Institut für Seefischerei (TI-SF)

THÜNEN

Herwigstraße 31, 27572 Bremerhaven Telefon 0471 94460-117 Datum: 12.05.2025 Az: Ulle./Rose./4803

Cruise Report FRV "Tarajoq"

Survey 0125 - 24.03. – 27.04.2025

German Participation in the International Mackerel and Horse Mackerel Egg Survey 2025 (Replacement for WH488)

Scientist in charge: Jens Ulleweit

INTRODUCTION

The mackerel and horse mackerel egg survey forms a part of an ICES-coordinated international study in the Eastern North Atlantic conducted during the first half of 2025. This investigation takes place triennially since the late 1970s and is coordinated by the ICES Working Group on Mackerel and Horse Mackerel Egg Surveys (WGMEGS).

The main objective of this series of individual cruises from January until July is to produce both an index and a direct estimate of the biomass of the Northeast-Atlantic mackerel stock and the southern and western horse mackerel stocks. The mackerel and horse mackerel egg survey is the main source providing fishery independent information for these stocks.

The general method is to quantify the freshly spawned eggs in the water column on the spawning grounds. To be able to establish a relationship between eggs and spawning stock biomass, the fecundity of the females must also be determined. This is done by sampling sufficient numbers of gonads before, during and after spawning. These samples are then histologically analysed. In combination, the realised fecundity (potential fecundity minus atresia) of the females and the actual number of freshly spawned eggs in the water render an estimate of the spawning stock biomass.

As a consequence of the long spawning period and the large area involved, the mackerel and horse mackerel eggs surveys have been highly international from the very beginning. In 2025, a total of 18 individual cruises with research vessels and chartered fishing vessels will be carried out, with the contribution of UK (Scotland and England), Denmark, Spain (AZTI and IEO), Ireland, Germany, the Netherlands, and the Faroese Islands.

Verteiler:

Schiffsführung FFS „Solea" „Walther Herwig III"
BA für Landwirtschaft und Ernährung (BLE) Fischereiforschung
BM für Ernährung und Landwirtschaft (BMEL), Ref. 614
BA für Seeschifffahrt und Hydrographie (BSH), Hamburg
Deutscher Angelfischerverband e.V.
Deutsche Fischfang-Union, Cuxhaven
Deutscher Fischereiverband Hamburg
Doggerbank Seefischerei GmbH, Bremerhaven
Erzeugergemeinschaft der Deutschen Krabbenfischer GmbH
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GEOMAR Helmholtz-Zentrum für Ozeanforschung Kiel
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Thünen-Institut - Präsidialbüro
Thünen-Institut - Reiseplanung Forschungsschiffe, Dr. Rohlf
Fahrtteilnehmer*innen

The cruise of FRV "Tarajoq" is a contribution to these international efforts assessing and managing the mackerel and horse mackerel stocks. This cruise was a replacement of the 488th cruise of FFS "Walther Herwig III" which had to be cancelled due to technical issues. The survey itself is part of the European data sampling directive established in 2002 and financially supported by the EU.

PARTICIPANTS

Ms Marsha Dechant	TI SF, Hochschule Bremerhaven
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Ms Alexandra Poell	TI-SF
Mr Sergej Schachray	TI SF
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Ms Pauline Wagner	TI SF, University of Hamburg
Mr Simon Wieser	TI-SF

CRUISE ITINERARY

Date

24/03	Boarding Hirtshals
25/03	Departure Hirtshals
29/03, 02:08 UTC	Arrival in standard sampling area, start of sampling
08/04, 11:57 UTC	End of sampling 1st leg
09/04 / 10/04	Port Call Brest
10/04, 19:06 UTC	Start of sampling 2nd leg
22/04, 06:09 UTC	End of sampling and departure from survey area
26/04	Arrival in Hirtshals
27/04	Disembarkment of scientific crew

Narrative

In 2025 the entire spawning period of mackerel and horse mackerel is divided into seven sampling periods. According to the survey proposal of the responsible ICES working group it is planned to obtain a full coverage of the entire spawning area throughout all sampling periods. FRV "Tarajoq" was advised to contribute to the sampling during the 3rd period (March/April) and during the 4th period (April/May). For period 3 FRV "Tarajoq" was supposed to cover the survey area in the West of Ireland and the Celtic Sea between 53°15`N and 48°45`N and in period 4 in the area West of Ireland, the Celtic Sea and the northern Bay of Biscay between 54°15`N and 47°45`N, respectively. The proposal was to conduct, if possible, alternate transects during the first part of every leg of the survey and then fill in the missing transects on the way back.

