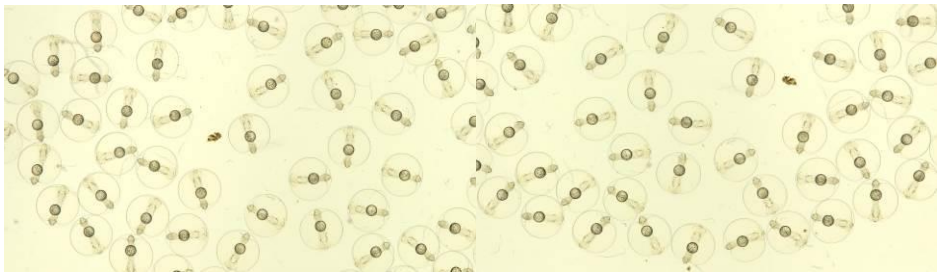
Mackerel winter spawning surveys 2014-2015 December survey

C.J.G. van Damme[1] & Brendan O'Hea[2]

Report number C043/15



IMARES Wageningen UR

(IMARES - Institute for Marine Resources & Ecosystem Studies)

Client: Pelagic Freezer-trawler Association (PFA)
P.O. Box 72
2280 AB, Rijswijk, The Netherlands

Publication date: 24 March 2015

---

[1] IMARES
[2] Marine Institute, Fisheries Ecosystems Advisory Services

IMARES WAGENINGEN UR

IMARES vision:

- 'To explore the potential of marine nature to improve the quality of life'.

IMARES mission:

- To conduct research with the aim of acquiring knowledge and offering advice on the sustainable management and use of marine and coastal areas.

IMARES is:

- An independent, leading scientific research institute.

P.O. Box 68
1970 AB IJmuiden
Phone: +31 (0)317 48 09 00
Fax: +31 (0)317 48 73 26
E-Mail: imares@wur.nl
www.imares.wur.nl

P.O. Box 77
4400 AB Yerseke
Phone: +31 (0)317 48 09 00
Fax: +31 (0)317 48 73 59
E-Mail: imares@wur.nl
www.imares.wur.nl

P.O. Box 57
1780 AB Den Helder
Phone: +31 (0)317 48 09 00
Fax: +31 (0)223 63 06 87
E-Mail: imares@wur.nl
www.imares.wur.nl

P.O. Box 167
1790 AD Den Burg Texel
Phone: +31 (0)317 48 09 00
Fax: +31 (0)317 48 73 62
E-Mail: imares@wur.nl
www.imares.wur.nl

A_4_3_2-V14.1

Contents

Summary

In recent years the western Atlantic mackerel stock has expanded, resulting in an earlier start of spawning and earlier occurrence of the mackerel peak of spawning. In 2014 and 2015 mackerel winter spawning surveys have been conducted to determine the start date of mackerel spawning in the western area. During the surveys both plankton sampling and trawl hauls are carried out.

This report contains the results of the December 2014 survey, carried out on board the Nida. Plankton samples were collected at 25 stations in the Bay of Biscay, and the eggs they contained were preserved in 4% buffered formaldehyde. In the laboratory in IJmuiden eggs were identified. Eggs were found in 7 samples, these contained 7 eggs of *Molva spp* and three codlike (small eggs without an oil globule) eggs, but no mackerel eggs. Due to technical problems with the vessel's trawl winches no pelagic trawl hauls were carried out. It was tried to collect mackerel gonad samples from the Irish ground fish survey in the Celtic Sea. As only 7 immature mackerels were collected, no information could be obtained on gonad and oocyte development in December.

Due to the bad weather the Celtic Sea could not be sampled during this survey. But it seems unlikely mackerel were spawning in the Celtic Sea, while no spawning occurred in the Bay of Biscay, since fish eggs were collected, but no mackerel eggs.

The crew on board Nida was very friendly and helpful. It should however be realised that fishing vessels are not ideal platforms for performing plankton surveys for practical reasons. On one hand collection of samples is suboptimal, and there is no proper area to sort out and identify eggs from the samples.

