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Survey Report FRV Walther Herwig III
Survey WH 364 - 20.03. – 25.04.2013

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German Participation in the International Mackerel and Horse Mackerel Egg Survey 2013

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 2013. 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 August 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 only 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.

To provide a reliable estimate of the quantity of spawned eggs and the fecundity, an extensive coverage of the spawning area is required both in time and space. The spawning of the southern horse mackerel stock and the southern mackerel component starts already in late December off the Portuguese coast and proceeds further north along the continental shelf edge with increasing water temperature. The peak of the spawning occurs normally in April-May in the area of the Great and Little Sole Bank with an extension to the Porcupine Bank. However, at the same time spawning is also observed in the inner Bay of Biscay and extends as far north as the waters of the Faroese Islands.

As a consequence of the long spawning period and the large area involved, the mackerel and horse mackerel egg surveys have been highly international from the very beginning. In 2013, a total of 17 individual cruises will be carried out, with the contribution of Spain, Scotland, Ireland, Portugal, Germany, the Netherlands, Faroese Islands, Iceland and Norway.

The 364th cruise of FRV “Walther Herwig III” is a contribution to these international efforts assessing and managing the mackerel and horse mackerel stocks. The survey is part of the European data collection established in 2002 and financially supported by the EU.

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CRUISE ITINERARY

Date / UTC

20/03, 10:00 hrs	Boarding Bremerhaven (delayed departure due to technical problems)
24/03, 06:00 hrs	Departure Bremerhaven
26/03, 13:00 hrs	Testing CTD, plankton sampler
27/03, 18:30 hrs	Arrival in standard sampling area, start of sampling
28/03, 09:30 hrs to 02/04, 20:00 hrs	No sampling due to weather conditions
08/04, 14:00 hrs to 16/04, 06:00 hrs	Break in Brest, France (personnel exchange, extended stay due to weather conditions)
16/04, 18:00 hrs	Arrival in standard sampling area, start of leg 2 sampling
22/04, 06:00 hrs	End of sampling and departure from survey area
25/04, 11:00 hrs	Arrival WH III in Bremerhaven

Narrative

In 2013, the entire spawning period of mackerel and horse mackerel was divided into six sampling periods. According to the survey proposal of the responsible ICES working group, it was planned to obtain a full coverage of the entire spawning area throughout all sampling periods. FRV "Walther Herwig III" was advised to contribute to the sampling during the 3rd period in March and April. FRV "Walther Herwig III" was supposed to cover the survey area in the West of Ireland, the Celtic Sea and the most northern part of the Bay of Biscay between 53.45 N and 48.45N. The proposal was to conduct alternate transects on the first leg of the survey and then fill in the missing transects on the way back.

"Walther Herwig III" started at ICES statistical rectangle 36D9 at 53°45`N 10°15`W continuing sampling westwards on the same latitude thereafter. Due to heavy weather conditions, the vessel had to stop sampling after a few plankton hauls and had to take cover near the Irish coast. Sampling could not continue before April, 2nd with the first haul at 52°45'N 010°15'W". The survey area was then covered on every other row of statistical ICES rectangles on short alternate transects southwards towards 48°45'N.

The first leg ended with a scheduled personnel exchange on April, 8th in Brest, France. Because of again very bad weather conditions with wind forces up to 12 Beaufort and wave heights more than 10m, the stay had to be extended until April, 16th. The remaining survey time was then used to cover the investigation area in northerly direction utilising the same "alternate transects" strategy as during the first leg. Due to time constraints, the Scottish research vessel "Scotia" covered the most north-westerly plankton stations at the area of the "Porcupine Bank". Sampling for FRV "Walther Herwig III" ended with the 96th plankton haul at 50°15'N 007°15' W.

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

METHODS

Plankton

Plankton samples were taken with a Hydrobios "Nackthai" (a modified Gulf VII sampler) equipped with a CTD probe to measure real time in-situ 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 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 were 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.

All samples were completely sorted for fish eggs and the remaining plankton organisms were roughly identified and their qualitative composition was noted. The spray method recommended by the WGMEGS report was also used especially when large quantities of fish eggs were present in the sample. All fish eggs were sorted into eggs with and without oil globule and counted.

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 semi-pelagic net PSN 205 was used. The trawling stations were placed on the shelf edge between 160 and 180m 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. 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 have been sent to different laboratories for the histological fecundity analysis.

