NOTIFICATION OF PROPOSED RESEARCH CRUISE

GENERAL

Part A

1. **Name of research ship:**
Arni Fridriksson

Cruise No.: A-7-2021

2. Dates of cruises:
From: 6 July 2021
To: 20 July 2021

3. Operating Authority:
Marine and Freshwater Research Institute, Reykjavik, Iceland
Telephone: +354 575 20 44
Telefax: +354 575 20 01

4. Owner (if different from par. 3):

5. Particular of ship:
Name: Arni Fridriksson
Nationality: Icelandic
Overall length: 69.9 meters
Maximum draught (m): 7.5 meters
Nett tonnange: 1200
Propulsion: 4x1200 HP
Call Sign: TFNA

6. Crew:
Name of Master: Heimir Örn Hafsteinsson
No. of Crew: 16

7. Scientific Personnel:
Name and address of Scientist in charge: Anna H Olafsdottir
Telephone/Telefax: +354 575 20 00/575 20 01
No. of scientists: 6

8. Geographical area in which ship will operate (with reference in latitude and longitude):
60° 00′ N - 71° 00′ N, 2° 00′E - 41° 0′ W. The detailed operation within the Greenland EEZ will depends on mackerel distribution at the time of survey. Thus survey may extend somewhat further south and further west than given above.

9. Brief description of purpose of cruise:

Goal of the survey is to estimate abundance of mackerel, herring, and blue whiting during the summer feeding season of these species in Nordic Seas. Another goal is to measure hydrographical condition and zooplankton abundance in the pelagic layer where these species feed.

10. Dates and names of intended ports of call:

None intended.

11. Any special logistic requirements at ports of call:

NOTIFICATION OF PROPOSED RESEARCH CRUISE DETAIL
DETAIL

Part B

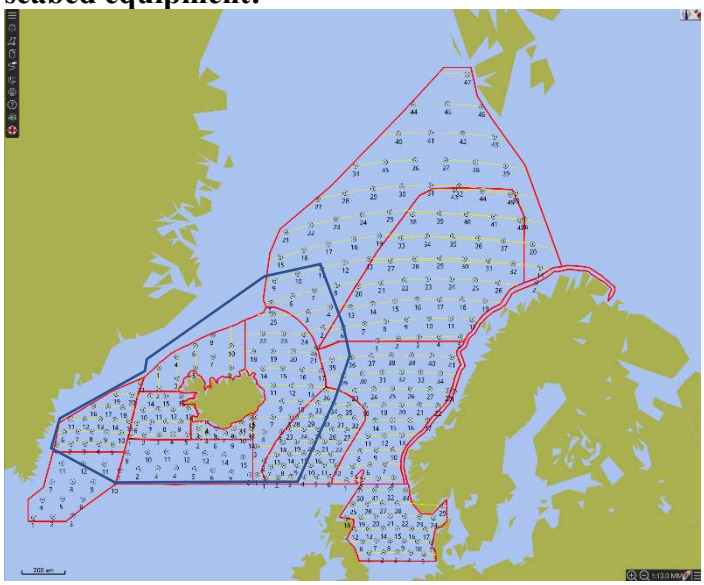
1. Name of research ship
Arni Fridriksson

Cruise No.
A-7-2021

2. Dates of cruise:
From: 6.7.2021
To: 20.7.2021

3. Purpose of research and general operational methods:
This is a coordinated ecosystem survey investigating the pelagic ecosystem in Nordic Seas during summer. The survey participants are research institutes in Iceland, Faroe Island, Norway, Greenland, and Denmark. Goal of the survey is to estimate abundance of mackerel, herring and blue whiting using surface trawling and acoustic methods. Fish is sampled from catch in the surface trawl. Environmental variables, such as temperature and salinity are measurements by CTD. Zooplankton abundance is determined by sampling by WP2-plankton nets.

4. Attach chart showing (on an appropriate scale) the geographical area work, positions of intended stations, tracks of survey lines, positions of moored/ seabed equipment:



Maps shows proposed sampling stations and survey tracks for all nations participating in the IESSNS 2021. Geographical work area of the Icelandic vessel is within the area defined by the blue polygon. Locations of surface trawl stations, CTD and plankton sampling (open circle with a dot in centre) and survey tracks (yellow solid lines).

