NOTIFICATION OF PROPOSED RESEARCH CRUISE

GENERAL

Part A

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

Cruise No.: A-7-2023

2. Dates of cruises:
From: 3 July 2023
To: 22 July 2023

3. Operating Authority:
Marine and Freshwater Research Institute, Hafnarfjordur, Iceland
Telephone: +354 575 20 00
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 44/575 20 01
No. of scientists: 7

8. Geographical area in which ship will operate (with reference in latitude and longitude):
60° 00′ N - 71° 00′ N, 00° 00′E - 40° 00′ W. The detailed operation within the Norwegian EEZ will depends on mackerel distribution at the time of survey.

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

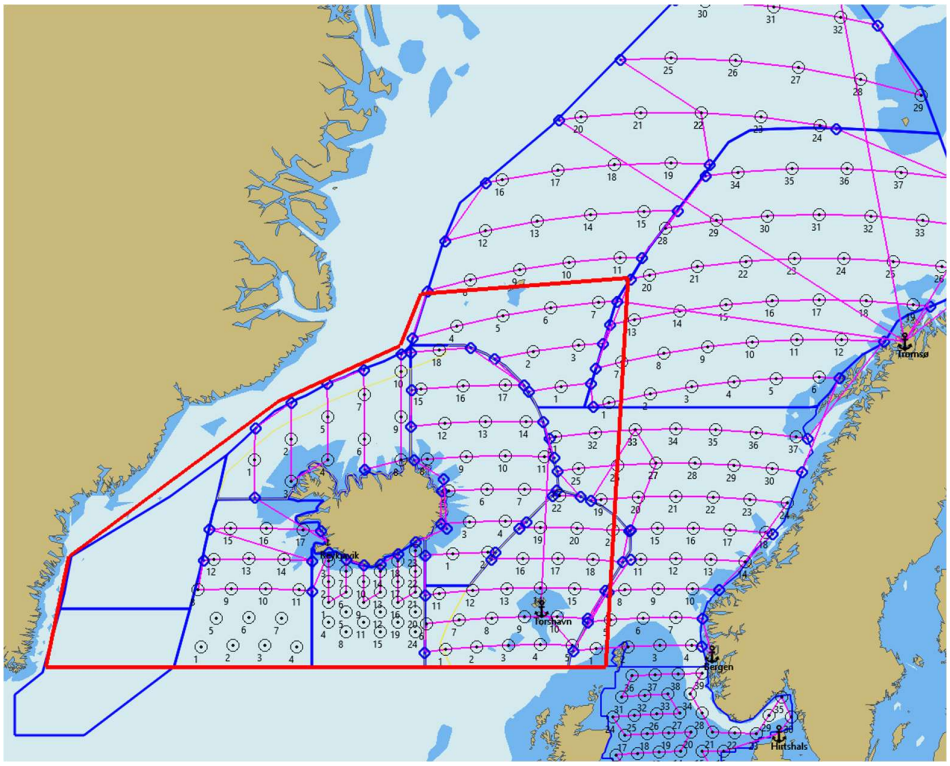
1. Name of research ship
Arni Fridriksson

Cruise No.
A-7-2023

2. Dates of cruise:
From: 3 July 2023
To: 22 July 2023

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 2023. Geographical work area of the Icelandic vessel is within the area delineated by the red polygon. Locations of surface trawl stations, CTD and plankton sampling (open circle with a dot in centre), survey track (pink line), survey track turn (open blue diamond), survey strata boundary (blue line) and EEZ lines between Iceland-Greenland-Faroe Islands which do not overlap with strata boundaries (yellow line).

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 in 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 group on widely distributed stocks (WGWIDE) in the autumn 2022 (ICES. 2022. Working Group on Widely Distributed Stocks (WGWIDE). ICES Scientific Reports. 4:73. 922 pp. http://doi.org/10.17895/ices.pub.21088804), and in January 2023 to ICES Working Group for International Pelagic Surveys (WGIPS), report not published when application prepared February 15th, 2023. The WGWIDE report is available at www.ices.dk. Norwegian scientists are active participants in the survey planning and executing and contribute to reports. The executive summary for the 2022 IESSNS survey, 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 2023 to ICES WGWIDE and in January 2024 to ICES WGIPS. Coastal state scientists, from Faroe Islands, Norway and Greenland, 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 Continental Shelf	DISTANCE FROM/COAST			
			Within 3 NM	Between 3-12 NM	Between 12-50 NM	Between 50-200 NM
Pelagic trawling, echo sounders, CTD and plankton net (WP2)	Yes	Yes	No	No	Yes	Yes

Appendix 1: Executive summary from IESSNS survey report 2022 (ICES. 2022. Working Group on Widely Distributed Stocks (WGWIDE). ICES Scientific Reports. 4:73. 922 pp. http://doi.org/10.17895/ices.pub.21088804).

