

NORWAY LOBSTER – HUMAR

Nephrops norvegicus

INTRODUCTION

Fishery of Norway lobster (*Nephrops norvegicus*), initiated in the 1950's and during the first decades it was a mixed fishery of Icelandic, Belgian and France fleets which targeted mainly the easternmost grounds (Table 1). The fishery soon established and this species has been fished only by Icelandic boats since 1974. In the beginning it was fished mainly during spring and summer and the fleet was large or up to 200 boats in the 1970's. In recent years the season has been lengthening as the fishery starts in the middle of March and ends in November/ December. There has also been a gradual decrease in number of boats and during the last couple of years there have been as few as 14 boats active in the fishery. The lobster is entirely caught in *Nephrops* trawls, but through the decades there have been occasional creel trials.

The fishing grounds in Iceland are at the northernmost part of the species distributional range. For females it has been shown that there is a biennial reproductive cycle and, therefore, slower postmaturity growth than in, for example, Scottish, Irish, French and Portuguese waters of mostly annual spawning (Eiriksson, 2014). That has implications for productivity of the stock and warrants lower exploitation rate than applied in other *Nephrops* stocks.

COMMERCIAL FISHING

LANDINGS

In 2016, 1 398 tonnes of *Nephrops* were landed which is a reduction of 56 tonnes from previous year (Table 1, Figure 1). The catch has generally been declining from the year 2010 when it reached 2540 tonnes after nearly doubling since the year 2004. There have been periodic fluctuation in landings since then onset of the fishery in the 1950's which soon reached 6 000 tonnes in 1963, following few years with high catches.

In 2016, 812 tonnes were landed from the southwestern ground which is a reduction of 144 tonnes from previous year but that is rather high in historical perspective (Table 2, Figure 2). Large portion of the catch from the southwestern area was from the ground Jökuldjúp or 427 tonnes. On the southern ground only 57 tonnes were landed, which is the lowest catch historically since the fisheries took off and decrease from 26 tonnes from 2015. In the southeast area 529 tonnes were landed which was an increase of 114 tonnes from previous year.

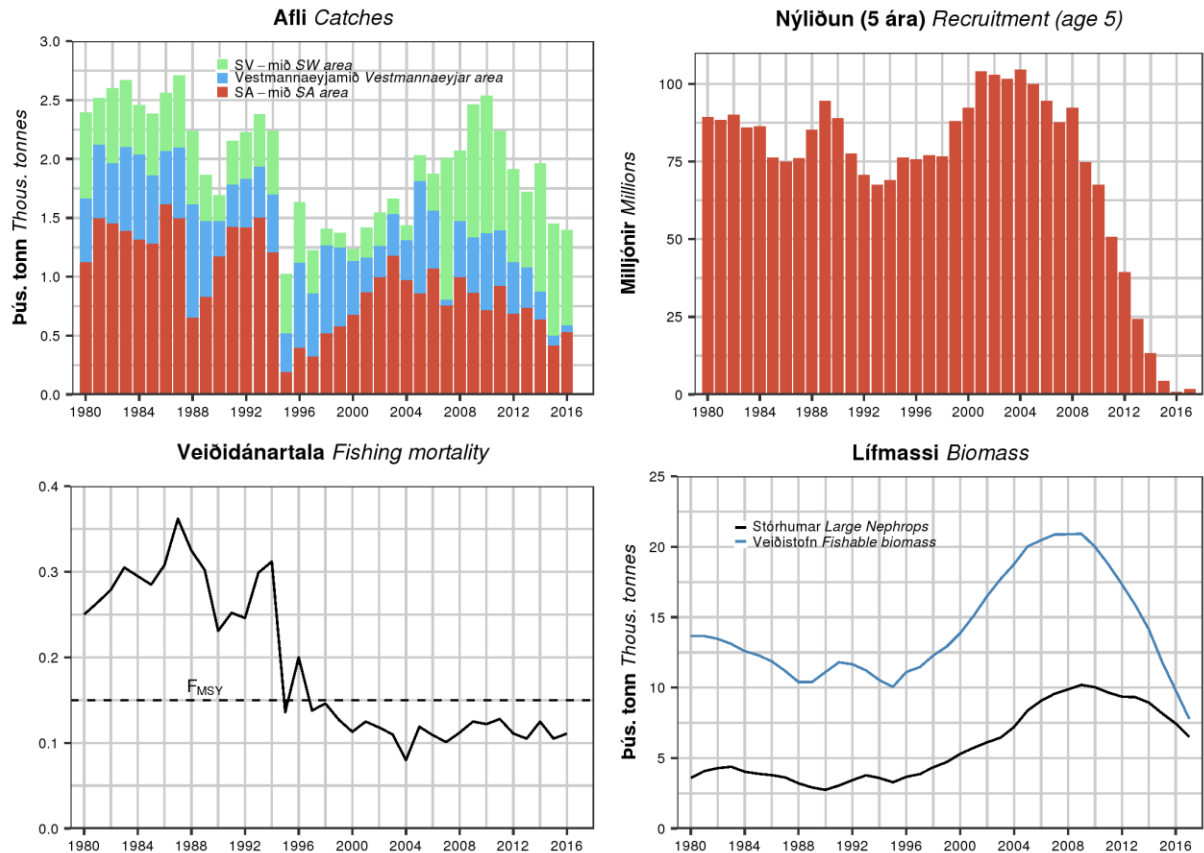


Figure 1. Catches by area, recruitment at age 5, fishing mortality and indices of fishable (6 years and older) and large category (10 years and older) biomass.

Mynd 1. Afli eftir svæðum, nýliðun 5 ára, veiðidánartala og vísitölur veiðistofns (6 ára og eldri) og stórhumars (10 ára og eldri).

CPUE AND EFFORT

Catch per unit effort (CPUE, standardized to 1 trawl and the period May – August) declined slightly between 2016 and 2017, from 48.3 to 44.5 kg per towed hour (Table 2, Figure 3). CPUE has declined severely since the record years of 2007 – 2008 when more than 100 kg of *Nephrops* were caught every trawled hour. There have been overall similar fluctuation between areas with regard to CPUE (Figure 4). It has on average been higher in the southeast area, and in recent years it has been lowest in the southern area where in last year it reached the minimum of the timeseries that started in 1970, or 23.6 kg h^{-1} .

There has been a decreasing trend in the fishing effort, it reached minimum in 2007 and 2008 but has slightly increased since then but was stable between years. On different grounds there has been a decrease in effort in the southern area but increase in southwestern area and little changes in the southeastern area (Figure 5).

