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Icelandic Beam Trawl Survey
Result summary 2017

Guðjón Már Sigurðsson og Jónbjörn Pálsson

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Marine and Freshwater Research in Iceland

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Abstract

Stock assessment for plaice (Pleuronectes platessa*) and dab* (Limanda limanda*) in Icelandic waters has historically been limited by lack of recruitment data due to the fact that younger fish are rarely caught in the existing bottom trawl surveys. A pilot survey with a beam trawl in the coastal waters of western Iceland was conducted in 2016 and was largely successful. The objective of this study was therefore to build on the successful pilot study and extend the survey area to include the south and parts of the north coasts. The survey was successful in catching high densities of plaice and dab, and the vast majority of the fish caught were in young age groups (1-4 year old) that are largely missing from the existing groundfish trawl surveys. The survey was however not successful in finding recruitment grounds of lemon sole (*Microstomus kitt*), as no young fish (1-2 year old) were caught which suggests that they are found in deeper waters. The success of this study warrants extension to include the eastern part of the country, so that the coastal waters all around the country are adequately covered.*

Lykilorð: *Flatfish, beam trawl survey, plaice, dab, lemon sole*

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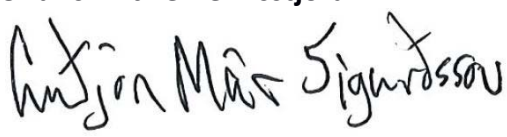	

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Introduction

Stock assessment for flatfish in Icelandic waters has historically been limited by lack of data, despite the fact that landed value of the 6 most commonly fished species (plaice, lemon sole, witch, dab, rough dab, and megrim) has been north of €13.000.000 over the last few years. In particular, recruitment data and knowledge about the locations of nursery areas of these species is lacking.

Plaice has historically been the most targeted flatfish in Icelandic coastal waters, with catches exceeding 14.000 tonnes in the 1980s. Overfishing during that period led to lowered catches, and as a result TAC was put in place in 1997, followed by area closures in 2001 to protect the three main spawning grounds for plaice. Despite its importance and value, there is a knowledge gap on the spatial distribution of the species for the first 3 years of their life, or until they start to appear in the fishery and bottom trawl surveys at 3-4 years old. No recruitment index exists, which increases uncertainty in stock assessment and setting of TAC. Similar story can be said about dab, which is rarely caught in the existing bottom trawl surveys. Recruitment indices for witch, rough dab, and megrim can be attained from other surveys as their recruitment occurs in deeper water, while lemon sole recruits are sporadically found in other bottom trawl surveys.

The Marine and Freshwater Research Institute's annual spring survey that was started in 1985 and has over 600 stations around the country does not adequately catch juvenile plaice or dab due to the type of otter trawl used and the fact that it is difficult to deploy in shallow water (100 meters or less) where most of the juveniles of these species are thought to be found. Trials to sample these species in shallow water in 2006 with a modified nephrops trawl with 40 mm shrimp mesh ended in shreds as the gear was ripped easily on the complex bottom, and earlier trials with modified demersal seine ended similarly. Investigation into other gear to sample the juvenile flatfish around Iceland suggested that beam trawl with chain mats would be ideal.

A pilot study using a standard 4 meter beam trawl was conducted in 2016. It went well, the gear worked well on the ragged coastline of Iceland, and several recruitment hotspots of plaice and dab were found. Due to the experimental nature of the study and limited ship time, only the west coast of Iceland was sampled in the pilot survey.

As the pilot study was successfull, the objective of this study was therefore to expand the sampling programme to the south and north coasts of the island, using a standard 4 meter beam trawl at 10-50 meter depth, to identify and monitor recruitment grounds of plaice and dab. A sub-objective was to attempting to find recruitment hotspots for lemon sole, and monitor other coastal species of commercial importance such as juvenile cod, haddock and sea cucumber.

Methods

Gear

A standard 4 meter beam trawl was bought from Brixham Trawl Makers UK and is the same type of trawl used in the British and Irish beam trawl surveys in the North- and Irish Seas. The trawl has a 4 meter steal beam, with a chain mat and flip up rope (figure 1). Netting of the trawl has 75 mm mesh, while the cod-end was lined with a 40 mm shrimp mesh.

Figure 1. The 4 m beam trawl used in this study.

Vessel and tow information

The survey in 2016 was conducted on the shrimp trawler and former research vessel Dröfn RE-035, but as that ship got sold abroad in 2017, research vessel Bjarni Sæmundsson RE-030 was

used in its place. Bjarni Sæmundsson is 56 meters long, 10.6 meters wide and 247 tonnes gross weight. The ships engines are 1800 hp. Tow duration was 30 minutes, at 4 nm/h for a total length of 2 nm. In few cases towing was cut short due limited area to tow on, or due to issues or high catch of shellhash, but no tows were shorter than 1 nm. We therefore report density of fish as number/nm.

Site selection

Tow sites were selected based on four criteria and were therefore not selected randomly (figure 2). The first three criteria was that the tow depth had to be less than 50 m, that it had to be close to the shore (within 5 nm) and the bottom had to be sandy according to the ships sonar, but young plaice and dab are thought to prefer shallow sandy bottom close to the shore. The fourth and final criteria was that the tow had to be close (within 10 nm) to areas marked by dermersal seine fishermen as areas were juvenile flatfish were found. Several tows were done in deeper water than 50 meters off the south coast for experimental purposes.

