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WP3 - Proposal of coordinated subregional assessment, GES determination and monitoring strategy for cetacean bycatch.

Deliverable 3.1. Inventory of existing bycatch monitoring programmes and other past or ongoing related projects in France, Spain and Portugal

CetAMBICion

**Coordinated Cetacean Assessment,
Monitoring and Management Strategy
in the Bay of Biscay and Iberian Coast subregion**

Work Package 3 Task 3.1

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Coordinated Cetacean Assessment, Monitoring and Management Strategy in the Bay of Biscay and Iberian Coast subregion (CetAMBICion).

The CetAMBICion project, coordinated by the Spanish National Research Council (CSIC) and which includes 15 partners from Spain, France and Portugal, aims to strengthen collaboration and scientific work between the three countries to estimate and reduce cetacean bycatch in the subregion Bay of Biscay and Iberian Coast, in close collaboration with the fishing industry. Until 2023, the project will work to improve scientific knowledge on population abundance, incidental bycatch and on mitigation measures for the latter.

The project is part of the European Commission's DG ENV/MSFD 2020 (Marine Strategy Framework Directive) call and the objectives are aligned with the Habitats Directive and the Common Fisheries Policy too.



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Glossary

Criteria: Distinctive technical features closely linked to qualitative descriptors (Article 3(6) of the Directive [1]). The criteria refer to the aspects that will be evaluated, through the application of the appropriate indicators, to determine if Good Environmental Status is being achieved. In order to avoid confusion between the use of the term "criteria" in this particular context and its use in other contexts, these specific criteria will be referred to as Good Environmental Status criteria.

Criterion element: Constituent elements of an ecosystem, particularly its biological elements (species, habitats and their communities), or aspects of pressures on the marine environment (biological, physical, substances, litter and energy), which are assessed under each criterion [2].

Descriptors: Basis for the description and determination of Good Environmental Status. The Directive (in its Annex I) provides a list of the 11 qualitative descriptors that each member state must use to define Good Environmental Status.

Ecosystem elements: Relevant ecosystem components such as species groups of birds, mammals, reptiles, fish and cephalopods (Descriptor 1), pelagic habitats (Descriptor 1), benthic habitats (Descriptors 1 and 6) and ecosystems, including food webs [2].

Environmental state: General state of the environment in marine waters, considering the structure, function and processes of the ecosystems that make up the marine environment, the natural physiographic, geographical, biological, geological and climatic factors, as well as the physical, acoustic and chemical conditions derived, in particular, from human activities inside or outside the area in question.

Environmental target: Qualitative or quantitative statement on the desired condition of the different components of, and pressures and impacts on, marine waters in respect of each marine region or subregion. Environmental targets are established in accordance with Article 10 of the Directive [1].

Functional group: A set of species within an ecosystem that have similar ecological roles and belong to the same broad taxon, the status of which is assessed collectively. The term is often applied to groups of highly mobile or widely-dispersed species (birds, reptiles, mammals, fish and cephalopods). Each functional group represents a predominant ecological role (e.g., top predator). Currently, the term has been replaced by the more neutral term 'species group'.

Good Environmental Status: The environmental status of marine waters where these provide ecologically diverse and dynamic oceans and seas that are clean, healthy, and productive within their intrinsic conditions, and the use of the marine environment is at a level that is sustainable, thus safeguarding the potential for uses and activities by current and future generations (Article 3(5) of the Directive [1]).

Indicators: Specific attributes of each criterion of Good Environmental Status. They can be described qualitatively or quantitatively, as a means of determining whether each criterion meets the Good Environmental Status, or to show the extent to which each criterion deviates from it. Given the complexity of the descriptors, due both to their multiple characteristics and the number of aspects that contribute to their evaluation, it is common to use a set of indicators that facilitate feasible surveillance programmes and simplify the evaluation. The use of indicators reduces the number of parameters that must be monitored to a subset that is considered to broadly and effectively represent the functional and structural aspects of the ecosystem.

Management Unit: A group of animals that is the target (or potentially it will be the target) of some management action. It may refer to a sub-population, population or species. Management units provide an indication of the spatial scales at which impacts of measures, plans and projects (alone, cumulatively and in combination) need to be assessed.

Marine region: Geographical area identified under Article 4 of the Directive [1]. Marine regions and their subregions are designated for the purpose of facilitating implementation of the Marine Strategy Framework Directive and are determined considering hydrological, oceanographic and biogeographic features.

Marine Reporting Units: Specific areas of each region or subregion over which a judgement is made on whether GES has been achieved for a specified element or Descriptor. Within a single Marine Reporting Unit, there may be multiple observations of relevant parameters, which are aggregated to conclude on the extent to which GES has been achieved.

Marine strategy: The initiative or plan of act to be developed and implemented in respect of each marine region or subregion concerned as laid down in Article 5 of the Directive [1].

Marine waters: In Article 3 of the Marine Strategy Framework Directive [1] they are defined as: (a) the waters, the seabed and the subsoil on the seaward side of the baseline from which the extent of territorial waters is measured extending to the outmost reach of the area where a Member State has and/or exercises jurisdictional rights, in accordance

with the UNCLOS (United Nations Convention on the Law of the Sea), with the exception of waters adjacent to the countries and territories mentioned in Annex II to the Treaty and the French Overseas Departments and Collectives; and (b) coastal waters as defined by the Water Framework Directive 2000/60/EC [3], their seabed and their subsoil, in so far as particular aspects of the environmental status of the marine environment are not already addressed through that Directive or other Community legislation.

Monitoring programme: All substantive arrangements for carrying out monitoring, including general guidance with cross-cutting concepts, monitoring strategies, monitoring guidelines, data reporting and data handling arrangements. Monitoring programmes include several scheduled and coordinated activities to provide the data needed for the on-going assessment of environmental status and related environmental targets.

Monitoring strategy: A well-defined approach and plan to be used to monitor activities and results, whose methodology and data to be collected are specified in a monitoring programme. It is a function of: (i) objectives, (ii) size and characteristics of the area to be assessed, (iii) existing monitoring, (iv) number and types of parameters to be monitored, (v) specificity and sensitivity of monitoring techniques, (vi) sampling frequency, duration and spatial resolution, (vii) magnitude of natural variability, and (viii) available resources.

Parameter: Measurable characteristic of an indicator. These characteristics can be used as indicators, such as those included in Commission Decision 2010/477/EU [4], replaced by Commission Decision 2017/848/EU [2].

Programme of measures: A set of management actions that the Member States are responsible for implementing, in coordination with each other, referring to the environmental targets they address. The programme of measures includes existing and new measures in accordance with Articles 13.1, 13.2 and 13.3 of the Directive [1].

Reference point: Among the indicative list of characteristics to be considered for setting environmental targets. The Annex IV (8) to MSFD refers to, where appropriate, specification of reference points (target and limit reference points).

Species groups: Species with similar structural, functional and/or taxonomic characteristics, such as their mode of feeding or their habitat. Each group normally has a defined and distinct ecological role within the ecosystem.

Threshold value: Value or range of values that allows for an assessment of the quality level achieved for a particular criterion, thereby contributing to the assessment of the extent to which Good Environmental Status is being achieved [2].

Acronyms

ABI – Bay of Biscay and the Iberian Coast subregion

ABIES-NOR – North Atlantic Marine demarcation, within Spanish mainland territorial waters

ABIES-SUD – South Atlantic Marine demarcation, within Spanish mainland territorial waters

ACCOBAMS – Agreement on the Conservation of Cetaceans of the Black Sea, Mediterranean Sea and Contiguous Atlantic Area

ASCOBANS – Agreement on the Conservation of Small Cetaceans of the Baltic, North-East Atlantic, Irish and North Seas

AZTI – Arrantzuarekiko Zientzia eta Teknologia Iraskundea (Basque Institute for Marine and Food Research)

BD – Bird Directive

CBMA – Centro de Biología Molecular e Ambiental (Centre of Molecular and Environmental Biology)

CCMAR – Centro de Ciências do Mar (Center of Marine Studies)

CEMMA – Coordenadora para o Estudo dos Mamíferos Mariños (Coordinator for the Study of Marine Mammals)

D1 – Descriptor 1, Biodiversity

DaS – Days at Sea

DCF – Data Collection Framework (<https://datacollection.jrc.ec.europa.eu/>)

DG-Mare – The European Commission’s Directorate-General for Maritime Affairs and Fisheries

DGRM – Direção Geral de Recursos Naturais, Segurança e Serviços Marítimos (Directorate General for Natural Resources, Safety and Maritime Services)

DIRM NAMO – Direction Interrégionale de la mer Nord-Atlantique – Manche Ouest (Interregional Directorate for the North Atlantic Ocean and West Channel)

DIRM SA – Direction Interrégionale de la mer Sud-Atlantique (Interregional Directorate for the South Atlantic Ocean)

DWS – Deep-water species boat dredge

EEZ – Economic Exclusive Zone

EMS – Electronic Monitoring Systems

ES – Spain

EU-MAP – European multi-annual programme for the DCF Regulation

FPO – Pot trap

FR – France

GES – Good Environmental Status

GND – Drift gillnet

GNS – Set gillnet

GTR – Trammel net

ICES – International Council for the Exploration of the Sea

ICNF – Instituto da Conservação da Natureza e das Florestas (Institute for Nature Conservation and Forests)

IEO – Instituto Español de Oceanografía (Spanish Institute of Oceanography)

IFREMER – Institut Français de Recherche pour l'Exploitation de la Mer (French Research Institute for Exploitation of the Sea)

IIM-CSIC – Instituto de Investigaciones Marinas del Consejo Superior de Investigaciones Científicas (Marine Research Institute of the Spanish National Research Council)

IPMA – Instituto Português do Mar e da Atmosfera (Portuguese Institute for Sea and Atmosphere)

LLS – Set Longline

LPO – Ligue pour la Protection des Oiseaux (League for the Protection of Birds)

MMPA – US Marine Mammal Protection Act

MRU – Marine Reporting Unit

MS – Member States

MSC – Marine Stewardship Council

MSFD – Marine Strategy Framework Directive

MU – Management Unit

OFB – Office Français de la Biodiversité (The French Biodiversity Agency)

OSPAR – Convention for the Protection of the Marine Environment of the North-East Atlantic

OTB – Bottom Otter Trawl

OTM – Single Boat Midwater Otter Trawl

PETS – Protected, Endangered and Threatened Species

PS – Purse seine

PSU – Primary Sampling Unit

PT – Portugal

PTB – Pair Trawl

PTM – Pelagic Pair Trawl

REM – Remote Electronic Monitoring

RIAS – Centro de Recuperação e Investigação de Animais Selvagens Ria Formosa (Wildlife Rehabilitation and Research Centre of Ria Formosa)

SDN – Danish seine

SGBYC – ICES Study Group for Bycatch of Protected Species

SGP-MAPA – Secretaría General de Pesca – Ministerio de Agricultura, Pesca y Alimentación (Spanish General Secretariat for the Fisheries of the Ministry of Agriculture, Fisheries and Food)

SPA – Special Protection Area (under the Birds Directive)

SPEA – Sociedade Portuguesa para o Estudo das Aves (Portuguese Society for the Study of Birds)

SRSWOR – Simple Random Sampling Without Replacement

SRSWR – Simple Random Sampling With Replacement

TB – Bottom trawl (not specified)

TBB – Beam trawl

UAlg – University of Algarve

UC – University of Coimbra

UG – Unidades de Gestión (Management Units)

WGBYC – ICES Working Group on Bycatch of Protected Species

WGCATCH – ICES Working Group on Commercial Catches

WGMME – ICES Working Group on Marine Mammal Ecology

WKMOMA – ICES Workshop on estimation of Mortality of Marine Mammals due to Bycatch

WKPETSAMP – Joint ICES WGBYC/WGCATCH Workshop on sampling of bycatch and PET species

WP – Work Package

Executive summary

The Marine Strategy Framework Directive (MSFD) requires Member States (MS) to achieve or maintain Good Environmental Status (GES) of their waters, defined in terms of eleven descriptors. To achieve GES, MS must take management measures supported by the results of the assessments. For the monitoring and data collection of the different elements of the ecosystem, MS must design a series of monitoring strategies made up of several monitoring programmes. MS sharing a subregion, as it is the case of France, Spain and Portugal in the Bay of Biscay and the Iberian Coast (ABI) subregion, should cooperate to ensure that coherence is achieved in the area. One of the descriptors established by the MSFD to define GES is Descriptor 1, referred to as biodiversity maintenance. Its primary criterion, related with the mortality rate from incidental bycatch, should be assessed for marine mammals, which is one of the elements that must be evaluated within this descriptor.