FRV "Tarajoq" started at ICES statistical rectangle 27E2 at 49°15`N 007°15`W continuing sampling westwards on the same latitude thereafter. The survey area was then covered by plankton hauls on every other row of statistical ICES rectangles on alternate transects northwards towards 53°15'N. This was the most northern transect to be covered during the 1st leg. On the way southwards FRV "Tarajoq" sampled the remaining transects until 49°75`N securing a full coverage of the assigned survey area for period 3. For fecundity sampling five fishing hauls were conducted by FRV "Tarajoq" during this part of the survey.

Sampling for period 4 started on 10th April at ICES rectangle 24E3 at 47°45`N 006°15`W and the investigation area was then covered in northerly direction until the transect on 54°15`N. On this most northerly transect sampling was interrupted by 16 hours due to an upcoming storm front. The remaining survey time was then used steaming southwards to fill in missing transects. Sampling for FRV "Tarajoq" ended with the 184th plankton haul at

51°15`N 12°45`W. Seven fishing hauls were conducted during this part of the survey for fecundity sampling of adult fish.

Results of the survey were intermittently communicated to the survey-coordinator. Figure 1 provides an overview over all positions and activities carried out during the cruise.

METHODS

Plankton

Plankton samples were taken with a Hydrobios "Nackthai" (a modified Gulf sampler) equipped with a CTD probe to measure depth, temperature and salinity as well as the permanent water flow through the mouth opening and outside the net to determine the volume of filtered water.

The "Nackthai" net mesh size was 280 µm. The plankton sampler was towed at a nominal speed of 4-5 knots through the water at a towing cable lowering as well as retrieval speed of 0.5 ms^{-1} allowing for a uniform sampling of the water column. Maximum sampling depth was 200 m or 5 m above the sea bed. Ship's and towing cable lowering and retrieval speed were monitored continuously and noted along with data on starting position, date, time (both UTC), weather condition, total cable length, temperature and salinity at pre-defined depths as well as the haul duration.

After completion of each plankton haul the contents of the net was gently washed down into the cod-end bucket that was detached thereafter and the plankton sample was preserved and stored according to the standard WGMEGS operation procedure. The samples were then allowed to stand for at least 12 h before they were further processed to make sure that all organisms were well fixed and soaked with formaldehyde.

Fish eggs in the samples were separated from the remaining plankton organisms by performing the spray method recommended by the WGMEGS report. All fish eggs were sorted into eggs with and without oil globule and counted. Fish eggs with oil globules were then identified by species and staged.

At the end of the cruise all egg samples had been sorted once for mackerel and horse mackerel eggs in total or, as representative sub-samples of up to 200 eggs per sample. At least sub-samples of up to 150 individuals per target species were staged.

Fecundity

For trawling the bottom trawl "Bacalao" of FRV "Tarajoq" were used. The trawling stations were placed on the shelf edge and the Porcupine Bank between 161 and 195m water depth, since concentrations of mackerel (and horse mackerel) were expected here. No trawling was conducted in Irish Coral Reef Special Areas of Conservations.

The whole catch was sorted by fish species. Either all mackerel or a subsample of mackerel was selected, of which length and weigh, sex and maturity were determined and otoliths were taken. Furthermore, for mature female mackerel the following parameters were also determined: Length, weight (total, ovary), sex and maturity. Four parallel micropipette samples were then taken of the ovaries. Then the ovaries were removed, sliced into halves and put into different formalin jars.

Micropipette samples and ovaries will be sent to different laboratories for the histological fecundity analysis.

RESULTS

Meteorology and Hydrography

The weather conditions during both sampling periods were predominantly good to very good. Only a few passing low-pressure systems with strong westerly winds occurred leading to an overall interruption of the sampling activities for less than 24 hours during the survey.