Additional work

In collaboration with AZTI Tecnalia (San Sebastian, Spain), some Nackthai hauls were repeated in order to get samples for genetical investigations on the possible determination of different mackerel populations. Furthermore, for the comparison of the conventional method of fish egg species determination with a newly developed genetic method, mackerel and horse mackerel eggs were separated for further analysis at the German centre for marine biodiversity research (DZMB, Wilhelmshaven) during the 2nd leg.

RESULTS

Meteorology and Hydrography

Both legs were hampered by heavy weather conditions. The first leg was characterized by severe low pressure systems with easterly winds, the second leg by the rapid passing of severe low-pressure systems with south westerly winds with forces up to 12 Beaufort.

During both legs, sea temperature in 5m depth was between < 8.2°C in the North and East and >11.7 °C in the South and West of the sampled area (Fig.2). Temperatures on the shelf were always distinctly cooler than over the shelf edge and beyond it. Therefore, a strong front developed particularly west of Ireland. Due to still winterly conditions, the water body was well mixed.

Egg distribution

A total of 96 Nackthai catches were conducted during the whole cruise containing a total of 30751 fish eggs. Only very few samples contained no fish eggs at all and highest egg densities were encountered above the shelf edge as well as above Porcupine Bank (Fig. 3).

Of all fish eggs, 71% (= 21809) were of mackerel and only 0.9 % (= 288) of horse mackerel, respectively. Other eggs caught in significant numbers were those of hake (*Merluccius merluccius*), blue whiting (*Micromesistius poutassou*), gurnards (Triglidae), Argentine *(Argentina. silus) and* Lesser Argentine (*A. sphyraena)*, Pearlside (*Maurolicus muelleri)*, *Soleidae* (*Solea solea*)*,* Macrourids (Macrouridae) and Dealfish (*Trachipterus arcticus).* Noticeable is the low abundance of found horse mackerel eggs but because of the significant low number of this year´s samples a direct comparison with 2010 is not possible. Additionally, more hake eggs were identified than in the years before.

Mackerel eggs were found in 83% of the plankton samples with the highest abundance above the shelf break and water depths between 150 and 500 m. Highest mackerel egg densities were encountered westerly of the Irish shelf and north-easterly of the Porcupine Bank (Fig 4). As in 2010, about 40 % of all mackerel eggs were of stages IA and IB. Figure 5 shows the geographical distribution. The mean egg number per station was 311 eggs (all stages). Highest mackerel egg numbers could be found at 52°45'N 011°45'W with a maximum value of 5778.

Horse mackerel eggs were much less abundant than mackerel eggs. Figure 6 shows the horse mackerel distribution in the investigation area. All together only 288 horse mackerel eggs (54 in stages 1A and 1B) were found on five stations. The average egg number was 33 eggs per station of all stages with the maximum value of 166 eggs at 49°45'N 010°45'W.

Fecundity sampling

Due to the weather conditions, only 2 fishing stations were conducted throughout the survey. The first haul consisted of 100% mackerel with a weight of 1289kg, the second haul of 1kg mackerel and blue whiting. All together, 46 fecundity samples of mackerel were taken as well as length, sex, maturity and otoliths of a bigger subsample of mackerel.

In contrast to the years before, most of the mackerel (male and female) had not spawned or just started spawning, but due to the low number of samples, this cannot be taken as an indicator for a shift in spawning time.

PARTICIPANTS

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Tim Kirchner	TI SF, University of Hamburg
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Sakis Kroupis	TI SF
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Sergey Schachray	TI SF
Birgit Suer	TI SF
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Jens Ulleweit	TI SF, Chief Scientist

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I wish to thank Captain Jürgen Vandrei and his crew onboard FRV “Walther Herwig III” for their support and co-operation. Also, I would like to thank all members of the scientific team for their hard work in bad weather conditions.

Hamburg, 15/05/2013

Jens Ulleweit
(Cruise Leader WH364)

