EMFF Operational Programme 2014-2020

EMFAF Operational Programme 2021-2027

Marine Biodiversity

Monitoring the recovery of exploited deep-water species

EMFF 2014-2020

Marine Institute Report Series

Authors: Eoghan Kelly and Hans Gerritsen

Fisheries Ecosystems Advisory Services, Marine Institute, Rinville, Oranmore, Galway, Ireland, H91R673

Foras na Mara Marine Institute

Có-mhaoinithe ag an Aontas Eorpach

Co-funded by the European Union

Ireland's EU Structural and Investment Funds Programmes 2014 - 2020

Co-funded by the Irish Government and the European Union

Rialtas na hÉireann Government of Ireland

Monitoring the recovery of exploited deep-water species

Eoghan Kelly and Hans Gerritsen,

The Marine Institute, Rinville, Oranmore, Co. Galway

This report may be downloaded from: www.marine.ie

Photograph 'Cute Chimaera' used on the cover has been provided by © Eoghan Kelly

Suggested citation:

Kelly, E. and Gerritsen, H. (2022). Monitoring the recovery of exploited deep-water species. EMFF 2014-2020 Marine Institute Report Series. Marine Institute.

Contents

Introduction

Commercial fisheries for deep-water species off the Irish coast developed in the late 1990s and declined in the early 2000s. Many of the exploited stocks were depleted a result of commercial exploitation and ICES has advised a zero catch for Orange Roughy since 2004, and for Portuguese Dogfish and Leafscale Gulper shark since 2005. Since 2016, the deep water access regulation has effectively banned trawling in waters deeper than 800 m (EC, 2016) and fishing for deep-water sharks with static netting >600 m is also banned by the technical measures regulation (EC, 2019). However, some of these species continue to be caught, either by gears not covered by this regulation or in water <800 m deep.

The Marine Institute carried out a survey programme to assess the distribution and abundance of these species between 1992 and 1999 and again between 2006 and 2009. Since 2019, 3 days of the Irish Anglerfish and Megrim Survey have been allocated to monitoring the recovery of commercial deep-water species. This work was funded under the European Maritime and Fisheries Fund (EMFF) from 2019 to 2021 and European Maritime, Fisheries and Aquaculture Fund (EMFAF) since 2022.

The main objective of the current project is to assess the recovery of exploited deep-water species in Irish waters by comparing the results from 2019 to 2022 surveys with those from the previous period in 2006 to 2009. (methods used in the earlier period 1992 to 1999 were different, therefore a direct comparison with that period is not possible).

Methods

Data on deep water stocks were collected by extending the depth range of the existing Irish Anglerfish and Megrim Survey (IAMS), which takes place in the first quarter of the year and covers the continental shelf to 1,000m depth. In order to obtain additional information on the selected deep-water species, two 'deep water' transects were carried out, each composed of 5 stations extending from 500-1,500m. Three days of additional days-at-sea were required during 2019 and 2022 to complete the additional sampling.

The fishing gear used during 2019 to 2022 was based on a standard commercial otter trawl, also known as a 'Jackson trawl', employed in the anglerfish fishery and is described in detail in Reid *et al*. (2007). The mesh size varied from 200mm in the wings gradually reducing to 100mm in the cod-end. The ground gear was fitted with 16'' rock hopper disks and a 19mm tickler chain was mounted between the wings, rigged to run ahead of the ground gear. The trawl doors were 5.45m^2 Thyboron Type 16 straight oval doors. The fishing gear used during 2006 to 2009 was also a 'Jackson trawl' with 16'' rock hopper disks although there was no tickler chain. Trawl doors used were Morgere ovalfoil 1,700 kg doors (area 5.82m^2), and the floats were 11" titanium floats. The fishing gear used during 2019 to 2022 was therefore functionally analogous to the fishing gear used during 2006 to 2009 survey.

During 2019-2022 the fishing gear was trawled at 3kn for one hour at each station and the warp to depth ratio was 2:1 plus 200m. This was the same gear configuration as used during the previous deep-water surveys in 2006 to 2009. However, haul duration was two hours from 2006 to 2008 and reduced to one hour for 2009 and from 2019 to 2020. This difference in haul duration was corrected for by using catch per unit effort (numbers per hour) in the comparative analysis. Door spread, wing spread, headline height and bottom contact were monitored using Scanmar and Marport trawl sensors (distance sensors in the doors and wing-ends, headline sensor and a trawl-eye sensor positioned on the top sheet directly over the foot rope). Unfortunately, wing spread data were not available from deep-water survey during 2006 to 2009 period and door spread data were not available for the 2006

deep-water survey. A comparison of door spread at various haul depths revealed no significant differences between deep-water surveys in 2007 to 2009 and Irish Anglerfish and Megrim Surveys in 2019 to 2022.

Station positions, heading and bottom depth were recorded at the moment the gear settled on the bottom and when the gear lifts off on haul-back. Tide and wind direction and speed, barometric pressure, heave, pitch and roll were recorded at the mid-point in the tow. The median values of the door spread, wing spread and headline height were recorded at the end of the tow. Software produced by the Centre for Environment, Fisheries and Aquaculture Science (CEFAS) in the UK was used to enter station data and import catch data. These data were stored in a SQL database on a local server on board the vessel.

At each station the entire catch was sorted to species level and weighed. Full biological sampling, length, weight, sex, maturity and age, was carried out on all commercial species. Additional biological sampling, without ageing, was carried out on all elasmobranchs and chimaerids. For each species a random sample of the entire catch was taken for these measurements. Where fish were difficult to identify samples were preserved for further identification ashore. Samples of unusual or rare fish were also preserved.

The gear sensor data as well as bottom depth and GPS position were also recorded in a SQL database at intervals of approximately one per second.

Catch weights, length frequency distributions and biological data were captured using the CEFAS Electronic Data Capture system and stored into local a Microsoft Access databases before being imported into the central SQL database.

Results

From 2006 to 2008 two of the areas previously surveyed during the Irish deep-water survey programme in the 1990s were revisited. The areas selected were ‘Area 4’, which is located on the continental slope west of Donegal, and ‘Area 5’, which is located on the northern slope of the Porcupine bank (Figure 1). During this period a total of 22 valid stations were completed in ‘Area 4’ and 26 were completed in ‘Area 5’ (Table 1). Between 2019 and 2022 a total of 33 valid deep-water tows were completed as an additional objective during the Irish Anglerfish and Megrim Survey (Table 1). There were 17 stations carried out in ‘Area 4’ and 16 stations in ‘Area 5’. There were zero invalid hauls and no major damage to gear. A more detailed view of these survey areas is presented in Figure 2 and Figure 3 and haul details are given in Table 2 and Table 3.

A list of deep-water species was compiled from those most commonly encountered on previous Marine Institute deep water surveys 2006-2009 (O’Hea *et al*., 2009). Additional deep-sea shark species under management (Fisheries Management Notice No. 35 of 2020), as defined in Annex I to Regulation (EU) 2016/2336 of the European Parliament and of the Council, were also added to species list (Table 4).

In order to increase the volume of information available for the exploration of species abundance distribution by depth over time, all catch rate data from Irish Anglerfish and Megrim Survey stations from 2019 to 2022 which were deeper than 400m were included in analysis. This produced a dataset of 168 stations ranging in depth from 404-1,887m. Because the relative abundance of most species varies strongly with depth, and because not all depth strata were sampled each year, the annual index abundance of each species was modelled using General Additive Modelling. The model was used to

account for the influence of depth on catch per unit effort (numbers per hour) of each species and a bootstrap procedure was then applied to estimate uncertainty in the abundance index. This analysis required at least 10 observations per year so full set of results in not available for every species (Table 4).

Modelling was performed in R, using the 'mgcv' library for General Additive Models. A hurdle model approach was applied where first the presence/absence is modelled across all years as follows:

gam(presence ~ s(depth), family=binomial)

where *presence* is a value of one for each haul where the species was present and zero if absent and *depth* is the mean depth of the haul in meters; s() is a spline function.

A second model was applied to all the non-zero observations:

gam(CPUE ~ s(depth, k=5) + year, family=poison)

where CPUE is the catch (in numbers) per hour fished, and *year* is a factor (so it is introduced to the model as a categorical variable and years are assumed to be independent).

The CPUE was then predicted across a depth range of 400-1,500m and the average CPUE across these depths in any year was taken as an index of abundance. Where sufficient data for modelling was unavailable the raw CPUE by year is presented as a bar chart.

Background information for each species is presented here; this was obtained from www.fishbase.se.

Table 1: Deep-water stations in Area 4 and Area 5 from 2006-2009 and 2019-2022

Survey Name	Area 4	Area 5	Total
2006 DEEP	7	6	13
2007 DEEP	6	7	13
2008 DEEP	5	7	12
2009 DEEP	4	6	10
IAMS2019	8	5	13
IAMS2020	4	3	7
IAMS2021	2	5	7
IAMS2022	3	3	6
Total	**39**	**42**	**81**

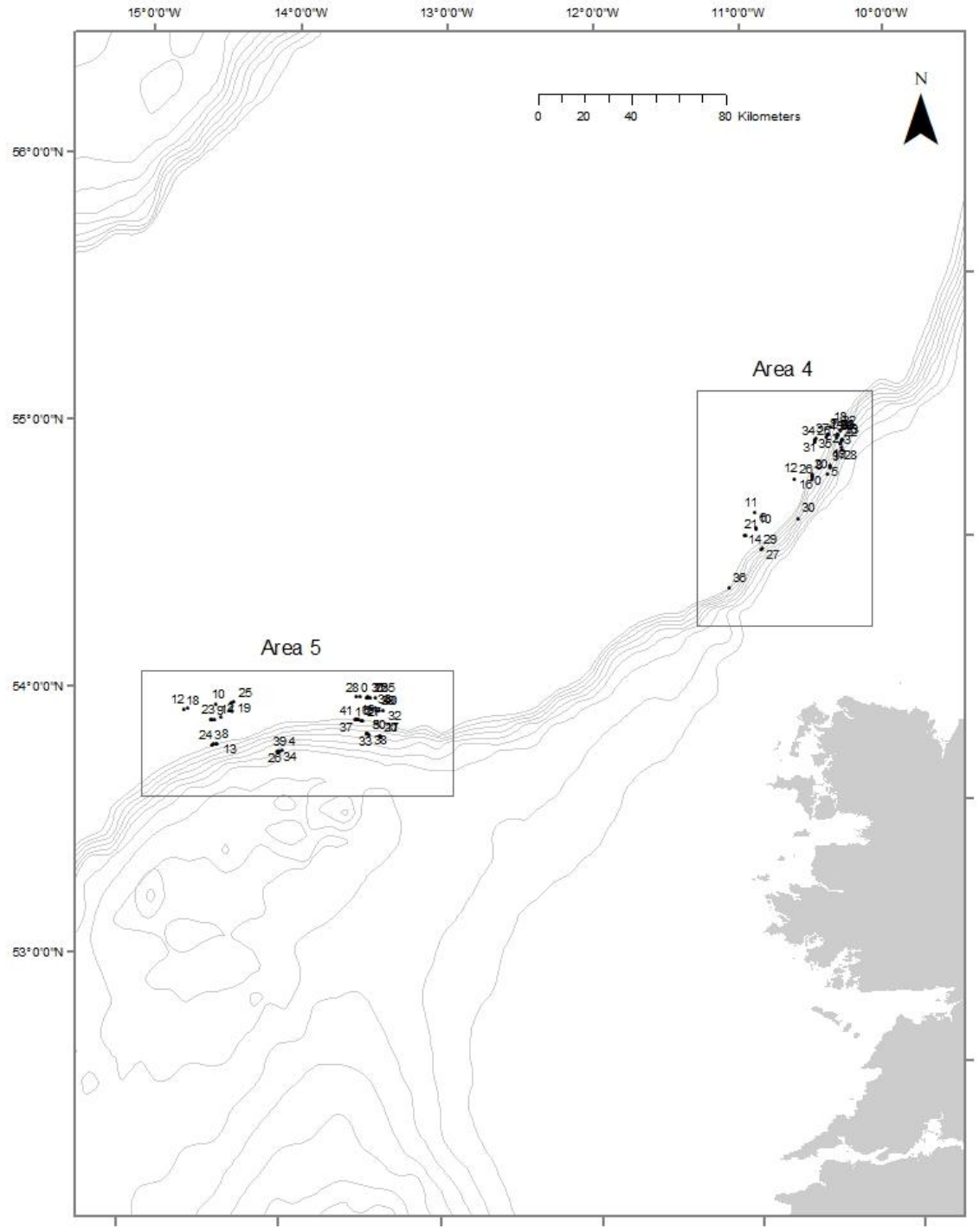


Figure 1: Location of deep water stations (2006-2009 and 2019-2022) in Area 4 and Area 5

(Note: depth contour lines are 200m-1,000m 100m intervals)

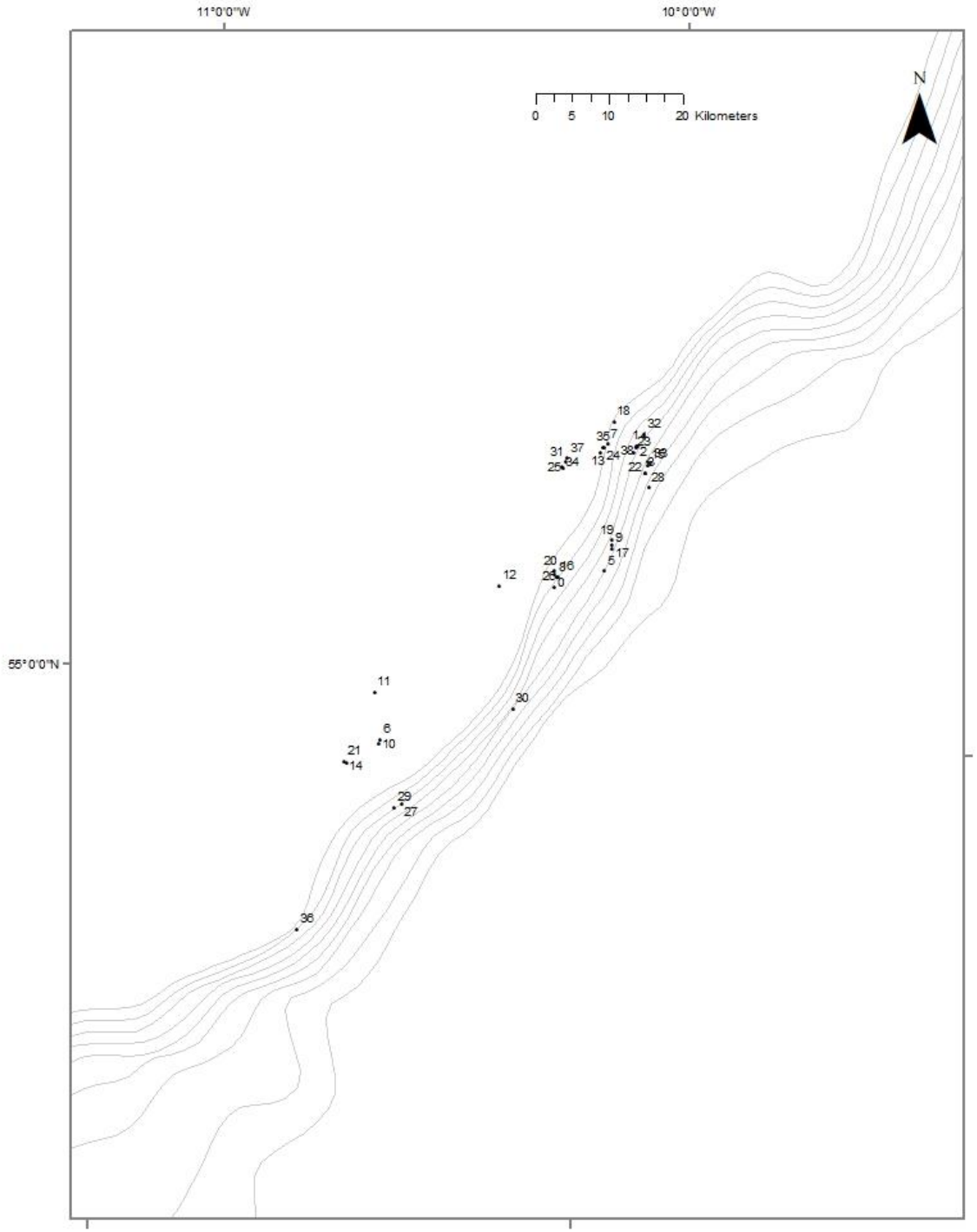


Figure 2: Location of deep water stations (2006-2009 and 2019-2022) in Area 4

(Note: see Table 2 for station details)

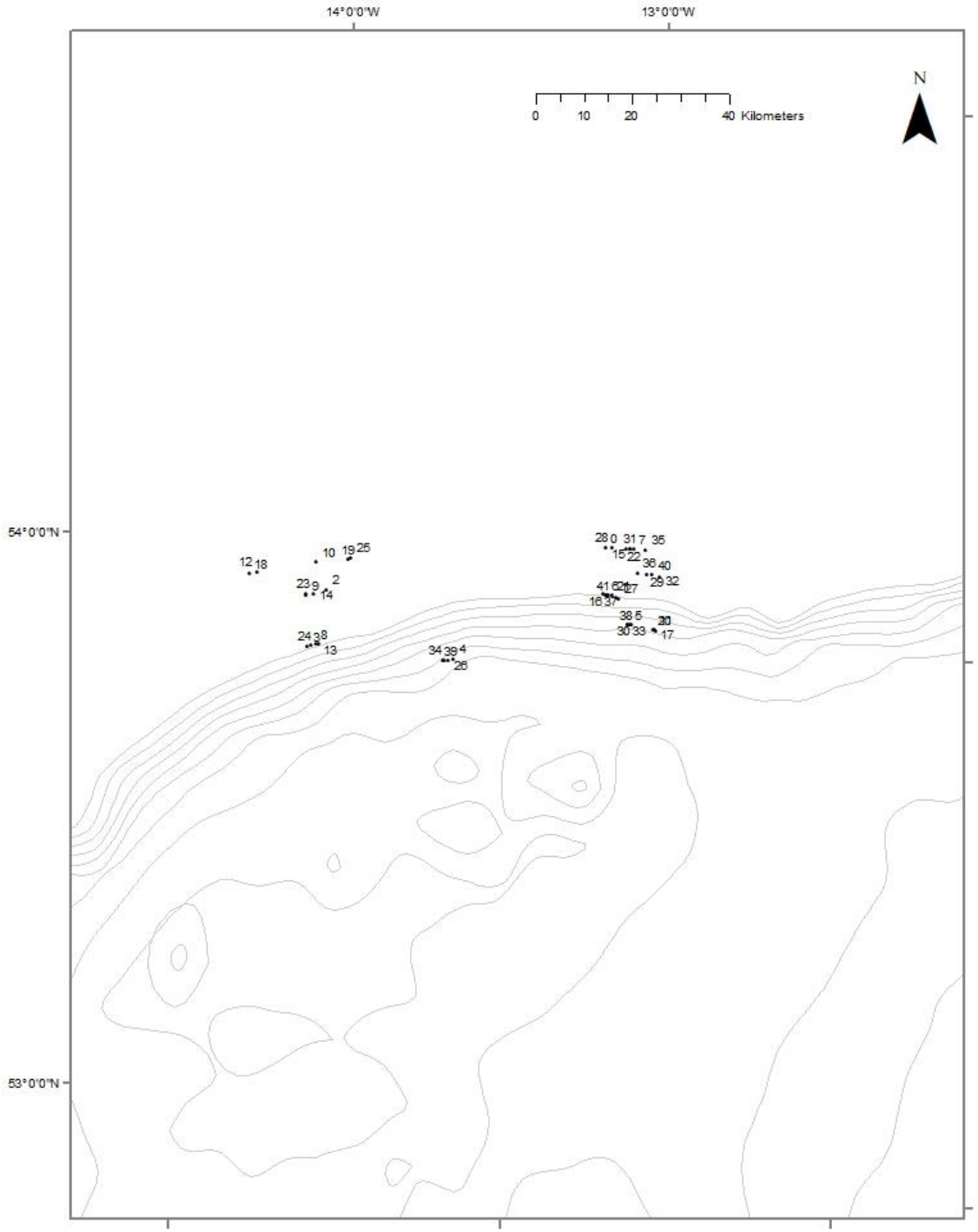


Figure 3: Location of deep water stations (2006-2009 and 2019-2022) in Area 5

(Note: see Table 3 for details)

Table 2: Station details for deep water surveys in Area 4 from 2006-2009 and 2019-2022

Station Number	Survey Name	Time Hauled	Area	Longitude Mid-point	Latitude Mid-Point	Depth (meters)	Tow Duration (minutes)
0	2006 DEEP	05:36	Area 4	-10.1675	55.1720	1,059	80
1	2006 DEEP	20:00	Area 4	-10.0215	55.3380	734	120
2	2006 DEEP	08:00	Area 4	-9.9940	55.3200	510	120
3	2006 DEEP	00:00	Area 4	-9.9985	55.3065	512	90
4	2006 DEEP	16:00	Area 4	-10.0210	55.3360	730	120
5	2006 DEEP	12:00	Area 4	-10.0630	55.1825	492	120
6	2006 DEEP	12:00	Area 4	-10.4985	54.9505	1,470	120
7	2007 DEEP	20:48	Area 4	-10.0830	55.3370	985	120
8	2007 DEEP	07:12	Area 4	-10.1635	55.1690	1,156	90
9	2007 DEEP	18:00	Area 4	-10.0510	55.2110	496	120
10	2007 DEEP	09:12	Area 4	-10.5000	54.9450	1,472	120
11	2007 DEEP	22:48	Area 4	-10.5205	55.0070	1,809	120
12	2007 DEEP	05:36	Area 4	-10.2820	55.1520	1,479	120
13	2008 DEEP	08:24	Area 4	-10.0960	55.3255	1,011	120
14	2008 DEEP	22:00	Area 4	-10.5650	54.9180	1,508	120
15	2008 DEEP	07:12	Area 4	-9.9930	55.3160	524	120
16	2008 DEEP	17:12	Area 4	-10.1600	55.1700	1,131	100
17	2008 DEEP	14:48	Area 4	-10.0525	55.2150	521	120
18	2009 DEEP	12:24	Area 4	-10.0745	55.3645	1,002	60
19	2009 DEEP	13:36	Area 4	-10.0545	55.2210	530	60
20	2009 DEEP	13:36	Area 4	-10.1690	55.1765	1,030	60
21	2009 DEEP	22:00	Area 4	-10.5685	54.9195	1,491	60
22	IAMS2019	07:12	Area 4	-9.9980	55.3055	512	62
23	IAMS2019	16:00	Area 4	-10.0255	55.3295	711	61
24	IAMS2019	18:24	Area 4	-10.0915	55.3325	990	51
25	IAMS2019	09:36	Area 4	-10.1720	55.3015	1,226	68
26	IAMS2019	14:24	Area 4	-10.1660	55.1575	1,132	62
27	IAMS2019	20:24	Area 4	-10.4400	54.8760	803	36
28	IAMS2019	13:12	Area 4	-9.9875	55.2900	430	61
29	IAMS2019	14:48	Area 4	-10.4535	54.8705	824	52
30	IAMS2020	12:24	Area 4	-10.2260	55.0045	718	45
31	IAMS2020	15:36	Area 4	-10.1680	55.3100	1,250	40
32	IAMS2020	18:48	Area 4	-10.0080	55.3530	702	64
33	IAMS2020	13:36	Area 4	-9.9885	55.3190	537	65
34	IAMS2021	10:24	Area 4	-10.1750	55.3030	1,248	31
35	IAMS2021	09:36	Area 4	-10.0920	55.3320	1,009	60
36	IAMS2022	13:36	Area 4	-10.6300	54.7105	804	40
37	IAMS2022	12:24	Area 4	-10.1655	55.3150	1,244	49
38	IAMS2022	09:12	Area 4	-10.0200	55.3370	718	40