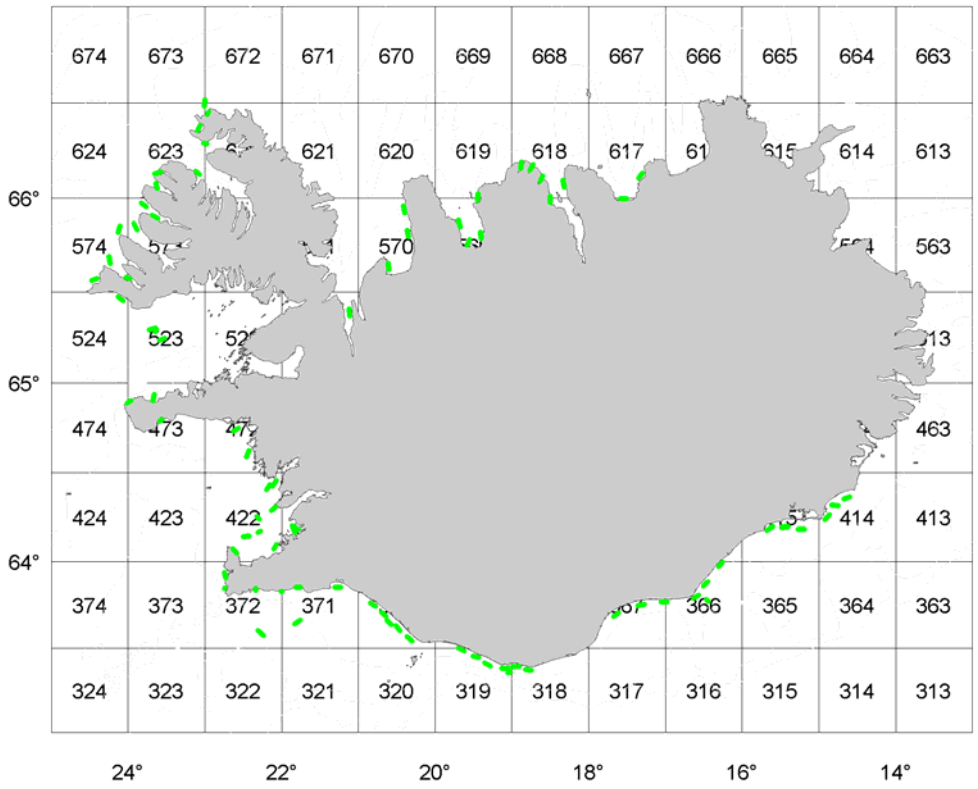

Figure 2. Map showing the location of the 81 tows taken in the survey.The contour lines resemble 100, 200 and 500 m depth contours.

Data collection

All fish that were caught in the trawl were identified on board and the first 50 individuals of each species were measured. In addition to the fish, all crabs, lobsters, sea cucumbers, scallops, cyprines, and shrimps counted. If more than 50 individuals were measured of a species, the remaining individuals were counted to speed up processing. Otoliths were taken randomly from 10 individuals per station of all flatfish species caught (plaice, dab, lemon sole, rough dab,

flounder, halibut, and witch). Age of the fish was then estimated from the otoliths using a standardized protocol established within the Icelandic Marine Research Institute.

Results

A total of 36 species of fish were caught in the survey, six species of crabs, in addition to two shellfish species, one species of sea cucumber and one species of lobster. Dab was the most common fish species, closely followed by sea cucumbers and plaice. Other noteworthy commercially important species are Atlantic cod, thorny skate, haddock, whiting and wolffish (table 1). One European sprat (*Sprattus sprattus*) was caught in the survey, and is this the first record of the European sprat in Icelandic waters.

Table 1. Total count, number of measured individuals and number of otoliths taken from the species found at the 81 stations of the survey.

Common name	Latin name	Counted	Measured	Otoliths	Total
Dab	*Limanda limanda* (Linnaeus, 1758)	1360	3544	670	4904
Sea cucumber	*Cucumaria frondosa* (Gunnerus, 1767)	3400	0	0	3400
Plaice	*Pleuronectes platessa* (Linnaeus, 1758)	901	2133	547	3034
Cod	*Gadus morhua* (Linnaeus, 1758)	0	891	0	891
Thorny skate	*Amblyraja radiata* (Donovan, 1808)	4	678	0	682
Lemon sole	*Microstomus kitt* (Walbaum, 1792)	0	618	257	618
Swimming crab	*Liocarcinus holsatus* (Fabricius, 1798)	552	0	0	552
Long rough dab	*Hippoglossoides platessoides* (Fabricus, 1780)	48	459	176	507
Haddock	*Melanogrammus aeglefinus* (Linnaeus, 1758)	0	480	0	480
Spider crab	*Hyas araneus* (Linnaeus, 1758)	203	0	0	203
Whiting	*Merlangius merlangus* (Linnaeus, 1758)	0	175	0	175
Atlantic wolffish	*Anarhichas lupus* (Linnaeus, 1758)	0	165	0	165
Iceland cyprine	*Arctica islandica* (Linnaeus, 1767)	163	0	0	163
Grey gurnard	*Eutrigla gurnardus* (Linnaeus, 1758)	26	83	0	109
Rock crab	*Cancer irroratus*	84	0	0	84
Norway pout	*Trisopterus esmarkii* (Nilsson, 1855)	44	24	0	68
Witch	*Glyptocephalus cynoglossus* (Linnaeus, 1758)	0	60	26	60
Shorthorn sculpin	*Myoxocephalus scorpius* (Linnaeus, 1758)	0	40	0	40
Monkfish	*Lophius piscatorius* (Linnaeus, 1758)	0	35	0	35

