

Bycatch of endangered, threatened and protected species of marine mammals, seabirds and marine turtles, and selected fish species of bycatch relevance

Advice summary

ICES summarizes estimates of the annual numbers of specimen taken as bycatch (annual bycatch) and multiannual bycatch rates of endangered, threatened, and protected (ETP) species of marine mammals, seabirds, marine turtles, and fish, based on reported bycatch and monitoring data received through ICES data calls.

Annual bycatch estimates in 2023 are provided for 116 ETP species as part of 316 combinations of species, fishing gear (métier level 4), and ecoregion. Among these ETP species are 12—2 marine mammals, 3 marine turtles, 1 seabird, and 6 fish—from DG MARE's list of 26 priority species. Subregional estimates are also provided for 103 combinations of ETP species, métier level 4 and ICES subdivisions/Mediterranean GSAs, including 6 priority species.

For priority marine mammals, seabird and marine turtles, ICES notes the highest estimated bycatch of short-beaked common dolphin (*Delphinus delphis*) is in set gillnets (GNSs) and trammel nets (GTRs) in the Bay of Biscay and the Iberian Coast ecoregion. The highest estimated bycatch of harbour porpoise (*Phocoena phocoena*) is in GNSs in the Norwegian Sea ecoregion. The highest bycatch of loggerhead turtle (*Caretta caretta*) is in bottom otter trawls (OTBs) in the Adriatic Sea ecoregion. An annual bycatch estimate is provided for the Balearic shearwater (*Puffinus mauretanicus*) in GTRs in the Bay of Biscay and the Iberian coast ecoregion.

Annual bycatch estimates of priority fish are provided for Adriatic sturgeon (*Acipenser naccarii*) in OTBs in the Ionian Sea and the Central Mediterranean Sea ecoregion; beluga sturgeon (*Huso huso*) in midwater otter trawls (OTMs) in the Black Sea; angel shark (*Squatina squatina*) in GTRs and GNSs in the Celtic Seas ecoregion; common skate (*Dipturus batis* and *Di. intermedius*) in four ecoregions; and spiny butterfly ray (*Gymnura altavela*) in OTBs in three ecoregions.

To improve accuracy and precision in estimates of annual bycatch and multiannual bycatch rates, ICES advises (i) to increase monitoring effort in area/métier combinations identified as high priority for bycatch monitoring and (ii) to prioritize at-sea observers and electronic bycatch monitoring protocols.

ICES reiterates that reporting of complete fishing effort and monitoring effort data for all métiers, even when no bycatch has been reported, is needed for bycatch assessments.

ICES summarizes available abundance estimates for priority ETP species and notes that bycatch sustainability thresholds exist for some species. It is a priority to evaluate such thresholds for alignment with available population estimates and management objectives.

Request

ICES shall develop advice as a priority to provide, on the basis of data provided by Member States and any other relevant data sources, estimates of the annual total numbers of specimens of ETP species (sensitive species as defined in Article 6(8) of Regulation (EU) 2019/1241) taken as by-catch as appropriate and feasible, disaggregated by sea area and type of fishing gear. They shall be provided by December each year and shall cover incidental catches made until 31 December of the previous year. Where the precision of the estimates does not support the meaningful calculation of annual total by-catch of ETP species, ICES may instead deliver multiannual bycatch rates." These estimates shall be accompanied with evaluations or estimates of their precision where possible. ICES will prioritize delivering advice on the high-priority species as received from DG MARE in 2023 ICES should include information on mitigation measures in place, where appropriate.

ICES shall strive progressively to accompany the by catch estimates with markers of sustainability, such as potential biological removal (PBR) where appropriate.

For species with high extinction risk, where there is no near-term realistic prospect of estimating by-catch rates and associated markers of sustainability, ICES shall develop advice as a priority to highlight the types of fishing gears and activities which pose the greatest risk to these species of concern, taking account of available information on the species distribution area and seasonality. ICES shall also develop advice concerning mitigation measures appropriate for reducing these risks.

Where the available bycatch monitoring data and other information is not adequate to allow ICES to complete these tasks, ICES shall advise, where possible, on the remedial measures necessary to obtain the required information.

Elaboration on the advice

This advice focuses on priority ETP species identified by DG MARE, including marine mammals, seabirds, marine turtles, and fish species, that are identified by ICES (2024a) as of bycatch relevance. For the Mediterranean and Black Sea ecoregions, all data submitted for marine mammals, seabirds, and marine turtles bycatch are considered in this advice.

Estimated numbers of specimens taken as bycatch in 2023 and multiannual bycatch rates (2017-2023) are based on the reported monitoring and fishing effort at métier level 4 level.

In 2023, ICES estimated the number of specimens taken as bycatch in fishing métiers (level 4) for 116 ETP species (11 marine mammals, 26 seabirds, 3 marine turtles, and 76 fish) across 16 ecoregions (total 316 combinations of species, fishing gear, and ecoregion). ICES estimated multiannual bycatch rates (numbers of bycaught specimens per monitored day-at-sea, BPUE) (period 2017–2023) for an additional 253 combinations of species, fishing gear and ecoregion, for which annual bycatch could not be estimated. ICES notes that several of these estimates have high uncertainty as indicated by wide confidence intervals (CIs). ICES emphasises that several factors, including low sampling/reporting rates, observations of rare species and localised species distribution can result in bycatch estimates being under or over-estimated.

ICES summarises available abundance estimates for priority ETP species. ICES notes that bycatch sustainability thresholds exist for some ETP species. ICES has only evaluated the potential biological removals (PBRs) threshold for the Baltic Proper population of harbour porpoise (0.7 porpoise [IMR/NAMMCO, 2018]) and short-beaked common dolphin (4927 dolphins [ICES, 2020]) in the Northeast Atlantic.

Annual estimates of the numbers of specimens of priority ETP species taken as bycatch

This section describes annual bycatch estimates for DG MARE priority species in 2023.

Estimates of the number of specimens taken as bycatch in fishing métiers (level 4) were available for 12 priority species in 2023 (2 marine mammals, 1 seabird, 3 marine turtles, and 6 fish). Despite meeting data availability and quality criteria, the precision of these estimates was highly variable, with CIs in some cases extending several orders of magnitude.

There were cases where within-ecoregion variability or missing data prevented the estimation of bycatch in métiers level 4 at the scale of entire ecoregions, and ICES/GSA area information was sufficient to reliably estimate bycatch at a sub-regional level. In such cases, area-specific estimates of annual bycatch and multiannual bycatch rates are provided for priority and other species in Data Product 2 (ICES, 2024h).

Marine mammals

Annual estimates of bycatch were available for two priority species: the short-beaked common dolphin in 3 ecoregions and 8 ecoregion/métiers combinations, and the harbour porpoise in 7 ecoregions and 11 ecoregion/métiers combinations (Figure 1 and Annex 1).

The estimated numbers of short-beaked common dolphins taken as bycatch in 2023 were highest in the Bay of Biscay and the Iberian coast ecoregion, where they ranged from 312 dolphins (95% CI 128–759) in bottom otter trawls (OTB), to a high of 1 834 dolphins (95% CI 912–3 689) in set gillnets (GNS). Together, set gillnets and trammel nets (GTR) in this ecoregion contributed most (70%) of the estimated bycatch of short-beaked common

dolphins for all ecoregions in 2023. The estimated bycatch of short-beaked common dolphins in other ecoregions were lower. In the Greater North Sea ecoregion, an estimated 188 dolphins (95% CI 66–541) were taken as bycatch in purse seine (PS); and in the Celtic Seas ecoregion, between 2 (95% CI < 1–12) and 19 dolphins (95% CI 3–125) were taken as bycatch in PS and twin otter trawls (OTTs), respectively.

The estimated numbers of harbour porpoises taken as bycatch in 2023 were highest in set gillnets (GNS) in the Norwegian Sea ecoregion (2 267 individuals [95% CI 1 323–3 905]) and Icelandic Waters ecoregion (559 specimens [95% CI 312–1034]), followed by trammel nets (GTR) in the Greater North Sea (389 porpoises [95% CI 64–2 362]) and in the Bay of Biscay and the Iberian coast ecoregion (377 porpoises [95% CI 201–707]). Other fisheries and ecoregions had lower estimated numbers of harbour porpoises taken as bycatch, ranging from 17 porpoises (95% CI 4–69) in twin otter trawls (OTT) in the Celtic Seas ecoregion to 126 porpoises (95% CI 14–1 163) in gillnets (GNS) in the Black Sea ecoregion.

