

2 Stocks and Fisheries of the Oceanic Northeast Atlantic

2.1 Area overviews

Stocks and fisheries of the Oceanic Northeast Atlantic (Mid-Atlantic Ridge and oceanic seamounts and the Azores archipelago). The Mid-Atlantic Ridge (MAR) is the spreading zone between the Eurasian and American plate. The ridge is continually being formed as the two plates spread at a rate of about two cm/year. In the ICES area it extends over 1500 nm from the Iceland to the Azores, crossing the Azores archipelago between the western and central islands groups. The subareas with hard substrata are characterized by a rough bottom topography comprising summits and upper slopes of seamounts and seamount complexes, the central rift valley slopes, and several fracture zones with steep slopes. However, the MAR is mainly sediment-covered and has generally gentle sloping bathymetry, and only about 5% of the lower bathyal area is hard substratum (Niedzielski *et al.* 2013).

The oceanic Northeast Atlantic also has off-ridge seamounts and seamount complexes with summits reaching into fishable depths, e.g. the Altair and Antialtair, and the Josephine Seamount.

The Azorean archipelago of nine islands and many seamounts is a major geomorphological feature spanning the MAR in the southern end of the ICES area.

2.2 Fisheries overview

Two different types of deep-water fisheries occur in the area, i.e. 1) oceanic fisheries with large midwater and bottom trawlers and longliners fishing in the central region and northern parts of the MAR, and 2) longline and handline fisheries inside the Azorean EEZ where trawling is prohibited. The latter fishery is targeted at stocks which may extend south of the ICES area.

This section deals with fisheries on the MAR and in the Azores.

2.2.1 Azores EEZ

The Azores deep-water fishery is a multispecies and multigear fishery. The dynamics of the fishery appears primarily determined by the main target species *Pagellus bogaraveo*. However, others commercially important species are also caught and the target species change seasonally according abundance, species availability, and market demand.

The fishery is relatively small scale in which the small vessels (<12 m; 90% of the total fleet) predominate, using mainly traditional bottom longline and several types of handlines. The ecosystem is a seamount and island slope type with fishing operations occurring in all available areas, from the islands coasts to the multiple seamounts within the Azorean EEZ. The fishery takes place at depths up to 1000 m, catching species from different assemblages, with a mode in the 200–600 m strata which is the intermediate strata where the most commercially important species occur.

2.2.2 Mid-Atlantic Ridge

The Northern MAR is a very extensive area located between Iceland and Azores, and comprises features such as the comparatively shallow Reykjanes Ridge extending from southern Iceland to the Charlie-Gibbs Fracture Zone, as well as prominent seamount complexes such as the Faraday Seamounts just south of that fracture zone. Trawl fisheries started on the MAR in 1973, and more than 40 seamounts have subsequently been explored, fished for shorter or longer periods, and regarded as commercially important in Soviet/Russian assessments (Table 2.7.1). Figure 2.7.1 illustrates subareas of the area beyond national jurisdiction (where the Northeast Atlantic Fisheries Commission regulates fisheries) with depths shallower than 2000 m. These are the subareas within the approximate maximum depth of deep-water fisheries in the ICES area (in reality few fisheries extend deeper than 1500 m).

The basis of the pioneer Soviet deep-water fishery was the discovery of concentrations of round-nose grenadier (*Coryphaenoides rupestris*) on multiple hills along the MAR. Later aggregations of alfonsino (*Beryx splendens*), orange roughy (*Hoplostethus atlanticus*), cardinal fish (*Epigonus telescopus*), tusk (*Brosme brosme*), 'giant' redfish (*Sebastes marinus*) and blue ling (*Molva dypterygia*) were found during multi-nation exploratory and commercial operations in the 1970s–1990s. Trawl and longline fisheries were conducted in Subareas 10, 12, 14 and 5 (Figure 2.7.2) by Russian, Icelandic, Faroese, Polish, Latvian, Spanish and Norwegian vessels. However, few of these (often subsidized) efforts led to lasting regular fisheries. It has also been suspected that IUU fishing occurred by vessels from other areas, but the scale of such activity is unknown.

The fishing activity has declined substantially during the last decade and in recent years (i.e. after 2010) the fisheries on the MAR comprised primarily a minor Faroese fishery targeting orange roughy on a few seamounts, and a recently developed Spanish trawl fishery (with benthopelagic trawls) targeting grenadiers (*Macrouridae*). Both fisheries fished in very limited areas compared with historical operations.

