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REPORT OF THE STUDY GROUP FOR BYCATCH OF PROTECTED SPECIES (SGBYC)

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ICES International Council for the Exploration of the Sea

CIEM Conseil International pour l'Exploration de la Mer

International Council for the Exploration of the Sea
Conseil International pour l'Exploration de la Mer

H. C. Andersens Boulevard 44–46
DK-1553 Copenhagen V
Denmark
Telephone (+45) 33 38 67 00
Telefax (+45) 33 93 42 15
www.ices.dk
info@ices.dk

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Contents

Executive summary

The Study Group meet for the first time in Copenhagen in January 2008. There were six terms of reference, but one, relating to Council Regulation 812/2004 on cetacean bycatch dominated the work of the Study Group.

The Study Group compiled a preliminary list of methods and technologies that have been used to minimise bycatches of species of concern, and spent time reviewing the problems associated with the application of pingers (acoustic deterrent devices) in static gear as a cetacean bycatch mitigation measure. Although mandated in the US and EU, pinger deployment has proven difficult to implement for a variety of reasons. In reviewing these reasons, the Study Group proposed a framework for the development and implementation of future mitigation measures.

The Study Group reviewed various criteria that are widely used to define potential bycatch limits, and applied these to recent abundance estimates for certain small cetacean populations.

The Study Group had only a brief discussion on allocating take limits of protected species between and among fisheries, and deferred further discussion of this topic until next year.

The European Commission had asked ICES whether it could review the National Progress report by EU member states of work carried out under EC Regulation 812/2004 on cetacean bycatch. The Study Group noted that there is a wide variety of report structures and was able to propose a standardised reporting format for next years' reports. The study group made a number of recommendations concerning the implementation and possible revision of the 812/2004 regulation.

Using the National Reports under 812/2004, together with additional information from Norway and the USA, the Study Group compiled recent data on estimates of protected species bycatch in European and US Atlantic fishing fleets.

The Study Group reviewed ongoing experimental work directed at protected species bycatch mitigation in Europe and North America.

1 Opening of the meeting

The Study Group for Bycatch of Protected Species met in Copenhagen from 29–31 January 2008. Delegates were welcomed to ICES by Diane Lindemann. A complete list of participants is given at Annex 1 of this report.

2 Adoption of the agenda

A major motivation for the establishment of the Study Group was to enable scientists involved in implementing the obligations of European Council Regulation 812/2004 to coordinate their activities and to share their experiences with colleagues involved in bycatch measurement and mitigation for other protected species groups, and from nations other than EU member states. The Study Group adopted its Terms of Reference as the Agenda for the meeting. The Terms of Reference for the Study Group were as follows:

a) Review methods and technologies that have been used to minimise bycatch of species of interest, including methods that have failed;

b) Review information on sustainable take limits for species and populations for which relevant data are available;

c) Consider the advantages and disadvantages of allocating take limits, and if relevant, propose methods;

d) Co-ordinate monitoring programmes under EU Regulation 812/2004 and the Habitats Directive;

e) Review new estimates of bycatch of relevant species;

f) Co-ordinate relevant bycatch mitigation trials.

Under ToR (d) the Study Group considered a request from the European Union to consider National Reports from member states relating to the implementation of Council Regulation 812/2004 on cetacean bycatch. To this end the Commission had supplied copies of all 812/2004 National Reports to ICES. ToR (d) dominated discussions during the three day meeting, and several other agenda items were therefore considered only briefly.

3 ToR A: Review of methods and technologies that have been used to minimise bycatch of species of interest, including methods that have failed

3.1 Rationale

This term of reference is linked to a TOR to be addressed by the ICES-FAO WGFTFB at its 2008 meeting to be held in April in the Faeroe Islands as follows:

"A WGFTFB topic group of experts will be formed with the following ToRs:

Identify fisheries where technical mitigation measures have been introduced to reduce the bycatch of protected species; and

Review the efficacy of these technical mitigation measures introduced to reduce the bycatch of protected species such as small cetaceans or turtles".

It has been identified by a number of sources including the EU, FAO and GFCM in the Mediterranean that in a number of fisheries mitigation measures to reduce bycatch of protected species (cetaceans, pinnipeds, turtles and large fish species) have been introduced (e.g. new type of hooks, TEDS, acoustic deterrents, etc.) and in many cases bycatch has been reduced, but as yet little assessment has been made as to the effects of such devices. This TOR to be addressed by SGBYC is seen as a pre-cursor to the work to be completed by FTFB later in 2008 in attempting to develop a framework to assess the impacts of these measures based on the assessment carried out by FTFB in reviewing the efficacy of recently introduced (2003) technical measures introduced into the North Sea *C. crangon* fishery (Sieve nets/grids) aimed at reducing discarding of juvenile whitefish (ICES, 2007). This assessment considered social, biological and economic factors along with technical issues in the design and use of the technical measure.

3.1.1 Introduction

As identified by Werner *et al*. (2006) among others, bycatch reduction of protected species is a very active area of research with numerous ongoing studies and the frequent development and testing of novel initiatives and mitigation devices. This research in many cases has been driven by genuine concerns among fisheries managers, researchers and fishermen to protect endangered species, while some research has been motivated by the need to reduce gear damage caused by interactions with protected species or reducing consumption of target catch by these species. Worldwide, there are a number of successful examples in which technical conservation measures have greatly reduced fisheries impacts and usually these have been developed with a high level of involvement from fishermen working closely with fisheries scientists. Such examples include the use of turtle excluder devices (TEDs) in many tropical shrimp fisheries that has reduced the mortality rates of several turtle species (Shiode and Tokai, 2004), while modification of hook shape has reduced turtle bycatches associated with longline fisheries (Gilman E., 2006). Similarly, the development of acoustic deterrents in gillnet fisheries as described by Kraus *et al*. (1997), Barlow and Cameron (2003) and Gearin *et al*. (2000) and simple operational changes in purse seine and trawl fisheries (Perrin *et al.*, 2002) have also been shown to reduce cetacean bycatch in some fisheries. Annex 5 provides a summary in tabular form of many of the bycatch reduction devices/strategies tested and an indication of how successful they have been. This Annex is largely drawn from Werner *et al*. (2006), but should be considered a work in progress.

However, it is apparent that there is still only a limited knowledge on the behaviour of marine mammals around fishing gear and this has hindered the development of more acceptable solutions. In some fisheries, gear/marine mammal interaction is high, but with a comparatively low bycatch rate. This suggests that certain species of marine mammals, particularly cetaceans, are aware of the presence of nets or longlines, and may actively use them during foraging or feeding. It also means that the use of certain gear types or fishing methods may result in a higher probability of fishing associated mortality in non-target catch. Understanding the circumstances that lead to incidental capture can provide a basis for developing mitigation strategies.

It is also fair to say that the introduction of bycatch reduction technologies into fisheries has not always been done in a systematic manner that has led to widespread adoption by fishermen. In many cases there has been a failure by managers to consider all of the issues and impacts of adopting legislation to use bycatch reduction devices leading to:

- Poor compliance by fishermen with regulations;
- Negative Ecological Impacts;
- Economic Impacts on stakeholders;
- Technical Problems with the devices;
- Biological Impacts;
- Poor monitoring; and
- Poor acceptance by stakeholders.

The following sections describe these issues in more detail and using specific examples attempt to outline factors, which managers should consider when implementing new regulations or encouraging the voluntary use of mitigation technologies. This includes examples where implementation has been successful e.g. Turtle Excluder Devices and Bird Scaring Devices ("tori lines") as well as examples of situations when the introduction of bycatch technology has been compromised due to a combination of factors, as illustrated by the use of active acoustic devices ("pingers") into EU fisheries under Regulation No. 812/2004 allied with some similar experiences in the US.

The issues identified below can be seen as an outline framework for developing and implementing bycatch reduction measures. At this stage the framework is not intended to be prescriptive, but experience suggests that each of these issues needs to be addressed if bycatch mitigation measures are to have a reasonable chance of success.

3.1.2 Control and enforcement

One of the biggest difficulties encountered with the introduction of bycatch reduction technologies, particularly but not exclusively, for protected species has been in the area of control and enforcement. This has ultimately led to poor compliance by fishermen and negative perception from control and enforcement agencies that have found it difficult to enforce the regulations. For example, in the US the mandated use of pingers to the Northwest Atlantic (Gulf of Maine) sink gillnet fishery to reduce bycatch of harbour porpoise was implemented in 1999. The first year of compliance in the pinger regulated areas was good however compliance decline annually thereafter to a record low in 2003 due primarily to a lack of enforcement. Data collected by fisheries observers show that fishermen generally do not 1) maintain the

devices; 2) use the required number of pingers mandated by regulation; or 3) fish in closed areas even with observers on board the vessel. Attempts to reinvigorate compliance through circulars to fishermen re-iterating the regulatory requirements, as well as dockside pinger certification programs have had limited success. As a result, due to a lack of enforcement, the effectiveness and integrity of the US pinger program to reduce harbour porpoise bycatch has been compromised.

Attempts to reinvigorate the mandatory use of pingers under Article 2 of Regulation 812/2004 for vessels over 12m in certain areas of Community waters has run into even more serious difficulties. In most EU countries anecdotal evidence suggests there is only limited enforcement of the regulations and only a limited number of vessels complying with the regulations; e.g. Denmark reports around 30 vessels, while Sweden report 9 vessels in the Baltic Area using pingers. In both of these Member States pilot projects funded under FIFG have been used as a mechanism to supply pingers to vessels. Control and enforcement agencies have indicated the regulations are practically unenforceable given the difficulties in testing whether devices are operational or whether fishermen have them attached to gear. In this sense 812/2004 has largely failed in introducing the use of pingers into the identified problem fisheries by being unrealistically prescriptive.

In addition to poor compliance in the US Northwest Atlantic, the lack of information on the effectiveness of the pingers (e.g. are the pingers physically working) has added another layer of complexity to the effectiveness of the pinger program. The US Northeast fisheries observer program implemented a pinger tester program in 2003. The objective of the program was not enforcement but rather to collect data for science. The intent was to learn more about how many of the pingers in the field are audible (how many are actually audible, inaudible and/or damaged). To date the pinger tester program has had little to moderate success due to low compliance and manufacturing defects in the pinger testers. Two prototypes have been manufactured. Due to poor performance in the field a third prototype will soon be developed. Results on the effects of the Northwest Atlantic pinger program on the bycatch of harbour porpoise will be presented at the 2008 Summer IWC scientific meeting.

The Study Group learned very late in the meeting that a Danish company (Etec-Mr. Torben Roenne) has developed a long distance control device, in cooperation with the Federal Research Institute for Rural Areas, Forestry and Fisheries (vTI), Institute for Baltic Sea Fisheries, Germany, to determine compliance with EC Regulation 812/2004 by enabling Fishery Inspection vessels to check for pinger use on actively fishing nets (Further details are available from Harald Wienbeck, vTI, OSF, Germany). The SG was unable to discuss the significance of this initiative.

In contrast to the experiences with pingers, the use of TEDs is now effectively regulated in shrimp trawl fisheries globally with good compliance. The use of TEDs has spread to other countries following US regulations that have required nations exporting shrimp to the US to introduce TEDs in their shrimp trawl fleets. This strong economic driver, accompanied with adaptive management to take account of design differences required for different gear types, has also ensured reasonable level of compliance in a number of countries, notably Australia. In addition to the US and Australia, TEDs are now used in Southeast Asian countries including Thailand, Malaysia and the Philippines mainly through the initiative of the Southeast Asian Fisheries Development Centre (SEAFDEC). In addition scientists in Mexico, Belize, Guatemala, Honduras, El Salvador, Nicaragua, Costa Rica and Panama in Latin

America, as well as India, Kenya, Nigeria and other countries in Africa are encouraging the use of TEDs. In most of these countries, TED design has been adapted successfully to fit different gears. NOAA in the US has been able to show that TEDs are effective at excluding up to 97% of sea turtles with minimal loss of shrimp catch (MTCP, 2004) and the introduction of TEDs to shrimp fisheries must be considered a real success story.

3.1.3 Ecological impacts

Additional ecological impacts of introducing mitigation technologies should also be considered before encouraging or legislating for their use. For some devices such impacts include increased depredation by other protected species, impacts on other species or possible behavioural changes (habitat exclusion) in animals as a result of widespread use. For other devices there is less of an issue, for instance the use of TEDs or of Tori lines to deter seabirds from longline hooks do not appear to have any negative ecological impacts, and in fact in the case of TEDs have had positive impacts in releasing the bycatch of unmarketable or undersize fish species. In contrast introducing devices such as pingers in some areas has led to depredation by other marine mammals, particularly pinnipeds. The acoustic devices may act as "dinner bells". An example of this is the artisanal gillnet fishery in Argentina, where during trials with pingers to reduce the bycatch of Franciscana dolphins, increased predation by sea lions was observed (Bordino *et al.*, 2002).

Studies in Sweden also indicate increased depredation by grey seals which used pingers as a cue for finding cod nets. This possibility has raised concern that widespread use of pingers could increase encounters between gillnets and individuals of a vulnerable harbour seal population in the Baltic, thereby increasing the probability of bycatch of this population.

Similarly the introduction of circle hooks into longline fisheries has reportedly resulted in a bycatch of pilot whales due to the fact that these hooks are stronger than conventional J-hooks.

