Sardine, anchovy, mackerel (Spain, France, Portugal)

Scomber colias, Engraulis encrasicolus, Trachurus trachurus, Sardina pilchardus, Trachurus mediterraneus, Scomber scombrus

Atlantic, Northeast

Purse seines, Handlines and hand-operated pole-and-lines

Report ID 27873

March 6,2023

Seafood Watch Standard used in this assessment: Fisheries Standard v4

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About Seafood Watch

Monterey Bay Aquarium's Seafood Watch program evaluates the environmental sustainability of wild-caught and farmed seafood commonly found in the United States marketplace. Seafood Watch defines sustainable seafood as originating from sources, whether wild-caught or farmed, which can maintain or increase production in the long-term without jeopardizing the structure or function of affected ecosystems. The program's goals are to raise awareness of important ocean conservation issues and empower seafood consumers and businesses to make choices for healthy oceans.

Seafood Watch's science-based ratings are available at www.SeafoodWatch.org. Each rating is supported by a Seafood Watch assessment, in which the fishery or aquaculture operation is evaluated using the Seafood Watch standard.

Seafood Watch standards are built on our guiding principles, which outline the necessary environmental sustainability elements for fisheries and aquaculture operations. The guiding principles differ across standards, reflecting the different impacts of fisheries and aquaculture.

- Seafood rated Best Choice comes from sources that operate in a manner that's consistent with our guiding principles. The seafood is caught or farmed in ways that cause little or no harm to other wildlife or the environment.

- Seafood rated Good Alternative comes from sources that align with most of our guiding principles. However, one issue needs substantial improvement, or there's significant uncertainty about the impacts on wildlife or the environment.

- Seafood rated Avoid comes from sources that don't align with our guiding principles. The seafood is caught or farmed in ways that have a high risk of causing harm to wildlife or the environment. There's a critical conservation concern or many issues need substantial improvement.

Each assessment follows an eight-step process, which prioritizes rigor, impartiality, transparency and accessibility. They are conducted by Seafood Watch scientists, in collaboration with scientific, government, industry and conservation experts and are open for public comment prior to publication. Conditions in wild capture fisheries and aquaculture operations can change over time; as such assessments and ratings are updated regularly to reflect current practice.

More information on Seafood Watch guiding principles, standards, assessments and ratings are available at www.SeafoodWatch.org.

Guiding Principles

Seafood Watch defines sustainable seafood as originating from sources, whether fished[1] or farmed, that can maintain or increase production in the long term without jeopardizing the structure or function of affected ecosystems.

The following guiding principles illustrate the qualities that fisheries must possess to be considered sustainable by the Seafood Watch program (these are explained further in the Seafood Watch Standard for Fisheries):

- Follow the principles of ecosystem-based fisheries management.
- Ensure all affected stocks are healthy and abundant.
- Fish all affected stocks at sustainable levels.
- Minimize bycatch.
- Have no more than a negligible impact on any threatened, endangered, or protected species.
- Managed to sustain the long-term productivity of all affected species.
- Avoid negative impacts on the structure, function, or associated biota of aquatic habitats where fishing occurs.
- Maintain the trophic role of all aquatic life.
- Do not result in harmful ecological changes such as reduction of dependent predator populations, trophic cascades, or phase shifts.
- Ensure that any enhancement activities and fishing activities on enhanced stocks do not negatively affect the diversity, abundance, productivity, or genetic integrity of wild stocks.

These guiding principles are operationalized in the four criteria in this standard.Each criterion includes:

- Factors to evaluate and score
- Guidelines for integrating these factors to produce a numerical score and rating

Once a rating has been assigned to each criterion, Seafood Watch develops an overall recommendation. Criteria ratings and the overall recommendation are color coded to correspond to the categories on the Seafood Watch pocket guides and online guide:

Best Choice/Green: Buy first; they're well managed and caught or farmed responsibly.

Good Alternative/Yellow: Buy, but be aware there are concerns with how they're caught, farmed or managed.

Avoid/Red: Take a pass on these for now; they're caught or farmed in ways that harm other marine life or the environment.

[1] "Fish" is used throughout this document to refer to finfish, shellfish and other invertebrates

Summary

This assessment covers the main purse seine and handline fisheries for small pelagic fish species prosecuted by France, Spain, and Portugal in the Bay of Biscay and Iberian Coast ecoregion.

Most species in this fishery have a stock assessment with MSY-based reference points. For four out of the six species assessed, at least one of the stock components is a high concern for abundance and/or fishing mortality.

Bycatch in the hook and line fishery is not a concern because the fishing gear is species-specific. Bycatch in the purse seine fishery is thought to be low. There is a landing obligation in place, so discards are low, but observer coverage is also low. Thus, bycatch impacts are not well understood.

The management strategy and implementation is ineffective for most fisheries, because a number of the stocks are overfished and there are not management measures in place, such as HCRs or rebuilding plans, to effectively address overfishing. The exception is the Spanish purse seine targeting anchovy in areas 27.8.b and 27.8.c (Bay of Biscay). The only species caught in significant volumes is anchovy, and fishing impacts on the anchovy stock caught in this area are managed through a limit reference point and a TAC consistent with ICES advice, and there are currently no major concerns over the stock's status. The management strategy and implementation for these fisheries is considered highly effective.

Based on the available data, bycatch is low and the bycatch strategy scores highly effective. The stocks are regularly assessed, landings data are collected, and fishery-independent surveys are conducted. But, observer coverage in these fisheries is low, so data collection and analysis scores moderately effective. Enforcement measures are in place and are coordinated between the European Union and Member States. But, there is criticism that sanctions are not strong enough to dissuade bad actors. Therefore, enforcement scores moderately effective. Stakeholders are included in the decision-making process through regional advisory councils, but these councils have a limited number of seats. This skews participation toward well-organized entities and makes it difficult for individuals to participate. Stakeholder inclusion scores moderately effective.

Both purse seines and hook-and-line gear types have negligible bottom contact. This fishery targets forage fish species, but management has a single-species focus and does not use HCRs that are appropriately precautionary to account for the key role that forage fish play in the ecosystem. Ecosystem-based fishery management scores moderate concern for most species because a single-species management strategy is being implemented. European pilchard on the Portuguese continental shelf has been identified as a key forage species, which require a more precautionary approach for management. Fisheries catching this stock are considered high concern for this factor.

European pilchard targeted by Spanish purse seines in ICES area 27.8.c is rated "Good Alternative" while the same fleet targeting the same species in area 27.8.a, 27.8.b, and 27.9.a is rated "Avoid." European anchovy targeted by Spanish purse seines in ICES area 27.8.b and 27.8.c is rated "Best Choice" while the same fleet targeting the same species in area 27.9.a is rated "Avoid." All other species in this fishery are rated "Avoid." From Spain, this includes Atlantic chub mackerel, Atlantic mackerel, and European horse mackerel caught in purse seines. It also includes Atlantic mackerel caught with hook-and-line gear from Spain. From Portugal, this includes Atlantic chub mackerel, European anchovy, European pilchard, and European horse mackerel caught in purse seines. From France, this includes European pilchard, Atlantic chub mackerel, and Mediterranean horse mackerel caught in purse seines.

Final Seafood Recommendations

SPECIES | FISHERY	C 1 TARGET SPECIES	C 2 OTHER SPECIES	C 3 MANAGEMENT	C 4 HABITAT	OVERALL	VOLUME (MT) YEAR
Atlantic chub mackerel | Atlantic, Northeast | Portuguese Waters - East (Division 27.9.a) | Purse seines | Portugal | Spain	2.644	1.732	1.000	2.828	**Avoid (1.897)**	20,373 (MT) 2020
Atlantic mackerel | Subareas 1–8 and 14,and in Division 9.a (Northeast Atlantic and adjacent waters) Stock | Bay of Biscay | Atlantic, Northeast | Bay of Biscay - South (Division 27.8.c) | Handlines and hand-operated pole-and-lines | Spain	1.916	5.000	1.000	3.464	**Avoid (2.400)**	11,340 (MT) 2020
Atlantic mackerel | Subareas 1–8 and 14,and in Division 9.a (Northeast Atlantic and adjacent waters) Stock | Bay of Biscay | Atlantic, Northeast | Bay of Biscay - South (Division 27.8.c) | Purse seines | Spain | Mackerel target	1.916	5.000	1.000	3.464	**Avoid (2.400)**	9,224 (MT) 2020
European anchovy | Subarea 8 (Bay of Biscay) Stock | Atlantic, Northeast | Bay of Biscay - North (Division 27.8.a) | Purse seines | France	3.318	1.000	1.000	3.464	**Avoid (1.841)**	19 (MT) 2020
European anchovy | Division 9.a (Atlantic Iberian waters) Stock | Atlantic, Northeast | Portuguese Waters - East (Division 27.9.a) | Purse seines | Portugal | Spain	1.732	2.644	1.000	2.828	**Avoid (1.897)**	12,045 (MT) 2020
European anchovy | Subarea 8 (Bay of Biscay) Stock | Atlantic, Northeast | Bay of Biscay - Central (Division 27.8.b) | Purse seines | Spain | Anchovy target	3.318	5.000	4.000	3.464	**Best Choice (3.894)**	873 (MT) 2020
European anchovy | Subarea 8 (Bay of Biscay) Stock | Atlantic, Northeast | Bay of Biscay - South (Division 27.8.c) | Purse seines | Spain | Anchovy target	3.318	5.000	4.000	3.464	**Best Choice (3.894)**	24,444 (MT) 2020
European horse mackerel | Division 9.a (Atlantic Iberian waters) Stock | Atlantic, Northeast | Portuguese Waters - East (Division 27.9.a) | Purse seines | Portugal | Spain	5.000	1.732	1.000	2.828	**Avoid (2.225)**	14,223 (MT) 2020
European pilchard | Divisions 8.a–b and 8.d (Bay of Biscay) Stock | Atlantic, Northeast | Bay of Biscay - Central (Division 27.8.b) | Purse seines | France	1.000	5.000	1.000	3.464	**Avoid (2.040)**	1,507 (MT) 2020
European pilchard | Divisions 8.a–b and 8.d (Bay of Biscay) Stock | Atlantic, Northeast | Bay of Biscay - North (Division 27.8.a) | Purse seines | France	1.000	3.318	1.000	3.464	**Avoid (1.841)**	5,674 (MT) 2020

European pilchard | Divisions 8.c and 9.a (Cantabrian Sea and Atlantic Iberian waters) Stock | Atlantic, Northeast | Portuguese Waters - East (Division 27.9.a) | Purse seines | Portugal | Spain	2.644	1.732	1.000	2.828	**Avoid (1.897)**	18,694 (MT) 2020
European pilchard | Divisions 8.c and 9.a (Cantabrian Sea and Atlantic Iberian waters) Stock | Bay of Biscay | Atlantic, Northeast | Bay of Biscay - South (Division 27.8.c) | Purse seines | Spain | Sardine target	2.644	5.000	1.000	3.464	**Good Alternative (2.601)**	2,616 (MT) 2020
European pilchard | Divisions 8.a–b and 8.d (Bay of Biscay) Stock | Atlantic, Northeast | Bay of Biscay - Central (Division 27.8.b) | Purse seines | Spain | Sardine target	1.000	5.000	1.000	3.464	**Avoid (2.040)**	6,802 (MT) 2020

Source: ICES catch, landings and discards data: https://stecf.jrc.ec.europa.eu/dd/fdi (STECF 2022). Target assemblage is "Small pelagic fish." Records of "Pacific chub mackerel" are assumed to be of Atlantic chub mackerel.

Scoring Guide

Scores range from zero to five where zero indicates very poor performance and five indicates the fishing operations have no significant impact.

Final Score = geometric mean of the four Scores (Criterion 1, Criterion 2, Criterion 3, Criterion 4).

Best Choice/Green = Final Score >3.2, and no Red Criteria, and no Critical scores

Good Alternative/Yellow = Final score >2.2-3.2, and neither Harvest Strategy (Factor 3.1) nor Bycatch Management Strategy (Factor 3.2) are Very High Concern2, and no more than one Red Criterion, and no Critical scores

Avoid/Red = Final Score ≤2.2, or either Harvest Strategy (Factor 3.1) or Bycatch Management Strategy (Factor 3.2) is Very High Concern or two or more Red Criteria, or one or more Critical scores.

[2] Because effective management is an essential component of sustainable fisheries, Seafood Watch issues an Avoid recommendation for any fishery scored as a Very High Concern for either factor under Management (Criterion 3).

Introduction

Scope of the analysis and ensuing recommendation

This assessment covers the main purse seine and handline fisheries for small pelagic fish species prosecuted by France, Spain, and Portugal in the Bay of Biscay and Iberian Coast ecoregion.

Species Overview

The target species for the fisheries included in this assessment are Atlantic mackerel (*Scomber scombrus*), European pilchard (*Sardina pilchardus*), European anchovy (*Engraulis encrasicolus*), and Atlantic chub mackerel (*Scomber colias*). All are relatively small pelagic schooling fish distributed in the Northeast Atlantic including the Mediterranean, and some range into the Southern Hemisphere and/or the Atlantic coast of North and South America.

Atlantic mackerel (*Scomber scombrus*)

Atlantic mackerel is a schooling species found along the coasts of the North Atlantic Ocean. In the northeast Atlantic, the species is most abundant from Norway to Spain, including Ireland, the United Kingdom, and the western Mediterranean Sea (Collette & Nauen 1983).

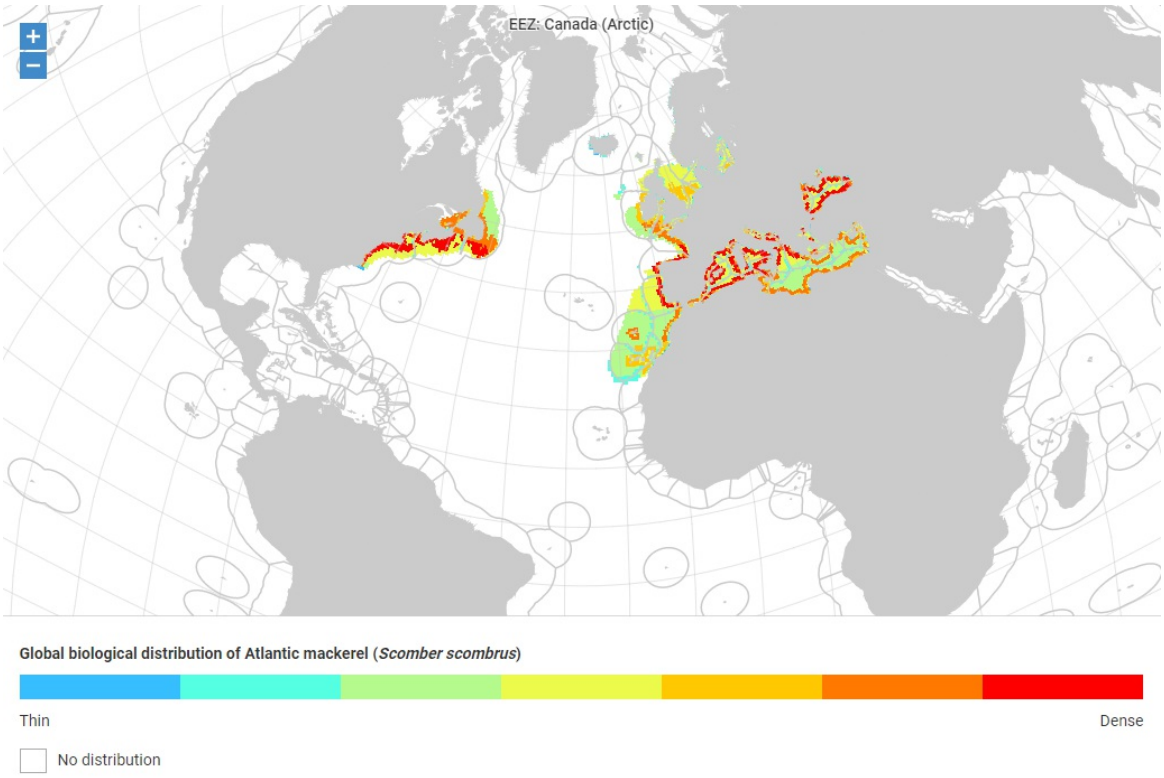


Figure 1: Image from SeaAroundUs.org.

European pilchard (*Sardina pilchardus*)

The European pilchard is distributed throughout the Mediterranean and extending along the Northeast Atlantic from northern Africa to southern Norway (Parrish et al. 1989). It is a small pelagic fish which is considered a forage fish species (ICES 2013). The population level is driven by year-to-year recruitment, with recruitment being influenced by environmental factors which affect egg and larval survival (ICES 2013) (MSC 2020). The majority of the population is made up of age-1 individuals (ICES 2022a). The species mature quickly, reaching sexual maturity by year two. Spawning occurs in the late spring and early summer months (MSC 2020).

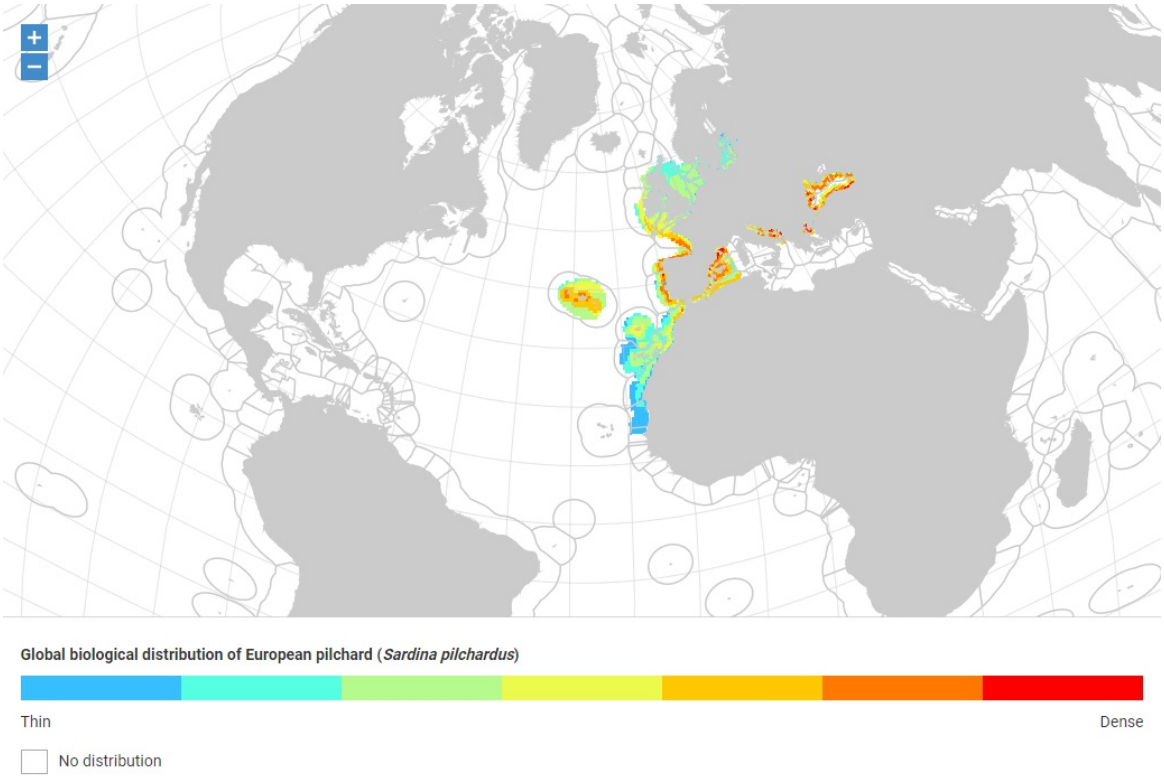


Figure 2: Image from SeaAroundUs.org.