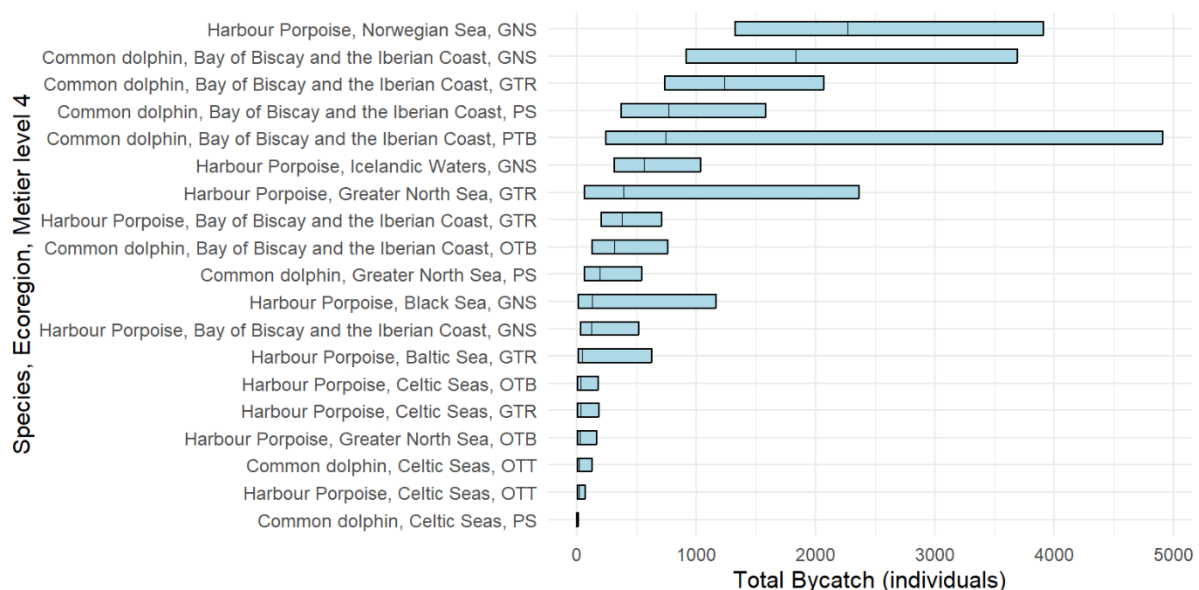


Figure 1. Estimates of the numbers of specimens of priority marine mammals taken as bycatch by species, ecoregion, and métier level 4 combinations, with 95% confidence intervals (bars); and by decreasing bycatch (from top to bottom).

Subregional estimates at the scale of ICES divisions and subdivisions were available for both species in 2023 (Annex 2). Bycatch estimates for short-beaked common dolphins were available for bottom otter trawls (OTB) in four divisions (27.7.e, 27.7.f, 27.7.g, and 27.7.h) and for set gillnets (GNS) and trammel nets (GTR) in Division 27.7.e. The highest bycatch was estimated for bottom otter trawls (OTB) in Division 27.7.e in the Greater North Sea ecoregion, with 205 common dolphins taken as bycatch (95% CI 71–594). Subregional estimates for harbour porpoise were available for gillnets (GNS) in subdivisions 27.3.c.22 (393 specimens [95% CI 209–740]) and 27.3.b.23 (70 specimens [95% CI 43–114]) in the Baltic Sea ecoregion.

Seabirds

Annual bycatch of Balearic shearwater in 2023 was estimated for s (GTR) in the Bay of Biscay and the Iberian Coast ecoregion (Table 1).

A subregional bycatch estimate was available for Balearic shearwater in set longlines (LLS) in Division 27.9.a in the same ecoregion (118 specimens [95% CI 17–839]) (Table 2).

Table 1. Estimated numbers of specimens of a priority seabird species taken as bycatch in 2023 (est. bycatch) and multiannual bycatch rates (BPUE) for 2017–2023 with uncertainty (95% confidence intervals [CI]), including information on ecoregion-scale abundance estimates where available. Complementary information on reported bycatch, monitoring, and fishing effort is presented in Data Product 1 (ICES, 2024h).

Ecoregion	Métier Level 4	Species	BPUE (95% CI) (2017–2023)	Est. bycatch (95% CI) (2023)	Abundance estimate (reference)
Bay of Biscay and the Iberian Coast	Trammel nets	<i>Puffinus mauretanicus</i>	0.008 (0.0020–0.029)	425 (113–1 604)	4902–20,449 (Araújo <i>et al.</i> , 2022)
Bay of Biscay and the Iberian Coast	Set gillnets	<i>Puffinus mauretanicus</i>	0.006 (0.001–0.062)	n.a.	
Bay of Biscay and the Iberian Coast	Bottom otter trawls	<i>Puffinus mauretanicus</i>	0.003 (0.000–0.083)	n.a.	23,780–26,535 (Arroyo <i>et al.</i> , 2014)

Table 2. Subregional estimate of annual bycatch for 2023 (est. bycatch) and multiannual bycatch rates (BPUE) (for 2017–2023) with uncertainty (95% CI) for a priority seabird in an ICES Division and métier level 4.

Ecoregion	ICES Division	métier L4	Species	BPUE (95% CI) (2017–2023)	Est. bycatch (95% CI) (2023)
Bay of Biscay and the Iberian Coast	27.9.a	LLS	<i>Puffinus mauretanicus</i>	0.007 (0.001–0.047)	118 (17–839)

Marine Turtles

Estimates of bycatch of marine turtles in métier level 4 in 2023 were available for the three priority species. Estimates for the loggerhead turtle were available in 6 ecoregions and 11 ecoregion–métier combinations, while estimates for the green sea turtle (*Chelonia mydas*) and leatherback turtle (*Dermochelys coriacea*) were each available for 2 ecoregion–métier combinations (Figure 2 and Annex 3).

The estimated numbers of loggerhead turtle taken as bycatch were highest in the Adriatic Sea ecoregion, with an estimated bycatch of 2 887 specimens (95% CI 531–15 826) in bottom otter trawls (OTB) and 491 specimens (95% CI 338–712) in midwater pair trawls (PTM). Other estimated bycatch of ranged from 16 specimens (95% CI 2–113) in drifting longlines in the Aegean–Levantine Sea ecoregion to 333 specimens (95% CI 155–712) in bottom otter trawls (OTB) in the same ecoregion.

Estimates of bycatch of green sea turtles in 2023 ranged from 25 specimens (95% CI 4–175) in s (GNS) in the Azores ecoregion to 125 specimens (95% CI 20–774) in drifting longlines in the Aegean–Levantine Sea ecoregion.

Estimated numbers of leatherback turtles taken as bycatch in 2023 were available for drifting longlines and ranged from 14 specimens (95% CI 2–102) in the Western Mediterranean Sea to 30 specimens (95% CI 11–83) in the Azores ecoregion.

