

LETURHUMAR

Nephrops norvegicus

INNGANGUR

Veiðar á leturhumri (*Nephrops norvegicus*) við Ísland hófust upp úr 1950. Fyrstu tvo áratuginu voru veiðarnar stundaðar af Belgum, Frökkum og Íslendingum en Íslendingar hafa svo staðið einir að veiðunum frá 1974 (Tafla 1). Í upphafi voru humarveiðar einkum stundaðar á vorin og sumrin og tóku allt að 200 bátar þátt í veiðunum á sjöunda og áttunda áratugnum. Á undanförunum árum hefur vertíðin lengst og hefst veiðitímabilið nú 15. mars og stendur út október með einstaka framlengingum til nóvember og desember. Fjöldi báta sem stunda veiðarnar hefur fækkað jafnt og þétt, allt niður í níu báta síðastliðin ár. Humar hefur nær eingöngu verið veiddur í humarvörpu við Ísland, en mis umfangsmiklar tilraunir með gildirur hafa þó farið fram á undanförunum áratugum.

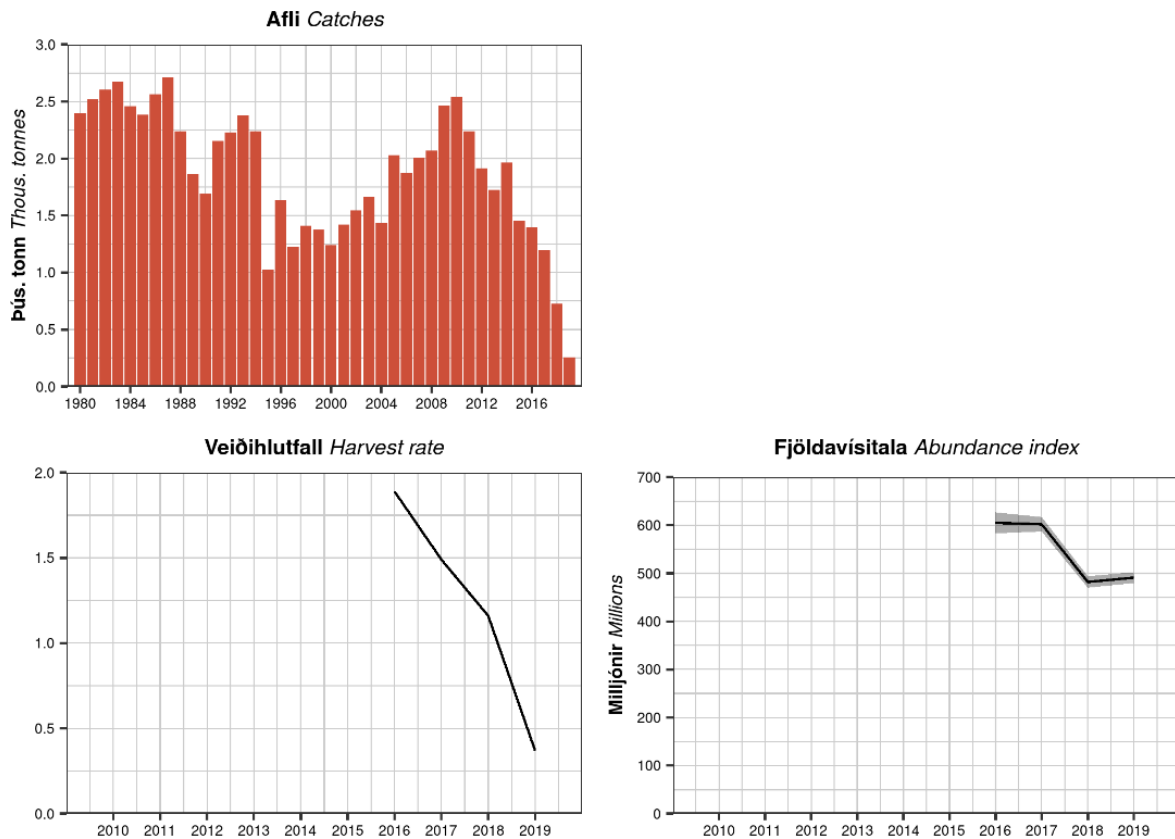
Humarmiðin við Ísland liggja við norðurmörk útbreiðslu tegundarinnar. Sýnt hefur verið fram á æxlunarferill kvendýra við Ísland tekur að jafnaði tvö ár, samanborðið við árlegan ferill við Skotland, Írland, Frakkland og Portúgal (Eiríksson, 2014). Það sem veldur því er að vöxtur þeirra eftir kynþroska er hægari og framleiðni minni hér við land. Það hefur áhrif á afraksturgetu stofnsins samanborðið við suðlægari stofna og gefur tilefni til varkárari nýtingar.

VEIÐAR

LANDANIR

Vegna slæms ástandsins humarstofnsins voru einungis ráðlagðar takmarkaðar veiðar til að fylgjast með ástandi stofnsins (könnunarveiðar) árið 2019 og allar humarveiðar bannaðar í Jökuldjúpi og Lónsdjúpi. Alls var landað 259 tonnum af humri á síðastliðnu ári, minnkun um 469 tonn frá árinu 2018 (Tafla 1, Mynd 1). Aflinn hefur farið stöðugt minnkandi frá árinu 2010 þegar hann var 2540 tonn. Aflinn náði mest 6000 tonnum árið 1963 og í kjölfarið fylgdu nokkur ár með mikilli veiði (Eiríksson and Jónasson, 2018).

Árið 2019 var 159 tonnum landað frá suðvesturmiðum sem var minnkun um 243 tonn frá fyrra ári (Tafla 2, Mynd 2). Frá svæðum við suðurströndina (Vestmannaeyjamið) var aðeins landað um 6 tonnum, ögn minna en síðustu tvö ár þar á undan, en aldrei hafði verið landað jafnt litlu af því svæði frá upphafi veiða. Frá suðaustursvæðum var landað 94 tonnum sem er 222 tonnum minna en 2018.

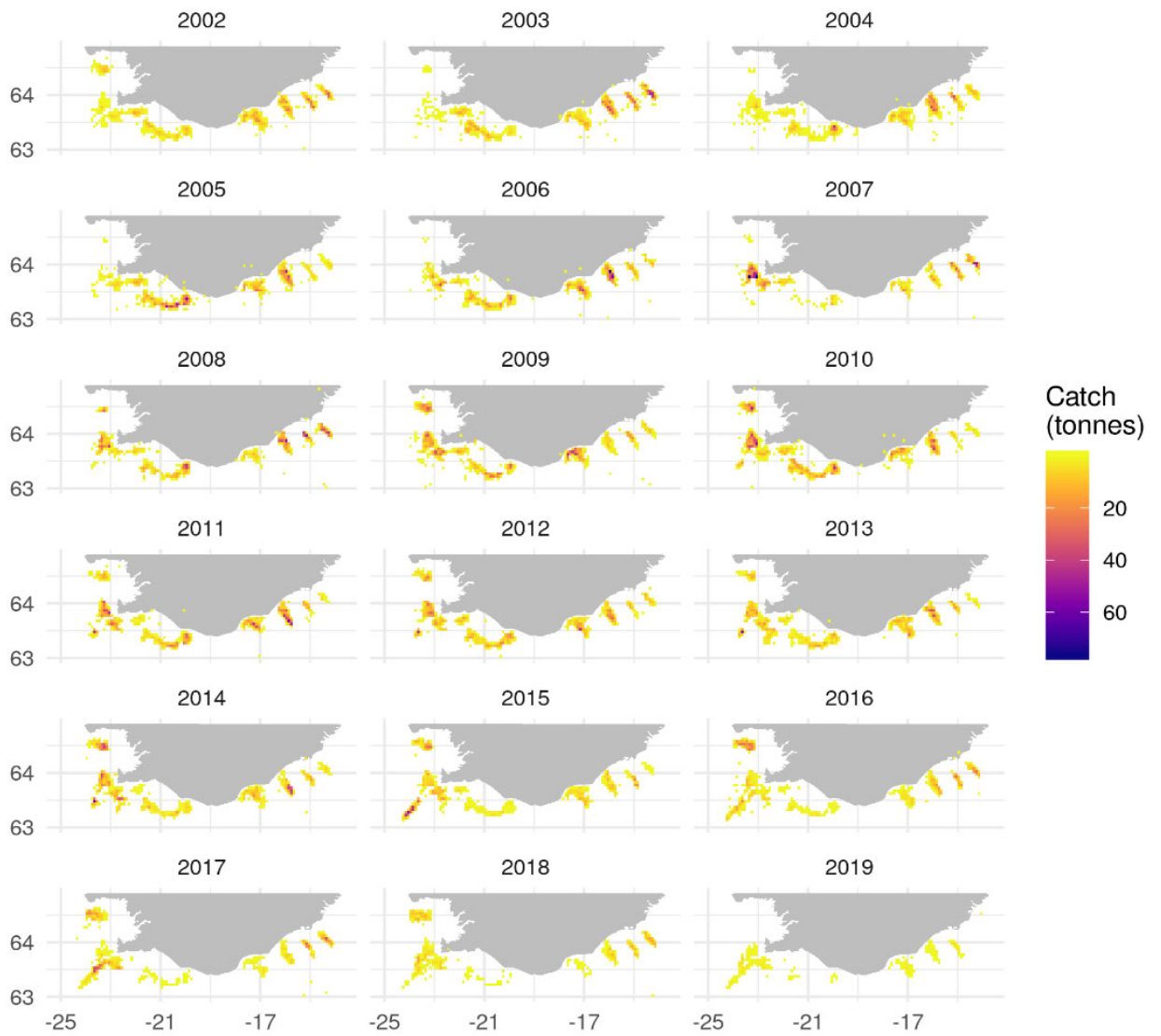


Mynd 1. Humar. Afli, veiðihlutfall (fjöldi veiddra humra deilt með fjölda úr stofnmælingu), stofnstærð (humarholu myndataka, fjöldi í milljónum með 95% öryggismörkum).

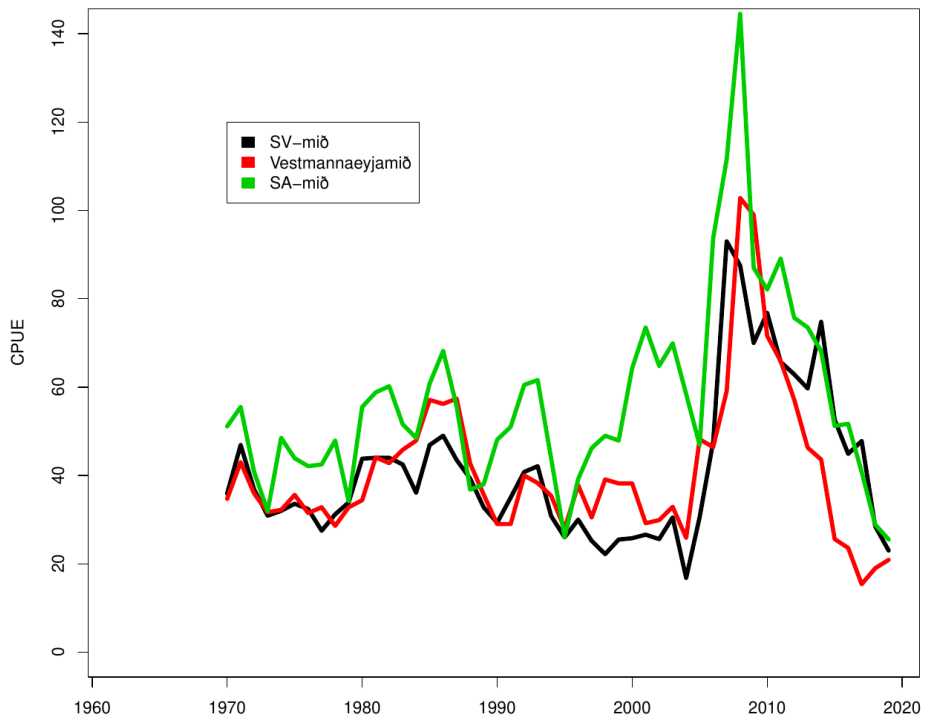
AFLI Á SÓKNAREINGU OG SÓKN

Afli á sóknareiningu (staðlaður við eina vörpu, tímabilið maí-ágúst) minnkaði á milli árunna 2018 og 2019 úr 28,3 í 23,4 kg á togtíma (Tafla 2). Afli á sóknareiningu hefur minnkað mikið síðan toppi var náð árin 2007-2008 þegar yfir 100 kg veiddust að jafnaði á togtíma. Afli á sóknareiningu hefur einungis mælst lægri árið 1995, en það ár var þriggja vikna verkfall yfir mánaðarmótin maí/júní. Afli á sóknareiningu hefur í gegnum tíðina sveiflast nokkuð líkt á milli svæða en hefur þó að jafnaði verið hærri á suðaustursvæðum og lægri á svæðum við suðurströndina (Vestmannaeyjarnar) (Mynd 3).

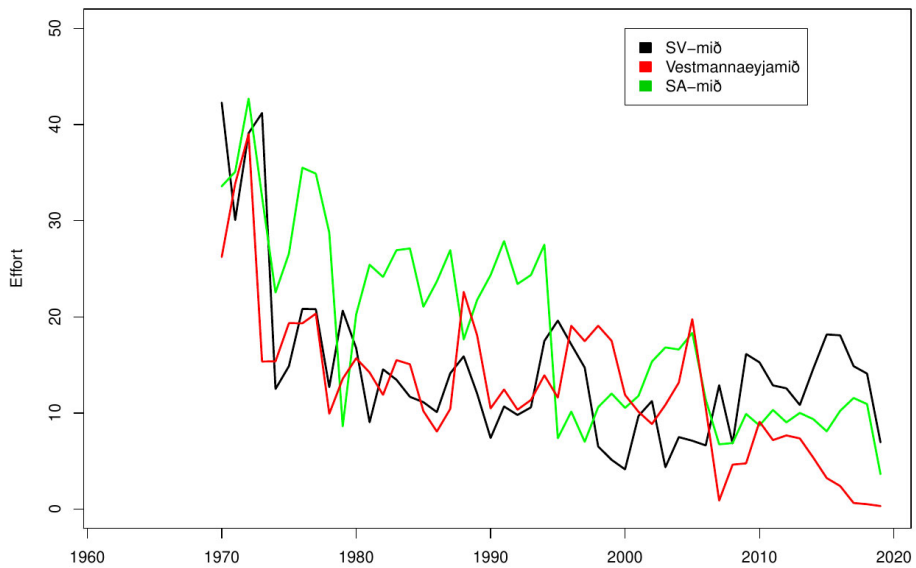
Almennt hefur sókn í humar farið minnkandi frá árinu 1970 til árunna 2000-2008, en aðeins misjafnt eftir svæðum (Mynd 4). Frá árinu 2008 hefur sóknin minnkað á svæðum kringum Vestmannaeyjar, aukist á suðvestursvæðum en staðið í stað á suðaustursvæðum. Í könnunarveiðum síðastliðins árs dró mikið úr sókn á suðvestur- og suðaustursvæðunum.



Mynd 2. Humar. Dreifing afla árin 2002-2019.