Table 3: Station details for deep water surveys in Area 5 from 2006-2009 and 2019-2022

Station Number	Survey Name	Time Hauled	Area	Longitude Mid-point	Latitude Mid-Point	Depth (meters)	Tow Duration (minutes)
0	2006 DEEP	16:00	Area 5	-12.9660	54.1225	1,488	125
1	2006 DEEP	20:48	Area 5	-12.9130	54.0340	995	90
2	2006 DEEP	03:36	Area 5	-13.8095	53.9705	1,505	100
3	2006 DEEP	22:00	Area 5	-13.8430	53.8620	1,000	90
4	2006 DEEP	16:00	Area 5	-13.3865	53.8790	438	110
5	2006 DEEP	20:24	Area 5	-12.8575	53.9880	748	110
6	2007 DEEP	07:12	Area 5	-12.9415	54.0360	1,004	120
7	2007 DEEP	10:48	Area 5	-12.8775	54.1275	1,489	120
8	2007 DEEP	16:24	Area 5	-13.8180	53.8685	1,000	120
9	2007 DEEP	03:12	Area 5	-13.8710	53.9550	1,476	120
10	2007 DEEP	12:24	Area 5	-13.8555	54.0185	1,800	65
11	2007 DEEP	08:48	Area 5	-12.7765	53.9855	750	75
12	2007 DEEP	17:36	Area 5	-14.0325	53.9835	1,828	120
13	2008 DEEP	14:00	Area 5	-13.8100	53.8700	999	120
14	2008 DEEP	12:00	Area 5	-13.8480	53.9600	1,484	120
15	2008 DEEP	18:00	Area 5	-12.8870	54.1280	1,498	120
16	2008 DEEP	14:00	Area 5	-12.9510	54.0370	1,009	120
17	2008 DEEP	00:48	Area 5	-12.7735	53.9830	746	85
18	2008 DEEP	18:48	Area 5	-14.0580	53.9780	1,824	120
19	2008 DEEP	06:00	Area 5	-13.7590	54.0315	1,886	120
20	2009 DEEP	16:00	Area 5	-12.7820	53.9850	748	50
21	2009 DEEP	10:00	Area 5	-12.9255	54.0370	1,010	60
22	2009 DEEP	18:00	Area 5	-12.8900	54.1260	1,506	60
23	2009 DEEP	06:00	Area 5	-13.8730	53.9575	1,492	60
24	2009 DEEP	18:48	Area 5	-13.8330	53.8645	1,000	60
25	2009 DEEP	08:48	Area 5	-13.7500	54.0355	1,852	60
26	IAMS2019	02:00	Area 5	-13.4010	53.8760	410	32
27	IAMS2019	04:48	Area 5	-12.9015	54.0335	998	40
28	IAMS2019	14:00	Area 5	-12.9435	54.1255	1,510	31
29	IAMS2019	11:36	Area 5	-12.8250	54.0835	1,282	30
30	IAMS2019	07:36	Area 5	-12.8645	53.9880	755	31
31	IAMS2020	22:48	Area 5	-12.8990	54.1270	1,516	39
32	IAMS2020	16:48	Area 5	-12.7835	54.0840	1,272	50
33	IAMS2020	01:12	Area 5	-12.8650	53.9885	767	67
34	IAMS2021	16:24	Area 5	-13.4190	53.8740	422	34
35	IAMS2021	15:36	Area 5	-12.8400	54.1295	1,526	30
36	IAMS2021	12:24	Area 5	-12.8535	54.0850	1,294	30
37	IAMS2021	08:00	Area 5	-12.9455	54.0365	1,017	30
38	IAMS2021	18:00	Area 5	-12.8505	53.9880	763	30
39	IAMS2022	14:24	Area 5	-13.4155	53.8740	413	42
40	IAMS2022	16:48	Area 5	-12.8080	54.0845	1,270	45
41	IAMS2022	12:48	Area 5	-12.9375	54.0360	992	47

Table 4: List of deep-water species for analysis

Species Name	Common Name
Alepocephalus agassizii	Agassiz smooth-head
*Alepocephalus bairdii^*	Baird's smooth-head
*Aphanopus carbo^*	Black scabbard
*Apristurus aphyodes**	Ghost Catshark
Argentina silus	Great silver smelt
*Centrophorus squamosus^*	Gulper Shark
*Centroscyllium fabricii**	Black Dogfish
Centroscymnus coelolepis^*	Portuguese Shark
Centroscymnus crepidater^*	Longnose Velvet Dogfish
*Chimaera monstrosa^*	Rabbit fish
Coelorinchus coelorhincus	Hollow-nosed rattail
Coelorinchus labiatus	Spear-snout grenadier
Coryphaenoides guentheri	Gunther's grenadier
Coryphaenoides mediterraneus	Mediterranean grenadier
*Coryphaenoides rupestris^*	Round-nose grenadier
*Dalatias licha**	Darkie Charlie
Deania calcea^*	Bird-beak dogfish
*Etmopterus princeps**	Great Lanternshark
*Etmopterus spinax**	Velvet Belly
Gadiculus argenteus	Silvery pout
*Galeus melastomus^*	Black-mouth dogfish
*Galeus murinus**	Mouse Catshark
Helicolenus dactylopterus	Blue-mouth redfish
*Hexanchus griseus**	Six-Gilled Shark
*Lepidion eques^*	North Atlantic Codling
*Mora moro^*	Common Mora
*Nezumia aequalis^*	Smooth rattail
Somniosus rostratus	Greenland Shark
Scymnodon ringens	Knifetooth Dogfish
Synaphobranchus kaupi	Northern Cut-throat Eel
Trachyrincus murrayi	Murray's rattail

* Deep-sea shark species under management (Fisheries Management Notice No. 35 of 2020), as defined in Annex I to Regulation (EU) 2016/2336 of the European Parliament and of the Council

^ Full analysis of CPUE using General Additive Modelling available for this species

Alepocephalus agassizii (Agassiz Smooth-head)

Classification / Names
Actinopteri (ray-finned fishes) > Alepocephaliformes (Slickheads and tubeshoulders.) > Alepocephalidae (Slickheads)

Etymology: Alepocephalus: Greek, alepos, alepidotos = without scales + Greek, kephale = head.

Environment
Marine; bathydemersal; depth range 600 - 2500 m. Deep-water; 70°N - 15°N, 72°W - 5°W

Distribution
Eastern Atlantic: Iceland and Greenland, west of British Isles, Morocco south to Mauritania. Western Atlantic: Davis Strait south to Honduras.

Size / Weight / Age
Maturity: Length at maturity is unknown

Max length: 123 cm SL male/unsexed; common length: 70.0 cm SL male/unsexed;

Biology
Bathypelagic. Found over sand and clay bottoms. Gregarious. Feeds mostly ctenophores, but also crustaceans, echinoderms and polychaetes.

Life cycle and mating behaviour
No information available.

IUCN Red List Status: Least Concern (LC); Date assessed: 11 July 2012

CITES: Not Evaluated

CMS: Not Evaluated

Threat to humans: Harmless

Human uses: Fisheries: of potential interest

Reference: https://www.fishbase.se/summary/Alepocephalus-agassizii.html

Results

This species was caught in relatively small numbers from 2006 to 2009 but one station in 2009 recorded 1,742 individuals. Only 4 individuals were observed in 2019 and none in 2020. Numbers observed in 2021 and 2022 were 3 and 1 respectively. Most abundant at a depth of ~1,300m. Further analysis was not possible due to insufficient data.

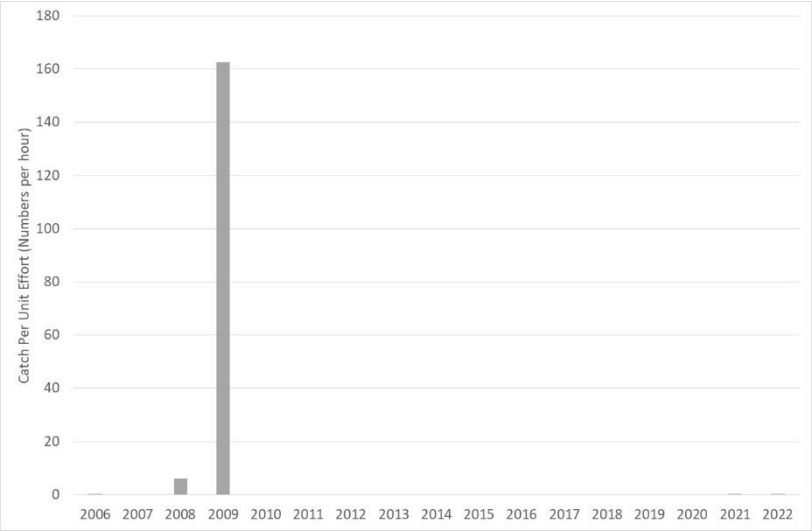


Figure 4: Raw catch per unit effort by year

Alepocephalus bairdii (Baird's Smooth-head)

Classification / Names
Actinopteri (ray-finned fishes) > Alepocephaliformes (Slickheads and tubeshoulders.) > Alepocephalidae (Slickheads)

Etymology: Alepocephalus: Greek, alepos, alepidotos = without scales + Greek, kephale = head.

Environment
Marine; bathydemersal; depth range 365 - 1700 m. Deep-water; 66°N - 17°N, 78°W - 0°E

Distribution
Eastern Atlantic: Greenland and Iceland southward to 17°N. Western Atlantic: Greenland to Grand Banks and 29°52'N, 77°09'W.

Length at first maturity / Size / Weight / Age
Maturity: Lm 55.0 cm

Max length: 100.0 cm SL male/unsexed; max. reported age: 38 years

Biology
Found over ooze and sand bottoms. Bathypelagic. Feeds mostly on coelenterates, but also decapods, tunicates and fishes.

Life cycle and mating behaviour
Annual fecundity indeterminate.

IUCN Red List Status: Data deficient (DD); Date assessed: 15 July 2012

CITES: Not Evaluated

CMS: Not Evaluated

Threat to humans: Harmless

Human uses: Fisheries: minor commercial

Reference: https://www.fishbase.se/summary/Alepocephalus-bairdii.html

Results

Estimated annual CPUE peaked in 2009 at ~430nhr^{-1}), before declining to ~80-90nhr^{-1} in 2020-21 before increasing to ~125 nhr^{-1} in 2022. Most abundant at a depth of ~1,250m.

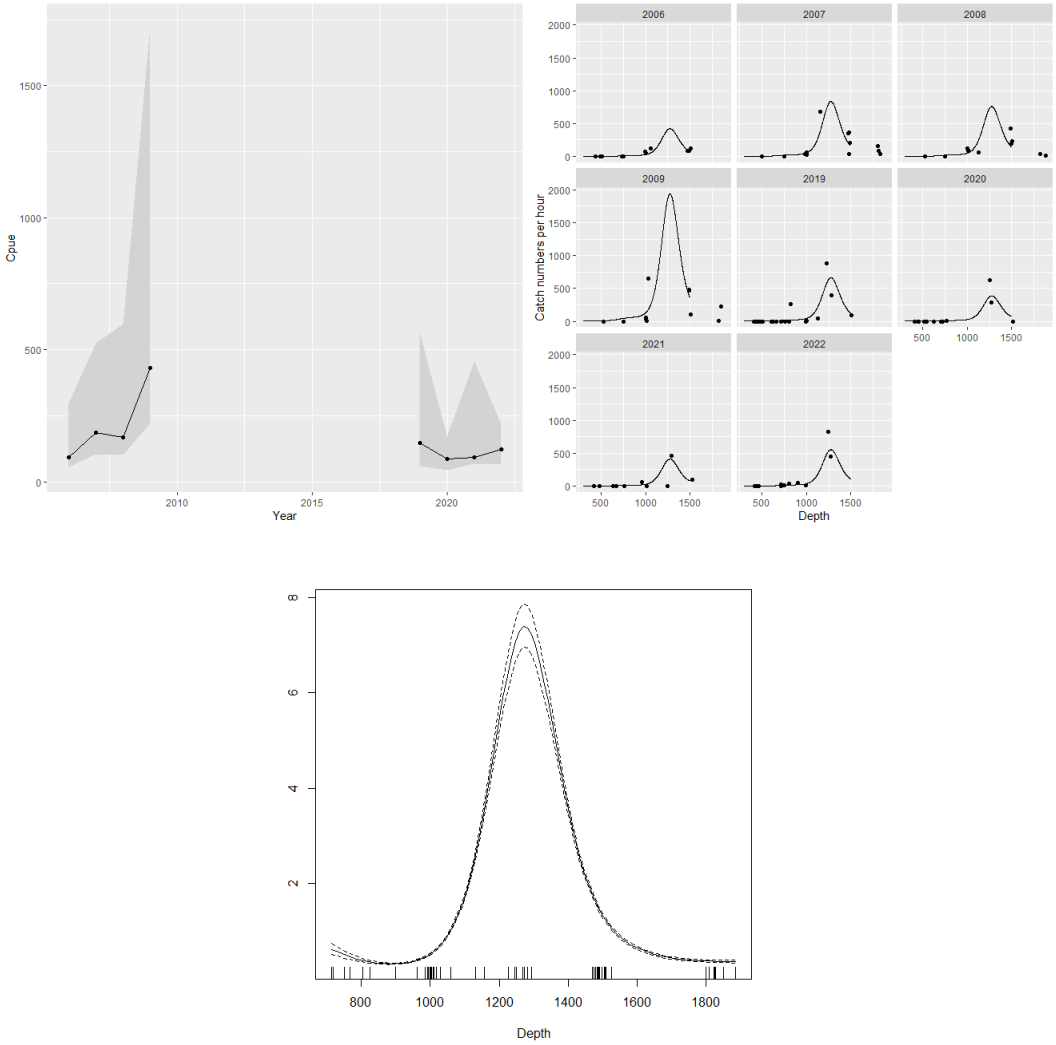


Figure 5 (Clockwise from top left): Bootstrapped CPUE with confidence intervals from 2006-2009 and 2019-2022; Catch numbers per hour by depth (m) and year; Abundance of species by depth (m).

Aphanopus carbo (Black scabbard)

Classification / Names
Actinopteri (ray-finned fishes) > Scombriformes (Mackerels) > Trichiuridae (Cutlassfishes) > Aphanopodinae

Etymology: Aphanopus: Greek, aphanes = hidden + Greek, pous = foot.

Environment
Marine; bathypelagic; oceanodromous; depth range 200 - 2300 m, usually 700 - 1300 m. Deep-water; 71°N - 23°S, 82°W - 17°E

Distribution
North Atlantic: on both sides and at underwater rises from Denmark Strait to Cape Verde.

Length at first maturity / Size / Weight / Age
Maturity: Lm 111.6 range? - 117.5 cm

Max length: 151 cm TL male/unsexed; common length: 70.0 cm SL male/unsexed;

Short description
Dorsal spines (total): 34 - 41; Dorsal soft rays (total): 52-56; Anal spines: 2; Anal soft rays: 43 - 48; Vertebrae: 97 - 100. Body is extremely elongated, with body depth 10.8 to 13.4 times in SL. The snout is large with strong fang-like teeth. Pelvic fins represented by a single spine in juveniles but entirely absent in adults. Colour is coppery black with iridescent tint. The inside of the mouth and gill cavities black.

Biology
Juveniles mesopelagic. Adults Bathypelagic. Migrate to midwater at night and feed on crustaceans, cephalopods and fishes (mostly macrourids, morids and alepocephalids). Mature at 80 to 85 cm. Eggs and larvae are pelagic. Data from study reveal mature individuals undertake horizontal migration to spawning and nursery grounds located off the Madeira and Canary Islands. Commercial catch up to 1000 t was caught off Madeira with a specialized commercial deep water longline. Appear as bycatch in the trawl fishery west of the British Isles, along the Middle-Atlantic Ridge and at Corner Rise. Important and fabled food fish in Madeira. Some specimens reach 145 cm.

Life cycle and mating behaviour
Displays determinate fecundity. Mature individuals undertake horizontal migration to spawning and nursery grounds. Suspended pre-spawning stages occurred in some areas of the Northeast Atlantic caused by atresia in ovaries.

IUCN Red List Status: Least Concern (LC); Date assessed: 12 October 2018

CITES: Not Evaluated

CMS: Not Evaluated

Threat to humans: Harmless

Human uses: Fisheries: highly commercial

Reference: https://www.fishbase.se/summary/Aphanopus-carbo.html

Results

Estimated annual CPUE was ~50 nhr^{-1} from 2006-2009 and increased to ~280 nhr^{-1} in 2019 before declining to ~60 nhr^{-1} in 2021. In 2022 the estimated CPUE increased to ~110 nhr^{-1}. Most abundant at a depth of ~900m.

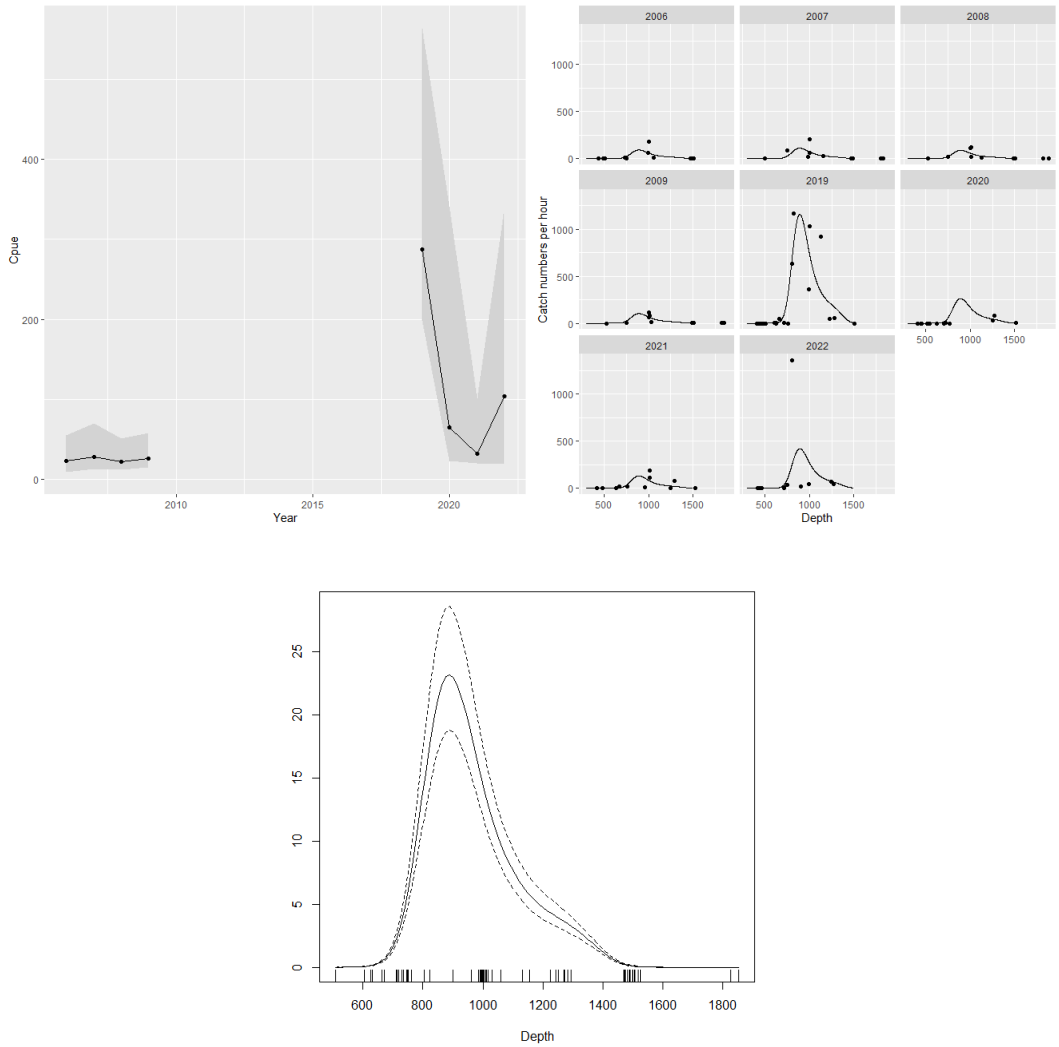


Figure 6 (Clockwise from top left): Bootstrapped CPUE with confidence intervals from 2006-2009 and 2019-2022; Catch numbers per hour by depth (m) and year; Abundance of species by depth (m).

Apristurus aphyodes (Ghost Catshark)

© Dr. Cristina Rodriguez-Cabello, Instituto Español de Oceanografía, Santander, Spain

Classification
Elasmobranchii (sharks and rays) > Carcharhiniformes (Ground sharks) > Pentanchidae (Deep-water catsharks)

Etymology: Apristurus: a-, Latin privative, i.e., without; pristis, from pristes (Gr.), sawyer (but here meaning saw); oura (Gr.), tail, referring to absence of saw-toothed crest of enlarged dermal denticles along upper edge of caudal fin as found in the closely related Pristiurus (=Galeus). aphyodes: Greek for whitish, referring to its pale-grey coloration.

Environment
Marine; bathypelagic; depth range 1014 - 1800 m. Deep-water; 58°N - 57°N

Distribution
Northeast Atlantic.

Length at first maturity / Size / Weight / Age

Maturity: Lm 56.9 (range unknown).

