

# NORTHERN SHRIMP IN THE ELDEY AREA – RÆKJA VIÐ ELDEY

## *Pandalus borealis*

### COMMERCIAL FISHING

Shrimp fishing started in the Eldey area 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). 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 have decreased and in 2015-2016 only 4 vessels landed shrimp in the Eldey area.

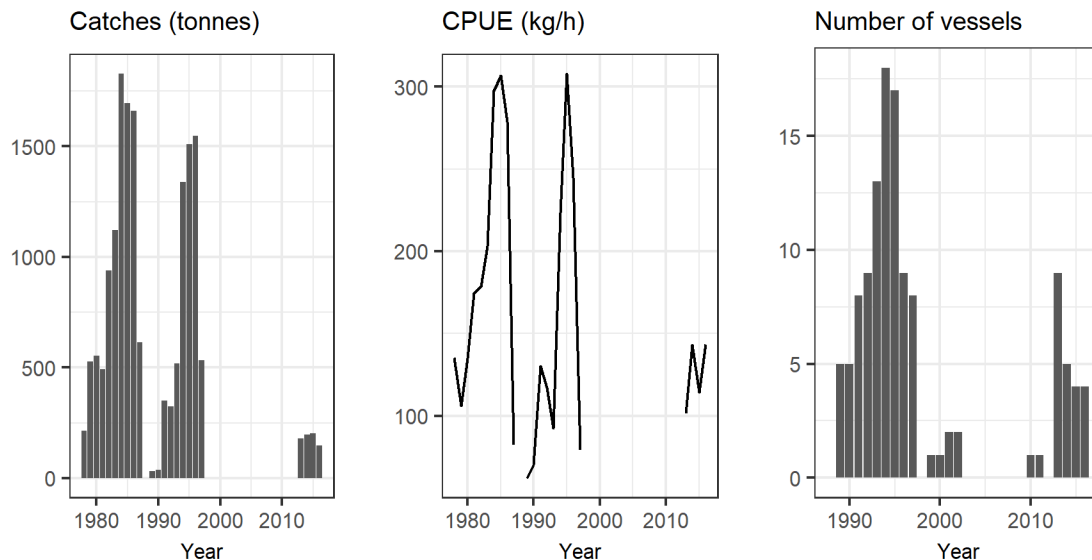


Figure 1. Total catch, catch per unit effort and number of commercial vessels in the Eldey area.

*Mynd 1. 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.

