6.1 Bay of Biscay and the Iberian Coast ecoregion – Ecosystem Overview

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Ecoregion description

The Bay of Biscay and the Iberian Coast ecoregion covers the southwestern shelf seas and adjacent deeper eastern Atlantic Ocean waters of the EU. The oceanography in this ecoregion is characterized by marked seasonal mixing and stratification of water masses typical of temperate seas. This general pattern is modified over the shelf by wind-driven upwelling, river outflow, and tidal-related processes, increasing the productivity of the system with large variation across the region. Habitats further offshore are shaped by the influence of Atlantic waters in the Bay of Biscay and western Iberia.

The ecoregion includes waters from Brittany to the Gulf of Cadiz; four key areas constitute the ecoregion (Figure 1):

- the **Bay of Biscay**, characterized by a wide shelf extending west of France. Upwelling events occur in summer, off southern Brittany, and low-salinity water lenses are associated with the river outflows of the Landes coastline;
- the **Cantabrian Sea** (northern Iberian shelf), characterized by a narrow shelf with intermittent summer upwelling events west of Cape Peñes and a winter slope undercurrent, the Iberian Poleward Current;
- the **western Iberian Shelf**, characterized by a narrow shelf with upwelling events in summer and the Iberian Poleward Current in winter. Off Galicia (at its northern limit) the input of freshwater from rivers and estuaries form the Western Iberian Buoyant Plume, which is an important shaping event under downwelling-favourable winds; and
- the **Gulf of Cadiz**, characterized by a wide shelf strongly influenced by river inputs, zonal currents, wind patterns, and the deep inflow of Mediterranean water.

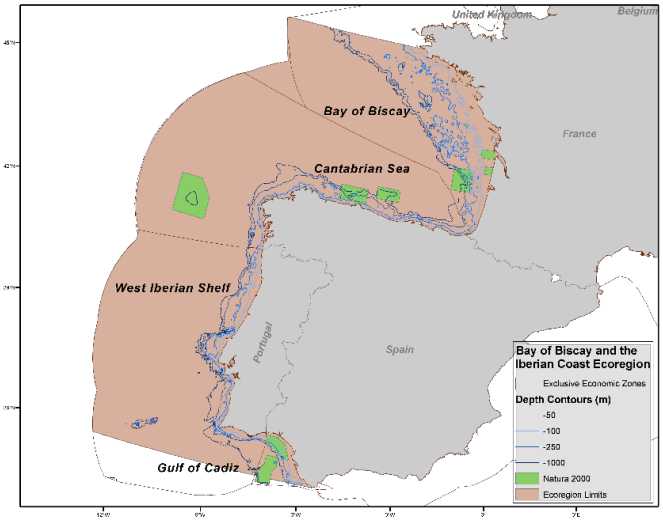

Figure 1 The Bay of Biscay and the Iberian Coast ecoregion, showing EEZs and larger offshore Natura 2000 sites.

The ecoregion includes parts of three Exclusive Economic Zones (EEZs) of EU Member States (France, Spain, and Portugal) and a small portion of high seas; it strongly overlaps with the administrative region of the South West Waters Advisory Council (SWWAC). Fisheries in the Bay of Biscay and the Iberian Coast ecoregion are managed through national administrations under the Common Fisheries Policy (CFP), with some fisheries managed by the North East Atlantic Fisheries Commission (NEAFC) and by coastal states. Responsibility for salmon fishery management lies with the North Atlantic Salmon Conservation Organization (NASCO) and for large pelagic fish with the International Commission for the Conservation of Atlantic Tunas (ICCAT). Fisheries advice is provided by the International Council for the Exploration of the Sea (ICES), the European Commission's Scientific Technical and Economic Committee for Fisheries (STECF), and the SWWAC. The EU's marine conservation policy is coordinated by the Habitats Directive and the Marine Strategy Framework Directive (MSFD). In coordination with the Birds Directive, the Habitats Directive has established the EU Natura 2000 ecological network of protected areas, which includes some vulnerable marine ecosystems (VMEs). Environmental policy is guided by national agencies and OSPAR, with advice being provided by both of these as well as the European Environment Agency (EEA) and ICES. International shipping is managed under the International Maritime Organization (IMO).

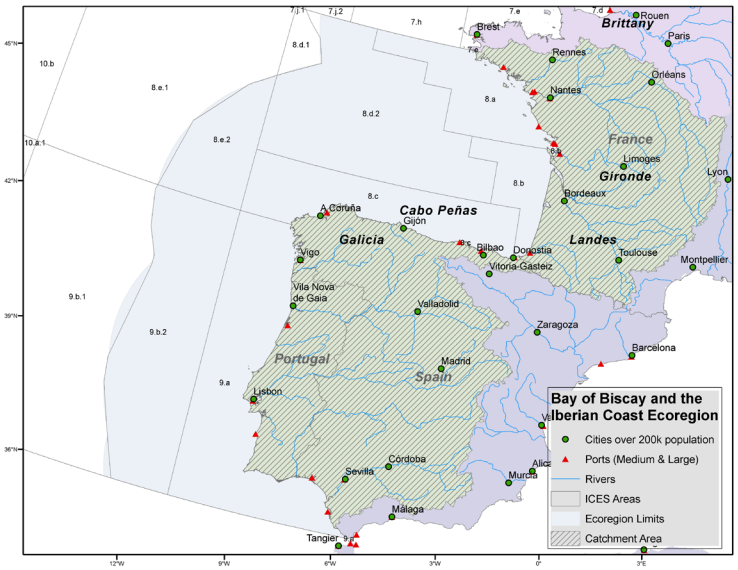

Figure 2 Catchment area for the Bay of Biscay and the Iberian Coast ecoregion, showing major cities, ports, and ICES areas.

Key signals within the environment and the ecosystem

- Climate change effects are evident within the ecoregion, notably in the Gulf of Cadiz, where warming has been observed over the last two decades.
- The distribution of warm-water copepod species such as *Temora stylifera* and *Calanoides carinatus* has moved northwards across the ecoregion.
- Winters in recent years have seen more northerly winds coupled with strong upwelling events, which can influence the recruitment of commercially important species such as sardine (*Sardina pilchardus*), anchovy (*Engraulis encrasicolus*), southern hake (*Merluccius merluccius*), Norway lobster (*Nephrops norvegicus*), and horse mackerel (*Trachurus trachurus*).
- A marked decrease in the individual condition of several small pelagic fish, including anchovy and sardine, has been noted in the Bay of Biscay since the mid-2000s. Similar trends have been observed in some demersal species.

