WITCH – LANGLÚRA
Glyptocephalus cynoglossus

GENERAL INFORMATION

Witch is found all around Iceland, but the highest concentration is observed in the relatively warm waters south and west of Iceland. It is a demersal species found at 25-500 m depth, but is most common at 50-300 m on a sandy or muddy substrate.

Females grow larger than males. Only a small proportion of males become longer than 40 cm, as compared to 45 cm for females. Size at sexual maturity differs between the sexes. At the main fishing grounds south of Iceland, about half of the males have reached maturity at 25 cm length, but females reach that level at 32 cm.

THE FISHERY

The geographical distribution of the witch fisheries has remained more or less unchanged in recent years (Figure 1), with main fishing grounds in the southwest of Iceland, extending along the south coast in the deeper areas. Practically no catch has been reported from the northwest, north and east of Iceland.

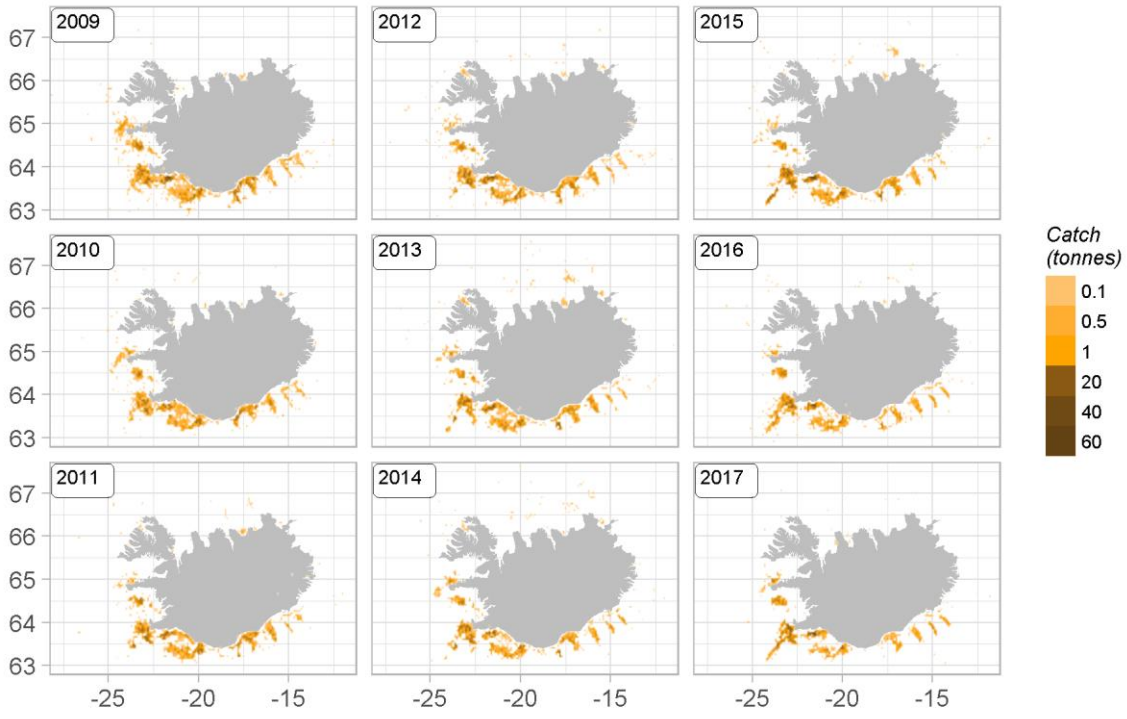

Figure 1. Witch. Geographical distribution of the Icelandic fishery since 2009. Reported catch from logbooks.

Mynd 1. Langlúra. Útbreiðsla veiða á Íslandsmiðum frá 2009 samkvæmt afladagbókum.

Since 2000, the main fishing grounds of witch have been in the southern and western part of the Icelandic shelf (Figure 2) according to logbook entries. Spatial distribution of Icelandic witch fishery is considerably stable, with over 50% of the witch caught on the south-western part of the shelf.

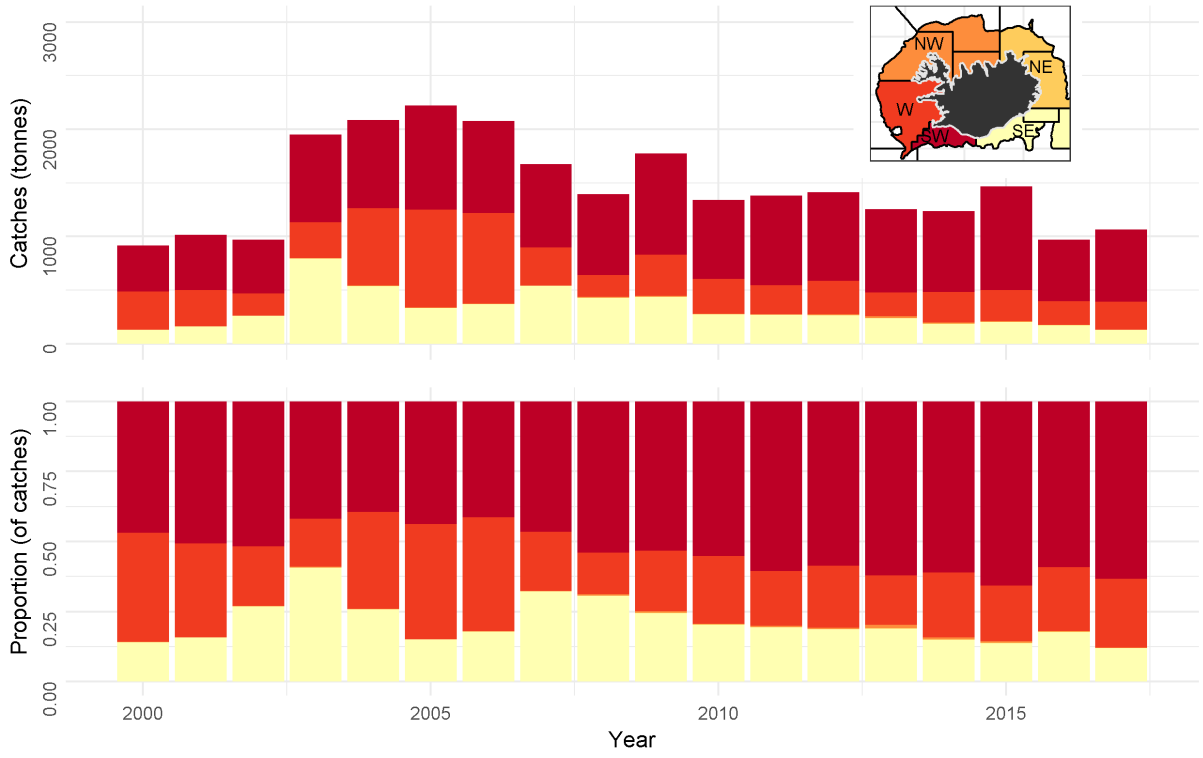

Figure 2. Witch. Spatial distribution of the Icelandic fishery by fishing area from 2000-2017. All gears combined.

Mynd 2. Langlúra. Útbreiðsla veiða á íslensku veiðisvæði árin 2000-2017. Öll veiðarfæri samanlagt.

Of the combined catch in demersal seine and *Nephrops* trawl, about 85-90% was caught at 101-200 m depth in most years (Figure 3). In 2011-2016, that proportion had declined to about 60% while the proportion of the catch taken at 51-100 m depth increased. This was solely due to increase in demersal seine at that depth range. Most of the catch in demersal seine was taken at 101-150 m, but at 151-200 m depth in *Nephrops* trawl.

Witch in Icelandic fishing grounds is mainly caught in demersal seine and *Nephrops* trawl, or approximately 95% of all reported landings (Figure 4, Table 1). This proportion has been a relatively stable throughout the years. During the last 8 years, however, the proportion of landed witch caught by seiners has decreased and reported landings from *Nephrops* trawlers and other trawlers has increased. Since 2000, 37-83 vessels have landed over 1000 kg of witch annually, with a decrease in number of vessels over the last 5 years (Table 1).