During both legs sea temperature in 20m depth was between < 9.9°C in the North and East and >13.2°C in the South and West of the sampled area. Temperatures on the shelf towards Ireland were always distinctly cooler than over the shelf edge and beyond it. Fig 2 shows the water temperatures for both periods. Due to still wintry conditions the water body was well mixed.

Egg distribution (preliminary results)

A total of 184 Nackthai catches (2022: 129, 2019: 180, 2016 and 2013: 96) were achieved containing a total of 20294 fish eggs. In 75% of all hauls fish eggs were found and identified. Highest egg densities were encountered above the shelf edge as well as above Porcupine Bank (Fig 3).

Preliminary results show that of all fish eggs, 73% (n=14735, 2022: 9083; 2019: 32814) were of mackerel and 16 % (n=3343, 2022: 2862; 2019: 352) of horse mackerel, respectively. The percentage of mackerel eggs is therefore higher than 2022 but still substantially lower than observed in 2019 (91%) whereas the percentage of horse mackerel is much higher (1% in 2019). Other eggs caught in significant numbers were those of blue whiting (*Micromesistius poutassou*), pearlside (*Maurolicus muelleri)*, triglidae, macrourids (Macrouridae) and different flatfish species.

Mackerel eggs were found in 47% of the plankton samples with the highest abundance above the shelf break and water depths between 122 and 211 m. There is a distinct difference in found mackerel eggs between period 3 and 4. Period 4 yielded only 3% (496) of all found mackerel eggs. Overall, highest mackerel egg densities were encountered on the Irish shelf and the Northern Celtic Sea (Fig.4).

41% off all mackerel eggs were freshly spawned (stages 1A and 1B), in period 3 5861 eggs of 14229 (41%), in period 4 196 of 486 eggs in total (40%). Mean egg number per station were 80 eggs (all stages; 2022: 70, 2019: 182, 2016: 197). Highest mackerel egg numbers could be found at 50°15'N 09°45'W with a maximum value of 2982.

Horse mackerel eggs were less abundant than mackerel eggs (in 28% of all hauls). All together 3343 horse mackerel eggs (all stages) of which 2248 horse mackerel eggs in stages 1A and 1B) were found. Figure 5 shows the geographical distribution of all horse mackerel eggs.

Looking at both periods spawning activity seems to be less for mackerel especially in period 4 and higher for horse mackerel in comparison to the surveys in the years before. But this cannot be taken as a general trend as the results of all participating institutes needs to be taken into account.

Fecundity sampling

12 fishing stations were conducted during the survey, five in sampling period 3 and seven in period 4. All fishing hauls were conducted with a bottom trawl following the perception that mackerel is aggregated more to the bottom during spawning and daytime.

In period 3 mackerel were caught in three of five hauls yielding in >600kg mackerel all together. In period 4 in all hauls mackerel were caught but only in very limited numbers (33kg all together). Horse mackerel were present in eight of the total 12 hauls (~2100kg). Other species caught were boarfish, blue whiting, hake, John Dory, monkfish, megrim,

haddock, cod, argentines, witch, lemon sole, thickback sole, dogfish, tope, gray shark and different cephalopods.

All together 105 fecundity samples of female mackerel were taken as well as length, sex, maturity and otoliths of a bigger subsample of mackerel (male and female). Fig. 6 shows the maturity stage distribution of female mackerel analysed during the egg survey.