European anchovy (*Engraulis encrasicolus*)

European anchovy is a small pelagic species which forms large schools and is widely distributed. The Bay of Biscay stock is relatively isolated from other Northeast Atlantic stocks. In the summer months, the population moves closer to the shore and migrates north along the French coast. In the winter, they migrate south and inhabit deeper waters off around the east and southeast Bay of Biscay (ICES 2009). Spawning occurs between April and July. Larval survival is highly variable and is driven by environmental factors (ICES 2009).

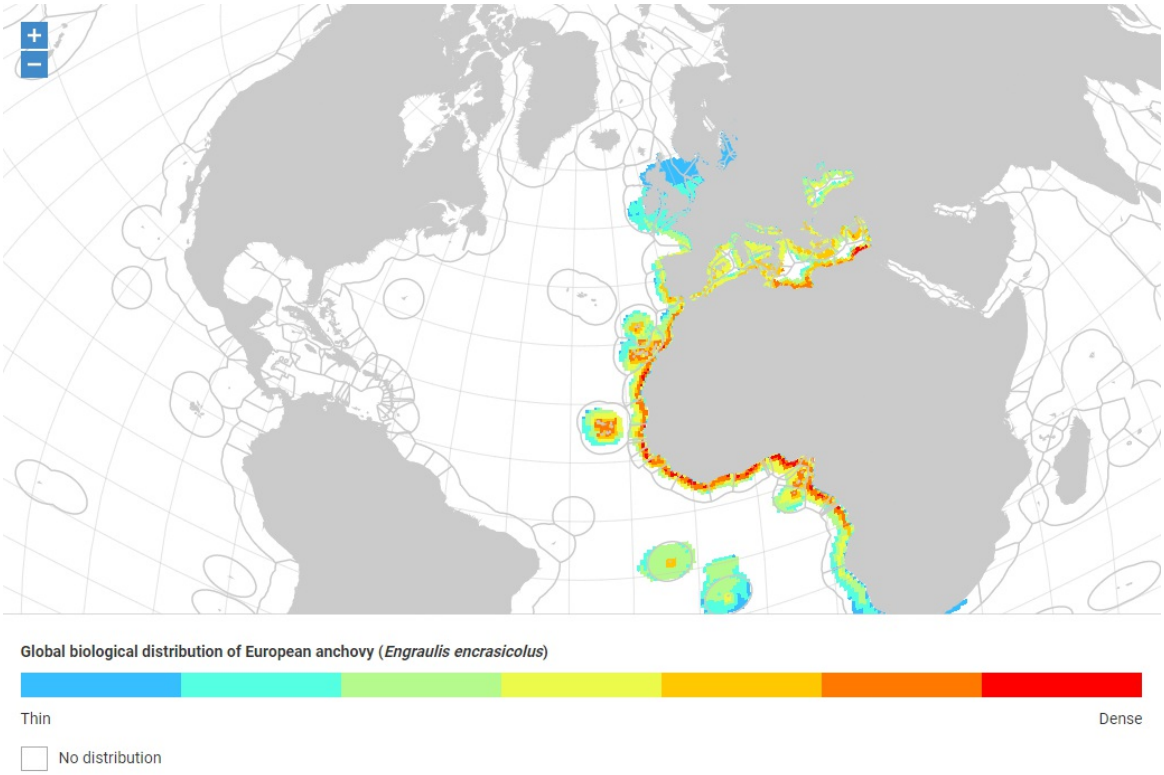


Figure 3: Image from SeaAroundUs.org.

Atlantic chub mackerel (Scomber colias)

Atlantic mackerel is distributed throughout the Atlantic Ocean, Mediterranean Sea, and the Black Sea. The Atlantic Ocean population is considered a separate stock (Collette 2011). It is a coastal pelagic species which forms schooling aggregations (Collette & Nauen 1983). Spawning occurs in winter and spring when waters reach 15°-20° C. The species is fast-maturing, reaching sexual maturity at after 1-2 years and it can live up to 13 years (Martins et al. 2013).

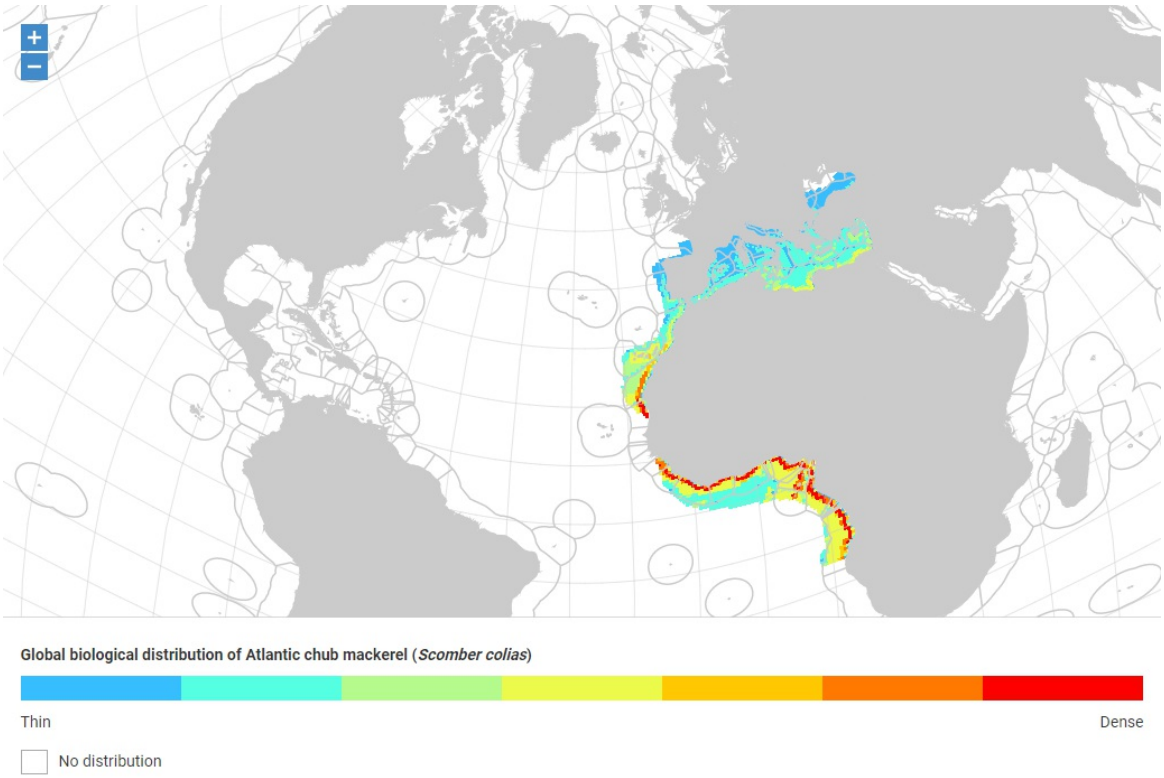


Figure 4: Image from SeaAroundUs.org.

Production Statistics

All species are caught across their range, with European pilchard and Atlantic mackerel catches exceeding 1 million mt a year (FAO 2022).

Table 1: Aggregate annual catch 2016-2020 of small pelagics from France, Spain, and Portugal using purse seines and hand lines. Data from FAO Statistical Query Panel (FAO 2022).

Species	2016	2017	2018	2019	2020
European pilchard(=Sardine)	1278734	1434260	1603926	1496107	1330635
Atlantic mackerel	1140395	1218589	1046677	868949	1048720
Atlantic chub mackerel	517167	459043	507308	590928	490948
European anchovy	356304	529175	479242	595527	514755
European horse mackerel	120536	122575	140258	183952	128900
Mediterranean horse mackerel	14326	13058	18991	18036	11931

Atlantic mackerel

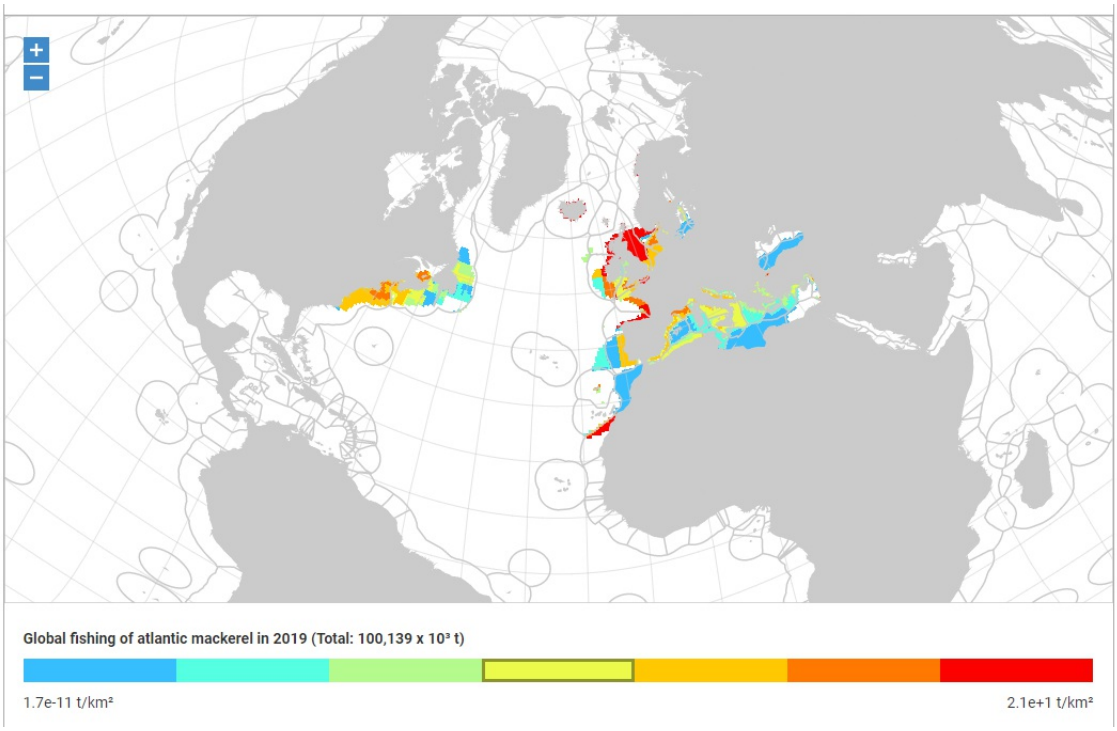


Figure 5: Image from SeaAroundUs.org, based on reconstructed catches.

European pilchard

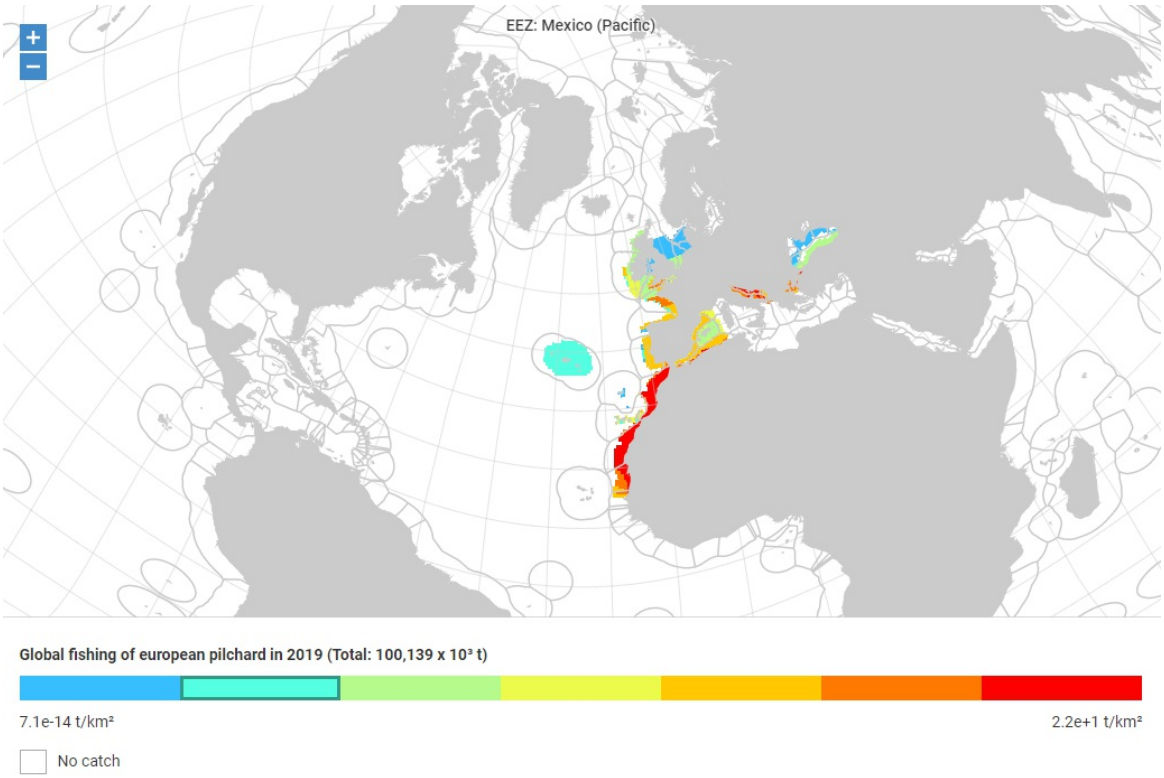


Figure 6: Image from SeaAroundUs.org, based on reconstructed catches.

European anchovy

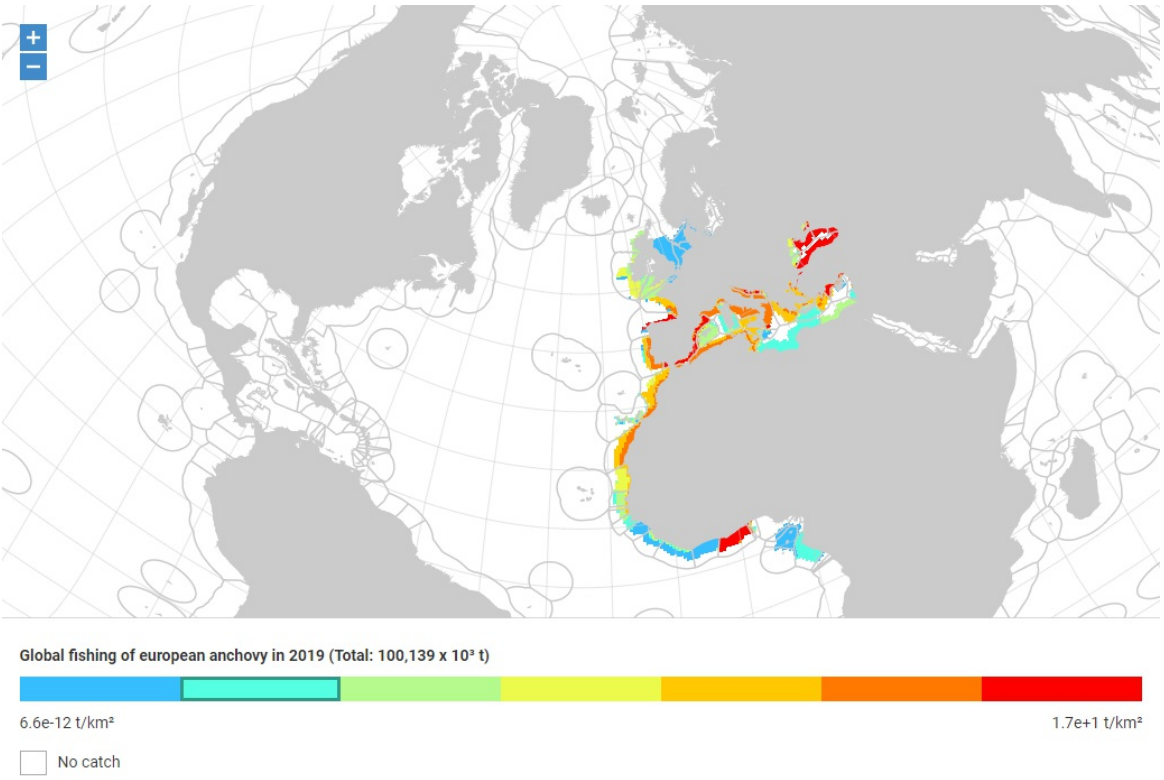


Figure 7: Image from SeaAroundUs.org, based on reconstructed catches.

Atlantic chub mackerel

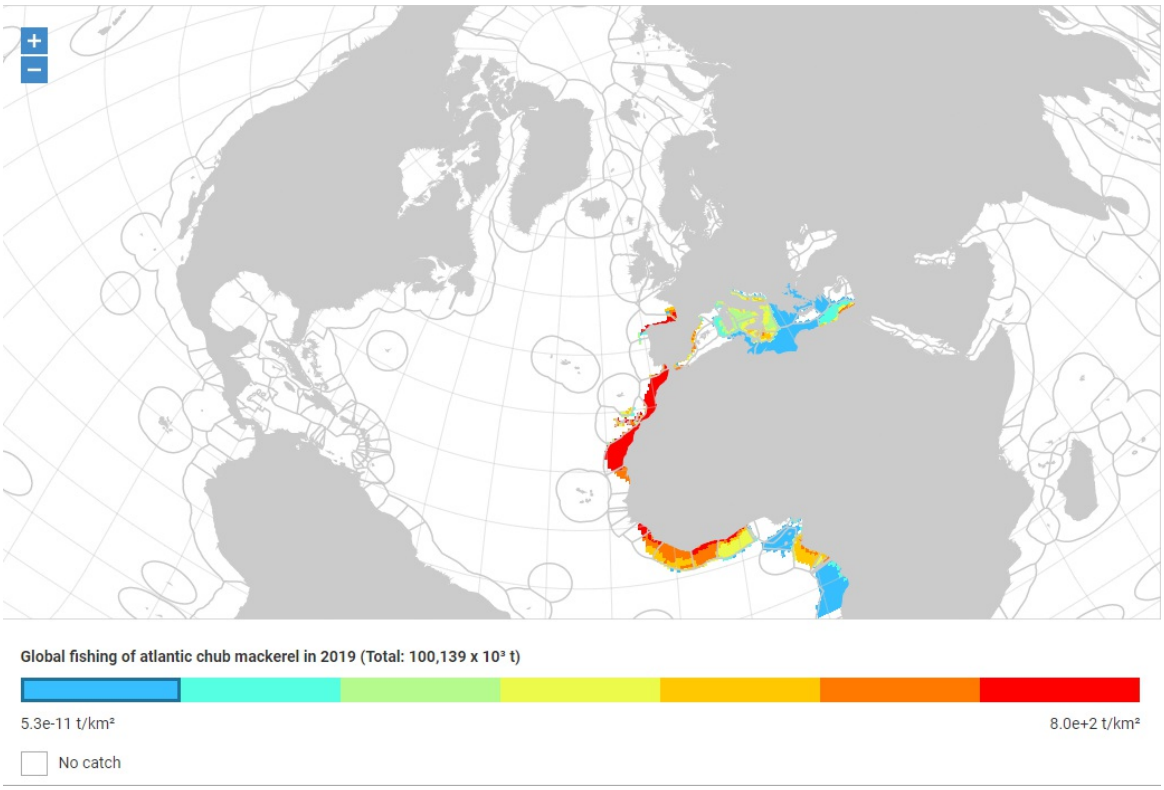


Figure 8: Image from SeaAroundUs.org, based on reconstructed catches.

Fisheries covered in this present Seafood Watch assessment

The latest ICES Fishery Overview provides the following summary of the Bay of Biscay and Iberian Coast ecoregion (ICES 2021a). It covers the southwestern areas of the EU. It includes areas of the deeper eastern Atlantic Ocean, as well as coastal areas from Brittany in the north to the Iberian Peninsula and Gulf of Cadiz in the south.

The following areas constitute this ecoregion:

- Bay of Biscay (divisions 8.a and 8.b, and part of subdivisions 8.d.2 and 8.e.2);
- The Cantabrian Sea (Division 8.c); and
- The western coast of Spain, the Portuguese coast, and the Gulf of Cadiz (Division 9.a and part of Subdivision 9.b.2).

