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1 Executive summary

The Study Group for Bycatch of Protected Species met at the ICES building in Copenhagen from 19–22 January 2009. Simon Northridge (UK) chaired the meeting, which was attended by 21 participants from 11 countries.

The Study Group examines the monitoring, assessment and mitigation of the incidental capture of protected species. It also coordinates activities conducted under EU Council Regulation 812/2004 on cetacean bycatch, including observer programmes and bycatch mitigation trials, and it reviews annual reports from member states that address the obligations of Regulation 812/2004 and collates data provided in these and other reports with the aim of providing an overview of bycatch levels of protected species impacted in and around the ICES Area.

The meeting addressed the terms of reference (Annex 2) in turn and much of the work was completed in subgroups with regular plenary updates and review of the draft report sections in plenary.

The SG collated data from Member States' Annual Reports on 812/2004 for the year 2007, but noted again that it had not received reports from almost half of the relevant member states, that some had been only in their native languages, and that only three had followed a standard format for reporting. This made a thorough review impossible, and made compiling the data difficult. The Study Group also made suggestions for improvements should the Regulation be revised, and again recommended that Member States supply reports in a standardized format and with an English translation or summary.

The Study Group also reviewed pilot projects and scientific studies conducted under Regulation 812/2004. Many of the required pilot projects had not been addressed. Most of the scientific studies addressed a variety of issues about the use of pingers to minimize cetacean bycatch. The Study Group also considered the proposed plans and recent studies conducted to address bycatch mitigation of protected species in the wider Atlantic region.

The Study Group considered ways in which wider collaboration with other interested parties might be promoted in the ICES Area and adjacent waters, and endorsed a proposal from NAMMCO's Scientific Committee to hold a joint workshop on bycatch monitoring and assessment.

The SG endorsed an online electronic database coordinated by the New England Aquarium in Boston as a suitable medium and clearing house for reports of mitigation trials that have been undertaken, whether successful or not, as a resource for the wider research community.

In considering data that have been collected by discard sampling programmes in EU member states under the Data Collection Regulations, the SG agreed that these datasets hold valuable information on the occasional bycatch of protected species including mammals, turtles and birds. The SG recommended better coordination between ICES expert groups to ensure that these data were made best use of in assessing bycatch of protected species and in planning future monitoring programmes for protected species bycatch.

The SG also designed a preliminary database to hold bycatch and fishing effort data from nations that conduct bycatch monitoring programmes, with the aim of being able to provide synoptic bycatch assessments at an international level and across fishing fleets rather than solely than at a national level. Populating the database with

data from recent bycatch monitoring schemes will be carried out intersessionally. The SG recommended that the proposed data schema should be considered by the EC in the adoption of any standard EU reporting format for reporting under the 812/2004 regulation.

The Study Group reviewed recent research directed toward understanding the mechanisms and potential solutions for protected species bycatch in gillnets. Much of the discussion was centred on small cetacean bycatch in gillnets, but the group agreed that there was much that is still unknown about the factors that increase bycatch probability, and that this ignorance impedes the development of novel mitigation measures.

The Study Group proposed a revised terms of reference for 2010 and proposed meeting in Copenhagen in early February 2010.

2 Opening of the meeting

The Study Group for Bycatch of Protected Species met in Copenhagen from 19-22 January 2009. Delegates were welcomed to ICES by Helle Gjeding Jørgensen. A complete list of participants is given at Annex 1 of this report. The Terms of Reference are given at Annex 2.

3 Adoption of the agenda

The terms of reference were adopted as an agenda, noting the late addition of two further terms of reference in response to questions from the European Commission. The terms of reference are displayed in Annex 2. Several of the Terms of Reference relate directly to the standing request to review member states reports on the European Council regulation 812/2004 on cetacean bycatch. The Study Group also agreed to try to spend much of the last day on a more general discussion of the mechanisms and potential solutions to bycatch of protected species in gillnets (ToR J).

4 ToR A: Review of Annual Reports on Regulation 812/2004 and coordination of bycatch monitoring programmes

4.1 National reports

The group reviewed national reports on the EU Regulation 812/2004 for the calendar year of 2007. Eleven reports were available to review. Nine countries had not sent a report to the Commission. Reports are not required from the remaining seven (land-locked or Black Sea) countries. The Swedish report had been completed but had not been received by the Commission and was not available for review, though some information from that report was available.

Adherence to the proposed standardized reporting format (ICES 2008) for 812 reports was poor (see Table 1). One report was written according to the format as agreed by SGBYC 2008 and as subsequently amended by the Advice Drafting Group and ACOM. Two reports had been written according to the agreed format of the last years' meeting of SGBYC. In nine remaining reports a variety of formats had been used. Eight reports were in English. Eight countries reported on the use of pingers (see Table 7).

The general lack of a standardized format was because of the fact that the Commission has yet to consult Member States on the process and is currently adapting the format proposed by ICES in 2008 to Commission standards.

The variety of reporting formats for the 2007 reports meant that, as was the case at the 2008 SGBYC meeting, it was not possible to make a detailed assessment of the reports and their results. As was the case in 2008, the national reports were not received from the Commission until a few days before the start of the meeting, and not all were available in English. Tables 3 to 7 present the collated data from the national reports as best the SG could do in the time available. In all the mandatory monitoring programmes together, based on the available information on days at sea observed and days at sea by national fleets, 2225 observation days have been executed compared with at least 77 127 fleet days. Only one country reported any cetacean bycatches among these mandatory observation days: 19 incidents in which 31 animals were involved, but the tables provided under this ToR do not evaluate all of the observations made under pilot projects and scientific studies on vessels under 15 m. Further results are also demonstrated under ToR F, in which 47 cetaceans and two seals were recorded in the pilot projects (Table 13). The lack of a consistent reporting format meant that it was impossible for the SG to reconcile pilot projects and scientific studies with the obligations under 812/2004.

The SG noted again that in most cases it has proven impossible to determine sampling levels that will be required to obtain a bycatch estimate with a target CV of 0.3, because bycatch events are so rare and so few have been observed. As a consequence most member states have, understandably, continued with their monitoring directed toward the pilot monitoring scheme targets laid down in Annex III of the 812/2004 Regulation (5% or 10% of fishing effort). The SG **recommended** that any revision of the Regulation should also include a review of the targets set for monitoring levels.

Once again, the Study Group **strongly recommends** that national reports on data collected under Regulation 812/2004 are submitted to the Commission in a standard format as proposed by ICES (see also 4.2 and 7 (ToR D) below for further details). Where individual member states would prefer to keep using their own national formats, the Study Group recommends that an English summary is provided, along

with tables in the recommended format and with the correct numbering as an Annex to the national report.

4.2 Reporting format

The changes to the SGBYC's 2008 proposed reporting format that were applied by the Advice Drafting Group/ACOM in 2008 were discussed by the SG. The group supported the inclusion of data on the use of pingers in the fleet segments which are reported on. The proposed format by the SGBYC 2008 meeting had been merely focused on the monitoring of bycatches whereas the implementation of the pingers regulations should be reported on as well.

The inclusion of columns on "target species" in Table 1 and Table 4 of the ACOM Advice is not helpful to determine whether the member states have achieved their monitoring targets as specified by Regulation 812, which makes no mention of target species. The columns may give some useful information for the reader of the report for some purposes, but it should be noted that there is no definition of what a "target species" is, and the point of the proposed Table 1 was to describe each fishery segment so that descriptors such as target species or area etc should not need to be repeated in other tables.

The reporting format described under ACOM advice also includes additional instructions to include detailed descriptions of the gear types as well as details of static gears types and mesh sizes. This is not in accordance with the meaning of Table 1 as proposed by SGBYC which was to reflect the fisheries that need to be reported on under 812/2004 and to label them with a code for use in the subsequent tables. Also it is to be expected that a more extensive description of gear will lead to confusion, because there is a lack of comprehensive categorization of different types of gear: there is no international consensus about what type of gear is meant by "trammelnets", "set gillnets", "tanglenets," etc.

Concerning the "number of vessels" column, the member states should make a note of how many pair trawlers are involved in the text, and whether this means vessels or pair teams.

The SG **recommended** the inclusion of another column in the Tables 1 and 3 of the proposed reporting format labelled "pilot", in order to invite member states to report on pilot studies (under 15 m vessels; vessels using pingers) within the same reporting framework, and to allow such fisheries to be identified and to have a reference code for the rest of the report.

The SG **recommended** that SGBYC or another expert group should make clear which international description of fishing gear categories is most suitable for bycatch monitoring in future, and that should be provided as an annex in any revision of EU Regulation 812/2004.

The SG did not consider the replacement of the previously proposed single table on fishing and observer effort by the ACOM's proposed two tables (one for set-nets and one for towed gears) to be an improvement and the Group felt that the previous single table would have worked better.

5 ToR B: Review of other recent estimates of bycatch of relevant species in the ICES and EU areas

Relevant species for the EU region that are not included in national reports on Regulation 812/2004 include cetacean species from areas and countries not affected by Regulation 812 (e.g. neighbouring or non-EU states) or, within the EU, other protected species that require monitoring for incidental mortality under the Habitat Directive, such as birds and some sharks.

Given the migratory and trans-boundary nature of many protected species, the group decided to extend the term of reference from the EU region to the ICES area and the Mediterranean and Black Seas, considering that these areas were relevant to the work of the SG and the monitoring of bycatch in the EU region.

The SG therefore compiled recent additional bycatch data that were available from areas fished by EU member states and other areas of the wider Northeast and Northwest Atlantic Ocean under three general areas: Mediterranean Sea (Table 8), Northern Northeast Atlantic (Table 9), and Northwest Atlantic (Table 10). The data were extracted from a variety of sources (journal articles, published and unpublished reports) noted in the tables or in the list of references, and the tables were structured according to the available data. The data presented do not pretend to be exhaustive, but represent what was available to the group. Information is also provided for each area describing how bycatch reporting is conducted in the area concerned.

The Study Group considered bycatch estimates among four categories of protected species: marine mammals, birds, turtles and elasmobranchs, which are discussed below, in turn. Information on elasmobranch bycatch, which is rarely the subject of any dedicated research or monitoring, is also summarized from the report of WGEF in Table 11.

5.1 Marine mammals

For the Mediterranean and Black Sea region, a joint workshop held under the aegis of ACCOBAMS and GFCM in Rome in October 2008 summarized current knowledge of cetacean bycatch issue in Mediterranean, Black sea and adjacent Atlantic waters. Quantitative estimates of cetacean bycatch are generally lacking, yet bycatches are widely reported anecdotally or through more or less systematic strandings surveys or interviews with fishers. In many cases the frequency of such bycatch events still remains unclear. Monitoring programmes involving at sea observations of fishing activity were reported in Spain, France, Italy, Slovenia and the Ukraine. Such programmes have only recently been implemented and only a few preliminary estimates of total bycatch were available. In four cases out of five the catalyst for implementing these programmes has been Council Regulation (EC) 812/2004. Evidence from strandings reveals that cetacean bycatch occurs in several other countries including Albania, Algeria, Bulgaria, Montenegro, Romania, and Turkey. However, experts were aware that similar data exist for other countries where cetacean stranding networks are operating with different levels of effort and organization. These include, for example, Croatia, France, Greece, Israel, Italy, Spain and Tunisia. Direct contacts with fishers have also yielded observations and minimum estimates in several countries including Bulgaria, Romania, Turkey, Ukraine, Israel and Algeria. In the Black Sea the harbour porpoise was the most frequently recorded cetacean among incidentally caught animals; whereas in the Mediterranean Sea, common and striped dolphins, as well as some bottlenose dolphins were the most frequently reported. A summary of existing cetacean and other species bycatch data for the Mediterranean is given in Table 8.

For the northern Northeast Atlantic bycatch monitoring practice differs in the four countries as explained below. More complete information can be found in NAMMCO (2006-Report of the MC). A summary of available information is given in Table 9.

Faroe Islands: Fishery logbooks are mandatory for all vessels larger than 110 BRT; however the reporting of bycatch in these logbooks is encouraged but not required. The logbooks are not formatted for recording bycatch, and such records must be entered as supplementary comments. There is no logbook system in place for smaller boats. Bycatches of larger whales are usually reported directly to the Museum.

Greenland: Reporting of bycatch of large cetaceans to the Ministry of Fisheries and Hunting is mandatory. Because this ministry covers the financial expenses associated with the bycatch of large whales this type of bycatch is usually reported. It is obligatory for fishing vessels to deliver standardized logbooks to the Ministry of Fisheries and Hunting. The latest version of these logbooks includes an item for bycatch of marine mammals. However, reporting marine mammal bycatch is voluntary. In contrast, it is mandatory to report bycatch of commercially important species of fish. To date, the data on marine mammal bycatch from the fisheries logbooks has not been entered into any electronic database. Bycatches of seals and small whales by smaller vessels are probably recorded in the yearly hunt reports that hunters need to deliver to the Ministry of Fisheries and Hunting in order to renew their licences.

Iceland: Reporting of marine mammal bycatch in Icelandic fisheries is mandatory. All fishing vessels are obliged to report both catch and bycatch in logbooks. No observation scheme is carried out in order to evaluate the reliability of the system. The reporting is entirely based on the cooperation of the fishers and is therefore voluntary in practice, most likely resulting an inadequate monitoring of marine mammal bycatch in Icelandic fisheries. The procedure of reporting marine mammal bycatch via logbooks has been introduced specially by a letter and species identification guide sent to the gillnet fleet in 2002 and again with all new logbooks delivered to the fishers since.

Norway: Norwegian Fisheries include a large number of vessels and gear types. Further information on catch and effort can be found on http://www.fiskeridir.no/. **Offshore fisheries**: the gear types operated by the larger vessels (mostly purse-seine and demersal trawl) are regarded as having a relatively low risk for bycatches of marine mammals in Norwegian fisheries. Two sources of information are used to monitor bycatches of marine mammals in Norwegian shelf and offshore fisheries (in general vessels longer than 15 m total length): 1) on-board independent observers from the Directorate of Fisheries and 2) ten vessels contracted by IMR to report detailed statistics of effort, catches and bycatches. **Coastal and inshore fisheries**: different gillnets and fish traps used by the coastal fleet are anticipated to have a higher risk for entanglement of marine mammals. These assumptions and the practical problems associated with independent observers on board small vessels were considered when a system was developed in autumn of 2005 to initiate the monitoring of marine mammal bycatches in coastal waters. By the end of 2005 and continuing in 2006, 18 coastal gillnetters less that 15 meters total length were contracted by IMR, two vessels in each of nine domestic fishery statistics areas, to report detailed statistics on effort, catch and bycatches including incidental catches of seabirds and marine mammals. Estimates of total bycatch for 2005–2008 should become available later in 2009.

In the Northwestern Atlantic, to comply with the US Marine Mammal Protection Act (sec. 118; 60 FR 45086, August 30, 1995) all US fisheries are categorized into three groups. These categories are defined by the level of serious injury and mortality incurred by a marine mammal stock attributable to a particular fishery. The categories

are defined as: category I-annual mortality and serious injury of a stock in a fishery is greater than or equal to 50 per cent of the stocks potential biological removal level (PBR; Barlow *et al*., 1995); category II-annual mortality and serious injury of a stock in a given fishery is greater than 1% and less than 50% of the stocks PBR; and category III-annual mortality and serious injury of a stock in a given fishery is less than or equal to 1% of the stocks PBR (NMFS 2008a). As a result, all fisheries with known interactions in the US are monitored at some level by observer programmes. In the US Northwest Atlantic region the Northeast Fisheries Observer Programme (NEFOP; NMFS 2008b) currently monitors these fisheries in addition to fisheries that interact with endangered or threatened sea turtles protected by the Endangered Species Act (Table 10).

In Canada observations of harbour porpoise bycatch in the Bay of Fundy (BOF) sink gillnet fishery began in the early 1980s through casual observations and discussions with fishers. An observer programme was implemented during summer in 1993 and harbour porpoise bycatch was estimated for the BOF region through 2001 (Waring *et al*., 2007). There has been no observer programme during summer since 2002 in the Bay of Fundy region, though the fishery was active. Since the early 1990s marine mammal bycatch has been monitored in the Canadian herring weir fishery through cooperative efforts between commercial fishers and biologists. A large proportion of the harbour porpoise interactions in Canadian herring weir fisheries result in live releases because of these cooperative efforts (Waring *et al*., 2007). In the 1990s (1991–1996) there was a Canadian observer programme that placed observers on board all foreign vessels operating in Canadian waters and marine mammal bycatch was observed (Waring *et al*., 2007). The presence and/or extent of observer programmes to monitor marine mammal, sea turtle or seabird bycatch in Atlantic Canadian waters is unknown to the SG at this time.

US Northwest Atlantic bycatch estimates for cetaceans and pinnipeds in Table 9 are preliminary estimates currently being reviewed by the Atlantic Scientific Review Group (ASRG) and will subsequently be made available for public comment. The final published estimates will be available in late 2009 or early 2010. All estimates were reported for the most recent year available. For estimates from previous years refer to the SGBYC 2008 report (ICES 2008a) and list of references in Table 10.

5.2 Birds

Seabird bycatch and mortality has been recorded from all types of commercial fisheries, notably longline fisheries, set gillnets and driftnets. The issue has been addressed in some detail by the ICES WG on Seabird Ecology, especially pertaining to bycatch in longline fisheries, both in terms of bycatch data, issues and mitigation measures. Published documents providing data on seabird bycatch are collated in the report of the Working Group on Seabird Ecology (see ICES 2008b).

In the Faroes although there has been no formal investigation of seabird bycatch, it is not thought to be a major problem, except for fulmars (Olsen, pers. comm.). There is only a small set-net fishery and the nets are set so deep, that they catch very few birds. It has been estimated that the longline fishery takes between 5000 and 25 000 fulmars per year. The population of fulmars is estimated to 600 000 pairs, so the bycatch is not regarded as problematic. The fishers however do use streamer lines in an attempt to scare birds away from the line.

In Greenland, reporting of bycatch of eiderducks in lampsucker nets is mandatory and data can be accessed through the Greenlandic Ministry of Fisheries and Hunting,

In Iceland there is no reporting of seabird bycatch (Olafsdóttir, pers. comm.).

Bjørge (pers. comm.) informed the SG that Norway intended in 2009 to expand the monitoring programme for marine mammals to include birds, and it is likely that 2010 will be the first year of complete bird data.

Other seabird bycatch observation data are available in national discard sampling programmes and other monitoring schemes but have rarely been analysed. Additional records of seabird incidental mortality can be found in Table 14 (see also ToR G).

5.3 Sea turtles

In the Mediterranean area, a meeting of the GFCM SCMEE/SCSA Transversal Working Group on bycatch/incidental catches in Rome in October 2008 gathered information on the bycatch of relevant taxa, including sea turtles and elasmobranchs. Although the information presented was interesting and valuable, the lack of standardization in data collection and analysis, particularly for elasmobranchs and sea turtles, makes it difficult to translate such observations into management advice. Extrapolation of non-standardized bycatch rates is not only misleading, but also detrimental for management. The scenario was worsened by the fact that the available information was not homogenously spread in geographic terms.

It was noted during that workshop that some long-term studies carried out to assess interactions between turtles and tuna and/or swordfish longline fisheries, for example in Spain and Italy, could help in producing estimates of bycatch of such species.

Some data on loggerhead sea turtle bycatch can be found in Table 8 and in Table 10 (for the USA). Iceland has not had any record of turtle bycatch for many years (Olafsdóttir, pers. comm.). The SG believed that further records are likely to be available through national discard reporting schemes and bycatch monitoring coordinated by ICCAT. Such records should be included in future assessments.

5.4 Elasmobranchs

The 2008 report of the ICES Working Group on Elasmobranch Fish (WGEF) was reviewed in relation to the bycatch and discarding of these species in European waters. The WGEF report is subdivided by species or species group, and therefore although there is no explicit assessment of elasmobranch bycatch, bycatch information is provided for some species and has been summarized in Table 11.

WGEF recommends that discard data should be brought to and collated at the WGEF's annual meeting and also points out that there is a general need for more detailed studies of existing discard datasets. In addition WGEF reported that landings data are often incomplete or aggregated (as "nei") and that there are problems of species identification for those species which are rare, or are found occasionally but in large aggregations, both for discards and landings. WGEF also believes that some species may be under-reported to avoid highlighting bycatch in some fisheries where this may be a significant problem. Landings from inshore vessels that may have large bycatches of certain species are also not always included in official landings statistics. Bycatch or discard monitoring schemes could be used to help address this issue.

The SG noted that shark bycatch and discards are reported to WGEF by some countries, but not all (see ICES 2008c), and that such data should be available in the ICES database. Improved access to discard data and better coordination among ICES expert groups would help make best use of such data.

The Study Group considered that in future it would be useful to include in its deliberations species of conservation concern such as *Squalus acanthias*, which has recently

has been listed in CMS appendices although it is not included in any of the Annexes of the Habitats Directive for example.

5.5 General recommendations

The SG made the following observations regarding bycatch estimation:

For the Mediterranean area, once again considering the shared nature of the stocks of most of the relevant species, the group **recommended** that efforts should be made by ICES, by GFCM, by ACCOBAMS and by other relevant organizations to ensure that bycatch data are collected in a compatible and coordinated format and made available from all countries, so estimates of total bycatch can be obtained, allowing a proper risk evaluation for the region.

For the Northern Northeast Atlantic, the group noted that the data collated from published reports and/or as communicated to the group, do not provide nor allow the estimation of any total bycatch numbers. Most of the data relate to marine mammal bycatch reported from logbooks or from incidental reporting, with no related effort data, preventing any estimation of total bycatch numbers. In some areas where bycatch of some marine mammals could be significant, e.g. Norway and Iceland, the group was aware of the existence of monitoring programmes, although no evaluation of the programmes and no estimate of bycatch had been made available to the group. The group **recommended** that total bycatch estimates and details of the monitoring programmes for these areas should be communicated to the group as its next meeting.

For the Northwest Atlantic, the US Marine Mammal Protection Act and the Endangered Species Act are vehicles which have established observer programmes to monitor and estimate bycatch of marine mammals, and also sea turtles and seabirds. In addition, Canada enacted the Species at Risk Act (SARA) in June 2003. However, it is not known at this time if observer programmes will be established to meet the conservation objectives of SARA. The group **recommends** that Canada appoint a scientist with expertise in protected species bycatch in Canadian waters to the SGBYC.

Regarding data availability and provision of data, the Study Group made the following observations:

The Study Group was aware that although they had reviewed published estimates of bycatch, there are other sources of data on the bycatch of protected species that have not been fully analysed. These include the results of observer schemes in Norway and Iceland, but also the data that have been collected over many years by EU member states under their Discard Sampling and other at-sea monitoring programmes.

