LING

Molva molva

GENERAL INFORMATION

The common ling is one of the largest fish of the Gadiformes order reaching a maximum length of 200 cm, with a mean length of about 70-90 cm according to data from the annual Icelandic spring groundfish survey. It is a demersal fish that preys on fish and invertebrates and can be found at depths 10 and 1300 meters but is mainly caught at depths between 100 and 400 meters. It reaches sexual maturity at the age of 5-8 years and 60-80 cm total length. Ling spawns in May and June mostly along the edges of the south, southwest and west of the Icelandic continental shelf.

THE FISHERY

LANDINGS TRENDS

In 1947 to 1971, landings of ling from Icelandic waters ranged between 8000 to more than 15000 tonnes. Landings decreased between 1972 and 2000 to as little as 3000 tonnes as a result of most foreign vessels being excluded from the Icelandic EEZ. In 2001-2010, catches increased constantly and reached 11 000 tonnes in 2010 and remained at that level for the most part until 2014, when the catches increased to 14 000 tonnes. Since 2014, ling catches have reduced and in 2022, 7657 tons were landed (Table 1 and Figure 1).

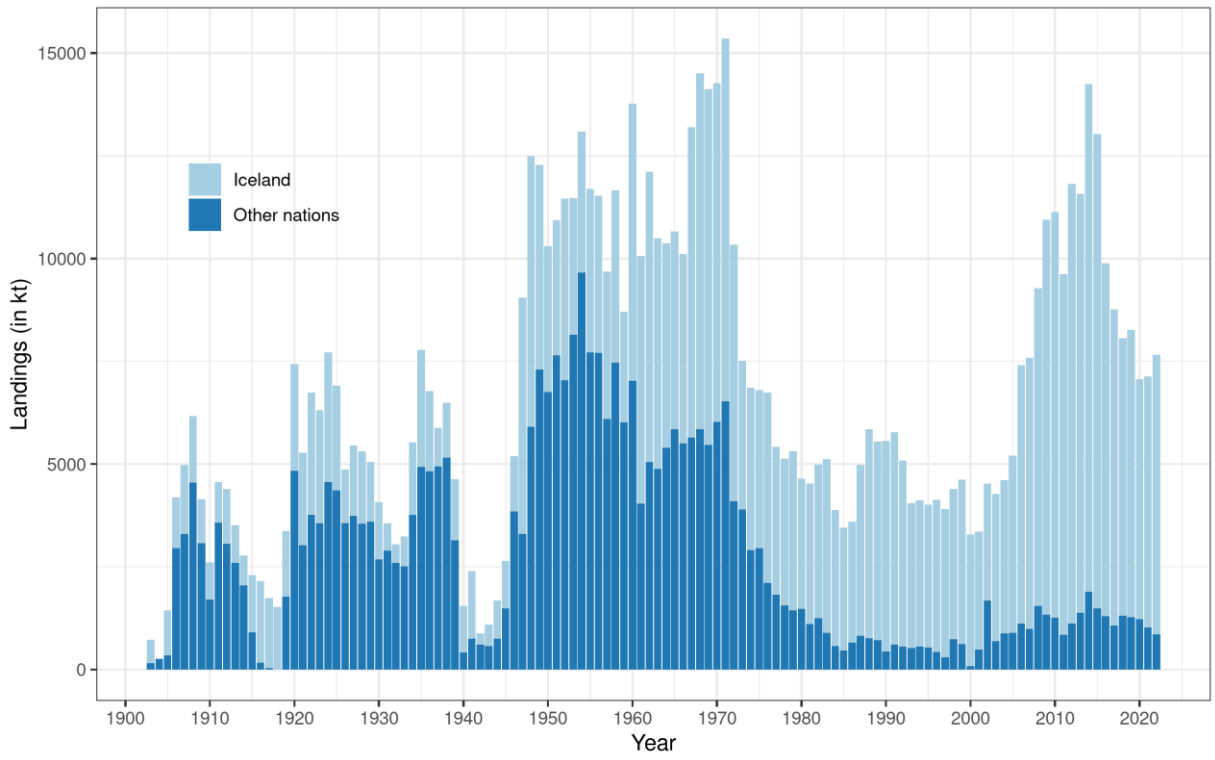

Figure 1. Ling. Nominal landings from Icelandic waters.

The fishery for ling in Icelandic waters has not changed substantially in recent years. Around 100-300 longliners annually report catches of ling, around 30-200 gillnetters and around 60-140 trawlers. Most of ling is caught on longlines (Figure 2, Table 1) which has increased since 2000 to around 60% in 2022. At the same time the proportion caught by gillnets has decreased from 20–30% in 2000–2007 to around 4% in 2022. Catches in trawls have varied less and have been at around 20% of Icelandic catches (Figure 2, Table 1).

Most of the ling caught by Icelandic longliners is caught at depths less than 300 m, and by trawlers at less than 400 m (Figure 3). The main fishing grounds for ling as observed from logbooks are in the south, southwestern and western part of the Icelandic shelf (Figure 4). The main trend in the spatial distribution of catches according to logbook entries is the decreased proportion of catches in the southeast and increased catches on the western part of the shelf two decades ago. Around 50% of ling catches are caught on the southwestern part of the shelf (Figure 5). In recent years, the main fishing pressure has shifted towards shallower waters (Figure 3).

Table 1. Ling. Number of Icelandic boats and their catches (in tonnes) by fleet segment participating in the ling fishery, based on logbooks. Total catch is from both Icelandic and foreign vessels in Icelandic waters.

YEAR	Longliners	Gillnetters	Trawlers	Longline	Gillnet	Trawl	Others	Total catch
2000	287	184	140	1538	704	890	77	3209
2001	252	232	130	1093	1061	639	79	2872
2002	234	203	122	1282	648	852	61	2843
2003	243	172	119	2210	454	850	70	3585
2004	234	165	116	2017	545	977	187	3727
2005	260	127	115	2046	501	1497	268	4313
2006	258	99	106	3732	629	1697	225	6283
2007	251	86	105	4042	633	1642	282	6599
2008	208	68	96	5004	477	1927	330	7738
2009	208	78	88	6232	723	2193	468	9616
2010	197	69	86	6532	363	2528	444	9868
2011	201	61	82	5595	222	2625	348	8789
2012	206	62	81	7479	245	2509	462	10695
2013	206	62	85	6779	345	2808	266	10198
2014	206	57	78	8728	673	2717	231	12350
2015	193	55	75	7766	650	2802	333	11552
2016	173	55	71	5244	681	2426	232	8583
2017	157	48	70	4903	556	2063	171	7692
2018	137	47	68	4061	387	2114	195	6756
2019	135	33	61	4688	115	2009	180	6993
2020	114	36	67	3540	138	1985	174	5838
2021	108	39	66	3812	126	2074	99	6111
2022	91	30	65	4059	262	2236	242	6799

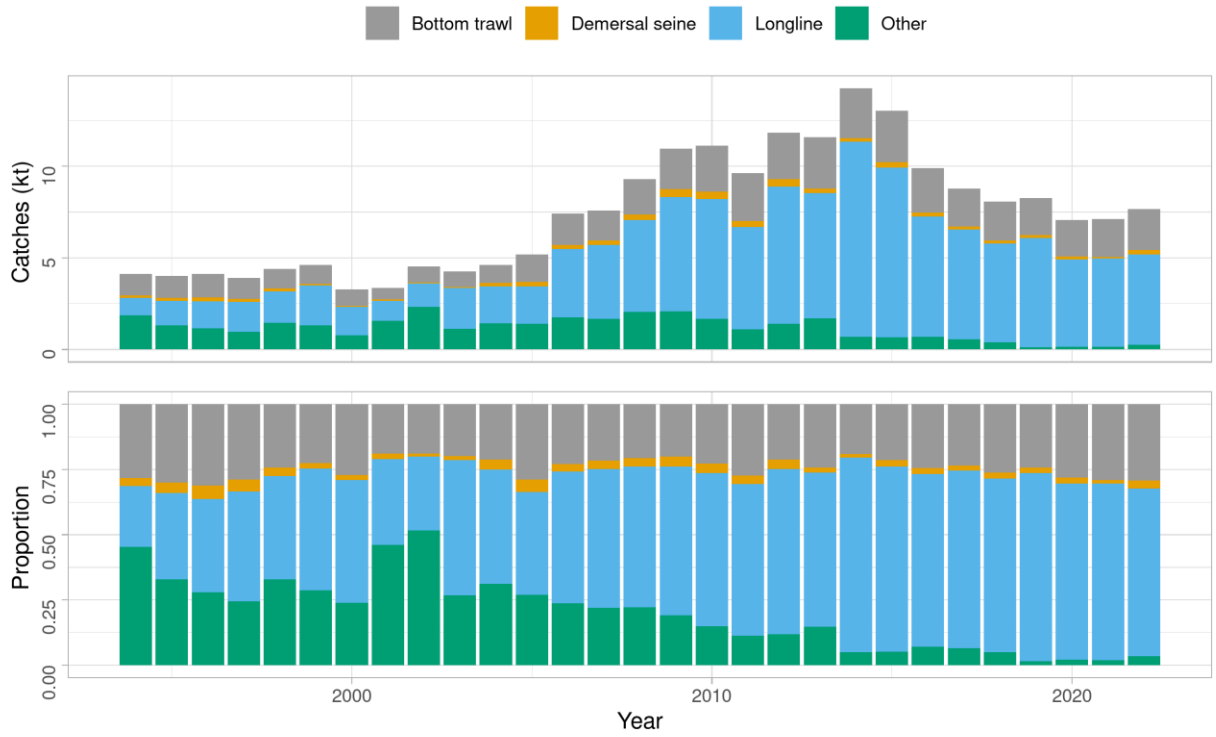

Figure 2. Ling. Total catch (landings) by fishing gear since 1994, according to statistics from the Directorate of Fisheries.