Short description

Body slender and cylindrical. Dermal denticles from dorsolateral side of body small and erect.

Biology
No information available

Life cycle and mating behaviour
Oviparous, paired eggs are laid. Embryos feed solely on yolk.

IUCN Red List Status: Least Concern (LC) ; Date assessed: 17 November 2014

CITES: Not Evaluated

CMS: Not Evaluated

Threat to humans: Harmless

Human uses
No information available

Reference: https://www.fishbase.se/summary/Apristurus-aphyodes.html

Results

Catch rates declined from 5.3 to 0.7 nhr^{-1} between 2007 and 2009. This species was not observed in 2019 and catch rate in 2022 was 0.8 nhr^{-1}. Most abundant at ~1,550m. Further analysis was not possible due to insufficient data.

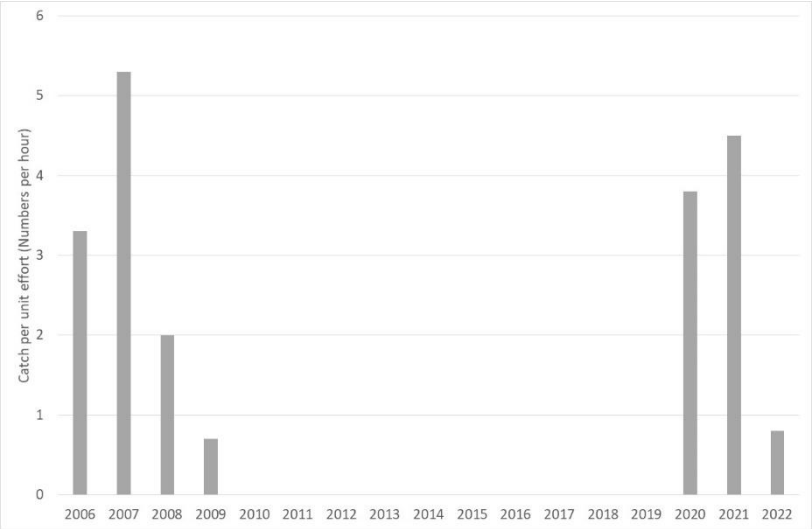


Figure 7: Raw catch per unit effort by year

Argentina silus (Great Silver Smelt)

Classification / Names
Actinopteri (ray-finned fishes) > Argentiniformes (Marine smelts) > Argentinidae (Argentines or herring smelts)

Etymology: Argentina: Latin, argentus = silver.

Environment
Marine; bathypelagic; oceanodromous; depth range 140 - 1440 m, usually 55 - 550 m. Deep-water; 80°N - 42°N, 71°W - 31°E

Distribution
Eastern Atlantic: Svalbard to west coasts of Scotland and Ireland, deeper parts of North Sea and across the Wyville Thomson ridge to Denmark Strait. Western Atlantic: Davis Strait to George's Bank in Canada. Arctic Ocean: east to Finnmark, Norway, Barents Sea.

Length at first maturity / Size / Weight / Age
Maturity: Lm 26.0 (range unknown).

Max length: 70.0 cm SL male/unsexed; max. reported age: 35 years

Short description
Dorsal soft rays (total): 11-13; Anal soft rays: 11 - 17. Scales with tiny spines on exposed parts. Dorsal fin begins above or nearly above tip of pectoral fin. Swim bladder elongated and silvery. Body slender to robust.

Biology
Bathypelagic. Prefer depths of 182.8-255.9 m, temperature 7-10°C and mean salinity 34 ppt. Probably form schools close to the bottom. Feeds on planktonic invertebrates including euphausiids, amphipods (arrow worms, krill and Thermisto), chaetognaths, squids and ctenophores, also small fishes. Spawns from April to July. Growth is slow. Eggs and young are pelagic at depths of 400-500m. Used fresh or in fish meal production.

Life cycle and mating behaviour
No information available

IUCN Red List Status: Not Evaluated

CITES: Not Evaluated

CMS: Not Evaluated

Threat to humans: Harmless

Human uses: Fisheries: commercial

Reference: https://www.fishbase.se/summary/Argentina-silus.html

Results

Catch rates declined from 220 to 21 nhr^{-1} from 2006 to 2009 and declined further to 5 nhr^{-1} in 2019. This species was not observed in 2020, 2021 or 2022. Most abundant at ~650m. Further analysis was not possible due to insufficient data in recent years.

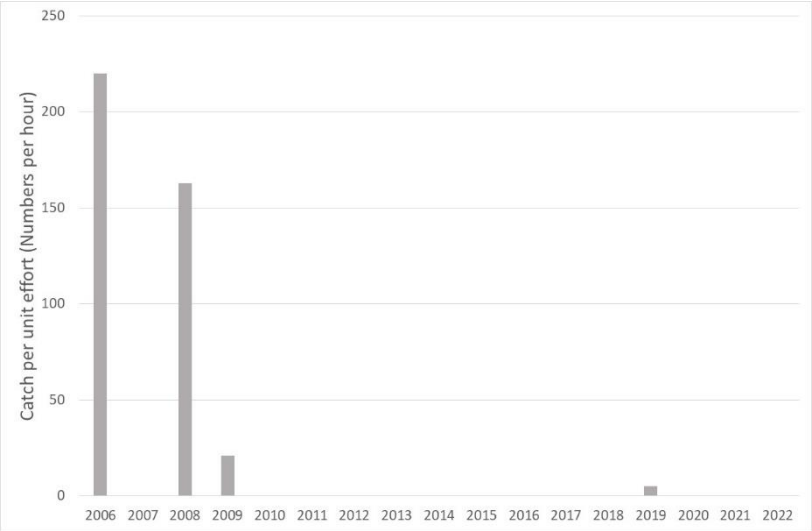
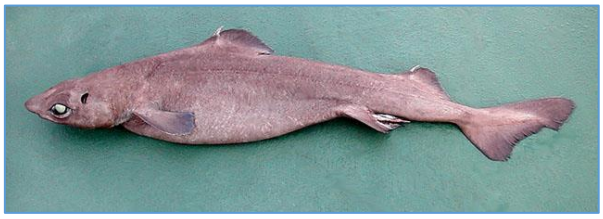


Figure 8: Raw catch per unit effort by year

Centrophorus squamosus (Leafscale Gulper Shark)



Classification / Names
Elasmobranchii (sharks and rays) > Squaliformes (Sleeper and dogfish sharks) > Centrophoridae (Gulper sharks)

Etymology: *Centrophorus*: centr[um] (L.), prickle or sharp point; phorus, from phoreus (Gr.), bearer or carrier, referring to grooved spines on dorsal fins; *squamosus*: squama (L.), scale; -osus, Latin suffix connoting fullness, i.e., scaly, referring to its large scales.

Environment
Marine; bathydemersal; depth range 145 - 2400 m. Deep-water; 69°N - 54°S, 92°W - 176°W

Distribution
North-western Atlantic, north-eastern and south-eastern Atlantic. Western and eastern Indian Ocean. South-western Pacific, north-western Pacific, and south-eastern Pacific.

Length at first maturity / Size / Weight / Age
Maturity: L_m 126.1, range 110 - 158 cm

Max length: 164 cm TL male/unsexed

Short description
Dorsal spines (total): 2; Dorsal soft rays (total): 0; Anal spines: 0; Anal soft rays: 0. A large gulper shark with a short, broad snout, a long, low 1st dorsal fin, short pectoral rear tips, and large, rough, leaf-like denticles. Dark grey or chocolate brown in colour.

Biology
Found on or near the bottom of continental slopes; also found pelagically in the upper 1,250 m of water 4,000 m deep. Presumably feeds on fish and cephalopods. Ovoviviparous. Utilized and fishmeal and dried salted for human consumption; meat and fins (low value) and liver oil (very high value), and occasionally for its mature eggs.

Life cycle and mating behaviour
Ovoviviparous, embryos feed solely on yolk. Young numbers 5-8 in a litter. Size at birth 35-43 cm. Distinct pairing with embrace.

IUCN Red List Status: Endangered (EN) (A2bd); Date assessed: 22 November 2019

CITES: Not Evaluated

CMS: Not Evaluated

Threat to humans: Harmless

Human uses: Fisheries: minor commercial

Reference: https://www.fishbase.se/summary/Centrophorus-squamosus.html

Results

CPUE was <1.5 nhr^{-1} from 2006 to 2009 and increased to ~6 nhr^{-1} in 2019 before declining continuously to ~1.1 nhr^{-1} in 2022. Species has a wide depth range between 600-1,400m.

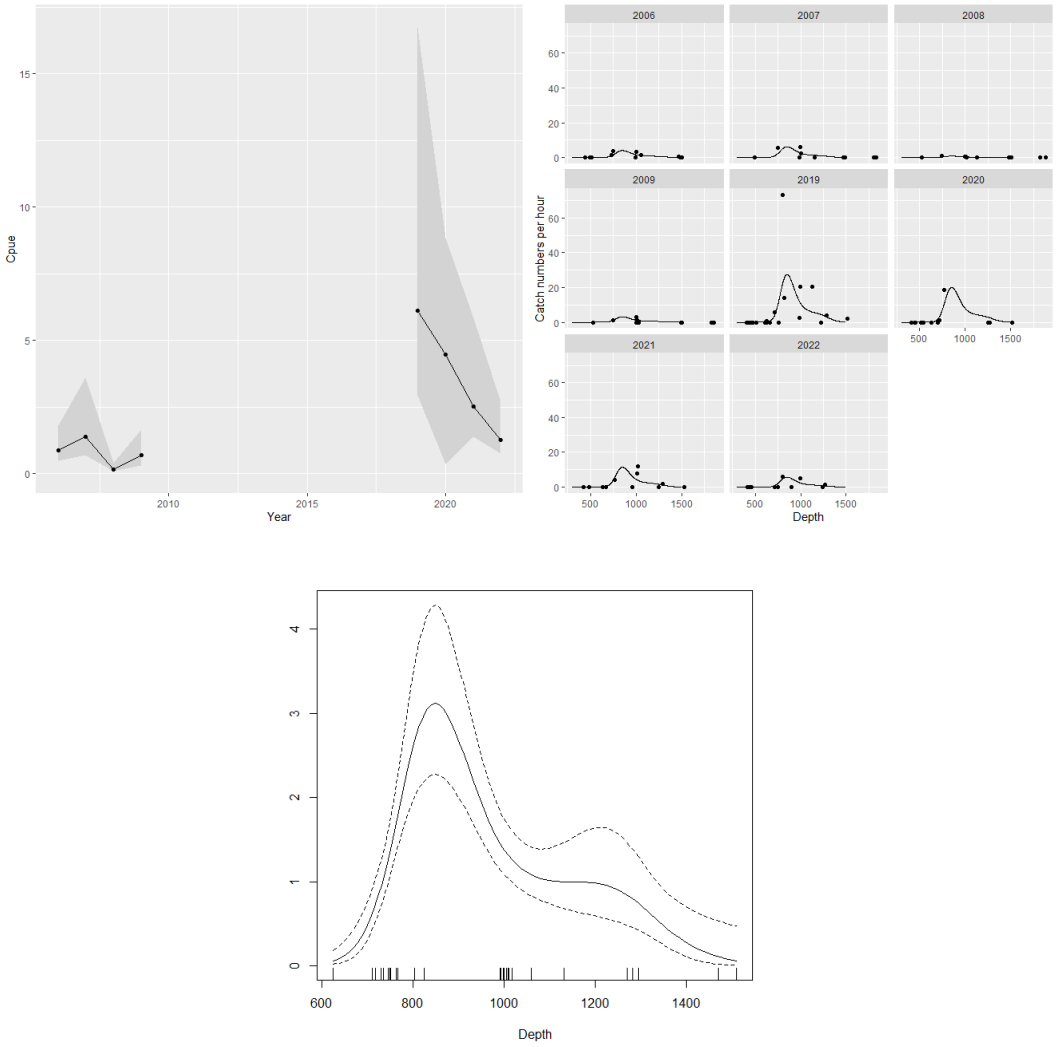


Figure 9 (Clockwise from top left): Bootstrapped CPUE with confidence intervals from 2006-2009 and 2019-2020; Catch numbers per hour by depth (m) and year; Abundance of species by depth (m).

Centroscyllium fabricii (Black Dogfish)

Classification / Names
Elasmobranchii (sharks and rays) > Squaliformes (Sleeper and dogfish sharks) > Etmopteridae (Lantern sharks)

Etymology: Centroscyllium: Greek, kentron = sting + Greek, skylla = a kind of shark.

Environment
Marine; bathydemersal, usually 180 - 2250 m. Deep-water; 68°N - 57°S, 99°W - 120°E

Distribution
Northwest Atlantic: South Baffin Island and Greenland to Virginia, USA and possibly the Gulf of Mexico. Eastern Atlantic: Iceland along Atlantic slope to Senegal; Guinea to Sierra Leone; Namibia to Quoin Point, South Africa. Southwest Atlantic: Uruguay to Argentina.

Length at first maturity / Size / Weight / Age
Maturity: Lm 64.0, range 58 - 70 cm

Max length: 107 cm TL male/unsexed; common length: 84.0 cm TL male/unsexed; common length :70 cm TL (female)

Short description
Adults uniformly blackish; fins of juveniles with white margins.

Biology
Found on the outermost continental shelves and upper slopes, mostly below 275 m. Epibenthic-pelagic. At high latitudes, may move up to the surface especially during the winter. Bottom water temp. Are from 3.5 to 4.5°C, but sometimes down to 1°C. Segregation by sex and size as well as by movement into shallower water and by increase in school size is sometimes seen. Feeds on crustaceans, cephalopods, jellyfish and small fishes. Ovoviviparous, with at least 14 pups in a litter. Has luminescent organs in skin. May reach 107 cm.

Life cycle and mating behaviour: Distinct pairing with embrace.

IUCN Red List Status: Least Concern (LC); Date assessed: 18 June 2019

CITES: Not Evaluated

CMS: Not Evaluated

Threat to humans: Harmless

Human uses: Fisheries: subsistence fisheries

Reference: https://www.fishbase.se/summary/Centroscyllium-fabricii.html

Results

Catch rates declined from 0.7 nhr^{-1} to 0.2 nhr^{-1} between 2006 and 2008 and it was not recorded at all during 2009 survey. Catch rates improved to 2.6 nhr^{-1} in 2021 but declined to 1.3 nhr^{-1} in 2022. No further analysis was possible due to insufficient data.

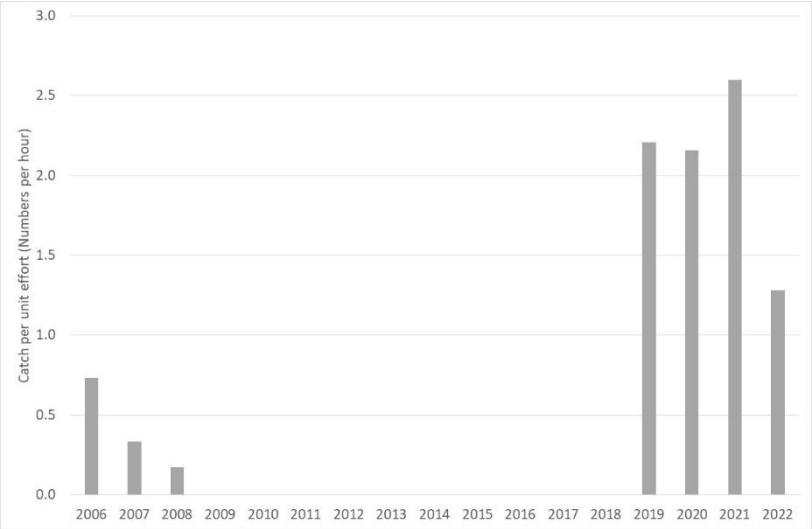
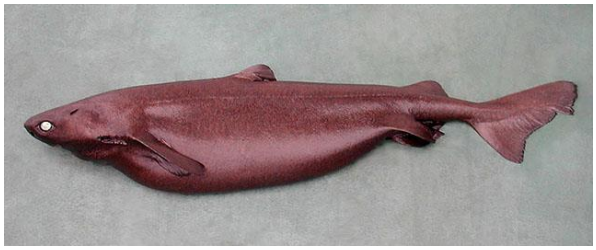


Figure 10: Raw catch per unit effort by year

Centroscymnus coelolepis (Portuguese Shark)



Classification / Names
Elasmobranchii (sharks and rays) > Squaliformes (Sleeper and dogfish sharks) > Somniosidae (Sleeper sharks)

Etymology: Centroscymnus: centr[um] (L.), prickle or sharp point, referring to spines on both dorsal fins; scymnus, an ancient name for some kind of shark, derived from a Greek word meaning young animal, cub or whelp. coelolepis: coelo-, from koilos (Gr.), hollow; lepis (Gr.), scale, referring to its concave skin denticles.

Environment
Marine; bathydemersal; depth range 128 - 3700 m, usually 400 - 2000 m. Deep-water; 5°C - 13°C; 75°N - 61°S, 98°W - 147°W

Distribution
Western Atlantic: Grand Banks to Delaware, USA; Cuba. Eastern Atlantic: Iceland south along Atlantic slope to the southwestern Cape coast of South Africa; also western Mediterranean. Western Pacific: off Japan, New Zealand, and Australia. Western Indian Ocean: Seychelles.

Length at first maturity / Size / Weight / Age
Maturity: Lm 101.8, range 95 - 110 cm

Max length: 121 cm TL male/unsexed; common length: 92.0 cm TL male/unsexed; max. published weight: 10.1 kg

Short description
Dorsal spines (total): 2; Dorsal soft rays (total): 0; Anal spines: 0; Anal soft rays: 0. Dorsal fins with very small spines, very short snout, lanceolate upper teeth and bladelike lower teeth with short, oblique cusps, stocky body that does not taper abruptly from pectoral region, very large lateral trunk denticles with smooth, circular, acuspidate crowns in adults and subadults. Uniformly golden brown to dark brown in colour.

Biology
Found on continental slopes and abyssal plains. Feeds mainly on fish (including sharks) and cephalopods, also gastropods and cetacean meat. Ovoviviparous, with 13 to 29 young per litter, born at 27-31 cm; 32-35 cm TL in North Atlantic. Utilized as fishmeal, dried and salted for human consumption, or as a source of squalene.

Life cycle and mating behaviour
Ovoviviparous, with 13 to 29 young per litter. Born at 27-31 cm. Distinct pairing with embrace.

CITES: Not Evaluated

CMS: Not Evaluated

Threat to humans: Harmless

Human uses: Fisheries: minor commercial

Reference: https://www.fishbase.se/summary/Centroscymnus-coelolepis.html

Results

CPUE was <2 nhr^{-1} from 2006-2009 and increased to ~8 nhr^{-1} in 2019 before declining to <2 nhr^{-1} in 2022. Most abundant at ~1,200m.

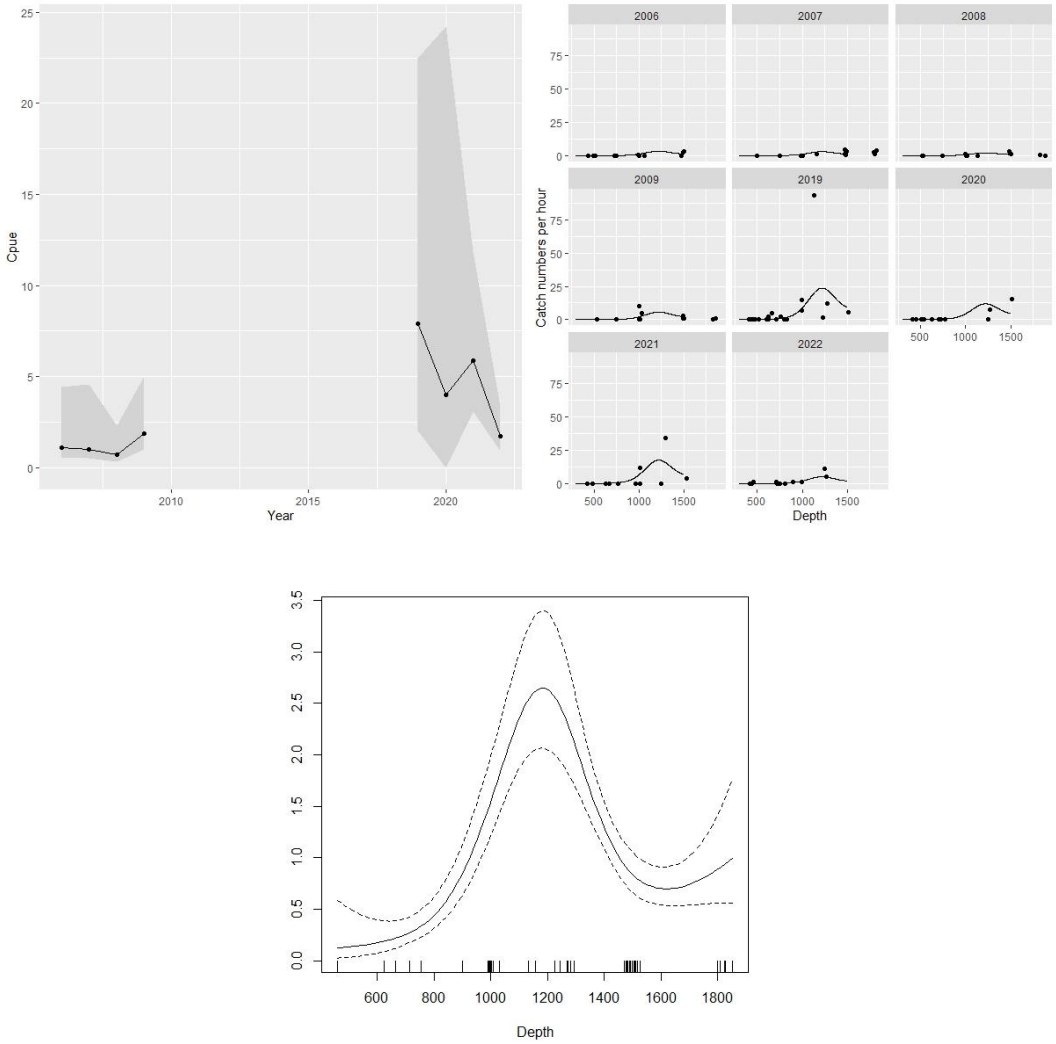


Figure 11 (Clockwise from top left): Bootstrapped CPUE with confidence intervals from 2006-2009 and 2019-2022; Catch numbers by depth (m) and year; Abundance of species by depth (m).

