Contents

Executive summary

The WKBYC workshop was held to address three advice requests from the European Commission to the Working Group on Bycatch of Endangered Species.

To address these issues DGMARE requests ICES to consider the following:

1) Assess the extent to which current fishery monitoring schemes, including *inter alia* those conducted under the DCF and Regulation 812/2004, provide an acceptable means of assessing the nature and scale of cetaceans and other protected species bycatch. Consider alternative means and other sources of data that could be used to improve our understanding of the conservation threat posed to cetaceans and protected species by bycatch in European fisheries.

2) Advise on how Annex II of Regulation 812/2004 defining technical specifications and conditions of use Acoustic Deterrent Devices could be best revised in light of technical and scientific progress in this field.

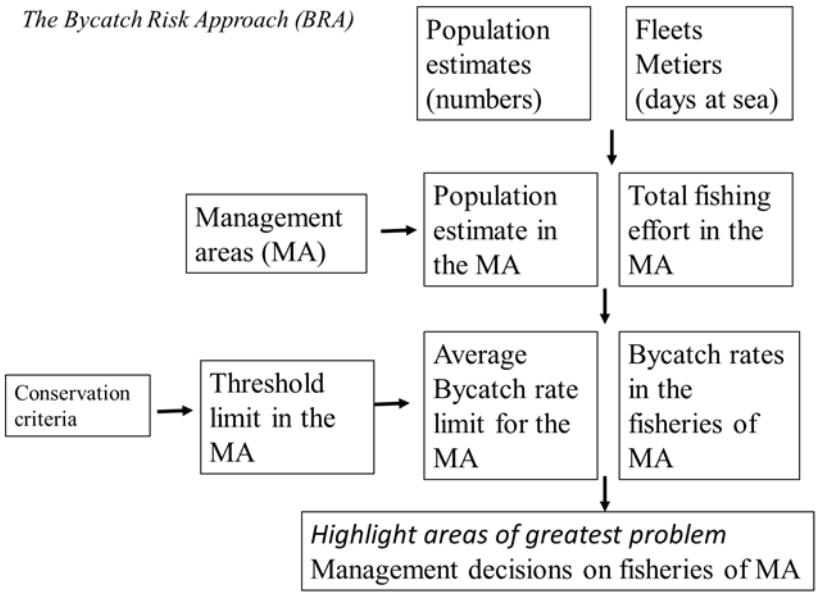
3) Based on the methodology used and the estimates of bycatch limits (take limits) generated by region at WKREV812 and other relevant analyses, propose effective ways to define limits or threshold reference points to bycatch that could be incorporated into management targets under the reformed CFP. Limits or threshold reference points should take account of uncertainty in existing bycatch estimates, should allow current conservation goals to be met, and should enable managers to identify fisheries that require further monitoring, and those where mitigation measures are most urgently required.

In response to the first request: ICES compared the coverage of current sampling under the DCF and the EU Regulation 812/2004 programmes with known abundances of cetaceans (and approximate indications of abundances of other protected species), with an index of bycatch vulnerability and with minimum estimates of fishing effort by métier. Métiers/areas were identified where the risk to populations of certain species (groups) being adversely affected was greatest, and where coverage of the present monitoring schemes was relatively poor.

Second request: ICES also approached a small number of underwater acousticians and manufacturers of ADDs and asked them for their views on how Annex II of Regulation 812/2004 could be best revised. A number of existing ADDs are effective in reducing harbour porpoise bycatch, but the full bounds of the technical specifications between an effective and an ineffective ADD are not known. The group recommends that rigorous experiments are needed to demonstrate the effectiveness of new ADDs, while prescriptive constraints are unhelpful. ICES bases its advice for an >80% reduction in bycatch on the results of all the successful pinger experiments listed by Dawson *et al.* (2013), with >95% being the standard level of confidence for scientific studies.

Third request: the group considered that the existing procedures to establish limits and reference points (CLA, PBR, and 1.7%), has been reviewed several times in the past decade. The WKBYC notes the recommendations made by the WGMME (2013), particularly that the Catch Limit Algorithm (CLA) approach is recognized as the most appropriate method to set limits on the bycatch of cetaceans and that explicit

timated for each fishery and compared with any proposed take limit, such as the 1.7% limit for cetaceans (ASCOBANS, 2000[1]). During WKREV812 this approach enabled fisheries with levels of fishing effort that could pose a potential threat to cetacean species at a regional level to be identified. The approach is summarized below. This approach was adopted in the current Workshop to try to identify fisheries that are most in need of further bycatch monitoring for all protected species.



[1] http://www.ascobans.org/pdf/mops/MOP3_2000-3_IncidentalTake.pdf.

2 Request 1: towards an optimal monitoring scheme

The old *Data Collection Framework* (DCF) is currently under revision by the STCEF. Its new name will be *Data Collection Multi-Annual Programme* (DCMAP). The DCMAP will guide future fishery monitoring and data collection within the EU covering a broad range of objectives. With the DCMAP still under discussion, its contents are not yet certain. The reflections and the advice in this chapter are based on the current DCF and may be used in the interim period until the introduction of the new DCMAP. However, these may also be used in the development of sampling coverage plans in the new DCMAP. One of the current uncertainties over the DCMAP is the upcoming EU 'discards ban' and how this will be implemented in detail. This ban may have profound consequences for how any fishery monitoring is conducted in future. It could for example result in port- or market sampling schemes, rather than sea going observer schemes. Although one can argue that the catch of PETS (Protected and Endangered Species) is discards, it is not likely that specimens of rare and protected species will be kept on board and landed (which would infringe existing national legislation of numerous Member States.

Firstly, below, an overview is given of the current sampling under EU Regulation 812/2004 and the DCF. The coverage of these programmes is cross checked against known abundances of cetaceans and approximate indications of abundances of other PETS. The objective is to identify métiers/areas which are not covered, those where there may be a risk of populations of certain species (groups) being adversely affected, or where coverage of the present monitoring schemes is sufficient.

Secondly, the possibilities of practical integration in the design and on board sampling are assessed. This topic has been dealt with in SGPIDS2012 in cooperation with WGBYC.

Thirdly, alternative means of monitoring are (briefly) discussed.

2.1 Monitoring carried out in relation to fishing effort, known bycatch rates and abundance

Member States of the EU are obliged to develop national programmes for monitoring fisheries, including on board monitoring, under Article 3 of Council Regulation 199/2008, Commission Regulation 665/2008 and the Annex of Commission Decision 2010/93/EU. National plans include detailed data on fleet capacity and fishing effort by métier and fishing area. National Plans for 15 member states were made available to the Working Group; these plans covered proposed sampling for 2011–2013. Each national plan contains detailed information on fleet activity for a reference year (or more than one such year), including fishing effort and catch for fleet segments that are segregated by gear type or métier (to Level 6, including gear type, target group and to some extent, mesh size), and by fishing ground. Fishing grounds are those agreed by Anonymous (2005; see Table 1.).

The Group compiled a data table from all the available national plans detailing effort by métier and by fishing region for the reference fleets under 812/2004, and also tabulated the planned sampling under the DCF for those same fleet segments. Effort totals were labelled as days at sea in each Member State National Plan, but it was clear that in at least two cases these were not the units being used; which were more likely hours fished or kw.days (because the totals were improbably large). Data from Germany and Belgium were therefore dropped from further compilations. No National Plans for Greece, Bulgaria, Cyprus, Finland, Latvia or Estonia were available to the

Group. Information on the Mediterranean/Black Sea and the Baltic Sea fisheries is therefore very limited.

Table 2 shows the total effort in the reference fleets by métier (level 4) for each Fishing Ground (all member states combined). This gives an approximate impression of the scale of fishing effort by region, but is likely an underestimate of the true total.

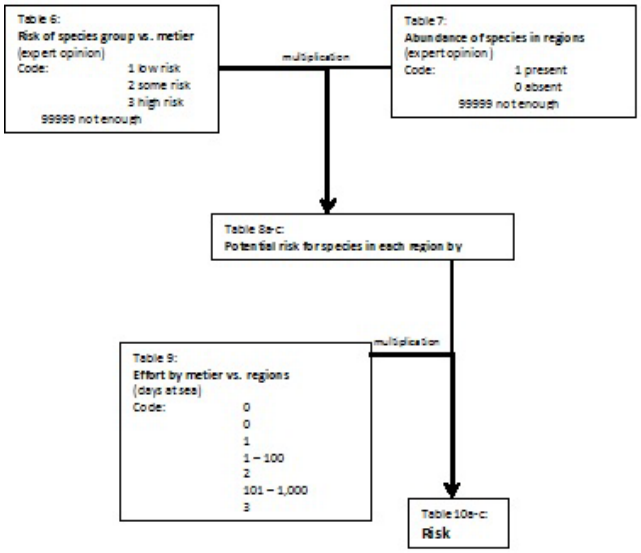
Sampling plans are given in terms of the number of trips that are planned for each métier aggregated over all three sampling years (2011–2013). Table 3 shows the number of planned trips by métier for each fishing ground (note that the Mediterranean and Black Sea have been treated here as a single unit for expedience).

The majority of Member States have submitted a combination of DCF and dedicated observer data in respect of reporting requirements under EC 812/2004 so these combined data, available in the WGBYC database, were then used to assess the level of observer coverage achieved under 812/2004. Gear types were restricted to pelagic trawls and nets as required under 812/2004. These gear types represented over 88% of observer days in the WGBYC database. A table of agreed fishing grounds which forms the basis of DCF monitoring was incorporated into WGBYC database to facilitate a common definition of geographic areas between datasets. This table is called the 'DCF areas' table for the purposes of this report. Additional categorizations in respect of aggregated fishing areas used in the WGBYC database but which were not in the original table were also included (Table 1). Details of observer coverage (this does not include other monitoring tools like REM, interview,...) achieved under 812/2004 are outlined in Table 4. Observer effort is aggregated by all years and all countries and summarized by métier level 3 and DCF areas.

