ESTONIAN SVALBARD EXPLORATORY SURVEY

RESEARCH REPORT

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1. INTRODUCTION

Estonia has been the Contracting Party to the Svalbard Treaty since 1930 Soviet occupation interrupted Estonian national activities and international co-operation to develop sustainable use and conservation of the marine living resources including the fish in the Svalbard Archipelago Protection Area. After regaining independence in 1991 Estonian fisherman continued the interrupted fishing operations in the area.

Estonia is an active member of ICES scientific community contributing a lot of effort in developing the fisheries science covering the Baltic fishery resources. At the same time Estonian Fisheries Administration is encouraging the distant water fisheries research, and first of all the research in connection to the Conventions and Agreements, Estonia is a Contracting Party to. In addition to ICES, Estonian scientists are increasingly active under the frame of the NAFO Scientific Council.

Estonian Fisheries Administration is sharing the deep concern of the ICES Community and the Svalbard Treaty Contracting Parties in connection to the status of the Greenland halibut stock in ICES Sub-area I, and is aware of Estonia's responsibility under the Svalbard Treaty to contribute into the fisheries research, more efficient conservation and the sustainable use of fish resources in the Svalbard Archipelago Protection Area. The Estonian Arctic Exploratory Survey in 2002 was the first step in this important direction.

2. AIM OF THE EXPLORATORY SURVEY

The aim of Estonian Exploratory Survey was to expand the fish stocks research into the Svalbard area in order to contribute to the international efforts in fish stocks research and resource conservation. The Estonian exploratory survey was planned in order to obtain recent data on fish species composition, spatial distribution and relative abundance in the Svalbard area (ICES division IIb) in the second half of 2005.

The objectives of the survey were:

1. To define the spatial distribution and relative abundance of commercially important groundfish species – Greenland halibut (*Reinhardtius hippoglossoides*) and Atlantic cod (*Gadus morhua*), deepsea redfish (*Sebastes mentella*), long rough dab (*Hippoglossoides platessioides*) and roughhead grenadier (*Macrourus berglax*).
2. To determinate the length composition of Greenland halibut and Atlantic cod.
3. To collect age structures and obtain biological data from Greenland halibut and Atlantic cod.

3. CHARTER VESSEL AND GEAR SPECIFICATIONS

The survey was carried out using the fishing trawler "Lootus II". The characteristics of the vessel are presented in Table 1.

The vessel used similar "Pedeira" type of gear (Tab. 2 and Fig. 2, 3 and 4) as has been used in Spanish bottom trawl surveys carried out in the slope of Svalbard area. The main feature is that it is fit with a mix train "Rockhopper" with bobbins and rubber separators, which makes it especially suitable for deepwater fishing at irregular bottom depths.

4. SURVEY DESIGN AND METHODOLOGY

The survey was developed in a depth range between 500 and 1500 meters (Tab. 3) on the west slope of the Svalbard archipelago, covering an area limited by 80ºN 4ºE, 80ºN 6ºE, 76ºN 15ºE, 73º30´N 17ºE, 73º30´N 13ºE and 80ºN 4ºE (Fig. 5). The survey took place from 27th October to 20th November 2005, with 23 effective fishing days. The localization of the survey hauls is presented in the Figure 6.
The Table 3 shows the surface area (in square nautical miles) of each stratum surveyed, the latitude and depth range limits, as well as the number of hauls made in each. Because the survey trawl was couple of times seriously damaged during the trawling in deeper areas, less trawl hauls were made in the stratum 3 and 6 than in the other stratums.

The standard hauls were performed using a trawling speed of 3±0.2 knots (Tab. 4) measured as the speed over the ground. The valid hauls were accomplished with minimum duration 30, and with maximum duration 75 minutes (Tab. 4). Haul start time is defined as the moment when the vertical net opening is stable at the stated towing speed. End time is defined as the start of hauling back the trawl.

For each trawl haul the following data were recorded:

- Date
- Time, position and the water depth at the start and at the end of the haul
- Species composition and catch by species
- Incidental mortality of sea birds and mammals (if any)
- Other important notices or incidental occurrences

All the catches were sorted by species for estimation of the species composition, storing different species separately boxes, and weighted. Random samples were taken for Greenland halibut and Atlantic cod length-frequency determinations. The sample size for Greenland halibut was approximately 200 individuals and for Atlantic cod 50 individuals.
Also sub-samples of Greenland halibut and Atlantic cod for biological data were taken. After length measuring the fish, the individual weight, sex and sexual maturity was estimated and recorded. Age structures of Greenland halibut and Atlantic cod were collected from 10 individuals per 1 cm length-class according to the length-frequency for estimation of the age distribution.

5. RESULTS

The species compositions of the catches of the survey hauls are listed in the Table 5 and 6. Greenland halibut was dominating in all hauls during the Estonian Svalbard exploratory survey. The share of all other species was less than 3,5% of the total catch (Fig. 7). No incidental by catch of sea birds and mammals was observed.

In total 15172 Greenland halibuts and 474 Atlantic cods were measured from 77 valid hauls for length-frequency determinations. The length composition of Greenland halibut and Atlantic cod in the survey hauls is shown in the Figure 8 and 9 respectively. From 451 Greenland halibuts and 187 Atlantic cods biological data and age structures were collected. The abundance of male Greenland halibuts in the survey hauls was in average 3,6 times higher than the abundance of females (Fig. 8). The share of male Atlantic cods in the survey hauls was in total about 6 % higher than the share of females (Fig. 9). Greenland halibut age composition in the survey hauls was dominated 5-7 year old specimens (Fig. 10). The age composition data of Atlantic cod is at the moment not available because the age reading is not finished yet.

The abundance and biomass estimates by strata for Greenland halibut are presented in the Table 7. Compared to the similar estimates from Spanish bottom trawl survey in 2004 (Paz et al., 2005), our abundance estimate is about 23% and biomass estimate about 5% higher.
The weight at length relationship of Greenland halibut is shown in the Figure 11. The densest concentrations of Greenland halibut were detected between 600 and 900 meters (Fig. 12) and from 74°N to 76°N (Fig. 13). The average share of mature specimens of Greenland halibut in the survey hauls was 37,4% (Tab. 8). The share of mature specimens was higher between the depths of 500 and 700m, and in the southern part of the survey area, reaching up to 48,4% in stratum 4 (Tab. 8).

The densest concentrations of Atlantic cod and deepwater redfish were detected between 500 and 700 meters in the southern part of the survey area (Tab. 9). The abundance and biomass estimates by strata for Atlantic cod are presented in the Table 10. The weight at length relationship of Atlantic cod is shown in the Figure 14. The densest concentrations of northern wolffish and arctic skate were detected in the northern part of the survey area between 500 and 700 meters, and between 1000 and 1500 meters respectively (Tab. 9). The densest concentrations of roughhead grenadier and long rough dab were detected between 700 and 1000, and between 500 and 700 meters respectively (Tab. 9).

The biomass estimates by strata for all fish species are presented in the Table 11.

6. OTHER REMARKS

During the survey four tagged Greenland halibuts were found in the hauls. Three of them were with tags of Norwegian origin (No 06603, 14380 and 20128) and one was with Russian tag (although the letters on the label were USSR PINRO No 12261VH).

REFERENCES

Paz, X., Gonzales, C. and Roman, E., 2005. Informe de la Campana Fletan Arctico 2004 en la Zona de Protection de Svalbard, Division IIb del CIEM. Inst. Esp. Ocean. Equipo de Pesquerias Lejanas, Centro Oceanografico de Vigo.

APPENDIX I – TABLES

Table 1. Characteristics of the survey vessel.

Vessel name:	Lootus II
Board number:	EK-0010
Call sign:	ESPU
Owner:	MFV Lootus Teine OÜ
Registration port:	Tallinn / Estonia
Registration (IMO) number:	7407659
Official number:	1F00L75
MMSI:	276428000
Maximum length:	53,3 m
Maximum breath:	8,52 m
Maximum draught:	4,05 m
Gross tonnage:	555 T

Table 2. Description of the gear "*Pedeira*".

Length of float rope:	43,5 m
Length of ground rope:	34,5 m
Vertical opening of trawl:	3 m
NET:	Material: polyetylen
	Mesh size: 140 mm
COD-END:	Material: nylon
	Mesh size: 140 mm
GROUND GEAR:	Type: "Rock hopper"
	Diameter of rubber discs and half spheres: 18''
FLOATS:	Number of floats: 56
	Float diameter: 250 mm
DOORS:	Type: Tiburon 125
	Weight of doors: ~2000 kg

Table 3. Stratum characteristics in the survey area (Svalbard Protection Area, ICES Division IIb).

Strata	Latitude	Depth (m)	Surface (NM²)	No of hauls	No of valid hauls
1	76°00'-80°00'N	500-699	702	14	14
2	76°00'-80°00'N	700-999	1263	18	16
3	76°00'-80°00'N	1000-1500	2693	6	4
4	73°30'-76°00'N	500-699	488	21	17
5	73°30'-76°00'N	700-999	761	21	21
6	73°30'-76°00'N	1000-1500	1672	6	5
Total			7579	86	77

Table 4. Characteristics of survey hauls in Svalbard Protection Area in 2005.