Hooknose	*Agonus cataphractus* (Linnaeus, 1758)	0	32	0	32
Whelk	*Buccinum undatum* (Linnaeus, 1758)	29	0	0	29
Arctic lyre crab	*Hyas coarctatus* (Leach, 1816)	22	0	0	22
Scallop	*Chlamys islandica* (O. F. Müller, 1776)	16	0	0	16
Norway redfish	*Sebastes viviparus* (Kröyer, 1845)	0	15	0	15
Halibut	*Hippoglossus hippoglossus* (Linnaeus, 1758)	0	12	12	12
Raitt´s sandeel	*Ammodytes marinus* (Raitt, 1934)	0	10	0	10
Skate	*Dipturus batis* (Linnaeus, 1758)	0	9	0	9
Megrim	*Lepidorhombus whiffiagonis* (Walbaum, 1792)	0	9	8	9
Atlantic mackerel	*Scomber scombrus* (Linnaeus, 1758)	0	9	0	9
Hermit crab	*Pagurus spp.*	7	0	0	7
Flounder	*Platichthys flesus* (Linnaeus, 1758)	0	6	6	6
Saithe	*Pollachius virens* (Linnaeus, 1758)	0	5	0	5
Checker eelpout	*Lycodes gracilis* (Sars, 1867)	0	5	0	5
Snake blenny	*Lumpenus lampretaeformis* (Walbaum, 1792)	0	5	0	5
Lumpfish	*Cyclopterus lumpus* (Linnaeus, 1758*)*	0	3	0	3
Moustache sculpin	*Triglops murrayi* (Günther, 1888)	0	3	0	3
Spotted snake blenny	*Leptoclinus maculatus* (Fries, 1837*)*	0	3	0	3
Bluemouth	*Helicolenus dactylopterus* (Delaroche, 1809)	0	3	0	3
Golden redfish	*Sebastes norvegicus* (Ascanius, 1772)	0	2	0	2
Herring	*Scomber scombrus* (Linnaeus, 1758)	0	2	0	2
Fourbearded rockling	*Rhinonemus cimbrius* (Linnaeus, 1758)	0	2	0	2
Greater forkbeard	*Phycis blennoides* (Brünnich, 1768)	0	2	0	2
Norway lobster	*Nephrops norvegicus* (Linnaeus, 1758)	1	0	0	1
Greater sandeel	*Hyperoplus lanceolatus* (Le Sauvage, 1824)	0	1	0	1
Stone king crab	*Lithodes maja* (Linnaeus, 1758)	1	0	0	1
Norwegian topknot	*Phrynorhombus norvegicus* (Günther, 1862)	0	1	0	1
Arctic rockling	*Onogadus argentatus* (Reinhardt, 1838)	0	1	0	1
European sprat	*Sprattus sprattus* (Linnaeus, 1758)	0	1	0	1

The spatial distribution of plaice was not uniform (figure 3). The highest density was observed within Faxaflói, more specifically in Borgarfjörður and Hafursfjörður, but higher than averages densities were also observed around Snæfellsnes, northern part of Vestfirðir peninsula, and in Skagafjordur in the northern part of the country

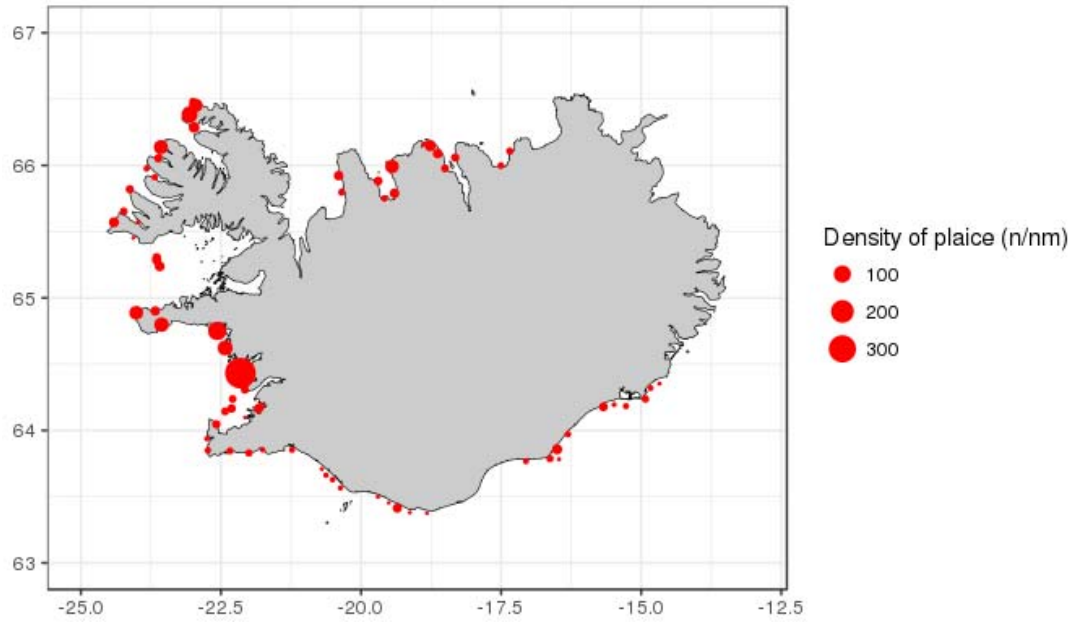

Figure 3. Map showing density (n/nm) of plaice (*Pleuronectes platessa*) at the 81 tow stations taken during the survey.

Distribution of juvenile plaice (<30 cm) was more patchy, and predominantly found in Faxaflói in the west, northern part of Vestfirðir and Skagafjörður in the north (figure 4).