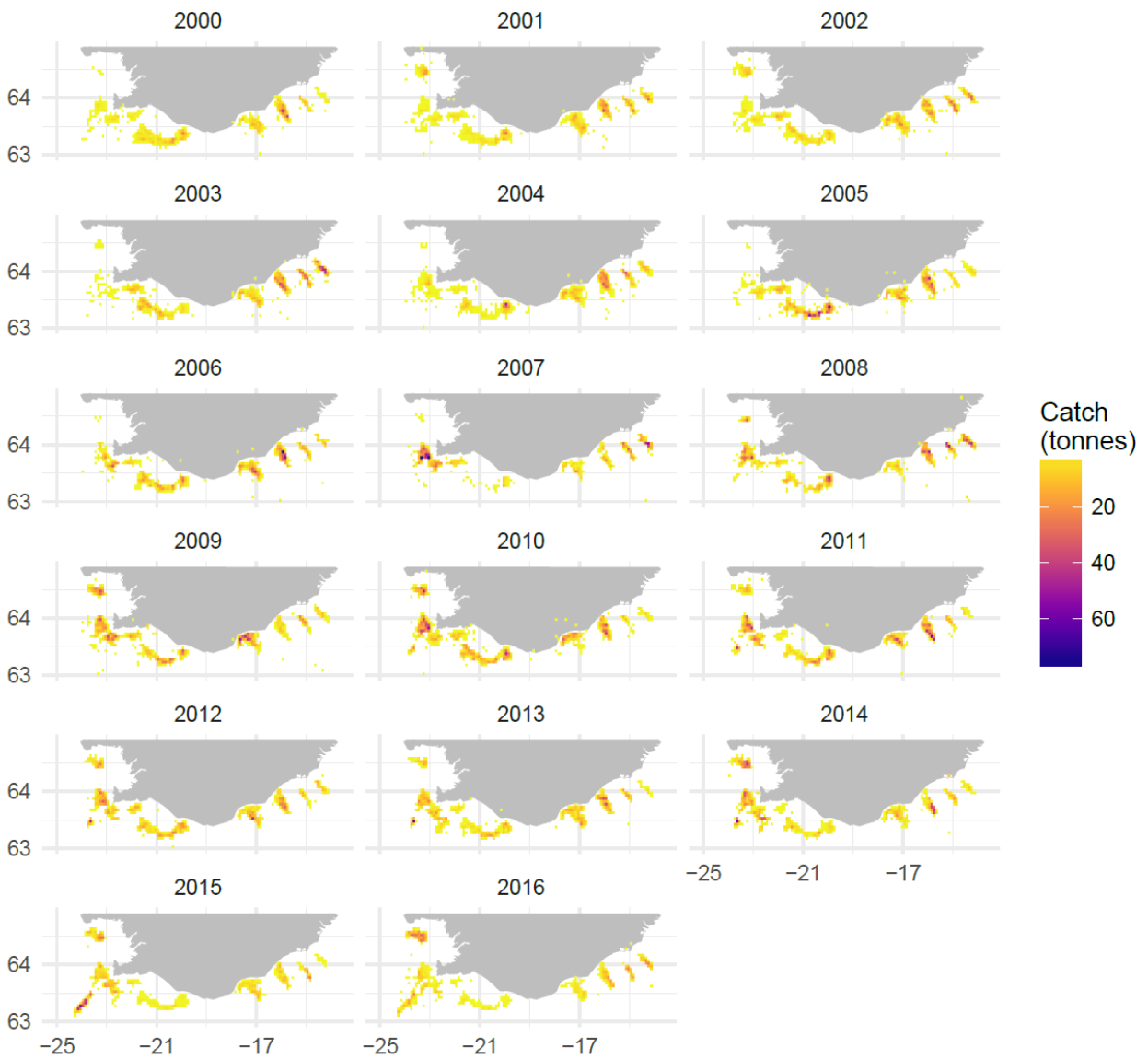


Figure 2. Distribution of *Nephrops* catch from 2000 to 2016.

Mynd 2. Dreifing humarafla árin 2000-2016.

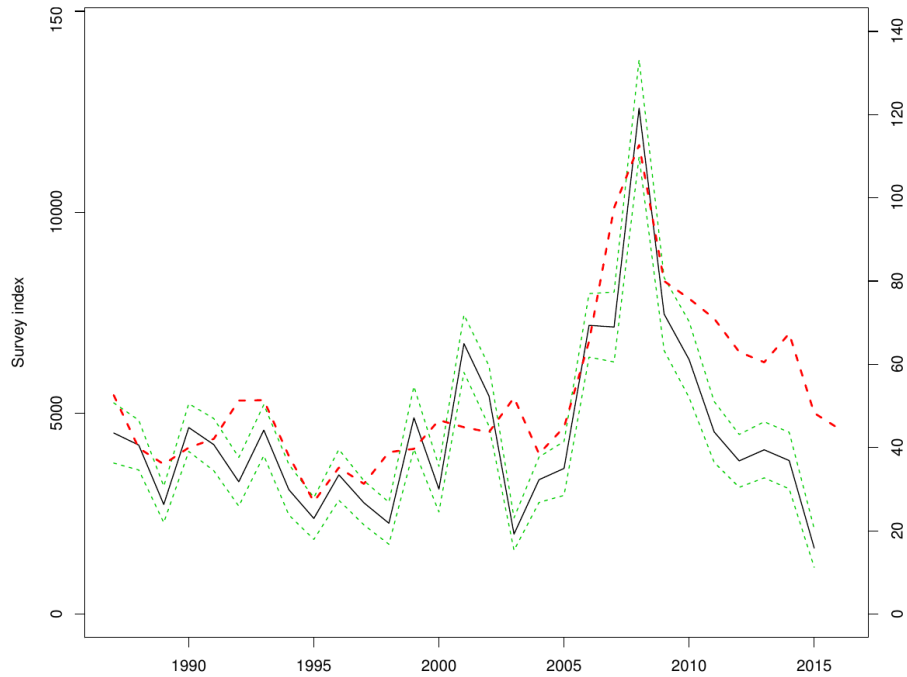


Figure 3. Total biomass indices from the *Nephrops* survey 1987 – 2015 (black line) and standardized CPUE from 1987 – 2016 (red dotted line).

Mynd 3. Vísitala humars (þyngd) úr humartogleiðingrum 1987-2015 (svört lína) og staðlaður aflí á sóknareiningu 1987-2016 (rauð brotalína).

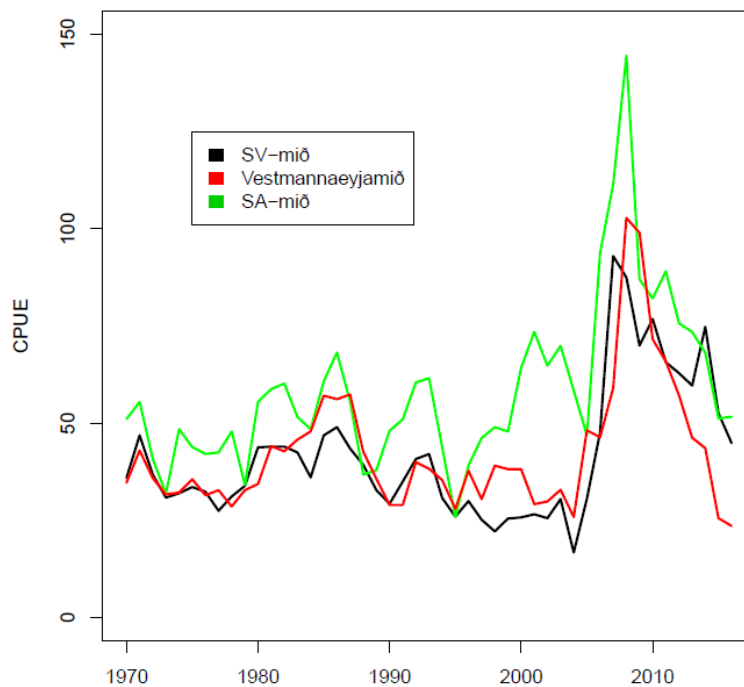


Figure 4. Standardized CPUE from 1970 – 2016 on SW-, Vestmannaeyja (south) and SA areas.

Mynd 4. Staðalaður aflí á sóknareingu á SV-, Vestmannaeyja- og SA-miðum á árunum 1970 – 2016.

