

# Preliminary cruise report: Acoustic assessment of the Iceland-East Greenland-Jan Mayen capelin stock in December 2020/.

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## Objective

The main objective of this winter survey was acoustic assessment of the maturing part of the capelin stock. This was a coordinated collaboration of 4 fishing vessels where the stock estimate was based on combined acoustic and trawl data from all vessels. 3 Scientists from MFRI were on board each vessel and all assessments were based on acoustic data from calibrated echosounders.

## Methods

### Acoustic sampling

Acoustic data was sampled with Simrad 38 kHz EK80 or ES80 echosounders. The data were scrutinized by a scientist onboard each vessel using LSSS (version 2.9.0) software where capelin backscatter was defined and its Nautical Area Scattering Coefficient (NASC) in SA units ( $m^2/nmi^2$ ) calculated at 0.1 nmi integration intervals. Then, average NASC within squares of 30 minutes latitude and 1 degree longitude was calculated. Abundance in numbers was estimated using a length dependent target strength (TS; in dB re  $1m^2$ )

$$TS = 19.1 * \log(L) - 74.5$$

Total length of the capelin was measured to nearest mm. For each length interval within the length distribution of capelin in the samples the following parameters were calculated: backscattering proportion, number and weight.

$$\sigma_L = 4 * \pi * 10^{TS_L/10}$$

$$C_L = \frac{\sum_L \frac{C_{sL} * \sigma_L}{(C_L * \sigma_L)} * NASC * A}{\sigma_L}$$

$$W_L = C_L * \overline{W_{sL}}$$

Where L is measured length,  $\sigma$  is backscattering cross-section, C is total number, Cs is number in sample, A is surface area and Ws is average weight in sample.

### Biological sampling:

**Pelagic trawl:** Total length and weight of up to 100 individual capelin fish was measured for a subsample from the catch at each trawl station. Also, sex and maturity were estimated visually and the roe from maturing capelin were weighted. Age will be estimated from otoliths after the survey.

## Results

### Coverage in 6-11 December 2020

The acoustic measurements were conducted by the fishing vessels Asgrimur Halldorsson, Jona Edvalds, Kap and Iivid with 3 scientist from the Marine and Freshwater Research Institute onboard each vessel.

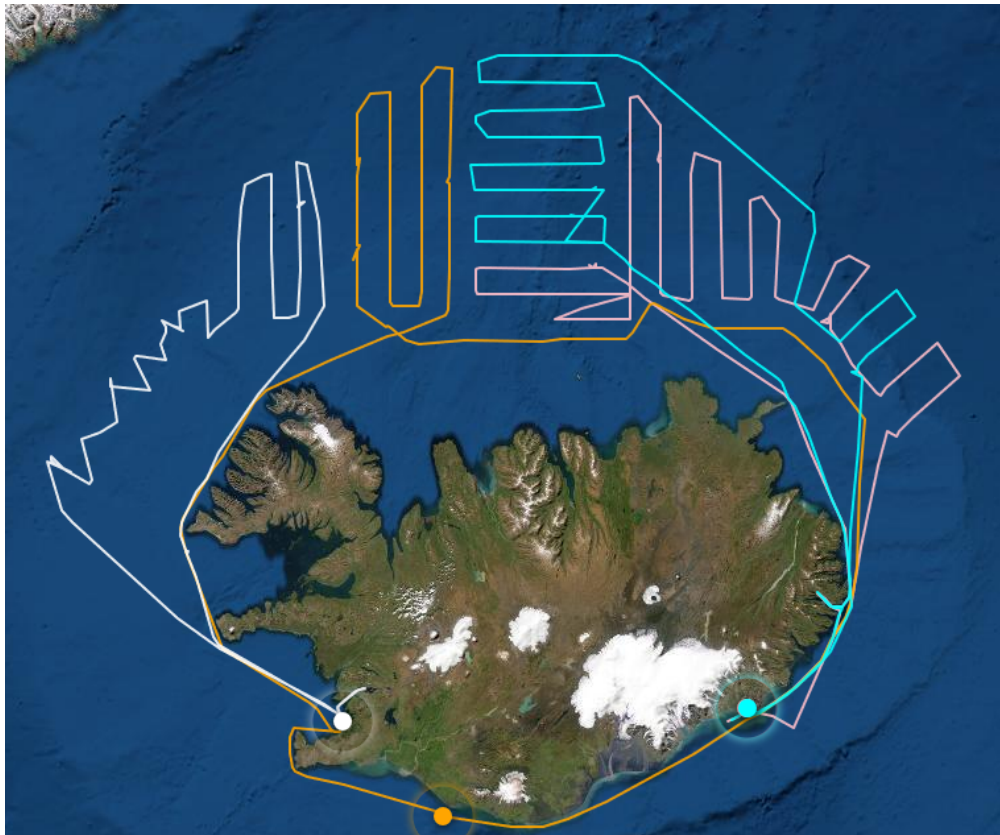


Figure 1: Routes of the research vessels. Asgrimur Halldorsson (pink), Jona Edvalds (Cyan), Kap (orange), Iivid (white)

