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WORKSHOP ON FISHERIES EMERGENCY MEASURES TO MINIMIZE BYCATCH OF SHORT-BEAKED COMMON DOLPHINS IN THE BAY OF BISCAY AND HARBOUR PORPOISE IN THE BALTIC SEA (WKEMBYC)

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i Executive summary

Following a submission of two reports from 26 European environmental non-governmental organisations (NGOs) to the European Commission (DG MARE) concerning the introduction of emergency measures to mitigate bycatch of common dolphins in the Bay of Biscay and harbour porpoises in the Baltic Sea, ICES established the Workshop on Emergency Measures to mitigate BYCatch of harbour porpoise in the Baltic Sea and common dolphin in the Bay of Biscay (WKEMBYC). WKEMBYC was tasked to build on the work conducted by WGMME and WGBYC to assess the emergency measures proposed by the NGOs, explore alternative measures, and suggest emergency measures that are necessary to ensure a satisfactory conservation status of these stocks. The work of WKEMBYC was based on the examination of the information provided by NGOs, as well as the work conducted by WGMME 2020 and WGBYC 2020 under ToR E and ToR G respectively.

The population of harbour porpoise in the Baltic Proper is considered to be critically endangered and its abundance is 497 individuals (95% CI 80–1091). At least 5–10 individuals might die from bycatch every year. A Potential Biological Removal (PBR) limit for the Baltic Proper harbour porpoise was estimated at 0.7 animals per year. Data from the North Sea and the Celtic Sea showed that the highest bycatch rate for harbour porpoise was in gillnet and trammel net fisheries (GNS and GTR). Data from 2016 to 2018 from Bay of Biscay bycatch rates are highest in midwater pair trawls (PTM). Harbour porpoises are also caught in bottom and midwater otter trawls (OTB, OTT and OTM). The three proposed emergency measures by NGOs aiming at a reduction of bycatch numbers are not sufficient for the protection and recovery of the Baltic Proper harbour porpoise popula-tion, therefore WKEMBYC recommended adjustments.. The proposed monitoring actions by NGOs would increase the knowledge of the harbour porpoise population.

The common dolphin is one of the most abundant cetacean species in European waters. The appropriate scale at which to evaluate the population status of common dolphins occurring in the Bay of Biscay is the European Atlantic Assessment Unit, where its abundance is estimated to be 634 286 (CV=0.307). In 2017 and 2018, the mortality due to bycatch inferred from French strandings in the Bay of Biscay and Western English channel at large was respectively estimated at 9300 [5800; 17 900] and 5 400 [3400; 10 500] common dolphins. In the Bay of Biscay and the Iberian Coast, the mean annual bycatch estimated from at sea observations for 2016–2018 across all métiers amounted to 3973 (95% CI 1998–6599) dolphins. PBR was calculated as 4926 individuals per year. Comparing bycatch estimates obtained from strandings with PBR suggests recent estimates (2017–2019) were higher than the PBR limit. Removing bycatch in the January–March winter period reduces the estimated bycatch to a small proportion of the total, and much lower than the calculated PBR.

WKEMBYC considered that the NGO proposed closure of all fisheries of concern in the Bay of Biscay from December to March was expected to significantly reduce bycatch of common dolphins. However, suggestions of alternative closures needed to be further explored and the use of 'pingers' needed to be considered.

It was considered important that measures allowing the population to increase are implemented as soon as possible, implemented in a long term, and that the mortality limit of 0.7 animals per year is used as an operational threshold. Specifically, WKEMBYC recommended closure of a defined summer core area for the population form all fishing gears, with the exception of passive gears proven not to bycatch harboutr porpoises. Closures were also recommended in a number of Nature 2000 sites and additional areas, within the seasonal distribution range of the Baltic

Proper harbour porpoise. Additionally the workshop recommended prohibiting the use of static nets without the simultaneous use of pingers in the entire seasonal Baltic Proper harbour porpoise management area. A series of monitoring recommendations aiming at increasing the knowledge on bycatch risk and status of the Baltic proper harbour porpoise population were given.

Regarding the Bay of Biscay common dolphin, WKEMBYC agreed that PBR may be a useful tool and that the *métiers* of concern are PTM_DEF, PTB_MPD, GTR_DEF, OTM_DEF, PS_SPF, GNS_DEF, and PRM_LPF in Subareas 8 and 9. Bycatch values derived from monitoring programmes and stranding were considered to be two views of the same phenomenon and their uncertainty ranges were considered to contain the true bycatch level.

In the absence of other agreed thresholds and considering the large uncertainty bounds of the annual bycatch estimates, two management objectives were tested; Reduce bycatch below 50% of PBR and Reduce bycatch below 10% of PBR. To achieve a level of bycatch below 50% of PBR, WKEMBYC recommended a two-month closure for the *métiers* of concern, from mid-January to mid-March, and the use of acoustic deterrents, proven to be effective for reducing common dolphin bycatch in trawls, on PTM and PTB the rest of the year. To achieve reductions that minimise bycatch (<10% PBR) WKEMBYC recommended a three-month winter closure from January to March, and a one-month summer closure from mid-July to mid-August for the *métiers* of concern along with the use of acoustic deterrents, proven to be effective for reducing common dolphin bycatch in trawls, on PTM and PTB the rest of the year. WKEMBYC also recommended a series of monitoring actions to improve bycatch estimates and the assessment of the northeast Atlantic common dolphin.

ii Expert group information

Expert group name	Workshop on fisheries Emergency Measures to minimize BYCatch of short-beaked common dolphins in the Bay of Biscay and harbour porpoise in the Baltic Sea (WKEMBYC)
Expert group cycle	Annual
Year cycle started	2019
Reporting year in cycle	1/1
Chair	Vincent Ridoux
Meeting venue and dates	1–3 April 2020, by correspondence (26 participants)

1 Introduction

Baltic Sea harbour porpoise and of the north eastern Atlantic common dolphin populations. As a consequence, the present report will incorporate extensive parts of the WGMME and WGBYC reports (indicated in section titles).

Report of the WKEMBYC meeting was due April 21 2020 and was independently reviewed by Mark Tasker (UK), Christian Von Dorrien (GER), and Sinead Murphy (IRE) within one week of report submission, and further handed over to the Advice Drafting Group (ADG) that convened in May. The ADG would review group chair and experts to ensure full expertise.

1.1 Review of ToRs

Following the special request from the DG MARE to the ICES, the Workshop on fisheries Emergency Measures to minimize BYCatch of short-beaked common dolphins in the Bay of Biscay and harbour porpoise in the Baltic Sea (WKEMBYC) was established (2019/WK/HAPISG12). Based on available information provided to ICES by the European Commission and work to be done by WGBYC 2020 and WGMME 2020, WKEMBYC has been requested to provide advice regarding the two following Terms of Reference:

a) assess, and if applicable, propose alternative appropriate emergency measures that could be used to ensure a satisfactory conservation status of these stocks; (Science Plan codes: 6.1);
b) suggest emergency measures that are necessary to ensure a satisfactory conservation status of these stocks. (Science Plan codes: 6.1).

The work described under ToR a) and ToR b) is needed to evaluate whether the fisheries emergency measures for the North East Atlantic short beaked common dolphin in the Bay of Biscay and the Baltic Sea harbour porpoise, described in the information provided to ICES by the European Commission, are necessary and appropriate, in the context of EU law, in particular Articles 2 and 12 of Regulation (EU) 1380/2013; Article 3(2) of Regulation (EU) 1241/2019 and Article 1(i) of Council Directive 92/43/EEC. Also, the workshop will contribute to evaluate alternative measure that could be used to ensure a satisfactory conservation status of these stocks, in the context of EU law as above

There were some differences of interpretation about whether the workshop had to consider socioeconomic aspects of the emergency measures and other recommendations. It was the view of the presenter (HO) that these considerations are within the tasks of the working group. However, the conclusions proposed by WKEMBYC do not consider the social or economic appropriateness of the measures suggested and are exclusively focused on their potential effectiveness on reducing bycatch and the conservation of the Baltic Proper population of harbour porpoises and the Bay of Biscay common dolphin.

The terms necessary and appropriate need some flexibility. The group is invited to take a pragmatic approach, the request does not explicitly ask for any wider effects to be considered, but those could be evaluated or qualified in some way, i.e. reduced catches. The workshop task is about conservation measures but needs to consider other effects when possible. However, the expertise within the working group is oriented toward providing scientific advice, not socioeconomic ones.

Considering the life history of small cetaceans, any protection measures can be effective only when applied continuously for a long period of time. Emergency measures implemented under

Article 12 of the CFP can be applied only for 6 months with the possibility to be prolonged for another 6 months. It is therefore understood, that emergency measures must be viewed as a transition toward longer term measures if any effect on small cetaceans are to be expected.

Finally, it was agreed that measures should be formulated as precisely and specific as possible to be workable for the European Commission, and final recommendations have to be harmonised with results from the Bay of Biscay.

1.2 Review of regulations (as from WGMME 2020)

Here, we briefly summarise the relevant legislation, its relevant conservation objectives and targets, and the obligations specified in relation to monitoring and mitigation, as we understand them. We draw on a summary provided by Kenneth Patterson (EC) as well as material compiled by ICES and by WGMME members. Extracts from legislation shown or highlighted here do not represent full legal obligations and are presented for information and discussion only. The views presented are the views of the authors and do not purport to represent the official views of ICES or the European Commission.

Cetacean bycatch in fisheries is covered by the Common Fisheries Policy (in particular amendments under Regulation 1380/2013), Habitats Directive (Directive 92/43/EEC), Regulation 2019/1241 (which has replaced Regulation 812/2004) and the Marine Strategy Framework Directive (Directive 2008/56/EC). It should also be noted that the US National Oceanic and Atmospheric Administration (NOAA) has requested all countries exporting fish and fish products to the USA to demonstrate that their fisheries do not cause bycatch mortality of marine mammals in excess of what would be permitted in US waters under the Marine Mammal Protection Act.

Regulation 2019/1241: In relation to the special request, this regulation is relevant, because it requests Member States to "take the necessary steps to collect scientific data on incidental catches of sensitive species" and, given "scientific evidence, validated by ICES, STECF, or in the framework of GFCM, of negative impacts of fishing gear on sensitive species", to "submit joint recommendations for additional mitigation measures for the reduction of incidental catches". The relevant objectives of this regulation include: (i) ensure that incidental catches of sensitive marine species, including those listed under Directives 92/43/EEC and 2009/147/EC, that are a result of fishing, are minimised and where possible eliminated so that they do not represent a threat to the conservation status of these species, and (ii) ensure, including by using appropriate incentives, that the negative environmental impacts of fishing on marine habitats are minimized. Its targets include: incidental catches of marine mammals, marine reptiles, seabirds and other non-commercially exploited species do not exceed levels provided for in Union legislation and international agreements that are binding on the Union.

CFP amendments under Regulation 1380/2013: The objectives of this regulation include implementation of "the ecosystem-based approach to fisheries management so as to ensure that negative impacts of fishing activities on the marine ecosystem are minimized, and coherence with the Union environmental legislation, in particular with the objective of achieving a good environmental status by 2020 as set out in Directive 2008/56/EC (MSFD). In relation to the NGO request for the introduction of Fishery Emergency Measures, the NGOs refer to CFP Article 11(4) for measures within the Natura 2000 sites for the Baltic Proper porpoise (as a species listed in HD Annex II, i.e. a species for which Natura 2000 sites shall be designated) and to Article 12 for measures for the Baltic Proper porpoise outside the Natura 2000 sites and for the common dolphin. CFP Article 11 concerns "Conservation measures necessary for compliance with obligations under Union environmental legislation". Article 11(1) is applicable to obligations under HD Article 6, which concerns management of Natura 2000 sites. CFP Article 11(5) states: "5. the measures referred to in paragraph 4 shall apply for a maximum period of 12 months which may be extended for a maximum period of 12 months where the conditions provided for in that paragraph continue to exist." CFP Article 12 concerns "Commission measures in case of a serious threat to marine biological resources" and in 12(1) it states: "1. On duly justified imperative grounds of urgency relating to a serious threat to the conservation of marine biological resources or to the marine ecosystem based on evidence, the Commission, at the reasoned request of a Member State or on its own initiative, may, in order to alleviate that threat, adopt immediately applicable implementing acts applicable for a maximum period of six months in accordance with the procedure referred to in Article 47(3).". In 12(3) it states: "3. before expiry of the initial period of application of immediately applicable implementing acts referred to in paragraph 1, the Commission may, where the conditions under paragraph 1 are complied with, adopt immediately applicable implementing acts extending the application of such emergency measure for a maximum period of six months with immediate effect. Those implementing acts shall be adopted in accordance with the procedure referred to in Article 47(3)."

Habitats Directive (Directive 92/43/EEC): Article 12 requires Member States to establish a system to monitor the incidental capture and killing of animal species listed in Annex IV (which includes all cetaceans). Based on the information gathered, Member States "shall take further research or conservation measures as required to ensure that incidental capture and killing does not have a significant negative impact on the species concerned". Harbour porpoise is listed also in Annex II and as such is a species for which protected areas (Special Areas of Conservation) should be designated.

MSFD (Directive 2008/56/EC): Relevant objectives include: (D1) "Biological diversity is maintained. The quality and occurrence of habitats and the distribution and abundance of species are in line with prevailing physiographic, geographic and climatic conditions" and (D4) "All elements of the marine food webs, to the extent that they are known, occur at normal abundance and diversity and levels capable of ensuring the long term abundance of the species and the retention of their full reproductive capacity". Furthermore, Commission Decision 2017/848, with reference to species of birds, mammals, reptiles and non-commercially-exploited species of fish and cephalopods which are at risk from incidental by-catch, defines the following criteria for Good Environmental Status (GES): "The mortality rate per species from incidental by catch is below levels which threaten the species, such that its long term viability is ensured" (criterion D1C1) and "The population abundance of the species is not adversely affected due to anthropogenic pressures, such that its long term viability is ensured" (criterion D1C2).

Also relevant are ASCOBANS and the OSPAR and HELCOM regional conventions. ASCOBANS has specifically focused on the recovery of the Baltic Proper population with the enactment of the Jastarnia Plan (ASCOBANS 2016). The Baltic Sea States have agreed in HELCOM Recommendation 17/2 to protect the harbour porpoise in the Baltic Marine Area.

In relation to whether Member States are meeting conservation objectives, relevant considerations include whether Member States are taking the necessary steps to collect scientific data on incidental catches of sensitive species and whether the objective of minimizing bycatch mortality (and where possible eliminating it) necessarily requires actions beyond those needed to achieve the objective of maintaining viable populations. Associated questions concern the degree to which a precautionary approach should be followed in the face of incomplete information and the timescale for responses by Member States to fill knowledge/monitoring gaps and introduce mitigation measures.

1.3 Available documents

The work was based on the examination of several documents. Annex I and Annex II of the special request introduced by the consortium of 26 NGOs present the fisheries emergency measures for the North East Atlantic short-beaked common dolphin in the Bay of Biscay and the Baltic Sea harbour porpoise, respectively. In its ToR E, the WGMME 2020 report evaluates current conservation status and threats to the two populations of interest. The WGBYC 2020 report evaluated current threats to the populations due to commercial fisheries bycatches and evaluates whether the proposed emergency measures are appropriate.

1.4 Discussions

After the presentations several questions were raised by the group. In particular it was reminded that the ASCOBANS acceptable levels (1% and 1.7%) are not binding on the EU and EU Member States, because ASCOBANS recommendations are just recommendations until they are formally written into EU and national laws.

It was identified that there are internal inconsistencies in the existing laws, in particular within the Habitat Directive. The provisions set out in Article 12 for the strict protection of Annex IV species throughout their natural range from*: (a) all forms of deliberate capture or killing of specimens of these species in the wild; (b) deliberate disturbance of these species, particularly during the period of breeding, rearing, hibernation and migration; […] (d) deterioration or destruction of breeding sites or resting places*. Furthermore, 12 (4) states that *Member States shall establish a system to monitor the incidental capture and killing of the animal species listed in Annex IV (a). In the light of the information gathered, Member States shall take further research or conservation measures as required to ensure that incidental capture and killing does not have a significant negative impact on the species concerned.* A significant negative impact is understood as an impact that would negatively affect the Conservation Status of the species concerned. Therefore, bycatches can be seen as a form of deliberate killing that has to be minimized while at the same time bycatches can be seen as sustainable if they have no significant negative impact on the conservation status of the species concerned. The EC observer suggested some scope for developing two separate advices—one to meet one provision and another to meet the other provision. Both issues are present in the law, it is a matter of interpretation, the workshop could examine both, and ICES could take a position on one. It is agreed that the workshop needs to consider both views and make a response for each.

In the case of much depleted Baltic harbour porpoise population, the Habitats Directive again is not clear whether using a gear known to catch cetaceans in such an area would still be considered as "deliberate". It is a matter of legal interpretation, but fishing would be probably accepted if industry is at least making some attempt to minimise bycatch levels. The Baltic Proper harbour porpoise population is a highly endangered population, every bycatch is potentially very important. The Habitats Directive would be considered for such populations but it is unclear how. Uncertainty regarding the status of the two populations to be considered by the workshop is central to the debate and has been discussed in the work of WGMME and WGBYC. However, it remains unclear how quantifying the uncertainty get included in any advice. ICES advice from last year included "high uncertainty" of exceeding a threshold; such an advice is not operational.

ASCOBANS has thresholds but the EU has not formally signed up to any so not clear if the ASCOBANS limit are useful or not. Some experts expressed the view that there needs to be clear advice about what ICES thinks should be done. There is no ICES bycatch threshold or limit, and there are different views as to whether thresholds should be set by scientists, by managers, or by ICES. Some participants considered that EU looks to ICES to generate advice and therefore cannot expect managers to set thresholds. There was no clear conclusion on this issue and general agreement on the fact it is a difficult situation to resolve who sets thresholds and why. PBR values calculated by WGMME and used in the context of the special request by WGBYC, can be used but the workshop needs to judge if they are appropriate. No clear conclusion was agreed on this fundamental issue, but there was a general agreement that overall, the workshop needs to provide advice in a pragmatic and reasonable way.

2 Baltic Sea harbour porpoise

2.1 Review of annex II on Baltic harbour porpoise (from Annex II of NGOs request)

The second request refers to Baltic Sea harbour porpoise and was presented at the WKEMBYC meeting by Sara Königson. The NGOs' document indicates:

> "The Baltic Sea harbour porpoise is listed by IUCN and HELCOM as critically endangered. Today its geographical range is significantly smaller than what can be inferred from historical records, and there are only a few hundred animals left. While pollution and disturbance through underwater noise may be contributing to the population failing to recover, bycatch is the one acute threat causing direct mortalities in significant numbers. The Baltic Sea harbour porpoise is susceptible to bycatch in different types of gillnet fisheries, mainly surface set nets for salmonids as well as bottom set nets for cod and flatfish. Driftnets formerly used for salmonids had significant harbour porpoise bycatch. These nets were banned in 2008 by EC regulation 812/2004, but a form of semi-drift nets (also known as swing nets) are still used, and there is concern that these are still causing significant bycatch of harbour porpoises, e.g. in Polish waters. There is also significant bycatch occurring in German Baltic waters, but it is very likely that the large majority of these animals belong to the Belt Sea population rather than the Baltic Proper population".

Given the small size of the population, the sex ratio and age distribution, and the proportion of females potentially infertile due to high contaminant load, there may be less than 100 fertile females in the Baltic Proper. Losing even one of those females could have a devastating effect on the ability of the population to recover or even stay stable at the low numbers of today. Hence, to allow this critically endangered population to recover, bycatch must be reduced to an absolute minimum, ideally to zero.

However, to date, initiatives from Member States to minimize bycatch are very limited and there are currently no closures of areas for the purpose of protecting the Baltic Sea harbour porpoise. While Sweden has designated the main part of the porpoise breeding area in the central Baltic Proper in December 2016 as a Natura 2000 site, the long and slow process for Member States to agree on joint measures for nature conservation purposes under the Common Fisheries Policy (CFP) is currently risking the survival of the population.

The e-NGOs request urges "the European Commission take the necessary emergency measures to: 1) completely close all fisheries on the Northern Midsea Bank within the Swedish Natura 2000 area Hoburgs bank och Midsjöbankarna; 2) close all gillnet fisheries in the rest of the Swedish Natura 2000 area Hoburgs bank och Midsjöbankarna and in all Natura 2000 areas east of 13.5°E where the harbour porpoise is listed as present, based on Article 11(4) of the CFP, until site-specific assessments has been made of the impact of use of Acoustic Deterrent Devices (ADDs); 3) require mandatory use of ADDs outside of Natura 2000 areas in the entire range of the Baltic Proper harbour porpoise population, i.e. east of 13.5°E; 4) require accurate data collection, monitoring and reporting in the whole Baltic Sea; 5) require monitoring and mitigation measures for gillnet fisheries, based on Article 12 of the CFP". (Figure 1; adapted from European NGOs, 2019b).

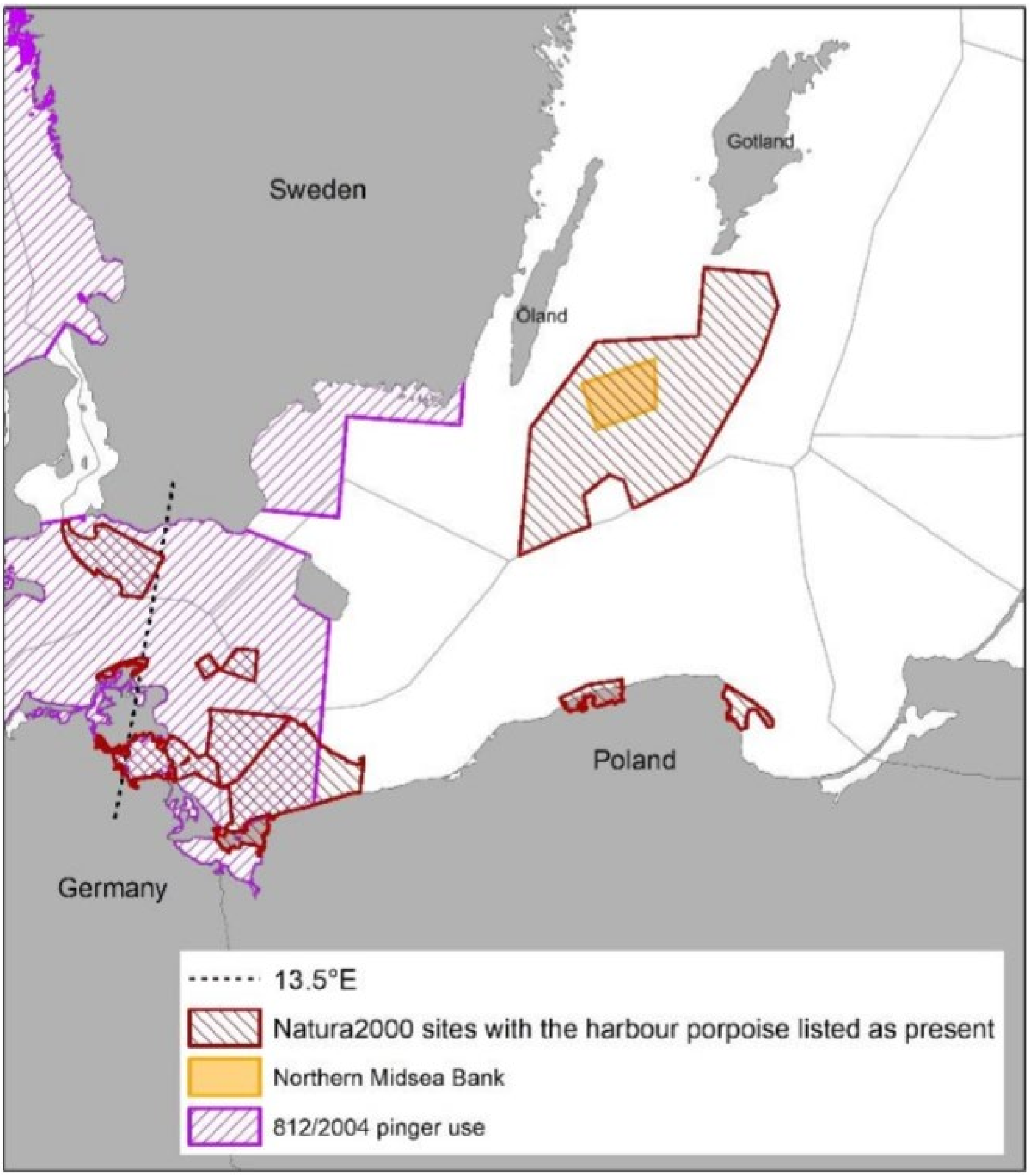

Figure 1. Proposed measures for the protection of the Baltic subpopulation from bycatch. All fisheries would be closed within Northern Midsea Bank and gillnet fisheries closed in all SACs east of 13.5°E. Pingers should be used in other areas.

2.2 Review of WGMME report (adapted from WGMME ToR E report)

The main results of the WGMME workshop regarding the Baltic Sea harbour porpoise were presented to WKEMBYC by Julia Carlström. The following sections are in the same sequence as in the original report. Full text and illustrations are available in ICES WGMME 2020 report.

2.2.1 Management unit

Genetic studies indicate that harbour porpoises in the Belt Sea/western Baltic are distinct from porpoises in the adjacent Kattegat-Skagerrak and North Sea, while porpoises from the Baltic

Proper represent a critically endangered population which is assessed separately by HELCOM. Both genetic and morphological evidence support the recognition of the harbour porpoises in the Baltic Proper as a separate population (Huggenberger et al., 2002; Wiemann et al., 2010; Galatius et al., 2012; Lah et al., 2016). Carlén et al. (2018) showed a spatial separation in the southern Baltic Sea during the breeding season, interpreted as a separation of the populations, and Sveegaard et al. (2015) showed that tagged Belt Sea animals rarely move east of 13.5°E during the breeding season.

There is limited information on the spatial extent of the Baltic Proper harbour porpoise population over the year, and it is suggested to use already proposed borders that accommodate seasonal movements of the population. During May–October, a western management border has been proposed based on the seasonal pattern of acoustic detection rates across the Baltic Proper between the Island of Hanö in southeast Sweden to the village of Słupsk in Poland in the southern Baltic Sea (Figure 2: left) (Carlén et al., 2018). During November–April, there is no clear spatial separation between the Belt Sea and Baltic Proper populations, however, seasonal patterns of acoustic detection rates at monitoring stations in German waters around Rügen, and the abiotic factors explaining these patterns, indicate that Baltic Proper animals move at least as far west as to the offshore waters northeast of Rügen in winter (Gallus et al., 2012). Based on the seasonal porpoise distribution patterns at Rügen, the morphological difference between the populations, and the bathymetry of the southern Baltic, showing that the deep waters of the Arkona Basin north of Rügen reach approximately longitude 13°E) (Figure 2: right), longitude 13°E is proposed as the western management border of the Baltic Proper harbour porpoise population during November–April.

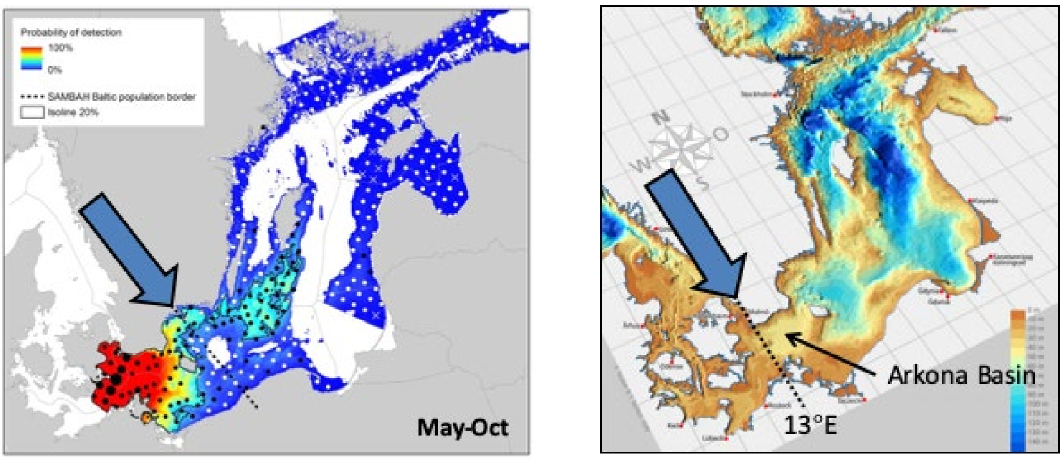

Figure 2. May–October distribution pattern of harbour porpoise in the Baltic Sea (left). The dashed line indicates the western 13.5°E management border during May–October. The deep waters of the Arkona Basin (Baltic Sea) reach approximately to longitude 13°E to the west. Original map by Seifert et al., 2001 (right). The dashed line indicates the western 13°E management border from November–April.

To the north, incidental sightings of harbour porpoises have been reported from the northernmost part of the Bothnian Bay, also during the 2000s. Incidental sightings should be interpreted with caution, but the general pattern shows that porpoises have primarily been sighted south of a line drawn approximately between latitude 60.5°N at the Swedish east coast and latitude 61°N at the Finnish west coast, and we therefore suggest this as the northern management border of the Baltic Proper harbour porpoise population.

2.2.2 Abundance and status

During May–October, the highest densities of Baltic Proper harbour porpoises are found around the offshore banks of Hoburgs Bank and the Northern and Southern Midsea Banks south of Gotland (Figure 1). During November–April, the population is more spread out. The detection rates increase along the coasts of the Baltic Proper, although the area around Hoburgs Bank and the Midsea Banks remains important. In 2011–2013, the highest overall detection rates were recorded at the Northern Midsea Bank (Amundin et al., in prep.). This pattern has remained at the subset of 10–12 stations monitored in Swedish waters since 2017, indicating that the Northern Midsea Bank is of utmost importance to the population.

The abundance of the Baltic Proper population has only been estimated once in a two-year acoustic survey in 2011–2013, resulting in an estimate of 497 animals (CV=0.42, 95% CI 80–1091) (SAMBAH, 2016).

According to ASCOBANS, "the Baltic sub-population of the harbour porpoise is of particular concern". It has been listed as critically endangered by IUCN and HELCOM. For the harbour porpoise in the Baltic Marine Region, all available assessments under the Habitat Directive (by Denmark, Sweden, Germany, Poland) indicate that the status of harbour porpoise in the Baltic is U2 (unfavourable-bad).

2.2.3 Bycatches

Of the bycatches recorded in the Baltic Proper, 97% or more have been reported to occur in static nets (Berggren, 1994;, EC-DGMARE, 2014, Skóra and Kuklik, 2003). 'Static nets' are here defined as in the technical measures regulation (EU 2019/1241), i.e. any type of gillnet, entangling net or trammel net that is anchored to the seabed for fish to swim into and become entangled or enmeshed in the netting. Thereby it includes bottom set nets as well as semi-drift nets (also known as swing nets), floating above the bottom but anchored to the bottom at one end.

In the 2019 WGBYC report, referring to 2017 bycatch data, there were no reported bycatches from the Baltic Proper. Given the low density of porpoises in the Baltic Proper and the low observer coverage of the fisheries, the lack of recorded bycatches cannot be used to infer that bycatches do not occur or that the level is sustainable.

2.2.4 Strandings

Minimum numbers can be derived from carcass collection programmes. The NGO request for fishery emergency measures in the Baltic Sea states that the only reported bycatches which can be interpreted as stemming from the Baltic Proper population since 2009 (according to the HELCOM/ASCOBANS harbour porpoise database) were one individual caught in Poland during 2014, and one in 2018. To this can be added one animal that was bycaught in Finnish waters in 2018 but released alive. There are also strandings along the Polish coast, with 14 animals found on Polish beaches in 2018. The number of bycaught or stranded harbour porpoises opportunistically reported to or collected by the Swedish Museum of Natural History within the Baltic Marine biogeographic region during 2000–2018 varies from 0–18 individuals per year. Five of these animals were encountered as bycatches, and one as likely killed by a boat. These six animals were collected during the years 2001–2008, two east of Hanö and four between 13.5°E and Hanö.

For most of the stranded animals the cause of death could not be determined, but it is likely that at least some of those had been bycaught. Given the number of strandings recorded by Poland and Sweden, the minimum bycatch mortality would be 5–10 individuals per year, which would represent an annual loss of at least 1–2% of the best population estimate.

2.2.5 Mortality limit

An IMR-NAMMCO workshop in Tromsø in 2018 carried out an assessment of the status of the Baltic Sea harbour porpoise population in the context of fishery bycatch. Using (i) the abundance estimate from 2011–2013 (SAMBAH, 2016), (ii) bycatch numbers estimated from observed bycatch rates in the Belt Sea porpoise population adjusted for fishing effort and harbour porpoise density in the Baltic Proper, and (iii) a recovery factor of 0.1 (to be used for endangered US stocks of marine mammals), the PBR mortality limit for the Baltic Proper harbour porpoise was estimated to be 0.7 animals per year.

Both the estimated bycatch number for 2017 (7 animals) and the minimum bycatch numbers for the years 2000–2012 (average ca. 3 animals per year, assuming the same average minimum numbers in 2010–2012 as compiled for 2000–2009) exceed this level.

2.2.6 Other threats and pressures

ICES WGMMME (2019) developed threat matrices for different marine mammal species in each ecoregion. For harbour porpoise in the Baltic Sea, threat levels were considered high (evidence or strong likelihood of negative population effects, mediated through effects on individual mortality, health and/or reproduction) for bycatch, contaminants, and underwater noise (mainly from seismic surveys, military sonar, and explosions).

Some of the highest levels of PCBs in the marine environment in Europe occur in the Baltic Sea (HELCOM, 2010 and 2018; ASCOBANS, 2016). Harbour porpoises are particularly vulnerable, with evidence of negative impacts on reproduction and health (including immunity to disease) (Jepson et al., 2005 and 2016; Murphy et al., 2015). Mean total PCB levels in harbour porpoises in the Baltic Proper have ranged from 16–46 mg/kg of lipid (Kannan et al., 1993; Berggren et al., 1999; ASCOBANS. 2016).

Seismic surveys and sonar activities have been undertaken over a wide area of the Baltic Proper, largely along the south and east coasts of Sweden, whereas explosions (of military ordinance) have been conducted in a few restricted areas (ICES Impulsive Noise Register, reviewed in Evans and Similå, 2018). Negative responses to sonar have been demonstrated in captive porpoises (Kastelein et al., 2015). So far, only short-term reactions to seismic airguns have been found in porpoises (Thompson et al., 2013; Pirotta et al., 2014), although temporary hearing threshold shift has been found in a harbour porpoise after exposure to multiple airgun sounds (Kastelein et al., 2017).

2.2.7 Conclusions

The population of harbour porpoise in the Baltic Proper is considered to be critically endangered and its abundance is approximately 500 individuals (497, 95% CI 80–1091; SAMBAH 2016). Information on fishery bycatch of animals in this population is limited; however, based on minimum numbers of bycatches as well as strandings in Poland and strandings and bycatches in Sweden, at least 1–2% of the population may die from bycatch mortality. As pingers reduce, but do not eliminate, bycatches of harbour porpoises (Dawson et al., 2013; Larsen and Eigaard 2014), and more than 97% of the bycatches in the Baltic Proper have been reported to occur in static nets, a combination of area closures and pinger use within the distribution range of the Baltic Proper harbour porpoise is not considered sufficient to reach the estimated PBR limit of less than one bycatch per year. This limit is only expected to be reached if all fishing with static nets are closed within the seasonal suggested management areas of the Baltic Proper harbour porpoise.

In spite of the limitation in available bycatch data, the small size of this population makes it vulnerable to extinction. There is sufficient evidence to conclude that large-mesh gillnets for e.g. cod and salmonid fish at least within "high-density areas" and areas with documented bycatches are a threat to the population's survival.

The NGOs also propose a closure of all fisheries at the Northern Midsea Bank within the Natura 2000 site Hoburgs bank and Midsjöbankarna (SE0330308), referring to the proposal for the area to be designated as an area without local anthropogenic impacts by the Swedish Agency for Marine and Water Management (Havs och vattenmyndigheten, 2018). Such a measure may reduce disturbance and improve the local prey abundance, if current fisheries have such an impact. If the current impact is negligible, the measure will ensure this remains the case. As the Northern Midsea Bank is of utmost importance for the Baltic Proper population, the measure may be beneficial to the population and thereby increases its chances of survival.

From a wider perspective, the following monitoring actions would increase the knowledge of the harbour porpoise population, facilitating more precise and efficient conservation actions:

- National acoustic monitoring following a design that has been optimised Baltic-wide to detect changes in local detection rates, indicative of changes on the population level.
- Repeated large-scale surveys for estimating trends in abundance.
- Collection, necropsy and sampling of all stranded and bycaught animals that are in good enough condition for studies of health, reproductive parameters and environmental pollutants east of longitude 13°E.

Genetic sampling of all animals within the Baltic Marine Region for analyses of the spatio-temporal distribution pattern of Baltic Proper porpoises.

2.3 Review of WGBYC report (adapted from WGBYC ToR G report)

The main results of the WGBYC workshop regarding the Baltic Sea harbour porpoise were presented to WKEMBYC by Adam Woźniczka. The following sections are in the same sequence as in the original report. Full text and illustrations are available in ICES WGBYC 2020 report.

- Bycatch data: highest bycatch rates of harbour porpoises occur in gillnet and trammel net fisheries, less bycatch occurs in trawl fishery; longlines, pots have no recorded bycatch.
- Commercial fishing effort has declined recently, especially since the cod ban of 2019.
- Long-term measures are urgently needed for the protection of the Baltic proper population, emergency measures are just a start.
- Measures proposed in Annex II are **not sufficient** for the protection and recovery of the Baltic harbour porpoise population.

2.3.1 Abundance, distribution, and population structure

Based on genetic and morphological evidence, as well as acoustic and telemetry studies, the Baltic Sea can be separated into three management units for harbour porpoises, the North Sea population, the Kattegat Belt Sea population, and the Baltic harbour porpoise population. There is limited information on the western boundary of the Baltic harbour porpoise population. Between May and October, there is a separation between the Kattegat, Belt Sea population and the Baltic harbour porpoise populations from the island of Hanö (Sweden) to Jarosławiec near Słupsk (Poland). Based on the seasonal porpoise distribution patterns at Rügen and the environmental variables explaining this, the morphological difference between the populations (Galatius et al., 2012), and the bathymetry of the southern Baltic showing that the deep waters of the Arkona

Basin north of Rügen reach approximately to longitude 13°E to the west, ICES WGMME (2020) in their review of emergency measures suggests longitude 13°E as the western management boundary of the Baltic Proper harbour porpoise population during November-April. To the north, a general pattern shows that during the 21st century, porpoises have primarily been sighted south of a line drawn approximately between latitude 60.5°N at the Swedish east coast and latitude 61°N at the Finnish west coast, and WGMME therefore suggest this as the northern management border of the Baltic Proper harbour porpoise population.

Based on acoustic monitoring within the SAMBAH project, the abundance of the Baltic proper population has been estimated at only 497 individuals (95% CI: 80–1091) and it has a wide overall distribution range (SAMBAH, 2016). During the winter season, it stretches from the Åland and Archipelago Seas in the north, to the Southern Baltic Proper in the southwest, and perhaps even further west thereof. In the summer season, however, when calving and mating take place, the majority of the population aggregates at and around the Hoburgs and Northern and Southern Midsea Banks in the Baltic Proper (ASCOBANS, 2016; Carlén et al., 2018).

2.3.2 Characterisation of the Baltic Sea fisheries

Fisheries in the Baltic Sea are focused on a few major fish species. The pelagic fisheries, which account for the largest catches (by weight) in the region, are the mid-water trawl fisheries for sprat and herring. The most important demersal fisheries are the bottom-trawl fisheries for cod and flatfish. The demersal fisheries are concentrated in the south and west of the Baltic Sea, while the pelagic fisheries are more widespread. Set gillnets are widely used both in offshore fisheries targeting cod, flatfish, and herring and in coastal fisheries exploiting a large variety of species, including cod, flatfish, herring, whitefish, pikeperch, perch, pike, sea trout, and salmon. Basin-wide, commercial fishing effort has declined since 2004. Total fishing effort (in Days at Sea) in the Baltic Sea is dominated by gillnets. Further details on fish catches over time, description of the fisheries, and the status of the fishery resources can be found in the Baltic Sea Ecoregion fisheries overviews.

2.3.3 Historical information on Baltic harbour porpoise bycatches

Historical information on harbour porpoise bycatch in the Baltic Proper is very limited. EU Member States have submitted reports annually to WGBYC as part of the obligations to the EU Regulation 812/2004. These have been compiled into the WGBYC database since 2006, along with other data summarised in WGBYC reports. However, the monitored effort is limited (1126 monitored days at sea in gillnet and entanglement fisheries). Thus, given current reporting levels and the very small size of the population, information on bycatch needs to come from other sources.

NAMMCO-IMR (2019) estimated bycatch numbers from bycatch rates calculated from the neighbouring Belt Sea population. These were derived largely from Remote Electronic Monitoring but also onboard observers, reported to ICES WGBYC in Areas 21, 22, and 23 during 2007–2016. Fishing effort was obtained from the ICES Regional Database. A 95% confidence interval was calculated by assuming a binomial distribution, resulting in an upper limit of 0.0417 bycatches per Days at Sea. The upper limit of the Belt Sea bycatch rate was adjusted for the lower porpoise density within the Baltic Proper assessment unit, using the density estimate for Block 2 in SCANS III (Hammond et al., 2017) and the overall density within the summer distribution range in the SAMBAH survey (SAMBAH, 2016). This resulted in a Baltic bycatch upper rate of 0.000148 animals per Days at Sea. By multiplying this by the total gillnet fishing effort in ICES sub-areas 25–29 for each of the years from 2009 to 2017, the estimated annual number of bycaught harbour porpoises of the Baltic Proper population was obtained. This number declined from 12 in 2009 to 7 in 2017.

For Finnish waters, data on bycaught and caught harbour porpoises during 1900–1990 have been compiled and checked by the Finnish Ministry of the Environment (2006). According to the data reported to HELCOM, the average number of records of bycaught or caught porpoises between 1900 and 1939 was 14 per decade. There were no records from the 1940s. From 1950–1999, the number averaged less than two animals per decade. Between 2000 and 2017, no harbour porpoises were recorded bycaught in Finland but one was caught in a salmon net and released in 2018 (O. Loisa, *pers. comm.*).

For Polish waters, catch and bycatch data for 1922–1987 have been compiled by Skóra et al. (1988). Until early 1935, hundreds of animals were recorded in fishery statistics as direct captures under a bounty scheme. Between 1951 and 1987, information on bycatches was collected based on available unpublished literature, yielding only a proportion of the reported bycatch within the summer distribution range of the Baltic Proper porpoise population, estimated to be ca. 10-–14 harbour porpoises. For the period 1990–2009, a minimum of 66 harbour porpoises were reported bycaught along the entire Polish coast; of those, 95% were from semi-drift nets mainly targeting salmonids, and bottom-set nets for cod (Skóra and Kuklik, 2003; Professor Krzysztof Skóra Hel Marine Station database). Since 2004, voluntary reporting of bycatch has been much reduced so it has not been possible to obtain information in recent years from these fisheries. One report of a bycaught harbour porpoise was delivered by a fishes in 2014 and a second in 2018, when a further 14 porpoises were found stranded on Polish beaches (causes of death unknown) (Professor Krzysztof Skóra Hel Marine Station data submitted to the HELCOM/ASCOBANS harbour porpoise database).

In Swedish waters, minimum bycatch numbers are available from the database of the Swedish Museum of Natural History of necropsied and/or sampled animals. Between 1976 and 2017, a total of 18 bycaught animals were collected that were believed to be from the Baltic Proper population. For most stranded animals, the cause of death could not be determined, but at least some of those are likely to have been bycaught. Given the number of strandings recorded only by Poland and Sweden in recent years, WGMME (2020) estimates the minimum bycatch mortality to be 5–10 individuals per year, which would represent an annual loss of at least 1–2% of the best population estimate.

2.3.4 Bycatch data from 2006–2018

As noted above, bycatch events for Baltic Proper harbour porpoises are extremely rare due to the low abundance of harbour porpoises and low monitored effort in the region. All observed effort data included in the WGBYC database was compiled, from the first year of submitted data, 2006, until 2018. The area included in the summary is ICES division 3d (subdivision 24–32). A total of 7258 days at sea have been monitored across all métiers from 2006 until 2018 with no bycatch of harbour porpoise reported. However, one harbour porpoise was bycaught in subdivision 24 in 2015 in the bottom otter trawl fishery, but there is no monitored effort reported in connection with this bycatch. Various sources of bias in fishing effort and bycatch numbers were discussed but their magnitude is unknown.

2.3.5 Fisheries with potential for bycatch

Since the abundance of harbour porpoise is extremely low, bycatch incidents in the Baltic Proper are particularly rare and in order to evaluate which métiers pose a risk to bycatch of harbour porpoise, we have assessed the bycatch of harbour porpoise in areas outside of the Baltic. We have summarised harbour porpoise bycatch at métier level 4 for the North Sea (ICES division 3a, 4, 7e and d), the Celtic Sea (ICES division 6 and 7), and the Bay of Biscay (ICES division 8a and b). Since the abundance of harbour porpoise has changed in the Celtic Sea and Bay of Biscay, data were summarised over the time periods 2005 to 2010, 2011 to 2015, and 2016 to 2018. All areas and all assessed time periods showed the highest bycatch rate for harbour porpoise in gillnet or trammel net fisheries (GNS or GTR). However, harbour porpoises are also caught in bottom and midwater otter trawls (OTB, OTT and OTM) as well as in midwater pair trawls (PTM). No harbour porpoises were observed bycaught in passive gears such as longlines and pots (LLS, LHM, and FPO).

2.3.6 Effort analysis for the relevant fisheries

A request was made to the ICES Secretariat for fishing effort data from 2009 until 2018 from the ICES RDB. The assessment in the previous section showed that GNS, OTT, OTB, OTM and PTM are métiers that have a risk of bycatch of harbour porpoise. However, GNS is the métier with the highest bycatch rate. Data on fishing effort (Days at Sea) for métiers GNS/GTR, OTB/OTT, OTM and PTM from the ICES RDB have therefore been summarised by ICES rectangle for the years 2009 until 2018 and plotted on maps of the Baltic Sea.

Gillnets constitutes the main fishing effort in terms of DaS in the Baltic. These are concentrated in the southern Baltic along the German and Polish coasts. Gillnet effort for cod has significantly decreased since August 2019 in the southern Baltic due to the cod ban. In the Baltic overall, gillnet fishing effort has decreased by 44% over the past 10 years. Also trawl fisheries is focused in the southern Baltic. Neither gillnet fisheries nor do trawl fisheries occur in any larger extent in the areas especially designated for harbour porpoise (Hoburgs Bank och Midsjöbankarna).

2.3.7 Population consequences of bycatch

The population of harbour porpoise in the Baltic Proper is considered to be critically endangered with its abundance estimated at approximately 500 individuals (497, 95% CI 80–1091; SAMBAH, 2016). The low abundance and the low monitoring coverage in the Baltic gives no reliable estimates of bycatch of harbour porpoises in the area. Therefore, evaluating the effect of bycatch is demanding with lack of data on bycatch, abundance trends and fishing effort. However, since the population is very small it makes it vulnerable to extinction.

ICES WGMME (2020) reviewed an assessment of the status of the Baltic Proper population undertaken by IMR-NAMMCO at a workshop in December 2018 (NAMMCO/IMR, 2019). Using the abundance estimate from 2011–2013 (SAMBAH, 2016), bycatch numbers estimated from observed bycatch rates in the neighbouring Belt Sea porpoise population, adjusted for fishing effort and for harbour porpoise density in the Baltic Proper, and applying a recovery factor of 0.1 (as used for endangered US stocks of marine mammals), a Potential Biological Removals (PBR) limit for the Baltic Proper harbour porpoise was estimated to be 0.7 animals per year. ICES WGBYC concluded that even if other assessment methods were used to evaluate the status of the Baltic Proper porpoise, the results will most likely not differ to any extent from the NAMMCO assessment. The mortality limit for the Baltic proper would still be approaching zero. Because of the population's small size, making it vulnerable to extinction, it can be concluded that since gillnet fisheries and other fisheries also posing a risk of bycatch occur in the Baltic Proper bycatch is a threat to the population.

2.3.8 Evaluating the described conservation measures within the request

2.3.8.1 Technical mitigation measures to reduce bycatch

In principle, there are three types of mitigation measures which lead to reduction of bycatch of harbour porpoise: 1) pingers and other acoustic devices designed to deter porpoises from the fishing gear; 2) gear modifications or alternative fishing gears which are designed in such a way as to minimise or prevent bycatch of harbour porpoises; and 3) various ways of effort control to reduce bycatch such as closed areas or general effort reduction.

→ *Pingers*

In order to assess whether deployment of pingers, other acoustic devices or alternative fishing gears may be suitable as emergency measures or long-term measures to reduce harbour porpoise bycatch, it is important to compile information from scientific studies and trials on alternative gears, as well as from pinger use in fisheries in the Baltic and other seas.

In general, pingers have shown to be effective in reducing bycatch of harbour porpoise, during scientific trials and in commercial fisheries. In most studies bycatch was reduced by 63 to 100%. Pingers have also been implemented in commercial fisheries and has resulted in a reduction of bycatch over a long time of about 50 to 80% (see WGBYC 2020 report for details).

Many factors affect the effectiveness of the use of acoustic devices. The more important ones include characteristics of the pinger signal, background noise, habituation, pinger maintenance requirements, and seal depredation. Many other factors need to be taken into regards when implementing pingers (deployment according to the recommended specifications; maintenance of pingers, compliance and enforcement; fisher training and awareness; transferability of performance between fisheries; habituation; underwater noise pollution; seal attraction and associated depredation and bycatch).

→ *Gear modifications or alternative fishing gears*

Fishing gear may be modified with the aim of reducing the bycatch rate, while not affecting the catch rate of the target species. Another technical mitigation measure is alternative fishing gears with lower or no observations of harbour porpoise bycatch, which should replace most commonly used gears such as gillnets.

Trials on acoustic enhancement of nets have been carried out in several countries. Different methods have been used to increase detectability of the net by porpoises such as the addition of barium sulphate ($BaSO_4$) or iron oxide to the netting material, or the use of pearl nets. Lights attached to gillnets have also been tested in the Baltic Sea but with the conclusion that further tests were needed to check their effectiveness in reducing bycatch of Protected Endangered and Threatened Species (PETS).

Among alternative fishing gears for which lower bycatch rates of harbour porpoise can be assumed compared to static nets are longlines, pontoon traps, cod pots, and small seine nets. So far the most promising trials on alternative fishing gears as a replacement for static nets which have been carried out in the Baltic Sea are small cod pots and small seine nets.

→ *Effort limitation*

Operational mitigation measures include various ways of limiting fishing effort. Examples of such measures are time-area closures, bycatch caps, fleet communication, and effort control. Time-area closures focus on reducing the degree of spatial or temporal overlap between fisheries and occurrence of the bycaught species (O'Keefe et al., 2014). Bycatch caps in theory mean that bycatch can be limited through the use of bycatch quotas. Fleet communication is a voluntary form to change fishing patterns in order to minimise bycatch when protected species are encountered. Finally, effort control means controlling or limiting the effort where the bycatch of PETS.

2.3.8.2 Designation of Marine Protected Areas for harbour porpoise

Since the proposed mitigation measures are focused on designated Natura 2000 areas and it has been suggested to close all Natura 2000 sites east of 13.5°E for gillnet and trammel net fisheries in which the harbour porpoise is listed as present, the appropriateness of this measure can be considered by evaluating the importance of areas to harbour porpoises. All Natura 2000 sites which list the harbour porpoise are analysed here. The population status gives an indication of the assumed fraction of the "local population" which is the abundance in national waters (A: 15–100%; B: 2–15%; C: 0–2% of local population; D: non-significant population; see Table 1). It must be taken into account that the "local populations" in SE and DE are much larger than in PL due to the regular occurrence of animals of the much larger population of the Kattegat, Belt Sea, and Western Baltic in their national waters. Thus, the given population status can only be compared within a country, and for DE and SE these population status notes cannot express the importance of the site for the Baltic Proper harbour porpoise population only.

Table 1. Natura 2000 sites east of 13° East with harbour porpoise listed as present. Population status codes (A: 15–100%; B: 2–15%; C: 0–2% of local population; D: non-significant population). Note: * indicates the Natura 2000 areas included in the NGO Annex II (Source: Natura 2000 Standard Data Forms).

Natura 2000 site name	Site code	Marine area (ha)	Population status
Adlergrund	DE1251301	23,397	C
Westliche Rönnebank	DE1249301	8,601	C
Pommersche Bucht mit Oderbank	DE1652301	110,115	B
Pommersche Bucht (under Birds Directive) *	DE1552401	200,417	B
Steilküste und Blockgründe Wittow	DE1346301	1,633	D
Greifswalder Boddenrandschwelle und Teile der Pommerschen Bucht	DE1749302	40,401	C
Erweiterung Libben, Steilküste und Blockgründe Wittow und Arkona	DE1345301	7,570	C
Plantagenetgrund *	DE1343301	14,909	C
Hoburgs Bank och Midsjöbankarna	SE0330308	1,051,111	C
Sydvästskånes utsjövatten	SE0430187	115,128	C
Zatoka Pucka i Półwysep Helski	PLH220032	21,798	A
Ostoja Słowińska	PLH220023	11,501	B
Wolin i Uznam	PLH320019	5,761	B
Ostoja na Zatoce Pomorskiej	PLH990002	242,718	B

2.3.9 Discussions and conclusions

2.3.9.1 Evaluating pressures and threats due to commercial fisheries bycatches to harbour porpoise in the Baltic Proper

Based on genetic and morphological evidence, as well as acoustic and telemetry studies, there is evidence for a separate harbour porpoise population in the Baltic Proper (e. g. Sveegaard et al., 2015). Its size of only 497 individuals (95% CI: 80–1091, ASCOBANS, 2016) is critically low. In order to protect this population, yet allow recovery, strict conservation measures will be needed. One of the main pressures to the population identified is bycatch in static net fisheries and the mortality limit for the Baltic Proper is likely close to zero.

Data from WGBYC confirms literature that the highest bycatches of harbour porpoises are found in gillnets and trammelnet fisheries (GNS and GTR). However, harbour porpoises are also bycaught in otter trawls (OTB, OTT, and OTM) and midwater pair trawls (PTM).

There has been continuous monitoring in the Baltic through sampling programs under the DCF/EU map in Baltic fisheries. A total of 7258 days at sea (DaS) have been monitored across all métiers from 2006 until 2018 with no bycatch of harbour porpoise reported. However, the sampling is mainly carried out in the trawl fishery and monitoring gillnet fisheries has been limited. In the Baltic Sea 1126 DaS has been monitored in the gillnet fisheries from 2006 until 2018.

Evaluating fisheries effort shows that gillnets constitutes the main fishing effort in terms of DaS in the Baltic, and that the effort is concentrated in the southern Baltic along the German and Polish coasts. Also trawl fisheries is focused in the southern Baltic. Neither gillnet fisheries nor do trawl fisheries occur in a larger extent in the areas designated for harbour porpoise (Midsjöbankarna). In the Baltic overall, gillnet fishing effort has decreased by 44% over the past 10 years. Since August 2019, gillnet effort targeting cod has significantly decreased due to the cod ban in the southern Baltic. In Sweden this constitutes the main gillnet effort in southern Baltic.

2.3.9.2 Emergency measures proposed for harbour porpoise in the Baltic Proper

i. Role of Natura 2000 areas in the protection of the harbour porpoise population of the Baltic Sea

It is obvious that, except for the Natura 2000 site Hoburgs Bank och Midsjöbankarna, most Natura 2000 sites have been designated for other qualifying features (species, habitats) for protection—and harbour porpoises have been added, often based on limited or opportunistic information on their occurrence. However, this also means that in many cases, areas that are important for harbour porpoises have not been designated as Natura 2000 sites.

The designation of Natura 2000 areas in the NGO Annex II did in one case take the distribution and abundance of the Baltic Proper harbour porpoise into account (Hoburgs Bank och Midsjöbankarna). Some other important areas for the harbour porpoise population of the Baltic Proper such as the Southern Midsea Bank and boundary areas further south or Hanö Bight have not been designated Natura 2000 sites. Depending on porpoise density and fishing effort, implementing mitigation measures in these areas can be more efficient than in some Natura 2000 sites which mention the harbour porpoise (and for which this is based only on assumptions or opportunistic sightings). In other sites, e.g. the German nature conservation area Pommersche Bucht-Rönnebank, the seasonal importance for the harbour porpoise population of the Baltic Proper has later been verified (Benke et al., 2014).

ii. General remarks with respect to emergency measures

Considering the status of the harbour porpoise Baltic Proper population, its biology and life history, any protection measures can be effective only when applied continuously for a long period of time—for years and even decades. Emergency measures implemented under Article 12 of the CFP can be applied only for 6 months with the possibility to be prolonged for another 6 months.

Given the conservation status, the sum of threats (not only from fisheries but also from other pressures) and the state of depletion of this population, there is no doubt that measures are urgently needed to protect this population and emergency measures can be a start. Since bycatch appears to be a major conservation issue for this population, all measures which potentially reduce bycatches can contribute to achieving conservation objectives.

Returning to business as usual after the cessation of emergency measures would likely result in the extirpation of the population.

The measures proposed are fishery closures and the use of pingers accompanied by appropriate recording of data and monitoring. Reducing fishing effort in areas of importance for harbour porpoise can be an effective mitigation measure. However, the measures described in the NGO Annex II will likely not solely positively affect the population status.

2.3.9.3 Appropriateness of the emergency measures proposed for Baltic harbour porpoise

In the NGO Annex II, six measures are proposed to protect the critically endangered Baltic Proper harbour porpoise population. However, only three of them are "protection" measures, while the other three are guidelines to improve bycatch monitoring and management. Therefore, in this document we have focused on evaluating the appropriateness of the "protection" measures.

The proposed emergency measures aiming at a reduction of bycatch numbers are not sufficient for the protection and recovery of the Baltic Proper harbour porpoise population. This is mainly due to the already heavily depleted state of the population which would require decades to recover after the implementation of suitable conservation measures. Further, emergency measures are limited in time. Thus, immediately following emergency measures, long-term conservation measures will be needed to improve the status of the population.

The PBR of 0.7 animals per year suggests that even the avoidance of a low number of bycatch events by a measure would have a positive effect on the population. Decreasing the overall bycatch numbers by conservation measures depends on the spatio-temporal extent of each measure and the overlap of porpoise occurrence and density (which is uncertain in most areas) and fishing effort in métiers which pose a bycatch risk to the species. As a consequence, it is difficult to assess the potential benefit **to the population**, especially for measures which have a small spatiotemporal extent (such as closures of small Natura 2000 sites).

i. Closure of the Northern Midsea Bank for all fisheries

The Natura 2000 area Hoburgs Bank och Midsjöbankarna provides core habitat for the Baltic Proper harbour porpoise population and SAMBAH results indicate that density is highest in the Northern Midsea Bank. However, due to the low fishing effort reported in this area which is mostly pelagic trawling (also posing a bycatch risk but at a much lower scale compared to static nets), currently the bycatch risk in this area is assumed to be relatively low. Provided that the effort in the area will not increase, e.g. due to other conservation measures elsewhere (e.g. shifting of effort), this total closure for all fisheries should decrease bycatch but will most likely not have a significant positive effect on the population. Therefore, additional mitigation measures such as overall reduction of fishing effort needs to be taken into consideration.

ii. Closing of gillnet fisheries in the rest of the Natura 2000 area Hoburgs Bank och Midsjöbankarna (SE0330308) as well as in all other Natura 2000 areas east of 13.5°E where the harbour porpoise is listed as present

The closure of the Natura 2000 site Hoburgs Bank och Midsjöbankarna (SE0330308) to static net fisheries has a low likelihood to reduce the bycatch of harbour porpoises in the area. From the

SAMBAH project results it is clear that the Natura 2000 site represents core habitat for this harbour porpoise population and therefore the Natura 2000 site was established primarily to protect the "Baltic Proper" porpoise population. However, the fishing effort in this area is currently very low, and therefore the risk for the porpoise to be bycaught in this area is small. Therefore, this closure will not contribute much to the required harbour porpoise bycatch reduction and thus it is likely that this measure alone will not have a significant positive effect on the population.

Not all core habitat was included in the Natura 2000 site. E.g. the Southern Midsea Bank south of the area is no less important for the Baltic Proper harbour porpoise population but has not been included in the protected area. A similar case is for the outer part of the Puck Bay which is outside of the Natura 2000 site. Closures or other mitigation measures could also be considered in these areas.

Most of the Natura 2000 sit**es** in the NGO Annex II are small and cover mainly the coastal areas. Exceptions to this is a large interconnected cluster of the German and Polish Natura 2000 sites: Pommersche Bucht mit Oderbank; Greifswalder Boddenrandschwelle und Teile der Pommerschen Bucht; Ostoja na Zatoce Pomorskiej; and Uznam i Wolin. The area Oderbank designated under the Birds Directive would interconnect the cluster of Natura 2000 sites with Adlergrund and Westliche Rönnebank to form a large connected protected area of almost 5000 km^2. There is considerable fishing effort with static nets in this area and by reducing the effort in this area it will likely have a significant effect on the population.

iii. Exclusion of fisheries for the two small Polish Natura 2000 sites namely Natura 2000 area Zatoka Pucka i Półwysep Helski (PLH220032) and Ostoja Słowińska (PLH220023)

Although the harbour porpoise is listed simply as occurring in the Zatoka Pucka i Półwysep Helski site, this is an important location for the Baltic harbour porpoise population (Skóra and Kuklik 2003; Hel Marine Station UG, unpublished data). This Natura 2000 site is also relatively small, semi-closed and very shallow, and is used by small fishing boats. In addition, it borders the most important area for harbour porpoise in the region which is the outer part of Puck Bay where relatively high bycatch numbers continue to be reported (Hel Marine Station IO UG, unpublished data). If fisheries were excluded from the site, this would in practice mean that all fisheries within the site would relocate fishing effort to neighbouring areas. In effect, that could create a high concentration zone of fishing effort around the borders of the Natura 2000 site. That might then affect the ability of porpoises to enter and leave their favoured area during seasonal migration and would actually increase the risk of being bycaught in the neighbouring areas. Therefore, relocation of fishing effort could create higher bycatch risk for the individuals that occupy the outer, unprotected area adjacent to the Natura 2000 site which forms the inner part of Puck Bay. Appropriate temporal and fishing method (including alternatives) management of this Natura 2000 area could thus be more effective as a mitigation measure.

Ostoja Słowińska (PLH220023) is a natural area with reported bycatches, and live observations of Baltic harbour porpoises (Hel Marine Station database). However, it covers marine areas only to minor extent (11 501 ha), with rather low fishing effort and there is no clear scientific evidence that this area is of a special importance for the harbour porpoise compared to the surrounding areas. Since the site is also part of the Słowiński National Park, the fishery in this area is controlled by the park authorities and they are authorised to implement fisheries management measures. Closing fisheries in this area therefore would probably have no effect on the Baltic Sea harbour population.

iv. Mandatory use of ADDs in all commercial gillnet fisheries outside Natura 2000 areas

Most of the fishing effort with static nets appears to be outside Natura 2000 sites. Therefore it is important to reduce the bycatch risk of harbour porpoises also outside these areas. The large-scale use of pingers in static net fisheries regardless of vessel size addresses the fishing métiers with the highest bycatch rates and affects a large fraction of static nets. Although pingers cannot eliminate bycatch, they have the potential to reduce bycatch rates of these nets to 50–80% in operational fisheries compared to nets without pingers (Orphanides & Palka, 2013). Thus, the expected bycatch reduction by this measure will likely have a positive effect on the population. In areas where porpoises are not abundant and only occasionally observed, the disadvantages of using pingers might exceed the advantages. For pingers to be effective, a number of conditions have to be met. These include the fishers' awareness, the maintenance of pingers, training, compliance, and enforcement. Also, there a few disadvantages and restrictions of this method, as listed in the section on technical mitigations. Large scale use of pingers may reduce the foraging efficiency of harbour porpoises which in turn could result in negative population impacts.

In order to be effective as a conservation measure, this approach should be taken into account for the longer term in addition to "emergency measures" implemented under Article 12 of the CFP. However, as the Jastarnia Plan (ASCOBANS, 2016) points out, pingers are only suited as an interim measure until alternative gears are available.

v. Accurate recording of fishing effort and gear type used

vi. Dedicated electronic monitoring on all gillnet vessels in the region

vii. Monitoring and adaptive management/mitigation measures of gillnet fisheries

All three measures are aimed at improving bycatch monitoring, and management rather than measures dedicated for direct protection of harbour porpoises. In order to obtain robust data which are essential for proper bycatch evaluation and in providing further advice for implementing appropriate actions for reduction of PETS bycatch, the proposed measures/guidelines are appropriate and worth implementing not only to monitor bycatch of harbour porpoise but to get more reliable data on bycatch of all of protected species. However, the idea to cover by REM (or other monitoring) 100% of gillnet fishing effort over almost the entire Baltic Sea is very ambitious, and need time, money and dedicated solutions to be implemented.

It is clear that the effect of conservation measures above cannot be robustly assessed by a monitoring program even if observer/REM coverage in the fisheries affected is 100%. However, what can (and should) be monitored is the compliance of fishermen, and possible changes to their behaviour (fishing effort and/or methods) in response to measures, e.g. closures in order to safeguard that this does not counteract the measures taken.

2.4 WKEMBYC discussions

i. ToRs and objectives

The terminology used in the ToRs required some further clarification. The word 'appropriate' refers to a measure expected to provide positive conservation outcomes. The word 'necessary' refers to a measure that would respond specifically to a piece of legislation, in particular the Habitats directive.

The workshop can propose amendments to the emergency measures proposed by the NGOs. The workshop is also requested to identify possible alternative measures and gaps in the proposal and in the reviews. It was agreed to refer to the results of WGMME and WGBYC concerning appropriateness of measures and propose amendments if needed.

The issue of which conservation objective to use was raised. For the Baltic harbour porpoise there is no difference between the different scenarios, because the PBR is so low (0.7 individual) that being under PBR equates having no bycatch.

Clarification was asked regarding uncertainty around the estimated PBR of 0.7 individuals caught per year. PBR is a point estimate; however, uncertainty is included in the analysis (growth rate).

The PBR is the best threshold that can be used for this population. Factors used in PBR calculation include abundance, population growth rate (default value 4% for small cetaceans), and recovery factor (0.1 for endangered population); however, true population growth rate could be lower than 4% because of high PCB content in the Baltic Sea. The PBR value is then compared to the estimated annual bycatch (7 animals per year). ICES advice on finding reference values was that the choice of the most appropriate procedure depends on the conservation objective; the PBR is accepted by ICES, it is state of the art for a depleted population, ICES also uses the PBR for data limited seal stocks. It was agreed that for the harbour porpoise in the Baltic, the PBR is the best available threshold.

ICES advice operates on validated data. Different sources are possible, the data does not necessarily have to be published in a peer-reviewed journal.

ii. Population, Abundance and Distribution

Clarification was asked regarding the proposed border at 13°E for the management unit in winter. The 13.5° border that was used in Annex II has been proposed as the management border of the Belt Sea population in summer, but not as the border of the Baltic Proper population any time of the year. It is unclear how far west the Baltic Proper population is travelling in winter. The border of 13° was used by WKEMBYC because of the detection rate of harbour porpoises in offshore waters in winter and the border of deeper water (Arkona Basin). Since the two porpoise populations were found to have different skull features, it was suggested that Baltic Proper animals feed on pelagic prey and therefore use deeper water than the Belt Sea animals which feed on benthic prey.

Some clarification about the quality of the SAMBAH data was requested. The Swedish monitoring program has confirmed that the area of Midsea Bank identified initially by the SAMBAH project is a core habitat and of utmost importance for the Baltic Proper harbour porpoise. Lower probability of acoustic detection in other areas indicates that porpoises occur here in certain times of the year and that migration has to be considered. Maps do not show density, but detection probability and confidence intervals have been published. It must be noted that data estimates on abundance could also be lower. Maps are a good indicator of large-scale distribution patterns for the Baltic harbour porpoises, but should not be used at a very fine resolution.

iii. Emergency Measures

Although harbour porpoise can also be caught in trawl fisheries, WGBYC focused on evaluating measures proposed in the NGO proposal on emergency measures. In addition, WKEMBYC can propose amendments and priorities. However, bycatch rates in trawl fisheries are very low compared to static net fisheries.

The three mitigation measures were assessed independently and considered to be insufficient on their own; consequently, it is considered necessary to combine several measures. The group concluded that the zero bycatch aim cannot be reached even combining all the measures. Regarding the efficiency of pingers, a bycatch reduction of up to 100% was possible in research projects; however, in operational fisheries, the efficiency with respect to reducing bycatch was lower—perhaps due to lack of maintenance, enforcement, or monitoring. Therefore, pingers cannot eliminate bycatch, even if they can significantly reduce it. On the other hand, the use of alternative gears would have the potential to eliminate bycatch.

An amendment to the NGO Annex II proposal on the use of pingers outside Natura 2000 sites should be to replace gillnets with alternative gears. Since there is no bycatch of harbour porpoises in some gears, those could be used as a long term alternatives to gillnets, for example pots. An advantage of some gears is also that they are seal-safe and resolve the harbour porpoise bycatch and seal depredation problem at the same time.

Additional areas for measures (Southern Midseabank, Hanö Bight, Outer Puck Bay) have been proposed because of high detection rates, for being breeding, feeding and migration areas, or because of potential conflict with fisheries. For these additional focus sites for mitigation measures, the borders of the sites and the conservation actions still have to be discussed and defined. For the outer Puck Bay, data on recent acoustic monitoring is needed and will be sought.

iv. Measure 1 - Closing of Northern Midsea Bank for all fisheries

It was asked whether closing all fisheries on the Northern Midsea Bank would reduce bycatch and help the Baltic harbour porpoise population in general.

The Swedish Agency for Marine and Water Management has proposed to protect the Northern Midsea Bank from local anthropogenic impact, and it is a core area for the Baltic Proper harbour porpoise. The area is also relevant for prey abundance. It can be assumed that higher prey availability resulting the fishery closure will be beneficial to the harbour porpoise population. The measure could cause porpoises to stay longer in core area and not go to areas where fishing is occurring.

Although emergency measures are only short-time, sufficient measures can be put into place in the meantime; additionally, it should be considered that the measures proposed as emergency measures could be continued afterwards. In Natura 2000 sites, measures can be stricter since they can have additional objectives such as the improvement of the habitat. The session agreed that the effectiveness of the measures should be evaluated in a combined manner.

3 Bay of Biscay common dolphin session

3.1 Review of annex I on Biscay common dolphin (from Annex I of NGOs request)

The first request refers to Bay of Biscay common dolphin and was presented at the WKEMBYC meeting by Kelly Macleod. It is stated:

> "The Northeast Atlantic common dolphin is considered to have an 'Unfavourable-Inadequate' conservation status for the European Atlantic. France, Spain and Portugal all classified common dolphin as having an Unfavourable status, with bycatch in fishing gear being the primary concern. Regional experts, the ICES Bycatch Working Group and ASCOBANS (Agreement on the Conservation of Small Cetaceans of the Baltic, North East Atlantic, Irish and North Seas), have raised repeated concerns about the high and unsustainable level of bycatch, and these concerns have been reiterated by the International Whaling Commission Scientific Committee in 2019, which identified that bycatch threatens the conservation status of the population. More than 100,000 common dolphins may have been bycaught since bycatch was first identified in the 1990s. Common dolphins have been entangled in fishing gear in high numbers for at least 30 years. Most recently, there was a dramatic increase in strandings along the French coastline from December 2018 to March 2019 (Peltier et al., 2019). Only a small percentage of dolphins that become bycaught in fishing gear will wash ashore. Given the Unfavourable status of common dolphins, and the uncertainty about number of populations in this region, this issue requires urgent and decisive action" (European NGOs, 2019a)

According to the low genetic differentiation of this species in the north Atlantic, it is commonly admitted that common dolphins can be managed as a single management area (Murphy et al., 2013), but according to ecological tracers (stable isotopes, fatty acids, metal tracers, stomach contains), two management areas should be considered for common dolphin management (Caurant et al., 2011; Lahaye et al., 2005).

The NGOs reviewed the situation of common dolphin bycatches in all range states, including Ireland, United Kingdom, France, Spain, and Portugal. In particular, from December 2018 to April 2019, 1200 cetaceans washed ashore along the French coastline. 90% of those were examined by the national stranding scheme of which 93% were identified as common dolphins, 85% of them being diagnosed as bycatches (Peltier et al., 2019). The years 2016–2019 display outstanding record numbers of stranded common dolphins in February or March or in both months.

According to ICES (2016, 2018) and other organisations, the level of bycatch of common dolphin in the region is likely "unsustainable". Analyses of stranding data permitted likely areas and periods of mortality to be identified. Fisheries operating in these areas and periods include pair trawlers, bottom trawlers, set nets, pelagic freezers, and VHO trawlers targeting the following species seabass, hake, mackerel, cuttlefish, sole.

Therefore, the group of European NGOs, requests "that the European Commission take emergency measures based on article 12 of the Common Fisheries Policy, and with reference to Article 12 of the Habitats Directive". The group further asks "that the European Commission takes the necessary measures to 1) close the fisheries that are responsible for the common dolphin bycatch in the North East Atlantic between the beginning of December 2019 and the end of March 2020, including, *ad minima*, the pair-trawl and the gillnet fisheries and 2) implement real time monitoring and dynamic mitigation measures on a permanent basis, as per the recommendations of the IWC Scientific Committee advice. (European NGOs, 2019a).

Discussions clarified that the most appropriate spatial scale, in context of the NGO document, is the Management Unit of common dolphins.

3.2 Review of WGMME report (adapted from WGMME ToR E Report)

The main results of the WGMME workshop regarding the Bay of Biscay common dolphin were presented to WKEMBYC by Graham Pierce. The following sections are in the same sequence as in the original report. Full text and illustrations are available in the ICES WGMME 2020 report.

3.2.1 Management unit

The common dolphin is one of the most abundant cetacean species in European Atlantic waters and the most abundant cetacean in the southern half of the Northeast Atlantic area. WGMME considered that the appropriate scale at which to evaluate the population status of common dolphins occurring in the Bay of Biscay, and pressures and threats to this species in this area, is the European Atlantic Assessment Unit.

3.2.2 Abundance and status

Estimates of abundance of common dolphins in European Atlantic waters are available from the large-scale multinational SCANS-II and CODA surveys in summer 2005 and 2007 (Hammond et al., 2013; CODA, 2009) and the SCANS-III and ObSERVE surveys in summer 2016 (Hammond et al., 2017; Rogan et al., 2018). These surveys cover the majority of EEZ waters in the European Atlantic but exclude offshore waters in the Portuguese EEZ. The area covered by the SCANS and ObSERVE surveys effectively matches most of the recommended European Atlantic Assessment Unit.

To calculate an estimate of the total number of common dolphins, estimates of abundance for positively identified common dolphins were corrected to include a proportion of the abundance of common or striped dolphins that were unidentified to species. This was done separately for SCANS-III ship, SCANS-III aerial and ObSERVE aerial surveys, by multiplying the estimate of unidentified common or striped dolphins by the proportion of identified sightings that were common dolphins (see e.g. Rogan et al., 2017). This generated a total estimate of common dolphin abundance of 634 286 (CV=0.307).

Under the Habitat Directive, the 2013-2018 assessment for common dolphin in the Atlantic Marine Region varied with Member States. France assessed the status of common dolphin as U1 (unfavourable / inadequate) while the assessment by Spain was XX (unknown). The overall automatic assessment is a mixture of FV (favourable), XX and U1, although it should be noted that all methods of combining the data show FV to be the smallest component.

3.2.3 Bycatches

ICES WGBYC (2019) estimated bycatch rates for all marine mammals in the entire WGBYC database (2005–2017) for the Greater North Sea and Celtic Seas Ecoregions and the eastern Bay of Biscay shelf (8a and b).

Observer coverage of fleets fishing in Biscay ranges from 0.28% to 1.07% (ICES WGBYC, 2019). In total, 482 days at sea in Biscay yielded observations of 19 incidents killing a total of 65 common dolphins. This equates to a bycatch rate of 0.134 specimens per observed day at sea, although values for individual fleets range from 0.005 and 0.941. If extrapolated to total effort by all fleets reporting bycatch of common dolphins, this would lead to an estimate of 8904 bycatch deaths in 2017 (95% CI 3142–20 026), assuming a binomial distribution of bycatch events and applying the mean number of specimens bycaught per incident. Including data on common dolphin bycatch in other areas (specifically the Greater North Sea and Celtic Seas Ecoregions) would increase the estimate to 9373 (95% CI 3184–21956). It is interesting to note that the extrapolation yields bycatch estimates of the same order of magnitude as those obtained from reverse drift modelling of strandings. However, the more recent analyses conducted by WGBYC and WKEMBYC identified issues with part of the French fishing effort data base and used a corrected version, leading to substantially lower estimates (see Section 3.3.4 below).

Based on abundance surveys in 2016, the best estimate of common dolphin abundance in the European Atlantic is 634 268 individuals. The extrapolated total bycatch in 2017 would be 1.48% of the population (95% CI 0.60%–3.46%) or 1.40% (95% CI 0.50%–3.16%) if only Biscay bycatches are considered.

The above estimates of bycatch mortality required extrapolation from observation of a very low proportion of fishing activity (at least in those fleets which reported bycatch mortality), and it is apparent that monitoring effort is too low to generate robust estimates. Nevertheless, it is possible that bycatch mortality of Northeast Atlantic common dolphins, a high proportion of which appears to take place in the Bay of Biscay, is unsustainable.

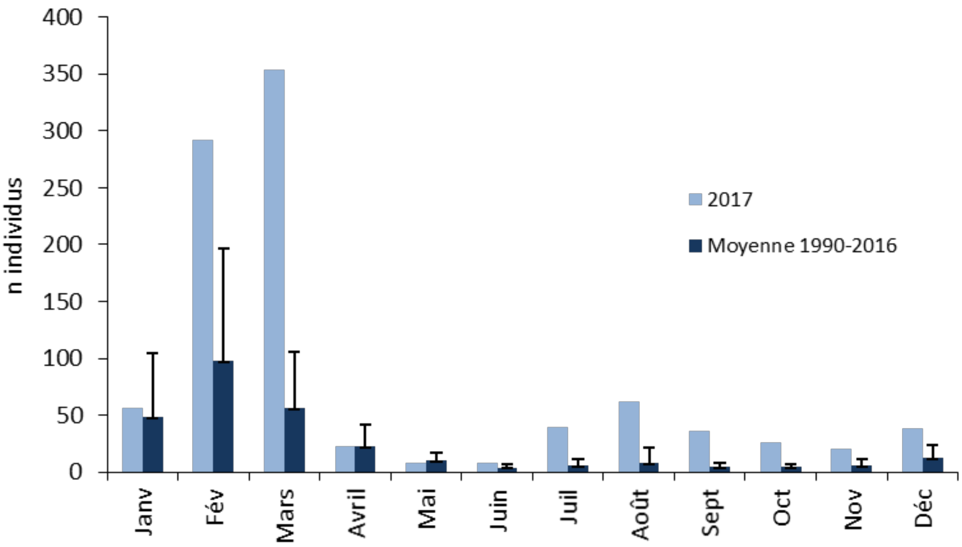

Figure 3. Number of stranded common dolphins by month in the French coast of the Bay of Biscay. Light blue, 2017 stranding; dark blue, median of 1990-2016 strandings (from Dars et al., 2018).

3.2.4 Strandings

During the last decade, hundreds of common dolphins bearing signs of bycatch mortality have washed up on French Biscay coasts in the first part of the calendar year (see previous WGMME reports for details; data for 2017 shown in Figure 3). Reverse drift modelling indicates that the likely area of origin is on the continental shelf in the north of Bay of Biscay, an area mainly used by French vessels, but with some activity by the Spanish fleet. The gears involved include PTM, GNS and VHO targeting bass and hake. The dolphins often had full stomachs indicating that they were feeding around the time of death (Observatoire Pelagis, unpublished data).

3.2.5 Mortality limit

WGMME has previously reviewed pressures and threats to marine mammal species on a regional basis (ICES WGMME, 2019). This indicates that, although other threats (e.g. contaminants) may also be important, the primary pressure on common dolphins in the Bay of Biscay is fisheries bycatch. Accordingly, in responding to ToR E at their 2020 meeting, WGMME did not consider mortality due to other anthropogenic threats, but these should be considered when formulating advice.

Estimates of abundance of common dolphins in European Atlantic waters are available from the large-scale multinational SCANS-II and CODA surveys in summer 2005 and 2007 (Hammond et al., 2013; CODA 2009) and the SCANS-III and ObSERVE surveys in summer 2016 (Hammond et al., 2017; Rogan et al., 2018). Estimates of abundance have been made for common dolphins, striped dolphins, and also for common and striped dolphins combined, because there are a substantial number of sightings of unidentified common or striped dolphins. The total estimate of common dolphin abundance is 634 286 (CV=0.307).

In 2018, WGBYC undertook a bycatch risk approach (BRA) for common dolphins in the Bay of Biscay and Celtic Sea regions using data on bycatch rate and fishing effort for the period 2015–2016. Total bycatch in 2016 for Subareas 7 (Celtic Sea) and 8 (Bay of Biscay) was estimated to lie within the interval 1760 to 5259 animals (ICES WGBYC, 2018). This estimated bycatch was considered in the context of the best estimate of abundance of common dolphins in the Celtic Sea and Bay of Biscay from the SCANS-III surveys in 2016, resulting in a calculated range in mortality due to bycatch of 0.53% to 1.57% of abundance in these areas.

WGBYC (2018) also considered estimates of bycatch of common dolphins in the Bay of Biscay based on stranding using the methods of Peltier et al. (2016, 2020). The motivation for the development of these methods has been the lack of observer data from which to estimate bycatch in this area. As reported by WGBYC (2018), a review of the methods by the IWC Scientific Committee "highlighted uncertainties in the estimation of immersion level, the probability of being buoyant, the probability of stranding, the time of death and potential sensitivity of this approach to application beyond the Bay of Biscay" (WGBYC, 2018, section 5.2 pages 61-63). Nevertheless, using these methods applied to strandings data has generated estimates of bycatch of common dolphins in the Bay of Biscay that are the same order of magnitude as those estimated using observer data (WGBYC, 2018, pages 61-62).

WGMME agreed to use the methodology based on strandings (Peltier et al., 2016) to generate estimates of common dolphin bycatch in the Bay of Biscay for the period 1990 to 2019 (95% interval estimates shown in Figure 4).

Bycatch also occurs in the Assessment Unit area outside the Bay of Biscay. For Spanish fisheries, there is no dedicated observer programme and no co-ordinated nationwide strandings programme. WGBYC (2018) considered bycatch in fisheries under Spanish flag. No systematic estimates of bycatch are available, but an estimate based on a population model incorporating strandings data suggests that at least several hundred common dolphins could be bycaught each year (Saavedra et al., 2017). Bycatch in UK gillnet fisheries was estimated from observer data at around 240 common dolphins in 2015, but this estimate is likely to be biased high (ICES Advice 2017). WGMME therefore recognises that the estimates of bycatch from strandings along the French coast of the Bay of Biscay do not include all bycatches of common dolphins in the Assessment Unit area. However, the scale of the estimated bycatch in French waters is likely approximately an order of magnitude greater than other bycatch in the area.

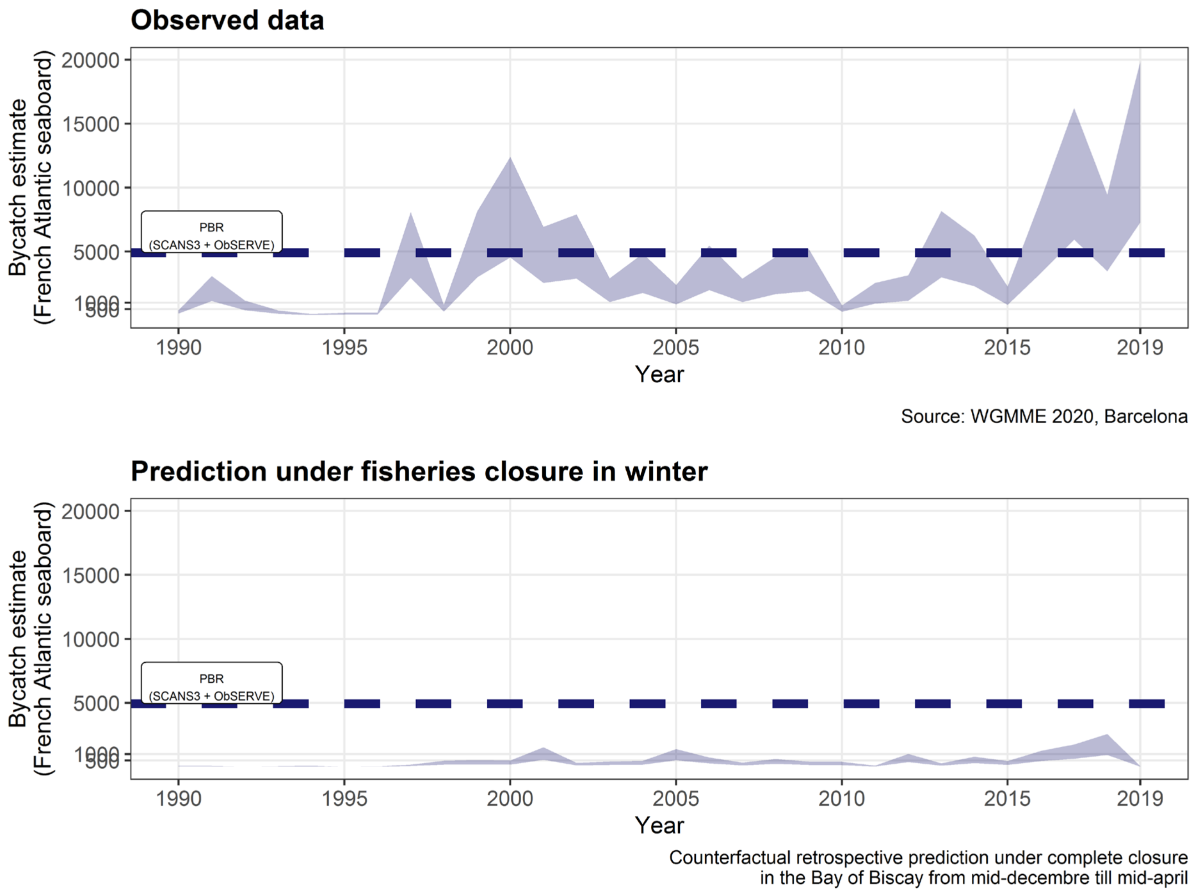

Figure 4. Upper panel: Interval estimates of bycatch of common dolphins in the Bay of Biscay generated from strandings data using the methods of Peltier et al. (2016). The dashed line is the value of PBR calculated as explained in the text. Lower panel: scaled interval estimates of bycatch assuming no bycatch in the period mid-December to mid-April to illustrate the effect of a closure of all relevant fisheries during this period.

To evaluate the impact of bycatch, WGMME focused on estimates of bycatch in relation to estimated abundance in the European Atlantic Assessment Unit. In the absence of defined conservation objectives, WGMME agreed to use the PBR equation, originally conceived to generate a level of mortality above which the population may not achieve the conservation objectives of the US Marine Mammal Protection Act (Wade, 1998). According to the simulations used to develop PBR, an annual bycatch no greater than PBR will allow a population to recover to or be maintained at or above 50% of carrying capacity with 95% probability, the US MMPA definition of an Optimum Sustainable Population.

The PBR equation requires an estimate of minimum population size $N_{\min}$ typically calculated as the 20[th] percentile of the error distribution of the best available abundance estimate. It also requires values of the maximum rate of increase of the population,$R_{\max}$ and a recovery factor F_r. In the absence of information specific to common dolphins in the European Atlantic, $R_{\max}$ was set at the default value for cetaceans of 4%. The default value of F_r=0.5 was also used. PBR= $0.5 \times N_{\min} \times R_{\max} \times F_r$. With the above input values, PBR will be equal to 1% of minimum population size.

Minimum population size $N_{\min}$ was calculated as the 20[th] percentile of the log-normal error distribution of the total estimate of common dolphin abundance of 634 286 (CV=0.307), giving 492 582 from which PBR was calculated as 4926, i.e. 0.78% of the best estimate of population size.

Estimates of common dolphin bycatch in the Bay of Biscay show high inter-annual variability but also show a pattern of increasing bycatch in recent years. Comparing these bycatch estimates with PBR calculated as described above illustrates that previous bycatch estimates were on average lower than this PBR level but that current estimates (2017–2019) are higher (Figure 4 upper panel). Removing bycatch in the January-March winter period reduces the estimated bycatch to a small proportion of the total and much lower than the calculated PBR (Figure 4 lower panel).

When considering the estimates of bycatch compared to the calculated PBR, WGMME notes that:

- The estimates of bycatch calculated from strandings are uncertain and possibly biased to an unknown extent;
- The estimates of bycatch do not include all bycatches in the Assessment Unit area;
- The conservation objectives to which PBR is tuned are not entirely reflected in the relevant EU legislation (Habitats Directive, Common Fisheries Policy, Marine Strategy Framework Directive);
- The default value of R_{max}= 4% in the PBR calculation may be too low for common dolphins;
- Use of a value of F_r different from the default of 0.5 would change PBR proportionally;
- Because of these choices for R_{max} and F_r, the calculated value of PBR is less than 1% of the best estimate of common dolphin abundance in the Assessment Unit area. For example, 1.7% of the best estimate of abundance (a reference level previously used for total anthropogenic mortality in harbour porpoise) is greater than 10 000 (but the 2017 and 2019 bycatches, as estimated from strandings along the French Biscay coast, may also have exceeded this value).

3.2.6 Other threats and pressures

Threat matrices developed by ICES WGMME (2019) for different marine mammal species in each ecoregion, concluded that threat levels for common dolphin in the Bay of Biscay were high only for bycatch and contaminant exposure. Levels of PCBs in the marine environment have long been high in the Celtic Sea and Bay of Biscay, although they have shown some reduction over time (OSPAR, 2010, 2017b).

3.2.7 Conclusions

Discussion of the report noted that although PBR was chosen by WGMME as an appropriate threshold metric with which to measure bycatch levels against, this method has not been agreed by OSPAR and is not being utilised by OSPAR in its next round of assessments.

The issue of justification of PBR was raised, in particular the choice of R value, with suggestions that it may have been set too low. However, WGMME highlighted that there is uncertainty around whether common dolphins meet the reproductive levels indicated and as such they chose a precautionary approach.

Common dolphins in the Bay of Biscay belong to a wide-ranging population, of which those animals living in European Atlantic waters are a part. Considering abundance estimates for the entire assessment unit, bycatch estimated from strandings in the Bay of Biscay for the last three years exceeds PBR calculated using default values for R_{max} and F_r; however, estimates of bycatch have wide confidence limits and may be biased to an unknown extent.

The extent of monitoring of fishing fleets in Bay of Biscay is limited and apparently falls short of what is needed under existing legislation. Therefore, the proposal to implement real time monitoring and dynamic mitigation measures seems justifiable. Since, in principle, Fishery Emergency Measures would remain in effect for up to six months (although potentially extendable for a further 6 months), to maximize effectiveness they should be introduced in late autumn to ensure that the critical winter period is covered. Closure of the responsible fisheries during December-March would be expected to greatly reduce the threat to population viability posed by bycatch mortality in this area, assuming that the responsible fleets could be identified reliably. However, if the alternative of monitoring + dynamic mitigation is capable of achieving the same goal, it would seem to be the more proportionate approach. As in the case of the harbour porpoise (although arguably the common dolphin population is facing a less severe risk to its viability), due to uncertainties inherent in the data, introduction of such measures would be essentially precautionary.

3.3 Review of WGBYC report (adapted from WGBYC ToR G Report)

The main results of the WGBYC workshop regarding the Bay of Biscay common dolphin were presented to WKEMBYC by Hélène Peltier. The following sections are in the same sequence as in the original report. Full text and illustrations are available in ICES WGBYC 2020 report.

3.3.1 Abundance, distribution and population structure

The common dolphin is one of the most numerous cetacean species in the Northeast Atlantic (Murphy et al., 2019). Genetic evidence suggests that common dolphins in the Northeast Atlantic form a single panmictic population; they are a separate population from those in the Northwest Atlantic and Mediterranean Sea (Westgate, 2007; Evans and Teilmann, 2009). ICES WGMME (2014) supported an earlier proposal from an ASCOBANS workshop (Evans and Teilmann, 2009) that the entire north east Atlantic range of common dolphins should be treated as a single management unit (MU). Within the MU, tentative evidence suggests that there may be separate ecological stocks inhabiting the neritic and oceanic waters of the northeast Atlantic (Lahaye et al., 2005; Caurant et al., 2009).

For the purposes of this report, the boundaries of the Northeast Atlantic "Assessment Unit" (AU) are defined by those of the SCANS-III (Hammond et al., 2017) and ObSERVE surveys (Rogan et al., 2018) as these provide the most recent summer abundance estimates and greatest coverage of the population (Figure 5). The SCANS-III survey in July 2016 estimated common dolphin abundance in the entire survey area to be 467 673 animals (95% confidence intervals 281 100–778 000). An additional 13 633 common dolphins (CV=0.85) in Irish waters was estimated from the ObSERVE surveys in summer 2015 (Rogan et al., 2018).

To calculate an estimate of the total number of common dolphins, WGMME (2020; see above) corrected estimates of abundance for positively identified common dolphins by including a proportion of the abundance of common or striped dolphins that were unidentified to species. This generated a total estimate of common dolphin abundance of 634 286 (CV=0.307; 95% CI 352 227–1 142 213).

Model-based abundance estimates have been determined for common dolphin by year for the Bay of Biscay and indicate an overall increase in numbers between the 1990s and the 2010s followed by a plateau thereafter. The actual values should be considered provisional as a sensitivity analysis has yet to be undertaken, but this is unlikely to affect the observed trend.

Seasonal movements of common dolphins in the North East Atlantic are also suggested from recent work by Waggitt et al. (2019) and independently, by smaller-scale regional surveys (e.g. Macleod and Walker, 2005; Brereton et al., 2005; Rogan et al., 2018; Van Canneyt et al., 2020). The Marine Ecosystems Research Programme (MERP) collated cetacean survey effort amounting to around three million kilometres from more than fifty research groups in Northwest European seas covering the period 1978–2018 (but with most effort in the last 15 years). In the Bay of Biscay, the maps for common dolphin shows highest densities concentrated along the shelf break (over the 200–2000 m contour), particularly in winter.

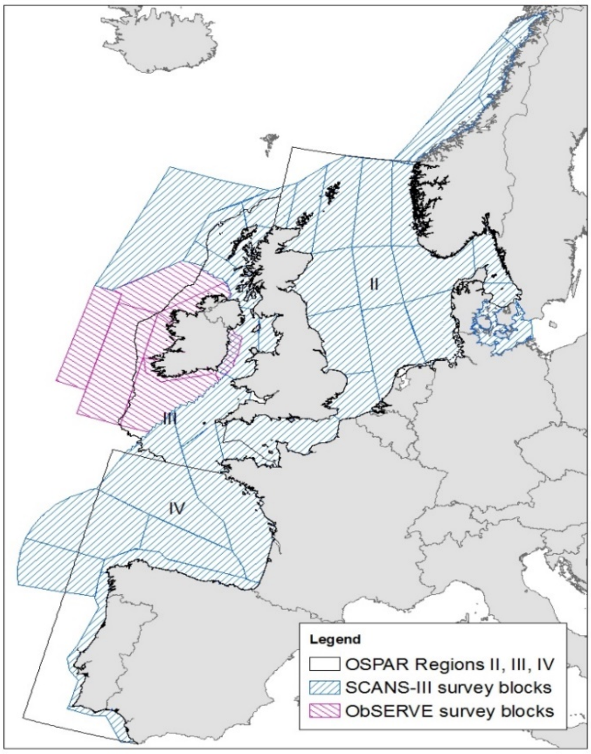

Figure 5. SCANS-III and ObSERVE surveys areas that approximate the North East Atlantic Assessment Unit for the purposes of this report. OSPAR Regions depict the AU proposed by ICES Advice (2014a).

Regionally, the ObSERVE programme undertook aerial surveys in both summer and winter 2015/2016 of Irish waters and noted that densities of common dolphins were much higher during the winter than the summer (Rogan et al., 2018).

Further south in the Western English Channel and northern Bay of Biscay, seasonal sightings rates were also higher during the winter, at least over the period 1995–2002 (Macleod and Walker, 2005; Brereton et al., 2005). These data were collected from fixed-transect opportunistic surveys on ferries which can provide good temporal resolution in sightings data although spatially restricted.

There is further evidence that an increase in winter densities also occurs in the Bay of Biscay. In 2019, four aerial surveys were conducted on part of the shelf of the Bay of Biscay to detect seasonal changes in densities and distribution of cetaceans (Van Canneyt et al., 2020). The results highlighted highest density of common dolphins in winter, mostly around the 100 m isobath. The pattern in common dolphin distribution in winter must be considered carefully according to the small scale of these surveys, but they could suggest seasonal changes and highest densities of common dolphins in winter in inner part of the continental shelf of the Bay of Biscay.

3.3.2 Historical information on common dolphin bycatches

3.3.2.1 Areas and métiers with high common dolphin bycatch

Within the NE Atlantic, common dolphin bycatch is thought to have been greatest within the Celtic Sea and Western Approaches to the English Channel (ICES Division 7h), the western English Channel (ICES Division 7e), Bay of Biscay (ICES Division 8a), and along the shelf edge of Atlantic Spain and Portugal (ICES Divisions 8c, 9a) (Morizur et al., 1999; ICES WGMME, 2005; Fernández-Contreras et al., 2010; Marçalo et al., 2015; ICES WGBYC, 2015, 2016).

Multi-national pelagic pair trawl fisheries for sea bass have operated each winter in the Celtic Sea and western English Channel (ICES Area 7e, h). The offshore pelagic trawl fishery has been predominantly a French fishery accounting for three quarters of annual fishing effort in the Western Channel during the 1990s, whilst about a quarter have been UK vessels, mainly from Scotland (Northridge et al., 2003). The UK bass fishery in the Channel declined gradually from the mid-2000s to the present (Northridge, 2006; SMRU, 2008; Northridge and Kingston, 2010).

In the Bay of Biscay, bycatch has been reported in pelagic trawl and purse seine fisheries targeting a range of fish including albacore tuna, sea bass, blue whiting, horse mackerel, sardine and anchovy, 'very high vertical opening' (VHVO) bottom pair trawl fisheries targeting hake, as well as bottom-set gillnets and trammel nets (Morizur et al., 1996a, 1996b, 1999, 2014; Tregenza et al., 1997; Tregenza & Collet, 1998; Wise et al., 2007; Northridge and Kingston, 2009; Fernández-Contreras, et al., 2010; Marçalo et al., 2015).

Around the Atlantic Iberian Peninsula, common dolphins have also occurred as bycatch in a number of fisheries such as Spanish and Portuguese gillnets, beach seine, and trawl nets (López et al., 2003; Silva & Sequeira, 2003).

3.3.2.2 Bycatches between 1990–2000

During the 1990s, the albacore tuna driftnet fishery in the NE Atlantic caught large numbers of common dolphins, with annual estimates ranging from 243 (1990) to 2101 individuals (1999), until a ban was introduced in 2002 (Goujon, et al., 1993; Goujon, 1996; Rogan and Mackey, 2007).

Monitoring of UK and Irish bottom-set gillnet fleets operating in the Celtic Sea (Subarea 7) targeting hake between 1992 and 1994 indicated a bycatch rate of 1.4 common dolphins per 1000 km of net and a total annual bycatch of 234 (95% CI= 78–702) common dolphins (Tregenza et al., 1997). A slightly higher bycatch rate was reported for the UK hake gill net fleet during the period 1999–2000 (0.0042 common dolphins/haul compared with 0.0032 common dolphins/haul in 1992–1994), with most being caught between October and March (ICES WGMME, 2005).

Independent observer schemes in the French pelagic trawl fishery in the mid-1990s estimated bycatches of common and striped dolphins between the low hundreds and low thousands per year (Morizur et al., 1996, 1999; Tregenza and Collet, 1998). Cetacean bycatch in 11 pelagic trawl fisheries operated by four different countries were studied in Areas 7 and 8 (Morizur et al., 1999). Common dolphins were caught in the Dutch horse-mackerel, French hake, French tuna and French sea bass fisheries. Common dolphin bycatch rates were highest in the French sea bass fishery. All bycatches occurred at night.

Interviews with fishers from the Galician fleet between 1998 and 1999 suggested an annual bycatch of 200 cetaceans in inshore waters and around 1500 offshore, with the majority of these animals thought to be common dolphins (López et al., 2003). Bycatch numbers were estimated by extrapolating to the entire fleet from the number of vessels sampled and their total number of trips in a year. Fisheries included gillnets, longlines, seine nets, traps and trawls, with gillnets and trawls having the highest reported bycatch.

3.3.2.3 Bycatches between 2000-2012

Between 2000 and 2003, the UK fishery in the Channel were reported to take around 90 common dolphins annually (Northridge et al., 2003). Common dolphin bycatch estimates in the winter seasons of the UK bass pelagic pair trawl fishery in ICES Area 7 varied from 38 in 2001-02 to 503 in 2003–2004 (Northridge, 2006). Since then, reported bycatches from this fishery have been very low due to little effort after the introduction of measures to protect bass stocks in 2015 (ICES WGBYC, 2011, 2012, 2013, 2014).

Overall estimates of common dolphin bycatch from UK set net and tangle net fisheries in Area 7 varied from 114 (2007) to 544 (2008) (Northridge et al., 2007; SMRU, 2008, 2009, 2011; Northridge and Kingston, 2010). Pooling observation data from 2005 to 2014, common dolphin bycatch in UK set net fisheries was estimated at 276 for the year 2014 (ICES WGBYC, 2016).