The major fishery in waters on and adjacent to the MAR is, however, currently the midwater trawl fishery along the western slope of the Reykjanes Ridge and in the Irminger Sea targeting *Sebastes mentella*. Annual landings in international waters ranged between 23 and 41 thousand tonnes in 2012–2014 (ICES, 2015).

2.3 Details on the history and trends in fisheries

2.3.1 Azores EEZ

Since the mid-1990s the landings of deep-water species show a decreasing tendency (Figure 2.7.3 and Table 2.7.2), reflecting the change in the fleet behaviour towards targeting blackspot sea bream.

Since 2000, the use of bottom longlines in the coastal areas has been significantly reduced as a result of the interdiction by the local authorities of the use of longlines in the coastal areas on a range of 6 miles from the islands coast. Large vessels (>24 m) are restricted to seamount areas outside 30 miles from the islands. As a consequence, the smaller boats that operate in the islands coast area have changed their gears to several types of handlines, which may have increased the pressure on some species. The deep-water bottom longline is at present only a seamount fishery. An expansion on the fishing area has been observed for this fleet class during the last decade.

Also in one other fleet component, the medium size boats, ranging from 12–16 meters, a change from bottom longline to handlines has been observed during the last decade. All these changes

in the fishing pattern of the fleet may explain the changes in the landings of some species that were more vulnerable to the use of bottom longlines or target on specific handlines.

2.3.2 Mid-Atlantic Ridge

Grenadier (Macrouridae) fisheries: The greatest annual catch of roundnose grenadier (almost 30 000 t) on the MAR was taken by the Soviet Union in 1975, fluctuating in subsequent years between 2800 and 22 800 t. The fishery for grenadier declined after the dissolution of the Soviet Union in 1992. In the last 19 years, there has only been a sporadic fishery (Figure 2.7.2) by vessels from Russia (annual catch estimated at 200–3200 t), Poland (500–6700 t), Latvia (700–4300 t) and Lithuania (catch data are not available). During the entire fishing period to 2009, the catch of roundnose grenadier from the northern MAR amounted to more than 236 000 t, mostly from ICES Subarea 12.

Spain carried out five limited exploratory trawl surveys to seamounts on the MAR between 1997–2000 and a longline survey in 2004, but except for sporadic fisheries in the northern area (Division 14.b) there has been a decline in interest.

A new Spanish fishery for grenadiers has developed in Division 14.b since 2010. Official Spanish landings of roundnose grenadier have ranged between 242 and 2075 t. In the same period annual catches of 4–2687 tonnes of roughhead grenadier as well as 3–448 tonnes of roughsnout grenadier were reported to the working group. Spain have reported regularly landings of roundnose grenadier from subdivision 14.b1 and 12a.1. In 2020 the official Spanish landings were reported 131t from 12.a1.

Blue ling fisheries: The deep-water fisheries off Iceland tend to be on the continental slopes although in 1979 a short-lived fishery on spawning blue ling (*Molva dypterygia*) was initiated on a “small steep hill” at the base of the slope near the Westman Islands. The fishery peaked at 8000 t in 1980 and subsequently declined rapidly. Later, in 1993, French trawlers found a small seamount in southerly areas of the Reykjanes Ridge at the border of the Icelandic EEZ and were fishing for blue ling there with 390 t of catch. The maximum Icelandic catch in that area was more 3000 t also in 1993. Catches declined sharply to 300 and 117 t for next two years and no fishery was reported later (Figure 2.7.2). A fishery on the seamount was resumed by Spanish trawlers in the 2000s with biggest catch about 1000 t, but this has ceased. During 2020 Spain reported a landing of 0.272t from 12.a1.

Orange roughy fisheries: In 1992 the Faroe Islands began a series of exploratory cruises for orange roughy beginning in their own waters and later extending into international waters. Exploitable concentrations were found in late 1994 and early 1995. Several vessels began a commercial fishery but only one vessel managed to maintain a viable fishery. Most of the fishery took place on five banks. In the northern area (ICES Subarea 12) catches peaked in 1995–1998 (570–802 t), and since then have generally been less than 300 t (Figure 2.7.2). Catches from 6 to 470 t per annum were also made in ICES Subarea 10 in 1996–1998, 2000–2001, 2004–2011, 2012, 2014, 2015 and 2016. The black scabbardfish was the main bycatch species and for the most recent years’ (2009–2014) catches were 45–313 t for both Subareas. There are no landings reported since 2016.

Longline fisheries for redfish: In 1996 a small fleet of Norwegian longliners began a fishery for ‘giant’ redfish and tusk on the Reykjanes Ridge. The fishery was mainly conducted close to the summits of seamounts and vertical longlines were used in the fishery in rugged terrain. The fishery continued in 1997, but experienced an 84% decrease in cpue. Norway carried out two exploratory longline surveys in 1996 and 1997. A Russian longline fishery was conducted in the same area in 2005–2007 and 2009.

