NORWAY REDFISH
Sebastes viviparus

GENERAL INFORMATION

Norway redfish (*Sebastes viviparus*) is the smallest of the three *Sebastes* species found in Icelandic waters, rarely reaching length over 30 cm. Norway redfish is distributed around Iceland with highest densities along the south and southwest coast of Iceland at depths ranging from 40 to 400 m. Little is known about the biology of the species but as with other redfish species in Icelandic waters the Norway redfish is slow-growing and long-lived.

THE FISHERY

A directed fishery for Norway redfish in Icelandic waters started in 1997 with landings of 1 200 t (Figure 1 and Table 1). The catches declined rapidly and between 2001 and 2009 only a few tonnes were landed annually. In 2010, a directed fishery started again with total landings of 2 600 t. Landings have since then declined and annual landings in 2017–2022 were on average around 116 t. Landings in 2022 were 58 t which is the lowest landings since the directed fishery started again in 2010. Norway redfish is caught by demersal trawlers.

The main fishing grounds for Norway redfish are southeast and south of Iceland (Figures 2 and 3). Small portions are taken along the Reykjanesridge.

Norway redfish is mainly caught at depths between 100 and 400 m (Figure 4).

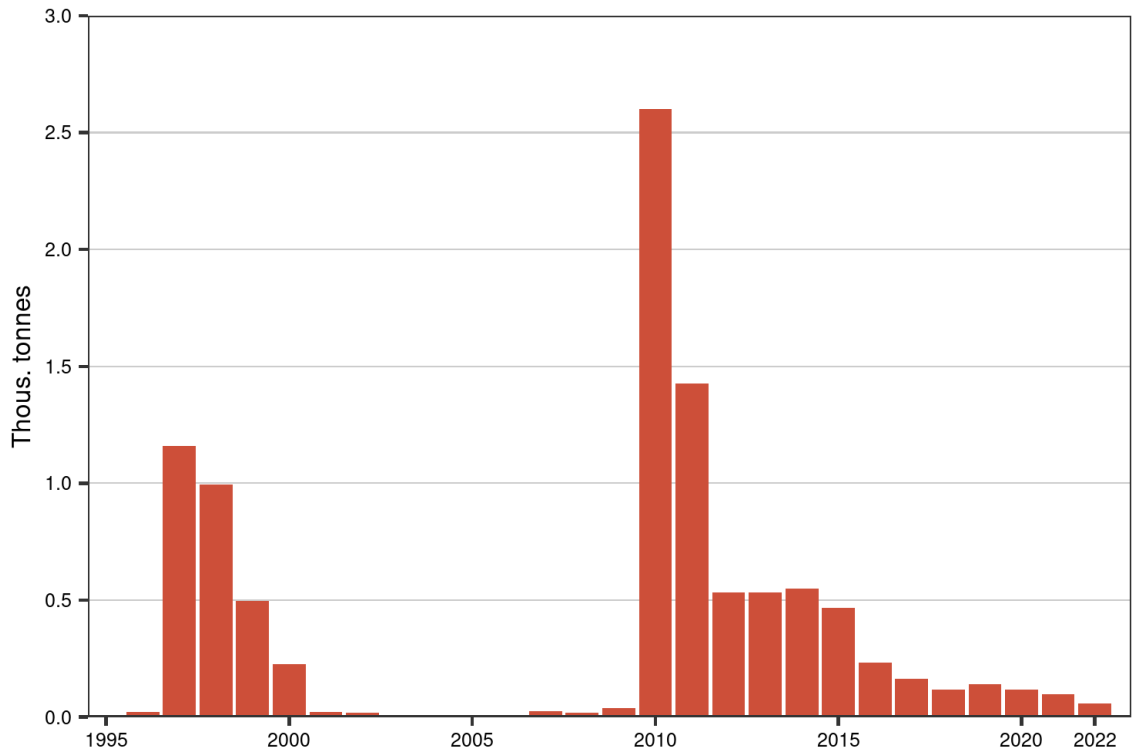

Figure 1. Norway redfish. Landings 1996–2022.

