

ANGLERFISH - SKÖTUSELUR

Lophius piscatorius

GENERAL INFORMATION

Anglerfish (or monkfish) 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 Icelandic groundfish surveys. 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 anglerfish, which renders it more sensitive to changes in temperature and salinity, than many other species.

THE FISHERY

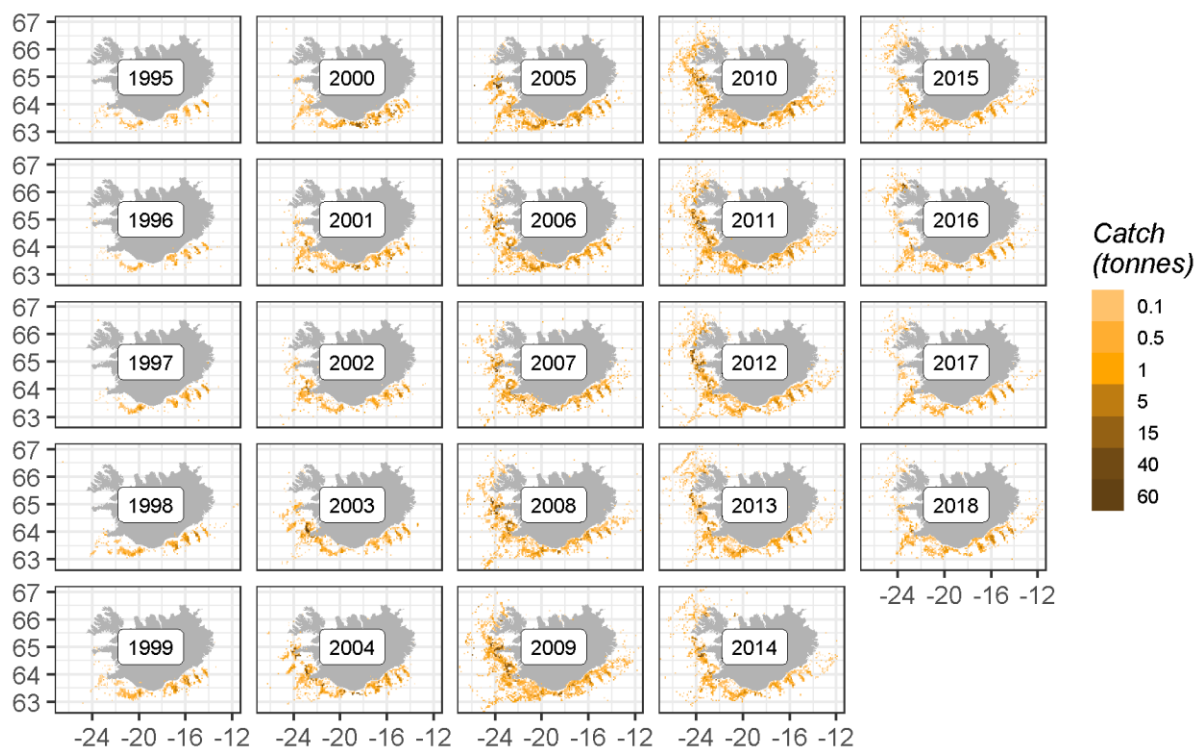


Figure 1. Anglerfish. Geographic distribution of the Icelandic fishery since 1995 as reported in logbooks.

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

In 2017-2018, 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).

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 declined annually amounting to 467 tonnes in 2017 but have since increased to 643 tonnes in 2018. 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 and 16% in 2018 (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. During the past two years, spatial distribution has started to resemble that of the period before the large increase started around 2003 (Figure 1).