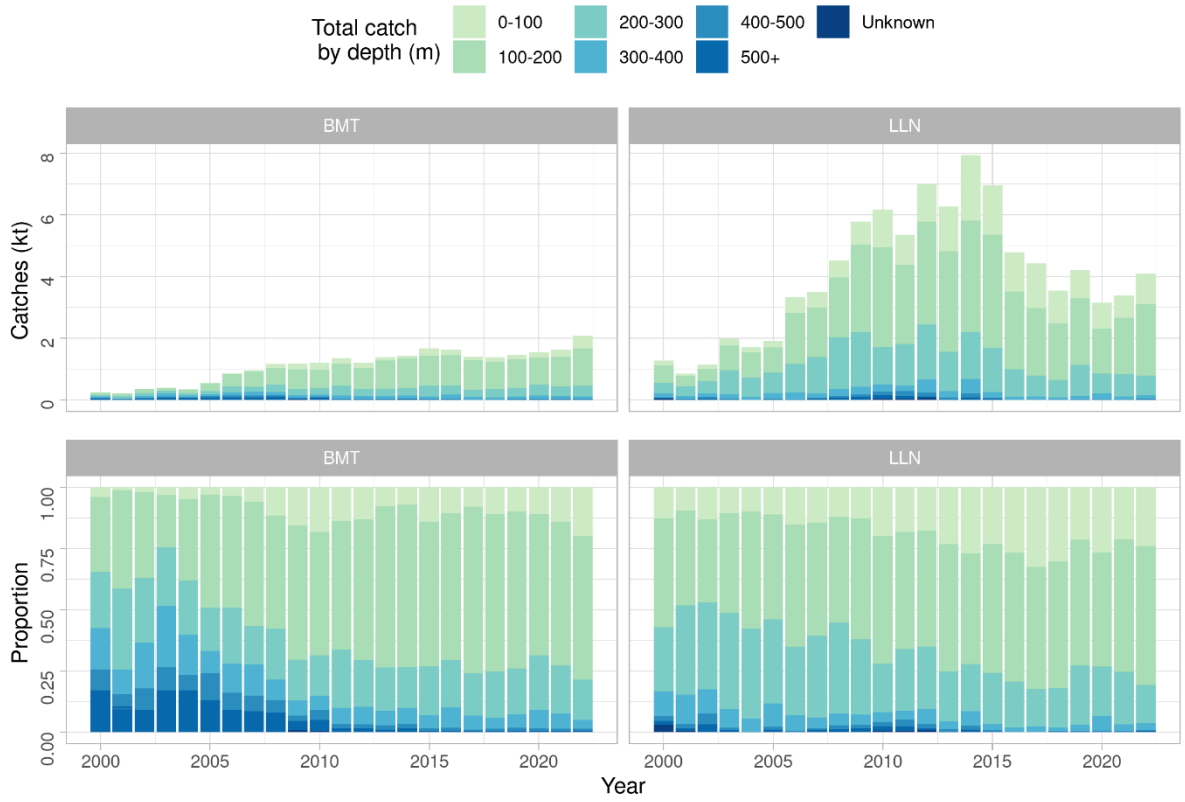

Figure 3. Ling. Depth distribution of ling catches from longlines and trawls from Icelandic logbooks.

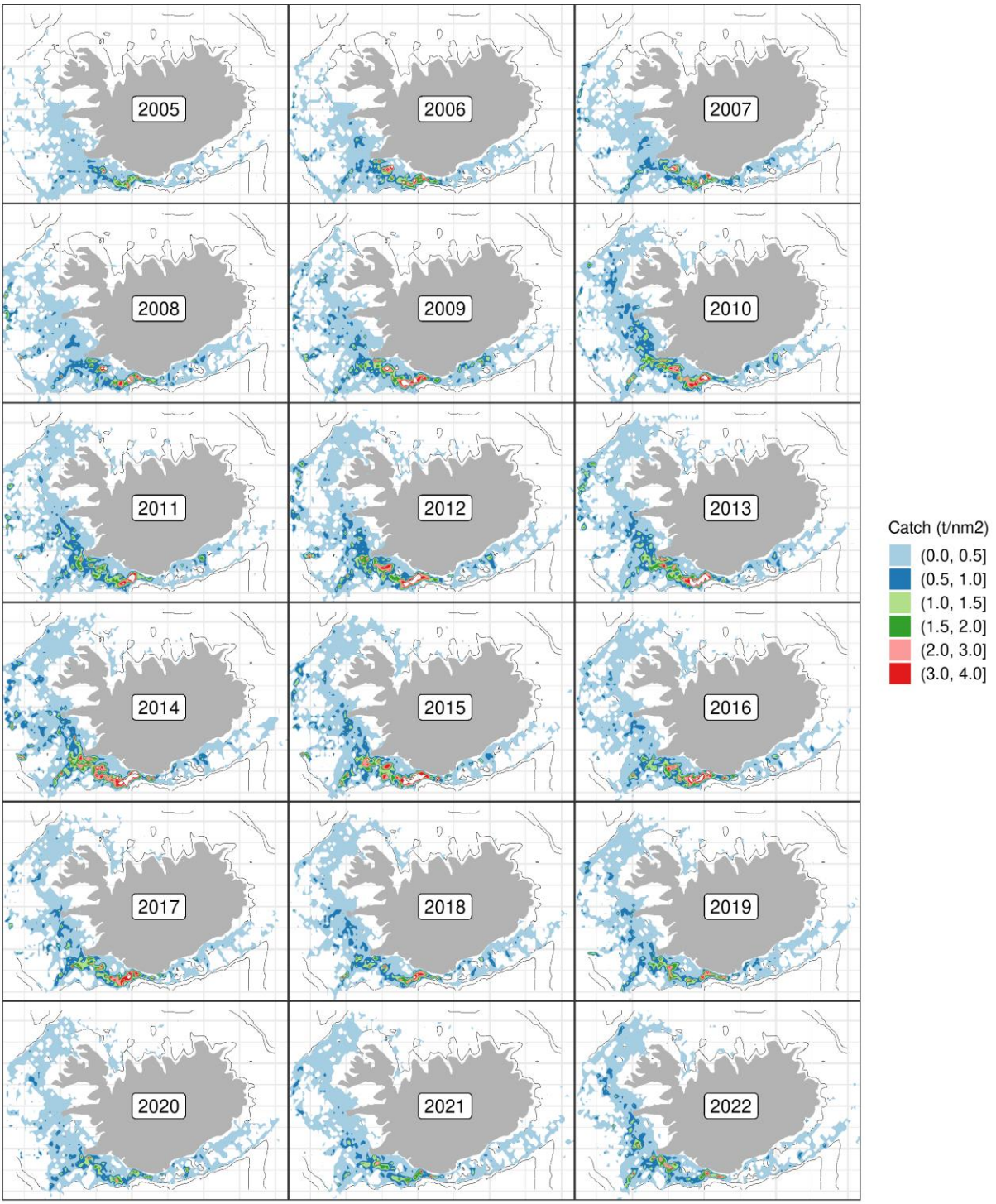

Figure 4. Ling. Geographical distribution (tonnes/square mile) of the Icelandic longline fishery since 2005 as reported in logbooks by the Icelandic fleet.

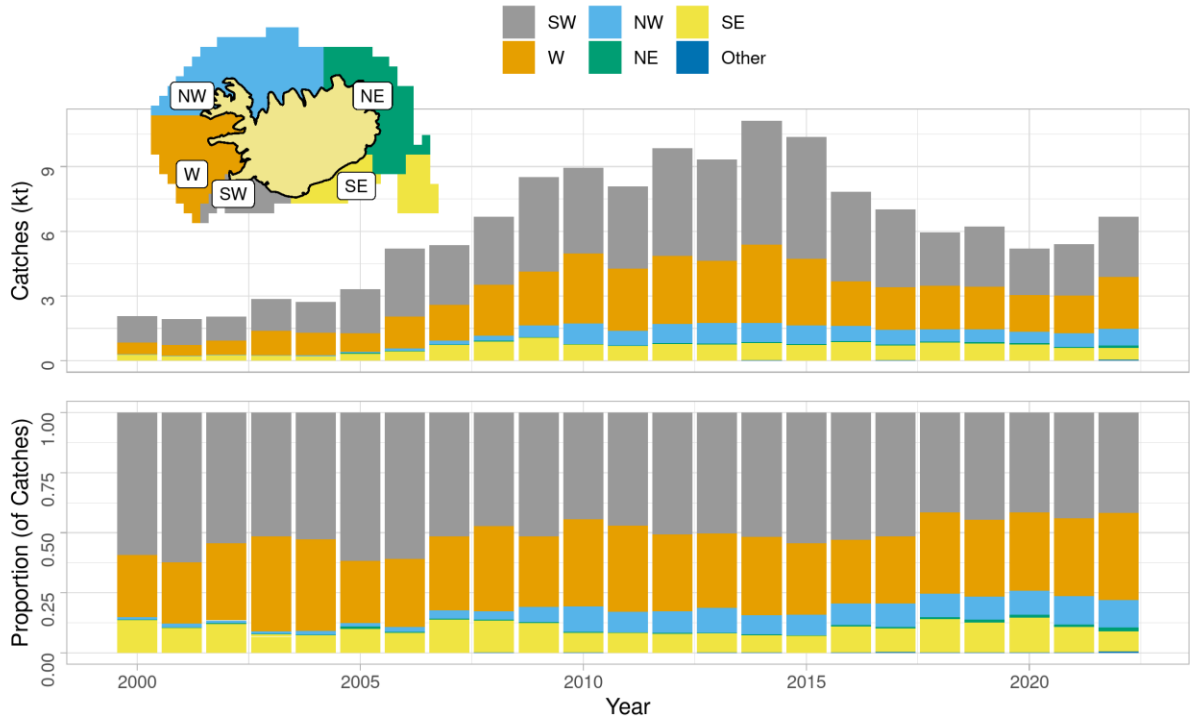

Figure 5. Ling. Catch distribution and proportions by area according to logbooks.

LANDING DATA AVAILABLE

In general sampling is considered good from commercial catches from the main gears (longlines and trawls). Sampling does seem to cover the spatial distribution of catches for longlines and trawls but less so for gillnets. Similarly, sampling does seem to follow the temporal distribution of catches (Figure 6, WGDEEP 2012).