5. Types of samples required, e.g. Geological/Water/Plankton/Fish/ Radioactivity/ Isotope and methods by which samples will be obtained (including dredging/coring/drilling):

Fish sampled by pelagic trawl for biological data and abundance estimate. Pelagic trawling will be done in the surface at predetermined stations and opportunistically on acoustical registrations along the survey transects, trawl depth from surface to 500m depth. At predetermined surface trawl stations, water samples will be collected at various depths between surface and 500 m to measure salinity, nutrient concentration, and phytoplankton. Zooplankton sampling by WP-2 plankton net, surface to 200m, will also be conducted at all predetermined surface trawl stations.

6. Details of moored equipment: Not applicable

Dates:

Longitude:

Latitude:

Description:

Recovery:

Laying:

7. Explosives: **Not applicable**

(a) Type and Trade name:

(b) Chemical content:

(c) Dept of Trade class and storage:

(d) Size:

(e) Depth of detonation:

(f) Frequency of detonation:

(g) Position in latitude and longitude:

(h) Dates of detonation:

8. Detail and reference of:

(a) Any relevant previous/future cruises:

Similar cruises have been carried out annually since 2009 in Icelandic, Faroese, Norwegian, Greenlandic (since 2013), Denmark (since 2018), and International waters, in cooperation between marine research Institutes from these countries.

(b) Any previously published research data related to the proposed cruise (Attach separate sheet if necessary):

There is an annual survey report, including results from all participating vessels, that is submitted to ICES working groups on pelagic fish in the autumn, WGWIDE (ICES.2020. Working Group on Widely Distributed Stocks (WGWIDE).ICES Scientific Reports. 2:82. 1019pp.http://doi.org/10.17895/ices.pub.), and in winter the following year to ICES Working Group for International Pelagic Surveys (ICES.2020. Working Group of International Pelagic Surveys (WGIPS).ICES Scientific Reports. 2:56. 473pp.http://doi.org/10.17895/ices.pub.6088). The report is available at www.ices.dk. Greenland scientists are active participants in that work and contribute to reports. The executive survey 2020 summary from the WGWIDE report is attached to the current application, see Appendix 1.

9. Names and addresses of scientists of the coastal state in whose waters the proposed cruises takes place with whom previous contact has been made:
Leif Nøttestad, Institute of Marine Research, Bergen,

10. State:
(a) Whether visits to the ship in port by scientists of the coastal state concerned will be acceptable: Not applicable as no calls to port are planned.

(b) Whether it will be acceptable to carry on board an observer from the coastal state for any part of the cruise and dates and ports of embarkation-disembarkation:
Yes, please contact cruise leader.

(c) When research date from intended cruise is likely to be made available to the coastal state and if so by what means:
Results will be reported in fall 2021 to ICES Working Group on Widely Distributed Stocks and in January 2022 to ICES Working Group of International Pelagic Surveys. Coastal state scientists (Faroese, Norwegians, and Greenlanders) also participate in the ICES work. Reports are available for ICES home page (www.ices.dk.).

SCIENTIFIC EQUIPMENT

11. **Complete the following table** - SEPARATE COPY FOR EACH COASTAL STATE (INDICATE "YES" OR "NO")

List of all major Marine Scientific Equipment it is proposed to use and indicate waters in which it will be deployed	Within Fishing Limits	On Con-tinental Shelf	DISTANCE FROM/COAST			
			Within 3 NM	Between 3-12 NM	Between 12-50 NM	Between 50-200 NM
	Yes	Yes			Yes	Yes

Pelagic trawling, echo sounders, CTD and plankton net (WP2)	

Appendix 1: Executive summary from IESSNS survey report 2020 (ICES.2020. Working Group on Widely Distributed Stocks (WGWIDE). ICES Scientific Reports. 2:82. 1019pp.http://doi.org/10.17895/ices.pub).

The International Ecosystem Summer Survey in the Nordic Seas (IESSNS) was performed within approximately 5 weeks from July 1st to August 4th in 2020 using six vessels from Norway (2), Iceland (1), Faroe Islands (1), Greenland (1) and Denmark (1). The main objective is to provide annual age-segregated abundance index, with an uncertainty estimate, for northeast Atlantic mackerel (*Scomber scombrus*). The index is used as a tuning series in stock assessment according to conclusions from the 2017 and 2019 ICES mackerel benchmarks. A standardised pelagic swept area trawl method is used to obtain the abundance index and to study the spatial distribution of mackerel in relation to other abundant pelagic fish stocks and to environmental factors in the Nordic Seas, as has been done annually since 2010. Another aim is to construct a new time series for blue whiting (*Micromesistius poutassou*) abundance index and for Norwegian spring-spawning herring (NSSH) (*Clupea harengus*) abundance index. This is obtained by utilizing standardized acoustic methods to estimate their abundance in combination with biological trawling on acoustic registrations. The time series for blue whiting and NSSH have now been conducted for five years (2016-2020).