The annual bycatch of common dolphins in Irish gill net fisheries for hake and cod in the Celtic Sea between 2006 and 2007 was approximately double what it had been in 1992–1994 (Tregenza et al., 1997, Cosgrove and Browne, 2007). In addition, all common dolphins recorded in the earlier period were caught in late autumn and winter (Tregenza et al., 1997), a period that was not sampled in the later study (Cosgrove and Browne, 2007).

Set net fisheries operated by French vessels mainly in the Bay of Biscay (Divisions 8a, b, c, but also 6a, 7a, b, and 9a) were estimated to take 100 common dolphins in 2008 (ICES SGBYC, 2010).

Bycatch estimates from the French pelagic trawl fishery for sea bass for ICES Areas 7 and 8 varied from 105 in 2010 to 489, and largely common dolphins in 2003 (Northridge et al., 2006; French Annual Report to ASCOBANS, 2009; Murphy et al., 2013; French Annual Report to ASCOBANS, 2010; Demaneche et al., 2010; ICES WGBYC, 2011).

In 2009, ca. 900 common dolphins were estimated bycaught also in the French pelagic trawl fishery for tuna in ICES Areas 6, 7 and 8 (Berthou et al., 2008; Demaneche et al., 2010; ICES SGBYC, 2010; ICES WGBYC, 2011; reviewed in Murphy et al., 2013). Previously, this fishery had been estimated to have a relatively low common dolphin bycatch of 60 (2006), 13 (2007), and 120 (2008) (Berthou et al., 2008; Demaneche et al., 2010; ICES SGBYC, 2010; reviewed in Murphy et al., 2013).

In 2006, the French otter trawl fishery in Areas 4, 7 and 8 targeting a range of fish species (sea bass, horse mackerel, mackerel, herring, and sardine) was estimated to have a common dolphin bycatch of 57 animals (ICES SGBYC, 2010), whereas in 2011, this fishery operating in the same Area had a bycatch of 760 common dolphins along with 216 common dolphins in Area 7 (ICES WGBYC, 2013) and 214 common dolphins in the same Area in 2012 (ICES WGBYC, 2014).

As part of the EU PETRACET project, the French and Irish pelagic trawl fisheries targeting tuna were recorded having a bycatch of 133 common dolphins in 2003 (Northridge et al., 2006).

In 2010, a bycatch rate of 0.50 dead common dolphins per haul between October and December (n=5 bycaught individuals) was determined for the French sardine purse-seine net fishery in Area 8 (Morizur et al., 2011).

There have been rather few bycatch estimates from Spanish and Portuguese fisheries. The Spanish pair trawl fishery targeting blue whiting (but taking also mackerel, hake and horse mackerel) off NW Spain (Galicia: Area 8) was estimated to have an annual bycatch in 2001–2002 of 394 common dolphins (95% CI 230-632) (Fernández-Contreras, et al., 2010). These were largely taken at night between May and September around the continental shelf-break. In 2009, Spanish set nets for hake in Area 8a had an estimated bycatch of 773 common dolphins in 2721 Days at Sea (i.e. a bycatch rate of 0.28 animals per Day at Sea) (ICES WGBYC, 2011).

In 2010, a bycatch rate of 0.055 common dolphins killed per “fishing trip/haul” was determined for Portuguese polyvalent boats using gill or trammel nets targeting hake and sea bream in Area 9 (ICES WGBYC, 2012).

3.3.2.4 Recent bycatch rates

WGBYC have not reviewed the literature of recent rates as this has been carried out by WGMME (2020.). Much of the recent data on bycatch of common dolphins comes from the work summarised in WGBYC annual reports and, in turn, this is based on the two data sources we use here: the WGBYC database and the results of modelling stranded dolphins.

3.3.3 Characterisation of the northeast Atlantic fisheries with potential for bycatch

3.3.3.1 General overview of fishing effort in ICES 6, 7 & 8

In this section only gears mentioned in the NGOs report are considered.

The bottom otter trawler (OTB) fishery is considered as a mixed demersal fishery (Iriondo et. al., 2010), targeting mixed demersal species (OTB_DEF métier Level 5) where, megrim, hake are the most important commercial species together with some seasonal demersal and cephalopods species (OTB_MCF métier Level 5) as red mullets, Sea bass, squid and cuttlefish.

The gear used by these vessels is the gear called as “Baka”. Considering the impact on Common dolphin bycatch, it is relevant to mention that the vertical opening of this gear is between 1.2–1.5 metres (Ibermix, 2007).

In the case of Pair bottom trawlers (PTB), the gear is a Very High Vertical Opening (VHVO) net that can achieve a vertical opening of 25 metres. The bottom pair trawl fishery targets hake as single species contributing 95% of the total catch (PTB_DEF métier Level 5).

The vessels involved in gillnet fisheries (GNS) are under the 24-<40 fleet segment and the target species is the hake as single species with the 96% of the total catches. This gear is called “volanta” and each piece of nettings has a maximum height of 10m and total length of 50 m.

3.3.3.2 Spanish fleet characterization in ICES 8c

In the Iberian region (ICES division 8c), the Spanish fisheries are the most important fisheries considering the total effort exerted. Spanish fisheries are the responsible of the 97% of the total effort. Due to the residual effort of the rest of the countries, only the Spanish fleet will be considered in ICES 8c.

In the case of bottom and pair trawlers, around 75 vessels are involved in this division (Acosta et. al., 2019)). These vessels are included under the 24-<40 metres fleet segment with a mean of 28.4 m LOA.

In the case of the bottom otter trawlers there are two main gears based on the target species. The “baca” gear is used when targeting demersal species (OTB_DEF métier level 5) and the “jurelera” gear when targeting pelagic species (OTB_MPD métier Level 5). The main difference is the vertical opening of the nets, 1.2–1.5 metre for the “baca” against 5–5.5 meters for the “jurelera”.

The pair trawlers use a Very High Vertical Opening (VHVO) net with a vertical opening of 25m. The target species are both, demersal and pelagic (PTB_MPD métier level 5).

In the case of gillnets, the biggest vessels are included in the 18-24 fleet segment. These vessels use “Volanta” when targeting hake and “Rasco” for anglerfish. Total height of “volanta” is 10 metres and against 3.5 meters in “rasco”.

Finally, there are the smallest vessels, most of them with LOA below 12 m using gillnets. The number of vessels under this fleet segment is around 4.000 vessels. This is a multi-gear and multi species fishery. Gillnets and trammel nets are important gears used by them, with maximum height of 2–3 metres.

3.3.3.3 French fleet characterization in ICES 8ab

In 2018, 1486 fishing vessels operated in subarea ICES 8. The length of most of them (72%) stand below 12 metres, including 14% below 7 metres. Only 5% of fishing vessels exceed 24 metres. The activity of these vessels is mostly coastal (69%), 12% operated exclusively offshore and 19% have a mixed activity. A total of 39% of fishing vessels used nets in the Bay of Biscay, 30% used bottom trawls and 5% used midwater trawls (single and pair).

In 2018, 570 vessels with nets operated in the Bay of Biscay, the size of 91% of them was below 12 metres. The main landed species are hake, sole, monkfish and sea bass. Among these vessels, 71% operated within 12 NM from French coasts, 12% operated exclusively offshore, and 9% in both areas. For coastal nets, the main target species is sole and pollack, whereas it is hake (60 to 70%) for larger vessels.

Midwater pair trawlers are larger vessels, all above 12 metres. On average 15 pairs operated in the Bay of Biscay in winter. In winter, more than 90% of landings are hakes, the rest is mainly composed of sea bass and mackerels. During spring, they can target sardines and then tuna in summer and early autumn. On average over a year, landings are distributed in those five species, and 15 to 20% of other species. Midwater pair trawlers can operate as bottom trawlers also and are usually not dedicated to a single fishing gear.

The fishery of bottom trawlers is the second one in term of number of vessels in the Bay of Biscay (451 vessels in 2018). Gears used can vary from low opening to high vertical opening up to 15 metres. For larger vessels, the main target species are monkfish, cuttlefish and hakes. Almost 50% of landings are a mix of diverse species.

For GNS below 12 metres fishery, pollack is the species with highest landings achieving 24% of total landings, followed by hake with 10%.

The fishery of GTR vessels below 12 metres is a mixed fishery where more than 40 different species are landed. Sole is the species with highest landings (25%), followed by anglerfish with (11%).

French PTM under 12 metres is a single species fishery where hake achieves 80% of the total landings. Black sea bream and sea bass are the other relevant species with 4% and 3% of the total landings.

3.3.4 Estimation of common dolphin bycatch

3.3.4.1 Analysis of WGBYC and strandings data used

i. WGBYC data

Monitored effort and bycatch events and specimens within the database were extracted for the period 2005–2018. Data were cleaned and validated and partitioned into three periods: 2005–2010 (A); 2011–2015 (B); and 2016–2018 (C). The data were summarised within each period in the two ICES defined ecoregions: Celtic Seas (Divisions 6.a, 6.b.2, 7.c.2, f, g , h, 7.j.2, 7.j.1 and 7.k.2, 7 e and 7 d) and Bay of Biscay (Areas 8 a,b,d,e) and Iberian Coast (8 c and 9 a). Monitored effort (Days at Sea or DaS) and the number of dolphins (specimens) bycaught were summarised for métier Level 4 (gear) and métier Level 5 (target assemblage).

As the exact frequency distribution of the bycatch is not available for the data in the WGBYC database, a modelling exercise was conducted on a subset of data provided by the Netherlands (cetaceans in pelagic trawl), UK (cetaceans and seals in gillnets, cetaceans in pelagic trawls), Denmark (cetaceans in gillnets), and Norway (cetaceans and seabirds in gillnets). To estimate the 95% confidence intervals around the error rates in the areas of interest, a Poisson distribution was assumed, and the confidence intervals estimated with bootstrapping given the mean and sample size.

Correlations between mortality areas of bycaught stranded common dolphins and fishing effort in the Bay of Biscay

Strandings are collected along the coasts of the Bay of Biscay by the French stranding network that currently includes over 400 trained volunteers distributed along the entire French coast. Carcasses are examined using a standardised protocol. The observation effort has been relatively stable since 1990 (Authier et al., 2014).

Strandings were used to detect correlations between likely origin of stranded common dolphins showing evidence of bycatch (following Bernaldo de Quirós et al., 2018; Kuiken, 1994) and fishing effort of different fisheries operating in the Bay of Biscay. The analysis was restricted to stranded "bycaught" common dolphins from multiple stranding events, which were fresh and slightly decomposed and examined by trained members of the French stranding network. This choice can underestimate the number of bycaught cetaceans found stranded and is therefore a minimal estimation.

The origin of stranded animals recorded during the unusual mortality events between 2006 and 2019 was determined following the methodology described in Peltier et al. (2016). Spike and Slab Bayesian prediction and variable selection were used to explore the spatial overlap between total fishing effort and the estimated distribution of bycaught common dolphins at sea as obtained by carcass drift back-calculation (Peltier et al., 2019).

The estimation of mortality at sea inferred from strandings is calculated following Peltier et al. (2016). Stranding numbers are corrected by drift conditions and by the proportion of buoyant animals. This last correction factor has a major effect on final estimates and could be further improved by increasing the number of experimentally released carcasses and by refining estimates of discovery rates along the French and UK coasts.

Several parameters must be considered for the use of the drift prediction model MOTHY (Modèle Océanique de Transport d'Hydrocarbures), developed by MétéoFrance (e.g. date and stranding location, buoyancy rate, drift duration). Drift duration is established according to external visual criteria, by 5 to 10 days interval (Peltier et al., 2012). This temporal uncertainty would be directly converted into spatial uncertainty when calculating the reverse drift trajectories. Variation in buoyancy of ±10% is associated with an error of 8–16% in distance drifted. The average uncertainty around the model predictions was 27.1±24.5 km.

3.3.4.2 Effort analysis for the relevant fisheries

Three fisheries were identified by European NGOs as having the most important impact on common dolphin population in the NE Atlantic: gillnet fishery (GNS), midwater pair trawler fishery (PTM) and single and pair bottom trawlers (OTB/PTB).

Description of fishing effort of the relevant fisheries in sub-area 8: Spanish fleet in sub-areas ICES a,b,d,e

Total fishing effort: Among the gears considered by the NGOs report, bottom otter trawlers accounted for 65% of the total Spanish effort, gillnets, 22%, and 13% pair trawlers, 13%.

In the case of the OTB, the annual effort is between 2613 and 3167 days at sea with the mean being 2949 days. In the case of the GNS, the trend is almost constant for those years with a mean effort of 1016 days. In the case of the PTB, the trend is also quite similar with a mean of 587 days.

Description of fishing effort of relevant fisheries in sub-area 8: Spanish fleet in ICES 8 c

Total fishing effort: The highest Spanish fleet effort in ICES Division 8 c for all the gears is in 2016 and 2017 with an important decrease in 2018 for netters (GNS and GTR). In the case of bottom and pair trawlers, the 2016 and 2017 efforts were almost the same with a slight decrease in 2018.

Fishing effort related to landed species:

→ *OTB Métiers*

From February to April, there is an important decrease for OTB_DEF métier and an important increase for OTB_MPD. This is because the vessels change the gear used from the "baca" to the "jurelera". The OTB_MPD is a seasonal fishery targeting pelagic species, especially mackerel in the mentioned months. The trend changes completely after April increasing OTB_DEF effort and decreasing the OTB_MPD.

→ *PTB*

There is a unique métier at level 5 for PTB. This métier is PTB_MPD. Monthly effort for 2015–2018 period is quite homogeneous during the year. March is the month with the highest effort and there is an important decrease in December.

→ *GNS*

In the case of the gillnets, there is a unique métier for gillnets, GNS_DEF. However, it is important to split this métier at métier level 6, because the gears used and the fleet segments involved are different. GNS catching demersal species with a mesh >100 mm (GNS_DEF=>100) and GNS catching demersal species with a mesh of between 60 to 99 mm (GNS_DEF_60-99) are the two métiers at métier level 6. Large meshes are mostly used for hake and monkfish. Smaller meshes are used by small fisheries, catching diverse smaller species. The effort of GNS_DEF=>100 is similar during the year with the highest effort in winter, resulting from the "rasco" fishery being a winter fishery and the "volanta" a year-round fishery. The fleet segment involved in this métier are vessels above 18 metres. The monthly effort for GNS_DEF_60-99 is the highest in summer and autumn, and decreases in winter. Vessels involved in this métier are from the small-scale fleet, under 12 m.

Description of fishing effort of the relevant fisheries in sub-area 8: French fleet in Sub-areas ICES 8 a,b

Total fishing effort for vessels >12 m: Total fishing effort per métier is quite stable over the period 2015-2018. The main change is the increase of PTM activity between 2015 and 2016-2018. On average, fishing effort doubled in 2016 compared to 2015. For the other fisheries under consideration, the changes between years ranged between 4% and 15%. If the calculation of the fishing effort inferred from vessel speed does not allow one to compare static gears and active gears, we can, however, conclude that PTM fisheries represent a small fraction of overall fishing activity in ICES 8 a,b. The OTB fishing effort shows a slight decrease since 2015.

The activity of GTR is highest between September and March, whereas PTM fishing effort reaches a maximum in August. GNS fishing effort shows a seasonal pattern, with the maximum reached in January.

Fishing effort related to landed species for >12 m: Only the main species caught in winter are detailed in this section.

In ICES 8 a,b, fishing effort of different relevant fisheries remained quite stable from 2015 to 2018. Changes between years ranged from 8% for GTR fisheries to 25% for PTM fisheries.

Most of the fishing gears showed seasonality in their fishing activities. Fishing effort for GNS related to hake catch is 2.6 times higher in January than in June. For PTM catching hakes operating in ICES 8 a,b, the peak of fishing effort is reached from February to March, on average 10 times higher than during summer months. The PTM effort related to sea bass catch reaches a maximum in February and March. The highest GTR fishing effort related to sea bass and monkfish is reached between October and February (on average three times higher than in April-May).

The winter distribution of GNS effort related to hake landings highlighted highest activity along the continental slope between December and March. PTM effort catching hake and sea bass is mostly concentrated in southern Brittany and between 45°N and 46°N, in front of Gironde estuary. PTM fishing effort related to mackerel landings increased and expanded across the continental shelf during winter, but remains mainly south of 47°N. The GTR effort related to sea bass catch is high and mostly coastal during winter months, and monkfish related fishing effort is not only very coastal but also occurs on the continental slope. The OTB fishing effort is quite similar for three main target species and covers mainly the Bay of Biscay below 47°N within the 100 m isobath, and in southern Britany.

Total fishing effort for vessels <12 m: For the under 12 m fleet, there is an important increase for GNS and GTR during 2016 and 2017 compared to 2015. In the case of pair trawlers, there is also a steady increase during the years, with 453 days at sea in 2015, 571 in 2016, and 633 in 2017.

The PTM effort is steady at a low level during the whole year. In the case of GNS, the highest effort is from April to July, with a peak in May and June. The winter months are the lowest effort months, decreasing effort to one-third compared to the peak months. The GTR shows a quite stable effort during the year, with a steady increase during summer months.

3.3.5 Results of bycatch assessment

3.3.5.1 Bycatch estimates using at-sea observations

Within the Celtic Seas during 2005–2015, bycatch rates of common dolphin were highest in pelagic trawls (PTM) targeting demersal fish species. For the period 2016–2018, the highest rates were estimated in midwater otter trawls (OTM) for small pelagic fishes, and gillnets (GNS) for demersal fish. The bycatch rates in the most recent time period were an order of magnitude lower than in the métiers with highest rates prior to 2016. The bycatch rates from 2016–2018 were raised using the average annual fishing effort within the métier (ML5) from the RDB. The highest numbers of dolphins caught were in the gillnet (GNS) and bottom otter trawl (OTB) fisheries targeting demersal fish, both capturing 180 dolphins (95% CI 80–280 and 95% CI 98–278, respectively). When bycatch rates were raised by the mean fishing effort per métier for 2016-2018, the total amount of annual bycatch was 584 dolphins (95% CI 214–1115).

In the Bay of Biscay and around the Iberian Peninsula, the highest bycatch rates occurred in 2016–2018 in midwater otter trawls (OTM) and pelagic trawls (PTM) for demersal fish. However, it should be noted that the OTM result was based on just 0.8 DaS observed and a single dolphin caught; further monitoring would be needed to get a more robust rate for this métier. During 2005–2015, bycatch rates were highest in PTM for demersal fish species. The bycatch rates for 2016–2018 were raised using the average annual fishing effort for the same period within the métier (ML5) from the RDB/VMS data. The highest number of dolphins caught annually was in trammel net fisheries targeting demersal fish (GTR-DEF) amounting to 1379 dolphins (95% CI 805–2069). The total amount of annual bycatch in 2016-2018 in this ecoregion across all métiers was 3199 (95% CI 1557–5413).

When both ecoregions are combined, in a fuller representation of bycatch in the North East Atlantic, the total number of dolphins bycaught annually for 2016–2018 was 3783 (95% CI 1771–6527) of which 85% occurred in the Bay of Biscay. The WGBYC monitoring data from 2016-2018 were reviewed to examine common dolphin bycatch rates by month and quarter by métier level 5. At this temporal resolution, the monitoring data are scarce, with very few days of monitoring in most métiers per quarter and even less per month. However, from the quarterly data, the highest bycatch rates occur in quarter 1 (January–March) in pelagic trawls for demersal fish (PTM_DEF) and in quarter 4 (October–December) in bottom pair trawls where the target assemblage is mixed pelagic and demersal fish (PTB_MPD).

3.3.5.2 Bycatch estimates inferred from strandings

The identification of positive correlations between the origin of stranded common dolphins inferred from standings and fishing effort operating at the same location and at the same time suggests the recurrence of these potential interactions.

The PTM, GNS, GTR and Spanish OTB are the most often correlated fisheries with the mortality areas of common dolphins. The SDN fishery appears to be correlated over only the last three years, but this could suggest recent changes in SDN practices or simply larger overlap between fishing activities and dolphin presence. Since 2017 and the large increase of strandings of common dolphins in Biscay, the correlations are similar (except for the Spanish bottom trawlers in 2019).

Although the positive correlations between common dolphins and fishing gear in the Bay of Biscay involve a large diversity of métiers, two characteristics are shared: fisheries targeting predatory fishes in winter and using high vertical opening gears (Peltier et al., 2020).

The co-occurrence of bycaught dolphins and fishing effort of different fisheries is not evidence for a causal relationship but highlights a risk of lethal interaction and identifies those fisheries that require further investigation.

In 2017 and 2018, the mortality inferred from French strandings in the Bay of Biscay and the Western Channel were respectively estimated at 9300 [5800; 17 900] and 5400 [3400; 10 500] common dolphins. The advanced decomposition status observed in 2018 on 44% of common dolphins found stranded (versus 34% in 2017) reduced the potential for bycatch identification and may have underestimated mortality estimations.

3.3.6 Population consequences of bycatch

Existing conservation objectives under the various relevant European legislation are not well defined or expressed in quantitative terms which hinders the process of setting limits (or thresholds). An expert group convened by the Scientific, Technical and Economic Committee for Fisheries (STECF, 2019) was asked to provide a summary of candidate maximum bycatch thresholds for the cetacean species most typically bycaught within European waters. However, on review of the expert group report, the STECF advice to the European Commission was that “in the absence of reliable population estimates, current conservation status and stated conservation objectives for cetacean populations in EU waters, there is no objective scientific basis to propose reliable estimates for maximum potential bycatch thresholds for all the cetacean species most typically bycaught (i.e. harbour porpoises, common, striped and bottlenose dolphins, minke and humpback whales)” (STECF, 2019).

Within Europe, the only limit widely utilised for assessing bycatch is that established under the Agreement on the Conservation of Small Cetaceans of the Baltic, North East Atlantic, Irish and North Seas (ASCOBANS). The agreement has the general aim to *minimize (i.e. ultimately to reduce to zero) anthropogenic removals (i.e. mortality), and in the short term, to restore and/or maintain biological or management units to/at 80 per cent or more of the carrying capacity; (b) in order to reach this objective, the intermediate precautionary aim is to reduce bycatch to less than 1 per cent of the best available population estimate* (ASCOBANS, 2000, 2016). In the absence of other internationally agreed limits, the

ASCOBANS 1% limit is often used in assessments of the risk posed by bycatch to species other than the harbour porpoise (e.g. ICES WGBYC 2018).

The CODA project (CODA, 2009) applied Potential Biological Removal (PBR) and Catch Limit Algorithm (CLA) approaches to derive bycatch limits for common dolphins in the northeast Atlantic. In both cases, the bycatch limits depict the levels of mortality which should enable conservation objectives for the population to be met. In the case of the CODA work, the objective was based on that of ASCOBANS and the limits derived to ensure that populations were restored/maintained at 80% carrying capacity over 200 years. Both methods gave bycatch limits in the range of approximately 200–1500 common dolphins a year based on estimates of abundance from surveys in July 2005 (shelf waters) and July 2007 (offshore waters). However, the PBR was originally designed to assess whether a population was at an Optimum Sustainable Population under the US Marine Mammal Protection Act. If annual bycatch is below the PBR limit, then a population should recover or be maintained at or above 50% of carrying capacity with 95% probability. In July 2015/2016, there were new wide-scale surveys of cetacean abundance (Rogan et al., 2018; Hammond et al., 2017) and the ICES WGMME utilised abundance estimates from this in a PBR using the US MMPA conservation objective; the PBR limit was given as 4926 animals for the northeast Atlantic AU (ICES WGMME, 2020). It is worth noting that the PBR is 0.78% of the best available abundance estimate, i.e. lower than the ASCOBANS 1% limit.

However, the WGMME (2020) caveated the PBR limit with the following:

The conservation objectives to which PBR is tuned are not entirely reflected in the relevant EU legislation (Habitats Directive, Common Fisheries Policy, Marine Strategy Framework Directive); the default value of $\boldsymbol{R_{\mathbf{max}}}$= 4% in the PBR calculation may be incorrect for common dolphins.

WGBYC also noted that the abundance estimate was derived from estimates for common dolphins and a proportion of common/striped dolphins for July 2015/2016. Numbers in the entire survey area can vary markedly between years and between seasons; we know that common dolphins occur beyond the area surveyed, but it is not known what proportion that is nor how that is varying over time. The abundance estimate applied by WGMME was based upon assignment of most unidentified common/striped dolphins from the surveys to common dolphins. Striped dolphin abundance is highest offshore and in the southern sector of the Bay of Biscay, but overall numbers appear to be much lower than for common dolphin.

To explore some of the uncertainties highlighted with the WGMME PBR estimate, WGBYC have explored other scenarios to review effects on PBR outcomes. These include using only estimates of abundance for identified common dolphins, and changing some of the parameters in the PBR calculation:

$$\mathrm{PBR} = \mathrm{N_{min}} \cdot \frac{1}{2}\, \mathrm{R_{max}} \cdot \mathrm{F_R} \tag{1}$$

where N_{min} is the minimum population estimate (the 20th centile), R_{max} is the maximum theoretical or estimated productivity rate of the population and F_R is a recovery factor between 0.1 and 1.0.

The justification for choosing the scenarios are:

<u>Scenario 1:</u> uncertainty in R_{max}. We examined a range of 0.3–0.5. The widely-used default value, in the absence of empirical data, is a value of 0.4; this was used by WGMME (2020*)*. However, noting the estimated reproductive rates for heavily depleted populations such as bowheads (4%) and southern right whales (6%), this parameter may not be lower than 0.4 for common dolphin.

Scenario 2: uncertainty in the recovery factor. We examined a range of 0.6–0.9. Under the US MMPA, it is advised to use a value of up to 1.0 for populations that are at their optimum sustainable level or of unknown status but known to be increasing, and 0.4–0.5 for populations which are threatened/depleted or of unknown status. Values less than 0.4 are usually reserved for endangered species or populations known to be in decline. Higher values of F_r were considered because there is no evidence that the abundance in the North East Atlantic Assessment Unit is declining (although redistribution of the population may be occurring).
Scenario 3: uncertainty in the abundance estimates. As explained above, the WGMME estimate may be biased upwards due to apportionment of sightings of common/striped dolphin as common dolphins in the abundance estimate. So, PBR was also estimated using a conservative "common dolphins only" from the survey data. There may also be population structure which would result in an over-estimation of abundance. On the other hand, if the assessment unit spans a wider area than those for which the abundance estimates have been applied, overall abundance could be larger. The large difference in abundance estimates between 2005 and 2016 indicates that may well be the case.

Twelve potential PBR scenarios were run (Table 16 in Annex 7). The estimate of recent annual bycatch using the WGBYC observer data for the NE Atlantic AU was 3783 dolphins (95% CI 1771–6527). The point estimate is below the WGMME PBR estimate proposed of 4926; our estimated bycatch in the North East Atlantic AU is equivalent to 77% of the PBR. However, the upper 95% CI of the bycatch estimate (6527) exceeds the WGMME PBR and so we cannot confidently conclude that bycatch is below the PBR. In only 3 of the 12 scenarios did the point estimate of bycatch exceed the PBR and these were when the more conservative estimate of abundance is used and/or the estimated productivity rate of the population is lower. However, the upper 95% confidence limit around the bycatch estimate is higher than PBR in 8 of the 12 PBR outcomes. The PBR is a precautionary method but given the limitations highlighted in the monitoring and effort data, it is possible that current levels of bycatch exceed PBR limits. When estimates of mortality from the strandings data are considered, the likelihood of annual mortality exceeding the WGMME PBR is higher. In 2017 and 2018, the mortality inferred from French strandings in the Bay of Biscay and the Western Channel were respectively estimated at 9300 [5800; 17 900] and 5400 [3400; 10 500] common dolphins.

An online marine mammal bycatch impacts exploration tool (in development) was used to explore the population outcomes of current levels of bycatch for different depletion levels of the population. The advanced tool uses an age structured population dynamics model and the user inputs parameters for their species of interest, including survival rates for calves and age 1+ yr. animals, age at sexual maturity, population abundance and associated CV, annual bycatch mortality range and a level of population depletion. The population is assumed to start at some stable age structure in year 1 of the projection period. The numbers at age correspond to a constant bycatch mortality rate, which is calculated from the initial depletion level. The tool does not have a "common dolphin" option for species; we chose the closest available relative, bottlenose dolphin, and increased the age at sexual maturity to 8 years. This aligns with the average age of sexual maturity in females reported for the NE Atlantic (8.2 years: Murphy et al., 2019 and references therein) and in Galicia (8.4 years: Read et al., 2016). The default survival rates based on published values for bottlenose dolphins were retained in the absence of empirical data for this species. Two scenarios (different only in the abundance estimate) for common dolphins were considered:

Scenario 1: Abundance used was a precautionary estimate of common dolphins only from the SCANS-III and ObSERVE surveys i.e. 481 306 abundance with a CV~0.3.

Scenario 2: Abundance used in common dolphins and common/striped dolphins from SCANS-III and ObSERVE surveys i.e. 634 286 abundance with a CV~0.3.

- Population depletion for both scenarios was set to 25%; this is meant to reflect the history of human-caused mortality that best fits the population;
- Bycatch range was set as 1770 6527 (CV~0.3) for both scenarios based on our analyses of the WGBYC monitoring data;
- Maximum Net Productivity Level (MNPL) as a proportion of carrying capacity of 0.4.

The results from scenarios 1 and 2 show, given the input parameters selected, that even after 10 years and with bycatch at the lower end of estimated range (~1770), the population abundance will have been reduced to 71% of carrying capacity in both scenarios; this is below the ASCOBANS objective to maintain carrying capacity (K) at 80% in the "long-term". After 50 years, the population will be at 0.65 and 0.69 of K, for scenario 1 and 2, respectively. For higher bycatch rates, the reductions in abundance are more severe. The result indicates a probable decline in the population for both population abundance scenarios.

3.3.7 Discussions and conclusions

3.3.7.1 Evaluating pressures and threats due to commercial fisheries bycatches to common dolphins in the Bay of Biscay

The common dolphin in the North-East Atlantic is a separate population from that in the Western North Atlantic and the Mediterranean. For management and assessment purposes, a single AU should be used which we have defined for the purposes of this report to be the boundary of the most recent, wide scale abundance surveys (Hammond et al., 2017; Rogan et al., 2018). Recent abundance estimates in this area are considerably higher than a decade before and WGMME (2020) proposed an estimate of 634 286 (CV=0.307) dolphins in the AU. The AU does not cover the entirety of this species range; for example, sightings occur west and south of the SCANS-III survey area. There have been a series of North Atlantic Sightings Surveys (NASS) to the north and west of the AU over the last three decades, but it has not been possible to derive robust estimates of common dolphin abundance from most of these. The exception was for a "west" block of the Faroese summer surveys in 1995 from which 273 159 (CV=0.26; 95% CI=153 392–435 104) common dolphins were estimated (Cañadas et al., 2009). However, given this estimate is now 25 years old it was not deemed appropriate to use it as contribution to our AU abundance estimate.

There is no evidence of decline in the AU but seasonal movements are evident from broad scale modelling exercises following collation of the various surveys (e.g. Waggitt et al., 2019) as well as smaller regional surveys (Macleod and Walker, 2005; Rogan et al., 2018; Van Canneyt, 2020) with higher densities on the Celtic Shelf, Biscay Shelf and west of Ireland in winter. In the NE Atlantic, winter densities appear highest in waters deeper than 150 m but less than 2000 m (Van Canneyt et al., 2020; Waggitt et al., 2019). So, it is important to note that winter abundance in the AU may be higher than summer estimates that we have used to derive the PBR, if the animals from out with the AU move into the AU during the winter period.

Estimates of annual common dolphin bycatch using WGBYC data for 2016–2018 in the Celtic Seas ecoregion and Bay of Biscay and Iberian ecoregion amount to 584 (95% CI 214–1115) and 3199 (95% CI 1557–5413). The estimated PBR for the NE Atlantic AU was 4926 animals (WGMME, *in prep*). The evidence from WGBYC analyses, coupled with that from strandings data, suggest that the current levels of common dolphin mortality may be unsustainable. Uncertainty in the PBR limit was explored, and whilst the point estimate only exceeded levels for 3 PBR scenarios, the upper limits of bycatch exceeded 8 of the 12 scenarios. Therefore, we cannot be confident from analyses of the WGBYC data that the bycatch of common dolphins is below the estimated PBR.

The annual mortality estimates from strandings are higher than those from WGBYC and exceed the PBR (point estimates of 9300 and 5400 for 2017 and 2018, respectively). The difficulties of deploying random sampling strategies on fishing vessels can partially explain the difference between estimates inferred from strandings and at-sea observers. Observation effort differs greatly between countries, areas, and métiers. This has been driven to some extent by Regulation EC 812/2004 (now repealed) which focused on monitoring of the most "relevant" fisheries for small cetacean bycatch. The designation of candidate fisheries suggested a good knowledge of the interactions between fishing vessels and small cetaceans, but also a stability in these interactions across years. The contributions of different fisheries to total cetacean bycatch may have varied greatly over time, making the monitoring requirements of the Regulation less appropriate. In addition, for practical reasons, only larger vessels (>15 m) tended to be monitored. The Regulation required Member States to carry out scientific studies on smaller vessels, but that was neglected by most of them. Vessels under 15 m represent over 80% of European fishing boats, and it is widely accepted that even small scale and subsistence fisheries can jeopardize marine mammal populations (Lewison et al., 2004; Zappes et al., 2013). In addition, the final decision as to whether an observer was accepted on board a vessel was that of the master, a practice that has hindered the implementation of statistically meaningful sampling protocols (Stratoudakis et al., 1998); however, the new EU-MAP makes it mandatory for observers to be accepted onboard, unless safety reasons justify prevention.

Strandings cannot generally inform on the type of gear involved in the bycatch events, but they are a source of information on cetacean bycatch irrespective of the size and the flag of the fishing vessel involved, and independent of the industry's willingness to contribute. However, strandings only reflect processes affecting cetacean populations within a given distance from the coast; this distance varies regionally with current and wind regimes. Several parameters in mortality estimates inferred from strandings can modify the outcomes of the modelling. The decomposition status of carcasses can conceal the evidence of bycatch on stranded carcasses, and therefore underestimate the bycatch numbers. The model uncertainties due to local coastal currents, the estimate of drift duration based on visual criteria or the precision of drift prediction can also modify the estimates. Finally, the correction of dead dolphins found stranded by the proportion of buoyant animals is the main correction factor in the model, and this has been based on in situ experiments and a modelling process. Small variations in this proportion could give rise to significant bias in the bycatch estimates.

Observers at sea and monitoring of strandings provide two different views of the same phenomenon. Observer programmes, despite difficulties of implementation, are able to provide more detailed information on the métiers with interactions between cetaceans which should be a prerequisite to any bycatch management strategy. Strandings monitoring, despite several uncertainties, can provide in the Bay of Biscay at least an overview of the potential magnitude of the bycatch.

In the Bay of Biscay, where recent mortality levels appear to be most significant, the gears that are estimated to make the largest contribution to the overall mortality are trammel nets for demersal species (GTR_DEF métier Level 5). Significant bycatch was also estimated in bottom pair trawls where the target assemblage is mixed pelagic demersal (PTB_MPD métier Level 5); bycatch rates are also highest in quarter 1. Midwater pair trawlers (PTM) also contribute approximately 364–496 common dolphins to the total estimated mortality.

3.3.7.2 Appropriateness of the emergency measures proposed for common dolphin in the Bay of Biscay

The measures requested by European NGO's for common dolphin bycatch reduction encompassed closures of fisheries, technical measures and improvement of monitoring effort on fishing vessels. **The conclusions proposed by WGBYC do not consider the social or economic appropriateness of the measures suggested and are exclusively focused on their potential effectiveness for common dolphin conservation.**

Static closures of relevant fisheries

i. Identification of fisheries

European NGOs highlighted three fisheries operating in ICES Subareas 6, 7 and 8 as high risk for common dolphin bycatch: gillnets (GNS), midwater pair trawlers (PTM) and single bottom trawlers (OTB). The bycatch rate calculated for PTM targeting demersal species in the Bay of Biscay and Iberian Peninsula ecoregion was 0.63 [0.53–0.73] dolphins bycaught per day at sea (ICES areas 8 and 9 for years 2017 and 2018). This is the highest bycatch rate recorded since 2000 in the Celtic Sea and the Bay of Biscay and is consistent with likely mortality origins of common dolphins inferred from strandings data since 2006. The observer effort coverage on PTM fishery was on average 9% in 2017 and 2018 and is higher than most of the other fisheries. Due to the high levels of bycatch recorded in this fleet, observation effort was increased to better understand these interactions in recent years. The estimates of 429 (95% CI: 364–495) common dolphins bycaught on PTM is consistent with the estimate based on a dedicated study carried out in winter 2019 in the Bay of Biscay on this fleet (420 dolphins, 95% CI: 70–1030) (Direction des Pêches Maritimes et Aquaculture et al., 2019). However, in 2019 the whole fleet was equipped with pingers, and is therefore not directly comparable to 2016-2018 estimates. Moreover, WGBYC estimates are mostly based on data from a bycatch observer program in 2018 (programme PIC, Rimaud et al., 2019) aiming at evaluating the efficiency of pingers on only three pairs of midwater trawlers. However, the highest estimate of bycaught dolphins in the Bay of Biscay and Iberian Peninsula ecoregion was in trammel nets (GTR), where 1379 dolphins (95% CI: 805–2069) dolphins are bycaught annually (2016–2018).

Bycatch in gillnets (GNS) appeared to present a lower risk but, compared to some other fisheries, has had relatively low observer effort. The bycatch rates in GNS fisheries targeting demersal species were relatively low in both ecoregions for 2016–2018 (0 to 0.01 per DaS), yielding an estimate of approximately 300 bycaught common dolphins per year across those areas. However, the observation effort in this fishery was only ~3% in the Celtic Sea and 0.6% in the Bay of Biscay and Iberian Peninsula. Due to the high number of nets in these areas, it is likely that bycatch events are difficult to detect and that the lack of a sampling protocol hinder our ability to measure the magnitude of the bycatch issue in these fisheries. Moreover, there has been spatial and temporal overlap between fishing effort of gillnets catching hake and trammel nets catching monkfish and sea bass, and mortality areas of dolphins inferred from strandings almost every year during 2006–2019. The generally small size but large numbers of vessels operating with gillnets (e.g. 84% are under 12m in the Bay of Biscay, subarea 8) may influence the representivity of observed fishing effort on this fleet. In addition, the bycatch rate estimated for the trammel net fishery operating in the Bay of Biscay (0.024, 95%CI: 0.014–0.035) suggests that up to 1379 (95% CI: 804–2069) common dolphins are being bycaught in this fishery. With few exceptions, the majority of vessels operating with nets have mixed activity and use trammel nets and gillnets within single trips. This level of fishing detail can be hard to detect in official statistics. As a result, a precautionary approach would be relevant to consider both gillnets and trammel nets together when examining bycatch.

In the Bay of Biscay, a bycatch rate was calculated for bottom pair trawlers (PTB), targeting both pelagic and demersal species (0.15, 95%CI: 0.07–0.22 per DaS), and an estimated annual bycatch of 775 dolphins (95% CI: 388–1163) common dolphins during 2016–2018. However, it should be noted that this rate was based on a single observed bycatch event. In the Celtic Sea, the bycatch rate estimated for single bottom trawlers catching demersal fish is the highest recorded for the area (0.004, 95% CI: 0.002–0.006). Bottom trawlers targeting crustaceans were determined to have a relatively low bycatch rate and a total estimate of 94 (95% CI: 0–282) bycaught dolphins for the Celtic Sea area. The positive correlation between mortality areas of dolphins inferred from strandings and fishing effort of Spanish bottom trawlers (both single and pair) in the Bay of Biscay appeared to be recurrent since 2006. Interactions between PTB using Very High Vertical Opening (VHVO) trawls and common dolphins were described 20 years ago (Fernández-Contreras et al., 2010), but few Spanish pairs have operated as PTB since 2009 in the Bay of Biscay. This identification comes from logbook data. In addition, the lack of information on trawl vertical opening ("aperture") in the French bottom trawl fishery impedes our understanding of the characteristics of this fleet and the details of possible interactions with common dolphins.

The identification of midwater pair trawlers as one of the most high-risk fisheries for bycatch in the Bay of Biscay by the NGOs is verified by the data available to WGBYC. Midwater otter trawls also have had historically high bycatch rates in the Bay of Biscay; however, data from recent years are based on less than one day of monitoring effort and so further observer effort is required in this fleet. This result therefore requires careful interpretation in the light of differing levels of dedicated bycatch observer effort deployed on this fleet when compared to other fisheries. The analysis by WGBYC on data from gillnets specifically was not sufficient to fully determine the mortality of common dolphins; however, bycatch estimates provided on trammel nets suggested possibly higher bycatch rates than those calculated for gillnets. Although interactions between VHVO trawls (PTB) and common dolphins in the Spanish fleet have previously been documented and then confirmed by this work with high bycatch rate estimates, the 2016-2018 WGBYC analysis presented here cannot determine whether single bottom trawlers are responsible for high bycatch rates.

Based on the data above, WGBYC conclude that the evidence supports consideration of closures and/or other mitigation approaches to reduce bycatch of common dolphin in the relevant areas and métiers (PTM; GNS/GTR).

ii. Spatial scale

The bycatch rates estimated by WGBYC were calculated for the Bay of Biscay (8 a,b,d,e), the Iberian Peninsula (8c, 9a), and the Celtic Sea (Subareas 6 and 7). The high stranding levels referred to in the NGO document were primarily recorded along the coasts of the Bay of Biscay, although bycatch events were identified in many areas including the Iberian Peninsula, western Ireland, and Cornwall, UK.

The large-scale closure suggested by the NGOs will likely bring about a decrease in fishing pressure on common dolphin populations, but the exact spatial scale of the closure needs to be carefully considered. Large vessels may be able to change fishing area in order to continue to fish in adjacent areas that remain open but that could result in high bycatch also. Careful examination of the seasonal distribution and density of common dolphins in the context of the seasonal fishery effort and their target species is required to define the limits of the spatial closure. For example, the analysis of collated cetacean surveys indicates the importance of the shelf break as the area where common dolphins are aggregating at high density, particularly between January and March. This corresponds with the area where gillnetting for hake appears to be concentrated, which is also where hake is known to aggregate to spawn between January and March (Murua, 2010). The fact that net marks have been found on many stranded common dolphins identified as bycatch, and that, as stated earlier, we cannot be confident about the bycatch rate estimates for this métier, suggest this needs closer examination.

iii. Temporal scale

European NGOs suggested the closure of fisheries between December and March.

The seasonal estimation of PTM bycatch rates highlight that the highest bycatch numbers occurred between January and March, on demersal species. The main demersal fish caught by midwater trawlers are hake and sea bass; although classed as demersal species, both of these fish can live in the water column away from the seabed. An analysis of the monthly distribution of fishing effort related to these species in the Bay of Biscay suggested that the peak of activity occurred between January and May, and with higher levels in February and March. For both gillnets and trammel nets vessels greater than 12 metres, the main demersal fish targeted is hake, and the fishing effort of these fisheries occurred mainly between November and March. For smaller trammel netters, the main target species is sole which is caught primarily in spring and summer. The bycatch events recorded from GNS/GTR and reported to WGBYC occurred year-round. However, it appears that the peak of activity of the GNS fleet occurred mainly during winter months. The bycatch rate calculated for bottom pair trawlers (PTB) was based on one single event that occurred in autumn.

The seasonality of the closure suggested by the NGOs corresponds with the timing of highest strandings records from the Bay of Biscay, and the fishing activity of midwater pair trawlers targeting “demersal” species. The data available for GNS and GTR fisheries suggest that bycatch could potentially occur all year round, but the highest fishing activity for demersal species (hake and monkfish) for GNS occurs in winter. For bottom trawlers, the difficulties associated with fleet identification and the rare events recorded mean that available data cannot be used to detect potential seasonality in bycatch.

The proposal of a four-month winter closure (December to March) is relevant for the PTM (most described fishery) and possibly also for larger GNS and GTR targeting demersal species. However, due to low data availability for smaller GTR fisheries, the same conclusion cannot be reached for these fisheries.

iv. Technical measures

A full assessment of the appropriateness of the technical measures suggested by the NGOs, including the daytime setting of nets and the "move on” procedure is not possible without (a) additional, more specific, information (such as gears concerned, detailed procedure) and (b) access to data that are not currently available to WGBYC. As such, a review of existing literature was carried out to examine potential appropriateness of these measures.

The “move-on” procedure requiring fishermen to move fishing area if bycatch occurs would be based almost entirely on the willingness of fishermen to comply and a willingness to accept at-sea monitoring to ensure implementation of such a measure. Details of what level of bycatch would trigger the move-on rule would also need to be determined and decided upon. Moreover, there are no certainties that the bycatch risk in the new fishing area after the “move-on” procedure was completed would be lower than in the original area given the wide-scale distribution and highly mobile nature of common dolphins. There is also a possibility that dolphins are deliberately associating with some trawl gears which may also limit the utility of this type of measure.

If diel bycatch rates in the relevant trawl fisheries are consistent with literature on common dolphin bycatch, restrictions on night-time trawling may reduce bycatch (but may also have impacts on commercial catch rates). However, the application of this type of measure to gill or trammel nets does not seem to be based on existing publications and consideration would need to be given to what the typical soak times are in these fisheries and practical issues of how a fishery might operate under such measures. Such diel type restrictions would also require significant increases of controls at sea; and may not ensure a reduction in bycatch.

v. Pingers

A further technical measure that has shown promise at reducing common dolphin (and other cetacean species) bycatch but which is not mentioned in the e-NGO document is the use of Acoustic Deterrent Devices (ADDs). For completeness, we include some details of relevant ADD trials here.

In the UK, a considerable amount of common dolphin bycatch mitigation work was carried out between 2003 and 2010 in the English Channel pair trawl fishery for bass (Northridge et al., 2011). Initially this work focused on the use of excluder grids but from 2007 the focus shifted to using a particular type of ADD, the DDD-02 and DDD-03, manufactured by STM Products. Vessels in the fishery used ADDs on a voluntary basis for several years, so the trials were not carried out in a strictly managed experimental way, but the results were promising. Not all monitored hauls had ADDs in use, and some hauls had ADDs that were either positioned sub-optimally or were not functioning correctly on hauling. This provided an opportunity to compare bycatch rates in optimally pingered hauls against non-pingered and sub-optimally pingered hauls. Overall by-catch rates were reduced significantly (by 75–90%) in optimally pingered hauls.

A more recent study carried out in the Bay of Biscay on three midwater pair trawl teams in winter 2018 highlighted a reduction of 65% of bycaught common dolphins with the use of pingers (DDD-03). Following this experiment, the use of pingers is now generalised in the Bay of Biscay for all French midwater trawlers (OTM and PTM). The efficiency of pingers on PTM encouraged their use on PTB fishery, as they share some operational similarities, concerned a relatively small number of vessels, and both fisheries showed high levels of bycatch.

However, stranding numbers of common dolphins in the Bay of Biscay in winter 2019 and early winter 2020 were the highest ever recorded in the French time series. These events would suggest that fisheries operating in this area other than PTM were generating high levels of bycatch (or that pinger use is not being properly implemented in the pair trawl fisheries). According to the wide coverage and high intensity of netting effort in the Bay of Biscay, the widespread use of pingers in this fishery in winter could have deleterious consequences for common dolphins, but that has not been properly assessed yet.

vi. Increase of monitoring

Regulation 812/2004 is now repealed and superseded by the Regulation (EU) 2019/1241 of the European Parliament and of the Council of 20 June 2019 on the conservation of fisheries resources and the protection of marine ecosystems through technical measures. Annex XIII sets out comparable monitoring requirements in relation to cetacean bycatch as Regulation 812/2004: it is worth noting that it is mandatory for "Monitoring schemes [to] be undertaken on an annual basis and established for vessels […] with an overall length of 15 m or more to monitor cetacean by-catch, for the fisheries and under the conditions defined below" (Table 2). It is notable that the specific requirement for pilot/scientific studies on smaller vessels as per Regulation 812/2004 has been removed from the TCM Annex XIII.

Observer programmes have specific value in identifying and fully characterising interactions between fisheries and small cetaceans, so monitoring strategies should be improved in order to provide reliable and complete statistics on cetacean mortality.

Table 2. Monitoring requirements for cetaceans under the new Technical Conservation Measures in subareas and divisions relevant to the Celtic Seas, Bay of Biscay [and Baltic]. These requirements are only relevant to vessels of overall length of 15 m or greater.

Area	Gear
ICES sub-areas 6,7 and 8	Pelagic trawls (single and pair)
ICES divisions 6a,7a,7b,8a,8b,8c and 9a	Bottom-set gillnet or entangling nets using mesh sizes equal to or greater than 80mm
ICES sub-area 4, ICES division 6a, and ICES subarea 7, except ICES divisions 7C AND 7K	Driftnets

Area	Gear
ICES divisions 3a,3b,3c,3d south of 59N, 3d north of 59N (only 1 June to 30 Sept) and ICES sub-areas 4 and 9	Pelagic trawls (single and pair)
ICES sub-areas 6,7,8 and 9	High-opening trawls
ICES divisions 3b, 3c and 3d	Bottom set gillnet or entangling nets using mesh sizes equal to or greater than 80mm

3.4 WKEMBYC Discussions

WKEMBYC reviewed the conclusions of the working groups with regards to the NGO proposed measures; the group then agreed some general conclusions with regard to each set of measures proposed (Table 3). The WKEMBYC considered that measures were necessary but suggestions of closures needed to be further explored. Also, other measures (e.g. pingers) should be given due consideration.

Table 3. WKEMBYC discussion of the NGO proposed measures.

	Measures proposed by NGOs	WKEMBYC consideration
1-1	Close the responsible fisheries in the North East Atlantic between December 2019 and March 2020 (*ad minima* pair trawls and gillnet fisheries)*	Responsible fisheries were defined as fisheries with bycatch of common dolphins recorded by onboard observers from 2016 to 2018 in ICES sub-areas 6, 7, 8 and 9. These were PTM, PTB, OTM, OTB, OTT, GNS, GTR and PS. In addition, from analysis of stranding records, the fishing effort in metier SDN overlapped (in terms of location and timing) with common dolphin bycatch. The closure, from December to March, of responsible fisheries as identified above is expected to significantly reduce bycatch of common dolphins. However, it would be valuable to investigate the temporal and spatial patterns in bycatch further, through continued and increased on-board monitoring (as well as via the monitoring and analysis of strandings) to refine the extent of the closure and determine its impact. The value of other approaches, including effort reduction and/or use of pingers should be considered Where specific fisheries are able to demonstrate, notably by conducting pilot projects, that there is no bycatch, there could be exemptions to measures. WKEMBYC would explore the expected outcome of closures/effort reduction and pinger use in a series of scenarios to identify the most appropriate approach (section 5.1)
1-2	monitoring + dynamic closures	The feasibility of these recommendations was questioned; including the practicality of implementation across all the 'responsible' metiers identified, the necessity of 100% (or at least very high) observer coverage, and the allocation of a bycatch allowance across metiers. The implementation of 100% observer coverage within the timeframe of the emergency measures or even within a year was not thought to be achievable, particularly in the small gillnet fishery. Increased monitoring coverage will improve the current understanding of metier-specific bycatch rates and will contribute to an acceptable long-term solution.

	Measures proposed by NGOs	WKEMBYC consideration
		It is however essential that observer coverage provides random sampling of all vessel sizes, across all metiers and all periods of the year. It is compulsory within EU-MAP for observers to be accepted onboard vessels, unless there are health and safety reasons not to. There is concern that this loophole may compromise implementation of random sampling. Monitoring priorities would need to be established depending on PETS bycatch risk for the different metiers through implementation of pilot projects under EU-MAP and national catch sampling programme designs. Implementation of adequate monitoring is challenging (especially on large fleets of small vessels for example) and until such time that it can be achieved, the feasibility of dynamic closures across all relevant metiers is low. There is a lack of information currently to assess the feasibility of the approach and its potential efficiency in terms of bycatch reduction. Pilot projects to address this would be of value.
2.1	Technical measures: - daylight fishing - move-on procedure	Discussions clarified that when referring to “daylight setting measures” the NGOs were referring to fishing during daylight hours rather than just the setting of static nets. There is limited scientific literature available to support these measures, with the exception of one study of bottom pair trawlers in Spanish waters, which found evidence to suggest higher bycatch rates at night, and a study on French midwater pair trawlers operating in the Bay of Biscay where all common dolphin bycatches were recorded during night-time hauls. It was noted that for certain metiers, such as PTM, targeting demersal fishes in winter, a restriction to daylight fishing only would be equivalent to a complete closure of the fishery due to the higher total catch value of night-time fishing due to catch rates and different target species. It was further noted that accurately determining when set nets are actively fishing is problematic. WKEMBYC does not currently have sufficient information available to evaluate the suitability of these proposed measures. The appropriate level of resolution in the bycatch monitoring data that is needed to evaluate these measures is not available in the WGBYC database. However, it should be available within individual Member States fisheries databases. WGBYC will consider the need for accessing this information in future ICES data calls. In addition, it was suggested that these measures could be trialled in pilot projects to evaluate their efficacy.
2.2	Dedicated bycatch observers and/or electronic monitoring should be undertaken on all fleets that may be involved in common dolphin bycatch in the region year-round. Fishing vessels should only fish in the region if they allow independent observations to be undertaken on board.	WKEMBYC agrees that dedicated bycatch observer or electronic monitoring (EM) programmes should be prioritised in high risk metiers, periods and areas currently under-sampled in DCF at-sea sampling programmes. It was also suggested that participation in the monitoring programme should be compulsory under vessel licensing systems. However, this was not discussed in detail or agreed by the group. Given the size of the fleets involved, WKEMBYC recognised that complete coverage by observers or EM presents logistical and financial challenges. Nor is 100% coverage strictly necessary if the aim is to collect adequate data for robust bycatch estimation. However, as noted above, increased coverage of under-sampled metiers is needed.

3.5 WKEMBYC further work

During discussions, the necessity of implementing a reduction in fishing effort across all fleets and all seasons was queried, and it was agreed to examine this in more detail (see section 5.1). Monthly fishing effort data are available for the period 2016–2018 but on-board bycatch monitoring data are currently insufficient to allow estimation of monthly bycatch rates. Consequently, for the mitigation scenarios investigated, the proportion of bycatch assigned to each fortnightly period was based on the temporal distribution of bycatch mortality estimated from strandings data for the same period. Several potential bycatch reduction scenarios were considered, noting that this process should not be exhaustive at this time; however, scenarios could be expanded or altered upon request of the ICES Advice Drafting Group (ADG) or the European Commission if required.

There was discussion of how to incorporate the two different bycatch estimates in the testing of the scenarios, i.e. one calculated from monitoring data and the other from strandings data. There are acknowledged biases in both estimates and the "true" level of bycatch is unknown. However, it was decided that both datasets were essential to this process and a methodology was developed that used both (see section 5.1). A methodology for fine-tuning, or selecting, individual scenarios would also be needed and was developed. In addition, the rationale behind each scenario and the chosen threshold/objective would be documented along with the pros and cons for each. The issue of which conservation objective to use was discussed, given apparent differences in requirements across the relevant EU legislation.

Applying different bycatch mitigation strategies to different métiers was also discussed. The difficulty of implementing effort reduction was discussed; limiting soak times of static gears was considered challenging but limiting consecutive fishing days on a monthly basis could be more effective. GNS was also highlighted as a gear type from which it would be necessary to obtain more detailed information. This métier is not well-monitored and, since it is often difficult to determine the mesh sizes involved from stranded bycaught animals, it is not currently possible to robustly assess which specific fisheries within GNS gear type contribute to bycatch mortality.

Following a query raised in relation to discrepancies between the French and WGBYC fishing effort data during the discussion of the WKEMBYC report, a proportion of the annual fishing effort data was corrected. The primary difference in data was in the pair-trawl métier as the RDB effort was reported for individual vessels rather than for a pair of vessels fishing together. There were further inconsistencies between the French data submitted to WKEMBYC and that recorded in the RDB that could not be fully explained. The corrections resulted in a substantial decrease in PTM_DEF effort. The overall bycatch estimate from monitoring data is below PBR. However, it was noted that confidence intervals for this estimate span the PBR level and total bycatch estimated from strandings is above PBR. In addition, it was noted that observer programmes cover a relatively small percentage of fishing effort and is biased toward larger vessels in GNS and GTR métiers, leaving bycatch of smaller vessels poorly documented.

It was noted that France implemented increased monitoring effort in 2019, to improve sampling coverage and improve understanding of the interactions between common dolphin and PTM fisheries. In addition, it was highlighted that all midwater pair trawlers used pingers in the winter of 2019 and 2020 and a reduction in bycatch of 65% (compared to hauls made without pingers on the same year, tested on three pairs during winter 2018) was attributed to this (Rimaud et al., 2019). As the WGBYC report only includes data up to 2018 (due to limitations in data availability), the information about the additional French monitoring and pinger use was simply noted in the text of the report.

During discussions, it was highlighted that the métier-level data available to WGBYC did not permit the examination of bycatch rates in specific gear types, for example for high vertical opening trawlers, and specific fisheries within GNS and GTR.

4 Recommendation for the Baltic harbour porpoise

4.1 Bycatch mitigation recommendations for the Baltic Proper harbour porpoise population: reasoning behind the proposed measures

4.1.1 Background

The Baltic Proper harbour porpoise population is listed as Critically Endangered (CR) by IUCN and HELCOM (Hammond et al., 2008; HELCOM, 2013). All EU Member States who have submitted reports on its conservation status according to the Habitats Directive Article 17 have reported it as Unfavourable-Bad (U2) at least since 2001. The highest threat to the survival of the population has been identified as bycatches, together with environmental pollutants and some impulsive noise sources (ICES, 2019). Mitigating the bycatches is a key element to secure the survival of the population. If no bycatch mitigation measures would be taken, there is a high risk that the population becomes extinct. The negative impact by environmental pollutants cannot be mitigated in the short term, and the high level of the threat by underwater noise is largely an effect of the small population size, making the population less resilient to disturbance.

The population abundance was estimated to 497 animals (95% CI 80–1091) in 2011–2013 (SAMBAH, 2016). The anthropogenic mortality limit has been estimated to 0.7 animals per year using the PBR approach[1] (North Atlantic Marine Mammal Commission and Norwegian Institute of Marine Research, 2019). To put the abundance estimate into perspective, it can be compared to the that of the neighbouring Belt Sea population, which was estimated to 42 324 animals (95% CI 23 368–76 658) in 2016 (Hammond et al., 2017).

It is important that measures allowing the population to increase are implemented as soon as possible. The smaller a population is, and the longer time the population is small, the higher is the risk of inbreeding and extirpation due to stochastic events and environmental changes driven by anthropogenic activities.

ICES WGMME concluded that to reach the anthropogenic mortality limit, all fishing with static nets[2] within the management range of the population has to be closed. It will not be sufficient to use pingers on all static nets as pingers reduce but to dot eliminate bycatches. WGBYC concluded that pingers have been shown to reduce bycatches of harbour porpoises in gillnets by 50–80% in in operational fisheries compared to nets without pingers, and that bycatches of harbour porpoise also occur in bottom and pelagic trawls. For a constructive way forward, WGBYC evaluated each measure proposed by the NGOs. Based on this, and with the aim of minimizing the bycatch risk while recommending as little fisheries regulations as possible, WKEMBYC recommends that the mortality limit of 0.7 animals per year is used an operational threshold, and that a set of bycatch mitigation measures are implemented. If the whole set of measures recommended by WKEMBYC is implemented, this will significantly reduce the number of bycatches

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[1] Potential Biological Removal (PBR) infers that the population will recover to 50% of the carrying capacity (Wade 1998).

[2] As defined in Art. 6 of the Technical Regulations (EU Reg. 2019/1241): 'static nets' means any type of gillnet, entangling net or trammel net that is anchored to the seabed for fish to swim into and become entangled or enmeshed in the netting". The use of this term also includes nets held in place by e.g., stones, lead lines, or boats.

of Baltic Proper harbour porpoises, although the mortality limit of 0.7 animals per year will probably not be achieved by those measures alone. If the WKEMBYC measures would be implemented immediately and continued in the long term (a number of porpoise generations), they will likely be sufficient to allow the population to increase again, although it will take longer time for the population to recover to favourable conservation status than if the bycatches were eliminated.

The recommendations have a strong focus on Natura 2000 sites. Two sites are specifically designated for the conservation of harbour porpoise. In a number of sites, harbour porpoise occurrence is documented and its conservation important in management plans. Moreover, Natura 2000 sites are frequently designated for specific habitats (e.g. reefs and sandbanks), that are key for the food chain and important for top predators such as the harbour porpoise. In addition, these sites are easy to control, and it is likely that conservation measures can continue here after the end of emergency measures. The recommended management measures include a closure of certain fisheries in Natura 2000 sites and other key areas for the Baltic proper harbour porpoise as well as the mandatory use of pingers in static nets outside these sites within the seasonal management area of the Baltic proper harbour porpoise. Only pingers which have thoroughly been tested and proven to unambiguously reduce bycatch should be used in implementing these measures. An overview of pros and cons of recommended bycatch mitigation measures is presented in Annex 3.

These mitigation measures need to be accompanied by a proper monitoring of fishing effort, harbour porpoise bycatch and population status. The best method to monitor any changes in the population status of the Baltic Proper population would be long-term acoustic monitoring of detection rates in key sites, combined with large-scale surveys of population abundance and distribution.

Data on fishing effort (Days at Sea) from the ICES Regional Database the year 2018 for gillnet and trammel net fisheries in the (summarized effort per ices rectangle for Baltic Sea) was analysed by WGBYC and their analyses were used in the development of recommendations. Effort maps can be found in the ICES WGBYC report. Also bycatch risk maps were available for Swedish waters (from HELCOM ACTION 2020) (see Annex 4).

4.2 Bycatch mitigation recommendations for the Baltic Proper harbour porpoise population

i. **Close the Northern Midsea Bank for all fisheries, with the exception of passive gears proven not to bycatch harbour porpoises. Such gears include for example pots, traps, and longlines. Static nets with pingers or other acoustic devices should not be allowed.**

The Northern Midsea Bank is here defined as the area delimited as the area within the following coordinates (see Figure 7):

- NW: 56.241°N, 17.042°E
- SW: 56.022°N, 17.202°E
- NE: 56.380°N, 17.675°E
- SE: 56.145°N, 17.710°E

According to the SAMBAH project, this area is the core area for the Baltic Proper harbour porpoise population during the breeding season. Monthly maps of harbour porpoise predicted probability of detection per km², on a basis of acoustic monitoring (SAMBAH project), can be found in the ICES WGBYC report.

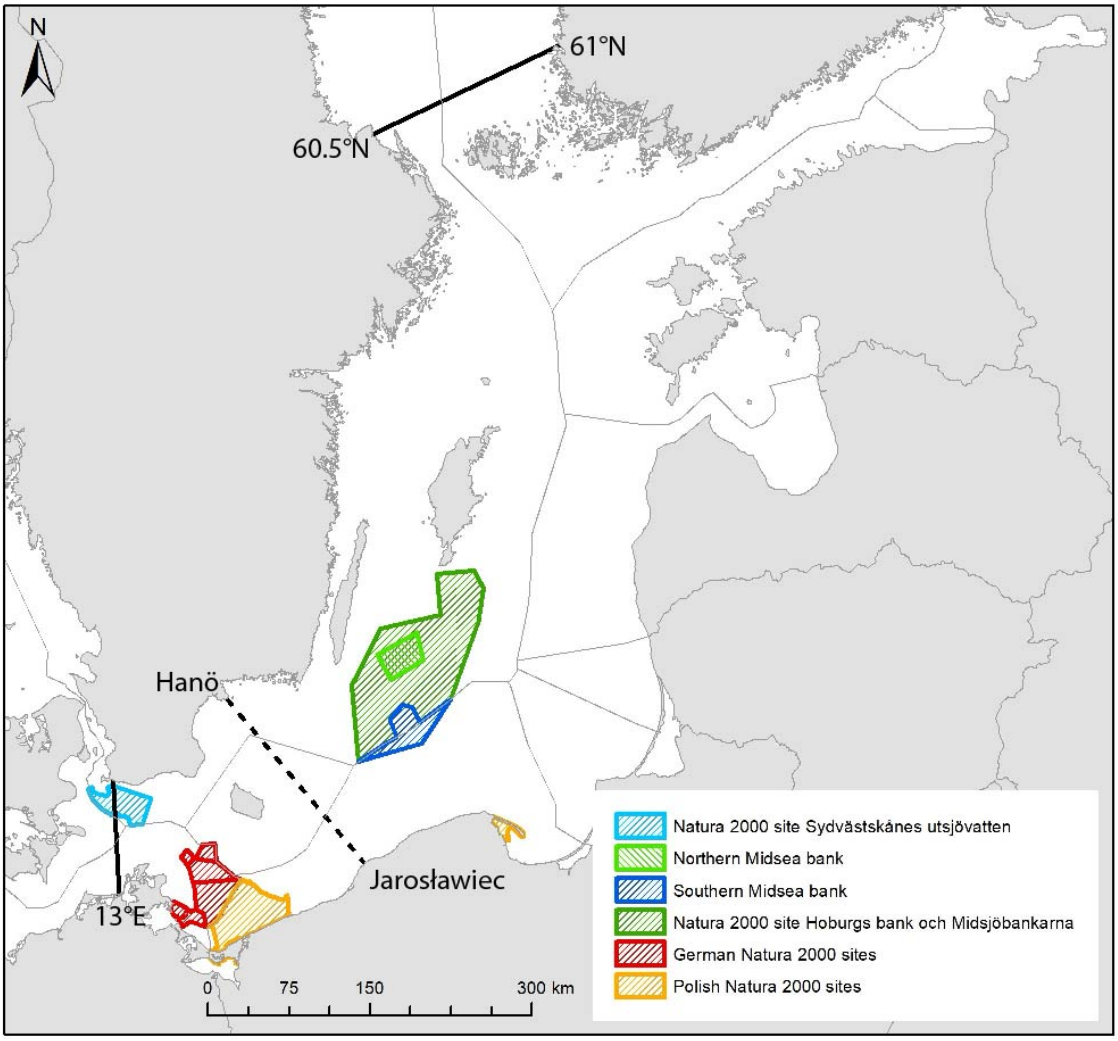

Figure 6. Map showing the Baltic Sea region with the sites and areas referred to in the text.

ii. Close the Natura 2000 site Hoburgs bank och Midsjöbankarna (SE0330308) for fishing with static nets.

Hoburgs bank och Midsjöbankarna has been designated specifically to protect the Baltic Proper harbour porpoise based on the results from the SAMBAH project. The area encompasses a large proportion of the Baltic Proper harbour porpoise population in summer, and is also used to a high extent in winter. The current fishing effort with static nets is low within the site, but the probability of occurrence is high in the area (Carlén et al., 2018) and thus a closure is needed to ensure low bycatch numbers also in the future. Relocation of fishing effort taking place would very likely be to an area with lower harbour porpoise density.

iii. Close the Southern Midsea Bank for fishing with static nets.

The Southern Midsea Bank is here defined as the Swedish part of the Southern Midsea Bank covering all waters between the Natura 2000 site Hoburgs bank och Midsjöbankarna (SE0330308) and the Swedish-Polish border, and the Polish waters delimited as the area within the following coordinates:

- SW: 55.377°N, 16.589°E
- SE: 55.466°N, 17.538°E
- NE: 55.797°N, 18.037°E

The Southern Midsea Bank here defined by a proposed boundary as shown by a dark blue line.

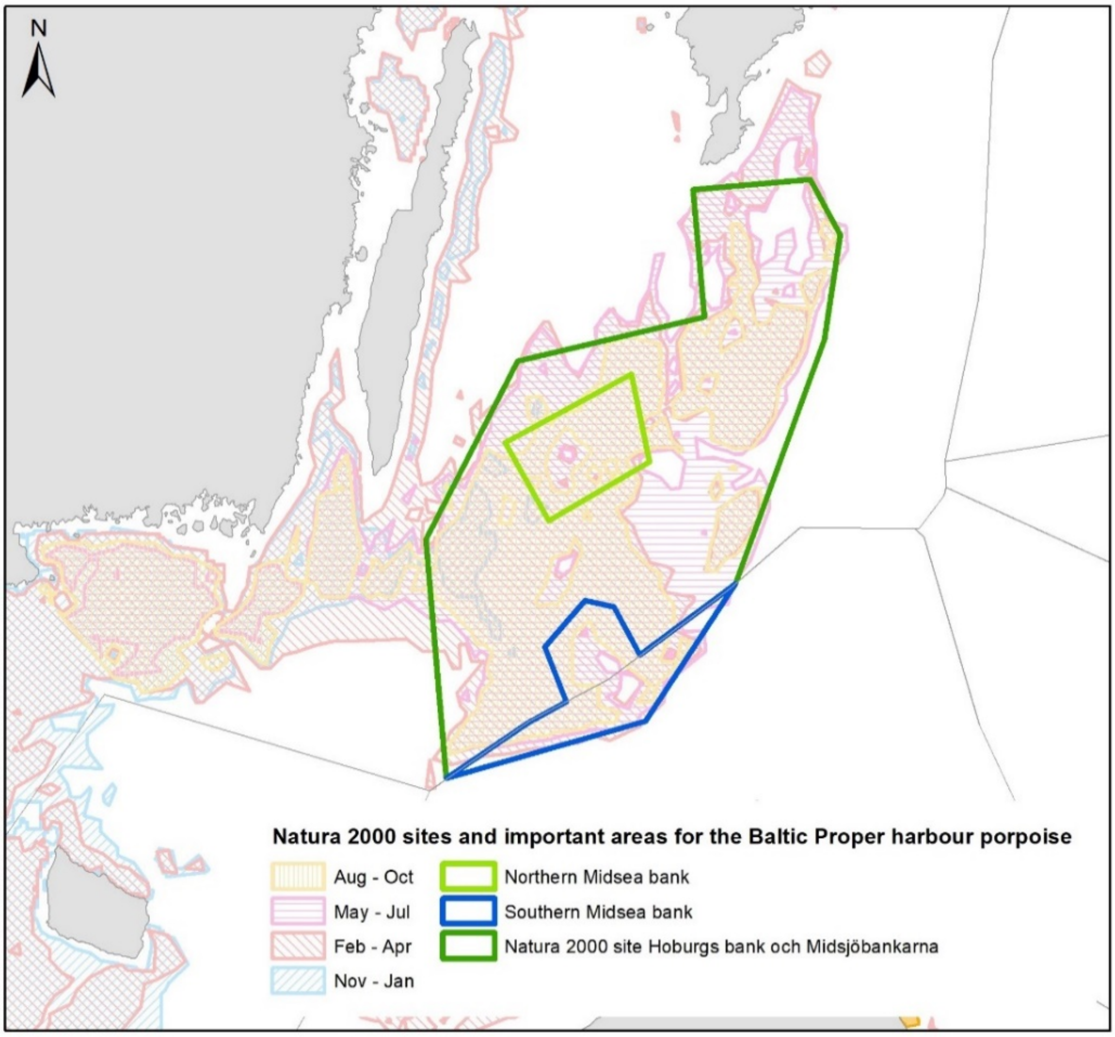

Figure 7. Map showing the location of the Natura 2000 site Hoburgs bank och Midsjöbankarna (dark green), Northern Midsea Bank (light green) and the area recommended for closure of static net fishery at the Southern Midsea Bank (blue).Important areas for harbour porpoises are shown as areas with a high probability of detection of harbour porpoises taken from Carlström & Carlén (2016).

According to the information provided by the SAMBAH project, this area is an important habitat for the Baltic Proper harbour porpoise population, especially during the breeding season. Based on RDBES data fishing effort with static nets is low in this area. Even though the Southern Midsea Bank is not protected under the Habitats Directive (Council Directive 92/43/EEC), closure of fisheries generating bycatch of harbour porpoises, is strongly recommended for this area to decrease the bycatch risk by existing fisheries.

iv. **Close the Natura 2000 sites Adlergrund (DE1251301), Westliche Rönnebank (DE1249301), Pommersche Bucht mit Oderbank (DE1652301), and Greifswalder Boddenrandschwelle und Teile der Pommerschen Bucht (DE1749302) and the site Pommersche Bucht (DE1552401) designated under the Directive 2009/147/EC for fishing with static nets[3] during November–April.**

v. **Close the Natura 2000 sites Ostoja na Zatoce Pomorskiej (PLH990002) and Wolin i Uznam (PLH320019) for fishing with static nets‡ during November-April. Alternatively prohibit the use of static nets without the simultaneous use of pingers, provided the use of such devices is in line with the conservation objectives of the site.**

[3] "Static gears" edited to "Static nets" in May 2020.

According to SAMBAH project, these five German sites (including the German site Pommersche Bucht DE1552401, designated under the Birds directive where according to the Standard Data Form harbour porpoise are also present) and two Polish sites are important as feeding habitats for the Baltic Proper harbour porpoise population during winter. Here, these sites are combined into a cluster of Natura 2000 sites, forming a large connected protected area of almost 5000 km². The proposed fisheries measures within this cluster of sites would lead to a decreased bycatch risk and therefore have a positive effect on the Baltic Proper harbour porpoise population. The suggested size increases the conservation effect, ensure connectivity between sites and could prevent effort displacement forming high concentrations of fishing intensity which would pose a high by-catch risk in the boundary area (in accordance with the proposal included into the final ICES WGBYC report).

For the two Polish Natura 2000 sites (Ostoja na Zatoce Pomorskiej as well as Wolin i Uznam), conservation measures, including fisheries management measures, have not been decided in a management plan yet. Using pingers instead of full static net closures during November through April, could also be considered.

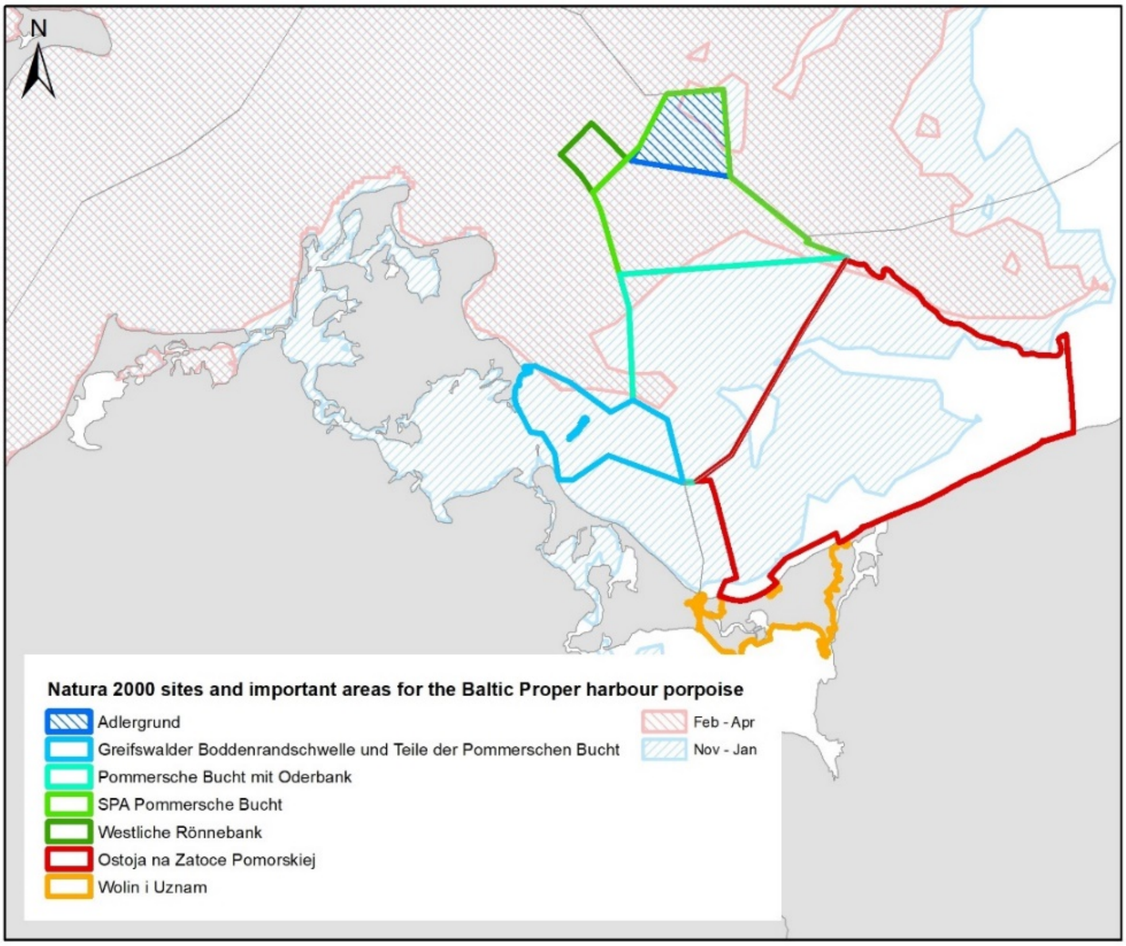

Figure 8. Map showing the cluster of German and Polish Natura 2000 sites.

vi. **Obligatory use of pingers on static nets in the Zatoka Pucka i Półwysep Helski (PLH220032) Natura 2000 site, area to the west from the sandbank Ryf Mew (Figure 10), and in areas outside the borders of the Natura 2000 site (including outer Puck Bay). Close the Zatoka Pucka i Półwysep Helski (PLH220032) Natura 2000 site, the area east from the sandbank Ryf Mew, for fishing with static nets. Both mitigation measures (pingers and closure) must be implemented simultaneously.**

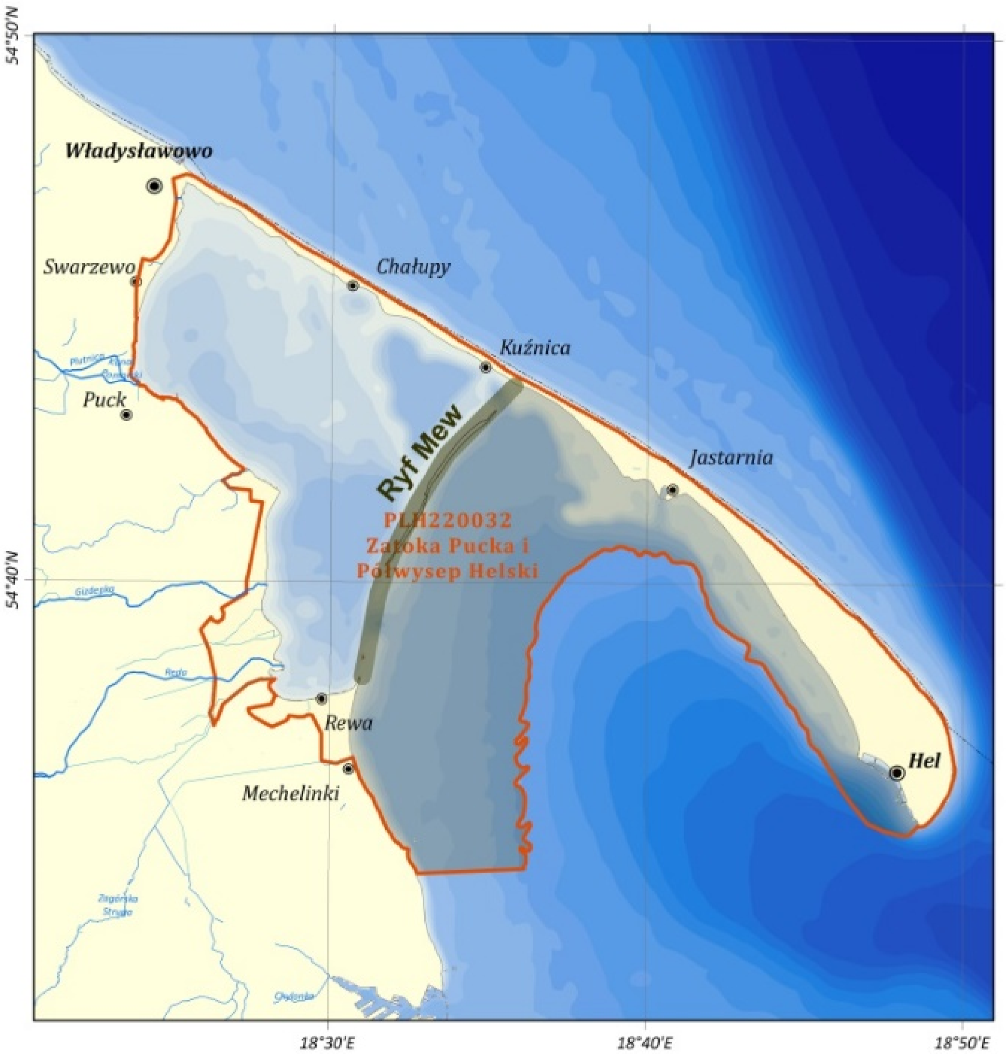

Figure 9. The Natura 2000 site Zatoka Pucka and Półwysep Helski (PLH220032) Natura 2000 site (brown contour). The area shaded light grey indicates the proposed closure area for static nets south from the sandbank Ryf Mew (dark grey).

This proposal is based on historical data (20th century) collected by the Hel Marine Station IOUG where in the Puck Bay, high numbers of sightings and bycaught harbour porpoises have been observed (Skóra and Kuklik 2003, Figure 11) and (HELCOM)[4]. Moreover, as this area is inside of the summer distribution of the Baltic Proper harbour porpoise population which is accordance with the south western management border proposed by Carlén et al. (2018), it is assumed, that harbour porpoises occurring in this site are individuals from the Baltic Proper harbour porpoise population only.

Concerning the mitigation measures proposed above, it is very important for this relatively small site, that the two mitigation measures proposed (closure and use of pingers), are implemented simultaneously. Otherwise, if only for e.g. closing the Natura 2000 site east of Ryf Mew will be implemented as a mitigation measure, possible fishing effort displacement to the surrounding

[4] http://maps.helcom.fi/website/mapservice/, accessed 21 Feb 2020.

areas could cause a higher bycatch risk for the harbour porpoises, than leaving the area without any mitigation measure.

An acoustic monitoring project on harbour porpoises has been carried out in Puck Bay (Annex 5).

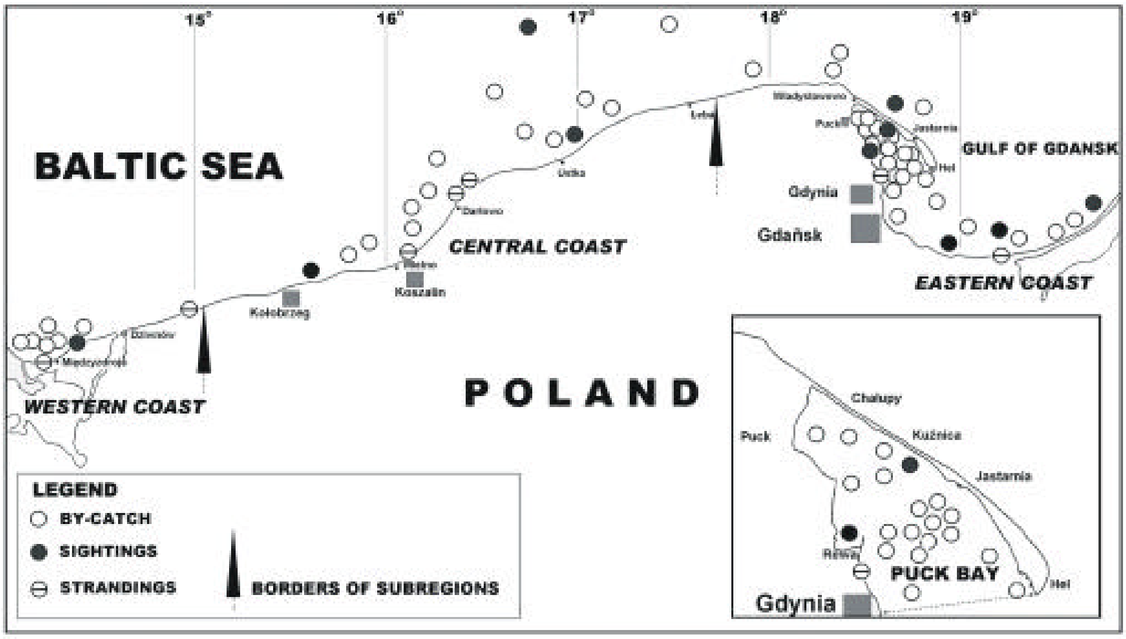

Figure 10. Locations of sightings, bycatches and strandings of harbour porpoises on the Polish coast in the years 1990-1999. Geographical subregions of the coastal waters are according to Polish Sea Fishery Inspections (Skóra and Kuklik 2003).

vii. Prohibit the use of static nets without the simultaneous use of pingers within the part of the Natura 2000 site Sydvästskånes utsjövatten (SE0430187) that is located east of 13°E during November–April.

WGMME suggested using 13°E as the western management border for the Baltic Proper harbour porpoise population during November-April. The Natura 2000 site Sydvästskånes utsjövatten has been designated for harbour porpoises based on the results from the SAMBAH project. As the summer density of the Belt Sea population is approximately 300 times larger than that of the Baltic Proper population (Hammond et al., 2017; SAMBAH, 2016), and both populations are likely to use this area during the winter, the majority of the present animals are likely to the Belt Sea population. Further, as the site was delimitated based on the area of high predicted detectability of harbour porpoises, irrespectively of population as they cannot be told apart acoustically, there may be even more important areas for the Baltic Proper population east of the Natura 2000 site (towards the summer management area). Nevertheless, as the Baltic Proper harbour porpoise is critically endangered, and part of this site is within the suggested management area of this population during November–April, we recommend that static nets shall not be used without simultaneous use of pingers in the Natura 2000 site Sydvästskånes utsjövatten during November-April. This recommendation is included in the general recommendation to use pingers in static net fisheries. In the long-term, the area should be prioritised for the implementation of passive gears proven not to bycatch harbour porpoises. The aim would be to reduce bycatch in the area and not have acoustic disturbance.

viii. During May–October, the use of static nets without the simultaneous use of pingers should be prohibited in the EU waters between the south western management border proposed by Carlén et al. (2018) (a line drawn from island of Hanö, Sweden, to Jarosławiec near Słupsk, Poland) and a line drawn between 60.5°N at the Swedish

coast and 61°N at the Finnish coast, and during November–April, the EU waters between a line drawn along east of longitude 13°E between the Swedish and German coasts and a line drawn between 60.5°N at the Swedish coast and 61°N at the Finnish coast, with the exception of the Natura 2000 sites and other areas where static net fisheries have been closed.

The above mitigation measure is proposed on a basis of the SAMBAH results as well as stranding and sightings data, which shows that Baltic Proper harbour porpoise occur in this area during May–October. However as most of the fishing effort with static nets appears to be outside Natura 2000 sites, it is important to reduce the bycatch risk of harbour porpoises also outside these areas. The large-scale use of pingers in static net fisheries regardless of vessel size addresses the fishing métiers with the highest bycatch rates and affects a large fraction of static nets. Although pingers cannot eliminate bycatch, they have the potential to reduce bycatch rates of these nets to 50–80% in operational fisheries compared to nets without pingers (Orphanides and Palka, 2013). Thus, the expected bycatch reduction by this measure will likely have a positive effect on the population (WGBYC, 2020).

In the absence of a scientific basis for a population boundary, WKEMBYC participants are not in a position to agree on precise management borders. The extent of proposed emergency measures is 13°E the west due to the likelihood that Baltic Proper animals can occur there in winter (WGMME, 2020). This however is obscured in the SAMBAH data by the much higher density of Belt Sea animals occurring in the same area. This is different from the NGO proposal who suggested 13.5°E. For such a boundary however, there is no scientific basis. The 13.5°E boundary is rather the eastern management boundary of the Belt Sea population during summer (Sveegaard et al., 2015).

4.2.1 Monitoring recommendations

The knowledge on bycatch risk of harbour porpoises of the Baltic Proper population and its spatio-temporal variation must be increased. In this respect, it is essential to back up management decisions with fishery data of a high quality. Therefore, WKEMBYC recommends implementing:

a) **Accurate spatiotemporal recording of fishing effort (in meaningful metrics such as km*soak time for nets) and gear type used for all vessels irrespectively of the vessel size:** This can be done by daily reporting in logbooks for all vessels, irrespective of their size. This should include the obligation to indicate the geographical position, net length, and soak time of daily fishing in these logbooks. Having a tracking system or smartphone app on board will facilitate the data collection and reporting.

b) **Increased monitoring of bycatch of protected and threatened species, ideally as a dedicated monitoring:** It has been shown that use of observers not dedicated to bycatches of protected species, which is mainly used under DCF monitoring, may lead to a downward bias in the number of recorded events (WGBYC, 2015). Remote Electronic Monitoring (REM) can be used for this purpose in a cost-effective way which would in turn enable a high coverage. The proposal in the NGO Annex II to cover bycatch monitoring by 100% of static net fishing effort over almost the entire Baltic Sea is very ambitious and challenging to implement this solution in six months' time. However, the recommended bycatch mitigation measures need to be continued for a long time. Also the monitoring measures need to be implemented from the beginning and continued in the long-term. The monitoring should also include other PETS.

c) **Monitoring of the responses of the fishing fleet to the implementation of the recommended bycatch mitigation measures:** Such monitoring would be needed with regards to magnitude, spatiotemporal distribution, and fishing gears used in response to the implementation of bycatch mitigation measures such as closures, and if needed take adaptive management measures to safeguard that such responses do not counteract the aim of the measures taken.

d) **Compliance control of bycatch mitigation measures:** For active acoustic deterrence devices, this includes controlling both the use and the functionality of the devices. In this respect it is important to rule that the devices must be fully operational while nets are in the water, in order to allow sanctioning of infringements detected during inspections.

Further, to fulfil the obligations on further research or conservation measures as required to ensure (by means of suitable fisheries management measures) that incidental capture and killing does not have a significant negative impact on the species concerned[5], WKEMBYC recommends the following monitoring of Baltic Proper harbour porpoises:

e) **Long-term acoustic monitoring in key areas for the Baltic Proper harbour porpoise population**[6]: Examples of monitoring areas are Hoburgs Bank and Northern and Southern Midsea Bank, Hanö Bight, Pomeranian Bay and along the Polish coast into Gulf of Gdansk. Such monitoring would be indicative of changes in abundance and/or distribution on the population level. This should also include monitoring of responses to recommended bycatch mitigation measures.

f) **Repeated large-scale acoustic surveys for harbour porpoises:** These should be repeated every 12 years, aligned with the assessment periods of the MSFD and HD for estimating trends in abundance and detection of possible shifts in the distribution pattern of the Baltic Proper harbour porpoise population. This is important to adapt conservation measures if needed. Repeated abundance estimates will also improve the ability to provide robust estimates of anthropogenic mortality limits.

g) **Collection, necropsy and sampling of stranded and bycaught harbour porpoises east of longitude 13°E:** All stranded and bycaught harbour porpoises that are in good enough condition for studies of health, reproductive parameters and impact of environmental pollutants should be sampled. Such data are indicative of population status and provide an improved scientific basis for robust estimates of anthropogenic mortality limits.

h) **Genetic sampling of all stranded and bycaught harbour porpoises east/south of the Darss and Limhamn Ridges:** Genetic sampling is needed for improved knowledge on the spatiotemporal distribution range of the Baltic Proper harbour porpoise population.

4.3 General conclusions

The WKEMBC workshop concluded that the set of measures proposed by NGOs would probably have a positive effect on the population (by reducing bycatch of harbour porpoises), although not sufficiently for the protection and recovery of the population. This is mainly due to the already severely depleted status of the population, which probably would need decades to recover. Thereby any emergency measures will not be effective if they are only implemented for 6+6 months (in accordance with art. 12 Regulation 1380/2013 on CFP). In order to make the measures effective, they should be implemented for the long-term. In addition to the longer time perspective, WKEMBYC also proposes further mitigation measures, adjustments of the areas concerned, and adjustments of some of the measures proposed by NGOs in the Special Request.

[5] Article 12(4) of Council Directive 92/43/EEC.

[6] The definition of 'key areas' for long-term acoustic monitoring of the Baltic Proper harbour porpoise population is currently being developed within HELCOM.

Implementation of the mitigation measures proposed by WKEMBYC as a whole should lead to significant improvements of the conservation status of Baltic Proper harbour porpoise, which however need to be carefully monitored.

For the Baltic Proper harbour porpoise population, the pressures from bycatches, environmental pollutants, and some underwater noise sources are considered high (ICES WGMME, 2019). The combination of several high threat levels underlines the importance of managing those than can be mitigated in the short term, i.e. bycatches and underwater noise. A major reduction of the main pressures should allow the harbour porpoise population to achieve PBR close to zero and an improvement of the conservation status, while a few limited measures are not likely to be sufficient.

Furthermore, when discussing the mitigation measures as outlined in the recommendations for the Baltic Proper harbour porpoise, the workshop concluded that the fisheries around the Baltic Sea should be entirely rebuilt by giving up fishing with static nets and replacing those with gears in which neither harbour porpoises, seals or seabirds are likely to get bycaught—i.e. pots, traps, fyke nets, and pound nets. Although such a shift should be considered as a long term perspective. If all fisheries with static nets could be replaced by passive gears proven not to bycatch harbour porpoises (often referred to as alternative gears), such measures are likely to be sufficient for reducing the bycatches of the Baltic Proper harbour porpoise population below the PBR limit. For this reason, the development of alternative gears deserves high priority. Cooperation between countries and providing additional funding is key for this. As an incentive, passive gears documented not to bycatch harbour porpoises, could be allowed in marine Natura 2000 sites, provided their use is in accordance with other conservation objectives of the area. The implementation of the ban on cod fisheries in the eastern Baltic Sea in 2020, which discontinued the development of alternative gears for cod at least temporarily, should not prevent further research and development in alternative gears.

It is assumed that during the past 20 years, the bycatch pressure the Baltic Proper harbour porpoise population has declined, as the static net fishing effort has declined significantly. According to the RDB data (ICES Regional Database), the static net fishing effort in ICES Subdivisions 24 to 32, has decreased by 45% over the past 10 years (from 2009 to 2018). In the Swedish waters of the southern and central Baltic, Subdivision 24 to 29, the dominating static net fisheries targeting cod have decreased by 80% between 2006 and 2017 (Königson et al., 2020). Since 24 July 2019 there has been a ban on fishing for cod in Baltic waters, leading to a further decline in fishing effort. No gillnet fisheries for cod are allowed in subdivision 25 to 32. In 24, fishing for cod is allowed but only in waters shallower than 20 metres (Commission Regulation (EU) 2019/1248, Council Regulation (EU) 2019/1838). It should be noted that the summer management range of the Baltic Proper harbour porpoise population is approximately from ICES Subdivision 25 and higher.

5 Recommendation for the Bay of Biscay common dolphin

5.1 Recommendations for the common dolphins in the Bay of Biscay: reasoning behind the proposed measures

5.1.1 Objectives for the emergency measures

WKEMBYC used the estimates of bycatch mortality to explore a range of "emergency measures" scenarios. A decision had to be made concerning what European legislation requirements needed to be met, in relation to common dolphin conservation. Table 4 summarises conservation and management objectives in the relevant European legislation as identified in the Commission's request to ICES. None of the legislation provides thresholds or quantitative objectives from which thresholds can be calculated. However, although the conservation and management objectives differ between legislation, there are some commonalities which WKEMBYC identified as the legal drivers underpinning any conservation measures. Both the Common Fisheries Policy and Technical Conservation Measures refer to minimising impacts of fishing/bycatch and the need to comply with other Union legislation. The Marine Strategy Framework Directive and Habitats Directive refer to ensuring impacts from bycatch do not have a significant negative impact/effect on the long-term viability of the species with a view to achieving/maintaining Favourable Conservation Status/Good Environmental Status. Based on these, WKEMBYC agreed two quantitative management objectives, against which reduction in bycatch mortality achieved under each of the "emergency measures scenarios" could be tested. The group acknowledged that interpretation of Article 12 of the Habitats Directive could require strict protection from killing protected species and bycatch (or even knowledge of the potential for bycatch to occur) of cetaceans could be deemed a deliberate and thereby illegal act. However, WKEMBYC found this interpretation difficult to reconcile with the Terms of Reference for the working groups and WKEMBYC.

The level of reduction of bycatch was also discussed, specifically whether a reduction to PBR, or some percentage of PBR was more appropriate, given the levels of strandings recorded (which for the 2016-2018 period led to an estimated bycatch mortality approximately double that estimated from onboard monitoring and which, furthermore, increased in winter 2019 to 11 330 (95%CI [7 550; 18 530]) common dolphins) and the uncertainties surrounding the bycatch estimates. While the estimated PBR aids identification of high-risk métiers and can be used as an indication that current levels of bycatch may not be sustainable, it was noted that the Technical Conservation Measures and CFP refer to 'minimising bycatch' which may not be in line with meeting a particular PBR value. It was agreed that, in the absence of other agreed thresholds, PBR may be a useful tool, however, the uncertainties surrounding the data should be highlighted. The agreed management objectives for testing scenarios are:

i. Management objective 1: Reduce bycatch to 50% below PBR

Achieving levels of bycatch below the PBR should allow the population to be maintained at or above 50% of the carrying capacity 95% of time. WKEMBYC agreed that this should ensure that the population viability is maintained in the long-term thereby aiming to satisfy elements of the

MSFD and the CFP/Technical Measures provisions. Whilst the monitoring point estimate of mortality (3973 common dolphins)[7] is below the PBR, the upper 95% CI exceeds the PBR (95% CI 1998 - 6598~)[*]. The point estimate from strandings data (6620)[*] exceeds PBR and the range of potential values (95% CI) is 4411–10 827 dolphins. There is also uncertainty around the abundance estimate that is used to generate the PBR (see WGBYC PBR scenarios). Given the high levels of uncertainty around these estimates, a precautionary approach was taken and WKEMBYC agreed that the objective of achieving levels of bycatch that are 50% below the PBR would be used[8].

This means that the threshold of bycatch (i.e. 50% of PBR) will be equivalent to an annual bycatch of 2464 common dolphins in the North East Atlantic management unit.

ii. Management objective 2: Reduce bycatch to 10% of PBR

This quantitative objective aims to provide an interpretation of what "minimise and where possible eliminate" might mean in the context of bycatch reduction. This objective results in a threshold for annual bycatch of 493 common dolphins in the North East Atlantic management unit. *It should however be noted that this is not equivalent to the present legal interpretation of Habitats Directive Article 12. Existing case law suggests that where there is a known risk of fishery bycatch mortality to a protected species, the act of fishing may be considered equivalent to deliberate killing. Therefore, this Article may be interpreted as requiring measures to eliminate fishery bycatch as far as possible (in this case of common dolphins), not simply to reduce it to a low level.*

5.1.2 Emergency measures scenarios

A number of different bycatch reduction scenarios were explored using available fishing effort, bycatch rate and strandings data to assess the appropriateness of the 4-month closure proposed in the NGO document. A variety of realistic scenarios were discussed and WKEMBYC agreed they should include several different temporal fisheries closures (in line with the approach proposed by the NGOs), year-round total fishing effort reductions, technical mitigation approaches (in this case, pingers) and combinations of temporal closures and use of pingers. It was agreed that mitigation and/or closures applying to all 'responsible' fisheries would be a more equitable and reliable method of achieving bycatch reduction. This raised the point that there are multiple ways of achieving a reduction in bycatch in relation to different closures and mitigation measures. However, it was noted that there are currently no conclusively demonstrated mitigation tools for common dolphins bycatch in gillnets and the broad scale use of acoustic deterrents in these fisheries could exclude common dolphins from some of the Bay of Biscay. In addition, the issue of displacement of fishing effort in response to the introduction of management measures, particularly for larger vessels, needs to be addressed.

Although there is some evidence in the monitoring data of seasonal fluctuations in bycatch rates within some métiers, the quantity of monitoring data at fine temporal scales precludes using these bycatch rates to generate mortality estimates for short periods of time. However, seasonal strandings patterns along the French coast indicate a significant peak in bycatch mortality through the winter months and a much shallower peak in the summer.

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7 Note that this number was updated after ADGBYC2020-1 in May 2020 given an error found in the database (duplication of observer effort data from one MS was found in the database).

8 Workshop participants acknowledge that the 50% of PBR threshold is a rather arbitrary level picked because it was a precautionary approach considering the uncertainty around the bycatch mortality estimates. Other thresholds could be tested and found more appropriate depending on the conservation objective to be achieved. The group have not performed any simulation work to determine what implementing such a threshold would achieve in terms of population status.

Table 4. Conservation and management objectives within the relevant legislation in the Commission request. Adapted from Scientific, Technical and Economic Committee for Fisheries (STECF), 2019.