Haul No	Stratum	Validity (yes/no)	Date	Speed (knots)	Cable (m)	Initial Latitude	Final Latitude	Initial Longitude	Final Longitude	Initial depth	Final depth
1	2	Yes	27.10.05	3.1	1 800	78º26,30	78º28,00	009º20,70	009º16,80	703	699
2	1	Yes	27.10.05	3.1	1 600	78º32,30	78º33,80	009º07,90	009º03,60	616	613
3	2	Yes	27.10.05	3.1	1 800	78º38,30	78º40,00	008º43,40	008º41,40	719	728
4	2	Yes	27.10.05	3.0	2 200	78º42,10	78º43,60	008º15,40	008º10,40	904	928
5	3	No	27.10.05	3.2	2 350	78º48,90	78º51,00	007º56,80	008º00,70	1 036	1 038
6	1	Yes	28.10.05	3.1	1 850	78º15,80	78º13,00	009º15,60	009º15,40	707	656
7	1	Yes	28.10.05	3.1	1 600	78º05,80	78º03,30	009º20,60	009º21,70	595	605
8	1	Yes	28.10.05	3.1	1 650	77º56,60	77º54,20	009º30,10	009º57,70	626	557
9	2	Yes	29.10.05	3.0	1 850	78º06,20	78º09,00	009º15,60	009º13,90	732	746
10	2	Yes	29.10.05	3.1	2 250	78º08,50	78º05,40	009º07,80	009º09,50	917	918
11	3	Yes	29.10.05	2.9	2 450	77º59,60	77º57,10	009º05,90	009º09,90	1 112	1 094
12	2	Yes	29.10.05	2.8	2 200	77º56,00	77º53,60	009º20,70	009º25,90	900	915
13	1	Yes	30.10.05	3.1	1 700	77º48,00	77º51,10	009º56,50	009º46,50	670	610
14	2	No	30.10.05	3.1	2 000	77º53,00	77º55,80	009º31,80	009º22,90	830	853
15	2	Yes	31.10.05	3.1	2 000	77º46,50	77º49,00	009º54,90	009º44,90	848	855
16	1	Yes	31.10.05	3.2	1 700	77º48,20	77º45,70	009º55,60	010º04,30	686	690
17	1	Yes	31.10.05	3.1	1 600	77º41,40	77º39,40	010º23,10	010º33,20	698	651
18	1	Yes	31.10.05	3.0	1 700	77º35,50	77º32,90	010º48,20	010º55,70	640	651
19	2	Yes	01.11.05	3.1	1 850	77º12,20	77º15,48	011º19,80	011º14,99	765	771
20	2	Yes	01.11.05	3.1	1 850	77º24,00	77º27,00	011º08,50	011º03,90	758	758
21	2	Yes	02.11.05	2.9	1 900	77º23,30	77º20,50	011º07,73	011º09,85	788	786
22	1	Yes	02.11.05	2.9	1 800	77º16,23	77º15,70	011º17,45	011º18,00	690	691
23	2	No	02.11.05	2.5	1 850	77º14,20	77º13,20	011º19,50	011º20,40	720	720
24	1	Yes	03.11.05	3.0	1 600	76º49,94	76º46,90	012º57,70	013º07,20	552	541
25	1	Yes	03.11.05	2.8	1 600	76º48,70	76º51,00	012º56,80	012º48,40	683	676
26	2	Yes	03.11.05	3.1	1 800	76º57,78	76º59,40	012º22,31	012º09,60	701	726
27	3	No	04.11.05	3.1	2 300	76º47,60	76º45,00	012º43,10	012º51,00	1 003	1 003
28	2	Yes	04.11.05	3.1	1 800	76º42,30	76º39,40	013º11,90	013º20,60	717	714
29	2	Yes	04.11.05	3.1	1 800	76º35,90	76º34,30	013º36,50	013º45,60	727	733
30	1	Yes	05.11.05	3.1	1 800	76º14,00	76º11,00	014º16,70	014º12,70	692	695
31	1	Yes	05.11.05	3.1	1 750	76º04,30	76º00,00	014º06,20	014º04,00	690	683
32	3	Yes	05.11.05	3.1	2 300	76º10,00	76º12,90	013º46,40	013º49,30	1 012	1 010
33	2	Yes	05.11.05	3.0	1 800	76º06,58	76º03,50	014º04,29	014º04,60	745	715
34	1	Yes	06.11.05	3.0	1 500	76º10,01	76º07,40	014º23,30	014º20,30	656	626
35	4	Yes	06.11.05	3.1	1 800	75º59,90	75º57,00	014º03,00	014º00,70	692	686
36	5	Yes	06.11.05	3.1	1 800	75º47,00	75º43,90	013º56,50	013º56,10	710	713
37	6	Yes	07.11.05	3.1	2 300	75º36,00	75º39,10	013º40,30	016º37,50	1 007	1 012
38	6	Yes	07.11.05	3.1	2 350	75º48,70	75º55,70	013º35,40	013º37,50	1 026	1 020
39	5	Yes	07.11.05	3.0	1 800	75º46,90	75º45,40	013º56,40	013º55,90	716	710
40	4	No	07.11.05	3.0	1 700	75º47,90	75º51,00	013º58,40	013º58,00	677	695
41	4	Yes	07.11.05	3.1	1 600	75º51,00	75º48,00	014º04,30	014º03,90	583	576
42	4	Yes	08.11.05	3.1	1 800	75º27,80	75º24,90	014º08,60	014º13,20	679	679
43	4	Yes	08.11.05	3.0	1 600	75º21,30	75º18,60	014º25,70	014º32,10	583	558
44	4	No	08.11.05	3.1	1 500	75º17,70	75º20,30	014º37,10	014º30,60	512	532
45	4	Yes	08.11.05	3.1	1 800	75º25,20	75º28,20	014º11,70	014º07,50	697	686
46	4	Yes	09.11.05	3.1	1 800	75º55,50	75º58,70	014º01,10	014º03,10	668	678
47	2	Yes	09.11.05	3.1	1 900	76º07,80	76º10,70	013º59,96	014º02,40	817	830
48	2	Yes	09.11.05	3.1	1 950	76º18,60	76º21,40	014º10,50	014º13,10	830	855
49	3	Yes	09.11.05	3.2	2 300	76º30,00	76º32,10	013º46,80	013º37,10	1 057	1 118
50	3	Yes	10.11.05	3.1	2 300	76º06,20	76º03,30	013º36,00	013º34,80	1 100	1 103

Table 4. continues

Haul No	Stratum	Validity (yes/no)	Date	Speed (knots)	Cable (m)	Initial Latitude	Final Latitude	Initial Longitude	Final Longitude	Initial depth	Final depth
51	5	Yes	10.11.05	3.1	1 900	75º57,40	75º54,40	013º43,70	013º52,30	814	808
52	5	Yes	10.11.05	3.1	1 900	75º44,30	75º41,40	013º50,00	013º49,80	814	818
53	4	Yes	10.11.05	3.0	1 600	75º38,00	75º34,90	014º05,50	014º06,90	584	598
54	6	Yes	11.11.05	3.1	2 250	75º29,00	75º26,10	013º43,10	013º47,20	1 029	1 033
55	5	Yes	11.11.05	3.0	2 000	75º22,30	75º20,10	014º07,70	014º14,80	840	802
56	5	Yes	11.11.05	3.1	1 850	75º16,50	75º14,00	014º26,30	014º32,00	752	790
57	5	Yes	11.11.05	3.1	1 900	75º10,00	75º08,30	014º48,50	014º58,70	814	795
58	4	Yes	12.11.05	3.1	1 800	74º43,10	74º40,80	015º41,00	015º47,30	705	685
59	4	Yes	12.11.05	3.1	1 850	74º37,70	74º35,20	015º55,40	016º01,10	688	682
60	4	No	12.11.05	3.0	1 500	74º40,20	74º41,80	015º58,00	015º51,30	515	517
61	5	Yes	12.11.05	3.0	1 800	74º41,90	74º39,47	015º42,00	015º48,70	730	720
62	6	Yes	13.11.05	2.9	2 300	74º50,10	74º47,80	015º15,70	015º19,40	1 035	1 005
63	5	Yes	13.11.05	3.1	1 825	74º52,60	74º55,70	015º29,30	015º30,50	730	715
64	5	Yes	13.11.05	2.8	1 850	75º02,20	75º04,60	015º27,70	015º20,60	721	724
65	4	Yes	13.11.05	3.1	1 500	75º17,80	75º20,60	014º27,00	014º21,60	688	675
66	5	Yes	16.11.05	3.1	1 800	75º42,50	75º39,60	013º55,80	013º56,60	714	706
67	5	Yes	16.11.05	3.1	1 900	75º30,90	75º28,10	013º59,00	013º59,90	816	812
68	5	Yes	16.11.05	3.0	1 850	75º24,10	75º21,60	014º12,20	014º16,50	720	710
69	5	Yes	17.11.05	3.1	1 950	75º37,80	75º34,80	013º48,60	013º50,90	850	850
70	5	Yes	17.11.05	3.1	1 950	75º28,00	75º25,30	013º54,70	013º59,20	890	880
71	6	Yes	17.11.05	3.0	2 250	75º17,10	75º14,60	014º06,20	014º12,30	1 012	1 018
72	5	Yes	17.11.05	3.1	1 900	75º11,00	75º09,00	014º44,70	014º54,00	811	811
73	4	No	17.11.05	3.0	1 750	75º03,40	75º00,60	015º26,80	015º33,00	680	690
74	4	Yes	18.11.05	3.1	1 600	74º49,90	74º53,00	015º35,50	015º35,40	595	587
75	4	Yes	18.11.05	3.1	1 600	74º57,70	75º00,40	015º40,20	015º38,00	658	643
76	4	Yes	18.11.05	3.1	1 700	75º01,40	74º58,50	015º33,10	015º37,30	658	643
77	4	Yes	18.11.05	3.1	1 700	74º53,80	74º50,90	015º33,10	015º33,40	630	632
78	6	No	19.11.05	3.1	2 400	74º41,30	74º42,20	015º22,30	015º20,70	1 114	1 098
79	5	Yes	19.11.05	3.1	1 850	74º40,60	74º38,00	015º44,80	015º51,30	737	741
80	5	Yes	19.11.05	3.1	1 800	74º34,80	74º32,30	016º01,60	016º07,40	690	984
81	5	Yes	19.11.05	3.1	1 900	74º17,40	74º14,30	016º10,00	016º08,00	737	760
82	5	Yes	19.11.05	3.1	1 800	74º11,70	74º08,60	016º08,80	016º06,90	754	732
83	5	Yes	20.11.05	3.1	1 850	74º10,10	74º13,00	016º06,40	016º07,30	717	769
84	4	Yes	20.11.05	3.1	1 600	74º11,00	74º08,00	016º12,40	016º10,20	650	627
85	4	Yes	20.11.05	3.1	1 600	74º02,00	73º59,30	016º00,80	015º56,70	660	595
86	4	Yes	20.11.05	3.1	1 600	73º52,50	73º50,00	015º39,80	015º32,70	665	630