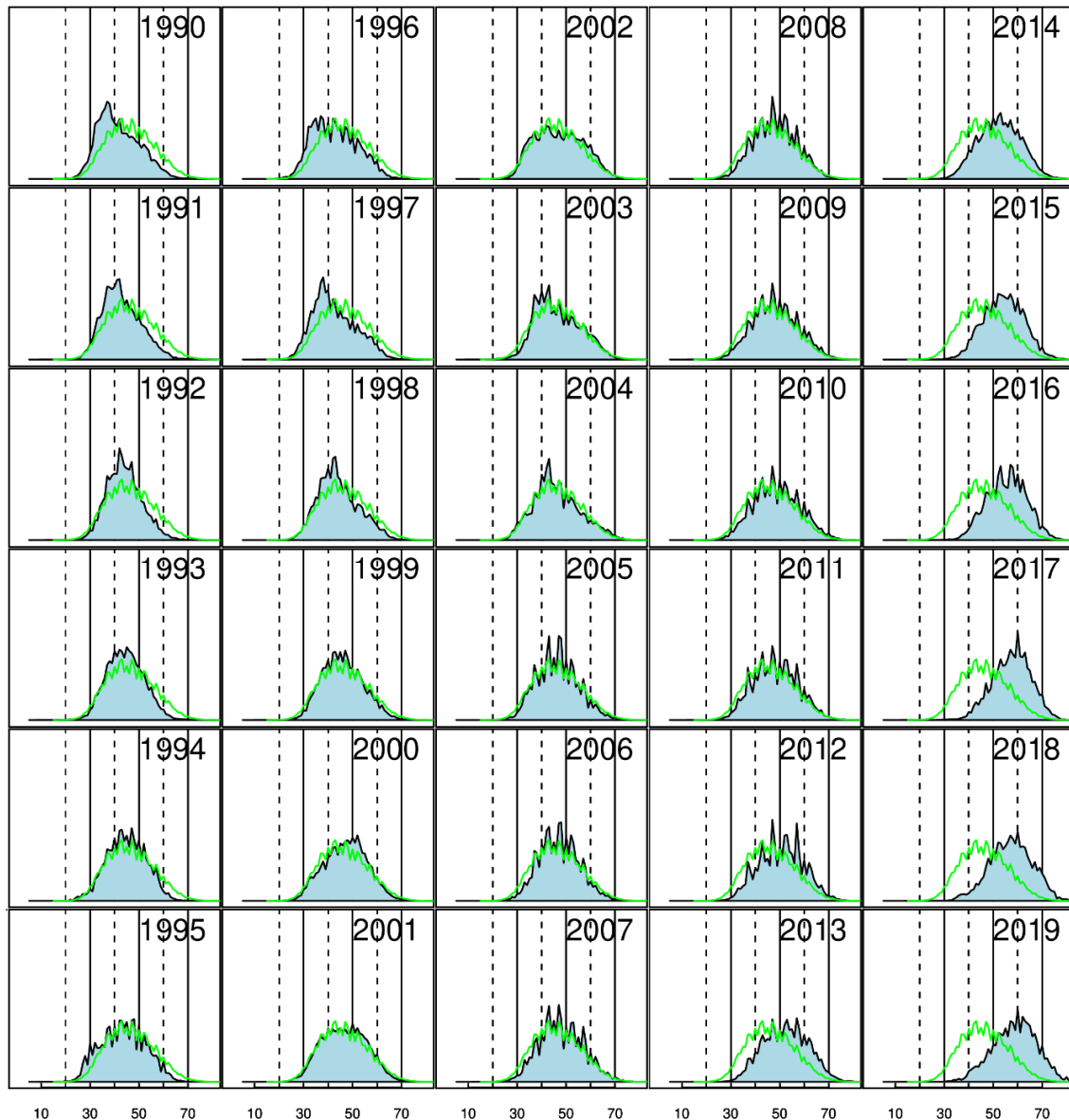
Mynd 3. Humar. Staðlaður afli á sóknareiningu á SV-, Vestmannaeyja- og SA-miðum árin 1970–2019.



Mynd 4. Humar. Stöðluð sókn á SV-, Vestmannaeyja- og SA-miðum árin 1970–2019.

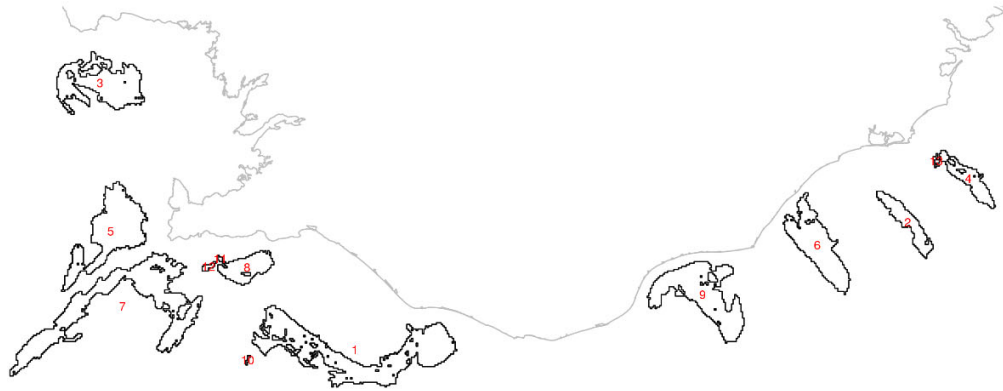
LENGDARDREIFINGAR

Árið 2019 fengust 79 sýni úr aflu og humarholuleiðangri, til að meta stærðarsamsetningu veiðistofnsins. Það er líkur fjöldi og undanfarin ár. Algegnasta stærð karldýra árið 2019 var um 60 mm skjaldar lengd (CL, Mynd 5). Mjög fáir smáir humrar hafa veiðst undanfarin ár og á síðastliðnu ári mældist lægsta hlutfall humra minna en 40 mm skjaldar lengd. Hátt hlutfall karldýra var yfir 60 mm og fjöldi dýra yfir 70 mm var svipaður og dýra undir 50 mm; ástand sem hefur aldrei sést áður í þessum stofni.



Mynd 5. Humar. Lengdardreifing karldýra (skyggt svæði) árin 1990–2019. Græna línan sýnir meðaltal árána 1970–2019.

LEIÐANGRAR

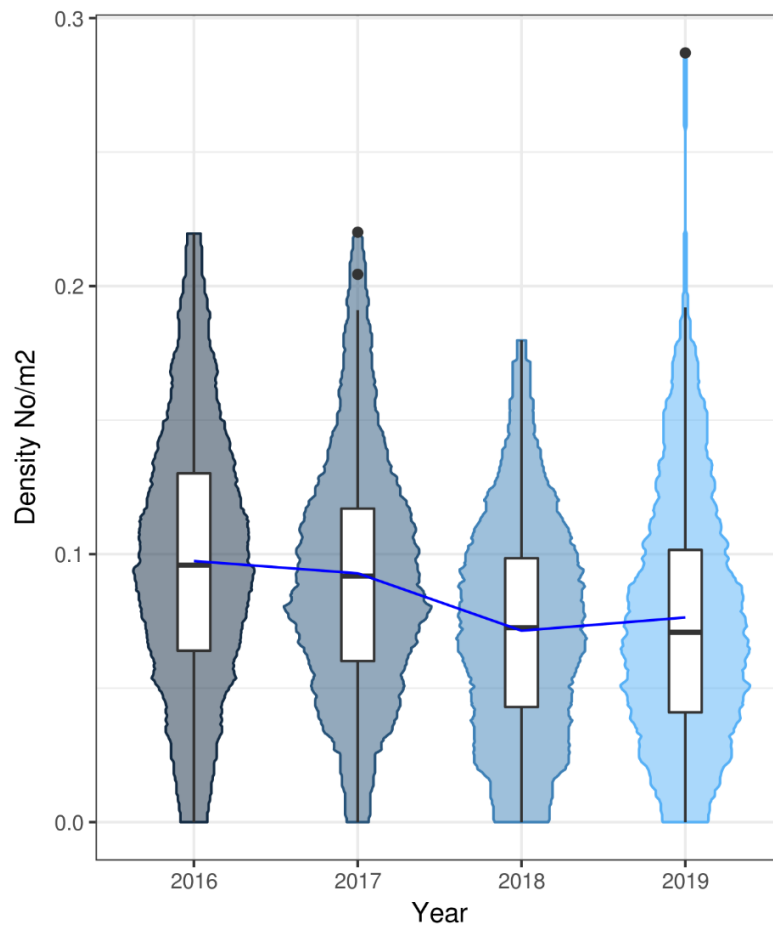


Mynd 6. Humar. Humarsvæði áætluð úr frá veiðigögnum (VMS, sjá Mynd 2). Sjá töflu 4 fyrir heiti svæða sem táknuð eru með rauðu númeri.

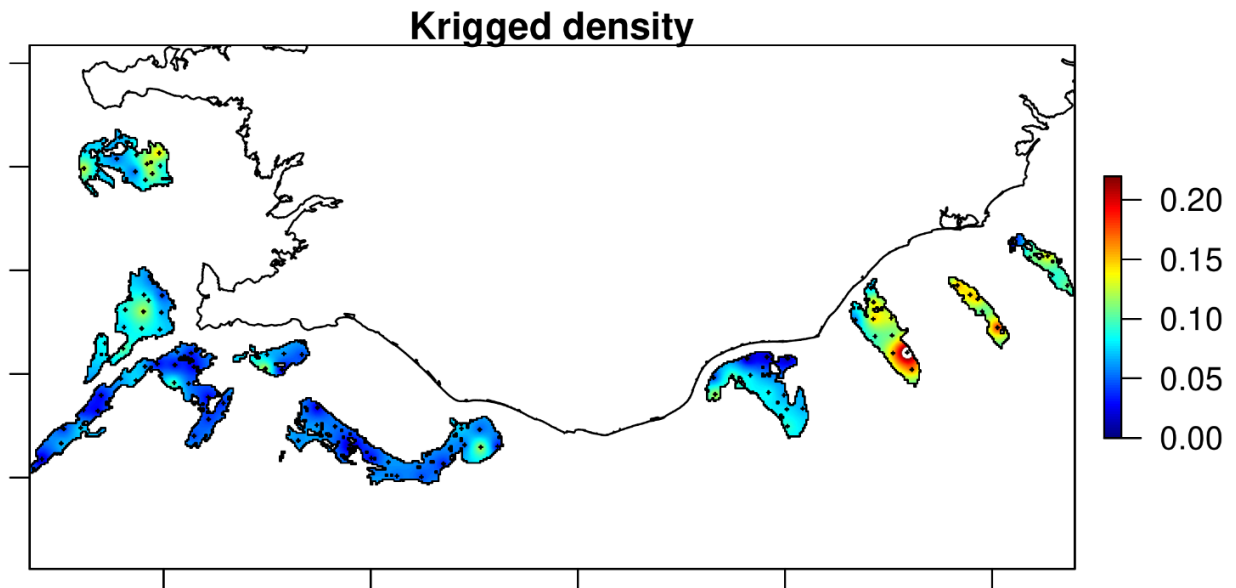
HUMARHOLUMYNDATAKA

Fyrsta humarholumyndatakan (UWTV) fór fram í júní árið 2016, eftir forkönnun í Jökuldjúpi í apríl sama ár. Alls var myndað á 86 stöðvum á um 4.5 sjómílna stöðvaneti á öllum þekktum humarsvæðum fyrsta árið. Stærð humarsvæðanna var metið út frá staðsetningu veiðiskipa (VMS gögn). Stuðst er við að lágmarki 6 staðsetningar skipa á toghraða innan 800*800 m reitakerfis, en innan þeirra eru um 99% allra staðsetninga. Reitir sem liggja saman eru svo sameinaðir og haldið efir reitum stærri en 4 km². Heildarstærð allra veiðisvæða var metin 5989 km² byggt á gögnum frá 2007-2016. Það mat var svo endurskoðað árið 2018 þar sem töliverð veiði var á jaðar- og nýjum svæðum milli árana, sérstaklega á suðvestur svæðum. Nýtt mat árið 2018 var 6588 km² (Tafla 4, Mynd 6). Í heildina eru þetta níu mismundandi svæði, sem eru frá 47-1400 km². Stærsta svæðið (Vestmannaeyjar) liggur frá Háfadjúpi að Selvogsbanka og það minnsta er í Lónsdjúpi. Þrjú svæðanna skiptast í einn stóran fleka og 1-2 í minni hliðarfleka; Vestmannaeyjar, Hornafjarðardjúp og Selvogsgrunn.

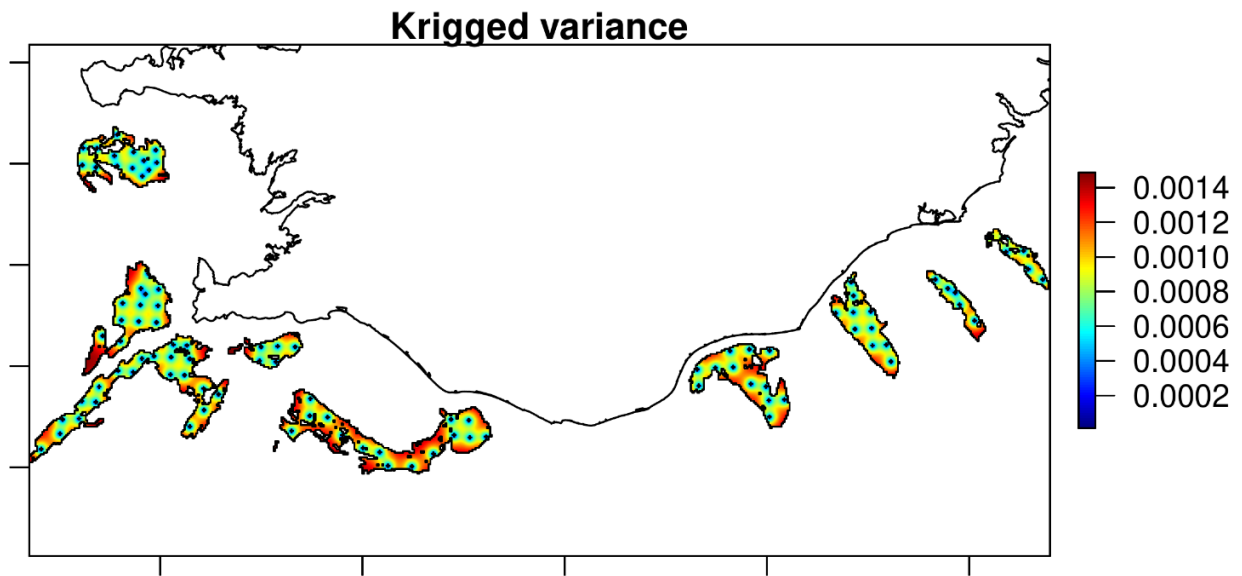
Heildarfjöldi humra var metinn 491 milljón dýr (holur) í leiðangri í júní árið 2019. Það er örlítið aukning frá fyrra ári, en um 20% minna en árin 2016 og 2017 (Myndir 7 og 8). Meðal þéttleiki árið 2019 var 0.07 holur á fermeter (Tafla 4, Mynd 7). Mesti þéttleiki var í Breiðamerkur- og Hornafjarðardjúpi; 0.13 holur á fermeter (Myndir 8 og 9). Lægsti þéttleikinn var á Vestmannaeyjasvæðinu, eða 0.06 holur á fermeter. Mesti fjöldi holna var í Breiðamerkurdjúpi (638 km²) eða 81.9 milljón holur. Niðurstöður eldri ára eru sýndar á myndum 10 og 11.