SGBYC felt that it did not have sufficient access to such bycatch or discard data that are collected under the DCRs and that are routinely communicated to some other ICES WGs. For example bycatch of elasmobranchs are reported by some countries to the WGEF, and some countries use discard sampling surveys to address the requirements of EC Regulation 812/2004. Although it is clear from discussions under ToR G that not all EU member states record marine mammals and seabird bycatch in their discard surveys, some including the UK and Spain do.

The group was unable 1) to check the extent to which all the discard programmes include species of relevance to the group (such as marine mammals, birds, and elasmobranchs), 2) to obtain access to such data other than those included under ToR G. It is clear that there are a lot of relevant data on the bycatch of protected species that are not currently being adequately assessed, and that there is only limited coordination between ICES expert groups in the assessment of bycatch of relevant species.

The Study Group therefore **recommended** better coordination between different ICES expert groups, such as WG on Marine Mammal Ecology, WG on Sea Birds Ecology, WG on Elasmobranch Fishes and the Planning Group on Commercial Catch, Discards and Biological Sampling. In particular the data available through the EU data collection framework should be made available to all groups.

6 ToR C: Review of ongoing bycatch mitigation trials with recommendations for further trials

The Study Group reviewed ongoing bycatch mitigation trials in Europe and the NE USA through several short presentations by members of the SG.

6.1 Poland

In **Poland** a project to reduce porpoise bycatch in the Polish Baltic has been established under the Jastarnia Plan of ASCOBANS. This project takes into account local environmental and fishery conditions. Two regions are considered: Puck Bay (ICES Subarea 26) and Pomeranian Bay (ICES Subarea 24). Most of the reported bycatches of harbour porpoises in Polish waters have come from Puck Bay from a very small boat fishery using gillnets. The Pomeranian Bay is included in the area designated for obligatory use of pingers under Reg.812/2004.

It has been ascertained that in both areas Reg. 812/2004 has not helped protect harbour porpoises, and moreover makes the objective evaluation of the problem very difficult. The main reason is that Regulation 812 makes pinger use mandatory only for boats >12 m whereas the observer programmes are mandatory only for boats >15 m. The majority of boats fishing with set gillnets in the Pomeranian Bay are <15 m (84%) and <12 m (71%), and in the Puck Bay 78% and 77% respectively. Thus Reg. 812/2004 omits the majority of the fishing sector which is known to record bycatch.

Strandings and voluntary bycatch records (including carcasses of bycaught porpoises brought in by fishers) have been recorded by Hel Marine Station of Gdańsk University since 1988 from the Polish Baltic waters, but after the ban on driftnet fishing in 2004 very few records or samples have been made available by fishers, although the number of stranded animals has increased.

Most of the porpoise bycatch appears to occur in shallow water in set gillnets (CEC 2001). Seatrout/salmon set gillnets, also called "semi-driftnets", as well as bottom-set gillnets are responsible for the majority of the bycatch. The "semi-drift" nets are designated as set-nets, although they fish in a manner that might be (and used to be) termed driftnets until the EU provided a legal definition in 2007.

As Puck Bay covers only about 1% of the Polish EEZ and about 40% of bycatch records come from this area, and moreover most (78%) of the set gillnet fishery in this area is not subject to any observer scheme, it has been decided to design and implement a special programme of bycatch reduction with a simultaneous *in situ* evaluation of fishing structure, including the types of nets.

As a local approach to bycatch reduction the idea of temporary deployment of a line of pingers across the Bay to prevent porpoises from entering Puck Bay during intensive fishing seasons is being implemented. First, two lines of 24 T-pods (self contained porpoise click loggers used to determine porpoise presence) were deployed across the entrance to Puck Bay in autumn of 2008, with the intention of checking the movements of porpoises in and out of the Bay throughout the year. Fishing effort is also being determined. It has proven difficult to do this by surveying the waters as different flag types are used for different gear types on marker buoys (dahns) but not in any systematic or reliable way for 20% of fishing gears. Set gillnets are highly concentrated in the centre of Puck Bay in autumn and winter and create a trap for harbour porpoise.

The SG agreed that Regulation 812/2004 has not been effective in reducing porpoise bycatch in Polish waters, nor has it helped in gaining better information on porpoise bycatch. Therefore, the SG **recommended** that any future review of Regulation 812/2004, should apply a more regional approach which will evaluate specificity of different sea regions and fishing fleets. This approach would help to establish better targeted observer programmes as well as targeting the use of pingers where the risk of bycatch is the highest.

6.2 UK

Bycatch mitigation trials in the UK have focused on the use of acoustic deterrent devices. In the pelagic trawl fishery for bass there have been over 40 tows observed while DDD-02Fs (an acoustic deterrent device produced by STM products of Italy) have been used since 2006, with no concomitant dolphin bycatches. Although observations have been sporadic as few boats have been involved and overall fishing effort has been low, the observations thus far strongly suggest that these devices are effective in minimizing the bycatch of common dolphins in pelagic pair trawl fisheries for bass.

Two trials have also been undertaken in the UK to determine the effective range of DDD-02 devices used on gillnet fisheries. To address the question of acoustic exclusion from foraging areas, two DDD-02s were attached to a single short fleet of tanglenets set in coastal waters off the Lizard Peninsula in Cornwall. A series of T-Pods were deployed in a range of distances initially between 1 km and 7 km from the experimental net string. The nets with the DDD-02s was deployed, removed, deployed and removed again at approximately two week intervals and the number of porpoise and dolphin clicks were recorded during each of the control and both of the deployment periods. The ratio of the mean number of detections-per-day during periods with and without active DDDs were plotted by distance from the net string. In 2007 there were no detections by the T-Pod on the string (500m from the DDD), whereas the rate of porpoise and dolphin clicks was more or less the same between deployment and control periods beyond about 1.5 km from the source. In 2008 the trial was repeated with T-pods deployed more densely close to the string, from 0 to 3 km. During this trial lower click detection rates were recorded for both porpoises and dolphins out to 2.5–3 km, suggesting a more aversive response in the second year. It was not known why this might be the case.

The results of these trials were used to estimate the approximate area from which dolphins and porpoises might be excluded if DDDs were widely used on UK gillnets in the southwest of England. Assuming a deterrent effect out to about 2 km, and assuming that on a peak fishing day around 1500 km of net might be deployed by locally based boats, if DDDs were deployed on nets at a spacing of 4 km, then a maximum of about 1.5% of the total Celtic Sea area might be ensonified enough to displace porpoises and dolphins.

Fishing trials of the devices have now been initiated with three local boats (1 under 12 m and two over 12 m). Trialling of the devices starting in August 2008. So far no cetaceans have been recorded in any net strings equipped with DDDs although three porpoises have been recorded in unpingered control nets.

6.3 France

In France during 2005 and 2006, fieldwork focused on determining the reactions of free swimming common dolphins to the acoustic signals generated by Fumunda FMDP2000, Marexi, AquatecAquaMark200 and Savewave High Impact Black Saver

devices. No changes in behaviour were noted. The Cetasaver device and the DDD pingers both elicited an avoidance reaction by common dolphins. The Cetasaver is an acoustic device designed through a collaborative project between IFREMER and the French company Ixtrawl. It has a broadband signal from 30–150 KHz with a mean source level of 180 db (ref. 1 μPa @ 1 m); it is designed to be directional to ensure that the acoustic deterrent effect can be focused on the area of concern, rather than broadcast in all directions. This should help to minimize the unnecessary exclusion of dolphins from the wider area around fishing gear.

The Cetasaver has been deployed in pelagic trawls to test its efficacy in 2007 and 2008 ((Morizur *et al*., 2008). 121 tows have been made with the device deployed and 129 without. In 5 tows with the Cetasaver 6 dolphins were caught, whereas 20 dolphins were taken in 10 tows when the device was absent, suggesting that the device is about 50%–70% effective. The reduction was observed in each of the two years. Trials are still continuing with fishers in 2009

Experiments are being undertaken in France to compare the efficiency of DDD's, (Aquamark 100 and the Marexi pinger) in the tanglenet fisheries of the Iroise Sea (Area VIIe). These experiments are being conducted in cooperation with the fishing industry and the Parc Marin d'Iroise. There are ongoing studies to adapt cetasavers on gillnets to confine the deterrent effect to the axis of the net, thereby confining the displacement of animals to the zone immediately around the net.

6.4 Spain

In Spain, since 2002, the research organization Alnitak, in collaboration with the Spanish Environment Ministry (SGM), Spanish Oceanographic Institute (I.E.O.), NOAA NMFS, WIDECAST, SMRU of St Andrews University, CRAM and Submon, has identified a series of potential technological measures for the mitigation of sea turtle bycatch in surface longlines, based on data of over 20 years of fishery monitoring, fishers' experience and diverse studies on sea turtle habitat use and biology.

From 2005 to 2008 four experimental fishing campaigns were conducted separately testing bait type, hook type (C12/0), depth and soak time for the longlining fisheries targeting swordfish and bluefin tuna. Experiments were complemented with studies on hooking severity and turtle survival, as well as the development of equipment and training materials for optimal handling and release of turtles.

Results obtained prove it possible to reduce bycatch rates by over 85% in both fisheries without affecting target catch. In order to facilitate the implementation of mitigation measures and maintain a constant communication between research, fisheries policy and the fishers an online service for the adaptive management of the bycatch problem was created including direct assistance, news on management measures, training courses and a G.I.S. with diverse maps including an experimental bycatch risk zoning map.

Future work will include testing of C16/0 circle hooks in the swordfish fishery including severity of lesion and survival studies. Electronic monitoring data from experimental vessels together with satellite tracking of turtles will be used in order to promote the active involvement of fishers and especially their usage of the online fishers' assistance service.

Since 2005 the Spanish Oceanographic Institute has conducted a series of pilot projects focusing on the development of bycatch mitigation measures (IEO Report, Mejuto *et al*., 2006).

With regards to the important problems of depredation of set-nets by bottlenose dolphin, the Fisheries Council of the Balearic Islands has conducted research on mitigating such interactions, focusing on the use of pingers (Brotons *et al*., 2008).

A final Report of the "Field study to assess some mitigation measures to reduce bycatch of marine turtles in surface longline fisheries (Reference No. FISH/2005/28A - Service Contract SI2.439703-"Assessment of turtle bycatch"), was submitted in February 2008 by MRAG Ltd in association with Lamans s.a. Management Services and AZTI, Tecnalia to the Directorate-General for Fisheries and Maritime Affairs.

6.5 USA

In the US the National Marine Fisheries Service (NMFS) has been developing new types of turtle excluder devices (TEDs) for scallop and flounder trawls to reduce sea turtle mortality. A hinged grid has been developed to make deployment and retrieval easier, horizontal bars have also been added to the original grid and the grid angle in the TED extension has been modified to 30 degrees. Increased bar spacing to greater than 4 inches (10 cm) is also being investigated. In addition, data loggers are being designed for fitting to bottom-trawl doors to record and monitor (for enforcement) tow duration. Tow duration restrictions are being explored as a mitigation measure to reduce sea turtle interactions in bottom-trawl fisheries.

NMFS has also developed a modified scallop dredge to reduce injury to sea turtles. Adding turtle chains to hinder the entry of sea turtles into the trawl has helped to reduce midwater sea turtle interactions. NMFS is now currently redesigning the scallop dredge bar to ensure that sea turtles are not dragged under the bar during fishing. Turtle carcasses have been used to test the efficacy of this design, with 9/12 carcasses going over the bar rather than under it where they can be seriously injured or killed (Milliken *et al*., 2007).

NMFS is also planning to test the effect of the hanging ratio of gillnets to see whether changes in net slackness can influence the bycatch rate of harbour porpoises. The hang-ratio trials are scheduled to begin in February 2009.

An international project to test the efficacy of stiff nets and nets made from barium sulphate impregnated nylon is also being developed by the New England Aquarium in Boston. Several previous studies with barium sulphate impregnated nets (Trippel *et al*., 2003) have demonstrated that cetacean bycatch can be reduced using such nets. It had been supposed that such nets could be more acoustically reflective thereby reducing the chance of an echo-locating animal from becoming entangled. However, it has not always been possible to test such nets under ideal experimental conditions, and in one trial (Northridge *et al*., 2003) porpoise bycatch was actually higher in barium sulphate nets than in a standard nylon nets. Furthermore, bycatches of seabirds in one study were also lower in the barium sulphate nets, suggesting that some mechanical property of the net material might be responsible for these lower bycatch rates. The present project intends to test barium sulphate, standard nylon and stiffened nylon in a three way comparison in two widely separated geographical sites (possibly in Argentina and Denmark) in order to try to determine exactly what the effects of stiffness and barium sulphate are in terms of bycatch reduction.

The Study Group was also advised of a concurrent workshop in Hawaii that is examining turtles bycatch reduction in gillnets and agreed to consider its report at the next meeting.

The SG did not recommend any specific mitigation trials beyond those currently being planned, largely through a lack of time to explore the possibilities.

7 ToR D: Design and establishment of a database for cetacean bycatch in EU and adjacent waters

The collation of bycatch data on protected species in European and adjacent waters would be more effective and efficient if the data were stored in a relational database. A proposed database structure for a relational database constructed in Microsoft Access is outlined in Figure 1. The database is based on standard format spreadsheet data tables which were developed as part of SGBYC's workplan in 2008.

Detailed descriptions of each field in each table are provided in the Access database and are also described as follows:

Fleet table

This refers to the general characteristics of each fleet for a specified gear type. A range of drop down boxes can be added to this table as the database is developed further to include e.g. ICES subdivisions. Some discussion occurred on the size ranges of vessels which should be included and it was agreed that fleets could initially be categorized as <10, 10 - <15, >/=15. Some discussion also occurred on the definition of gear types and the variation in gear types between different countries. FAO gear codes may be used to identify gear types unless a more suitable system becomes available e.g. from the WGFTFB. Inclusion of mesh size along with the gear type may assist in distinguishing gear types and a mesh size field has therefore been included. The target species e.g. top three species could be selected from a species table. A fishing season text field has been added to permit general observations on temporal fleet activity to be submitted. An empirical estimate of temporal fleet activity will however be provided in the Fleet effort table. Required observer coverage may be useful in terms of reviewing the data in relation to 812/2004 and therefore a field has been included to this effect. This table is linked to the Fleet effort table on a one-to-many basis.

Fleet effort table

This table provides spatially (Ices subdivision) and temporally (year, month) aggregated fleet effort data. Data should be submitted by ICES subdivisions (e.g. 'VIIf') where possible, and a drop down box could be added to facilitate this. Where data are only available at ICES division level (e.g. 'VII'), then a single ICES Division representing several ICES subdivisions could also be selected which will simplify data entry. Year and month are also included in the table to reference the data temporally. Numbers of vessels, trips, days, hauls and fishing hours can be entered as measures of effort for each spatially and temporally defined strata. Information on the use of pingers and other mitigation devices at fleet level can also be added to this table. This table is linked to the Sample effort table on a one-to-many basis.

Sample effort table

This table refers to the Observer sampling effort carried out in relation to the strata defined in the Fleet effort table. A 'Mandatory sample'/'Sample required' field in Yes/No format is included to denote if the data were required under 812/2004. If the data are from a European country and are not required then they are considered to have originated from pilot projects. A "Sample representative" field in Yes/No format is also included to denote whether samples are considered to be representative and therefore qualify for extrapolation of sample data up to fleet level. Scientists who submit the data should state whether they consider the data to be statistically representative and therefore qualifies for further assessment as to whether the data should

be raised up to represent a fleet strata. The ultimate decision on whether data are considered representative will depend on how the quality of the data are controlled and this issue ties in with TOR H and the assessment of representativeness of monitoring programmes. Numbers of vessels, trips, days, hauls and fishing hours can be entered as measures of effort for each sampled strata. Pinger data can also be collected at the on-board observer level, possibly in more detail, than at fleet level, so pinger data can also be input to this table. This table is related to the Bycatch table on a one-to-many basis.

Bycatch table

This table contains details of protected species bycatch landed under the strata defined in the above tables. Multiple records (numbers of animals and numbers of bycatch incidences) of different species can be added to the table for each sample effort record. A field has also been included to permit scientists to provide estimates of Coefficient of Variation (CV%) of extrapolated bycatch estimates for each stratum. Estimates of total bycatch for each species in each defined strata could also be calculated automatically based on data already provided. Information on pingers may also be available in relation to specific bycatch incidences and so a number of pinger related fields are also included in this table. This table is related to the Species table on a many-to-one basis.

It was noted that in some country's bycatch monitoring programmes not all hauls or tows are monitored for all species. For example in France only a proportion of all observed hauls are monitored for shark bycatches. In this case a new record under sample effort should simply be provided with the actual observed effort for this species.

Species table

This table contains information on bycatch species and is linked on a many-to-one basis to both the Bycatch and the Fleet tables.

The format of the database permits simple queries to be applied which can be used for example to calculate the proportion of coverage of observed effort in relation to total effort. Also the total bycatch for a particular fleet operating in a specified area can be extrapolated; provided the samples are representative (as denoted in the database), the number of animals caught for a specified species in the Bycatch table can be divided by a related and specified effort unit in the Sample effort table and multiplied by the related effort unit in the Fleet effort table to give an extrapolated total bycatch for the fleet strata defined in the Fleet effort table. Confidence limits and CVs could be calculated from the data as described, but only by making a number of assumptions about the statistical distribution of bycatch events; clearly these issues are more appropriately dealt with at the research programme level, although the database would allow a higher level overview of the scale of bycatch by species.

Excel spreadsheets have also been designed to permit data to be submitted as input to the database and the headings of these sheets are outlined in Table 12.

The SG **recommended** that members should work intersessionally to populate the database and gauge how well the proposed structure would work, and that this should be reviewed at the next meeting. Specifically, the SG agreed that:

National scientists should enter the data into excel worksheets that follow the described format.

Electronic versions of the excel tables should be distributed to National scientists to facilitate submission of data in a standard format.

It is recommended that the SG issue the finalized excel work sheets to National scientists where these are not the same people.

There was general agreement among the working group that the content of the database would be available in the public domain and therefore data should not be made available at a high resolution in order to prevent issues of confidentiality.

The data should be aggregated up to ICES subdivision level. This is the level at which data are required under 812/2004 and is generally the level at which data are available from the National Reports.

Further work should be carried out intersessionally to populate the database with data already collected by the working group. This will facilitate further assessment and development of the database.

The database should be assessed by an expert to see if the basic structure is adequate.

Consideration should be given to incorporating the data into a larger existing database e.g. DATRAS or FISHFRAME which are online resources.

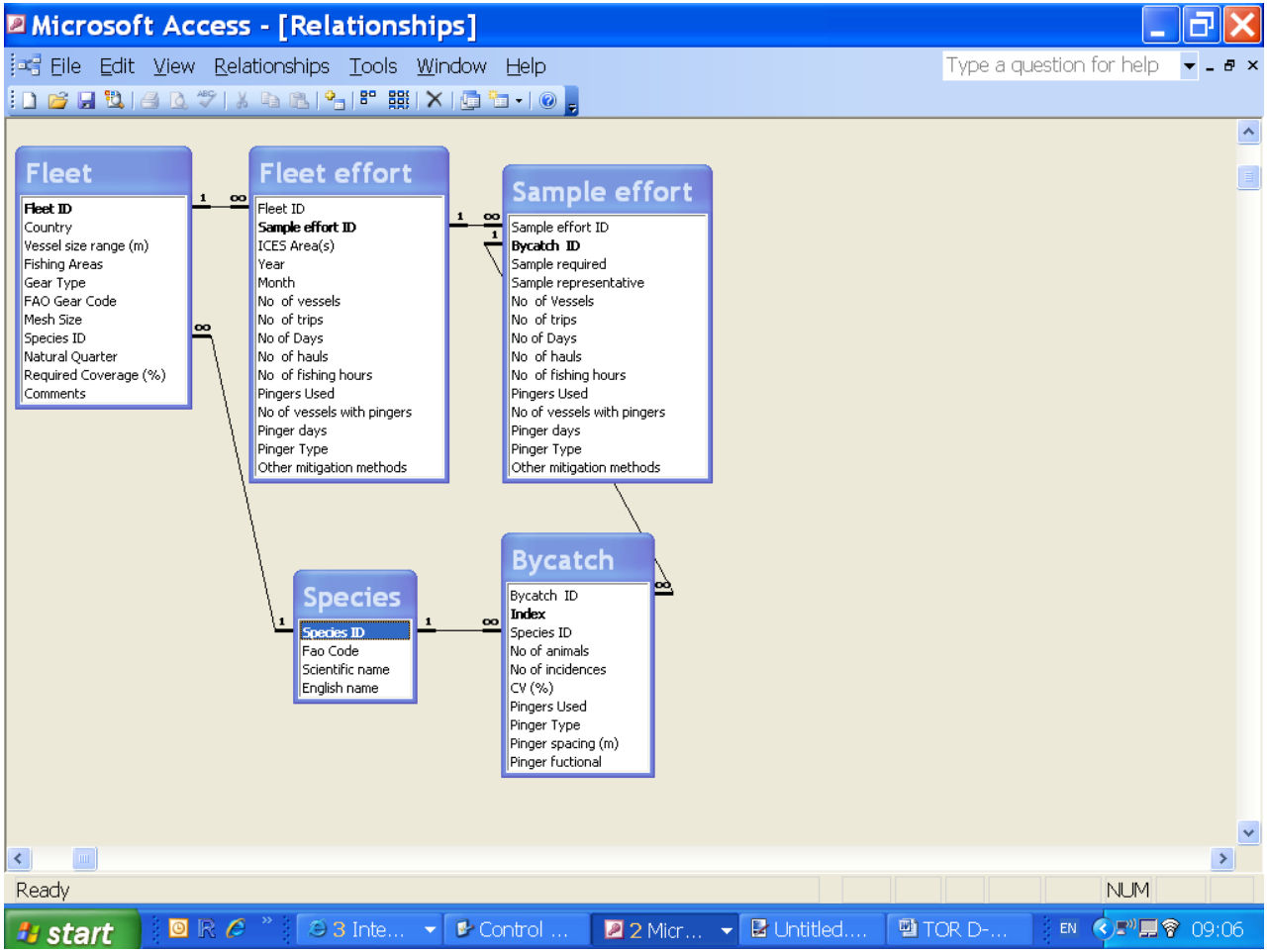

Figure 1. Proposed basic structure of relational database for bycatch of protected species.

8 ToR E: Compilation of a compendium of mitigation measures

At the first SGBYC working group meeting a table of bycatch mitigation measures for protected species, including methods that have failed was compiled in order to provide an accessible compendium of relevant research. This compendium was further updated at a Fishing Technology and Fish Behaviour (FTFB) working group meeting in 2008. At the 2009 SGBYC meeting it was agreed to further review this compendium and examine the possibility of storing this information in a new or existing database. Tim Werner gave a presentation to the SG on a database used for this purpose and hosted at the New England Aquarium and also provided a description of the database.

