

## 3.2 Azores ecoregion – Fisheries overview

### Table of contents

Executive summary .....	1
Introduction.....	1
Who is fishing .....	2
Catches over time.....	3
Description of the fisheries.....	5
Fisheries management .....	8
Management plans.....	9
Status of the fishery resources .....	9
Mixed fisheries .....	9
Species interactions.....	10
Effects of fisheries on the ecosystem .....	10
Sources and references .....	11
Annex.....	13

### Executive summary

The majority of the fisheries in the Azores ecoregion are targeted by Azorean vessels. Only a small proportion of catch is taken by surface longliners from mainland Portugal and Spain targeting swordfish and blue shark. The fisheries are classified as small scale, because around 60% of the vessels are less than nine metres in length and target many different species. The most important targets are tuna and tuna-like species, deep-water demersal species, and small pelagic species. The most important fishing methods are handline and bottom longline, followed by pole and line (bait boats). Surface longline is also used but mainly by non-regional vessels that operate outside a 100 nautical mile area. The Azores Exclusive Economic Zone (EEZ) is recognized as a no-take area for nets (including a trawl ban) excluding a few small coastal gillnets and purse-seiners for small pelagics.

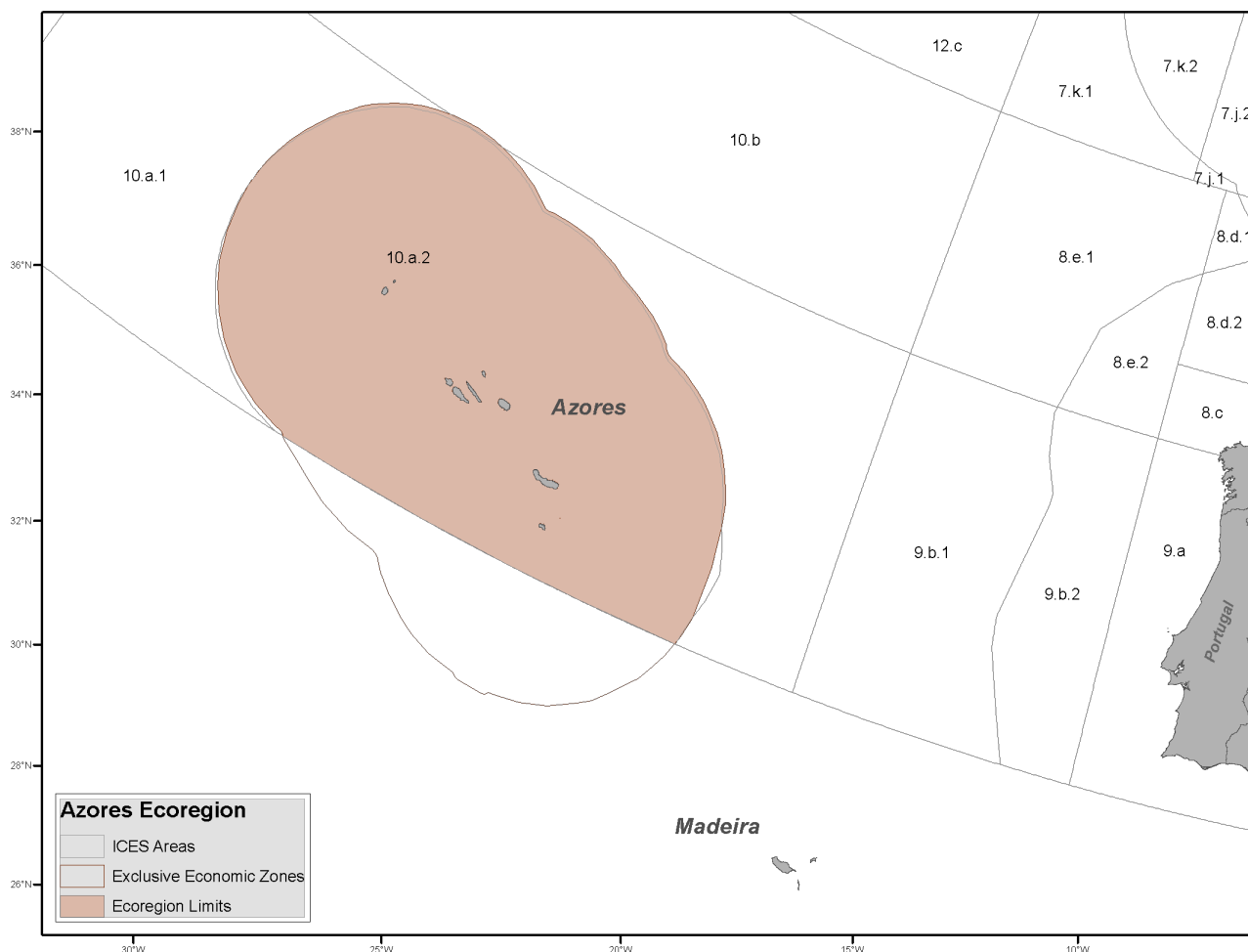
Fisheries in the ecoregion are managed under the EU Common Fisheries Policy (CFP), with some fisheries managed by the North East Atlantic Fisheries Commission (NEAFC), the International Commission for the Conservation of Atlantic Tunas (ICCAT), and national Portugal and regional Azores governments.

The status of the 12 stocks in this ecoregion assessed by ICES remain unknown. These stocks are considered as data limited and are managed following the precautionary approach (category 3–5 stocks).

### Introduction

For this overview, the Azores ecoregion corresponds to the Azores EEZ inside ICES Subarea 10 (Figure 1). The ecoregion lies within a much larger open ocean ecosystem, and straddles the Mid-Atlantic Ridge (MAR). The Azores is a Portuguese archipelago composed of nine islands with almost no geological continental shelf, and the Azores EEZ includes 461 identified seamounts.

This overview covers ICES Subdivision 27.10.a.2 (Figure 1). Vessel monitoring system (VMS) data are available for static gears only as there is no bottom trawling in this ecoregion.