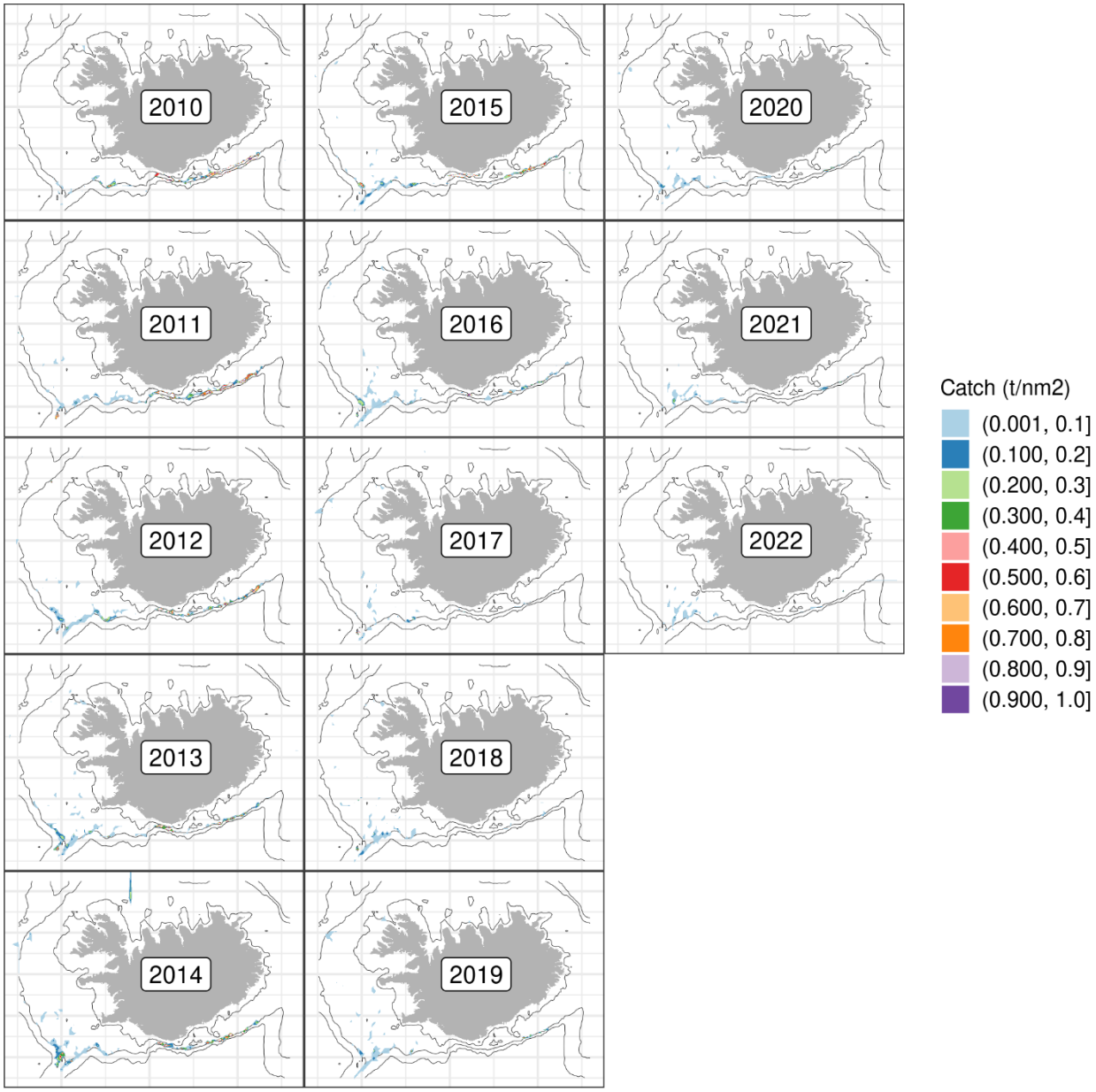

Figure 2. Norway redfish. Geographical distribution of the Icelandic fishery 2010–2022. Reported catch from logbooks.

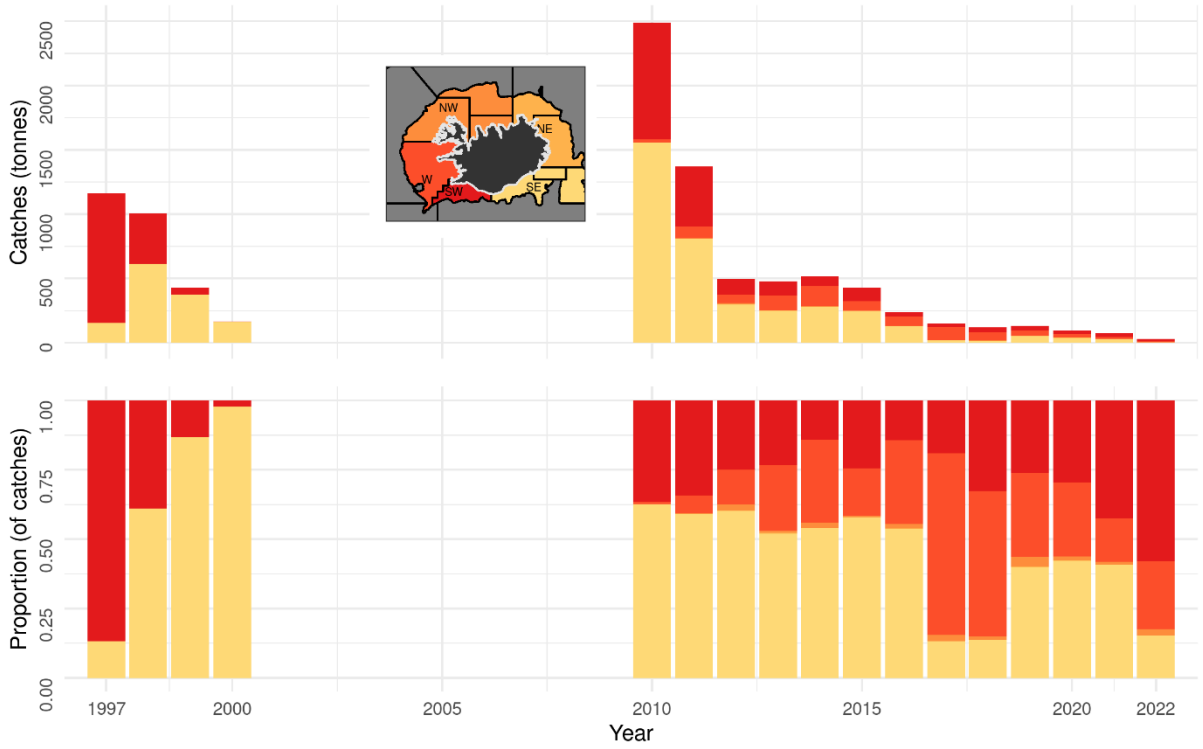

Figure 3. Norway redfish. Spatial distribution of the Icelandic fishery by fishing area from 1997–2022.