Table 5. Catches (kg) of survey hauls (only valid hauls) taken from the Svalbard Protection Area during the survey in 2005.

Haul No	Greenland halibut	Atlantic cod	Deepwater redfish	Northern wolffish	Greenland skark	Arctic skate	Roughhead grenadier	Long rough dab	Spotted wolffish	Blue whiting	Thorny skate	Lumpfish	Spinetail ray	Haddock	Greater eelpout	Polar sculpin	Doubleline eelpout	Roundnose grenadier	Rabbitfish
1	292.56	8.00				12.90	2.23	0.82			1.25		1.40						
2	195.04	47.88	0.85				1.92			0.10		0.80				0.82			
3	368.00	7.00	0.60			30.00	9.30	0.30					2.00			0.10	0.75		
4	218.04					32.00													
6	758.00	20.50					1.25				0.80					0.72	0.10		
7	1150.00	47.05	2.80	19.00				2.50	2.10	0.23	1.10							1.20	
8	632.00	150.00		74.50			0.35	4.34	2.20	0.20	2.40	6.00							
9	1200.60	11.25					0.26									0.65			1.00
10	701.04																		
11	253.00					11.30													
12	1027.64												1.20						
13	552.00			20.00															
15	1265.00				500.00								1.00						
16	585.12	64.23	2.53	15.00		7.57	0.37	0.43		0.20	1.28				0.47				
17	552.00	51.42	1.14	86.50		3.33				0.24									
18	390.08	17.17		43.00			0.38									0.27			
19	1483.04	13.55		16.50			0.32				2.68	3.76							
20	1419.56	87.00		69.00		3.32													
21	253.00					4.15													
22	552.00	12.52																	
24	1138.04	160.00	0.58	24.00			6.53	7.17	2.03										
25	1166.56	60.00						1.19											
26	862.04	110.00		42.50				1.20				1.85							
28	1465.56																		
29	1155.52																		
30	828.00	2.11					0.64												

Table 5. continues

Haul No	Greenland halibut	Atlantic cod	Deepwater redfish	Northern wolffish	Greenland skark	Arctic skate	Roughhead grenadier	Long rough dab	Spotted wolffish	Blue whiting	Thorny skate	Lumpfish	Spinetail ray	Haddock	Greater eelpout Polar sculpin	Doubleline eelpout	Roundnose grenadier	Rabbitfish
31	736.00	27.14	5.87															
32	483.00		1.96															
33	943.00	4.26					0.36	0.34			1.20						0.24	
34	2144.52	215.00	12.53	150.00					5.20		1.27			1.76	0.40			
35	2288.04	31.48		16.00														
36	1449.00																	
37	1270.52	3.50								0.30	0.10							
38	1005.56																	
39	1426.00																	
41	2139.00	14.00	6.27				1.04	0.44										
42	2190.52	5.50																
43	1403.00	32.00	82.00	23.50			2.25											
45	2420.52	17.41	26.00	51.00									0.35					
46	2190.52	27.30	14.00						11.50									
47	1633.00	3.18				10.56	5.22											
48	2052.52					14.97	8.62				1.62							
49	483.00					50.69												
50	235.52					8.00												
51	2346.00					37.80	3.34											
52	2162.00																	
53	1914.52	14.02	45.00															
54	97.52																	
55	1794.00					6.79												
56	2783.00																	
57	2553.00		0.63															
58	2464.68	30.00				5.89									0.34			

Table 5. continues

Haul No	Greenland halibut	Atlantic cod	Deepwater redfish	Northern wolffish	Greenland skark	Arctic skate	Roughhead grenadier	Long rough dab	Spotted wolffish	Blue whiting	Thorny skate	Lumpfish	Spinetail ray	Haddock	Greater eelpout Polar sculpin	Doubleline eelpout	Roundnose grenadier	Rabbitfish
59	2093.00														0.98			
61	1932.00						0.24	1.28								0.86		
62	575.00																	
63	3639.52	17.00	8.84	15.00				0.26										
64	2783.00	4.14					4.10											
65	2602.68	20.00	25.00															
66	5635.00	5.47																
67	4025.00	8.20																
68	8763.00	2.10					0.18											
69	6279.00																	
70	4623.00																	
71	189.52																	
72	3864.00	2.76																
74	5060.00	830.00	45.00															
75	2093.00	502.00	3.00															
76	3818.00	33.00												3.07				
77	4600.00	26.70	65.00					19.23							0.87			
79	4278.00	10.18	2.47				4.85	7.83			2.05							
80	6532.00	10.00	23.00					5.38										
81	1748.00					3.18	8.02											
82	3864.00	2.91	8.67				12.84				2.19							
83	5658.00	2.97	1.76	3.21		3.50	19.70		1.73						0.10			
84	3772.00	150.00	230.00															
85	4600.00	120.00	210.00	16.00		3.33					2.20							
86	2484.00	18.00	184.00	30.00						20.00	0.30							

Table 6. Total catches of fish species taken from the Svalbard Protection Area in ICES Division II b during the survey (only valid hauls) in 2005.

Common name	Scientific name	Total catch (kg)
Greenland halibut	Reinhardtius hippoglossoides	158 582.12
Atlantic cod	Gadus morhua	3 059.90
Deepwater redfish	Sebastes mentella	1 009.50
Northern wolffish	Anarhichas denticulatos	714.71
Greenland shark	Sommiosus microcephalus	500.00
Arctic skate	Amblyraja hyperborea	249.28
Roughhead grenadier	Macrourus berglax	94.31
Long rough dab	Hippoglossoides platessoides	52.71
Spotted wolffish	Anarhichas minor	24.76
Blue whiting	Micromesistius poutassou	21.27
Thorny skate	Amblyraja radiata	20.44
Lumpfish	Cyclopterus lumpus	12.41
Spinetail ray	Bathyraja spinicauda	5.95
Haddock	Melanogrammus aeglefinus	4.83
Greater eelpout	Lycodes esmarkii	3.16
Polar sculpin	Cottunculus microps	2.56
Doubleline eelpout	Lycodes eudipleurostictus	1.71
Roundnose grenadier	Coryphaenoides rupestris	1.44
Rabbitfish	Chimaera monstrosa	1.00

Table 7. Greenland halibut abundance and biomass estimates in Svalbard Protection Area in 2005.

Strata	Surface (NM²)	No of valid hauls	Density (Kg / NM²)	Steep area (NM²)	Abundance (Number)	Biomass (T)
1	702	14	34712	0.3278	23365262	24368
2	1263	16	45644	0.3580	68933059	57648
3	2693	4	14600	0.0996	47161901	39319
4	488	17	113198	0.4252	43373943	55240
5	761	21	153374	0.5094	123492247	116718
6	1672	5	25490	0.1231	42779687	42620
Total	7579	77		1.8432	349106099	335913

Table 8. The average share (%) of mature specimens of Greenland halibut in the survey hauls taken in Svalbard Protection Area by strata in 2005.

1	2	3	4	5	6	Average
36.0	26.6	28.6	48.4	33.7	34.7	37.4

Table 9. Average CPUE (catch kg/h at trawl speed 3 knots) of abundant fish species by strata in Svalbard Protection Area in 2005.