- Fishing, and to a lesser extent tourism and recreation, are the main activities contributing to direct, human-induced pressures to the ecoregion. Fleet size and commercial fishing effort have been decreasing since the late 1990s/early 2000s. The importance of recreational fishing in coastal areas is increasing.
- The spawning-stock biomass (SSB) of benthic-demersal (since 2002) and pelagic (since 2010) fisheries guilds has been increasing, while some elasmobranchs remain well below the reference level (MSY $B_{trigger}$).
- Community-level changes include a reorganization of demersal fish species biodiversity in the southern Bay of Biscay. This is mainly related to an increased occurrence of deep-water species previously found further south and increased replacement of species in the northern Bay of Biscay.
- A decline in habitat-forming macroalgae has been observed in the northwestern Iberian Peninsula.
- Non-indigenous species introductions are increasing in the southernmost part of the ecoregion, the Gulf of Cadiz.
- A number of seabird species have experienced declines across the ecoregion, with the Iberian guillemot (a common guillemot subspecies, (*Uria aalge ibericus*)) considered extinct as a breeder in Iberia and the black-legged kittiwake (*Rissa tridactyla*) considered regionally extinct.
- In recent years, the very high numbers of common dolphin (*Delphinus delphis*) bycatch in fisheries in the Bay of Biscay are a cause for concern.

Pressures

The five most important pressures in the Bay of Biscay and the Iberian Coast ecoregion are the selective extraction of species, abrasion, nutrient and organic enrichment, smothering, and substrate loss. These pressures are mainly linked to the following human activities: fishing, shipping, tourism and recreation, land-based industry, and agriculture (Figure 3). Other pressures include the introduction of contaminating compounds, the introduction of non-indigenous species, noise, and marine litter. The main pressures described below are defined in ICES Technical Guidelines.

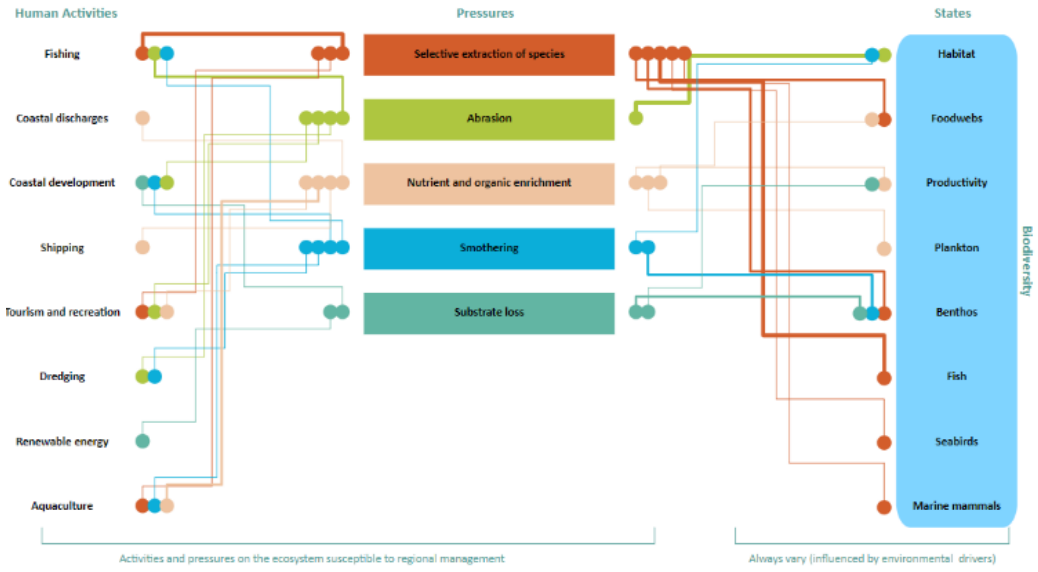

Figure 3 Bay of Biscay and Iberian Waters ecoregion overview with the major regional pressures, human activities, and ecosystem state components. The width of the lines indicates the relative importance of the main individual links (the scaled strength of pressures should be understood as a relevant strength between the human activities listed, not as an assessment of the actual pressure on the ecosystem). Climate change affects human activities, the intensity of the pressures, and some aspects of state, as well as the links between these.

Selective extraction of species

Fishing, and to a lesser extent tourism and recreation, are the main activities contributing to this pressure in this ecoregion. Both demersal and pelagic commercial fisheries occur in most parts of the ecoregion. The recreational fishery in coastal areas is becoming a relatively important activity, and is in some cases taken into consideration for the management of marine fisheries. This pressure has four main effects on the ecosystem and its components; these are described below.

Impacts on commercial stocks

Figure 4 shows the historical evolution of fishing mortality relative to reference points by fish guild in the Bay of Biscay and the Iberian Coast ecoregion. A general decrease in fishing effort in the region (in many cases because of a reduction in the fleet) has contributed to an overall decline in the fishing mortality (F) of commercial fish stocks since 1988. The mean F is now closer to the level that produces maximum sustainable yield (MSY).

Stocks of small pelagics like sardine and anchovy are highly influenced by natural recruitment variability and are therefore prone to periodic collapses linked to oceanographic variability. These stocks are closely monitored and regulated by strict management.

All cephalopod groups have shown a decreasing trend in landings in Bay of Biscay and the Iberian Coast since a strong peak in 2012. *Loliginidae* squid landings have decreased by around two thirds since 2012. The long-term trend in landings of *ommastrephids* squid also shows a decline. Cephalopod landings are dominated by cuttlefish (mainly *Sepia officinalis*) in the Bay of Biscay and octopods (mainly *Octopus vulgaris*) in the Iberian coast (constituting 90% of the octopod landings in the ecoregion). Annual cuttlefish landings are still below the mean for the period 1992–2019.

Some coastal waters in the ecoregion have fisheries targeting resident immature eels or migrating spawners.

For detailed information on fishing activities in this ecoregion, see the Bay of Biscay and the Iberian Coast Fisheries Overview.