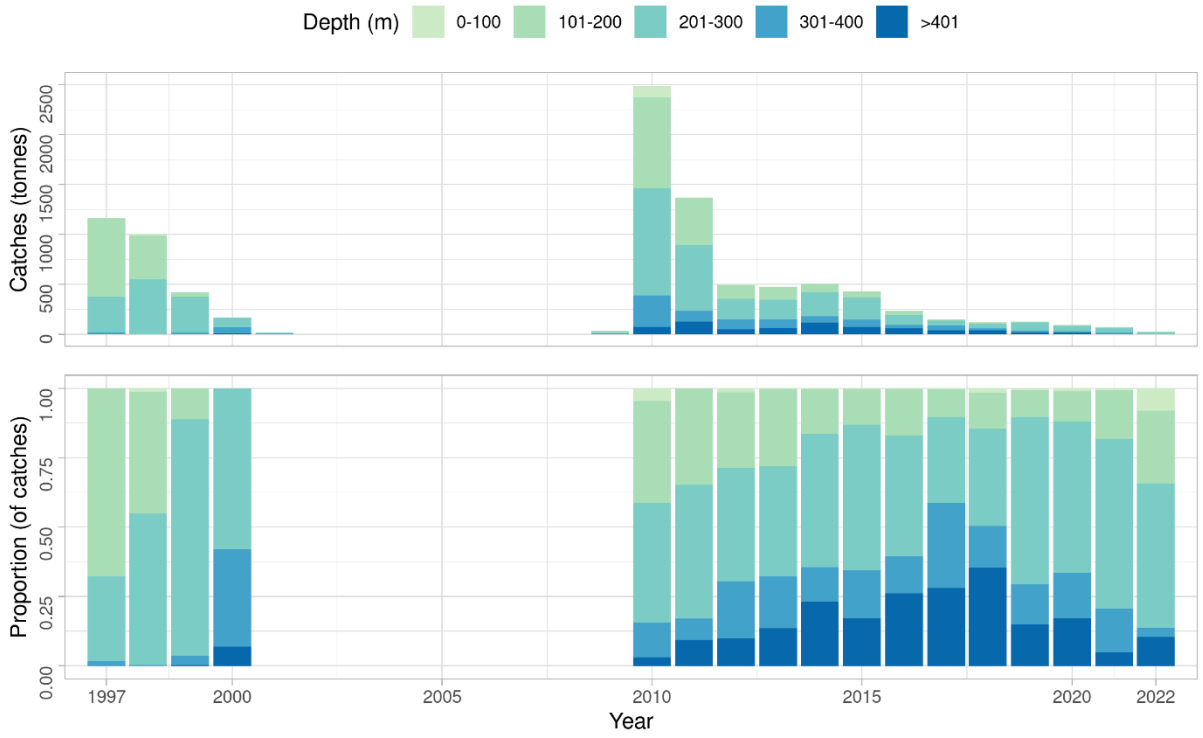

Figure 4. Norway redfish. Depth distribution of demersal trawl catches according to logbooks 1997–2022.

Table 1. Norway redfish. Number of Icelandic trawlers landing catch of 1000 kg or more of Norway redfish, and all landed catch 1997–2022.

	NUMBER OF VESSELS	CATCHES (TONNES)
YEAR	Demersal trawlers	Total
1996	2	22
1997	6	1159
1998	8	994
1999	7	498
2000	5	227
2001	2	21
2002	2	20
2003	-	3
2004	-	2
2005	-	4
2006	-	9
2007	2	24
2008	1	15
2009	4	37
2010	23	2602
2011	21	1427
2012	21	535
2013	18	532
2014	14	550
2015	13	468
2016	12	234
2017	10	161
2018	7	117
2019	12	143
2020	12	118
2021	11	96
2022	10	52

CATCH PER UNIT EFFORT (CPUE) AND EFFORT.

CPUE estimates of Norway redfish in Icelandic waters are not considered representative of stock abundance as changes in fleet composition and technical improvements have not been accounted for when estimating CPUE.

Non-standardized estimates of CPUE in demersal trawl (kg/h), in hauls where redfish was more than 10% of the catch, decreased from about 2700 kg/h to 1200 kg/h in 1997–2000 (Figure 5). In 2010, when the fishery commenced again, CPUE was about 1300 kg/h but decreased and has in recent nine years fluctuated between 500–1000 kg/h. Total fishing effort (number of towing hours decreased between 1997 and 2000 but increased rapidly in 2010 when target fishery started again. Since 2010, fishing effort has steadily decreased and was in 2017–2021 the lowest in the time series (Figure 5). The decrease in effort is due to decrease in the targeted fishery towards Norway redfish. Effort and CPUE data were not available for 2022.