LANDINGS AND DISCARDS

Data on landings by Icelandic vessels are collected by the Icelandic Directorate of Fisheries. Landings of Norwegian and Faroese vessels are registered through the Icelandic Coast Guard. Discarding is banned by law in the Icelandic demersal fishery. Based on limited data, discard rates in the Icelandic longline fishery for ling are estimated very low (<1% in either numbers or weight) (WGDEEP, ICES 2011:WD02). Measures in the management system such as converting quota share from one species to another are used by the fleet to a large extent and this is thought to discourage discarding in mixed fisheries. A description of the management system is given in the area overview (ICES 2019).

LENGTH COMPOSITIONS

Most length measurements of ling are from longlines and bottom trawls (Table 2). The number of available length measurements increased in recent years in line with increased landings but in 2020 they were fewer (due to the covid pandemic). Length distributions from the Icelandic longline and trawling fleet are presented in Figure 7. Sampling from commercial catches of ling is considered good; both in terms of spatial and temporal distribution of samples (Figure 6). Mean length as observed in length samples from longlines and trawls decreased from 2006-2008 from around 86 to 80 cm (Figure 7). This may be the result of increased recruitment in recent years rather than increased fishing effort. Mean length has increased in the period and in 2022, the highest mean length of 99 cm was recorded (Figure 7).

Table 2. Ling. Number of available length measurements from Icelandic commercial catches.

YEAR	LONGLINES	GILLNETS	DEMERSAL SEINE	TRAWLS	OTHER	SUM
2000	1624	566	0	377	6	2573
2001	1661	493	0	37	0	2191
2002	1504	366	0	221	0	2091
2003	2405	300	0	137	143	2985
2004	2640	348	46	141	150	3175
2005	2323	31	101	349	180	2954
2006	3354	645	0	1157	405	5557
2007	3661	0	76	400	0	4137
2008	5847	357	15	819	150	7188
2009	9014	410	0	516	450	10390
2010	7322	57	0	1146	1200	9724
2011	7248	0	150	1234	750	9393
2012	11356	85	150	1411	1337	14339
2013	19405	267	122	993	1344	12131
2014	6448	1286	120	2089	2964	12907
2015	3315	1563	0	2615	3052	10545
2016	2483	2039	0	2460	1212	8194
2017	1637	485	0	1963	1226	5311
2018	1424	559	0	1603	712	4298
2019	3598	0	0	1830	819	6247
2020	1099	4	0	1718	498	3439
2021	1056	0	0	2028	466	3550
2022	563	370	0	1805	1534	4272

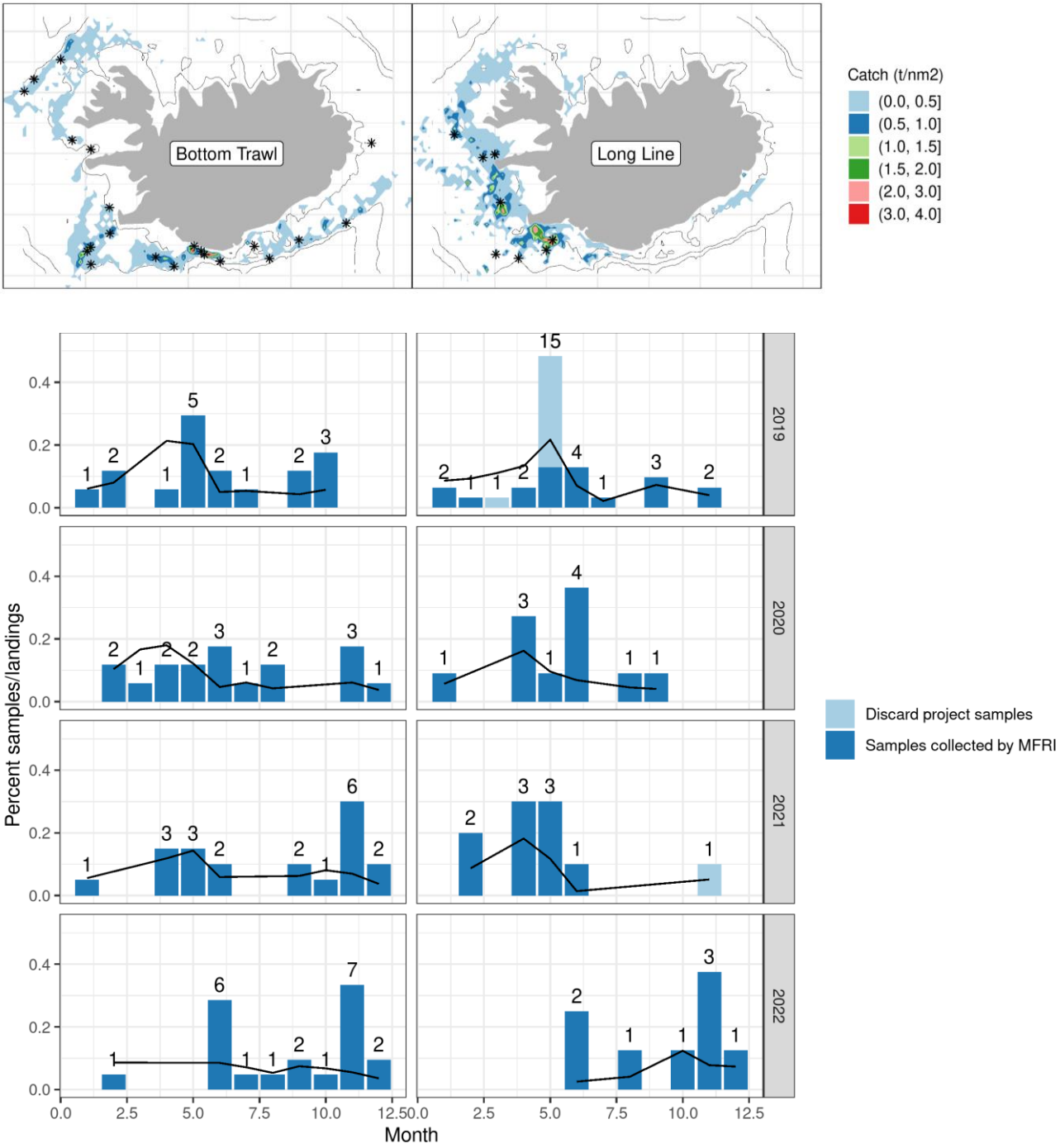

Figure 6. Ling. Spatial distribution of length samples (black dots) from commercial catches in Icelandic waters (upper) and numbers of samples taken per month by project (bars) and proportion of landings per month (black line) (lower)

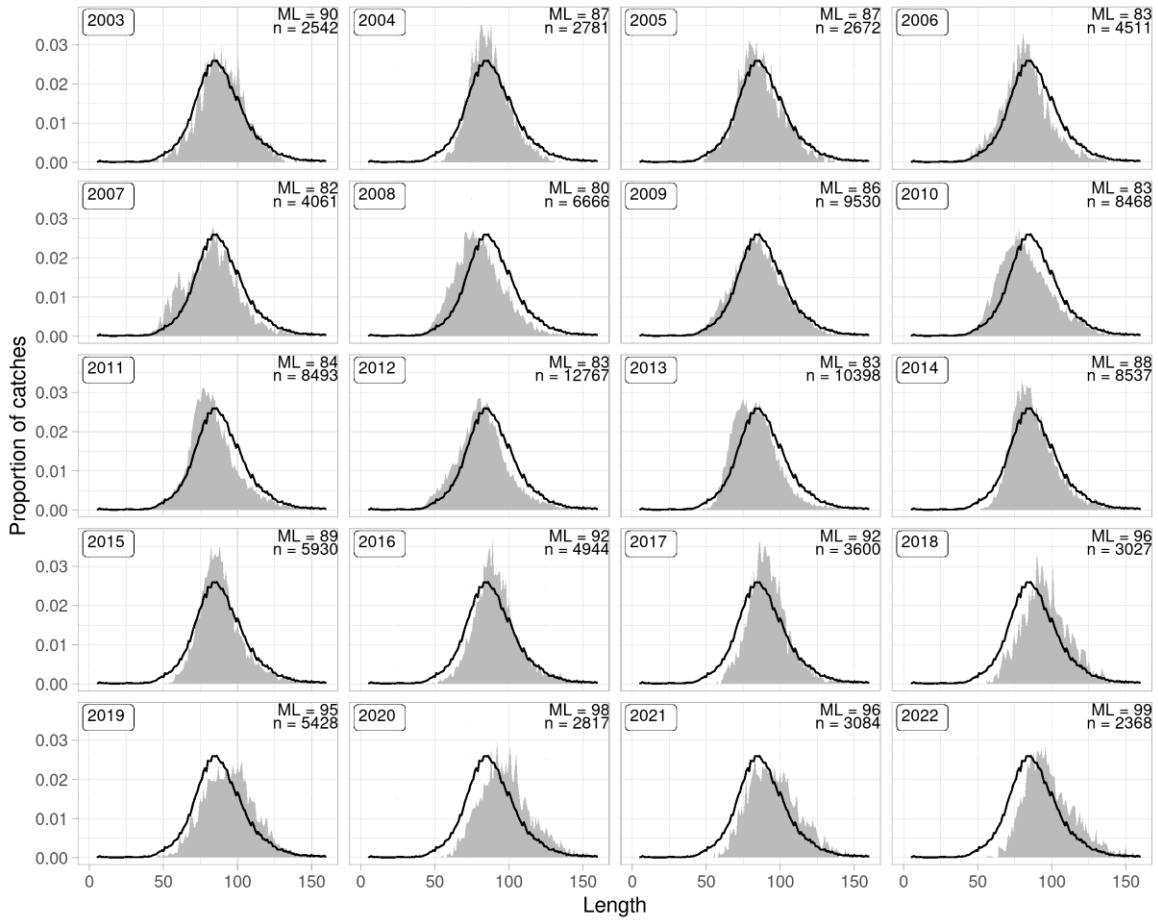

Figure 7. Ling. Length distributions from the Icelandic longline and trawl fleet (grey area) and mean length distribution (black lines) from 2003-2022.