The research and development of bycatch reduction techniques is a very active and dynamic field, involving hundreds of engineers, biologists, and fishers from around the world. In order to facilitate the exchange of information about these techniques, researchers based at the New England Aquarium (Boston, USA) have created a searchable online database of studies undertaken to evaluate bycatch reduction methods.

The *Bycatch Reduction Techniques Database* at (www.bycatch.org) has citations for bycatch studies including summaries of each one's main findings. Users can conduct searches of these studies by year, type of fishing gear, reduction technique, or non-target wildlife group. Where available, there are links to the studies themselves and contact information for authors. Also included on this website are descriptions of bycatch reduction techniques and commercial fishing methods.

The database was created and is administered by the *Consortium for Wildlife Bycatch Reduction*[1], a project administered by the New England Aquarium. The *Consortium*, a collaboration among scientists and the fishing industry to reduce bycatch of threatened non-target animals, created this database to improve the accessibility and exchange of information about bycatch reduction techniques. The database is structured to encourage its registered users to make voluntary submissions of new studies as they become available. This approach was adopted in order to reduce administrative resources needed for keeping the database content as up-to-date as possible. At the same time, quality control is maintained by a database administrator who can track the origin of all submissions and can approve, reject, or edit submissions in consultation with the researcher who submitted them. Support for the database and website has been provided by NOAA Fisheries to the *Consortium for Wildlife Bycatch Reduction*.

The Study Group discussed the possibility of using this online database to update mitigation trials. Anyone can access the database and can upload material once they have completed a short registration procedure and non peer reviewed material is encouraged. It was agreed that SGBYC should use this resource to update information on mitigation trials. The Study Group **recommended** that:

Suggestions on ways that the database could be refined or improved are encouraged and SGBYC members and other researchers should contact Tim Werner (contact details in Annex 1).

[1]http://www.neaq.org/conservation_and_research/projects/fisheries_bycatch_aquaculture/bycatch/consortium_for_wildlife_bycatch_reduction/index.php

SGBYC members should update and maintain the content of the online resource with relevant material on a regular basis. This process commenced during the WG meeting. Reports on new mitigation trials which were included in the latest bycatch compendium/table which were not in the online database were uploaded. Furthermore SGBYC participants provided further references of recent mitigation trials which were also uploaded to the online resource.

The online resource should be promoted to the wider research community who have an interest in bycatch mitigation trials. The web link and contact details were forwarded to the chair of the FTFB who agreed to distribute these details to members of that working group. Further ways of promoting the resource should also be examined.

Further information regarding the online database should be directed to Tim Werner (see Annex 1). A tabulated form of the data available online is displayed at Annex 3.

9 ToR F: Review of pilot studies carried out under Regulation 812/2004

Under Council Regulation 812/2004, member states are required to carry out pilot projects or scientific studies under two criteria. The first requires that pilot projects or scientific studies are conducted on certain vessels defined in Annex III of the Regulation) less than 15 m in overall length in order to assess bycatch. Second, member states are required to conduct pilot projects or scientific studies to investigate the effects over time of the use of acoustic deterrent devices in the fisheries and areas concerned by the regulation. Member states are required to ensure the quality and standard of the design and implementation of scientific studies and pilot projects and provide detailed information on this when reporting to the Commission.

A breakdown of reported pilot projects by year and country are outlined below. The summary includes those projects carried out in 2006 as a lack of time prevented the completion of this task at the 2008 SGBYC meeting. In addition some countries made reference to pilot projects which were carried out in 2008 or are due to occur in 2009 and these have also been included.

Member states have reported on a wide variety of studies into aspects of ADD (pinger) usage, and the SG has made no attempt to distinguish between those that "investigate the effects over time of the use of acoustic deterrent devices" and those with wider objectives. Indeed, Member States are obliged under Article 6 of the Regulation to report "any other appropriate information, including any research conducted within the Member States to reduce the incidental capture of cetaceans in fisheries".

Furthermore, several member states report on pilot projects or scientific studies that involve monitoring fleets that are not covered by Annex III of the Regulation. Article 12 of the Habitats Directive (Council Directive 92/43/EEC) also requires European Union Member States to monitor the incidental capture of species listed on Annex IVa. The SG has also included any such studies if they have been reported (as "appropriate other information") to the Commission under Regulation 812/2004.

9.1 2005 and 2006 projects

9.1.1 Denmark-ADD studies

Pinger detection: In 2006 a Danish patrol vessel was equipped with a pinger detection device and Danish inspectors also assisted German colleagues in using the detectors.

Pinger spacing: In 2006 experiments were conducted to investigate the effects of increasing pinger spacing on harbour porpoise bycatch rates in bottom-set gillnets. Results from these experiments led to an increase in pinger spacing from 200 metres (as stipulated in Annex III of Regulation 812) to 455 metres being implemented under national administrative law. Trials investigating the use of alerting devices to reduce harbour porpoise bycatch were conducted in the same year but did not yield promising results.

Pinger practicalities: Large-scale trials to determine handling and endurance of four commercially available pingers concluded that there were problems with the durability of all three brands under commercial fishing conditions.

9.1.2 France-pilot observer monitoring projects

France undertook several pilot observer monitoring projects for vessels less than 15 meters. All the sampling efforts are allocated by month and port. Single pelagic trawling is observed at 5% or 10% coverage in Areas VII and VIII. Netters less than 15 m are covered at 1% of fishing effort. All the pair pelagic trawling vessels were included in the segment of vessels greater than 15 m. All the observations projects started in July 2006. As pelagic trawling is a part time activity for single vessels, many observations on this segment of fleet were obtained for bottom trawling. No bycatch of cetaceans was observed on this segment. 32 days-at-sea were observed for netters less than 15 m and all with no bycatch.

9.1.3 Ireland-ADD studies

Pinger practicalities: BIM carried out a series of trials aimed at assessing the practical implications of using pingers in Irish gillnet fisheries in 2005 and produced a report on this work in 2006. Four models made by different manufacturers were assessed in terms of their impact on fishing operations, functionality, durability, and cost. Key problems identified during the trials included pingers becoming tangled in the nets, net flaking (sorting) machines becoming blocked, slowing of operations, damage to pingers, pingers ceasing to function, negative buoyancy of pingers and the effect of this on fishing gear, and crew safety issues in terms of general fishing operations and dealing with hazardous lithium batteries.

Some solutions proposed by BIM included a modified attachment system which consisted of mounting individual pinger units between floats in baitbag tubing and attaching the customized device at the interface between sheets of netting known as the 'joins'. This modification reduced the impact of heavy collisions, assisted in keeping the headline buoyant, and greatly reduced tangling with the gear. Following consultation with manufacturers, two companies improved their moulding processes in order to boost pinger durability and prevent contact of lithium batteries with seawater.

9.1.4 Sweden-ADD studies

Pinger Practicalities: The SFR and County of Skåne commissioned a study to investigate issues relating to the practical use and safety of pingers on Swedish fishing vessels. Results found no practical problem with having pingers on nets, but reported that boats that used wire net cleaners would need to modify the way in which they set-nets when equipped with pingers.

Pinger effects: The effects of pingers on seals were investigated in 2006 and results revealed higher incidence of seal interactions with fishing gear when pingers were deployed.

9.1.5 Sweden-other appropriate studies

In cooperation with local inshore fishers, a survey took place with 30 audio recording PCL (porpoise click loggers) deployed close to the coast in the Swedish part of ICES Areas 24 and 25. 2409 days of acoustic data were collected at 184 separate locations. Porpoise presence was detected at 13 locations during 20 days. Almost all the detections were made during the months from July to November and the majority of the detections were made in the western part of survey area.

9.1.6 UK-pilot projects and Habitats Directive Monitoring

In 2005–2006 the UK undertook pilot projects on <15 m vessels that are listed in Annex III of Regulation 812. These consisted of observer coverage on almost half of all under-15 m pelagic trawlers operating in western waters, mostly in the bass pair trawl fishery, though hauls for anchovy, herring and mackerel were also observed. In addition 34 days-at-sea by driftnetters in VIIe were observed (>10% for that region, but just over 1% of the two year total for all regions). Ten hauls were monitored during five days-at-sea by under 15 m gillnetting vessels in ICES Divisions VIa, VII a and b, VIIIa, b and c, and IXa. More observations were made in the early part of 2007 in Division VIIa. Bycatch of common dolphins in the bass pair trawl fishery was estimated at 155 animals in 2005 and 40 in 2006.

In addition to these fisheries, for which pilot studies are required under regulation 812, the UK also made observations under Article 12 of the Habitats Directive on over 1700 fishing operations by gillnetters and tanglenetters in the North Sea and in VIIefgh. Estimates of bycatch of cetaceans in these fisheries were 153 common dolphins in 2005 and 554 in 2006, and 464 porpoises in 2005 and 730 in 2006.

9.2 2007 pilot projects

9.2.1 Finland-pilot observer monitoring project

In 2006 and 2007 Finland conducted five trips on >15 m pelagic trawlers as a pilot project observer scheme.

9.2.2 France-pilot observer monitoring projects

France planned 86 days-at-sea observations for single pelagic trawling less than 15 m in Areas VII and VIII and 288 days-at-sea for netters in area VIII. As pelagic trawling is a part time activity for single vessels, many observations on this segment of fleet were obtained for bottom trawling. Eight porpoises were recorded bycaught in setnetters less than 15 meters, most of them in Area VIIIa. Most observations-at-sea were obtained on vessels of 8–15 m. There was no possibility for observations on vessels less than 8 meters for safety reasons. A relationship between length of nets and vessel size was established to standardize the days-at-sea of the vessels for the extrapolation to the fleet segment. The observations-at-sea demonstrate that the greater part of the porpoise bycatch occurs in the fleet segment of less than 15 m, probably because they work more inshore.

9.2.3 Ireland-ADD studies

Pinger spacing: The Irish Sea Fisheries Board (BIM) carried out a project during 2006 and 2007 to examine the number of pingers required on fishing gear. Council Regulation 812/2004 requires pingers to be deployed at a maximum spacing of 200 m. However, this was likely a conservative spacing, and the maximum effective spacing had not been determined, although the sound characteristics of specific pinger models suggested that the spacing could be higher than 200 m. Because of low bycatch levels no statistical difference was observed between groups of stations with pingers deployed at 200 m, 600 m and control deployments with no pingers attached during 2006 and 2007. A similar trial was carried in 2006 by DIFRES in the Danish North Sea hake fishery where a 100% reduction in porpoise bycatch rates was observed in nets with 455 m spacing and a 78% reduction in bycatch in nets with 585 m spacing with no significant difference between pinger spacing groups. Based on the research carried out by BIM and DIFRES the Irish government issued a derogation in June 2007 permitting an increase in the maximum spacing from 200 m to 500 m.

Pinger effects: The EU funded NECESSITY project (with partners from France, Spain, Ireland, UK, Netherlands and Denmark) was completed in 2007. Under this project BIM developed an interactive deterrent system for pelagic trawls which emitted acoustic signals in response to echolocating dolphins in the vicinity of the device. Two trials involving direct playback experiments were carried out in January and April 2007 testing the effect of various potential acoustic signals with common dolphins in an attempt to find a consistently effective deterrent signal which could be incorporated into the interactive device. No evasive behaviour was observed in response to any acoustic signals. In 2009 BIM are hoping to carry out an experiment to test the effect of recordings of killer whale vocalisations on common dolphins as a potential deterrent signal.

9.2.4 UK-ADD studies

Pinger effects: Pilot studies by the UK in 2007 and 2008 were focused on testing DDD pingers to determine the exclusion effect of these louder devices on cetaceans and to investigate if using these devices would limit the number required to be deployed per net string. Results of the exclusion experiment revealed a reduction in cetacean detections in the vicinity of the DDDs, but this effect was limited to within 1–2 km. Trials to investigate the bycatch efficacy of these pingers have been initiated in 2008 and initial results on are expected in spring 2009.

Pinger effects: During the 2006/2007 winter bass pair trawl fishery a new acoustic deterrent device (DDD) was tested in relation to mitigating common dolphin bycatch in this fishery. Initial results were encouraging with a no bycatch observed in 18 hauls, but further observations are required to determine exactly how effective these devices might be. Further test of these devices will continue in 2008/2009 season.

Pinger detectors: The UK Marine and Fisheries Agency (MFA) have commissioned scientific research to investigate the development and possible purchase of 'Pinger Detectors'. Pingers Detectors are listening devices, which will verify the functionality of the pingers. The practical application of this initiative will assist the UK in the conservation of cetaceans and the enforcement of the EU legislation 812/2004.

The MFA has conducted training courses for the Fisheries Protection Squadron who conduct boarding at sea on behalf of the MFA. This has raised awareness of cetacean and bird bycatch issues. The UK's Monitoring, Control and Surveillance System (MCSS) is now in place for boarding officers to record the number of cetaceans that have been captured as part of a fishing operation (as witnessed during a boarding) or any information given by the Master of the vessel regarding bycatch of cetacean and wild birds. To-date, MCSS has not generated any reports on cetacean bycatch.

9.3 2008 pilot studies

9.3.1 France-ADD studies

Pinger effects: France conducted a pilot study called "Sea trial of acoustic pingers in the Iroise Marine Park" in April 2008. The first objective of the trial was to determine the bycatch rate of harbour porpoise in gillnet fisheries within the marine park boundaries. Aerial survey provided data on which species of marine mammals were located in the area. Comparing the location of the fisheries and the populations of small cetaceans in the area assisted in efficiently designing the trial. The second objective was to evaluate the efficiency of acoustic deterrents in reducing harbour porpoise bycatch in the marine park bottom-set gillnet fisheries targeting monkfish. The marine park team used three different commercial pinger types. Observations of experimental nets (with pingers) and commercial nets (standard nets without pingers)

hauled by some vessels with observers were made. Observers quantified the number of porpoises in the experimental and standard nets. The study is scheduled to be finished in 2010. Provisional results from 2008 recorded three harbour porpoises bycaught in commercial nets (without pingers) and two bycaught in nets where pingers were used. Also one grey seal was bycaught during that year. Problems with pinger durability occurred with many devices, which were attached to the headline, being damaged during operations.

9.3.2 France-pilot observer monitoring projects

France planned 86 days-at-sea for single pelagic trawling less than 15 m. in Areas VII and VIII and 288 days-at-sea for netters in Area VIII. 49 days-at-sea were achieved for pelagic vessels with no bycatch observed. As pelagic trawling is a part time activity for single vessels, some observations on this segment of fleet were obtained for bottom trawling. 213 days-at-sea were achieved on netters less than 15 m, this corresponds to 1152 fishing operations. No bycatch was observed in single trawling. Some bycatch of porpoises was observed in netting.

9.3.3 Italy-ADD studies

Pelagic trawl deterrent**:** Italy commenced a pilot project in 2008 on the deployment of Turtle Exclusion Devices, which are also suitable for helping the release of elasmobranchs during pair pelagic (or midwater) trawls.

9.3.4 Netherlands-ADD studies

Pinger practicalities: The Netherlands conducted trials of both Aquamark and DDD pingers with two gillnet vessels. The project investigated the first operational experiences of these devices by Dutch set gillnet fishers and a report of this study is in preparation.

9.3.5 Netherlands-pilot observer monitoring projects

48 day trips by vessels less than 10 m were observed in the Dutch trammelnet fishery. The bycatch of one harbour porpoise and one grey seal was observed during the monitoring period and the report for this project is in preparation.

9.3.6 Poland-other relevant studies

Hel Marine Station University of Gdańsk, commenced research on the use of an acoustic barrier to prevent bycatch of harbour porpoises in the Puck Bay area in Poland. The main aim of the study is to minimize conflict among traditional small fisheries and nature protection recommendations for the region, under NATURA 2000 and the Baltic Sea Protected Areas network established under the Helsinki Convention.

9.3.7 Spain-pilot observer monitoring project

In order to meet Spanish government obligations under EC Council Regulation 812/2004, the Secretaria General del Mar contracted the Instituto Español de Oceanografía to design and implement a pilot monitoring programme to obtain data of incidental catches of cetaceans using observers on board vessels with an overall length of 15 m or over, for the bottom-set gillnet operating on Sub area VII and Divisions VIII a and b.

Data of effort and catch from registered national logbooks for 2007 have been analysed to design a sample scheme with the required level of coverage. Moreover Ves-

sel Monitoring System (VMS) positions to determine spatial distribution and effort database from IEO have been analysed. The numbers of vessels in this Spanish gillnet fleet that operates in ICES Divisions VIIIab and Sub area VII for 2007 was 30. Also some Spanish gillnetting activity took place in ICES Sub area VI. The resulting monitoring programme commenced in October 2008.

9.3.8 Sweden-pilot studies

An Electronic Monitoring system was hired from a Canadian company as a pilot study using video monitoring to register marine mammal bycatch on vessels <15 m in 2007. The system was mounted on two gillnetters in the central Baltic that fish for flatfish and cod. The system was tested for four months, including 71 days of fishing operations, and proved to be reliable, with only a few days of data lost because of technical problems. During the study, no porpoises were bycaught but one seal and 15 seabirds were observed bycaught.

9.4 2009 Mitigation Studies

9.4.1 Poland-ADD studies

Pinger Practicalities: In Poland the Monitoring Scheme for Incidental Catches of Cetaceans was initiated in 2006. In 2007 an Open Tender was issued for the purchase of acoustic deterrent devices-pingers for bottom-set gillnets and entangling nets for the Polish zone of ICES Sub region 24. It was not possible, however to find any contractor, because there are no producers of pingers in Poland. The tender was re-issued in June 2008, and information about the tender was also sent to the Official Journal of the European Union. Three offers were submitted.

These problems caused a slight delay in the purchase of pingers, which were successfully bought and delivered to the fishers by the end of October 2008. Polish fishers are obliged to use pingers in ICES zone 24. Pilot projects on usage of pingers and their effect on reduction of bycatch of harbour porpoises should be established in the coming years. A lack of any bycaught mammal observations in the Monitoring Scheme so far, may cause difficulties in assessing the effect of pingers on cetaceans in the Polish Marine Areas.

Pinger Detectors: Poland is planning to buy two Pinger Detectors in 2009, in order to monitor if pingers are functioning properly. Pinger Detectors will be distributed to the Control Inspectors in Szczecin (close to ICES 24 zone, where the use of pingers is obligatory).

9.5 Summary

For 2005–2006 only four countries reported pilot studies, and only three countries reported such studies for 2007. However, six member states have already reported on studies in 2008. To date scientific studies into the use of ADDs have focused on three general questions: the practical use of these devices in commercial fisheries, the minimum spacing distance that can be used while still ensuring bycatch reduction, and the effects (exclusion/attraction) of such devices on marine mammals. Results reveal problems with the practical use of a number of currently available models in commercial fisheries. Trials to investigate whether increasing the spacing of deployed pingers in order to reduce the number of devices needed have found that a reduction in bycatch rates is still possible at spacing distances greater than those suggested by the manufacturers. The effects of commercially available ADDs and potential acoustic signals to deter or alert marine mammals have been investigated for trawl and gillnet fisheries and further projects in this area are planned for 2009. In addition a number

of member states are investigating the use of pinger detectors to monitor pinger use in fisheries.

10 ToR G: Review and collate information from the Data Collection Regulations on bycatch in demersal trawl fisheries, and of birds in all fisheries

The Study Group was aware that although its remit covers all protected species in all types of fisheries, its focus during its initial meeting (2008) had been very much directed to the bycatch of cetaceans in gillnets and pelagic trawls, as directed by Regulation 812/2004. The SG was aware, however that cetaceans are also taken in other gear types, and it was not clear how the fisheries listed in Regulation 812 for monitoring had been decided upon. The SG was also aware of evidence that other protected species are taken in a variety of fisheries, but that such bycatches remain poorly documented. The SG therefore proposed a more rational approach to deciding dedicated bycatch sampling in future would be to review all such evidence before deciding where sampling should be focused. The most useful sets of data in Europe with which to assess overall bycatch frequency of protected species (including seabirds, see ToR K) in a wide range of gear types are those collected under the discard sampling programmes established by the Data Collection Regulations (DCR) and the new Data Collection Framework.

The DCRs stipulate how fishery sampling should be carried out by EU member states. Most recently Council Regulation (EC) No 199/2008 established a Community framework for the collection, management and use of data in the fisheries sector and for the support for scientific advice relating to the Common Fisheries Policy. This regulation established guidelines for the monitoring of fishing with the aim of ensuring their sustainability. The Framework likewise encourages member states to collect survey information on fish stocks as well as on environmental impacts that may be caused by fisheries on the marine ecosystem in order to implement progressively an ecosystem-based approach to fisheries management. It seems logical to think that such aims should lead to the collection of information about the bycatch of protected species as a tool to achieve this purpose.

Nevertheless, Commission Decision of 6 November 2008 adopted a multiannual Community programme pursuant to Council Regulation (EC) No 199/2008, in which the sampling strategy for the fishing trips was established. In this strategy the species to be sampled are defined, but there is no mention of protected species.

In spite of the fact that it is not mandatory under the DCR, some member states do collect information about bycatch of protected species in the trips with observer programmes in the framework of the DCR. The SG was unable to determine which member states do so and which do not, but some data were collated during the meeting and Table 14 displays some summary information on discard sampling trips and protected species bycatch for several European fishing fleets.

Table 14, although very far from complete, demonstrates that discard sampling has covered a wide range of fisheries, and in many cases a large number of operations have been observed. The preliminary nature of this tabulation precludes any detailed analysis, but records of bird bycatch are evident in several types of fishery, including gillnets, hook and line and trawl fisheries, while cetacean bycatches are also recorded in several demersal trawl fisheries as well as in those gillnet and pelagic trawl fisheries with which cetacean bycatch is more usually associated. Without more information on the extent to which the observations here may be representative of the fleets in general it is not sensible to try to extrapolate to total fleet bycatch estimates. Furthermore it is not always clear whether individuals of certain taxa are actually being recorded during such sampling programmes. An important first step to making use

of such data are therefore to determine which species groups were being recorded by observers during which survey programmes, and which, if any were being ignored.

10.1 Recommendations

The Study Group **recommended** that Study Group members should establish the extent to which their national discard sampling schemes have recorded mammals, reptiles, birds, sharks and other rare fish in such programmes, and over what period, and that this table should be expanded at next year's meeting with additional records from discard sampling programmes.

The SG also **recommended** by that protected species bycatch should be considered within the framework of the DCR in order to provide an unbiased and wide ranging overview of the environmental impact that may be caused by fisheries on the marine ecosystem. This should be considered as a first step in the objective of implementing progressively the ecosystem based approach to fisheries management as required under Regulation 199/2008.

11 ToR H: Consider technical aspects of bycatch monitoring and assessment

The SG had agreed to consider under this term of reference several issues that are important to the collection and analysis of bycatch data. These included how to assess whether or not an existing monitoring programme is representative of the fishery that is being sampled, how to determine bycatch reference limits that could be used to determine an appropriate level of monitoring, how best to determine sampling levels that should be applied to specific fisheries, and the best methods for extrapolating observed bycatch rates to the fleet level.