Common name	1	2	3	4	5	6
Greenland halibut	843.44	1109.06	354.76	2750.48	3726.70	619.37
Atlantic cod	64.86	16.58	0.00	106.94	3.13	0.69
Deepwater redfish	1.95	0.04	0.48	53.44	2.16	0.00
Northern wolffish	32.02	8.69	0.00	7.80	0.87	0.00
Arctic skate	0.81	7.32	17.07	0.53	2.45	0.00
Roughhead grenadier	0.85	1.79	0.00	0.19	2.54	0.00
Long rough dab	1.16	0.18	0.00	1.12	0.70	0.00

Table 10. Atlantic cod abundance and biomass estimates in Svalbard Protection Area in 2005.

Strata	Surface (NM^2)	No of valid hauls	Density (Kg / NM^2)	Steep area (NM^2)	Abundance (Number)	Biomass (T)
1	702	14	2669	0.3278	647267	1874
2	1263	16	682	0.3580	297655	862
3	2693	4	0	0.0996	0	0
4	488	17	4401	0.4252	741899	2148
5	761	21	129	0.5094	33917	98
6	1672	5	28	0.1231	16420	48
Total	7579	77		1.8432	1737158	5029

Table 11. Fish species biomass estimates (T) by strata in Svalbard Protection Area in 2005.

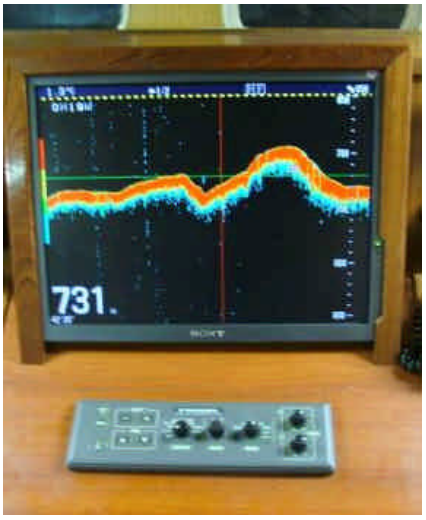
Common name	1	2	3	4	5	6	Total
Greenland halibut	24368	57648	39319	55240	116718	42620	335913
Atlantic cod	1874	862	0	2148	98	48	5029
Arctic skate	23	381	1892	11	77	0	2383
Greenland shark	0	1764	0	0	0	0	1764
Northern wolffish	925	452	0	157	27	0	1561
Deepwater redfish	56	2	53	1073	68	0	1253
Roughhead grenadier	24	93	0	4	80	0	201
Long rough dab	33	9	0	23	22	0	87
Blue whiting	2	0	0	23	0	4	29
Thorny skate	15	24	0	3	6	1	49
Spotted wolffish	25	0	0	13	3	0	40
Lumpfish	15	20	0	0	0	0	34
Spinetail ray	0	20	0	0	0	0	20
Haddock	4	0	0	4	0	0	7
Polar sculpin	4	3	0	0	0	0	7
Greater eelpout	2	0	0	3	0	0	5
Doubleline eelpout	0	3	0	0	1	0	4
Searabbit	0	4	0	0	0	0	4
Roundnose grenadier	3	1	0	0	0	0	3

APPENDIX II – FIGURES

VIDEO PLOTTER

TURBO WIN NAVIGATING SYSTEM

COLOUR NET RECORDER



COLOUR LCD SOUNDER

S-BAND RADAR

SATELLITE COMPASS

Figure 1. Characteristic of the nautical instruments on board of the Lootus II.

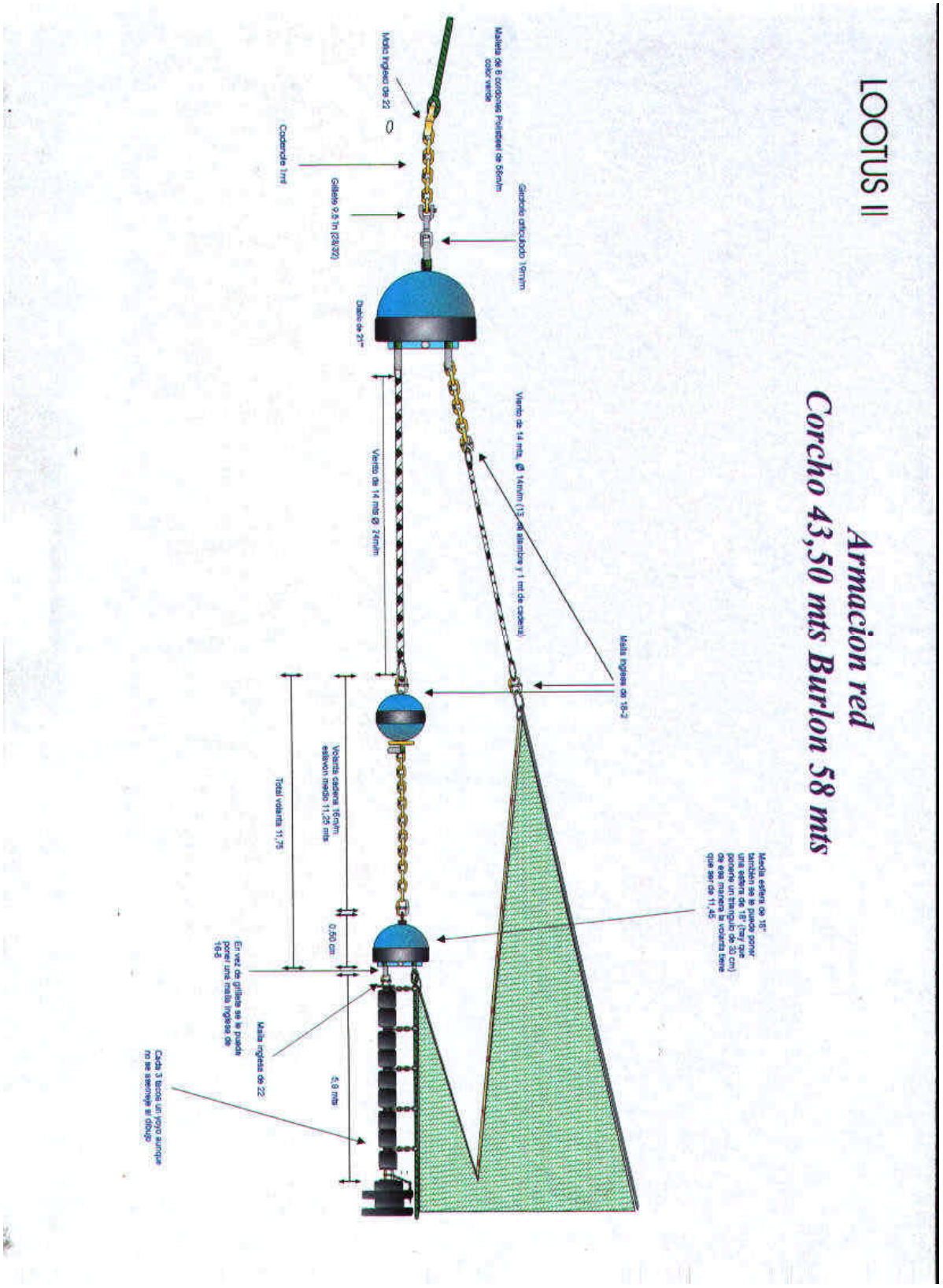


Figure 2. Rigging profile of the "Pedeira" survey trawl.