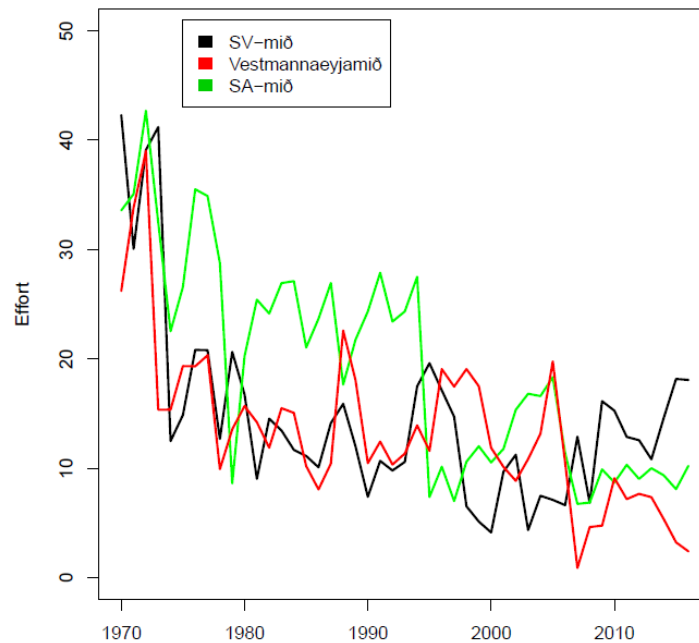


Figure 5. Standardized effort from 1970 – 2016 on SW-, Vestmannaeyja (south) and SA areas.

Mynd 5. Stöðluð sókn á SV-, Vestmannaeyja- og SA-miðum á árunum 1970 – 2016.

SURVEY INDICES

TRAWL SURVEY

A *Nephrops* trawl survey was conducted from 1973 - 2015. In the survey 55 two hours tows were conducted on all *Nephrops* grounds. The stock abundance index declined from the maximum in 2009 and reached its lowest value in 2015 (Figure 3). There have been some similarities between the stock index and CPUE, but less in recent years and during the early years of the survey. The catchability has been related to water clarity (mainly due to phytoplankton) with generally higher catches in murkier waters, and with less *Nephrops* when groundfish numbers are high. This is reflected in the biology and the burrowing behavior of *Nephrops* as the strong temporal patterns in catch rates make the traditional trawl surveys unfeasible to estimate abundance. Among other factors this has led to the progress of using UWTV survey in 2016 to assess stock development and provide management advice for *Nephrops* stock (Campbell, *et al.*, 2009).

There have been somewhat different fluctuations in length frequency distributions from the trawl survey. During the period 1987 – 2015 strong recruitment pulses have been seen on the ground Breiðamerkurdjúp in southeastern Iceland (Figure 6). Since 2010 almost no recruitment has been visible there and the mean size has gone over 50 mm carapace length (CL) in 2015. The trend at Eldey ground in southwestern Iceland has been a bit different as large animals dominated the catch between 2000-2005 (Figure 7). The mean size has also increased in recent years, but smaller *Nephrops* were also seen.

When we look at all *Nephrops* areas there has been general increase in mean size of *Nephrops* from 2005 to 2015 (Figure 8). The mean size of *Nephrops* was above 50 mm CL in 2014 and 2015 surveys. There has also been increase in larger animals from the year 2000 as seen in the increase of 98 % quantile mark. Prior that it was around 60 mm CL but has reached 70 mm CL in 2015.

Length distribution from all samples (Trawl survey and land based samples)

In 2016 78 length samples were available and is that a reduction from 150 samples of previous year, but a lot of that reduction is due to the fact that no trawl survey was carried out and few trawl samples for length frequency distribution came from the UWTV survey that replaced it. The most frequent size of males in the samples in 2016 were 58 mm CL and another peak around 53 mm CL (Figure 9). Like during last few years really few small *Nephrops* were caught and there has never been lower ratio of *Nephrops* smaller than 40 mm CL. Large proportion were above 60 mm and the ratio of animals over 70 mm CL was higher than those below 40 mm CL.

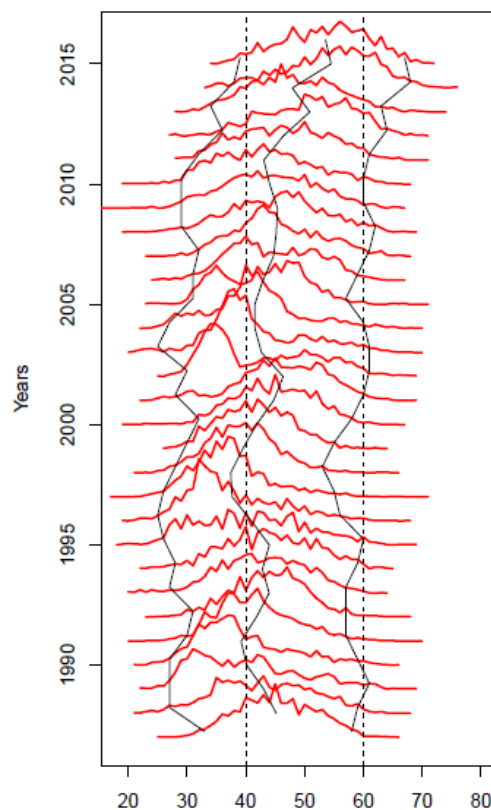


Figure 6. Length frequency distribution by years (1987 – 2015) in Breiðamerkurdjúp from *Nephrops* survey. The 2% and 98 % quantiles with the mean are plotted.

Mynd 6. Þróun í lengdardreifingu í Breiðamerkurdjúpi á árunum 1987 -2015 úr humarleiddangri. Sýnd eru 2 og 98 % hlutfallsmörk auk meðaltals.

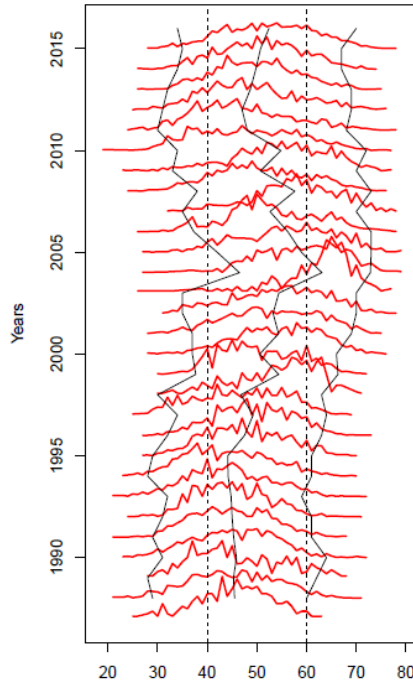


Figure 7. Length frequency distribution by years (1987 – 2015) in Eldey from *Nephrops* survey. The 2% and 98 % quantiles with the mean are plotted.

Mynd 7. Þróun í lengdardreifingu norður af Eldey á árunum 1987-2015 úr humarleiðangri. Sýnd eru 2 og 98 % hlutfallsmörk auk meðaltals.

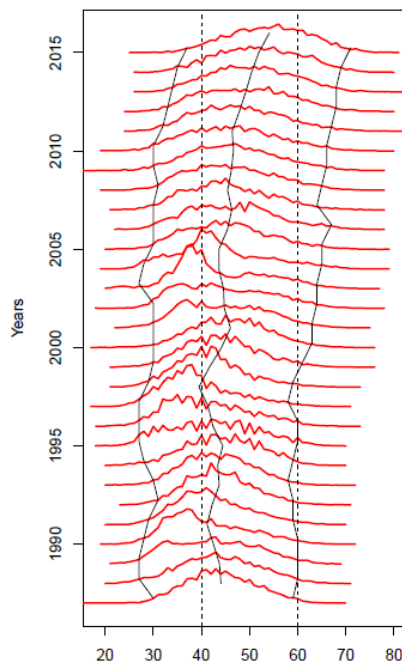


Figure 8. Length frequency distribution by years (1987 – 2015) of all areas from *Nephrops* survey. The 2% and 98 % quantiles with the mean are plotted.

