

ANGLERFISH - SKÖTUSELUR

Lophius piscatorius

GENERAL INFORMATION

Anglerfish is a benthic "sit and wait" predator that is most abundant south and west of Iceland. It is found at depths ranging from 20 to 2800 meters, though most abundant between 50 and 250 meters.

Females grow larger than males with an average length of 72 cm compared with 60 cm for males according to measurements from the spring and autumn survey from 1999 to 2017. Females can reach a size of 130 cm while males larger than 80 cm are rare. Similarly, females become sexually mature around 80 cm and males around 61 cm.

Iceland is placed at the northern edge of the habitable area of monkfish, which renders it more sensitive to changes in temperature and salinity, than many other species.

THE FISHERY

In 2017, anglerfish was caught in the southeast, southwest, west and, to a small extent, northwest of Iceland as reported in logbooks (Figure 1). From 1995-2000 captures were mostly in the southeast and southwest after which it was captured increasingly west and more recently northwest of Iceland (Figure 1-2).



Figure 1. Anglerfish. Geographic distribution of the Icelandic fishery since 1995 as reported in logbooks.

Mynd 1. Skötuselur. Útbreiðsla skötusels á Íslandsmiðum frá 1995 samkvæmt afladagbókum.

On Icelandic fishing grounds, anglerfish is caught almost exclusively in anglerfish gillnets, bottom trawls and *Nephrops* trawls (Figure 4, Table 1). The number of boats reporting anglerfish catches peaked in 2007, with a total of 418 boats, but annual catch peaked in 2009 at 4069 tonnes. Since then catches have been smaller every year and amounted to 467 tonnes in 2017. A large reduction in catches between 2016 and 2017 can be explained by a reduction in the anglerfish gillnet fishery which accounted for 56% of the anglerfish fisheries in 2016 but only 19% in 2017 (Table 1).

Until 2002, anglerfish was mainly caught southeast of Iceland after which it was caught in greater numbers in the southwest and west. In 2010-2016, anglerfish was caught in high numbers in small areas with high catch rates, to a large extent in the northwest (Figures 1 and 2).

Geographic distribution has changed mostly in the form of more aggregated patches, as a result of a large reduction in catches, in the southeast, south, southwest and west area apart from a large increase in the northwest from 2010-2016 (Figure 1).

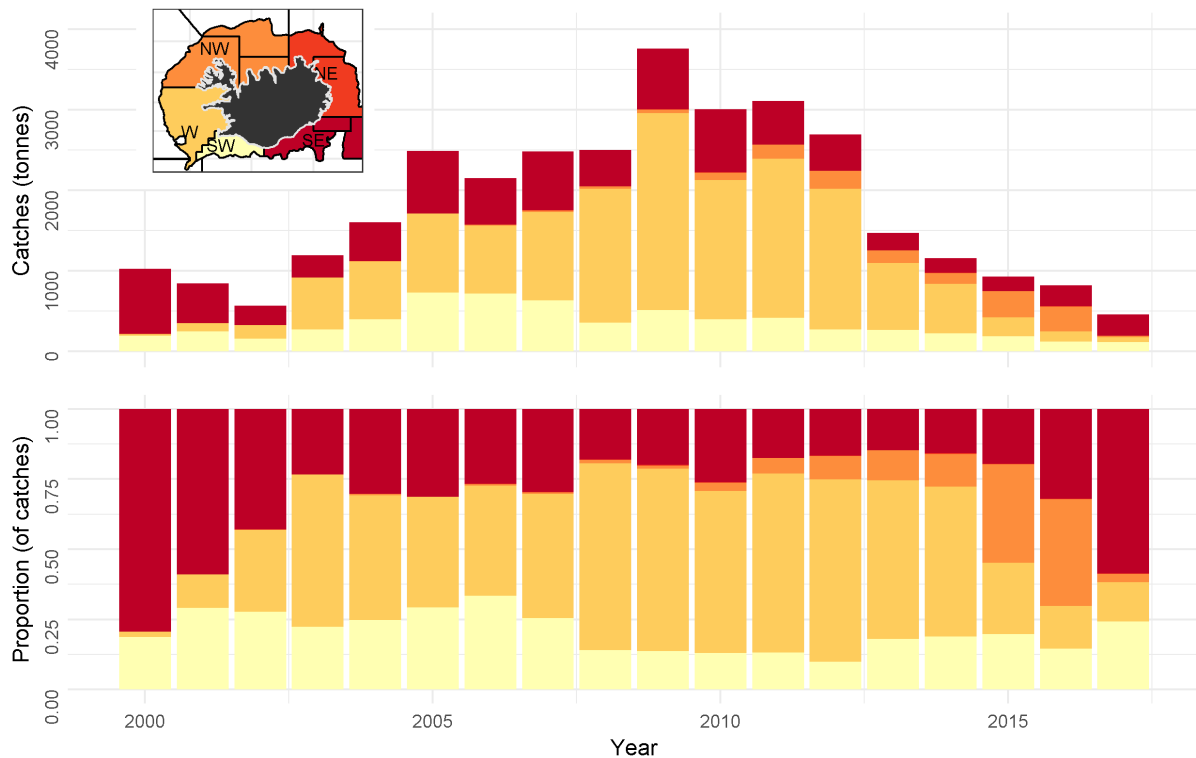


Figure 2. Anglerfish. Catch distribution and proportions by area from the year 2000 according to logbooks.

Mynd 2. Skötuselur. Afli eftir svæðum ásamt hlutfalli innan hvers svæðis frá 2000 samkvæmt afladagbókum.