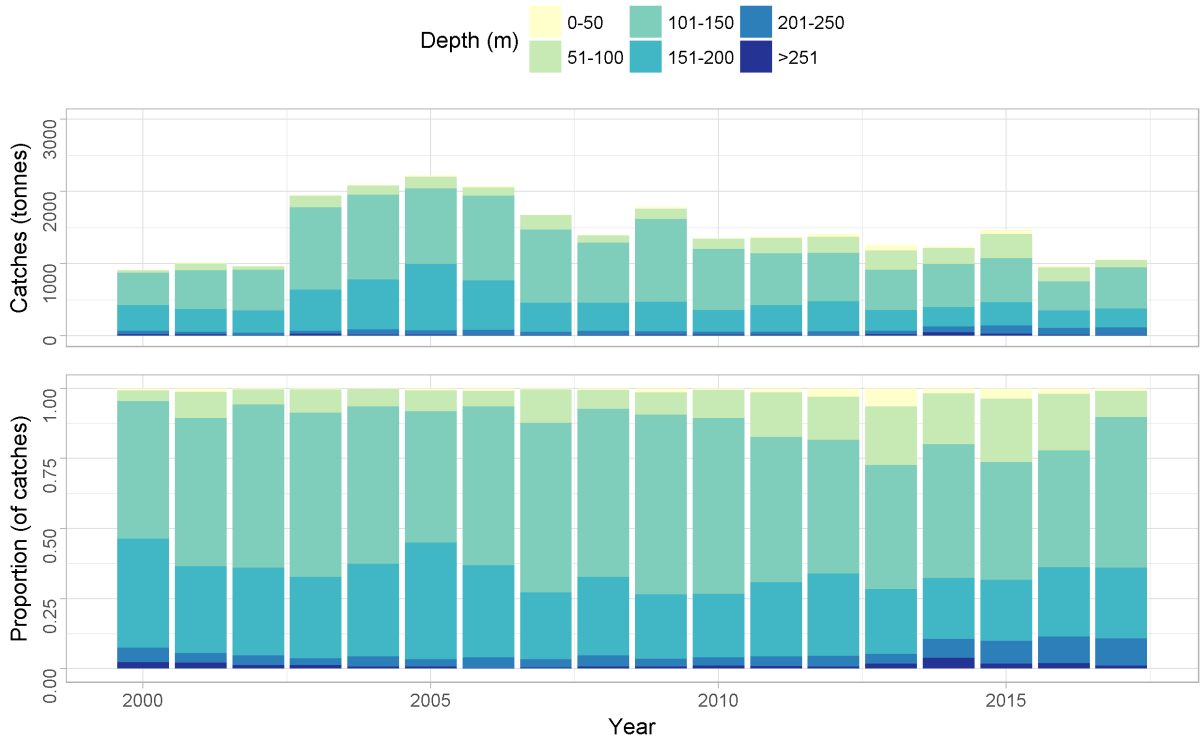

Figure 3. Witch. Depth distribution of catches according to logbooks.

Mynd 3. Langlúra. Afli samkvæmt afladagbókum, skipt eftir dýpi.

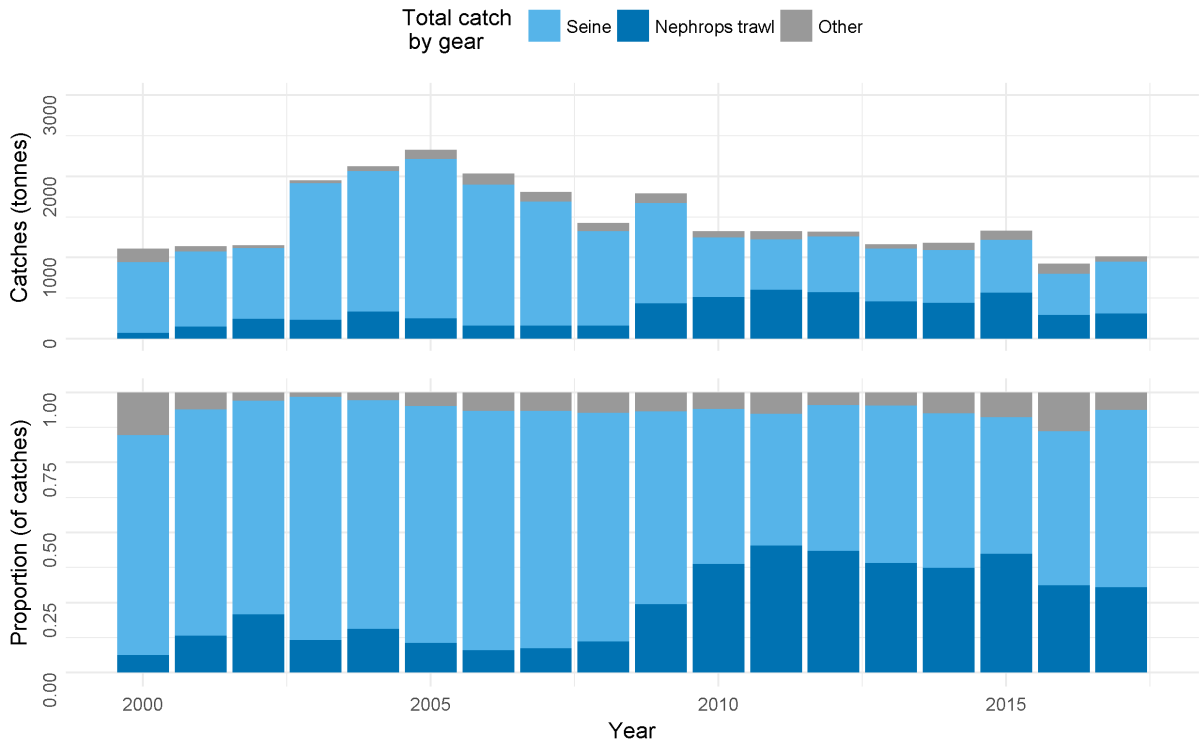

Figure 4. Witch. Total catch (landings) by fishing gear since 2000, according to statistics from the Directorate of Fisheries.

Mynd 4. Langlúra. Landaður afli eftir veiðarfærum frá 2000, samkvæmt aflaskráningarkerfi Fiskistofu.

Table 1. Witch. Number of Icelandic vessels landing 1000 kg or more of witch, and all landed catch divided by gear type.

Tafla 1. Langlúra. Fjöldi íslenskra skipa landað hafa yfir 1000 kg af langlúru og allur landaður afli eftir veiðarfærum.

	NUMBER OF VESSELS			CATCHES (TONNES)			
YEAR	*Seiners*	*Nephrops trawl*	*Other*	*Demersal seine*	*Nephrops trawl*	*Other*	*Sum*
2000	30	19	34	877	56	165	1098
2001	26	24	18	920	136	77	1133
2002	22	27	7	874	236	37	1147
2003	31	22	9	1689	228	30	1947
2004	32	22	17	1731	334	59	2124
2005	32	23	24	1967	242	115	2324
2006	30	20	24	1738	170	122	2030
2007	26	14	26	1530	150	125	1805
2008	27	15	22	1166	158	103	1427
2009	32	16	23	1230	418	141	1789
2010	30	16	17	734	546	76	1326
2011	29	15	18	620	603	101	1324
2012	32	15	17	697	521	95	1313
2013	26	15	12	652	456	54	1162
2014	21	14	14	650	422	107	1179
2015	20	13	14	647	548	130	1324
2016	17	11	16	506	277	142	925
2017	18	9	10	641	309	63	1012

The number of vessels accounting for 95% of the total catch of witch in Icelandic waters reduced from about 100 vessels in 1996-1998 to about 40 vessels in 2002, despite annual catches being at similar levels (Figure 5). In 2002-2014, the number of vessels accounting for 95% of the catches (ranging from 1200-2300 tonnes) remained relatively constant. In the last two years only about 25 vessels have accounted for 95% of the annual catch of witch.