Alfonsino fisheries: The first commercial catches of alfonsino in this area were taken by pelagic trawling on the Spectre seamount in 1977 and this and other seamounts were exploited in 1978 and 1979. No commercial fishing took place during the 1980s but nine exploratory and research cruises yielded about 1000 t of mixed deep-water species, mostly alfonsino, but also commercial catches of cardinal fish, orange roughy, black scabbardfish and silver roughy (*Hoplostethus mediterraneus*). A joint Norwegian-Russian survey in 1993 used a bottom trawl to survey three seamounts and a catch of 280 t, mainly alfonsino and cardinal fish, was taken from two of them. Orange roughy, black scabbard fish and wreckfish (*Polyprion americanus*) were also of potential commercial significance. Commercial fishing yielded more than 2800 t over the next seven years (Figure 2.7.2). In recent years there have been no indications of a target fishery for alfonsino. Since the discovery of the seamounts in the North Azores area Soviet and Russian, vessels have taken about 6000 t, mainly of alfonsino. Vessels from the Faroe Islands and the UK have also taken small catches of the species in the area. Faroe Islands reported landings of 141 t of alfonsinos and 82 t of orange roughy from area 10 (and 1.7 t from area 12) during 2015. During 2016 Faroes reported landings, from area 10, of 48 t of alfonsinos, 86 t of orange roughy (and 7 t from area 12) and 50 t of black scabbardfish (and 0.2 t from area 12). During 2019 Faroe report landings of 5 t from area 10.

Current status: Deep-water fisheries in the MAR have declined to very low levels in the recent years in Subareas 10 and 12, due to many reasons, including the economic reason and the implementation of a range of management measures.

2.4 Technical interactions

2.4.1 Azores EEZs

The fishery is multispecies and so technological interactions are observed. In the past the bycatch of this fishery was considered insignificant, according to a pilot study conducted in 2004 (ICES, 2006). However, reported discards from observers in the longline fishery from 2004–2010 shows that for some species, like deep-water sharks, the discards may be important. Actually, commercial value species like red blackspot sea bream and alfonsinos among others, are also discarded. These changes may be due to the management measures introduced, particularly the TAC/quotas, minimum size and fishing area restrictions that changed the fleet behaviour on targeting, expanding the fishing areas to more offshore seamounts and deeper strata. Fisheries occurring outside the ICES area to the south of the Azores EEZ may be exploiting the same stocks as considered here.

2.4.2 Mid-Atlantic Ridge

Seamount aggregating species such alfonsinos and orange roughy are sensitive to sequential local depletion. However, no data were available to assess such effects in these areas. Little is understood about the stock structure of these species and it is not known whether the trawler fleets that fished in international waters of the MAR fish the same stocks that are exploited inside the EEZ by the Azorean fishery.

2.5 Ecosystem considerations

2.5.1 Azores EEZ

The Azores is considered a “seamount ecosystem area” because of its high seamount density. The Azores, as for most of the volcanic islands, do not have a coastal platform and are surrounded by extended areas of great depths, punctuated by some seamounts where fisheries occur. The average depth in the Azores EEZ is 3000 m, and only 0.8% (7715 km²) has depths <600 m while 6.8% is between 600 and 1500 m. The deep-water fishery in the Azores is mostly a seamount fishery where only bottom longlines and handlines are used.

2.5.2 Mid-Atlantic Ridge

Most of Divisions 12.a, 12.c, 10.b, 14.b1 and 5.a are abyssal plain habitats with an average depth of around 4000 m which remains unexploited. The major topographic feature is the northern part of the MAR, located between Iceland and the Azores. The geomorphological characteristics of seamounts and ridges and the hydrographic conditions associated with them form the basis for densely populated filter-feeding epifaunal communities comprising sponges, bivalves, brittlestars, sea lilies and a variety of corals (gorgonians, scleractinians a.o.), including the cold-water coral *Lophelia pertusa* and *Solenosmilia* (Mortensen *et al.*, 2008). This benthic habitat, probably also benefitting from impinging biomass of mesopelagic organisms (fish, zooplankton) (Sutton *et al.*, 2008), supports elevated levels of biomass in the form of aggregations of fish such as roundnose grenadier, orange roughy, alfonsoinos, etc. The sessile benthic communities on hard substrata (i.e. regarded as ‘vulnerable marine ecosystems’ *sensu* FAO (2009) are highly susceptible to damage by bottom fishing gear, and the fish stocks can be rapidly depleted due to the life-history traits and behaviour of the species. The demersal fish fauna of the MAR has been well described based on data from exploratory fishing and scientific investigations (e.g. Hareide and Garnes, 2001; Bergstad *et al.*, 2008; Fossen *et al.*, 2008). Several of the seamount fish have long lifespans, low production rates and form easily targeted aggregations.