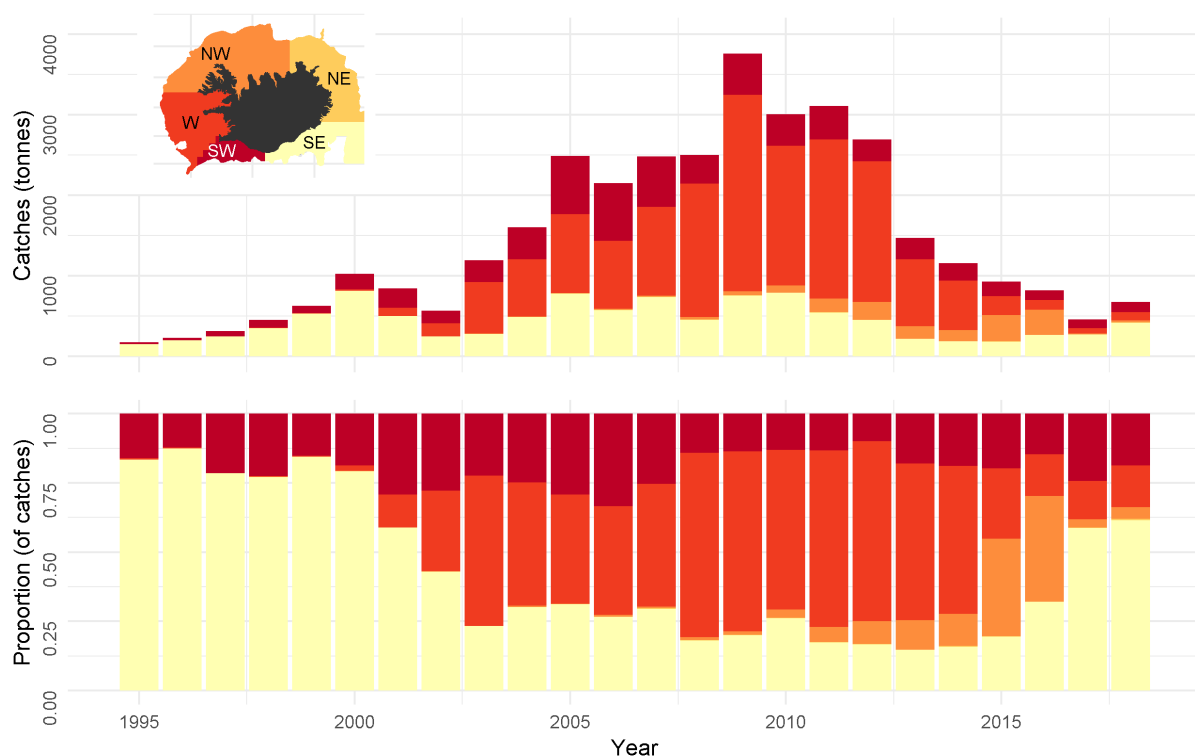


Figure 2. Anglerfish. Catch distribution and proportions by area from 1995 according to logbooks.

Mynd 2. Skötuselur. Afli eftir svæðum ásamt hlutfalli innan hvers svæðis frá árinu 1995 samkvæmt afladagbókum.

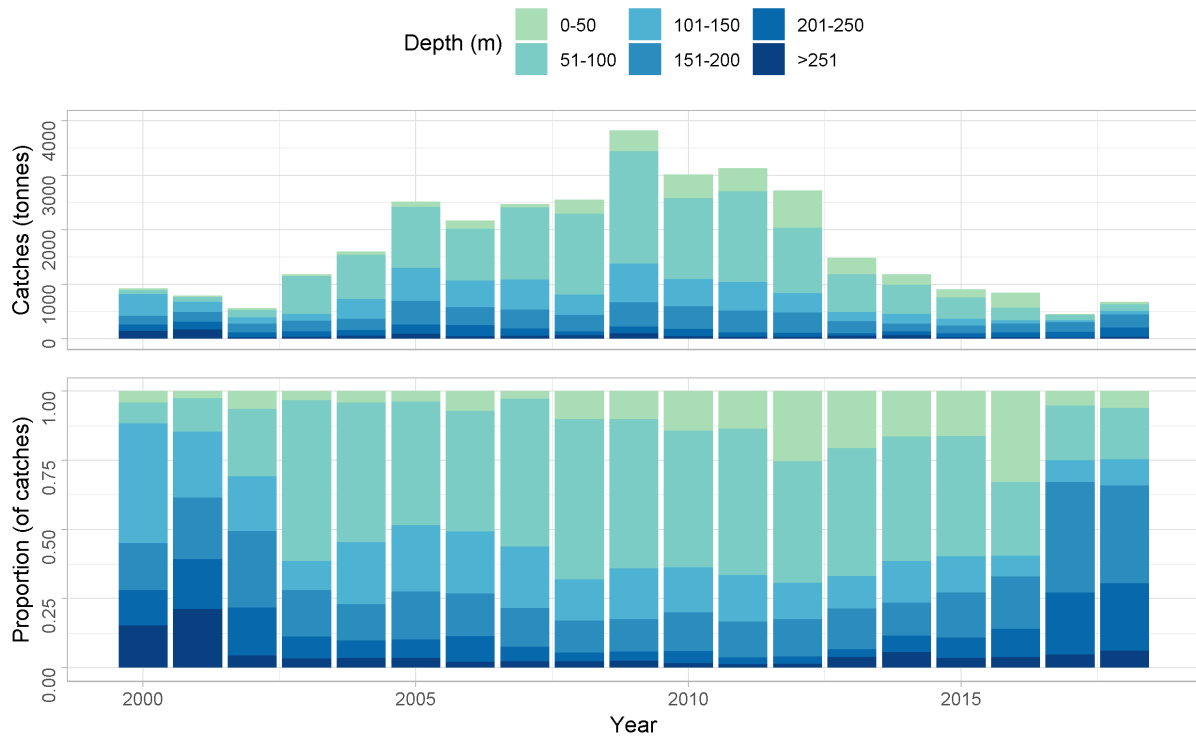


Figure3. Anglerfish. Depth distribution of catches according to logbooks.

Mynd 3. Skötuselur. Afli eftir dýpi samkvæmt afladagbókum.