Centroscymnus crepidater (Longnose Velvet Dogfish)

Classification / Names
Etymology: Centroselachus: centr[um] (L.), prickle or sharp point, referring to spines on both dorsal fins; scymnus, an ancient name for some kind of shark, derived from a Greek word meaning young animal, cub or whelp; crepidater: crepida (L.), low shoe (e.g., slipper); ater (L.), black, transliteration of Portuguese vernacular sapata preta, black shoe, allusion not explained, possibly referring to superficial resemblance to a black velvet slipper.

Environment
Marine; bathydemersal; depth range 230 - 1500 m. Deep-water; 64°N - 57°S, 77°W - 159°W

Distribution
Eastern Atlantic: Iceland, Faeroe Islands along Atlantic slope to Portugal, Senegal, Madeira, Gabon to Democratic Republic of the Congo, Namibia. Indian Ocean: Aldabra and the Travancore coast of India. Western Pacific: New South Wales, Australia and New Zealand. Southeast Pacific: northern Chile.

Length at first maturity / Size / Weight / Age
Maturity: Lm 75.4, range 82 - ? cm

Max length: 130 cm TL male/unsexed; max. reported age: 54 years

Short description
Dorsal spines (total): 2; Dorsal soft rays (total): 0; Anal spines: 0; Anal soft rays: 0. Black or blackish brown in colour, dorsal fins with very small fin spines, very long snout, greatly elongated labial furrows that nearly encircle mouth, lanceolate upper teeth and bladelike lower teeth with moderately long, oblique cusps, fairly slender body that does not taper abruptly from pectoral region, moderately large lateral trunk denticles with partly smooth, oval, cuspidate crowns in adults and sub adults.

Biology
A fairly common species found on continental and insular slopes, on or near the bottom. Feeds mainly on fish and cephalopods. Ovoviviparous, with 4-8 young in a litter, born at 28-35 cm. The flesh is high in mercury; utilized as fishmeal and source of squalene.

Life cycle and mating behaviour
Ovoviviparous, with 4-8 young in a litter. Born at 28-35 cm. Distinct pairing with embrace.

IUCN Red List Status: Near Threatened (NT) (A2bd); Date assessed: 21 November 2019

CITES: Not Evaluated

CMS: Not Evaluated

Threat to humans: Poisonous to eat

Human uses: Fisheries: minor commercial

Reference: https://www.fishbase.se/summary/Centroselachus-crepidater.html

Results

CPUE increased from ~3.5 nhr^{-1} to ~6 nhr^{-1} from 2006 to 2007 before declining to ~2 nhr^{-1} and ~1 nhr^{-1} in 2008 and 2009. Catch rates improved to ~8.5 nhr^{-1} in 2019 and have varied between ~3.5 nhr^{-1} and 5.5 nhr^{-1} between 2020 and 2022. Most abundant at ~1,050m.

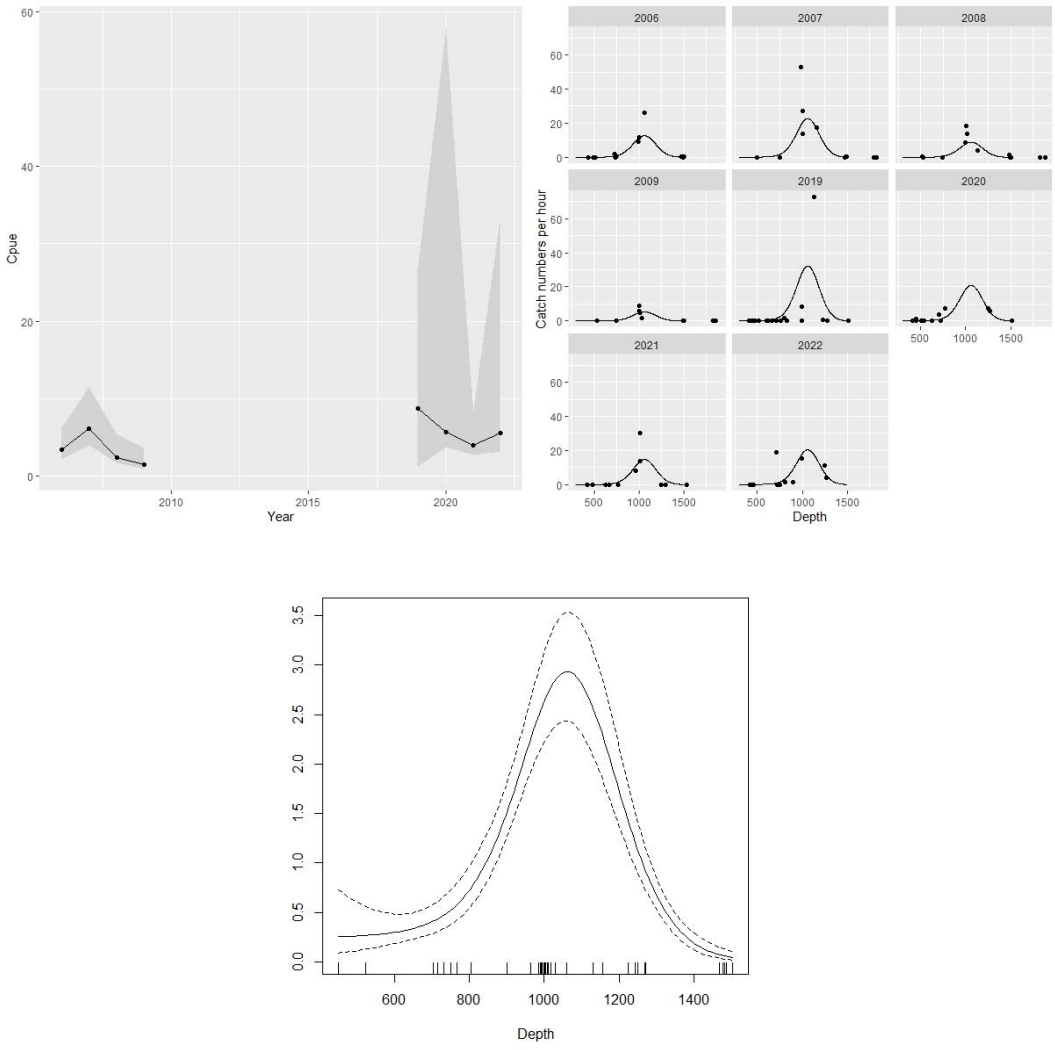
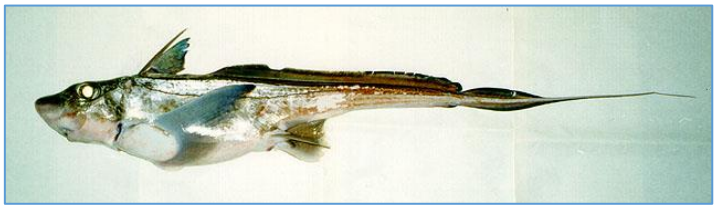


Figure 12 (Clockwise from top left): Bootstrapped CPUE with confidence intervals from 2006-2009 and 2019-2022; Catch numbers by depth (m) and year; Abundance of species by depth (m).

Chimaera monstrosa (Rabbit Fish)



Classification / Names
Holocephali (chimaeras) > Chimaeriformes (Chimaeras) > Chimaeridae (Shortnose chimaeras or ratfishes)

Etymology: Chimaera: Named for the mythological creature composed of parts of multiple animals, referring to their odd mix of characteristics; monstrosa: Latin for strange or grotesque, referring to its strange appearance, as if composed of parts of multiple animals.

Environment:
Marine; bathydemersal; oceanodromous; depth range 40 - 1400 m, usually 300 - 500 m. Deep-water; 75°N - 27°N, 32°W - 35°E

Distribution
Eastern Atlantic: northern Norway and Iceland, Skagerrak and Kattegat south to Morocco including western Mediterranean (some isolated records from eastern part), Azores and Madeira Islands. Records from South Africa are questionable. Reported from Oshima, Japan.

Length at first maturity / Size / Weight / Age
Maturity: Lm 45.9 (range unknown).

Max length: 150 cm TL male/unsexed; max. published weight: 2.5 kg

Biology
Bathydemersal to benthopelagic generally between 300 and 500 m depth. Found in the upper continental slope. Usually found in deeper waters in southern latitudes, while making a summer inshore migration up to 40-100 m in the northern areas. Sluggish, usually occurring in small groups. Feeds mainly on bottom-living invertebrates. The single dorsal spine is sharp and pointed, and although only mildly venomous can inflict a painful wound. Oviparous. Males have a clasper on the forehead that is probably used to hold on to the female during copulation. Egg capsules are about 17 cm long; young look alike adults and hatch when 10 cm long. Common by-catch when trawling for shrimps in the North Sea or Skaggerak.

Life cycle and mating behaviour
Oviparous; egg-capsules slender, club-shaped with narrow lateral membranes and a horny filament at the long pointed end, 17 cm long and 3 cm wide; deposited mainly in spring and summer. The embryos developing in about 9-12 months and hatch at 10 cm length.

IUCN Red List Status: Vulnerable (VU) (A2bd); Date assessed: 02 September 2019

CITES: Not Evaluated

CMS: Not Evaluated

Threat to humans: Traumatogenic

Human uses: Fisheries: minor commercial

Reference: https://www.fishbase.se/summary/Chimaera-monstrosa.html

Results

CPUE was ~45 nhr^{-1} between 2006 and 2008 and increased from ~70 nhr^{-1} in 2009. Between 2019 and 2021 catch rates fluctuated from ~40 to 80 nhr^{-1} and were observed to be ~85 nhr^{-1} in 2022. Species has a wide depth distribution ranging from 400-1,400m although depth range may not be entirely covered.

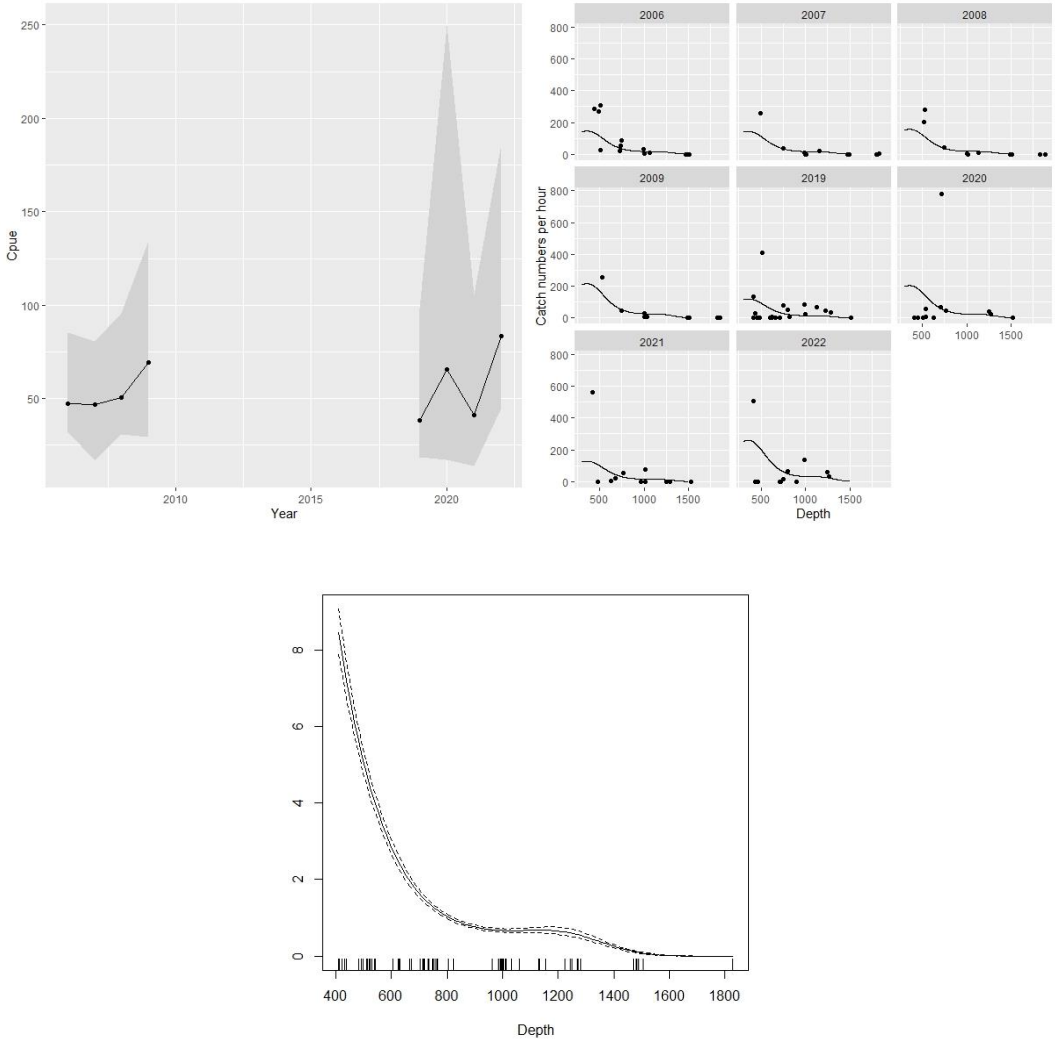


Figure 13 (Clockwise from top left): Bootstrapped CPUE with confidence intervals from 2006-2009 and 2019-2022; Catch numbers by depth (m) and year; Abundance of species by depth (m).

Coelorinchus coelorhincus (Hollow-nosed Rattail)

Classification / Names
Actinopteri (ray-finned fishes) > Gadiformes (Cods) > Macrouridae (Grenadiers or rattails)

Etymology: Coelorinchus: Greek, koilos = a hollow + Greek, rhyngchos = jaw.

Environment

Marine; benthopelagic; non-migratory; depth range 90 - 1485 m, usually 200 - 500 m. Deep-water; 62°N - 18°S, 98°W - 17°W

Distribution
Northeast Atlantic and Mediterranean Sea. A loose sort of southern limit for Caelorinchus caelorhincus caelorhincus is probably around Cape Verde; most specimens south and to the east into the Gulf of Guinea are likely to be Caelorinchus caelorhincus geronimoi. Northwest Atlantic: Canada.

Size / Weight / Age
Maturity: Length at maturity is unknown

Max length: 48.0 cm TL male/unsexed; common length: 30.0 cm TL male/unsexed; max. reported age: 10 years

Short description
Dorsal spines (total): 0; Anal spines: 0. Eyes large; snout short, moderately pointed, its anterolateral margin incompletely supported by bone. Head ridges strong but with rather fine spinules; terminal snout scute trifid, wider than long, small and blunt to large and pointed, with a terminal and two lateral arms of about equal size. Underside of the snout naked medially. Light organ large, a black naked fossa between and slightly anterior to the pelvic fin bases. Overall colour is pale grayish-brown to swarthy, with a series of broad saddle marks in some; oral cavity pale to dark. Spiny fin ray of first dorsal fin with a smooth and rounded leading edge.

Biology
Found commonly in about 200-500 m. Feeds on a variety of benthic organisms, such as polychaetes, gastropods, cephalopods, numerous crustacean groups (copepods, gammarians, isopods, cumaceans, Natantia) and fish.

Life cycle and mating behaviour: No information available.

IUCN Red List Status: Least Concern (LC); Date assessed: 14 May 2013

CITES: Not Evaluated

CMS: Not Evaluated

Threat to humans: Harmless

Human uses: Fisheries, minor commercial

Reference: https://www.fishbase.se/summary/Coelorinchus-caelorhincus.html

Results

CPUE increased from ~90 nhr^{-1} in 2006 to ~235 nhr^{-1} in 2009 but decreased to very low levels in 2020 before increasing again to ~50 nhr^{-1} in 2022. Depth range from 400-1,000m although depth range may not be entirely covered. CPUE confidence intervals could not be calculated due to insufficient data.

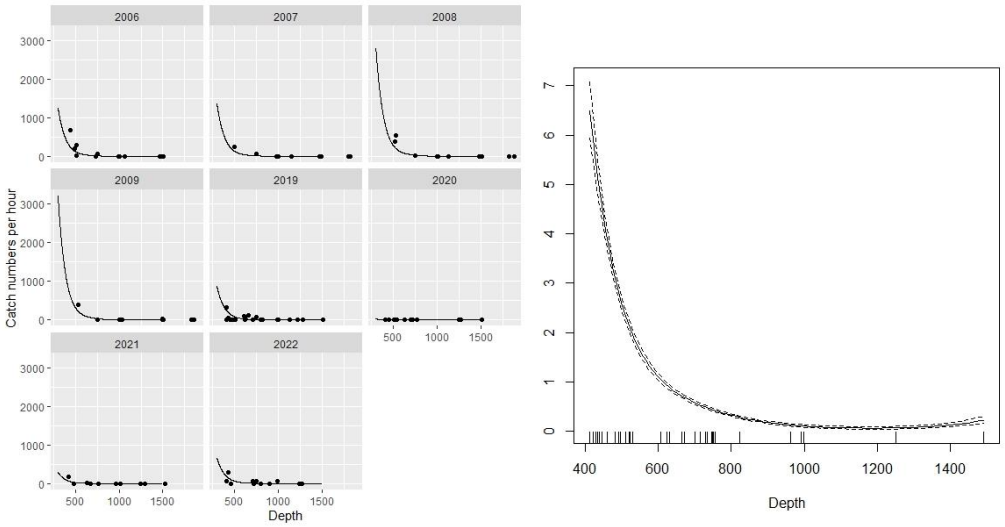


Figure 14: Catch numbers by depth and year and Abundance of species by depth (m).

Coelorinchus labiatus (Spear-snout Grenadier)

Classification / Names
Actinopteri (ray-finned fishes) > Gadiformes (Cods) > Macrouridae (Grenadiers or rattails)

Etymology: Coelorinchus: Greek, koilos = a hollow + Greek, rhyngchos = jaw

Environment:
Marine; bathydemersal; non-migratory; depth range 460 - 2220 m. Deep-water; 61°N - 12°N, 28°W - 28°E

Distribution
Eastern Atlantic.

Size / Weight / Age
Maturity: Length at maturity unknown (range unknown).

Max length: 50.0 cm TL male/unsexed; max. reported age: 10 years

Short description
Dorsal spines (total): 2; Anal spines: 0. Snout long and sharply pointed, its anterolateral margin almost completely supported by bone. Underside of the head entirely naked; the dorsal surfaces of the head with broad areas behind the anterolateral margins either naked or with small, thin scales. Light organ short and not visible externally. Overall colour grayish, with a prominent thing around the eye; the mouth and gill cavities blackish; the first dorsal fin uniformly dusky.

Biology
Feeds primarily on small fish and bottom-living crustaceans.

Life cycle and mating behaviour
No information available.

IUCN Red List Status: Least Concern (LC); Date assessed: 11 July 2012

CITES: Not Evaluated

CMS: Not Evaluated

Threat to humans: Harmless

Human uses: Fisheries, of no interest.

Reference: https://www.fishbase.se/summary/Coelorinchus-labiatus.html

Results

CPUE was stable at ~15nhr^{-1} from 2006 to 2008 and increased year on year to >150nhr^{-1} by 2021 before declining to ~20nhr^{-1} in 2022. Most abundant at ~1,500m but depth range may not be entirely covered. CPUE confidence intervals could not be calculated due to insufficient data.

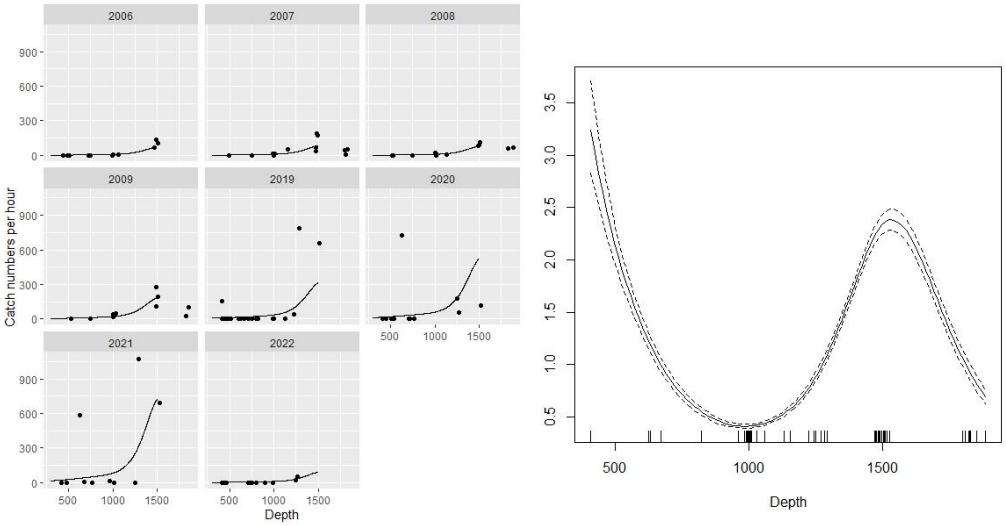


Figure 15: Catch numbers by depth (m) and year and Abundance of species by depth (m).

Coryphaenoides guentheri (Gunther's Grenadier)

Classification / Names
Actinopteri (ray-finned fishes) > Gadiformes (Cods) > Macrouridae (Grenadiers or rattails)

Etymology: Coryphaenoides: Greek, koryphaina = dolphin fish + Suffix oides = similar to

Environment
Marine; bathydemersal; non-migratory; depth range 831 - 2830 m. Deep-water; 62°N - 19°N, 74°W - 17°E

Distribution
Atlantic Ocean: Faroe-Shetland Channel to the Canary Islands, Iceland, Denmark Strait, Nunavut and the western Mediterranean.

Size / Weight / Age
Maturity: Length at maturity is unknown

Max length: 50.0 cm TL male/unsexed

Short description
Dorsal spines (total): 0; Dorsal soft rays (total): 11-12; Anal spines: 0. The head is relatively compressed; the eyes are large. The mouth is small and inferior. The scales have about 10 rows of large and broad spinules. The body is generally brownish, with the mouth and gill cavity darker.

Biology
Epibenthic. Feeds on small benthic invertebrates (annelids, isopods and mysids).

Life cycle and mating behaviour
No information available.

IUCN Red List Status: Least Concern (LC); Date assessed: 11 July 2012

CITES: Not Evaluated

CMS: Not Evaluated

Threat to humans: Harmless

Human uses: Fisheries, of no interest

Reference: https://www.fishbase.se/summary/Coryphaenoides-guentheri.html

Results

Catch rates increased from ~10 nhr^{-1} to 44 nhr^{-1} between 2006 and 2007 and remained steady at 34 nhr^{-1} in 2009. This species was not recorded at all in 2019 and only 6 individuals were observed in 2020. Only 3 individuals were observed in 2021 and it was not recorded at all in 2022. Most abundant at ~1,750m. Further analysis not possible due to insufficient data.