The MAR is isolated from the continental slope except for the relatively continuous shallower connections via the Greenland and Scotland ridges, and some seamount chains, e.g. the New England seamounts provide other linkages to the continents. There is a substantial literature on biogeography of seamounts and the MAR, and also some recent studies of population genetics. Demersal fish assemblages on the MAR resemble those on adjacent slope areas on either side (Bergstad *et al.*, 2012), and for some important commercial species, e.g. roundnose grenadier, genetic studies suggest homogeneity across wide areas across the ocean basin (Knutsen *et al.*, 2012).

2.6 Management of fisheries

2.6.1 Azores EEZ

In the Azorean EEZ fisheries management is based on regulations issued by the European Community, by the Portuguese government, and by the Azores regional government. Under the EC Common Fisheries Policy (CFP), TACs were introduced for some species, e.g. blackspot sea bream, black scabbardfish, and deep-water sharks, in 2003 (EC. Reg. 2340/2002) and revised/maintained thereafter. Specific access requirements and conditions applicable to fishing for deep-water stocks were also established (EC. Reg. 2347/2002). Fishing with trawl gears is forbidden in the Azores region. A box of 100 miles limiting the deep-water fishing to vessels

registered in the Azores was created in 2003 under the management of fishing effort of the CFP for deep-water species (EC Reg. 1954/2003). Some technical measures were also introduced by the Azores regional government since 1998 (including fishing restrictions by area, vessel type and gear, fishing licences based on landing thresholds, minimum lengths, marine protected areas and closed seasons) and updated thereafter. Some target fisheries are managed based on quarter TACs by islands and vessel.

2.6.2 Mid-Atlantic Ridge

There is a NEAFC regulation of fishing effort in the fisheries for deep-sea species (species on the NEAFC Annex 1b) list of regulated resources). This generalized measure is intended to prevent expansion in fisheries, including by third parties. The use of gillnets is prohibited beyond 200 m depth.

Specific measures including the TAC were introduced for grenadiers, orange roughy, blue ling and deep-water sharks (http://neafc.org/managing_fisheries/measures/current). In 2015, the fishery for orange roughy was closed, and directed fishery for deep-water sharks has been prohibited.

Current NEAFC measures also include regulations on bottom fishing aimed to protect VMEs. Regular fishing with bottom-touching fishing gear is only allowed in restricted subareas of the NEAFC Regulatory Area designated as 'existing fishing areas' (Figure 2.7.4). Other areas are either closed to bottom fishing or considered subareas only open to pre-assessed exploratory fisheries evaluated and accepted by the commission. In the event a possible VME is encountered in 'existing fishing areas' or during exploratory fishing, move-on rules apply and temporary closures established until it has been determined that a VME exists or not.

European Union TACs for deep-sea species apply to licensed EU vessels fishing on the MAR.

2.7 References

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2.8 Tables

Table 2.7.2. Overview of landings in Subareas 10 (a.1, a.2, b), 12I (c, a.1) (does not include information from 12.b, Western Hatton Bank) and 14. b1).