The work package 3 of the project CetAMBICion aims to analyse cetacean bycatch sampling schemes currently implemented in the ABI subregion and to propose a common coordinated strategy to monitor and assess cetacean bycatch in the area. More specifically, the objective of the present deliverable is to compile existing marine mammals bycatch monitoring programmes and other related projects in the ABI subregion. The methodology followed was the revision and compilation of all the information available on the monitoring programmes and the compilation of the data provided by the authorities responsible for bycatch monitoring and other participant institutions of the project.

To place this deliverable in context, a detailed description of the administrative subdivisions in each of the countries of the ABI subregion (France, Spain and Portugal) is provided, along with the list of marine mammal species assessed in each of them. The common legal framework, related with marine mammal bycatch at European level, is also presented followed by the different national transpositions and regulations in each country.

The product of this document is the compilation of the past and ongoing effort carried out in each of the participant countries in cetacean bycatch monitoring through (i) Data Collection Framework fisheries observer programmes; (ii) specific monitoring of protected, endangered and threatened species, including dedicated observers and remote electronic monitoring; (iii) other bycatch monitoring effort and alternative sources of bycatch information, including strandings, interviews and fisheries logbooks. The data on cetacean bycatch collected under monitoring programmes of the ABI subregion, from different sources, have their application in the assessment of bycatch thresholds (through their assembly or individual use) ideally integrated in Management Strategy Evaluations (MSE).

1 Introduction

1.1 The Marine Strategy Framework Directive (MSFD)

The Marine Strategy Framework Directive (MSFD), Directive 2008/56/EC of the European Parliament and of the Council of 17 June of 2008 [1], establishes the legal framework for Community action in the field of marine environmental policy. The MSFD aims to achieve a healthy marine environment in Europe while ensuring the sustainable use of the marine resources upon which maritime economic and social activities depend. This objective requires Member States (MS) to achieve or maintain the Good Environmental Status (GES) of their waters.

GES is defined in terms of 11 descriptors, according to Commission Decision 2017/848/EU [2] which sets out criteria and methodological standards for Good Environmental Status of marine waters, as well as specifications and standardised methods for monitoring and assessment (repealing Commission Decision 2010/477/EU [4]). The MSFD requires MS to develop marine strategies structured in five consecutive phases: (1) an initial assessment of the current environmental status of their waters and an analysis of the predominant pressures and impacts, including human activity, on the environmental status of their waters (Article 8); (2) definition of what GES means for their waters (Article 9); (3) establishment of environmental targets and associated indicators (Article 10); (4) establishment and implementation of monitoring programmes to collect the data needed to determine the environmental status going forward (Article 11); and finally (5) the establishment of a programme of measures designed to achieve or maintain GES (Article 13).

Article 5 of the MSFD specifies that MS sharing a marine region or subregion should cooperate, making use of existing regional cooperation structures, to ensure that, within each marine region or subregion, coherence is achieved.

1.2 Subregion Bay of Biscay and Iberian Coast (ABI)

The MSFD, in Article 4, lists the marine regions and subregions that should be taken into consideration by MS when implementing their obligations under this Directive (Figure 1). The North-East Atlantic Ocean is one of the four European marine regions, and includes four subregions, namely the Bay of Biscay and the Iberian Coast (ABI) which includes waters from France, Spain and Portugal.

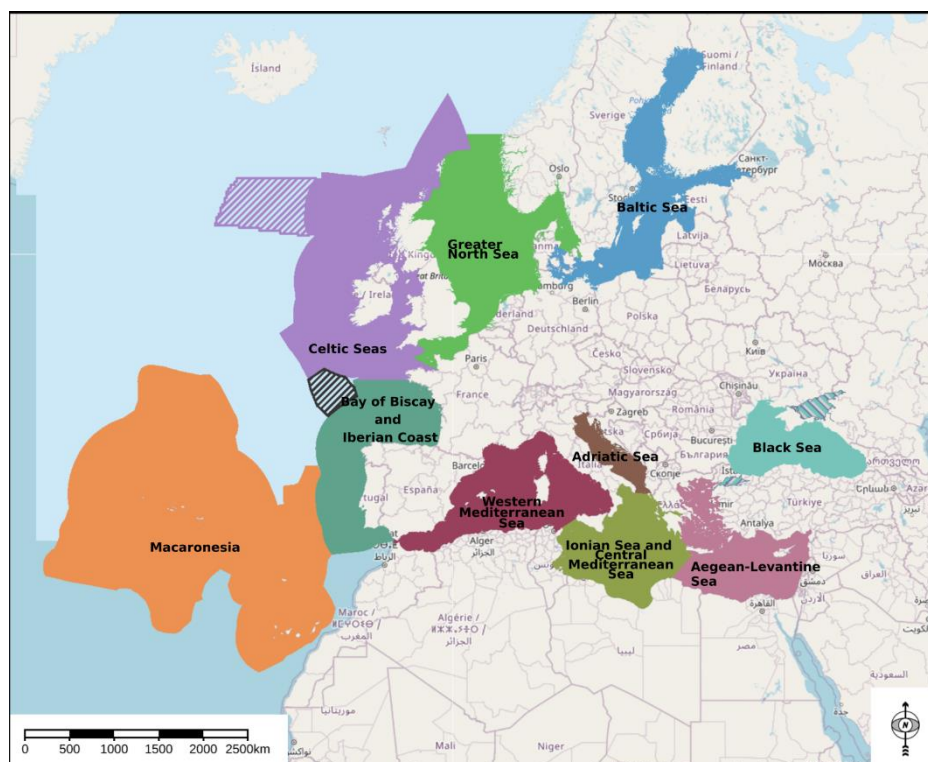


Figure 1. Representation of the marine regions and subregions of the MSFD as defined in its Article 4. From: <https://water.europa.eu/marine/regions>

France

The French marine subdivision that belongs to the ABI subregion, and is comprised of Spanish waters to the south and the Celtic Seas to the north, is administratively further divided into two: (i) the “Direction Interrégionale de la mer (DIRM) Nord-Atlantique – Manche Ouest” (DIRM NAMO) and (ii) the “DIRM Sud-Atlantique” (DIRM SA) (Figure 2).

Spain

There are two Spanish demarcations or subdivisions that belong to the ABI subregion: (i) ABIES-NOR: North Atlantic marine demarcation, comprising those marine waters to the north and west of Spain, over which Spain exercises sovereignty or jurisdiction, bounded to the north by French waters of the Bay of Biscay to the south by Portuguese waters. (ii) ABIES-SUD: South Atlantic marine demarcation, comprising those marine waters to the

south of Spain over which Spain exercises sovereignty and jurisdiction, extending from the boundary with Portuguese waters in the Gulf of Cádiz eastwards to the meridian that passes through Cape Espartel (Figure 2).

Portugal

There is one single Portuguese administrative subdivision within the ABI subregion: “Continente” (i.e. Mainland). This area covers the mainland Portuguese jurisdictional waters, located between Spanish ABIES-NOR and ABIES-SUD (Figure 2).

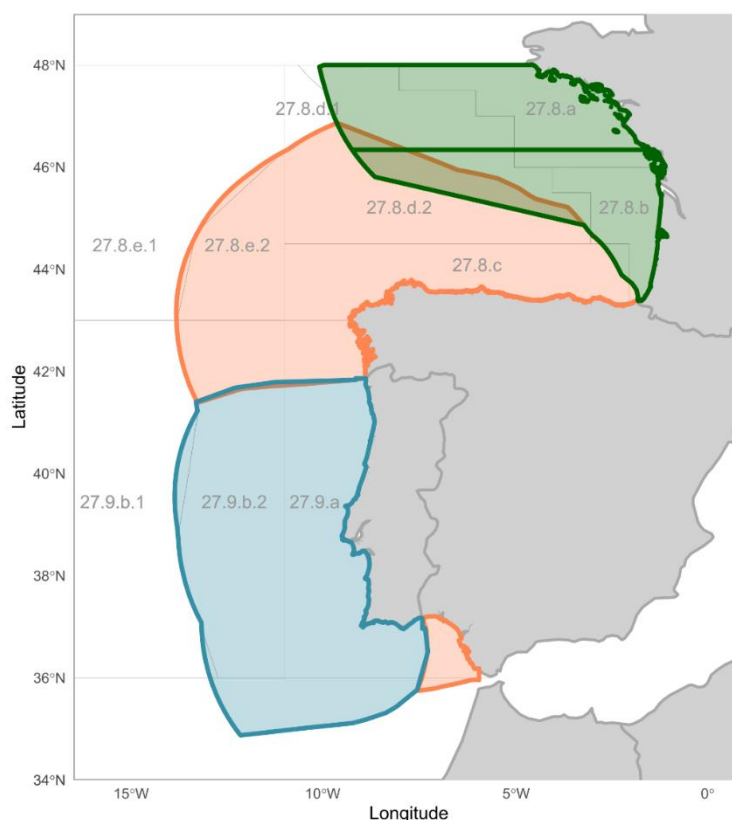


Figure 2. Administrative demarcations or subdivisions in the ABI subregion per country. Green – DIRM NAMO and DIRM SA demarcations, partially corresponding to the French waters in ICES Divisions 8abd2. Orange – ABIES-NOR and ABIES-SUD demarcations, partially corresponding to the Spanish waters in ICES Divisions 8bcde and 9ab (ABIES-NOR) and 9a (ABIES-SUD). Blue – Continente demarcation, partially corresponding to the Portuguese waters in ICES Divisions 9ab.

1.3 Descriptor 1 - Biodiversity

The MSFD in its Annex 1 establishes eleven qualitative descriptors to help MS determine the GES of their national marine waters. The first descriptor, Descriptor 1, specifically refers to biodiversity and has the following objective: “Biological diversity is maintained. The quality and occurrence of habitats and the distribution and abundance of species are in line with prevailing physiographic, geographic and climatic conditions”.