Other factors such as habituation and exclusion from specific habitats that might result from wide scale pinger deployment have also been cited as an undesirable ecological impact of using pingers; however, evidence to support this as a real impact at the population level is missing. There is no doubt that animals will be excluded to some extent from areas close to nets equipped with pingers, that being the whole point of using pingers, but studies have shown this effect on harbour porpoises disappears once the pingers are removed (Larsen & Hansen, 2000; Jørgensen *et al.*, 2006). Whether this short-term exclusion will have any population effects depends on how critical these areas are to the porpoise populations. Habituation to pinger signals has been shown to occur in behavioural studies of both captive animals and animals in the wild (e.g. Cox *et al.*, 2001, 2003), however, no studies so far have shown this to lead to increased bycatch.

Introduction of mitigation measures may also result in shifting effort into other fisheries, which may have an equal or greater impact on protected species. For instance EU restrictions on driftnetting in the Mediterranean has resulted in vessels from European countries re-registering to countries such as Algeria and Morocco not subject to these restrictions, which has not resulted in any decrease in bycatch.

3.1.4 Economic Impacts

Costs associated with the introduction of mitigation technologies remain an issue for fishermen and ways to help mitigate economic costs should be carefully considered. For instance the requirement for fishermen to use pingers under Regulation 812/2004 has very real cost implications for fishermen. In Europe current commercially available devices cost in the region of €50–100 per device and a vessel fishing with 10 km of gillnet gear using the recommended spacing between devices of 100 m–200 m would require 50–100 devices at a cost in the region of €2500–5000. Given there are still technical difficulties with these devices, which were flagged when 812/2004 was being formulated, these costs are significant and have undoubtedly been a hindrance to acceptance by fishermen in Europe. In the U.S. some gillnet fishermen have also indicated financial difficulties associated with purchasing and maintaining pingers and feel that using gear modifications would be more cost effective.

Pilot projects or grant aid schemes to offset some of these costs have some merit but are not the complete solution and probably result in initial uptake by fishermen but as such schemes usually only apply to first purchase, subsequent maintenance or replacement is at best sporadic.

The other economic impact that can be a hindrance to introducing bycatch reduction devices is a reduction in target catch associated with the use of the device. The use of circle hooks in longline fisheries, where turtle bycatch can be a problem for instance has been adopted in a number of areas due to the fact that research and development work carried out with fishermen has shown no loss of target catch, despite initial concerns expressed. Other gear modifications that have been tested, for example excluder devices (rope barriers and rigid grids) in pelagic trawl fisheries, when tested have found to give significant reductions in catch of target species making them unacceptable to fishermen. This, however, seems to be related to the behaviour of the target species but also on how quickly the uses of such devices are made mandatory. In Australia and New Zealand, industry appears to have accepted the use of excluder devices to prevent fur seal bycatch in midwater trawl fisheries for squid and hoki. The regulation has been accompanied by monitoring of economic loss of target fish catch.

3.1.5 Technical issues

As described by SGFEN (2001), prior to adoption of mitigation technology on a fishery wide basis, experimental tests of devices should be carefully monitored for a significant period in a commercial fishery. Such R&D work is required in order to identify technical problems and unintentional ecological impacts, as well as aiding acceptance by fishermen that may be difficult to address once a specific measure has been adopted. Experience in the US suggest that once regulations defining mitigation methods are introduced the incentive to support further technical development can be impaired; there has been no change in the technical specifications for pingers in the U.S. since 1995, although devices with a wide variety of different acoustic characteristics are available in Europe. It is therefore important in introducing mitigation technologies that a structure to allow for re-evaluating effectiveness be included in any assessment.

For instance fishermen in a number of countries, particularly in Europe have raised concerns about the resilience of the current commercially available "pingers" and also the practicalities of using these devices for commercial fisheries. These concerns have been addressed in trials carried out in Ireland, UK, Sweden, Denmark and France in 2005 and 2006 (Cosgrove *et al.*, 2005). These trials have highlighted a

number of serious issues and difficulties relating mainly to the reliability of the devices but have been carried out after regulations have been introduced, creating a negative reaction by fishermen to comply with the regulations. It is clear that more consideration of the construction, practical handling and deployment of mitigation devices is required before they can be considered a universal solution to certain bycatch problems in fisheries affected by legislation.

One hindrance to further R&D work that has been experienced with the development of pingers has been that the limited market opportunities for these devices has meant that pinger manufacturers have been reluctant to put further resources into improving on designs. Either the firms involved in developing the devices are small with limited resources or the devices form only a very small part of their overall business. It is thus important to ensure the progressive development of mitigation devices and technologies, and that commercial firms are encouraged and funded to be involved in the process.

In contrast since TED development began in the US, TED design has been constantly evolving, with modifications made to account for differences between fisheries and turtle species. In Australia, given that US style TEDs were too large for Australian trawl gears, a "soft" TED has been developed, which lacks the metal frame used in the US TED. Flexible and soft grids were instead developed and introduced which retained the characteristics of the conventional TED but addressed operational and safety issues specific to the Australian fisheries. This technical development of TED designs has been in collaboration with the fishing industry, with a lot of the fine-tuning being based on recommendations made by practising fishermen. Another important factor in the successful widespread use of TEDs has been in the strong education programmes that have accompanied their introduction in fisheries, notably in the US, South-east Asia and Australia where extensive efforts have been made to advise fishermen on correct installation and handling, as well as provision of back up technical assistance to solve rigging and handling problems that may have arisen. Future improvements and refinements will concentrate on the survival of turtles that escape through TEDs.

3.1.6 Biological assessment

There is still intense speculation as to why, when and where protected species, particularly marine mammals are captured in fishing gear and this lack of understanding can be a hindrance in the development process and successful introduction of mitigation measures. What little is known is based on a few, opportunistic direct observations. For instance, Northridge (2003) indicated that it is likely that cetaceans are alive when inside the trawl and actively swim to the back of the trawl, but they die due to drowning during the fishing operation. Some authorities also claim that marine mammals may be particularly vulnerable to capture during certain phases of the fishing operation. Zollet (2005) suggests that when a net is deployed, cetaceans or seals may be captured due to the proximity to a vessel. Alternatively, they may enter the mouth of a trawlnet during towing but become caught when the boat slows, turns or hauls back the gear. Changes in speed and direction may contribute to bycatch since the size and shape of the net may be altered and the space available for feeding animals changes in time or may be reduced thereby causing confusion, although there is no direct evidence for this suggestion. Other factors such as the size and condition of the animal, time of day, seasonality or even the sex of the animal may be contributing factors to incidental capture. Similarly in gillnets, fishermen claim that bycatch usually occurs when nets

are being hauled, although again there is little evidence to support this contention. In longline fisheries knowledge of bycatch species sensory biology is essential to identify and develop possible measures to avoid attraction to gear and hooks, while knowledge of habitat use in areas or fisheries with bycatch problems (e.g. diving patterns, temperature preference, feeding behaviour) are important in developing appropriate mitigation devices.

In adopting measures it is important to define which species the mitigation devices are designed to protect. Regulation 812/2004 has the objective of mitigating incidental catches of cetacean species in general. However, research and development has mainly been focused on the use of pingers to reduce harbour porpoise bycatch in gillnet fisheries (Kraus *et al.*, 1997; Larsen, 1999; Gearin *et al.*, 2000). Results of trials involving other cetacean species are less clear-cut, with somewhat contradicting results (Barlow and Cameron, 2003; Anon., 2006).

A consideration of spatial and temporal factors when developing and introducing mitigation technologies for protected species is also vital. Many bycatch problems are localised or seasonal and real-time adaptive management systems rather than mitigation devices can be more appropriate e.g. Dynamic Area Management (DAM) developed by NOAA for protection of right whales, which temporarily restrict the use of lobster trap/pot and anchored gillnet fishing gear that doesn't comply with required gear modifications on an expedited basis have proved successful and accepted by fishermen.

3.1.7 Monitoring

Adequately quantifying bycatch of protected species and the impact of introducing mitigation technologies requires essentially a high level of on board observer coverage (typically at a level of 25–30% of total fishing effort) to be able to provide accurate estimates and associated confidence limits around estimates (Northridge and Thomas, 2003). Levels of coverage by nation and fishery on introduction of mitigation technologies are frequently at much lower levels than this. For instance, Regulation 812/2004 seeks assessment and monitoring of the impact of pingers on bycatch but in reality very few Member States have been able to carry out such monitoring. This is mainly due to the costs involved in maintaining observer programmes. In some cases a large amount of data from anecdotal sources has been used to supplement the quantitative data gathered from observer programmes. This lack of systematic monitoring prevents the true extent and potential impacts of devices on protected species bycatch from being fully understood or documented. Scientific monitoring is essential to identify unexpected negative effects of mitigation devices. For example in longline fisheries increasing the set depth for longlines has been found to reduce overall catch rates of turtles but has led to increased mortality of turtles that are still hooked but die through drowning. In the Eastern Tropical Pacific tuna purse seine fishery an observer programme with 100% coverage coupled with an IATTC training programme in bycatch reduction measures, has helped to ensure continuing declines in dolphin bycatch mortalities in this fishery.

3.1.8 Acceptance/incentives

Experiences from around the world have shown that the key to successfully introducing bycatch technologies is acceptance by stakeholders, recognising that the main drivers for introducing such technologies will always be either economic or regulatory or a combination of both. For instance, the use of the medina panel in conjunction with the "back down" procedure for release of dolphins in the purse

seine fishery for yellowfin tuna in the Eastern Tropical Pacific is an example of a method that has been successfully adopted by fishermen in this fishery, resulting in a significant reduction in bycatch. This device and procedure were developed by fishermen driven by economic pressures but shows how fishermen will develop and adopt devices when there is a strong economic incentive, in this the case the concept of "dolphin friendly tuna". Similarly the adoption of circle hooks by longline fishermen in the US and Hawaii, which can reduce turtle bycatch has been relatively straightforward in many fisheries as these hooks had already been developed and proven to be efficient for catching target fish species so there was already widespread acceptance in the industry and with a strong economic driver in that target fish catch increased with their use.

Ways to demonstrate the effectiveness of mitigation technologies to Fishery Managers, NGO's and the general public need also to be considered. In developing these technologies, given the public empathy with protected species, it is vital to strengthen links between research efforts and stakeholders to avoid mis-representation of technological measures resulting in a negative public perception. For instance some NGO's have claimed that pingers can cause widespread habitat exclusion if used extensively in areas, without any scientific evidence to support this claim. Similarly following the first encouraging trials with circle hooks some NGO's took these results as a justification for the use of circle hooks to be adopted in all longline fisheries globally and lobbied fisheries administration intensively to achieve this goal. Subsequent research in other longline fisheries identified problems with these hooks specific to these fisheries, leading to the NGO's reversing their position and generating negative publicity regarding circle hooks. This has lead to suspicion from fishermen in some areas e.g. Mediterranean and also confusion amongst administrations such as the EU as to what their position should be towards this particular gear modification. In order to avoid this it is important that communication on the effectiveness of devices should be based on the results of scientific research, specific to the fishery and bycatch problem and avoids generalisation and conjecture.

3.1.9 Legislation

The Study Group recognised that the successful implementation of a framework for bycatch reduction can be encouraged by appropriate legislation, while conversely legislation can also unwittingly be an impediment to successful introduction of bycatch mitigation technologies. Framing legislation therefore needs to be done after consideration of all of the issues raised above.

3.1.10 Conclusions

The introduction of any bycatch mitigation measure needs to be accomplished by considering a wide range of issues that include technical issues, economic impacts, biological and wider ecological assessments, continued monitoring, positive incentives, legislation, social aspects including the acceptance of the measure by all stakeholders, and possible enforcement issues. There is much scope for hastily introduced mitigation measures to fail or possibly to increase bycatch rates if careful consideration is not given to these issues.

3.1.11 Recommendations

The SG recommended that any further mitigation plans for minimising cetacean or other protected species bycatches should be introduced only after careful consideration of all of the above mentioned factors. The Study Group recognised that

its deliberations on these subjects was largely driven by considerations on cetacean bycatch mitigation and recommended that experts with expertise in the bycatch of other protected species groups should be encouraged to join the Study Group to help further develop this bycatch mitigation framework.

4 ToR B: Review information on sustainable take limits for species and populations for which relevant data are available

The Study Group did not have time to develop this ToR very far. The study Group noted that several criteria for defining sustainable take levels of cetaceans are currently in use. These include criteria that have been proposed by the International Whaling Commission, by ASCOBANS, and a method used in the USA (PBR). Criteria for other species such as sea birds and turtles were not discussed, though expertise on these subjects should be sought for future meetings of the SG.

The Scientific Committee of the IWC reviewed the conservation status of harbour porpoises *Phocoena phocoena* in 1995 (Anon, 1996). During these deliberations the Committee agreed that, in the absence of any detailed information on stock status, an estimated annual bycatch of 1% of the estimated population size would indicate that further research should be undertaken immediately to clarify the status of the stocks and that an estimated annual bycatch of 2% may cause the population to decline and requires immediate action to reduce bycatch. On this basis, the IWC's Scientific Committee expressed concern for the conservation status for any small cetacean populations with estimated bycatch greater than *2% of a best estimate of abundance*.

At the third Meeting of Parties to the Agreement on the Conservation of Small Cetaceans in the Baltic and North Seas, it was decided that bycatch levels of small cetaceans of less than 1.7% of the best population estimates should be the targets for all Parties to the Convention. ASCOBANS Parties later agreed that a take of 1% of the population size should be used as an "intermediate precautionary objective". The 1.7% limit was based on the results of a joint IWC/ASCOBANS working group that addressed the sustainable take limits for harbour porpoises (Anon, 2000), though ASCOBANS also applies the same take limit criteria to all small cetaceans. In 2006, at the Fifth Meeting of Parties, ASCOBANS reiterated that a precautionary objective entails reducing bycatch to less than 1% of the best available abundance estimate.