At its southeastern limit, this ecoregion is connected to the Mediterranean Basin by the Strait of Gibraltar. Deepwater currents composed of Mediterranean water have a strong influence on the southwest Iberian and Gulf of Cadiz circulation patterns.

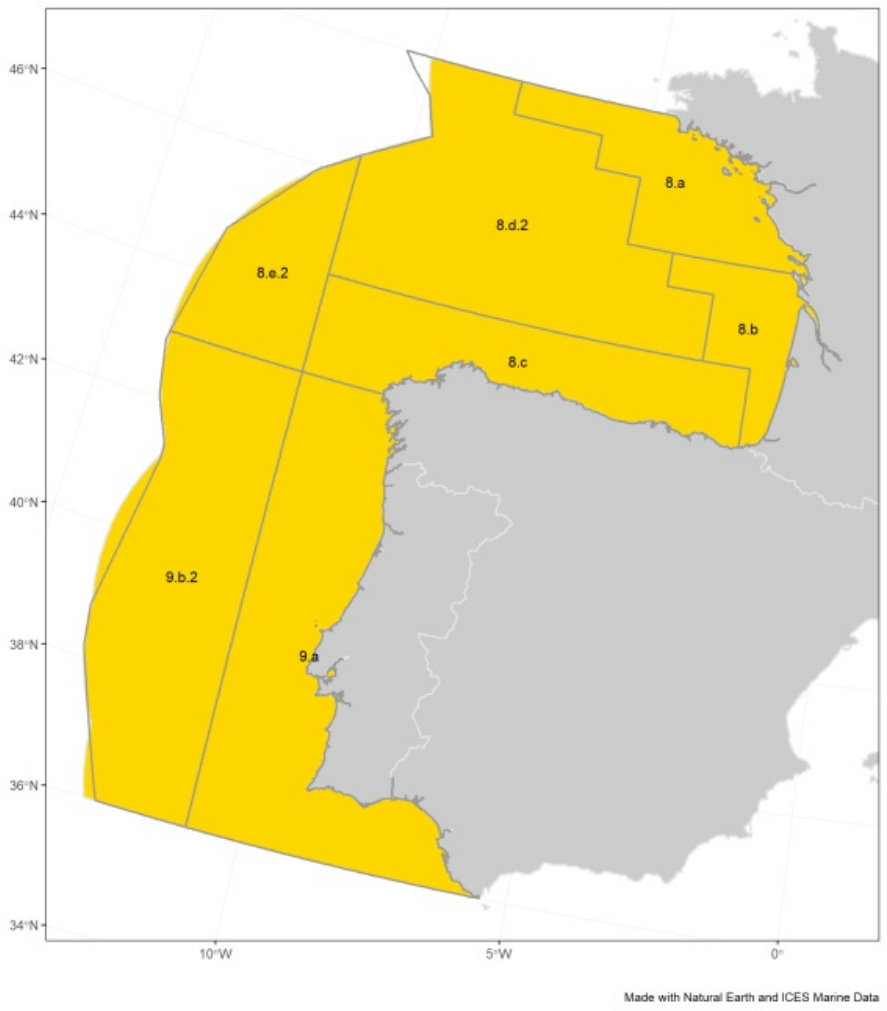


Figure 9: The Bay of Biscay and Iberian Coast ecoregion (highlighted in yellow) and ICES statistical areas (ICES 2021a)

The majority of the small pelagic catch in the ecoregion is taken by purse seines (880kmt or 86% summed across 2016-2020), with smaller volumes taken by midwater trawl (60kmt or 6%) and handlines (45kmt or 5%). Other gears include beach seines, otter trawl and gillnets (STECF 2022).

Purse seines

Table 2: Top 10 species caught with purse seine in each area in the Bay of Biscay and Iberian Coast ecoregion in 2020 (STECF 2022). Excludes confidential catch (which is unquantified). The catch of small pelagics in offshore waters in this ecoregion (i.e. 8.d.2, 8.d.3, 9.b.2) is insignificant. Species highlighted in dark blue and light blue account for at least 5% and 1% of landings in that fishery, respectively. Data from EU Scientific, Technical and Economic Committee for Fisheries (STECF 2022).

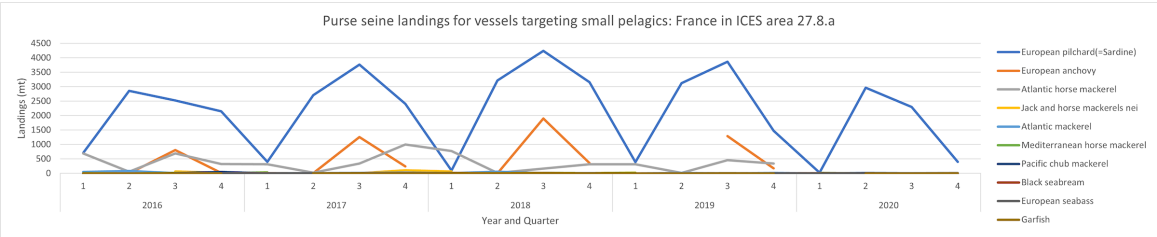
Sub-region	Country name	English name	Landings (mt, live weight)

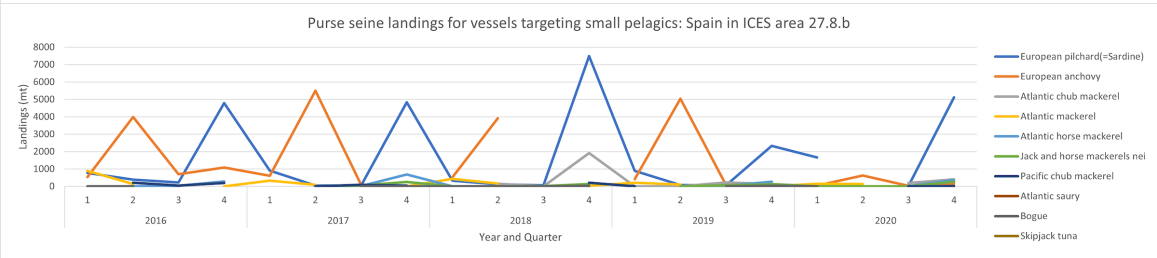
27.9.A	**Portugal**	European pilchard(=Sardine)	15030
		Atlantic chub mackerel	14304
		European anchovy	5409
		European horse mackerel	3506
		Blue jack mackerel	1445
		Bogue	130
		Atlantic bonito	56
		Atlantic mackerel	54
		Axillary seabream	50
		Common two-banded seabream	49
		Others	100
	Portugal Total		**40134**
	Spain	European horse mackerel	10726
		European anchovy	6636
		Atlantic chub mackerel	6083
		European pilchard(=Sardine)	3664
		Jack and horse mackerels nei	2569
		Bogue	1078
		Atlantic mackerel	552
		Bluefish	128
		Pacific chub mackerel	125
		White seabream	91
		Others	307
	Spain Total		**31957**
27.9.A Total			72091
27.8.C	**Spain**	European anchovy	24444
		European horse mackerel	14971
		Atlantic mackerel	9224
		Atlantic chub mackerel	3417
		Jack and horse mackerels nei	2929
		European pilchard(=Sardine)	2616
		Bogue	1860
		Atlantic saury	409
		Atlantic bonito	174
		Mediterranean horse mackerel	88
		Others	377
	Spain Total		**60511**
27.8.C Total			**60134**
27.8.B	**Spain**	European pilchard(=Sardine)	6802
		European anchovy	873

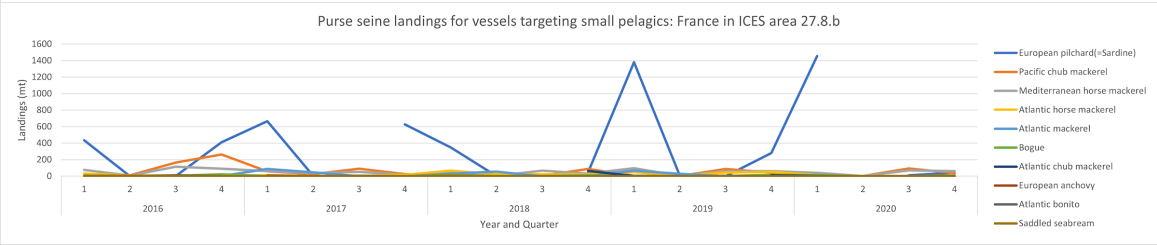
		Atlantic chub mackerel	598
		European horse mackerel	390
		Atlantic mackerel	299
		Jack and horse mackerels nei	287
		Skipjack tuna	69
		Atlantic saury	64
		Bogue	31
		Pacific chub mackerel	16
		Others	21
	Spain Total		**9451**
	France	European pilchard(=Sardine)	1507
		Mediterranean horse mackerel	176
		Pacific chub mackerel	131
		Bogue	22
		European horse mackerel	18
		Atlantic mackerel	17
		Atlantic bonito	3
		Atlantic chub mackerel	2
		European anchovy	2
		Saddled seabream	1
		Others	2
	France Total		**1882**
27.8.B Total			**11333**
27.8.A	**France**	European pilchard(=Sardine)	5674
		European horse mackerel	21
		European anchovy	19
		Mediterranean horse mackerel	17
		Atlantic mackerel	16
		Black seabream	6
		European sprat	6
		White seabream	3
		Thicklip grey mullet	2
		Leaping mullet	2
		Others	6
	France Total		**5767**
27.8.A Total			**5767**
Bay of Biscay and Iberian Coast	**Total**		**149709**

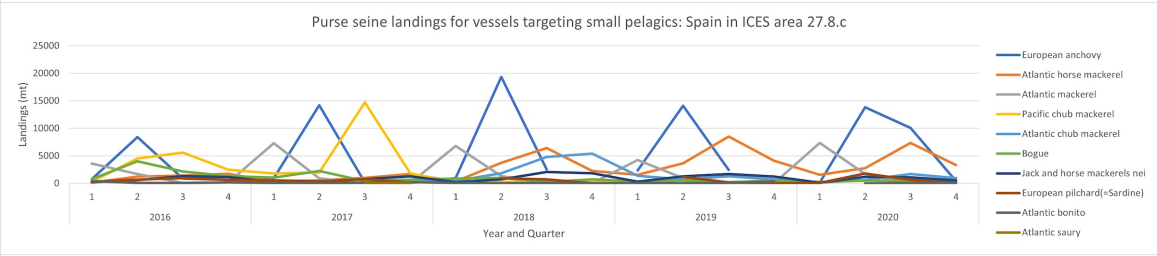
Figure 1: Landings composition by species, fishery (ICES division, country, gear type) and month (2016-

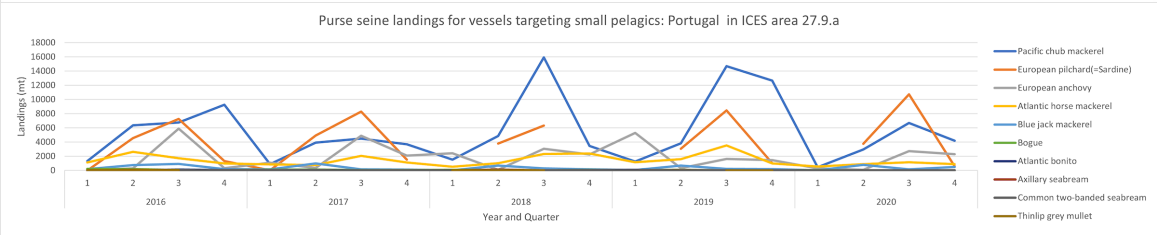
2020) (STECF 2022), showing sequential multi-species nature of a number of fisheries (see Criterion 2 summary for more information).

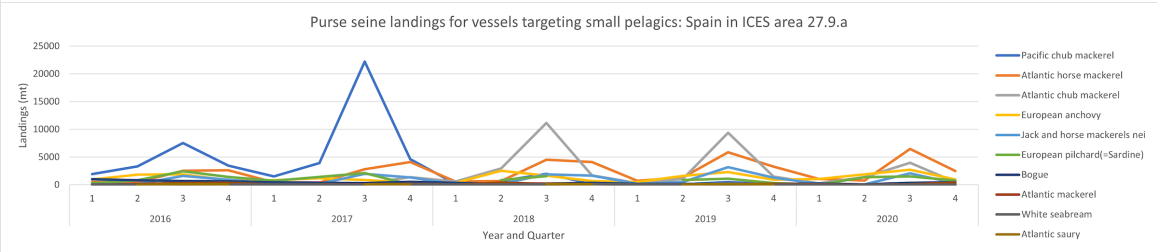












Handlines/pole and lines

Handline/pole and line fisheries targeting small pelagics in the region are dominated by the Spanish fleet in 27.8.c (11340mt in 2020, almost entirely Atlantic mackerel). Smaller handline/pole and line fisheries (in terms of 2020 landings) in the region are Spain in 27.8.b (121 mt, all Atlantic mackerel), France in 27.8.b (6mt, all Atlantic mackerel) and France in 27.8.a (29mt, all Atlantic mackerel), and Spain in 27.9.a (5mt, all Atlantic mackerel) (STECF 2022). There are no reported landings by Portuguese vessels using these gears in the region in 2020.

Importance to the US/North American market.

US domestic production

Some 8,000 metric tons of Atlantic mackerel were landed in domestic commercial fisheries in 2020. Virtually no Atlantic chub mackerel were landed that year (25mt) (NMFS 2022).

Trade

Trade statistics are often opaque to species, and those for small pelagics are no exception. Those product forms that can be identified to a taxon that would include those caught in the fisheries rated in this assessment are below; summed 2017-2021 imports in mt are summed for all product forms within the taxon (NMFS 2022). 'Sardine' and 'mackerel' dominate the imports across these taxa. Of the countries included in this Seafood Watch assessment, Spain and Portugal are the most significant sources (highlighted in blue below). Total imports across these taxa from France summed across 2017-2021 was 86mt. These statistics do not include fishmeal and fish oil as the species are not identified in these commodities. The US does export mackerel and anchovy, at around 3286mt of 'mackerel' (some 50% of which goes to Canada) and 434mt of 'anchovy' in 2020.

Table 3: US imports of small pelagic taxon by exporting country from 2017-2021. Weights presented in metric tons summed across all product forms. This does not include product forms which may be a mixture of multiple taxa, such as fish meal or fish oil. Data from NMFS (NMFS 2022).

Exporting Country	"Anchovy"	"Horse and Jack Mackerel"	"Mackerel"	"Sardine"	"Sardine, Sardinella, Brisling, Sprat"
MOROCCO	3943		2081	41162	5055
CHINA	327	2795	32068	13855	654
MEXICO	1	619	2672	1551	36168
POLAND			980	39130	
THAILAND	127	2	19080	16411	
NORWAY	0	1748	32263		
ECUADOR		144	2611	26002	
VIETNAM	121	89	11318	7766	36
CANADA	328	159	2751	12749	2
PHILIPPINES	70		418	9984	84
SOUTH KOREA	940	11	5696	107	
PORTUGAL		1158	246	3231	2055

CHILE	529	314	4461		
LATVIA			183	4868	2
SPAIN	1560	532	737	2037	69
PERU	3690		580	29	
ARGENTINA	4192				
JAPAN	628	789	1996	212	542
TAIWAN	27	196	2976	37	312
ITALY	2850		8	42	
ICELAND	14	37	2466		
SURINAME		139	1568		
INDIA	270		517	10	578
BRAZIL		1062	240		29
UNITED KINGDOM	8	387	284	624	
Others	*832*	*385*	*5110*	*1182*	*1167*
Grand Total	**20455**	**10566**	**133311**	**180988**	**46755**

Common and market names.

Table 4: The FDA Common Name, FDA Acceptable Market Name, and FAO/ASFIS Common Name are presented in the table below (FDA 2022)(FAO/ASFIS 2022).

Scientific name	FDA common name	FAO common name	FDA acceptable market names
Scomber scombrus	Atlantic mackerel	Atlantic mackerel	Mackerel
Sardina pilchardus	European pilchard	European pilchard/sardine	Pilchard, Sardine
Engraulis encrasicolus	European anchovy	European anchovy	Anchovy
Scomber colias	Atlantic chub mackerel	Atlantic chub mackerel	Mackerel, chub
Trachurus trachurus	European horse mackerel	Atlantic horse mackerel	Scad
Trachurus mediterraneus	Not Listed	Mediterranean horse mackerel	None specified

Primary product forms

Imports of anchovy are mostly canned, though fresh and salted anchovies are also imported. Sardine imports are all canned. Mackerel is imported fresh, frozen, smoked or salted, while Jack/horse mackerel is imported frozen or fresh (NMFS 2022). Mackerel is used for direct human consumption and for bait for fisheries for lobster and large pelagics.

Assessment

This section assesses the sustainability of the fishery(s) relative to the Seafood Watch Standard for Fisheries, available at www.seafoodwatch.org. The specific standard used is referenced on the title page of all Seafood Watch assessments.

Criterion 1: Impacts on the species under assessment

This criterion evaluates the impact of fishing mortality on the species, given its current abundance. When abundance is unknown, abundance is scored based on the species' inherent vulnerability, which is calculated using a Productivity-Susceptibility Analysis. The final Criterion 1 score is determined by taking the geometric mean of the abundance and fishing mortality scores. The Criterion 1 rating is determined as follows:

- ***Score >3.2=Green or Low Concern***
- ***Score >2.2 and ≤3.2=Yellow or Moderate Concern***
- ***Score ≤2.2 = Red or High Concern***

Rating is Critical if Factor 1.3 (Fishing Mortality) is Critical.