The Study Group did not have much time to investigate any of these issues in great depth and discussions ranged over aspects of all of these questions.

The problem of sampling fisheries with rare bycatch events was discussed in some detail. The issue here is that in most cases there is a limited amount of observer effort available, and this has to be deployed in an optimal manner to make best use of sampling potential.

In the US one strategy is to adopt pulsed sampling where a particular fishery or métier is very heavily sampled for a short period of time. For example, in North Carolina all of the available observation effort for one fishery is clumped at the peak fishing times and when the bycatch species of concern (bottlenose dolphins) are present. The underlying idea is to try to maximize the chance of observation of any bycatch that might occur. The SG was not clear whether this strategy would lead to any improved estimate of bycatch overall.

Another tactic considered in the US is to rotate observer effort among fisheries with a low level of bycatch, sampling any one of them only once every three to five years (Didier and Cornish, 1999). Another strategy used in the UK and the US is to pool observations across years to generate more precise estimates of bycatch rates; this can only be done of there is reasonable certainty that there are no interannual trends in the bycatch rates (Palka and Rossman, 2001).

A technique deployed in the US is to analyse 'modified' observation data, by drawing a selection of data from the observations and analysing those alone, for example by excluding particular observations that have come from a fishery type that is no longer present in the fleet. In this way the removal of non-current data types can simulate current fishing patterns within an older dataset.

Another way to focus sampling may be to use inferences about animal behaviour made from parallel studies. Tagging studies, sightings surveys, photographic analyses of scars and acoustic detections could be used to determine seasonal or geographical distribution patterns, and possibly associations with specific geographical features or fishery types. Such inferences could then be used to direct bycatch observations to specific strata of a fishery in which bycatch might be most likely. Strandings may also be useful to determine seasonal patterns in bycatch.

In some areas it may be possible to use fishers to assist in sampling, though some studies have demonstrated that relying on fishers' records to determine bycatch rates is often likely to lead to severe biases in reporting. Nevertheless in some circumstances reports by fishers may be useful in determining patterns of bycatch or the scale of such events. In Norway fishers are contracted to take fish measurements and also to report on bycatches. Case-specific solutions should be found in each situation.

Finally the Study Group also discussed the possibilities of using patrol vessels and also video recordings to monitor fishing activities and bycatch rates. In North Carolina for example, such a method has been used under the "Alternative Platform Observer Programme" (Kolkmeyer *et al*., 2007). Video cameras are already used in several fisheries to monitor catches and operational aspects (Ames *et al*., 2004, McElderry *et al*., 2008), and in theory bycatch could be monitored in the same way. Initial costings for such a scheme in Denmark have demonstrated that such as system would compete favourably with paying observers.

The Study Group noted that whereas in the US observer sampling trips are allocated first by region, port and month, then randomly to vessels of particular categories within those monthly and spatial strata, in much of Europe observer trip allocation is done on the basis of pragmatic considerations. In part this is as a consequence of the overall lower observer rates in Europe, which means there are not enough observers to cover large areas: it is more economic to ensure that an observer makes a trip rather than wait for the arrival of, or travel some distance to, a randomly allocated boat. In France, which has the largest number of bycatch observer days of any EU member state, observer days are allocated by port and by month for each fishery, but the exact vessel allocation is then negotiated.

Whether or not trips are allocated randomly, it is important to check that trip allocation has not led to a bias in the sampling of the fleet. Several simple metrics are possible, but the SG recommended that the observed vessels should be compared with the rest of the fleet with respect to their length distributions, fishing effort by month and by area, and by comparing the species composition and landed weight of the observed vessels and the rest of the fleet. The same points have been made by WKDRP 2007.

The SG noted that in some countries difficulties have been experienced in placing observers on boats; in Poland for example some reluctance was demonstrated by skippers fishing in areas of highest bird densities. The SG recommended that incentives and reprisals should be used to ensure that observers are not prevented from sampling areas of higher than usual bycatch. Taking an observer should be mandatory under Regulation 812/2004, and national regulations should reflect this. In the US records of refusals are kept, and if a skipper repeatedly refuses to take an observer, their fishing licence may not be renewed. However, most members of the group felt that this was not a common problem.

The Study Group did not have time to explore the possible allocation of bycatch reference levels. It was pointed out that although in the EU and the US sampling is geared toward achieving a bycatch estimate with a target CV, in many case this can lead to unnecessary high levels of sampling, where a lot of observer effort is put into obtaining a precise estimate of bycatch when even an imprecise one would have demonstrated that bycatch levels are too low to be of concern. Such an approach (Northridge and Thomas, 2003) requires a bycatch reference level, the level below which it is not important to have a very accurate bycatch estimate, but this reference level needs to be decided upon, and there are no accepted rules for so doing.

The SG also briefly discussed the best method for extrapolating observed bycatch rates to the fleet level, and noted that this problem is not quite the same as in raising observed discard rates to the fleet level (WGDRP 2007), because bycatches are likely to be less variable than discards (which can depend on market factors and vessel storage capacity among other things), and are probably more closely linked to fishing effort. Nevertheless the SG agreed with the WKDRP that it is best to use several methods to check that similar answers are obtained. In the US an average rate across

several methods might be used to obtain an estimate of total bycatch. The SG noted that WKDRP had developed a 'key' or flowchart for checking that methods of discard estimation are consistent.

12 ToR I: Consider ways to encourage other EU countries to expand or develop observer programmes

Considering the migratory and trans-boundary nature of many protected species, the group agreed that it was important to encourage not only EU countries in expanding and developing observer programmes, but also other countries fishing in adjacent waters. Recognizing also the difficulty of the issue, both in term of risk assessment and implementation of successful mitigation measures, the Group underlined the importance of promoting the widest possible cooperation and sharing of expertise and experience.

Although much of the work of SGBYC derives from requests for advice from the European Commission, the SG noted that its remit in general is a broader one, and the SG recognized the importance of contributions from members from outside the EU and/or outside the ICES area.

Concerning the Mediterranean and Black Seas, the Group noted that two recent expert meetings organized by Agreement on the Conservation of Cetaceans of the Black Sea, Mediterranean Sea and contiguous Atlantic (ACCOBAMS) and the General Fisheries Commission of the Mediterranean (GFCM) aimed to assess current knowledge of the incidental capture of species of conservation concern and to set a common standard or protocol for collecting reliable data on incidental catches. The first of these meetings was a Working Group on the issue of bycatch of cetaceans and other endangered marine species under the coordination of the Sub-Committee on Marine Environment and Ecosystems (SCMEE) and the Sub-Committee on Stock Assessment (SCSA). The second was an International Workshop on Cetacean bycatch within ACCOBAMS area. In both cases experts drew similar conclusions, particularly:

- There is a lack of standardization in data collection and analysis that makes it difficult: a) to realistically assess the extent of these events and, therefore, b) to put the mortality caused by some fishery activity into a population viability context.
- There is a lack of studies on population dynamics (population size, structure and demographics) on species of conservation concern (also in terms of fishery management), that could help clarify the status of the populations and evaluate the efficiency and the cost-effectiveness of mitigation measures.

In addition to these issues, the heterogeneous nature of the economic status and priorities in environmental policies in different countries within these areas made the challenge of achieving a common framework for monitoring incidental catches even more difficult.

The importance of good coordination between projects carried out at the international and national level was also emphasized by the SG. Coordination would include the enhancement of effectiveness of each single project through a) the exchange of ideas, b) use of standard protocols and c) sharing of results promptly. Such coordination is not only desirable, but also necessary for optimization of the available human and financial resources, which are scarcer than needed.

The SG also noted that in the last years the North Atlantic Marine Mammal Commission (NAMMCO) had started addressing the issue of bycatches of marine mammals by its member countries (NAMMCO 2005, 2006, in press). In 2007 the NAMMCO requested its Scientific Committee to

Review bycatch monitoring systems used in other jurisdictions and various types of fisheries, and provide advice on the most effective systems in terms of delivering accurate and precise estimates of bycatch at reasonable cost;

Review information on fisheries and bycatch in NAMMCO member countries to determine which fisheries are likely to catch the greatest number of marine mammals and/or negatively affect the conservation status of marine mammal stocks;

Provide recommendations specific to country and fishery for monitoring bycatch in NAMMCO member countries;

On an ongoing basis, review the bycatch monitoring programmes that are in place in member countries and provide advice on how they can be improved.

Recognizing that issues regarding marine mammal bycatch were addressed by various organizations working on the conservation of marine resources and sustainable fisheries, the NAMMCO SC agreed that the most effective way of addressing its Terms of Reference could be to learn from the experiences of other organizations addressing similar issues and to join forces. The SC concluded that an effective way forward would be to organize a joint workshop on bycatch monitoring with the objective of reviewing the use and applicability of bycatch monitoring systems in use in different areas and fisheries, to evaluate requirements for obtaining reliable estimates of bycatch and collating best practices. NAMMCO SC further proposed that acceptable alternatives be discussed for areas/fisheries where observer programmes were not feasible. The potential outcome of such a workshop would be advice or guidelines on how to organize, implement and carry out a reliable monitoring scheme for various fisheries, under various levels of data availability and conservation levels.

The SG commended this spirit of cooperation and agreed that one way of encouraging other EU and non EU countries to expand or develop observer programmes was to hold a workshop with wide participation on monitoring programmes, based both on observer programme and also alternative methods, with comparisons of the cost-effectiveness. The Study Group strongly recommended that the proposition of the NAMMCO SC should be followed up, so that a workshop involving NAMMCO, ICES and other relevant IGOS should be organized to take place at the end of 2009 or beginning of 2010.

The SG also suggested that new efforts be made toward promoting coordinated studies in cooperation with other relevant IGOs (e.g. ACCOBAMS, ASCOBANS, NAMMCO, GFCM, IWC, Black Sea Commission, etc.) on the following topics:

population dynamics of species of conservation concern, such as marine turtles, mammals, birds, elasmobranchs, etc.;

standardization of data collection on incidental captures and for regional planning of monitoring programmes;

pilot projects on bycatch mitigation in specific métiers, taking into account not only technological measures for mitigation, but also the social aspects connected with that métier (especially in artisanal fisheries);

studies on promising technical and operational changes in fishing practices (e.g. soaking time, circle hooks, TEDs, deep sets, area restrictions, etc);

13 ToR J: Review of mechanisms and solutions across species groups relating to bycatch of protected species in gillnets

The SG had agreed to devote some time under this ToR to examine the issue of bycatch of protected species in gillnets, specifically to explore mechanisms that influence bycatch rates with a view to exploring potential mitigation measures. To this end the SG considered a list of research needs -or questions- that had been posed in 1994 at a NMFS sponsored workshop on harbour porpoise bycatch in gillnet fisheries (Frady *et al*., 1994). The questions were ones that the participants at that workshop had decided were important to understanding how and why porpoises become entangled in gillnets, but in fact many of the same questions could be posed for other species and taxa too. The research needs that were listed by Frady *et al*., 1994 were therefore used to facilitate discussion and identify the status of our knowledge of a number of these research needs in 2009.

13.1 Research questions relating to gillnet bycatch mitigation

How do animals behave around gear? How many animals encounter the net yet avoid capture?

The SG agreed that there is still uncertainty as to how cetaceans and other protected species behave around gillnets. Work in the UK in 1999 using TPODs found that harbour porpoises were detected in the vicinity of nets much more often than they were caught (SMRU *et al*., 2001). There was a discussion about whether porpoises might be attracted to gillnets. There was no consensus on whether this was the case, but work conducted in Sweden and Denmark using Porpoise Click Locators (PCLs) found no difference in the acoustic detection of porpoises in the vicinity of gillnets to areas without nets (Lunneryd, unpublished data). Currently work is being conducted by Magnus Wahlberg tracking porpoises by eye around gillnets and the SG heard that although some animals change course around the net, others have gone over/through the nets. The group noted similar result with bottlenose dolphins by Read *et al.,* 2003.

Does entanglement occur at the surface when the net is being shot/hauled or when it is set?

The group was in agreement that porpoises generally get caught in gillnets when they are fishing on the bottom, and not only when they are being hauled or shot. However this has not been answered unequivocally for all protected species. Tregenza *et al*., 1997 suggested that common dolphins may get caught during net shooting as bycatch had been observed in some nets where dolphins had previously been seen playing close to the boats when the same nets had been set. Subsequently, some common dolphins in the English channel have been found with gillnet twine in their stomach (SMRU unpublished data) suggesting depredation of nets and an interaction with these nets while they were fishing.

What is the cue to porpoises when they successfully avoid the net?

The SG recalled that Kastelien demonstrated in his captive experiments (Kastelein *et al*., 1995a, 1995b) that porpoises could learn to avoid the net in their enclosure. However, once the animal was distracted either by the introduction of a con-specific or fish into the enclosure then entanglement in the net occurred. The question which is still unanswered is whether porpoises perceive a gillnet as a barrier, whether they use nets to forage around or whether they do not perceive nets as a hindrance to their passage.

What is the fine scale distribution of forage fish around the net?

The group agreed that as yet there are no data to answer this question; however data collection could be achieved by dive survey or by using an underwater camera. Questions which should be addressed include the temporal scale by which forage fish may arrive at the net. Bottlenose dolphins have been observed to use static nets as a barrier to catch fish against (Read *et al*., 2003) and it was suggested that porpoises might be using nets in the same way.

What is the age, size and familial relationship of porpoises being entangled?

Although a lot of work has been done in this area, it is difficult to draw conclusions as the age structure of the population is not known. The familial relationships of animals caught in groups have been little studied.

Improving acoustic profile of floats

A number of studies have trialled the use of passive detectors as a means of making gillnets more acoustically visible to echolocating cetaceans and these have had mixed results. While some results indicated animals (bottlenose dolphins) initiated avoidance behaviour at distances over 50 m from the modified net. In a study with harbour porpoises, half of the observed groups were recorded to avoid nets equipped with passive reflectors, while 92% of the observed groups avoided the net equipped with an active pinger. A trial in California found that although all of the experimental passive reflectors trialled caused net avoidance in some porpoise groups, this result was not consistent across all groups. In addition some of the passive reflectors which have been tested were prone to becoming entangled in the fishing gear.

Monitoring migration to identify times of vulnerability

Data on the seasonal movements of harbour porpoise have been collected using a number of techniques including visual surveys (aerial and boat based), acoustic surveys or fixed passive acoustic monitoring (TPODs/PCLs) both in Europe and North America. The seasonal movements observed are most likely related to prey availability. Harbour porpoise peak abundance occurs in summer in both the German North Sea and Baltic although porpoises were recorded present throughout the year. In comparison a study by Thomsen *et al*., 2007 found no seasonal trend in harbour porpoise distribution in the offshore area of the central German Bight, but instead found irregular peaks in months throughout the year. In Sweden results presented by Fontaine *et al*., 2007 on stable isotope and trace elements indicates that throughout the year harbour porpoises adapt their feeding habits to local ecological and oceanographic conditions along the Scandinavian coasts rather than perform extensive migrations. In Danish waters the use of visual, acoustic and satellite telemetry data have been used to identify areas of high porpoise density that could be utilized in the designation of protected areas under the EU Habitats Directive.

Develop tools to track individual animals

A number of studies have utilized VHF or satellite tags to track individual animals. The longest track obtained in the Bay of Fundy was 174 days. In addition recently developed acoustic tags have been used to study the echolocation behaviour of free ranging cetaceans and have been deployed on harbour porpoise, finless porpoise. New developments in passive acoustic monitoring techniques may also result in this methodology becoming applicable for tracking individual animals. The impact that such tools have had on developing mitigation tools has been limited.

Track fine scale behaviour near nets

Fine scale behaviour has mainly been limited to observations of animals from the surface, though some video monitoring inside trawls, especially in Australia, has revealed some useful insights into dolphin behaviour in such nets (Mackay and Stephenson, 2008); similar experiments in gillnets would help understand how and why animals become entangled.

Tracking coarse scale behaviour near nets

Currently Magnus Wahlberg is conducting cliff top observations of harbour porpoise around gillnets. Work by Read *et al*. in 2003 looked at the fine scale behaviour of bottlenose dolphins around coastal gillnets using an aerial camera. During this study the authors reported observing dolphins coming in physical contact with the net but no entanglement occurred.

Assess the noise nets make underwater

Lunneryd *et al*., 2002. investigated the behaviour of whitefish (*Coregonus sp*.) in relation to the setting of leader line or cork structure in an experimental net pen. Their results demonstrated that in some cases whitefish were able to detect the net structure up to 5 m away, and although the sounds recorded from the net were not of an intensity which could be heard by fish at such a distance, the authors suggest this result may be as a result of differences in the recorded acoustic pressure from the nets and the particle acceleration component which would be detected by the whitefish.

Measure wild harbour porpoise echolocation use around nets

Cox and Read, 2004 compared echolocation rates of porpoise around commercial nets and BaSO4 nets and found the occurrence or rate of echolocation did not differ between the two net types. However, echolocation rate and occurrence varied with both depth and location and there were significantly more detections during the day than at night.

Other studies have compared echolocation click rates around nets and in control settings.

Determine the time of entanglement (time of day actual time of entanglement)

Seals are reported frequently caught in setnets at night in Sweden. It is still unclear if time of day affects the probability of cetaceans becoming entangled in gillnets. Analysis of observer data has found soak time to be a main predictor for bycatch in a number of areas.

Determine specific visual sensitivity acuity of harbour porpoise

The group was unaware of any detailed study that had been conducted on vision in harbour porpoise. It was suggested that a meeting with gear technologists would be useful to see how non-target visual acuity may have been used in the development of mitigation techniques for other species.

Relating environmental variables to bycatch

Many studies have used environmental variables to predict bycatch of marine mammals from observer data and stranding data and newly developed statistical methodologies are being utilized to answer this question.

Assess food habits of harbour porpoise and fish in and around nets

Kindt-Larsen, 2008 did not find the same prey items in the stomachs of hake and bycaught porpoises caught in the same nets. However, according to the literature there is an overlap in prey items for these species.

The group agreed that many of the questions posed at the 1994 workshop still remain to be answered, and agreed that these might usefully inform further investigations into this topic. Much of the work the SG had discussed was focused on cetaceans, and it is likely that more work has been done on gillnet bycatch of this group of animals than with other species of conservation concern. The SG did also specifically and briefly address other taxa.

13.2 Turtles

Turtles are reported to be bycaught in the Mediterranean in trammel/gillnets and madragues (tuna traps) and mortality in both these fisheries is reported to be high. In the Balearics, for example, Carreras *et al*., 2004 estimated that close to 200 loggerhead turtles per year are killed per year in trammelnet fisheries mainly for lobster, and that some areas appear to have higher bycatch rates. These authors note that the trammelnet mortality rates are much higher than in longline fisheries where a large proportion of turtles that are hooked may survive. Indeed Peckham *et al.*, 2007 have argued that small-scale coastal fisheries including gillnet fisheries represent a greater global threat to turtle populations than the more widely reported bycatches in longline fisheries.

The SG learned that in the Gulf of Mexico the use of using light sticks in gillnets to reduce turtle bycatch was mentioned, but the details of this trial were not available for the meeting.

The SG was not aware of any other studies that have examined how and why turtles become caught in gillnets or trammelnets, but noted that at exactly the same time as the SG meeting, a technical workshop was being held in Hawaii to discuss this specific topic. The group therefore **recommended** reviewing the output of the "Technical Workshop on Mitigating Sea Turtle Bycatch in Coastal Net Fisheries" which was held in Honolulu from the 20th to 22nd of January 2009 at its next meeting.

13.3 Seabirds

The SG noted the WGSE was examining aspects of seabird bycatch in longline and other fisheries. The SG noted that technical measures to reduce bycatch of seabirds in gillnets appear to be limited. The study by Melvin *et al*., 1999 appears to have been the only one so far to have demonstrated that gear modifications can be used to reduce seabird bycatch in gillnets. They demonstrated a 40–45% reduction in bycatch of common murres (guillemots: *Uria aalge*) and rhinoceros auklets (*Cerorhinca monocerata*) in salmon driftnets where a visual alerting panel was used in the top segment of the net. They also noted that abundance-based fishery openings and time-of-day restrictions could provide a set of three complementary tools to reduce seabird bycatch in the Puget Sound drift gillnet fishery for a possible reduction in seabird bycatch of up to 70–75% without a significant reduction in target fishing efficiency.

13.4 Elasmobranch fish

The Study Group was unaware of relevant studies on minimizing bycatch of elasmobranchs or other fish species of conservation concern in gillnets, but note that increased dialogue with WGEF might help stimulate further work in this area.

14 K: Response to European Commission request for advice on the formulation of an NPOA on seabirds, regarding seabird bycatch in EU fisheries

The Study Group became aware during January 2009 that the European Commission had asked ICES for advice on the establishment of a National Plan of Action for seabirds, as promulgated through the International Plan of Action adopted by the FAO in 2001. This request had been addressed by WGSE, yet the working group was aware that further information in seabird bycatch would be available through national observer schemes, to which WGSE did not necessarily have access. To address this late ToR in the most expedient manner the Study Group agreed to include bycatches of birds and turtles in consideration of ToRs B and G as appropriate. Although the SG found no new published estimates of bird bycatch that have not already been covered in the review by WGSE, work under ToR G demonstrated that there are many records available within the discard surveys that are organized under the DCR. Further records of bird bycatch exist within the records of the bycatch monitoring schemes that have been established to address national obligations under the Habitats Directive and Regulation 812/2004. There was not time to fully address this issue in the present meeting, and the SG agreed to **recommend** that a ToR for 2010 should be to collate existing records of seabird bycatch from discard and bycatch monitoring schemes to the extent that this proves possible (see also recommendations under ToR G). This work should be addressed intersessionally.

15 L: Response to European Commission request for a review of member states reports under Article 17 of the Habitats Directive

15.1 Background

The Study Group had been requested to examine the draft EU database compiled from reports in fulfilment of Article 17 of Directive 92/43/EEC (the Habitats Directive), and to comment upon its usefulness and make recommendations.

Article 17 of the Directive requires that, every six years, Member States shall draw up a report on the implementation of the measures taken under the Habitats Directive. These reports are assembled into a single comprehensive draft report by the European Commission then passed back to Member States for verification prior to eventual publication. A copy of a draft of the single comprehensive report was supplied to ICES in case it was useful in carrying out its advisory functions on marine mammals. SGBYC was asked to examine the data from the perspective of bycatch, while WGMME will examine it from the perspective of population status.