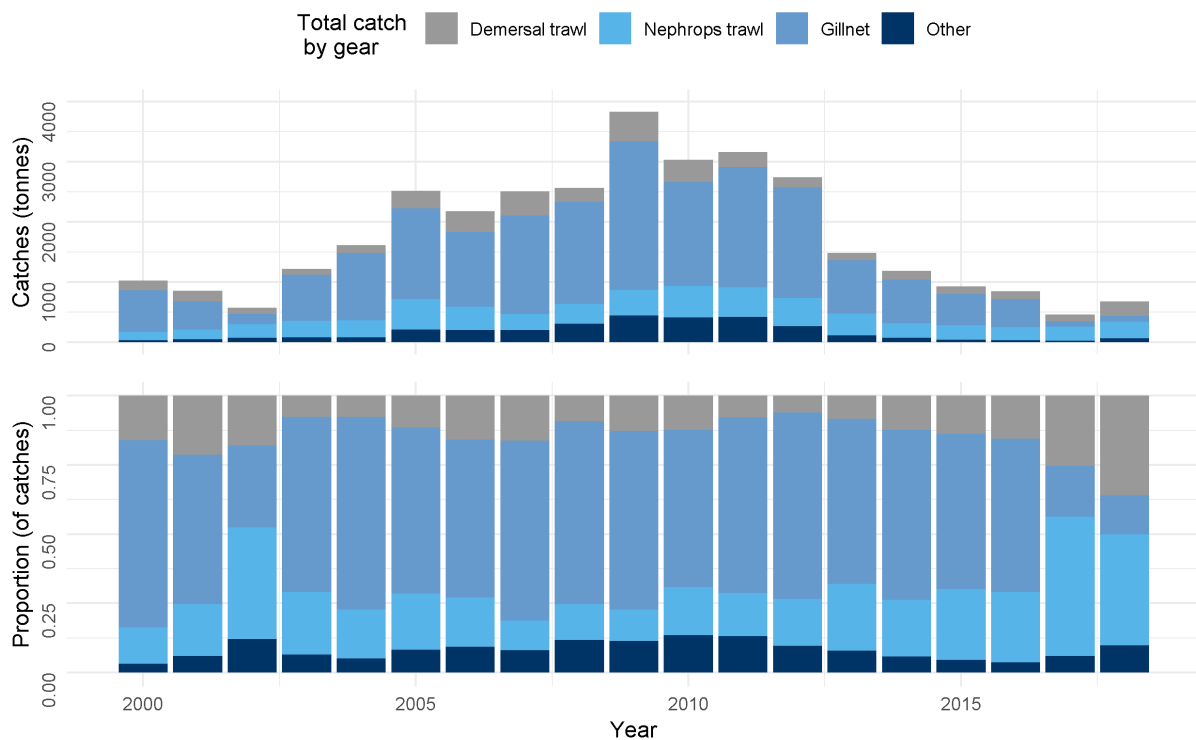


Figure 4. Anglerfish. Total catches and proportion captured with bottom trawl, gillnets, *Nephrops* trawl or other gear since 2000 as reported in logbooks.

Mynd 4. Skötuselur. Heildarafli ásamt hlutfalli sem veiddist í botnvörpu, net, humarvörpu eða önnur veiðarfæri frá árinu 2000 samkvæmt afladagbókum.

Table 1. Anglerfish. Number of Icelandic vessels reporting captures of anglerfish, and landed catch divided by gear type.*Tafla 1. Skötuselur. Fjöldi íslenskra skipa sem landað hafa skötusel ásamt heildarafla og afla eftir veiðarfærum.*

YEAR	NUMBER OF VESSELS				CATCHES (TONNES)				
	<i>Bottom trawl</i>	<i>Gillnets</i>	<i>Nephrops trawl</i>	<i>Other</i>	<i>Bottom trawl</i>	<i>Gillnets</i>	<i>Nephrops trawl</i>	<i>Other</i>	<i>Sum</i>
2000	94	149	34	139	355	834	220	164	1573
2001	74	215	36	161	279	613	251	208	1351
2002	73	188	36	154	185	248	309	233	975
2003	74	167	37	180	184	875	341	279	1679
2004	76	158	29	181	307	1211	353	352	2223
2005	79	117	31	204	451	1488	514	390	2843
2006	72	95	28	222	488	1266	405	431	2590
2007	72	92	22	232	560	1484	310	437	2791
2008	63	80	22	226	381	1669	341	555	2946
2009	62	91	17	222	574	2397	419	679	4069
2010	62	132	18	207	452	1762	556	512	3282
2011	54	136	17	199	299	1989	475	465	3228
2012	54	124	18	184	175	1744	444	304	2667
2013	58	75	16	169	142	859	339	156	1496
2014	50	70	16	149	140	707	234	105	1186
2015	45	51	14	133	141	511	223	60	935
2016	50	40	12	120	156	501	200	37	894
2017	44	29	9	121	129	87	213	38	467
2018	47	31	9	96	248	100	244	51	643

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).