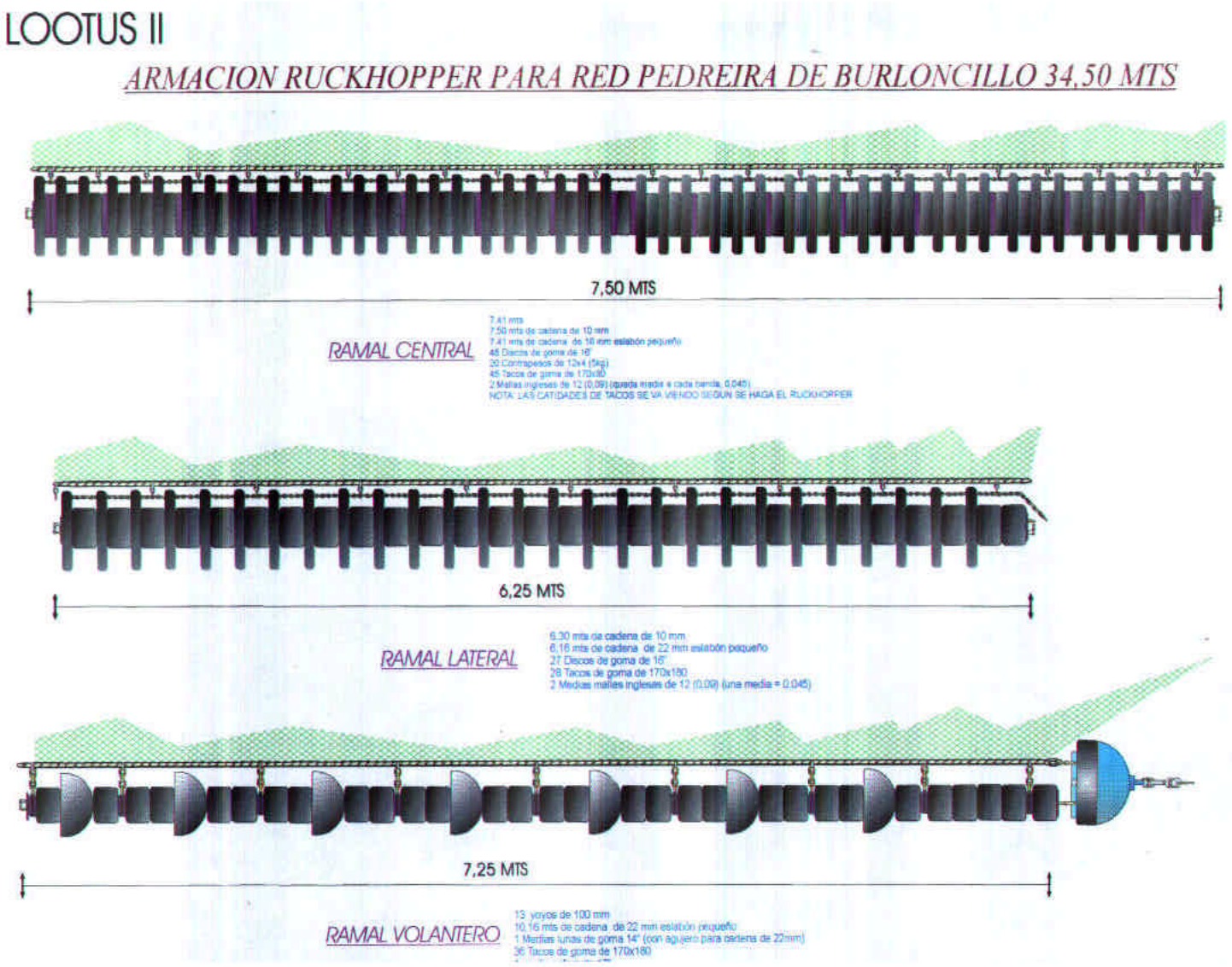


Figure 3. Groundrope profile of the “Pedeira” survey trawl.

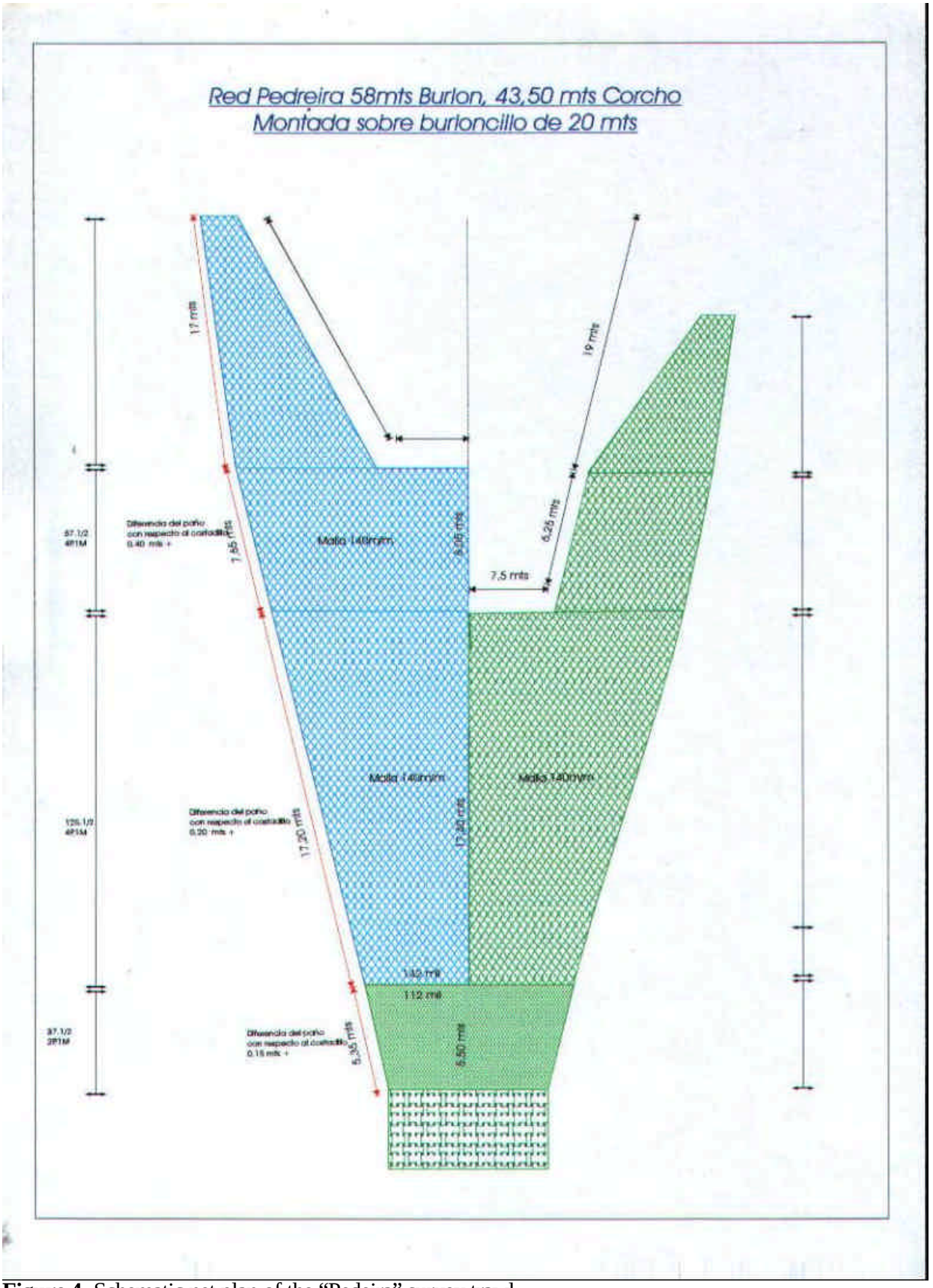


Figure 4. Schematic net plan of the "Pedeira" survey trawl.

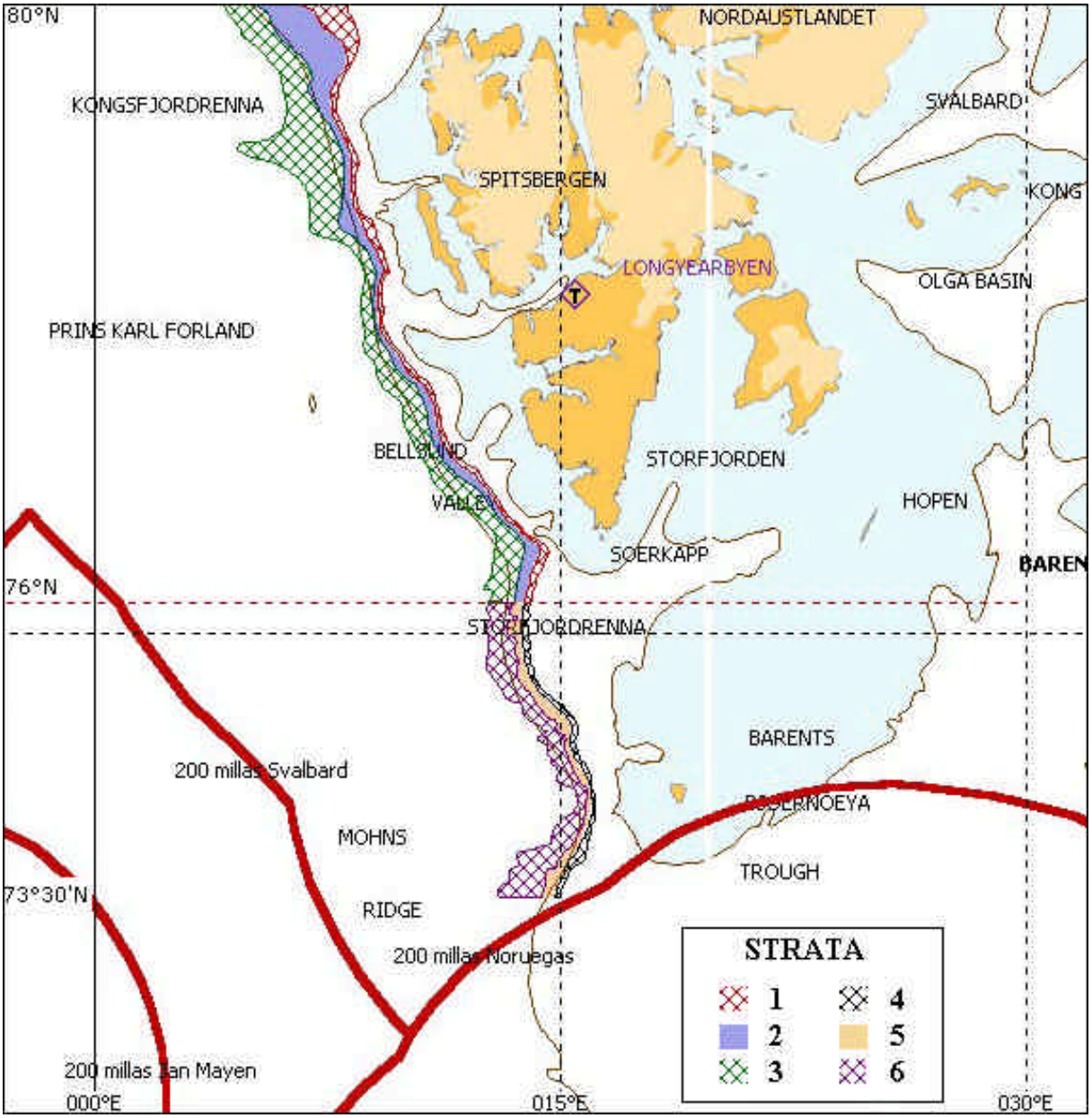


Figure 5. Schematic map of the survey area showing the six considered strata in Svalbard Protection Area in 2005.