1.3.1 Marine mammal species and Management Units

Marine mammals are among the species groups (formerly referred to as functional groups) contained within D1 ecosystem elements. The Commission Decision 2017/848/EU [2] states that, for each species group, “Member states shall establish the list of species through regional or subregional cooperation”. Furthermore, Commission Decision 2017/848/EU [2] divides marine mammals’ species into four different categories, and the Guidance for Assessment under Article 8 of the MSFD [5] recommends different assessment scales according to the group:

- Baleen whales – Regional assessment
- Deep-diving toothed cetaceans – Regional assessment
- Small toothed cetaceans – Subregional assessment
- Seals – Subregional assessment

France

In the French ABI subregion, 14 cetacean species have been selected as representative species based on their observation frequency in stranding or at-sea sightings (> 1% of all animals sighted). The list includes 4 small toothed cetaceans, 7 deep-diving toothed cetaceans and 3 baleen whales:

- Harbour porpoise (*Phocoena phocoena*)
- Common dolphin (*Delphinus delphis*)
- Striped dolphin (*Stenella coeruleoalba*)
- Bottlenose dolphin (*Tursiops truncatus*)

- Risso’s dolphin (*Grampus griseus*)
- Long-finned pilot whale (*Globicephala melas*)
- Sperm whale (*Physeter macrocephalus*)
- Pygmy sperm whale (*Kogia breviceps*)
- Cuvier’s beaked whale (*Ziphius cavirostris*)
- Sowerby’s beaked whale (*Mesoplodon bidens*)
- Northern bottlenose whale (*Hyperoodon ampullatus*)

- Minke whale (*Balaenoptera acurostrata*)
- Fin whale (*Balaenoptera physalus*)
- Humpback whale (*Megaptera novaeangliae*)

The achievement of a Good Environmental Status is assessed based on several indicators related to fishery bycatch mortality (D1C1), abundance (D1C2), demographic characteristics (e.g., extreme mortality events) (D1C3), and distribution (D1C4) of marine mammals.

For the assessment of each criterion, species were selected based on available data. For instance, criterion D1C1 related to bycatch mortality was assessed through its associated indicator in France, for harbour porpoise and common dolphin. For criteria other than D1C1, a larger suite of species could be assessed, although species inclusion in assessments was dictated by data availability.

i) DIRM NAMO

The DIRM NAMO is nested within the larger ABI subregion (Figure 2) and no assessment was made at the scale of the DIRM NAMO itself: the assessment was made at the scale of the French ABI subregion and the result applied to the DIRM NAMO. Concerning D1C1, the species relevant to DIRM NAMO were the harbour porpoise and the common dolphin.

ii) DIRM SA

The DIRM SA is also nested within the larger ABI subregion (Figure 2) and no assessment was made at the scale of the DIRM SA itself: the assessment was made at the scale of the ABI subregion and the result applied to the DIRM SA. Concerning D1C1, the species relevant to DIRM SA was only the common dolphin.

Spain

In each marine demarcation, several Management Units (MUs) were selected, representing either complete populations or the parts of populations that inhabit this demarcation. For the selection of these MUs, several criteria were followed: (i) representativeness of different ecological niches (coastal, slope, and deep waters); (ii) availability and robustness of absolute abundance estimates; (iii) common reporting needs with other EU legislation; and (iv) relevance to assess anthropogenic pressures, identifying threats which impacts could be related to the total population abundance.

i) ABIES-NOR

In the ABIES-NOR demarcation 5 MUs (in Spanish, *Unidades de Gestión - UG*) were selected, 4 of small toothed cetaceans, and 1 of baleen whales.

- UG1 – Harbour porpoises (*Phocoena phocoena*) of the Iberian population.

- UG2 – Bottlenose dolphins (*Tursiops truncatus*) resident in coastal waters of southern Galicia.
- UG3 – Bottlenose dolphins (*Tursiops truncatus*) in waters of the north and northwest shelf.
- UG9 – Common dolphins (*Delphinus delphis*) from the Atlantic population (NOR).
- UG21 – Fin whales (*Balaenoptera physalus*) from the Atlantic population.

ii) ABIES-SUD

In the ABIES-SUD demarcation 4 MUs were selected, 3 of small toothed cetaceans, and 1 of baleen whales.

- UG4 – Bottlenose dolphins (*Tursiops truncatus*) in the waters of the Gulf of Cádiz shelf.
- UG10 – Common dolphins (*Delphinus delphis*) from the Atlantic population (SUD).
- UG18 – Killer whales (*Orcinus orca*) from the Gulf of Cadiz and adjacent waters.
- UG22 – Fin whales (*Balaenoptera physalus*) from the Atlantic population.

Portugal

In Portuguese mainland waters several species were selected, considering their occurrence, distribution relevance or representativeness and residence patterns. The list includes 6 small toothed cetaceans, 2 deep-diving toothed cetaceans, and 1 baleen whale:

- Common dolphin (*Delphinus delphis*)
- Long-finned pilot whale (*Globicephala melas*)
- Risso's dolphin (*Grampus griseus*)
- Harbour porpoise (*Phocoena phocoena*)
- Striped dolphin (*Stenella coeruleoalba*)
- Bottlenose dolphin (*Tursiops truncatus*)
- Pygmy sperm whale (*Kogia breviceps*)
- Cuvier's beaked whale (*Ziphius cavirostris*)
- Common minke whale (*Balaenoptera acutorostrata*)
- Fin whale (*Balaenoptera physalus*)

1.4 Criterion D1C1 - Bycatch

The first of the five criteria that should be evaluated for marine mammals is D1C1 [2]. D1C1 is a Primary criterion that is defined as: “the mortality rate per species from incidental

bycatch is below levels which threaten the species, such that its long-term viability is ensured”.

1.5 CetAMBICion

The project “CetAMBICion” (Coordinated Cetacean Assessment, Monitoring and Management strategy in the Bay of Biscay and Iberian Coast subregion), will address this criterion for bycatch mortality (D1C1) under work package 3 (WP3), through the proposal of a coordinated monitoring strategy and programmes, and through the agreement on common approaches to GES determination and threshold definition for bycatch.

The main objective of WP3 is thus to analyse bycatch sampling schemes currently implemented in the ABI subregion and to propose a common coordinated strategy to monitor and assess the bycatch of cetaceans. The specific objectives are to:

- Analyse and compare the national bycatch sampling schemes, as well as other related initiatives or projects;
- Identify the fishing gear, technical and behavioural characteristics of the fleet, and areas, which present the greatest risk of producing bycatch of cetaceans in terms of number of animals bycaught;
- Agree on common approaches to GES determination and threshold calculation for bycatch (criterion D1C1);
- Carry out an analysis of the different bycatch monitoring programmes or pilot projects currently underway or under development, for example concerning the accuracy and precision of resulting bycatch estimates, and make proposals for their improvement and/or implementation;
- Feed results into the proposals for a coordinated monitoring strategy and programmes in WP2;
- Foster cooperation between scientific institutions, fisheries authorities and stakeholders.

The methodology implemented for the development of this work package includes (i) a review of the monitoring programmes and other available information about cetacean bycatch; (ii) a risk assessment of the fisheries with the highest incidence of bycatch, in quantitative terms; (iii) a review and update of the GES definition and bycatch thresholds; (iv) an analysis of the information on bycatch from different sources and pilot projects to propose a coordinated action to address the bycatch problem in the ABI, comparing similarities and differences between participating countries.

1.5.1 Task 3.1

The first task of the WP3 (Task 3.1) aims to carry out an in-depth review of the available information and monitoring schemes on bycatch carried out to date in the ABI, which has as its product the present deliverable. To conduct this task, the following information has been reviewed: (i) information and data produced in the sampling programmes and protocols carried out in France, Spain and Portugal under the DCF; (ii) data from various studies and pilot projects carried out to date; and (iii) information provided to different working groups of ICES (e.g., WGBYC and WGMME), workshops and other projects as well as the conclusions and suggestions derived from them. Relevant entities related with the tasks (authorities responsible for monitoring the fisheries in each of the countries involved, institutions in charge of its application, and all the other institutions participating in the project), have contributed by providing the necessary information to carry out an inventory of the existing bycatch monitoring programmes, as well as other (past or ongoing) related projects in France, Spain and Portugal.

2 Bycatch legislation in the EU

From 2021 onwards, ICES through its agreement with DG-MARE is the organization in charge of providing annual estimates of the numbers of specimens of sensitive species (as defined in Article 6(8) of Regulation (EU) 2019/1241 [6]), excluding fish species, caught incidentally in fishing activities in the EU, disaggregated by sea area and type of fishing gear. Therefore, from 2021 onwards, the work of the ICES WGBYC is driven mainly by this assignment. The agreement states that *“These estimates shall be accompanied with evaluations or estimates of their accuracy where possible. They shall be provided by December each year and shall cover incidental catches made until 31 December of the previous year. ICES shall progressively accompany these estimates with calculated values of potential biological removal (PBR), or alternative markers of sustainability where appropriate”*. Furthermore, ICES is asked to *“provide warnings of any serious threats (i.e. if there is at this moment, a threat to the abundance posing a risk so serious that it would be unwise to postpone action) from fishing activities alone or in conjunction with any other relevant activity to local ecosystems or species as soon as ICES is aware of such threats”*.

Furthermore, the Regulation (EU) 2019/1241 (Technical Conservation Measures Regulation) [6], which repealed and replaced the Council Regulation (EC) No 812/2004 [7], has three main objectives: (i) to minimise, and where possible eliminate, incidental catches of sensitive species so that fishery-related mortality does not represent a threat to their

conservation status; (ii) to minimise negative impacts of fishing on marine habitats, and (iii) to put in place management measures to comply with the Habitats, Birds, Water Framework and Marine Strategy Framework Directives. The measures cited in the third objective shall ensure that bycatches of sensitive species do not exceed levels established in the Union legislation and international agreements. Furthermore, MS are required to take the necessary steps to collect data on these species. The measures intended to monitor, manage and mitigate bycatch of sensitive species are subject to regional management through Joint Recommendations to the EC prepared by MS.

Provisions on vessel sizes, areas and fishing gears for monitoring and mitigation measures contained in Council Regulation (EC) No 812/2004 [7] are retained, as well as the provisions on the use of acoustic deterrent devices, from the same Regulation. The technical descriptions of these devices are contained in the Commission Implementing Regulation (EU) 2020/967 [8], together with the mandate of the devices to remain functional throughout the fishing operation, not only when nets are set.

Bycatch monitoring of PETS in the EU is also contemplated in other legal provisions such as:

- Council Directive 92/43/EEC (Habitats Directive) [9], which in its Article 12(4) states that “MS shall establish a system to monitor the incidental capture and killing of the animal species listed in Annex IV.” [...] “MS shall take further research or conservation measures as required to ensure that incidental capture and killing does not have a significant negative impact on the species concerned”.
- Directive 2008/56/EC (MSFD) [1] and the Commission Decision 2017/848/EU (for the implementation of the MSFD) [2], which specifies a primary criterion linked to the assessment of bycatch (D1C1) for the assessment of GES.
- Regulation (EU) No 1380/2013 [10] – Common Fisheries Policy.
- Regulation (EU) 2017/1004 [11] – Data Collection Framework (DCF).

The latter establish the rules on the collection, management and use of data concerning the fisheries sector which, moreover, should also apply to data for which collection is required under other European Union legal acts including the repealed Council Regulation (EC) No 812/2004 [7], and now included in Regulation (EU) 2019/1241 (Technical Conservation Measures Regulation) [6].

2.1 France

France transposes the EU objectives and regulations by national decrees and action plans:

- **Arrêté du 17 décembre 2012** relatif à la définition du bon état écologique des eaux marines¹: defines the GES under the MSFD.
- **Arrêté du 1er juillet 2011** fixant la liste des mammifères marins protégés sur le territoire national et les modalités de leur protection²: this regulation protects marine mammal species and mandate fishermen to report all marine mammal bycatch that may happen during a fishing operation.
- **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 Gascogne³: to make mandatory the use of acoustic deterrent devices by pelagic and bottom-pair trawls and laying down the obligation to equip pelagic trawls with acoustic deterrent devices in the Bay of Biscay.
- **Plan d'action du gouvernement pour lutter contre les captures accidentelles**⁴: this plan builds onto the two previous regulations: strengthening bycatch monitoring (either by onboard observers or electronic monitoring; e.g., CCTV), advancing knowledge and finding solutions to reduce bycatch.
- **Plan d'actions pour la protection des cétacés**⁵: completes the action in favour of marine mammals.