Mynd 8. Þróun í lengdardreifingu á árunum 1987-2015 úr humarleiðangri. Sýnd eru 2 og 98 % hlutfallsmörk auk meðaltals.

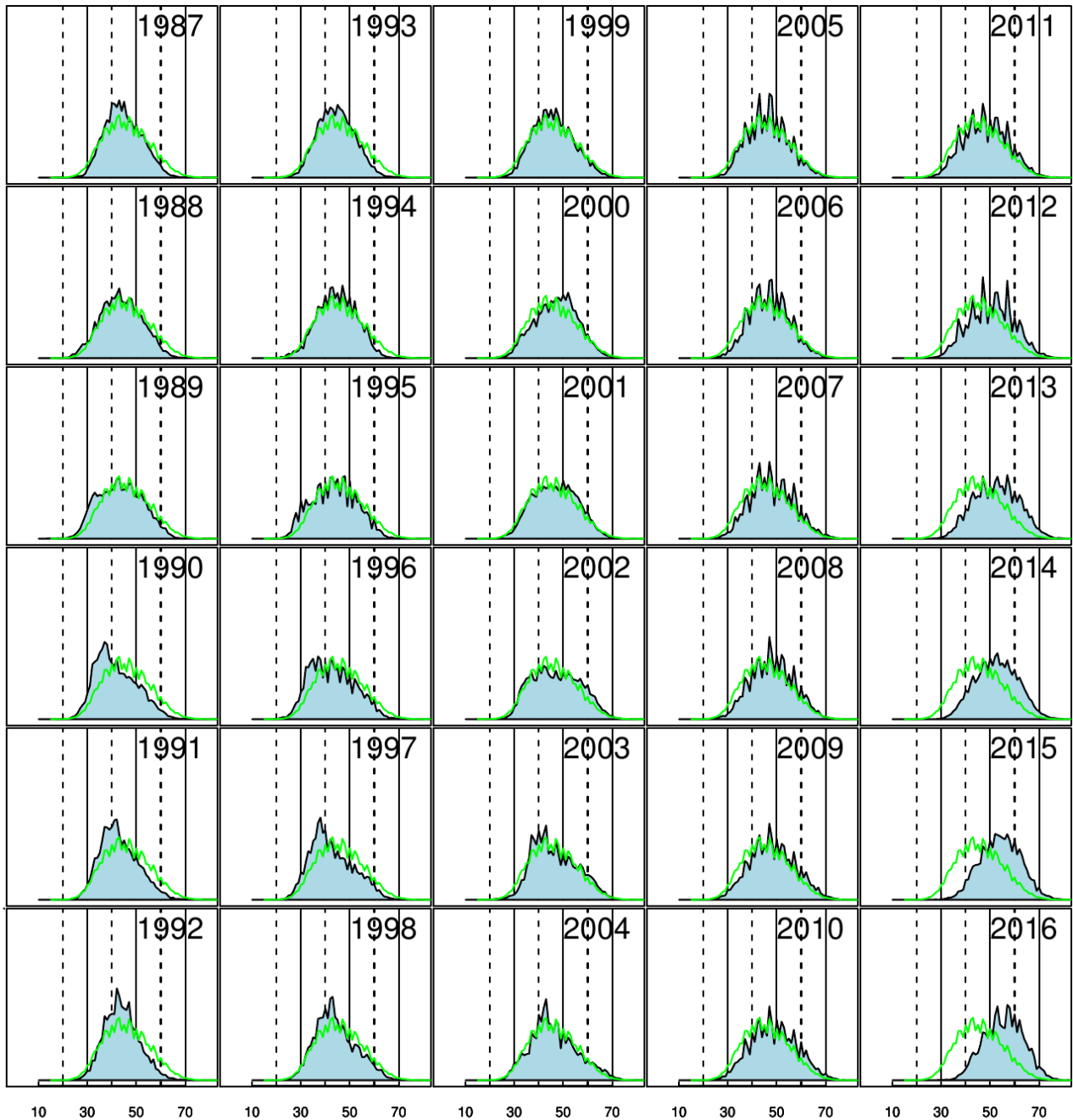


Figure 9. Length frequency distribution of all *Nephrops* samples from 1987 – 2016. The blue polygon is individual year and the green line the average of the years 1970 – 2016.

Mynd 9. Lengdardreifing allra humarsýna frá 1987 – 2016. Bláa svæðið táknar dreifingu hvers árs og græna línan er meðal lengdardreifing árunna 1970- 2016.



Figure 10. Polygons of *Nephrops* ground (see figure 2) based on VMS data. See name of grounds marked by the red ID in Table 7.

Mynd 10. Humarsvæði áætluð úr frá veiðigögnum (VMS, sjá mynd 2). Sjá töflu 7 fyrir heiti svæða sem táknuð eru með rauðu númeri.

UWTV SURVEY

The first UWTV survey in Icelandic water was conducted in June of 2016 with pilot study in Jökuldjúp ground in April. In total there were 86 stations completed on all known *Nephrops* ground. The total size of the grounds was estimated to be 5 989 km² (Table 7, Figure 10). The size of the *Nephrops* area was estimated from VMS data. In total there were ten distinct areas ranging from 210.5 to 1 383.4 km². The largest ground is in the southern part from Háfadjúp to Selvogsbanki and the smallest one is Lónsdjúp in the east. Two grounds were split up into 2 – 3 patches, Hornafjarðdjúp and Selvogsgrunn respectively.

The total number of *Nephrops* on all ground in Iceland was estimated to be 534.8 million animals. Average density was 0.09 burrows per square meter (Figure 11). Highest density of burrows was on the three easternmost grounds, 0.12 burrows per m². Lowest density was on the largest ground (Vestmannaeyjar) in the southern part 0.07 burrows per m². That area had also the highest number of burrows or 101 million.

