

SHRIMP IN SKJÁLFANDI – RÆKJA Í SKJÁLFANDA

Pandalus borealis

THE FISHERY

Shrimp fishing started in Skjálfandi in 1990. The catch increased to around 1000 tonnes in six years and decreased sharply until 1998. No fishing was allowed from the autumn 1999 until 2012 due to low biomass indices, but in 2012 and 2015 catches were 85 and 142 tonnes, respectively (Figure 1). The quota year has been from early winter (following the survey in October) until 30 April. CPUE increased sharply in the beginning but after a maximum in 1996 it decreased until 1998.

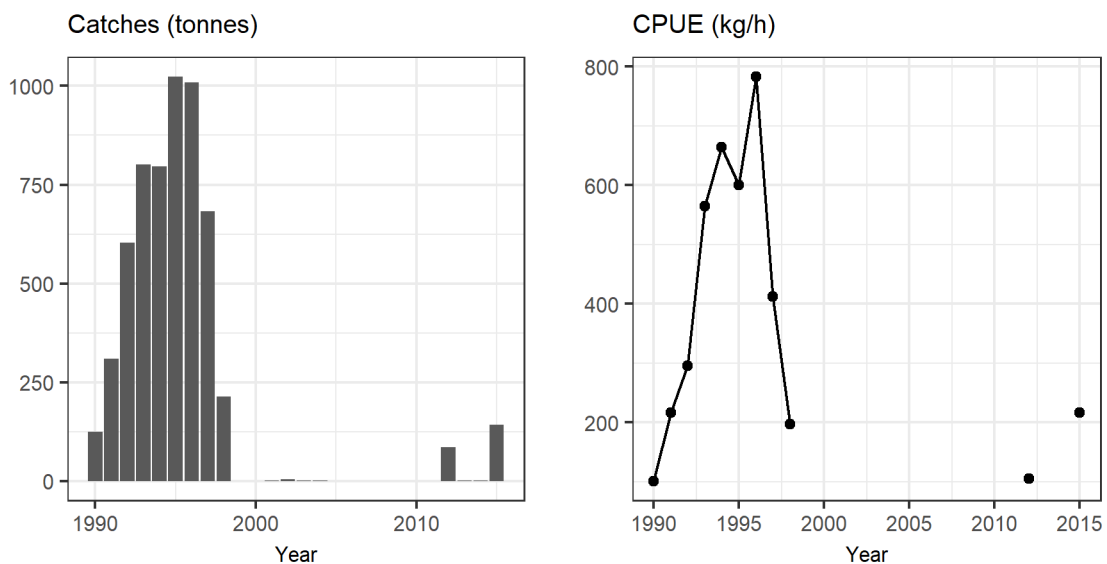


Figure 1. Shrimp in Skjálfandi. Total catch and catch per unit effort.

Mynd 1. Rækja í Skjálfanda. Heildarafli og afli á sóknareiningu.

SURVEY DATA

The annual Icelandic shrimp survey has been conducted since 1990 in Skjálfandi. The 2018 survey was conducted on 21-22 October and included 12 fixed stations at depths of 88–214 m. Information on sampling procedure can be found in the report 'Northern shrimp research in Icelandic waters, 1988-2015' (Jónsdóttir et al. 2017).

Shrimp is found in the whole study area (Figure 2). There has been no clear pattern on where the highest abundance of shrimp is found and it varies between years.



Figure 2. Shrimp in Skjálfandi. Distribution and abundance of shrimp in the annual shrimp survey. X denotes stations where no northern shrimp was found.

Mynd 2. Rækja í Skjálfanda. Útbreiðsla og magn rækju í stofnmælingu. x sýnir stöðvar þar sem engin rækja fékkst.

INDICES

Four indices are used to assess the state of the stock; total biomass, fishable biomass, female biomass and juvenile biomass. Juveniles include all individuals equal to and below 13 mm carapace length while the fishable biomass index includes all individuals equal to and above 15.5 mm carapace length. Individuals between 13 and 15.5 mm carapace length are divided between the juvenile and fishable biomass indices. The female biomass includes all females.

All the indices decreased between 1995 and 1999 (Figure 3). Since 1999, the indices have fluctuated at low levels, with the exception of 2011 and 2012 when it increased temporarily. In 2018, the fishable index was below the reference level where the state of the stock is considered critical.

