16 Demersal elasmobranchs - Iceland and East Greenland

16.1 Ecoregion and stock boundaries

The elasmobranch fauna off Iceland and Greenland is little-studied and comprises 15 skate and 21 shark species (with six species of chimaeroid also present). The number of species decreases as water temperature decreases, and only a few of these species are common in Icelandic and Greenland waters.

An ecosystem overview for the ecoregion of Icelandic waters has been published and is available at the ICES website:

(http://ices.dk/sites/pub/Publication%20Reports/Advice/2017/2017/Ecosystem_overview-Icelandic_Waters_ecoregion.pdf).

The most abundant elasmobranch species in this ecoregion is starry ray (thorny skate) *Amblyraja radiata*.

In Icelandic waters, other skate species commonly occurring are: Common blue skate *Dipturus batis,* Arctic skate *Amblyraja hyperborea,* round skate *Rajella fyllae,* spinytail skate *Bathyraja spinicauda* and sailray *Rajella lintea* (former *D. linteus*). The remaining seven species are sporadically caught: Jensen's skate *Amblyraja jenseni*,, Norwegian skate *Dipturus nidarosienis,* shagreen ray *Leucoraja fullonica*, roughskin skate *Malacoraja spinacidermis,* Krefft's skate, *Malacoraja kreffti*, deepwater ray *Rajella bathyphila* and Bigelow's skate *Rajella bigelowi,* , .

In Greenland waters, the commonly found skates include *R. fyllae, B. spinicauda* and *A. hyperborea,* with species such as *R. bathyphila*, *M. spinacidermis, R. lintea*, *A. jenseni* and *R. bigelowi* being less frequent (Möller *et al.*, 2010).

Dogfish and sharks in this ecoregion include spurdog *Squalus acanthias* (Section 2); Portuguese dogfish *Centroscymnus coelolepis* and leafscale gulper shark *Centrophorus squamosus* (Section 3); birdbeak dogfish *Deania calcea*, black dogfish *Centroscyllium fabricii*, great lantern shark *Etmopterus princeps*, velvet belly lanternshark *E. spinax,* longnose velvet dogfish *Centroselachus crepidater* and six gill shark *Hexanchus griseus* (Section 5); porbeagle shark *Lamna nasus* (Section 6); basking shark *Cetorhinus maximus* (Section 7); Greenland shark *Somniosus microcephalus* (Section 24); and several scyliorhinid catsharks (Iceland catshark *Apristurus laurussonii,* white ghost catshark *A. aphyodes*, small-eye catshark *A. microps* and mouse catshark *Galeus murinus*).

The distribution of demersal sharks in Icelandic waters is mainly restricted to upper slope and shelf break along the southeast to northwestern waters. The exception is *Squalus acanthias* which is found in shallower waters most commonly in the south and west but with patchy distribution also in other areas.

Chimaeras (rabbitfish *Chimaera monstrosa*, spearnose chimaera *Rhinochimaera atlantica*, large-eyed rabbitfish *Hydrolagus mirabilis*, *H. pallidus*, small-eyed rabbitfish *Hydrolagus affinis*, narrownose chimaera *Harriotta raleighana*) all occur in the area (Jakobsdóttir et al. 2020).

Stock boundaries are not known for the species in this area. Neither are the potential movements of species between coastal and offshore areas. Further investigations are necessary to determine potential migrations or interactions of elasmobranch populations within this ecoregion and neighbouring areas.

16.2 The fishery

16.2.1 History of the fishery

Skates and sharks are mainly a bycatch in fisheries, with Iceland being the main fishing nation operating in the ecoregion. Common skate complex is fished with a variety of fishing gears (Figure 16.1a). They used to be regarded as fairly common in Icelandic waters, but landings may now only be about 10% of what was landed 50 years ago. A large part of the landed catch is for local consumption, as the species within the common skate complex are traditional food in Iceland, particularly at Christmas time. The remaining catch is processed and mainly exported.

A. radiata is a bycatch in a variety of fishing gears around Iceland but was usually discarded. Increased landings since the 1990s may be related to an increased retention compensating for a lower abundance of the common skate complex. Landings are reported mainly from the longline fishery (Figure 16.1b). Reported landings have increased from low levels in 1980 to more than 1000 tonnes annually from 1995–2004. Thereafter, landings declined but have increased again to levels exceeding 1700 tonnes in 2012. From 2012 to 2016, landings have gradually reduced to approximately 1250 tonnes in 2016, followed by an abrupt decline in 2017, being ca. 600 tonnes in 2018. In 2019 and 2020, landings slightly increased again, but are not at the same level as observed before 2017. A relatively large proportion of the landings is for local consumption.

16.2.2 The fishery in 2021

No new information.

16.2.3 ICES advice applicable

ICES does not provide advice on these stocks.

16.2.4 Management applicable

There is no TAC for demersal skates in these areas.

16.3 Catch data

16.3.1 Landings

From 1973–2021, 13 countries reported landings of skates, demersal sharks and chimaeras from Divisions 5.a (Iceland) and 14.a and 14.b (East Greenland). Iceland is the main nation fishing in these areas.

Reported landings of skates from Iceland (Division 5.a) and eastern Greenland (Subarea 14) are given in Table 16.1, with these data comprising national landings data provided to WGEF, landings statistics from the Faroese national database (www.hagstova.fo), and data from the ICES database.

Icelandic national data for estimated landings of the common blue skate (1973–2021), *A. radiata* (1977–2021), *R. lintea* (2000–2021) are available. Database entries for all species with national landings for the years 2001–2021 are available.

Prior to 1992, all skates (except *A. radiata* and common skate complex) were reported as '*Raja* rays nei'. Since 1992, when skates have been reported to the species level, *A. radiata* and *Dipturus*

batis-complex have accounted for about 98% of the annual skate landings. Only small quantities of *L. fullonica*, *R. lintea* and *B. spinicauda* have been reported. Fishers do not usually distinguish between *L. fullonica* and *R. lintea* in Icelandic waters, and so landings of *R. lintea* are likely to be underestimated and landings of *L. fullonica* overestimated (as landings of the latter species, which is relatively rare in Icelandic waters, includes some *R. lintea*). Landings reported as *D. batis*-complex could also sometimes be *R. lintea.* Therefore, official landings on *L. fullonica* will be reported as *Raja* rays nei until this issue is locally resolved.