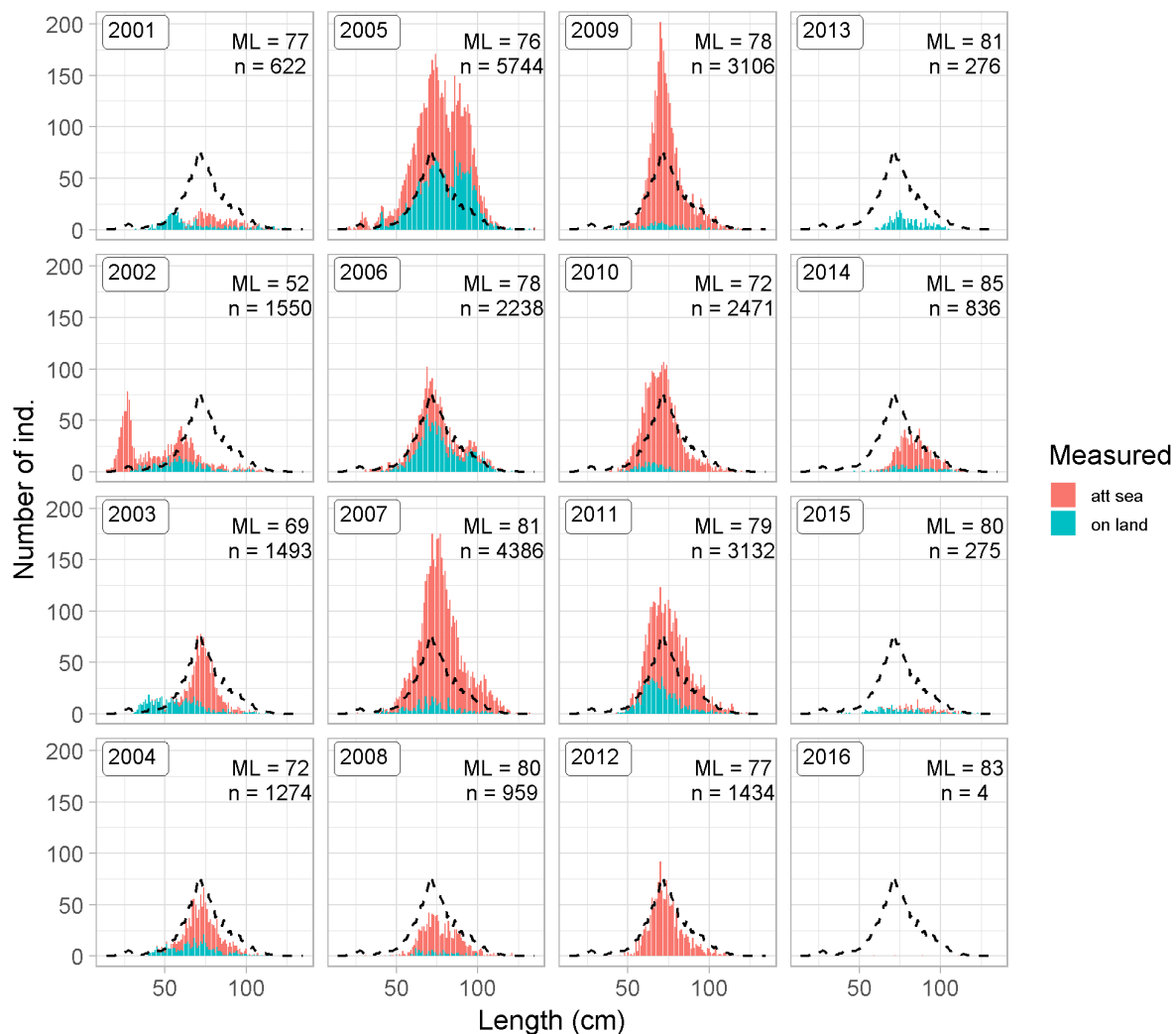


Figure 5. Anglerfish. Relative length distribution from commercial catches 2001-2016. Dotted lines indicate the average length distribution in 2001-2015. No length measurements are available for 2016-2018.

Mynd 5. Skötuselur. Hlutfallsleg lengdardreifing úr afla árin 2001-2015. Punktalínan sýnir meðallengdardreifinguna 2001-2016. Engir skötuselir voru mældir úr afla árin 2016-2018.

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 40 cm or larger in total body length. From 1998 to 2005 the biomass index increased rapidly and remained high until 2011 but has declined since with the exception of a small increase from 2018 to 2019 (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 relative length distribution towards larger individuals (Figure 7).