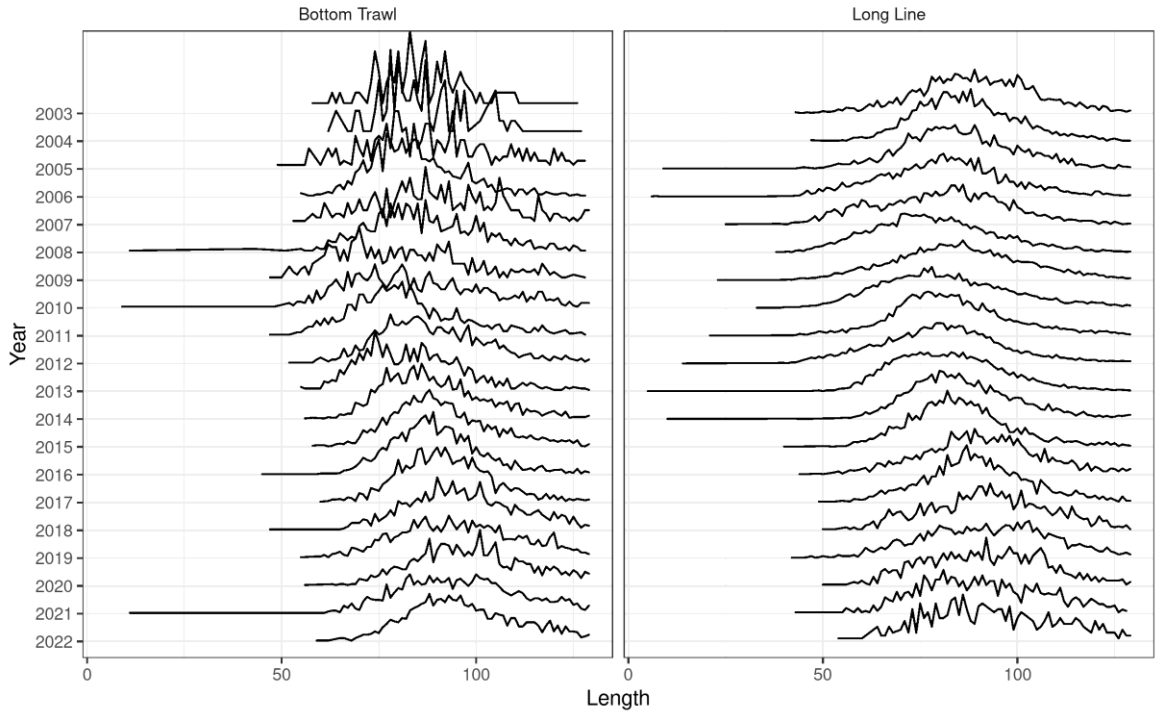

Figure 8. Ling. Length distributions from the Icelandic longline and trawl fleet since 2003.

AGE COMPOSITIONS

Aged data are available from 2000 onwards (Table 3). In previous years, most of the ling caught in the Icelandic spring survey were between age 5 and 8 but from longlines the age was between 6 and 9. The past several years have shown a much larger composition of older fish, common up to 12, from both sample sources (see Survey Data, next section).

Table 3. Ling. Number of aged otoliths from the commercial catches.

YEAR	LONGLINES	GILLNETS	D. SEINE	TRAWLS	OTHER	TOTAL
2000	650	200	0	150	0	1000
2001	550	193	0	37	0	780
2002	519	166	0	150	0	835
2003	900	100	0	150	50	1150
2004	750	100	46	100	50	996
2005	750	0	0	231	50	981
2006	1137	288	0	550	100	1975
2007	1300	0	50	100	0	1450
2008	1950	150	0	365	50	2465
2009	2550	150	0	400	150	3100
2010	2498	50	0	850	400	3398
2011	2546	0	50	700	250	3296
2012	3521	50	50	541	400	4562
2013	2590	100	50	350	450	3540
2014	665	225	20	399	514	1823
2015	595	300	0	483	520	1898
2016	440	345	0	460	220	1465
2017	310	85	0	370	225	990
2018	245	100	0	310	120	775
2019	385	0	0	340	140	865
2020	225	40	0	355	102	772
2021	180	0	0	398	100	678
2022	163	80	0	400	318	981

CATCH AND EFFORT

The CPUE estimates of ling from commercial fisheries in Icelandic waters have not been considered representative of stock abundance.

SURVEY DATA

The Icelandic spring groundfish survey, which has been conducted annually in March since 1985, covers the most important distribution area of the ling fishery. In addition, the autumn survey was commenced in 1996 and expanded in 2000, however a full autumn survey was not conducted in 2011 and therefore the results for 2011 are not presented.

Figure 9 shows distribution of ling in groundfish surveys in spring 2023 and autumn 2022. Figure 10 shows both a recruitment index and the trends in biomass from both surveys. Length distributions from the spring survey are shown in Figure 11 (abundance) and changes in spatial distribution in the spring survey are presented in Figure 12.

Ling in both the spring and autumn surveys are mainly found in the deeper waters south and west off Iceland. Both the total biomass index and the index of the fishable biomass (>40 cm) gradually decreased in the spring survey until 1995 (Figure 10). In the years 1995-2003 these indices were half of the mean from 1985–1989. In 2003-2007, the recruitment indices increased and remained high until 2010. The index of the large ling (80 cm and larger) shows a similar trend as the total biomass index (Figure 10). The recruitment index of ling, defined here as ling smaller than 40 cm, showed a considerable increase in 2003-2007 and remained high until 2010. Then the juvenile index fell to a very low level in 2014 and has been relatively low since then (Figure 10).

Length distributions from the spring survey show a similar pattern as survey indices, with the 2012-2018 peak in abundance observed as high proportions of fish in the range of 60–100 cm, that has slowly decreased as they have reached sizes 80–120 cm (Figure 11). This pattern is likely to have caused the increase in ling sizes observed in the trawl samples (Figure 7).

Biomass indices in the autumn survey were low in 1996-2000 but have increased since then (Figure 10). There is consistency between the two surveys; the autumn survey biomass indices are however derived from substantially fewer ling caught. Also, there is an inconsistency in recruitment indices (<40 cm), where the autumn survey shows much lower recruitment, in absolute terms compared with the spring survey (Figure 10). This discrepancy is likely a result of much lower catchability of small ling (due to different gears) in the autumn survey, where ling less than 40 cm has rarely been caught.

Changes in spatial distribution as observed in surveys: According to the spring survey most of the increase during the 2012–2018 peak in ling abundance was in the western area, but an increase was seen in most areas. However, most of the index in terms of biomass comes from the southwestern area or around 40% compared to around 30% between 2003 and 2011. Since 2016, the amounts of biomass in the west and southwest have, however, reduced while the proportions in the southeast have increased, leading to a greater contribution of ling from the northwest and southeast to the total index. A similar pattern is observed in the autumn survey.

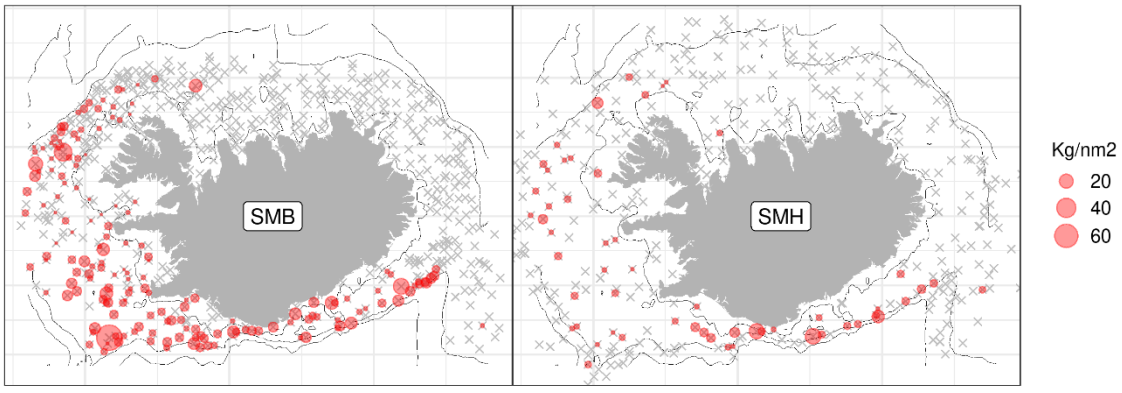

Figure 9. Ling. Location and abundance of ling in the spring survey (SMB) in 2023 and the autumn survey (SMH) in 2022.

