>U1</td>
</tr>
<tr>
<td>PHOCVITU</td>
<td>Harbour seal</td>
<td>FV</td>
<td>FV</td>
<td>FV</td>
<td>FV</td>
<td>FV</td>
</tr>
</tbody>
</table>

### III) German Marine Natura 2000 Habitats Baltic Sea (Continental Biogeographic Region)

<table>
<thead>
<tr>
<th>Code</th>
<th>Name</th>
<th>Range</th>
<th>Area</th>
<th>Structure</th>
<th>Future Prospects</th>
<th>Overall Assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1110</td>
<td>Sandbanks</td>
<td>FV</td>
<td>XX</td>
<td>XX</td>
<td>XX</td>
<td>XX</td>
</tr>
<tr>
<td>1130</td>
<td>Estuaries</td>
<td>FV</td>
<td>U1</td>
<td>U2</td>
<td>U1</td>
<td>U2</td>
</tr>
<tr>
<td>1140</td>
<td>Mudflats</td>
<td>FV</td>
<td>FV</td>
<td>U1</td>
<td>FV</td>
<td>U1</td>
</tr>
<tr>
<td>1150</td>
<td>Lagoons</td>
<td>FV</td>
<td>FV</td>
<td>U2</td>
<td>U1</td>
<td>U2</td>
</tr>
<tr>
<td>1160</td>
<td>Bights</td>
<td>FV</td>
<td>FV</td>
<td>U1</td>
<td>U1</td>
<td>U1</td>
</tr>
<tr>
<td>1170</td>
<td>Reefs</td>
<td>FV</td>
<td>XX</td>
<td>XX</td>
<td>U1</td>
<td>U1</td>
</tr>
</tbody>
</table>

### IV) German Marine Natura 2000 Species Baltic Sea (Atlantic Biogeographic Region)

<table>
<thead>
<tr>
<th>Code</th>
<th>Species</th>
<th>Range</th>
<th>Population</th>
<th>Habitat</th>
<th>Future Prospect</th>
<th>Overall Assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>LAMPFLUV</td>
<td>River lamprey</td>
<td>FV</td>
<td>U2</td>
<td>U2</td>
<td>XX</td>
<td>U2</td>
</tr>
<tr>
<td>PETRMARI</td>
<td>Sea lamprey</td>
<td>XX</td>
<td>XX</td>
<td>XX</td>
<td>XX</td>
<td>XX</td>
</tr>
<tr>
<td>ALOSALOS</td>
<td>Allis shad</td>
<td>U2</td>
<td>XX</td>
<td>U2</td>
<td>XX</td>
<td>U2</td>
</tr>
<tr>
<td>ALOSFALL</td>
<td>Twaiate shad</td>
<td>XX</td>
<td>U2</td>
<td>XX</td>
<td>XX</td>
<td>U2</td>
</tr>
<tr>
<td>HALOCRYP</td>
<td>Grey seal</td>
<td>U2</td>
<td>U2</td>
<td>U2</td>
<td>XX</td>
<td>U2</td>
</tr>
<tr>
<td>PHOCPHOC</td>
<td>Harbour porpoise</td>
<td>XX</td>
<td>U2</td>
<td>U1</td>
<td>U1</td>
<td>U2</td>
</tr>
<tr>
<td>PHOCVITU</td>
<td>Harbour seal</td>
<td>FV</td>
<td>U2</td>
<td>U1</td>
<td>U1</td>
<td>U2</td>
</tr>
<tr>
<td>Code</td>
<td>Species</td>
<td>U2</td>
<td>U2</td>
<td>U1</td>
<td>U1</td>
<td>U2</td>
</tr>
</tbody>
</table>

#### 4.4 Discussion and conclusions on conservation objectives

The work in the EMPAS project is defined by the EU Birds and Habitats Directives. The key operational phrase in these Directives is “favourable conservation status” (FCS). Each EU member state can define “favourable conservation status” by itself
independently as long as it can justify why it calls such and such “favourable conservation status”. Hence, there can be differences between Member States in what is defined “favourable conservation status” for different species and habitats. The German standards of FCS are based on EU and national conservation law. Therefore, in this workshop standards for “favourable conservation status” defined by Germany were taken as set. As a second step measures to achieve FCS have to be identified. Protected areas are one of the main tools, however, other or additional measures to achieve “favourable conservation status” may be required. The Habitats Directive requires Member States to report on the conservation status of the protected sites and species every six years. Member States have the obligation to add additional management measures to protected habitat sites and species if needed. In practise the phrase “favourable conservation status” means that protected habitats and species are prospering or moving in the direction of improvement and stability in the long run. It does not mean that habitats and species should reach “pristine conditions”, which is especially difficult to define for marine ecosystems. The “baseline” of the condition of species and habitats is not described in the scientific literature. However a sound guidance of a positive development of the condition for habitats and species in our marine environment is possible. Investigations of activities which impede the ability of protected habitats and species to move in a more natural determined status are a second prerequisite for sound determinations of the conservation status.

Conclusions Conservation Objectives:

- “Letters of law” matters (court decisions). Details in the legal framework are really important. A legal interpretation is likely to be over a biological interpretation of what is the right thing to do, if the biological interpretation does not fit to the letter of the law.
- The responsible German nature agency has the right to define “favourable conservation status” (FCS). This was accepted as basis for further discussion.
- We are able to discuss the degree to which the MPAs, if “operating effectively”, would allow FCS to be achieved for each species or habitat.
- What to do if MPA cannot contribute effectively to FCS without measures outside MPA, and those measures would produce FCS without the extra provisions of an MPA?
- We are able to discuss what measures have to be in place for the MPA to “operate effectively”.

Science aspects of Conservation Objectives:

- Translated into science, we need to consider:
  - Which fishing activities threat the nature conservation goals and the effectiveness of Natura 2000 MPA?
  - The level that of interference of each activity to the nature conservation goals
  - Effective mitigation measures?
  - The level of benefit to be expected from each proposed measures?
  - For Habitats: “Favourable conservation status” (FCS) needs specific structures and functions to exist and they should be likely to continue to exist.
  - For species: FCS requires that range and area are stable or increasing, and population dynamics stable or increasing.
  - Moving in right direction more important than the end-point.
5 Areas and Nature of Potential Conflicts (ToR c)

Human activities are stressor on the seabed and on the marine environment in general. Human activities can be grouped into several different types of pressure to describe the specific ways that ecosystems and their components are perturbed (Eastwood et al., 2007). Impacts are the changes in ecosystem components caused by the pressures, and these may vary within a single pressure type. Examples of human activities in the North Sea are:

- Oil and gas exploration & drilling
- Marine mineral dredging
- Fishing
- Stone fishing
- Wind farms
- Cables
- Dredge material disposal
- Waste disposal

The EU marine strategy requires comprehensive assessments of pressures from all human activities on the marine environment. Eastwood et al. (2007) has made an assessment of direct, physical pressure on the seabed of human activities in UK offshore waters. Fishing has the largest biological disturbance effects on the marine ecosystem and it has ‘traditionally’ been a very large ‘stressor’ in the European northern seas for over a century (Eastwood et al., 2007; Callaway et al., 2007; Ducrotoy and Elliott, 2008).

Although the conservation of the sites may require the implementation of appropriate management measures other than fisheries measures (wind power parks and other energy projects, oil and mineral prospection and exploitation, geological survey, maritime traffic, military activities, ecotourism, etc.), these other measures have not been addressed in the EMPAS project and in this workshop.

In the EMPAS project the focus is on potential conflicts between nature conservation objectives and fishing activities in and around the German Natura 2000 sites. This section gives summaries of the presentations of research and studies on potential nature conflicts with fishing activities.

5.1 Generic Problems and Conflicts: Working Group on Ecosystem Effects of Fishing Activities (WGECO)

Stuart Rogers presented the ICES Working Group on Ecosystem Effects of Fishing Activities (WGECO). WGECO has over the past 20 years been looking at the ecological consequences of different aspects of fishing activities and in some cases the consequences you can expect from certain types of mitigation measures.

For many years the focus of work within WGECO has been assessing the effects of fishing on the ecosystem. During a series of working group meetings there has been developed a body of literature that has dealt with effects on most marine environmental components, including benthic invertebrates and structural habitats, cetacean, seabirds and fish. This activity has been partly supported by internal requests for advice within ICES, but also to deliver specific products to commissioning bodies including OSPAR and the European Commission. Substantial efforts have been de-
voted to development of the EcoQO process within OSPAR, and review of the IMPACT R&D programme.

Although the knowledge has been accumulated over several meetings, it is still considered to be a good first source of knowledge of the effects of fishing. Furthermore, key outputs have been published in the peer reviewed literature to increase their exposure to a wider audience. The most recent activity of the group in 2008 draws on this experience to advise an active group of scientists and gear technologists developing gear-based technical measures (GBTM) for fishing gears. As there has been no systematic work to assess whether mitigation measures have been focussed on priority issues, and no assessment of whether technical measures have been effective, WGECO advice will provide a framework within which such judgements can be made.

Expertise from gear technologist and gear based technical measures are important and needed in WGECO. Therefore WGECO developed a framework and a process for selecting interaction between fleets and the ecosystem. This selection process will allow gear technologists to highlight those areas of interactions and conflicts which were most significant and which could generate favourable outcomes when gear technological changes had been applied. The framework was based on previous work in WGECO on understanding interactions between fleets and the ecosystem and also on recent FAO guidelines on levels of significance of interactions. Fishing clearly affects the ecosystem but the important issue here was how can it be quantified whether it is significant or not. The framework developed the latter approach and it is specifically meant for gear technologists. The framework is going to be part of the WGECO terms of reference for several years ahead and the description of the framework is available in the WGECO 2008 report. The knowledge to set up the framework has been generated over several years particularly in the WGECO 2007 report where summaries of the effects of fishing on the North Sea ecosystem were given. This work was requested by the OSPAR and it has recently been expanded into a contribution to the OSPAR quality status report for 2010. Over the years WGECO has look at for example effects of beam trawls on habitats, effects of fixed gears on birds and mammals, the use of pingers and other acoustic devices and the consequences of their use. In addition to describing impacts, indicators and objectives have been prepared which will allow managers to record progress against certain thresholds and to show that progress have been made when the correct management measures have been applied. Hence, all the experience and work already available in ICES and in the ICES literature should be taking into consideration and be used in the Natura 2000 process.

5.2 FishPact: Impact assessment of bottom trawling on benthic species in MPAs within the German EEZ of the North Sea: A modelling approach

Alexander Schroeder and Lars Gutow, Alfred-Wegener-Institut, Germany, presented the methods and results from a project funded by the German Federal Agency for Nature Conservation (BfN) on the spatial distribution of potential impacts of bottom trawling on characteristic species of protected habitat types in the North Sea. It is designed as a contribution to the ICES / BfN project “Environmentally Sound Fishery Management in Protected Areas [EMPAS]” aiming at fisheries management plans of the Natura 2000 sites (SCI) within the German EEZ of the North Sea and Baltic Sea.

The modelled responses of defined ecotypes (i.e. species with similar ecological and life history characteristics: r/K-species) to fishing disturbance are combined with in-
formation about the spatial distribution of fishing intensity to identify areas of potential conflict with conservation targets. The proposed population model is based on published data on life history parameters including the timing of recruitment, age specific mortality and longevity of benthic species. The model simulates trawling induced increased age specific mortality rates for all age classes present at the time of the trawling. Trawling induced mortality rates are taken from published experimental investigations on the impact of bottom trawling on benthic species. Assuming constant recruitment rates in an area it identifies differential demographic reactions of the suggested ecotypes to variations in gear type, trawling intensity and the temporal distribution of trawling events (Figure 5.2.1).

The spatial distribution of potential population impacts is assessed by an estimation of trawling frequency based on Vessel Monitoring System (VMS) records. The German VMS-Dataset from 2006 covering all vessels fishing within the German EEZ including information on employed gear type and associated time interval was supplied by H. Fock from the Institute for Sea Fisheries in the von Thünen Institute Hamburg. As the data set is only representative for German waters, the subsequent analysis was restricted to this area. The effort was converted into the fished area per record by multiplying the fishing time by the average fishing speed for each gear type times the average gear width. Annual fishing frequency per hectare was then calculated using a quadratic Kernel density function (Figure 5.2.2).

![Figure 5.2.1 Differential demographic reactions of the defined ecotypes to different beam trawling intensities in the MPAs of the German Bight.](image)

\[
f(x) = 72.89 \cdot e^{(-0.199x)} + 26.56
\]

This allows a presentation of the spatial distribution of trawling frequency for each bottom trawling gear type. For each of the designated habitat features in the MPAs, an annual trawling frequency can be estimated.

The temporal trawling regime did also differ between the SCI and the results from the population model indicated that the timing of trawling events determines population effects especially for short-lived species (Figure 5.2.3).

Thus, the temporal distribution of trawling was calculated for beam and otter trawls for each area separately and used as input for the population models. The models
produce regression functions of population reduction for annual fishing regimes of different trawling frequencies (Figure 5.2.1). These functions were then used to derive the spatial distribution of predicted population reduction from local trawling frequency for each ecotype and area separately (e.g. Figure 5.2.4 & 5.2.5). These can be separately seen for beam or otter trawls or summed over both gear types. Characteristic species of the habitat types sandbanks and reefs can be attributed to the designated ecotypes and thus inferences can be made about the influences of bottom trawling on these species.

In this way the model is able to identify potential conflicts between ongoing fishery activities and conservation strategies. Especially for long-lived species the models predict a considerable impact in parts of the SCI. The fishing disturbance results not only in a reduction of local population density but also in a change of the size structure and production of the affected populations. The mean individual body size is reduced, while the resulting productivity increases. This effect was much stronger for long-lived species (e.g. *E. cordatum* Figure 5.2.6 right), where each age class is affected repeatedly each year over its live span.

![FishPact](image)

Figure 5.2.2. Total fishing frequency per hectare from all bottom trawls in the German EEZ.
Figure 5.2.3. Demographic reactions of r- (top) and K-selected (bottom) epifaunal species to different temporal distributions of trawling events in the MPAs of the German Bight. (MPAs: BRG = Borkum reef ground; DGB = Dogger bank; SAR = Sylt outer reef; SAREGB = Overlap of Sylt outer reef & Eastern German Bight bird protective area).
Figure 5.2.4. Spatial distribution of predicted reduction of natural populations [%] from bottom trawling for infaunal r-selected species (Ecotype i/r) in the Natura 2000 areas.

Figure 5.2.5. Spatial distribution of predicted reduction of natural populations [%] from bottom trawling for epifaunal K-selected species (Ecotype e/K) in the Natura 2000 areas.
Figure 5.2.6 Influence of annual beam trawl fishing frequency on mean individual body mass (filled symbols, left y-axis) and P/B-ratio (open symbols, right y-axis: productivity) of Nephtys hombergii (left) and Echinus esculentus (right).

By plotting the resulting production against the relative population size (Figure 5.2.7) all modelled populations displayed an upward curving correlation, with the largest reduction in production exerted by a trawling frequency of once per year (dashed line in Figure 5.2.7). A “safe” level of disturbance was thus not determinable.

Figure 5.2.7. Relation of calculated production [kJ/y] and population size (abundance in % of undisturbed population) of Nephtys hombergii (left) and Echinus esculentus (right). Dashed line indicates the population status with a trawling frequency of once per year at the published trawling mortality rates of 60 % (N. hombergii) and 36 % (E. esculentus), respectively.

Discussion: Questions: The first trawl haul is obviously the one with highest impact, but what is the baseline year for the modelling studies? How does the model account for recovery? What is the value of the model exercise in the EMPAS project? Answers: There is no baseline year and the model is not saying anything about impact of the first haul. The model estimates impact of trawling once per year in a stable regime which is trawled in the same pattern year after year under the assumption that the trawling has the same spatial pattern as in 2006 (the only data we have for the moment). The model predicts the population reduction in relation to a population not impacted by fishing. The recovery is not really dependant on the local population because many of the species are dependent on planktonic larvae and the larvae source locations are often quite far from where the disturbed populations are located. Putting the larvae source and sink question into the model will require a North Sea wide hydrodynamic particle tracking model on top of the presented FishPact model.
in order to say something about the recovery potentials. For example some benthic populations in the German Bight may be recruited from areas in the Netherlands. The value of the Fish- Pact model is that it is possible to predict the potential effects on a local benthic population without having data for the population at a certain locality but only information about fishery in the area. We can say something about which areas are likely to be most impacted and which areas are probably in better conservation status. **Comment:** The question is where in the areas will there be most to gain in conservation status by reducing trawling impacts. This question can be answered based on information about the distribution of K and r selected species and the impact from fishing. **Comment:** The model gives conservative results because it is assumed that there is a constant recruitment/colonisation which there is probably not. **Question:** What knowledge exists on the actual situation for the benthic communities? Are there samples and information about this? What does the community looks like on for example a sandbank trawled once compared a sandbank intensively trawled? **Answer:** It has been a problem that detailed fisheries information (e.g. VMS data) has not been available until recently. Now when we have the information about fisheries intensity we can go and sample areas with high and low fishing impact because we know where to go. The data which have been available are based on samples taken at large spatial and temporal scales where directly related detailed fishery data are presently not available at the required spatial and temporal resolution, which does not allow investigations of the effects of fisheries on specific locations. **Question:** I understand that the model is driven by fishing effort and the distribution of the temporal fishing effort and that this is described for four different ecotypes. Is it possible to characterise the benthic communities in terms of different contributions of these ecotypes different weights of the ecotypes? For information a working document on ongoing work has been uploaded to the Share Point site this document describes some benthos-fisheries interactions (working document in Annex 5). **Answer:** Benthic communities are mostly defined at a very large scale. Reef epifauna communities will be more K-selected species dominated whereas in sand communities will be more short lived and r-selected species. However, to quantify this in relation to fishing intensity is with the present existing data not possible. **Comment:** The questions are: Do we know what the pristine communities are? Can we define them and get back to these? That is not possible to say because we don’t know the fishing history and we don’t know what the benthic community looked like in the past. However, we have some ideas what undisturbed epibenthic communities may look like from diving observation in reef areas and on sandbanks close to or between reefs with little or no fishing activities. In these areas there are generally larger individuals, more biomass, more long lived and K-selected species.

### 5.3 Evidence based information about effects of trawling on sandbanks and reefs

During the morning subgroup meeting on Tuesday 3 June, Jan Geert Hiddink, University of Wales, Bangor, UK, presented methods for assessing habitat sensitivity to human impacts. Methods are needed to gauge the sustainability of existing impacts, develop spatial management plans and support meaningful environmental impact assessments. The methods should be quantitative, validated, repeatable and applicable at the scales of impact and management.

Short term and small scale experimental bottom trawling studies indicate that biogenic habitats such as reefs are very sensitive to bottom trawling disturbance, but that sand habitats such as sand banks are much less vulnerable to disturbance (Kaiser et al., 2006). Little quantitative information exists on the recovery rates of benthic com-
munitions from large scale chronic trawling, but the available evidence suggests that recovery from bottom trawling will take about 6 years (Hiddink et al., 2006).

A size based model that was developed for the North Sea, and validated with sampling in different habitats including sandbanks, suggest that sandbanks such as the Dogger bank are relatively resilient to bottom trawling disturbance relative to deeper and more muddy areas of the North Sea, because recovery in sandbank areas is fast relative to bottom trawling frequencies (Figure 5.3.1, Hiddink et al., 2007).

![Image showing map and recovery time production]

**Figure 5.3.1** Recovery time in years of benthic production after a single trawl (Hiddink et al., 2007).

### 5.4 Conflict analysis of fisheries with static gear and seabird distribution in the German Baltic Sea

The presentation by Stefan Garthe, Henriette Dries, and Nicole Sonntag (Research and Technology Centre, Germany) consisted of four main parts: (1) bird mortality, (2) seabird distribution, (3) fishing activity, and (4) conflict intensity. Main focus was placed on the SPA Pomeranian Bay, but other areas of the German Baltic Sea were also under consideration.

1. No data exist on mortality rates of seabirds in the SPA Pomeranian Bay. The best quantitative evidence on the problem of seabird bycatch in set nets is available from the southern coast of the Pomeranian Bay along the coast of the island of Usedom. Data collected and published show that almost all diving seabird species have been caught in nets. Long-tailed ducks, common scoters, red-throated divers and red-necked grebes are among the species caught most often. In relation to the average numbers of birds present in winter in the assumed fishing area of Usedom fishers, the catch rate is particularly high for red-throated divers (70%). It was mentioned that there are many more bycatch studies from other areas in the southern Baltic Sea that show related patterns of bycatch.

2. Seabird distribution in the German Baltic Sea was studied from ship and planes. Distribution maps were shown for five seabird species. The maps clearly showed the high importance of the SPA Pomeranian Bay (example of the common scoter in
summer: Figure 5.4.1). Total numbers of birds in the SPA are usually around a quarter million, with important concentrations existing year-round.

(3) Fishing activity in the SPA was assessed from two different sources. First, recording of set nets during bird surveys from ships were used. These set nets could be identified by their flags. Second, Vessel Monitoring System, VMS data for boats larger than 15 m from all European countries in 2006 were supplied by H. Fock, von Thünen Institute, Hamburg. Data were filtered to derive 'days with VMS records'. There was no full match between the two different data sets, mainly due to the fact that most set net flags sightings were from rather small boats below 15 m that dominate the set net fishery in the Baltic Sea and are not monitored by VMS yet. Anyhow, there is evidence for set net fisheries in the SPA Pomeranian Bay, mainly on the Adlerground (and mainly in winter), but also in the Odra Bank area (mainly in late spring/early summer). An example of the set net activity by VMS recordings is given in Figure 5.4.2.

![Distribution: Common Scoter, summer](image)

**Figure 5.4.1.** Distribution: Common Scoter, summer.

(4) In a final step, maps on the conflict intensity were developed by relating bird distribution and fisheries distribution data. Fishing intensity was quantified according to abundances of set net flags and VMS days. Bird distribution was quantified based on the abundances of all species that were selected in the designation process as priorities for the SPA. Main current conflicts exist in the Adler Ground area in winter and in the Odra Bank area in late spring/early summer (see Figure 5.4.3). It was mentioned, however, that any fishing activity in winter in the Adler Ground area and around the year in the Odra Bank area will lead to conflicts because of the high bird concentrations in those areas and periods.
Figure 5.4.2 Distribution of fishing effort: VMS data.

Figure 5.4.3 Conflict situation in SPA.
Discussion: **Question:** What is the influence of the depth factor on the distribution of seabirds? **Answer:** Almost all seabirds are concentrated in shallow waters and the diving depth of sea ducks is maximum 25 meters when foraging for bivalves and other benthic invertebrates. Therefore the probability for seabird bycatch in set-net in in water depth exceeding 25 m is extremely low. **Question:** What is the effect of changing from ordinary gill-nets to trammel nets? There have been a major change to trammel nets in the Danish waters and the trammel nets might be more visible for diving birds than the former used gill-net types. Therefore, birds might avoid to be trapped in trammels. **Answer:** The effect of different set net types on bycatch is not exactly known, but there is probably a difference in the bycatch rate of seabirds between the two net types. Gill-nets are currently by far the most important passive gear (18.4% of total landings in 2006) in the German EEZ and fishing effort with trammel nets is almost neglectable (0.5% of total landings).

5.5 Conflict analysis between gill-net fisheries and porpoise distribution in German waters

Helena Herr and Ursula Siebert, Research and Technology Centre, Germany, presented bycatch data, porpoise distribution, and potential conflicts with gill-net fisheries.

Bycatch of harbour porpoises (*Phocoena phocoena*) in the Baltic Sea is of great concern with respect to their conservation. As all harbour porpoise populations occurring in German waters are in an unfavourable conservation status (North Sea: Unfavourable - inadequate; Baltic Sea: Unfavourable - bad), any unnatural mortality must be considered as a strong impact on the population. Moreover, apart from fisheries bycatch porpoises of the Baltic Sea face a variety of other anthropogenic impacts which make them especially vulnerable. At least two separate harbour porpoise (sub)populations are distinguished in Baltic waters, of which the Baltic Proper population, occurring east of the Darss and Limhamn ridge, has been severely reduced and is estimated at less than 600 remaining animals.