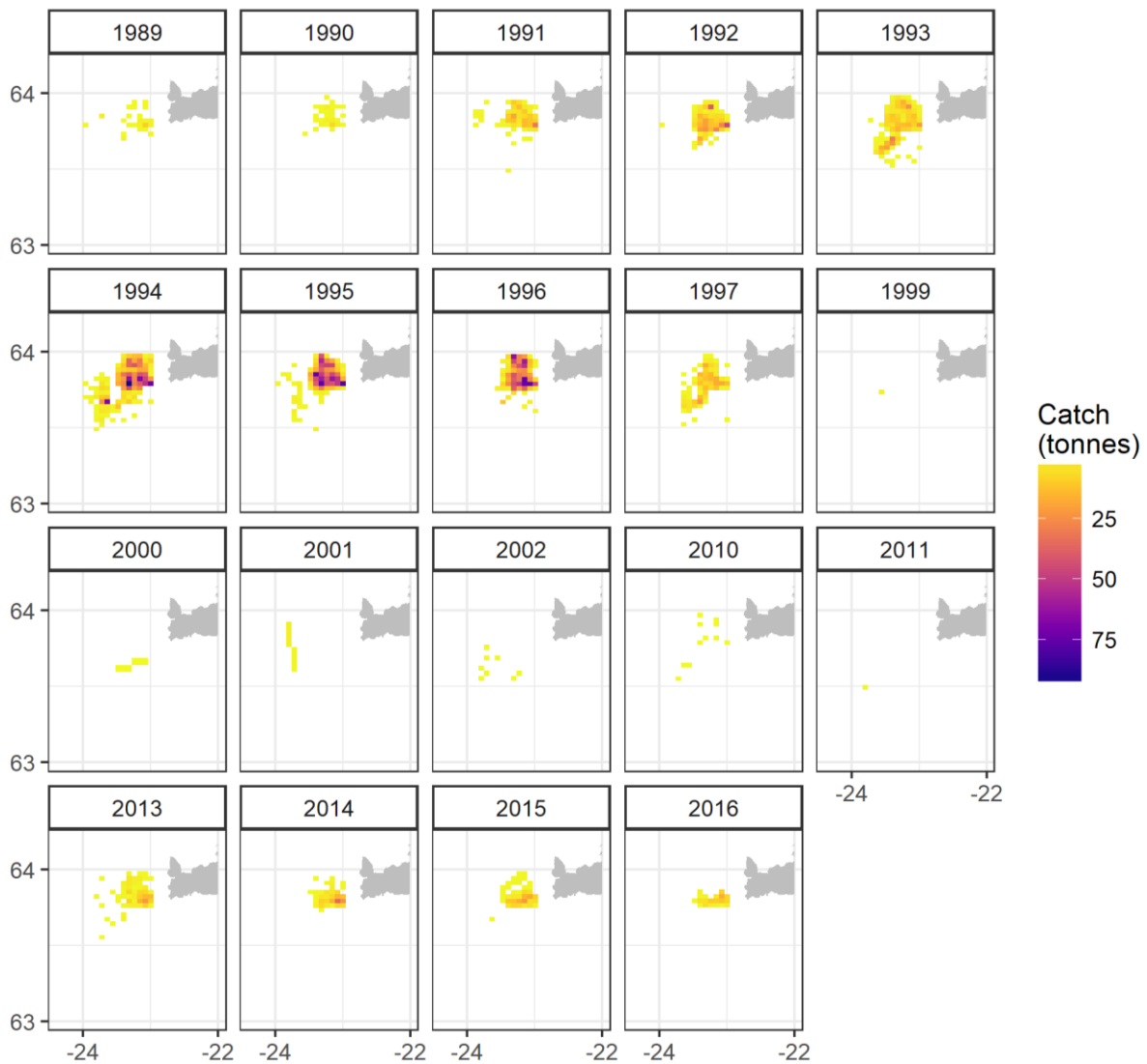


Figure 2. Distribution of shrimp catch in the Eldey area from 1989 to 2016.

*Mynd 2. Dreifing rækjuafra við Eldey 1989-2016.*

## ICELANDIC SHRIMP SURVEY

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 13<sup>th</sup> and 14<sup>th</sup> of June 2017 and included 11 fixed stations at 116-226 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 2017, density of shrimp was low compared with 2013-2016.