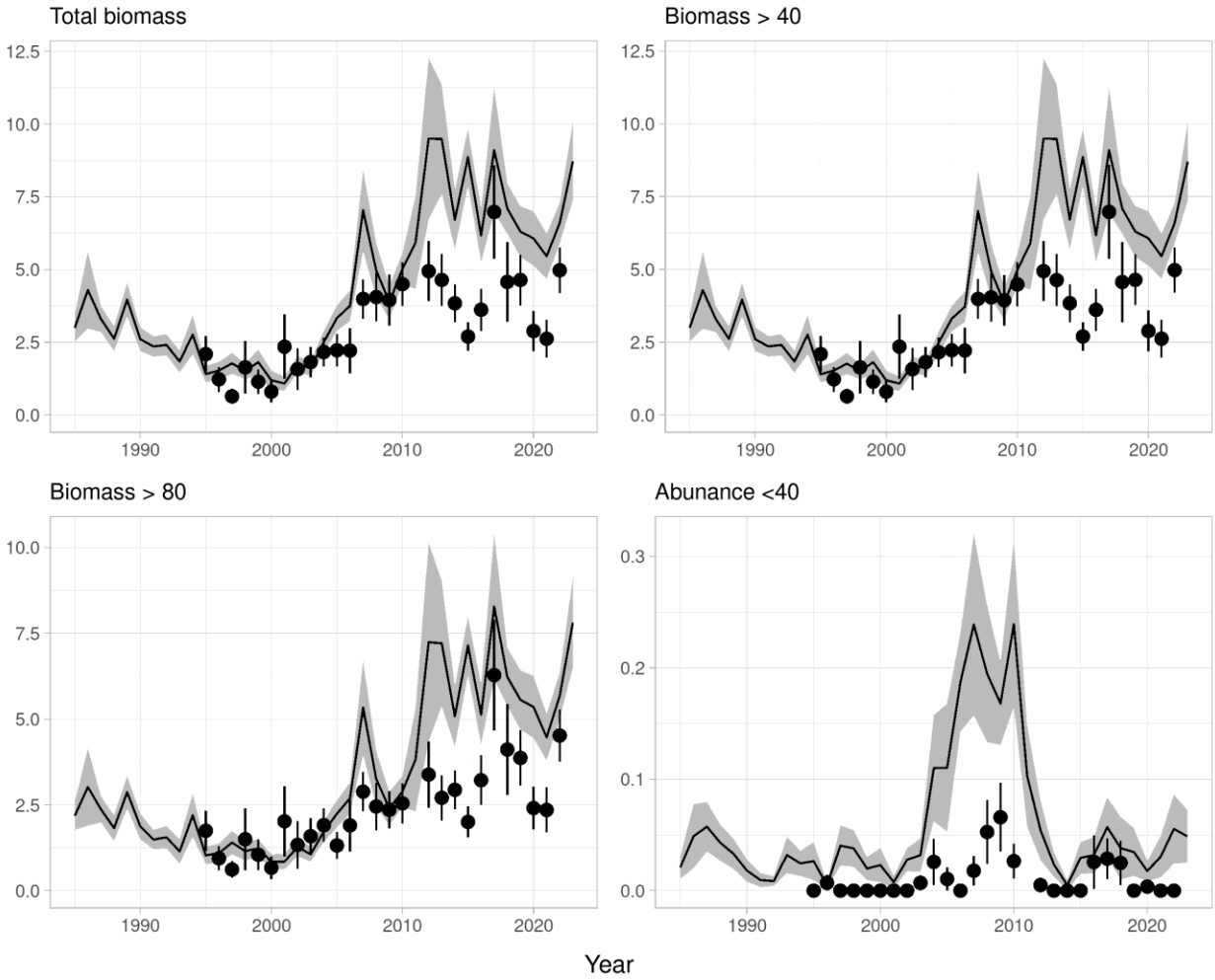

Figure 10. Ling. Total biomass indices, biomass indices >40 cm, biomass indices >80 cm, and abundance indices <40 cm. The lines with shaded area show the spring survey index from 1985 and the points with the vertical lines show the autumn survey from 1996. The shaded areas and vertical lines indicate +/- standard error.

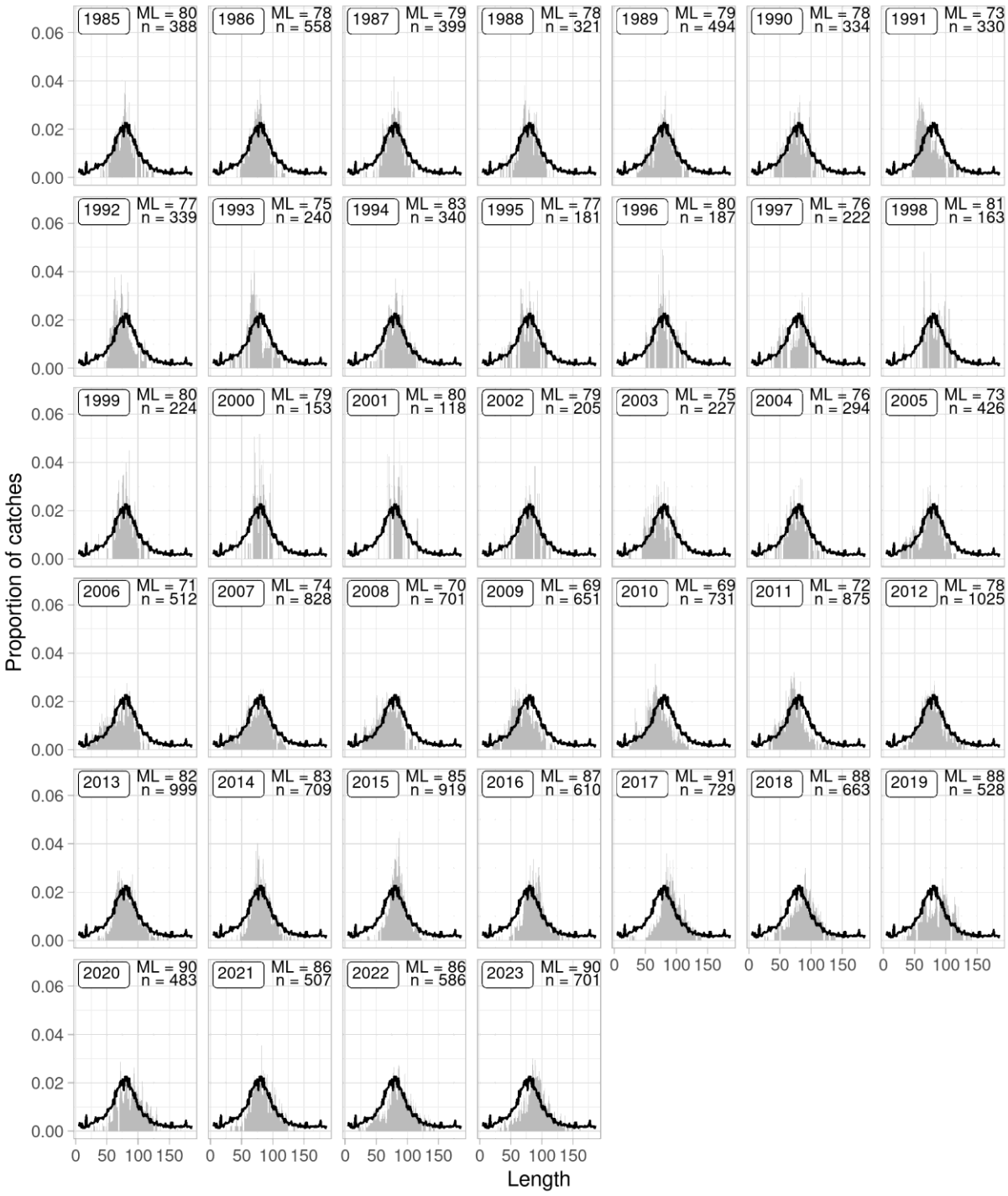

Figure 11. Ling. Length distributions (grey area) and mean length distribution (black line) from the spring survey.

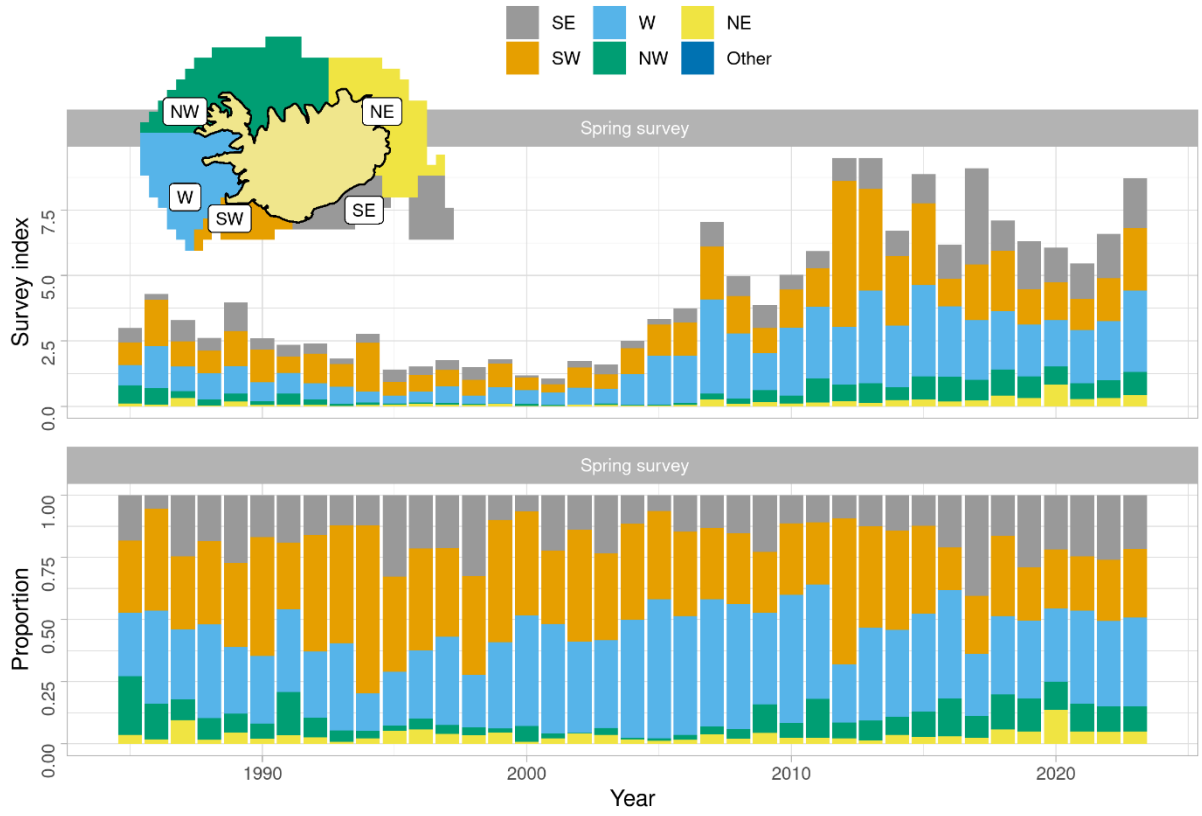

Figure 12. Ling. Survey biomass indices in the spring survey by year from different parts of the continental shelf (upper figure) and as proportions of the total (lower figure).

ANALYTICAL ASSESSMENT USING SAM

In 2022, Ling in 5.a was reassessed as the previously benchmarked Gadget model had begun to show great instability in retrospective patterns in recent years. As a part of a Harvest Control Evaluation requested by Iceland (WKICEMSE, ICES 2022a), the stock was benchmarked (WKICEMSE, ICES 2022c) which resulted in changes in the assessment method and updated reference points. Model setup and settings are described in the Stock Annex (ICES 2022b).

DATA USED AND MODEL SETTINGS

Data used for tuning are given in the stock annex (ICES 2022b).