Bottom set gill-nets are known as the major source for anthropogenic caused mortality of harbour porpoises and feature by far the highest bycatch rates among fishing gear types. In the Baltic Sea, set net fisheries account for a major part of the total fishing activity. Bycatch of porpoises in set nets along the German coast occurs regularly. However, netmarks and mutilations found on stranded carcasses indicate that only a small fraction of all actually bycaught animals is reported. Bycatch reports are omitted and bycatch is actively hidden by opening body cavities and sinking carcasses with the help of rocks. Hence, true bycatch numbers remain unknown and most probably bycatch numbers are underestimated.

**Stranding and bycatch numbers along the German Baltic coast:** Since 1987 the Research and Technology Centre of the University of Kiel (FTZ) has been collecting carcasses found on the shores of Schleswig-Holstein and partly also of Mecklenburg Western Pomerania, which since 2000 is covered by the German Oceanographic Museum (DMM). Figure 5.5.1 presents the combined results of both institutes. Carcasses collected are judged as bycatch only from direct reports and as suspected bycatch only due to mutilations (cut off fluke, fins, flippers or cut open abdomen) and netmarks indicating injury before death (thus excluding carcasses that might have drifted into nets). All other animals are classified as “stranded”. Reports of direct bycatch have decreased over the years, while suspected bycatch numbers have increased, indicating less willingness of fishers to report bycatches.
Since 2000 a rise of carcass numbers from averagely 30–40 dead animals collected per year to more than 150 in 2007 was observed (Figure 5.5.1).

Although search effort might have slightly increased over the years (e.g. due to public awareness), it could not possibly account for the high increase in animals found. Moreover, a 150 km strip of coastline in Schleswig Holstein with constant effort since 1987 exhibited the same trend as the overall trend. Increasing population numbers could be another explanation, but lack proof. Abundance estimates from 2007 are not available and earlier population estimations neither exhibited a population trend nor showed a significant change in densities.

![Figure 5.5.1. Carcasses collected along the German Baltic Sea coast from 2000 to 2007 by the FTZ and DMM. Category bycatch comprises only bycaught animals delivered by fishers. “Suspected” bycatch comprises carcasses with netmarks and mutilations. All other carcasses were categorised as stranded.](image)

In the time period 2000–2007 in average 17% of the carcasses were classified as bycatch or suspected bycatch. However, as more than 80% of all carcasses collected are in bad states of preservation, it can be assumed, that many bycatch indications remain undetected. Considering only animals in good to moderate states of conservation (12% of the total number) 47% were classified as suspected bycatch.

Generally, the geographic distribution of stranding numbers mirrors the population distribution of porpoises in the Baltic, with highest numbers found in the Western Baltic and lowest numbers in the east (Figure 5.5.2). Evaluated as animals found per km of coastline, strandings on Fehmarn were especially numerous. Bycatch occurs all along the German coast of the Baltic Sea, also in areas with very low harbour porpoise densities (i.e. in the Central Baltic).

**Estimating conflict between porpoises and set net fisheries in the Baltic Sea:** Assessing the impact of set net fisheries on porpoises in the Baltic Sea is especially difficult. More than 70% of set net fishing activity is carried out by small vessels and the part time fisheries. These vessels are not VMS equipped (<15 m length) and no obligation to fill out logbooks (< 8 m length). Hence neither movement nor fishery effort of this fleet segment are monitored. To approximate the temporal and spatial effort of set net fisheries in the German Baltic, set net flag sightings, recorded during aerial surveys following line transect methodology, were used to calculate flag density (flags/km) as a proxy for set net density.
As an approach to determine conflict potential, local set net and porpoise densities were calculated for cells of a grid scheme. For each cell, porpoise density was multiplied with the average set-net density of all neighbouring cells and the results were treated as an index for conflict potential.

Results showed that set netting is carried out in German coastal waters and the EEZ year round, with highest effort in winter and spring (Figure 5.5.3). Harbour porpoises occur in German waters in the Baltic Sea all-season. In winter, highest densities are found in the Western Baltic. From here porpoises move into the Mecklenburg Bight during spring to late summer, where high densities can be found until September. In the eastern part of the German Baltic harbour porpoises are thought to belong to the small Baltic Proper population. Densities here are generally low, but sometimes peak in spring and summer.

Conflict in winter (Nov-Feb) was mainly predicted for the Kiel Bight, as elsewhere porpoise densities in winter are low. In spring (Mar-Jun), potential conflict extended largely into the area around Fehmarn, including the Natura 2000 site “Fehmarnbelt”. Similarly, conflict was also predicted for the Mecklenburg and Pomeranian Bay, including all other three Natura 2000 sites. In summer/autumn (Jul-Oct) conflict potential remained strong around Fehmarn and along the western Mecklenburg coast, as well as in the Kiel Bight and Pomeranian Bay.

**Conclusion:**

- Numbers of stranded and suspected bycaught harbour porpoises in the German Baltic Sea have risen in the time period 2000-07
- No evidence for a population increase in harbour porpoises in the same area and time period
- Baltic Proper population is especially vulnerable/endangered. Already a single bycatch must be considered as unsustainable for the population.

![Figure 5.5.2. Locations of bycaught and stranded porpoises between 2000 and 2007.](image)
• Analysis showed that conflict between set net fisheries and harbour porpoise distribution is widespread
• Marine Natura 200 sites in the German EEZ of the Baltic Sea are areas of conflict
• In order to analyse any conflict potential of harbour porpoises with set net fisheries, fisheries effort and bycatch of small boats and the part time fisheries must be assessed. Implementation of an effective fisheries monitoring scheme including all fishery vessels within Natura 2000 site could be a first step to improve the data situation regarding effort and bycatch number.
• Harbour porpoise abundance in the Baltic Sea must be monitored carefully to be able to detect and analyse population trends.

Figure 5.5.3. Average density of porpoises and setnet flags in winter (A), spring (B) and summer (C), based on aerial surveys from 2002-2006. Densities were calculated for a 10x10 km grid scheme. The larger the symbol, the higher the density. Conflict potential was calculated as the product of porpoise density and mean set net density of the surrounding cells.
**North Sea**: An investigation of porpoise and fisheries distribution in the German North Sea showed seasonal association and high overlap between set net fisheries and porpoises in summer (May-July), partly in the area of the SCI Sylt Outer Reef, which has been proposed and outlined as a Natura 2000 site based on harbour porpoise occurrence (Herr et al., 2008). So far, no proof for by catch in that area is given. However, as the SCI Sylt Outer Reef has been found an especially important feeding ground and reproduction site for harbour porpoises and features highest porpoise densities in European waters during late spring and summer, set net fisheries are associated with especially high bycatch risk in that area and should be considered with concern. The harbour porpoise distribution in the North Sea is shown in Figure 5.5.4.

![Porpoise distribution](image)

Figure 5.5.4. The seasonal harbour porpoise distribution in the North Sea. (From presentation by Helena Herr, Research and Technology Centre, Germany).
5.6 Status and distribution of Harbour porpoises in relation to potential Natura 2000 sites in Danish waters

Jonas Teilmann and Signe Sveegaard, National Environmental Research Institute, Denmark, presented the status and distribution of harbour porpoises in relation to potential Natura 2000 sites in Danish waters.

Status of harbour porpoises in Danish and adjacent waters: Based on satellite tracking, genetics and morphology, the harbour porpoise is divided into several populations throughout its range. In Danish waters, studies on satellite telemetry and genetics have identified at least two populations (or perhaps subpopulations); one in the Northern North Sea including Skagerrak and one in the Inner Danish Waters including Kattegat (Andersen et al., 2001; Teilmann et al., 2008). A third population existed in the Baltic Sea until the 1960s, but it has since undergone a severe decline and was estimated to 599 (95% CI 200-3300) animals in 1995 (Hiby and Lovell, 1996) and 93 (95% CI 10-460) in 2002 (Berggren et al., 2004). Little is known about its current distribution, but its status is highly critical (Koschinski, 2002). It is currently unknown whether the porpoises residing in the Southern North Sea are genetically connected with the Northern North Sea population or belong to a separate fourth population in the southern North Sea.

The harbour porpoise has been observed in most parts of the Danish seas (e.g. Kinze et al., 2003; Hammond et al. 2002). However, porpoises are not believed to be evenly distributed throughout their range (Teilmann et al., 2007). The distribution is presumably linked to the distribution of prey, which in turn is linked to parameters such as hydrography and bathymetry, but little is known about the relationship between porpoises and their prey.

To date there have been two major abundance surveys conducted in Danish waters SCANS in 1994 and SCANS-II in 2005. During these two surveys the North Sea and adjacent waters were divided into several survey blocks without considering national borders (Hammond et al., 2002). The total abundance estimate for harbour porpoises in the entire North Sea area was 288,000 porpoise in 1994 and 231,000 in 2005 (DSM estimates, Hammond et al. in prep). The density of porpoises has changed significantly in the North Sea between the two surveys. In the Northern North Sea the abundance estimate has decreased by about 100,000 animals from 1994 to 2005 while the estimate has increased by about 44,000 animals in the southern North Sea. It is likely that the majority of the changes from north to south in the North Sea are due to a displacement of animals, but a decrease in the north due to other causes e.g. bycatch and a true population increase in the south could also play a role. For the Skagerrak, Kattegat, Belt Seas and western Baltic Sea, the DSM abundance estimates for 1994 was 31,715 (CV=0.25) porpoises and for 2005 15,557 (CV=0.30) porpoises (Hammond et al. in prep). Due to large confidence intervals in line transect surveys, this 38-51% decline was however, not statistically significant, but should give reason for concern. It should also be noted that the DSM estimates are based on a model for the entire surveys area which assume that the porpoises prefer the same type of habitat throughout the area (e.g. depth). This adds an unknown uncertainty to the estimates for the smaller strata areas.

High density areas: Designating protected areas for harbour porpoises implies identifying areas of high porpoise density. To identify key habitats for porpoises in Danish waters, data from satellite tracking and aerial/ship surveys as well as acoustic surveys collected from 1991 to 2007 have been evaluated (for full report see Teilmann et al. 2008). The primary source of data for identifying key habitats is satellite tracking
of 63 harbour porpoises in the period 1997-2007. The only major areas that were not covered by the tagged animals were the Southern North Sea and the waters around Bornholm. In the Southern North Sea, data from aerial surveys was used to identify high density areas. Data from the area around Bornholm were too limited to determine harbour porpoise distribution and density. In northern North Sea and Inner Danish Waters acoustic ship surveys and aerial surveys were used as an independent method to confirm the presence of the high density areas found by analysis of the satellite tracking data. An overview of available sources of information is displayed in Figure 5.6.1.

**Figure 5.6.1. Available sources of information on harbour porpoise density and movements in Danish and adjacent waters (Modified from Teilmann et al. 2008).**

The Danish waters have been divided into four proposed managements areas based on data availability and population structure information. Only for three areas there are data enough to identify high density areas. The high density areas are ranked based on our current knowledge of population structure, density, seasonal variation in distribution and other relevant information. The rankings are defined as 1=high importance, 2=medium importance and 3=lower importance. Sixteen areas were found to have high density (see Figure 5.6.2) and were ranked as follows for the three areas:

**Inner Danish Waters:** Northern Little Belt (2), southern Little Belt (1), southern Samsø Belt (2), northern Samsø Belt (3), Northern Øresund (1), Store Middelgrund (2), Kalundborg Fjord (1), Great Belt (1), Smålandsfarvandet (3), Flensborg Fjord (1), Fehmarn Belt (1), Kadet Trench (2).

**Northern North Sea:** Tip of Jylland (1), Skagerrak (along Norwegian Trench, 2).

**Southern North Sea:** Horns Rev (1), German Bight (1).
Figure 5.6.2. Sixteen areas of high porpoise density in Danish waters marked by numbers. The areas were identified based on knowledge of population structure, density, seasonal variation in distribution and other relevant information. The numbers refers to the areas described in the text above.

5.7 Annex II fish species and assemblages in and around the Natura 2000 sites in the German EEZ

Anne Sell, Christian von Dorrien & Heino Fock, vTI – Institute of Sea Fisheries, Hamburg and Institute of Baltic Sea Fisheries, Rostock, Germany, presented an overview of fish distributions – particularly for Annex II species - in the German Baltic and the North Sea EEZ, based on scientific surveys. The institute for Baltic Sea Research in Rostock contributes to the international BITS (Baltic International Bottom Trawl Survey) and conducts a national survey BaltBox within the EEZ (Figure 5.7.1).
The Institute of Sea Fisheries conducts and participates in a variety of annual surveys covering the North Sea EEZ with different types of fishing gear (Figure 5.7.2). It should be noted that these surveys apply gear types which sample relatively close to the sea floor and are therefore not expected to be fully representative for pelagic fish.

Within the Germany EEZ, the representation of fish species listed in Annex II of the Habitats Directive is generally very low. This is largely attributed to the fact that they are anadromous fish species, which migrate into the rivers for spawning and hence concentrate in the rivers themselves and in the river mouths during their migration and spawning activity. Within the EEZs of both, the North Sea and the Baltic, for most Annex II species only single individuals have been caught. Overall, measures for the protection of the Annex II fish species would be most effective in rivers.

Occurrence of Annex II fish species in the German EEZ of the North and Baltic Sea:

1) *Alosa fallax* (Twaite shad): The most abundant of the Annex II species, especially in the North Sea, where it is regularly present in the EEZ stations closest to shore.

2) *Alosa alosa* (Allis shad): only two records in North Sea EEZ since 1985.

3) *Acipenser sturio* / *oxyrinchus* (Atlantic sturgeon): no records in the German EEZ.

4) *Lampetra fluviatilis* (river lamprey): Only single records in the Baltic Sea, in the North Sea regularly caught in the EEZ, but in very low numbers.

5) *Petromyzon marinus* (sea lamprey): Single records only.

6) *Coregonus oxyrinchus* (houting): no records.
The three North Sea sites nominated under the Habitats Directive are compared in terms of their fish species assemblages. Cluster analyses reveal clear differences in fish community structure between the three sites Dogger Bank, Sylt Outer Reef and Borkum Reef Ground.

Figure 5.7.2. Survey stations within the German North Sea EEZ: German Small-scale Bottom Trawl Survey (GSBTS), International Beam Trawl Survey (IBT), Survey of the German EEZ (GASEEZ), Sole Survey (SOLES), Crangon Survey and Demersal Youngfish Survey (DYFS).

**Comment:** Since 2007, *Acipenser oxyrinchus* has been reintroduced in the context of a BIN project in the Odra River, which has based on historical data been identified as an important feeding ground. Results of tagging experiments showed a high bycatch rate of *A. oxyrinchus* in bottom set-net gill-net (15 animals have been caught 23 times) and indicate that under the current prevailing fishing regime the reintroduction of sturgeons is almost impossible. Nevertheless technical modifications of set net have been developed and show, that bycatch can be avoided. The reintroduction of *Acipenser sturio* with individuals from artificial reproduction in France in suitable a North Sea river (e.g. Elbe) is planned in the near future.
6 Identify all areas where fisheries activities may affect achievement of the Conservation Objectives, and to the extent possible describe and quantify the associated risks (ToR c)

6.1 Conclusions from presentations on potential conflicts between conservation objectives and fishing activities

A summary and the conclusions of the presentations and discussions from the first workshop day were provided by the workshop chair Jake Rice. He informed about the many existing ICES advices and science documentations given by WGECO over the years on issues which are very relevant for this workshop, regarding both the identification of potential conflicts and their solutions. The workshop should not re-invent advice which ICES expert groups already have made and documented the science background for. With regard to the threats to the MPAs other than fishing we can discuss what types of other threats exists and what levels they have, but at this workshop we only have the mandate and expertise to develop the advice for threats to the areas from fishing activities.

The presentation of the benthic community impacts was a very well put together modelling study about what happen at the scale of the impacts from fishing gear. The first fishing event has by far the biggest impact on benthic communities, second one a large impact but with more fishing events the impacts effects are low. Therefore, looking at high impacted areas a reduction to zero fishing will have the greatest conservation benefit as long as the areas have the features intend to be protected. In areas fished 8-10 times a year even halving that effort will only achieve very little conservation benefit. We have no idea what a pristir ratio of r/K species in a benthic community of the North Sea look like, but we are reasonable confident that right now in many areas past rates of fishing have scud the community towards dominance of r selected species and communities. Therefore, a change to more K selected species will be a move in the right direction towards better conservation status.

With regard to the birds and porpoise impacts we saw very good data which suggest that both the seabirds and porpoises are not randomly distributed in the German EEZ of the North Sea and Baltic Sea. The German Natura 2000 sites are put in the areas where the seabirds and porpoises are most abundant. Within the Natura 2000 areas low conflicts were because of low fishing activities not because key species did not use the area. Of major concern is the population of porpoises in the German Baltic Sea (Baltic Proper) because this population is in a pour status and declining. Even a small bycatch of porpoises is a serious threat to the porpoise population.

In the North Sea, the MPAs were to protect from the bycatch mortality in fishing gears. Another MPA issue was protection of the food species from being depleted by fishing. The latter could give an indirect benefit for seabirds and marine mammals by securing food supply.

Finally, with regards to Annex II fish species we got a very nice analyses and presentation informing that the North Sea fish community has fundamentally shifted from the 1980s to the current decade from a cod dominated fish community to a flat fish community. The goals of MPAs are not to manage fish communities to any particular configuration. We also saw that the most important habitats for the Annex II species are not the features in the MPAs it is the estuaries and the near costal zones that is the crucial habitats for those fish species. We can go as far as to say we have no habitat preferences for the Annex II species to suggest that the MPAs have any particular conservation value for these species. They are anadromous and depend on the estuar-
ies and freshwater areas as the crucial habitats. Also when they occur in the MPAs they are up in the pelagic zone rather than down near the bottom. Nevertheless all Annex II fish species occurring in German waters are in unfavourable conservation status and some species are close to or already extinct. Therefore human activity caused mortality for example bycatch in the commercial fisheries hinders the improvement of the conservation status of these species and therefore, is not acceptable. Even if density of Annex II fish species in the EEZ and within Natura 2000 sites is low, bycatch mortality should be avoided, by reducing harmful fishing efforts or other gear-types to reduce fishing mortality.

6.1.1 Conclusions Past ICES advice

- ICES has already developed expert advice on for example:
  - Impacts of trawl gears on benthic communities and habitats (ICES, 2007b,c).
  - Effectiveness/consequences of “pingers” (ICES, 2007d).
  - Strategies for identifying threats most in need of management intervention (ICES, 2007b).
  - Useful habitat and population status indicators (ICES, 2007b).
  - Appropriate buffer sizes around features being protected (ICES, 2007e).
- Past advices are the basis for actual advice.
- Non-fishery threats/risks are considered, but WKFMMPA has not the mandate to advise specific measures for them.

6.1.2 Conclusions Benthic Community Impacts

- Model results are for trawl path, not total distribution of populations.
- First trawling event has the greatest impact, next two also have a large impact (measured as changes in standing stock with no density dependence in production).
- After about ~ 5 tows per year impacts of bottom trawling reaches the bottom line of an asymptote, therefore the conclusions:
  - Getting low impact areas to zero achieves the greatest benefits.
  - Reducing 8+ impacts per year by e.g. 50% does not help to improve the benthic communities.
- “Natural” ratio of r/K-species is unknown, but the present fishing intensity has driven the benthic communities towards r-selected species.
- The shift of the r/K-species ratio of communities can be an indicator for improving the conservation status.

6.1.3 Conclusions Bird / Porpoise Impacts

- Distributions of individuals of all species are non-random.
- MPAs developed in 2004 in habitat areas of highest concentration.
- Therefore areas in the MPAs without conflicts are because of no or low fishing effort, and not induced due to missing birds.
- Concentrations of seabirds and marine mammals also exists outside of the MPAs. This dislocation of effort is important for effective measures.
- The porpoise populations in Baltic seas critical, so even low bycatch is a serious threat
- Need to clarify if the solutions to the conflicts are bycatch reduction or removal of food competition?
6.1.4 Conclusions Annex II fish species outside of Natura 2000 sites

- Since 1980s overall North Sea fish communities has changed fundamentally, however, Natura 2000 MPAs are not implemented to manage fish communities.
- Important habitats for most Annex II species are NOT those protected by the Natura 2000 MPAs (value of estuaries & coastal)
  - Habitat preferences of annex II fishes (most of them use the pelagial) suggests that the seafloor of the Natura 2000 MPAs have no specific value for them.

6.2 Subgroup: Effects of bottom trawling (North Sea)

Subgroup report:

Chair Jan Geert Hiddink, assistant rapporteur Odette Paramor. Subgroup participants: Alexander Schröder, Anne Sell, Cora Markensteijn, Emilie Hugenholtz, Geert Raeymaekers, Gerjan Piet, Heino Fock, Jacob Hagberg, Jake C. Rice, Jan Geert Hiddink, Jesper Juul Larsen, Jochen Krause, Marie Storr-Paulsen, Natalie Steins, Odette Paramor, Ole Tendal, Olivier Abellard, Patricia Comiskey, Patricia de Vries, Stuart I. Rogers

At the meeting three presentations were given by Jochen Krause (BfN), Alexander Schroeder (Alfred-Wegener-Institut), and Jan Hiddink (University of Bangor).

Jochen Krause (BfN) gave a presentation of a workshop held on the Island of Vilm 9–11 April 2008 (Annex 3). The summery record of the Isle of Vilm workshop is available in Annex 3. Important points from the Vilm workshop was highlighted by Jochen Krause: 1) Effects of trawling on habitats based on best data available; 2) Only sandbanks and reefs have to be considered in the German EEZ; 3) Distribution of sandbanks are based on a comprehensive data set. Number of areas with reefs can increase with ongoing research activities, however, most of them are mapped; 4) BfN has developed procedures to assess the significance of impacts for plans or projects; 5) The EU criteria for the assessment monitoring and reporting of the conservation status (Doc Hab -04/03/03 (rev. 3) and the Habitats Directive are based mainly on five criteria. For species these are range, population, habitat of species and future prospect. For the habitats these are range, area covered, specific structures and functions including typical species and future prospects. Protected species and habitats are assessed as “favourable” when non of the criteria is inadequate or bad (‘one out all out’).

To ensure the maintenance and restoration of reefs at favourable conservation status – two options were proposed at Vilm workshop (Annex 3):

1) stop bottom trawling
2) if 1) this not practically feasible, prioritize protection of areas with high ecological importance to those areas that have been identified as having low and / or no fishing activities

Prevent degradation through potential future displacement of fishing effort

To ensure the maintenance and restoration of sandbanks at favourable conservation status – two options were proposed at Vilm workshop (Annex 3):

1) stop bottom trawling
2) if 1) this not practically feasible, prioritize exclusion of bottom trawling from those areas with highest ecological importance
Alexander Schroeder (AWI) presented the methods and results from a project assessing the impact of bottom trawling in MPAs through modelling (a summary of the presentation is given in section 5.2 and below).

The chair Jan Hiddink (University of Bangor) presented methods for assessing habitat sensitivity to human impacts that are needed to gauge the sustainability of existing impacts, develop spatial management plans and support meaningful environmental impact assessments (a summary of the presentation is given in section 5.3).

**Impacts of bottom trawling on reefs and sandbanks**

The conservation objectives for the two marine habitats “sandbanks” and “reefs” in the German EEZ derive from the obligation of the Member States to report every six years to the EU Commission on the conservation status and efforts made to maintain or recover all natural habitats of Annex I at a “favourable conservation status”. The specific reporting criteria are explained in detail by a note of the Commission from 2005 (DocHa. -04-03/03 rev. 3).

The overall assessment of the conservation status is comprised of the four criteria "range", "area covered", "structure and function" and “future prospect” which we named in article 1 HD.