Legislation	Conservation Objective	Management Objective	Threshold
Regulation (EU) No. 1380/2013 Common Fisheries Policy (CFP)	Shall ensure that fishing and aquaculture activities are environmentally sustainable in the long-term [..] 2. apply the precautionary approach to fisheries management and shall aim to ensure that exploitation of living marine biological resources restores and maintains populations of harvested species above levels which can produce the maximum sustainable yield [...].	Shall implement the ecosystem-based approach to fisheries management so as to ensure that negative impacts of fishing activities on the marine ecosystem are minimised […]	NONE
Regulation (EU) 2019/1241 of the European Parliament and of the Council of 20 June 2019 on the conservation of fisheries resources and the protection of marine ecosystems through technical measures	Technical measures should [also] minimise impacts of fishing gears on sensitive species and habitats [..] contribute to having in place fisheries management measures for the purposes of complying with the obligations under Directives 92/43/EEC, 2009/147/EC, 2008/56/EC in particular with a view to achieving good environmental status in line with Article 9(1) of that Directive	ensure that incidental catches of sensitive marine species, including those listed under Directives 92/43/EEC and 2009/147/EC […] that result from fishing are minimised and where possible eliminated such that they do not represent a threat to the conservation status of these species	NONE - targets relating to the levels of […] bycatches of sensitive species [...] should be established […] that bycatches of marine mammals […] do not exceed levels provided for in Union legislation and international agreements that are binding on the Union
Directive 2008/56/EC Marine Strategy Framework Directive	Achieve or maintain good environmental status in the marine environment by the year 2020 at the latest	The mortality rate per species from incidental bycatch is below levels which threaten the species, such that its long-term viability is ensured (COM 2017/848/EU)	NONE - Member States shall establish threshold values for the mortality rate from incidental bycatch per species, through regional or sub-regional cooperation
Council Directive 92/43/EEC Habitats Directive	Maintain or restore, at favourable conservation status, natural habitats and species of wild fauna and flora of Community interest. European court of justice (Cas C-221/04 European commission against Spain): establishes that “For the condition as to ‘deliberate’ action in Article 12(1)(a) of the directive to be met, it must be proven that the author of the act intended the capture or killing of a specimen belonging to a protected animal species or, at the very least, accepted the possibility of such capture or killing.”	Member States shall take the requisite measures to establish a system of strict protection for the animal species listed in Annex IV (a) in their natural range, prohibiting:… all forms of deliberate capture or killing of specimens of these species in the wild. Ensure that incidental capture and killing does not have a significant negative impact on the species concerned.	NONE

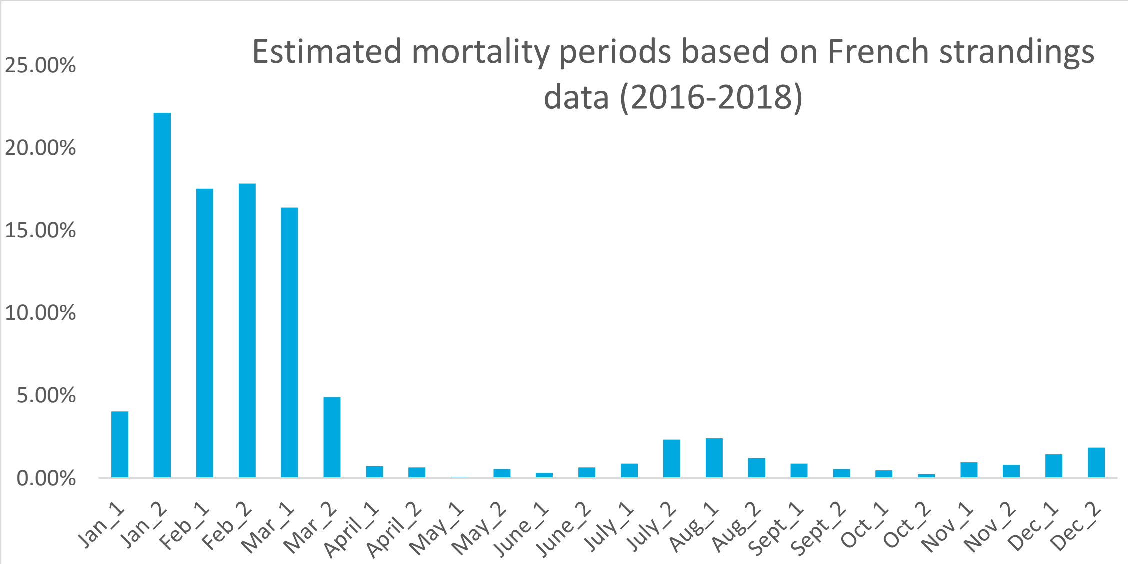

Figure 11. Proportion of common dolphin bycatch mortality at sea (inferred from strandings) by fortnight from 2016-2018 along the French Biscay and western Channel coast.

Analysis of fishing effort data showed that except for PTM targeting demersal fishes in winter and large pelagic fishes in summer, there were no really clear seasonal peaks in fishing effort (Figure 12) for relevant métiers during winter that might explain the significant peaks seen in strandings. Mortality timings based on strandings suggest about 75% of mortality occurs in an 8-week period from mid-January to mid-March (Figure 12). During this period the main fisheries show essentially flat trends in effort (Figure 12). Preliminary evidence suggests that dynamic changes in common dolphin density within the Bay of Biscay is the main driver of the observed peak in bycatch mortality (Van Canneyt et al. 2020). Therefore, it was considered important to include the seasonality in bycatch mortality inferred from strandings into subsequent scenarios to ensure they reflected reality as much as possible. The list of scenarios tested is shown in Table 5.

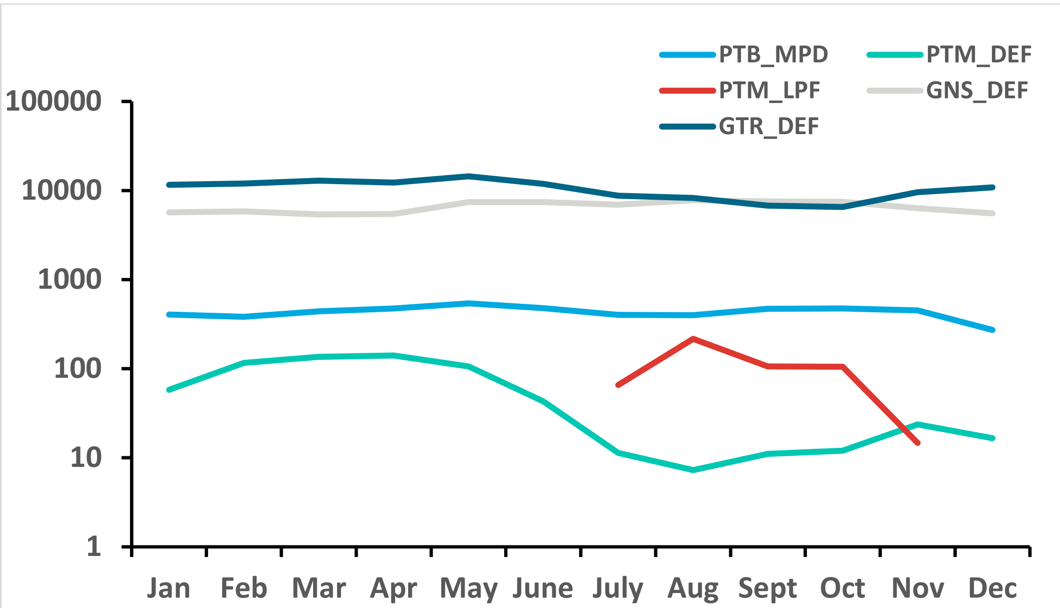

Figure 12. Mean (2016-2018) monthly fishing effort in Subarea 8 by métier from the ICES RDB. Note logarithmic scale.

Table 5. Scenarios used for assessing possible alternative bycatch reduction approaches.

Scenario	Description	Explanation
A	NGO proposed 4-month closure (Dec-Mar) all metiers	4-month closure from December to March of all relevant metiers as proposed in the NGO Emergency Measures request
B	Annual effort reduction of 40% all metiers	Flat annual 40% reduction in total effort for relevant metiers, does not consider strandings patterns
C	2-month closure (mid-Jan to mid-Mar) all metiers	2-month closure of all relevant metiers determined using the % mortality in that peak period based on strandings
D	6-week closure (mid-Jan to end Feb) all metiers	6-week closure of all relevant metiers determined using the % mortality in that peak period based on strandings
E	4-week closure (mid-Jan to mid-Feb) all metiers	4-week closure of all relevant metiers determined using the % mortality in that peak period based on strandings
F	2-week closure (mid-Jan to end Jan) all metiers	2-week closure of all relevant metiers determined using the % mortality in that peak period based on strandings
G	Pinger all PTM/PTB all year and same 6 week closure all other metiers	PTM/PTB to use pingers all year + a 6-week closure of all other relevant metiers determined using the % mortality in that peak period based on strandings
H	6-week closure (mid-Jan to end Feb) all metiers (*including PTM/PTB*) and pinger PTM/PTB rest of year	6-week closure of all relevant metiers determined using the % mortality in that peak period based on strandings + PTM/PTB to use pingers during the rest of the year
I	Pinger all PTM/PTB all year and same 4 week closure all other metiers	PTM/PTB to use pingers all year + a 4-week closure of all other relevant metiers determined using the % mortality in that peak period based on strandings
J	Pinger all PTM/PTB all year and same 2 week closure all other metiers	PTM/PTB to use pingers all year + a 2-week closure of all other relevant metiers determined using the % mortality in that peak period based on strandings
K	Pinger all PTM/PTB all year	PTM/PTB to use pingers all year, no other measures introduced.
L	2-month closure all (mid-Jan to Mid-Mar) + pingers	2-month closure for all fleets + pingers on PTM/PTB the rest of the year
M	4-month closure all (mid-Jan to Mid-Mar) + pingers	4-month closure for all fleets + pingers on PTM/PTB the rest of the year
N	4-month closure (3 in winter + 1 in summer) + pingers	Closure during 3 months in winter (Jan – March) and 1 month in summer (mid-July – mid-August) for all fleets + pingers on PTB/PTM the rest of the year
O	4-month closure (3 in winter + 1 in summer)	Closure during 3 months in winter (Jan – March) and 1 month in summer (mid-July – mid-August) for all fleets

5.1.3 Testing the emergency measures scenarios

To determine the bycatch levels associated with each scenario, the group first used RDB fishing effort data and bycatch rates from observer programmes to determine annual bycatch removal by the following métiers PTM_DEF, PTB_MPD, GTR_DEF, OTM_DEF, PS_SPF, GNS_DEF and PRM_LPF in Subareas 8 and 9. Total bycatch was estimated at 3199 common dolphins (95%CI:

1557–5413). The temporal pattern of bycatch mortality obtained from the strandings data along the French coast (Subarea 8) was used to allocate the total bycatch derived from monitoring programmes to fortnights. These fortnightly distributions of bycatch for each métier allowed the different closure scenarios to be associated to a specific bycatch level. Considering that average annual bycatch estimated from strandings was 6625 individuals for the same period 2016-2018, we used a constant ratio of 2.07 to derive a series of scenario-specific bycatch level obtained from strandings. The two series of bycatch values (one from monitoring programmes, the other from stranding) were considered to be two views of the same phenomenon and their uncertainty ranges were considered to contain the true bycatch level (Table 6).

Table 6. Summary of bycatch mortality by métier from monitoring and strandings in the Bay of Biscay and Iberian Coast (Subareas 8 and 9). The strandings data have been attributed to métier-based on the ratio between total monitoring/strandings (1/2.07). Note that this Table was updated after ADGBYC2020-1 in May 2020 given an error found in the database (duplication of observer effort data from one MS was found in the database).

Ecoregion	Metier L4	Metier L5	RDB Fishing Effort (DaS)	Bycatch rate (animals/DaS fished)	At Sea Monitoring Estimate (95% CI)	Stranding Estimate	% coverage
Bay of Biscay and the Iberian Coast	PTM	DEF	682	0,71	481 (408 - 555)	802	8,17
	PTB	MPD	5195	0,15	775 (388-1163)	1292	0,43
	GTR	DEF	58365	0,04	2061 (1203-3092)	3435	0,19
	OTM	DEF	243	1,22	297 (0-890)	495	0,11
	PS	SPF	35564	0,01	213 (0 - 532)	355	0,31
	GNS	DEF	36836	0,00	137 (0-343)	228	0,49
	PTM	LPF	510	0,02	8 (0-23)	13	4,26
TOTAL (95% CI)					**3973* (1998–6598)**	**6620**	

*** CIs too wide as not possible to calculate variance in bycatch rates and consequently CIs are summed metier mortality**

ɪ Based on a ~1 day of monitoring effort

For each scenario, the bycatch reduction rate was calculated as well as the fishing effort reduction rate. An efficiency score for each scenario was obtained by dividing the bycatch reduction rate by the effort reduction rate. This efficiency score could be considered as a rough cost-effectiveness index for each scenario considering that a reduction of effort would be a cost for the industry. This is not meant to be based on real costs as it is understood that the workshop was not tasked with making economic analyses and as such did not include experts in economic analysis. Note also that the cost of placing pingers on trawls is not included in the efficiency index.

The results from testing each scenario as reported in Table 7 including the resulting bycatch obtained (according to monitoring and to stranding), %PBR reached with colour code (according to monitoring and to stranding), bycatch reduction rate, effort reduction rate and efficieny.

Table 7. Synthesis of scenarios' performances. For scenarios A to O, key information given are scenario title, total bycatch mortality as of monitoring programmes, total bycatch mortality as of strand-ing data, by catch reduction obtained, effort reduction implied, and efficiency score. A colour code indicates how each scenario reach the different management objectives, with green denoting <10% of PBR, blue <50% of PBR, pink <90% PBR and red > PBR (Table 5). The efficiency score of each scenario is bycatch reduction rate divided by effort reduction rate. This efficiency could be considered as a rough cost effectiveness for each scenario considering that a reduction of effort is a cost for the industry (see main text for further detail). Note that this Table was updated after ADGBYC2020-1 in May 2020 given an error found in the database (duplication of observer effort data from one MS was found in the database). Therefore, number provided in the following page referring back to Table 5 were also updated after ADGBYC2020-1.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
Scenario	NGO proposed 4 month closure (Dec-Mar) all metiers	Annual effort reduction of 40% all metiers	2 month closure (mid Jan - mid Mar) all metiers	6 week closure (mid Jan - end Feb) all metiers	4 week closure (mid Jan - mid Feb) all metiers	2 week closure (mid Jan - end Jan) all metiers	Pinger PTM / PTB all year & same 6 week closure all other metiers	6 week closure (mid Jan - end Feb) all metiers and pinger PTM / PTB rest of	Pinger PTM / PTB all year and same 4 week closure all other metiers	Pinger PTM / PTB all year and same 2 week closure all other metiers	Pinger PTM / PTB all year	2 month closure (mid Jan - mid Mar) all metiers + pinger PTB / PTM rest of year	4 month closure (Dec-Mar) all metiers + pinger PTM / PTB rest of year	3 month (Jan–Mar) + 1 month (mid-Jul–mid-Aug) closure all metiers + pinger	3 month (Jan–Mar) + 1 month (mid-Jul–mid-Aug) closure all metiers
Total resulting bycatch - monitoring mortality	548	2384	1034	1685	2392	3087	1593	1340	2077	2551	3151	824	437	391	494
Total resulting bycatch - strandings mortality	913	3975	1725	2809	3989	5148	2657	2235	3463	4254	5254	1374	729	651	824
Bycatch Reduction obtained	0.86	0.40	0.74	0.58	0.40	0.22	0.60	0.66	0.48	0.36	0.21	0.79	0.89	0.90	0.88
Effort reduction needed	0.3	0.4	0.2	0.1	0.1	0.0	0.1	0.1	0.1	0.0	0.0	0.2	0.3	0.3	0.3
Efficiency score	2.6	1.0	4.4	5.0	5.2	5.8	5.4	5.5	6.5	9.7	N/A	4.8	2.7	2.7	2.6

Colour codes used in table above for PBR levels.

% of PBR	<10%	<50%	≥50% and ≤PBR	>PBR
Number bycaught	<493	<2464	2464 - 4927	>4927

For scenarios with a temporal component, the % of bycatch mortality estimated from strandings within each fortnightly time period (data years 2016–2018) was used to calculate the reduction from the annual estimate that would result from closure during that specific time period. The scenario with a flat effort reduction did not make reference to the temporal pattern of strandings. For scenarios with pingers on PTM and PTB, a reduction of 65% in bycatch rates was applied based on recent findings from trials on 3 pairs of midwater trawlers in France (Rimaud et al., 2019) and assumed a comparable efficiency on PTB. Pingers are already mandatory from 1 January until 30 April in the French mid-water single and pair trawls (PTM, OTM, TM) since a national regulation adopted in December 2019. Scenarios combining temporal closures and pingers used both approaches to calculate the resulting bycatch reduction. The scenarios are based initially on mortality estimates from monitoring data, scaled up using fishing effort data for the entire Bay of Biscay and Iberian Coast Ecoregion (ICES subareas 8 and 9), which are then raised, by métier, to the strandings mortality estimate, using a factor of 2.07 (calculated by dividing the strandings mortality point estimate by the monitoring mortality point estimate). The temporal strandings patterns are based on data from the French coast only.

Looking hierarchically at PBR performance first, followed by bycatch reduction rate and measure efficiency, scenarios could be classified or ranked as follows.

Scenario N (four-month closure from January through March and from mid-July to mid-August) all métiers, and pingers on PTM/PTB the rest of the year) performs best in terms of PBR thresholds (10%/50%) and bycatch reduction (bycatch reduction rate=0.90). Its efficiency is intermediate because the closure period is broader than the typical duration of the period of high bycatch.

Scenario M (four-month, December through March closure all métierd and pingers on PTM/PTB the rest of the year) performs second best in terms of bycatch reduction (bycatch reduction rate=0.89). Its efficiency is intermediate because the closure period is broader than the typical duration of the period of high bycatch.

Scenario O (four-month closure from January to March and from mid-July to mid-August) all métiers) performs third best in terms of bycatch reduction (bycatch reduction rate=0.88). Its efficiency is intermediate because the closure period is broader than the typical duration of the period of high bycatch.

Scenario A (four-month, December through March closure, as proposed by the NGOs) performs fourth best in terms of bycatch reduction (bycatch reduction rate=0.86). Its efficiency is intermediate because the closure period is broader than the typical duration of the period of high bycatch.

Scenario L (two-month, mid-January to mid-March closure all métiers and pingers on PTM/PTB the rest of the year) ranked fifth on the first two criteria (PBR: 50%/50%; bycatch reduction rate=0.79) and displayed an efficiency over twice as high as scenario A because it was more focused on the peak period of mortality and additional bycatch reduction is achieved by using pingers on pair trawls.

Scenario C (two-month, mid-January to mid-March closure) ranked sixth on the first two criteria (PBR: 50% /50%; bycatch reduction rate=0.74) and displayed a cost effectiveness twice as high as scenario A because it was more focused on the peak period of mortality.

Scenarios B , D, E, G, H, I, J, and K ranked 7th to 15th on bycatch reduction and achieved bycatch reduction rates between 0.36 and 0.66.

The least effective in terms of bycatch reduction were F (two-week winter closure, bycatch reduction rate 0.22) and K (pingers on pair trawls all year round, no closure, bycatch reduction rate=0.21). They do not reach the PBR when mortality data derived from stranding are considered.

It is noticeable that scenario B, a year-round flat rate reduction of effort, has the lowest efficiency (efficiency=1). In that case, the reduction of bycatch is directly proportional to the reduction in effort because it does not take advantage of the strong temporal pattern in bycatch to draw optimal benefit of effort reduction.

The group therefore agreed that scenarios F and K showed the lowest conservation performance (we cannot preclude that bycatch estimated from stranding data could be higher than PBR) and that scenario B had the lowest efficiency score (one can get the same conservation benefit with less constraint to the industry).

The group further agreed that although scenarios A, M, N and O performed the best in terms of conservation and bycatch reduction they performed less well in terms of the efficiency score than all other scenarios except B, because of the breadth of the proposed closure period. A broad closure window can be sought to accommodate year-to-year variation in the timing of the period of acute bycatch mortality. However, recent strandings records show that the period of acute bycatch mortality did not start earlier than mid-January in the past five years.

All scenarios based on the combination of pingers for all PTM/PTB and closure of various durations for the other fleets (G, H, I, J, K, L, M, N) show that the benefits of each component of the scenarios (pinger + closure) are not additive. Indeed, for longer closure periods (i.e. six weeks), the expected 65% bycatch reduction benefit of using pingers on all PTM/PTB year-round is largely offset by the residual 35% bycatch generated during the closure period if the PTM/PTB would continue to operate (compare scenarios D and G).

Finally, scenarios based on a temporary closure which includes the winter peak period of mortality are the most effective ones provided that the closure's duration is at least six weeks but longer closures can substantially further reduce bycatch (compare scenarios D (six-week closure, 58% reduction) and O (three month winter closure plus one month summer closure, 88% reduction).

To conclude, and considering the management objectives used by WKEMBYC, the preferred "emergency measures" and their associated pros and cons are:

Chosen emergency Measures to meet annual common dolphin mortality of 50% of the PBR

Scenario	Pros	Cons
L 2 month closure all métiers + pinger PTB / PTM rest of year	Achieves high level bycatch reduction with shorter temporal closures (than A, for example)	Slightly less bycatch reduction than scenario A, M, N, O. Assumption that pingers are as effective in PTB as in PTM. Fisheries closures of all relevant métier in subarea 8

Chosen Emergency Measures to meet annual common dolphin mortality of 10% of the PBR

Scenario	**Pros**	**Cons**
N 3 month (Jan–Mar) + 1 month (mid-Jul–mid-Aug) closure all métiers + pinger PTB / PTM rest of year	Achieves the highest level of by-catch reduction	High cost to industry Both winter and summer closures required in subarea 8 Assumption that pingers are as effective in PTB as in PTM

5.2 Recommendations for the common dolphin in the Bay of Biscay—bycatch mitigation

5.2.1 Mitigation

A combination of technical mitigation measures and/or effort reduction in trawls and static nets could be used to reduce mortality safely below PBR. WKEMBYC chose two possible management objectives that may satisfy the requirements of EU legislation. The group thought that adopting the 10% PBR management objective might be perceived as unreachable by the fishing industry in a short-term emergency measure. Minimising bycatch to that level could likely only be achieved over the long-term to allow workable alternatives to ongoing annual large-scale fisheries closures to be developed.

1. To achieve a level of bycatch that would ensure the viability of the population is maintained (50% of PBR), WKEMBYC recommend scenario L. This scenario contains two measures: a two-month closure for PTM_DEF, PTM_LPF, PTB_MPD, GTR_DEF, OTM_DEF, PS_SPF, and GNS_DEF, in Subarea 8 from mid-January to mid-March, and the use of acoustic deterrents, that have been proven to be effective (e.g. DDD_03) for reducing common dolphin bycatch in trawls, on PTM and PTB for the rest of the year.
2. To achieve reductions that minimise bycatch, WKEMBYC recommends scenario N. This scenario contains three measures: a three-month winter closure for PTM_DEF, PTM_LPF, PTB_MPD, GTR_DEF, OTM_DEF, PS_SPF, and GNS_DEF from January to March; a one-month summer closure for PTM_DEF, PTM_LPF, PTB_MPD, GTR_DEF, OTM_DEF, PS_SPF and GNS_DEF; and the use of acoustic deterrents, that have been proven to be effective (e.g. DDD_03) for reducing common dolphin bycatch in trawls, on PTM and PTB the rest of the year. All measures to be applied in Subarea 8.
3. The inclusion of SDN_DEF and the extension of the pinger component to OTM in the emergency measure should be considered, after appropriate data on bycatch rates are collected by independent observer programmes or electronic monitoring.
4. Similarly, further data is required to determine appropriate measures in Subarea 9 that would contribute to the conservation of common dolphin.
5. Currently, the only approach that would eliminate the risk of bycatch in the responsible fisheries would be complete fisheries closures—and at a larger spatial scale (6,7,8,9); this appears to be the only scenario that might satisfy Article 12 of the Habitats Directive, under the assumption that no report of fishing effort would occur.
6. It was suggested that emergency measures could be relaxed if and when specific fleets or métiers were able to demonstrate that they are 'dolphin-safe', i.e. when fisheries demonstrate their involvement in scientific monitoring programmes, compliance with taking observers or EM on board, pinger use, demonstrated no or agreed low levels of bycatch.
7. The NGO proposal of dynamic closures is not feasible at this time.
8. WKEMBYC recommend that WGBYC consider revising their 2021 data call to collate data for evaluation of the NGO proposed measures of a "move-on" procedure and "daylight fishing" as a means of reducing bycatch. Data should be available within individual Member States' fisheries databases that would permit preliminary assessment of these measures. WGBYC will consider the need for this in future ICES data calls.
9. The provision of funding for fishers to transition to alternative fishing practices, métiers with lower cetacean bycatch risk, selective practices for long-line fisher, or adoption of mitigation measures while ensuring that these measures are also safe to other Protected, Endangered or Threatened Species (PETS).

5.2.2 Monitoring

10. Adequate monitoring through dedicated observers or REM should be implemented in Subareas 8 and 9, based on a random sampling design that ensures representative coverage of the relevant métiers and vessel sizes; likewise, the at-sea control system should check if pingers are adequately deployed and in working order.
11. For GNS and GTR métiers, improved reporting of data on certain net dimensions (length and height) as an indication of the capacity of the net to bycatch dolphins; similarly the vertical opening of trawls, in particular HVO and VHVO trawls, should be clearly documented as it seems to be critical to assess their capacity to catch common dolphin.
12. Encouragement of or incentivising the use of REM on fishing vessels to ensure more complete monitoring and enable an efficient sampling strategy to be implemented.
13. The elevated levels of bycatch appear to be primarily driven by changes in the seasonal distribution of common dolphin, rather than elevated winter fishing effort. The seasonal distribution could change in the future and the need for emergency (or any) measures might also change as a result. Therefore strandings need to be supported along both the French and Iberian coastlines to help determine the efficacy of and requirement for ongoing bycatch reduction measures.
14. Large scale surveys to estimate the abundance of common dolphins should be implemented more regularly than the current decadal interval of the SCANS surveys; this is particularly relevant for any management decisions based on PBR or other thresholds.
15. Regional-scale (e.g. Bay of Biscay) abundance surveys should also be carried out on a seasonal basis to monitor short-term changes in distribution and density of common dolphins which will also help determine the appropriateness of management measures. In the absence of adequate monitoring of common dolphin in the Bay of Biscay, it will be difficult to gauge the effectiveness of any mitigation measures adopted (e.g. an observed decrease in strandings could not definitely be attributed to the mitigation measures without concurrent knowledge of the at-sea distribution and abundance of common dolphins).
16. Maintain or reinforce existing stranding networks in the NE Atlantic common dolphin range states and encourage joint analyses and experimentations, including tagging experiments of dolphin carcasses to refine key parameters allowing bycatch mortality to be estimated.

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Annex 1: List of participants

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Annex 2: Resolutions

Workshop on fisheries Emergency Measures to minimize BYCatch of short-beaked common dolphins in the Bay of Biscay and harbor porpoise in the Baltic Sea (WKEMBYC)

2019/WK/HAPISG12 The **Workshop on fisheries Emergency Measures to minimize BYCatch of short-beaked common dolphins in the Bay of Biscay and harbor porpoise in the Baltic Sea (WKEMBYC)**, chaired by Vincent Ridoux, France, will be established and will meet by correspondence (WebEx) on 1-3 April 2020 to:

a) Produce and analyse maps of fishing effort in the relevant areas of the Bay of Biscay and Baltic Sea using the VMS and logbook information collected through the ICES data call.

b) Based on available information provided to ICES by the European Commission and work by WGBYC 2020 and WGMME 2020, WKEMBYC will:

1. assess, and if applicable, propose alternative appropriate emergency measures that could be used to ensure a satisfactory conservation status of these populations; (Science Plan codes: 6.1);
2. suggest emergency measures that are necessary to ensure a satisfactory conservation status of these populations. (Science Plan codes: 6.1);

WKEMBYC will report by 21 April 2020 for the attention of the ACOM and SCICOM.

Supporting information

Priority	This workshop was set up to produce the scientific basis to answer a special reques from DGMARE. Consequently, the workshop is considered to have a high priority.
Scientific justification	The work described under ToR a) and ToR b) is needed to evaluate whether the fisheries emergency measures for the North East Atlantic short beaked common dolphin in the Bay of Biscay and the Baltic Sea harbour porpoise, described in the information provided to ICES by the European Commission, are necessary and appropriate, in the context of EU law, in particular Articles 2 and 12 of Regulation (EU) 1380/2013; Article 3(2) of Regulation (EU) 1241/2019 and Article 1(i) of Counci Directive 92/43/EEC. Also, the Workshop will contribute to evaluate alternative measure that could be used to ensure a satisfactory conservation status of these stocks, in the context of EU law as above.
Resource requirements	None, apart from meeting facilities and Secretariat support.
Participants	The workshop will be attended by 10-15 persons.
Secretariat facilities	None.
Financial	Additional resource requirements will be met by funded advisory requests from clients.
Linkages to advisory committees	ACOM
Linkages to other committees or groups	WGMME, WGBYC, HAPISG, EPDSG
Linkages to other organizations	

Annex 3: Table of pros and cons of bycatch measures

Table of pros and cons of bycatch measures. Individual measures are presented first, followed by the combined set of measures recommended by WKEMBYC, and alternative fishing gears to static nets. Only the combination of measures is evaluated on the population level. None of the individual measures alone will allow meeting the operational bycatch limit. The pros and cons are based on the assumption of that the recommended bycatch mitigation measures will continue after the termination of emergency measures under Art 12 CFP.

Measure	Pros	Cons
Large scale pinger use	For the Baltic Proper harbour porpoise population (and other biota)	
	• 50-80% overall reduction of bycatch in operational static net fisheries were pingers are used	• No elimination of bycatch • Negative impact by noise pollution (e.g. reduce the foraging efficiency) may exceed the positive effects from bycatch mitigation if used to a high degree in core areas although possible effects of noise pollution can be reduced as range varies with frequency and source level
	For static net fisheries	
	• Small scale fisheries can continue in larger part of the Baltic	• Additional costs (if pingers need to be bought by fishermen) • Additional labour (during setting and hauling, maintenance)
	For managers, authorities	
	• Smaller political costs compared to closures, prevention of subsidizing fishermen.	• Large resources needed for implementation, control, enforcement and sanctioning • Difficult to implement only as a short lasting measure (6+6 months) • Fishermen need to be instructed to use pingers correctly • Risk of low compliance by fishery if not adequately tested and planned prior to implementation • Pinger use in protected areas may not be in line with the conservation objectives • Costs for pinger co-funding (if provided to fishermen by authorities)

		• Pingers are considered an interim measure only (ASCOBANS Jastarnia Plan 2016) and thus additional (long-term) measures will be needed
Closure of small areas to static net fishery (part of the Natura 2000 site Zatoka Pucka i Półwysep Helski)	For the Baltic Proper harbour porpoise population (and other biota)	
	• Elimination of static net bycatch in closure area important to harbour porpoises • Other protected species (such as birds) benefit from static net closures	• Possible increase of bycatch outside closure area with similar porpoise density by relocation of fishing effort if higher porpoise density outside the closure area and effort relocation is not compensated for by measures outside the closure (e.g. pingers) • Possible negative effects of effort relocation to other species (e. g., birds) • Possible 'barrier effects' by large numbers of nets just outside the boundary of the closure • Bycatch in closure area might still occur if effort shifts to other gears causing bycatch
	For static net fisheries	
	• Small scale fishermen have fishing opportunities near their former fishing grounds	• Additional time and fuel costs needed due to larger transition distances if fishing grounds are further away from the port
	For managers	
	• Smaller political costs compared to large closures • Easier control compared to pinger use • Increased likelihood to reach conservation targets of Natura 2000 sites for other species, such as birds	• Many small closed areas are difficult to manage and control compared to one large closure •
Closure of large areas to static net fishery (Natura 2000 site Hoburgs bank och Midsjöbankarna together with the Southern Midsea Bank, and the cluster of protected German and Polish sites)	For the Baltic Proper harbour porpoise population (and other biota)	
	• Elimination of static net bycatch in closure area important to harbour porpoises (especially important in core area) • Fishing effort relocation to areas of lower likelihood of porpoise occurrence decreases overall bycatch risk	• Bycatch in closure area might still occur if other gears causing bycatch are still allowed, such as trawls

	• Other protected species (such as birds) benefit from static net closures.	
	For static net fisheries	
	• Target fish stocks recover in the closure area, spill-over effect (even more likely if area or parts of it are closed for all fisheries) • Larger fish in closed area allow for better recruitment • Incentive to develop of gears not catching harbour porpoises	• Lost fishing opportunities • For relocated vessels, especially for small-size vessels, additional time and fuel costs needed due to longer transition distances, and increased navigation safety risks
	For managers	
	• Easier control compared to pinger use or many small closures • If closed areas are Natura 2000 sites, boundaries are included in charts already • Higher likelihood to reach conservation targets compared to small closures • Likelihood to reach conservation targets of Natura 2000 sites for other species, such as birds	• Strong opposition by fishermen
Combination of measures suggested by WKEMBYC	For the Baltic Proper harbour porpoise population (and other biota)	
	• Elimination of bycatch in static nets in closed areas in combination with reduction of bycatch in pinger-use areas will significantly reduce the bycatch	Bycatch will still occur in static nets carrying pingers (although to a lower degree than without pingers), and in other gears such as trawls
	For static net fisheries	
	• Small scale fisheries can continue in larger part of the Baltic • Incentive to develop of gears not catching harbour porpoises	• High burden on small scale fishermen with closed fishing grounds
	For managers	
	• High likelihood to reach conservation targets if emergency measures are continued after 6+6 months	• Measures might still not be sufficient to reach the operational mortality limit (FCS), wherefore favourable conservation status is likely to be reached later than if bycatches are below this limit • Pingers are considered an interim measure only (ASCOBANS Jastarnia Plan 2016)

		• Additional long-term measures, such as replacement of static nets with pingers by fishing gears that do not catch harbour porpoises, likely to be needed to reach the operational mortality limit
Replacement of static nets by other gears which do not catch harbour porpoise, e.g. pots, traps, fyke nets, pound nets	For the Baltic Proper harbour porpoise population (and other biota)	
	• Elimination of static net bycatch of harbour porpoises, reduction of bird bycatch, and for some gears also reduction of seal bycatch • No noise pollution or risk of habituation as for static nets with pingers	• Possible bycatches of other protected species (e.g., birds) if gear is not carefully chosen and tested
	For static net fisheries	
	• Fishermen can continue to fish in areas closed for static net fisheries • Potential increase of revenues to fishers by certification of alternative gear fishery and higher fish quality • Reduced risk of seal damage on catch and gear in case of using seal safe gears	• CPUE may be lower and thus accompanying measures may have to be taken to compensate for lower yield (e.g., direct marketing, certification) • Replacement fishing gears must be (further) developed in some places, wherefore it cannot always be immediately implemented • Adaptations needed on vessels, which may be challenging especially for small vessels due to larger storage needed
	For managers	
	• Long-term solution • Increased likelihood of reaching conservation targets of Natura 2000 sites for other species, such as birds • In case seal safe gear is used, less compensation for seal damage to be paid • Easier to control than pinger use	• Exclusion devices may have to be to be implemented for some alternative gears to secure that replacement gear does not cause bycatches of other protected species • More difficult to control than closures for static net fisheries

Annex 4: Additional information from bycatch risk maps

Annex 4 presents latest available information on the bycatch risk of harbor porpoise in Swedish static net fisheries in the Baltic Sea from the ongoing Helcom Action project (Kindt-Larsen et al., 2020). Seasonal maps of the relative risk of harbour porpoise have been produced by multiplying the probability of detection of harbour porpoises from May 2011 to April 2013 (Carlén et al., 2018), by unpublished data on Swedish static net fishing effort (all mesh sizes and target species) reported to the Swedish Agency for Marine and Water Management for 2019. On 24 July 2019, Commission Regulation (EU) 2019/1248 entered into force, valid until 31 December 2019. The Commission Decision was followed by Council Regulation (EU) 2019/1838, regulating fisheries for the year 2020. These regulations close gillnet fisheries for cod in waters deeper than 20 metres in ICES Subdivision 24, and in all gillnet fisheries for cod in Subdivisions 25–32. Trawl fisheries targeting cod in the area was also affected. In Subdivisions 24 and 25, gillnet fisheries were mainly targeting cod, therefore the ban has resulted in a significant decrease in gillnet fishing effort in these Subdivisions since 24 July 2019. The evaluation time period includes fishing effort before and after EU Regulations 2019/1248 and 2019/1838 came into place, therefore it is not possible to temporally evaluate the when there is a high risk of bycatch in respective area.

However the spatial distribution can be assessed. According to the bycatch risk maps (Figure A.1), the highest bycatch risk is south of Scania (southernmost part of Sweden). This area is primarily used by the Belt Sea harbour porpoise population during May-October, while both populations occur here during November-April (Carlén et al., 2018; ICES WGMME, 2020).The second highest bycatch risk is in Hanö Bight. Also a high bycatch risk, but more scattered in space, is found at the Northern and Southern Midsea Banks. During May-October, the north eastern side of Hanö Bight is primarily used by the Baltic Proper harbour porpoise population, and the south western side by the Belt Sea population (Carlén et al., 2018). As the populations mix and the Baltic Proper population spreads out more during November-April, Baltic Proper animals are likely to be present in the entire Hanö Bight during these months. The Northern and Southern Midsea Banks are within the core area of the Baltic Proper population year round.

The remaining risk is mainly spread out along the coasts of the Swedish mainland northeast of Hanö Bight, and along the coast of the islands of Öland and east of Gotland. These areas are within the distribution range of the Baltic Proper population year round.

In order to reduce the bycatch risk of Baltic Proper harbour porpoises in Swedish waters, it is most important to focus on the waters around the Northern and Southern Midsea Banks and the north eastern side of Hanö Bight. Here the bycatch risk is relatively high, and the areas are within the distribution range of the Baltic Proper harbour porpoise year round. The second most important focus areas for bycatch reduction are the south western side of Hanö Bight and the waters south of Scania, where Baltic Proper harbour porpoises primarily occur during November-April. Here the bycatch risk is higher, but Baltic Proper porpoises are likely to occur at lower densities than the more numerous Belt Sea population.

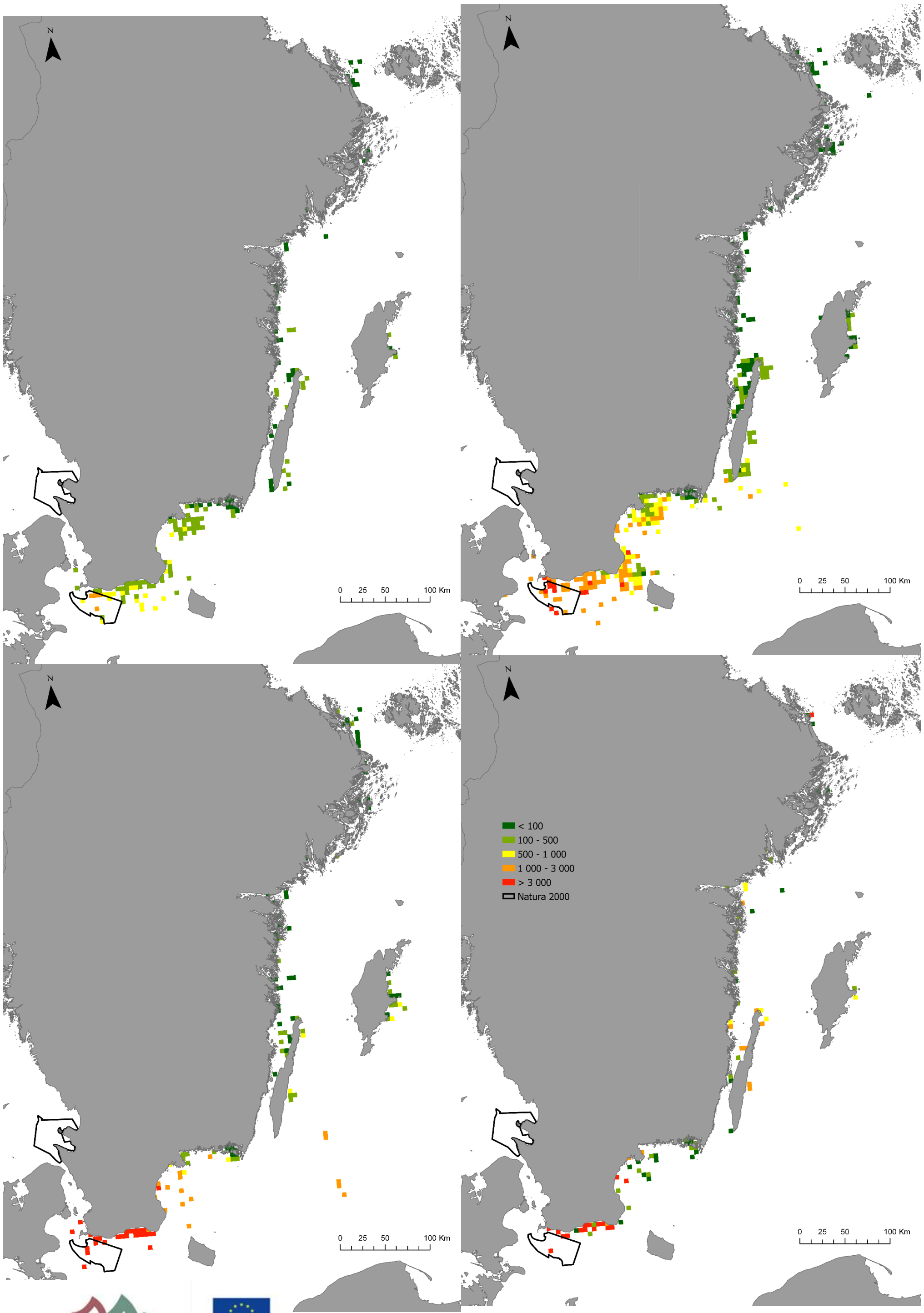


Figure A. Relative bycatch risk estimated as the probability of harbour porpoise detection during May 2011-April 2013 (data from Carlén et al., 2018) multiplied by gillnet fishing effort reported to the Swedish Agency for Marine and Water Management for 2019; top left: Feb-Apr; top right: May-July; lower left: Aug-Oct (gillnet effort data after implementation of cod fishing ban); lower right: Jan (gillnet effort data before the cod fishing ban) and Nov-Dec (gillnet effort data after the cod fishing ban). The maps have been produced within the Helcom Action project (Kindt-Larsen et al., 2020).

Annex 5: Porpoise additional info on acoustics

Additional studies and information on acoustic monitoring of harbor porpoise for the outer Puck Bay, area adjacent to Polish Natura 2000 site Zatoka Pucka i Półwysep Helski (PLH220032), provided after the WKEMBC workshops.

To reduce the risk of bycatch of harbour porpoises in outer Puck Bay, for which historic data show high bycatches, the recent acoustic monitoring data from that area should be taken into account to define proper measures. This data was collected during one year in 2017/2018 by Hel Marine Station, University of Gdańsk - a Polish partner of SAMBAH project.

Acoustic C-POD monitoring was conducted at 25 locations in the Puck Bay. The monitoring was focused on the outer part of the Bay (south-east of the sandy reef) where most cases of bycatch were reported in the 1990s the and highest gillnet fishing effort has been observed. C-PODs were deployed at 20 stations in the outer part and 5 in the inner shallow part. Harbour porpoises were detected during the whole period of investigation on each of the 20 C-PODs in the outer part of Puck Bay showing some variability in time and space (Table A.1 and Figure A.2). No detections were recorded in the inner part of the area.

Table A.1. Number of PPD (Porpoise Positive Day) and PPM (Porpoise Positive Minutes) in all locations in the Puck Bay.

Year	Month	Number of PPD	Number of PPM
2017	10	1	1
2017	11	4	17
2017	12	3	7
2018	1	3	9
2018	2	2	6
2018	3	14	196
2018	4	4	30
2018	5	4	34
2018	6	3	5
2018	7	5	29
2018	8	2	5
2018	9	1	1

The detections were registered both within the Natura 2000 site and outside (Fig.1). The bycatch mitigation measures should be implemented adequately to the fishery effort and presence of harbour porpoises.

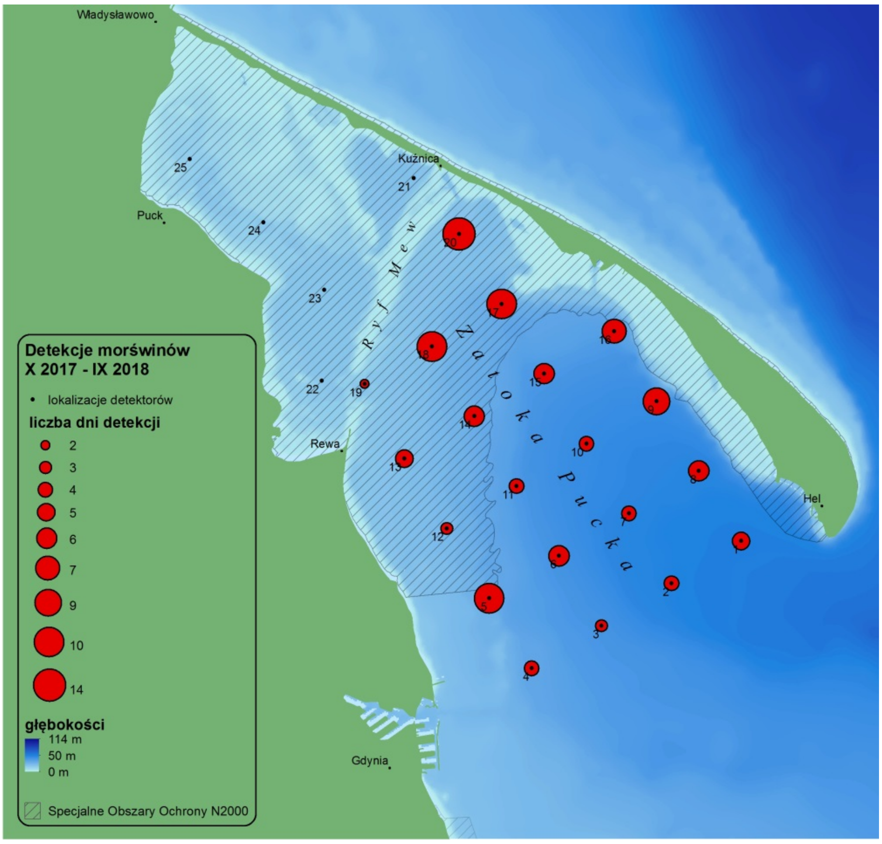


Figure A.2. Numbers of PPD detected in the Puck Bay in period 1 Oct 2017 – 30 Sept 2018 showed by the size of circles. Figures at the circles are the SAM stations numbers. The area of Natura 2000 site inside the Puck Bay is marked with diagonal lines.

Analysis shows that the outer Puck Bay, partly Natura 2000 site, is used by harbour porpoises throughout the year with the majority of detections noticed in spring and summer months. In comparison with the SAMBAH results from other Polish waters the data shows that the Puck Bay is an important area for harbour porpoises (Hel Marine Station IO UG unpublished data).

The SAMBAH project was designed to provide large-scale information on the distribution of harbour porpoises in the Baltic Sea. It only had one C-POD monitoring station at the opening of the Puck Bay, and its results are not suitable for management of smaller areas, such as Puck Bay. It should be noted that at the majority of the monitoring stations in the Puck Bay, the acoustic detection rates were significantly higher than the detection rates at the Polish SAMBAH stations (Table A.2).

Table A.2. Comparison of harbour porpoise detection numbers in Polish part of SAMBAH and Puck Bay in 2017-2018.

Project	whole Puck Bay	outer Puck Bay	Polish SAMBAH area
maximum PPMpD	0,1316	0,1316	0,0722
minimum PPMpD	0,0000	0,0055	0,0016
Mean PPMpD	0,0396	0,0495	0,0157

The outer Puck Bay is a relatively small marine area with observed high gillnet fishing effort (ICES WGBYC report. Closure of static nets in this area, would likely increase fishing effort in bordering areas. Therefore, it is recommended to take the possible fishing effort displacement into account when designing bycatch mitigation measures for this area.x

Annex 6: WGMME 2020 work related to the special request

ToR E responds to a special request to ICES from the European Commission, which in turn derives from two requests for the introduction of Fisheries Emergency Measures directed at reducing bycatch mortality of cetaceans, which were received by the European Commission in July 2019 (European NGOs, 2019 a,b). WGMME and WGBYC have been asked to consider the special request, which will be further considered at an ICES Workshop in April 2020 (WKEMBYC). The two requests refer to common dolphin bycatch in the Bay of Biscay and harbour porpoise bycatch in the Baltic Sea.

The first request refers to common dolphin in the eastern Bay of Biscay. It is stated: "The Northeast Atlantic common dolphin is considered to have an 'Unfavourable-Inadequate' conservation status for the European Atlantic. France, Spain and Portugal all classified common dolphin as having an Unfavourable status, with bycatch in fishing gear being the primary concern. Regional experts, the ICES Bycatch Working Group and ASCOBANS (Agreement on the Conservation of Small Cetaceans of the Baltic, North East Atlantic, Irish and North Seas), have raised repeated concerns about the high and unsustainable level of bycatch, and these concerns have been reiterated by the International Whaling Commission Scientific Committee in 2019, which identified that bycatch threatens the conservation status of the population. More than 100 000 common dolphins may have been bycaught since bycatch was first identified in the 1990s. Common dolphins have been entangled in fishing gear in high numbers for at least 30 years. Most recently, there was a dramatic increase in strandings along the French coastline from December 2018 to March 2019 (Peltier *et al.*, 2019). Only a small percentage of dolphins that become bycaught in fishing gear will wash ashore. Given the Unfavourable status of common dolphins, and the uncertainty about number of populations in this region, this issue requires urgent and decisive action." (European NGOs, 2019a)

The second request refers to Baltic Sea harbour porpoise. It is stated: "The Baltic Sea harbour porpoise is listed by IUCN and HELCOM as critically endangered. Today its geographical range is significantly smaller than what can be [inferred] from historical records, and there are only a few hundred animals left. While pollution and disturbance through underwater noise may be contributing to the population failing to recover, bycatch is the one acute threat causing direct mortalities in significant numbers. Given the small size of the population, the sex ratio and age distribution and the proportion of females potentially infertile due to high contaminant load, there may be less than 100 fertile females in the Baltic Proper. Losing even one of those females could have a devastating effect on the ability of the population to recover or even stay stable at the low numbers of today. Hence, to allow this critically endangered population to recover, bycatch must be reduced to an absolute minimum, ideally to zero. However, to date initiatives from Member States to minimize bycatch are very limited and there are currently no closures of areas for the purpose of protecting the Baltic Sea harbour porpoise. While Sweden has designated as Natura 2000 the main part of the porpoise breeding area in the central Baltic Proper in December 2017, the long and slow process for Member States to agree on joint measures for nature conservation purposes under the Common Fisheries Policy (CFP) is currently risking the survival of the population." (European NGOs, 2019b).

2. Implications of current legislation

Here, we briefly summarise the relevant legislation, its relevant conservation objectives and targets and the obligations specified in relation to monitoring and mitigation, as we understand them. We draw on a summary provided by Kenneth Patterson (EC) as well as material compiled by ICES and by WGMME members. Extracts from legislation shown or highlighted here do not represent full legal obligations and are presented for information and discussion only. The views presented are the views of the authors and do not purport to represent the official views of ICES or the European Commission.

Cetacean bycatch in fisheries is covered by the Common Fisheries Policy (in particular amendments under Regulation 1380/2013), Habitats Directive (Directive 92/43/EEC), Regulation 2019/1241 (which has replaced Regulation 812/2004) and the Marine Strategy Framework Directive (Directive 2008/56/EC). It should also be noted that the US National Oceanic and Atmospheric Administration (NOAA) has requested all countries exporting fish and fish products to the USA to demonstrate that their fisheries do not cause bycatch mortality of marine mammals in excess of what would be permitted in US waters under the Marine Mammal Protection Act.

Regulation 2019/1241: In relation to the special request, this regulation is relevant, because it requests Member States to "take the necessary steps to collect scientific data on incidental catches of sensitive species" and, given "scientific evidence, validated by ICES, STECF, or in the framework of GFCM, of negative impacts of fishing gear on sensitive species", to "submit joint recommendations for additional mitigation measures for the reduction of incidental catches". The relevant objectives of this regulation include: (i) ensure that incidental catches of sensitive marine species, including those listed under Directives 92/43/EEC and 2009/147/EC, that are a result of fishing, are minimised and where possible eliminated so that they do not represent a threat to the conservation status of these species, and (ii) ensure, including by using appropriate incentives, that the negative environmental impacts of fishing on marine habitats are minimized. Its targets include: incidental catches of marine mammals, marine reptiles, seabirds and other non-commercially exploited species do not exceed levels provided for in Union legislation and international agreements that are binding on the Union.

CFP amendments under Regulation 1380/2013: The objectives of this regulation include implementation of "the ecosystem based approach to fisheries management so as to ensure that negative impacts of fishing activities on the marine ecosystem are minimized, and coherence with the Union environmental legislation, in particular with the objective of achieving a good environmental status by 2020 as set out in Directive 2008/56/EC (MSFD). In relation to the NGO request for the introduction of Fishery Emergency Measures, the NGOs refer to CFP Article 11(4) for measures within the Natura 2000 sites for the Baltic Proper porpoise (as a species listed in HD Annex II, i.e. a species for which Natura 2000 sites shall be designated) and to Article 12 for measures for the Baltic Proper porpoise outside the Natura 2000 sites and for the common dolphin. CFP Article 11 concerns "Conservation measures necessary for compliance with obligations under Union environmental legislation". Article 11(1) is applicable to obligations under HD Article 6, which concerns management of Natura 2000 sites. CFP Article 11(5) states: "5. The measures referred to in paragraph 4 shall apply for a maximum period of 12 months which may be extended for a maximum period of 12 months where the conditions provided for in that paragraph continue to exist." CFP Article 12 concerns "Commission measures in case of a serious threat to marine biological resources" and in 12(1) it states: "1. On duly justified imperative grounds of urgency relating to a serious threat to the conservation of marine biological resources or to the marine ecosystem based on evidence, the Commission, at the reasoned request of a Member State or on its own initiative, may, in order to alleviate that threat, adopt immediately applicable implementing acts applicable for a maximum period of six months in accordance with the procedure referred to in Article 47(3).". In 12(3) it states: "3. Before expiry of the initial period of application of immediately applicable implementing acts referred to in paragraph 1, the Commission may, where the conditions under paragraph 1 are complied with, adopt immediately applicable implementing acts extending the application of such emergency measure for a maximum period of six months with immediate effect. Those implementing acts shall be adopted in accordance with the procedure referred to in Article 47(3)."

Habitats Directive (Directive 92/43/EEC): Article 12 requires Member States to establish a system to monitor the incidental capture and killing of animal species listed in Annex IV (which includes all cetaceans). Based on the information gathered, Member States "shall take further research or conservation measures as required to ensure that incidental capture and killing does not have a significant negative impact on the species concerned". Harbour porpoise is listed also in Annex II and as such is a species for which protected areas (Special Areas of Conservation) should be designated.

MSFD (Directive 2008/56/EC): Relevant objectives include: (D1) "Biological diversity is maintained. The quality and occurrence of habitats and the distribution and abundance of species are in line with prevailing physiographic, geographic and climatic conditions" and (D4) "All elements of the marine food webs, to the extent that they are known, occur at normal abundance and diversity and levels capable of ensuring the long term abundance of the species and the retention of their full reproductive capacity". Furthermore, Commission Decision 2017/848, with reference to species of birds, mammals, reptiles and non-commercially-exploited species of fish and cephalopods which are at risk from incidental by-catch, defines the following criteria for Good Environmental Status (GES): "The mortality rate per species from incidental by catch is below levels which threaten the species, such that its long term viability is ensured" (criterion D1C1) and "The population abundance of the species is not adversely affected due to anthropogenic pressures, such that its long term viability is ensured" (criterion D1C2).

Also relevant are ASCOBANS and the OSPAR and HELCOM regional conventions. ASCOBANS has specifically focused on the recovery of the Baltic Proper population with the enactment of the Jastarnia Plan (ASCOBANS 2016). The Baltic Sea States have agreed in HELCOM Recommendation 17/2 to protect the harbour porpoise in the Baltic Marine Area.

In relation to whether Member States are meeting conservation objectives, relevant considerations include whether Member States are taking the necessary steps to collect scientific data on incidental catches of sensitive species and whether the objective of minimizing bycatch mortality (and where possible eliminating it) necessarily requires actions beyond those needed to achieve the objective of maintaining viable populations. Associated questions concern the degree to which a precautionary approach should be followed in the face of incomplete information and the timescale for responses by Member States to fill knowledge/monitoring gaps and introduce mitigation measures.

3. Relevant management units and population size estimates

3.1. Common dolphins in the Bay of Biscay

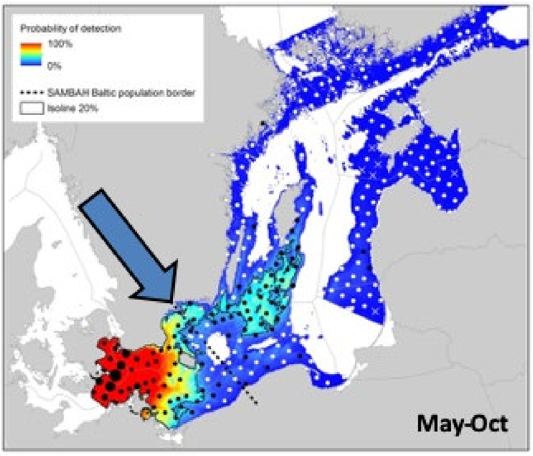
The common dolphin is one of the most abundant cetacean species in European Atlantic waters and the most abundant cetacean in the southern half of the Northeast Atlantic area. The species also occurs in the Mediterranean and Black Sea. These latter animals show genetic differences from the Atlantic population and, indeed, the Black Sea animals have been designated as a separate subspecies. Common dolphins in the Bay of Biscay belong to the European Atlantic Assessment Unit (ICES advice 2014; page 5), itself part of a wide-ranging North Atlantic population. Note, however, that lack of evidence precludes us being certain that there is a single population unit in this area. WGMME therefore considered that the appropriate scale at which to evaluate the population status of common dolphins occurring in the Bay of Biscay, and pressures and threats to this species in this area, is the European Atlantic Assessment Unit.

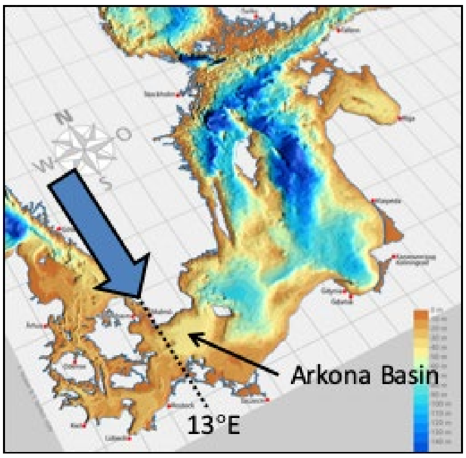
Estimates of abundance of common dolphins in European Atlantic waters are available from the large-scale multinational SCANS-II and CODA surveys in summer 2005 and 2007 (Hammond *et al.*, 2013, CODA 2009) and the SCANS-III and ObSERVE surveys in summer 2016 (Hammond *et al.*, 2017, Rogan *et al.*, 2018). These surveys cover the majority of EEZ waters in the European Atlantic but exclude offshore waters in the Portuguese EEZ. Estimates of abundance have been made for common dolphins, striped dolphins, and also for common and striped dolphins combined, the latter because there are a substantial number of sightings of unidentified common or striped dolphins. Using data from SCANS-III ship, SCANS-III aerial and ObSERVE aerial surveys, the total estimate of common dolphin abundance is 634,286 (CV = 0.307). See Section 5.1 below for a full explanation.

3.2. Harbour porpoises in the Baltic Proper

Genetic studies indicate that harbour porpoises in the Belt Sea/western Baltic are distinct from porpoises in the adjacent Kattegat-Skagerrak and North Sea, while porpoises from the Baltic Proper represent a critically endangered sub-population[9] which is assessed separately by HELCOM. Both genetic and morphological evidence support the recognition of the harbour porpoises in the Baltic Proper as a separate population (Huggenberger *et al.,* 2002; Wiemann *et al.*, 2010; Galatius *et al.* 2012; Lah *et al.*, 2016). Carlén *et al.* (2018) showed a spatial separation in the southern Baltic Sea during the breeding season, interpreted as a separation of the populations, and Sveegaard *et al.* (2015) showed that tagged Belt Sea animals rarely move east of 13.5°E during the breeding season.

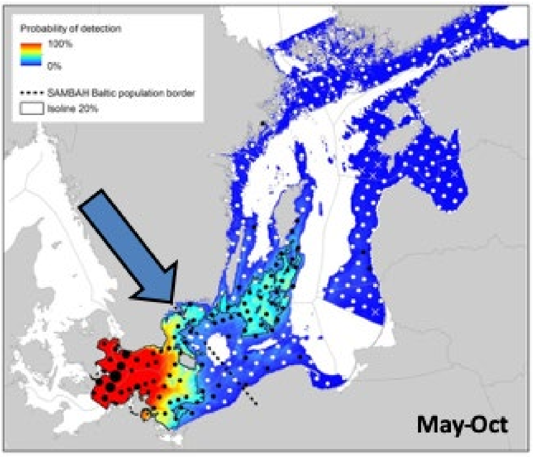
There is limited information on the spatial extent of the Baltic Proper harbour porpoise population over the year. During May-October, a western management border has been proposed based on the seasonal pattern of acoustic detection rates across the Baltic Proper. It follows a line approximately between the Island of Hanö in southeast Sweden to the village of Słupsk in Poland in the southern Baltic Sea (

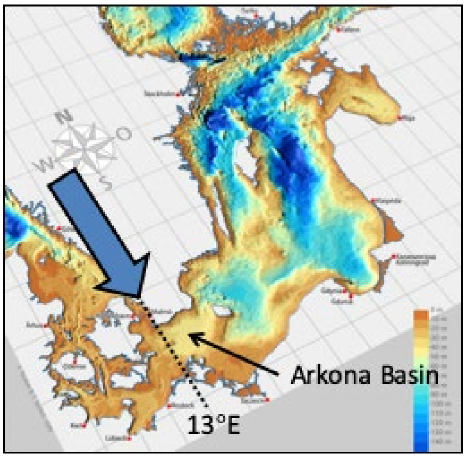




) (Carlén *et al.*, 2018). During November-April, there is no clear spatial separation between the Belt Sea and Baltic Proper populations (

[9] https://www.helcom.fi/wp-content/uploads/2019/08/HELCOM-Red-List-Phocoena-phocoena.pdf





). However, seasonal patterns of acoustic detection rates at monitoring stations in German waters around Rügen, and the abiotic factors explaining these patterns, indicate that Baltic Proper animals move at least as far west as to the offshore waters northeast of Rügen in winter (Gallus *et al.*, 2012). Based on skull morphology, Belt Sea harbour porpoises have been suggested to be adapted to a greater reliance on benthic and demersal prey, and Baltic Proper harbour porpoises to be adapted to feeding more on pelagic prey. Based on the seasonal porpoise distribution patterns at Rügen, the morphological difference between the populations, and the bathymetry of the southern Baltic, showing that the deep waters of the Arkona Basin north of Rügen reach approximately to longitude 13°E to the west) (**Figure 15**), we suggest longitude 13°E as the western management border of the Baltic Proper harbour porpoise population during November-April.

To the north, incidental sightings of harbour porpoises have been reported from the northernmost part of the Bothnian Bay, also during the 2000s. Incidental sightings should be interpreted with caution, but the general pattern shows that porpoises have primarily been sighted south of a line drawn approximately between latitude 60.5°N at the Swedish east coast and latitude 61°N at the Finnish west coast (**Figure 16**), and we therefore suggest this as the northern management border of the Baltic Proper harbour porpoise population.

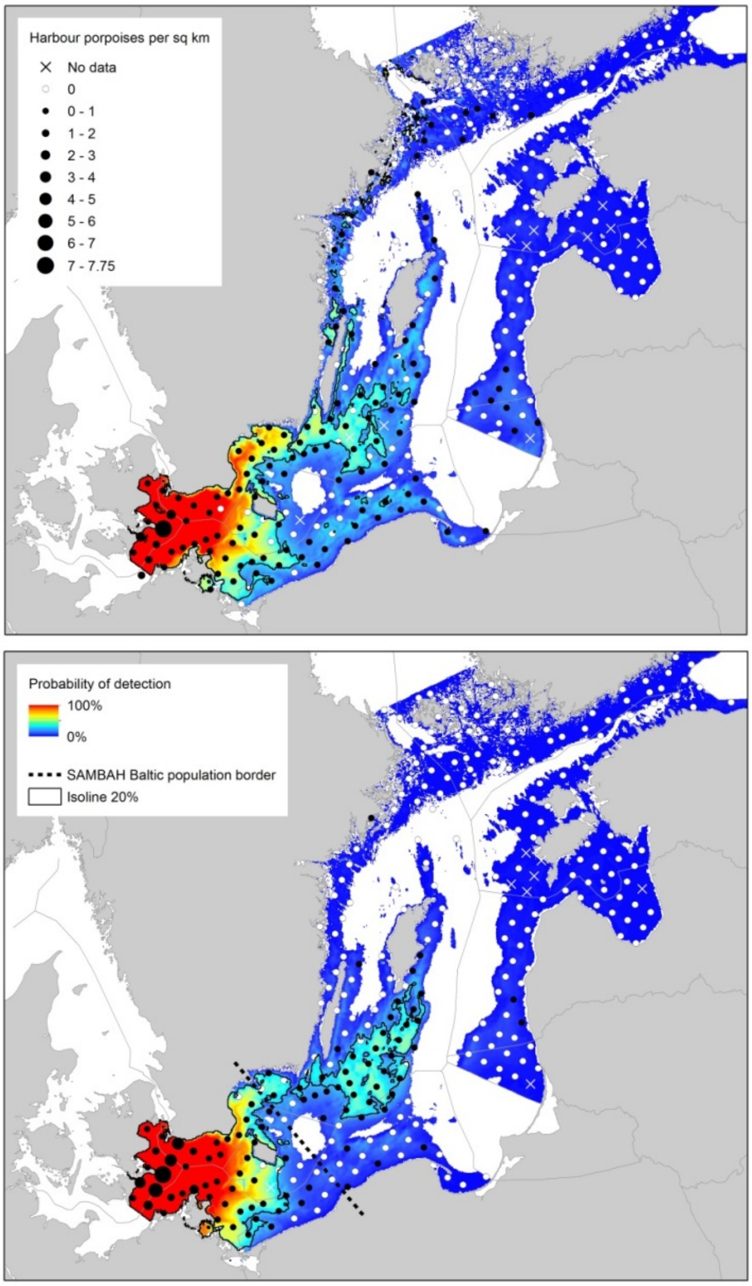


Figure 13. May-October (left) and November-April (right) distribution pattern of harbour porpoises in the Baltic Sea. The dashed line indicates the western management border during May-October.

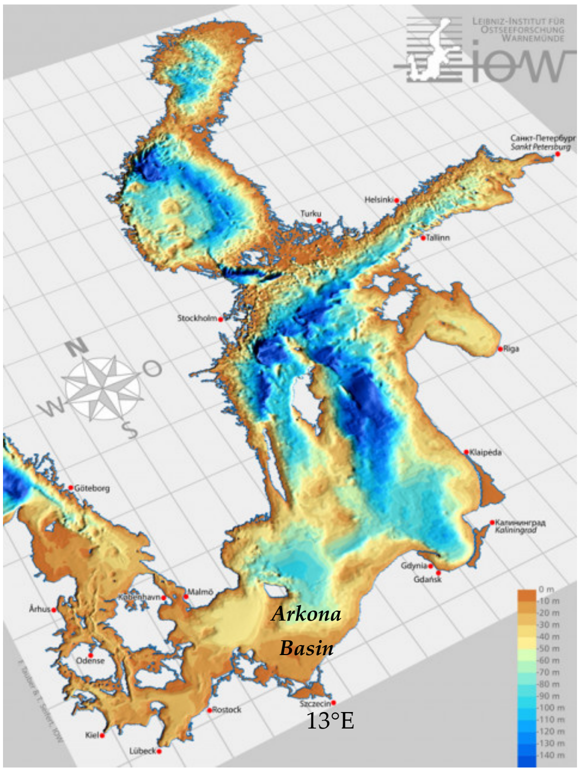


Figure 14. The deep waters of the Arkona Basin (Baltic Sea) reach approximately to longitude 13°E to the west (original map by Seifert *et al.*, 2001).

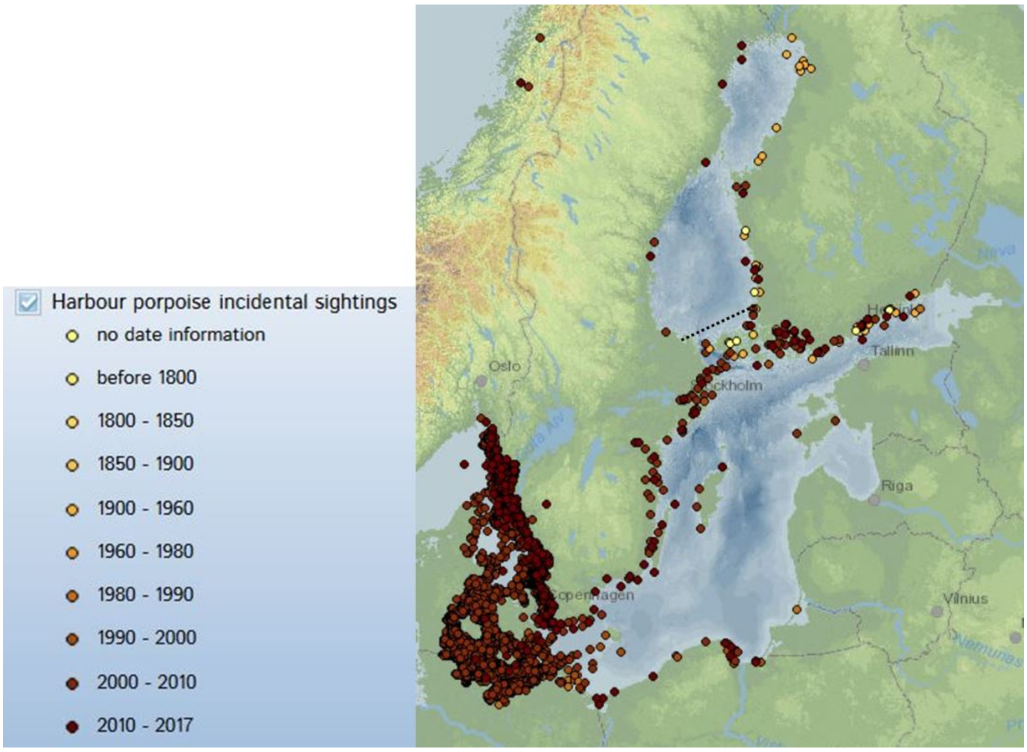
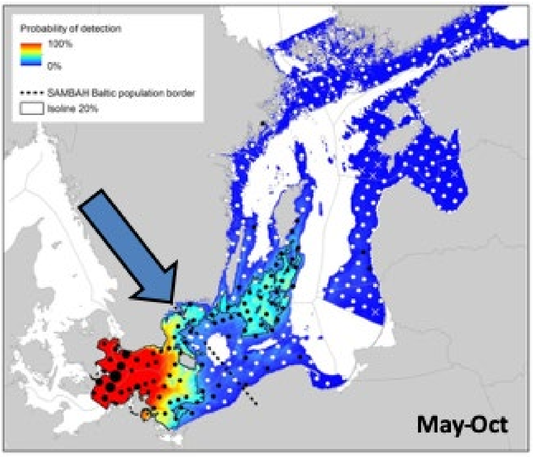
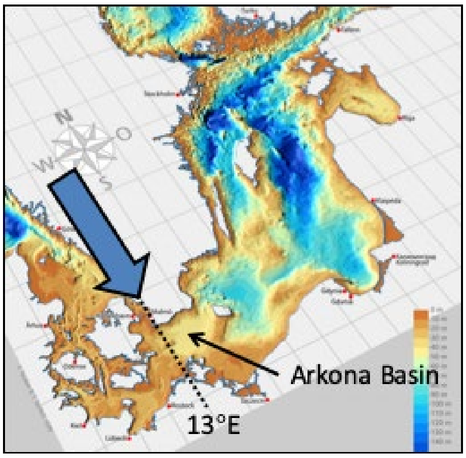


Figure 15. Incidental sightings of harbour porpoises reported to HELCOM (http://maps.helcom.fi/website/mapservice/, accessed 21 February 2020). The dashed line connects approximately between latitude 60.5°N at the Swedish coast and 61°N at the Finnish coast.

During May-October, the highest densities of Baltic Proper harbour porpoises are found around the offshore banks of Hoburg's Bank and the Northern and Southern Mid-Sea Banks south of Gotland. During November-April, the population is more spread out. The detection rates increase along the coasts of the Baltic Proper, although the area around Hoburg's Bank and the Mid-Sea Banks remains important (





). In 2011-2013, the highest overall detection rates were recorded at the Northern Mid-Sea Bank (Amundin *et al.*, in prep.). This pattern has remained at the subset of 10-12 stations monitored in Swedish waters since 2017, indicating that the Northern Mid-Sea Bank is of utmost importance to the population[10].

According to ASCOBANS, "the Baltic subpopulation of the harbour porpoise is of particular concern"11. The abundance of the Baltic Proper population has only been estimated once in a two-year acoustic survey in 2011-2013, resulting in an estimate of 497 animals (CV = 0.42, 95% CI 80-1091) (SAMBAH, 2016).

[10] https://sharkweb.smhi.se/

[11] https://www.ascobans.org/es/species/phocoena-phocoena

4. Available evidence about mortality due to fishery bycatch

4.1. Assessments under the Habitats Directive 2013-2018

4.1.1. Common dolphins in the Bay of Biscay

Common dolphin in the Atlantic Marine Region: for the period 2013-2018, France assessed the status of common dolphin as U1 (unfavourable / inadequate) while the assessment by Spain was XX (unknown). The overall automatic assessment is a mixture of FV (favourable), XX and U1, although it should be noted that all methods of combining the data show FV to be the smallest component[12].

4.1.2. Harbour porpoises in the Baltic Proper

Harbour porpoise in the Baltic Marine Region: all available assessments (by Denmark, Sweden, Germany, Poland) indicate that the status of harbour porpoise in the Baltic is U2 (unfavourable-bad)[13]. Note that, as the Baltic Marine Region probably covers the entire distribution range of the Baltic Proper porpoise, and a part of the Belt Sea porpoise management area, at least Denmark and Germany have reported for this combination, while Sweden has only considered the Baltic Proper population in its assessment.

4.2. Reported bycatch

4.2.1. Common dolphins in the Bay of Biscay

ICES WGBYC (2019) estimated bycatch rates for all marine mammals in the entire WGBYC database (2005-2017) for the Greater North Sea and Celtic Seas Ecoregions and the eastern Bay of Biscay shelf (8a and b). The highest bycatch rates found when the whole WGBYC database (2005-2017) was analysed were those reported for common dolphin, from observations of mid-water trawls in the eastern Bay of Biscay. Overall observed bycatch rates for this period were 0.285 – 0.372 dolphins per day at sea. These rates were, however, lower than the estimated 0.424 – 0.676 dolphins bycaught per day at sea observed, based on the most recent data (2015-2017).

Based on Table 2 in ICES WGBYC (2019), observer coverage of fleets fishing in Biscay ranges from 0.28% to 1.07%. In total, 482 days at sea in Biscay yielded observations of 19 incidents killing a total of 65 common dolphins. This equates to a bycatch rate of 0.134 specimens per observed day at sea, although values for individual fleets range from 0.005 and 0.941. If extrapolated to total effort by all fleets reporting bycatch of common dolphins, this would lead to an estimate of 8904 bycatch deaths (95% CI 3142 – 20026), assuming a binomial distribution of bycatch events and applying the mean number of specimens bycaught per incident. Including data on common dolphin bycatch in other areas (specifically the Greater North Sea and Celtic Seas Ecoregions) would increase the estimate to 9373 (95% CI 3184 – 21956). It is interesting to note that the extrapolation yields bycatch estimates of the same order of magnitude as those obtained from reverse drift modelling of strandings.

Based on abundance surveys in 2016, the best estimate of common dolphin abundance in the European Atlantic is 634 268 individuals. The extrapolated total bycatch in 2017 would be 1.48% of the population (95% CI 0.60% - 3.46%) or 1.40% (95% CI 0.50% - 3.16%) if only Biscay bycatches

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[12] https://nature-art17.eionet.europa.eu/article17/reports2012/species/summary/?period=5&group=Mammals&subject=Delphinus+delphis&region=MATL

[13] https://nature-art17.eionet.europa.eu/article17/reports2012/species/summary/?period=5&group=Mammals&subject=Phocoena+phocoena&region=MBAL

are considered. The population estimate has a CV of 0.307, so the true 95% CI for bycatch mortality would be considerably wider. If we use the "N_min" population size of 492 582, as derived during the PBR calculations in section 5.1 below, bycatch mortality represents 1.90% of the population estimate (95% CI 0.65% - 4.46%) or 1.81% (95% CI 0.64% - 4.07%) if only Biscay bycatches are considered.

The above estimates of bycatch mortality required extrapolation from observation of a very low proportion of fishing activity (at least in those fleets which reported bycatch mortality), and it is apparent that monitoring effort is too low to generate robust estimates. Nevertheless, it is possible that bycatch mortality of Northeast Atlantic common dolphins, a high proportion of which appears to take place in the Bay of Biscay, is unsustainable.

4.2.2. Harbour porpoises in the Baltic Proper

In the 2019 WGBYC report, referring to 2017 bycatch data, the only bycatch of harbour porpoise reported from the Baltic Sea region was from area 27.3.b.23 (i.e. in the Belt Sea), based on observation of 17 days at sea by boats deploying nets, a coverage of 0.7% of the fleet's activity. There were no reported bycatches from the Baltic Proper. The NGO request for fishery emergency measures in the Baltic Sea (European NGOs 2019b) noted that there was little monitoring of fishing effort in the Baltic Proper since Regulation 812/2004 (now replaced by Regulation EU 2019/1241, see above, and ToR C section X.X.X) focused on boats >15 m, whereas most boats deploying gill nets in the Baltic are <15 m. Given the low density of porpoises in the Baltic Proper and the low observer coverage of the fisheries, the lack of recorded bycatches cannot be used to infer that bycatches do not occur or that the level is sustainable.

4.3. Other evidence (e.g. strandings)

Determination of cause of death from stranded animals is highly dependent on how fresh the carcass is, and bycatch numbers inferred from stranded animals are to be considered as an underestimate of the true bycatch numbers.

4.3.1. Common dolphins in the Bay of Biscay

During the last decade, hundreds of common dolphins bearing signs of bycatch mortality have washed up on French Biscay coasts in the first part of the calendar year (see ToR C and previous WGMME reports for details; data for 2017 appear below in **Figure 17**). Reverse drift modelling indicates that the likely area of origin is on the continental shelf in the north of Bay of Biscay (**Figure 18**), an area mainly used by French vessels, but with some activity by the Spanish fleet (see **Figure 19**, based on VMS data). The gears involved include PTM, GNS and VHO targeting bass and hake. The dolphins often had full stomachs indicating that they were feeding around the time of death (Observatoire Pelagis, unpublished data).

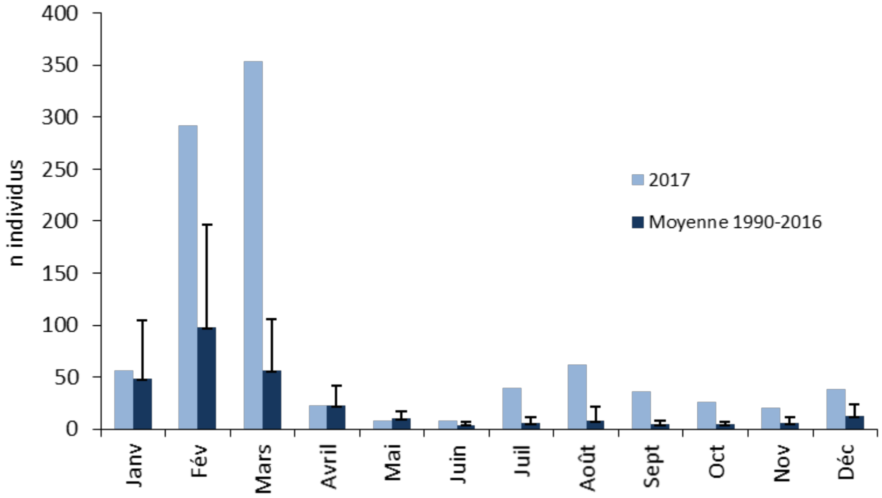

Figure 16. Number of stranded common dolphins by month in the French coast of the Bay of Biscay. Light blue, 2017 stranding; dark blue, median of 1990-2016 strandings (from Dars *et al.*, 2018).

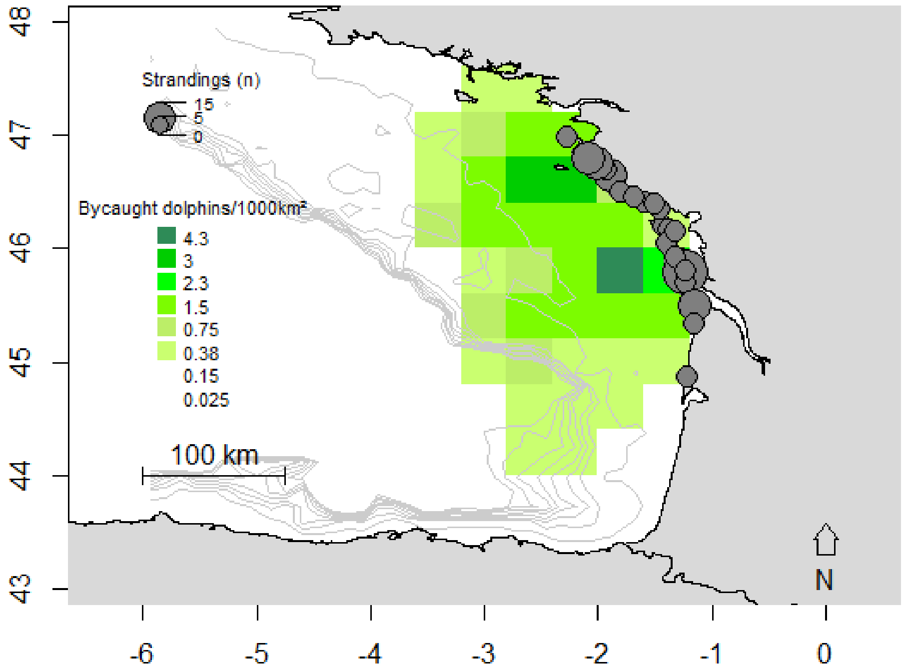

Figure 17. Likely mortality areas in February 2017 of stranded common dolphins (fresh carcasses) with bycatch evidence (see Peltier *et al.*, 2019 for all details)

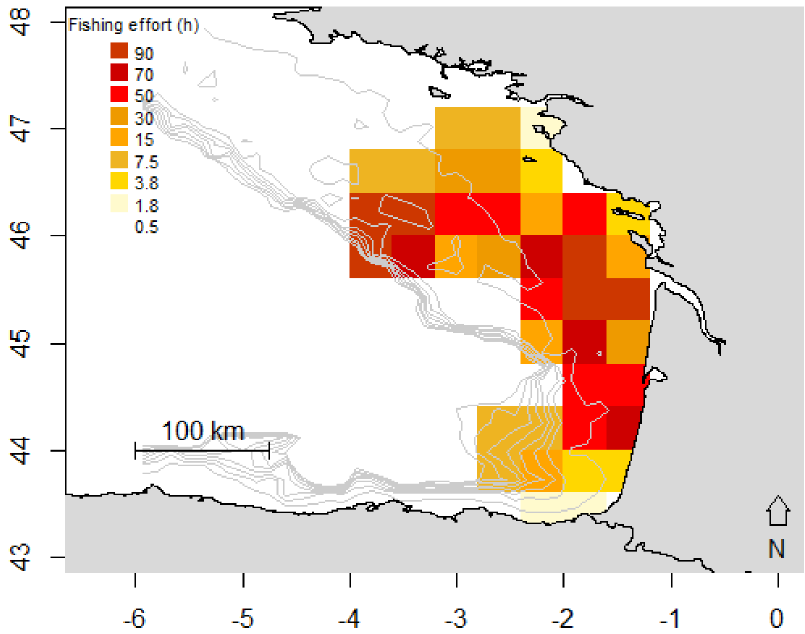

Figure 18. Cumulative Fishing effort (in hours) of Pair Trawlers (PTM) flying a French flag based on VMS data collected in February and March 2019 (see Peltier et al. 2019 for all details)

4.3.2. Harbour porpoises in the Baltic Proper

The NGO request for fishery emergency measures in the Baltic Sea states that the only reported bycatches which can be interpreted as stemming from the Baltic Proper population since 2009 (according to the HELCOM/ASCOBANS harbour porpoise database) were one individual caught in Poland during 2014, and one in 2018. To this can be added one animal that was bycaught in Finnish waters in 2018 but released alive. There are also strandings along the Polish coast, with 14 animals found on Polish beaches in 2018. Records of bycaught or stranded animals in Polish waters are shown in **Figure 20**, copied from Figure 4 in the NGO document. The number of bycaught or stranded harbour porpoises opportunistically reported to or collected by the Swedish Museum of Natural History within the Baltic Marine biogeographic region during 2000-2018 is shown in **Figure 21**. Additional animals may have been collected for necropsy. Five of the animals in **Figure 21** were encountered as bycatches, and one as likely killed by a boat. These six animals were collected during the years 2001-2008, two east of Hanö and four between 13.5°E and Hanö.

For most of the stranded animals, the cause of death could not be determined, but it is likely that at least some of those had been bycaught. The NGO document further notes that while reports of fishery bycatches of harbour porpoises decreased after the introduction of regulation 812/2004, there was a corresponding increase in reported strandings, suggesting that bycatch mortality was in fact continuing (see **Figure 20** below). Given the number of strandings recorded by Poland and Sweden, the minimum bycatch mortality would be 5-10 individuals per year, which would represent an annual loss of at least 1-2% of the best population estimate.

Of the bycatches recorded in the Baltic Proper, 97% or more have been reported to occur in static nets (Berggren 1994, EC-DGMARE 2014, Skóra and Kuklik 2003). 'Static nets' are here defined as in the technical measures regulation (EU 2019/1241), i.e. any type of gillnet, entangling net or trammel net that is anchored to the seabed for fish to swim into and become entangled or enmeshed in the netting. Thereby it includes bottom set nets as well as semi-drift nets (also known as swing nets), floating above the bottom but anchored to the bottom at one end.

	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	20
str	1	2	2	4	5	1	2	5	2	1	4	5	3	5	9	
byc	7	1	1	0	0	0	2	0	0	0	0	1	0	0	0	

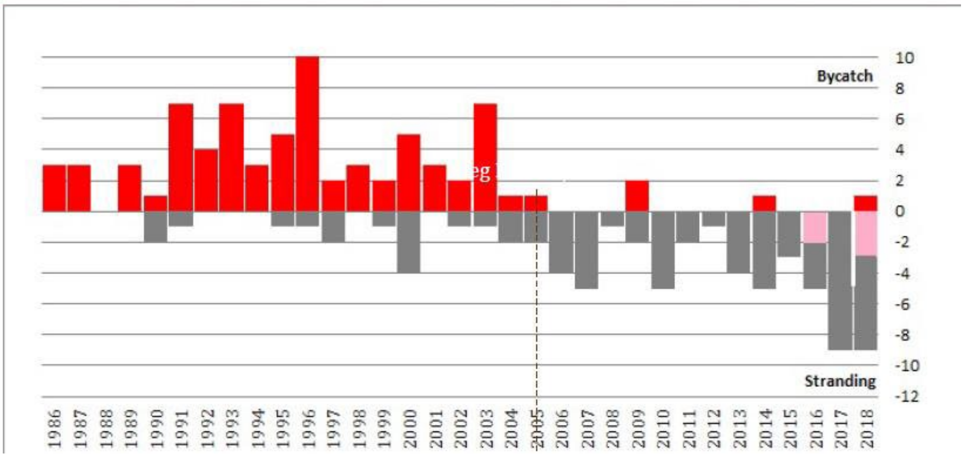

Figure 19. Reported harbour porpoise bycatch and strandings in Poland from 1986 to 2018 (source, NGO 2019b).

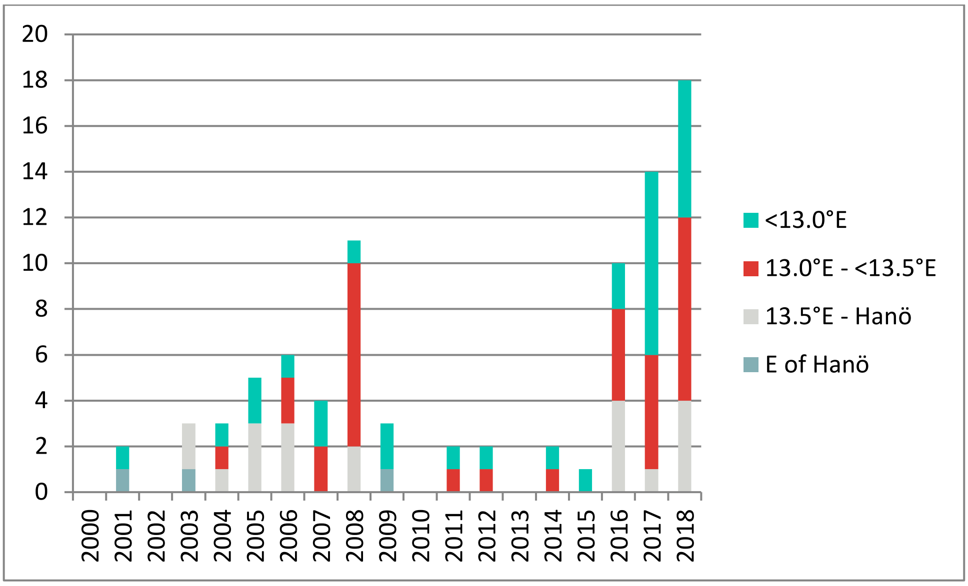

Figure 20. Number of bycaught or stranded harbour porpoises opportunistically reported to or collected by the Swedish Museum of Natural History within the Baltic Marine biogeographic region during the years 2000-2018. Additional animals may have been collected for necropsy. The management range of the Belt Sea harbour porpoise population is proposed to extend to the waters west of 13.5°E in summer although we suggest a management border at longitude 13°E for the Baltic Proper population in winter. The summer management border for the Baltic Proper population is proposed to extend to a line approximately between Hanö, Sweden, and Słupsk, Poland, in summer.

5. Estimates of bycatch numbers in relation to PBR

5.1. Common dolphins in the Bay of Biscay

Common dolphins are widely distributed across the central and eastern North Atlantic (Cañadas *et al.*, 2009; Murphy *et al.*, 2013). In addition to estimates of abundance from the European Atlantic (see below), abundance has been estimated in an area (approximately 370 000 km^2) south of Iceland to be 273 000 (CV = 0.26) from the Faroese NASS in summer 2001 (Cañadas *et al.*, 2009). WGMME (ICES WGMME 2012, section 3.1.1.2 pages 10-11) concluded that there is a single assessment/management unit of common dolphins in the European North Atlantic. Despite the continuous distribution across the North Atlantic, the lack of genetic samples in offshore areas other than the Bay of Biscay led ICES WGMME (2012) to recommend that the assessment/management unit for common dolphins in the northeast Atlantic be confined to European continental shelf and slope waters plus the oceanic waters of the Bay of Biscay. This area is effectively the area covered by SCANS and related surveys (see below).

WGMME has previously reviewed pressures and threats to marine mammal species on a regional basis (ICES WGMME 2019). This indicates that, although other threats (e.g. contaminants) may also be important, the primary pressure on common dolphins in the Bay of Biscay is fisheries bycatch. Accordingly, in responding to ToR e at their 2020 meeting, WGMME did not consider mortality due to other anthropogenic threats, but these should be considered when formulating advice.

Abundance

Estimates of abundance of common dolphins in European Atlantic waters are available from the large-scale multinational SCANS-II and CODA surveys in summer 2005 and 2007 (Hammond *et al.*, 2013; CODA 2009) and the SCANS-III and ObSERVE surveys in summer 2016 (Hammond *et al.*, 2017; Rogan *et al.*, 2018). These surveys cover the majority of EEZ waters in the European Atlantic but exclude offshore waters in the Portuguese EEZ. Estimates of abundance have been made for common dolphins, striped dolphins, and also for common and striped dolphins combined, the latter because there are a substantial number of sightings of unidentified common or striped dolphins. **Table 8** summarises these estimates. Note that no sightings of striped dolphins were made on the ObSERVE surveys in summer 2016.

To calculate an estimate of the total number of common dolphins, estimates of abundance for positively identified common dolphins were corrected to include a proportion of the abundance of common or striped dolphins that were unidentified to species. This was done separately for SCANS-III ship, SCANS-III aerial and ObSERVE aerial surveys, by multiplying the estimate of unidentified common or striped dolphins by the proportion of identified sightings that were common dolphins (e.g. Rogan *et al.*, 2017). This generated a total estimate of common dolphin abundance of 634 286 (CV = 0.307).

French SAMM surveys in the northern Bay of Biscay and English Channel estimated the abundance of common and striped dolphins combined to be 285 000 (CV = 0.23) in winter 2011/12 and 494 000 (CV = 0.17) in summer 2012 (Laran *et al.*, 2017). Of the sightings of these two species, 72% were of common dolphins, 1% were of striped dolphins, and 27% were of unidentified common or striped dolphins. These estimates are therefore likely to be strongly dominated by common dolphins (although in deeper waters of the Bay of Biscay, striped dolphins tend to dominate). These estimates have been included in the OSPAR intermediate assessment in 2017 (OSPAR 2017a).

Bycatch

In 2018, WGBYC undertook a bycatch risk approach (BRA) for common dolphins in the Bay of Biscay and Celtic Sea regions using data on bycatch rate and fishing effort for the period 2015-

16. Total bycatch in 2016 for Subareas 7 (Celtic Sea) and 8 (Bay of Biscay) was estimated to lie within the interval 1760 to 5259 animals (ICES WGBYC 2018). This estimated bycatch was considered in the context of the best estimate of abundance of common dolphins in the Celtic Sea and Bay of Biscay from the SCANS-III surveys in 2016, resulting in a calculated range in mortality due to bycatch of 0.53% to 1.57% of abundance in these areas.

Table 8. Estimates of abundance of common and striped dolphins in the European Atlantic from SCANS, CODA and ObSERVE surveys.

Species	Year	Abundance (CV)	Survey	Source
Common dolphin	2005/07	17 ,485 (0.27)	SCANS-II + CODA	Hammond *et al.* (2013); CODA (2009)
Striped dolphin	2007	61 364 (0.93)	CODA	CODA (2009)
Common + striped	2005/07	306 045 (0.29)	SCANS-II + CODA	Hammond *et al.* (2013); CODA (2009)
Common dolphin	2016	467 673 (0.26)	SCANS-III	Hammond *et al.* (2017)
Striped dolphin	2016	372 340 (0.33)	SCANS-III	Hammond *et al.* (2017)
Common + striped	2016	998 180 (0.18)	SCANS-III	Hammond *et al.* (2017)
Common dolphin	2016	13 633 (0.85)	ObSERVE	Rogan *et al.* (2018)
Common + striped	2016	33 215 (0.415)	ObSERVE	Rogan *et al.* (2018)

WGBYC (2018) also considered estimates of bycatch of common dolphins in the Bay of Biscay based on stranding using the methods of Peltier *et al.* (2016, 2020). The motivation for the development of these methods has been the lack of observer data from which to estimate bycatch in this area. As reported by WGBYC (2018), a review of the methods by the IWC Scientific Committee "highlighted uncertainties in the estimation of immersion level, the probability of being buoyant, the probability of stranding, the time of death and potential sensitivity of this approach to application beyond the Bay of Biscay" (WGBYC 2018, section 5.2 pages 61-63). Nevertheless, using these methods applied to strandings data has generated estimates of bycatch of common dolphins in the Bay of Biscay that are the same order of magnitude as those estimated using observer data (WGBYC 2018, pages 61-62).

WGMME agreed to use the methodology based on strandings (Peltier *et al.*, 2016) to generate estimates of common dolphin bycatch in the Bay of Biscay for the period 1990 to 2019; interval estimates (at the 95% level) are presented in **Figure 22**.

Bycatch also occurs in the Assessment Unit area outside the Bay of Biscay. For Spanish fisheries, there is no dedicated observer programme and no co-ordinated nationwide strandings programme. WGBYC (2018) considered bycatch in fisheries under Spanish flag. No systematic estimates of bycatch are available, but an estimate based on a population model incorporating strandings data suggests that at least several hundred common dolphins could be bycaught each year (Saavedra *et al.*, 2017). Bycatch in UK gillnet fisheries was estimated from observer data at around 240 common dolphins in 2015, but this estimate is likely to be biased high (ICES Advice 2017).

WGMME therefore recognises that the estimates of bycatch from strandings along the French coast of the Bay of Biscay do not include all bycatches of common dolphins in the Assessment Unit area. However, the scale of the estimated bycatch in French waters is likely approximately an order of magnitude greater than other bycatch in the area.

Evaluation of impact of bycatch

To evaluate the impact of bycatch, WGMME focused on estimates of bycatch in relation to estimated abundance in the European Atlantic Assessment Unit. In the absence of defined conservation objectives, WGMME agreed to use the PBR equation (see also ToR C, section X.X.X), originally conceived to generate a level of mortality above which the population may not achieve the conservation objectives of the US Marine Mammal Protection Act (Wade, 1998). According to the simulations used to develop PBR, an annual bycatch no greater than PBR will allow a population to recover to or be maintained at or above 50% of carrying capacity with 95% probability, the US MMPA definition of an Optimum Sustainable Population.

The PBR equation requires an estimate of minimum population size, $N_{\min}$, typically calculated as the 20th percentile of the error distribution of the best available abundance estimate. It also requires values of the maximum rate of increase of the population[14], $R_{\max}$, and a recovery factor, F_r. In the absence of information specific to common dolphins in the European Atlantic, $R_{\max}$ was set at the default value for cetaceans[15] of 4%. The default value of F_r = 0.5 was also used. PBR = 0.5 $\times N_{\min} \times R_{\max} \times F_r$, so, with the above input values, **PBR will be equal to 1% of minimum population size**.

Data on $R_{\max}$ are difficult to obtain. The best information comes from monitoring of populations of whales that are recovering from severe depletion by industrial whaling. Examples of studies that have estimated rates of population growth from such data include humpback whales off eastern South America (7%), Western Australia (10%), West Africa (5%) and West Greenland (9%), bowhead whales off Alaska (4%), and southern right whales off SW Australia (6%) (Bannister unpublished; Givens *et al.*, 2016; Heide-Jorgensen *et al.*, 2012; IWC 2011 (page 29)). The relevance of these estimates is that it would be predicted that the maximum population growth rate of common dolphin populations would be at least as high as for some of these large whale species and that the default value of $R_{\max}$ = 4% used in the PBR calculation is likely to be an underestimate.

Minimum population size, $N_{\min}$, was calculated as the 20th percentile of the log-normal error distribution of the total estimate of common dolphin abundance of 634,286 (CV = 0.307), giving 492 582, from which PBR was calculated as 4926. The PBR thus calculated is therefore 0.78% of the best estimate of population size. This value of PBR is plotted in **Figure 22** to allow comparison with the time-series of bycatch estimates.

Figure 22 illustrates that estimates of common dolphin bycatch in the Bay of Biscay show high inter-annual variability but also show a pattern of increasing bycatch in recent years. Notwithstanding that estimated bycatch was high in 2000 but was then followed by a period of comparatively lower bycatch in the 2000s, the increasing pattern in recent years is a cause for concern. Comparing these bycatch estimates with PBR calculated as described above illustrates that previous bycatch estimates were on average lower than this PBR level but that current estimates (2017-2019) are higher. Removing bycatch in the January-March winter period reduces the estimated bycatch to a small proportion of the total and much lower than the calculated PBR.

[14] Note that PBR calculations use the maximum growth rate, which occurs when population sizes are small, and the life history parameter values will be different from those for a larger population.

[15] Note that $R_{\max}$ is determined by life history and, ideally, species-specific values should be used if available.

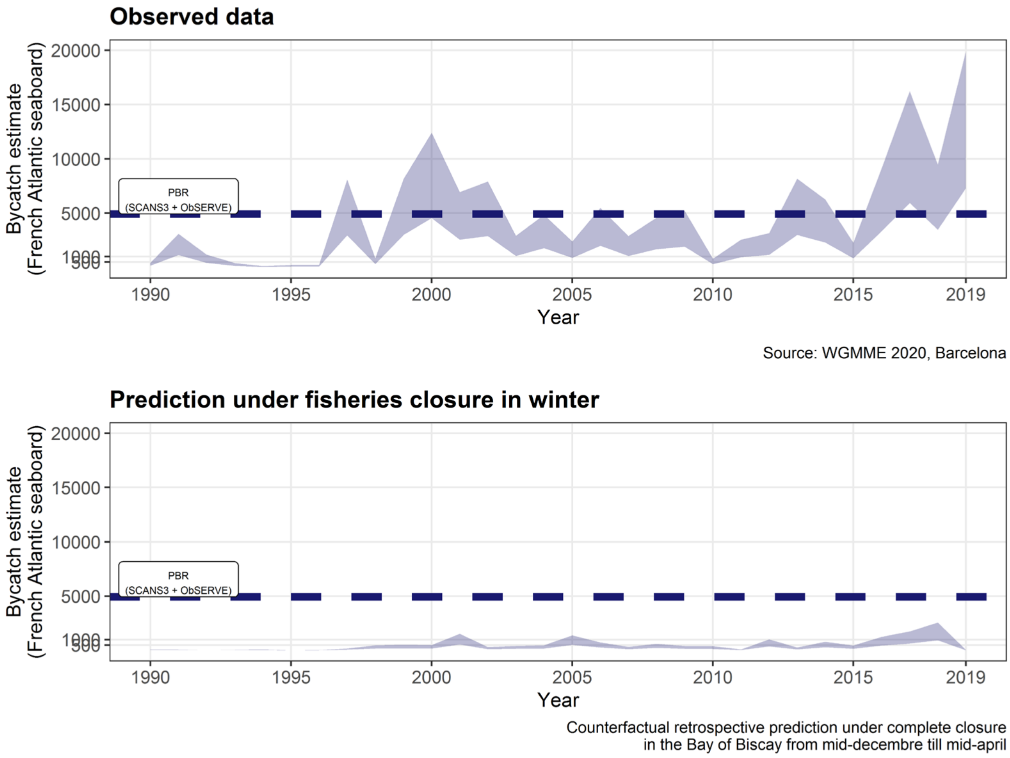

Figure 21. Upper panel: Interval estimates of bycatch of common dolphins in the Bay of Biscay generated from strandings data using the methods of Peltier *et al.* (2016). The dashed line is the value of PBR calculated as explained in the text. Lower panel: scaled interval estimates of bycatch assuming no bycatch in the period mid-December to mid-April to illustrate the effect of a closure of all relevant fisheries during this period.

