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MARINE AND FRESHWATER RESEARCH IN ICELAND

A manual for Icelandic Groundfish Survey in Autumn 2025

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Ágrip

Handbók þessi lýsir tækjum, aðferðum og umfangi gagnasöfnunar í Stofnmælingum botnfiska að haustlagi (SMH).

SMH hefur farið fram árlega frá árinu 1996. Helsta markmið verkefnisins er að styrkja mat á stofnstærð helstu botnlægra nytjastofna á Íslandsmiðum. SMH er skipulagt með sérstakri áherslu á lífshætti og stofnstærð grálúðu og djúpkarfa. Auk þess er markmið verkefnisins að afla upplýsinga um útbreiðslu, líffræði og fæðu helstu fiskitegunda á Íslandsmiðum og safna líffræðilegum upplýsingum um djúpfiska. Í gegnum tíðina hefur söfnun í SMH orðið veigamikill þáttur í langtímavöktun lífríkis á hafsvæði Íslands.

Lykilorð: Handbók, haustrall, stofnmæling, SMH, gagnasöfnun

Abstract

This the English translation of the manual describing the equipment, methods, and scope of data collection in the Icelandic groundfish survey in autumn (IAGS, IS-SMH).

IAGS has been conducted annually since 1996. The primary objective of the project is to enhance assessments of the stock size of the main demersal commercial fish species on Icelandic fishing grounds. IAGS is specifically designed to focus on the life history and stock size of Greenland halibut and beaked redfish. Additionally, the project aims to gather information on the distribution, biology, and diet of the major fish species on Icelandic fishing grounds, as well as collect biological data on deep-sea fish. Over time, data collection in the IAGS has become a crucial component in the long-term monitoring of marine life in Icelandic waters.

***Keywords**: IAGS, Autumn survey, demersal fish, groundfish, manual, sampling*

Contents

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1 Preface

This is an English version of the technical manual for the annual Icelandic Autumn Groundfish Survey (IAGS) of the MFRI carried out in 2024. It describes survey fishing gear and provides instructions on sampling, registration of information and fishing methods. A more detailed description of the methodology can be found in a report from 2007 (Björnsson et al. 2007). Although the survey is carried out in the same way each year there are usually some alternations to the protocol and thus, a new manual is published each year prior to the survey. These manuals are written in Icelandic since the project is almost exclusively carried out by Icelandic scientist and fishermen. However, due to international scientific collaborations and participants of nonnatives there is a need for an English version of the manual.

THE IAGS has been conducted annually since 1996. The main objective is to gather fishery independent information on biology, distribution, and biomass of demersal fish species in Icelandic waters, with particular emphasis on Greenland halibut (*Reinhardtius hippoglossoides*) and deepwater redfish (*Sebastes mentella*). This is because the Icelandic Groundfish Survey (IGS) conducted annually in March does not cover the distribution of these deep-water species.

Another main objective of the survey is to obtain a second evaluation on biomass and biology of demersal species carried out in IGS, such as cod (*Gadus morhua*), haddock (*Melanogrammus aeglefinus*) and golden redfish (*Sebastes marinus*), to improve the precision of stock assessments. Other objectives are collection of stomach data, biological information on non-target species, and to monitor distribution, biomass trends of main demersal fish species inhabiting Icelandic waters, and collection of environmental data (depth, temperature etc.). The data collection of the IAGS has emerged as a valuable source of information for long-time monitoring of the fish fauna on the Icelandic shelf and shelf break.

IAGS is conducted in October, which is a suitable month in relation to diurnal vertical migration, distribution and availability of Greenland halibut and deep-sea redfish. The research area is the Icelandic continental shelf and slope within the Icelandic Exclusive Economic Zone to depths down to 1500 m. The research area is divided into a shelf area (~ 0-400 m) and a deep-water area (150-1500 m). The shelf area is the same area as covered the by Icelandic groundfish survey in spring (IGS). The deep-water area is the shelf break/slope around Iceland directed at the distribution of Greenland halibut, mainly found at depths from 800-1400 m west, north and east of Iceland, and beaked redfish, mainly found at 500-1200 m depths southeast, south, and southwest of Iceland. Initially, 430 stations were divided between the two areas. However, over the study period, the number of stations has been reduced due to financial or technical reasons (see also Anon. 2010). In the 2024 survey 372 stations will be taken (Figure 1). The hired trawler Þórunn Sveinsdóttir VE-401 will cover the shallow water (179 tows) and the hired trawler Breki VE-61 will cover most of the slope (155 tows). Additionally, r/v Árni Friðriksson will sample 38 tows deep off West Iceland.

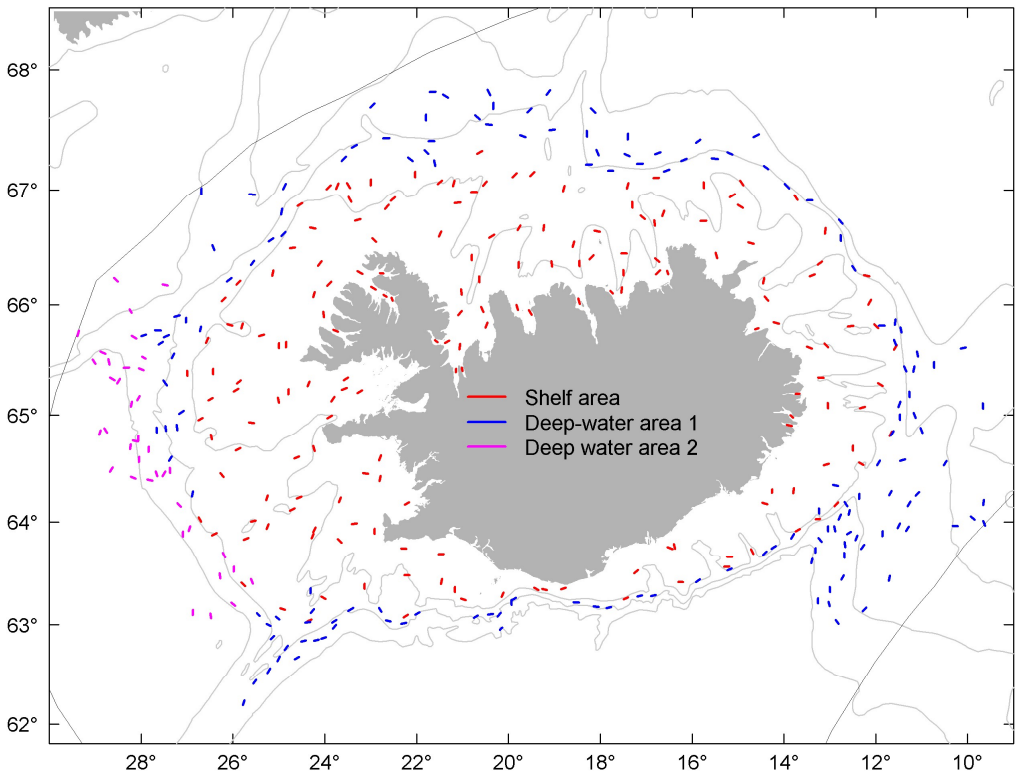


Figure 1. In 2024 three ships were used: hired trawlers Þórunn Sveinsdóttir VE-401 for the shallow water area (179 tows, red marks), Breki VE-61 for the deep-water area (155 stations, blue marks) and the R/V Árni Friðriksson HF-200 covered one part of the deep-water area (38 tows, magenta marks).

2 Preparing the survey

Before leaving harbor, it is necessary to check whether all instruments are onboard and in working condition. The working area must be prefixed, and scales, computers and headsets must be connected and checked. It must be checked carefully if there is a danger of losing small fish, e.g. through interstices in processing lines or conveyor belts. The cruise leader, together with vessel members, checks whether the trawls conform to standardized specifications and if instruments used for measuring gear geometry and environmental parameters are onboard and working.

3 Data collection

3.1 Data registration

All information on species, length, total number in catch, otolith removals, gender identification, weighing and stomach contents are registered in computer attached to the scale used (Marel Sea scale). The data collection program is an inhouse program called *Hafvog or SeaScale (hereafter referred to as Hafvog)*.

A copy is made of all data to be transferred to the survey leader. The survey leader adds the stations info and checks the sampling data and sampling procedure for errors or abnormalities (See Appendix 3).

Tablets have been introduced as a tool for data collection and will, among other things, take over the role of laminated sheets at the worksite. They will contain all information regarding data collection, in addition to detailed material related to species identification of fish and various invertebrates as well as maturity assessments. Expedition members are encouraged to use the tablet's camera to photograph rare species, unclear maturity stages, and other similar instances that are considered unusual. Please note that a label with the expedition name and station number should be visible in the photograph.

3.2 Species identification

For fish identification, please refer to the book 'Íslenskir fiskar' (Gunnar Jónsson & Jónbjörn Pálsson 2013) and the handbook 'Identification of Species, Maturity, and Diet.' Tablets will be on board all ships, containing material that aids in the identification of various species, including both fish and invertebrates. Laminated sheets are also on board. If identification is unclear, the specimen should be frozen and brought ashore. It is advisable to take pictures with the tablet, ensuring that the station number is visible in the photo.

3.3 Length measurements and counts.

3.3.1 Length measuring and counting fish

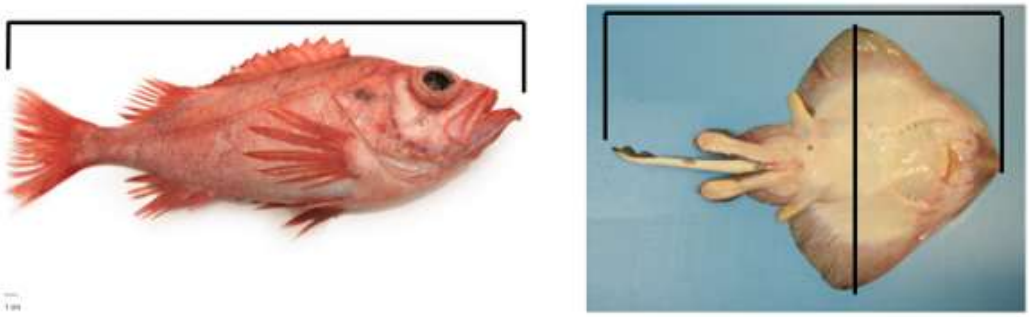
At each station, ALL fish species must be measured for length.

The general rule is to measure 2 x the continuous interval of length of a given species. Exceptions from this rule can be seen in Table 1.

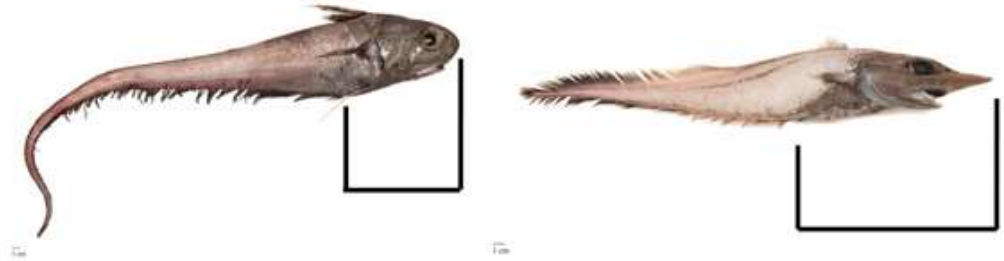
All fish not measured should be counted.

An example of measurement frequency according to a double length interval: If the continuous length distribution of the species ranges from 21 to 100 cm, the fish is spread over an 80 cm range, requiring 160 fish to be measured to meet the rule. Any catch beyond the measurement should always be counted.

At each station, the length of all fish species is measured to the nearest centimeter. For most species, the total length is recorded, measuring from the tip of the snout to the tip of the longer lobe of the caudal fin. This method also applies to sharks and rays. Rabbitfish and other chimaeras are measured from the tip of the snout to the front end of the caudal fin (Pre Supra-Caudal Fin Length). For grenadier species, the pre-anal fin length is measured from the tip of the snout to the base of the first anal fin ray (Pre Anal-Fin Length). For smoothheads, the length is measured from the snout to the tail end of the vertebral column (Standard Length). All length measurements are taken in 1-cm intervals, except for grenadiers, which are measured in half-centimeter intervals.



Total length (TL,cm) for most fish species. For starry ray, also Disc width (DW,cm) is measured.



On grenadier species, the pre-anal fin length is measured from the tip of the snout to the base of the first anal fin ray (Pre Anal-Fin Length, cm (Hafvog input in mm)).

For smoothheads, the length is measured from the snout to the tail end of the vertebral column (Standard Length,cm).

Rabbitfish and other chimaeras are measured from the tip of the snout to the front end of the caudal fin (Pre Supra-Caudal Fin Length,cm).

Figure 2. Different types of Length measurements in IAGS.

Samples for length measurements must be taken randomly so that the length measurement reflects the length distribution in the catch. If the length distribution of a species is uneven, for example, if

there is a relatively large number of small fish compared to larger fish, care must be taken during sampling to ensure that the correct proportion between them is represented in the measurement.

3.3.1.1 Execution of counts

It is important that counting fish from large catches is carried out correctly. Usually, a subsample needs to be based on certain units e.g. baskets, or compartments of the processing line. The (mean) number of fish in one unit is counted and multiplied by number of units to get the total number in the haul.

For very large catches, at least 2-3 subsamples are needed, e.g. taken at the start, middle and end of the process. Also, subsamples can be taken every n^{th} (e.g. every 10^{th}) unit and the number of units is then multiplied by the average number from the subsamples.

When subsamples are not taken but counting is made fish-by-fish, it is important not to count more than 100 fish at a time. The number 100 is given to the person doing data entry, starting again from zero. Avoid counting more than one species at a time, and never count more than two species.

Sometimes, high numbers of fish counted look suspicious when analyzing data. Therefore, it is important to register high numbers, not only into the digital data entry program but also handwrite numbers in notebooks that are later stored with station sheets. The rule is to register all counting above 100 fish in the notebook, thus given the cruise leader the opportunity to check off numbers entered into the data base.

COUNTING BASED ON LENGTH DISTRIBUTION:

If the length distribution of a species is highly skewed and it is almost impossible to get a representative sample using the methods described above, there is a possibility of using the option “Lengdarbilsháð talning” (Length-based counting) in the *Hafvog* data collection program. This option should only be used as an exception.

Using the haddock example below, it would be possible to measure about 2-times the length distribution of the haddock juveniles and all the larger haddock. The whole of the counted fish is then assigned to haddock at the length interval of 11-20 cm. This method is described in detail in the manual for *Hafvog*.

If length-based counting option is used, conventional counting is NOT to be used for the same species at the same station.

An example of haddock sampling: The length distribution of catch of haddock can be uneven (large amount of juveniles with several large adult fish). At least the double length interval of the juvenilesis measured and ALL large adult fish. The counted catch will therefore be all juveniles in certain length interval such as 11-20 cm. From the menu in Hafvog program the length-based counting („Lengdarbilsháð talning“) is chosen. Then the species (i.e. haddock) is chosen, length interval (11-20 cm) and the numbers of counted catch. The program is asked to calculate („reikna“) which will give estimated count per cm length. At last, these numbers are entered into the database („Skrá í gagnagrunn“).
When this method is used no fish will be registered as counted!

3.3.1.2 Sex and/or maturity recording in sample of length-measured fish

For the following species, the sex of individuals is also recorded during length measurements: Lumpfish, all skates and rays, sharks and chimaeras. For Atlantic wolffish additionally maturity level is recorded.

3.3.2 Length measurement and counting of other groups

Group	#ID	Operation in Hafvog	Type of input
Norway lobster and crabs*		10- Talning/þyngdarskráning	Number
Squids	44	10- Talning/þyngdarskráning	Number
Todorodes sagittatus	639	1-Lengdarmæling (mantle length)	Length (cm)
Shrimp *Pandalus borealis*	41	10- Talning/þyngdarskráning	Weight (kg)
Sea cucumbers	799	10- Talning/þyngdarskráning	Weight(kg)
Cucumaria frondosa	199	10- Talning/þyngdarskráning	Number/weight (kg)
Egg clusters of wolffish and spotted wolffish - intact	904	3-Kvörnun	Weight(kg)
Egg clusters of wolffish and spotted wolffish - damaged	904	10-Talning/þyngdarskráning	Number
Egg cases of starry ray	344	10- Talning/þyngdarskráning	hatched 90 or unhatched 91 Number

Sjávarspendýr	1001-1063	10- Talning/þyngdarskráning	Fjöldi
Draslskráning		40-Draslskráning (sjá kafla 3.6)	Fjöldi/þyngd (g)

Norway lobster and crabs (e.g. northern stone crab and common spider crab, and more species, see identification sheets) are recorded as number of individuals in *Hafvog* under main menu 10 Talning/Þyngdarskráning.

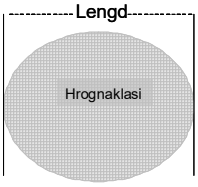
The quantity of shrimps (*Pandalus borealis*) should be estimated and recorded by weight (kg).

Squids (no. 44) are counted except for the squid *Todorodes sagittatus* (no. 639) where mantle length (cm) is measured.

Octopuses (no. 160) are counted.

Sea cucumbers are registered in *Hafvog* in main menu Talning/Þyngdarskráning, separately for the species *Cucumaria frondosa* (no. 199, number and weight in kg) and unidentified sea cucumbers (no. 799, only weight in kg).

Egg clusters of wolffish (no. 904). When intact, the egg cluster is measured for maximum length (see figure) and weight entered under 3 Kvörnun in *Hafvog*. If damaged, the egg cluster is registered as counted under 10 Talning/Þyngdarskráning í *Hafvog*.



A common size of egg clusters is about 15 cm in diameter for Atlantic wolffish and probably a little larger for spotted wolffish. In March, the egg clusters are probably greyish, and it is likely that eyes of larvae are visible.

Egg cases of skates and rays (no. 344), sharks (no. 345) and chimaeras (no. 183) are counted as empty or unhatched. Identification sheets are used to distinguish between the three types, registered in *Hafvog* under 10 Talning/Þyngdarskráning.

Marine mammals (no. 1001-1063) and seabirds (no. 1100-1171) that are caught are registered under "10 Talning/Þyngdarskráning" in *Hafvog*. This happens only rarely. Register in the yellow notebook whether the animals are dead or alive.

Pieces of marine litter caught in the trawl, e.g. trawl material, bottles and plastic bags are registered in numbers and weight (g) in *Hafvog* under "40 Draslskráning" (see Appendix). NOTE: Do not register material originating from the trawl of the research vessel e.g. pieces of string.

3.4 Otolith sampling and weighing

Otolith will be sampled from 21 species (Table 1). RANDOM SAMPLING of fish collected for otolith extraction is IMPORTANT! The overview of the IAGS data sampling is shown in Table 1.

Table 1. Overview of otolith sampling in IAGS 2024.

		Length measurem.				Otoliths and stomach. Always length, sex and maturity.								
Nr.	Species	Length interval	Sex	Maturity	Max number	Max/min number	Every n.th fish	Rate (%)	Ungutted weight	Gutted weight	Liver weight	Gonads weight	Stomac content	Stomach notes
1	Cod	2				15/10	10	10	x	x	x	x	x	max10
2	Haddock [4]	2				10/5	30	3	x	x	x	x	x	
3	Saithe	2				10/5	5	20	x	x	x	x	x	
4	Whiting	2												
5	Golden redfish	2				15/5	10	10	x				x	max10
6	Ling	2				10/1	4	25	x	x	x	x	x	
7	Blue ling	2				10/1	4	25	x	x	x	x	x	
8	Tusk	2				10/1	4	25	x	x	x	x	x	
9	Atl. wolffish	2	x[5]	x[5]		5/1	5	20	x	x	x	x		
10	Roundn. grenadier	3				(5/5)[1]			x				x	
12	Starry ray	2	x			(5/5)[1][6]			x				x	
13	Spotted wolffish	2[3]				25/1	3	33	x	x	x	x		
16	Spurdog	2				(20/20)[1]			x	x	x			
19	Gr. Silver smelt	2				10/5	30	3	x					
21	Halibut	2				15/15			x	x				
22	Greenland halibut	2				15/15			x	x	x	x	x	
23	Plaice	2				10/3	5	20	x					
24	Lemon sole	2				5/3	20	5	x					
25	Witch	2				10/3	15	7	x					
26	Megrim	2				10/3	15	7	x					
27	Dab	2				10/3	15	7	x					
28	Long rough dab	2				1/1			x				x	
33	Norway pout	2												
48	Lumpfish [2]	2	x			2/1			x	x	x	x		
49	Orange roughy	2				25/25			x	x	x		x	
60	Norway redfish	2												
61	Beaked redfish	2				25/10	10	10	x				x	
62	Rough head Grenad	2				(5/5)[1]			x				x	
161	Baird's smoothhead	2			20	(5/5)[1]			x				x	
171	Roughnose Grenad.	2				(5/5)[1]			x				x	
173	Black scabbard fish	2			20	(5/5)[1]			x				x	
178	Agassiz´smoothhead	2				(5/5)[1]							x	
184	Redish unid.	2				25/5	10	10	x				x	

Table 1. cont. Overview over otolith sampling in IAGS 2024.

		Length measurem.			Otoliths and stomach. Always length, sex and maturity.								
Nr.	Species	Length interval	Sex	Maturity	Max number	Max/min number	Every n.th fish	Rate (%)	Ungutted weight	Gutted weight	Liver weight	Gonads weight	Stomac content	Stomach notes
15	Blue skate		20		20	(5/5)[1)]			x					x
82	Spinytail skate		20		20	(5/5)[1)]			x					x
87	Round skate		20		20	(5/5)[1)]			x					x
90	Arctic skate		20		20	(5/5)[1)]			x					x
179	Sailray		20		20	(5/5)[1)]			x					x
17	Greenland shark	Length and sex recorded. Released if viable. Otherwise maturity and diet recorded												
64	Great lantern shark		20		20	(5/5)[1)]			x	x	x			x
96	Black dogfish		20		20	(5/5)[1)]			x	x	x			x
114	Iceland catshark		20		20	(5/5)[1)]			x	x	x			x
118	Mouse catshark		20		20	(5/5)[1)]			x	x	x			x
125	Velvet belly		20		20	(5/5)[1)]			x	x	x			x
163	Leafscale gulper shark		20		20	(5/5)[1)]			x	x	x			x
164	Longnose velvet dogfish		20		20	(5/5)[1)]			x	x	x			x
168	Birdbeak dogfish		20		20	(5/5)[1)]			x	x	x			x
174	Portuguese dogfish		20		20	(5/5)[1)]			x	x	x			x
570	White ghost catshark		20		20	(5/5)[1)]			x	x	x			x
39	Rat fish		20		20	(5/5)[1)]			x					x
145	Smalleyed rabbitfish		20		20	(5/5)[1)]			x					x
167	Large-eyed rabbitfish		20		20	(5/5)[1)]			x					x
169	Longnose chimaera		20		20	(5/5)[1)]			x					x
175	Knifenose chimaera		20		20	(5/5)[1)]			x					x

[1)] No otolith sampling, however, in the program *Hafvog* the option "otolith sampling" used.

[2)] 1 female and 1 male sampled.

[3)] Spotted wolffish released after measuring.

[4)] Within stat. squares 318, 319, 320, 366, 422, 473, 523, 524: A minimum of 15 fish sampled for otolith and stomach contents.

[5)] Sex and maturity identification omitted in indiviuals < 25 cm

[6)] Disc width also measured

Otoliths are sampled from the following species: **cod, haddock, saithe, golden redfish, ling, blue ling, tusk, Atlantic wolffish, spotted wolffish, greater silver smelt, Atlantic halibut, Greenland halibut, plaice, lemon sole, witch, megrim, dab, long-rough dab, lumpsucker, deep-sea redfish and redfish >60 cm** (Table 1).

The first fish of each species is taken for otolith extraction and every n^{th} fish thereafter, e.g. every 10^{th} cod, every 5^{th} saithe, every 30^{th} haddock etc. (Table 1). It is necessary to estimate whether the minimum number will be obtained by collecting every n^{th} fish. For example, to fulfil the minimum for cod, 100 fish (10/0.1) are needed. If this does not appear to be the case, 10 fish need to be taken randomly aside for otolith sampling before finishing the length measurements. In cases where individuals of cod are 10 or less, all fish are taken for otolith extraction.

RANDOM SAMPLING of fish collected for otolith extraction is IMPORTANT!
Hafvog is programmed to send a sound signal for every n length measured fish, where n depends on the otolith sampling ratio. The fish is either taken for otolith extraction immediately or put aside for later inspection. Fish collected for otolith sampling are not measured for length until the otolith extraction takes place.

During otolith collection the following variables must be recorded: length, sex, and maturity stage. Furthermore, the following measurements are made (depending on species, see Table 1)

- Ungutted weight (g)
- Gutted weight (g)
- Liver weight (g)
- Gonads in mature fish (g)

Otolith should be extracted from all fish that have been taken aside for an otolith sample, also the smallest fish. However, for cod, haddock and Atlantic wolffish less than 15 cm, and redfish less than 10 cm that have been selected for otolith extraction, only ungutted weight needs to be recorded.