- “Range” describes roughly the spatial limits within which the habitat occurs in a given biographic region.
- “area covered” describes within range of the habitat the distribution of the surface area of all occurring features.
- "structure and function" describes the integrity of the habitat structures including the conservation status of the typical species.
- “Future prospects” describes the known pressures and threats which have impacts on the three categories named before.

Based on these criteria, the current German report of 2007 for the reporting period of 2000–2006 assessed the conservation status of sandbanks and reefs in the Baltic Sea, and sandbanks of the North Sea as “unknown.” Therefore, Germany is obliged to conduct further research on their conservation status. Reefs in the North Sea were assessed as ‘unfavourable’ (section 4.3), which oblige Germany to analyse the reasons and to develop measures for improvement.

Further analyses of the conservation status of the habitats have been conducted within the EMPAS project (ICES, 2007a) conflict analyses identified the effects of dredges and beam trawls as ‘very likely’, and otter trawls and Danish seiners as ‘likely’ to have negative effects on the typical species and hence on the conservation status of the two habitats. Due to missing reference values for both, reefs and sand-banks, the actual difference of the characteristic benthic communities to an undisturbed (‘pristine’) situation is “unknown”. However, analyses of the benthic communities of existing unfished areas, which all are only small proportions of the seafloor behind wrecks or around oil or gas rigs (IMPACT II, Bergmann et al. 2005) show a significant loss of long-lived, large species, which can be summarised as K-selected species. Additionally, the results of studies of the benthic communities of chronic trawled sea bottoms (RESPONSE project) show impacts on the benthic communities in abundance, biomass and species richness of both infauna and epifauna. This evidence is confirmed by the outcome of model developed by Schröder & Gutow (2008, section 5.2), which calculated population growth rates of a number of species characteristic for both habitats under the impact of various bottom trawl re-
gimes. Additionally, VMS data in the German EEZ for 2006 were used assuming that effort and distribution was representative of what can be expected in the near future.

In considering these results at the Vilm workshop on ‘Effects of bottom trawling on typical species of sandbanks and reefs in the German EEZ of the North Sea’ (Annex 3) it was agreed that (a) any trawling activity on both sandbanks and reefs prevents populations of typical species from prospering, (b) the first and second trawls of the year in a given location lead to a disproportionately large reductions of local populations and (c) this effect is significantly more pronounced for K-selected (long-lived, few annual offspring) than for r-selected (short-lived, many annual offspring) species (see Fig. 5.2.3). However, if current levels of fishing activity were to be maintained it cannot be stated that further deterioration would necessarily take place (See Vilm workshop report Annex 3).

The group considered fishing impacts on the reefs and sandbanks areas within the SCIs of the EEZ of the German North Sea only and discussed what activities would threaten effectiveness of the protection of SCIs and what level of threat for the various fishing activities.

Given the current scientific techniques and data available, it was not possible to quantify the level of bottom trawling that would yield favourable conservation status. As there is no scientific basis to relate an acceptable level of bottom trawling to quantified ecological benefit for typical specific species and areas, and trends in abundances of long lived species are also not available. Therefore closed areas seem the only available management option that will offer certainty in conservation benefits, i.e. increasing the number, abundance and biomass of long lived large typical species for these habitats. Closures were regarded as most efficient in areas with the most sensitive benthic communities and in currently less impacted areas which to date partly shows highest species richness. Given that the most severe impact of the first trawl in these areas leads to the largest loss of K-selected species, protection of such areas also offers the greatest chance to a pronounced improvement of the conservation status. Fishing effort should not be displaced from closed areas to neighbouring areas outside of closed areas. Therefore, total fishing effort reduction was recognised as desirable accompanying measures.

The conservation status of each of the SCIs was examined in terms of the categories range, area covered, structure and function and future prospects, which are explained above and in which Member States according to article 17 HD have to report to the EU Commission (DocHab 04-03/03 rev.3). ‘By ‘Future prospect’ an expert judgement has to be given on how long existing threats are likely to persist in the near future, by which a time frame of 6 to 12 years is meant. The results of the discussion are presented in Table 6.2.1.
Table 6.2.1. Site specific conflict analyses of bottom contact fishery and the criteria to assess the conservation status of natural habitat of Annex I HD in the North Sea.

<table>
<thead>
<tr>
<th>Site</th>
<th>Range (Physical extent of sandbanks and reefs)</th>
<th>Area Covered (Area and physical integrity of the features)</th>
<th>Structure &amp; Function (Typical species, recovery of large long lived species, realizing that a pristine situation cannot be reached)</th>
<th>Future Prospects (For next 6 years any impact that are a threat to maintenance and recovery)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dogger Bank (DOG)</td>
<td>Sandbanks</td>
<td>No conflict identified</td>
<td>Conflict with beam trawls &gt; otter trawls. Removing long lived K-selected species on sandbanks.</td>
<td>Fishery will go on in the future, although expected at a reduced level.</td>
</tr>
<tr>
<td>Sylt Outer Reef (SAR)</td>
<td>Reefs and sandbanks</td>
<td>No conflict identified</td>
<td>Conflict with beam trawls &gt; otter trawls. Removing long lived K-selected species on both sandbanks (beam and otter trawls) and reefs (beam trawls only). Areas of particular conservation interest are beam trawls at the NW of the reefs, but most of the area fished by heavy beam trawls does not contain the majority of the reefs. The sandbank area and some reefs is fished by shrimp trawls, but scientific data on the impact of shrimp trawls is largely absent. Some current shrimp trawling grounds have a large epifaunal biomass under the current fishing regime.</td>
<td>Fishery will go on in the future, although expected at a reduced level.</td>
</tr>
<tr>
<td>Borkum Reef Ground (BRG)</td>
<td>Reefs and sandbanks</td>
<td>No conflict identified</td>
<td>The boulders are much larger here (1-2 m) and therefore unlikely to be affected by fishing gears.</td>
<td>There seems to very little bottom trawling occurring in this area, but this may be because the small shrimpers are &lt;15m and not recorded by VMS, although this is unlikely. Mostly the sandbank area and some of the reefs are affected by shrimp trawls.</td>
</tr>
</tbody>
</table>
In summary no site specific conflicts between bottom contact gear and the conservation status of the natural habitats of Annex I HD were identified for the criteria “range” and “area covered” with the exception that beam trawlers can collect boulders from the seafloor or destroy the physical structure of the boulder reefs and therefore, can reduce the actual area covered by the habitat type “reefs”. Conflicts exist for the recovery of large long lived species for all Natura 2000 sites in the North Sea on “sandbank” and “reefs” and will persist for the next years, although a reduction in fishery is likely.

Report back discussion: Comment: Based on the German logbooks there are very few vessels in the North Sea without VMS and therefore the data we have gives good indication of the fishing effort.

6.3 Subgroup: Impact assessment of fisheries on marine mammals and seabirds (Baltic Sea)

Subgroup report:
Chair Thomas Kirk Sørensen, assistant rapporteurs Jim Reid, and Ursula Siebert. Subgroup participants: Thomas Kirk Sørensen, Christian Pusch, Jake Rice, Stefan Garthe, Ursula Siebert, Szymon Bzoma, Helena Herr, Jim Reid, Henrik Lund, Marie Storr-Paulsen, Signe Sveegaard, Jonas Teilmann, Clare Eno, Sabine Christiansen, Christian von Dorrien.

Christian Pusch presented the summary record from the May 2008 workshop on Vilm (Annex 4). The main tasks of this workshop have been the analyses of the impact of ongoing fishing activities on marine mammals and seabirds. The scientific background of this workshop has been provided by two projects by the Research and Technology Centre (FTZ), Germany.

The main conflicts between fishing activities with static gears and seabirds/marine mammal for each Natura 2000 site in the German EEZ, which have been identified from this meeting were summarised and presented to the subgroup. Presentations were given by Stefan Garthe (section 5.4) and Helena Herr (section 5.5). The subgroup analysed the site specific conflicts evaluations - the nature and scale of the existing conflicts in the German EEZ of the North Sea and the Baltic Sea.

The subgroup welcomed the report of the Vilm workshop and agreed on the identified conflict assessment stated in the Vilm workshop report (Annex 4). The subgroup added additional information and perspectives to the Vilm workshop results.

Points discussed by the subgroup

- Food Depletion: Conflicts arising from prey depletion of species due to fisheries were not discussed, but must be analysed in more detail in the future. (E.g. bivalve fishery is at this time not a threat for birds in the German EEZ in the North Sea. However, the sandeel fishery in the North Sea and the sprat fishery in the North Sea and Baltic Sea may constitute a potential conflict, as especially this species are an important food source for predators such as seabirds or marine mammals)

- Seals: Seals are not included in the tables as fisheries induced mortality is mostly caused by seal bycatch which for the time being is not considered a major threat for the population. In addition the main distribution area of seals is in coastal waters and therefore not in the spatial range of the EMPAS project, which is focused on the offshore waters of the EEZ.
• **National Conservation Status:** Member States have to report every six years to the EU Commission on the conservation status and efforts made to maintain or recover all species listed in Annex II at a “favourable conservation status”. Based on these criteria, the current German report of 2007 for the reporting period of 2000 - 2006 (section 4.2) assessed the conservation status of harbour porpoise in the Baltic Sea as “unfavourable-bad” and in the North Sea as “unfavourable-inadequate”.

• **Definition of gear Type:** During the discussion questions arise from an industry representative regarding the generalisation of impact of different types of passive gears. In accordance to the definition given by FAO fishing gears and methods addressed by the EMPAS project are gill-nets and entangling nets, which includes bottom set gill-net and trammel nets.

• **Gear type specific rates of mortality:** Scientific studies indicate constraints between bycatch mortality rate and specific gears in combination with mesh size. It was recommended to further analyse effects of different mesh size on the bycatch rates of seabirds and marine mammals for a given site. Nevertheless first results of a BfN research project show that all types of gilnetts cause bycatch of seabirds in the Baltic Sea independent of the respective mesh size.

• **Data availability:** The subgroup identified an urgent need to enhance availability of data about set net fisheries. Data on net length set, soak time and fishing depth are not available and therefore fishing effort is hard to assess. Vessel monitoring system data (VMS) are only available for vessels larger 15 m, which only represent a small fraction of the whole fleet. The group pointed out the obvious lack of data about bycatch rates of seabirds and marine mammals, emphasising the need to implement effective observer schemes.

• **Further Research on alternative gear:** The group recommended an urgent need for further research in alternative gear (e.g. fishtraps) or modified fishing techniques as an alternative for the bycatch intensive gill-net fishery. For instance fishing at night is much less conflicting with seabirds than day fishing; e.g. some nets have soak times of only a few hours and could be deployed only during the night.

**Conflicts identified by the subgroup**

The analysis has been done separately for marine mammals and seabirds, and for each Natura 2000 site in the German EEZ of the North Sea and Baltic Sea (Table 6.3.1). The analysis is based on the intensity of current fishing activities (various data sets from 2002 to 2006) and the distribution of protected species, taking into account the specific conservation status

**Seabirds**

Gill-nets fisheries represent a serious threat on fish-feeding seabirds and sea ducks diving for benthic food resources.
North Sea

Analyses of the available data from 2002 to 2006 indicate that in the German EEZ of the North Sea due to low set net fishing activity, there might a reduced bycatch risk for seabirds. Analysis of fishing effort with static gear showed minor fishing activity in the SPA Eastern German Bight (Figure 6.3.1). However, gill-net fishery effort might increase in the future, due to rising fuel costs which might lead to a shift from trawls to set net fishery, and/or recovery of cod stock, which is the main target species in gill-net fisheries.

Red throated and Black throated divers which are species vulnerable to bycatch in gill-nets winter in the area mainly from October – May. Other bird species also susceptible to bycatch mortality like Guillemots and Razorbills are present year round foraging in the area.

Figure 6.3.1. Location of the SPA Eastern German Bight and VMS positions of set net fishing vessels in 2006 in the German North Sea.

Baltic Sea

The group agreed that bycatch causes a major conflict with the obligations of the Birds Directive and the regulations of SPA Pomeranian Bay because Article 5 BD does not allow any deliberate killing or capture of wild birds.

The highest risk of bycatch mortality occurs in areas where the feeding grounds of seabirds and gill-net fisheries is overlapping. The fishery data about the distribution of gill-net fishing activities, which are solely based on VMS data underestimate the effort as only vessels larger than 15m are mandatory equipped with vessel monitoring system (VMS). However for the recent conflict analysis, additional data have been collected by ship surveys while monitoring seabird distributions in the areas.
Mendel et al. (2008) showed the species specific importance of the SPA Pomeranian Bay for divers, auks and sea ducks, with important concentrations existing year round. A conflict map (section 5.4, Garthe et al., 2008) based on a spatial analysis of data about set net fisheries and the distribution of relevant bird species according to the Birds directive, shows two major conflict centres within the SPA. One in the southern part on a sandbank called the Odrabank and one in the northern part of the SPA Pomeranian Bay in the Adler Ground area.

Due to uncertainty about the distributions of fishing effort (section 5.4 and 5.5) the subgroup analysed the conflicts on the basis of risk maps of the SPA Pomeranian Bay (see Figure 6.3.2). The six maps show the seasonal distribution of relevant seabirds according to the Birds Directive, which are vulnerable the bycatch mortality in gill-nets (birds species are: red-throated diver, black throated diver, red necked grebe, slavonian grebe, long-tailed duck, common scoter, velvet scoter).

**Risk maps: Distribution of birds sensitive to set nets**

Figure 6.3.2. Risk maps: Distribution of birds sensitive to set nets in SPA Pomeranian Bay, German Baltic Sea, in two month periods (From presentation by Stefan Garthe, Research and Technology Centre, Germany).

**Marine mammals**

Three marine mammal species occur regularly in the German North and Baltic Seas: Harbour porpoises (*Phocoena phocoena*), Grey seals (*Halichoerus grypus*) and Harbour
seals (*Phoca vitulina*). To date, bycatch risk is a significant threat only for the Harbour porpoise. The following discussion is therefore focussing on this species.

The Harbour porpoise is a protected species according to Annex II and IV of the EU Habitats Directive and therefore of particular conservation importance. Specific management measures are required, including the establishment of Marine Protected Areas (Natura 2000) and if necessary, specific management measures for the protection of the population throughout its range. Harbour porpoises are vulnerable to bycatch, particularly from set nets and it is widely accepted that bycatch is one of the most important anthropogenic mortality factors for harbour porpoises.

Because of significant diminished genetically exchange between standing stocks Three distinct populations of Harbour porpoises are distinguished in German waters: 1) North Sea; 2) Western Baltic (connected with the Belt Sea); and 3) Central Baltic (Baltic Proper). Spatial bycatch risk for Harbour porpoises in set nets has been done separately for each marine Natura 2000 sites and taking into account the specific conservation status of each population (see Table 6.3.1).

**North Sea**

An investigation of porpoise and fisheries distribution in the German North Sea (Herr *et al.* submitted) showed seasonal associations and high overlap between set net fisheries and porpoises in summer (May-July). In the north western part of the SCI Sylt Outer Reef these fishery overlap with the area covered by the Harbour porpoise. To date, bycatch was not recorded by fishers in that area. However, Sylt Outer Reef is an especially important feeding and reproduction sea area for Harbour porpoises and features one of the highest porpoise densities in European waters during late spring and summer. Therefore, set net fisheries are associated with especially high bycatch risk in areas are of concern.

Since three years a concentration hot spot of Harbour porpoises is observed in the vicinity of the SCI Borkum Reefground. Therefore, this site is of increasing conservation importance. At the same time, the area is also an important area for set net fishery (e.g. there is a Danish fishery for sole from approx. April to August). The highest spatial overlap between the distribution between set net fishery and harbour porpoises occurs in spring (March to May).

**Baltic Sea**

The conflict situation between the set net fishery and the harbour porpoise distribution is shown in Figure 6.3.3. From 2002 to 2007 along the coast of the German Baltic Sea more than 40% of all shortly after dead collected Harbour porpoises were either confirmed or suspected bycaught individuals (33 out of 77 individuals) (section 5.5; Herr and Siebert, 2008). However, total mortality numbers are missing since reporting of bycaught Harbour porpoises is not obligatory and not based on systematic sampling.

This conflict can be of high risk for the harbour porpoise population. If actually 40% of all animals collected were bycaught, more than 100 of the 1300 to 2900 Harbour porpoises (maximum of 4610) in the whole German Baltic Sea (cf. MINOS plus), would die because of bycatch per year. This rate would exceed the bycatch limits agreed by ASCOBANS (1.6 %) and the IWC (1 %) by far.
Western Baltic

In the Western Baltic Sea highest Harbour porpoise densities are reported during winter. During spring to late summer Harbour porpoises move into the Mecklenburg Bight, where increasing densities are detected until September. Scientific evidence indicates that this population is not moving regularly further east and therefore do not mix with the small Baltic Proper population. Population densities are in general deceasing from west to east, with irregularly peaks in spring and summer.

Conflict in winter (Nov-Feb) is predicted for Kiel Bight. In all other areas Harbour porpoise densities in winter are too low. With the beginning of Harbour porpoises to migrate in spring (Mar-Jun), potential conflict extended largely into the area around Fehmarn, including the SCI “Fehmarnbelt”. A similar conflict is predicted for the Mecklenburg and Pomeranian Bight, including all Natura 2000 sites in the EEZ of the German Baltic Sea. In summer/autumn (Jul-Oct) Harbour porpoises are detected around Fehmarn and along the western Mecklenburg coast, as well as in the Kiel and Pomeranian Bight, which leads to a conflict with the set net fishery occurring at the same time in these areas.

Baltic Proper

The Baltic Proper population, occurring east of the Darss and Limhamn ridge, has been severely reduced and is estimated at less than 600 animals remaining. Already a single bycatch must be considered as threat for the population.

Report back discussion: Question: An issue considered in the other subgroup was future prospects. Due to the increasing fuel costs the industry are looking for more
fuel saving fishing methods and passive fishing gears could be one way to go - did the group discuss this issue? Answer: We did not really discuss this issue because we did not have the expertise to deal with this issue. Comment: If we find that some of our proposed options for future changes in the fisheries to improve the conservation status have some attractive prospects we should inform about them. However, we don’t have to say that we are sure the fuel price will go up. Comment: Maybe we should not use too much time to think about what might happen in the future but simply say that we need an adaptive management which takes account of changes. We need to say something about the usefulness of making an environment impacts assessment of the areas. By doing this we can account for future changes and todays unknown developments. Comment: We cannot manage the fuel costs therefore I don’t think we should spend much time discussing the fuel costs.
Table 6.3.1. Summary of the site specific conflicts between sea birds and Harbour porpoises, and set net fishery. Additional information and perspectives from the Summery Record from the Vilm workshop in Annex 4.

<table>
<thead>
<tr>
<th><strong>North Sea</strong></th>
<th><strong>Species</strong></th>
<th><strong>Fishing activities</strong></th>
<th><strong>Conflicts: WKFMPA subgroup</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>SCI Borkum Reef Ground</td>
<td>Harbour porpoise</td>
<td>High set net (gill-net) fishery effort</td>
<td>An increasing population hot spot is detected in the vicinity of the SCI. Also increasing set netting in the area. The conflict is mainly in Spring (March-May). There is fishing (DK) for sole from approx. April-August with high set net fisheries effort.</td>
</tr>
<tr>
<td>SCI Sytter Outer Reef</td>
<td>Harbour porpoise [reproduction site, with high mother/calf abundance]</td>
<td>Set net (gill-net), Existing, much higher in the 1990th</td>
<td>No actual bycatch recorded. However, conflict (bycatch) is potentially high (few data) due to the sensitivity of the area and higher set net fishing effort in the 1990s for cod. Harbour porpoise distribution hotspot in the North Sea and most important reproduction area. Mainly April/May-approx. Sept. VMS shows that there is set net fisheries in the area. Due to the decline of the cod stock in the North Sea the setnet fishery heavily decreased. In the case cod stocks recover fishing effort of set net fishery targeting cod will resume again. This process might be fostered by increasing fuel costs.</td>
</tr>
<tr>
<td>SPA Easter German Bight</td>
<td>Sea Birds</td>
<td>Set net (gill-net)</td>
<td>Potential conflict (bycatch). However, no direct data are available yet. The site is an important wintering area for Red throated and Black throated diver (mainly Oct-May), which are vulnerable to bycatch and to a lesser extent guillemots and razorbills (year round).</td>
</tr>
<tr>
<td><strong>BALTIC SEA</strong></td>
<td><strong>SPECIES</strong></td>
<td><strong>FISHING ACTIVITIES</strong></td>
<td><strong>CONFLICTS: WKFMMPA SUBGROUP</strong></td>
</tr>
<tr>
<td>----------------------------</td>
<td>----------------------------------------------------------------------------</td>
<td>-------------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>SCI Fehmarn Belt</td>
<td>Harbour porpoise [Western Baltic population]</td>
<td>Set net (gill-net)</td>
<td>High conflict especially March-September: Porpoises migrate from west to east but are constantly present in the SCI. The main DK fishery in that area is trawling although there is some turbot fishery with gill-nets.</td>
</tr>
<tr>
<td>SCI Kadet Trench</td>
<td>Harbour porpoise [Western Baltic population]</td>
<td>Set net (gill-net) [effort relatively low]</td>
<td>Medium conflict especially July-December The main DK fishery in the area is trawling (otter/danish seines) for cod and flatfish and pelagic trawling for herring.</td>
</tr>
<tr>
<td>SCI Western Rönne Bank</td>
<td>Harbour porpoise [Baltic Proper population]</td>
<td>Set net (gill-net) [high effort]</td>
<td>Highly sensitive population in intensive fishing areas. Highest conflict due to intense set net effort and very small and vulnerable population.</td>
</tr>
<tr>
<td>SCI Adlerground</td>
<td>Harbour porpoise [Baltic Proper population]</td>
<td>Set net (gill-net) [high effort]</td>
<td>Very few animals per sq km but they are detected year round. Important DK cod fishery (gill-net) in that area from mid-Nov to May (mainly Rønne Banke due to bottom structures). In areas the seafloor is more flat/smooth seines and trawls are employed. Gill-net fishery is occurring both by large and small vessels, of the same risk to porpoises.</td>
</tr>
<tr>
<td>SCI Pomeranian Bay with Odrabank</td>
<td>Harbour porpoise [Baltic Proper population]</td>
<td>Set net (gill-net) [high effort]</td>
<td></td>
</tr>
<tr>
<td>SPA Pomeranian Bay</td>
<td>Seabirds [Annex I BD, resting, overwintering, moulting bird species]</td>
<td>Set net (gill-net) [high effort]</td>
<td>High conflict; spatial-temporal gradient, From Nov-March/Apr conflict peak on Adlerground, Trench between Adler Ground and Odra bank is “less sensitive” due to increasing water depth. The Odra Bank is an area of high conflict in summer (due to e.g. presence of scoters etc) but there are also conflicts in winter months. The group underlined that the analyses are based on the best available scientific information. VMS covers only a small percentage of total fishing effort. Many improvements can be made to increase knowledge regarding spatial distribution of fishing activities, length of nets, soak times, nettypes/mesh sizes, depth etc.</td>
</tr>
</tbody>
</table>
7 **Review Socio-economic information (ToR e)**

ICES has not traditionally provided advice on social and economic aspects of management options. Also the WKFMPA workshop did not attract experts with experience in socio-economic analyses, to undertake such evaluations during our meeting. Participants took full note that many management options will have consequences of the economics of individual fishers as well as fleets, and for employment opportunities in the fisheries. They noted further that analyses of these consequences should be a component of the processes which follow on from this workshop. Results of such analyses may be very helpful in informing dialogue and consultation on the feasibility of the various options identified on ecological grounds at this workshop.