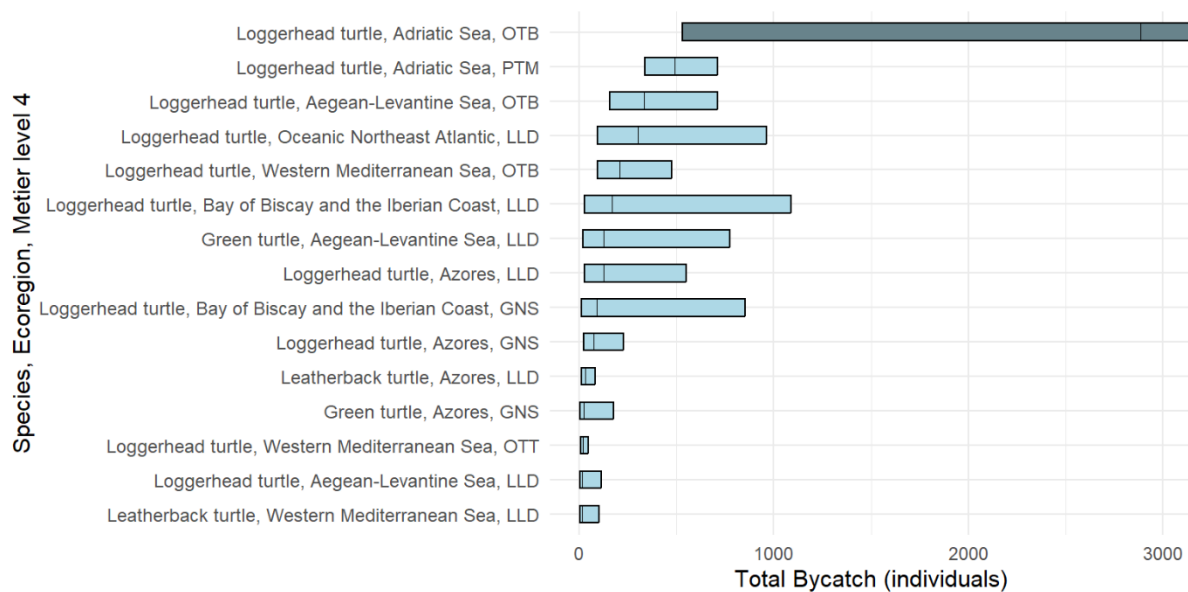


Figure 2. Estimates of the numbers of specimens of priority marine turtles taken as bycatch by species, ecoregion, and métier level 4 combinations, with 95% confidence intervals (CI) (bars); and by decreasing bycatch (from top to bottom). The higher CI for the top species/ecoregion/métier combination (top bar) extended beyond 15 000 individuals and was cropped to improve visual representation.

Subregional bycatch estimates were available for the loggerhead turtle and the leatherback turtle (Annex 4). For the loggerhead, annual bycatch was estimated in drifting longlines in GSA areas 5 and 6 in the Western Mediterranean Sea ecoregion. These estimates were equivalent to 356 (95% CI 273–465) and 103 bycaught specimens (95% CI 32–338), respectively. For the leatherback, bycatch was estimated in drifting longlines in Subdivision 27.9.b.1 (Oceanic Northeast Atlantic ecoregion) and was equivalent to 24 specimens (95% CI 3–169).

Fish

Estimated numbers of priority fish species taken as bycatch in 2023 were available for the Adriatic sturgeon (*Acipenser naccarii*) in s (OTB) in the Ionian Sea and the Central Mediterranean Sea ecoregion (153 specimens [95% CI 22–1 084]; for the common skate complex *Dipturus batis* and *D. intermedius*, in four ecoregions and six ecoregion/métier combinations; for the spiny butterfly ray (*Gymnura altavela*) in bottom otter trawls (OTB) in three ecoregions; for the angel shark (*Squatina squatina*) in trammel nets (GTR) and set gillnets (GNS) in the Celtic Seas ecoregion (60 specimens [95% CI 23–155] and 15 specimens [95% CI 2–105], respectively); and for the beluga sturgeon (*Huso huso*) in midwater otter trawls (OTM) in the Black Sea (41 specimens [95% CI 7–243]) (Figure 3 and Annex 5).

Estimated numbers of common skate taken as bycatch in 2023 were higher in multi-rig otter trawls (OTT) in the Greater North Sea ecoregion (182 specimens of *D. intermedius* [95% CI 66–501]) and in anchored seines (SDN) in Icelandic Waters ecoregion (169 specimens of *D. batis* [95% CI 24–1 202]).

Bycatch estimates for the spiny butterfly ray in bottom otter trawls (OTB) ranged from 33 specimens (95% CI 5–235) in the Bay of Biscay and the Iberian Coast ecoregion to 221 specimens (95% CI 31–1584) in the Ionian Sea and the Central Mediterranean Sea ecoregion.

A subregional estimate of bycatch for 2023 was available for Atlantic sturgeon (*Acipenser oxyrinchus*) in set gillnets (GNS) in Subdivision 27.3.d.24 (Baltic Sea ecoregion) and was equivalent to 1 274 specimens (95% CI 355–4 575) (Annex 6).

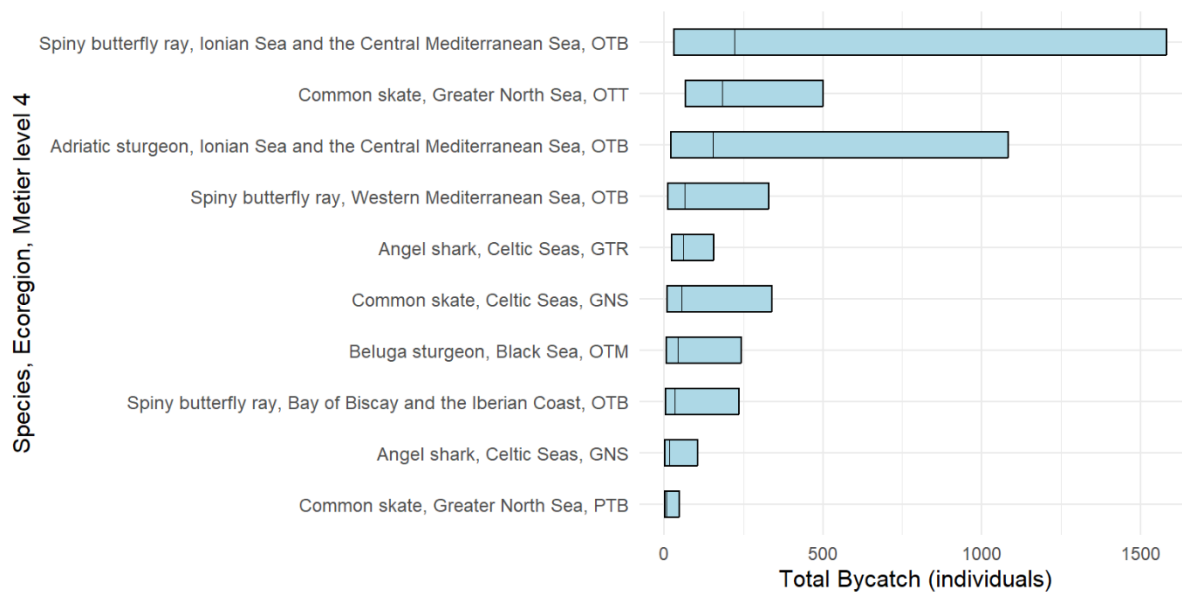


Figure 3. Estimates of the numbers of specimens of priority fish species taken as bycatch by ecoregion and métier level 4 combinations, with 95% confidence intervals (bars), and by decreasing bycatch (from top to bottom).

Multiannual bycatch rates

Multiannual bycatch rates (BPUE) for the period 2017–2023 are provided for priority species, métier level 4 and ecoregion combinations in Annex 1 (marine mammals), Table 1 (seabird), Annex 3 (marine turtles), and Annex 5 (fish).

Marine mammals

For priority marine mammals for which an annual number of specimens taken as bycatch could not be estimated in 2023, the three highest estimated multiannual bycatch rates in métier/ecoregion were for

- Short-beaked common dolphin in midwater otter trawls (OTM) in the Bay of Biscay and the Iberian Coast ecoregion (BPUE 0.203 [95% CI 0.020–2.092])
- Harbour porpoise in set gillnets (GNS) in the Barents Sea ecoregion (BPUE 0.040 [95% CI 0.001–1.222])
- Harbour porpoise in anchored seine (SDN) in the Greater North Sea ecoregion (BPUE 0.008 [95% CI 0.001–0.100])

Seabird

For the priority seabird Balearic shearwater, multiannual bycatch rates for the period 2017–2023 were available for set gillnets (GNS) and bottom otter trawls (OTB) in the Bay of Biscay and the Iberian Coast ecoregion. These rates were equivalent to 0.006 (95% CI 0.001–0.062) and 0.003 (95% CI < 0.001–0.083), respectively (Table 1).

Marine turtles

The three highest estimated bycatch rates of priority marine turtles were for the loggerhead turtle in drifting longlines (LLD) and purse seine (PS) in the Adriatic Sea ecoregion (BPUE 0.114 (95% CI 0.004–2.977) and 0.018 (95% CI 0.001–0.213), respectively), and in set longlines (LLS) in the Aegean–Levantine Sea ecoregion (BPUE 0.008 (95% CI < 0.001–0.281) (Annex 3).