Reported skate landings peaked at 2500 t in 1951. Since then, the landings of the *D. batis*-complex have decreased but landings of *A. radiata* have increased in later years. Landings of *A. radiata* were under 1000 t but after 2005 increased to about 1800 t in 2012 contributing the bulk of landings of elasmobranchs in this ecoregion (Table 16.1; figures 16.2–16.3). Overall, over 95% of the skate landings came from Division 5.a. The share taken by Iceland from this area increased from <50% in the 1970s to nearly 100% from 1999 onwards.

Information on elasmobranch bycatch in East Greenland waters is unavailable, but several species are probably taken and discarded in fisheries for cod, shrimp and Greenland halibut *Reinhardtius hippoglossoides*.

16.3.2 Discards

No discard data were available.

16.3.3 Quality of catch data

The main skates landing nations in this ecoregion now provide species-specific information, but species identification needs improvement.

16.3.4 Discard survival

No data available to WGEF for the fisheries in this ecoregion.

16.4 Commercial catch composition

No data on the length distribution or sex ratio in commercial landings were available.

16.5 Commercial catch and effort data

No data available.

16.6 Fishery-independent surveys

16.6.1 Surveys in Greenland waters

Since 1998, the Greenland surveys (GR-GHXIVB) have covered the area between 61°45'–67°N at depths of 400–1500 m, although the area between 63–64°N was not covered by the surveys, as the bottom topography was too steep and rough. The surveys are aimed at Greenland halibut, although all fish species are recorded. The surveys use an ALFREDO III trawl (wingspread ≈ 21 m; headline height ≈ 5.8 m; mesh size (cod end) = 30 mm) with rock-hopper ground gear. These data were presented to WGEF in a working paper by Jørgensen (2006) and are summarized

in Table 16.2. Another source of survey data in Greenland waters is the German Greenland groundfish survey (GER (GRL)-GFS-Q4), and these data need to be examined.

16.6.2 Surveys in Icelandic waters

The Icelandic autumn groundfish survey (IS-SMH) is the main source of fishery-independent data for demersal elasmobranchs in Icelandic waters (Jakobsdóttir *et al.*, 2021). Further, data can be compiled for some species from other surveys e.g. spring groundfish survey (IS-SMB), shrimp and flatfish surveys undertaken by MFRI.

The IS-SMH survey covers the Icelandic shelf and upper slope at depths of 20–1500 m. It is a stratified systematic survey with standardized fishing methods. Small-meshed bottom trawls (40 mm in the cod-end) with a rock-hopper ground gear are towed at a speed of 3.8 knots for a predetermined distance of 3 nautical miles (See Björnsson *et al.*, 2007 for a detailed description of methodology).

Catch data and frequency of occurrence for skates from IS-SMH is summarised in Table 16.3. Catch data (number of individuals per survey) of all demersal elasmobranchs, for the years 1996–2020, can be found in Jakobsdóttir *et al.* (2020).

16.7 Life-history information

Published information on life history of skates and rays in Icelandic waters is scarce.

Amblyraja radiata is by far the most abundant elasmobranch species in Icelandic waters with the highest estimates in biomass, the mean annual survey biomass estimated around 7550 tonnes. It has a widespread distribution over the Icelandic shelf and upper slope (Figure 16.4 and 16.6). Seasonal differences in distributional patterns have been noted, with *A. radiata* much less abundant on the shelf during autumn surveys (IS-SMH) than in spring survey (IS-SMB), and the bulk of catches in IS-SMH is taken on shelf break/slope north and east of Iceland (Figure 16.4 a and b, see also MFRI Assessment reports, 2022).

Anecdotal information suggests that *A. radiata* undertakes seasonal migrations in relation to egg-laying activity, but this is unconfirmed. Trawl survey data may provide useful information on catches of viable skate egg cases and/or on nursery grounds.

Length–frequency distributions of *A. radiata* in IS-SMH (Figure 16.5) indicate the majority of specimens are <60 cm L_T. Data on maturity derive from autumn survey allowing for calculations of maturity ogives. Length-at-50%-maturity (L_{50}) is 42.9 cm and 41.0 cm (MFRI, Assessment reports, 2021) L_T for males and females respectively (L_{95} for males is 51.1 cm and 50 cm for females). These values are lower in comparison to adjacent waters to the NW Atlantic stock (Templeman, 1987), but larger than observed in the North Sea, where L_{50} is 36.2 and 38.4 cm L_T for males and females, respectively (McCully *et al.*, 2012).

16.8 Exploratory assessment models

Total biomass, biomass trends and probability of capture can be estimated for 5 skate species and 8 shark species frequently occurring in the Icelandic groundfish surveys using conventional standardized swept-area biomass indices. The spring survey IS-SMB provides estimates for common blue skate and starry ray. Estimates for the other skates and sharks are derived from the Icelandic autumn survey (IS-SMH). Remaining skate and shark species from the region are only infrequently/sporadically caught int these two surveys.

Skates

Amblyraja radiata is the most widely distributed and by far the highest in biomass, the mean annual spring survey biomass estimated around 16000 t. The stock biomass in the last decade is around half that observed in the beginning of the time series (Figure 16.6). Abundance indices and biomass estimates for *A. radiata* in Icelandic waters (Va) have been calculated based on IS-SMB and IS-SMH, with a decreasing trend in large skates (>50 cm) observed (Björnsson *et al.*, 2007). Preliminary survey results indicate stable trends in major size groups in recent years after a period of decline (MFRI, Assessment reports, 2022).

In Icelandic waters *Dipturus batis* is the second most abundant skate species and its distribution is mainly within the warmer waters off South and West Iceland. The mean biomass in annual spring survey is estimated around 600 tonnes. Index shows increasing trend since 2010 with exception of this year's index.

Arctic skate *Amblyraja hyperborea* is the second most abundant skate in the IS-SMH survey. The distribution is limited to the upper shelf and slope off N and East Iceland. The mean biomass estimate is one tenth that of *Amblyraja radiata*, being around 660 t. Stock size has been relatively stable in the past two decades (Figure 16. 6) .

Spinytail skate (*Bathyraja spinicauda*) and round skate (*Rajella fyllae*) are reported in the autumn survey every year with mean estimated survey biomass of 396 t and 253 t respectively. *Bathyraja spinicauda* is most commonly found in deeper waters northwest and southeast of the island, *Rajella fyllae* being confined to the outer shelf and slope from southeast to northwestern waters. The stock size of round skate is estimated at historical low (Fig. 16.6).

Sharks

Of the 12 shark species that occur in IS-SMH *Centroscyllium fabricii* has by far the highest survey biomass estimates of 12.000 t. Interannual variability is quite high, the abundance in the last decade being higher than the first decade of this century (Figure 16.7).