2.2 Spain

Spain transposes the EU objectives and regulations by the following national decrees and action plans:

- **Ley 42/2007**, de 13 de diciembre, del Patrimonio Natural y de la Biodiversidad⁶: it represents the basic rule for nature protection in Spain, and includes the transposition of Council Directive 92/43/EEC (Habitats Directive) [9].
- **Ley 41/2010**, de 29 de diciembre, de protección del medio marino⁷: designed for the protection of the marine environment, to transpose the Directive 2008/56/EC [1].

¹ <https://www.legifrance.gouv.fr/loda/id/JORFTEXT000026864150/2019-09-26/?isSuggest=true>

² <https://www.legifrance.gouv.fr/loda/id/JORFTEXT000024396902/>

³ <https://www.legifrance.gouv.fr/jorf/id/JORFTEXT000042602319>

⁴ <https://www.mer.gouv.fr/cetaces>

⁵ https://www.ecologie.gouv.fr/sites/default/files/DGALN_plan-actions-protection-cetaces_web.pdf

⁶ <https://www.boe.es/eli/es/l/2007/12/13/42/con>

⁷ <https://www.boe.es/eli/es/l/2010/12/29/41/con>

- **Real Decreto 139/2011**, de 4 de febrero, para el desarrollo del Listado de Especies Silvestres en Régimen de Protección Especial y del Catálogo Español de Especies Amenazadas⁸: it develops the list of wildlife species in special protection regime and the catalogue of threatened species in Spain.
- **Real Decreto 957/2018**, de 27 de julio⁹: it modifies the law 41/2010 and includes the lists of characteristics, pressures and impacts of anthropogenic pressures on the marine environment, including a reference to bycatch.
- **Plan Nacional para la reducción de las capturas accidentales en la actividad pesquera** (BOE-A-2022-4961)¹⁰: it establishes the plan to reduce bycatch in fisheries activities in Spain.
- **Orden APA/1200/2020**¹¹ establishes the obligation to comply with various mitigation measures from January 1, 2020, including the use of acoustic deterrent devices in trawlers operating in North Atlantic waters, and the application of movement rules, as well as the obligation of landing accidental catches of cetaceans, and the commitment to increase knowledge on these populations.

2.3 Portugal

Portugal transposes the EU objectives and regulations by the following national decrees and action plans:

- **Decreto Lei 263/81**, de 3 de setembro - Regulamento de Protecção dos Mamíferos Marinhos na Zona Costeira e Zona Económica Exclusiva Continental Portuguesa¹²: it regulates the protection of marine mammals in the Portuguese coastal zone and continental exclusive economic zone by prohibiting the deliberate capture, transport, killing and sale in markets of these animals when bycaught in fishing gears or found stranded.
- **Lei 11/87** de Bases do Ambiente, de 7 de abril¹³, repealed by **Lei 19/2014**, de 14 de abril¹⁴: it defines the basis of environmental laws in Portugal.

⁸ <https://www.boe.es/eli/es/rd/2011/02/04/139>

⁹ <https://www.boe.es/eli/es/rd/2018/07/27/957>

¹⁰ https://www.boe.es/diario_boe/txt.php?id=BOE-A-2022-4961

¹¹ <https://www.boe.es/eli/es/o/2020/12/16/apa1200>

¹² <https://dre.pt/dre/detalhe/decreto-lei/263-1981-565194>

¹³ <https://dre.pt/dre/detalhe/lei/11-1987-666148>

¹⁴ <https://dre.pt/dre/legislacao-consolidada/lei/2014-107758109>

- **Decreto Lei 140/99**, de 24 de abril¹⁵, as amended by the **Decreto Lei 49/2005**, de 24 de fevereiro¹⁶: transposes the Habitats Directive (Council Directive 92/43/EEC [9]).
- **Resolução do Conselho de Ministros 152/2001**¹⁷, de 11 de outubro – Estratégia Nacional de Conservação da Natureza e da Biodiversidade, repealed by Resolução do Conselho de Ministros n.º 55/2018¹⁸, de 7 de maio - Estratégia Nacional de Conservação da Natureza e Biodiversidade 2030: National Strategy for Nature Conservation and Biodiversity.
- **Decreto Lei 108/2010**, de 13 de outubro de 2010 (changed by **Decreto Lei 201/2012**, de 27 agosto, **Decreto Lei 136/2013**, de 7 de outubro, **Decreto Lei 143/2015**, de 31 de julho, and **Decreto Lei 137/2017**, de 8 de novembro): transposes Directive 2008/56/EC [1] and sets the legal framework for the adoption of measures to ensure the GES of marine waters.
- **Portaria nº 172/2017**¹⁹, de 25 de maio, makes mandatory the use of acoustic deterrent devices where it operates (North-central western coast - ICES Area 9a) and especially in areas with high abundance of porpoises and common dolphins.
- **Despacho nº 19/DG/2020**²⁰, de 4 de agosto, determines the characteristics of the use of acoustic deterrent devices in beach seines.

3 Bycatch monitoring

Interactions between fisheries and non-target species such as protected, endangered and threatened species (PETS), including cetaceans, are frequent in European fisheries but vary substantially depending, mainly, on the fishing gear and area, and usually show a patchy occurrence. Different methodologies have been used to collect data on PETS. Although direct observations (observers onboard or REM) are the preferred and commonly used method since it provides fishery independent data, their implementation is limited by

¹⁵ <https://dre.pt/dre/detalhe/decreto-lei/140-1999-531828>

¹⁶ <https://dre.pt/dre/detalhe/decreto-lei/49-2005-608175>

¹⁷ <https://dre.pt/dre/detalhe/resolucao-conselho-ministros/152-2001-621510>

¹⁸ <https://dre.pt/dre/detalhe/resolucao-conselho-ministros/55-2018-115226936>

¹⁹ <https://data.dre.pt/eli/port/172/2017/05/25/p/dre/pt/html>

²⁰ https://www.dgrm.mm.gov.pt/documents/20143/46478/Despacho+19_DG_2020.pdf/6a1bb004-127e-61a4-1adb-257a1225c766

several aspects (e.g., vessel size, habitability, weather, logistics), and the possibility of their implementation for attaining high coverage rates is limited [12], [13].

3.1 DCF Fisheries observer programmes

Most of the data gathered by ICES on PETS bycatch, through its annual data call [Data call for ICES advisory work related to bycatch of protected species (WGBYC)], comes from the at-sea observations carried out under DCF for fisheries monitoring, as part of the Multiannual Plan (DCF/EU-MAP).

Since 2002, the EU has established a pan-European monitoring programme of commercial fleets (Council Regulation (EC) No 2371/2002 [14], later repealed by Regulation (EU) No 1380/2013 (Common Fisheries Policy) [10], which rules on the collection, management and use of the data are established in Regulation (EU) No 2017/1004 [11]), including both on-shore and at-sea sampling. The latter Regulation was mainly designed to compile discards data, however, the implementation of the Landing Obligation regulation (introduced in 2015 and fully in force since 2019) (Regulation 2019/1241 [6]), as well as the MSFD [1], require that the sampling protocols now also include the recording of bycatch and incidental catches. Furthermore in 2021, the Commission Delegated Decision (EU) 2021/1167 [15] established the multiannual Union programme for the collection and management of data in fisheries and aquaculture sectors from 2022.

At present, in the three countries of the study area of this project (France, Spain and Portugal) the trips for onboard sampling are selected through stratified random sampling, (i.e., within each metier, which are considered as strata, the selection of the vessels and trips is randomized). Generally, vessels under 15 m in length are excluded because of safety and work conditions for observers. Observers collect data on catches and discards including biological sampling, mainly lengths. In addition, observers also collect data on incidental bycatch of protected species, namely marine mammals, birds, and reptiles. However, observers are not fully dedicated to activities specifically aimed at observing incidental catches [16], and the sampling protocols for catches, discards, and bycatch of PETS differ depending on the metier, with different implications due to the limitations of such protocols. Fleets under 15m (artisanal fleets) are sometimes sampled by the same institutions, or by local entities, and the sampling protocols may vary in these cases, sometimes even being limited to interviews with fishermen without the presence of observers onboard due to, mainly, habitability limitations.

3.1.1 France

The French national DCF sampling programme is held under the Obsmer programme, carried out by the Ministry of the Sea (Direction Générale des Affaires Maritimes, de la Pêche et de l'Aquaculture (DG AMPA, ex-DPMA)) and the Institut Français de Recherche pour l'Exploitation de la Mer (IFREMER) (see Annex I).

The Obsmer programme includes an exhaustive observation of all PETS species (mammals, birds, reptiles, fishes) bycaught during:

- All fishing operations sampled for mammals, birds and reptiles.
- All fishing operations sampled for protected fishes.

For mammals, observers have to report the species name, geographical position, length, weight, how the animal was released (alive, dead), if any mark of fishing gear is present, and which type. Observers fix a plastic bracelet on the caudal peduncle of the released cetaceans released dead in order to be able to identify them if they end up stranded on the coast.

Obsmer sampling plan is designed according to its objectives and considers fishing effort. The total trips sampled in a year ($N \sim 1200$ for all Metropolitan France) is spread across all strata (sampling frames of fleets) based on the volume of landings or Regulatory prerequisite, when exists, for each of the fleets. The number of vessels to sample for each stratum is drawn randomly with replacement from the list of vessels in the sampling frame. However, as Obsmer is not designed specifically to observe bycatch of PETS, the sampling plan does not include a risk analysis of bycatch. The Obsmer protocol is stratified into 4 strata:

- Passive gear >15m
- Passive gear <15m
- Active gear > 12m
- Active gear < 12m

A few metiers are excluded from the sampling scheme (e.g., dredgers, targeted fishery of seashells). Global coverage is around 0.5 % of fishing trips.

A reinforced Obsmer programme is in place since 2018, from December to April, to closely monitor the bycatch of common dolphins in the Bay of Biscay. This reinforced sampling targets fisheries identified as high risk (currently pelagic trawlers and netters), but the sampling protocol is identical to the Obsmer protocol. Dedicated strata are set up for Brittany and Bay of Biscay to adapt the sampling scheme to the structure of the fleet.

Observation effort is determined depending on the risk analysis performed using observation data collected in the area in the preceding years. Refusal rates are recorded following various categories (e.g., fishermen refusal, absence of administrative authorisation to embark observers, bad weather, boat maintenance, impossibility to contact fishermen, no contact details).

This reinforced programme in the Bay of Biscay allows to improve coverage of at-risk fleets in the area, with the following results in winter 2020-2021:

- PTM – pelagic pair trawls – 2.7% of fishing trips observed
- GTR – trammel netters – 3.3% of fishing trips observed
- GNS – gillnetters – 3.0% of fishing trips observed

Seiners were included in the sampling plan in 2021-2022, but results and coverage are not available yet.

Table 1. Observation effort carried out under the reinforced Obsmer programme in Brittany and the Bay of Biscay. Gears: GNS – Set Gillnetter; GTR – Trammel netter; OTB – Bottom Otter Trawl; PTM – Pelagic Pair Trawl; SDN – Danish Seine. The column “Vessel” refers to the number of vessels observed out of the total number of operating fishing vessels for each gear and time period. The column “Trip” refers to the number of trips observed out of the total number of trips for each gear and time period. The column “OP” refers to the observed fishing operations, the number of fishing operations with bycatch of cetaceans, and total number of cetaceans bycaught for each gear and time period. The column “Fishing Time” refers to the number of fishing days observed out of the total number of fishing days for each gear and time period. The column “DaS” refers to the number of days at sea observed out of the total number of days for each gear and time period.