Guiding principles

- *Ensure all affected stocks are healthy and abundant.*
- *Fish all affected stocks at sustainable level*

Criterion 1 Summary

ATLANTIC CHUB MACKEREL			
REGION / METHOD	**ABUNDANCE**	**FISHING MORTALITY**	**SCORE**
Atlantic, Northeast | Portuguese Waters - East (Division 27.9.a) | Purse seines | Portugal | Spain	2.330: Moderate Concern	3.000: Moderate Concern	Yellow (2.644)

ATLANTIC MACKEREL			
REGION / METHOD	**ABUNDANCE**	**FISHING MORTALITY**	**SCORE**
Subareas 1–8 and 14,and in Division 9.a (Northeast Atlantic and adjacent waters) Stock | Bay of Biscay | Atlantic, Northeast | Bay of Biscay - South (Division 27.8.c) | Handlines and hand-operated pole-and-lines | Spain	3.670: Low Concern	1.000: High Concern	Red (1.916)
Subareas 1–8 and 14,and in Division 9.a (Northeast Atlantic and adjacent waters) Stock | Bay of Biscay | Atlantic, Northeast | Bay of Biscay - South (Division 27.8.c) | Purse seines | Spain | Mackerel target	3.670: Low Concern	1.000: High Concern	Red (1.916)

EUROPEAN ANCHOVY			
REGION / METHOD	**ABUNDANCE**	**FISHING MORTALITY**	**SCORE**
Subarea 8 (Bay of Biscay) Stock | Atlantic, Northeast | Bay of Biscay - North (Division 27.8.a) | Purse seines | France	3.670: Low Concern	3.000: Moderate Concern	Green (3.318)
Division 9.a (Atlantic Iberian waters) Stock | Atlantic, Northeast | Portuguese Waters - East (Division 27.9.a) | Purse seines | Portugal | Spain	1.000: High Concern	3.000: Moderate Concern	Red (1.732)
Subarea 8 (Bay of Biscay) Stock | Atlantic, Northeast | Bay of Biscay - Central (Division 27.8.b) | Purse seines | Spain | Anchovy target	3.670: Low Concern	3.000: Moderate Concern	Green (3.318)
Subarea 8 (Bay of Biscay) Stock | Atlantic, Northeast | Bay of Biscay - South (Division 27.8.c) | Purse seines | Spain | Anchovy target	3.670: Low Concern	3.000: Moderate Concern	Green (3.318)

EUROPEAN HORSE MACKEREL			
REGION / METHOD	**ABUNDANCE**	**FISHING MORTALITY**	**SCORE**
Division 9.a (Atlantic Iberian waters) Stock | Atlantic, Northeast | Portuguese Waters - East (Division 27.9.a) | Purse seines | Portugal | Spain	5.000: Very Low Concern	5.000: Low Concern	Green (5.000)

EUROPEAN PILCHARD			
REGION / METHOD	**ABUNDANCE**	**FISHING MORTALITY**	**SCORE**
Divisions 8.a–b and 8.d (Bay of Biscay) Stock | Atlantic, Northeast | Bay of Biscay - Central (Division 27.8.b) | Purse seines | France	1.000: High Concern	1.000: High Concern	Red (1.000)
Divisions 8.a–b and 8.d (Bay of Biscay) Stock | Atlantic, Northeast | Bay of Biscay - North (Division 27.8.a) | Purse seines | France	1.000: High Concern	1.000: High Concern	Red (1.000)
Divisions 8.c and 9.a (Cantabrian Sea and Atlantic Iberian waters) Stock | Atlantic, Northeast | Portuguese Waters - East (Division 27.9.a) | Purse seines | Portugal | Spain	2.330: Moderate Concern	3.000: Moderate Concern	Yellow (2.644)
Divisions 8.c and 9.a (Cantabrian Sea and Atlantic Iberian waters) Stock | Bay of Biscay | Atlantic, Northeast | Bay of Biscay - South (Division 27.8.c) | Purse seines | Spain | Sardine target	2.330: Moderate Concern	3.000: Moderate Concern	Yellow (2.644)
Divisions 8.a–b and 8.d (Bay of Biscay) Stock | Atlantic, Northeast | Bay of Biscay - Central (Division 27.8.b) | Purse seines | Spain | Sardine target	1.000: High Concern	1.000: High Concern	Red (1.000)

Seafood Watch scoring and ICES reference points

Seafood Watch scoring is made relative to MSY-based reference points where they have been defined (see Seafood Watch Standard for Fisheries, v4) (Seafood Watch 2020). Traditionally, the ICES reference points

F_{pa}, F_{lim}, B_{pa}, and B_{lim} utilized were not equivalent to MSY-based reference points. In fact, comparisons demonstrated that F_{pa} is typically above F_{MSY} and B_{pa} is typically below B_{MSY}, such that MSY-based reference points are generally more conservative (ICES 2010) (also seen in the reference points table in recent stock assessments for stocks included in this Seafood Watch assessment). In many cases, B_{pa} is well below B_{MSY} and even below 1/2 B_{MSY} (Kell et al 2005). Therefore, guidance for evaluating stock health using B_{pa} and fishing mortality using F_{pa} is conservative, accounting for the difference between these reference points and MSY-based reference points. For the purposes of scoring abundance in Seafood Watch assessments, the maximum score for a stock assessed relative to B_{pa} is 2.33 (moderate concern) unless there is good reason to score 3.67 (Low concern) such as the reference points have been show to be conservative or biomass is well above reference points. For scoring fishing mortality, the maximum score for a stock assessed relative to F_{pa} is 3 (moderate concern).

ICES has been moving towards a MSY approach for some time, and guidance for MSY based reference points was developed over a number of workshops in the last decade (ICES 2021g). Where this approach has been applied, abundance is often presented relative to MSY $B_{trigger}$ and F_{MSY}. Where MSY $B_{trigger}$ is set at B_{pa}, the above guidance for scoring stands.

Forage species

European pilchard/sardine in the Iberian Peninsula ecosystem (i.e. the European pilchard stock ICES Division 27.9.a) meet the criteria of being a 'forage species,' for which scoring of abundance and fishing mortality is more conservative than for species that do not meet the criteria (see Appendix 1 for more information). For this stock, Seafood Watch considers forage stock biomass and fishing mortality to be highly uncertain, with a best possible score of "Moderate concern" for C1.1 Abundance and "Moderate concern" for C1.2 Fishing Mortality.

Criterion 1 Assessments

SCORING GUIDELINES

Factor 1.1 - Abundance
Goal: Stock abundance and size structure of native species is maintained at a level that does not impair recruitment or productivity.

- *5 (Very Low Concern) — Strong evidence exists that the population is above an appropriate target abundance level (given the species' ecological role), or near virgin biomass.*
- *3.67 (Low Concern) — Population may be below target abundance level, but is at least 75% of the target level, OR data-limited assessments suggest population is healthy and species is not highly vulnerable.*
- *2.33 (Moderate Concern) — Population is not overfished but may be below 75% of the target abundance level, OR abundance is unknown and the species is not highly vulnerable.*
- *1 (High Concern) — Population is considered overfished/depleted, a species of concern, threatened or endangered, OR abundance is unknown and species is highly vulnerable.*

Factor 1.2 - Fishing Mortality
Goal: Fishing mortality is appropriate for current state of the stock.

- *5 (Low Concern) — Probable (>50%) that fishing mortality from all sources is at or below a sustainable level, given the species ecological role, OR fishery does not target species and fishing mortality is low enough to not adversely affect its population.*
- *3 (Moderate Concern) — Fishing mortality is fluctuating around sustainable levels, OR fishing mortality relative to a sustainable level is uncertain.*
- *1 (High Concern) — Probable that fishing mortality from all source is above a sustainable level.*

Atlantic chub mackerel

Factor 1.1 - Abundance

Atlantic, Northeast | Portuguese Waters - East (Division 27.9.a) | Purse seines | Portugal | Spain

Moderate Concern

There are no stock assessments for Atlantic chub mackerel in the region, so stock status is unknown. IUCN has rated the species a Least Concern (Collette 2011), but that assessment is now too old to use for scoring. The score is therefore based on a PSA (see justification below), the result of which allows for a score of 2.33 (moderate concern).

Justification:

Productivity-Susceptibility Analysis for *Scomber colias*

Productivity Attribute	High productivity (score=1)	Medium productivity (score = 2)	Low productivity (Score=3)	Score	Value; {Reference(s)}
Average age at maturity (yrs)	< 5	5-15	>15		No data found
Average maximum age (yrs) (don't use if max size is available)	<10	10-25	>25	N/A	7 yrs; (Velasco, E.M. et al. 2011)(Daley, T. 2018)
Von Bertalanffy (Brody) Growth Coefficient (K)	>0.25	0.15-0.25	<0.15	1	0.31; (Velasco, E.M. et al. 2011)(Vasconcelos, J.M.A. et al. 2011)(Daley, T. 2018)
Fecundity (eggs/yr)	>20,000	100-20,000	<100		No data found
Average maximum size (cm)	< 100	100-300	>300	1	39 cm; (Velasco, E.M. et al. 2011)(Daley, T. 2018)

Average size at maturity (cm)	<40	40-200	>200	1	21 cm; (Vasconcelos, J. et al. 2012)(Reis, R. et al. 2010)
Reproductive strategy	Broadcast spawner	Demersal egg layer or brooder	Live bearer	1	
Productivity score (mean of attribute scores)				**1**	

Susceptibility Attribute (default scores in bold)	**Low S (score = 1)**	**Medium S (score = 2)**	**High S (score = 3)**	**Score**	**Value/notes; (reference)**
Areal overlap (all fisheries)	>90% of species concentration is unfished	70%-90% of species concentration is unfished	**>30% of the species concentration is fished**	3	Default selected
Vertical overlap (all fisheries)	>67% of species' depth range is unfished	33-66% of species' depth range is unfished	**>33% of species' depth range is unfished**	3	Default selected
Seasonal Availability (all fisheries)	Fisheries overlap with species <3 months/year	Fisheries overlap with species 3-6 months/year	**Fisheries overlap with species >6 months/year**	3	Default selected
Selectivity of fishery (specific to fishery under assessment)	Species is not targeted AND is not likely to be captured by gear	**Species is targeted, or is incidentally encountered AND is not likely to escape the gear**	Species is targeted or is incidentally encountered AND combination of fishery attributes and species' biology increase its susceptibility to the gear	2	Default selected
Post-capture mortality (specific to fishery under assessment)	>66% individuals survive post-capture	33-66% individuals survive post-capture	**Retained species, or >66% do not survive post capture**	3	Default selected
Susceptibility score (mean of attribute scores)				**2.8**	

Productivity-Susceptibility Score ($V=\sqrt{(P^2+ S^2)}$)	**2.973**
Vulnerability Rating: < 2.64 = Low vulnerability, ≥ 2.64 and ≤ 3.18 = Medium vulnerability, > 3.18 = High vulnerability	Medium

Factor 1.2 - Fishing Mortality

Atlantic, Northeast | Portuguese Waters - East (Division 27.9.a) | Purse seines | Portugal | Spain

Moderate Concern

As there is no stock assessment for Atlantic chub mackerel and fishing mortality reference points have not been defined, fishing mortality relative to a sustainable level is unknown. A score of 3 (moderate concern) is awarded.

Atlantic mackerel

Factor 1.1 - Abundance

Subareas 1–8 and 14,and in Division 9.a (Northeast Atlantic and adjacent waters) Stock | Bay of Biscay | Atlantic, Northeast | Bay of Biscay - South (Division 27.8.c) | Handlines and hand-operated pole-and-lines | Spain
Subareas 1–8 and 14,and in Division 9.a (Northeast Atlantic and adjacent waters) Stock | Bay of Biscay | Atlantic, Northeast | Bay of Biscay - South (Division 27.8.c) | Purse seines | Spain | Mackerel target

Low Concern

ICES considers Atlantic mackerel in the Northeast Atlantic a single stock, though with three spawning components (ICES 2022c). The most recent stock assessment used data through 2021 and found the stock to be well above MSY $B_{trigger}$, B_{pa} and B_{lim} reference points (see figure below). However, MSY $B_{trigger}$ is set at B_{pa} and the stock has been declining from a recent high in the early 2010s, though it has arguably stabilized in recent years at a level significantly above the target. A score of 3.67 (low concern) is given.

Justification:

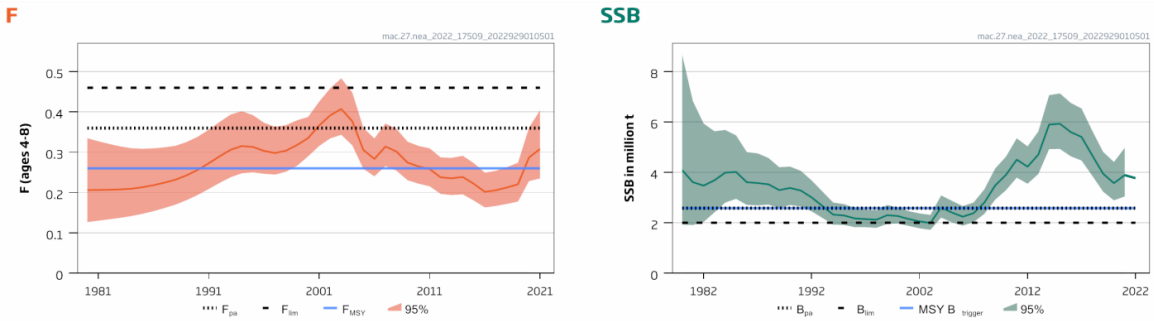


Figure 11: Mackerel in subareas 1–8 and 14, and in Division 9.a. Summary of the stock assessment. From (ICES 2022c).

Factor 1.2 - Fishing Mortality

Subareas 1–8 and 14,and in Division 9.a (Northeast Atlantic and adjacent waters) Stock | Bay of Biscay | Atlantic, Northeast | Bay of Biscay - South (Division 27.8.c) | Handlines and hand-operated pole-and-lines | Spain
Subareas 1–8 and 14,and in Division 9.a (Northeast Atlantic and adjacent waters) Stock | Bay of Biscay | Atlantic, Northeast | Bay of Biscay - South (Division 27.8.c) | Purse seines | Spain | Mackerel target

High Concern

Northeast Atlantic mackerel fishing mortality has been below F_{MSY} since the mid-2010s, but has exceeded F_{MSY} in the most recent year (2021) (see figure in abundance section) (ICES 2022c).

Fishing mortality remains below F_{pa} and F_{lim}. A score of 1 (high concern) is awarded.

European anchovy

Factor 1.1 - Abundance

Division 9.a (Atlantic Iberian waters) Stock | Atlantic, Northeast | Portuguese Waters - East (Division 27.9.a) | Purse seines | Portugal | Spain

High Concern

European anchovy in the Atlantic Iberian waters is assessed as a single stock with two components (ICES 2022d). Abundance reference points have not been defined for the western component, and spawning biomass is below B_{pa} and B_{lim} for the southern component. A score of 1 (high concern) is awarded out of concern for the abundance of the southern stock.

Justification:

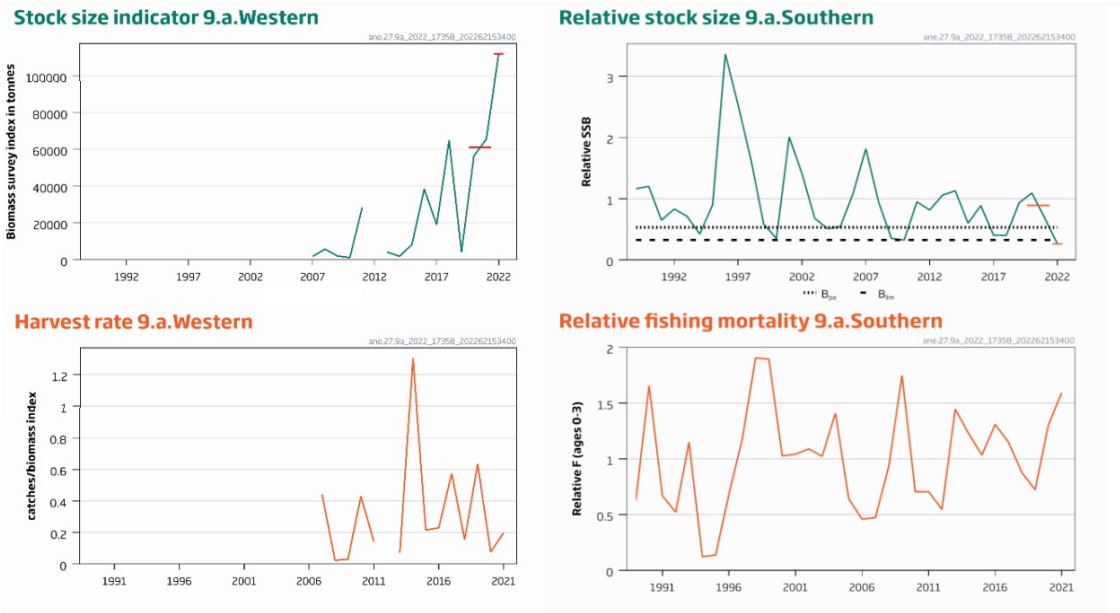


Figure 12: Anchovy in Division 9.a. Summary of the stock assessments (left panels: western component; right panels: southern component). The stock-size indicator and harvest rates (the ratio of catches/stock-size indicator) are presented for the western component. For the southern component, spawning-stock biomass (SSB) and fishing mortality (F) are expressed as relative to the average of the time-series (years correspond to the beginning of the management period, e.g. 1989 corresponds to the beginning of the period 1 July 1989 to 30 June 1990). The horizontal orange lines in the stock-size indicator and relative stock size plots indicate the average values of the respective years. From (ICES 2022d)

Subarea 8 (Bay of Biscay) Stock | Atlantic, Northeast | Bay of Biscay - North (Division 27.8.a) | Purse seines | France
Subarea 8 (Bay of Biscay) Stock | Atlantic, Northeast | Bay of Biscay - Central (Division 27.8.b) | Purse seines | Spain | Anchovy target
Subarea 8 (Bay of Biscay) Stock | Atlantic, Northeast | Bay of Biscay - South (Division 27.8.c) | Purse seines | Spain | Anchovy target

Low Concern

Anchovy in the Bay of Biscay were most recently assessed using data through 2021 (plus preliminary catches for 2022)(ICES 2022h). While B_{lim} has been defined (the mean of SSB estimates in the two years 1987 and 2009), the reference points B_{pa} and MSY $B_{trigger}$ have not. This precludes a score of 5 (very low concern) despite the stock appearing to be at an all time high for the time series (around 1987-2021)(estimated biomass also declined from the all time high in 2021). A score of 3.67 (low concern) is thus given.

Justification:

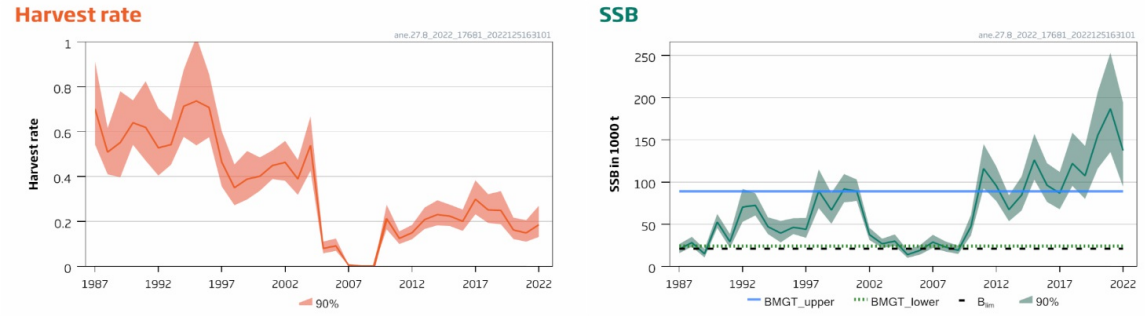


Figure 13: Anchovy in Subarea 8. Summary of the stock assessment (from (ICES 2022h))

Factor 1.2 - Fishing Mortality

Division 9.a (Atlantic Iberian waters) Stock | Atlantic, Northeast | Portuguese Waters - East (Division 27.9.a) | Purse seines | Portugal | Spain

Moderate Concern

As fishing mortality reference points have not been defined for the Atlantic Iberian European anchovy stock (ICES 2022d) (see figure in abundance section), fishing mortality relative to a sustainable level is unknown and a score of 3 (moderate concern) is awarded.

Subarea 8 (Bay of Biscay) Stock | Atlantic, Northeast | Bay of Biscay - North (Division 27.8.a) | Purse seines | France
Subarea 8 (Bay of Biscay) Stock | Atlantic, Northeast | Bay of Biscay - Central (Division 27.8.b) | Purse seines | Spain | Anchovy target
Subarea 8 (Bay of Biscay) Stock | Atlantic, Northeast | Bay of Biscay - South (Division 27.8.c) | Purse seines | Spain | Anchovy target

Moderate Concern

As fishing mortality reference points have not been defined for the Bay of Biscay European anchovy

stock (ICES 2022h)(see figure in abundance section), fishing mortality relative to a sustainable level is unknown and a score of 3 (moderate concern) is awarded.

European horse mackerel

Factor 1.1 - Abundance

Division 9.a (Atlantic Iberian waters) Stock | Atlantic, Northeast | Portuguese Waters - East (Division 27.9.a) | Purse seines | Portugal | Spain

Very Low Concern

The Atlantic Iberian waters stock of Atlantic horse mackerel was last assessed using data through 2021 (ICES 2022g). Although there is significant uncertainty in the estimate, it is likely well above the MSY B_{trig} reference point. MSY B_{trig} for this stock is not the same as B_{pa}; rather it is the "[l]ower bound (average) of 90% confidence intervals of the SSB time-series in a stock being exploited well below F_{MSY}." Thus, a score of 5 (very low concern) is awarded.