Fish

For priority fish species for which an annual bycatch estimate could not be estimated in 2023, the three highest estimated multiannual bycatch rates were for

- Stellate sturgeon (*Acipenser stellatus*) in beam trawls (TBB) in the Black Sea ecoregion (BPUE 0.066 [95% CI 0.003–1.428])
- Stellate sturgeon in midwater otter trawls (OTM) in the Black Sea ecoregion (BPUE 0.019 [95% CI 0.001–0.279])
- Spiny butterfly ray in trammel nets (GTR) in the Western Mediterranean Sea ecoregion (BPUE 0.012 [95% CI < 0.001–0.332])

Additional species of bycatch relevance

This section highlights the highest bycatch estimates (2023) and multiannual bycatch rates (2017–2023) in métiers level 4/ecoregion combinations for additional species of bycatch relevance. All other bycatch and multiannual bycatch rate estimates for 2023 are provided by species/métier/ecoregion combinations in Data Product 1 (ICES, 2024h) and by species/métier/ICES subdivision/Mediterranean GSA in Data Product 2 (ICES, 2024i).

Marine mammals

In 2023, the three highest estimates of annual bycatch for marine mammals were for

- Harbour seal (*Phoca vitulina*) in set gillnets (GNS) in the Norwegian Sea ecoregion (455 specimens [95% CI 214–966])
- Bottlenose dolphin (*Tursiops truncatus*) in set gillnets (GNS) in the Bay of Biscay and the Iberian Coast ecoregion (315 specimens [95% CI 113–880])
- Harbour seal in fykenets (FYK) in the Greater North Sea ecoregion (222 specimens [95% CI 37–1 342])

The three highest multiannual bycatch rates for the period 2017–2023 were for

- Harbour seal in fykenets (FYK) in the Greater North Sea ecoregion (BPUE 0.219 [95% CI 0.036–1.319])
- Harbour seal in set gillnets (GNS) in the Icelandic Waters ecoregion (BPUE 0.108 [95% CI 0.021–0.558])
- Harbour seal in set gillnets (GNS) in the Barents Sea ecoregion (BPUE 0.063 [95% CI 0.002–2.238])

Seabirds

In 2023, the three highest estimates of annual bycatch for seabirds were for

- Northern gannet (*Morus bassanus*) in set longlines (LLS) in the Bay of Biscay and the Iberian Coast ecoregion (1 890 specimens [95% CI 675–5 293])
- Northern gannet in set gillnets (GNS) in the Bay of Biscay and the Iberian Coast ecoregion (1 687 specimens [95% CI 819–3 474])
- European shag (*Phalacrocorax aristotelis*) in bottom otter trawls (OTB) in the Adriatic Sea ecoregion (1 314 specimens [95% CI 168–10 296])

The three highest multiannual bycatch rates for the period 2017–2023 were for

- Common guillemot (*Uria aalge*) in set gillnets (GNS) in the Icelandic Waters ecoregion (BPUE 0.558 [95% CI 0.318–0.977])
- Common eider (*Somateria mollissima*) in set gillnets (GNS) in the Icelandic Waters ecoregion (BPUE 0.382 [95% CI 0.050–2.917])
- Common guillemot in drifting gillnets (GND) in the Bay of Biscay and the Iberian Coast ecoregion (BPUE 0.128 [95% CI 0.039–0.422])

Fish

ICES notes that the following fish species may be targeted by fishing operations in some areas/ecoregions, although they are currently included in the ICES list of ETP fish species of bycatch relevance (ICES, 2024a).

In 2023, the three highest estimates of annual bycatch for fish species were for

- Blackbelly rosefish (*Helicolenus dactylopterus*) in set longlines (LLS) in the Azores ecoregion (185 879 specimens [95% CI 82 792–417 323])

- Blackbelly rosefish in bottom pair trawls (PTB) in the Bay of Biscay and the Iberian Coast ecoregion (185 250 specimens [95% CI 23 562–1 456 500])
- Scabbardfish (*Lepidopus caudatus*) in set longlines (LLS) in the Azores ecoregion (68 958 specimens [95% CI 41 769–113 848])

The three highest multiannual bycatch rates for the period 2017–2023 were for

- Blackbelly rosefish in bottom otter trawls (OTB) in the Oceanic Northeast Atlantic ecoregion (BPUE 5.199 [95% CI 0.021–1284.843])
- Norway haddock (*Sebastes viviparus*) in bottom otter trawls (OTB) in the Oceanic Northeast Atlantic ecoregion (BPUE 2.285 [95% CI 0.012–422.671])
- Undulate ray (*Raja undulata*) in bottom pair trawl (PTB) in the Greater North Sea ecoregion (BPUE 1.861 [95% CI 0.007–493.447])

Remedial measures to improve ETP bycatch estimation and assessments

The primary issues preventing the estimation of annual bycatch and multiannual bycatch rates (BPUE) relate to data availability.

ICES reiterates that improving monitoring to estimate bycatch is not only about increasing coverage. It may also require strategically stratifying monitoring effort based on bycatch probability (ICES, 2024d). For example, when the likelihood of interactions between ETP species and fisheries is low, stratifying monitoring by métier will be most effective. For very rare species with extremely low bycatch probability, reliable bycatch estimates may be unachievable with any level of monitoring effort, and the focus should be on the implementation of suitable mitigation measures (ICES, 2024d).

Several EU priority species/ecoregion/métier combinations failed to produce a bycatch estimate due to missing or incomplete fishing effort data. ICES recommends that improved reporting of fishing effort would increase the proportion of species/ecoregion/métier combinations for which annual bycatch can be estimated, as well as multiannual bycatch rates. Monitoring effort for smaller vessels (< 12 m) remains limited, and an increase is required to support bycatch estimation.

Recommendations

ICES recommends the routine use of mitigation measures to minimize and, where possible, eliminate bycatch of ETP species (ICES, 2020). The use of mitigation measures must meet accepted operational standards to ensure that bycatch rates will be effectively and consistently reduced. Mitigation measures need to be prioritized for species/populations with extremely low bycatch probability, such as the Baltic Proper harbour porpoise population (ICES, 2024e).

ICES recommends that Member Countries use at-sea observers and electronic monitoring protocols, corresponding to systems with appropriately placed cameras and suitable species identification methods, for the collection of robust and reliable bycatch data; and that, as stated in ICES data call specifications, they submit complete fishing effort and monitoring effort data for all métiers, even when no bycatch has been reported.

ICES reiterates that no single monitoring design can achieve a precise and accurate BPUE estimate for all ETP species (ICES, 2024d). To improve the accuracy and precision of bycatch estimation, ICES recommends that Member Countries increase monitoring coverage, particularly in high-risk métiers as identified in this advice (Table 3); increase the number of fishing vessels monitored; and/or consider stratifying monitoring effort based on the likelihood of interactions between ETP species and fisheries.

Basis of the advice

Data call

ICES estimated the annual numbers of specimens of ETP species taken as bycatch (for 2023) and multiannual bycatch rates (BPUE, for 2017–2023), based on data received through the 2024 and earlier ICES data calls to ICES Member Countries (except the Russian Federation, US, and Canada) and to eight non-ICES EU Member States, six from the Mediterranean Sea region and two from the Black Sea region (ICES, 2024b). The 2024 data call requested data from 2023 on fishing effort, bycatch monitoring effort, and reported bycatch of marine mammals, seabirds, marine turtles, and fish of bycatch relevance. For the Mediterranean and Black Sea ecoregions, all reported bycatch of marine mammals, seabirds, and marine turtles was requested. Monitoring and bycatch data were gathered from dedicated ETP species bycatch programmes (e.g. observer or remote electronic bycatch monitoring programmes and bycatch pilot projects) and non-dedicated multipurpose monitoring programmes (e.g. the Data Collection Framework). Twenty-three countries out of 25 provided data in response to the data call. Issues were detected in the reporting of fishing effort submitted by one country; as a result, the 2022 fishing effort was used for that country to estimate the numbers of specimens taken as bycatch in 2023. In general, the quality and scope of the information provided through the data call is improving but remains variable (ICES, 2024c).

The bycatch monitoring data consisted of information collected through different methods, including at-sea observers, electronic monitoring, port observers, vessel crew observers, and logbook data. Data based on port observers or recorded in logbooks were summarized in the report but are not used for providing advice. ICES considers at-sea observers and electronic monitoring to be the most reliable sources of data for ETP bycatch assessments. These monitoring methods are also the source of a majority of reported bycatch records in 2023. At-sea observers, electronic monitoring, and selected reliable vessel crew observer data are used to estimate annual bycatch and multiannual bycatch rates.