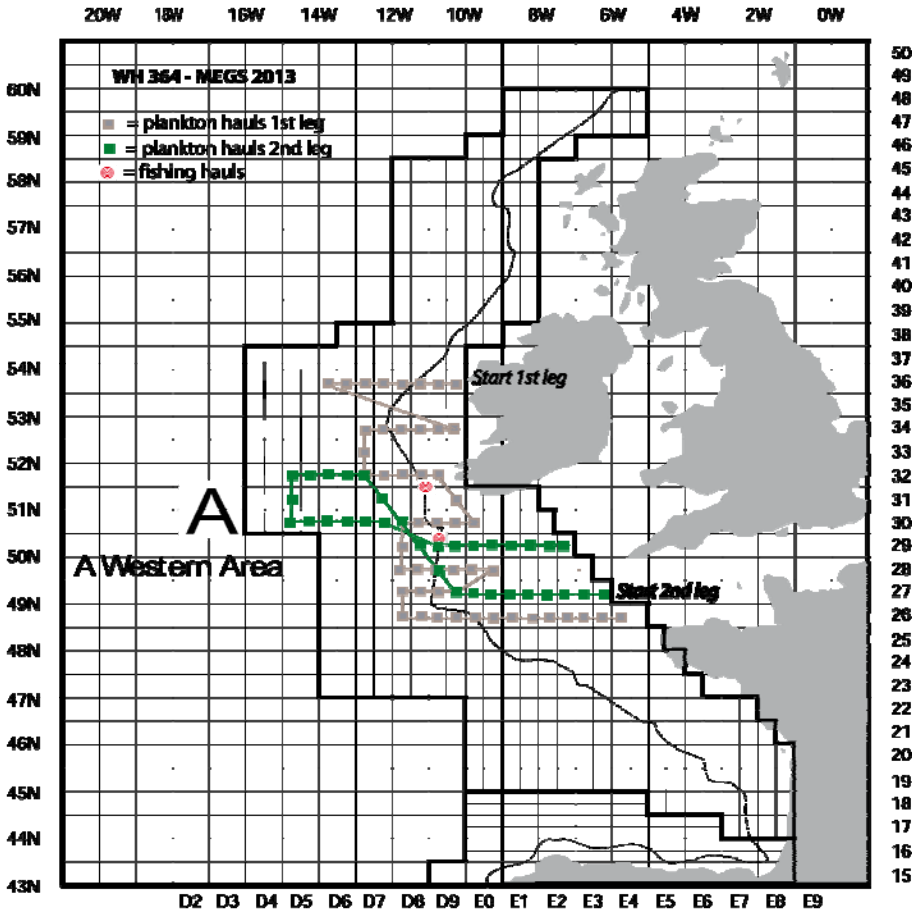

Fig.1: 364th cruise, cruise track and station grid

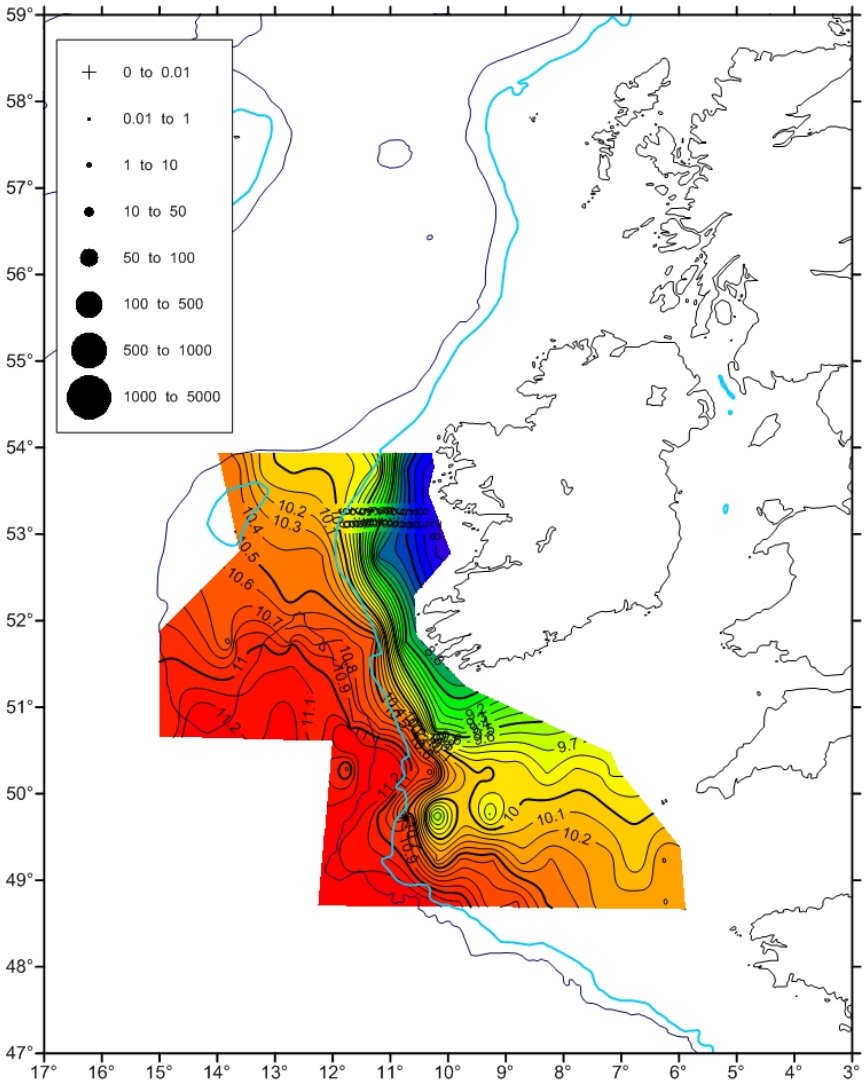