These reports include assessment of the status of all cetacean and seal species in Member States waters. In relation to the general work of SGBYC, the standard format of the reports produced by Member States includes an evaluation of both the "threats" and the "pressures" faced by each marine mammal species. Pressures were identified as known adverse factors currently affecting the status of the species while identified threats were the more ephemeral/potential future impacts on the population. Little guidance was provided however on this and treatment between Member states may not have been uniform. Relevant possible categories of "threats/pressures" from fisheries for marine mammals are:

Drift-net fishing

Trawl fishing

Fixed location fishing

Leisure fishing

Professional fishing

Fish and shellfish aquaculture

As can be seen there is some overlap between these categories (e.g. most fisheries could be either professional or leisure and one of the first three categories). Little guidance on how to use these categories was provided and questions such as "where does purse seining fit in?" were not addressed. Member States were also asked to report for each relevant Regional Sea (Mediterranean, Atlantic, Macronesian or Baltic); thus France might report for both the Mediterranean and the Atlantic.

15.2 Results

Examination of the draft database reveals that there are many inconsistencies within it; sufficient that any analysis would be likely to give spurious results. There appeared to be no difference between the pressure and threat reports. No pressure or threat to marine mammals from fisheries has been reported from Germany, Finland, Estonia, Latvia or Lithuania. Monitoring schemes exist in at least Germany and Finland that have reported marine mammal bycatch. Only three countries report a pressure or threat from fish and shellfish aquaculture (Spain, France, Ireland) and although some seals may be adversely affected near aquaculture, it is difficult to imagine a threat or pressure from aquaculture on nineteen species of cetacean including some deep-water and very rare species such as Blainville's *Mesoplodon densirostris*,

True's *M. mirus* and Gervais' *M. europaeus* beaked whale as reported by Spain. Equally, there are good records of pressures on seals from shooting near aquaculture installations in many more countries than Spain, France and Ireland. Other Member States had reported only pressures from Leisure fishing or Professional fishing, with no further specification of type of fishery.

These inconsistencies lead SGBYC to recommend that this draft database cannot be used for a reliable analysis of the main threats or pressures on marine mammals in European waters. Should such an analysis be required, it seems likely that a first step should be to issue some consistent guidance on completion of the reports by Member States that have been used in compiling the database.

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17 Tables

17.1 Table 1. Summary of reporting status

National reports for the calendar year 2007 on Council Regulation 812/2004.

Nation	Report (Y/N)	Format[1]	Language	Reporting on pinger use (Y/N)	Reporting on pilot studies (Y/N)
Belgium	N	-	-	-	-
Bulgaria[2]	N	-	-	-	-
Cyprus	N	-	-	-	-
Denmark	Y	National	Native	N	N
Estonia	Y	National	English	Y	N
Finland	Y	National	English	Y	Y
France	Y	National	Native	Y	Y
Germany	N[3]	-	-	-	-
Greece	N	-	-	-	-
Ireland	Y	National	English	Y	N
Italy	Y	National	English	N	N
Latvia	N	-	-	-	-
Lithuania	Y	National	English	N	N
Malta	N	-	-	-	-
Netherlands	Y	SGBYC	English	N	N
Poland	Y	National	English	Y	Y
Portugal	N	-	-	-	-
Romania[2]	N	-	-	-	-
Slovenia	N	-	-	-	-
Spain	Y	National	Native	N	N
Sweden	Y[4]	SGBYC	English	N	N
UK (UK)	Y	ACOM	English	Y	Y

[1] 'SGBYC' refers to the reporting format advised by SGBYC in 2008.

[1] 'ACOM' refers to the revised format put forward to the EC by ACOM.

[1] 'National' refers to an independent reporting format.

[2] Bulgaria and Romania are not obliged to submit reports under Council regulation 812/2004, though both member states have done so in the past.

[3] Germany provides reports on observations made under DCR to the Commission which include information on cetacean bycatch. Some of this information was made available at the meeting.

[4] A Swedish report had been compiled but had not been received by the Commission in January 2009 and was therefore unavailable at the meeting; information from the report was made available at the meeting though the report itself was not reviewed.

17.2 Table 2. Observer coverage achieved by country

As a percentage of the level of coverage required under EU Council Regulation 812/2004.

Nation	Fleet segment code	0%	1–49%	50–100%	>100%	Target days at sea	Coverage required	Fleet effort (days at sea)
Denmark	1	x				9	5%	174
Denmark	2				x	64	5%	1277
Denmark	3			x		60	5%	1196
Denmark	4				x	105	5%	2105
Estonia	5&6		x			Ni	fishing hours given	
Finland	7	x				2	5%	30
Finland	8				x	1	5%	20
Finland	9				x	36	5%	700
France	10			x		175	10%	1745
France	11	x				76	10%	760
France	13				x	230	5%	4605
France	14		x			74	5%	1480
France	16		x			533	5%	10668
Ireland	19	x				Ni	10%	Ni
Ireland	20			x		24	10%	239
Ireland	21	x				Ni	10%	Ni
Ireland	22	x				Ni	10%	Ni
Ireland	23	x				Ni	10%	Ni
Ireland	24	x				Ni	10%	Ni
Italy	25			x		398	5%	7961
Lithuania	26	?				58	5%	1158
Lithuania	27	x				14	5%	282
Netherlands	28			x		57	10%	565
Netherlands	29				x	77	5%	1545
Poland	30		x			308	5%	6165
Poland	31		x			114	5%	2288
Spain	32	x				Ni	5%	Ni
Spain	33	x				Ni	5%	Ni
UK	34			x		98	10%	984
UK	35				x	26	5%	512
UK	36	x				18	5%	365
UK	37	x				0	5%	9
UK	38				x	43	5%	861
Sweden	41				x	20	5%	399
Sweden	42				x	138	5%	2761
Sweden	43			x		3	5%	68
Sweden	44	x				1	5%	22
Sweden	45				x	7	5%	141

Ni = no information.

17.3 Table 3. Fleet Segments that Require Monitoring under Council Regulation 812/2004-listed by Member State

Country	Fleet segment	Fishing area (ICES)	Gear type	Season	Required pilot coverage	Comments
Denmark	1	IIIbcd	Setnets	All year	5%	
Denmark	2	IIIbcd	Pelagic trawl (single and pair)	All year	5%	
Denmark	3	IIIa	Pelagic trawl (single and pair)	All year	5%	
Denmark	4	IVb	Pelagic trawl (single and pair)	All year	5%	
Estonia	5	IIIabcd	Pelagic trawl (single)	June - September	5%	
Estonia	6	IV & IX	Pelagic trawl (single)	All year	5%	
Finland	7	IIId	Setnets	All year	5%	
Finland	8	IIId south	Pelagic trawl (single and pair)	All year	5%	
Finland	9	IIId north	Pelagic trawl (single and pair)	From 1 June to 30 September	5%	
France	10	VI, VII & VIII	Pelagic trawl (pair)	January to March & December	10%	
France	11	VI, VII & VIII	Pelagic trawl (single)	January to March & December	10%	
France	12	VI, VII & VIII	Pelagic trawl (single)	All year	5%	Pilot
France	13	VI, VII &VIII	Pelagic trawl (pair)	April to November	5%	

Country	Fleet segment	Fishing area (ICES)	Gear type	Season	Required pilot coverage	Comments
France	14	VI, VII & VIII	Pelagic trawl (single)	April to November	5%	
France	15	VI, VII & VIII	Pelagic trawl (single)	April to November	5%	Pilot
France	16	VIa, VIIa,b, VIII abc, IXa	Setnets	All year	5%	
France	17	VIa, VIIa,b, VIII-a, b, c, IXa	Setnets	All year	1%	Pilot
France	18	VII, IVc	Setnets	All year	100%	Pingers
Ireland	19	VIIghj	gillnets	All year	10%	Pilot cod &hake
Ireland	20	VI, VII, VIII	Pelagic trawl (pair)	July - October	10%	Albacore tuna
Ireland	21	VI, VII	Pelagic trawl (single & pair)	All year	10%	Mackerel
Ireland	22	VI, VII	Pelagic trawl (single & pair)	All year	10%	Herring
Ireland	23	VI, VII	Pelagic trawl (single & pair)	All year	10%	Blue whiting
Ireland	24	ni	Pelagic trawl (single & pair)	Ni	10%	Horse Mackerel
Italy	25	Mediterranean	Pelagic trawl (pair)	All year	5%	
Lithuania	26	IIId	Pelagic trawl (single)	All year	ni	
Lithuania	27	IIId	Setnets	All year	ni	

Country	Fleet segment	Fishing area (ICES)	Gear type	Season	Required pilot coverage	Comments
Netherlands	28	VI, VII & VIII	Pelagic trawl (single & pair)	January to March & December	10%	
Netherlands	29	II, IV, V, VI, VII, VIII	Pelagic trawl (single & pair)	April to November	5%	
Poland	30	IIId	pelagic trawl (single and pair)	All year	5%	
Poland	31	IIId	Setnets	All year	5%	
Spain	32	VIa, VIIb, VIIIabc, IXa	Setnets	All year	5%	
Spain	33	VI, VII ,VIII & IX	High opening trawls	All year	5%	
UK	34	VI,VII & VIII	Pelagic trawls	Dec, Jan -March	10%	
UK	35	VI,VII & VIII	Pelagic trawls	April to November	5%	
UK	36	VIa, VIIab, VIII	Set gillnets	All year	5%	
UK	37	VIIef	Driftnets	Dec, Jan-March	5%	
UK	38	IV	Pelagic trawls	All year	5%	
UK	39	IV	Monkfish, cod	All Year	-	Pilot studies
UK	40	VIIdefghj	Turbot, cod, Pollock, ling, hake, monkfish	All year	-	Pilot studies
Sweden	41	IIId south of 59°N, IIId north of 59°N (1 June–30 September)	pelagic trawl (single and pair)	All year	5%	
Sweden	42	IV a	pelagic trawl (single and pair)	All year	5%	
Sweden	43	IV b	pelagic trawl (single and pair)	All year	5%	
Sweden	44	III d	Pelagic trawls	All year	5%	
Sweden	45	III d	Setnet mesh >80 mm	All year	5%	

17.4 Table 4. Fishing effort and sampling effort by fleet segment. A: Setnets

			Fishing effort of the national fleet				Sampling effort achieved					
Country	Fleet segment	ICES Subarea	No of vessels	No of landings	Days at sea	No of Hauls	No of vessels	No of trips	Days at sea	No of hauls	Coverage	Comment
Denmark	1	IIIbcd	Ni	Ni	174	Ni	Ni	Ni	0	0	0.00%	
Finland	7	IIId	3	30	30	Ni	0	0	0	0	0.00%	
France	16	VIIIab	Ni	Ni	10668	Ni	Ni	61	154	426	1.44%	
France	17	VIIIab	Ni	Ni	27552	Ni	Ni	198	213	1152	0.77%	pilot
Lithuania	27	IIId	5	Ni	282	Ni	Ni	ni	0	0	0.00%	
Poland	31	IIId	Ni	Ni	2288	Ni	1	4	7	Ni	0.31%	
Spain	32	VIa,VIIb,VIIIabc, Ixa	Ni	Ni	Ni	Ni	Ni	Ni	Ni	Ni	0.00%	pilot
UK	36	VIa	3	7	55	Ni	0	0	0	0	0.00%	
UK	36	VIIa	1	1	1	Ni	0	0	0	0	0.00%	
UK	36	VIIb	3	7	47	Ni	0	0	0	0	0.00%	
UK	36	VIII	5	88	262	Ni	0	0	0	0	0.00%	
UK	37	VIIe	1	1	3	Ni	0	0	0	0	0.00%	
UK	37	VIIf	1	3	6	Ni	0	0	0	0	0.00%	
Sweden	45	IIId	6	Ni	141	Ni	3	Ni	24	Ni	9.30%	
Ireland	19	VIIghj	Ni	Ni	Ni	Ni	ni	ni	ni	Ni	0.00%	

17.5 Table 4. Fishing effort and sampling effort by fleet segment. B: Pelagic trawls

			Fishing effort of the national fleet					Sampling effort achieved					
Country	Fleet segment	ICES subarea	No vessels	No of trips	Days at sea	No of hauls	Fish hours	No of vessels	No of trips	Days at sea	No of hauls	Fish hours	Coverage%
Denmark	4	IVb	ni	ni	2105	Ni	Ni	Ni	Ni	142	Ni	Ni	6.7%
Denmark	2	III bcd	ni	ni	1277	Ni	Ni	Ni	Ni	87	Ni	Ni	6.8%
Denmark	3	IIIa	ni	ni	1196	Ni	Ni	Ni	Ni	44	Ni	Ni	3.6%
Estonia	5&6	IIIabcd; IV&IX	single	60	ni	Ni	74260	Ni	Ni	Ni	Ni	87	0.1%
Finland	9	III d North	34	700	810	Ni	Ni	Ni	36	Ni	Ni	Ni	5.0%
Finland	8	III d south	8	115	560	Ni	Ni	Ni	1	Ni	Ni	Ni	5.0%
France	10	VII+VIII	pair	ni	1745	Ni	Ni	Ni	43	170	295	Ni	9.7%
France	11	VII+VIII	single	ni	760	Ni	Ni	0	0	0	0	0	0.0%
France	12	VII+VIII	single	ni	280	Ni	Ni	Ni	3	2	12	Ni	0.1%
France	14	VII+VIII	single	ni	1480	Ni	Ni	Ni	8	34	39	Ni	0.7%
France	13	VII+VIII	pair	ni	4605	Ni	Ni	Ni	70	341	487	Ni	7.4%
France	15	VII+VIII	single	ni	740	Ni	Ni	Ni	46	30	134	Ni	4.1%
Ireland	20	VI, VII, VIII	15	77	239	239	1195	2	3	14	14	70	5.9%
Ireland	21	VI, VII	ni	ni	ni	Ni	Ni	2	2	6	10	Ni	ni
Ireland	22	VI, VII	ni	ni	ni	Ni	Ni	2	2	23	44	Ni	ni
Ireland	23	VI, VII	ni	ni	ni	Ni	Ni	2	2	12	22	Ni	ni
Ireland	24	ni	ni	ni	ni	Ni	Ni	2	2	3	9	Ni	ni
Italy	25	Mediterranean	139	7961	7961	35883	Ni	6	199	199	888	Ni	2.0%
Lithuania	26	IIId	26	ni	1158	Ni	Ni	Ni	Ni	Ni	Ni	Ni	0.0%

			Fishing effort of the national fleet					Sampling effort achieved					
Country	Fleet segment	ICES subarea	No vessels	No of trips	Days at sea	No of hauls	Fish hours	No of vessels	No of trips	Days at sea	No of hauls	Fish hours	Coverage%
Netherlands	29	IIa	ni	ni	146	Ni	Ni	2	2	41	47	166	28.1%
Netherlands	29	IVa	ni	ni	383	Ni	Ni	3	5	67	147	470	17.5%
Netherlands	29	IVb	ni	ni	89	Ni	Ni	2	2	10	23	61	11.2%
Netherlands	29	IVc	ni	ni	104	Ni	Ni	0	0	0	0	0	0.0%
Netherlands	29	Vb	ni	ni	11	Ni	Ni	0	0	0	0	0	0.0%
Netherlands	28	VIa	ni	ni	153	Ni	Ni	1	1	13	27	190	8.5%
Netherlands	29	VIa	ni	ni	270	Ni	Ni	3	4	34	100	474	12.6%
Netherlands	28	VIb	ni	ni	29	Ni	Ni	1	1	3	5	29	10.3%
Netherlands	29	VIb	ni	ni	0	Ni	Ni	1	1	1	1	4	??
Netherlands	28	VIIb	ni	ni	46	Ni	Ni	2	2	8	17	45	17.4%
Netherlands	29	VIIb	ni	ni	99	Ni	Ni	1	1	5	5	14	5.1%
Netherlands	28	VIIc	ni	ni	145	Ni	Ni	0	0	0	0	0	0.0%
Netherlands	29	VIIc	ni	ni	2	Ni	Ni	0	0	0	0	0	0.0%
Netherlands	28	VIId	ni	ni	81	Ni	Ni	2	2	11	20	28	13.6%
Netherlands	29	VIId	ni	ni	237	Ni	Ni	0	0	0	0	0	0.0%
Netherlands	28	VIIe	ni	ni	13	Ni	Ni	1	1	5	7	13	38.5%
Netherlands	29	VIIe	ni	ni	156	Ni	Ni	0	0	0	0	0	0.0%
Netherlands	29	VIIf	ni	ni	2	Ni	Ni	0	0	0	0	0	0.0%
Netherlands	29	VIIg	ni	ni	2	Ni	Ni	0	0	0	0	0	0.0%
Netherlands	28	VIIh	ni	ni	3	Ni	Ni	1	1	2	3	7	66.7%
Netherlands	28	VIIIa	ni	ni	12	Ni	Ni	0	0	0	0	0	0.0%
Netherlands	29	VIIIa	ni	ni	2	Ni	Ni	0	0	0	0	0	0.0%
Netherlands	28	VIIIb	ni	ni	1	Ni	Ni	0	0	0	0	0	0.0%

			Fishing effort of the national fleet					Sampling effort achieved					
Country	Fleet segment	ICES subarea	No vessels	No of trips	Days at sea	No of hauls	Fish hours	No of vessels	No of trips	Days at sea	No of hauls	Fish hours	Coverage%
Netherlands	28	VIIId	ni	ni	4	Ni	Ni	0	0	0	0	0	0.0%
Netherlands	28	VIIj	ni	ni	78	Ni	Ni	1	1	4	9	24	5.1%
Netherlands	29	VIIj	ni	ni	42	Ni	Ni	0	0	0	0	0	0.0%
Poland	30	IIId	ni	ni	6165	Ni	Ni	13	ni	140	183	1132	2.3%
Spain	33	VII,VIII	ni	ni	ni	Ni	Ni	ni	ni	ni	ni	Ni	ni
UK	34	VIa	26	128	449	416	Ni	>4	15	84	66	Ni	15.9%
UK	34	VIb	6	8	38	36	Ni	0	0	0	0	Ni	0.0%
UK	34	VIIb	7	11	35	32	Ni	0	0	0	0	Ni	0.0%
UK	34	VIIc	12	24	184	171	Ni	1	1	7	7	Ni	4.1%
UK	34	VIId	4	28	71	66	Ni	0	0	0	0	Ni	0.0%
UK	34	VIIe	6	77	80	74	Ni	0	0	0	0	Ni	0.0%
UK	34	VIII	2	4	8	8	Ni	0	0	0	0	Ni	0.0%
UK	34	VIIJ	9	23	119	111	Ni	0	0	0	0	Ni	0.0%
UK	35	VIa	29	98	269	196	Ni	>1	11	26	19	Ni	9.5%
UK	35	VIb	1	3	5	4	Ni	0	0	0	0	Ni	0.0%
UK	35	VIIa	2	45	53	39	Ni	0	0	0	0	Ni	0.0%
UK	35	VIId	2	14	40	92	Ni	1	3	3	7	Ni	7.6%
UK	35	VIIe	3	117	124	183	Ni	3	10	19	28	Ni	15.3%
UK	35	VIIJ	3	8	21	32	Ni	0	0	0	0	Ni	0.0%
UK	38	IVa	34	299	777	406	Ni	>2	23	76	39	Ni	9.7%
UK	38	IVb	6	14	33	Ni	Ni	0	0	0	0	Ni	0.0%
UK	38	IVc	3	28	51	Ni	Ni	0	0	0	0	Ni	0.0%
Sweden	41	IIIa	36	ni	399	466	Ni	8	ni	18	30	97	7.9%

			Fishing effort of the national fleet					Sampling effort achieved					
Country	Fleet segment	ICES subarea	No vessels	No of trips	Days at sea	No of hauls	Fish hours	No of vessels	No of trips	Days at sea	No of hauls	Fish hours	Coverage%
Sweden	42	IIId	57	ni	2,761	3,151	Ni	22	ni	140	166	1086	5.1%
Sweden	43	IVa	26	ni	68	78	Ni	1	ni	2	4	11	3.9%
Sweden	44	IVb	10	ni	22	34	Ni	0	ni	0	0	0	0.0%

17.6 Table 5. Cetacean bycatch observations by 812/2004 fleet segment

Country	Fleet segment	ICES subarea	Main target species	Pingers in use (y/n)	Cetacean species bycaught	Number of incidents	Number of specimens
Denmark	1	IIIbcd	ni	ni		ni	ni
Denmark	2	ICES IIIcbd	Mackerel, herring, sprat	n		0	0
Denmark	3	ICES IIIa	Mackerel, herring, sprat	n		0	0
Denmark	4	ICES Ivb	Mackerel, herring, sprat	n		0	0
Estonia	5&6	IIIab c, IIId south of 59°N, IIId north of 59°N , IV & IX	Herring, sprat	n		0	0
Finland	9	IIId North	Baltic herring , Sprat	n		0	0
Finland	8	IIId south	Sprat	n		0	0
Finland	7	IIId	ni	n		0	0
France	10	VI, VII and VIII	Sea bass	(y)	Delphinus delphis	6	13
France	11	VI, VII and VIII	Mackerel, horse mackerel, sardine, sprat, herring	n		ni	ni
France	12	VI, VII and VIII	Mackerel, horse mackerel, sardine, herring	n		0	0
France	13	VI, VII and VIII	Tuna, mackerel, black bream, horse mackerel	n	Delphinus delphis	1	1
France	13			n	Tursiops truncatus	1	4
France	13			n	Globicephala melas	1	1
France	13			n	Stenella coeruleoalba	1	3

Country	Fleet segment	ICES subarea	Main target species	Pingers in use (Y/N)	Cetacean species bycaught	Number of incidents	Number of specimens
France	14	VI, VII and VIII	Mackerel, horse mackerel, sardine, sprat, herring	n		0	0
France	15	VI, VII and VIII	Mackerel, horse mackerel, sardine, herring	n		0	0
France	16	VIa, VIIa,b, VIIIa, b, c, IXa	Sole	n	Phocoena phocoena	1	1
France	17	VIa, VIIa,b, VIIIa, b, c, IXa	Sole, monkfish, pollack, red mullet	n	Phocoena phocoena	8	8
Ireland	19	VIIghj	Cod & Hake	ni		ni	ni
Ireland	20	VI, VII, VIII	albacore tuna	N		0	0
Ireland	21	VI, VII	Mackerel	N		ni	ni
Ireland	22	VI, VII	herring	Y		ni	ni
Ireland	23	VI, VII	blue whiting	Y		ni	ni
Ireland	24	ni	Horse Mackerel	N		ni	ni
Italy	25	Mediterranean	Anchovy, sardines (20%)	n		0	0
Lithuania	26	IIId				ni	ni
Lithuania	27	IIId				ni	ni
Netherlands	28	VI, VII & VIII	Horse mackerel, blue whiting	n		0	0
Netherlands	29	II, IV, V, VI, VII, VIII	Herring, blue whiting	n		0	0
Poland	31	ICES 24	Cod, flatfish	y		0	0
Poland	31	ICES 25-26	Cod, flatfish	n		0	0
Poland	30	IIId	Herring, sprat	n		0	0