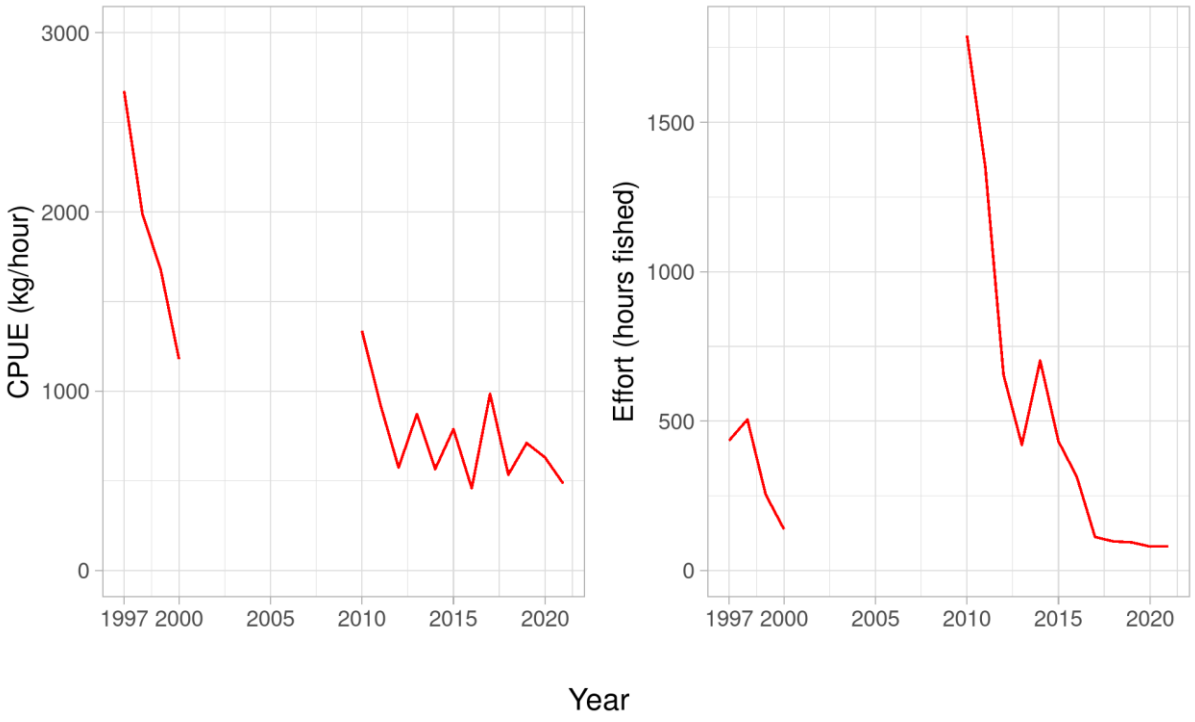

Figure 5. Norway redfish. Non-standardised estimates of CPUE (kg/hour, left) and fishing effort (right, hours fished) from demersal trawl. Effort and CPUE data were not available for 2022.

SURVEY DATA

The Icelandic spring groundfish survey (IS-SMB), which has been conducted annually in March 1985–2023, covers the main distribution of Norway redfish in Icelandic waters. Figure 6 shows the total biomass and recruitment indices (fish smaller than 15 cm). The total biomass index has increased rapidly since 2011 and was in 2016–2022 the highest recorded and more than three times higher than in 2000. The index in recent years is largely dominated by a few large hauls, causing high variance.

The juvenile abundance index for individuals smaller than 15 cm indicates stronger recruitment in 2003–2012 compared to other years (Figure 6).