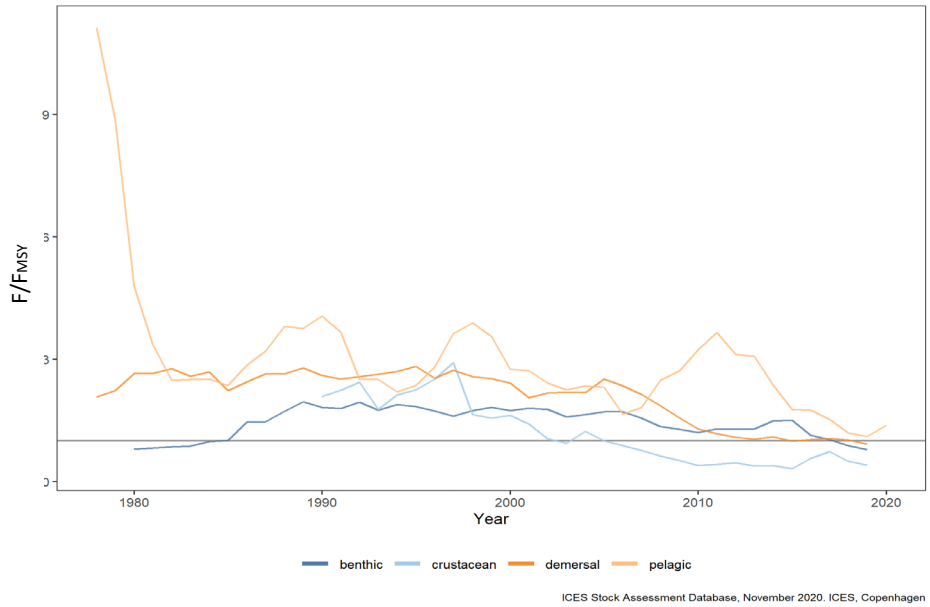

Figure 4 Time-series of annual relative fishing mortality (F to F_{MSY} ratio) by fisheries guild for benthic, demersal, crustaceans, and pelagic stocks. Table A1 in the Annex details which species belong to each fish category.

Impact on threatened and declining fish species

Several fish species have been adversely affected by fishing and are now on the OSPAR list of threatened and declining species (see Table 1). These include the sturgeon (*Acipenser sturi*), European eel (*Anguilla anguilla*), gulper shark (*Centrophorus granulosus*), skates and rays (the common skate complex (*Dipturus* spp.), thornback ray, (*Raja montagui)*, and white skate (*Rostroraja alba*)), spurdog (*Squalus acanthias*), and salmon (*Salmo salar*). Although there are no specific TACs for these species and landings of some of them are prohibited under EU law, several are vulnerable to existing fisheries. *Dipturus* spp. and spurdog are caught as bycatch in demersal trawl fisheries, while deep-water sharks are caught in the mixed deep-water trawl fishery. Bottom trawls and static nets are responsible for bycatch of *Dipturus* spp., small-eyed ray (*Raja microocellata*), sandy ray (*Leucoraja circularis*), undulate ray (*Raja undulata*), and spurdog, while bluntnose six-gilled shark (*Hexanchus griseus*) and basking shark (*Cetorhinus maximus*) only occur in static nets. Bycatch of elasmobranchs in longline and seine fisheries is minor.

Impacts on foodwebs

Fishing can disturb the foodweb. Predator–prey relationships can change depending on the species and on the amount of food (prey) that is available to a given predator. Poor management of fishing for one species could have an adverse effect on the whole foodweb. Multispecies assessment methods can account for some of these interactions and guide appropriate management measures.

Indicators like the large fish indicator (LFI) index (which describes the proportion [by weight] of the demersal fish community from a survey catch that is larger than regional length thresholds) can be used to monitor changes in the fish populations. In the Bay of Biscay, the LFI index has shown a positive temporal trend since the year 2000 (Figure 5a); there is no trend in the LFI in the Portuguese waters of the Iberian coast, however, where the index shows high interannual variability (Figure 5b).

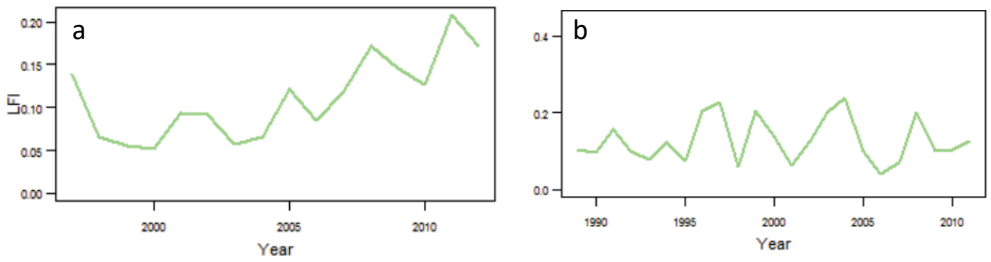

Figure 5 Time-series of the large fish indicator (LFI) in: (a) the Bay of Biscay and (b) Portuguese waters (ICES, 2013).

Impacts on seabirds and marine mammals

Bycatch of common dolphins has been recorded in several fisheries off France, Spain, and Portugal. The mean annual bycatch of common dolphin across all métiers for the period 2016–2018 amounted to 3973 individuals. Trammelnets account for the largest bycatch.

Interactions also occur with gears such as setnet, pelagic trawls, and bottom trawls. It was estimated from stranded common dolphin along the French coastlines of the Bay of Biscay and the western English Channel that bycatch mortality of the species was 5800–17 900 individuals in 2017 and 3400–10 500 individuals in 2018. The available bycatch mortality estimates for common dolphin in the Northeast Atlantic (based on at-sea monitoring and on stranded animals) are either close to or exceed the potential biological removal (PBR) threshold (4927 individuals per year).

Harbour porpoises (*Phocoena phocoena*) are being caught as bycatch off Iberia, mainly in set nets and beach seines, to the extent that may affect sustainability of the local population.

Seabird bycatch in set nets has contributed to the loss of the Iberian form of the common guillemot in both Galicia and Portugal. Coastal driftnets may have contributed to the loss of other seabird species in areas such as central and northwestern Portugal. Longlining may be impacting the endangered Balearic shearwater (*Puffinus mauretanicus*).

The mean seabird bycatch in bottom trawl, demersal longline, purse-seine, beach seine, set-net, and trap fisheries along the mainland Portuguese coast was estimated at 0.05 individuals per fishing event. Species more affected include Balearic shearwater, Cory´s shearwater (*Calonectris borealis*), and Northern gannet (*Morus bassanus*). The European shag (*Phalacrocorax aristotelis*) is also widely affected, particularly by gillnets, in northwest Spain.

Abrasion

This pressure principally affects the seabed habitats and is associated with bottom-contacting mobile fishing gear, in particular beam trawling and otter trawling as well as local activities like dredging or those linked to tourism such as anchoring.

Using vessel monitoring system (VMS) and logbook data, ICES estimates that mobile bottom trawls used by commercial fisheries in the 12 m+ vessel category were deployed over approximately 144 300 km^2 of the ecoregion in 2018; this corresponds to approximately 19.1% of the ecoregion's spatial extent (Figure 6).