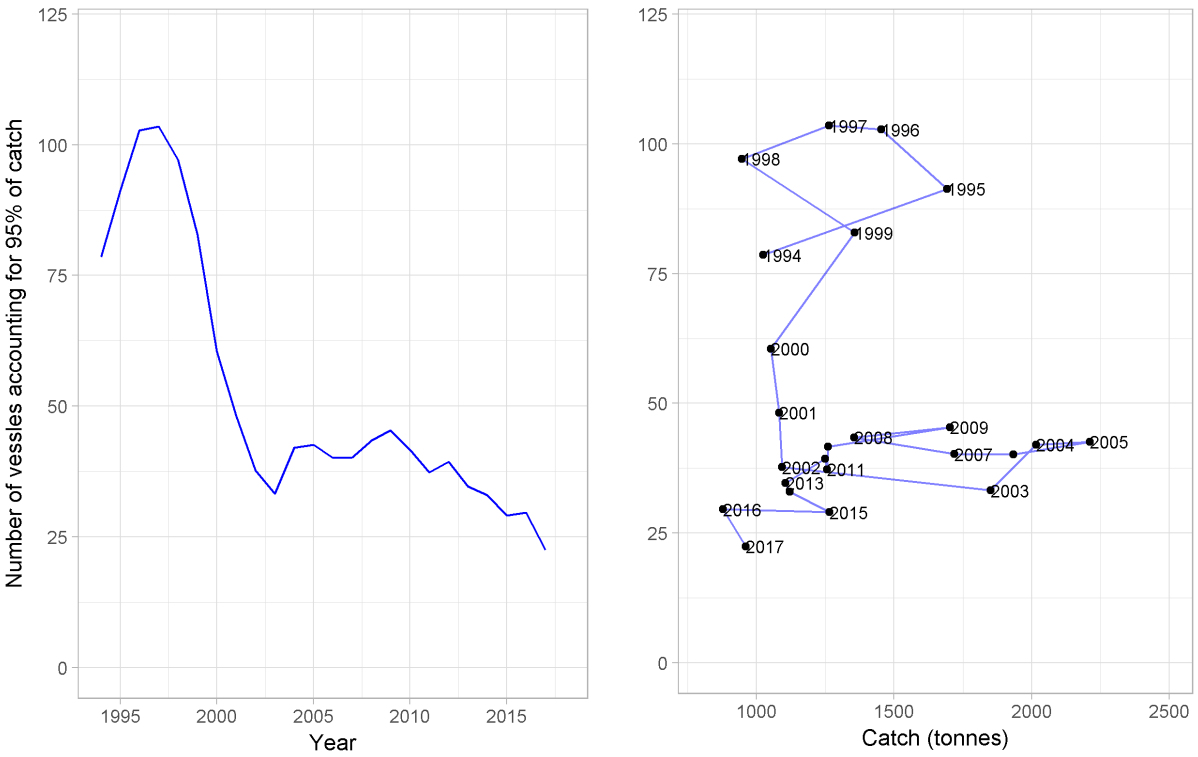

Figure 5. Witch. Number of vessels (all gear types) accounting for 95% of the total catch annually since 1994. Left: Plotted against year. Right: Plotted against total catch. Data from the Directorate of Fisheries.

Mynd 5. Langlúra. Fjöldi skipa og báta (öll veiðarfæri) sem veiddu 95% heildaraflans hvert ár frá 1994. Vinstri: Sýnt eftir árum. Hægri: Sýnt í samanburði við heildarafla. Gögn frá aflaskráningarkerfi Fiskistofu.

CATCH PER UNIT EFFORT (CPUE) AND EFFORT.

CPUE estimates of witch in Icelandic waters are not considered representative of stock abundance as changes in fleet composition, technical improvements and differences in gear setup among other things have not been accounted for when estimating CPUE.

Non-standardised estimates of CPUE in demersal seine (kg/set) is calculated as the total weight in sets in where witch was more than 10% of the catch. According to logbooks, witch CPUE in demersal seine has been fluctuating between 200-570 kg/set. CPUE of *Nephrops* trawl (kg/h), in hauls where witch is more than 10% of the catch has remained relatively stable, and was around 80 kg/hour last year (Figure 6).

Total fishing effort for witch in demersal seine is estimated as the number of sets where witch was more than 10% of the total catch. The fishing effort increased in years 2002-2005, however since 2006 it has been decreasing gradually, except in 2009 when some increase in effort occurred (Figure 6).

Effort (number of towing hours where witch was 10% or more of the total catch) in *Nephrops* trawl has been fluctuating considerably (Figure 6). These fluctuations are in line with fluctuations in the annual total towing hours of the *Nephrops* fleet. Witch is a bycatch in the *Nephrops* fishery and reporting was poor in the first years of the mandatory logbooks. Before 2003, less than 50% of witch landings from *Nephrops* trawl were reported in logbooks, but from 2009 onwards there is some overestimation in the catch of witch.

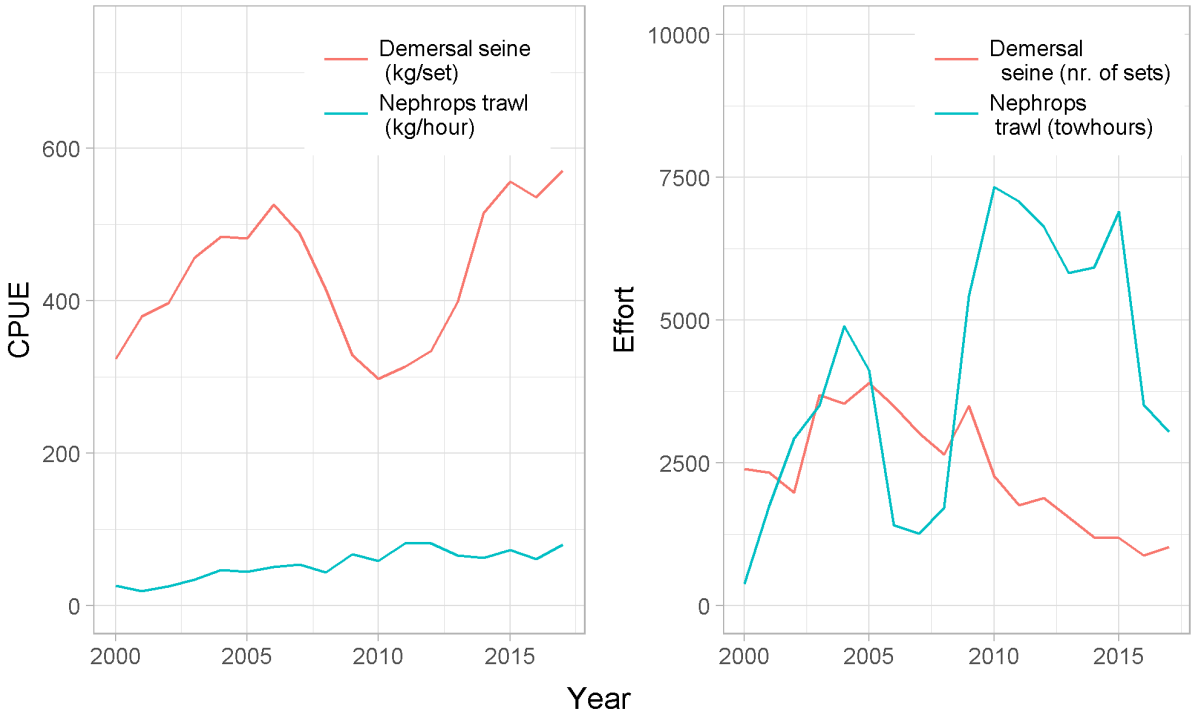

Figure 6. Witch. Non-standardised estimates of CPUE (left) and fishing effort (right) from demersal seine (kg/set or nr. of sets) and *Nephrops* trawl (kg/hour or towhours).

Mynd 6. Langlúra. Afli á sóknareiningu (vinstri) og sókn (hægri) með dragnót (kg í kasti eða fjöldi kasta) og humarvörpu (kg/klst eða togtímar).

AGE DISTRIBUTION OF LANDED WITCH

Analysis done in 2013 by the Marine Research Institute (MRI) suggested that excessive amounts of otoliths were being taken from commercial catches of witch, and as a result the number of samples was reduced to save time and resources. Before this change, around 5000 otoliths from 100 samples were being taken yearly, but for last four years 20-35 samples from demersal seine, 10-24 from *Nephrops* trawl and 1-5 from demersal trawl were collected, or a total of 500-875, 250-600 and 25-123 otoliths, respectively (Table 2, Figure 7).

Table 2. Witch. Number of samples and aged otoliths from landed catch.

Tafla 2. Langlúra. Fjöldi sýna og aldursgreindra fiska úr lönduðum afla.

	Demersal seine		***Nephrops trawl***		***Demersal trawl***	
Year	Samples	Otoliths	Samples	Otoliths	Samples	Otoliths
2010	45	2239	48	2400	7	350
2011	38	1900	56	2800	3	150
2012	46	2300	50	2500	1	50
2013	40	1950	28	1400	3	150
2014	26	650	18	450	3	75
2015	35	875	24	600	1	25
2016	20	500	10	250	3	75
2017	30	750	12	300	5	123

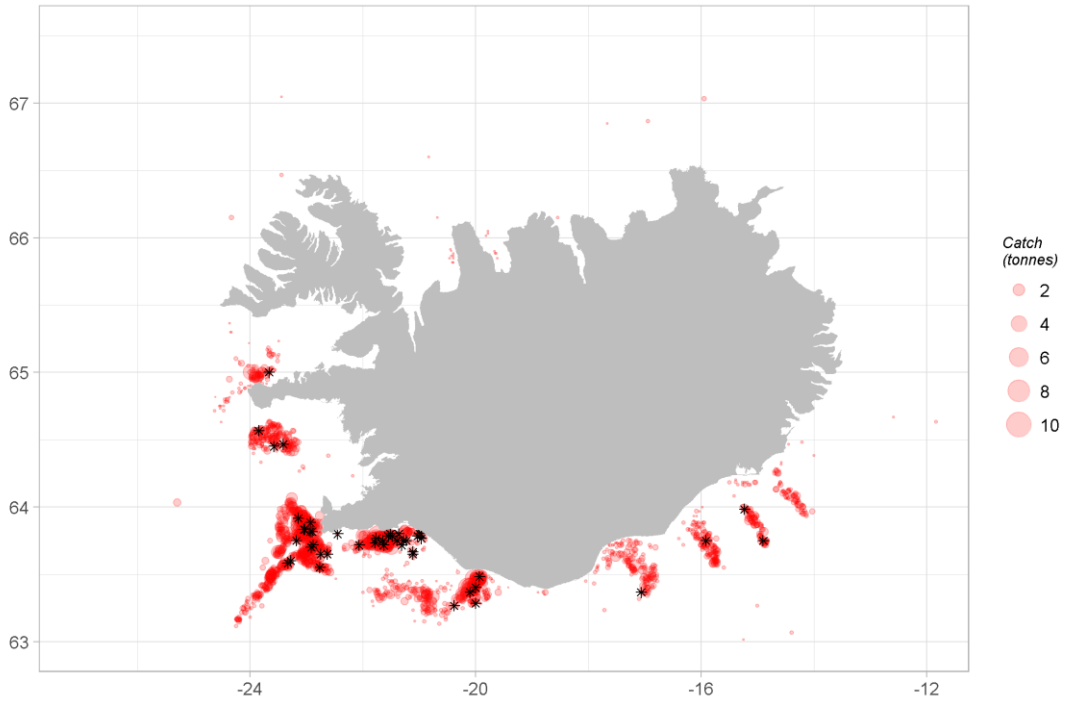

Figure 7. Witch. Fishing grounds in 2017 as reported in logbooks (red) and positions of samples taken from landings (asterisks).