The Government ministers of North Sea riparian states decided under the Bergen Declaration (2002) that an unacceptable bycatch limit for harbour porpoises was 1.7% of the best estimate of population size. They also agreed on a precautionary objective to reduce the bycatch of all marine mammals to less than 1% of the best available population estimate. Under the Goteborg Declaration in 2006, Government Ministers of North Sea riparian states also agreed that "Special attention should also be given to the development of fishing gear and fishing methods that will help reduce bycatches of marine mammals to less than 1% of the best population estimate."

In the United States the National Marine Fisheries Service under the provisions of the Marine Mammal Protection Act, uses an index of Potential Biological Removal (PBR) to determine the limits of sustainable takes. The PBR procedure was designed to calculate the maximum number of animals, not including natural mortalities, which can be removed from a marine mammal stock, while still allowing that stock to reach or maintain its optimum sustainable population level (Wade, 1998). It is designed to prevent populations from declining below their Maximum Net Productivity Level (MNPL), which is thought to be between 50–80% of carrying capacity (K) (Taylor and DeMaster, 1993). The PBR operates on a single current estimate of absolute abundance. It is calculated as follows:

$PBR = N_{min} \times ½ R_{max} \times F_R$

where N_{min} = 'minimum' estimated total population size at time t,

R_{max} = maximum population growth rate/potential rate of increase and

F_R = a recovery factor.

Population simulations have demonstrated (Wade, 1998) that the goal of preventing populations from declining below their MNPL can be achieved by defining Nmin as the 20th percentile of a log-normal distribution based on an estimate of the number of animals in a stock (which is equivalent to the lower limit of a 60% 2-tailed confidence interval):

$Nmin = N/\exp(0.842 * (\ln(1+CV(N)^2))^{1/2})$

Where N is the abundance estimate and CV(N) is the coefficient of variation of the abundance estimate.

The MMPA defines the recovery factor, F_R, as being between 0.1 and 1.0. The intent here is to ensure the recovery of populations to their Optimum Sustainable Population levels (i.e. above the level of maximum net productivity), and to ensure that the time necessary for populations listed as endangered, threatened, and depleted to recover is not significantly increased. The use of F_R less than 1.0 allocates a proportion of expected net production towards population growth and compensates for uncertainties that might prevent population recovery, such as biases in the estimation of Nmin and Rmax or errors in the determination of stock structure. Population simulation studies demonstrate that the default F_R for stocks of endangered species should be 0.1, and that the default F_R for depleted and threatened stocks and stocks of unknown status should be 0.5. The default status is considered as "unknown".

R_{max} is defined as the maximal growth rate in the absence of density effects, namely at low population sizes. It is therefore not an easy parameter to estimate.

The SG was able to review only the most recent abundance estimates for cetaceans (from the SCANS II project) and the take limits according to each of the four criteria listed above are shown in Table 1 below. Abundance estimates are for the entire SCANS II area (North Sea, Inner Danish waters, Skagerrak.) Atlantic shelf waters Shetland to Portugal, during summer. Common dolphin abundance is higher in on-shelf waters in the winter. The Recovery Factor (F_R) is set at the default value of 0.5 in the PBR calculations, on the assumption that current population status is unknown. (For populations known to be above their respective levels of Maximum Net Productivity F_R would be set at 1.0, doubling the PBR). The value of R_{max} is taken to be 0.04 per year, which is a widely assumed default value for small cetaceans.

SPECIES	ABUNDANCE ESTIMATE	CV	PBR	1%	1.7%	2%
Harbour Porpoise	385,617	0.2	3264	3856	6555	7712
Common dolphin	63,366	0.46	438	634	1077	1267
White beaked dolphin	22,655	0.42	161	227	385	453
Bottlenose dolphin	12,645	0.27	101	126	215	253
Minke whales	18,614	0.3	145	186	316	372

Further work under SCANS II also addresses sustainable take limits through population modelling, and these will be discussed in the near future by WGMME.

5 ToR C: Consider the advantages and disadvantages of allocating take limits, and if relevant, propose methods

The SG had a brief discussion on the advantages and disadvantages of allocating take limits, and agreed after some discussion that this ToR is ambiguous and should be clarified. A take limit could be understood to imply the establishment by fishery managers of bycatch 'quotas' for individual protected species for specific fisheries or even by vessel within a fleet. The establishment of such a system would open up a wide range of problems for monitoring, data interpretation, enforcement and legislation. It would also be necessary to consider whether single annual limits or multi-annual limits should be set.

Another interpretation of this ToR could be of 'notional' take limits or guidelines allocated to individual fisheries in order to determine (a) how much monitoring might be required for each fishery (see ToR D below) and (b) to set bycatch reduction targets (without necessarily implying 'quotas') for individual fisheries. This means that the limit, instead of being a mechanism to close the fisheries once numbers are reached, is more a performance standard for stakeholders and fishermen to work together to achieve.

The essential problem is that in European fisheries bycatches of species that are protected at a European level are taken at varying rates by more than one fishery and usually by vessels of several EU member states. Common dolphins, for example, are taken in pelagic trawls, gillnets and tanglenets (*inter alia*), and by vessels registered in France, Ireland, the UK, the Netherlands, Spain and Portugal. If such bycatches are to be reduced, it is important to develop some allocation measures that will enable managers to determine the extent to which bycatches in any of these national fisheries involved needs to be reduced. Expecting all fisheries from all nations to reduce bycatch rates by a fixed proportion or to a fixed limit could well be an impractical, unfair and unproductive means to reducing the overall level of bycatch to below a sustainable level.

The Study Group did not have a much time to explore this issue, which is complex and quickly enters the realm of politics. The SG noted that there are strong parallels with calculating maximum levels of unwanted catch or discards, and suggested that methodology used by the Discards Study Group would be worth examining.

In the U.S. guidelines recommend that when a Marine Mammal stock is migratory the overall take limit can be allocated in proportion to the time that population spends in each nation's waters.

Where a population is trans-boundary and wide-ranging the PBR is based on the number found in US waters not on the whole biological population. Where two nations, such as the US and Canada, share a marine mammal population (such as harbour porpoises) but there is no clear idea of the proportion of that population on each side of the border, uncertainty remains over how best to resolve the situation, and it becomes a political problem as to how the PBR should be divided (Wade and Angliss, 1997).

The situation is more difficult in Europe because there is much more overlap between nations and possibly even between fisheries (for example the common dolphin bycatches in trawls and in static nets). There are several ways in which the total bycatch limit or PBR for a protected species stock might be allocated among fisheries. These could include allocation by the landed weight of catch for each fishery, by landed value of catch, by the number of boats involved, by the number of fishermen

involved or by the amounts of fishing effort as measured by some standard metric. Any such method, however, might overlook social or economic aspects of the group of fisheries involved that might be considered to be more important than for example landed catch value.

The US Guidelines for Assessing Marine Mammal Stocks (Wade and Angliss, 1997) recognise this as a 'political' problem, and the SG therefore **recommended** keeping this item under consideration, while seeking political advice and also to consider how similar issues may have been dealt with in other ICES study groups and working groups.

6 ToR D: Co-ordinate monitoring programmes under EU Regulation 812/2004 and the Habitats Directive

6.1 Background

ICES received a request from the European Commission to investigate whether scientific advice could be provided on National Reports under Regulation 812/2004, and specifically to propose a standardised reporting format that would make interpretation of National Reports easier. ICES was also asked whether it could compile information on bycatches and assess their effects at a population level in the Baltic based on the reporting obligations of Regulation 2187/2005 (Regulation of Technical Measures in the Baltic).

Bearing in mind that the SG does not anticipate meeting again until 2009, it agreed that it would be productive to try to address these issues to the extent feasible during the present meeting, and especially to draw up a suggested standard reporting format for reports under the 812/2004 Regulation that will be due in June 2008. The SG therefore spent time discussing the National Reports under the 812/2004 regulation that had been made available by the Commission, to the extent that it was able, and with due consideration to time constraints, to provide an initial overview and some preliminary suggestions for a standardised reporting format. The SG also briefly considered the Commission's request with respect to Regulation 2187/2005.

Additionally, the SG considered the following topics specifically relevant to the co-ordination of Council Regulation 812/2004.

- A rationale for analysing observations conducted under Regulation 812/2004 in tandem with trials of mitigation devices
- Better co-ordination of sampling across national fleets
- Appropriate levels of sampling required under Regulation 812/2004
- The relevance of the fleets and fisheries currently being sampled to address the objectives underlying Regulation 812/2004
- Links between the Data Collection Regulations and 812/2004
- Relationship with the Habitats Directive
- Analysis of operational factors associated with bycatch
- The best methods of extrapolating from bycatch observations to total bycatch estimation

6.2 Review of National Reports under 812/2004

The Commission provided ICES with copies of National Reports from the following countries: Belgium, Bulgaria, Cyprus, Denmark, Estonia, Finland, France, Germany, Greece, Ireland, Italy, Latvia, Netherlands, Poland, Portugal, Romania, Slovenia, Spain, Sweden, and UK. Many of these were in English, or have English summaries or translations. SG members were able to read a few others in their national languages (France, Spain, Portugal), but the SG was unable to address the reports from Germany, Italy and Finland because none of the SG could read these languages. A summary of sampling, bycatch observations and estimated bycatch levels (where given) has been compiled as Annex 6.

The Study Group **recommended** that Reports should be made available in English in the future if an adequate review is to be made.

The Study Group noted that the implementation of Article 2 of Council Regulation 812/2004 (use of acoustic deterrent devices) has been poor. Subsequent observations of fisheries using such devices have therefore been lacking. There are technical, social, political and economic reasons why Article 2 has been poorly implemented, and the Study Group stressed the need to implement a framework for mitigation implementation such as the one developed under ToR A.

In reviewing the National Reports the Study Group recognised a wide variety of reporting styles, from a simple one-page letter to detailed tables of observations made. The Study Group also recognised that there are broadly speaking two functions that National Reports may serve. The first is to demonstrate to the Commission and the public that National obligations under 812/2004 have been met- and this may require descriptive text as well as summary data tables. The second is to provide for a pan-European analysis of the nature and scale of cetacean bycatch. The second objective was recognised as being very important from a scientific view point. The SG recognised the potential utility of being able to maintain a functioning database that would enable European-wide estimates of bycatch to be made and **recommended** that further thought should be given to a European bycatch database design and data structures at next years SGBYC meeting.

The National reports showed no evidence of any European integration, and it was clear that each report had been the result of independent national efforts. The establishment of SGBYC should make it easier to co-ordinate monitoring plans in future years.

The Study Group **recommended** that future Reports should present data in a more homogenous geographical scale, and suggested that the ICES sub-divisional level would be generally appropriate, while recognising that in some particular cases a larger or smaller scale might be appropriate. The issue of spatial scale would also need to be considered in relation to the development of any European bycatch database.

The Study Group noted that there is a variety of measures of fishing effort used through the National Reports. While this is to some extent inevitable, because of differences in National effort data collection schemes, the Study Group **recommended** that some common measures also be included where possible-to enable some calibration of fleet effort between nations (see section on standardised reporting below).

There was a general paucity of reporting on total fleet effort and fleet size, which makes it difficult both to determine the extent to which monitoring goals had been met, and makes it impossible to make any European-wide extrapolations of bycatch totals. In relation to this point the Study Group has not validated in detail what each nation has done compared with what it should have done. This would be a major undertaking, but which is likely necessary. The Study Group noted that sampling levels that are set before a fishing season has begun are not always easy to reach when future effort levels can only be guessed based on the previous year's data.

Bycatch events are often distributed in a very heterogeneous manner, and biases in bycatch estimation may easily be introduced through unrepresentative sampling. The Study Group **recommended** that there is a clear need for some analysis of how representative the sampling has been -or will be- by considering in detail the geographical and seasonal distribution of fleets.

The Study Group noted that overall there are few actual records of bycatch reported in the National Reports under the 812/Regulation-reflecting the fact that much sampling is directed at fisheries which are suspected to have low bycatch rates, while little or no sampling has been directed at others that may have higher bycatch rates. The SG noted that this issue has been addressed to some extent in several National Reports (France, UK, Ireland) that contain data not mandated under 812/2004, but which have been collected under the broader aegis of the Habitats Directive (for example under 15m vessels; static gear in Area VII).

The Study Group noted a wide disparity in the resources that have been channelled towards this task in various EU member states. France in particular has achieved a lot of sampling at a high cost. Some other nations such as the UK have adequately funded their sampling programmes, while others such as Ireland and Germany have provided no additional funds to develop monitoring of cetacean bycatch, and have relied to a greater or lesser extent on ongoing discard sampling. The Study Group noted the lack of on-board observer programmes from Spain and Portugal, under the conditions established in Regulation 812/2004, although the existence of information from sources other than this (such as observer programmes to monitor fisheries/discards) is mentioned in the Spanish National Report. The Study Group **recommended** that funding should be made available by national governments to establish formal monitoring programmes where these have not already been established, so that National obligations under Regulation 812/2004 can be fully met.

The Study Group **recommended** that the Commission should establish some review of the fleets that are currently being sampled under 812/2004.