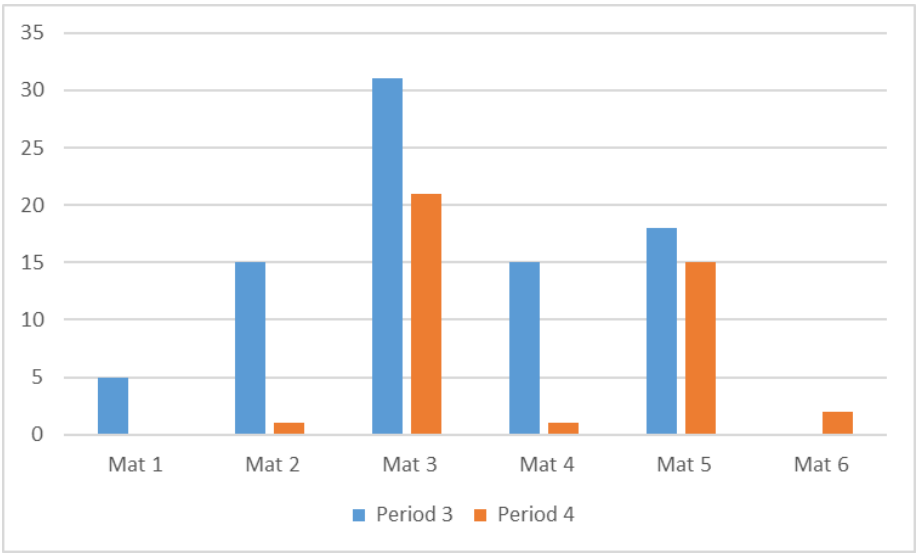

Fig.6: Maturity stages distribution of female mackerel, MEGS 2025

Most of the analysed mackerel in both periods were in maturity stage 3 (actively spawning) but due to the low number of samples this alone cannot be taken as an indicator for the spawning time.

ACKNOWLEDGEMENT

The cruise was partly funded by the European Commission (DG-Fish) under the EU directive 2017/1004.

I wish to thank Captain Jákup G. Mikkelsen and his crew onboard FRV "Tarajoq" from the Greenland Research Institute for their excellent work and co-operation. It was a pleasure to work with them. Also, I would like to thank all members of the scientific team for their hard work especially in very bad weather conditions.

Bremerhaven, 30/04/2025

Jens Ulleweit
(Scientist in charge)

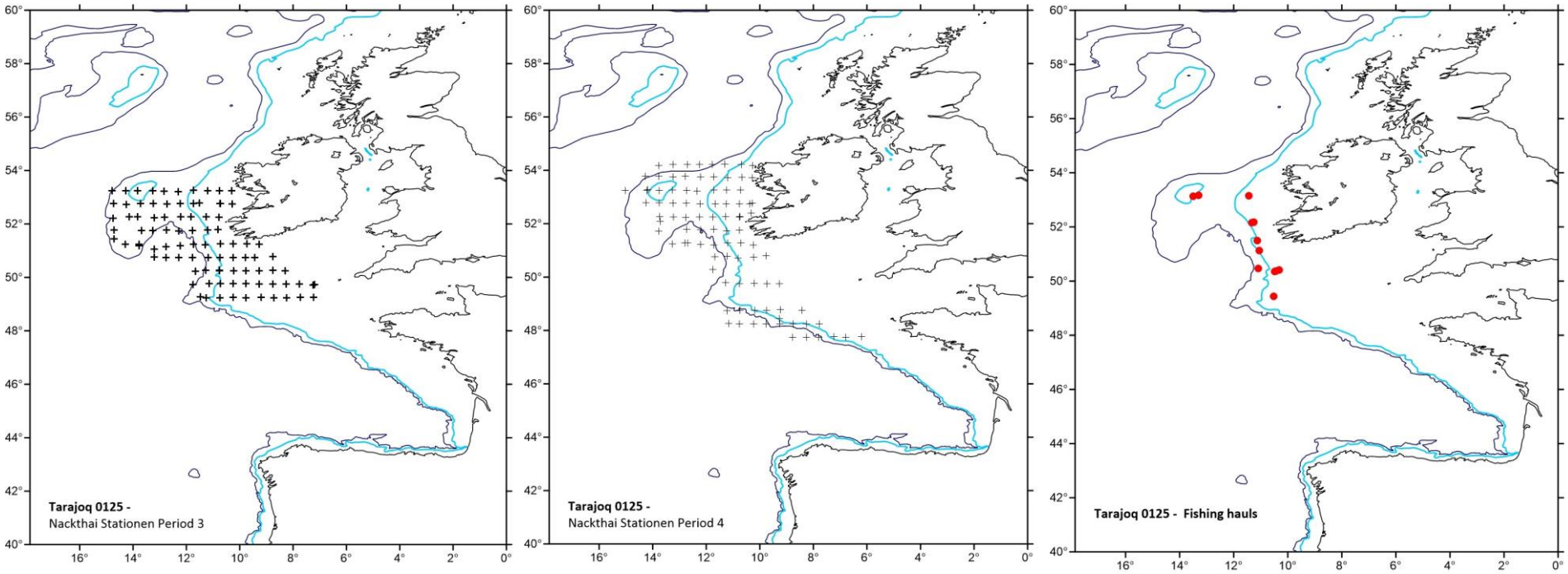

Fig.1: FRV "Tarajoq" MEGS25, plankton station grid in the 3rd (left panel) and 4th sampling period (middle panel) and the position of the fishing hauls for both periods (right panel); black crosses = positions of plankton hauls; red circles = positions of fishing hauls

