

EU request on mitigation measures to reduce bycatches of common dolphin (*Delphinus delphis*) in the Bay of Biscay (ICES Subarea 8)

Advice summary

This advice concerns the evaluation of mitigation measures to reduce bycatch of the common dolphin only in the Bay of Biscay (ICES Subarea 8), in order to facilitate direct comparison with previous advice (ICES, 2020a). Advice released earlier this year evaluated the same mitigation measures in scenarios applied to both the Bay of Biscay and Iberian waters (ICES, 2023).

ICES concludes that, taking into account data from 2019–2021 and bycatch mortality estimates based on strandings data, none of the fifteen proposed mitigation scenarios can reduce bycatch of the common dolphin (*Delphinus delphis*) in the Bay of Biscay below the potential biological removal (PBR) limit.

ICES reaches the further conclusion that, based on data from 2019–2021 and bycatch estimates derived from at-sea monitoring data, six of the fifteen proposed mitigation scenarios are likely to reduce bycatch of the common dolphin below the PBR limit. Two mitigation scenarios made it possible to reduce estimated bycatch to less than 75% of the PBR, while none could reduce bycatch to less than 50% of the PBR. This is in contrast with previous results based on 2016–2018 data, and reflects greater bycatch estimates in the recent period; these are partly due to improvements in the knowledge base (including métiers covered by at-sea sampling and more accurate assignment of effort to different métiers), and changes in the distribution of common dolphin within the Bay of Biscay.

ICES notes that uncertainty surrounding the extent to which the species is distributed, and of its abundance dynamics, are of concern. Availability of bycatch estimates for the species' entire distribution range, and evaluation of mitigation measures at the same scale, would also increase confidence in the evaluation of the mitigation measures performance.

Given the low observation rates in several métiers of concern, ICES reiterates persistent issues in data quality, representativity, and coverage to inform bycatch assessments. ICES recommends enhanced monitoring to assess the effectiveness of management measures (including pinger use) and to augment precision in bycatch mortality estimates of common dolphin.

Request

DGMARE Special request to ICES:

Concerning common dolphin in the Bay of Biscay, ICES is requested to:

- *evaluate whether the scenarios described in the ICES advice of 26 May 2020* are still valid taking into account the data from 2019-2021.*
- *update the scenarios taking the most recent data of 2019-2021 into account, including the updated total effort. This updating should include any results of current mitigation trials, to the extent that ICES considers these reliable. At-sea monitoring data and strandings based estimates should be included in this work, where possible. The same thresholds, as developed at WKEMBYC 2020 and reflected in the ICES advice of 26 May 2020, should be used.*

The latest ICES advice of 26.5.2020 on dolphins in the Bay of Biscay is limited to an analysis of data reported by Member States until 2018, while the Commission would require an analysis of more recent data.

* ICES. 2020. EU request on emergency measures to prevent bycatch of common dolphin (*Delphinus delphis*) and Baltic Proper harbour porpoise (*Phocoena phocoena*) in the Northeast Atlantic. In Report of the ICES Advisory Committee, 2020. ICES Advice 2020, sr.2020.04. <https://doi.org/10.17895/ices.advice.6023>

Elaboration on the advice

Common dolphin in the Bay of Biscay

Common dolphins in the Northeast Atlantic are considered a single panmictic population that ranges from Northwest Africa to Norway and west at least to the Mid-Atlantic ridge. Abundance estimates rely largely upon the SCANS surveys of July 2005 (supplemented by an offshore CODA survey in July 2007), and July 2016 (with abundance estimates from the latest one [SCANS-IV] in summer 2022 not yet being available [ICES, 2022]). Large-scale and regional surveys indicate important movements within the species' range both seasonally and from year to year. The surveyed areas are smaller than the assessment unit for this species (Figure 1); therefore, the overall size of the eastern North Atlantic population remains unknown. In 2020, ICES used a total estimate of 634 286 (95% confidence interval [CI]: 352 227–1 142 213) common dolphins to estimate potential biological removal (PBR) in scenario evaluations (ICES, 2020a). This estimate was derived from the 2016 surveys, which were largely focused on shelf areas.

Based on international surveys, primarily taking place in the summer months, the Bay of Biscay and Iberian Coast ecoregion is where common dolphins are considered most abundant. Based on at-sea monitoring data for bycatch collected year-round, bycatch also appears to be highest in this ecoregion. The species, however, also occurs beyond this ecoregion (Figure 1), where it is subject to bycatch that has not been fully quantified. Therefore, because the PBR calculation is for the whole assessment area, it should be considered that the bycatch estimate for the Bay of Biscay and Iberian Coast is an underestimation of the total bycatch when comparing with PBR objectives. This advice includes bycatch mortality calculations for divisions 8.a–d and 9.a and the French coast of Division 7e, while mitigation scenarios are calculated for divisions 8.a–d only, to facilitate direct comparison with previous advice from 2020 (ICES, 2020a).