The Study Group noted that several institutes responsible for implementing monitoring obligations under the 812/2004 regulation have no access to (extracts of) the National logbook administration of their country whereas this is a prerequisite to designing a sample scheme with the required level of coverage and to extrapolate to fleet level. The group strongly **recommends** that the administrations of Member States must give access to appropriate logbook and effort data to the research institutes charged with responsibility for the data reporting requirements under Regulation 812/2004.

The Study Group noted that Regulation 812/2004 is not fully explicit about whether or not trammelnets should be included in observer monitoring. The regulation lists gillnets and tanglenets as the setnet gears to be observed. It would be useful to include trammelnets explicitly to this list, as they are known to have cetacean bycatches, and it is not necessarily clear that they should be included in the tanglenet category. In part this issue may be due to some difference in the definition of setnet gears in the various translated versions of the 812/2004 regulation. In contrast to the 812/2004 nomenclature, the Nantes matrix (STECF-SGRN, 2006) lists at the gear type level (level 4) both “trammelnets” and “set gillnets” with no mention of entangling nets. It should also be noted that the Baltic regulation 2187/2005 does explicitly specify trammelsnets in the list of gears. The SG **recommends** that the Commission is careful in specifying exactly which of the three gear types is intended in future Regulations.

The SG noted that Regulation 812/2004 suggests pilot studies to assess the impact of vessels less than 15 meters. The SG noted that it is generally agreed that interviewing fishermen is not a reliable method in this context. The only reliable way is to use independent monitoring, either by using observers at sea or by using a camera system.

The SG did not have time to examine the pilot studies that are described under the National reports, but **recommended** that these should be considered next year.

The SG agreed that it could undertake a more thorough review of what is currently being done and what is required in 2009.

6.3 Standardised reporting format

The Study Group observed considerable variation in format between the different National reports. The differences between the reports were due in part to the level of detail, focused on the national circumstances and the different fleet segments by area and time that have to be covered according to EC Council Regulation 812/2004. It was agreed that future annual reviews of the National reports by SGBYC should ideally be done by analyzing data maintained in a European bycatch database, as recommended above. However, in the current situation without such a database and with most national programmes still in the pilot state a review is only possible at a higher level of data aggregation on the basis of simple, straightforward tables containing the same information and units. For this purpose a template for a proposed standard report was prepared (Annex 7). It was agreed that the main body of the text (preferably English) should contain four tables with a fixed number of columns. Any tables and maps that provide more detailed information should be put in the annexes to the report.

The Study Group **recommends** SGBYC members use the template for standardized reporting (Annex 7) for National reports under Council Regulation 812/2004.

6.4 Commission request concerning advice regarding Regulation 2187/2005 on the Baltic Sea

On 16 January 2008 the European Commission requested that ICES investigate whether ICES could provide scientific advice on Regulation 2187/2005:

> The Regulation of Technical Measures in the Baltic, Regulation 2187/2005 includes a reporting obligation in Article 27 based on 'a scientific assessment of the effects of using in particular gillnets, trammelnets and entanglingnets on cetaceans'. ICES is requested to compile the information on such bycatches and assess the effects of the use of these gear types on the relevant populations of cetaceans."

Regulation 2187/2005 defines the Baltic as subdivisions 22–32, in other words including the Baltic Sea, the Belts and the Sound. This area is regularly inhabited by just one cetacean species: the harbour porpoise. There has been considerable scientific debate as to population divisions in this area: either there is one population covering the entire region, or one population in the "Baltic proper" (approximately subdivisions 24 (east) to 32) and one population in the Belts and the Sound which ranges also northwards into the Kattegat. At present ICES works on the assumption of two populations in the region. Harbour porpoise abundance in an area corresponding approximately to subdivisions 24–26 was estimated to be ca. 600 animals in 1995 (Hiby and Lovell, 1996), whereas a survey of subdivisions 24–25 in 2002 resulted in an estimate of 93 animals (Berggren *et al.*, 2004). The population in the Belts, Sound and Kattegat was estimated at approximately 23 000 in 2005 (SCANS II: report submitted). For the population of harbour porpoises in the Baltic proper there has been a recovery plan elaborated by ASCOBANS which emphasises the need for a regional approach to help conservation.

The recording of bycatches of harbour porpoise in the Baltic proper is very challenging, mainly due to the scarcity of harbour porpoises. The observer programmes carried out by the Baltic countries under Regulation 812/2004 in 2006 covered from 0.1 to 9% of the national fleets concerned, yet not a single bycatch event was recorded. However, the overall scarcity of harbour porpoises makes it highly unlikely that any new data will be collected based on observer programmes covering only 5% of the fleet operations. In this regard, the Study Group noted that Regulation 812/2004 has not been helpful in minimising bycatch in the Baltic, and Regulation 2187/2005 which eliminates driftnetting in the Baltic by January 2008, while also requiring masters of driftnet vessels to report any cetacean bycatch, has stifled the flow of information on bycatch from that sector. The Study Group recognised that bycatch of porpoises is still an important issue in the Baltic, but suggested that best conservation efforts are likely to include stakeholder involvement and should require local assessment of the current situation.

Although there have apparently been no recent records of Baltic porpoise bycatches, it is not clear that all historical data have necessarily been fully analysed. Historical information on Baltic harbour porpoise bycatch from the past few decades is available in both published sources and in national databases. This information was collected using a variety of methods (interviews, bonus systems, voluntary reporting, observer programmes, stranding schemes) and relate to different periods.

There are also issues of data paucity for the relevant fisheries in the Baltic, with limited effort and spatial data available from some countries and some confusion too over how specific net configurations should be categorised (e.g. semi-driftnet fisheries).

The Study Group therefore felt that detailed analysis of all such data might be helpful. This would require Baltic coastal states to search all relevant national sources and provide these for analysis by ICES. The range of the harbour porpoise population in the Baltic indicates that most work would be needed in Denmark, Sweden, Poland and Germany, as there are unlikely to be many records in other Baltic countries. It is likely that this process would take several months, especially as some important datasets are owned by scientists who are not supported to attend ICES meetings. Denmark and Sweden are also starting to implement observer schemes in areas 22, 23 and 24, and further data may come from these observations.

Nevertheless, the Study Group was also aware that the Jastarnia Group under ASCOBANS is also reviewing past bycatches of harbour porpoises, and it would therefore be sensible for ICES to determine what they may already have come up with, and what they intend to do, before proceeding. The Study Group therefore **recommended** that ICES should determine what progress is being made under the Jastarnia Plan and that if appropriate a thorough analysis be made of existing Baltic porpoise bycatch data, combined with any relevant new Danish and Swedish observations.

Should ICES be asked to undertake an assessment of the effects of these gears in the Baltic, a long period of notice will assist relevant scientists in extracting data for this request.

With respect to the implementation of Regulation 812/2004 in the Baltic, the SG agreed that this also unlikely to lead to sufficient monitoring of harbour porpoise bycatch in the Baltic Sea (ICES IIId). Assuming that the harbour porpoises in this area are a reproductively isolated stock that is depleted with an estimated population size of ca. 600 animals (Hiby and Lovell, 1996), the local populations is vulnerable to

almost any level of bycatch. In addition, when the density of animals is low bycatch monitoring needs to occur at a relatively high level to monitor rare incidences of fishery bycatch. Data collected by several different institutions (Hel Marine Station in Poland, Museum of Natural History in Stockholm, Museum of Oceanography in Stralsund *inter alia*) on self-reported incidents of bycatch and strandings shows there are about 6–7 reported bycatches in the Baltic IIId annually (Berggren, 2002, Skora and Kuklik, 2003, Benke *et al*., 1998). Sampling coverage at 5% of fishing effort is likely insufficient to monitor true levels of HP bycatch in the Baltic Sea. When bycatch is a rare event and sampling levels are low it leads to significant challenges in estimating mortality with accuracy and precision. By analogy, the Northwest Atlantic stock of coastal bottlenose dolphins is listed as a depleted stock in the U.S. that is also threatened by relatively low levels of mortality (Waring *et. al*., 2007). It has been estimated that nearly 80% observer coverage of the U.S. Mid-Atlantic gillnet fishery is required to have sufficient power (probability of making type II error) to estimate mortality levels with a high degree of confidence. Due to the conditions described above the Baltic Sea porpoise population is an example of how the regulation in its present form may not be of service to the conservation of depleted stocks.

6.5 A rationale for analysing observations conducted under Regulation 812/2004 in tandem with trials of mitigation devices

The Study Group was aware that in some cases observations under regulation 812/2004 are being made on vessels that are also trialling mitigation devices. Clearly this could compromise estimates of bycatch rate. Nevertheless, mitigation trials combined with observer deployment at sea is technically and scientifically feasible, so long as it is possible to separate comparative hauls with and without mitigation measures in place. In trials where comparative hauls (experimental and standard) are used it is possible to obtain a clear insight into the effects of the experimental treatment while eliminating other factors that might influence bycatch rates. In such an experimental system standard hauls can still be treated as representative of normal hauls and can still be used for raising bycatch numbers for other vessels which are not using or testing any mitigation system. Thus when raising the bycatch data, only the standard hauls are included in the extrapolation and two levels (first the trip level and then fleet level) are required in the process.

Carrying out such experiments on commercial boats is a sound way to be able to generate the high number of experimental replicates that are required for analysis of incidental catch problems. There may also be an advantage in getting observers greater and easier access to fishing vessels.

6.6 Better co-ordination of sampling across national fleets

The Study Group recognised that where there are national fleets that work together in a common fishery, or where vessels from national fleets are owned by entities in other EU countries, it may make sense for sampling to be done at a fleet level rather than by each nation individually. However, there remain some major differences in the ways in which vessels from different countries carry out their fishing strategies. The Study Group concluded that there is a need to explore ways in which sampling can be done in a representative manner with the aim of enabling integrated sampling across national fleets. The SG **recommended** that members of the group should explore how representative existing sampling strategies are before taking this issue any further.

6.7 Appropriate levels of sampling required under Regulation 812/2004

Regulation 812/2004 requires sampling to be done in order to achieve a target CV of 0.3. This objective can lead to a lot of wasted resources where actual bycatch rates are very low, and may often therefore be extremely hard if not impossible to achieve. At least one alternative approach has been suggested (Northridge and Thomas, 2003, 2007). The Study Group recommended that such ideas should be considered if and when Regulation 812/2004 is revised.

6.8 The relevance of the fleets and fisheries currently being sampled to address the objectives underlying Regulation 812/2004

The Study Group also considered this topic under its review of the National Reports. The Study Group re-iterated its **recommendation** that a review of the fleets that are currently being sampled under Regulation 812/2004 should be undertaken, to elaborate a more relevant sampling list. The Study Group also noted that there is a need to be able to make a continuous assessment of what needs to be sampled using - for example- data collected under the Data Collection Regulations (DCR). The Study Group noted that in the USA some relevant bycatch occurs in bottom trawls (targeting squids) and for some cetacean species the bycatch with this gear may be a significant percentage of the PBR in the USA. The **SG recommended** that EU demersal trawl fisheries should also be assessed, based initially on observer data collected under the DCR regulations.

6.9 Links between the Data Collection Regulations and 812/2004

Current EU monitoring of protected species bycatch under 812/2004 are separate to the requirements for Member States to collect data on the biology of fish stocks, on the fleets and their activities and on economic and social issues as specified in the EU Data Collection Regulation No. 1543/2000. SGBYC **recommends,** that to enhance the data on protected species bycatch, a provision in the DCR regulations is included requiring Member States to routinely collect information on protected species bycatch in addition to fish stocks. This should not be seen as a replacement for the existing observer programmes under 812/2004 but as a way to collect data on fisheries where bycatch of protected species is rare but has been recorded from time-to-time but not necessarily documented (e.g. cetaceans in demersal trawl fisheries). This is also seen as a way to monitor new fisheries or fisheries where a bycatch problem may arise due to a shift in population of a protected species or a change of the gear type used in the fishery. Ultimately it may be appropriate for a specific data collection provision relating to protected species bycatch monitoring to be included as part of the DCR as a separate mandatory requirement of the Member States programmes with a specified list of protected species to be monitored.

6.10 Relationship with the Habitats Directive

The SG did not have time to discuss the issue in detail, but noted that bycatch monitoring is also mandated by the Habitats Directive, although the Habitats Directive does not stipulate how much monitoring should be done. The SG **recommended** that the Commission should bring some clarification to the concept of "favourable conservation status", as this is the only legislative instrument that informs EU member states what a sustainable take limit or reference take level might be. This contrasts with the U.S. where sustainable take limits are precisely defined in legislation.

6.11 Analysis of operational factors associated with bycatch

The Study Group recognised the potential value of compiling data from national observer schemes in order to investigate factors that might underlie or control bycatch events. This in turn could help us to understand how and why bycatch events occur, and assist in developing and testing hypotheses concerning bycatch reduction. However, any such analysis would require an integrated database, which the SG had previously agreed would be a useful goal. The topic was deferred for later discussion.

6.12 The best methods of extrapolating from bycatch observations to total bycatch estimation

The Study Group did not have time to explore the details of the various methods used for bycatch extrapolation. The SG noted that in some fleet sectors, it is difficult to put observers on a representative sample of vessels due to certain national safety rules on access to vessels. So the observed vessels may therefore be the vessels of the greatest size. When the fishing effort unit used in the sampling scheme is days at sea, it must be stressed that a bias is probably introduced if the length of nets hauled in a day varies according to the size of the vessel. This could be corrected by using relationships concerning length of nets by day, vessel size and target species. Some countries such as France are exploring this approach. However in some cases detailed information on net lengths does not exist, and therefore landings could be a proxy to raise the bycatch. Some countries such as Norway will try to explore this approach. The problem is similar for raising discards data and the SG **recommended** that members should follow any progress made in ICES-WKDRP (2007) on extrapolation of discards.