Gear	Period	Vessel	Trip	OP	Fishing Time	DaS
PTM	12/2018 - 04/2019	16/41	50/1011	281/11(28)	77/1476	201/1770
	05/2019 - 11/2019	19/64	26/2296	142/0(0)	21/3558	115/4741
	12/2019 - 04/2020	5/38	8/562	37/2(4)	9/799	21/924
	05/2020 - 11/2020	12/63	15/2423	63/0(0)	7/3497	58/4320
	12/2020 - 04/2021	12/32	21/759	100/9(23)	25/1116	75/1256
OTB	12/2018 - 04/2019	9/260	11/5911	82/0(0)	12/8012	24/8824
	05/2019 - 11/2019	16/287	241/14847	158/0(0)	19/17034	40/17779
	12/2019 - 04/2020	6/251	6/5761	36/0(0)	5/7736	10/8467

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	05/2020 – 11/2020	11/280	12/13738	45/1(1)	5/15940	12/16417
	12/2020 – 04/2021	3/242	3/6254	8/0(0)	1/8124	11/8905
SDN	12/2018 – 04/2019	6/11	6/380	60/0(0)	3/565	12/673
	05/2019 – 11/2019	6/13	9/725	103/0(0)	4/1077	20/1203
	12/2019 – 04/2020	3/13	3/386	40/0(0)	2/556	8/666
	05/2020 – 11/2020	1/13	1/674	18/0(0)	0/971	3/1103
	12/2020 – 04/2021	0/13	0/354	0/0(0)	0/511	0/602
GTR	12/2018 – 04/2019	41/323	52/8734	255/2(2)	217/10430	93/11164
	05/2019 – 11/2019	58/328	85/13141	330/0(0)	481/14239	118/14957
	12/2019 – 04/2020	23/300	46/7021	184/1(1)	148/8607	78/9253
	05/2020 – 11/2020	24/316	32/13090	139/2(2)	155/14174	48/14928
	12/2020 – 04/2021	72/299	276/8197	992/7(7)	1006/10032	340/10634
GNS	12/2018 – 04/2019	36/265	53/6221	226/0(0)	129/7228	97/7878
	05/2019 – 11/2019	57/305	92/9595	374/2(2)	174/9846	129/10391
	12/2019 – 04/2020	28/265	54/6085	319/0(0)	156/7112	141/7636
	05/2020 – 11/2020	27/297	32/9373	206/1(2)	153/9859	79/10421
	12/2020 – 04/2021	56/269	175/5684	673/4(4)	327/7057	229/7639
Other	12/2018 – 04/2019	39/1083	55/37094	372/1(1)	176/39041	193/41052
	05/2019 – 11/2019	61/1026	78/51529	439/0(0)	327/53014	144/56010

12/2019 – 04/2020	20/1036	25/33165	109/1(1)	46/34624	39/36103
05/2020 – 11/2020	37/1039	50/48879	238/0(0)	117/51062	57/53526
12/2020 – 04/2021	39/1048	73/36656	338/0(0)	168/38011	96/39626

3.1.2 Spain

The Spanish national DCF sampling programme is coordinated by the Ministry of Agriculture, Fisheries and Food (MAPA), whose scientific part is entrusted to the Spanish Institute of Oceanography (IEO) and the Basque Institute for Marine and Food Research (AZTI), for monitoring the Spanish non-Basque and Basque fleets, respectively.

The IEO's Atlantic DCF at-sea sampling programme, which is responsible for sampling the Spanish non-Basque fleet, covers the métiers more susceptible to produce discards due to the use of less selective fishing gears (e.g., gillnets and trawls). In addition, it also includes sampling onboard of other métiers which, although being more selective, are difficult to sample at landing ports due to logistical reasons (e.g., purse seiners of the Gulf of Cádiz, ABIES-SUD). On a secondary basis, information on incidental catches of sensitive species is also collected, as well as marine litter data.

For reasons of operability, the sampling of the fleet has been stratified in the following four strata according to the official lists of licensed vessels, excluding small-scale gillnetters and trammel nets with no habitability for observers onboard²¹ (target percentages for coverage of the fishing trips are presented as shown):

1. Spanish non-Basque large-scale set gillnets of the Cantabrian-Northwest fishing ground (IEO_P1_S_CN_GNS): 0.6% coverage.
2. Spanish non-Basque bottom trawl fleet of the Cantabrian-Northwest fishing ground (IEO_P1_S_CN_TB): 1.0% coverage.
3. Spanish bottom trawl fleet of the Gulf of Cadiz (IEO_P1_S_GC_OTB): 0.6% coverage.
4. Spanish purse seine fleet of the Gulf of Cadiz (IEO_P1_S_GC_PS): 0.7% coverage.

The primary sampling unit (PSU) is the vessel, which is randomly selected by Simple Random Sampling with Replacement (SRSWR), from the official lists of boats with a fishing

²¹ The definition of the acronyms used in the names of the different sampling strata can be found in the acronyms section of this document.

license. The call protocol followed for the selection of the PSU includes the recording of responses, which are classified into the six following categories:

1. Affirmative: trip sampled.
2. Hard refusal: skipper declines collaboration.
3. Soft refusal: temporary unavailability of the vessel or trip (e.g., repair, temporary lack of space, seasonally dedicated to other fishing activities).
4. Observer refusal: e.g., for security reasons.
5. No answer: unable to contact.
6. No contact details.

AZTI is responsible for the at-sea sampling programmes covering the Spanish vessels with port base in the Basque Country. Most of the effort is focused on the fleets with the highest discards (trawlers), but in the last years, some other fisheries and metiers have been included in the routinely sampling programme (e.g., purse seiners and the artisanal polyvalent fleet), even sampling vessels under 15m in length. In the case of AZTI, the sampling of the fleet has been stratified in the following metiers (target percentages for coverage of the fishing trips are presented as shown):

1. Basque otter bottom trawler fleet in the BB (AZTI_P1_S_BB_OTB): 5.5 % coverage.
2. Basque pair bottom trawler fleet in the BB (AZTI_P1_BB_PTB): 3.2 % coverage.
3. Basque pair bottom trawler fleet in the CN (AZTI_P1_CN_PTB): 0.2 % coverage.
4. Basque purse seiner fleet in the CN (AZTI_P1_CN_PS): 0.4 % coverage.
5. Basque longline fleet in the CN (AZTI_P1_CN_LLS): 0.06% coverage.
6. Basque artisanal trammel net fleet in the CN (AZTI_P1_CN_GTR): 2.7% coverage.
7. Basque artisanal gillnet fleet in the CN (AZTI_P1_CN_GNS): 0.2% coverage.

As in the case of the IEO, the PSU is the vessel, which is randomly selected by SRSWR, from the official lists of boats with a fishing license. Refusal rates are also recorded as well as the reason given by the vessel owners and the reasons for it.

The programme carried out by the IEO has been collecting and reporting data to the WGBYC since 2003 while the programme carried out by AZTI has been collecting and reporting data to the WGBYC since 2005 although there were some gaps in several years. Since 2017, and because of the obligation to collect this information under the DCF regulation, the protocols for observers have been modified and adapted to collect bycatch information, following the protocols and guidelines provided by several ICES Working Groups (i.e., WGBYC, WGCATCH).

3.1.3 Portugal

The Portuguese national DCF sampling programme is coordinated by Direção-Geral de Recursos Naturais, Segurança e Serviços Marítimos (DGRM), through Programa Nacional de Recolha de Dados (PNRD). In the particular case of Continental/Mainland Portugal, the collection of biological data is performed by the Portuguese Institute for Sea and Atmosphere (IPMA), through the National Biological Sampling Programme (PNAB/EU-DCF).

IPMA's DCF at-sea sampling programme, covers the métiers more susceptible to produce discards due to the use of less selective fishing gears. Information on incidental catches of sensitive species is also collected, as well as marine litter data.

The sampling of the fleet has been stratified in the following six strata according to the official lists of licensed vessels, excluding smaller vessels with no habitability and safety for observers onboard (target percentages for coverage of the fishing trips are presented as shown):

1. Portuguese vessels with a length overall >12 m operating with set gill/trammel nets in the Portuguese waters of the Iberian coast (metier GNSGTR_0_0_0_0): 0.25%.
2. Portuguese vessels with a length overall >12 m operating with set longline for deep water species in the Portuguese waters of the Iberian coast (metier LLS_DWS_0_0_0): 0.77% coverage.
3. Portuguese vessels with a length overall >12 m operating with bottom otter trawl for crustaceans in the Portuguese waters of the Iberian coast (metier OTB_CRU_>=55_0_0): 0.48% coverage.
4. Portuguese vessels with a length overall >24 m operating with bottom otter trawl for demersal fishes in the Portuguese waters of the Iberian coast (metier OTB_DEF_>=65_0_0): 1.35% coverage.
5. Portuguese vessels with a length overall >12 m operating with purse seine for small pelagic fishes in the Portuguese waters of the Iberian coast (metier PS_SPF_>=16_0_0): 0.23% coverage.
6. Portuguese vessels operating with beam trawl in the Portuguese waters of the Iberian coast (metier TBB_0_0_0_0): 0.25% coverage.

The primary sampling unit (PSU) is the trip, which on a given date is randomly selected by Simple Random Sampling without Replacement (SRSWOR), from the official lists of boats with a fishing license. The protocol followed for the selection of the PSU includes the recording of responses, which are classified into the six following categories:

1. Affirmative: trip sampled.
2. Hard refusal: skipper declines collaboration.
3. Soft refusal: temporary unavailability of the vessel or trip (e.g., repair, temporary lack of space, seasonally dedicated to other fishing activities).
4. Observer refusal: e.g., for security and habitability reasons.
5. No answer: unable to contact.
6. No contact details.

The programme carried out by IPMA started collecting data on bycatch of PETS in 2004 and reporting regularly to the ICES WGBYC in 2010.

3.2 Specific monitoring of PETS bycatch

Although most of the data on incidental catches of PETS comes from at-sea observations carried out under the DCF sampling programme, it has been demonstrated that the DCF programme may underestimate bycatch events in some métiers or, at worst, may not detect the events [17]. WGBYC, being aware of the latest improvements to monitoring protocols within the DCF, recommended considering sampling designs and protocols that make progress towards data collection driven by the EU-MAP and the Technical Measures Regulation. For these reasons, some countries have been running pilot projects or dedicated programmes to generate improved bycatch rate estimates.

3.2.1 France

3.2.1.1 Dedicated Observers

In France, in addition to increasing the monitoring effort of the DCF program, there have also been an increase of observers onboard in the last years within various dedicated programmes. Some of them are described in

Table 2. Nonetheless, the observation effort during other dedicated programmes is not included (e.g, LICADO, DolphinFree).

Table 2. Dedicated programmes carried out by France during the last years.