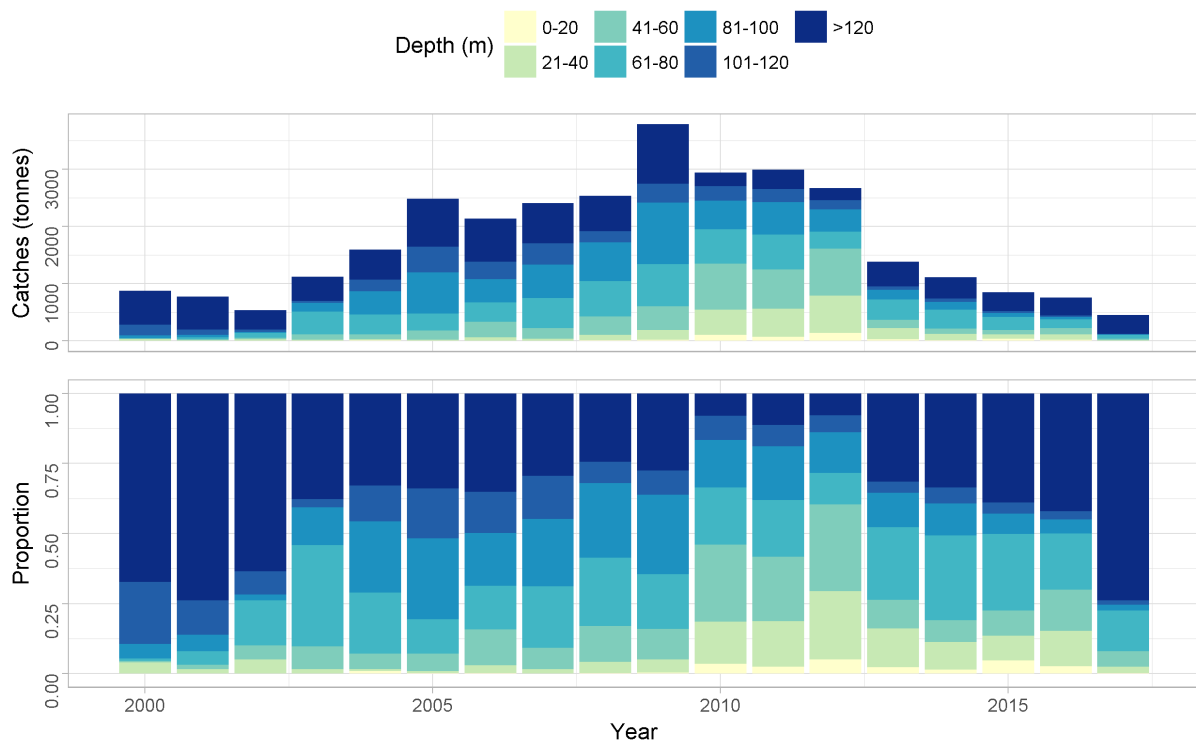


Figure3. Anglerfish. Depth distribution of catches according to logbooks.

Mynd 3. Skötuselur. Afli eftir dýpi samkvæmt afladagbókum.

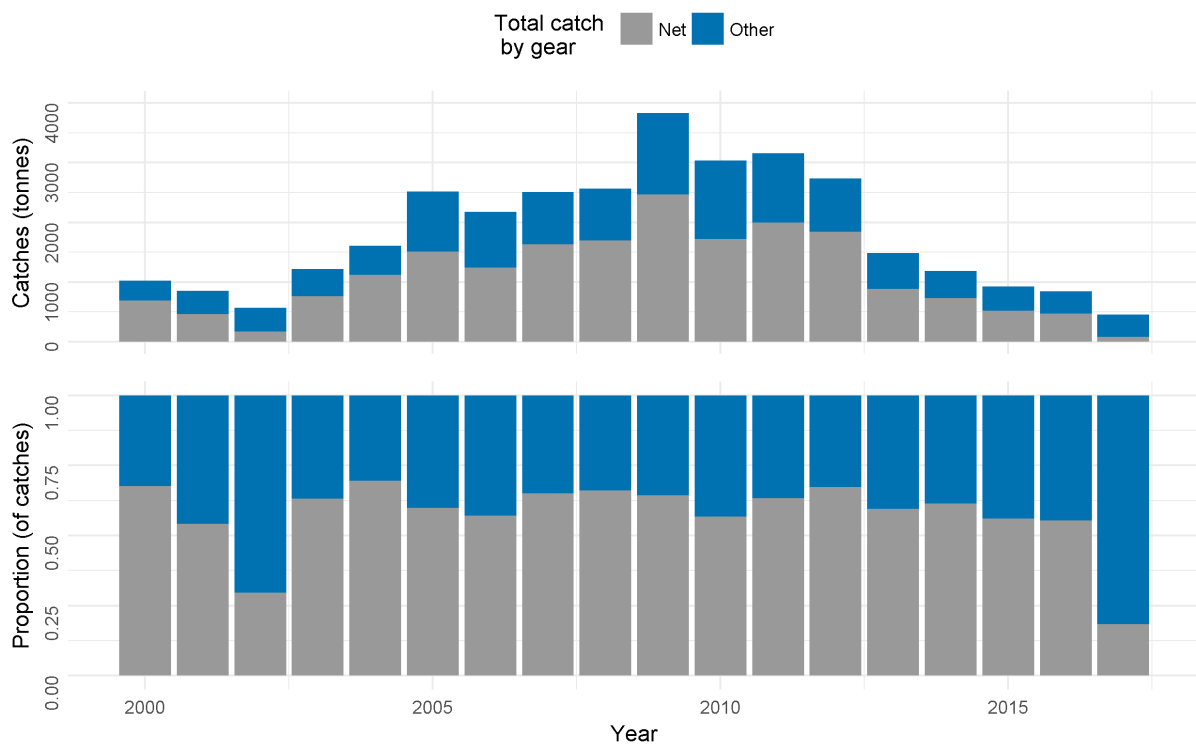


Figure 4. Anglerfish. Total catches and proportion captured with gillnets from 2000 to 2017 as reported in logbooks.

Mynd 4. Skötuselur. Heildarafli ásamt hlutfalli sem veiddist í net frá árinu 2000-2017 samkvæmt afladagbókum.