**Figure 1** The Azores ecoregion (highlighted in brown) and ICES statistical areas.

## Who is fishing

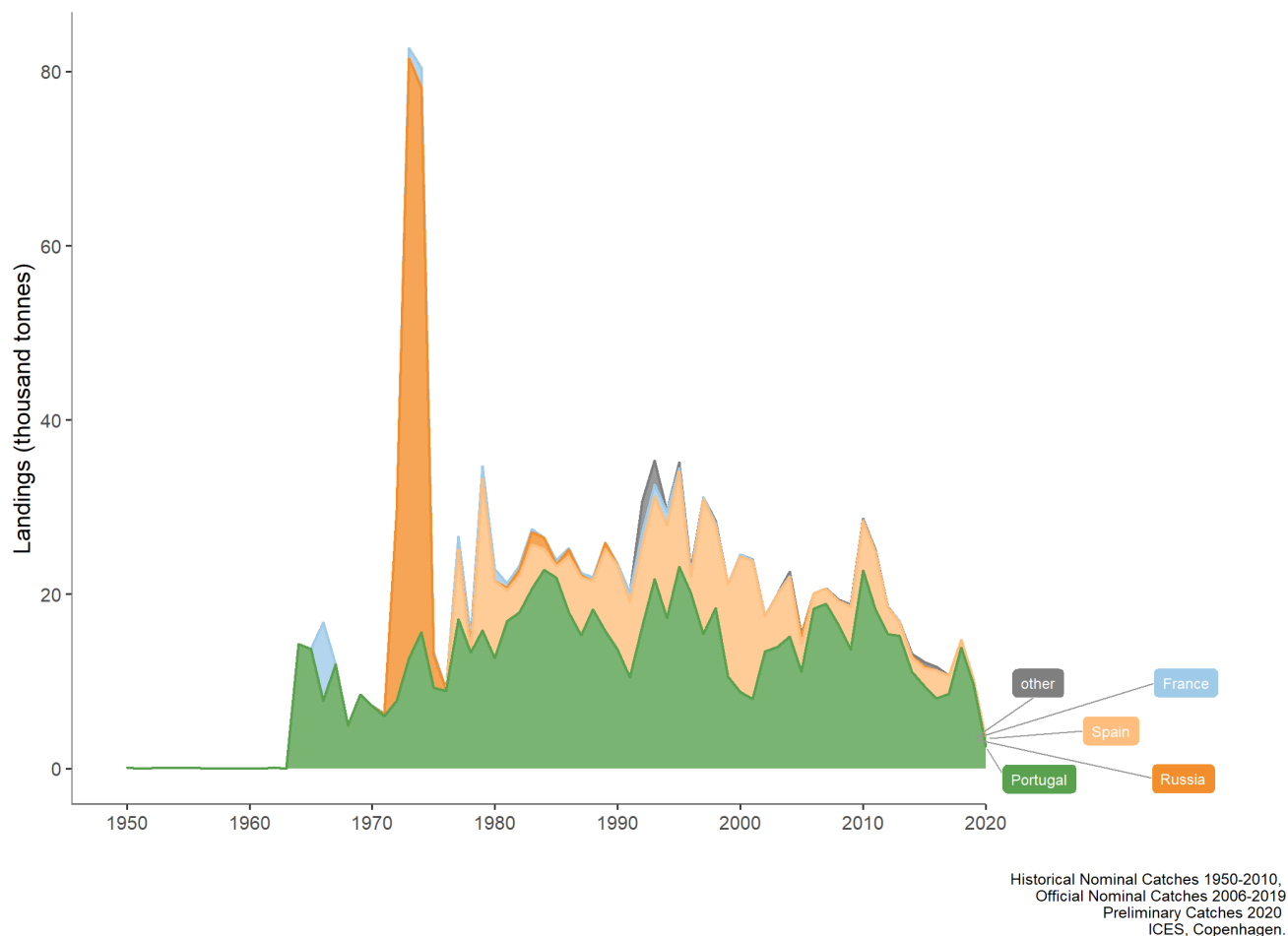
Portugal and Spain are currently the main countries fishing in the Azores ecoregion. France, the United Kingdom, and Faroe Islands also fish but take lesser amounts. The Russian fleet was fishing in the ecoregion until the early 1980s.

### Portugal

The Portuguese fleet operating in the ecoregion is currently composed of around 600 vessels. Most of these have a length of less than 12 m, and they are typically licensed to use several different gear types around the archipelago and seamounts to target pelagic (small pelagics and tuna) and demersal deep-water species (such as blackspot seabream (sbr.27.10), alfonosinos (alf.27.nea), and Atlantic wreckfish (Santos *et al.*, 2019, 2020a). There is also a longline surface fishery targeting swordfish and blue shark. .

### Spain

Spain has historically been fishing in the ecoregion and currently has around ten vessels that use surface longline to target swordfish and blue shark inside the Azores EEZ.