The efficacy of mitigation scenarios proposed in ICES (2020a) for meeting long-term management goals and candidate management objectives were reassessed. Scenarios and methods remained unchanged to ensure comparability between both evaluations. As in 2020, ICES used the potential biological removal (PBR) algorithm to estimate the level of anthropogenic mortality that would allow the population to be maintained at or above 50% of its carrying capacity 95% of the time. This was used as a quantitative measure of the limit bycatch mortality that might threaten the conservation status of the species (EU, 2019), and to define a candidate management objective consistent with the management goal of ensuring the "long-term viability" (EU, 2017) of the population. Given the uncertainties around the bycatch estimates and common dolphin abundance data, ICES also considered four additional bycatch mortality limits (ICES, 2020a) corresponding to varying levels of precaution:

- less than 75% of PBR (least precautionary, though more precautionary than the PBR limit);
- less than 50% of PBR (precautionary);
- less than 20% of PBR (more precautionary);
- less than 10% of PBR (most precautionary).

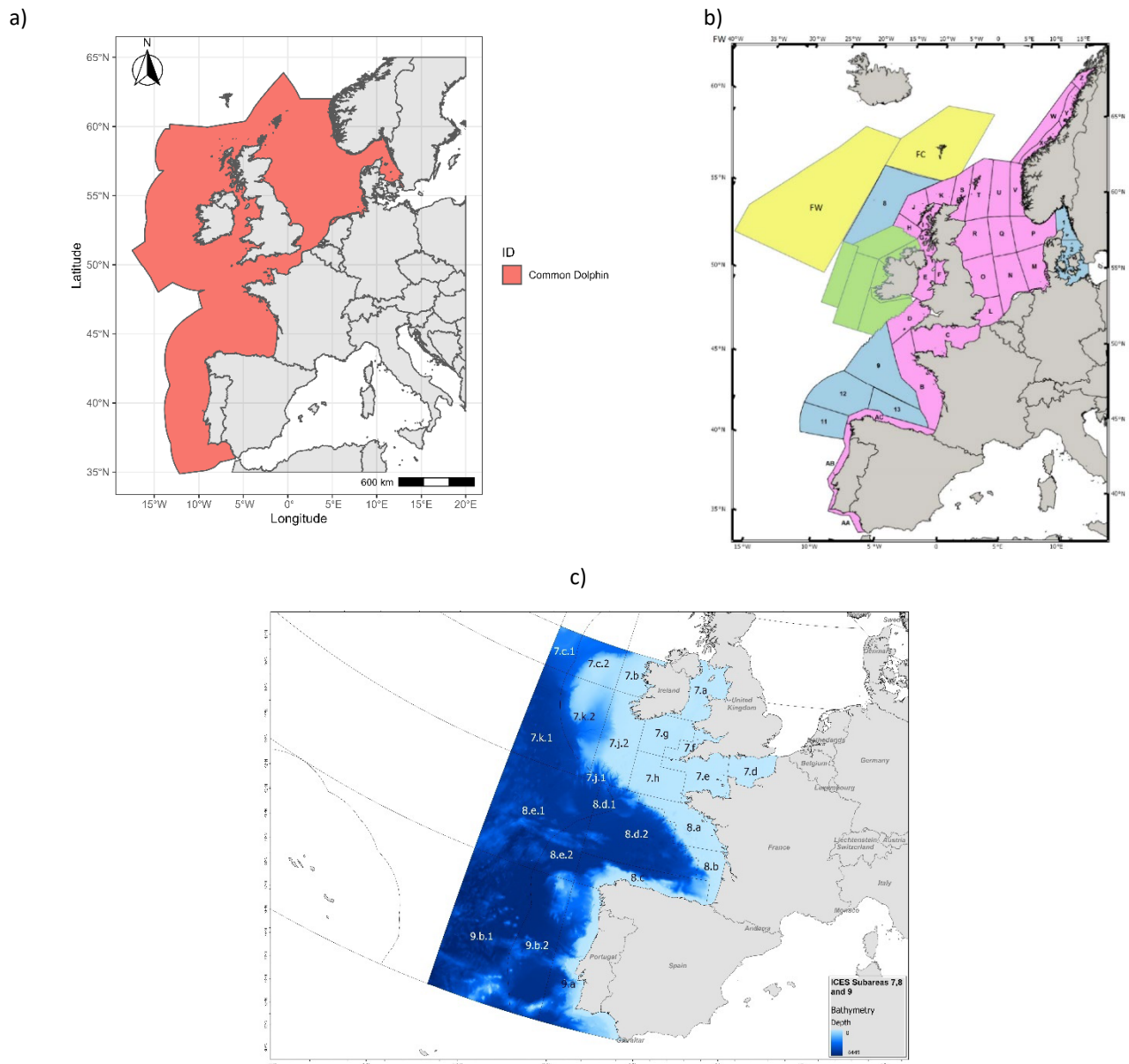


Figure 1 Maps showing a) the common dolphin assessment unit (Source: ICES, 2021); b) SCANS-III & Irish ObSERVE Survey Area upon which abundance estimate is based (Source: Hammond *et al.*, 2021); c) ICES subareas 7, 8, and 9 with bathymetry.

Less than 20% of PBR was calculated that equates to the mPBR (modified PBR) which was recently developed and agreed by OSPAR (OSPAR, 2021). Reducing bycatch to less than 10% of PBR was used as a quantitative interpretation of the more precautionary management goal to “minimise and where possible eliminate” bycatch (EU, 2019), while acknowledging that this may be insufficient to meet the requirements of strict protection under Council Directive 92/43/EEC (EU, 1992). The development of these candidate management objectives was necessary to enable a quantitative interpretation of the EU legislation, but the objectives may be insufficient to meet the legislative requirements.