Table 1. Anglerfish. Number of Icelandic boats reporting captures of anglerfish, captures by fishing gear (gillnets vs. other) and yearly reported landings.

Tafla 1. Skötuselur. Fjöldi íslenskra skipa sem veitt hafa skötusel ásamt lönduðum afla í net eða önnur veiðarfæri ásamt heildarafla fyrir hvert ár.

YEAR	NUMBER OF VESSELS				CATCHES (TONNES)		
	<i>Gillnets</i>	<i>Nephrops trawl</i>	<i>Bottom trawl</i>	<i>Other</i>	<i>Gillnets</i>	<i>Other</i>	<i>Sum</i>
2000	149	34	94	139	834	739	1573
2001	215	36	74	161	613	738	1351
2002	188	36	73	154	248	727	975
2003	167	37	74	180	875	804	1679
2004	158	29	76	181	1211	1012	2223
2005	117	31	79	204	1488	1355	2843
2006	95	28	72	222	1266	1324	2590
2007	92	22	72	232	1484	1307	2791
2008	80	22	63	226	1669	1277	2946
2009	91	17	62	222	2397	1672	4069
2010	132	18	62	207	1762	1520	3282
2011	136	17	54	199	1989	1239	3228
2012	124	18	54	184	1744	923	2667
2013	75	16	58	169	859	637	1496
2014	70	16	50	149	707	479	1186
2015	51	14	45	133	511	424	935
2016	40	12	50	120	501	393	894
2017	37	9	44	108	87	380	467

LENGTH DISTRIBUTIONS FROM COMMERCIAL CATCHES

Recruitment can be observed from length distributions from 2001-2007 after which little recruitment was observed resulting in larger mean length (Figure 5). This is a likely cause for the reduction in catches since 2010 (Figure 5).

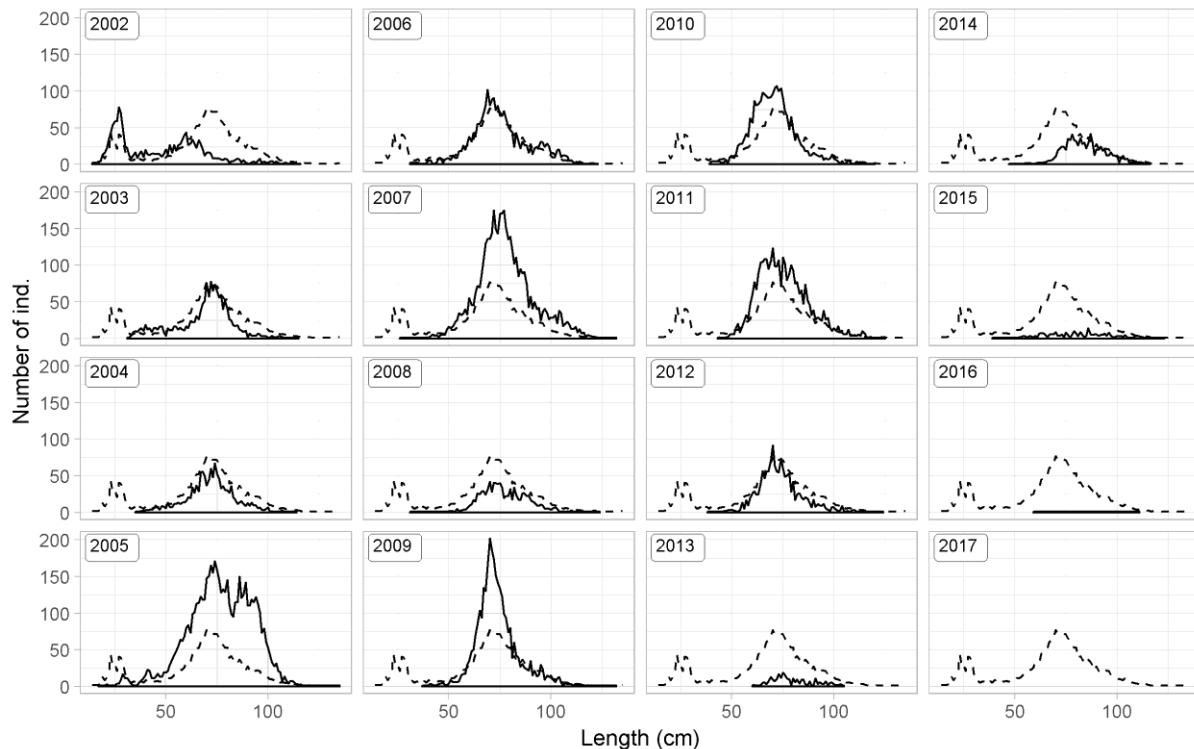


Figure 5. Anglerfish. Length distribution from commercial catches 2002-2017. Dotted lines indicate the average length distribution in 2002-2017.

Mynd 5. Skötuselur. Lengdardreifing úr afla árin 2002-2017. Punktalínan sýnir meðallengdardreifinguna 2002-2017.

SURVEY DATA

The annual Iceland spring groundfish survey has been conducted in March since 1985 and covers the whole Icelandic anglerfish distribution area. An additional autumn groundfish survey has been conducted annually from 1996 but does not represent the anglerfish distribution and abundance as well as the spring survey. Additionally, due to a labour dispute, the autumn survey was not fully completed in 2011. For the purpose of monitoring and advice, harvestable biomass and juvenile indices for ages one and two separately were estimated for the spring groundfish survey (Figure 6). The (harvestable) biomass index is calculated as total biomass of individuals that are 40 cm or larger in total body length. Due to changes in stratification (certain stations were excluded from the analysis as they had not always been included in the survey), the biomass index is somewhat lower than previous years but all trends remain the same. From 1998 to 2005 the biomass index increased rapidly and remained high until 2011 (Figure 6). Juvenile indices, estimated as abundance of one and two year old individuals, where age is estimated from length distribution, show a dramatic reduction in recruitment starting in 2008. This resulted in a change in length distribution towards larger individuals (Figures 5 and 7).