To provide some perspective on the scale of social and economic issues that are relevant here, ICES did develop estimates of the values of the fisheries within these MPAs. To do so, the total landings of each species by 3x3 nm rectangle within each MPA were summed over (time period). These annual landings by species were multiplied by the 2006 annual average landing value per kg for each species, as listed in the landing and catch statistics 2006 by the Danish Directorate of Fisheries. Price varies seasonally, regionally, and over years, so these estimates should not be taken as precise estimates of the future value of these fisheries. However the results are sufficient to provide insight into the scale of value of these fisheries. They at least provide a context for discussing the scale of impact of various management options on the economics of these fisheries and the coastal communities where these fisheries operate.

**Discussion:** Comment: I don’t think it is correct to present Tables with value/cost of closing areas in this report when we do not have the expertise of fisheries economy present at the meeting. There are many additional costs and factors which we need to take into consideration which are not reflected by the numbers in these Tables. For example there may be benefits in the longer run from closing areas and this is not reflected by the Tables. Comment: In the same way we include maps of fishing distributions for one year, it should be appropriate to include the Tables of fish value to provide some perspective on the scale of social and economic issues. The Tables provide the scale of impact on the fishery for discussing the effects of management options. Therefore I think they should be included. A person outside this meeting wish to know what fish value we are talking about – a few thousands, a few hundreds of thousands or several million Euro’s worth of fishing. Comment: I have a big problem with presenting these estimated values in the report because they have been calculated based on values of fish landed to Danish ports. The fish values may be very different landed to Dutch ports. Much fish from the North Sea will be landed in Dutch ports and the value here may be much higher. I recommend we don’t present the Tables of estimated fish values. Comment: I don’t think the present value is the major issue. If you closed an area you need to estimate how much fish will be missing from the market. In the Netherlands it has been calculated that if you close 10% of the area catchability of the fish will stay basically the same. Model studies have also shown that if you close areas large enough you may also catch more fish because you start to protect fish. Comment: I understand that some participants are uncomfortable with the value calculation of the fish, but it is not new, for example in Germany it is a standard procedure to calculate these value figures in the same way as it has been done in the presented Tables. These standard calculations in Germany are called market reports and they are used to follow the economic developments in the different regions. It is not new to society although it may be new to ICES. **Conclusion and**
**agreement**: The value Tables are not included in the report, but the estimated catches by species Tables are kept in the report. The Tables of estimated catches by species add value to the report and give information about how much and what kinds of fish are taken in the protected areas. The tonnes taken in the squares are informative and relevant without getting into the price issues.

### 7.1 Potential costs of North Sea MPA management options

Nathalie Steins, representing the Dutch Fish Product Board, provided the following review of potential costs of North Sea MPA management options.

**Reefs**

**Sylt Outer Reef:**

1) Full closure of all identified reefs for all bottom trawling gears would lead to direct losses for fishers concerned. Resulting displacement of would have economic effects on all fishers who fish in the areas where the effort moves to (reduced CPUE).

2) Focusing on the western ‘boulder reef’ that covers a large stretch and is relatively unspoilt by fisheries will keep costs for industry low while you protect those areas that are highly susceptible for first impact. Effects of displacement (on nature and CPUE of other fishers) will be low.

3) For the eastern part of the Plaice Box area it does not seem to be necessary from a nature conservation point of view to close the reef areas to bottom-trawling (shrimp) under the current fisheries management conditions. Closing those areas would lead to substantial displacement effects into the Wadden Sea (nature + economics through CPUE). Furthermore for control purposes you would need large stretches, because most shrimp vessels are not equipped with VMS. If you wanted tailor-made closures around the reefs you would need to install VMS or other surveillance equipments on the <15m vessels which would increase costs for industry.

**Borkum Reef Ground:**

4) Closure of the boulder reefs to bottom trawling would lead to some economic losses but these are not likely to be large because there’s hardly any fisheries taking place. Displacement effects seem limited.

5) From an ecological point of view it is not necessary for the reefs to close the area in between the reefs (triangle shape). For practical reasons (area is small, not a lot of fishing anyway, enforcement) it may be better to do it. Industry raises a number of objections including the support for management measures as a ‘practicality’ and the precedent it may create for areas that are larger and cover important fishing grounds).

6) Additional costs of any form of closure here may result from the need to equip <15m vessels with VMS/surveillance equipment (and the polling costs). We don’t know how many vessels this would concern.

**Sandbanks**

**Borkum Reef Ground:**

7) The area between the reefs cover sandbanks. If the triangle (see 5) is closed to bottom-trawl fisheries then there seems to be no further need for sandbank protection measures in this MPA. Economic losses mainly pertain to
the fishing industry in the southern stretch of the triangle. Effects of displacement are low.

8) There is a case for protecting a larger area, which should focus to the northern area (not fished very much so protection would lead to maximum result in relation to first impact) as opposed to the eastern area (important fishing ground).

9) The sandbanks have stable important communities and not susceptible to natural disturbances (‘we think’). In discussing management measures for bottom-trawls which includes 7 and 8, the shrimp trawls seem to have little effect on the sandbanks so it seems they could be fitted in. Following on from this remark, there needs to be a discussion about how ‘tolerant’ we can be in relation to bottom-trawl effects on these particular beds. The stricter you get, the higher the costs for the industry.

Sylt/Amrun Bank:

10) The question is whether management measures for the ‘hilly sandbank’ will have any visible effect to the community (dynamic area, low expected of shrimp fishery which is the main fishery) while any management measures will cost. It is advisable to carry out experimental research on the effects of bottom-trawling on the benthic community here to make an informed management decision in future.

Dogger Bank:

11) Dogger Bank heavily fished and seems very resilient. Closure will result in large economic losses and to severe displacement issues (costs for nature and industry).

12) Dogger fishery is a very clean fishery. Other displacement costs would include increasing discards levels in other areas (effects on future catching opportunities?, costs for extra management measures).

13) In view of high costs of full closure (for industry, enforcement and nature in other areas), some ‘creativeness’ is needed. Look at option of protecting representative samples of the three communities. It is advisable to sit down with the industry and identify those long-lived sensitive species areas that need protection. The fishers will need something in return, e.g., an agreement that improves the identified communities while securing bottom-trawl (including beamers) access to remainder of Dogger Bank (knowing that the top community seems resilient to fisheries).

Other observations

14) Consistency is needed for the EU MPAs, particularly in areas which are within jurisdiction of different Member States such as Dogger Bank. Besides the need for maximizing the benefits for nature conservation values, the costs for the industry would increase further if they have to comply with multiple management regimes within one defined fishing ground.

15) Fishing effort will go down as part of EU flatfish plan because of increased fuel costs. Is that perhaps sufficient enough to meet management objectives for Dogger in view of high costs of protection measures to industry?

16) The question needs to be answered how it is possible that long-lived sensitive communities are there despite heavy fishing (Dogger). And what
status they are at (unclear now). This is important for successful discussions with fishing industry about protective measures.

17) Approach of management measures in ‘large squares’ for control purposes will bring additional costs. With modern technology (including control equipment such as VMS/AIS) it is possible to have tailor-made boundaries.

18) Can we think of putting in incentives for the industry to change to alternative gears that are acceptable in terms of the effects on the nature conservation values, i.e. low impact gears (e.g., allow pulse-trawl in areas where the beam-trawl is prohibited). This may serve as a mitigation measure to compensate the industry for loss of fishing grounds.

19) Information is available on value of the catches in the areas. It should be noted that value of the catches does not necessarily say something about how important these areas are for the fleets and/or individual fishers. Equally, the fact that there is a VMS poll indicating fishing isn’t necessarily an indicator for the economic importance of the area.

8 Options for managing Fisheries in the MPAs (ToR f)

Discussion: Question: In ToR (f) it is said “including consideration of co-management systems appropriate for management within an ecosystem approach” could you elaborate on this sentence so it becomes clear what precisely is meant and expected? Comment: It hasn’t been the custom of ICES to provide advice on governance systems for fisheries. ICES has been a natural and physical science body. However, it may be the time to change this. If that is going to happen we will need other types of experts in the room than we have now to get into this in detail. Management options we propose may need to be linked to some kind of monitoring programme to ensure we are getting some benefits from the management measures. The nature of the management will to some extend depends on the conservation objectives for within the MPAs, but some of the most informative monitoring might be different and outside the MPAs as well, depending on management options applied. So what is also relevant to consider is what kind of monitoring programme would be most informative about whether the management measures will do any good. Another aspect is what kind of incentives might increase the likelihood of getting a high compliance with the intent of the measures. This is important because a measure that looks good on paper but has low compliance may result in a huge cost to force compliance and therefore may not be very attractive. Hence to be considered are: what is the likelihood of getting compliance of the measure?; what level of compliance and conditions would be needed to get the benefits we expect to observe? If we have an option where all the benefits are dissipated by a fraction of 1% of the participants violating the rule it may not be as good an option as something that is a little less ecological efficient but is much more robust to mistakes, errors, and violating the rules.

8.1 Subgroup: Effects of bottom trawling (North Sea)

Subgroup report:

Chair Stuart Rogers, assistant rapporteurs Odette Paramor, and Anne Sell. Subgroup participants: Alexander Schröder, Anne Sell, Cora Markensteijn, Emilie Hugenhoftz, Geert Raeymaekers, Gerjan Piet, Heino Fock, Jacob Hagberg, Jake C. Rice, Jan Geert Hiddink, Jesper Juul Larsen, Jochen Krause, Marie Storr-Pallesen, Natalie Steins, Odette Paramor, Ole Tendal, Olivier Abellard, Patricia Comiskey, Patricia de Vries, Sabine Christiansen, Stuart I. Rogers.
Practical background information

The group recognised practical views on the effects of trawling on the seabed by the fishery industry. Also underwater videos were shown to illustrate the effects of different gears on catch efficiency, which demonstrated clearly the operation of escape grids to reduce bycatch.

The different gear designs which separate beam and otter trawls was also shown, to inform on chain mats to avoid capture of large rocks and boulders, and others are lighter with no or few chains. Design of other gears was also illustrated, including the beam trawl with v-net (tickler chains), typically used by Netherlands compared to the heavy gear with chain mats, used on rocky seabed.

The group generally tried to formulate generic recommendations that can be used for other Natura 2000 sites in other Member States, respectively.

In general the group recognised that there is a potential problem of all Member States, including Germany, that only regulations for their national vessels can be set, and that there eventually an EU decision is needed to make this valid for all fisheries in the area. Measurements to discriminate fleets of other Member States have to be avoided and advice must be specific to fleets with specific gear types without consideration of political concerns.

The outcome of the Vilm workshop on the effects of bottom trawling (Annex 3) presented by Jochen Krause were welcomed. Recommendations of the Vilm workshop were:

Section 1.01 To ensure the maintenance or restoration of favourable conservation status for the reefs the following is suggested:

1) Full exclusion of bottom trawling from all reefs has the greatest potential to achieve favourable conservation status for the habitat and its typical species.

If this is not practical,

2) Priority for exclusion of bottom trawling should be given to areas with high ecological importance and to those areas that have been identified as having low and/or no fishing activities. It is accepted that the initial occurrence of trawling causes the greatest impact and that there would therefore be greater conservation gain from protecting less impacted sites. This should also prevent degradation through potential future displacement of fishing effort.

Section 1.02 Irrespective of the two suggestions under (d), the group acknowledged that large beam trawlers with heavy rigged gear should be fully excluded from all reef areas as they might compromise the physical integrity of the reefs.

The group welcomed closing ecological important parts of reef areas that are presently under low impact of fishing, while considering all gears that are relevant for that area and the could harm this habitat type. An unsolved question is how far the boundary around specific reef including sufficient of buffer zone has to be.

The Group considered in light of the small areas of reefs, and the heterogeneous distribution of fleets in the German EEZ that zonation within the designated areas was a potential management measure for individual sites.

The subgroup discussed fisheries management measures for all SCIs of the German North Sea (Figure 8.1.1) separately considering the following aspects:
• Likelihood of achieving conservation objectives
• Impacts of measure on fisheries
• Consider low impact gear
• What monitoring is required?
• What level of compliance necessary for objectives to be achieved?
• Consider cost / total value

Figure 8.1.1 Overview of the German EEZ showing the three SCI, annual trawling frequency of all bottom trawls, the plaice box (red line) and designated habitat types (Shroeder et al., 2008).

8.1.1 Sylt Outer Reef

8.1.1.1 Reef habitats (Figure 8.1.2)
• Question of whether all reefs within the SAR site need to be equally protected.
• Suggestion was to focus on the areas of reefs least fished
• Suggestion to categorize reefs within the area depending on degree of fishing activities and type of fleet / detail of conflict
• Overall purpose is to stop further deterioration throughout the site, rather than to close all the sites.
• To allow effective monitoring it was suggested to increase VMS frequency around reef areas closed to fishing
• In all sites (including SAR reef habitat) it will be necessary for monitoring biology and habitat structures to be agreed for all areas
• Proposal (part 1): to close a thin triangular area around reefs in the SW of the SAR, which is currently hardly fished by small trawlers but does experience direct impact from the largest category of beam trawl, to ex-
clude/prevent fishing with towed bottom gears. Possibly the same could be applied to the reefs in the north, which are also not fished intensely.

- **Proposal (part 2):** Reefs in the east are currently fished quite heavily with light gear or by beam trawl vessels <300 hp only (it is already protected from large gears in the Plaice Box) so measures excluding heavy gear are already in place. It is recommended that no additional measures are put in place for the eastern reefs in SAR, and that fishing with light gear (shrimpers) is still allowed, on the condition that no additional deterioration of habitat is expected. These two proposals together will ensure that the condition of the reef throughout the region will be improved, through strict measures in some sites. It needs to be made clear that one of the conditions of this advice is that the existing management applied by the Plaice Box is maintained, and if these conditions change, then the advice will also change. Furthermore, the alternative of closing the area for shrimpers could relocate fleet into areas closer to shore, which would presumably create more harm.

![Figure 8.1.2 Trawling frequency of all bottom trawls and designated habitat types in the SCI „Sylt Outer Reef“ (Shroeder et al., 2008).](image)

**Impact on Fisheries**

Full closure of all identified reefs for all bottom trawling gears would lead to direct losses for fishers concerned. Resulting displacement would have economic effects on all fishers who fish in the areas where the effort moves to (reduced CPUE).

Focusing on the western ‘boulder reef’ that covers a large stretch and is relatively unspoilt by fisheries will keep costs for industry low while protection given to those areas that are highly susceptible for first impact. Effects of displacement (on nature and CPUE of other fishers) will be low.
For the reefs in the eastern part of the Plaice Box area it does not seem to be necessary from a nature conservation point of view to close the reef areas to bottom-trawling (shrimp) under the current fisheries management conditions. Closing those areas would lead to substantial displacement effects into the Wadden Sea (nature + economics through CPUE). Furthermore for control purposes large stretches would be needed, because most shrimp vessels are not equipped with VMS. Tailor-made closures around the reefs would need VMS or other surveillance equipments on the <15m vessels which would increase costs for the industry.

8.1.1.2 Sandbank habitats (Figure 8.1.2)

- Conflict analysis for the interaction between fisheries and sandbank habitats (Summary of presentation by Alexander Schroeder in section 5.2) showed that the sandbank on eastern border of SAR is fished by small beam trawlers (< 300 hp) and that this is likely to cause a decline in the condition of benthic species which have more K-selected life-history strategies. The amount of conflict is not clear, because gears used are mainly shrimp nets without chains and less impact than other small beam trawlers. The only evidence from the scientific literature in relation to shrimp trawl effects on benthos relates to impacts to Sabellaria reefs (Vorberg, 2000; ICES, 2007b). There are no known studies of the effects of shrimp trawls on sandbank habitat, although work in ICES and elsewhere (see WGECO reports) suggests that this gear is likely to have less damaging effects than other heavily rigged gears such as 4 m chain mat beam trawls and scallop dredgers. (ICES, 2007b). There are also survey observations from within sandbank habitats in the German Bight (Heino Fock, vTi) of the presence of epifaunal species in fished sandbank habitat (Annex 5).

- A suggestion of closing the sandbank site in SAR to mobile gears was discussed, but no clear conclusion was reached on the effect of specific gears - in this case, small beam trawls without chains for shrimp fisheries. In the absence of specific conservation objectives for species known to be under threat in these environments, it was not possible to identify associated measures for this light trawl fishery.

- Proposal to install experimental closure in the sandbank site in order to gain more knowledge about the K-selected benthic species. These experimental sites would have the benefit of identifying whether there are other factors such as high levels of natural disturbance that might prevent change or recovery. It would however be important that the results of any experimental closure were implemented if they showed that exclusion of these fleets resulted in significant improvements to the sandbank biota.

- No recommendations to close fisheries in the SAR sandbank habitats were made.

Impact on Fisheries

The question is whether management measures for the ‘hilly sandbank’ will have any visible effect to the community (dynamic area, low expectation of impact from the shrimp fishery which is the main fishery), while any management measures will cost. It is advisable to carry out experimental research on the effects of bottom-trawling on the benthic community here to make an informed management decision in future.
8.1.2 Borkum Reef Ground

8.1.2.1 Reef habitats (Figure 8.1.3)

- There is a specific conservation value of the Borkum reefs as they are large boulders, and different in community structure to those at SAR. As a result it appears necessary to also consider measures for these reefs (in addition to those in SAR).
- Only otter trawls occur around the reefs in the south of the area. The reefs in the north are less affected by these gears except for some activity between the shipping lanes in the south.
- It was discussed whether the three small reef areas should be closed as separate areas instead of combining them. The argument to increase closure area for practical reasons (by joining them with a single closed site) was not shared by fishing industry who felt that the best reasons for closing a site was for the protection of specific species or habitats.
- It was suggested that closed areas would be appropriate for these grounds but that dimensions should not be based purely on practicality of enforcement, especially if this leads to displacement of effort away from sites that are not high priority.
- The benefits of practicality (i.e. a single site including several smaller sites) outweigh the problems with displacement in this example.
- In addition, there is a continuum or gradient in the habitats from reef to surrounding sandbank which means that there are not discrete areas for closure but that additional benefits could be gained from a larger more inclusive closure.
• **Proposal** to close triangular shape including all three reefs for all towed gears. Potentially this can be expanded to include sandbanks which overlap the site (discussed below).

• **General Statement**: Areas where both types of habitats occur in combination have a higher ecological and need a higher level of protection value of protection and should be of higher priority when considering closure.

**Impact on Fisheries**

Closure of the boulder reefs to bottom trawling would lead to some economic losses but these are not likely to be large because limited fisheries take place. Displacement effects also seem limited.

From an ecological point of view it is not necessary for the reefs to close the area between the reefs (triangle shape). For practical enforcement reasons (area is small, not a lot of fishing anyway) it may be better to combine three sites. However industry raises a number of objections including the support for management measures as a ‘practicality’ and the precedent it may create for areas that are larger and cover important fishing grounds.

Additional costs of any form of closure here may result from the need to equip <15m vessels with VMS/surveillance equipment (and the polling costs). We don’t know how many vessels this would concern.

**8.1.2.2 Sandbank habitats (Figure 8.1.3)**

- The potential conflict analysis for this site (Summary of presentation by Alexander Schroeder in section 5.2) related to the effects of towed gears, especially shrimp trawlers which occur inshore of the site – large beam trawls occur offshore. As described previously, it is assumed that shrimp trawls are lower on scale of damaging trawls than other towed gears.

- There was a general discussion about what impact shrimp trawlers can have on sandbanks. Impact was considered to move in the order; Heavy beam trawls > light beam trawls > pulse beam trawls / otter trawls.

- In light of these arguments – already made in relation to the interaction between shrimp trawls and SAR sandbank habitat, no conclusions were made about suitable management measures for fisheries.

**Impact on Fisheries**

The areas between the reefs cover sandbanks. If the triangular area is closed to bottom-trawl fisheries then there seems to be no further need for sandbank protection measures in this MPA. Economic losses mainly pertain to the fishing industry in the southern stretch of the triangle. Effects of displacement are low.

There is a case for protecting a larger area, which should focus to the northern area (not fished very much so protection would lead to maximum result in relation to first impact) as opposed to the eastern area (important fishing ground).

Suggested was that the sandbanks have stable important communities not susceptible to natural disturbances. In discussing management measures for bottom-trawls which includes the two preceding points, the shrimp trawls seem to have little effect on the sandbanks so it seems they could be fitted in. Following on from this remark, there needs to be a discussion about how ‘tolerant’ we can be in relation to bottom-
trawl effects on these particular beds. The stricter you get, the higher the costs for the industry.

8.1.3 Dogger Bank

8.1.3.1 Sandbank habitats (Figure 8.1.4)

Figure 8.1.4 Trawling frequency of all bottom trawls, VMS-records for larger beam trawlers (>300hp) and designated habitat types in the SCI „Dogger Bank“ (Shroeder et al., 2008).

- Conflict analysis suggests impact through ground gear removing long-lived benthic species (three communities identified by Ingrid Kröncke within German EEZ on Dogger Bank, see Annex 5).

- Group recognized that there is high fishing intensity on the Dogger Bank. Costs of larger closed areas will be high. Current discussion to focus on requirements for conservation purposes. Proposal to have joint meeting with fisheries industry to discuss areas with high conservation values or high value for fisheries to identify areas best suited for closure.

- It is recognised from published studies that the effect of beam trawling will be to increase the level of mortality, and that this will shift the specie composition towards those with r-selected life-histories. On the Dogger Bank (and elsewhere) there is less evidence that lighter trawls will have the same effect, so some for of experimental closure (as recommended for the SAR) may be appropriate.

- In terms of conservation objectives, there is no clear idea of what a climax sandbank community looks like, so there is little guidance on how far management should act to restore the community to an unknown former state.

- There is the additional concern that management of one part of the Bank (restricting effort and causing displacement) will generate higher mortali-
ties in other parts of the Dogger Bank, thereby not providing conservation benefits for the entire feature.

- There should be the opportunity to apply management measures to the larger beam trawl fleet (restricting their access) to assess the benefits of this exclusion. Subsequently to restrict shrimp or light trawl access to assess whether there are any detectable additional benefits of this measure for small gears.

- Assuming that these measures generate a recovery of habitat, the resulting patchwork of fragmented sites will need to be sustainable and connected in an ecological / hydrographic sense. Further work will be required to assess this.

- For the adjacent parts of the Dogger Bank other measures will be decided upon by the other EU Member States.

- **It was recommended** that common measures amongst all Member States should be agreed upon. – Group opinion that Germany should still suggest suitable measures, which may later be considered by other Member States also.

- It was also discussed how there may already have been a decrease in effort due to increased fuel prices. – How much can this contribute to conservation objectives?

- Suggestion to promote alternative gears with less impact - in the meantime (discussion on options) - it was suggested to apply pulsed beam trawls.

- Suggestion that Dogger Bank area should be presented with details on distribution of sensitive benthic communities in order to identify areas of highest conservation value (Kröncke et al. data, see Annex 5).

- Because of fundamental conflicts of interest in the Dogger Bank area the group could not agree on management proposals.

- However a **proposal** to install experimental closure in order to gain more knowledge about the K-selected benthic species and distribution patterns of the three benthic communities in question was suggested as management option.

**Impact on Fisheries**

Dogger Bank heavily fished and seems very resilient. Closure will result in large economic losses and to severe displacement issues (costs for nature and industry). Also the Dogger fishery is a very clean fishery. Other displacement costs would include increasing discards levels in other areas (effects on future catching opportunities?, costs for extra management measures).

In view of high costs of full closure (for industry, enforcement and nature in other areas), some ‘creativity’ is needed. Look at option of protecting representative samples of the three communities. It is advisable to sit down with the industry and identify those long-lived sensitive species areas that need protecting. The fishers will need something in return, e.g., an agreement that improves the identified communities while securing bottom-trawl (including beamers) access to remainder of Dogger Bank (knowing that the top community seems resilient to fisheries).
Summary

In summary, the group agreed that closures of ecologically important and less frequently fished areas within the SCIs in the North Sea are the most efficient fisheries management measures to improve the conservation status of the HD annex I habitat ‘reefs’. Closures of these sites would result in low costs for the fishing industry and have a reduced risk of displacing fishing effort to ecological sensitive areas outside the MPA.