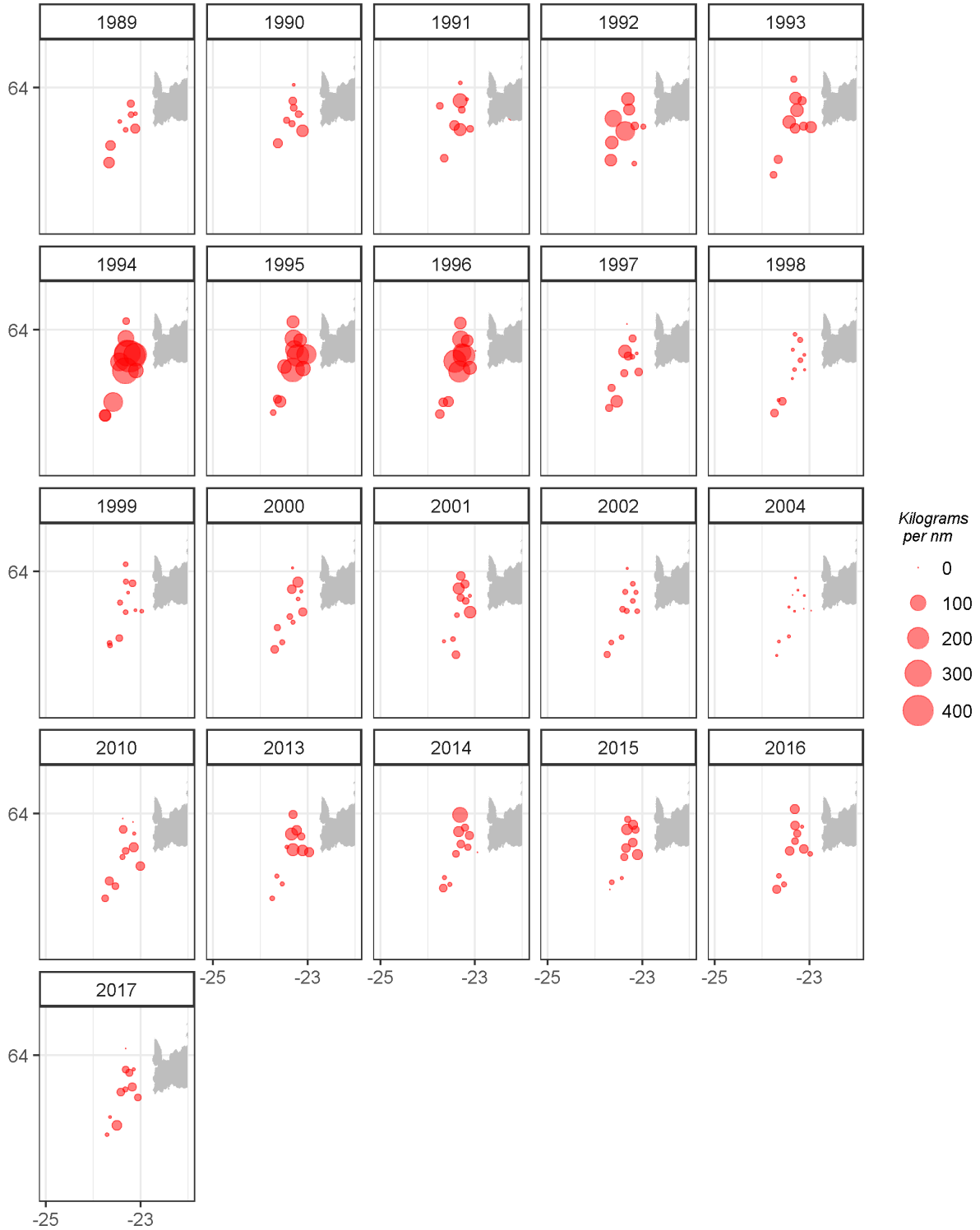


Figure 3. Distribution and abundance of shrimp in the annual shrimp survey from 1989 to 2017.

*Mynd 3. Útbreiðsla og magn rækju í stofnmælingu 1990-2017.*

## SURVEY 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 and is equivalent to the spawning stock biomass of various fish species.

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 2017, 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.

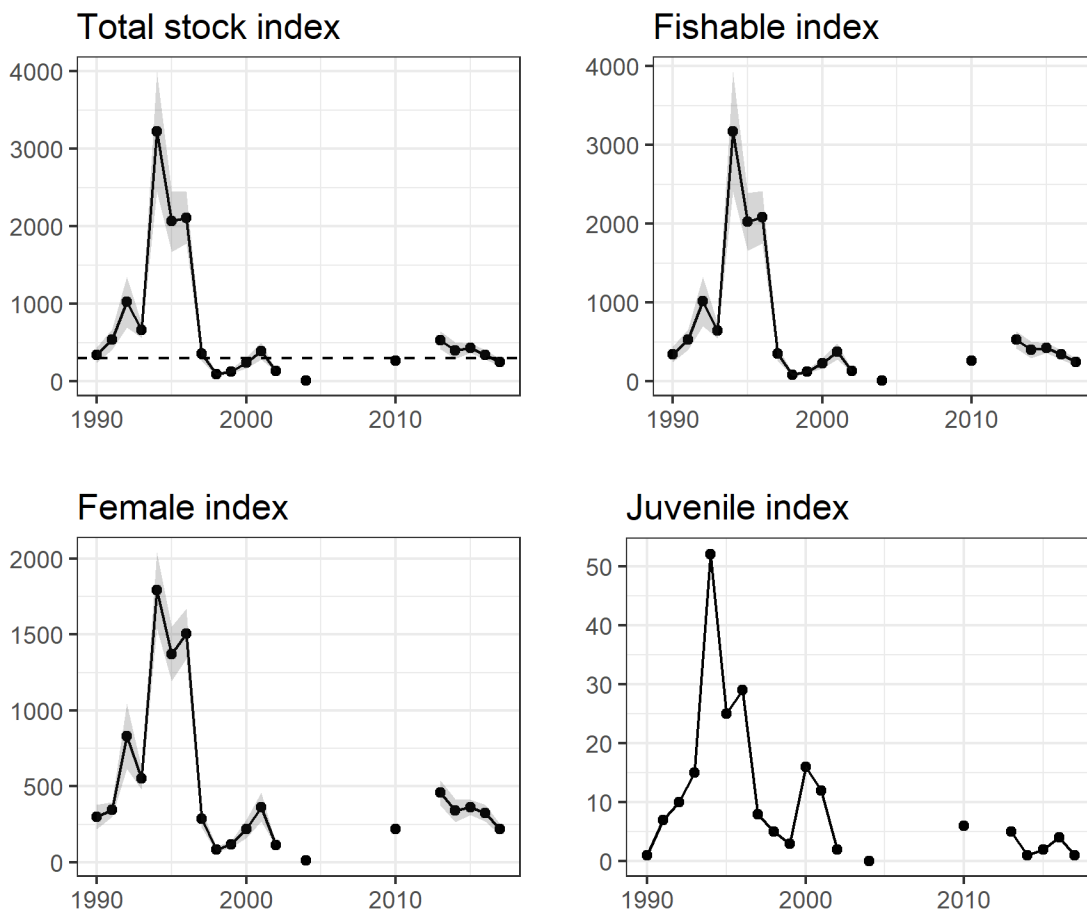


Figure 4. Stock biomass index, fishable biomass index, female biomass index, and juvenile biomass index of shrimp. The horizontal line indicates a value where the state of the stock is considered to be critical.