	Winter 2018-2019	Winter 2019-2020	Winter 2020-2021	Winter 2021-2022
Fleet concerned	Midwater pair trawls	Midwater pair trawls and gillnets	Midwater trawls and gillnets	Midwater trawls, gillnets, purse seine
Target fishing effort observed and its achievement	Target: 10% Achieved: 28%	Target: 5% Achieved: 3% trawl and 1% gillnet	Target: 5% Achieved: 3%	Target: 3% Achieved: <i>in progress</i>
Number of bycatches of small cetaceans observed	29	7	37	In progress (>4)
Conclusions and remarks	Observations of all pelagic trawls allow us to conclude that the contribution to the incidental catches is lower than expected but significant. Although it should be noted that all trawls were not observed and mostly not during the highest bycatch risk period (Jan-Feb)	Difficulty in achieving the objective due to weather conditions, the health crisis covid-19 and fishermen acceptance	Same difficulty in 2021 as in 2020, with difficulties to embark on small vessels that give a hard or soft refusal	In progress

At the end of 2021, when the reinforced Obsmer programme finished, the stratification was simplified into five strata and completed by purse seine. Only the distance to the coast is considered and no longer the vessel length:

1. 3 miles gillnetters
2. Coastal gillnetters
3. Mixed gillnetters
4. Offshore gillnetters
5. Pelagic trawlers
6. Purse seine

Another change was made to the sampling plan. France no longer considers a fishing effort objective but an objective of accuracy in estimating the incidental catches of cetaceans (choice to the nearest 500 individuals).

3.2.1.2 Remote Electronic Monitoring (REM)

France is currently carrying out a pilot program by using onboard camera systems to complete the information about incidental bycatches of marine mammals in Bay of Biscay French gillnetters, within the context of the OBSCAMe project. It is coordinated by the French Office of Biodiversity (OFB), in partnership with the French fishermen representatives' organizations, the scientific collaboration of IFREMER and UAR 3462 Observatoire Pélagis La Rochelle University-CNRS, and political supervision of the Ministries in charge of environment and fisheries. The project has the following objectives (note that the project was not developed to control fisheries activity):

- Test the scientific contributions of onboard electronic observation, to better understand the interactions between gillnetters and common dolphins in the Bay of Biscay,
- Complement existing schemes for monitoring incidental bycatch of marine mammals.

The onboard camera system is composed of a central computer unit, a GPS antenna, and a camera that records the images of the hauled net along the freeboard of the boat. Optionally, a second camera can record above the sorting table and a pressure sensor can be installed on the net hauler.

In the first phase of the project (from January to May 2021), five voluntary static netters (vessels from 10 to 18 m) have been equipped with cameras. This phase permitted to validate the feasibility of onboard cameras in the Bay of Biscay French gillnetters, for protected species bycatch (e.g., image quality, species identification, the interest of a second camera). The 4G system allows to monitor in real-time the state of different sensors and cameras, and to change the configuration remotely. From February to June 2021, a total of

149 trips were observed corresponding to 1030 fishing hours (hauling), and only one bycatch of harbour porpoise was observed.

The second phase of the project started in October 2021, with 15 additional static netters equipped during winter 2021-2022, until December 2022, with the same 20 voluntary vessels.

3.2.2 Spain

3.2.2.1 Dedicated Observers

In Spain, different onboard sampling programmes have been carried out for monitoring the bycatch of PETS over the last years.

In 2008, a pilot observer's scheme was implemented for the bottom-set gillnet operating on ICES Divisions 6a, 7ab, and 8ab, on vessels with an overall length of 15m or over [18]. The pilot project was designed, implemented, and managed by the Spanish Institute of Oceanography (IEO), by commission of the Spanish General Secretariat for Fisheries of the Ministry of Agriculture, Fisheries and Food (SGP-MAPA). Most of the effort was concentrated in the last quarter of 2008 and ICES Divisions 8ab. A total of 32 hauls were observed in the gillnet fleet, in which only the incidental catch of one common dolphin was recorded.

As a continuation of the pilot project carried out in 2008, and to accomplish the requirements of the MS under Council Regulation (EC) No 812/2004 [7], another dedicated observer's pilot project was implemented in 2009 in gillnetters by the SGP-MAPA, with the support of the IEO and the collaboration of AZTI [19]. The project was focused on ICES Divisions 8abd throughout the year, with most of the observation effort (and fishing effort) concentrated in divisions 8a and 8b with a coverage of 2.97% and 4.1%, respectively. A total of 61 hauls were observed, recording the bycatch of 24 common dolphins in division 8a and 12 harbour porpoises in divisions 8a and 8b.

Starting in 2020, another Spanish onboard sampling programme for monitoring the bycatch of marine mammals and other PETS, carried out by the SGP-MAPA with the support of the IEO and the collaboration of AZTI, arose as a result of the DG-MARE's request for advice to ICES concerning the analysis of certain measures aimed at reducing the mortality of the common dolphin in waters of the Bay of Biscay. The programme was focused on the observation of the Spanish bottom gillnet and pair trawling fleets in waters of the Cantabrian-Northwest national fishing ground (ICES Divisions 8c and 9a) and French

waters of the Bay of Biscay (ICES Divisions 8abd). The initial duration of this pilot programme was one year, starting in October 2020. However, it has been extended and continued without gaps until 2022 and its execution is budgeted until 2023. Its continuity after 2023 not confirmed yet, but it is considered a priority for Spain.

The objective of this specific onboard observation programme for PETs was twofold:

- To establish a programme specifically aimed at monitoring the bycatch of vulnerable species, adding other species to cetaceans (elasmobranches, turtles, birds, and invertebrates) to optimize the investment required in the execution of the programme.
- To obtain data that can be compared with those collected by DCF monitoring programme to statistically determine the possible discrepancy between the two, so that it allows determining the appropriate methodological changes and/or the increase in the coverage necessary for the onboard observation programme properly estimate the bycatch.

The procedure for selecting sampling units (PSU) follows the same protocol as the one used in the IEO's DCF at-sea sampling programme (Section 3.1.2). The vessel (PSU) is randomly selected from the official list of boats with fishing licenses using a SRSWR-type sampling design. In the first phase of the programme, four sampling strata are established:

1. Spanish set gillnet fleet in French waters of the Bay of Biscay (ICES Divisions 27.8.a.b.d2).
2. Spanish large-scale set gillnet fleet of the Cantabrian-Northwest fishing ground (ICES Divisions 27.8.c and 27.9.a, and Spanish waters in ICES Division 27.8.b).
3. Spanish pair trawl fleet in French waters of the Bay of Biscay (ICES Divisions 27.8.a.b.d2).
4. Spanish pair trawl fleet of the Cantabrian-Northwest fishing ground (ICES Divisions 27.8.c and 27.9.a, and Spanish waters in ICES Division 27.8.b).

After the trip selection, the skipper's response is recorded according to a code, similar to the IEO's DCF at-sea sampling programme, that allows differentiating the sampled trips from those that were rejected.

In its second phase, the observation coverage has been increased by 50% and new sampling strata have been incorporated: otter bottom trawl in ICES Divisions 8c, 9aN and 8abd; small scale fleet and purse seine in ICES Divisions 8c and 9aN. Furthermore, as of October 2021, there was a junction between the DCF and the dedicated project for Basque pair trawl and

the same for the otter bottom trawl in French waters of the Bay of Biscay (8abd), as of January 2022.

In the first year of the programme (October 2020 - September 2021), a total of 313 days at sea (DaS) were observed during which 16 bycatch incidents were registered, with a total of 42 marine mammals captured.

MSC certified fisheries are required to provide evidence on PETS interaction. So, on a smaller scale, the MSC (Marine Stewardship Council) certification process for the Cantabrian Sea purse seine anchovy fishery²² has also provided monitoring effort on PETS since 2015. The fishery, that includes the fleets from the Basque Country and Cantabria, had two conditions of improvement, for the MSC certification, that had to do with generating better information for bycatch species and PETS interactions. To solve MSC conditions of improvement, OPEGUI (producers organisations from Gipuzkoa, Basque Country) signed a contract with AZTI to get observers onboard to verify interactions with PETS and OPACAN (Producers Organisation from Cantabria) signed a contract with IPD S.L. (a company providing fishing observers services) to get observers onboard to quantify interactions with PETS. Also, in the context of this MSC certification, AZTI produced the manual of good practices including best practices for releasing and it was delivered to all the skippers. The details are available in the 4th surveillance audit report²³.

3.2.2.2 Remote Electronic Monitoring (REM)

Currently, in Spain, AZTI is carrying out the MITICET pilot project with a first phase conducted from February to May 2021 and continued with a second phase from November 2021 until May 2022. The project consists of the monitoring of cetacean bycatch with Electronic Monitoring Systems (EMS) and evaluating the efficiency of pingers (DDD-03H, STM) in pair bottom trawlers (PTB_MPD) in the ICES 8c area, in the Bay of Biscay.

The approach used in the project, of applying REM onboard for exhaustive observation of accidental capture and of taking advantage of the dynamics of alternating sets between the two vessels of a trawler pair, allows applying an economical and affordable working method. The possibility of collecting a high number of observations of fishing operations to be observed with the EMS, thanks to the methodology applied, will allow to obtain statistically significant and conclusive results on the effect of pingers under normal fishing

²² [Cantabrian Sea purse seine anchovy fishery - MSC Fisheries](#)

²³ [Cantabrian Sea purse seine anchovy fishery - 4th Surveillance Audit Report](#)

conditions. Therefore, it will be possible to conclude the real effectiveness of pingers in commercial fishing.

3.2.3 Portugal

3.2.3.1 Dedicated Observers

In Portugal, there is a project ongoing between 2019-2023 (LIFE + Ilhas Barreira) carried out by Sociedade Portuguesa para o Estudo das Aves (SPEA) with the participation of University of Algarve (UAlg) and the Center of Marine Sciences (CCMAR), Instituto da Conservação da Natureza e das Florestas (ICNF), University of Coimbra (UC), Aldeia/RIAS and Animaris. In this project, the task of monitoring the interaction between fisheries and seabirds (but also cetaceans and reptiles) is under the responsibility of UAlg-CCMAR and is being assessed through harbour enquiries to fishing vessel skippers, dedicated logbooks filled out by fishing vessel skippers, and dedicated scientific observers onboard. The project focuses on the purse seine fleet and multi-gear vessels working with gill and/or trammel nets.

SPEA is currently leading the actions implemented by LIFE PanPuffinus (2020-2025) in Portugal. The project targets mainly the interactions and bycatch between seabirds and fisheries, but data on other PETS is also being collected (including cetaceans and reptiles) through harbour enquiries to fishing vessel skippers, dedicated logbooks filled out by fishing vessel skippers and dedicated scientific observers onboard. The project focuses on the purse seine fleet and multi-gear vessels working with gillnets and/or trammel nets.

Between 2018 and 2021, the University of Algarve and the CCMAR carried out the project iNOVPESCA to evaluate the interactions between marine protected species (as cetaceans) in coastal fisheries of the Algarve (i.e., South) coast, to assess bycatch and to test mitigation measures. The methodology used harbour enquiries to fishing vessel skippers, dedicated paper logbooks filled out by fishing vessel skippers, dedicated scientific observers onboard and pilot studies testing acoustic mitigation devices. The project focused on the purse seine fleet and multi-gear fleet. The results from the harbour enquiries demonstrated that the fisheries with the highest rates of negative interaction with PETS use gill and/or trammel nets, and purse seine comparatively to set longline and pots and/or traps [20]. Thus, onboard observations and mitigation testing within the project focused on the purse seine fleet and multi-gear fleet operating bottom set nets (gillnet and/or trammel nets). In 2020, the skippers of five different purse seiners declared 21 common dolphins incidentally

captured in 92 trips. In 2021, the skippers from five different vessels declared the incidental capture of 15 common dolphins in 113 trips.