It is important to note that the reduction of fishing effort for métiers of concern as implied by the various scenarios is not redistributed or displaced within the assessment unit either spatially or temporally. Furthermore, ICES has not evaluated the consequences of large reductions in fishing effort for some métiers in ICES Subarea 8 implied by all scenarios, neither in terms of potential effort redistribution towards other gears nor in terms of socio-economic impacts.

The use of pingers has been mandatory for French PTM/OTM/PTB vessels > 12 m in the first four months of the year since 2020 (Arrêté du 26 Décembre 2019[†]) and year-round for all French PTM/OTM/PTB since 2021 (Arrêté du 27 Novembre 2020[‡]) in ICES divisions 8a-d. Since 2020 the use of pingers has been mandatory for all Spanish trawlers while operating in ICES Subarea 8 and the northern part of Division 9.a (Orden APA/1200/2020)[§]. All bycatch mitigation scenarios assume full compliance with pinger use on all such métiers and correct use of pingers in all cases. As a result, no additional pinger related reduction in bycatch rates were applied to these métiers. Scenarios combining temporal closures and pinger use will therefore result in identical bycatch estimates as those scenarios considering temporal closures only in a number of cases (scenarios A/M, C/L, D/H, and O/N).

Fifteen mitigation scenarios (A to O; Table 1) were explored to identify mitigation measures and resulting reduction of annual common dolphin mortalities for each of the five candidate management objectives described above (Table 2) in ICES Subarea 8.

- a) None of the scenarios considered resulted in a reduction in the annual common dolphin mortality to less than 50% of the PBR (and therefore neither to 20% or 10%) for mortality estimates derived from either at sea sampling or strandings (Table 2).
- b) None of the scenarios considered resulted in a reduction in the annual common dolphin mortality to less than **75% of the PBR** for mortality estimates derived from both at sea sampling and strandings.

The following measures resulted in a reduction in annual common dolphin mortality to less than **75% of the PBR**, for mortality estimates derived from at-sea sampling only (Table 2):

- Scenario O (three-month closure [Jan–Mar] + one month closure [mid Jul–mid-Aug] all métiers) and scenario N (scenario O + pinger PTM/PTB rest of year).
- Scenario A (four-month closure [Dec–Mar] all métiers) and scenario M (scenario A + pinger PTM/PTB rest of year).

- c) None of the scenarios considered resulted in a reduction in annual common dolphin mortality **below the PBR** for mortality estimates derived from both at-sea sampling and strandings.

The following measures resulted in a reduction in annual common dolphin mortality **below the PBR** value, for mortality estimates derived from at-sea sampling only (Table 2):

- Scenario C (two-month closure [mid-Jan–mid-Mar] all métiers) and scenario L (scenario C + pinger PTM/PTB rest of year).
- Scenario D (six-week closure [mid-Jan–end of Feb] all métiers) and scenario H (scenario D + pinger PTM/PTB rest of year)
- Scenario B (annual effort reduction of 40% all métiers).
- Scenario G (pinger PTM/PTB all year and same six-week closure all other métiers)

Mitigation measures applied for Subarea 8 only are much less efficient than if implemented in a larger area that includes Subarea 8 and Division 9.a (ICES, 2023a).

The evaluation of the performance of different mitigation measures is sensitive to the current uncertainties in bycatch estimates (all scenarios), and to the timing of the peak dolphin mortality (scenarios D/H, and G). In all scenarios it is also

[†] Arrêté du 26 décembre 2019 portant obligation d'équipement de dispositifs de dissuasion acoustique pour les chaluts pélagiques dans le golfe de Gascogne. NOR : AGRM1928574A. JORF n°0302 du 29 décembre 2019. Texte n° 98. <https://www.legifrance.gouv.fr/jorf/id/JORFTEXT000039686029> in French.

[‡] Arrêté du 27 novembre 2020 portant modification de l'arrêté du 26 décembre 2019 portant obligation d'équipement de dispositifs de dissuasion acoustique pour les chaluts pélagiques dans le golfe de Gascogne. NOR : MERM2033160A. JORF n°0292 du 3 décembre 2020. Texte n° 54. <https://www.legifrance.gouv.fr/jorf/id/JORFTEXT000042602319> in French.

[§] Orden APA/1200/2020, de 16 de diciembre, por la que se establecen medidas de mitigación y mejora del conocimiento científico para reducir las capturas accidentales de cetáceos durante las actividades pesqueras. Orden APA/1200/2020. <https://www.boe.es/eli/es/o/2020/12/16/apa1200> in Spanish.

conditional on the enforcement of correct pinger use being in place, and in fishing effort being reduced (as opposed to redistributed).

The relative risk of not achieving the candidate management objectives depends on the evidence base considered to derive the bycatch estimates (i.e. strandings vs at-sea sampling), as well as the duration and timing of proposed closures. Estimates based on at-sea sampling and strandings data can be regarded as proxies for, respectively, the lower- and upper estimates of the actual bycatch mortality. All scenarios presented have a higher risk than in previous advice (ICES, 2020a); this is because they are based on data from strandings that are above the PBR estimate. Shorter closures are associated with a higher risk because they are more likely to miss the peak of mortality.