In order to give an overview of the coverage by the DCF (trips) and 812/2004 (days) at level 3, the observer effort has been indexed (Table 5). Effort at métier level 3 for the 812 Reg. from the WGBYC database (days at sea; data from 2005 to 2011) is expressed as follows: 0 days = 0; 1–100 days = 1; 101–1000 = 2; > 1000 days = 3. The planned DCF effort from the DCF National Programs for 2012 as agreed in the Regional Coordination Meetings (RCM's) is indexed likewise: 0 trips = 0; 1–10 trips = 1; 11–100 trips = 2; > 100 trips = 3. The average of both numbers gives a (very) rough index of the level of coverage under both monitoring programmes. A value of 0 indicates that this métier is not covered by either of the programmes; a value of 3 indicates that the métier is covered under both programmes. Note that this does not necessarily means that the double effort as members states tend to combine the monitoring (see reports from SGBYC 2007–2011 and WGBYC 2012–2013). The group was not able to give an overview of this overlap.

Ideally, to produce a robust bycatch risk assessment the group would compile estimates of numerical abundance for all vulnerable species for each of the fishing grounds as designated by "Fishing Grounds" as used in the Regional Coordination Meetings (RCMs). At present however, such information is only available for a few cetacean species in the North Sea and Atlantic waters from the SCANS and CODA surveys. The Workshop therefore decided to opt for a simpler and more expedient approach.

The following flow diagram expresses the protocol followed in order to identify the risk for each species based métier, abundance, region and effort.



The first step is to define the risk of bycatch for each species by each métier. Within the limited time available, the group used expert opinion and a system of three categorizations (1: low risk, 2: some risk, 3: high risk) (Table 6). Risk here is taken to represent just the likelihood of bycatch and does not signify the population level risk.

The second step is to identify the presence of the species within the different fishery regions (presence=1; absence = 0; Table 7). The combination of the species abundance matrix (Table 7) and the risk of bycatch for species by each métier (Table 6) results in a potential risk matrix (e.g. Tables 8a–c) and indicates which species have a potential risk in which region. Because fishing intensity of the different métiers differs in each region, the fishing effort of the different métiers has to be taken into account. Therefore the third step is to combine the potential risk matrix (Table 8) with the fishing effort of the different métiers (e.g. days at sea) by the different fishing regions (Table 9). The effort has been indexed as well, with five levels of effort from low to high (see flow diagram above). The resulting matrix gives an impression of the risk to each species based on the métier, fishing effort and abundance in each different fishing region (Tables 10a–c). Table 11 then presents those index numbers summed across all species for each fishing region and métier. This provides an index of which areas and fishing gears are most in need of sampling.

In order to check the relative distribution of monitoring effort in the DCF against the risk by the métier, fishing effort and abundance at different regions (Table 11) is then combined with the planned effort in the DCF National programs (Table 3). In order to do this the numbers by métier in both tables are expressed as percentages of the total in each area. The differences between these percentages are given in Table 12. Thus, positive numbers indicate relative undersampling; negative numbers indicate relative oversampling. The group noticed that bottom trawling is generally oversampled with respect to monitoring of protected species bycatch, while in some specific fishing areas set-nets, lines, purse-seines are undersampled.

Table 12 therefore provides an initial blueprint for determining which métiers in which fishing areas require relatively more monitoring in order to improve estimates or understanding of bycatch across all protected species groups. Clearly the Table produced here should be viewed as a first attempt to map out the regions and gear

types that should be examined in more detail, but the map is very dependent on all the assumptions that have been made during the process described above, and is also subject to the improvisations that the Group made in determining, among other things, risk of bycatch and population abundance.

Nevertheless the Group agreed that the approach, combining species abundance, bycatch rates (or risk), fishing effort and current monitoring levels, to identify shortfalls in monitoring, is a useful one that would best be elaborated in more detail and future Working Group meetings.

2.2 Is it possible to combine monitoring of PETS and sampling of discards/catch on board/in the sampling scheme?

This question has been addressed by SGPIDS 2012 and WGBYC 2013. Protocols can be adjusted in some cases to make the routine discards sampling more usable for the monitoring of (incidental) bycatch. It was noted that if the protocol has to be amended to include large specimens, like dolphins and seals, these should be recorded at the haul level: the observer should observe the hauling of the net and the opening of the codend rather than relying on a subsample (sample level).

The DCF sampling is not designed to estimate bycatch of PETS. Implementing protected species bycatch monitoring is not just a matter of adjusting protocols. In order to estimate bycatch rates by ICES areas, sampling schemes should be adjusted according to the distribution and rate of expected incidental bycatch, which would require much higher effort. However this should not be a reason not to collect data on PETS: these are rare by definition and are being caught incidentally. Taking into account the current approaches to implement an Ecosystem Based Management to Fisheries and the EU Marine Strategy Framework Directive that seeks to achieve Good Environmental Status for the marine areas within the EU, it would be desirable to collect as much information as possible about PETS subject to bycatch in commercial fisheries. One instrument to achieve this could be the DCF. However, once a discard ban for commercial fish species is implemented, PETS may be the only groups to be sampled.

In some sampling schemes the recording of incidental bycatches may result in the crew becoming less cooperative, because the bycatch of some PETS – in particular harbour porpoises and dolphin species – draw attention of the public and add to a negative image of the fishery.

Adequate sampling of comparatively rare fish species of small size (for example shads) is difficult to implement, as it may involve sampling of the whole catch instead of taking a subsample. It requires flexible sampling, depending on the catch, which is hard to achieve on commercial vessels, and will be difficult to implement within current DCF protocols.

It was noted that in some métiers a single observer, responsible for collecting data on commercial fish species, may become overloaded with too many tasks at the same time. This emphasizes the need for strict protocols (limiting the tasks for an observer), for proper training and for an adequate sampling manual. In the US there is already a great deal of experience in training observers – for example under the North East Fisheries Observer Program (NEFOP) – to carry out multiple tasks under predefined schedules and protocols. NOAA provides an extensive observer manual which has been updates regularly over the year and may be used as an example in Europe (Anonymous, 2010).

SGPIDS notified several other issues which could be solved more easily:

1) Protocols should include a list of rare species that should be recorded during trips. These species should have a code in the institute database and code lists should be available to the observer who enters the data in the database.

2) Following the above, it is also important to have reference codes for international databases.

3) Identification of rare bycatch is often a problem, because observers are not familiar with all the species involved. This can be dealt with, by limiting the number of species, acceptance of identification by group (for example both shad species are difficult to distinguish), collection of specimens for further investigation ashore, provision of identification guides and taking pictures. An extensive manual with clear instructions and which includes a section for the identification of rare species is very important.

4) Rare species are often considered to have been dead already at the time they were being bycaught. This seems to happen often in the sampling on board beam trawlers where observers assume that it is impossible to catch a large, fast swimming animal, like a harbour porpoise, because of the low vertical opening of the trawl.

5) SGPIDS emphasized that a clear list of PETS is required. In situations where it is possible to sample more than a (few) basket(s), this may give the observer a clue to which species the catch should be scanned for. A list is also required in a number of sampling schemes where only a selection of (commercial) species is recorded. It was suggested to sample cetaceans, seals, birds, turtles (identification by species); shads (two species: *Alosa alosa*, *Alosa fallax*); Lampreys (two species*: Lampetra fluviatilis*, *Petromyzon marinus*) and sturgeon (one species: *Acipenser oxyrinchus*).

WKBYC prepared an overview of PETS already monitored in the current DCF and under other data collection regulations. Table 13 is based on input from SGBYC 2010, WGBYC and SGPIDS 2012.

Strong differences exist between countries in the monitoring of protected species groups (Table 13). Better coordination will be required under the new DCMAP.

Concerning cetaceans, some countries have dedicated monitoring schemes for EU 812/2004 purposes while some other countries have merged the requirements of all regulations (mainly DCF and Reg. 812). Some other countries have no monitoring (or irregular monitoring) because for undetermined reasons.

While species of small size (*Alosa*, lamprey) are generally observed at a sample level under the DCF, the species of larger size and or of which bycatches only occur rarely have to be observed at the haul level (SGPIDS, 2012). To optimize costs and to maximize the chance of recording these species, there is a need to observe the maximum number of hauls in a trip to get the highest precision.

During the present meeting WKBYC added to this that European grants as used for the DCF are useful to enhance the collection of PETS data at sea. Member states have also to avoid any administrative penalties for the vessels taking observers (such as for example requiring additional safety measures) while incentives for vessels accepting observers would instead be useful to improve participation levels in the monitoring schemes.

2.3 Consider alternative means and other sources of data that could be used to improve our understanding of the conservation threat posed to cetaceans and protected species by bycatch in European fisheries

Due to the rarity of some species bycatch events, sufficient data collection by observers is very expensive and difficult to perform. Therefore alternative data sources and sampling methods will be discussed in this section. Additional information could be found in the report of the WKBOMB 2010 (ICES, 2011).

I. Remote Electronic Monitoring System (REM)

The remote electronic monitoring system (REM) has already been successfully installed on many different vessel types with different gears (McElderry *et al*., 2005; 2006; 2008). The largest provider of REM-Systems is Archipelago Marine Research Ltd. Victoria, BC, Canada.