1. Introduction

In recent years the western Atlantic mackerel stock has expanded, resulting in an earlier start of spawning and earlier occurrence of the mackerel peak of spawning. Recent surveys in 2010 and 2013 have clearly shown that spawning starts earlier and that the spawning peak occurs earlier than has been observed previously. The net result is that potentially an unknown part of the spawning early in the season was missed in the 2010 and 2013 Atlantic mackerel egg surveys.
The current triennial mackerel egg survey is designed to cover the whole spawning area and period. To get a reliable estimate of the spawning stock biomass from an egg survey, the egg survey needs to cover the whole spawning area and period.

2. Aim of the project

The aim of the mackerel winter surveys project is to determine the start time for mackerel spawning in the western spawning component area in 2015, preparatory for a full triennial egg survey in 2016. Four surveys will be carried out, the first one in December 2014. This project is a collaboration between research institutes and the pelagic industry from The Netherlands, Denmark, Ireland and Scotland.

The principle purpose of these surveys is to identify where and when mackerel spawning starts in the western area. This information is vital in planning the appropriate spatial and temporal coverage for the next ICES Triennial Mackerel Egg Survey in 2016. Any new information on start of the spawning season will also add to the analysis of the egg survey results to produce the estimate of the stock biomass used in the analytical assessment.

This report contains the cruise report and results of the sample analyses of the December 2014 survey.

3. Materials and Methods

3.1 Vessel

The survey was carried out on board the "Nida KL759", a trawler owned by Parlevliet & van der Plas, registered in Lithuania (Figure 3.1).

Figure 3.1. The vessel Nida KL759.

3.2 Sampling gear

The sampling of the mackerel eggs was performed with a "Gulf VII High Speed Plankton Sampler" (Nash *et al*. 1998), with a plankton net with mesh size 280 µm. A small Scripps depressor (25 kg) was attached for stabilisation of the plankton sampler in the water. The amount of water filtered during each haul was measured using an electronic or mechanical flowmeter mounted inside the nosecone.
A Hydro-Bios CTD with an electronic flowmeter was mounted on the sampler frame to measure temperature, salinity and water flow during deployment. After the first haul the CTD was damaged and removed but a mechanical flow sensor replaced the electronic one. A Scanmar depth sensor was attached to the frame to monitor depth of the plankton sampler in the water column.

Mackerel were planned to be sampled using the pelagic trawl of the vessel or with handlines.

3.3 Fishing method

The speed during fishing with the plankton sampler was 4 knots through the water. A 'double oblique' haul (a V-shaped haul through the water column) was performed, trying to sample each 10 meters of the water column per minute going down and going up. Plankton samples were taken up to 10 m of the bottom or on deeper water, to 200 m maximum depth.

When markings were visible on the echo sounder it was planned to carry out a trawl haul to catch adult mackerel.

3.3 Proposed sampling grid

Figure 3.2 shows the proposed sampling grid for the survey. The setup of the survey was to sample around the 200m depth contour (shelf edge) where highest spawning concentrations occur during the standard mackerel egg surveys. At planned stations a haul with the plankton sampler would be performed to sample mackerel eggs. A total of 100 mackerel gonads were planned to be collected for oocyte development and fecundity analysis.