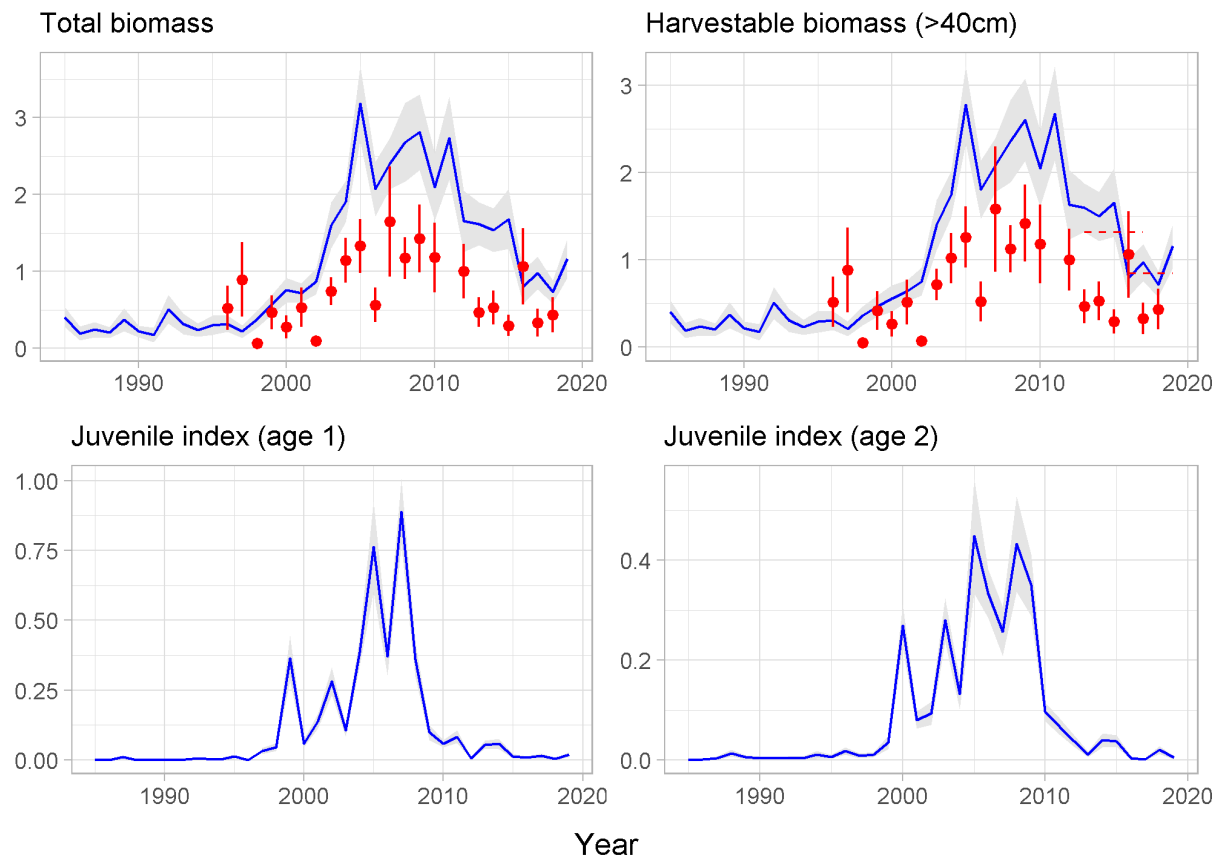


Figure 6. Anglerfish, Total groundfish survey biomass index, harvestable biomass index (>40 cm) and juvenile indices for one and two year olds. Blue lines indicate spring survey and red dots indicate autumn survey. Shaded areas and error bars indicate standard deviation.

Mynd 6. Skötuselur. Heildarlífsmassavísitala, lífmassavísitala veiðistofns, nýliðunarvísitala (fjöldi eins og tveggja ára). Gögn úr stofnmælingum að vori (blátt) og hausti (rautt).

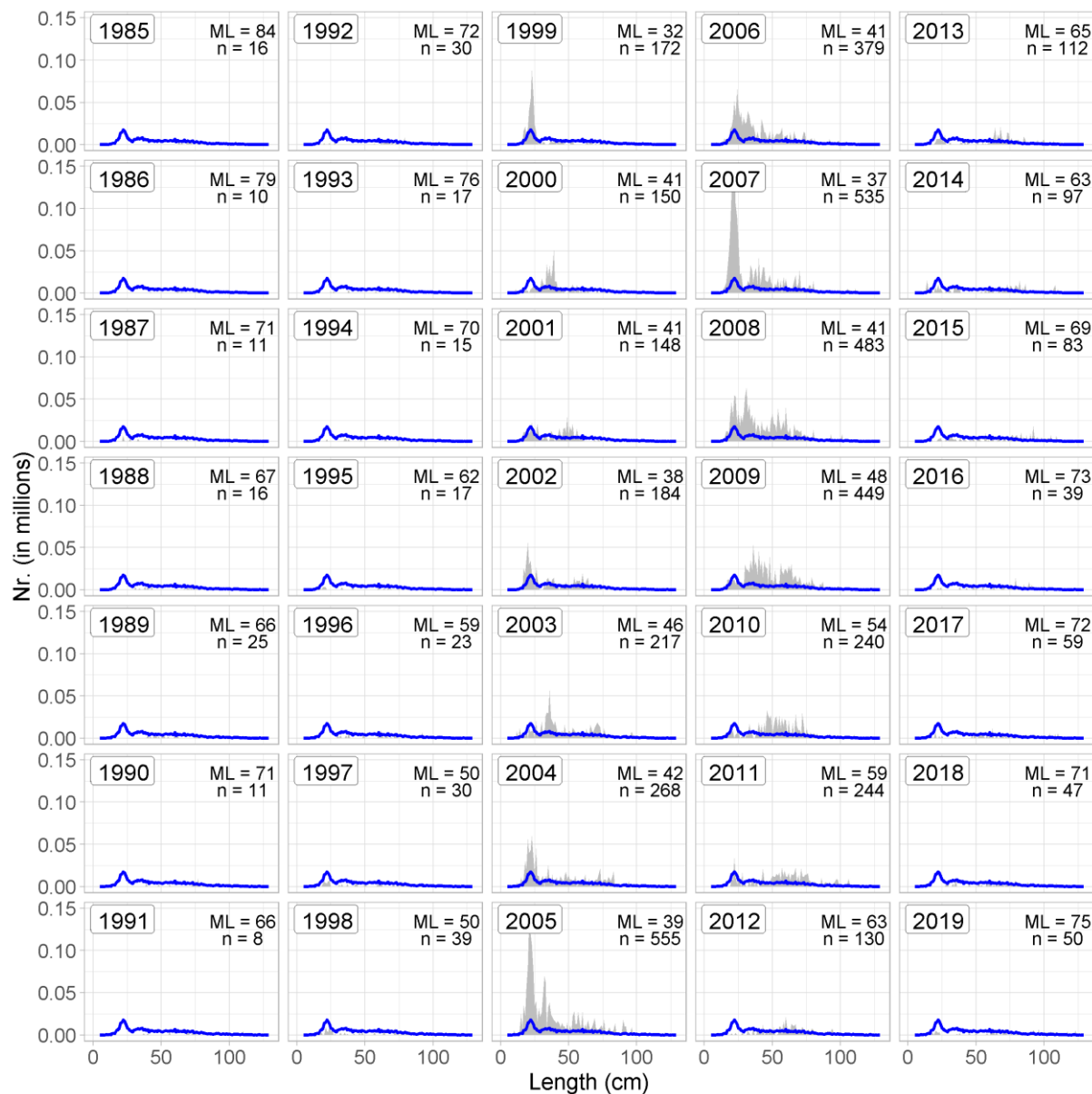


Figure 7. Anglerfish. Length distribution from the spring survey. The blue line indicates mean length for all years.