Table 1 Scenarios used to assess possible bycatch reduction measures for the common dolphin in the Bay of Biscay (Subarea 8). Métiers of concern are those with recorded bycatch of common dolphins in ICES databases in Subarea 8 and Division 9a.

Scenario	Description	Explanation
A	Four-month closure (December–March) – all métiers	Four-month closure from December to March of all métiers of concern
B	Annual effort reduction of 40% – all métiers	Flat annual 40% reduction in total effort for métiers of concern, does not consider strandings patterns
C	Two-month closure (mid-January–mid-March) – all métiers	Two-month closure of all métiers of concern determined, using the % mortality in the peak period based on strandings
D	Six-week closure (mid-January–end of February) – all métiers	Six-week closure of all métiers of concern determined, using the % mortality in that peak period based on strandings
E	Four-week closure (mid-January–mid-February) – all métiers	Four-week closure of all métiers of concern determined, using the % mortality in that peak period based on strandings
F	Two-week closure (mid-January–end of January) – all métiers	Two-week closure of all métiers of concern determined, using the % mortality in that peak period based on strandings
G	Pinger all PTM/PTB all year and same six-week closure all other métiers	PTM/PTB to use pingers all year + a six-week closure of all other métiers of concern determined, using the % mortality in that peak period based on strandings
H	6-week closure (mid-January to end of February) all métiers (including PTM/PTB) and pinger PTM/PTB for the rest of the year	Six-week closure of all métiers of concern 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 métiers	PTM/PTB to use pingers all year + a four-week closure of all other métiers of concern 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 métiers	PTM/PTB to use pingers all year + a two-week closure of all other métiers of concern 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	Two-month closure all (mid-January to mid-March) + pingers	Two-month closure for all fleets + pingers on PTM/PTB for the rest of the year
M	Four-month closure all (mid-January to mid-March) + pingers	Four-month closure for all fleets + pingers on PTM/PTB for the rest of the year
N	Four-month closure (three in winter [January to March] + one in summer [mid-July to mid-August]) + pingers	Closure for three months in winter and one month in summer for all fleets + pingers on PTB/PTM for the rest of the year
O	Four-month closure (three in winter [January to March] + one in summer [mid-July to mid-August])	Closure for three months in winter and one month in summer for all fleets

Table 2 Scenarios that enable the candidate, PBR-based, management objectives to be met, expected outcomes, and evaluation of associated risks for the common dolphin in ICES Subarea 8. Scenarios are ordered alphabetically. For further information on scenario performance, see Table 4. Risk levels in relation to missing the peak in mortality based on previous advice (ICES, 2020a) were defined as follows: very high for 2-week closure, high for 4-week closure, medium for 6-week closure, and low for 2-month or longer closure. All scenarios now have a higher risk, because all bycatch estimations based on strandings data are above the PBR value.

Scenarios that meet candidate management objectives	Expected outcomes	Relative risk of not achieving the objective	Comment on the scenario risk
Management objective: < 75% of PBR			
A and M. A: 4-month closure all métiers; and M: A + pingers on PTB and PTM gears for the rest of year	Bycatch reduction: 40% Efficiency score: 1.2	Medium	A 4-month closure is more likely to capture the peak in mortalities when compared to shorter closures. Bycatch inferred from strandings remains above PBR.
N and O. N: 3 month (Jan–Mar) + 1 month (mid-Jul–mid-Aug) closure all métiers; and O: N + pingers on PTB and PTM gears for the rest of year	Bycatch reduction: 44% Efficiency score: 1.3	Medium	Risk around the timing of the shorter second closure. Bycatch inferred from strandings remains above PBR.
Management objective: < PBR*			
B: Annual fishing effort reduction of 40% in métiers of concern	Bycatch reduction: 20% Efficiency score: 0.5	High	High risk of not achieving the objective because bycatch is only reduced by 20%. Bycatch inferred from strandings remains above PBR.
C and L. C: two-month closure (mid-Jan–mid-Mar) of all métiers; and L: C + pingers on PTB and PTM gears for the rest of the year	Bycatch reduction : 33% Efficiency score : 2	High	Two month closure that may miss part of the peak mortality. Bycatch inferred from strandings remains above PBR.
D and H. D: six-week closure (mid-Jan–end of Feb.) of all métiers; and H: D + pingers on PTB and PTM gears for the rest of the year	Bycatch reduction: 27% Efficiency score: 2.3	Very high	A six-week closure is less likely to capture the peak in mortality compared to longer closures. Bycatch inferred from strandings remains above PBR.

Scenarios that meet candidate management objectives	Expected outcomes	Relative risk of not achieving the objective	Comment on the scenario risk
G. Pinger PTM/PTB all year and six-week closure of all other métiers of concern (mid-Jan–end of Feb)	Bycatch reduction: 18% Efficiency score: 1.6	Very high	A six-week closure is less likely to capture the peak in mortality compared to longer closures and bycatch reduction was only 18%. Bycatch inferred from strandings remains above PBR.

* Scenarios that achieve the candidate management objective of < 75% PBR also achieve the candidate management objective of < PBR.