Management measures in order to improve the conservation status of the annex I habitat ‘sandbanks’ with low costs for the fishing industry are considerably more difficult to identify, as most sandbanks are important fishing grounds. Additionally, hardly any unfished sandbanks exist in the North Sea and therefore scientific evidence on the ecological status and the impact of fishing on this habitat is missing. Especially, for lighter gears such as used by the shrimp fisheries the ecological impact on benthic communities is unclear.

As a solution sufficient large experimental closures of ecological representative areas of sandbanks, which can demonstrate effects of such closures are recommended as management option.

Other observations

Dispersal

A wider discussion should be started to ensure that, when implemented at a European level, there is connectivity between the sites and that egg and larvae dispersal is appropriate to ensure continued viability of the habitats.

The advice assumes that there will be an assessment process for all new fleets introduced to the area. A process has recently been agreed by the FAO that will be implemented increasingly.

Impact on Fisheries

Consistency is needed for the EU MPAs, particularly in areas which are within jurisdiction of different Member States such as Dogger Bank. Besides the need for maximizing the benefits for nature conservation values, the costs for the industry would increase further if they have to comply with multiple management regimes within one defined fishing ground.

Fishing effort will go down as part of EU flatfish plan and because of increasing fuel cost. Is that perhaps sufficient enough to meet management objectives for Dogger Bank in view of high costs of protection measures to industry?

The question needs to be answered how it is possible that long-lived sensitive communities are there despite heavy fishing (Dogger Bank). And what status they are at (unclear now). This is important for successful discussions with fishing industry about protective measures.

Approach of management measures in ‘large squares’ for control purposes will bring additional costs. With modern technology (including control equipment such as VMS/AIS) it is possible to have tailor-made boundaries.

Can we think of putting in incentives for the industry to change to alternative gears that are acceptable in terms of the effects on the nature conservation values, i.e. low impact gears (e.g., allow pulse-trawl in areas where the beam-trawl is prohibited).
This may serve as a mitigation measure to compensate the industry for loss of fishing grounds.

Information is available on value of the catches in the areas. It should be noted that value of the catches does not necessarily say something about how important these areas are for the fleets and/or individual fishers. Equally, the fact that there is a VMS poll indicating fishing isn’t necessarily an indicator for the economic importance of the area.

8.1.4 Report back discussion

Comment: To add to the subgroup report presented by Stuart Rogers. For the Sylter Outer Reef it was stated that it is important to identify areas where reef closures are a good idea and to make sure that other reefs which are not protected can continue in the conservation status they have now. For the Borkum Reef Ground it was stressed that closures of sandbank areas around the reefs should be put in place not only for practical reasons but also because of the unique structure of the benthic community in these areas. The Dogger Bank MPA is put in place because it is a unique ecological structure in the German North Sea. It is recognised that there is many conflicts with fisheries in this area, but it is important to find a way to protect the area and the ecological structures and functions of the area in the future. Comment: The management option of closing all reefs to bottom trawling in the Sylt Outer Reef is necessary for the protection of the reefs and associated biology in order to reach the conservation objectives. Therefore, closing all reefs to bottom trawling should be included as a management measure for the Sylt Outer Reef. Socio-Economic arguments cannot be a reason for not recommending this management option. Also for the Borkum Reef Ground it was recommended to close a triangle for all bottom trawling fishery in order to be able to reach the conservation objectives. Comment: For the Sylt Outer Reef it was suggested to close two reefs in the northern part of the area with little ongoing fishery. Question: Did you discuss connectivity, dispersal of larvae and recruitment processes? Answer: No, that was not discussed. We don’t at this meeting have the hydrodynamic modelling information available to say anything quantitatively about this, but it would probably not change much in the proposals for fisheries management measures for the areas. Comment: The sites in the southern North Sea are all well connected because of the current circulation which links the sites together. Therefore, there are most likely a high degree of connectivity between the German sites we are looking at, but it depends on the species and what amount of larval population needs to be transferred. There are no barriers like deep basins or strong currents to separate sites and associated populations in the area. Comment: The connectivity between reefs is more problematic than for the sand banks because the southern North Sea is almost exclusively sandy areas. Whereas the relatively few hard structures with their typical species definitely need stepping stones because their planktonic larvae need to settle on these few reef locations. Question: What is the reason for not considering the high effort of shrimp trawling as a major impacting factor for nature conservation in the area? How can Germany expect to be able to reach favourable conservation status for reefs and sand banks in the designated areas if measures to reduce the impact from the shrimp trawling fleet are not put in place? Answer: Little information exist about effects of shrimp trawling. One paper state that shrimp trawling does not affect Sabellaria reefs. Comment: We have discussed that a closure of some features in the site may be enough to give a positive outcome for the whole site. It might not be necessary to close all features for fishery in the site to have an overall positive effect in the site. Comment: The shrimp trawls fish on sandy areas and they do not have chains like other beam trawls and therefore are ex-
pected to have lower impact on the communities of epifauna. In the Netherlands there are a MPA with the objective to be restored and in this area ordinary beam trawling will be prohibited while shrimp trawling will be allowed because of the low impact of the shrimp trawls. The latter was decided after a scientific evaluation of the shrimp trawl impacts. There will be a study of the shrimp trawling effects in the area and a re-evaluation of the shrimp trawling impacts in the area after a certain period. **Comment:** Danish and Dutch shrimp fishers are in the process of being MSC certified and it is expected that they will be so in the near future. In Denmark the necessary studies to become MSC certified are presently being carried out. **Comment:** Little is known about the effects of the shrimp trawls. It is necessary to have areas undisturbed in several years to give them a chance to restore and first thereafter allow a trial shrimp fishery in the area to study the effects on the biological community. It is very important to consider that there are effects of beam trawling and that there has been a change in the baseline. At present we don’t know what the effects of shrimp trawls are and therefore areas need to be closed which is large enough for restoration of sandbank communities and for research of the effects of fishing on these “natural” communities. **Comment:** For reefs it is easier to find solutions than it is for sand banks. For shrimp trawls we don’t know the effects and therefore it has been suggested to have some experimental closures. **Comment:** The reef areas are different in structures as can be seen from the fishery data. Also here experimental closures may be useful to find out about fishing impacts. **Comment:** With regard to management measures specifically for the shrimp trawling fleet fishing on sand bank it was proposed to make experimental closure and to do research to find out about the effects of trawling. **Comment:** In Syltier Outer Reef an experimental closure of a sand bank area could probably be a good idea, but there must be a revision and evaluation after a certain period. For the Dogger Bank and the Borkum Reef areas which are very large sand bank areas it is difficult to see how a small area closure will be enough to reach the conservation objectives. **Comment:** A reason for not suggestion larger closures is that there is very little fishing going on for the moment and therefore the conservation objectives are probably not compromised. **Comment:** The management measures should not just be looking on what is happening today but also what might be happening in the future. **Comment:** We are not only talking about the shrimp fishery impact but also the impacts from beam trawling for flatfish. We know there is a very high intensity of this type of fishery fishing for demersal species. We don’t know what the effects are therefore I believe we should be much more precautionary or on the safe side when we give science advice and be aware/inform about the risks. **Comments:** Science advice describes what the risks are, we are not managers, it is up to the managers to take decisions which can be either precautionary or not. Do we have scientific evidence for stating that the communities on sand banks would be different from what they are now if any of the fishing gear where excluded from the areas? Must a community be in a pristine status to be in a favourable status? No - that was discussed at the last EMPAS workshop in 2007 and at this workshop again. There is an obligation to make sure that the typical species is prospering (section 4.3). **Comment:** If we assume that beam trawling have had an effect in an area and you remove the beam trawling from the area and the community then will change towards K-selected species (in the direction towards better favourable status) then we are only considering a specific site not the feature throughout the waters of other Member States and the consequences protecting just that site may result in redistribution of damaging fishery elsewhere. In addition there are socio-economic effects to take into account. **Comment:** For the habitat type sand bank all Member
States have the commitment to identify enough sand bank area to be protected in their waters.

**Conclusions from the report back discussion**

**Reefs and Sandbanks protection**

- Closures of ecological important and regularly less fished areas within the SCIs in the North Sea are the most efficient fisheries management measures to improve the conservation status of the HD Annex I habitat ‘reefs’. Closures of these sites would result in low costs for the fishing industry and have a reduced risk of displacing fishing effort to ecological sensitive areas outside the MPA.

- Management measures to improve the conservation status of the Annex I habitat ‘sandbanks’ with low costs for the fishing industry are considerably more difficult to identify, as most sandbanks are important fishing grounds. Additionally, hardly any not-fished sandbank is existing in the North Sea and therefore scientific evidence on the ecological status and the impact of fishing on this habitat is missing. Especially, for lighter gears such as used by the shrimp fisheries the ecological impact on benthic communities is unclear.

- As a solution sufficient large experimental closures of ecological representative areas of sandbanks, which can demonstrate effects of such closures are recommended as management option.

**Shrimp trawling on sand bank benthic communities**

- We are not proposing any major management measures for the shrimp trawl fleet in sand bank areas.

- The small amount of information available does not suggest major impacts of shrimp trawling on the benthic communities.

- We know they fish in the sand bank areas and we know there is a high fauna biomass but we don’t know what the structure of a baseline community would be. Therefore it is proposed that some experimental closures of adequate size should be implemented somewhere as a research tool to find out if sand bank communities would move towards a very different community composition than they are in now. The closures should be large enough and be there for long enough time to be able to give scientific results.

**Bottom trawling on sand bank benthic communities**

- There is a lack of knowledge and understanding of the consequences of the effect of fishing especially with the recent developments and use of new gear technology.

- It is suggested that there are a pre-assessment of environmental impacts before a type of fishery is allowed in an MPA or a type of fishery wish to reallocate or change fishing pattern in an MPA. As per agreements in FAO and CBD.

- Bottom trawling and especially large and heavy rigged beam trawling will increase total mortality on the benthic community and it is very likely that trawling will shift the species composition away from a mature community with lots of K-selected species towards a community with more r-selected species and less K-selected species. Nobody knows what a “climax sandbank community” would look like and at present we don’t know how far from it
we are right now. Therefore at present we don’t know if there are enough sand bank areas with sand bank communities in favorable condition.

- A management option is to exclude large beam trawlers from operating on the sand banks. Even if they go to areas where they have a much larger impact than they have at present. Because it will give the sand bank communities in the MPAs a change to develop and move in the right direction towards whatever a “climax sand bank community” looks like. In some of the sand bank areas shrimp trawling should also be excluded to see if the sandbank communities will change and move further towards the “climax sandbank community” state.
8.2 Subgroup: Impact assessment of fisheries on marine mammals and seabirds (Baltic Sea)

Subgroup report:

Chair Christian von Dorrien, assistant rapporteurs Jim Reid, and Ursula Siebert. Subgroup participants: Christian Pusch, Jake Rice, Stefan Garthe, Ursula Siebert, Szymon Bzoma, Helena Herr, Jim Reid, Henrik Lund, Marie Storr-Paulsen, Signe Sveegaard, Jonas Teilmann, Clare Eno, Christian von Dorrien.

Discussion on ToR (f) for the Baltic Sea fishery impact on marine mammals and seabirds, and, concerning the harbour porpoise, also the North Sea: develop options for managing fisheries in and around the German Natura 2000 sites, including consideration of co-management systems appropriate for management within an ecosystem approach. For each option report on the possible impacts of the management measure(s) on the fisheries, and the likelihood of achievement of the conservation objectives for the site.

The breakout group concentrated its discussion on those management options that have been developed at the second expert workshop “Impact assessment of fisheries on marine mammals and seabirds in Natura 2000 sites within the German EEZ of the North and Baltic Seas” that took place on Isle of Vilm, Germany, 5-7 May 2008 (Annex 4).

It should be noted, that the terms of reference for the ICES workshop WKFMMPA are to concentrate on management options in and around the German Natura 2000 sites within the German EEZ. As a consequence, some of the management options proposed at the Vilm workshop mentioned above, that aim on larger or other areas, have been discussed during WKFMMPA, but are presented here at the end of the whole section, for information purposes only and not as formal recommendations agreed upon by WKFMMPA.

It was agreed by the breakout group to focus the discussion on the most conflicting cases for seabirds and marine mammals, as identified at earlier meetings. Other potential impacts, like effects of trawling on habitats, disturbance of birds (e.g. during moulting) and food depletion by fisheries were not discussed at the breakout group.

It has been stated during the discussions that many of the management options proposed for sea birds and harbour porpoises, would also be of benefit for seals in the areas mentioned.

The section for each of the management options for seabirds and harbour porpoises, respectively, is organised as follows:

- Option for managing fisheries
- Likelihood of achievement of conservation objectives
- Possible socio-economic effects on the fisheries
- Open questions and other remarks
8.2.1 Seabirds

Conflicts between fisheries and seabirds in the Baltic Sea

A summery of the presentation of the bird-fishery conflict analysis is given in Section 5.4 and in risk maps presented in Figure 6.3.2.

One of the most conflicting areas between gill-net fisheries and seabirds is the SPA Pomeranian Bay in the Baltic Sea. This site is protected as a nature conservation site under national legislation because of high concentration of divers, auks and sea ducks, many with important parts of their biogeographic populations. The sea and water birds use the site for resting and feeding during winter and spring with concentration hot spots on the Adler Ground in the north and the Odra Bank in the south. Additionally, the Odra Bank is used in summer by Common and Velvet scoters for moulting.

Options for managing fisheries

Option: Full spatial year-round exclusion of static gear from the SPA Pomeranian Bay

Likelihood of achievement of conservation objectives

- This management measure would reduce the bycatch to zero in the SPA Pomeranian Bay. The SPA is covering areas with highest concentrations of migratory waterbirds, including several species listed in Annex I of the Bird Directive.

- There is a high likelihood that seabirds wintering in this area are stationary. No increased migratory behaviour of seabirds during wintering seasons to, e.g. in deeper areas has been observed. But, there would be a quite frequent exchange between the different feeding and resting sites.

- As individuals move also outside the area, they might be affected by set net fishery outside the area. So, even a full ban of set net within the SPA might not ensure bycatch reduction to zero for all species during their wintering time in the German part of the Baltic Sea. Nevertheless, the management measure would improve the conservation status of seabirds significantly, so that conservation objectives according to the Bird Directive would be achieved.

Possible impact on the fisheries

- The management measure would result in loss of fishing opportunities within the SPA Pomeranian Bay. The fishing industry would have to move to areas outside the SPA or use alternative, ecologically sound fishing gears. The bottom set gill-net fleet is a large segment in the Baltic Sea, including a high proportion of part-time fisheries and many small boats. The extent of the bycatch mortality by different static gears is not exactly known, but recent studies show, that seabirds get entangled in all kind of set net and different mesh size. For the fleets affected, the options for gear substitutions are more limited than for other fleets. Rather than closing all bottom set gill net fisheries, there should be looked for gill-net methods that don’t produce seabird bycatch. Fishing effort might get displaced, in areas outside the SPA Pomeranian Bay, (e.g., north of the Rönne Bank, or into the Swedish
EEZ), if gears are not substituted by alternative gears or fishing effort is fade out.

- Possible increase of fishing effort (soak time), because fishing effort is displaced into areas with lower densities of target fish species.

**Option:** Temporal closures for static gear in the part of the SPA Pomeranian Bay, with the highest conflicts between set net fisheries and seabirds. e.g. from November to April

**Likelihood of achievement of conservation objectives**

- Risk maps, which are based on the distribution of relevant bird species, show that the Odrabank is an area of high potential conflicts between seabirds and fishing activities.

- Bycatch mortality of seabirds would be reduced close to zero in this part of the SPA Pomeranian Bay during the season of highest conflicts between set net fisheries and seabirds

- The analysis performed by experts of the Research and Technology Centre (FTZ) showed high conflicts between distribution of static gears and seabirds in the southern part of the SPA Pomeranian Bay (Odra-bank), due to high concentrations of red-throated diver, blackthroated diver, red necked grebe, slavonian grebe, long-tailed duck, common scoter, velvet scoter around the year.

- Although conflict potential in the Adlerground area is significantly reduced during summer month, some bird species will be affected through bycatch mortality (e.g. razorbills)

**Possible impact on the fisheries**

- Loss of fishing opportunities for cod in the set net fishery during the closed season.

- The substitution of gill-net targeting cod by other fishery methods like trawlers, seiners might be difficult, due to the rough seafloor in the Adlerground area

- But alternative fishing methods exist (e.g. fish traps, see below), to substitute gill-nets

**Option:** Use of alternative fishing gears, like for example fish traps.

**Likelihood of achievement of conservation objectives**

- It would be possible to reduce bycatch of seabirds close to zero.

- The preliminary results of a BfN project show that fish traps have a only little impact on the seafloor and the bycatch of marine mammals and seabirds is zero

- Swedish studies show, that larger traps might cause bycatch of seals, but deterrent devices are already available

**Possible impact on the fisheries**

- Reduced catch efficiency of alternative gear compared to gill-net.

- Investment in new gear and re-construction of vessels.
The European Fisheries Funds (EFF) might be available to cover cost for gear substitution, at least partly, to reduce the bycatch mortality.

**Open questions and other remarks**

Because there might be other impacts on the environment, e.g., on the habitat (for example, by big traps on sea bottom), an Environmental Impact Assessment should be carried out before their introduction.

**Option:** Regulation of total fishing effort by bottom set gill-net gear in order to limit bycatch to less than 1% of the numbers of every bird species. The effort limits may differ seasonally and spatially, and according to gear type.

**Likelihood of achievement of conservation objectives**

- This option seems to be too complicate to implement, with the risk to miss to achieve the objective. The reasons are:
  - Limited knowledge about total abundances of seabird populations as well as proportions present in the area at a certain time. This relates also to population numbers to non-EU countries.
  - A bycatch limit would be needed to be calculated, implemented and controlled for each affected area, jointly. In addition, also other reasons of mortalities have to be taken into account when calculating a maximum bycatch rate.
  - For some species, a 1% bycatch rate would mean up to 2,000 bycaught birds each year. Based on an EU court case with regard to “deliberate killing of birds”, it might be problematic to allow a maximum bycatch rate. However, this might depend on the conservation status of each species.

- In case of a narrow and very strict interpretation of “deliberate” and the limited knowledge on absolute population numbers, the only option would consequently be a complete ban of bottom set gill-nets in the SPA.

**Possible impact on the fisheries**

- The fishery would need to land and monitor each bird that has been bycaught. There would be substantial problems with the control and compliance of the management measure.

**Option:** An effective monitoring scheme for the fishery should be implemented in the SPA Pomeranian Bay to get a better data background about the spatial and temporal distribution of fishing effort, soak time, gear type, mesh size and bycatch mortality rates.

**Option:** Environmental Impact Assessment before introducing new fisheries methods/gears. Including consideration, assessment and regulation of fisheries that are extending the effort spatially or temporarily in the area in the future.

**Open questions and other remarks**

Issues surrounding the extent of fishing effort and its management were discussed. It was recommended that rather than develop a complicated system of regulations for application within individual SPAs one should seek simpler solutions that pertain
more widely to the marine environment. For example, at the request of the Commission, ICES, through its Working Group on Seabird Ecology, advised that there is a seabird by-catch problem in various fisheries within the EU, and recommended that an EU-wide Plan of Action (EC-POA) to reduce this by-catch be compiled and implemented (ICES, 2008c). Having accepted this advice, the European Commission aims to publish the plan in 2009. The EC-POA should be modelled on the UN Food and Agriculture Organisation International POA-Seabirds. Although the FAO Plan of Action pertains to long-line fisheries, WGSE and the EC recognise that any European Community plan should target all fishing gears where by-catch exists, including gill-nets. It should:

- establish an independent observer programme for fishing vessels;
- complement the observer scheme with interviews of fishermen;
- implement and test mitigation measures; and
- assess the actual fishing effort of both EU and non-EU fleet fishing in EU waters.

An extra meeting of WGSE has been proposed for autumn 2008 to more fully assess the extent of seabird by-catch in all fishing gears in European waters, although this is very much dependent on access to fisheries effort data. Thereafter, the next annual WGSE meeting in March 2009 will aim to provide the EC with further input towards drafting the EC-POA. Key participants in the EMPAS workshop will be invited to attend one or both of these meetings. There is a need to link EU-wide measures (such as POA) with SPA-specific management.

8.2.1.1 Report back discussion on seabirds

Comment: Regarding the issue of bird migrations outside the areas it is important to keep in mind that the EU Member States have the obligation to identify all suitable sites for birds and the most important sites should be designated as SPAs. In the German EEZ the most important areas for relevant bird species according to the EU Bird Directive are Eastern German Bight SPA in the North Sea and Pomeranian Bay SPA in the Baltic Sea. As all Member States have the same obligation to designate SPAs and especially migratory bird species will be protected by a network of SPAs in Europe. Comment: The limit of bycatch to less than 1% of the numbers of every bird species could mean two types management measures: 1) A regulation that allow a bycatch of 1% of the population. Measurement of the bycatch and closure of the fishery when the 1% (whatever that number is) has been reached, or 2) Taking a long term calculated bycatch numbers estimated from fishing effort data and reallocating the effort without monitoring the actual bycatch? Comment: Both options have been discussed. First one needs to identify where the conflict areas are and then decide on which measures needs to be taken. To control the bycatch is necessary to be able to observe and control the bycatch on each vessel and today this is complicated especially in the Baltic Sea with a large number of small vessels. Another issue is that the Birds Directive do not allow any deliberate killing of birds, therefore it is not legal to manage the set net fishery with a maximum bycatch rate even if it is very small.

Comment: To add to the latter comment. If it is allowed to bycatch 1% of the population in all MPAs where the birds migrate to it will be impossible to control when the overall 1% level has been reached for the total population. Comment: To explain what “deliberate” means: in a famous European court case “deliberate” means “knowing” that you may kill a bird when you use a certain type of fishing gear in a certain area. It is mainly the difficulty in controlling a bycatch of birds which is a big
problem if allowing 1% “deliberate” killing of birds. **Comment:** It is very difficult to estimate a “safe” number of birds to be killed (the 1% of the total population) and it is impossible to monitor when that number will be reached if “the” number can be estimated. **Comment:** It is important also to be aware that fishery is just one induced mortality factor on seabirds all other activities and their negative effect on the bird populations should also be considered in the 1% tolerated mortality. This complicates the whole issue of setting a bycatch quota on a bird population. Therefore the science advice should be: no allowed bycatch of birds.

### 8.2.2 Harbour Porpoise

**Conflicts between fisheries and harbour porpoise in the Baltic Sea and in the North Sea**

A summery of the presentation of the harbour porpoise-fishery conflict analysis is given in Section 5.5.

Three distinct areas of Harbour porpoise distribution were distinguished in German waters: 1) Central Baltic (Baltic Proper); 2) Western Baltic (connected with the Belt Sea); and 3) North Sea. The options for fisheries management measures have been recommended for the N2000 areas, taking into account different levels of conflict between harbour porpoises and current fishing activities. However, see comments below for conservation of this species outside the areas of mandate.

**Options for managing fisheries**

**Central Baltic population**

For the German Central Baltic east of the Kadet Trench, the Harbour porpoise population is known to be at a critical level. T-POD data prove the year-round presence of the species in the Pomeranian Bay including in the Natura 2000 sites, but concentration areas could not be defined due to the low overall harbour porpoise abundance. Clearly, favourable conservation status of this population cannot be reached with any bycatch at all in the whole distribution area.

The working group agreed that management measures to reduce by-catch mortality of Harbour porpoise of the Central Baltic population, which are restricted to areas within Natura 2000 sites are not sufficient to reach the conservation targets set by the EU Habitat Directive.

As a consequence, management options for Harbour porpoise in the whole Central Baltic have been discussed during WKFMMPA, even so terms of reference for the ICES workshop WKFMMPA stipulate the members to concentrate on management options in and around the German Natura 2000 sites within the German EEZ. Management options are therefore presented here for information purposes only and not as formal recommendations agreed upon by WKFMMPA.