Mynd 7. Langlúra. Veiðisvæði við Ísland árið 2017 samkvæmt afladagbókum (rautt) og staðsetningar sýna úr lönduðum afla (stjörnur).

In 2001-2005, most of the catch was 4-7 years old witch (Figure 8). The proportion of these age classes in the catch has since decreased and 10 year old fish were most commonly caught last year. Thus, the catch has gradually become older, and there are no signs of recruitment of younger fish into the fishery.

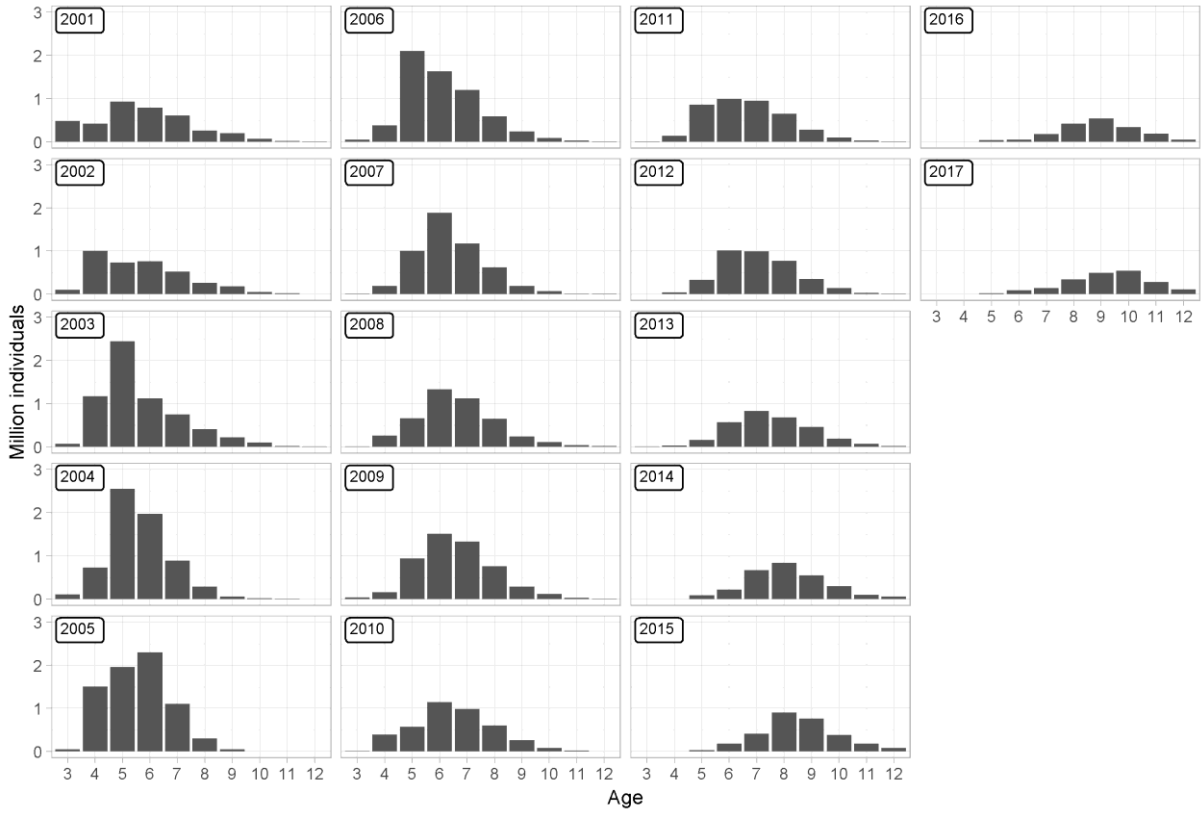

Figure 8. Witch. Estimated age distribution of landed catch based on landings and otoliths collected from landed catch.

Mynd 8. Langlúra. Áætluð aldursdreifing landaðs afla byggð á aldursgreiningum á fiskum úr afla.

LENGTH DISTRIBUTION OF LANDED WITCH

Over the last six years, there has been a shift towards larger fish in the length distribution of landed catch (Figure 9). As a result, the average length in the samples taken from commercial catch has increased from 38 cm in 2011 to 42 cm in 2017. Very few smaller fish have been seen entering the fishery over the last 4 years.

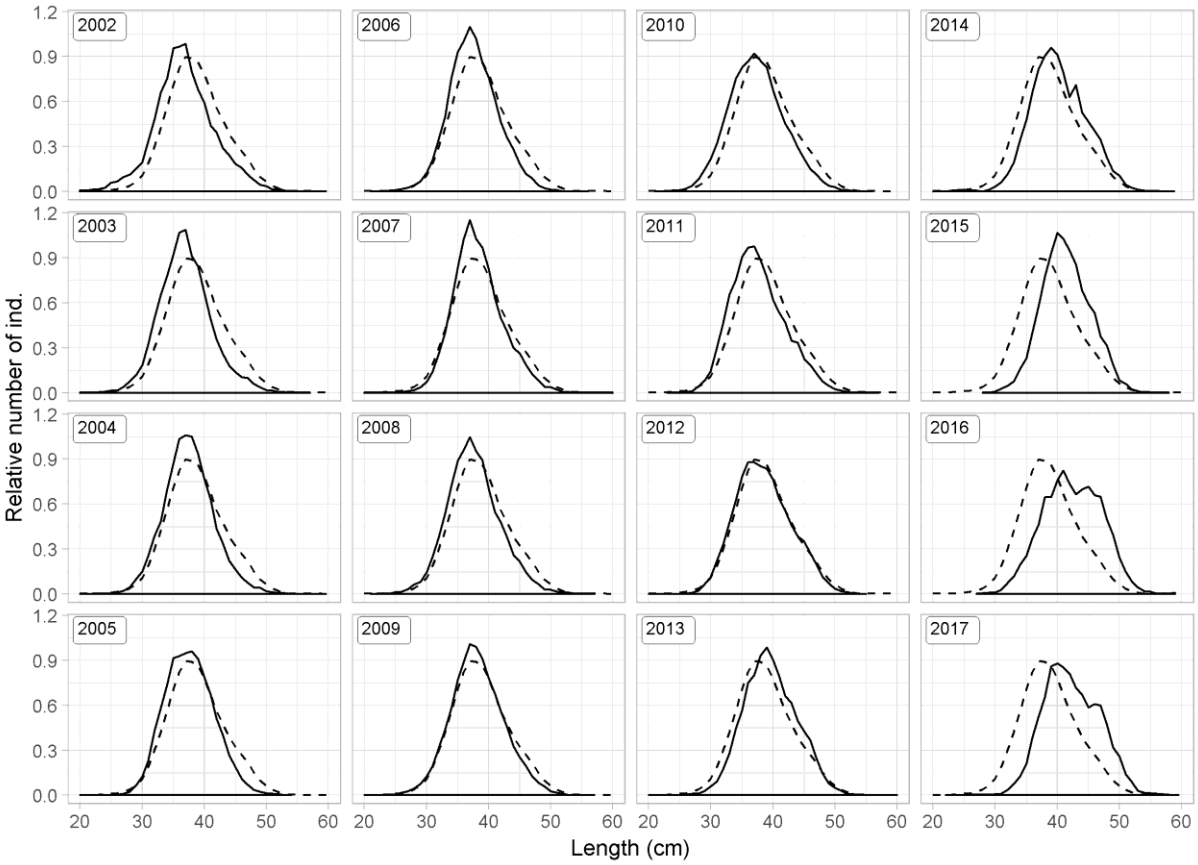

Figure 9. Witch. Length distribution of fish sampled from landed catch since 2002. The dotted line represents the mean length for all years.