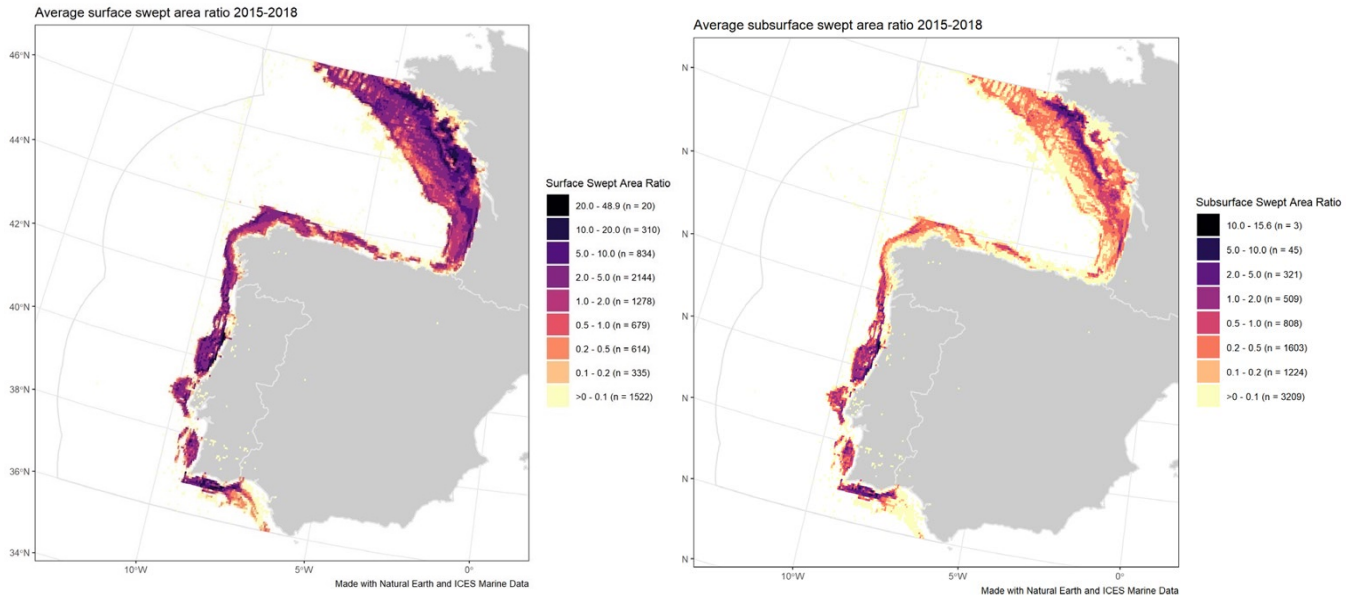

Figure 6 Surface and subsurface abrasion pressure expressed as the swept-area ratio, obtained from VMS data from 2015 to 2018 in the Bay of Biscay and the Iberian Coast ecoregion.

Nutrient and organic enrichment

The input of nutrients is a relatively important pressure in coastal areas, particularly off areas of intensive agriculture and land-based industries. Rivers account for most waterborne inputs of nitrogen and phosphorous. There is no clear trend in nitrate inputs in this region, in contrast to the decreasing trends in other EU waters. Shipping, aquaculture, and increasing tourism and recreation along the coast also contribute to this pressure.

Eutrophication is mainly limited to coastal areas such as bays and estuaries with restricted circulation. Along the French coast, elevated levels of chlorophyll, nuisance phytoplankton species, and algal toxins have been observed.

Smothering

Smothering is caused by several human activities in this ecoregion: extraction of aggregates (sand and gravel), disposal of materials on the seabed, and navigational dredging for shipping as well as bottom trawling in soft sediment areas. The main dredging sites are found in France in the harbours and estuaries of the Loire (Nantes), Gironde (Bordeaux), and Adour (Bayonne), and in Spain in the harbours of Avilés, Vilagarcía, Huelva, and the estuary of the Guadalquivir river.

Substrate loss

Coastal construction and renewable energy devices contribute to substrate loss.

Marine and coastal habitats have been lost in recent decades to land claim for port, industry, residential development and agriculture, coastal defences (including dykes, seawalls, and beach nourishment schemes), aquaculture infrastructure, roads, piers, marinas, and wastewater treatment facilities.

Other pressures

Other relevant pressures in this ecoregion are:

- **Underwater noise**, caused by activities such as shipping, tourism and recreation, and renewable energy installations, which may affect marine mammals, fish, and other organisms using sound or pressure senses.
- **Introduction of non-indigenous species**, primarily associated with shipping and aquaculture activities, have been observed to affect structure and abundance of native species.
- **Introduction of contaminating compounds,** due primarily to coastal discharges and maritime transport (shipping). This pressure can affect all ecosystem components but may accumulate in the foodweb, having an effect in particular on higher trophic levels (mammals and birds). Some of these compounds may be very stable and remain in the ecosystem for many decades after their introduction.
- **Marine litter,** including microplastics and plastic waste derived from many human activities. Larger items can entangle larger organisms while smaller items, including microplastics, can be ingested by many organisms.

Climate change impacts

Ata global level, current greenhouse gas emissions are most closely following the Intergovernmental Panel on Climate Change's (IPCC) Representative Concentration Pathway (RCP) 8.5 scenario. Within the Bay of Biscay and the Iberian Coast ecoregion, this scenario projects a 1.5°C to 3.0°C warming above mean conditions for the years 2050–2099. Positive anomalies are forecasted everywhere in the region and are most pronounced in the shelf areas (Figure 7).