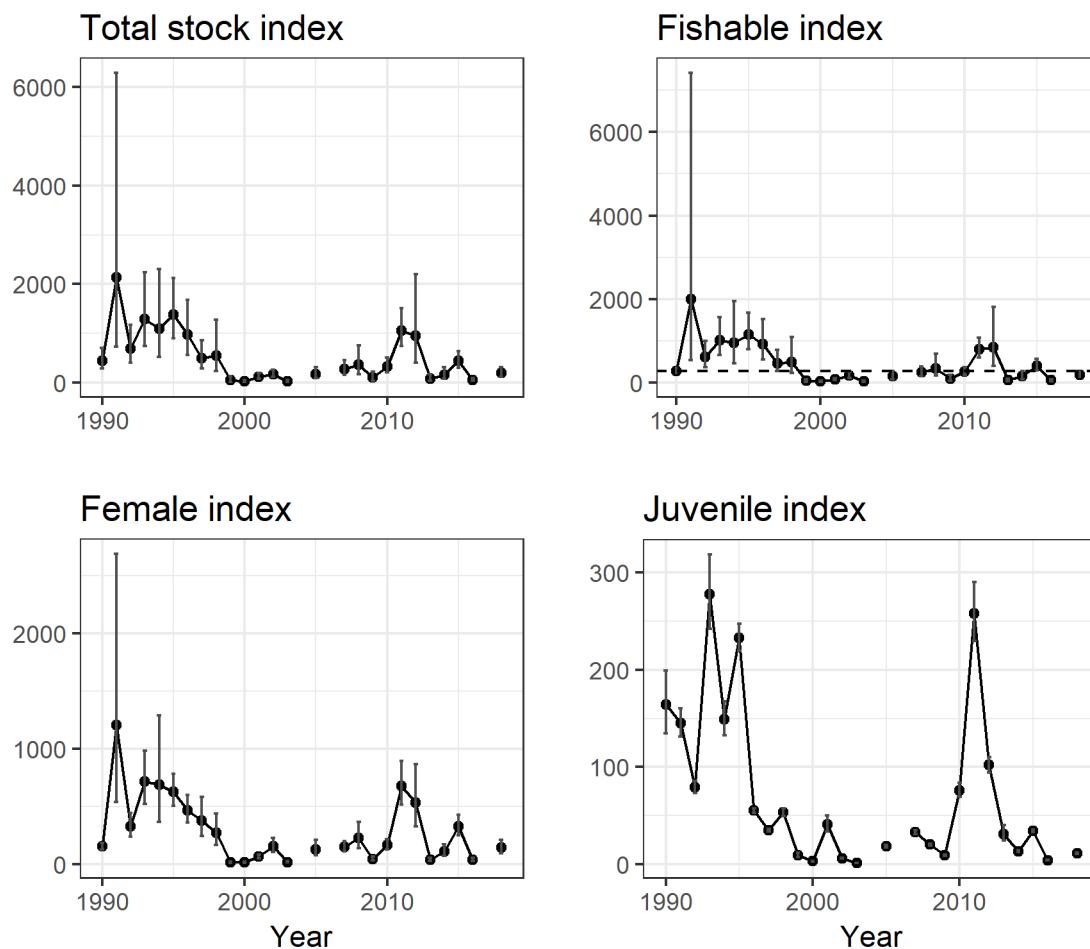


Figure 3. Shrimp in Skjálfandi. Stock biomass index, fishable biomass index, female biomass index and juvenile biomass index of shrimp. The horizontal line indicates a value where the state of the stock is considered to be critical (20% of the mean of the three highest indices).

Mynd 3. Rækja í Skjálfanda. Heildarstofnsvísitala, veiðistofnsvísitala, kvendýravisitala og vísitala ungrækju. Lárétt lína sýnir viðmiðunargildi fyrir ástand stofnsins (20% af meðaltali þriggja hæstu vísitalna).

LENGTH DISTRIBUTION

The abundance of males was low in 2018, whereas the number of females was just below average (Figure 4).