Maturity stages can vary widely between fish species. Identifying these stages accurately requires specific knowledge and experience.
***Descriptions and definitions** of maturity stages can be found in the manual "Greiningar á tegundum, kynþroska og fæðu." This information is also available on a tablet or laminated sheets.*
***It is crucial** that researchers and cruise leaders collaborate to discuss and resolve any uncertainties regarding maturity identifications.*


Nr. 9
Tegund 1
Staður TB1-2011-30
Dagsetn.
Lengd 64 sm
Kyn 1 Kynþr. 2
Aldur
Þyngd kg
Aths.

Otoliths from all species except greater silver smelt and Greenland halibut are put in paper envelopes. The following information are written on each envelope:

No. of fish – species – survey id and station – length – sex – maturity

Otoliths are kept at the bottom of the envelope, else they may be broken when the envelope is stamped at the laboratory.

For each station, envelopes from each species are kept together with a rubber band (many) or paper clips (few). Envelopes of all species per station are kept together using rubber bands, without damaging the envelopes.

The envelopes are kept in an open box or bag and stored in a dry place.

Tegund:		Bakki nr.:
Stöðvarnúmer	Fyrsta kvörn/hólf	Síðasta kvörn/hólf
	1	

Otoliths of greater silver smelt and Greenland halibut are stored in special plastic boxes. Boxes must be marked with survey id – species – stations.

Otoliths from each station are put in separate row/rows in the boxes. Otoliths from each station should be placed in a new row within the ray. Make sure that otoliths from same stations are all in the same box.

Otoliths of Greenland halibut should be covered with freshwater and kept in a freezer.

3.4.1 Otolith sampling – ***the whole catch measured for length***

The first fish of each species is taken for otolith extraction and every n^{th} fish thereafter, e.g. every 10^{th} cod, every 5^{th} saithe, every 30^{th} haddock etc. (Table 1). it is necessary to estimate whether the minimum number will be obtained by collecting every n^{th} fish. For example, to fulfil the minimum for cod, 100 fish (10/0.1) are needed. If this does not appear to be the case, 10 fish need to be taken randomly aside for otolith sampling before finishing the length measurements. In cases where individuals of cod are 10 or less, all fish are taken for otolith extraction.

Example I: *Saithe: The length interval turns out to be 50 cm, but there are a total of 60 fish in the catch and therefore all are measured for length (2 x length interval = 100 fish). Every 5^{th} fish is taken aside for otolith extraction (20%) 0.2 × 60 = 12 fish. However, the maximum is 10 fish and therefore 10 fish undergo otolith extraction, and the rest will be length measured.*

Example II: *Haddock: the length interval turns out to be 50 cm and therefore 2x length interval =100 fish should be measured. However, there are only 90 fish in the catch. Every 30^{th}h is taken aside for otolith extraction (3%) 0.03 × 90 = 3 fish. A minimum of five fish for otolith extraction is not met and therefore two are fish added i.e. taken into the program for otolith extraction instead of length measurement.*

3.4.2 Otolith sampling – ***part of the catch measured for length***

When the catch is large and not all the fish are measured for length, sampling for length and otoliths typically happens as is shown in the example below:

The following example of cod is a typical procedure when only a part of the catch can be measured:
1. The length interval of cod at one station appears to be 50 cm, and therefore the length measurement frequency is twice the length interval (see chapter 3.3.1.) or 2 x 50 = 100 fish.
2. Out of the total measured fish, 10% will have their otoliths removed for age determination. In this case 10 fish.
3. From the remaining fish after the initial sampling, another 10% will have their otoliths removed. If there are 200 fish remaining, 20 of them will be sampled.
4. After calculating the total number of fish sampled for otoliths, the final number is adjusted the maximum allowed for the station (15 cod). The extra 15 fish are simply counted but no otoliths sampled.

3.5 Stomach contents analysis

3.5.1 Predators and number of stomachs analysed

Stomach contents are analyzed from 35 species (see Table 1). For the following species, stomach content is analysed along with otolith extraction and other measurements: Cod, haddock, saithe, golden redfish, beaked redfish, redfish unid (> 60 cm, “giant redfish”), ling, blue ling, tusk, long rough dab and Greenland halibut. Additionally, stomach contents are analyzed from several deep-water species i.e. roundnose grenadier, rough head grenadier, roughnose grenadier black scabbard fish and numerous chondrichthyans i.e. blue skate, spinytail skate, round skate, Arctic skate, sailray, great lantern shark, black dogfish, Iceland catshark, mouse catshark, velvet belly, leafscale gulper shark, longnose velvet dogfish, birdbeak dogfish, Portuguese dogfish, white ghost catshark, ratfish, smalleyed rabbitfish, large-eyed rabbitfish, longnose chimaera and knifenose chimaera.

3.5.2 Methods and registration in *Hafvog*

Preferably the stomach content should be analysed concurrently with the otolith sampling and registered directly in *Hafvog/ SeaScale*.

Following biological measurements of the fish, the program asks for the “condition of the stomach” - categorised into five groups:

1. Containing prey

2. Empty

3. Regurgitated

4. Undigested remains

5. Everted

If condition of the stomach is graded 2 or 5 and has been registered as such, the data collection of that individual is finished, and the program asks for the length of the next fish in the otolith sampling.

If condition of the stomach is graded 1, 3 or 4 the prey items are analysed. That follows directly after the entry of the stomach condition. Only use stomach condition = 3 when it is clear that a part of the stomach content has been lost.

1. Condition of the stomach is entered (1,3 or 4) and then press the ENT-key.

2. The prey group is chosen by prey id number (see list of prey groups) and then confirmed with the ENT-key. If the prey is measured for length it is done at this step.

3. If the prey is to be length measured select F5 when the prey has been selected and the program will enter into length measurement of the selected prey. When the length measurement (in mm) is finished, F8 is used to get back to the previous step.

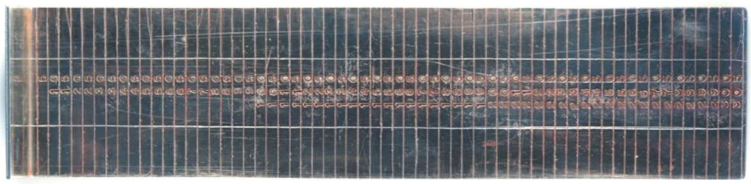
4. Total number of the particular prey (both measured and unmeasured) is registered and confirmed with the ENT-button.

5. The particular prey group is put on the scale and total weight is confirmed by the ENT-button. The program now asks for the next prey.

6. When all prey items have been analysed, F8 is used to go to the next fish in the otolith extraction

During analysis of stomach content, the following methods are applied:

- All prey items that obviously have been eaten in the trawl must be rejected, for example prey that is still alive. Fresh prey (but dead) could have been eaten just before the predator was caught by the trawl and must be accepted as valid.
- Fish prey should be identified to species level if possible, or else as far in the classification system as possible considering the conditions at hand. For each group of prey, the total number must be counted or estimated, and the group weighed.
- Intact prey fish that have been identified to species, are measured for length in steps of 5-mm using a specified measurement board.



- It is important to measure length and identify sex of capelin that has not lost any length due to digestion. If sex cannot be identified F7 is used to omit those registrations.

  O It is important to measure capelin although only one or a few are found in the stomach sample.
  O A maximum of 30 capelin from stomachs are measured at each station.

EXAMPLE: Work arrangement when measuring length of capelin from stomachs: Select F5 after the prey group capelin has been selected - and the program enters measurements of prey. When all measurable capelins have been measured (in mm), use F8 to get one step back into the prey group. Total number of capelin (number measured and not measured) is registered and accepted by ENT-button. All capelins are put on the scale and total weight accepted. When analysis of stomach content is finished, F8 is used to enter the next predator fish.

- The shrimp species *Pandalus borealis*, *Pandalus montagui* and *Hymenodora glacialis* are identified to the species level when possible.
- Other invertebrates shall be identified in accordance to the classification system. See identification sheets and the list on the following page
- Identify and record mysida (#271), especially the species *Gnathophausia zoea* (#492).

- The list of prey groups is based on species or group identity number in the MFRI database

- **Plastic materials in stomachs are registered in *Hafvog* under species no. 998.**

Stomach content analysis can be postponed or made on a different weighing scale aside otolith collection. If this road is chosen, it is important that the connection between the individual fish in the otolith sample and the stomach sample is not lost. The connection is first of all the station ID number, then species, and at last the individual otolith ID number, which is a running number for each species at each station.

If analysis of the stomach content is postponed, it must be labelled with the above information to ensure registration to the corresponding individual fish. In this case, the F8-button is used after the condition of stomach has been registered during otolith removal and weighing process, by which the program asks for the length of the next fish. This applies if stomach condition has been registered as “1 Containing prey”, 3 Regurgitated or “5 Undigested remains”, but for other conditions the data sampling is now finished.

Starting the stomach contents analysis, the proper station is opened in the *Hafvog* program and “*20 Fæðugreining*” chosen from the main menu. The fish species and the individual number of the fish (otolith number) are chosen, and the analysis of stomach content continued as described above.

Table 2 Species identity number (ID) of most common prey groups.

Group	ID	Ísl. heit	Lat. heiti
	29	Flatfish	Heterosomata
Fish	1250	Silver smelts unid	Argentinidae
Groups	75	Lanternfish	Myctophidae
	84	Blennies	Lumpenix
	85	Eelpouts	*Lycodes* sp.
	184	Redfish	*Sebastes* sp.
	300	Gadoids	Gadidae
	301	Fish unidentified	Pisces
	301	Sandeel	Ammodytidae
	1	Cod	*Gadus morhua*
Fish	2	Haddock	*Melanogrammus aeglefinus*
Species	5	Golden redfish	*Sebastes norvegicus*
	9	Atlantic wolffish	*Anarhichas lupus*
	19	Greater silver smelt	*Argentina silus*
	28	Long rough dab	*Hippoglossoides platessoides*
	30	Herring	*Clupea harengus*
	31	Capelin	*Mallotus villosus*
	33	Norway pout	*Trisopterus esmarkii*
	34	Blue whiting	*Micromesistius poutassou*
	53	Moustache sculpin	*Triglops murray*
	56	Atlantic poacher	*Leptagonus decagonus*
	57	Fourbeard rockling	*Enchelyopus cimbrius*
	60	Norway haddock	*Sebastes viviparus*
	65	Spotted snake blenny	*Leptoclinus maculatus*
	74	Atlantic hookear sculpin	*Artediellus atlanticus*
	88	Arctic rockling	*Onogadus argentatus*
	94	Snake blenny	*Lumpenus lampretaeformis*
	136	Goiter blacksmelt	*Bathylagus euryops*
	40	Norway lobster	*Nephrops norvegicus*
Crustaceans	41	Northern shrimp	*Pandalus borealis*
	51	Pink shrimp	*Pandalus montagui*
	52	Northern ambereye	*Hymenodora glacialis*
	182	Hermit crabs	Pagurus
	186	Krill	Euphausiacea
	190	Copepods	Copepoda
	271	Mysids	Mysida
	303	Shrimps unidentified	Natantia
	304	Arctic lyre crab	*Hyas coarctatus*
	305	Decapods	Decapoda
	306	Gammarids	Gammaridea
	307	Hyperiids	Hyperiidae
	308	Crustaceans	Crustacea
	403	Galatheid crabs	*Mundia* sp.
	492	Gnathophausia	*Gnathophausia zoea*
	160	Cephalopods	Cephalopoda
Lindýr	191	Sea urchins	Echinoidea
Skrápdýr	193	Arrow worms	Chaetognatha
Annað	199	Sea cucumbers	Holothurioidea
	309	Bivalves	Bivalvia
	310	Gastropods	Gastropoda
	311	Benthos unidentifed	Benthos unid.
	312	Brittle stars	Ophiuroidea
	313	Comb jellies	Ctenophora
	314	Polychaetes	Polychaeta
	445	Pycnogonids	Pycnogonidae
	490	Stones	
	998	Plastics	Plast
	999	Unidentifiable	Unid.

3.6 Registering marine litter

3.6.1 Method

Plastic material and other litter that enters the trawl, are registered as number and weight (g) in *Hafvog* under “40 Draslskráning“.

First, determine in which of the 3 categories the piece of litter falls:

1 Fishing gear

2 Fishing industry (other than fishing gear)

3 Litter (not necessarily originating from fishing industry)

For example, trawl string pieces and trawl net are registered under 1 Fishing gear, but plastic and aluminum bottles under 3 Litter.

Under each category there are several sub-categories that allow for detailed classification. Only if the litter does not fall under any of the given sub-categories, use the appropriate “other” subcategory (99). When using any (99) – “other” category, note in the yellow notebook what kind of waste it was and the weight.

If the marine debris is clearly man-made but cannot be identified, use Litter (3) – Unidentifiable (98).

Do not register litter that originates from the ongoing research cruise. Those will usually be new cuttings of string and netting from mending of the trawl, or broken floats.

All litter, also litter that the crew picks from the trawl on the upper deck, shall be registered. It is important that the crew is aware of this and alert researcher if large items are found that are too heavy or bulky to be brought downstairs. These items shall all be classified, weight estimated (g) and entered in the Hafvog.

Table 3 Litter ID numbers. Litter registration – 40

ID -Group	ID	ID-Subgroup	Description
1 Fishing gear	1	pieces of string	<10 mm diameter
	2	pieces of twine/cord	>10 mm diameter
	3	nets from trawl gear	pieces of nets from trawl gears
	4	nets from gillnets	pieces of nets from various types of
	5	Longlines	Lines and hooks
	6	Handlines	monofilaments and hooks
	7	Floating balls	Whole or pieces
	8	Rubber bobbins	
	9	Steel bobbins	
	10	Wire/chains/locks	
	99	Other items from fishing gear	
2 Fishing industry	1	Clothing	Protective clothes,mittens, gloves, rubber boots
	2	Fish containers	Whole or pieces
	3	Packaging	All packaging from fishing industry
	4	Labels and tags	
	5	Unidentified fishing industry	as an example a part of conveyor belt
	99	Unidentified	
3 General litter	1	Plastic bottles	
	2	Plastic cans	
	3	Plastic bags	
	4	Plastics -films	
	5	Metall Aluminium cans	
	6	Glass - glass bottles	
	7	Clothing	Other than protective gear (fishing industry)
	10	Sanitary products unidentified	
	11	Sanitary- Napkins/tampons	
	12	Sanitary- Dipers	
	13	Sanitary - Wet wipes	
	20	Plasics - Unidentifiable	
	30	Metall -Unidentifiable	
	40	Wood- Unidentifiable	
	50	Paper/cartoons	
	60	Glass- Unidentifiable	
	70	Rubber- Unidentifiable	
	71	Rubber- Tires	
	98	Unidentifiables	
	99	Everything else	Not categorized above

3.7 Additional collection of fish or other biota

3.7.1 Collection of rare fish species or uncertain identifications

Some species may be difficult to identify and sometimes cause confusion. When in doubt freeze a sample and bring to the laboratory. Make sure that labelling is correct i.e. survey name and station number. Please note if the fish has already been entered into the *Hafvog* database (if so under wich species ID) or not. As mentioned earlier, the book „Íslenskir fiskar“ (authors Gunnar Jónsson og Jónbjörn Pálsson) is the primary reference for identification. All material can be found on the tablet. Researchers are encouraged to use the tablet for photos of peculiarities. Please remember to include a label with survey name and station number.

3.7.2 Collections of fish and other biota for exhibitions and/or educational purposes

Annually, MFRI organizes fish exhibitions for the public. Due to limited freezer space on the hired trawlers this will be mainly collected on R/V Árni Friðriksson. All main species should be collected and frozen according to a specific list. Collections for schools are also organized by request.

3.7.3 Monitoring undesirable substances in commercial fish

Sampling for MATÍS. The purpose of the project is to gather information and evaluate the status of Icelandic seafood products in terms of undesirable substances. Substances measured include heavy metals, dioxins and dioxin like PCB, marker PCBs, brominated flame retardants (PBDE), polyaromatic hydrocarbons (PAH) and pesticides. Below are instructions on how samples shall be collected.

The substances are found in low concentrations in the flesh, and it is important to avoid any external contamination. Take care that the fish do not come into contact with any source of contamination. Check carefully if there are any signs of contamination from hydraulic fluids.

1. Fish is bled when applicable, gutting not needed.

2. Each fish put separately in a plastic bag.

3. A label containing the following information is put in a small plastic envelope and placed in the plastic bag with the fish.

Species – cruise id – station number – size class – number of fish

4. Each sample (usually 10 fish) is put in a separate box and carefully labelled. Note that if all 10 fish are not collected from the same station, it is important that all fish are caught in the same area/fishing ground. Each individual fish is labelled with station number.

5. Finally, the whole sample is frozen.

Table 4. Overview over collection for undesirable substances in commercial fish.

Species	Area	Vessel	Number	Length interval (cm)
Greenland halibut	V	Árni	10	Even distribution
Greenland halibut	N	Breki	10	Even distribution
Greenland halibut	A	Breki	10	Even distribution

3.7.4 Other additional collections

3.7.4.1 Sampling of benthos on Árni

Sampling will be done by a special team. More details in the Icelandic version of the manual

3.7.4.2 Sampling of unidentified fish prey in cod stomachs

In diet analyses, it is recommended that fish found in stomachs are identified to species level if possible, otherwise as precisely as possible given the available knowledge, the degree of digestion of the prey, and the circumstances.
In the surveys (SMB and SMH), a large proportion is assigned to the category *unidentified fish* (302 Pisces). In the March survey 2025, an attempt was made to collect unidentified fish prey for closer examination on land. It turned out that the majority of these fish could be

identified to species or genus with more careful study and the use of magnification.
In SMH 2025, it is recommended that diet analyses be carried out in the same way as before, with emphasis placed on identifying fish prey to species, genus, or family.

A sample should be taken from the diet of cod for closer examination on land, as follows:

If it is necessary to assign fish prey to the category 302 Pisces:

- At each station, freeze unidentified fish from one stomach.
- Enter into Hafvog in the usual way as 302 Pisces, with number and weight.
- Place the unidentified fish in a bag and label it with cruise, station, predator, and grinder number.
- For example: TTH1-2025-25, Cod no. 2
- Collect all samples together in a separate bag and label: Cruise, Unidentified fish in diet.

These samples will then be examined in more detail on land. The aim is to assess which cod prey most often ends up under the species code 302.

3.7.4.3 Genetic sampling for blue ling

Two genetic samples and otoliths should be collected from blue ling captured outside the regular sampling to a maximum of 48 (96 tubes in total). Half the samples (appr. 24) should be taken during the western part of the country, and the other half during the second half around the Iceland–Faroe Ridge.

The fish is sampled for otoliths as normal. Additionally, it is important to press **F4** at some point during the otolith process to inform that a genetic sample has been collected.

It is crucial for transport of the data to use the 'F4' to „flag" the genetic sampling

Instructions:

- During otolith sampling, remember to press F4
- Use the LVL "hook" to collect a tissue sample from a muscle.
- Two samples should be collected per individual.
- Make sure to tighten the lid on the tubes.
- Place a sticker on each tube.
- Write station nr, species nr, fish nr (if more than one per station) and tube number on the form that comes with it.
- Place the tubes in the freezer.

3.7.4.4 Genetic sampling for greenland halibut

A genetic sample should be collected from Greenland Halibut as part of regular sampling, up to a maximum of 100 individuals. Half the samples (50) should be taken during surveys in the western part of the country, and the other half (50) during surveys in the northern part of the country. From the first three female and first three males that measure at or above 50cm in length in each region, an additional sample from the gonad should be taken (so an additional 6 samples from the West, and an additional 6 samples from the North).

The fish is sampled the same way as during otolith sampling. Length, weight and cleaned weight, sex, weight of gonads, sexual development stage, should all be recorded. Additionally, it is important to press F4 at some point during the otolith process to inform that a genetic sample has been collected.

It is crucial for transport of the data to use the 'F4' to „flag" the genetic sampling

Instructions

- During sampling, remember to press F4
- Use the LVL "hook" to collect a tissue sample from a muscle.
- Make sure to tighten the lid on the tubes.
- Write station nr, species nr, fish nr, and tube number on the stickers that comes with it.
- Place a sticker on each tube.
- Place the tubes in the freezer.

Additional sample for fish over 50cm:

- Same as above but tissue is sampled from gonad.
- Draw a star on the sticker
- Place the tubes in the freezer.

3.7.4.5 Parasites in Chondrichtyans

RANNÍS (The Icelandic Centre for research) supports a project led by specialists from Keldur (Institute of experimental pathology) and University of Iceland that investigates parasites and their distribution and development in chondrichthyans. A special team will be guests onboard Árni for this collection.

3.7.4.6 Student project in collaboration with University of Iceland

A master's student will participate in the cruise onboard on R/V Árni Friðriksson. His project concerns biology of deep-sea catsharks.

4 Stations

4.1 Station information

Information on the tow and environmental factors are to be registered by the captain and the first officer in the upper part of the paper ”Station sheet”, in co-operation with the cruise leader. All remarks and comments regarding the station are written on the “Station sheet“ and later entered in a specific “comments” field in the *Hafvog* program. Comments on the data sampling, e.g. if corrections are yet to be made or if some extra sampling has been carried out, are entered in the comments field in *Hafvog*.

In each tow, total catch is estimated in kg, e.g. 50, 100, 250, 500, 1000, 2000, 3000 kg. This is best done either on-deck or in the fish reception but onboard r/v Árni Friðriksson all catches are weighed in a weighing trough before sorting. The estimated total catch of the station is recorded in the notebook and the cruise leader then records it on the station sheet and in *Hafvog* in the field Afli (kg). It must be noted if a large part of the catch is something that is not recorded e.g. benthic invertebrates or gravel from the bottom.

The cruise leader compares the estimated total catch with the calculated catch in *Hafvog*. Calculated catch is based on the number of fish by length and length-weight relationships. This comparison is part of the "Quality control by cruise leaders" (see Appendix).

Leið. eink.	Ár	Stöð	Sk. Skr.nr.	Vindátt	Lofthiti°	Síriti
TB1	2015	25	1278	05	2	
Dags. / mán.				Vindhraði	Botnhiti°	Sonda
10/3				10	2,3	
Reitur	Smár.		Tog. nr.	Sjór	Yfirborðshiti°	DST
666	1		1	4	2,5	C6427
	Skiki		Fjarðarreitur	Veður	Hiti á togdýpi°	
				1		
Veiðarfæri nr.	Möskvastærð		Grnd. lengd fm.	Ský	Sjóndýpi (m)	
73	40		35	5		
Kennitala veiðaf.			Heildarafli	Loftvog	Ís	
12			700	998		
Kastað	N. br.	V. le.		Hift	N. br.	V. le.
	66°45'73	16°47'30			66°49'71	16°45'85
	Kl.	Togstefna°			Kl.	Vír úti (fm)
	12:45	5			13:48	200
	Botndýpi (m)	Togdýpi (m)			Botndýpi (m)	Togdýpi (m)
	110				126	
	Lóðrétt opnun (m)	Hlerabil (m.)			Toglengd (sjm)	Togtími (mín) / Toghraði (sjm)
	2,4	85			4	63 / 3,8

Figure 3. Upper part of a station sheet and an example of the captain’s registration.

4.2 Tow information

A paper “station sheet” must be filled for each tow (station). Information that must be registered include cruise ID (e.g. TTH1 for trawler Þórunn Sveinsdóttir, the first cruise in the given year), year, station i.e. a running number starting with 1, vessel registry no. of the given vessel and date. Furthermore, number of the statistical square within which the tow is located, the number of the sub-square, and tow number, which is a fixed number for the tow, must be filled out (see Station list and station maps). Note that the sub-square for each tow has been fixed and is registered according to the

Station list. The ID number of the gear type (77 for fishing gear used on the shelf, 78 for fishing gear used on deepwater i.e. shelf break/slope), mesh size (40 mm), sweeps length (35 fm for shelf gear, 36 fm for the deepwater) and the gear ID are also entered.

The geographical location of the stations is registered as latitudinal and longitudinal coordinates (in degrees, minutes and seconds converted to decimals according to GPS calculations, depth in meters and time in hours and minutes (clock, four number digits) at the beginning and end of each trawl haul. The tow starts when the trawl touches the bottom and ends when the hauling of the trawl starts. Trawling direction in degrees is registered, as well as warp length used. Trawling speed and trawling distance are calculated with GPS. Vertical and horizontal opening of the trawl is registered in meters (mean values for the whole haul).

If it is not possible to finish a full tow, e.g. because of snagging of the trawl or other malfunction, it is necessary to register the reasons and the location of the snag.