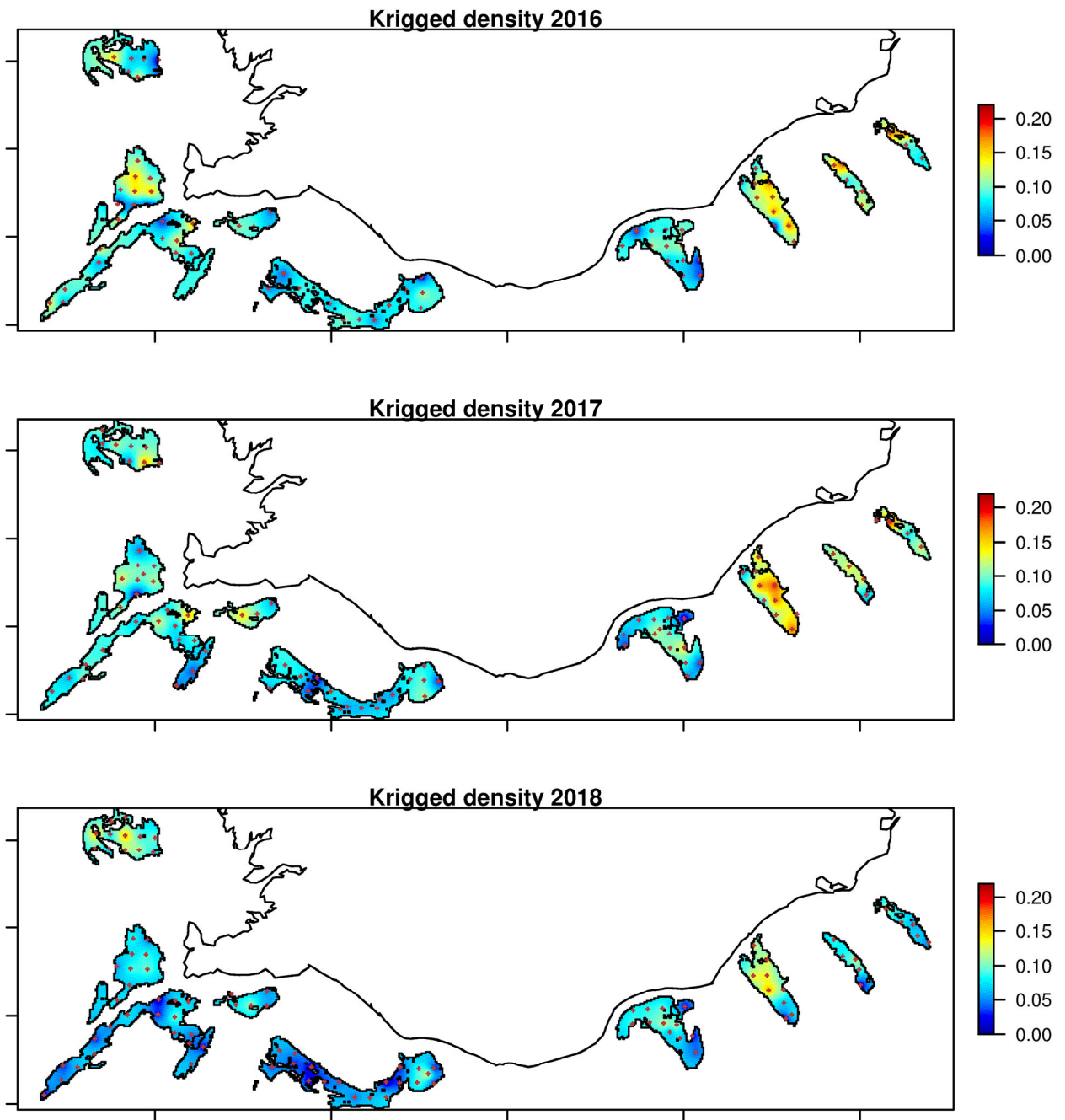
Mynd 7. Humar. Þéttleiki (fiðlu- og kassagröf) af leiðréttum fjölda humarhola 2016-2019. Bláa línan táknar meðal þéttleika, svarta línan í miðjum kassa sýnir miðgildi, kassinn sýnir fjórðungsmörk dreifingar, svört lóðrétt lína spönn og svartir punktar útgildi.



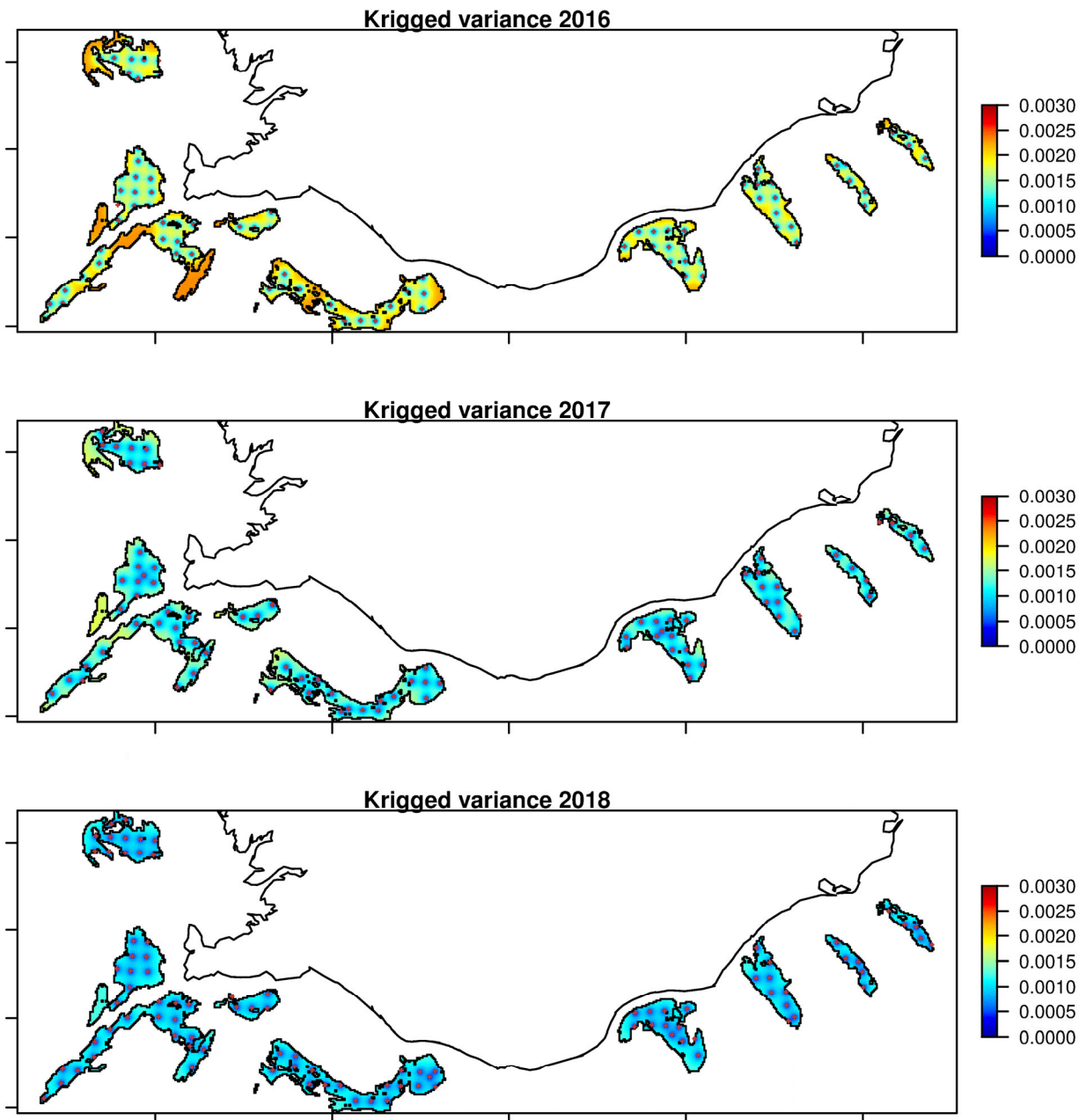
Mynd 8. Humar. Þéttleiki humarhola (fjöldi á 100 m²) í myndavélaleiðangri árið 2019. Myndin að ofan sýnir brúuð gögn með kriging aðferð (Gaussian líkan). Krossar tákna stöðvar.



Mynd 9. Humar. Dreifni niðurstaðna úr brúunarfalli á holuþéttleika (humarholur á 100 m²) í myndavélaleiðangri árið 2019. Krossar tákna stöðvar.



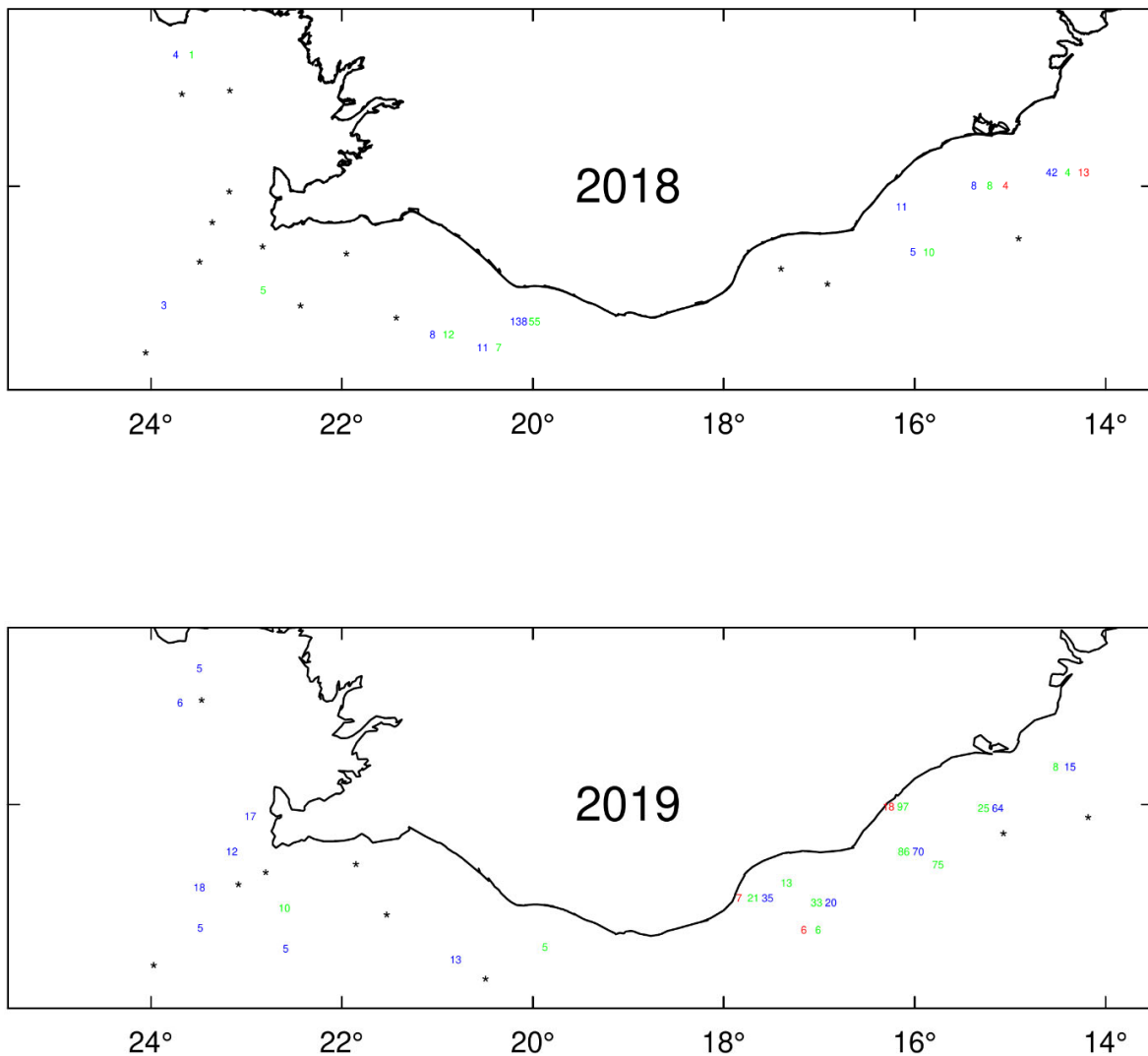
Mynd 10. Humar. Þéttleiki humarhola (fjöldi á 100 m²) í myndavélaleiðangri árin 2016-2018. Myndin að ofan sýnir brúuð gögn með kringing aðferð (Gaussian líkan). Brúnir krossar tákna stöðvar.



Mynd 11. Humar. Dreifni niðurstaðna úr brúunarfalli á holupéttleika (humarholur á 100 m²) í myndavélaleiðangri árin 2016-2018. Brúnir krossar tákna stöðvar.

LIRFURANNSÓKNIR

Árið 2018 var byrjað að safna í humarholuleiðangri háfsýnum til að meta fjölda humarlirfa. Þannig voru teknar 23 stöðvar með bongóháf (500 μm möskvastærð) eftir um það bil fjórðu hverja humarholustöð árið 2018 og 28 stöðvar árið 2019. Bongóháfinum er slakað niður á um 40 metra dýpi og svo híður upp í "V" laga prófíl að yfirborði. Humarlirfur fundust á 10 stöðvum árið 2018 og 19 stöðvum 2019 (Mynd 12). Meðalþéttleikinn var 15.1 lirfa í 1000 m^3 árið 2018 og 24.9 lirfa í 1000 m^3 árið 2019. Útbreiðsla lirfanna var einnig meiri árið 2019, þar sem mest af lirfum fannst á SA-hluta rannsóknasvæðisins. Bæði árin veiddust öll lirfustigin (zoea) við SA-land. Lagt er til áframhald á söfnun humarlirfa með þessum hætti í komandi leiðöngrum til að fá mat á framtíðar nýliðun.



Mynd 12. Humar. Fjöldi humarlirfa sem veiddust í bongóháf á hverja 1000 m^3 úr leiðöngrum 2018 og 2019. Bláar tölur tákna fjölda lirfa á Zoea stigi 1, grænar Zoea stigi 2 og rauðar tölur Zoea stigi 3. Svartar stjörnur tákna stöðvar þar sem engar lirfur fundust.

HUMARVÖRPULEIÐANGUR

Farnir voru árlegir leiðangrar með humarvörpu á árabílinu 1973-2015. Í leiðöngrunum voru tekin 55 stöðluð tveggja klst tog á öllum þekktum humarsvæðum. Stofnvisitalan úr leiðöngrunum náði hámarki árið 2009 og lágmarki við lok þeirra árið 2015. Líkindi voru á milli stofnvisítölnunnar og afla á sóknareiningu, en það samband var lélegra undir lok þessarar tímaraðar. veiðanleiki humars í humarvörpu hefur verið tengdur sjóndýpi (styrkleika þörungablómans) þar sem meiri afli fékkst jafnan þegar mikill gróður var og lítið sjóndýpi. Einnig hefur aukið magn bolfisks áhrif þar sem minni humar veiðist þegar fiskafli er mikill. Allt endurspeglast þetta svo í líffræði humarsins. Hann grefur sér holur í leirinn og getur dvalið lengi í þeim. Þetta hegðunarmynstur hans útskýrir mikinn breytileika í veiðanleika sem aftur veldur því að hefðbundin stofnmæling með humar/fiskivörpu er ekki heppileg aðferð til að meta veiðistofninn. Þess vegna var þegar færi gafst og með stærra rannsóknarskipi hafnar árlegar humarholumyndatökur/leiðangur til að fá mat á veiðistofninum árið 2016 líkt og tíðkast við stofnstærðarmat flestra stofna leturhumars (Campbell *et al.*, 2009).