When considering the estimates of bycatch compared to the calculated PBR, WGMME notes that:

17. The estimates of bycatch calculated from strandings illustrated in Figure 22 are uncertain and possibly biased to an unknown extent;
18. The estimates of bycatch do not include all bycatches in the Assessment Unit area;
19. The conservation objectives to which PBR is tuned are not entirely reflected in the relevant EU legislation (Habitats Directive, Common Fisheries Policy, Marine Strategy Framework Directive);
20. The default value of $R_{\max}$ = 4% in the PBR calculation may be too low for common dolphins;
21. Use of a value of F_r different from the default of 0.5 would change PBR proportionally;
22. Because of these choices for $R_{\max}$ and F_r, the calculated value of PBR is less than 1% of the best estimate[16] of common dolphin abundance (i.e., it is less than 6,343) in the Assessment Unit area. A percentage value higher than this, as frequently considered in Europe as a conservation reference level when evaluating the impact of bycatch and other mortality on cetaceans, would give a higher level of permitted bycatch. For example, 1.7% of the best estimate of abundance (a reference level previously used for total anthropogenic mortality in harbour porpoise) is greater than 10,000 (but the 2017 and 2019 bycatches, as estimated from strandings along the French Biscay coast, may also have exceeded this value).

[16] PBR is computed as a percentage of the minimum abundance estimate, which is taken to be the 20% percentile, assuming a log-normal distribution, of the sampling distribution of the best abundance estimate. It is thus expected that the PBR will be less than 1% of the best estimate in the case of common dolphins, since PBR is computed as 1% of the minimum estimate.

5.2. Harbour porpoises in the Baltic Proper

An IMR/NAMMCO workshop in Tromsø in 2018 carried out an assessment of the status of the Baltic Sea harbour porpoise population in the context of fishery bycatch. Using (i) the abundance estimate from 2011-2013 (SAMBAH, 2016), (ii) bycatch numbers estimated from observed by-catch rates in the Belt Sea porpoise population adjusted for fishing effort and harbour porpoise density in the Baltic Proper, and (iii) a recovery factor of 0.1 (to be used for endangered US stocks of marine mammals), the PBR mortality limit for the Baltic Proper harbour porpoise was estimated to be 0.7 animals per year. Both the estimated bycatch number for 2017 (7 animals) and the minimum bycatch numbers for the years 2000-2012 (average ca 3 animals per year, assuming the same average minimum numbers in 2010-2012 as compiled for 2000-2009) exceed this level. The preliminary conclusion by the workshop was that "the Baltic Sea harbour porpoise population is severely depleted, its abundance is estimated to be declining, and the population is not able to recover given the rate at which by-catch is currently occurring" (North Atlantic Marine Mammal Commission and the Norwegian Institute of Marine Research 2020). However, it should be noted that a subsequent workshop in 2019 concluded that "the Tromsø WS did not have sufficient time to perform in-depth reviews and that further analysis was required to deliver formal assessments for providing management advice" (NAMMCO 2019).

6. Other threats

This section briefly reviews other threats to the two populations, apart from fishery bycatch, providing additional context for the conclusions.

6.1. Common dolphins in the Bay of Biscay

Threat matrices developed by ICES WGMME (2019) for different marine mammal species in each ecoregion, concluded that threat levels for common dolphin in the Bay of Biscay were high only for bycatch and contaminant exposure. Levels of PCBs in the marine environment have long been high in the Celtic Sea and Bay of Biscay, although they have shown some reduction over time (OSPAR 2010, 2017b). PCBs have been shown to negatively affect reproduction in common dolphins (Murphy et al. 2018). Murphy *et al.* (2018) found that 16.8% (18 out of 107) of female common dolphins sampled with reproductive system pathologies were associated with higher blubber ΣPCB lipid concentrations, all above the recognised threshold for the onset of adverse health effects in marine mammals. Cases of reproductive failure were also reported that may be linked to exposure to these endocrine disrupting chemicals.

6.2. Harbour porpoises in the Baltic Proper

ICES WGMMME (2019) developed threat matrices for different marine mammal species in each ecoregion. For harbour porpoise in the Baltic Sea, threat levels were considered high (evidence or strong likelihood of negative population effects, mediated through effects on individual mortality, health and/or reproduction) for bycatch, contaminants, and underwater noise (mainly from seismic surveys, military sonar, and explosions).

Some of the highest levels of PCBs in the marine environment in Europe occur in the Baltic Sea (HELCOM 2010, 2018, ASCOBANS 2016). Harbour porpoises are particularly vulnerable, with evidence of negative impacts on reproduction and health (including immunity to disease) (Jepson *et al.*, 2005, 2016; Murphy *et al.*, 2015). Mean ΣPCB levels in harbour porpoises in the Baltic Proper have ranged from 16-46 mg/kg of lipid (Kannan *et al.*, 1993; Berggren *et al.*, 1999; ASCOBANS 2016).

Seismic surveys and sonar activities have been undertaken over a wide area of the Baltic Proper, largely along the south and east coasts of Sweden, whereas explosions (of military ordinance) have been in a few restricted areas (in the south-west of the basin and off the south coast of Finland) (ICES Impulsive Noise Register, reviewed in Evans and Similå, 2018). Negative responses to sonar have been demonstrated in captive porpoises (Kastelein *et al.*, 2015). So far, only short-term reactions to seismic airguns have been found in porpoises (Thompson *et al.*, 2013; Pirotta *et al.*, 2014), although temporary hearing threshold shift has been found in a harbour porpoise after exposure to multiple airgun sounds (Kastelein *et al.*, 2017).

7. Conclusions

Here we summarise our conclusions about the likely impacts of fishery bycatch in the two cases. Without clearly defined conservation objectives, it is difficult to comment on the appropriateness of proposed management measures. Thus, the validity of our comments about the management measures is contingent on our interpretation of conservation objectives being the correct one. It should be noted that the situation regarding emergency measures differs in the two cases. The NGOs refer to Article 11(4) for measures within the Natura 2000 sites for the Baltic Proper porpoise (as a species being listed in HD Annex II, i.e. a species for which Natura 2000 sites shall be designated), and Article 12 for measures for the Baltic Proper porpoise outside the Natura 2000 sites and for the common dolphin. Within Natura 2000 sites, emergency measures can last for up to 12 months, and may be extended for a further 12 months. Elsewhere, measures can last for up to 6 months, and may be extended for a further 6 months (see section 2 above for further detail).

7.1. Common dolphins in the Bay of Biscay

Common dolphins in the Bay of Biscay belong to a wide-ranging population, of which those animals living in European Atlantic waters are a part. Considering abundance estimates for the entire assessment unit, bycatch estimated from strandings in the Bay of Biscay for the last three years exceeds PBR calculated using default values for R_{max} and F_r; however, estimates of bycatch have wide confidence limits and may be biased to an unknown extent.

The extent of monitoring of fishing fleets in Bay of Biscay is limited and apparently falls short of what is needed under existing legislation. Therefore, the proposal to implement real time monitoring and dynamic mitigation measures seems justifiable. Since, in principle, Fishery Emergency Measures would remain in effect for up to 6 months (although potentially extendable for a further 6 months), to maximize effectiveness they should be introduced in late autumn to ensure that the critical winter period is covered. Closure of the responsible fisheries during December-March would be expected to greatly reduce the threat to population viability posed by bycatch mortality in this area, assuming that the responsible fleets could be identified reliably. However, if the alternative of monitoring + dynamic mitigation is capable of achieving the same goal, it would seem to be the more proportionate approach. As in the case of the harbour porpoise (although arguably the common dolphin population is facing a less severe risk to its viability), due to uncertainties inherent in the data, introduction of such measures would be essentially precautionary.

7.2. Harbour porpoise in the Baltic Proper

The population of harbour porpoise in the Baltic Proper is considered to be critically endangered and its abundance is approximately 500 individuals (497, 95% CI 80-1091; SAMBAH 2016). Information on fishery bycatch of animals in this population is limited; however, based on minimum numbers of bycatches as well as strandings in Poland and strandings and bycatches in Sweden, at least 1-2% of the population may die from bycatch mortality. As pingers reduce, but do not eliminate, bycatches of harbour porpoises (Dawson *et al.*, 2013; Larsen and Eigaard, 2014), and more than 97% of the bycatches in the Baltic Proper have been reported to occur in static nets, a combination of area closures and pinger use within the distribution range of the Baltic Proper harbour porpoise is not considered sufficient to reach the estimated PBR limit of less than one bycatch per year. This limit is only expected to be reached if all fishing with static nets are closed within the seasonal suggested management areas of the Baltic Proper harbour porpoise, i.e. from the border proposed by Carlén *et al.* (2018) during May-October, and longitude 13°E during November-April, to a border drawn from latitude 60.5°N at the Swedish east coast to 61°N at the Finnish coast.

In the absence of accurate data on bycatch rates in all fisheries with static nets, i.e. including nets of all mesh sizes and throughout the population's distribution range, it could be argued that closure of all fisheries would essentially be a precautionary measure unless the overriding conservation objective is to reduce bycatch to zero. However, the small size of this population makes it vulnerable to extinction. There is sufficient evidence to conclude that large-mesh gillnets for e.g. cod and salmonid fish at least within "high-density areas" and areas with documented bycatches are a threat to the population's survival. The additional cumulative threats and pressures such as environmental pollutants and underwater noise underline the need for reducing the bycatches, to increase the population's chances of survival.

The NGOs also propose a closure of all fisheries at the Northern Mid-Sea Bank within the Natura 2000 site Hoburgs bank and Midsjöbankarna (SE0330308), referring to the proposal for the area to be designated as an area without local anthropogenic impacts by the Swedish Agency for Marine and Water Management (Havs-och vattenmyndigheten, 2018). Such a measure may reduce disturbance and improve the local prey abundance, if current fisheries have such an impact. If the current impact is negligible, the measure will ensure this remains the case. As acoustic monitoring during a total of five years during 2011-2020 show that the Northern Mid-Sea Bank is of utmost importance for the Baltic Proper population, the measure may be beneficial to the population and thereby increases its chances of survival.

From a wider perspective, the following monitoring actions would increase the knowledge of the harbour porpoise population, facilitating more precise and efficient conservation actions:

23. National acoustic monitoring following a design that has been optimized Baltic-wide to detect changes in local detection rates, indicative of changes on the population level.
24. Repeated large-scale surveys for estimating trends in abundance.
25. Collection, necropsy and sampling of all stranded and bycaught animals that are in good enough condition for studies of health, reproductive parameters and environmental pollutants east of longitude 13°E.
26. Genetic sampling of all animals within the Baltic Marine Region for analyses of the spatiotemporal distribution pattern of Baltic Proper porpoises.

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Annex 7: WGBYC 2020 work related to the special request

Executive summary

Background to the request

1. **ICES Working Group on Bycatch of Protected Species (WGBYC) were tasked with responding to an additional Term of Reference to *Address the special request from EU on emergency measures bycatch NE Atlantic by;***
    a. *Evaluating pressures and threats due to commercial fisheries by-catches to harbour porpoises in the Baltic Sea and common dolphins in the Bay of Biscay.*
    b. *Evaluating whether the described conservation measures within the request are appropriate.*
2. **WGBYC met in Den Helder, the Netherlands 10th -13th March 2020. Two subgroups were established to tackle the request, one each for the Baltic Sea and Bay of Biscay. Due to a COVID-19 concern, the meeting was cancelled on the afternoon of the 11th March. Subgroups have since endeavoured to work remotely to deliver this report.**
3. **The requirement to monitor bycatch of cetaceans and to put in place measures to mitigate significant impacts is underpinned by several European Directives and Regulations, including the Common Fisheries Policy, Habitats Directive, Marine Strategy Framework Directive and Regulation (EU) 2019/1241 on the conservation of fisheries resources and the protection of marine ecosystems through technical measures.**

Approach

1. **To address the request, WGBYC explored bycatch monitoring data collated in the WGBYC database. These data have been collected historically primarily via at-sea sampling efforts under the Data Collection Framework (DCF). Several issues are recognised with these data for the quantification of some protected species bycatch due to sampling designs and data collection protocols within the DCF being optimised to quantify catches, discards, length frequencies and age distributions of commercially important species rather than protected species bycatch rates. Other data contained within the WGBYC database have been collected through dedicated bycatch observer schemes and Remote Electronic Monitoring which are widely considered to provide more robust protected species bycatch rates for most relevant taxa. Overall monitoring data within the WGBYC database tends to be biased towards larger fishing vessels but in some countries monitoring of smaller vessels has also occurred at reasonably high levels.**
2. **WGBYC monitoring data from 2005-2018 were used to estimate bycatch rates. Associated confidence intervals were calculated using a bootstrap procedure assuming a Poisson distribution. The most recent data, 2016-2018, were raised using fishing effort to provide estimates of mortality for common dolphin. There were no data for harbour porpoise in the Baltic Proper, so bycatch rates from the North Sea, Celtic Sea and Biscay were used to infer high risk métiers.**
3. **Records of bycaught animals from cetacean stranding networks were also used to help understand the scale of the issue. In the Bay of Biscay these data have been used to estimate total bycatch mortality employing the MOTHY model.**
4. **Fishing effort was collated and analysed using the ICES Regional Database (RDB) which holds data from official fishing vessel logbooks (>8m in the Baltic and >10m**

elsewhere). The RDB also holds data for smaller vessels but these tend to be less reliable as data are primarily derived from sales notes. Fishing effort data obtained from Vessel Monitoring System (VMS) (>12m) were also utilised in both regions to explore distribution of fishing effort.

Common dolphins in the Bay of Biscay: evaluation of bycatch

1. **The North-East Atlantic has a single panmictic population of common dolphins. There is some, but limited, evidence to suggest there may be two ecological types inhabiting shelf and offshore waters respectively.**
2. **An assessment unit (AU) in the North-East Atlantic was defined for the purposes of our analyses; this was represented by the boundaries to the SCANS-III and ObSERVE surveys. Abundance of common dolphins in the AU was estimated to be 634,286 (95% CI 352,227 – 1,142,213).**
3. **In the Celtic Seas ecoregion, UK fisheries dominate in Subarea 6 whilst both French and UK fisheries are the main countries fishing in Subarea 7. In the Bay of Biscay (division 8abde)), French fisheries are the most important (93% of the total effort) followed by Spain (6%), and in the Iberian region (division 8c), are the Spanish fisheries (97% of the total effort) although the dominance of either varies depending on the gear, target species and division. Trawlers and static gears are used and common target species include hake (*Merluccius merluccius*), sea bass (*Dicentrarchus labrax*) anglerfish (*Lophius spp.*), sole (*Solea solea*) and megrim (*Lepidorhombus whiffiagonis*)**
4. **In the Celtic Seas ecoregion, highest numbers of dolphins caught were estimated to be in bottom otter trawl (OTB) and gillnet (GNS) fisheries targeting demersal fish, capturing 276[18] dolphins (95% CI 151 - 427) and 192 dolphins (95% 85 – 299 CI) respectively. The total amount of annual bycatch in recent years (2016-2018) across all métiers amounted to 720 dolphins (95% CI 278 – 1,345).**
5. **In the Bay of Biscay and Iberian Peninsula ecoregion, the highest numbers of dolphins caught annually were estimated to be in the trammel net fisheries for demersal fish (GTR_DEF) amounting to 2,061 dolphins (95% CI 1,202 – 3,092). The mean annual bycatch in recent years (2016-2018) across all métiers amounted to 3,973 dolphins (95% CI – 1,998 – 6,599).**
6. **When both ecoregions are combined to represent the North East Atlantic AU, the total number of dolphins bycaught is 4,693 (95% CI 2,276 – 7,944). In 2017 and 2018, the mortality inferred from French strandings in the Bay of Biscay and the Western Channel were respectively estimated at 9,300 (5,800-17,900) and 5,400 (3,400-10,500) common dolphins.**
7. **The calculated Potential Biological Removal (PBR) for the AU was 4,926 animals and therefore, our analyses of WGBYC monitoring data (95% CI 2,276 – 7,944) and strandings data (3,400-10,500 in 2018) both suggest that bycatch is likely exceeding this. Bycatch above the PBR would be expected to negatively affect the population in the longer term.**

[18] All metier specific and ecoregion total bycatch estimates from at-sea monitoring data in this report have been updated due to problems found with the French data in the RDB and WGBYC database. During WKEMBYC, the days at sea fished by the French fleet was revised; the previous values from the RDB were replaced with those directly from France to account for doubling of effort treatment for pair-trawls and the conversion of hours fished to days fished in the RDB both of which had caused inflation. During ADGBYC-1 in May 2020, duplicate submission of observer (and fishing) effort were identified in the WGBYC database which affected estimated rates and total mortality; these have been corrected in this report.

8. **Results[19] from an advanced tool (available here: https://msi-ple.shinyapps.io/mammaltool/) that uses an age structured population dynamics model along with the available bycatch and population dynamics data suggest that with the higher end of estimated bycatch based on at-sea monitoring, the population abundance relative to carrying capacity will be at 61-70% in 50 years due to the impact of bycatch; this is below the ASCOBANS objective of maintaining carrying capacity at 80% or above in the long term.**

Common dolphins in the Bay of Biscay: evaluation of measures

1. **NGOs proposals for emergency measures to reduce bycatch were centred on closures of relevant fisheries in the North East Atlantic but as a minimum, the pair trawl and gillnet fisheries.**
2. **The data that WGBYC have available to them, show that pelagic pair trawls for demersal fish in quarter 4 of the Bay of Biscay have high bycatch rates, but do not contribute the largest proportion to the overall annual mortality. A closure of the fishery would contribute to a reduction in bycatch of common dolphin, but the spatial extent would need to be carefully defined to ensure redistribution of fishing effort did not also result in high bycatch.**
3. **The highest mortality was estimated in trammel nets; the level of bycatch in gillnets is likely underestimated in our analyses due to bias in sampling (to larger vessels and pelagic trawls) and difficulties for observers to distinguish between gillnets and trammel nets at sea. The proposal of a 4-month winter closure (December – March) is possibly relevant for larger GNS and GTR vessels targeting demersal species.**
4. **The utility of the "move-on" or "night-setting" procedure could not be concluded due to limited literature in support of the proposal and lack of empirical data on which to base an assessment of their merit.**
5. **Although NGOs did not consider the use of pingers or other gear modifications, a more recent study carried out in the Bay of Biscay on three midwater pair trawl teams in winter 2018 highlighted a common dolphin bycatch reduction of 65% with the use of pingers (DDD-03). Alternative technical measures should be considered as part of the Workshop on Emergency Measures Bycatch (WKEMB).**

Harbour porpoise in the Baltic: evaluation of bycatch

1. **The population of harbour porpoise in the Baltic Proper is critically endangered with its abundance estimated at approximately 500 individuals (497, 95% CI 80-1091; SAMBAH, 2016).**
2. **Bycatch events of the Baltic Proper harbour porpoise are extremely rare due to their low abundance and monitoring effort is also low.**
3. **A Potential Biological Removal (PBR) limit for the Baltic Proper harbour porpoise was estimated to be 0.7 animals per year. WGMME (2020) estimates the minimum bycatch mortality to be 5-10 individuals per year, which would represent an annual loss of at least 1-2% of the best population estimate**
4. **In the Baltic Sea (ICES Areas 24 – 32), fishing effort is dominated by gillnets accounting for up to 75% of fishing effort (in DaS) from the ICES RDB in 2017. Set gillnets are widely used both in offshore fisheries targeting cod, flatfish, and herring and in**

[19] The value of the input parameters, MNPL and bycatch range were updated on the basis of reviewer's comments ahead of the ADGBYC-1 in May 2020 and on the basis of the updated bycatch estimates (see footnote on previous page), respectively.

coastal fisheries exploiting a large variety of species, including cod, flatfish, herring, whitefish, pikeperch, perch, and pike. Basin-wide, commercial fishing effort has declined since 2004.

5. **Analyses of WGBYC monitoring data confirmed that the highest bycatch rates for harbour porpoise occurred in gillnet or trammel net fisheries (GNS or GTR) in the North Sea and the celtic Seas ince 2005. In The Bay of Biscay in 2016 to 2018 midwater pair trawls (PTM) had the highest bycatch rates. However, it is reasonable to conclude that gillnet and trammel nets are the gears that poses the greatest threat to the harbour porpoise in the Baltic.**
6. **However, harbour porpoises are also caught in bottom and midwater otter trawls (OTB, OTT and OTM) as well as in midwater pair trawls (PTM). No harbour porpoises were observed bycaught in passive gears such as longlines and pots (LLS, LHM and FPO).**
7. **Based on RDB data, gillnet fishing effort is mainly concentrated in the southern Baltic, and around the German and Polish coasts. The cod ban introduced in August 2019 has significantly reduced the amount of gillnet effort in the southern Baltic. In the Baltic overall, gillnet fishing effort has decreased by 44% over the past 10 years.**

Harbour porpoise in the Baltic: evaluation of measures

1. **The most important Natura 2000 sites for harbour porpoise in the Baltic are: *Hoburgs Bank och midsjöbankarna*; *Pommersche Bucht-Rönnebank*; *Wolin i Uznam* and *Ostoja na Zatoce Pomorskiej and Zatoka Pucka i Półwysep Helski.***
2. **However, fishing effort within these sites is low and so whilst closure of fisheries within them would reduce bycatch risk to some extent, it is unlikely to make a significant contribution to the improvement of the population status.**
3. **The SAMBAH acoustic monitoring project has identified other higher porpoise density areas, out with Natura2000 sites that coincide with higher gillnet fishing effort; this should be considered further as part of the Workshop on Emergency Measures Bycatch (WKEMB).**
4. **Pingers cannot eliminate bycatch, but they have been shown to reduce bycatch rates in gillnets by 50-80% in operational fisheries compared to nets without pingers. Wide-scale use of pingers will decrease bycatch and thereby have a significant effect on the population. However, other factors such as habituation and noise pollution should be taken into consideration.**
5. **Most of the Natura 2000 sites suggested in the Annex are small and cover mainly coastal areas. However, if these areas could be considered as interconnected with an area in between (not designated for harbour porpoise) these would form a rather large area within which measures could be taken. Since there is considerable fishing effort with static nets in this area and an elevated harbour porpoise abundance compared to the Baltic Proper then by reducing the effort in this area will likely have a significant positive effect on the population.**
6. **The NGOs propose 100% coverage of gillnet fishing effort to observe bycatch over almost the entire Baltic Sea. WGBYC conclude that this is very ambitious or even impossible and could not be implemented within the six-month time window of the measures. It is also questionable whether the resource needed justifies the end given the rarity of porpoise bycatch events.**
7. **However, in the event of closures, the compliance of fishermen, and possible changes to their behaviour (fishing effort and/or methods) would be needed.**

1 ToR G: Address the special request from EU on emergency measures [for cetacean bycatch] in NE Atlantic

1.1 Introduction

Following a submission from 26 European environmental non-governmental organisations (NGOs) to the European Commission (DG MARE) concerning the introduction of emergency measures to mitigate bycatch of common dolphins in the Bay of Biscay and harbour porpoises in the Baltic Sea, ICES was asked to provide advice. ICES were asked to review the impacts of bycatch on the conservation status of these cetacean species and also consider whether proposed emergency measures were appropriate in the context of relevant European legislation. The e-NGO submission consisted of two Annexes:

Annex I: Fisheries Emergency Measures for the North East Atlantic short-beaked common dolphin in the Bay of Biscay.

The NGOs note:

"The common dolphin is facing ever-increasing anthropogenic pressures in the Northeast Atlantic, the most significant of which is bycatch (ASCOBANS, in prep.; Fernández-Contreras et al., 2010; Mannocci et al., 2012; Deaville, 2015; Peltier et al., 2016). Common dolphin interactions with fisheries were first identified in the early 1990's (Tregenza et al., 1997; Tregenza and Collet, 1998). Peltier et al. (2017) calculated that since 1997 between 3,600 and 4,700 dolphins were bycaught per year on average. Peak years were 2001 and 2003, with more than 8,500 animals estimated bycaught yearly in fishing gear. These estimates, based on strandings data, demonstrate an unsustainable level of bycatch (Peltier et al. 2017).

ICES (2018) advises that the total common dolphin bycatch in mid-water trawls and in static nets in subareas 7 and 8 (Celtic Seas and Bay of Biscay) in 2016 was likely to have been between 153 -904 and 1607 - 4355 individuals, respectively. Combined, these figures represent approximately 0.5% and 1.6% of the common dolphin population present in the two subareas. The upper estimate for subarea 27.8 (2.0%) exceeds the (unprecautionary) threshold of 1.7% of abundance. This short-term threshold limit, set by ASCOBANS, is supposed to prevent population level impacts. The number of common dolphin bycatches reported in the literature for the Iberian Peninsula during recent years seems to exceed 1.7% (Saavedra et al., 2017, reported in ICES, 2018). The results from bycatch assessments using cetacean strandings show comparable numbers of bycaught common dolphin (ICES, 2018b)".

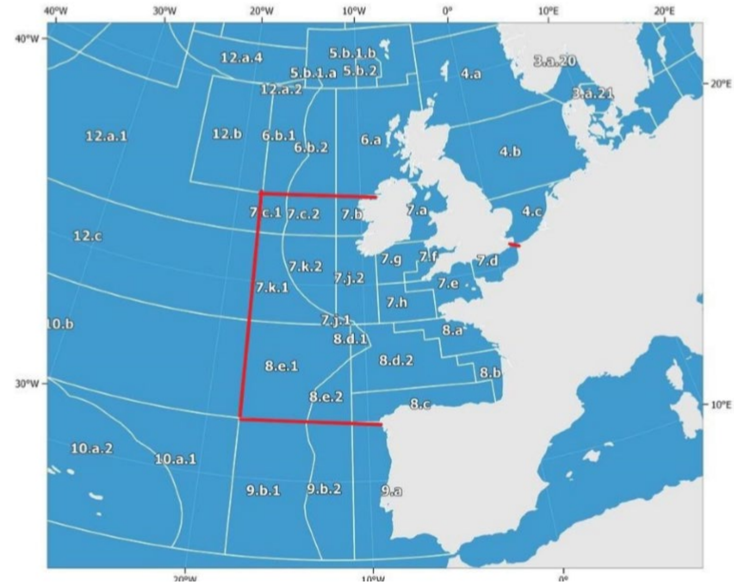


Figure 22 ***ICES fishing areas in North East Atlantic (subareas 4 to 12).*** **Note the "red boundary" was defined in the NGO Annex; WGBYC have interpreted it to be the main area of interest with regards to the introduction of measures as described in the NGO document.**

The e-NGOs request "*that the European Commission take emergency measures based on Article 12 of the Common Fisheries Policy, and with reference to Article 12 of the Habitats Directive. We ask that the European Commission takes the necessary measures to 1) close the fisheries that are responsible for the common dolphin bycatch in the North East Atlantic between the beginning of December 2019 and the end of March 2020, including, ad minima, the pair-trawl and the gillnet fisheries and 2) implement real time monitoring and dynamic mitigation measures on a permanent basis, as per the recommendations of the IWC Scientific Committee advice*".

Annex II: Fisheries Emergency Measures for the Baltic Sea harbour porpoise.

The e-NGOs note:

"the Baltic Sea harbour porpoise is listed by IUCN and HELCOM as critically endangered.[…] The Baltic Sea harbour porpoise is susceptible to bycatch in different types of gillnet fisheries, mainly surface set nets for salmonids as well as bottom set nets for cod and flatfish. Driftnets formerly used for salmonids had significant harbour porpoise bycatch. These nets were banned in 2008 by EC regulation 812/2004, but a form of semi-drift nets (also known as swing nets) are still used, and there is concern that these are still causing significant bycatch of harbour porpoises, e.g. in Polish waters (see Fig. 4 for total number of bycatches and strandings in Poland during the last decades). There is also significant bycatch occurring in German Baltic waters, but it is very likely that the large majority of these animals belong to the Belt Sea population rather than the Baltic Proper population".

The e-NGOs request "*that the European Commission take the necessary emergency measures to 1) completely close all fisheries on the Northern Midsea Bank within the Swedish Natura 2000 area "Hoburgs bank och Midsjöbankarna", 2) close all gillnet fisheries in the rest of the Swedish Natura 2000 area "Hoburgs bank och Midsjöbankarna" and in all Natura 2000 areas east of 13.5°E where the harbour porpoise is listed as present, based on Article 11(4) of the CFP, until site-specific assessments has been made of the impact of use of Acoustic Deterrent Devices (ADDs), as well as, 3) require mandatory use of ADDs outside of Natura 2000 areas in the entire range of the Baltic Proper harbour porpoise population, i.e. east of 13.5°E, 4) require accurate data collection, monitoring and reporting in the whole Baltic Sea and 5) require monitoring and mitigation measures for gillnet fisheries, based on Article 12 of the CFP".*

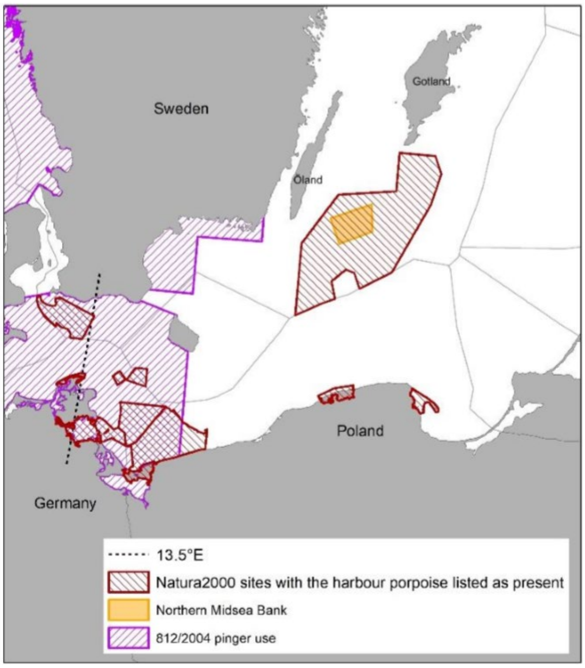


Figure 23 Proposed measures for the protection of the Baltic population from bycatch. All fisheries would be closed within Northern MidSea Bank and gillnet fisheries closed in all SACs east of 13.5°E. Pingers should be used in other areas.

The ICES response was to have two expert working groups (Marine Mammal Ecology [WGMME] and Bycatch of Protected Species [WGBYC]) to consider the e-NGO submission and prepare a scientifically robust evidence base to support ICES advisory process. The outputs from both WGs would be considered at a workshop (Emergency Measures Bycatch [WKEMB]) which would formulate *recommendations* (?) for the ICES Advice Drafting Group.

Specifically, the Term of Reference for WGBYC was to:

Address the special request from EU on emergency measures bycatch NE Atlantic by;

- *i) Evaluating pressures and threats due to commercial fisheries by-catches to harbor porpoises in the Baltic Sea and common dolphins in the Bay of Biscay.*
- *ii) Evaluating whether the described conservation measures within the request are appropriate.*

WGBYC met in Den Helder, the Netherlands 10th -13th March 2020. Two subgroups were established to tackle the request, one each for the Baltic Sea and Bay of Biscay. Due to a COVID-19 concern, the meeting was cancelled on the afternoon of the 11th. Subgroups have since endeavoured to work remotely to deliver this report.

1.2 Relevant legislation

Several European Regulations and Directives are relevant to the request:

1.2.1 Regulation (EU) No 1380/2013 of the European Parliament and of the Council of 11 December 2013 on the Common Fisheries Policy (CFP)

The scope of the CFP *includes the conservation of marine biological resources and the management of fisheries targeting them.* Under Article 2 it states that the CFP *shall ensure that fishing and aquaculture activities are environmentally sustainable in the long-term and are managed in a way that is consistent with the objectives of achieving economic, social and employment benefits, and of contributing to the availability of food supplies.*

Its contribution to the protection of the marine environment will be achieved through *the sustainable management of all commercially exploited species, and in particular to the achievement of good environmental status by 2020, as set out in Article 1(1) of Directive 2008/56/EC of the European Parliament and of the Council (2)* (Marine Strategy Framework Directive).

Under Article 12, it states that *on duly justified imperative grounds of urgency relating to a serious threat to the conservation of marine biological resources or to the marine ecosystem based on evidence, the Commission, at the reasoned request of a Member State or on its own initiative, may, in order to alleviate that threat, adopt immediately applicable implementing acts applicable for a maximum period of six months in accordance with the procedure referred to in Article 47(3).*

1.2.2 Regulation (EU) 2019/1241 of the European Parliament and of the Council of 20 June 2019 on the conservation of fisheries resources and the protection of marine ecosystems through technical measures (TCM)

Article 3(2) sets out how technical measures will contribute to objectives of the Regulation, including to *ensure that incidental catches of sensitive marine species, including those listed under Directives 92/43/EEC* [….] *that are a result of fishing, are minimised and where possible eliminated so that they do not represent a threat to the conservation status of these species.*

Article 4 concerning targets goes on to state that *bycatches of marine mammals, marine reptiles, seabirds and other non-commercially exploited species do not exceed levels provided for in Union legislation and international agreements that are binding on the Union*.

Article 3 (2) also states that the Regulation will contribute to c) ensure, including by using appropriate incentives, that the negative environmental impacts of fishing on marine habitats are minimised; (d) have in place fisheries management measures for the purposes of complying with Directives 92/43/EEC [Habitats Directive], [..] and 2008/56/EC [MSFD], in particular with a view to achieving good environmental status in line with Article 9(1) […]

When this Technical Conservation Measures Regulation came into force Regulation 812/2004 of 26.4.2004 laying down measures concerning incidental catches of cetaceans in fisheries was repealed. However, the requirements for mitigation measures in certain fisheries and for monitoring set out in Regulation 812/2004 (Annexes I and III) have been largely transposed into Annex XIII of the TCM.

1.2.3 Directive 2008/56/EC of the European Parliament and of the Council of 17 June 2008 establishing a framework for community action in the field of marine environmental policy (Marine Strategy Framework Directive)

Article 9(1) states that *Member States shall, in respect of each marine region or subregion concerned, determine, for the marine waters, a set of characteristics for good environmental status, on the basis of the qualitative descriptors listed in Annex I.* Bycatch is a pressure on marine biodiversity and was therefore considered by many Member States as an indicator for Descriptor 1 on Biological Diversity. With the publication of the Commission Decision (EU) 2017/848 of 17 May 2017 assessments of bycatch by Member States are now a requirement against the criteria "*The mortality rate per species from incidental by-catch is below levels which threaten the species, such that its long-term viability is ensured*." Furthermore, the decision requires MS to establish the "threshold values" (levels or limits) for the mortality rate from incidental by-catch per species, through regional or sub-regional cooperation.

1.2.4 Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora (Habitats Directive)

Of particular relevance to cetaceans, are the provisions set out in Article 12 for the strict protection of Annex IV species throughout their natural range from*: (a) all forms of deliberate capture or killing of specimens of these species in the wild; (b) deliberate disturbance of these species, particularly during the period of breeding, rearing, hibernation and migration; […] (d) deterioration or destruction of breeding sites or resting places*. Specific to bycatch, 12 (4) states that *Member States shall establish a system to monitor the incidental capture and killing of the animal species listed in Annex IV (a). In the light of the information gathered, Member States shall take further research or conservation measures as required to ensure that incidental capture and killing does not have a significant negative impact on the species concerned.* The definition of what constitutes a significant negative impact is not defined but given the overall objective of the Directive, we understand that this is an impact that would negatively affect the Conservation Status of the species concerned. The Conservation Status of a species means: *the sum of the influences acting on the species concerned that may affect the long-term distribution and abundance of its populations […] The conservation status will be taken as 'favourable' when: — population dynamics data on the species concerned indicate that it is maintaining itself on a long-term basis as a viable component of its natural habitats, and — the natural range of the species is neither being reduced nor is likely to be reduced for the foreseeable future, and — there is, and will probably continue to be, a sufficiently large habitat to maintain its populations on a long-term basis.* Bycatch has the potential to impact the conservation status of cetaceans through effects on population dynamics.

It also noteworthy that Article 2 (3) of the Directive States that *measures taken pursuant to this Directive shall take account of economic, social and cultural requirements and regional and local characteristics.*

1.2.5 WGBYC interpretation of the legal context

WGBYCs interpretation of the legislation with regards to the request from the Commission is presented here; WGBYC caveat this with the fact that there is no legal expertise within the group. Likewise, WGBYC cannot assess the socio-economic impacts of any measures as this is also beyond the expertise within the group.

The relevant legislation all has conservation objectives couched in the need to ensure the viability of populations and maintenance/achievement of a favourable/good conservation and environmental status. The CFP and Habitats Directive allude to the balance required between achieving their conservation objectives whilst taking account of economic, social and cultural requirements and safeguarding the supply of fish for consumers. If bycatch is deemed a serious threat to the conservation of marine ecosystems, then the Commission (or a Member State) may move to use implementing acts enforcing fisheries "emergency measures". With these requirements in mind, WGBYC interprets the need for the group to evaluate the evidence available to it and establish whether bycatch poses a serious threat to the conservation status of common dolphin in the Bay of Biscay and harbour porpoise in the Baltic.

The level of bycatch which constitutes a "serious threat" can be informed by the use of thresholds. Legislation which specifically requires setting of thresholds , such as MSFD and the TCM implies that the use of thresholds should be employed to manage (reduce through the introduction of measures) levels of bycatch. The thresholds per se are not necessarily the levels at which mitigation measures must be introduced; but for the purposes of this report, this is how WGBYC has contextualised them. The use of a bycatch threshold (see 1.4.5) to demarcate the levels which threaten population viability and potentially conservation status, enables us to compare estimated mortality levels for the populations of concern and conclude whether or not mitigation measures are necessary.

1.3 Approach and limitations

Since 2018 ICES have issued a formal annual data call to obtain information on fishing effort, monitoring effort and bycatch events of protected species. Prior to this, data were collated either through an informal data call from WGBYC or extracted directly from Member States annual reports submitted under Regulation 812/2004. Since 2005 WGBYC has maintained an international database of protected species bycatch information. The format of the data requested annually by WGBYC has evolved over time as data and reporting requirements have altered and expanded, and consequently combining data across years and formats is labour intensive. However, a dataset spanning 2005-2018 was available to support the work carried out under this ToR. The bycatch monitoring data contained in the WGBYC database are from a variety of sampling programmes (see 1.3.2), but predominately from the Data Collection Framework (DCF). A smaller component of the data is from Protected, Endangered and Threatened Species (PETS) bycatch monitoring programmes using dedicated bycatch observers and/or Remote Electronic Methods (REM). Sampling designs and data collection protocols (particularly within the DCF) are not always optimal for quantifying PETS bycatch and monitoring coverage of relevant métiers is often quite low.

Similarly, there are several different sources of fishing effort data. For the work undertaken in this report, WGBYC utilised data held in the ICES Regional Database (RDB) and VMS data. There is no "perfect" dataset on fishing effort and each has data type its limitations (see 1.3.1) All fishing effort data was used in accordance with ICES Data Policy.

WGBYC build on the information that WGMME have prepared (WGMME *2020*).

1.3.1 Fishing Effort: Data sources and limitations

1.3.1.1 ICES Regional Database

The RDB is a regionally coordinated database platform for the coordination of monitoring sampling programmes at regional level under the DCF and for fisheries assessments. The database covers fisheries in the North Atlantic Ocean, the North Sea and the Baltic Sea. It addresses fishery management needs related to the European Union Common Fisheries Policy. Since 2012 the RDB has been hosted and maintained by ICES for the preparation and analysis of commercial catch, landings and fishing effort data received from the cooperating countries.

Much of the data submitted to the RDB is taken from official fishing vessel logbooks (or more recently e-logs) for vessel sizes where logbooks are mandatory (>8m in the Baltic if vessel has a cod quota and >10m elsewhere or in Baltic without cod quota). Effort and catch information from smaller vessels, which are not required to fill in logbooks, are generally derived from sales notes and these tend to provide a less reliable source of information, particularly in relation to fishing effort by small scale fleets and spatial accuracy.

1.3.1.2 Vessel Monitoring System (MS)

The European Commission (EU) decided to require automatic monitoring of fishing vessels in 1997, which was implemented aboard all fishing vessels >24 m in overall length in 2000 (Commission Regulation (EC), 1997), >18 m in 2004 (Commission Regulation (EC), 2003), >15 m in 2005 and > 12 m in 2010 (Commission Regulation (EU) 1224/2009). VMS data therefore represents only the fishing effort of larger vessels (>12m), which represent a low proportion of European fishing vessels by numbers (e.g. 27% of the French fishing fleet in 2016 (SIH-Systeme d'Informations Halieutiques)). In addition, there are exceptions for the 12-15 fleet segment for this requirement. For this fleet segment, if the duration of the trips in less than 24 hours and they´re fishing in National waters, it´s not mandatory to have installed neither the VMS nor the electronic logbooks. This leads to that in the case of some MS the proportion of vessels without VMS is still higher (e.g. Spanish fleet).

VMS location data are converted into fishing effort data on the basis of assumed vessel activity. Vessels are considered to be in transit if the mean speed was >4.5 knots and are considered to be fishing if the mean speed was <4.5 knots. The activity was unknown when speed was 0 or when the time interval between two locations exceeded 6 hrs. Non-fishing operations are removed from the VMS dataset (Leblond et al., 2008). The algorithms used to identify fishing effort in hours consider all fishing vessel types in the same way: the interpretation of actual net fishing effort has to be carefully considered, and is more related to the setting and hauling times (soak duration) rather than fishing effort based in simple speed rules. Moreover, false-positive results (where vessels were travelling at "fishing" speeds but were not actually engaged in fishing) cannot be detected, although it is unlikely that this occurs often (Bertrand et al., 2008; Gerritsen and Lordan, 2011). VMS data from different métiers are often standardized as kw per hours of fishing or similar.

VMS data came from two sources: the ICES VMS 2019 data call and for the French fishing effort data, relating to landings, were provided by the French Institute for Marine Research and Exploitation (IFREMER) and the Directory of Marine Fisheries and Aquaculture (DPMA), from the Ministry in charge of Agriculture.

1.3.2 Bycatch Monitoring: Data sources and limitations

1.3.2.1 Data Collection Framework (DCF)

WGBYC has historically used data provided by EU Member States (MS) through annual reports submitted under Council Regulation 812/2004 as the primary source of information for calculating cetacean bycatch rates. Regulation 812/2004 required the implementation of dedicated bycatch monitoring programmes but largely due to cost constraints most MS shifted to using existing DCF at sea sampling programmes to provide broadscale data on protected species bycatch but not always from the relevant métiers as prescribed under Regulation 812/2004.

Sampling designs and on-deck sampling protocols under the DCF (Council Regulation (EC) No. 199/2008) at sea sampling programmes are optimised to quantify catches, discards, length frequencies and age distributions of commercially important species and there is generally a heavy focus on sampling of demersal towed gears which are associated with relatively high commercial discard rates but are not perceived to pose a significant threat to cetacean populations. Sampling of static nets and to a lesser extent midwater trawls, which have relatively higher impacts on cetaceans, is generally at a lower level because these métiers are not considered as significant in terms of commercial discard levels.

The on-deck sampling protocols may also not be optimal for quantifying PETS bycatch: for example, there may be no specific requirement for observers to monitor or even record incidents where mammals, birds or turtles may fall from gear during hauling operations; or specimens are discarded before reaching the observer's work area; or where there is a very low probability of recording very rare fish species due to sampling routines that only consider small fractions of the total catch. Additionally, national onboard sampling schemes often only sample a small fraction of the total fishing effort within a fleet, further reducing the likelihood of observing relatively rare events such as bycatches of PETS.

In addition, until recently the collection of PETS information was not mandatory for observers to record if they observed such an occurrence. However, this doesn´t mean that different institutes observers were not collecting bycatch data although it should be recognised that it was not the main priority as it is in the case of dedicated bycatch programmes. For this reason, PETS data collected under the previous DCF at sea observer programmes needs to be analysed with some caution and checked how the protocols were implemented by the observers in relation to PETS bycatch data collection. With the entry into force of the current DCF (Regulation (EU) 2017/1004) in 2017, the collection of PETS data when observers are onboard is mandatory and some adjustments to sampling protocols (but not necessarily sampling designs) are being implemented from 2020 which should improve the reliability of DCF data for PETS bycatch quantification.

MS have begun to implement new protocols in the at sea observer programmes following the advice from some ICES Experts Working Groups (WGBYC, WGCATCH) which prepared guidelines and this will improve the quality of the data if the recommendations are implemented accordingly. However, sampling effort within the new DCF is still focused heavily on towed gears (e.g. trawlers) with low effort in static gears.

In addition, in 2018 ICES organized a Workshop (WKPETSAMP, ICES 2020) to summarize the information on MS sampling schemes, including Data Collection Framework (DCF) at sea-sampling programmes, dedicated bycatch monitoring programmes and directed bycatch studies, in which bycatch data was obtained. The inventory developed at the workshop describes when the various programmes/surveys started, what kind of monitoring it is, what the main objective of the programme is, where it takes place, what fishery it covers, the sampling design of the programme, sampling intensity and how data is stored, along with some expert judgement on the perceived importance of these fisheries compared to other fisheries in relation to the bycatch of birds, mammals, rare fish species, elasmobranchs and reptiles. This information is very important when considering the results of analyses using bycatch data collected under each of these programmes.

1.3.2.2 At-sea data collection: visual and digital data collection

At-sea data collection on bycatch can be gathered in a number of different ways, including by trained scientific observers, either in dedicated bycatch programmes or in catch sampling programmes, self-sampling by fishers themselves, or by electronic monitoring (EM).

Independent observations made by trained and experienced dedicated bycatch scientific observers are the most reliable and useful means of collecting data on PETS bycatch. Dedicated observers monitor all parts of the fishing process and record detailed information on bycatch of any protected species. However, while dedicated observer programmes focused on collecting bycatch data are the most effective way to collect bycatch data, they can be expensive, especially in fisheries where protected species bycatch is rare. Monitoring of bycatch as part of discard or fishery research programmes (i.e. non-dedicated scientific observers) can be used to assess bycatch levels, however, research has shown that historically such programmes are likely to significantly underestimate bycatch rates (ICES 2019). Non-dedicated observers are not focused on the collection of PETS bycatch data under these programmes and have other priorities that could impact on their ability to carry out effective bycatch monitoring. Nonetheless, this is widely employed by individual countries as reported data, if recorded appropriately, can be expected to be of reasonably high quality and can thus provide an opportunity to extrapolate observed bycatch events to the entire fishery or fleet to produce mortality estimates. With this type of sampling, the collection of information on whether all parts of the fishing process were actually monitored for incidental bycatch is crucial and allows the identification of full or partially observed hauls with true zero bycatch.

Electronic monitoring (EM) technologies are more complex than observer monitoring programmes, consisting of multiple closed-circuit television cameras, a variety of sensors including Global Position System (GPS), winch rotation and hydraulic pressure, all connected to a video and data storage box. The technology is designed to operate autonomously and continuously while a fishing vessel is at sea, and with the exception of the initial purchasing and installation of equipment, may be more cost effective over the long-term than observer monitoring. In addition, significant coverage levels can be achieved improving detection of rare bycatch events.

However, it should be noted that large conspicuous protected species such as cetaceans are more readily detected and correctly identified than bycatch events of smaller animals such as seabirds or some rare fish. However, unlike dedicated observer programmes which can monitor all aspects of the fishing operation, EM cameras tend to focus on only the hauling part of operation, although they can be placed at other locations if necessary. In addition, while EM programmes run independently at-sea, they may require expensive equipment, expert installation and maintenance, and post-survey data analysis, and all of these elements need to be taken into account when calculating the full costs of such systems.

Self-sampling by fishers is a cost-effective method of collecting bycatch data and has been employed by a number of countries (ex. Bærum *et al* 2019; Luck *et al* 2020). Sampling and data collection methods are similar to the system used by non-dedicated scientific observers during at-sea sampling programmes. However, data from this source require examination as the reliability of this method is questionable. To ensure data quality and reliability, training for crew is vital and validation of data through comparison with a small number of on-board observers or alternative sources of information is needed. An important issue in self-sampling programmes is the need for incentives for fishermen to participate. If there are no incentives it is likely that motivation drops, data quality may decrease, and cooperation will probably decrease over time.

1.3.2.3 Strandings data collection

For many decades, strandings have been the most important source of information on the natural history of marine mammals. Today, other monitoring techniques have developed and improved their efficiency; but strandings still remain the main source of biological samples and determination of cause of death for many protected species.

As a result of their comparatively low cost per unit effort, strandings data can be collected across wide spatial and temporal ranges and at fine resolution. But because the geographical origin of a sample is not accessible and sampling is mostly opportunistic in nature, the ecological relevance of strandings is often disputed. Nevertheless, it is commonly acknowledged that stranded animals represent a minimum measure of at-sea mortality (Epperly et al., 1996).

Theoretically dedicated on-board bycatch observers are the most direct and reliable tool to monitor protected species mortality. However in some European countries, technical and administrative constraints have hindered the capacity to capture the whole phenomenon (Benoît and Allard, 2009). Although in most cases strandings are not able to inform about precisely if a fishery is involved, and if markings from fishing gears are present, which fishery is involved, they can at least provide mortality estimates at large spatiotemporal scales, across national jurisdictions and independently of vessel size, flag and regardless of the willingness of the fishing industry to carry observers (Peltier et al., 2016).

Assessing the conservation status of small cetacean populations on the basis of abundance estimates and observer programs alone remains difficult for a variety of reasons. So other sources of information such as mortality estimates inferred from strandings are valuable parameters to be considered jointly in population assessments.

1.3.2.4 The use of different datasets

Several different datasets were available and were used to provide different parameters in order to assess the NGO request (**Table 9**). Fishing effort data were obtained from the RDB, from VMS data prepared and stored by ICES, and a combination of VMS and landings data (for France). Data on monitoring levels and numbers of bycaught specimens were obtained from the WGBYC database which holds data from long-term and widespread dedicated bycatch monitoring and DCF catch sampling programmes, as well as from more focussed bycatch research efforts. Bycatch rate calculation and extrapolated estimates were therefore carried out using a combination of WGBYC and RDB datasets. The low temporal resolution and aggregation level of information contained in these datasets can restrict fine scale descriptions of fishing practices using these datasets.

VMS data are collected at a finer resolution but only on vessels above 12 metres (around 20% of European fleet by number). Therefore, fisheries operating in NE Atlantic were described using both datasets: RDB data for vessels under 12 metres and VMS data for vessels above 12 metres.

For the French fleet in the Bay of Biscay, the fishing effort related to landed species was also available.

Strandings were used as an additional dataset to provide independent mortality estimates and another insight of potentially lethal interactions between common dolphins and fishing effort in Bay of Biscay.

Table 9 Matrix to summarise how fisheries and bycatch monitoring data were coupled in the WGBYC analysis

Fishing effort sources	-Description	Bycatch monitoring sources and use	
		WGBYC and RDB	Strandings
RDB	-Log book data and sales notes -Fishing effort description <12m NE Atlantic -Fishing effort description ICES 8c	-Bycatch rates -Total mortality estimates	-
VMS	-Location and activity data from Vessel Monitoring System - Fishing effort description >12m NE Atlantic	-	-
VMS + landed species	- Log book data and sales notes ; VMS -Fishing effort description >12m ICES 8ab	-	- Correlations between mortality areas inferred from strandings and fishing effort ICES 8ab for ICES8

1.4 Evaluating pressures and threats due to bycatch of common dolphins in the Bay of Biscay

1.4.1 Overview of abundance, distribution and population structure

The common dolphin is one of the most numerous cetacean species in the Northeast Atlantic (Murphy et al., 2019). It is also widely distributed but the range is not fully understood; it includes at least Macaronesia (off Northwest Africa) in the south extending north to the Faroe Islands and southern Iceland and spanning westward at least to the mid-Atlantic ridge (40°W) (Cañadas et al., 2009; Lawson et al., 2009). Its range includes oceanic and continental shelf waters, although it occurs in only small numbers east of the UK in the North Sea and adjoining seas, including the Eastern English Channel (Waggitt et al., 2019).

Genetic evidence suggests that common dolphins in the Northeast Atlantic form a single panmictic population; they are a separate population from those in the Northwest Atlantic and Mediterranean Sea (Westgate, 2007; Evans & Teilmann, 2009). ICES WGMME (2014) supported an earlier proposal from an ASCOBANS workshop (Evans & Teilmann, 2009) that the entire north east Atlantic range of common dolphins should be treated as a single management unit (MU). Within the MU, tentative evidence suggests that there may be separate ecological stocks inhabiting the neritic and oceanic waters of the northeast Atlantic (Lahaye et al., 2005; Caurant et al., 2009).

For the purposes of this report, the boundaries of the Northeast Atlantic "Assessment Unit" (AU) are defined by those of the SCANS-III (Hammond et al., 2017) and ObSERVE surveys (Rogan *et al.*

2018) as these provide the most recent summer abundance estimates and greatest coverage of the population (**Figure 25**). Previous ICES advice (2014a) recommended that OSPAR Regions II, III, and IV (**Figure 25**) should be considered one AU; however, there are gaps in abundance estimates for this area in offshore waters of the Iberian Peninsula. The SCANS-III survey in July 2016 estimated common dolphin abundance in the entire survey area to be 467,673 animals (95% confidence intervals 281,100 – 778,000). An additional 13,633 common dolphins (CV = 0.85) in Irish waters was estimated from the ObSERVE surveys in summer 2015 (Rogan *et al*. 2018). These recent estimates contrast with those from surveys almost a decade previous (July 2005 and 2007) when the abundance of common dolphins was estimated to be 174,485 (CV 0.27) in an area comparable to SCANS-III. The results from these surveys suggest that over this time period there has likely been an influx of dolphins into the European Atlantic area of the AU at least, potentially from oceanic waters. Available abundance estimates within the AU are summarised in **Table 10**.

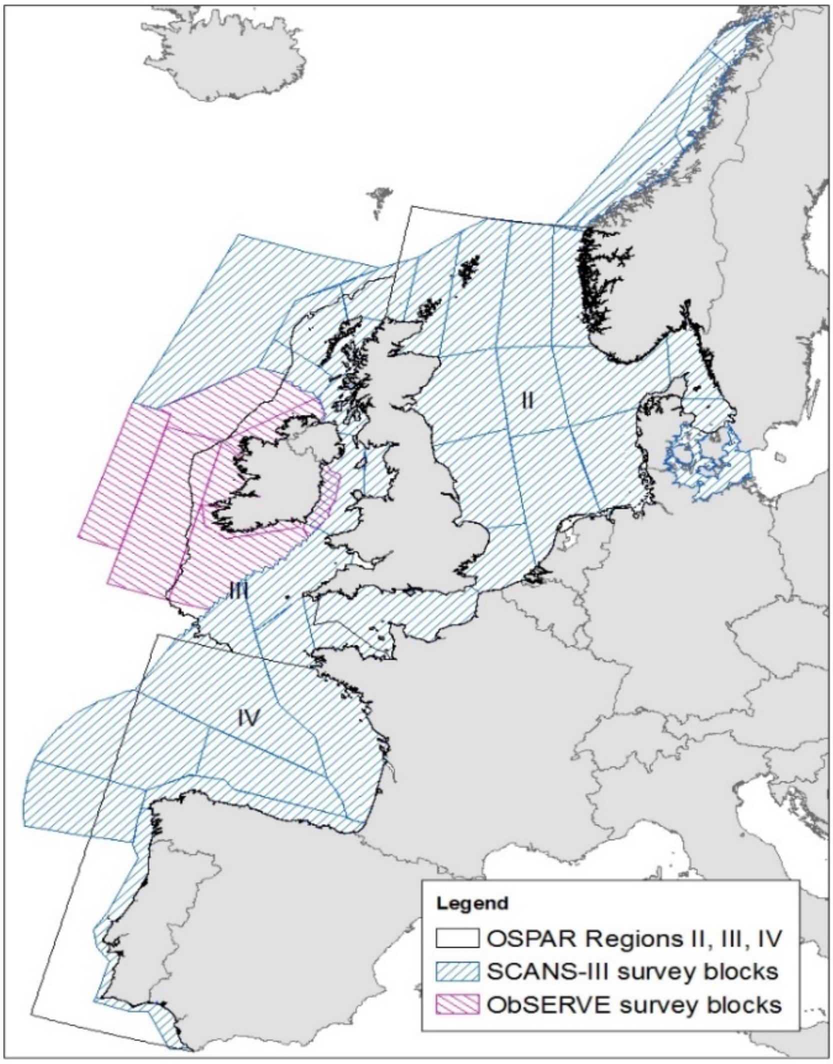


Figure 24 SCANS-III and ObSERVE surveys areas that approximate the North East Atlantic Assessment Unit for the purposes of this report. OSPAR Regions depict the AU proposed by ICES Advice (2014a)

Model-based abundance estimates have been determined for common dolphin by year for the Bay of Biscay and indicate an overall increase in numbers between the 1990s and the 2010s (**Figure 26**). The actual values should be considered provisional as a sensitivity analysis has yet to be undertaken, but this is unlikely to affect the observed trend.

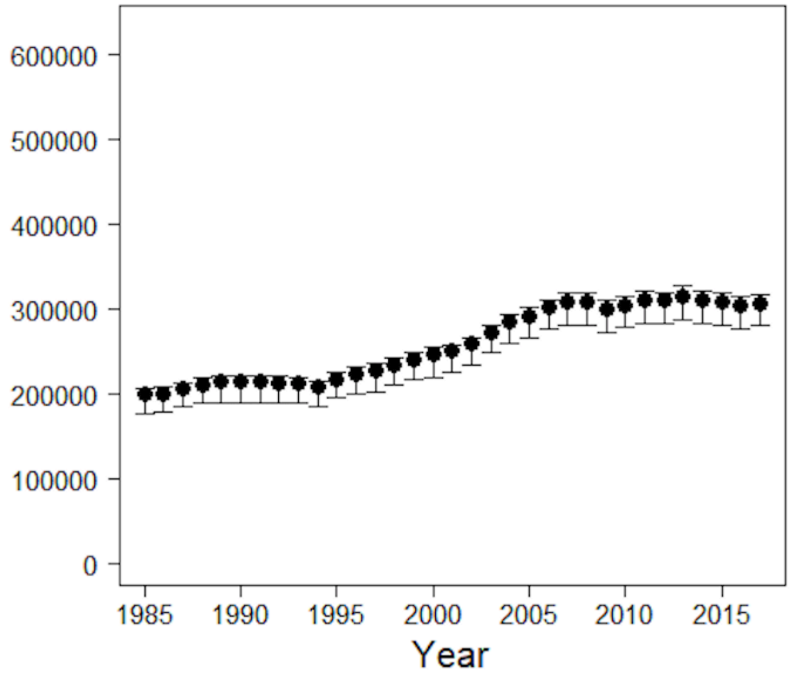


Figure 25 Annual trend in model-based abundance estimates for common dolphins in the Bay of Biscay (OSPAR Region IV)

Seasonal movements of common dolphins in the North-East Atlantic are also suggested from recent work by Waggitt et al. (2019) and independently, by smaller-scale regional surveys (e.g. Macleod and Walker, 2005; Brereton et al., 2005; Rogan et al., 2018; Van Canneyt et al., 2020). The Marine Ecosystems Research Programme (MERP) collated cetacean survey effort amounting to around three million kilometres from more than fifty research groups in Northwest European seas covering the period 1978-2018 (but with most effort in the last 15 years). Using hurdle models that incorporate a range of environmental parameters believed to influence prey distributions and prey capture availability for different cetacean species, integrating the probability of encountering the species and its abundance, density maps of the 12 most common species were produced at monthly temporal and 10km spatial resolution (Waggitt et al., 2019). In the Bay of Biscay, the maps for common dolphin (**Figure 27**) shows highest densities concentrated along the shelf break (over the 200-2,000m contour), particularly in winter. Plotting the percentage deviation from the annual mean for each month of the year reveals a movement towards the shelf edge west of Ireland and into the Bay of Biscay over the winter months, January to April (**Figure 28**).

Table 10 Summary of available abundance estimates for common and striped dolphins in the North East Atlantic.

SUMMER						
Species	**Period**	**Year**	**Abundance (CV)**	**Survey**	**Area**	**Source**
Common dolphin	1990s	1993	61,900	MICA	Offshore NW Biscay and SE Ireland	Goujon et al. (1993)
Common dolphin	1990s	1994	75,400	SCANS	Celtic Shelf	Hammond et al (2002)
Common dolphin	1990s	1995	273,159 (0.26)	NASS-95 Faroese survey	Central North Atlantic	Cañadas et al. (2009)
Common dolphin	2000-2004	2001	17,600	ATLANTCET	French Biscay shelf	Ridoux et al. 2003
Common dolphin	2005-2010	2005/07	174,485 (0.27)	SCANS-II + CODA	European shelf and offshore waters	Hammond et al. (2013); CODA (2009)
Common + striped	2005-2010	2005/07	306,045 (0.29)	SCANS-II + CODA	European shelf and offshore waters	Hammond et al. (2013); CODA (2009)
Common + striped	2010-2015	2012	494,000 (0.17)	SAMM	Northern Biscay and Channel	Laran et al. (2017)
Common dolphin	2016-2018	2016	467,673 (0.26)	SCANS-III	European shelf and offshore waters	Hammond et al. (2017)
Common + striped	2016-2018	2016	998,180 (0.18)	SCANS-III	European shelf and offshore waters	Hammond et al. (2017)
Common dolphin	2016-2018	2016	13,633 (0.85)	ObSERVE	Irish EEZ	Rogan et al. (2018)
Common + striped	2016-2018	2016	33,215 (0.415)	ObSERVE	Irish EEZ	Rogan et al. (2018)
WINTER						
Common + striped	2010-2015	2010/ 2011	285000 (0.23)	SAMM	Northern Biscay and Channel	Laran et al. (2017)

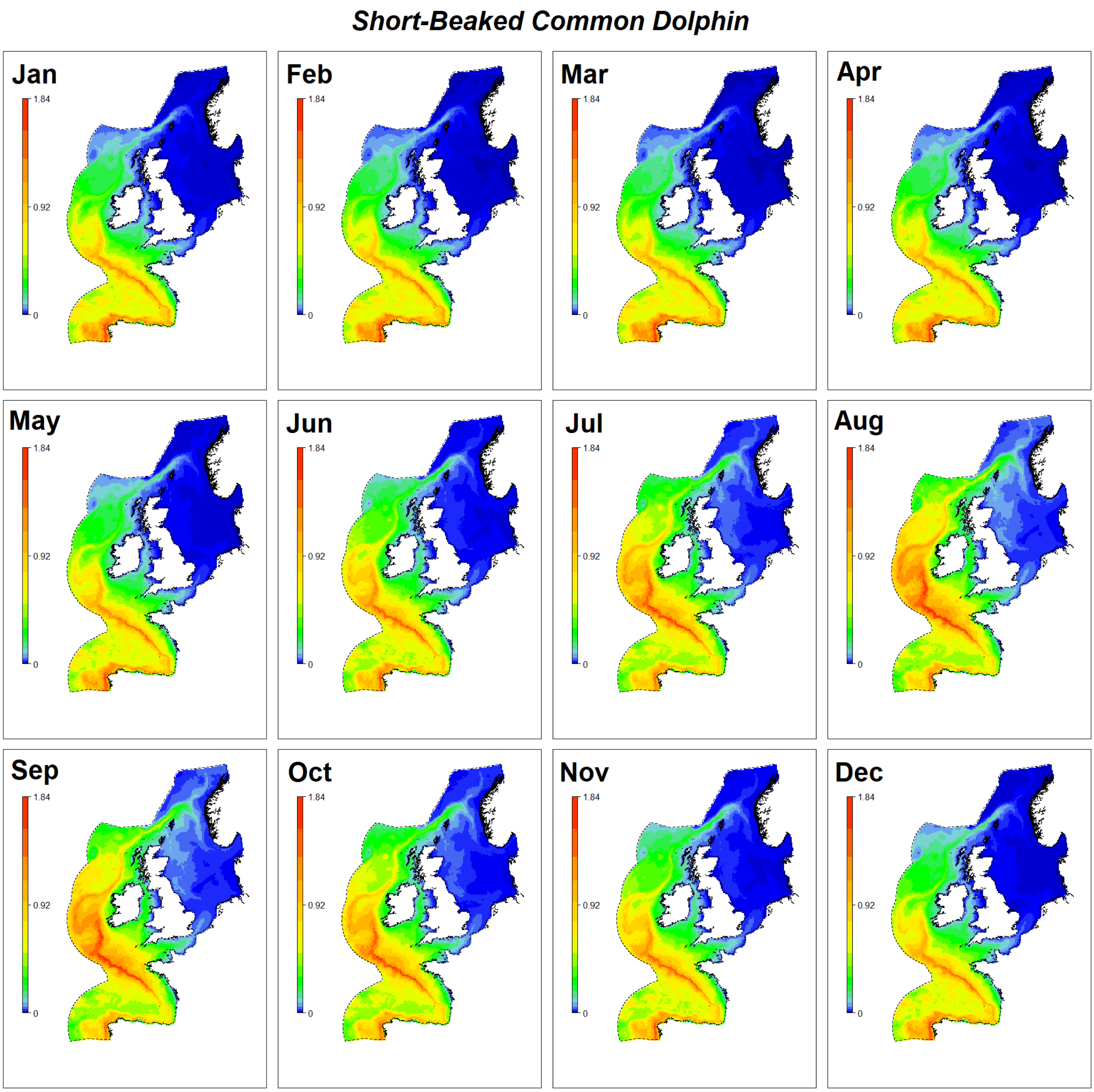


Figure 26 Model-based mean monthly density distributions of common dolphin, 1989-2018 (Waggitt et al. 2019)

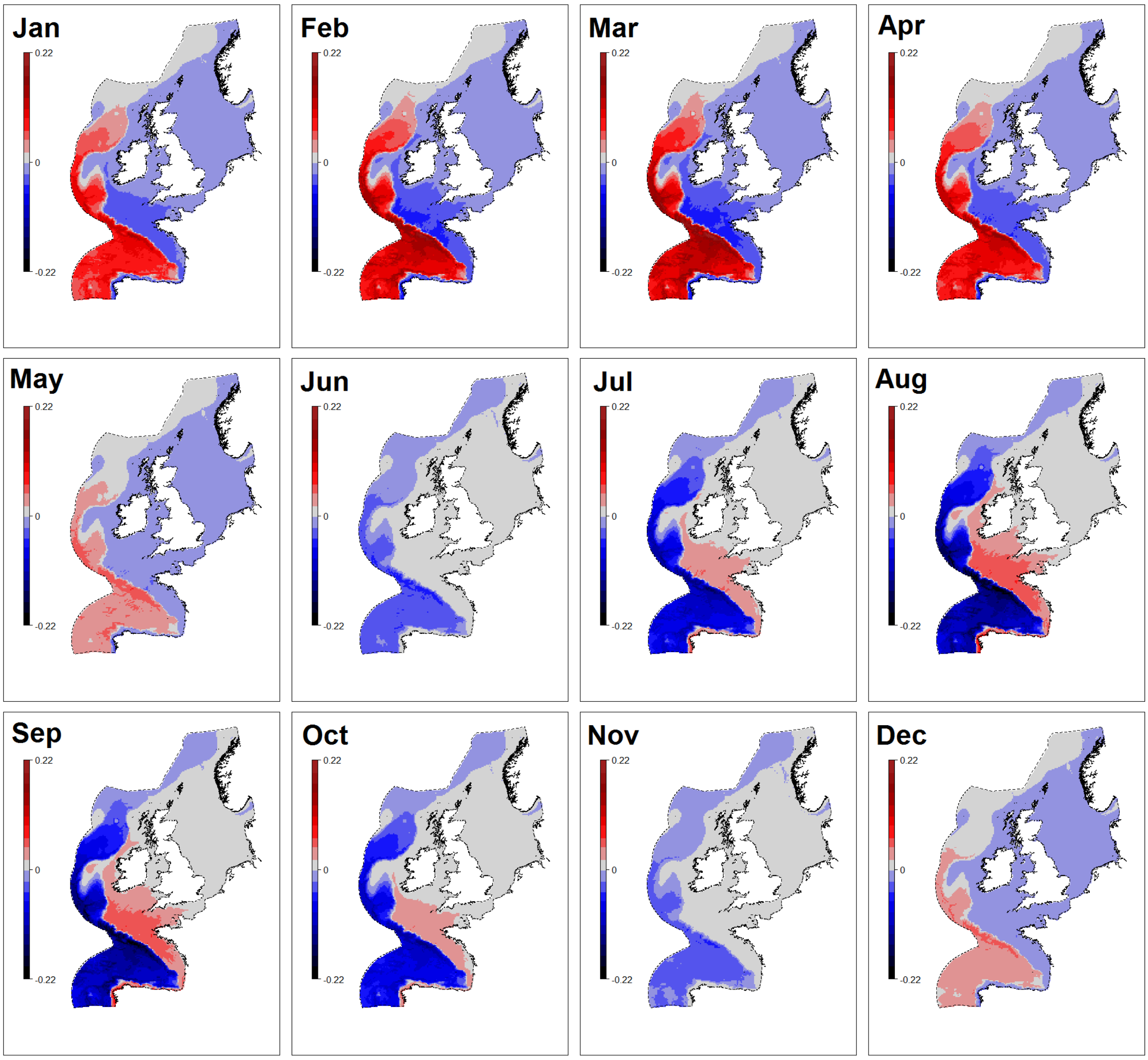


Figure 27 Seasonal movements of common dolphins. Red denotes positive and blue negative deviations from the annual mean densities (Waggitt et al 2019)

Regionally, the ObSERVE programme undertook aerial surveys in both summer and winter 2015/2016 of Irish waters and noted that densities of common dolphins were much higher during the winter than the summer (Rogan et al., 2018). Abundance estimates for smaller dolphin species, including the common dolphin, striped dolphin and common bottlenose dolphin, were 80,763 individuals in summer (Coefficient of Variation [CV]: 0.15) and 145,173 in winter (CV: 0.10) (Rogan et al., 2018).

Further south in the Western English Channel and northern Bay of Biscay, seasonal sightings rates were also higher during the winter, at least over the period 1995-2002 (Macleod and Walker, 2005; Brereton et al., 2005). These data were collected from fixed-transect opportunistic surveys on ferries which can provide good temporal resolution in sightings data although spatially restricted. The annual and seasonal peaks in relative abundance within the ICES divisions sampled is shown in **Figure 29**).

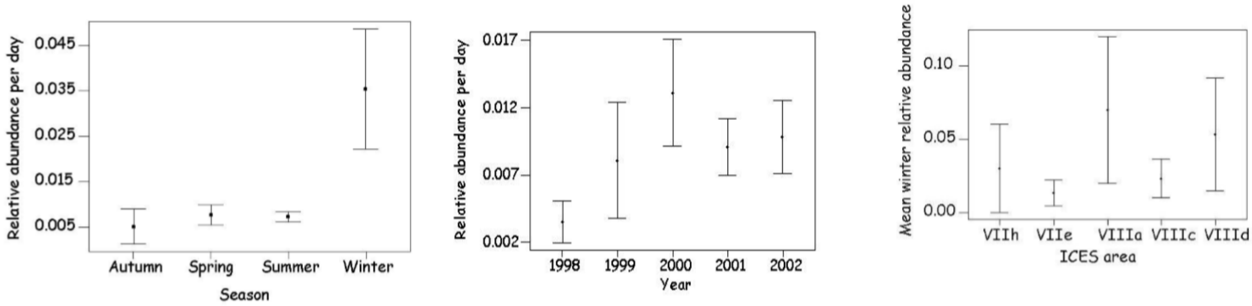


Figure 28 Mean and standard error of relative abundance per day of common dolphin by season (left), year (middle) and by for winter by ICES division (right) from data collected onboard ferries Portsmouth, UK to Bilbao, Northern Spain

There is further evidence that an increase in winter densities also occurs in the Bay of Biscay. In 2019, 4 aerial surveys were conducted on part of the shelf of the Bay of Biscay to detect seasonal changes in densities and distribution of cetaceans (Van Canneyt et al., 2020). The results highlighted highest density of common dolphins in winter, mostly around the 100m isobath (

Figure 30). The pattern in common dolphin distribution in winter must be considered carefully according to the small scale of these surveys, but they could suggest seasonal changes and highest densities of common dolphins in winter in inner part of the continental shelf of the Bay of Biscay.

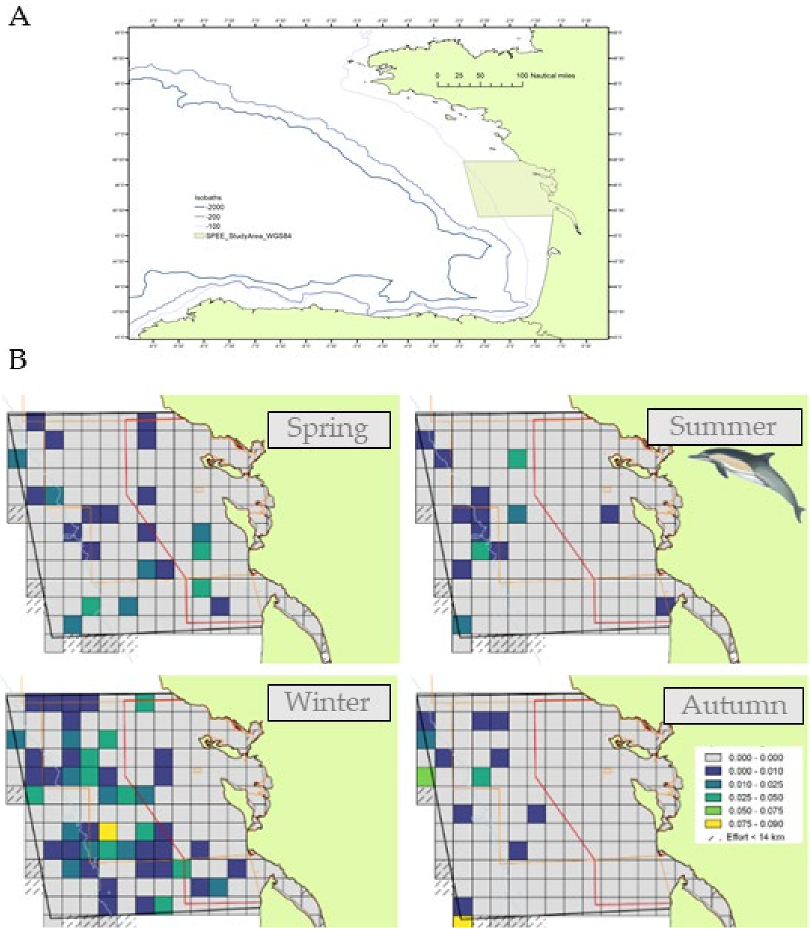


Figure 29 Encounter rates (sightings/km) of common dolphins during seasonal aerial surveys in 2019 in the Bay of Biscay (A: Overview of the study area; B: Seasonal encounter rates of common dolphins) (Van Canneyt et al. 2020).

1.4.2 Historical information on common dolphin bycatch

1.4.2.1 Areas and métiers with high common dolphin bycatch

Within the NE Atlantic, common dolphin bycatch is thought to have been greatest within the Celtic Sea and Western Approaches to the English Channel (ICES Division 7h), the western English Channel (ICES Division 7e), Bay of Biscay (ICES Division 8a), and along the shelf edge of Atlantic Spain and Portugal (ICES Divisions 8c, 9a) (Morizur et al., 1999; ICES WGMME, 2005; Fernández-Contreras et al., 2010; Marçalo et al., 2015; ICES WGBYC, 2015, 2016).

Multi-national pelagic pair trawl fisheries for sea bass have operated each winter in the Celtic Sea and western English Channel (ICES Area 7e, h). The offshore pelagic trawl fishery has been predominantly a French fishery accounting for three quarters of annual fishing effort in the Western Channel during the 1990s, whilst about a quarter have been UK vessels, mainly from Scotland (Northridge et al., 2003). The UK bass fishery in the Channel declined gradually from the mid-2000s to the present (Northridge, 2006; SMRU, 2008; Northridge & Kingston, 2010).

In the Bay of Biscay, bycatch has been reported in pelagic trawl and purse seine fisheries targeting a range of fish including albacore tuna, sea bass, blue whiting, horse mackerel, sardine and anchovy, 'very high vertical opening' (VHVO) bottom pair trawl fisheries targeting hake, as well as bottom-set gillnets and trammel nets (Morizur et al., 1996a, b, 1999, 2014; Tregenza et al., 1997; Tregenza & Collet, 1998; Wise et al., 2007; Northridge & Kingston, 2009; Fernández-Contreras, et al., 2010; Marçalo et al., 2015).

Around the Atlantic Iberian Peninsula, common dolphins have also occurred as bycatch in a number of fisheries such as Spanish and Portuguese gillnets, beach seine and trawl nets (López et al., 2003; Silva & Sequeira, 2003).

Table 11 and Table 12 summarise estimated bycatch rates for common dolphin a) by haul and b) by Day at Sea, respectively. Further details are provided below.

1.4.2.2 Bycatches between 1990-2000

During the 1990s, the albacore tuna driftnet fishery in the NE Atlantic caught large numbers of common dolphins, with annual estimates ranging from 243 (1990) to 2,101 individuals (1999), until a ban was introduced in 2002 (Goujon, et al., 1993; Goujon, 1996; Rogan & Mackey, 2007). Using landings of albacore tuna as an indicator of effort, a total minimum bycatch of 11,723 (95% CI = 7,670–15,776) common dolphins was estimated for the period 1990 to 2000 (Rogan & Mackey, 2007).

Monitoring of UK and Irish bottom-set gillnet fleets operating in the Celtic Sea (Subarea 7) targeting hake (pollack, and other gadoids were also caught) between 1992 and 1994 indicated a bycatch rate of 1.4 common dolphins per 1000 km of net and a total annual bycatch of 234 (95% CI= 78–702) common dolphins (Tregenza *et al*., 1997). A slightly higher bycatch rate was reported for the UK hake gill net fleet during the period 1999–2000 (0.0042 common dolphins/haul compared with 0.0032 common dolphins/haul in 1992-94), with most being caught between October and March (ICES WGMME, 2005).

Independent observer schemes in the French pelagic trawl fishery in the mid-1990s estimated bycatches of common and striped dolphins between the low hundreds and low thousands per year (Morizur *et al*., 1996, 1999; Tregenza & Collet, 1998). Cetacean bycatch in 11 pelagic trawl fisheries operated by four different countries (French anchovy, hake, tuna, black bream and sea bass fisheries, UK and French pilchard fisheries, UK mackerel, Irish herring, and French and Dutch horse-mackerel fisheries) were studied in Areas 7 and 8 (Morizur *et al*., 1999). Common dolphins were caught in four (Dutch horse-mackerel, French hake, French tuna and French sea bass fisheries) of the 11 fisheries. Common dolphin bycatch rates varied from 0.0336 to 0.0476 per tow and 0.0048 to 0.0137 per hour of towing and were highest in the French sea bass fishery. All bycatches occurred at night.

Interviews with fishers from the Galician fleet between 1998 and 1999 suggested an annual bycatch of 200 cetaceans in inshore waters and around 1,500 offshore, with the majority of these animals thought to be common dolphins (López et al., 2003). Bycatch numbers were estimated by extrapolating to the entire fleet from the number of vessels sampled and their total number of trips in a year. However, it was not possible to calculate bycatch rates because neither number of days at sea nor number of hauls could be determined. However, to give some indication of the scale of the fishery, there were estimated to be 6,000 fishing vessels undertaking c. 1.1 million trips in a year. Fisheries included gillnets, longlines, seine nets, traps and trawls, with gillnets and trawls having the highest reported bycatch

1.4.2.3 Bycatches between 2000-2012

Between 2000 and 2003, the UK fishery in the Channel were reported to take around 90 common dolphins annually (Northridge *et al*., 2003). Common dolphin bycatch estimates in the winter seasons of the UK bass pelagic pair trawl fishery in ICES Area 7 were 190 (95% CI: 172-265; based on 91 observed/332 hauls, 2000-01), 38 (95% CI: 23-84; 0.10 animals/haul based upon 91 observed/295 hauls, 2001-02), 115 (95% CI: 88-202; 0.23 animals/haul based upon 111 observed/493 hauls, 2002-03), 503 (95% CI: 491-592; 1.27 animals/haul based upon 133 observed/396 hauls, 2003-04), 139 (95% CI: 139-146; 0.63 animals/haul based upon 152 observed/223 hauls, 2004-05), 84 (95% CI: 84-85; 1.45 animals/haul based upon 54 observed/59 hauls, 2005-06) (Northridge, 2006). It is not possible to estimate in the same way the number of common dolphin bycatch in the pair trawl bass fishery in 2006-07 but it was thought to have been probably somewhere between 50 and 100 animals (SMRU, 2008; Northridge & Kingston, 2010). Since then, reported bycatches from this fishery have been very low due to little effort after the introduction of measures to protect bass stocks in 2015 (ICES WGBYC, 2011, 2012, 2013, 2014).

Overall estimates of common dolphin bycatch from UK set net and tangle net fisheries in Area 7 were 221 (95% CI: 84-398; 2006), 114 (95% CI: 29-440; 2007), 544 (95% CI: 211-947; 2008) and 237 (95% CI: not applicable; 2009) (Northridge et al., 2007; SMRU, 2008, 2009, 2011; Northridge & Kingston, 2010). A bycatch estimate of 115 common dolphins was reported for UK hake set nets in 2008, for UK monkfish (230 dolphins) and pollack fisheries (214 dolphins) (Northridge & Kingston, 2009, SMRU, 2009). In the Cornish tangle and gill net fisheries, estimated bycatch rates in 2005–2008 were 1.15 per 100 hauls and 0.36 per 100 hauls, respectively (Northridge & Kingston, 2009). Pooling observation data from 2005 to 2014, common dolphin bycatch in UK set net fisheries was estimated at 276 for the year 2014 (ICES WGBYC, 2016).

The annual bycatch of common dolphins in Irish gill net fisheries for hake and cod in the Celtic Sea between 2006 and 2007 was approximately double what it had been in 1992–1994 (Tregenza *et al*., 1997, Cosgrove & Browne, 2007). In addition, all common dolphins recorded in the earlier period were caught in late autumn and winter (Tregenza *et al*., 1997), a period that was not sampled in the later study (Cosgrove & Browne, 2007).

Set net fisheries operated by French vessels mainly in the Bay of Biscay (Divisions 8a, b, c, but also 6a, 7a, b, and 9a) were estimated to take 100 common dolphins in 2008, (based upon 265 observed Days at Sea out of 13,120 Days at Sea of fishing, giving a bycatch rate of 0.076 per Day at Sea (ICES SGBYC, 2010).

Bycatch estimates from the French pelagic trawl fishery for sea bass for ICES Areas 7 and 8 were 489, and largely common dolphins in 2003 (Northridge *et al*., 2006), 290 common dolphins in 2007 (French Annual Report to ASCOBANS, 2009; Murphy *et al*., 2013), and 300 common dolphins in 2008 (French Annual Report to ASCOBANS, 2010). Between January and March 2004, 90 hauls in the French sea bass pelagic trawl fishery were observed in Area 8, of which 10 had a bycatch of 68 common dolphins (including 44 on a single trip) (ICES WGMME, 2005). In 2009, the same fishery was estimated to have bycaught 40 common dolphins in Area 7 and between 300 and 400 in Area 8 (Demaneche *et al*., 2010; ICES WGBYC, 2011), but in 2010, a much lower bycatch of 105 was reported in the same area (ICES WGBYC, 2011). In 2009, c. 900 common dolphins were estimated bycaught also in the French pelagic trawl fishery for tuna in ICES Areas 6, 7 and 8 (Berthou *et al*., 2008; Demaneche *et al*., 2010; ICES SGBYC, 2010; ICES WGBYC, 2011; reviewed in Murphy *et al*., 2013). Previously, this fishery had been estimated to have a relatively low common dolphin bycatch of 60 (2006), 13 (2007), and 120 (2008) (Berthou *et al*., 2008; Demaneche *et al*., 2010; ICES SGBYC, 2010; reviewed in Murphy *et al*., 2013). In 2010, the pelagic trawl fishery for sea bass reported a bycatch of 105 common dolphins in Area 8. In 2006, the French otter trawl fishery in Areas 4, 7 and 8 targeting a range of fish species (sea bass, horse mackerel, mackerel, herring, and sardine) was estimated to have a common dolphin bycatch of 57 animals (ICES SGBYC, 2010), whereas in 2011, this fishery operating in the same Area had a bycatch of 760 common dolphins along with 216 common dolphins in Area 7 (ICES WGBYC, 2013) and 214 common dolphins in the same Area in 2012 (ICES WGBYC, 2014). As part of the EU PETRACET project, the French and Irish pelagic trawl fisheries targeting tuna were recorded having a bycatch of 133 common dolphins in 2003 (Northridge *et al*., 2006).

In 2010, a bycatch rate of 0.50 dead common dolphins per haul between October and December (n=5 bycaught individuals) was determined for the French sardine purse-seine net fishery in Area 8 (Morizur *et al*., 2011).

There have been rather few bycatch estimates from Spanish and Portuguese fisheries. The Spanish pair trawl fishery targeting blue whiting (but taking also mackerel, hake and horse mackerel) off NW Spain (Galicia: Area 8) was estimated to have an annual bycatch in 2001-02 of 394 common dolphins (95% CI 230-632) (Fernández-Contreras, *et al*., 2010). These were largely taken at night between May and September around the continental shelf-break. In 2009, Spanish set nets for hake in Area 8a had an estimated bycatch of 773 common dolphins in 2,721 Days at Sea (i.e. a bycatch rate of 0.28 animals per Day at Sea) (ICES WGBYC, 2011).

In 2010, a bycatch rate of 0.055 common dolphins killed per "fishing trip/haul" was determined for Portuguese polyvalent boats using gill or trammel nets targeting hake and sea bream in Area 9 (ICES WGBYC, 2012).

1.4.2.4 Recent bycatch rates

WGBYC have not reviewed the literature of recent rates as this has been carried out by WGMME (*2020.).* Much of the recent data on bycatch of common dolphins comes from the work summarised in WGBYC annual reports and, in turn, this is based on the two data sources we use here: the WGBYC database and the results of modelling stranded dolphins.

Table 11 Common Dolphin Bycatch Rates for different fisheries in NE Atlantic by no. of hauls/tows (1992-2006)

Fishery	ICES Area/Division	Year(s)	Target Species	Observed Effort	Bycatch Rate	Reference

UK/Irish Nets	7	1992-1994	Hake	949 hauls	0.0032	ICES WGMME, 2005
UK/Irish Nets	7	1999-2000	Hake	237 hauls	0.0042	ICES WGMME, 2005
UK PTM	7	2000-2001	Sea bass	91 hauls	0.57	Northridge, 2006
UK PTM	7	2001-2002	Sea bass	91 hauls	0.10	Northridge, 2006
UK PTM	7	2002-2003	Sea bass	113 hauls	0.23	Northridge, 2006
UK PTM	7	2003-2004	Sea bass	131 hauls	1.29	Northridge, 2006
UK PTM	7	2004-2005	Sea bass	152 hauls	0.63	Northridge, 2006
UK PTM	7	2005-2006	Sea bass	54 hauls	1.43	Northridge, 2006
Irish GND	7j, k	1996	Albacore tuna	125 hauls	1.24	Rogan & Mackey, 2007
Irish GND	7j, k	1998	Albacore tuna	18 hauls	0.72	Rogan & Mackey, 2007
Irish PTM	7, 8	1998	Albacore tuna	144 hauls	0.0833	ICES WGMME, 2005
Irish PTM	7, 8	1999	Albacore tuna	330 hauls	0.0697	ICES WGMME, 2005
Irish PTM	7, 8	2002	Albacore tuna	113 hauls	0.0442	ICES WGMME, 2005
Irish PTM	7, 8	2003	Albacore tuna	55 hauls	0.0182	ICES WGMME, 2005
Irish PTM	7, 8	2004	Albacore tuna	35 hauls	0.0286	ICES WGMME, 2005
Dutch PTM	7d-e, h-j	1994-1995	Horse mackerel	119 tows	0.0336	Morizur et al., 1999
French PTM	8a, b	1994-1995	Hake	52 tows	0.0435	Morizur et al., 1999
French PTM	8a-d	1994	Albacore tuna	66 tows	0.0455	Morizur et al., 1999
French PTM	7e, 8b	1995	Sea bass	21 tows	0.0476	Morizur et al., 1999
French PTM	7, 8	2004	Albacore tuna	98 hauls	0.0612	ICES WGMME, 2005
French PTM	7, 8	2004 (Jan-Mar)	Anchovy	43 hauls	0.0000	ICES WGMME, 2005
French PTM	7, 8	2004 (July-Nov)	Anchovy	221 hauls	0.0000	ICES WGMME, 2005
French PTM	7	2005 (Feb-Mar)	Sea bass	59 hauls	0.0339	ICES WGMME, 2005
French PTM	8	2004 (Jan-Mar)	Sea bass	90 hauls	0.7555	ICES WGMME, 2005
French PTM	7	2004	Horse mackerel	20 hauls	0.0000	ICES WGMME, 2005

Spanish PTB	8a, b, d	2000	Hake	81 hauls	0.0494	ICES WGMME, 2005
Spanish PTB	7, 8	2001	Hake	118 hauls	0.0085	ICES WGMME, 2005

Table 12 Common Dolphin Bycatch Rates for different fisheries in NE Atlantic by Day at Sea (2004-2012)

Fishery	ICES Area	Year	Target Species	Observed Effort (days at sea)	Bycatch Rate	Reference
UK GNS	7g	2008	Hake	38	0.0286	ICES SGBYC, 2010
UK GNS	7f	2008	Hake	52	0.0192	ICES SGBYC, 2010
UK GNS	7e	2008	Monkfish	55	0.0182	ICES SGBYC, 2010
UK PTR	7e	2008	Sea Bass	10	0.4545	ICES SGBYC, 2010
Irish GNS	7g	2006	Cod, hake, turbot	14	0.1429	ICES SGBYC, 2010
Irish GNS	7g	2006	Cod, hake, turbot	31	0.0323	ICES SGBYC, 2010
Irish PTR	7a	2006	Various	16	0.2500	ICES SGBYC, 2010
Dutch PTM	6, 7, 8	2004-05	Horse mackerel	98	0.0306	ICES SGBYC, 2010
French PTM	4c, 7, 8	2006	Sea bass, sardine etc	276	0.0145	ICES SGBYC, 2010
French PTM	6, 7, 8	2007	Sea bass	170	0.0765	ICES SGBYC, 2010
French PTM	6, 7, 8	2007	Various	341	0.0029	ICES SGBYC, 2010
French GNS	6a, 7, 8, 9	2008	Sole, monkfish etc	265	0.0075	ICES SGBYC, 2010
French PTM	6, 7, 8	2008	Various	238	0.0210	ICES SGBYC, 2010
French OTM	6, 7, 8	2008	Sea bass	196	0.0969	ICES SGBYC, 2010
Spanish Nets	8a, b	2008	Various	25	0.0400	ICES SGBYC, 2010
Spanish OTM	8a, b, d	2008	Hake	36	0.0278	ICES SGBYC, 2010
UK GNS/GTR	7e-h, j	2009		261	0.0115	ICES WGBYC, 2011
French PTM	8a (Jul-Sep)	2009	Various	16	0.0625	ICES WGBYC, 2011
French PTM	7 (Jan-Mar)	2009	Sea bass	81	0.0741	ICES WGBYC, 2011
French PTM	7 (Jul-Sep)	2009	Sea bass	124	0.0161	ICES WGBYC, 2011
French PTM	8 (Jan-Mar)	2009	Sea bass	32	0.6560	ICES WGBYC, 2011
French PTM	8 (Jul-Sep)	2009	Sea bass	251	0.4580	ICES WGBYC, 2011

Spanish Nets	8a	2009	Hake	81	0.0741	ICES WGBYC, 2011
French PTM	8a	2010	Sea bass, bream	6	0.3333	ICES WGBYC, 2012
Portugal GTR	9a	2010	Sea bass, hake etc	161	0.0621	ICES WGBYC, 2012
Portugal GTR	9a	2010	Trachurus, sardine	80	0.0625	ICES WGBYC, 2012
Portugal PS	9a	2010	Sardine	369	0.0062	ICES WGBYC, 2012
UK GTR	7g	2010	Demersal	18	0.0555	ICES WGBYC, 2013
UK GTR	7h	2011	Demersal	25	0.0400	ICES WGBYC, 2013
UK PTM	7e	2011	Demersal	106	0.1132	ICES WGBYC, 2013
Irish GNS	7b	2011	Demersal	4	0.0250	ICES WGBYC, 2013
Irish GNS	7b	2011	Demersal	2	0.5000	ICES WGBYC, 2013
French OTB	7e	2011	Demersal	35	0.0857	ICES WGBYC, 2013
French PTM	7e	2011	Demersal	23	0.2609	ICES WGBYC, 2013
UK GNS <15m	7e	2012	Demersal	58	0.0345	ICES WGBYC, 2014
UK GNS >15m	7e	2012	Demersal	29	0.0690	ICES WGBYC, 2014
UK PTM	7e	2012	Demersal	44	0.0682	ICES WGBYC, 2014
French GTR	7e	2012	Demersal	46	0.0217	ICES WGBYC, 2014
French PTM	7e	2012	Demersal	21	0.2381	ICES WGBYC, 2014
French PTM	7h	2012	Demersal	5	2.6000	ICES WGBYC, 2014
Portugal GTR	9	2012	Demersal	71	0.0423	ICES WGBYC, 2014
Portugal PS	9	2012	Small pelagic	94	0.0106	ICES WGBYC, 2014

1.4.3 Characterisation of the northeast Atlantic fisheries with potential for bycatch

1.4.3.1 General overview of fishing effort in ICES 6, 7 & 8

At least 8 countries operated in ICES 6, 7 & 8 Subareas (Figure 9). Spain, France, Germany and United-Kingdom are the main countries operating in Subareas 6 & 7.

In the Bay of Biscay ICES divisions 8abde, the French fisheries are the most important fisheries considering the total effort exerted. French fisheries are responsible for 93% of the total effort. Spain is the next relevant country with 6%. There are other countries fisheries with some effort, but this is residual. However, it´s important to highlight that this percentage rate changes considering the different fleet segments and gears. According to the differences in fishing practices and country operating in different divisions within Subarea 8, the French and Spanish fisheries, divided in Divisions abde and c were considered separately in fishing effort description.

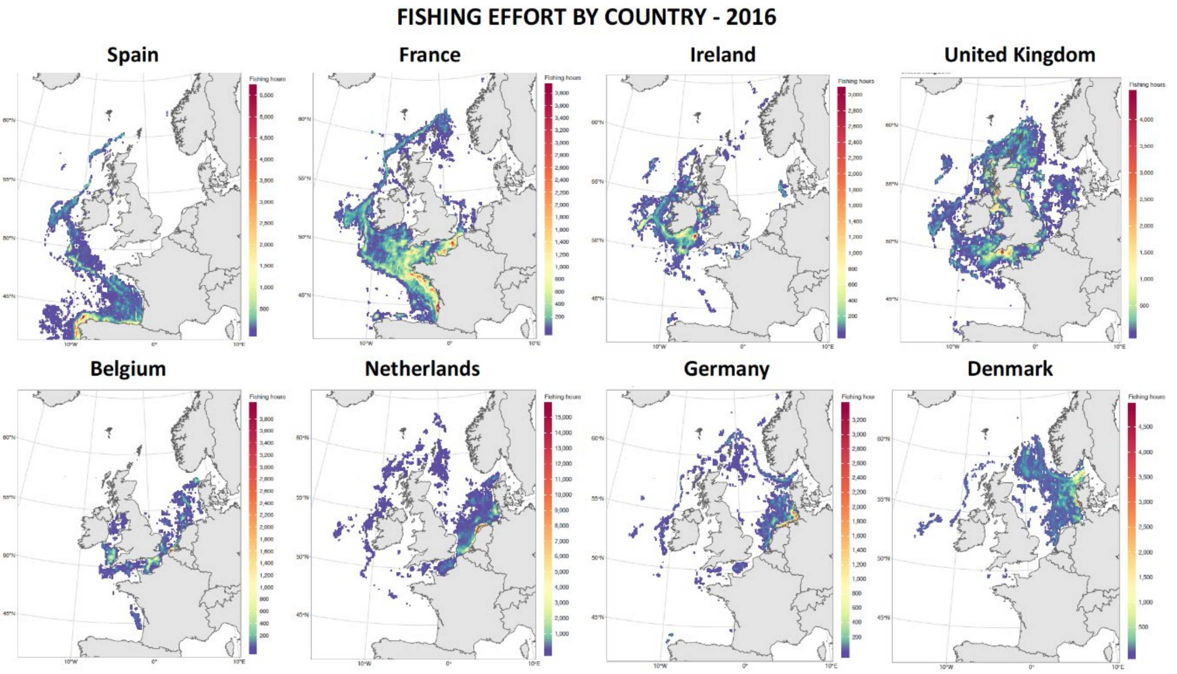


Figure 30 Fishing effort of 8 main countries operating in subareas ICES 6, 7 & 8 in 2016.

1.4.3.2 Spanish fleet characterization in ICES 8abde

In this section only gears mentioned in the NGOs report are considered.

In the case of the Bottom otter trawlers and pair trawlers, the vessels characteristics are quite homogeneous. These are vessels between 30-40 metres total LOA and with similar engine power (EU fleet register).

The bottom otter trawler (OTB) fishery is considered as a mixed demersal fishery (Iriondo et. al., 2010), targeting mixed demersal species (OTB_DEF métier Level 5) where anglerfish (*Lophius spp*.), megrim (*Lepidorhombus whiffiagonis*), hake (*Merluccius merluccius*) are the most important commercial species together with some seasonal demersal and cephalopods species (OTB_MCF métier Level 5) as red mullets (*Mullus spp*.), Sea bass (*Dicentrarchus labrax*), squid (*Loligo spp.)* and cuttlefish (*Sepia officinalis*) (**Figure 32**).

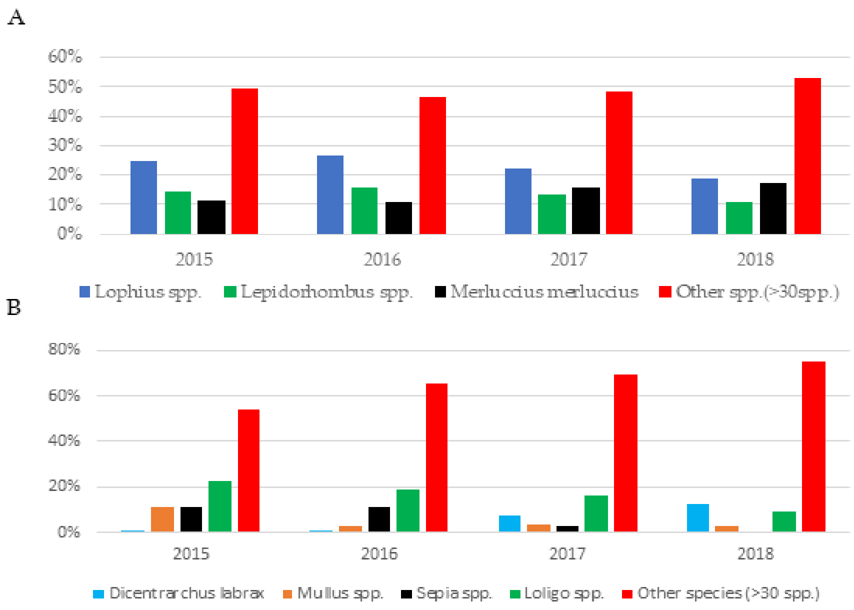


Figure 31 Proportion of main landed species for Spanish OTB targeting demersal species (A) and seasonal demersal and cephalopods (B) operating in ICES 8 abde from 2015 to 2018.

The gear used by these vessels is the gear called as "Baka". Considering the impact on Common dolphins (*Delphinus delphis*) bycatch, it is relevant to mention that the vertical opening of this gear is between 1,2-1,5 meters (Ibermix, 2007)

In the case of Pair bottom trawlers (PTB), it´s a Very High Vertical Opening (VHVO) net, and the gear can achieve a vertical opening of 25 metres. The bottom pair trawl fishery targets hake as single species contributing 95% of the total catch (PTB_DEF métier Level 5) (**Figure 33**). Due to the high vertical opening of this gear, it has been considered as a high-risk gear for dolphin bycatch.

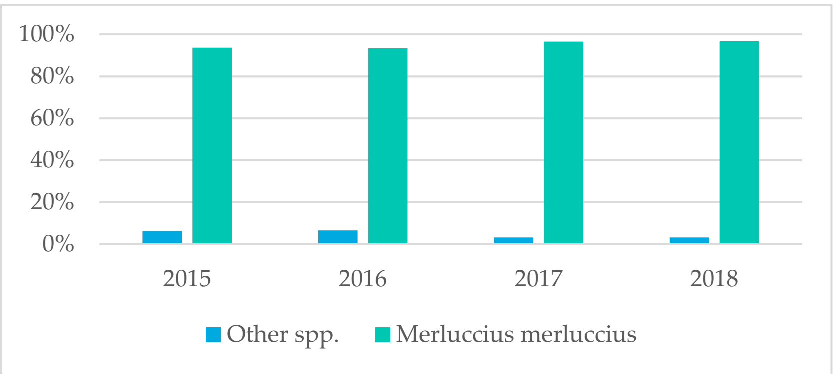


Figure 32 Proportion of main landed species for Spanish PTB operating in ICES 8 abde from 2015 to 2018.