7 ToR E: Review new estimates of bycatch of relevant species

The Study Group was constrained by time and was unable to make a thorough review of this item. The Study Group simply compiled relevant information available at the meeting. Data on bycatch estimates of relevant species provided in National Reports under Council Regulation 812 and other relevant sources of information are summarised in Annex 8. The SGBYC is concerned with bycatch of relevant species throughout the North Atlantic and Mediterranean so information from countries outside the EC has also been included where available. The table includes the following data where provided:

- Data categorised by Year, Fishing Gear and specific fishery information for each country.
- Observed effort, total fleet effort and associated estimated percentage coverage of each sampling programme.
- Observed and total estimated numbers of by-caught animals along with respective coefficients of variation (CVs).

A more detailed analysis of national reports will be required to assess if sampling has been carried out in a representative manner and therefore determine if bycatch estimates are valid.

The Study Group **recommended** that future National reports should contain clear indications of whether sampling programmes are considered to be representative and therefore qualify for further assessment of bycatch estimates.

8 ToR F: Co-ordinate relevant bycatch mitigation trials

The Study Group reviewed the current state of the art with respect to ongoing bycatch mitigation trials with the aim of helping to coordinate activities in this field and to identify the key questions.

An overarching problem in bycatch mitigation is that there is still a lack of understanding as to why animals are caught in gillnets or in trawls and this is hampering scientists' ability to develop effective solutions. Conflicting results between and among behavioural studies and mitigation trials in real fisheries show that there is still a lack of understanding of the behaviour of animals in the vicinity of fishing gears.

It would be useful to eliminate some of the possible hypotheses of why animals are bycaught, especially whether or not detection of the fishing gear is part of the problem or a possible area of research to consider as a potential solution i.e. by making fishing gear more detectable to animals allowing easier acoustic mapping and aiding escape.

The Study Group recognised that many results of experiments remain unreported or in the grey literature, which can make for slower than necessary progress in understanding these issues. ToR A was partly established to address this problem, and it must be hoped that continued exploration of unpublished results and the grey literature will help to define and eliminate hypotheses.

Gillnet fisheries

Pingers

Pingers (acoustic alarms) have been shown in a number of controlled experiments to be very effective in reducing harbour porpoise bycatch (Kraus *et al.*, 1997; Trippel *et al.*, 1999; Larsen, 1999; Gearin *et al.*, 2000), and Larsen and Krog (2007) showed that some pingers can be used at wider spacing than currently recommended under the EU Council Resolution 812/2004. However, it is still not clear why pingers actually work. Initial experiments showed that pingers are very aversive at least to naïve animals (Goodson *et al.*, 1997; Berggren *et al.*, 2002) but more recent experiments have shown that porpoises are not always frightened away from pingers (Desportes *et al.*, 2006). The explanation for this behaviour is unclear, but presumably some kind of habituation is involved. Whether this kind of habituation could lead to increased bycatches in the long term is not known. Recent Danish trials (Larsen and Krog, 2007) have shown that pingers are no less effective in Danish fisheries than they were in 1997, but there is no way of determining whether the animals involved had become habituated or not. A general problem is that we seem to get conflicting results between and among behavioural studies and pinger trials in real fisheries.

Pingers have also been shown to reduce bycatch of common dolphins (*Delphinus delphis*) in the California drift gillnet fishery (Barlow and Cameron, 2003), but it is not clear if this result can be extrapolated to other fisheries in other areas. Behavioural studies conducted as part of the NECESSITY project seem to show that common dolphins in different geographical areas react very differently to the same pinger signals. However, there is a clear need to develop effective mitigation for static gear in the near future as there is an increasingly evident issue with common dolphin bycatch in certain gillnet and tanglenet fisheries especially in the Celtic Sea area (Northridge, *pers.comm.*).

It can be argued that the fact that pingers can be shown to work in a fishery is all that matters. However, the conflicting results from studies of behavioural reactions to pingers and from fishery trials highlights our lack of understanding of the mechanisms involved, which in turn hampers our ability to improve on the technology or to guarantee that they will work in other species or areas.

Other mitigation methods

An alerting device (PAS-pinger) was tested in the Danish North Sea gillnet fishery in 1996 in a blind, controlled experiment (Kindt-Larsen *et al.*, 2007). The hypothesis behind this concept is that bycatch of harbour porpoises in gillnets happens because the porpoises are not paying sufficient attention to their surroundings. The PAS-pinger was designed to attract the attention of animals to the net by emitting signals mimicking a porpoise click, as previous studies had shown that such signals could increase the echolocation activity of porpoises (Tregenza, *pers. comm.*). However, the experiment showed no decrease in bycatch rate when using the PAS-pinger. Research is ongoing to determine the cause of this failure to reduce bycatch, including tests of the relative behavioural responses to different alerting signals.

A series of experiments with captive porpoises have been conducted by the Danish National Institute of Aquatic Resources in collaboration with the Fjord&Belt Centre and University of Aarhus to determine how well porpoises can detect normal nylon gillnets and whether they can detect any differences between normal nylon nets and $BaSo_4$ and Fe_2O_3 nets. Both a behavioural experiment using a "Two alternative forced choice" paradigm as well as Auditory Brainstem Response measurements were used. Preliminary results suggest that the animals are not necessarily as good at detecting nets as expected based on theoretical predictions. The consortium has also continued measurements of target strength of $BaSo_4$ and Fe_2O_3 nets under different conditions. These net types were found not to differ much from standard nylon nets, but differences in the ability to trap air bubbles on the nets may create differences in target strength during the initial deployment phase. However, this effect disappears after a few hours of submergence.

Plans for future work

In Denmark, the Danish Fishermen's Association in collaboration with DTU-Aqua will continue looking at handling problems and durability of pingers. This will include new models from existing manufacturers (e.g. Aquatec) as well as models from new manufacturers. DFA/DTU-Aqua will probably also conduct a trial in a North Sea gillnet fishery, testing passive acoustic reflectors.

In France, IFREMER will be testing three pinger types (Marexi; Aquamark 100; DDD-02) in an experiment in the Iroise Sea near Brest in the monkfish tanglenet fishery. It is not yet clear what the background bycatch rates are in this fishery. The objectives are to determine how efficient each pinger is in reducing bycatch; assess practicality; identify effects on other marine mammals; and determine the area of impact. The protocol for the trial is being developed.

In the Netherlands, IMARES will be collaborating with the industry in order to gauge from fishermen how well two available pingers (DDD-02 and Aquamark) perform operationally.

In Poland, the University of Gdansk plans to conduct an experiment with pingers to reduce bycatch of harbour porpoises in a small area of the Puck Bay, which has a high density of fisheries and a high bycatch (>40% of all recorded bycatch in Poland).

Instead of deploying pingers on all nets, the plan is to place a string of pingers across the entrance to the bay to prevent porpoises from entering the high density fishing zone. This is a three year project, where the first year will be used to document (using T-PODs) the presence and density of porpoises in the bay.

In Sweden the National Board of Fisheries will be testing fish pots as an alternative to gillnets. Previous trials had shown possible problems with seals, but found a way of minimising seal bycatch. The main objective is to find a way of minimising seal depredation on fish caught in gillnets, but it would also have the effect of helping reduce porpoise bycatch.

In the UK, SMRU has looked at the effects of DDD-02s (loud pingers, source levels ~165dB) as excluding devices (Mackay *et al.*, 2007) and found no effect outside about two km using passive acoustic monitoring, which is in agreement with NECESSITY results. SMRU plans to look more closely at what happens within two km of the DDDs, *i.e.* how effective are they in excluding animals. There is also a need to do a controlled fishery trial of the DDDs, but there are no firm plans as yet. SMRU will also be looking at how different headline types on gillnets may influence the amount of porpoise echo-location in the net vicinity.

In the USA, the NMFS will be conducting trials of $BaSO_4$-nets as well as nets with heavier twine in Southern New England south of George's Bank in May 2008. A consortium led by the New England Aquarium is also planning to conduct trials of stiff nets in Latin America and in the Black Sea.

Pelagic trawl fisheries

As alluded to above, we still do not know what dolphins are doing inside trawls and this is hampering our ability to develop effective mitigation measures. Video observations are of very limited use in most situations because of their limited range. Sonar based systems have a much larger range and could probably be used to study the behaviour of dolphins and other animals inside pelagic trawls. It may also be possible to use Passive Acoustic Monitoring to study dolphin movement (at least bearings) inside the trawls.

Pingers

Pingers of different types have been trialled in a number of European pelagic trawl fisheries to assess their effectiveness in reducing bycatch of primarily common dolphins (Results of the Necessity Project: report submitted). Because bycatch is a rare event in these fisheries, statistically significant effects have been difficult to obtain, but results from both the UK and the French sea bass fisheries suggest that some types of pingers can reduce bycatch of common dolphins in pelagic trawl fisheries (Results of the Necessity Project: report submitted).

Exclusion devices

Exclusion devices-rigid grids and rope barriers-have also been trialled in a number of European pelagic trawl fisheries to assess their effectiveness in reducing bycatch of primarily common dolphins (Results of the Necessity Project: report submitted). Although common dolphins have been shown able to use escape devices, none of the configurations tested so far has proven as effective as is deemed necessary.

Plans for future work

In France, the fishing industry with help of IFREMER and Xtrawl wants to continue testing the Cetasaver VII pinger in the bass fishery in a controlled experiment with

observer coverage. There are no current plans to continue using DDDs in France because of concerns about the possible exclusion effects of these very loud pingers. Neither are there any plans to continue using exclusion devices.

In Ireland, BIM may deploy DDDs in the tuna trawl fishery to determine the effect of these pingers on dolphin bycatch. The trial will use controls on those trips that have observer coverage.

In Spain, AZTI is looking for funds to test the effectiveness of the escape devices they have developed for use in very-high-vertical-opening trawls. They may also be able to test pingers.

In the UK, SMRU will deploy DDD-02Fs in pelagic trawl fisheries together with observers this season. The results from the 2006–7 season showed promise, but there is a need for more data to determine the effectiveness of the device.

In the US, some initial studies of trawls are looking into how fish loss is affected by escape holes. This is done using cameras to monitor slits in nets in different locations.

Conclusions

Some frustration was expressed by the SGBYC that there was not enough time for a thorough discussion of the above aspects of bycatch, although they are seen to be central to our ability to develop effective mitigation measures. It was agreed that for the next meeting the SGBYC should agree on one specific topic for discussion and set aside enough time to deal with it in depth. It was also agreed that the SG should seek additional members with expertise in bycatch monitoring and mitigation in other protected species groups. It was further agreed to extend the meeting with one day to ensure sufficient time for such an in depth discussion. The SGBYC agreed that the topic for the next meeting should be:

"Why do protected species get caught in gillnets?"

As an inter-sessional task it was agreed to compile a bibliography of relevant documents on the above question as well as on pingers and the reason that pingers work.

Annex 1: List of participants

NAME	ADDRESS	PHONE/FAX	EMAIL
Arregi Errazkin, Luis	AZTI-Tecnalia AZTI Sukarrieta Txatxarramendi ugartea z/g E-48395 Sukarrieta (Bizkaia) Spain	Phone +34 946029400 Fax +34 946870006	larregi@suk.azti.es
Cosgrove, Ronan	Irish Sea Fisheries Board BIM Office New Docks Galway City Co. Galway Eire	Phone +353 91 564318/319 Fax +353 91 568569	cosgrove@bim.ie
Couperus, Bram	IMARES, Wageninen UR P.O. Box 68 NL-1970 AB IJmuiden Netherlands	Phone +31 2555 64763 Fax +31 2555 646444	bram.couperus@wur.nl
Lunneryd, Sven-Gunnar	Institute of Coastal Research/Swedish Board of Fisheries Tjärnö Marine Biological Laboratory SE-452 96 Strömstad Sweden	Phone +46 526 68625 +46 70 6612596 (mob)	Sven-gunnar.lunneryd@fiskeriverket.se
Kuklik, Iwona	Hel Marine Station University of Gdansk PO Box 2 PL-84-150 Hel Poland	Phone +48 58 6751 316 Fax +48 58 6750 420	oceik@univ.gda.pl
Larsen, Finn	Danish Institute for Fishery Research Department of Sea Fisheries Charlottenlund Castle DK-2920 Charlottenlund Denmark	Phone +45 33963468 Fax +45 33963333	fl@difres.dk
Lens, Santiago	Instituto Español de Oceanografía Centro Oceanográfico de Vigo P.O. Box 1552 E-36200 Vigo (Pontevedra) Spain	Phone +34 986 462946 Fax +34 986 492351	santiago.lens@vi.ieo.es
Lewita, Helena	Department Rybolowstwa Ministerstwo Rolnictwa i rozwoju wsi ul. Wspólna 30 00-930 Warszawa Poland	Phone +22 385 57 94	hlewita@mgm.gov.pl