Archipelago's remote electronic monitoring system contains up to eight video cameras, gear sensors (hydraulic pressure transducer, photoelectric drum rotation sensor) and GPS mapping to record profiles of a vessel's fishing activity at sea. An onboard control box equipped with Archipelago's monitoring software package records each of these sensor data (EM Interpret Users Guide 2011). Sensor data will be used to validate fishing time and position in order to describe the spatial and temporal parameters for each fishing operation. REM sensor data and image recording are logged permanently at a flexible frequency. Thus, fishing activities and equipment usage (winches, pumps) are displayed in real time during the entire fishing activity as well as the entire fish processing and saved on removable hard disks. Flexible settings allow defining non-fishing areas like ports, so that no image recording is done in the port.

Different trials and pilot studies were performed focusing on the REM and fully documented fisheries in Europe. As an example, the results of the Danish pilot study demonstrate that the use of REM-Systems is a good approach to collect data of fishing behaviour and catch composition (Kindt-Larsen *et al*., 2011; Dalskov *et al*., 2012). With relatively low cost, a high sampling density can be achieved.

Lotte Kindt-Larsen reported on Danish trials of CCTV to monitor bycatch. Between September 2008 and July 2009, six Danish commercial fishing vessels, (four trawlers, one seiner, and one gillnetter) had an Electronic Monitoring System installed onboard. All 732 hours of video recording from the gillnet vessel were therefore analysed in order to record the number of bycaught marine mammals and seabirds. A total of three harbour porpoises (*Phocoena phocoena*), one harbour seal (*Phoca vitulina*), two cormorants (*Phalacrocrax carbo*) and one seagull (Laridai) were caught. The quality of the images showed that bycatch of marine mammals and seabirds could easily be verified on the images and the images could be processed at the highest possible speed (ICES, 2011). Germany performed a REM pilot study combined with a logbook on small gillnet vessels (<12 m) in the Baltic and could identify different seabirds at species level as well. The results show that the REM has a high potential to provide a powerful set of bycatch data. But consideration should be given to how to encourage fishers' to install a REM system onboard, extra quota or MSC could be a helpful tool.

REM may be applicable for other PETS than mammals and birds. Depending on the settings (frame rate) fish species may be monitored as well. However, experience from ongoing studies shows (i.e. the German and Danish studies mentioned above) that the analysis time increases if smaller targets are being observed.

II. MSC Schemes

The Marine Stewardship Council (MSC: http://www.msc.org/) environmental standard for sustainable fishing is the standard that a fishery must meet to become MSC certified. The certification process includes a public assessment on the fishery by the MSC assessors and takes the problematic bycatch into account. However, this rarely means that any additional sampling or monitoring is done, and more usually assessors rely on existing and sometimes very low levels of monitoring. In some cases, if the assessors recognize the potential for any bycatch problems, the fishery could be certified under a requirement for further bycatch sampling. In that case the fishery has to provide more bycatch data which could be used as well.

III. External platforms

There are a lot of small fishing vessels (e.g. small gillnet vessels) in European coastal areas. Due to the small size it is not possible to accommodate an independent onboard observer. Additional the location of small vessels are difficult because they often launch from private or public ramps in contrast to larger vessels that are docked at designated landing sites. To preserve more information about the bycatch of these small vessels, in specific cases, it may be possible to monitor bycatches from an external platform (i.e. an observation vessel amid a fishing fleet or a landbased station situated on a high cliff with a seabird colony).

IV. Interviews

Compared to the bycatch observer programmes, interviewing fishermen is a cheaper way of collecting information on bycatch. The weak points of this approach are that information depends on the fishers' memory, their skills in species identification (especially seabirds) and their trust. But interviews can help to gain a first impression of the scale of bycatch in a region before decisions are taken to implement more detailed and expensive monitoring programmes.

V. Voluntary logbook and compulsory/regulatory reporting

A voluntary logbook can provide a lot of information about the bycatch. Compared to the interviews the data are not based on the memory of the fishermen, but it still depends on the fishermen's skills in species identification and their trust. As an extension of a voluntary logbook, bycaught specimens may be brought in for examination. Consideration should be given to how to encourage fishers' to fill in a voluntary logbook.

Reporting of detailed fishery data in official logbooks is practised widely in many European fisheries. Potentially large quantities of detailed information on the catch, fishing effort, and bycatch can be extracted from logbook data and can be used for estimating removals of bycatch species, but reporting of bycatch is voluntary in most European countries. However, while in theory it is possible that all catch can be recorded in the logbooks in practice there are many examples where fishery logbooks have been shown to be inconsistent with data collected by independent observers. Therefore bycatch information is based on the fishers' skills in species identification (especially a problem for seabirds), on the cooperative spirit and awareness of the fishers. Thus, it is impossible to interpret logbook data without investigating the fishers' response rates and correct the data for possible "non-reporting".

VI. Compulsory/regulatory reporting

No information.

VII. Strandings

There exist several projects which monitor the strandings of cetaceans around Europe. Some of these projects may also target seals, birds and turtles, but the workshop did not have information on this. The projects give an overview about how many cetaceans strand in a region each year, what species they are, where and when they strand and try to identify the causes of death. The presence of dead animals on coasts or at sea may highlight the fact that bycatch is occurring in that region but as a quantitative measure such observations are not common because the number of dead animals that strand is not necessarily directly linked to the number of animals that are bycaught in the region. Byrd *et al*. (2008), however, showed that observer-generated annual estimates of bottlenose dolphin (*Tursiops truncatus*) bycatch in a gillnet fishery for spiny dogfish (*Squalus acanthias*) in North Carolina (USA) were correlated with numbers of stranded animals. Large-scale strandings of porpoises (*Phocoena phocoena*) in England and in the Netherlands and Belgium have also been used to highlight the existence of bycatch in coastal fisheries, but have not been directly linked to any change in fishing effort or actual bycatch rates. Care must be taken not to over-interpret data from stranded animals, and protocols for establishing cause of death must be followed. Strandings can help augment other data sources and raise awareness of bycatch in an area. However, low stranding rates do not provide proof of low bycatch rates in an area and furthermore, strandings of small animals on remote or inaccessible shores are likely to go unnoticed. Another weak point of these data is that (detailed) bycatch information (spatial distribution of the bycatch, fishery métier, etc.) is not available.

VIII. Assessing scars on (?) live animals

Another indirect means is to assess scars and injuries of live animals. Identified scars and injuries which are caused by fisheries interaction can provide information on exposure risk to different fishing gears and help to identify species at high bycatch risk in a fishing area (Kiszka *et al*., 2008). Such studies are suitable in small areas where the entanglement risk is relatively high. Migration of animals between areas with different levels of fishing effort may however lead to bias. This type of monitoring is probably not applicable in European waters.

IX. Monitoring local population

The monitoring of a local population can provide some evidence of the population size. But a stable population size as well as an increasing population size does not mean that there are no bycatches. Additionally a decreasing population size does not mean that it is due to fisheries bycatches. The reasons for the change in population size could not be identified in that kind of monitoring. But the data can help to gain a first impression of the potential threat of the local populations and therefore the need of a more detailed bycatch monitoring.

3 2nd request: revision of Annex 2 EC Reg. 812/2004

Re. request 2

WKBYC had been asked how Annex II of Regulation 812/2004 defining technical specifications and conditions of use for Acoustic Deterrent Devices could be best revised in light of technical and scientific progress in this field. To assist with this, the Workshop had approached a small number of underwater acousticians and manufacturers of pingers and asked them how in their view Annex II of Regulation 812/2004 could be best revised. The Workshop used their comments as input to discussing how to ensure that pingers manufactured are effective at reducing bycatch of small cetaceans without overly restrictive specifications placing unnecessary restraints and limits on the development of more optimal and cost-effective pingers. The Workshop also discussed the detailed specifications of the existing Annex II [which was concerning pingers for porpoise mitigation even if not mentioned in the regulation] and provided the following comments on revising Annex II:

Signal synthesis: There is no need to be prescriptive about how signals are synthesized. It constrains the design without actually determining the nature of the output.

Tonal/wideband: The distinction between the two is not quantified and thus of very limited value.

Source level (max–min) re. 1 μPa@1m: Although the specifications say that source level should be given as a max–min interval, the source level is actually given as min–max, and only for Set 2, while for Set 1 is given just one value. More importantly, source level is not adequately specified in Annex II. It should be specified how the source level should be computed, and the Workshop proposes that it should be expressed as dB re. 1 μPa rms@1m. It should also be specified in which direction the source level should be measured, since the transducers used in most pingers are not omnidirectional. Finally the source level should be given as the average over the whole duration of the ping and not just some peak value.

Fundamental frequency: The term fundamental frequency is not relevant to pingers that use multiple frequencies, and a pinger could have a 10 kHz fundamental frequency while producing very little sound at that frequency. It would be better to change this to '**Signal Frequency**' and define it as: *"The frequency range in which the output is measured"*.

High-frequency harmonics: Without any specification of either relative or absolute intensities of harmonics this measure is meaningless and could be removed. Alternatively a specification should be added, describing the relative or absolute intensities of the harmonics, but there is almost no information available on which to base such a specification.

Pulse duration (nominal): There is very little information available on which to base the specification of this parameter. The 300 ms chosen by several manufacturers appears to be based on the choice made for the pinger used in the very first rigorous pinger trial, i.e. the New England trial carried out in 1995. The Working group was aware of only one case where this has been the subject of research, which is the EU funded EPIC project (Lockyer *et al*., 2001). This research investigated, among other things, whether a pulse duration shorter than 300 ms could be as effective as the 300 ms signal, because there could be significant savings in energy consumption with a shorter signal. The results of the research showed that signals as short as 64 ms were

still as aversive to captive animals as signals 256 ms long. On the other hand the signal should not be too short, because it is more difficult to determine the direction to very short signals.