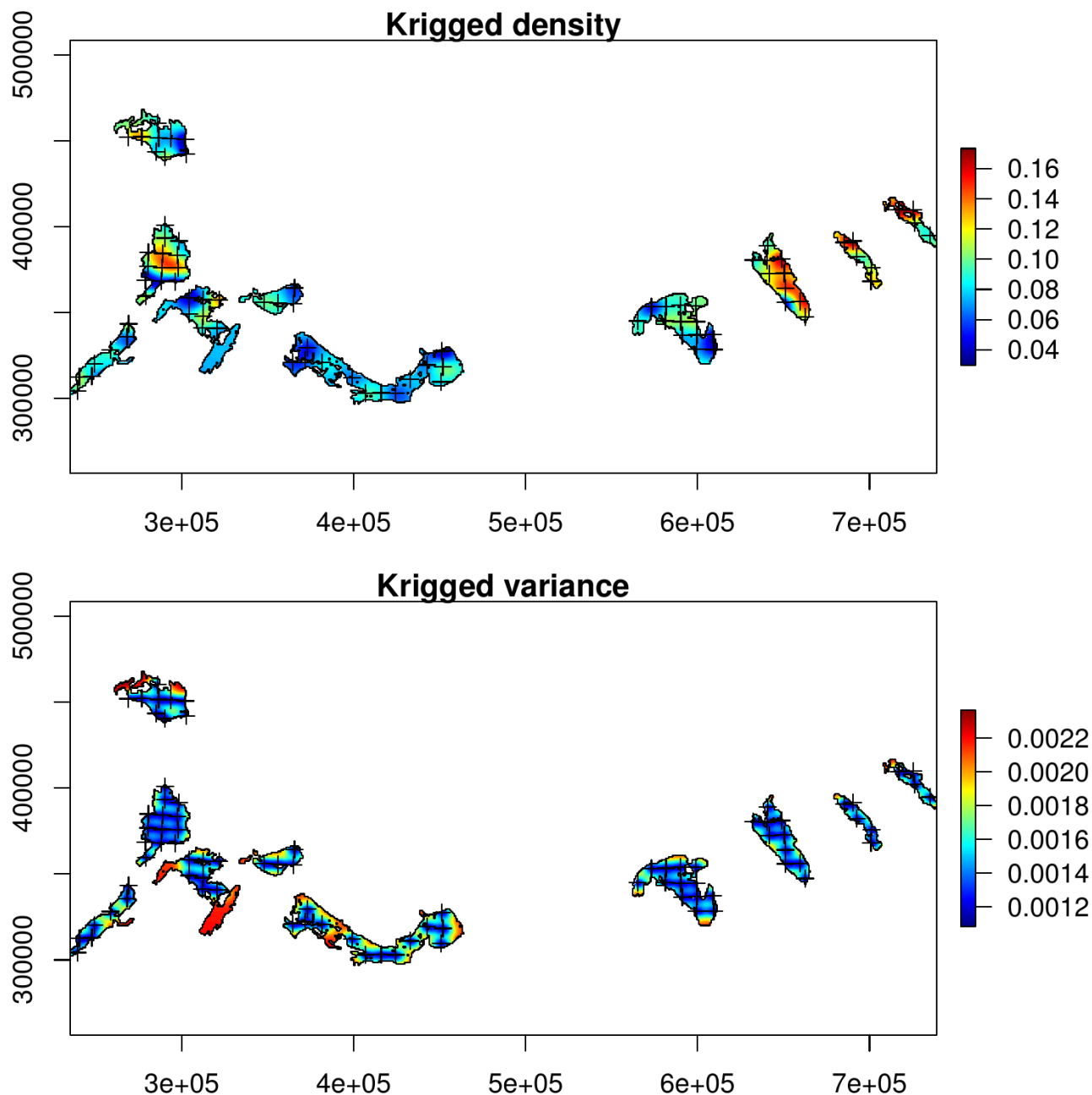


Figure 11. Density of burrows on *Nephrops* ground (per m²) from UWTV survey conducted in 2016. The figure above is the krigged density values (Gaussian model). The figure below is the krigged variance of the data. The crosses represent the stations.

Mynd 11. Holupéttleiki (humarholur á m²) í myndavélaleiðangir árið 2016. Myndin að ofan sýnir brúuð gögn með kriging aðferð (Gaussian líkan). Myndin að neðan sýnir dreifni niðurstöðunnar úr brúunarfallinu. Krossarnir tákna stöðvar.

STOCK ASSESSMENT

VPA

Annual virtual population analysis (VPA) stock assessments were initiated in 1977. Since most of the *Nephrops* landings are composed of the larger-bodied males (>90-95%) stock assessments by VPA have concentrated only on males. In applying the VPA technique to numbers caught in each varying-sized length group, that is estimated to compose a certain virtual "age group", a number of input values are required such as L_{∞} , M and K . Maximum recorded size of males on all major *Nephrops* grounds around Iceland range from 77-88 mm CL (Eiríksson, 2014, personal observations) and here 80 mm CL for the asymptotic length (L_{∞}) has been the standard. Moreover, by assuming that the growth curve is of the von Bertalanffy type, the value of K (growth rate coefficient, *i.e.* the rate at which L_{∞} is approached) for a given value of L_{∞} can be determined provided that at least one annual growth increment is known. Annual length frequency modal progressions, as well as certain amount of data on growth from tagging experiments, have indicated that the growth of male *Nephrops* decreases with size (age) from approximately 5 to 3 mm per annum within the size range of 25 to 50 mm CL (Eiríksson, 1982, 1992). As the slope of the Ford-Walford plot is $\exp(-K)$, the growth coefficient K was obtained from the relation $L_{\infty} - CL_{i+1} / L_{\infty} - CL_i$, giving K around 0.10 depending on points chosen in the length distribution. Therefore, the growth coefficient $K = 0.10$ was accepted as a near average.

Cohorts ("year-classes") were formed by slicing the length frequency distributions into knife-edged demarcations ranging from 6 mm (19-24 mm CL) to 2 mm (56+ mm CL). The validity of the cohorts were diagnosed by a steady state cohort analyses for a period of some 5 years and the value of dt (the time required to grow from the beginning to the end of each length group) was approximated at around 1 in each case. Further, by using the von Bertalanffy equation and the parameters described above, gives similar divisions into length groups (Eiríksson, 1976, 1979).

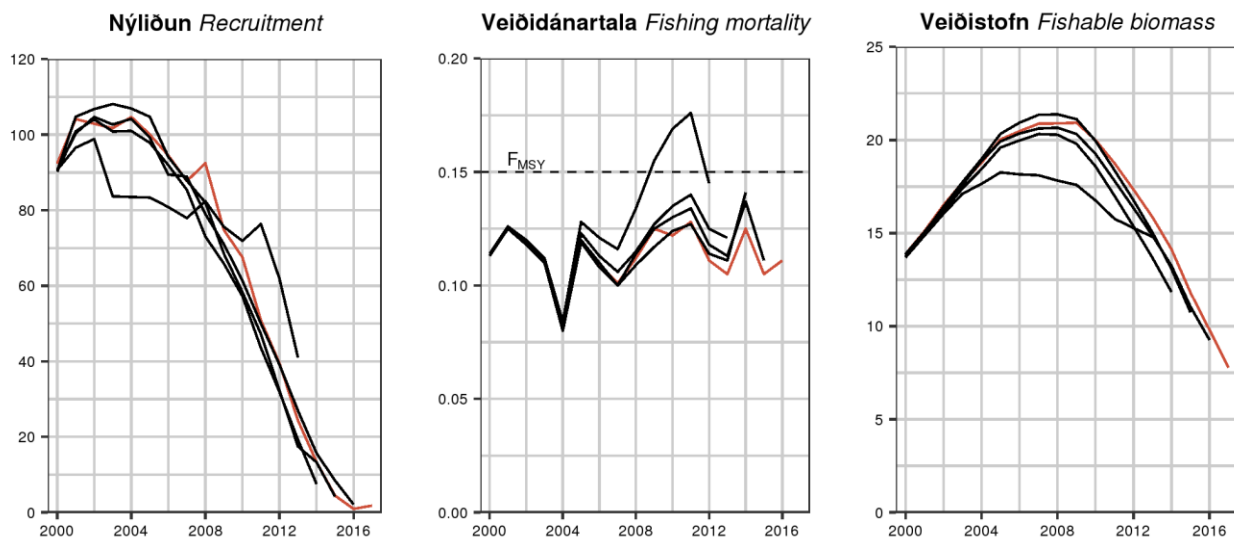


Figure 12. Historical assessment results 2013–2017 (red line: 2017 assessment).

Mynd 12. Samanburður á stofnmati árána 2013–2017 (rauð lína: stofnmat 2017).

The input data is derived from the annual *Nephrops* Trawl Survey and samples from commercial catches (Table 3). The trawl which was used in the survey was a commercial fishing trawl ("Gafhari"). The input data for catch in numbers was based on logbook data at the resolution of Icelandic statistical rectangles. When length samples were missing the adjacent rectangles were merged together.