Morizur, Yvon	IFREMER Centre de Brest P.O. Box 70 F-29280 Plouzané France	Phone +33 2982 244 81 Fax +33 2982 24653	yvon.morizur@ifremer.fr
Northridge, Simon (Chair)	The Gatty Marine Laboratory University of St Andrews KY16 8LB St. Andrews Scotland UK	Phone +44 1334 462654 Fax +44 1334 462632	Spn1@st-andrews.ac.uk
Rihan, Dominic	Irish Sea Fisheries Board P.O. Box 12 Crofton Road Dun Laoghaire Co. Dublin Eire	Phone +353 1 2841544 Fax +353 1 2300564	Rihan@bim.ie
Sagarminaga van Buiten, Ricardo	Spanish Cetacean Society c/ Nalón 16 E-28240 Hoyo de Manzanares Madrid Spain	Phone +34 Fax +34	ricardo@cetaceos.com
Rossman, Marjorie	NOAA Fisheries Northeast Fisheries Science Center 166 Water Street Woods Hole MA 02543 USA	Phone +011 1-508-495-2111 fax +011 1-508-495-2066	Marjorie.rossman@noaa.gov
Tasker, Mark	Joint Nature Conservation Committee Dunnet House 7 Thistle Place Aberdeen AB10 1UZ Scotland UK	Phone +44 1224 655701	mark.tasker@jncc.gov.uk

Annex 2: Agenda

The Study Group met at ICES headquarters, Copenhagen, 29–31 January 2008. The Agenda followed the Terms of Reference:

a) Review methods and technologies that have been used to minimise bycatch of species of interest, including methods that have failed

b) Review information on sustainable take limits for species and populations for which relevant data are available;

c) Consider the advantages and disadvantages of allocating take limits, and if relevant, propose methods;

d) Co-ordinate monitoring programmes under EU Regulation 812/2004 and the Habitats Directive;

- i) Scientific advice on National Reports under regulation 812/2004
- ii) Propose a standardised reporting format
- iii) Compilation of data on bycatches in the Baltic
- iv) A rationale for analysing observations conducted under Regulation 812/2004 in tandem with trials of mitigation devices
- v) Better co-ordination of sampling across national fleets
- vi) Appropriate levels of sampling required under Regulation 812/2004
- vii) The relevance of the fleets and fisheries currently being sampled to address the objectives underlying Regulation 812/2004
- viii) Links between the Data Collection Regulations and 812/2004
- ix) Relationship with the Habitats Directive
- x) Analysis of operational factors associated with bycatch
- xi) The best methods of extrapolating from bycatch observations to total bycatch estimation

e) Review new estimates of bycatch of relevant species;

f) Co-ordinate relevant bycatch mitigation trials.

Annex 3: SGBYC terms of reference for the 2009 meeting

The **Study Group for Bycatch of Protected Species [SGBYC].** (Chair: Simon Northridge, UK) will meet for a second time early in 2009, probably in Copenhagen. The date of the meeting will be established by the ASC in light of the timing of other relevant ICES group meetings. The terms of reference for 2008 will be carried forward to 2009 and an agenda addressing these issues will be agreed at or by the ASC.

a) Co-ordinate bycatch monitoring programmes under EU Regulation 812/2004 and the Habitats Directive;

b) Review methods and technologies that have been used to minimise bycatch of species of interest, including methods that have failed;

c) Co-ordinate relevant bycatch mitigation trials;

d) Consider the advantages and disadvantages of allocating take limits, and if relevant, propose methods;

e) Review new estimates of bycatch of relevant species;

f) Review information on sustainable take limits for species and populations for which relevant data are available;

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; species of conservation concern. • Bycatch rate estimation methodology • Bycatch estimation clearing house • Mitigation measures • Determination of acceptable bycatch level
RESOURCE REQUIREMENTS:	
PARTICIPANTS:	The Group is normally attended by some 15–25 members.
SECRETARIAT FACILITIES:	None.
FINANCIAL:	No financial implications.
LINKAGES TO ADVISORY COMMITTEES:	There overviews prepared by WGRED are used directly by all three advisory committees. The work done on including environmental considerations in assessments and advice is directly relevant to ACFM and ACE.
LINKAGES TO OTHER COMMITTEES OR GROUPS:	There is a very close working relationship with all the groups of the Fisheries Technology Committee. It is also very relevant to the Working Group on Ecosystem Effects of Fisheries.
LINKAGES TO OTHER ORGANIZATIONS:	The work of this group is closely aligned to major research projects funded by the EU and work conducted by other ICES expert groups.
SECRETARIAT MARGINAL COST SHARE:	ICES:100%.

Annex 4: Recommendations

RECOMMENDATION	FOR FOLLOW UP BY:
The SG **recommended** that any further mitigation plans for minimising cetacean or other protected species bycatches should be introduced only after careful consideration of all of the factors listed under the bycatch mitigation framework.	European Commission
The SG **recommended** that experts with expertise in the bycatch of other protected species groups should be encouraged to join the Study Group to help further develop this.	SGBYC; ICES; National Delegates
The SG **recommended** keeping under consideration potential measures for allocating bycatch reference limits, while seeking political advice on how this should be done.	SGBYC, ICES, STECF
The Study Group **recommended** that Reports on Council regulation 812/2004 should be made available in English in future if an adequate review is to be made.	National Reporting Authorities; European Commission
Recommended that further thought should be given to a European bycatch database design and data structures at next years SGBYC meeting	SGBYC; ICES
The Study Group **recommended** that 812 Reports should in future present data in a more homogenous geographical scale, and suggested that the ICES sub-divisional level would be generally appropriate, while recognising that in some particular cases a larger or smaller scale might be appropriate.	National Reporting Authorities; European Commission
The SG **recommended** that some common measures of fishing effort are also included in 812 Reports where possible-to enable calibration of fleet effort between nations.	National Reporting Authorities; European Commission
The SG **recommended** some analysis of how representative the sampling has been under 812/2004 by considering in detail the geographical and seasonal distribution of fleets.	National Reporting Authorities; European Commission; SGBYC
The SG **recommended** that funding should be made available by national governments to establish formal monitoring programmes where these have not already been established, so that National obligations under Regulation 812/2004 can be fully met.	National Authorities among EU member states.
The Study Group **recommended** that the Commission should establish some review of the fleets that are currently being sampled under Regulation 812/2004	European Commission
The group strongly **recommends** that the administrations of Member States must give access to appropriate logbook and effort data to the research institutes charged with responsibility for the data reporting requirements under Regulation 812/2004.	National Authorities among EU member states.
The SG **recommends** that the Commission is careful in specifying exactly which of three static gear types is intended in future Regulations.	European Commission
The SG **recommended** that pilot studies conducted under 812/2004 should be considered next year.	SGBYC
The SG **recommends** group members to use the template for standardized reporting (Annex 7) for National reports under Council Regulation 812/2004.	National Reporting Authorities;
The SG **recommended** that ICES should determine what progress towards assessing Baltic porpoise bycatch is being made under the Jastarnia Plan, and that if appropriate a thorough analysis be made of existing Baltic porpoise bycatch data, combined with any relevant new Danish and Swedish observations.	ICES; SGBYC

The SG **recommended** that members of the group should explore how representative existing sampling strategies are before taking any further the issue of co-ordinated (trans-national) monitoring,	SGBYC
The SG **recommended** that such new ideas on how much monitoring is required should be considered if and when Regulation 812/2004 is revised.	SGBYC
The SG re-iterated its **recommendation** that a review of the fleets that are currently being sampled under Regulation 812/2004 Should be undertaken, to elaborate a more relevant sampling list.	SGBYC; European Commission
The SG **recommends,** that to enhance the data on protected species bycatch, a provision in the DCR regulations is included requiring Member States to routinely collect information on protected species bycatch in addition to fish stocks.	European Commission
The SG **recommended** that the Commission should bring some clarification to the concept of "favourable conservation status".	European Commission
SG **recommended** that members should follow any progress made in ICES-WKDRP (2007) on extrapolation of discards.	SGBYC
The Study Group **recommended** that future National reports should contain clear indications of whether sampling programmes are considered to be representative and therefore qualify for further assessment of bycatch estimates.	National Reporting Authorities
The SG **recommended** that bycatch of protected species by EU demersal trawl fisheries should also be assessed, based initially on observer data collected under the DCR regulations.	SGBYC; European Commission; National Authorities.

Annex 5: Compendium of Mitigation Methods deployed to minimise bycatch of protected species (Work Ongoing under ToR A)

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		Larsen, 1999, Kraus, 1997
Active acoustic devices	Pingers	Driftnets	sea lions	Pinnipeds	California swordfish and sharks fishery	effective			Barlow and Cameron, 2003
Active acoustic devices	Pingers	Gillnets	harbour seals	Pinnipeds	Washington salmon and sturgeon fishery	Ineffective			Gearin *et al.*, 2000
Active acoustic devices	Pingers	Gillnets	Franciscana river dolphin	Cetaceans	Argentinian fishery	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

Mitigation Methods	Specific Device	Fishing Gear	Species	Species Category	Test forum	Performance	Regulatory status	Comments	References
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
Active acoustic devices	Modified/Interactive Pingers	Pelagic trawls	Common dolphins	Cetaceans	IRL, DM, FR pelagic trawls bass albacore, bowriding	Inconclusive & Inconsistent	Not required		Anon, 2006
Active acoustic devices	Modified/Interactive Pingers		Bottlenose Dolphins	Cetaceans	IRL, Bowriding 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 signalled closed cod-ends	Trawls				Operationally possible, yet to be tested in sea trials	Not required		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 P. 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	Worked for porpoises in Bays in British Columbia	Ineffective		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	Scordino & Pfeifer, 1993	Ineffective		Cummings & Thompson 1971; Fish & Vania 1971; Jefferson and Curry, 1997
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

Mitigation Methods	Specific Device	Fishing Gear	Species	Species Category	Test forum	Performance	Regulatory status	Comments	References
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	Weighted Bait	Longlines	albatross spp	Birds	Atlantic swordfish	Effective			Boggs, 2001
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	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, minimising day soak time,	Gilman *et al.*, 2005 Gilman *et al.*, 2006 Watson *et al.*, 2004
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	SEDs	Pelagic Trawls	fur seals, sea lions	Pinnipeds	Australia, NZ, Tasmaina, 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 yellowfin 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
Operational Practices	Night Sets	Longlines	seabirds	Birds	Hawaii fishery	effective			McNamara *et al.*, 1999 Boggs, 2003
Operational Practices	Side Sets	Longlines	Albatross spp	Birds	Hawaiian swordfish/tuna Western North Pacific	effective			Gilman *et al.*, 2003a Gilman *et al.*, *in press* Yokota and Kiyota, 2006

Mitigation Methods	Specific Device	Fishing Gear	Species	Species Category	Test forum	Performance	Regulatory status	Comments	References
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 so presume was effective?	McNamara *et al.*, 1999
Operational Practices	Time area closures	Gillnets	Hector's Dolphins	Cetaceans	New Zealand fisheries	highly effective	Required		Read *et al.*, 2006
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	Yet to be tested?	Not required		
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

Mitigation Methods	Specific Device	Fishing Gear	Species	Species Category	Test forum	Performance	Regulatory status	Comments	References
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
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 Mure, 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 6: A summary of sampling, bycatch observations and estimated bycatch levels

Summary of fleet data, observer effort and bycatch observations from National Reports under Regulation 812/2004

Part 1: Nation, area and fishery

Fishery Number	Country	Year	ICES divisions	Vessel size	Gear	Season
1	Spain	2005	VIa, VIIa, b, VIIIa, b and c, Ixa	<15 m	gillnet	year round
2	Spain	2005	VIa, VIIa, b, VIIIa, b and c, Ixa	>15 m	gillnet	year round
3	Spain	2006	VIa, VIIa, b, VIIIa, b and c, Ixa	<15 m	gillnet	year round
4	Spain	2006	VIa, VIIa, b, VIIIa, b and c, Ixa	>15 m	gillnet	year round
5	Spain	2006	VI, VII, VIII and IX	>15 m	HVO	year round
6	Spain	2006	VI, VII, VIII and IX	>15 m	HVO	year round
7	France	2006	IVc, VII bdehgj, VIIIabce	>15 m	Pelagic Trawl	year round
8	France	2006	IVc, VII bdehgj, VIIIabce	>15 m	gillnet	year round
9	France	2006	IVc, VII bdehgj, VIIIabce	<15 m	gillnet	year round
10	Netherlands	2004/2005	VI, VII, VIII	> 15 m	Pelagic Trawl	12(2004) & 1–3
11	Netherlands	2006	VI, VII, VIII	> 15 m	Pelagic Trawl	1–3 & 12
12	Ireland	2005	VIa	<15 m	driftnet	2
13	Ireland	2005	VIIg	>15 m	Gillnet	1, 2
14	Ireland	2005	VIIb, VIIg	<15 m	tanglenet	1, 2
15	Ireland	2005	VIIj	>15 m	pair pelagic trawl	3
16	Ireland	2005	VIIb	>15 m	pair pelagic trawl	1
17	Ireland	2005	VIa	>15 m	Pelagic trawl	4
18	Ireland	2005	VIIk	>15 m	Pelagic trawl	1
19	Ireland	2006	VIIg	>15 m	Gillnet	3,4