Bycatch Evaluation and Assessment Matrix (BEAM)

ICES applies a BEAM screening procedure to evaluate the various inputs needed for full quantitative assessments of the population impacts of fisheries bycatch. Criteria considered by the BEAM in the generation of this advice are: 1) BPUE quality and analysis, 2) fishing effort data availability, 3) bycatch estimation; and 4) population abundance estimate availability. With regards to the application of criterion 3, only estimated numbers of specimens taken as bycatch are considered. Survival rates required to estimate mortality are not yet available. The applied BEAM methodology is scheduled to be benchmarked at the end of 2025.

Multiannual bycatch rates

Multiannual bycatch rates were estimated for ETP species, métier level 4, and ecoregion (and in some cases [sub]divisions/GSA) combinations for which bycatch was observed/reported over the 2017–2023 period. The first criterion of the BEAM (BPUE quality analysis) applies a statistical procedure to quantify the precision and ensure the representativeness of pooled métier level 4 BPUE estimates derived from observed bycatch events from different monitoring programmes (ICES, 2024c). Such programmes can vary by year, observation method, fishing gear deployed within the métier observed, location of fishing operations, vessel length, and reporting nation and will result in heterogeneity in BPUE observations. In addition to this procedure, a minimum monitoring ratio of one monitoring day in 2023 for every 1 000 fishing days in 2023 (i.e. a ratio of 0.001) was selected as an expert-informed threshold for representativeness, consistent with the available evidence and standardization approach. Pooled BPUE estimates are provided for species, métier level 4, and ecoregion that meet this threshold, and for which the sampling protocol matched the reported species bycatch. Most cases in which a multiannual bycatch rate (pooled BPUE) could not be estimated were due to no bycatch being reported/observed. In cases where within-ecoregion variability prevented the estimation of a pooled BPUE at the ecoregion scale, a multiannual bycatch rate was estimated at subregional level for species, métier level 4, and ICES subdivisions/GSA combinations.

Annual numbers of specimens taken as bycatch

Once a BPUE has been estimated, bycatch can be estimated (with precision) if fishing effort is available for the relevant species, métier, and ecoregion combination. According to BEAM criterion 3 (bycatch mortality estimation), bycatch is estimated by predicting the number of bycaught individuals based on the fishing effort, using the pooled BPUE estimate. In instances when heterogeneity in BPUE was detected, bycatch is only estimated if the fishing effort was available for all levels of the monitoring programme variable/factor identified as a source of heterogeneity. If between-year heterogeneity was detected, only the 2023 BPUE estimate was used to calculate bycatch given the 2023 fishing effort.

The BEAM procedure related to fishing effort data availability (criterion 2) does not currently include any assessment of the accuracy of the fishing effort data. The estimated numbers of specimens taken as bycatch therefore rely on the assumption that the reported fishing effort is complete, which is not the case for all regions (e.g. some fishing countries are not represented in the Black Sea and the Mediterranean Sea in 2023). Additionally, fishing effort is currently presented by Days at Sea, the lowest common denominator across various datasets. This metric does not necessarily properly reflect the actual exposure to risk for ETP species for all gear types.

Additional information

Mitigation measures

ICES highlights mitigation measures that have been demonstrated to reduce bycatch and that could be applicable for high-priority species and métiers but notes that the results of such trials may be species-, métier- and area-specific. This information is based on the newly published evidence in 2023.

Spatial management measures accounting for high densities of large cetaceans may effectively reduce their bycatch in fisheries (Reikkola *et al.*, 2023). For small cetaceans, dolphin deterrent devices (DDD) significantly reduce bycatch of common dolphin (95.6% reduction) in pair bottom trawl fisheries (Puente *et al.*, 2023). Application of pingers in Norwegian gillnet fisheries reduced bycatch of harbour porpoises by 70–100% without affecting the catch of target species (Moan & Bjørge, 2023). Other available evidence also suggests possible detrimental impacts of such pinger devices on harbour porpoise populations (Lusseau *et al.*, 2023).

Bird scarers were also shown to be an effective deterrent to keep gulls (*Larus michahellis* and *L. fuscus*) and northern gannets away from fishing operations (Almeida, 2023). The addition of a small-meshed net panel to the bottom of set gillnets reduced bycatch of common eider by 71% but caused a 25% reduction in target catches (Post *et al.*, 2023).

The use of circle hooks in pelagic longlines efficiently reduced the number of bycaught loggerhead turtles but increased bycatch of blue shark (*Prionace glauca*) (Lima *et al.*, 2023).

Trammel-net gear modifications can reduce the bycatch of elasmobranchs. Increasing the length of the rigging twine between the footrope and the netting panel and decreasing the mesh size of the outer panels successfully lowered captures of the marbled electric ray (*Torpedo marmorata*) without negatively affecting the target species catch (Ganias, 2023). Release protocols and onboard handling modifications in tuna purse-seine fisheries reduced post-release mortality for Mobulids (Cronin *et al.*, 2023).

For harbour porpoise in the Baltic Sea, ICES recently reviewed the effectiveness of dynamic closures and other mitigation measures to reduce or prevent bycatch in fisheries (ICES 2024f).

High-priority areas and métiers for bycatch monitoring

For each ecoregion, ICES identified the five combinations of ICES subdivisions/GSAs and fishing métiers level 4 with comparatively high levels of fishing effort and a high perceived risk of ETP bycatch occurring (Table 3). The relative risk of bycatch occurring was assessed based on expert knowledge and available evidence (ICES, 2024c). These area-métiers combinations are considered high priority for bycatch monitoring. ICES notes that most of these high-priority métiers/areas had limited monitoring, while several had no bycatch monitoring in 2023.

For seabirds in the Oceanic Northeast Atlantic ecoregion, ICES recently identified midwater otter trawls and drifting longlines as the fishing gears contributing a higher bycatch risk to seabirds (ICES, 2024g).

Table 3. Top priority areas and métier level 4 combinations for ETP bycatch monitoring in 2023. Monitoring coverage; percentage of the total fishing effort (days-at-sea) monitored for bycatch.

Ecoregion	ICES Subdivision/GFCM GSA	Métier Level 4	Monitoring coverage (%) (2023) *
Adriatic Sea	17	GNS	0.768
	17	OTB	2.351
	18	GNS	0.051
	17	GTR	1.247
	18	OTB	0.189
Aegean Levantine Sea	22	GTR	0.078
	22	GNS	0.105
	22	LLS	0.092
	25	GNS	0.056
	25	GTR	0.059
Azores	27.10.a	LHP	1.618
	27.10.a	LLS	1.710
	27.10.a	LLD	1.148
	27.10.a	GNS	0.777
	27.10.a	PS	0.741
Baltic Sea	27.3.d	GNS	0.127
	27.3.d	FYK	0.024
	27.3.d	OTM	2.848
	27.3.c	GNS	2.677
	27.3.c	GTR	1.281
Barents Sea	27.1.b	GNS	0
	27.1.a	OTB	9.094
	27.1.b	OTB	0
	27.1.b	OTT	0
	27.1.a	TBB	0
	27.9.a	GNS	0.048

Ecoregion	ICES Subdivision/GFCM GSA	Métier Level 4	Monitoring coverage (%) (2023) *
Bay of Biscay and the Iberian coast	27.9.a	OTB	0.355
	27.9.a	FPO	0.043
	27.9.a	GTR	0.876
	27.8.a	GNS	0.668
Black Sea	29	GNS	0.470
	29	OTM	1.358
	29	TBB	1.514
	29	FPO	0
	29	LLD	0
Celtic Seas	27.6.a	OTB	1.348
	27.6.a	FPO	0
	27.7.j	OTB	0.470
	27.7.a	OTB	0.301
	27.7.g	OTB	1.090
Faroes	27.5.b	OTB	0.97
	27.5.b	OTM	0
	27.5.b	FPO	0
	27.5.b	OTT	0
	27.5.b	LLS	0
Greater North Sea	27.3.a	OTB	0.514
	27.4.a	OTB	1.937
	27.4.b	OTB	0.672
	27.7.e	OTB	0.742
	27.4.b	TBB	0.392
Greenland Sea	27.14.b	OTB	9.738
	27.14.a	OTB	0
	27.14.b	OTT	0
Icelandic Waters	27.5.a	OTB	5.512
	27.5.a	LLS	0.291

Ecoregion	ICES Subdivision/GFCM GSA	Métier Level 4	Monitoring coverage (%) (2023) *
	27.5.a	GNS	11.196
	27.5.a	OTM	2.719
	27.5.a	SDN	0.544
Ionian and the Central Mediterranean Sea	20	GTR	0.090
	20	GNS	0.075
	20	LLS	0.054
	19	GTR	0.121
	16	GTR	0
Oceanic Northeast Atlantic	27.10.b	LLD	0
	27.12.c	OTB	0
	27.12.c	LLD	0
	27.12.c	OTT	0
	27.10.b	GNS	0
Norwegian Sea	27.2.a	GNS	2.067
	27.2.b	OTB	27.769
	27.2.a	OTM	1.980
	27.2.b	OTT	0
	27.2.a	OTB	14.385
Western Mediterranean Sea	10	GTR	0
	6	OTB	0.337
	10	GNS	0
	11.2	GTR	0
	11.2	GNS	0

*Exception for Icelandic Waters ecoregion, which uses 2022 fishing effort information.