In 1995 the estimated stock size was at minimum and the fishing was slow (Table 4, Figure 1). Since then the advice has been to fish at F_{MSY} of 0.15 (for yearclasses 6-13). Fishing mortality has been lower than F_{MSY} in recent years and is still slightly below F_{MSY} . Old yearclasses from 1996 – 2000 are estimated to be large. Following those strong yearclasses and with less effort there was an increase in catch and subsequently CPUE. During 2006 -2010 the estimated stock size was at maximum or above 20 000 tonnes. Recruitment has been gradually decreasing from those strong yearclasses or since 2005. That will most likely lead to further decrease in recommended TAC in coming years as yearclasses from 2010 are all below what was previously estimated as the lowest yearclass size. Harvestable biomass is now estimated to be 7 780 tonnes. The biomass has decreased sharply and is at its lowest level, but the abundance of large specimens (10+) is still high. This year's assessment estimates of recruitment, mortality and reference biomass are in line with the assessments of 2013–2016 (Figure 12).

BURROW COUNTS

According to the UWTV survey the harvest ratio of the total stock in 2016 varied quite a bit between grounds or 0.14 – 8.36 %, with an average harvest ratio of 2.14 % (Table 7). The lowest harvest ratio was in Selvogur, followed by the large Vesmannaeyjar area and in Skeiðarárdjúp/Meðallandsbugt. Average ratio (between 1-2 %) was at Grindavíkurdjúp, Eldey and Breiðamerkurdjúp. In the two of the eastern grounds of Hornafjarðardjúp and Hornafjarðardjúp the ratio was 4.25 % and 3.52 %, respectively. On the newly expanded ground of Skerjadjúp the ratio was 3.74 %. The highest fishing pressure was in Jökuldjúp or 8.36 %. The ratio of males in the catches was between 89 – 99 % and the harvest ratio for the males is therefore almost twofold as presented for the whole stock.

ADVICE

Recruitment has been decreasing since 2005 which will most likely lead to further decrease in the harvestable biomass and further reduction in recommended TAC in coming years. In the next few years the catch option will be based on the new UWTV survey. Until then the advice will be based on the stock assessment from VPA analysis. MFRI advises that when the MSY approach is applied, catches in the fishing year 2017/2018 should be no more than 1 150 tonnes.

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Table 1. *Nephrops*, landings from Icelandic waters.

Tafla 1. Leturhumar, aflí á Íslandsmiðum

Year	Icelandic	Others	Total
1951	0	26	26
1952	0	53	53
1953	0	144	144
1954	0	236	236
1955	0	203	203
1956	0	138	138
1957	0	312	312
1958	728	593	1321
1959	1404	602	2006
1960	2081	451	2532
1961	1490	322	1812
1962	2662	154	2816
1963	5550	512	6062
1964	3487	586	4073
1965	3706	409	4115
1966	3465	546	4011
1967	2731	208	2939
1968	2489	157	2646
1969	3512	189	3701
1970	4026	119	4145
1971	4657	155	4812
1972	4321	260	4581
1973	2791	5	2796
1974	1983	6	1989
1975	2357	0	2357
1976	2780	0	2780
1977	2723	0	2723
1978	2059	0	2059
1979	1440	0	1440
1980	2398	0	2398
1981	2520	0	2520
1982	2603	0	2603
1983	2672	0	2672
1984	2459	0	2459
1985	2385	0	2385
1986	2564	0	2564
1987	2712	0	2712
1988	2240	0	2240
1989	1866	0	1866
1990	1692	0	1692
1991	2157	0	2157
1992	2230	0	2230
1993	2381	0	2381
1994	2238	0	2238
1995	1027	0	1027
1996	1633	0	1633

1997	1228	0	1228
1998	1411	0	1411
1999	1376	0	1376
2000	1239	0	1239
2001	1420	0	1420
2002	1548	0	1548
2003	1666	0	1666
2004	1437	0	1437
2005	2030	0	2030
2006	1875	0	1875
2007	2006	0	2006
2008	2070	0	2070
2009	2464	0	2464
2010	2540	0	2540
2011	2240	0	2240
2012	1914	0	1914
2013	1724	0	1724
2014	1965	0	1965
2015	1454	0	1454
2016	1398	0	1398

Table 2. *Nephrops*. Landings (in tonnes) and CPUE (kg/hour trawled) by area.

Tafla 2. Leturhumar aflí (í tonnum) og aflí á tog tíma (kg/klst) eftir svæðum.

Year	swLandings	swCPUE	sLandings	sCPUE	seLandings	seCPUE	Landings	CPUE
1970	1517	35.9	916	34.7	1593	51.1	4026	40.2
1971	1393	46.9	1446	43.0	1818	55.5	4657	48.4
1972	1500	36.8	1370	35.9	1451	40.8	4321	37.7
1973	1130	30.9	535	31.6	1126	31.9	2791	31.3
1974	408	32.0	492	32.2	1083	48.5	1983	39.4
1975	527	33.6	717	35.6	1113	43.9	2357	38.5
1976	817	32.4	608	31.5	1355	42.1	2780	36.2
1977	571	27.5	663	32.8	1489	42.5	2723	35.7
1978	395	31.2	290	28.6	1374	47.9	2059	40.0
1979	700	33.9	445	32.8	295	34.2	1440	33.6
1980	734	43.8	540	34.4	1124	55.5	2398	45.5
1981	398	44.0	627	44.1	1495	58.8	2520	51.8
1982	640	44.0	509	42.8	1454	60.2	2603	51.5
1983	572	42.5	710	45.8	1390	51.6	2672	47.8
1984	422	36.1	722	47.9	1315	48.5	2459	45.6
1985	522	46.9	583	57.1	1280	60.8	2385	56.4
1986	495	49.0	454	56.2	1615	68.2	2564	61.3
1987	615	43.5	599	57.4	1498	55.6	2712	52.6
1988	625	39.3	965	42.7	650	36.8	2240	39.9
1989	394	32.8	645	35.7	827	38.0	1866	36.0
1990	217	29.3	304	29.0	1171	48.1	1692	40.0
1991	374	35.0	361	29.0	1422	51.0	2157	42.1
1992	400	40.8	414	40.0	1417	60.5	2230	51.3
1993	446	42.1	435	38.3	1500	61.6	2381	51.4
1994	539	30.8	493	35.4	1205	43.8	2238	38.0
1995	510	26.0	325	28.0	192	26.0	1027	27.0
1996	514	30.0	721	37.8	398	39.2	1633	35.2
1997	371	25.2	533	30.5	324	46.2	1228	31.3
1998	145	22.2	746	39.1	520	49.0	1411	38.9
1999	131	25.5	669	38.2	576	47.9	1376	39.7
2000	107	25.8	454	38.2	678	64.3	1239	46.6
2001	258	26.6	296	29.2	866	73.5	1420	44.9
2002	288	25.6	265	29.9	995	64.8	1548	43.7
2003	133	30.5	357	32.9	1176	69.9	1666	52.0
2004	126	16.8	341	25.9	970	58.4	1437	38.5
2005	218	30.6	953	48.2	860	46.9	2030	44.9
2006	316	47.6	490	46.4	1069	93.7	1875	65.5
2007	1200	93.0	53	59.1	753	111.5	2006	97.6
2008	599	87.5	477	102.8	994	144.5	2070	112.7
2009	1130	70.0	472	99.8	862	86.9	2464	80.0
2010	1173	76.8	652	71.6	715	82.1	2540	75.8
2011	846	65.7	474	65.9	920	89.1	2240	71.0
2012	791	62.9	439	57.2	684	75.7	1914	63.0
2013	647	59.7	341	46.3	736	73.5	1724	60.5
2014	1093	74.8	234	43.6	638	68.1	1965	67.4
2015	956	52.6	83	25.6	415	51.2	1454	48.3
2016	812	44.9	57	23.6	529	51.7	1398	44.5

Table 3. *Nephrops*. Catch in numbers at age (in millions)
 Tafla 3. Leturhumar, skipting aflans í fjölda eftir aldri (í milljónum).