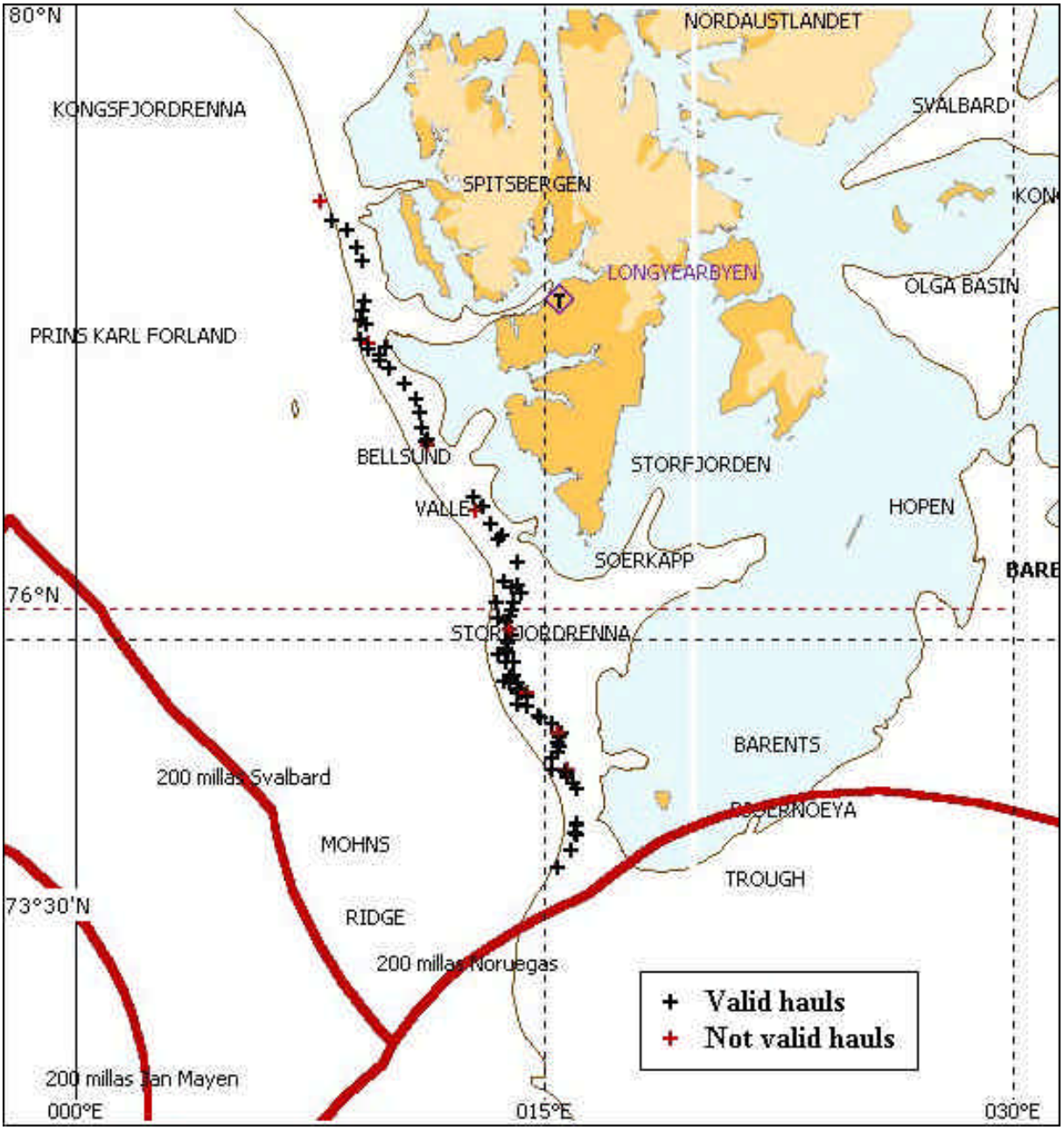


Figure 6. Schematic map of the survey area showing the haul positions in Svalbard Protection Area in 2005.

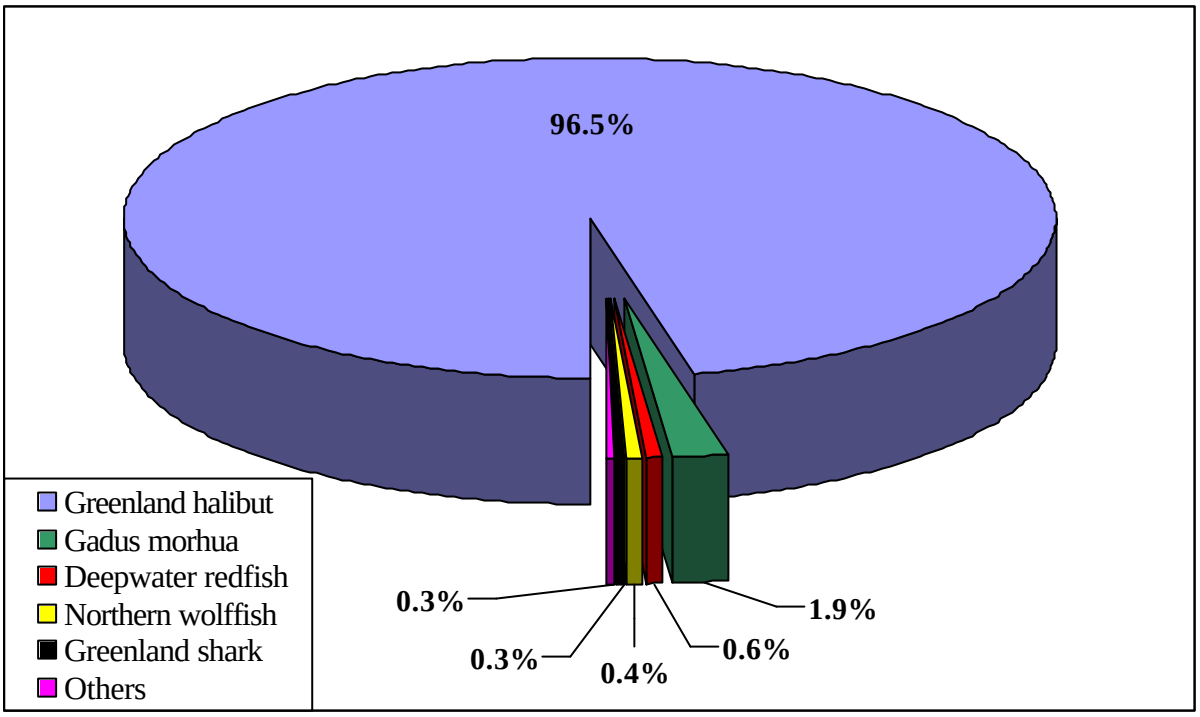


Figure 7. The mean share by weight of main fish species in the survey hauls in Svalbard Protection Area in 2005.

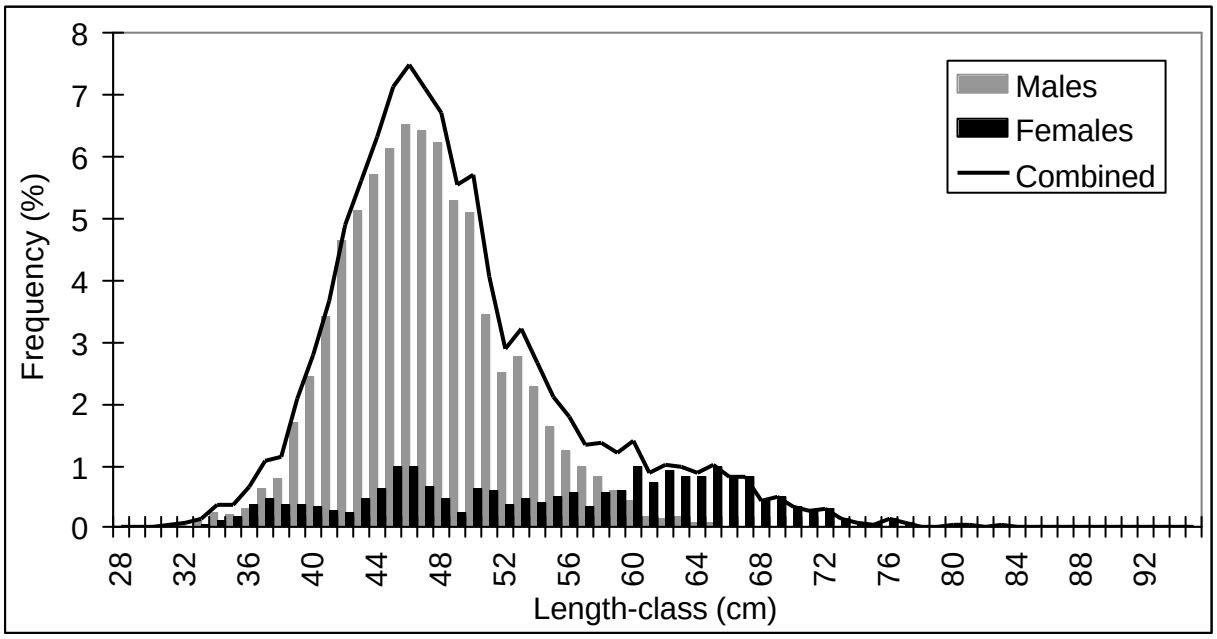


Figure 8. The length composition and relative abundance of male and female Greenland halibuts by length-classes in the survey hauls in Svalbard Protection Area in 2005.