BOTNVÖRPUVEIÐAR Á HUMARSLÓÐ

VEIÐIÁLAG

Til viðbótar við veiðar með humarvörpu, þá eru nokkuð umfangsmiklar veiðar með fiskibotnvörpu stundaðar á humarsvæðum. Árlega er togað með botnvörpu í um 6600 togtíma á ári (árin 2014-2018) á humarslóð (Tafla 5). Mest er togað við Vestmannaeyjar eða um 4000 togtímar á ári (2.4 togtímar á km²). Örlítið meira álag af botnvörpu er á hvern ferkílómetur í Breiðamerkurdjúpi, eða 2.5 togtímar á km². Nokkuð mikið álag er einnig í Hornafjarðardjúpi (0.9 togtímar á km²) og Lónsdjúpi (0.7 togtímar á km²). Að meðaltali er afli þorsks á sóknareiningu í botnvörpu suður af 65°N um hálf tonn á hvern togtíma (Tafla 5). Á humarsvæðum var afli þorsks á sóknareiningu mestur við Vestmannaeyjar um 1.2 tonn á togtíma. Hinsvegar var afli þorsks á sóknareiningu nokkuð undir meðaltali, eða um 0.3 tonn á togtíma í Breiðamerkur-, Hornafjarðar- og Lónsdjúpi (Mynd 13, Tafla 5). Afli ýsu og löngu á sóknareiningu var einnig hærrí við Vestmannaeyjar en á öðrum svæðum suður af 65°N (Tafla 5).

Í ljósi slæmrar stöðu humarstofnsins er lagt til að kjarna humarsvæðin innan þriggja austustu djúpanna verði lokað til að minnka óþarfa rask á humarslóð og vernda uppvaðandi árganga (Mynd 13, Tafla 5). Á þessum svæðum er nokkuð mikið álag af botnvörpu en svæðin eru minna mikilvæg fyrir bolfisk en Vestmannaeyjasvæðið.

Tillögur að bannsvæðum fyrir fiskibotnvörpu árið 2020 (svæðunum var lokað með reglugerð til eins árs árið 2019):

Breiðamerkurdjúp

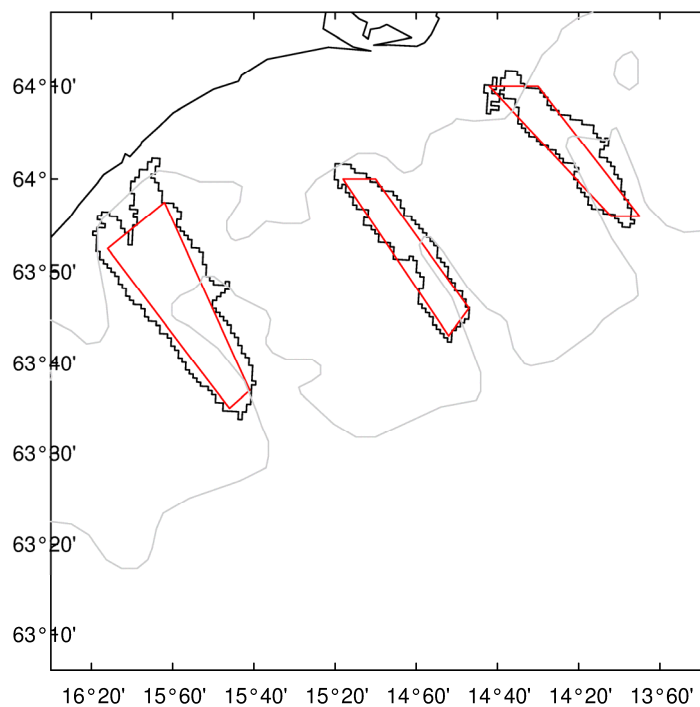
1. 63°52'50"N - 16°16'00"V
2. 63°35'00"N - 15°46'00"V
3. 63°37'00"N - 15°41'00"V
4. 63°57'50"N - 16°02'00"V
5. 63°52'50"N - 16°16'00"V

Hornafjarðardjúp

1. 64°00'00"N - 15°18'00"W
2. 63°43'00"N - 14°52'00"W
3. 63°46'00"N - 14°47'00"W
4. 64°00'00"N - 15°10'00"W
5. 64°00'00"N - 15°18'00"W

Lónsdjúp

1. 64°10'00"N - 14°42'00"W
2. 63°56'00"N - 14°12'00"W
3. 63°56'00"N - 14°05'00"W
4. 64°10'00"N - 14°30'00"W
5. 64°10'00"N - 14°42'00"W



Mynd 13. Humar. Humarsvæði áætluð úr frá veiðigögnum (VMS) við Suðausturland og fyrirhugaðir lokanir fyrir botnvörpu (rauðar línur). Að auki eru 100 og 200 m dýptarlínur sýndar.

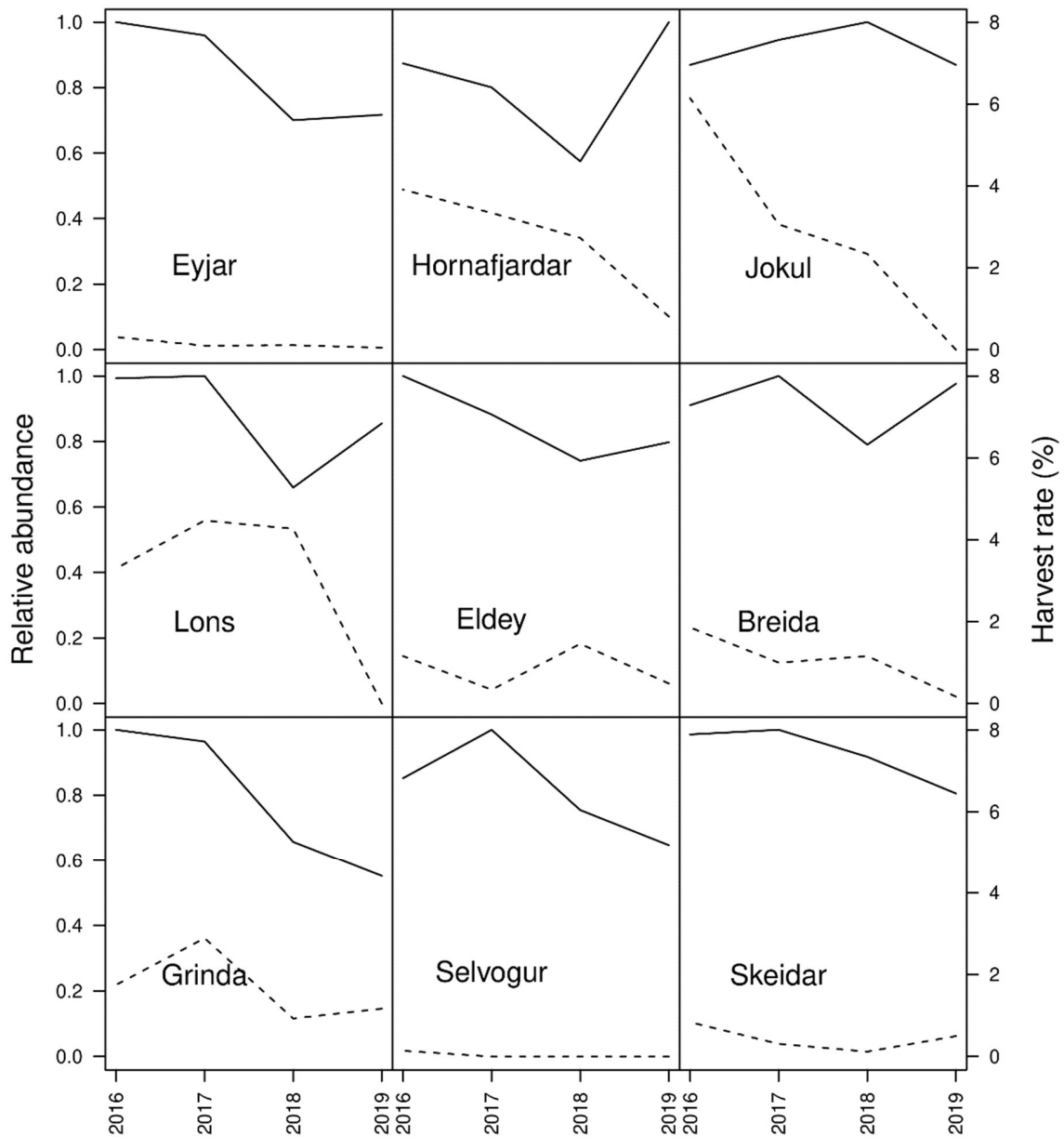
STOFNMAT

VEIÐIHLUTFALL

Samkvæmt humarholutalningum árið 2019, var veiðihlutfall á einstaka veiðislóð á bilinu 0-1.17%, og að jafnaði 0.37% (Tafla 4). Takmarkaðar veiðar og mjög lágt veiðihlutfall var við Vestmannaeyjar og á Selvogsgrunni. Hæsta veiðihlutfallið var í Grindavíkurdjúpi og næst hæsta í Hornafjarðardjúpi. Hlutfall karldýra í aflanum var á bilinu 50–99%. Óvenju hátt hlutfall kvendýra var í Breiðamerkurdjúpi (Tafla 4), en að jafnaði er hlutfall karldýra um 90%.

Með minni afla hefur veiðihlutfallið minnkað úr 1.89% árið 2016 í 0.37% árið 2019 (Mynd 1). Eins og búast mátti við í könnunarveiðunum síðasta árs lækkaði veiðihlutfallið milli ára á flestum svæðum, að frátalinni smávægilegri aukningu í Grindavíkur- og Skeiðarárdjúpi (Mynd 14). Þrátt fyrir að humarsvæðin séu skilin að

í rúmi og að fáar stöðvar séu á mörgum af smærri veiðisvæðunum, þá sveiflast magnið nokkuð líkt milli svæðanna. Nokkur aukning var í Jökuldjúpi fyrstu þrjú árin, en hluta af því má skýra með hærri þéttleika á nýjum svæðum sem könnuð voru eftir að veiðar hefjast á þeim (Myndir 8, 10 og 14). Aukning var á fjölda holna í austustu djúpunum þremur, Breiðamerkur-, Hornafjarðar- og Lónsdjúpi árið 2019 (Myndir 8 og 14).



Mynd 14. Humar. Hlutfallslegur fjöldi humarholna (heil lína) og veiðihlutfall (brotin lína) á einstökum veiðisvæðum (Eyjar – svæði 1, Hornafjardar - svæði 2, Jokul – svæði 3, Lons – svæði 4, Eldey – svæði 5, Breida - svæði 6, Grinda – svæði 7, Selvogur – svæði 8 og Skeidar – svæði 9) árin 2016 til 2018 (sjá Mynd 6 fyrir staðsetningu svæða).

RÁÐGJÖF

Í ljósi slæmrar stöðu humarstofnsins árið 2019, lagði Hafrannsóknastofnun til takmarkaðar veiðar til að fylgjast með þróun stofnsins (könnunarveiðar, e: *monitoring fishery*). Stofnstærð sem byggir á holufjölda, lækkaði um 20% milli árána 2016 og 2018, en var stöðug milli 2018 og 2019. Þéttleiki humarhola við Ísland er á meðal þess allra lægsta sem mælist innan veiðisvæða Alþjóðahafrannsóknaráðsins (ICES). Engar vísbendingar voru um nýliðun í stofninn árið 2019. Humarstofninn við Ísland hefur verið vaktaður síðan snemma sjöunda áratugnum og aldrei hefur sést eins lítið af smáum humri. Afli á sóknareiningu lækkar lítillaga milli ára, en skástu aflabrögðin árið 2018 voru á svæðum sem lokuð voru 2019. Gátmörk (B_{MSY} og $B_{trigger}$) hafa ekki verið skilgreind fyrir humarstofninn, en í ljósi núverandi þekkingar má gera ráð fyrir að stofninn sé undir gátmörkum (B_{lim}).

Lagt er til að leyfðar verði takmarkaðar veiðar til að fylgjast með þróun stofnsins árið 2020. Einnig er lagt að Jökuldjúp og Lónsdjúp verði áfram lokuð fyrir humarveiði, en í þessum djúpum hafði verið hátt veiðiálag áður en lokað var árið 2019. Ennfremur að humarsvæði í Breiðamerkur-, Hornafjarðar- og Lónsdjúpi skuli áfram vera lokuð fyrir veiðum með fiskibotnvörpu.

Lagt er til að miða við sama veiðihlutfall og ráðlagt var árið 2019 ($HR = 0.376\%$) í könnunarveiðum árið 2020. Grundvöllur ráðgjafarinnar árið 2019 var veiðiálag ársins 2018 ($UWTV HR_{2018} = 1.16\%$) skalað niður með hlutfallslegri minnkun á eldra stofnmats sem byggði á VPA greiningu og skilaði $HR_{2019} = 0.376\%$ (MFRI 2019). Veiðiálagið er margfaldað með núverandi fjöldamati úr humarholutalningu og meðalþyngd í veiði á síðasta ári. Meðalþyngd humars eykst milli ára úr 130 í 141 g, sem leiða ætti til lítilsháttar hækkunar á ráðgjöf. Hinsvegar, fyrir núverandi ár er lagt til að einungis skuli miðað við talningar á svæðum sem opin eru fyrir veiðum (sleppa Lónsdjúpi og Jökuldjúpi), eða 404 milljón holur:

$$TAC_{2020} = HR_{2020} * Holumyndafjöldi_{2019} * meðalþyngd_{2019}$$

$$TAC_{2020} = 0.376\% * 404 \text{ milljón holur} * 0.141 \text{ g} = 214 \text{ tonn}$$

Í ljósi þessa leggur Hafrannsóknastofnun til takmarkaðar veiðar árið 2020 til að fylgjast megi með þróun stofnsins og að hámarksafli skuli vera 214 tonn.

HEIMILDIR

Eiríksson, H., 2014. Reproductive Biology of Female Norway Lobster, *Nephrops norvegicus* (Linnaeus, 1758) Leach, in Icelandic Waters During the Period 1960–2010: Comparative Overview of Distribution Areas in the Northeast Atlantic and the Mediterranean. *Advances in Marine Biology*, vol. 68, pp. 65-210.

Eiríksson, H., Jónasson, J.P. 2018. The fishery and stock assessment of Norway lobster (*Nephrops norvegicus*) in Icelandic waters during 1950-2016. Haf- og vatnarannsóknir. HV2018-25.

Campbell, N., Dobby, H., Bailey, N. 2009. Investigating and mitigating uncertainties in the assessment of Scottish *Nephrops norvegicus* populations using simulated underwater television data. *ICES J Mar Sci* 2009; 66 (4): 646-655.

MFRI. 2019. Assessment Reports. Norway lobster. Marine and Freshwater Research Institute, 31. January 2019.

Tafla 1. Humar. Afli á Íslandsmiðum.

Ár	Íslendingar	Aðrir	Alls
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
2017	1194	0	1194
2018	728	0	728
2019	259	0	259

Tafla 2. Humar. Afli (tonn) og afli á togtíma (CPUE, kg/klst) eftir svæðum.

Ár	SV-afli	SV-CPUE	S-afli	S-CPUE	SA-afli	SA-CPUE	Afli	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
2017	711	47.8	10	15.4	472	40.8	1194	44.4
2018	402	28.5	10	19.0	316	28.9	728	28.3
2019	160	23.0	6	20.9	93	25.5	259	23.4

Tafla 3. Humar. Tillögur Hafrannsóknastofnunar um hámarksafli (Ráðl.TAC), ákvörðun stjórnvalda um aflamark (TAC) og landaður afli (tonn). *Afli haustsins 2018 meðtalin. #Ekkert aflamark var útgefið 2019, en leyft var að veiða flutt aflamark frá eldri árum.

Ár	Ráðl. TAC	TAC	Afli
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	1186
2017/18*	1150	1150	869
2019	235	#	259
2020	214		

Tafla 4. Humar. Myndataka á humarholum og upplýsingar um afla 2019. Nafn á svæðum, merki svæðis (sjá mynd 6), stærð svæða (km²), fjöldi hola (milljónir), fjöldi hola á hvern fermetur, afli hvers svæðis, meðalþyngd veiddra humra, hlutfall karldýra í afla, fjöldi veiddra humra og veiðihlutfall á hverju svæði.