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

Anglerfish is caught in the spring groundfish survey mainly to the southeast, southwest and northwest of Iceland (Figures 8 and 9). The cold waters northeast and east 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 northwest until 2016-2017. Since then, the relative abundance has decreased in the northwest and west (Figure 9).

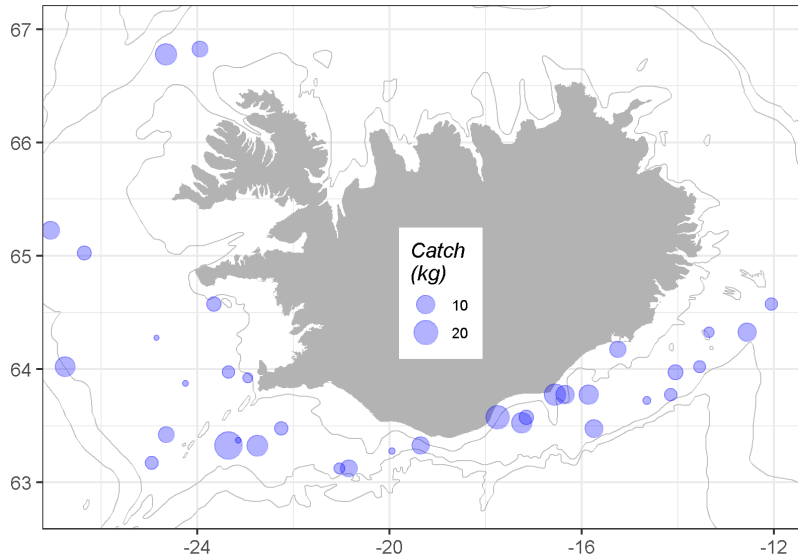


Figure 8. Anglerfish. Spatial distribution from the spring groundfish survey in 2019. Grey lines indicate depth of 100, 500 and 1000 meters.

Mynd 8. Skötuselur. Útbreiðsla í stofnmælingum botnfiska að vori árið 2019. Sýndar eru 100, 500 og 1000 metra dýptarlínur.

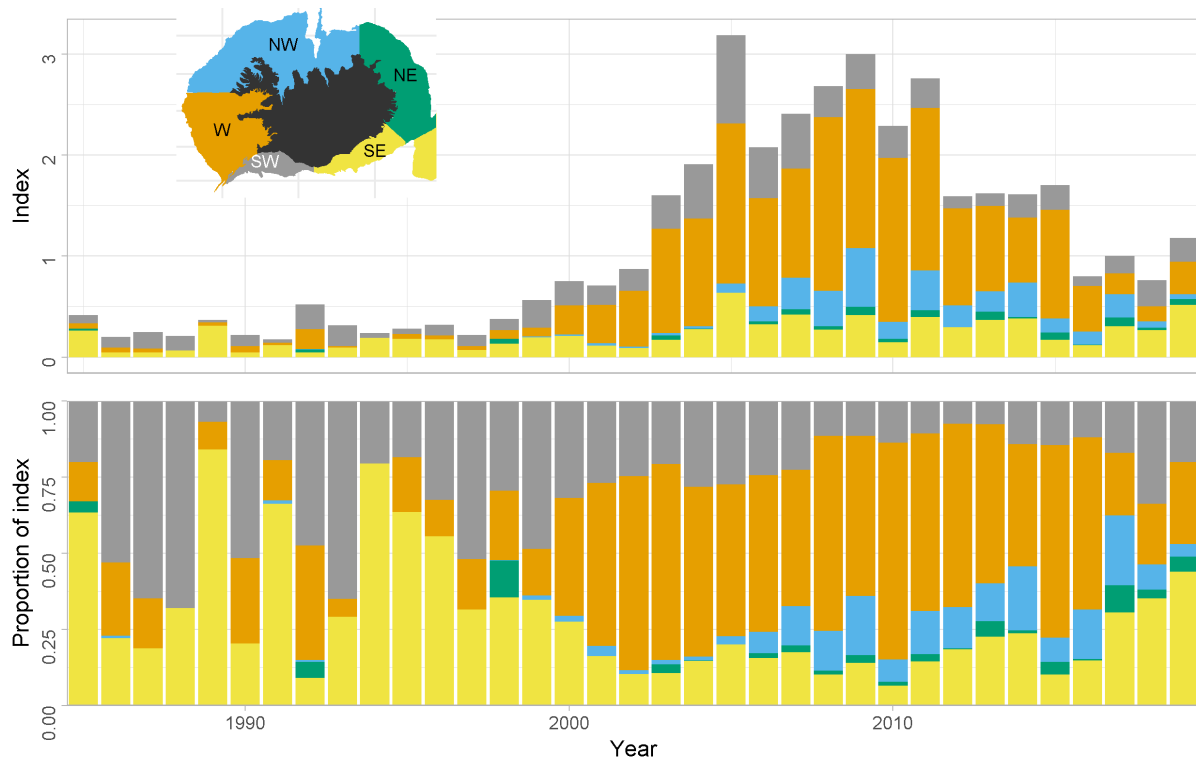


Figure 9. Anglerfish. Spatial distribution of catches from the spring groundfish survey.

Mynd 9. Skötuselur. Útbreiðsla í stofnmælingum botnfiska að vori.