Fig.2: 364th cruise, sea temperatures in 5m depth

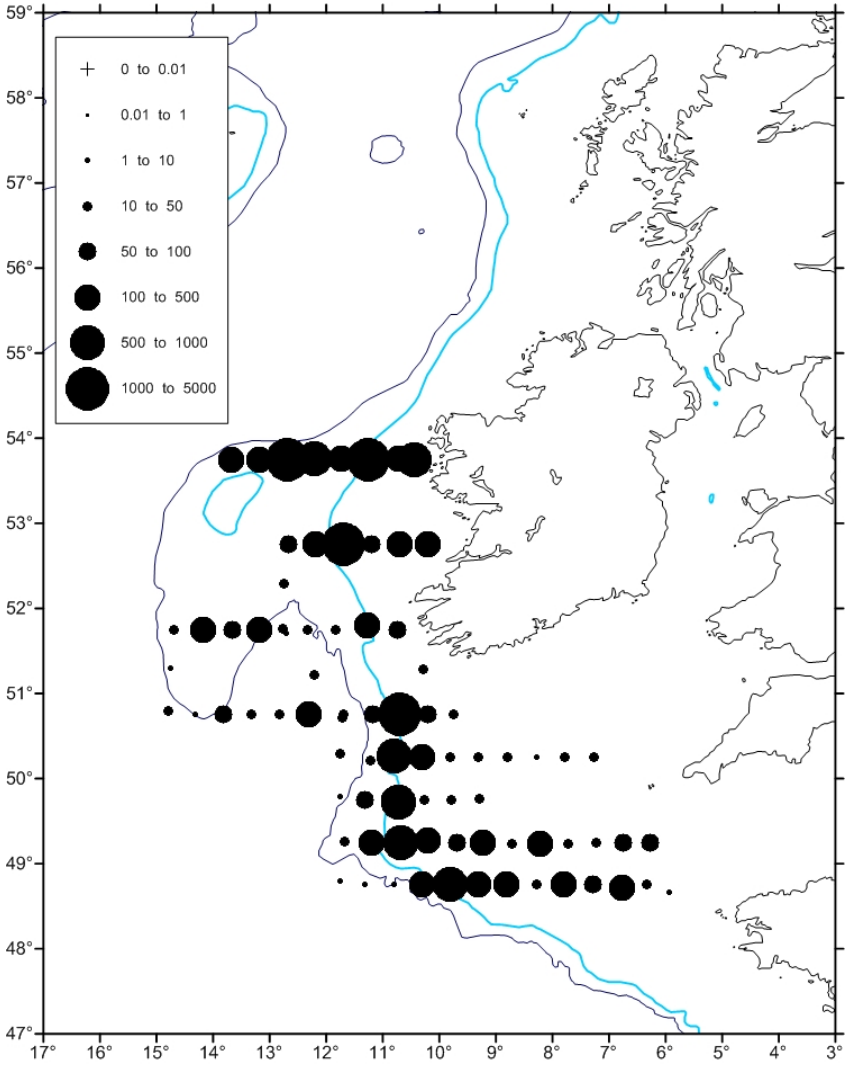

Fig.3: 364th cruise, the distribution of all fish eggs (numbers per m²)