Figure 13 shows the overall fit to the survey indices described in the stock annex. In general, the model appears to follow the stock trends historically. Furthermore, the terminal estimate is not seen to deviate substantially from the observed value for most length groups, with model overestimating the abundance in the two largest length groups. Summed up over survey biomass the model overestimates the biomass in the terminal years.

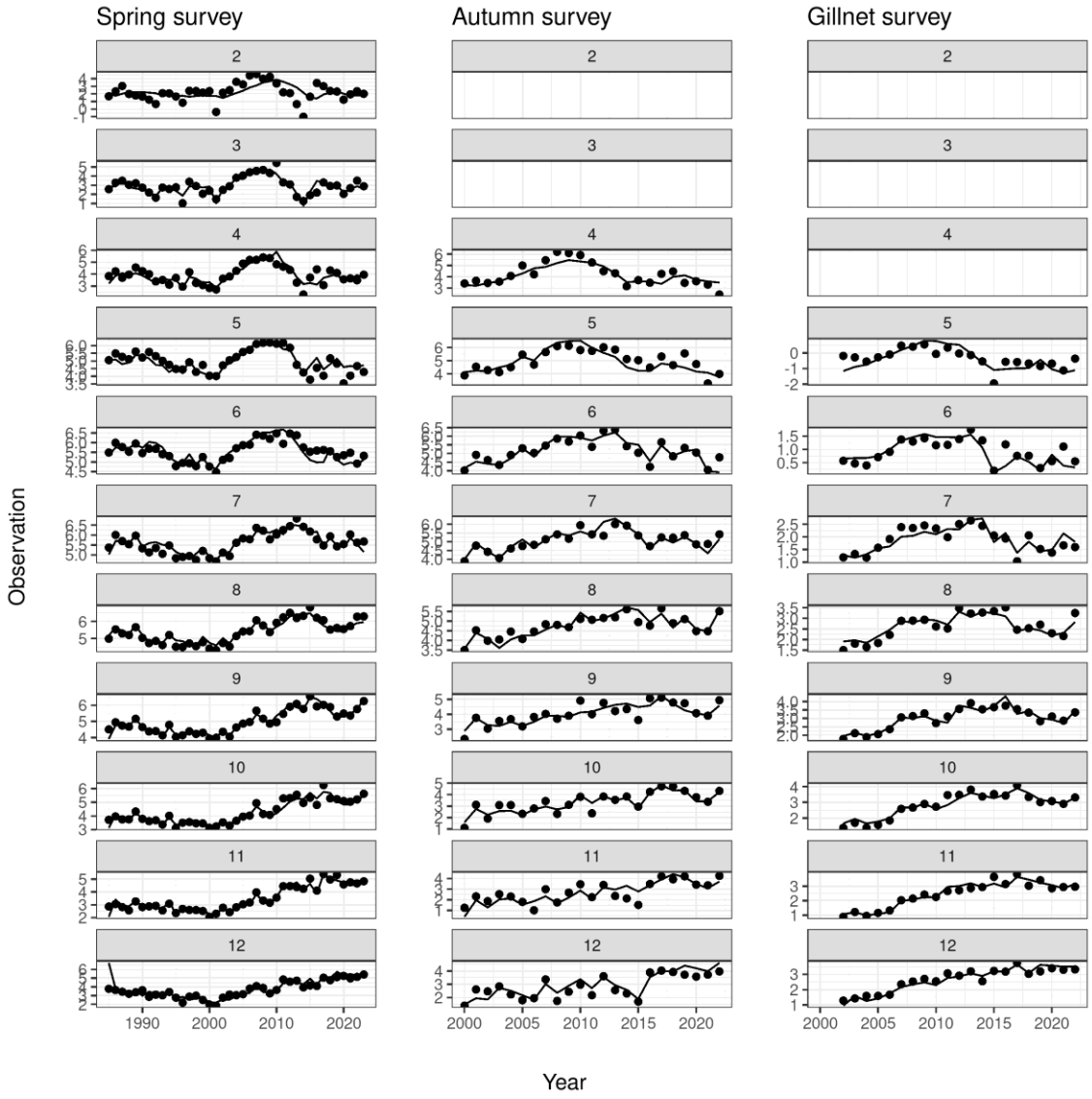

Figure 13. Ling. Model fit to indices from the spring survey, autumn survey and gillnet survey. Black dots are observed values and the black line is the model fit.

RESULTS

Population dynamics of the ling estimated in this model show a clear trend of a high recruitment period from 2004-2010, corresponding with increased spawning stock biomass (SSB) and catches during the 2010-2019 period. Fishing mortality remained rather steady until 2015 but has declined since then (Figure 14).

Figure 14. Ling. Model results of population dynamics overview: estimated catch, average fishing mortality over ages 8-11 (Fbar), recruitment (age 2), and spawning stock biomass (SSB). Catch and fbar values in 2023 are projections.

RETROSPECTIVE ANALYSIS

Analytical retrospective analysis shows a revision of spawning stock biomass over the 5-year peel (Figure 15). Estimates of *F* and recruitment are decently stable except for the apparent peak in 2017-2018. As explained in reference to the survey indices, this is likely the influence of highly variable survey indices that, for the smallest sizes in the most recent years, have no repeated observations at larger sizes with which this influence can be tempered. Therefore, it is expected that these recruitment peaks may simply be the result of uncertainty in survey indices and are likely to disappear in the coming assessment years.

Mohn's ρ was estimated to be -0.0301 for SSB, 0.0720 for F, and 0.312 for recruitment. Neither observation nor process residuals show obvious trends (Figures 16 and 17).

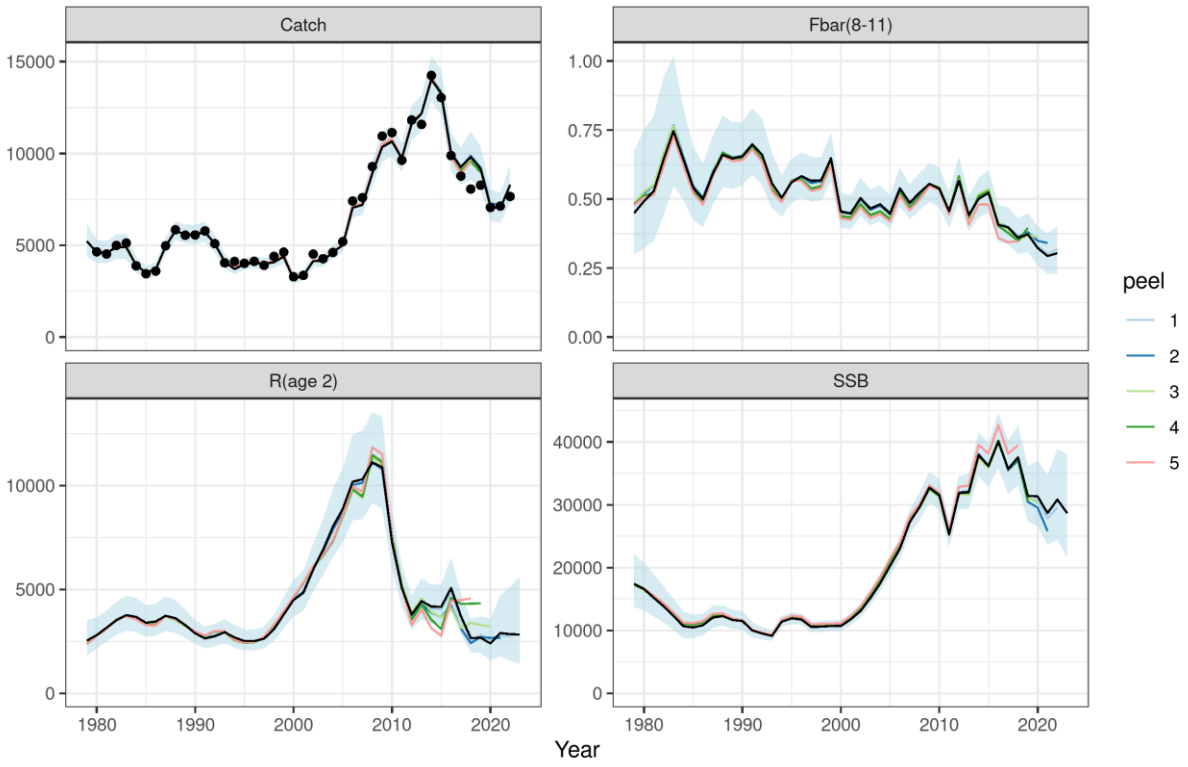

Figure 15. Ling. Retrospective plots illustrating stability in model estimates over a 5-year 'peel' in data. Results of spawning stock biomass, fishing mortality F, and recruitment (age 2) are shown.