Year	a3	a4	a5	a6	a7	a8	a9	a10	a11	a12	a13	a14	a15	a16	a17	a18	a19	a20
1977	0.312	3.224	9.773	10.27	10.39	8.687	5.053	3.808	2.348	1.128	0.850	0.539	0.292	0.149	0.051	0.047	0.016	0.014
1978	0.091	1.256	6.336	7.691	7.385	6.501	4.304	3.011	1.959	0.699	0.511	0.295	0.186	0.136	0.076	0.060	0.025	0.009
1979	0.019	0.319	2.391	4.493	5.195	4.731	2.911	2.458	1.445	0.551	0.401	0.209	0.104	0.053	0.015	0.005	0.004	0.004
1980	0.042	0.478	3.081	5.713	8.010	8.715	5.376	4.041	2.614	0.980	0.588	0.281	0.171	0.074	0.026	0.017	0.006	0.000
1981	0.070	0.639	2.749	4.912	6.885	8.001	5.815	4.869	3.392	1.215	0.698	0.411	0.171	0.076	0.013	0.005	0.000	0.000
1982	0.080	0.981	5.411	6.207	7.336	8.025	5.793	4.623	3.513	1.283	0.962	0.322	0.157	0.059	0.038	0.005	0.000	0.000
1983	0.105	0.733	4.493	6.814	6.641	6.646	4.741	5.005	3.790	1.774	1.161	0.629	0.336	0.146	0.046	0.015	0.002	0.000
1984	0.256	1.453	4.744	5.967	6.862	6.176	4.005	3.414	3.199	1.528	1.271	0.798	0.471	0.328	0.117	0.070	0.015	0.019
1985	0.049	0.890	3.703	5.216	5.777	6.589	5.147	4.016	3.262	1.331	0.998	0.568	0.333	0.130	0.054	0.029	0.007	0.000
1986	0.006	0.440	3.253	6.387	8.609	7.511	5.254	4.130	3.298	1.202	0.961	0.523	0.225	0.066	0.045	0.000	0.000	0.000
1987	0.054	0.423	2.437	5.290	7.339	8.308	5.429	4.454	3.328	1.621	1.063	0.610	0.379	0.171	0.107	0.048	0.017	0.016
1988	0.088	0.726	2.698	4.531	6.035	6.182	5.252	3.993	2.526	1.187	0.885	0.473	0.371	0.136	0.044	0.053	0.013	0.001
1989	0.070	0.751	3.365	3.808	4.586	5.064	3.521	2.991	2.593	1.219	0.819	0.526	0.344	0.147	0.057	0.019	0.008	0.000
1990	0.085	1.094	5.436	7.147	5.927	4.424	2.777	2.133	1.571	0.828	0.633	0.423	0.333	0.158	0.087	0.041	0.013	0.009
1991	0.041	0.866	4.859	7.939	9.021	6.951	3.811	2.847	1.902	0.836	0.610	0.364	0.258	0.107	0.058	0.022	0.019	0.001
1992	0.014	0.444	3.113	6.303	8.338	8.279	4.889	3.120	2.014	0.904	0.551	0.302	0.184	0.078	0.021	0.015	0.006	0.006
1993	0.049	0.348	2.492	4.652	6.347	6.940	5.159	3.898	3.110	1.407	0.896	0.515	0.309	0.147	0.073	0.043	0.005	0.001
1994	0.120	0.895	2.267	4.053	5.450	6.089	4.471	3.793	3.126	1.641	1.013	0.492	0.342	0.129	0.039	0.022	0.003	0.000
1995	0.057	0.529	1.709	2.071	2.258	2.577	1.889	1.780	1.370	0.705	0.436	0.378	0.236	0.087	0.036	0.014	0.002	0.000
1996	0.072	0.728	3.104	4.229	4.194	4.134	2.814	2.277	1.994	1.009	0.831	0.629	0.379	0.159	0.077	0.033	0.005	0.003
1997	0.028	0.510	2.482	3.569	3.590	2.878	1.812	1.583	1.455	0.795	0.642	0.471	0.288	0.171	0.064	0.027	0.008	0.003
1998	0.003	0.186	1.400	2.536	3.494	3.319	2.244	1.881	1.712	0.962	0.787	0.621	0.428	0.242	0.116	0.042	0.018	0.002
1999	0.029	0.179	1.257	2.645	3.631	4.012	2.827	2.104	1.652	0.775	0.536	0.369	0.283	0.135	0.075	0.037	0.008	0.006
2000	0.030	0.194	1.176	1.606	2.213	2.748	2.232	2.223	1.872	0.944	0.658	0.446	0.290	0.142	0.075	0.030	0.013	0.003
2001	0.017	0.221	0.874	1.550	2.345	2.847	2.229	2.345	2.144	1.230	0.900	0.634	0.401	0.212	0.109	0.043	0.012	0.005
2002	0.006	0.170	1.770	2.213	2.230	2.522	1.979	2.098	1.982	1.224	1.058	0.934	0.713	0.408	0.227	0.099	0.037	0.016
2003	0.065	0.264	1.042	3.308	3.606	3.016	2.143	1.897	1.767	1.131	1.035	0.883	0.778	0.459	0.292	0.131	0.041	0.014
2004	0.030	0.557	1.994	2.595	4.647	4.532	2.320	1.737	1.246	0.666	0.517	0.430	0.393	0.277	0.207	0.126	0.073	0.031
2005	0.025	0.217	1.762	3.445	3.937	5.161	4.612	3.540	2.648	1.382	0.770	0.559	0.445	0.204	0.123	0.047	0.024	0.011
2006	0.010	0.223	1.191	2.825	4.135	4.290	3.587	3.311	2.603	1.286	0.883	0.581	0.417	0.198	0.131	0.051	0.030	0.020
2007	0.019	0.122	0.799	1.821	2.929	3.880	2.821	2.580	2.487	1.617	1.140	0.989	0.844	0.448	0.376	0.210	0.188	0.110
2008	0.018	0.237	1.213	2.421	3.501	3.994	3.650	3.432	2.691	1.569	1.014	0.949	0.733	0.371	0.254	0.112	0.063	0.036
2009	0.043	0.256	1.294	2.381	3.356	4.276	3.716	3.431	2.956	1.815	1.214	1.220	1.156	0.681	0.553	0.268	0.179	0.125
2010	0.019	0.240	1.394	2.551	3.547	4.343	3.552	3.556	2.860	1.891	1.220	1.369	1.142	0.744	0.521	0.303	0.265	0.166
2011	0.017	0.252	1.495	2.845	3.274	4.172	3.415	3.193	2.930	1.832	1.081	0.990	0.901	0.528	0.427	0.178	0.113	0.084
2012	0.001	0.088	0.695	1.539	2.108	2.889	2.817	2.561	2.406	1.703	1.075	1.017	1.018	0.558	0.419	0.233	0.132	0.156
2013	0.002	0.025	0.294	0.884	1.615	2.405	2.208	2.180	2.300	1.451	1.125	1.013	0.970	0.599	0.420	0.242	0.131	0.135
2014	0.000	0.014	0.203	0.729	1.573	2.391	2.302	2.432	2.477	1.569	1.291	1.185	1.062	0.793	0.536	0.330	0.169	0.170
2015	0.000	0.007	0.144	0.472	1.010	1.609	1.564	1.713	1.702	1.113	0.993	0.865	0.881	0.612	0.481	0.267	0.137	0.114
2016	0.000	0.006	0.016	0.131	0.491	0.994	1.279	1.458	1.735	1.173	1.174	0.914	0.928	0.574	0.481	0.254	0.153	0.166

Table 4. *Nephrops*, recruitment as 5-year-olds in millions, fishable (6+) and large category (10+) stock in tonnes, landings in tonnes, and fishing mortality (average for ages 6–13)

Tafla 4. Leturhumar, fjöldi fimm ára nýliða í milljónum, veiðistofn (6 ára og eldri) og stofn stórhúmars (10 ára og eldri) í upphafi árs í tonnum, aflí í tonnum og fiskveiðidánartala (meðaltal fyrir 6–13 ára).