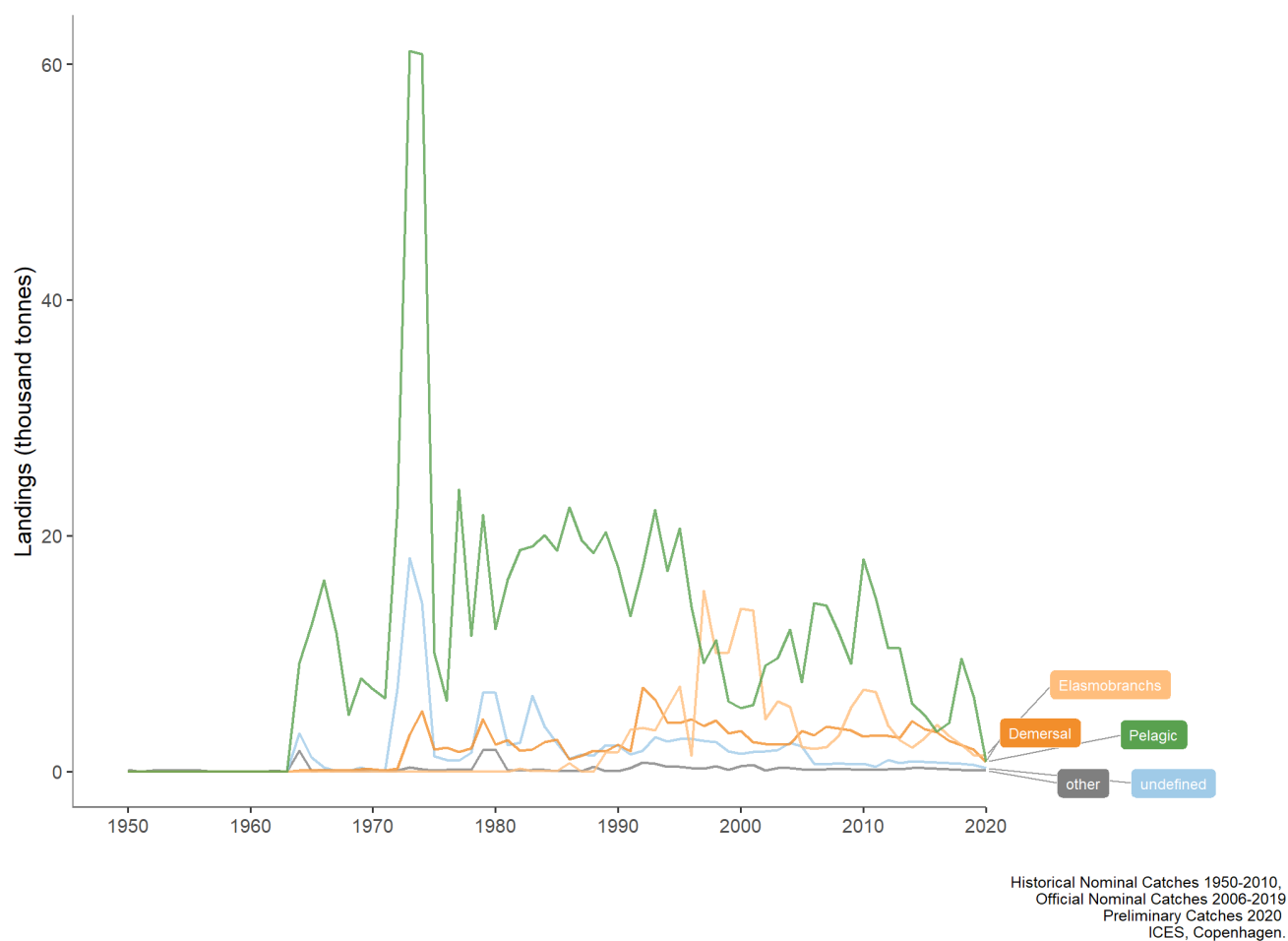


**Figure 2** Landings (thousand tonnes) from the Azores ecoregion 1950–2020, by country. The four countries with the highest landings are displayed separately; the remaining countries are aggregated and displayed as “other”.