4.3 Environmental information

Information on weather condition and other environmental factors is registered as follows:

Wind speed is registered in m/s. If an anemometer is onboard, it is necessary to observe it for a few minutes as wind speed or direction is not stable but fluctuates around some mean value. If an anemometer is not onboard, wind speed is estimated by Table 5. Direction of wind is estimated and registered according to descriptions in Table 6, weather, clouds, and sea state according to Table 7 and Sea ice according to Table 8.

Table 5. Wind speed. Definition and numbers used for registration.

Windspeed (m/s)	Description	Sea condition		Likely wave height (m)	Likely unit for sea
0 - 0,2	Calm	Calm mirrorlike sea			0
0,3 - 1,5	Light air	Riplls without crests.		0.1	1
1,6 - 3,3	Light breeze	Small wavelets. Crests of glassy appearance, not breaking.		0.2	2
3,4 – 5,4	Gentle breeze	Large wavelets. Crests begin to break; scattered whitecaps.		0.6	3
5,5 – 7,9	Moderate breeze	Small waves - becoming longer; fairly frequent white horses.		1	3
8,0 – 10,7	Fresh breeze	Moderate waves, taking a more pronounced long form; many white horses are formed - a chance of some spray.		2	4
10,8 – 13,8	Strong breeze	Large waves begin to form; the white foam crests are more extensive with probably some spray.		3	5
13,9 – 17,1	Near gale	Sea heaps up and white foam from breaking waves begins to be blown in streaks along direction of wind.		4	5-6
17,2 – 20,7	Gale	Moderately high waves of greater length; edges of crests begin to break into spindrift; foam is blown in well-marked streaks along the direction of the wind.		5.5	6
20,8 – 24,4	Strong gale	High waves; dense streaks of foam; crests of waves begin to topple, tumble and roll over; spray may affect visibility.		7	7

24,5 – 28,4	Storm	Very high waves with long overhanging crests; the resulting foam in great patches is blown in dense white streaks; the surface of the sea takes on a white appearance; the tumbling of the sea becomes heavy with visibility affected.		9	7-8
28,5 – 32,6	Violent storm	Exceptionally high waves; small and medium sized ships occasionally lost from view behind waves; the sea is completely covered with long white patches of foam; the edges of wave crests are blown into froth.		11.5	8
≥32,6	Hurricane force	Huge waves. The air is filled with foam and spray. Sea completely white with driving spray; visibility seriously affected.		14	8

Table 6. Wind direction. Numbers used for registration.

Calm	00	**SE**	14	**W**	27
NNE	02	**SSE**	16	**WNW**	29
NE	05	**S**	18	**NW**	32
ENE	07	**SSW**	20	**NNW**	34
E	09	**SW**	23	**N**	36
ESE	11	**WSW**	25	**Undef.**	99

Table 7. Weather, clouds, and sea state. Definition and numbers used for registration.

3. Weather	**4. Clouds**	**5. Sea state**	**Wave hieight (M)**
0 No clouds, clear	0 Clear skies	0 Calm (mirror)	0
1 Cloudy	1 1/8 or less but no 0	1 Calm (rippled)	0-0.1
2 Overcast	2 2/8	2 Smooth (wavelets)	0.1-0.5
3 Sandwind, soilwind	3 3/8	3 Slight	0.5-1.25
4 Fog or mist	4 4/8	4 Moderate	1.25-2.5
5 Drizzle	5 5/8	5 Rough	2.5-4
6 Rain	6 6/8	6 Very rough	4-6
7 Snow or sleet	7 7/8 or more but not 8/8	7 High	6-9
8 Skúrir	8 8/8	8 Very high	9-14
9 Not registered	9 Not registered	9 Not registered	

Table 8. Sea ice. Definition and number used for registration.

0	No ice
1	Ice is close, directly visible or in radar, but the type is unknown
2	Few icebergs (10 or less)
3	Many icebergs (more than 10)
4	Very thin or thin cover of drift ice, 6/10 or less in density, in more than 1 nautical miles from station
5	Dense cover of drift ice, more than 6/10 in density, in more than 1 nautical miles from station

6	Very thin or thin cover of drift ice, 6/10 or less in density, in less than 1 nautical miles from station
7	Dense cover of drift ice, more than 6/10 in density, in less than 1 nautical miles from station
8	Station within a dense drift ice etc.
9	No visibility

Other environmental parameters should be registered as described below:

1. **Air temperature** is measured in °C.

2. **Surface temperature** is measured í °C and registered according to a pre-calibrated thermometer in the bridge (See Appendix). Surface temperature is recorded with a 0.1 °C resolution.

3. **Bottom temperature** is measured in °C with *Scanmar/Marport* trawl sensor or a similar instrument. The trawl sensor must be calibrated according to Appendix 1. Bottom temperature is also measured with Starmon TD temperature recorders from Star-Oddi, placed on the upper belly of the trawl.

When switching between trawls, e.g. when one trawl is damaged, the Starmon TD recorder needs to be swapped to the trawl to be used.

4. **Air pressure**. Air pressure is recorded at each station.

5 Tow stations

5.1 Fishing methods

Positions, directions, speed and length of tows: Positions of tows are according to the station list and towing trajectories from previous surveys. The towing direction is the one given in the station list or the opposite direction. The towing speed is 3.8 knots over the bottom. The trawling distance is 3.0 nautical miles, from when the trawl has set on the bottom until the hauling begins. However, several tows are shorter than 3.0 nm.

Warp length: The length of the towing warp of each tow is not fixed but should be similar to earlier years. The length of the towing warp may also be decided in relation to position and status of the trawl according to measurements from trawl sensors.

Invalid tows, snags, net damage, malfunctions etc.:

- A tow is invalid and needs to be repeated if;
  - o there is a hang up or net damage before a towing distance of 2 nm is reached or
  - o something is wrong in relation to the trawl, such as if the codend is stuck to the headline, the wings are damaged, or something is wrong with the otter boards or
  - o the codend has a hole
- If parts of the headline, the footrope or the sweeps are broken, the tow is only valid if the tow has reached at least 2 nm, and the trawl is hauled immediately and snagging is believed to be the cause of the breakdown.
- If the net in the upper or lower belly, wings and the square have holes or are ragged, the tow is only valid if it is believed to have had no effect on the sampling efficiency of the trawl and the tow length is at least 2 nm.

In cases where the tow needs to be terminated due to potentially very high catches, e.g. of golden redfish, it is necessary to sail over the remainder of the tow. Write a note on station sheet whether the echosounder indicates a similar or different number of fish compared to the first part. On research vessels data from the echosounder need to be saved.

Number of repetitions: When invalid tows are repeated, a towing distance of 2 nm is sufficient. If a repeated tow is also invalid, the cruise leader must decide whether a third attempt shall be made, e.g. by shifting the tow track or changing the tow direction. No data sampling takes place on invalid tows and they do not receive a station number.

Weather: Trawling is stopped when wind force exceeds 18 m/s or with corresponding sea condition.

Following issues are important during towing and documentation of information on each station:

- Towing direction is not fixed; captains decide from which end each tow starts.
- The execution of trawling needs to be according to locations given in list of stations and other guidelines.
- If a stationary fishing gear, such as longline or gillnets, are within the towing direction of a given station, the tow shall be relocated by a maximum of 2 nautical miles from the standard tow, but only if depth and bottom type is similar to the standard tow. Otherwise, the tow is omitted.
- Sub-square within each statistical square is as given in the station list.
- All deviations from the standard tow need to be documented on the station sheet.

5.2 Malfunctions of equipment

It is not self-evident to resume sampling if important research equipment, such as temperature sensors or weighing scales, break down during the survey. On such occasions the possibility must be considered to sail to the next harbor and get the equipment repaired. If this solution is not applicable, the cruise leader must consult the coordinator of the project for the next steps.

5.3 Number of stations

The total number of stations in IAGS 2025 is 372. The research area is divided into two parts: Shelf area and the deep-water area (shelf break). Two vessels will sample the deep-water area and one vessel the shelf area (Table 9).

Table 9. Number of stations and division of area and stations between vessels.

Area	Vessel	Cruise ID	Number of stations
Shelf area	Þórunn Sveinsdóttir VE	TTH2-2025	179
Deep-water	Árni Friðriksson	A13-2025	38
Deep-water	Breki VE	TB2-2025	155
Total number			372

5.4 Station list

Locations, depths mean warp length and mean horizontal and vertical opening of the trawl are listed in chapter 5.4.1 for the shelf area and 5.4.2 for the deep- water area. Maps are shown in chapter 5.5. Issues with tows are listed in chapter 5.6 (shelf area in 5.6.1, and deep-water area in 5.6.2).

Please note that sub squares are defined in the station list, but not always according to the sub square in the beginning of the tow.

CRUISE LEADERS! All notes and comments on tows must be delivered to the coordinator of the project after the survey. See Chapter “Remarks and notes on tows”.

Remember to document all comments on to the station sheet in *Hafvog*.

Plotting and preserving trajectories of the tows. The actual tows must be plotted and saved by captains. Cruise leaders take a copy of the plots at the end of the survey and deliver them to the project coordinator.

5.4.1 Tow stations – shelf area

Remarks (issues with tow stations) are found in 5.6.1.

Stat sq.	Tow-no.	Sub-sq.	Pos.Begin N	Pos.begin W	Pos. end N	Pos.end W	Depth begin (m)	Depth end (m)	Wrp (fm)	Tow length (nm)	Vert. open.* (m)	Horiz. open* (m)	Remark
316	11	2	632504	161854	632503	161174	130	145	210	3	5.0	75.4	
317	1	2	631488	173056	631583	172410	180	177	290	3	4.9	79.4	
318	1	1	632078	185100	632190	184468	61	79	100	3	5.3	63.0	
319	1	2	632164	192630	632016	192036	105	119	170	3	5.1	71.4	
319	11	2	632026	190946	632105	191604	96	93	130	3	5.1	65.8	ath
320	2	2	631622	200909	631899	200659	136	136	200	3	4.9	76.0	ath
320	11	3	631538	210175	631453	205537	155	157	225	3	4.8	76.2	ath
321	3	2	632222	211018	631924	211022	131	153	230	3	4.6	78.4	
321	4	2	632666	212664	632381	212837	127	142	210	3	4.9	74.0	
322	2	2	632910	220890	632898	221569	206	239	300	3	4.6	82.2	
322	11	4	630426	221759	630555	221153	369	333	450	3	4.9	83.8	ath
323	2	2	632048	230818	632354	230804	269	231	310	3	5.0	80.8	ath
323	12	1	631370	240450	631530	235890	237	239	360	3	4.9	82.4	
324	2	4	630230	242150	630090	242750	390	422	535	3	4.9	87.0	
324	12	3	630872	245084	630951	245722	297	309	335	3	4.9	84.2	ath
325	11	1	632279	254391	632481	254900	360	356	450	3	4.8	86.8	ath
363	11	1	635488	134467	635655	133891	177	238	300	3	5.0	81.4	
364	2	3	634435	144325	634166	144014	180	170	230	3	4.9	80.0	ath
365	1	4	633400	151815	633403	151132	108	150	210	3	4.9	76.6	ath
365	11	4	633980	150781	633996	151456	111	107	180	3	5.1	71.8	ath
366	1	2	634470	162226	634767	162393	87	64	115	3	5.2	66.6	
366	2	1	634571	163242	634455	162630	73	80	113	3	5.2	65.6	
367	11	4	633022	171630	633208	171097	108	165	200	3	5.0	76.4	ath
371	31	4	634150	213195	634161	212513	106	89	140	3	4.9	67.6	
372	2	1	635340	225520	635645	225512	103	93	160	3	5.1	68.0	
372	12	4	634485	222076	634483	221390	106	109	115	3	5.0	71.0	ath
373	3	2	635900	231760	635890	232466	116	124	195	3	5.0	75.0	ath
373	12	1	634800	233780	635003	234267	148	150	255	3	5.1	74.4	
374	2	2	635030	241800	635297	241468	270	268	400	3	5.0	81.6	ath
374	3	2	635440	241496	635713	241155	312	312	410	3	5.0	84.4	ath
375	1	2	635890	251350	635605	251590	225	235	280	3	5.0	83.2	
375	11	1	635119	253760	635020	254400	222	220	270	3	5.0	80.0	ath
376	1	2	635370	262130	635240	262750	260	306	360	3	4.8	82.4	ath
412	3	3	640898	125330	641107	124828	338	357	450	3	5.0	85.8	ath
413	2	4	640132	132089	640138	131419	252	385	370	3	5.0	81.8	ath
413	15	1	641968	134629	641675	134773	150	131	220	3	5.0	74.0	
414	1	4	641000	142192	641086	142796	156	167	210	3	5.0	76.6	
414	36	2	641671	141488	641868	141488	103	98	135	2	5.0	73.8	ath
422	11	1	642336	224861	642629	224689	83	81	140	3	5.3	66.2	

Stat sq.	Tow-no.	Sub-sq.	Pos.Begin N	Pos.begin W	Pos. end N	Pos.end W	Depth begin (m)	Depth end (m)	Wrp (fm)	Tow length (nm)	Vert. open.* (m)	Horiz. open* (m)	Remark
422	32	4	641120	220990	640980	221610	36	24	70	3	5.4	54.2	
423	3	2	642750	231040	642690	230370	137	121	225	3	4.9	71.4	
423	12	3	640984	234193	641264	233928	120	109	150	3	5.3	72.6	ath
424	3	3	640772	243928	640639	244450	224	209	300	3	5.1	79.8	ath
424	13	3	641450	243060	641340	243670	213	195	275	3	5.1	79.8	ath
425	11	4	641500	251470	641210	251670	252	255	370	3	5.0	84.0	
425	12	3	640100	252940	635996	253590	182	207	250	3	4.9	80.8	ath
426	1	3	640020	264200	640300	264470	414	408	470	3	4.9	88.8	ath
426	11	2	642550	261300	642770	261660	280	273	360	3	4.8	83.4	ath
461	1	1	645103	113892	644832	114216	316	259	400	3	4.9	85.6	
462	2	4	643343	122237	643203	121607	199	192	280	3	4.9	81.8	ath
462	7	3	643988	122992	644289	122985	145	148	220	3	5.0	78.8	ath
463	1	4	643195	130782	643274	130107	125	128	180	3	5.0	74.4	
463	32	1	645475	135663	645416	134968	86	96	115	3	5.4	62.0	ath
463	35	1	645881	134810	650003	135174	143	154	200	2	5.0	72.4	ath
472	11	3	643790	224620	643510	224900	51	63	115	3	5.3	62.4	
473	2	1	645878	235575	650038	234960	214	217	270	3	5.0	77.6	ath
474	4	4	644000	241320	644300	241590	105	146	260	3	5.1	74.2	ath
474	11	3	643580	243970	643700	243310	266	275	425	3	4.9	82.2	
475	1	3	644060	255550	644170	254910	229	220	270	3	4.9	81.8	
475	3	1	645610	253970	645560	253260	173	160	270	3	4.9	78.8	
476	1	2	644590	262710	644856	262895	198	195	300	3	5.0	81.8	ath
476	12	1	645740	264540	645860	263880	207	190	270	3	4.9	81.4	ath
511	11	1	651766	115732	651616	115095	216	197	325	3	5.0	81.8	ath
512	14	4	650393	122080	650476	121387	208	189	270	3	5.0	82.4	
513	2	4	650396	130273	650730	130314	156	145	200	3	4.9	76.0	ath
513	11	2	652054	130809	652077	131529	203	180	280	3	5.0	79.0	ath
513	35	3	651179	134580	651204	134112	88	93	130	2	5.4	64.2	ath
521	35	2	652344	210869	652571	210833	50	72	95	2	5.5	59.8	
521	36	2	652438	210011	652635	210125	66	72	95	2	5.5	59.0	
523	11	3	651046	234789	650780	235122	62	107	95	3	5.2	64.6	ath
523	31	4	651384	231100	651218	231686	101	146	125	3	5.1	69.6	ath
523	35	1	651410	233786	651517	233068	48	56	95	3	5.4	61.8	
523	36	1	652065	233023	651929	233526	52	62	95	3	5.2	61.2	ath
524	11	3	651451	245090	651148	245214	90	102	150	3	5.0	70.6	ath
524	12	3	650974	250135	650678	250005	116	119	200	3	5.0	73.4	ath
524	35	2	651608	242250	651876	241986	90	140	125		5.1	67.2	
525	11	1	651937	254924	651762	255512	131	137	210	3	5.0	77.4	
525	13	3	651475	255289	651306	255886	137	147	220	3	4.9	76.6	
526	3	2	652564	262598	652262	262617	155	152	240	3	5.0	77.8	
526	11	4	650963	262483	650874	263167	156	161	265	3	5.0	79.0	
527	1	2	652498	265994	652198	270028	277	258	315	3	5.0	84.0	ath
561	1	3	653600	113604	653859	113210	260	285	345	3	5.0	84.8	
562	1	2	654752	115666	654947	120233	194	178	240	3	5.0	80.6	
562	3	1	654900	122951	654838	123669	138	141	220	3	4.9	78.0	ath
563	2	4	653652	132362	653745	133060	104	122	170	3	5.1	74.4	
563	11	4	653721	130258	653943	130744	183	202	240	3	5.0	79.0	
564	1	2	654988	140635	655080	141449	124	147	195	3	5.1	76.0	ath
564	35	3	654676	143800	654751	143352	108	102	125	2	5.2	68.6	
569	11	1	655979	194951	655686	194749	112	88	160	3	5.1	70.0	
569	33	1	655750	193370	655484	193000	107	99	165	3	5.1	66.6	

Stat sq.	Tow-no.	Sub-sq.	Pos.Begin N	Pos.begin W	Pos. end N	Pos.end W	Depth begin (m)	Depth end (m)	Wrp (fm)	Tow length (nm)	Vert. open.* (m)	Horiz. open* (m)	Remark
570	2	1	655899	203610	655621	203338	145	128	215	3	5.1	70.8	
570	33	1	654770	203043	655070	202720	102	110	185	3	5.2	67.8	
571	1	2	655457	210686	655660	210117	230	220	285	3	4.8	77.5	ath
571	33	4	653880	210290	653590	210440	130	135	185	3	5.2	71.0	ath
571	34	4	653950	212280	654040	212000	150	145	190	3	5.1	73.8	ath
571	35	3	654091	213560	654010	213291	107	116	180	2	5.2	66.0	ath
573	31	1	654533	234238	654662	234904	86	80	135	3	5.3	62.4	ath
574	1	3	653984	245961	653683	245990	76	73	125	3	5.3	68.0	ath
574	31	3	654015	245074	653711	245078	58	62	100	3	5.3	62.4	ath
574	35	2	655310	240091	655607	240200	45	39	90	3	5.4	57.4	
575	1	1	655068	254662	654777	254885	210	198	295	3	5.0	79.0	
575	3	4	654410	251810	654320	252510	136	167	225	3	4.9	76.6	
576	2	3	654216	263244	653945	263565	179	161	275	3	5.0	78.8	ath
576	3	2	654876	260050	654975	260738	216	250	295	3	4.8	81.0	
612	1	4	661553	121585	661500	120838	259	298	350	3	4.9	84.0	
612	13	4	655977	120929	660261	120652	280	268	260	3	4.7	86.6	
613	3	2	662121	131562	662279	130905	208	196	280	3	5.0	79.4	
613	12	2	661500	132628	661594	131916	147	129	220	3	5.1	75.4	
614	11	4	661130	142720	661429	142597	221	230	340	3	5.0	80.4	
614	12	4	660223	142084	660454	142548	107	173	230	3	5.0	78.4	
615	1	2	662450	152699	662738	152892	106	150	220	3	5.0	75.0	
616	11	1	661813	164164	661611	164728	194	191	275	3	5.0	75.2	
616	33	1	662256	164304	662451	164862	200	228	280	3	5.0	78.0	
616	36	2	661592	163106	661789	163275	69	55	100	2	5.4	64.2	
617	3	1	662692	172688	662700	173441	222	315	325	3	5.0	80.8	
617	12	2	661515	172962	661814	173017	211	225	315	3	4.8	82.2	
617	33	3	660905	173160	660612	173279	180	160	245	3	4.9	78.6	
617	35	3	660694	174635	660552	174284	140	179	200	2	5.0	78.0	ath
618	11	2	662338	182695	662029	182733	140	184	235	3	5.1	77.2	
618	12	2	662633	180898	662402	181402	75	73	135	3	5.3	71.8	
618	31	2	660307	182893	660012	182652	99	58	120	3	5.3	64.0	
619	1	1	662261	194628	661957	194676	184	177	240	3	5.0	80.8	
619	4	2	662017	190294	662315	190442	221	190	315	3	4.9	82.0	
620	1	3	661495	203862	661192	203748	187	158	255	3	5.0	77.2	
620	2	1	662336	204788	662636	204794	172	180	265	3	5.0	77.8	
621	14	4	660791	210215	660495	210080	150	128	195	3	5.0	75.4	ath
622	1	3	660808	225338	660953	230000	124	122	135	3	5.2	69.8	
622	35	1	661650	224385	661657	224868	91	96	105	2	5.3	62.8	
622	36	3	660700	226520	660868	227233	108	107	105	2	5.3	68.0	ath
622	37	3	660328	225220	660637	225543	77	69	90	2	5.4	62.4	ath
623	14	2	661633	231138	661787	231778	62	71	110	3	5.2	64.6	ath
623	31	3	661210	235128	661011	235683	41	50	80	3	5.4	57.6	ath
624	4	2	662294	240384	662071	240901	109	103	170	3	5.1	72.2	ath
624	5	4	660695	241301	660408	241532	47	69	90	3	5.4	59.4	ath
625	11	3	661278	254998	661063	255531	230	265	335	3	5.1	84.0	
625	16	2	661530	250830	661790	250730	127	132	245	3	5.0	74.2	
626	11	4	660350	261032	660142	261570	247	210	315	3	5.2	79.0	ath
663	1	4	663750	130621	664048	130510	256	200	265	3	4.8	82.6	ath
663	11	1	665476	134205	665728	134631	292	299	390	3	4.9	86.4	
664	2	3	663200	144048	663283	144797	147	152	110	3	5.2	74.2	
664	11	1	665224	150044	665073	145372	107	120	190	3	5.2	74.0	
665	2	2	665785	150405	665624	151065	147	138	235	3	5.0	78.4	

Stat sq.	Tow-no.	Sub-sq.	Pos.Begin N	Pos.begin W	Pos. end N	Pos.end W	Depth begin (m)	Depth end (m)	Wrp (fm)	Tow length (nm)	Vert. open.* (m)	Horiz. open* (m)	Remark
665	3	3	664403	154070	664385	154834	175	140	250	3	5.1	77.2	ath
666	11	3	664439	164975	664140	164879	140	172	220	3	5.1	76.6	ath
666	14	1	664945	163600	664659	163868	179	148	220	3	5.1	76.8	ath
667	12	2	665393	171825	665094	171796	231	235	320	3	5.0	82.6	
667	14	2	664670	170704	664461	170141	213	251	345	3	5.0	81.6	
668	3	4	663821	180084	663907	180820	160	195	325	3	5.0	79.6	ath
668	11	3	663336	183380	663043	183584	223	220	315	3	4.9	82.0	
669	3	3	663907	194768	664178	194422	141	152	205	3	4.9	77.2	
669	4	4	663900	191424	664200	191323	310	312	415	3	4.9	85.2	ath
670	4	1	665901	204151	665900	204933	223	182	260	3	4.9	80.2	
670	12	4	663527	202622	663650	201935	281	224	375	3	4.9	83.4	ath
671	2	2	665306	211030	665357	210264	125	136	205	3	5.0	76.6	
671	11	4	663865	212733	663605	213132	117	117	135	3	5.2	72.8	
672	3	2	665410	223350	665620	222810	162	176	265	3	5.0	79.4	
672	12	1	665030	224100	665250	223640	126	143	215	3	5.0	76.4	
672	35	3	663491	225857	663286	225287	63	75	100	3	5.3	67.4	ath
673	3	2	665400	232600	665680	232950	205	219	330	3	4.9	80.2	ath
673	13	4	664414	232135	664480	231393	143	114	225	3	5.1	74.8	
674	12	3	662974	244589	663020	243843	110	105	200	3	5.1	73.4	ath
674	15	1	665150	243659	665297	242994	213	223	330	3	5.0	82.4	
674	16	4	664055	242056	663993	241310	144	247	300	3	4.9	81.4	ath
714	11	3	670471	145668	670217	145258	226	211	305	3	4.9	84.2	
715	11	3	670397	154518	670092	154503	165	166	260	3	4.9	79.4	ath
716	11	3	670623	164382	670604	165162	348	365	460	3	4.8	87.6	
717	1	4	670403	172263	670120	172522	235	240	345	3	5.0	83.2	ath
718	2	3	670227	184645	665933	184857	188	170	255	3	4.9	80.2	
719	2	3	670867	194892	670660	195453	296	274	400	3	4.8	85.4	ath
719	11	4	670728	193150	670933	192573	375	454	470	3	4.7	90.0	
720	11	1	671956	203478	671825	204187	346	325	425	3	4.9	88.0	
720	14	3	670457	202807	670232	203334	233	226	320	3	5.0	81.6	
721	1	3	670494	212635	670309	213248	213	219	280	3	5.0	83.2	ath
721	11	4	670204	211260	670496	211075	172	181	250	3	5.0	81.6	
722	2	3	670570	230000	670270	230000	261	240	340	3	4.9	82.8	
722	4	4	670620	220220	670920	220200	217	224	295	3	4.9	83.4	
723	2	4	670140	232770	670400	233190	236	227	350	3	4.9	80.8	
723	4	3	670020	234580	670300	234290	209	224	370	3	5.0	80.4	
723	11	3	670047	235788	670253	235233	250	244	330	3	4.9	82.2	ath

* Average 2020-2024

5.4.2 Tow stations- deep-water

Remarks (issues with tow stations) are found in 5.6.2. Rows with grey shadow are stations that r/v Árni Friðriksson will cover.

