

NORTHERN SHRIMP IN THE ELDEY AREA – RÆKJA VIÐ ELDEY

Pandalus borealis

THE FISHERY

Shrimp fishing in the Eldey area started in 1970 and have fluctuated greatly since then. Since 1970, the Eldey area has three times been closed for shrimp fishing due to low shrimp biomass caused by high abundance of fish in the area. No fishing was allowed between 1998 and 2012 but shrimp fishing started again in 2013 (Figure 1). No fishing was allowed in 2017.

The main fishing season is during summer and autumn. Since 2013 the annual catch ranged between 146 and 202 tonnes. The number of commercial shrimp vessels in the Eldey area was highest in 1994, when 18 vessels landed shrimp (Figure 1). When shrimp fishing was reopened in 2013, 9 vessels landed shrimp and since then the number of vessels has decreased and in 2015-2016 only 4 vessels landed shrimp in the Eldey area.

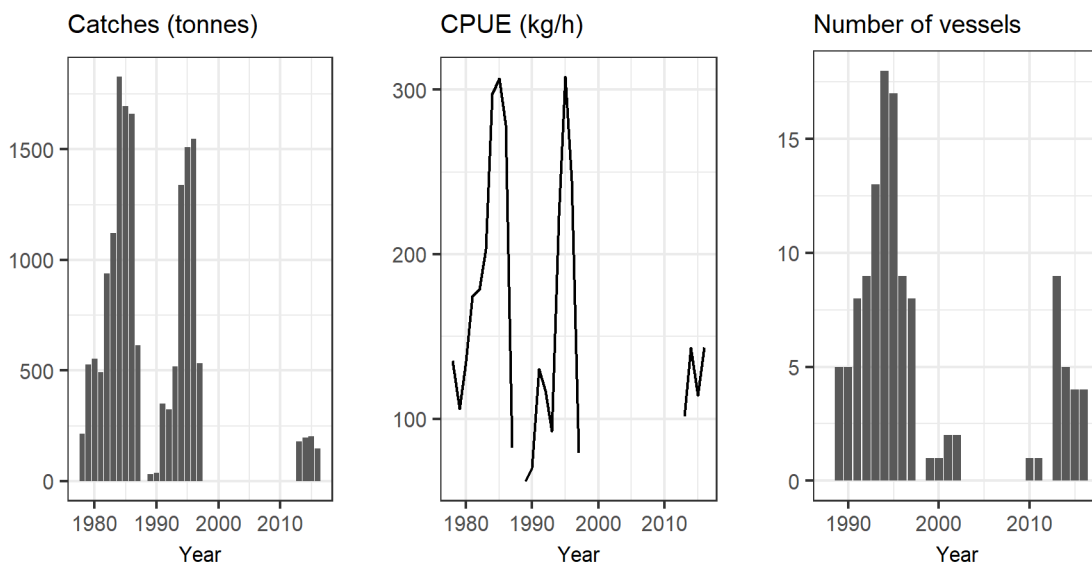


Figure 1. Shrimp in the Eldey area. Total catch, catch per unit effort (CPUE), and number of commercial vessels in the Eldey area.

Mynd 1. Rækja við Eldey. Heildarafli, afli á sóknareiningu og fjöldi skipa á rækjuveiðum við Eldey.

The distribution of the fishery has varied over time (Figure 2). Between 1992 and 1995, the main fishing ground was larger compared with 2013-2016. Since 2013, most of the catch has been taken from small areas and in 2016 the catch was taken from a relatively small area within the Eldey area.