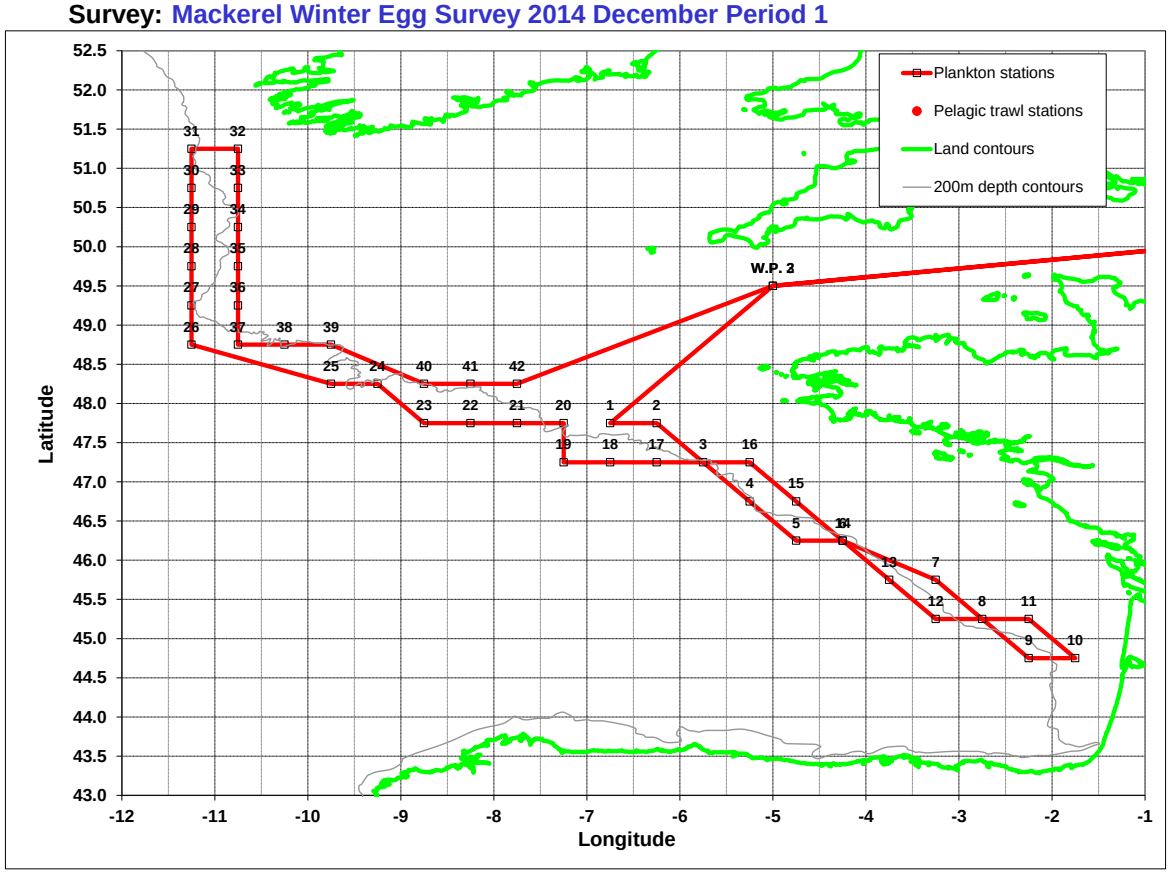


Figure 3.2. Proposed sampling grid.

3.4 Workup of samples

If possible eggs were sorted and identified on board during the survey. The remainder of the samples was sorted and eggs identified upon return in the laboratory in IJmuiden. After 12 to 24 hours of fixation, the fish eggs are collected manually from the sample. All eggs are measured, identified to species and staged.

4. Results

Date, time and harbours

From (harbour)	Date	Time (UTC)	To (harbour)	Date	Time (UTC)
IJmuiden	05-12-2014	17:00	IJmuiden	17-12-2014	10:00

Scientific crew Brendan O'Hea (cruise leader; MI Ireland)
Claire Moore (GMIT Ireland)

Deviations from the planned sampling grid

Due to bad weather circumstances during the whole survey the proposed sampling grid could not be followed. Figure 4.1 shows the positions of the plankton hauls which could be sampled.
After a couple of days at sea the captain announced that there was a major failure with the trawl winches. This failure was not possible to fix while at sea, therefore it was not possible to trawl for fish. A number of attempts were made to catch fish using handlines, however these were all unsuccessful. Radio contact was also made with a number of fishing vessels at regular intervals but none had any mackerel on board.