Stat. sq.	Tow-no.	Sub-sq.	Pos.begin N	Pos.begin W	Pos.end N	Pos.end W	Depth begin (m)	Depth end (m)	Wrp (fm)	Tow lenth (nm)	Vert. open.* (m)	Horiz. open.* (m)	Remark
225	51	2	622700	252937	622459	253315	658	666	680	3	5.6	129	ath
225	61	3	621450	254480	621170	254690	790	739	770	3	5.6	131	

Stat. sq.	Tow-no.	Sub-sq.	Pos.begin N	Pos.begin W	Pos.end N	Pos.end W	Depth begin (m)	Depth end (m)	Wrp (fm)	Tow lenth (nm)	Vert. open.* (m)	Horiz. open.* (m)	Remark
270	61	2	625607	201254	625834	200827	834	844	840	3	5.7	129	ath
272	51	2	630112	221322	630051	221971	734	699	740	3	5.6	130	ath
273	51	1	625995	234522	625758	234931	616	617	640	3	5.5	129	ath
274	51	2	625115	240780	625046	241420	736	702	720	3	5.5	131	
274	52	2	625270	235830	625160	240450	634	644	650	3	5.5	129	
274	53	3	624092	243346	623948	243900	741	720	760	3	5.5	131	
274	61	1	624740	244860	624490	245220	464	515	530	3	5.6	124	
274	62	3	624061	245834	623796	250133	435	481	475	3	5.6	125	Ath
274	63	2	625080	242440	624980	243140	664	628	720	3	5.5	130	
275	52	2	625140	251090	625330	250590	448	365	410	3	5.5	124	ath
275	61	4	623390	251130	623130	251500	684	725	730	3	5.6	129	
311	71	1	632875	114124	632592	114327	380	391	400	3	5.7	121	
312	1	1	631954	125978	632253	130040	626	630	620	3	5.8	123	ath
312	51	3	630040	124870	630340	125290	561	570	570	3	5.8	122	
312	61	1	632648	124495	632910	124170	528	509	520	3	5.7	122	
312	71	4	630990	121290	630768	121717	415	423	410	3	5.6	122	ath
313	1	4	631070	130000	631356	130198	626	622	620	3	5.8	120	ath
313	21	4	631270	131530	631570	131511	767	760	770	3	5.7	123	
315	51	1	632666	155034	632547	155583	220	246	250	3	5.6	107	ath
316	61	1	631770	164770	631680	165350	538	560	550	3	5.9	123	ath
317	61	3	631050	174610	630980	175260	570	565	550	3	5.8	127	ath
317	62	3	631742	170536	631655	171168	210	207	245	3	5.7	105	ath
318	51	3	631330	183520	631300	182820	177	195	210	3	5.6	99.8	ath
318	61	4	631040	180240	631100	180880	558	558	550	3	5.7	125	
319	61	3	631436	195595	631139	195611	615	621	630	3	5.6	128	ath
319	62	1	631580	195020	631440	195610	594	522	560	3	5.6	127	
320	51	3	630592	204026	630410	204555	391	420	440	3	5.5	124	ath
320	61	4	630662	201998	630671	202664	431	452	435	3	5.7	121	ath
320	62	4	630730	200980	630500	201400	417	516	520	3	5.5	125	
321	51	3	630740	215640	630600	220230	516	517	540	3	5.6	126	
322	61	3	630750	224590	631010	224940	530	470	550	3	5.6	124	
322	62	4	630200	223370	630270	224020	601	647	600	3	5.6	125	
323	51	4	631000	232420	630800	232940	478	516	500	3	5.5	124	
323	61	3	630280	234480	630120	235020	552	546	560	3	5.6	127	
324	51	4	630700	241840	630920	241410	303	281	360	3	5.6	118	
324	52	2	632040	241920	632200	241400	196	182	250	3	5.6	110	ath
324	61	4	630120	242540	630160	241900	406	414	450	3	5.6	125	
325	51	1	632710	253670	632430	253430	313	297	320	3	5.7	115	ath
325	52	4	630470	250410	630310	245920	461	473	510	3	5.6	126	ath
325	53	4	625940	251080	630060	251610	644	675	710	3	5.6	130	ath
325	54	4	630520	252500	630690	252860	821	878	880	3	5.5	131	
326	1	4	631330	260260	631140	255800	1020	1036	1010	3	5.9	126	ath
326	2	3	630571	265265	630871	265248	1354	1318	1280	3	5.8	130	
326	3	4	630711	262966	630413	262890	1281	1318	1280	3	5.8	125	ath
326	51	2	632720	261640	632980	261750	837	793	835	3	5.9	125	ath
359	1	1	640070	93990	635790	93710	740	724	730	3	5.7	129	ath

Stat. sq.	Tow-no.	Sub-sq.	Pos.begin N	Pos.begin W	Pos.end N	Pos.end W	Depth begin (m)	Depth end (m)	Wrp (fm)	Tow lenth (nm)	Vert. open.* (m)	Horiz. open.* (m)	Remark
360	1	2	635780	101320	635788	102003	587	536	580	3	5.7	128	ath
361	1	1	635650	113159	635921	112866	326	322	320	3	5.8	117	
361	71	2	635499	112033	635752	111666	368	351	345	3	5.7	120	ath
361	72	1	635508	115084	635212	115166	366	373	390	3	5.8	120	
362	1	1	634862	124075	634565	123982	558	554	550	3	5.9	119	ath
362	51	1	635230	122420	634950	122690	454	458	450	3	5.8	120	ath
362	52	2	634720	121500	634460	121900	408	405	420	3	5.8	121	
362	61	3	633950	124090	634250	124140	523	539	530	3	5.8	117	ath
362	63	1	635300	123800	635450	123200	530	509	550	3	5.9	124	ath
363	1	4	634194	131927	634492	131857	875	884	850	3	5.8	130	
363	2	4	633893	132302	633605	132425	899	930	960	3	5.7	129	
363	4	2	635460	130222	635760	130243	436	706	735	3	5.8	128	
363	51	2	634870	131110	635100	131500	780	827	820	3	5.8	130	
363	61	1	635303	134715	635046	135070	236	224	250	3	5.7	109	ath
363	62	2	635770	125450	635470	125300	655	643	660	3	5.8	125	ath
364	51	4	634640	141100	634470	141670	365	326	355	3	5.6	119	ath
364	52	4	634295	142233	634101	142756	413	408	490	3	5.8	117	ath
365	51	4	633300	150840	633190	151450	271	295	315	3	5.5	111	ath
375	1	3	633400	255888	633100	255896	370	193	345	3	5.8	115	ath
376	3	1	635427	265854	635702	265581	964	840	880	3	5.7	125	ath
376	51	4	633965	260990	634216	261366	441	474	490	3	5.9	114	
377	2	2	635432	270511	635132	270518	1063	1113	1050	3	5.9	129	ath
409	1	3	640131	95059	640321	95590	708	684	710	3	5.7	131	ath
409	2	3	641270	93850	640976	93990	824	838	800	3	5.6	131	ath
411	1	2	641487	110779	641712	110323	337	348	340	3	5.7	120	
411	2	4	640906	111800	641174	111489	333	340	320	3	5.7	119	
411	71	1	641790	113930	641520	114260	354	350	345	3	5.6	122	
412	1	1	642038	124915	642097	125594	168	167	200	3	5.7	105	
412	2	4	641597	122148	641299	122221	472	481	470	3	5.8	122	ath
412	3	3	640680	123377	640395	123588	536	554	530	3	5.8	125	ath
412	51	3	640930	123750	641190	124120	514	455	470	3	5.7	121	ath
412	61	3	640154	124857	640420	124577	609	577	620	3	5.7	124	ath
413	51	4	640780	131430	640460	131360	139	172	200	3	5.6	105	
426	1	1	641443	265375	641736	265232	432	366	390	3	5.9	115	ath
427	1	1	642822	272874	642564	273228	776	833	780	3	5.6	125	
427	3	1	642388	275096	642311	274425	917	924	880	3	5.6	129	
427	41	2	642733	272185	643031	272265	721	712	690	3	5.7	124	
427	51	1	642570	273900	642850	274120	840	824	845	3	5.7	128	
427	52	4	640840	270720	641040	271210	753	771	750	3	5.8	125	
428	2	2	642434	280670	642545	281315	1189	1180	1200	3	5.7	129	
428	3	1	643070	283725	642817	284098	1299	1277	1275	3	5.7	130	ath
460	1	4	643163	103156	643417	102786	490	463	460	3	5.6	125	ath
461	1	2	645857	110810	650142	111030	602	584	570	3	5.6	130	
461	2	2	644990	105864	645265	110148	479	445	430	3	5.6	126	ath
461	3	1	645106	113719	644843	114057	293	344	365	3	5.9	119	
461	4	3	643430	115520	643168	115859	382	377	405	3	5.8	119	
461	5	1	650040	112834	645740	112848	415	381	390	3	5.7	121	

Stat. sq.	Tow-no.	Sub-sq.	Pos.begin N	Pos.begin W	Pos.end N	Pos.end W	Depth begin (m)	Depth end (m)	Wrp (fm)	Tow lenth (nm)	Vert. open.* (m)	Horiz. open.* (m)	Remark
461	71	4	643530	112180	643440	112840	427	435	440	3	5.6	124	
477	1	3	643935	275038	644234	274985	942	897	930	3	5.6	129	ath
477	21	1	645000	274000	645300	274000	715	690	710	3	5.6	124	
477	51	2	645391	272821	645095	272718	550	559	575	3	5.8	122	ath
477	61	4	643670	271960	643430	272350	608	662	625	3	5.7	124	
477	71	2	645180	271280	645480	271390	386	357	400	3	5.8	115	
478	3	2	644517	280360	644570	281053	1050	1082	1040	3	5.7	133	
478	4	2	644950	280355	644650	280389	1091	1107	1065	3	5.8	130	ath
478	5	4	643633	280271	643334	280328	1014	1050	1010	3	5.5	131	
478	7	4	644364	281330	644070	281467	1089	1089	1100	3	5.7	130	
478	41	1	644903	285464	645191	285267	1001	999	950	3	5.7	128	ath
478	44	1	645269	284742	645009	284391	1047	1116	990	3	5.6	126	ath
509	1	3	650671	94023	650371	93984	770	754	760	3	5.6	133	
510	1	1	652872	104381	652572	104393	824	873	810	3	5.6	131	
511	2	2	652673	112311	652398	112021	459	476	500	3	5.6	125	
511	3	2	652411	111097	652703	110933	706	716	690	3	5.6	130	ath
511	21	4	650738	115087	651207	114682	309	353	360	3	5.7	120	ath
511	41	4	651031	111556	651329	111646	576	591	610	3	5.5	130	
527	2	2	651673	272647	651910	273086	461	544	495	3	6	111	ath
527	71	4	650070	271050	650250	270440	296	246	290	3	5.8	110	
528	1	4	650480	281343	650771	281168	1025	1032	975	3	5.7	128	ath
528	2	2	652007	282783	651746	283136	1155	1168	1160	3	5.6	128	ath
528	4	1	652776	284142	653071	284270	1199	1140	1180	3	5.6	129	
528	5	2	652624	281685	652591	282402	1038	1052	1040	3	5.6	128	ath
528	6	4	650849	280503	651106	280135	952	922	945	3	5.7	130	ath
528	7	2	652482	275712	652596	280379	884	937	880	3	5.7	129	ath
528	8	1	651917	283413	652062	284042	1248	1281	1230	3	5.6	128	ath
529	21	2	653011	290247	652756	285865	1274	1173	1180	3	6	128	ath
560	1	4	653638	100952	653717	100251	844	844	820	3	5.7	132	
561	1	1	654881	114843	654868	115574	192	164	250	3	5.6	114	
561	2	4	653500	110625	653204	110501	811	867	870	3	5.6	132	
561	3	1	655226	113413	654929	113520	362	381	420	3	5.7	121	
561	4	3	654037	113560	653738	113256	254	311	240	3	5.6	114	ath
561	21	2	654774	112765	654479	112630	613	600	600	3	5.6	131	
576	71	1	654522	264376	654810	264173	304	265	305	3	5.7	111	ath
577	1	4	653110	271957	653391	271701	503	487	485	3	5.8	115	ath
577	5	4	654380	272402	654240	273047	582	690	595	3	5.8	122	ath
577	6	2	655439	270944	655348	271644	522	578	590	3	5.8	121	
577	7	3	654022	273141	653860	273754	640	701	620	3	5.8	124	ath
577	8	2	654994	270169	655293	270125	456	468	430	3	5.6	119	ath
577	11	3	653233	280006	653088	275373	834	818	820	3	5.9	126	ath
577	41	1	654627	274246	654628	273496	699	631	670	3	5.6	128	ath
577	42	3	654296	280019	654395	275330	816	765	810	3	5.7	129	ath
578	3	2	655770	281551	655512	281177	479	544	605	3	5.7	124	ath
578	4	4	654320	281158	654166	280532	888	873	930	3	5.7	128	ath
578	6	3	653356	284634	653477	285298	1145	1105	1150	3	5.7	129	ath
579	1	4	654298	292302	654589	292123	421	377	450	3	5.8	126	

Stat. sq.	Tow-no.	Sub-sq.	Pos.begin N	Pos.begin W	Pos.end N	Pos.end W	Depth begin (m)	Depth end (m)	Wrp (fm)	Tow lenth (nm)	Vert. open.* (m)	Horiz. open.* (m)	Remark
612	1	1	662054	123128	661800	122731	421	489	510	3	5.7	128	ath
625	71	1	662080	253650	662350	253170	318	333	360	3	5.6	117	
626	1	4	661236	260800	661400	260177	441	425	460	3	5.6	120	
627	1	3	661072	273285	661015	272568	476	480	570	3	5.7	126	ath
628	1	3	661220	283008	661415	283573	344	315	320	3	5.7	117	ath
662	2	3	663655	124597	663361	124565	304	297	350	3	5.8	119	
662	41	3	664477	124865	664243	124389	981	906	920	3	5.6	134	
663	21	2	665470	133038	665465	132273	554	609	640	3	5.6	127	
674	1	1	664719	245715	665012	245555	640	692	695	3	5.7	130	ath
674	71	3	663590	245650	663810	245130	272	265	340	3	5.6	116	
675	1	1	665797	253853	665755	253094	928	1003	915	3	5.6	129	ath
675	71	4	663330	251380	663490	250700	422	396	440	3	5.7	122	
676	1	4	662884	262428	663159	262728	615	580	570	3	5.7	125	ath
676	2	1	665800	264104	670100	264123	520	487	515	3	5.7	123	ath
713	1	3	670315	135869	670092	135355	410	375	480	3	5.7	125	
714	1	1	672689	143864	672815	143154	964	996	910	3	5.6	135	
714	21	4	671235	142635	671044	142038	465	461	480	3	5.5	127	
715	1	1	671602	153400	671562	152631	320	300	315	3	5.7	117	
715	2	2	671909	151405	671781	150702	452	423	450	3	5.8	124	ath
715	21	1	672376	155590	672532	154923	708	737	710	3	5.6	130	
716	1	2	671461	161460	671583	160751	373	403	400	3	5.6	122	
716	21	3	670945	163723	671033	162984	392	403	400	3	5.6	122	
716	22	1	671823	164844	671921	164109	717	697	740	3	5.6	133	
717	1	2	671630	171787	671760	172488	800	761	850	3	5.7	131	ath
717	2	4	671325	171181	671345	170408	609	637	610	3	5.6	129	
717	3	2	672536	172410	672835	172364	963	939	940	3	5.7	128	
717	21	3	670975	175103	670974	174330	417	390	370	3	5.7	122	
718	2	4	671289	181800	671302	181026	490	478	460	3	5.7	124	
718	21	2	672990	181815	672691	181761	554	622	630	3	5.6	127	
718	22	2	672026	180504	671755	180171	763	836	760	3	5.6	130	
719	1	1	672753	194509	672658	193767	348	255	370	3	5.7	120	
721	1	3	671219	213573	671511	213751	287	256	280	3	5.7	117	
721	2	1	671825	214465	672025	215045	393	379	370	3	5.6	120	ath
721	3	1	672455	213687	672452	214468	500	505	530	3	5.6	127	
722	1	1	672611	223420	672591	224200	468	461	520	3	5.6	125	
722	71	2	671650	221140	671480	220540	362	376	390	3	5.6	113	
723	1	2	672277	231736	672141	232430	452	458	500	3	5.7	125	
723	2	1	671682	233245	671463	233774	395	401	425	3	5.7	122	
724	2	3	670050	245455	670318	245108	942	974	990	3	5.5	129	ath
768	2	4	673809	180493	674008	181083	897	986	940	3	5.5	132	ath
769	1	2	674954	190565	674723	191072	895	787	880	3	5.6	131	
769	2	3	674088	192998	673874	193552	443	428	440	3	5.7	122	
769	3	4	673007	190682	673048	185905	489	410	440	3	5.6	117	ath
770	1	4	674073	201972	674372	201920	587	701	660	3	5.6	129	
770	2	2	674743	202420	675012	202771	816	884	900	3	5.7	132	
770	3	4	673297	202985	673261	202205	425	377	400	3	5.7	113	
770	4	3	673743	204390	673559	203768	551	490	500	3	5.6	126	
771	2	1	674884	214245	674908	213453	774	729	825	3	5.6	132	
771	3	2	674760	212547	674602	211872	809	825	860	3	5.7	132	

Stat. sq.	Tow-no.	Sub-sq.	Pos.begin N	Pos.begin W	Pos.end N	Pos.end W	Depth begin (m)	Depth end (m)	Wrp (fm)	Tow lenth (nm)	Vert. open.* (m)	Horiz. open.* (m)	Remark
771	21	3	673490	214795	673790	214785	620	644	650	3	5.6	127	
772	1	3	674110	230066	674314	225486	739	752	750	3	5.7	131	

* Average 2020-2024

5.5 Station maps

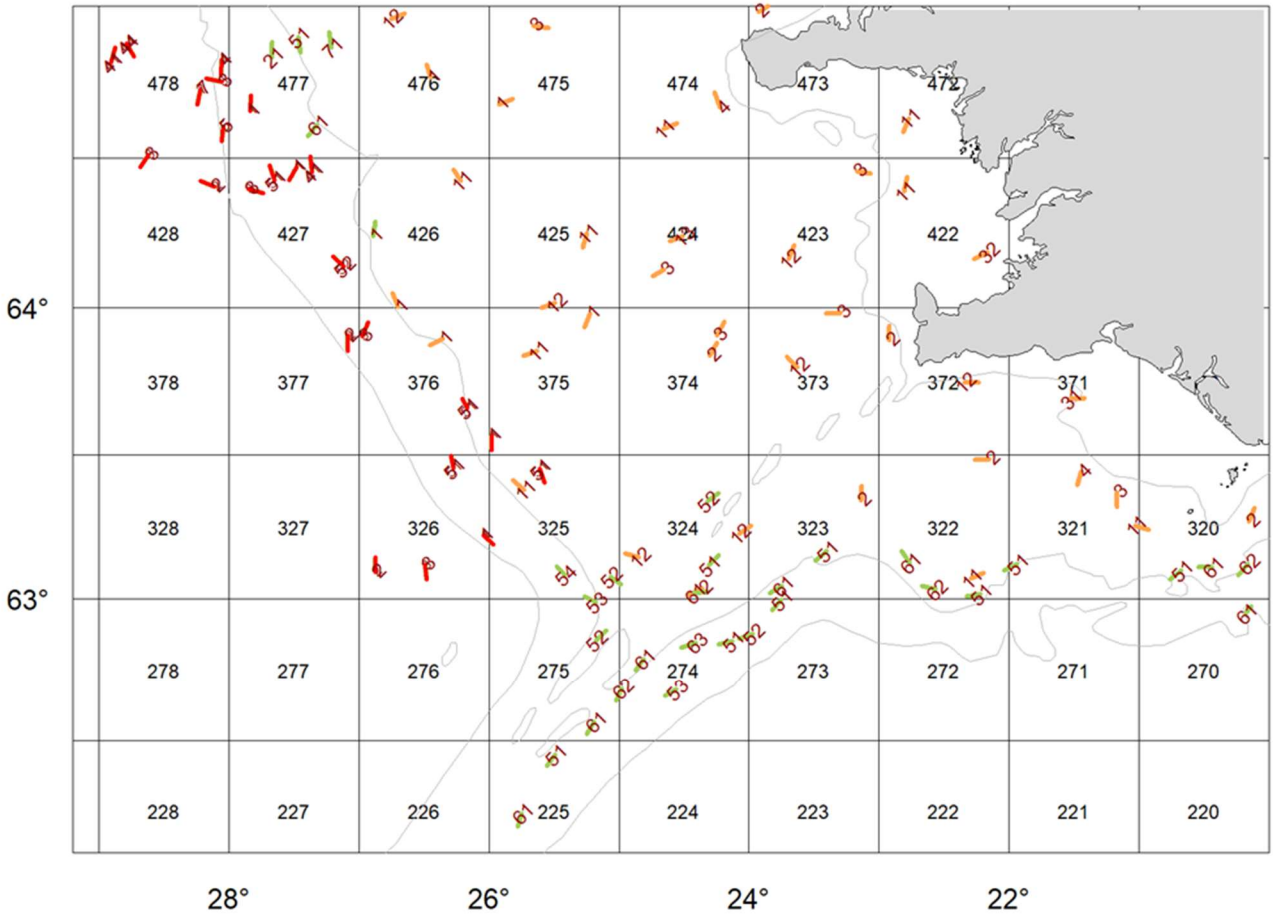


Figure 4. IAGS 2025. *Stations in both shelf and deep-water areas off SW Iceland. Green segments annotate deep-water stations of Breki, and red segments annotate deep-water stations of Árni Friðriksson. Orange segments annotate stations in shelf area taken by Þórunn Sveinsdóttir.*

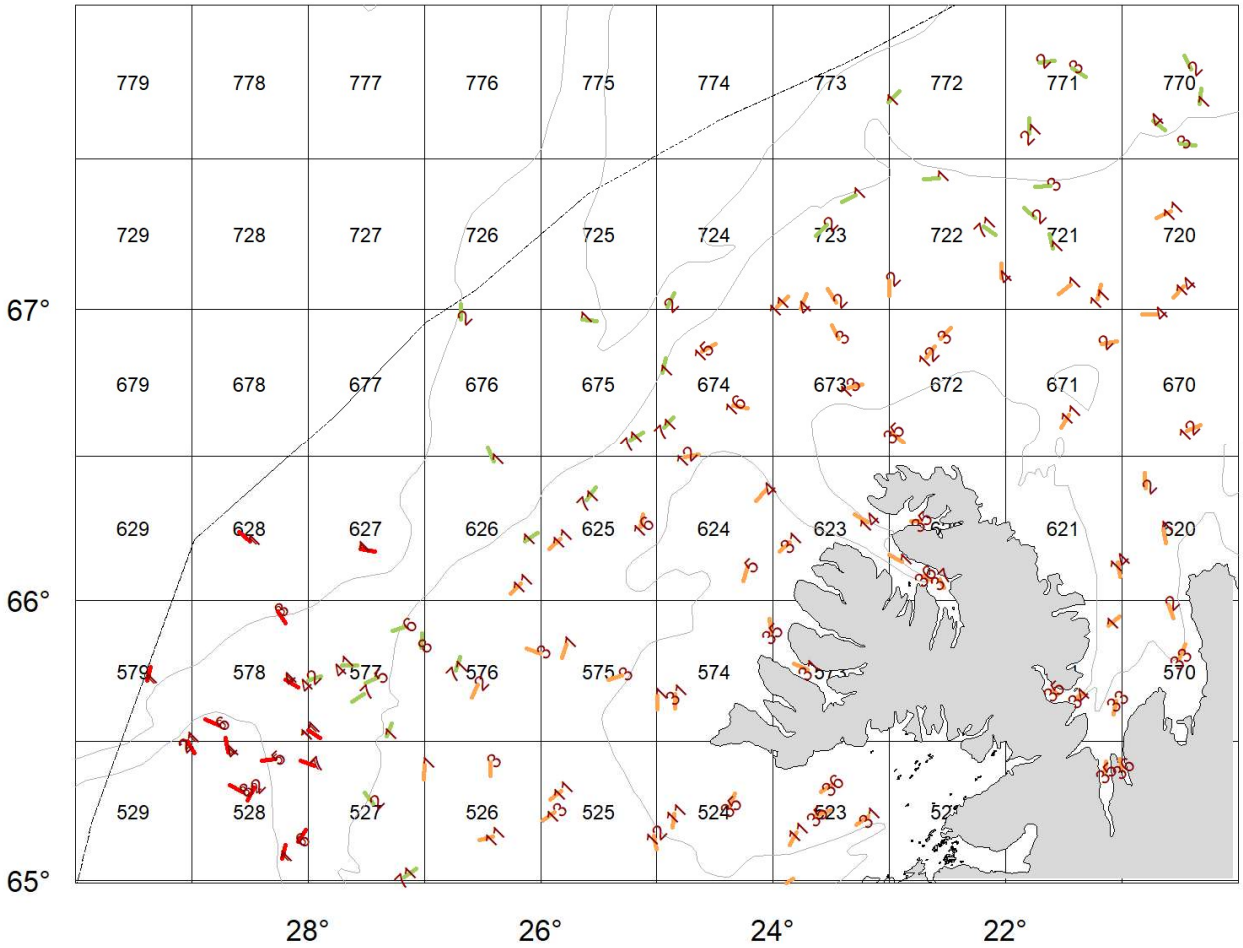


Figure 5. *IAGS 2025. Stations in both shelf and deep-water areas off NW Iceland. Green segments annotate deep-water stations of Breki, and red segments annotate deep-water stations of Árni Friðriksson. Orange segments annotate stations in shelf area sampled by Þórunn Sveinsdóttir.*