Country	Fleet segment	ICES subarea	Main target species	Pingers in use (Y/N)	Cetacean species bycaught	Number of incidents	Number of specimens
Spain	33	VII,VIII	Blue whiting, Horse mackerel Mackerel Hake, Monkfish	n		ni	ni
Spain	32	VIa,VIIb,VIIIabc, Ixa	Hake	ni		ni	ni
UK	34	VI,VII & VIII	Mackerel, herring, blue whiting, horse mackerel, sardine, sprat, bass, anchovy	n		0	0
UK	35	VI,VII & VIII	Herring, blue whiting, horse mackerel, mackerel, sardine sprat, anchovy	n		0	0
UK	36	VIa, VIIab, VIII	Herring, mackerel, horse mackerel	n		ni	ni
UK	37	VIIef	Bass	n		ni	ni
UK	38	IV	Mackerel	n		0	0
UK	39	IV	Monkfish, cod	n		0	0
UK	40	VIIdefghj	Turbot, cod, Pollock ling, hake, monkfish	n		0	0
Sweden	41	IIId south of 59°N, IIId north of 59°N (1 June–30 September)	Pelagic trawls (singles and pairs)	n		0	0
Sweden	42	IVa	Pelagic trawls (singles and pairs)	n		0	0

Country	Fleet segment	ICES subarea	Main target species	Pingers in use (Y/N)	Cetacean species bycaught	Number of incidents	Number of specimens
Sweden	43	IVb	Pelagic trawls (singles and pairs)	n		0	0
Sweden	44	IIId	Pelagic trawls	n		ni	ni
Sweden	45	IIId	Setnet mesh >80 mm	y		0	0

17.7 Table 6. Summary cetacean bycatch rates by fleet segment

Country	Fleet segment	Cetacean species (scientific name)	Bycatch rate expressed per unit of fishing effort*	Total bycatch estimate	Estimate CV percentage	Comment
Denmark	2	-	0	0		
Denmark	3	-	0	0		
Denmark	4	-	0	0		
Estonia	5&6	-	0	0		
Finland	8	-	0	0		
Finland	9	-	0	0		
Finland	7	-	Ni	Ni		No Observations
France	13	Delphinus delphis	0.003	13	Not Calc	
France	13	Tursiops truncatus	0.012	54	Not Calc	
France	13	Globicephala melas	0.003	13	Not Calc	
France	13	Stenella coeruleoalba	0.009	40	Not Calc	
France	14	-	0.000	0		
France	15	-	0.000	0		
France	16	Phocoena phocoena	0.006	100	Not Calc	
France	17	Phocoena phocoena	0.038	500	Not Calc	
France	10	Delphinus delphis	0.129	226	Not Calc	
France	11	-	0.000	0		
France	12	-	0.000	0		
Ireland	20	-	0	0		
Ireland	24	-	0	0		
Ireland	21	-	0	0		
Ireland	22	-	0	0		
Ireland	23	-	0	0		
Italy	25	-	0	0		
Lithuania	26	-	ni	ni		No observations
Lithuania	27	-	ni	ni		No observations
Netherlands	28	-	0	0		
Netherlands	29	-	0	0		
Poland	31	-	0	0		
Poland	30	-	0	0		
Spain	33	-	ni	ni		No Observations
Spain	32	-	ni	ni		No Observations
UK	34	-	0	0		
UK	35	-	0	0		
UK	36	-	0	0		No Observations
UK	37	-	0	0		No Observations
UK	38	-	0	0		
Sweden	41	-	0	0		
Sweden	42	-	0	0		
Sweden	43	-	0	0		
Sweden	44	-	0	0		No Observations
Sweden	45	-	0	0		

17.8 Table 7. Pinger use by fleet segment

COUNTRY	FLEET SEGMENT	PINGERS MANDATORY?	% VESSELS USING PINGERS	COMMENTS
Denmark	1	yes	Unknown	
Finland	8	yes	0	ICES Subdivision 24 (Setnets)
Finland	9	yes	0	ICES Subdivision 24(Driftnets)
France	18	yes	Unknown	
France	10	no	<10% mainly area 7	control and experimental trawls, sea bass pair trawling, observers on board
Ireland	19	yes	ni	
Ireland	20	no	0	
Ireland	21	no	0	
Ireland	22	no	0	scientific survey trips only
Ireland	23	no	VI, VII	scientific survey trips only
Ireland	24	no	0	
Lituaia	27	yes	Unknown	
Poland	31	yes	At least 9–10 vessels got pingers	
Spain	32	yes	ni	
UK	39	yes	Unknown	Only some métiers require pingers
UK	40	yes	Unknown	
Sweden	45	yes	Unknown	

17.9 Table 8. Mediterranean Sea: Summary of recent protected species bycatch data and estimates of totals

The data presented here are extracted from Casale *et al.*, 2004; Fortuna, 2008; Tudela *et al.*, 2005; Brotons *et al.*, 2007; Sagarminaga, 2008.

COUNTRY	REGION	GEAR/FISHERY	YEAR	COVERAGE %	SPECIES	OBSERVED	ESTIMATE (CV)
Italy	Mediterranean	Bottom Trawl	1999/2000	0.004	Bottlenose dolphin	0	
					Loggerhead turtle	62	4273 (CI: 2186-8546)
Italy	Mediterranean	Pair midwater/pelagic trawl	1999/2000	0.011	Bottlenose dolphin	0	
					Loggerhead turtle	0	
Italy	Mediterranean	Pair midwater/pelagic trawl	Jul 2006–Nov 2008	2.3	Bottlenose dolphin	2 dead, 1 released	34 (NA)
					Loggerhead turtle	78 (released alive) + 2 (dead)	1284 bycaught (NA) 34 dead (NA)
Morocco	Mediterranean	IUU driftnets	Dec 2002–Sept 2003	0.6	Striped and common dolphins	237	3647 (95% CI 537) - 50% Sc & 50% Dd
					Loggerhead turtle	46	
Spain	Mediterranean	Trammelnet	2001–2003	NA	Bottlenose dolphin	2	
Spain	Mediterranean	Surface longlines		NA	Loggerhead turtle	588	
Romania (EU)	Black Sea	Turbot gillnets	2002–2006	NA	Harbour porpoise	46	NA
					Common dolphin	3	NA
					Bottlenose dolphin	2	NA
Turkey	Black Sea		1999, 2002, 2003	NA	Harbour porpoise	68	
					Common dolphin	0	
					Bottlenose dolphin	1	

17.10 Table 9. Northern Northeast Atlantic: Observed bycatch in Faroes, Greenland, Iceland and Norway from 2002 onward

These data are extracted from NAMMCO, 2003; 2004; 2005; 2006; in press, and for 2008 are provided by Droplaug Olafsdóttir, (pers. comm.) for Iceland and Ole Heinrich for Greenland. Data from the Faroes and Greenland are from 'incidental reports'. The Icelandic data are mainly from fishery logbooks with a few incidental reports. The Norwegian data are from diverse sources, as explained in the main text.

COUNTRY	REGION	FISHERY	YEAR		OBSERVED
Faroes	Faroe shelf	Long-line	2007	Grey seal	1
			2006		0
		Long-line	2005	Harbour porpoise	1
		Long-line	2004	Grey seals	2
			2003		0
			2002		0
Greenland		Bundgarn	2008	Humpback whale	1
		Codgarn		Humpback whale	1
		Salmon net		Minke whale	1
		Sealnet		Narwhal	1
		Sinknet		Narwhal	1
			2007		?
		Cod poundnet	2006	Humpback whale	2
				Bowhead whale	1
	W. Greenland		2005	Humpback whale	4
	W. Greenland		2004	Humpback whale	2
			2003	Humpback whale	1
	W. Greenland	Salmon net	2002	Humpback whale	1
	W. Greenland	Crab trap		Humpback whale	2
	W. Greenland	Crab trap		Fin whale	1
	W. Greenland	Crab trap		Minke whale	1
Iceland		Gillnet	2008 Jan-Jun	Harbour seal	44
		Gillnet		Unid. dolphin	84
		Gillnet		Harbour porpoise	3
		Gillnet	2007	Common seal	32
		Gillnet		Grey seal	5
		Gillnet		Harp seal	4
		Gillnet		Ringed seal	1
		Gillnet		Bearded seal	1
		Gillnet		Unid. dolphin	8
		Gillnet		Harbour porpoise	147
		Gillnet	2006	Common seal	91
		Gillnet		Grey seal	5
		Gillnet		Harp seal	2
		Gillnet		Bearded seal	1
		Gillnet		Hooded seal	1
		Gillnet		Unid. dolphin	4
		Gillnet		Harbour porpoise	120
		Gillnet		White-beaked dolphin	2
		Gillnet		Common seal	58

Country	Region	Fishery	Year		Observed
		Gillnet	2005	Grey seal	2
		Gillnet		Ringed seal	1
		Gillnet		Unid. dolphin	14
		Gillnet		Harbour porpoise	219
	N. Iceland	Gillnet		Minke whale	1
	E. Iceland	Fish-farming pen		Minke whale	1
		Gillnet	2004	Common seal	70
		Gillnet		Grey seal	7
		Gillnet		Harp seal	2
		Gillnet		Ringed seal	1
		Gillnet		Unid. dolphin	3
		Gillnet		Harbour porpoise	362
	NW Iceland	Purse seine		Humpback whale	1
		Gillnet	2003	Common seal	12
		Gillnet		Harp seal	1
		Gillnet		Ringed seal	2
		Gillnet		Bearded seal	2
		Gillnet		Harbour porpoise	167
		Sinknet		Humpback whale	3
		Bottom trawl		Humpback whale	1
		Gillnet	2002	Common seal	42
		Gillnet		Grey seal	6
		Gillnet		Harp seal	1
		Gillnet		Ringed seal	4
		Gillnet		Bearded seal	4
		Gillnet		Hooded seal	4
		Gillnet		Unid. Dolphin	2
		Gillnet		Harbour porpoise	128
		Gillnet		White-beaked dolphin	4
Norway	ICES area IIa2	Gillnet	2006	Common seal	23
	ICES area IIIa	Gillnet		Common seal	1
	ICES area Iva	Fish trap		Common seal	1
	ICES area Iva	Gillnet		Common seal	2
	ICES area IIa	Gillnet		Grey seal	10
	ICES area Ia	Gillnet		Harp seal	8
	ICES area Ia	Gillnet		Harbour porpoise	1
	ICES area IIa2	Gillnet		Harbour porpoise	134
	ICES area IIIa	Gillnet		Harbour porpoise	10
	ICES area Iva	Gillnet		Harbour porpoise	4
	ICES area IIa	Gillnet	2005	Common seal	6
	ICES area IVa	Gillnet		Common seal	1
	ICES area IVa	Lobster trap		Common seal	3
	ICES area IIa	Gillnet		Grey seal	13
	ICES area IIb	Gillnet		Harp seal	8
	ICES area IIa	Gillnet		Harbour porpoise	21
	ICES area IVa	Gillnet		Harbour porpoise	5

17.11 Table 10. Northwest Atlantic Region; recent estimates of bycatch of protected species-USA and Canada

Country	Region	Gear/Fishery	Year	Coverage %	Species	Observed	Estimate (CV)
USA	Atlantic	Northeast Gillnet	2007	7.00	Harbor Porpoise	35	395 (0.37)
					Short-beaked Common Dolphin	1	11 (1.08)
					Harbor Seal	6	92 (0.48)
					Gray Seal	80	886 (0.24)
					Harp Seal	11	119 (0.35)
USA	Atlantic	Mid-Atlantic Gillnet	2007	6.00	Harbor Porpoise	1	58 (1.03)
					Harp Seal	1	38 (0.90)
USA	Atlantic	Northeast Mid-water Trawl	2007	1.00	No Bycatch Observed		
USA	Atlantic	Mid-Atlantic Mid-water Trawl	2007	31.40	White-sided Dolphin	1	3 (0.70)
					Short-beaked Common Dolphin	1	3 (0.70)
					Pilot Whale spp.	1	5 (0.70)
USA	Atlantic	Northeast Bottom Trawl	2007	6.00	Pilot Whale spp.	4	12 (0.35)
					Short-beaked Common Dolphin	3	24 (0.28)
					White-sided Dolphin	1	147 (0.35)
					Gray Seal	9	unkb
					Harbor Seal	3	unkb
USA	Atlantic	Mid-Atlantic Bottom Trawl	2007	3.00	Pilot Whale spp.	0a	36 (0.38)
					Short-beaked Common Dolphin	0a	66 (0.27)
					White-sided Dolphin	2	21 (0.24)
			1996–2004	0.80	Loggerhead Sea Turtle	66	616d

COUNTRY	REGION	GEAR/FISHERY	YEAR	COVERAGE %	SPECIES	OBSERVED	ESTIMATE (CV)
USA	Atlantic	Scallop Trawl	2004-2005	2.70	Loggerhead Sea Turtle	8	81-191 (0.32-0.50)e
USA	Atlantic	Scallop Dredge	2005	3.00	Loggerhead Sea Turtle	0	0 (0.19)f
Canada	Atlantic	Herring Weir	2007	Unkc	Harbor Porpoise	3	3 (unkc)

a. The method used to estimate bycatch mortality of cetaceans in bottom-trawl gear includes data pooled over years and a bycatch rate is predicted using a generalized linear model. The pooled data are treated as one dataset and assumed to represent average fishing practices during the period (2000–2005). Therefore, if there was no observed bycatch reported for any subsequent years (e.g. 2007), this does not imply that there was no bycatch during that year. Year was not selected by the model as an important factor associated with observing pilot whale spp. and common dolphin bycatch (Rossman, 2006 in review).

b. Analysis of bycatch mortality for pinniped species attributed to the Northeast bottom-trawl fishery has not been developed.

c. Canada has not reported coverage level for the Herring Weir Fishery; Unk=unknown.

d. The loggerhead sea-turtle estimate represents mean annual mortality during the reported period; Coefficient of Variation (CV) not reported (Murray, 2006).

e. Three different methods were used to estimate bycatch. The estimate represents the midpoint from 6 different estimates. The range of CV's shown coincides with the 6 different estimates (Murray, 2007).

f. Prior to 2005 there was documented bycatch of loggerhead sea turtles in the scallop dredge fishery (Murray, 2004; 2004a; 2005).

17.12 Table 11. Overview of EU elasmobranch bycatch extracted WGEF report (ICES 2008c)

Species	Gear types mentioned by WGEF	Comments
Basking shark	Gillnet (mainly coastal), trawls, entanglement in pot ropes	All EU fleets are required to discard any catches of basking sharks. Quantification of bycatch and discarding is required for the entire ICES area. In Norwegian waters live bycaught basking sharks must be released immediately and in the EU these fish cannot be retained on board. However this means that in practice there is little or no information on catch rates by EU fleets because of the discarding practice. WGEF suggest a better protocol for recording and obtaining scientific data from these bycatches is needed in order to properly assess this stock. They recommend a proper quantification of basking shark bycatch and discarding (by numbers and weight) is required for the entire ICES area.
Spurdog	Mixed trawl, hand-held gear, longlines, gillnets	Outside II and IV there is currently a "TAC" of 5% bycatch quota in north sea in order to prevent fisheries targeting aggregations of these fish. A reduction in effort in mixed trawl fisheries should result in bycatch reduction. WGEF recommend that a review of the catch composition of fixed gear fisheries that capture spurdog should be undertaken and those taking a large proportion of adult females should be strictly regulated.
Siki shark	Mixed trawl fisheries, gillnet	The term siki shark is used to encompass a number of deep-water shark species. A number of effort regulations exist in the targeting of these species, and two council regulations (EC) No 1568/2005 and EC no 41/2007 ban the use of gillnets in waters over 200m and 600m in depth respectively. Discarding of these species is likely to occur in the southern fishery where restrictive quotas for shark are in place. Some countries are known to discard certain species and there is anecdotal information to suggest that discarding of rotten deep-water shark species occurs in gillnet fisheries after excessive soak times.
Kitefin shark	Mixed deep-water fisheries, and 3 were recorded in the Irish horse mackerel fisheries in Subarea VIIc at 300 m depth	In 2006 the advice from ICES was that Kitefin shark be managed as part of deep-sea shark fisheries and that no targeted fisheries should be permitted unless there are reliable estimates of current exploitation rates and sufficient data to assess productivity." There were no discard rates available for this species.

Skates & Rays	Beam trawls fitted with outrigger, longlines, VHO trawls	Under EU legislation, there are a number of restrictions on mesh size, which can be used when targeting rays and skates, and in UK waters there are local bylaws, which state the minimum landing size allowed for these species. A number of bycatch and discarding estimates exist for demersal elasmobranchs in certain areas of the ICES region. However the group again notes that these species are prone to being unidentified or underreported. No discard data were available for sharks or rays in the Norwegian sea. In the North Sea, Skagerrak, Kattegat and eastern Channel discard data and length frequency data are being collected for these species by a number of countries.
Blue shark	Major bycatch in Tuna fisheries	EU regulation 1185/2003 prohibits the removal of fins from these species and subsequent discarding of the body by all community vessels in all waters, and other vessels in community waters. As blue sharks have a low commercial value discard rates for this species are unknown and a better quantification of these rates will be needed to conduct proper stock assessments. Observer records demonstrate substantially more blue sharks are caught then reported
Porbeagle shark	Longline and trawl fisheries	WGEF recommend that additional measures should be taken to prevent porbeagle bycatch in fisheries targeting other species and suggest that live porbeagles should be released from longline fisheries as a method of bycatch mitigation. Because this species is of high commercial value discard rates are thought to be low.

17.13 Table 12. Proposed headings for spreadsheets used for data submission for input to database

Fleet Table	Fleet index	Country	Vessel Size range	Fishing Areas (ICES)	Gear Type	Gear FAO code	Mesh Size (mm)	FAO Species (Top 3)	Natural Quarter (1–4)	Required Coverage %	Comments				
Fleet Effort Table	Fleet Index	Sample Index	Fishing Areas (ICES)	Year	Month	No. of vessels	No. of trips	No. of days	No. of hauls	No. of fishing hours	Piners Used (Yes/No)	No. of vessels with pingers	Pinger days	Pinger type(s)	Other mitigation methods
Sample Effort Table	Sample Index	Bycatch Index	Sample required (Yes/No)	Sample Representative (Yes/No)	No. of vessels	No. of trips	No. of Days	No. of hauls	No. of fishing hours	Piners Used (Yes/No)	No. of vessels with pingers	Pinger days	Pinger type(s)	Other mitigation methods	
Bycatch Table	Bycatch Index	FAO Species	No. of animals	No. of Incidences	CV (%)	Pingers Used	Pinger Type(s)	Pinger Spacing (m)	Pinger functional (Yes/No)						

17.14 Table 13. Summary of Pilot Projects carried out under Regulation 812/2004

YEAR	COUNTRY	PROJECT	STATUS	RESULTS
2006	Denmark	A Danish patrol vessel was equipped with a pinger detection device.	Completed	-
2006	Denmark	Investigation on the effects of pinger spacing on bycatch	Completed	Pingers were found to remain effective at reducing bycatch at larger spacing's. Under national administrative law, pinger spacing was increased from 200 metres to 455m (100% reduction in harbour porpoise bycatch was observed using this pinger spacing in the North Sea hake fishery.)
2006	Denmark	Trials of alerting pingers	Completed	Did not yield promising results as a technology to reduce harbour porpoise bycatch.
2006	Finland	Technical assessment of pinger handling and durability – 3 models trialled	Completed	There were problems with durability for all 3 models under commercial fishing conditions.
2006	Ireland	Technical assessment of pinger handling and durability – 4 models trialled	Completed	(See BIM, 2006) Damage to pingers and entanglement with gear was observed. In addition more than half of one model was found to have stopped working by the end of the trial. A modified attachment system developed by BIM was found to boost durability.
2006	Sweden	Static acoustic monitoring of harbour porpoise in ICES area 24 and 25	Ongoing	
2006	Sweden	Effect of pingers on seals	Completed	A higher incidence of seal interaction with nets was observed when pingers were deployed.
2006	Sweden	Technical assessment of pinger handling and safety	Completed	No practical problems found although boats using wire net clears needed to modify how nets were set.
2006	UK	Observer monitoring of <15 m vessels	Completed	No cetacean bycatch was observed in 34 days at sea by driftnetters in VIIe or 5 days in 15m gillnetting vessels in ICES Via, VIIa and b, VIIa, b and c, and IXa. Common dolphin bycatch in set gillnets and tanglenets in VII estimated at 153 and 554 in 2005 and 2006 respectively, harbour porpoises 464 and 730 in 2005 and 2006 respectively.
2007	Finland	Bycatch monitoring on 15 m and under pelagic trawlers	Completed	Monitored 5 trips out of 284 trips. No cetacean bycatch was observed

YEAR	COUNTRY	PROJECT	STATUS	RESULTS
2007	Finland	>15 m vessels. Requirement to report all bycatches to Employment and Economic Development Centres	Ongoing	No bycatch was reported in 2006-2007
2007	France	Observer monitoring of <15 m vessels	Completed for 2007	The study monitored single pelagic trawls and netters. It demonstrates that bycatch of porpoise occurs in set-nets in area VIII with a higher bycatch in area VIIIa than area VIIIb. Eight porpoises were observed caught in 2007 in several kind of nets fish target and mesh)
2007	Ireland	Investigation on the effects of pinger spacing on bycatch	Completed	No statistical difference in bycatch rate was observed between control nets and those with pingers spaced at 200m or 600m. In June 2007 the Irish Government issued a derogation permitting an increase in maximum pinger spacing of 500m.
2007	Ireland	Trial of pelagic trawl acoustic deterrent device(s)	Completed	No evasive behavioural response was observed when various potential acoustic signals were played back to free ranging common dolphins.
2007	Sweden	Video monitoring in <15 m vessels	Ongoing	-
2007	UK	At sea observer scheme	Ongoing	UK has introduced a Monitoring, Control and Surveillance System (MCSS) for Fisheries Protection Squadron who conduct boarding at sea on behalf of the MFA. Officers have been trained in the recording of cetacean and bird bycatch.
2007	UK	Observer scheme	Ongoing	444 additional days of observer monitoring were conducted in gillnet and pair trawl fisheries outside the requirements of Regulation 812. 11 cetacean bycatches were recorded from 1,158 observed hauls in gillnet fisheries, and 22 common dolphin bycatches were recorded in 16 hauls by a pair trawl fishery.
2008	France	Investigation on the effects of pinger spacing on bycatch on cetacean bycatch - 3 models tested	Completed	The study used aerial surveys to identify areas where cetaceans and gillnet fisheries overlapped within a marine park. 3 models of pingers were then trialled on monkfish gillnets and observations of standard nets with pingers and commercial nets without pingers were made. 3 porpoise were caught in nets without pingers, and 2 were caught in nets using 1 make of pinger. In addition 1 grey seal bycatch was observed. Problems with pinger durability were noted.
2008	France	Observer monitoring of <15 m vessels	On going	The study monitors single pelagic trawls in area VII and VIII and netters in area VIII (observation targets of 5% and 1% respectively)

YEAR	COUNTRY	PROJECT	STATUS	RESULTS
2008	Italy	Deployment of Turtle Excluder Devices (TEDs) in pelagic/ midwater trawls	Ongoing	TEDs will be assessed in relation to cetacean and elasmobranch bycatch mitigation.
2008	NL	First trials with Aquamark and DDD pingers by two vessels	Report in preparation	First operational experiences by Dutch set gillnet fishers.
2008	NL	Monitoring of gillnet fishery: Trammelnets	Report in preparation	One harbour porpoise and one grey seal in 48 day trips. Estimated bycatch harbour porpoises by investigated fishery less than 10.
2008	Poland	Acoustic barrier	Ongoing	Acoustic barrier in Puck Bay
2008	Spain	Observer Scheme	Ongoing	Observer programme commenced in October 2008
2008	UK	Investigate the excluder effect of DDD pingers on cetaceans	Ongoing	There was a reduction in cetacean detections at distances up to 1-2 km from the pinger deployment site.
2008	UK	Investigation on the effects of pinger spacing on bycatch on cetacean bycatch – using DDD	Ongoing	Trials are ongoing in gill and tanglenets.
2008	Germany	Pilot study to analyse the applicability of ecologically sound fish traps as an alternative to bottom-set gillnets	Completed	Commercial fishers compared fish traps with bottom-set gillnets regarding selectivity on target and non-target species, catch efficiency and effects on habitats and species. No bycatch of marine mammals and seabirds has been recorded in fish traps. In bottom-set gillnet 14 seabirds have been bycaught in 4 trials and no marine mammals. Seabird bycatch revealed a high spatial and seasonal variability.
2008	Germany	Observer programme to study the bycatch mortality of resting and wintering seabirds in the German Baltic Sea	Ongoing	Seabird bycatch mortality is monitored by on-board observers and self-sampling of commercial fishers in coastal and offshore waters in the German EEZ. Bycatch mortality rates revealed a high spatial and temporal variability. The observer programme will be continued, until 2009.