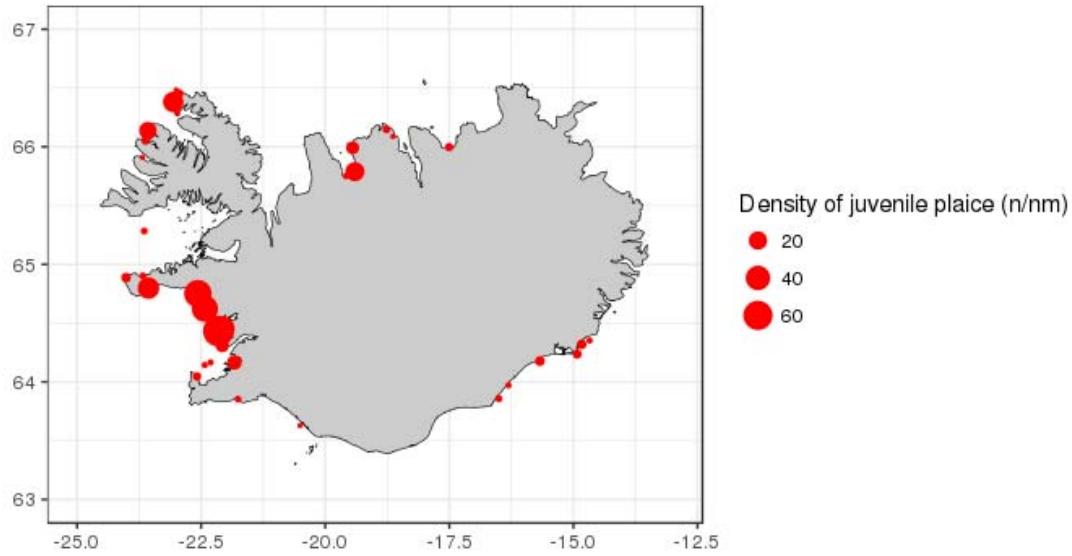

Figure 4. Map showing density (n/nm) of juvenile plaice (*Pleuronectes platessa*) smaller than 30 cm in length at the 81 tow stations taken during the survey.

In comparison to plaice, dab density was lower overall and more uniform spatially. The highest concentrations were in Skagafjordur in the north, within Faxaflói, around the south of Reykjanes, and at one station off the south coast close to Vestmannaeyjar (figure 5).

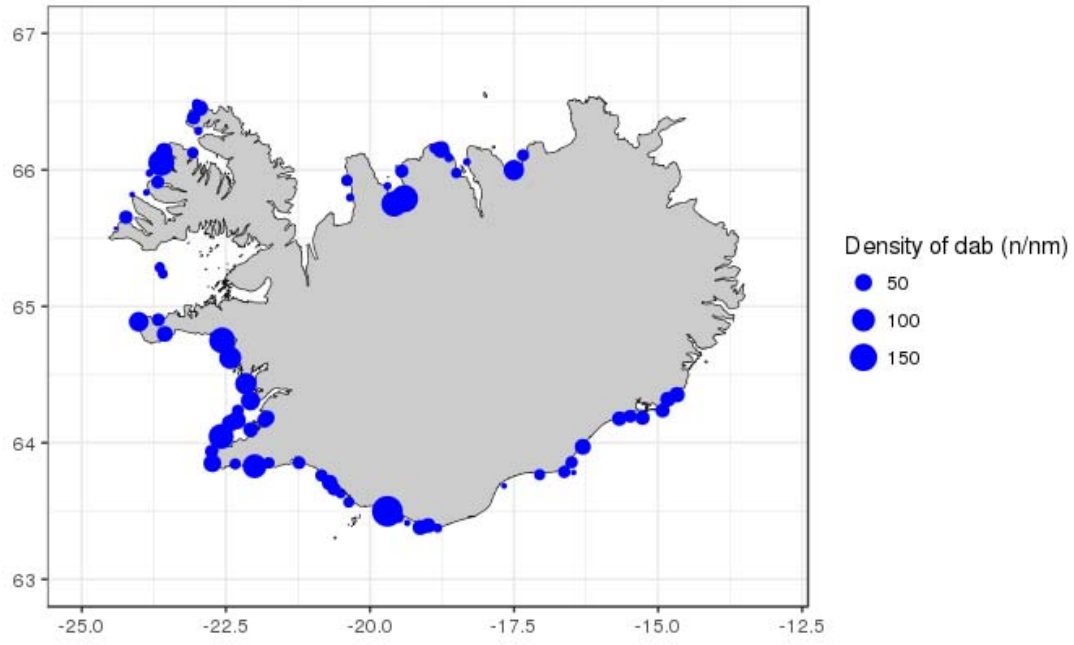

Figure 5. Map showing density (n/nm) of dab (*Limanda limanda*) at the 81 tow stations taken during the survey.

Juvenile dab density distribution was very similar to the overall distribution of dab, with the highest densities seen in Faxaflói, Vestfirðir and Skagafjörður (figure 6).

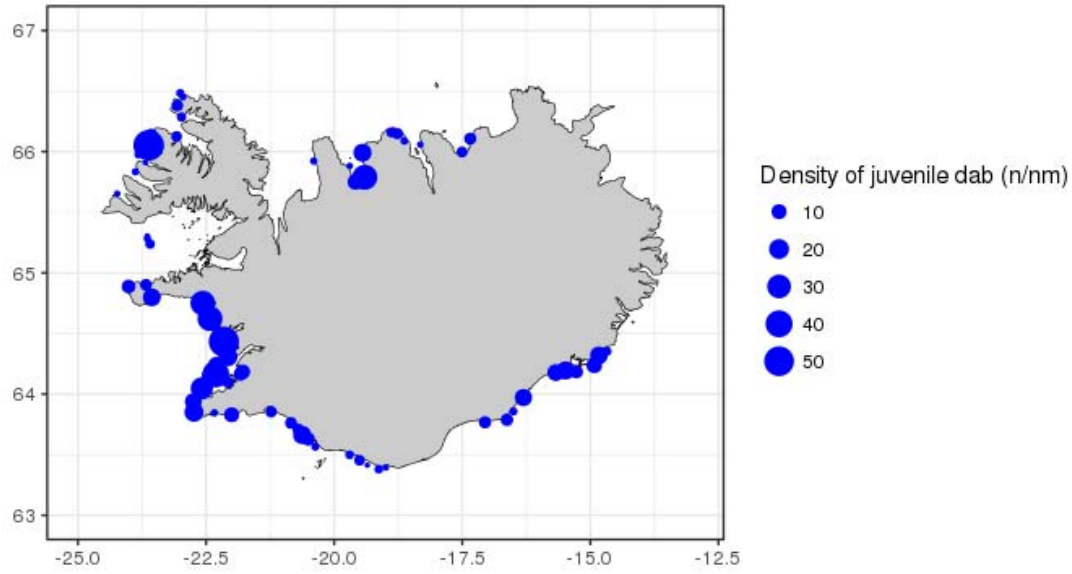

Figure 6. Map showing density (n/nm) of juvenile dab (*Limanda limanda*), smaller than 20 cm length, at the 81 tow stations taken during the survey.