Of those shark species that persistently are recorded in the autumn survey, 2 species show a decline in abundance: *Cenytoscymnus coelolepis* (mean biomass estimates of 591 t) and *Deania calcea* (mean biomass estimates of 763 t) (Figure 16.7). Another 3 species, *Etmopterus spinax* (mean biomass estimates of 1799 t), *Galeus murinus* (mean biomass estimates of 648t) and *Apristurus laurussonii* (mean biomass estimates of 622 t) show no trend in biomass over the last two decades. 3 species, *Etmopterus princeps* (mean biomass estimates of 2747 t), *Centroscymnus crepidater* (mean biomass estimates of 1927 t) and *Centrophorus squamosus* (mean biomass estimates of 535 t) show an increase in biomass (Figure 16.7).

16.9 Stock assessment

In 2020 MFRI started to publish advice for starry ray in Icelandic waters based on precautionary approach for category 3 stocks (MFRI Advice, 2022). However, starry ray is not subject to management such as TAC limitations. Only explorative assessments have been undertaken for other skates and sharks in this ecoregion.

16.10 Quality of assessments

Exploratory analyses of survey trends have been conducted for *A. radiata*. However, the majority of commercial landings data are being taken by gears other than bottom trawl (Figure 16.1) and this should be considered.

16.11 Reference points

No reference points have been proposed for any of these species.

16.12 Conservation considerations

The common skate complex has been found to be vulnerable to exploitation and has been near-extirpated from coastal areas elsewhere in their range (e.g. parts of the Irish and North Seas). Preliminary investigation of the common skate complex in Icelandic waters indicated that the dominant species currently found in Icelandic waters is the smaller *D. batis* now currently referred to as the common blue skate (Last *et al*., 2016)

16.13 Management considerations

The elasmobranch fauna off Iceland and Greenland is little studied and comprises relatively few species (21 sharks, 15 skates and six chimaeras). Most of the landings of skates are now reported to species.

The most abundant demersal elasmobranch in the area is *A. radiata*, which is widespread and abundant in this and adjacent waters. Negative survey trends for large size starry rays have been observed (Björnsson *et al*., 2007). Preliminary results of more recent data indicate that after a period of decline, stock trends have been stable for a few years.

16.14 References

Björnsson, H., Sólmundsson, J., Kristinsson, K., Steinarsson, B.Æ., Hjörleifsson, E., Jónsson, E., Pálsson, J., Pálsson, Ó.K., Bogason, V., Sigurðsson, Þ. 2007. Stofnmæling botnfiska á Íslandsmiðum (SMB) 1985–2006 og stofnmæling botnfiska að haustlagi (SMH) 1996–2006. The Icelandic groundfish surveys in spring 1985–2006 and in autumn 1996–2006. In Fjölrit Hafrannsóknastofnunarinnar / MRI Reykjavík, Technical Report no. 131, 220 pp. (Available at http://www.hafro.is/Bokasafn/Timarit/fjolr.htm).

Jakobsdóttir, K., Björnsson, H., Sólmundsson, J., Kristinsson, K., Ólafsdóttir, S.H., Bogason, V. 2020. Icelandic autumn groundfish survey 2020: Implementation and main results. In Haf og vatnarannsóknir/ MFRI. HV 2020-54. 61pp. (Available at https://www.hafogvatn.is/static/research/files/hv2020-54.pdf).

Jakobsdóttir, K., Björnsson, H., Sólmundsson, J., Kristinsson, K., Bogason, V. 2021. Icelandic autumn groundfish survey 2020: Implementation and main results. In Haf og vatnarannsóknir/ MFRI. HV 2020-60. 61pp. (Available at https://www.hafogvatn.is/static/research/files/hv2021-60.pdf)

Jakobsdóttir, K. , Jónasson, J.P., Kristinsson, K. and Pálsson, J. 2020. Hámýs í stofnmælingaleiðöngrum Hafrannsóknastofnunar. In Haf og vatnarannsóknir MFRI. HV 2020-47. 47 pp. Available at https://www.hafogvatn.is/is/midlun/utgafa/haf-og-vatnarannsoknir/hamys-i-stofnmaelingaleidongrum-hafrannsoknastofnunar-hv-2020-47

Jørgensen, O. A. 2006. Elasmobranchs at East Greenland, ICES Division 14B. Working paper ICES Elasmobranch WG. June 2006.

McCully, S. R., Scott, F., and Ellis, J. R. 2012. Lengths at maturity and conversion factors for skates (Rajidae) around the British Isles, with an analysis of data in the literature. ICES Journal of Marine Science, 69: 1812–1822.

MFRI Assessment Reports 2022. Starry ray. *Amblyraja radiata*. 11 pp. Available at https://www.hafogvatn.is/static/extras/images/24-starryray1326054.pdf.

MFRI Advice 2022. Starry ray. 3 pp. Available at https://www.hafogvatn.is/static/extras/images/24-starryray1326054.pdf

Möller, P. R., Nielsen, J. G., Knudsen, S. W., Poulsen, J. Y., Sunksen, K. and Jorgensen, O. A. 2010. A checklist of the fish fauna of Greenland waters. Zootaxa, 1–84.

Last, P. R., Naylor, G., Séret, B.,White,W., Stehmann, M. & de Carvalho, M.(Eds.). 2016. *Rays of the World*. CSIRO Publishing. https://doi.org/10.1071/9780643109148

Templeman, W. 1987. Differences in sexual maturity and related characteristics between populatons of thorny skate (Raja radiata) in the northwest Atlantic. Journal of Northwest Atlantic Fishery Science, 7: 155–167.

Electronic references

www.hagstova.fo Accessed 19 June 2018.

ICES. 2016a. Historical Nominal Catches 1950-2010. Version 20-06-2016. Accessed 20-06-2016 via http://ices.dk/marine-data/dataset-collections/Pages/Fish-catch-and-stock-assessment.aspx ICES, Copenhagen.

ICES. 2021b. Official Nominal Catches 2006-2019. Version: 19-10-2021. Accessed 22-06-2022 via https://www.ices.dk/data/dataset-collections/Pages/Fish-catch-and-stock-assessment.aspx ICES, Copenhagen.

Table 16.1. Demersal elasmobranchs - Iceland and East Greenland. Reported landings of skates from Iceland (Division 5.a) and East Greenland (Subarea 14). Data were updated with landings from ICES historic nominal landings database (ICES, 2016) and national landings data provided to the WG (June 2021). Faroese landings 1990–2015 were extracted from Faroes national statistics database available on www.hagstova.fo *1990–2015: Total catch (live weight). ** Prior to 1992 all skates nei are assumed to belong to common skate complex (see earlier reports).