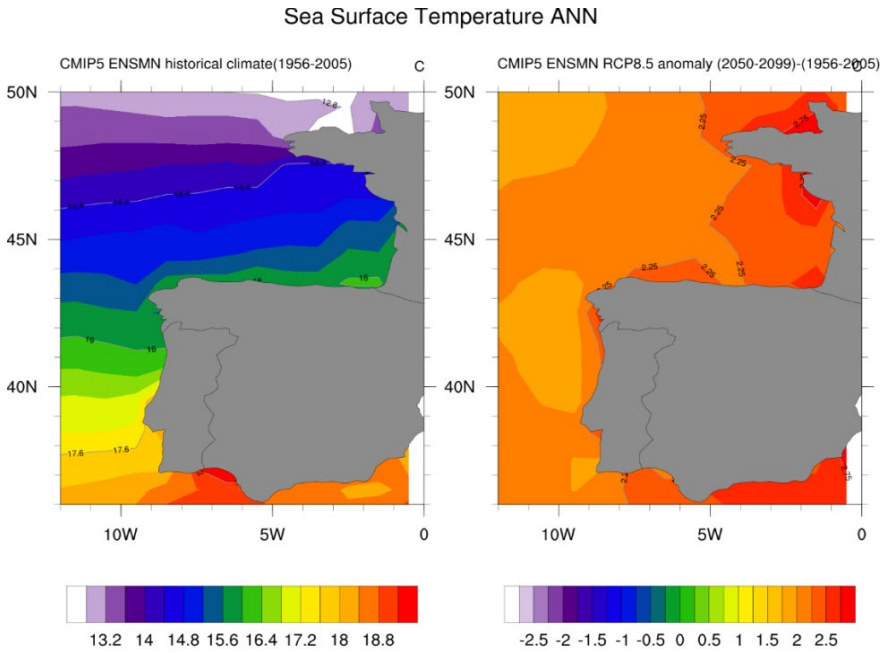

Figure 7 Ensemble mean sea surface temperature (SST) from the Coupled Model Intercomparison Project Phase 5 (CMIP5), interpolated on a 1 × 1 grid for the entire year in the Bay of Biscay and the Iberian Coast ecoregion. Left panel: historical SST for 1956–2005. Right panel: difference in the mean climate between the future time period 2050–2099 (according to the RCP 8.5 scenario and the historical reference period.

Climate change has already influenced the Bay of Biscay and the Iberian Coast ecoregion. Studies have shown that sea surface temperatures have increased.

The southern part of the ecoregion (from west of Cape Peñes in the Cantabrian Sea to north of the Gulf of Cadiz) is strongly influenced by upwelling events, which are in turn influenced by wind intensity and direction. Off northern Iberia, upwelling intensifies during northerly winds. The winters of recent years have had more northerlies, coupled with strong upwelling events. Furthermore, it has been demonstrated that winter northerly wind regime shifts have occurred since 2005 in western Iberia.

Upwelling intensity and river outflow off Galicia have been seen to affect the degree of synchrony (and stability) of the zooplankton community, which in turn is likely to impact upper trophic levels.

The timing of the mackerel (*Scomber scombrus*) fishery has changed, showing an earlier peak of landings in the Cantabrian Sea. This could reflect a change in the timing of migration in response to climate change effects on upwelling patterns.

An increase in the richness of the demersal fish community, together with a western shift in the distribution of many species has been reported in the Cantabrian Sea and Galicia over the last three decades, along with a northwards distributional change of species previously distributed further south. New occurrences and distributional changes of fish in the Bay of Biscay are attributed to increasing temperatures. Examples include changes in the nursery areas of some flatfish and the increased occurrence of deep-water species previously found further south. In contrast, no major distributional trends in demersal fish communities have been observed along the Portuguese continental shelf and upper slope over the last 25 years.

The northwest Iberian Peninsula constitutes the southern limit of the geographic distribution of several canopy-forming seaweeds with cold-temperate affinities. Since the start of this century, a drastic and general decline of these seaweed species has been observed, with a westward retraction in their distributional ranges. Canopy loss leads to rapid shifts to turf-forming

(hydroids, bryozoans) communities, which results in the ecological and functional impoverishment of the coastal system. The decline in these habitat-forming macroalgae has obvious foodweb implications in the intertidal and subtidal areas.

In the Gulf of Cadiz, the African coral *Dendrophyllia laboreli,* has undergone an expansion in recent years; this has been attributed to increasing temperatures. From the single, isolated, individuals described in 2010, communities now exist in several rocky-bottom sites.

Fish recruitment was reduced by the occurrence of winter northerly winds over the western coast of Portugal at the time of spawning. Sea surface temperature, wind regimes, and river discharges have been identified as factors influencing anchovy early life stages at sea. However, no evidence of the effects of warming have been detected through investigations at one of the essential nursery habitats of anchovy in the Gulf of Cadiz.

A marked decrease in the physical condition of several small pelagic fish, including anchovy and sardine, has been noted in the Bay of Biscay since the mid-2000s. Studies are being conducted to assess the respective roles of density dependence, fishing, and climate change in this weakening of condition.

Sea warming, acidification, and eutrophication have been seen to positively affect the palatability of seagrass in the Gulf of Cadiz, triggering an increase in grazing by sea urchins; this may, in turn, have implications for habitat and trophic regulation changes in coastal areas, with potential consequences for artisanal and recreational fisheries.

Climate-induced changes in temperature and salinity have affected the biological communities of the Gironde estuary and modified its nursery function for marine juvenile fish and potentially the migration routes of diadromous species.

State of the ecosystem

Substrate and water masses

The shelf substrate varies greatly across the ecoregion. While sand and muddy-sand areas dominate in the Bay of Biscay, the Cantabrian Sea and Galician shelf are covered by fine sediments with isolated rocky areas in the coastal- and inner-shelf areas, and by sand and mud in the mid- and outer-shelf. The western Iberian Shelf is characterized by sand-sized sediments, with fine sediments forming significant mud bodies on the mid-shelf off the main rivers. In the Gulf of Cadiz, the inner shelf is covered by a sandy sediment belt with local gravels and rocky outcrops, and muddy patches in the proximity of the most important river mouths that also cover most of the mid- to outer shelf. The Gulf of Cadiz continental slope is dominated by muddy and sand sediments, depending on the intensity of the current above the seabed (Figure 8).

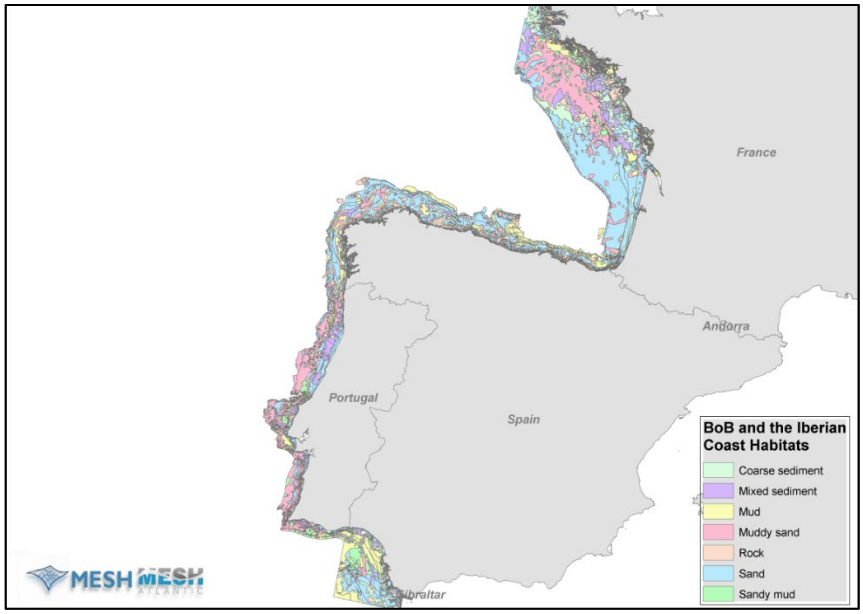

Figure 8 Major substrates on the shelf of the Bay of Biscay and the Iberian coast (as compiled by EMODNET seabed habitats; www.emodnet-seabedhabitats.eu).