Lemon sole was mostly found around the southwest corner, in Breiðafjörður and at two stations in the southeast (figure 7). Densities were overall lower than that of plaice and dab.

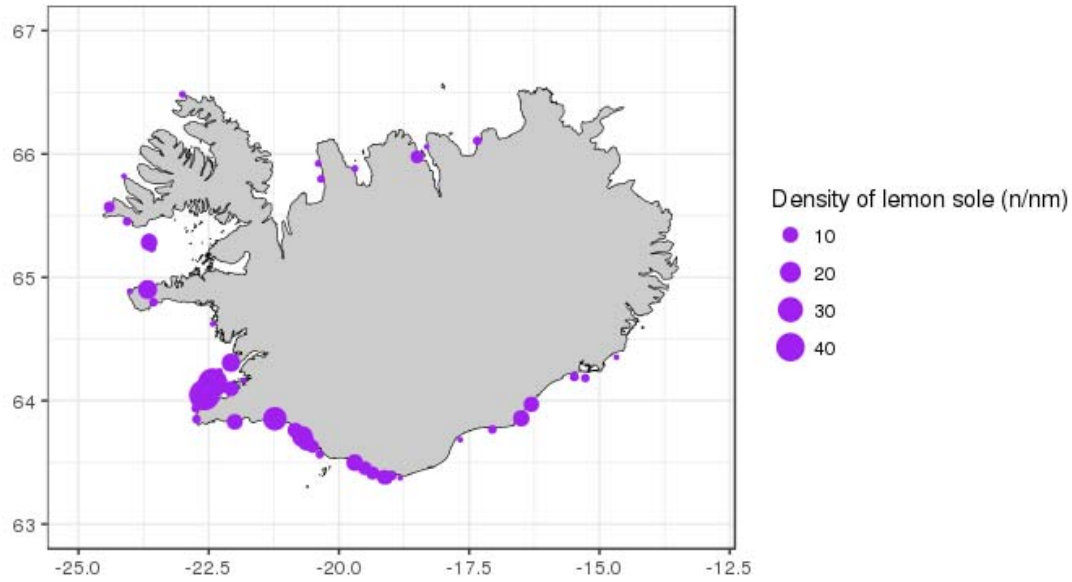

Figure 7. Map showing density (n/nm) of lemon sole (*Limanda limanda*) at the 81 tow stations taken during the survey.

Most of the plaice and dab caught were between 1 and 4 years old, while most of the lemon sole was between 3 and 10 years old. Very few plaice and dab were older than 7 year old while lemon sole caught were mostly adults (figure 8).

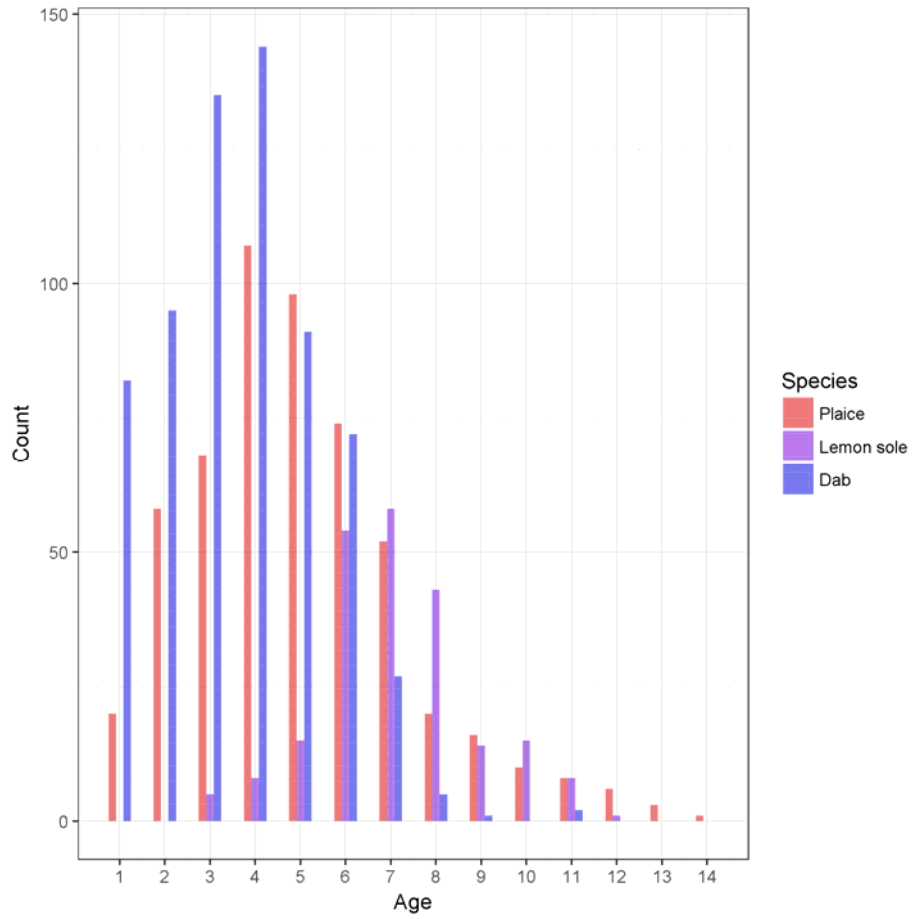

Figure 8. Age distribution of plaice, lemon sole and dab caught in the survey.