From 2014 to 2022, several projects (Life Berlingas (2014-2019), MedAves Pesca (2018-2020) and Anzol+ (2019-2022)) funded a programme to monitor seabird bycatch and fisheries interactions in “Berlingas” Special Protection Area (SPA) and surroundings. Data on other PETS was/is also collected (including cetaceans and reptiles) through harbour enquiries to fishing vessel skippers, dedicated logbooks filled out by fishing vessel skippers and dedicated scientific observers onboard. The programme focuses on the purse seine fleet and multi-gear vessels working with gillnet and/or trammel nets, bottom longlines, traps and angling. In the case of trawls and drifting longlines, only data from skipper enquiries were collected.

Also, a previous international project (FAME), including Portugal, was carried out between 2010-2012 by RSPB (BirdLife UK) with the participation of BirdWatch Ireland, Ligue pour la Protection des Oiseaux (LPO), SEO BirdLife, University of Minho, WavEC Offshore Renewables, SPEA and Sociedade Portuguesa de Vida Selvagem, OFB, Martifer SGPS SA. This project aimed to monitor seabirds at sea to provide data on seabirds’ interactions with artisanal fisheries in mainland Portugal and attain possible bycatch estimates, while also monitoring interactions with other animal groups such as cetaceans and marine turtles. The sampling methods were the same as the ones used in the previously mentioned dedicated projects. It focused on the following fleets or metiers: bottom trawl, multi-gear vessels using mainly hooks and lines, traps, bottom set nets (gill and/or trammel nets) and purse seine, targeting vessels of two lengths categories (<10 m and >10 m).

A previous national project (LIFE + MarPro) was carried out with sampling, especially between 2010-2016, by the University of Aveiro with the participation of the University of Minho and the Centre of Molecular and Environmental Biology (CBMA), IPMA, ICNF and SPEA. Especially during 2010-2012, the project implemented several methods, namely harbour enquiries to fishing vessel skippers, dedicated logbooks filled out by fishing vessel skippers, dedicated scientific observers onboard and a pilot with REM. These methods were implemented in several fleets and/or metiers, namely bottom trawl, multi-gear fleet using mainly hooks and lines, traps, bottom set nets (gillnet and/or trammel nets), purse seine fleet and multi-gear fleet using beach seine nets. Moreover, the project used data from two strandings networks.

Lastly, a previous project (SafeSea, funded by EEA Grants) was carried out between 2008-2011 by Sociedade Portuguesa de Vida Selvagem with the participation of the University of

Minho and the University of Aveiro. The project aimed to implement dedicated monitoring to assess the bycatch of cetaceans, seabirds and reptiles, and also included pilot studies with mitigation devices. This project used the same sampling methods mentioned above (harbour enquiries, dedicated scientific observers onboard and dedicated logbooks filled out by skippers) and focused on the following fleets and/or métiers: bottom trawl, hooks and lines, traps, bottom set nets (gillnet and/or trammel nets) and purse seine.

Other smaller dedicated studies, that are not included here, may have been implemented.

3.2.3.2 Remote Electronic Monitoring (REM)

The approach of using REM was introduced in Portugal as a pilot study within the project Life + MarPro. Originally, this approach was to be used mainly to improve the monitoring of incidental captures of cetaceans, marine turtles and marine birds in gears of most concern, especially bottom set nets and purse seine. However, the constraints associated to (i) the amount of time needed to install the devices in the vessels, (ii) the extra time required to calibrate them, and (iii) the permissions to use and analyse the surveillance cameras recordings (the National Commission for Data Protection had to provide some clarifications in order to be allowed to use and analyse the recordings), prevented the registered data to be analysed and reported as a whole. Nonetheless, the team located in the Southern coast of Portugal (Algarve), which installed and monitored REM systems in one multi-gear vessel using gillnets and two purse seiners, could contribute with data for internal reporting.

3.3 Other bycatch monitoring and alternative sources

3.3.1 Strandings

Stranding records of marine mammals and other PETS are an important source of biological data, species composition and distribution. The use of standardized protocols by the stranding schemes can contribute to knowledge of the cause of death, including bycatch. The examination of stranded individuals can provide additional information on the impact and the general distribution of bycatch of marine megafauna in fishing gears when the deployment of observers onboard can be challenging.

Although the stranding rate by subregion can be biased by natural factors or even by the accessibility of the carcasses, the analysis of strandings and the use of drift models may provide estimates of bycatch. Drifting models have been already applied to provide estimates of bycaught common dolphins from 1990 to 2020 and are available in WGBYC reports, following the methodology described in [21].

In the EU, many countries provide data on strandings, from which bycatch can be identified as a cause of death. On the NE-Atlantic coast, the most reported species was the common dolphin [22], with up to 2125 dolphins in 2020 (from Portugal to UK coasts). They also represented the species with the highest proportion of bycaught animals, with an average of 61% in 2020. In the Iberian coast (ICES Division 9a), the frequent stranding records of harbour porpoise with evidence of bycatch coupled with the low density of the Iberian population and a high level of gillnet fishing activity in the area suggests that the population is severely affected as a result of bycatch [23]. In 2019 and 2020, a total of 1655 harbour porpoises strandings were reported from the Iberian Peninsula to Denmark coasts, presenting a variable proportion of individuals with bycatch evidence (from 0% of the individuals in 2020 in Germany, to 60% in 2019 in NW Spain)[22].

In France, since the establishment of the national stranding network in the late 70s (Réseau National d'Échouage), common dolphins have reached unprecedented records with 1142 strandings collected in 2019 and 1289 in 2020. The historical proportion of common dolphins with an attributed cause of death as bycatch was between 64 and 72%. Harbour porpoises were the second most frequent stranded species (279 in 2019 and 215 in 2020), from which bycatch evidence were detected on more than a quarter (25%) of examined porpoises. A few dozen striped and bottlenose dolphins were examined, and few individuals also showed bycatch evidence. Figure 3 shows the number of small cetaceans stranded and collected by the RNE during winter, generally the season with the highest number of strandings, since 2017. Correcting the stranding by drift conditions and probability of sinking provided bycatch estimates of 9700 (CI 95% [6890; 14200]) common dolphins in 2019 and 8700 (CI 95% [6330; 13050]) in 2020 in the Bay of Biscay and Western Channel. As a complementary method to quantify bycatch levels in France, fishermen have tagged carcasses with plastic numbered marks from Support and Research Unit Observatoire Pelagis (Unité d'Appui et de Recherche) (259 tagged cetaceans between 2004 and 2021, suggesting a proportion of 24% (CI 95% = 17 - 32 %) floating carcasses). In addition, the recent project BALPHIN (funded by France Filière Pêche) tracks the carcasses of accidentally caught common dolphins, using telemetric tags and sensors to collect data on depth, temperature and even light, to better estimate the drift of the individuals arriving to the Atlantic coasts.

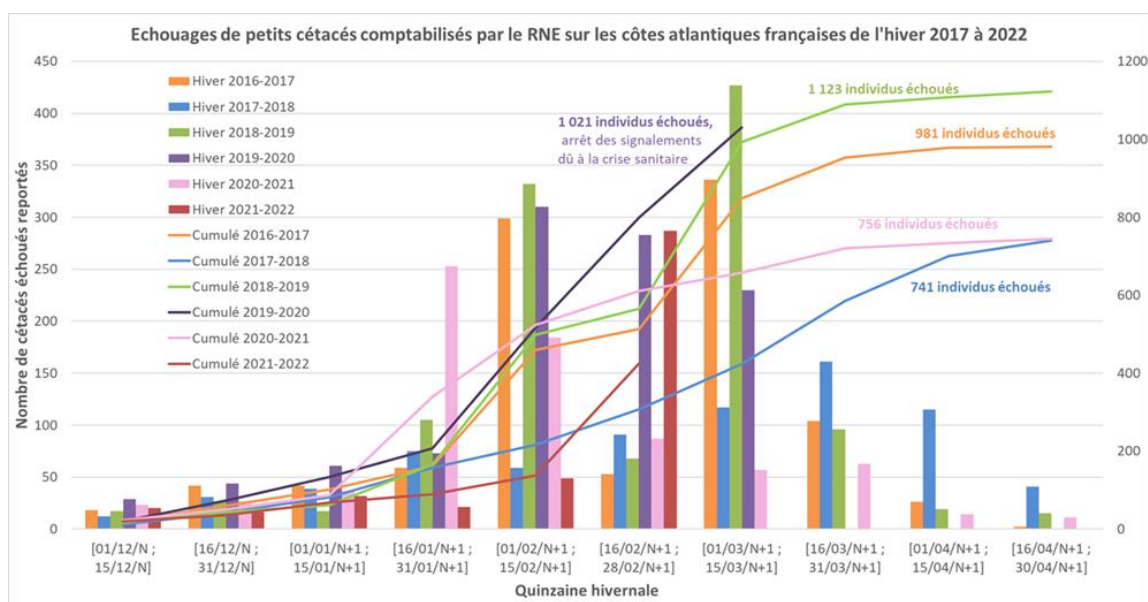


Figure 3. Strandings of small cetaceans collected by the RNE (Réseau National d'échouage) on the French Atlantic coasts during winter, from 2017 to 2022. The horizontal axis indicates each of the winter fortnights and the vertical axis indicates the number of stranded cetaceans reported. The coloured bars correspond to the winter of each year (e.g., winter 2016-2017 in orange). The thin coloured lines indicate the number of individuals stranded accumulated over the course of each winter period.

In Spain, probable bycatch of harbour porpoises rose to nearly 60% of the stranded animals (information provided by the NGO CEMMA) [24]. The proportion was very similar for common dolphins. For other species like the bottlenose dolphin, a few strandings were reported and a large proportion of examined individuals presented bycatch evidence.

In Portugal, the stranding network is coordinated by the National Institute of Conservation of Nature and Forests (ICNF). The temporal coverage highly differs depending on the region (since 2000 in the north of Portugal, since 2010 to 2016 in the south, and up to since 2020 for the south and other areas). In 2019, in the Western North-Central coast, about 50% of the stranded carcasses were analysed and incidental capture was attributed in about 60% of cases, particularly evident for common dolphin and harbour porpoise. In 2020, on the Southern coast, also with sampling effort \approx 50% of the year period, 76% of the analysed cetaceans were considered to have died because of fisheries interaction, particularly evident for common dolphin, bottlenose dolphin, and harbour porpoise [24].

3.3.2 Interviews

Interviews and questionnaires for fishermen can hold a significant amount of information about when and where bycatches occur, and over a larger scale than other dedicated monitoring programmes. The information and data collected through these interviews may be difficult to use in quantitative assessments but can be incorporated as a screening procedure to design or implement sampling programmes, or even to validate the outcomes

of other programmes [20]. Several projects of bycatch have included interviews of fishers as part of their tasks, as described in previous sections.

3.3.3 Logbooks

The Council Regulation (EC) No 1224/2009 [25] establishes the obligation for certain vessels to install an electronic system for recording and transmitting data related to fishing, like detailed information on the catch and effort. This system is called “electronic logbooks”. The records in logbooks can also be a relevant source of information about accidental catches of PETS, but as bycatch is usually considered something negative there is a risk of underreporting these events. Therefore, the information held in logbooks may be needed to be validated by other methodologies such as REM and/or dedicated observers.

As with the information collected through interviews, the data registered in the logbooks should be ideally complemented with the record of the level of fishing effort.

In France, cetacean bycatch must be reported in the electronic logbook since 2019. Thus, during last winter 121 incidental catches of small cetaceans were declared by 59 different vessels by fishing professionals, and during the year 2021: 145 declarations for 150 bycatches.