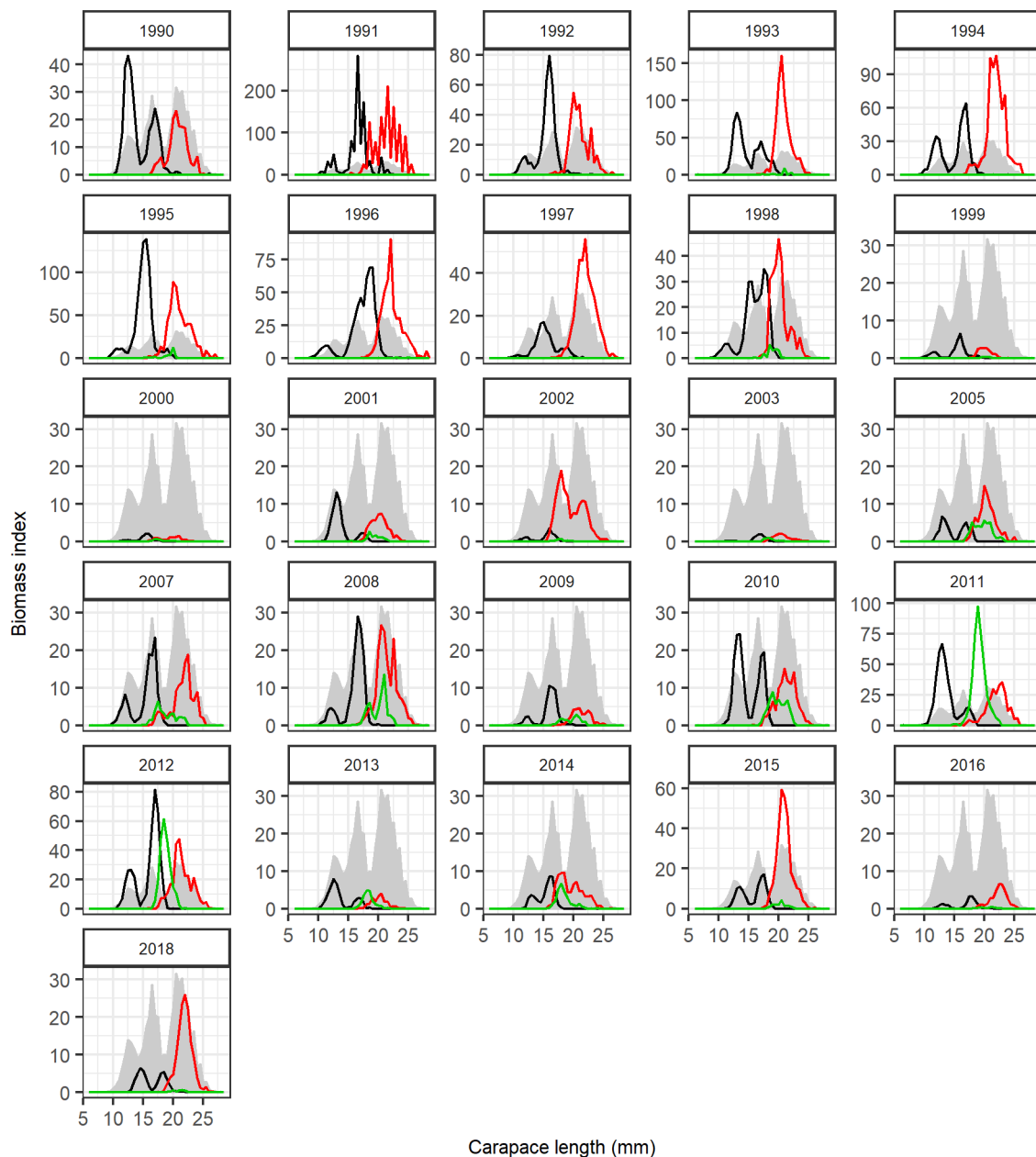


Figure 4. Shrimp in Skjálfandi. Length distribution of shrimp. The black line indicates males, the green immature females, and the red line mature females. The grey area is the mean length distribution of both sexes for the whole study period. Note different scales on y-axes.

Mynd 4. Rækja í Skjálfanda. Lengdardreifing rækju í stofnmælingu. Svört lína sýnir karldýr, græn lína ókynþroska kvendýr og sú rauða kynþroska kvendýr. Gráa svæðið sýnir meðallengdardreifingu beggja kynja allt rannsóknatímabilið. Ath. mismunandi skala á y-ás.

ABUNDANCE OF COD AND HADDOCK

Cod and haddock juvenile abundance indices fluctuated without a trend throughout the study period (Figure 5). Cod abundance index increased in 1998 and was highest in 1998 to 2001 when it decreased. Haddock abundance index increased from 1997-2005, after which it decreased and fluctuated at lower levels since 2010.