Mynd 9. Langlúra. Lengdardreifing aflasýna frá árinu 2002 með meðallengd fyrir öll árin (punktalína).

SURVEY DATA

The Icelandic spring groundfish survey (hereafter spring survey, IS-SMB), which has been conducted annually in March since 1985, covers the most important distribution area of the witch fishery. In addition, the Icelandic autumn groundfish survey (hereafter autumn survey, IS-SMH) was commenced in 1996. However, a full autumn survey was not conducted in 2011 due to a labour dispute and therefore the results for 2011 are not presented.

The spring survey is considered to measure changes in abundance/biomass better than the autumn survey. It does not, however, adequately cover the main recruitment grounds for witch, which are poorly known.

Figure 10 shows both a recruitment index based on abundance of witch smaller than 30 cm, and trends in various biomass indices in the spring and autumn surveys. Survey length distributions are shown in Figures 11-12, abundance and changes in spatial distribution in Figures 13-16.

Total biomass index and the biomass index for witch larger than 30 cm (harvestable part of the stock) increased rapidly in 2004 (Figure 10) and have remained high. Biomass of large fish (43 cm and larger) has been increasing rapidly since 2010, while recruitment (numbers below 30 cm) has been going down over the same period.

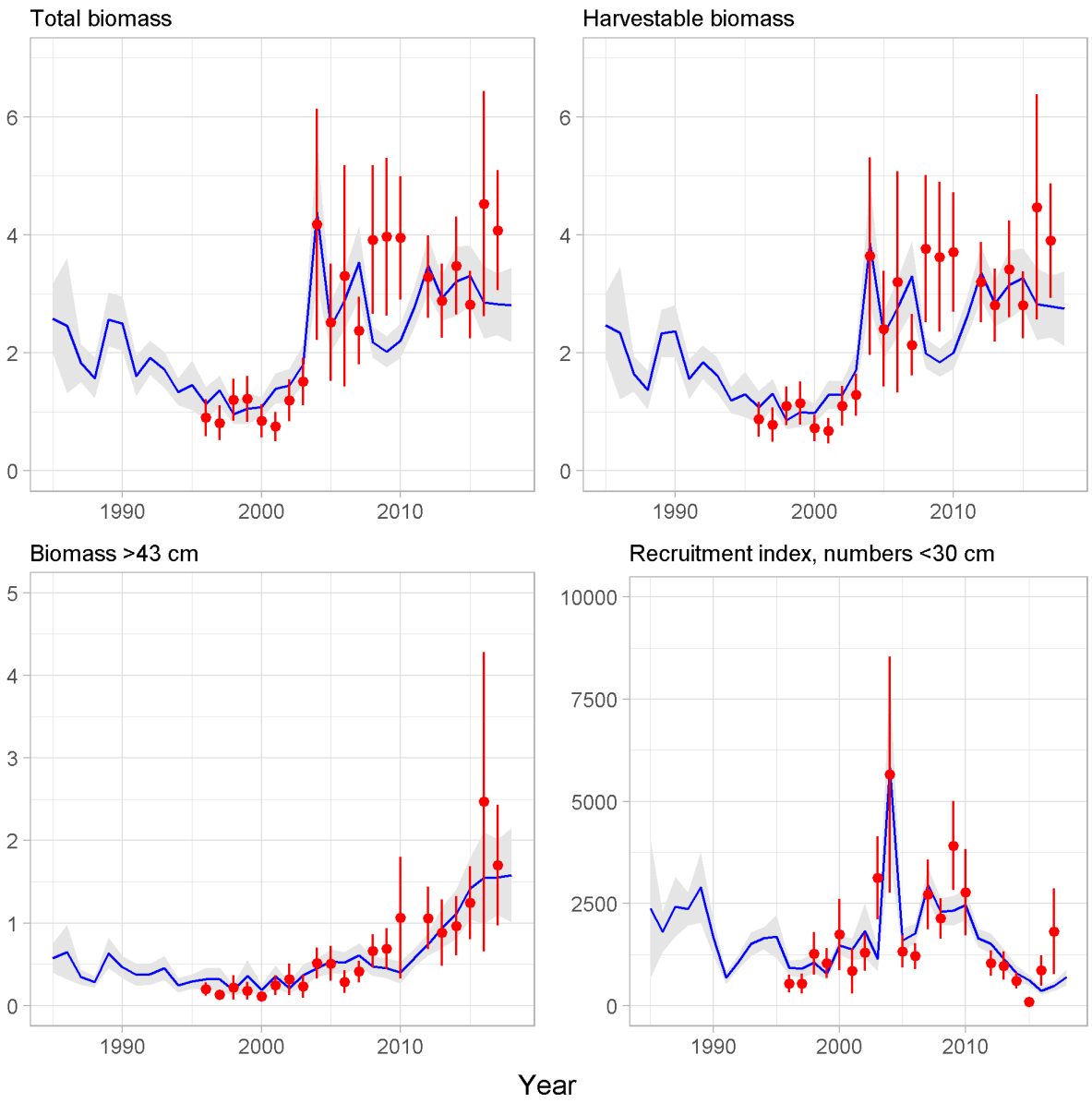

Figure 10. Witch. Total biomass indices (upper left), harvestable biomass indices (>30 cm) (upper, right) and biomass index of larger ind. (>43 cm) (lower left), juvenile abundance indices (<30 cm) (lower right), from the spring survey (blue) and autumn survey (red), along with the standard deviation.

Mynd 10. Langlúra. Stofnvísitala (efri til vinstri), vísitala veiðistofns (30 cm og stærri, efri til hægri), vísitala stærri einstaklinga (43 cm og stærri, neðri til vinstri) og nýliðunarvísitala (neðri til hægri) úr stofnmælingu botnfiska að vori (blátt) og hausti (rautt), ásamt staðalfráviki.

Like in samples from the commercial catch, there has been a shift towards larger fish in the length distribution of individuals measured in the spring survey (Figure 11). The average length of witch in the survey samples has increased from 33 cm in 2009 to 38 cm in 2018. Data from the autumn survey tells a similar story, with a marked increase in average size of witch caught (Figure 12).

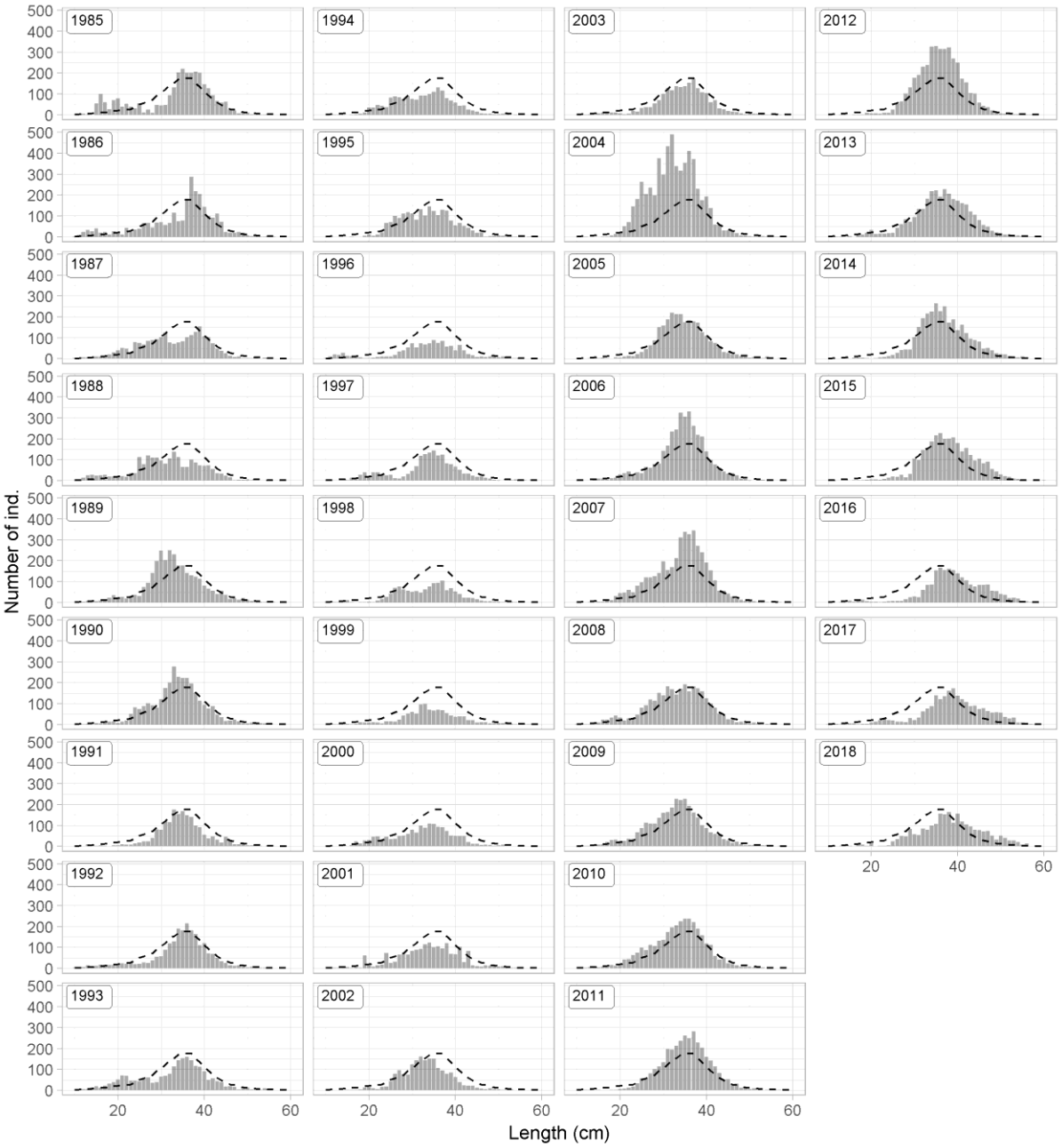

Figure 11. Witch. Length distribution from the spring survey. The dotted line shows mean length for all years combined.