Svæði	id	km ²	Holur	Holur m ²	Afli (t)	M.þyngd (g)	M%	Veiddir	Veiðihlutfall
Jökuldjúp	3	737	64	0.09	0			0	0%
Eldey	5	845	68	0.08	44.7	0.135	0.95	0.33	0.81%
Grindav.-/Skerjadjúp	7	1307	65	0.05	114.1	0.150	0.95	0.76	1.17%
Selvogur	8, 11, 12	296	19	0.07	0.1	0.128	0.99	0.00	0.00%
Vestmannaeyjar	1, 10	1400.0	78	0.06	5.9	0.160	0.97	0.04	0.05%
Skeiðarárdjúp	9	859	58	0.07	38.6	0.133	0.93	0.29	0.50%
Breiðamerkurdjúp	6	638	82	0.13	13.0	0.093	0.50	0.14	0.17%
Hornafjarðardjúp	2	259	34	0.13	42.4	0.153	0.72	0.28	0.81%
Lónsdjúp	4,13	247	24	0.10	0			0	0%
Alls		6588	491	0.07	258.9	0.141		1.83	0.37%

Tafla 5. Humar. Yfirlit yfir árlega meðalsókn (2014-2018) með botnvörpu á humarslóð og alls suður af 65°N. Sóknin er í klukkustundum, S / km² er sókn á ferkílómetur á humarsvæði. Dálkarnir sýna meðal ársafla í tonnnum fyrir þorsk, ýsu og löngu á hverju svæði og afla á sóknareiningu (CPUE) er afli á sóknareiningu fyrir gefna tegund (tonn á klukkustund).

Svæði	id	Sókn	S / km ²	Þorskur	Þ CPUE	Ýsa	Ý CPUE	Langa	L CPUE
Suður af 65°N		47371		23784	0.50	7068	0.15	772	0.02
Jökuldjúp	3	53	0.07	18	0.35	3	0.06	1	0.02
Eldey	5	317	0.38	239	0.75	44	0.14	10	0.03
Grindav.-/Skerjadjúp	7	468	0.36	106	0.22	17	0.04	13	0.03
Selvogur	8	13	0.04	7	0.51	1	0.07	0	0.01
Vestmannaeyjasvæði	1	3387	2.42	3970	1.17	821	0.24	408	0.12
Skeiðarárdjúp	9	360	0.42	44	0.12	66	0.18	18	0.05
Breiðamerkurdjúp	6	1619	2.54	488	0.30	67	0.04	57	0.04
Hornafjarðardjúp	2	237	0.91	72	0.31	14	0.06	3	0.01
Lónsdjúp	4	172	0.70	60	0.35	15	0.09	2	0.01

NORWAY LOBSTER

Nephrops norvegicus

INTRODUCTION

Fishery of Norway lobster (*Nephrops norvegicus*) started in the early 1950s and during the first two decades it was mainly conducted by Icelandic, Belgian and French vessels (Table 1). The 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 longer, as the fishery starts in the middle of March and ends in November/December. There has been a gradual decrease in number of boats participating in the *Nephrops* fishery and during the last couple of years there have been as few as nine boats active in the fishery. The species is entirely caught in *Nephrops* trawls, but through the decades there have been occasional creel trials.

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 affects the productivity of the stock and warrants lower exploitation rate than applied in other *Nephrops* stocks.

COMMERCIAL FISHING

LANDINGS

Due to poor stock status a monitoring fishery was conducted in 2019 and the fishing grounds Jökuldjúp in SW and Lónsdýpi in SA were closed. As such, 259 tonnes of *Nephrops* were landed in 2019, which is a reduction of 469 tonnes from the previous year (Table 1, Figure 1). The catch has steadily declined since 2010 when it reached 2540 tonnes. There have been periodic fluctuations in landings since the onset of the fishery in the 1950's, which soon reached 6000 tonnes in 1963, following a few years with high catches (Eiriksson and Jónasson, 2018).

In 2019, 159 tonnes were landed from the southwestern ground, a reduction of 243 tonnes from the previous year (Table 2, Figure 2). On the southern ground only 6 tonnes were landed, slightly less than in previous two years, which was the lowest catch historically. In the southeast area 94 tonnes were landed, a decrease of 222 tonnes from the previous year.

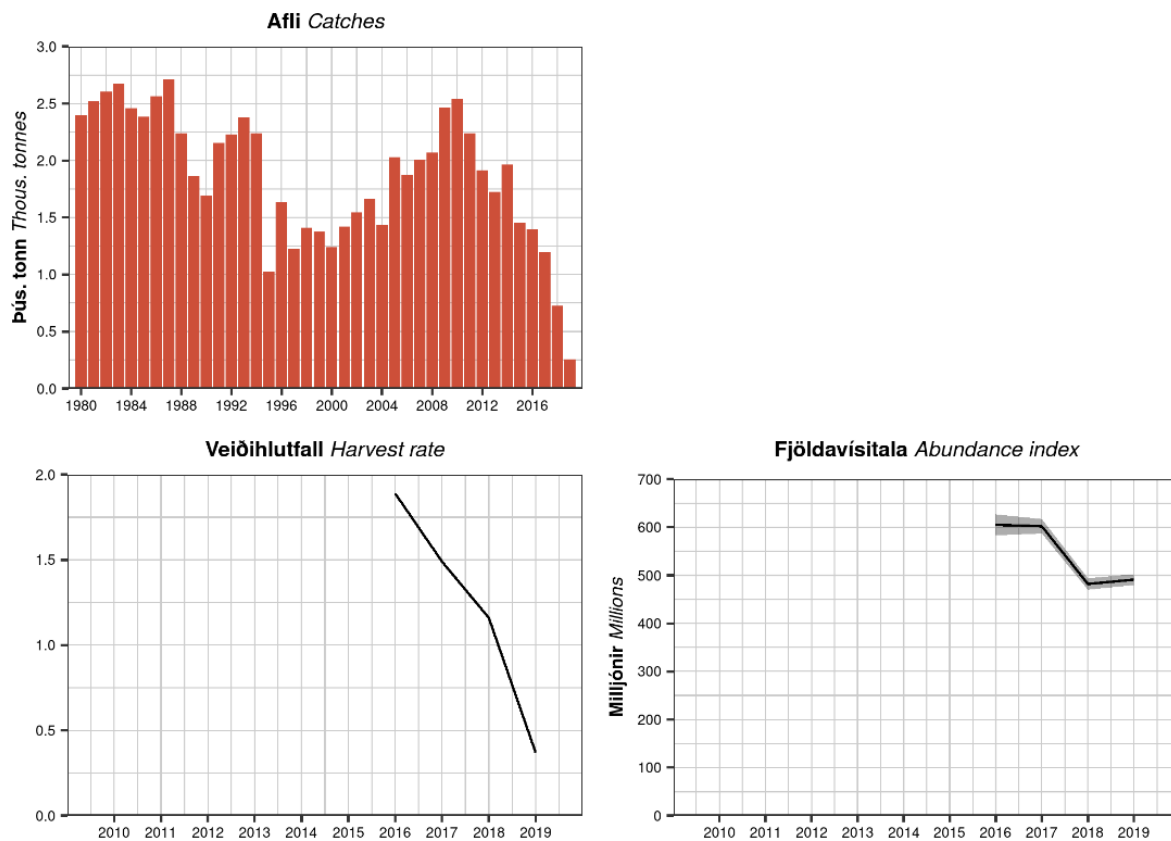


Figure 1. Norway lobster. Catches, harvest rate (sum of landings in numbers, divided by total abundance), stock abundance (Underwater TV, millions; SSB proxy, 95% confidence intervals).

CPUE AND EFFORT

Catch per unit effort (CPUE, standardized to 1 trawl and the period May–August) declined between 2018 and 2019, from 28.3 to 23.4 kg per hour towed (Table 2). CPUE has declined drastically since the peak in 2007 and 2008 when more than 100 kg of *Nephrops* were caught per hour towed. Only in 1995 was the CPUE lower, but in that year a three weeks strike interrupted the fisheries during May/June. There have been overall similar fluctuations between areas with regards to CPUE (Figure 3). CPUE has on average been higher in the southeast area, and in recent years it has been lowest in the southern area.

There was a decreasing trend in the fishing effort from 1970 to 2000–2008, depending on areas. Since 2008, there has been a decrease in effort in the southern area, an increase in southwestern area, but effort has not changed much in the southeastern area (Figure 4). In the monitoring fishery of 2019, the effort decreased sharply in the southwestern and southeastern areas.

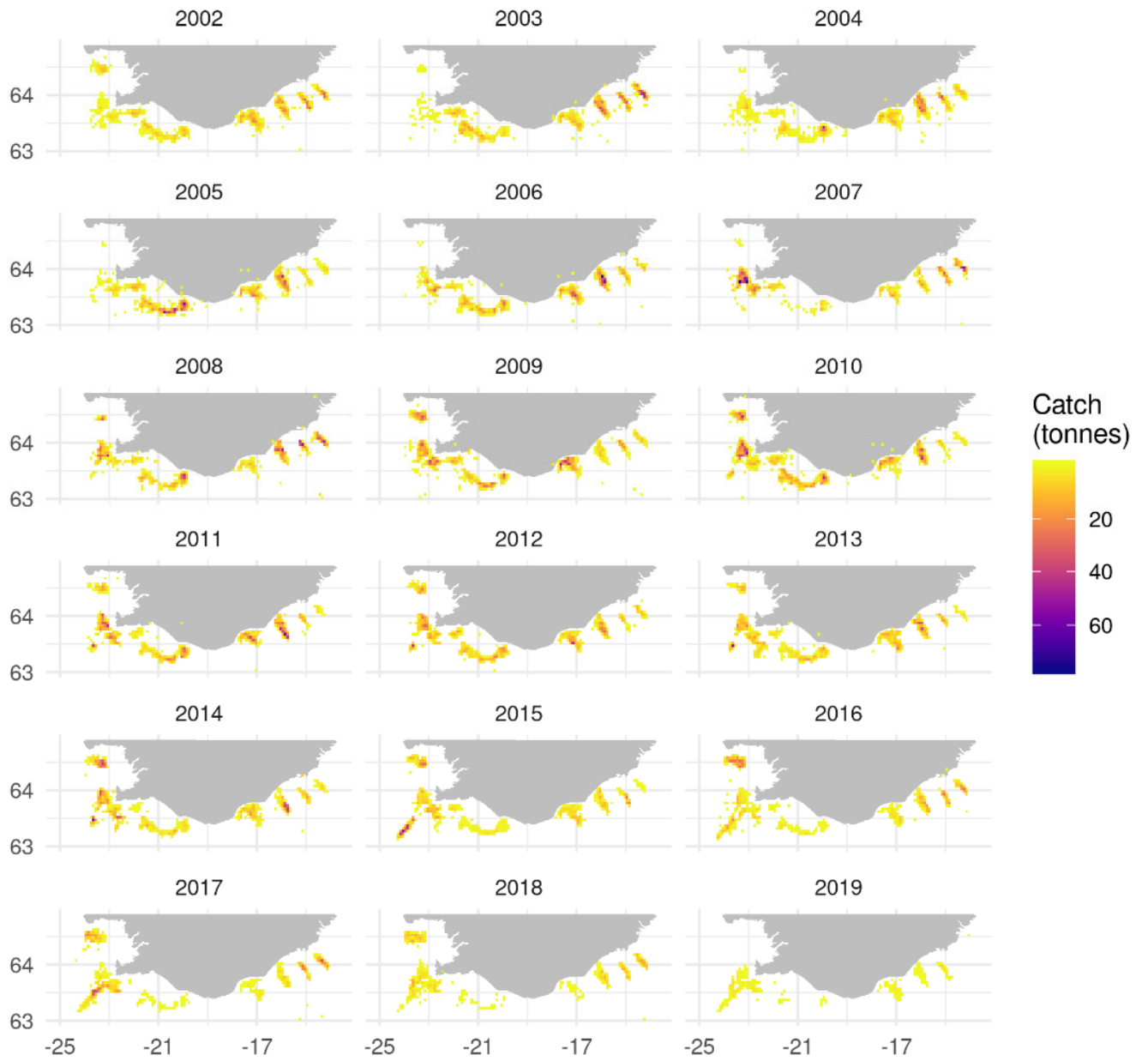


Figure 2. Norway lobster. Distribution of catches in 2002-2019.

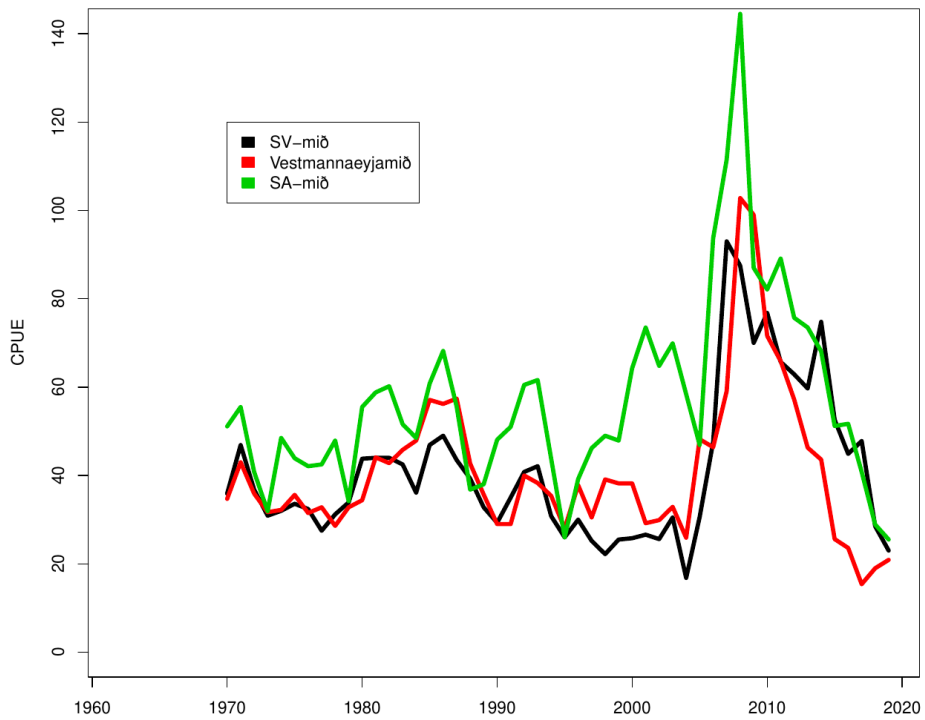


Figure 3. Norway lobster. Standardized CPUE in 1970–2019 in the SW- (black), Vestmannaeyjar- (south) (red) and SE areas (green).