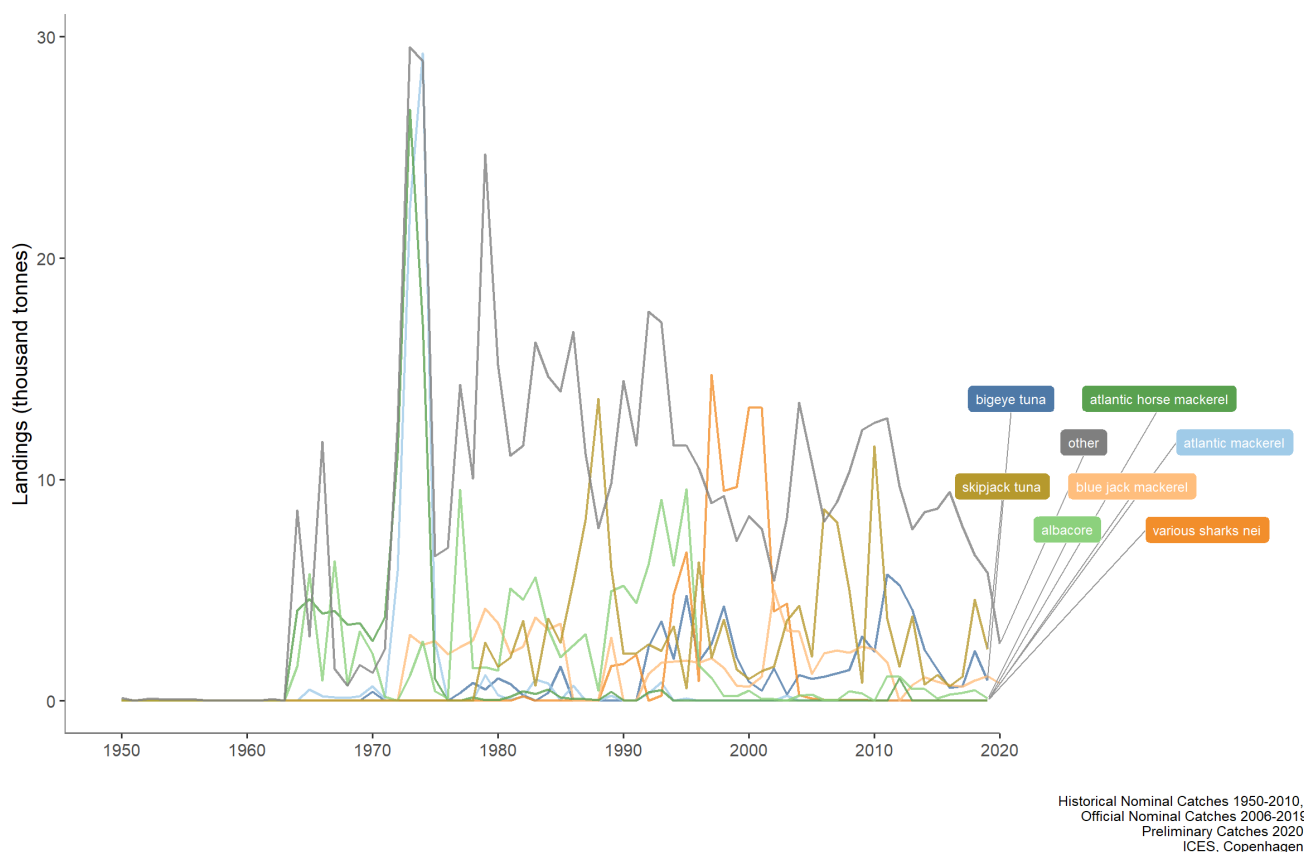
### Catches over time

Landings in the Azores ecoregion showed an increasing trend from the 1960s to the late 1990s. During the 1970s landings peaked at over 80 000 tonnes as a result of Russian fishing activity. This was followed by an abrupt decrease in the early 1980s. From the 1980s to the early 1990s landings increased again to close to 40 000 tonnes and have since decreased to 10 000 tonnes (Figure 2). Total landings comprise pelagic, demersal, and benthic species, including crustacean and elasmobranch species, with pelagic fisheries contributing the highest proportion. Other species not assigned to any of these groups are combined in a very large "Undefined" category (Figure 3). The four top species in terms of numbers landed are: blue jack mackerel (jaa.27.10a2), skipjack tuna, bigeye tuna, and albacore,

As the highest proportion of the landings comprises large pelagic and deep-water demersal species, it follows that purse-seine targeting blue jack mackerel and bait boats targeting tuna produce the highest landings, followed by static gears used to catch demersal species in the deep waters around the islands.



**Figure 3** Landings (thousand tonnes) from the Azores ecoregion 1950–2020, by fish category. Table A2 in the Annex details which species belong to each fish category.



**Figure 4** Landings (thousand tonnes) from the Azores ecoregion 1950–2020, by species.

## Discards

Discard estimates are available in the ecoregion for all years since 1950 (Pham *et al.*, 2013; Fauconnet *et al.*, 2019). Discard rates are generally low (less than 20% by weight), particularly in pelagic fisheries.. Discard estimates for elasmobranchs are highly uncertain.

## Description of the fisheries

Fishing in the Azores ecoregion occurs mostly around the island slopes and the numerous surrounding offshore seamounts. This represents less than 1% of the total area that can potentially be fished to a depth of 1000 metres (Figure 5). The surface longline fishery from Spain and mainland Portugal occurs in offshore areas (beyond 100 nautical miles from the islands; Figure 6).

### Bottom longline and handline (hooks and lines)

The bottom hook and line fishery targeting deep-water and demersal species is the main fishery in the ecoregion in terms of landed value of catches, number of boats, and jobs. It is a small-scale fishery operating all year round from coastal areas to offshore seamounts. Total landings from the commercial bottom fisheries constitute on average 40% of all landed weight in the Azores. Bottom fisheries are also by far the most valuable, representing about 75% of all landed value.

Many different types of longlines and handlines are used (Menezes, 2003). The artisanal fleet operates mainly during the summer months, with fishing trips lasting for a day or week at most. The large-scale fleet operates all year round, with fishing trips lasting up to a month. This fishery targets mostly deep-water demersal fish such as blackspot seabream, Atlantic wreckfish, alfonsinos, and the blackbelly rosefish (Santos *et al.*, 2019).

### **Drifting pelagic longline**

The American surface longline is the most common gear used in the Azores. Large vessels usually fish for about a month (can be up to three months). Fishing occurs year-round, but the effort is highest between January and June. The pelagic longline fishery targets swordfish and blue shark (Vandeperre *et al.*, 2020).

### **Drifting deep-water longline**

The drifting deep-water longline fishery targets black scabbardfish (bsf.27.nea [Machete *et al.*, 2011]).

### **The pole and line tuna fishery**

The tuna fishery is concentrated mainly around the central and eastern parts of the archipelago, as well as around offshore seamounts (Silva *et al.*, 2002; Dâmaso, 2007; Morato *et al.*, 2008). All tuna fishing vessels operate with pole and line using live bait and water spray. The fishery usually lasts from April to October (Silva *et al.*, 2002) with high interannual variability.

### **Small pelagic fisheries**

A small coastal purse-seine fleet catches small pelagic fish, mostly blue jack mackerel and chub mackerel (Santos *et al.*, 2020a). Fishing operations occur mostly during the night using lights (Vasconcelos *et al.*, 2006). This fishery operates only around the islands of São Miguel and Terceira.