	ALFONSINOS (<i>Beryx</i> spp.)	ARGENTINES (<i>Argentina silus</i>)	BLUE LING (<i>Molva dypterygia</i>)	BLACK SCABBARDFISH (<i>Aphanopus carbo</i>)	BLUEMOUTH (<i>Helicolenus dactylopterus</i>)	DEEP WATER CARDINAL FISH (<i>Epigonus telescopus</i>)	GREATER FORKBEARD (<i>Phycis blennoides</i>)	LING (<i>Molva molva</i>)	MORIDAE	ORANGE ROUGHY (<i>Hoplostethus atlanticus</i>)	RABBITFISHES (Chimaerids)	RAGIDAE	ROUGHHEAD GRENADIER (<i>Macrourus berglax</i>)	ROUNDNOSE GRENADIER (<i>Coryphaenoides rupestris</i>)	RED (=BLACKSPOT) SEABREAM (<i>Pagellus bogaraveo</i>)	BEAKED REDFISH (<i>Sebastes mentella</i>)	SHARKS, VARIOUS	SILVER SCABBARDFISH (<i>Lepidopus caudatus</i>)	SMOOTHHEADS (Alepocephalidae)	Trachipterus sp	TUSK (<i>Brosme brosme</i>)	WRECKFISH (<i>Polyprion americanus</i>)	TOTAL
1995	731		602	304	589		75	50		676				644	1115		1385	789			18	244	7222
1996	1510	1	814	455	483		47	2		1289				1739	1052		1264	826	230		158	243	10113
1997	384		438	203	410		32	9		814	32			8622	1012		891	1115	3692		30	177	17861
1998	229		451	253	381		39	2		806	42			11979	1119		1051	1187	4643		1	140	22323
1999	725	2	1363	224	340		41	2		441	115		3	9696	1222		50	86	6549		1	133	20993
2000	484		607	357	452	3	100	7	1	447	48		7	8602	947		1069	28	4146		5	268	17578
2001	199		675	134	301		91	59	88	839	79		10	7926	1034		1208	14	3592		52	232	16533
2002	243		1270	1062	280	14	63	8	113	28	98		7	11 468	1193		35	10	12538		27	283	17272
2003	172		1069	502	338	16	56	19	140	201	81		2	10 805	1068		25	25	6883		83	270	10950
2004	139	4	644	384	282	21	46		91	711	128		28	10 748	1075		6	29	4368		16	189	8161
2005	161		35	198	190	4	22	2	69	324	193		8	513	1383		14	31	6872		66	279	10364
2006	192		65	73	209	10	134		127	104			8	86	958		104	35			64	497	2666
2007	211		1		275	7	201		86	20				2	1070		63	55			19	664	2674
2008	252			80	281	7	18		53	108				13	1089		12	63				513	2489
2009	312			162	267	7	26	1	68	26	22		6	5	1042		1	64			2	382	2393
2010	245		72	240	213	5	14		54	74	0		0	1691	687		7	68			107	238	3715
2011	232		0	163	231	5	11		55	112			0	3366	624		5	148			0	266	5218
2012	222		16	16	190	4	6	0		139	2		2726	2724	613		31	282	160	54	29	226	7441
2013	168		9	206	235	4	8	0			6		868	1907	692		70	0	17			209	4398
2014	131			85	200	2	9			47			448	2075	663			713				121	4493
2015	292		0	7	256	4	10	1		84				862	701			429			1	116	2764
2016	156			86	306		10			93				660	515			87				101	2014
2017	149	0	0	63	333	5	15	0	169	<1	0	70	0	84	499	2277	75	101	0	0	0	128	3967
2018	157	0	28	17	283	4	75	0		0	0	60	0	27	474	2873	0	65	0	0	506	80	4649
2019	143	0	1	21	187	9	13	0			0	43	0	215	481	2403	0	65	0	0	0	80	3662
2020*	139	0	0	11	130	5	9	0		0	0	5	0	131	491	2205	1	88	0	0	0	81	3297

*- provisional data

Table 2.7.1. Summary data on seamount fisheries on the MAR.

Main species	Discovery		No. of commercial seamounts	Maximum catch/yr ('000 t)
	Year	Country		
<i>Coryphaenoides rupestris</i>	1973	USSR	34	29.9
<i>Beryx splendens</i>	1977	USSR	4	1.1
<i>Hoplostethus atlanticus</i>	1979	USSR	5	0.8
<i>Molva dypterygia</i>	1979	Iceland	1	8.0
<i>Epigonus telescopus</i>	1981	USSR	1	0.1
<i>Aphanopus carbo</i>	1981	USSR	2	1.1
<i>Brosme brosme</i>	1984	USSR	15	0.3
<i>Sebastes marinus</i>	1996	Norway	10	1..0