Anglerfish is caught in the spring groundfish survey mainly to the southeast, southwest and northwest of Iceland (Figures 8 and 9), while it is mainly caught in southwest, west and northwest in the autumn

survey (Figures 10 and 11). The cold waters northeast of Iceland are almost completely void of anglerfish. Until 1999, anglerfish was caught almost exclusively in the southeast to southwest after which it was captured in greater numbers in the west and southwest between 1999 and 2007. Since then, the spatial distribution has been equal between the southeast, southwest, west and northwest, with the exception of 2017 when the index was again low in the northwest (Figure 9).

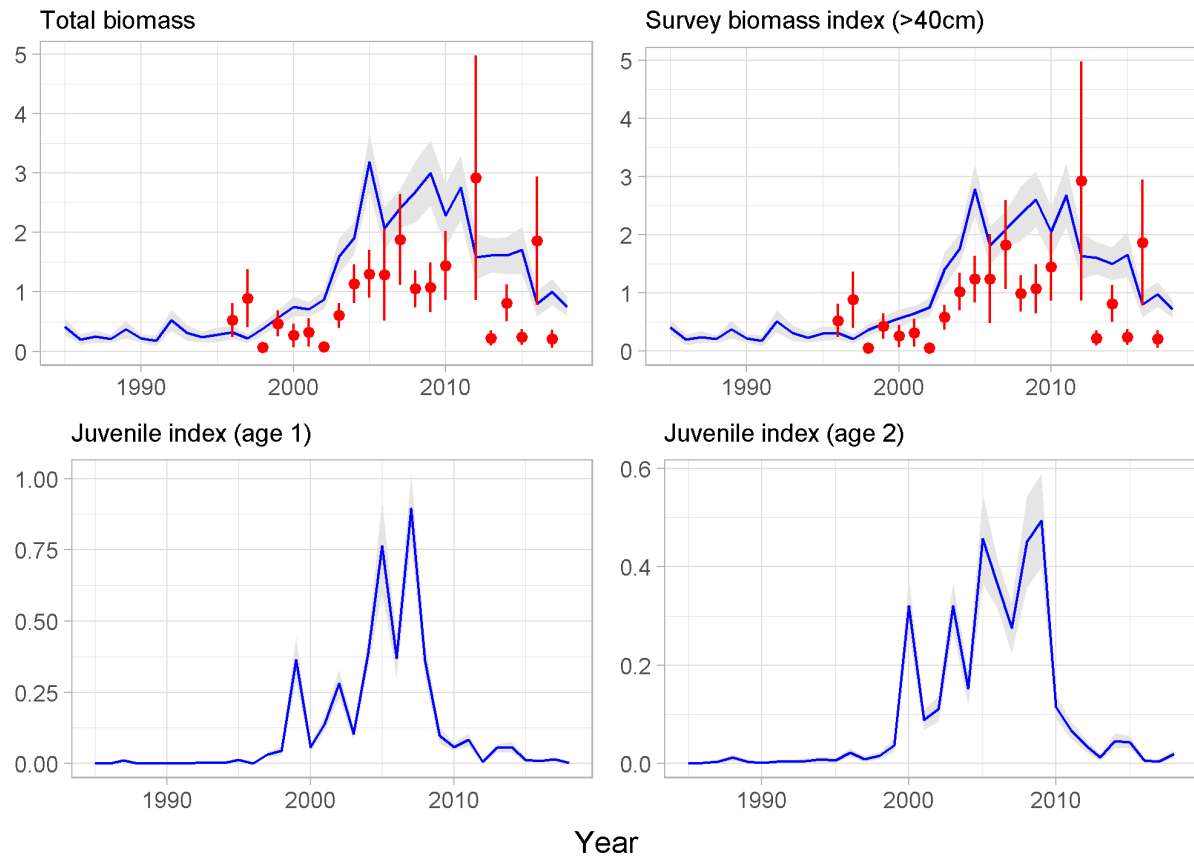


Figure 6. Anglerfish, Total groundfish survey biomass index, reference biomass index (>40cm) and juvenile indices for one and two year olds. Blue lines indicate spring survey and red dots indicate autumn survey. Shaded areas and error bars indicate coefficient of variance.

Mynd 6. Skötuselur. Heildarlífmassavísitala, lífmassavísitala, nýliðunarvísitala (fjöldi eins og tveggja ára) og útbreiðsla í stofnmælingum botnfiska. Gögn úr stofnmælingum að vori eru sýnd með bláum lit og haustleiðangur með rauðum.