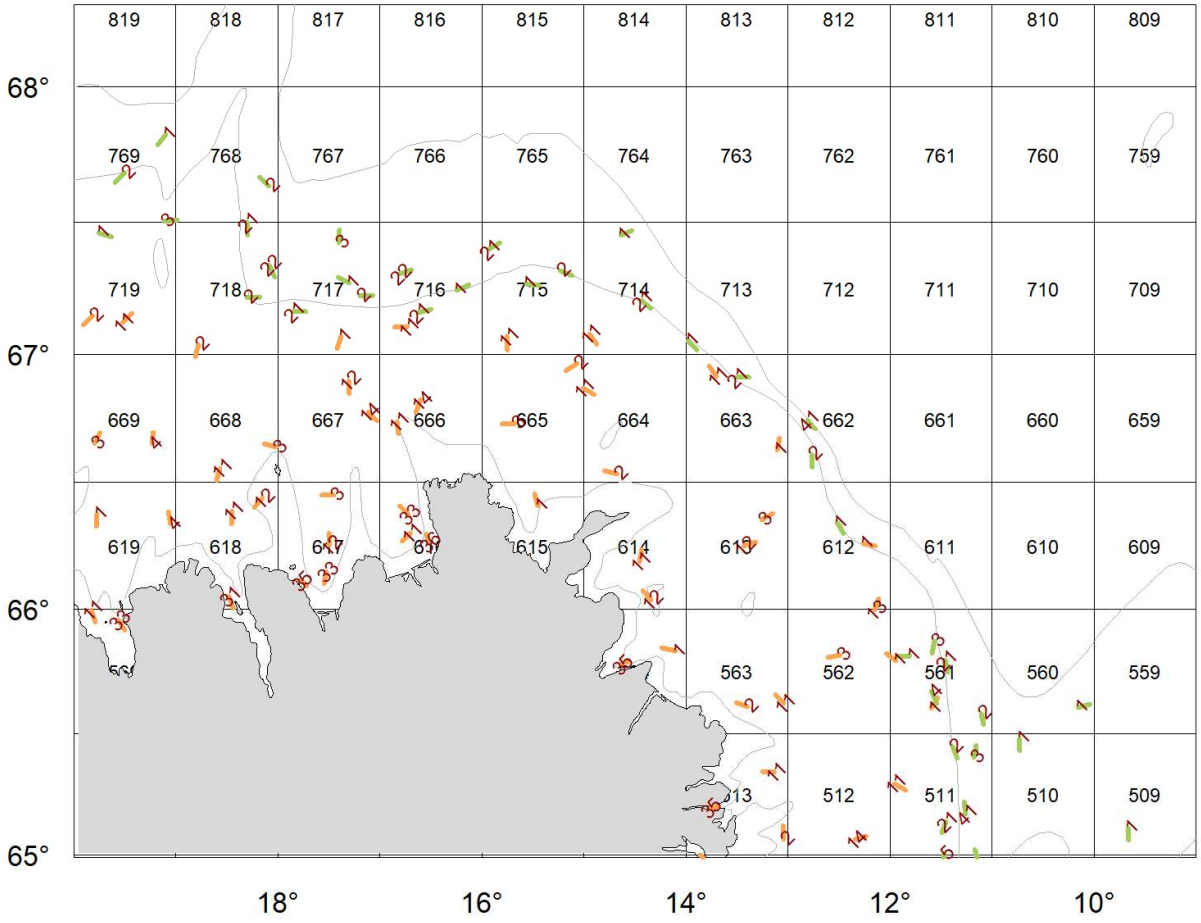


Figure 6. *IAGS 2025. Stations in both shelf and deep-water areas off NE Iceland. Green segments annotate deep-water stations of Breki, and orange segments annotate stations in shelf area sampled by Þórunn Sveinsdóttir.*

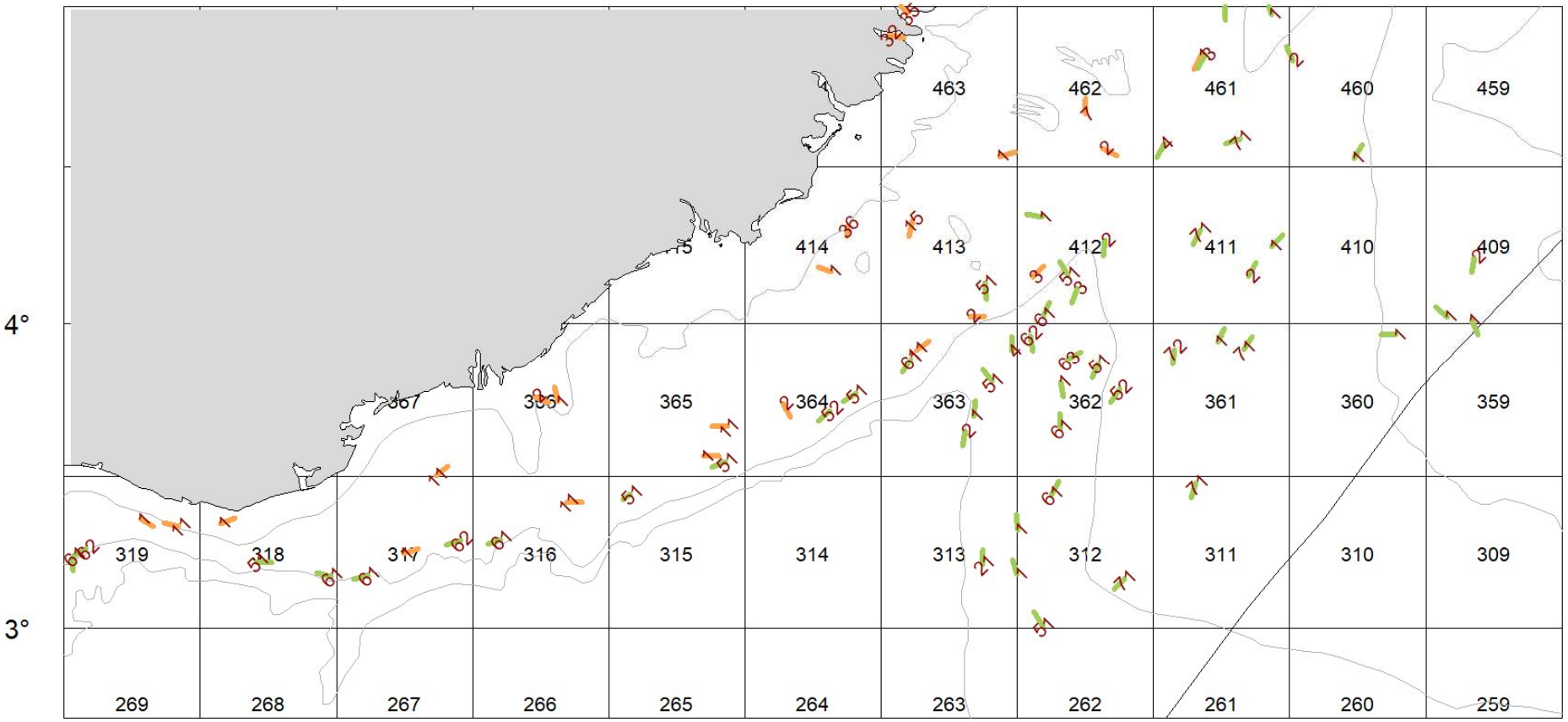


Figure 7. *IAGS 2025. Stations in both shelf and deep-water areas off SE Iceland. Green segments annotate deep-water stations of Breki, and orange segments annotate stations in shelf area sampled by Þórunn Sveinsdóttir.*

5.6 Remarks and notes on tows

Deviations from standard procedures which have been recorded during the execution of the survey, as well as other useful information which must be considered during a haul. The identification and/or location of each haul is indicated by statistical square number (Sq.) and tow number.

5.6.1 List of remarks on tows on shelf area

Sq.	Tow no	Year	Remarks
319	11	**2004** **2007**	Move app. 1 m to the west due to topography at the end of the tow. Location changed in station list.
320	2	**2003** **2009** **2023**	Trawl stuck after 2.1 nm and again after 2.9 nm. Otter board stuck but got unstuck and tow was continued. Trawl stuck and hoisted after 2.7 nm.
320	11		Ship wreck in close proximity at 63°13’82-20°54’35.
322	11	**2009** **2013** **2017**	Otter board on portside stuck but got unfastened and the tow continued. Stuck at 63°04’11-22°15’51 after 1.5 nm. Otter board on portside stuck after 0.4 nm. Hoist and repeated
323	2	**2013**	Stuck at 63°21’86-23°08’07 after 2.3 nm.
324	2	**2023**	Tow moved aside because of longline squaring the towpath.
324	12	**2006**	Otter board stuck after 3 min at 63°08’72 – 24°50’78, direction 285°, depth 299 m.
325	11	**1999** **2001-2003** **2021**	Stuck at 63°22’05-25°45’31. Moved aside to appr. 1.5 nm. In these years tows at position: 63°22’79-25°43’91 d:360. Hoist: 63°24’81-25°49’00 d: 356. Direction 315°. Tow was added in 1998. Coordinates changed in station list in **2004.** Older position.: Begin 63°22’89-25°49’44. End 63°20’68-25°42’29. Stuck after 2.2. nm.
364	2	**2014**	Stuck after 1.3 nm at 63°43’06-14°41’70. Hoisted, leg wires torn, repeated.
365	1	**2017** **2019**	Loosely stuck at beginning, unfastened and continued with the tow. Stuck. Hoisted after 2.0 nm.
365	11	**2016** **2020**	Otter board stuck after 1.7 nm invalid tow and repeated. Longline squaring tow path. Tow moved to the west.
367	11	**General**	IGS tow. Stuck **1993** at 63°29’80-17°16’80. Stuck **1994** í 63°30’71-17°13’94.
372	12	**2010** **2012** **2013** **2014** **2017**	Stuck after 2 nm at 63°44’79-22°18’70. Stuck after 2.3 nm at 63°44’88-22°19’57. Stuck after 2.1 nm at 63°44’85-22°14’37. Stuck after 2.2 nm. Stuck after 2.2 nm.
373	3	**General** **2012**	Change direction from 270° to 220° at 63°58’00-23°25’00 due to topography. Otter board stuck after 2.4 nm.
374	2	**2017**	Stuck after 2.4 nm.
374	3	**General**	General note on shipwreck at pos. í 63°58’00-24°12’14 , depth 188-190 m.
375	11	**General** **2008** **2010**	During daytime a large catch of redfish can be expected at this station. Large catch of redfish. Tow length 1.2 nm. Catch more than 15 tons. Tow end at 0.5 nm. Catch appr. 3 tons.
376	1	**General**	IGS tow. Almost stuck in **1991**, direction 90° í 635411-262152. Stuck **1994** after 2.5 nm direction 280° at 63°53’01-26°25’14.

Sq.	Tow no	Year	Remarks
		2003	Stuck at 63°53’27-26°23’27. Repeated.
		General	During daytime a large catch of redfish can be expected.
		2008	Tow length only 1 nm because of large catch (more than 10 tons).
		2010	Tow length 0.5 nm. Catch appr. 3 tons.
		2015	Tow ends after 2.0 nm because of large catch.
		2017	Stuck after 2.7 nm.
412	1	**2016**	Stuck after 2.8 nm. Leg wires torn.
413	2	**2009**	Otter boards stuck. Towlength 2.9 nm.
		2010	Stuck but trawl intact. Towlength 2 nm.
		2012	Otter board stuck. Towlength 2.7 nm.
		2023	Stuck after 2.7 nm. Tow ended.
414	36	**2009**	Suggestion: Better to tow this station to northwards.
423	12	**2006**	Stuck at 64°10’52–23°42’09 Towed for 2.1 nm.
		2008	Stuck after 2.0 nm.
		2009	Trawl torn after after 0.4 nm. Repeated. Otter board stuck but loosened and tow completed.
		2012	Stuck otter board on portside after 2 nm. Leg wire torn.
		2013	Stuck at both ends of the path and therefore towed for 2 nm.
		2014	Stuck at 64°12’74-23°39’07 (south of tear in year 2009).
		2015	Stuck after 2.5 nm. Repeated somewhat more to the west.
		2016	Stuck after 2.1 nm. Leg wire torn.
		2019	Stuck after 1.4 nm. Leg wire turned. Tow repeated.
424	3	**General**	IGS (SMB) tow. Stuck **1993** after 2.2 nm, direction 65° at 64°07’24-24°44’89.
		2009	Hoisted due to large catch.
424	13	**2009**	Otter board stuck. Repeated.
425	12	**1998**	Least problematic at the eastern part of the tow path.
		1999	Began East because it was stuck.
		2008	Hoisted after 2.2 nm because of large catch. Large redfish catch expected (see also tows 375-11 and 376-1).
		2023	Stuck aftir 2.2 nm. Heavy countercurrent.
426	1	**2009**	Stuck after 2.8 nm.
426	11	**2009**	Otter board stuck loosened and tow continued.
462	2	**General**	IGS (SMB) tow. Stuck **1990** after 3.5 nm, direction 305° at 64°34’55-12°21’87.
		2014	Stuck after 1.9 nm at 64°32’86-21°19’74. Repeated.
462	7	**2022**	Tow moved somewhat aside because of longlines in tow path.
463	32	**2022**	Stuck after 2 nm. Otter board stuck.
463	35	**2014**	Stuck after 2.0 nm.
473	2	**General**	IGS (SMB) tow. Moved southwards **1987**. Mostly shortened towlength due to topography or stationary nets in the tow path.
474	4	**General**	Shipwreck at tow path (BERGUR) at 64°42’79-24°15’93 (position of wreck corrected in 2014).
		1998	Stuck after 0.9 nm at 64°41’10–24°13’19.
		2009	Stuck bobbins at 64°41’44-24°15’41. Tow continued.
476	1	**General**	IGS (SMB) tow. Trawl lost in **1988.** Aircraft at 64°44’5-26°24’56.
		2010	Stuck after 2.9 nm.
476	12	**2011**	Stuck at 64°58’30-26°38’71. Repeated.

Sq.	Tow no	Year	Remarks
511	11	**2003**	Tow moved because of a new marine cable. Position changed in station list 2004. Initial position: Begin 65°18'62-11°56'15 d:237. End: 65°16'33-11°51'34 d:193.
		2019	Tow moved due to longline in towpath.
513	2	**2009**	Northward tow preferable.
		2012	Stuck after 0.7 nm (otter board)…loosened and tow completed.
		2016	Stuck after 1 nm. Repeated and then 2 nm.
513	11	**2003**	Tow moved because of a new marine cable. Position changed in station list 2004. Initial position: Begin 65°19'78-13°15'94 d:185. End: 65°20'05-13°08'72 d:204.
513	35	**2008**	Hoisted because of large catch mainly seaweed.
		2021	Strong tidal force out of the fjord.
523	11	**General**	IGS (SMB) tow. Stuck **1986** after 3.4 nm. Stuck **1988** after 1.5 nm at 65°08'50-23°51'04.
		2003	Fast eftir 2.0 nm.
		2010	Four attempts made 1) Stuck after 0.4 nm, torn leg wire. 2) Stuck shortly after begin. 3) Stuck after 1.4 nm. 4) After 2 nm torn leg wire. Tow omitted.
		2012	Stuck after 2.1 nm.
		2013	Repeated. Torn leg wire. Tow length 2 nm due to topography.
		2014	Stuck after 2.5 nm.
		2015	Stuck after 1.3 nm. Trawl torn. Repeated.
		2019	Stuck after 0.8 nm. Repeated.
523	31	**1998**	Difficult bottom around middle of tow path. Tow moved slightly SW . 3.4 nm.
		1999	Tow shortened due to difficult bottom. Stuck at 65°12'20-23°51'30, repeated at 65°10'60-23°20'60.
		2007	Bottom topography very rough. Position of tow changed in station list 2007 í manual 2007 using position from 2006. Initial position: Begin 65°12'03–23°15'95, depth 99 m. End 65°10'79–23°20'03, depth 68 m.
		2011	Stuck after 2.2 nm at 65°12'42-23°15'76.
523	36	**2010**	Stuck after 2.6 nm.
524	11	**2008**	Stuck after 2.2 nm.
		2017	Stuck after 2.5 nm.
524	12	**2009**	Stuck otter board after 0.9 nm loosened and tow completed.
		2012	Stuck after 1.3 nm loosened and continued but stuck again after 2.8 nm.
		2017	Stuck after 2 nm however loosened and tow completed.
527	1	**General**	IGS (SMB) tow. Stuck **1986** after 2.0 nm at 65°23'40-27°00'69.
		2010	Torn leg wire and repeated.
		2011	Stuck at 65°22'18-27°00'28.
		2012	Stuck after 2.7 nm.
		2018	Stuck after 0.3 nm. Repeated.
562	3	**General**	IGS (SMB) tow. Stuck **1992** after 3.2 nm, Direction 254° at 65°48'19-12°37'44.
		2003	Stuck after 2.4 nm at 65°48'92-12°30'30, direction 80° depth 145 m.
		2013	Stuck at the beginning of tow. Repeated and stuck by hoisting.
		2017	Stuck after 2.0 nm.
564	1	**2014**	Stuck after 0.6 nm. Torn leg wire. Repeated.
571	1	**2003**	Tow ended after 2.4 nm due to weather conditions.
		2006	Birgisvikurpollur. There is ruffle/break in the towpath at 65°55'45–21°04'74. Recommend to tow somewhat more easterly.
		2010	Tow toward SW. Over a break on the SW at 65°55'83-21°02'52

Sq.	Tow no	Year	Remarks
571	33	**2006**	Tow ended after 2.2 nm due to. Stationary nets squaring tow path.
		2009	Stuck after 2.3 nm.
571	34	**2013**	Stuck and repeated. Tow length 2 nm.
		2014	Stuck after 2.9 nm.
		2015	Stuck after 2.5 nm.
		2023	Arc-like tow path with direction 86-60 °
571	35	**2008**	Rough bottom.
		2009	Two riffles/breaks in tow path.
		2016	Tow length 1.2 nm direction 128° and 0.8 nm in direction 96°. It is recommended to tow toward W along the riffles/breaks.
		2023	Arc tow path direction 280-310 °
573	31	**2018**	Tow omitted
		2019	Tow moved new a new permanent position because of an MFRI research buoy.
574	1	**2006**	Recommended to tow northward.
		2017	Stuck otter board portside after 2.1 nm but loosened and tow completed.
574	31	**2006**	Recommended to tow northward.
		2021	Stuck after 1.8 nm.
575	1	**2019**	Stuck after 0.3 nm. Repeated.
575	3	**2021**	Stuck after 2.7 nm. Trawl intact but plenty of mud and boalders.
576	2	**2012**	After 1 nm hoisted and inspected. Tow continued.
		2017	Stuck after 1.5 nm. Loosened and tow completed.
615	1	**2019**	Stuck after 1.5 nm. Repeated.
617	35	**2009**	Tow shortened because of large catch.
		2010	Tow shortened because of large catch. Turn out to be seaweed and small haddock.
620	2	**2017**	Tow moved 300 fm W and N because of a longline squaring tow path. Tow ended after 2.8 nm because of a rough bottom.
621	14	**1999**	Tow moved. Begin 66°07’15-21°01’61; End 66°04’46-21°00’69. Initial position: Begin 66°04’96-21°06’05. End: 66°06’89-21°02’10.
		2008	Tow less than 3 nm. Change in station list and new position as in 2008.
		2010	Otter board portside stuck. Tow continued after some maneuvering. Stuck after 2.9 nm and ended. Recommended to tow toward south at 66°05’02-21°01’12 and 66°04’70-21°00’88.
		2021	Tow moved 0.6 nm north because of longline in tow path.
622	36	**2009**	Tow ended after 1.7 nm.
		2010	Recommended to tow towards SE.
		2013	At 66°05’13-22°42’35 turning portside to avoid a break occurring in the tow path.
		2023	Begin 500 fm W due to aquaculture sea cages.
622	37	**2023**	Tow began 600 fm to the west due to aquaculture sea cage at the end of tow path.
623	14	**2015**	Leg wire torn just before hoisting.
623	31	**1999**	Stuck at 66°12’00-23°51’30, repeated in direction 230°, 75 fm warp.
		2003	Stuck after 2.8 nm.
		2010	Stuck after 1.3 nm. Repeated.
		2012	Stuck after 1.4 nm. Trawl inspected and tow continued.
		2018	Stuck after 2.5 nm.
624	4	**2017**	Stuck after 2.0 nm.
		2022	Tow moved aside because of longline in tow path.

Sq.	Tow no	Year	Remarks
624	5	**2009**	Otter board stuck after 1.9 nm at 66°06'90-24°12'88, depth 54 m.
626	11	**2011**	Stuck after 2.2 nm. Strong countercurrent.
		2018	Stuck after 2.6 nm.
		2021	Stuck after 2.6 nm.
663	1	**2006**	Stuck after 0.7 nm at 66°39'70–13°05'47, direction 190°.
		2008	Stuck at 66°39'70-13°05'47.
665	3	**2003**	Stuck after 1.8 nm. Repeated.
666	11	**2012**	Stuck after 2.7 nm. Ended at 66°44'27-16°49'65. Mud.
666	14	**1998**	Stuck after 1.1 nm at 66°48'61-16°36'71.
668	3	**2010**	Stuck after 0.7 nm. Ended and repeated. Rough bottom. Headline fluctuating.
		2014	Stuck after 1.6 nm at 66°38'57-18°04'72. Headline wire torn. Repeated.
669	4	**2022**	Tow for 2.2 nm and moved somewhat due to longline in tow path.
670	12	**2012**	Stuck after 2.7 nm.
672	35	**2014**	Stuck after 0.2 nm but continued after inspection.
673	3	**2015**	Tow 2.0 nm because of longline in tow path.
673	13	**2019**	Stuck after 0,6 nm. Repeated.
674	12	**2015**	Legwire torn 0.1 nm before the end of tow.
		2019	Stuck after 2.1 nm.
674	16	**2003**	Stuck after 0.8 nm. After inspection tow continued.
		2010	Stuck but loosened and tow continued.
715	11	**2014**	Stuck after 2.7 nm. Legwire torn.
717	1	**2003**	Stuck after 2.4 nm.
		2018	Hoisted after 2.3 nm because of boulders in trawl.
719	2	**2014**	Stuck after 2.7 nm.
721	1	**2013**	Otter board stuck. Repeated.
721	11	**2018**	Stuck but tow continued after inspection.
723	11	**2017**	Stuck after 2.6 nm.

5.6.2 List of remarks on tows- deep-water area

Sq.	Tow no.	Year	Remarks
225	51	**2005**	Stuck after 1 nm, loosened and tow completed (2 nm).
		2016	Stuck after 2.8 nm.
270	61	**?**	Moved Eastward because of marine cable.
		2007	Stuck after 2.6 nm.
272	51	**2001**	Moved to shallower water. Ended in different stat. square but the initial code was kept. Positions changed in station list 2004. Initial position: Begin 63°00'50-22°20'20. End: 63°00'80-22°13'30.
273	51	**2001**	Moved to shallower water. Ended in different stat. square but the initial code was kept. Positions changed in station list 2004. Initial position: Begin 62°59'70-23°45'10. End 62°57'40-23°49'40.
274	62	**2007**	Hoisted after 2.5 nm because of a ruffle/ridge 20 m height.
		2018	Hoisted after 0.2 nm. Trawl torn and exchanged. Repeated.