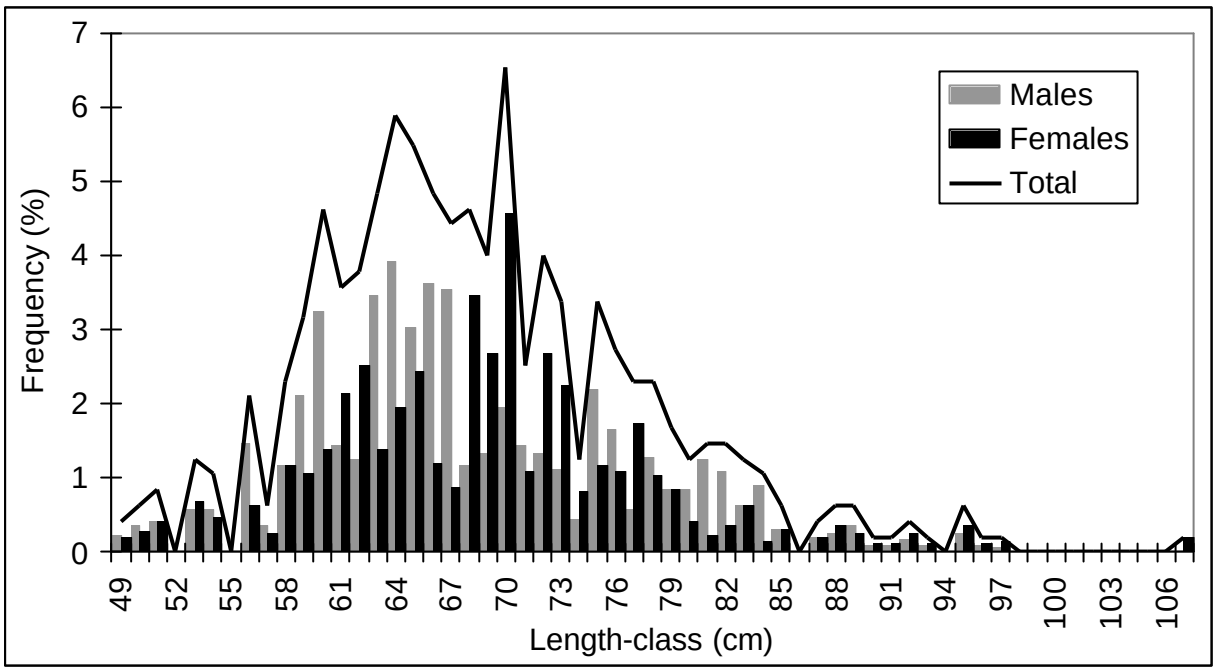


Figure 9. The length composition and relative abundance of male and female Atlantic cods by length-classes in the survey hauls in Svalbard Protection Area in 2005.

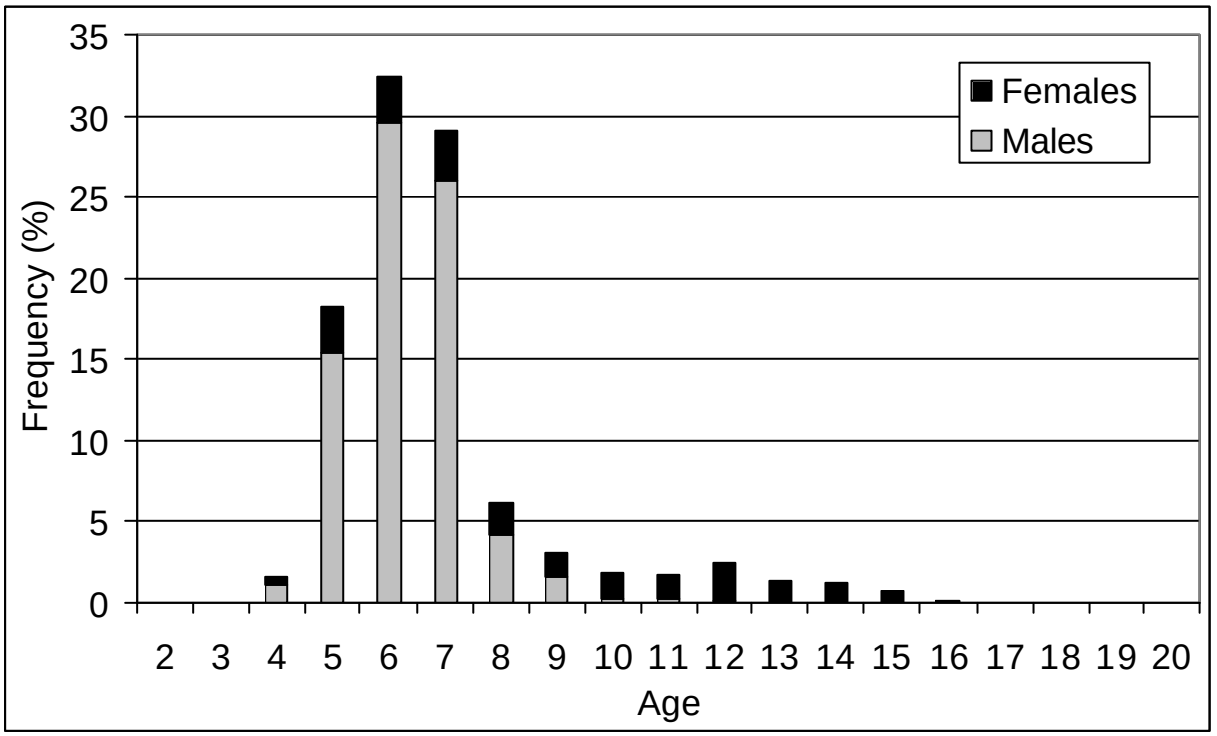


Figure 10. Greenland halibut age composition in the survey hauls in Svalbard Protection Area in 2005.

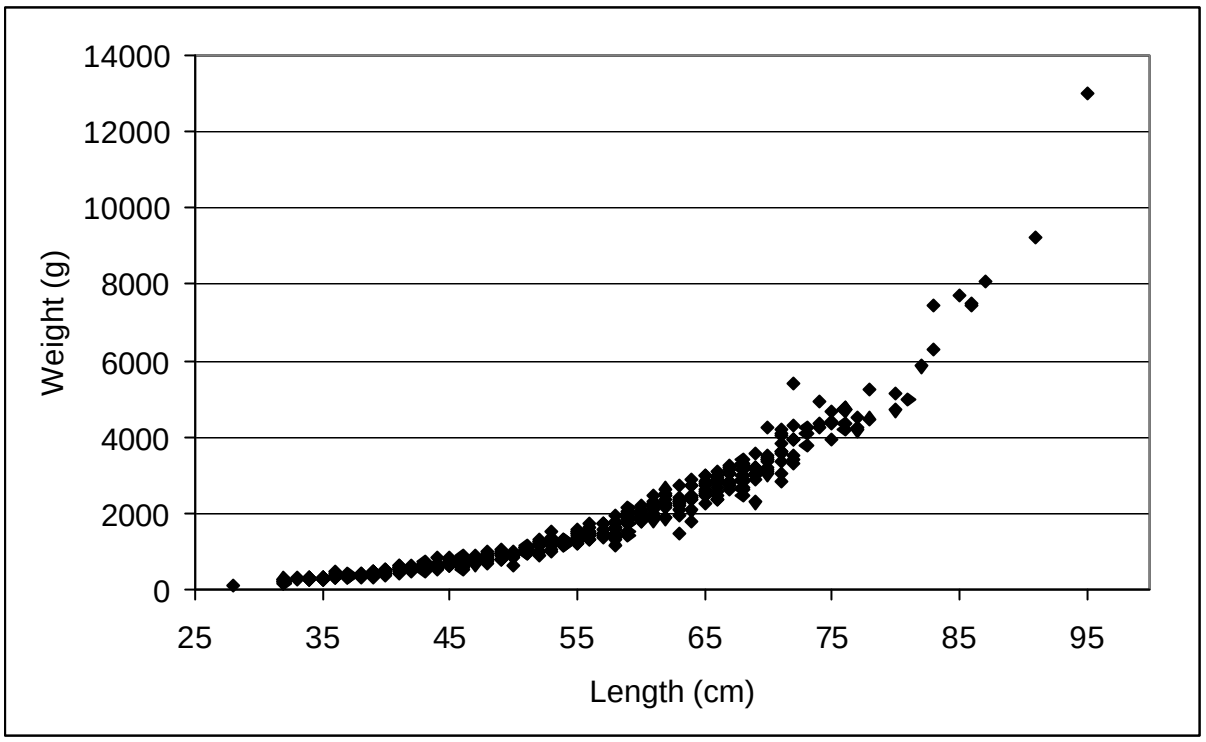


Figure 11. Greenland halibut weight at length relationship in Svalbard Protection Area in 2005.