Circulation

The main circulation patterns within the region are characterized by central waters (of 200–700 m depth) and Labrador seawater (approximately 2000 m) flowing from the northwest, while Mediterranean waters spread from their origin at Gibraltar. Deep waters describe slow cyclonic flow. In the Gulf of Cadiz, the water exchange is governed by a two-layered inverse estuarine circulation with Mediterranean water flowing into the Gulf under Atlantic water flowing into the Mediterranean Sea.

Productivity

The most important features enhancing primary production and phytoplankton biomass are coastal upwelling, coastal run-off and river plumes, seasonal currents, and internal waves and tidal fronts. Concentrations of toxic dinoflagellates exhibit interannual variations that are determined mainly by changes in the upwelling regime, river run-off, inoculum size, and other environmental parameters.

The abundance of autotrophic picoplankton in the mid-shelf of the central part of the north Iberian coast does not show a significant long-term trend, but heterotrophic picoplankton show a significant long-term increase that has been associated with warming of the sea surface in this area.

Zooplankton

The copepods *Acartia clausi* and *Paracalanus parvus* are the most abundant species of mesozooplankton in most areas. The macrozooplankton species *Calanus helgolandicus* is also important in terms of biomass. The distribution of warm-water copepod species like *Temora stylifera* and *Calanoides carinatus* has moved northwards across the ecoregion. The seasonal pattern of the mesozooplankton in off-shelf areas sees an annual maximum in spring and a secondary peak in late summer–early autumn. This pattern is modified in many coastal areas by the summer upwelling (western Iberian shelf, western Cantabrian sea), and river plumes, which have strong influence in shelf areas across the ecoregion as well as to a minor extent in the Cantabrian sea. Both the upwelling and the plumes enhance zooplankton growth in summer.

Decreasing trends have been observed in copepod abundance in off-shelf areas since the late 1950s. Conversely, increasing trends in coastal zooplankton off Galicia have been observed since the late 1980s, while no recent trends are evident in the eastern Cantabrian region.

Cephalopods

Within this ecoregion the topographic diversity and the wide range of substrates result in many different habitats for cephalopods. The most abundant and commercially exploited species are long-finned squid (*Loliginidae*) and cuttlefish (*Sepiidae*). The abundance of short-finned squid (*Ommastrephidae*) increases westwards towards Galicia and decreases to the south of the Iberian coast. Short-finned squid are abundant and heavily exploited along the Iberian coast by a large artisanal fleet, with concomitant social relevance. There are indications of a decline in octopus biomass index in Galicia and an increase off western Portugal. Stocks of both long-finned squid and short-finned squid have declined in the southern Bay of Biscay.

Cuttlefish landings and population indices from the English Channel and Bay of Biscay have shown decreasing trends in recent years. Low biomass indices for *Loligo forbesii* were observed in the Bay of Biscay during 2016–2018 compared to 2013–2015. Other loliginids (*L. vulgaris* and *Alloteuthis* sp.) display an increasing trend in survey abundance, although landings are decreasing. The survey abundance for *Illex coindetii* has shown an increasing trend since 2015 in the Bay of Biscay but not in the Iberian Coast. The other ommastrephid species (*Todarodes sagittatus* and *Todaropsis eblanae*) have shown a decreasing trend both in surveys and landings. Survey abundance indices for octopus show wide annual fluctuations without a clear trend.

Fish

Fish diversity is high in this ecoregion, reflecting its wide latitudinal dimension. The pelagic habitat is mainly dominated by sardine, anchovy, mackerel, horse mackerel, and blue whiting (*Micromesistius poutassou*). Some migratory species also appear in specific periods, such as tuna species (albacore [*Thunnus alalunga*] and bluefin [*Thunnus thynnus*], which feed upon smaller pelagic fish. Hake is the most abundant predator species in the demersal community. Anglerfish (*Lophius budegassa, Lophius piscatorius*), megrim (*Lepidorhombus boscii, Lepidorhombus whiffiagonis*), and sole (*Solea solea*) are more abundant in the northern part of the ecoregion. The limit of distribution for some cold-water species such as whiting (*Merlangius merlangus*) and pollack (*Pollachius pollachius*) is in the north of Portugal. Skates, sharks, and deep-sea fish occur over the continental slope and in the deeper parts of this ecoregion. Recruitment to the European eel (*Anguilla anguilla*) population has declined sharply in recent decades. For evaluated stocks, the spawning-stock biomass (SSB) is above reference points ($B_{trigger}$). Figure 9 displays the historical evolution of SSB relative to reference points by fish guild in the Bay of Biscay and the Iberian Coast ecoregion, and shows an increase in the SSB that has been observed since 2002.

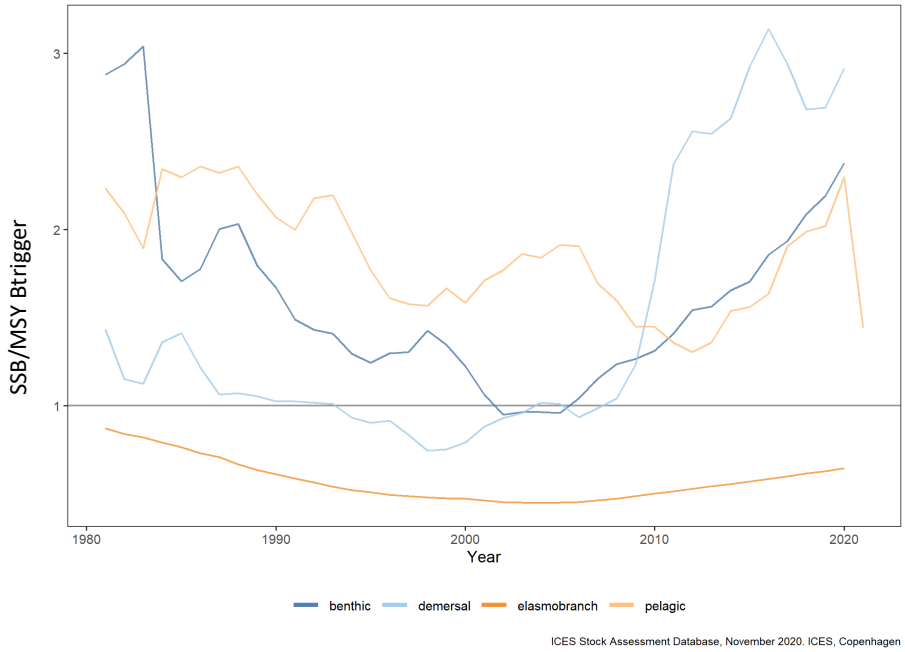

Figure 9 Time-series of annual relative spawning-stock biomass (SSB to MSY $B_{trigger}$ ratio) by fisheries guild for benthic, demersal, crustaceans, and pelagic stocks. Table A1 in the Annex details which species belong to each fish category.