The vessels involved in gillnet fisheries (GNS) are under the 24-<40 fleet segment and the target species is the hake as single species with the 96% of the total catches (**Figure 34**). This gear is called "volanta" and each piece of nettings has a maximum height of 10m and total length of 50m.

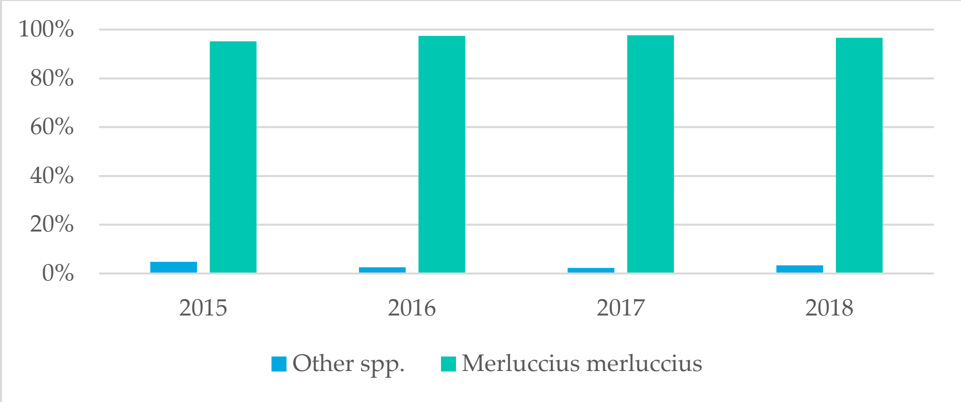


Figure 33 Proportion of main landed species for Spanish GNS operating in ICES 8 abde from 2015 to 2018.

1.4.3.3 Spanish fleet characterization in ICES 8c

In the Iberian region (ICES division 8c), the Spanish fisheries are the most important fisheries considering the total effort exerted. Spanish fisheries are the responsible of the 97% of the total effort. Due to the residual effort of the rest of the countries, only the Spanish fleet will be considered in ICES 8c.

In the case of bottom and pair trawlers, around 75 vessels are involved in this division (Acosta et. al., 2019)). The characteristics of the vessels are also quite similar. These vessels are included under the 24-<40 metres fleet segment with a mean of 28,4 m LOA.

In the case of the bottom otter trawlers there are two main gears based on the target species. The "baca" gear is used when targeting demersal species (OTB_DEF métier level 5) and the "jurelera" gear when targeting pelagic species (OTB_MPD métier Level 5). The main difference is the vertical opening of the nets. In the case of the "baca" gear this is between 1,2-1,5 metres and in the case of the "jurelera" it´s able to achieve a vertical opening of 5-5,5 meters.

The pair trawlers use a Very High Vertical Opening (VHVO) net that is able to achieve a vertical opening of 25m. The target species are both, demersal and pelagic (PTB_MPD métier level 5).

In the case of gillnets, the biggest vessels are included in the under 18-24 fleet segment. These vessels use two different gears depending on the target species. "Volanta" is used when targeting hake and "Rasco" when the target species are the anglerfish (*Lophius spp.).* The main difference is the total height they can achieve and the mesh size. This total height could be relevant considering dolphins bycatch. In the case of "volanta" gear this can achieve 10 metres and in the case of "rasco" the maximum height is 3,5m. 69 vessels where operating with these gear in this division.

Finally, there are the smallest vessels, most of them with LOA below 12m using gillnets. The number of vessels under this fleet segment is around 4.000 vessels, the called small scale fleet. This is a multi-gear and multi species fishery. Gillnets and trammel nets are important gears used by them. However, both gears can achieve a maximum height of 2-3 metres.

1.4.3.4 French fleet characterization in ICES 8ab

In 2018, 1486 fishing vessels operated in subarea ICES 8. The length of most of them (72%) stand below 12 metres, including 14% below 7 metres. Only 5% of fishing vessels exceed 24 metres.

The activity of these vessels is mostly coastal (69%), 12% operated exclusively offshore and 19% have a mixed activity.

A total of 39% of fishing vessels used nets in the Bay of Biscay, 30% operated with bottom trawlers and 5% with midwater trawlers (single and pair).

In 2018, 570 vessels with nets operated in the Bay of Biscay, the size of 91% of them was below 12 metres. The main landed species are hake, sole, monkfish and sea bass. Among these nets, 71% operated within 12NM from French coasts, 12% operated exclusively offshore, and 9% in both areas.

For coastal nets, the main target species is sole and pollack, whereas it is hake (60 to 70%) for larger vessels (Figure 13 A).

Midwater pair trawlers are larger vessels, all above 12 metres. On average 15 pairs operated in the Bay of Biscay in winter. In winter, more than 90% of landings are hakes, the rest is mainly composed of sea bass and mackerels. During spring, they can target sardines and then tuna in summer and early autumn. On average over a year, landings are distributed in those five species, and 15 to 20% of other species (Figure 13 B). Midwater pair trawlers can operate as bottom trawlers also and are usually not dedicated to a single fishing gear.

The fishery of bottom trawlers is the second one in term of number of vessels in the Bay of Biscay (451 vessels in 2018). Gears used can varied from low opening to high vertical opening up to 15 metres. For larger vessels, the main target species are monkfish, cuttlefish and hakes. Almost 50% of landings are a mix of diverse species (Figure 13 C).

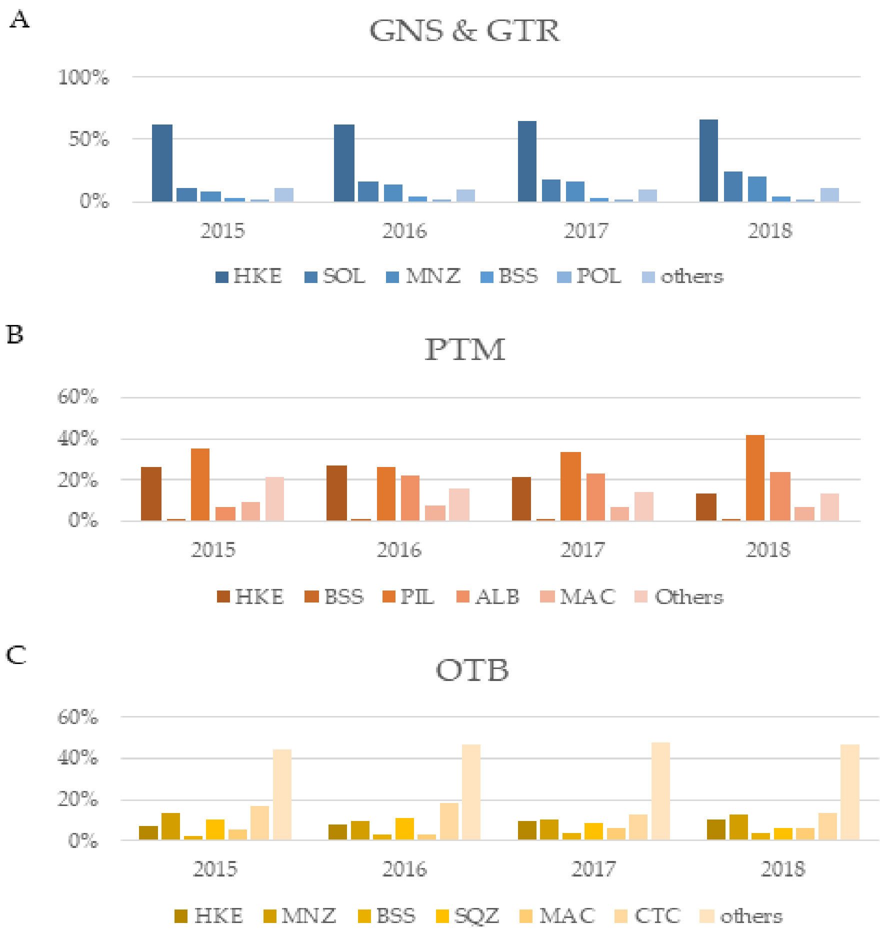


Figure 34 Proportion of main landed species for fishing vessels above 12 metres operating in ICES 8 ab (A: gillnets and trammel nets; B: midwater pair trawlers, C: single bottom trawlers).

For GNS below 12 metres fishery, pollack (*Pollachius pollachius*) is the species with highest landings achieving the 24% of the total landings, followed by the hake with 10%. Species with less than 1% of the total landings are grouped as other species (Figure 14 A).

The fishery of GTR vessels below 12 metres is a mixed fishery where more than 40 different species are landed. Sole (*Solea solea*) is the species with highest landings achieving the 25%, followed by anglerfish (*Lophius spp*.) with 11%. Species with less than 2% of the total landings are grouped as other species (Figure 14 B).

French PTM under 12 metres is a single species fishery where hake achieves 80% of the total landings. Black sea bream (*Spondyliosoma cantharus)* and sea bass (*Dicentrarchus labrax*) are the other relevant species with 4% and 3% of the total landings (Figure 14 C).

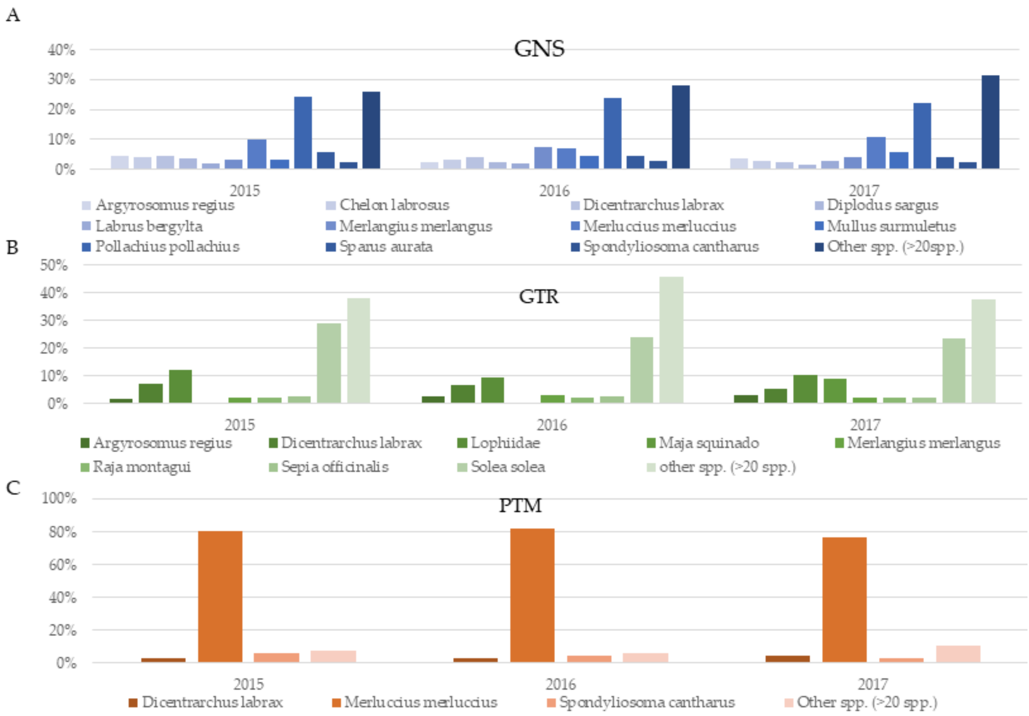


Figure 35 Proportion of main landed species for fishing vessels under 12 metres operating in ICES 8 ab (A: gillnets; B: trammel nets, C: midwater pair trawlers).

1.4.4 Estimation of common dolphin bycatch

1.4.4.1 Analysis of WGBYC and strandings data used

i. WGBYC data

Monitored effort and bycatch events and specimens within the database were extracted for the period 2005-2018. Data were cleaned and validated and partitioned into three periods: 2005-2010 (A); 2011-2015 (B); and 2016-2018 (C). The data were summarised within each period in the two ICES defined ecoregions: Celtic Seas (Divisions 6.a, 6.b.2, 7.c.2, f, g , h, 7.j.2, 7.j.1 and 7.k.2, 7 e and 7 d[20]) and Bay of Biscay (Areas 8abde) and Iberian Coast (8c and 9a). Monitored effort (Days at Sea - DaS) and the number of dolphins (specimens) bycaught were summarised for métier Level 4 (Gear) and métier Level 5 (target assemblage).

As the exact frequency distribution of the bycatch is not available for the data in the WGBYC database, a modelling exercise was conducted on a subset of data provided by the Netherlands (cetaceans in pelagic trawl), UK (cetaceans and seals in gillnets, cetaceans in pelagic trawls), Denmark (cetaceans in

[20] 7e and 7d are not within the ICES Celtic Seas analysis but they were important areas to be considered in the context of this task.

gillnets) and Norway (cetaceans and seabirds in gillnets). Several different probability distributions were tested on the sample datasets, and the best fit determined. A binomial distribution had been used in the past for work of WGBYC, so that was tested along with Poisson and negative binomial distributions. The result of this exercise showed that Poisson or the negative binomial distributions fitted better to the given data. To estimate the 95% confidence intervals around the error rates in the areas of interest, the Poisson distribution was therefore assumed, and the confidence intervals estimated with bootstrapping given the mean and sample size.

ii. Correlations between mortality areas of bycaught stranded common dolphins and fishing effort in the Bay of Biscay

Strandings are collected along the coasts of the Bay of Biscay by the French stranding network, that currently includes over 400 trained volunteers distributed along the entire French coast. Carcasses are examined using a standardised protocol. The observation effort has been relatively stable since 1990 (Authier et al., 2014).

Along the coasts of the Bay of Biscay, a strong increase in common dolphin strandings was recorded in winter (January to April) since 2016 (Dars et al., 2019).

Strandings were used to detect correlations between likely origin of stranded common dolphins showing evidence of bycatch and fishing effort of different fisheries operating in the Bay of Biscay. Evidence of lethal encounters with fishing gear include a combination of factors including net marks, good nutritional condition, evidence of recent feeding, jaw and rostrum fractures, froth in the airways, oedematous lungs and dorsal fin, pectoral fin or tail fluke amputations (Bernaldo de Quirós et al., 2018; Kuiken, 1994). The analysis was restricted to stranded "bycaught" common dolphins from multiple stranding events, which were fresh and slightly decomposed and examined by trained members of the French stranding network. Multiple stranding events were defined as high numbers of strandings occurring in restricted area with a common cause of death. The threshold was defined at 30 cetaceans over 10 consecutive days recorded along a maximal distance of 200 km in the Bay of Biscay (Peltier et al., 2016). This choice can underestimate the number of bycaught cetaceans found stranded and is therefore a minimal estimation.

The origin of stranded animals recorded during the unusual mortality events between 2006 and 2019 was determined following the methodology described in Peltier et al. (2016).

The reverse trajectories of stranded examined animals diagnosed as bycaught were calculated from the stranding locations to the likely area of mortality at sea by using the drift prediction model to predict the drift of floating object under the influence of tides and wind. Available information includes VMS data, declarative landing statistics (log-books and sales provided by the French ministry in charge of fishery) and survey data (Leblond et al., 2008). Fishing effort (in hours) related to landed fishes are available for French fisheries, and correlations between French fishing effort related to caught fishes were analysed in ICES 8ab. For other fisheries operating in this area, only total fishing effort was analysed.

Spike and Slab Bayesian prediction and variable selection were used to explore the spatial overlap between total fishing effort and the estimated distribution of bycaught common dolphins at sea as obtained by carcass drift back-calculation (Peltier et al., 2019).

The estimation of mortality at sea inferred from strandings is calculated following Peltier et al., 2016. Stranding numbers are corrected by drift conditions and by the proportion of buoyant animals, based on an *in situ* experiment (which estimated the probability for a bycaught dolphin to float). This last correction factor has a major effect on final estimates and could be further improved by increasing the number of experimentally released carcasses and by refining estimates of discovery rates along the French and UK coasts. Small changes in proportion of buoyant animals could notably modify mortality estimates.

Several parameters must be considered for the use of the drift prediction model MOTHY (Modèle Océanique de Transport d'Hydrocarbures), developed by MétéoFrance (*e.g.* date and stranding location, buoyancy rate, drift duration). Drift duration is established according to external visual criteria, by 5 to 10 days interval (Peltier et al., 2012). This temporal uncertainty would be directly converted into spatial uncertainty when calculating the reverse drift trajectories. Variation in buoyancy of ±10% is associated with an error of 8–16% in distance drifted. The average uncertainty around the model predictions was 27.1 ± 24.5 km. This could be explained by some aspects of drift model simulations. The model mostly takes into account the effects of wind and tide on a floating object (Daniel et al., 2002); in contrast, general circulation and details of coastal currents are not considered, and these could potentially have an impact on the outcomes.

1.4.4.2 Effort analysis for the relevant fisheries

Three fisheries were identified by European NGOs as having the most important impact on common dolphin population in the NE Atlantic: gillnet fishery (GNS), midwater pair trawler fishery (PTM) and single and pair bottom trawlers (OTB/PTB). The description of the fishing effort in ICES 8 will be dedicated to these three fisheries.

The fishing effort in subareas 6 and 7 are presented in Annex 4.

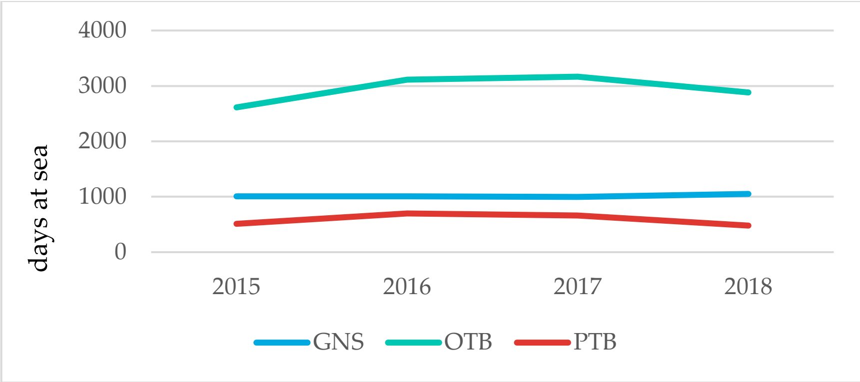
iii. Description of fishing effort of the relevant fisheries in sub-area 8: Spanish fleet in subareas ICES abde

Total fishing effort

Among the gears considered by the NGOs report, bottom otter trawlers accounted for 65% of the total Spanish effort, gillnets, 22%, and 13% pair trawlers, 13%.

The annual effort is quite similar among the four years of the analysis. In the case of the OTB, the annual effort is between 2,613 and 3,167 days at sea with the mean being 2,949 days (

Figure 37). The highest effort was in 2016 and 2017, decreasing again in 2018. In the case of the GNS, the trend is almost constant for those years with a mean effort of 1,016 days. In the case of the PTB, the trend is also quite similar with a mean of 587 days with higher effort in 2016 and 2017 and decreasing to the lowest year of effort in 2018 with 480 days at sea.



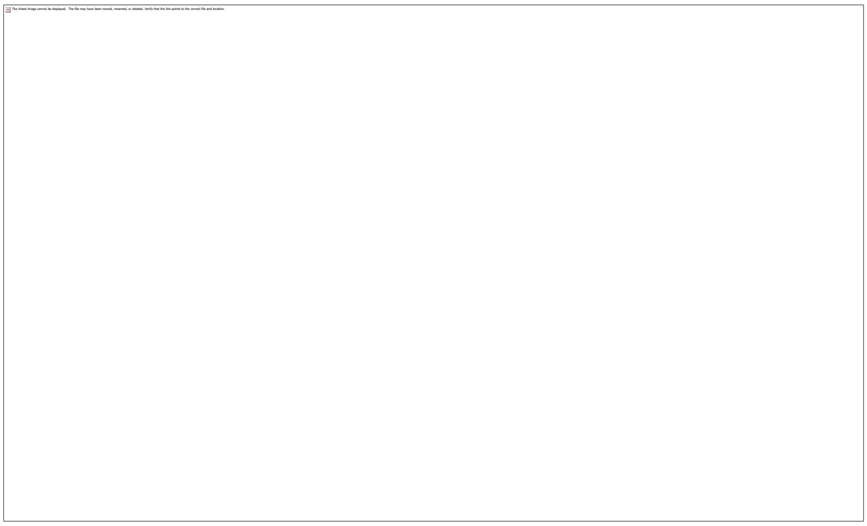


Figure 36 Fleet effort of Spanish vessels in days at sea operating in ICES 8 abde by year (top) and month (bottom)

iv. Description of fishing effort of the relevant fisheries in sub-area 8: Spanish fleet in ICES 8 c

Total fishing effort

In this section, the Spanish fleet effort is analysed in ICES Division 8c. **Figure 38** shows the total effort (days at sea) for the period between 2015-2018 by gear type. The highest effort for all the gears is in 2016 and 2017 with an important decrease in 2018 for netters (GNS and GTR). In the case of bottom and pair trawlers, 2016 and 2017 effort is almost the same with a decrease in 2018 but not as pronounced as for the netters.

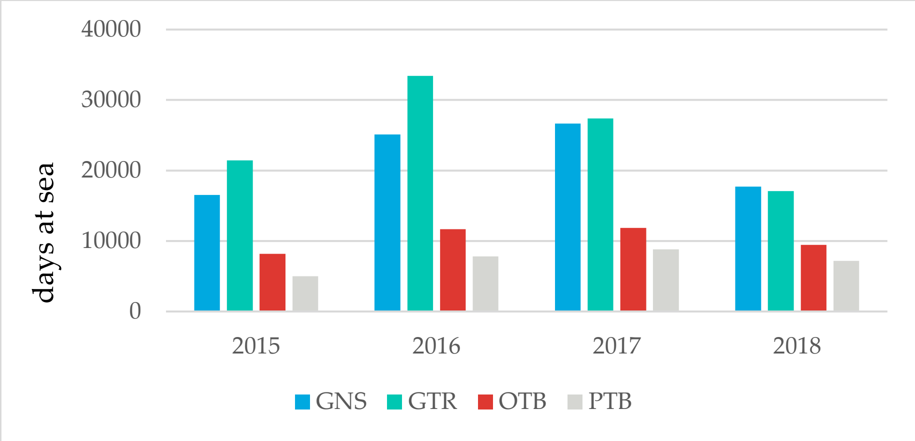


Figure 37 Annual Spanish fishing effort of different fisheries operating in ICES 8c from 2015 to 2018.

Fishing effort related to landed species

OTB Métiers

Figure 39 shows the monthly effort distribution at métier level 5 for OTB. It can be seen that from February to April, there is an important decrease for OTB_DEF métier and an important increase for OTB_MPD. This is because same vessels change the gear used from the "baca" gear to the "jurelera" gear. The OTB_MPD is a seasonal fishery targeting pelagic species, especially mackerel (*Scomber scombrus*) in the mentioned months. The trend changes completely after April increasing OTB_DEF effort and decreasing the OTB_MPD.

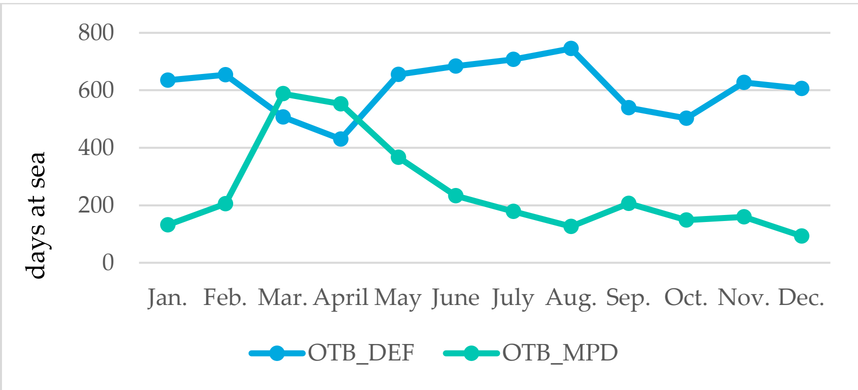


Figure 38 Monthly Spanish fishing effort of OTB fishery operating in ICES 8ac, averaged from 2015 to 2018.

PTB

There is a unique métier at level 5 for PTB. This métier is PTB_MPD. In **Figure 40** the monthly effort for 2015-2018 period. The effort is quite homogeneous during the year. March is the month with the highest effort and there is an important decrease in December.

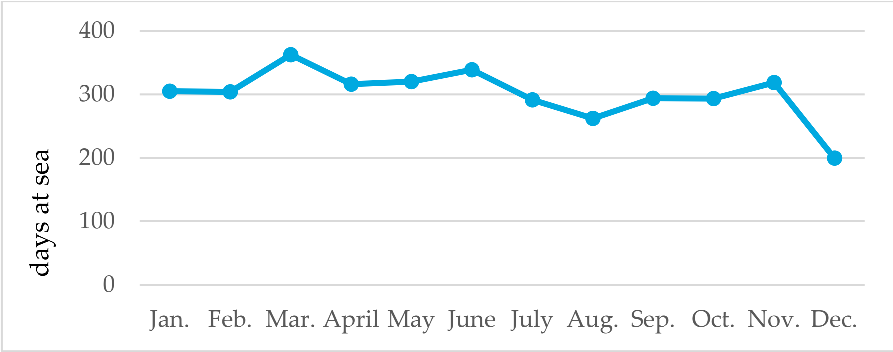


Figure 39 Monthly Spanish fishing effort of PTB targeting both pelagic and demersal species fishery operating in ICES 8ac, averaged from 2015 to 2018.

GNS

In the case of the gillnets, there is a unique métier for gillnets, GNS_DEF. However, it is important to split this métier at métier level 6, because the gears used and the fleet segments involved are different. GNS catching demersal species with a mesh >100mm (GNS_DEF=>100) and GNS catching demersal species with a mesh of between 60 to 99mm (GNS_DEF_60-99) are the two métiers at métier level 6. Large meshes are mostly used for hake and monkfish. Smaller meshes are used by small fisheries, catching diverse smaller species.

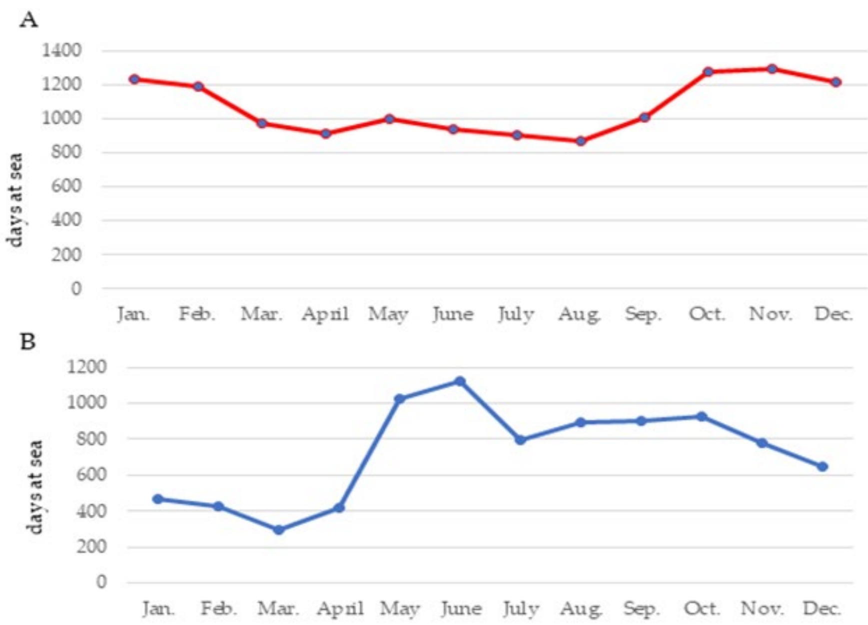


Figure 41 shows the monthly effort distribution for GNS_DEF=>100. The effort is similar during the year with the highest effort in winter. This increase occurs because the "rasco" fishery is a winter seasonal fishery whereas the "volanta" fishery occurs during the whole year. The fleet segment involved in this métier are vessels above 18 metres. The monthly effort for GNS_DEF_60-99 is shown in Figure 19b. For this metier, the highest effort is in summer and autumn, with effort decreasing in winter. The vessels involved in this métier are the small-scale fleet, the under 12m fleet segment.

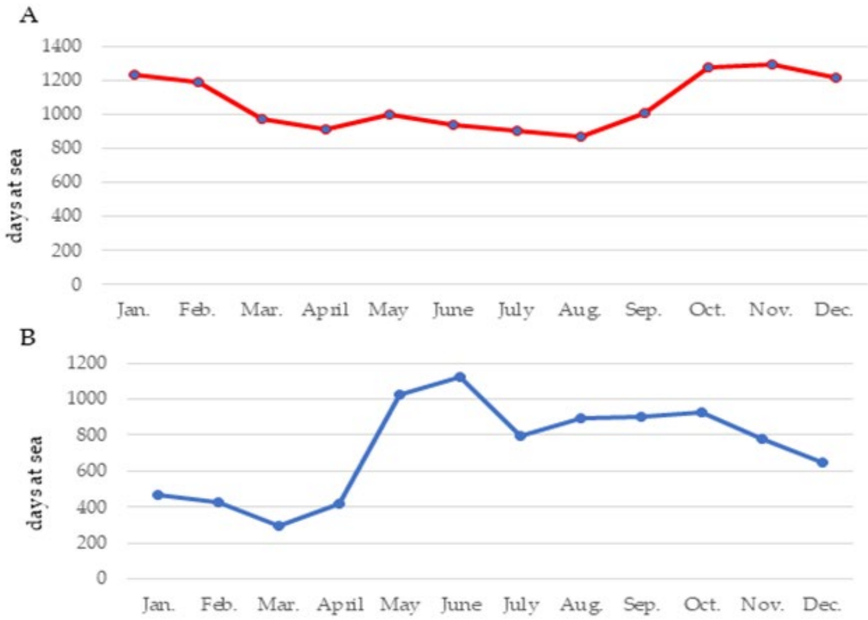


Figure 40 Monthly Spanish fishing effort of gillnet fishery catch demersal species with large mesh >100mm (A) and small meshes (60 – 99 mm) (B) fisheries operating in ICES 8c, averaged from 2015 to 2018.

v. Description of fishing effort of the relevant fisheries in sub-area 8: French fleet in Sub-areas ICES 8 ab

Total fishing effort for vessels >12m

Total fishing effort per métier is quite stable over the period 2015-2018 (**Figure 42**). The main change is the increase of PTM activity between 2015 and 2016-2018. On average, fishing effort doubled in 2016 compared to 2015. For the other fisheries under consideration, the changes between years ranged between 4 and 15%. If the calculation of the fishing effort inferred from vessel speed does not allow one to compare static gears and active gears, we can, however, conclude that PTM fisheries represent a small fraction of overall fishing activity in ICES 8 ab. The OTB fishing effort shows a slight decrease since 2015.

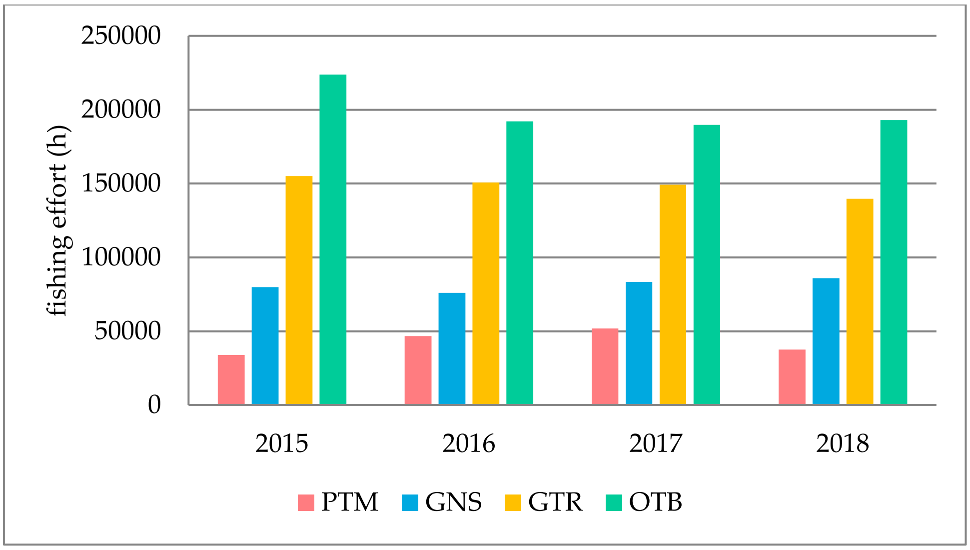


Figure 41 Annual fishing effort of different fisheries operating in ICES 8ab from 2015 to 2018 for vessels >12m.

The activity of GTR is highest between September and March (see Annex), whereas PTM fishing effort reaches a maximum in August. GNS fishing effort shows a seasonal pattern, with the maximum reached in January.

Fishing effort related to landed species for >12m

Only the main species caught in winter are detailed in this section.

In ICES 8ab, fishing effort of different relevant fisheries remained quite stable from 2015 to 2018 (**Figure 43**). Changes between years ranged from 8% for GTR fisheries to 25% for PTM fisheries.

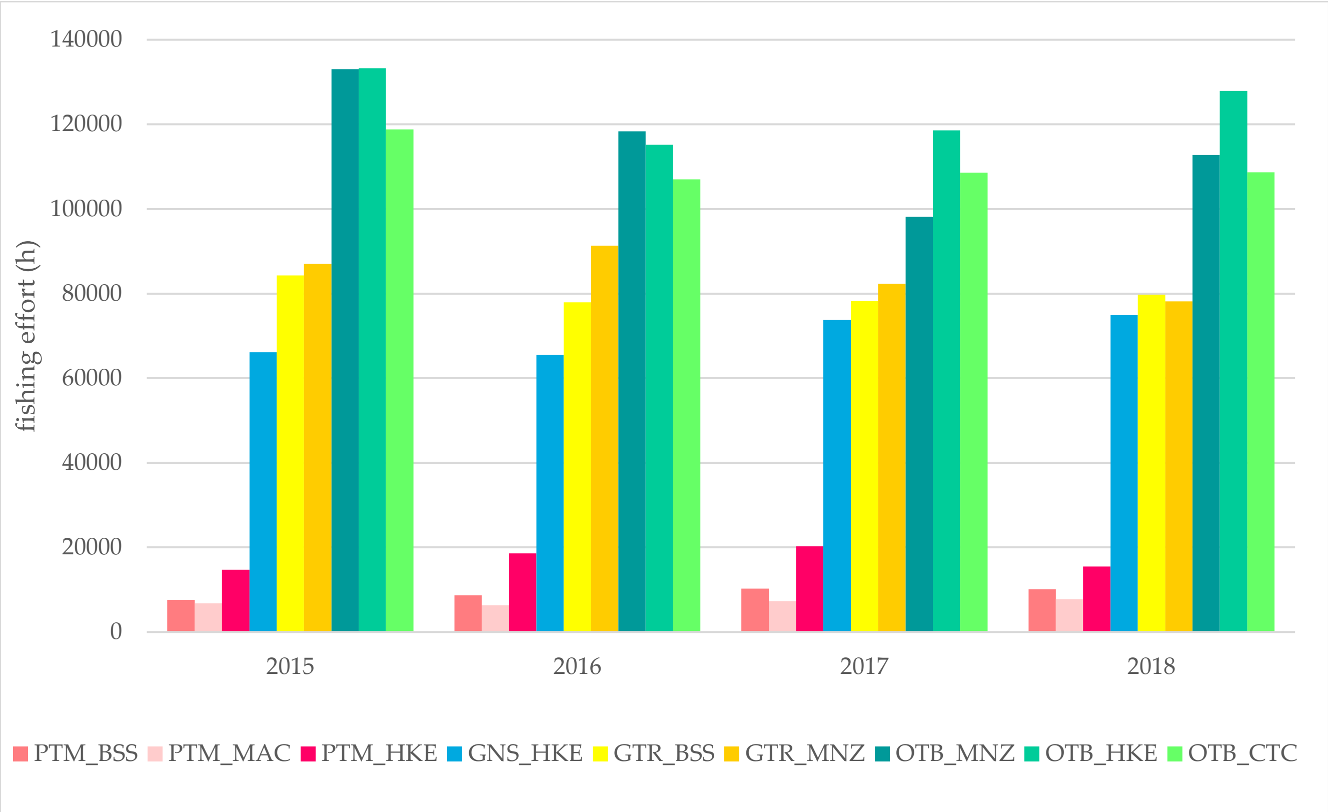


Figure 42 Annual French fishing effort of different fisheries operating in ICES 8ab from 2015 to 2018 (vessel >12metres)): GNS_HKE: Gillnets targeting hake (*Merluccius merluccius*); GTR_BSS: trammel nets targeting sea bass (*Dicentrarchus labrax)*; GTR_MNZ: trammel nets targeting monkfish (*Lophius spp*.); OTB_CTC: bottom trawler targeting cuttlefish (*Sepia spp*); OTB_HKE: bottom trawlers targeting hake (*Merluccius merluccius*); OTB_MNZ: : bottom trawlers targeting monkfish (L*ophius spp.*), PTM_HKE: midwater pair trawlers targeting hake (*Merluccius merluccius*); PTM_MAC: midwater pair trawlers targeting mackerel (*Scomber scombrus*); PTM_BSS: midwater pair trawlers targeting sea bass *Dicentrarchus labrax)*.

Most of the fishing gears showed seasonality in their fishing activities. Fishing effort for GNS related to hake catch is 2.6 times higher in January than in June (**Figure 44**). For PTM catching hakes operating in ICES 8ab, the peak of fishing effort is reached from February to March, on average 10 times higher than during summer months. The PTM effort related to sea bass catch reaches a maximum in February and March. The highest GTR fishing effort related to sea bass and monkfish is reached between October and February (on average three times higher than in April-May).

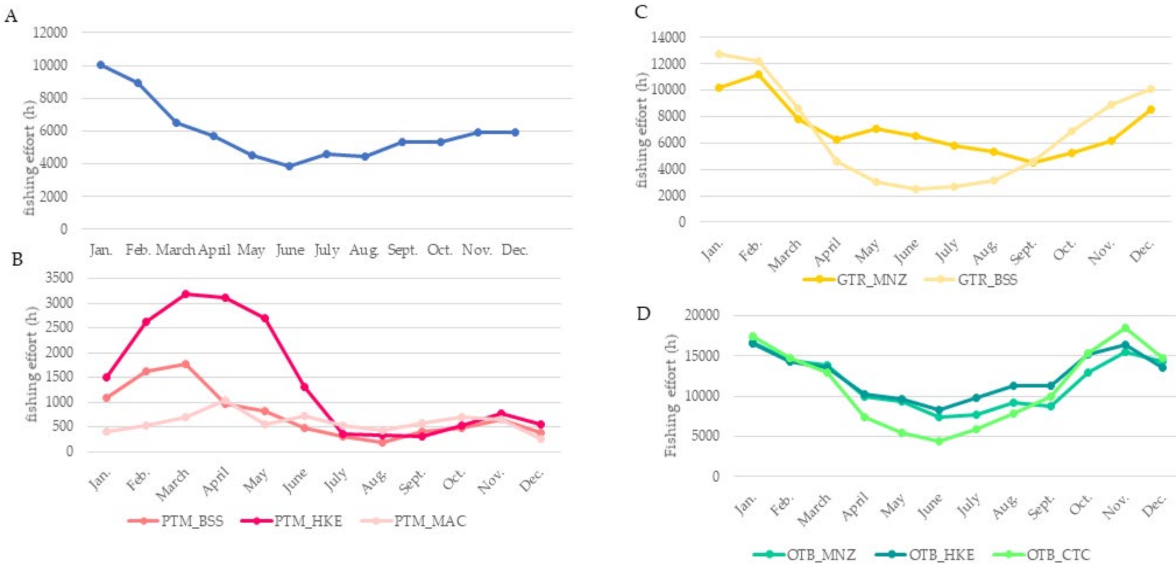


Figure 43 Monthly fishing effort (hrs) of different fisheries operating in ICES 8ab, averaged from 2015 to 2018 (vessel >12metres). GNS: French fishing effort related to catch of hake (HKE)(A); PTM: French fishing effort related to catch of sea bass (BSS), hake (HKE) and mackerel (MAC) (B); GTR: French fishing effort related to catch of sea bass (BSS) and monkfish (MNZ) (C),; OTB: French fishing effort related to catch of hake (HKE), cuttlefish (CTC) and monkfish (MNZ)

The winter distribution of GNS effort related to hake landings highlighted highest activity along the continental slope between December and March (**Figure 45**). PTM effort catching hake and sea bass is mostly concentrated in southern Brittany and between 45°N and 46°N, in front of Gironde estuary. PTM fishing effort related to mackerel landings increased and expanded across the continental shelf during winter, but remains mainly south of 47°N. The GTR effort related to sea bass catch is high and mostly coastal during winter months, and monkfish related fishing effort is not only very coastal but also occurs on the continental slope. The OTB fishing effort is quite similar for three main target species and covers mainly the Bay of Biscay below 47°N within the 100m isobath, and in southern Britany.

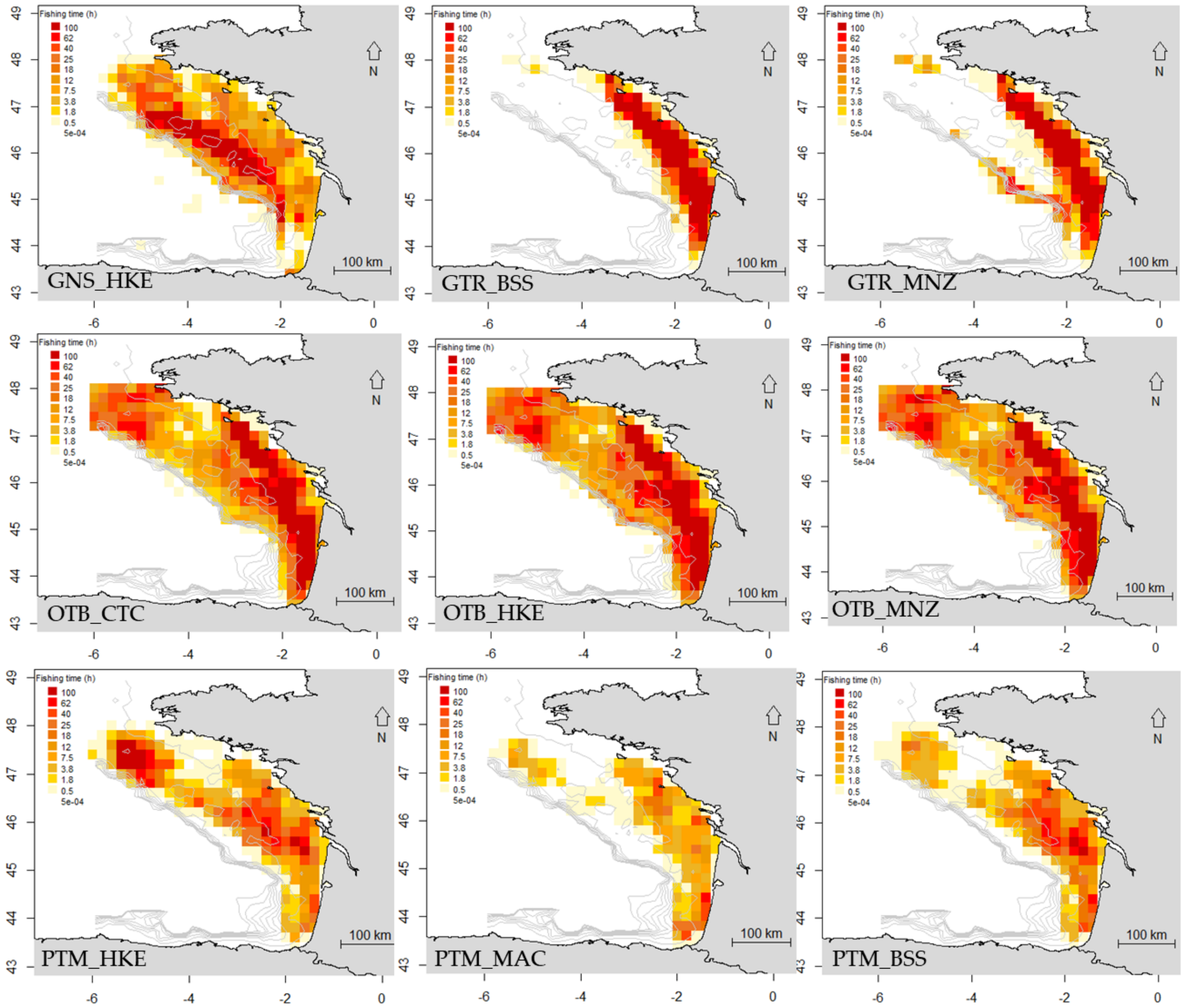


Figure 44 Distribution of French fishing effort related to landed species during winter months, averaged from 2015 to 2018 (vessel >12metres): GNS_HKE: Gillnets targeting hakes (*Merluccius merluccius*); GTR_BSS: trammel nets targeting sea bass (*Dicentrarchus labrax)*; GTR_MNZ: trammel nets targeting monkfish (*Lophius spp*.); OTB_CTC: bottom trawler targeting cuttlefish (*Sepia spp*); OTB_HKE: bottom trawlers targeting hake (*Merluccius merluccius*); OTB_MNZ: : bottom trawlers targeting monkfish (*Lophius spp.*), PTM_HKE: midwater pair trawlers targeting hake (*Merluccius merluccius*); PTM_MAC: midwater pair trawlers targeting mackerel (*Scomber scombrus*); PTM_BSS: midwater pair trawlers targeting sea bass *Dicentrarchus labrax)*.

Total fishing effort for vessels <12m

Figure 46 shows the annual effort for the under 12m fleet. There is an important increase for GNS and GTR during 2016 and 2017 compared to 2015, being 2 points higher for the effort in those years. In the case of pair trawlers, there is also a steady increase during the years, with 453 days at sea in 2015, 571 in 2016, and 633 in 2017.

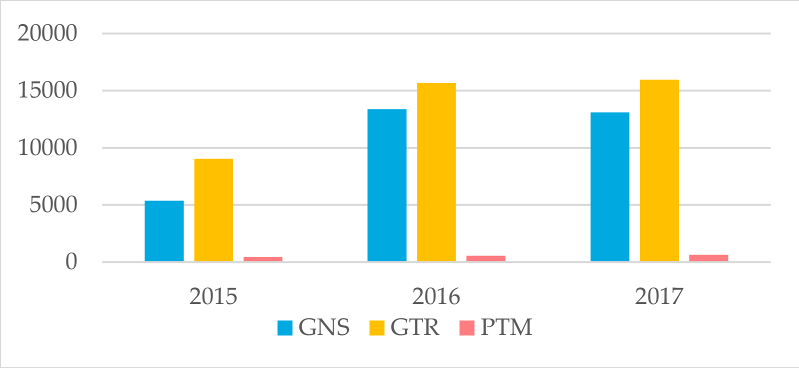


Figure 45 Annual effort for the French fleet under 12m fleet between 205 and 2017.

The PTM effort is steady at a low level during the whole year (**Figure 47**). In the case of GNS, the highest effort is from April to July, with a peak in May and June. The winter months are the lowest effort months, decreasing effort to one-third compared to the peak months. The GTR shows a quite stable effort during the year, with a steady increase during summer months

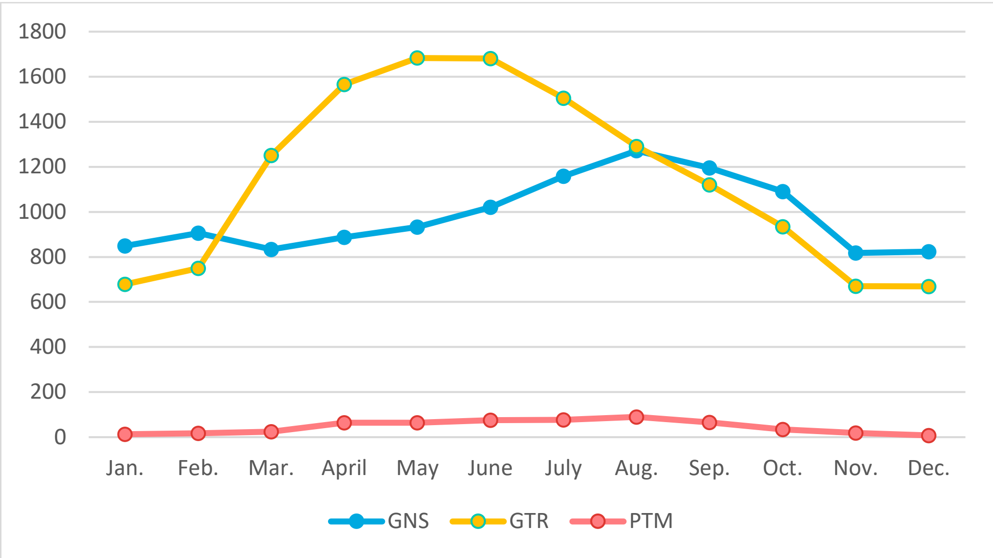


Figure 46 Monthly fishing effort of different fisheries (vessels <12 metres) operating in ICES 8ab, averaged from 2015 to 2017.

1.4.5 Results of bycatch assessment

1.4.5.1 Bycatch estimates using at-sea observations[21]

Within the Celtic Seas between 2005-2015, bycatch rates of common dolphin were highest in pelagic trawls (PTM) targeting demersal fish species (**Table 13**). Bycatch rates in this métier over that period were higher than any bycatch rates calculated in the more recent years, 2016-2018; for this period, the highest rates were estimated in midwater otter trawls (OTM) for small pelagic fishes, and trammel

[21] This section was updated after an error was corrected. During ADGBYC-1 in May 2020, duplicate submission of observer (and fishing) effort were identified in the WGBYC database which affected estimated rates and total mortality; these have been corrected in this report.

nets (GTR) and gillnets (GNS) for demersal fish. The bycatch rates in the most recent time period, however, were an order of magnitude lower than in the métiers with highest rates prior to 2016. The bycatch rates from 2016-2018 were raised using the average annual fishing effort within the métier (ML5) from the RDB (**Table 14**). The highest numbers of dolphins caught were in the bottom otter trawl (OTB) and gillnet (GNS) fisheries targeting demersal fish, capturing 276 dolphins (95% CI 151 – 427) and 192 dolphins (95% CI 85 – 299)), respectively. When bycatch rates were raised by the mean fishing effort per metier for 2016-2018, the total amount of annual bycatch in 2016-2018 across all métiers was 720 dolphins (95% CI 278 – 1,345)[22].

In the Bay of Biscay and around the Iberian Peninsula, the highest bycatch rates occurred in 2016-2018 in midwater otter trawls (OTM) and pelagic trawls (PTM) for demersal fish (**Table 13**). However, it should be noted that the OTM result was based on just 0.8 DaS observed and a single dolphin caught; further monitoring would be needed to get a more robust rate for this métier. Between 2005-2015, bycatch rates were highest in PTM for demersal fish species. The bycatch rates for 2016-2018 were raised using the average annual fishing effort for the same period within the métier (ML5) from the RDB/VMS data (**Table 14**). The highest number of dolphins caught annually was in trammel net fisheries targeting demersal fish (GTR-DEF) amounting to 2061 dolphins (95% CI 1203 - 3092). The total amount of annual bycatch in 2016-2018 in this ecoregion across all métiers was 3,973 (95% CI 1998 – 6599) .

When both ecoregions are combined, in a fuller representation of bycatch in the North East Atlantic, the total number of dolphins bycaught annually for 2016-2018 was 4,693 (95% CI 2,276 – 7,944) of which the majority (85%) occurred in the Bay of Biscay. The WGBYC monitoring data from 2016-2018 were reviewed to examine common dolphin bycatch rates by month and quarter by métier level 5. At this temporal resolution, the monitoring data are scarce, with very few days of monitoring in most métiers per quarter (even less per month). However, from the quarterly data, the highest bycatch rates occur in quarter 1 (Jan-March) in pelagic trawls for demersal fish (PTM_DEF) and in quarter 4 (Oct – Dec) in bottom pair trawls where the target assemblage is mixed pelagic and demersal fish (PTB_MPD).

Table 13 Summary of metier specific bycatch rates (individuals/Day at Sea Observed) of common dolphins by ecoregion

Ecoregion	Period	Métier4	Métier5	Days at Sea observed	Dolphins	Bycatch Rate	CI5	CI95
Celtic Seas	**2005-2010**	**PTM**	**DEF**	**223.00**	**29**	**0.13**	**0.09**	**0.17**
	2005-2010	PTM	SPF	484.00	6	0.01	0.00	0.02
	2005-2010	GNS	DEF	648.00	7	0.01	0.00	0.02
	2005-2010	OTM	SPF	132.66	1	0.01	0.00	0.02
	2011-2015	**PTM**	**DEF**	**309.00**	**56**	**0.18**	**0.14**	**0.22**
	2011-2015	OTB	DEF	35.00	3	0.09	0.03	0.17
	2011-2015	GNS	DEF	1304.97	12	0.01	0.01	0.01
	2011-2015	GTR	DEF	828.97	6	0.01	0.00	0.01
	2011-2015	PTM	LPF	225.00	1	0.00	0.00	0.01

[22] The confidence intervals for total bycatch estimates summed across metiers are wider than they should be. It was not possible to estimate a variance or CV by metier Level 5 for the bycatch rate due to how the data are collected and therefore not possible to calculate an accurate CI around the summed estimates.

	2011-2015	OTM	SPF	690.99	3	0.00	0.00	0.01
	2016-2018	**OTM**	**SPF**	**481.88**	**16**	**0.033**	**0.02**	**0.05**
	2016-2018	GTR	DEF	323.79	4	0.012	0.003	0.025
	2016-2018	GNS	DEF	851.9	9	0.011	0.005	0.016
	2016-2018	OTB	DEF	1778.64	11	0.006	0.003	0.009
	2016-2018	OTB	CRU	273.09	1	0.004	0	0.011
	2016-2018	GNS	CRU	356.17	1	0.003	0	0.008
	2016-2018	OTT	CRU	350	1	0.003	0	0.008
	2016-2018	OTB	DWS	520.28	1	0.002	0	0.006
Bay of Biscay	**2005 - 2010**	**PTM**	**DEF**	**306.00**	**142**	**0.46**	**0.40**	**0.53**
	2005 - 2010	PS	SPF	427.00	47	0.11	0.08	0.14
	2005 - 2010	SBV	SPF	80.00	6	0.08	0.03	0.13
	2005 - 2010	OTM	several species	16.00	1	0.06	0.00	0.19
	2005 - 2010	Polyva-lent	DEF	283.00	12	0.04	0.02	0.06
	2005 - 2010	OTM	DEF	36.00	1	0.03	0.00	0.08
	2005 - 2010	GNS	several species	46.00	1	0.02	0.00	0.07
	2005 - 2010	GNS	DEF	1455.00	23	0.02	0.01	0.02
	2011 - 2015	**PTM**	**DEF**	**27.50**	**3**	**0.11**	**0.04**	**0.22**
	2011 - 2015	GNS/GTR	DEF	311.00	13	0.04	0.02	0.06
	2011 - 2015	PS	SPF	153.00	4	0.03	0.01	0.05
	2011 - 2015	GNS	DEF	625.50	8	0.01	0.01	0.02
	2011 - 2015	GTR	DEF	628.50	2	0.00	0.00	0.01
	2016 - 2018	**OTM**	**DEF**	**0.82**	**1**	**1.22**	**0.00**	**3.67**

	2016 - 2018	PTM	DEF	167.17	118	0.706	0.598	0.813
	2016 - 2018	PTB	MPD	67	10	0.149	0.075	0.224
	2016 - 2018	GTR	DEF	339.74	12	0.035	0.021	0.053
	2016 - 2018	PTM	LPF	65.16	1	0.015	0.00	0.046
	2016 - 2018	PS	SPF	334.50	2	0.006	0.00	0.015
	2016 - 2018	GNS	DEF	536.84	2	0.003	0.00	0.009

Table 14 Summary of dolphin mortality for 2016-2018 in the Bay of Biscay and Celtic Seas by métier (L5). DaS = day at sea; CI = confidence interval; bycatch rate is number of individuals per day at sea observed; and bycatch is total number of individuals

Ecoregion	Metier4	Metier5	Effort Observed (DaS)	Number of Common Dolphins	Bycatch Rate	Lower 95% CI	Upper 95% CI	Effort Fished (Das)	Bycatch	Lower	Upper	% observer coverage
Celtic Seas (Division 6 &7)	**OTB**	**DEF**	**1778.64**	**11**	**0.006**	**0.003**	**0.009**	**44691.33**	**276**	**151**	**427**	1.33
	GNS	**DEF**	**851.9**	**9**	**0.011**	**0.005**	**0.016**	**18207.00**	**192**	**85**	**299**	1.56
	OTB	CRU	273.09	1	0.004	0.000	0.011	26597.00	97	0	292	0.34
	GTR	DEF	323.79	4	0.012	0.003	0.025	7117.00	88	22	176	1.52
	OTM	SPF	481.88	16	0.033	0.021	0.048	943.33	31	20	45	17.03
	OTT	CRU	350	1	0.003	0	0.009	7025.67	20	0	60	1.66
	GNS	CRU	356.17	1	0.003	0	0.008	4621.00	13	0	39	2.57
	OTB	DWS	520.28	1	0.002	0	0.006	1040.33	2	0	6	16.67
Bay of Biscay and Iberian Peninsula (Division 8 & 9)	**GTR**	**DEF**	**339.74**	**12**	**0.035**	**0.021**	**0.053**	**58364.83**	**2062**	**1203**	**3092**	0.19
	PTB	MPD	67	10	0.149	0.075	0.224	5195.00	775	388	1163	0.43
	PTM	DEF	167.17	118	0.706	0.598	0.813	682.00	481	408	555	8.17
	OTM	DEF	0.82	1	1.22	0	3.667	242.75	297	0	891	011
	PS	SPF	334.50	2	0.006	0	0.015	35563.67	213	0	532	0.32
	GNS	DEF	536.84	2	0.004	0	0.009	36838.67	137	0	343	0.49
	PTM	LPF	65.16	1	0.015	0	0.046	510.00	8	0	23	4.26

1.4.5.2 Bycatch estimates inferred from strandings

The identification of positive correlations between the origin of stranded common dolphins inferred from standings and fishing effort operating at the same location and at the same time suggests the recurrence of these potential interactions (**Table 15**).

Table 15 Main positive correlations between mortality areas of bycaught stranded common dolphins and fishing effort in the Bay of Biscay between 2006 and 2019. Red cells represent years with positive correlations, grey cells represent years with negative or flat correlations.

Year	PTM Fr BSS-HKE-MAC	GTR Fr BSS-MNZ	GNS Fr HKE	SDN Fr BSS-WHG	OTB Sp All species
2006				No fishing effort	
2007				No fishing effort	
2008					
2009					
2010	No Multiple Stranding Event				
2011					
2012					
2013					
2014					
2015					
2016					
2017					
2018					
2019					
Years correlated	77%	69%	54%	36%	61%

The PTM, GNS, GTR and Spanish OTB are the most often correlated fisheries with the mortality areas of common dolphins. The SDN fishery appears to be correlated over only the last three years, but this could suggest recent changes in SDN practices or simply larger overlap between fishing activities and dolphin presence. Since 2017 and the large increase of strandings of common dolphins in Biscay, the correlations are similar (except for the Spanish bottom trawlers in 2019).

Although the positive correlations between common dolphins and fishing gear in the Bay of Biscay involve a large diversity of métiers, two characteristics are shared: fisheries targeting predatory fishes in winter and using high vertical opening gears (Peltier et al., 2020).

The co-occurrence of bycaught dolphins and fishing effort of different fisheries is not evidence for a causal relationship but highlights a risk of lethal interaction and identifies those fisheries that require further investigation.

In 2017 and 2018, the mortality inferred from French strandings in the Bay of Biscay and the Western Channel were respectively estimated at 9,300 [5,800; 17,900] and 5,400 [3,400; 10,500] common dolphins. The advanced decomposition status observed in 2018 on 44% of common dolphins found stranded (vs 34% in 2017) reduced the potential for bycatch identification and may have underestimated mortality estimations.

1.4.6 Population consequences of bycatch

Existing conservation objectives under the various relevant European legislation are not well defined or expressed in quantitative terms which hinders the process of setting limits (or thresholds). An expert group convened by the Scientific, Technical and Economic Committee for Fisheries (STECF, 2019) was asked to provide a summary of candidate maximum bycatch thresholds for the cetacean species most typically bycaught within European waters. However, on review of the expert group report, the STECF advice to the European Commission was that "in the absence of reliable population estimates, current conservation status and stated conservation objectives for cetacean populations in EU waters, there is no objective scientific basis to propose reliable estimates for maximum potential bycatch thresholds for all the cetacean species most typically bycaught (i.e. harbour porpoises, common, striped and bottlenose dolphins, minke and humpback whales)" (STECF, 2019).

Nevertheless, some thresholds have been proposed for the more "data rich" species, such as harbour porpoise and common dolphin. Within Europe the only limit widely utilised for assessing bycatch is that established under the Agreement on the Conservation of Small Cetaceans of the Baltic, North East Atlantic, Irish and North Seas (ASCOBANS). The agreement has the general aim to *minimize (i.e. ultimately to reduce to zero) anthropogenic removals (i.e. mortality), and in the short term, to restore and/or maintain biological or management units to/at 80 per cent or more of the carrying capacity; (b) in order to reach this objective, the intermediate precautionary aim is to reduce bycatch to less than 1 per cent of the best available population estimate* (ASCOBANS, 2000, 2016). In the absence of other internationally agreed limits, the ASCOBANS 1% limit is often used in assessments of the risk posed by bycatch to species other than the harbour porpoise (e.g. ICES WGBYC 2018). The merits of doing this have not been fully considered.

The CODA project (CODA, 2009) applied Potential Biological Removal (PBR) and Catch Limit Algorithm (CLA) approaches to derive bycatch limits for common dolphins in the northeast Atlantic (**Table 16** in Annex 7). In both cases, the bycatch limits depict the levels of mortality which should enable conservation objectives for the population to be met. In the case of the CODA work, the objective was based on that of ASCOBANS and the limits derived to ensure that populations were restored/maintained at 80% carrying capacity over 200 years. Both methods gave bycatch limits in the range of approximately 200-1500 common dolphins a year based on estimates of abundance from surveys in July 2005 (shelf waters) and July 2007 (offshore waters). However, the PBR was originally designed to assess whether a population was at an Optimum Sustainable Population under the US Marine Mammal Protection Act. If annual bycatch is below the PBR limit, then a population should recover or be maintained at or above 50% of carrying capacity with 95% probability. In July 2015/2016, there were new wide-scale surveys of cetacean abundance (Rogan et al., 2018; Hammond et al., 2017) and the ICES WGMME utilised abundance estimates from this in a PBR using the US MMPA conservation objective; the PBR limit was given as 4,926 animals for the northeast Atlantic AU (ICES WGMME, 2020) (Table 8). The new higher limits are driven by the much higher abundance estimate in this region than a decade ago. It is worth noting that the PBR is less than 1% (0.78%) of the best available abundance estimate, i.e. lower than the ASCOBANS 1% limit.

However, the WGMME (2020) caveated the PBR limit with the following:

- **The conservation objectives to which PBR is tuned are not entirely reflected in the relevant EU legislation (Habitats Directive, Common Fisheries Policy, Marine Strategy Framework Directive);**
- **The default value of R_{max} = 4% in the PBR calculation may be incorrect for common dolphins**

WGBYC also noted that the abundance estimate was derived from estimates for common dolphins and a proportion of common/striped dolphins for July 2015/2016. Numbers in the entire survey area can vary markedly between years and between seasons; we know that common dolphins occur beyond the area surveyed, but it is not known what proportion that is nor how that is varying over time. The abundance estimate applied by WGMME was based upon assignment of most unidentified common/striped dolphins from the surveys to common dolphins. Striped dolphin abundance is highest offshore and in the southern sector of the Bay of Biscay, but overall numbers appear to be much lower than for common dolphin.

To explore some of the uncertainties highlighted with the WGMME PBR estimate, WGBYC have explored other scenarios to review effects on PBR outcomes (**Table 17**). These include using only estimates of abundance for identified common dolphins, and changing some of the parameters in the PBR calculation:

$$\mathrm{PBR} = \mathrm{N_{min}} \,.\, \frac{1}{2}\,\mathrm{R_{max}} \,.\, \mathrm{F_R}$$

where N_{min} is the minimum population estimate (the 20th centile), R_{max} is the maximum theoretical or estimated productivity rate of the population and F_R is a recovery factor between 0.1 and 1.0.

The justification for choosing the scenarios are:

Scenario 1: uncertainty in R_{max}. We examined a range of 0.3-0.5. The widely used default value, in the absence of empirical data, is a value of 0.4; this was used by WGMME (2020*)*. However, noting the estimated reproductive rates for heavily depleted populations such as bowheads (4%) and southern right whales (6%), this parameter may not be lower than 0.4 for common dolphin.

Scenario 2: uncertainty in the recovery factor. We examined a range of 0.6 – 0.9. Under the US MMPA, it advises the use of a value of up to 1.0 for populations that are at their optimum sustainable level or of unknown status but known to be increasing, and 0.4-0.5 for populations which are threatened/depleted or of unknown status. Values less than 0.4 are usually reserved for endangered species or populations known to be in decline. Higher values of F_r were considered because there is no evidence that the abundance in the North East Atlantic Assessment Unit is declining (although re-distribution of the population may be occurring).

Scenario 3: uncertainty in the abundance estimates. As explained above, the WGMME estimate may be biased upwards due to apportionment of sightings of common/striped dolphin as common dolphins in the abundance estimate. So, PBR was also estimated using a conservative "common dolphins only" from the survey data. There may also be population structure which would result in an over-estimation of abundance. On the other hand, if the assessment unit spans a wider area than those for which the abundance estimates have been applied, overall abundance could be larger. The large difference in abundance estimates between 2005 and 2016 indicates that may well be the case.

Twelve potential PBR scenarios were run (**Table 16** in Annex 7). The estimate of recent annual bycatch using the WGBYC observer data for the NE Atlantic AU was 4,693 dolphins (95% CI 2,276 – 7,944). The point estimate is just below the WGMME PBR estimate of 4,926; our estimated bycatch in the North East Atlantic AU is equivalent to 95%% of the PBR. However, the upper 95% CI of the bycatch estimate (7,944)) exceeds the WGMME PBR and so we cannot confidently conclude that bycatch is below the PBR. In only 3 of the 12 scenarios did the point estimate of bycatch exceed the PBR and these were when the more conservative estimate of abundance is used and/or the estimated productivity rate of the population is lower. However, the upper 95% confidence limit around the bycatch estimate is higher than 8 of the 12 PBR outcomes. The PBR is a precautionary method but given the limitations highlighted in the monitoring and effort data, it is possible that current levels of bycatch exceed PBR limits. When estimates of mortality from the strandings data are considered, the likelihood of annual mortality exceeding the WGMME PBR is higher. In 2017 and 2018, the mortality inferred from French strandings in the Bay of Biscay and the Western Channel were respectively estimated at 9,300 [5,800; 17,900] and 5,400 [3,400; 10,500] common dolphins (Peltier et al., 2019). [23]

[23] This paragraph was updated after an error was corrected. During ADGBYC-1 in May 2020, duplicate submission of observer (and fishing) effort were identified in the WGBYC database which affected estimated rates and total mortality; these have been corrected in this report.

Table 16 Summary of bycatch thresholds estimated for the northeast Atlantic Management Unit for common dolphin. * note that this abundance estimate is derived from common dolphin and a proportion of common/striped dolphin.

Method	Year of abundance survey	Abundance	95% confidence intervals	Bycatch threshold	Conservation Objective (CO)	Basis of CO	Reference
CLA	2005 + 2007	180075	56915-246740	227-1547 (scenarios)	80% carrying capacity over 200 years	ASCOBANS	CODA (2009)
PBR	2005 + 2007	180075	56915-246740	345-1524 (scenarios)	80% carrying capacity over 200 years	ASCOBANS	CODA (2009)
PBR	2016	634286*	352227 - 1142213	4,926	maintained at or above 50% of carrying capacity with 95% probability	U.S. Marine Mammal Protection Act	ICES WGMME (2020).

Table 17 Scenarios to examine the impact of uncertainty on parameterisation of the Potential Biological Removal for common dolphins in the northeast Atlantic. The grey shaded cells represent the WGMME calculated PBR, and CV = coefficient of variation in N; N_{min} is the minimum population estimate (the 20th centile); R_{max} is the maximum theoretical or estimated productivity rate of the population and F_R is a recovery factor between 0.1 and 1.0.

Scenario	Abundance (N)	CV (N)	N_{min}	R_{max}	F_R	PBR
Rmax uncertainty	634286	0.307	492652.5	0.04	0.5	4927
	634286	0.307	492652.5	0.03	0.5	3695
	634286	0.307	492652.5	0.05	0.5	6158
Recovery factor uncertainty	634286	0.307	492652.5	0.04	0.6	5912
	634286	0.307	492652.5	0.04	0.75	7390
	634286	0.307	492652.5	0.04	0.9	8868
Precautionary abundance	481306	0.26	387711.9	0.04	0.5	3877
	481306	0.26	387711.9	0.03	0.5	2908
	481306	0.26	387711.9	0.05	0.5	4846
	481306	0.00	481306	0.04	0.6	5776
	481306	0.00	481306	0.04	0.75	7220

	481306	0.00	481306	0.04	0.9	8664

An online marine mammal bycatch impacts exploration tool (in development) was used to explore the population outcomes of current levels of bycatch for different depletion levels of the population. The advanced tool uses an age structured population dynamics model and the user inputs parameters for their species of interest, including survival rates for calves and age 1+ yr animals, age at sexual maturity, population abundance and associated CV, annual bycatch mortality range and a level of population depletion. The population is assumed to start at some stable age structure in year 1 of the projection period. The numbers at age correspond to a constant bycatch mortality rate, which is calculated from the initial depletion level. The tool does not have a "common dolphin" option for species; we chose the closest available relative, bottlenose dolphin, and increased the age at sexual maturity to 8 years. This aligns with the average age of sexual maturity in females reported for the NE Atlantic (8.2 years: Murphy et al., 2019 and references therein) and in Galicia (8.4 years: Read et al., 2016). Males mature later, at 10-11 years (Murphy et al., 2019). The default survival rates based on published values for bottlenose dolphins were retained in the absence of empirical data for this species. Two scenarios (different only in the abundance estimate) for common dolphins were considered:

- **Scenario 1: Abundance used was a precautionary estimate of common dolphins only from the SCANS-III and ObSERVE surveys i.e. 481,306 abundance with a CV ~0.3**
- **Scenario 2: Abundance used in common dolphins and common/striped dolphins from SCANS-III and ObSERVE surveys i.e. 634,286 abundance with a CV ~0.3**
- **Population depletion for both scenarios was set to 25%; this is meant to reflect the history of human-caused mortality that best fits the population.**
- **Bycatch range was set as 1,998 – 6,598 (CV ~0.3)[24] for both scenarios based on our analyses of the WGBYC monitoring data; and**
- **Maximum Net Productivity Level (MNPL) as a proportion of carrying capacity of 0.5[25]**

The results from scenarios 1 and 2 are presented in **Table 18** and **Table 19**. The results show, given the input parameters selected that if bycatch is at the higher end of the estimated range then the population abundance will have been reduced to 61-70% relative to K over the long term (50 years); this is below the ASCOBANS objective to maintain carrying capacity (K) at 80%. If the true number of bycaught animals is better represented by estimates from strandings (bycatch range 4411-10827), then middle to high bycatch levels would, as expected, lead to greater declines in abundance relative to the carrying capacity of the population; abundance relative to K after 50 years could be 0.5[26]. These results indicate a probable decline in the population for both population abundance scenarios.

[24] This estimate was updated after an error was corrected. During ADGBYC-1 in May 2020, duplicate submission of observer (and fishing) effort were identified in the WGBYC database which affected estimated rates and total mortality; these have been corrected in this report. This correction affects the estimates for the 3 scenarios shown below that were consequently updated in May 2020.

[25] The value of the input parameters, MNPL was updated (form 0.4 to 0.5) on the basis of reviewer's comments ahead of the ADG.

[26] This third scenario, using the higher abundance and strandings bycatch range (all other parameters the same) was run during ADGBYC and this section updated for completeness.

Table 18 Scenario 1: abundance 481,306 common dolphins

	Lower end of bycatch range	Middle	Higher end of bycatch range
Probability (Above MNPL in 50 years)	1.00	0.98	0.82
Probability (Above MNPL in 100 years)	1.00	0.99	0.59
Abundance relative to K after 10 years	0.76	0.73	0.70
Abundance relative to K after 20 years	0.79	0.73	0.67
Abundance relative to K after 50 years	0.85	0.73	0.61

Table 19 Scenario 2: abundance 634,286 common dolphins

	Lower end of bycatch range	Middle	Higher end of bycatch range
Probability (Above MNPL in 50 years)	1.00	0.99	0.97
Probability (Above MNPL in 100 years)	1.00	1.00	0.98
Abundance relative to K after 10 years	0.76	0.74	0.72
Abundance relative to K after 20 years	0.80	0.76	0.71
Abundance relative to K after 50 years	0.87	0.79	0.70

1.5 Evaluating pressures and threats due to commercial fisheries bycatches to harbour porpoises in the Baltic Sea

1.5.1 Overview of abundance, distribution and population structure

Based on genetic and morphological evidence, as well as acoustic and telemetry studies, the Baltic Sea can be separated into three management units for harbour porpoises, the North Sea population, the Kattegat Belt Sea population and the Baltic harbour porpoise population. The summer range of the Kattegat, Belt Sea population extends to about 13.5° East as shown by telemetry data (Sveegaard et al., 2015). There is however limited information on the western boundary of the Baltic harbour porpoise population. Between May and October, there is a separation between the Kattegat, Belt Sea population and the Baltic harbour porpoise populations from the island of Hanö (Sweden) to Jarosławiec near Słupsk (Poland). However, there appears to be an overlap between populations from November to April further west (**Figure 48**) (Sveegaard et al., 2015; Carlén et al., 2018). Underlying migrations causing this seasonal shift of population boundaries are not understood. In Polish waters, an autumn maximum of acoustic activity in the Pomeranian Bay, east of Rügen (Germany), followed by a smaller peak in winter has been interpreted as a shared area use of both populations with a fraction of the Baltic Proper population immigrating in winter after Western Baltic animals left the area (Gallus et al., 2012; Benke et al., 2014). It is not clear how far west harbour porpoises from the Baltic Proper population migrate in winter. Based on the seasonal porpoise distribution patterns at Rügen and the environmental variables explaining this, the morphological difference between the populations (Galatius et al., 2012), and the bathymetry of the southern Baltic showing that the deep waters of the Arkona Basin north of Rügen reach approximately to longitude 13°E to the west, ICES WGMME (2020) in their review of emergency measures suggests longitude 13°E as the western management boundary of the Baltic Proper harbour porpoise population during November-April. To the north, a general pattern shows that during the 21st century, porpoises have primarily been sighted south of a line drawn approximately between latitude 60.5°N at the Swedish east coast and latitude 61°N at the Finnish west coast, and WGMME therefore suggest this as the northern management border of the Baltic Proper harbour porpoise population.

From latest shipboard surveys during SCANS III the abundance of the Kattegat, Belt Sea population is estimated at 42,324 (95% CI: 23,368-76,658) animals (Hammond et al., 2017). Based on acoustic monitoring within the SAMBAH project, the abundance of the Baltic Proper population has been estimated at only 497 individuals (95% CI: 80 – 1091) and it has a wide overall distribution range (SAMBAH, 2016). During the winter season, it stretches from the Åland and Archipelago Seas in the north, to the Southern Baltic Proper in the southwest, and perhaps even further west thereof. In the summer season, however, when calving and mating take place, the majority of the population aggregates at and around the Hoburg's and Northern and Southern Midsea Banks in the Baltic Proper (ASCOBANS, 2016; Carlén et al., 2018).

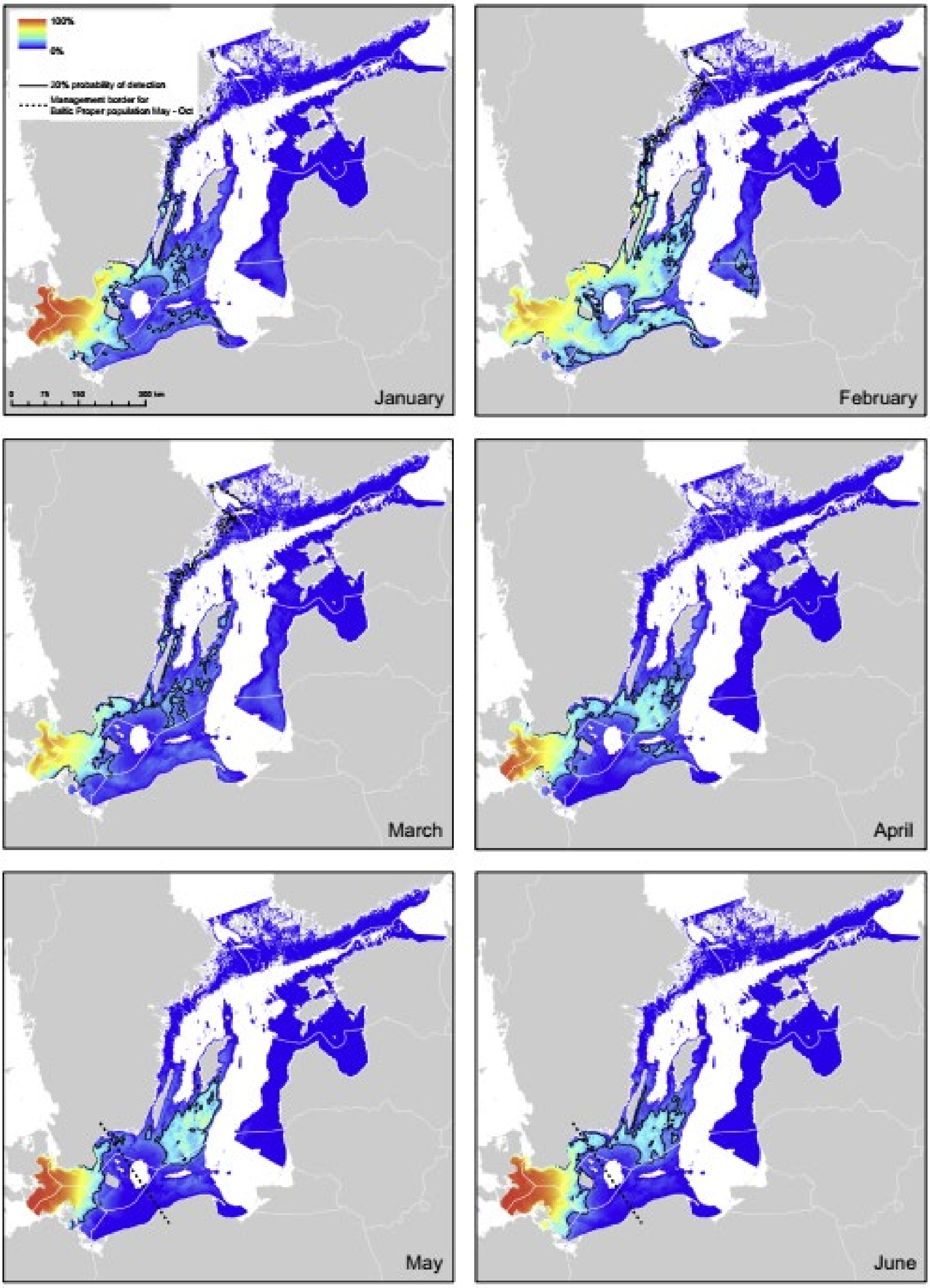


Figure 47 Predicted probability of detection per km² and month of harbour porpoises in the SAMBAH study area, for each month January to December. The probability scale is the same in all figures. The black lines indicate the 20% probability of detection. The dotted line shown for May–October is the seasonal management border proposed for the Baltic Proper population. From: Carlén et al. (2018)

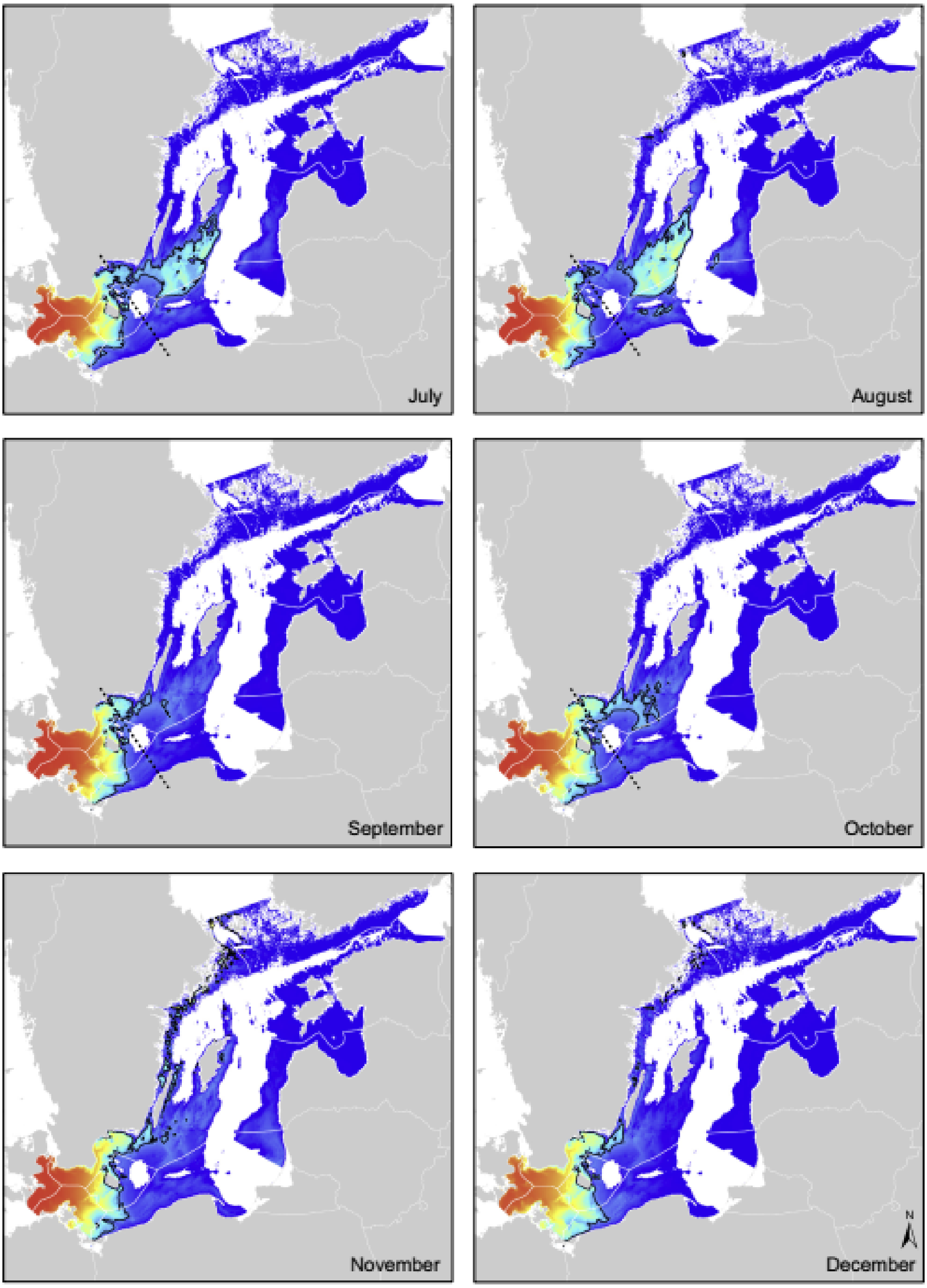


Figure 26 (cont) Predicted probability of detection per km² and month of harbour porpoises in the SAMBAH study area, for each month January to December. The probability scale is the same in all figures. The black lines indicate the 20% probability of detection. The dotted line shown for May–October is the seasonal management border proposed for the Baltic Proper population. From: Carlén et al. (2018)

1.5.2 Characterisation of the Baltic Sea fisheries

Fisheries in the Baltic Sea are focused on a few major fish species. The pelagic fisheries, which account for the largest catches (by weight) in the region, are the mid-water trawl fisheries for sprat and herring. The most important demersal fisheries are the bottom-trawl fisheries for cod and flatfish. The demersal fisheries are concentrated in the south and west of the Baltic Sea, while the pelagic fisheries are more widespread. Set gillnets are widely used both in offshore fisheries targeting cod, flatfish, and herring and in coastal fisheries exploiting a large variety of species, including cod, flatfish, herring, whitefish, pikeperch, perch, pike, sea trout and salmon. Basin-wide, commercial fishing effort has declined since 2004. Further details on fish catches over time, description of the fisheries, and the status of the fishery resources can be found in the Baltic Sea Ecoregion fisheries overviews.[27]

1.5.3 Historical information on Baltic harbour porpoise bycatch

Historical information on harbour porpoise bycatch in the Baltic Proper is very limited. EU Member States have submitted reports annually to WGBYC as part of the obligations to the EU Regulation 812/2004. These have been compiled into the WGBYC database since 2006, along with other data summarised in WGBYC reports. However, the monitored effort is limited (1126 monitored days at sea in gillnet and entanglement fisheries). Thus, given current reporting levels and the very small size of the population, information on bycatch needs to come from other sources.

NAMMCO/IMR (2019) estimated bycatch numbers from bycatch rates calculated from the neighbouring Belt Sea population. These were derived largely from Remote Electronic Monitoring but also onboard observers, reported to ICES WGBYC in Areas 21, 22 and 23 during 2007-2016. Fishing effort was obtained from the ICES Regional Database. A 95% confidence interval was calculated by assuming a binomial distribution, resulting in an upper limit of 0.0417 bycatches per Days at Sea. The upper limit of the Belt Sea bycatch rate was adjusted for the lower porpoise density within the Baltic Proper assessment unit, using the density estimate for Block 2 in SCANS III (Hammond et al., 2017) and the overall density within the summer distribution range in the SAMBAH survey (SAMBAH, 2016). This resulted in a Baltic bycatch upper rate of 0.000148 animals per Days at Sea. By multiplying this by the total gillnet fishing effort in ICES sub-areas 25-29 for each of the years from 2009 to 2017, the estimated annual number of bycaught harbour porpoises of the Baltic Proper population was obtained. This number declined from 12 in 2009 to 7 in 2017.

For Finnish waters, data on bycaught and caught harbour porpoises during 1900 – 1990 have been compiled and checked by the Finnish Ministry of the Environment (2006). According to the data reported to HELCOM, the average number of records of bycaught or caught porpoises between 1900 and 1939 was 14 per decade. There were no records from the 1940s. From 1950 – 1999, the number averaged less than two animals per decade. Between 2000 and 2017, no harbour porpoises were recorded bycaught in Finland but one was caught and released in 2018 (O. Loisa, *pers. comm.*); no porpoise bycatch has been recorded since 2000 in Estonia and Lithuania (ASCOBANS, 2016), although there were two records of freshly dead porpoises from Latvia, one bycaught in a salmon net in 2003 and the other bycaught in a cod net in 2004, and handed in to the natural history museum in Riga (Jüssi, 2004).

For Polish waters, catch and bycatch data for 1922-1987 have been compiled by Skóra et al. (1988). Until early 1935, hundreds of animals were recorded in fishery statistics as direct captures under a bounty scheme. Since the 1940s when the catch stopped, no data on harbour porpoises were recorded by the fishery, and all data on bycatch until now have been based only upon voluntary reports from fishermen. Between 1951 and 1987, information on bycatches was collected based on available unpublished literature, yielding only a proportion of the reported bycatch within the summer distribution range of the Baltic Proper porpoise population, estimated to be c. 10-14 harbour porpoises. These made up over two-thirds of all voluntary reported bycatches along the Polish coast within this time period. For the period 1990-2009, a minimum of 66 harbour porpoises were reported bycaught along the entire Polish coast; of

[27] https://www.ices.dk/sites/pub/Publication%20Reports/Advice/2019/2019/BalticSeaEcoregion_FisheriesOverviews.pdf

those, 97% were from semi-drift nets (categorised as GNS after the EC definition was released in 2008 as they represent static gillnets anchored at one end to the seabed) mainly targeting salmonids, and bottom-set nets for cod (Skóra & Kuklik, 2003; Professor Krzysztof Skóra Hel Marine Station database). Since 2004, voluntary reporting of bycatch has been much reduced so it has not been possible to obtain information in recent years from these fisheries. One report of a bycaught harbour porpoise was delivered by a fisherman in 2014 and a second in 2018, when a further 14 porpoises were found stranded on Polish beaches (causes of death unknown) (Professor Krzysztof Skóra Hel Marine Station data submitted to the HELCOM/ASCOBANS harbour porpoise database).

In Swedish waters, 50 harbour porpoises were collected in the Baltic Sea from Nov 1960 to Oct 1961, 46-48 of which were within the summer distribution range of the Baltic Proper population. They had all been bycaught in salmon gear and the aim of the collection was to investigate their stomach contents (Lindroth, 1962). In more recent years, minimum bycatch numbers are available from the database of the Swedish Museum of Natural History of necropsied and/or sampled animals. Between 1976 and 2017, a total of 18 bycaught animals were collected that were believed to be from the Baltic Proper population.

For Danish waters, although porpoise strandings have been recorded in past years, very few of them have been from locations that are relevant for the Baltic Proper population, and for most of them the cause of death was unknown.

For most stranded animals, the cause of death could not be determined, but at least some of those are likely to have been bycaught. Given the number of strandings recorded only by Poland and Sweden in recent years, WGMME (2020) estimates the minimum bycatch mortality to be 5-10 individuals per year, which would represent an annual loss of at least 1-2% of the best population estimate.

1.5.3.1 Bycatch data from 2006 until 2018

As noted above, bycatch events for Baltic Proper harbour porpoises are extremely rare due to the low abundance of harbour porpoises and low monitored effort in the region. We compiled all observed effort data included in the WGBYC database, from the first year of submitted data, 2006, until 2018 (**Table 20**). The area included in the summary is ICES division 3d (subdivision 24-32). A total of 7258 days at sea have been monitored across all métiers from 2006 until 2018 with no bycatch of harbour porpoise reported. However, one harbour porpoise was bycaught in subdivision 24 in 2015 in the bottom otter trawl fishery. However, there is no monitored effort reported in connection with this bycatch. The observed effort has mainly been in pelagic trawl fisheries (midwater otter trawls), with some also in gillnet (GNS) and bottom otter trawl fisheries. Analysing data submitted under the sampling program to the WGBYC database for the years 2015 to 2017, the midwater otter trawl fishery accounts for 40% of the observed effort under Regulation 812/2004, and the rest is under DCF/EU-MAP. Gillnet fisheries have been carried out mainly under DCF/EU-MAP (75%) whilst up to 96% of observed bottom trawl effort is under DCF or EU-MAP. The amount of effort monitored under DCF/EU-MAP reflects the quality of the monitoring carried out in the Baltic. WGBYC have reported previously on the downward bias in bycatch rates from data collected in non-dedicated compared with dedicated observer schemes. Depending on the observer protocol and procedures adopted, bycaught animals falling out of the net during hauling (see, for example, Kindt-Larsen et al., 2012) may be overlooked, which may also produce additional downward bias. Furthermore, focusing attention on monitoring of commercial fish instead of protected species may also result in the reporting of false zeroes. For example, the full fishing operation might not have been monitored if the observer is below deck focusing upon sorting and measuring fish while the next trawl is being hauled. Conversely, monitoring within DCF/EU-MAP observer programs have focused upon larger vessels, which are assumed to have higher bycatch due to larger numbers of nets set, and this could cause a positive bias in the assessments. The magnitude of each potential bias in fishing effort and bycatch numbers is unknown.

Table 20 Total observed number of days at sea (DaS) for the Baltic including division 24 from the year 2006 until 2018.

Gear	Métier Level4	Total DaS 2006 - 2018

Stationary uncovered pound nets	FPN	30
Pots and traps	FPO	121
Fyke nets	FYK	34
Set gillnet	GNS	1126
Trammel net	GTR	10
Drifting longlines	LLD	255
Set longlines	LLS	7
Bottom otter trawl	OTB	1031
Midwater otter trawl	OTM	4569
Multi-rig otter trawl	OTT	3
Bottom pair trawl	PTB	10
Midwater pair trawl	PTM	55
Anchored seine	SDN	6
Fly shooting seine	SSC	1
	Total	7258

1.5.4 Characterisation of the fisheries with potential for bycatch

Since the abundance of harbour porpoise is extremely low, bycatch incidents in the Baltic Proper are particularly rare and in order to evaluate which métiers pose a risk to bycatch of harbour porpoise, we have assessed the bycatch of harbour porpoise in areas outside of the Baltic. We have summarized harbour porpoise bycatch at métier level 4 for the North Sea (ICES division 3a, 4, 7e and d), the Celtic Sea (ICES division 6 and 7), and the Bay of Biscay (ICES division 8a and b). Since the abundance of harbour porpoise has changed in the Celtic Sea and Bay of Biscay, data were summarized over the time periods 2005 to 2010, 2011 to 2015 and 2016 to 2018. All assessed time periods in the Nort Sea and the Celtic Sea showed the highest bycatch rate for harbour porpoise in gillnet or trammel net fisheries (GNS or GTR). Assessed time period 2016 to 2018 from Bay of Biscay bycatch rates are highest in midwater pair trawls (PTM). However, harbour porpoises are also caught in bottom and midwater otter trawls (OTB, OTT and OTM). No harbour porpoises were observed bycaught in passive gears such as longlines and pots (LLS, LHM and FPO).

In the North Sea, all data from 2005 until 2018 were pooled. Harbour porpoises were bycaught in GNS, GTR, OTM and PTM (see Table 20 for clarification of abbreviation). The mean bycatch rate of GNS (the métier with the highest bycatch rate) was 28 times higher than the bycatch rate in OTM, and 37 times higher than in PTM. In the Celtic Sea during the assessment period 2016 to 2018, bycatch was observed in OTB and OTT. The mean bycatch rate of GNS was 32 times higher than in OTB and 8 times higher than in OTT. In the Bay of Biscay, harbour porpoises are also bycaught in PTM. The highest mean bycatch rates of GTR were 1.6 times higher than in OTB and range from 1.6 to 9 times higher than in PTM but bycatch rates in GTR are only 1.8 times higher than in OTB. In anlaysis of data collected from 2016 to 2018 the mean bycatch rates were actually higher in PTM than in GTR. It should be noted that due to the low coverage and summarizing data over a large area and time, these bycatch rates do come with large caveats and rather gives an indication of which gears catch harbour porpoises than a comparison between gears.[28]

Table 21 shows the observed days at sea for all métiers, summarized by area and for the different time periods. It should be noted that for a number of métiers in the different areas and time periods, the observed numbers of days are low and thereby not giving reliable bycatch rates.

[28] This paragraph was updated after an error was corrected. During ADGBYC-1 in May 2020, duplicate submission of observer (and fishing) effort were identified in the WGBYC database which affected estimated rates and total mortality; these have been corrected in this report.

To conclude, there is evidence to that highest bycatches of harbour porpoises are found in gillnets and trammel fisheries (GNS and GTR). Harbour porpoises are also bycaught in otter trawls (OTB, OTT and OTM) and midwater pair trawls (PTM). No harbour porpoises were observed bycaught in passive gears such as longlines and pots (LLS, LHM and FPO).

1.5.5 Effort analysis for the relevant fisheries

A request was made to the ICES Secretariat for fishing effort data from 2009 until 2018 from the ICES RDB. The assessment in the previous section showed that GNS, OTT, OTB, OTM and PTM are métiers that have a risk of bycatch of harbour porpoise. However, GNS is the métier with the highest bycatch rate. Data on fishing effort (Days at Sea) for métiers GNS/GTR, OTB/OTT, OTM and PTM from the ICES RDB have therefore been summarized by ICES rectangle for the years 2009 until 2018 and plotted on maps of the Baltic Sea.

The maps of GNS effort, based on RDB data (**Figure 49**) show that fishing effort is mainly concentrated in the southern Baltic, and around the German and Polish coasts. The focus of effort in these waters might actually be due to an over reporting of fishing effort for small-scale fisheries in Germany where small-scale fishermen report their catch only once a month. The reports are then multiplied by the number of days per month, i.e. 30 or 31. This most likely overestimates the fishing effort for small scale fisheries in this area. The maps of VMS data (**Figure 50**), representing fishing effort from vessels >15 metres) also show that gillnet fisheries are focused in the southern Baltic, although mainly from outside Polish coastal waters. These data are likely to be showing only where the number of fishing vessels larger than 15 metres are operating rather than the overall fishing effort. Sweden for example, has no vessels over 15 metres fishing with gillnets and thereby the gillnet effort is not shown on the map.

Sweden and Poland are two Baltic countries where fishing effort is reported in logbooks for all vessels independent of size. Therefore, we can spatially and temporally evaluate fishing effort by this means, at least in Swedish and Polish waters. In Sweden and Poland, the fishing effort for all vessels with an overall length greater than 8 metres fishing for cod report their daily catch to the EU logbook. In southern Swedish waters, the main gillnet fisheries are targeting cod so that in this area a large part of all gillnet fisheries effort is reported to the logbook on a daily basis. Other vessels less than 8 metres or vessels with a length less than 10 metres that are fishing for other target species report their catch on a monthly basis, both in Sweden and Poland.

Figure 51 shows the spatial distribution of fishing effort in Swedish waters across two periods of the year (January to June and July to December) for the years 2018 and 2019. The fishing effort is mainly distributed along the coast in southern Swedish waters. Since August 2019 there has been a ban on fishing for cod in Baltic waters, leading to a decline in fishing effort (EU 2019/1838). No gillnet fisheries for cod are allowed in Subdivision 25, 25 and 26. In Area 24, fishing for cod is allowed but only in waters shallower than 20 metres. Overall, gillnet fisheries targeting cod, which is the dominant fisheries, in the southern and central Baltic have decreased by 80 % since 2006 (Königson et al., 2020).

Table 21 Observed days at Sea (DaS) and number of bycaught harbour porpoises per métier level 4 for the North Sea, Celtic Sea and Bay of Biscay. Only métiers where there has been more than 150 observed days at sea is included in the table. All métiers with bycatch of porpoises are in bold. [29]

Area	Time period	Métier	Days at Sea Observed	No. harbour porpoise	Lower 95 & CI	Upper 95 % CI
North Sea (4a, b, c; 7 d, e; 3a)	2005-2018	**GNS**	**2772**	**126**	**0.039**	**0.052**
		GTR	**1248**	**19**	**0.010**	**0.021**
		GTR/GNS	180	0	0.000	0.000
		OTB	3575	0	0.000	0.000
		OTM	**1235**	**2**	**0.000**	**0.004**
		OTT	619	0	0.000	0.000
		Pelagic trawls	426	0	0.000	0.000
		PTB	438	0	0.000	0.000
		PTM	**819**	**1**	**0.000**	**0.004**
		SDN	166	0	0.000	0.000
		TBB	975	0	0.000	0.000
Celtic Sea (7e. f. g. h)	2005-2010	**GNS**	**653**	**17**	**0.017**	**0.037**
		PTM	755	0	0.000	0.000
	2011-2015	**GNS**	**1357**	**66**	**0.039**	**0.059**
		GNS/GTR	203	0	0.000	0.000
		GTR	**849**	**15**	**0.011**	**0.026**
		OTM	749	0	0.000	0.000
		PTM	795	0	0.000	0.000
	2016-2018	**GNS**	**1227**	**14**	**0.007**	**0.016**
		GTR	337	0	0.000	0.000
		LLS	102	0	0.000	0.000
		OTB	**2820**	**1**	**0.000**	**0.001**
		OTM	483	0	0.000	0.000
		OTT	**1408**	**2**	**0.000**	**0.004**
		PTM	168	0	0.000	0.000
		TBB	852	0	0.000	0.000
Bay of Biscay (8a, b)	2005-2010	**GNS**	**641**	**16**	**0.016**	**0,036**
		GTR	**244**	**1**	**0.000**	**0,012**
		PTM	**362**	**1**	**0.000**	**0,008**
	2011-2015	**GNS**	**598**	**1**	**0.000**	**0.005**
		GTR	**653**	**2**	**0.000**	**0.008**
		PTM	156	0	0.000	0.000
	2016-2018	GNS	337	0	0.000	0.000
		GTR	**348**	**5**	**0.006**	**0.026**
		OTB	**115**	**1**	**0.000**	**0.026**

[29] This Table was updated after an error was corrected. During ADGBYC-1 in May 2020, duplicate submission of observer (and fishing) effort were identified in the WGBYC database which affected estimated rates and total mortality; these have been corrected in this report.