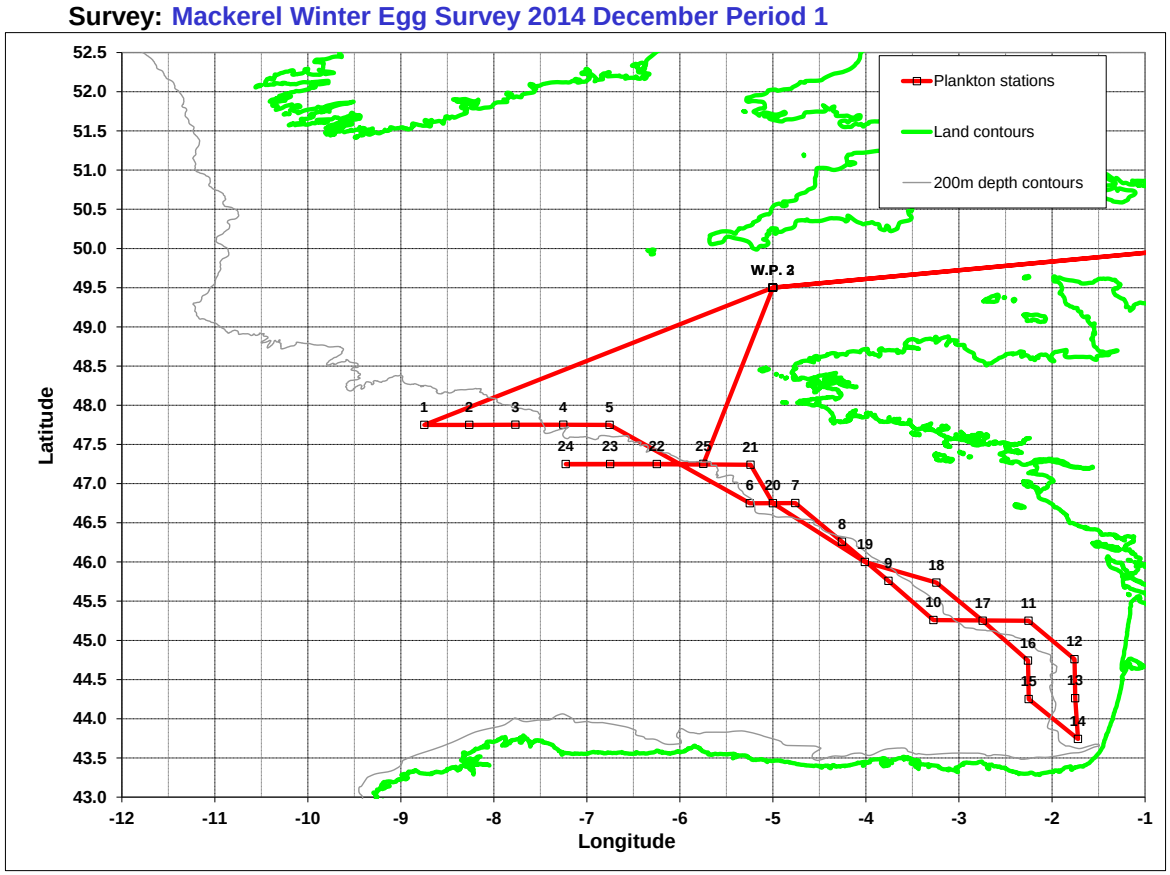


Figure 4.1. Stations sampled in December 2014.

Damage to sampling equipment

At the end of the first plankton haul, as the plankton sampler was being retrieved, the sampler smashed into the stern of the vessel. The nose cone was broken off and was lost, along with its associated electronic flowmeter. The CTD was also damaged in the incident and it ceased working. The nose cone and CTD were replaced and a mechanical flowmeter was inserted.

When retrieving the plankton sampler after the third haul the fibreglass tail was damaged and needed to be replaced.

Survey

On Friday 5th December mobilisation took place in IJmuiden, the Netherlands. The vessel sailed at 17:00 towards its starting point at 47.75N 008.75W. During the steaming to the first station the weather turned quite poor and progress was slowed down. We arrived at the first station on 8th December at 09:00 and started sampling. The plankton sampler was damaged when retrieving it after the first haul. It was repaired and sampling could continue. The first transect was completed at 19:23 at position 47.75N 006.75W with five stations being carried out.

On Tuesday weather conditions were very good and sampling started at 07:02 at position 46.75N 005.25W. We followed the 200m contour line for the day and carried out a further four stations, finishing at 21:52 at position 45.25N 003.25W. During the day the captain announced that they were having trouble with the main trawl winches and that it might not be possible to carry out fishing operations. The engineers were working on the problem and would report back later.

On Wednesday the captain announced in the morning that the main trawl winches could not be repaired during the trip. Instead we decided to attempt to catch some fish using handlines. The captain would also contact any fishing vessels in our area in the hope of getting samples if they had any adult mackerel on board. The first plankton station was carried out at 07:00 at position 45.25N 002.25W. We again followed the 200m contour, and three further stations were carried out during the day, finishing at 43.75N 001.75W, the most southerly position of the survey. During the evening handlining was carried out but the attempt was unsuccessful.

The first station on Thursday was sampled at 07:00 at position 44.25N 002.25W. We started heading northwards again along the 200m contour. Four stations were carried out, finishing at 45.75N 003.25W. Further, unsuccessful, handlining was carried out in the evening.