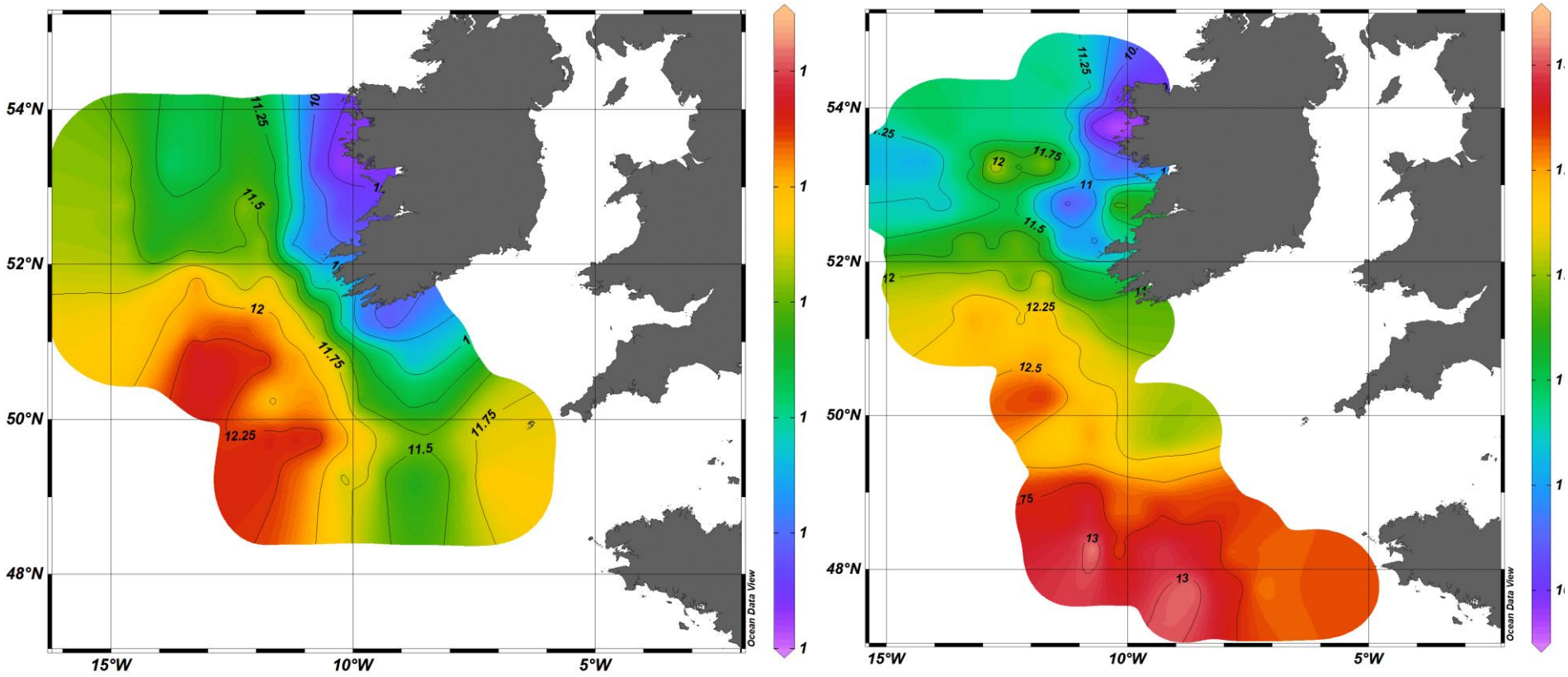

Fig .2: Water temperatures (°C, surface) in the 3rd (left panel) and 4th sampling period (right panel)