Bycatch risk assessment for data-limited ETP species

To underpin bycatch assessments for high-extinction-risk and low-information species for which quantitative estimation of bycatch and bycatch rates is not possible, ICES is developing a robust, transparent, and repeatable risk assessment method. Preliminary testing and review of the methodology is ongoing (ICES, 2024c). This method is expected to inform the prioritization of those species/gear combinations likely to pose the greatest risk of bycatch, taking into account spatial and temporal overlap between species distributions and fishing effort.

Strandings information

Strandings data can provide auxiliary information on bycatch of cetaceans. In 2023, reported strandings data highlighted probable bycatch interactions for 7 cetacean species.

The short-beaked common dolphin was the main species reported stranded in 2023. An unprecedented high number of strandings (1 756 specimens) was recorded along the French coast of the Bay of Biscay and the Iberian coast ecoregion. The apparent bycatch rate of short-beaked common dolphin (percentage of stranded specimens with bycatch evidence relative to the total number of stranded specimens examined) was very high (> 70%) along the French coast of the Bay of Biscay and the Iberian Coast ecoregion and reached 80% between the months of January and March.

Harbour porpoise was the second-most-frequent species in reported strandings, with a total of 1 564 specimens reported stranded in seven countries. Based on national reports of strandings data, apparent bycatch rates of porpoises ranged from 3% in UK waters to 84% along the Portuguese coast.

Other reported stranded species with evidence of bycatch in 2023 included the bottlenose dolphin *Tursiops truncatus*, the Risso's dolphin (*Grampus griseus*) and the striped dolphin (*Stenella coeruleoalba*), as well as Minke whales (*Balaenoptera acutorostrata*) and humpback whale (*Megaptera novaeangliae*).

Strandings data can be used to estimate bycatch mortality based on drift models (Peltier, 2016). Based on recorded strandings for short-beaked common dolphins and harbour porpoises in French waters of the Bay of Biscay and Western Channel, the 2023 bycatch mortality estimate of common dolphin was 11 330 (95% CI 8 490; 15 990); the estimate for harbour porpoise was 140 specimens (95% CI 100–190). Such analyses have not yet been conducted in other areas (Méheust *et al.*, 2024).

Annexes

Annexes 1 to 6 include estimated numbers of specimens of priority species taken as bycatch in 2023 and multiannual bycatch rates (BPUE) for 2017-2023, with uncertainty (95% CI). Annexes 7 and 8 describe column headers and specifications in two data products.

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Annexes

Annex 1. Estimated numbers of specimens of priority marine mammals species taken as bycatch in 2023 (Est. bycatch) and multiannual bycatch rates (BPUE) for 2017-2023, with uncertainty (95% CI), including information on ecoregion-scale abundance estimates, where available. The information is presented by species and by decreasing estimated bycatch values for species-ecoregion-métier combinations. Complementary information on reported bycatch, monitoring and fishing effort, is available in Data Product 1 (ICES, 2024h). n.a.; not available due to within-ecoregion variability or missing fishing effort data, which prevented the estimation of bycatch in métiers level 4 at the scale of entire ecoregions.

Ecoregion	métier L4	Species	BPUE (95% CI) (2017-2023)	Est. bycatch (95% CI) (2023)	Abundance estimate (reference)
Bay of Biscay and the Iberian Coast	GNS	<i>Delphinus delphis</i>	0.012 (0.006-0.025)	1834 (912-3689)	302238 (95% CL = 106975 - 323306) (Gilles et al., 2023)
Bay of Biscay and the Iberian Coast	GTR	<i>Delphinus delphis</i>	0.022 (0.013-0.037)	1236 (738-2070)	
Bay of Biscay and the Iberian Coast	PS	<i>Delphinus delphis</i>	0.012 (0.006-0.026)	765 (371-1579)	
Bay of Biscay and the Iberian Coast	PTB	<i>Delphinus delphis</i>	0.006 (0.000-38.394)	744 (241-4908)	
Bay of Biscay and the Iberian Coast	OTB	<i>Delphinus delphis</i>	0.004 (0.002-0.011)	312 (128-759)	
Greater North Sea	PS	<i>Delphinus delphis</i>	0.076 (0.026-0.218)	188 (66-541)	1814 (95% CL = 25 - 5981) (Gilles et al., 2023)
Celtic Seas	OTT	<i>Delphinus delphis</i>	0.002 (<0.001-0.012)	19 (3-125)	162716 (95% CL = 83618 - 303467) (Gilles et al., 2023)
Celtic Seas	PS	<i>Delphinus delphis</i>	0.014 (0.002-0.101)	2 (0-12)	
Bay of Biscay and the Iberian Coast	OTM	<i>Delphinus delphis</i>	0.203 (0.020-2.092)	n.a.	302238 (95% CL = 106975 - 323306) (Gilles et al., 2023)
Bay of Biscay and the Iberian Coast	FPO	<i>Delphinus delphis</i>	0.007 (0.001-0.049)	n.a.	
Celtic Seas	GTR	<i>Delphinus delphis</i>	0.005 (<0.001-0.056)	n.a.	
Bay of Biscay and the Iberian Coast	LLS	<i>Delphinus delphis</i>	0.004 (<0.001-0.108)	n.a.	
Greater North Sea	OTB	<i>Delphinus delphis</i>	0.000 (0.000-0.014)	n.a.	
Aegean-Levantine Sea	LLS	<i>Monachus monachus</i>	0.001 (<0.001-0.006)	n.a.	438-582 (Karamanlidis AA., 2024)
Norwegian Sea	GNS	<i>Phocoena phocoena</i>	0.040 (0.017-0.090)	2267 (1323-3905)	70314 (IMR/NAMMCO, 2019)
Icelandic Waters	GNS	<i>Phocoena phocoena</i>	0.207 (0.063-0.685)	559 (312-1034)	86731 (IMR/NAMMCO, 2019)
Greater North Sea	GTR	<i>Phocoena phocoena</i>	0.037 (0.006-0.224)	389 (64-2362)	338918 (95% CL = 243063 – 479203) (Gilles et al., 2023)

Ecoregion	métier L4	Species	BPUE (95% CI) (2017-2023)	Est. bycatch (95% CI) (2023)	Abundance estimate (reference)
Bay of Biscay and the Iberian Coast	GTR	<i>Phocoena phocoena</i>	0.007 (0.004-0.013)	377 (201-707)	4043 (95% CL = 1842 – 7309) (Gilles et al., 2023)
Black Sea	GNS	<i>Phocoena phocoena</i>	0.020 (0.002-0.182)	126 (14-1163)	258900 (Popov et al., 2023)
Bay of Biscay and the Iberian Coast	GNS	<i>Phocoena phocoena</i>	0.001 (<0.001-0.004)	123 (30-515)	4043 (95% CL = 1842 – 7309) (Gilles et al., 2023)
Baltic Sea	GTR	<i>Phocoena phocoena</i>	0.010 (0.001-0.148)	45 (10-625)	14403+491 (Gilles et al., 2023 + Amundin et al., 2022)
Celtic Seas	OTB	<i>Phocoena phocoena</i>	0.001 (<0.001-0.003)	31 (5-181)	26870 (95% CL = 17745 - 41536) (Gilles et al., 2023)
Celtic Seas	GTR	<i>Phocoena phocoena</i>	0.014 (0.002-0.092)	27 (4-183)	
Greater North Sea	OTB	<i>Phocoena phocoena</i>	<0.001 (0.000-0.002)	24 (3-168)	338918 (95% CL = 243063 – 479203) (Gilles et al., 2023)
Celtic Seas	OTT	<i>Phocoena phocoena</i>	0.002 (<0.001-0.006)	17 (4-69)	26870 (95% CL = 17745 - 41536) (Gilles et al., 2023)
Barents Sea	GNS	<i>Phocoena phocoena</i>	0.040 (0.001-1.222)	n.a.	Not available
Greater North Sea	SDN	<i>Phocoena phocoena</i>	0.008 (0.001-0.010)	n.a.	338918 (95% CL = 243063 – 479203) (Gilles et al., 2023)
Bay of Biscay and the Iberian Coast	PTM	<i>Phocoena phocoena</i>	0.002 (<0.001-0.038)	n.a.	4043 (95% CL = 1842 – 7309) (Gilles et al., 2023)
Bay of Biscay and the Iberian Coast	OTB	<i>Phocoena phocoena</i>	0.001 (<0.001-0.029)	n.a.	