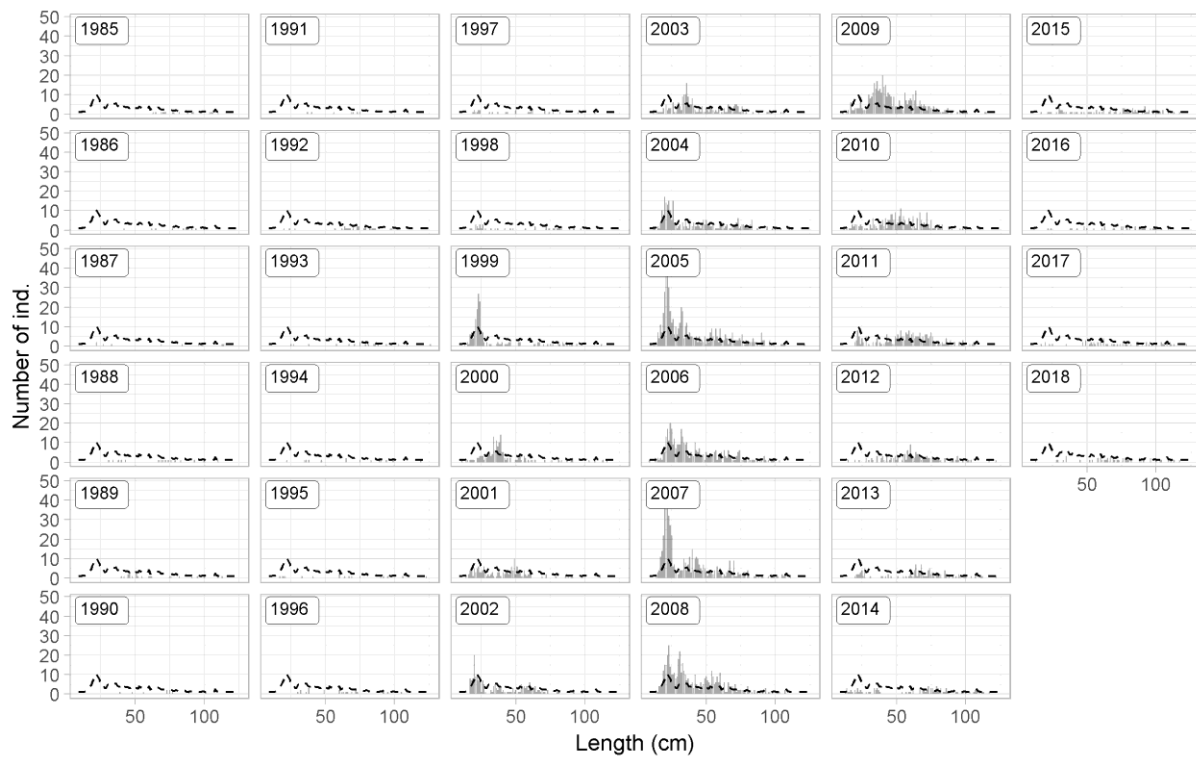


Figure 7. Anglerfish. Length distribution from the spring survey. The dotted line indicates mean length for all years.

Mynd 7. Skötuselur. Lengdardreifing úr stofnmælingum botnfiska að vori frá 1985 ásamt meðallengd (punktalína).

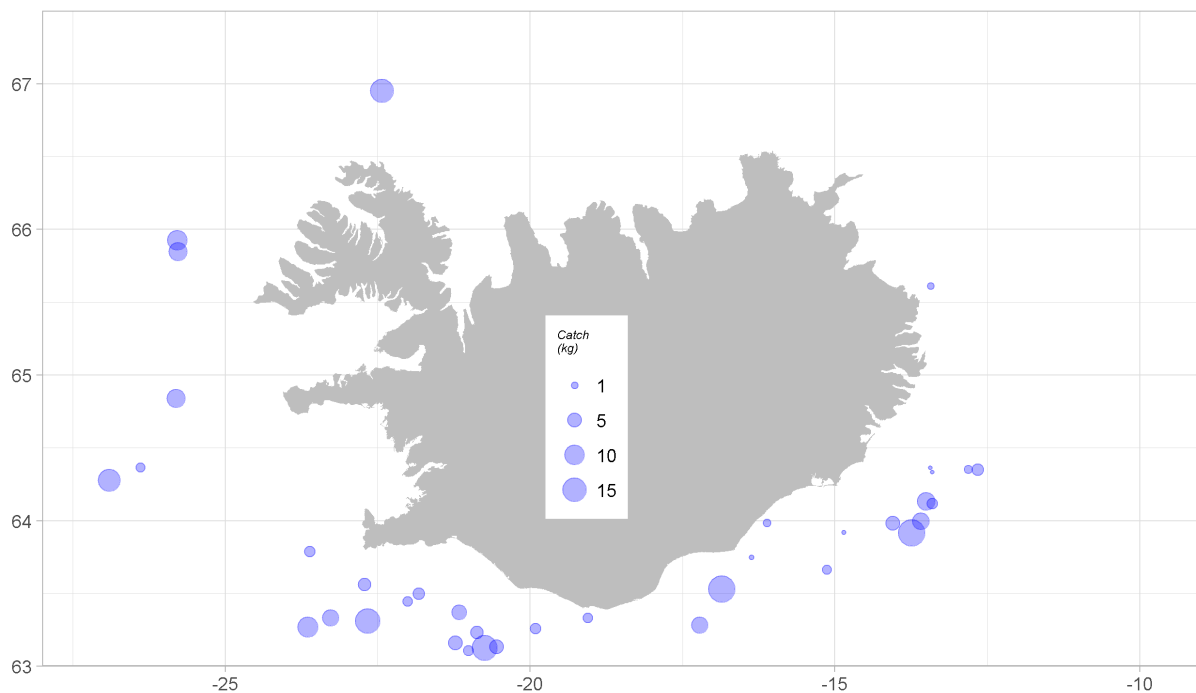


Figure 8. Anglerfish. Spatial distribution from the spring groundfish survey in 2018.

Mynd 8. Skötuselur. Útbreiðsla í stofnmælingum botnfiska að vori árið 2018.