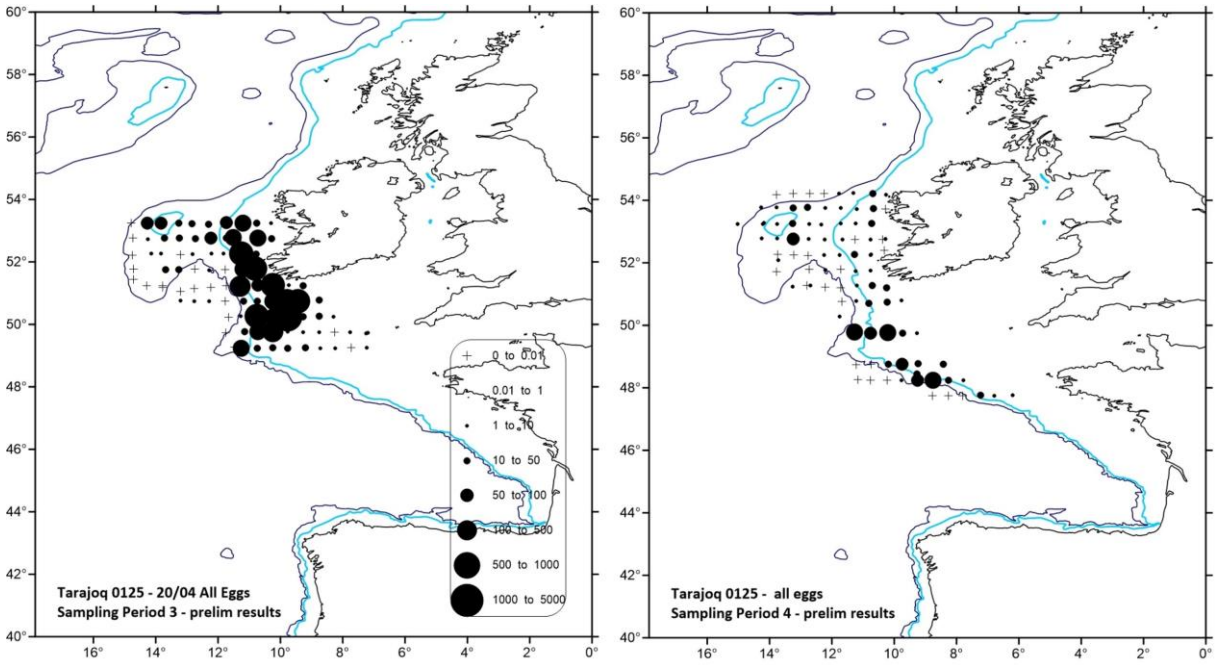

Fig.3: FRV "Tarajoq" MEGS25, distribution of all fish eggs in the 3rd (left panel) and 4th sampling period (right panel) in absolute numbers