Mynd 11. Langlúra. Lengdardreifing úr stofnmælingu botnfiska að vori frá 1985 ásamt meðallengd allra ára (punktalína).

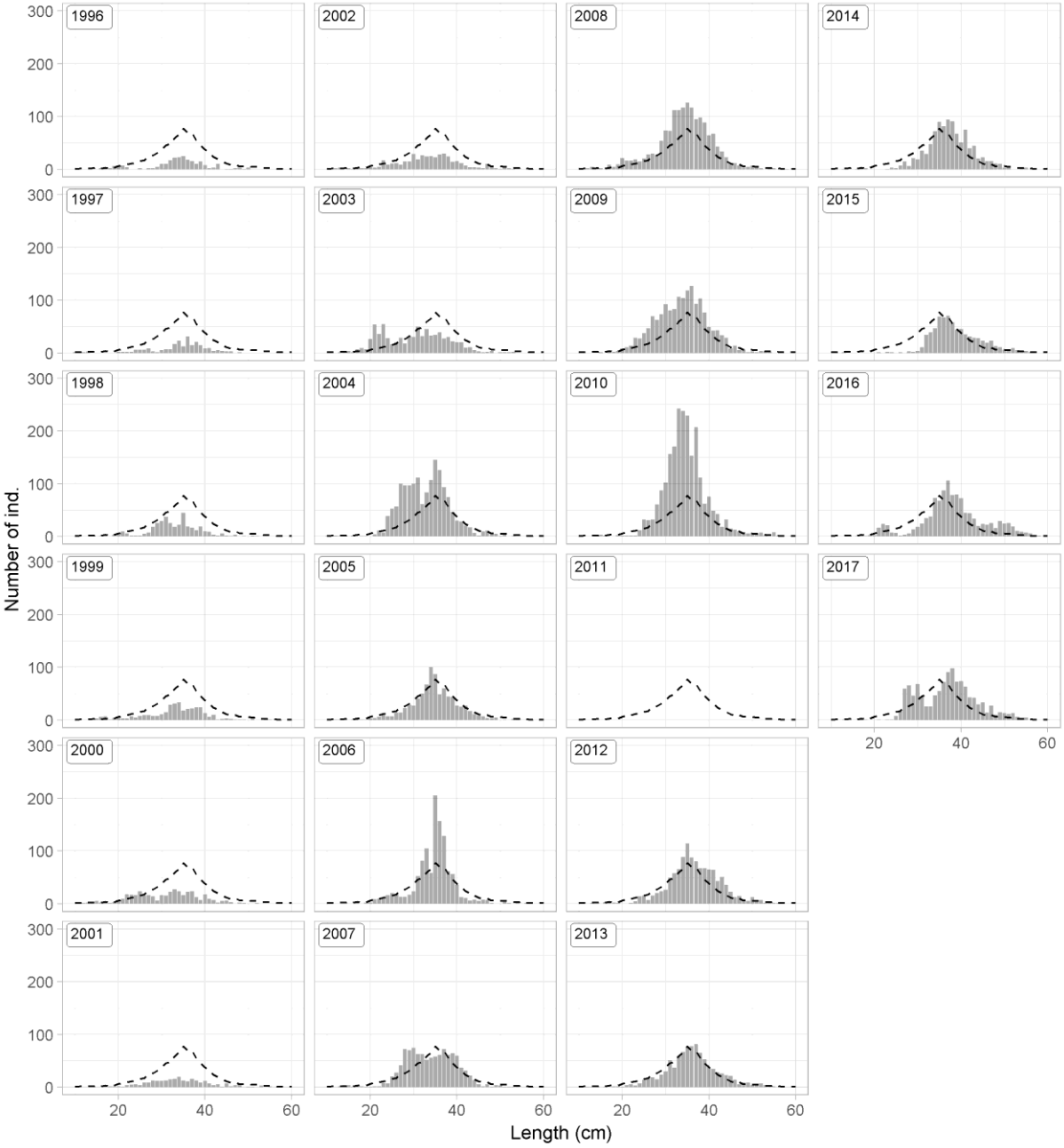

Figure 12. Witch. Length distribution from the autumn survey. The dotted line shows mean length for all years combined.

Mynd 12. Langlúra. Lengdardreifing úr stofnmælingu botnfiska að hausti frá 1996 ásamt meðallengd allra ára (punktalína).

According to the spring survey, witch is found all around Iceland, but only in very small quantities off the east coast (Figures 13-14). Abundance of witch is highest and particularly stable in the SW and W areas. However since 2002, abundance in the SE area has increased considerably and in most recent years also in the north. The autumn survey shows a similar trend (Figures 15-16).

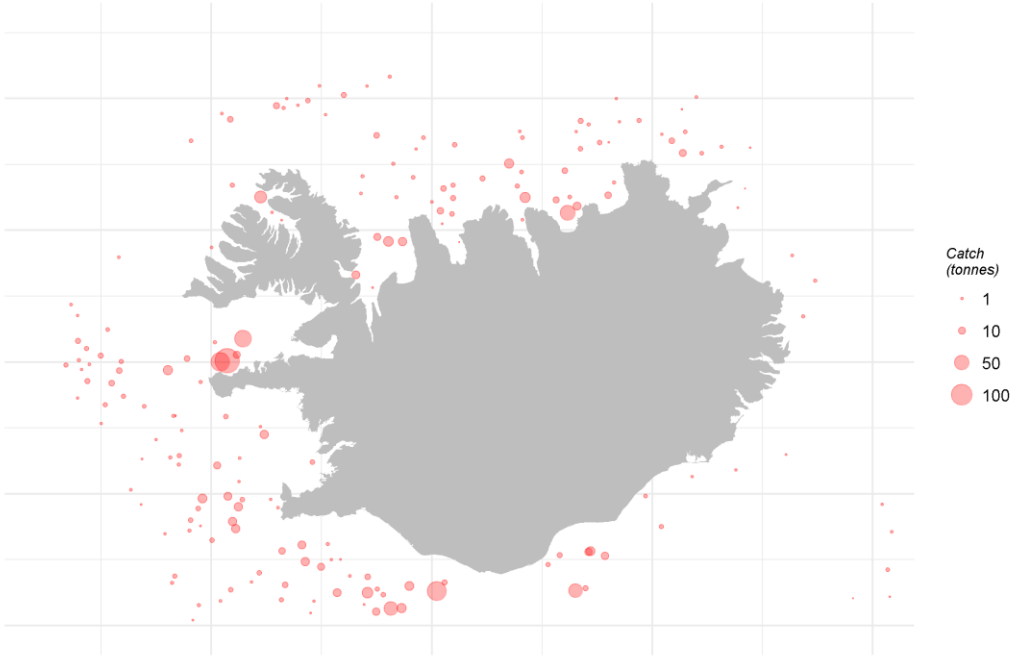

Figure 13. Witch. Spatial distribution in the spring survey in 2018.

Mynd 13. Langlúra. Útbreiðsla í stofnmælingu botnfiska að vori 2018.