Justification:

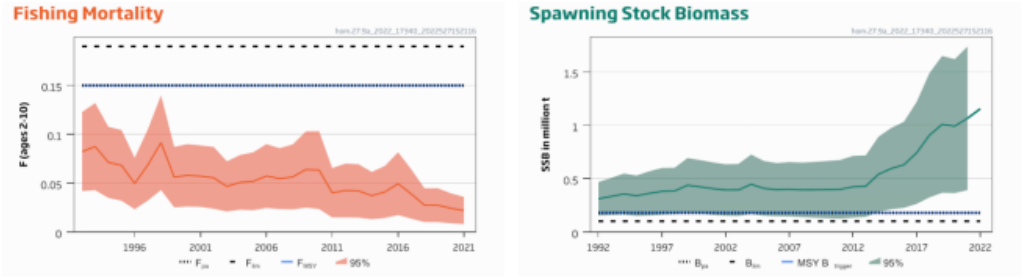


Figure 1 Horse mackerel (*Trachurus trachurus*) in Division 9.a. Summary of the stock assessment. The assumed recruitment values for 2021 and 2022 are shaded in a lighter colour.

Figure 14: Horse mackerel (Trachurus trachurus) in Division 9.a. Summary of the stock assessment. From (ICES 2022g).

Factor 1.2 - Fishing Mortality

Division 9.a (Atlantic Iberian waters) Stock | Atlantic, Northeast | Portuguese Waters - East (Division 27.9.a) | Purse seines | Portugal | Spain

Low Concern

Fishing mortality of the Atlantic Iberian stock of Atlantic horse mackerel is well below F_{MSY} levels (see figure in abundance section) (ICES 2022g). Therefore a score of 5 (low concern) is awarded.

European pilchard

Factor 1.1 - Abundance

Divisions 8.a–b and 8.d (Bay of Biscay) Stock | Atlantic, Northeast | Bay of Biscay - Central (Division 27.8.b) | Purse seines | France
Divisions 8.a–b and 8.d (Bay of Biscay) Stock | Atlantic, Northeast | Bay of Biscay - North (Division 27.8.a) | Purse seines | France
Divisions 8.a–b and 8.d (Bay of Biscay) Stock | Atlantic, Northeast | Bay of Biscay - Central (Division 27.8.b) | Purse seines | Spain | Sardine target

High Concern

The Bay of Biscay European pilchard stock was most recently assessed using data through 2021 {ICES 2022k}. Abundance (SSB) has recently dropped below B_{lim}. This is a departure from the previous assessment in 2020 and may be due to a data gap in 2020 and a high sensitivity to the inclusion of 2021 data (ICES 2021k). Biomass in 2022 was higher than Blim but remained well below $MSYB_{trigger}$ (which is defined at B_{pa} for this stock); however, uncertainty is significant, with the lower bound well below B_{lim}. Since the stock abundance may be below B_{lim}, the stock scores "High concern."

Justification:

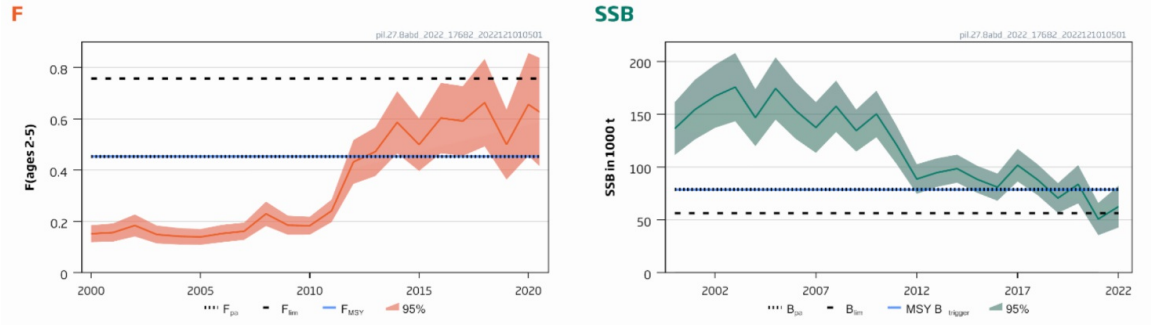


Figure 15: European pilchard in divisions 8.a–b and 8.d. Summary of the stock assessment. From {ICES 2022k}.

Divisions 8.c and 9.a (Cantabrian Sea and Atlantic Iberian waters) Stock | Atlantic, Northeast | Portuguese Waters - East (Division 27.9.a) | Purse seines | Portugal | Spain
Divisions 8.c and 9.a (Cantabrian Sea and Atlantic Iberian waters) Stock | Bay of Biscay | Atlantic, Northeast | Bay of Biscay - South (Division 27.8.c) | Purse seines | Spain | Sardine target

Moderate Concern

The Cantabrian Sea and Atlantic Iberian waters stock of European sardine was last assessed with data through 2021 (ICES 2022j). After declining to below the MSY $B_{trigger}$ and B_{lim} in around 2011, the stock has rebounded to well above MSY B_{trig} in 2020 and 2021. However, as MSY B_{trig} is set at B_{pa}, the stock only recently exceeded MSY B_{trig} and uncertainty is relatively high (the lower 95% CI bound exceeds MSY B_{trig}, but not by very much), a score of "Moderate concern" is awarded. The stock is also a key forage species (see Criterion 1 summary and Appendix 1), further justifying the score.

Justification:

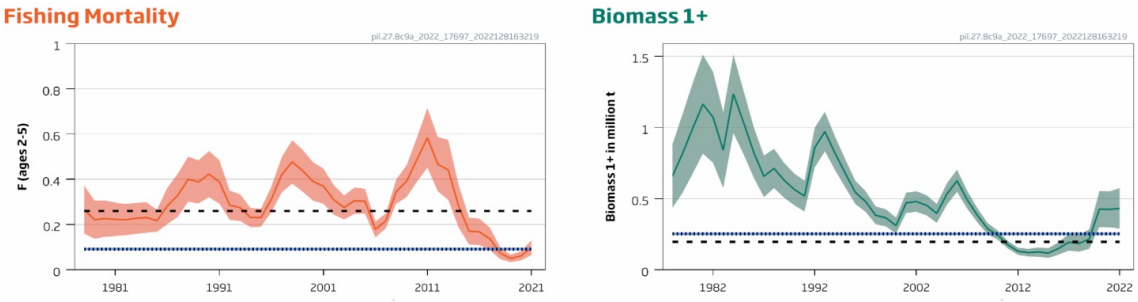


Figure 16: European pilchard in divisions 8.c and 9.a. Summary of the stock assessment. From (ICES 2022j).

Factor 1.2 - Fishing Mortality

Divisions 8.a–b and 8.d (Bay of Biscay) Stock | Atlantic, Northeast | Bay of Biscay - Central (Division 27.8.b) | Purse seines | France
Divisions 8.a–b and 8.d (Bay of Biscay) Stock | Atlantic, Northeast | Bay of Biscay - North (Division 27.8.a) | Purse seines | France
Divisions 8.a–b and 8.d (Bay of Biscay) Stock | Atlantic, Northeast | Bay of Biscay - Central (Division 27.8.b) | Purse seines | Spain | Sardine target

High Concern

Fishing mortality of the Bay of Biscay European pilchard stock has been above F_{MSY} since around around 2015 {ICES 2022k}. There is large uncertainty around the current F with the lower bound of the 95% CI dipping below F_{MSY} and the upper bound above F_{lim}. Since F has been consistently estimated above F_{MSY}, Fishing Mortality scores 1 (high concern).

Divisions 8.c and 9.a (Cantabrian Sea and Atlantic Iberian waters) Stock | Atlantic, Northeast | Portuguese Waters - East (Division 27.9.a) | Purse seines | Portugal | Spain
Divisions 8.c and 9.a (Cantabrian Sea and Atlantic Iberian waters) Stock | Bay of Biscay | Atlantic, Northeast | Bay of Biscay - South (Division 27.8.c) | Purse seines | Spain | Sardine target

Moderate Concern

Fishing mortality of the Cantabrian Sea and Atlantic Iberian waters stock has steadily declined since 2012. It finally dipped below F_{MSY} in 2019 but has since increased to around that level in 2021 (ICES 2022j). With the consistent decreasing trend in fishing mortality and F now around F_{MSY}, Fishing Mortality scores 3 (moderate concern). The moderate score is further justified by the stock being a key forage species (see Criterion 1 summary and Appendix 1).

Criterion 2: Impacts on Other Species

All main retained and bycatch species in the fishery are evaluated under Criterion 2. Seafood Watch defines bycatch as all fisheries-related mortality or injury to species other than the retained catch. Examples include discards, endangered or threatened species catch, and ghost fishing. Species are evaluated using the same guidelines as in Criterion 1. When information on other species caught in the fishery is unavailable, the fishery's potential impacts on other species is scored according to the Unknown Bycatch Matrices, which are based on a synthesis of peer-reviewed literature and expert opinion on the bycatch impacts of each gear type. The fishery is also scored for the amount of non-retained catch (discards) and bait use relative to the retained catch. To determine the final Criterion 2 score, the score for the lowest scoring retained/bycatch species is multiplied by the discard/bait score. The Criterion 2 rating is determined as follows:

- ***Score >3.2=Green or Low Concern***
- ***Score >2.2 and ≤3.2=Yellow or Moderate Concern***
- ***Score ≤2.2 = Red or High Concern***

Rating is Critical if Factor 2.3 (Fishing Mortality) is Crtitical

Guiding principles

- *Ensure all affected stocks are healthy and abundant.*
- *Fish all affected stocks at sustainable level.*
- *Minimize bycatch.*

Criterion 2 Summary

Criterion 2 score(s) overview

This table(s) provides an overview of the Criterion 2 subscore, discards+bait modifier, and final Criterion 2 score for each fishery. A separate table is provided for each species/stock that we want an overall rating for.

ATLANTIC CHUB MACKEREL			
REGION / METHOD	**SUB SCORE**	**DISCARD RATE/LANDINGS**	**SCORE**
Atlantic, Northeast | Portuguese Waters - East (Division 27.9.a) | Purse seines | Portugal | Spain	1.732	1.000: < 100%	Red (1.732)

ATLANTIC MACKEREL			
REGION / METHOD	**SUB SCORE**	**DISCARD RATE/LANDINGS**	**SCORE**
Subareas 1–8 and 14,and in Division 9.a (Northeast Atlantic and adjacent waters) Stock | Bay of Biscay | Atlantic, Northeast | Bay of Biscay - South (Division 27.8.c) | Handlines and hand-operated pole-and-lines | Spain	5.000	1.000: < 100%	Green (5.000)
Subareas 1–8 and 14,and in Division 9.a (Northeast Atlantic and adjacent waters) Stock | Bay of Biscay | Atlantic, Northeast | Bay of Biscay - South (Division 27.8.c) | Purse seines | Spain | Mackerel target	5.000	1.000: < 100%	Green (5.000)

EUROPEAN ANCHOVY			
REGION / METHOD	**SUB SCORE**	**DISCARD RATE/LANDINGS**	**SCORE**
Subarea 8 (Bay of Biscay) Stock | Atlantic, Northeast | Bay of Biscay - North (Division 27.8.a) | Purse seines | France	1.000	1.000: < 100%	Red (1.000)
Division 9.a (Atlantic Iberian waters) Stock | Atlantic, Northeast | Portuguese Waters - East (Division 27.9.a) | Purse seines | Portugal | Spain	2.644	1.000: < 100%	Yellow (2.644)
Subarea 8 (Bay of Biscay) Stock | Atlantic, Northeast | Bay of Biscay - Central (Division 27.8.b) | Purse seines | Spain | Anchovy target	5.000	1.000: < 100%	Green (5.000)
Subarea 8 (Bay of Biscay) Stock | Atlantic, Northeast | Bay of Biscay - South (Division 27.8.c) | Purse seines | Spain | Anchovy target	5.000	1.000: < 100%	Green (5.000)

EUROPEAN HORSE MACKEREL			
REGION / METHOD	**SUB SCORE**	**DISCARD RATE/LANDINGS**	**SCORE**
Division 9.a (Atlantic Iberian waters) Stock | Atlantic, Northeast | Portuguese Waters - East (Division 27.9.a) | Purse seines | Portugal | Spain	1.732	1.000: < 100%	Red (1.732)

EUROPEAN PILCHARD			
REGION / METHOD	**SUB SCORE**	**DISCARD RATE/LANDINGS**	**SCORE**
Divisions 8.a–b and 8.d (Bay of Biscay) Stock | Atlantic, Northeast | Bay of Biscay - Central (Division 27.8.b) | Purse seines | France	5.000	1.000: < 100%	Green (5.000)
Divisions 8.a–b and 8.d (Bay of Biscay) Stock | Atlantic, Northeast | Bay of Biscay - North (Division 27.8.a) | Purse seines | France	3.318	1.000: < 100%	Green (3.318)
Divisions 8.c and 9.a (Cantabrian Sea and Atlantic Iberian waters) Stock | Atlantic, Northeast | Portuguese Waters - East (Division 27.9.a) | Purse seines | Portugal | Spain	1.732	1.000: < 100%	Red (1.732)
Divisions 8.c and 9.a (Cantabrian Sea and Atlantic Iberian waters) Stock | Bay of Biscay | Atlantic, Northeast | Bay of Biscay - South (Division 27.8.c) | Purse seines | Spain | Sardine target	5.000	1.000: < 100%	Green (5.000)
Divisions 8.a–b and 8.d (Bay of Biscay) Stock | Atlantic, Northeast | Bay of Biscay - Central (Division 27.8.b) | Purse seines | Spain | Sardine target	5.000	1.000: < 100%	Green (5.000)

Criterion 2 main assessed species/stocks table(s)

This table(s) provides a list of all species/stocks included in this assessment for each 'fishery' (as defined by a region/method combination). The text following this table(s) provides an explanation of the reasons the listed species were selected for inclusion in the assessment.

ATLANTIC, NORTHEAST | PORTUGUESE WATERS - EAST (DIVISION 27.9.A) | PURSE SEINES | PORTUGAL | SPAIN			
SUB SCORE: 1.732	DISCARD RATE: 1.000	**SCORE: 1.732**	
SPECIES	**ABUNDANCE**	**FISHING MORTALITY**	**SCORE**
European anchovy	1.000: High Concern	3.000: Moderate Concern	Red (1.732)
Atlantic chub mackerel	2.330: Moderate Concern	3.000: Moderate Concern	Yellow (2.644)
European pilchard	2.330: Moderate Concern	3.000: Moderate Concern	Yellow (2.644)
European horse mackerel	5.000: Very Low Concern	5.000: Low Concern	Green (5.000)

BAY OF BISCAY | ATLANTIC, NORTHEAST | BAY OF BISCAY - CENTRAL (DIVISION 27.8.B) | PURSE SEINES | FRANCE			
SUB SCORE: 5.000	DISCARD RATE: 1.000	**SCORE: 5.000**	
SPECIES	**ABUNDANCE**	**FISHING MORTALITY**	**SCORE**
European pilchard	1.000: High Concern	1.000: High Concern	Red (1.000)

BAY OF BISCAY | ATLANTIC, NORTHEAST | BAY OF BISCAY - CENTRAL (DIVISION 27.8.B) | PURSE SEINES | SPAIN | ANCHOVY TARGET

SUB SCORE: 5.000 | DISCARD RATE: 1.000 | **SCORE: 5.000**

SPECIES	ABUNDANCE	FISHING MORTALITY	SCORE
European anchovy	3.670: Low Concern	3.000: Moderate Concern	Green (3.318)

BAY OF BISCAY | ATLANTIC, NORTHEAST | BAY OF BISCAY - CENTRAL (DIVISION 27.8.B) | PURSE SEINES | SPAIN | SARDINE TARGET

SUB SCORE: 5.000 | DISCARD RATE: 1.000 | **SCORE: 5.000**

SPECIES	ABUNDANCE	FISHING MORTALITY	SCORE
European pilchard	1.000: High Concern	1.000: High Concern	Red (1.000)

BAY OF BISCAY | ATLANTIC, NORTHEAST | BAY OF BISCAY - NORTH (DIVISION 27.8.A) | PURSE SEINES | FRANCE

SUB SCORE: 1.000 | DISCARD RATE: 1.000 | **SCORE: 1.000**

SPECIES	ABUNDANCE	FISHING MORTALITY	SCORE
European pilchard	1.000: High Concern	1.000: High Concern	Red (1.000)
European anchovy	3.670: Low Concern	3.000: Moderate Concern	Green (3.318)

BAY OF BISCAY | ATLANTIC, NORTHEAST | BAY OF BISCAY - SOUTH (DIVISION 27.8.C) | HANDLINES AND HAND-OPERATED POLE-AND-LINES | SPAIN

SUB SCORE: 5.000 | DISCARD RATE: 1.000 | **SCORE: 5.000**

SPECIES	ABUNDANCE	FISHING MORTALITY	SCORE
Atlantic mackerel	3.670: Low Concern	1.000: High Concern	Red (1.916)

BAY OF BISCAY | ATLANTIC, NORTHEAST | BAY OF BISCAY - SOUTH (DIVISION 27.8.C) | PURSE SEINES | SPAIN | ANCHOVY TARGET

SUB SCORE: 5.000 | DISCARD RATE: 1.000 | **SCORE: 5.000**

SPECIES	ABUNDANCE	FISHING MORTALITY	SCORE
European anchovy	3.670: Low Concern	3.000: Moderate Concern	Green (3.318)

BAY OF BISCAY | ATLANTIC, NORTHEAST | BAY OF BISCAY - SOUTH (DIVISION 27.8.C) | PURSE SEINES | SPAIN | MACKEREL TARGET

SUB SCORE: 5.000 | DISCARD RATE: 1.000 | **SCORE: 5.000**

SPECIES	ABUNDANCE	FISHING MORTALITY	SCORE
Atlantic mackerel	3.670: Low Concern	1.000: High Concern	Red (1.916)

BAY OF BISCAY | ATLANTIC, NORTHEAST | BAY OF BISCAY - SOUTH (DIVISION 27.8.C) | PURSE SEINES | SPAIN | SARDINE TARGET			
SUB SCORE: 5.000	DISCARD RATE: 1.000	**SCORE: 5.000**	
SPECIES	**ABUNDANCE**	**FISHING MORTALITY**	**SCORE**
European pilchard	2.330: Moderate Concern	3.000: Moderate Concern	Yellow (2.644)

Criterion 2 assesses the population impacts of the fisheries on all species caught other than those assessed in Criterion 1 (though the Criterion 2 score for a species assessed under Criterion 1 may be driven by another species assessed under Criterion 1). The Criterion also assesses the impacts of bait use and discards.

Landings

Landings statistics indicate the purse seine fisheries in the region generally land a number of different small pelagic species (see Table 2 in the Introduction to this assessment for fishery-specific landing statistics). There is evidence that at least some of the fisheries are sequentially multi-specific, meaning that they target different species at different times of the year (see Figure 1 in the Introduction for quarterly landings charts). There is also evidence that the seasonal target accounts for over 90% of the landings at that time.

Spanish purse seine in the Bay of Biscay (27.8.b and 27.8.c)

Granular data are available for the Spanish purse seine fishery operating in the Bay of Biscay (Ruiz et al 2021). The authors identify *metiers* in the fishery, which take into account the varying catch composition and selectivity of different species by season.

Metier	Main species	Trips (%)				Main season (month)	Area
		2016	2017	2018	2019		
"Mix"	Atlantic chub mackerel, horse mackerel, sardine, Mediterranean horse mackerel, bogue, Atlantic bonito	22 %	19 %	26 %	19 %	4 to 6 &9 to 11	Onshore and offshore in Divisions 8.c and 8.b
"Sardine"	Sardine	19 %	16 %	16 %	12 %	10 to 11	Division 8.b
"Anchovy"	Anchovy	50 %	56 %	50 %	62 %	4 to 5	Onshore and offshore in Divisions 8.c and 8.b
"Mackerel"	Mackerel	9%	10 %	7%	7%	3	Onshore in Division 8.c

Figure 17: Metier characterization. For each of the metiers, the table shows the main species captured, the percentage of trips it accounts for, the main season and the main fishing grounds. From (Ruiz et al 2021).

species	Metier			
	anchovy	sardine	mix	mackerel
anchovy	97.62%	0.16%	2.50%	1.80%
mackerel	0.90%	0.07%	0.36%	93.61%
sardine	0.40%	98.64%	9.44%	2.60%
chub mackerel	0.31%	0.58%	37.32%	0.61%
horse mackerel	0.27%	0.23%	28.79%	0.16%
Mediterranean horse mackerel	0.25%	0.06%	7.64%	0.34%
Bogue	0.13%	0.02%	3.91%	0.78%
Atlantic bonito	0.04%	0.03%	3.65%	0.03%
Other species	0.09%	0.21%	6.40%	0.07%

Figure 18: Species composition (average landing) by metier. In the highlighted cells, color intensity indicates the relevance of a particular species in a metier. From (Ruiz et al 2021).