Age classes of the younger plaice and dab (1-3 year old) caught in the survey were easily distinguished by size (figure 9). As an example, two year old plaice caught in the survey were all around 20 cm, and easily distinguishable from 1 and 3 year old plaice. After the age of 3, age classes become increasingly harder to distinguish as growth slows down due to the onset of maturity. Lemon sole at the age of 3 is distinguishable from older fish, while it is harder to distinguish older age classes.

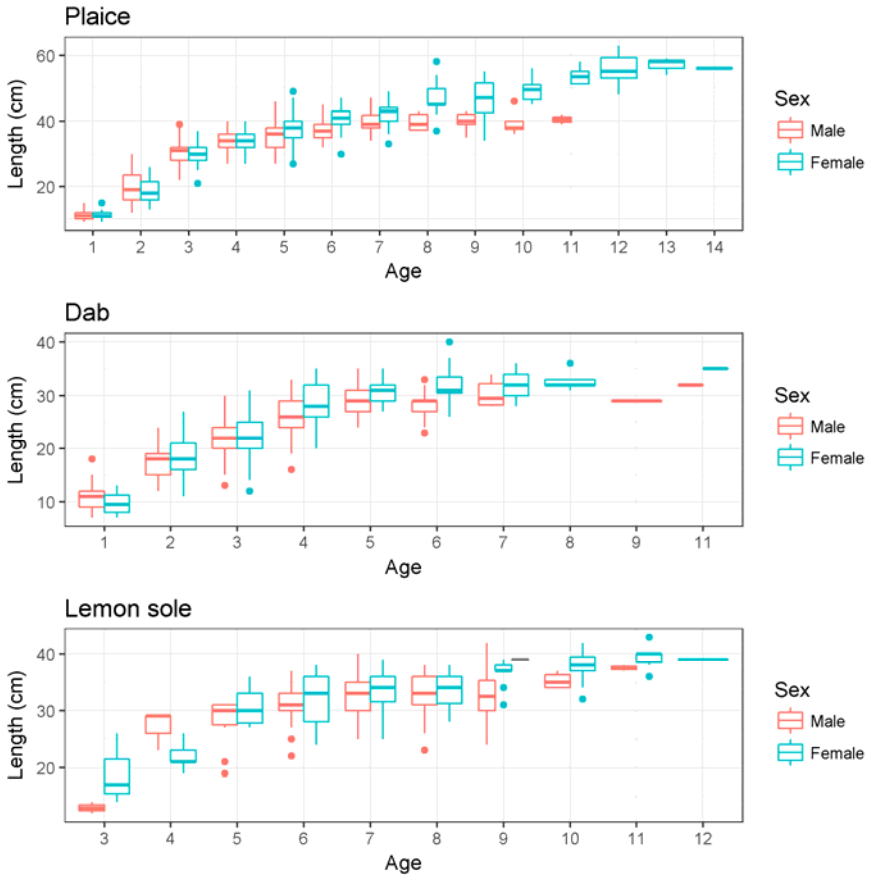

Figure 9. Relationship between age and size of male and female plaice, dab, and lemon sole caught in the survey.

Discussion

The survey was successful in catching the main target species, plaice and dab, and the wast majority of the fish caught were in the age groups that are largely missing from the existing groundfish trawl surveys. This study can therefore be considered successful in the process of filling the knowledge gap that has caused issues in stock assessment of those two species. Lemon sole caught were mostly older juveniles or adult fish, and 1-2 year old fish were not found, suggesting that they might be in deeper water. The density of plaice was higher than dab, but more patchy and dab was more abundant in total. Lemon sole was mostly bound to the southwest corner. In addition to those three target species, high density of several other commercially important species were caught, such as the sea cucumber (*Cucumaria frondosa*), juvenile cod (*Gadus morhua*), haddock (*Melanogrammus aeglefinus*) and whiting (*Merlangius merlangus*) (see appendix for density figures). Fewer Atlantic rock crabs (*Cancer irroratus*) and sand shrimp (*Crangon crangon*) were caught this year compared to last year. Considerable number of juvenile monkfish (*Lophius piscatorius*) were found along the south coast, but recruitment of that species has been very low or none in recent years. Juvenile Atlantic halibut (*Hippoglossus hippoglossus*) were also found, mostly off the west coast, but direct fishing of Atlantic halibut was banned in 2012.

The success of this survey warrants expansion of the study area to include flatfish grounds in the northeast and east of the country so this survey can provide recruitment information for these flatfish species around the entire country.

Appendix

Distribution of sea cucumbers, cod, haddock, whiting, halibut and monkfish caught in the study.

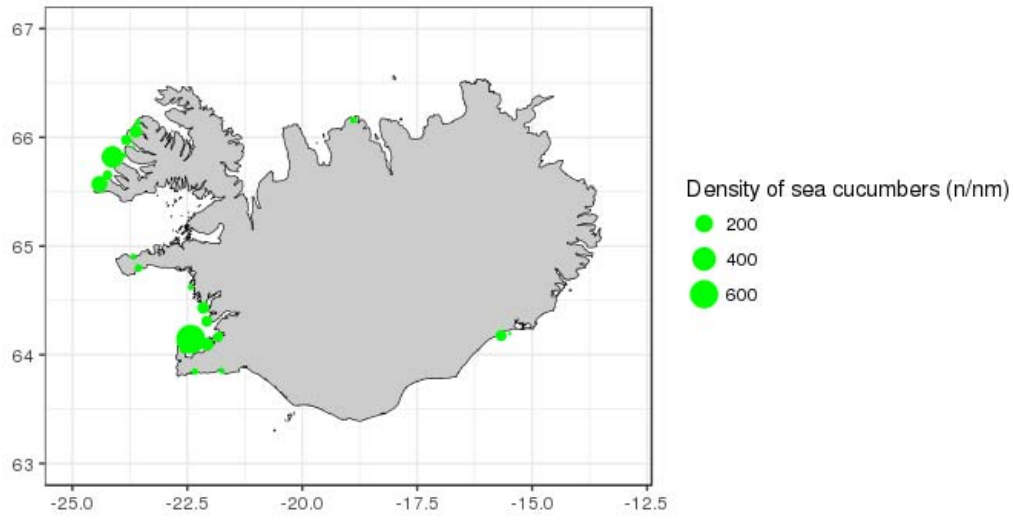

Figure 10. Map showing density (n/nm) of sea cucumber (*Cucumaria frondosa*) at the 81 tow stations taken during the survey.