In the autumn survey anglerfish is mainly caught in southwest, west and northwest (Figures 10 and 11). Relative abundance in the NW area was usually high in 2005-2017, in accordance to the spring survey

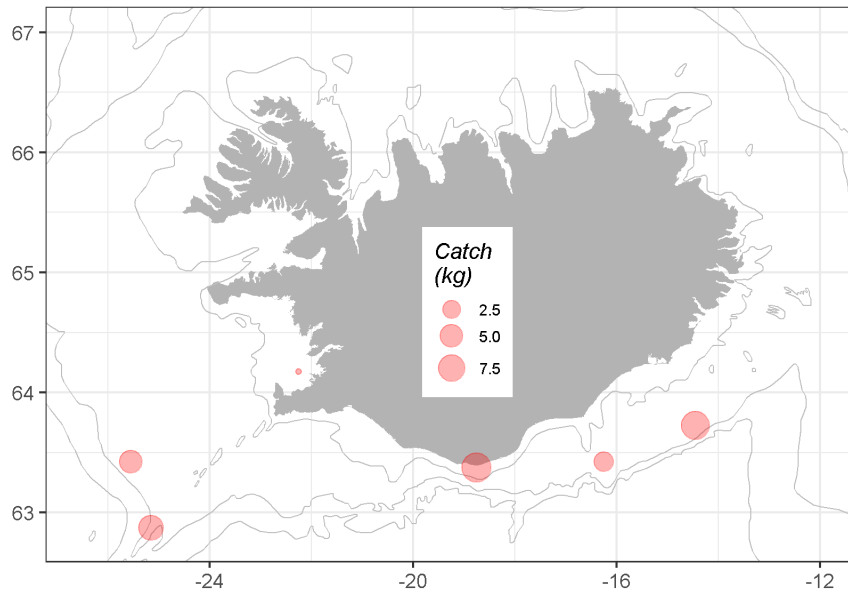


Figure 10. Anglerfish. Spatial distribution of catches from the autumn groundfish survey 2018. Grey lines indicate depth of 100, 500 and 1000 meters.

Mynd 10. Skötuselur. Útbreiðsla í stofnmælingum botnfiska að hausti árið 2018. Sýndar eru 100, 500 og 1000 metra dýptarlínur.

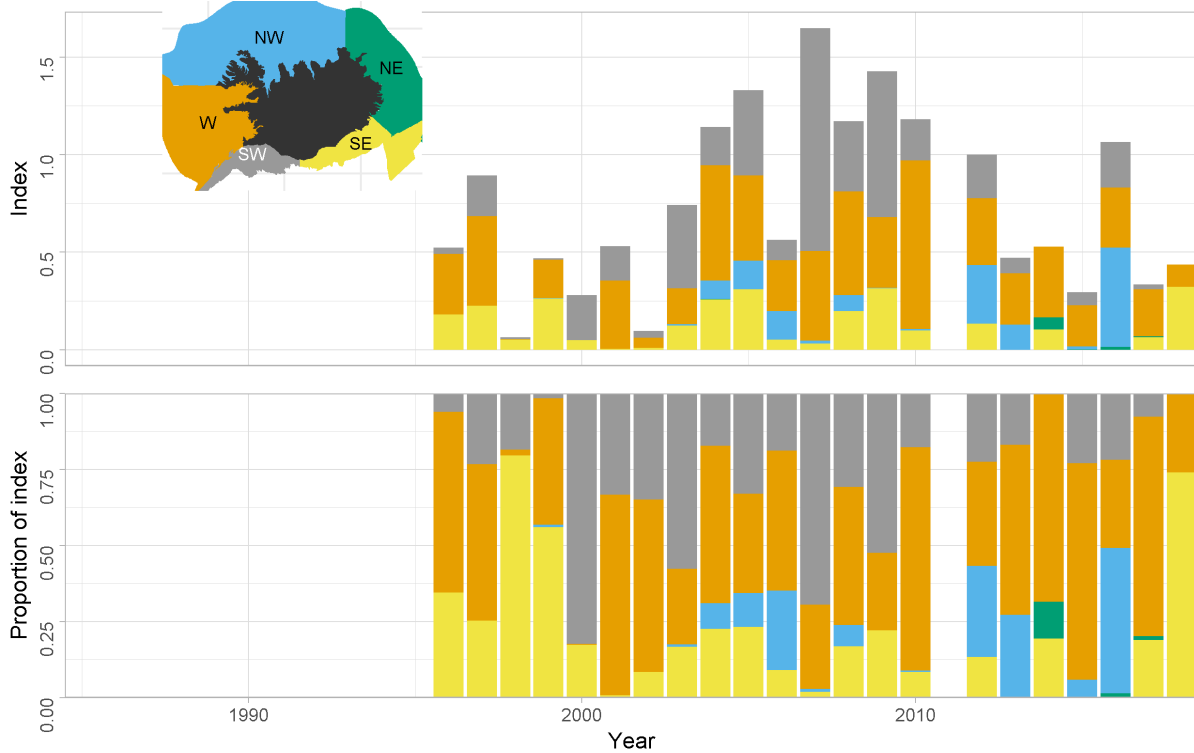


Figure 11. Anglerfish. Spatial distribution of catches from the autumn groundfish survey.

Mynd 11. Skötuselur. Útbreiðsla í stofnmælingum botnfiska að hausti

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 and, additionally, catches were sometimes even higher. Since 2015/2016 however, catches were 5-9% lower than the set TAC until 2017/2018 when they were 23% lower (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, which amounted to 12% in the 2017/2018 quota year. Transfer of anglerfish quota to the next fishing year has usually been under 12%.