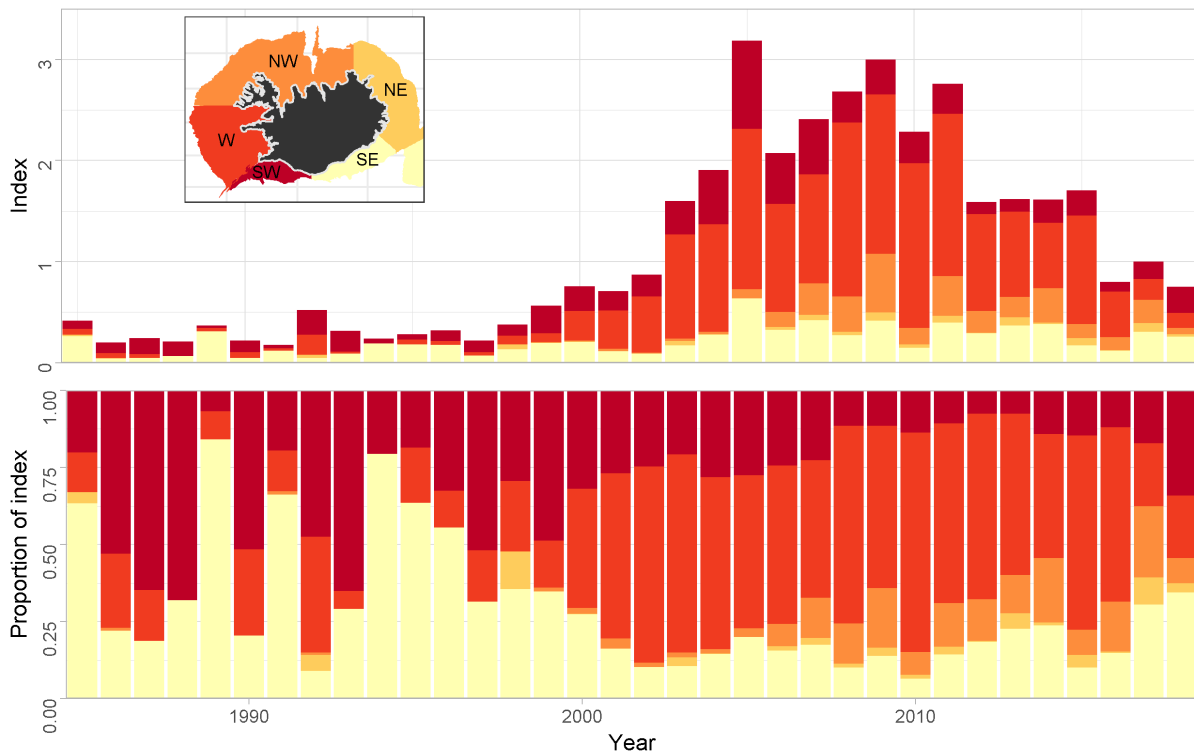


Figure 9. Anglerfish. Spatial distribution of catches from the spring groundfish survey in 1985-2017.

Mynd 9. Skötuselur. Útbreiðsla í stofnmælingum botnfiska að vori árin 1985-2017.

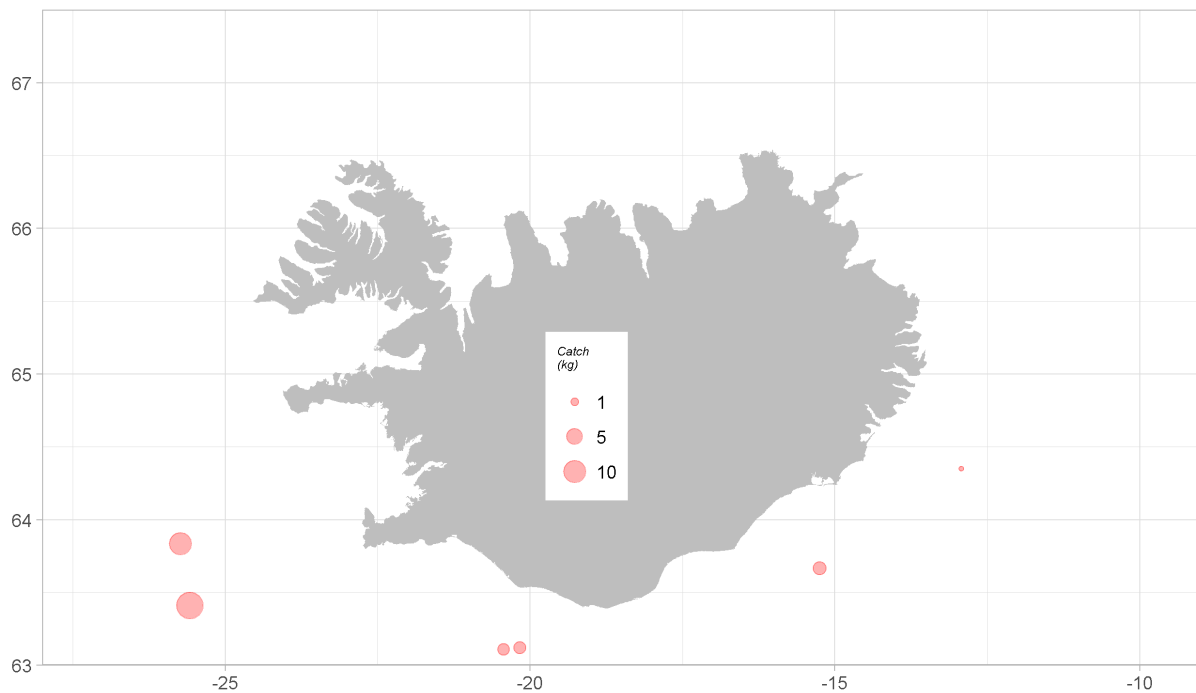


Figure 10. Anglerfish. Spatial distribution of catches from the autumn groundfish survey 2017.

Mynd 10. Skötuselur. Útbreiðsla í stofnmælingum botnfiska að hausti árið 2017.