Annex 2. Subregional estimates of annual bycatch for 2023 (Est. bycatch) and multiannual bycatch rates (BPUE) (for 2017-2023) with uncertainty (95% CI) for priority marine mammals by ICES Division and Subdivision and métier level 4.

Ecoregion	ICES subdivision	métier L4	Species	BPUE (95% CI) (2017-2023)	Est. bycatch (95% CI) (2023)
Greater North Sea	27.7.e	OTB	<i>Delphinus delphis</i>	0.012 (0.004-0.0347)	205 (71-594)
Greater North Sea	27.7.e	GTR	<i>Delphinus delphis</i>	0.033 (0.003-0.392)	141 (30-677)
Celtic Seas	27.7.f	OTB	<i>Delphinus delphis</i>	0.115 (0.017-0.77)	151 (22-1015)
Celtic Seas	27.7.g	OTB	<i>Delphinus delphis</i>	0.013 (0.002-0.084)	94 (14-629)
Greater North Sea	27.7.e	GNS	<i>Delphinus delphis</i>	0.008 (0.002-0.033)	44 (10-190)
Celtic Seas	27.7.h	OTB	<i>Delphinus delphis</i>	0.0035 (0.001-0.025)	16 (2-113)
Baltic Sea	27.3.c.22	GNS	<i>Phocoena phocoena</i>	0.0578 (0.031-0.109)	393 (209-740)
Greater North Sea	27.3.b.23	GNS	<i>Phocoena phocoena</i>	0.0361 (0.022-0.059)	70 (43-114)

Annex 3. Estimated numbers of specimens of priority marine turtle species taken as bycatch in 2023 (Est. bycatch) and multiannual bycatch rates (BPUE) for 2017-2023 with uncertainty (95% confidence intervals, CI), including information on ecoregion-scale abundance estimates, where available. Additional details on the quality of these estimates are available in ICES, 2024c. The information is presented by species and by decreasing estimated bycatch values for species-ecoregion-métier combinations. Complementary information on reported bycatch, monitoring and fishing effort, is presented in Data product 1 (ICES, 2024h). n.a.; not available due to within-ecoregion variability or missing fishing effort data, which prevented the estimation of bycatch in métiers level 4 at the scale of entire ecoregions.

Ecoregion	métier L4	Species	BPUE (95% CI) (2017-2023)	Est. bycatch (95% CI) (2023)	Abundance estimate (reference)
Adriatic Sea	OTB	<i>Caretta caretta</i>	0.034 (0.010-0.111)	2887 (531-15826)	27000 (95% CI = 24000-31000) (Fortuna et al. 2018); 34200* (95% CI = 28900-40400) (ACCOBAMS, 2021)
Adriatic Sea	PTM	<i>Caretta caretta</i>	0.058 (0.040-0.084)	491 (338-712)	
Aegean-Levantine Sea	OTB	<i>Caretta caretta</i>	0.009 (0.004-0.019)	333 (155-712)	13345 (95% CI = 6114-29128) (ACCOBAMS, 2021)
Oceanic Northeast Atlantic	LLD	<i>Caretta caretta</i>	0.067 (0.021-0.212)	302 (95-963)	n.a.
Western Mediterranean Sea	OTB	<i>Caretta caretta</i>	0.001 (0.001-0.003)	208 (92-473)	102037 (95% CI = 94013-110746) (ACCOBAMS, 2021)
Bay of Biscay and the Iberian Coast	LLD	<i>Caretta caretta</i>	0.063 (0.010-0.415)	166 (25-1090)	Not available
Azores	LLD	<i>Caretta caretta</i>	0.052 (0.012-0.229)	124 (28-549)	5187 (95% CI = 2170 - 12399) (Saavedra et al., 2018)
Bay of Biscay and the Iberian Coast	GNS	<i>Caretta caretta</i>	0.001 (<0.001-0.006)	90 (9-854)	Not available
Azores	GNS	<i>Caretta caretta</i>	0.034 (0.011-0.105)	74 (24-229)	5187 (95% CI = 2170 - 12399) (Saavedra et al., 2018)
Western Mediterranean Sea	OTT	<i>Caretta caretta</i>	0.004 (0.001-0.010)	17 (6-46)	102037 (95% CI = 94013-110746) (ACCOBAMS, 2021)
Aegean-Levantine Sea	LLD	<i>Caretta caretta</i>	0.010 (0.001-0.072)	16 (2-113)	13345 (95% CI = 6114-29128) (ACCOBAMS, 2021)

Ecoregion	métier L4	Species	BPUE (95% CI) (2017-2023)	Est. bycatch (95% CI) (2023)	Abundance estimate (reference)
Adriatic Sea	LLD	<i>Caretta caretta</i>	0.114 (0.004-2.977)	n.a.	27000 (95% CI = 24000-31000) (Fortuna et al. 2018); 34200 (95% CI = 28900-40400) (ACCOBAMS, 2021)
Adriatic Sea	PS	<i>Caretta caretta</i>	0.018 (0.001-0.213)	n.a.	
Adriatic Sea	GTR	<i>Caretta caretta</i>	0.006 (0.001-0.040)	n.a.	
Aegean-Levantine Sea	LLS	<i>Caretta caretta</i>	0.008 (<0.001-0.281)	n.a.	13345 (95% CI = 6114-29128) (ACCOBAMS, 2021)
Ionian Sea and the Central Mediterranean Sea	GTR	<i>Caretta caretta</i>	0.007 (<0.001-0.200)	n.a.	166648 (95% CI = 155844-178201) (ACCOBAMS, 2021)
Aegean-Levantine Sea	GTR	<i>Caretta caretta</i>	0.001 (<0.001-0.033)	n.a.	13345 (95% CI = 6114-29128) (ACCOBAMS, 2021)
Aegean-Levantine Sea	LLD	<i>Chelonia mydas</i>	0.080 (0.013-0.493)	125 (20-774)	0.26–2.21 million for the whole Mediterranean Sea (Casale & Heppell, 2016)
Azores	GNS	<i>Chelonia mydas</i>	0.011 (0.002-0.080)	25 (4-175)	Not available
Aegean-Levantine Sea	OTB	<i>Chelonia mydas</i>	0.007 (<0.001-0.207)	n.a.	0.26–2.21 million for the whole Mediterranean Sea (Casale & Heppell, 2016)
Azores	LLD	<i>Dermochelys coriacea</i>	0.013 (0.005-0.035)	30 (11-83)	Not available
Western Mediterranean Sea	LLD	<i>Dermochelys coriacea</i>	<0.001 (<0.001-0.003)	14 (2-102)	Not available
Bay of Biscay and the Iberian Coast	LLD	<i>Dermochelys coriacea</i>	<0.001 (0.000-13.655)	n.a.	Not available

Annex 4. Subregional estimates of annual bycatch for 2023 (Est. bycatch) and multiannual bycatch rates (BPUE) (for 2017-2023) with uncertainty (95% CI) for priority marine turtles by ICES Subdivision or GCA areas and métier level 4.