The survey area was on and along the shelf edge from Vikurall northwest of Iceland to Vopnafjardargrunn east of Iceland (Figure 1). Three vessels, Asgrimur Halldorsson, Jona Edvalds and Kap, started their transects in the proximity of Kolbeinsey-ridge while Iivid started at the western part of the survey area progressing from west to east towards the coverage of Kap. In the beginning, the echosounders of Asgrimur Halldorsson and Jona Edvalds were calibrated in Eskifjordur, while Iivid was calibrated in Hvalfjordur, but Kap had previously been calibrated in March. The vessels managed to cover the planned survey area except for considerably hindered coverage in Denmark Strait due to sea ice.

Immature capelin dominated in the western most part of the survey region while mature capelin was found further east in the Denmark Strait (in the proximity of the sea ice edge). Mixtures of immature and mature capelin were found between Denmark Strait and Kolbeinsey-ridge. Further to the east, in the proximity of Kolbeinsey-ridge, mature capelin dominated. Total SSB was estimated 487 000 tonnes but due to restricted coverage because of sea ice in the Denmark Strait, this could be an underestimate.

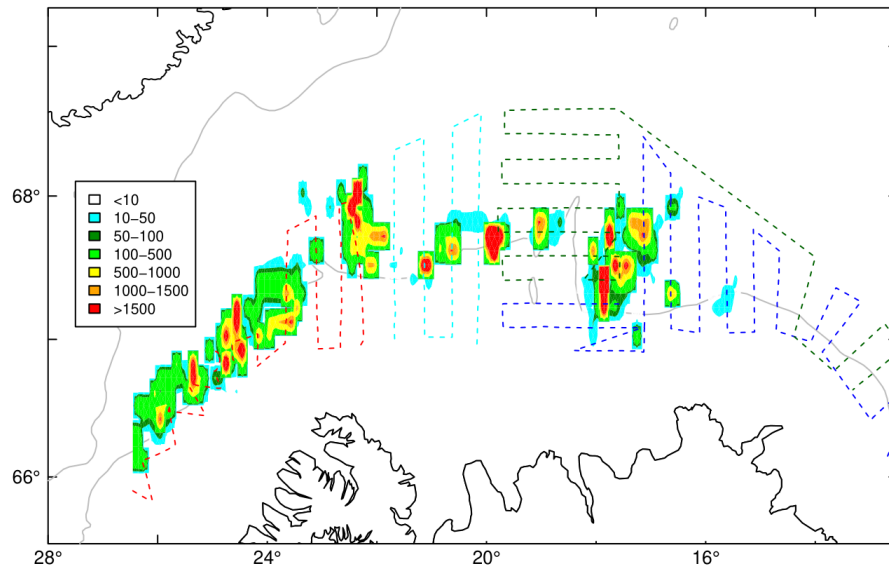


Figure 2: Capelin distribution as relative density of acoustic backscatter during the survey.

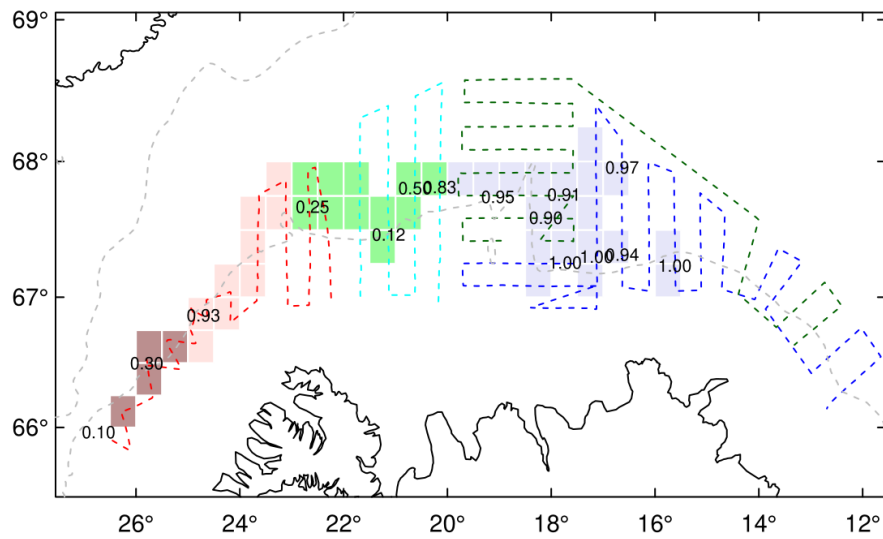


Figure 3: Maturity proportion at each trawl station.