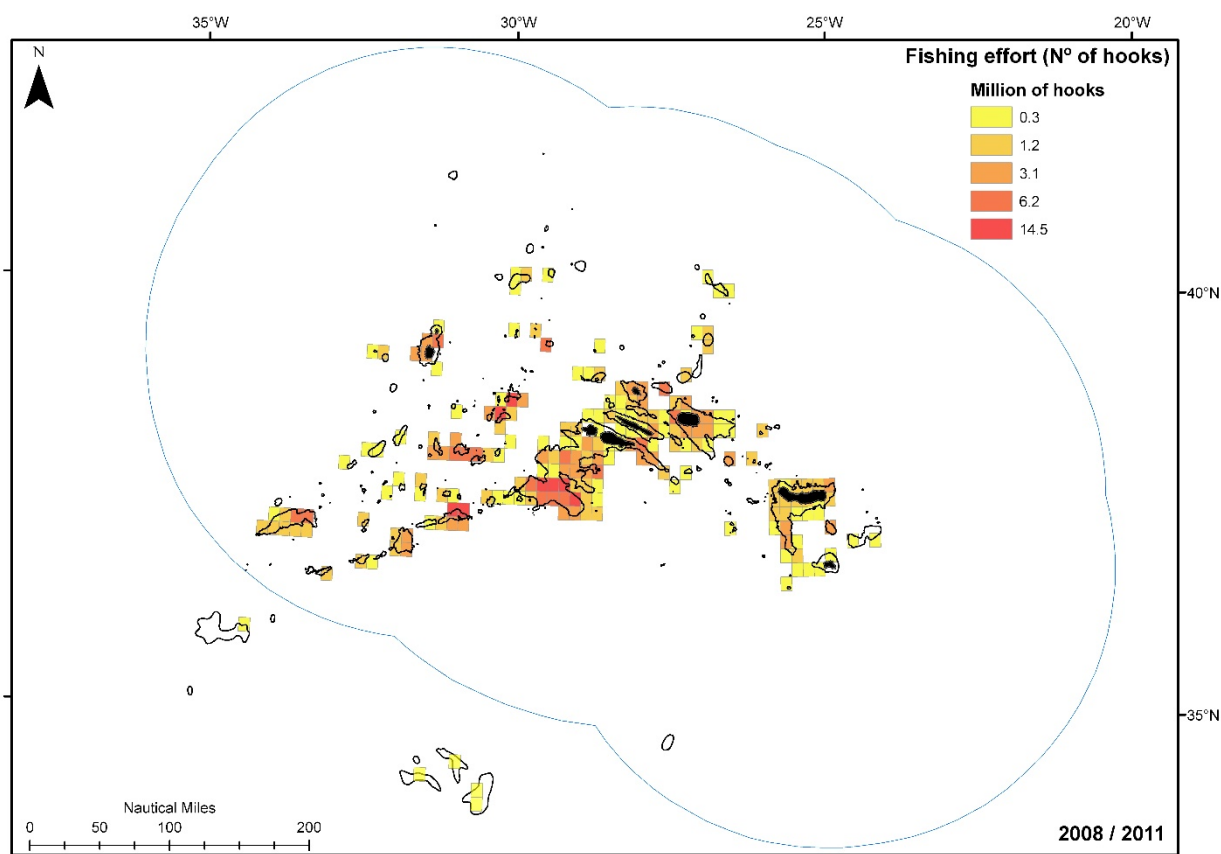
### **Coastal fisheries**

Traps and coastal net fisheries are a small component of the artisanal fisheries. The species most commonly fished by traps are crustaceans (crabs) and by net fisheries are parrotfish, grey mullet, Atlantic bonito, yellowmouth barracuda, pompano, white seabream and salema.

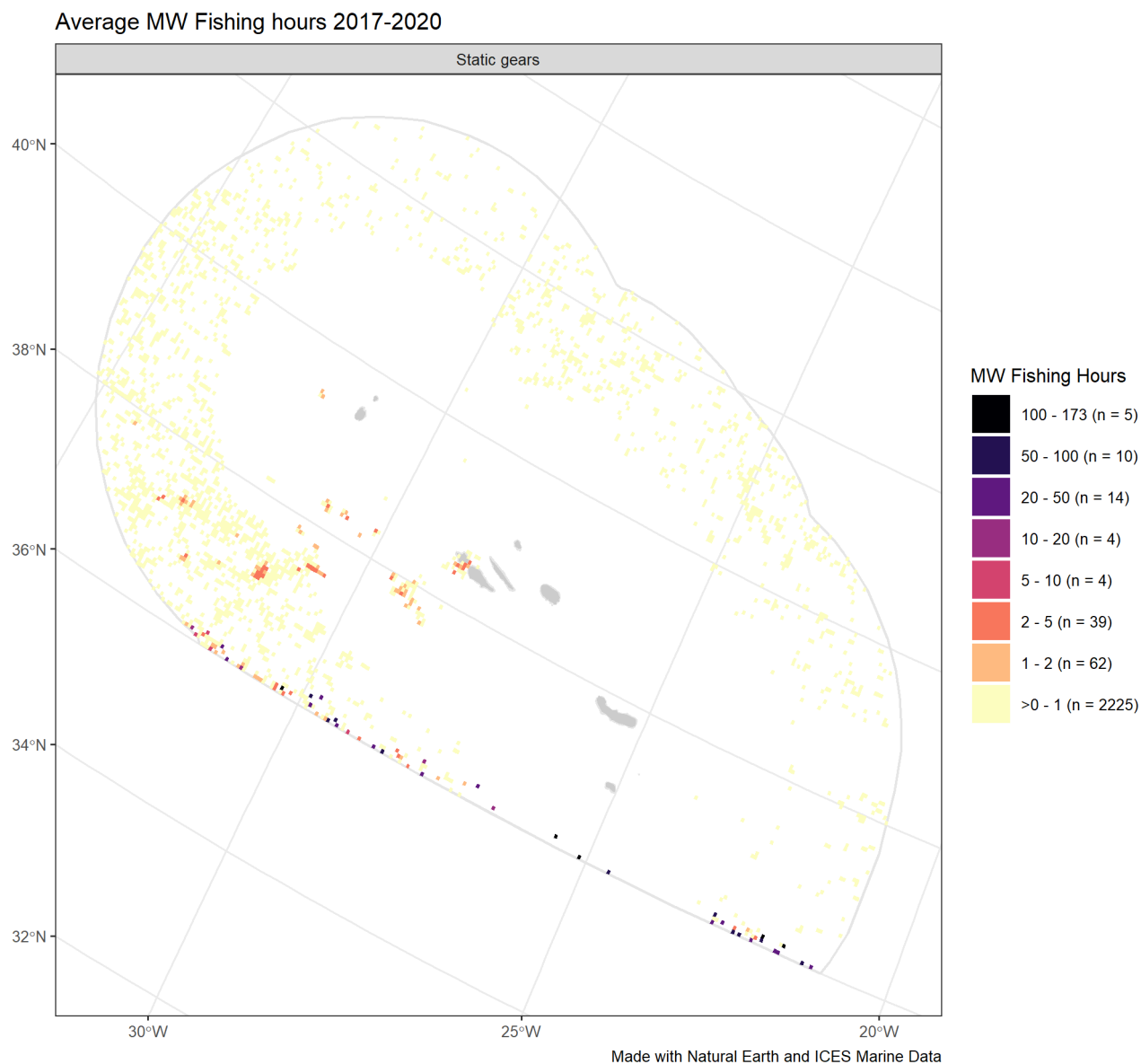
Invertebrates such as limpets and octopus are also harvested by licensed collectors, while a specific handline fishery with lures targets veined squid (Santos *et al.*, 2020a)

### **Recreational fishing**

The main recreational fishing methods in the Azores are spear fishing, boat fishing, rod fishing from shore, and hand collecting (Diogo, 2007). The most important species are white seabream, blacktail comber, chub mackerel, and parrotfish (Santos *et al.*, 2020a). Atlantic blue marlin is an important species in terms of recreational fishing in the tourism sector.