Interpulse interval: This parameter is difficult to specify because it is a compromise between the need for regular pulse emissions and the need to conserve battery life. It is further complicated because the upper limit of the interpulse interval depends on the effective range of the pinger (which is rarely known) and the swimming speed of the cetacean it is directed at, so it is to a large degree species-specific. The current upper limit of 30 seconds is based on very limited information on harbour porpoise swimming speeds and should be used with caution. The random aspect of the interpulse interval could be important for avoiding or reducing habituation and should be retained.

Maximum spacing between two ADDs along nets: This depends mainly on the effective range of the pinger, which is rarely known but assumed to be dependent on the source level of the pinger, and also to some degree on the directionality of the signal emissions. The spacings given by pinger manufacturers tend to be conservative, but only one study (Larsen *et al*., in press) has been reported which achieved significant results on whether the spacing for one particular pinger could be increased relative to what the manufacturers recommend as outlined in the current Annex II. This study found that the Aquamark100 could be deployed with a spacing of 455 m without loss of bycatch reduction ability, and this is the basis for the derogation that Denmark and Ireland have received from the European Commission. The Workshop noted that some types of pingers are not actually mounted on the nets, and therefore proposes to change the wording to something like "*Maximum distance between any netting and the nearest pinger*".

Other comments

- It is not clear from CR 812/2004 whether the specifications of Annex II are requirements to be strictly followed, or if the ranges given for e.g. frequency mean that a signal should be within these bounds, but not necessarily cover the whole range.
- Pingers should ideally have a means of showing whether they are functioning correctly, showing not just the battery level, but also whether the transducers are functioning. This will make it easier for the fishermen to determine if their pingers are functioning, and will also make it easier to monitor compliance.
- It would be advantageous if some kind of certification of pingers was introduced in the EU. This would ensure that pingers are living up to the specifications provided by the manufacturers that they are functioning correctly and are sufficiently robust and reliable. This in turn would reduce the problems encountered earlier with many of the pingers and provide some certainty to the fishermen that their investment in pingers was not lost. It could also increase compliance with mandatory pinger use.

The two sets of specifications in Annex II were originally meant to describe the two pingers that had been shown to be efficient at reducing harbour porpoise bycatch when Annex II was drafted. Since then, a number of other pinger manufacturers, some of them with several pinger types, have entered the market. Thus the Workshop did not see the need for retaining two different sets of specifications, but was in

favour of merging them into one set. However, it is clear from the comments above to the various parameters of the existing specifications that it is very difficult to specify all the different parameters, which could influence the effectiveness of a pinger, particularly if the specifications are supposed to encompass not only pingers for harbour porpoises but also pingers for other species of cetaceans. At the same time, we know very little about which characteristics of a pinger signal are the most important in determining the effectiveness of the pinger in reducing bycatch even for harbour porpoises and comparatively less for other cetacean species.

Because of these issues, the Workshop agreed that a better way of defining which pingers were acceptable should be based on their proven ability to reduce bycatch in commercial fisheries. By 'proven ability', the Workshop meant to include only pingers where results of experiments had been shown to *significantly reduce* bycatch of a cetacean species with a high *level of confidence*, and only if the experiment had been conducted with a *rigorous design*. The Workshop suggested that the minimum requirements for the operative parameters in the preceding sentence (the words in italics) would be the following:

Significant reduction: >80%

This is an arbitrary number and it is based on the results of all the successful pinger experiments carried out so far (Dawson *et al*., 2013).

Level of confidence: >95%

Standard level of confidence for scientific studies.

Rigorous design: This requirement has a number of aspects, which are:

- The experiment should be conducted in such a way that parties with a vested interest in the results cannot influence the outcome.
- The experiment should include at least one control group and one treatment group.
- The experiment should be covered 100% by independent on-board observations.
- Bycatch rates should be based on statistically independent bycatch events.

It could be argued that the effect of ADDs might vary between areas, for example due to differences in background noise, salinity, temperature, traffic and predators. This would require studies on the same populations of harbour porpoises on which the pingers will be used. The group noted that so far there is no evidence of this. However, the possibility that ADDs tested in other areas may not be effective should be taken into account. Therefore the use of ADDs should not be an excuse to exclude the fishery from routine monitoring.

Choosing this avenue gets around the problems of specifying sufficiently precisely what a pinger should do to be acceptable, and will ensure that only pingers with a proven effect are marketed in the EU. It also gets around the problems inherent in attempting to specify pingers for cetacean species where the available knowledge is even less perfect than for harbour porpoises. Under the proposed system, Annex II would include a list of pingers that have been determined to be acceptable according to the requirements given above, and include a list of relevant parameters. The Workshop envisaged that an expert group established by the European Commission would be responsible for this evaluation of experiment results and determining the relevant parameters. The certification process proposed above would thus include

tests of whether the pingers manufactured do indeed have the specifications of the pingers used in the original experiment.

During the meeting itself noise exposure limit criteria for marine mammals were not considered. However such considerations may play a role in future in the definition of requirements for pingers (Southall *et al.*, 2007).

4 Request 3: How to set bycatch limits and classifying fisheries to risk

4.1 What is the best way of setting bycatch limits

The WKBYC was requested by the EC to propose effective **ways** to define limits or threshold reference points to bycatch of PETS that could be incorporated into management targets under the reformed CFP.

The group was also asked to propose effective ways to enable managers to identify fisheries that require further monitoring, and those where mitigation measures are most urgent.

Conservation and management objectives are integral parts of defining thresholds. Effective ways to define limits or threshold reference points to bycatch that could be incorporated into management targets under the reformed CFP have been already identified in a number of meetings. Differences between existing management procedures (CLA for cetaceans, PBR for all PETS and 1.7% for specifically for harbour porpoises) have been thoroughly considered by SGFEN (2001 and 2002) and more recently by the ICES WGMME (2013). This table summarizes two key aspects of management procedures: conservation objectives and population simulation time frames:

Management algorithm	Conservation objectives	Simulation time frame
CLA/RMP (as implemented by the International Whaling Commission)	72% carrying capacity on average (50% of the time)	100 years
PBR (as implemented under US legislation)	50% of carrying capacity (95% of the time)	100 years
ASCOBANS 1.7%	80% of carrying capacity (95% of the time)	100 years

The WKBYC **notes** the recommendations made by the WGMME (2013), particularly that: a) the Catch Limit Algorithm (CLA) approach is recognized as the most appropriate method to set limits on the bycatch of cetaceans; b) explicit conservation and management objectives for managing interactions between fisheries and cetacean populations should be adopted at a European level; c) the time frame for CLA trials should be set at 100 years.

Concerning other species of conservation concern, for birds there have been some attempts to apply the PBR approach (Žydelis *et al*., 2009; Warden, 2010). Moreover, ICCAT conducted Ecological Risk Assessments (ERA) for sharks and other bycatch species in tuna fisheries (Cortes *et al*., 2010; Arrizabalaga *et al*., 2011). This year it will conduct an ERA for sea turtles. The ultimate aim will be the approval by contracting Parties of ICCAT management plans.

When testing the CLA or other similar methods (e.g. ERA) for setting reference points, the following issues related with the bycatch issue must be taken into consideration:

- For fishery-induced mortality the age structure of the population is an important aspect. For example juvenile males in harbour porpoises may be

more prone to entanglement than other specimens of different age and gender. According to the demographics of this order, this mortality has a potentially lower impact at population level than that of fecund females.

- Uncertainty from bycatch estimates should also be taken into account and added to the uncertainty coming from abundance estimates.
- Relationships between Ecological Management Units and existing fisheries management areas need to be considered. Species do not respect boundaries, but some consideration needs to be given to the format of existing fishery data that will be the main basis for estimating total bycatch numbers.
- The choice of reference points should allow for different levels of management responses, going from more "monitoring and research" (low bycatch limit) to "immediate fishery management actions" (high bycatch limit).

Within the context of the ongoing scientific and technical discussions related to the implementation of MSFD, the OSPAR Intersessional Correspondence Group on the Co-ordination of Biodiversity Assessment and Monitoring (ICG-COBAM) is considering the development of the "mortality rate due to bycatch" as indicator for Good Environmental Status (GES). The parameter to be measured is '*numbers of individuals being bycaught in relation to population estimate set for each population range or Management Unit (MU)*' with the target of reducing the annual bycatch rate for marine mammals to below levels that are expected to allow conservation objectives to be met. Other countries (e.g. Italy) have proposed within the framework of GES indicators and environmental targets, the adoption of one of the above management procedures as the primary objective which should become fully operative by 2018.This should occur after proper scientific evaluation and political negotiation which, given the highly mobile nature of the species involved, aims toward a common international approach to management and monitoring of the marine mammal bycatch issue.

The WKBYC **agrees** with this general approach. Although the WKrev812 advice was provisionally based on the application of the 1.7% rule to existing quantitative information, there is a clear need to move away from using simple fractions of best population estimates (e.g. applying a percentage originally designed solely for harbour porpoises to all cetacean species) as in the long term such generalizations could negatively impact species and local populations.