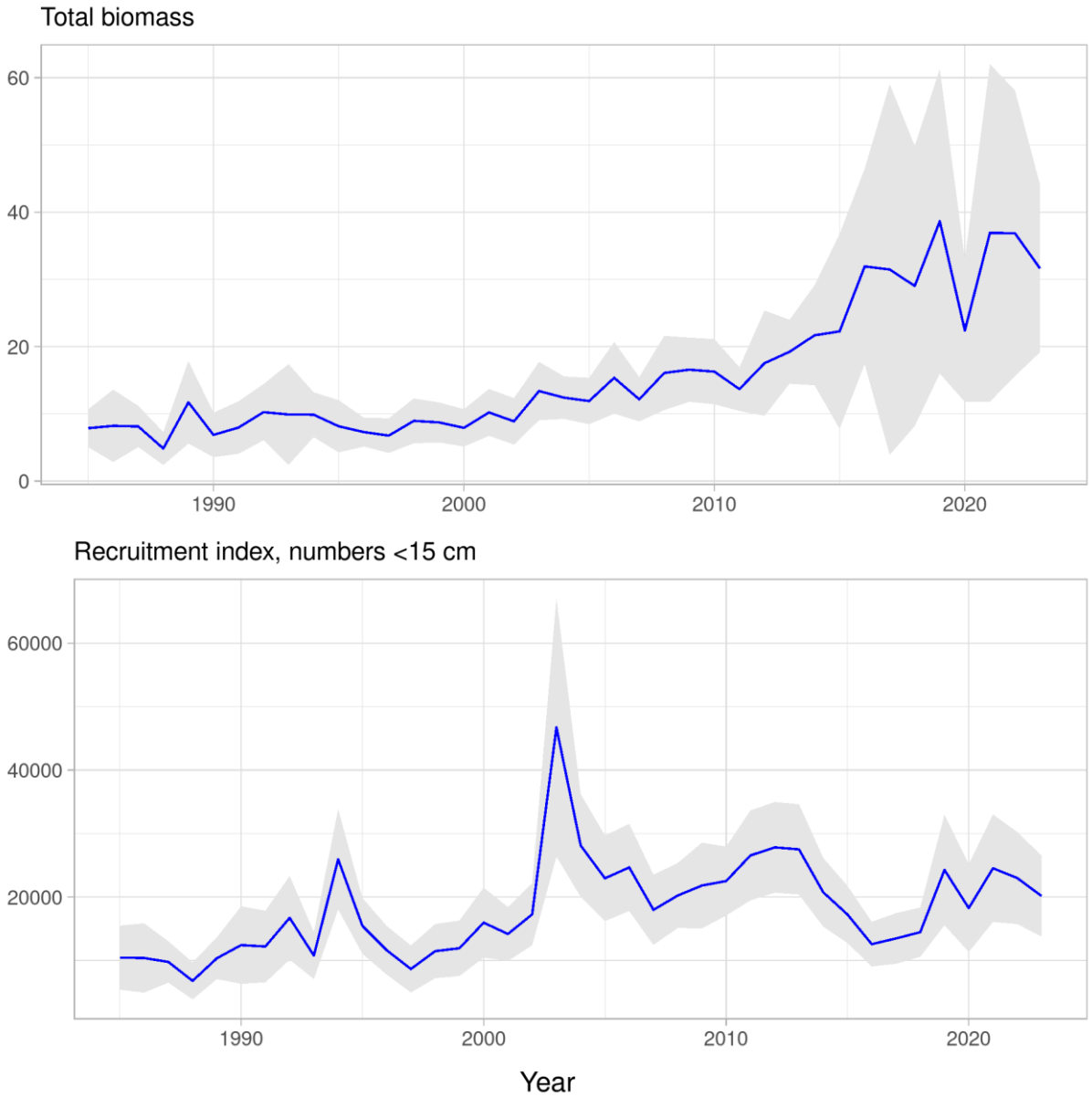

Figure 6. Norway redfish. Total biomass index (upper) and juvenile abundance indices (<15 cm) (lower) from the spring survey 1985–2023. The grey area represents 95% CI.

Length distributions from IS-SMB show that the modes are between 20 and 25 cm (Figure 7). The increased abundance of fish smaller than 15 cm can be observed in 2003–2012 in the IS-SMB (Figure 7) and this fish has contributed to increased stocks size of Norway redfish since 2008.