*Mynd 4. Heildarstofnsvísitala, veiðistofnsvísitala, kvendýravisitala og vísitala ungrækju við Eldey 1989-2017. Lárétt lína sýnir viðmiðunargildi fyrir ástand stofnsins.*

## LENGTH DISTRIBUTION OF SHRIMP

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, the number of females was lower compared with earlier years.

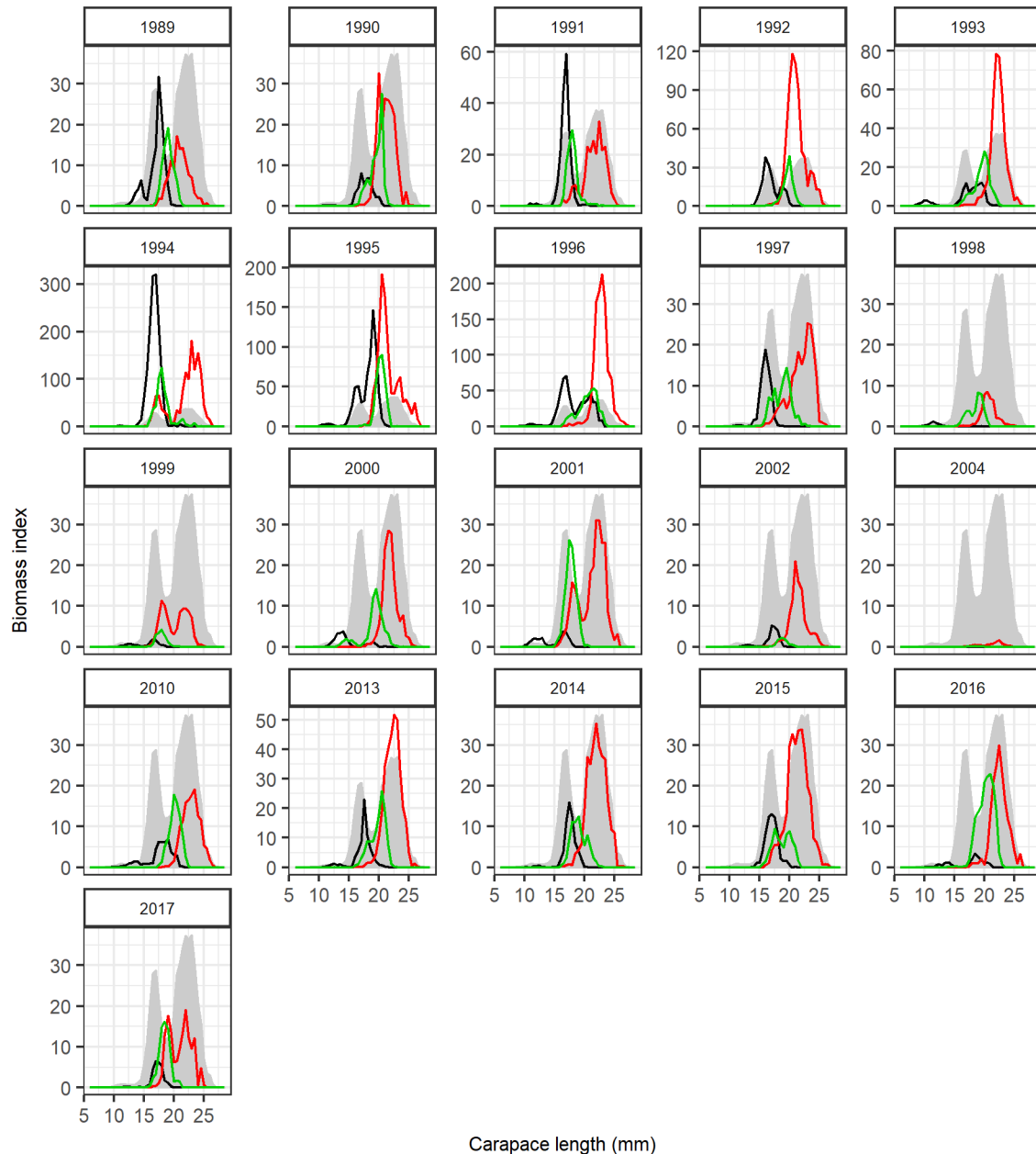


Figure 5. Length distribution of shrimp. The black line indicates males, the green immature females, and the red line mature females. The grey area is the mean length distribution of both sexes for the whole study period.