4.2 Classifying fisheries according to risk

In its third request, the EC requested WKBYC to propose effective ways to enable managers to identify fisheries that require further monitoring and those where mitigation measures are most urgent. The WKBYC reiterated the ICES advice based on the deliberations of the WKrev812 (ICES, 2010). Despite the lack of complete information on fishery effort, the fact that many fisheries are not monitored for bycatch of protected species it was clear that some species are highly likely to be at risk from specific fishing gears in specific areas (e.g. static nets for harbour porpoise of the Baltic, or set-nets for Mediterranean bottlenose dolphins; see ICES Advice 2011). The WKBYC also proposes a bycatch risk approach (BRA) for the classification of fisheries in terms of risk to protected species and species of conservation concern (see flow diagram in paragraph 1.4).

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Annex 2: Tables

Table 1. Fishing areas used in DCF and WGBYC datasets: from Anonymous (2005) and a column added with the abbreviations of the second Column Additional categorizations in respect of aggregated fishing areas used in the WGBYC database but which were not in the original table were also included (Italics).

RCM	Fishing ground	Area	Code
Baltic	Eastern Baltic	ICES Subdivision 25–32	EB
Baltic	*Skagerrak and western and eastern Baltic*	*SK & WB & EB*	*SK & WB & EB*
Baltic	Western Baltic	ICES Subdivision 22–24	WB
Baltic	*Western and Eastern Baltic*	*ICES Subdivision 22–32*	*WB & EB*
Mediterranean & Black Sea	GSA 16	GSA 16	GSA 16
Mediterranean & Black Sea	GSA 17	GSA 17	GSA 17
Mediterranean & Black Sea	GSA 7	GSA 7	GSA 7
Mediterranean & Black Sea	GSA 8	GSA 8	GSA 8
Mediterranean & Black Sea	Northern Alboran Sea	GSA01	GSA01
Mediterranean & Black Sea	Azov Sea	GSA30	GSA30
Mediterranean & Black Sea	*Multiple or unkown areas in Mediterranean*	*MED*	*MED*
North Atlantic	Bay of Biscay	ICES Divisions VIIIabde	BB
North Atlantic	Western Channel	ICES Division VIIe	WC
North Atlantic	Azores	ICES Subarea X	AZ
North Atlantic	Celtic Sea	ICES Divisions VIIfgh	CS
North Atlantic	Iberian Sea	ICES Subarea IX and Division VIIIc	IB
North Atlantic	Irish Sea	ICES Division VIIa	IS
North Atlantic		ICES Subarea XII, XIV and Division Va	MA
North Atlantic	*Multiple areas in NorthAatlantic*	*NA*	*NA*
North Atlantic	NAFO	NAFO areas	NAFO
North Atlantic	Western Ireland	ICES Divisions VIIbcjk	WI
North Atlantic	Western Scotland	ICES Subarea VI	WS
North Atlantic	Faroe Islands	ICES Division Vb	FI
North Sea & Eastern Arctic	Eastern Arctic	ICES Subareas I and II	EA
North Sea & Eastern Arctic	North Sea and Eastern Channel	ICES Subarea IV and Division VIId	NS
North Sea & Eastern Arctic	*North Sea and Skagerrak*	*NS & SK*	*NS & SK*
North Sea & Eastern Arctic	*Skagerrak and Kattegat*	*ICES Division IIIa*	*SK*
Unknown	*Unknown*	*Unknown*	*Unknown*

Table 2. Total effort (days at sea) in the reference fleets by métier (level 4) for each Fishing Ground (all member states combined without Germany and Belgium). AZ=Azores; BB=Bay of Biscay; CS=Celtic Sea; EA=Eastern Arctic; EB=Eastern Baltic; FI=Faroe Islands; IB=Iberian Sea; IS=Irish Sea; MA=Mid-Atlantic; ME=Mediterranean; NS=North Sea and Eastern Channel; SK=Skagerrak and Kattegat; WB=Western Baltic; WC=Western Channel; WI=Western Ireland; WS=Western Scotland.

Updated gear	Effort	AZ	BB	BS	CS	EA	EB	FI	IB	IS	MA	ME	NS	SK	WB	WC	WI	WS
BTF	19.5						19.5											
DRB	203331		8192.5		735				49595	5795		78938	28843.5	138.5		26438.5	219	4436
FPN	8680.5			364			6078					354			1884.5			
FPO	460281		20185.5		14699		12544		89631	22565.5	20.5	67526	105203	13391.5	5583	44038.5	2775	62118.5
FYC	8962								8962									
FYK	31963		1514				5258.5					17989	19	6288	894.5			
GND	17500		2316		42.5		266.5					13111	1401	12		351		
GNS	672412.8	3076	23074	38	7040.5	73	61101	91	157136.5	1031		309595	48776.25	7740	25996.5	20472	6061	1111
GTR	490644.9		32126.5		1273.5		242		111896	32		314510.9	21026.5	1079	839.5	7488.5	129.5	1
LA	2370.5											2370.5						
LHM	87680	27912	193.5	29	4046.5				16073	58.5		32292.5	3810.5			3211	45.5	8
LHP	28749	4738	4018		579	0	8933		10	4		3865	2379	1463.5	177.5	2349	232	1
LLD	80338		430		28		680.5		7251			71785			14.5	47	102	
LLS	213113.6	7315	21658.5	1.5	1525	18	6268		51968	67.5		99092.1	3017	208.5	405	5131	10657.5	5781
LTL	11049.5		1593									8876.5				580		
MIS	58355		18945		726		87.5			1		33408.5	1485	84.5	24.5	3590	1	2
OTB	966647		40711.5		24692.5	1897.5	18668.75	690	100395	20664	2026	497513.5	99032.52	37640.15	12405.54	32287.5	38109	39913.5
OTM	28952.88		2152	749	186.5	1049.75	7849	30.5	21	978	383	5383	5345.883	433.75	534	1033	1450.5	1374
OTT	59450.5		31461		10328		33	2.5	13	34.5			10267	3370	39	623.5	1082	2197
PS	143072.8	5085	3797		40.5	123.6667	12		68081	5.5		64935	497.5833	88.5		397	1	9
PTB	24251.37		1962		1	335	995.5	2	12691				7341.786	195.25	519.3333	37	66	105.5
PTM	39414.85		5443		137.5	31	3845.3		408	122	11	22001	2750.967	457.8333	658.75	2075.5	1043.5	429.5
SB	12992				11.5		39					12614		323		4.5		
SDN	5169.452						26.5			1.5			1222.879	2874.479	1041.095	3		
SND	126												126					
SSC	6333				738					123.5			4489.5		111.5	304.5	254.5	311.5
TBB	94115.5		153		5111.5				13028	1133.5		12604	55142.5	292		6584.5	65	1.5
TGB	4												4					
TOTALS	**3880681**	**48126**	**219926**	**1181.5**	**71942**	**3527.917**	**132947.6**	**816**	**687159.5**	**52617**	**2440.5**	**1668765**	**402181.4**	**76080.46**	**51128.72**	**157046.5**	**62294**	**117800**

Table 3. Number of trips by métier for each fishing ground under the DCF as reported by MS Annual Plans. AZ=Azores; BB=Bay of Biscay; CS=Celtic Sea; EA=Eastern Arctic; EB=Eastern Baltic; FI=Faroe Islands; IB=Iberian sea; IS=Irish Sea; MA=Mid Atlantic; ME=Mediterranean; NS=North Sea and $Èstern "hannel; SK=Skagerrak and Kattegat; WB=Western Baltic; WC=Western Channel; WI=Western Ireland; WS=Western Scotland.

Updated gear	no of trips	AZ	BB	CS	EA	EB	FI	IB	IS	MA	ME	NS	SK	WB	WC	WI	WS
DRB	70			7					31			20			12		
FPN	102					18					72			12			
FPO	384			11		57		0	202		0	12	36	21	0	11	34
FYC	0							0									
FYK	33					1						0	30	2			
GND	0																
GNS	711			56		157	7	126	8	7	60	105	60	51	56	16	2
GTR	432		120	6				40			180	40			46		
LA	15										15						
LHM	144	144									0						
LHP	36			0		36						0			0		
LLD	268					24					244						
LLS	252	144	36			24		36			12	0					
LTL	0										0						
MIS	0																
OTB	4149		134	113	17	261	32	652	266	13	1257	421	425	189	127	97	145
OTM	524		40		15	60		4	36	6	114	62		9	12	148	18
OTT	12											12					
PS	270							96			174						
PTB	183		24		6	12		141						0			
PTM	125		13	10	1	0		8	16		24	6		6	8	24	9
SDN	60		12									12	36				
SSC	44			2					3			36				3	
TBB	316			40				36	6			161			72	1	
ALL Gears	**8130**	**288**	**379**	**245**	**39**	**650**	**39**	**1139**	**568**	**26**	**2152**	**887**	**587**	**290**	**333**	**300**	**208**

Table 4. Observer coverage (days at sea/year) achieved under EU Reg. 812/2004. Data are summarized by métier level 3 and DCF areas. AZ=Azores; BB=Bay of Biscay; CS=Celtic Sea; EA=Eastern Arctic; EB=Eastern Baltic; FI=Faroe Islands; IB=Iberian Sea; IS=Irish Sea; MA=Mid-Atlantic; ME=Mediterranean; NS=North Sea and $Èstern Channel; SK=Skagerrak and Kattegat; WB=Western Baltic; WC=Western Channel; WI=Western Ireland; WS=Western Scotland.