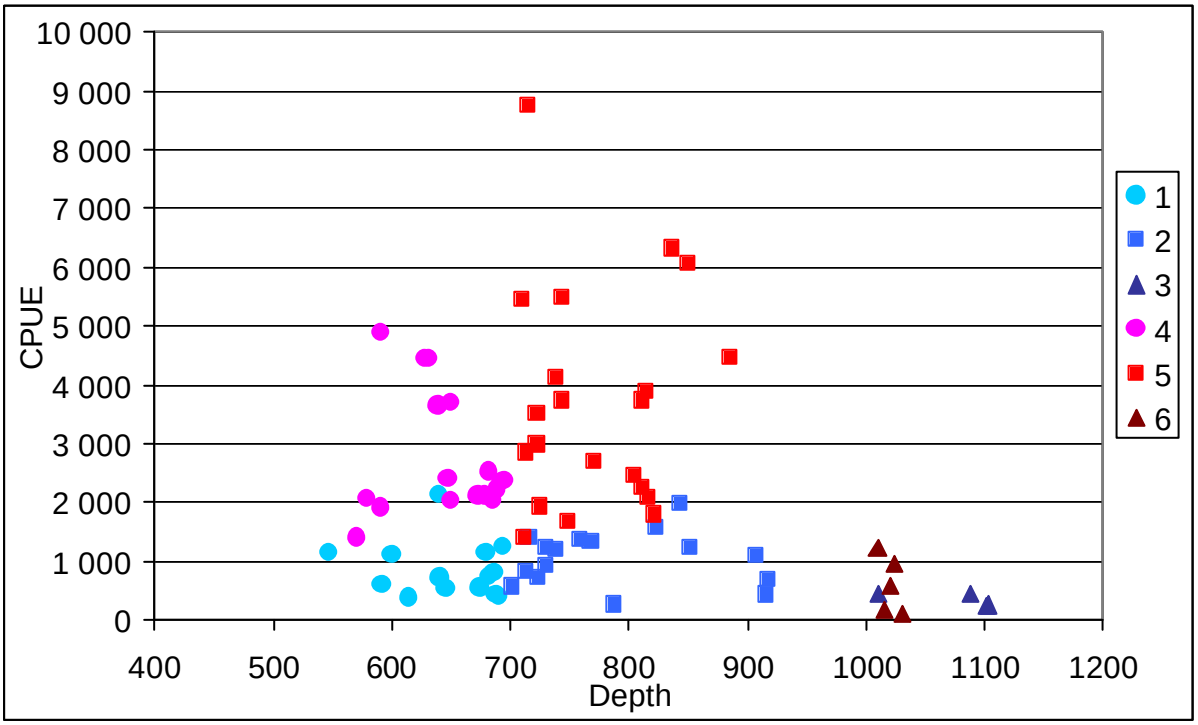


Figure 12. Greenland halibut CPUE (catch kg/h at trawl speed 3 knots) relation to water depth by strata in Svalbard Protection Area in 2005.

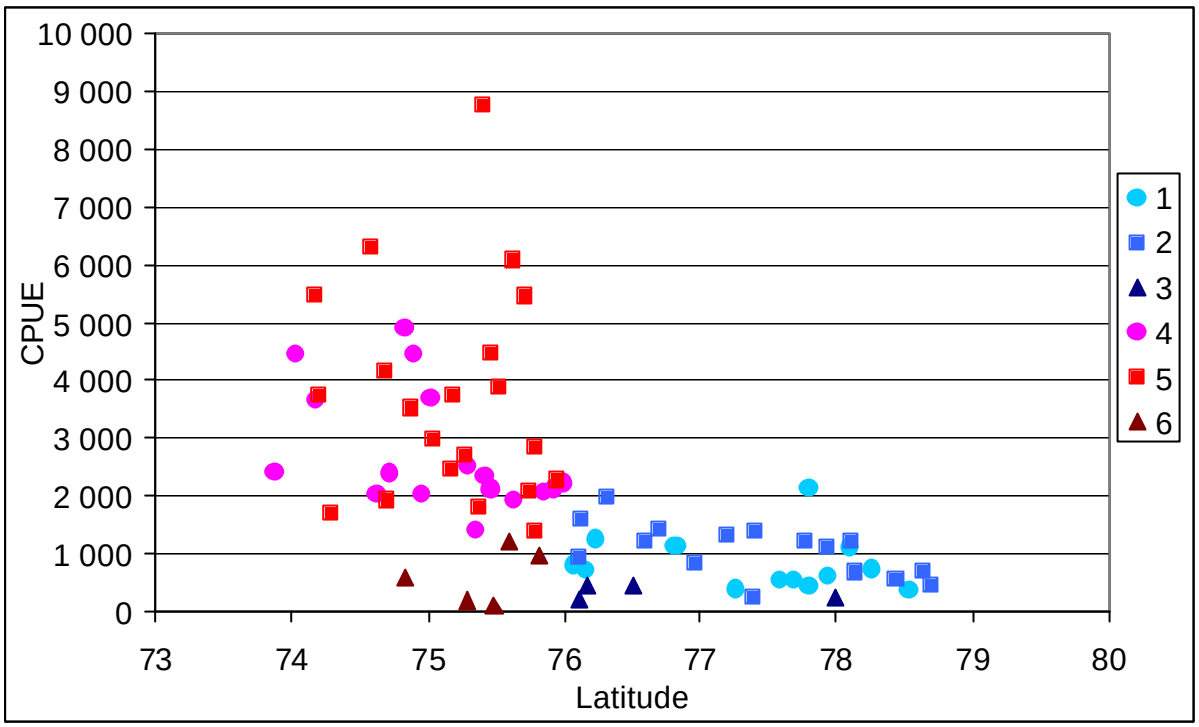


Figure 13. Greenland halibut CPUE (catch kg/h at trawl speed 3 knots) relation to geografical latitude by strata in Svalbard Protection Area in 2005.

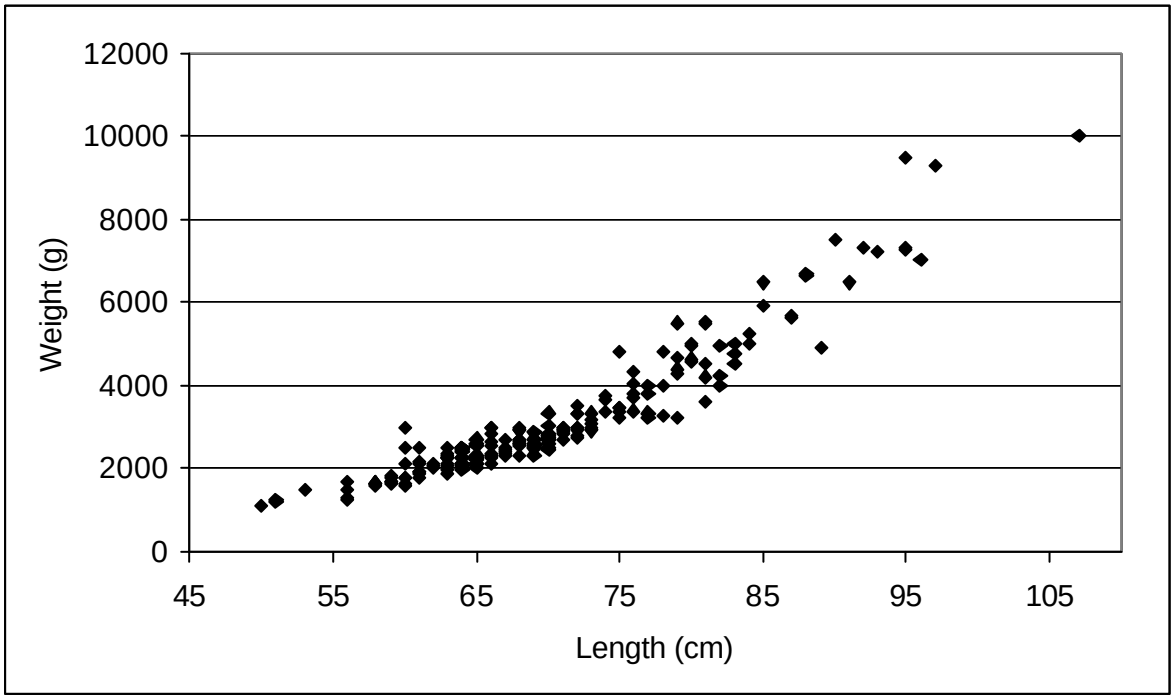


Figure 14. Atlantic cod weight at length relationship in Svalbard Protection Area in 2005.