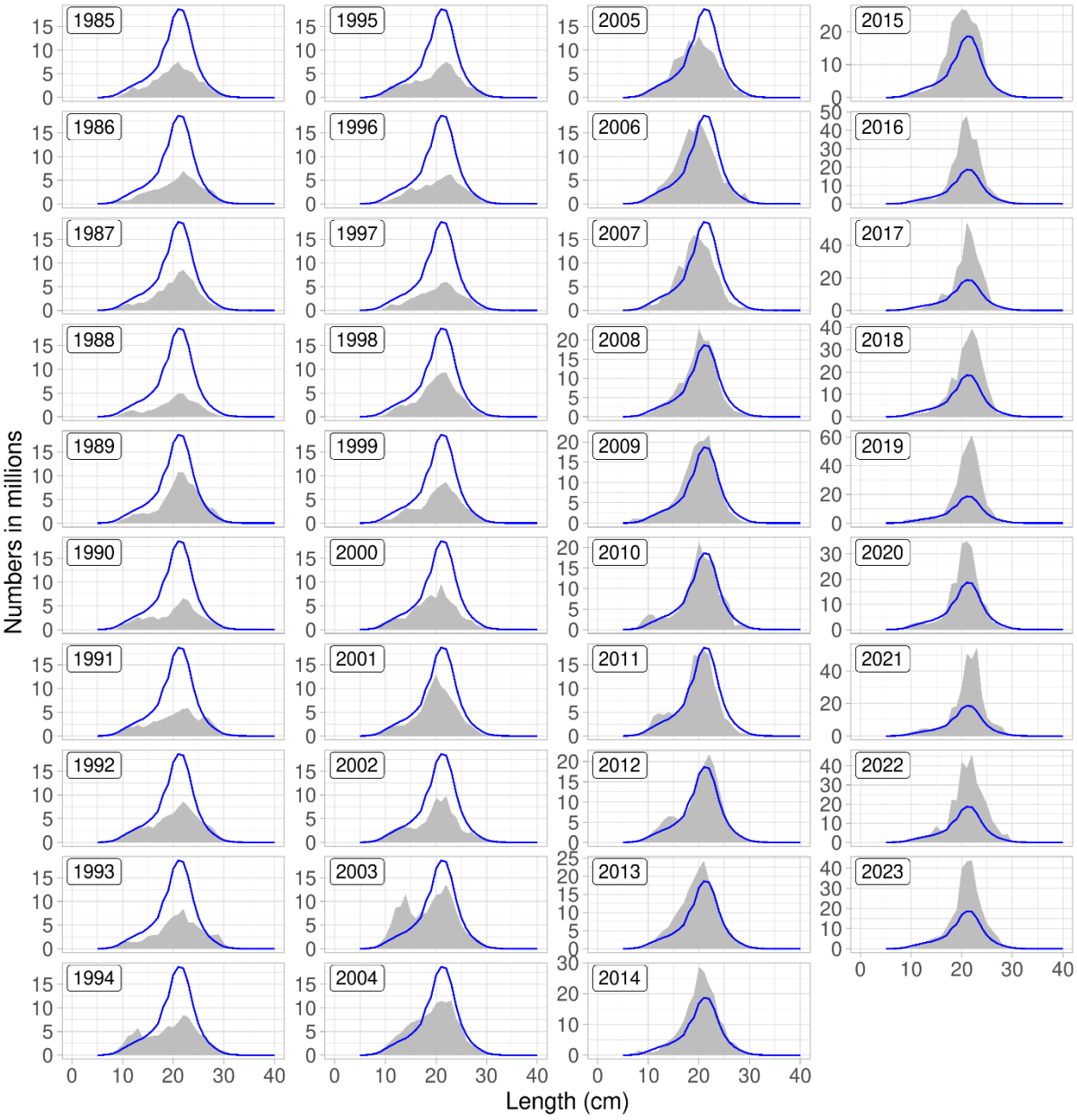

Figure 7. Norway redfish. Length disaggregated abundance indices from the spring survey 1985–2023. The blue line shows the mean for all years. Note that the y-axis is not the same on the figures.

Norway redfish in the spring survey is found all around Iceland but is most abundant along the south and southwest of Iceland (Figures 8). In recent years, the abundance in the West area has increased and since 2015 majority of the Norway redfish biomass was measured in that area.

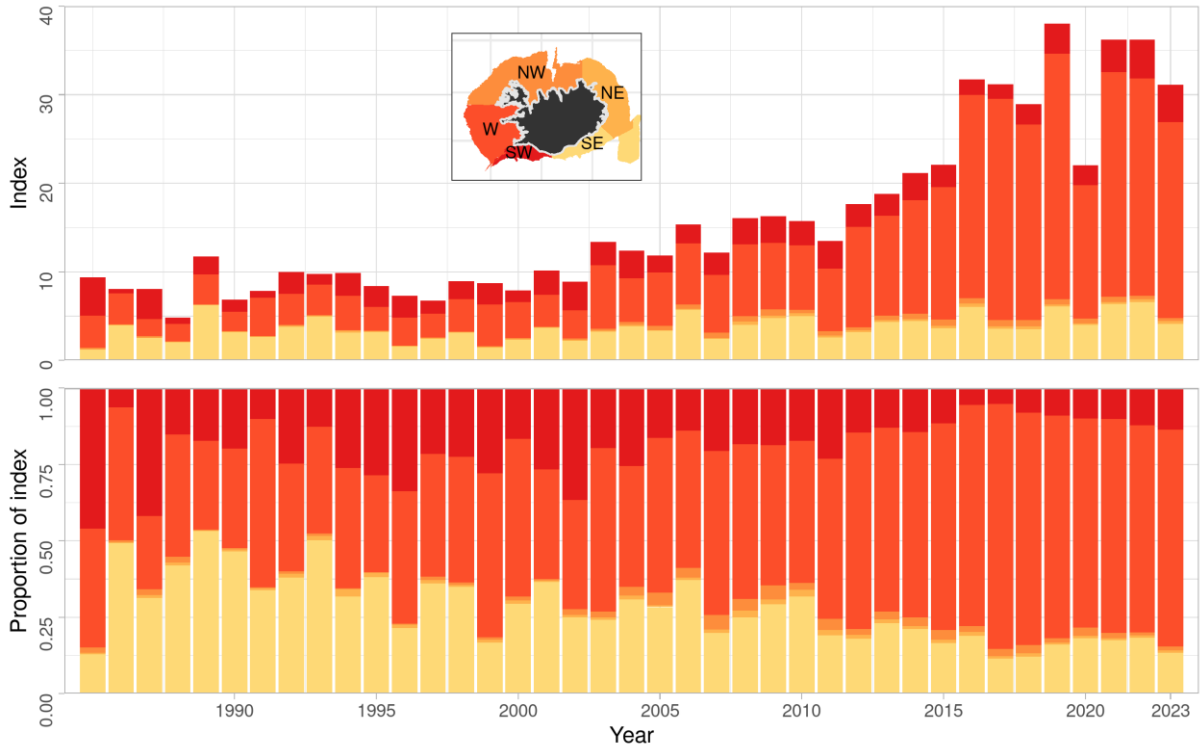

Figure 8. Norway redfish. Spatial distribution of the biomass index from the spring survey 1985–2023.

STOCK ASSESSMENT

No analytical assessment is conducted on this stock due to lack of data.

BASIS FOR THE ADVICE

Icelandic slope beaked redfish is considered a data limited stock (DLS) and follows the ICES framework for such (Category 3.2; ICES 2012). Below is the description of the formulation of the advice.