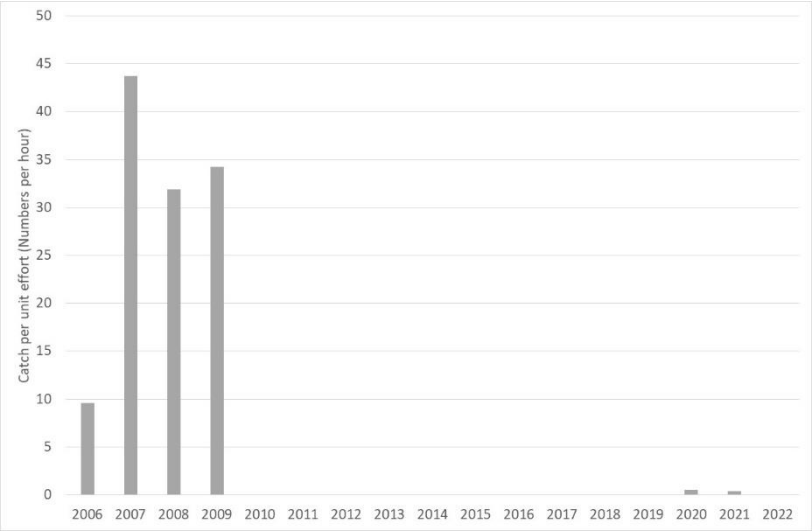
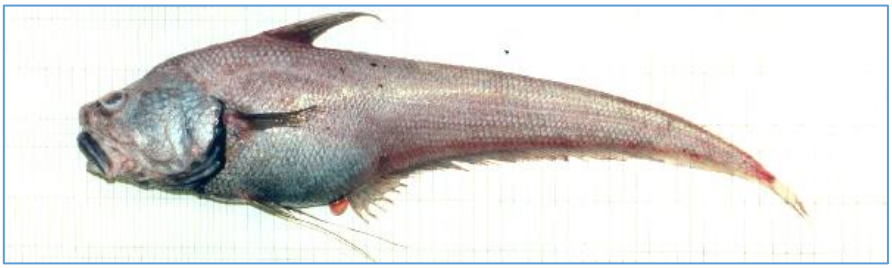


Figure 16: Raw catch per unit effort by year

Coryphaenoides mediterraneus (Mediterranean Grenadier)



Classification / Names
Actinopteri (ray-finned fishes) > Gadiformes (Cods) > Macrouridae (Grenadiers or rattails)

Etymology: Coryphaenoides: Greek, koryphaina = dolphin fish + Suffix oides = similar to.

Environment
Marine; bathypelagic; depth range 1000 - 4262 m. Deep-water; 67°N - 18°N, 98°W - 17°E

Distribution
Northeast Atlantic: Azores to west Scotland. Reported from Iceland. Also in the western Mediterranean. Western Central Atlantic: Gulf of Mexico.

Length at first maturity / Size / Weight / Age
Maturity: Length at maturity unknown, range 62 - ? cm

Max length: 73.0 cm TL male/unsexed;

Short description
Dorsal spines (total): 0; Anal spines: 0. Head scaled except for gular and branchiostegal membranes.

Biology
Depth range is reported at 1000m-3000m. Feeds on small benthic invertebrates. Minimum depth from.

Life cycle and mating behaviour
No information available.

IUCN Red List Status: Least Concern (LC); Date assessed: 02 February 2015

CITES: Not Evaluated

CMS: Not Evaluated

Threat to humans: Harmless

Human uses: no information available

Reference: https://www.fishbase.se/summary/Coryphaenoides-mediterraneus.html

Results

CPUE increased from 2 nhr^{-1} to 11 nhr^{-1} from 2006-2009 and declined to 2 nhr^{-1} in 2019 and 1 nhr^{-1} 2021. This species was not observed in 2022. Most abundant at ~1,750m. Further analysis not possible due to insufficient catch numbers.

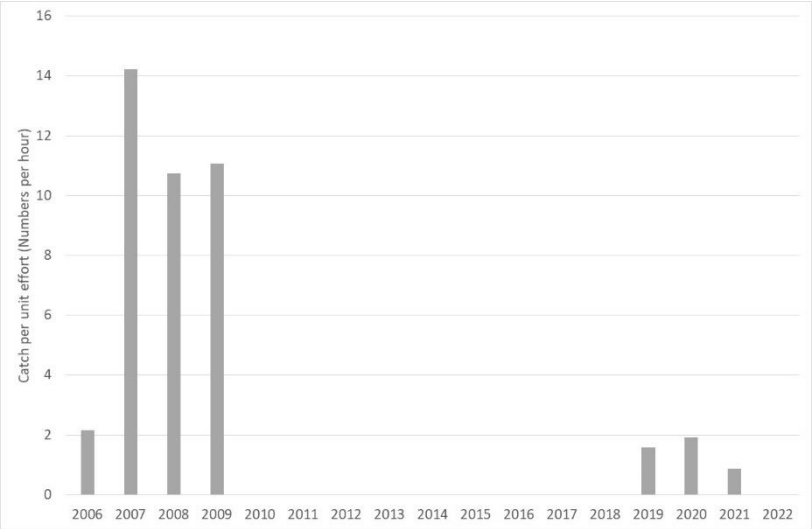


Figure 17: Raw catch per unit effort by year

Coryphaenoides rupestris (Round-nose Grenadier)

Classification / Names
Actinopteri (ray-finned fishes) > Gadiformes (Cods) > Macrouridae (Grenadiers or rattails)

Etymology: Coryphaenoides: Greek, koryphaina = dolphin fish + Suffix oides = similar to.

Environment
Marine; bathypelagic; depth range 180 - 2600 m, usually 400 - 1200 m. Deep-water; 73°N - 20°N, 77°W - 32°E

Distribution
North Atlantic: from about 37°N to Baffin Island and Greenland in the western Atlantic, and off Iceland and Norway to 73°N to Barents Sea, south to North Africa in the eastern Atlantic. Reported to occur from the tongue of the Ocean east of Andros Islands (about 24°N, 77°W) in the Bahamas.

Length at first maturity / Size / Weight / Age
Maturity: Lm 52.7, range 60 - ? cm

Max length: 110 cm TL male/unsexed; max. published weight: 1.7 kg; max. reported age: 54 years

Short description
Dorsal spines (total): 2; Anal spines: 0. Head broad, rather soft; snout broad, rounded, with a large blunt tubercular scute at its tip; chin with small barbel. Scales relatively adherent; spinules dense on body scales, long, thin and recurved, narrowly lanceolate, with longitudinal anterior concavity. Pyloric caeca 29 to 31, long and slender. Colour medium brown to greyish; orbits, oral and branchial cavities, and fins blackish to brownish grey.

Biology
Benthopelagic to bathypelagic in about 400 and 1200 m depth. Minimum depth from. Form large schools at 600 to 900 m depth. Feed on a variety of fish and invertebrates, but primarily on pelagic crustaceans such as shrimps, amphipods and cumaceans; cephalopods and lantern fishes constitute a lesser portion of the diet. Batch spawner. This species is currently facing overexploitation in the North Atlantic. Utilized frozen and for fishmeal; can be fried and baked.

Life cycle and mating behaviour
No information available

IUCN Red List Status: Critically Endangered (CR) (A4bd); Date assessed: 11 July 2012

CITES: Not Evaluated

CMS: Not Evaluated

Threat to humans: Harmless

Human uses: Fisheries: commercial

Reference: https://www.fishbase.se/summary/Coryphaenoides-rupestris.html

Results

CPUE was ~275nhr^{-1} in 2006 and increased to ~375nhr^{-1} in 2009 before declining to ~280 nhr^{-1} in 2019 and ~140 nhr^{-1} in 2022. Most abundant at ~1,400m.

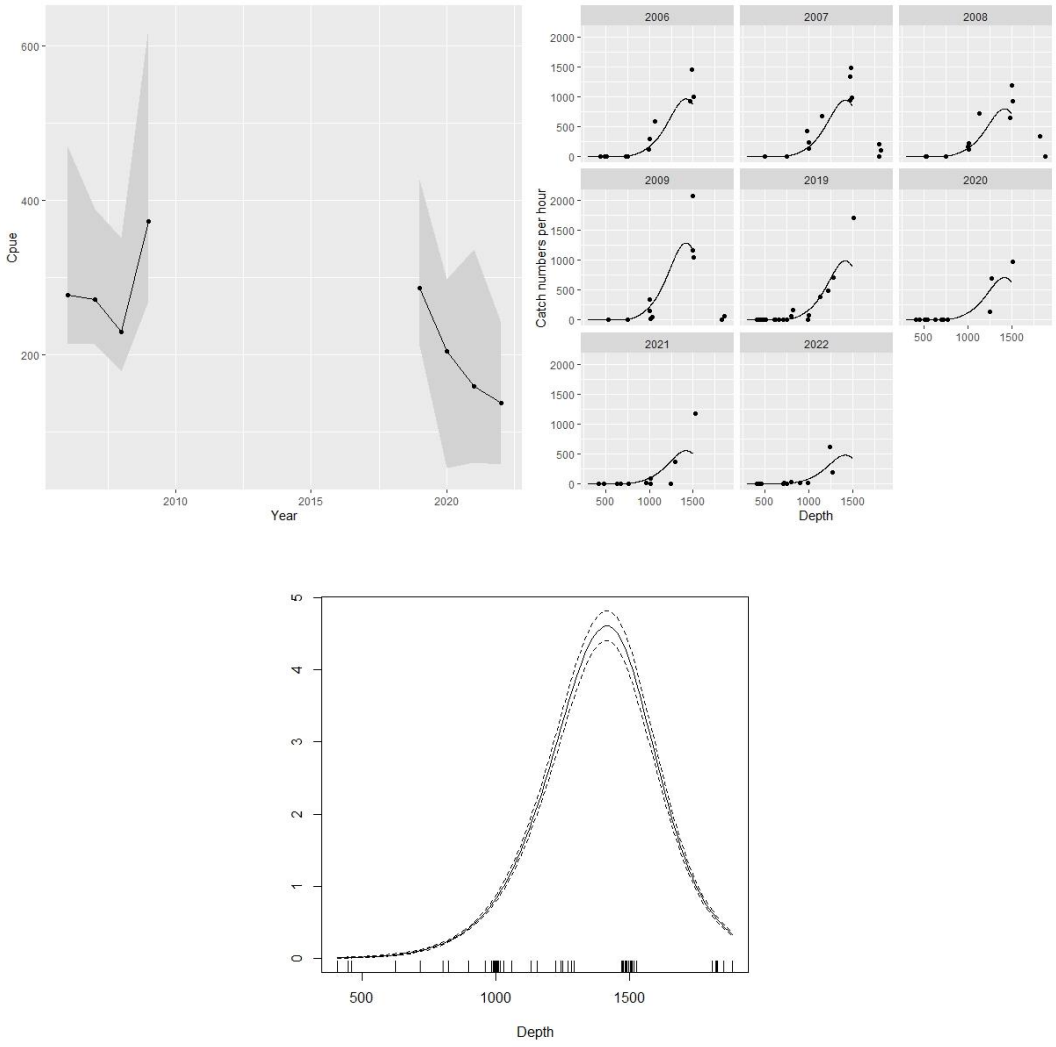
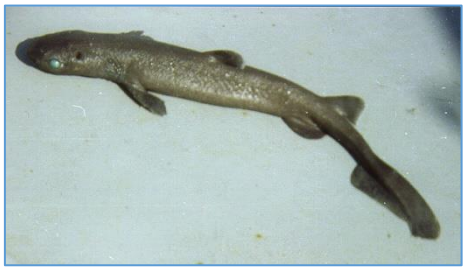


Figure 18 (Clockwise from top left): Bootstrapped CPUE with confidence intervals from 2006-2009 and 2019-2020; Catch numbers by depth (m) and year; Abundance of species by depth (m).

Dalatias licha (Darkie Charlie)



Classification / Names
Elasmobranchii (sharks and rays) > Squaliformes (Sleeper and dogfish sharks) > Dalatiidae (Sleeper sharks)

Etymology: Dalatias: Etymology not explained nor evident. A few online sources suggest Dalatias is derived from dalos (Gr.), torch or firebrand, but nothing in the original description supports this interpretation. Interestingly, D. licha is bioluminescent, a fact that was discovered and reported only recently and was certainly unknown to early naturalists; icha: Latinization of “La Liche” an old French word for this shark, possibly from from the Occitan lecha or lec, meaning “glutton”.

Environment
Marine; bathydemersal; depth range 37 - 1800 m, usually 300 - 600 m. Deep-water; 72°N - 56°S, 98°W - 153°W

Distribution
Western Atlantic: Georges Bank and northern Gulf of Mexico. Eastern Atlantic: Iceland, Scotland, and Irish Atlantic slope to Morocco, western Mediterranean, Madeira to Cameroon. Western Indian Ocean: Mozambique and South Africa. Western Pacific: Japan, Australia, and New Zealand. Central Pacific: Hawaii.

Length at first maturity / Size / Weight / Age
Maturity: Lm 139.0, range 117 - 159 cm

Max length: 182 cm TL male/unsexed;

Short description
Dorsal spines (total): 0; Dorsal soft rays (total): 0; Anal spines: 0; Anal soft rays: 0. Moderately sized, short- and blunt-snouted shark with two almost equal-sized dorsal fins; papillose thick lips; small slender-cusped upper teeth and very large lower teeth with erect triangular serrated cusps and distal blades; first dorsal fin on back with its origin behind the pectoral rear tips and its base closer to the pectoral base than the pelvic fins; and caudal fin with the ventral lobe not expanded. Dark grey-brown to black; trailing edges of fins translucent.

Biology
Found on outer continental and insular shelves and slopes. Mainly found on or near the bottom but readily occurs well off the substrate. Often pelagic. Found singly or in small schools. Feeds mainly on deep-water bony fish, but also skates, other sharks (etmopterids), cephalopods and crustaceans. This bioluminiscent shark (currently the largest luminous vertebrate) emit light ventrally to counter illuminate which might be used to illuminate the ocean floor while searching/hunting for prey; or to stealthily approach prey, using counter illumination camouflage, before striking fast when it is close

enough. Ovoviviparous, with 10-20 young born at 30-42 cm. Used for its squalene liver oil, leather and meat, as well as for fishmeal.

Life cycle and mating behaviour

Ovoviviparous (10-20 young born at 30-42 cm; 10-16 young born at 30 cm TL. Distinct pairing with embrace.

IUCN Red List Status: Vulnerable (VU) (A2bd+3d); Date assessed: 03 July 2017

CITES: Not Evaluated

CMS: Not Evaluated

Threat to humans: Harmless

Reference: https://www.fishbase.se/summary/Dalatias-licha.html

Results

This species was observed very infrequently in 2007 and 2008 with only 1 and 4 individuals recorded in those years respectively. It was not observed at all in 2006 and 2009. Numbers increased in 2019 and 2020 with 17 and 14 individuals recorded and 68 individuals were observed in 2022 (66 at one station). This species has a wide depth distribution but is most abundant at ~1,500m. Further analysis not possible due to insufficient data in 2006 and 2009.

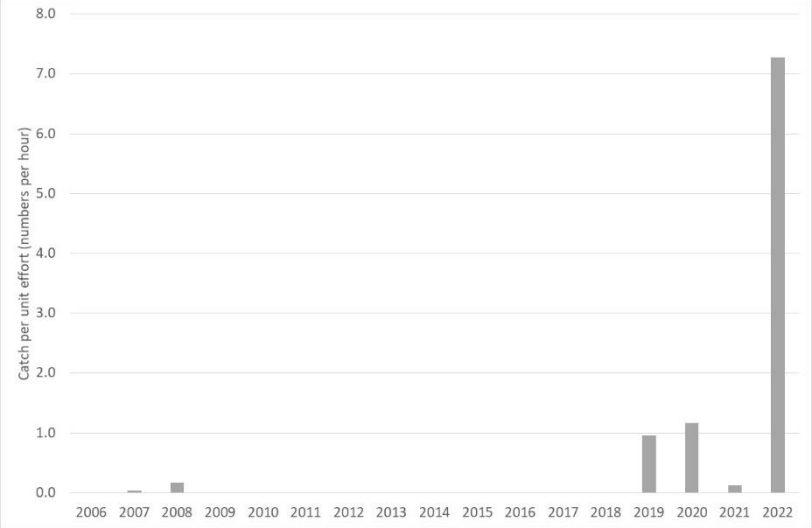


Figure 19: Raw catch numbers per unit effort by year

Deania calceus (Bird-beak Dogfish)

Classification / Names

Elasmobranchii (sharks and rays) > Squaliformes (Sleeper and dogfish sharks) > Centrophoridae (Gulper sharks)

Etymology: Deania: -ia (Gr.), belonging to: American ichthyologist Bashford Dean (1867-1928), American Museum of Natural History, for his research on selachian fishes. calceus: Latin for shoe, from the Portuguese vernacular sapata for this and other squaliform sharks, e.g., Centroselachus crepidater, Somniosidae; also known as sapata branca, white shoe, allusion not explained, perhaps referring to how its gray-white body with a long snout resembles a velvet slipper [often misspelled calcea].

Environment:

Marine; bathydemersal; depth range 60 - 1490 m, usually 400 - 1400 m. Deep-water; 70°N - 56°S, 180°W - 180°E

Distribution

Eastern Atlantic: Iceland along Atlantic slope to Algoa Bay, South Africa. Western Pacific: southern Honshu in Japan, southern Australia, New Zealand. Occurrence in the Western Central Pacific uncertain. Eastern Pacific: southern Chile to northern Peru.

Length at first maturity / Size / Weight / Age

Maturity: Lm 97.8, range 70 - 111 cm

Max length: 127 cm TL male/unsexed; max. published weight: 8.7 kg

Short description

Dorsal spines (total): 2; Dorsal soft rays (total): 0; Anal spines: 0; Anal soft rays: 0. A longnose dogfish with a long, 1st dorsal fin and no subcaudal keel. Grey-brownish in colour.

Found on the outer continental and insular shelves and upper slopes. Usually on or near the bottom but sometimes found well above it. Apparently in large schools. Feeds on pelagic bony fish, squid, octopus and shrimp. Ovoviviparous. Caught very rarely by demersal longline fisheries operating in deep-water of Indonesia. Utilized for its meat, fins (low value) and liver oil (very high value).

Life cycle and mating behaviour

Ovoviviparous, embryos feed solely on yolk. Young possibly number 6 to 12 in a litter, as these were the number of fertilized eggs found in the uteri of some specimens. Size at birth 29 to 34 cm. Distinct pairing with embrace.

IUCN Red List Status: Near Threatened (NT) (A2bd); Date assessed: 21 November 2019

CITES: Not Evaluated

CMS: Not Evaluated

Threat to humans: Harmless

Human uses: Fisheries: minor commercial

Reference: https://www.fishbase.se/summary/Deania-calceus.html

Results

CPUE increased from ~15 nhr^{-1} to ~26 nhr^{-1} from 2006 to 2009 and was ~47 nhr^{-1} in 2019 declining to <10 nhr^{-1} in 2022. Most abundant at ~800m.

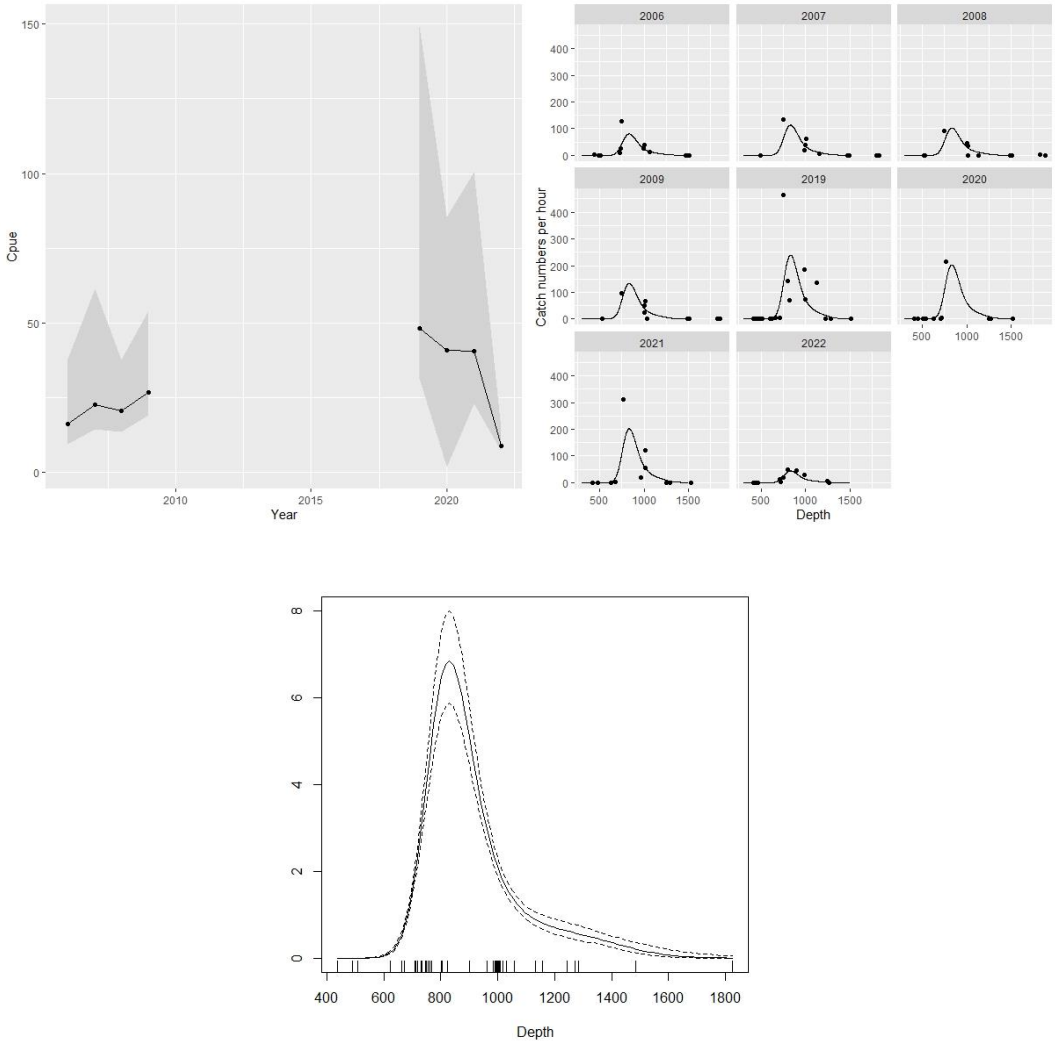


Figure 20 (Clockwise from top left): Bootstrapped CPUE with confidence intervals from 2006-2009 and 2019-2022; Catch numbers by depth (m) and year; Abundance of species by depth (m).