### Biomass and age composition of capelin

Length disaggregated biomass is shown in tables 1-6. The total number of capelin amounted to 32 billion. The total biomass estimate was 573 000 tonnes where of about 487 000 tonnes were maturing capelin. Tables 1-6 give the age disaggregate biomass, numbers and weights of the capelin stock components.

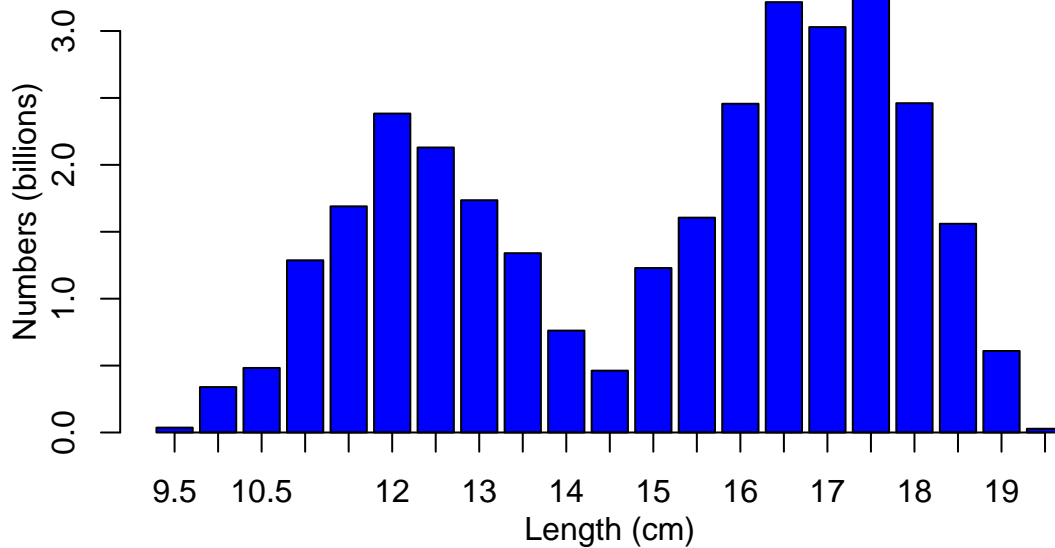
## Total stock

Table 1: Estimated stock size of Iceland-Greenland-Jan Mayen capelin total stock in numbers (millions) by length (cm), and biomass (thous. tonnes) from the acoustic survey in 6. – 11. December 2020. Mean weight is in grams

length	numbers	biomass	weight.mean
9.5	36.52	102.98	2.82
10.0	339.39	1181.04	3.48
10.5	482.23	1900.51	3.94
11.0	1286.65	5956.49	4.63
11.5	1689.92	9336.46	5.52
12.0	2383.10	15072.99	6.32
12.5	2129.58	15688.66	7.37
13.0	1735.70	14717.02	8.48
13.5	1339.86	13025.58	9.72
14.0	761.43	8566.55	11.25
14.5	462.19	6032.19	13.05
15.0	1228.95	18460.85	15.02
15.5	1605.28	27681.73	17.24
16.0	2456.48	48336.85	19.68
16.5	3215.62	71328.17	22.18
17.0	3029.44	74835.68	24.70
17.5	3285.87	90664.52	27.59
18.0	2460.59	74946.30	30.46
18.5	1559.51	52537.62	33.69
19.0	609.07	21968.07	36.07
19.5	27.92	1006.56	36.05