The advice is based on ICES *rfb*-rule for data limited stocks and this is the first time. The method takes into account life history traits, exploitation characteristics and other relevant parameters for data-limited stocks (ICES 2021). The rfb-rule has the following form:

$$A_y = A_{y-1}\, r\, f\, b\, m$$

where A_y is the advised catch, A_{y-1} is last years advice, r corresponds to the trend in biomass index (as in the current ICES "2 over 3" rule), f is a proxy for the exploitation (mean catch length divided by an MSY reference length) and b a biomass safeguard (reducing the catch when biomass index drops below a trigger value).

r is the ratio of the mean of the last two survey indices and the mean of the three preceding values or:

$$r = \frac{\sum_{i=y-2}^{y-1} I_1\,/2}{\sum_{i=y-3}^{y-5} I_1\,/3}$$

f is the length-ratio component where:

$$f = \frac{\overline{L}_{y-1}}{L_{F=M}}$$

where $\overline{L}$ is the mean catch length above target reference length, $L_{F=M}$. $L_{F=M}$ is calculated as:

$$L_{F=M} = 0.75L_c + 0.25L_\infty$$

where L_c is the length where frequency is half that of the modal value, and $L_\infty$is from von Bertalanffy growth equation.

b is the biomass safeguard and is used to reduce catch advice when the last year's index falls below trigger:

$$b = min\left(1, I_y - 1/I_{trigger}\right)$$

where $I_{trigger} = 1.4 * I_{loss}$ and I_y is the latest index value.

m is a multiplier based on stock growth. K for Norway redfish is <0.2 (slow growing) and therefore m is set as 0.95.

APPLICATION OF *RFB*-RULE

- The total biomass index from the Icelandic spring groundfish survey (IS-SMB) was used for the stock development for Norway redfish.
- The lowest index or the I_{loss} for Norway redfish was set to the second lowest value in the times series (1990) or 6751. $I_{trigger}$ is I_{loss} *1.4 or 9451 (Figure 9).
- Figure 10 shows the mean length in the commercial catches. $L_{F=M}$ is 23.1 cm. Note that length samples from the fishery are scarce and data were not available in some years.
- Not age data are available for Norway redfish. $L_\infty$was therefore defined as the average observed maximum length in the survey and the 99th quantile of the length distribution in the survey (Figure 11).
- Age data is not available for Norway redfish but like other redfish species it is considered slow growing. *m*, tuning parameter, for slow growing species (with von Bertalanffy K<0.2), *m* equals to 0.95.

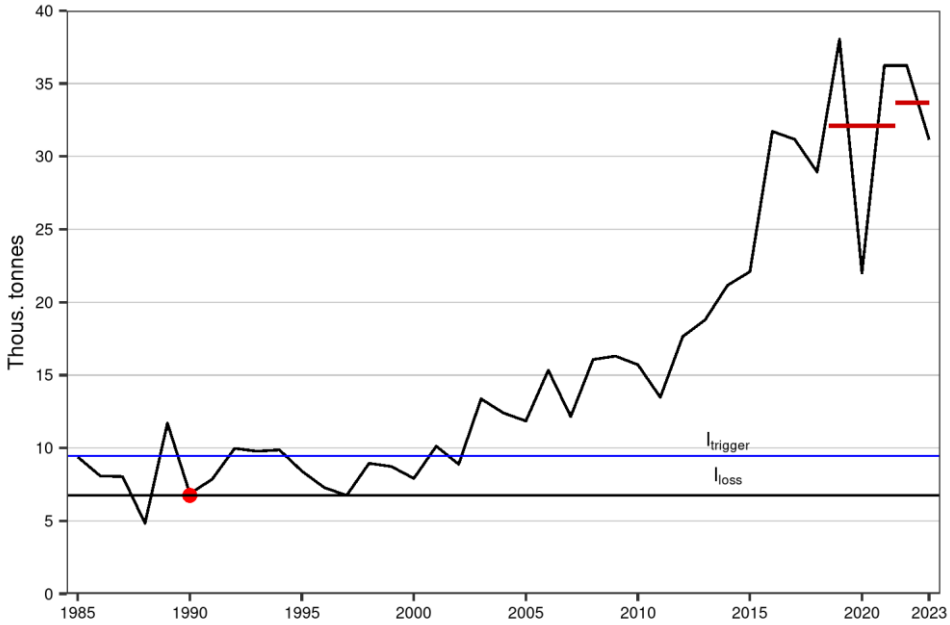

Figure 9. Norway redfish. Biomass index 1985–2023. The red lines show the average of the last two years' values and the three preceding years. The blue line is the $I_{trigger}$ and the red dot is I_{loss} (defined as the second lowest value in the time series).

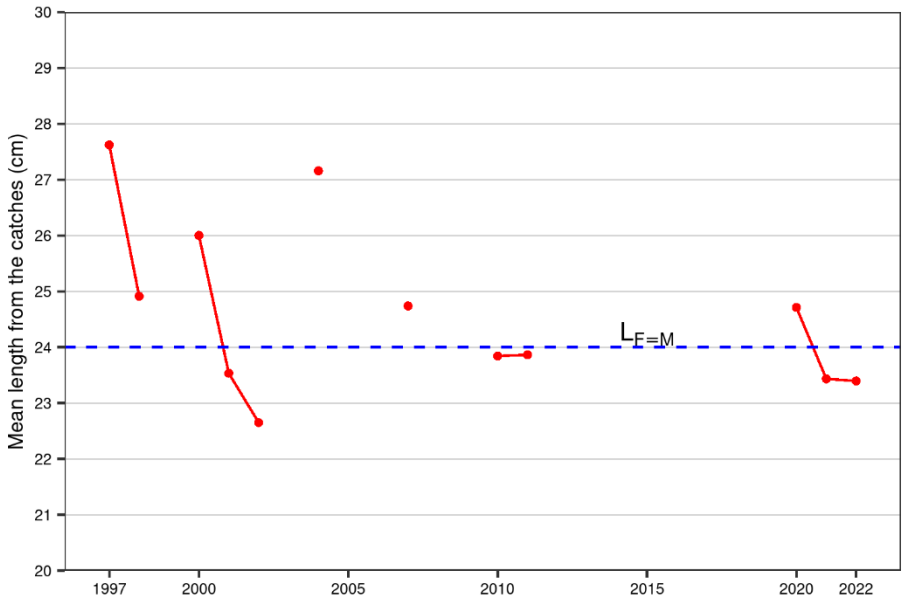

Figure 10. Norway redfish. Mean length from catches 1997–2022. The blue dashed line shows the target reference length ($L_{F=M}$).