Recommendations

Relevant EU regulations (i.e. Habitats Directive, MSFD, and EU Technical regulations for Fisheries), and most recently communication by the EU (Action plan: Protecting and restoring marine ecosystems for sustainable and resilient fisheries), require the minimization and where possible the elimination of bycatch of common dolphin. EU legislation requires that bycatch of marine mammals should not exceed pre-determined levels (EU, 2019). ICES notes that robust methods for setting limits for bycatch of protected species already exist (ICES, 2013, 2014), but clear conservation objectives are not yet quantitatively defined. ICES reiterates its previous advice that it is willing to assist EU competent authorities in establishing quantitative conservation or management objectives, involving both managers and scientists.

ICES recommends an adaptive management approach with enhanced monitoring of seasonal common dolphin abundance and bycatch in fisheries. Sequential implementation of progressively more constraining management measures (in terms of effort reduction) over a longer period of time (e.g. five years) could be used to achieve the candidate management objectives proposed by ICES. This would allow for the development and implementation of fishing gears that have a lower bycatch risk to cetaceans and other protected, endangered and threatened species. This would be akin to the approach taken for management of “strategic stocks” within the US Marine Mammal Protection Act (2017).

ICES reiterates that temporal closures in Subarea 8 in métiers of concern (Table 4) are likely to be the most effective management measures for reducing bycatch mortality in the short term. ICES notes that the performance of the technical management measures (i.e. pingers) is conditional upon the pingers performing optimally in both PTM and PTB gears. There is presently limited, but promising, evidence of the effectiveness of pingers in mitigating common dolphin bycatch; preliminary trials carried out to assess the effectiveness of the Dolphin Deterrent Device (DDD) pinger in French PTM resulted in a 65% reduction in the bycatch rate (Rimaud *et al.*, 2019). The DDD-03 pinger was reported to be highly effective at reducing common dolphin bycatch in the UK bass pair-trawl fishery – though it was noted that a fully controlled experimental trial was not undertaken and pingers were used voluntarily by vessels (Northridge *et al.*, 2011). ICES also strongly recommends ongoing data acquisition and field trials to reliably assess the efficiency of technical mitigation measures in reducing common dolphin bycatch, and refers here to the French large-scale experiment in the Bay of Biscay on the application of new mitigation devices and enforcement monitoring through use of onboard cameras^{***†}. ICES also recommends compliance monitoring of pinger use (both voluntary and mandatory).

Enhanced monitoring is required to minimise uncertainties and increase confidence in the assessment of the effectiveness of alternative management measures for reducing bycatch of common dolphins, and to augment precision in estimates of

^{**} Arrêté du 29 décembre 2022 relatif à l'amélioration de la collecte de données sur les captures accidentelles d'espèces protégées et à l'expérimentation de dispositifs techniques de réduction des captures accidentelles de dauphin commun à bord de navires de pêche sous pavillon français. NOR : PRMM2237098A. JORF n°0303 du 31 décembre 2022. Texte n° 10. <https://www.legifrance.gouv.fr/eli/arrete/2022/12/29/PRMM2237098A/jo/texte> in French.

^{††} Arrêté du 27 décembre 2022 relatif à l'obligation de participer à un programme d'observation embarquée des navires de pêche de plus de quinze mètres sous pavillon français. NOR : PRMM2237097A. JORF n°0302 du 30 décembre 2022. Texte n° 3. <https://www.legifrance.gouv.fr/eli/arrete/2022/12/27/PRMM2237097A/jo/texte> in French.

population abundance, seasonal distribution, and bycatch mortality. More complete monitoring should be implemented throughout the range of the species in the Northeast Atlantic (ICES subareas 6–9) to achieve representative coverage of the métiers of concern. Where technical measures are used, at-sea control systems should be implemented to check if pingers are adequately deployed and operational. 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 assess the continued appropriateness of the proposed management measures in time. ICES recommends to maintain or reinforce existing national stranding networks in the Northeast Atlantic common dolphin range, and encourages cooperation to fulfil analyses and data collection to further evaluate life history parameters and the impacts of other threats on the population, as well as tagging experiments of dolphin carcasses to refine key parameters for estimating bycatch mortality from stranding data at a broader scale.

Basis of the advice

PBR bycatch limit calculations

ICES has evaluated bycatch of common dolphins against PBR (Wade, 1998), including five candidate limits for anthropogenic mortality: less than PBR, less than 75% of PBR, less than 50% of PBR, less than 20% of PBR, and less than 10% of PBR. The 20% of PBR limit additionally included in the current advice corresponds to the mPBR (modified PBR), recently developed and agreed by OSPAR (2021).

Testing of bycatch reduction scenarios

ICES used the estimates of common dolphin bycatch mortality from at-sea monitoring and strandings to explore a range of mitigation scenarios. Different temporal fisheries closures for the métiers of concern, year-round total fishing effort reductions for the same métiers, technical mitigation approaches (in this case, pingers) and combinations of temporal closures and use of pingers were investigated. ICES considers that mitigation and/or closures applied to all fisheries of concern would be a more equitable and reliable method of achieving bycatch reduction.