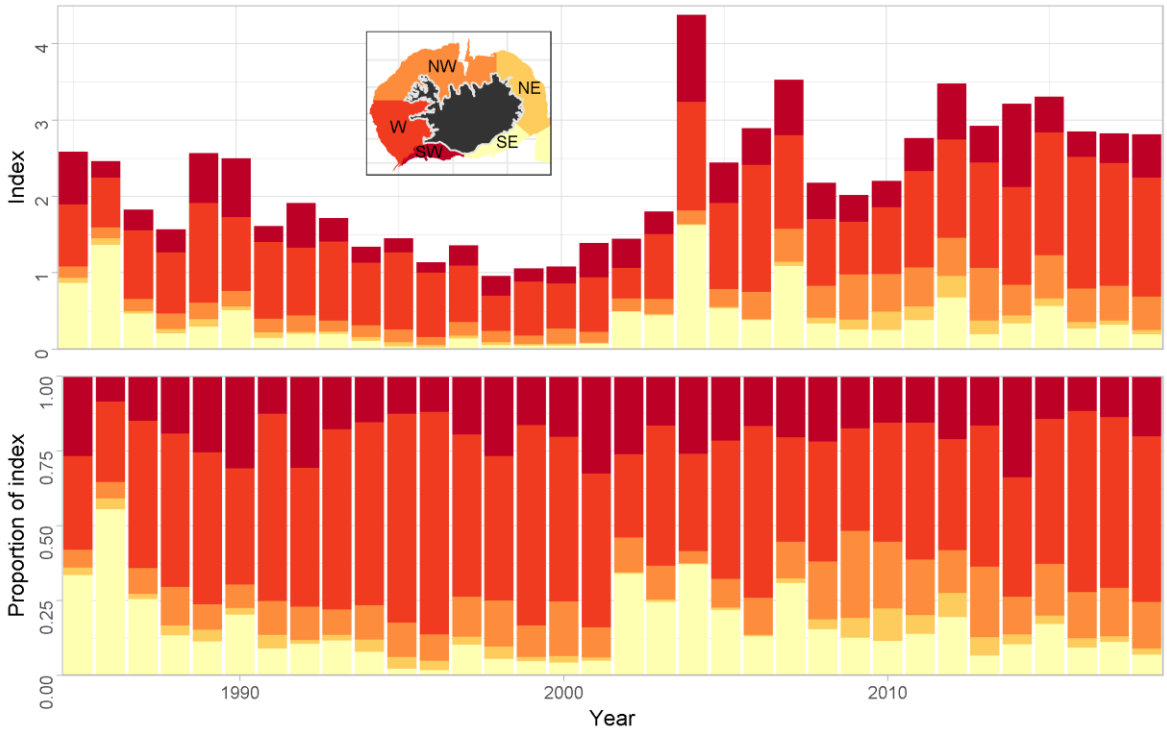

Figure 14. Witch. Spatial distribution of biomass index from the spring survey in 1985-2018.

Mynd 14. Langlúra. Dreifing lífmassavísitölu í stofnmælingu botnfiska að vori, árin 1985-2018.

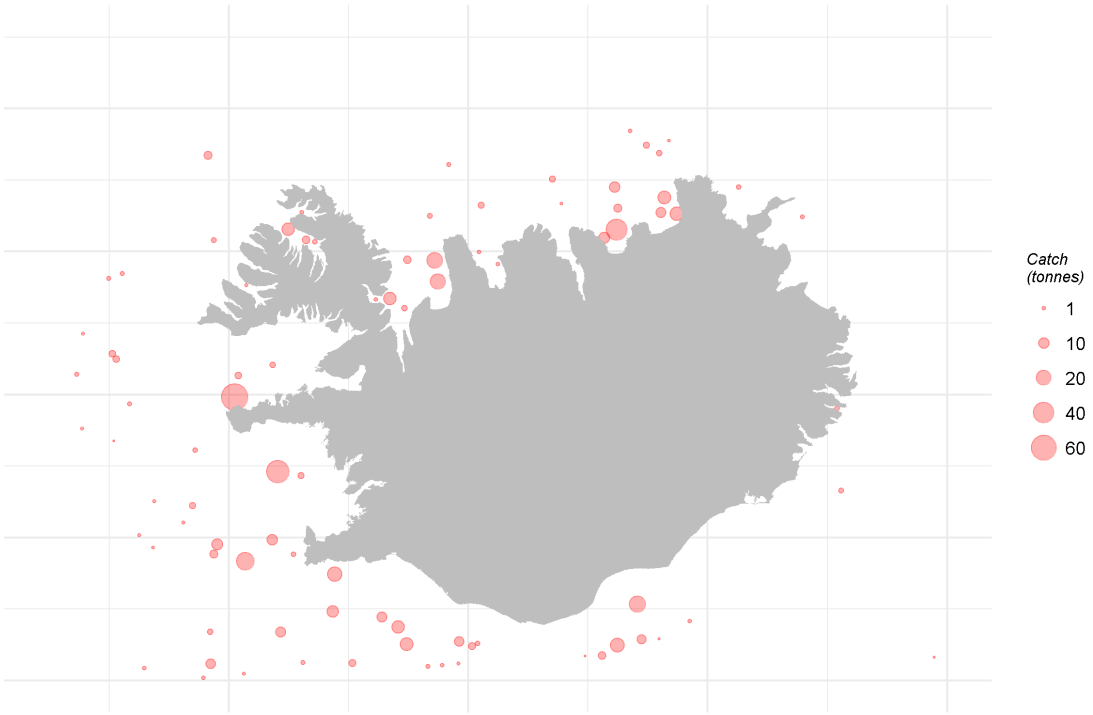

Figure 15. Witch. Spatial distribution in the autumn survey in 2017.

Mynd 15. Langlúra. Útbreiðsla í stofnmælingu botnfiska að hausti árið 2017.

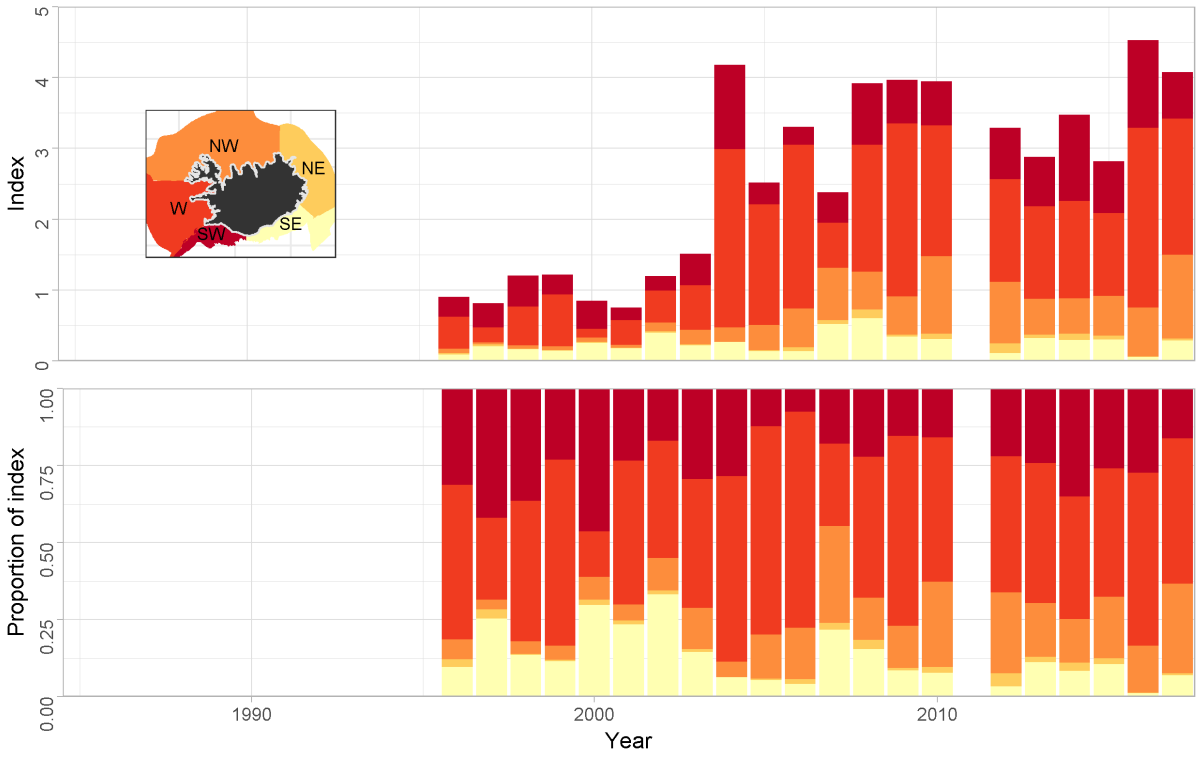

Figure 16. Witch. Spatial distribution of biomass index from the autumn survey in 1996-2017.

Mynd 16. Langlúra. Dreifing lífmassavísitölu í stofnmælingu botnfiska að hausti, árin 1996-2017.

MANAGEMENT

The Ministry of Industries and Innovation is responsible for management of the Icelandic fisheries and implementation of legislation. Witch was included in the ITQ system in the 1996/1997 quota year and as such subjected to TAC limitations.

For the quota years 2005/2006 to 2009/2010 the TAC was set higher than recommended by Marine Research Institute (MRI) but this practice stopped in the 2010/2011 quota year (Table 3). For most quota years the net transfers between witch and other species in the Icelandic ITQ-system are less than 10% of the national TAC (Figure 17). The main exception from this was during the quota years 2008/2009 and 2009/2010 when the national TAC was set considerably higher than recommended, and considerable proportion of witch quota was transferred to other species (Figure 17, Table 3). For the last three quota years there has been a net transfer to witch from another species quota. Transfer of witch quota between fishing years is usually within 10% (Figure 17).