Etmopterus princeps (Great Lanternshark)

Classification / Names
Elasmobranchii (sharks and rays) > Squaliformes (Sleeper and dogfish sharks) > Etmopteridae (Lantern sharks)

Etymology: Etmopterus: Greek, ethmos, -ou = sieve or ethmoides bone + Greek, pteron = wing, fin.

Environment
Marine; bathydemersal; depth range 300 - 2213 m, usually 300 - 2000 m. Deep-water; 69°N - 13°N, 77°W - 16°E

Distribution
Northwest Atlantic: Nova Scotia, Canada to New Jersey, USA. Northeast Atlantic: southern Iceland along Atlantic slope to Faeroes, Hebrides, UK, English Channel, Bay of Biscay and Gibraltar, Mauritania. Nominally recorded from New Caledonia in the Western Central Pacific, but its status there needs clarification - other large species of lanternsharks (Etmopterus baxteri and Etmopterus unicolor) may be involved.

Length at first maturity / Size / Weight / Age
Maturity: Length at maturity unknown; range 55 - ? cm

Max length: 94.0 cm TL male/unsexed

Biology
Found on the continental slopes. Probably fished in the eastern Atlantic but details not known. Ovoviviparous.

Life cycle and mating behaviour
Distinct pairing with embrace.

IUCN Red List Status: Least Concern (LC); Date assessed: 20 June 2019

CITES: Not Evaluated

CMS: Not Evaluated

Threat to humans: Harmless

Human uses: Fisheries, of no interest.

Reference: https://www.fishbase.se/summary/Etmopterus-princeps.html

Results

CPUE was <5 nhr^{-1} from 2006-2009 but increased to ~80 nhr^{-1} in 2019 before declining to ~20 nhr^{-1} in 2021 and ~10 nhr^{-1} in 2022. Abundant at 1,100m and also at ~1,600m.

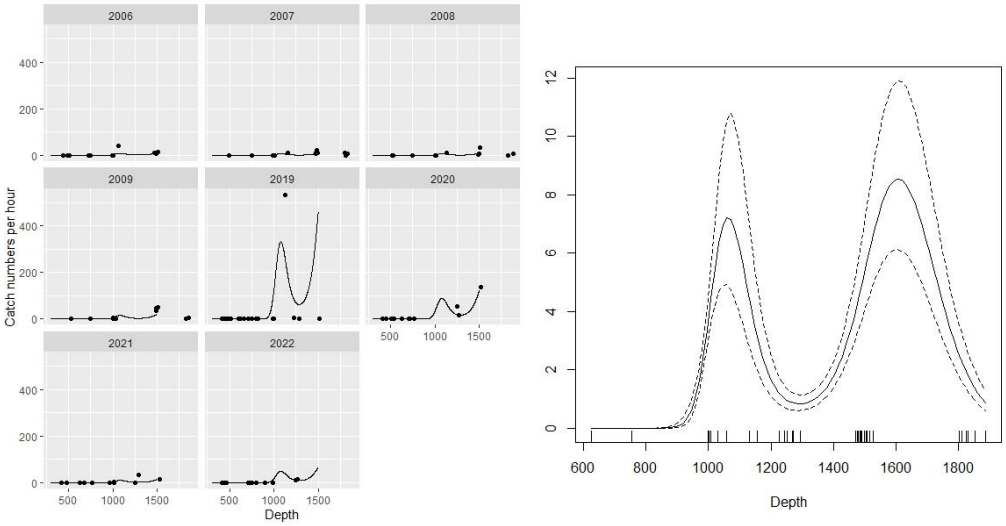
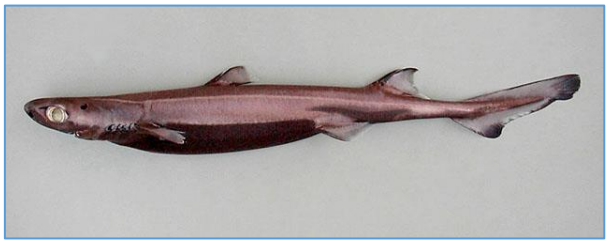


Figure 21: Catch numbers by depth (m) and year and Abundance of species by depth (m).

Etmopterus spinax (Velvet Belly)



Classification / Names
Elasmobranchii (sharks and rays) > Squaliformes (Sleeper and dogfish sharks) > Etmopteridae (Lantern sharks)

Etymology: Etmopterus: Greek, ethmos, -ou = sieve or ethmoides bone + Greek, pteron = wing, fin.

Environment
Marine; bathydemersal; depth range 70 - 2490 m, usually 200 - 500 m. Deep-water; 75°N - 48°S, 42°W - 36°E

Distribution
Eastern Atlantic: Iceland, Norway, and the western Mediterranean to Morocco, Senegal, Sierra Leone, Côte d'Ivoire to Nigeria, Cameroon to Gabon, Azores, Cape Verde, and Cape Province, South Africa.

Length at first maturity / Size / Weight / Age
Maturity: Lm 34.5, range 33 - 36 cm

Max length: 60.0 cm TL male/unsexed; common length: 45.0 cm TL male/unsexed; max. published weight: 850g.

Biology
Found on the outer continental shelves and upper slopes. Feeds on small fishes, squids, and crustaceans. Ovoviviparous, with number of young from 6 to 20 in a litter. Utilized for fishmeal and prepared dried salted for human consumption. Depth range reported at 70m-2000m.

Life cycle and mating behaviour

Distinct pairing with embrace.

IUCN Red List Status: Vulnerable (VU) (A2bd); Date assessed: 31 August 2020

CITES: Not Evaluated

CMS: Not Evaluated

Threat to humans: Harmless

Human uses: Fisheries: minor commercial

Reference: https://www.fishbase.se/summary/Etmopterus-spinax.html

Results

CPUE was <4 nhr^{-1} for entire time series apart from 2008 when it was ~4.5 4 nhr^{-1}. Most abundant at ~500m. Further analysis not possible due to insufficient data in 2007.

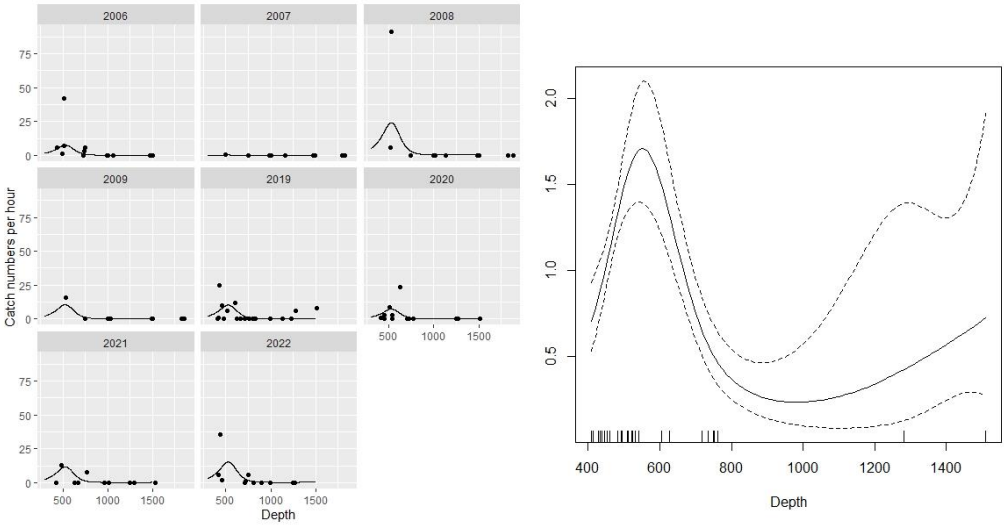


Figure 22: Catch numbers by depth (m) and year and Abundance of species by depth (m).

Gadiculus argenteus (Silvery Pout)

Classification / Names
Actinopteri (ray-finned fishes) > Gadiformes (Cods) > Gadidae (Cods and haddocks)

Etymology: Gadiculus: Latin, gadus = a fish, cod?

Environment
Marine; pelagic-oceanic; non-migratory; depth range 100 - 1000 m. Temperate; 69°N - 24°N, 18°W - 17°E

Distribution
Northeast Atlantic: found in the western Mediterranean and in the Atlantic around the Strait of Gibraltar and to the south along the Moroccan coast.

Size / Weight / Age
Maturity: Length at maturity unknown (range unknown).

Max length: 15.3 cm TL male/unsexed; common length: 10.0 cm TL male/unsexed; max. reported age: 3.00 years

Short description

Dorsal spines (total): 0; Anal spines: 0. Eyes large; mouth oblique; chin barbel absent. Colour varies from pink to light brown dorsally, silvery on sides and ventrally. Scales large, silvery and easily detached. Lateral line ends in 7 open mucus grooves on the upper side of the head.

Biology
Occurs in large schools over mud, muddy sand, gravel and rock bottoms. Feeds on small crustaceans and maybe worms. Preyed upon by other valuable fish. Spawns in the winter in the western Mediterranean and in the spring farther north.

Life cycle and mating behaviour

The major spawning grounds are located in the western part of the Mediterranean, on both sides of the Straits of Gibraltar, in deep water.

IUCN Red List Status: Not Evaluated

CITES: Not Evaluated

CMS: Not Evaluated

Threat to humans: Harmless

Human uses: Fisheries: minor commercial; bait: usually

Reference: https://www.fishbase.se/summary/Gadiculus-argenteus.html

Results

Catch rates were 2 nhr^{-1} in 2006 and this species was not observed in 2007. Only three individuals were observed in 2008 but catch rates increased to 20 nhr^{-1} in 2009. It was not observed in 2019 and only 13 individuals were recorded in 2020. This species was also not observed in 2021 or 2022. Most abundant at <500m. Further analysis not possible due to insufficient data.

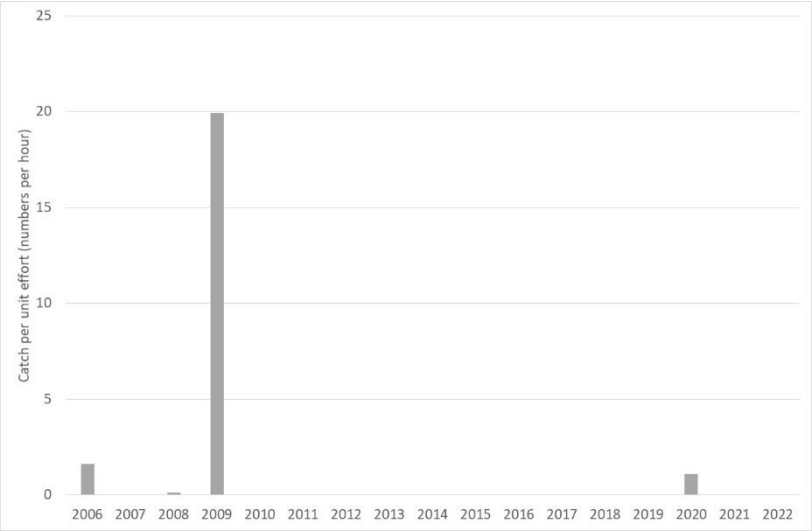


Figure 23: Raw catch per unit effort (numbers per hour)

Galeus melastomus (Black-mouth Dogfish)

Classification / Names

Elasmobranchii (sharks and rays) > Carcharhiniformes (Ground sharks) > Pentanchidae (Deep-water catsharks)

Etymology: *Galeus*: galeos, a small shark or dogfish according to Aristotle and others. (See ETYFish.org); *melastomus*: melas, black; stoma, mouth, referring to colour inside of mouth (common in congeners but quickly lost after preservation).

Environment

Marine; demersal; depth range 55-1873 m, usually 150-1200 m. Deep-water; 64°N-14°N, 19°W-36°E

Distribution

Northeast Atlantic: Faeroe Islands and Trondheim, Norway southward to Senegal. Mediterranean Sea.

Length at first maturity / Size / Weight / Age

Maturity: Lm 64.7, range 56 -? cm

Max length: 75.0 cm TL male/unsexed; 90.0 cm TL (female); common length: 50.0 cm TL male/unsexed; max. published weight: 1.4 kg.

Biology

Depth range is reported at 55m-1200m. Found on the outer continental shelves and upper slopes. Feeds mainly on bottom invertebrates, including shrimps and cephalopods, but also on small pelagic bony fishes (lantern fishes) and other small elasmobranchs. Oviparous, with up to 13 eggs present in the oviducts at one time. Individuals from the Ionian Sea apparently reproduces from end of February to September and eggs are laid between 200 and 600 meters. Utilized fresh and dried-salted for human consumption, and for leather.

Life cycle and mating behaviour: Oviparous, embryos feed solely on yolk.

IUCN Red List Status: Least Concern (LC); Date assessed: 31 August 2020

CITES: Not Evaluated

CMS: Not Evaluated

Threat to humans: Harmless

Human uses: Fisheries: minor commercial

Reference: https://www.fishbase.se/summary/Galeus-melastomus.html

Results

CPUE was <10 nhr^{-1} from 2006 to 2008 before increasing to ~35 nhr^{-1} in 2009. From 2019 to 2020 the CPUE index decreased from ~20 nhr^{-1} to <10 nhr^{-1} before increasing to almost 70 nhr^{-1} in 2022. Most abundant at ~600m with a depth range of 400m to 1,000m.

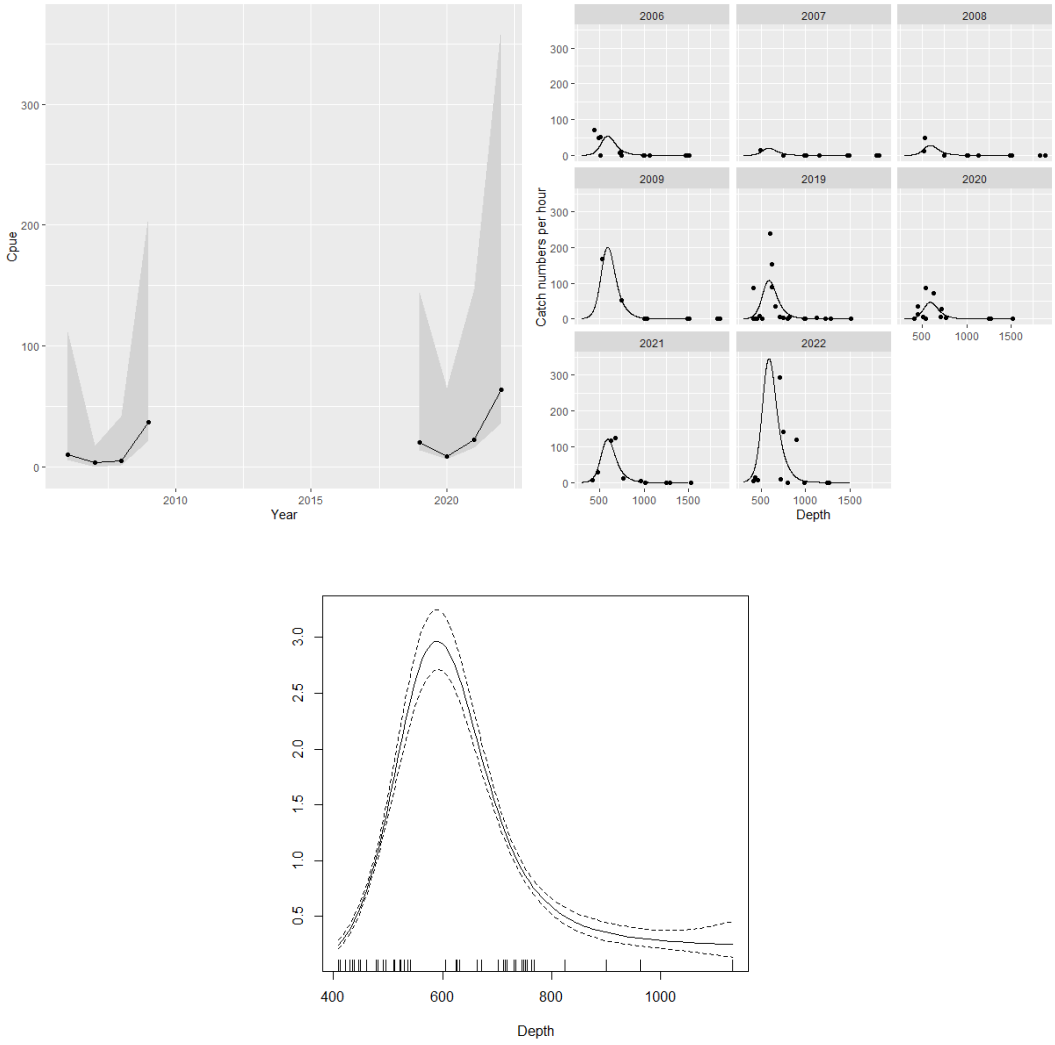
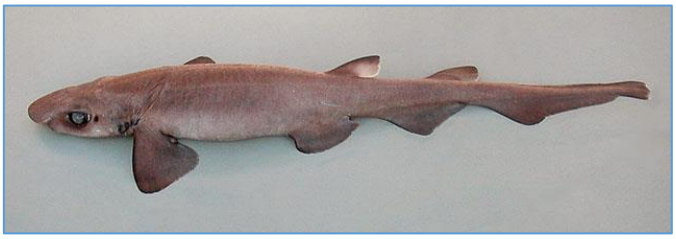


Figure 24 (Clockwise from top left): Bootstrapped CPUE with confidence intervals from 2006-2009 and 2019-2022; Catch numbers per hour by depth (m) and year; Abundance of species by depth (m).

Galeus murinus (Mouse Catshark)



Classification / Names
Elasmobranchii (sharks and rays) > Carcharhiniformes (Ground sharks) > Pentanchidae (Deep-water catsharks)

Etymology: Galeus: galeos, a small shark or dogfish according to Aristotle and others; murinus: Latin for mouse-grey, possibly referring to its mouse-like “uniformly grey” colour.

Environment
Marine; bathydemersal; depth range 475 - 1200 m. Deep-water; 66°N - 61°N, 28°W - 5°W

Distribution
Northeast Atlantic: Iceland and Faeroes.

Size / Weight / Age
Maturity: Lm? (range unknown).

Max length: 63.0 cm TL male/unsexed;

Biology
Found on the continental slopes.

Life cycle and mating behaviour
No information available.

IUCN Red List Status: Least Concern (LC); Date assessed: 06 October 2014

CITES: Not Evaluated

CMS: Not Evaluated

Threat to humans: Harmless

Human uses: Fisheries: of no interest

Reference: https://www.fishbase.se/summary/Galeus-murinus.html

Results

Catch rates were low (<1.2 nhr^{-1}) between 2006 and 2008 and it was not observed in 2009. Abundance improved to 2.6 nhr^{-1} in 2019 but declined again to 1.1 nhr^{-1} in 2020. This species was not observed in 2021 or 2022. Most abundant at ~1,150m. Further analysis not possible due to insufficient data.

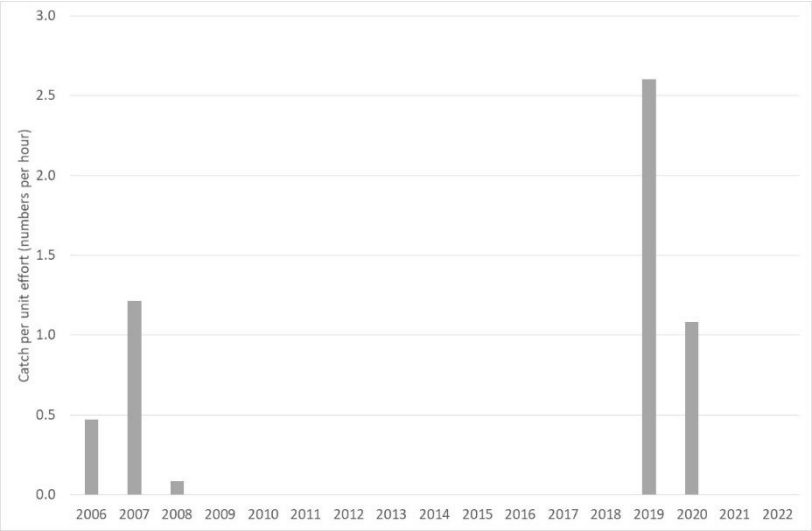


Figure 25: Catch per unit effort by year (numbers per hour)

Helicolenus dactylopterus (Blue-mouth Redfish)

Classification / Names
Actinopteri (ray-finned fishes) > Perciformes/Scorpaenoidei (Scorpionfishes) > Sebastidae (Rockfishes, rockcods and thornyheads) > Sebastinae

Etymology: Helicolenus: Greek, helike, -es = spiral + Greek, lenos, -ou = cavity.

Environment
Marine; bathydemersal; depth range 50 - 1100 m, usually 150 - 600 m. Deep-water; 70°N - 46°S

Distribution
Western Atlantic: Nova Scotia, Canada to Venezuela. Eastern Atlantic: Iceland and Norway to the Mediterranean and the Gulf of Guinea, including Madeira, the Azores, and the Canary Islands; also Walvis Bay, Namibia to Natal, South Africa.

Length at first maturity / Size / Weight / Age
Maturity: Lm 32.0 (range unknown).

Max length: 50.0 cm TL male/unsexed; common length: 25.0 cm TL male/unsexed; max. published weight: 1.6 kg; max. reported age: 43 years

Short description
Dorsal spines (total): 12; Dorsal soft rays (total): 12-13; Anal spines: 3; Anal soft rays: 5. Pinkish with faint dusky bars; Y-shaped dark bar between soft dorsal and anal fins.

Biology
Adults are found in soft bottom areas of the continental shelf and upper slope. They feed on both benthic and pelagic organisms (crustaceans, fishes, cephalopods, and echinoderms). The reproductive mode is a zygoparous form of oviparity, intermediate between oviparity and viviparity. Larvae and juveniles are pelagic. Anterolateral glandular grooves with venom gland. Sold fresh.

Life cycle and mating behaviour
The reproductive mode is a zygoparous form of oviparity, intermediate between oviparity and viviparity. Eggs covered with gelatinous material are fertilised in the ovary. Eggs are released into the seabed at various stages of development and larvae assumes a planktonic existence once the gelatinous covering dissolves.

IUCN Red List Status: Least Concern (LC); Date assessed: 06 May 2013

CITES: Not Evaluated

CMS: Not Evaluated

Threat to humans: Venomous

Human uses: Fisheries: commercial

Reference: https://www.fishbase.se/summary/Helicolenus-dactylopterus.html

Results

CPUE was <50 nhr^{-1} from 2007 to 2022 but large numbers (6,193 individuals) were observed in 2006 resulting in a catch rate of 266 nhr^{-1}. This value declined from to 23 nhr^{-1} in 2009 and was 36 nhr^{-1} in 2019. This species was not observed in 2021 or 2022. Most abundant at ~400m. Further analysis not possible due to insufficient data.