**Figure 5** Spatial distribution of average fishing effort (number of hooks) of demersal/deep-water mixed hook and line fisheries in the Azores ecoregion 2008–2011. Black markings show islands; colours represent the proportional fishing effort (habitat until 700 m depth). The blue line indicates the Azores Exclusive Economic Zone (EEZ). Data are from the EU Data Collection Framework (DCF) port inquiries.



**Figure 6** Spatial distribution of average annual fishing effort (MW fishing hours) in the Azores ecoregion 2017–2020, by gear type. Fishing effort data are only shown for vessels > 12 m that also have vessel monitoring systems (VMS).

## Fisheries management

Fisheries in the Azores ecoregion are managed under the EU Common Fisheries Policy (CFP), with some managed by the North East Atlantic Fisheries Commission (NEAFC), the International Commission for the Conservation of Atlantic Tunas (ICCAT), and the regional government of the Azores. Fisheries advice is provided by the International Council for the Exploration of the Sea (ICES), the European Commission's Scientific Technical and Economic Committee for Fisheries (STEFCF), the South West Waters Advisory Council (SWWAC), and the Long Distance Advisory Council (LDAC). For large pelagic fish (tuna and tuna-like species) fisheries advice is provided by ICCAT. Whaling is managed by the International Whaling Commission (IWC).

Under the CFP, TACs were introduced for some stocks, such as blackspot seabream, black scabbardfish, and deep-water sharks. TACs were also introduced by the regional government of the Azores for some other stocks such as Greater forkbeard, island grouper, blackbelly rosefish, offshore rockfish, conger eel, common mora, and wreckfish. In addition, several local technical measures are in place to regulate the fisheries.



Fishing with bottom trawls is forbidden in the Azores EEZ. A demarcation of 100 nautical miles limiting fishing for deep-water species to vessels registered in the Azores was created in 2003 under the CFP's management of fishing effort.

There are 35 coastal and 15 offshore marine protected areas (MPAs) as well as 12 coastal and one offshore areas closed to fishing, all of which have been established to prevent overexploitation of resources. Most of these only allow sustainable fishing or function as no-take areas under different management regimes.

A NEAFC regulation exists for deep-sea fisheries in the NEAFC regulatory area. Among other effort regulations, the use of gillnets is prohibited beyond the depth of 200 m. Also, specific measures, including the TAC, were introduced for grenadiers, orange roughy, blue ling, and deep-water sharks. In 2015, the fishery for orange roughy was closed; the directed fishery for deep-water sharks has been prohibited.

### Management plans

There are no management plans defined for this area.

### Status of the fishery resources

With the exception of blackspot seabream in Subarea 10 and blue jack mackerel in Subdivision 10.a.2 (Table A3), the stocks exploited in the Azores ecoregion are defined as parts of Northeast Atlantic stock units.

In 2019 ICES provided catch advice for 12 stocks in the ecoregion. The majority of the species are deep-water, encompassing four demersal, seven elasmobranch, and two pelagic stocks. All stocks are considered data-limited stocks (category 3–5 stocks) and the fisheries are managed according to the precautionary approach. The state of these stocks is unknown because no reference points have yet been defined.

### Mixed fisheries

This section gives an overview of the mixed fisheries in the Azores ecoregion.

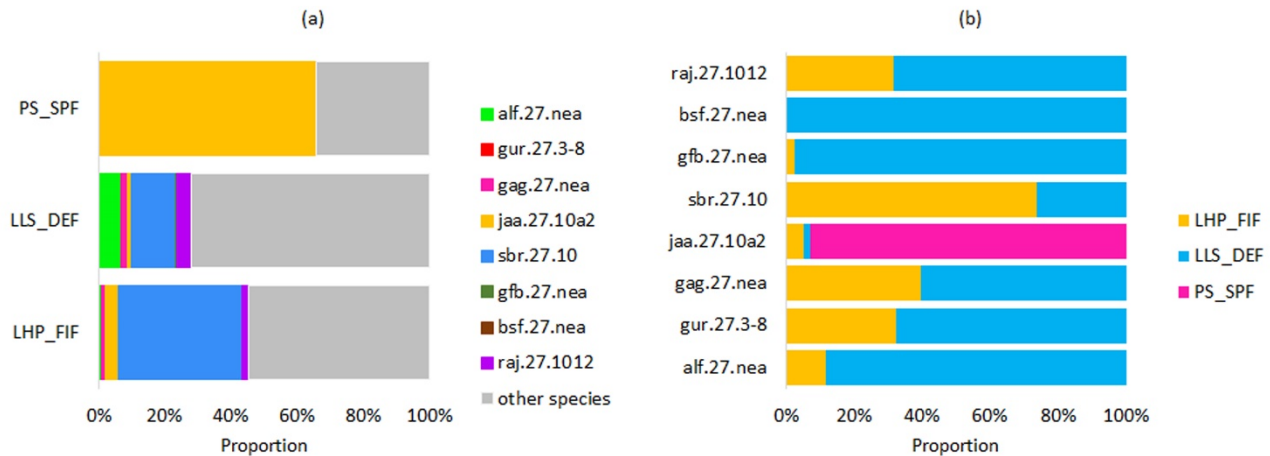
Fishing gear operations that harvest multiple types of fish simultaneously are defined as mixed fisheries. However, some can be more selective than others. For example, pole and line catches are composed mainly of the targeted species and lower amounts of bycatch, while demersal longlines and handlines all usually catch a wide spectrum of species in a single fishing event.