YEAR	COUNTRY	PROJECT	STATUS	RESULTS
Starts in 2009	Germany	FLOS: Fehmarn Landing Obligation Study (lead by vTI-OSF)	Future trial	The proposed study aims at investigating the feasibility and medium-term advantages and disadvantages of a complete discard ban (or landing obligation) for the fishery, science and management for one particular fleet in the Western Baltic Sea (trawl fishery; targeting mainly cod but also herring and flatfish). All catch of marine animals including undersized fish or non-target species (including cetaceans and seabirds, if any) will be retained on board and landed. Five boats will participate in the project (9-24 m), including two gillnet fishers. Although the number of boats is low, the share in total landings is higher. Scientific observers will participate at ca. 12% of all cruises at sea and take market samplings at another 13% of all cruises.
2009	Ireland	Trial of pelagic trawl acoustic deterrent device(s)	Future trial	Aim to test the behavioural response of free ranging common dolphins to playbacks of killer whale vocalizations as a potential acoustic deterrent signal.
2009	Poland	Pinger trials	Future trial	Pilot projects will be conducted to assess practical aspects of pinger usage and effects on harbour porpoise bycatch. It is noted that the lack of any bycatch being recorded in the Polish Monitoring Scheme will make it difficult to assess if pingers are successful as a bycatch mitigation measure.

17.15 Table 14: preliminary list of data on protected species bycatch held under Data Collection Regulation and other discard surveys

Country	Region	Fishery	Years of observation	No of days observed	No of hauls observed	Estimated fleet effort: days-at-sea 2007	Estimated fleet effort: hauls 2007	Mammals	Birds	Turtles	Fish	Remarks
Poland	III	Bottom trawls	2006–2008	120		3000		0	0	0	?	
Poland	III	Pelagic trawls	2006–2008	200		6500		0	not recorded	0	?	
Poland	III	Gillnets	2006–2008	100		2500		0	not recorded	0	?	
Poland	III	Driftnets	2006–2007	200		1200		1 grey seal	477 by spp			not DCR; only 17% dead
Poland	III	Gillnets	2008	120		2500		0	0	0	n=? Twaite shad	not DCR
Poland	III	Bottom trawls	2008	120		3000		0	0	0	?	not DCR
Spain	VII	Bottom trawls	2007–2008	36	1160	17 345	1905+					tbd= to be determined
Spain	VIIIabd	Bottom trawls	2007–2008	132	583	3290	11 600+					
Spain	VIIIc, IXa	Bottom trawls	2007–2008		491	42 716						tbd
Spain	VII	VHVOBT				697	350+					
Spain	VIIIabd	VHVOBT	2007–2008	77	197	800	3000	1 Common dolphin	0	0		

Country	Region	Fishery	Years of observation	No of days observed	No of hauls observed	Estimated fleet effort: days-at-sea 2007	Estimated fleet effort: hauls 2007	Mammals	Birds	Turtles	Fish	Remarks
Spain	VIIIc, IXa	VHVOBT	2007–2008	2	81	5720	1300	0	0	0		
Spain	VII	Gillnets				1500		0	0	0		
Spain	VIIIabd	Gillnets				1900		1 Common dolphin	0	0		
Spain	VIIIc, IXa	Gillnets	2007–2008		40	5500						tbd
England	V-VIII	Beam trawl	1994–2007	816	3561			0	Gannets: 1	0	na	
England	IV	Demersal trawl	1994–2007	745	1837			Porpoise 1	0	0	na	
England	V–VIII	Demersal trawl	1994–2007	674	1487			0	0	0	na	
England	IV	Dredge	1994–2007	1	3			0	0	0	na	
England	V–VIII	Dredge	1994–2007	70	390			0	0	0	na	
England	IV	Gillnets	1994–2007	51	197			0	0	0	na	
England	V–VIII	Gillnets	1994–2007	320	837			Porpoise 18	Fulmars 42; Gannets 1; Guillemots 3	0	na	
England	IV	Hooks	1994–2007	14	21			0	0	0	na	
England	V–VIII	Hooks	1994–2007	98	98			0	Fulmars 9; Unid 1	0	na	

Country	Region	Fishery	Years of observation	No of days observed	No of hauls observed	Estimated fleet effort: days-at-sea 2007	Estimated fleet effort: hauls 2007	Mammals	Birds	Turtles	Fish	Remarks
England	IV	*Nephrops* trawl	1994–2007	316	593			0	Gannet 1; Unid 1	0	na	
England	V–VIII	*Nephrops* trawl	1994–2007	93	186			Porpoise 2	0	0	na	
England	IV	Pelagic trawl	1994–2007	22	16			0	0	0	na	
England	V–VIII	Pelagic trawl	1994–2007	78	64			Common dolphin 14; Unid dolphin: 9	0	0	na	
England	IV	Pots and traps	1994–2007	2	4			0	0	0	na	
England	V–VIII	Pots and traps	1994–2007	16	64			0	0	0	na	
England	IV	Seine	1994–2007	46	171			0	0	0	na	
England	V–VIII	Seine	1994–2007	7	29			0	0	0	na	
USA	Northeast and Mid-Atlantic	Bottom trawls	2000–2005		51 675		2 908 752	White-sided Dolphin 74; Common Dolphin 39; Pilot Whale spp. 12	tbd	na	na	not DCR; fleet effort reported in hours; na=not applicable; tbd=to be determined
USA	Mid-Atlantic	Bottom trawl	1996–2004		18 665		5 691 840	na	na	66 Loggerhead	na	not DCR; fleet effort reported in hours; na=not applicable

Country	Region	Fishery	Years of observation	No of days observed	No of hauls observed	Estimated fleet effort: days-at-sea 2007	Estimated fleet effort: hauls 2007	Mammals	Birds	Turtles	Fish	Remarks
USA	Mid-Atlantic	Scallop trawl	2004–2005		830		29895	na	na	8 Loggerhead	na	not DCR; na=not applicable
Ireland	VIIg	*Nephrops* trawl	2003	11	17			0	0	0		
Ireland	VIIg	Seiner	2004	11	36			0	0	0		
Ireland	VIIa	*Nephrops* trawl	2004	7	19			0	0	0		
Ireland	VIIg	*Nephrops* trawl	2004	8	20			0	0	0		
Ireland	VIIg	*Nephrops* trawl	2005	9	20			0	0	0		
Ireland	VIIg	Seiner	2005	4	19			0	0	0		
Ireland	VIIg	*Nephrops* trawl	2005	10	19			0	0	0		
Ireland	VIIj	Seiner	2005	15	56			0	0	0		
Ireland	VIIb	*Nephrops* trawl	2006	8	35			0	0	0		
Ireland	VIIb	*Nephrops* trawl	2007	12	26			0	0	0		
Ireland	VIIg	*Nephrops* trawl	2008	7	14			0	0	0		
Sweden	IIIb–d	Cod directed trawl fishery	2004–2007	174		6000		0	na	0		

Country	Region	Fishery	Years of observation	No of days observed	No of hauls observed	Estimated fleet effort: days-at-sea 2007	Estimated fleet effort: hauls 2007	Mammals	Birds	Turtles	Fish	Remarks
Sweden	IIIa S	Bottom trawl for demersal species	2004–2007	218		2323		0	na	0		
Sweden	IIIa S	*Nephrops* trawl fishery	2004–2007	216		11624		0	na	0		
Sweden	IIIa N	*Nehprops* trawl fishery with sorting grid	2004–2007	104		7755		0	na	0		
Sweden	IIIa N	Pandalus trawl fishery	2004–2007	28		5000		0	na	0		
Germany	IV	Beam trawls targetting fish and brown shrimp	2002–2007	191	370	16 909		0	not recorded	-	yes, recorded	
Germany	IV	Gillnets	2002–2007	69	180	385		7 harbour porpoises (all in 2003)	2 Uria aalge, 1 Fulmarus glacialis (all 2003)	-	yes, recorded	
Germany	IV	Bottom trawls incl. seines	2002–2007	449	669	3108		0	not recorded	-	yes, recorded	

Country	Region	Fishery	Years of observation	No of days observed	No of hauls observed	Estimated fleet effort: days-at-sea 2007	Estimated fleet effort: hauls 2007	Mammals	Birds	Turtles	Fish	Remarks
Germany	all regions without III,IV	Bottom trawls	2002–2007	1007	1871	450		0	not recorded	-	yes, recorded	
Germany	all regions without III	Pelagic trawls	2002–2007	1454	1546	541		0	not recorded	-	yes, recorded	
Germany	IV	Dredges	no observer	-	-	32		-	-	-	-	
Germany	IV	Miscellaneous (not specified)	no observer	-	-	184		-	-	-	-	
Germany	IV	Pole lines	no observer	-	-	1		-	-	-	-	
Germany	all regions without III,IV	Pots and traps	no observer	-	-	380		-	-	-	-	
Germany	all regions without III,IV	Gillnets	no observer	-	-	416		-	-	-	-	
Germany	IV	Trammelnet	no observer	-	-	0		-	-	-	-	

German days observed = days at sea incl. steaming

Germany no of hauls observed: in case of gillnets specified is the number of nets

German fleet effort is calculated by fishing time in hours divided by 24

USA fleet effort reported in hours;

Na = not applicable;

Tbd = to be determined

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Annex 2: Terms of Reference

The terms of reference as adopted by the working group were as follows:

Coordinate bycatch monitoring programmes under EU Regulation 812/2004 and the Habitats Directive and review annual national reports submitted to the Commission under Regulation 812/2004;

Review any other new estimates of bycatch of relevant species for the EU region that are not included in national reports on Regulation 812;

Review ongoing bycatch mitigation trials and make recommendations for further work;

In association with the ICES data centre, design and establish a database for cetacean bycatch in European Community and adjacent waters and make recommendations.

Continue to review and update the Compendium of Mitigation Methods and Technologies that have been used to minimize bycatch of species of interest, including methods that have failed;

To review such pilot studies as have been carried out under the 812 Regulation;

To review and collate available information collected under the DCR on protected species bycatch in demersal trawl fisheries, and other relevant fisheries;

Continue to consider technical aspects of bycatch monitoring and assessment-inter-alia to consider how to assess the representativeness of existing monitoring programmes, how to determine bycatch reference limits, how best to determine sampling levels that should be applied to specific fisheries, and best methods for extrapolating observed bycatch rates to the fleet level taking account of the work of WKDRP.

Consider ways to encourage, instigate or expand bycatch monitoring schemes and promote further development of bycatch mitigation measures in further EU Member States and adjacent areas.

Review mechanisms and solutions across species groups relating to bycatch of protected species in gillnets.

To consider the EC request to ICES for advice on the establishment of a European Plan of Action for Seabirds, specifically with respect to information on seabird bycatch.

To examine the draft EU database compiled from reports in fulfilment of Article 17 of Directive 92/43/EEC (the Habitats Directive), comment upon its usefulness and make recommendations.

Annex 3: Catalogue of bycatch mitigation measures by method, gear type and species concerned, from the Bycatch Consortium database (see Section 8, ToR E, above)

Mitigation Methods	Specific Device	Fishing Gear	Species	Species Category	Test forum	Performance	Regulatory status	Comments	References
Active acoustic devices	Pingers	Gillnets	Porpoises	Cetaceans	US, EU, Mediterranean Gillnet fisheries	Effective	Required		Kraus, 1997, Larsen, 1999
Active acoustic devices	Pingers	Driftnets	Sea lions	Pinnipeds	California swordfish and sharks fishery	Effective	Required		Barlow and Cameron, 2003
Active acoustic devices	Pingers	Gillnets	Harbour seals	Pinnipeds	Washington salmon and sturgeon fishery	Ineffective	Required		Gearin *et al*., 2000
Active acoustic devices	Pingers	Gillnets	Franciscana river dolphin	Cetaceans	Argentinean fishery	Effective		Reduced bycatch but dinner bell for sea lions	Bordino *et al*., 2002
Active acoustic devices	Pingers	Bottom trawl?	Dugongs	Dugongs	Australian fishery	Inconclusive	Not required		Anon, 2003
Active acoustic devices	Pingers	Fish traps	Humpback whale	Cetaceans	Newfoundland cod and pollack	Effective			Lien *et al*., 1992
Active acoustic devices	Pingers	Gillnets	Hector's Dolphin	Cetaceans	New Zealand fishery	Effective			Stone *et al*., 1997
Active acoustic devices	Pingers	Gillnets	Common Murre, Rhinoceros auklet	Birds	Puget sound salmon, NW US Pacific	Not significant		Reduced bycatch of Common Murre, but not the Rhinoceros auklet	Melvin *et al*., 1999

Mitigation Methods	Specific Device	Fishing Gear	Species	Species Category	Test forum	Performance	Regulatory status	Comments	References
Active acoustic devices	Pingers	Gillnet	Harbour porpoise	Cetaceans	Sweden, Skaggerak Sea	No bycatch observed		No bycatch was observed in either nets with or without pingers. Target catch was not affected.	Carlstrom *et al*., 2002
Active acoustic devices	Modified/Interactive Pingers	Pelagic trawls	Common dolphins	Cetaceans	IRL, DM, FR pelagic trawls bass albacore, bow riding	Inconclusive & Inconsistent	Not required		Anon, 2006
Active acoustic devices	Modified/Interactive Pingers		Bottlenose Dolphins	Cetaceans	IRL, Bow riding experiments	Effective	Not required		Leeney *et al*., 2007
Active acoustic devices	Oil Filled tubes	Purse Seine	Dolphins	Cetaceans	Japanese and Tunisian fisheries	Short term, followed by habituation			SGFEN, 2001.
Active acoustic devices	Pyrotechnics		Killer whales	Cetaceans	Alaska Sablefish	Ineffective	Illegal	Also ineffective for California Sea Lion	Dahlheim, 1998
Active acoustic devices	Transponder signaled closed codends	Trawls				Operationally possible	Not required	Yet to be tested in sea trials	Pennec and Woerther, 1993
Active acoustic devices	Arc-discharge transducer	Trawls, Purse Seines	Fur seals	Pinnipeds	South Africa Hake fishery	Some effect in trawls, Not effective in purse-seines			Shaughnessy *et al*., 1981

Mitigation Methods	Specific Device	Fishing Gear	Species	Species Category	Test forum	Performance	Regulatory status	Comments	References
Active acoustic devices	AHDs	Gillnets, trawls	Harbour seal, fur seals	Pinnipeds	Oregon Salmon fishery, New Zealand hoki	Ineffective		Worked for porpoises in Bays in British Columbia	Geiger and Jefferies, 1987 Stewardson and Cawthorn, 2004
Active acoustic devices	Predator sounds (Killer whales)	Area tests	Gray whale Beluga whale Dall's Porpoise	Cetaceans	California Coast, Alaska, Japan	Effective			Cummings and Thompson, 1971; Fish and Vania, 1971; Jefferson and Curry, 1996
Active acoustic devices	Predator sounds (Killer whales)	Purse Seine?	California Sea Lion	Pinnipeds	Washington	Ineffective			Cummings and Thompson 1971; Fish and Vania, 1971; Scordino and Pfeifer, 1993; Jefferson and Curry, 1996
Active acoustic devices	AHDs	Traps and gillnets	Grey Seal	Pinnipeds	Baltic Sea		Not required	Mixed results. Testing driven by increasing predation by seals	Fjalling *et al*., 2006
Active acoustic devices	Pingers	Gillnets	Grey Seal	Pinnipeds	Baltic Sea		Ineffective	Negative results. Dinner bell and increased predation observed	Stridh, 2008

Mitigation Methods	Specific Device	Fishing Gear	Species	Species Category	Test forum	Performance	Regulatory status	Comments	References
Active acoustic devices	Pingers	Gillnets	Beaked whales	Cetaceans	California, USA	Reduced beaked whale bycatch to zero	Effective		Carretta *et al*., 2008
Active acoustic devices	Pingers	Trawls	Common dolphin	Cetaceans	North-East Atlantic		Effective	No effect on the target species	Morizur *et al*., 2008
Alternative buoy ropes	Break away lines, light messenger ropes, glow ropes, acoustic triggers	Traps and Gillnets	Northern Right whales	Cetaceans	US and Canada fisheries	more data required			Werner *et al*., 2006
Bait & Lure Alterations	Dyed bait (blue)	Longlines	albatross spp	Birds	Hawaiian swordfish/tuna	Effective			McNamara, 1999; Boggs, 2001; Gilman *et al*., 2003a
Bait & Lure Alterations	Dyed bait (blue)	Longlines	loggerhead, leatherback turtles	Turtles	Costa Rica, West Atlantic	Ineffective			Swimmer *et al*., 2005; Watson *et al*., 2002
Bait & Lure Alterations	Dripping oil behind the vessel	Hooks and Lines	Seabirds	Birds	New Zealand	Effective		Galeorhinus galeus liver oil dripped behind fishing vessels reduced seabird numbers and dives on bait The shark liver oil did not affect the catch of target species.	Pierre and Norden, 2006
Bait & Lure Alterations	Weighted Bait	Longlines	albatross spp	Birds	Atlantic swordfish	Effective			Boggs, 2001

Mitigation Methods	Specific Device	Fishing Gear	Species	Species Category	Test forum	Performance	Regulatory status	Comments	References
Bait & Lure Alterations	Novel Bait switch to mackerel	Longlines	loggerhead, leatherback turtles	Turtles	Atlantic	No effect		Noxious bait no effect on California Sea Lion either	Watson *et al.*, 2005
Bait & Lure Alterations	Warp cable modification	Trawl	Kelp gull and Black-browed albatross	Birds	Argentina, West Atlantic	Effective at reducing seabird bycatch			Gonzalez-Zevallos *et al.*, 2007
Bait & Lure Alterations	Funnel and scaring lines	Demersal longline	Albastross and petrels	Birds	South Africa	Effective		Sub-sea sets using a funnel reduced seabird bycatch	Ryan and Watkins, 2002.
Bait & Lure Alterations	Streamer Lines & towed buoys	longlines	albatross other seabirds	Birds	Hawaiian swordfish, Norwegian Longline	effective			Boggs, 2001; Lokkeborg, 2001; McNamara *et al.*, 1999
Bait & Lure Alterations	Circle Hooks	Longlines	turtles	Turtles	Global Longline fisheries	effective but may increase shark catches	Required in some instances	Other: Deeper sets, single bait hooking, minimizing day soak time,	Gilman *et al.*, 2005; Gilman *et al.*, 2006; Gilman *et al.*, 2007; Watson *et al.*, 2004
Bait & Lure Alterations	Rare-earth magnets	Hooks and lines	Spiny dogfish	Elasmobranchs	Gulf of Maine, USA	No significant reduction in bycatch	Not required	Experimental & Field trials	Tallack *et al.*, 2009

Mitigation Methods	Specific Device	Fishing Gear	Species	Species Category	Test forum	Performance	Regulatory status	Comments	References
Bait & Lure Alterations	Rare-earth magnets	Longlines	Spiny dogfish	Elasmobranchs	Alaska	Slightly reduced bycatch of spiny dogfish but had a greater reduction on catch of longnose skate	Not required	No effect on target catch of halibut.	Kaimmer and Stoner, 2008
Bait & Lure Alterations	Circle Hooks	Longlines	Turtles	Turtles	Mediterranean Sea	Some success with circle hooks	Not required	Experimental stage	ICES WGFTFB, 2008
Bait & Lure Alterations	Quick release metal wire	Troll fishery	Bottlenose dolphin	Cetacean	Florida	Effective		Reduced bottlenose dolphin depredation on King mackerel and did not effect catch.	Zollet and Read, 2006.
Exclusion Devices	Sorting grid	Trawls	8 species of groundfish	Boney fish	Gulf of Maine, USA	Effective		Increased larger shrimp in the target catch.	Richards and Hendrickson, 2006
Exclusion Devices	TEDs	Trawls	turtles, sharks, rays	Turtles	Global Shrimp fisheries	extremely effective	Required		Clark *et al*., 1991; Shiode and Tokai, 2004

Mitigation Methods	Specific Device	Fishing Gear	Species	Species Category	Test forum	Performance	Regulatory status	Comments	References
Exclusion Devices	TEDs	Bottom trawls	Turtles, sharks, rays	Turtles	Mediterranean Sea	Effective at reducing turtle bycatch and reducing debris. Losses of marketable fish a problem	Not required	Experimental and needs further development	Sala *et al*., 2008 (project LIFE 04 NAT/IT/000187) and E.Taskavak and S. Atabey (Turkish study)
Exclusion Devices	TEDS	Shrimp trawls	Turtles	Turtles	Cameroon	Not yet evaluated	Proposed	Experimental but extensive testing of super shooter, double flap cover.	REFERENCE REQUIRED
Exclusion Devices	TEDS	Shrimp trawls	Turtles	Turtles	Nigeria		Required (Super shooter, double flap cover) US certified	Big incentives in US market certification; socio-economic effects need to be studied	REFERENCE REQUIRED
Exclusion Devices	TEDS	Shrimp trawls	Turtles	Turtles	Mexico	Effective in reducing turtle bycatch	Required (Super shooter, double flap cover) US certified		REFERENCE REQUIRED
Exclusion Devices	BRDs	Trawls	Boney fish	Fish	Washington, Oregon and Northern California, USA	Effective	Not required	Fish bycatch was 66%–88% of historical levels	Hannah and Jones, 2007