**Option:** Urgent phasing out of the use of set nets by 2010.

**Likelihood of achievement of conservation objectives**

- Bycatch mortality of harbour porpoises in the Central Baltic would be reduced close to zero.

- The phasing out of the set net fishery would be the most effective management measure to sustain the harbour porpoise population of the Central Baltic and reach the conservation target, as every single by-
caught animal, would increase the risk of extinction for the small porpoise population (an estimated 600 individuals).

Possible impact on the fisheries

- The management measure would have a significant impact on the set net fishery in the Baltic Sea, mainly smaller vessels and also the part time fishery. Gear modification and substitution financed by the European Fisheries Fund, might be possible to attenuate socio economic effects.

Option: Mandatory use of acoustic deterrent devices (pingers) on all gill-nets nets and all vessel sizes. This measure has to be accompanied by an effective observer scheme to control its effectiveness.

Likelihood of achievement of conservation objectives

- Depending on the effectiveness of pingers bycatch of harbour porpoises could be reduced close to zero. Nevertheless some studies show habituation of porpoises to acoustic deterrent devices and bycatch rate may increase again after a while. Pingers reduce the quality of harbour porpoise habitats and might even scare animals away from the habitats. Therefore pingers can only be an urgency and interim measure, to prevent the further deterioration of the harbour porpoise population of the Central Baltic.

Possible impact on the fisheries

- According to EU regulation 812/2004 the use of acoustic deterrent devices (‘pingers’) already obligatory for vessels larger 12 m operating in the Baltic Sea ICES subarea 24. Acoustic deterrent devices could be financed by the EU fisheries fund. Nevertheless the regulation is still not implemented in German waters due to a lack of control and compliance.

Option: Modified gear (e.g. set nets marked with barium sulphate to enhance the perception for porpoise) or alternative gear, as fish traps and/or long lines.

Likelihood of achievement of conservation objectives

- The effectiveness of modified gears, like barium sulphate marked gill-net in avoiding/reducing bycatch of harbour porpoises is still under scientific consideration.

- The use of alternative gears like fish traps and longlines would reduce the bycatch of harbour porpoises close to zero.

Western Baltic population

In general the same management options are valid, which have been discussed for the Central Baltic population. However, because the mandate of WKFFMPA was restricted to the Natura 2000 sites management options in the Western Baltic Sea were restricted to the SCI Fehmarn Belt.

Option: Closure of the Fehmarn Belt area for gill-net fisheries during the abundance peak of harbour porpoises.
Likelihood of achievement of conservation objectives

- If closing an area for bottom set net gill fishery could result in a displacement of effort to other areas, if the effort is not simultaneously fade out or substituted by alternative gears. As Harbour porpoise are highly mobile individuals they spent a significant amount of time in areas outside their identified concentration hot spots. Therefore, exclusion of static gears only in a hot spot site of harbour porpoises distribution, might not result in an over all reduction of Harbour porpoise bycatch as displacement of gears might result in increasing bycatch rates outside the protected areas.

Possible impact on the fisheries

- Loss of fishing opportunities, e.g. for Danish turbot fishery. Resulting in economic losses and social impacts.

North Sea population

Option: Immediate closure of set nets in the SCI Sylt Outer Reef which has been identified as an especially important feeding and reproduction ground for Harbour porpoises and features one of the highest porpoise densities in European waters during late spring and summer as set net fisheries are associated with especially high bycatch risk in that area. The use of pingers in this site would not be an option as pingers can also disturb Harbour porpoises at this site, which is the most important reproduction area for Harbour porpoises at least in Germany.

Likelihood of achievement of conservation objectives

- Removing this threat out of the ‘hot spot’ area would help to improve the conservation status of the whole North Sea population and could prevent future harm to the population.
- The use of pingers in this breeding site is not an option, as acoustic deterrent devices would decrease the habitat quality and could repel porpoises out of their reproduction site.

Possible impact on the fisheries

- Loss of fishing opportunities, although there is currently only little fishing effort with bottom set gill-net. The resulting economic losses and social impacts would therefore be very low.
- For the same reason displacement of fishing effort to areas outside the SCI Sylter Outer Reef are neglect able

Comments on fisheries management options aiming on the conservation of harbour porpoise outside the areas of mandate for WKFMMPA:

Participants at WKFMMPA noticed that the Harbour porpoise is listed in Annex II and Annex IV of the EU Habitats Directive, which characterise this species as of particular conservation importance for which specific management measures are required in the whole range of the species. Therefore, at the Vilm workshop (Annex 4) management measures for the protection of the population throughout its range have been recommended that goes beyond the boundaries of marine Natura 2000 sites, e.g. Phase out bottom set gill-nets in the Central and Western Baltic Sea. This has been identified as the most effective management measure to sustain the small and endan-
gered harbour porpoise population of the Central Baltic Proper. On the other hand, such a measure would have significant impact on the fleet, especially small and part

time fisheries, and would lead to significant and socio-economic impacts. As an alter-

tative measure, it would be possible to replace bycatch intensive bottom set gill-

net by modified or alternative gears (e.g. fish traps, long lines), which could be fi-

nanced by the European Fisheries Fund.

Another management option to be implemented outside the protected areas, includes

as an interim emergency measure, the mandatory use of pingers on all set nets. This

measure has to be accompanied by an effective observer scheme to control its effec-

tiveness. Depending on effectiveness of pingers (e.g., due to habituation), this is only

an interim measure, because it might have the potential to reduce the quality of the

habitat. For the fishery, the implementation of such measures would not cause huge

problems, as the acquisition of acoustic deterrent devises could be also financed at

least partly by the European Fisheries Fund.

If closing an area for bottom set net gill fishery would result in a displacement of ef-

fort to other areas, the effects in achieving conservation objective could be very low,

depending on the bycatch rates for harbour porpoise outside the area. Therefore, ef-

fort displacement should be avoided. In areas like the SCI Sylter Outer Reef a reloca-

tion of effort in areas outside the MPA would already gain benefit for the harbour

porpoise population, due to the high concentration of harbour porpoises and the

enormous ecological importance of the site as feeding and reproduction ground.

8.2.2.1 Report back discussion on harbour porpoise

Question: What about recreational gill-net fisheries – is it important? Answer: In

Germany recreational gill-net fishery is not allowed. However, former or older com-

mercial fishers are allowed to fish as part-time fishers with gill-nets. Comment: In the

offshore Natura 2000 sites we are developing management proposal for in the EMPAS

project, recreational or part time gill-net fishery is not an issue because these ar-

eas are too far from the shore for both recreational and part-time fishers. Question:

Have you considered facing out gill-net fisheries not only in Natura 2000 sites but

also in the whole German EEZ as recommended in the Vilm workshop report (Annex

4)? Answer: The question has been discussed. It is clear that facing out all gill-net

fisheries in the whole German EEZ is going beyond the mandate of the EMPAS pro-

ject. However, if we look at what will be needed to protect the harbour porpoise

population in the Baltic Sea it is clear that one has to consider the potential bycatch in

all gill-net fisheries where the conflict may occur and that is not restricted to the off-

shore Natura 2000 sites, but certainly also gill-net fisheries outside the MPAs and in

the coastal small boat gill-net fisheries. Comment: The Habitats Directive clearly state

that there is an obligation to protect the species in the whole area of its distribution

and that means we need measures in the whole area of the distribution and in addi-

tion in the special sites for them (SACs). Comment: Although our mandate for this

workshop is to give advice for the German offshore MPAs it would be silly not to

acknowledge that the Vilm workshop (Annex 4) exist and it is completely appropri-

ate to bring the recommendations into this workshop. Comment: The discussions

from the Vilm workshop (Annex 4) have also been taken at this workshop therefore

the conclusions from the Vilm workshop is not different from the conclusions we

have from this workshop.
9 Conclusions and other issues

General protection measures should be implemented to protect vulnerable habitats and species even for sites where currently no conflicts exist.

E.g. currently, the reefs in the German Baltic Sea are not trawled and a relevant bottom trawl management plan is not necessary at present. It is recommended that before bottom trawl fishing may be allowed on presently undisturbed habitats an environmental impact assessment according to the HD should be conducted.

MPAs need monitoring programmes including pre-agreed response actions to allow rapid response when monitoring results detect new threatening activities.

There is a need to get scientific data and information on the environmental impact of brown shrimp (Crangon crangon) fisheries in the North Sea.

Monitoring schemes to analyse bycatch rates of marine mammals, seabirds and other protected species are needed. Additionally, fishing effort data and information on finer scales on soak time of gill-nets and length of nets are needed especially for smaller vessels below 15 m. The latter information is needed in order to be able to calculate actual mortality rates of harbour porpoise and seabirds in an area.

Fisheries management is not the only measure required to reach FCS in the German Natura 2000 MPAs as additional activities are conducted within the site, i.e. wind power parks and other energy projects, oil and mineral prospection and exploitation, geological survey, maritime traffic, military activities, ecotourism, etc, and any of these activities has the potential to impact species and habitats. These impacts have not been addressed in the EMPAS project and in this report.

Closing words by the Chair Jake Rice:

ICES has had a difficult time opening up its science processes in all the directions towards the NGO’s, towards the industry people who have a knowledge and perspectives that are essential to us getting the right advice out. The diverse participation represented at the workshop and by the discussions taken is the type of discussions that has to go on every time in the ecosystem approach to management. Even if we don’t like it we better learn to get good at it.

10 References


Hammond et al. Results of SCANS-II. Report to the EU LIFE program. in prep.


Implementierung des Bestandserholungsplanes für die Schweinswale der Ostsee (Jastarnia-Plan). Endbericht, BfN, FKZ 804 86 011, unpublished.


Ostsee In: Untersuchungen an Schweinswalen in der Ostsee als Grundlage für die Implementierung des Bestandserholungsplanes für die Schweinswale der Ostsee (Jastarnia-Plan). Endbericht, BfN, FKZ 804 86 011, unpublished.


## Annex 1: List of participants

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Annex 2: Agenda

Workshop on Fisheries Management in Marine Protected Areas [WKFMMPA]
Chair: Jake Rice
ICES
2-4 June

Workshop AGENDA

13:00 Welcome, Orientation, and ToRs
   • Jake Rice/Søren Anker Pedersen/Vivian Piil
13:20 Workshop Participants Introductions

13:25-15:15 Fishery in the German EEZ and fishery objectives
13:25 The EMPAS project and the work plan
   • Søren Anker Pedersen

13:55 Danish fishery objectives
   • Henrik Lund/Michael Andersen

14:10 Dutch fishery objectives
   Nathalie Steins/Cora Markensteijn
14:25 The best available fisheries data
   • Heino Fock

14:30-15:15 Agreement on fisheries data - ToR (a)
   • Chair Jake Rice

ToR (a) - consolidate all information on position, effort, and fishing activities in and around the Natura 2000 sites, and finalize maps and data tables of this information;

15:15 Coffee Break

15:30-16:45 Nature conservation objectives
15:30 Natura 2000 in the German EEZ and conservation objectives
   • Jochen Krause

16:00-16:45 Agreement on Nature Conservation Objectives - ToR (b)
   • Chair Jake Rice

ToR (b) - review all Conservation Objectives that have been proposed by the German Nature Ministry for each Natura2000 site for clarity and specificity, and if necessary provide operational ecological interpretations of individual objectives;
16:45-19:00 Impacts of Fishing activities on Habitats, Seabirds, Marine Mammals, and protected Fish species

16:45 Generic Problems and Conflicts: Working Group on Ecosystem Effects of Fishing Activities
   • Stuart Rogers/Jake Rice

17:05 The FishPact project: "Impact assessment of bottom trawling on benthic species in MPAs within the German EEZ of the North Sea: A modelling approach."
   • Alexander Schröder

17:25 Coffee Break

17:40 Conflict analysis of fisheries with static gear and seabird distribution in the German Baltic Sea
   • Stefan Garthe

18:00 Conflict analysis between gill-net fisheries and Harbour porpoises in German waters
   • Helena Herr

18:20 Status and distribution of Harbour porpoises in relation to Natura 2000 sites in Danish waters
   • Jonas Teilmann/Sigge Sveegaard

18:40 Annex II fish species and fish communities in and around the Natura 2000 sites
   • Anne Sell/Christian von Dorrien

19:00 Workshop get-together in the ICES lunch room (light meal and drinks)

Tuesday Morning, June 3, 2008. Meeting in the ICES: “Atlantic room”

9:00 Summary of Monday and work plan
   • Chair Jake Rice

9:20 ToR (c) - Two breakout sub-working groups

ToR (c) - based on a) and b), identify all areas where fisheries activities may affect achievement of the Conservation Objectives, and to the extent possible describe and quantify the associated risks.

Sub-working group (North Sea room):
Fishing effects on typical species and habitats of sandbanks and reefs
   • Chair Jan Geert Hiddink (gave also a presentation on gear impact)

Summery record of Isle of Vilm Expert Workshop: Effects of bottom trawling on typical species of sandbanks and reefs in the German EEZ of the North Sea
   • Presentation by Jochen Krause
Sub-working group (Biscay room):
Impact assessment of fisheries on marine mammals and seabirds

- Chair Thomas Kirk Sørensen

Summery record of Isle of Vilm Expert Workshop: Impact assessment of fisheries on marine mammals and seabirds in Natura 2000 sites within the German EEZ of the North and Baltic Seas

- Presentation by Christian Pusch

11:30 Sub-working groups report back

12:00-13:00 Agreement on response to ToR (c)
13:00-14:00 Lunch Break (ICES lunch room)

14:00-15:00 ToR (d) and (e)
14:00-14:10 Introduction to ToR (d) and (e) - Costs of Changes

- Chair Jake Rice

14:10-15:00 Discussion of responses to ToR (d) and ToR (e)

ToR (d) - consolidate and report any other information on fisheries operations and goals that may be relevant to fisheries management plans in the Natura 2000 sites, including social and economic information;

ToR (e) - review socio-economic aspects to be considered in fisheries management plans in the Natura 2000 sites;

15:00 Coffee Break

15:15-18:00 ToR (f)
15:15 Introduction to ToR (f)

- Chair Jake Rice

15:20-17:00 ToR (f) - Two breakout sub-working groups: 1) North Sea and 2) Baltic Sea

ToR (f) - develop options for managing fisheries in and around the German Natura 2000 sites, including consideration of co-management systems appropriate for management within an ecosystem approach. For each option report on the possible impacts of the management measure(s) on the fisheries, and the likelihood of achievement of the conservation objectives for the site.

Sub-working group North Sea (North Sea room)

- Chair Stuart Rogers

Sub-working group Baltic Sea (Biscay room)

- Chair Christian von Dorrien

17:00 Sub-working groups Report Back
Wednesday Morning, June 4, 2008. Meeting in the ICES: “Atlantic room”
9:00-13:00 Report on workshop ToRs, consolidate management plans/measures, and write the workshop conclusions
9:00 Summary of Sub-working groups on ToR (f) reports
  • Chair Jake Rice
11:00 Coffee Break

13:00 Lunch Break (ICES lunch room)
14.00-15.00 Finalize conclusions and recommendations regarding management plans/measures and other workshop conclusions
15:00 Wrap up and good bye
  • Chair Jake Rice
Annex 3: Summary record Isle of Vilm workshop: Effects of bottom trawling

Preparatory Expert Workshop to ICES WKFMMPA

Effects of bottom trawling on typical species of sandbanks and reefs in the German EEZ of the North Sea

Isle of Vilm, Germany, 9-11 April 2008

Summary record

The summary record is divided into two sections: I) Presentations and notes from the meeting; and II) key conclusions. The key conclusions were discussed and agreed to on the last day of the meeting.

I. Presentations and notes from the meeting

The meeting was opened by Henning von Nordheim. He welcomed the participants on behalf of the Federal Agency for Nature Conservation (BfN). Von Nordheim pointed out the importance of the workshop in the process of establishing the scientific basis for the development of possible management measures for Natura 2000 sites in the German EEZ. Recent communications are indicating that the European Commission intends to prepare a guideline document for the evaluation of Member States’ proposals for the implementation of fishery management measures in Natura 2000 sites, based on the best available scientific information. The workshop will be one important step in the process of the identification of possible conflicts between certain fisheries and nature conservation targets, and will by that serve as a possible example for similar situations in other EU Member States.

Soeren Anker Pedersen (ICES) gave an introduction into the EMPAS project and reported on the current status of the project work. The results of FISHPACT will feed into the preparation of the final EMPAS workshop in Copenhagen in June 2008. Effects of bottom trawling on the habitat types sandbanks and reefs have been identified as one of the potential conflicts between fishing activities and nature conservation targets in the marine Natura 2000 sites.

Jochen Krause (BfN) reported on the nature conservation requirements according to the EU Birds- and Habitats Directives. Three Sites of Community Importance (SCI) have been designated in the German Exclusive Economic Zone (EEZ) of the North Sea: Sylt Outer Reef, Borkum Reefground and Doggerbank. The Federal Agency for Nature Conservation (BfN) is responsible for the selection and management of these sites. The management objectives for these sites are principally determined in Article 4 (3) of the Habitat Directive (92/43/EEC), which obliges Member States to establish priorities in the light of the importance of the sites for the maintenance or restoration, at a favourable conservation status, of a natural habitat type in Annex I or a species in Annex II and for the coherence of the Natura 2000 network, and in the light of the threats of degradation or destruction to which those sites are exposed.

The protected Habitat types of Annex I in the German North Sea are ‘sandbanks slightly covered by seawater all the time’ (EU-Code 1110) and ‘reefs’ (EU-Code 1170) as defined and explained in the ‘Guidelines for the establishment of the Natura 2000 network in the marine environment’ of the European Commission from May 2007 (http://ec.europa.eu/environment/nature/natura2000/marine/index_en.htm).
Favourable conservation status is defined in Article 1(e) and (i) and further described in the document of the European Commission for the assessment, monitoring and reporting of the conservation status (DocHab-04-03/03 rev. 3): "...In simple words it can be described as a situation where a habitat type or species is prospering (in both quality and extent/population) and with good prospects to do so in future as well. The fact that a habitat or species is not threatened (i.e. not faced by any direct extinction risk) does not mean that it is in favourable conservation status. The target of the directive is defined in positive terms, oriented towards a favourable situation, which needs to be defined, reached and maintained. It is therefore more than avoiding extinctions. Member States are expected to take all requisite measures to reach and maintain the objective of FCS."

Based on these guidelines Jochen Krause summarized the aims of the workshop:

- Can we determine whether typical species of sandbanks and reefs are vulnerable to specific fisheries, or not?
- If yes, are there conflicts between the effects of specific fisheries and the aim to maintain or reach a favourable conservation status of typical species of sandbanks and reefs?
- If yes, does actual fishery deteriorate or prevent a prospering development of the typical species?

**Paolo Pizzolla (JNCC)** reported about the current status of the UK designation of Natura 2000 sites in their EEZ and about activities to establish the impact of fishing activities on habitat features. In UK most areas designated according to the Habitat Directive are so far located in territorial waters (within 12-nautical miles). The UK intends to nominate a first set of seven offshore sites during 2008, mostly containing the habitat types "submarine structures made by leaking gases", "sandbanks" and "reefs". However, most experience on the impact assessments of bottom trawling fishery in the UK originates from coastal areas.

The research by JNCC has shown that impacts on habitats and associated fauna are hard to detect due to missing baselines, high natural variability which is masking impact effects, and inappropriate scales (e.g. detection of trawl marks are sometimes only possible on larger scales). In future, the UK conservation agencies will further outline definitions for typical species to improve the conservation objectives of SACs and ensure that appropriate assessments are carried out on a wider basis. In addition, SAC monitoring activities will be re-prioritised to focus more on the pressures (presence/absence of human activities e.g. fisheries) than on the pure condition (state) monitoring that has been done to date. At the same time, for management decisions the sensitivity of a biotope will be considered the sensitivity of the most sensitive occurring species.

**Hilmar Hinz (University of Bangor)** presented results of three different research projects: "Cost-impact" (EU), "Response" (EU), "Lyme Bay" (DEFRA). The 'Cost-impact' project is a metaanalysis of experimental impact studies. Even though the study showed that the project approach was a sound indicator related to different gears and habitats, as well as the severeness of the impact, it remained unclear if the model is applicable to real fishing effort. Most problematic was the lack of data about the impact of chronic trawling and the effects recorded along a gradient of fishing intensity. This gap was addressed in the "Response" project, where intensively, chronically trawled areas and less trawled areas were compared. The results highlight the significant effect of chronic trawling on benthic community structure in the parameters
abundance, biomass and species richness in both infauna and epifauna. The third project presented analysed the effectiveness of marine protected areas to conserve a lime stone reef system, indicated by the ecological state of corals and scallops.

GerJan Piet (IMARES) presented aspects based on various modelling approaches, which have to be taken into account to estimate the impact of fishing on fish and benthos. It was pointed out that the impact of trawling on the benthic ecosystem is largely dependent on the fishing gear, the trawling frequency and the microdistribution of trawling. Using a theoretical model based on real high resolution fishing data in the NL the high importance of the spatial and temporal scale for measuring the distribution of fishing effort was demonstrated and implications for management were depicted. Inter alia it was pointed out that a medium scale resolution of fisheries data is needed to enable a sufficient assessment of fishing effort distribution. This resolution lies well above the resolution of VMS data.

Lars Gutow and Alexander Schröder (AWI) presented the methods and preliminary results of the AWI-Project "Fishpact" explaining the method that has been applied to study the impact of bottom trawling on benthic species in MPAs within the German EEZ of the North Sea. In the following a brief summary is given:

**The Population model**

In the initial approach, population growth rates of characteristic benthic species from the designated MPAs were calculated from life history parameters including age specific survival probabilities and the age specific number of produced recruits by the use of Matrix Population Models. The calculated population growth rate served as a measure of the fitness of a given species under the impact of various bottom trawling regimes.

Life history data were taken from the literature. Extracted data on age specific survival probabilities varied in their degree of uncertainty according to the way of presentation in the literature. Temporal gaps in the data sets were closed by inter- or extrapolation assuming constant mortalities over the time period of the gap. Direct information on the production of new recruits was largely lacking and was, thus, mainly estimated indirectly from age class distributions within populations. No information was available on the effects of bottom trawling on the fertility of benthic invertebrates. The simulation of trawling events could thus be performed by the manipulation of mortality rates only.

An identical linear reaction of the population growth of species with fundamentally different life histories to an assumed trawling induced standard mortality revealed that the application of Matrix Population Models for simulation of the impacts of bottom trawling on the fitness of benthic species is inappropriate if the simulation is based solely on the manipulation of survival probabilities.

In an alternative approach the annual time of recruitment, the age specific survival probabilities, and the life span were used to simulate the effects of bottom trawling on the population density of benthic species. The survival probability was reduced for each age class (monthly resolution) present at the time of a simulated trawling event.

The simulation revealed that the mean monthly population density was stronger affected by additional trawling induced mortality in long-living (so called K-selected) species than in short-living (so called r-selected) species indicating a higher sensitivity of K-selected species due to specific life history characteristics. The model further
revealed that the first yearly trawling event has the strongest negative effect on the mean monthly population density.

In order to simulate the ongoing trawling induced demographic processes in the designated MPAs, standard mortalities were replaced by taxon and gear specific “real-world” trawling induced mortalities taken from the COST-IMPACT database. The trawling induced reductions in survival probabilities were distributed within the life cycles of the species according to temporal distribution of trawling events in the designated MPAs taken from VMS data from the year 2006.

The initially suggested Matrix Population Models were used to determine trawling induced variations in the population structure. With knowledge of the age-specific biomass the impact of bottom trawling on the mean yearly biomass and, thus, on the productivity can be calculated.

Spatial distribution of potential population impacts

The first step in the impact assessment is the estimation of trawling frequency based on Vessel Monitoring System (VMS) records. A dataset of identified “fishing” records from the German VMS-Dataset from 2006 including information on employed gear type and associated time interval was prepared and supplied by H. Fock from the von Thünen Institute Hamburg. As the data set is only representative for German waters, subsequent analysis was restricted to this area. The effort was converted into the fished area per record by multiplying the fishing time by the average fishing speed for each gear type times the average gear width. Annual fishing frequency per hectare was then calculated using a quadratic Kernel density function.