In the anchovy, sardine and mackerel metiers, those species account for the majority of the landings and no other species accounts for ≥5% of the landings. The 'mix' metier has a number of species accounting for ≥5% of the catch (and is not included in the present assessment).

Other purse seine fisheries

No analysis like that in Ruiz et al (2021) was found for the other fisheries in the region. However, quarterly landings data do suggest some patterns (see quarterly landings charts in the Introduction to this assessment):

- Landings in the French fishery in 27.8.a were virtually all sardine (>98%) in 2020, though anchovy and Atlantic horse mackerel have accounted for a greater percentage in previously years (11% and 10%, respectively, of total landings 2016-2020). Sardine and anchovy both appear to be caught in the summer months, where as Atlantic horse mackerel is more typically landed in the winter months.
- The annual catch in the French fishery in 27.8.b is dominated by sardine (65% of the average catch 2016-2019, and 80% in 2020). The other two species that comprised >5% of the catch are Atlantic chub mackerel (12% across 2016-2020, 7% in 2020) and Mediterranean horse mackerel (11% across 2016-2020 and 9% in 2020). However, nearly all of the sardine is caught in the winter (1455/1507mt or 97% in 2020) while the majority of the mackerel species seem to be caught in the fall months.
- Such seasonal trends are not as evident in the quarterly landings statistics for the Spanish and Portuguese fisheries off the coast of Portugal (27.9.a)

Other species

Blue jack mackerel (*Trachurus picturatus*) and bogue (*Boops boops*) do account for more than 1% of the landings in some of the purse seine fisheries (see the landings table in the Introduction). Both are considered Least Concern by the IUCN (Pollard et al 2014)(Smith-Vaniz 2015) and so are not considered further in this assessment.

Spanish hook and line fishery targeting mackerel

The Spanish hook and line fishery for mackerel is essentially mono-specific as it doesn't land any other species (STECF 2022).

Discarded catch

In addition to the analysis of landings summarized above, Ruiz et al (2021) provide a detailed account of the discarded catch in the Spanish fishery in the Bay of Biscay (27.8.b and 27.8.c). Based on four years of observer sampling of the MSC certified component of the fishery (accounting for about 62% of the Spanish fleet operating in the Bay of Biscay), they conclude that discards accounted for <1% of the catch for almost all metiers and years (with a maximum of 3.76% being from the anchovy metier in 2019). Discards were mainly of small pelagics (mackerel, sardine, anchovy, blue whiting, chub mackerel). Observer coverage was low, however (1-2% across the years in the sardine, anchovy metiers, and the mackerel metier coverage was even less), and the number of species documented increased with higher levels of observer coverage, suggesting the list of discarded species may be incomplete. No species were discarded in significant volume to include as a main species in this assessment.

The authors also found that interaction with vulnerable species like seabirds and turtles was almost non-existent. Specifically, they note that despite the observation of more than 7500 individuals of 16 species of birds and mammals in the vicinity of the fishery, there was only a single case of a bird entanglement (a yellow-legged gull (*Larus michahellis*)), and the bird was released alive and uninjured (Ruiz et al 2021).

Observer rates in other purse seine fisheries, and in the hook and line fisheries, is also very low (<2%). Seine nets in the region (Bay of Biscay and the Iberian Coast) have documented catches in 2018 of allisa shad (*Alosa alosa*), twaite shad (*Alosa fallax*), bluntnose sixgill shark/cow shark (*Hexanthus griseus*). Discard data suggests garfish (*Belone belone*) is also caught (and mostly discarded) in the Spanish fishery in area 27.9.a (STECF 2022) (also documented in the Ruiz et al (2021) study). Common dolphin is the only mammal observed caught in purse seines in the region (in 2019 and 2020), and there are no documented catches of mammals in the hook and line fisheries (Table 4 in (ICES 2022b)). No turtles have been observed caught in purse seines in the region, though there was one loggerhead turtles (*Caretta caretta*) documented as caught in a similar fishery in Ionian Sea and Central Mediterranean Sea (Tables 5 and 6 in (ICES 2022b)). ICES has not yet defined protected, endangered and threatened fish species, and while some member states have developed risk assessments they are not yet publicly available (p30 in (ICES 2022b)). The shads, gull, dolphin and garfish are considered Least Concern by IUCN (Freyhof and Kottelat 2008a) (Freyhof and Kottelat 2008b) (Birdlife International 2019) (Braulik et al 2021)(Collette 2015) and the shark is Near Threatened (Finucci et al 2020). Allis shad is considered Vulnerable under the OSPAR Commission, but the main threats are from habitat modification that hinders migration and spawning, and the occasional take in marine fisheries is not thought to be a major threat (OSPAR Commission 2008). Overall, there is no particular indication of significant bycatch impacts to vulnerable taxa such as turtles, seabirds and mammals from the purse seine and hook and line fisheries though, based on ICES reports (ICES 2021a) (ICES 2022b) (ICES 2020c), the very limited discards data available (STECF 2022), data from analyses such as Ruiz et al (2021) and the impacts of similar fisheries in the Northeast Atlantic (see Seafood Watch Standard for Wild Capture Fisheries bycatch risk matrices for more information).

Slipping

A common practice in purse seine fisheries is to deliberately release fish from the net over the float line

after it has been partially hauled in but he catch is still in the water (Roda 2019). The reasons for this 'slipping' vary, but include undesirable species or size composition of the catch, an excessive amount of catch, or in response to regulatory restrictions or market demands. This practice is generally banned under the Common Fisheries Policy of the EU, but an exception has been granted for the Bay of Biscay fishery (Ruiz et al 2021). Ruiz et al (2021) indicate that slipping for the Spanish fleet in the Bay of Biscay varied by metier and year, from 3.94% to 22.02% in the anchovy metier, and from 0% to 48% in the sardine metier (the average for both metiers across 2016-2019 is presented in the table below - no information is available for the mackerel metier). The main species 'slipped' were small pelagics.

Metier	% retained	% discarded	% slipped	species slipped
anchovy	87.1	1.1	11.83	anchovy (64%)
sardine	87.2	0.7	12.1	jack mackerel, sardine, anchovy, and mackerel were the main slipped species, representing 32%, 28%, 25% and 12%, respectively

Though not typically considered 'discarding', slipping can lead to mortality if not conducted properly (Roda 2019). Ruiz et al (2021) suggest high survival rates of most of the small pelagics slipped in the Spanish purse seine fishery in the Bay of Biscay - horse mackerel: 89.7–100 %; anchovy: 54.2–97.8 %; sardine: 83.9–100 % and Atlantic chub mackerel: 100 %), but the variability for the mackerel was large (3–100 %). It is assumed in this Seafood Watch assessment that slipping rates and survival rates are simliar across the purse seine fisheries in the Bay of Biscay and off Portugal.

Summary

The purse seine fisheries targeting small pelagics in the region and the Spanish hook-and-line mackerel fishery appear to have very few impacts on species other than the targets. Review of quarterly landings data (or monthly landings data in the case of Ruiz et al (2021)) suggests a sequential targeting of different species in different seasons, at least in the Bay of Biscay fisheries. The catch of small pelagics other than the target appears minimal and no main species other than the target is assessed for these fisheries. Improved data may allow the same conclusion to be drawn for the fisheries operating off of Portugal, but for now these are considered multi-species fisheries where all small pelagics that comprise a significant component of the catch (≥5%) are considered main species in this assessment.

Criterion 2 Assessment

SCORING GUIDELINES

Factor 2.1 - Abundance
(same as Factor 1.1 above)

Factor 2.2 - Fishing Mortality
(same as Factor 1.2 above)

Factor 2.3 - Modifying Factor: Discards and Bait Use
Goal: Fishery optimizes the utilization of marine and freshwater resources by minimizing post-harvest loss. For fisheries that use bait, bait is used efficiently.

Scoring Guidelines: The discard rate is the sum of all dead discards (i.e. non-retained catch) plus bait use divided by the total retained catch.

Ratio of bait + discards/landings	Factor 2.3 score
<100%	1
>=100	0.75

Factor 2.3 - Discard Rate/Landings

Atlantic, Northeast | Portuguese Waters - East (Division 27.9.a) | Purse seines | Portugal | Spain
Subareas 1–8 and 14,and in Division 9.a (Northeast Atlantic and adjacent waters) Stock | Bay of Biscay | Atlantic, Northeast | Bay of Biscay - South (Division 27.8.c) | Handlines and hand-operated pole-and-lines | Spain
Subareas 1–8 and 14,and in Division 9.a (Northeast Atlantic and adjacent waters) Stock | Bay of Biscay | Atlantic, Northeast | Bay of Biscay - South (Division 27.8.c) | Purse seines | Spain | Mackerel target
Subarea 8 (Bay of Biscay) Stock | Atlantic, Northeast | Bay of Biscay - North (Division 27.8.a) | Purse seines | France
Division 9.a (Atlantic Iberian waters) Stock | Atlantic, Northeast | Portuguese Waters - East (Division 27.9.a) | Purse seines | Portugal | Spain
Subarea 8 (Bay of Biscay) Stock | Atlantic, Northeast | Bay of Biscay - Central (Division 27.8.b) | Purse seines | Spain | Anchovy target
Subarea 8 (Bay of Biscay) Stock | Atlantic, Northeast | Bay of Biscay - South (Division 27.8.c) | Purse seines | Spain | Anchovy target
Divisions 8.a–b and 8.d (Bay of Biscay) Stock | Atlantic, Northeast | Bay of Biscay - Central (Division 27.8.b) | Purse seines | France
Divisions 8.a–b and 8.d (Bay of Biscay) Stock | Atlantic, Northeast | Bay of Biscay - North (Division 27.8.a) | Purse seines | France
Divisions 8.c and 9.a (Cantabrian Sea and Atlantic Iberian waters) Stock | Atlantic, Northeast | Portuguese Waters - East (Division 27.9.a) | Purse seines | Portugal | Spain
Divisions 8.c and 9.a (Cantabrian Sea and Atlantic Iberian waters) Stock | Bay of Biscay | Atlantic, Northeast | Bay of Biscay - South (Division 27.8.c) | Purse seines | Spain | Sardine target
Divisions 8.a–b and 8.d (Bay of Biscay) Stock | Atlantic, Northeast | Bay of Biscay - Central (Division 27.8.b) | Purse seines | Spain | Sardine target

< 100%

Discards in the small pelagics fisheries is a very small percentage of landings (see Criterion 2 summary) (Roda 2019) (Ruiz et al 2021)(ICES 2021a)). The ratio of bait+discards/landings is considered to be lower than 100% for all fisheries in this assessment.

Criterion 3: Management Effectiveness

Five factors are evaluated in Criterion 3: Management Strategy and Implementation, Bycatch Strategy, Scientific Research/Monitoring, Enforcement of Regulations, and Inclusion of Stakeholders. Each is scored as either 'highly effective', 'moderately effective', 'ineffective,' or 'critical'. The final Criterion 3 score is determined as follows:

- *5 (Very Low Concern) — Meets the standards of 'highly effective' for all five factors considered.*
- *4 (Low Concern) — Meets the standards of 'highly effective' for 'management strategy and implementation' and at least 'moderately effective' for all other factors.*
- *3 (Moderate Concern) — Meets the standards for at least 'moderately effective' for all five factors.*
- *2 (High Concern) — At a minimum, meets standards for 'moderately effective' for Management Strategy and Implementation and Bycatch Strategy, but at least one other factor is rated 'ineffective.'*
- *1 (Very High Concern) — Management Strategy and Implementation and/or Bycatch Management are 'ineffective.'*
- *0 (Critical) — Management Strategy and Implementation is 'critical'.*

The Criterion 3 rating is determined as follows:

- ***Score >3.2=Green or Low Concern***
- ***Score >2.2 and ≤3.2=Yellow or Moderate Concern***
- ***Score ≤2.2 = Red or High Concern***

Rating is Critical if Management Strategy and Implementation is Critical.

Guiding principle

- The fishery is managed to sustain the long-term productivity of all impacted species.

Five factors are evaluated in Criterion 3: Management Strategy and Implementation, Bycatch Strategy, Scientific Research/Monitoring, Enforcement of Regulations, and Inclusion of Stakeholders. Each is scored as either 'highly effective', 'moderately effective', 'ineffective,' or 'critical'. The final Criterion 3 score is determined as follows:

Criterion 3 Summary

FISHERY	MANAGEMENT STRATEGY	BYCATCH STRATEGY	DATA COLLECTION AND ANALYSIS	ENFORCEMENT	INCLUSION	SCORE
Atlantic, Northeast | Portuguese Waters - East (Division 27.9.a) | Purse seines | Portugal | Spain	Ineffective	Highly effective	Moderately Effective	Moderately Effective	Moderately Effective	**Red (1.000)**
Bay of Biscay | Atlantic, Northeast | Bay of Biscay - Central (Division 27.8.b) | Purse seines | France	Ineffective	Highly effective	Moderately Effective	Moderately Effective	Moderately Effective	**Red (1.000)**

Bay of Biscay | Atlantic, Northeast | Bay of Biscay - Central (Division 27.8.b) | Purse seines | Spain | Anchovy target	Highly effective	Highly effective	Moderately Effective	Moderately Effective	Moderately Effective	**Green (4.000)**
Bay of Biscay | Atlantic, Northeast | Bay of Biscay - Central (Division 27.8.b) | Purse seines | Spain | Sardine target	Ineffective	Highly effective	Moderately Effective	Moderately Effective	Moderately Effective	**Red (1.000)**
Bay of Biscay | Atlantic, Northeast | Bay of Biscay - North (Division 27.8.a) | Purse seines | France	Ineffective	Highly effective	Moderately Effective	Moderately Effective	Moderately Effective	**Red (1.000)**
Bay of Biscay | Atlantic, Northeast | Bay of Biscay - South (Division 27.8.c) | Handlines and hand-operated pole-and-lines | Spain	Ineffective	Highly effective	Moderately Effective	Moderately Effective	Moderately Effective	**Red (1.000)**
Bay of Biscay | Atlantic, Northeast | Bay of Biscay - South (Division 27.8.c) | Purse seines | Spain | Anchovy target	Highly effective	Highly effective	Moderately Effective	Moderately Effective	Moderately Effective	**Green (4.000)**
Bay of Biscay | Atlantic, Northeast | Bay of Biscay - South (Division 27.8.c) | Purse seines | Spain | Mackerel target	Ineffective	Highly effective	Moderately Effective	Moderately Effective	Moderately Effective	**Red (1.000)**
Bay of Biscay | Atlantic, Northeast | Bay of Biscay - South (Division 27.8.c) | Purse seines | Spain | Sardine target	Ineffective	Highly effective	Moderately Effective	Moderately Effective	Moderately Effective	**Red (1.000)**

Criterion 3 Assessment

SCORING GUIDELINES

Factor 3.1 - Management Strategy and Implementation

Considerations: What type of management measures are in place? Are there appropriate management goals, and is there evidence that management goals are being met? Do manages follow scientific advice? To achieve a highly effective rating, there must be appropriately defined management goals, precautionary policies that are based on scientific advice, and evidence that the measures in place have been successful at maintaining/rebuilding species.

Factor 3.2 - Bycatch Strategy

Considerations: What type of management strategy/measures are in place to reduce the impacts of the fishery on bycatch species and when applicable, to minimize ghost fishing? How successful are these management measures? To achieve a Highly Effective rating, the fishery must have no or low bycatch, or if there are bycatch or ghost fishing concerns, there must be effective measures in place to minimize impacts.

Factor 3.3 - Scientific Research and Monitoring

Considerations: How much and what types of data are collected to evaluate the fishery's impact on the species? Is there adequate monitoring of bycatch? To achieve a Highly Effective rating, regular, robust

population assessments must be conducted for target or retained species, and an adequate bycatch data collection program must be in place to ensure bycatch management goals are met.

Factor 3.4 - Enforcement of Management Regulations

Considerations: Do fishermen comply with regulations, and how is this monitored? To achieve a Highly Effective rating, there must be regular enforcement of regulations and verification of compliance.

Factor 3.5 - Stakeholder Inclusion

Considerations: Are stakeholders involved/included in the decision-making process? Stakeholders are individuals/groups/organizations that have an interest in the fishery or that may be affected by the management of the fishery (e.g., fishermen, conservation groups, etc.). A Highly Effective rating is given if the management process is transparent, if high participation by all stakeholders is encouraged, and if there a mechanism to effectively address user conflicts.

Factor 3.1 - Management Strategy And Implementation

Atlantic, Northeast | Portuguese Waters - East (Division 27.9.a) | Purse seines | Portugal | Spain
Bay of Biscay | Atlantic, Northeast | Bay of Biscay - South (Division 27.8.c) | Handlines and hand-operated pole-and-lines | Spain
Bay of Biscay | Atlantic, Northeast | Bay of Biscay - South (Division 27.8.c) | Purse seines | Spain | Mackerel target
Bay of Biscay | Atlantic, Northeast | Bay of Biscay - North (Division 27.8.a) | Purse seines | France
Bay of Biscay | Atlantic, Northeast | Bay of Biscay - Central (Division 27.8.b) | Purse seines | France
Bay of Biscay | Atlantic, Northeast | Bay of Biscay - South (Division 27.8.c) | Purse seines | Spain | Sardine target
Bay of Biscay | Atlantic, Northeast | Bay of Biscay - Central (Division 27.8.b) | Purse seines | Spain | Sardine target

Ineffective

Management of these fisheries is conducted by the respective countries in accordance with the EU's Common Fisheries Policy. Since these are mostly mixed-species fisheries, scoring for this section considers how well management performs across all of the main species caught in each fishery.

Most stocks have appropriate reference points in place, but management's ability to constrain catches to target levels has been more limited. There is a concern with fishing impacts on at least one stock in most fisheries, whether that be a recent stock assessment that finds fishing mortality too high (suggesting measures are not enough to constrain catches), a lack of TAC or summed TACs exceeding scientific (i.e. ICES) advice, or catches exceeding TACs (see Justification table below). The requirement that effective management is in place for at least 70% of the stocks caught is not met for any of these fisheries, driving a score of 2 (Ineffective) for this factor.

Justification:

The Fisheries Overview for the Bay of Biscay and the Iberian Coast ecoregion provides an overview of management of the fisheries is this ecosystem (ICES 2021a). The fisheries in this assessment all operate in the EEZs of France, Spain and Portugal. As part of the EU, "management is conducted in accordance with the EU Common Fisheries Policy (CFP), and catching opportunities for stocks under EU competency are agreed upon during meetings of the Council of Ministers. National authorities manage activities in coastal waters (i.e. within 12 nautical miles). International fisheries advice for these fisheries is provided by the International Council for the Exploration of the Sea (ICES) and the European Commission's Scientific Technical and Economic Committee for Fisheries (STECF). Total allowable catch (TAC) is the main fishery management tool in the ecoregion. These were introduced for most stocks in the 1980s, but the TACs (and quotas) were generally not restrictive until the early 1990s. The 2013 reform of the Common Fisheries Policy aimed to eliminate discarding through the introduction of the EU landing obligation (LO), which is now in place for all TAC species.