RCM	RCM codes	Nets	Pelagic trawl	Grand Total
Baltic	EB	308	1738	2046
	SK & WB & EB	15	10	25
	WB	351		351
	WB & EB	184	590	774
Baltic total		858	2338	3196
Mediterranean & Black Sea	GSA 16		55	55
	GSA 17		1395	1395
	GSA 7		199	199
	GSA 8	164		164
	MED		217	217
Mediterranean & Black Sea Total		164	1866	2030
North Atlantic	BB	791	357	1148
	CS	600	96	696
	FI		1	1
	IB	28	7	35
	IS	20	18	38
	NA	1269	1722	2991
	WC	459	427	886
	WI	182	596	778
	WS	59	738	797
North Atlantic Total		3408	3962	7370
North Sea & Eastern Arctic	EA		162	162
	NS	222	445	667
	NS & SK	85		85
	SK	596	85	681
North Sea & Eastern Arctic Total		903	692	1595
Grand total		5333	8858	14 191

Table 5. Coverage, index scores and average of index scores to indicate combined coverage by the Reg. 812 and DCF. Effort at métier level 3 is given in table a for the 812 Reg. from the WGBYC database (days at sea; data from 2005 to 2011). Table b gives the planned DCF effort from the DCF National Programs for 2012 as agreed in the Regional Coordination Meetings (RCM's). The coverage of the DCF is indexed in table c (0 trips = 0; 1–10 trips = 1; 11–100 trips = 2; > 100 trips = 3). Coverage under Reg. 812 is given in table d (0 days = 0; 1–100 days = 1; 101–1000 = 2; > 1000 days = 3). Table e gives the averages and thus a (very) rough index of the level of coverage under both monitoring programmes. AZ=Azores; BB=Bay of Biscay; CS=Celtic Sea; EA=Eastern Arctic; EB=Eastern Baltic; FI=Faroe Islands; IB=Iberian Sea; IS=Irish Sea; MA=Mid-Atlantic; ME=Mediterranean; NS=North Sea and $Èstern Channel; SK=Skagerrak and Kattegat; WB=Western Baltic; WC=Western Channel; WI=Western Ireland; WS=Western Scotland.

a)	Metier Level 3	Total (days)	AZ	BB	CS	EA	EB	FI	IB	IS	MA	ME	NS	SK	WB	WC	WI	WS
WGBYC	Nets	3616		791	600		308		28	20			222	596	351	459	182	59
coverage	Pelagic trawl	4670		357	96	162	1738	1	7	18			445	85		427	596	738

b)	Updated gear	Total (Sampled trips)	AZ	BB	CS	EA	EB	FI	IB	IS	MA	ME	NS	SK	WB	WC	WI	WS
DCF pelagic trawls	Nets	1143	0	120	62	0	157	7	166	8	7	240	145	60	51	102	16	2
and nets coverage	Pelagic trawl	649	0	53	10	16	60	0	12	52	6	138	68	0	15	20	172	27

c)	Metier Level 3		AZ	BB	CS	EA	EB	FI	IB	IS	MA	ME	NS	SK	WB	WC	WI	WS
WGBYC	Nets		0	2	1	2	3	1	1	1	0	0	2	1	0	2	2	2
scores	Pelagic trawl		0	2	2	0	2	0	1	1	0	0	2	2	2	2	2	1

d)	Updated gear		AZ	BB	CS	EA	EB	FI	IB	IS	MA	ME	NS	SK	WB	WC	WI	WS
DCF pelagic trawls	Nets		0	3	2	0	3	1	3	1	1	3	3	2	2	3	2	1
and nets scores	Pelagic trawl		0	2	1	2	2	0	2	2	1	3	2	0	2	2	3	2

e)	Metier Level 3		AZ	BB	CS	EA	EB	FI	IB	IS	MA	ME	NS	SK	WB	WC	WI	WS
Average of	Nets		0	2.5	2	0	2.5	0.5	2	1	0.5	1.5	2.5	2	2	2.5	2	1
index scores	Pelagic trawl		0	2	1	2	2.5	0.5	1.5	1.5	0.5	1.5	2	0.5	1	2	2.5	2

Table 6. Identified risk (by expert opinion) for species groups by each fishing métier: 1: low risk; 2: medium risk; 3: high risk.

Gear	Lampreys	Round fish	Turtles	Diving birds	Surface birds	Seals	Dolphins	Harbour porpoise	Large whales
Boat dredge [DRB]	1	1	1	1	1	1	1	1	1
Bottom otter trawl [OTB]	2	2	3	1	2	2	1	1	1
Multi-rig otter trawl [OTT]	2	2	3	1	1	1	1	1	1
Bottom pair trawl [PTB]	2	2	3	1	1	1	1	1	1
Beam trawl [TBB]	2	1	3	1	1	1	1	1	1
Midwater otter trawl [OTM]	1	3	2	2	2	2	2	1	2
Pelagic pair trawl [PTM]	1	3	2	2	2	2	2	1	2
Hand and Pole lines [LHP] [LHM]	1	1	1	1	1	1	1	1	1
Trolling lines [LTL]	1	1	1	2	3	1	1	1	1
Drifting longlines [LLD]	1	1	3	2	3	1	1	1	2
Set longlines [LLS]	1	1	3	2	3	1	1	1	2
Pots and Traps [FPO]	2	1	1	1	1	1	1	1	2
Fykenets [FYK]	3	2	1	2	1	3	1	1	1
Stationary uncovered poundnets [FPN]	1	1	1	1	1	2	1	1	1
Trammelnet [GTR]	1	3	3	3	1	3	2	3	2
Set gillnet [GNS]	1	3	3	3	1	3	2	3	2
Driftnet [GND]	1	3	3	3	3	3	3	3	3
Purse-seine [PS]	1	1	1	1	1	1	2	1	1
Lampara nets [LA]	1	1	1	1	1	1	1	1	1
Fly shooting seine [SSC]	2	2	1	1	1	1	1	1	1
Anchored seine [SDN]	2	2	1	1	1	1	1	1	1
Pair seine [SPR]	2	2	1	1	1	1	1	1	1
Beach and boat seine [SB] [SV]	2	2	1	1	1	1	1	1	1
Glass eel fishing	2	1	1	1	1	1	1	1	1

Table 7. Abundance of the species group (by expert opinion) at the different areas: 1: present; 0: absent. AZ=Azores; BB=Bay of Biscay; CS=Celtic Sea; EA=Eastern Arctic; EB=Eastern Baltic; FI=Faroe Islands; IB=Iberian Sea; IS=Irish Sea; MA=Mid-Atlantic; ME=Mediterranean; NS=North Sea and $Èstern Channel; SK=Skagerrak and Kattegat; WB=Western Baltic; WC=Western Channel; WI=Western Ireland; WS=Western Scotland.

Area	lampreys	roundfish	turtles	diving birds	surface birds	seals	dolphins	harbour porpoise	large whales
WB	1	1	0	1	1	1	0	1	0
EB	1	1	0	1	1	1	0	1	0
SK	1	1	0	1	1	1	1	1	1
EA	1	1	0	1	1	1	1	1	1
NS	1	1	0	1	1	1	1	1	1
WC	1	1	1	1	1	1	1	1	1
BB	1	1	1	1	1	1	1	1	1
CS	1	1	1	1	1	1	1	1	1
IS	1	1	1	1	1	1	1	1	1
FI	1	1	1	1	1	1	1	1	1
WS	1	1	1	1	1	1	1	1	1
WI	1	1	1	1	1	1	1	1	1
IB	1	1	1	1	1	1	1	1	1
MA	1	1	1	1	1	1	1	1	1
AZ	1	1	1	1	1	1	1	0	1
ME	1	1	1	1	1	1	1	1	1

Table 8a. Potential risk for the species groups for each métier in the Western Baltic (combination of Tables 6 and 7).

Métier	WB								
	lampreys	**round fish**	**turtles**	**diving birds**	**surface birds**	**seals**	**dolphins**	**harbour porpoise**	**large whales**
Boat dredge [DRB]	1	1	0	1	1	1	0	1	0
Bottom otter trawl [OTB]	2	2	0	1	2	2	0	1	0
Multi-rig otter trawl [OTT]	2	2	0	1	1	1	0	1	0
Bottom pair trawl [PTB]	2	2	0	1	1	1	0	1	0
Beam trawl [TBB]	2	1	0	1	1	1	0	1	0
Midwater otter trawl [OTM]	1	3	0	2	2	2	0	1	0
Pelagic pair trawl [PTM]	1	3	0	2	2	2	0	1	0
Hand and Pole lines [LHP] [LHM]	1	1	0	1	1	1	0	1	0
Trolling lines [LTL]	1	1	0	2	3	1	0	1	0
Drifting longlines [LLD]	1	1	0	2	3	1	0	1	0
Set longlines [LLS]	1	1	0	2	3	1	0	1	0
Pots and Traps [FPO]	2	1	0	1	1	1	0	1	0
Fykenets [FYK]	3	2	0	2	1	3	0	1	0
Stationary uncovered poundnets [FPN]	1	1	0	1	1	2	0	1	0
Trammelnet [GTR]	1	3	0	3	1	3	0	3	0
Set gillnet [GNS]	1	3	0	3	1	3	0	3	0
Driftnet [GND]	1	3	0	3	3	3	0	3	0
Purse-seine [PS]	1	1	0	1	1	1	0	1	0
Lampara nets [LA]	1	1	0	1	1	1	0	1	0
Fly shooting seine [SSC]	2	2	0	1	1	1	0	1	0
Anchored seine [SDN]	2	2	0	1	1	1	0	1	0
Pair seine [SPR]	2	2	0	1	1	1	0	1	0
Beach and boat seine [SB] [SV]	2	2	0	1	1	1	0	1	0
Glass eel fishing	2	1	0	1	1	1	0	1	0

Table 8b. Potential risk for the species groups for each métier in the North Sea and $astern Channel (combination of Tables 6 and 7).