Having established the current anthropogenic mortality limit as 4927 common dolphins for the Northeast Atlantic assessment unit using the PBR approach (ICES, 2020a), and based on the considerations above and without prejudice to all applicable requirements under EU law and methodologies to be established in relation to those requirements, five quantitative candidate management objectives were proposed, against which reduction in bycatch mortality achieved under each of the “mitigation measures scenarios” could be tested. At-sea sampling data were available for ICES Subarea 8 and Division 9.a, based on which the bycatch rates were estimated jointly by métier for all Bay of Biscay and Iberian waters; no difference was assumed between these two areas. The strandings data used in the analyses are from divisions 8.a–b and 7e along the French coast only, 95% of which were collected from the coast of divisions 8.a and 8.b. As per the EC request, and for consistency with previous advice (ICES, 2020a), the scenarios were tested for Subarea 8 only. The overall bycatch mortality obtained from strandings for 2019–2021 could be underestimated, as only strandings collected along French coasts (Subarea 8 and Division 7.e) were used for bycatch estimates, highlighting mainly mortality in ICES divisions 8.a–c.

Candidate management objective 1: reduce bycatch below PBR

The objective is to reduce bycatch to PBR level or below; this should ensure that the population remains at 50% of its carrying capacity (K), 95% of the time, over the long term. This is one interpretation of “long-term viability” (EU, 2017) of the population and is a means of measuring the mortality limit that might threaten the conservation status of the species (EU, 2019). This objective corresponds to an annual anthropogenic mortality below 4927 common dolphins for the Northeast Atlantic assessment unit.

Candidate management objective 2: reduce bycatch to < 75% of PBR

This is a “more precautionary” objective that takes into account high levels of uncertainty in the abundance estimate used in the PBR calculation and the bycatch estimates. This objective corresponds to an annual anthropogenic mortality below 3695 common dolphins for the Northeast Atlantic assessment unit.

Candidate management objective 3: reduce bycatch to < 50% of PBR

This objective applies a greater level of precaution than the 75% PBR objective and aims to reduce levels of bycatch to below 50% of the PBR. This objective corresponds to an annual anthropogenic mortality below 2464 common dolphins for the Northeast Atlantic assessment unit.

Candidate management objective 4: reduce bycatch to < 20% of PBR

This objective applies an even greater level of precaution and is considered equivalent to the mPBR level developed and adopted by OSPAR. This objective corresponds to an annual anthropogenic mortality below 985 common dolphins for the Northeast Atlantic assessment unit.

Candidate management objective 5: reduce bycatch to < 10% of PBR

This objective provides an interpretation of what “minimise and where possible eliminate” might mean in the context of bycatch reduction, and corresponds to the greatest level of precaution (or most risk-averse) of the candidate management objectives considered. This objective currently corresponds to an annual anthropogenic mortality below 493 common dolphins for the Northeast Atlantic assessment unit.

Bycatch estimates derived from monitoring programmes and from strandings data correspond to consolidated datasets from the years 2019–2021. To determine bycatch levels associated with each scenario option, fishing effort data from the ICES Regional Database (RDB) or ICES WGBYC database (depending on the quality criteria selected by the data meeting; see ICES [2023b] for details) as well as bycatch rates obtained from at-sea sampling were used to determine annual bycatch removals by the following métiers (Table 3): PTM_DEF, PTM_SPF, PTB_DEF/MPD, GTR_DEF, OTM_DEF, OTB_DEF, PS_SPF, GNS_DEF, GTR_DEF, and LLS_DEF (in ICES Subarea 8 and Division 9.a). Métier-specific bycatch rates (individuals/days-at-sea fished) were derived for the at-sea monitoring data, pooled over 2019–2021 and divisions 8.a–d and 9.a. To estimate 95% confidence intervals around the bycatch rate, the Poisson distribution was assumed, and confidence intervals were estimated with bootstrapping. The bycatch rate was then raised to annual bycatch estimates, using an annual average of the available métier-specific fishing effort for 2019–2021 (Table 3). Due to the insufficient temporal resolution of reporting of at-sea sampling bycatch monitoring, the temporal pattern of bycatch mortality obtained from the strandings data along the French coast (ICES divisions 8.a–b and Division 7.e) was used to allocate the total bycatch derived from monitoring programmes to fortnights. As strandings data cannot currently provide métier information on bycatch, the bycatch estimates derived from monitoring programmes for each métier were used to proportionally allocate the total bycatch derived for strandings to individual métiers. The joint use of these datasets made it possible to derive métier-specific bycatch estimates at a finer (fortnightly) temporal scale. Finally, the efficiency of each mitigation scenario was evaluated for bycatch estimates derived from both at-sea sampling and strandings data (Table 4). The two series of métier-specific bycatch estimates were seen as two views of the same phenomenon and were considered, locally and within their uncertainty range, to contain the true bycatch level. At the broader spatial scale of the entire assessment unit for common dolphins in the NE Atlantic, and in relation to the PBR, these bycatch estimates are considered to be underestimates.

The bycatch and fishing effort reduction rates were calculated for each scenario option. An efficiency score for each scenario was obtained by dividing the bycatch reduction rate with the effort reduction rate (Table 4). This efficiency score could be seen as a rough cost-effectiveness index for each scenario, considering that a reduction of effort would incur in a cost for the industry (ICES, 2020b, 2023b).