*Mynd 5. Lengdardreifing rækju í stofnmælingu við Eldey 1989-2017. 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.

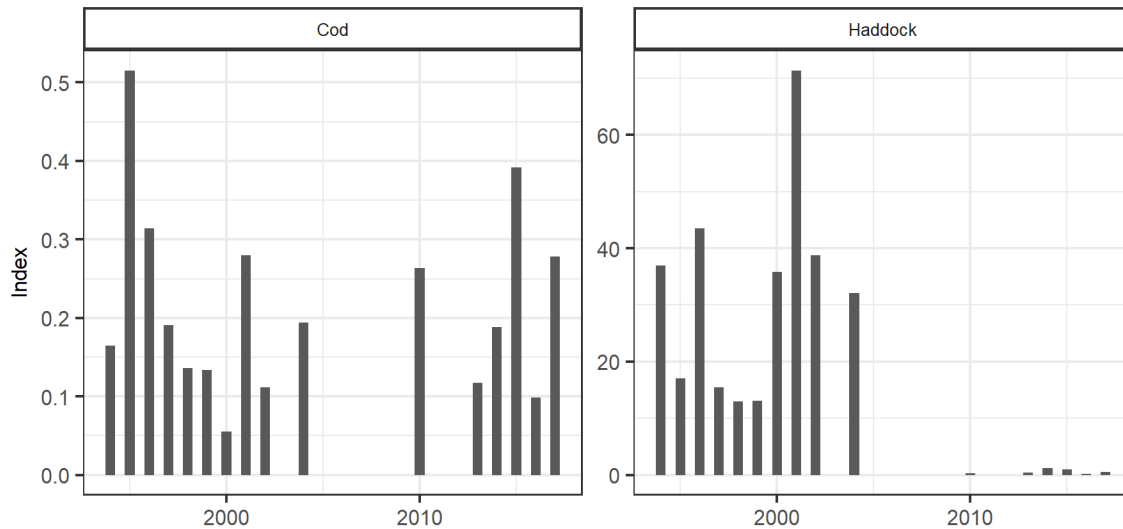


Figure 6. Abundance indices of cod and haddock from 1994 to 2017.

*Mynd 6. Vísitala þorsks og ýsu í stofnmælingu rækju við Eldey 1994 til 2017.*

## ADVICE

The Icelandic shrimp survey is used as a biomass indicator. The target  $F_{\text{proxy}}$  (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  $B_{\text{lim}}$  or an  $I_{\text{lim}}$ . If the total biomass index is below 300, zero catch is advised. If the total biomass index is above  $I_{\text{lim}}$ , the advice is based on multiplying the most recent biomass index value with the target  $F_{\text{proxy}} = 0.5$ .

In June 2017, 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 2017.

**Table 1.** Biomass index (BI), state of the stock (relative to the mean of the three highest indices), advice, catch (tonnes in fishing year) and  $F_{\text{proxy}}$ *Tafla 1. Heildarstofnsvísitala, ástand stofns (vísitala miðað við meðaltal þriggja hæstu vísitölu gilda), ráðgjöf, afli og vísitala veiðihlutfalls ( $F_{\text{proxy}}$ )*

Year	BI Total	Relative state	Rec. TAC	Catch	$F_{\text{proxy}}$
1989	319	0.13		30	0.09
1990	343	0.14		36	0.10
1991	537	0.22	100	350	0.65
1992	1023	0.42	800	690	0.67
1993	658	0.27	600	607	0.92
1994	3221	1.31	1500	1505	0.47
1995	2052	0.83	1500	1511	0.74
1996	2112	0.86	1600	1548	0.73
1997	357	0.15	500	537	1.50
1998	91	0.04	0	0	-
1999	127	0.05	0	0	-
2000	242	0.10	0	0	-
2001	390	0.16	0	0	-
2002	134	0.05	0	0	-
2003	-	-	-	0	-
2004	11	0	0	0	-
2005	-	-	-	0	-
2006	-	-	-	0	-
2007	-	-	-	0	-
2008	-	-	-	0	-
2009	-	-	-	0	-
2010	267	0.11	0	0	-
2011	-	-	-	0	-
2012	-	-	-	0	-
2013	532	0.22	250	179	0.34
2014	400	0.16	200	197	0.49
2015	428	0.17	200	202	0.46
2016	343	0.14	171	146	0.43
2017	246	0.10	0		

## 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.