Scientific name	Nation	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
common skate complex	Iceland	364	275	188	333	442	424	403	196	229	245	185	178	120	108
Amblyraja radiata	Iceland	0	0	0	0	0	0	0	0	0	9	12	46	15	44
Raja rays nei**	Belgium	59	51	62	36	41	23	27	36	28	11	15	15	19	18
	Faeroe Islands	80	56	43	35	75	27	37	21	25	23	73	24	21	0
	Germany	76	41	49	41	37	10	2	1	2	2	4	3	2	1
	Norway	1	0	63	4	2	3	2	3	6	1	10	3	5	0
	UK - England & Wales	385	187	195	106	5	0	0	0	0	0	0	0	0	0
	UK - Scotland	5	8	14	8	0	0	0	0	0	0	0	0	0	0
Total		970	618	614	563	602	487	471	257	290	291	299	269	182	171

		1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
common skate complex	Iceland	130	152	152	222	304	363	274	299	245	181	118	108	80	94
	Norway	0	0	0	0	0	0	0	0	0	0	0	0	0	3
Amblyraja radiata	Iceland	125	39	100	163	286	317	294	1206	1749	1493	1430	1252	996	1076
Leucoraja fullonica	Iceland	0	0	0	0	0	0	2	12	24	19	16	12	21	27
Raja rays nei**	Belgium	22	20	22	6	9	6	3	0	0	0	0	0	0	0
	Faeroe Islands*	8	2	2	16	5	2	3	3	9	2	2	7	5	0
	Germany	0	0	0	1	3	1	2	0	9	0	0	1	0	7
	Norway	0	0	0	0	0	25	8	8	7	10	2	19	8	3
	Portugal	0	0	0	0	0	0	0	0	0	0	1	0	0	0
	UK - Eng+Wales+N.Irl.	0	0	0	0	0	1	2		4	0	0	1	2	0
Total		285	213	276	408	607	715	588	1529	2047	1705	1569	1400	1112	1210

Table 16.1. (continued). Demersal elasmobranchs - Iceland and East Greenland. Reported landings of skates from Iceland (Division 5.a) and East Greenland (Subarea 14). Data were updated with landings from ICES historic nominal landings database (ICES, 2016a) and national landings data provided to the WG. *Faroese landings 1990–2017 were extracted from Faroes national statistics database available on www.hagstova.fo. Total catch (live weight). ** Official reports on *L. fullonica* are likely misidentification and thus, from 2005, these numbers are reported to WG as rays nei.

Scientific name	Nation	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
common skate complex	Iceland	82	59	120	145	166	136	123	126	128	117	125	145	153	141	165	143	147	124	194	160	158
	Norway	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0	0	0	0	0	
Amblyraja radiata	Iceland	1211	1781	1491	1013	657	530	496	634	866	1026	1416	1978	1847	1625	1397	1273	652	604	963	804	760
Rajella lintea	Iceland	0	0	10	8	1	8	7	0	8	12	9	9	7	4	11	3	5	4	5	4	10
***Leucoraja fullonica*	Iceland	37	32	17	23													0				
Raja rays nei	Faeroe Islands*	2	1	0	8	9	16	7	11	6	5	14	5	6	4	0	8	3	3			
	Germany	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0				
	France												0	0	0	0	0	0				
	Iceland	0	0	0	0	16	16	17	4	33	19	17	21	37	14	15	13	10	12	31	17	23
	Norway	6	5	1	0	0	7	0	1	2	4	4	0	0	0	1	1	0	0	4		
	Portugal	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
	Russian Federation	0	0	0	2	6	3	0	0	na	na	0	0	na	na	na	0	0	NA			
	Spain	0	0	15	0	0	0	0	0	0	0		0	0	0	0	0	0	0			
	UK	1	0	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0			
Raja clavata	France								0	0	0	1	0	0	0	0	0	0	0			
Total		1340	1878	1655	1200	855	726	650	786	1043	1183	1520	2039	1917	1788	1595	1433	817	761	1197	985	951

Table 16.2. Demersal elasmobranchs - Iceland and East Greenland. Demersal elasmobranch species captured during groundfish surveys at East Greenland (1998–2005) giving the total number, observed maximum weight (kg), depth range (m) and bottom temperature range °C and most northern position (decimal degrees). Source: Jørgensen (2006).

Species	N	Max wt (kg)	Depth range (m)	Temp range (°C)	Maximum latitude
Bathyraja spinicauda	82	61.5	548–1455	0.5–5.6	65.46°N
Rajella bathyphila	57	45.3	476–1493	0.3–4.1	65.44°N
Rajella fyllae	117	4.8	411–1449	0.8–5.9	65.46°N
Amblyraja hyperborea	12	23.4	520–1481	0.5–5.4	65.47°N
Amblyraja radiata	483	22.1	411–1281	0.8–6.6	66.21°N
Malacoraja spinacidermis	3	3.1	1282–1450	2.3–2.7	62.25°N
Apristurus laurussoni	3	0.7	836–1255	1.7–4.3	65.22°N
Centroscyllium fabricii	812	128	415–1492	0.6–5.1	65.40°N
Somniosus microcephalus	9	500	512–1112	1.4–4.9	65.35°N

Table 16.3. Demersal elasmobranchs - Iceland and East Greenland. Catch data of skates and rays in MRI annual autumn groundfish survey at Iceland (Division 5.a), giving the number of individuals caught (N) and the frequency of occurrence (percentage of stations where species was collected, %O). 2011 survey (noted with asterisk) was discontinued and therefore data are incomplete.