Métier	WB								
	lampreys	**foundfish**	**turtles**	**Diving sbirds**	**Surface birds**	**seals**	**dolphins**	**harbour porpoise**	**Large whales**
Boat dredge [DRB]	1	1	0	1	1	1	1	1	1
Bottom otter trawl [OTB]	2	2	0	1	2	2	1	1	1
Multi-rig otter trawl [OTT]	2	2	0	1	1	1	1	1	1
Bottom pair trawl [PTB]	2	2	0	1	1	1	1	1	1
Beam trawl [TBB]	2	1	0	1	1	1	1	1	1
Midwater otter trawl [OTM]	1	3	0	2	2	2	2	1	2
Pelagic pair trawl [PTM]	1	3	0	2	2	2	2	1	2
Hand and Pole lines [LHP] [LHM]	1	1	0	1	1	1	1	1	1
Trolling lines [LTL]	1	1	0	2	3	1	1	1	1
Drifting longlines [LLD]	1	1	0	2	3	1	1	1	2
Set longlines [LLS]	1	1	0	2	3	1	1	1	2
Pots and Traps [FPO]	2	1	0	1	1	1	1	1	2
Fykenets [FYK]	3	2	0	2	1	3	1	1	1
Stationary uncovered poundnets [FPN]	1	1	0	1	1	2	1	1	1
Trammelnet [GTR]	1	3	0	3	1	3	2	3	2
Set gillnet [GNS]	1	3	0	3	1	3	2	3	2
Driftnet [GND]	1	3	0	3	3	3	3	3	3
Purse-seine [PS]	1	1	0	1	1	1	2	1	1
Lampara nets [LA]	1	1	0	1	1	1	1	1	1
Fly shooting seine [SSC]	2	2	0	1	1	1	1	1	1
Anchored seine [SDN]	2	2	0	1	1	1	1	1	1
Pair seine [SPR]	2	2	0	1	1	1	1	1	1
Beach and boat seine [SB] [SV]	2	2	0	1	1	1	1	1	1
Glass eel fishing	2	1	0	1	1	1	1	1	1

Table 8c. Potential risk for the species groups for each métier in the Mediterranean Sea (combination of Tables 6 and 7).

MÉTIER	ME								
	lampreys	**Roundfish**	**turtles**	**diving birds**	**surface birds**	**seals**	**dolphins**	**harbour porpoise**	**large whales**
Boat dredge [DRB]	1	1	1	1	1	1	1	1	1
Bottom otter trawl [OTB]	2	2	3	1	2	2	1	1	1
Multi-rig otter trawl [OTT]	2	2	3	1	1	1	1	1	1
Bottom pair trawl [PTB]	2	2	3	1	1	1	1	1	1
Beam trawl [TBB]	2	1	3	1	1	1	1	1	1
Midwater otter trawl [OTM]	1	3	2	2	2	2	2	1	2
Pelagic pair trawl [PTM]	1	3	2	2	2	2	2	1	2
Hand and Pole lines [LHP] [LHM]	1	1	1	1	1	1	1	1	1
Trolling lines [LTL]	1	1	1	2	3	1	1	1	1
Drifting longlines [LLD]	1	1	3	2	3	1	1	1	2
Set longlines [LLS]	1	1	3	2	3	1	1	1	2
Pots and Traps [FPO]	2	1	1	1	1	1	1	1	2
Fykenets [FYK]	3	2	1	2	1	3	1	1	1
Stationary uncovered poundnets [FPN]	1	1	1	1	1	2	1	1	1
Trammelnet [GTR]	1	3	3	3	1	3	2	3	2
Set gillnet [GNS]	1	3	3	3	1	3	2	3	2
Driftnet [GND]	1	3	3	3	3	3	3	3	3
Purse-seine [PS]	1	1	1	1	1	1	2	1	1
Lampara nets [LA]	1	1	1	1	1	1	1	1	1
Fly shooting seine [SSC]	2	2	1	1	1	1	1	1	1
Anchored seine [SDN]	2	2	1	1	1	1	1	1	1
Pair seine [SPR]	2	2	1	1	1	1	1	1	1
Beach and boat seine [SB] [SV]	2	2	1	1	1	1	1	1	1
Glass eel fishing	2	1	1	1	1	1	1	1	1

Table 9. Fishing effort by métier at the different areas by fishing days. (0:0, 1: 1–100, 2: 101–1000, 3: 1001–10 000, 4: 10 001–100 000, 5: >100 000). AZ=Azores; BB=Bay of Biscay; CS=Celtic Sea; EA=Eastern Arctic; EB=Eastern Baltic; FI=Faroe Islands; IB=Iberian sea; IS=Irish Sea; MA=Mid-Atlantic; ME=Mediterranean; NS=North Sea and $Èstern Channel; SK=Skagerrak and Kattegat; WB=Western Baltic; WC=Western Channel; WI=Western Ireland; WS=Western Scotland.

Métier	WB	EB	SK	EA	NS	WC	BB	CS	IS	FI	WS	WI	IB	MA	AZ	ME
Boat dredge [DRB]	0	0	2	0	4	4	3	2	3	0	3	2	4	0	0	4
Bottom otter trawl [OTB]	4	4	4	3	4	4	4	4	4	2	4	4	5	3	0	5
Multi-rig otter trawl [OTT]	1	1	3	0	4	2	4	4	1	1	3	2	1	0	0	0
Bottom pair trawl [PTB]	2	2	2	2	3	1	3	1	0	1	2	1	4	0	0	0
Beam trawl [TBB]	0	0	2	0	4	3	2	3	3	0	1	1	4	0	0	4
Midwater otter trawl [OTM]	2	3	2	3	3	3	3	2	2	1	3	2	1	2	0	3
Pelagic pair trawl [PTM]	2	3	2	1	3	3	3	2	2	0	2	3	2	1	0	4
Hand and Pole lines [LHP] [LHM]	3	0	2	3	3	2	1	1	0	4	4	1	1	4	3	3
Trolling lines [LTL]	0	0	0	0	0	2	3	0	0	0	0	0	0	0	0	3
Drifting longlines	1	2	0	0	0	1	2	1	0	0	0	2	3	0	0	4

Métier	WB	EB	SK	EA	NS	WC	BB	CS	IS	FI	WS	WI	IB	MA	AZ	ME
[LLD]																
Set longlines [LLS]	2	3	2	1	3	3	4	3	1	0	3	4	4	0	3	4
Pots and Traps [FPO]	3	4	4	0	5	4	4	4	4	0	4	3	4	1	0	4
Fykenets [FYK]	2	3	3	0	1	0	3	0	0	0	0	0	0	0	0	4
Stationary uncovered poundnets [FPN]	3	3	0	0	0	0	0	0	0	0	0	0	0	0	0	2
Trammelnet [GTR]	2	2	3	0	4	3	4	3	0	0	1	2	5	0	0	5
Set gillnet [GNS]	4	4	3	1	4	4	4	3	3	1	3	3	5	0	3	5
Driftnet [GND]	0	2	1	0	3	2	3	1	0	0	0	0	0	0	0	4
Purse-seine [PS]	0	1	1	2	2	2	3	1	1	0	1	1	4	0	3	4
Lampara nets [LA]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
Fly shooting seine [SSC]	2	0	0	0	3	2	0	2	2	0	2	2	0	0	0	0
Anchored seine [SDN]	3	1	3	0	3	1	0	0	1	0	0	0	0	0	0	0
Pair seine [SPR]	99999	99999	99999	99999	99999	99999	99999	99999	99999	99999	99999	99999	99999	99999	99999	99999

MÉTIER	WB	EB	SK	EA	NS	WC	BB	CS	IS	FI	WS	WI	IB	MA	AZ	ME
Beach-seine [SB]	0	1	2	0	0	1	0	1	0	0	0	0	0	0	0	4
Glass eel fishing	99999	99999	99999	99999	99999	99999	99999	99999	99999	99999	99999	99999	99999	99999	99999	99999

Table 10a. Identified risk factor for the species groups for each métier in the Western Baltic (combination of Tables 8 and 9). 99999 means unknown. A large number means a relatively high risk; a small number means a relatively low risk.

	WB								
	LAMPREYS	ROUNDFISH	TURTLES	DIVING BIRDS	SURFACE BIRDS	SEALS	DOLPHINS	HARBOUR PORPOISE	LARGE WHALES
Boat dredge [DRB]	0	0	0	0	0	0	0	0	0
Bottom otter trawl [OTB]	8	8	0	4	8	8	0	4	0
Multi-rig otter trawl [OTT]	2	2	0	1	1	1	0	1	0
Bottom pair trawl [PTB]	4	4	0	2	2	2	0	2	0
Beam trawl [TBB]	0	0	0	0	0	0	0	0	0
Midwater otter trawl [OTM]	2	6	0	4	4	4	0	2	0
Pelagic pair trawl [PTM]	2	6	0	4	4	4	0	2	0
Hand and Pole lines [LHP] [LHM]	3	3	0	3	3	3	0	3	0
Trolling lines [LTL]	0	0	0	0	0	0	0	0	0
Drifting longlines [LLD]	1	1	0	2	3	1	0	1	0
Set longlines [LLS]	2	2	0	4	6	2	0	2	0
Pots and Traps [FPO]	6	3	0	3	3	3	0	3	0
Fykenets [FYK]	6	4	0	4	2	6	0	2	0
Stationary uncovered poundnets [FPN]	3	3	0	3	3	6	0	3	0
Trammelnet [GTR]	2	6	0	6	2	6	0	6	0
Set gillnet [GNS]	4	12	0	12	4	12	0	12	0
Driftnet [GND]	0	0	0	0	0	0	0	0	0
Purse-seine [PS]	0	0	0	0	0	0	0	0	0
Lampara nets [LA]	0	0	0	0	0	0	0	0	0

	WB								
	LAMPREYS	ROUNDFISH	TURTLES	DIVING BIRDS	SURFACE BIRDS	SEALS	DOLPHINS	HARBOUR PORPOISE	LARGE WHALES
Fly shooting seine [SSC]	4	4	0	2	2	2	0	2	0
Anchored seine [SDN]	6	6	0	3	3	3	0	3	0
Pair seine [SPR]	99999	99999	0	99999	99999	99999	0	99999	0
Beach and boat seine [SB] [SV]	0	0	0	0	0	0	0	0	0
Glass eel fishing	99999	99999	0	99999	99999	99999	0	99999	0

Table 10b. Identified risk factor for the species groups for each métier in the North Sea (combination of Tables 8 and 9). 99999 means unknown.