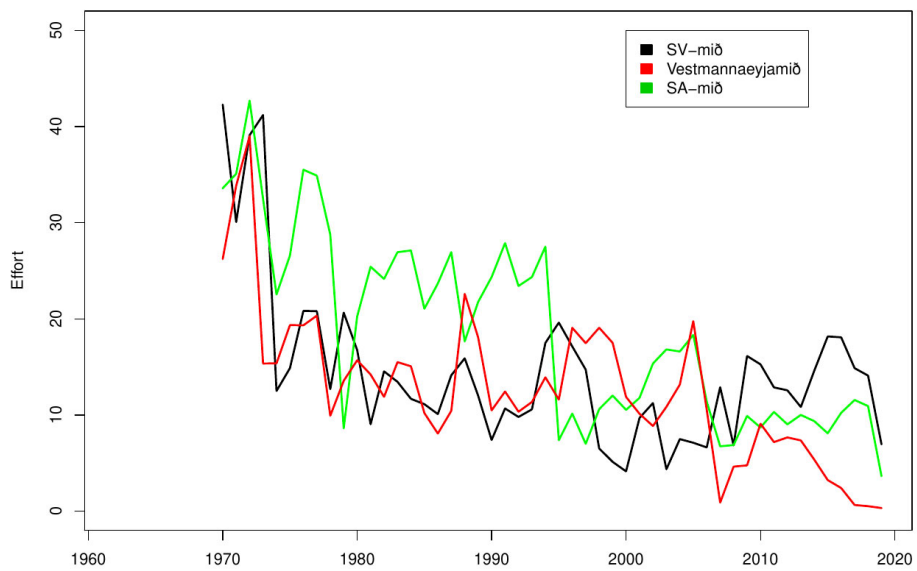


Figure 4. Norway lobster. Standardized effort in 1970–2019 in the SW- (black), Vestmannaeyjar- (south) (red) and SE-areas (green).

LENGTH DISTRIBUTIONS

In 2019, 79 length samples were obtained from the landed catch and survey which is a similar number of samples as in recent years. The most frequent sizes (CL) of males in the samples in 2018 were around 60 mm (Figure 5). In recent years very few small *Nephrops* have been caught and in 2019 was the lowest ratio of *Nephrops* smaller than 40 mm CL recorded. Large proportion was above 60 mm and the ratio of animals over 70 mm CL was almost similar as for those below 50 mm CL.

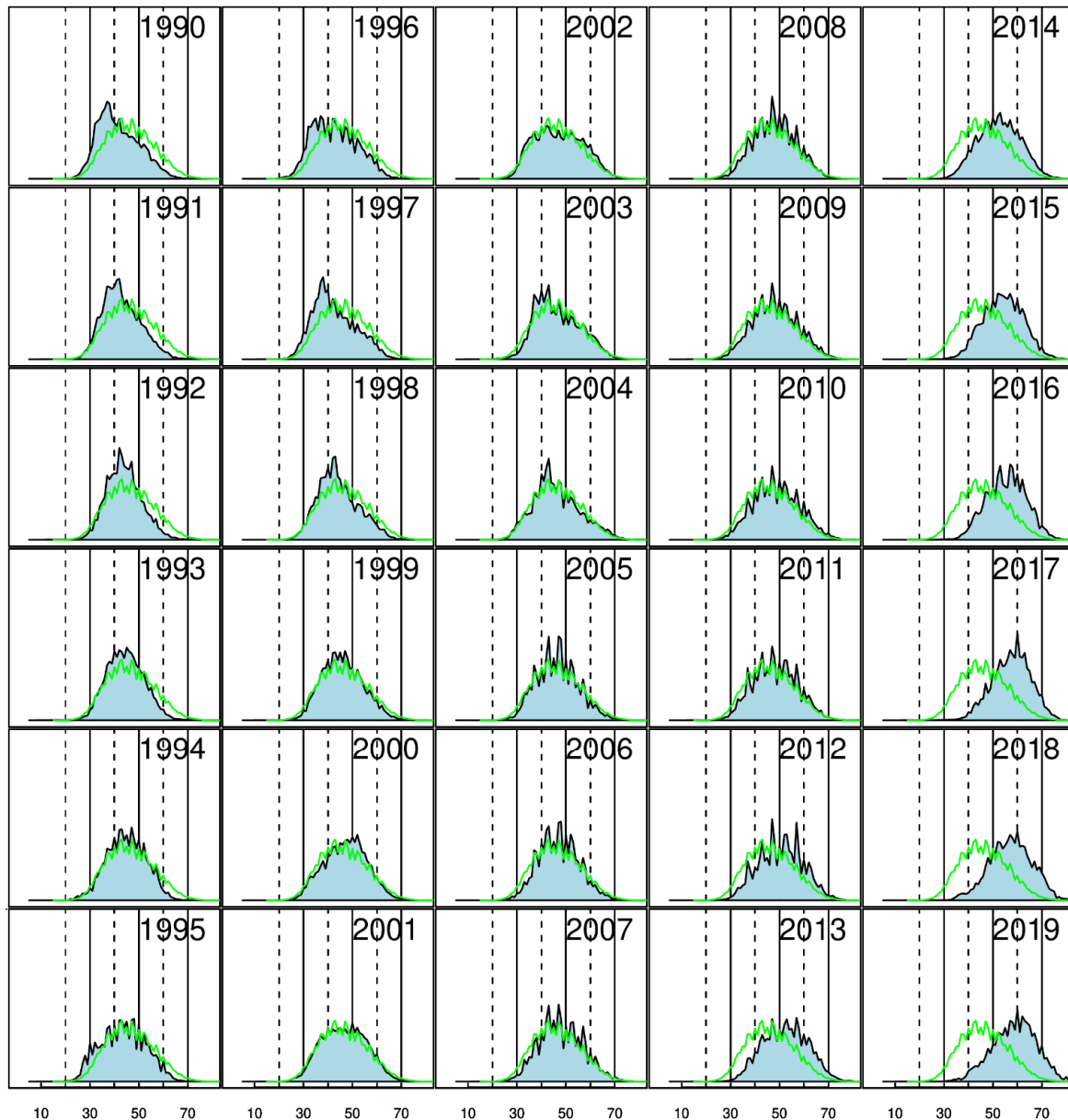


Figure 5. Norway lobster. Length frequency distribution (shaded area) of all samples 1990–2019. The green line shows the average of the years 1970–2019.

SURVEYS

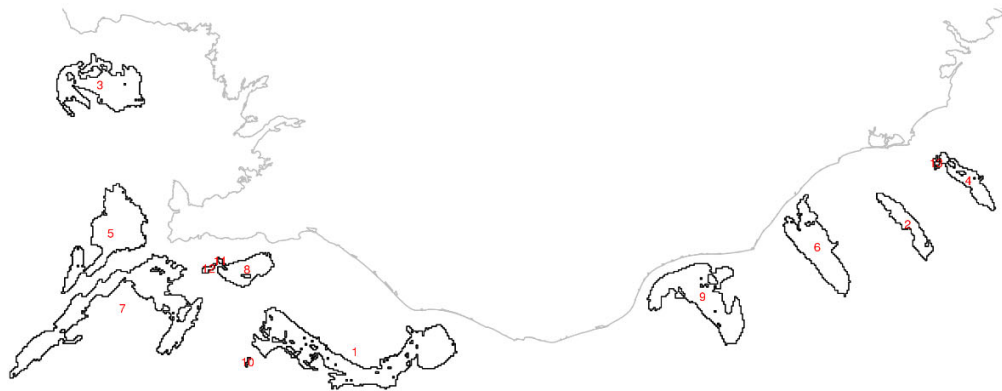


Figure 6. Norway lobster. Polygons of *Nephrops* grounds (see Figure 2) based on VMS data. See name of grounds marked by the red number in Table 4.

UWTV SURVEY

The first UWTV survey in Icelandic water was conducted in June 2016, following a pilot study in Jökuldjúp in April. In total, 86 UWTV-stations on a roughly 4.5 nautical mile grid were completed on all known *Nephrops* grounds in 2016. The size of the *Nephrops* area was estimated from VMS data. A minimum of 6 pings from *Nephrops* vessel at fishing speed on 800*800 meters resolution grid was used as a threshold, which approximately includes 99% of the pings. Adjoining grids are then combined and fishing grounds smaller than 4 km² are excluded. The total size of the fishing grounds was estimated to be 5989 km² based on data from 2007–2016, but there was a gradual shift to fishing on new or connected grounds in 2017 and 2018, especially in the SW area. The estimated size of *Nephrops* grounds in 2018 was 6588 km² (Table 4, Figure 6). In total there were nine distinct areas ranging from 247 km² to 1400 km². The largest ground (Vestmannaeyjar) is in the southern part (Háfadjúp to Selvogsbanki) and the smallest one is Lónsdjúp in the east. Three grounds were split up into 2–3 patches; Vestmannaeyjar, Hornafjarðardjúp and Selvogsgrunn.

The total number of *Nephrops* in June 2019 on all Icelandic grounds was estimated to be 491 million animals, a marginal increase from 482 million animals in 2018, but 20% less than during the surveys of 2016 and 2017. Average density in 2019 was 0.07 burrows per square meter (Table 4, Figure 7). Highest density of burrows was in Breiðamerkurdjúp and Hornafjarðardjúp; 0.13 burrows per m² (Figure 8 & 9). The largest ground (Vestmannaeyjar, 1400 km²) had the lowest density or 0.06 burrows per m². Highest number of burrows was found on the Breiðamerkurdjúp ground (638 km²) or 81.9 million. Older years are shown in figures 10 and 11.

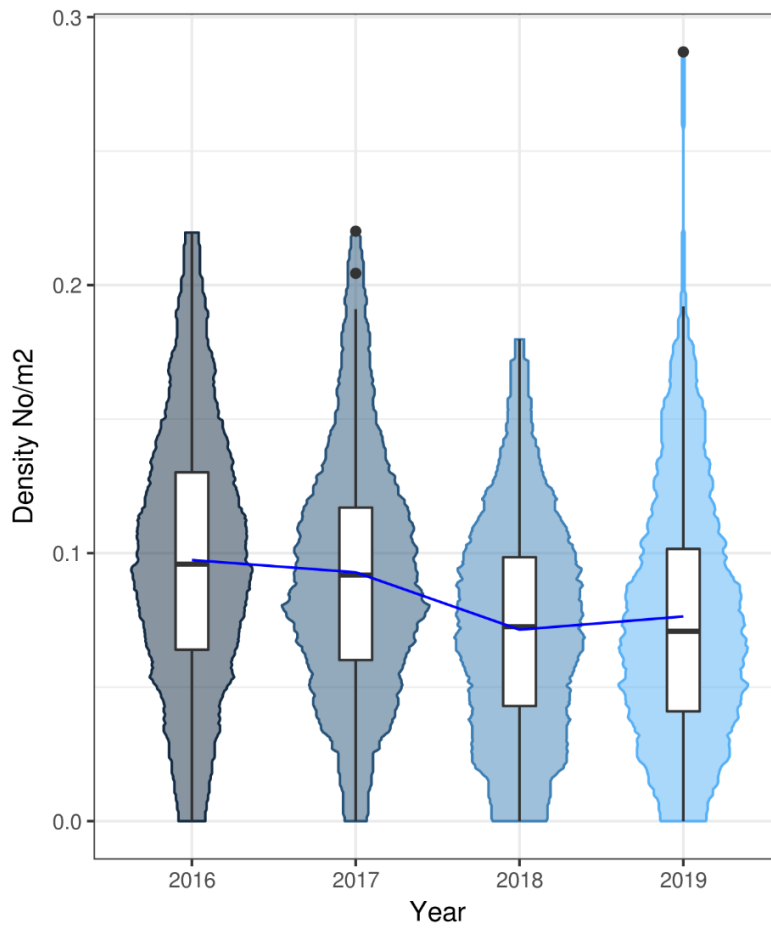


Figure 7. Norway lobster. Violin and boxplots of adjusted burrow density distributions by year 2016-2019. The blue line indicates the mean density over time. The horizontal black lines represent the median, white boxes are the inter quartile ranges, the black vertical lines show the range and the black dots are outliers.

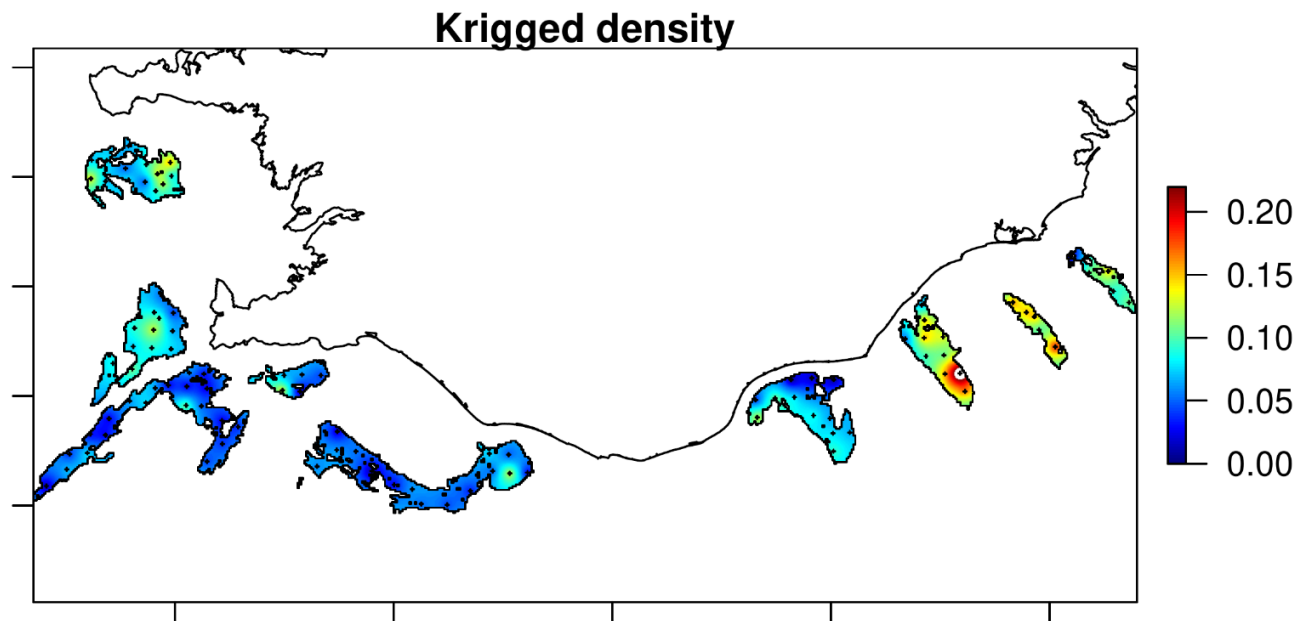


Figure 8. Norway lobster. Density of burrows (krigged density per 100 m², gaussian model) on *Nephrops* grounds from the UWTV surveys conducted in 2019. The crosses represent the stations.

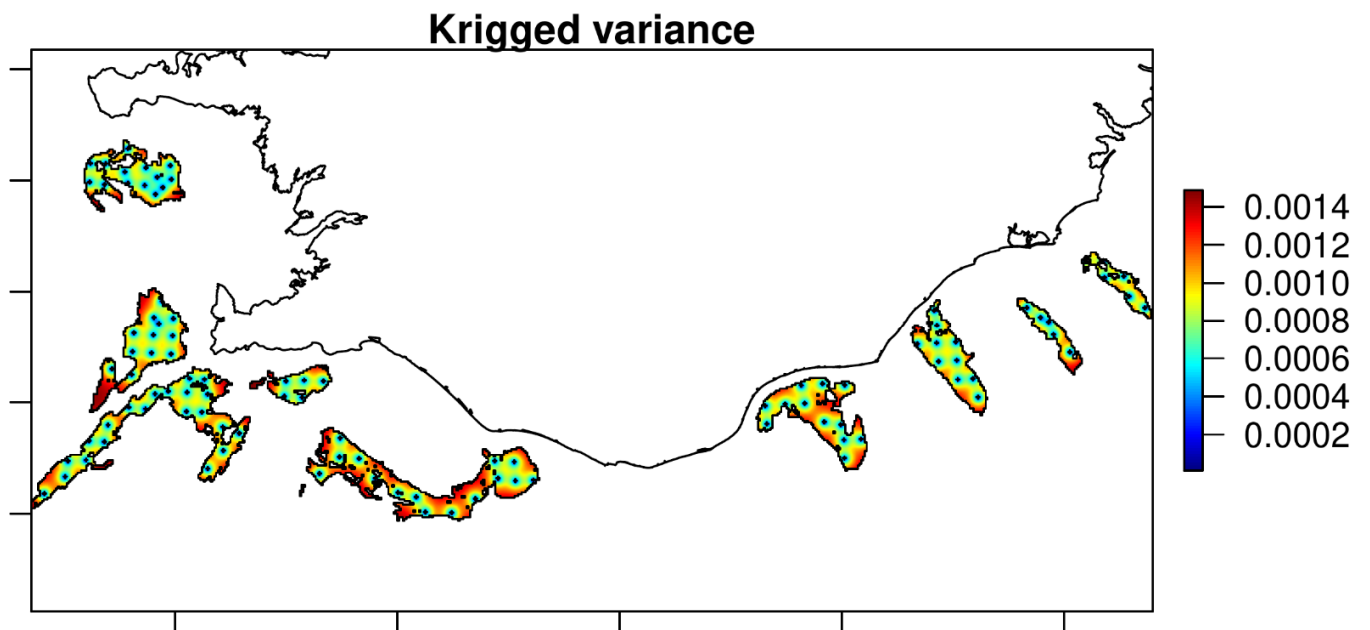


Figure 9. Norway lobster. Krigged variance of burrows density on *Nephrops* ground (per 100 m²) from the UWTV surveys conducted in 2019. The crosses represent the stations.