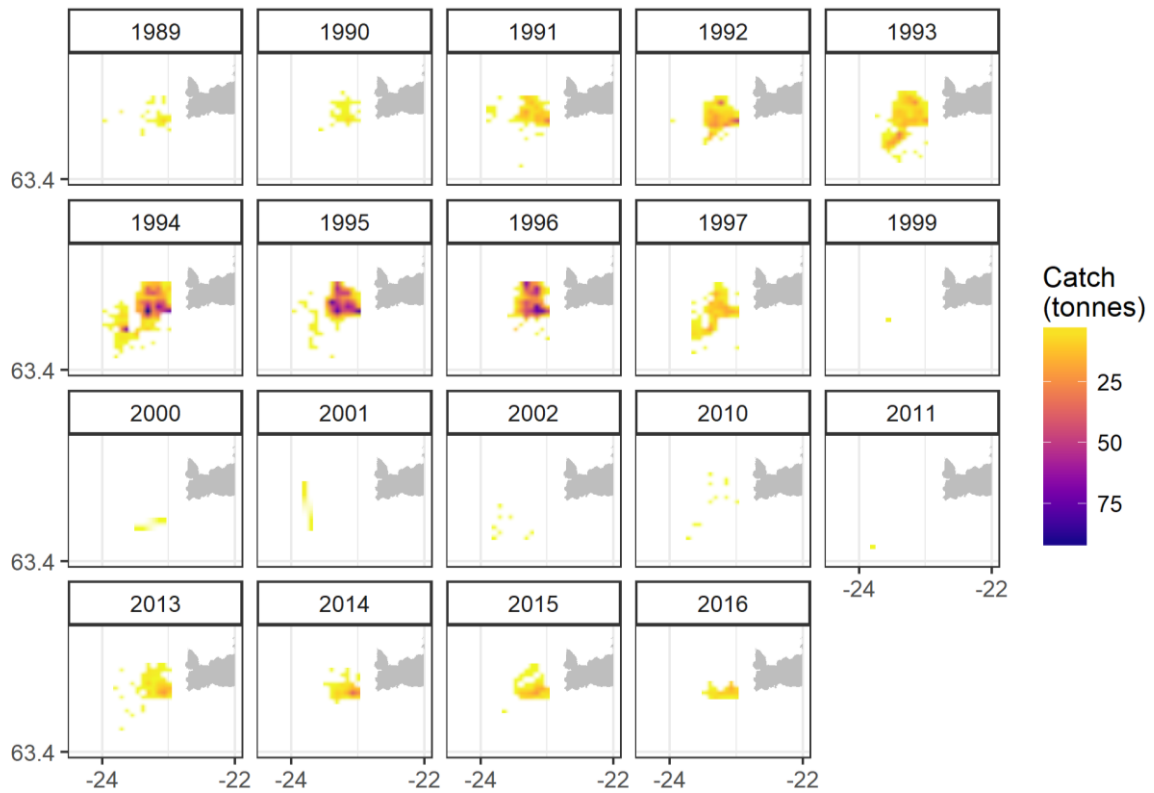


Figure 2. Shrimp in the Eldey area. Distribution of shrimp catch in the Eldey area.

Mynd 2. Rækja við Eldey. Dreifing rækjuafla við Eldey.

SURVEY DATA

The annual Icelandic shrimp survey has been conducted since 1989 in the Eldey area. No survey was conducted in 2003, 2005-2009, or in 2011-2012. The survey was conducted on 10th and 11th of July 2018 and included 11 fixed stations at 116-233 m depth. Due to diurnal vertical migration of shrimp, all tows are carried out during the daylight hours. All information on sampling procedure can be found in the report 'Northern shrimp research in Icelandic waters, 1988-2015' (Jónsdóttir et al. 2017).

In the past years, density of shrimp was highest west of Reykjanes but lower at the southern part of the area (Figure 3). In 2018, density of shrimp was low compared with 2013-2017.



Figure 3. Shrimp in the Eldey area. Distribution and abundance of shrimp in the annual shrimp survey. x indicates no shrimp.

Mynd 3. Rækja við Eldey. Útbreiðsla og magn rækju í stofnmælingu. x sýnir hvar engin rækja fannst.

INDICES

Four indices are used to assess the state of the shrimp 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 include 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. The total biomass index is used for calculating the advice.

All the indices were high in 1994-1996, but they decreased sharply from 1996 to 1998 (Figure 4). Since 2012 the indices have steadily decreased and have been at low levels compared with 1994-1996. In 2018, the indices were lower compared to 2016 and were the lowest observed since 2010. The total biomass index was below the reference level where the state of the stock is considered critical.