Year	Rec	B6plus	B10plus	Landings	Fbar
1980	89.3	13674	3596	2398	0.25
1981	88.5	13662	4077	2520	0.26
1982	90.1	13462	4284	2603	0.28
1983	86.1	13098	4382	2672	0.30
1984	86.4	12587	4031	2459	0.30
1985	76.4	12300	3887	2385	0.28
1986	75.0	11872	3789	2564	0.31
1987	76.2	11182	3626	2712	0.36
1988	85.3	10388	3206	2240	0.32
1989	94.7	10389	2914	1866	0.30
1990	89.1	11101	2738	1692	0.23
1991	77.6	11798	3051	2157	0.25
1992	70.8	11657	3431	2230	0.25
1993	67.5	11223	3775	2381	0.30
1994	69.0	10532	3559	2238	0.31
1995	76.2	10052	3276	1027	0.14
1996	75.8	11109	3669	1633	0.20
1997	77.0	11451	3863	1228	0.14
1998	76.6	12273	4345	1411	0.15
1999	88.1	12907	4717	1376	0.13
2000	92.3	13859	5300	1239	0.11
2001	104.1	15092	5728	1420	0.13
2002	102.9	16476	6122	1548	0.12
2003	101.7	17691	6450	1666	0.11
2004	104.7	18745	7213	1437	0.08
2005	100.0	20002	8377	2030	0.12
2006	94.5	20426	9065	1875	0.11
2007	87.7	20812	9566	2006	0.10
2008	92.4	20824	9873	2070	0.11
2009	74.8	20837	10196	2464	0.13
2010	67.6	19912	10030	2540	0.12
2011	50.8	18665	9645	2240	0.13
2012	39.5	17240	9361	1914	0.11
2013	24.3	15756	9324	1724	0.11
2014	13.3	14036	8941	1965	0.13
2015	4.4	11717	8162	1454	0.11
2016	0.9	9718	7447	1398	0.11

Table 5. *Nephrops*, input parameters for stock projection. Natural mortality coefficient, $M=0.2$.
 Tafla 5. Leturhumar, forsendur í framreikningum á þróun stofnsins. Náttúrulegur dánarstuðull $M=0.2$.

Age	Stock size	Selectivity	Mean weight (g)
5	1.80	0.05	23
6	0.75	0.12	34
7	2.76	0.22	46
8	6.39	0.35	60
9	8.71	0.42	75
10	10.52	0.60	89
11	9.47	0.80	104
12	9.07	0.85	119
13	6.98	1.00	131
14	6.58	1.00	145
15	3.58	1.00	159
16	2.50	1.00	175
17	1.50	1.00	217
18	0.92	1.00	238
19	0.46	1.00	268
20	0.17	1.00	284

Stock size: Stock size in millions in 2017.

Selectivity: Relative fishing mortality on each age group in 2016.

Mean weight: From length-weight regression.

Stofnstærð: Stofnstærð í milljónum 2017.

Veiðimynstur: Hlutfallsleg veiðidánartala hvers aldursflokks 2016.

Meðalþyngd: Út frá sambandi lengdar og þyngdar.

Table 6. *Nephrops*. Recommended TAC, National TAC set by the Ministry and landings (tonnes).

Tafla 6. Leturhumar. Tillögur Hafrannsóknastofnunar um hámarksafla, ákvörðun stjórnvalda um aflamark og landaður afli (tonn).

Year	Rec. TAC	TAC	Landings
1984	2400	2600	2500
1985	2300	2400	2400
1986	2500	2500	2600
1987	2700	2800	2700
1988	2600	2600	2200
1989	2100	2100	1900
1990	2100	2000	1700
1991	2100	2100	2200
1991/92	2100	2100	2200
1992/93	2200	2400	2400
1993/94	2200	2400	2200
1994/95	2200	2200	1000
1995/96	1500	1500	1600
1996/97	1500	1500	1200
1997/98	1500	1200	1400
1998/99	1200	1200	1400
1999/00	1200	1200	1300
2000/01	1400	1400	1400
2001/02	1500	1500	1577
2002/03	1600	1600	1687
2003/04	1600	1600	1437
2004/05	1500	1500	2035
2005/06	1600	1800	1946
2006/07	1700	1800	1946
2007/08	1900	1900	2000
2008/09	2200	2200	1999
2009/10	2200	2200	2456
2010/11	2100	2100	2259
2011/12	2000	2100	2130
2012/13	1900	1900	1965
2013/14	1750	1750	1983
2014/15	1650	1650	1425
2015/16	1500	1500	1536
2016/17	1300	1300	
2017/18	1150		

Table 7. Summary of 2016 *Nephrops* UWTV survey and information about the catch in 2016. Name of area, ID of area (see figure 10), size of the area (km²), number of burrows (million), mean number of burrows per meter square, catches per area, mean weight of *Nephrops* in catch, ratio of males in the catch (%), number of animals removed and harvest ratio in 2016.

Tafla 7. Holumyndataka leturhumars 2016 og upplýsingar um afla 2016. Nafn á svæðum, merki svæðis (sjá mynd 10), stærð svæða (km²), fjöldi hola (milljónir), fjöldi hola á hvern fermeter, afli hvers svæðis, meðalþyngd veiddra humra, hlutfall karldýra í afla, fjöldi veiddra humra og veiðihlutfall á hverju svæði 2016.

Area	ID	km ²	Burrows	Burrows m ²	Catch (t)	M.weight (g)	M %	Removals	Harvest ratio
Jökuldjúp	4	549.8	47.0	0.085	426.5	0.109	0.95	3.92	8.36%
Eldey	10	701.3	70.5	0.101	120.1	0.121	0.95	0.99	1.40%
Skerjadjúp	1	395.9	32.9	0.083	161.2	0.131	0.94	1.23	3.74%
Grindavíkurdjúp	7	744.6	59.6	0.080	104.1	0.125	0.93	0.83	1.39%
Selvogur	9, 11, 12	294.3	23.8	0.081	5073	0.147	0.97	0.03	0.14%
Vestmannaeyjasvæði	2	1383.4	101.2	0.073	54.1	0.159	0.97	0.34	0.34%
Skeiðarárdjúp	8	851.5	69.4	0.081	78.7	0.133	0.99	0.59	0.86%
Breiðamerkurdjúp	6	630.9	77.3	0.123	178.4	0.125	0.89	1.42	1.84%
Hornafjarðardjúp	3	227.2	27.4	0.121	129.6	0.111	0.91	1.17	4.25%
Lónsdjúp	5,13	210.5	25.7	0.122	139.7	0.155	0.98	0.90	3.52%
Total		5989.3	534.8	0.089	1397.5	0.122		11.43	2.14%