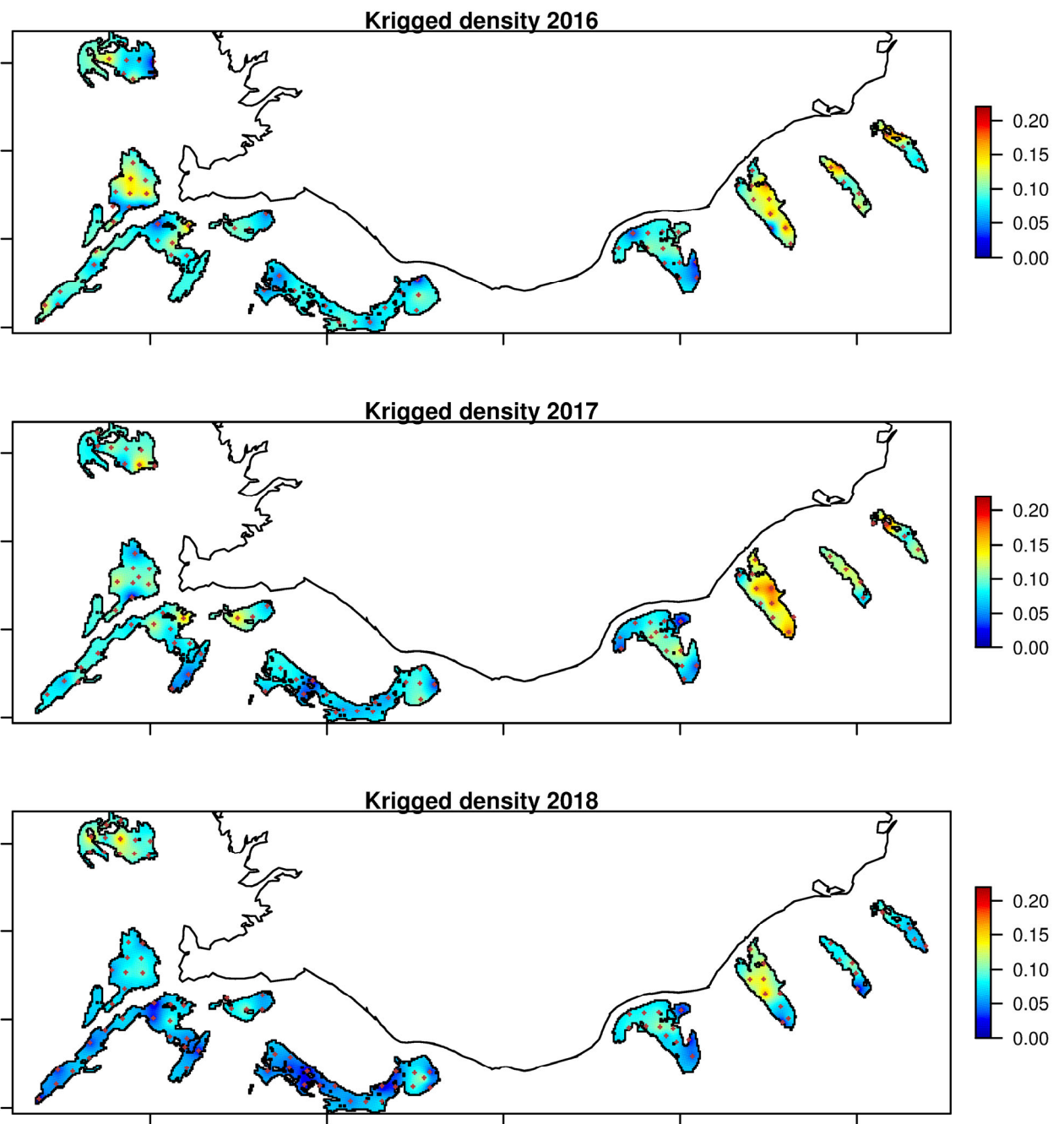


Figure 10. Norway lobster. Density of burrows (krigged density per 100 m², gaussian model) on *Nephrops* grounds from the UWTV surveys conducted in 2016-2018. The brown crosses represent the stations.

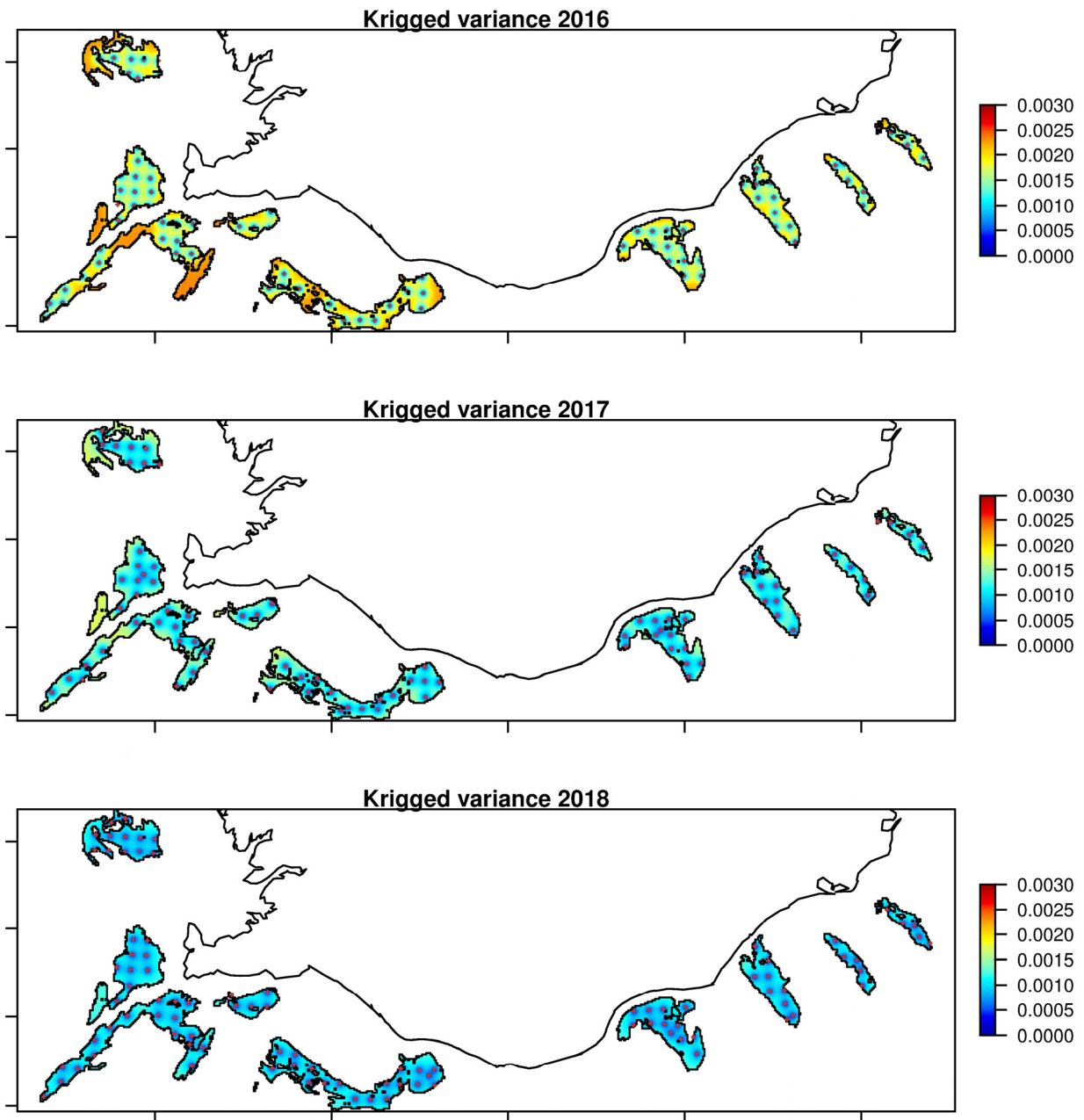


Figure 11. Norway lobster. Krigged variance of burrows density on *Nephrops* ground (per 100 m²) from the UWTV surveys conducted in 2016-2018. The brown crosses represent the stations.

LARVAE SURVEY

During the 2018 UWTV survey, for the first time, 23 bongo-net stations (500 μm mesh size) were accomplished after the completion of every fourth UWTV station and further 28 stations in 2019. The bongo-net was towed in a V-shaped manner down to 40 m and up to the surface. *Nephrops* larvae were found on 10 stations during 2018 and on 19 stations 2019 (Figure 12). The average density was 15.1 larvae per 1000 m^3 in 2018 and 24.9 larvae per 1000 m^3 during the 2019 survey. The distribution was also wider in the 2019 survey with higher abundance on most of the areas in the southeast. During both years, all the Zoea stages (I-III) were found in the southeast region. It is proposed to continue with the larvae sampling during upcoming UWTV survey and hopefully the information can be indicative of future recruitment.

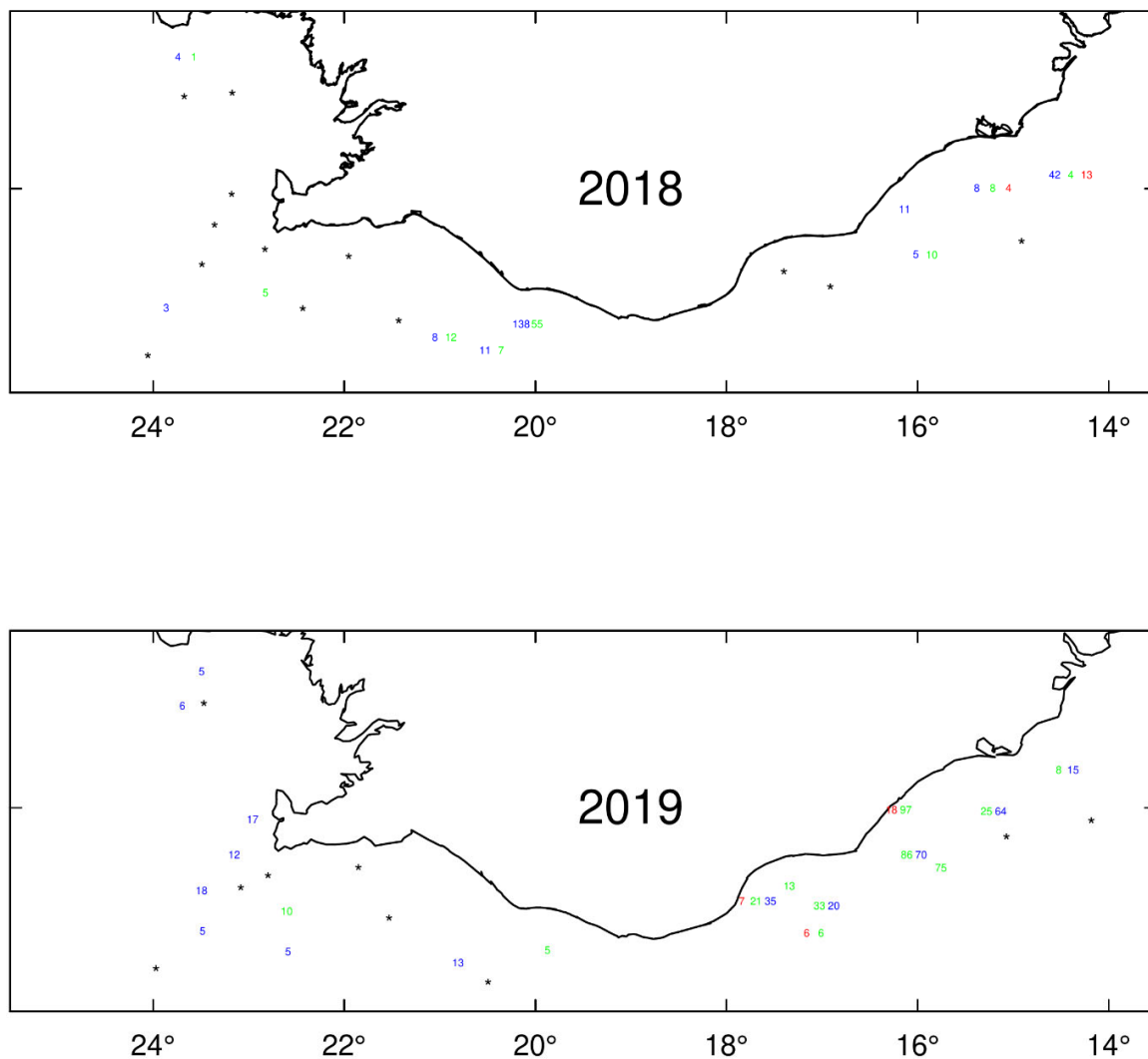


Figure 12. Norway lobster. Number of *Nephrops* larvae caught in bongo-net per 1000 m^3 from surveys conducted in 2018 and 2019. Blue numbers indicate larvae on Zoea stage 1, green Zoea stage 2, and red Zoea stage 3. Black asterisks are stations where no *Nephrops* larvae were found.

TRAWL SURVEY

A *Nephrops* trawl survey was conducted from 1973 to 2015. In the survey, 55 standardized two-hour tows were conducted on all *Nephrops* grounds. The stock abundance index declined from the peak in 2009 and reached the lowest value in 2015. There have been some similarities between the stock index and CPUE, but less in recent years and during the early years of the survey. 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. This led to the progress of using UWTV survey in 2016–2019 to assess stock development and provide management advice for the *Nephrops* stock in Icelandic waters (Campbell, *et al.*, 2009).

BOTTOM TRAWLING ON NEPHROPS GROUNDS

TRAWLING INTENSITY

In addition to trawling with *Nephrops* trawl, a considerable amount of bottom trawling for groundfish occurs on *Nephrops* grounds. There are around 6600 towed hours annually (2014–2018) on *Nephrops* grounds (Table 5). Most of the activity is on the Vestmannaeyjar *Nephrops* ground or almost 4000 towed hours (2.4 hours annually per km²). Slightly higher trawling activity is in Breiðamerkurdjúp or 2.5 h per km² and high trawling activity is also in Hornafjarðardjúp (0.9 h per km²) and Lónsdjúp (0.7 h per km²). On average, the CPUE of cod (*Gadus morhua*), the most important demersal fish species, south of 65°N is 0.5 tonnes per hour towed (Table 8). The CPUE of cod was high within Vestmannaeyjar grounds (1.2 t/h), but lower than average in the eastern *Nephrops* areas, i.e. Breiðamerkurdjúp, Hornafjarðardjúp and Lónsdjúp, or around 0.3 t/h in all regions (Figure 13, Table 5). CPUE of haddock (*Melanogrammus aeglefinus*) and ling (*Molva molva*) is also higher within the Vestmannaeyjar region compared to other areas south of 65°N (Table 8).