	NS								
	LAMPREYS	ROUNDFISH	TURTLES	DIVING BIRDS	SURFACE BIRDS	SEALS	DOLPHINS	HARBOUR PORPOISE	LARGE WHALES
Boat dredge [DRB]	4	4	0	4	4	4	4	4	4
Bottom otter trawl [OTB]	8	8	0	4	8	8	4	4	4
Multi-rig otter trawl [OTT]	8	8	0	4	4	4	4	4	4
Bottom pair trawl [PTB]	6	6	0	3	3	3	3	3	3
Beam trawl [TBB]	8	4	0	4	4	4	4	4	4
Midwater otter trawl [OTM]	3	9	0	6	6	6	6	3	6
Pelagic pair trawl [PTM]	3	9	0	6	6	6	6	3	6
Hand and Pole lines [LHP] [LHM]	3	3	0	3	3	3	3	3	3
Trolling lines [LTL]	0	0	0	0	0	0	0	0	0
Drifting longlines [LLD]	0	0	0	0	0	0	0	0	0
Set longlines [LLS]	3	3	0	6	9	3	3	3	6
Pots and Traps [FPO]	10	5	0	5	5	5	5	5	10
Fykenets [FYK]	3	2	0	2	1	3	1	1	1
Stationary uncovered poundnets [FPN]	0	0	0	0	0	0	0	0	0
Trammelnet [GTR]	4	12	0	12	4	12	8	12	8
Set gillnet [GNS]	4	12	0	12	4	12	8	12	8
Driftnet [GND]	3	9	0	9	9	9	9	9	9
Purse-seine [PS]	2	2	0	2	2	2	4	2	2
Lampara nets [LA]	0	0	0	0	0	0	0	0	0

	NS								
	LAMPREYS	ROUNDFISH	TURTLES	DIVING BIRDS	SURFACE BIRDS	SEALS	DOLPHINS	HARBOUR PORPOISE	LARGE WHALES
Fly shooting seine [SSC]	6	6	0	3	3	3	3	3	3
Anchored seine [SDN]	6	6	0	3	3	3	3	3	3
Pair seine [SPR]	99999	99999	0	99999	99999	99999	99999	99999	99999
Beach and boat seine [SB] [SV]	0	0	0	0	0	0	0	0	0
Glass eel fishing	99999	99999	0	99999	99999	99999	99999	99999	99999

Table 10c. Identified risk factor for the species groups for each métier in the Mediterranean and Black Seas (combination of Tables 8 and 9). 99999 means unknown.

	ME								
	LAMPREYS	ROUNDFISH	TURTLES	DIVING BIRDS	SURFACE BIRDS	SEALS	DOLPHINS	HARBOUR PORPOISE	LARGE WHALES
Boat dredge [DRB]	4	4	4	4	4	4	4	4	4
Bottom otter trawl [OTB]	10	10	15	5	10	10	5	5	5
Multi-rig otter trawl [OTT]	0	0	0	0	0	0	0	0	0
Bottom pair trawl [PTB]	0	0	0	0	0	0	0	0	0
Beam trawl [TBB]	8	4	12	4	4	4	4	4	4
Midwater otter trawl [OTM]	3	9	6	6	6	6	6	3	6
Pelagic pair trawl [PTM]	4	12	8	8	8	8	8	4	8
Hand and Pole lines [LHP] [LHM]	3	3	3	3	3	3	3	3	3
Trolling lines [LTL]	3	3	3	6	9	3	3	3	3
Drifting longlines [LLD]	4	4	12	8	12	4	4	4	8
Set longlines [LLS]	4	4	12	8	12	4	4	4	8
Pots and Traps [FPO]	8	4	4	4	4	4	4	4	8
Fykenets [FYK]	12	8	4	8	4	12	4	4	4
Stationary uncovered poundnets [FPN]	2	2	2	2	2	4	2	2	2
Trammelnet [GTR]	5	15	15	15	5	15	10	15	10
Set gillnet [GNS]	5	15	15	15	5	15	10	15	10
Driftnet [GND]	4	12	12	12	12	12	12	12	12
Purse-seine [PS]	4	4	4	4	4	4	8	4	4
Lampara nets [LA]	3	3	3	3	3	3	3	3	3

Annex 3: Technical minutes from the Review Group for the Request on bycatch of cetaceans and other protected species

- RGBYC
- 11–12 April 2013 in Copenhagen, Denmark
- Participants: Mark Tasker (Chair), Meike Scheidat and Bram Couperus (Chair of WKBYC) and Henrik Sparholt and Michala Ovens (ICES Secretariat)
- Expert Group: WKBYC

General

Overall, nice report. Like the tables, which give some great overview! I think those will be very useful in the future.

Detailed comments are extracted below from a text version of the report. These are some general points (also in text):

- It is important that throughout the report, it is always clear if the text refers to PETS, mammals, cetaceans or porpoises. This changes between the parts and thus sometimes becomes confusing.
- Decide on use of by-catch or bycatch and ensure consistency throughout text.
- ICES loves acronyms; please make sure there is a glossary or that the terms are explained during the first use.
- Make sure any table can be used on itself. This means that any acronyms, scales, etc. need to be described either in the title or below the table.
- Concerning pingers specify that any research on pinger effectiveness should be done in the area of interest (on the target population).

Introduction

These conclusions are very much focussed on cetacean bycatch. But the report is on all bycatch of protected species? Has there no work been done on other PETS by the EU?

General comment to make sure all acronyms are either listed in a glossary or explained the first time.

Section 2.3

It should be made clear in the text that you are not really addressing birds. Or are you?

MSFD and HR do target only a part of all protected species mentioned above, right?

Section 3: Request 1: towards an optimal monitoring scheme

Is there a clear definition of PETS, if so, please spell it out. Under which legislation they are considered protected and endangered? Is this based on IUCN or some other forum? And does it only include megafauna (birds, turtles, mammals, sharks, large fish) or also other type of species?

I think this needs elaboration. It is not suitable for all species and taxa. Again, how useful is this in the context of the EU request?

This to me is a strange point. Monitoring the population size is just that–monitoring the population size. How would an increase or decrease in size be linked to mortality from fishery, if there is no other data (e.g. strandings, monitoring) available?

Maybe elaborate something like: "A decrease in population size could be caused by a range of factors. These could include a reduced reproduction, increased mortality or, on a smaller scale, it could also be due to a shift in distribution. An increase in mortality is not necessarily caused by bycatch, but could also be due to infectious diseases or trauma (e.g. from noise, collision). To determine if fishery is involved further information is needed."

This is very similar to the section on voluntary reporting. So I would either join them or reorder them, so they are close to each other.

Section 4 2nd request: revision of Annex 2 EC Reg. 812/2004

I think this is a great approach in principle. I would only be worried about differences between regions. E.g. it might be good to specify that the experiment is done in the general area (e.g. North Sea) where the pingers will be used.

There are attempts to use "warning calls" or "Orca sounds" which might vary between regions. Some of the experiments of pinger effectiveness have been done in Canada, where the porpoises might react differently (for whatever reason) to specific sounds. And to compare pristine quiet waters with the southern NS might not be useful.

Also water depth, salinity and temperature as well as background noise levels (e.g. due to shipping) might play a role.

So, without making it too complex, I would suggest adding something like "the experiments should be done on the same population of harbour porpoises on which the pingers will be used."

Section 5 Request 3: How to set bycatch limits and classifying fisheries to risk

Needs clarification if this is now specific to porpoises or all PETS!

Not sure, but my feeling is that this needs a bit more background information. Right now it is very simplified and by mixing models specific to porpoises with others and later mentioning birds and sharks, it gives the feeling that these three methods could just be used immediately.

I am missing here somewhere that CLA/RMP can be done specific for an area and species. And incorporating additional information (if available) such as reproduction. It needs more than just one population estimate. It will provide the "best" threshold, but it needs more data (which is not always available).

And here also, PBR can incorporate some uncertainty, e.g. in the status of the population.

This number is specific to one species only–the harbour porpoise.

This is again based on porpoises. It gets confusing when taxa are not clarified.

Does this mean populations? Would like some clarification. There are management units and populations. And of course national stocks. What is an ecological management unit for porpoises?

What species. Reiterate that this needs to be developed for all PETS.

Section 6 References

The SCANS II report provides a large section on the RMP/CLA application for harbour porpoises. Might be good to add.

Annex 3 Tables

Table 2 Define what effort means here.

Table 3 What does planned trip mean?

Table 4 For what time (years?)?

Table 6 Very nice!

Table 7 Please add the translations for these in the graph title or below.

Table 8a Is this defined somewhere? Anything not a dolphin?

Table 9 Add the definition of these. Tables will be copy and pasted and it will be useful to have all information in the title or below graph to understand it. It should be clear even if it stands on its own.

Table 10a Add what the scale means.