	2000		2001		2002		2003		2004		2005		2006		2007		2008		2009		2010	
	N	%O	N	%O	N	%O	N	%O	N	%O	N	%O	N	%O	N	%O	N	%O	N	%O	N	%O
common skate complex	6	<1	1	<1	3	<1	3	<1	1	<1	4	<1	6	1	7	1	7	1	9	1	4	<1
Amblyraja radiata	1589	48	1413	45	1442	49	1379	49	1957	51	1678	53	1716	52	1474	52	1569	48	1590	39	1399	46
Rajella lintea	2	<1	0	0	0	0	0	0	0	0	0	0	2	<1	0	0	0	0	0	0	0	0
Amblyraja hyperborea	110	9	160	9	80	8	88	8	97	9	104	8	120	10	59	10	90	9	103	9	86	10
Rajella fyllae	24	4	54	8	53	8	77	6	37	6	53	7	81	8	44	8	106	5	48	10	70	7
Bathyraja spinicauda	7	2	11	2	10	2	25	1	12	2	16	2	21	2	7	2	18	2	11	2	1	2
Rajella bathyphila	1	<1	0	0	0	0	1	<1	0	0	1	<1	0	0	0	0	2	<1	0	0	0	0
Rajella bigelowi	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	<1	0	0	0	0

	2011*		2012		2013		2014		2015		2016		2017		2018		2019		2020		2021	
	N	%O	N	%O	N	%O	N	%O	N	%O	N	%O	N	%O	N	%O	N	%O	N	%O	N	%O
common skate complex	1	1	0	<1	0	0	5	1	17	2	0	0	4	<1	10	1	4	1	4	<1	1	<1
Amblyraja radiata	295	42	918	34	1142	41	1289	52	1066	49	1268	48	1026	45	1218	42	159	43	919	48	774	44.48
Rajella lintea	0	0	0	0	0	0	0	0	0	0	1		0	0	0	0	-	0	2	<1	1	<1
Amblyraja hyperborea	27	8	73	7	63	8	95	9	68	5	79	8	43	5	54	6	21	6	66	7	44	5.8
Rajella fyllae	36	5	24	17	35	4	71	10	30	6	46	6	33	9	41	7	26	7	36	7	19	4.7
Bathyraja spinicauda	2	0	11	1	4	2	11	2	5	1	4	1	5	1	7	1	0	0	2	1	4	1.1
Rajella bathyphila	0	0	0	0	0	0	0	0	0	0	0	0	1	<1	0	0	0	0	0	0	2	<1
Rajella bigelowi	0	0	0	0	0	0	0	0	1	<1	0	0	1	<1	0	0	0	0	0	0	0	0
Malacoraja kreffti									2	<1	3	<1	3	<1	0	0	1	<1	2	<1	0	0

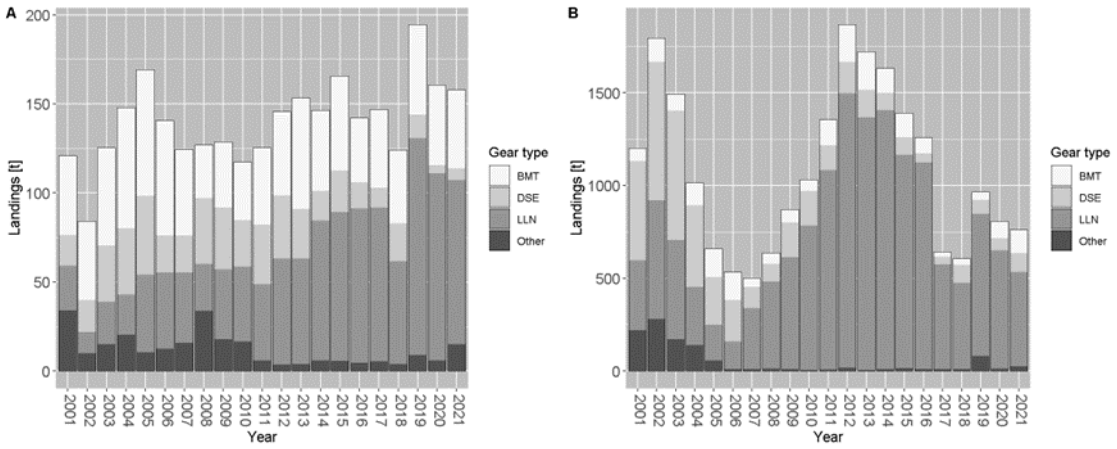


Figure 16.1. Demersal elasmobranchs - Iceland and East Greenland. Icelandic landings of (a) common blue skate and (b) starry ray *A. radiata* by fishing gear). Note different scales at the y-axis.

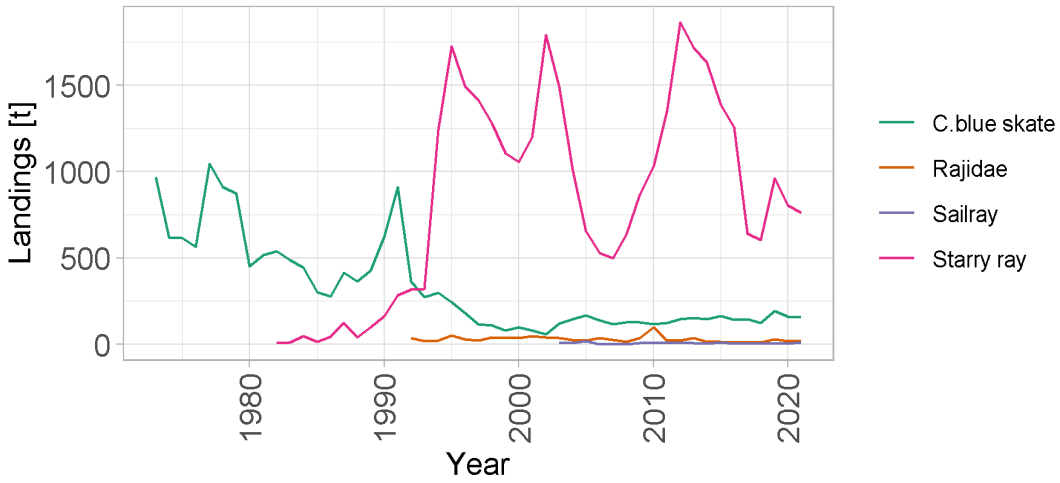


Figure 16.2. Demersal elasmobranchs - Iceland and East Greenland. Landings of skates in division 5.a. Prior to 1992, all skates nei are assumed to belong to common skate complex (see earlier reports). Data were updated with nominal landings from ICES database (ICES, 2021) for years 2006–2019 and also contain national landings data provided to the WG.