Table 2. Anglerfish. Recommended TAC, national TAC set by the Ministry, 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	653
2018/19	722	722	
2019/20	441		

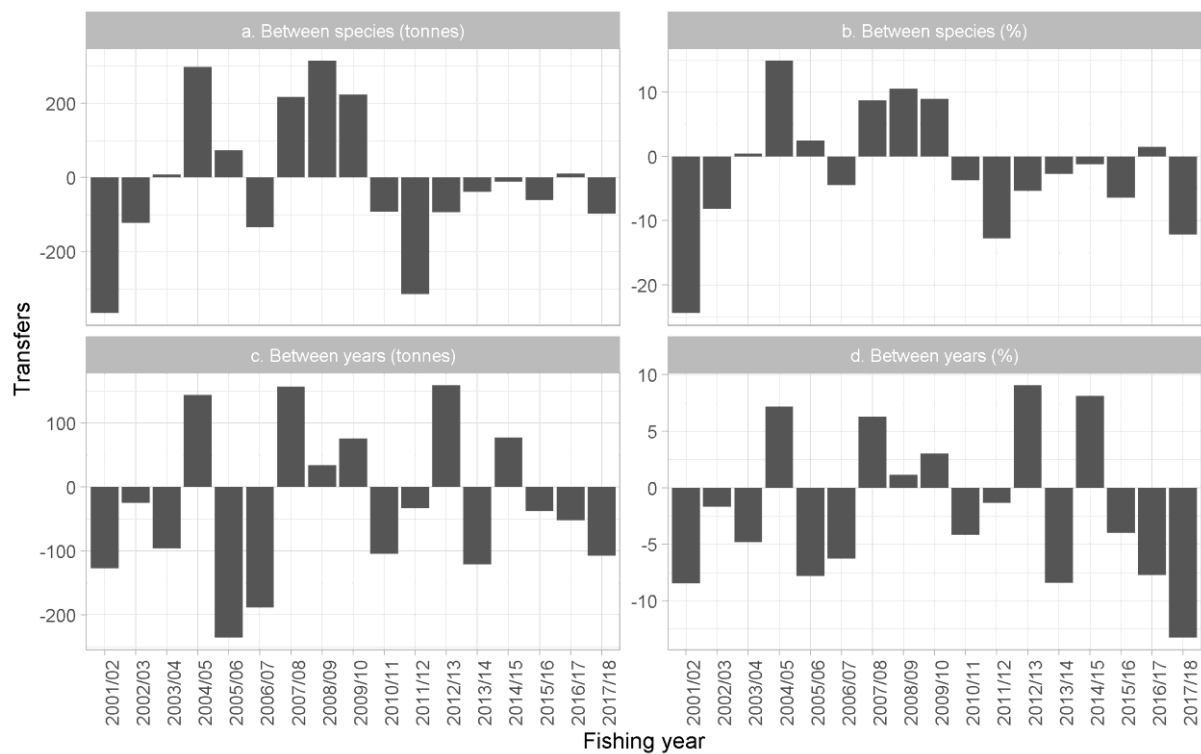


Figure 12. Anglerfish. Net transfers of quota in the Icelandic ITQ system by quota year. Between species (upper): Positive values indicate a net transfer of other species' quota to anglerfish, but negative values indicate a net transfer of anglerfish quota to other species. Between years (lower): Net transfer of quota in a given quota year.

Mynd 18. Skötuselur. Nettó tilfærsla á kvóta eftir fiskveiðiárum. 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): Nettó tilfærsla kvóta á viðkomandi fiskveiðiári.

ADVICE

In 2012-2018, annual advice was given based on the ICES framework for category 3.3 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, along with catch, was used to calculate F_{proxy} (catch/survey biomass index). A target F_{proxy} was calculated as 80% of the mean F_{proxy} in the reference period 2003-2015. Advice was calculated by multiplying the most recent values for biomass index with the target F_{proxy} , though limited to change in advice between years to 20%.

After nearly a decade of very low recruitment estimates, the target F_{proxy} is no longer appropriate. Consequently, the ICES framework for category 3 stocks using survey trends was applied instead. As before, the spring survey index was used as the index for the stock development. The advice is now based on the ratio of the mean of the last two index values (index A) and the mean of the three preceding values (index B) multiplied by the mean catches in the last three years. The index ratio is estimated to have decreased by 20% and thus the uncertainty cap was not applied. The stock status relative to candidate reference points is unknown and the precautionary buffer was applied. The result is advice for 2019/2020 set at 441 t ($(942/1142) \times 668 \times 0.8$), which results in a 39% decrease from last year's advice.

Table 3. Anglerfish. Advice calculations.

Tafla 3. Skötuselur. Útreikningur ráðgjafar.

Vísitala A (2017-2018) – Index A (2017-2018)		942
Vísitala B (2014-2016) – Index B (2014-2016)		1142
Vísitölulutfall (A/B) – Index ratio (A/B)		0.8
Sveiflujöfnun – Uncertainty cap	Ekki beitt – Not applied	-
Meðalafli 2016-2018 – Average catches 2016-2018		668
Varúðarlækkun – Precautionary buffer	Beitt – Applied	0.8
Ráðgjöf – Catch advice		$668 * 0.82 * 0.8 = 441$ t