		OTT	629	0	0.000	0.000
		PTM	**60**	**1**	**0.00**	**0.050**

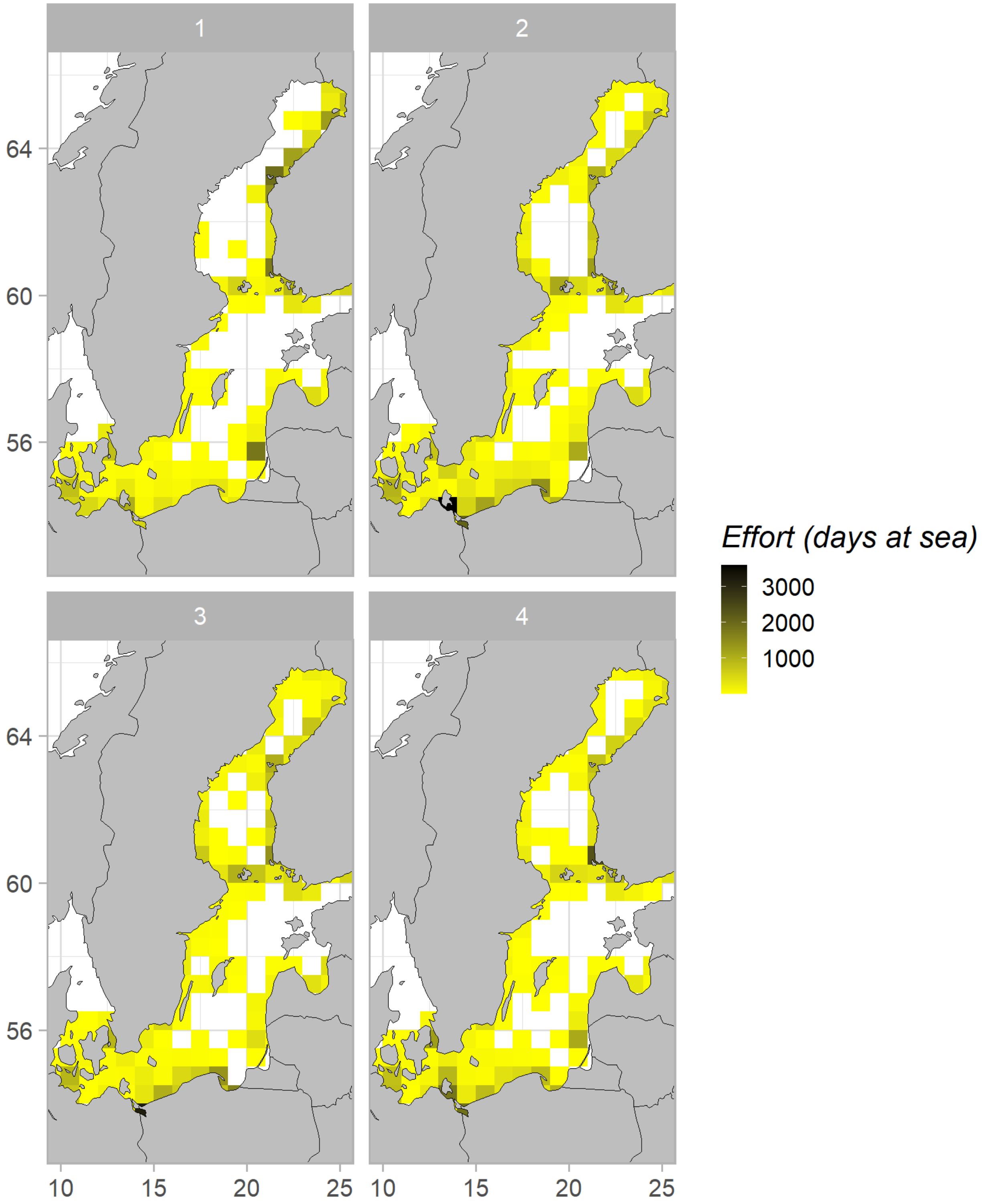


Figure 48 Data on fishing effort (Days at Sea) from the ICES Regional Database summarized effort per ices rectangular for the year 2018 for gillnet and trammel net fisheries.

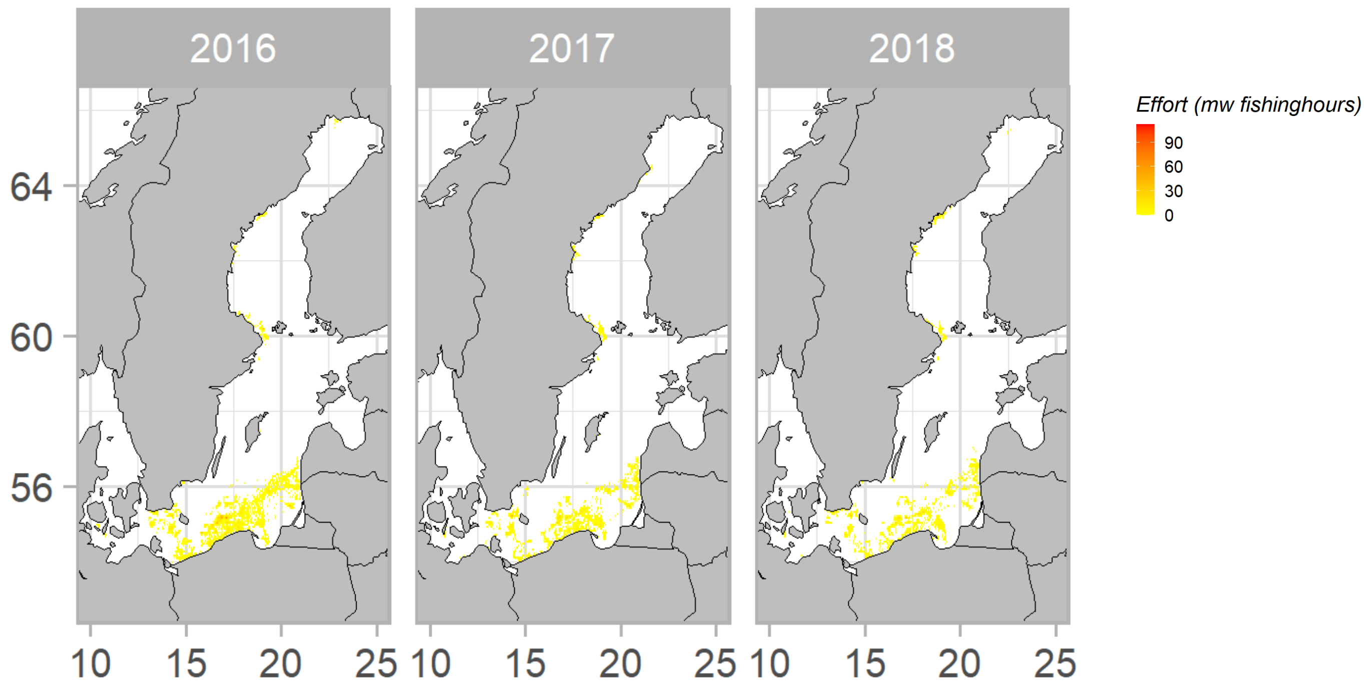


Figure 49 The summarized VMS data per C-square and year from 2016 until 2017 for gillnet and trammel net fisheries.

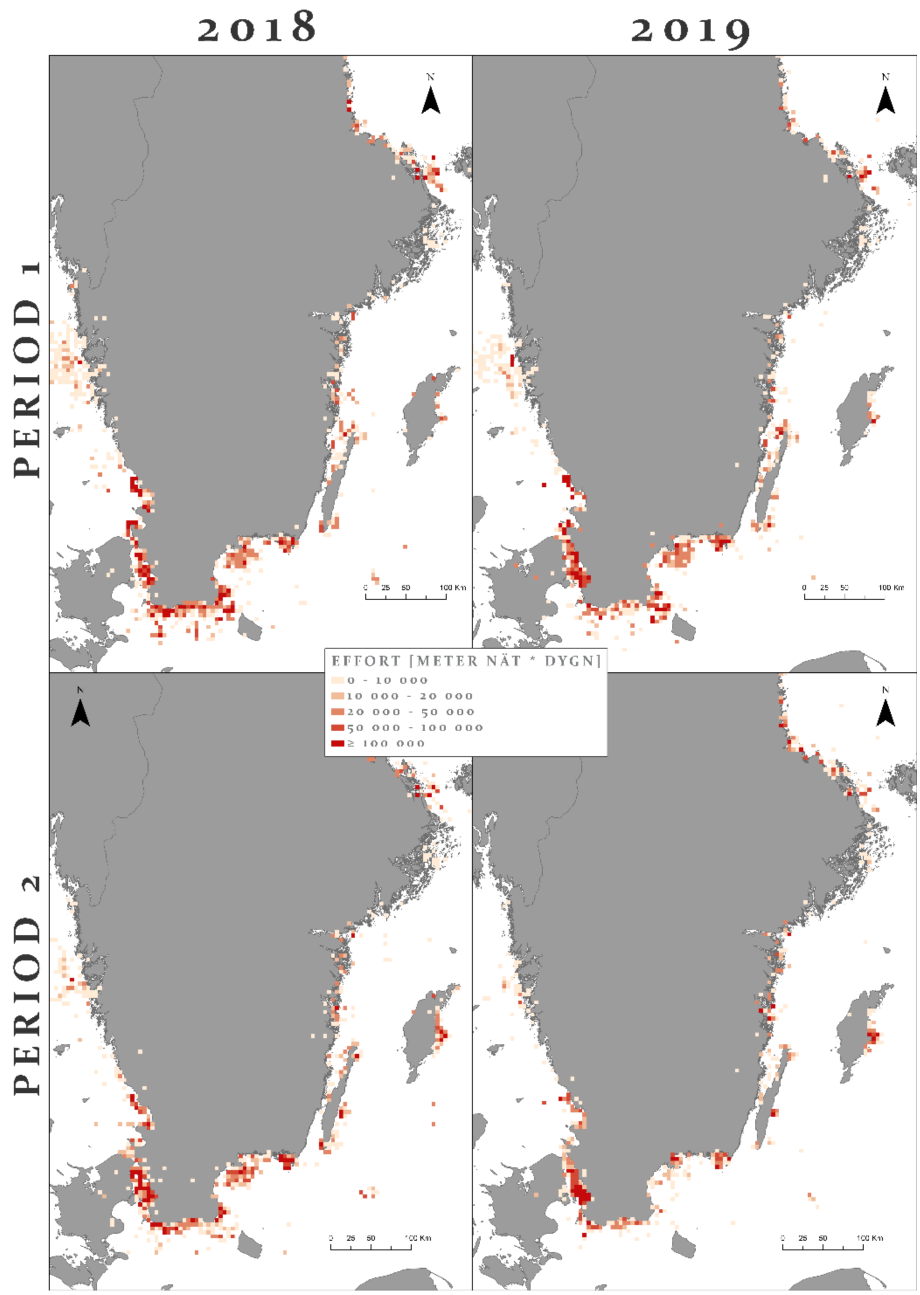


Figure 50 The spatial distribution of gillnet and trammelnet fishing effort (metre net per day) for period 1 - January to June 2018, and for period 2 - July to December 2018 and 2019.

Evaluating Polish gillnet fisheries both spatially and temporally in the southern Baltic (**Figure 52**) highlights how fishing effort (measured in days at sea) is concentrated in coastal Polish waters. Fishing effort for each quarter between 2016 and 2019 clearly shows the decrease of gillnet fisheries due to the ban on cod fishing in place since August 2019.

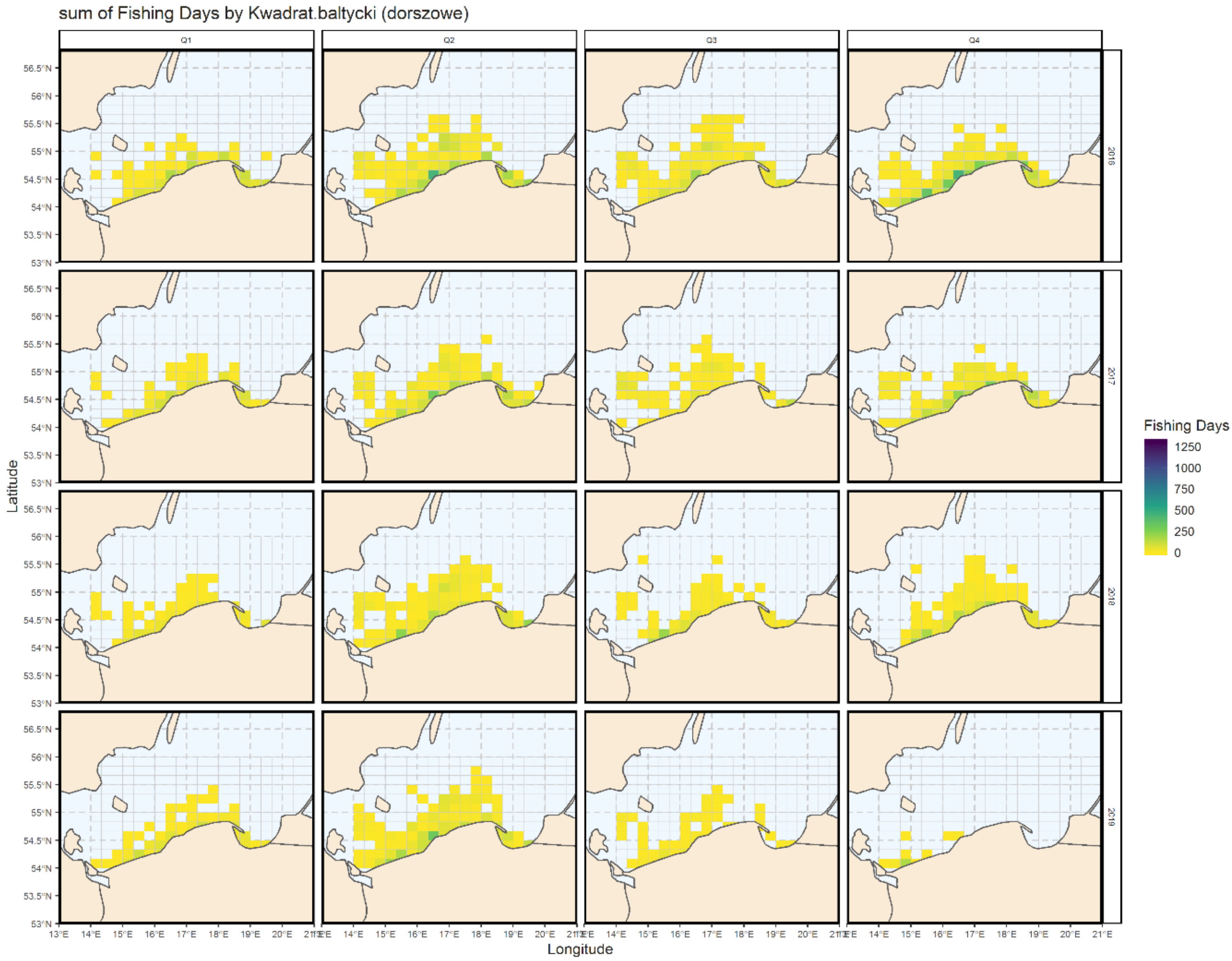


Figure 51 Polish fishery cod gillnet effort (days at sea) in years 2016-2019. Source: National Marine Fisheries Research Institute .

Analysing fishing effort on trawl fisheries in the Baltic using data from the ICES Regional database, the bottom trawl fishery is mainly focused upon the south and central Baltic along with pair trawling. Mid-water trawling on the other hand is carried out in the whole of the Baltic Sea. Maps showing the distribution of fishing effort over the years 2009 until 2017 are collated in Annex 7 (Appendix b).

The risk of bycatch is not only dependent on the métier used but the amount of fishing effort in the area. In the Baltic Sea (ICES Areas 24 – 32), fishing effort is dominated by GNS. In 2017, up to 75% of fishing effort (in DaS) from the ICES RDB was GNS (**Table 22**). GTR only constitutes 0.2% of the total effort. With GNS being the métier with the highest risk of bycatch of harbour porpoise, and also the most commonly used gear in the Baltic, the main threat from fisheries is gillnets.

Table 22 The total effort per year in days at sea (DaS) for gillnets (GNS) and trawl fisheries in the southern Baltic for 2009 until 2018. The decrease is calculated from 2009.

Year	GNS (DaS)	OTB, OTM, OTT, PTB, PTM (DaS)	% decrease in DaS, GNS	% decrease in DaS, OTB, OTM, OTT, PTB, PTM
2009	222 872	74 821		
2010	213 161	77 349	4	-3
2011	184 624	58 797	17	21
2012	183 545	66 184	18	12
2013	185 689	58 993	17	21
2014	189 624	56 094	15	25
2015	175 057	56 549	21	24
2016	179 475	55 550	19	26
2017	159 522	48 467	28	35
2018	122 625	47 052	45	37

To conclude, gillnets constitutes the main fishing effort in terms of DaS in the Baltic. These are concentrated in the southern Baltic along the German and Polish coasts. Gillnet effort for cod has significantly decreased since August 2019 in the southern Baltic due to the cod ban. In the Baltic overall, gillnet fishing effort has decreased by 44% over the past 10 years. Also trawl fisheries is focused in the southern Baltic. Neither gillnet fisheries nor trawl fisheries occur in any larger extent in the Natura 2000 areas especially designated for harbour porpoise (*Hoburgs Bank och Midsjöbankarna)*.

1.5.6 Population consequences of bycatch

The population of harbour porpoise in the Baltic Proper is considered to be critically endangered with its abundance estimated at approximately 500 individuals (497, 95% CI 80-1091; SAMBAH, 2016). The low abundance and the low monitoring coverage in the Baltic gives no reliable estimates of bycatch of harbour porpoises in the area. Therefore, evaluating the effect of bycatch is demanding with lack of data on bycatch, abundance trends and fishing effort. However, since the population is very small it is vulnerable to extinction.

ICES WGMME (2020) reviewed an assessment of the status of the Baltic Proper population undertaken by IMR/NAMMCO at a workshop in December 2018 (NAMMCO/IMR, 2019). Using the abundance estimate from 2011-2013 (SAMBAH, 2016), bycatch numbers estimated from observed bycatch rates in the neighbouring Belt Sea porpoise population, adjusted for fishing effort and for harbour porpoise density in the Baltic Proper, and applying a recovery factor of 0.1 (as used for endangered US stocks of marine mammals), a Potential Biological Removals (PBR) limit for the Baltic Proper harbour porpoise was estimated to be 0.7 animals per year. There are several sources of uncertainty in the estimated mortality limit; the bycatch and abundance estimates and the estimated population growth rate. Further, the conservation objective used in the PBR calculation does not entirely reflect those in EU legislation. Despite these caveats, ICES WGBYC concluded that even if other assessment methods were used to evaluate the status of the Baltic Proper porpoise, the results will most likely not differ to any extent from the NAMMCO assessment. The mortality limit for the Baltic Proper would still be approaching zero. Because of the population's small size, making it vulnerable to extinction, it can be concluded that since gillnet fisheries and other fisheries also posing a risk of bycatch occur in the Baltic Proper bycatch is a threat to the population.

1.6 Evaluating the described conservation measures within the request.

1.6.1 Common dolphins in the Bay of Biscay

The proposal from the NGOs with regards to measures to be implemented to minimise the impact of bycatch on the North East Atlantic common dolphin comprises:

1) Spatial and temporal closures

1.1. close the fisheries that are responsible for the common dolphin bycatch in the North East Atlantic between the beginning of December 2019 and the end of March 2020. This must include, ad minima, the pair-trawl and the gillnet fisheries. Reduction rather than displacement of fishing effort is required, due to the wide range of common dolphins and the risk of moving the bycatch problem rather than solving it. Closures should remain in place each winter until effective bycatch prevention and conservation measures are implemented on a permanent basis by the Member States.

1.2. Dynamic, real-time closures should be considered once a predetermined level of bycatch has occurred in any fishery. These levels must be determined independently by regional cetacean bycatch scientists.

2) Year-round on-board observations and mitigation

2.1 dedicated observations (observers and/or electronic monitoring) and a pre-agreed set of rules on a specific course of action as a response to observed dolphins at sea and to bycatch should be implemented. Fishing vessels should only fish in the region if they allow independent observations to be undertaken on board. If effective electronic monitoring is available, this may be sufficient to allow such actions based on observations by the fishermen. This would require an agreed code of conduct which would be backed up by the possibility of examining video records.

Dedicated observers and/or electronic monitoring should be undertaken on all fleets that may be involved in common dolphin bycatch in the region year-round.

2.2. Nets should only be set during daylight hours.

2.3. If dolphins are observed by independent observations in the vicinity of the gear, nets should not be set and the vessel should move area.

2.4. Fishing activities should halt and the vessel should move area as soon as any bycatch is observed

2.5. Member States should report monitoring measures to ICES in a specified format on a monthly basis and results should lead directly to concurrent mitigation actions.

2.6. At the same time, a scientific panel should be set up to meet regularly and to look at the data as it comes in and to develop a robust, coherent regional mitigation plan to be implemented within and no later than 12 months. After 12 months a longer-term monitoring and mitigation plan is in place, and funding is secured for implementation, as required based on the first 12 months of data.

WGBYC conducted a review of the measures proposed in light of available evidence from the literature and the outcomes of the analyses within this report.

1.6.1.1 Review of the emergency measures proposed

There are several types of spatial and temporal closures that could be applied in the management of marine wildlife; static closures, move-on rules, triggered closures, predictive forecasting and near real-time monitoring (Werner et al., 2015). We are not considering the latter two as they would involve either a high level of analytic effort and long-term data series (predictive forecasting) or are most effective at smaller scales. Therefore, the latter two options will not be discussed further.

vi. Static closures

Static closures refer to areas closed to fishing permanently or for set periods of the year, for designated gear types or all gear types. These closures generally would need to be large, based on animal movements that are geographically broad. This may greatly impact fisheries by closing off much of the fishing area. They would be infeasible where marine mammal habitat and fishing grounds largely overlap in time/space with limited or no possibility for relocating fishing (Werner et al., 2015).

Examples of these type of closures are found for example in USA. A protected species zone extending 50 nautical miles around the Northwest Hawaiian Islands and its corridors was stablished in 1991 in response to the interactions between Hawaiian monk seals (*Neomonachus schauinslandi*) and pelagic longline fishery (NOAA, 2012e). Also, the false killer whale (*Pseudorca crassidens*) and harbor porpoise Take Reduction Plans include, among other measures, the establishment of permanent and temporal closures for specific fisheries (permanent Longline Fishing Prohibited Area around the main Hawaiian islands for false killer whales and temporal and area closures for certain types of gillnets for the harbour porpoise[30]).

vii. Triggered closures and move-on rules.

Triggered closures refer to the closure of a fishery, usually for the remainder of the fishing season, following a recorded event or threshold. They provide incentives to comply with other existing mitigation measures and pursue cooperative research (Werner et al., 2015). Move-on rules refer to closures that apply only to a specific area and/or a specific period within a particular fishing season and may involve one or more gear types. Vessels are expected to move out of a specified area once a triggering event has occurred. Move-on rules are difficult to enforce (Werner et al., 2015).

Examples of these type of closures are found for example in USA and Australia. Move-on provisions are in place to protect North Atlantic right whale (*Eubalaena glacialis*) from ship collisions. For this purpose, Dynamic Area Management (DAM) are triggered as temporary protection zones when three or more whales are sighted within 2-3 miles of each other outside of active Seasonal Management Areas. A DMA is a rectangular area centred over whale sighting locations and encompasses a 15-nautical mile buffer surrounding the sightings' core area to accommodate the whales' movements over the DMA's 15-day lifespan (Clapham and Pace, 2001[31]). The False Killer Whale Take Reduction Plan recommends, among other measures, to establish a "Southern Exclusion Zone" that would be closed to deep-set longline fishing upon reaching a specified threshold level of observed false killer whale mortalities or serious injuries inside the EEZ around Hawaii[32]. In addition, the Australian Government has approved a gillnet dolphin mitigation strategy[33]. Following this strategy, when an individual fishing boat reaches an established threshold of bycaught animals (6 or more dolphins) or bycatch incidents (1 dolphin interaction: 210,000 metres of net) during a 6-month review period, the boat may be excluded from fishing with gillnets for a period of 6 months in the South Australian Dolphin Zone or in the whole Southern and Eastern Australian Scalefish and Shark Fishery.

viii. Long term monitoring and mitigation

[30] https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-take-reduction-plans-and-teams#take-reduction-teams

[31] https://www.nefsc.noaa.gov/rcb/interactive-monthly-dma-analyses/

[32] https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-take-reduction-plans-and-teams#take-reduction-teams

[33] https://afma.govcms.gov.au/sites/default/files/gillnet_dolphin_mitigation_strategy_updated_aug_2019_accessible.pdf

ICES has noted in previous advice that "the numbers of bycaught dolphins recorded on the shores of the Bay of Biscay indicate that a dedicated bycatch observer programme and bycatch mitigation is required for relevant fisheries in this area"(ICES 2017, 2018)".

In relation to the NGOs suggestion that nets should be set during daylight hours only, Fernandez-Contreras et al (2010) reported that time of the day was the second operational factor that influenced significantly the rate of pair trawler capture of common dolphin in NW Spain. Depth was identified as the most significant factor influencing the rate of pair trawler capture in that study. Most of the capture events observed by Fernandez-Contreras et al were by day since the majority of the tows by pair trawlers were made in daylight. However, Fernandez-Contreras et al found that the percentage of night-time tows that captured common dolphins was significantly higher than expected, in accord with the distribution of fishing during day and night, indicating a greater vulnerability of short-beaked common dolphins to pair trawlers at night. Morizur et al. (1999) reported that all capture events of common and white-sided dolphins observed in pelagic trawl fisheries operating in the Northeast Atlantic (ICES subareas 7 and 8) were at night.

Aguilar (1997) identified pair trawls as being the main cause of common dolphin mortality in Spanish Atlantic waters based on interviews to fishermen (N=196) and onboard observers in pair trawls (18 trips covered). Aguilar reported that, according to the fishermen interviewed, during nocturnal fishing it was rare not to catch dolphins, usually between one and ten and sometimes 30 or more. During 1996 and 1997, observers were present on four pair trawls fishing operations at night and in all cases common dolphins were caught, totalling eight individuals (Aguilar, 1997).

The USA bottlenose dolphin take reduction plan includes night-time fishing restrictions of medium mesh gillnets operating in North Carolina coastal state waters from November 1 through April 30.[34]

1.6.2 Harbour porpoise in the Baltic

1.6.2.1 Review of technical mitigation measures to reduce bycatch

In principle, there are three types of mitigation measures which lead to reduction of bycatch of harbour porpoise: 1) pingers and other acoustic devices designed to deter porpoises from the fishing gear; 2) gear modifications or alternative fishing gears which are designed in such a way as to minimise or prevent bycatch of harbour porpoises, and 3) various ways of effort control to reduce bycatch such as closed areas or general effort reduction.

In order to assess whether deployment of pingers, other acoustic devices or alternative fishing gears may be suitable as emergency measures or long-term measures to reduce harbour porpoise bycatch, it is important to compile information from scientific studies and trials on alternative gears, as well as from pinger use in fisheries in the Baltic and other seas.

Detailed information about trials of different technical mitigation, their characteristics, measures and studies on pinger use, as well as other mitigation measures are in the Annex 4 to this report.

ix. Acoustic deterrents, pingers

Trials have been carried out using several different types of digital pingers such as AQUATEC AQUAmark 100, 10 kHz pingers such as Dukane NetMark 1000 or Future Oceans NetGuard, as well as DDD pingers. In general, pingers have shown to be effective in reducing bycatch of harbour porpoise, during scientific trials and in commercial fisheries. **Table 23** summarizes scientific studies evaluating the pingers effectiveness in reducing bycatch. In all studies, except for one study carried out in Turkey, bycatch was

[34] https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-take-reduction-plans-and-teams#take-reduction-teams

reduced by 63 to 100 %. Pingers have also been implemented in commercial fisheries and has resulted in a reduction of bycatch over a long time of about 50 to 80% (**Table 24**).

Besides pingers, which are designed to deter harbour porpoises from the vicinity of fishing gear, alerting devices that use synthetic click trains in order to encourage porpoises to increase their echolocation and thus detect and avoid the net have been developed; so called Porpoise Alerting Devices (PALs). These mimic porpoise antagonistic "upsweep" signals at 133 kHz. However, results from scientific studies evaluating PALs effectiveness in reducing bycatch differ depending on the area the study has been carried out in. Therefore, it is not recommended yet to introduce PALs in the Baltic Proper as a conservation measure for the critically endangered harbour porpoise population.

There are several other factors which affect the effectiveness of the use of acoustic devices. The more important ones include characteristics of the pinger signal, background noise, habituation, pinger maintenance requirements and seal depredation. There are many factors needed to be taken into regards when implementing pingers, below are the main factors listed:

- In general, a high effectiveness (up to 100 % bycatch reduction) is possible with ADDs. However, there appears to be a difference in pinger effectiveness between scientific trials and operational fisheries. It is therefore very important that pingers are deployed according to the recommended specifications.
- Maintenance of pingers, compliance and enforcement are critical for the success of implementation of pinger use.
- Fishermen need to be educated and trained on how to use pingers.
- Awareness of fishermen and the general public needs to be raised in order to increase acceptance.
- Findings of pinger studies appear to be specific for pinger type, fishery and sea area. The findings from one study cannot necessarily be transferred to another region, fishery and pinger type without taking into account differences in signal propagation of various pingers in differing soundscapes.
- Habituation may be an issue for some pinger types.
- Underwater noise pollution needs to be taken into account when using pingers at a larger scale, especially when anti-depredation devices (such as DDD pingers) are used which radiate to great distances and have a large scaring effect of harbour porpoises which should be protected inside and outside protected areas under the Habitats Directive.
- Seal attraction by pingers should be taken into account which would increase both depredation and bycatch of seals.

x. Gear modifications and alternative gears

Fishing gear may be modified with the aim of reducing the bycatch rate, while not affecting the catch rate of the target species. Another technical mitigation measure is alternative fishing gears with lower or no observations of harbour porpoise bycatch, which should replace most commonly used gears such as gillnets.

Trials on acoustic enhancement of nets have been carried out in several countries within the Baltic Sea and beyond. Different methods have been used to increase detectability of the net by porpoises such as the addition of barium sulphate or iron oxide to the netting material, or the use of pearl nets.

Lights attached to gillnets have also been tested in the Baltic Sea but with the conclusion that further tests were needed to check their effectiveness in reducing bycatch of PETS.

Among alternative fishing gears for which lower bycatch rates of harbour porpoise can be assumed compared to static nets are longlines, pontoon traps, cod pots, and small seine nets. So far, the most promising trials on alternative fishing gears as a replacement for static nets which have been carried out in the Baltic Sea are small cod pots and small seine nets.

xi. Effort limitation

Operational mitigation measures include various ways of limiting fishing effort. Examples of such measures are time-area closures, bycatch caps, fleet communication and effort control. Time-area closures focus on reducing the degree of spatial or temporal overlap between fisheries and occurrence of the bycaught species (O'Keefe et al., 2014). Bycatch caps in theory mean that bycatch can be limited through the use of bycatch quotas. Fleet communication is a voluntary form to change fishing patterns in order to minimise bycatch when protected species are encountered. Finally, effort control means controlling, limiting the effort where the bycatch of PETS is high.

Table 23 Results from pinger trials and relevance for the special request. All reports are scientifically peer reviewed except one indicated by a *.

study	study area	fishery	type of pinger	operational details	bycatch reduction	relevance
Larsen et al., 2013	Danish North Sea	hake gillnet fishery	Aquatec AQ-UAmark100 (20-160 kHz)	pinger spacing 585 and 455 m	78 to 100 % (control 41 hauls: n=45, 455m24 hauls: n=0, 585m 43 hauls: n=5)	derogation from Reg 812 requiring 200 m spacing
Larsen and Eigaard, 2014	Danish North Sea	cod gillnet fishery on wrecks	prototype LU-1 by Loughborough University, 40-120 kHz, 300 ms signal every 5-30 s	pinger spacing max 140 m, i.e. 1 pinger every other net, 2-4 strings of 4-10 nets of 70-80m	100% (n=8 in nets with dummy pingers)	wreck net fishery had highest bycatch rates in DK, one order of magnitude larger than in flat bottom fishery
	Danish North Sea	flat bottom/stony ground fishery	prototype LU-1 by Loughborough University, 40-120 kHz, 300 ms signal every 5-30 s	pinger spacing max 140 m, i.e. 1 pinger every other net, 20-60 nets parallel or zigzag	>90% (n=1 in pinger nets, n=6 in dummy pinger net, n=9 in nets without pingers)	
Zaharieva et al. 2019	Bulgarian Black Sea	Turbot gillnet fishery	Future Oceans 10 kHz	100-150 m spacing	100 % (n=14 in control nets)	very high bycatch rates ranging from 0.07 to 0.67 Ind./km*d
Bilgin & Köse 2018	Turkish Black Sea	Turbot fishery	AquaMark 100 (20-160 kHz)	200 m spacing	0%	bycatch rate 0.011 ± 0.0076

						Ind./km*d (control net)
	Turkish Black Sea	Turbot fishery	AquaMark 200 (5-160 kHz)	200 m spacing	0%	bycatch rate 0.012 ± 0.0076 Ind./km*d (control net)
Gönener & Bilgin 2009	Turkish Black Sea	Turbot Gill Net Fishery	Dukane NetMark 1000 (10 kHz nominal frequency)	200 m spacing	98 % (n=92 in control nets, n=2 in pinger nets)	
Kraus et al. 1997	Gulf of Maine USA	sink gill-net fishery	10 kHz fundamental frequency	92 m spacing	92% (n=25 in 423 control strings, n=2 in 421 pinger strings)	
Trippel et al. 1999	Bay of Fundy	demersal gillnet fishery	Dukane NetMark 1000 (10 kHz nominal frequency)	100 m spacing	68 % in 1996	blind test with pingers activated /deactivated for 3 days
	Bay of Fundy	demersal gillnet fishery	Dukane NetMark 1000 (10 kHz nominal frequency)	100 m spacing	85 % in 1997	nets deployed either with or without alarms, **study design might have influenced the results**
Kingston & Northridge 2011*	English Channel and Celtic Sea	bottom set gillnets and entangling nets	DDD 02 (in 2008), DDD 03L (2010/11)	varied spacings 2000 up to >4000 m	63 % (n=16 in 780 control hauls, n=7 in 929 pinger hauls)	pinger is very loud, spacing can be higher compared to other pingers but also much higher noise pollution

Table 24 Results from scientific evaluation of pinger use in operational fisheries and relevance for the special request

Orphanides & Palka 2013	yes	NW Atlantic, USA	Gulf of Maine and Mid Atlantic gillnet fisheries 1999-2010	10 kHz, 132 dB 300 ms signal every 4s	various fisheries, (large mesh (17.8-45.7cm, small mesh 12.7-17.8 cm), spacing 300 ft.	50 to 80% in the operational fishery, fluctuating over the years, especially with compliance	poor compliance and enforcement have not resulted in expected bycatch reduction, pinger training needed, enforcement needed
Palka et al. 2008	yes	US Northeast	gillnet fishery	10 kHz, 132 dB 300 ms signal every 4s	spacing 300 ft	results presumably included in Orphanides & Palka 2013	(1) During years of high pinger usage, 87% of the tested pingers were functional, while only 36% of the tested pingers were functional during years of low pinger usage. (2) bycatch rates of observed hauls with an incomplete set of pingers were higher that in observed hauls without pingers (3) no evidence for temporal trends in bycatch which otherwise could indicate habituation.

1.6.2.2 Designation of Marine Protected areas for Harbour Porpoise

Since the proposed mitigation measures are focused on designated Natura 2000 areas and it has been suggested to close all Natura 2000 sites east of 13.5°E for gillnet and trammel net fisheries in which the harbour porpoise is listed as present, the appropriateness of this measure can be considered by evaluating the importance of areas to harbour porpoises. It is helpful to understand the reasoning behind designating the areas for harbour porpoises. Since ICES WGMME (2020) suggested the western boundary of the management area at 13°E, all Natura 2000 sites which list the harbour porpoise are analysed here. **Table 25**lists these areas, their size and the population status in the area. The population status gives an indication of the assumed fraction of the "local population" which is the abundance in national waters (A=>15-100%, B=>2-15%, C=>0-2%, D=non-significant population). It must be taken into account that the "local populations" in SE and DE are much larger than in PL due to the regular occurrence of animals of the much larger population of the Kattegat, Belt Sea and Western Baltic in their national waters. Thus, the given population status can only be compared within a country.

The SAMBAH Project and other dedicated studies using passive acoustic monitoring have identified a number of areas where porpoises from the Baltic Proper population occur at higher frequency. Some of these areas have been proposed and designated as Natura 2000 sites under the Habitats Directive. However, there are some other areas of relatively high importance for porpoises that are not Natura 2000 sites and some Natura 2000 sites designated for other species or particular habitats where porpoises occur only occasionally, so that fisheries measures in order to protect the species would be less relevant. The sections below focus upon only those sites believed to be important, first the ones that are MPAs for porpoises, and then other sites as yet unprotected but where fisheries measures would help reduce the impact on this endangered population.

All Natura 2000 sites but the Swedish ones were designated before the SAMBAH project which systematically investigated occurrence and abundance of harbour porpoises in the Baltic Proper. Germany is the only country which has had a harbour porpoise monitoring program before SAMBAH, using line transect aerial surveys and porpoise click detectors, C-PODs.

xii. Germany

Based on a unique sighting of a local aggregation of 84 harbour porpoises in 32 groups in summer 2002 and frequent acoustic activity recorded in the Pomeranian Bay using PODs, the SCIs *Adlergrund* (DE1251301), *Westliche Rönnebank* (DE1249301), *Pommersche Bucht mit Oderbank* (DE1652301) have been designated in January 2008. These have been combined with the SPA *Pommersche Bucht* (DE 1552-401), designated in September 2005, to a single large nature protected area (NSG) under German legislation, *NSG Pommersche Bucht-Rönnebank*. Acoustic data show an an autumn maximum in acoustic activity followed by a smaller peak in winter, with year-round occurrence in the Pomeranian Bay from 2008 onwards. The two peaks and a peak in the Kadet Trench further west, time-delayed with the first maximum, indicate that the Western Baltic population uses the Pomeranian Bay area in late summer and autumn whereas a portion of the Baltic Proper population appears to congregate in the Pomeranian Bay during winter (Benke et al., 2014). The description of the *NSG Pommersche Bucht-Rönnebank* (Bildstein et al., 2020) emphasises its importance for harbour porpoises: "The nature conservation area represents an important winter refuge for harbour porpoises of the population of the central Baltic Sea. In addition, the protected area is an important feeding and migration habitat for both the endangered population of the Central Baltic Sea and the populations of the Western Baltic Sea, Belt Sea and Kattegat".

The SCI *Steilküste und Blockgründe Wittow* (DE1346301) has also been designated in 2004. For the management plan only literature data and opportunistic observations of harbour porpoises have been evaluated (STALU, 2011a).

The SCI *Greifswalder Boddenrandschwelle und Teile der Pommerschen Bucht* (DE1749302) has been designated in 2009. Based on existing studies, the management plan concludes that the entire area serves as a feeding and migration area for harbour porpoises (STALU, 2019a).

The SCI *Erweiterung Libben, Steilküste und Blockgründe Wittow und Arkona* (DE1345301) has been designated in 2009. The management plan concludes that for the harbour porpoise, the SCI is important as a feeding habitat and migration area. Furthermore, it is assumed that the SCI is also relevant as a breeding habitat for harbour porpoises. A reduction of the incidental by-catch is recommended (STALU, 2019b).

The management plan for the Natura 2000 site *Plantagenetgrund* states that the area is an important migration and foraging habitat for harbour porpoises and also a potential habitat for reproduction but that it is unclear whether the area is used by individuals of the Baltic Proper population on their migrations. A reduction of harbour porpoise bycatch is a development target (STALU 2019c).

xiii. Sweden

In 2016, Sweden proposed several new or extended Natura 2000 sites for harbour porpoises. The proposal was based on a petition to the Government by the Swedish Environmental Protection Agency, which in turn was based on petitions from coastal County Administrative Boards. For the Baltic Sea, the coastal County Administrative Boards based their proposals on the results from the SAMBAH project. In this project, distribution data were derived by large-scale systematic acoustic monitoring. Species distribution models generated by generalized additive models were used to describe the monthly probability of detecting porpoise clicks as a function of spatially-referenced covariates and time. By modelling the spatial and seasonal distribution of harbour porpoises in the Baltic Proper, an important breeding ground for the Baltic Proper population was identified (Carlén et al., 2018).

In their petition to the Environmental Protection Agency, all County Administrative Boards proposed to protect the major areas frequently used by harbour porpoises in their waters, with the exception of Blekinge County in southwestern Sweden and Västra Götaland County on the northern Swedish west coast. The Environmental Protection Agency did not propose any changes in its petition to the Government. However, the Government excluded the Southern Midsea Bank in their final proposal. This resulted in the following two Natura 2000 sites in Swedish waters of the Baltic Sea east of longitude 13°E (entirely or partially):

Hoburgs Bank och Midsjöbankarna (SE0330308): This site covers the most important area for Baltic Proper harbour porpoises in the Swedish part of the Baltic Sea, except that neither the Southern Midsea Bank nor the frequently used waters in Hanö Bight in Blekinge County are protected. The Southern Midsea Bank is no less important for the Baltic Proper harbour porpoise population, but has been designated as a National Interest Area for Wind Farm Development (https://www.4coffshore.com/offshorewind/).

Sydvästskånes utsjövatten (SE0430187): This site is used by the Belt Sea population in summer, and likely also by Baltic Proper harbour porpoises in winter. During Nov-Apr, the Baltic Proper population spreads out more, a part of the population is likely to move west of the May-Oct management border in the southern Baltic Sea, resulting in no clear spatial segregation between the Baltic Proper and the Belt Sea populations in the southern Baltic Sea. Due to this, it was not possible to identify appropriate areas for protection specifically for the Baltic Proper population in the southern Baltic Sea during Nov-Apr, only to harbour porpoises in general. As the Belt Sea population is far more abundant than the Baltic Proper population in the southern Baltic Sea, areas important primarily to the Baltic Proper population may have been missed.

xiv. Poland

There are four Natura 2000 sites in Polish Baltic waters where harbour porpoise has been listed in Standard Data Forms as occurring, based upon data from reported bycatch and opportunistic sightings collected during the 1980s and 1990s by the Hel Marine Station, Institute of Oceanography, University of Gdańsk (Skóra and Kuklik, 2003). However, none of these were designated specifically for harbour porpoise.

Natura 2000 site *Zatoka Pucka i Półwysep Helski* (PLH220032) was proposed in 2004 and designated in 2008. The site includes only the inner part of the Bay while the majority of bycatch was reported from the part outside the borders of the Natura 2000 site (Hel Marine Station unpublished data). Bycatch recorded across the entire Puck Bay (Zatoka Pucka) was the highest of all areas in Polish waters (Skóra and Kuklik, 2003). The data collected indicated that Puck Bay was one of the most important habitats for the Baltic Sea harbour porpoise.

Ostoja Słowińska (PLH220023) was proposed in 2004 and designated also in 2008. Information on the presence of harbour porpoises for this area came from opportunistic sightings.

According to data from the SAMBAH project from 2012-2014, the highest densities of harbour porpoises have been observed in Polish Baltic Sea waters of the Natura 2000 site *Ostoja na Zatoce Pomorskiej* (PLH990002) designated in 2009. However, this site is outside the summer distribution of the Baltic population of harbour porpoise and studies indicate that it is used mostly by the neighbouring population. The three-year project "Pilot monitoring of marine species and habitats" which was undertaken between 2015-2018 at the request of the Chief Inspectorate for Environmental Protection confirmed the presence of harbour porpoises in the site.

The Natura 2000 site *Wolin i Uznam* (PLH320019) was designated in 2008. Harbour porpoise is listed as category B. Although there is no evidence that it occurs at any higher density there than elsewhere in Polish waters, the probability of its occurrence is high, taking into account the proximity of this site to the Natura 2000 site *Ostoja na Zatoce Pomorskiej* (PLH990002).

Table 25 Natura 2000 sites east of 13° East with harbour porpoise listed as present. Population status A=>15-100%, B=>2-15%, C=>0-2% of local population, D=non-significant population. * indicates the Natura 2000 areas included in the NGO Annex II. (source: Natura 2000 Standard Data Forms).

Natura 2000 site name	Site code	Marine area (ha)	Population status
Adlergrund	DE1251301	23,397	C
Westliche Rönnebank	DE1249301	8,601	C
Pommersche Bucht mit Oderbank	DE1652301	110,115	B
Pommersche Bucht (under Birds Directive) *	DE1552401	200,417	B
Steilküste und Blockgründe Wittow	DE1346301	1,633	D
Greifswalder Boddenrandschwelle und Teile der Pommerschen Bucht	DE1749302	40,401	C

Erweiterung Libben, Steilküste und Block-gründe Wittow und Arkona	DE1345301	7,570	C
Plantagenetgrund *	DE1343301	14,909	C
Hoburgs Bank och Midsjöbankarna	SE0330308	1,051,111	C
Sydvästskånes utsjövatten	SE0430187	115,128	C
Zatoka Pucka i Półwysep Helski	PLH220032	21,798	A
Ostoja Słowińska	PLH220023	11,501	B
Wolin i Uznam	PLH320019	5,761	B
Ostoja na Zatoce Po-morskiej	PLH990002	242,718	B

1.7 Discussion and conclusions

1.7.1 Evaluating pressures and threats due to commercial fisheries by-catches to common dolphins in the Bay of Biscay

The common dolphin in the North-East Atlantic is a separate population from that in the Western North Atlantic and the Mediterranean. For management and assessment purposes, a single AU should be used which we have defined for the purposes of this report to be the boundary of the most recent, wide scale abundance surveys (Hammond et al., 2017; Rogan et al., 2018). Recent abundance estimates in this area are considerably higher than a decade before and WGMME (2020) proposed an estimate of 634,286 (CV = 0.307) dolphins in the AU. The AU does not cover the entirety of this species range; for example, sightings occur west and south of the SCANS-III survey area. There have been a series of North Atlantic Sightings Surveys (NASS) to the north and west of the AU over the last three decades, but it has not been possible to derive robust estimates of common dolphin abundance from most of these. The exception was for a "west" block of the Faroese summer surveys in 1995 from which 273,159 (CV=0.26; 95% CI=153,392-435,104) common dolphins were estimated (Cañadas et al., 2009). However, given this estimate is now 25 years old it was not deemed appropriate to use it as contribution to our AU abundance estimate.

There is no evidence of decline in the AU but seasonal movements are evident from broadscale modelling exercises following collation of the various surveys (e.g. Waggitt et al., 2019) as well as smaller regional surveys (Macleod and Walker, 2005; Rogan et al., 2018; Van Canneyt, 2020) with higher densities on the Celtic Shelf, Biscay Shelf and west of Ireland in winter. In the NE Atlantic, winter densities appear highest in waters deeper than 150m but less than 2,000m (Van Canneyt et al., 2020; Waggitt et al., 2019). So, it is important to note that winter abundance in the AU may be higher than summer estimates that we have used to derive the PBR, if the animals from outwith the AU move into the AU during the winter period.

Estimates of annual common dolphin bycatch using WGBYC data for 2016-2018 in the Celtic Seas ecoregion and Bay of Biscay and Iberian ecoregion amount to 720 (95% CI) and 3,973 (95% CI

1,998 – 6,598)[35]. The estimated PBR for the NE Atlantic AU was 4,926 animals (WGMME, *in prep*). The evidence from WGBYC analyses, coupled with that from strandings data, suggest that the current levels of common dolphin mortality may be unsustainable. Uncertainty in the PBR limit was explored, and whilst the point estimate only exceeded levels for 3 PBR scenarios, the upper limits of bycatch exceeded 8 of the 12 scenarios. Therefore, we cannot be confident from analyses of the WGBYC data that the bycatch of common dolphins is below the estimated PBR.

The annual mortality estimates from strandings are higher than those from WGBYC and exceed the PBR (point estimates of 9,300 and 5,400 for 2017 and 2018, respectively). The difficulties of deploying random sampling strategies on fishing vessels can partially explain the difference between estimates inferred from strandings and at-sea observers. Observation effort differs greatly between countries, areas, and métiers. This has been driven to some extent by Regulation EC 812/2004 (now repealed) which focused on monitoring of the most "relevant" fisheries for small cetacean bycatch. The designation of candidate fisheries suggested a good knowledge of the interactions between fishing vessels and small cetaceans, but also a stability in these interactions across years. The contributions of different fisheries to total cetacean bycatch may have varied greatly over time, making the monitoring requirements of the Regulation less appropriate. In addition, for practical reasons, only larger vessels (>15m) tended to be monitored. The Regulation required Member States to carry out scientific studies on smaller vessels, but that was neglected by most of them. Vessels under 15 m represent over 80% of European fishing boats, and it is widely accepted that even small scale and subsistence fisheries can jeopardize marine mammal populations (Lewison et al., 2004; Zappes et al., 2013). In addition, the final decision as to whether an observer was accepted on board a vessel was that of the master, a practice that has hindered the implementation of statistically meaningful sampling protocols (Stratoudakis et al., 1998); however, the new EU-MAP makes it mandatory for observers to be accepted onboard, unless safety reasons justify prevention.

Strandings cannot generally inform on the type of gear involved in the bycatch events, but they are a source of information on cetacean bycatch irrespective of the size and the flag of the fishing vessel involved, and independent of the industry's willingness to contribute. However, strandings only reflect processes affecting cetacean populations within a given distance from the coast; this distance varies regionally with current and wind regimes Several parameters in mortality estimates inferred from strandings can modify the outcomes of the modelling. The decomposition status of carcasses can conceal the evidence of bycatch on stranded carcasses, and therefore underestimate the bycatch numbers. The model uncertainties due to local coastal currents, the estimate of drift duration based on visual criteria or the precision of drift prediction can also modify the estimates. Finally, the correction of dead dolphins found stranded by the proportion of buoyant animals is the main correction factor in the model, and this has been based on in situ experiments and a modelling process. Small variations in this proportion could give rise to significant bias in the bycatch estimates.

Observers at sea and monitoring of strandings provide two different views of the same phenomenon. Observer programmes, despite difficulties of implementation, are able to provide more detailed information on the métiers with interactions between cetaceans which should be a pre-

[353535] These values were updated after an error was corrected. During ADGBYC-1 in May 2020, duplicate submission of observer (and fishing) effort were identified in the WGBYC database which affected estimated rates and total mortality; these have been corrected in this report.

requisite to any bycatch management strategy. Strandings monitoring, despite several uncertainties, can provide in the Bay of Biscay at least an overview of the potential magnitude of the bycatch.

In the Bay of Biscay, where recent mortality levels appear to be most significant, the gears that are estimated to make the largest contribution to the overall mortality are trammel nets for demersal species (GTR_DEF métier Level 5). Significant bycatch was also estimated in bottom pair trawls where the target assemblage is mixed pelagic demersal (PTB_MPD métier Level 5); bycatch rates are also highest in quarter 1. Midwater pair trawlers (PTM) also contribute approximately 408 – 555[36] common dolphins to the total estimated mortality.

1.7.2 Appropriateness of the emergency measures proposed for common dolphin in the Bay of Biscay

The measures requested by European NGO's for common dolphin bycatch reduction encompassed closures of fisheries, technical measures and improvement of monitoring effort on fishing vessels. **The conclusions proposed by WGBYC do not consider the social or economic appropriateness of the measures suggested and are exclusively focused on their potential effectiveness for common dolphin conservation.**

1.7.2.1 Static closures of relevant fisheries

xv. Identification of fisheries[37]

European NGOs highlighted three fisheries operating in ICES Subareas 6, 7 & 8 as high risk for common dolphin bycatch: gillnets (GNS), midwater pair trawlers (PTM) and single bottom trawlers (OTB). The bycatch rate calculated for PTM targeting demersal species in the Bay of Biscay and Iberian Peninsula ecoregion was 0.71 [] dolphins bycaught per day at sea (ICES areas 8&9 for years 2017 and 2018). This is the highest bycatch rate recorded since 2000 in the Celtic Sea and the Bay of Biscay and is consistent with likely mortality origins of common dolphins inferred from strandings data since 2006. The interaction between common dolphins and pair trawlers has been documented over the last 20 years, and is thought to be primarily driven by trophic relationships (Morizur et al., 1999; Northridge et al., 2006; Spitz et al., 2013). The observer effort coverage on PTM fishery was on average 9% in 2017 and 2018 and is higher than most of the other fisheries. Due to the high levels of bycatch recorded in this fleet, observation effort was increased to better understand these interactions in recent years. The estimates of 481 (95% CI: 408-555) common dolphins bycaught on PTM is consistent with the estimate based on a dedicated study carried out in winter 2019 in the Bay of Biscay on this fleet (420 dolphins, 95% CI: 70-1030) (Direction des Pêches Maritimes et Aquaculture et al., 2019). However, in 2019 the whole fleet was equipped with pingers, and is therefore not directly comparable to 2016-2018 estimates. Moreover, WGBYC estimates are mostly based on data from a bycatch observer program in 2018 (programme PIC, Rimaud et al., 2019) aiming at evaluating the efficiency of pingers on only 3 pairs of midwater trawlers. However, the highest estimate of bycaught dolphins in the Bay of Biscay and Iberian Peninsula ecoregion was in trammel nets (GTR), where 2,061 dolphins (95% CI: 1,203 – 3,092) dolphins are bycaught annually (2016-2018).

Bycatch in gillnets (GNS) appeared to present a lower risk but, compared to some other fisheries, has had relatively low observer effort. The bycatch rates in GNS fisheries targeting demersal

[36]This value was updated after an error was corrected. During ADGBYC-1 in May 2020, duplicate submission of observer (and fishing) effort were identified in the WGBYC database which affected estimated rates and total mortality; these have been corrected in this report.

[37] The bycatch estimates by fishery were updated after an error in observer effort was corrected. See previous footnote.

species were relatively low in both ecoregions for 2016-2018 (0 to 0.01 per DaS), yielding an estimate of approximately 330 bycaught common dolphins per year across those areas. However, the observation effort in this fishery was only ~1.5% in the Celtic Sea and 0.6% in the Bay of Biscay and Iberian Peninsula. Due to the high number of nets in these areas, it is likely that bycatch events are difficult to detect and that the lack of a sampling protocol hinder our ability to measure the magnitude of the bycatch issue in these fisheries. Moreover, there has been spatial and temporal overlap between fishing effort of gillnets catching hake and trammel nets catching monkfish and sea bass, and mortality areas of dolphins inferred from strandings almost every year between 2006-2019. The generally small size but large numbers of vessels operating with gillnets (e.g. 84% are under 12m in the Bay of Biscay, subarea 8) may influence the representivity of observed fishing effort on this fleet. In addition, the bycatch rate estimated for the trammel net fishery operating in the Bay of Biscay (0.04, 95%CI 0.021-0.053) suggests that up 2,061 (95% CI: 1,203 – 3,092) common dolphins are being bycaught in this fishery. With few exceptions, the majority of vessels operating with nets have mixed activity and use trammel nets and gillnets within single trips. This level of fishing detail can be hard to detect in official statistics. As a result, a precautionary approach would be relevant to consider both gillnets and trammel nets together when examining bycatch.

In the Bay of Biscay, a bycatch rate was calculated for bottom pair trawlers (PTB), targeting both pelagic and demersal species (0.15, 95%CI: 0.07-0.22 per DaS), and an estimated annual bycatch of 775 dolphins (95% CI: 388 – 1,163) common dolphins between 2016-2018. However, it should be noted that this rate was based on a single observed bycatch event. In the Celtic Sea, the bycatch rate estimated for single bottom trawlers catching demersal fish is the highest recorded for the area (0.006, 95%CI 0.003 – 0.009). Bottom trawlers targeting crustaceans were determined to have a relatively low bycatch rate and a total estimate of 97 (95% CI 0-292) bycaught dolphins for the Celtic Sea area. The positive correlation between mortality areas of dolphins inferred from strandings and fishing effort of Spanish bottom trawlers (both single and pair) in the Bay of Biscay appeared to be recurrent since 2006. Interactions between PTB using Very High Vertical Opening (VHVO) trawls and common dolphins were described 20 years ago (Fernández-Contreras et al., 2010), but few Spanish pairs have operated as PTB since 2009 in the Bay of Biscay. This identification comes from logbook data. In addition, the lack of information on trawl vertical opening (”aperture”) in the French bottom trawl fishery impedes our understanding of the characteristics of this fleet and the details of possible interactions with common dolphins.

The identification of midwater pair trawlers as one of the most high-risk fisheries for bycatch in the Bay of Biscay by the NGOs is verified by the data available to WGBYC. Midwater otter trawls also have had historically high bycatch rates in the Bay of Biscay; however, data from recent years are based on less than one day of monitoring effort and so further observer effort is required in this fleet. This result therefore requires careful interpretation in the light of differing levels of dedicated bycatch observer effort deployed on this fleet when compared to other fisheries. The analysis by WGBYC on data from gillnets specifically was not sufficient to fully determine the mortality of common dolphins; however, bycatch estimates provided on trammel nets suggested possibly higher bycatch rates than those calculated for gillnets. Although interactions between VHVO trawls (PTB) and common dolphins in the Spanish fleet have previously been documented and then confirmed by this work with high bycatch rate estimates, the 2016-2018 WGBYC analysis presented here cannot determine whether single bottom trawlers are responsible for high bycatch rates.

Based on the data above, WGBYC conclude that the evidence supports consideration of closures and/or other mitigation approaches to reduce bycatch of common dolphin in the relevant areas and métiers (PTM; GNS/GTR).

xvi. Spatial scale

The bycatch rates estimated by WGBYC were calculated for the Bay of Biscay (8abde), the Iberian Peninsula (8c,9a), and the Celtic Sea (Subareas 6 and 7). The high stranding levels referred to in the NGO document were primarily recorded along the coasts of the Bay of Biscay, although bycatch events were identified in many areas including the Iberian Peninsula, western Ireland, and Cornwall, UK.

The large-scale closure suggested by the NGOs will likely bring about a decrease in fishing pressure on common dolphin populations, but the exact spatial scale of the closure needs to be carefully considered. Large vessels may be able to change fishing area in order to continue to fish in adjacent areas that remain open but that could result in high bycatch also. Careful examination of the seasonal distribution and density of common dolphins in the context of the seasonal fishery effort and their target species is required to define the limits of the spatial closure. For example, the analysis of collated cetacean surveys indicates the importance of the shelf break as the area where common dolphins are aggregating at high density, particularly between January and March. This corresponds with the area where gillnetting for hake appears to be concentrated, which is also where hake is known to aggregate to spawn between January and March (Murua, 2010). The fact that net marks have been found on many stranded common dolphins identified as bycatch, and that, as stated earlier, we cannot be confident about the bycatch rate estimates for this métier, suggest this needs closer examination.

xvii. Temporal scale

European NGOs suggested the closure of fisheries between December and March.

The seasonal estimation of PTM bycatch rates highlight that the highest bycatch numbers occurred between January and March, on demersal species. The main demersal fish caught by midwater trawlers are hake and sea bass; although classed as demersal species, both of these fish can live in the water column away from the seabed. An analysis of the monthly distribution of fishing effort related to these species in the Bay of Biscay suggested that the peak of activity occurred between January and May, and with higher levels in February and March. For both gillnets and trammel nets greater than 12 metres, the main demersal fish targeted is hake, and the fishing effort of these fisheries occurred mainly between November and March. For smaller trammel netters, the main target species is sole which is caught primarily in spring and summer. The bycatch events recorded from GNS/GTR and reported to WGBYC occurred year-round. However, it appears that the peak of activity of the GNS fleet occurred mainly during winter months. The bycatch rate calculated for bottom pair trawlers (PTB) was based on one single event that occurred in autumn.

The seasonality of the closure suggested by the NGOs corresponds with the timing of highest strandings records from the Bay of Biscay, and the fishing activity of midwater pair trawlers targeting “demersal” species. The data available for GNS and GTR fisheries suggest that bycatch could potentially occur all year round, but the highest fishing activity for demersal species (hake and monkfish) for GNS occurs in winter. For bottom trawlers, the difficulties associated with fleet identification and the rare events recorded mean that available data cannot be used to detect potential seasonality in bycatch.

The proposal of a 4-month winter closure (December to March) is relevant for the PTM (most described fishery) and possibly also for larger GNS and GTR targeting demersal species. However, due to low data availability for smaller GTR fisheries, the same conclusion cannot be reached for these fisheries.

1.7.2.2 Technical measures

A full assessment of the appropriateness of the technical measures suggested by the NGOs, including the daytime setting of nets and the "move on” procedure is not possible without (a) additional, more specific, information (such as gears concerned, detailed procedure) and (b) access to data that are not currently available to WGBYC. As such, a review of existing literature was carried out (see 1.6.1.1) to examine potential appropriateness of these measures

The "move-on" procedure requiring fishermen to move fishing area if bycatch occurs would be based almost entirely on the willingness of fishermen to comply and a willingness to accept at-sea monitoring to ensure implementation of such a measure. Details of what level of bycatch would trigger the move-on rule would also need to be determined and decided upon. Moreover, there are no certainties that the bycatch risk in the new fishing area after the "move-on" procedure was completed would be lower than in the original area given the wide-scale distribution and highly mobile nature of common dolphins. There is also a possibility that dolphins are deliberately associating with some trawl gears which may also limit the utility of this type of measure.

If diel bycatch rates in the relevant trawl fisheries are consistent with literature on common dolphin bycatch, restrictions on night-time trawling may reduce bycatch (but may also have impacts on commercial catch rates). However, the application of this type of measure to gill or trammel nets does not seem to be based on existing publications and consideration would need to be given to what the typical soak times are in these fisheries and practical issues of how a fishery might operate under such measures. Such diel type restrictions would also require significant increases of controls at sea; and may not ensure a reduction in bycatch.

xviii. Pingers

A further technical measure that has shown promise at reducing common dolphin (and other cetacean species) bycatch but which is not mentioned in the e-NGO document is the use of Acoustic Deterrent Devices (ADDs). For completeness, we include some details of relevant ADD trials here.

In the UK, a considerable amount of common dolphin bycatch mitigation work was carried out between 2003 and 2010 in the English Channel pair trawl fishery for bass (Northridge et al., 2011). Initially this work focused on the use of excluder grids but from 2007 the focus shifted to using a particular type of ADD, the DDD-02 & DDD-03, manufactured by STM Products. Vessels in the fishery used ADDs on a voluntary basis for several years, so the trials were not carried out in a strictly managed experimental way, but the results were promising. Not all monitored hauls had ADDs in use, and some hauls had ADDs that were either positioned sub-optimally or were not functioning correctly on hauling. This provided an opportunity to compare bycatch rates in optimally pingered hauls against non-pingered and sub-optimally pingered hauls. Overall bycatch rates were reduced significantly (by 75-90%) in optimally pingered hauls.

A more recent study carried out in the Bay of Biscay on three midwater pair trawl teams in winter 2018 highlighted a reduction of 65% of bycaught common dolphins with the use of pingers (DDD-03). Following this experiment, the use of pingers is now mandatory in the Bay of Biscay for all French midwater trawlers (OTM and PTM). The efficiency of pingers on PTM encouraged their use on PTB fishery, as they share some operational similarities, concerned a relatively small number of vessels, and both fisheries showed high levels of bycatch.

However, stranding numbers of common dolphins in the Bay of Biscay in winter 2019 and early winter 2020 were the highest ever recorded in the French time series. These events would suggest that fisheries operating in this area other than PTM were generating high levels of bycatch (or that pinger use is not being properly implemented in the pair trawl fisheries). According to the wide coverage and high intensity of netting effort in the Bay of Biscay, the widespread use of pingers in this fishery in winter could have deleterious consequences for common dolphins, but that has not been properly assessed yet.

xix. Increase of monitoring

Regulation 812/2004 is now repealed and superseded by the Regulation (EU) 2019/1241 of the European Parliament and of the Council of 20 June 2019 on the conservation of fisheries resources and the protection of marine ecosystems through technical measures. Annex XIII sets out comparable monitoring requirements in relation to cetacean bycatch as Regulation 812/2004: it is worth noting that it is mandatory for "Monitoring schemes [to] be undertaken on an annual basis and established for vessels […] with an overall length of 15 m or more to monitor cetacean by-catch, for the fisheries and under the conditions defined below" (**Table 26**). It is notable that the specific requirement for pilot/scientific studies on smaller vessels as per Regulation 812/2004 has been removed from the TCM Annex XIII.

Table 26 Monitoring requirements for cetaceans under the new Technical Conservation Measures in subareas and divisions relevant to the Celtic Seas, Bay of Biscay [and Baltic]. These requirements are only relevant to vessels of overall length of 15m or greater.

Area	Gear
ICES sub-areas 6,7 and 8	Pelagic trawls (single and pair)
ICES divisions 6a,7a,7b,8a,8b,8c and 9a	Bottom-set gillnet or entangling nets using mesh sizes equal to or greater than 80mm
ICES sub-area 4, ICES division 6a, and ICES subarea 7, except ICES divisions 7C AND 7K	Driftnets
ICES divisions 3a,3b,3c,3d south of 59N, 3d north of 59N (only 1 June to 30 Sept) and ICES subareas 4 and 9	Pelagic trawls (single and pair)
ICES sub-areas 6,7,8 and 9	High-opening trawls
ICES divisions 3b, 3c and 3d	Bottom set gillnet or entangling nets using mesh sizes equal to or greater than 80mm

Observer programmes have specific value in identifying and fully characterising interactions between fisheries and small cetaceans, so monitoring strategies should be improved in order to provide reliable and complete statistics on cetacean mortality.

1.7.3 Evaluating pressures and threats due to commercial fisheries by-catches to harbour porpoise in the Baltic Proper

Based on genetic and morphological evidence, as well as acoustic and telemetry studies, there is evidence for a separate harbour porpoise population in the Baltic Proper (e. g., Sveegaard et al. 2015). Its size of only 497 individuals (95% CI: 80–1091, SAMBAH 2016) is critically low. In order to protect this population, yet to allow recovery, strict conservation measures will be needed. One of the main pressures to the population identified is bycatch in static net fisheries and the mortality limit for the Baltic Proper is likely close to zero.

Data from WGBYC confirms literature that the highest bycatches of harbour porpoises are found in gillnets and trammel net fisheries (GNS and GTR). However, harbour porpoises are also by-caught in otter trawls (OTB, OTT and OTM) and midwater pair trawls (PTM).

There has been continuous monitoring in the Baltic through sampling programs under the DCF/EU map in Baltic fisheries. A total of 7258 days at sea have been monitored across all métiers from 2006 until 2018 with no bycatch of harbour porpoise reported. However, the sampling is mainly carried out in the trawl fishery and monitoring gillnet fisheries has been limited. In the Baltic Sea 1126 DaS has been monitored in the gillnet fisheries from 2006 until 2018.

Evaluating fisheries effort shows that gillnets constitutes the main fishing effort in terms of DaS in the Baltic which are concentrated in the southern Baltic along the German and Polish coasts. Also trawl fisheries is focused in the southern Baltic. Neither gillnet fisheries nor trawl fisheries occur in a larger extent in the areas designated for harbour porpoise (Midsjöbankarna). In the Baltic overall, gillnet fishing effort has decreased by 44% over the past 10 years. Since August 2019 in the southern Baltic, gillnet effort targeting cod has significantly decreased due to the cod ban. In Sweden, this constitutes the main gillnet effort in the southern Baltic.

1.7.4 Emergency measures proposed for harbour porpoise in the Baltic Proper

1.7.4.1 Role of Natura 2000 areas in the protection of the harbor porpoise population of the Baltic Sea

It is obvious that except for the Natura 2000 site *Hoburgs Bank och Midsjöbankarna* most Natura 2000 sites have been designated for other qualifying features (species, habitats) for protection, and harbour porpoises have been added, often based on limited or opportunistic information on their occurrence. However, this also means that in many cases areas that are important for harbour porpoises have not been designated as Natura 2000 sites.

The designation of Natura 2000 areas in the NGO Annex II did in one area take the distribution and abundance of harbour porpoises into account, (*Hoburgs Bank och Midsjöbankarna* Table 17,). Some other important areas for the harbour porpoise population of the Baltic Proper such as the Southern Midsea Bank and boundary areas further south or Hanö Bight have not been designated Natura 2000 sites. Depending on porpoise density and fishing effort, implementing mitigation measures in these areas can be more efficient than in some Natura 2000 sites which mention the harbour porpoise and for which this is based only on assumptions or opportunistic sightings.

In other sites, e.g. the German Nature Conservation Area *Pommersche Bucht-Rönnebank*, the seasonal importance for the harbour porpoise population of the Baltic Proper has later been verified (Benke et al., 2014).

1.7.4.2 General remarks with respect to emergency measures

Considering the status of the harbour porpoise Baltic Proper population, its biology and life history, any protection measures can be effective only when applied continuously for a long period of time, in this case for years, and maybe even decades. Emergency measures implemented under Article 12 of the CFP can be applied only for 6 months with the possibility to be prolonged for another 6 months.

Given the conservation status, the sum of threats (not only from fisheries but also from other pressures), and the state of depletion of this population, there is no doubt that measures are urgently needed to protect this population and emergency measures can be a start. Since bycatch appears to be a major conservation issue for this population, all measures which potentially reduce bycatches can contribute to achieving conservation objectives.

Returning to business as usual after the cessation of emergency measures would likely result in the extirpation of the population. At least the recovery of the population will, to the best of scientific knowledge, not be possible if the bycatch problem is not solved for the long term. This will require strong effort of all countries with relevant activities within the distribution area of that population, and especially in their core habitat and along migration routes (the latter being unknown).

It is further worth underlining the fact that all emergency measures could be implemented only in waters under EU countries' jurisdiction. We must bear in mind that there are areas in Russia's territorial waters and EEZ where the measures could not be implemented, and where harbour porpoise status and bycatch risk is unknown. On the other hand, porpoises are thought to be very rare in those waters (SAMBAH, 2016).

The measures proposed are fishery closures and the use of pingers accompanied by appropriate recording of data and monitoring. Reducing fishing effort in areas of importance for harbour porpoise can be an effective mitigation measure. However, the measures described in the NGO Annex II will likely not positively affect the population status unless accompanied by further measures.

1.7.5 Appropriateness of the emergency measures proposed FOR Baltic harbour porpoise

In the NGO Annex II, six measures are proposed to protect the critically endangered Baltic Proper harbour porpoise population. However, only three of them are "protection" measures, while the other three are guidelines to improve bycatch monitoring and management. Therefore, in this document we have focused on evaluating the appropriateness of the "protection" measures.

The conclusions proposed by WGBYC do not consider the social or economic appropriateness of the measures suggested and are exclusively focused on their potential effectiveness on reducing bycatch and the conservation of the Baltic Proper population of harbour porpoises.

The proposed emergency measures aiming at a reduction of bycatch numbers are not sufficient for the protection and recovery of the Baltic Proper harbour porpoise population. This is mainly due to the already heavily depleted state of the population which would require decades to recover after the implementation of suitable conservation measures. Further, emergency measures are limited in time. Thus, immediately following emergency measures, long-term conservation measures will be needed to improve the status of the population.

. The PBR of 0.7 animals per year suggests that even the avoidance of a low number of bycatch events by a measure would have a positive effect on the population. Decreasing the overall bycatch numbers by conservation measures depends on the spatiotemporal extent of each measure and the overlap of porpoise occurrence and density (which is uncertain in most areas) and fishing effort in métiers which pose a bycatch risk to the species. As a consequence, it is difficult to assess the potential benefit <u>to the population</u> especially for measures which have a small spatiotemporal extent (such as closures of small Natura 2000 sites).

xx. Closure of the Northern Midsea Bank for all fisheries

The Natura 2000 area *Hoburgs Bank och Midsjöbankarna* provides core habitat for the Baltic Proper harbour porpoise population and SAMBAH results indicate that density is highest in the Northern Midsea Bank. However, due to the low fishing effort reported in this area which is mostly pelagic trawling (also posing a bycatch risk but at a much lower scale compared to static nets), currently the bycatch risk in this area is assumed to be relatively low. Provided that the effort in the area will not increase, e.g., due to other conservation measures elsewhere (e.g. shifting of effort), this total closure for all fisheries should decrease bycatch but will most likely not have a significant positive effect on the population.

Therefore, additional mitigation measures such as overall reduction of fishing effort, needs to be taken into consideration.

Bottom and midwater trawls are also métiers with a risk of harbour porpoise bycatch, and therefore the closure of these areas should decrease bycatch. However, as with gillnets, current fishing effort in this area is very small and for the present will most likely not have a significant effect on the population.

xxi. Closing of gillnet fisheries in the rest of the Natura 2000 area Hoburgs Bank och Midsjöbankarna (SE0330308) as well as in all other Natura 2000 areas east of 13.5°E where the harbour porpoise is listed as present.

The closure of the Natura 2000 site ***Hoburgs Bank och Midsjöbankarna*** (SE0330308) to static net fisheries has a low likelihood to reduce the bycatch of harbour porpoises in the area. Bycatch risk is driven by two factors: the fishing intensity (effort) and the density of animals in the area. From the SAMBAH project results it is clear that the Natura 2000 site represents core habitat for this harbour porpoise population and therefore the Natura 2000 site was established primarily to protect the "Baltic Proper" porpoise population. However, the fishing effort in this area is currently very low, and therefore the risk for the porpoise to be bycaught in this area is small. Therefore, this closure will not contribute much to the required harbour porpoise bycatch reduction and thus it is likely that this measure alone will not have a significant positive effect on the population.

Not all core habitat was included in the Natura 2000 site. E.g., the Southern Midsea Bank south of the area is no less important for the Baltic Proper harbour porpoise population but has not been included in the protected area. A similar case is for the outer part of the Puck Bay which is outside of the Natura 2000 site. Closures or other mitigation measures could also be considered in these areas.

Most of the **Natura 2000 sites** in the NGO Annex II are small and cover mainly the coastal areas. Exceptions to this is a large interconnected cluster of the German and Polish Natura 2000 sites *Pommersche Bucht mit Oderbank, Greifswalder Boddenrandschwelle und Teile der Pommerschen Bucht, Ostoja na Zatoce Pomorski,* and *Wolin i Uznam (*indicated in **Table 25***).* If the area *Oderbank* designated under the Birds Directive (not included in the the NGO Annex II but include in Table 17) this would interconnect the cluster of natura 2000 sites with *Adlergrund* and *Westliche Rönnebank* to form a large connected protected area of almost 5,000 km². There is considerable fishing effort with static nets in this area (Figure 30) and by reducing the effort in this area it will likely have a significant effect on the population.

These areas are in a region where gillnet fisheries are focused in the Baltic (Figure 30). Even if the area is not specifically designated for harbour porpoises, SAMBAH results indicate that in this area harbour porpoise density is elevated compared to the Baltic Proper. It is believed that porpoises of the Kattegat, Belt Sea population form the major fraction of these animals although there is immigration of Baltic Proper harbour porpoises in winter (Gallus et al. 2012, Benke et al. 2014, Carlén et al. 2018). A high static net effort in combination with an elevated porpoise density results in a significant bycatch risk. A closure of the Natura 2000 sites in this area will reduce bycatch of harbour porpoises. Since a fraction of the harbour porpoises in the area belongs to the Baltic Proper population, this population would also benefit from this or other mitigation measures (ie pingers or alternative gears) reducing bycatch.

xxii. Exclusion of fisheries for the two small Polish Natura 2000 sites namely Natura 2000 area *Zatoka Pucka i Półwysep Helski* (PLH220032) and *Ostoja Słowińska* (PLH220023).

Although the harbour porpoise is listed simply as occurring in the Zatoka Pucka i Półwysep Helski site, this is an important location for the Baltic harbour porpoise population (Skóra and

Kuklik 2003; Hel Marine Station UG, unpublished data). Its importance is also confirmed by historical data on harbour porpoise bycatch numbers, with up to 250 individuals during the years 1933-1935 around this area (Ropelewski, 1957). This Natura 2000 site is also relatively small, semi-closed and very shallow and is used by small fishing boats. In addition, it borders the most important area for harbour porpoise in the region which is the outer part of Puck Bay where relatively high bycatch numbers continue to be reported (Hel Marine Station IO UG unpublished data). If fisheries were excluded from the site, this would in practice mean that all fisheries within the site would relocate fishing effort to neighbouring areas. In effect, that could create a high concentration zone of fishing effort around the borders of the Natura 2000 site. That might then affect the ability of porpoises to enter and leave their favoured area during seasonal migration and would actually increase the risk of being bycaught in the neighbouring areas. Therefore, relocation of fishing effort could create higher bycatch risk for the individuals that occupy the outer, unprotected area adjacent to the Natura 2000 site which forms the inner part of Puck Bay. Appropriate temporal and fishing method (including alternatives) management of this Natura 2000 area could thus be more effective as a mitigation measure.

Ostoja Słowińska (PLH220023) is a natural area with reported bycatches, and live observations of Baltic harbour porpoises (Hel Marine Station database). However, it covers marine areas only to minor extent (11,501 ha), with rather low fishing effort. Furthermore, there is no clear scientific evidence that this area is of a special importance for the harbour porpoise compared to the surrounding areas. Since the site is also part of the Słowiński National Park, the fishery in this area is controlled by the Park authorities and they are authorised to implement fisheries management measures. Closing fisheries in this area therefore would probably have no effect on the Baltic Sea harbour population

xxiii. Mandatory use of ADDs in all commercial gillnet fisheries outside Natura 2000 areas

Most of the fishing effort with static nets appears to be outside Natura 2000 sites. Therefor it is important to reduce the bycatch risk of harbour porpoises also outside these areas. The large-scale use of pingers in static net fisheries regardless of vessel size addresses the fishing métiers with the highest bycatch rates and affects a large fraction of static nets. Although pingers cannot eliminate bycatch, they have the potential to reduce bycatch rates of these nets to 50-80 % in operational fisheries compared to nets without pingers (Orphanides & Palka 2013). Thus, the expected bycatch reduction by this measure will likely have a positive effect on the population. In areas where porpoises are not abundant and only occasionally observed, the disadvantages of using pingers might exceed the advantages. For pingers to be effective, a number of conditions have to be met. These include the fishermen's awareness, the maintenance of pingers, training, compliance and enforcement. Also, there a few disadvantages and restrictions of this method, as listed in the section on technical mitigations. Large scale use of pingers may reduce the foraging efficiency of harbour porpoises which in turn could result in negative population impacts.

In order to be effective as a conservation measure, this approach should be taken into account for the longer term in addition to "emergency measures" implemented under Article 12 of the CFP. However, as the Jastarnia Plan (ASCOBANS 2016) points out, pingers are only suited as an interim measure until alternative gears are available.

Mandatory use of ADDs in all gillnet fisheries in almost the entire Baltic Sea is a challenge and implementing this measure will be both costly and time consuming. Also, a system of inspection of use and proper operation of ADDs will be required simultaneously if pinger use is regulated and not used voluntarily by fishermen. Further, it is important to provide adequate funding for pinger deployment. In principle, they are eligible for EMFF funding although national co-founding is required. Due to seal depredation in gillnets, it is also advisable to choose a pinger type which emits signals outside the hearing spectrum of seals to avoid the "dinner-bell effect".

xxiv. Accurate recording of fishing effort and gear type used
xxv. Dedicated electronic monitoring on all gillnet vessels in the region
xxvi. Monitoring and adaptive management/mitigation measures of gillnet fisheries

All three measures are aimed at improving bycatch monitoring, and management rather than measures dedicated for direct protection of harbour porpoises. In order to obtain robust data which are essential for proper bycatch evaluation and in providing further advice for implementing appropriate actions for reduction of PETS bycatch, the proposed measures/guidelines are appropriate and worth implementing not only to monitor bycatch of harbour porpoise but to get more reliable data on bycatch of all of protected species. However, the idea to cover by REM (or other monitoring) 100% of gillnet fishing effort over almost the entire Baltic Sea is very ambitious, and need time, money and dedicated solutions to be implemented. It would be completely impossible to implement this solution in six months' time. It also questionable whether the resource needed justifies the end given the rarity of porpoise bycatch events.

It is clear that the effect of conservation measures above cannot be robustly assessed by a monitoring program even if observer/REM coverage in the fisheries affected is 100%. However, what can (and should) be monitored is the compliance of fishermen, and possible changes to their behaviour (fishing effort and/or methods) in response to measures, e.g. closures in order to safeguard that this does not counteract the measures taken.

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Appendix a. List of participants

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Adam Wozniczka

Appendix b. Spatial and temporal distribution of trawl fishing effort in the Baltic Sea

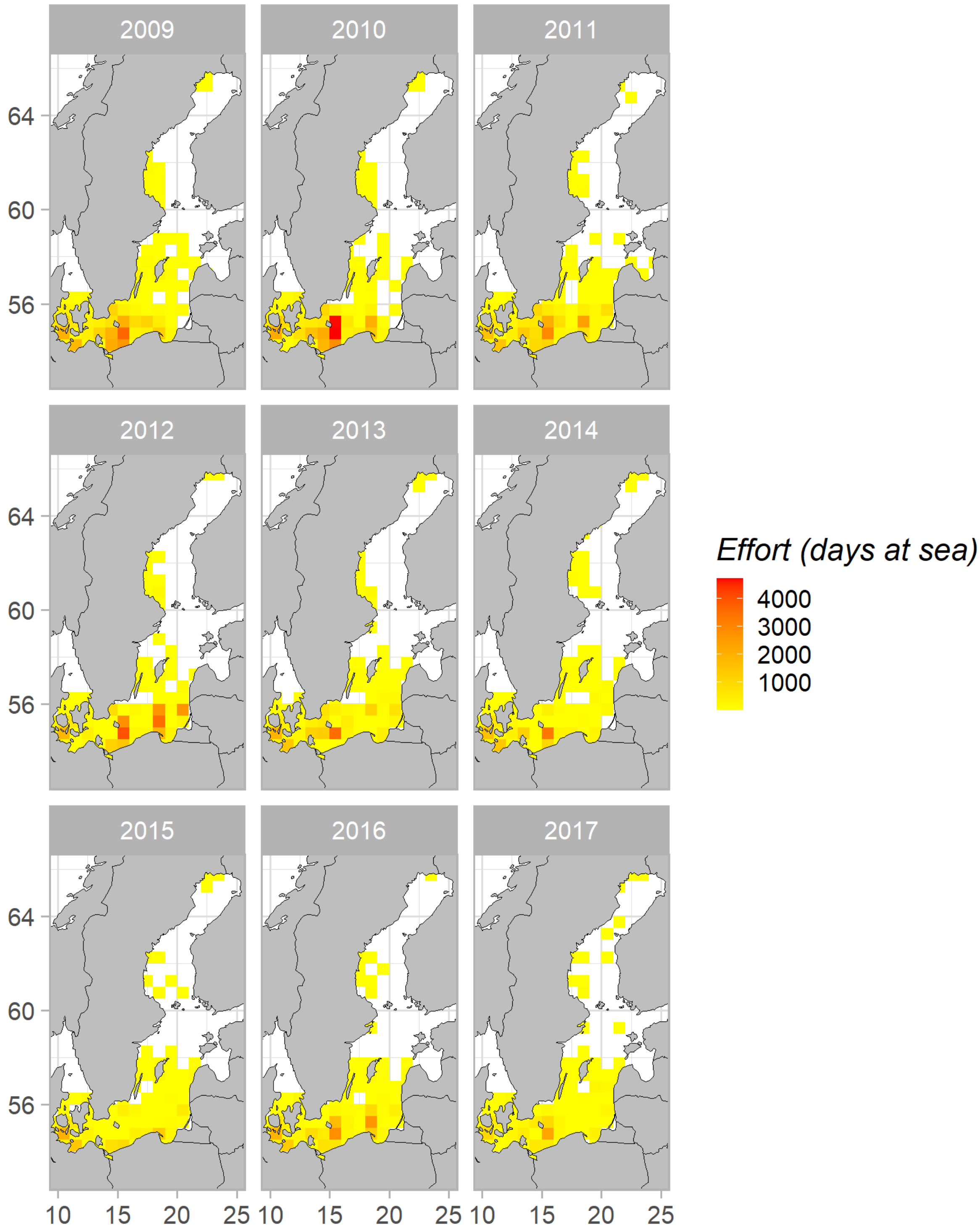

Figure b.1. Summarized effort per ices rectangular 2009 until 2017 for days at sea for bottom trawls including métiers bottom otter trawl, multi-rig otter trawl and beam trawl (OTB, OTT and TBB).

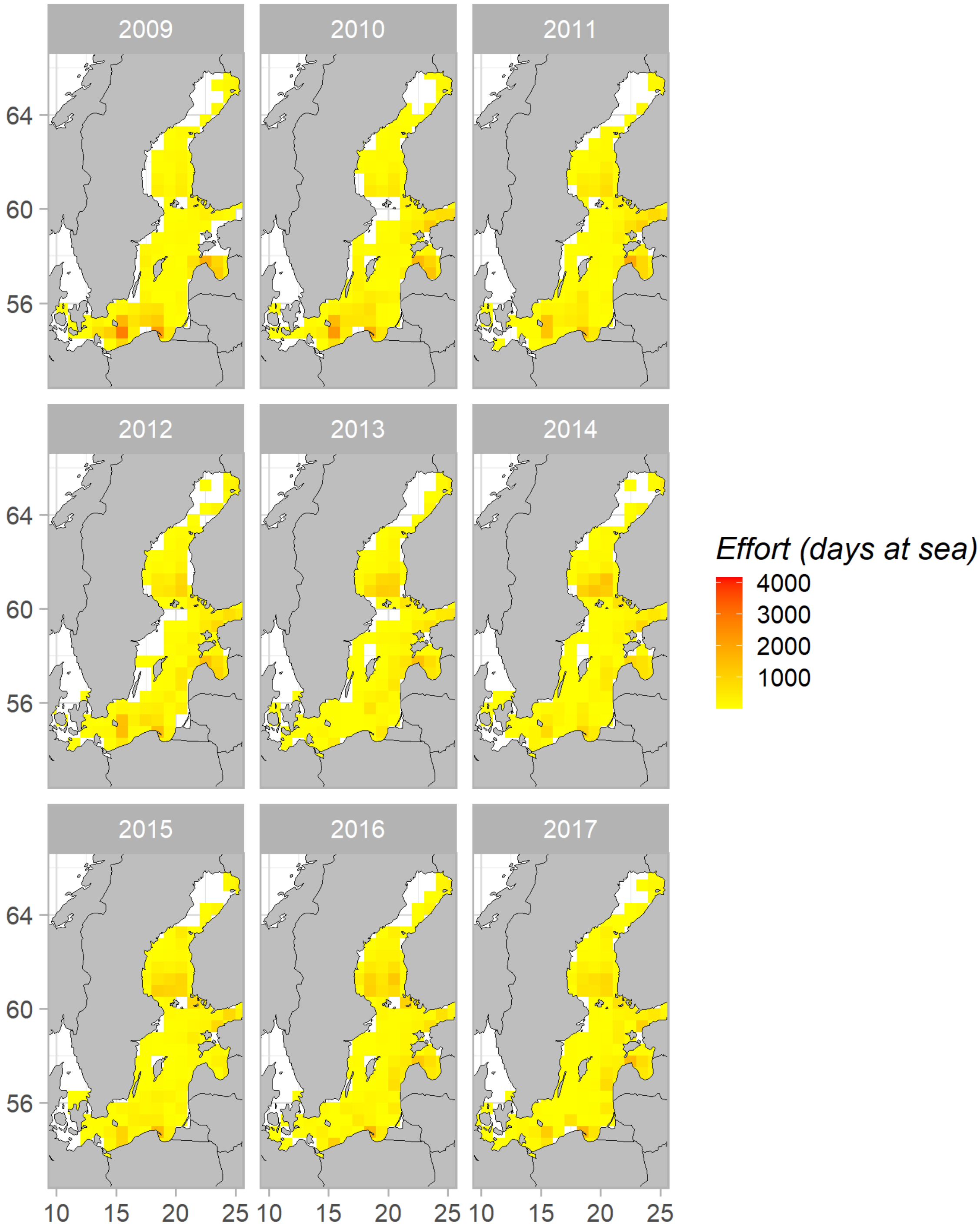

Figure b.2. Summarized effort per ices rectangular 2009 until 2017 for days at sea for pelagic trawls including midwater otter trawl (OTM).

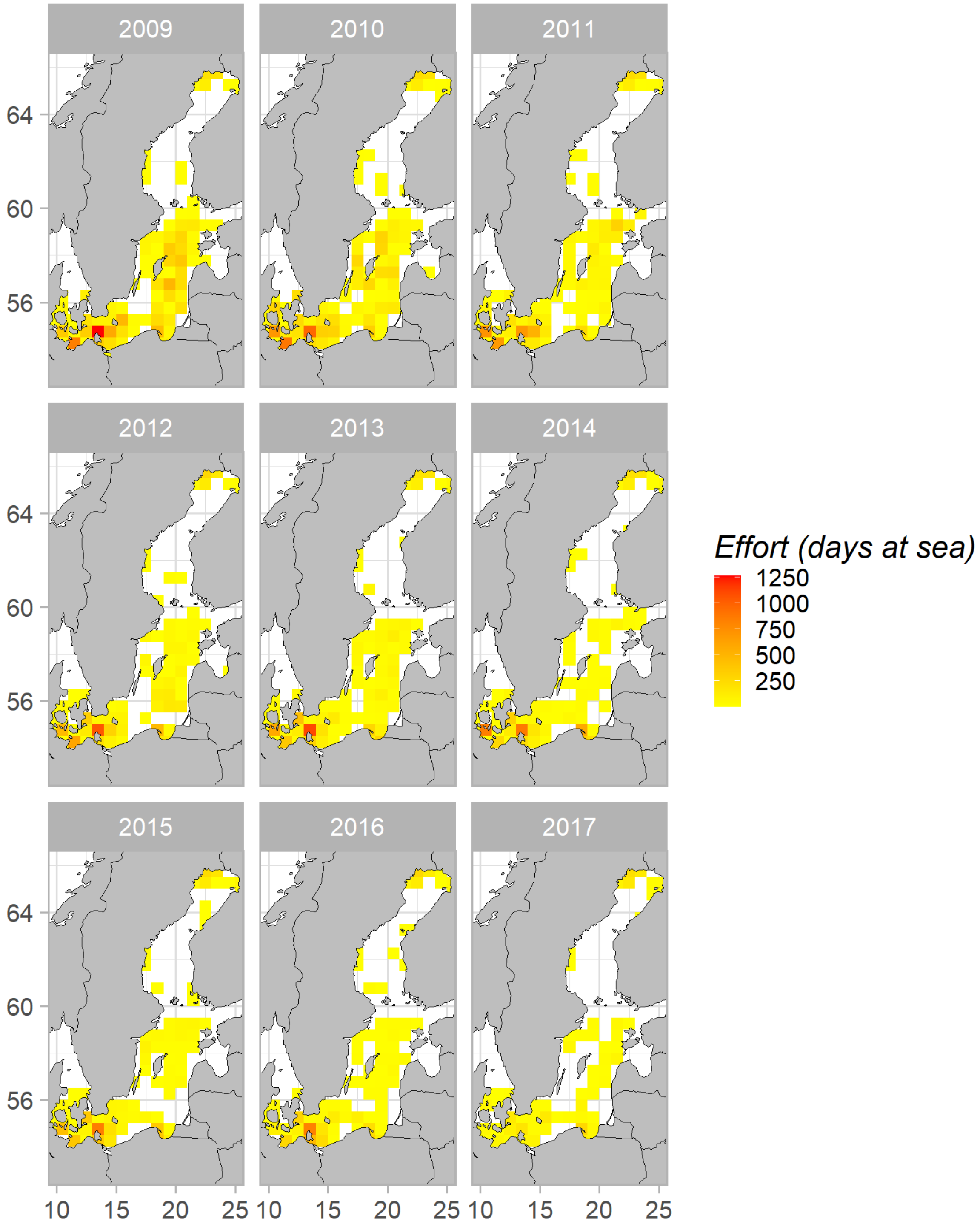

Figure b.3. Summarized effort per ices rectangular 2009 until 2017 for days at sea for pair trawls including midwater pair trawl and bottom pair trawl (PTM and PTB).

Appendix c. Technical and operational mitigation methods

Further information has been compiled from scientific studies and from pinger use in fisheries in the Baltic and other seas.

Scientific pinger trials in fisheries

In the Danish North Sea, **digital pingers** producing a variety of ultrasound sweeps in the frequency range of 20 or 40 to 160 kHz (*LU-1* prototype, *AquaMark 100*) were tested in different net fisheries. The bycatch reduction in pinger nets ranged from 78 to 100%. Pingers were efficient even at spacings much larger than those which had been required by EU Reg. 812/2004 (Larsen et al., 2013; Larsen and Eigaard, 2014). In the Black Sea, digital pingers (*AquaMark 100*) were also tested but they caught too few porpoises to be able to determine if there was any effect (Bilgin and Köse, 2018).

Instead, **10 kHz pingers** (*Dukane NetMark 1000* and *Future Oceans*) used in experiments in the Black Sea gillnet fishery were able to reduce porpoise bycatches by 98 and 100% (Gönener and Bilgin, 2009; Zaharieva et al., 2019). *NetMark 1000* pingers were also tested in the Swedish Skagerrak but with no clear result (Carlström et al., 2002). In the Gulf of Maine/Bay of Fundy area, experiments with this type of pinger resulted in bycatch reduction rates between 68 and 92% (Kraus et al., 1997; Trippel et al., 1999).

In the English Channel and Celtic Sea, ***DDD pingers*** were tested in bottom-set gillnets and entangling nets. These pingers have a much higher source level (165 dB re 1µPa @ 1m) compared to conventional pingers, i.e. those in Annex II of EU Reg. 812/2004 (130 to 150 dB re 1µPa @ 1m). At various spacings (2 km to >4 km), a bycatch reduction of 63% was achieved (Kingston and Northridge, 2011).

Scientific review of pinger use in operational fisheries

Despite high bycatch reduction rates of up to 100% in experimental setups (see above), in operational fisheries the bycatch reduction appears to be much smaller. Between 1999 and 2010, in the **Gulf of Maine and mid-Atlantic gillnet fisheries**, poor compliance and enforcement have not resulted in the expected bycatch reduction by pingers (typically used model: *Dukane NetMark 1000* pingers). The bycatch reduction fluctuated over the years between 50 and 80% (Orphanides and Palka, 2013). Maintenance of pingers has a significant effect on the bycatch reduction rate. Bycatch rates of observed hauls with an incomplete set of pingers were intermediate between hauls without pingers and hauls with the full set of pingers. During years with high pinger usage, 87% of tested pingers were functional, decreasing to 36% in years with low pinger usage (Palka et al., 2008).

The efficiency of pinger deployment in the Baltic Sea (subdivision 24 and two small areas near the southern coast of Sweden for vessels >12 m in length) is unknown. Although requested in Reg. 812/2004 National Reports and reviewed annually by WGBYC, no clear picture can be drawn with respect to the use of pingers (number of vessels, pinger type, numbers deployed), compliance and enforcement. They clearly are effective in scientific trials but deployments in real life situations will require full compliance and enforcement.

Trials with other acoustic devices

Besides pingers which are designed to deter harbour porpoises from fishing gear, alerting devices use synthetic click trains in order to entice porpoises to increase their echolocation and finally detect and avoid the net.

Acoustic devices (**Porpoise Alerting Sound (PAS) pingers**) producing synthetic click trains with 50 to 2500 clicks per second at 110 kHz that mimic porpoise echolocation signals, were tested in a hake fishery in the Danish North Sea (Kindt-Larsen, 2008). Bycatch in nets with PAS pingers was not significantly different from that in control nets with dummy pingers. It could not be ruled out that porpoises were attracted to PAS pingers. In a separate study investigating echolocation activity at stations with pingers and without pingers, results were inconclusive.

Porpoise Alerting Devices (PALs) mimic porpoise agonistic "upsweep" signals at 133 kHz. From 2014 to 2016, PALs were tested in German and Danish gillnet fisheries in the Western Baltic and Öresund. In a paired design, five porpoises were caught in nets equipped with PALs, and 17 in control nets. The decrease of harbour porpoise bycatch by >70% was significant (p=0.016). However, the results of trials in the North Sea showed no reduction in bycatch (Culik et al., 2017). In April 2018, PALs were tested in the Icelandic cod gillnet fishery on two commercial vessels in paired sets with and without PALs. No significant bycatch reduction was found in nets with PALs (n=12) compared to control nets (n=11). Eleven out of twelve porpoises bycaught in PAL nets were large adult males, eight of which were found beside the PAL devices (ICES WGBYC, 2018). These inconclusive and, so far, unexplained results should not lead to the introduction of PALs in the Baltic Proper as a conservation measure for the critically endangered harbour porpoise population. In conclusion, alerting devices have not been sufficiently studied for use in the Baltic Proper static net fisheries.

Additional aspects from studies with acoustic devices: Factors affecting efficiency of acoustic devices

The effects of acoustic devices depend on several different factors, e.g. source level of the device, frequency spectrum, background noise, propagation losses, directivity of the device, audiogram and directional hearing abilities of the animals (Kindt-Larsen, 2008).

- Habituation

In a fishery study using *Dukane NetMark 1000* pingers (fundamental frequency 10 kHz, 300 ms ping duration, 4 s inter-ping interval), the closest observed approach of tracked porpoises decreased in the course of only a few days (Cox et al., 2001). In operational gillnet fisheries in the Gulf of Maine where pingers are mandatory, no evidence for temporal trends in bycatch was found which otherwise could indicate habituation (Palka et al., 2008). In a study on the effects of pingers on porpoises in Danish waters, indications of habituation were suggested for the *AquaMark300* pinger (signals identical to the *Dukane NetMark 1000*) but not for the *AquaMark100* (Kindt-Larsen et al., 2019). Possible factors affecting habituation are: predictability of the signal, source level, porpoise density, and site fidelity.

- Noise pollution

Due to the large numbers of pingers deployed in an area, noise pollution can be assumed to have some effect on the marine fauna. Possible factors influencing the impact to the marine environment are: frequency range, signal amplitude, background noise, water depth, sediment properties and bottom contours. Furthermore, hearing sensitivity of receivers is an important factor. In general, low frequencies of the pinger spectrum are radiated to much larger distances than high frequencies. Seal scarers, *DDD pingers* and other so-called "anti-depredation pingers" have much higher amplitude and thus affect a larger area than pingers specified in Annex II of EU Reg. 812/2004. Although ultrasonic pingers ensonify a smaller area than those at low frequencies, both have the potential to impact the behaviour and activity budget of marine animals. This kind of disturbance must be taken into account when introducing acoustic devices in MPAs or at a large scale.

- Maintenance requirements

As mentioned above, maintenance of pingers is a very important aspect as gaps in the line of pingers can reduce their effectiveness (Palka et al., 2008).

- Seal depredation

Seal depredation can be an issue if parts of the frequency spectrum of pingers are within the hearing sensitivity of seals. This is especially the case in pingers with a fundamental frequency of 10 kHz such as the *Dukane NetMark 1000* or the *Future Oceans Netguard Porpoise & Dolphin Pinger*. On the market, a number of products are available in the 70 kHz range, which is above the hearing spectrum of harbour seals and presumably grey seals (Kastelein et al., 2009a; Kastelein et al., 2009b). However, peer-reviewed results of fishery studies using these pingers could not be identified.

Acoustic enhancement of nets

Harbour porpoises are able to detect netting material with their biosonar at short ranges only. Predicted detection ranges depend among other things on the mesh size, twine diameter and other properties of the material as well as the approach angle and background noise level. Even under optimum conditions (low noise level, approach perpendicular to the net and acoustically enhanced net (see below)) the detection range may not be greater than 14 m (Mooney et al., 2007). Other components of the net such as float line and lead line have a higher reflectivity and may be detected at larger distances. Porpoises may be distracted by prey or conspecifics and thus fail to interpret the received echoes from a net as a deadly barrier.

- Passive reflectors

A method to increase the detectability of netting material is the enhancing of sonar reflectivity. Early theodolite tracking studies with air-filled plastic objects attached to nets show the potential of these objects to make nets more detectable as shown by harbour porpoise avoidance behaviour at acoustic barriers (Goodson et al., 1994; Koschinski and Culik, 1997). However, the reflectors used in those studies are impractical for use in fisheries due to their large buoyancy.

Smaller and less buoyant reflectors were identified in a systematic study investigating the acoustic reflectivity of a variety of objects of different shapes, sizes and bulk characteristics (e.g. Young's Modulus, density). Acoustic target strength has been simulated, and simulations experimentally verified in a water tank. The initial simulation results indicate that commercially available acrylic glass spheres of less than 10mm diameter exhibit promising characteristics with up to -42dB target strength at 130 kHz (the peak echolocation frequency of harbour porpoise). Echograms taken with a 120 kHz echo-sounder revealed that the net with spheres is highly visible compared to a standard gillnet.

Field tests were conducted in the Turkish turbot fishery in the Black Sea using a set of modified nets against a set of standard gillnets. In total, ten hauls were conducted. The analysis is still in progress, but it seems advisable to carry out further trials and conduct a behavioural experiment where porpoises are observed around standard and modified gear (Kratzer et al. in prep.). At the moment, the pearl net is used in the Swedish lumpsucker fishery with F-PODs attached to both sides in order to examine the porpoise echolocation behaviour around the nets.

- New net materials

Fisheries studies with nets acoustically enhanced with barium sulphate or iron oxide as fillers of the twine have been promising with respect to bycatch reduction but inconclusive with respect to catch of target fish. In a gillnet study in the Danish North Sea, no harbour porpoises were caught in iron oxide nets whereas eight were bycaught in standard nylon nets but the catch of target fish was also reduced. Acoustic measurements did not find any difference in target strength of the two net types (Larsen et al., 2007). In a demersal gillnet fishery in the Bay of Fundy area, in 1998 and 2000, no bycatch occurred in barium sulphate nets whereas nine animals were bycaught in standard nylon nets (Trippel et al., 2003). In 2001, a year of relatively high abundance of harbour porpoises in the study area, 16 porpoises were bycaught in 401 strings of barium sulphate nets and 23 in 382 strings of standard net. The catch of haddock was reduced but cod, pollock and spiny dogfish were not affected (Trippel et al., 2008). Besides acoustic reflectivity, the stiffness of the new net materials seems to play an important role in the reduction of bycatch but also of target fish catch (Mooney et al., 2007).

It can be concluded that net modifications have not been sufficiently studied or are not available yet for use in the Baltic Proper static net fisheries.

Operational mitigation methods

O'Keefe et al. (2014) developed five evaluation criteria, for which operational mitigation methods could be analysed against:

1. reduced identified bycatch or discards
2. no or minimal negative effect on the catch of target species
3. no or minimal negative effect on the catch of other non-target species or sizes
4. no or minimal spatial or temporal displacement of bycatch in response to time/area closures and other fishing restrictions
5. economic viability for the fishery

It is not always possible to meet all five criteria. In the case of the critically endangered harbour porpoise and the large number of small vessels involved in static net fisheries in the Baltic Proper, it will also be difficult to investigate whether criteria are met by measures.

Time-area closures

Time-area closures focus on reducing the degree of spatial or temporal overlap between fisheries and occurrence of the bycaught species (O'Keefe et al., 2014). Closures can produce simple and enforceable regulations. However, inter-annual variation in the occurrence of the bycaught species may cause a mismatch making the closure ineffective, especially when closed areas are very small.