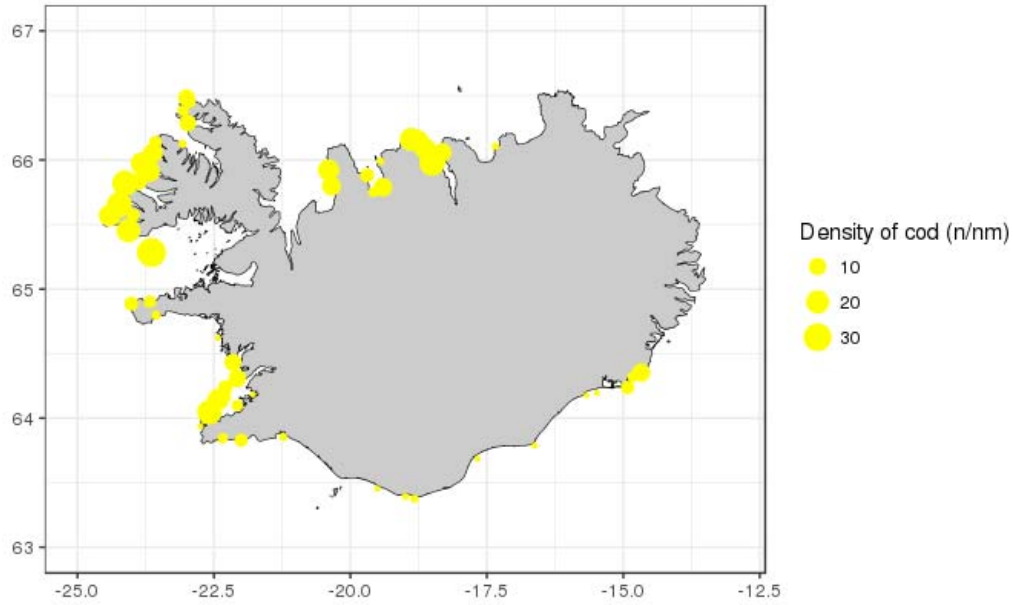

Figure 11. Map showing density (n/nm) of cod (*Gadus morhua*) at the 81 tow stations taken during the survey.

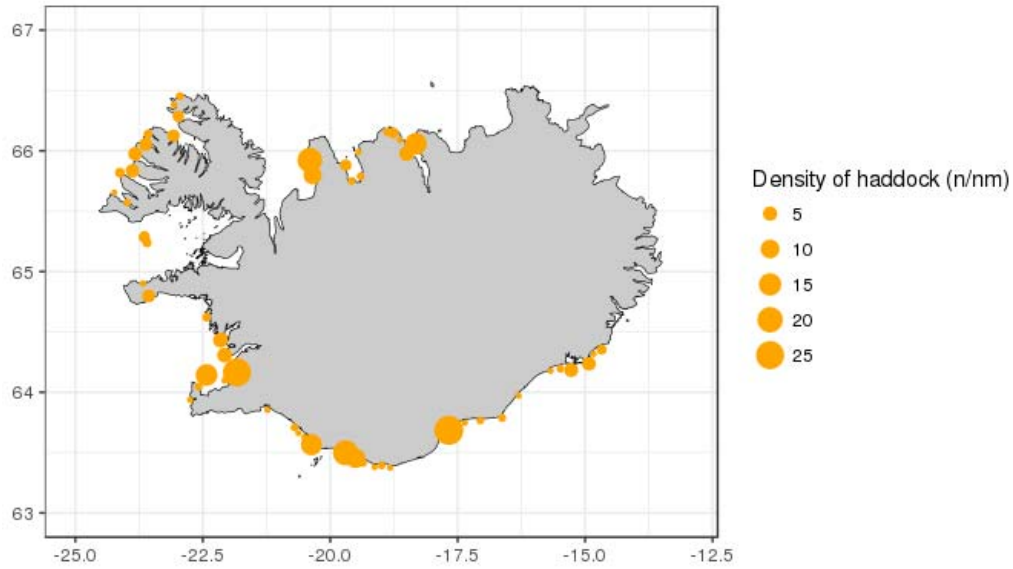

Figure 12. Map showing density (n/nm) of haddock (*Melanogrammus aeglefinus*) at the 81 tow stations taken during the survey.