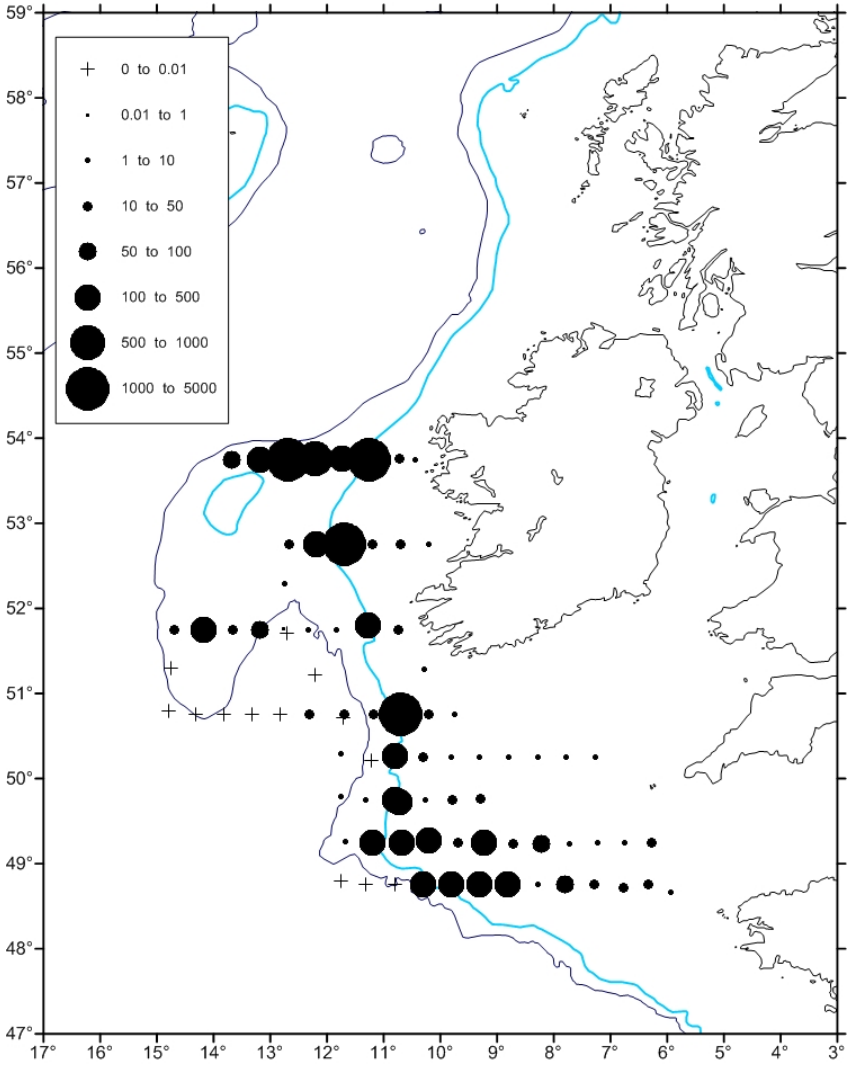

Fig.4: 364th cruise, the distribution of all mackerel eggs (numbers per m²)