Table X (broken into two tables to fit on page): Summary of concerns of the main targeted stocks

in each fishery in this assessment. "Fishery" is defined here in terms of ICES area (i.e. 27.X.x), country, gear type (PS=purse seine, HL=Handline), and target species where it matter to distinguish one fishery from another. Cells highlighted in red indicate areas of concern (stock is overfished or subject to overfishing based on Criterion 1, TACs are set too high, or catches exceed TACs or scientific advice).

Stock				Fishery (ICES area - country, gear, target)			
Name	**Reference points**	**TAC/scientific advice**	**Current status (Criterion 1)**	**8.a - France PS**	**8.b - France PS**	**8.b - Spain PS - anchovy**	**8.b - Spain PS - sardine**
European pilchard - Divisions 8.a–b and 8.d (Bay of Biscay)	Yes	No TAC, catch below ICES level in last few years	high/ high	x	x		x
European anchovy - Subarea 8 (Bay of Biscay)	Biomass limit only	TACs set at ICES advice level	low/ moderate	x		x	

Stock				Fishery (ICES area - country, gear, target)					
Name	**Reference points**	**TAC/scientific advice**	**Current status (Criterion 1)**	**8.c - Spain HL**	**8.c - Spain PS - anchovy**	**8.c - Spain PS - sardine**	**8.c - Spain PS - mackerel**	**8.c - Spain HL**	**9.a - Port.&Spa. PS**
European anchovy - Subarea 8 (Bay of Biscay)	Biomass limit only	TACs set at ICES advice level	low/ moderate		x				
Atlantic mackerel - Subareas 1–8 and 14,and in Division 9.a (Northeast Atlantic and adjacent waters)	Yes	Summed TACs significantly exceed ICES advice	low/ high	x			x	x	
European pilchard - Divisions 8.c and 9.a (Cantabrian Sea and Atlantic Iberian waters)	Yes	No TAC, Catch exceeded ICES advice since at least 2014	moderate/ moderate			x			x

European anchovy - Division 9.a (Atlantic Iberian waters)	none for western component; based on pa for southern	TAC set at around ICES level. Exceeded in some recent years	high/ moderate						x
Atlantic chub mackerel - no stock defined	None	No TAC	moderate/ moderate						x
Atlantic horse mackerel - Division 9.a (Atlantic Iberian waters)	Yes	TACs set at ICES advice level, catches well below TAC (Trachurus spp. combined)	very low/ low						x

Atlantic mackerel - Subareas 1–8 and 14,and in Division 9.a (Northeast Atlantic and adjacent waters) (ICES 2021)

Reference points based on MSY and the precautionary approach (pa) have been defined. ICES advice has been based on MSY since 2016. There is no long-term management strategy for Northeast Atlantic mackerel agreed by all parties involved in the mackerel fishery, though options have recently been recently reviewed by ICES at the request of some member states (ICES 2020e). The sum of all unilateral TACS has significantly exceeded the catch corresponding to the ICES advice since at least 2009, including in the most recent years (2021 advice is no more than 852,284mt, summed TAC is 1,287,198mt; 2022 advice is no more than 794,920mt, summed TAC is 1,264,378mt (ICES 2021)(EU 2022c)). The total annual catch over the last decade has typically been around or below the TACs, but the TACs have been exceeded in some years (most recently in 2018). Estimates from 2021 and 2022 suggest catches were well below the TAC and declining, but still above ICES advice (provisional 2022 estimate is 899,934mt compared to the ICEAS advice of 794,920mt)(EU 2022c)).. Bringing the catch below advice is a stated goal of managers, with the delegates from each fishing nation agreeing to a total TAC of 782,066mt. Moving these agreements through to implementation appears to be the challenge, however, so the delegates have put a hard deadline for a final agreement of March 31 2023 (EU 2022c). The majority of catches of Northeast Atlantic mackerel are in the north of the stock's range (90% of the summed catches from 2016-2020 were made outside of ICES divisions 27.8 and 27.9) (STECF 2022).

European anchovy - Subarea 8 (Bay of Biscay) (ICES 2022h)

The only reference point defined for this stock is a biomass limit. ICES advice is currently based on the 2016 harvest control rule, which ICES has concluded is precautionary. TACs have been set at the maximum catch corresponding to ICES advice, which is based on the HCR. The HCR also provides for closure of the fishery if biomass falls below a lower limit (24kmt, vs the 21kmt set as B_{lim}). Catches have not exceeded the TACs in recent years (since 2015).

European anchovy - Division 9.a (Atlantic Iberian waters) (ICES 2022d)

This stock is composed of two components. No reference points have been defined for the western

component. Biomass limit and target reference points based on the precautionary approach have been defined for the southern component, but none have been defined in terms of MSY. There are no reference points for fishing mortality. There is no agreed precautionary management plan in place for this stock. ICES still provides catch advice for both components of the stocks, and the TAC is set at around the level corresponding to the advice. Total catch (including discards) has exceeded the TAC in some recent years (e.g. 2021-2022, 2018, 2017, 2014).

Atlantic horse mackerel - Division 9.a (Atlantic Iberian waters) (ICES 2022g)

Reference points based on MSY and the precautionary approach (pa) have been defined. There is no management plan for the stock, though options have recently been reviewed by ICES at the request of some member states. ICES advice has been based on MSY since 2014. TACs for all *Trachurus* species combined have been set at the catch level corresponding to the ICES advice for *Trachurus trachurus* since 2014. Catches of *Trachurus trachurus* have been way below the TAC since at least 2014.

European pilchard - Divisions 8.a–b and 8.d (Bay of Biscay) (ICES 2022j)

Reference points based on MSY and the precautionary approach (pa) have been defined. There is no agreed precautionary management plan in place for this stock. ICES advice has been based on MSY since 2018. There is no official TAC for the stock, but landings were way above a catch level corresponding to ICES advice from 2014 to 2019. Landings were below that level in recent years, however (2020-2022).

European pilchard - Divisions 8.c and 9.a (Cantabrian Sea and Atlantic Iberian waters) (ICES 2021c)

Reference points based on MSY and the precautionary approach (pa) have been defined. ICES has recently evaluated an HCR that is proposed to be part of a management plan for 2021–2026 and found it be precautionary. ICES advice has been based on MSY since 2018. There is no official TAC for the stock, but landings have been above a level that corresponds to ICES advice since at least 2014.

Atlantic chub mackerel - no stock defined

No reference points have been defined or stock assessments conducted.

Bay of Biscay | Atlantic, Northeast | Bay of Biscay - Central (Division 27.8.b) | Purse seines | Spain | Anchovy target
Bay of Biscay | Atlantic, Northeast | Bay of Biscay - South (Division 27.8.c) | Purse seines | Spain | Anchovy target

Highly effective
Anchovy is the only species caught in significant volumes in the Spanish fleet targeting anchovy in 27.8.b and 27.8.c. Fishing impacts on the anchovy stock caught in this area are managed through a limit reference point and a TAC consistent with ICES advice, catches appear to be controlled such that they do not exceed the TAC, and there are currently no major concerns over the stock's status.

These fisheries receive a score of 5 (Highly effective).

See this account under the other fisheries for more context.

Factor 3.2 - Bycatch Strategy

Atlantic, Northeast | Portuguese Waters - East (Division 27.9.a) | Purse seines | Portugal | Spain
Bay of Biscay | Atlantic, Northeast | Bay of Biscay - South (Division 27.8.c) | Handlines and hand-operated pole-and-lines | Spain
Bay of Biscay | Atlantic, Northeast | Bay of Biscay - South (Division 27.8.c) | Purse seines | Spain | Mackerel target
Bay of Biscay | Atlantic, Northeast | Bay of Biscay - North (Division 27.8.a) | Purse seines | France
Bay of Biscay | Atlantic, Northeast | Bay of Biscay - Central (Division 27.8.b) | Purse seines | Spain | Anchovy target
Bay of Biscay | Atlantic, Northeast | Bay of Biscay - South (Division 27.8.c) | Purse seines | Spain | Anchovy target
Bay of Biscay | Atlantic, Northeast | Bay of Biscay - Central (Division 27.8.b) | Purse seines | France
Bay of Biscay | Atlantic, Northeast | Bay of Biscay - South (Division 27.8.c) | Purse seines | Spain | Sardine target
Bay of Biscay | Atlantic, Northeast | Bay of Biscay - Central (Division 27.8.b) | Purse seines | Spain | Sardine target

Highly effective
Most of the catch is the targeted species and <5% of catch is bycatch. This is based on the landings data, which has included robust bycatch data since a landing obligation came into effect in 2015. Under the landing obligation, all catches must be kept on board, landed, and counted against the quotas. Undersized fish cannot be marketed for direct human consumption purposes whilst prohibited species (e.g. some species of sharks) cannot be retained on board and must be returned to the sea (EC 2020). Details of the implementation are included in multiannual plans or in specific discard plans when no multiannual plan is in place. These details include the species covered, provisions on catch documentation, minimum conservation reference sizes, and exemptions (EC 2020). Under the Council Regulation (EC) 812/2004 (EU 2004), the European countries are required to report any bycatch of marine mammals in European waters, fisheries with a high level of bycatch are obliged to implement pingers and other mitigation measures.

Bycatch volumes from this fishery are relatively small. There are measures in place to monitor and minimize bycatch. While species of concern are caught, this fishery does not cause a high impact on those species. Therefore, Bycatch Strategy scores 5 (Highly effective.)

Factor 3.3 - Scientific Data Collection and Analysis

Atlantic, Northeast | Portuguese Waters - East (Division 27.9.a) | Purse seines | Portugal | Spain
Bay of Biscay | Atlantic, Northeast | Bay of Biscay - South (Division 27.8.c) | Handlines and hand-operated pole-and-lines | Spain
Bay of Biscay | Atlantic, Northeast | Bay of Biscay - South (Division 27.8.c) | Purse seines | Spain | Mackerel target
Bay of Biscay | Atlantic, Northeast | Bay of Biscay - North (Division 27.8.a) | Purse seines | France
Bay of Biscay | Atlantic, Northeast | Bay of Biscay - Central (Division 27.8.b) | Purse seines | Spain | Anchovy target
Bay of Biscay | Atlantic, Northeast | Bay of Biscay - South (Division 27.8.c) | Purse seines | Spain | Anchovy target
Bay of Biscay | Atlantic, Northeast | Bay of Biscay - Central (Division 27.8.b) | Purse seines | France
Bay of Biscay | Atlantic, Northeast | Bay of Biscay - South (Division 27.8.c) | Purse seines | Spain | Sardine target
Bay of Biscay | Atlantic, Northeast | Bay of Biscay - Central (Division 27.8.b) | Purse seines | Spain | Sardine target

Moderately Effective

Target species in this fishery are regularly assessed for stock health and fishing pressure (ICES 2021a). The forage species in this fishery are assessed at 1 year or 2 year intervals, which is an appropriate frequency for forage fish.

ICES collects landings data from each country. The landings data includes non-target species since the landing obligation was passed in 2015. There are fisheries-independent surveys and data collection, including biological samples collected from landings data in surveys carried out by the Spanish Institute of Oceanography (IEO) and the Basque Technological Centre in Marine Food Innovation (AZTI) (MSC 2020). Data collection and oversight is conducted by the Scientific, Technical and Economic Committee for Fisheries (STECF). Member states are responsive to STECF requests for data clarification (STECF 2022a). Observer coverage in the fishery is low. In 2018, purse seine coverage was 0.17-1.95% and hook and line observer coverage was <1% (ICES 2020d).

The data collection and analysis for this fishery includes landings data, bycatch data, fisheries independent data, surveys, and frequent stock assessments. However, the level of observer coverage is too low to be considered highly effective. Therefore, Scientific Data Collection and Analysis scores "Moderately effective."

Factor 3.4 - Enforcement of and Compliance with Management Regulations

Atlantic, Northeast | Portuguese Waters - East (Division 27.9.a) | Purse seines | Portugal | Spain
Bay of Biscay | Atlantic, Northeast | Bay of Biscay - South (Division 27.8.c) | Handlines and hand-operated pole-and-lines | Spain
Bay of Biscay | Atlantic, Northeast | Bay of Biscay - South (Division 27.8.c) | Purse seines | Spain | Mackerel target
Bay of Biscay | Atlantic, Northeast | Bay of Biscay - North (Division 27.8.a) | Purse seines | France
Bay of Biscay | Atlantic, Northeast | Bay of Biscay - Central (Division 27.8.b) | Purse seines | Spain | Anchovy target
Bay of Biscay | Atlantic, Northeast | Bay of Biscay - South (Division 27.8.c) | Purse seines | Spain | Anchovy target
Bay of Biscay | Atlantic, Northeast | Bay of Biscay - Central (Division 27.8.b) | Purse seines | France
Bay of Biscay | Atlantic, Northeast | Bay of Biscay - South (Division 27.8.c) | Purse seines | Spain | Sardine target
Bay of Biscay | Atlantic, Northeast | Bay of Biscay - Central (Division 27.8.b) | Purse seines | Spain | Sardine target

Moderately Effective

National authorities in each country and the European Fisheries Control Agency coordinate inspection and enforcement operations (EU 2022a). Member States carry out inspection and enforcement in line with common criteria set out and coordinated by the EFCA (Eliantonio & Cacciatore 2021). These include regulations to deter and eliminate IUU fishing (EU 2008). Routine inspection activities are carried out by Member States while specific inspections are carried out by EU inspectors (Eliantonio & Cacciatore 2021). Member States are in charge of prosecuting violations. There is a points system in place for serious violations which aims to ensure that these violations are handled consistently across Member States (Eliantonio & Cacciatore 2021).

The European Commission verifies that each nation is enforcing the regulations (EU 2022a). This includes real-time monitoring of vessel speed and location via VMS on vessels longer than 12m. These vessels are also required to adhere to the Electronic Reporting System, which includes submitting catch data via an electronic logbook (EU 2022b).

There has been some criticism that the sanctions against violators are not strong enough to dissuade bad actors (ECA 2017) . A key problem seems to be uneven adherence to policy and compliance across Member States, so there appears to be efforts for the EU itself to take on more enforcement responsibilities (Eliantonio & Cacciatore 2021). Enforcement of and Compliance with Management Regulations scores "Moderately effective."

Factor 3.5 - Stakeholder Inclusion

Atlantic, Northeast | Portuguese Waters - East (Division 27.9.a) | Purse seines | Portugal | Spain
Bay of Biscay | Atlantic, Northeast | Bay of Biscay - South (Division 27.8.c) | Handlines and hand-operated pole-and-lines | Spain
Bay of Biscay | Atlantic, Northeast | Bay of Biscay - South (Division 27.8.c) | Purse seines | Spain | Mackerel target
Bay of Biscay | Atlantic, Northeast | Bay of Biscay - North (Division 27.8.a) | Purse seines | France
Bay of Biscay | Atlantic, Northeast | Bay of Biscay - Central (Division 27.8.b) | Purse seines | Spain | Anchovy target
Bay of Biscay | Atlantic, Northeast | Bay of Biscay - South (Division 27.8.c) | Purse seines | Spain | Anchovy target
Bay of Biscay | Atlantic, Northeast | Bay of Biscay - Central (Division 27.8.b) | Purse seines | France
Bay of Biscay | Atlantic, Northeast | Bay of Biscay - South (Division 27.8.c) | Purse seines | Spain | Sardine target
Bay of Biscay | Atlantic, Northeast | Bay of Biscay - Central (Division 27.8.b) | Purse seines | Spain | Sardine target

Moderately Effective
EU implemented regionalization to allow stakeholders more direct access and influence within their area of fishing. Part of this was setting up seven regional advisory councils (RACs) which forward the opinions of their regional constituents to the European Commission (EU 2013). The Commission takes the RACs input into account in the decision-making process, making RACs a key nexus of information exchange between administration, scientist, and fishers. The South West Waters Advisory Council (SWWAC) is the RAC which covers this fishing area (SWWAC 2022).

The decision-making process can slow down as the number of participants actively involved in the process increases (Linke & Jentoft 2016). To strike the right balance of inclusion and efficiency, SWWAC membership is constrained with 60% of the members comprised of representatives from the fishing sector and 40% of the members comprised of other sectors, including NGOs, consumer advocates, and environmental associations (Linke & Jentoft 2016) (SWWAC 2022). This limitation on the number of parties that can participate in the RAC and the delineation between the fishing sector and all other sectors skews participation towards pre-existing organizations. Fundamentally, this means that small-scale fishers do not have a place at the table unless they organize (Linke & Jentoft 2016).

Though the RACs have garnered criticism because of the way that larger stakeholders and interest groups can flex their power, the RACs nonetheless provide an avenue for stakeholder inclusion. Stakeholder inclusion for this fishery scores "Moderately effective."

Criterion 4: Impacts on the Habitat and Ecosystem

This Criterion assesses the impact of the fishery on seafloor habitats, and increases that base score if there are measures in place to mitigate any impacts. The fishery's overall impact on the ecosystem and food web and the use of ecosystem-based fisheries management (EBFM) principles is also evaluated. Ecosystem Based Fisheries Management aims to consider the interconnections among species and all natural and human stressors on the environment. The final score is the geometric mean of the impact of fishing gear on habitat score (factor 4.1 + factor 4.2) and the Ecosystem Based Fishery Management score. The Criterion 4 rating is determined as follows:

- ***Score >3.2=Green or Low Concern***
- ***Score >2.2 and ≤3.2=Yellow or Moderate Concern***
- ***Score ≤2.2 = Red or High Concern***

Guiding principles

- Avoid negative impacts on the structure, function or associated biota of marine habitats where fishing occurs.
- Maintain the trophic role of all aquatic life.
- Do not result in harmful ecological changes such as reduction of dependent predator populations, trophic cascades, or phase shifts.
- Ensure that any enhancement activities and fishing activities on enhanced stocks do not negatively affect the diversity, abundance, productivity, or genetic integrity of wild stocks.
- Follow the principles of ecosystem-based fisheries management.

Rating cannot be Critical for Criterion 4.

Criterion 4 Summary

FISHERY	FISHING GEAR ON THE SUBSTRATE	MITIGATION OF GEAR IMPACTS	ECOSYSTEM-BASED FISHERIES MGMT	FORAGE SPECIES?	SCORE
Atlantic, Northeast | Portuguese Waters - East (Division 27.9.a) | Purse seines | Portugal | Spain	Score: 4	Score: 0	High Concern	Yes	**Red (2.828)**
Divisions 8.a–b and 8.d (Bay of Biscay) Stock | Atlantic, Northeast | Bay of Biscay - Central (Division 27.8.b) | Purse seines | France	Score: 4	Score: 0	Moderate Concern		**Green (3.464)**
Subarea 8 (Bay of Biscay) Stock | Atlantic, Northeast | Bay of Biscay - Central (Division 27.8.b) | Purse seines | Spain | Anchovy target	Score: 4	Score: 0	Moderate Concern		**Green (3.464)**
Divisions 8.a–b and 8.d (Bay of Biscay) Stock | Atlantic, Northeast | Bay of Biscay - Central (Division 27.8.b) | Purse seines | Spain | Sardine target	Score: 4	Score: 0	Moderate Concern	No	**Green (3.464)**
Subarea 8 (Bay of Biscay) Stock | Atlantic, Northeast | Bay of Biscay - North (Division 27.8.a) | Purse seines | France	Score: 4	Score: 0	Moderate Concern	No	**Green (3.464)**
Subareas 1–8 and 14,and in Division 9.a (Northeast Atlantic and adjacent waters) Stock | Bay of Biscay | Atlantic, Northeast | Bay of Biscay - South (Division 27.8.c) | Handlines and hand-operated pole-and-lines | Spain	Score: 4	Score: 0	Moderate Concern	No	**Green (3.464)**
Subarea 8 (Bay of Biscay) Stock | Atlantic, Northeast | Bay of Biscay - South (Division 27.8.c) | Purse seines | Spain | Anchovy target	Score: 4	Score: 0	Moderate Concern	No	**Green (3.464)**
Subareas 1–8 and 14,and in Division 9.a (Northeast Atlantic and adjacent waters) Stock | Bay of Biscay | Atlantic, Northeast | Bay of Biscay - South (Division 27.8.c) | Purse seines | Spain | Mackerel target	Score: 4	Score: 0	Moderate Concern	No	**Green (3.464)**
Divisions 8.c and 9.a (Cantabrian Sea and Atlantic Iberian waters) Stock | Bay of Biscay | Atlantic, Northeast | Bay of Biscay - South (Division 27.8.c) | Purse seines | Spain | Sardine target	Score: 4	Score: 0	Moderate Concern		**Green (3.464)**

Criterion 4 Assessment

SCORING GUIDELINES

Factor 4.1 - Physical Impact of Fishing Gear on the Habitat/Substrate
Goal: The fishery does not adversely impact the physical structure of the ocean habitat, seafloor or associated biological communities.