Sq.	Tow no.	Year	Remarks
		2021	Position changed in station list 2021. Initial position: 62°40'97-24°58'96 (447m)/ 62°38'20-25°01'62 (516) Warps 470 fm
275	52	**2001**	Stuck at 62°54'00-25°10'10. Continued after inspection. Rough bottom and tow moved. Initial position Begin 62°52'40-25°13'90 (476m) /End 62°54'40-25°09'30 (497m) -Warps 550 fm.
312	1	**2006**	Stuck after 2. 0 nm.
312	51	**2020**	Stuck after 2.0 nm.
312	71	**2004**	Hoisted after 0.5 nm. A fiber optic cable in the tow path. Tow needs to me moved 1 nm to the south.
313	1	**2005**	Stuck after 2.5 nm.
		2014	Stuck after 2.5 nm.
315	51	**2001**	Tow moved to the west. Coral in the area could be moved even more north about 1 nm.
		2005	Trawl torn. Repeated.
		2013	Stuck. Repeated. Tow length 2.4 nm.
		2014	Stuck after 1.3 nm, 63°25'64-15°53'29. Continued after inspection.
		2017	Coral in trawl catch.
316	61	**2014**	Stuck after 1.3 nm loosened and tow completed.
317	61	**2001**	Moved to shallower waters to the east as in station list.
317	62	**2001**	Moved because of wrong position. Position in station list has been corrected.
318	51	**2001**	Moved to shallower waters and to the east. Position changed in station list **2004**. Initial position: Begin 631100-184200/ End 63°14'00-18°42'00.
		2005	Stuck after 2.8 nm.
		2008	Stuck after2.5 nm.
319	61	**2001**	Moved to the west in 2002. Position changed in station list 2004. Initial position: Begin 63°10'00-19°54'00/ End 63°13'00-19°54'00.
320	51	**2000**	The tow needs reconsideration because of rough bottom to the east of tow path.
		2001	Station moved up on the shelf break 0.8 nm SW.
320	61	**Gen.**	Tow in near proximity to an old (idle) marine cable (IceCan). Another fiber optic cable in the area.
		2014	Tow moved to the east. Tow path between marine cables, moved eastwards.
		2021	Tow changed in station list due to marine cables.
323	61	**2017**	Stuck at the end of tow. Some damages.
324	52	**2013**	Stuck at 63°21'59-24°15'51 after 2.2. nm.
		2017	Stuck when hoisting.
		2020	Moved appr. 2 nm SW 63°19'81-24°20'76 because of topography.
325	51	**2005**	Stuck after 2.7 nm. Leg wire torn.
325	52	**2015**	Stuck after 2.5 nm.
		2016	Stuck after 2.7 nm. Leg wire torn.
325	53	**2001**	Tow too easterly and therefore shortened about 2 nm (63°00'00-25°24'00/62°59'30-25°10'00). Station no.110
		2018	Towed for 2.8 nm and hoisted because of steep ridge.
		2020	Towed for 2.8 nm and hoisted because of steep ridge.
326	1	**1996**	Stuck after 2 nm at a ruffle. Next time tow in direction 180°.
		1997	Stuck after 1.3 nm. After three more attempts omitted.
		1998	Stuck after 2.2 nm. New position needs to begin more northwards.
		1999	Begin more northwards appr. At 641659, 260624.
		2001	Stuck and repeated.

Sq.	Tow no.	Year	Remarks
		2004	Position changed in station list 2004. Initial position: Begin 63°14'12-26°06'52 / End 63°12'20-26°11'63.
		2005	Stuck after 1 nm. Repeated.
		2006	Stuck after 2.6 nm. Torn Leg wire.
		2014f	Stuck after 2.8 nm but trawl intact.
326	3	**1996**	Stuck after 1.3 nm but loosened and tow completed.
		2001	Stuck after 2.1 nm.
		2005	Stuck after 2.6 nm. Torn sweeps.
		2014	Stuck after 0.6 nm.
		2019	Towed slowly due to short warps.
326	51	**2012**	Stuck at the end of tow. Torn leg wire.
		2013	Stuck after 2.1 nm at 63°29'12-26°16'84.
		2015	Stuck after 1 nm. Repeated by towing from the other end of the tow path.
		2016	Stuck and repeated.
		2017	Stuck after 2.4 nm. Torn leg wire.
		2018	Stuck after 2.3 nm. Torn headline wire.
359	1	**1997**	Uneven bottom at the middle of the tow path. Move 1.4 nm north.
		2001	Station moved 0.7 nm to the north in station list.
		2005	Stuck after 2.6 nm.
360	1	**2015**	Stuck after 0.6 nm. Repeated.
		2019	Stuck and trawl torn. Repeated.
361	71	**2000**	Stuck after 2.3 nm at 63°55'70-11°19'90.
362	1	**1998**	Stuck after 2.0 nm.
		1999	Stuck after 2.8 nm.
		2020	Stuck after 2.2 but loosened and tow completed.
362	51	**2001**	Stuck after 2.1 nm at 63°51'60-12°25'30, direction 26°.
362	61	**2014**	Stuck after 2.9 nm.
		2021	Stuck after 2.2 nm. Continued after inspection of trawl.
362	63	**2001**	Stuck after 2.1 nm at 63°51'60-12°33'70, direction 60°.
		2005	Stuck after 1.5 nm. Repeated.
363	61	**2015**	Stuck after 2.6 nm.
363	62	**Gen.**	This station has been problematic was in Sq. 362 remains the old number.
		2014	Stuck after 2.5 nm.
		2018	Stuck after 0.8 nm. Repeated.
364	51	**2001**	Moved to the west up on the shelf break (see station list).
		2002	Stuck after 2.1 nm.
		2013	Some coral.
364	52	**2000**	Stuck after 2.6 nm at 63°54'00-14°21'80, direction 50°.
		2013	Considerable amount of coral.
365	51	**2001**	Moved to west. See station list.
375	1	**2012**	Stuck after 2.8 nm.
376	2	**2010**	Stuck after 1.7 nm.
		2014	Stuck after 0.6 but loosened and tow continued. Considerable amount of coral.
		2015	Torn leg wire and other damages by hoisting.
		2016	Stuck after 2.4 nm.

Sq.	Tow no.	Year	Remarks
		2021	Stuck after 2.6 nm.
		2022	Considerable amount of coral.
		2023	Station omitted from stations list due to location in a protective area and coral catch.
376	3	**1996**	Stuck after half of towlength. Loosened and tow completed.
		2002	Stuck after 2.6 nm.
376	4	**2023**	Dead coral in catch.
377	2	**2012**	Stuck after 1.4 nm. Repeated.
		2014	Stuck after 0.6 nm. Repeated from the north end of tow path. Tow length 2.2 nm.
409	1	**2019**	Stuck after 2.2 nm but trawl intact.
409	2	**2014**	Stuck after 0.5 nm. Continued after inspection.
		2017	Stuck after 0.5 nm. Trawl damages. Repeated.
		2020	Stuck after 2.8 nm. Trawl damages due to boulders.
		2023	Considerable amount of mud in trawl.
412	2	**1999**	Stuck after 2.5 nm.
		2006	Stuck. Torn leg wire.
		2014	Stuck after 2.8 nm.
412	3	**1997**	Rough bottom at the north end. Begin 0.7 nm more to the south. Stuck after 2.4 nm.
		2000	Stuck after 2.6 nm.
412	51	**2001**	Stuck after 2.8 nm at 64°11'70-12°40'30, trawl damages.
		2005	Stuck after 2.5 nm.
412	61	**2000**	Stuck after 2.0 nm at 64°01'50-13°01'40/64°03'70-13°01'40.
		2001	Stuck after 2.4 nm.
426	1	**2007**	Stuck after 2 min. Repeated.
428	3	**2007**	Stuck after 2.5 nm.
460	1	**2014**	Stuck when hoisting.
461	2	**1998**	Stuck after 2.2 nm.
477	1	**1997**	Stuck after 2.1 nm.
		2014	A large catch of sponge. Small tore in trawl.
477	51	**2002**	Stuck after 2.7 nm.
		2012	Stuck and repeated.
478	4	**2014**	Stuck after 2.3 nm. Mud appr. 1 ton.
		2021	Stuck and repeated.
478	41	**2005**	Considerable amount of mud.
		2008	Large catch of sponge.
		2014	Appr. 2 tons of sponge.
		2015	Stuck after 2.1 nm. Appr. 1 ton of sponge.
478	44	**1999**	Stuck after 2.3 nm. Trawl damages. Appr. 2 tons of sponge.
		2002	Stuck after 2.0 nm.
		2014	Appr. 3 tons of sponge.
511	3	**1997**	The tow was turned for more even depth during towing.
		2002	Stuck after 2.1 nm.
511	21	**2003**	In proximity to an old marine cable (telephone cable) . In 2003 new fiber optic cable has been laid nearby the old cable.
		2023	Fiber optic cable at the end of tow path.
527	2	**1996**	Better bottom conditions beneath 490 m.

Sq.	Tow no.	Year	Remarks
		1998	Stuck after 2.1 nm.
		1999	Stuck after 2.2 nm.
		2005	Towing wire torn. Tow repeated.
		2007	Coral in catch.
		2012	Stuck and repeated. Towlength 2.1 nm.
		2014	Stuck after 1.2 nm. After inspection tow continued.
528	1	**2001**	Stuck after 0.6 nm at 65°05'20-28°12'80. Repeated.
		2012	Large catch of sponge.
		2018	Stuck after 2 nm.
		2020	Stuck after 2.7 nm.
528	2	**2014**	Stuck after 2.1 nm.
		2017	Stuck after 2.0 nm. Trawl damages.
528	5	**2014**	Stuck at 65°26-28°21. Tow continued after inspection.
528	6	**2006**	Stuck and repeated.
		2012	Stuck and repeated.
		2014	Stuck after 2.6 nm.
		2015	Stuck at begin. Repeated.
		2016	Stuck after 2.3 nm.
		2019	Some stains on warps but loosened quickly.
528	7	**1999**	Stuck after 2.4 nm.
		2005	Leg wire torn after 1 nm. Repeated.
528	8	**2012**	Stuck after 1.4 nm. Repeated.
		2017	Stuck. Leg wire torn. Repeated.
529	21	**1996**	Strong current.
		1997	Stuck after 1.0 nm but continued.
		1998	Stuck in mud. Tow omitted.
		2000	Stuck after 2.2 nm at 65°30'6-29°04'5, direction 330°.
		2001	Stuck after 0.4 nm. Repeated but difficulties. Towlength 2 nm.
		2006	Stuck after 2.1 nm.
		2014	Stuck after 2.4 nm.
		2015	Stuck after 2.7 nm.
		2016	Stuck in hoisting. Trawl some damages.
561	4	**1997**	Stuck after 2.3 nm. Loosened and continued. Wing torn.
		2004	Stuck after 2.0 nm.
		2005	Stuck after 2.5 nm- some lava ridge in tow path.
		2006	Hoisted after 2.7 nm because of a ridge in tow path.
		2012	Stuck after 1.4 nm. Repeated.
		2022	Moved appr. 0.5 nm because of rough tow path.
576	71	**2001**	Stuck after 2.3 nm. Torn leg wire.
		2015	Stuck after 2.8 nm. Trawl damages. Strong countercurrent.
577	1	**2011**	Hoisted after 2 nm. Torn sweeps.
		2021	Stuck after 0.6 nm. Loosened and tow continued.
577	5	**2012**	Stuck after 2.9 nm.
		2014	Stuck after 0.6 nm. Tow continued after inspection.
		2015	Stuck after half tow length, loosened and tow continued.

Sq.	Tow no.	Year	Remarks
577	7	**2000**	Complications with tow.
		2005	Stuck after 2.3 nm.
		2018	Stuck after 2.8 nm.
		2020	Stuck after 2.7 nm.
577	8	**2014**	Stuck after 2.1 nm. Repeated.
577	11	**1999**	Stuck after 2.2 nm.
		2000	Torn and invalid. Tow omitted.
		2004	Torn. Repeated.
		2005	Stuck after 2.8 nm. Some damages.
		2011	Not stuck but trawl damages. Repeated.
		2021	Stuck after 2.4 nm.
577	41	**2017**	Stuck after 2.7 nm. Trawl damages.
		2021	Stuck by hoisting but trawl was intact.
		2022	Towed 1 nm more to the west.
		2023	Begin 0.5 nm more west because of rough bottom at the eastside of tow path.
577	42	**2007**	Stuck two times. Repeated. Tow length 2.2 nm.
		2014	Stuck after 2.5 nm.
578	3	**1996**	Rough bottom.
		1997	Tow moved.
		1998	Stuck after 2.3 nm.
		2000	Stuck after 2.3 nm at 65°57'2-28°15'8, direction 332°.
		2001	Begin 0.5 nm north.
		2012	Stuck after 2.1 nm.
578	4	**2002**	Stuck after 2 nm.
		2004	Stuck after 2.5 nm.
		2017	Stuck after 2.1 nm. Torn leg wire.
		2020	Stuck after 2.1 nm.
578	6	**1999**	Stuck after 2.2 nm.
		2001	Stuck after 0.4 nm. Repeated.
		2007	Stuck after 2.2 nm.
		2012	Stuck after 2.9 nm.
		2014	Stuck after 2.2 nm.
		2015	Stuck after 2.4 nm.
		2017	Stuck after 2.5 nm. Torn leg wire.
		2020	Stuck after 0.3 nm. Repeated.
612	1	**2006**	Stuck after 0.8 nm and repeated. Hoisted after 2.7 nm.
626	1	**2020**	Stuck after 2.8 nm.
627	1	**2018**	Trawl damages. Tow repeated.
628	1	**2011**	Trawl damages. Tow repeated.
		2014	Stuck after 0.5 nm. Loosened and repeated. Stuck after 2.8 nm.
674	1	**1998**	Stuck after 2.1 nm.
		2000	Stuck after 2.3 nm at 66°49'8-24°55'9, direction 10°.
		2005	Stuck after 2.8 nm.
		2012	Stuck after 2 nm.
		2019	Stuck. Otter board stuck in mud after 2.7 nm.

Sq.	Tow no.	Year	Remarks
		2021	Stuck after 1.4 nm. Repeated.
675	1	**2018**	Leg wire torn and tow repeated.
676	1	**2004**	Stuck after 1 nm. Continued after inspection.
		2014	Stuck after 2.4 nm.
		2020	Stuck after 2.6 nm.
676	2	**2014**	Stuck after 2.9 nm.
		2016	Stuck after 2.6 nm.
715	2	**2016**	Stuck after 1.2 nm. Repeated.
717	1	**1998**	Stuck after 2.7 nm.
		2002	Stuck after 2.8 nm.
		2015	Stuck after 0.6 nm. Trawl damages. Trawl exchanged and tow repeated.
		2020	Hoisted after 2.0 nm because of stationary nets in the tow path.
		2021	Bad ridge at the east end of tow path. Move tow 0.5 nm W.
721	2	**1997**	Stuck after 2.4 nm. Loosened and continued.
		2007	Stuck after 2.4 nm.
		2014	Stuck after 2.0 nm.
		2020	Hoisted after 2.0 nm because of stationary nets in tow path.
724	2	**2008**	Stuck after 2.6 nm but loosened. Some damages to trawl but tow valid.
768	1	**2021**	Omitted due to limitations of tow strength.
		2022	Omitted due to limitations of tow strength.
768	2	**1996**	Stuck after 2.6 nm.
		1999	Stuck after 2.0 nm.
		2000	Stuck after 2.6 nm.
		2008	Stuck after 2.9 nm.
		2014	Tow should in direction SE. NW direction is problematic.
		2015	Stuck after 2.5 nm.
		2018	Stuck after 2.5 nm.
		2020	Stuck after 2.0 nm.
		2021	Stuck after 2.2 nm.
769	3	**2002**	Stuck after 2.8 nm.
770	3	**2020**	Stuck after 2.0 nm. .
771	3	**2023**	A large amount of mud in codend.
771	21	**2021**	Moved to north because of stationary nets in tow path.
818	1	**2021**	Omitted due to limitations of tow strength.
		2022	Omitted due to limitations of tow strength.
		2023	Omitted due to limitations of tow strength.

6 Description of sampling gear

Two variations of the standardized bottom trawl type Gulltoppur are used for sampling: “Gulltoppur” is used in shelf area no. 77 (chapter **6.1**) and “Gulltoppur 66.6 m” no. 78 (chapter **6.2**) is used for deep water.

Each trawl has a unique ID number identified by a plate that is fastened to the headline of the trawl.

Replacement parts are listed in chapter **6.3.** in the Icelandic version of this manual. It is expected that the cruise leader and crew maintain bookkeeping about replacements.

Instructions on how to clean up and pack the trawl at the end of the survey are given in chapter **6.4.**

6.1 Sampling gear shelf-area (fishing gear no. 77)

For the shelf area a standardized bottom trawl of type "Gulltoppur" is used (Figures 8.-15). It is of utter importance that the sampling gear is assembled according to the figures in a correct manner. When onboard the cruise leader should oversee measurements of the trawl.

Detailed list of parts of the fishing gear can be found in the Icelandic version of the manual.

The measurements of main parts of the trawl are as followed:

Headline is 31 m. The fish line is 19.6 m. The footrope is 35 m whereof the bobbins footrope is 18.3 m weighing about 2150 – 2350 kg. The sweeps are 45.75 m (25 fm) + 18.3 m (10 fm) . When filling out the station sheet, a value of 35 fm should be entered for sweeps.

The otter boards are of type “Poly-Ice” type no. 7, weighing about 1950 kg each without backstrops. Backstrops are 9 m (6 m + 3 m extension)

The meshes of the trawl net are smaller than in an ordinary commercial bottom trawl. The front section of the trawl has a mesh size of 135 mm, the middle section (belly) 80 mm and the codend is covered inside with a 42 mm net. The lower parts (lower wings and first panel of lower belly) of the net have a double netting.

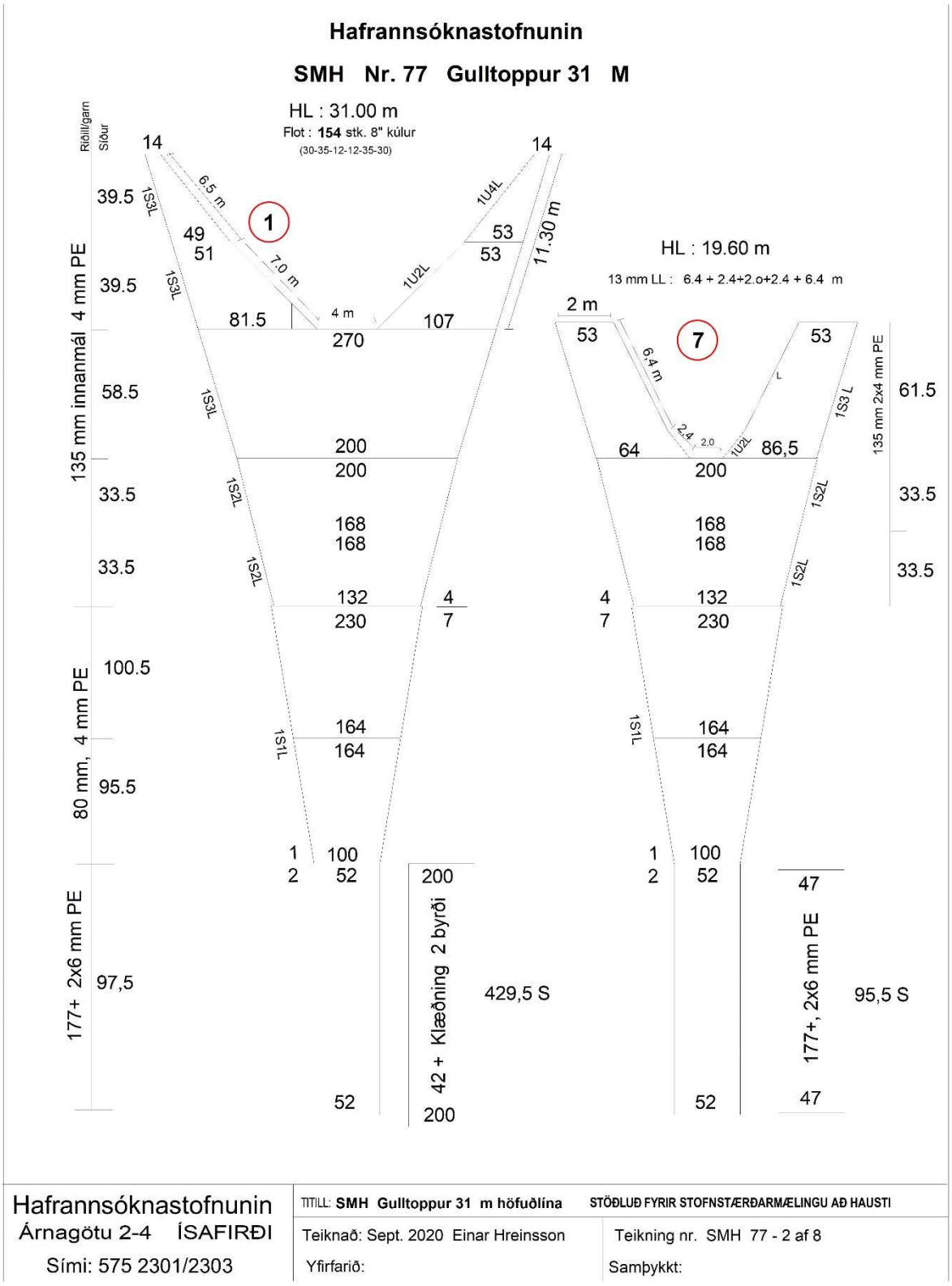


Figure 8. *Standardized bottom trawl no. 77 for use in Icelandic Autumn Groundfish survey - Shelf area. Main drawing.*

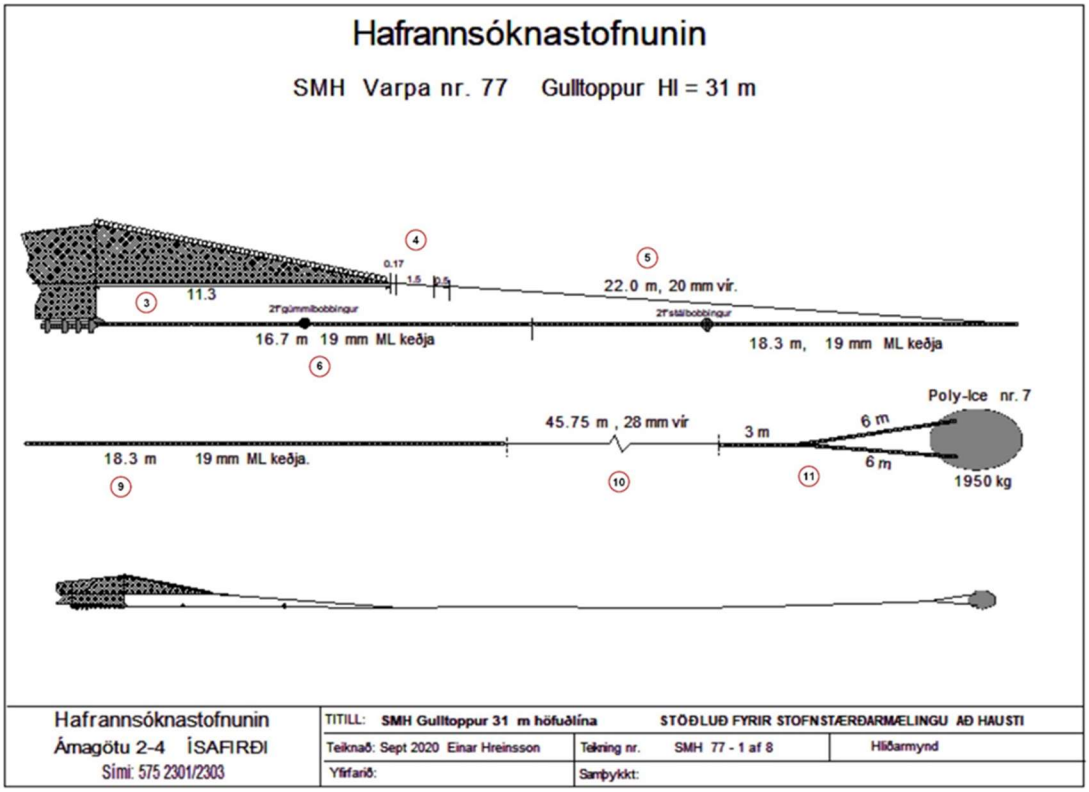


Figure 9. *Standardized bottom trawl no. 77 for use in Icelandic Autumn Groundfish survey - Shelf area. Side view (from square to ross).*