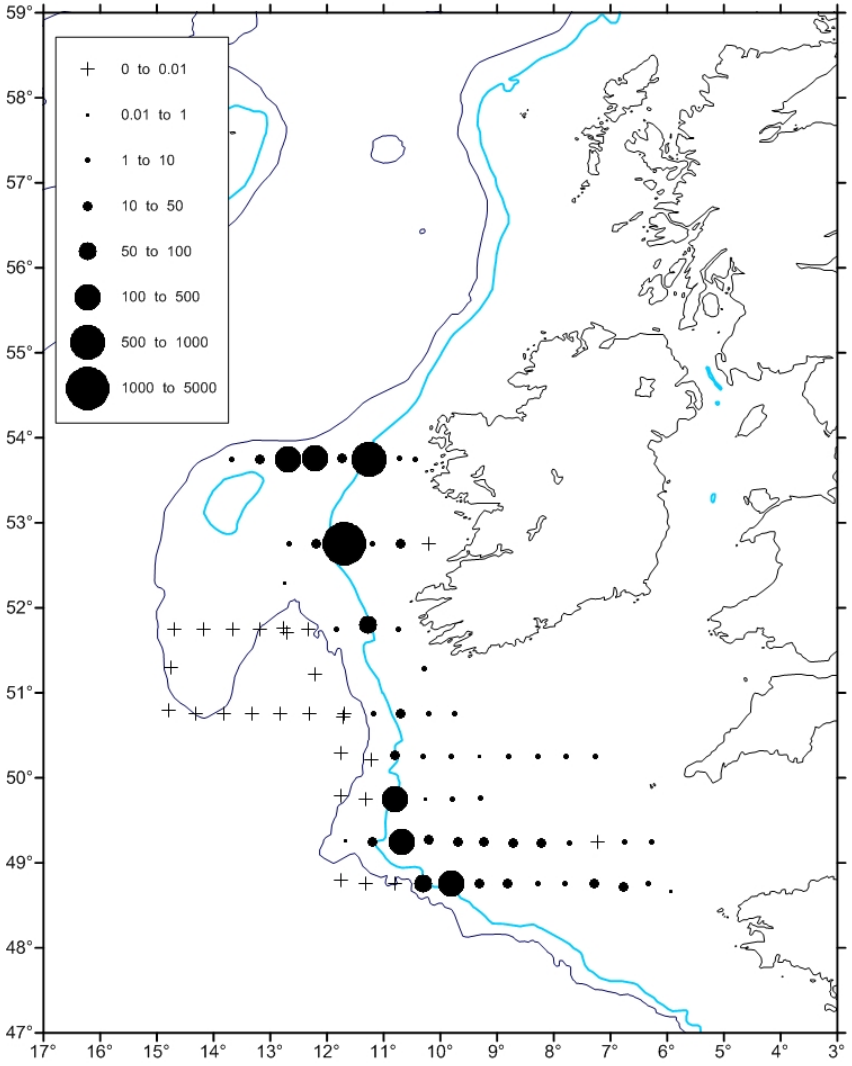

Fig.5: 364th cruise, the distribution of stage 1 mackerel eggs (numbers per m²)

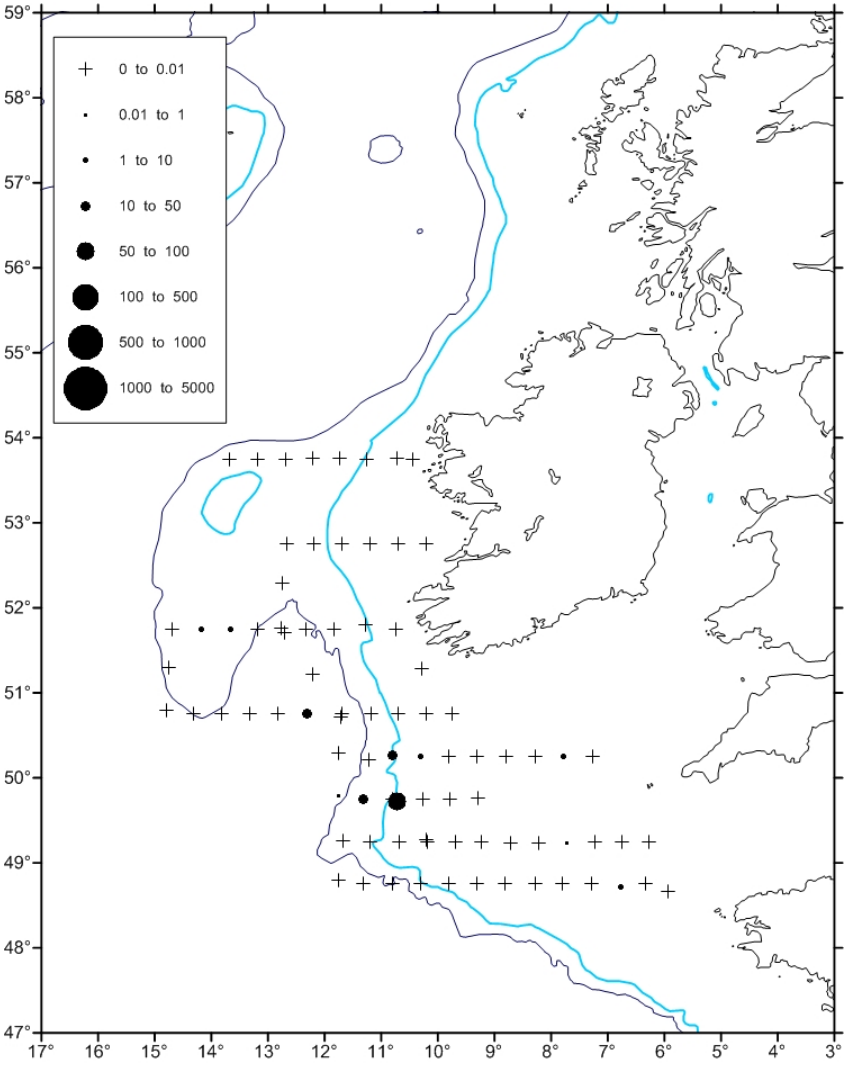

Fig.6: 364th cruise, the distribution of all horse mackerel eggs (numbers per m²)