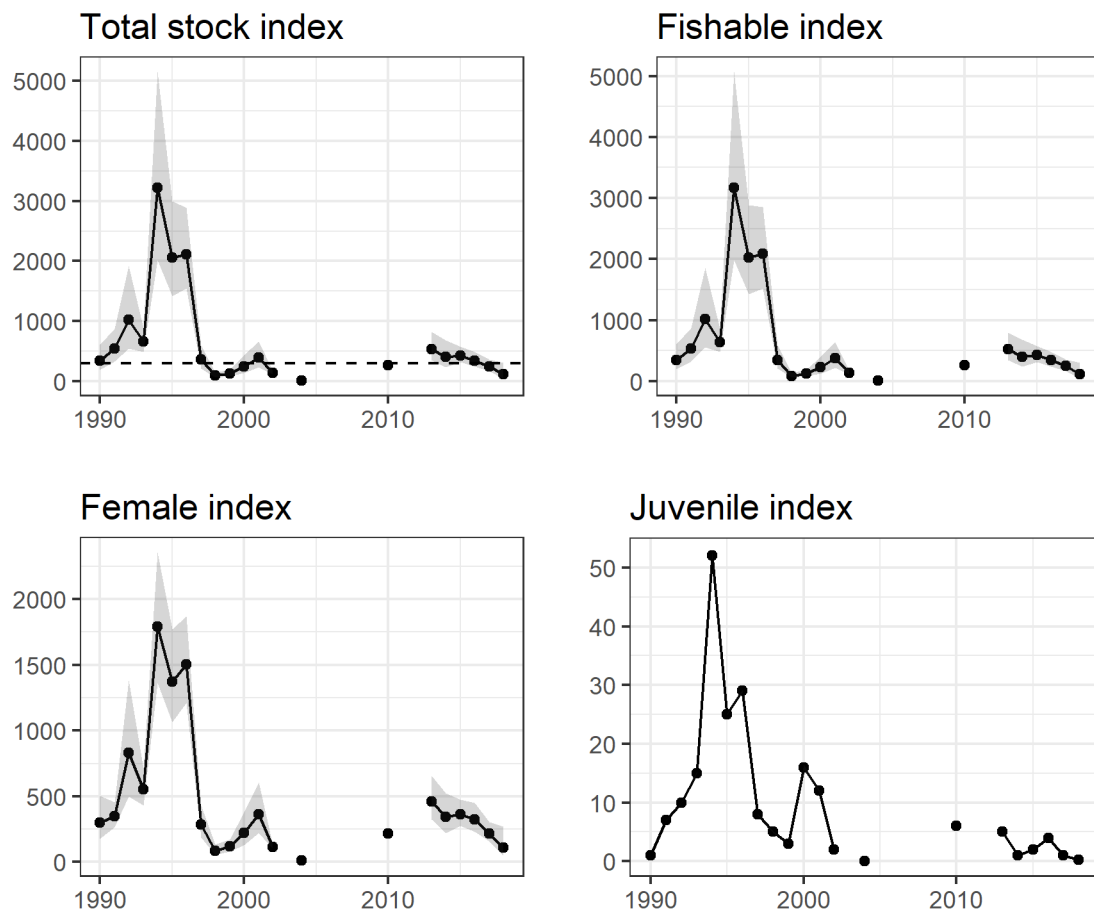


Figure 4. Shrimp in the Eldey area. Stock biomass index, fishable biomass index, female biomass index and juvenile biomass index of shrimp. The horizontal line indicates a value where the state of the stock is considered to be critical (20% of the mean of the three highest indices).

Mynd 4. Rækja við Eldey. Heildarstofnsvísitala, veiðistofnsvísitala, kvendýravísitala og vísitala ungrækju. Lárétt lína sýnir viðmiðunargildi fyrir ástand stofnsins (20% af meðaltali þriggja hæstu vísitalna).

LENGTH DISTRIBUTION

Females are a high proportion of the stock, whereas males often compose a considerably lower proportion of the fishable biomass (Figure 5). The absence of juveniles indicates that recruitment patterns and drift of larvae between adjacent areas are unknown. In 2017 and 2018, the number of females was lower compared with earlier years.