Data on catch and fishing effort from the Azorean fisheries are collected under the EU Data Collection Framework (DCF). Mean nominal catches were calculated for stocks that occur in the Azores EEZ, both those assessed by ICES and those that are not, and for which some information was available. Mean catches by stock for the 2015–2017 period were aggregated by métier. Métier classification was based on the fishing operation and target assemblage (data obtained from interviews). Métier definitions are described in Table A4.

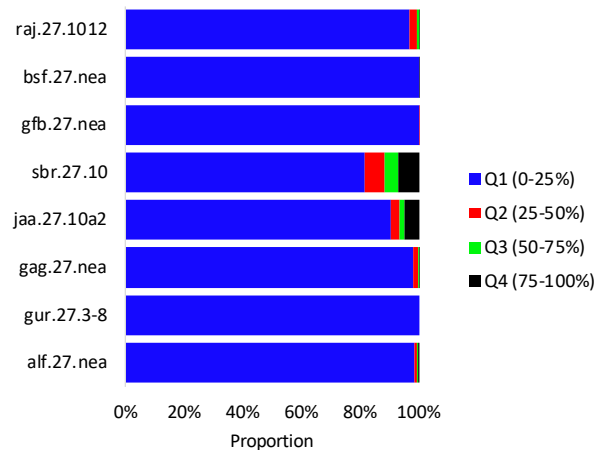
Catches were available for eight fish stocks exploited by the Azorean fleet and assessed by ICES: greater forkbeard (gfb.27.nea), black scabbardfish (bsf.27.nea), tope (gag.27.nea), blue jack mackerel, rays and skates (raj.27.1012), blackspot seabream, alfonsinos, and red gurnard (gur.27.3-8); Table A3. Blue jack mackerel is for instance the main landed species in the purse-seine fishery regardless of other catches in other métiers (Figure 7a). Blackspot seabream is caught in the longline and handline fisheries targeting that species (Figure 7b).

Figure 8 illustrates stock composition by individual fishing events considering all gears combined in the Azores. Some fishing activity can be seen directed at blue jack mackerel and blackspot seabream (i.e. catches of these stocks represent 50% or more of the total catch in a fishing event). However, most of the stocks were caught in fishing events where they constitute less than 25% of the total catch. This result highlights the multispecificity of the Azorean fisheries (Santos *et al.*, 2019, 2020a, 2021).

Fisheries in this area are mixed; this often results in restrictive quotas leading to changes in fishing patterns and discarding.



**Figure 7** Description of technical interactions in the Azores ecoregion (ICES Subdivision 10.a.2). The left panel (a) shows the stock composition by métiers of the Azorean fleet operating in Azorean waters. The right panel (b) shows the proportion of the catch of each stock accounted for by the different métiers. See Table A4 for métier definitions, and Table A2 for stock definitions. Data are obtained from DCF inquiries (2015–2017) of the Azorean fleet.



**Figure 8** Description of technical interactions in the Azores ecoregion (ICES Subdivision 10.a.2) caught with purse-seines, hooks and lines, gillnets, and static gears (all gears combined). The panel shows the proportion of a stock out of the total catch in a single fishing event (Q1:  $\leq 25\%$  of the total catch of a stock, Q2: 25–50%, Q3: 50–75%, and Q4:  $\geq 75\%$ ). See Table A2 for stock definitions.

## Species interactions

Commercially-exploited species of fish, invertebrates, and mammals are part of the marine food web and interact in various ways, including through predation and competition. The interactions between the different species in the ecoregion are rather complex, resulting in multiple interactions and impacts of the different fisheries on the different species in the ecoregion, and vice versa. The main top predators identified are toothed whales and the conger eel.

## Effects of fisheries on the ecosystem

Deep-water sharks are taken as bycatch in the bottom longline fishery and drifting longline fishery (Machete *et al.*, 2011; Ramos *et al.*, 2013), accounting for a respective 4.9% and 15.2% of the total catch of those fisheries (Fauconnet *et al.*, 2019). Many of those species are under fishing prohibition under EU regulations (EC 2025/2018), and several are listed as threatened under the IUCN Red List of Threatened species (Nieto *et al.*, 2015).

In the pelagic longline fisheries, catches of sharks are very high. These are composed mainly of blue sharks and shortfin mako, although bycatch of this fishery can also occasionally include species under fishing prohibition such as bigeye

thresher (*thr.27.nea*) and smooth hammerhead sharks, as well as the protected loggerhead turtles (Pham *et al.*, 2013; Fauconnet *et al.*, 2019). Bycatch rates in 2018 ranged from 0.003 to 0.006 specimens per monitored days-at-sea for the leatherback sea turtle (ICES, 2020a).

This ecoregion is known as a hotspot for cold-water corals. Mostly medium-sized, three-dimensional, and branched colonies of coral often occur as bycatch in bottom longlining fisheries, with *Leiopathes* spp., *Errina dabneyi*, and *Dendrophyllia* sp. most frequently encountered. Given the high incidence of coral bycatch in bottom longline fisheries around the Azores and the decrease in corals bycatch in traditional fishing grounds, conservation measures may be required (Sampaio *et al.*, 2012).

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## Annex

Supporting data used in the Azores ecoregion Fisheries overview is archived at ICES (2021).

**Table A1** Status summary of the Azores ecoregion stocks in 2021, in regards to the ICES maximum sustainable yield (MSY) approach and precautionary approach (PA) for stocks within the Bay of Biscay and Iberian Coast ecoregion. Grey represents unknown reference points. For the MSY approach: green represents a stock that is fished below  $F_{MSY}$  or whose size is greater than  $MSY B_{trigger}$ ; red represents a stock status that is fished above  $F_{MSY}$  or whose size is less than  $MSY B_{trigger}$ . For the PA: green represents a stock that is fished below  $F_{pa}$  or whose size is greater than  $B_{pa}$ ; yellow represents a stock that is fished between  $F_{pa}$  and  $F_{lim}$  or whose size is between  $B_{lim}$  and  $B_{pa}$ ; red represents a stock that is fished above  $F_{lim}$  or whose size is less than  $B_{lim}$ . SBL = safe biological limits; MSFD = EU Marine Strategy Framework Directive; D3C1 = MSFD indicator for fishing mortality; D3C2 = MSFD indicator for spawning-stock biomass; GES = good environmental status.