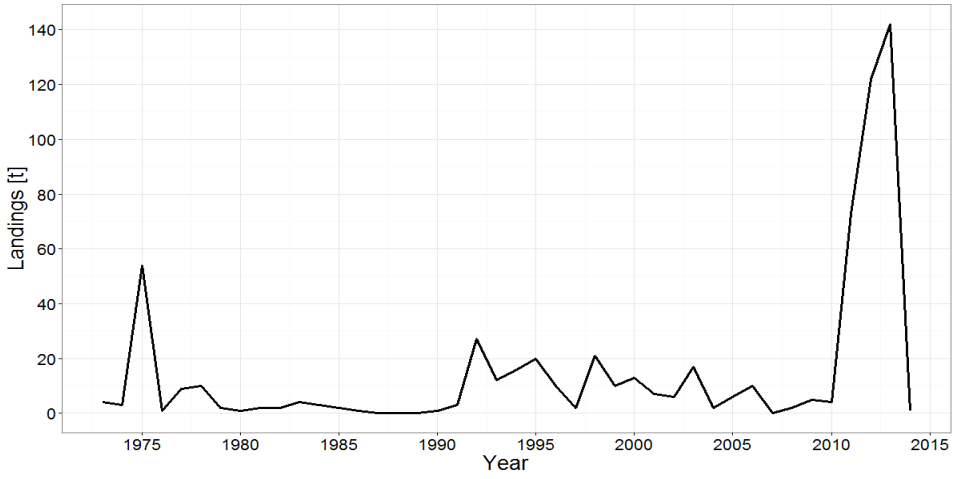


Figure 16.3. Demersal elasmobranchs - Iceland and East Greenland. Combined landings of rays and skates from East Greenland (Subarea 14). The peak landings in 2011–2013 originate from *Amblyraja radiata* (FAO Code RJR). Data from ICES (2016a, b).

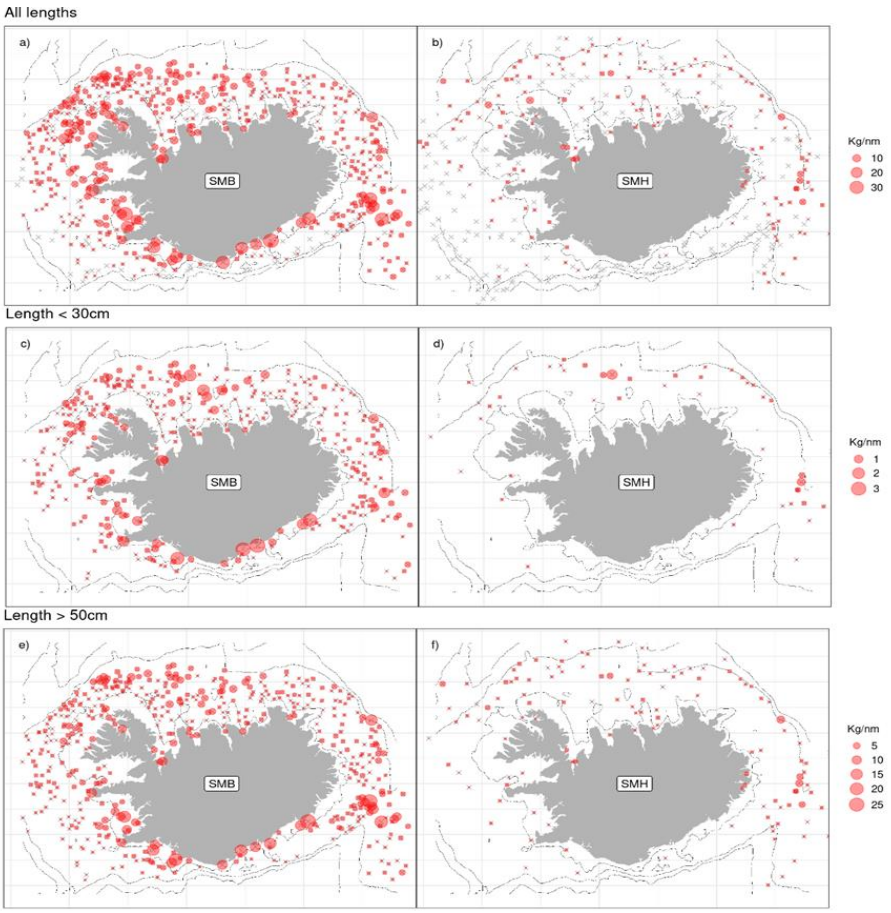


Figure 16.4. Demersal Elasmobranchs - Iceland and East Greenland. Spatial distribution of starry ray *A. radiata* in Icelandic waters (Division 5.a). Spatial distribution in IS-SMB 2022 (a, c, e) and in IS-SMH 2021 (b,d,f). The top panel shows all data, the middle panel shows individuals <30 cm, and the bottom panel shows larger individuals (>50cm). See also *MFRI Assessreports 2022*.