Fishery Number	Country	Year	ICES divisions	Vessel size	Gear	Season
20	Ireland	2006	VIIg	<15 m	tanglenet	1,2
21	Ireland	2006	VIIj	>15 m	pair pelagic trawl	3
22	Ireland	2006	VIa, VIb, VIIc	>15 m	Pelagic trawl	1,2
23	Ireland	2006	VIa, VIIb, VIIa, VIIj, VIIg	>15 m	Pelagic trawl	1, 4
24	Portugal	2005	VIa, VIIa, b, VIIIa, b and c, Ixa	<15 m	gillnet	year round
25	Portugal	2005	VIa, VIIa, b, VIIIa, b and c, Ixa	>15 m	gillnet	year round
26	Portugal	2006	VIa, VIIa, b, VIIIa, b and c, Ixa	<15 m	gillnet	year round
27	Portugal	2006	VIa, VIIa, b, VIIIa, b and c, Ixa	>15 m	gillnet	year round
28	Latvia	2006	III d	>15 m	trawl	year round
29	Latvia	2006	III d	>15 m	bottom gillnets	year round
30	Estonia	2006	III d	>15 m	trawl	year round
31	Poland	2006	III d	>15 m	trawl	from 15 Sep
32	Poland	2006	III d	>15 m	gillnet	from 15 Sep
33	Finland	2006	III d	>15 m	trawl	from July
34	Sweden	2006	III a, d	>15 m	trawl	from Sep
35	Lithunia		?			
36	Germany		?			
37	United Kingdom	2005	VI, VII, VIII	> 15 m	Pelagic trawl	December 2004–March2005
38	United Kingdom	2005	VI, VII, VIII	> 15 m	Pelagic trawl	April 2005–November 2005
39	United Kingdom	2005	Via, VIIb, VIIIa, b and c, Ixa	> 15 m	Gill and Tanglenets	year round
40	United Kingdom	2005	III, IV, IX	> 15 m	Pelagic Trawl	year round
41	United Kingdom	2005	VI, VII, VIII	<15 m	Pelagic Trawl	December 2004–March2005
42	United Kingdom	2005	VI, VII, VIII	<15 m	Pelagic Trawl	April 2005–November 2005
43	United Kingdom	2005	VIIe	not recorded	Demersal trawl	year round

Fishery Number	Country	Year	ICES divisions	Vessel size	Gear	Season
44	United Kingdom	2005	VII	not recorded	Gill and Tanglenets	year round
45	United Kingdom	2005	IV	not recorded	Gill and Tanglenets	year round
46	United Kingdom	2005	VIIe	not recorded	Ringnet	year round
47	United Kingdom	2006	VI, VII, VIII	> 15 m	Pelagic trawl	December 2004–March2005
48	United Kingdom	2006	VI, VII, VIII	> 15 m	Pelagic trawl	April 2005–November 2005
49	United Kingdom	2006	Via, VIIb, VIIIa, b and c, Ixa	> 15 m	Gill and Tanglenets	year round
50	United Kingdom	2006	III, IV, IX	> 15 m	Pelagic Trawl	year round
51	United Kingdom	2006	VI, VII, VIII	<15 m	Pelagic Trawl	year round
52	United Kingdom	2006	IV	<15 m	Pelagic Trawl	year round
53	United Kingdom	2006	VII	not recorded	Gillnets	year round
54	United Kingdom	2006	VII	not recorded	Tanglenets	year round
55	Romania	2006				
56	Slovenia	2006				
57	Greece	2006				
58	Bulgaria	2006				
59	Cyprus	2006				
60	Italy	2006		Nov 28	bottom/pelagic trawl	
61		2007				
62	Germany	2006	VI,VII,VIII	15+ m	pelagic trawl	
63	Germany	2006	IIIa,b,c , IV, IX	15- m	pelagic trawl	
64	Germany	2006		15+ m	pelagic trawl	
65	Germany	2005	VI			
66	Germany	2005	VII			
67	Germany	2005	VII			

Fishery Number	Country	Year	ICES divisions	Vessel size	Gear	Season
68	Belgium	2006	IV b		Dem trawl	
69	Belgium	2006	IV c		Gillnet	
70	Belgium	2006	IV c		Dem trawl	
71	Belgium	2006	VII a		Dem trawl	
72	Belgium	2006	VII d		Gillnet	
73	Belgium	2006	VII d		Dem trawl	
74	Belgium	2006	VII e		Dem trawl	
75	Belgium	2006	VII f		Dem trawl	
76	Belgium	2006	VII g		Dem trawl	
77	Belgium	2006	VII h		Dem trawl	
78	Denmark	2005	VI,VII,VIII	15+ m	Pelagic trawl	
79	Denmark	2005	dec-march	15- m	Pelagic trawl	
80	Denmark	2005	VI,VII,VIII	15+ m	Pelagic trawl	
81	Denmark	2005	apr-nov	15- m	Pelagic trawl	
82	Denmark	2005	IIIa,b,c,d,IV,IX	15+ m	Pelagic trawl	
83	Denmark	2005		15- m	Pelagic trawl	
84	Denmark	2005	IIIb,c,d	15+ m	Bot set gillnets	
85	Denmark	2005		15- m	Bot set gillnets	
86	Denmark	2006	VI,VII,VIII	15+ m	Pelagic trawl	
87	Denmark	2006	dec-march	15- m	Pelagic trawl	
88	Denmark	2006	VI,VII,VIII	15+ m	Pelagic trawl	
89	Denmark	2006	apr-nov	15- m	Pelagic trawl	
90	Denmark	2006	IIIa,b,c,d,IV,IX	15+ m	Pelagic trawl	
91	Denmark	2006		15- m	Pelagic trawl	

Fishery Number	Country	Year	ICES divisions	Vessel size	Gear	Season
92	Denmark	2006	IIIb,c,d	15+ m	Bot set gillnets	
93	Denmark	2006		15- m	Bot set gillnets	

Part 2: Fishing effort

	Target species	Fleet size	Boats Observed	Days at sea	Hours	Days fished
1	several species	no data	not reported	not reported		not reported
2	several species	no data	not reported	not reported		not reported
3	several species	no data	not reported	not reported		not reported
4	several species	no data	not reported	not reported		not reported
5	Blue whitting, Horse mackerel	several types	not reported	not reported		not reported
6	Hake	several types	not reported	not reported		not reported
7	Bass, Scad, mackerel, herring, sardine	125	23	8390		not reported
8	sole, bass, hake	532	7	10 640		not reported
9	sole, bass, hake	622	10	28 800		not reported
10	horse mackerel, mackerel, herring, blue whiting	15	8	834		no data
11	horse mackerel, mackerel, herring, blue whiting	15	5	685		no data
12	salmon			Not reported		Not reported
13	Hake and Cod			Not reported		Not reported
14	Turbot			Not reported		Not reported
15	albacore			Not reported		91
16	mackerel			Not reported		Not reported
17	blue whiting			Not reported		Not reported
18	herring			Not reported		Not reported
19	Hake and Cod			Not reported		2374
20	Turbot			Not reported		2374
21	albacore			Not reported		198
22	blue whiting			Not reported		Not reported
23	herring			Not reported		Not reported

	Target species	Fleet size	Boats Observed	Days at sea	Hours	Days fished
24	several species	no data	not reported	not reported		not reported
25	several species	no data	not reported	not reported		not reported
26	several species	no data	not reported	not reported		not reported
27	several species	no data	not reported	not reported		not reported
28	herring/sprat					
29	cod					
30	herring/sprat	67	7		24 218	
31	herring/sprat		3	4130		
32	cod		2	2857		
33	herring/sprat				6600	
34	herring/sprat	62	16		6100	
35						
36						
37	Mackerel, blue whiting	not recorded	not recorded	1283		not recorded
38	Herring and mackerel	not recorded	not recorded	524		not recorded
39	Anglerfish, sharks	not recorded	not recorded	748		not recorded
40	not recorded	not recorded	not recorded	1132		not recorded
41	Bass, sprats	bass = 1 pair	1 pair	95		not recorded
42	Sprats, bass	not recorded	not recorded	69		not recorded
43	not recorded	not recorded	not recorded	not recorded		not recorded
44	not recorded	not recorded	not recorded	not recorded		not recorded
45	not recorded	not recorded	not recorded	not recorded		not recorded
46	not recorded	not recorded	not recorded	not recorded		not recorded
47	Mackerel, blue whiting	not recorded	not recorded	not recorded		433

	Target species	Fleet size	Boats Observed	Days at sea	Hours	Days fished
48	Herring and mackerel	not recorded	not recorded	not recorded		468
49	Anglerfish, sharks	not recorded	not recorded	not recorded		687
50	not recorded	not recorded	not recorded	not recorded		609
51	Bass, sprats, herring, mackerel, anchovy	not recorded	not recorded	not recorded		378
52	herring, sprats	not recorded	not recorded	not recorded		299
53	not recorded	not recorded	not recorded	not recorded		86 836
54	not recorded	not recorded	not recorded	not recorded		37 742
55						
56						
57						
58						
59						
60	anchovy sardine	349	22 636			22 636
61						
62		4				
63		6				
64		44				
65					1320 hours	
66					2155 hours	
67					661 hours	
68				69		
69				228		
70				211		
71				2		

	Target species	Fleet size	Boats Observed	Days at sea	Hours	Days fished
72				58		
73				6		
74				6		
75				15		
76				161		
77				1		
78				120		
79				0		
80				35		
81				0		
82				15 900		
83				1150		
84				412		
85				6700		
86				640		
87				0		
88				35		
89				0		
90				9600		
91				1600		
92				200		
93				15 000		

Part 3: Observational effort and bycatch

	COVERAGE PLANNED	COVERAGE ACHIEVED	AIM	BYCATCH SPECIES	NO OF BYCATCHES	NO INDIVIDUALS	STRATUM
1	no plans	not reported	pilot	not reported	not reported	not reported	
2	no plans	not reported	pilot	not reported	not reported	not reported	
3	no plans	not reported	pilot	not reported	not reported	not reported	
4	no plans	not reported	pilot	not reported	not reported	not reported	
5	no plans	not reported	pilot	Common dolphin and bottlenose dolphin	no data	no data	
6	no plans	not reported	pilot	Common dolphin and bottlenose dolphin	no data	no data	
7		3.29%	pilot	Common dolphin	2	4	
8		0.57%	pilot	None	0	0	
9		0.10%	pilot	None	0	0	
10	10%	11.80%	pilot	Common dolphin	2	3	
11	10%	11.60%	pilot	Whitesided dolphin	1	1	
12			Not representative	None	0	0	
13			Not representative	Harbour porpoise	2	2	
14			Not representative	Harbour porpoise	1	1	
15	10%	15	No CV	None	0	0	
16			Not representative	None	0	0	
17			Not representative	None	0	0	
18			Not representative	None	0	0	
19			Not representative	Harbour porpoise, common and striped dolphins	7	7	
20			Not representative	None	0	0	
21	10%	6	No CV	None	0	0	
22			Not representative	None	0	0	
23			Not representative	Common dolphin	2	4	

	COVERAGE PLANNED	COVERAGE ACHIEVED	AIM	BYCATCH SPECIES	NO OF BYCATCHES	NO INDIVIDUALS	STRATUM
24	no plans	not reported		not reported	0	0	
25	no plans	not reported		not reported	0	0	
26	no plans	not reported		not reported	not reported	not reported	
27	no plans	not reported		not reported	not reported	not reported	
28	5%	5.9%	pilot	none			
29	5%	5.9%	pilot	none			
30	5%	0.76%	pilot	none			
31	5%	0.46%	pilot	none			
32	5%	0.21%	pilot	none			
33	5%	9%	pilot	none			
34	5%	3.5%	pilot	none			
35							
36							
37	10%	2.30%	pilot	None	none	none	none
38	5%	9.70%	pilot	None	none	none	none
39	5%	5.20%	pilot	None	none	none	none
40	0%	7.30%	pilot	None	none	None	None
41		93%	pilot	cetceans	not rec	not rec	none
42		72%	pilot	cetceans	not rec	not rec	none
43			Hab Dir	None	none	none	none
44			Hab Dir	None	none	none	none
45			Hab Dir	None	none	none	none
46			Hab Dir	None	none	none	none
47	10%	17.32%	pilot	None	none	0	none

	COVERAGE PLANNED	COVERAGE ACHIEVED	AIM	BYCATCH SPECIES	NO OF BYCATCHES	NO INDIVIDUALS	STRATUM
48	5%	16.45%	pilot	None	none	0	none
49	5%	0.00%	pilot	None	none	0	none
50	5%	26.11%	pilot	None	none	0	None
51	5%	49%	pilot	cetceans	not rec	164	none
52	5%	2%	pilot	cetceans	not rec	0	none
53			Hab Dir	C. dolphins	not rec	3	none
54			Hab Dir	C. dolphins	not rec	13	none
55							
56							
57							
58							
59							
60	5%	2.50%		Caretta caretta		26	
61							
62	10%	16.60%					
63	5%	0%					
64	5%	0.91%					
65	217 hours	16.60%					
66	252 hours	11.70%					
67	75 hours	11.40%					
68							
69							
70							
71							

	COVERAGE PLANNED	COVERAGE ACHIEVED	AIM	BYCATCH SPECIES	NO OF BYCATCHES	NO INDIVIDUALS	STRATUM
72							
73							
74							
75							
76							
77							
78	10%	20					
79							
80	5%	20					
81	5%	0					
82	5%	795					
83	5%	58					
84	5%	21					
85	5%	50					
86	10%	64					
87							
88	5%	20					
89	5%	0					
90	5%	480					
91	812 reg	50					
92	5%	20					
93	812 reg	50					