2.9 Figures

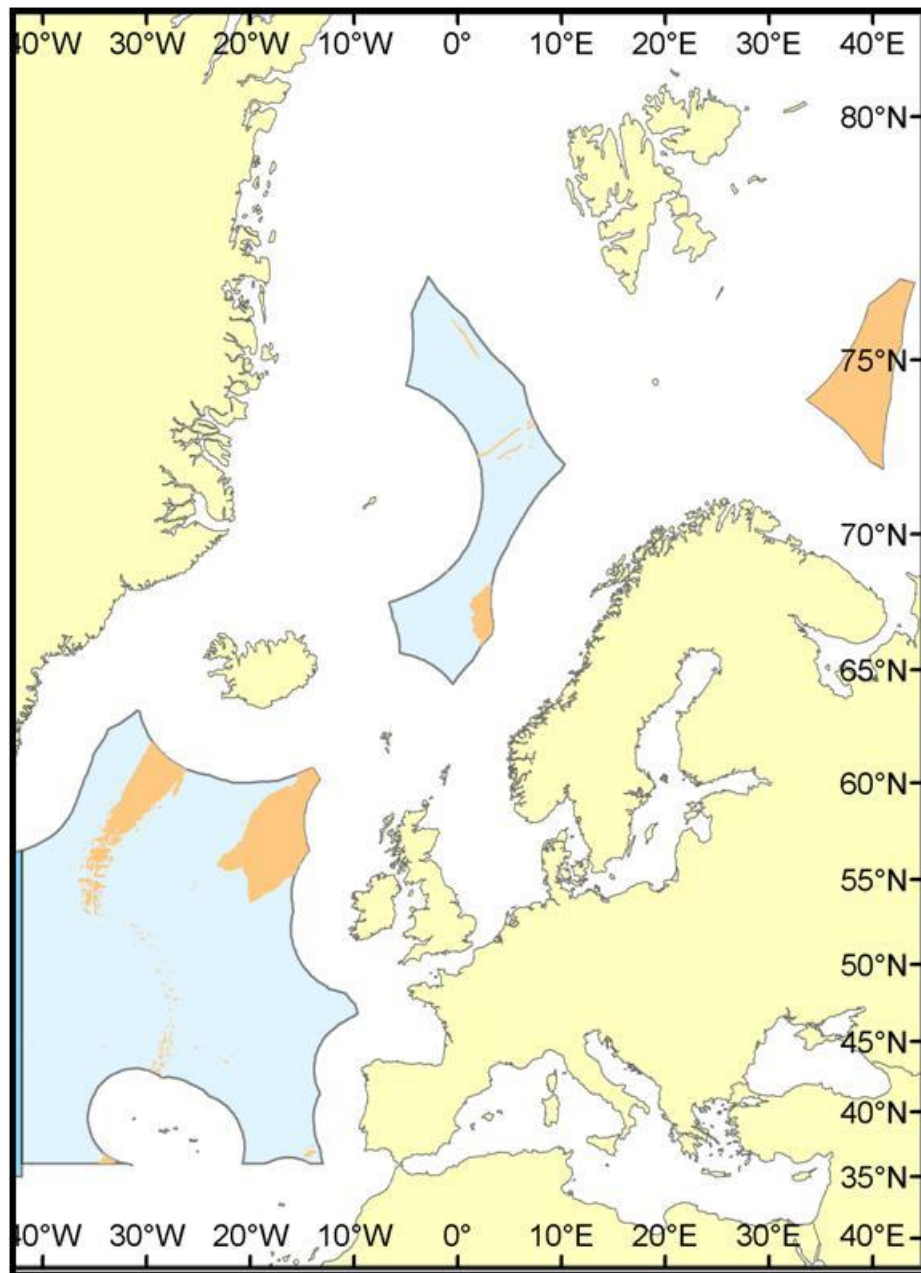


Figure 2.7.1. The NEAFC Regulatory Area (area beyond national jurisdiction) in the Northeast Atlantic (light blue polygons) with superimposed subareas shallower than 2000 m (light brown patches). Note that the NEAFC RA in the Barents Sea is entirely shallower than 2000 m, and that a high Arctic NEAFC RA (beyond 80°N) is not shown on the map.