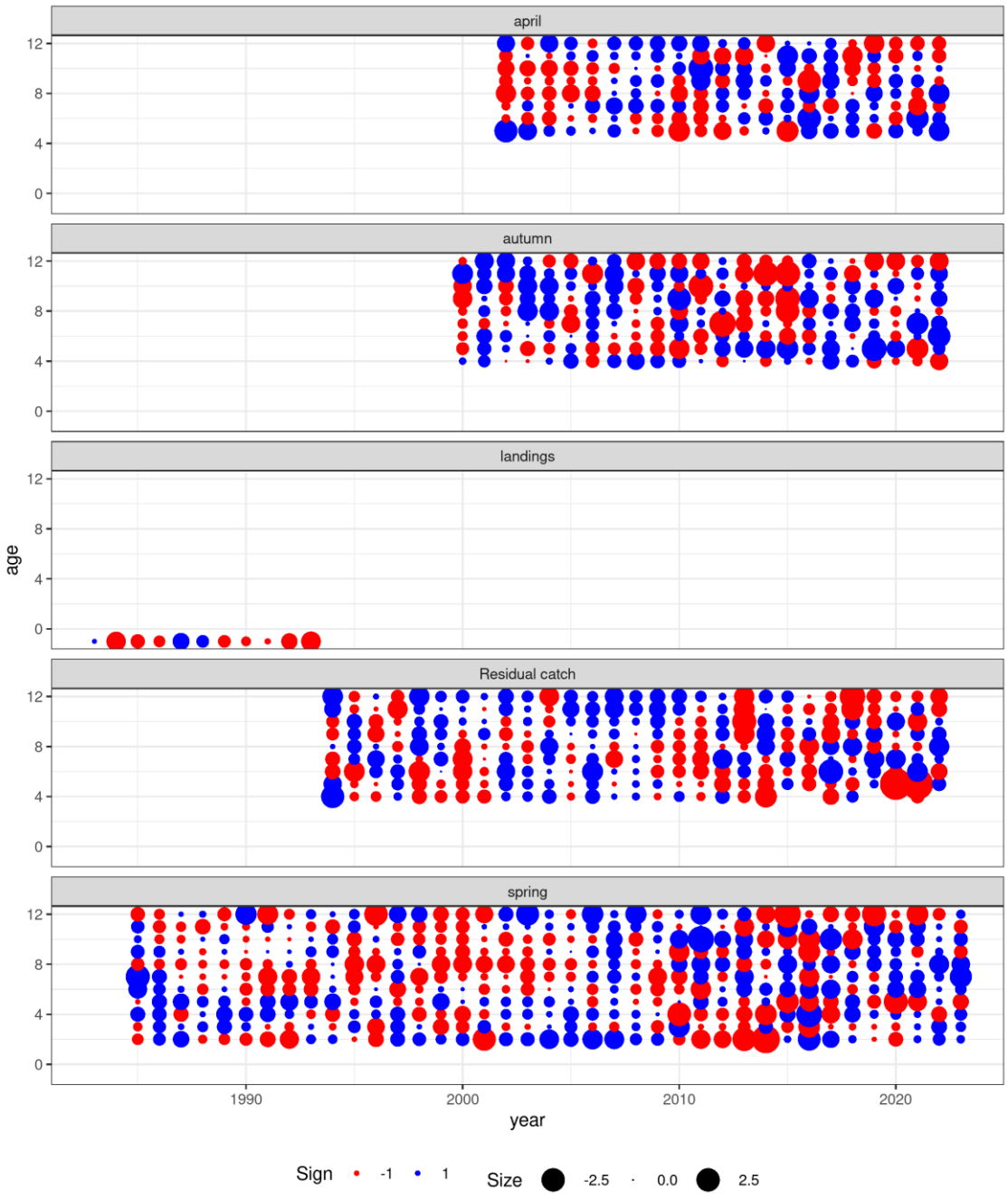

Figure 16. Ling. Observation error residuals of the SAM model.

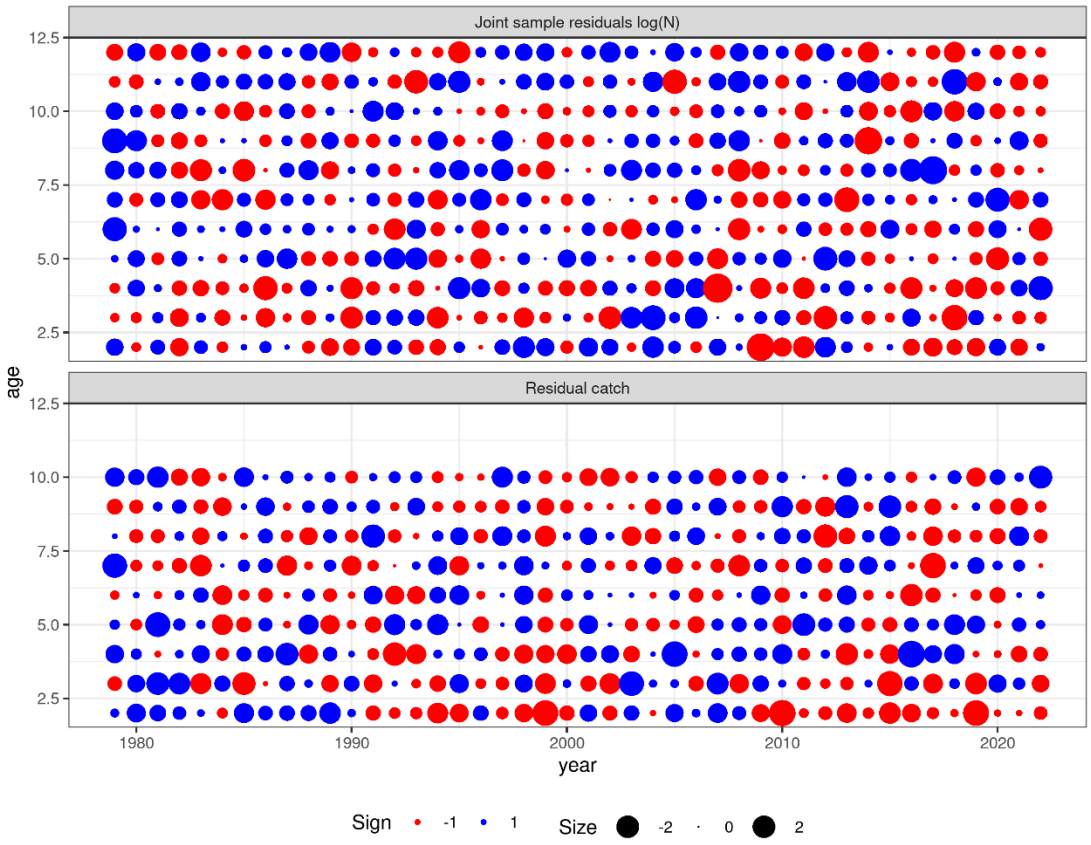

Figure 17. Ling. Process error residuals of the SAM model.

REFERENCE POINTS

As part of the WKICEMP 2022 HCR evaluations (ICES 2022c), the following reference points were defined.

Table 4. Ling. Reference points adopted from ICES WKICEMP 2022 (ICES 2022).

Framework	Reference point	Value	Technical basis
MSY Approach	MSY $B_{trigger}$	11 100	B_{pa}
	F_{MSY}	0.30	F that produces MSY in the long term
Precautionary Approach	B_{lim}	9000	B_{loss} (SSB in 1993)
	B_{pa}	11 100	$B_{lim} \times e^{1.645 * \sigma B}$
	F_{lim}	0.95	Fishing mortality that in stochastic equilibrium will result in median SSB at B_{lim}.
	F_{pa}	0.62	Maximum F at which the probability of SSB falling below B_{lim} is <5%
Management plan	MGT $B_{trigger}$	11 100	According to the harvest control rule
	F_{MGT}	0.30	According to the harvest control rule

The harvest control rule (HCR) for the Icelandic Ling fishery, which sets a TAC for the fishing year y/y+1 (September 1 of year y to August 31 of year y+1) based on a fishing mortality F_{MGT} of 0.30 applied to ages 8 to 11 modified by the ratio SSB_y/MGT $B_{trigger}$ when SSB_y < MGT $B_{trigger}$, maintains a high yield while being precautionary as it results in lower than 5% probability of SSB < B_{lim} in the medium and long term. WKICEMSE 2022 concluded that the HCR was precautionary and in conformity with the ICES MSY approach (ICES 2022c).

MANAGEMENT

The Icelandic Ministry of Food, Agriculture and Fisheries is responsible for management of the Icelandic fisheries and implementation of legislation. The Ministry issues regulations for commercial fishing for each fishing year (1 September–31 August), including an allocation of the TAC for each stock subject to such limitations. Ling in 5.a has been managed by TAC since the 2001/2002 fishing year.

Landings have exceeded both the advice given by MFRI and the set TAC from 2002/2003 to 2013/2014 but amounted to less than two thirds in 2015/2016 (Table 5). Overshoot in landings in relation to advice/TAC has been decreasing steadily since the 2009/2010 fishing year, with an overshoot of 53% to 35% in 2010/2011, 24% in 2011/2012 and 4% in 2012/2013. The reasons for the implementation errors are transfers of quota share between fishing years, conversion of TAC from one species to another (Figure 18) and catches by Norway and the Faroe Islands by bilateral agreement. The level of those catches is known in advance but has until recently not been taken into consideration by the Ministry when allocating TAC to Icelandic vessels. There is no minimum landing size for ling.

There are agreements between Iceland, Norway and the Faroe Islands relating to a fishery of vessels in restricted areas within the Icelandic EEZ. Faroese vessels are allowed to fish 5600 t of demersal fish species in Icelandic waters which includes maximum 1200 tonnes of cod and 40 t of Atlantic halibut. The rest of the Faroese demersal fishery in Icelandic waters is mainly directed at tusk, ling, and blue ling.

Table 5. Ling. Recommended TAC, national TAC, and catches (tonnes).

FISHING YEAR	RECOMMENDED TAC	NATIONAL TAC	CATCHES ICELAND	CATCHES OTHER	TOTAL CATCH
1999/2000			3 487	1	3 488
2000/2001			3 094	12	3 106
2001/2002	3 000	3 000	2 539	2	2 541
2002/2003	3 000	3 000	3 136	5	3 140
2003/2004	3 000	3 000	3 869	0	3 869
2004/2005	4 000	4 000	4 488	0	4 488
2005/2006	4 500	5 000	5 842	5	5 846
2006/2007	5 000	5 000	6 583	0	6 583
2007/2008	6 000	7 000	6 750	3	6 753
2008/2009	6 000	7 000	9 192	0	9 192
2009/2010	6 000	7 000	9 783	1	9 784
2010/2011	7 500	7 500	9 327	0	9 327
2011/2012	8 800	9 000	10 072	0	10 072
2012/2013	12 000	12 000	11 125	15	11 140
2013/2014	14 000	14 000	11 794	1 188	12 983
2014/2015	14 300	14 300	11 684	1 974	13 658
2015/2016	16 200	16 200	9 773	1 456	11 229
2016/2017	9 343	9 343	7 291	1 135	8 426
2017/2018	8 598[1)]	8 598	7 017	1 309	8 326
2018/2019	6 255[1)]	6 255	6 927	1 101	8 028
2019/2020	6 599[1)]	6 599	5 972	1 183	7 155
2020/2021	5 700[1)]	5 700	6 201	1 012	7 214
2021/2022	4 735[1)]	4 735	5814	885	6 699
2022/2023	6098[2)]	6098			