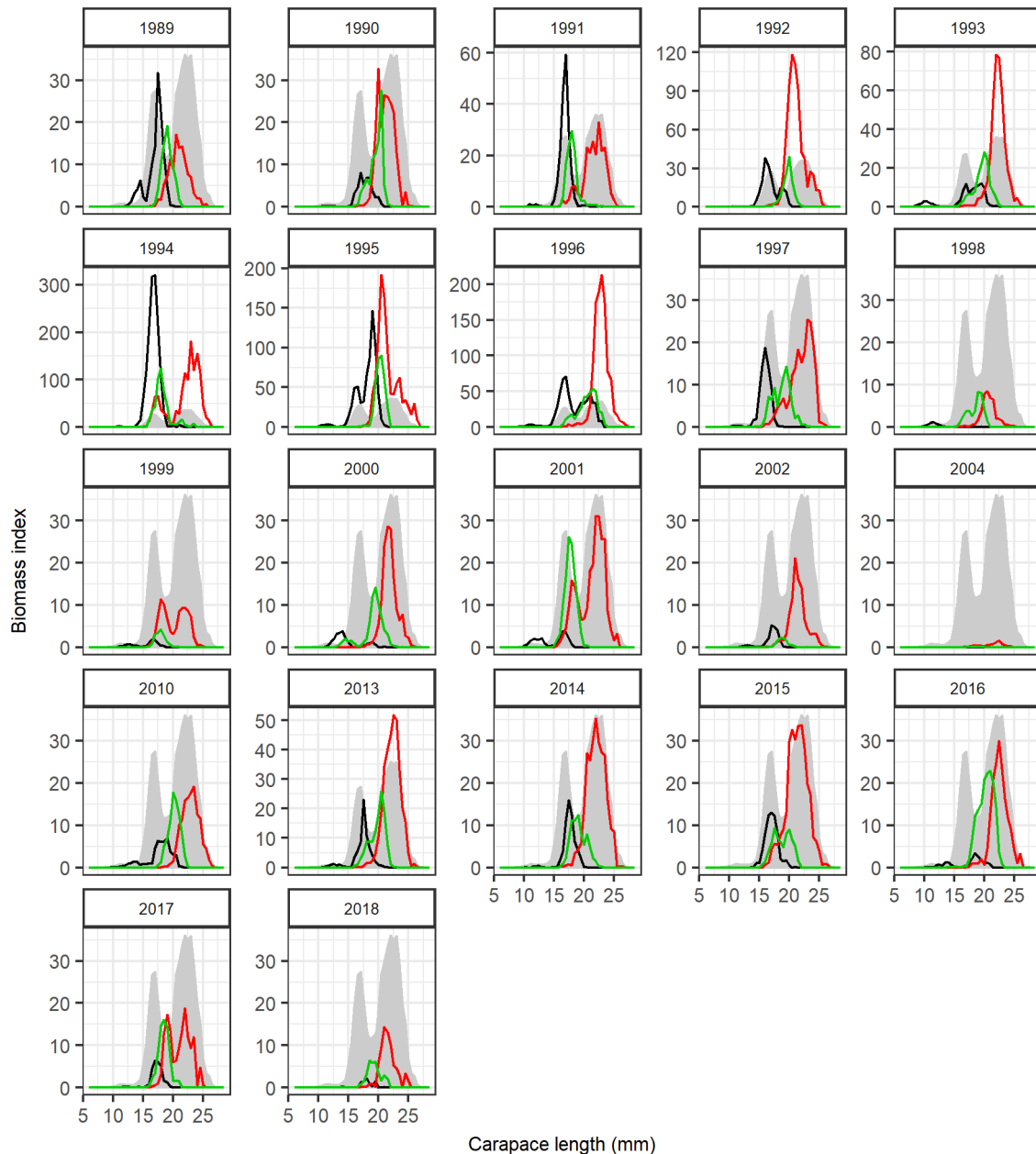


Figure 5. Shrimp in the Eldey area. Length distribution of shrimp. The black line indicates males, the green immature females, and the red line mature females. The grey area is the mean length distribution of both sexes for the whole study period.

Mynd 5. Rækja við Eldey. 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.

ABUNDANCE OF COD AND HADDOCK

In general, the cod abundance index has been relatively low throughout the study period. The haddock abundance index fluctuated between 1994 and 2004 (Figure 6). Since 2010 the haddock abundance index has been very low.