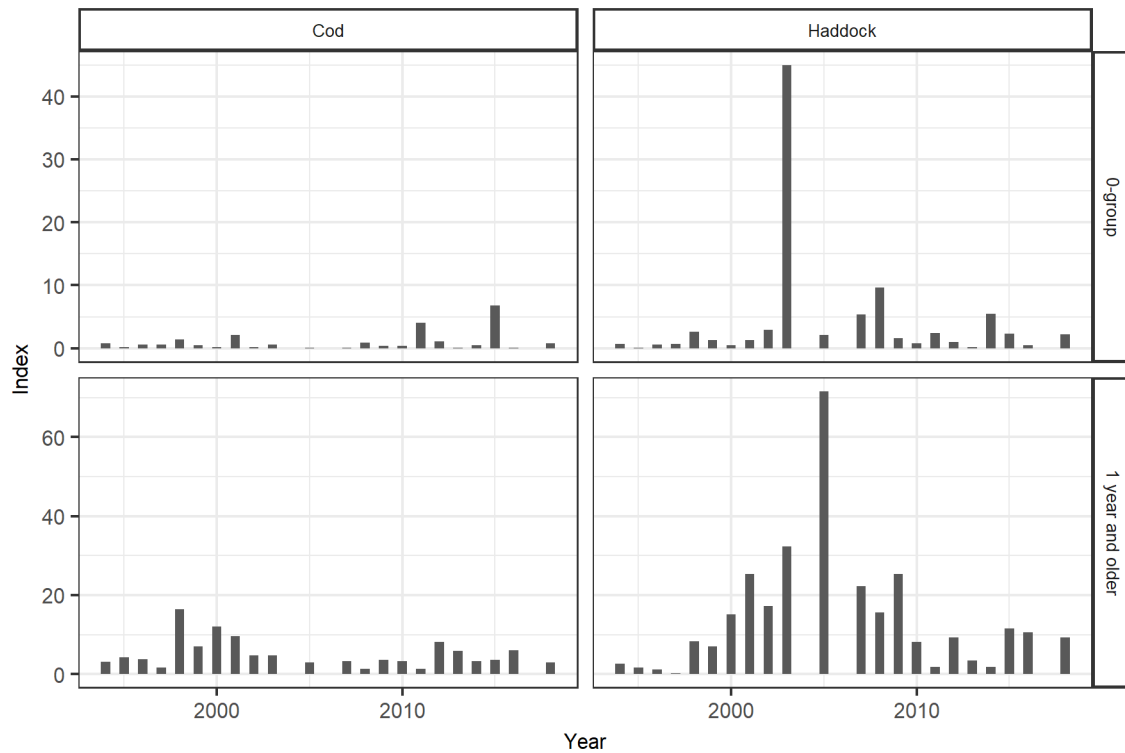


Figure 5. Cod and haddock in Skjálfandi. Abundance indices of cod and haddock in the annual shrimp survey.

Mynd 5. Þorskur og ýsa í Skjálfanda. Vísitala þorsks og ýsu í stofnmælingu rækju.

MANAGEMENT

The Ministry of Industries and Innovation is responsible for management of all marine fisheries in Iceland and implementation of legislation. The Marine Research Institute (MRI) first recommended TAC for shrimp in Skjálfandi in 1990. The fishing season was from early winter (following the annual Icelandic shrimp survey in September/October) until 30 April.

Table 1. Shrimp in Skjálfandi. Fishable biomass index, state of the stock (relative to the mean of the three highest indices), advice, catch (tonnes in fishing year) and F_{proxy} .

Tafla 1. Rækja í Skjálfanda. Heildarstofnsvísitala, ástand stofns (vísitala miðað við meðaltal þriggja hæstu vísitölu gilda), ráðgjöf, aflí og vísitala veiðihlutfalls (F_{proxy}).

Year	Biomass index	Relative state	Rec. TAC	National TAC	Catch	F_{proxy}
1988						
1989						
1990/91	281	0.20	125		125	0.44
1991/92	1996	1.44	300		310	0.16
1992/93	611	0.44	600		603	0.99
1993/94	1016	0.73	800		801	0.79
1994/95	945	0.68	700		797	0.84
1995/96	1150	0.83	1000		1023	0.89
1996/97	918	0.66	1000		1009	1.10
1997/98	464	0.33	700		682	1.47
1998/99	499	0.36	300		213	0.43
1999/00	39	0.03	0		0	-
2000/01	24	0.02	0		0	-
2001/02	82	0.06	0		2	0.02
2002/03	168	0.12	0		4	0.02
2003/04	28	0.02	0		2	0.07
2004/05	-	-	-		0	-
2005/06	153	0.11	0		0	-
2006/07	-	-	-		0	-
2007/08	240	0.17	0		0	-
2008/09	341	0.25	0		0	-
2009/10	91	0.07	0		0	-
2010/11	257	0.19	0		0	-
2011/12	800	0.58	0		2	0.003
2012/13	844	0.61	400		85	0.10
2013/14	56	0.04	0		1	0.02
2014/15	147	0.11	0		0	-
2015/16	406	0.29	140		142	0.35
2016/17	55	0.04	0		0	-
2017/18	-	-	-		0	-
2018/19	181	0.13	0			

ADVICE 2018

The Icelandic shrimp survey was used as a biomass indicator. The target F_{proxy} (catch/survey biomass) of 0.5 is considered precautionary based on the historical relationship between catch and survey index.

The state of the stock is considered critical if the total biomass index is below 277 (equivalent to a relative state of 0.2; the biomass index divided with the mean of the three highest indices). The biomass index value of 277 can therefore be considered a proxy for B_{lim} or I_{lim} . If the total biomass index is below 277, zero catch is advised, else the advice is based on multiplying the most recent index value with the target $F_{\text{proxy}} = 0.5$.

In October 2018, the total biomass index was below 277. Hence, MFRI advises zero catch in Skjálfandi in the quota year 2018/2019.