4 Current Assessment (bycatch rates)

4.1 Bycatch limits (thresholds)

Generally, the approach to develop removals limits is to carry out a Management Strategy Evaluation (MSE) such as the ones commonly carried out in the management of exploited fish species [26]. ICES, for example, has long recognized that this framework is the best suited to the management of cetacean bycatch, but requires explicit conservation objectives. ICES advice to the European Commission [27] stressed the need for explicit conservation objectives for marine mammal populations. However, the advice to the EC was not acted upon (see ICES, 2013 [28], pages 35–37 for further discussion; see also ICES 2020 [29]). An example of a removals limits is the Potential Biological Removal (PBR) from the US Marine Mammal Protection Act. The PBR is an upper limit to the level of mortality that would allow a population to achieve abundance equal to or greater than the Maximum Net Productivity Level (MNPL). A population that is at/above the MNPL is referred to as being at "optimum sustainable population" under the US Marine Mammal Protection Act (MMPA). The conservation objective of the MMPA is: a population that will remain at, or recover to, its maximum net productivity level MNPL (typically 50% of the population's carrying

capacity), with 0.95 probability, within 100 years. This conservation objective is legally binding in the US but there is no equivalent in the European Union. The only conservation objective relevant for small cetaceans in the North-East Atlantic is that of ASCOBANS which aims at maintaining/restoring the cetacean population to at least 80% of their carrying capacity [30]. By carrying out an MSE, Genu et al. (2021) [31] tuned PBR to a quantitative interpretation from the OSPAR Marine Mammal Expert Group (OMMEG) of the ASCOBANS interim objective "to restore and/or maintain stocks/populations to 80% or more of the carrying capacity" [30]. Results from this MSE were reviewed by OMMEG and presented to OSPAR BioDiversity Committee in 2021, which agreed on methods to set limits to anthropogenic removals of marine mammals in the OSPAR Maritime Area.

The threshold value for anthropogenic removals provided from OMMEG, by species, OSPAR region, and assessment unit, are presented in Table 3.

Table 3. Anthropogenic removal threshold value and estimated bycatch provided by OMMEG based on PBRm by cetacean species, OSPAR region, and assessment unit [32].

Species	OSPAR Region	Assessment Unit	Threshold value	Estimated bycatch (2020)
Common dolphin	II, III, IV	NE Atlantic	985	6406 (95% CI = 3051 - 9414)
Harbour porpoise	IV	Iberian Peninsula	0	-

4.2 Assessment

4.2.1 Observed and reported bycatch rates

4.2.1.1 DCF Fisheries observer programmes

The WGBYC reports the fishing and monitoring days with the number of bycatch events and specimens annually based on the data collected through its annual data call. Most of this data comes from the different DCF programmes that the member countries are carrying out, although for some MS, there is also data from dedicated observers. The data reported by the WGBYC for the area of concern of the present project, for the years 2019 and 2020 are presented in Table 4.

4.2.1.2 Strandings

Additionally, the WGBYC also reports the proportion of stranded and examined marine mammals that presented evidence of fisheries interaction, reported to total fresh and slightly decomposed carcasses. It is based on strandings data that each MS and their stranding networks unofficial report to the WGBYC. The data reported for the area of interest for this project, for the years 2019 and 2020, are presented in Table 5.

4.2.2 Estimated bycatch rates

The WKMOMA [32], addressing the special request from OSPAR on mortality of marine mammals, produced estimates of bycatch rates by ICES Divisions and by metier for three species of marine mammals: common dolphin, harbour porpoise and grey seal (*Halichoerus grypus*).

To produce these estimates, a modelling procedure divided into two steps was followed: 1) to model the factors that may be influencing the bycatch rates; 2) to fit Gamma hurdle models to estimate bycatch rates per day at sea. The data used in this procedure was the data requested by WKMOMA on fishing effort, at-sea monitoring effort, and the recorded incidental bycatches of the species of interest.

From the species modelled, only two are of interest for this project: common dolphin and harbour porpoise. For common dolphin, the total estimated bycatch rate is 6406 individuals bycaught (95% CI = 3052 - 9414) [33] in 2020 for the entire assessment unit. The highest bycatch estimate was for PTM (1544; 95% CI = 709 - 2414), followed by GNS/GND (1152; 95% CI = 616 - 1780), and OTM (978; 95% CI = 449 - 1530). The bycatch rates estimated for 2020 are in the same order of magnitude as previous ICES bycatch estimates based on observer programmes and strandings. Nonetheless, the point estimate for 2020 of 3973 common dolphins (95% CI = 1998 - 6599) [29] is higher than that of the mean annual bycatch estimate across all metiers for 2016-2018 for the Bay of Biscay and the Iberian Coast.

Due to the lack of data, the WKMOMA did not estimate the mortality of harbour porpoise for the Bay of Biscay and the Iberian Coast.

Table 4. Reported fishing and monitoring days, with the number of bycatch events and specimens in 2019 and 2020, for the area of interest for this project by metier (for all metiers with at least one recorded bycatch of marine mammal) and species [22].

ICES Division	Metier level 3	Year	Fishing days	Total Observed Effort (DaS)	Monitoring coverage	Species	Events	Specimens (N)
27.8.a	Nets	2019	220741.60	164.83	0.07	<i>Delphinus delphis</i>	4	4
						<i>Phocoena phocoena</i>	1	1
	2020	206685.81	228.98	0.11	<i>Delphinus delphis</i>	3	3	
	Pelagic trawls	2019	22886.82	167.75	0.73	<i>Delphinus delphis</i>	8	13
		2020	20388.26	32.04	0.16	<i>Delphinus delphis</i>	2	4
	Bottom trawls	2020	51267.85	72.96	0.01	<i>Delphinus delphis</i>	4	21
27.8.b	Pelagic trawls	2019	8573.72	50.95	0.59	<i>Delphinus delphis</i>	4	16
	Bottom trawls	2019	123485.13	164.07	0.13	<i>Delphinus delphis</i>	4	8
	Longlines	2020	20958.44	5.13	0.02	<i>Delphinus delphis</i>	1	1
	Nets	2020	124019.86	81.85	0.07	<i>Delphinus delphis</i>	1	2
27.8.c	Bottom trawls	2020	14730.24	62.00	0.42	<i>Delphinus delphis</i>	1	1
	Nets	2020	27969.71	49.00	0.18	<i>Delphinus delphis</i>	1	1
27.8.d.2	Bottom trawls	2020	5295.43	9.00	0.17	<i>Delphinus delphis</i>	1	4
27.9.a	Nets	2019	167598.46	302.00	0.18	<i>Tursiops truncatus</i>	1	1
		2020	170840.28	434.00	0.25	<i>Delphinus delphis</i>	4	6
	Surrounding nets	2019	157150.00	45.00	0.29	<i>Delphinus delphis</i>	1	2
		2020	25571.00	194.00	0.76	<i>Delphinus delphis</i>	4	4

Table 5. Proportion of the individuals stranded that presented evidence of fisheries interaction. Information presented is restricted to the area of interest to this project [22].

Species	Country	Year	Strandings	Examinations	Bycatch evidence/examinations (%)
<i>Phocoena phocoena</i>	France (Atl)	2019	276	134	34/134 (26%)
		2020	215	96	27/96 (28%)
	Portugal	2019	45	25	12/25 (50%)
		2020	40	20	10/20 (50%)
	Spain (Galicia)	2019	12	5	3/5 (60%)
		2020	23	7	4/7 (57%)
<i>Delphinus delphis</i>	France (Atl)	2019	1142	574	368/574 (64%)
		2020	1289	704	504/705 (72%)
	Portugal	2019	279	110	72/110 (65%)
	Portugal – W	2020	311	132	115/132 (72%)
	Portugal – S	2020	23	6	3/6 (50%)
	Spain (Galicia)	2019	261	53	30/53 (57%)
		2020	184	48	32/48 (67%)
<i>Tursiops truncatus</i>	France (Atl)	2019	41	16	3/16 (19%)
		2020	50	14	8/14 (57%)
	Spain (Galicia)	2019	31	10	3/10 (30%)
		2020	24	6	3/6 (50%)
	Portugal – W	2020	8	2	½ (50%)
	Portugal – S	2020	4	1	1/1 (100%)
<i>Stenella coeruleoalba</i>	France (Atl)	2019	36	19	2/19 (10%)

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		2020	42	17	6/17 (35%)
	Portugal - W	2020	11	5	1/5 (20%)
<i>Grampus griseus</i>	France (Atl)	2020	8	1	1/1 (100%)
	Spain (Galicia)	2019	5	3	1/3 (33%)
		2020	4	1	1/1 (100%)
<i>Balaenoptera acutorostrata</i>	Spain (Galicia)	2019	6	3	2/3 (67%)
	Portugal - W	2020	10	2	2/2 (100%)

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6 Annex I – Bycatch monitoring programmes

Table 6. Ongoing and past bycatch monitoring programmes carried out in the ABI subregion. DWS - Deep-water species boat dredge; FPO – Pot trap; GNS - Set Gillnetter; GTR - Trammel netters; LLS - Set Longline; OTB - Bottom Otter Trawl; PS - Purse Seine; PTB – Bottom Pair Trawl; PTM - Pelagic Pair Trawl; SDN - Danish seine; TBB - Beam Trawl. * Reinforced Programme Obsmer: (Dec - Apr). Note that each country monitors only its own fleet, but not exclusively operating in its national waters.

Country	Programme	Type of Data	Time period	Area	Fleet / Metier
FR	DCF at-sea sampling	Non-dedicated	2018 - Present*	Bay of Biscay	OTB, PTM
					GNS, GTR
					SDN
					Others
ES	DCF at-sea sampling	Non-dedicated	2005 - Present Reporting WGBYC since 2016	Cantabrian-NW Peninsula and Gulf of Cádiz	OTB, PTB
					GNS, GTR
					PS
					LLS
PT	DCF at-sea sampling	Non-dedicated	2004 - Present Reporting WGBYC since 2010	EEZ Continental Portugal	OTB, TBB
					GNS, GTR
					PS
					LLS, DWS
FR	Dedicated observers	Dedicated observers	Winter 2018 - 2019	Bay of Biscay	PTM
			Winter 2019 - 2020	Bay of Biscay	PTM
					GNS, GTR

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			Winter 2020 - 2021	Bay of Biscay	PTM
					GNS, GTR
			Winter 2021 - 2022	Bay of Biscay	PTM
					GNS, GTR
					PS
ES	Dedicated observers	Dedicated observers	2008	ICES 6a; 7ab; 8ab	GNS
			2009	ICES 8abd	GNS
			Sep 2020 - Sep 2021	ICES 8c; 9a; 8abd	PTB
					GNS
					PS
PT	Dedicated observers	Dedicated observers	2008 - 2011	Mainland Portugal	OTB
					GNS, GTR
					PS
					LLS
					FPO
			2010 - 2012	Mainland Portugal	OTB
					GNS
					PS
			2010 - 2016	Mainland Portugal	OTB
GNS					
PS					

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			2014 - 2022	Berlengas Islands (SPA) Central Portugal	GNS, GTR PS
			2018 - 2021	Algarve (S. Portugal)	GNS, GTR PS
			2019 - 2023	Barreira Islands (Ria Formosa Lagoon) Algarve (S. Portugal)	GNS, GTR PS
			2020 - 2025	SPA between Aveiro and Nazaré Northern and Central Portugal	GNS, GTR PS
FR	REM	Non-dedicated	Oct 2021 - Dec 2022	Bay of Biscay	GNS Others if possible
ES	REM	Non-dedicated (including evaluation of pingers effectiveness)	Feb - May 2021; Nov 2021 - May 2022	ICES 8c	PTB
PT	REM	Non-dedicated	NA	NA	NA