This allows a presentation of the spatial distribution of trawling frequency for each bottom trawling gear type. For each of the designated habitat features in the MPAs, an annual trawling frequency can be estimated. The results from the population model indicated that the timing of trawling events determines population effects. Thus the temporal distribution of trawling was calculated for beam and otter trawls for each MPA separately and used as input for the population models. The models produce regression functions of population reduction for annual fishing regimes of different trawling frequencies. These functions were then used to derive the spatial distribution of predicted population reduction from local trawling frequency for each ecotype and area separately. These can be separately seen for beam or otter trawls or summed over both gear types.

II. Key Conclusions of the Meeting

Chair: Han Lindeboom, Wageningen IMARES

Conclusions with regard to the AWI Fishpact model:

Section 1.03 Based on mortality rates derived from experimental studies the model shows differential vulnerability of “ecotypes” to fisheries. The following ecotypes used by the model were agreed upon: i/r = Infauna, r-selected; i/K = Infauna, K-selected; e/r = Epifauna, r-selected; e/K = Epifauna, K-selected.

Section 1.04 Using the temporal distribution data of trawling in each Natura 2000 site as input the population models produce regression functions of population reduction under annual fishing regimes of different trawling methods and frequencies.
Section 1.05 These functions can be used to derive the spatial distribution of predicted population reductions from local trawling frequencies for each ecotype and area separately.

Section 1.06 The model is thereby able to identify potential conflicts between ongoing fishery activities and conservation objectives.

Section 1.07 The methodological approach of the AWI model was widely accepted by the meeting.

Section 1.08 The following limitations of the model were identified:

- It is acknowledged that population data for the model were taken from ecosystems in unknown and probably differing levels of impact. The resulting values for percentages of population reduction are hence conservative;
- Data on the exact community structure in the reef habitats are not available;
- The model is based on a single year of fisheries intensity data (2006) as no other data is currently available.

Section 1.09 The following suggestions were made for further improvements:

- Determination of trawling induced mortality: Instead of means either single data sets or extreme values (full range) for simulations should be used;
- A sensitivity analysis for variation of input parameters should be added;
- Production instead of productivity (p/b) as population status parameter should be tested;
- *Arctica islandica* as a K-selected typical species should be included, even though occurring mainly on muddy substrates.

Section 1.10 AWI agrees to improve the model by mid May 2008 and will then circulate results to participants of the FishPact workshop for further comments.

Section 1.11 From the preliminary results of the AWI model, run for the specified ecotypes of typical species occurring in Natura 2000 habitats in the German North Sea, the group developed the following conclusions.

**Conclusions with regard to habitat type *Reefs* (EU-Code 1170)**

Section 1.12 From literature data it has been determined that typical species of reefs such as listed in Appendix 1 are vulnerable to bottom trawling fisheries.

Section 1.13 Spatially modelled effects of trawling on typical species (4 ecotypes) indicate the varying intensity of conflict between the activity and the conservation objectives of the SCIs of the German EEZ of the North Sea. Of particular note are:

- Activities of large beam trawlers occur in the SCI „Sylt outer reef“ but avoid central reef structures along the slopes of the ancient Elbe valley;
- Activities of heavy rigged large beam trawlers occur in the north-western part of the ancient Elbe valley reef structures;
- Activities of small beam trawlers are found on all reef structures in the eastern part of the SCI „Sylt Outer Reef“.

Section 1.14 Any trawling activity prevents populations of typical species from prospering. However, if current levels of fishing activity are maintained it cannot be stated that deterioration will necessarily take place, accepting that the reefs are to date not in a pristine or natural state.

Section 1.15 To ensure the maintenance or restoration of favourable conservation status for the reefs the following is suggested:

1) Full exclusion of bottom trawling from all reefs has the greatest potential to achieve favourable conservation status for the habitat and its typical species.

If this is not practical,

2) Priority for exclusion of bottom trawling should be given to areas with high ecological importance and to those areas that have been identified as having low and/or no fishing activities. It is accepted that the initial occurrence of trawling causes the greatest impact and that there would therefore be greater conservation gain from protecting less impacted sites. This should also prevent degradation through potential future displacement of fishing effort.

Section 1.16 Irrespective of the two suggestions under (d), the group acknowledged that large beam trawlers with heavy rigged gear should be fully excluded from all reef areas as they might compromise the physical integrity of the reefs.

**Conclusions with regard to habitat type "Sandbanks which are slightly covered by seawater all the time" (EU-Code 1110)**

Section 1.17 From literature data it has been determined that typical species of sandbanks such as listed in Appendix 2 are vulnerable to bottom trawling fisheries.

Section 1.18 Spatially modelled effects of trawling on typical species (4 ecotypes) indicate the varying intensity of conflict between the activity and the conservation objectives of the SCIs of the German EEZ of the North Sea. Of particular note are:

- Relatively low trawling activity occurs on Sandbanks in the SCI „Borkum reef ground“;
- The Amrum bank in the SCI „Sylt Outer Reef“ is heavily trawled by small beam trawlers;
- Parts of the Doggerbank are heavily trawled by either large beam or otter trawlers.

Section 1.19 Any trawling activity prevents populations of typical species from prospering. However, if current levels of fishing activity are maintained it cannot be stated that deterioration will necessarily take place, accepting that the sandbanks are to date not in a pristine or natural state.
Section 1.20 To ensure the maintenance or restoration of favourable conservation status for the sandbanks the following is suggested:

1) Full exclusion of bottom trawling from all sandbanks has the greatest potential to achieve favourable conservation status for the habitat and its typical species.

If this is not practical,

2) Priority for exclusion of bottom trawling should be given to those areas with the highest ecological importance and representing the regional variations of benthic sandbank communities.

Appendix 1

Typical benthic species of habitat type 1170 "Reefs" in the North Sea – as defined in Germany’s assessment schemes for reporting according to Article 17 of the habitats directive (Krause et al., report in press)

Plants:

Macrozoobenthos:
Alcyonium digitatum, Asterias rubens, Balanus crenatus, Balanus improvisus, Cancer pagurus, Capitella capitata, Caprella linearis, Carcinus maenas, Ciona intestinalis, Crepidula fornicata, Echinus esculentus, Electra pilosa, Elminius modestus, Flustra foliacea, Galathea intermedia, Galathea strigosa, Galathea squamifera, Galathea nixa, Hediste (Nereis) diversicolor, Heteromastus filiformis, Homarus gammarus, Jaera albilabris, Lanice conchilega, Lepidochitonina cinerea, Leucosolenia botryoides, Lineus viridis, Littorina littorea, Macoma balthica, Membranipora membranacea, Metridium senile, Mytilus edulis, Neanthes succinea, Ophiothrix fragilis, Polydora ciliata, Polypus cornuta, Pomatoceros triqueter, Pygospio elegans, Sabellaria spinulosa, Scoloplos armiger, Securiflustra securifrons, Semibalanus balanoides, Sertularia cupressina, Tharyx killianiensis, Tubificoides benedelli
Appendix 2

Typical benthic species of habitat type 1110 "Sandbanks which are slightly covered by sea water all the time" in the North Sea - as defined in Germany's assessment schemes for reporting according to Article 17 of the habitats directive (Krause et al., report in press)

Plants:
Mostly poor (Zostera marina, Zostera noltii) or devoid of macrophytes

Macrozoobenthos:

Doggerbank region:

German bight

Tellina fabula community, Goniadella-Spisula community, partly Macoma balthica community with: Aonides paucibranchiata, Bathyporeia elegans, Branchiostoma lanceolatum, Echinocyamus pusillus, Fabulina fabula, Gycera lapidum, Goniadella bobretzkii, Macoma balthica, Magelona mirabilis, Nephtys longosetosa, Ophelia limacina, Panaonis fulgens, Pison reticulata, Polinices pulchellus, Scololepis bonnieri, Scoloplos armiger, Spio filicornis, Spisula solida, Thracia papyracea, Urothoe poseidonis.

Annex 4: Summary record Isle of Vilm workshop: Impact assessment of fisheries on marine mammals and seabirds

Preparatory Expert Workshop to ICES WKFMMPA 2008

Impact assessment of fisheries on marine mammals and seabirds in Natura 2000 sites within the German EEZ of the North and Baltic Seas

Isle of Vilm, Germany, 5-7 May 2008

Summary record

The summary record is structured into two sections: I) Presentations and notes from the meeting II) Key conclusions of the meeting. The key conclusions were discussed and agreed to on Tuesday 06 May for the seabird section and on Wednesday 07 May for the marine mammal section.

I. Presentations and notes from the meeting

The meeting was opened by Henning von Nordheim (BfN). He welcomed the participants on behalf of the Federal Agency for Nature Conservation. Von Nordheim pointed out the importance of the workshop in the process of establishing the scientific basis for the development of possible management measures for Natura 2000 sites in the German EEZ. The workshop will be one important step in the process of the identification of possible conflicts between certain fisheries and nature conservation targets, and will by that serve as a possible example for similar situations in other EU Member States.

Soeren Anker Pedersen (ICES) gave an introduction to the EMPAS project and its background. He reported on the work plan for 2008 and the current status of the project. Bycatches of protected seabird species and marine mammals in gill-net and set-net fisheries have been identified to be in potential conflict with the nature conservation targets of the marine Natura 2000 sites. At the international expert workshop on the Isle of Vilm, the scientific results of mainly ongoing German research projects investigating interactions and potential conflicts between fisheries and the distributions of seabirds and mammals need to be presented and discussed in relation to conservation goals. The results will be important for the final WKFMMPA workshop, to be held on 2-4 June 2008 in the ICES headquarters in Copenhagen.

Jochen Bellebaum, Institute for applied Ecology (IfAÖ) gave a presentation about a BfN/IfAÖ project to assess the bycatch of birds in German gill-net fisheries in the Baltic Sea.

Fishing effort with gill-nets and bycatch of birds in SPAs in the German EEZ and territorial waters were studied in 2007 and 2008. Up to the end of April, a total of eight fishers had reported their effort (measured in 1000 net-meter-days) and four had actually reported bycatch of birds. These figures were used to calculate CPUE for bird bycatch which was similar to bycatch rates from other studies. Preliminary results show that bycatch rates were highest in lagoons holding large numbers of diving ducks bycatch. The bycatch rates in Herring nets were on average lower compared with gill-nets with larger mesh sizes but an earlier assumption that herring nets are harmless to seabirds could not be confirmed.

Temporal changes in bycatch were studied by collecting birds from 2-10 fishers on Usedom island during each winter since 1990. Bycatch frequencies here reflected
trends in wintering or staging numbers in the study area as could be shown for Red-necked Grebes caught during spring migration. Decreasing numbers of Long-tailed Ducks collected are probably due to a strong decrease in wintering numbers rather than changes in fishing effort or vulnerability. At the same time, numbers of by-caught Red-throated Divers increased. This long-term data set confirms the relatively low bycatch rates in 2007-08 documented in the recent study, which are likely to be caused by low numbers of wintering seaducks in the Pomeranian Bay due to relatively mild winters.

Interpretation of the temporal changes in bycatch frequencies which are also evident from ring recoveries would require data on gill-netting effort in coastal fisheries using boats 8-12 m or even <8 m length. The possibility of under-reporting of seabird bycatch also makes on-board observations necessary.

**Jochen Krause (BfN)** reported in two sections on the nature conservation requirements according to a) the **EU Birds- (79/409/EEC)** and b) the **Habitats (92/43/EEC) Directives**. In the German Exclusive Economic Zone (EEZ) the Federal Agency for Nature Conservation (BfN) is responsible for the selection and management of all so called Natura 2000 sites.

(a) **EU BIRDS Directive (79/409/EEC)**

Two Special Protected Areas (SPA) have been designated in the German Exclusive Economic Zone (EEZ): one in the North Sea – ‘SPA Eastern German Bight’, and one in the Baltic Sea – ‘SPA Pomeranian Bay’.

The management objectives for the SPAs are in principle described by Article 4.4 for the avoidance of pollution and deterioration of bird habitats and a general strict system for the protection of all birds stipulated by Article 5. Interpretation of the articles is clarified in a number of court cases run by the European Court of Justice.

**Inter alia**, according to the case-law of the EU Court, economic and recreational requirements are not considered within derogations from the system of protection (C57/89, Commission v. Germany - “Leybucht”).

Article 5 requires the establishment of a general system of protection for all species of birds referred to in Article 1 and prohibits in particular deliberate killing or capture of birds by any method and a deliberate disturbance of these birds in so far as disturbance would be significant with regard to the objectives of the Birds Directive.

The European Court of Justice specified the importance of complete and effective protection of migratory species and that any national legislation which delimits the protection of wild birds by reference to the concept of national heritage is incompatible with the Birds Directive (C-252/85, Commission v. France) and that provisions which constitute derogation from the prohibition laid down in Article 5 can only be taken into consideration in case the criteria laid down in Article 9 are met. It is important to know that these are not the rules of normal use of the land or the sea for agricultural, forestry and fishery purposes (C_412/85, commission v. Germany).

These specifications were expanded in the objectives of the ordinances given for both SPAs in the German EEZ, when they were protected under national law as nature conservation sites in 2005.

Based on these guidelines, Jochen Krause summarised the aims of the workshop for the bird section:
• Do we have deterioration or pollution of SPAs due to the activities of fisheries?

• Do we have evidence that the current mortality rate of the local seabird populations in the SPAs due to fisheries exceeds a level necessary to maintain or restore the populations?

• Do we have evidence that the mortality rate impacts the objectives of the regulation to protect the birds?

• If yes (one or all), do differences in mortality rates exist in space and time? And if yes, what are the necessary spatial and temporal regulations of fisheries?

(b) EU Habitats Directive (92/43/EEC)

Three Sites of Community Importance (SCI) have been designated in the German Exclusive Economic Zone (EEZ) of the North Sea: Sylt Outer Reef, Borkum Reefground and Doggerbank and five SCIs in the EEZ of the Baltic Sea: Fehmarn Belt, Kadet Trench, Western Ronnebank, Adler Ground and Pomeranian Bay with Odra Bank. The management objectives for these sites are principally determined in Article 4 (3) of the Habitats Directive (92/43/EEC), which obliges Member States to establish priorities in the light of the importance of the sites for the maintenance or restoration, at a favourable conservation status, of a natural habitat type in Annex I or a species in Annex II and for the coherence of the Natura 2000 network, and in the light of the threats of degradation or destruction to which those sites are exposed.

The protected species of Annex II in the German EEZ of the North Sea and the Baltic Sea are Harbour porpoises, Harbour seals, Grey seals, North Sea houtings, Twaites and Allis shads, Sturgeons and River and Sea lampreys. This workshop concentrates on Harbour porpoises.

Favourable conservation status for protected species is defined in Article 1(i) and further described in the document of the European Commission for the assessment, monitoring and reporting of the conservation status (DocHab -04-03/03 rev. 3): "...In simple words it can be described as a situation where a habitat type or species is prospering (in both quality and extent/population) and with good prospects to do so in future as well. The fact that a habitat or species is not threatened (i.e. not faced by any direct extinction risk) does not mean that it is in favourable conservation status. The target of the directive is defined in positive terms, oriented towards a favourable situation, which needs to be defined, reached and maintained. It is therefore more than avoiding extinctions. Member States are expected to take all requisite measures to reach and maintain the objective of FCS."

Harbour porpoises are additionally listed in Annex IV of the Habitats Directive. Therefore in combination with Article 12 f, Member States are obliged to take the requisite measures to establish a system of strict protection to prohibit all terms of deliberate capture or killing of specimens of these species in the wild, deliberate disturbance of these species, particularly during the period of breeding, rearing, hibernation and migration, and deterioration or destruction of breeding sites or resting places.

Based on these guidelines, Jochen Krause summarized the aims of the workshop for the marine mammal section:

• Can we determine whether protected species, especially Harbour porpoises, are vulnerable to specific fisheries, or not?
• If yes, are there conflicts between the effects of specific fisheries and the aim to maintain or reach a favourable conservation status of protected species?

• If yes, do actual fisheries deteriorate or prevent a prospering development of Harbour porpoise populations?

Peter Möller (Fish & Environment) gave a presentation on preliminary results of the project “Alternative ecologically sound fishing methods in the Baltic Sea” funded by the Federal Agency of Nature Conservation. In this project, the applicability of ecologically sound fish traps is studied as an alternative to gill set nets in coastal waters of Mecklenburg-Vorpommern and in the German Exclusive Economical Zone (EEZ).

In cooperation with commercial fishers, bottom-set two-chamber collapsible pots have been tested in the SCIs “Pomeranian Bay’ with Odrabank and Adlerground. The fish traps are employed as pot links with 20 traps and a soak-time up to five days. In order to study the ecological impacts and catch efficiency of the traps, set nets were employed as reference in the same study area. Initial results of the pilot projects are promising, indicating a much lower bycatch mortality of seabirds in fish traps (0 seabirds in five trials) compared to set nets (13 birds in five trials). Nevertheless, the collection and analysis of data is still not finalized.

Szymon Bzoma (Sea Fisheries Institute, Gdynia) reported on “Polish experience on monitoring of bycatch of marine mammals and seabirds”.

The presentation was divided in two parts:

In the first part, a review was given of the available literature on seabird bycatch in Polish waters.

The most affected species in Polish coastal waters is Long-tailed Duck (Clangula hyemalis) and Velvet Scoter (Melanitta fusca). The bycatch of seabirds in coastal Polish waters is high. According to Stempniewicz (1994), 17.500 seabirds are bycaught each year in the Gulf of Gdansk. Bottom set gill-nets and semi driftnets were identified as fishing gear with the highest bycatch rates, which have been assessed by Kieś & Tomek (1990) to vary between 1.9 to 5.3 birds per thousand net-metre days.

In the second part, Szymon presented research results from on-board monitoring of drift net vessels in Polish waters in 2006 and 2007. The bycatch number of seabird’s in Polish driftnet vessels was assessed to account for 1000 individuals per year. Most affected species have been Razorbill (Alca torda) representing 54% of all bycaught individuals, followed by Common Guillemot (Uria aalge) 43%, and Black-throated Diver (Gavia arctica) 3%.

Maria Boström (Institute of Coastal Research/Swedish Board of Fisheries) presented results of a voluntary logbook scheme as a method of monitoring bycatches of marine mammals and seabirds.

Swedish experiences in monitoring programs are observers on board, a telephone survey, and voluntary logbooks. The most useful method was the voluntary logbook where fishers were contracted to keep a detailed daily log of catches and bycatches. However, after the ban of drift-nets and goal of reduction of marine mammal bycatch to less than one percent of the population per year by 2010, fishers ceased cooperation. Since 2008, electronic monitoring (Archipelago Marine Research Ltd.) will be tested as an alternative method on larger fishing vessels. The seal-fishery conflict in Swedish waters was illustrated by showing videos on seals feeding from herring nets and within fish traps/pontoon traps for Salmonidae. The importance of good communication between fishers and scientists was addressed.
Iwona Kuklik (Hel Marine Station) gave a presentation on “Bycatch of marine mammals in Polish waters of the Baltic Sea”.

Data on harbour porpoises and seals bycatch and sightings collected in Hel Marine Station of University of Gdańsk was presented. Collection of bycatch was based on voluntary reporting by fishers but after the ban of drift nets was introduced in the Baltic fishery (EU Regulation 812/2004) they stopped reporting any bycatch and no more data have been collected since 2005.

Among 282 reports of seals occurrence collected in years 1990-2004 21% have been bycaught, 31% stranded and 48% observed. The carcasses of stranded animals were decomposed and no analysis has been done to determine the cause of death. The majority of bycatch (80%) occurs in the coastal set net fishery in April and May shortly after pupping season in the Baltic.

Population of harbour porpoise in the Baltic is severely depleted. In 1920 bycatch of harbour porpoises in Polish fishery was reported as an average of 60 animals annually. In comparison the average of reported animals was 5 animals in 1990. Polish database on harbour porpoises includes 105 reports of bycatch, strandings and sightings collected in years 1986-2006. The majority have been bycaught (68%), while only 10% of porpoises have been sighted. Bycatch of harbour porpoises takes place within all Polish waters with the majority in the Puck Bay and in the coastal set net fishery for salmonides (so called semi-drift nets) and cod (bottom set gill-nets) (40% each type of gear). Most of the reported bycaught harbour porpoises were juvenile (80% less than 2 years). To reduce the bycatch of harbour porpoises a three-years project is being implemented in the Puck Bay area with the independent temporary use of pingers and porpoises acoustic detectors.

Stefan Garthe (FTZ) gave a presentation on the results of the project “Conflict analysis of fisheries with static gear and seabird distribution in the German Baltic Sea”.

The talk consisted of four main parts.

(1) Seabird distribution in the German Baltic Sea was studied from ships and planes. Distribution maps were shown for five seabird species, as well as aggregated maps for all fish-eating species and all bivalve-eating species. The maps clearly showed the high importance of the SPA Pomeranian Bay and a few other SPAs in the 12-nm zone.

(2) Fishing activity was assessed from two different sources. First, recording of set nets during bird surveys from boats were used. These set nets could be identified by their flags. Second, VMS data for boats larger than 15 m from all countries in 2006 were supplied by H. Fock, von Thünen Institute, Hamburg. Data were filtered to derive ‘active fishing’ every 2 hours. Interestingly, set net flag distribution hardly matched with VMS data distribution. The main reason for this discrepancy is the fact that most set net flags were from rather small boats that are not yet monitored by VMS. Anyhow, there is evidence for set net fisheries in the SPA Pomeranian Bay, mainly on the Adlerground, but also in the Odra Bank area.

(3) In a next step, conflict maps were developed by overlaying bird distribution and fisheries distribution data. Fishing intensity was ranked high, low and none, based on abundances of set net flags and number of VMS locations. Bird distribution was presented by five abundance categories, ranging from no birds to high abundance. In the SPA Pomeranian Bay, due to high abundance of birds (especially in the Adlerground area in winter and in the Odra Bank area during all seasons), observed set net fisheries led to conflicts with conservation objectives.
(4) Current numbers of seabirds killed from set net fisheries existing from fisheries off Usedom island (data by courtesy of B. Schirmeister) were correlated with the average number of birds occurring in the area used by Usedom fishers.

**Helena Herr (FTZ)** presented the methods and first results of a project to study the impact of fisheries on marine mammals in the North Sea and the Baltic Sea.

**Baltic Sea**

Bycatch of Harbour porpoises (*Phocoena phocoena*) in the Baltic Sea is of great concern. As porpoise abundance is low, any unnatural mortality must be considered as a strong impact on the population. Moreover, apart from fisheries bycatch porpoises of the Baltic Sea face a variety of other anthropogenic impacts which make them especially vulnerable. At least two separate Harbour porpoise (sub)populations are distinguished in Baltic waters, of which the Baltic Proper population, occurring east of the Darss and Limhamn ridge, has been severely reduced and is estimated at less than 600 remaining animals.

Set nets are known as the major source for anthropogenic mortality of Harbour porpoises, and feature by far the highest bycatch rates among fishing gear types. In the Baltic Sea, set net fisheries account for a major part of the total fishing activity. Bycatch of porpoises in set nets along the German coast occurs regularly. However, netmarks and mutilations found on stranded carcasses indicate that only a fraction of all actual bycaught animals is reported. Bycatch reports are omitted and bycatch is actively hidden by opening body cavities and sinking carcasses with the help of rocks. Hence, true bycatch numbers remain unknown, and most probably bycatch is underestimated.

Assessing the impact of set net fisheries on porpoises in the Baltic Sea is especially difficult. More than 70% of set net fishing is carried out by small vessels of the part time fisheries. These vessels (<12m) are not VMS equipped and hence neither movement nor effort are monitored. To approximate the temporal and spatial effort of set net fisheries in the German Baltic, set net flag sightings recorded during aerial surveys following line transect methodology, were used to calculate flag density (flags/km) as a proxy for set net density.