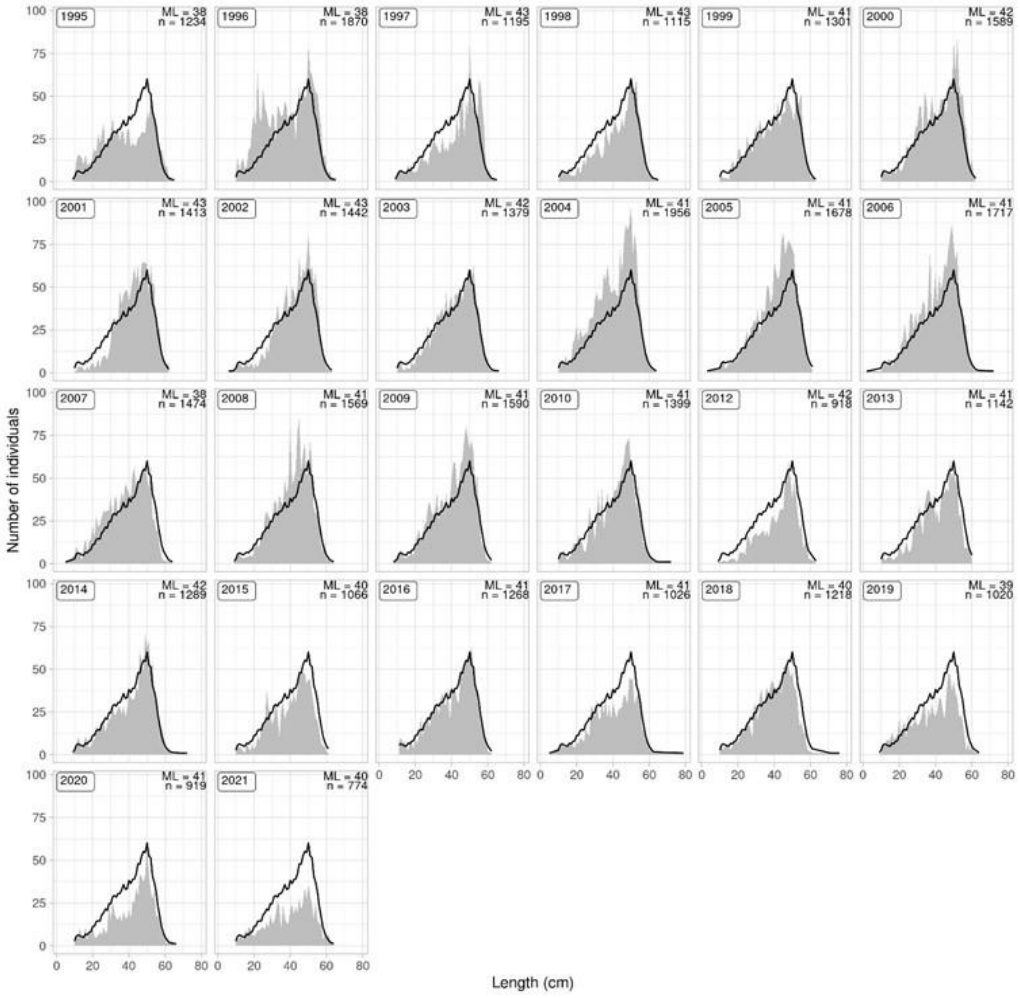


Figure 16.5. Demersal elasmobranchs - Iceland and East Greenland. Length distribution of starry ray *A. radiata* in Icelandic waters (Division 5.a) each year as observed in the annual autumn survey. Broken line denotes average value. Mean length each year is denoted in the upper right corner of each panel. (see also *MFRI Assessment reports 2022*)

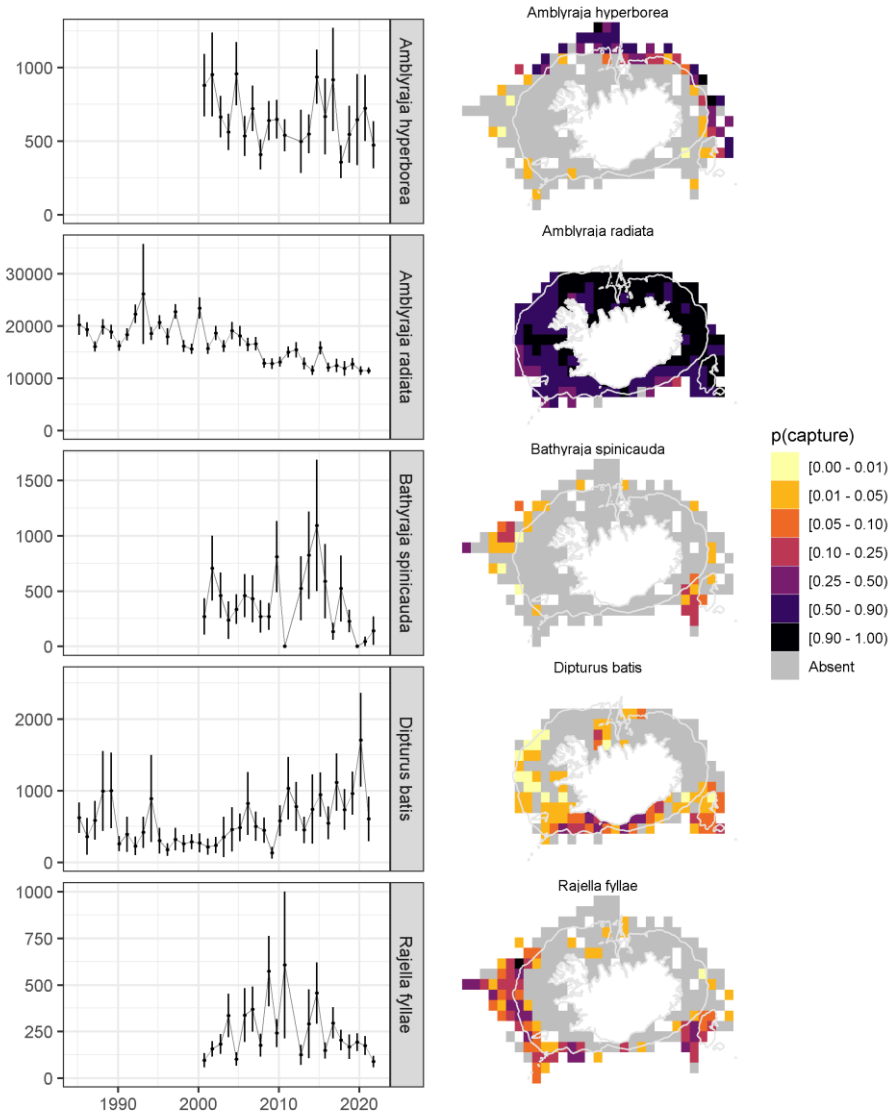
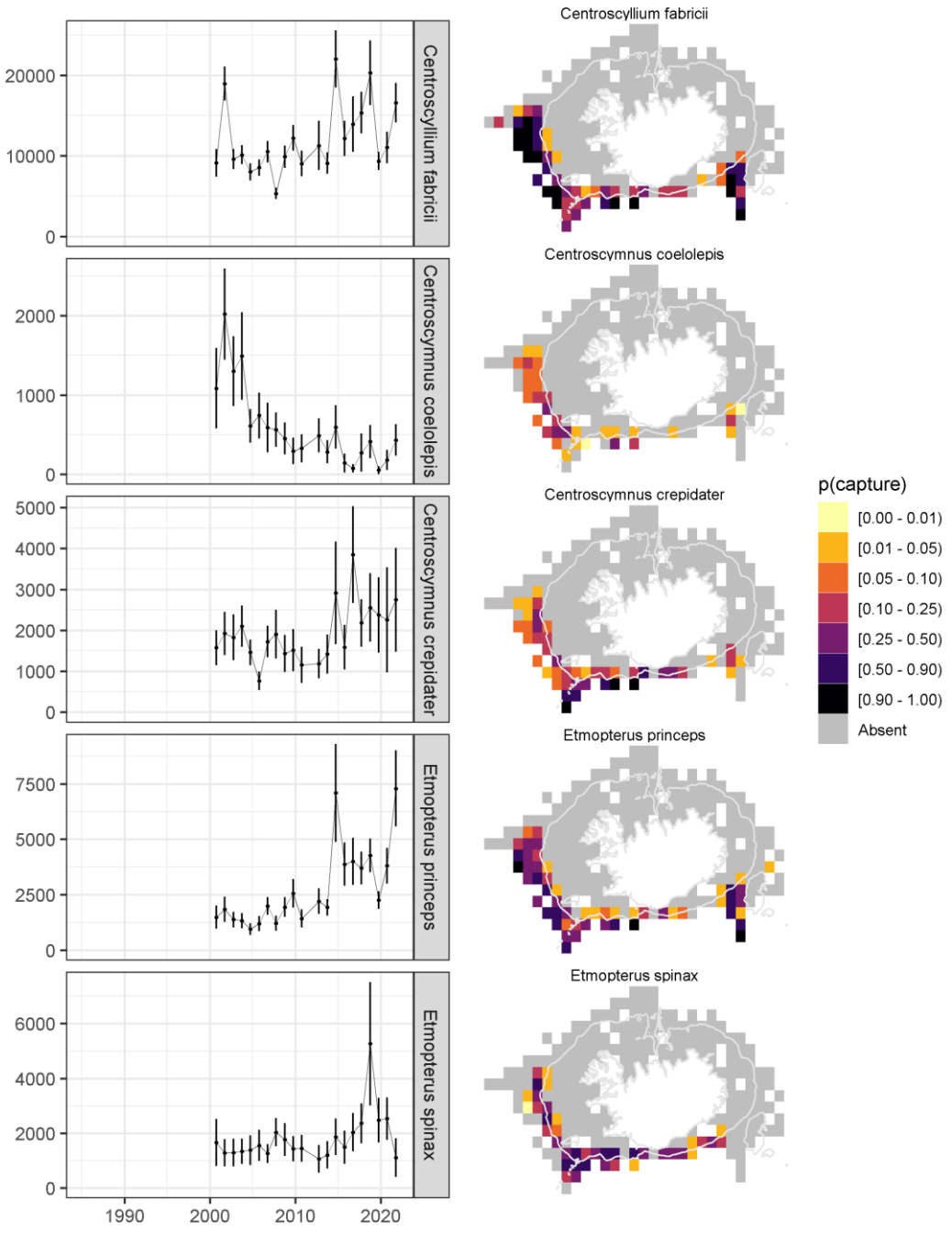