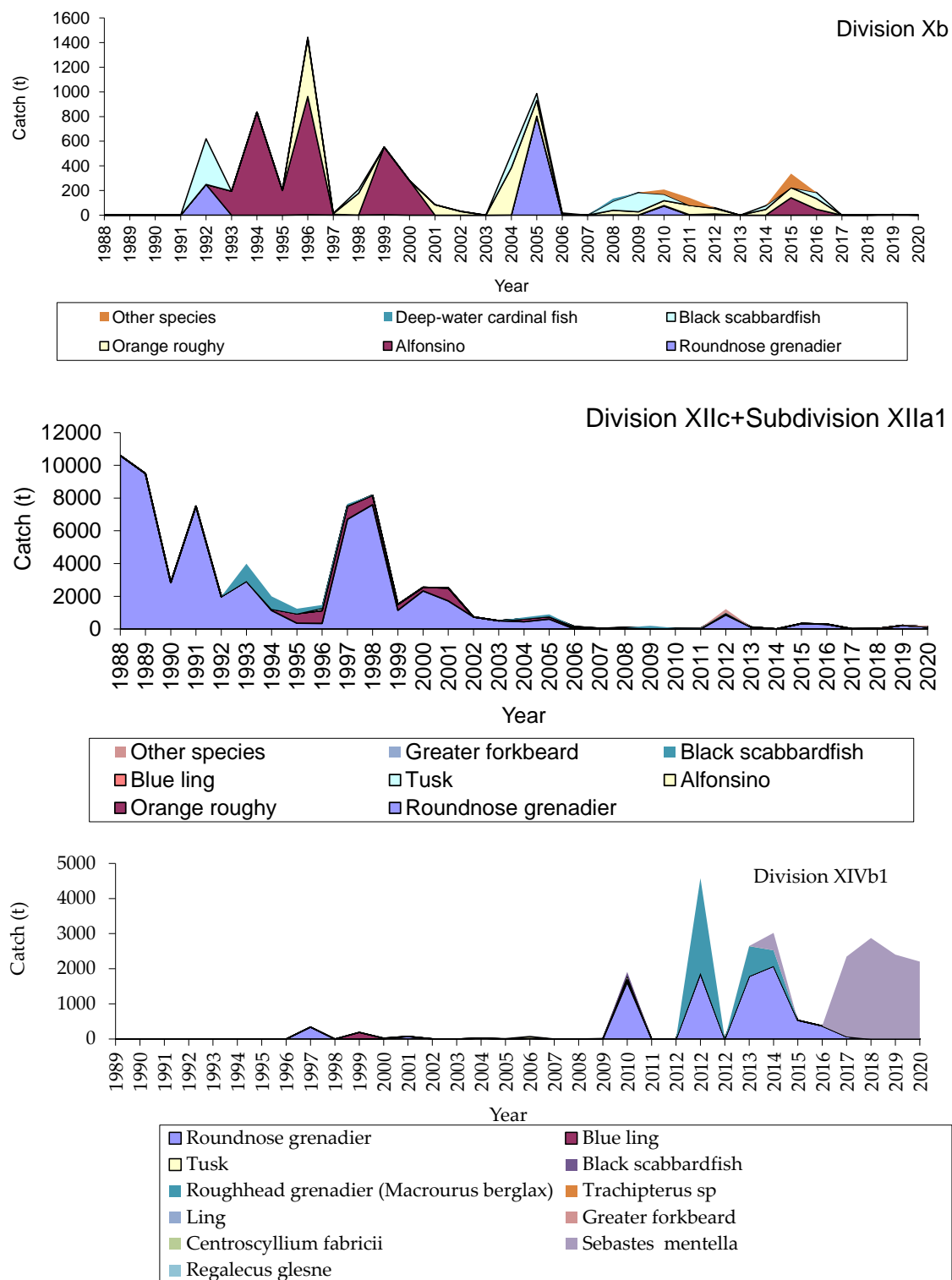


Figure 2.7.2. Annual catch of major deep-water species on MAR in 1988–2020.