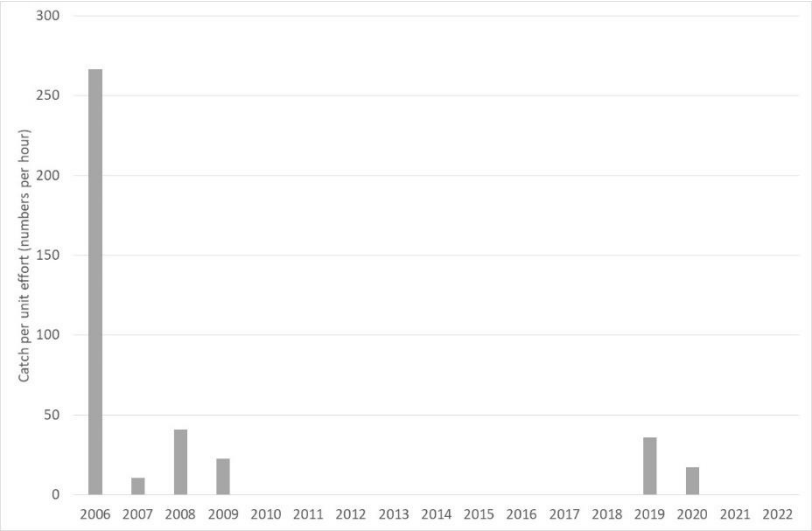


Figure 26: Catch per unit effort by year (numbers per hour)

Hexanchus griseus (Six-Gilled Shark)

Classification / Names
Elasmobranchii (sharks and rays) > Hexanchiformes (Frill and cow sharks) > Hexanchidae (Cow sharks)

Etymology: Hexanchus: hex (Gr.), six; anchus, etymology unclear, perhaps anchos (Gr.), choke or throttle, referring to how six gill openings of H. griseus extend down onto the throat; griseus: Medieval Latin for gray, reflecting the French vernacular “Le Griset,” referring to its dark-gray coloration.

Environment
Marine; bathydemersal; oceanodromous; depth range 1 - 2500 m, usually 180 - 1100 m. Subtropical; 65°N - 48°S, 180°W - 180°E

Distribution
Circumglobal: In tropical and temperate waters. Western Atlantic: North Carolina to Florida (USA) and northern Gulf of Mexico to northern Argentina. Eastern Atlantic: Iceland and Norway to Namibia, including the Mediterranean. Indian Ocean: Madagascar, Mozambique, South Africa, and Arabian Sea. Western Pacific: eastern Japan to New Zealand and Hawaii. Eastern Pacific: Aleutian Islands, Alaska to Baja California, Mexico; also Chile. Highly migratory species, Annex I of the 1982 Convention on the Law of the Sea.

Length at first maturity / Size / Weight / Age
Maturity: Lm 441.0, range 400 - 482 cm

Max length: 482 cm TL male/unsexed; common length: 300 cm TL male/unsexed; max. published weight: 590.0 kg

Short description
Dorsal spines (total): 0; Dorsal soft rays (total): 0; Anal spines: 0; Anal soft rays: 0. A heavily-bodied, broad-headed sixgill shark, mouth ventral with 6 rows of lower, bladelike, comb-shaped teeth on each side. Snout broadly rounded, body fusiform. Anal fin smaller than dorsal fin. Brown or grey above, paler below, with a light stripe alongside. Fins with white edges. Live specimens with fluorescent green eyes. Six gill slits are very long.

Biology
Depth range reported at 0m-2000m. A deep-water species of the outer continental and insular shelves and upper slopes. Near bottom, occasionally pelagic, adults usually below 91 m. Juveniles may be found close inshore. Found on the bottom by day, moving to the surface at night to feed, and where it may take longlines set for other species. Depth distribution related to growth and temperature, with juveniles having most shallow records and from colder, poleward regions. Feeds

on a wide range of marine organisms, including other sharks, rays, chimaeras, bony fish, squids, crabs, shrimps, carrion, and even seals. Ovoviviparous, with 22 to 108 pups in a litter. Marketed fresh, frozen, or dried salted; also utilized as a source of oil and fishmeal. Not known to have attacked people without provocation. Give birth to almost 100 young.

Life cycle and mating behaviour

Ovoviviparous, litters very large, 22 to 108. Size at birth 60-75 cm. Distinct pairing with embrace.

IUCN Red List Status: Near Threatened (NT) (A2bd); Date assessed: 21 November 2019

CITES: Not Evaluated

CMS: Not Evaluated

Threat to humans: Poisonous to eat

Human uses: Fisheries: commercial; gamefish: yes

Reference: https://www.fishbase.se/summary/Hexanchus-griseus.html

Results

CPUE was very low (<0.30 nhr^{-1}) from 2006-2009 and increased to ~1.8 nhr^{-1} in 2020 and was ~1.5 nhr^{-1} in 2022. This species had a wide depth range but most abundant at <1,000m. It was not possible to estimate confidence intervals for abundance index of this species as the model did not converge.

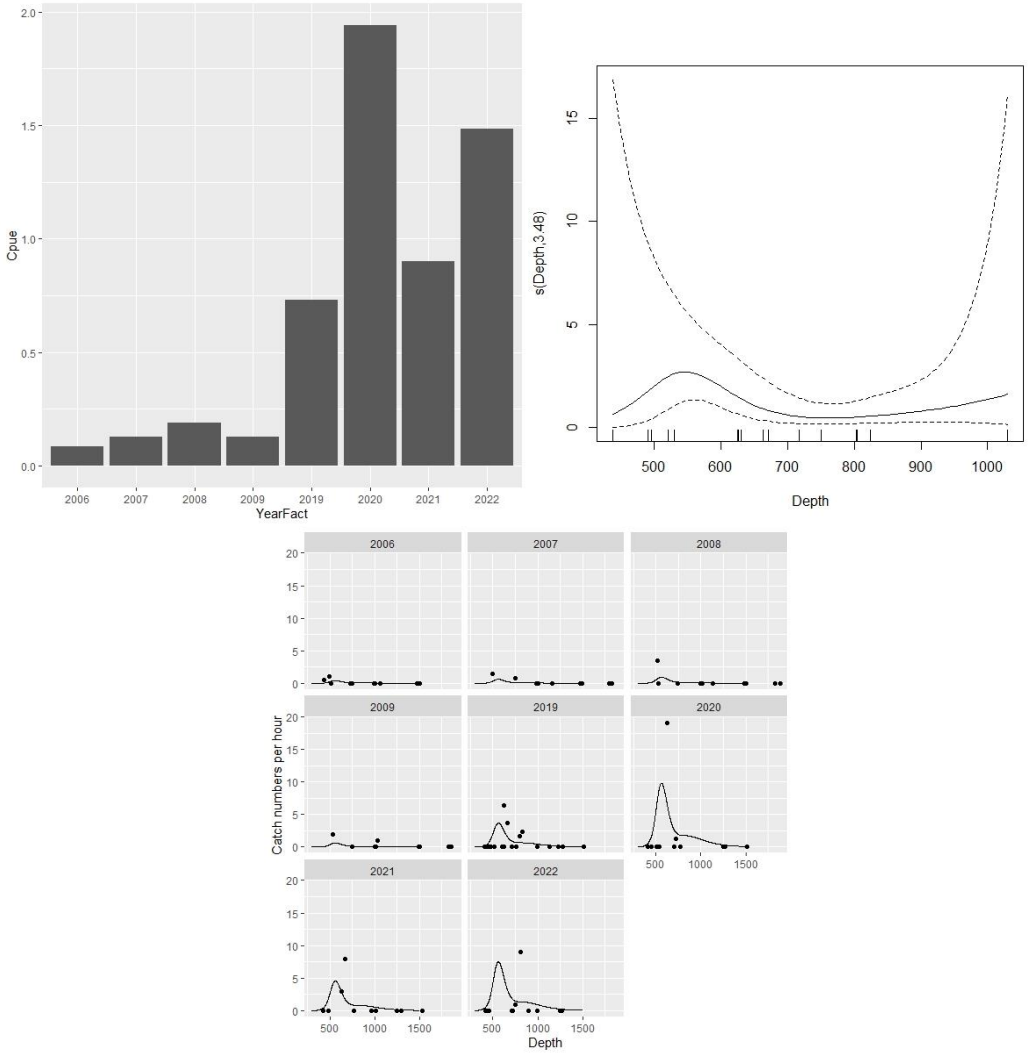


Figure 27 (Clockwise from top left): Estimated annual CPUE from 2006-2009 and 2019-2022; Abundance of species by depth (m); Catch numbers per hour by depth and year.

Lepidion eques (North Atlantic Codling)

Classification / Names
Actinopteri (ray-finned fishes) > Gadiformes (Cods) > Moridae (Morid cods)

Etymology: Lepidion: Greek, lepis = scale.

Issue: This species is a synonym of Lepidion lepidion according to Bañón et al. 2013 and Barros-García et al. 2016.

Environment
Marine; benthopelagic. Temperate; 75°N - 42°N, 66°W - 1°W

Distribution
North Atlantic: Bay of Biscay, along the western slopes of the British Isles, along the Iceland-Faroe Ridge of Iceland, Greenland, Davis Straits, Northern Labrador and the Grand Banks of Labrador. Rare in the western Atlantic.

Size / Weight / Age
Maturity: Length at maturity unknown (range unknown).

Biology
No information available

Life cycle and mating behaviour
No information available

IUCN Red List Status: Data deficient (DD); Date assessed: 04 February 2009

CITES: Not Evaluated

CMS: Not Evaluated

Threat to humans: Harmless

Human uses: Fisheries: of no interest

Reference: https://www.fishbase.se/summary/Lepidion-eques.html

Results

CPUE declined from ~70nhr^{-1} in 2006 to 35nhr^{-1}in 2008 and then increased to ~75nhr^{-1} in 2009 and ~90nhr^{-1} in 2019. Catch rates declined to ~25nhr^{-1} in 2020 but this may be an artefact of insufficient sampling that year at 1,000m. CPUE recovered to ~75nhr^{-1} in 2021 was ~90nhr^{-1} in 2022. Most abundant at ~1,000m.

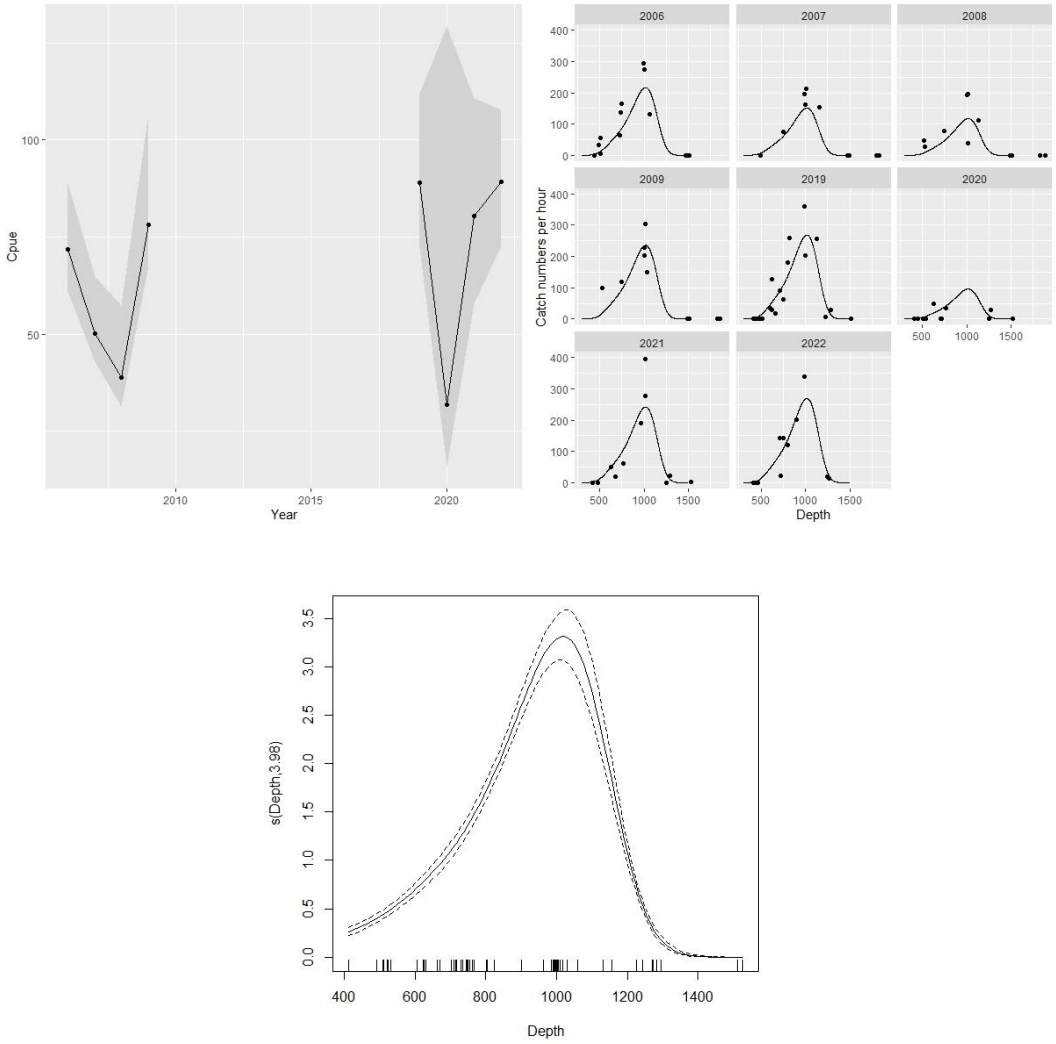
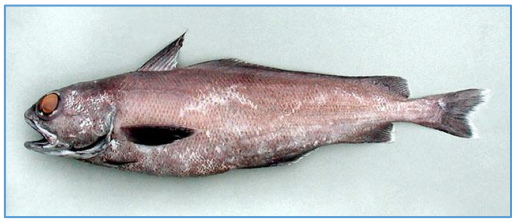


Figure 28 (Clockwise from top left): Bootstrapped CPUE with confidence intervals from 2006-2009 and 2019-2022; Catch numbers by depth (m) and year; Abundance of species by depth (m).

Mora moro (Common Mora)



Classification / Names

Actinopteri (ray-finned fishes) > Gadiformes (Cods) > Moridae (Morid cods)

Etymology: No information available

Environment

Marine; bathypelagic; depth range 450 - 2500 m. Deep-water; 64°N - 51°S, 77°W - 174°W

Distribution

Eastern Atlantic: Iceland and Faeroes to Cape Bojador, West Africa, and including Azores, Madeira, and western Mediterranean. Also known from the Walvis and Vavilov ridges. Reported from Mauritania. Western Indian Ocean: in the region south of Madagascar. Pacific Ocean: temperate Australia, New Zealand, and between Valparaiso, Chile and the Juan Fernandez Islands.

Size / Weight / Age

Maturity: Length at maturity unknown (range unknown).

Max length: 80.0 cm TL male/unsexed; common length: 45.0 cm TL male/unsexed;

Short description

Dorsal spines (total): 0; Dorsal soft rays (total): 54-59; Anal spines: 0; Anal soft rays: 18 - 21. Eyes relatively large, greater than snout length in diameter. Anal fin originating near mid-length of body, deeply indented at mid-length, sometimes appearing as two. Ventral light organ absent. Colour is generally grey.

Biology

Recorded from the upper continental slope. Occasionally found at 50 m. Feeds on fishes, crustaceans, molluscs and other invertebrates as well as food of terrestrial origin, including garbage. Probably a winter and early spring spawner.

Life cycle and mating behaviour

No information available

IUCN Red List Status: Least Concern (LC); Date assessed: 20 May 2013

CITES: Not Evaluated

CMS: Not Evaluated

Threat to humans: Harmless

Human uses: Fisheries: minor commercial

Reference: https://www.fishbase.se/summary/Mora-moro.html

Results

CPUE increased from ~5nhr^{-1} in 2006 to ~30nhr^{-1} in 2009, before declining to ~18 nhr^{-1} in 2019. Catch rates increased again to ~27 nhr^{-1} in 2020 and were ~18 nhr^{-1} in 2022. Most abundant at ~900m.

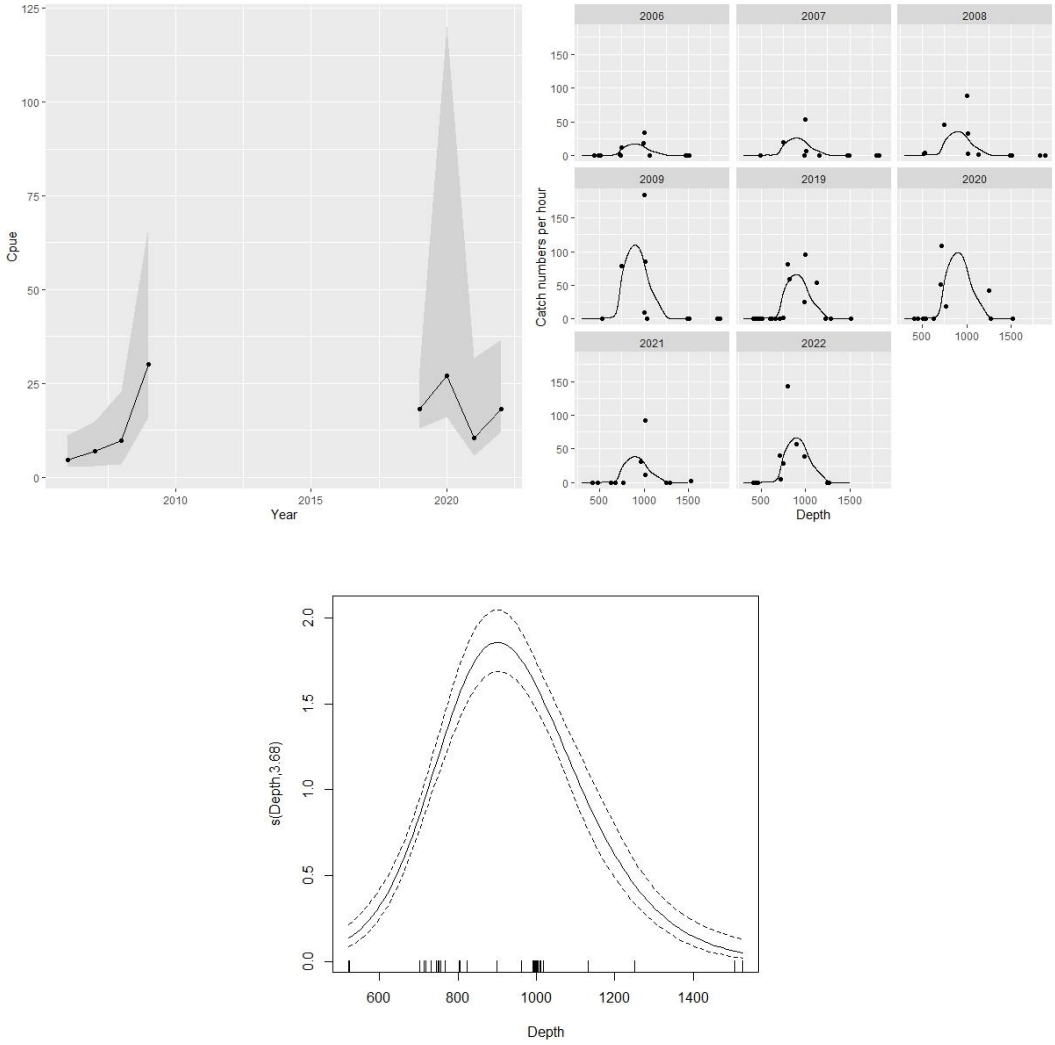
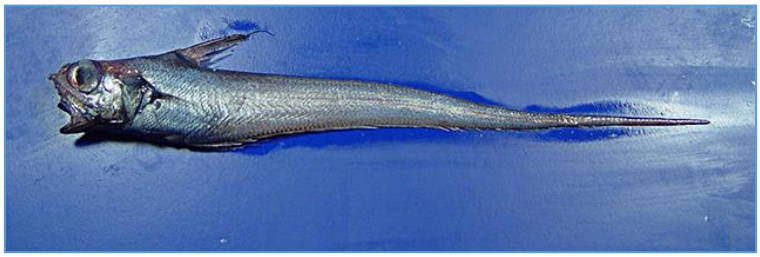


Figure 29 (Clockwise from top left): Bootstrapped CPUE with confidence intervals from 2006-2009 and 2019-2022; Catch numbers by depth (m) and year; Abundance of species by depth (m).

Nezumia aequalis (Smooth Rattail)



Classification / Names
Actinopteri (ray-finned fishes) > Gadiformes (Cods) > Macrouridae (Grenadiers or rattails)

Etymology: Nezumia: A Japanese word that means "mouse".

Issue: This species is often confused with Nezumia sclerorhynchus (Valenciennes, 1838).

Environment
Marine; benthopelagic; non-migratory; depth range 200 - 2320 m, usually 200 - 1000 m. Deep-water; 70°N - 12°S, 98°W - 30°E

Distribution
Atlantic Ocean: Eastern Atlantic: Faroe Bank to northern Angola and the Mediterranean Sea. Western Atlantic: Davis Straits to northern Brazil.

Length at first maturity / Size / Weight / Age

Maturity: Lm 4.5, range 4 - ? cm

Max length: 36.0 cm TL male/unsexed; common length: 25.0 cm TL male/unsexed; max. reported age: 9 years

Short description
Dorsal spines (total): 2; Anal spines: 0. Head short, completely scaled except for naked strip on the ventral surface of the snout; Eyes relatively large, 29 to 42% of head length; snout short, pointed; chin barbel very short. Body scales with lanceolate to shield-shaped spinules. Overall colour is bluish to violet, head somewhat tawny to swarthy; ventral portions silvery when fresh; pelvic fins black except outermost ray which is pale to white; oral cavity greyish; branchial cavity mostly black.

Biology
Feeds on benthic as well as pelagic animals like mysids, amphipods, small shrimps, copepods, isopods, ostracods and polychaete worms.

Life cycle and mating behaviour
No information available

IUCN Red List Status: Least Concern (LC); Date assessed: 21 May 2013

CITES: Not Evaluated

CMS: Not Evaluated

Threat to humans: Harmless

Human uses: Fisheries: minor commercial

Reference: https://www.fishbase.se/summary/Nezumia-aequalis.html

Results

CPUE declined from ~130nhr^{-1} in 2006 to ~10nhr^{-1} in 2022. Most abundant at ~900m.