As an approach to determine conflict potential, local set net and porpoise densities were calculated for cells of a grid scheme. For each cell, both densities were multiplied with each other, and the results were treated as an index for conflict potential.

Results showed that set netting is carried out year round, with highest effort in winter and spring. Porpoises occur in the Baltic all-season. In winter, highest densities are found in the Western Baltic. From here porpoises move into the Mecklenburg Bight during spring to late summer, where high densities can be found until September. In the eastern part of the German Baltic, porpoises are thought to belong to the small Baltic Proper population. Densities are generally low, but sometimes peak in spring and summer.

Conflict in winter (Nov-Feb) was mainly predicted for the Kiel Bight, as, elsewhere, porpoise densities in winter are low. In spring (Mar-Jun), potential conflict extended largely into the area around Fehmarn, including the Natura 2000 site “Fehmarnbelt”. Similarly, conflict was also predicted for the Mecklenburg and Pomeranian Bight, including all three of the other Natura 2000 sites. In summer/autumn (Jul-Oct), conflict potential remained strong around Fehmarn and along the western Mecklenburg coast, as well as in the Kiel and Pomeranian Bight.
Since 1987, the FTZ has been collecting carcasses found on the shores of Schleswig-Holstein and partly also of Mecklenburg Western Pomerania, where since 2000, the German Oceanographic Museum is responsible. Generally, the geographic distribution of stranding numbers mirrors the population distribution, with highest numbers found in the Western Baltic and lowest numbers in the east. Strandings on Fehmarn are especially numerous compared to the relatively short coastline. Strandings peak around August and September, when porpoises in the Baltic give birth. Around 30% of all collected animals are classified as adults. Carcasses collected by the FTZ are judged as bycatch only from direct reports and as suspected bycatch due to mutilations (cut off fluke, fins, flippers or cut open abdomen) and net marks indicating injury before death (thus excluding carcasses that might have drifted into nets). Nevertheless, as states of preservation of carcasses often do not allow the judgement of bycatch, it remains unclear how many bycatches remain undetected among the carcasses found. Of all carcasses in good to moderate states of preservation collected between 2002 and 2007 (20% of the total number) 40% were reported bycatches and 9% were suspected bycatch.

Reports of direct bycatch have decreased over the years, while suspected bycatch numbers have increased, indicating less willingness of fishers to report bycatches. Since 2002 stranding numbers have remarkably increased. From averagely 15 carcasses found per year on the Baltic Sea coast of Schleswig Holstein until 2001, strandings rose to around 50 per year until 2005 and have reached more than 100 in 2007, among which 19 were suspected and 3 confirmed bycatches. Mecklenburg at the same time reported 57 carcasses in 2007, of which 5 were classified as bycatch. Although search effort might have slightly increased over the years, it could not possibly account for the high increase in animals found. Moreover, a 150 km strip of coastline in Schleswig-Holstein with constant effort since 1987 exhibited the same trend as the overall trend. Increasing population numbers could be another explanation, but lacks proof. Abundance estimates from 2007 are not available and earlier population estimates neither exhibited a population trend nor showed a significant change in densities.

**Conclusion**

An independent observer scheme would provide the only means to obtain reasonable bycatch estimates. Until then, rising stranding numbers must be of considerable concern, as the amount of bycatch is unknown. If actually 40% of all animals collected were bycaught, this would mean more than 100 bycatch mortalities per year. With recent abundance estimates ranging between 1300 and 2900, and a maximum of 4610 porpoises in the whole German Baltic Sea (cf. MINOS plus), this rate would exceed any sustainable bycatch limit by far.

In the Baltic Proper, already a single bycatch must be considered as unsustainable for the population.

In order to analyse any conflict potential with set net fisheries, fishing effort by the part time fisheries (the small boats) must be assessed. A fisheries monitoring scheme in a certain area (e.g. a Natura 2000 site) could be a useful approach to estimate this effort.

Porpoise numbers in the Baltic Sea must be monitored carefully to be able to detect and judge population trends.
North Sea

An investigation of porpoise and fisheries distribution in the German North Sea (Herr et al. submitted) showed seasonal associations and high overlap between set net fisheries and porpoises in summer (May-July), partly in the area of Sylt Outer Reef, proposed as a Natura 2000 site based on Harbour porpoise occurrence. So far, no proof for bycatch in that area is given. However, as Sylt Outer Reef has been identified as an especially important feeding and breeding ground for Harbour porpoises and features one of the highest porpoise densities in European waters during late spring and summer, set net fisheries are associated with especially high bycatch risk in that area and should be cause for concern.

II Key Conclusions of the Workshop

The overall objective of the workshop was the identification of conflicts between nature conservation objectives for protected species and current fishing activities in the German EEZ of the North Sea and Baltic Sea, focusing on effects and measures within SCIs and SPAs. In the case of existing conflicts, management measures have been proposed to reach or maintain a favourable conservation status of species protected under the Birds- and Habitats Directives. If necessary, to achieve those conservation objectives, a broader spatial perspective should be taken.

All proposed management measures will be subsequently discussed with relevant stakeholders, at the final WKFMMPA workshop in June 2008 in Copenhagen.

Part I: Seabirds

Chair: Jim Reid, JNCC

a. Based on the results of the preliminary conflict analyses (ICES, 2007a), examination and discussion of the Vilm meeting were focused on the Baltic Sea and especially on the SPA “Pomeranian Bay,” where bycatch data are available (no bycatch data of seabirds in static gear in the North Sea are available. However, the meeting recognised that VMS data show a substantial use of static gear in the German North Sea).

b. Analyses and discussion focused on mortality caused by bycatch of static gear, mainly set nets. No data are available on the effects of long-lines in the Baltic Sea. However, it is recognised that substantial impacts of long-line fisheries to seabirds are described in other seas (ICES, 2008c). Additional potential anthropogenic effects such as food depletion (Camphuysen et al., 2005), harassment of moulting seabirds, and fisheries discards exist, but were not examined at the meeting (e.g. ICES, 2000; Garthe et al., 1996; Garthe & Scherp, 2003; Furness et al., 2007). Studies indicate, for example, that over 50% of the offal discarded in the Baltic Marine Area will be consumed by seabirds (ICES, 2000).

c. Mobile fishing gears used in the Baltic Sea do not appear to lead to an increased mortality of seabirds.

d. Several publications indicate that in the Baltic Sea, substantial numbers of seabirds die regularly in static gear (Kirchhoff, 1982; Schirmeister 2003; Dagys & Zydelis 2002). Mean bycatch rates range between 0.35 and 1.8 birds per thousand net-metre days.
e. Existing mortality rate due to bycatch is considered a threat for all resting, wintering and moulting bird species that are diving for food. The species of most concern are those with low reproductive rates, those with more than 1% of their biogeographical population in an SPA, and those with small or declining populations. In the SPA “Pomeranian Bay”, these species are Black-throated Diver (Gavia arctica), Red-throated Diver (Gavia stellata) Slavonian Grebe (Podiceps auritus), Red-necked Grebe (Podiceps grisegena), Long-tailed Duck (Clangula hyemalis), Velvet Scoter (Melanitta fusca), Common Scoter (Melanitta nigra), Black Guillemot (Cepphus grylle), Razorbill (Alca torda) and Common Guillemot (Uria aalge).

f. Very limited bycatch data of seabirds in the SPA “Pomeranian Bay” exist. Preliminary results of an ongoing project show bycatch rates of 0.2 – 1.2 birds per thousand net-metre days (Bellebaum unpublished), which were considered to be low. The most likely explanation is a shift in winter distribution because the last two winters (2006 & 2007) were mild, with substantial ice-free areas further north in the Baltic Sea (e.g. Gulf of Riga, Matsalu Bay) where seabirds could have over-wintered.

g. Numbers of several SPA qualifying species (e.g. Long-tailed Duck and Black Guillemot) have decreased in the “Pomeranian Bay”, although reasons are not known.

h. No adequate data on the effort of set net and long-line fisheries exist either for the Pomeranian Bay SPA or any other region in the southern Baltic Sea, though some unpublished and incomplete datasets have been identified in the context of this project. Thus, assessing overall fisheries effort remains a research priority.

i. At least for the German Baltic Sea, sufficient data on seabird distributions and abundance have been collected over a period of more than five years. Insufficient data are currently available for turnover rates of all resting, migrating and moulting birds in the Pomeranian Bay.

j. The calculation of the impact of bycatch to wintering, resting, and moulting seabirds in the SPA is limited due to missing data on fisheries effort (static gear, parameters, etc.) and observed bycatch rates. Therefore, scientifically sound extrapolations of bycatch rates are not possible at this time.

k. Based on bird distribution and abundance on the one hand, and observed flags of static gear as a proxy for the missing fisheries data on the other hand, a preliminary map of conflicts by the research group of Stefan Garthe was presented and discussed. The methodological approach to identify conflicts was widely accepted at the meeting. However, the following improvements of the conflict map were suggested.

- An index for the risk (fishing intensity x density of birds) should be calculated as a basis for assessing conflict.
- Vulnerability of birds should vary based on the percentage of the biogeographic population using the SPA, with a higher ranking for species in Annex I or currently threatened.
- Temporal resolution should be two months during the season of high bird densities
• Results of the specification of the flag model should be presented on a 2' x 3' square grid for flags, seabird abundance and VMS (positive fishery days). Grid squares without fishing activities should be included in the final presentation.

• The meting takes into account that actual days with fishing activities (data since 2000) were correlated with the observed flags, recognising that observed flags are underestimated, and will be further underestimated with increasing distance to the coastline, whereas VMS days could overestimate fishery activities, however, extent of the over or underestimation is unknown.

• Improvements will be presented at the Copenhagen workshop

1. In the preliminary analysis, three different levels of conflict were identified. Although preliminary, results show spatio-temporal variations in conflicts within the SPA.

m. As a result, the meeting agreed that bycatch causes a major conflict with the obligations of the Birds Directive and the regulations of SPA “Pomeranian Bay” as Article 5 BD does not allow any deliberate killing or capture of wild birds.

**Possible solutions to prevent bycatch**

n. Reduction to zero of bycatch is possible through the use of spatial and temporal closures for static gear within the SPA “Pomeranian Bay”. Results will be presented in tables and figures at the Copenhagen Workshop by Stefan Garthe, based on the distribution of birds from 2000-06.

o. A reduction of bycatch at least close to zero could also be achieved by measures such as alternative fishing gear. Such alternative gear could be fish traps. Preliminary results from a pilot study in German waters (SPA Pomeranian Bay) show that bycatch rates of seabirds could be reduced to zero by using fish traps. However, preliminary data indicate there may be trade-offs, namely a reduced catch rate of target species. Additionally, Swedish studies show interaction of fish traps with marine mammals with and bycatch of seals. Further improvements of alternative gear types have the potential to reduce or to exclude these deficits.

p. In case bycatch is not reduced sufficiently by mitigation measures, regulation of total fishing effort by static gear in order to limit bycatch to less than 1% of the numbers of every bird species in the SPA might be an alternative. For this approach, it is necessary that calculation of the background population of each species is based on the precautionary principle. The upper limit of fishing effort (in 1000 net-metres per day) could be calculated based on existing published bycatch rates. Such an effort limit may differ seasonally and spatially, and according to gear type. For this measure, monitoring the effectiveness requires mandatory reporting of fishing effort (net length and soak time) by every vessel fishing in the SPA, and on-board observers recording bycatch on selected vessels. Results of this monitoring should be regularly reviewed which allows revisions of the effort limits.

q. The meeting welcomed an initiative of the European Commission to publish a plan of action to protect seabirds in 2009. The EC asked ICES to review existing criteria to assess the need for national plans of action for seabirds and
to recommend one set of criteria for use by the European Commission. The ICES Working Group on Seabird Ecology (WGSE 2008) compiled a list of seabird species known or likely to be caught in long-line and other fisheries in EU waters, and reviewed information on their populations and bycatch. Although there are few data, WGSE noted that there is a seabird bycatch problem in the EU, and recommended that a Community Plan of Action (EC-POA) to reduce this bycatch be compiled and implemented.

The EC-POA should be modelled on the UN Food and Agriculture Organisation International POA-Seabirds. Although this Plan of Action pertains to long-line fisheries, WGSE and the EC recognise that any European Community plan should target all fishing gears where bycatch exists, including gillnets. It should:

- establish an independent observer programme for fishing vessels;
- complement the observer scheme with interviews of fishers;
- implement and test mitigation measures; and
- assess the actual fishing effort of both EU and non-EU fleet fishing in EU waters.

An extra meeting of WGSE has been proposed for autumn 2008 to more fully assess the extent of seabird bycatch in all fishing gears. Thereafter, there should be a meeting in March/April 2009 to draft the EC-POA. Key participants in the EMPAS workshop will be invited to attend one or both of these meetings.

There is a need to link EU-wide measures (such as POA) with SPA-specific management.

Part II: Marine Mammals

Chair: Peter Evans, Sea Watch Foundation

1. Preamble

In German waters, there are only three marine mammal species regularly occurring: Harbour porpoises (*Phocoena phocoena*), Grey seals (*Halichoerus grypus*) and Harbour seals (*Phoca vitulina*). Of these, only the Harbour porpoise is bycaught to any significant extent, and for this reason, the discussion focuses on that species. Other fisheries conflicts like prey depletion may, however, occur throughout the region (Herr *et al.* unpublished) but knowledge of detailed relationships as yet are generally missing. The Harbour porpoise is recognised in Annex II and IV of the EU Habitats Directive as of particular conservation importance for which specific management measures are required, including the establishment of Marine Protected Areas (Natura 2000). This requires management measures for the protection of the population throughout its range even if this goes beyond the boundaries of established MPAs.

2. Vulnerability of Harbour porpoises to specific fisheries

A very large literature and unpublished data show that Harbour porpoises are vulnerable to bycatch, particularly from set nets. It is widely accepted that bycatch is one of the most important anthropogenic mortality factors for Harbour

Additionally, in the German Baltic Sea, more than 40% of all fresh dead porpoises collected from 2002 to 2007 were either confirmed or suspected bycaught individuals (33 out of 77 individuals) (Herr, FTZ; personal communication 2008). However, total mortality numbers are missing since reporting of bycaught harbour porpoises is not obligatory.

3. Conflicts

a. Three distinct areas of Harbour porpoise distribution were distinguished in German waters: 1) North Sea; 2) Western Baltic (connected with the Belt Sea); and 3) Baltic Proper because of significant diminished population exchange between these stocks (Tiedemann et al. unpublished, Huggenberger et al., 2002; Börjesson and Arrhenius, 1997).

b. For the German North Sea, there is an identified hotspot (Sylt Outer Reef) for porpoises, with high year-round densities particularly in spring and summer, and high calf to adult ratios. Although there is relatively low gill-net fishing effort within this area, there is gill-net fishing on the outer margins, and so there is a potential threat of bycatch. Furthermore, the local population is part of a wider North Sea population known to experience bycatch, which in the mid 1990s was estimated to be unsustainable (Vinther, 1999; Northridge & Hammond, 1999; Hammond et al., 2002). Since the total estimate for the North Sea population between surveys in July 1994 and July 2005 (SCANS 1 & 2) shows no significant change, the potential impact of fisheries here remains unclear.

c. For the German Western Baltic Sea, there is a west-east gradient in porpoise density, with highest densities in the west. However, even in the western part of the German Baltic Sea, average densities are ten times lower than in the German North Sea. There is no evidence for a clear trend in abundance (due to high variance in estimates) within German waters, but further north in Danish Belt Seas, there has been an approximate halving of the population between 1994 and 2005 (Teilmann et al., 2008). Along the German Western Baltic coast, there has been a sharp increase in strandings since 2002. However, the cause of this increase is unknown. Although the magnitude of bycatch is not exactly known, the existing data strongly suggest a high contribution of bycatch to the total mortality, and hence gives reason for concern. Since there has been an apparent decline in Harbour porpoises in the Danish Belt Seas, and this population is believed to be the same as the one in the German Western Baltic, this gives cause for concern.

d. For the German Baltic Proper east of the Kadet Trench, the Harbour porpoise population is known to be at a critical level, with densities generally below 0.06/km². T-POD data prove the year-round presence of the species in the Pomeranian Bay including in the Natura 2000 sites (Meding et al., unpublished; Verfuss et al., 2007). Clearly Favourable Conservation Status cannot be reached with any bycatch at all. There is intense gill-net fishing in the region (involving particularly vessels of <15m length), and Harbour porpoise bycatch is documented for the Pomeranian Bay (Herr, unpublished data; Database DMM). Management action is therefore urgently needed.
4. Effective fisheries regulations

a. The meeting agreed that recognising the obligations of Article 12 of the Habitats Directive and in order to reach a favourable conservation status, it is necessary to ‘ensure that incidental capture and killing does not have a significant negative impact’ on Harbour porpoises.

The meeting agreed that the use of current types of set net fisheries inside and outside Natura 2000 sites is contrary to the objectives of Article 12, and to attaining favourable conservation status for Harbour porpoises. Additionally, since the EU Directive requires conservation measures of this species over its entire area of distribution, future fisheries management has to consider also areas outside Natura 2000 sites.

b. The meeting also support as a general reference value the reduction of bycatch of Harbour porpoises in the North Sea and the Baltic Sea to less than 1% of the best available abundance estimate as defined by ASCOBANS (Resolution 3, MOP 3, Bristol 2003; Resolution 5, MOP 5, The Netherlands 2006).

c. Management options to achieve this aim are in order of effectiveness:

- Areas closed to set net fisheries
- Change of fishing gear type away from set nets, e.g. fish traps
- Mitigation measures for set nets, e.g. pingers, reducing the height of the nets, barium sulphate, etc.8

d. In the Central Baltic Proper, the genetically distinct population has very low abundance (<600 individuals in total; it is estimated that about 60 individuals of the population are regularly present in the German part of the Baltic Proper (ASCOBANS, 2002; Scheidat et al., 2004)), and is considered threatened and endangered for extinction. The workshop recognised the ASCOBANS recommendation that bycatch of this population has to be reduced to zero (ASCOBANS, 2002). For this stock, the specific management recommendations for the German Central Baltic Proper are:

- Urgent phasing out of the use of set nets9 [by 2010];
- As an interim emergency measure, the mandatory use of pingers on all set nets on all vessel sizes. This measure has to be accompanied by an effective observer scheme to control its effectiveness.

e. For the German Western Baltic Sea, preliminary results from the EMPAS analysis for this region indicate areas of potential conflict with set net fisheries, particularly in the Fehmarn Belt. For this stock, the specific management recommendations are:

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8 It should be noted that while mitigation measures can reduce bycatch, they do not reduce it to zero.

9 It was noted that a phasing out of set nets could be accomplished through gear replacement. The importance of socioeconomic considerations was noted, though these were outside the terms of reference of this workshop. However, it was noted that meeting favourable conservation status of harbour porpoise legally cannot hinge on the acceptance of other gear types.
• Phasing out of the use of set nets\(^1\) by 2012;
• As an interim general measure, in spring to summer, the Fehmarn Belt area should be closed for set net fisheries during the abundance peak of Harbour porpoises;
• As an interim emergency measure, pingers on all set nets and all vessel sizes should be mandatory. This measure has to be accompanied by an effective observer scheme to monitor and control its effectiveness.

f. For the **German North Sea**, specific management recommendations are:

• Immediate closure of set nets in the Sylt Outer Reef SCI as it is a breeding site;
• Outside the Sylt Outer Reef SCI, use of pingers on all set nets of all vessel sizes, and for all areas should be mandatory. This measure has to be accompanied by an effective observer scheme to monitor and control its effectiveness.

g. Alongside this measure should be a monitoring programme of both Harbour porpoise numbers and numbers of animals bycaught. Particular attention should be paid to monitoring bycatch from vessels less than 15m length. Currently this is not a requirement of EC Regulation 812/2004. Methods to achieve this such as electronic surveillance and observer schemes (where one additional observer is feasible) should be investigated. The monitoring of small vessel activity should also be considered.

h. The meeting agreed in principal that within Protected Areas where these coincide with porpoise hotspots, as in the Sylt Outer Reef MPA in the North Sea, gill-net fisheries should be excluded.
Annex 5: Fisheries-benthos Interactions in the German EEZ in the North Sea: Preliminary Results

ICES WKFMMPA Working Document 5/2008

Fisheries-benthos Interactions in the German EEZ in the North Sea: Preliminary Results

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-- Referring to WKFMMPA 2008 agenda item 5.1.2 --

Abstract
For the years 2005-2007, VMS effort and sessile epifaunal benthos biomass were analysed in two survey areas in the German EEZ of the North Sea. Fishing effort was calculated differentially for preceding time periods of 20 to 70 days length. On log scale, a negative linear relationship appeared between sessile epifaunal biomass and fishing effort. Merging all sites, this relationship was strongest when fishing effort was calculated for a period of 30 days.

Introduction
The German Small-Scale Bottom Trawl Survey (GSBTS) comprises extensive benthos and fisheries sampling in 8 survey areas (‘boxes’) in the North Sea (Ehrich et al., 2007). Boxes are app. 10*10nm. Two boxes are situated in the German EEZ, i.e. box A and box N (Figure 1). Further, box N is situated inside the designated marine protected area (MPA) ‘Sylt outer reef’. Benthos dynamics in box A comprise strong seasonal movements of vagile epifauna (Hinz et al., 2004). Hence, only sessile epifauna was considered for this analysis.

For the WKFMMPA workshop in 2008, first results of the analysis are presented.

Methods
VMS data were analysed according to the protocol set up in WKFMMPA (Fock, 2008). For each box, effort was calculated for six 3*3 nm squares that were selected located fully inside the box. Effort was calculated for time periods of 20 to 70 days length prior to first sampling of benthos. Benthos sampling was undertaken in quarter 1 (box A, N) and quarter 3 (box A). For box N, no sampling was carried in 2005.

Benthos fauna was sampled with 2m-beam trawls and standardised to a swept area of 500 m². Efficacy measures for vagile epifauna indicate, that fauna is considerably undersampled, depending on sediment type (Reiss et al., 2006).

Linear analysis was applied to log transformed biomass data.
Results and discussion

In box A, effort was dominated by large beam trawlers, whereas in box N small beam trawlers were dominating. Effort is preliminarily displayed as total effort, including all fisheries. Considering different gear sizes for small and large beam trawls does not affect the analysis very much. The linear structure is mainly determined by the effort gradient observed in box A, and the 2 data points in box N represent the lower end of the gradient regardless applying conversion factors to account for different gear sizes.

Biomass was on average higher for box N, located inside the designated MPA, than for box A. Box A represents an area of extensive fishing. Dominating benthos was Ascidiacea, Anthozoa and Bryozoa in Box N, in Box A Ascidiacea and Anthozoa.

The linear relationship appeared when benthos data were log-transformed (Figure 2). Similarly, Hinz et al. (Hinz et al., 2008) found a log relationship between fishing effort and meiofauna abundance.

The linear relationship was strongest for a time period of 30 days of fishing effort before benthos sampling (Table 1). It must be noted that, at shorter time periods (20 days) co-factors may influence the analysis, e.g. season (winter and summer).

References


Table 1. Relationship between explained variance and time period for which fishing effort was calculated.

<table>
<thead>
<tr>
<th>$r^2$</th>
<th>time period prior to benthos sampling</th>
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<tr>
<td>0.66</td>
<td>20 days</td>
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<tr>
<td>0.92</td>
<td>30 days</td>
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<tr>
<td>0.85</td>
<td>40 days</td>
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<tr>
<td>0.84</td>
<td>50 days</td>
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<tr>
<td>0.84</td>
<td>60 days</td>
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<tr>
<td>0.77</td>
<td>70 days</td>
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</tbody>
</table>
Figure 1. Location of boxes A and N in the German EEZ in the North Sea.

Figure 2. Relationship between hours fished and epifaunal benthos biomass in the boxes A and N (N indicated) with hours fished calculated for 30 days prior to benthos sampling.