Seabirds

The Bay of Biscay and the Iberian Coast provide important breeding habitats for several seabird species. These include the European storm petrel (*Hydrobates pelagicus*), band-rumped storm petrel *Hydrobates Castro*), European shag, yellow-legged gull (*Larus michahellis*), lesser black-backed gull (*Larus fuscus*), great black-backed gull (*Larus marinus*), black-legged kittiwake, common guillemot, Little tern (*Sternula albifrons*), Audouin´s gull (*Larus* audouinii) and Cory´s shearwater.

A number of seabird species have experienced declines across the ecoregion, including European shag (Álvarez, 2015), with Iberian guillemot (a subspecies of common guillemot) considered extinct as a breeder in Iberia and the black-legged kittiwake considered regionally extinct.

The breeding populations of Cory´s shearwater demonstrate variable subregional trends. In Portugal, breeding populations have remained stable over the last ten years, whereas the biggest subcolony in the Berlengas archipelago has decreased over a similar time period. The species has recently colonized some areas in Galicia (northwest Spain).

The ecoregion is also important to numerous migratory seabird species as a flyway and wintering area. The most abundant species are: northern gannet, great skua (*Stercorarius skua*), Balearic shearwater, Manx shearwater (*Puffinus puffinus*), sooty shearwater (*Puffinus griseus*), great shearwater (*Puffinus gravis*), razorbill (*Alca torda*), common guillemot, Atlantic puffin (*Fratercula arctica*), and seven species of gull (*Larus* spp.). Areas of high seabird diversity are primarily located in Galician waters, decreasing towards the inner Bay of Biscay.

A decreasing trend in abundance of northern gannets and great skuas off the Portuguese coast has been observed over the last ten years and in abundance of razorbills and Balearic shearwaters on the western Iberian coast.

Seabirds in this region have been shown to be sensitive to oil spills, fishing bycatch, marine litter, and plastic ingestion. Many migrating seabirds are also dependent on pelagic fishes that are at early life stages such as the European anchovy.

Marine mammals

A total of 28 species of cetacean have been recorded in the ecoregion. There are nine species that are common or regular: harbour porpoise, common dolphin, striped dolphin (*Stenella coureoalba*), bottlenose dolphin (*Tursiops truncates)*, Risso's dolphin (*Grampus griseus)*, long-finned pilot whale (*Globicephala melas)*, Cuvier's beaked whale (*Ziphius cavirostris)*, sperm whale (*Physeter microcephalus)*, and fin whale (*Balaenoptera physalus)*. Very few seal species occur in the Bay of Biscay and Iberian Atlantic waters.

Non-indigenous species

At least 275 non-indigenous species (NIS) have been reported in the ecoregion with the earliest records dating to the year 1700. The rate of NIS detections has been increasing since the 1970s, corresponding with increased awareness and research effort. Nine new NIS were detected in the ecoregion during 2016–2018, however, the data for the most recent decade are likely incomplete because of a lag between the actual date of an NIS' introduction and the collection, identification and reporting of the species.

The southernmost part of the ecoregion, the Gulf of Cadiz, can be considered an NIS hotspot, exhibiting an accelerated recent invasion of such species. This may have been influenced by recent anthropogenic alteration of the habitat and facilitated by climate change through supporting the spread of warm-water NIS.

In general, the ecological impacts of NIS in the marine realm are poorly quantified. In this ecoregion, the decline of native species and structural changes in its benthic communities as a result of NIS introductions have been recorded. Other effects include the fouling of irrigation systems and clogging of fishing gear and aquaculture facilities.

Threatened and declining species in the Bay of Biscay and the Iberian Coast ecoregion

Table 1 OSPAR-listed threatened and declining species in the Bay of Biscay and the Iberian Coast ecoregion.

Scientific name	Common name
Invertebrates	
Arctica islandica	Ocean quahog
Nucella lapillus	Dog whelk
Seabirds	
Puffinus mauretanicus	Balearic shearwater
Sterna dougallii	Roseate tern
Uria aalge – Iberian population (synonyms: *Uria aalge albionis, Uria aalge ibericus*)	Iberian guillemot
Fish	
Acipenser sturio	Sturgeon
Alosa alosa	Allis shad
Anguilla anguilla	European eel
Centroscymnus coelolepis	Portuguese dogfish
Centrophorus granulosus	Gulper shark
Centrophorus squamosus	Leafscale gulper shark
Cetorhinus maximus	Basking shark
Dipturus batis spp.(synonym: *Raja batis*)	Common skate
Raja montagui (synonym: Dipturus montagui)	Spotted Ray
Hippocampus guttulatus (synonym: *Hippocampus ramulosus*)	Long-snouted seahorse
Hippocampus hippocampus	Short-snouted seahorse

Lamna nasus	Porbeagle
Petromyzon marinus	Sea lamprey
Rostroraja alba	White skate
Salmo salar	Salmon
Squalus acanthias	[Northeast Atlantic] spurdog
Squatina squatina	Angel shark
Reptiles	
Caretta caretta	Loggerhead turtle
Dermochelys coriacea	Leatherback turtle
Mammals	
Balaenoptera musculus	Blue whale
Eubalaena glacialis	Northern right whale

Threatened and declining habitats in the Bay of Biscay and the Iberian Coast ecoregion

Table 2 Threatened and declining habitats in the Bay of Biscay and the Iberian Coast ecoregion according to OSPAR.

Habitats
Coral gardens
Cymodocea meadows
Deep-sea sponge aggregations
Intertidal mudflats
Lophelia pertusa reefs
Modiolus modiolus beds
Ostrea edulis beds
Seamounts
Zostera beds

Sources and acknowledgements

The content for ICES regional ecosystem overviews is based on information and knowledge generated by the following ICES processes: Workshop on Benchmarking Integrated Ecosystem Assessment (WKBEMIA) 2012, ACOM/SCICOM Workshop on Ecosystem Overviews (WKECOVER) 2013, Workshop to draft Advice on Ecosystem Overviews (WKDECOVER) 2013, Workshop on Regional Climate Change Vulnerability Assessment for the large marine ecosystems of the northern hemisphere (WKSICCME-CVA) 2017, and Advice drafting groups to finalize draft Ecosystem Overviews (ADGECO) 2015, 2018, and 2019, which provided the theoretical framework and final layout of the documents.