The International Ecosystem Summer Survey in the Nordic Seas (IESSNS) was performed within approximately 5 weeks from July 1st to August 3rd in 2022 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 now consists of seven years (2016-2022).

The survey coverage area included in calculations of the mackerel index was 2.9 million km2 in 2022, which is 32% larger coverage compared to 2021. Survey coverage was increased in the western areas (Iceland and Greenland waters) compared to in 2021. Furthermore, 0.28 million km2 was surveyed in the North Sea in July 2022, but those stations are excluded from the mackerel index calculations.

The total swept-area mackerel index in 2022 was 7.37 million tonnes in biomass and 17.51 billion in numbers, an increase by 43% for biomass and 43% for abundance compared to 2021. In 2022, the most abundant year classes were 2020, 2019, 2010, 2011, respectively. The cohort internal consistency improved compared to last year, particularly for ages 5-8 years.

Most of the surveyed mackerel still appears to be in the Norwegian Sea. The mackerel were more westerly distributed than in the last 2 years.

The zero-line was reached south and north of Iceland and in the west in Greenland waters. It was not reached in the north-western and north-eastern part of the Norwegian Sea but given that the polar front with water too cold for mackerel is usually found close to the northwesternmost catches, we assume that the zero-line was practically reached here as well. Towards the Barents Sea the zero-line was not reached but considered of less quantitative importance based on low catch rates. The zero-line was not reached on the European shelf, where mackerel are present west of the British Isles and in the southern North Sea

A preliminary estimate suggests that total number of NSSH recorded during IESSNS 202 was 25.6 billion and the total biomass index was 7.26 million tonnes, or 26% (abundance) and 19% (biomass) higher than in 2021. The 2016 year-class 6-year-olds) completely dominated in the stock and contributed to 58% and 56% to the total biomass and total abundance, respectively, whereas the 2013 year-class (9-year-olds) contributed 8% and 7% to the total biomass and total abundance, respectively. The 2016 year-class is fully recruited to the adult stock.
The zero-line of the distribution of the mature part of NSSH was considered to be reached in all directions. The group considered the acoustic biomass estimate of herring in 2022 to be of the similar quality as in the previous survey years. The herring was mainly observed in the upper surface layer as relatively small schools.

A preliminary estimate suggests that total biomass of blue whiting registered during IESSNS 2022 was 2.1 million tons, which is similar to 2021 (2.2 mill tons). Estimated stock abundance (ages 1+) was 27.2 billion compared to 26.2 billion in 2021. Age 1 and 2 respectively, dominated the estimate in 2022 as they contributed to 44% and 33% (abundance) and 30% and 33% (biomass), respectively. The group considered the acoustic biomass estimate of blue whiting to be of good quality in the 2022 IESSNS as in the previous survey years.

As in previous years, there was overlap in the spatio-temporal distribution of mackerel and herring. This overlap occurred between mackerel and North Sea herring in the North Sea and partly in the southernmost part of the Norwegian Sea. There were also some overlapping distributions of mackerel and Norwegian spring-spawning herring (NSSH) particularly in the western, north-western part of the Norwegian Sea.

Other fish species also monitored are lumpfish (Cyclopterus lumpus) and Atlantic salmon (Salmo salar). Lumpfish was caught at 71% of surface trawl stations distributed across the surveyed area from southwestern part of Iceland, central part of North Sea to southwestern part of the Svalbard. Abundance was greater north of latitude 72°N compared to southern areas. A total of 60 North Atlantic salmon were caught in 38 stations both in coastal and offshore areas from 61°N to 76°N in the upper 30 m of the water column. The salmon ranged from 0.028 kg to 4.1 kg in weight, dominated by post-smolt and 1 sea-winter individuals. We caught from 1 to 6 salmon during individual surface trawl hauls. The length of the salmon ranged from 15 cm to 74 cm, with the highest fraction between 20 cm and 30 cm

Satellite measurements of sea surface temperature (SST) in the Northeast Atlantic in July 2022 show that parts of central Norwegian Sea and areas east and north of Iceland were slightly cooler than the long-term average for July 1990-2009. The northern regions of the Nordic Seas were slightly warmer than the average while the East Greenland Current was cooler that the long-term average. The SST in the Irminger Sea and Iceland Basin were slightly warmer than the average.

The zooplankton biomass varied between areas with a patchy distribution throughout the area. In the Norwegian Sea areas, the average zooplankton biomass was at similar level as last year, slightly lower in Icelandic waters, and higher in Greenlandic waters.

The acoustic results on Norwegian spring-spawning herring and blue whiting presented in the cruise report are preliminary and have not yet been finalized and properly quality checked. A final cruise report from the IESSNS 2022 will be available at the same time as the ICES WGWIDE report will be available on 30. September 2022.