[1)] 18% harvest control rule

[2)] F_{MSY} = 0.30

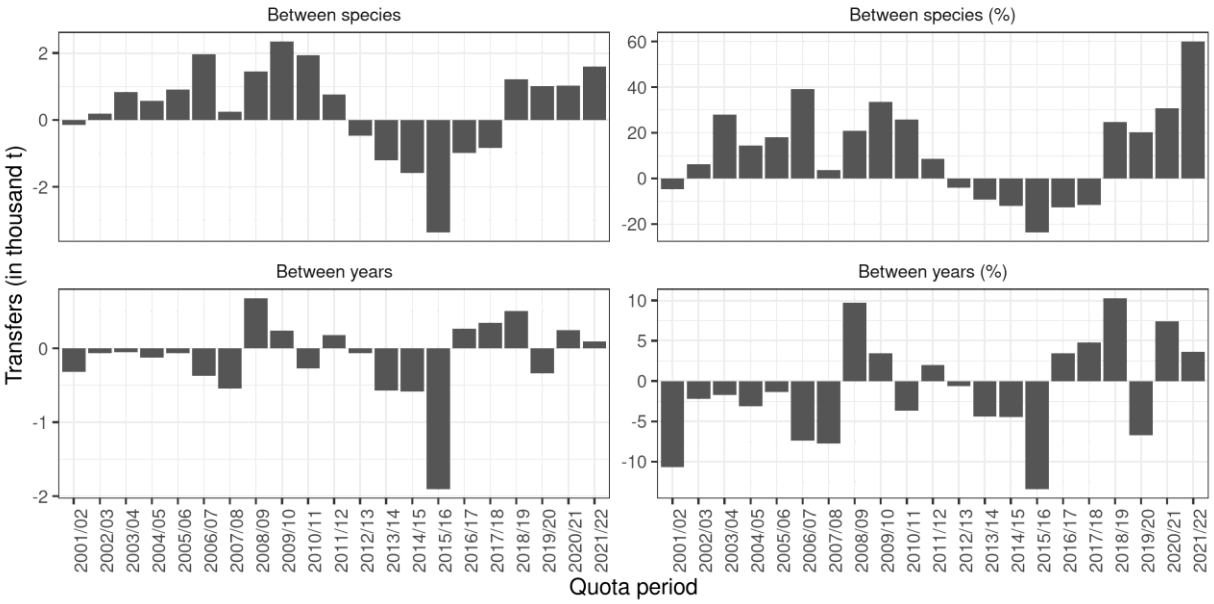

Figure 18. Ling. Net transfer of quota to and from ling in the Icelandic ITQ system by fishing year. Between species (upper): Positive values indicate a transfer of other species to ling, but negative values indicate a transfer of ling quota to other species. Between years (lower): Transfer of quota from given quota year to the next quota year.

MANAGEMENT CONSIDERATIONS

All the signs from commercial catch data and surveys indicate that ling is at present in a good state. This is confirmed in the SAM assessment. However, the drop in recruitment since 2010 will probably result in a rapid decrease in sustainable catches in the near future.

Currently the longline and trawl fishery represent 95% of the total fishery, while the remainder is assigned to gillnets. Should those proportions change dramatically, so will the exploratory patterns as the selectivity of the gillnet fleet is substantially different from other fleets.

Table 6. Ling. Catches in Icelandic waters by country (Source STATLANT).

YEAR	BELGIUM	FAROE	GERMANY	ICELAND	NORWAY	UK	TOTAL
1980	445	607	0	3149	423	0	**4624**
1981	196	489	0	3348	415	0	**4448**
1982	116	524	0	3733	612	0	**4985**
1983	128	644	0	4256	115	0	**5143**
1984	103	450	0	3304	21	0	**3878**
1985	59	384	0	2980	17	0	**3440**
1986	88	556	0	2946	4	0	**3594**
1987	157	657	0	4161	6	0	**4981**
1988	134	619	0	5098	10	0	**5861**
1989	95	614	0	4896	5	0	**5610**
1990	42	399	0	5153	0	0	**5594**
1991	69	530	0	5206	0	0	**5805**
1992	34	526	0	4556	0	0	**5116**
1993	20	501	0	4333	0	0	**4854**
1994	3	548	0	4049	0	0	**4600**
1995	0	463	0	3729	0	0	**4192**
1996	0	358	0	3670	20	0	**4048**
1997	0	299	0	3634	0	0	**3933**
1998	0	699	0	3603	0	0	**4302**
1999	0	500	0	3973	120	1	**4594**
2000	0	0	0	3196	67	3	**3266**
2001	0	362	2	2852	116	1	**3333**
2002	0	1629	0	2779	45	0	**4453**
2003	0	565	2	3855	108	5	**4535**
2004	0	739	1	3721	139	0	**4600**
2005	0	682	1	4311	180	20	**5194**
2006	0	960	1	6283	158	0	**7402**
2007	0	807	0	6592	185	0	**7584**
2008	0	1366	0	7736	176	0	**9278**
2009	0	1157	0	9610	172	0	**10939**
2010	0	1095	0	9867	168	0	**11130**
2011	0	588	0	8743	249	0	**9580**
2012	0	875	0	10706	248	0	**11829**
2013	0	1030	0	10212	294	0	**11445**
2014	0	1738	0	12450	158	0	**13930**
2015	0	1233	0	11553	250	0	**12862**
2016	0	1072	0	8582	230	0	**9884**
2017	0	829	0	7692	244	0	**8766**
2018	0	1103	0	6756	203	0	**8062**
2019	0	1093	0	6992	184	0	**8269**
2020	0	989	0	5836	237	0	**7061**
2021	0	926	0	6110	91	0	**7128**
2022	**0**	**727**	**0**	**6799**	**132**	**0**	**7657**

Table 7. Ling. Assessment summary by calendar year. Catches are ICES estimates.

YEAR	RECRUITMENT AGE 2			SPAWNING STOCK TONNES			CATCH TONNES	FISHING MORTALITY AGE 8-11		
	Value	**97.5 %**	**2.5 %**	**Value**	**97.5 %**	**2.5 %**		**Value**	**97.5 %**	**2.5 %**
1979	2537	3519	1830	17430	22167	13705	5224	0.45	0.67	**0.30**
1980	2798	3637	2153	16600	20783	13260	4616	0.49	0.75	**0.32**
1981	3157	3989	2499	15202	18903	12226	4587	0.53	0.80	**0.35**
1982	3520	4404	2814	13849	17068	11237	4877	0.64	0.94	**0.44**
1983	3762	4690	3017	12300	15011	10079	4897	0.75	1.02	**0.55**
1984	3679	4584	2953	10678	12993	8775	3919	0.64	0.83	**0.50**
1985	3394	4225	2727	10472	12538	8746	3512	0.54	0.69	**0.42**
1986	3459	4313	2774	10832	12694	9244	3693	0.50	0.63	**0.40**
1987	3733	4653	2995	12052	13905	10445	4939	0.59	0.73	**0.48**
1988	3615	4481	2917	12283	14028	10756	5781	0.66	0.80	**0.54**
1989	3282	4025	2676	11664	13280	10245	5592	0.65	0.78	**0.54**
1990	2887	3511	2374	11501	13105	10093	5574	0.66	0.78	**0.55**
1991	2641	3215	2170	9999	11353	8807	5715	0.70	0.83	**0.59**
1992	2744	3341	2254	9519	10572	8571	5079	0.66	0.79	**0.55**
1993	2939	3572	2418	9125	9956	8363	4110	0.56	0.67	**0.47**
1994	2686	3281	2199	11408	12332	10552	3705	0.51	0.59	**0.44**
1995	2516	3076	2057	11925	12869	11050	3978	0.56	0.65	**0.49**
1996	2513	3069	2058	11737	12660	10883	4052	0.58	0.67	**0.51**
1997	2627	3202	2156	10554	11411	9760	3982	0.57	0.65	**0.49**
1998	3077	3748	2527	10603	11498	9777	4075	0.57	0.65	**0.49**
1999	3793	4613	3119	10709	11604	9883	4374	0.65	0.74	**0.57**
2000	4492	5457	3697	10722	11639	9878	3161	0.46	0.52	**0.40**
2001	4840	5902	3969	11752	12734	10846	3357	0.45	0.51	**0.39**
2002	5956	7216	4917	13091	14177	12089	4140	0.50	0.58	**0.44**
2003	6907	8385	5689	15156	16416	13993	4159	0.47	0.54	**0.41**
2004	8029	9817	6567	17497	18897	16200	4622	0.48	0.55	**0.42**
2005	8874	10835	7269	20260	21843	18792	5007	0.45	0.51	**0.39**
2006	10180	12445	8327	22996	24733	21380	7039	0.54	0.61	**0.47**
2007	10300	12652	8386	27233	29291	25319	7202	0.49	0.55	**0.43**
2008	11126	13521	9154	29652	31942	27527	8912	0.52	0.59	**0.46**
2009	10876	13310	8887	32733	35253	30393	10343	0.56	0.63	**0.49**
2010	7274	8853	5976	31570	34090	29236	10648	0.54	0.61	**0.47**
2011	5064	6196	4139	25283	27454	23284	9731	0.46	0.53	**0.40**
2012	3793	4695	3065	31846	34606	29306	11617	0.57	0.66	**0.49**
2013	4438	5542	3554	32020	34943	29342	12171	0.44	0.51	**0.38**
2014	4175	5227	3335	37907	41531	34599	14026	0.50	0.58	**0.43**
2015	4162	5253	3297	36146	39872	32767	13252	0.52	0.61	**0.45**
2016	5069	6518	3941	40095	44712	35956	9996	0.41	0.48	**0.35**
2017	3721	4825	2870	35692	40163	31718	9254	0.40	0.47	**0.34**
2018	2658	3586	1970	37573	42622	33122	9800	0.36	0.43	**0.30**
2019	2676	3697	1937	31434	36157	27328	9166	0.37	0.45	**0.31**
2020	2397	3587	1602	31337	36954	26574	7121	0.32	0.40	**0.26**
2021	2900	4708	1786	28673	34807	23620	7005	0.29	0.37	**0.23**
2022	2845	5130	1578	30836	38868	24464	8284	0.30	0.40	**0.23**
2023	**2828**	**5603**	**1428**	**28657**	**38100**	**2155**	**6762**			

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