Table 2: Length aggregated total stock summary. T = Total, S = Stock, N = Numbers(billions), W = Weight(grams), L = Length(Cm), p = %

parameter	All
TSN	32.13
TSB	573.35
MeanW	17.85
MeanL	15.11
TSNp	100.00



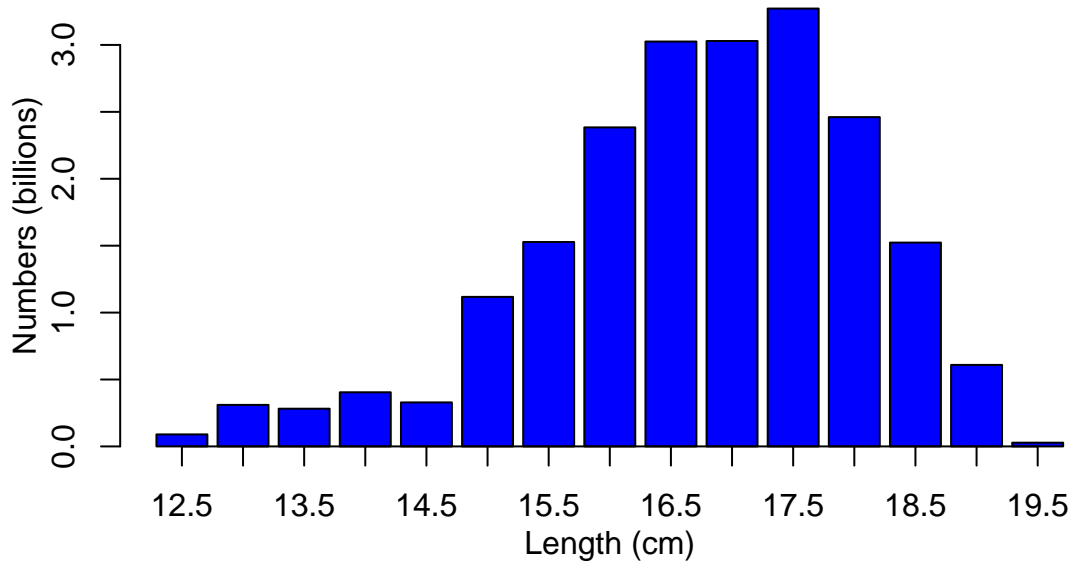
## Spawning stock

Table 3: Estimated stock size of the Iceland-Greenland-Jan Mayen capelin spawning stock component in numbers (millions) by length (cm), and biomass (thous. tonnes) from the acoustic survey in 6. – 11. December 2020. Mean weight is in grams

length	numbers	biomass	weight.mean
12.5	89.68	717.26	8.00
13.0	310.35	2734.42	8.81
13.5	281.87	2900.76	10.29
14.0	404.62	4681.10	11.57
14.5	328.90	4467.95	13.58
15.0	1117.27	16732.03	14.98
15.5	1527.44	26443.24	17.31
16.0	2384.00	46981.02	19.71
16.5	3025.37	67405.53	22.28
17.0	3029.44	74835.68	24.70
17.5	3271.91	90289.68	27.60
18.0	2460.59	74946.30	30.46
18.5	1522.99	51339.05	33.71
19.0	609.07	21968.07	36.07
19.5	27.92	1006.56	36.05

Table 4: Length aggregated spawning stock component summary. T = Total, S = Stock, N = Numbers(billions), W = Weight(grams), L = Length(Cm), p = %

parameter	All
SSN	20.39
SSB	487.45
MeanW	23.90
MeanL	16.73
SSNp	100.00



## Immature stock

Table 5: Estimated stock size of the Iceland-Greenland-Jan Mayen capelin immature stock component in numbers (millions) by length (cm), and biomass (thous. tonnes) from the acoustic survey in 6. – 11. December 2020. Mean weight is in grams

length	numbers	biomass	weight.mean
9.5	36.52	102.98	2.82
10.0	339.39	1181.04	3.48
10.5	482.23	1900.51	3.94
11.0	1286.65	5956.49	4.63
11.5	1689.92	9336.46	5.52
12.0	2383.10	15072.99	6.32
12.5	2039.91	14971.40	7.34
13.0	1425.35	11982.60	8.41
13.5	1057.99	10124.82	9.57
14.0	356.82	3885.45	10.89
14.5	133.29	1564.24	11.74
15.0	111.68	1728.82	15.48
15.5	77.84	1238.49	15.91
16.0	72.48	1355.83	18.71
16.5	190.25	3922.64	20.62
17.5	13.96	374.84	26.85
18.5	36.52	1198.57	32.82

Table 6: Length aggregated immature stock component summary. T = Total, S = Stock, N = Numbers(billions), W = Weight(grams), L = Length(Cm), p = %

parameter	All
ISN	11.73
ISB	85.90
MeanW	7.32
MeanL	12.30
ISNp	100.00