- *5 - Fishing gear does not contact the bottom*
- *4 - Vertical line gear*
- *3 - Gears that contacts the bottom, but is not dragged along the bottom (e.g. gillnet, bottom longline, trap) and is not fished on sensitive habitats. Or bottom seine on resilient mud/sand habitats. Or midwater trawl that is known to contact bottom occasionally. Or purse seine known to commonly contact the bottom.*
- *2 - Bottom dragging gears (dredge, trawl) fished on resilient mud/sand habitats. Or gillnet, trap, or bottom longline fished on sensitive boulder or coral reef habitat. Or bottom seine except on mud/sand. Or there is known trampling of coral reef habitat.*
- *1 - Hydraulic clam dredge. Or dredge or trawl gear fished on moderately sensitive habitats (e.g.,*

cobble or boulder)

- *0 - Dredge or trawl fished on biogenic habitat, (e.g., deep-sea corals, eelgrass and maerl) Note: When multiple habitat types are commonly encountered, and/or the habitat classification is uncertain, the score will be based on the most sensitive, plausible habitat type.*

Factor 4.2 - Modifying Factor: Mitigation of Gear Impacts
Goal: Damage to the seafloor is mitigated through protection of sensitive or vulnerable seafloor habitats, and limits on the spatial footprint of fishing on fishing effort.

- *+1 —>50% of the habitat is protected from fishing with the gear type. Or fishing intensity is very low/limited and for trawled fisheries, expansion of fishery's footprint is prohibited. Or gear is specifically modified to reduce damage to seafloor and modifications have been shown to be effective at reducing damage. Or there is an effective combination of 'moderate' mitigation measures.*
- *+0.5 —At least 20% of all representative habitats are protected from fishing with the gear type and for trawl fisheries, expansion of the fishery's footprint is prohibited. Or gear modification measures or other measures are in place to limit fishing effort, fishing intensity, and spatial footprint of damage caused from fishing that are expected to be effective.*
- *0 —No effective measures are in place to limit gear impacts on habitats or not applicable because gear used is benign and received a score of 5 in factor 4.1*

Factor 4.3 - Ecosystem-Based Fisheries Management
Goal: All stocks are maintained at levels that allow them to fulfill their ecological role and to maintain a functioning ecosystem and food web. Fishing activities should not seriously reduce ecosystem services provided by any retained species or result in harmful changes such as trophic cascades, phase shifts or reduction of genetic diversity. Even non-native species should be considered with respect to ecosystem impacts. If a fishery is managed in order to eradicate a non-native, the potential impacts of that strategy on native species in the ecosystem should be considered and rated below.

- *5 — Policies that have been shown to be effective are in place to protect species' ecological roles and ecosystem functioning (e.g. catch limits that ensure species' abundance is maintained at sufficient levels to provide food to predators) and effective spatial management is used to protect spawning and foraging areas, and prevent localized depletion. Or it has been scientifically demonstrated that fishing practices do not have negative ecological effects.*
- *4 — Policies are in place to protect species' ecological roles and ecosystem functioning but have not proven to be effective and at least some spatial management is used.*
- *3 — Policies are not in place to protect species' ecological roles and ecosystem functioning but detrimental food web impacts are not likely or policies in place may not be sufficient to protect species' ecological roles and ecosystem functioning.*
- *2 — Policies are not in place to protect species' ecological roles and ecosystem functioning and the likelihood of detrimental food impacts are likely (e.g. trophic cascades, alternate stable states, etc.), but conclusive scientific evidence is not available for this fishery.*
- *1 — Scientifically demonstrated trophic cascades, alternate stable states or other detrimental food web impact are resulting from this fishery.*

Factor 4.1 - Physical Impact of Fishing Gear on the Habitat/Substrate

Atlantic, Northeast | Portuguese Waters - East (Division 27.9.a) | Purse seines | Portugal | Spain
Bay of Biscay | Atlantic, Northeast | Bay of Biscay - South (Division 27.8.c) | Handlines and hand-operated pole-and-lines | Spain
Bay of Biscay | Atlantic, Northeast | Bay of Biscay - South (Division 27.8.c) | Purse seines | Spain | Mackerel target
Bay of Biscay | Atlantic, Northeast | Bay of Biscay - North (Division 27.8.a) | Purse seines | France
Bay of Biscay | Atlantic, Northeast | Bay of Biscay - Central (Division 27.8.b) | Purse seines | Spain | Anchovy target
Bay of Biscay | Atlantic, Northeast | Bay of Biscay - South (Division 27.8.c) | Purse seines | Spain | Anchovy target
Bay of Biscay | Atlantic, Northeast | Bay of Biscay - Central (Division 27.8.b) | Purse seines | France
Bay of Biscay | Atlantic, Northeast | Bay of Biscay - South (Division 27.8.c) | Purse seines | Spain | Sardine target
Bay of Biscay | Atlantic, Northeast | Bay of Biscay - Central (Division 27.8.b) | Purse seines | Spain | Sardine target

Score: 4

The target species are pelagic fish which are commonly caught by purse seine and hook and line at or near the surface at depths between 0 m and 100 m (ICES 2021a). Therefore, these fishing gears rarely contacts the seabed and the benthic communities. The default score for gears that do not contacts the seafloor is 5. Since this fishery occasionally contacts the seabed, it scores 4 for this factor.

Factor 4.2 - Modifying Factor: Mitigation of Gear Impacts

Atlantic, Northeast | Portuguese Waters - East (Division 27.9.a) | Purse seines | Portugal | Spain
Bay of Biscay | Atlantic, Northeast | Bay of Biscay - South (Division 27.8.c) | Handlines and hand-operated pole-and-lines | Spain
Bay of Biscay | Atlantic, Northeast | Bay of Biscay - South (Division 27.8.c) | Purse seines | Spain | Mackerel target
Bay of Biscay | Atlantic, Northeast | Bay of Biscay - North (Division 27.8.a) | Purse seines | France
Bay of Biscay | Atlantic, Northeast | Bay of Biscay - Central (Division 27.8.b) | Purse seines | Spain | Anchovy target
Bay of Biscay | Atlantic, Northeast | Bay of Biscay - South (Division 27.8.c) | Purse seines | Spain | Anchovy target
Bay of Biscay | Atlantic, Northeast | Bay of Biscay - Central (Division 27.8.b) | Purse seines | France
Bay of Biscay | Atlantic, Northeast | Bay of Biscay - South (Division 27.8.c) | Purse seines | Spain | Sardine target
Bay of Biscay | Atlantic, Northeast | Bay of Biscay - Central (Division 27.8.b) | Purse seines | Spain | Sardine target

Score: 0
As indicated in Factor 4.1, purse seines and hook and line fisheries that capture small pelagic species rarely come in contact with the bottom, and according to the SFW standard v4, mitigation techniques are not required.

Factor 4.3 - Ecosystem-based Fisheries Management

Atlantic, Northeast | Portuguese Waters - East (Division 27.9.a) | Purse seines | Portugal | Spain

High Concern
Harvest Control Rules, when present, are based on a single-species approach. ICES considers ecosystem impacts from fisheries through the lens of bottom contact and bycatch of species (ICES 2021a). A more precautionary approach that accounts for the ecological role of target species is an important aspect of ecosystem-based fisheries management.

This factor would score moderate concern in the Portuguese continental shelf ecosystem based on the above, but European pilchard is considered a key forage species in this ecosystem (see Criterion 1 summary). In these cases, additional precaution in setting catch limits is necessary to protect the role of the species in the ecosystem. The Lenfest Forage Fish Task Force (LFFTF) recommendations for forage fisheries followed by the SFW standard indicates that, in fisheries with an intermediate level of information (fisheries in which population abundance, status, and trends are monitored; environmental drivers of forage fish productivity are identified; and there is some monitoring and enforcement in the fishery), such as the Moroccan fishery, the application of a "hockey stick" harvest control rule with minimum biomass (B_{LIM}) ≥ 40% B_0 and fishing (F) not to exceed 50% of the natural mortality rate or 50% of the level that achieves MSY (F_{MSY}) is recommended (Pikitch et al. 2012). Because the fishery in Portuguese waters does not have reference points and/or a harvest strategy that is in line with the LFFTF recommendations, this factor is scored a high concern.

Bay of Biscay | Atlantic, Northeast | Bay of Biscay - South (Division 27.8.c) | Handlines and hand-operated pole-and-lines | Spain
Bay of Biscay | Atlantic, Northeast | Bay of Biscay - South (Division 27.8.c) | Purse seines | Spain | Mackerel target
Bay of Biscay | Atlantic, Northeast | Bay of Biscay - North (Division 27.8.a) | Purse seines | France
Bay of Biscay | Atlantic, Northeast | Bay of Biscay - Central (Division 27.8.b) | Purse seines | Spain | Anchovy target
Bay of Biscay | Atlantic, Northeast | Bay of Biscay - South (Division 27.8.c) | Purse seines | Spain | Anchovy target
Bay of Biscay | Atlantic, Northeast | Bay of Biscay - Central (Division 27.8.b) | Purse seines | France
Bay of Biscay | Atlantic, Northeast | Bay of Biscay - South (Division 27.8.c) | Purse seines | Spain | Sardine target
Bay of Biscay | Atlantic, Northeast | Bay of Biscay - Central (Division 27.8.b) | Purse seines | Spain | Sardine target

Moderate Concern

Harvest Control Rules, when present, are based on a single-species approach. ICES considers ecosystem impacts from fisheries through the lens of bottom contact and bycatch of species (ICES 2021a). A more precautionary approach that accounts for the ecological role of target species is an important aspect of ecosystem-based fisheries management. Thus, this factor is considered a moderate concern in the Bay of Biscay.

This factor would also score moderate concern in the Portuguese continental shelf ecosystem based on the above, but European pilchard is considered a key forage species in this ecosystem (see Criterion 1 summary). In these cases, additional precaution in setting catch limits is necessary to protect the role of the species in the ecosystem. The Lenfest Forage Fish Task Force (LFFTF) recommendations for forage fisheries followed by the SFW standard indicates that, in fisheries with an intermediate level of information (fisheries in which population abundance, status, and trends are monitored; environmental drivers of forage fish productivity are identified; and there is some monitoring and enforcement in the fishery), such as the Moroccan fishery, the application of a "hockey stick" harvest control rule with minimum biomass (B_{LIM}) ≥ 40% B_0 and fishing (F) not to exceed 50% of the natural mortality rate or 50% of the level that achieves MSY (F_{MSY}) is recommended (Pikitch et al. 2012). Because the fishery in Portuguese waters does not have reference points and/or a harvest strategy that is in line with the LFFTF recommendations, this factor is scored a high concern.

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Scientific review does not constitute an endorsement of the Seafood Watch® program, or its seafood recommendations, on the part of the reviewing scientists. Seafood Watch® is solely responsible for the conclusions reached in this report.

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Appendix A: Forage Species Determination

Version 4 of the Seafood Watch Standard for Fisheries (Seafood Watch 2020) updated requirements around 'forage species' thus (Seafood Watch 2020a):

- Criterion 1: Acknowledges the high level of uncertainty associated with static reference points and lower the score where B>Bmsy for forage species (relative to non-forage species). Specifically, static reference points with stationary parameters such as unfished biomass and B_0 are not considered to meet this requirement for forage species, due to those species' dynamic productivity that shifts in response to environmental conditions.
- Criterion 3: Requires adaptive and flexible management to account for environmental driven biomass and fluctuating populations (not just for forage species).
- Criterion 4: Requires a greater understanding of forage species role in the ecosystem to get a moderate concern or better. Addition of a critical score for when there is evidence of fisheries impacting the ecosystem e.g. trophic cascades

According to the glossary to the Version 4 of the Seafood Watch Standard for Fisheries (Seafood Watch 2020):

"Forage species play an important role in food webs because they 1) exhibit high connectance to other organisms in the ecosystem and 2) a large amount of energy is channeled through that species. Forage species typically exhibit highly variable productivity, such that there may be high uncertainty in their reference points, making it difficult to evaluate their stock status. The drivers of this variability in productivity may be environmental forcing and/or other factors. As a result of their importance in food webs these stocks require management that is tailored to their specific life histories and ecological roles. Species that generally qualify as forage species include sandeels, sandlances, herrings, menhaden, pilchards, sardines, sprats, anchovies, krill, lanternfish, smelts, capelin, mackerels, silversides, sand smelts, Norway pout (adapted from MSC Fisheries Standard V2.01, p. 14). Other species or stocks may qualify if they meet the definition above."

In order to determine whether a species within a particular ecosystem is defined as a 'forage species,' it must fulfill both of the criteria in the glossary term: 1) exhibits high connectance and 2) serves as a channel for a large amount of energy. To identify their potential key role, a forthcoming white paper commissioned by Seafood Watch computed three indices using data and food webs applied to existing static ecosystem models. The connectance index and the SUpportive Role to Fishery ecosystems (SURF) index were calculated from mass-balanced models and an energy index from energy-balanced models. Excerpts from that study are presented below. The supporting data are available upon request.

Bay of Biscay

The model area as considered in the food web model for the Bay of Biscay (Corrales et al 2022), ranged from Brest (Brittany, France) in the north to Cabo de Finisterre (Galicia, Spain) in the south (Fig. A1). The area included the continental shelf and upper slope, between 0 and 1000 m isobaths, and had a total area size of 120,433 km2 (Fig. A1). Its latitudinal limits are well-defined due to its geomorphological, oceanographic, and biological characteristics (Valdes and Lavin 2002)(Borja et al 2019). The modelled area included coastal waters which are important feeding and nursing habitats for many species. The model

represented the mean ecosystem functioning from 2000 to 2003, for which more reliable and available data existed.

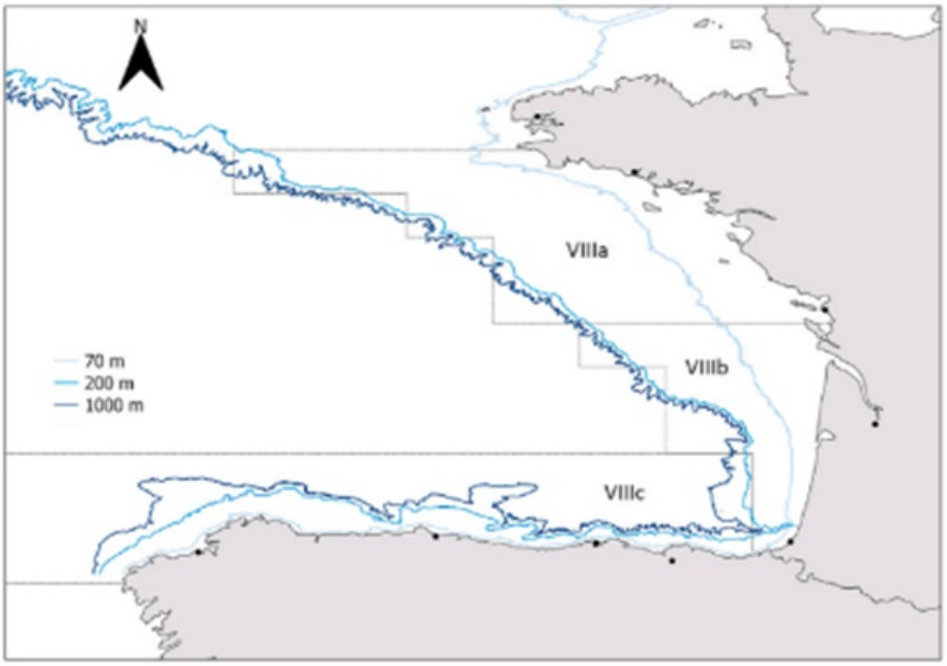

Figure A1: The model area of the Bay of Biscay (grey lines) in the northeast Atlantic between France and Spain as considered in the food web model by Corrales et al 2022. Depth contours and ICES divisions (VIIIa,b, and c) are also indicated. Image copied from Corrales et al. (2022)

Portuguese coast

The northeast Atlantic food web model developed by (Veiga-Malta et al 2019) included the Portuguese continental shelf ecosystem with a surface area of approximately 22,000 km2 between 36.5° and 42° N and between 10.5° and 7.5° W and depths between 30 and 200 m (Fig. A2). The width of the continental shelf varies between approximately 5 and 70 km with an average of 45 km (Fig. A2). The model was used to study the continental shelf ecosystem between 2006 and 2009.

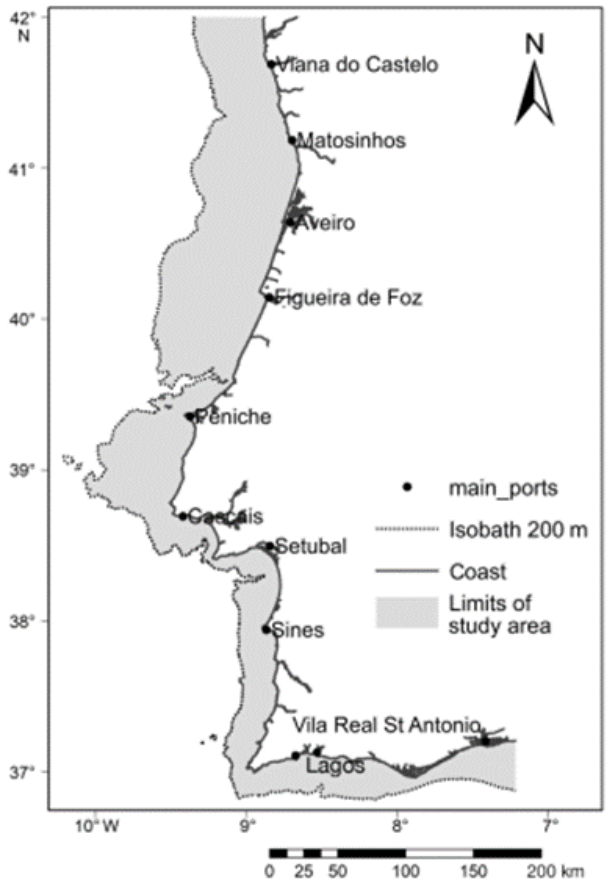

Figure 10: The model area off the Portuguese continental coast as considered for the food web model developed by Veiga-Malta et al. (2019) in grey. Image copied from Veiga-Malta et al. (2019).

Results

European pilchard/sardine off the Portuguese Coast is considered to meet the criteria for a forage species.

* The high occurrence of species' keyness according to the connectance index is due to the fact that this index is affected by species aggregation in general, whilst SURF is mainly affected by aggregation of forage species (Plaganyi and Essington 2014)(Plagányi and Essington, 2014). The SURF index is used here to determine whether a species meets the connectance requirement.

Ecosystem model	Model group name	Scientific name	Connectance*	SURF	Energy
Bay of Biscay	Sardine	*Sardina pilchardus*	KEY		KEY
	Anchovy	*Engraulis encrasicolus*	KEY		
	Mackerel	*Scomber colias, S. scombrus*	KEY		
Portuguese Coast	Sardine	*Sardina pilchardus*	KEY	KEY	KEY

	Anchovy	*Engraulis encrasicolus*	KEY		
	Mackerel	*Scomber scombrus*	KEY		
	Chub mackerel	*Scomber colias*	KEY		