The NOAA harbour porpoise take reduction plan (NOAA, 2010) has a number of closure elements for harbour porpoise conservation. The take reduction plan includes time and area closures, and closures to commercial sink gillnet fishing unless pingers (see above) are used in the prescribed manner. Further, *consequence closure areas* are defined as specific areas with historically high levels of harbour porpoise bycatch that will seasonally close if bycatch rates over two consecutive management seasons exceed a specified rate, and then remain in effect until bycatch levels achieve the *zero mortality rate goal,* or until new measures are developed and implemented. Such a rule, however, requires 100% observer coverage.

The argument of possible shifts in fishing effort away from closed areas and thus increased density of nets just outside closure areas leading to assumed higher overall bycatch risk, is often used to reject fisheries closures. This may be the case especially when a closure area is not well chosen, capped for political reasons (e.g. to allow economic use outside a protected area) or is too small. Closures may need to encompass the entire breeding or foraging range (depending on the conservation objectives) of a population, and not only a small fraction of it (cf. O'Keefe et al., 2014).

Bycatch caps

In theory, bycatch can be limited through the use of quotas, caps, and total allowable catches (O'Keefe et al., 2014). However, this is difficult to monitor and enforce.

Fleet communication

Fleet communication is a voluntary form of time/area fishing patterns to reduce bycatch and has the potential to allow commercial fisheries to operate in a coordinated manner (O'Keefe et al., 2014). Fleet communication could be a possible method to avoid concentrations of e.g. water birds, which are easy to observe by fishermen.

Effort control

Long-term bycatch data from the Gulf of Maine suggests that trends of harbour porpoise bycatch were correlated with landings of cod, suggesting that effort controls in the fishery, rather than porpoise conservation measures of take reduction plans, were responsible for initial bycatch reduction. Changes in fishing effort and distribution of key fisheries in particular were thought to play a large role in decreasing the bycatch in much of the Mid-Atlantic whilst increasing bycatch in southern New England and off the coast of New Jersey (Geijer and Read, 2013; Orphanides and Palka, 2013).

Review of available harbour porpoise mitigation measures in the Baltic Sea – alternative fishing gears.

In order to identify and assess available bycatch mitigation measures for marine mammals and birds, different alternative fishing gears and fishing techniques have been tested in the Baltic Sea in recent years. Basic information on these trials have been compiled in the HELCOM Questionnaire on alternative fishing gears and fishing techniques[38] which was prepared based upon contributions provided by several countries including Denmark, Germany, Poland and Sweden.

According to the questionnaire, several types of alternative gears have been considered in tests to replace set nets such trammel nets and gillnets (GTR, GNS) in order to reduce bycatch of Baltic Sea harbour porpoise. Bycatch of harbour porpoise with towed gears is a very rare incident in the Baltic Sea (Kuklik and Skóra, 2003), and therefore, no trials with the aim to reduce bycatch of harbour porpoise in the Baltic Sea with excluding devices in towed gears, have been conducted in recent years.

Replacement of trammel nets and gillnets by alternative gears with a similar catch efficiency (CPUE) compared to set nets, could be considered as a long-term solution.

- Automated longline system (métier longline)

Longlines have a greater chance of hauling in live or much fresher catch than gillnets with their longer soak times. This can increase the quality and price in the market.

In the Baltic Sea, this gear has been tested in Germany. Together with fishermen from Schleswig-Holstein, NABU and BfN tested the use of commercially available automated longline systems to catch cod and flatfish. The system was developed by an Icelandic company. Chopped herring and sprat were usually used as bait. The lines were set fully automatically, with the hooks picking up bait from a special baiter. A longliner usually runs to as much as 4,000 m of line with some 2,000 hooks. The results of the trials showed the technical feasibility of this gear for Baltic Sea conditions. It represented a successful cooperation between scientists, NGOs and fishermen[39],

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[38] HELCOM Questionnaire can be found here: https://portal.helcom.fi/workspaces/AlternativeFishingGearsQuestionnaire-171/default.aspx

[39] https://www.bfn.de/en/service/media-center/marine-nature-conservation/towards-sustainable-fisheries-video-transcript.html

and no bycatch of marine mammals was observed. It also allowed high quality catch, although the catch efficiency was low.

Studies of logbook data in Sweden (SLU Aqua) have shown that longlines can have comparable catch levels but are seasonally dependent (Königson and Hagberg, 2007). Generally, differences in catch amount, species composition, and size selectivity occur between gillnets and longlines ((Santos et al., 2002; Stergiou and Erzini, 2002; Erzini et al., 2003), which are among the issues to examine when considering switching from gillnets to longlines.

It should be noted, however, that longline fishing is very susceptible to depredation by grey seals, which are increasing in the Baltic Sea.

- Cod pots and flatfish pots (métier pots/traps)

Fishing with baited pots has the potential to eliminate bycatch, especially where porpoises are frequently caught in gillnets. During a 3-year study in the Baltic Sea, cod pots were used by commercial fishers in two areas off the coast of Sweden. Using the data from this study, catches from pots were assessed in relation to other gear types. The comparison of pots with other gear types showed that, during the first half of the year, the pot fishery generated lower daily catches than the gillnet and longline fisheries at comparable levels of fishing effort. During the second half of the year, catches in the pot fishery exceeded or were equal to those in the gillnet fisheries (Königson et al., 2011). A study visit by Polish coastal fishermen to Järnavik in April 2017 to learn about the use of cod pots in commercial fisheries showed their interest in using small sized cod pots in the Gulf of Gdańsk.

Flatfish pots were also tested in Sweden, in ICES area 25, by SLU Aqua Sweden, in 2017. The aim was to test if it was possible to catch flatfish and turbot using pots, ensuring among other reduction of bycatch of harbour porpoise. However, the pots showed low catch rates for the target species, flounder and turbot. The pot type is not ready for implementation due to a combination of low catch rate and few fishing occasions. More studies are needed to fully evaluate its potential within the fisheries (Nilsson, et al. 2018).

- Large fish traps (pound nets/pontoon fish chamber) (métier traps)

The pontoon fish chamber is an independent module which can be attached to trap-nets of several kinds. The fishing gear as a whole is then usually referred to as a pontoon trap. The chamber is basically a large cylinder of strong netting. It has two sections; the entrance part and the fish holding chamber itself which ensures high survival rate and high quality of catch (Hemmingsson et al., 2008).

According to the HELCOM questionnaire, trials have been carried out in the Bay of Greifswald in Germany by Thuenen Institute of Baltic Sea Fisheries, Rostock (Daniel Stepputtis) in 2019, and are ongoing. The main aim has been to replace herring gillnets in order to avoid bycatch of birds.

Pontoon traps have been also tested by Finland in the Gulf of Finland and Bothnia, as well as in Sweden and Denmark mainly to reduce seal depredation but should also reduce any marine mammal bycatch. Trials in Sweden have aimed at the testing of survival rates of cod caught in pontoon traps. Only bottom-set traps caught substantial amount of cod, probably due to the fact that cod hesitate to swim upwards in the water column. A 40mm selection panel allowed for cod bycatch reduction before emptying the trap. Survival rates were almost 100%, six days after handling cod when emptying the trap. The Pontoon trap was tested in Denmark by DTU Aqua (Finn Larsen) in 2018 and 2019, but catch rates of both cod and flatfish were too low to continue with the trials.

However, the traps are susceptible to external impact from wind and current, especially in an open seascape environment, so are not suitable for open sea conditions. Moreover, cod populations are mobile during different seasons; that is why a stationary gear for cod is only effective during certain times of the year, something that can affect the fisherman's financial sustainability. Pontoon traps have also been tested for catches of mackerel, herring, whitefish and salmon (Nilsson, et al., 2018).

Other types of alternative fishing gears tested in the Baltic Sea with the aim to reduce bycatch of PETS

- Jigging machines (Jigging -reels) (métier rods and lines),

Gears have been tested as alternatives to reduce bycatch of PETS in the Baltic Sea, in German coastal waters (Schleswig-Holstein) by NABU and financed by BFN. Tests were not successful.

- Lights attached to gillnets (gillnet modification).

Trials were conducted in Polish and Lithuanian Baltic Sea waters, with the aim to test whether two different gillnet modifications with visual stimuli can effectively reduce bycatch of protected species, mainly birds, while maintaining the volume of fish caught. Paired trials of two types of visual stimuli attached to nets: 1) high-contrast monochrome net panels and 2) net lights (constant green and flashing white LED lights) were conducted. Trials have not proven successful so far, but further studies are needed (Field et al., 2019).

Trials with flashing white LED lights were conducted in Denmark in Øresund, by DTU Aqua (Finn Larsen/Gildas Glemarec) in 2018, to reduce bycatch of both harbour porpoises and seabirds. There were too few bycatches of porpoises to allow a conclusion, but there were indications that the lights could reduce the bycatch of pelagic diving seabirds, although not of benthic diving seabirds. More trials are needed to draw a firm conclusion.

Small seine nets (métier seine)

According to the HELCOM Questionnaire, trials were carried out in Sweden, Denmark, and Germany in ICES Areas 24 and 31. The small Danish seine is designed to be used onboard the small vessels that would normally carry out gillnet fishing, *i.e.* vessels below 10m length. The aim was to test the catch efficiency of the small Danish seine. No bycatch of PETS and low discards were observed. Avoiding bycatch of PETS and seal depredation were the main reasons for testing the gears. These also have less impact on the seabed than trawling, and can have higher catch efficiency than other alternative gear types. According to studies made by SLU Sweden, this type of a gear has potential for catching vendace and flatfish. Trials will continue in Danish waters (ICES Areas 22 and 24) during 2020-2021 by DTU Aqua (Thomas Noack/Finn Larsen).

Characterisation of fishing effort in ICES 6 & 7

Region 6

In ICES region 6, the UK fisheries are the most important fisheries in terms of total effort in 2018, and they represent gears with high risk of bycatch. UK fisheries are responsible for 83% of the total effort. France is the next most important country with 7%, followed by Spain with 6%, and finally Germany with 1% of total effort (**Error! Reference source not found.**).

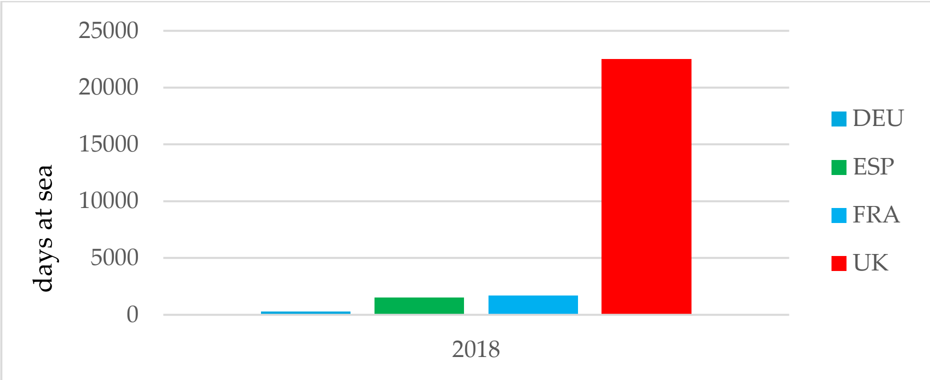

Figure 1 Total annual effort for year 2018 in ICES 6 by Member State

xxvii. Effort analysis 6a

Error! Reference source not found. shows the annual effort by gear type during the 2016-2018 period. In region 6, bottom otter trawlers (OTB) are the vessels with the highest effort, followed by the otter twin trawlers (OTT). The effort by gillnets and by pair trawlers is trivial compared to the other two gears. In addition, there was an important reduction of 20% in the total effort in 2017 and 2018 for OTB. There was also a small reduction in OTT effort during these years.

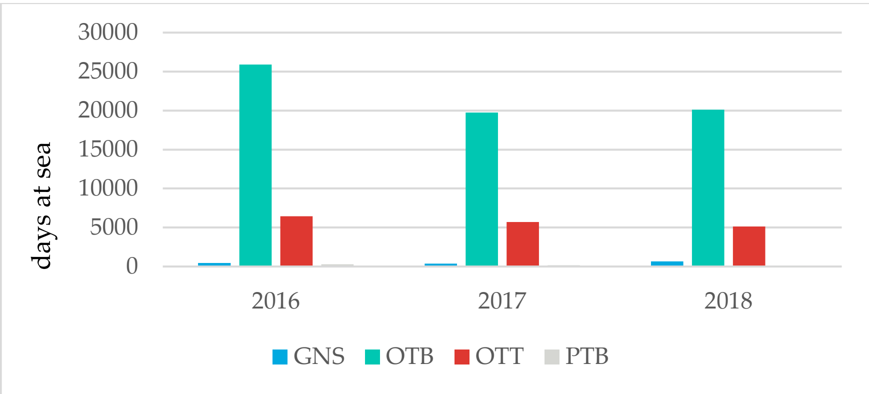

Figure 2 Total annual effort by gear (2016-2018) in ICES 6

Error! Reference source not found. shows the monthly effort distribution (2016-2018 average) by gear. Considering the two main gears, in the case of bottom otter trawlers (OTB), effort increases during the spring months, achieving the highest peak in June. Then effort goes declines with the lowest effort season being during winter months. In the case of otter twin trawlers (OTT), the trend is quite similar for the whole year, with a slight increase during spring and summer.

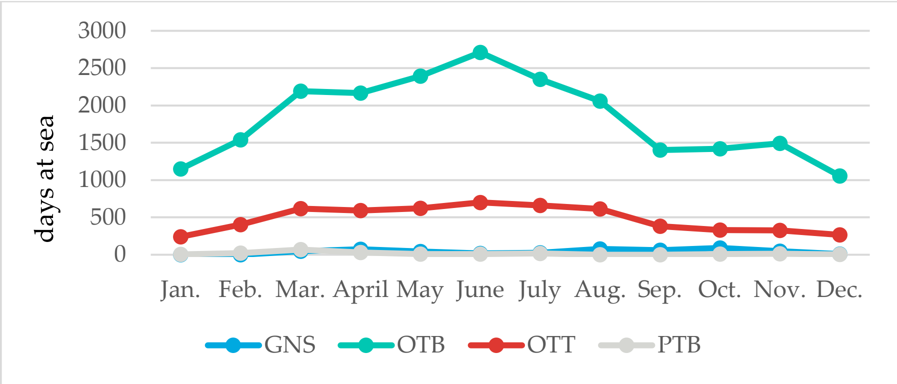

Figure 3 Total monthly effort averaged for 2016-2018 in ICES 6

Landings

In this section, the main landings of the two principal métiers are described.

OTB

shows the landings of the main species for OTB. This is a very mixed fishery targeting crustaceans, demersal, deep water fish and cephalopod species. Nephrpps (*Nephrops norvegicus*) is the species with highest landings, forming 20% of the total landings, followed by some demersal fish species, notably haddock (*Melanogrammus aeglefinus*) 16%, Saithe (*Pollachius virens*) 10%, and Anglerfish (*Lophius* spp.) 9%. Among the deep water species Black scabbardfish (*Aphanopus carbo*) is the most important species 4% and *Loligo* spp. among cephalopod species, 3%.

This composition of species allows the identification of several métiers at métier level 5: OTB_CRU targeting crustacean species such as Nephrops, OTB_DEF métier targeting demersal fish species, OTB_DWS métier targeting deep water fish species, and OTB_MOL targeting cephalopods.

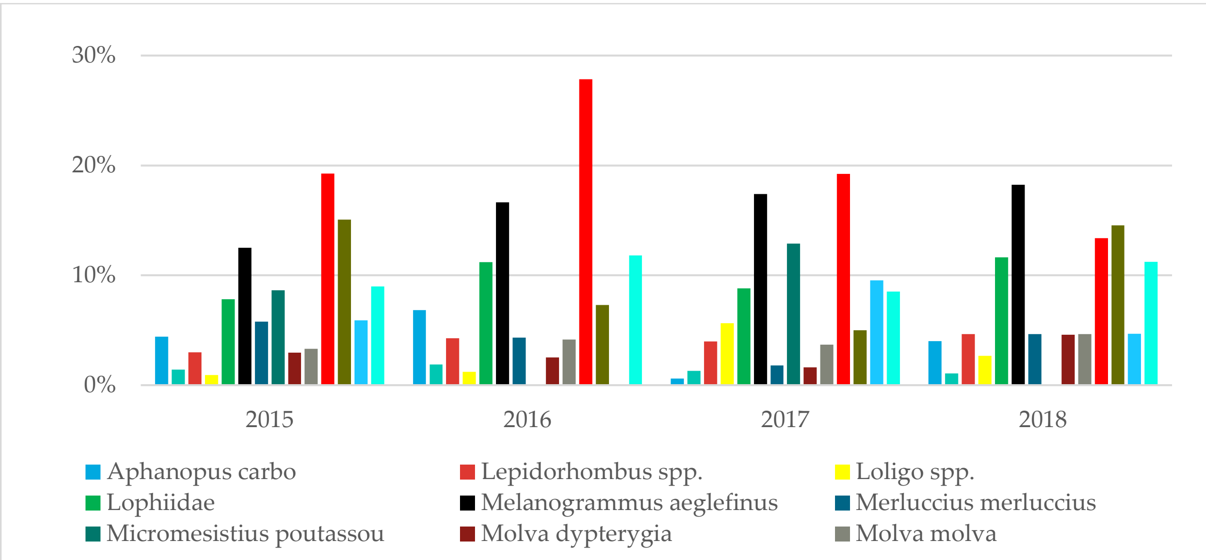

Figure 4 Proportion of OTB total landings for 2015-2018 in ICES 6

OTT

Error! Reference source not found. shows landings of the main species for OTT. This gear is very selective for Nephrops, and landings of this species form 58% of total landings. Anglerfish is the species with the next highest landings with 14%, followed by saithe with 7%.

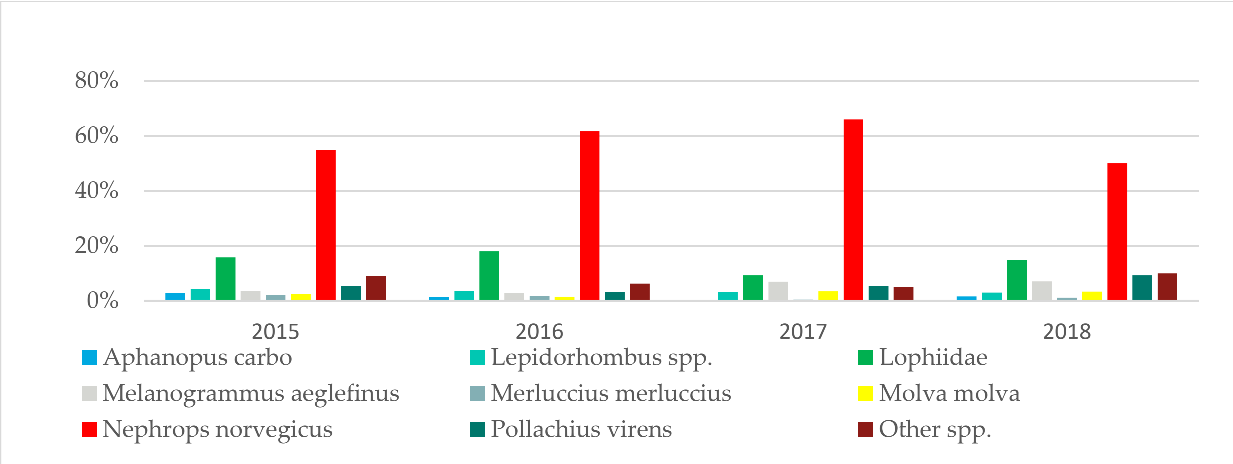

Figure 5 Proportion of OTT total landings for 2015-2018 in ICES 6

Region 7

In ICES region 7, French and UK fisheries are the most important fisheries in relation to the total effort during 2016-2018, and the gears with high risk of bycatch. French fisheries are responsible for 52% of total effort and UK 41%. Spain is the next most important country with 6%. The effort of the other MS is very small.

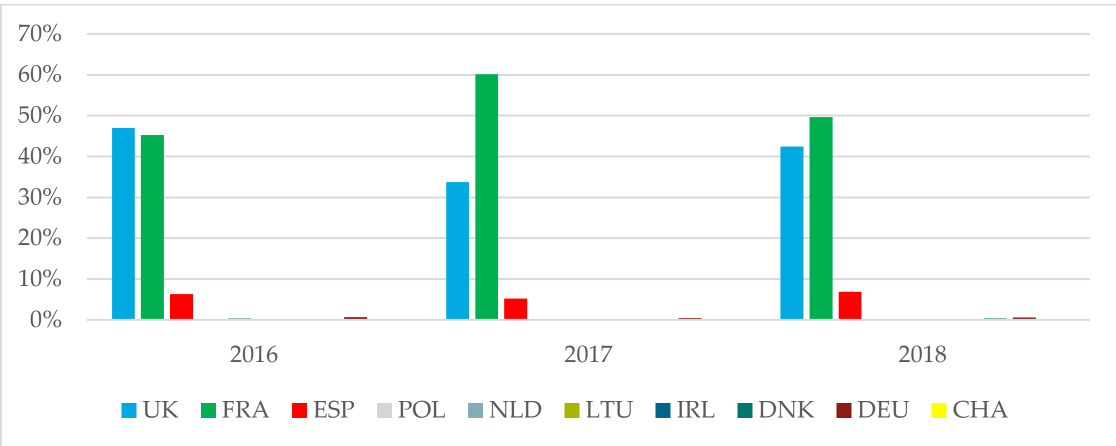

Figure 6 Total annual effort for year 2018 in ICES 7 by Member State

Error! Reference source not found. shows annual effort by gear type in region 7. Bottom otter trawlers accounted for 61% of the total effort, followed by gillnets, with 27% and trammel nets with 8%. Effort from other gears is extremely low. In the case of trawlers, effort has increases steadily from 2016 to 2018, and decreased slightly for gillnets and trammel nets.

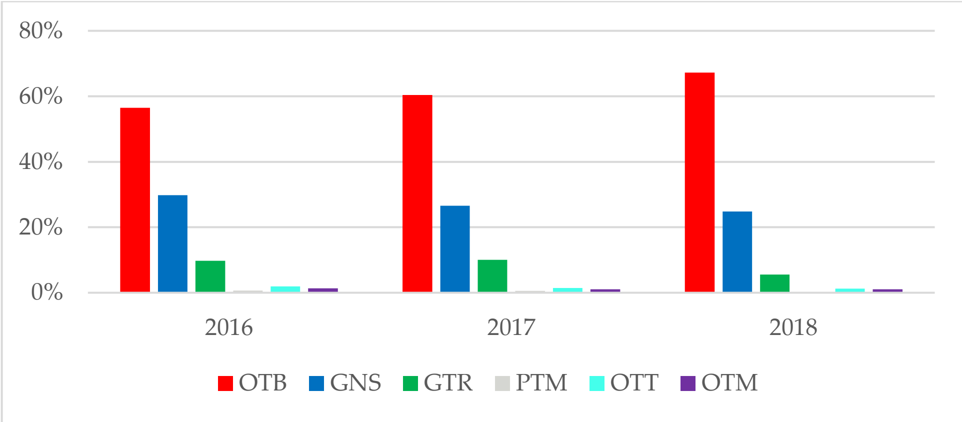

Figure 7 Total annual effort by gear type, 2016-2018, in ICES 7

Error! Reference source not found. shows the monthly trend in effort averaged for 2016-2018 by gear type. The trend is similar for all the gears. The highest effort occurs from March to August with peaks in summer months. The increase of effort in these months is more pronounced for bottom otter trawlers.

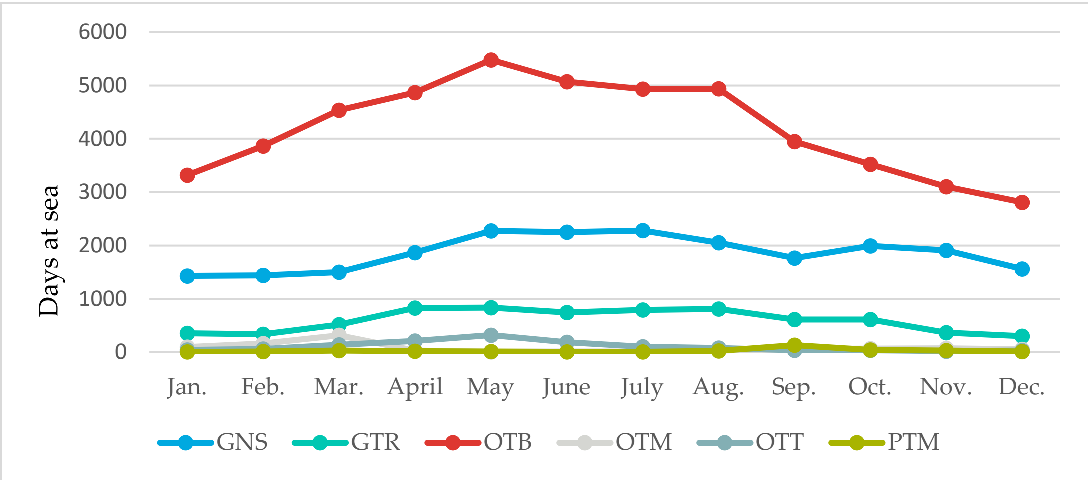

Figure 8 Monthly trend in total effort by gear type, averaged for 2016-2018 in ICES 7

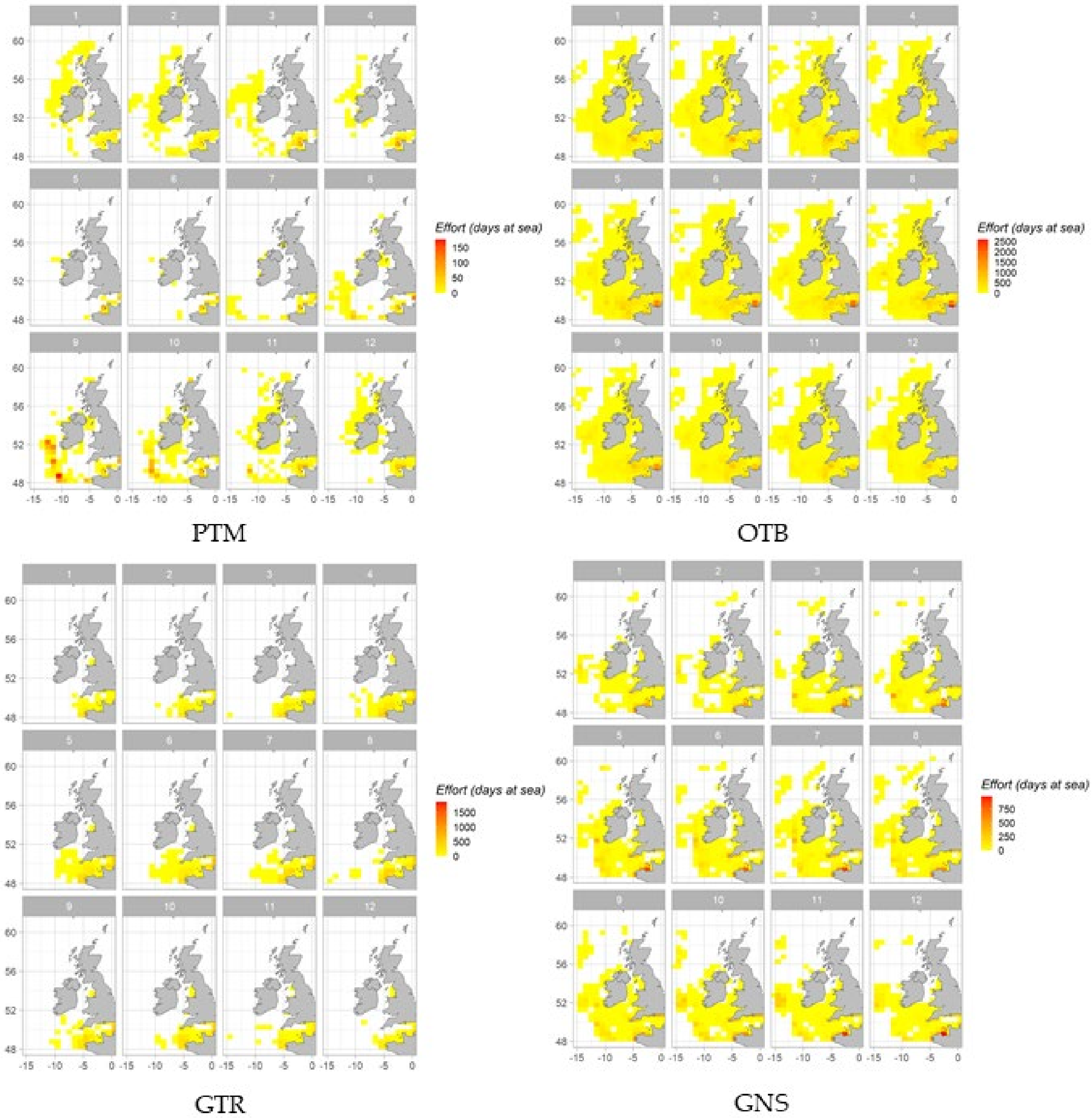

Figure 9 Total effort monthly distribution averaged for 2016-2018 in ICES 6 & 7

Landings

OTB

Error! Reference source not found. shows the landings by bottom otter trawlers during 2016-2018. It´s a mixed fishery with the dominant species being demersal fish, although the highest landings are from crustacean species such as Nephrops with 18% of total landings, followed by anglerfish 17%, megrim 9%, haddock 8%, and hake 6%. This composition of species allows one to identify two different métiers at level 5: OTB_CRU targeting Nephrops and OTB_DEF targeting demersal species.

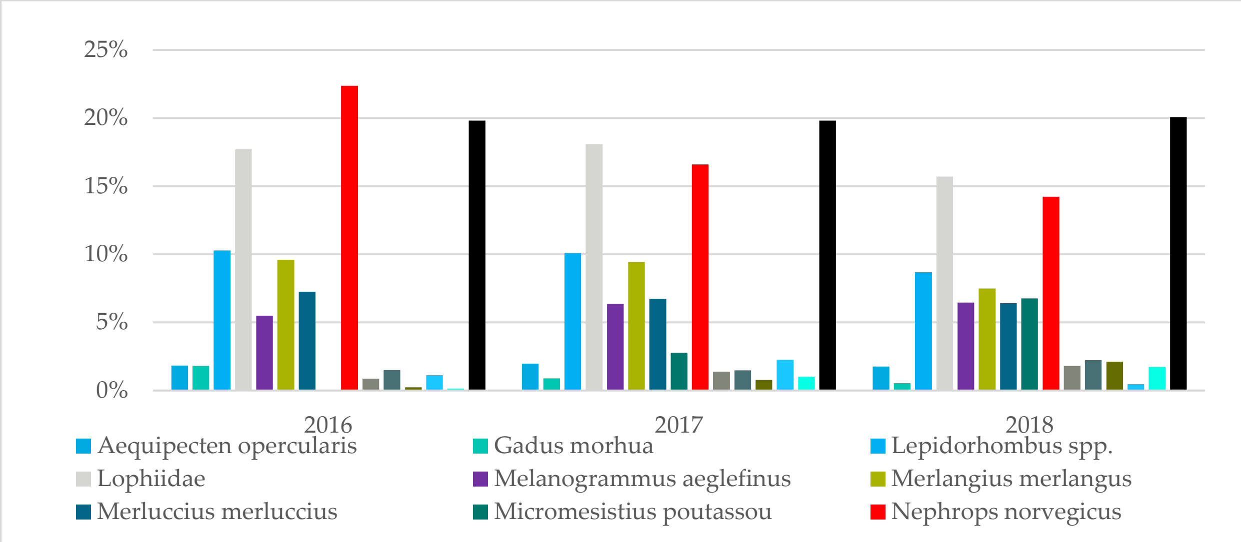

Figure 10 Proportion of OTB total landings for 2015-2018 in ICES 7

GNS

Error! Reference source not found. shows the landings by gillnets during 2016-2018. Hake is the dominant species with 51% of the total landings, followed by anglerfish 9%, and spider crab (*Maja squinado*) 9%. This species composition in the landings allows one to identify three fisheries, one targeting hake, the other one targeting *Lophius* spp. defined at level 5 métier with the same code, GNS_DEF and the third fishery targeting crustaceans, where spider crab and edible crab (*Cancer pagurus*) are the target species. This fishery in defined as GNS_CRU at métier level 5.

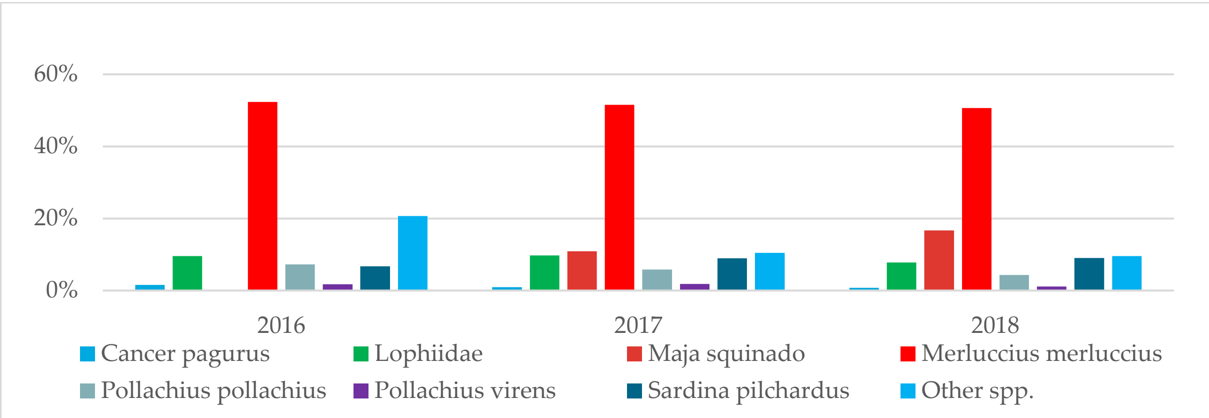

Figure 11 Proportion of GNS total landings for 2015-2018 in ICES 7

GTR

Error! Reference source not found. shows the landings by trammel nets during 2016-2018. Anglerfish is the dominant species with 49% of total landings, followed by edible crab at 9%, and turbot (*Scopthtalmus rhombus*) with 5%. This species composition allows one to identify two métiers at level 5: GTR_DEF targeting demersal species and GTHR_CRU targeting crustaceans.

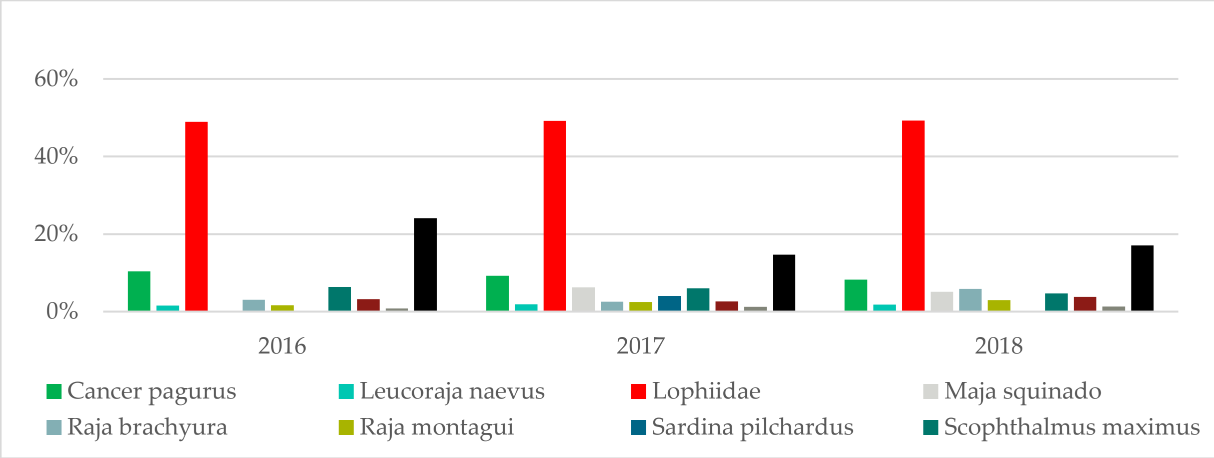

Figure 12 Proportion of GTR total landings for 2015-2018 in ICES 7

Annex 8: Rationale for closing cluster of German and Polish Natura 2000 sites for static nets fisheries during November-April to reduce bycatches of Baltic Proper harbour porpoises

Note: This work was done at ADGBYC-1 in May 2020.

Summary

The cluster of the protected German and Polish sites is recommended to be closed for static net fisheries during November-April, with the aim of reducing bycatches of Baltic Proper harbour porpoises, based on the following evidence:

- The total area of the cluster is 5,000 km^2, whereof approximately 80% covers areas that have been identified as important to harbour porpoises during November-April.
- Acoustic and telemetry studies show that the cluster is primarily used by the Baltic Proper population during November-April.
- The cluster has a high effort of static net fisheries, wherefore a removed fishing effort would reduce the number of Baltic Proper harbour porpoise bycatches.
- There is a low risk of relocation of fishing effort from such a large area, and the recommended simultaneous pinger use outside the cluster reduces the number of bycatches in any relocated fishing effort.

Natura 2000 sites and overlap with high density areas for harbour porpoises

This document presents the rationale for reducing the bycatches of harbour porpoises in a cluster of German and Polish Natura 2000 sites, with the aim of reducing bycatches of Baltic Proper harbour porpoises. The cluster consists of the sites listed in **Table 27** and shown in **Figure 53**.

Table 27. Natura 2000 sites in which bycatches of harbour porpoises are recommended to be reduced, with the aim on reducing bycatches of Baltic Proper harbour porpoises. 'Population status' indicates the ratio between the population within the site in relation to within the national territory, with A = >15-100%, B = >2-15%, C = >0-2%, D = non-significant.

Natura 2000 site name	Site code	Country	Marine area (ha)	Harbour porpoise population status
Adlergrund	DE1251301	Germany	23,397	C
Westliche Rönnebank	DE1249301	Germany	8,601	C
Pommersche Bucht mit Oderbank	DE1652301	Germany	110,115	B
Pommersche Bucht	DE1552401	Germany	200,417	B
Greifswalder Boddenrandschwelle und Teile der Pommerschen Bucht	DE1749302	Germany	40,401	C

Ostoja na Zatoce Pomorskiej	PLH990002	Poland	243,056	B
Wolin i Uznam	PLH320019	Poland	5,761	B

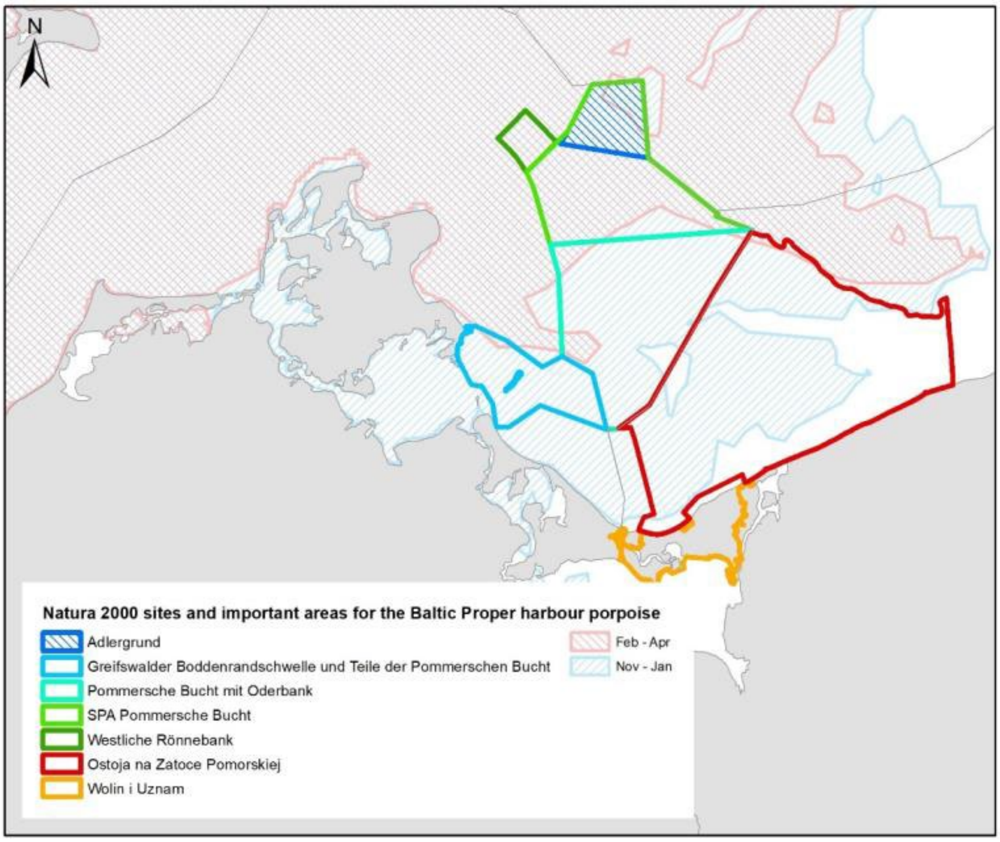

Figure 52. Map showing the Natura 2000 sites of the German-Polish cluster, together with high-density areas for harbour porpoises based on predictions of probability of detection (ASCOBANS, 2016). Only high-density areas during November-January and February-April are shown. From ICES (2020b).

All of the Natura 2000 sites are protected under the Habitats Directive, with the exception of Pommersche Bucht, which is protected under the Birds Directive. It should be noted that the population assessments (Table 27) are for porpoises of any population that occurs within the site. During November-April, the sites are primarily used by Baltic Proper harbour porpoises, while they only are used by Belt Sea porpoises during May-October (see below).

The total area of the cluster of protected German and Polish sites is 5,000 km². During November-April, approximately 80% of the cluster covers an area that has been identified as important to harbour porpoises (ASCOBANS, 2016). The total size of the area that is important to harbour porpoises during November-April between 13°E and a line drawn between 60.5°N on the Swedish coast to 61°N on the Finnish coast is 41,061 km². The cluster of the protected German and Polis sites covers approximately 10% of this area. For comparison, the Natura 2000 site Hoburgs bank och Midsjöbankarna covers approximately 18% of this area.

Baltic harbour porpoise abundance and distribution

In the SAMBAH project, important areas for harbour porpoises were identified based on areas with high probability of occurrence (SAMBAH, 2016). During May-October, the isoline of 20% probability of detection was estimated to encompass approximately 30% of the Baltic Proper harbour porpoise population. During November-April, the same isolines for probability of detection were applied without correlating them to the proportion of the population (**Figure 54**), as there is no clear spatial separation between the Belt Sea and Baltic Proper populations during these months (Carlén et al., 2018).

During May-October, the management border of the Baltic Proper population (Carlén et al., 2018) is located east of the cluster of the protected German and Polish sites (**Figure 54**), wherefore no bycatch mitigation measures are advised for these months. However, during November-April, Baltic Proper porpoises spread out across the Baltic Sea, and the distribution pattern indicates that a part of the population leave the May-October distribution range and move into the southern Baltic Sea (Carlén et al., 2018). In an acoustic monitoring study of harbour porpoises in the Pomeranian Bay, detection rates peaked twice seasonally: once associated with the summer occurrence of Belt Sea porpoises, and once correlated with (1) cold air temperatures and (2) air temperatures lower than water surface temperatures. Based on this, the authors suggest that to avoid suffocation during winter, Baltic Proper porpoises migrate into the Pomeranian Bay that is mostly ice-free (Gallus et al., 2012). A study of a larger data set covering approximately 10 years of acoustic monitoring data collected in German waters from Fehmarn Belt in the west to the Pomeranian Bay in the east (from approximately 11°E to 14.5°E) supports this interpretation (Benke et al., 2014) and proposes that the Pomeranian Bay is used by Baltic Proper porpoises from November-March, and by Belt Sea porpoises from July-October (**Figure 55**).

With regards to the Belt Sea population, the results of the acoustic monitoring studies are also in line with the seasonal distribution patterns of satellite tagged porpoises. During 2006-2012, 13 wild harbour porpoises tagged with satellite transmitters in Danish waters moved into the southern Baltic Sea east of 12°E (Mikkelsen et al., 2016). Based on daily positions, kernel densities and MaxEnt distribution models could be calculated for June-August and September-November, but the porpoise presence was too low for predictions during December-June (**Figure 56**). Even during summer (here May-September), when the German monitoring data indicates a peak in presence of Belt Sea porpoises, 85% of the 13 satellite tagged porpoises that moved east of 12°E and 90% of their daily positions were still west of 13.5°E, i.e. west of the Pomeranian Bay (Sveegaard et al., 2015). A study including all 40 harbour porpoises tagged with satellite transmitters in inner Danish waters during 1997-2007 identified that ≥90% of the daily positions of these animals remained west of 13.5°E year round (Sveegaard et al., 2011). Together these studies show that Belt Sea porpoises use the Pomeranian Bay to a very small extent in summer, and even less in winter.

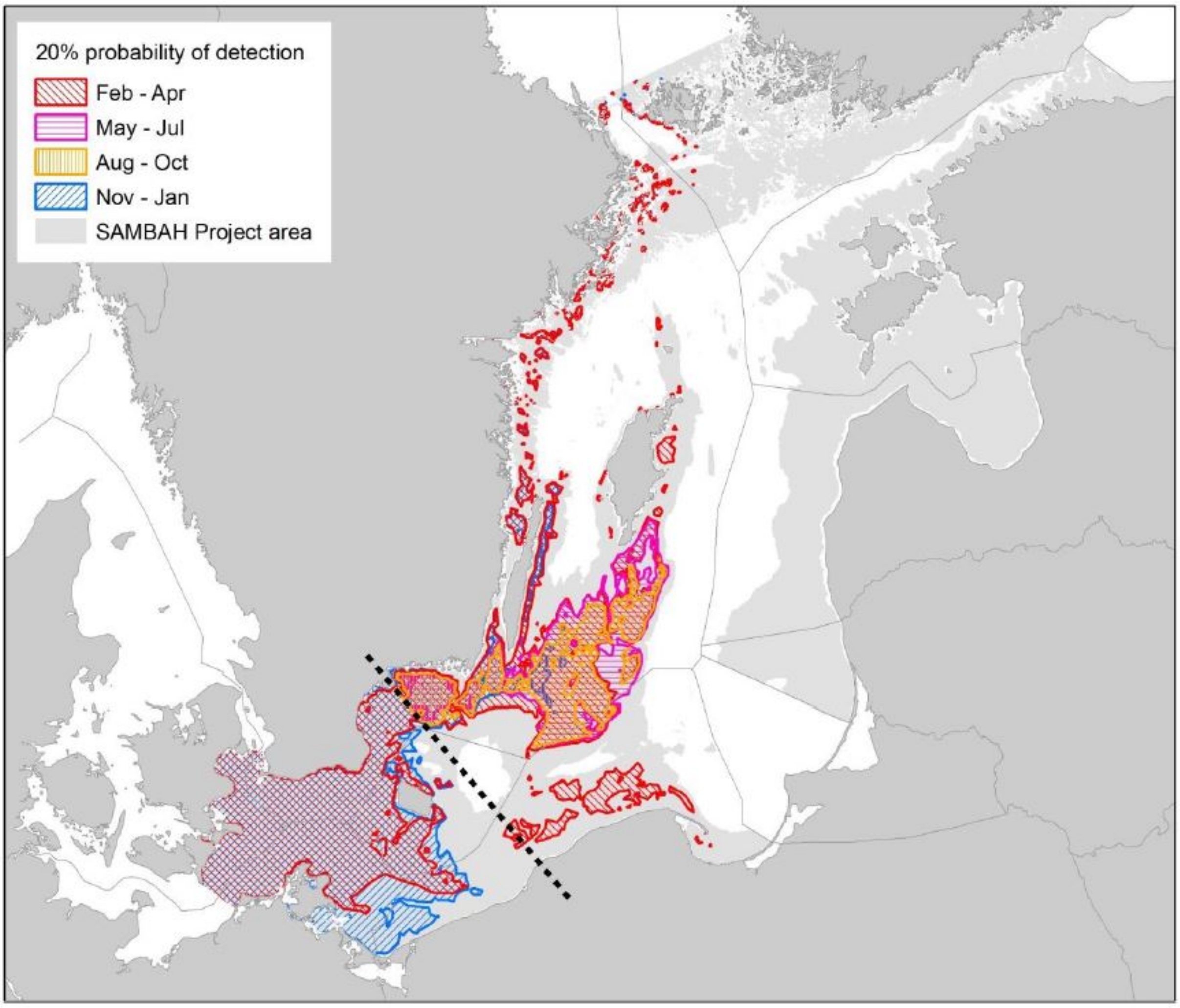

Figure 53. High-density areas for harbour porpoises in the SAMBAH area (shaded) based on predictions of probability of detection. During May – October, the isoline of 20% probability of detection encompasses approximately 30% of the Baltic harbour porpoise population. During November – April, the same isolines for probability of detection are shown without correlating them to the proportions of the population. Southwest of the SAMBAH population border, the high-

density areas are inhabited by animals from both the Baltic and the Belt Sea populations during November – April. From (ASCOBANS, 2016).

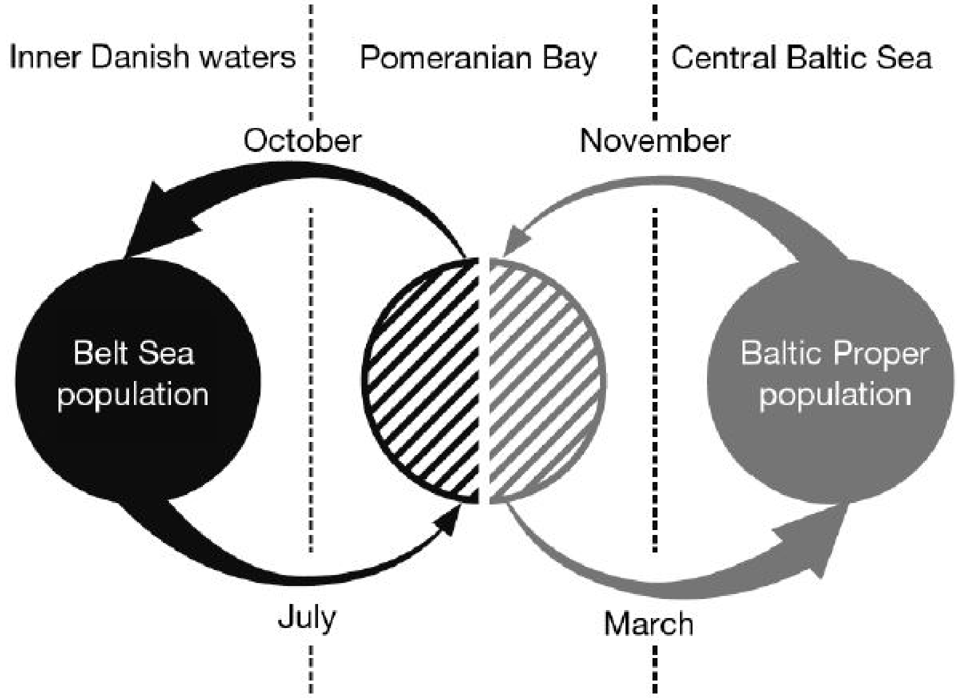

Figure 54. Schematic representation of likely seasonal habitat use of the boundary waters by the two harbour porpoise populations of the Baltic Sea. The months indicated represent mean values over the study period. From (Benke et al., 2014).

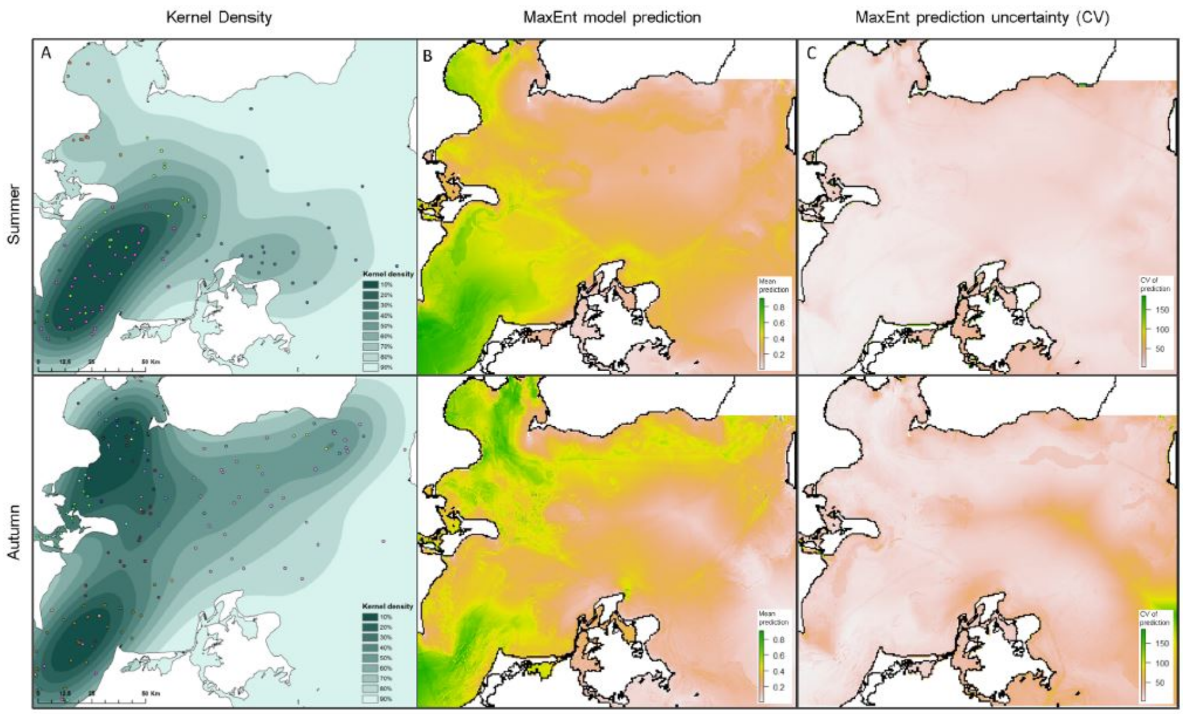

Figure 55. (A) Kernel density results for summer (Jun-Aug, top row) and autumn (Sep-Nov, bottom row). (B) Mean prediction of the probability of presence of harbour porpoise based on 100 bootstrap models. The scale of the colouring can

be interpreted as the relative probability of presence of harbour porpoise given the environment. (C) The uncertainty of the prediction expressed by the coefficient of variation (CV). From (Mikkelsen et al., 2016).

Fishing gears with high risk of bycatch and effects of possible relocation of fishing effort

In the Baltic Proper, 97% or more of the bycatches of harbour porpoises have been reported to occur in static nets (Berggren, 1994; EC-DGMARE, 2014; Skóra and Kuklik, 2003). If the fishing with static nets would be closed in the cluster of the German and Polish sites during November-April, the bycatch of harbour porpoises in these gears would be removed. If the fishery continues, but with simultaneous use of pingers, 20-50% of the bycatches are expected to remain, as pingers have been shown to reduce he bycatch rate of harbour porpoises in operational fisheries with static nets by 50-80%, in comparison to nets without pingers (Orphanides and Palka, 2013).

The closure of an area may cause the fishing effort to be relocated elsewhere. In the waters between 13°E and the cluster, the monthly estimated porpoise density at the SAMBAH monitoring stations during November-April is similar as at the SAMBAH monitoring stations within the cluster (zero at some stations, 0-5 porpoises/km^2 at most stations) (Figure 57**Figure 57**). The same is found for the German and Polish waters north of the cluster. However to the east of the cluster, the average density is lower Figure 57 and the waters are not identified as important to harbour porpoises (Figure 53 and 2). As most of the vessels fishing with static net within the cluster are the small (overall length typically 8-10 meters, depending on target species), they operate close to the ports and can only relocate to new fishing grounds by changing their home ports. Thereby a possible relocation is expected to be less than 100%, which means that the number of bycaught harbour porpoises will be reduced irrespectively of the direction a possible relocation. If a part of the fishing effort is relocated to the east, the reduction will be even greater. To this adds the recommended pinger use outside the cluster, contributing to an even greater reduction.

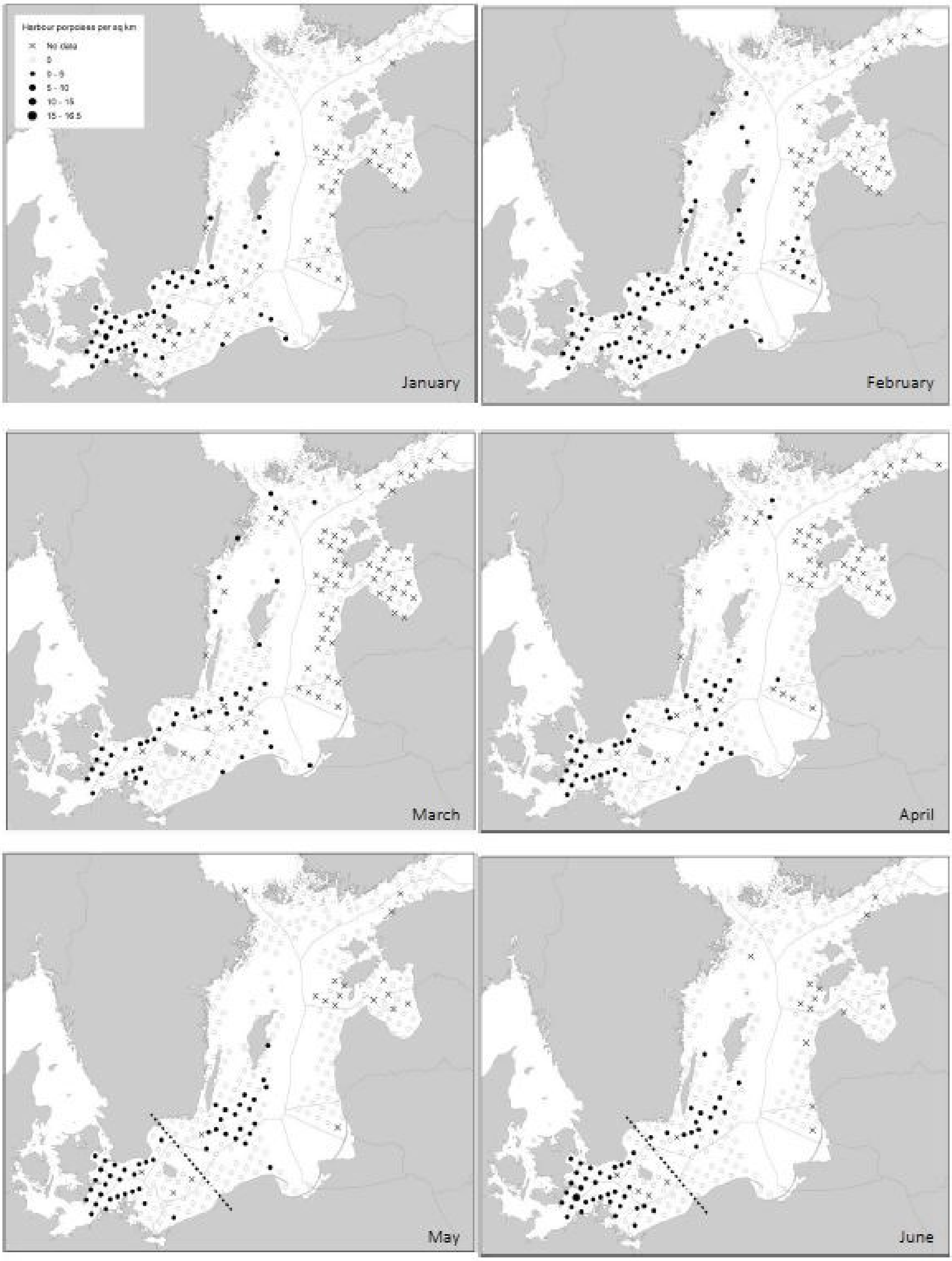

Figure 56a. Estimated number of harbour porpoises per square kilometre estimated at each SAMBAH station during January-April, combined for 2012 and 2013, and May-June, combined for 2011 and 2012. The dotted black line indicates the

spatial separation between the Belt Sea and Baltic harbour porpoise populations during May-October according to (SAMBAH, 2016). Copied from (ASCOBANS, 2016)

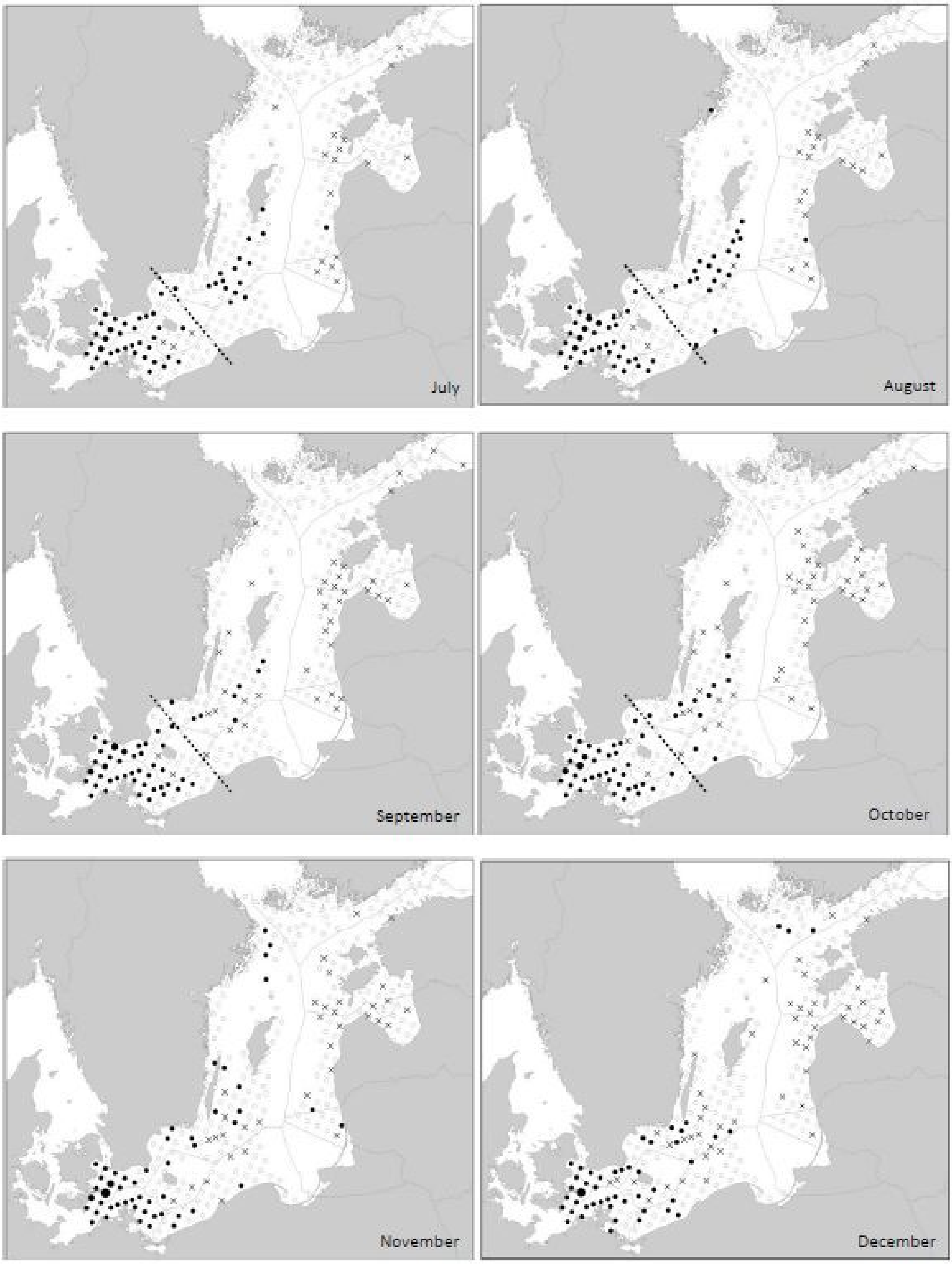

Figure 5b. Estimated number of harbour porpoises per square kilometre estimated at each SAMBAH station during July-December, combined for 2011 and 2012. The dotted black line indicates the spatial separation between the Belt Sea and

Baltic harbour porpoise populations during May-October according to (SAMBAH, 2016). The legend is shown in Figure 5a. Copied from (ASCOBANS, 2016).

Spatial distribution of fishing effort

The maps of GNS effort, based on RDB data (**Figure 58**), show that fishing effort is mainly concentrated in the southern Baltic around the German and Polish coasts. However, the high effort in German waters may be an overestimation. In Germany, small-scale fisheries report their catch only once a month. To estimate their total effort, the reports are multiplied by the number of days per month, i.e. 30 or 31, which is likely higher than the true number of fishing days. Nevertheless, since both Poland and Sweden report the fishing effort for all vessels, the maps still provide a general overview of the spatial and the temporal distribution of the fishing effort across the Baltic Sea.

In conclusion, the maps show that the cluster of Natura 2000 sites has a generally high static net fishing effort, and closing these fisheries will remove harbour porpoise bycatch within the area and have economic consequences on the fishing communities. The maps also show that the GNS fishing effort also is relatively high in the waters adjacent to the Natura 2000 sites (**Error! Reference source not found.**). As some of the adjacent waters have similar densities of Baltic Proper porpoises during November-April (Figure 57), it is important that mandatory use of pingers on static nets is implemented in the waters adjacent to the cluster, simultaneously with the closure for static nets within the cluster, to reduce harbour porpoise bycatch in any relocated fishing effort.

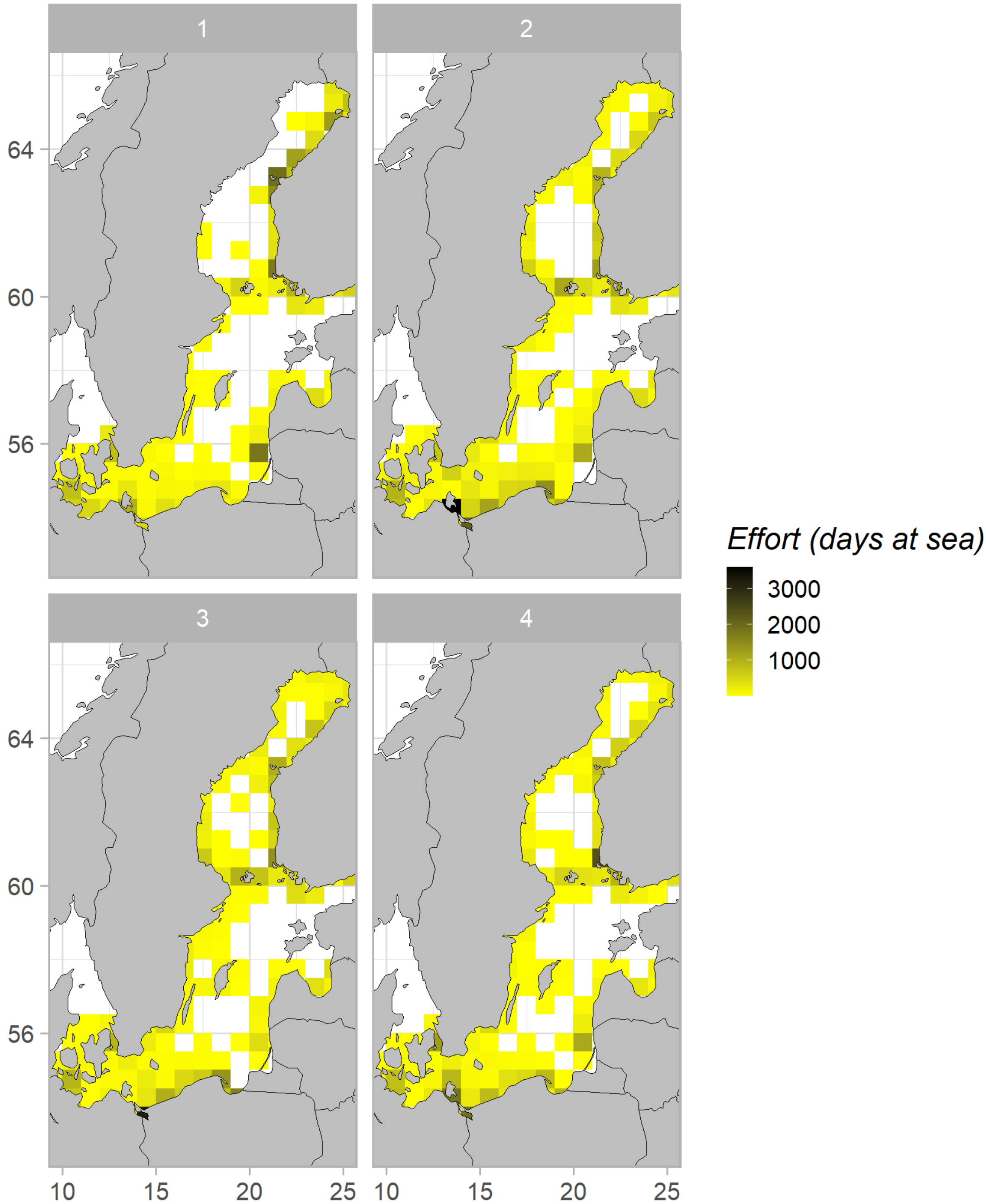

Figure 57. Data on fishing effort (Days at Sea) calendar quarter from the ICES Regional Database summarized effort per ICES rectangular for the year 2018 for gillnet and trammel net fisheries. From ICES (2020a)

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Annex 9: Additional information for common dolphins compiled at ADGBYC-1

Note: This work was done at ADGBYC-1 in May 2020.

Annex 9

This Technical Annex is a review of the scientific information that contributes to the advice provided by ACOM. The content is primarily drawn from expert group reports and scientific publications. The text has not necessarily been reviewed or agreed by all ACOM members.

Common dolphins in the Bay of Biscay

Information presented here has been largely drawn from three review studies on the species, including Murphy et al. (2013;2019) and the ASCOBANS Species Action Plan for the Common Dolphin in the North-east Atlantic, as well as the WKEMBYC report (ICES 2020). Further information on the species distribution and abundance, seasonal movements, health status and causes of death, feeding ecology, and threats can be found in those reviews. Information pertinent to the current request are extracted here.

Population structure

One panmictic common dolphin population has been proposed for the North-East Atlantic based on genetic and cranial morphometric analyses ((Murphy et al., 2019) and references therein), and the observed panmixia may be explained by long-distance dispersal of females from natal areas - whereas male common dolphins exhibit some degree of site fidelity (in waters off Portugal) (Ball et al., 2017). As samples assessed to date for both genetic and cranial morphometric analyses were obtained from continental shelf and contiguous waters of the Bay of Biscay, the extent/range of the North-East Atlantic population is unknown (Murphy et al. 2019).

Common dolphins have been observed at least out to the Mid-Atlantic Ridge, and a genetically and morphologically distinct population has been reported in the North-West Atlantic (Natoli et al., 2006; Westgate, 2007; Mirimin et al., 2009; Murphy et al., 2013). Relatively low level of genetic differentiation was observed across the whole North Atlantic and suggests a recent population split or a high level of gene flow between two or more populations (Mirimin et al., 2009; Murphy et al., 2009).

Abundance

Large-scale surveys of the North-east Atlantic have been undertaken on an approximately decadal frequency. The combined abundance estimate (467,673 plus 33,215 individuals) for common dolphins for July 2016 (Hammond et al. 2017; Rogan et al. 2018) is considerably larger than that recorded in 2005/2007 for an area of somewhat comparable size (CODA 2009; Hammond et al. 20137). The SCANS-II survey estimated 56,221 (CV = 0.23; 95% CI: 35,700–88,400) common dolphins for shelf waters for the year 2005 (Hammond et al., 2013), and the Cetacean Offshore Distribution and Abundance (CODA) survey estimated 116,709 (CV = 0.34; 95% CI: 61,400–221,800) common dolphins for offshore waters for the year 2007 (CODA, 2009). The combined 2016 SCANS-III and ObSERVE abundance estimate is consistent with results from the SAMM aerial surveys in French waters of the Bay of Biscay and the English Channel in summer 2012 (Laran et al., 2017). More recent analysis using model-based abundance estimates have been determined for common dolphin by year for the Bay of Biscay and indicate an overall increase in numbers between the 1990s and the 2010s.

Increasing abundance in the southwestern European waters is further supported by smaller scale surveys, such as those undertaken from 2007–2016 in north-west Spanish waters, which reported abundance, ranging between 5,533 animals (density 0.16; CV = 0.62) in 2008 and 22,662 (density 0.61; CV = 0.36) in 2010 (Saavedra et al., 2017).

Beyond the European Atlantic shelf seas, a historical abundance estimate of 273,159 common dolphins was reported for the North Atlantic Sighting Survey (NASS)-west survey block in 1995 (Cañadas et al., 2009). An additional 77,547 common dolphins were estimated for the NASS-east block in the same year, although this latter estimate was not considered reliable due to limitations in the survey. However, such high numbers of individuals were not observed when some of those areas were surveyed in 2000–2001 and 2007, including surveys such as Trans-NASS, during which a more southern distribution of common dolphins was observed compared with earlier NASSs (CODA, 2009; IWC, 2009; Lawson et al., 2009; Murphy et al., 2013).

Comparison of the most recent abundance estimate for the species from July 2016 with earlier estimates in the region, suggests there has been an increase in abundance of the species. It is very likely that thisreflects the variation between years in the distribution and movements of common dolphin groups. These may include latitudinal or offshore–inshore movements, or a mixture of the two. However, as samples for genetic and cranial morphometric analyses were obtained prior to 2016, it is unknown if the influx of individuals were from the same population. The common dolphin is a species where long-term distributional change has been reported in the past (Murphy et al. 2013; 2019), and thus the current re-distribution in the North-east Atlantic requires further investigation. Any management of activities in relation to common dolphins needs to be robust to large scale redistribution of the population. Furthermore, abundance is largely estimated using data from surveys undertaken during the summer, whereas recent anthropogenic mortality from fisheries interactions has largely been reported during the wintertime when higher densities have been observed in the Bay of Biscay (Murphy et al., 2013; Murphy et al., 2019).

Seasonal movements

Seasonal movements of common dolphins in the North-East Atlantic have been suggested by Waggitt *et al.* (2019) based on collated cetacean survey effort data collected between 1978 – 2018 (but with most effort in the last 15 years), and independently, by smaller-scale regional surveys (e.g. Macleod and Walker, 2005; Brereton et al., 2005; Rogan et al., 2018; Van Canneyt et al., 2020). All studies reported increased densities/abudnance of common dophins during the wintertime. The Waggitt study provides a broadscale picture of average density over the three decades of data, but noted that highest densities were concentrated along the shelf break (over the 200-2,000m contour), particularly in winter, and a seasonal movement towards the shelf edge west of Ireland and into the Bay of Biscay over the winter months, January to April (ICES, 2020).

There is further recent evidence that an increase in winter densities also occurs in the Bay of Biscay. In 2019, four aerial surveys were conducted on part of the shelf of the Bay of Biscay to detect seasonal changes in densities and distribution of cetaceans (Van Canneyt et al., 2020). The results show that the highest densities of common dolphins occur in winter, mostly around the 100m isobath (**Error! Reference source not found.**). The pattern in common dolphin distribution in winter must be considered carefully due to the small scale of these surveys, but they add support to their being seasonal changes in this region and that highest densities of common dolphins are in winter in the inner part of the continental shelf of the Bay of Biscay.

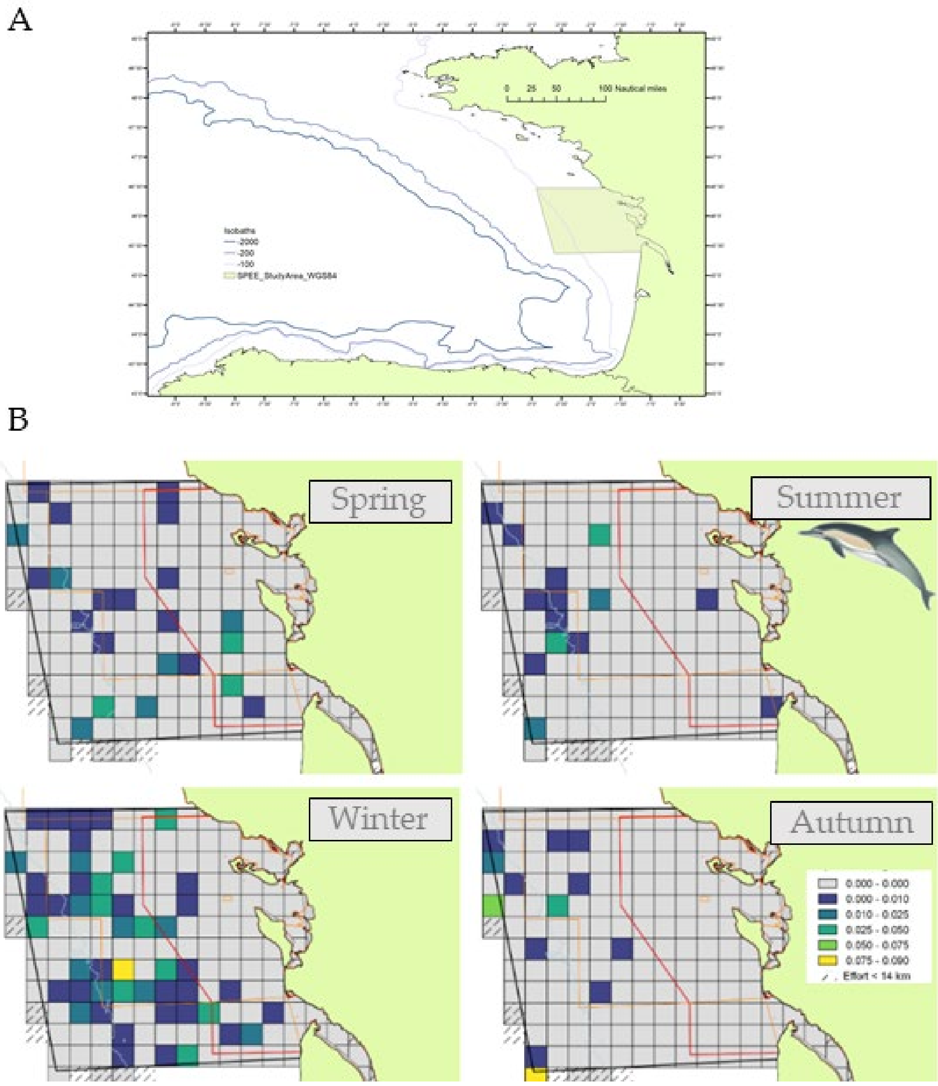

Figure 1. Encounter rates (sightings/km) of common dolphins during seasonal aerial surveys in 2019 in the Bay of Biscay (A: Overview of the study area; B: Seasonal encounter rates of common dolphins) (Van Canneyt et al. 2020).

Life history

A large-scale study assessing reproductive parameters in stranded and bycaught female common dolphins in the NE Atlantic (ranging from Portugal to Scotland) revealed an overall annual pregnancy rate of 26% and an extended calving interval of approximately 4 years, on average, for the period 1990–2006 (Murphy et al., 2009). Comparisons with all other available data for this species showed that the NE Atlantic population had a lower pregnancy rate than populations in the NW Atlantic, South Africa, the western Pacific and New Zealand (Murphy et al. 2019). The low annual pregnancy rate of the NE Atlantic population that was reported throughout the 16-year sampling period may suggest either that the population is at carrying capacity or that their prey base is declining at approximately the same rate as the dolphin population (Murphy, Winship, et al., 2009). Exposure to endocrine-disrupting pollutants could be a contributing factor to the lower reproductive output in the NE Atlantic population (Murphy et al., 2010; 2018).

In the NE Atlantic, the average age and length at sexual maturity in females were 8.2 years and 188 cm respectively (Murphy, Winship, et al., 2009). For males, sexual maturity was attained at an average age of 11.9 years and average length of 206 cm (Murphy, Collet, & Rogan, 2005). A mean generation time of 12.94 years was determined for the population (Murphy et al., 2007). The species' maximum recorded longevity was 30 years in the NE Atlantic (Murphy et al., 2010), although 98% of the females sampled were less than 20 years old (Murphy, Winship, et al., 2009). Together, these figures suggest a low lifetime reproductive output of possibly four to five calves per female, if an older age was attained (Murphy, Winship, et al., 2009). No significant differences were observed when comparing reproductive parameters in females from the 1990s with data collected during the 2000s

Life-history parameters have also been determined from a large sample of common dolphins stranded along the coast of Galicia, north-west Spain, between 1990 and 2009 (Read, 2016). Females reached up to 252 cm in length and 24 years of age, and males up to 240 cm and 29 years. Females in the region attained sexual maturity at an average age of 8.4 years and 187 cm length, and males at 10.5 years and 204 cm length. Using a sample size of 80 mature females, estimates of the annual pregnancy rate varied between 31% and 38% (the higher estimate did not exclude females that were sampled during the mating period), equivalent to a calving interval of 2.5–3 years (Read, 2016). The annual mortality rate was estimated at 12.8%, with no significant differences observed between males and females. Although this equates to an average life expectancy at birth of 7.2 years and 7.6 years for females and males respectively, which is lower than the age at sexual maturity, potential biases need to be explored and the assessment undertaken at the population level.

There was no evidence of senescence in mature females stranded along the Galician coastline (as previously reported by Murphy, Winship, et al., 2009), and no evidence of changes in the proportion of mature females over the time series. The higher pregnancy rate reported for the Galician region may be attributed to a higher number of bycaught (and thus possibly healthy) individuals within the sample. For example, Murphy, Winship, et al. (2009) also estimated an annual reproductive rate of 33% for bycaught individuals from UK waters using data from 46 mature females. Thus, excluding stranded females, whose reproduction may be compromised, increases the pregnancy rate estimate. As all wild populations contain individuals that are both 'healthy' and 'unhealthy' and some 'unhealthy' females may not associate with fishing activities, this should be accounted for when producing estimates of population life-history parameters. Bycatch samples can also show bias through bycatch selectivity for particular age–sex classes, and older females exhibiting a lower reproductive rate may be underrepresented (Murphy et al., 2013; Murphy, Winship, et al., 2009). Thus, the lower estimate of 26%, obtained using a large sample size of 248 mature females sampled from throughout the NE Atlantic, may still be more representative of the pregnancy rate for the NE Atlantic population (Murphy, Winship, et al., 2009).

Both sexes exhibit reproductive seasonality with a unimodal calving/mating period extending from April to September in the NE Atlantic, with a possibly more active period in July and August (Murphy et al., 2005; Murphy, Winship, et al., 2009). Common dolphins are found in a wide range of group sizes, up to 1000 to 5000 individuals (Murphy 2004 and references therein). There is evidence that smaller groups are segregated by age and sex, especially during winter (i.e., outside the mating period) (Murphy et al. 2013).

Fisheries selectivity of age- sex maturity classes

It is important to identify what age-sex class of individuals is incidentally captured by each fishery in the NE Atlantic. High mortality of mature (especially pregnant) females, calves and individuals approaching maturity will have a more detrimental effect on the common dolphin population than a high mortality rate of mature males, for example. Analysis of bycaught animals in the predominantly winter European sea bass pelagic trawl fishery revealed a predisposition to capturing juvenile and young adult common dolphins. Of aged common dolphins captured by the French fleet, 85% were less than 11 years of age, and 90% of aged dolphins caught by the UK fleet were less than 13 years, with a reported peak in the age-frequency distribution at 8 and 9 years (Murphy et al. 2007b). In summer, a bias towards male common dolphins was observed in nets of Spanish pair trawls targeting blue whiting, mackerel and other species in Galician waters (for the years 2001 and 2002), with an average age of 13.4 ± 4.4 (± standard deviation, SD) years for male *Delphinus delphis* and 11.5 ± 4.8 years for females (Fernández-Contreras et al. 2010). Two mass capture events comprising only males (7 and 15 dolphins), with an average age of 7.4 ± 3.2 years, were observed in July 2001 (Fernández-Contreras et al. 2010). As males attain sexual maturity around 11 years in age in the population, this further suggests age and sex segregation of the population during summer (Fernández- Contreras et al. 2010).

Low numbers of calves (<1 year old; 3% of the whole aged by-catch sample) and yearlings (6%) were incidentally captured by both the UK and French sea bass pelagic trawl fleets (Murphy et al. 2007b), and no calves were reported in Spanish pair trawls operating off Galicia (Fernández-Contreras et al. 2010). The low by- catch of calves and weaned juveniles may be due to a lack of association of these individuals with trawl nets (i.e., weaned juveniles not actively feeding within the trawl net) or from the cod end. However, the opposite was found for the (summer) Irish albacore tuna drift net fleet, as common dolphins 2 years old or younger or 165 cm long or less comprised 51.2% of the whole bycatch sample obtained between 1996 and 1999, indicating a strong propensity for calves and yearlings to be captured in drift nets (Murphy & Rogan 2006). A large proportion of calves were also reported in the bycatch of French albacore tuna drift nets, which operated in an area extending from 44°N to 51.5°N and from the Bay of Biscay region, 6°W to 21°W (Goujon et al. 1994). It was suggested that a lack of learned behaviour around nets and lower echolocation capabilities in calves were possible causes for their higher capture rate in the tuna drift net fishery compared to other age classes (Murphy & Rogan 2006). In addition, the high mortality rates of calves in drift nets may also have occurred due to a combination of the length of the net (up to 2.5 km), the lack of discriminating behaviour of this gear type (depending on the habitat usage by age-sex maturity groups), and the timing (during the calving season of the common dolphin) and location of the tuna drift net fishery (Murphy et al. 2007b). Sexually mature individuals of both sexes, including pregnant and recently pregnant females, were also incidentally captured by the Irish tuna drift net fleet, with 43% of the 91 aged common dolphins older than 10 years (Murphy & Rogan 2006). Thus, this fishery, which is now banned, was incidentally capturing the most important age-sex maturity groups in the population.

Population outcomes of bycatch

ICES WGBYC used an online marine mammal bycatch impacts exploration tool[40] (in development) to explore the population outcomes of current levels of bycatch (ICES, 2020). The advanced tool uses an age structured population dynamics model and the user inputs parameters for their species of interest, including survival rates for calves and age 1+ yr animals, age at sexual maturity, population abundance and associated CV, annual bycatch mortality range and a level of population depletion. The population is assumed to start at some stable age structure in year 1 of the projection period. The numbers at age correspond to a constant bycatch mortality rate, which is calculated from the initial depletion level. The tool does not have a "common dolphin" option for species; wechose the closest available relative, bottlenose dolphin, and increased the age at sexual maturity to 8 years. This aligns with the average age of sexual maturity in females reported for the NE Atlantic (8.2 years: Murphy et al., 2019 and references therein) and in Galicia (8.4 years: Read et al., 2016). Males mature later, at 10-11 years (Murphy et al., 2019). The default survival rates based on published values for bottlenose dolphins were retained in the absence of empirical data for this species. Two scenarios (different only in the abundance estimate) for common dolphins were considered:

• Scenario 1: Abundance used was a precautionary estimate of common dolphin sightings only from the SCANS-III and ObSERVE surveys i.e. 481,306 abundance with a CV =0.3

• Scenario 2: Abundance used in common dolphins and common/striped dolphin sightings from SCANS-III and ObSERVE surveys i.e. 634,286 abundance with a CV =0.3

• Population depletion for both scenarios was set to 25%; this is meant to reflect the history of human-caused mortality that best fits the population.

• Bycatch range was set as 1,770-6,527 (CV =0.3) for both scenarios based on our analyses of the WGBYC monitoring data for the North East Atlantic (subareas 6-9); and

[40] https://msiple.shinyapps.io/mammaltool/

• Maximum Net Productivity Level (MNPL) as a proportion of carrying capacity of 0.4.

- Scenario 3: Abundance of 634,286 (CV =0.3), all other parameters as above but bycatch range set to 4411-10827 as per strandings estimates.

The results from scenarios 1 and 2 are presented in **Error! Reference source not found.** and **Error! Reference source not found.**. The results show, given the input parameters selected that if bycatch is at the higher end of the estimated range then the population abundance will have been reduced to 61-70% of K over the long term (50 years); this is below the ASCOBANS objective to maintain carrying capacity (K) at 80%. If the true number of bycaught animals is better represented by estimates from strandings (scenario 3), then middle to high bycatch levels would, as expected, lead to greater declines in abundance relative to the carrying capacity of the population.

Table 1 Results of scenario 1

	Lower end of bycatch range	**Middle**	**Higher end of bycatch range**
Probability (Above MNPL in 50 years)	1	0.98	0.84
Probability (Above MNPL in 100 years)	1	1	0.65
Abundance relative to K after 10 years	0.76	0.73	0.7
Abundance relative to K after 20 years	0.79	0.73	0.67
Abundance relative to K after 50 years	0.86	0.74	0.61

Table 2 Results of scenario 2

	Lower end of bycatch range	**Middle**	**Higher end of bycatch range**
Probability (Above MNPL in 50 years)	1	0.99	0.97
Probability (Above MNPL in 100 years)	1	1	0.98
Abundance relative to K after 10 years	0.76	0.74	0.72
Abundance relative to K after 20 years	0.8	0.76	0.71
Abundance relative to K after 50 years	0.88	0.79	0.7

Table 3 Results of scenario 3

	Lower end of by-catch range	Middle	Higher end of bycatch range
Probability (Above MNPL in 50 years)	0.99	0.92	0.51
Probability (Above MNPL in 100 years)	1	0.89	0
Abundance relative to K after 10 years	0.74	0.71	0.68
Abundance relative to K after 20 years	0.75	0.69	0.63
Abundance relative to K after 50 years	0.78	0.65	0.5

Strandings

The information on stranded common dolphins along the coasts of the UK, Ireland and France show there is interannual variation in the numbers reported between 2005 – 2016 (Murphy et al. 2019) (**Error! Reference source not found.**). During the last decade, hundreds of common dolphins bearing signs of bycatch mortality have washed up on French Biscay coasts in the first part of the calendar year (see **Error! Reference source not found.**). Estimates of total mortality due to bycatch, based on the French strandings data for 2016-2018, also show interannual variation, with estimates of 5 200 [3 500; 8 500]; 9 300 [5 800; 17 900]; and 5 400 [3 400; 10 500], respectively (Peltier et al., 2019). The number of animals stranded along the French coast in 2019 was the highest yet recorded, and a preliminary estimate of mortality due to bycatch was 11 300 animals in January-April (95% CI = 7 550 -18 530) (Peltier et al. 2019).

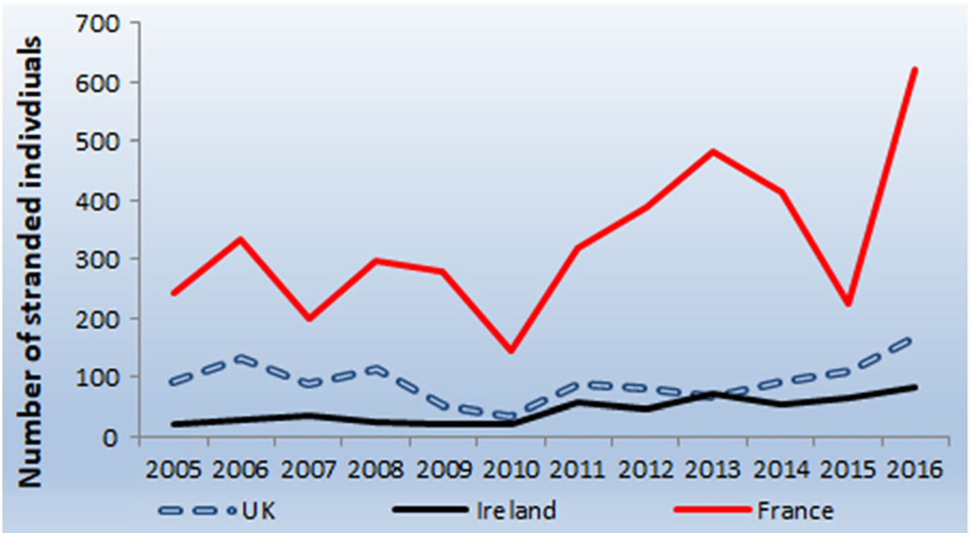

Figure 2 Interannaul variation in strandings of common dolphins in north-western European waters (2005 – 2016). Data provided by the UK Cetacean Strandings Investigation Programme, the Irish Whale and Dolphin Group, and the Centre de Recherche sur les Mammifères Marins, Université de La Rochelle, France.

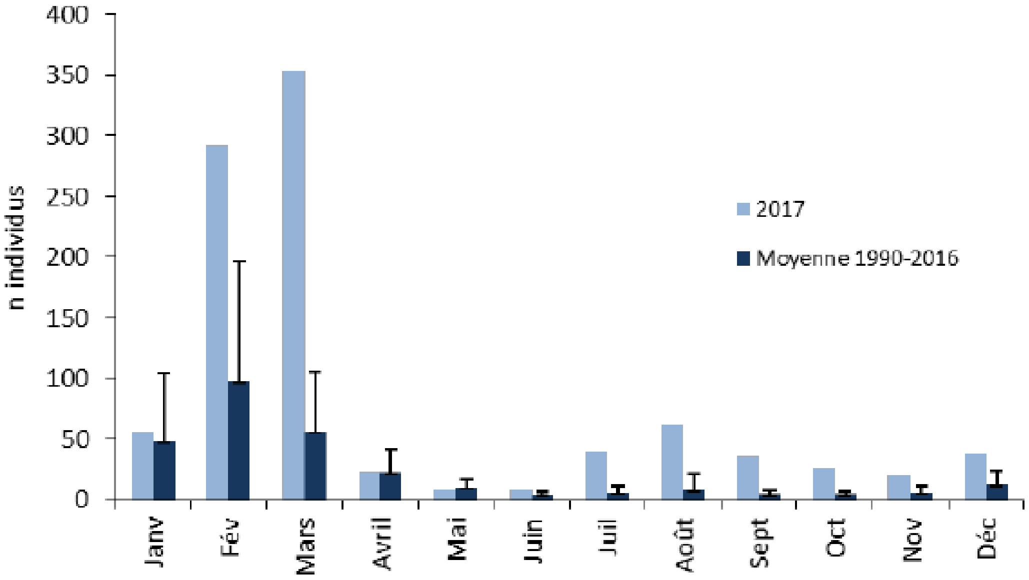

Figure 3 Number of stranded common dolphins by month in the French coast of the Bay of Biscay. Light blue, 2017 stranding; dark blue, median of 1990-2016 strandings (from Dars et al., 2018).

Pressures

Evaluation of any threat to a wild population will need to be put into context of all other pressures and threats on that species, as well as their biology and ecology, to fully evaluate their ability to respond to stressors. Thus, consideration for the population consequences of bycatch must be put within the context of multiple stressors on the population. For example, along with exposure to legacy and emerging pollutants that can reduce immunocompetence and cause endocrine disruption, potentially resulting in infertility (Pierce et al., 2008; Murphy et al., 2010; Jepson et al., 2016; Murphy et al., 2018; Murphy et al., 2019), there has been an increase in reported cases of nutritionally stressed individuals in both Irish and UK waters (Murphy et al., 2019).. A summary of these two additional pressures to common dolphins in the NE Atlantic are provided here.

Anthropogenic pollutants

Levels of PCBs in the marine environment have long been high in the Celtic Sea and Bay of Biscay, although they have shown some reduction over time (OSPAR 2010, 2017b). however, as these are Endocrine disrupting chemicals, they differ somewhat from general toxicants as they (e.g., chemicals with hormone-like properties) have the ability to act at low doses, exhibit non-monotonic dose responses (e.g., U-shaped curves), show varying effects over an individual's lifespan, delayed effects (of sexual dysfunction and physical abnormalities) that are not evident until later in life or until future generations, and have the potential to show combination effects when exposed to multiple pollutants (Bergman et al., 2013; Ingre-Khans et al., 2017; Murphy et al. 2018).

Work undertaken to date on female common dolphins in the NE Atlantic suggested that high PCB burdens, above a threshold for the onset of adverse health effects in marine mammals (9 mg kg−1 ΣPCB lipid) (Jepson et al., 2016; Kannan, Blankenship, Jones, & Giesy, 2000), did not inhibit ovulation, conception, or implantation (Murphy et al., 2010, 2018). However, reproductive failure, manifested in mid to late-term abortion and/or newborn mortality, and reproductive dysfunction in common dolphins inhabiting UK waters may be linked to exposure to PCBs (Murphy et al., 2018).

Reproductive failure was reported to occur in at least 30% of a 'control' group sample composed of mature female common dolphins that stranded dead along the UK coastline and were identified as bycatch mortalities from necropsy examinations (Murphy et al., 2018). Reported incidences of reproductive dysfunction are rare in cetaceans; however, within a large sample of bycaught and other stranded females (control and non-control samples), 16.8% (18 out of 107) presented with reproductive system pathologies, including conditions such as vaginal calculi (5.6%), suspected precocious mammary gland development (5.6%), and ovarian tumours (2.8%) (Murphy et al., 2018). Individual females also presented with an ovarian cyst, atrophic ovaries in a 17-year-old sexually immature individual, and the first reported case of an ovotestis in a cetacean species (Murphy et al., 2018; Murphy, Deaville, Monies, Davison, & Jepson, 2011). Where pollutant data were available, all observed cases of reproductive tract pathologies were recorded in females with ΣPCB burdens >22.6 mg kg−1 ΣPCB lipid (Murphy et al., 2018). Unlike females, males are unable to rid themselves of their lipophilic pollutant burden (through offloading during gestation and lactation) and accumulate high PCB concentrations; the effect of this is not fully understood in male cetaceans, as very few studies have been undertaken.

Further work is required to understand the population-level effects of PCB-induced reproductive impairment in common dolphins in this region, taking into consideration not only the level of contemporary PCB exposure but also inherited maternal pollutant burdens in first-born offspring and generational epigenetic effects (Murphy et al., 2018).

Kannan et al. (2000) proposed a threshold for the onset of physiological (immunological and reproductive) endpoints in marine mammals of 17 mg kg−1 PCB lipid weight (lw) for Aroclor 1254 (or 9 mg kg−1 for ΣPCBs as determined by Jepson et al. (2016)), based on observed effects in experimental studies on seals, otters, and mink. Helle, Olsson, and Jensen (1976) determined one of the highest PCB toxicity thresholds for marine mammals, 77 mg kg−1 for Clophen 50 (or 41 mg kg−1 lipid weight for ΣPCB by Jepson et al. (2016)), which was associated with profound reproductive impairment in Baltic ringed seals (Pusa hispida). Mean concentrations of ΣPCBs for male and female common dolphins in the NE Atlantic are shown in Figure 4. Seventy-six per cent of sexually immature individuals (males and females) had ΣPCB levels above the 9 mg kg−1 threshold, and 17% had levels greater than the 41 mg kg−1 threshold. Higher mean levels are seen in sexually mature males (mean ΣPCB 45.8 mg kg−1; range 7.0–119.8 mg kg−1 lipid) compared with sexually mature females (Murphy et al., 2018). In sexually mature females, who are capable of offloading their total organochlorine load (Borrell & Aguilar, 2005; Mongillo et al., 2016), 41% had blubber ΣPCB levels greater than the 9 mg kg−1 threshold and 7% had levels greater than 41 mg kg−1 (Murphy et al., 2018).

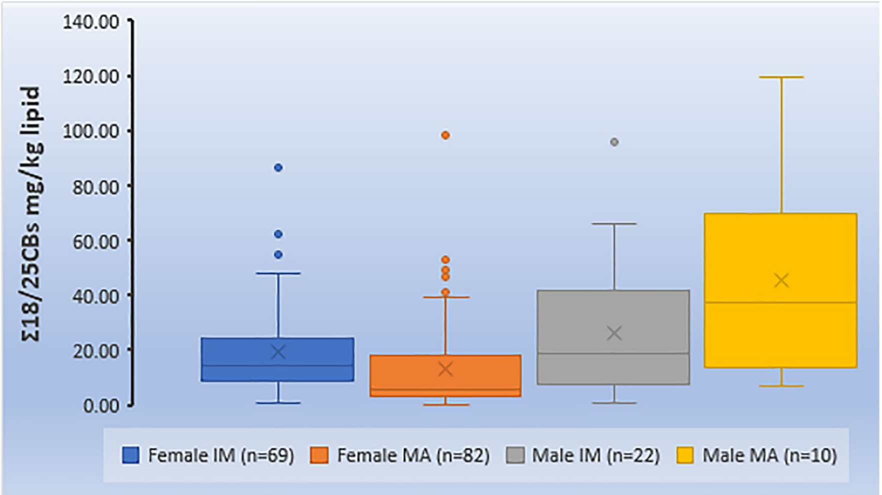

Figure 4. Box plots of male and female common dolphin reproductive status (IM: sexually immature; MA: sexually mature) and ΣPCB from stranded and bycaught common dolphins (1990–2013, n = 183). The dark horizontal line indicates the median, × markers indicate the mean, and outliers are highlighted by circles. Figure taken from Murphy et al. (2018).

Prey depletion

Common dolphins eat a wide range of fish and cephalopods (e.g. Brophy, Murphy, & Rogan, 2009; Pusineri et al., 2007; Santos et al., 2013), with several studies pointing to an apparent preference for 'fatty', i.e. higher calorific value, species due to their high energy requirements (e.g. Meynier et al., 2008; Spitz, Mourocq, Leauté, Quéro, & Ridoux, 2010; Spitz et al., 2012). This may be responsible for seasonal movements within the NE Atlantic, particularly in relation to the energetic demands of pregnant and lactating females (Brophy et al., 2009).

Prey depletion is a potential issue for common dolphins, at least for some prey species in some areas. For example, among the likely 'preferred' prey of common dolphins in Europe, the abundance of the Iberian sardine stock is currently very low, an issue exacerbated by poor recruitment in recent years. Indeed, the stock size has been estimated to be below biomass reference points (ICES 2019).