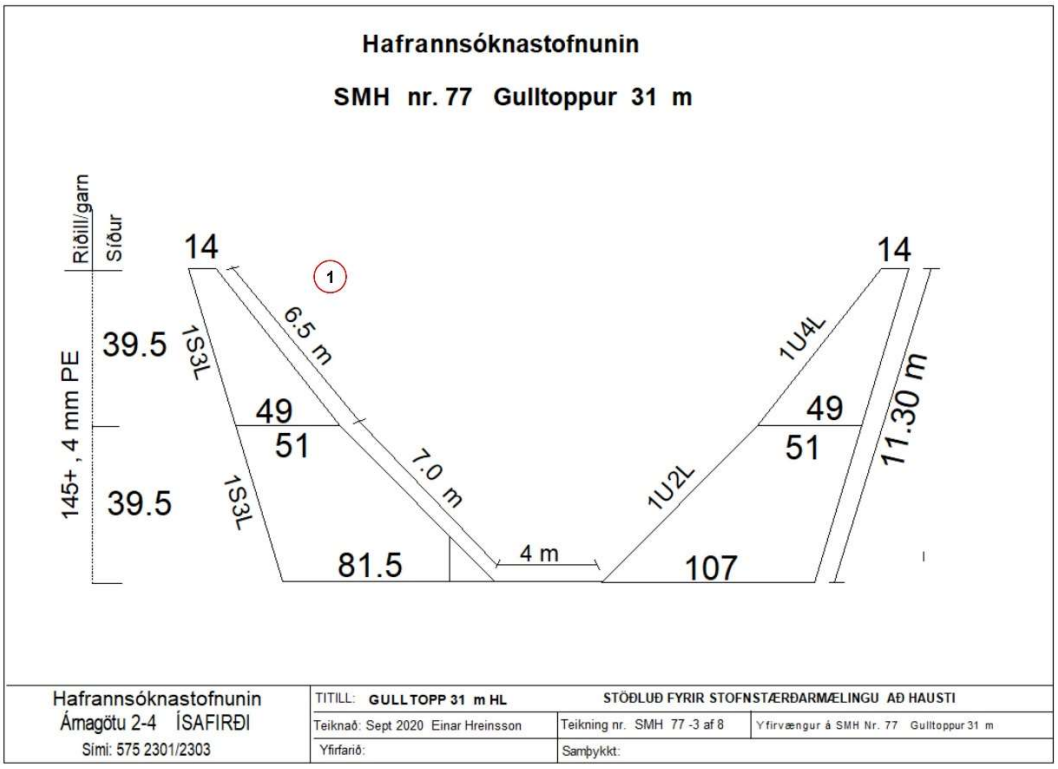


Figure 100. *Standardized bottom trawl no. 77 for use in Icelandic Autumn Groundfish survey - Shelf area. Top wing details.*

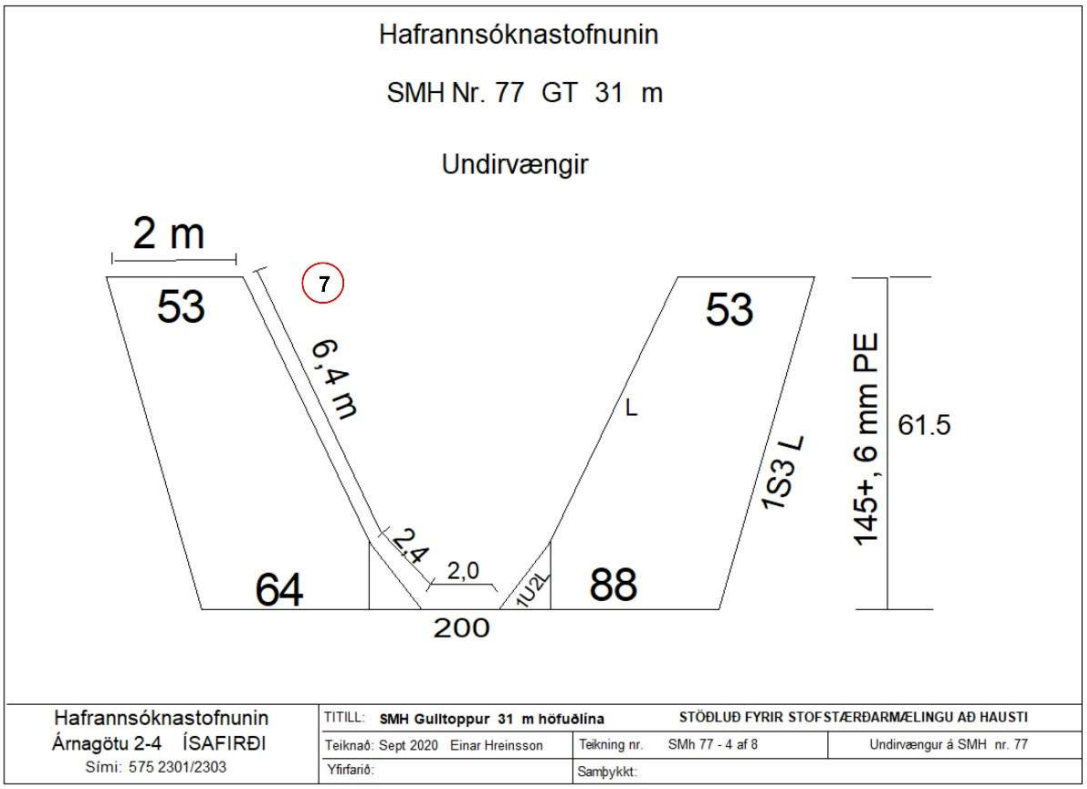


Figure 111. *Standardized bottom trawl no. 77 for use in Icelandic Autumn Groundfish survey - Shelf area.* Bunt details.

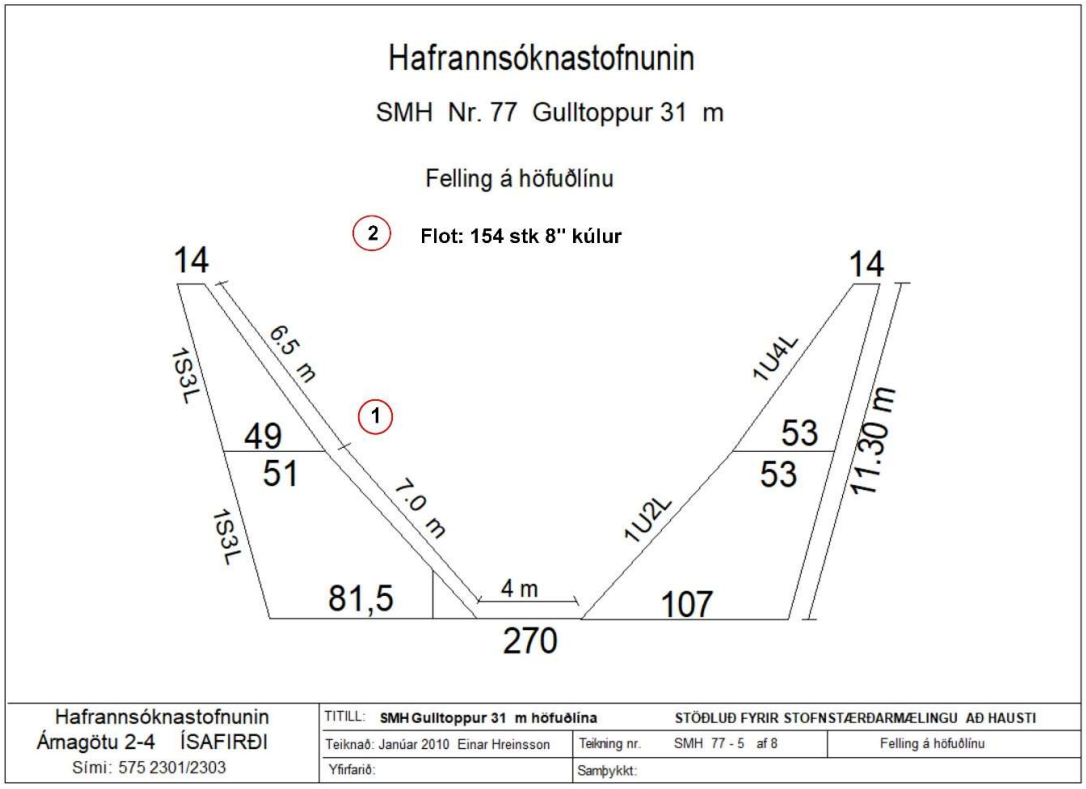


Figure 122. *Standardized bottom trawl no. 77 for use in Icelandic Autumn Groundfish survey - Shelf area. Hanging of headline.*

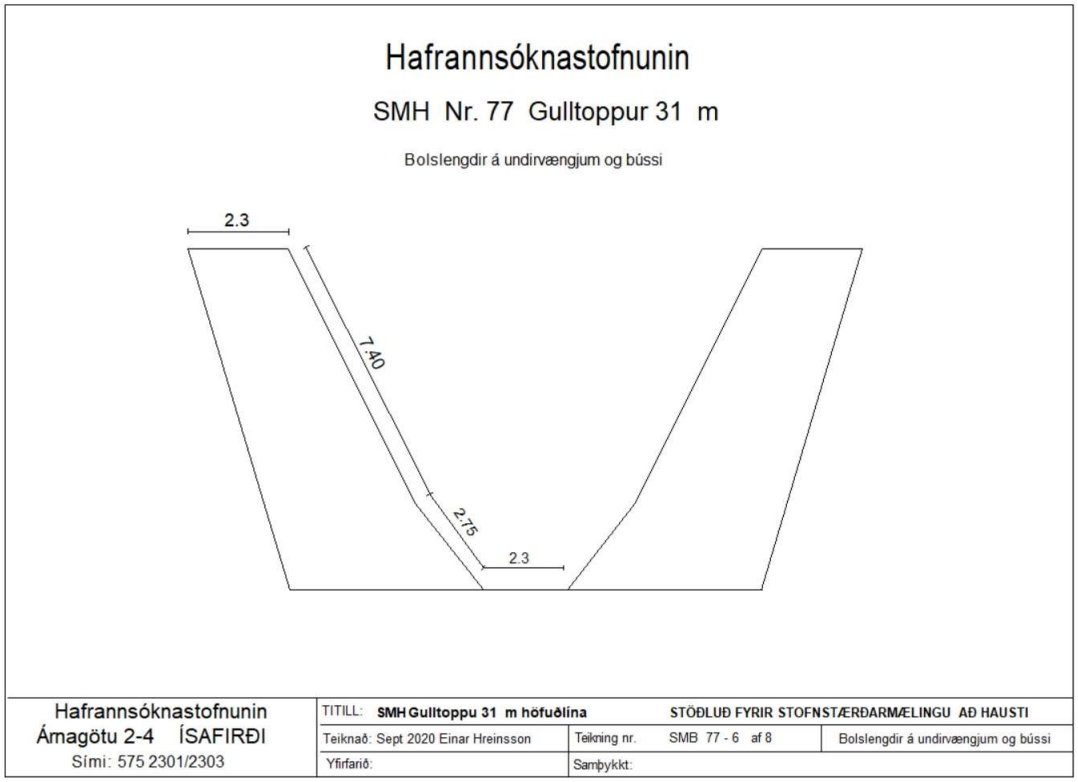


Figure 133. *Standardized bottom trawl no. 77 for use in Icelandic Autumn Groundfish survey - Shelf area.*

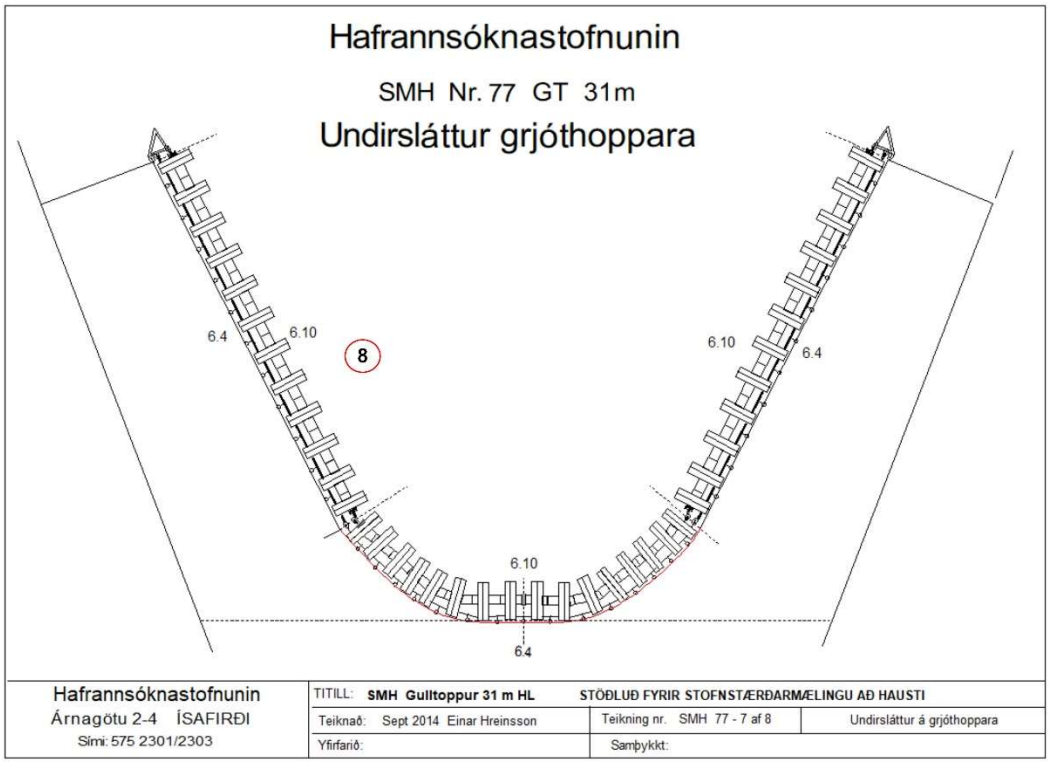


Figure 144. *Standardized bottom trawl no. 77 for use in Icelandic Autumn Groundfish survey - Shelf area. Footrope attachment*.

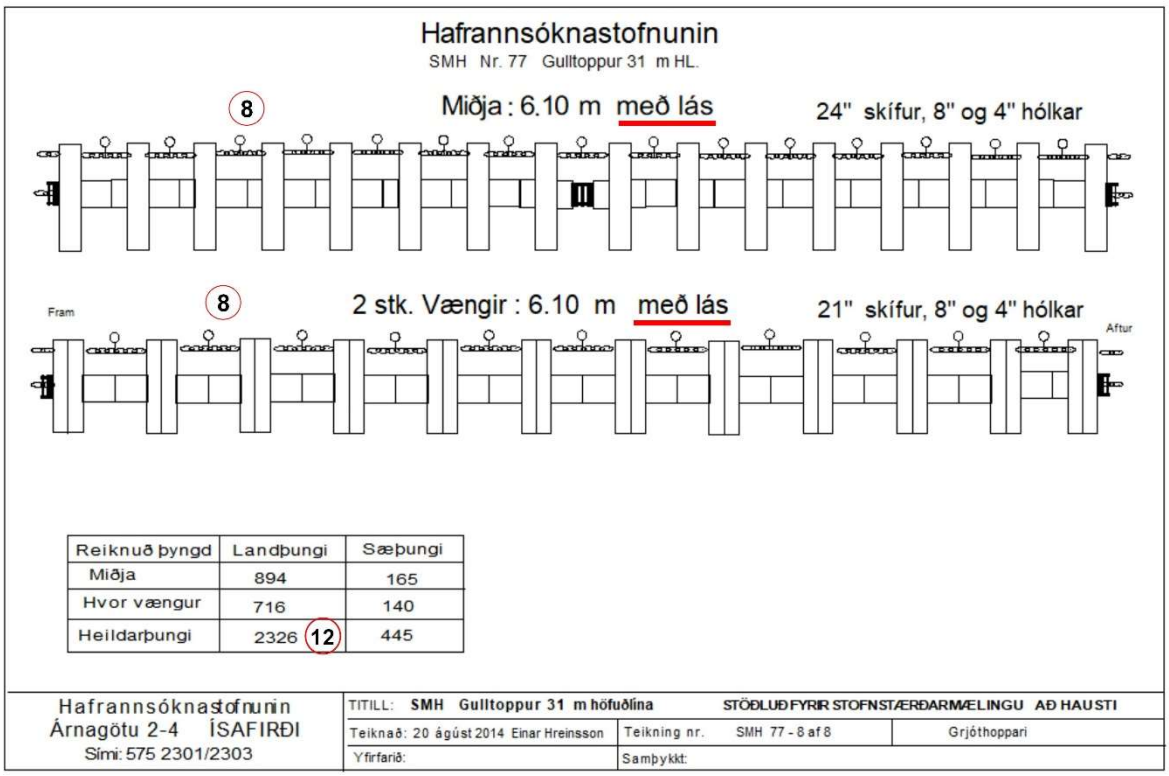


Figure 155. *Standardized bottom trawl no. 77 for use in Icelandic Autumn Groundfish survey - Shelf area. Footrope.*

6.2 Sampling gear deep-water area (fishing gear no. 78)

For the deep-water area a standardized bottom trawl of type "Gulltoppur 66.6 m" is used (Figures 16 - 23). It is of utter importance that the sampling gear is assembled according to the figures in a correct manner. When onboard the cruise leader should oversee measurements of the trawl.

Detailed list of parts of the fishing gear can be found in the Icelandic version of the manual (https://www.hafogvatn.is/static/research/files/handbok_smh_2024.pdf).

The measurements of main parts of the trawl are as followed:

Headline is 35.6 m. The fish line is 22.6 m. The footrope is 35 fm whereof the bobbins footrope is 18.3 m weighing about 2600–2800 kg. The sweeps are 65.5 m. When filling out the station sheet, a value of 36 fm should be entered for sweeps.

The otter boards are of type “Poly-Ice” type no. 8, weighing about 2700 kg each without backstrops. (backstrops 4.6+7.5=18.1 m).

The meshes of the trawl net are smaller than in an ordinary commercial bottom trawl. The front section of the trawl has a mesh size of 135 mm, the middle section (belly) 80 mm and the codend is covered inside with a 42 mm net. The lower parts (lower wings and first panel of lower belly) of the net have a double netting

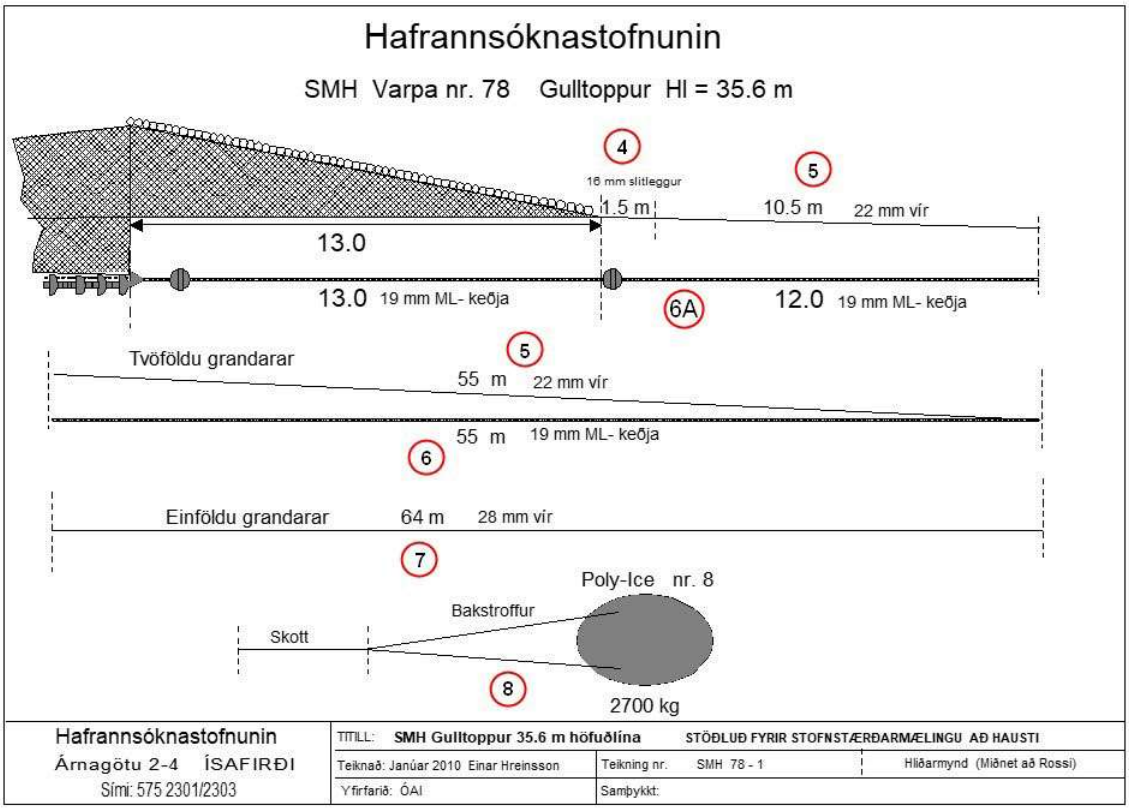


Figure 166. *Standardized bottom trawl no. 78 for use in Icelandic Autumn Groundfish survey – Deep-water area.* Side view from square to ross.

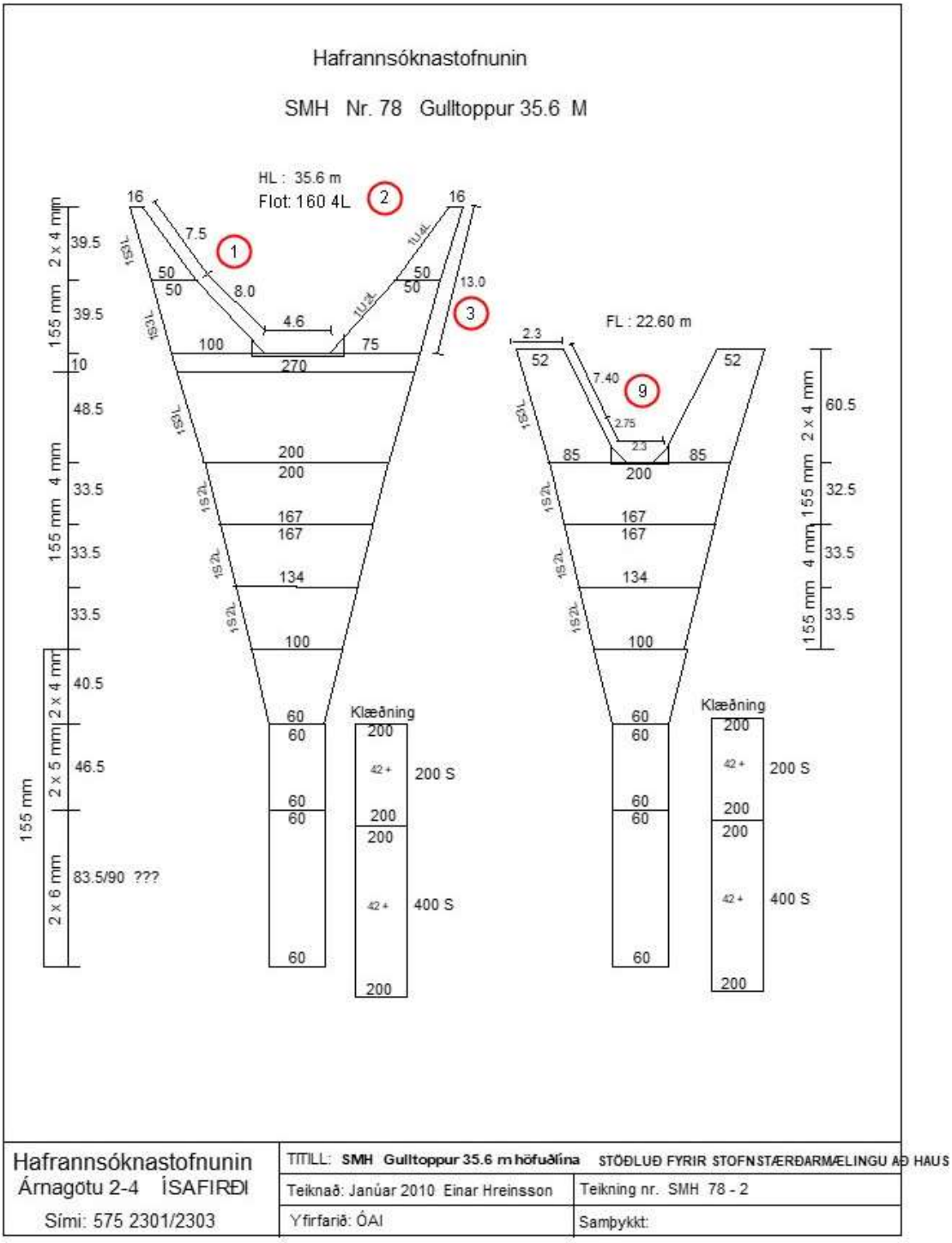
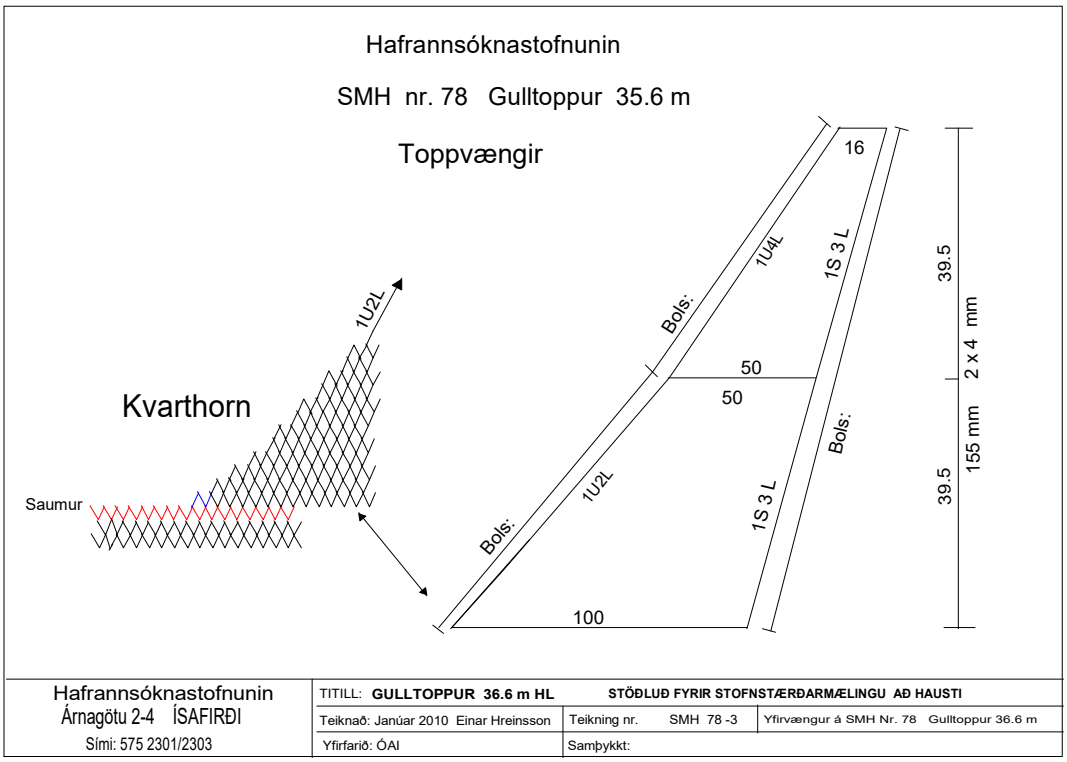


Figure 177. *Standardized bottom trawl no. 78 for use in Icelandic Autumn Groundfish survey – Deep-water area*. Main drawing.