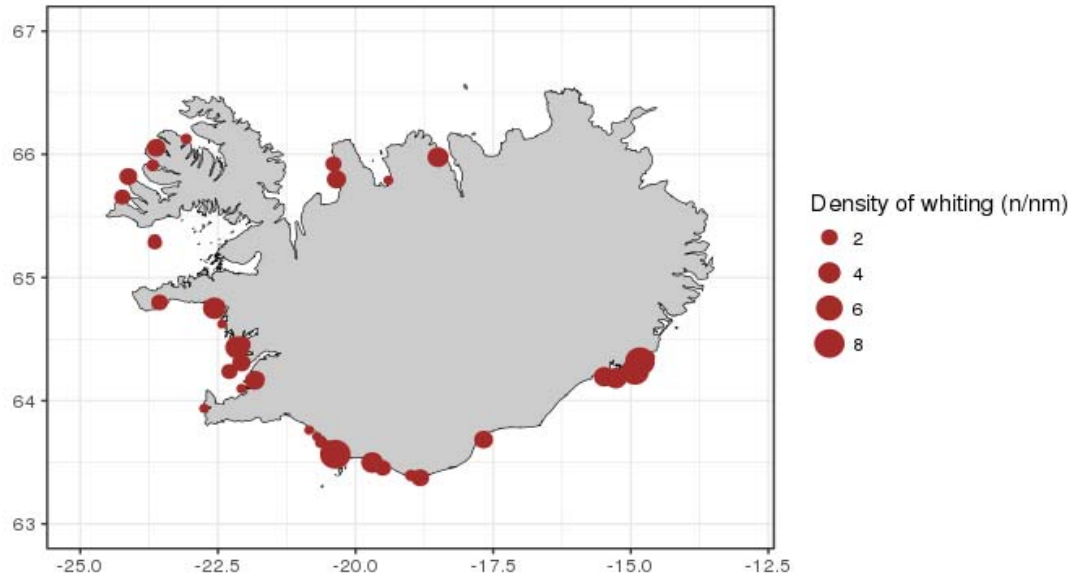

Figure 13. Map showing density (n/nm) of whiting (*Merlangius merlangus*) at the 81 tow stations taken during the survey.

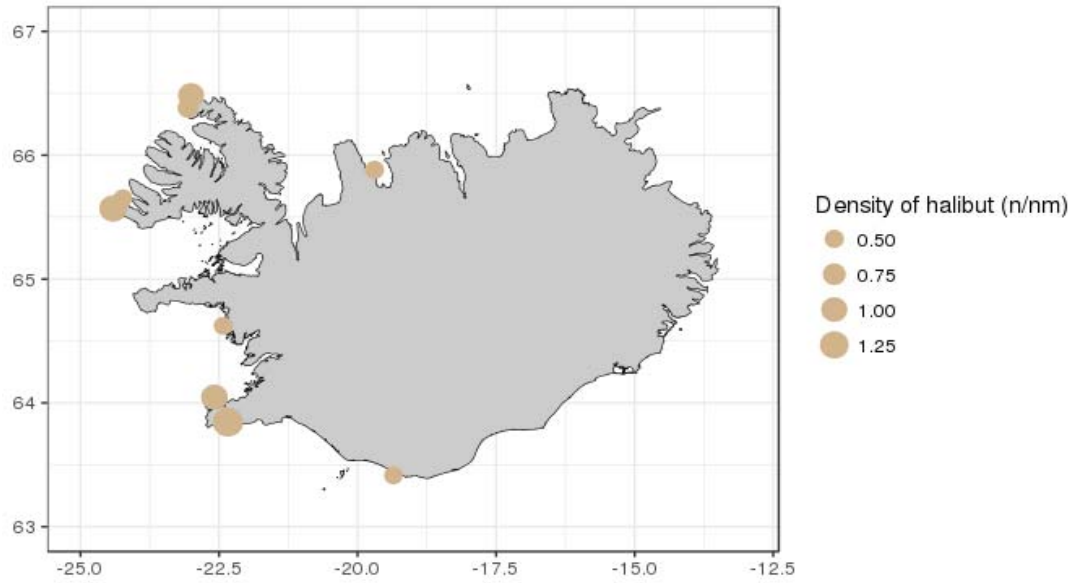

Figure 14. Map showing density (n/nm) of halibut (*Hippoglossus hippoglossus*) at the 81 tow stations taken during the survey.

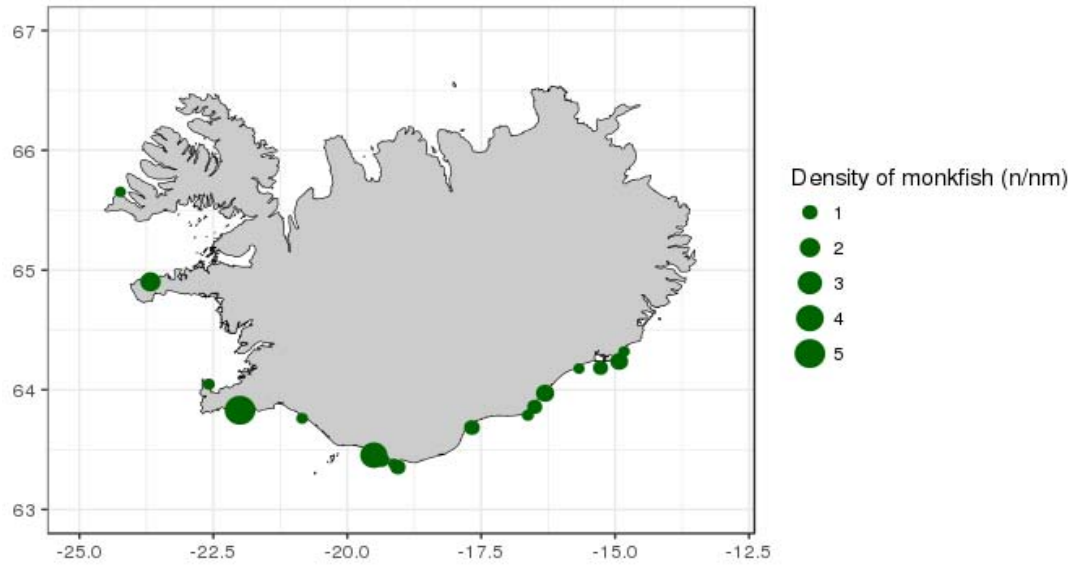

Figure 15. Map showing density (n/nm) of monkfish (*Lophius piscatorius*) at the 81 tow stations taken during the survey.

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