**There are no stocks with reference points in the Azores ecoregion.**

**Table A2** List of stocks in the Azores ecoregion in 2020 that do not have a full set of reference points.

Stock name	Stock description	Latin name	Fisheries guild	Data category	Assessment year	Advice category
<a href="#">alf.27.nea</a>	Alfonsinos in subareas 1–10, 12 and 14	<i>Beryx</i>	Demersal	5.2	2020	PA
<a href="#">bsf.27.nea</a>	Black scabbardfish in subareas 1, 2, 4–8, 10, and 14, and divisions 3.a, 9.a, and 12.b	<i>Aphanopus carbo</i>	Pelagic	3.2	2020	PA
<a href="#">cyo.27.nea</a>	Portuguese dogfish in subareas 1-10, 12 and 14	<i>Centrophorus squamosus</i> , <i>Centroscymnus coelolepis</i>	Elasmobranch	6.3	2019	PA
<a href="#">gfb.27.nea</a>	Greater forkbeard in subareas 1–10, 12 and 14	<i>Phycis blennoides</i>	Demersal	3.2	2020	PA

Stock name	Stock description	Latin name	Fisheries guild	Data category	Assessment year	Advice category
<a href="#">guq.27.nea</a>	Leafscale gulper shark in subareas 1–10, 12 and 14	<i>Centrophorus squamosus</i>	Elasmobranch	6.3	2019	PA
<a href="#">jaa.27.10a2</a>	Blue jack mackerel in Subdivision 10.a.2	<i>Trachurus picturatus</i>	Pelagic	5	2020	PA
<a href="#">por.27.nea</a>	Porbeagle in subareas 1–10, 12 and 14	<i>Lamna nasus</i>	Elasmobranch	6.3	2019	PA
<a href="#">sbr.27.10</a>	Blackspot seabream in Subarea 10	<i>Pagellus bogaraveo</i>	Demersal	3.2	2021	PA
<a href="#">sck.27.nea</a>	Kitefin shark in subareas 1–10, 12, and 14	<i>Dalatias licha</i>	Elasmobranch	6.3	2019	PA

**Table A3** Scientific names of species.

Common name	Species name
Albacore	<i>Thunnus alalunga</i>
Alfonsinos	<i>Beryx</i> spp.
Atlantic bonito	<i>Sarda sarda</i>
Atlantic blue marlin	<i>Makaira nigricans</i>
Atlantic wreckfish	<i>Polyprion americanus</i>
Bigeye thresher	<i>Alopias superciliosus</i>
Bigeye tuna	<i>Thunnus obesus</i>
Black scabbardfish	<i>Aphanopus carbo</i>
Blackbelly rosefish	<i>Helicolenus dactylopterus</i>
Blackspot seabream	<i>Pagellus bogaraveo</i>
Blacktail comber	<i>Serranus atricauda</i>
Blue jack mackerel	<i>Trachurus picturatus</i>
Blue ling	<i>Molva dypterygia</i>
Blue shark	<i>Prionace glauca</i>
Chub mackerel	<i>Scomber japonicus</i>
Coldwater corals	<i>Leiopathes</i> spp., <i>Errina dabneyi</i> , and <i>Dendrophyllia</i> spp.
Common mora	<i>Mora moro</i>
Conger eel	<i>Conger conger</i>
Forkbeard	<i>Phycis phycis</i>
Greater forkbeard	<i>Phycis blennoides</i>
Grenadiers	<i>Marcouridae</i>
Grey mullet	<i>Mugil cephalus</i>
Horse mackerel	<i>Trachurus trachurus</i>
Island grouper	<i>Mycteroperca fusca</i>
Leatherback sea turtle	<i>Dermochelys coriacea</i>
Limpet	<i>Patella vulgata</i>
Loggerhead turtle	<i>Caretta caretta</i>
Octopus	<i>Octopus vulgaris</i>
Offshore rockfish	<i>Pontinus kuhlii</i>
Orange roughy	<i>Hoplostethus atlanticus</i>
Parrotfish	<i>Sparisoma cretense</i>
Pompano	<i>Trachinotus ovatus</i>
Red gurnard	<i>Chelidonichthys cuculus</i>
Salema	<i>Sarpa salpa</i>
Shortfin mako	<i>Isurus oxyrinchus</i>
Skipjack tuna	<i>Katsuwonus pelamis</i>
Smooth hammerhead shark	<i>Sphyrna zygaena</i>
Swordfish	<i>Xiphias gladius</i>
Tope	<i>Galeorhinus galeus</i>

Common name	Species name
Veined squid	<i>Loligo forbesii</i>
White seabream	<i>Diplodus sargus</i>
Wreckfish	<i>Polyprion americanus</i>
Yellowmouth barracuda	<i>Sphyaena viridensis</i>

**Table A4** Métier categories used in the Azores ecoregion (ICES Subdivision 10.a.2) mixed-fisheries analysis.

Métier label	Gear type	Target assemblage
FPO_CRU	Pots and traps	Crustaceans
GNS_FIF	Gillnets	Coastal demersal and pelagic fish
LHP_CEP	Handlines	Cephalopods – Squids
LHP_FIF	Handlines	Demersal fish
LHP_MPD	Handlines (locally called “corrico”)	Pelagic fish
LHP_LPF	Pole and lines	Pelagic fish
LLD	Drifting longlines	Pelagic and demersal fish
LLS_DEF	Set longlines	Demersal fish
PS_SPF	Purse seines	Small pelagic fish