Mynd 188. *Standardized bottom trawl no. 78 for use in Icelandic Autumn Groundfish survey – Deep-water area. Topwing details*.

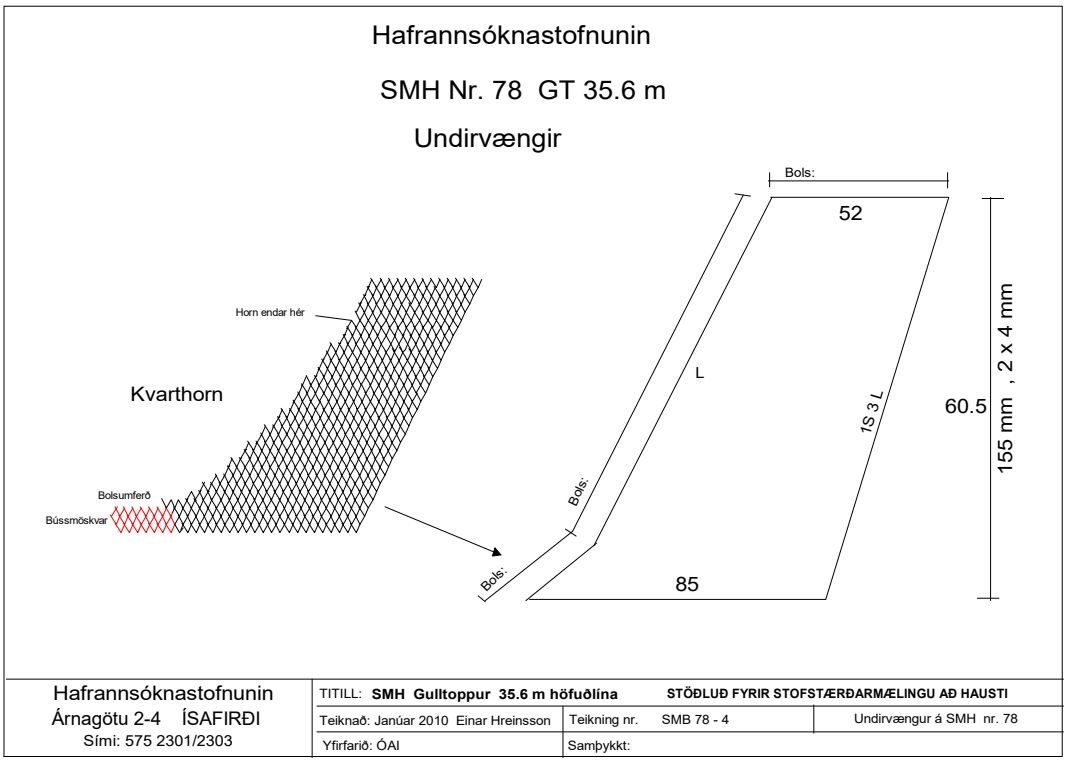


Figure 199. *Standardized bottom trawl no. 78 for use in Icelandic Autumn Groundfish survey – Deep-water area*. Bunt details.

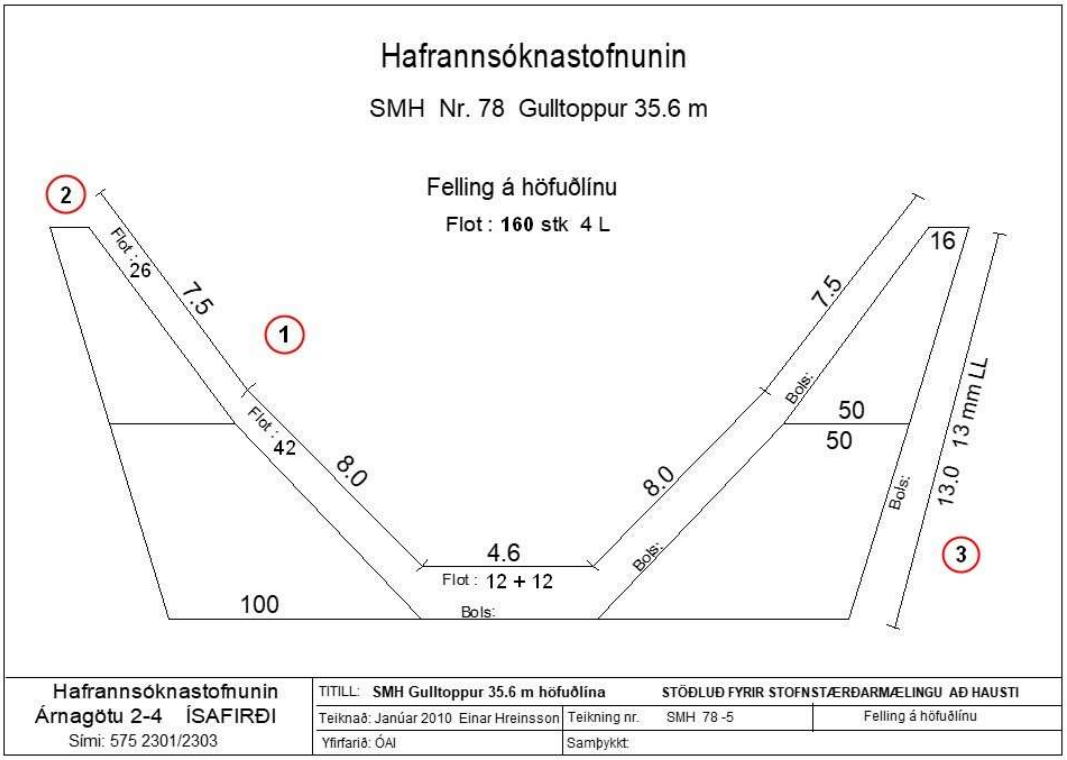


Figure 200. *Standardized bottom trawl no. 78 for use in Icelandic Autumn Groundfish survey – Deep-water area. Hanging of headline*.

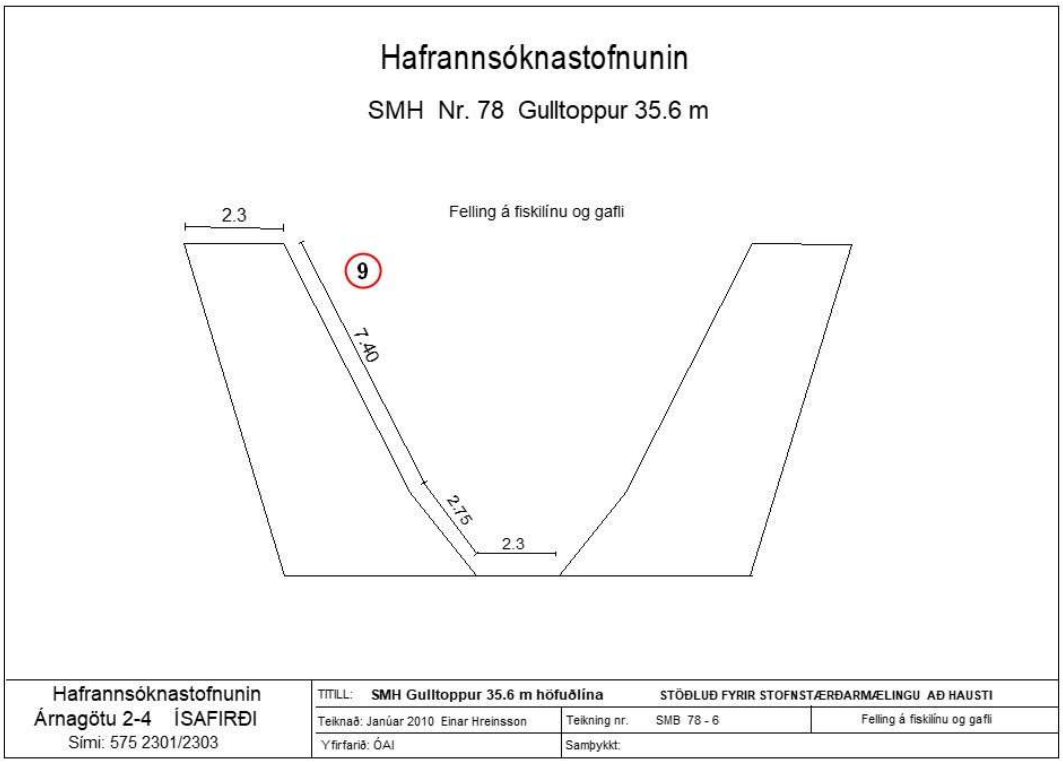


Figure 211. *Standardized bottom trawl no. 78 for use in Icelandic Autumn Groundfish survey – Deep-water area. Hanging of fish line*.

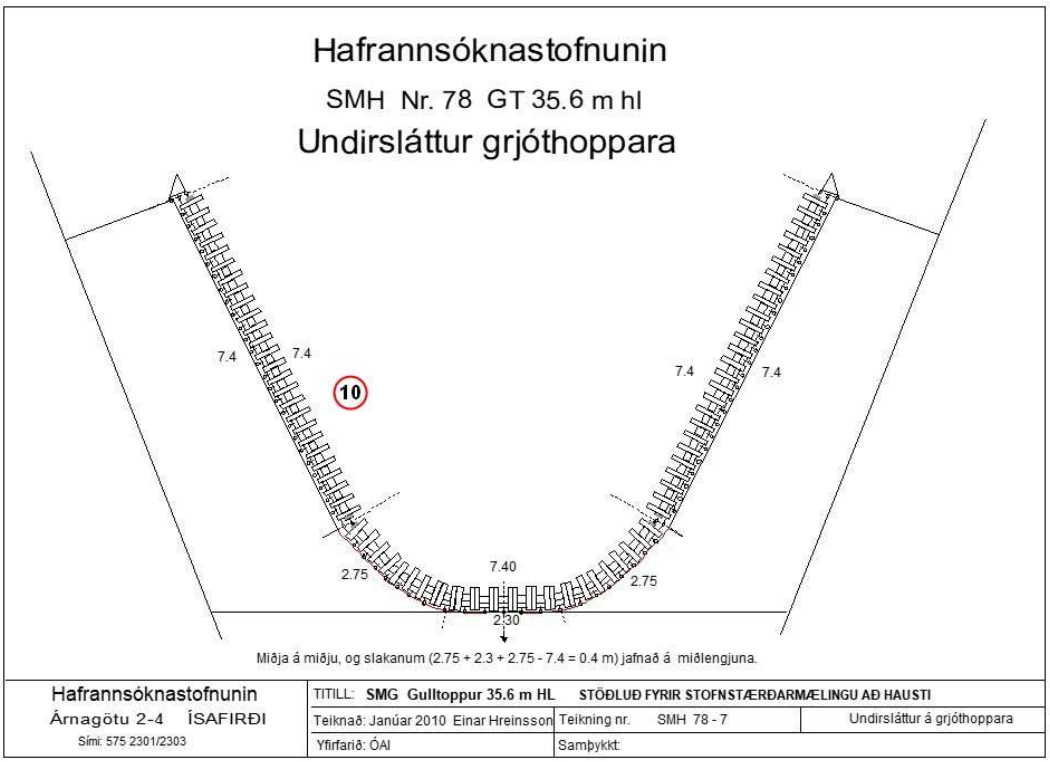


Figure 222. *Standardized bottom trawl no. 78 for use in Icelandic Autumn Groundfish survey – Deep-water area. Footrope attachments.*

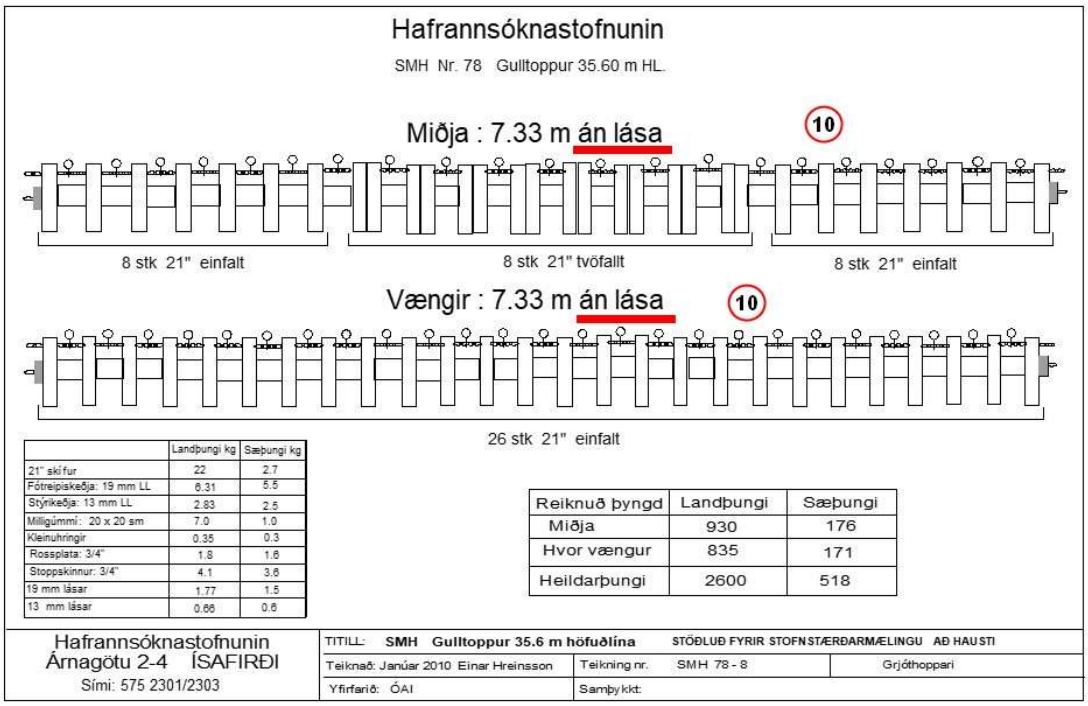


Figure 233. *Standardized bottom trawl no. 78 for use in Icelandic Autumn Groundfish survey – Deep-water area. Footrope.*

6.3 Fishing gear replacement parts

List over spare and replacement parts can be found in chapter 6.3 in the Icelandic version of the manual.

Crew and cruise leader do a bookkeeping of replacement parts.

6.4 Finishing and packing the trawls

Once the last station has been taken, the trawls must be towed at the surface for 10-15 minutes (with the sweeps) with both the inner and the outer bags open. This is done to flush the trawls and get rid of sand, mud, and various organic material before the trawls are put in storage.

When packing the trawls, stretch them well and securely tie the ropes around them. This is necessary because it is often difficult to get them out of the containers because everything sometimes collapses from the ropes. Preferably, wing ends should be tied together.

It is good to mark footropes and ross with their trawl number. It should be sufficient to mark one trawl in each container. This would simplify the follow-up of the condition of bobbins and other accessories. The number of the trawl can e.g. been written with a permanent marker on a torn material from old sea clothes.

The cruise leader keeps record of the number of tows taken with each trawl, and damage that has occurred. The condition of the trawls at the end of the cruise should also be reported.

7 References

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https://www.hafogvatn.is/static/research/files/fjolrit-131.pdf

Appendix 1: Temperature recorders and calibration of ship sensors

Pre-calibrated recorders from Star-Oddi (Starmon TD) are used to log temperature and depth during the tows. Scanmar/Marport sensor data are also logged and used to fill out the station sheet. To be able to calibrate the Starmon TD and Scanmar/Marport data against each other, the following procedure should be followed:

Sensors:

The main sensor used are the Starmon TD – large stainless steel housing. It will remain on the trawl for the entire tour and has to be swapped between the trawls in use. Starmon TD sensors are delivered on board in measurement mode and will take a measurement every minute. No setup required.

- A spare sensor (Starmon mini – small stainless housing) is provided in case of loss of the main sensor. It will have to be started using the SeaStar program and provided cable.

Calibration:

- The cruise leader will select 2 stations during the survey half, if possible one station in cold and one in warmer sea water). A provided Excel template is used to register the temperature of the trawl and trawl-door sensors (over a period of at least 10 minutes in one minute intervals) after the trawl has settled on the bottom (comparing bottom temperature). When the trawl is hauled at this station it has to be held at the surface for at least 5 minutes (comparing surface temperature) and the measurements entered in the Excel sheet.
- *An Excel sheet can be found with other data provided to the cruise leader.*
- Ensure that the date, time and station for the entries in the Excel sheet are correct.
- The comparison and adjustment of temperature will happen after the cruise.

Cruise leaders should have the newest version of SeaStar installed on their computer, should the need arise to set up the spare Starmon sensor.

Appendix 2: Collecting data from trawl sensors

On RV Árni these information are loaded via *Hafriti*. On the hired trawlers a computer is connected to Instructions on how to connect a PC to trawl sensor instruments in the wheelhouse, and how to use Hyper Terminal to collect and save text strings of data from the sensors. The text strings include information on e.g. time, position, temperature, vertical opening of the trawl and distance between otter boards. See further information in the Icelandic version of this manual.

Appendix 3: Quality control by cruise leaders

It is important that data are preliminary analysed at sea so that errors or incorrect methods can be corrected in time. The following are suggestions for a minimum data-scrutinization by cruise leaders. This check is best done in SeaScale or in programs such as R and Excel. In recent years, the inhouse-made „Dashboard of Icelandic Surveys“ (*smxapp*) based on R has been used to visualize and scrutinize the data. It is important to do a proper checkup during the survey. That is because it can be easier to follow up on errors, problems in sampling or possible malfunctions.

Following are the minimum data inspection requirements by cruise leaders.

Length measurements:

Check maximum and minimum lengths for all species and compare them to limits allowed in *Hafvog*. The *smxapp* will list weight values outside acceptable limits.

Check station information in *Hafvog* e.g. if all species of fish are measured for length (there should be no species where only numbers are counted).

Otoliths and maturity determination:

Scan data for fish collected for otoliths. Is there something ”abnormal” e.g. many sexually mature small fish, , big and immature fish, inconsistency between shifts etc. Discuss all discrepancy in maturity identification with researchers.

Weights:

Check length-weight relationships graphically. Are there many fish outside confidence limits? This could happen e.g. if the weighing scale is incorrectly calibrated, or if the person doing data entry enters weight before the weighing scale is stable. The *smxapp* lists values outside acceptable limits based on adjustments in *Hafvog*.

Numbers:

Make sure that all counting of fish above >100 are registered in the notebook. Compare abnormally high numbers in *Hafvog* with numbers written in the notebook.

Make sure that methods for counting fish from large tows are properly conducted (e.g. number of subsamples).

Notes and counting in notebook:

Check if account has been taken to comments in the notebooks, e.g. if counting data is missing or significant corrections written in the notebook have not been made in *SeaScale*. It has happened that corrections listed in notebooks have not entered the MFRI database.

Total catch:

See if estimated (weighted) total catch is in accordance with weight calculated by *SeaScale*. If there is a large difference, the cause must be ascertained, e.g. if sampling was skewed or something is wrong with counting of fish.

Stomach analyses:

Scroll through prey of fish collected for otoliths in *Hafvog*, abnormal numbers and weights of prey groups etc. There should be no negative values. The *smxapp* provides lists and figures that should be used to search for errors e.g. abnormal mean weight of prey and high stomach fullness.

Species identification:

Check species composition at each station, especially look for species that are ”unexpected” for that station. Also, if species that have always been recorded before do not exist this year – and then whether possibly a different species appears that has not been seen before.

Station information:

At the end of the cruise, or 2-3 times during the cruise (or before data are sent to data manager): Extract all station- and tow data into a table. Look for suspicious values, or missing data which should be included.

Check if the combination Square-tow number (e.g. 416-11) has unique values.

Check carefully if registrations of tow information and environmental factors (e.g. wind speed and units for sea) made by captains, are according to instructions in this manual. Check if the correct units are used.

Plot environmental factors and tow information graphically Are vertical opening, horizontal opening etc. similar to earlier years? Check plots for station information and location of tows in the *smxapp*.

Check dates and timings around midnight. Occasionally, a station is started in *Hafvog* before midnight whereas the haul starts after midnight, and vice versa. The time when the trawl sets at the bottom decides the date.

Appendix 4: List of participants in IAGS 2025

Shallow area Trawler: Þórunn Sveinsdóttir VE-401/ Cruise ID: TTH2-2025

Cruise leader: Valur Bogason
Alex Rafn Elfarsson
Elzbieta Baranowska
Gunnhildur V. Bogadóttir
Hrefna Zoëga
Auður Súsanna Bjarnadóttir
Eydís H. Njarðardóttir
Sólrún Sigurgeirsdóttir
Svandís E. Aradóttir

Deep-water area : R/s Árni Friðriksson HF-200/ Cruise ID: A13-2025

Cruise leader: Jón Sólmundsson
Ásgeir Gunnarsson
Magnús Thorlacius
Sigurlína Gunnarsdóttir
Svanhildur Egilsdóttir

Deep-water area: Trawler: Breki VE-61/ Cruise ID: TB2-2025

Fyrri hluti

Cruise leaders : Klara Jakobsdóttir (first half)/Kristján Kristinsson (Second half)

Hlynur Pétursson
Jón Sólmundsson
Kristín J. Valsdóttir
Orla Mallon
Sif Guðmundsdóttir

Appendix 5: Vessels, net loft and contacts

Breki VE-61 (registration number 2861)
Phone: Bridge: 6808861
Company: Vinnslustöðin, Vestmannaeyjum.
Fleet manager: Sverrir Haraldsson: 8698681 sverrir@vsv.is

Þórunn Sveinsdóttir VE-401 (registration number 2401)
Phone: Bridge: 891-7763
Company: Vinnslustöðin, Vestmannaeyjum.
Fleet manager: Sverrir Haraldsson: 8698681 sverrir@vsv.is

R/s Árni Friðriksson HF-200 (registration number 2350)
Phone: Bridge: 893-5024 / 412-1111 Crew 851-2087 / 412-1106 / 412-1107

Gear management
Hampiðjan – Netaverkstæði Ísafirði
Phone: 470-0830
Snorri Sigurhjartarson 856-0832

Research vessel and gear
Bárður Jón Grímsson. Phone: 892-2922

IAGS inhouse project number is 9120.