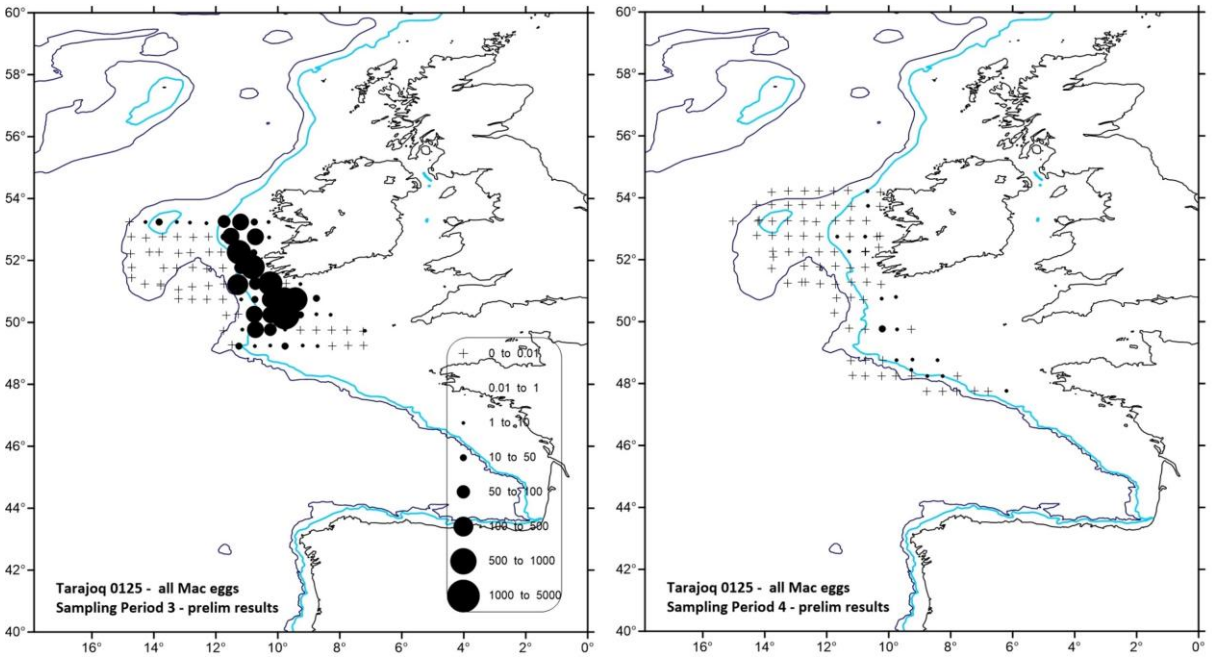

Fig.4: FRV "Tarajoq" MEGS25, distribution of all mackerel eggs in the 3rd (left panel) and 4th sampling period (right panel) in absolute numbers

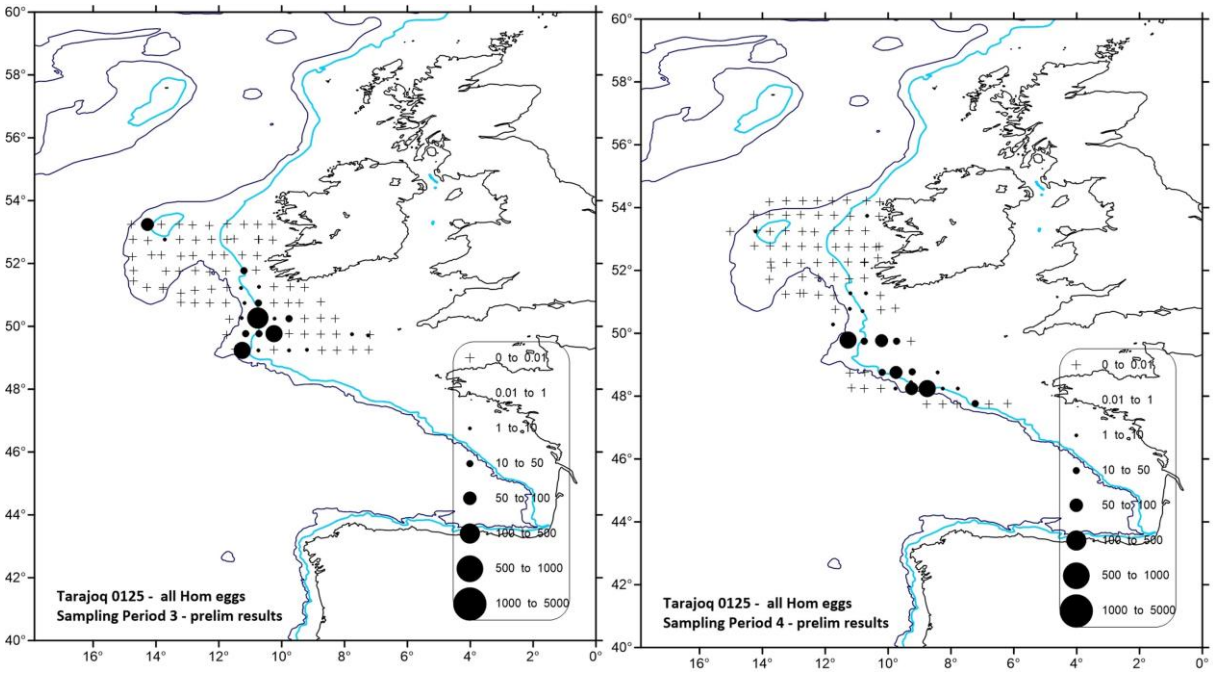

Fig.5: FRV "Tarajoq" MEGS25, distribution of all horse mackerel eggs in the 3rd (left panel) and 4th sampling period (right panel) in absolute numbers