Table 3 Comparison of common dolphin bycatch rates and estimates by métier in the Bay of Biscay and Iberian Coast between data collated for 2016–2018 (ICES, 2020b) and 2019–2021 (ICES, 2023b) based on at-sea sampling. DaS = days-at-sea; fishing eff. = fishing effort (as DaS); DaS observed = monitoring effort; % cov. = % monitoring coverage (monitoring effort/fishing effort x 100); no. spec = number of specimens observed; bycatch rate = animals/days-at-sea observed; bycatch est. = bycatch estimate. L95% CI and U95% CI = lower and upper confidence intervals. No values were provided for the 2016–2018 period for LLS_DEF, OTB_DEF and PTM_SPF, as either no monitoring or no bycatch were reported for those métiers in that time period. See <https://vocab.ices.dk/?ref=1498> for a description of the métiers (métier Level 4, L4) and <https://vocab.ices.dk/?ref=1499> for the description of targeted species assemblages (métier level 5, L5).

Métier level	Métier									
L4	GNS	GTR	LLS	OTB	OTM	PS	PTB	PTM	PTM	PTM
L5	DEF	DEF	DEF	DEF	DEF	SPF	DEF/MPD	DEF	SPF	LPF

2016–2018	Fishing eff. (DaS)	36836	58365			243	35564	5195	682		510
	DaS observed	536.84	339.74			0.82	334.5	67	167.17		65.16
	% cov	1.5%	0.6%			0.3%	0.9%	1.3%	24.5%		12.8%
	No. spec	2	12			1	2	10	118		1
2019–2021	Fishing eff. (DaS)	75428	16238 ₉	51196	26049	312	67890	4725	663	911	1209
	DaS observed	2103.36	970.13	186.04	508.23	0.75	626.5	465.61	344.09	47.56	265.04
	% cov	2.8%	0.6%	0.4%	2.0%	0.2%	0.9%	9.9%	51.9%	5.2%	21.9%
	No. spec	16	13	1	2	1	11	71	36	21	0
2016–2018	L95% CI	0	0.021			0	0	0.075	0.706		0
	Bycatch rate	0.004	0.035			1.22	0.006	0.149	0.598		0.015
	U95% CI	0.009	0.053			3.67	0.015	0.224	0.813		0.046
2019–2021	L95% CI	0.005	0.007	0	0	0	0.010	0.125	0.076	0.294	0
	Bycatch rate	0.008	0.013	0.005	0.004	1.333	0.018	0.154	0.105	0.442	0
	U95% CI	0.011	0.020	0.016	0.01	4	0.027	0.185	0.134	0.610	0
2016–2018	L95% CI	0	1203			0	0	388	408		0
	Bycatch est.	137	2061			297	213	775	481		8
	U95% CI	343	3092			890	532	1163	555		23
2019–2021	L95% CI	359	1172	0	0	0	650	582	50	268	0
	Bycatch est.	574	2176	275	103	416	1192	731	69	402	0
	U95% CI	825	3180	826	256	1248	1842	879	89	555	0
Change in fishing effort		105%	178%			28%	91%	–9%	–3%		137%
Change in at-sea sampling coverage		91%	3%			–35%	–2%	664%	112%		72%
Change in bycatch rate		100%	–63%			9%	200%	3%	–82%		–100%
Change in bycatch estimate		319%	6%			40%	460%	–6%	–86%		–100%

Overall bycatch estimates were higher for years 2019–2021 (9040 [95% CI 6640–13 300] based on strandings, and 5938 [95% CI 3081–9700] based on at-sea sampling data [ICES, 2023b]) than for years 2016–2018 (6620 [4411–10 827] based on strandings, and 3973 [1998–6598] based on at-sea sampling data [ICES, 2020b]). This increase in bycatch estimates is, in part, due to a considerable increase in reported fishing effort for the métiers GNS_DEF, GTR_DEF, and PS_SPF, as well as increased monitoring for the métiers GNS, GTR, LLS, OTB, PS, PTB, PTM_DEF, PTM_SPF, and PTM_LPF. The change in fishing effort is primarily due to more accurate assignment of effort to different métiers during the data submission process. This improved data enabled ICES to explore uncertainty in bycatch rates further by using a more detailed stratification approach that considers finer spatial and temporal scales (see the *Additional Information* section below and ICES, 2023b).

A relatively low bycatch rate was observed in GNS_DEF for both periods (period 1 (2016–2018): 95% CI 0–0.01; period 2 (2019–2021): 95% CI 0.01–0.01), but the increased fishing effort in the recent period resulted in a significantly higher bycatch estimate. During the recent period, bycatch rates in métier GTR_DEF decreased (period 1: 95% CI 0.02–0.05, period 2: 95% CI 0.01–0.02). However, a significant increase in fishing effort resulted in similar bycatch over the two periods. The estimate of 1192 (95% CI 650–1842) common dolphins bycaught in PS_SPF makes a significant contribution to the total mortality in the ecoregion and is an increase when compared with the 2016–2018 estimates (213 common dolphins, 95% CI 0–532), most likely due to increased fishing effort reported. The data from the recent period show that there has been a significant decline in the number of bycaught common dolphins in PTM-DEF (period 1: 481, 95% CI 408–555, period 2: 69, 95% CI 50–89). The fishing effort for this métier is comparable between the two time periods and the reduction in observed bycatches is driving the significantly lower estimate of bycatch mortality.