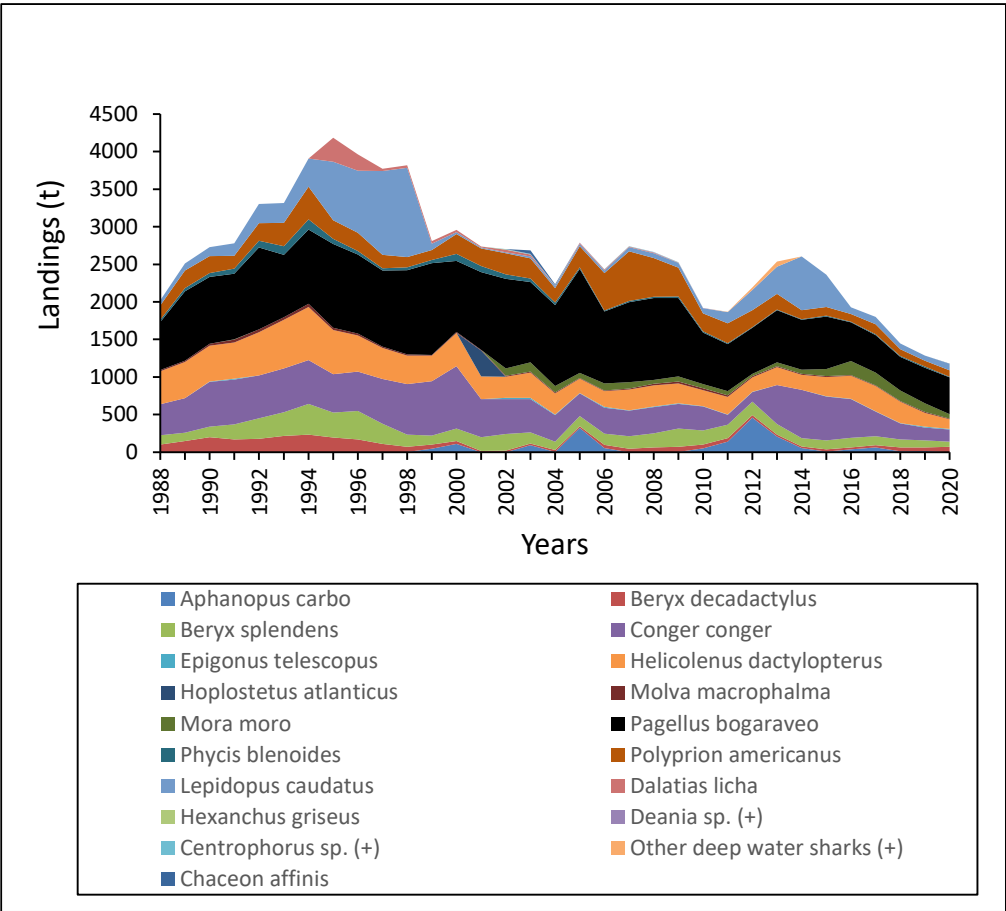


Figure 2.7.3. Annual landings of major deep-water species in Azores from hook and line fishery (1988–2020).

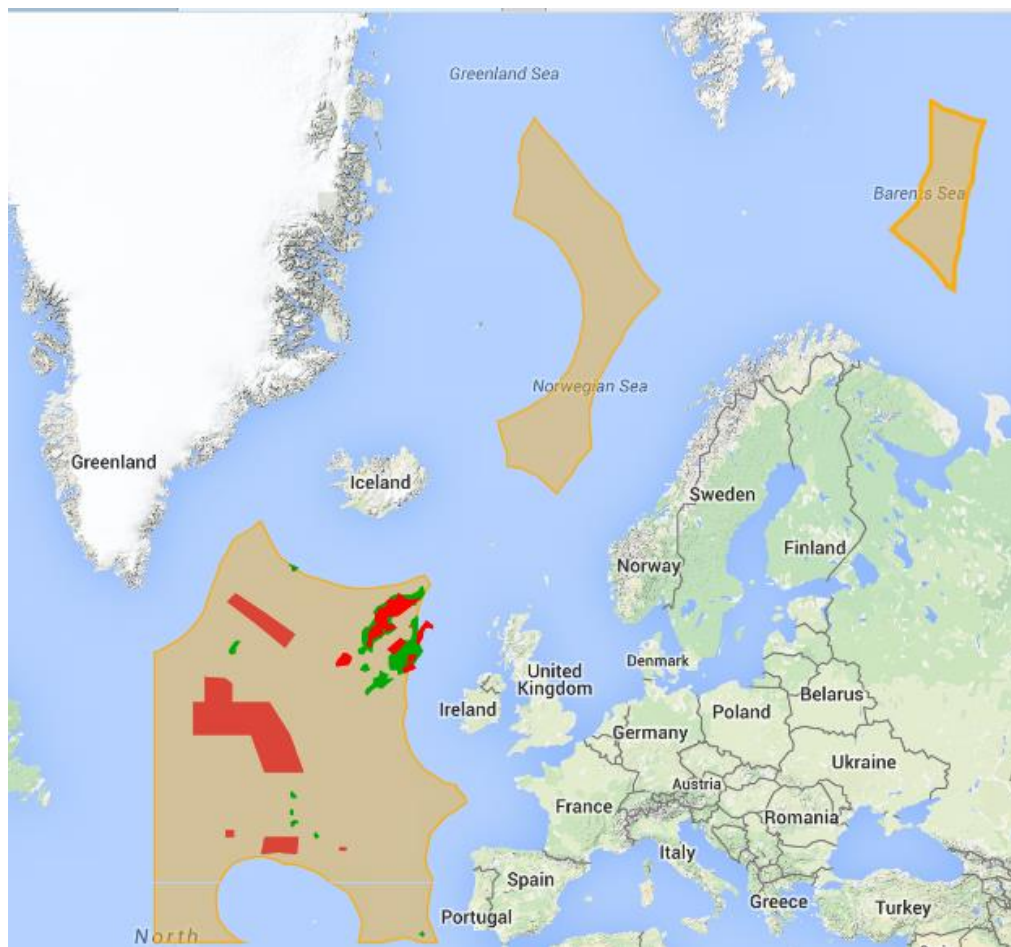


Figure 2.7.4. The regulatory area of NEAFC (light brown) and subareas of the Mid-Atlantic Ridge, seamounts and the Rockall-Hatton areas designated as bottom fishing closures (red), and 'existing fishing areas' (green). Areas outside closures and 'existing fishing areas' are only open to pre-assessed exploratory bottom fishing. Source: www.neafc.org.