Part 4: Observer effort and extrapolations

	DAYS OBSERVED	HOURS	FISHING OPERATIONS	HAULS OBSERVED	EXTRAPOLATION
1	not reported		not reported	not reported	not reported
2	not reported		not reported	not reported	not reported
3	not reported		not reported	not reported	not reported
4	not reported		not reported	not reported	not reported
5	not reported		not reported	not reported	not reported
6	not reported		not reported	not reported	not reported
7	276		189	189	57
8	61		101	101	0
9	30		118	118	0
10	98		no data	143	"tens per year?"
11	87		no data	135	
12	5		5	5	
13	21		21	21	
14	16		16	16	
15	14		14	14	not reported
16	12		13	13	
17	1		3	3	
18	7		15	15	
19	45		125	125	
20	6		11	11	
21	11		11	11	not reported
22	14		20	20	
23	26		60	60	not reported

	DAYS OBSERVED	HOURS	FISHING OPERATIONS	HAULS OBSERVED	EXTRAPOLATION
24	not reported		not reported	not reported	not reported
25	not reported		not reported	not reported	not reported
26	not reported		not reported	not reported	not reported
27	not reported		not reported	not reported	not reported
28	641				
29	222				
30		185.1			
31	19				
32	6				
33		595			
34		238			
35					
36					
37			29	not reported	not reported
38			51	not reported	not reported
39			39	not reported	not reported
40			83	not reported	not reported
41			88	not reported	not reported
42			50	not reported	not reported
43			8	not reported	not reported
44			136	not reported	not reported
45			1	not reported	not reported
46			3	not reported	not reported
47			not reported	433	75

	DAYS OBSERVED	HOURS	FISHING OPERATIONS	HAULS OBSERVED	EXTRAPOLATION
48			not reported	468	77
49			not reported		0
50			not reported	609	159
51			not reported	378	186
52			not reported	299	7
53			not reported	86 836	not reported
54			not reported	37 742	not reported
55					
56					
57					
58					
59					
60	243		1005	1005	
61					
62					
63					
64					
65					
66					
67					
68					
69					
70					
71					

	DAYS OBSERVED	HOURS	FISHING OPERATIONS	HAULS OBSERVED	EXTRAPOLATION
72					
73					
74					
75					
76					
77					
78					
79					
80					
81					
82					
83					
84					
85					
86					
87					
88					
89					
90					
91					
92					
93					

Part 5: Notes

55	Bycatch data “available on request”	
56	Funding difficulties for observer programme	
57	Not applicable	
58	Common, bottlenose and harbour porpoise harvested until 1967. Info on current legislation and penalties.	
59	812 Not applicable	
60	Estimated loggerhead turtle bycatch 525/year	One study in adriatic
62	Notes on pinger studies and control	
68	Notes of stranding network 22 strandings with bycatch evidence	

Annex 7: A template for a proposed standard report of activities carried out under EC Regulation 812/2004

The Study Group proposed the following template for future National Reports under Council Regulation 812/2004:

TITLE

TABLE OF CONTENTS

SUMMARY (ENGLISH)

SUMMARY (NATIVE)

1 Introduction

[Why is this report written with reference to Council Regulation 812/2004].

1.1 Description of the fleets

[Short description of the fleets that are dealt with; no. of boats; target species; catch handling].

Table 1 [table contains example text].

CODE NUMBER FOR FLEET SEGMENT	FISHING AREA	GEAR TYPE	SEASON	REQUIRED COVERAGE %
a	Areas VI, VII & VIII	Pelagic trawls (singles and pairs)	Dec. to March	10%
b	Areas VI, VII & VIII	Pelagic trawls (singles and pairs)	April to Nov.	10%
c	Mediterranean Sea	Pelagic trawls (singles and pairs)	April to Nov.	5%
d	ICES div. VIa,	Setnets	year round	5%
	VIIa,b, VIIIa, b, c, IXa	mesh >80m mm	year round	
	ICES IV, div. VIa & sub-area VII (excl.VIIc) & VIIk	Driftnets	year round	5%
	ICES sub-area IIIa, b, c, IIId south of 59°N, IIId north of 59°N (1 June–30 Sept.), IV & IX	Pelagic trawls (singles and pairs)	year round	5%

2 Methods

2.1 Observer effort

[Short description of the sampling scheme; for more details refer to Annex; mention possible integration with EU Council regulations 1543/2000 and/or 1639/2001; this paragraph should contain Table 2: note that the effort of the fleet segments is split by ICES subarea].

Table 2.

Fleet segment (refer to code in table 1)	ICES sub-area	Fishing effort of the national fleet					Sampling effort achieved					Coverage %
		No of vessels	No of trips	Days at sea	No of hauls	Fishing hours (x meters)	No of vessels	No of trips	Days at sea	No of hauls	Fishing hours (x meters)	
a	VIa											
a	VIb											
a	VIIa											
b	VIIIa											
b	VIIIb											
c	…											
c												
c												
….												

2.2 Registration of bycatch

[Short description of how the bycatch was observed and recorded by the observer]

3 Results

[This chapter should contain Tables 3 and 4; in Table 4 one is free to choose a stratum that is supposed to be the most suitable for the analysis]

Table 3 Bycatch by species and fleet segment

Fleet segment	ICES subarea	Cetacean species	number of incidents	number of specimens	Fish target species*
a	VIa				
a	VIb				
a	VIIa				
b	VIIIa				
b	VIIIb				
c					
c					

***List target species in order of importance concerning the bycatch rate.**

Table 4 Country XXXX: bycatch rate , fleet segment and target species.

Fleet segment or other stratum	Cetacean species (scientific name)	Bycatch rate* expressed by fishing effort unit (days/hauls/hours/ hours x meters…)	Total bycatch estimate	CV percent
A				
B				
(…)				

***units of effort may be for example: specimens/days, /hauls, /hours/ hours x meters.**

4 Discussion

[Discuss the results according to possible biases in the sampling scheme and put the results in the context of bycatch rates found in the previous years.]

5 References

[List references.]

6 Annexes

[Contains for example more detailed lists and tables or other studies.

Annex 8: Summary of bycatch estimates of relevant species provided in National Reports under Council Regulation 812/2004 and other relevant sources of information

Observer effort by Nation and fishery:

					Observed Effort			Total Fleet effort			Coverage
	Country	**Year**	**Gear**	**Fishery**	**Days**	**Hauls**	**Hours**	**Days**	**Hauls**	**Hours**	**%**
1	Netherlands	2004/2005	Pelagic Trawl	mixed	98			834			11.8
2	Netherlands	2006	Pelagic Trawl	mixed	87			685			12.7
3	Ireland	2005	Pair Pelagic Trawl	albacore	14			91			15.4
4	Ireland	2006	Pair Pelagic Trawl	albacore	11			198			5.6
5	Ireland	2005–2007	Gillnet	hake, cod, turbot	34			1723			2.0
6	Estonia	2006	Pelagic Trawl				185			24 218	0.8
7	Poland	2006	Pelagic Trawl		19			4130			0.5
8	Poland	2006	gillnet		6			2857			0.2
9	Finland	2006	Pelagic Trawl				595			6600	9.0
10	Sweden	2006	Pelagic Trawl				238			6100	3.9
11	Italy	2006	Demersal/pelagic trawl	anchovy/sardine	1005			22 636			4.4
12	Germany	2005	Pelagic Trawl				544			4136	13.2
13	Denmark	2005	Pelagic Trawl		893			17 205			5.2
14	Denmark	2005	Gillnet		71			7112			1.0
15	Denmark	2006	Pelagic Trawl		614			11 875			5.2
16	Denmark	2006	Gillnet		70			15 200			0.5

					Observed Effort			Total Fleet effort			Coverage
	Country	**Year**	**Gear**	**Fishery**	**Days**	**Hauls**	**Hours**	**Days**	**Hauls**	**Hours**	**%**
17	UK	2005&2006	Pair Pelagic Trawl	bass							
18	UK	2005&2006	Gillnets	hake, cod							
19	UK	2005&2006	Tanglenets								
20	UK	2005&2006	Other Pelagic trawls								
21	France	2006	Pair Pelagic Trawl	multiple	109			5900			1.8
22	Norway	2006	Gillnet								
23	USA	2002–2006	Northeast sink Gillnet								4.4
24	USA	2002–2006	Mid-Atlantic Gillnet								2.2
25	USA	2002–2006	Mid-Atlantic Bottom trawl								2.0
26	USA	2002–2006	Northeast Bottom trawl								6.0
27	USA	2002–2006	Mid-Atlantic Mid-Water trawl								5.2
28	USA	2002–2006	Northeast Mid-Water trawl								7.7
29	USA	2002–2006	Pelagic Longline								7.2
30	USA	2002–2006	Northeast sink Gillnet								4.4
31	USA	2002–2006	Northeast Bottom trawl								6.0
32	USA	2002–2006	Northeast Mid-Water trawl								7.7
33	USA	2002–2006	Mid-Atlantic Mid-Water trawl								5.2
34	USA	2002–2006	Mid-Atlantic Bottom trawl								2.0
35	USA	2001–2005	Northeast sink Gillnet								4.4
36	USA	2001–2005	Northeast Bottom trawl								5.0
37	USA	2001–2005	Mid-Atlantic Bottom trawl								1.8

Observed bycatches:

	Country	Year	Common Dolphin	White sided	Porpoise	Long finned Pilot Whales	Striped Dolphin	Logger head turtle	Seals (mixed)
1	Netherlands	2004/2005	2						
2	Netherlands	2006		1					
3	Ireland	2005							
4	Ireland	2006							
5	Ireland	2005–2007	3		7		1		
6	Estonia	2006							
7	Poland	2006							
8	Poland	2006							
9	Finland	2006							
10	Sweden	2006							
11	Italy	2006						26	
12	Germany	2005							
13	Denmark	2005							
14	Denmark	2005							
15	Denmark	2006							
16	Denmark	2006							
17	UK	2005&2006	164						
18	UK	2005&2006	3		14				
19	UK	2005&2006	13		6				

	Country	Year	Common Dolphin	White sided	Porpoise	Long finned Pilot Whales	Striped Dolphin	Logger head turtle	Seals (mixed)
20	UK	2005&2006							
21	France	2006	4						
22	Norway	2006		149					45
23	USA	2002–2006			126				
24	USA	2002–2006			38				
25	USA	2002–2006				5			
26	USA	2002–2006				7			
27	USA	2002–2006				0			
28	USA	2002–2006				1			
29	USA	2002–2006				1			
30	USA	2002–2006		10					
31	USA	2002–2006		80					
32	USA	2002–2006		4					
33	USA	2002–2006		9					
34	USA	2002–2006		1					
35	USA	2001–2005	4						
36	USA	2001–2005	9						
37	USA	2001–2005	26						

Estimates of total bycatch (Given as annual rates except UK-estimate for 2005&2006 combined):

	Country	Year	Gear	Porpoise	Common dolphins	Long finned pilot	White sided	Coverage %	Porpoise	Common dolphin	Long finned pilot	White sided dolphin
1	Netherlands	2004/2005	Pelagic Trawl					11.8				
2	Netherlands	2006	Pelagic Trawl					12.7				
3	Ireland	2005	Pair Pelagic Trawl		0			15.4		Not calculated		
4	Ireland	2006	Pair Pelagic Trawl		0			5.6		Not calculated		
5	Ireland	2005–2007	Gillnet	355				2.0		Not calculated		
6	Estonia	2006	Pelagic Trawl					0.8				
7	Poland	2006	Pelagic Trawl					0.5				
8	Poland	2006	gillnet					0.2				
9	Finland	2006	Pelagic Trawl					9.0				
10	Sweden	2006	Pelagic Trawl					3.9				
11	Italy	2006	Demersal/pelagic trawl					4.4				
12	Germany	2005	Pelagic Trawl					13.2				
13	Denmark	2005	Pelagic Trawl					5.2				
14	Denmark	2005	Gillnet					1.0				
15	Denmark	2006	Pelagic Trawl					5.2				
16	Denmark	2006	Gillnet					0.5				
17	UK	2005&2006	Pair Pelagic Trawl		196					0.04		
18	UK	2005&2006	Gillnets	911	195				0.29	0.57		
19	UK	2005&2006	Tanglenets	283	612				0.39	0.41		
20	UK	2005&2006	Other pelagic trawls									
21	France	2006	Pair Pelagic Trawl					1.8				

	Country	Year	Gear	Porpoise	Common dolphins	Long finned pilot	White sided	Coverage %	Porpoise	Common dolphin	Long finned pilot	White sided dolphin
22	Norway	2006	Gillnet									
23	USA	2002–2006	Northeast sink Gillnet	567				4.4	0.14			
24	USA	2002–2006	Mid-Atlantic Gillnet	299				2.2	0.27			
25	USA	2002–2006	Mid-Atlantic Bottom trawl			34		2.0			0.15	
26	USA	2002–2006	Northeast Bottom trawl			15		6.0			0.13	
27	USA	2002–2006	Mid-Atlantic Mid-Water trawl			5		5.2			0.34	
28	USA	2002–2006	Northeast Mid-Water trawl			1		7.7			0.35	
29	USA	2002–2006	Pelagic Longline			109		7.2			0.2	
30	USA	2002–2006	Northeast sink Gillnet				34	4.4				0.33
31	USA	2002–2006	Northeast Bottom trawl				193	6.0				0.13
32	USA	2002–2006	Northeast Mid-Water trawl				19	7.7				0.26
33	USA	2002–2006	Mid-Atlantic Mid-Water trawl				77	5.2				0.21
34	USA	2002–2006	Mid-Atlantic Bottom trawl				29	2.0				0.11
35	USA	2001–2005	Northeast sink Gillnet		5			4.4		0.8		
36	USA	2001–2005	Northeast Bottom trawl		28			5.0		0.13		
37	USA	2001–2005	Mid-Atlantic Bottom trawl		118			1.8		0.13		

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