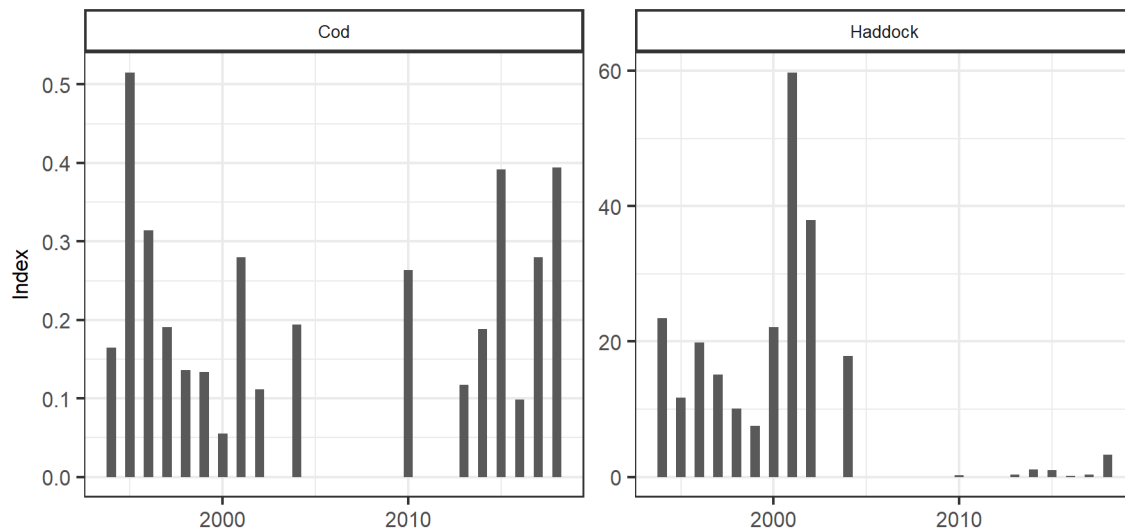


Figure 6. Cod and haddock in the Eldey area. Abundance indices in the annual shrimp survey at the Eldey area.

Mynd 6. Þorskur og ýsa við Eldey. Vísitölur í stofnmælingu rækju við Eldey.

MANAGEMENT

The Ministry of Industries and Innovation is responsible for management of the Icelandic fisheries and implementation of legislation. The Marine and Freshwater Institute (MFRI) first recommended TAC for shrimp in the Eldey area in 1991. The national TAC has been the same as the recommended TAC. The fisheries take place during the last 7 months of the year, from June to December. Therefore, the quota year from 1 September to 31 August does not apply for northern shrimp in the Eldey area.

Table 1. Shrimp in the Eldey area. Biomass index, state of the stock (relative to the mean of the three highest indices), advice, catch (tonnes in calendar year) and F_{proxy} .

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

Year	Biomass index	Relative state	Rec. TAC	National TAC	Catch	F_{proxy}
1989	319	0.13			30	0.09
1990	343	0.14			36	0.10
1991	537	0.22	400		350	0.65
1992	1023	0.42	800		690	0.67
1993	658	0.27	600		607	0.92
1994	3221	1.31	1500	1500	1505	0.47
1995	2052	0.83	1500	1500	1511	0.74
1996	2112	0.86	1600	1600	1548	0.73
1997	357	0.15	500	500	537	1.50
1998	91	0.04	0	0	0	-
1999	127	0.05	0	0	0	-
2000	242	0.10	0	0	0	-
2001	390	0.16	0	0	0	-
2002	134	0.05	0	0	0	-
2003	-	-	-	-	0	-
2004	11	0	0	0	0	-
2005	-	-	-	-	0	-
2006	-	-	-	-	0	-
2007	-	-	-	-	0	-
2008	-	-	-	-	0	-
2009	-	-	-	-	0	-
2010	267	0.11	0	0	0	-
2011	-	-	-	-	0	-
2012	-	-	-	-	0	-
2013	532	0.22	250	250	179	0.34
2014	400	0.16	200	200	197	0.49
2015	428	0.17	200	200	202	0.46
2016	343	0.14	171	171	146	0.43
2017	246	0.10	0	0	0	-
2018	117	0.05	0			

ADVICE 2018

The Icelandic shrimp survey is used as a biomass indicator using the total biomass index for calculating the advice. The target F_{proxy} (catch/survey biomass index) of 0.5 is considered precautionary based on the historical relationship between catch and survey indices of inshore shrimp stocks.

The state of the stock is considered to be critical if the total biomass index is below 300 (equivalent to a relative state of 0.12; the biomass index divided with the mean of the three highest indices). The biomass index value of 300 can be considered a proxy for B_{lim} or an I_{lim} . If the total biomass index is below 300, zero catch is advised. If the total biomass index is above I_{lim} , the advice is based on multiplying the most recent biomass index value with the target $F_{\text{proxy}} = 0.5$.

In June 2018, the total biomass index was below 300. Hence, the MFRI advises that no shrimp fishing should be conducted in the Eldey area in the calendar year 2018.

REFERENCES

Jónsdóttir, I.G., Bragason, G.S., Brynjólfsson, S.H., Guðlaugsdóttir, A.K., Skúladóttir, U. 2017. Northern shrimp research in Icelandic waters, 1988-2015. Marine and Freshwater Research Institute, Reykjavík, Iceland. HV 2017-007.