Ecoregion	GSA/ICES Subdivision	métier L4	Species	BPUE (95% CI) (2017-2023)	Est. bycatch (95% CI) (2023)
Western Mediterranean Sea ecoregion	5	LLD	<i>Caretta caretta</i>	0.195 (0.149-0.255)	356 (273-465)
Western Mediterranean Sea ecoregion	6	LLD	<i>Caretta caretta</i>	0.041 (0.012-0.134)	103 (32-338)
Oceanic Northeast Atlantic	27.9.b.1	LLD	<i>Dermochelys coriacea</i>	0.046 (0.006-0.323)	24 (3-169)

Annex 5. Estimated numbers of specimens of priority fish species taken as bycatch in 2023 (Est. bycatch) and multiannual bycatch rates (BPUE) for 2017-2023 with uncertainty (95% confidence intervals, CI), including information on ecoregion-scale abundance estimates, where available. The information is presented by species and by decreasing estimated bycatch values for species-ecoregion-métier combinations. Complementary information on reported bycatch, monitoring and fishing effort is presented in Data Product 1 (ICES, 2024h). n.a.; not available due to within-ecoregion variability or missing fishing effort data, which prevented the estimation of bycatch in métiers level 4 at the scale of entire ecoregions.

Ecoregion	métier L4	Species	BPUE (95% CI) (2017-2023)	Est. bycatch (95% CI) (2023)	Abundance estimate (reference)
Ionian Sea and the Central Mediterranean Sea	OTB	<i>Acipenser naccarii</i>	0.002 (<0.001-0.017)	153 (22-1084)	Not available
Black Sea	TBB	<i>Acipenser stellatus</i>	0.066 (0.003-1.428)	n.a.	Not available
Black Sea	OTM	<i>Acipenser stellatus</i>	0.019 (0.001-0.279)	n.a.	Not available
Icelandic Waters	SDN	<i>Dipturus batis</i>	0.016 (0.002-0.111)	169 (24-1202)	Not available
Icelandic Waters	GNS	<i>Dipturus batis</i>	0.035 (0.005-0.231)	70 (11-457)	Not available
Western Mediterranean Sea	OTB	<i>Dipturus batis</i>	<0.001 (0.000-0.001)	28 (4-202)	Not available
Aegean-Levantine Sea	OTB	<i>Dipturus batis</i>	0.003 (<0.001-0.028)	n.a.	Not available
Greater North Sea	OTT	<i>Dipturus intermedius</i>	0.000 (0.000-0.113)	182 (66-501)	Not available
Celtic Seas	GNS	<i>Dipturus intermedius</i>	0.004 (0.001-0.022)	54 (9-338)	Not available
Greater North Sea	PTB	<i>Dipturus intermedius</i>	0.001 (<0.001-0.010)	7 (1-48)	Not available
Greater North Sea	SSC	<i>Dipturus intermedius</i>	0.009 (0.001-0.105)	n.a.	Not available
Celtic Seas	OTT	<i>Dipturus intermedius</i>	0.000 (0.000-0.001)	n.a.	Not available
Ionian Sea and the Central Mediterranean Sea	OTB	<i>Gymnura altavela</i>	0.004 (0.001-0.025)	221 (31-1584)	Not available
Western Mediterranean Sea	OTB	<i>Gymnura altavela</i>	<0.001 (<0.001-0.002)	63 (12-329)	Not available
Bay of Biscay and the Iberian Coast	OTB	<i>Gymnura altavela</i>	0.001 (<0.001-0.003)	33 (5-235)	Not available
Aegean-Levantine Sea	LLS	<i>Gymnura altavela</i>	0.004 (0.001-0.010)	n.a.	Not available
Ionian Sea and the Central Mediterranean Sea	LLS	<i>Gymnura altavela</i>	0.003 (<0.001-0.024)	n.a.	Not available
Western Mediterranean Sea	GTR	<i>Gymnura altavela</i>	0.012 (<0.001-0.332)	n.a.	Not available
Aegean-Levantine Sea	GNS	<i>Gymnura altavela</i>	0.002 (<0.001-0.006)	n.a.	Not available
Ionian Sea and the Central Mediterranean Sea	GTR	<i>Gymnura altavela</i>	0.001 (<0.001-0.008)	n.a.	Not available
Aegean-Levantine Sea	GTR	<i>Gymnura altavela</i>	0.001 (<0.001-0.004)	n.a.	Not available
Black Sea	OTM	<i>Huso huso</i>	0.011 (0.002-0.066)	41 (7-243)	Not available
Ionian Sea and the Central Mediterranean Sea	GTR	<i>Squatina aculeata</i>	0.001 (<0.001-0.022)	n.a.	Not available
Celtic Seas	GTR	<i>Squatina squatina</i>	0.030 (0.012-0.078)	60 (23-155)	Not available
Celtic Seas	GNS	<i>Squatina squatina</i>	0.001 (<0.001-0.007)	15 (2-105)	Not available

Annex 6. Sub-regional estimate of annual bycatch for 2023 (Est. bycatch) and multiannual bycatch rate (BPUE) (for 2017-2023) with uncertainty (95% CI) for a priority fish species in an ICES Subdivision and métier level 4.

Ecoregion	ICES Subdivision	métier L4	Species	BPUE (95% CI) (2017-2023)	Est. bycatch (95% CI) (2023)
Baltic Sea	27.3.d.24	GNS	<i>Acipenser oxyrinchus</i>	0.105 (0.029-0.378)	1274 (355-4575)

Annex 7. Column headers in the Data Product 1 (.xlsx file) (ICES, 2024h).

Column header	Description
Ecoregion	Name of ICES Ecoregion: https://vocab.ices.dk/?codetypeguid=5c4fc316-99f8-413c-8d42-8bbd11f88ab3
Métier L4	métier Level 4: https://vocab.ices.dk/?codetypeguid=6f65b819-57ca-4904-a961-2d55699008d5
Taxon	Corresponding to Marine Mammals, Seabirds, Marine turtles, or Fish
Species latin name	Species Scientific name: https://www.marinespecies.org/
Species common name	English name
Reported bycatch 2017-2023	Individuals reported as bycatch to ICES in 2017-2023 and used in the byacatch estimation
Monitoring effort (DaS) 2017-2023	Days at Sea reported as monitoring effort in 2017-2023 and used in the bycatch estimation
Fishing effort (DaS) 2023	Days at Sea reported as fishing effort in 2023. For one country 2022 effort was used due to data quality issues with the reported 2023 fishing effort
BPUE	Bycatch Per Unit Effort (Individuals bycaught/Day at Sea observed)
BPUE lower CI	BPUE lower 95% confidence interval
BPUE upper CI	BPUE higher 95% confidence interval
Bycatch 2023	Annual bycatch estimate (number of individuals bycaught)
Bycatch lower CI	Annual bycatch lower 95% confidence interval
Bycatch upper CI	Annual bycatch higher 95% confidence interval

Annex 8. Column headers in the Data Product 2 (.xlsx file) (ICES, 2024i).

Column header	Description
ICES Subdivision/GSA	ICES area: https://vocab.ices.dk/?codetypeguid=b69f8d5e-1040-4bbd-908e-0af2d30c82b9/Geographical Subarea: https://vocab.ices.dk/?codetypeguid=05a0bd95-4be7-443c-9e12-cc4e4ca1f0f8
Métier L4	Métier Level 4: https://vocab.ices.dk/?codetypeguid=6f65b819-57ca-4904-a961-2d55699008d5
Taxon	Corresponding to Marine Mammals, Seabirds, Marine turtles, or Fish
Species	Species Scientific name: https://www.marinespecies.org/
Reported bycatch 2017-2023	Individuals reported as bycatch to ICES in 2017-2023 and used in the bycatch estimation
Monitoring effort (DaS) 2017-2023	Days at Sea reported as monitoring effort in 2017-2023 and used in the bycatch estimation
Fishing effort (DaS) 2023	Days at Sea reported as fishing effort in 2023. For one country 2022 effort was used due to data quality issues with the reported 2023 fishing effort
BPUE (2017-2023)	Bycatch Per Unit Effort (Individuals bycaught/Day at Sea observed)
BPUE lower CI	BPUE lower 95% confidence interval
BPUE upper CI	BPUE higher 95% confidence interval
Bycatch 2023	Annual bycatch estimate (number of individuals bycaught)
Bycatch lower CI	Annual bycatch lower 95% confidence interval
Bycatch upper CI	Annual bycatch higher 95% confidence interval