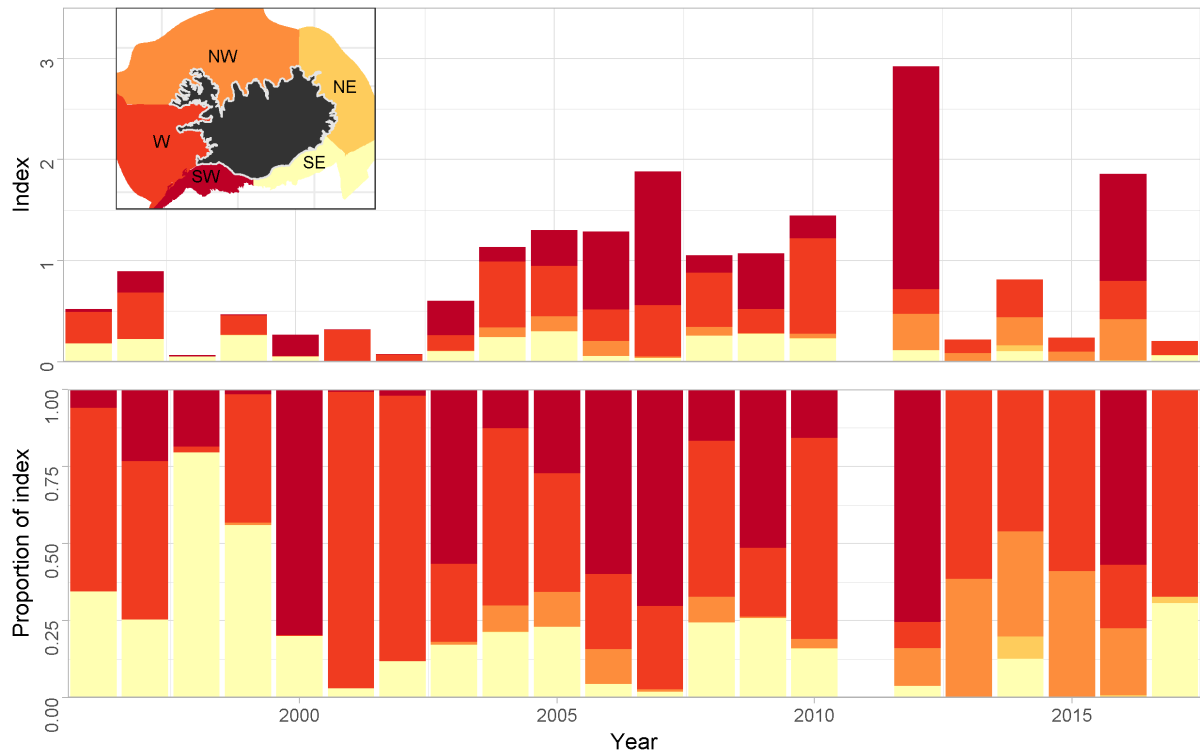


Figure 11. Anglerfish. Spatial distribution of catches from the autumn groundfish survey in 1996-2017.

Mynd 11. Skötuselur. Útbreiðsla í stofnmælingum 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. Anglerfish has been subject to TAC limitations from the 2001/2002 quota year. From the quota year 2003/2004 to 2012/2013, TAC limitations were set higher than recommended by the Marine Research Institute while catches were sometimes even higher. Since 2015/16 however, catches have been 5-9% lower than the set TAC (Table 2).

Figure 12 shows the net transfer of quota to and from anglerfish in the Icelandic ITQ system. During years with high catches, quota from other species was transferred to anglerfish. Since the population started declining anglerfish quota has been transferred to other species. Transfer of anglerfish quota between fishing years was under 10% for the last ten years, but was much higher or 17% in the 2016/17 quota year.

Table 2. Anglerfish. Recommended TAC, national TAC set by the Ministry of Industries and Innovation, and landings (tonnes).

Tafla 2. Skötuselur. Tillögur Hafrannsóknastofnunar um hámarksafla, ákvörðun stjórnvalda um aflamark og landaður afli (tonn).

FISHING YEAR	REC. TAC	NATIONAL TAC	CATCH
2001/02	-	1500	1001
2002/03	-	1500	1363
2003/04	1500	2000	1903
2004/05	1500	2000	2420
2005/06	2200	3000	2832
2006/07	2200	3000	2672
2007/08	2200	2500	2962
2008/09	2500	3000	3436
2009/10	2500	3200	3598
2010/11	2500	3000	3376
2011/12	2500	2850	3006
2012/13	1500	1800	1930
2013/14	1500	1500	1398
2014/15	1000	1000	1080
2015/16	1000	1000	913
2016/17	711	711	677
2017/18	853	853	
2018/19	722		