Table 4 Information on the tested scenarios in the Bay of Biscay 2019–2021. For all scenarios, key information is given in the scenario title, total bycatch mortality as of at-sea sampling programmes, total bycatch mortality as of stranding data, bycatch reduction obtained, effort reduction implied, and efficiency score. The efficiency score of each scenario is the bycatch reduction rate divided by the effort reduction rate. This efficiency could be considered as a rough cost effectiveness for each scenario considering that a reduction effort is a cost for the industry (see main text for further detail). Bycatch values are in number of individuals. A colour code indicating how each scenario reaches the different candidate management objectives is presented below the table. All scenarios assume full compliance with pinger use on all PT métiers since 2019 and correct use of pingers in all cases. As a result, no additional reduction in bycatch rates was applied to these métiers. Scenarios combining temporal closures and pinger use will therefore result in identical bycatch estimates as those scenarios considering temporal closures only in a number of cases (scenarios A/M, C/L, D/H, and O/N). All scenarios were retained in the table for consistency with the earlier advice (Table 8 in ICES, 2020a) and for ease of comparison.

Scenario	Basis	Total resulting bycatch - monitoring mortality	Total resulting bycatch - strandings mortality	Bycatch reduction obtained	Effort reduction needed	Efficiency score
A/M	Four-month closure (Dec–Mar) all métiers + pinger PTM/PTB rest of year	3571	5436	0.4	0.33	1.2
B	Annual effort reduction of 40% all métiers	4755	7238	0.2	0.4	0.5
C/L	Two-month closure (mid-Jan–mid-Mar) all métiers + pinger PTB/PTM rest of year	3985	6067	0.33	0.17	2
D/H	Six-week closure (mid-Jan–end-Feb) all métiers + all métiers and pinger PTM/PTB rest of year	4340	6608	0.27	0.12	2.3
E	Four-week closure (mid-Jan–mid-Feb) all métiers	4932	7509	0.17	0.08	2.2
F	Two-week closure (mid-Jan–end-Jan) all métiers	5406	8229	0.09	0.04	2.3

Scenario	Basis	Total resulting bycatch - monitoring mortality	Total resulting bycatch - strandings mortality	Bycatch reduction obtained	Effort reduction needed	Efficiency score
G	Pinger PTM/PTB all year & same six-week closure all other métiers	4886	7439	0.18	0.11	1.6
I	Pinger PTM/PTB all year and same four-week closure all other métiers	5276	8032	0.11	0.07	1.5
J	Pinger PTM/PTB all year and same two-week closure all other métiers	5588	8507	0.06	0.04	1.6
K	Pinger PTM/PTB all year	5938	9040	0.00	0.00	n/a
O/N	Three-month (Jan–Mar) + one-month (mid-Jul–mid-Aug) closure all métiers + pinger PTB/PTM rest of year	3334	5076	0.44	0.33	1.3

% of PBR	< 10%	< 20%	< 50%	< 75%	< PBR	> PBR
Number bycatches	493	985	2464	3695	< 4927	> 4927

For the years 2019–2021, no scenario achieved an estimated bycatch mortality less than 50% of the PBR, as bycatch estimates were higher for this period. By contrast, at least two scenarios achieved the candidate objective of bycatch reduction below 10% of the PBR for the years 2016–2018 (ICES, 2020a). In addition, for the years 2019–2021, none of the scenarios based on strandings information achieved the objective of reducing bycatch mortality to less than PBR, while only two did not achieve this objective based on available information for the years 2016–2018.

Since the previous evaluation based on data from 2016–2018, pinger use was implemented in all PTM and PTB fisheries in France and Spain. As a result, bycatch reductions in all scenarios examined for the years 2019–2021 were reliant on temporal closures only. The increase in reported fishing effort between evaluation periods, contributed to the observed increase in bycatch estimates. Bycatch rates also differ between evaluation periods, with a decrease in bycatch rates in the PTM_DEF fishery in 2019–2021, possibly due to the implementation of pingers in this métier. Changes in the spatial distribution of common dolphins, increased monitoring to minimise spatial and temporal uncertainty in bycatch rates, and/or changes in fleet behaviour and fishing practices, can explain changes in bycatch estimates between 2016–2018 and 2019–2021, and affect the evaluation of the performance of mitigation measures in all scenarios, particularly those with two- to four-weeks closures.

Additional information

ICES notes that the EC calls on member states to develop threshold values for the common dolphin in the Bay of Biscay by the end of 2023 (European Commission, 2023). The OSPAR Marine Mammal Expert Group (OMMEG) used management strategy evaluation (MSE; OSPAR, 2021) and the modified PBR (mPBR), which is the PBR control rule tuned to the following conservation objective: “a population should be able to recover to or be maintained at 80% of carrying capacity, with probability 0.8, within a 100-year period”. A time horizon of 100 years was chosen to align with the recommendation of ICES (2013); and a probability level of 0.8 as adopted by ASCOBANS (2015). This resulted in a new bycatch threshold value of 985 common dolphins in the assessment unit (OSPAR, 2021).

Further considerations on the results of pinger trials were included in earlier ICES advice (ICES, 2023a).

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