The mackerel index increased by 7.0% for biomass and 0.3% for abundance (numbers of individuals) compared to the 2019 index. In 2020, the most abundant year classes were 2010, 2016, 2011, 2013 and 2014, respectively. Overall, the cohort internal consistency continues to improve with a longer time series (2010-2020).

The survey coverage area was 2.9 million km2 in 2020,which is similar as in previous years from 2017 to 2019. Furthermore, 0.26 million km2 was surveyed in the North Sea in July 2020. Distribution zero boundaries were found in majority of the survey area with an exception of high mackerel abundance in the northwestern region of the Norwegian Sea into the Fram Strait west of Svalbard. The mackerel appeared less patchily distributed within the survey area and had a pronounced distribution in the central and northern Norwegian Sea in 2020 compared to previous years. This major difference in distribution consists of a substantial decline of mackerel in the west and corresponding increase in the central and northern part of the Norwegian Sea.

The total number of Norwegian spring-spawning herring (NSSH) recorded during IESSNS 2020 was 20.3 billion and the total biomass index was 5.93 million tonnes, which is significantly higher than in 2019 (34% and 24%, respectively). The increase was due to the recruiting 2016 year-class coming strongly into the survey area. The herring stock is dominated by 4-year old herring (year class 2016) in terms of numbers (40%) and biomass (33%), but this year class is still mainly in the northeastern part of the Norwegian Sea. The 2013 year class (7 year old) is distributed in all areas with herring in the survey and it contributes 22% and 20% to the total biomass and abundance, respectively.

The total biomass of blue whiting registered during IESSNS 2020 was 1.8 million tons, which is an 11% decrease since 2019. The stock estimate in number of age groups 1+ for 2020 is 16.5 billion compared to 16.2 billion in 2019. Age group 1 is dominating the estimate in 2020 (22% and 35% of the biomass and by numbers, respectively, looking at age groups 1+). A good sign of recruiting year class (0-group) was also seen in the survey this year. Of the older age groups 6 year old blue whiting was most abundant.

As in previous years, there was overlap in the spatio-temporal distribution of mackerel and herring. This overlap occurred in the southern and south-western parts of the Norwegian Sea, and with the strong 2016 year class of NSSH, there was also overlap in the central and north eastern part of the Norwegian Sea. In the eastern Norwegian sea between 62-67°N, mackerel were present but herring were in low abundance, in contrast, in areas north of Iceland, herring were present while mackerel were absent. Older and younger herring were spatially segregated with larger herring distributed to the east and north of Iceland and in the southern Norwegian Sea, while young herring were found in the northeastern Norwegian Sea.

Other fish species also monitored are lumpfish (*Cyclopterus lumpus*) and Atlantic salmon (*Salmo salar*). Lumpfish was caught at 74% of surface trawl stations distributed across the surveyed area from Cape Farwell, Greenland, to western part of the Barents Sea. Abundance was greater north of latitude 66 °N compared to southern areas. A total of 54 Atlantic salmon were caught in 30 stations both in coastal and offshore areas from 60°N to >77°N in the upper 30 m of the water column. The salmon ranged from 0.084 kg to 2.73 kg in weight, dominated by postsmolt weighing 100-180 grams and 1 sea-winter individuals weighing 1-2 kg.

Satellite measurements of the sea surface temperature (SST) showed that the eastern part of the Norwegian Sea and coastal waters of east Greenland in July 2020 was higher, while the western part of the Norwegian Sea, the waters south of Iceland, in the Irminger Sea and around the Faroe islands in July 2020 was broadly similar, to the average for July 1990-2009. The upper layer (10 m depth) was 1.0-2.0°C colder in 2020 compared to 2019 in most of Icelandic and Greenland waters but along the Norwegian coast, the temperature was 1.0-2.0°C warmer in 2020 compared to 2019.

Zooplankton biomass decreased from 2018-2020 in both Greenlandic and Icelandic waters. Average zooplankton biomass in the Norwegian Sea has been relatively stable over the years of the survey.