Between 1990 and 2016, 4.5% (32 of the 694) of necropsied common dolphins died as a result of starvation in the UK, although this rose to 9.7% (10 of 103 post mortem investigations) for the period 2012 to 2016 (Deaville, 2012, 2013, 2014, 2015, 2016, in press; Deaville & Jepson, 2011a). This excludes neonate deaths as a result of starvation/hypothermia because that may be a consequence of maternal separation for dependent neonates rather than due to prey depletion. In Ireland, a recently re-established cetacean stranding necropsy programme reported starvation/hypothermia as the cause of death in 21% (4/19) of necropsied common dolphins for the period June to November 2017, and this includes one case of starvation/hypothermia in a neonate (Levesque et al., 2018).

Cumulative effects of pressures

Work undertaken to date on the effects of persistent organic pollutants suggest that reproduction may be comprised in some individuals in the population. These results are of concern, as the population may be more vulnerable to exploitation than is normally assumed, especially from other anthropogenic activities such as incidental capture, and would not necessarily recover from exploitation in a predictable way.

Studies of cumulative impacts of pressures in cetaceans are at an early stage, focusing largely upon attempts to integrate sublethal effects relating to disturbance (mainly through noise) on physiological and behavioural changes (e.g. King et al., 2015). They have not yet been applied to the common dolphin. Following an assessment of the main pressures affecting the species, attempts should be made to estimate exposure rates to key pressures, and the dose–response relationship of each. As a means to assess effects upon vital rates, health indicators should be developed that can be applied to free-swimming and stranded animals. Candidate pressures could include indirect effects of fishing and climate change resulting in prey depletion, and effects of anthropogenic pollutants, including both legacy and emerging pollutants, on reproduction and development, in addition to the direct effects of fishing, i.e. incidental capture.

ASCOBANS Species Action Plan for the Common Dolphin in the North-east Atlantic

In 2019, ASCOBANS published a Species Action Plan (SAP) for the common dolphin in the North-East Atlantic[41]. The UK and France, as signatories to the ASCOBANS agreement, are therefore committed to working towards the objectives and actions set out within it. ASCOBANS intermediate conservation objective aims to 'restore and/or maintain biological or management stocks of small cetaceans at the level they would reach when there is the lowest possible anthropogenic influence' with 'a suitable short-term practical sub-objective to restore and/or maintain stocks/populations to 80% or more of the carrying capacity' (ASCOBANS, 1997). To work towards achieving this intermediate goal and, ultimately, a favourable conservation status for the NE Atlantic common dolphin, the SAP identifies the key pressures and threats facing the population, gaps in evidence, and proposes actions necessary to achieve the goal of restoring the population to a favourable conservation status. These actions include coordination of monitoring programmes on direct and indirect pressures, including bycatch, marine pollution and anthropogenic noise, to allow a full assessment of the effects on the population(s). Specific and essential actions linked to improving our understanding of bycatch of common dolphins are to: Identify the priority bycatch issues; improve estimates of bycatch rates to support development of a conservation strategy; and implement and assess gear modifications and mitigation measures to reduce bycatch. There are also complimentary actions to enhance monitoring of the seasonal abundance and distribution, which is needed to fully understand population impacts.

Current recommendations from the Steering Group of the SAP, arising from the 1st meeting of the Common Dolphin group in 2019, included the following:

- Work nationally (e.g. through work plans) and regionally (through Regional Coordination Groups) to improve quality and availability of fishing effort data (e.g. by region, gear type, net length, vessel size category, season, and country).
- Encourage further analysis towards fine-scale risk-mapping to better understand factors determining high bycatch and to direct resources to high-risk areas and times.
- Investigate gear specific solutions to mitigate bycatch, including alternative fishing methods to static gillnetting.
- A review should be undertaken of aerial survey monitoring techniques to better discriminate small delphinid species to ensure explicit estimates of population size and uncertainty;

[41] https://www.ascobans.org/sites/default/files/document/ascobans_common-dolphin-sap_aug2019_0.pdf

- Recommend that North-Atlantic-wide information on life history parameters be collected and analysed from strandings and bycaught animals in order to assess for evidence of temporal changes in those parameters that may have resulted from anthropogenic activities.
- Encourage adopting the 'Best Practice on Cetacean Post Mortem Investigation and Tissue Sampling', when available, which includes instruction on how one can define "bycatch" in strandings.

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Annex 10: Additional information for harbour porpoise compiled at ADGBYC-1

Note: This work was done at ADGBYC-1 in May 2020.

Annex 10

This Technical Annex is a review of the scientific information that contributes to the advice provided by ACOM. The content is primarily drawn from expert group reports and scientific publications. The text has not necessarily been reviewed or agreed by all ACOM members.

Baltic proper harbour porpoise

Pressures

If the complete set of suggested management measures is immediately implemented and continued for several porpoise generations, this may allow the abundance of Baltic Proper harbour porpoises to increase again, albeit at a reduced population growth rate (Cervin et al. in review). If the impacts of other stressors are considered, such as anthropogenic pollutants in absence of bycatch mortality, and a low pregnancy rate of 40% was assumed (taken from other populations that exhibited low reproductive rates likely due to pollutant exposure) the population would continue to decline, with the possibility of extinction within the next 100 years (Cervin et al. in review). If the combined effects of both these threats were considered, a bycatch rate of 7 individuals/year could led to a 100% and 55% risk for quasi-extinction within the next 100 years (Cervin et al. in review).

ICES WGMMME (2019) developed threat matrices for different marine mammal species in each ecoregion. For the Baltic Proper harbour porpoise, threat levels were considered high (evidence or strong likelihood of negative population effects, mediated through effects on individual mortality, health and/or reproduction) for bycatch, contaminants, and underwater noise (mainly from seismic surveys, military sonar, and explosions) (Table 13).

Table 1. Threat matrix for the Baltic Sea (ICES 2019). The information for 'harbour porpoise' concerns the Baltic Proper and not the Belt Sea harbour porpoise population.

Baltic Sea			Harbour porpoise
POLLUTION & OTHER CHEMICAL CHANGES	Contaminants		H
	Nutrient enrichment		L
	Microplastics		Risk of contamination leading to ill health or death possible, but no evidence of to date
PHYSICAL LOSS	Habitat loss		L
PHYSICAL DAMAGE	Habitat degradation		M
OTHER PHYSICAL PRESSURES	Litter (including plastics and discarded fishing gear)		L
	Underwater noise	Military Sonar	H
		Seismic surveys	H
		Pile-driving	M
		Explosions	H
		Shipping	M
	Barrier to species movement (offshore		L

	windfarm, wave or tidal device arrays)		
	Death or injury by collision	Death or injury by collision (with ships)	L
		Death or injury by collision (with tidal devices)	Tidal devices do not exist in the region
BIOLOGICAL PRESSURES	Introduction of microbial pathogens		L
	Removal of target and non-target species (prey depletion)		M
	Removal of non-target species (marine mammal bycatch)		H
	Disturbance (e.g. wildlife watching)		L
	Deliberate killing + hunting		Does not take place within the region

Some of the highest levels of PCBs in the marine environment in Europe occur in the Baltic Sea (HELCOM 2010, 2018, ASCOBANS 2016). Harbour porpoises are particularly vulnerable, with evidence of negative impacts on reproduction and health (including immunity to disease) (Jepson et al., 2005, 2016; Murphy et al., 2015). Mean ΣPCB levels in harbour porpoises in the Baltic Proper have ranged from 16-46 mg/kg of lipid (Kannan et al., 1993; Berggren et al., 1999; ASCOBANS 2016).

Seismic surveys and sonar activities have been undertaken over a wide area of the Baltic Proper, largely along the south and east coasts of Sweden, whereas explosions (of military ordinance) have been in a few restricted areas (in the south-west of the basin and off the south coast of Finland) (ICES Impulsive Noise Register, reviewed in Evans and Similä, 2018). Negative responses to sonar have been demonstrated in captive harbour porpoises (Kastelein et al., 2015). So far, only short-term reactions to seismic airguns have been found in harbour porpoises (Thompson et al., 2013; Pirotta et al., 2014; Sarnocińska et al., 2020), although temporary hearing threshold shift has been found in a harbour porpoise after exposure to multiple airgun sounds (Kastelein et al., 2017). The threat level by military sonar, seismic surveys and explosions were ranked as 'high' based on their spatial overlap with Baltic Proper harbour porpoises, their known effect, and the critically low population size, resulting in a strong likelihood of a negative population effect.

It is assumed that during the past 20 years, the bycatch pressure the Baltic Proper harbour porpoise population has declined, as the static net fishing effort has declined significantly. According to the Regional Database (RDB) data, the static net fishing effort in ICES Subdivisions 24 to 32, has decreased by 45% over the past 10 years (from 2009 to 2018) (ICES 2020). In the Swedish waters of the southern and central Baltic, Subdivision 24 to 29, the dominating static net fisheries target-ing cod have decreased by 80% between 2006 and 2017 (Königson et al., 2020). Since 24 July 2019 there has been a ban on fishing for cod in Baltic waters, leading to a further decline in fishing effort. No gillnet fisheries for cod are allowed in subdivision 25 to 32. In 24, fishing for cod is allowed but only in waters shallower than 20 metres (Commission Regulation (EU) 2019/1248, Council Regulation (EU) 2019/1838). It should be noted that the summer management range of the Baltic Proper harbour porpoise population is approximately from ICES Subdivision 25 to 29.

Dead harbour porpoises are occasioally found stranded on beaches around the Baltic Sea. Determination of cause of death from stranded animals is highly dependent on how fresh the carcass is, and bycatch numbers inferred from stranded animals are to be considered as an underestimate of the true bycatch numbers. Based on data on stranded harbour porpoises from Poland and Sweden, WGMME (2020) reached a minimum bycatch estimate of 1-2% of the Baltic Proper harbour porpoise population. The rarity of dead stranded harbour porpoises within the seasonal distribution ranges of the Baltic Proper population stresses the importance of efficient stranding networks for collection of the carcasses. Due to the limited access of fresh carcasses for necropsies, there is lack of data on reproduction, demography and health parameters for the Baltic Proper population (Cervin et al., in review).

Historical population size and range

Circumstantial evidence show that in the late 19th and early 20th century, harbour porpoises had a wide distribution range in the Baltic Sea and the species was more abundant than presently. A review of historical records gives examples of sightings in the northern Gulf of Bothnia, in the eastern Gulf of Finland and into the river Neva as far as Lake Ladoga, and in Estonian and Latvian waters including the river Daugava near Riga (Koschinski, 2001). In northern Sweden, there is a record of a group of harbour porpoises in the river Ångermanälven close to the village of Kramfors (Svärdson, 1955). Bycatches of five pregnant females bycaught in the local salmon fishery in Gdansk Bay in May 1905 indicate a wider distribution range during the breeding season than today (Carlén et al., 2018; Koschinski, 2001). Data from a Polish bounty scheme show that in the area around Hel peninsula and Puck Bay, 676 harbour porpoises were caught from 1922 to 1933, and approximately 800 during 1934-1935 (Psuty, 2013). A review of harbour porpoise observations in relation to winters with extensive ice coverage report on three occasions in the early 20th century when "hundreds" of dead harbour porpoises were washed ashore or encountered by fishermen, and one record of a group of roughly hundred harbour porpoises that was driven ashore on the northern coast of the island of Gotland by an ice belt and drowned (Svärdson, 1955). From November 1960 to October 1961, 50 bycaught harbour porpoises were collected from Swedish salmon fishermen, primarily operating in the waters from Hanö Bight up to the island of Gotland.

ASCOBANS Recovery Plan for Baltic Harbour Porpoises (Jastarnia Plan)

Denmark, Finland, Germany, Lithuania, Poland and Sweden are Parties to ASCOBANS and report annually on their progress in the implementation of the ASCOBANS Recovery Plan for Baltic Harbour Porpoises (Jastarnia Plan) (ASCOBANS, 2016). Key conclusions and recommendations from the evaluation of the national reports for 2018 Evans and Similä, 2019), relevant to the current advice, were:

- Bycatches: "There are huge differences between countriesin the Balticin terms of fundingfor monitoring, estimating and mitigating bycatch, as well as in how fisheries are regulated and by whom. [...] Attention needs to be paid to improvement in the extent and methods of recording fishing effort and cetacean bycatch, and most importantly, for this small porpoise population, mitigation actions should be taken starting immediately."
- Monitoring abundance and distribution: "Acoustic monitoring continues mainly in the western parts of the Baltic. These should continue and be extended eastwards. A new SAMBAH II project should be supported."
- Monitoring and assessing population status: "[This] is challenging for a population that is so rare over large parts of the Baltic Proper. It is important that all lines of evidence are utilised, including acoustics, opportunistic sightings, and strandings along with life history information derived from dead animals. Only Germany has a dedicated stranding scheme with good samples of animals necropsied. All other countries need to do more to maximise opportunities for data on porpoises."

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Annex 11: WKEMBYC report review & VMS maps review

Report from the Review Group for the

ICES WKEMBYC 2020 REPORT

(EU request)

Participants: Sinéad Murphy (Chair, IRE), Mark Tasker (UK)

and Christian von Dorrien (GER)

Review group participants worked both via correspondence and using a web conferencing platform.

30 April 2020

***Caveat**: Draft sections of the Workshop on Emergency Measures to mitigate Bycatch of harbour porpoise in the Baltic Sea and common dolphin in the Bay of Biscay (WKEMBYC) were reviewed over a very few days at the end of April 2020. These sections were all marked draft, but were not dated, so that some of the comments below may not be applicable to the final version of this report as the report may have been altered between the time that it was sent for review and the time that it was finalised.*

RGEMBYC were provided with the following sections of the WKEMBYC report for the purposes of this review:

1. Introduction
2. Section 2.4 – WKEMBYC Discussions in relation to the harbour porpoise
3. Section 3.4 – WKEMBYC Discussions in relation to the common dolphin
4. Section 4 – Recommendations for the Baltic harbour porpoise
5. Section 5 – Recommendations for the common dolphin in the Bay of Biscay
6. Annex 6 – WGMME report
7. Annex 7 – WGBYC report

Much of the report of WKEMBYC was based upon that of two other ICES expert groups: WGBYC and WGMME. Inevitably therefore this review is also reviewing the work of those groups.

- WGMME was tasked with "evaluate current conservation status and threats to the populations (i.e. different from commercial fisheries by-catches) take account of any further relevant information, including new material provided in Annexes 1 and 2"
- WGBYC was tasked with "evaluate current threats to the populations due to commercial fisheries by-catches taking account of any further relevant information, including the new material provided in Annexes 1 and 2. WGBYC to evaluate whether the measures described in Sections 3.1, 3.1.1 and 3.1.2 of Annex I (for common dolphin the Bay of Biscay) and Sections 3.1, 3.1.1, and 3.1.2 of Annex II (for harbour porpoise in the Baltic Sea) are appropriate."

- WKEMBYC was tasked with "If evaluated emergency measures by WGBYC are deemed inappropriate, WKEMB to assess any alternative measure that could be used to ensure a satisfactory conservation status of these stocks. If evaluated emergency measures by WGBYC are deemed appropriate, WKEMB to assess whether they are necessary".

We commend the efforts of both working groups and the participants of the workshop to address these issues as best they could, given the current restrictions under Covid 19. This review was undertaken during the lockdown period, as will the meeting of the ADG to address this special request. The WKEMBYC report highlights the remarkable efforts that people have gone to, to try and deliver on this EU request under these extraordinary circumstances.

This review report is in four parts: (1) Introduction, (2) Common dolphin in the Bay of Biscay, (3) Baltic Proper harbour porpoise, (4) Annex A.

Part 1 - WKEMBYC Introduction

1. The introduction is well written, the procedure is well thought out, the goals of the workshop are well formulated. The background is also well presented, the limitations of both the participants' expertise and the basic knowledge available are sufficiently explained. The decision of the workshop participants to assess the effectiveness of the measures in terms of the possibilities to reduce by-catches and to contribute to the conservation of stocks is described in a comprehensible way.
2. Socio-economic aspects. WKEMBYC discussed whether or not socio-economic factors should be covered in their work and decided not to include them on the basis that there was insufficient expertise in the group. This is reasonable and sensible. However, the uptake of mitigation measures by fishers will be influenced by these factors, and there is some experience evident of this in the work of WKBYC, which has many bycatch reduction experts in its membership – WGMME does not have this level of expertise. Where the reports of these two groups differed in bycatch reduction relevant issues, we consider the work of WGBYC to be much more reliable. We recommend ICES advice should follow this approach. This has implications for the values used by WKEMBYC, which appears to have chosen to use WGMME work in some places, and WGBYC work in others, with no justification.
3. Regarding the statement "*… final recommendations have to be harmonized with results from the Bay of Biscay*." This makes no reference to the Baltic Proper harbour porpoise.
4. The review of the relevant regulations appears accurate and complete. The law listed is not just "regulations" so we suggest amending the title of this section.
5. Include the words "Import Provisions rule" at the end of the sentence "*in US waters under the Marine Mammal Protection Act*".
6. When discussing the ASCOBANS Jastarnia Plan in relation to the Baltic proper harbour porpoise, the text should also note the ASCOBANS Species Action Plan for the common dolphin in the North-east Atlantic.
7. In the discussion, WKEMBYC writes: "*In particular it was reminded that the Ascobans acceptable levels (1% and 1.7%) are not binding on the EU and EU Member States, because Ascobans recommendations are just recommendations until they are formally written into EU and national laws.*" First, ASCOBANS does not define "acceptable levels"– it only defines "unacceptable"–and states that all bycatch should be eliminated if possible. Second, these unacceptable levels are binding on ASCOBANS Parties, all of whom are EU Member States (including UK for the current transitional period). They are not binding under EU law, but a Resolution is not a "recommendation" for ASCOBANS Parties. The two

levels also only apply to Harbour Porpoise, and for the Baltic are over-ridden by another part of the same Resolution that says that bycatch should be reduced towards zero in that Sea. The 1.7% level though has been used as a proxy in past ICES advice for all small cetacean species due to there being no EU decision on the definition of sustainability of bycatch. However, there is much debate on the use of 1.7% for the harbour porpoise, let alone the common dolphin (Murphy et al., 2019).

8. This is relevant also for the paragraph "*Ascobans has thresholds but EU not formally signed up to any so not clear if the Ascobans limit are useful or not. Some experts expressed the view that there needs to be clear advice about what ICES thinks should be done. There is no ICES bycatch threshold or limit and there are different views as to whether thresholds should be set by scientists, by managers or by ICES. Some participants considered that EU looks to ICES to generate advice and therefore cannot expect managers to set thresholds. There was no clear conclusion on this issue and general agreement on the fact it is a difficult situation to resolve who sets thresholds and why*." ICES has been very clear, to our knowledge at least twice in its advice, and at least once in face to face discussions, that EU managers should establish these thresholds. It is a societal choice as to how much bycatch is tolerable, not a scientific one. On these occasions, ICES has advised that it would be willing to help EU managers in mechanisms (such as a workshop, or to advise on the consequences of options for thresholds) to establish these thresholds. We recommend that ICES repeat this offer in the current advice.
9. We note that PBR has been used in some of the work of the ICES expert groups being reviewed here; in a similar way to thresholds, PBR (and its input parameterisation) has not been formally accepted as a way to provide advice in this area by the EU (on behalf of a wider society). This ought to be noted also.
10. The discussion also touches on the legal definition of "deliberate". Our (likely incomplete) understanding of some EU case law is that if a person/entity knows that it is likely to doing something would lead to something illegal occurring, then it would be classified as deliberate. There is one (older) case that found the opposite though. It would seem likely therefore that placing nets that could entangle and kill cetaceans would also be regarded as deliberate. WKEMBYC wisely avoids legal discussion, but we consider that ICES advice needs to bring this issue to the attention of the European Commission.
11. The text notes "*assess, and if applicable, propose alternative appropriate emergency measures that could be used to ensure a satisfactory conservation status of these stocks*." "Stocks" should be changed to "population and sub-population", as that is the level that both these species were assessed – not at the species or stock level. Thus, the wording should also change to "*In the context of the special request, the word "appropriate" is understood relative to the conservation of the <u>population/sub-population</u>*."
12. Insert 'include the' "The ADG would <u>include the</u> group chair and experts."
13. "It was the view of the presenter (HO) that…" Who is HO?

Part 2 - Review on the WKEMBYC report on the Common Dolphin in the Bay of Biscay

We commend all groups for their work under the current challenging conditions. The following is a short summary of our main points; details may be found in the following pages, along with furthermore detailed points not included in this summary.

- The expert groups did not contradict the need for "emergency" measures in their reports, but equally did not state that the Bay of Biscay situation was an emergency. RGEMBYC agrees with the expert groups that the evidence appears to demonstrate an increase (or at least certainly not a decrease) in abundance of Common Dolphins in the Bay of Biscay, but this may be due to a redistribution within the wider NE Atlantic. Further, RGEMBYC agrees that the variance in bycatch inter and intra-annually in the Bay of Biscay fisheries may well be caused by the variance in presence of common dolphins.
- Modelling based on two approaches indicates that bycatches are likely to lead to a decrease in the population.
- Information to answer the European Commission request to "*review the current conservation status and threats to the populations*" of common dolphins may be found in the WGBYC report, which although focused on commercial fisheries interactions appears reasonably comprehensive. RGEMBYC notes that threats and pressures cannot be dealt within in isolation. Evaluation of any threat to a wild population will need to be put into context of all other pressures and threats on that species, as well as their biology and ecology – to evaluate their ability to respond to stressors. Thus, consideration for the population consequences of bycatch must be put within the context of multiple stressors on the population, which was not considered by WKEMBYC.
- WKEMBYC did not find the NGO approach wholly inappropriate, but did recommend two more appropriate responses, following their (reasonable) definitions of possible management objectives. RGEMBYC consider these to be appropriate but would go further to suggest that ICES advice should provide a wider range of appropriate management responses. These can be drawn from the WKEMBYC report.
- RGEMBYC considers that a wider range of monitoring options could be recommended that would be used to reduce bycatch, rather than just monitor/assess bycatch rates. It is also very obvious that the approach of just requesting more (up to 100%) independent dedicated observer coverage of the relevant fleets has not worked, and seems unlikely to work in the near future. If this is an "emergency" then greater monitoring is not an appropriate response – it is vital though to understand whether any response is working as envisioned. Though it should be noted that poor bycatch monitoring to date has prevented undertaking a more complete assessment on whether emergency measures would necessarily ensure a satisfactory conservation status.
- RGEMBYC found that there are differing figures for common dolphin abundance and thereby subsequent calculations based upon those numbers across the three expert group reports. It is important that ICES advice is consistent in its use of numbers and explicit in terms of factors applied and assumptions made in calculations. It is also fundamentally important that limits and approaches to assessing bycatch be agreed by managers on behalf of wider society. Decisions in these areas are not for scientists alone.

Section 3.4 - WKEMBYC Discussion of NGO proposals for the Bay of Biscay

1. **General**: The NGO proposals use ICES expert working group reports as if these are statements from ICES. This is not reliable as these working group reports have not been peer reviewed and ICES advice (or a peer reviewed publication) might differ from the working group as a consequence. On the other hand, ICES's evidential thresholds for providing advice may be regarded by some as being higher than reasonable, especially when non provision of data by those required to provide such data can lead to ICES not

providing useable advice. This has occurred very frequently in relation to cetacean bycatch.

2. **Table Part 1-1**. This is a reasonable summary of the other expert group reviews. We suggest amending "*Where specific fisheries are able to demonstrate, notably by conducting pilot projects, that there is no bycatch, there could be exemptions to measures*." to include where there is existing information and we think the threshold of "no" bycatch is too low. Some Member States have monitored bycatch in relevant fisheries within the range of common dolphins and found low levels of bycatch. It would be unreasonable to penalise those fisheries that have complied or attempted to comply with monitoring obligations in the same way as fisheries that have ignored their obligations.
   We think that the sentence "*WKEMBYC would explore the expected outcome of closures/effort reduction and pinger use in a series of scenarios to* help to *identify the most appropriate approach*" ought to be modified with the addition of the words "help to" (as shown here). The request from the European Commission does not ask for the most appropriate approach, but for alternative measures if the approach requested by the NGOs is deemed inappropriate. The thought process followed by the expert groups is good and more helpful, but expert groups ought not to define the most appropriate approach as there are societal decisions to be made in this area.
3. **Table 1 Part 1-2**. Some of the comments here pertain to the current monitoring requirements and their non-fulfilment. The Health and Safety "loophole" and difficulties of small vessel sampling are examples. ICES could point out that the Health and Safety loophole could be largely plugged by the EU requiring all vessels above a certain length to be able to safely carry an observer (otherwise they cannot be licensed). On a wider point though, it appears that the variance in bycatch inter and intra-annually in the Bay of Biscay fisheries may well be caused by the variance in presence of common dolphins (rather than fishery variance in recent years). Some form of system for monitoring the location of the common dolphins might be an alternative form of monitoring – with "real time" closures following the arrival of larger numbers of dolphins and fisheries that can demonstrate low bycatches of dolphins under high abundance conditions allowed to remain open. We recognise the challenges of such monitoring, but flying aerial surveys may prove easier to achieve than placing monitors on a large proportion of the fleet in the Bay of Biscay, particularly as these monitors would have difficulty in identifying which areas might be "safe" if a move on rule was then to be used.
4. WKEMBYC did not consider the idea of a move on rule, and how that could be applied for common dolphins. In reality, this would require moving on once more than x bycatch events occurred in a given region – which requires fishermen/observers reporting bycatch on a daily basis and the exact location of those events, possibly through a mechanism such as an app. An alternative approach would be the estimation of bycatch thresholds/limits, in line with societal choices and allocation of those limits to specific fleets. Fishing would cease if those limits were exceeded.
5. **Table 1 Part 2.2**. With regard to the statement "*WKEMBYC agrees that dedicated bycatch observer or electronic monitoring (EM) programmes should be prioritised in high risk métiers, periods and areas currently under-sampled in DCF at-sea sampling programmes*." What does the WKEMBYC regard as dedicated? A dedicated PET/marine mammal bycatch observer? And would dedicated PET/marine mammal bycatch observers also be required on DCF sampled fisheries that are deemed to be sampled appropriately by DCF observers but deemed to be high risk métiers for common dolphins? Considering there are possibly still ongoing issues with some observer monitoring for PET species under the Member States DCF programmes - page 18-19 WGBYC report where it notes "*Sampling*

designs and data collection protocols (particularly within the DCF) are not always optimal for quantifying PETS bycatch….”.

6. What would be the exact definition of a high risk métier? And why not include those métiers which are medium risk? As noted within the workshop report, “*the dynamic changes in common dolphin density within the Bay of Biscay is the main driver of the observed peak in bycatch mortality (Van Canneyt et al. 2020)*.” Thus, a métier that could be deemed as medium risk this year, may become high risk in the following year.
7. Could the WKEMBYC clarify exactly what the “high risk” fisheries are for common dolphins for this request? In the recommendations of WKBYC (section 5.2) it proposes the “closure for PTM_DEF, PTM_LPF, PTB_MPD, GTR_DEF, OTM_DEF, PS_SPF and GNS_DEF, in Subarea 8”. Are all these fisheries deemed high risk - even though at sea observer estimates for PTM_LPF were only 4 common dolphins? Whereas, *WGBYC concluded “that the evidence supports consideration of closures and/or other mitigation approaches to reduce bycatch of common dolphin in the relevant areas and métiers (PTM; GNS/GTR)*. The WG further reported “*proposal of a 4-month winter closure (December to March) is relevant for the PTM (most described fishery) and possibly also for larger GNS and GTR targeting demersal species. However, due to low data availability for smaller GTR fisheries, the same conclusion cannot be reached for these fisheries*.”
8. While the implementation of 100% observer coverage within the timeframe of the emergency measures or even within a year was not thought to be achievable by the WKEMBYC, particularly in the small gillnet fishery, what level of coverage does the WKEMBYC think would be achievable across gear types? Considering how far data were stretched to undertake assessments for the various scenarios on alternative bycatch reduction approaches within the current report, an immediate priority is to obtain a good estimate of bycatch using a dedicated marine mammal observer programme.
9. It was noted that France had increased monitoring effort in 2019, to improve sampling coverage and improve understanding of the interactions between common dolphin and PTM fisheries. Few details were provided, for example the WKEMBYC report did not stipulate what percentage of the fleet was planned to be monitored, nor if there were plans to monitor other gear types. This report is not sufficiently adequate for ICES to comment on the French measures in 2019.
10. **WKEMBYC further work.** A correction of data used in the WGBYC report was noted, but it is unclear if this correction has been applied to the WGBYC report, or the Annex of the WKEMBYC report. It would be important to note this correction in both places if applied. Much of the discussion here is focussed on inadequate monitoring – the points made are good and should perhaps be bought together and expanded as advice to the European Commission and relevant Member States.
11. It is noted “*that all midwater pair trawlers used pingers in the winter of 2019 and 2020 and a reduction in bycatch of 65% (compared to hauls made without pingers on the same year, tested on 3 pairs during winter 2018) was attributed to this (Rimaud et al., 2019).*” Considering that the 65% reduction due to pingers was employed within the scenarios, further information on how this estimate was produced should have been provided - considering how sporadic bycatch can be at times, and clarifying the controls employed within the study. While these results are encouraging, without further detail, we consider there is insufficient information here for ICES to advise on the use of pingers in PTM fisheries.

Section 5. Recommendations for the Common Dolphin in the Bay of Biscay

1. This section ought to be titled Recommendations.
2. The discussion of Article 12 of the Habitats Directive ought to include a note that derogations from the Article are possible under Article 16 if the derogation is not detrimental

to the maintenance of the population of the species concerned. Derogations can only be for a limited number of reasons, that may or may not include fishery interests. We are not lawyers (neither is ICES legally expert), but we suggest that ICES advice should not be selective of the law if it is to be quoted.

3. The discussion of objectives is a good summary and does a good job at bringing together the points that others label "conflicting" in EU legislation, but it needs to be emphasised that the final objective chosen must be a societal choice. The options provided by WKEMBYC are a very good illustration of the support that science can provide in making those choices. The use of "PBR" is also a societal choice but appears to have been elevated above that in the discussion here. It would have been helpful to use the one societal target that has already been agreed internationally by a limited number of relevant EU Member States – that of ASCOBANS intermediate conservation objective. We are unclear as to why the italicised text Management Objective 2 is required, given the earlier discussion of this point (and it applies to Management Objective 1 as well).

5.1.1 Objectives for the emergency measures

4. As reviewed in the STECF 2019 report, EU legislation has not defined thresholds nor target population sizes for cetaceans in EU waters. However, the 2019 Technical Measures Regulation stipulated that "*incidental catches of marine mammals, marine reptiles, seabirds and other non-commercially exploited species do not exceed levels provided for in Union legislation and international agreements that are binding on the Union*." ASCOBANS has outlined explicit conservation objectives, one being the intermediate conservation objective which aims to '*to restore and/or maintain stocks/populations to 80% or more of the carrying capacity*' (Resolution 3.3 of 2000 on Incidental Take of Small Cetaceans). The European Union signed the ASCOBANS agreement, but it never ratified it. Even so, consideration could still be given to this agreement as France and the UK are contracting parties.
5. As commented in the review on WGBYC (see section 1.4.6 Population consequences of bycatch) and what parameters to include for the species in the NE Atlantic, it was recommended to use a Rmax of 4%, a Fr of 0.5 and the precautionary abundance estimate which produced a PBR estimate of <u>3,877 dolphins</u>. This is lower than the PBR estimate produced by the WGMME of 4,926 dolphins using a higher abundance estimate - which was in turn used in the WKEMBYC report (cited as 4,927). Note however, keeping bycatch below 3,877 common dolphins will only maintain populations at or above 50% of carrying capacity with 95%. A lower bycatch threshold estimate would be obtained if the ASCOBANS intermediate objective of at/above 80% of K was used, which would require further tuning and running simulations for the PBR as was undertaken by CODA (2009).
6. In 2019, OSPAR and HELCOM proposed the use of ASCOBANS intermediate conservation objective for the production of bycatch limits for cetacean species under the MSFD as well as exploring other options for setting thresholds such as the Catch limit Algorithm (CLA). In 2009, ICES advised that the CLA approach was the "*most appropriate method to set limits on the bycatch of harbour porpoises or common dolphins*." Though noted that "*specific conservation objectives must first be specified. In both species improved information on bycatch and the biology of the species would improve the procedure*" (ICES Advice, 2009). For a review of the different approaches for setting bycatch limits see Annex A.
7. In 2015, ASCOBANS recommended the implementation of a management framework defining the threshold of 'unacceptable interactions' or 'bycatch triggers' and 'bycatch limits', to help safeguard the favourable conservation status of European cetaceans in the long term and move towards the ASCOBANS overall aim of reducing bycatch to

zero (ASCOBANS, 2015a). ASCOBANS (2015) stated that '*a management framework procedure producing robust triggers and limits should enable specified conservation objectives to be met by allowing the impact of anthropogenic removal within and across Member States to be more fully assessed and effectively managed'. This framework would define 'trigger' levels of anthropogenic removal (bycatch) which would signal a need for urgent management action, as well as defining anthropogenic removal (bycatch/environmental) limits (i.e. a 'critical' or 'unacceptable' point*; (ASCOBANS, 2015b).

8. Such alternative approaches to setting bycatch limits/thresholds could be undertaken instead of estimating 50% of PBR.A figure of 10% of PBR Could be used to meet the objective of Article(2) of the TCM also notes to "*ensure that incidental catches of sensitive marine species, including those listed under Directives 92/43/EEC [….] that are a result of fishing, <u>are minimised and where possible eliminated</u> so that they do not represent a threat to the conservation status of these species*."
9. We note that elsewhere in the world, specific take reduction plans have been drawn up for protected marine mammals[42]. The goals of such reduction plans can include: (1) to reduce serious injury and mortality to less than a marine mammal stock's PBR within 6 months of the plan's implementation date, and (2) to reduce serious injury and mortality to insignificant levels, approaching a zero rate within 5 years.
10. **Section 5.1.2**. The statement that "*broad use of acoustic deterrents could exclude common dolphins from some of the Bay of Biscay*" is unsupported and not qualified temporally.
11. In Figure 2, many types of *métiers* showed no significant peaks, apart from an increase fishing effort by **PTM_DEF** during the first two quarters of the year, and a confined summer-autumn season for PTM_LFP. It is unclear if this graph was produced after the RDB database was corrected as described in the WKEMBYC report. If it was corrected it is unclear if this has changed the estimated bycatch rate of 3,199 common dolphins for the Bay of Biscay and Iberian Peninsula ecoregions (WGBYC estimate).
12. Figure 2 is very different to the text on seasonality of fishing effort (and Figure 22) in Bay of Biscay described by WGBYC for vessels >12m (Annex 7, page 46-47) and for vessels <12 m in length (Annex 7, Figure 25) (page 48-49). While Figure 2 in the WKEMBYC report is on a logarithmic scale, what are the other main differences between these figures?
13. In WGBYC text it was noted that there may be some issues with estimating fishing effort for static gear fisheries, it would be useful to understand the reliability of the fishing effort estimates for static gears in this assessment.
14. The bycatch estimate from observer programmes can be regarded as a minimum for common dolphins in the North-east Atlantic, due to due to a lack of data on incidental capture rates in some fisheries and limited sampling in other fisheries. WGBYC (2018) previously noted that the quality of data submitted on protected bycatch to WGBYC annually and, for cetaceans at least, reported to the EC under Reg. 812/2004 is variable and estimation of total bycatch can be challenging. Whereas under DCF, '*sampling of static nets and to a lesser extent midwater trawls, which have relatively higher impacts on cetaceans, is generally at a lower level because these métiers are not considered as significant in terms of commercial discard levels*' (WGBYC Annex 7). Further, most of the monitoring to date

[42] https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-take-reduction-plans-and-teams

has been undertaken on larger vessels, as noted by WGBYC (Annex 7) "*for practical reasons, only larger vessels (>15m) tended to be monitored. The (812) Regulation required Member States to carry out scientific studies on smaller vessels, but that was neglected by most of them.*" Whereas TCM has removed the requirements for pilot studies on small vessels (WGBYC Annex 7). As noted previously by WGBYC, bycatch is not a function of vessel length (ICES WGBYC, 2012). Estimates of bycatch rates for vessels <15m is essential for undertaken work for the current and future assessments.

15. As outlined by WGBYC (Annex 7), for the Bay of Biscay and Iberian Peninsula ecoregions for the period 2016-2018, the highest observed "*mortality was estimated in trammel nets; the level of bycatch in gillnets is likely underestimated in our analyses due to bias in sampling (to larger vessels and pelagic trawls) and difficulties for observers to distinguish between gillnets and trammel nets at sea*." This resulted in the at sea monitoring bycatch estimate for GTR of 1,379 dolphins, compared to 106 dolphins for GNS for subareas 8 and 9.
16. **Section 5.1.3**. We agree with WKEMBYC that "*The two series of bycatch values (one from monitoring programmes, the other from stranding) were considered to be two views of the same phenomenon and their uncertainty ranges were considered to contain the true bycatch level*". This is an important statement.
17. We have not had time to review the analyses of the emergency measures scenarios. While the methodology has been thought through by WKEMBYC and the results seem logical when compared with each other, we are concerned that the quality of some of the data, and the uncertainty surrounding some estimates, has not been thoroughly examined or taken into account. For example, at sea estimates in Table 4 in WKEMBYC are based on limited data on bycatch rates from observer programmes (including métiers that were poorly sampled, e.g. in 2017, for fishing fleets in the Bay of Biscay, a year of peak strandings, observer effort ranging from 0.28 to 1.07%, and thus issues arise when trying to generate robust bycatch estimates (WGMME Annex 6). Further, WGBYC reported "*In the Bay of Biscay, a bycatch rate was calculated for bottom pair trawlers (PTB), targeting both pelagic and demersal species (0.15, 95%CI: 0.07-0.22 per DaS), and an estimated annual bycatch of 775 dolphins (95% CI: 388 – 1,163) common dolphins between 2016-2018. However, it should be noted that this rate was based on <u>a single observed bycatch event</u>…..*"
18. Table 4 should include a column on the actual number of animals observed bycaught, before the column 'at sea monitoring estimate'.
19. We note the choices of Scenarios L and N of WKEMBYC from among their scenarios for logical reasons, but would suggest that ICES provides a few further choices to the European Commission as they request "*<u>any alternative measure</u>*".
20. **Section 5.2**. The text here appears well supported by logic and, where available, science. There has evidently been a serious lack of relevant science (and therefore data and information) in many parts of the fisheries system being considered here, despite legislative requirements. It is only through such science that it is possible to know what is happening and whether measures are adequate and appropriate. It is a clear responsibility of the European Commission to ensure that EU legislation is followed by Member States. Note that Paragraph 15 is approximately the same as the comment on Table 1, Part 1-2 above.
21. We agree that fishing effort data on static gear should be improved "*For GNS and GTR métiers, improved reporting of data on certain net dimensions (length and height) as an indication of the capacity of the net to bycatch dolphins*.", but would add that soak time should also be included.

The comments below are on issues that extend beyond those in the sections of the WKEMBYC report made above.

Comments on WGMME report (Annex 6)–relating to the Common Dolphin in the BoB

1. Threats and pressures cannot be dealt within in isolation. Evaluation of any threat to a wild population will need to be put into context of all other pressures and threats on that species, as well as their biology and ecology – to evaluate their ability to respond to stressors. Thus, consideration for the population consequences of bycatch must be put within the context of multiple stressors on the population. For example, along with exposure to legacy and emerging pollutants that can reduce immunocompetence and cause endocrine disruption, potentially resulting in infertility (Pierce et al., 2008; Murphy et al., 2010; Jepson et al., 2016; Murphy et al., 2018; Murphy et al., 2019), there has been an increase in reported cases of nutritionally stressed individuals in both Irish and UK waters (Murphy et al., 2019). Common dolphins have shown a preference for consuming energy-dense prey due to their high energy requirements (Spitz et al., 2010; Spitz et al., 2012), and resource/prey depletion may be a potential issue for the species, as evidenced by the poor condition and/or starvation of some stranded animals (Levesque et al., 2018; Levesque et al., 2019; Murphy et al., 2019), and the poor status of some fish stocks in the region (EEA, 2018). Further, fisheries selectivity of particular age-sex classes has been reported in the species (See page 230 (Murphy et al., 2013)), and it would be interesting to report on the observed age-sex profile of stranded animals along the French coastline during and outside peak stranding events.
2. A critical review of information on the general biology, ecology and other threats and pressures on this species would be required for this EU request. Most of that information has largely been reviewed by Murphy et al. (2013; 2019) and for the ASCOBANS Species Action Plan (SAP) for the North-east Atlantic Common Dolphin that was adopted intersessionally in August 2019[43]. Under section "implications of current legislation" where ASCOBANS is described, the establishment and implementation of this SAP among ASCOBANS Contracting Parties should have been noted, in addition to the main Actions and Tasks outlined within the SAP. The first meeting of the Steering Group of the SAP was held in September 2019, and although the report from that meeting is not yet available, recommendations from the meeting as well as presentations have been made available[44].
3. WGMME and WGBYC have both worked on bycatch levels (though our understanding was this was meant only to be done by WGBYC). For many reasons mostly relating to the understanding of fisheries and related data, we would recommend following the work of WGBYC (as has been done mostly by WKEMBYC).
4. WGMME have not reviewed the other threats to the Bay of Biscay Common Dolphins in their report. In section 6, WGMME do not appear to have challenged or checked the NGO assertion that there are "*ever increasing anthropogenic pressures*".
5. Further background (if needed) 4.1 Relevant management units and population size estimates:

[43] https://www.ascobans.org/en/document/ascobans-species-action-plan-north-east-atlantic-common-dolphin

[44] https://www.ascobans.org/en/document/recommendations-cd1

One panmictic common dolphin population has been proposed for the North-east Atlantic based on genetic and cranial morphometric analyses ((Murphy et al., 2019) and references therein), and the observed panmixia may be explained by long-distance dispersal of females from natal areas - whereas male common dolphins were found exhibit some degree of site fidelity (in waters off Portugal) based on genetic analysis (Ball et al., 2017).

As samples assessed to date for both genetic and cranial morphometric analyses were obtained from continental shelf and contiguous waters of the Bay of Biscay, the extent/range of the North-east Atlantic population is unknown. For the purposes of OSPAR's common mammal indicator assessments under the MSFD, where common dolphins have been employed, the WGMME in 2014 proposed the range of the assessment unit as OSPAR regions II, III and IV – with the anticipation that Member States would survey, at least, the extent of these waters for the species.

Common dolphins have been observed at least out to the Mid-Atlantic Ridge, and a genetically and morphologically distinct population has been reported in the North-west (NW) Atlantic (Natoli et al., 2006; Westgate, 2007; Mirimin et al., 2009; Murphy et al., 2013). Relatively low level of genetic differentiation was observed across the whole North Atlantic and suggests a recent population split or a high level of gene flow between two or more populations (Mirimin et al., 2009; Murphy et al., 2009).

Large-scale surveys of the North-east Atlantic have been undertaken on an approximately decadal frequency. As outlined in Murphy et al. 2019 "The combined abundance estimate (467,673 plus 33,215 individuals) for common dolphins for July 2016 is considerably larger than that recorded in 2005/2007 for an area of somewhat comparable size. The SCANS-II survey estimated 56,221 (CV = 0.23; 95% CI: 35,700–88,400) common dolphins for shelf waters for the year 2005 (Hammond et al., 2013), and the Cetacean Offshore Distribution and Abundance (CODA) survey estimated 116,709 (CV = 0.34; 95% CI: 61,400–221,800) common dolphins for offshore waters for the year 2007 (CODA, 2009). The combined 2016 SCANS-III and ObSERVE abundance estimate is consistent with results from the SAMM aerial surveys in French waters of the Bay of Biscay and the English Channel in summer 2012 (Laran et al., 2017). It is very likely that the apparent differences largely reflect variation between years (and quite possibly between months, given that these surveys, particularly aerial ones, are undertaken over a short period of time) in the distribution and movements of common dolphin groups. These may include latitudinal or offshore–inshore movements, or a mixture of the two. Surveys undertaken from 2007–2016 in north-west Spanish waters, for example, have reported a high interannual variability in abundance, ranging between 5,533 animals (density 0.16; CV = 0.62) in 2008 and 22,662 (density 0.61; CV = 0.36) in 2010 (Saavedra et al., 2017)."

As outlined further in Murphy et al. 2019 "Beyond the European Atlantic shelf seas, a historical abundance estimate of 273,159 common dolphins was reported for the North Atlantic Sighting Survey (NASS)-west survey block in 1995 (Cañadas et al., 2009). An additional 77,547 common dolphins were estimated for the NASS-east block in the same year, although this latter estimate was not considered reliable due to limitations in the survey. However, such high numbers of individuals were not observed when some of those areas were surveyed in 2000–2001 and 2007, including surveys such as Trans-NASS, during which a more southern distribution of common dolphins was observed compared with earlier

NASSs (CODA, 2009; IWC, 2009; Lawson et al., 2009; Murphy et al., 2013). With a recent influx of common dolphins into the management unit area, possibly from offshore waters, further genetic analysis is required to ascertain whether there is any evidence of genetic differentiation among these individuals. It should be noted that a higher abundance of common dolphins in the management unit area, particularly in more southern waters, means more individuals are now exposed to anthropogenic activities in western European waters."

6. Thus, even though the most recent abundance estimate for the species from July 2016 does not indicate a decline in the species in the region, as samples for genetic and cranial morphometric analyses were obtained prior to 2016, it is unknown if the influx of individuals were from the same population and requires further investigation. Further, abundance is largely estimated using data from surveys undertaken during the summer, whereas anthropogenic mortality from fisheries interactions has largely been reported during the wintertime (apart from the tuna driftnet fishery which is now banned) (Murphy et al., 2013; Murphy et al., 2019). Within the ASCOBANS SAP this is addressed through Action RES-03: improve understanding of causes of seasonal and annual variation in abundance and distribution, particularly in relation to human activities.
7. Based on current aerial survey methodologies, an exact estimate of abundance for common dolphins in the North-east Atlantic is difficult to obtain. As recommended by the ASCOBANS common dolphin SAP steering group in 2019 "*a review should be undertaken of aerial survey monitoring techniques to better discriminate small delphinid species to ensure explicit estimates of population size and uncertainty*."

4.1 Assessments under the Habitats Directive

8. Despite the larger abundance estimate for the species in continental shelf and adjacent waters of the Bay of Biscay in July 2016, many Member States in 2019 still classified the species overall conservation status as either unknown or unfavourable-inadequate, with only one Member State reporting its status as Favourable. Reviews of Member States conservation status reports are required to explain the large discrepancy in reporting among Member States for the same population. As the species is transboundary, assessments by Member States should be undertaken at the population level – or the range of Marine Atlantic bioregion. The provisional overall assessment for 2019 using the Method MTX matrix reported the species in the Marine Atlantic bioregion as "unknown"[45].

Table 1. EU Member States Conservation Status Assessments for common dolphin, undertaken for reporting under Article 17 of the Habitats Directive. Adapted from Murphy et al. (2019).

Country	2007	2013	2019
UK	Unknown	Favourable	Unknown
Ireland	Favourable	Favourable	Favourable

[45] https://nature-art17.eionet.europa.eu/article17/reports2012/species/summary/?period=5&group=Mammals&subject=Delphinus+delphis&region=MATL

France	Unknown	Unfavourable-Bad	Unfavourable-Inadequate
Spain	Unknown	Unfavourable-Bad	Unknown
Portugal	Favourable	Unfavourable-Inadequate	Unfavourable-Inadequate
Marine Atlantic	“Unknown”	“Unfavourable-Inadequate”	“Unknown”

5. Estimates of bycatch numbers in relation to PBR

8. As noted in the WGMME report, in 2018 the IWC Sub-Committee on Non-Deliberate Human-Induced Mortality of Cetaceans (HIM) reviewed the work undertaken in deriving bycatch estimates from strandings in recent years for the Bay of Biscay. This SC recommended to “*address uncertainties in the analysis arising from parameters that either don't appear to have been quantified directly in the analysis to date, or that have been assessed directly but with either very limited sample size or samples obtained in potentially unrepresentative contexts. The group also highlighted uncertainties in the estimation of immersion level, the probability of being buoyant, the probability of stranding, the time of death and potential sensitivity of this approach to application beyond the Bay of Biscay*.”
9. The SC noted though that strandings data could possibly be assessed to identify any potential gaps in observer coverage using the reverse drift analysis of cetacean carcasses approach. Work that was undertaken within Peltier et al. (2019) and reviewed by the IWC SC HIM in 2019.
10. Although WGMME agreed to use the drift model approach for deriving bycatch estimates from strandings for the Bay of Biscay, it did not clarify if any of the above concerns raised by the IWC were addressed in more recent work. While, drift modelling of bycatch carcasses is still somewhat in a developmental stage, the WGMME noted that estimates of bycatch from observer programmes within the region were of the same order of magnitude as those produced from reverse drift modelling of strandings.
11. For a discussion on the PBR, see review text of WGBYC (Annex 7) section 1.4.6 Population consequences of bycatch.
12. The equation reported in the WGMME report was incorrect (page 15). Should be PBR = Nmin * ½ Rmax * Fr
13. Figure 9. I am unsure as to why data were plotted this way. The PBR estimate used the larger effective population size that was estimated for the year 2016 (634,286 dolphins, CV = 0.307), and this was applied across all years, including those years when a much smaller abundance of common dolphins was reported in this region (WGBYC noted that the combined SCANS II and CODA estimates for the years 2005/2007 were 174,485 dolphins, CV = 0.27).
14. Calculations of bycatch estimates that are generated from strandings is based on the formula outlined in Peltier et al. 2016, which corporates abundance (total population size). When calculating the historical bycatch estimates from strandings for Figure 9, what abundance estimate was used?

Comments on WGBYC report (Annex 7)–relating to the Common Dolphin in the BoB

1. WGBYC noted "*The level of bycatch which constitutes a "serious threat" can be informed by the use of thresholds. However, the legislation which specifically requires setting of <u>thresholds is primarily for assessment purposes (i.e. under MSFD)</u>; only the TCM implies that the use of thresholds should be employed to manage (reduce) levels of bycatch*."

   While the MSFD requires assessment of indicators developed, it also requires the implementation of a programme of measures that will ensure that targets are achieved. The MSFD is not merely an assessment mechanism, Members States have to achieve GES of their waters through implementing measures to do so if required.

1.4.1 Overview of abundance, distribution and population structure

2. Within ICES, the terminology Management Unit and Assessment Unit have been used for delineating units for common dolphins, with the latter term employed for indicator assessment under the MSFD. As the boundaries proposed for the current exercise are somewhat different to those suggested for the MSFD indicator assessments (OSPAR regions II, III and IV) (and also different to the boundaries of earlier largescale surveys such as SCANS II and CODA undertaken in 2005/2007), we would propose using the term Management Unit rather than Assessment Unit within the report.
3. The ObSERVE estimate of common dolphin abundance of 13,633 individuals (CV = 0.85) in Irish waters was estimated from surveys undertaken in summer 2016 (Rogan et al., 2018) and not summer 2015 on page 22 of the report.
4. In Table 2 on summary of available abundance estimates for common and striped dolphins in the North East Atlantic, it would be good to include the quarter/months of the study.
5. In Figure 4 and associated text, what data were used to assess the "annual trend in model-based abundance estimates for common dolphins in the Bay of Biscay"
6. In 2005, ICES reviewed information on seasonal movements using data collected between 1979 and 1998 and noted "*There is some evidence of seasonal movement of common dolphins, with dolphins being more widely spread, especially in offshore deeper waters in summer than in winter, when there is a pronounced concentration in the shelf waters of the Western English Channel and further offshore parts of the Celtic Sea. Note however that the distribution of effort in winter did not cover deeper, off-shelf waters as well as in summer, so the conclusion of an apparent movement onto the shelf should be expressed cautiously. The movement into the western Channel at this time seems much more certain*."
7. This reported increase in Western English Channel and parts of the Celtic Sea during the winter is not so apparent Figures 5 and 6 in the WGBYC report and requires further investigation. These figures were taken from Waggitt et al. (2019) which used data collected between 1989-2018. WGBYC reported that the study employed hurdle models that "*incorporate a range of environmental parameters believed to influence prey distributions and prey capture availability for different cetacean species, integrating the probability of encountering the species and its abundance, density maps of the 12 most common species were produced at monthly temporal and 10km spatial resolution* (WGBYC Annex 2). Results from the Waggitt study noted that "*highest densities concentrated along the shelf break (over the 200-2,000m contour), particularly in winter. Plotting the percentage deviation from the annual mean for each month of the year reveals a movement towards the*

shelf edge west of Ireland and into the Bay of Biscay over the winter months, January to April (Figure 6; WGBYC Annex 7).

8. The common dolphin is a species where long-term distribution change has been reported in the past (Murphy et al. 2013; 2019), and thus the current re-distribution in the North-east Atlantic requires further investigation/assessment. Any management of activities in relation to Common Dolphins needs to be robust to large scale redistribution of the population.
9. Table 3 in Murphy et al. (2013) summarised all available annual estimates of total bycatch for common dolphin in ICES areas VI, VII & VIII between 1990 to 2009 (extracted below in Annex A). A number of inconsistences in bycatch estimates are evident between this table and that reported in WGBYC Annex 7. For example, Northridge & Kingston (2009) reported 439 (95% CI 379-512) common dolphins caught in the UK sea bass fishery for the period 2003-2004. Also noted differences were reported bycatch estimates for UK gill and tangle net fisheries - 594 individuals were reported by Northridge & Kingston (2009) for the year 2008, and 253 and 554 common dolphins were reported for the years 2005 and 2006, respectively (Northridge et al. 2007; Second annual report on the UK cetacean bycatch monitoring scheme). Were the published estimates in these earlier studies updated and those are the data provided in the ICES WGBYC report, or vice versa? **Section 1.4.3 Characterisation of the northeast Atlantic fisheries with potential for bycatch**
10. In this section for descriptions of the fleets (and throughout), best to follow use of commas for numbers as per English notation.

1.4.4.2 Effort analysis for the relevant fisheries

11. For the assessment of fishing effort, the period 'winter' was noted "Only the main species caught in winter are detailed in this section" as the definition for winter can vary by country, what definition was used in this analysis?
12. Within the section "Description of fishing effort of the relevant fisheries in sub-area 8: French fleet in Subareas ICES 8 ab. Total fishing effort for vessels >12m" it was noted that '*Total fishing effort per métier is quite stable over the period 2015-2018 (Figure 20). The main change is the increase of PTM activity between 2015 and 2016-2018. On average, fishing effort doubled in 2016 compared to 2015. For the other fisheries under consideration, the changes between years ranged be-tween 4 and 15%. If the calculation of the fishing effort inferred from vessel speed does not allow one to compare static gears and active gears, we can, however, conclude that PTM fisheries represent a small fraction of overall fishing activity in ICES 8 ab*". Unsure what this last statement means. How reliable are the estimates of fishing effort from static gears?

Section 1.4.5 Estimation of common dolphin bycatch

13. "*In 2017 and 2018, the mortality inferred from French strandings in the Bay of Biscay and the Western Channel were respectively estimated at 9,300 [5,800; 17,900] and 5,400 [3,400; 10,500] common dolphins*." The estimate for the year 2017 is approximately three times the average estimate from the fisheries observer programmes for that year "*The total amount of annual bycatch in 2016-2018 in this ecoregion across all métiers was 3,199 (95% CI 1,557 – 5,413)*". What exactly are these results highlighting? The fact that the bycatch rate is unknown? That strandings data are over estimating bycatch rates? Or that bycatch estimates based on data from observer programmes are not useable in the context of management advice?
14. Is there any reason why potential bycatch in Irish waters appears not to be covered?

15. There is a very important statement at the bottom of Page 40 that perhaps needs more prominence "*Stranding numbers are corrected by drift conditions and by the proportion of buoyant animals, based on an in situ experiment (which estimated the probability for a bycaught dolphin to float). This last correction factor has a major effect on final estimates and could be further improved by increasing the number of experimentally released carcasses and by refining estimates of discovery rates along the French and UK coasts. Small changes in proportion of buoyant animals could notably modify mortality estimates.*"

Section 1.4.6 Population consequences of bycatch

16. Section 1.4.6 of this Annex is of use should there be an exploration of thresholds and threshold setting by the European Commission in future.
17. The objectives of the CODA study were to develop analytical techniques for assessing the impact of bycatch on the common dolphin population and to develop a robust management procedure that uses available information to generate safe bycatch limits. To undertake this work CODA (2009) employed two approaches, the PBR and CLA, and ran simulations to investigate three tuning scenarios, that would achieve the interim conservation objective of the ASCOBANS: to allow populations to recover to and/or maintain 80% of carrying capacity. As outlined in Winship et al. (2009) the "*three tunings of the procedures based on three interpretations of the conservation objective. The first tuning achieved the conservation objective 50% of the time (median population status after 200 years was 80%). This tuning is appropriate for a conservation objective of maintaining the population at 80% of carrying capacity in the long term. The second tuning achieved the conservation objective ≥95% of the time (95% probability that population status was ≥80% after 200 years). This tuning is appropriate for a conservation objective of maintaining the population at or above 80% of carrying capacity in the long term. The third tuning was identical to the second tuning except that the objective was still achieved in a worst-case scenario. This tuning is therefore appropriate for a conservation objective of maintaining the population at or above 80% of carrying capacity in the long term under a worst-case scenario.*"
18. The PBR was originally designed, as WGBYC noted, "*to assess whether a population was at an Optimum Sustainable Population under the US Marine Mammal Protection Act (MMPA). If annual bycatch is below the PBR limit, then a population should recover or be maintained at or above 50% of carrying capacity with 95% probability.*" As part of their work, CODA re-ran simulations of the PBR to achieve ASCOBANS intermediate conservation objective, and a similar approach should have been undertaken for the current assessment.
19. For the scenario testing undertaken by WGBYC, estimates of Rmax (Scenario 1) for NE Atlantic common dolphins have been calculated using life history data and range from 4% to 4.5% per year (Murphy et al., 2007; Mannocci et al., 2012). In other geographic regions, Gerrodette *et al*. (2008) reported a trend in common abundance of 5% in the eastern tropical Pacific (ETP) between 1986 and 2006 (Winship et al., 2009). Though the life history traits of that population are not directly comparable to the NE Atlantic, as common dolphins in the ETP can calve year-round and have a higher pregnancy rate (47% vs 26%; Murphy et al. 2009 and references therein). Thus, c.4% should employed as the Rmax for the common dolphin population in the NE Atlantic.
20. In terms of the recovery factor (Fr) (Scenario 2), it was noted in the WBGYC report that "*higher values of Fr were considered because there is no evidence that the abundance in the North East Atlantic Assessment Unit is declining (although re-distribution of the population may be occurring).*" As noted in the text, while a re-distribution may be occurring in the wider Atlantic region, due to a lack of genetic and cranial morphometric analyses in recent years, it is unknown if the <u>influx of dolphins into continental shelf</u>

waters during the winter period (outside the breeding period) are in fact the same population/ecological stock. Thus, the default value of 0.5 is also applicable. Additionally, the observed large-scale anthropogenic mortality observed from strandings along the French Atlantic coast in recent years, would suggests a precaution approach to setting the recovery factor.

21. For scenario 3, taking a precautionary approach with regard to abundance is acceptable - only estimating abundance based on confirmed common dolphin sightings. As noted by Murphy et al. (2019) the notably higher abundance estimated determined by SCANS III and ObSERVE for July 2016 were based largely on aerial surveys, whereas the earlier SCANS-II and CODA surveys in these areas were ship-based. It is unknown if this change in survey method was influential or not.
22. WGBYC reported that "*the estimate of recent annual bycatch using the WGBYC observer data for the NE Atlantic AU was 3,783 dolphins (95% CI 1,771 - 6,527).*" This value can be taken as a minimum due to limited observer coverage in many fisheries. Using a Rmax of 4%, a Fr of 0.5 and a precaution abundance estimate produces a PBR estimate of 3,877 dolphins. Note however, keeping bycatch below this level will only maintain populations at or above 50% of carrying capacity with 95% probability. A lower PBR threshold estimate would be obtained if the ASCOBANS intermediate objective of at/above 80% of K was used.
23. With regard to the bycatch impacts exploration tool, why was 0.4 taken for the MNPL? As stated in Wade (1998) the Maximum Net Productivity Level in marine mammals ranges between 0.5-0.85% of K and is more than likely in the lower portion of that range. Thus, 0.5 would be more appropriate.
24. Again, survivorship has been estimated for common dolphins in the NE Atlantic by Murphy et al. (2007) and Mannocci et al. (2012). As noted in Mannocci et al. (2012) "*survivorship curve suggested that 90% of the females reach 2 years, only 60% reach 5 years and less than 30% reach 12 years survival (Table S2) appeared to be high at juvenile stage (especially for the first years of life) and very low at adult stage (respectively 0.92 and 0.84*)." Similar results were obtained by Murphy et al. (2007), which also employed data from French stranded common dolphins in their estimates. The values employed for bottlenose dolphins in the bycatch impact exploration tool uses a S_0 (pup or calf survival) of 0.865 and an S_{1+} (survival of 1+ individuals) of 0.951.

Part 3. Review on the WKEMBYC report on the Baltic Proper Harbour Porpoise

We commend all groups for their work under the current challenging conditions. The following is a short summary of our main points; details may be found in the following pages, along with furthermore detailed points not included in this summary.

- From the report the attempt is obvious to propose balanced measures based solely on the information available, even if this was not fully achieved. It is good to follow the main discussion during WKEMBYC that the measures proposed by the NGO were for short-term, but its long-term measures that are required, which we also agree with. Annex A provides a good overview of the pros and cons of the different approaches discussed by WKEMBYC, which the RGEMBYC agrees with.
- A measure to request the large-scale use of pingers on all static nets and for all vessel sizes, seems appropriate. Also, the proposal for a closure of the Natura 2000 sites Hoburgs bank och Midsjöbankarna together with the Southern Midsea Bank as well as the part of the Natura 2000 site Zatoka Pucka i Półwysep Helski seems well justified. However, this seems not to be the case for some of the other proposed measures regarding

spatial fisheries closures, these appear to have been developed not on the basis of sufficiently hard and well-founded facts alone. The closure of relatively small areas to protect animals with such high mobility as harbour porpoises only makes sense if these areas either have a higher concentration of individuals or if these areas are important for the life cycle of the stocks. Otherwise the fishing effort will shift to adjacent areas where bycatch rates may even be higher if the fishing effort is higher there because the CPUE of the target species is lower. For example, the assumption that a reduction of fishing effort in the area *Oderbank* designated under the Birds Directive would "likely have a significant effect on the [sub-]population" is hard to follow, since occurrence of individuals was only detected during some winter months and is only assumed to be an unknown proportion of the whole sub-population with low possibility of detection as found during the SAMBAH project. Further, whether it is sufficient to link this area to other areas where protection measures are also being taken to improve the overall protection of harbour porpoises is a matter of pure conjecture.

- In addition to that, the reasoning of different measures for the set of German and Polish protected areas make no sense at all. Firstly, it is not explained why, in the German areas, fishing with gillnets should be completely banned in the months from November to April, while in the directly adjacent Polish area, it is also proposed that fishing should continue, but then only with pingers attached. It can hardly be a scientific argument that no measures have yet been adopted in Polish territory? If areas where fisheries closures shall be proposed are not selected very carefully and on purely technical grounds, this could even lead to a shift of fishing effort to areas with not only the same but even higher density of individuals or which are important for the life cycle of the sub-population for other reasons. With even more negative consequences for the sub-population.
- Yet, a fundamental problem still is that information about distribution of the very low number of individuals of the Baltic Proper sub-population is limited. Therefore, the recommendations for monitoring of the sub-population, which urgently needs to be improved, are well justified and presented. However, the question remains on what basis the recommendation for large-scale acoustic monitoring is based exactly every 12 years. It should be noted that reporting for both the HD and the MSFD are on six-yearly intervals, thus undertaking surveys every 12 years would contribute to updated estimates in every other report. Previous ICES recommendations have described that the time period is related to both the degree of uncertainty and the level of risk and that these decisions must be taken by society. Only then can the necessary time interval between two monitoring exercises be deduced.
- The statement that the knowledge on bycatch risk of harbour porpoises of the Baltic Proper population and its spatio-temporal variation must be increased, is a good point and very valid. This also applies to the finding that in this respect it is essential to back up management decisions with fishery data of a high quality. Data about fishing effort especially of the gill net metiers on sufficiently fine spatial and time scales are still lacking, too. Therefore, one of the most important and urgent measures is to quickly collect sufficiently accurate data on both fishing effort and bycatches. The requirement to document sufficiently accurate fishing effort data in logbooks of all sizes of vessels is fully supported (and would be easy for the EU and Member States to implement). However, it is more difficult to implement the requirement for sufficiently accurate bycatch data
- It is definitely necessary to implement more projects such as the example of the bycatch risk assessment maps off the Swedish coast.

- When stating that the recommended bycatch mitigation measures need to be continued for a long time, an adaptive management approach should be requested and implemented at the same time. Thus, to ensure that the success and appropriateness of implemented measures will be checked on a regular basis and adapted if new data indicate the need. For example, in case measures do not result in positive developments in the population.
- Some other shortfalls of the report, like the misquoting from some references, should be corrected because this may jeopardise both the validity of the proposals and their acceptance.
- Finally, it needs to be clarified whether or not we are dealing with a sub-population or a population within the Baltic Proper. The opening sentence of section 4 states "*The Baltic Proper harbour porpoise population is listed as Critically Endangered (CR) by IUCN and HELCOM (Hammond et al., 2008; HELCOM, 2013*)." Both these bodies have listed the Baltic Proper harbour porpoise **sub-population** as CR. Recent genetic studies stated that the individuals of the Baltic Proper belong to a sub-population (Wiemann et al., 2010; Lah et al., 2016; Tiedemann et al., 2017; Autenrieth et al., 2018). If it is believed that the status should be raised to that of a population, this needs to be considered fully by ICES and proposed by ICES in the current workshop report document.

Section 2.4 —WKEMBYC Discussions on the Baltic Proper Harbour Porpoise

1. For the text relating to conservation objectives, this text should detail the ASCOBANS conservation objectives, including that bycatch should be reduced towards zero in the Baltic Sea. ASCOBANS also has an intermediate conservation objective – restoring populations to/above 80% of K. Contracting parties to ASCOBANS that reside in the Baltic Sea (Denmark, Germany, Sweden, Finland, Poland, and Lithuania) have signed up to this international agreement, and thus they are legally bound to it. ASCOBANS conservation objectives can be used in absence of explicit conservation objectives (regarding target population size) from the EU as most of the measures proposed reside within the EEZ of these countries.

2. Further information on uncertainties included in estimates of the PBR are included in Annex A below. The PBR was originally designed, as the WGBYC noted, "*to assess whether a population was at an Optimum Sustainable Population under the US Marine Mammal Protection Act (MMPA). If annual bycatch is below the PBR limit, then a population should recover or be maintained at or above 50% of carrying capacity with 95% probability*." It should be noted that the EU has not adopted the implementation of the PBR Framework for providing advice on cetaceans. For applying any of such Frameworks – the PBR or CLA – key policy decisions need to be decided upon, which are still subject to societal choice (ASCOBANS, 2013).

3. For the statement "*ICES advice on finding reference values was that the choice of the most appropriate procedure depends on the conservation objective; the PBR is accepted by ICES, it is state of the art for a depleted population, ICES also uses the PBR for data limited seal stocks*" Yes, the PBR has been employed in advice provide on seal stocks to Norway, when the operating model developed by WGHARP for calculating catch rates could not be employed due to poor data (see ICES Advice 2019). However, for future advice, it was noted that simulations of the PBR Framework will need to be run to ensure that the seal populations remain above a level of 70% of the maximum population size over a 15-year period, with 80% probability

4. However, as the PBR Framework estimated a threshold of 0.7 porpoises / year, which is essentially zero, this meets ASCOBANS general aim to ultimately reduce bycatch towards zero[46].
5. Within section 2.4, it would be worth including information on ASCOBANS recovery plan for the Baltic Proper harbour porpoise (Jastarian Plan) that has been agreed by contracting parties[47].

Section 4—Recommendations for the Baltic Proper Harbour Porpoise

Comments on the draft WKEMBYC text in Section 4 are provided below.

Page	Original Text	Comment
1	To put the abundance estimate into perspective, it can be compared to that of the neighbouring Belt Sea population, which was estimated to 42,324 animals (95% CI 23,368-76,658) in 2016…	This statement is somewhat misleading, because it is not known whether the Baltic proper ever showed similar abundance densities (see also (Koschinski, 2002).
1	It will not be sufficient to use pingers on all static nets as pingers reduce but to dot eliminate bycatches.	Should read: It will not be sufficient to use pingers on all static nets as pingers reduce but **do not** eliminate bycatches.
1	WKEMBYC recommends that the mortality limit of 0.7 animals per year is used an operational threshold,	… WKEMBYC recommends that the mortality limit of 0.7 animals per year is used **as** an operational threshold,…
1	…although the mortality limit of 0.7 animals per year will probably not be achieved by those measures alone.	This is a pure assumption based on what? There is also a contradiction to the next sentence that states "If the WKEMBYC measures would be implemented immediately and continued in the long term (a number of porpoise generations), they will likely be sufficient to allow the population to increase again,..
2	The recommendations have a strong focus on Natura 2000 sites	Reference the Table 17 from the WGBYC report summarising Natura sites here.
2	Moreover, Natura 2000 sites are frequently designated for specific habitats (e.g. reefs and sandbanks), that are key for the food chain and important for top predators such as the harbour porpoise.	On what information or references is this assumption based?
2	Only pingers which have thoroughly been tested and proven to unambiguously reduce bycatch should be used in implementing these measures.	Should include in this section, that pingers should be tested on other harbour porpoise sub-populations/populations if there is not opportunity to test those pingers on the Baltic proper population due to the rarity of the species in the region.

[46] https://www.ascobans.org/en/species/threats/bycatch

[47] https://www.ascobans.org/en/meeting/16th-meeting-jastarnia-group

	In regard to monitoring the status of the population it was noted "The best method to monitor any changes in the population status of the Baltic Proper population would be long-term acoustic monitoring of detection rates in key sites, combined with large-scale surveys of population abundance and distribution."	This should also include collection and sampling of both stranded and bycaught animals for health, life history and pollutant studies….
2	Data on fishing effort (Days at Sea) from the ICES Regional Database the year 2018 for gillnet and trammel net fisheries in the (summarized effort per ices rectangle for Baltic Sea) was analysed by WGBYC and their analyses were used in the development of recommendations.	This text needs to be updated to reflect all data used by WGBYC and how they were analysed. Perhaps I missed the info in the report. But it should be mentioned that the basis the is unfortunately quite weak. Because first, ICES-rectangles give in most cases much too broad spatial information for the relatively small N2000 areas. Secondly, effort of vessels smaller than 8 meters is in many cases not included. Secondly, VMS-Data are on a more finer geographical scale, but only available for vessel larger than 12 meter.
3	4.2 Draft bycatch mitigation recommendations for the Baltic Proper harbour porpoise population	This may be more appropriately entitled 'Evaluation and recommendations on proposed measures' This section could do with a short introduction stating its content and purpose.
3	Static nets with pingers or other acoustic devices should not be allowed	I could not find a justification or rational why pingers should not be allowed in this area? This needs to be fully justified in this section – and for each Natura 2K site
5	According to SAMBAH project, these five German sites (including the German site *Pommersche Bucht DE1552401*, designated under the Birds directive where according to the Standard Data Form harbour porpoise are also present) and two Polish sites are important as feeding habitats for the Baltic Proper harbour porpoise population during winter.	This seems to be an incorrect reference, because in the final report of the SAMBAH project, RGEMBYC could not find any reference to "important feeding habitats". There is another report from a project called BALHAB and commissioned by ASCOBANS, that analysed SAMBAH data with the aim to identify foraging habitats. However, there it is stated "We could not identify foraging areas within the high-density areas for harbour porpoises, which supports the theory that porpoises have to feed almost constantly and hence that porpoises occur where they can feed." (Kyhn et al., 2018)

5	The proposed fisheries measures within this cluster of sites would lead to a decreased bycatch risk and therefore have a positive effect on the Baltic Proper harbour porpoise population.	If these areas are not characterised by higher concentrations than the adjacent areas or otherwise are important for the life cycle, it is questionable whether their closure will have an overall positive effect on the harbour porpoise population.
5	For the two Polish Natura 2000 sites *(Ostoja na Zatoce Pomorskiej* as well as *Wolin i Uznam),* conservation measures, including fisheries management measures, have not been decided in a management plan yet. Using pingers instead of full static net closures during November-April, could also be considered.	These measures for the set of German and Polish protected areas make no sense at all. Firstly, it does not explain why, in the German areas, fishing with gillnets should be completely banned in the months from November to April, while in the directly adjacent Polish area, it is also proposed that fishing should continue, but then only with pingers attached. It can hardly be a scientific argument that no measures have yet been adopted in Polish territory? Moreover, the same applies to the German areas, where no measures have been adopted either, but no mention is made of this.
7	This proposal is based on historical data (20th Century) collected by the Hel Marine Station	Timeframes should be included here to note that some of these data are from the recent past. As noted in Annex C on the Polish study most cases of bycatch were reported in the 1990s.
8	*During May-October, prohibit the use of static nets without the simultaneous use of pingers in the EU waters between the southwestern management border proposed by Carlén et al. (2018) (a line drawn from island of Hanö, Sweden, to Jarosławiec near Słupsk, Poland) and a line drawn…*	This rather complex description of spatial fisheries measures should definitely be illustrated on a map. This may be shown appropriately in Figure 4.1? If so, that figure should be reference here.
9	However, the recommended bycatch mitigation measures need to be continued for a long time.	In this context, was it also discussed that measures may need to be adapted if new data indicate that this is appropriate? For example, because the measures do not result in positive developments in the population?
9	The proposal in Annex 7 to cover bycatch monitoring by 100% of static net fishing effort over almost the entire Baltic Sea is very ambitious and challenging to implement this solution in six months' time.	It should be included here how many boats they are taking about.
9	Points c) monitoring response of the fishing fleet & d) compliance control	These seem to be two sides of the same coin, so the two points could be combined.
9	In this respect it is important to rule that the devices must be fully operational while nets are in the water, in order to allow sanctioning of infringements detected during inspections.	This demand seems exaggerated and also difficult to grasp legally. How is a fisherman supposed to ensure that a pinger works over a long period of up to 48 hours? And how is a violation of this requirement to be legally proven?

10	Genetic sampling of all stranded and by-caught harbour porpoises east/south of the Darss and Limhamn Ridges	Continued sampling of Belt Seas porpoises is also required for assessing evidence of movements in the wider Baltic during the breeding seasons or reproductive isolation of the (sub)population.
9-10	ICES WKEMBYC RECCOMENDS	These recommendations should be put into context of the Actions outlined in ASCOBANS Jastarian Plan and recent recommendations from the group. Also these two pages of recommendations may be better suited in a separate section on monitoring and further research recommendations.
11	A major reduction of the main pressures should allow the harbour porpoise population to achieve PBR close to zero and an improvement of the conservation status, while a few limited measures are not likely to be sufficient.	RGEMBYC don't think it can be stated that essentially zero anthropogenic mortality / year is achievable. It was noted in section 2.4 of the WKEMBYC report that "The group concluded that the zero bycatch aim cannot be reached even combining all the measures"
11	It is assumed that during the past 20 years, the bycatch pressure on the Baltic Proper harbour porpoise population has declined, as the static net fishing effort has declined significantly. According to the RDB data (ICES Regional Database), the static net fishing effort in ICES Subdivisions 24 to 32, has decreased by 45% over the past 10 years (from 2009 to 2018).	This is an important observation that could be made further ahead in the text, before the measures are presented. For against this background of a general reduction in fishing effort, it is already possible to discuss whether some of the proposed measures are really necessary to this extent. This is because some of the figures presented on the presumed bycatch rates are based on earlier, much higher fishing effort. Also, while bycatch pressure/bycatch rate may be reduced due to lower fishing effort and lower density of porpoises, does not mean that the impacts from fisheries are less on a critically endangered sub-population. As shown with the PBR estimate of 0.7 animals/year.
13	Political costs	Is this term defined in this text and is it used in the correct meaning?
13	Possible increase of bycatch outside closure area with similar porpoise density by relocation of fishing effort if higher porpoise density outside the closure area and ef-	Apart from the fact that the phrase is not clearly formulated (similar or higher density?), it is true that possible positive effects of shifting fishing effort outside (small) protected areas can be neutralised if the densities of harbour porpoises inside the areas are not significantly higher than those outside (see above).

14	Target fish stocks recover in the closure area, spillover effect (even more likely if area or parts of it are closed for all fisheries)	This is an old argument, but still hardly proven for temperate latitudes. At least for the Baltic Sea there is almost no evidence, at least not for most commercially important stocks.
19	Annex C: *Additional studies and information on acoustic monitoring … provided after the WKEMBC workshops.*	If this data was only made available after the workshop, can it be part of this report?

Comments on WGMME report (Annex 6)—relating to the Baltic Proper Harbour Porpoise

1. Limited information has been published on this species from the Baltic proper regarding actual impacts of threats and pressures, due to the rarity of this species in the region. The NAMMCO-IMR (revised 2020) report on harbour porpoises in the North Atlantic includes an assessment area report for "the Baltic Proper" in Annex 10[48]. This assessment area report summarises available information on the impacts from other indirect (sub-lethal) pressures - information that is also contained within the ASCOBANS Jastarian plan[49]. In the context of EU request, it would also be good to summarise the work undertaken by the ASCOBANS Jastarnia Group overseeing the implementation of the recovery plan for the Baltic Proper harbour porpoise. Including the Research and Mitigation Actions agreed by contracting parties and current recommendations by the group. Additionally, the report should include the latest version of the ICES threat matrix, with additional text explaining the matrix and how the WG came to those conclusions for the Baltic Proper harbour porpoise – latest version of ICES threat matrix included below.
2. In the report text it was noted "*Given the number of strandings recorded by Poland and Sweden, the minimum bycatch mortality would be 5-10 individuals per year, which would represent an annual loss of at least 1-2% of the best population estimate*." For the summary of strandings along the Polish and Swedish coastlines that this information is based on, is there any information on seasonality in strandings or bycatch events? Due to fact that porpoises from the Baltic proper and Belt Sea mix during the winter.
3. One of the main recommendations that should arise from this report is the collection of biological material from stranded (and bycaught) animals wherever they occur due to limited contemporary information on life history, health status, pollutant levels, diet, etc. Of the 14 porpoises that were reported stranded along the Polish coastline in 2018, were samples collected from these individuals? The same for porpoises in Swedish waters in recent years?
4. The PBR estimate of 0.7 for the Baltic Proper harbour porpoise that was published in the NAMMCO-IMR workshop report (revised 2020), is a revised estimate and differs to the estimate published in the May 2019 NAMMCO-IMR report – as cited in the NGO document Fisheries Emergency Measures for the Baltic Sea harbour porpoise. This might be worth clarifying in the text.
5. With regard to the statement cited in WGMME "However, it should be noted that a subsequent workshop in 2019 concluded that "the Tromsø WS did not have sufficient

[48] https://nammco.no/wp-content/uploads/2020/03/final-report_hpws_2018_rev2020.pdf

[49] https://www.ascobans.org/en/meeting/16th-meeting-jastarnia-group

time to perform in-depth reviews and that further analysis was required to de-liver formal assessments for providing management advice" (NAMMCO 2019)." This largely pertains to the application of the modelling work that was undertaken at the workshop. The workshop tried to assess each assessment area using a population dynamics model. However, for the Baltic Proper harbour porpoise there were insufficient data to run a population dynamics model. So, the working group fell back on using the PBR for those situations - to get an idea of how the assessment area was doing.

6. For the Baltic proper harbour porpoise this meant just applying the simple PBR equation as per Wade (1998) and using a Fr of 0.1 as the sub-population is critically endangered.

Table 4. Threat matrix for the Baltic Sea.

Baltic Sea			HARBOUR PORPOISE	GREY SEAL	HARBOUR SEAL	RINGED SEAL
POLLUTION & OTHER CHEMICAL CHANGES	Contaminants		H	H	H	H
	Nutrient enrichment		L	L	L	L
	Microplastics		Risk of contamination leading to ill health or death possible, but no evidence of to date			
PHYSICAL LOSS	Habitat loss		L	M	L	H
PHYSICAL DAMAGE	Habitat degradation		M	M	M	H
OTHER PHYSICAL PRESSURES	Litter (including plastics and discarded fishing gear)		L	L	L	L
	Underwater noise	Military Sonar	H	L	L	L
		Seismic surveys	H	L	L	L
		Pile-driving	M	L	L	L
		Explosions	H	L	L	L
		Shipping	M	L	L	L
	Barrier to species movement (offshore windfarm, wave or tidal device arrays)		L	L	L	L
	Death or injury by collision	Death or injury by collision (with ships)	L	L	L	L
		Death or injury by collision (with tidal devices)	Tidal devices do not exist in the region			
BIOLOGICAL PRESSURES	Introduction of microbial pathogens		L	L	L	L
	Removal of target and non-target species (prey depletion)		M	M	M	M
	Removal of non-target species (marine mammal bycatch)		H	M	M	H
	Disturbance (e.g. wildlife watching)		L	L	L	L
	Deliberate killing + hunting		Does not take place within the region	M	M	M

Comments on WGBYC report (Annex 7)—relating to the Baltic Proper Harbour Porpoise

1. In general, WGBYC did provide a thorough overview of the available data and information about the population, fishing effort and bycatch rates. The group highlighted some important points: The sub-population of harbour porpoise in the Baltic Proper is critically endangered; bycatch events of the Baltic Proper harbour porpoise are extremely rare due to their low abundance and monitoring effort is low; fishing effort is dominated by gillnets accounting for up to 75% of fishing effort (in Days at Sea).
2. In the absence of available better data, the conclusion of WGBYC seems appropriate to use the PBR limit to evaluate the status of the Baltic Proper porpoise. The limitations of this approach are mentioned, e.g., are several sources of uncertainty in the estimated mortality limit; the bycatch and abundance estimates and the estimated population growth rate. It is also highlighted that the conservation objective used in the PBR calculation does not entirely reflect those in EU legislation.
3. WGBYC has correctly stated that most Natura 2000 sites (except *Hoburgs Bank och Midsjöbankarna*) have been designated for other qualifying features (species, habitats) for protection, and harbour porpoises have been added, often based on limited or op-

portunistic information on their occurrence. However, the generally made reverse conclusion that many areas that are important for harbour porpoises have not been designated as Natura 2000 sites is merely a presumption. Only in Sweden several new or extended Natura 2000 sites for harbour porpoises were proposed based on data from the SAMBAH project.

4. There are also places where the group tends to over interpret anecdotal evidence or pure assumptions. For example, it is correct to note that most Natura 2000 sites are small and located in coastal areas. However, whether it is sufficient to link these areas with other areas where protection measures are also being taken to improve the overall protection of harbour porpoises is a matter of pure conjecture.
5. The proposed measures take too little account of the fact that the data for the extrapolated bycatch rates are based on older data from a neighbouring sea areas, , while fishing effort has decreased considerably in recent years, down to half, and for some metiers and areas even more so.
6. From the six measures proposed by WGBYC to protect the critically endangered Baltic Proper harbour porpoise sub-population, only three of them are "protection" measures, while the other three are guidelines to improve bycatch monitoring and management. The group states correctly that decreasing the overall bycatch numbers by conservation measures depends on the spatiotemporal extent of each measure and the overlap of porpoise occurrence and density (which is uncertain in most areas) and fishing effort in métiers which pose a bycatch risk to the species. So, the problem still is that knowledge about porpoise occurrence and density is uncertain in most areas. Therefore, the statement is also correct that it is difficult to assess the potential benefit to the population especially for measures which have a small spatiotemporal extent (such as closures of small Natura 2000 sites). Only for an area off the Swedish coast detailed bycatch risk maps are available.
7. The assumption that a reduction of fishing effort in the area *Oderbank* designated under the Birds Directive would "likely have a significant effect on the [sub-]population" could not be followed, since occurrence of individuals was only detected during some winter months and is only assumed to be an unknown proportion of the whole sub-population with low possibility of detection as found during the SAMBAH project.

Comments on individual text passages

Page	Original Text	Comment
3 & 64	Harbour porpoises are also caught in bottom and midwater otter trawls (OTB, OTT and OTM) as well as in midwater pair trawls (PTM).	Is there any prove that the animal was really bycaught or perhaps already dead?
4	In the Baltic overall, gillnet fishing effort has decreased by 44% over the past 10 years.	Did WKEMBYC check in detail on the fact, that then the assumed bycatch figures derived by NAMMCO in 2018, are not valid any longer? All this is based on an indirectly derived figure of the highest bycatch rate observed in the Belt Sea with much higher densities.

4	Fishing effort within these sites is low and so whilst closure of fisheries within them would reduce bycatch risk to some extent, it is unlikely to make a significant contribution to the improvement of the population status.	RGEMBYC is not sure whether this finding was taken sufficiently into account by WKEMBYC when coming up with recommendations for measures.
4	Most of the Natura 2000 sites suggested in the Annex are small and cover mainly coastal areas. However, if these areas could be considered as interconnected with an area in between (not designated for harbour porpoise) these would form a rather large area within which measures could be taken.	This seems to be an assumption, not based on any findings? In addition, even then, would porpoises restrict their migrations to these areas, are there sufficient proves from the SAMBAH project?
4	The NGOs propose 100% coverage of gillnet fishing effort to observe bycatch over almost the entire Baltic Sea. WGBYC conclude that this is very ambitious or even impossible and could not be implemented within the six-month time window of the measures. It also questionable whether the resource needed justifies the end given the rarity of porpoise bycatch events.	This discussion falls too short, because it ignores that with REM (and a stratified approach) that might be achieved on much lower costs. In addition, even if bycatch events so rare, may be missed with _100%_ "observer" coverage.
64	Depending on the observer protocol and procedures adopted, bycaught animals falling out of the net during hauling (see, for example, Kindt-Larsen et al., 2012) may be overlooked, which may also produce additional downward bias. Furthermore, focusing attention on monitoring of commercial fish instead of protected species may also result in the reporting of false zeroes. For example, the full fishing operation might not have been monitored if the observer is below deck focusing upon sorting and measuring fish while the next trawl is being hauled.	At least for small gill net vessels with their open decks this is quite unrealistic. This might be valid for larger vessels fishing with OTM and PTM, but even on those vessels the risk at should be small, least in the Baltic, because these vessel target mainly herring or sprat that is not sorted under deck.
66	Overall, gillnet fisheries targeting cod, which is the dominant fisheries, in the southern and central Baltic have decreased by 80 % since 2006.	These findings should be mentioned further up in the report.

69	Figure 30. Data on fishing effort (Days at Sea) from the ICES Regional Database summarized effort per ices rectangular for the year 2018 for gillnet and trammel net fisheries.	It should be added what the four panels show – quarter of the year? And why is only one year showed, whereas in the next figure data for two years, and not per quarter are shown?
70	Figure 31. The summarized VMS data per ICES rectangle and year from 2016 until 2017 for gillnet and trammel net fisheries.	The caption should be corrected, because VMS data per C-Square are shown here.
73	To conclude, gillnets constitutes the main fishing effort in terms of DaS in the Baltic. These are concentrated in the southern Baltic along the German and Polish coasts. Gillnet effort for cod has significantly decreased since August 2019 in the southern Baltic due to the cod ban. In the Baltic overall, gillnet fishing effort has decreased by 44% over the past 10 years. Also trawl fisheries is focused in the southern Baltic. Neither gillnet fisheries nor trawl fisheries occur in any larger extent in the areas especially designated for harbour porpoise *(Hoburgs Bank och Midsjöbankarna).*	It can be asked and should be discussed in more detail whether under these conditions some of the proposed measures are really needed? The indirectly derived figure for bycatch rates *(using data from another population with much higher densities) is based on outdated fisheries effort data, because the actual fishing effort has decreased over the last 10 years by nearly 50%.* *In addition, measures are proposed for areas where the fishing effort is low.*
81	The description of the *NSG Pommersche Bucht-Rönnebank* (Bildstein et al., 2020) emphasises its importance for harbour porpoises: "The nature conservation area represents an important winter refuge for harbour porpoises of the population of the central Baltic Sea. In addition, the protected area is an important feeding and migration habitat for both the endangered population of the Central Baltic Sea and the populations of the Western Baltic Sea, Belt Sea and Kattegat".	The quotation reproduced here is more an assertion than a finding justified by the data. The mere observation of the occurrence of a few acoustic signals during the winter period does not tell us anything about whether this area would be of greater importance to the population than the neighbouring areas.
81	The SCI *Erweiterung Libben, Steilküste und Blockgründe Wittow und Arkona* (DE1345301) has been designated in 2009. The management plan concludes that for the harbour porpoise, the SCI is important as a feeding habitat and migration area. Furthermore, it is assumed	The mentioning of the breeding habitat is misleading here, because this is valid for the Belt Sea Population, only, as most of the sightings occurred during summer.

	that the SCI is also relevant as a breeding habitat for harbour porpoises. A reduction of the incidental bycatch is recommended (STALU, 2019b).	

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Part 4. Annex A.

Table 1. Approaches to setting bycatch limits for common dolphins. Taken from Murphy et al. (2019)

Approach	Pros	Cons
Percentage of abundance	Easy to assess – compared to maximum net productivity rate if known (and should be less than the maximum net productivity rate)	Harbour porpoise “1.7% of best population estimate” assumes a single stock with more or less independent dynamics assumed a maximum annual rate of increase of 4%, and did not incorporate any biological information on the species Does not incorporate uncertainty in estimates of population size or bycatch Does not include natural mortality
	Incorporates uncertainty in estimates of population size Incorporates a recovery factor (if unknown status, a recovery factor of 0.5 is used)	Uses only a single current value of absolute population size N_{min}; though in a model-based approach N_{min} is based on estimates of abundance from all previous surveys and Bayesian methods (Moore and Barlow, 2014). Does not incorporate estimates of bycatch Does not include natural mortality
Catch Limit Algorithm (CLA) approach*	Incorporates estimates of population size and bycatch Incorporates uncertainty in estimates of population size and bycatch Estimates relative population level (depletion) and allows implementation of a “protection level” below which limits to removals can be set to zero. This can shorten recovery time to target population levels. More conservative than PBR Safe by-catch limits can be calculated for multiple MUs for a species	If a time series of data on population size and bycatch rates are unavailable, it performs similar to the PBR Does not include natural mortality

***Developed as part of SCANS-II project and based on the framework for the IWC RMP (Winship et al., 2009).**

Table 2. Annual estimates of total bycatch of common dolphin Delphinus delphis in ICES areas VI, VII & VIII (1990–2009). Extracted from Murphy et al. (2013)

Fishery	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Driftnets																				
Irish, UK & French tuna[a]	243	390	608	1347	1580	666	546	947	1706	2101	1589	0	0	0	0	0	0	0	0	0
Pelagic trawls																				
French and Irish tuna[b]														133[50]						
French tuna (ICES VI, VII, VIII)[c, d, e, f, g]					95[51]												60	13	120	900
French sea bass (ICES areas VII and VIII)[b, c, d, f, h]					25[16]									489[52]				290[53]	300	
French sea bass (ICES areas VII)[e, g]																				40
French sea bass (ICES areas VIII) [e, g]																				300-400
French pelagic trawl (ICES area VIII) (various species)[g]																				13
French mid-water otter trawl (ICES AREAS IV, VII, VIII) (bass, scad, mackerel, herring and sardine)[F] -																	57			

[50] Data from France were from 2003, and data from Ireland were from 2004

UK sea bass (ICES IIV.1 and ICES IIV.2)[54 i, j, k, l]			190	38	115	439	139	84	50-100[55]	[56]	4[57]
Dutch horse-mackerel[c]		101[16]									
French hake pelagic trawls[c]		203[16]									
Spanish blue whiting[m]			394	394							
Other fisheries											
Irish & UK bottom-set gillnets (Celtic Sea)[n]	234										
UK set-net and tangle fisheries (ICES area VII)[i, k, l, o]							253	554	114	594	237

[51] Bycatch data obtained by the EU BIO-ECO project see Morizur et al. (1999) for further information, and extrapolated by Tregenza and Collet (1998) - although these values are only a rough estimate of actual bycatch, due to poor sampling during the project as a result of low observer coverage in France.

[52] French bass fleet effort for the 2003-2004 winter season (Oct 2003-Sept 2004), including some striped and Risso's dolphins.

[53] Revised estimate.

[54] Not annual data but fishing season, starting from 2000-2001 winter season.

[55] Pinger trial commenced, which continued until the 2008-2009 fishing season.

[56] Fishing effort low, and no observations carried out.

[57] All (46) hauls in this fishery were observed.

French set-nets (Bay of Biscay)[f, h]																				100	
Spanish hake set-nets (ICES VII and VIII)[g, h]																				23	773
Total minimum annual estimate	243	390	608	1581		2004	666	546	947	1706	2101	1589	584	432	737	439	392	755	492	1137	2317

a: (Rogan and Mackey, 2007)); b: (Northridge et al., 2006)); c: (Tregenza and Collet, 1998; Berthou et al., 2008; Demaneche et al., 2010; ICES SGBYC, 2010; ICES WGBYC, 2011)); h: (Tregenza and Collet, 1998; Northridge et al., 2006; Berthou et al., 2008; ICES, 2010; ICES SGBYC, 2010)); i: (SMRU, 2008; Northridge and Kingston, 2009; SMRU, 2009; Northridge and Kingston, 2010)): m:(Fernández-Contreras et al., 2010)); n: Tregenza et al. (1997); o: (Northridge et al., 2007; SMRU, 2008; 2009; Northridge and Kingston, 2010)).

WGSFDGOV report to the attention ADGBYC

Background

ICES received a special request from DGMARE to

(1) review the conservation status and threats to populations of common dolphin in the Bay of Biscay and harbour porpoise in the Baltic Sea,

(2) evaluate whether the measures described in the request are necessary and appropriate and in case they are not,

(3) advise on alternative measures to ensure a satisfactory conservation status of these stocks in the context of EU law (2013/1380 and 2019/1241).

Request to WGSFDGOV

As part of the process to answer the request, WGBYC and WKEMBYC have produced maps of fishing effort (mW-hours) by quarter and for several metiers in the Baltic and the Bay of Biscay using ICES VMS and logbook data (annex and WKEMBYC report). WGSFDGOV has been asked to review the maps and report to the ADGBYC (4-6 May) if they can be used for advice. WGSFDGOV met by correspondence 29 April 2020 to analyse the maps. The main topic of discussion was whether the data to be published is compliant with the latest ICES VMS and logbook data call and more specifically with the preservation of the vessel anonymity of the advice outputs.

Discussion by WGSFDGOV

Main comments

The advice outputs are four maps (see appendix A) with color-coded information of the fishing effort. The data is aggregated across all the vessel fleet so no information or details of the vessel are provided.

Underlying data supporting the maps will not be published.

WGSFDGOV concludes that the data presented is aggregated at a level that do not compromise anonymity of vessel id and hence supports the publication as advice output.

WGSFDGOV recommends WKEMBYC-WGBYC to publish the maps and provide a raster vector layer (collection of pixels with geolocation but not direct information or ID) if requested

Specific comments

Mistake in caption in Fig. 31. Resolution is not at ICES statistical rectangle but at c-square level.

Appendix A: Draft figures from WKEMBYC

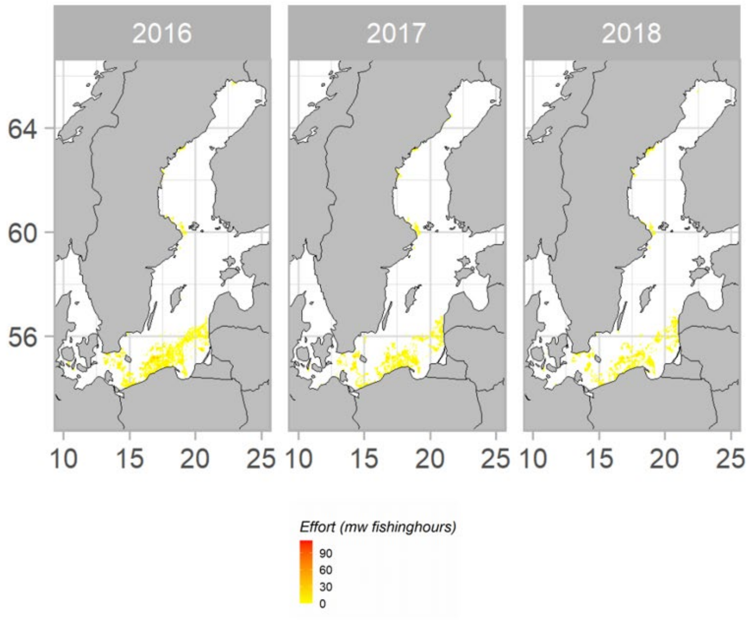
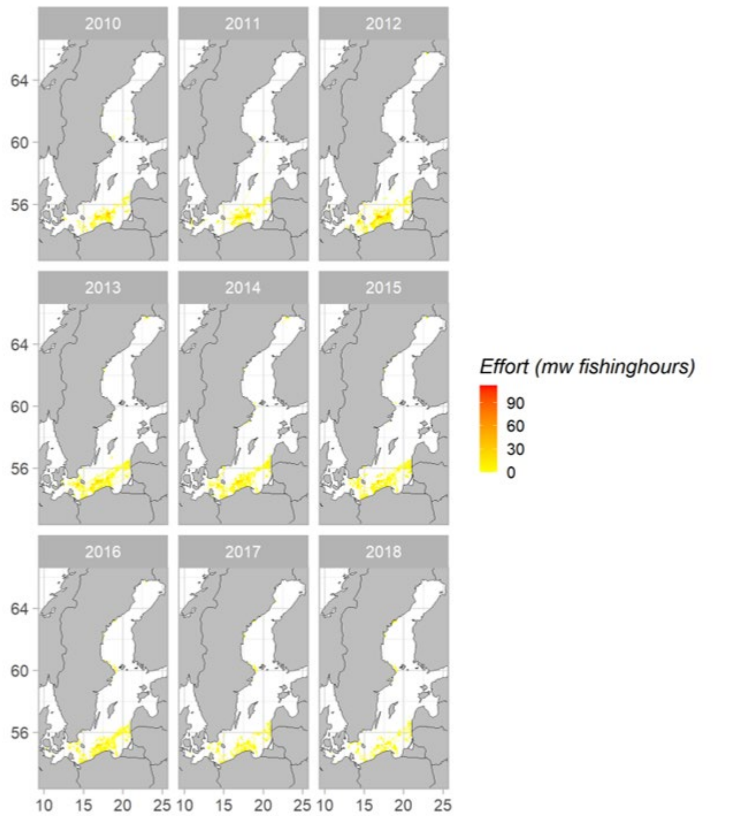
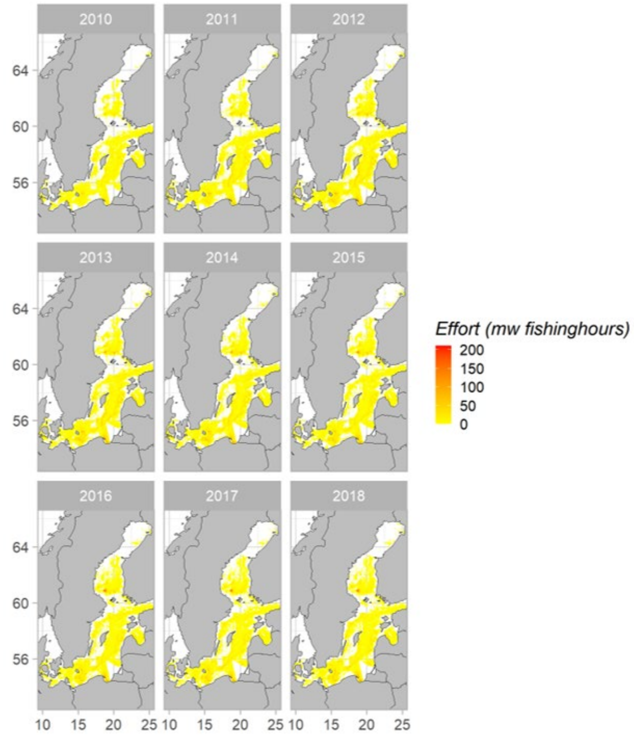


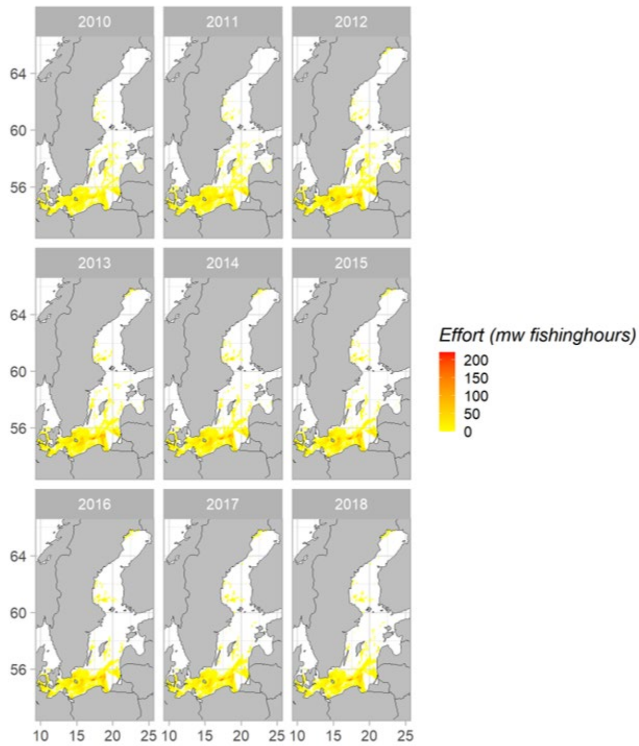
Figure 31. The summarized VMS data per ICES rectangle and year from 2016 until 2017 for gillnet and trammel net fisheries.



Baltic gnsVMS



Baltic midwater VMS



Baltic otter VMS

Appendix B: List of participants

1. Christian von Dorrien (chair)
2. Josefine Egekvist
3. Jens Rasmussen
4. Lena Szymanek
5. Neil Campbell
6. Roi Martinez
7. Neil Holdsworth.
8. Colin Millar
9. Lara Salvany