ICES Working Group on Ecosystem Assessment of Western European Shelf Seas (WGEAWESS) contributed to the main sections of this overview.

The following working groups contributed to drafting the subsections on the state of the ecosystem components: Benthos Ecology Working Group (BEWG), Working Group on Multispecies Assessment Methods (WGSAM), Working Group on Zooplankton Ecology (WGZE), Working Group on Cephalopod Fisheries and Life History (WGCEPH), Working Group on Marine Mammal Ecology (WGMME), Working Group on Introductions and Transfers of Marine Organisms (WGITMO), Working Group on Bycatch of Protected Species (WGBYC), Working Group for the Bay of Biscay and the Iberian Waters Ecoregion (WGBIE) and Joint OSPAR/HELCOM/ICES Working Group on Seabirds (JWGBIRD).

The maps and GIS products have been produced by the ICES Secretariat using data from:

1. Exclusive Economic Zones. Marineregions.org (VLIZ)
2. Offshore Wind-farms. OSPAR Commission
3. Depth Contours. General Bathymetric Chart of the Oceans (GEBCO)
4. Natura 2000. European Commission
5. Ecoregions. International Council for the Exploration of the Sea (ICES)
6. Ports. Global Shipping Lanes and Harbors (ESRI)
7. Cities. World Cities (ESRI)
8. Rivers. WISE Large Rivers and large lakes. European Environment Agency (EEA)
9. ICES Areas. International Council for the Exploration of the Sea (ICES)
10. Catchment Area. European Environment Agency (EEA). European Topic Centre on Inland, Coastal and Marine waters (ETC/ICM).
11. Substratemaps.EUEMODNETseabedhabitats;www.emodnet-seabedhabitats.eu
12. Non-indigenous species. *AquaNIS*; http://www.corpi.ku.lt/databases/index.php/aquanis

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Recommended citation: ICES. 2020. Bay of Biscay and the Iberian Coast ecoregion – Ecosystem overview. *In* Report of the ICES Advisory Committee, 2020. ICES Advice 2020, Section 6.1, https://doi.org/10.17895/ices.advice.7636.

Annex A

Table A1 Stocks with analytical assessments and guilds included in Figures 4 and 10.

Stock code	Stock name	Fisheries guild
ank.27.78abd	Black-bellied anglerfish (*Lophius budegassa*) in Subarea 7 and divisions 8.a–b and 8.d (Celtic Seas, Bay of Biscay)	Benthic
ank.27.8c9a	Black-bellied anglerfish (*Lophius budegassa*) in divisions 8.c and 9.a (Cantabrian Sea, Atlantic Iberian waters)	Benthic
ldb.27.8c9a	Four-spot megrim (*Lepidorhombus boscii*) in divisions 8.c and 9.a (southern Bay of Biscay and Atlantic Iberian waters East)	Benthic
meg.27.8c9a	Megrim (*Lepidorhombus whiffiagonis*) in divisions 8.c and 9.a (Cantabrian Sea and Atlantic Iberian waters)	Benthic
meg.27.7b-k8abd	Megrim (*Lepidorhombus whiffiagonis*) in divisions 7.b–k, 8.a–b, and 8.d (west and southwest of Ireland, Bay of Biscay)	Benthic
mon.27.78abd	White anglerfish (*Lophius piscatorius*) in Subarea 7 and divisions 8.a–b and 8.d (Celtic Seas, Bay of Biscay)	Benthic
mon.27.8c9a	White anglerfish (*Lophius piscatorius*) in divisions 8.c and 9.a (Cantabrian Sea and Atlantic Iberian waters)	Benthic
sol.27.8ab	Sole (*Solea solea*) in divisions 8.a–b (northern and central Bay of Biscay)	Benthic
nep.fu.2324	Norway lobster (*Nephrops norvegicus*) in divisions 8.a and 8.b, functional units 23–24 (northern and central Bay of Biscay)	Crustacean
nep.fu.2627	Norway lobster (*Nephrops norvegicus*) in Division 9.a, functional units 26–27 (Atlantic Iberian waters East, western Galicia, and northern Portugal)	Crustacean
nep.fu.2829	Norway lobster (*Nephrops norvegicus*) in Division 9.a, functional units 28–29 (Atlantic Iberian waters East and southwestern and southern Portugal)	Crustacean
bss.27.8ab	Seabass (*Dicentrarchus labrax*) in divisions 8.a–b (northern and central Bay of Biscay)	Demersal
hke.27.3a46-8abd	Hake (*Merluccius merluccius*) in subareas 4, 6, and 7, and divisions 3.a, 8.a–b, and 8.d, Northern stock (Greater North Sea, Celtic Seas, and the northern Bay of Biscay)	Demersal
hke.27.8c9a	Hake (*Merluccius merluccius*) in divisions 8.c and 9.a, Southern stock (Cantabrian Sea and Atlantic Iberian waters)	Demersal
dgs.27.nea	Spurdog (*Squalus acanthias*) in subareas 1–10, 12, and 14 (the Northeast Atlantic and adjacent waters)	Elasmobranch
ane.27.8	Anchovy (*Engraulis encrasicolus*) in Subarea 8 (Bay of Biscay)	Pelagic
ane.27.9a	Anchovy *(Engraulis encrasicolus*) in Division 9.a (Atlantic Iberian waters)	Pelagic
boc.27.6-8	Boarfish (*Capros aper*) in subareas 6–8 (Celtic Seas, English Channel, and Bay of Biscay)	Pelagic
hom.27.9a	Horse mackerel (*Trachurus trachurus*) in Division 9.a (Atlantic Iberian waters)	Pelagic
hom.27.2a4a5b6a7a-ce-k8	Horse mackerel (*Trachurus trachurus*) in Subarea 8 and divisions 2.a, 4.a, 5.b, 6.a, 7.a–c, and 7.e–k (the Northeast Atlantic)	Pelagic
mac.27.nea	Mackerel (*Scomber scombrus*) in subareas 1–8 and 14 and division 9.a (the Northeast Atlantic and adjacent waters)	Pelagic
pil.27.8abd	Sardine (*Sardina pilchardus*) in divisions 8.a–b and 8.d (Bay of Biscay)	Pelagic
pil.27.8c9a	Sardine (*Sardina pilchardus*) in divisions 8.c and 9.a (Cantabrian Sea and Atlantic Iberian waters)	Pelagic

whb.27.1-91214	Blue whiting (*Micromesistius poutassou*) in subareas 1–9, 12, and 14 (Northeast Atlantic and adjacent waters)	Pelagic