Figure 16.6. Demersal elasmobranchs - Iceland and East Greenland. Skates in Icelandic waters. Biomass estimates and probability of capture for *Amblyraja radiata* and *Dipturus batis* derived from IS-SMB survey 1985–2022. Biomass estimates for *Amblyraja hyperborea*, *Bathyraja spinicauda* and *Rajella fyllae* derived from IS-SMH survey 2000–2021.


Centroscyllium fabricii
Centroscymnus coelolepis
Centroscymnus crepidater
Etmopterus princeps
Etmopterus spinax
20000
10000
0
2000
1000
5000
4000
3000
7500
2500
6000
1990
2000
2010
2020
p(capture)
[0.00 - 0.01)
[0.01 - 0.05)
[0.05 - 0.10)
[0.10 - 0.25)
[0.25 - 0.50)
[0.50 - 0.90)
[0.90 - 1.00)
Absent

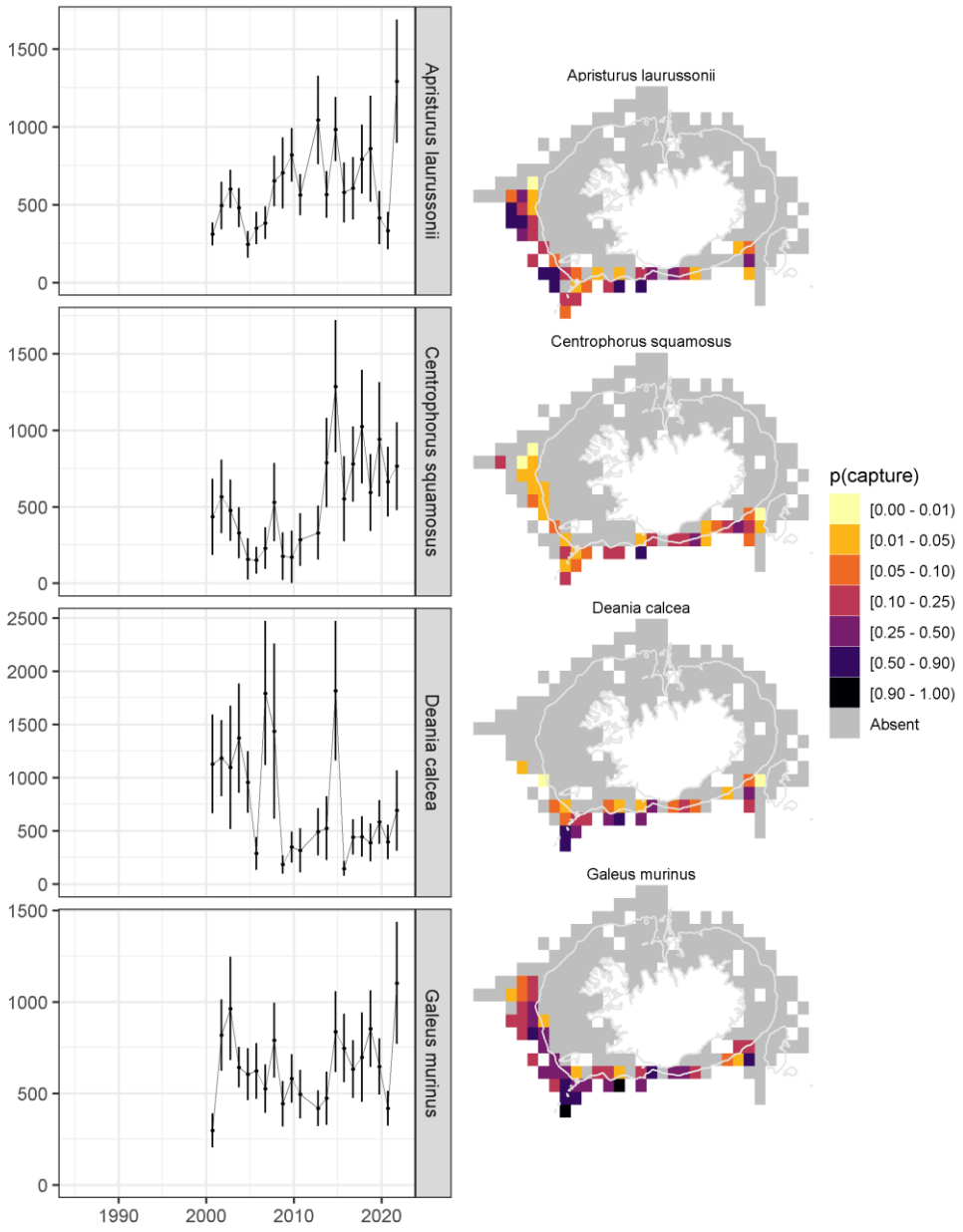


Figure 16.7. Demersal elasmobranchs - Iceland and East Greenland. Sharks in Icelandic waters. Biomass estimates and probability of capture based on annual autumn survey IS-SMH 2000–2021.