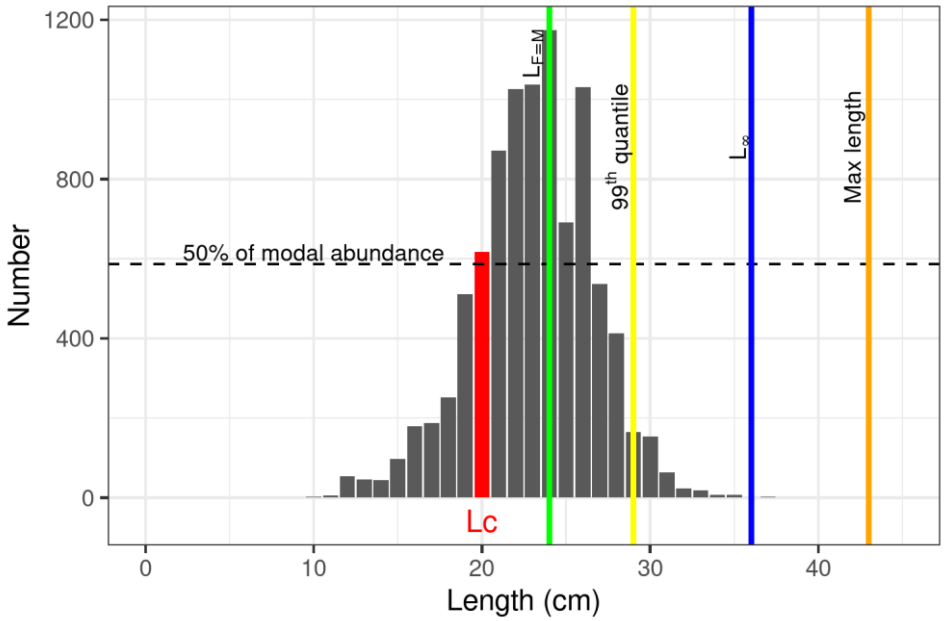

Figure 11. Norway redfish. Length frequency distribution from catches. Red bar is the length at first capture (Lc), green line is the target reference length (LF=M), orange line is the maximum length observed in IS-SMB, yellow line is the 99th quantile of the length distribution in IS-SMB, and the blue line is L_∞, which is the average of maximum length and 99th quantile. The horizontal line is 50% of modal abundance.

Table 4. Norway redfish. Parameters used in the calculation of advice (ICES *rfb*-rule),

PARAMETER	VALUE
Index A	Last 2 years
Index B	Three preceding values
L_∞	36 cm
L_c	20 cm
$L_{F=M}$ (target reference)	24 cm
Multiplier, *m*	0.95
I_{loss}	6751
$I_{trigger}$	9451

MANAGEMENT

The species is managed under the Icelandic ITQ system, without direct management. MFRI has given advice for the stock since the 2011/2012 fishing year and the Icelandic authorities have since the 2013/2014 fishing year issued a TAC. Since the 2013/2014 fishing year, only 10–30% of the TAC has been caught and landed. About 30% of the TAC has been transferred to other species, and between 11 and 27% has been transferred to the next fishing year. Between 40 to 60% of the total quota (TAC + what was transferred from previous fishing year) is not fished. Only 6–15% of the total TAC has been landed in recent six fishing years.

Table 2. Norway redfish. Recommended TAC, national TAC, and total TAC (includes interannual transfer from previous fishing year). The right side of the table shows how the TAC was used each fishing year and is divided to landed catch, transfer from Norway redfish to other species, transfer to next fishing year, and that TAC that was not used (not caught or transferred). All weights are in tonnes.

FISHING YEAR	REC. TAC	TAC	FROM PREVIOUS FISHING YEAR	TOTAL TAC	CATCH	BETWEEN SPECIES	TO NEXT FISHING YEAR	NOT USED
2010/2011	-	-	-		2347	-	-	-
2011/2012	1500	-	-		1219	-	-	-
2012/2013	1500	-	-		605	-	-	-
2013/2014	1500	1500	0	1500	666	431	176	227
2014/2015	1500	1500	176	1677	390	277	212	800
2015/2016	1500	1500	212	1712	421	489	210	591
2016/2017	1500	1500	210	1710	110	457	417	726
2017/2018	1500	1500	417	1917	151	421	212	1134
2018/2019	1500	1500	212	1712	164	475	211	863
2019/2020	697	697	211	908	138	175	143	456
2020/2021	684	684	143	827	96	167	88	476
2021/2022	609	609	88	697	74	151	64	408
2022/2023	585	585	64	649				