Because of poor state of the *Nephrops* stock, it is proposed to close the core *Nephrops* areas southeast of Iceland from additional disturbance of groundfish bottom trawling to protect the observed recruitment (Figure 13, Table 5). Those areas have relatively high trawling activity but are of less importance for groundfish than the Vestmannaeyjar grounds.

Recommended boundaries of closures for bottom trawling on Nephrops grounds:

Breiðamerkurdjúp

1. 63°52'50''N - 16°16'00''V
2. 63°35'00''N - 15°46'00''V
3. 63°37'00''N - 15°41'00''V
4. 63°57'50''N - 16°02'00''V
5. 63°52'50''N - 16°16'00''V

Hornafjarðardjúp

1. 64°00'00''N - 15°18'00''V
2. 63°43'00''N - 14°52'00''V
3. 63°46'00''N - 14°47'00''V

4. 64°00'00"N - 15°10'00"V
 5. 64°00'00"N - 15°18'00"V
- Lónsdjúp
1. 64°10'00"N - 14°42'00"V
 2. 63°56'00"N - 14°12'00"V
 3. 63°56'00"N - 14°05'00"V
 4. 64°10'00"N - 14°30'00"V
 5. 64°10'00"N - 14°42'00"V

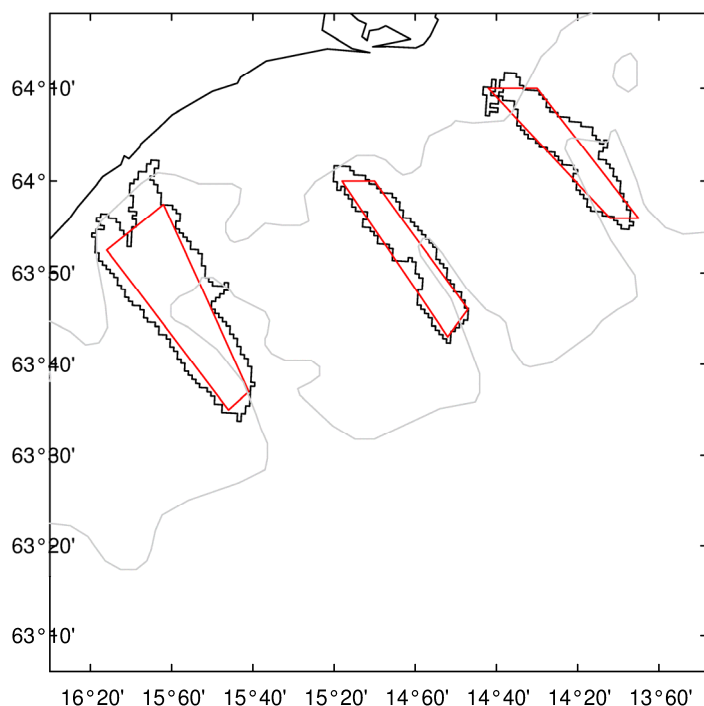


Figure 13. Norway lobster. Polygons of *Nephrops* grounds based on VMS data in southeastern Iceland. Proposed closed areas for bottom trawling within *Nephrops* areas are plotted (red lines) and depth contours (100 and 200 m, grey lines).

STOCK ASSESSMENT

HARVEST RATE

According to the UWTV survey, the harvest rate of the total stock in 2019 varied from 0–1.17% between grounds, with an average harvest rate of 0.37% (Table 4). Limited fisheries were on Vestmannaeyjar and Selvogsbanki with subsequently low harvest rate. The highest harvest rate was in Grindavíkurdjúp, followed by Hornafjarðardjúp. The ratio of males in the catches was 50–99%. Unusually high amounts of females were caught in Breiðamerkurdjúp in 2019 (Table 4), as the ratio of males in the catches is usually around 90%.

With declining catches, the harvest rate has declined from 1.89% in 2016 to 0.37% in 2019 (Figure 1). During the monitoring fishery of 2019, the harvest rate decreased as expected on most areas, apart from small increase in Grindavíkurdjúp and Skeiðarárdjúp (Figure 14). Despite the disjointed nature of the *Nephrops* ground in Iceland and therefore relatively small number of stations on each ground, the relative abundance shows similar fluctuations on separated grounds. Small increase in abundance was in Jökuldjúp during the

first years, but with the recent expansion of the fishing in Jökuldjúp during that period, more stations have been added to the newly exploited western half of that area. The burrow abundance has been higher there and explains the overall increase in burrow abundance (Figure 8, 10 & 14). Rather sharp increase was seen in Hornafjarðardjúp in 2019, but that is mostly explained by high density on one station in the eastern part of the ground (Figure 7, 8 & 14).

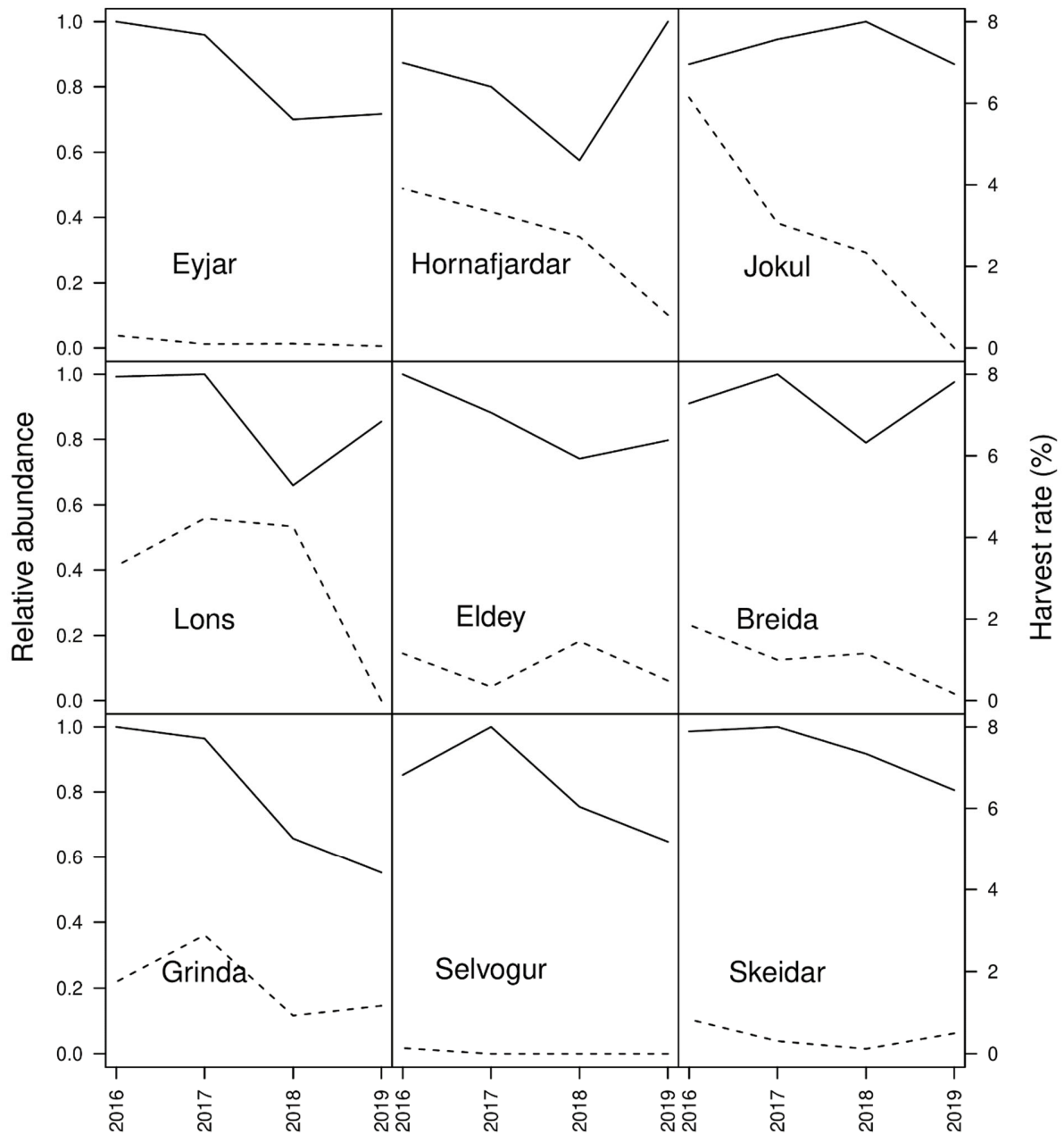


Figure 14. Norway lobster. Relative burrow abundance (solid line) and harvest rate (dotted line) in individual subareas (Eyjar–area 1, Hornafjardar – area 2, Jokul – area 3, Lons – area 4, Eldey – area 5, Breida area 6, Grinda – area 7, Selvogur – area 8 and Skeidar – area 9) during 2016 – 2018 (See Figure 6 for area id locations).

ADVICE

Due to poor status of stock MFRI advised in 2019 a monitoring fishery for sampling and mapping of distribution and to monitor stock status. Abundance, based on burrow counts, which had declined by 20% between 2016 and 2018 was stable between the surveys of 2018 and 2019. The observed density in Iceland is among the lowest reported compared to other functional units within ICES areas. There was no evidence of recruitment into the stock during 2019. This stock has been monitored since the early 1960's and such a gap in the length frequency due to recruitment failure has not been seen before. The CPUE declined slightly between years and is currently the lowest in the time series, but the recently high CPUE grounds of Jökuldjúp and Lónsdjúp were closed in 2019. Reference points (B_{MSY} or $B_{trigger}$) have not been defined for the stock. Given the current knowledge it is reasonable to believe that the stock is now below B_{lim} .

For the fishing year 2020 it is advised to continue with the monitoring fishery. Furthermore, it is advised that the most intensively fished *Nephrops* grounds of Jökuldjúp and Lónsdjúp during recent years should remain to be closed for all *Nephrops* trawling. Additionally, the *Nephrops* grounds in Breiðamerkurdjúp, Hornafjarðardjúp and Lónsdjúp should also remain to be closed for bottom trawling to decrease fishing disturbance in those areas.

It is proposed to use the same HR of 0.376% in the monitoring fishery of 2020 as was advised in 2019. Basis for the 2019 harvest rate (HR_{2019}) was the harvest rate of 2018 (UWTV $HR_{2018} = 1.16\%$), scaled with the relative decline of then current VPA stock status, which gave $HR_{2019} = 0.376\%$ (MFRI, 2019). The HR is multiplied with the recent UWTV survey abundance and the mean weight in landings of recent year. The mean weight increases from 130 – 141 g between years that should increase the TAC slightly. However, for 2020 is recommended to use the UWTV abundance of open grounds (excluding the closed Lónsdjúp and Jökuldjúp), which is 404 million burrows:

$$TAC_{2020} = HR_{2020} * UWTV \text{ abundance}_{2019} * \text{mean weight}_{2019}$$

$$TAC_{2020} = 0.376\% * 404 \text{ million} * 0.141 \text{ g} = 214 \text{ tonnes}$$

Given that, MFRI recommends that the monitoring fishing should be limited to 214 tonnes to provide data to support assessment for the stock.

REFERENCES

- Eiríksson, H., 2014. Reproductive Biology of Female Norway Lobster, *Nephrops norvegicus* (Linnaeus, 1758) Leach, in Icelandic Waters During the Period 1960–2010: Comparative Overview of Distribution Areas in the Northeast Atlantic and the Mediterranean. *Advances in Marine Biology*, vol. 68, pp. 65-210.
- Eiríksson, H., Jónasson, J.P. 2018. The fishery and stock assessment of Norway lobster (*Nephrops norvegicus*) in Icelandic waters during 1950-2016. Haf- og vatnarannsóknir HV2018-25.
- Campbell, N., Dobby, H., Bailey, N. 2009. Investigating and mitigating uncertainties in the assessment of Scottish *Nephrops norvegicus* populations using simulated underwater television data. *ICES J Mar Sci* 2009; 66 (4): 646-655.
- MFRI. 2019. Assessment Reports. Norway lobster. Marine and Freshwater Research Institute, 31. January 2019.

Table 1. Norway lobster. Landings from Icelandic waters.

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
2017	1194	0	1194
2018	728	0	728
2019	259	0	259

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

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
2017	711	47.8	10	15.4	472	40.8	1194	44.4
2018	402	28.5	10	19.0	316	28.9	728	28.3
2019	160	23.0	6	20.9	93	25.5	259	23.4

Table 3. Norway lobster. Recommended TAC, National TAC set by the Ministry and landings (tonnes). *Includes also autumn catches in 2018. #No TAC was issued in 2019 but allowed to fish quota transfers from previous years.

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	1186
2017/18*	1150	1150	869
2019	235	#	259
2020	214		

Table 4. Norway lobster. Summary of 2019 UWTV survey and information about the catch in 2019. Name of an area, id of area (see Figure 6), 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 rate.

Area	id	km ²	Burrows	Burrows m ²	Catch (t)	M.weight (g)	M%	Removals	Harvest rate
Jökuldjúp	3	737	64	0.09	0			0	0%
Eldey	5	845	68	0.08	44.7	0.135	0.95	0.33	0.49%
Grindav.-/Skerjadjúp	7	1307	65	0.05	114.1	0.150	0.95	0.76	1.17%
Selvogur	8, 11, 12	296	19	0.07	0.1	0.128	0.99	0.00	0.00%
Vestmannaeyjar	1, 10	1400.0	78	0.06	5.9	0.160	0.97	0.04	0.05%
Skeiðarárdjúp	9	859	58	0.07	38.6	0.133	0.93	0.29	0.50%
Breiðamerkurdjúp	6	638	82	0.13	13.0	0.093	0.50	0.14	0.17%
Hornafjarðardjúp	2	259	34	0.13	42.4	0.153	0.72	0.28	0.81%
Lónsdjúp	4,13	247	24	0.10	0			0	0%
Total		6588	491	0.07	258.9	0.141		1.83	0.37%

Table 5. Summary of the average (2014-2018) annual bottom trawl effort on *Nephrops* grounds and all areas south of 65°N. Effort is in hours, E / km² is the effort per km² on *Nephrops* ground. Cod, haddock and ling is the average tonnes caught per species with bottom trawl and CPUE is the tonnes caught per hour for given species.

Area	id	Effort	E / km ²	Cod	C CPUE	Haddock	H CPUE	Ling	L CPUE
South of 65°N		47371		23784	0.50	7068	0.15	772	0.02
Jökuldjúp	3	53	0.07	18	0.35	3	0.06	1	0.02
Eldey	5	317	0.38	239	0.75	44	0.14	10	0.03
Grindav.-/Skerjadjúp	7	468	0.36	106	0.22	17	0.04	13	0.03
Selvogur	8	13	0.04	7	0.51	1	0.07	0	0.01
Vestmannaeyjasvæði	1	3387	2.42	3970	1.17	821	0.24	408	0.12
Skeiðarárdjúp	9	360	0.42	44	0.12	66	0.18	18	0.05
Breiðamerkurdjúp	6	1619	2.54	488	0.30	67	0.04	57	0.04
Hornafjarðardjúp	2	237	0.91	72	0.31	14	0.06	3	0.01
Lónsdjúp	4	172	0.70	60	0.35	15	0.09	2	0.01