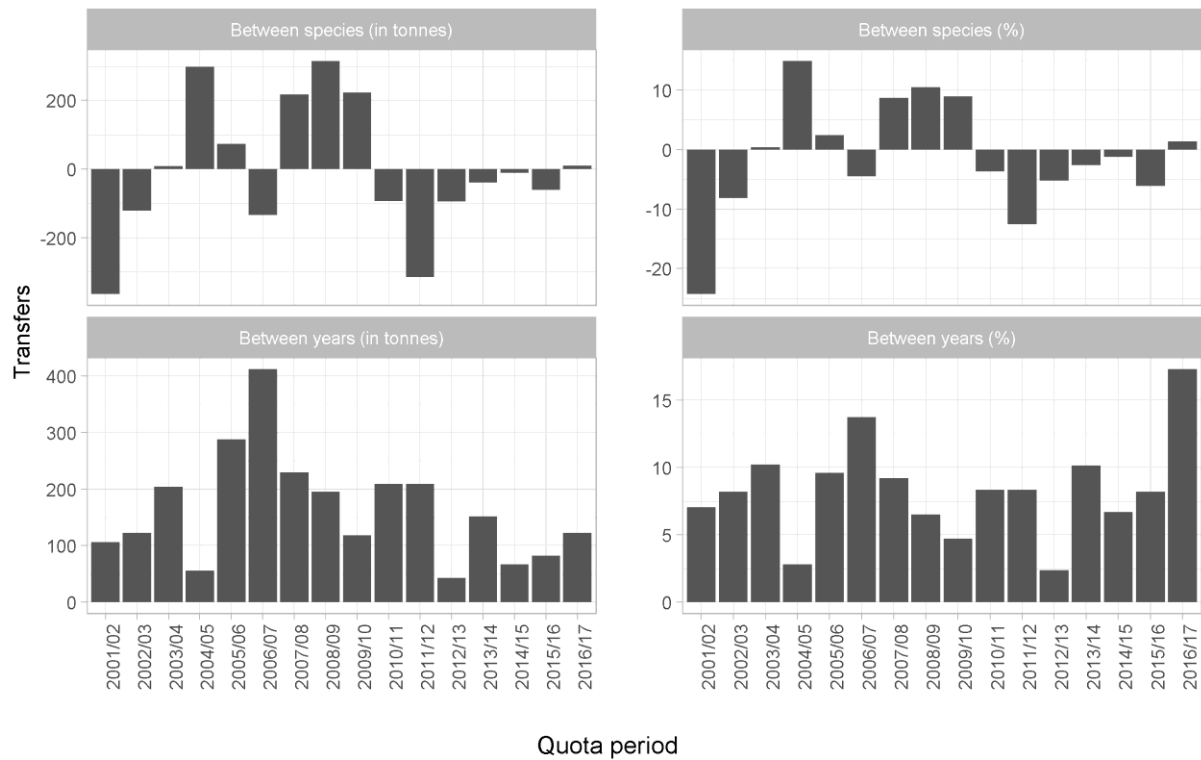


Figure 18. Anglerfish. Net transfers of quota in the Icelandic ITQ system by quota year. Between species (upper): Positive values indicate a transfer of other species' quota to anglerfish, but negative values indicate a transfer of anglerfish quota to other species. **Between years (lower):** Transfer of quota from the given quota year to the next quota year.

Mynd 18. Skötuselur. Nettó tilfærsla á kvóta eftir fiskveiðiarum. Tilfærsla milli tegunda (efri myndir): Jákvæð gildi tákna tilfærslu á kvóti annarra tegunda yfir á skötusel en neikvæð gildi tilfærslu skötuselskvóta á aðrar tegundir. Tilfærsla milli ára (neðri myndir): Tilfærsla kvóta frá viðkomandi fiskveiðiarum yfir á næsta fiskveiðiar.

ADVICE

Annual advice is given based on the ICES framework for category 3 stocks (ICES, 2012) where reliable stock biomass indices are available but without the possibility of analytical age-length based assessments. Spring survey biomass for anglerfish is an estimate for the biomass of individuals 40 cm and larger which, along with catch, is used to calculate F_{proxy} (catch/survey biomass index, Figure 13). A target F_{proxy} is calculated as 80% of the mean F_{proxy} in the reference period 2003-2015. The 20% reduction was added due to higher than optimal fishing mortality in previous years. Advice is calculated by multiplying the most recent values for biomass index with the target F_{proxy} , or $737 \times 0.98 = 722$ tonnes. As 722 is 15% lower than last year, the uncertainty cap, limiting change in advice between years to 20%, is not applied. The advice for the quota year 2018/2019 is therefore 722 tonnes (Table 3).

Table 3. Anglerfish. Advice calculations.

Tafla 3. Skötuselur. Útreikningur ráðgjafar.

Index 2018	737	
Target F_{proxy}	$0.8 \times 1.22 = 0.98$	
Advice 2017	853	
Index 2018 x Target F_{proxy} / Advice 2017	0.85	
Uncertainty cap	Not applied	20%
Catch advice	$737 \times 0.98 = 722$ t	

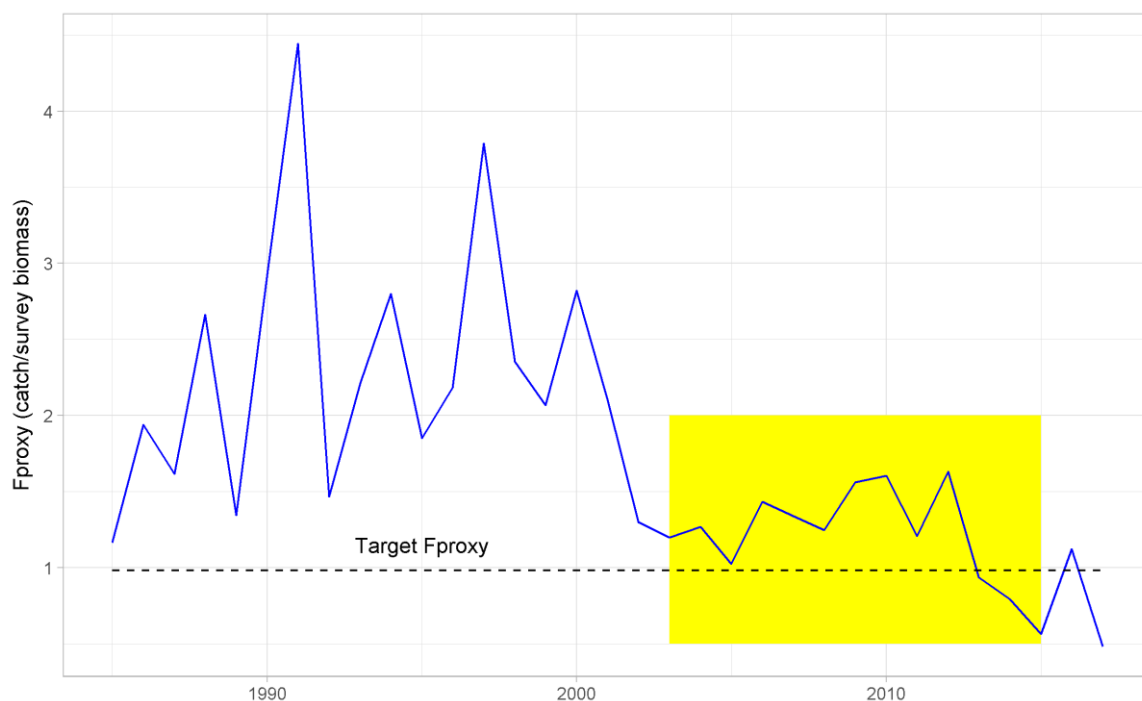


Figure 13. Anglerfish. F_{proxy} (catch/survey biomass). The target F_{proxy} is set as 80% of the mean value for the reference period (in yellow, 2003-2015).

Mynd 13. Skötuselur. Vísitala veiðihlutfalls ($F_{\text{proxy}} = \text{afli}/\text{vísitala}$). Markgildi (target F_{proxy}) er 80% af meðaltali árunna 2003-2015 (hér gult).