Mitigation Methods	Specific Device	Fishing Gear	Species	Species Category	Test forum	Performance	Regulatory status	Comments	References
Gear Modification	Bird scarers- tori line, Brady baffler & warp scarer	Trawls	Seabirds	Birds		Effective		All three scarers reduced bird bycatch, but tori lines were the most effective.	Sullivan *et al*., 2006
Gear Modification	Modified codend	Trawls	Boney fish	Fish	Australia	Variable results: the square mesh codend most effective		Square mesh codend reduced bycatch by 71% without reducing target catch (squid)	Scandol *et al*., 2006
Gear Modification	Modified trap	Trap net	Grey seal and ringed seal	Seal	Baltic	Effective		Reduced seal depredation. The target catch of salmon and whitefish remained same or increased in 4 of 5 modified traps.	Suuronen *et al*., 2006
Gear Modification	Square mesh codend	Trawls	Small fish, crabs, urchins and undersized scallops	Boney fish and invertebrates.	Australia	Effective		Reduced bycatch of non-target and undersized species. Did not affect catch of target scallop or prawns.	Cambell and Courtney, 2006

Mitigation Methods	Specific Device	Fishing Gear	Species	Species Category	Test forum	Performance	Regulatory status	Comments	References
Gear Modification	Chain mat	Scallop Dredge	Loggerhead, leatherback and green turtles	Turtles	Gulf of Maine	Effective		Eliminated bycatch but reduced target catches by 6.7%.	DuPaul *et al.*, 2004
Gear Modification	Modified leader line	Pound Net	Turtles	Finfish	Chesapeake Bay, USA	Effective		Reduced loggerhead turtle interactions and did not reduce target catch.	DeAlteris *et al.*, 1997
Exclusion Devices	TEDS	Shrimp trawls	Turtles	Turtles	Venezuela	Effective in reducing turtle bycatch	Required (Super shooter, double flap cover and single covernet) US certified	50% of commercial catch is lost through the use of TEDs	Marcano *et al.*,, 1998.
Exclusion Devices	SEDs	Trawls	Seals	Seals	Australia	Effective		The SED with the top opening reduced seal bycatch. No information on the effect on the target catch (blue grenadier)	Tilzey *et al.*, 2006

Mitigation Methods	Specific Device	Fishing Gear	Species	Species Category	Test forum	Performance	Regulatory status	Comments	References
Exclusion Devices	TEDS	Shrimp trawls	Turtles	Turtles	Columbia	Effective in reducing turtle bycatch	Required (Super shooter, double flap cover) US certified	Big incentives in US market certification; socio-economic effects need to be studied; 20-40% loss of marketable fish catch	REFERENCE REQUIRED
Exclusion Devices	TEDS	Shrimp trawls	Turtles	Turtles	Costa Rica	Effective in reducing turtle bycatch	Required (Modified Super shooter with a separation between bars of 6 inch, double flap cover) US certified	Big incentives in US market certification; socio-economic effects need to be studied	REFERENCE REQUIRED
Exclusion Devices	TEDs	Shrimp/Fish Trawls	Turtles	Turtles	Trinidad & Tobago		Not required	Extensive experimentation with different designs	REFERENCE REQUIRED
Exclusion Devices	TEDs	Shrimp/Fish trawls	Turtles	Turtles	Bahrain		Not required	Extensive experimentation with different designs	REFERENCE REQUIRED

Mitigation Methods	Specific Device	Fishing Gear	Species	Species Category	Test forum	Performance	Regulatory status	Comments	References
Exclusion Devices	TEDs	Shrimp/Fish Trawls	Turtles	Turtles	Iran		Required (super shooter, double flap net cover & AUSTED)		REFERENCE REQUIRED
Exclusion Devices	TEDs	Shrimp trawl	Turtles	Turtles	Indonesia		Required (super shooter, double flap net cover) US Certified		REFERENCE REQUIRED
Exclusion Devices	TEDs	Shrimp trawls	Turtles	Turtles	Southeast Asia (Thailand)	Effective in reducing turtle bycatch	Required (TTFD); US certified		REFERENCE REQUIRED
Exclusion Devices	TEDs	Shrimp trawls	Turtle, sharks, rays	Turtles	Madagascar	Effective in reducing turtle bycatch;	Required (Super shooter, double flap cover); US Certified	Big incentives following certification by US.	Report on TED implementation to the fishers's association
Exclusion Devices	TEDs	Shrimp trawls	Turtles, sharks, rays	Turtles	French Guyana	Effective in reducing turtle bycatch	Proposed (Nordmore grid, double flap net cover)		REFERENCE REQUIRED

Mitigation Methods	Specific Device	Fishing Gear	Species	Species Category	Test forum	Performance	Regulatory status	Comments	References
Exclusion Devices	TEDs	Shrimp Trawls	Totoaba mcdonaldi	Fish	Upper Gulf of California (Mexico)	Effective in reducing turtle bycatch	Required in MPA (Fish eye)	Bycatch reduction of 40%	Management plan for fishing in the Upper Gulf of California (Mexico)
Exclusion Devices	SEDs	Pelagic Trawls	fur seals, sea lions	Pinnipeds	Australia, NZ, Tasmania, squid, hoki, blue grenadier fisheries	effective, esp. with top escape hatch in large mw trawls	Required ?		Gibson and Isaken, 1998; Cawthorn and Starr, in prep; Anon, 2003.
Exclusion Devices	REDs (Rigid)	Pelagic Trawls	Common dolphins	Cetaceans	UK Bass, French albacore fisheries	inconclusive	Not required		Anon, 2006
Exclusion Devices	Net panels	Pelagic trawls	Common dolphins, other MF off Africa	Cetaceans	Dutch N. Africa, UK and FR Bass fisheries	Inconclusive, difficult to handle, major loss of target species	Not required		Anon, 2006
Exclusion Devices	Net panels	Purse Seine	dolphins	Cetaceans	Eastern Tropical Pacific yellow fin tuna fishery	effective		Called the Medina panel	Werner *et al.*, 2006
Exclusion Devices	Turtle chains/modified dredges	Scallop dredge	turtles	Turtles	US scallop fisheries	effective			Smolowitz, 2006
Exclusion Devices	Trap guards (bungee cord)	Traps (crabs)	bottlenose dolphins	Cetaceans	Indian River Lagoon	effective			Noke and Odell, 2002

Mitigation Methods	Specific Device	Fishing Gear	Species	Species Category	Test forum	Performance	Regulatory status	Comments	References
Operational Practices	Night Sets	Longlines	seabirds	Birds	Hawaii fishery	effective			McNamara *et al*., 1999; Boggs, 2003
Operational Practices	Deeper sets using weighted line	Longlines	Boney fish	Birds Turtles	Hawaii fishery	Effective for some species		No change in target catch rate between control and experimental sets.	Beverly *et al*., 2008.
Operational Practices	Side Sets	Longlines	Albatross spp	Birds	Hawaiian swordfish/tuna Western North Pacific	effective			Gilman *et al*., 2003a; Gilman *et al*., 2007b; Yokota and Kiyota, 2006
Operational Practices	Underwater Sets (chutes)	Longlines	seabirds	Birds	Hawaiian tuna, Norwegian Longline	effective		Increased catch rate for target species	Lokkeborg, 2001; Gilman *et al*., 2003 b
Operational Practices	Underwater Sets (subsurface)	Gillnets	Bottlenose and Long-snouted spinner	Cetaceans	North Australia multi species	effective (reduction ~50%)			Hembree and Harwood, 1987
Operational Practices	Discarding offal during shooting	Longlines	Albatross spp	Birds	Hawaiian swordfish/tuna	effective		Distracted the birds	McNamara *et al*., 1999
Operational Practices	Time area closures	Gillnets	Hector's Dolphins	Cetaceans	New Zealand fisheries	highly effective	Required		Read *et al*., 2006
Operational Practices	Decoys (anchored boats)	Static Gears	Grey Seal	Pinnipeds	Baltic	Short term effects noted	Not required		Fishermen's Information REFERENCE ?

Mitigation Methods	Specific Device	Fishing Gear	Species	Species Category	Test forum	Performance	Regulatory status	Comments	References
Operational Practices	Dropping headline of pelagic trawls	Pelagic Trawls	Small cetaceans	Cetaceans	NE Atlantic/Bay of Biscay	Not assessed	Voluntary	Main motivation is to target larger tuna	NECESSITY REFERENCE
Hydrodynamics	Use of a hydro dredge to lift scallops off the seabed when dredging	Dredge	Scallops, starfish, crabs, urchins	Invertebrates	UK, Isle of Man	Reduced likelihood of mortality for non-target species	Not required	Increased catch of surface dwelling scallops, decreased catch of deep dwelling scallops.	Shephard *et al*., 2009
Passive acoustic devices	Reflector devices		small cetaceans	Cetaceans	SA Beach protection	effective for short period	Not required		SGFEN, 2001.
Passive acoustic devices	Reflector devices (Aquatec)	Gillnets	porpoises	Cetaceans	EU gillnet and tanglenet fisheries	Tested in Albacore tuna fishery but inconclusive results	Not required		REFERENCE NEEDED
Passive acoustic devices	Reflector devices, metallic heads, barriers	Gillnets, float lines	Bottlenose Dolphins, porpoises	Cetaceans	NZ Gillnets, Simulated gilllnets Scotland, float lines Canada	metallic head ineffective, Scotch exp. Effective, Porpoises ineffective			Hembree and Harwood, 1987; Goodson and Mayo, 1995; Koschiski and Culik, 1997
Passive acoustic devices	Reflector nets barium/iron oxide	Gillnets	porpoises	Cetaceans	Bay of Fundy, Canada fisheries, North Sea,	mixed results, generally effective, but not in UK North Sea	Not required	Use with pingers/TADs recommended, also effective for Shearwaters in Canada	Koschinski *et al*., 2006; Larsen *et al*., 2007; Trippel *et al*., 2003; Northridge *et al*., 2003

Mitigation Methods	Specific Device	Fishing Gear	Species	Species Category	Test forum	Performance	Regulatory status	Comments	References
Passive acoustic devices	Echolocation disruptors	Gillnets	bottlenose dolphins	Cetaceans	Mediterranean fisheries	promising, but habituation may occur	Not required		Werner *et al.*, 2006
Twine alterations	Multi-monofilament, Thinner twines	Gillnets	porpoises	Cetaceans	North Sea and West of Scotland fisheries	multi mono ineffective thinner twine effective for porpoises and seals		thinner twine also effective for seals	Northridge *et al.*, 2003
Twine alterations	White Mesh	Gillnets	Common Murre, Rhinoceros auklet	Birds	Puget sound salmon, NW US Pacific	Effective	Some reductions in salmon landings	Some reductions in salmon landings	Melvin *et al.*, 1999

Annex 4: SGBYC terms of reference for the next meeting 2010

The **Study Group on Bycatch of Protected Species** [SGBYC] (Chair: S. Northridge UK) will meet at ICES headquarters in Copenhagen, Denmark, from 1–4 Feb 2010 to:

1) Review annual national reports submitted to the Commission under Regulation 812/2004: collate bycatch estimates and review mandatory and pilot projects and scientific studies carried out under thus regulation.

Collate other recent estimates of bycatch of protected species (birds, mammals, reptiles, fish) in the ICES and EU regions;

Review ongoing bycatch mitigation trials, compile recent results, upload relevant study details to "the database" and make recommendations for further work;

Compile bycatch data intersessionally as described in our 2009 report, and assess the development and utility "the database".

Assess the scale of relevant discard survey data available at a national level and update the discard survey table.

Continue to develop technical aspects of bycatch monitoring and assessment to improve and coordinate bycatch monitoring and assessment schemes: specifically in 2010 focusing on the how representative the monitoring data are with respect to the fleet data.

Consider and develop ways to encourage or expand and improve bycatch monitoring schemes and promote and improve bycatch mitigation measures throughout the ICES and adjacent region.

SGBYC will report by March 1st 2010 to the attention of the Advisory Committee.

Supporting Information

Priority:	HIGH
Scientific justification and relation to action plan:	Overall areas of interest: Unintended catches of non-commercial or limited commercial value species of conservation concern. • Methodologies of bycatch estimation; • Bycatch estimate clearing house; • Development and review of mitigation measures; • Co-ordinating activities conducted under EU Regulation 812/2004.
Resource requirements:	None beyond usual Secretariat facilities.
Participants:	13–21 members.
Secretariat facilities:	Secretariat support with meeting organisation and final editing of report.
Financial:	No financial implications.
Linkage to advisory committee:	ACOM
Linkages to other committees or groups:	WGFTFB, WGMME, WGSE, WGEF, PGCCDBS, SCICOM.
Linkages to other organizations:	NAMMCO, ASCOBANS, ACCOBAMSM, GFCM, EC

Annex 5: Recommendations

RECOMMENDATION	FOR FOLLOW UP BY:
1. Any revision of regulation 812/2004 should include a review of how the targets for monitoring level should be set.	European Commission, STECF
2. National Reports compiled under Regulation 812/2004 should be submitted in a standard format with a proposed structure in Annex 3 of this report. At least a summary should be provided in English.	European Commission, Relevant authorities in Member States
3. Pilot projects should be included in National Reports, and a column in the proposed Table 1 has been added to allow these to be identified consistently in the reports.	European Commission, Relevant authorities in Member States
4. Any revision of Regulation 812/2004 should include an agreed international description of fishing gear categories suitable for bycatch monitoring in an Annex.	European Commission, STECF, SGBYC, WGFTFB
5. Any revision of Regulation 812/2004, should apply a more regional approach which will evaluate specificity of different sea regions and fishing fleets.	European Commission, STECF
6. The Study Group recommended that relevant bycatch estimates and details of monitoring programmes in northern Northeast Atlantic countries should be communicated to the SGBYC.	Relevant authorities in Greenland, Iceland, Faroes, Norway; NAMMCO
7. Encourage the collection of bycatch data in the Mediterranean in a compatible and coordinated format and ensure these are shared by all countries in the region to obtain best estimates of bycatch.	GFCM, ICES, ACCOBAMS
8. A Canadian scientist with expertise in protected species bycatch in Canadian waters should be appointed to the SGBYC.	Canadian ICES Delegates
9. Better coordination on bycatch issues with other ICES groups including WGSE, WGEF, WGMME, PGCCDBS to ensure that data collected under the DCR are made available to all groups.	WGSE, WGEF, WGMME, PGCCDBS, ICES Secretariat
10. Inter-sessional work should proceed to populate the database on fishing effort and bycatch observations described in Section 7 (ToR D) above, to assess how well the present design works, and to review progress at the next SGBYC meeting.	SGBYC members
11. Suggested improvments on the design and structure of the bycatch consortium database should be forwarded to its co-ordinator, new studies should be uploaded, and the website should be promoted to the wider research community.	SGBYC, WGFTFB
12. Study Group members should establish the extent to which national discard sampling schemes have in the past recorded, and are currently recording, instances of the bycatch of species of conservation concern, and relevant data should be brought to the next meeting.	SGBYC
13. Protected species should be considered within the Data Collection Framework to provide an unbiased and wide ranging overview of some of the environmental impacts that may be caused by fisheries on the mairne environment.	STECF, European Commission, PGCCDBS
14. Observed vessels within bycatch monitoring or discard schemes should be compared with the rest of the fleet with respect to vessel length, effort by month and by area, and species composition and landed weight of the catch to ensure that sampling is unbiased.	SGBYC

15. Incentives and reprisals should be used to ensure that observers are not prevented from sampling representative parts of the fleets' activities.	Relevant agencies in member states.
16. A workshop should be convened in collaboration with NAMMCO, and involving other relevant regional IGOS, to address technical aspects of bycatch monitoring.	ACOM, NAMMCO, GFCM, EC
17. The report of the technical workshop on mitigatiing sea turtle bycatch in coastal net fisheries should be made available and reviewed by the SGBYC in 2010.	SGBYC
18. Records of seabird bycatch from the discard surveys under the DSR, and other surveys, shold be compiled inter-sessionally and made availabe to WGSE in 2010.	SGBYC, SGSE
19. The database of fishery related threats to species covered by Article 17 of the Habitats Directive cannot be used for reliable analysis and the the SG recommends that if this assessment is required under the Habitats Directive that detailed guidance is given to EU Member States on how such threats can be assessed and catalogued.	ACOM, EC, Habitats Committee

Annex 6: Technical Minutes from the Protected Species Review Group

RGPROT

By correspondence with a deadline of 15 May 2009

Reviewers: Nicole LeBoeuf (USA), Henrik Skov (Denmark, Chair), and Paul Thompson (UK)

Working Group: SGBYC 2009 (and WGSE 2009)

Review of Quality Assurance Arrangements for Select EcoQOs

OSPAR 5 asked ICES to review the quality assurance arrangements for the following EcoQOs and make suggestions for their further development and/or improvement on:

(i) oiled guillemots

(ii) harbour seal population trends; and

(iii) grey seal pup production

The Working Group on Marine Mammal Ecology was requested to review the geographical subunits for these EcoQOs, taking into account biologically appropriate management units for seals in the North Sea. The Working Group reviewed available information in order to propose biologically appropriate management units for seals in the North Sea.

For harbour seals, the Working Group recommended the use of the following four management units within southern Scandinavia waters in the North Sea area:

1) Skagerrak,
2) Kattegat,
3) central Limfjord, and
4) the Wadden Sea.

This proposal splits the current EcoQO subunit Kattegat, Skagerrak and Oslofjord. The Working Group further recommended slight alterations to the UK EcoQO subunit names to more accurately describe the areas that are monitored most frequently. These recommendations are contained within Chapter 6 of the Report of the Working Group on Marine Mammal Ecology (February 2–6, 2009).

The Working Group further recommended that genetic studies of harbour seals be carried out in areas where such information is lacking, in particular for populations were hunting is conducted, and that samples for genetic analyses should be obtained from breeding sites whenever possible.

For grey seals, the Working Group recommended maintaining the current OSPAR EcoQO grey seal subunits, as outlined in 2007 OSPAR handbook. The Working Group also recommended slight alterations to the UK EcoQO subunit names to include two recently established colonies from Norfolk, as well as a re-naming of the German subunit. Lastly, the Working Group recommended the removal of the grey seal "French North Sea and Channel coast" subunit as they may not actually be geographically within the boundary of the North Sea.

The Working Group on Marine Mammal Ecology recommended that a Northeast Atlantic wide genetic study of grey seal population structure be initiated by coordi-

nating the activities already ongoing in the distribution area of the species, using standardized genetic markers.

With regard to data needed to support EcoQO subunits for both species, the Working Group noted that regular surveys are required to determine trends for all harbour and grey seal management subunits and that removals of harbour and grey seals, catch and bycatch, should be recorded for all subunits.

The proposed revision of harbour seal population units appears sensible and pragmatic based upon the available data. However, it should be noted that the finer-scale scale subdivision of Scandinavian populations is based on more recent and powerful analyses than those used for earlier studies of other ICES areas. Rather than calling of additional work in those areas where data are currently lacking, it may be beneficial to encourage a wide scale analyses of all populations of interest, and use a common analytical approach to identifying population subunits.

Quality assurance guidelines have not previously been established for harbour and grey seal EcoQOs, although the Working Group noted that the EcoQO trigger levels were specified to detect declines in their populations. The Working Group recommended that power analysis should be used to assess the effectiveness of the existing survey schemes, relative to the specific EcoQO.

For grey seals, the Working Group recommended that the EcoQO be changed for the Wadden Sea using moult counts instead, noting, however, the importance to continue efforts in obtaining pup count data. UK.

For harbour seals, the Working Group noted that although the EcoQO was triggered in a number of subunits in 2007, they were unaware of actions taken or advice provided by OSPAR in response to this. The Working Group recommended feedback from OSPAR, in an appropriate time frame, when EcoQOs are triggered and asked that OSPAR and ICES encourage and support the responsible entity (e.g. *governments)* to take appropriate action when such triggers are reached.

The report correctly highlights that existing survey schemes for harbour seals proved suitable for detecting declines of 11–40%. What is less clear is how sampling frequency affects the power of these schemes to detect ***when*** changes in population growth occurred. Given the importance of this information for understanding the drivers of such change, it would be useful if power analyses included simulations to compare the ability of different survey schemes to identify the year in which populations started to decline.

The report discusses the difficulties of reporting N. Sea wide trends when different survey schemes are used in different subpopulations. Although differences in the frequency of surveys make the integration of these different time-series more complex, it should be possible to develop a statistical framework that can be used to model overall trends. Perhaps the development of such a framework could form an additional recommendation.

The Working Group on Seabird Ecology addressed actions that may be taken to ensure the highest probability of reaching the EcoQO for oiled guillemots. First, the Working Group noted that quality assurance guidelines have not yet been established for the oiled guillemot EcoQO, indicating that some such guidelines should be established in order to adequately assess trends in the oiled guillemot EcoQO. The Working Group noted that the EcoQO refers to both dead and dying birds. Because living birds could escape, and therefore not be available for determination of age or oiling status, thereby biasing the ratio of oiled to unoiled birds, the Working Group recom-

mended that living birds should not be included in the sample of oiled birds and that the wording of the EcoQO would have to be modified accordingly.

The Reviewers agreed that biases could be introduced into the evaluation of the EcoQO via the escape of live birds that are not sampled. However, as the Working Group also noted, the common guillemot is the species most frequently found oiled on beaches surrounding the North Sea, and is therefore an appropriate choice for an EcoQO aimed at monitoring of chronic oil pollution. This being the case, the Reviewers recommend that the Working Group consider some mechanism by which oiled, live birds may also be taken into account. Chronic oil pollution, rather than the acute impacts of an oiling event, may result in sublethal effects to birds that are also important to document. The Working Group may also wish to remind OSPAR contracting parties of the potential chronic, sublethal effects of oil pollution on seabirds, encouraging the sampling of live birds within each nation's own study protocols, although not for the purposes of this EcoQO. With this in mind, The Working Group should consider addressing this issue within their review of the quality assurance guidelines by drawing a distinction between what is to be gained from the analyses of dead oiled specimens vs. live oiled specimens.

The Working Group noted data collection challenges, such as the aging of guillemots, and recommended that each country appropriately train those recovering the specimens and collecting samples in the relevant identification techniques, including, where necessary, organising training for volunteers to judge on acceptability (in terms of freshness) and age of the corpses, proper detection of oil on bird plumages, and other information that is to be recorded. The Reviewers strongly support this recommendation, as well as the Working Group's recommendation that OSPAR contracting parties seek to standardize the time of year during which the data are collected. Where this is not possible, the reviewers agree that analysis of seasonal fluctuations by subregions is recommended.