Table 3. Witch. Recommended TAC, national TAC set by the Ministry, and landings (tonnes).

Tafla 3. Langlúra. Tillögur Hafrannsóknastofnunar um hámarksafla, ákvörðun stjórnvalda um aflamark og landaður afli (tonn).

FISHING YEAR	REC. TAC	NATIONAL TAC	CATCH
1994/95	1500	-	1760
1995/96	1400	-	1660
1996/97	1200	1200	1260
1997/98	1100	1100	960
1998/99	1100	1100	1160
1999/00	1100	1100	1110
2000/01	1100	1100	1160
2001/02	1350	1350	1220
2002/03	1500	1500	1530
2003/04	1500	1500	2000
2004/05	2000	2000	2250
2005/06	2200	2400	2190
2006/07	2000	2400	2200
2007/08	2000	2400	1540
2008/09	1600	2200	1700
2009/10	1600	2200	1300
2010/11	1300	1300	1220
2011/12	1100	1300	1450
2012/13	1100	1100	1180
2013/14	1100	1100	1170
2014/15	1100	1100	1220
2015/16	1100	1100	1140
2016/17	1110	1100	1090
2017/18	1116	1116	
2018/19	1100		

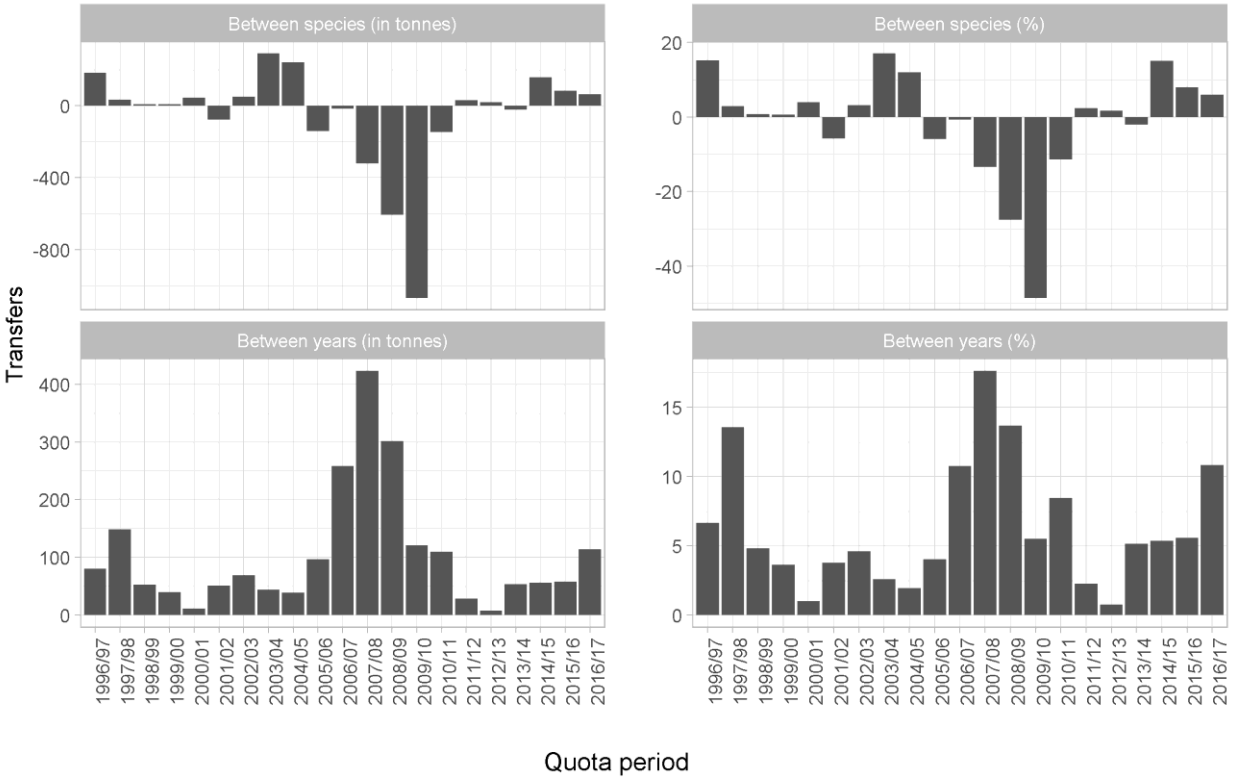

Figure 17. Witch. Net transfers of quota to and from witch in the Icelandic ITQ system by quota year. Between species (upper): Positive values indicate a transfer of other species to witch, but negative values indicate a transfer of witch quota to other species. Between years (lower): Transfer of quota from given quota year to the next quota year.

Mynd 17. Langlúra. Nettó tilfærsla á kvóta eftir fiskveiðiárum. Tilfærsla milli tegunda (efri myndir): Jákvæð gildi tákna tilfærslu á kvóta annarra tegunda yfir á langlúru en neikvæð gildi tilfærslu langlúrukvóta á aðrar tegundir. Tilfærsla milli ára (neðri myndir): Tilfærsla kvóta frá viðkomandi fiskveiðiári yfir á næsta fiskveiðiár.

ADVICE 2018

This advice follows ICES framework for stocks where reliable stock biomass indices are available, but analytical age-length based assessments are not feasible. Spring survey biomass index of witch 30 cm and larger, along with catch, is used to calculate F_{proxy} (catch/survey biomass) (Figure 18). The target F_{proxy} was defined as the mean from the reference period of 2013-2015, or 0.4. As the 2018 spring survey biomass was 2751, the MFRI advises that catches in the 2018/2019 fishing year should be no more than 1100 tonnes (Table 4).

Table 4. Witch. Advice calculations

Tafla 4. Langlúra. Útreikningur ráðgjafar

Index 2018	2751
Target F_{proxy}	0.4
Advice 2017	1116
Index 2018 x Target F_{proxy} / Advice 2017	0.98
Uncertainty cap	Not applied
Catch advice	2751 × 0.4 = 1100 t

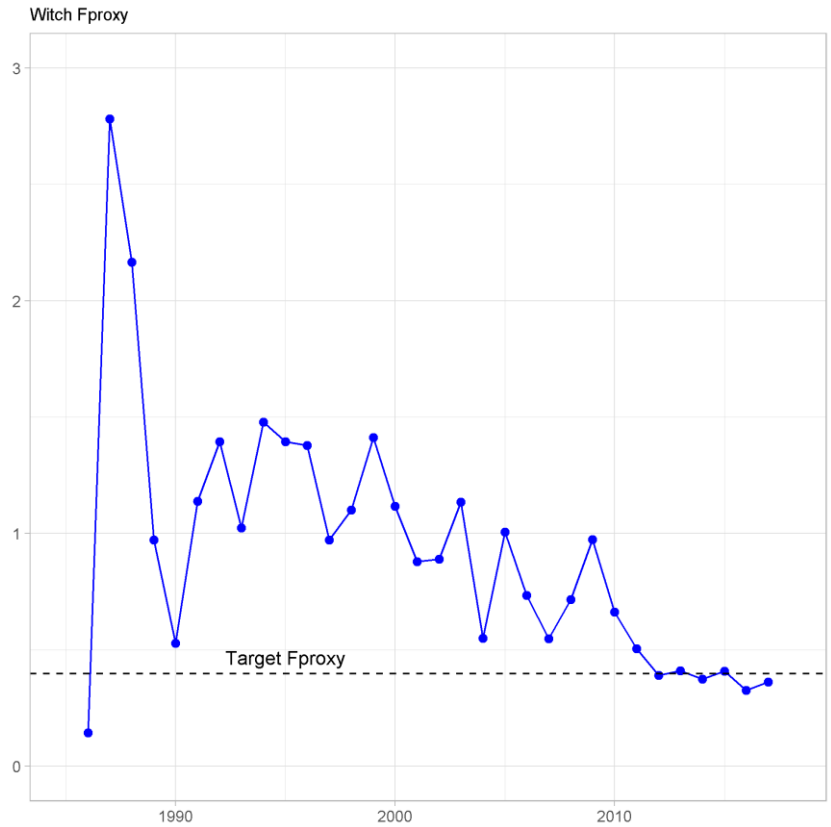

Figure 18. Witch. F_{proxy} (catch/survey biomass). The target F_{proxy} is set as the mean of the reference period of 2013-2015.

***Mynd 18. Langlúra. Vísitala veiðihlutfalls (*F_{proxy} *= afli/vísitala). Markgildi* F_{proxy} *byggir á* meðaltali áranna 2013-2015, en á þeim tíma voru vísitölur veiðihlutfalls og lífmassa stöðugar.**