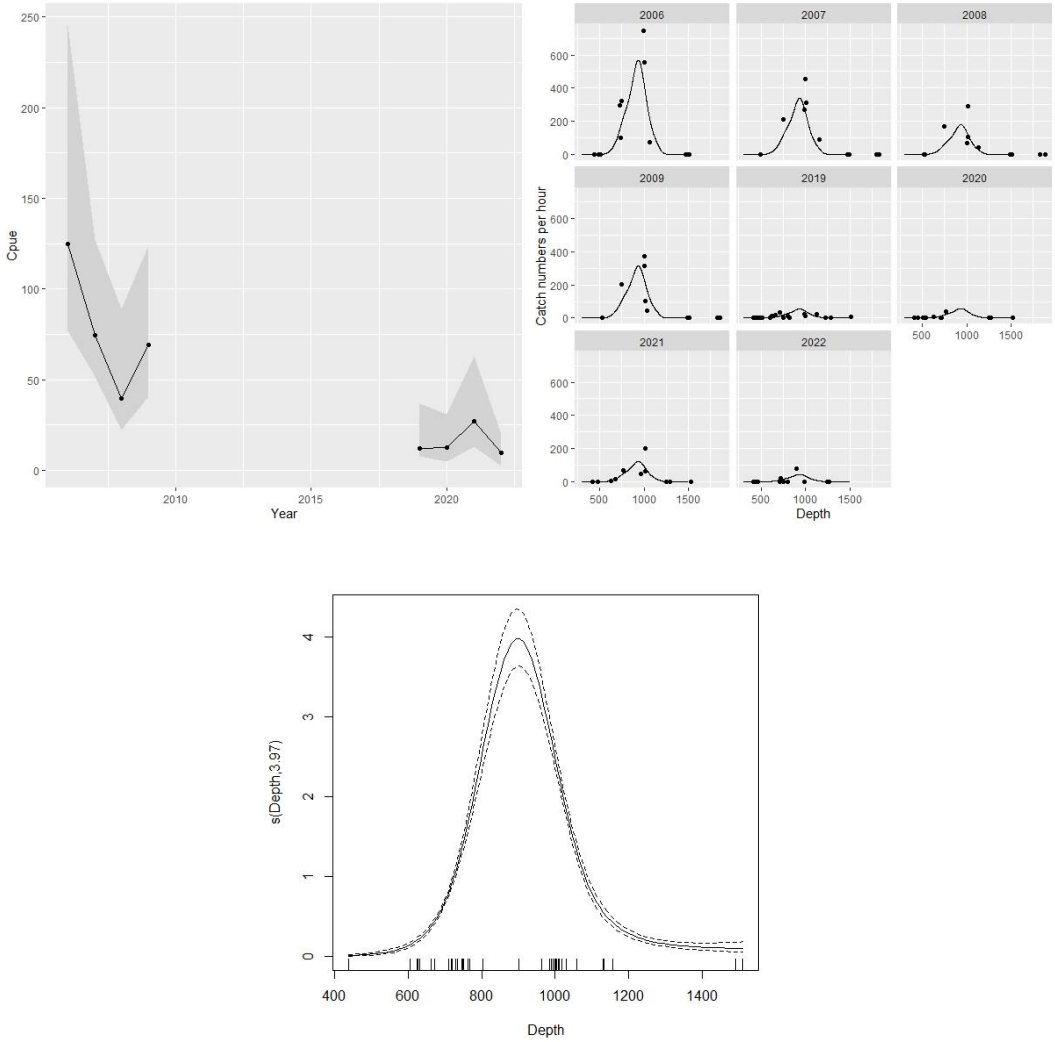


Figure 30 (Clockwise from top left): Bootstrapped CPUE with confidence intervals from 2006-2009 and 2019-2022; Catch numbers by depth (m) and year; Abundance of species by depth (m).

Scymnodon ringens (Knifetooth Dogfish)

Classification / Names
Elasmobranchii (sharks and rays) > Squaliformes (Sleeper and dogfish sharks) > Somniosidae (Sleeper sharks)

Etymology: Scymnodon: scymnus, an ancient name for some kind of shark, derived from a Greek word meaning young animal, cub or whelp; odon (Gr.), tooth, referring to large, triangular cutting teeth on lower jaw of S. ringens. ringens: Latin for gaping, referring to its large, open mouth ("ore amplo, hiante").

Environment
Marine; bathypelagic; depth range 200 - 1600 m, usually 550 - 1450 m. Deep-water; 61°N - 54°S, 18°W - 172°W

Distribution
Eastern Atlantic: along the slope from Scotland to Spain, Portugal, Senegal. Southwest Pacific: New Zealand.

Size / Weight / Age
Maturity: Length at maturity unknown (range unknown).

Max length: 110 cm TL male/unsexed;

Short description
Anal spines: 0; Anal soft rays: 0. Black in colour; small dorsal fin spines; short snout; small lanceolate teeth without cusplets in upper jaw and huge high, knife-cusped cutting teeth in lower jaw; mouth very wide and broadly arched; caudal fin with weak sub-terminal notch and no lower lobe.

Biology
A rare species inhabiting continental slopes. Usually mesopelagic although taken most often near the bottom. Its razor-edged lower teeth are used to attack and dismember large prey. Ovoviviparous. Utilized dried salted for human consumption and for fishmeal.

Life cycle and mating behaviour
Probably ovoviviparous. Distinct pairing with embrace.

IUCN Red List Status: Vulnerable (VU) (A2bd); Date assessed: 21 November 2019

CITES: Not Evaluated

CMS: Not Evaluated

Threat to humans: Traumatogenic

Human uses: Fisheries: minor commercial

Reference: https://www.fishbase.se/summary/Scymnodon-ringens.html

Results

Not observed at all in 2006 and present at very low levels (<0.5 nhr^{-1}) from 2007 to 2009. Increased in abundance to 0.7 nhr^{-1} in 2020 before declining to 0.3 nhr^{-1} in 2022. Further analysis not possible due to insufficient data in 2006.

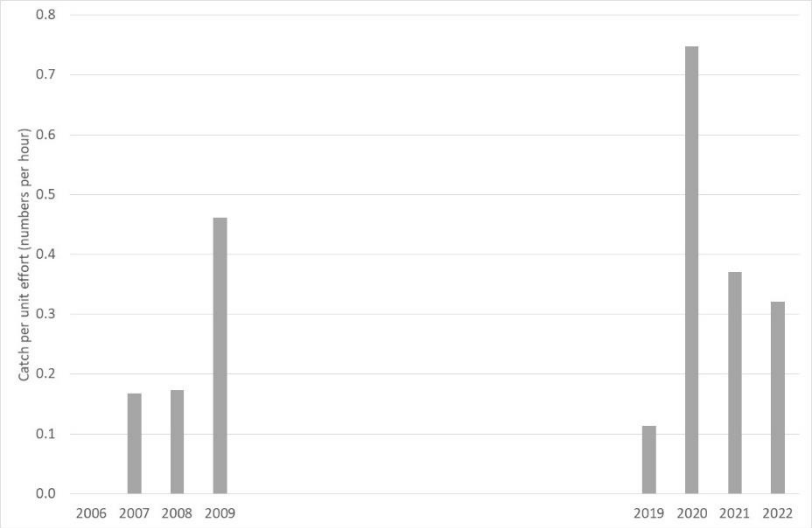
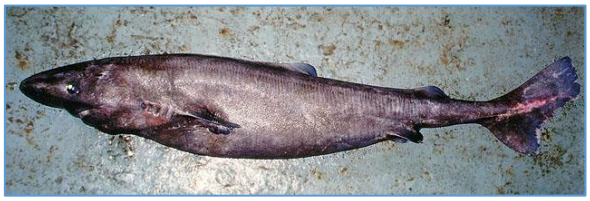


Figure 31: Catch per unit effort by year (numbers per hour)

Somniosus microcephalus (Greenland Shark)



Classification / Names

Elasmobranchii (sharks and rays) > Squaliformes (Sleeper and dogfish sharks) > Somniosidae (Sleeper sharks)

Etymology: Somniosus: Latin for sleepy, reflecting Lesueur's surmise that these sharks are slow or sluggish because of their relatively small fins (hence the name sleeper sharks). microcephalus: micro-, from mikros (Gr.), small; cephalus, from kephale (Gr.), head, allusion not explained, perhaps referring to its short, rounded snout compared with other sharks then included in the catch-all genus Squalus.

Environment

Marine; brackish; benthopelagic; oceanodromous; depth range 0 - 2992 m, usually 200 - 600 m. Boreal; -2°C - 17°C; 83°N - 35°N, 95°W - 61°E

Distribution

Arctic and North Atlantic: Canadian Arctic at Resolute Bay to Baffin Bay, southward in western Atlantic to Cape Cod, eastward to Greenland, Iceland, Arctic Ocean off Svalbard and Franz Josef Land, and the Barents and White Seas southward in the eastern Atlantic to the Kattegat and west of Ireland; rare records known farther south as well as in the Arctic.

Length at first maturity / Size / Weight / Age

Maturity: Lm 335.5, range 244 - 427 cm

Max length: 427 cm TL male/unsexed; 550.0 cm TL (female); max. published weight: 0.00 g; max. reported age: 392 years

Short description

Dorsal spines (total): 0; Dorsal soft rays (total): 0; Anal spines: 0; Anal soft rays: 0; Vertebrae: 41 - 44. A gigantic, heavily-bodied dogfish shark with a moderately long, rounded snout and small, low dorsal fins; lower caudal lobe long; upper jaw with small single-cusped teeth and lower jaw with moderate-sized, bent-cusped, slicing teeth. Medium grey or brown in colour, sometimes with transverse dark bands or small light spots.

Biology

Found on continental and insular shelves and upper slopes down to at least 1,200 m and to as deep as 2,200 m. Epibenthic-pelagic. In the Arctic and boreal Atlantic, it occurs inshore in the intertidal and at the surface in shallow bays and river mouths during colder months, retreating to depths of 180-550 m when the temperature rises. Reported to be found in temperatures from -1.8° to 17.2°C but commonly below 5°C with salinity range of 29.4-35.5. It is capable of undertaking long migrations. Feeds on pelagic and bottom fishes (herring, Atlantic salmon, Arctic char, capelin, redfish, sculpins, lumpfish, cod, haddock, Atlantic halibut, Greenland halibut and skates, sharks and skates, seals and small cetaceans, sea birds, squids, crabs, amphipods, marine snails, brittle stars, sea urchins, and jellyfish. Radiocarbon dating of eye lens nuclei from 28 caught female Greenland sharks

(81-502 cm TL) revealed a life span of at least 272 years, the oldest being nearly 400 years; age of sexual maturity is about 150 years. This large species is slow-growing. Petromyzon marinus was reported to have been attached to S. microcephalus. Ovoviviparous. Utilized fresh and dried for human and sled-dog food (flesh is said to be toxic when fresh); Inuit also used the skin to make boots, and the sharp lower dental bands as knives for cutting hair. A very sluggish shark. Reports in literature of lengths exceeding 640 cm TL (e.g. up to 730 cm TL remain unverified. Common length 244-427 cm TL.

Life cycle and mating behaviour

Ovoviviparous. Distinct pairing with embrace.

IUCN Red List Status: Vulnerable (VU) (A2bd); Date assessed: 20 June 2019

CITES: Not Evaluated

CMS: Not Evaluated

Threat to humans: Poisonous to eat

Human uses: Fisheries: minor commercial; gamefish: yes

Reference: https://www.fishbase.se/summary/Somniosus-microcephalus.html

Results

Only one individual observed during 2008 deep-water survey. No further analysis possible.

Synaphobranchus kaupi (Northern Cut-throat Eel)

Classification / Names
Actinopteri (ray-finned fishes) > Anguilliformes (Eels and morays) > Synaphobranchidae (Cutthroat eels) > Synaphobranchinae

Etymology: Synaphobranchus: Greek, syn, symphysis = grown together + Greek, aphoo, aphiemi = to throw + Greek, brangchia = gill.

Environment
Marine; bathydemersal; depth range 120 - 4800 m, usually 400 - 2200 m. Deep-water; -1°C - 10°C; 69°N - 40°S, 85°W - 154°W

Distribution
Eastern Atlantic: Faroes and Iceland to Cape Verde, Nigeria, Namibia, and South Africa. Western Atlantic: Greenland to Bahamas; also Brazil. Northwest Atlantic: Canada. Indo-West Pacific: Japan and Australia; absent in the Eastern Pacific except in Hawaii and the Indian Ocean.

Size / Weight / Age
Maturity: Length at maturity unknown (range unknown).

Max length: 100.0 cm TL male/unsexed;

Short description
Dorsal soft rays (total): 270. Dark purplish grey in colour. Anal rays about 270.

Biology
Found on the continental slope near the upper limit of abyssal zone. Epibenthic. Probably most common in 800 to 2,000 m. Do not tolerate higher water temperatures. Feeds mainly on Decapoda, Natantia, amphipods, but also fishes and cephalopods. Caught by bottom longline and baited fish trap.

Life cycle and mating behaviour
No information available

IUCN Red List Status: Least Concern (LC); Date assessed: 04 February 2009

CITES: Not Evaluated

CMS: Not Evaluated

Threat to humans: Harmless

Human uses: Fisheries: of no interest

Reference: https://www.fishbase.se/summary/Synaphobranchus-kaupii.html

Results

CPUE was between ~2.5 to 4.5 nhr^{-1} between 2006 and 2009, however, only 17 individuals were observed in total between 2019 and 2022. Most abundant at >1,500m. Further analysis not possible due to insufficient data in 2019 and 2020.

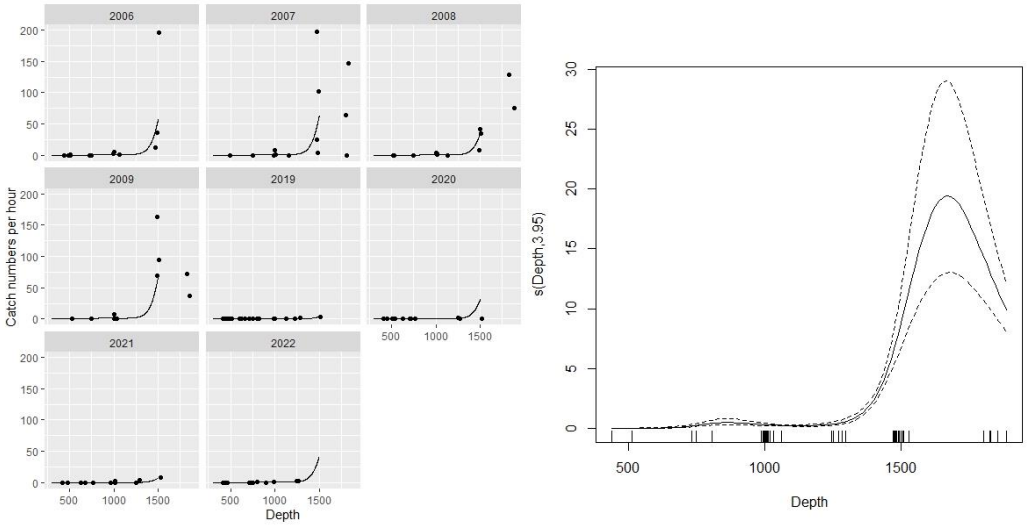


Figure 32: Catch numbers by depth (m) and year and Abundance of species by depth (m).

Trachyrincus murrayi (Murray's Rattail)

Classification / Names

Actinopteri (ray-finned fishes) > Gadiformes (Cods) > Trachyrincidae (Armoured grenadiers)

Etymology: Trachyrincus: Greek, trachys, -eia, -ys = rough + Greek, rhyngchos = snout.

Environment

Marine; benthopelagic; depth range 0 - 1630 m, usually 500 - 1630 m. Temperate; 65°N - 42°N, 71°W - 0°E

Distribution

Northeast Atlantic: Iceland. Northwest Atlantic: Canada. Southwest Pacific: east of New Zealand.

Size / Weight / Age

Maturity: Length at maturity unknown (range unknown).

Max length: 37.0 cm TL male/unsexed;

Biology

Epibenthic-pelagic; also benthopelagic. Feeds on crustaceans.

Life cycle and mating behaviour

IUCN Red List Status: Not Evaluated

CITES: Not Evaluated

CMS: Not Evaluated

Threat to humans: Harmless

Human uses: No information available

Reference: https://www.fishbase.se/summary/Trachyrincus-murrayi.html

Results

Catch rates ranged from 27 to 51 nhr^{-1} from 2006 to 2008. This species was not observed at all in 2019 and only 27 were observed in 2021. However, large numbers (>1,000 individuals) were recorded in 2020 and 2022 which resulted in catch rates of 105 nhr^{-1} and 195 nhr^{-1} respectively. Further analysis was not possible due to insufficient data in 2019. Most abundant at ~1,300m.

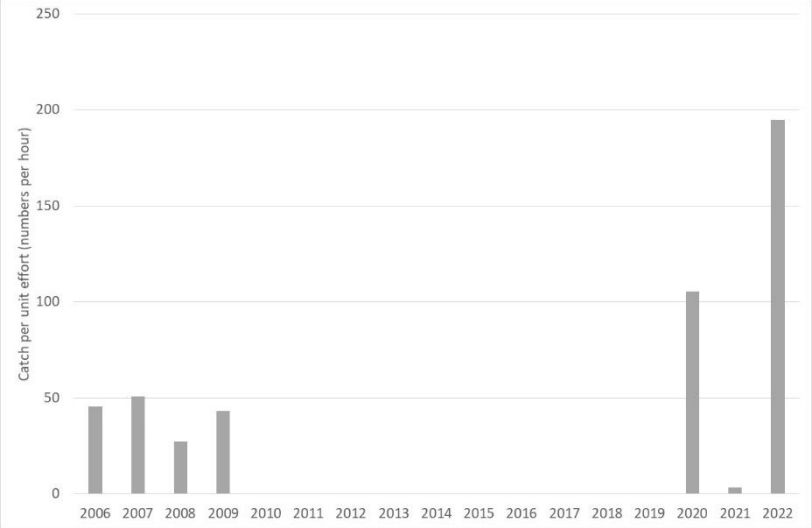


Figure 33: Catch per unit effort by year (numbers per hour)

Overall trends

Of the thirty species selected for analysis in Table 4 there were eighteen species that had sufficient data for modelling of abundance by depth and estimation of uncertainty. By comparing the mean abundance in the period 2006-2009 to the period 2019-2022 (Figure 34) it can be seen that thirteen out of eighteen of the species examined here displayed an increasing trend while five out of eighteen have decreased. In the most extreme case the abundance of *Etmopterus princeps* (Great Laternshark) had increased almost 1,200%; indicating the abundance in the 2019-2022 surveys was 12 times higher than during 2006-2009). However, this model fit was driven by a single large observation in 2019. *Hexanchus griseus* (Six Gilled Shark) also displayed a large increase in abundance with observations 8 times higher in the latter survey period. Other species that showed substantial improvements were *Aphanopus carbo* (Black Scabbard), *Centrophorus squamosus* (Leafscale Gulper Shark), *Centroscymnus coelolepis* (Portuguese Shark) and *Caelorinchus labiatus* (Spearsnouted grenadier) which had abundances 3 to 4 times higher in recent years than in the earlier survey period. Smaller improvements were seen in species such as *Galeus melastomus* (Black-mouth dogfish), *Centroscymnus crepidater* (Longnose velvet dogfish), *Deania calcea* (Birdbeak dogfish) and *Mora moro* (Common Mora). Species which displayed decreasing abundance included *Nezumia aequalis* (Smooth Rat-tail) and *Coelorinchus coelorhincus* (Hollow-nosed Rattail) which both had reductions of ~80% on earlier survey results. The remaining three species with decreased abundance were *Synaphobranchus kaupii* (Northern Cut-throat Eel), *Alepocephalus bairdii* (Baird's Smooth-head) and *Coryphaenoides rupestris* (Round-nose Grenadier).

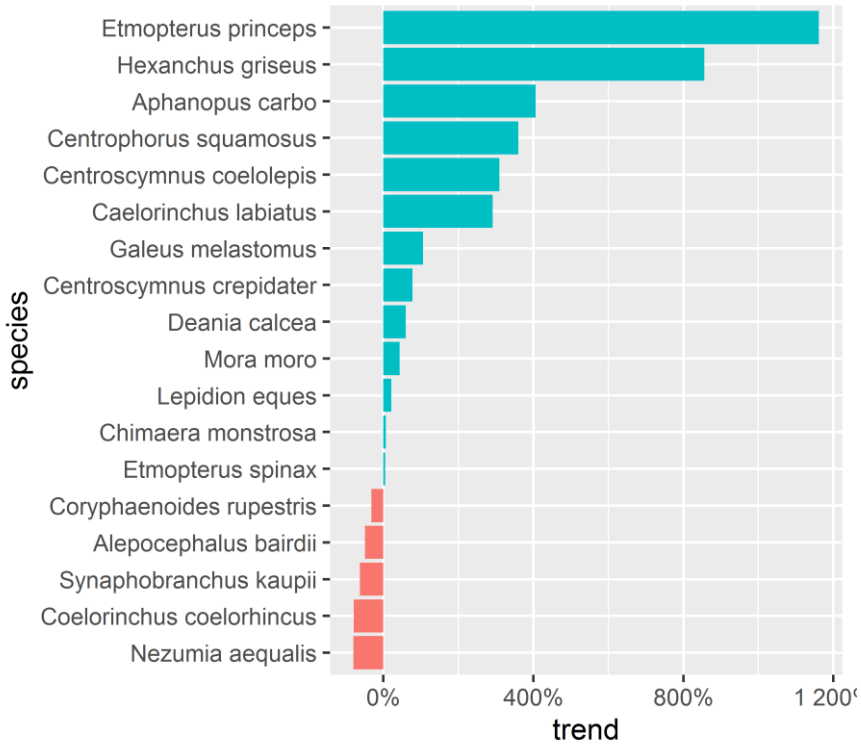


Figure 34: Overall trends in abundance in the period 2006-2009 versus 2019-2022

References

O'Hea, B., Johnston, G., Davie, S., Clarke, J., Kivimae, C., Wall, D., 2009. Deep water survey report 2009. Marine Institue, Rinville, Oranmore, Co. Galway, Ireland. 37 pp.

Reid, D.G., Allen, V.J., Bova, D.J., Jones, E.G., Kynoch, R.J., Peach, K.J., Fernandes, P.G. and Turrell, W.R., 2007. Anglerfish catchability for swept-area abundance estimates in a new survey trawl. ICES Journal of Marine Science: Journal du Conseil, 64(8), pp.1503-1511.