On Friday only one station was sampled early in the morning at position 46.00N 004.01W. After that the weather conditions were extremely poor and it was decided to suspend operations for the day.

On Saturday sampling was resumed and the first station was carried out at 07:00 at position 46.75N 005.00W. Five stations were sampled during the day, finishing at 21:24 at position 47.25N 007.25W.

On Sunday the first, and final station of the survey, was completed at 07:37 at position 47.25N 005.75W. The crew spent three hours handlining, without success. The vessel broke off the survey at 14:00 and headed for IJmuiden harbour. The vessel arrived in IJmuiden on Wednesday 17th December at 10:00. All equipment and scientific crew were loaded off the vessel at 12:00.

Samples and data

A total of 25 plankton hauls were carried out (Figure 4.1). In total 10 eggs were extracted from these plankton samples while at sea, however due to the unstable nature of the vessel it was not possible to identify these eggs properly. They were brought back to the laboratory for more detailed work.

Remarks for the next surveys

The crew of Nida was very nice and helpful. However, fishing vessels are not ideal to carry out plankton sampling with a Gulf VII type plankton sampler, mainly for practical reasons. A commercial fishing vessel contains no properly equipped space for sorting and identification of the plankton samples. Due to the reduced stability of the Nida compared to a research vessel it was not possible to sort out the samples accurately.

It is advised that for the next plankton survey on board a fishing vessel, the scientist in charge should go on board the vessel to check the circumstances and decide whether the vessel is suitable and what equipment is necessary to take on board.

Numbers of (mackerel) eggs

Of the 25 plankton samples collected 7 samples contained in total 10 fish eggs. Of these 7 eggs were identified as *Molva spp* and 3 as codlike. Codlike eggs cannot be visually identified to species level; these are small eggs which contain no oil globule and are thus not mackerel eggs, but because many of these species are gadoids these eggs are referred to as codlike. No mackerel eggs were found in any of the samples. Figure 4.2 shows the position of the fish eggs collected.

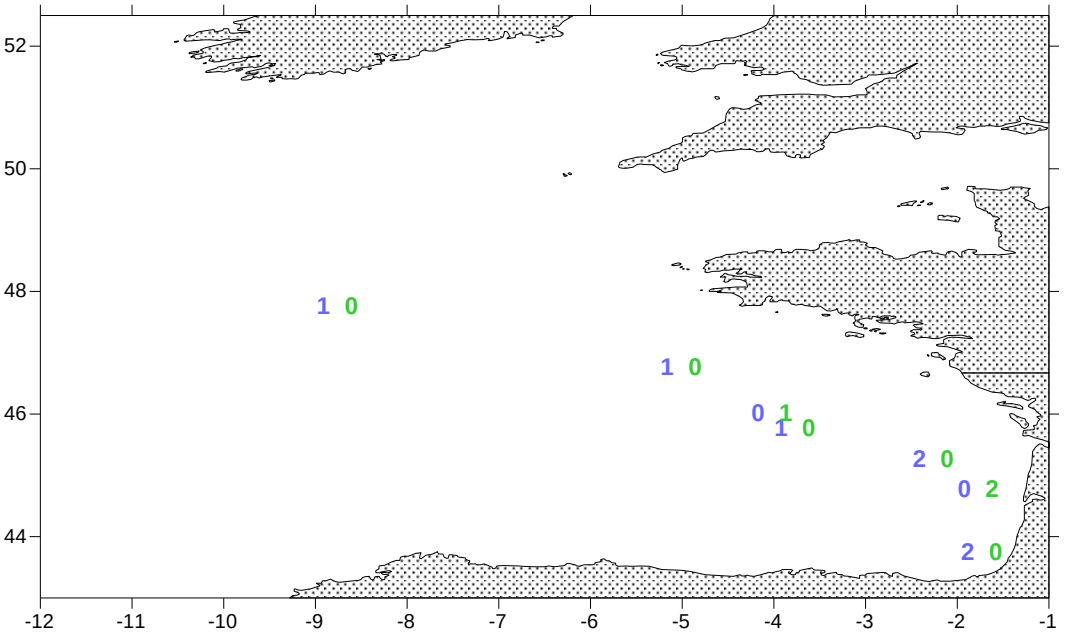


Figure 4.2. Positions and numbers of the fish eggs collected in December 2014 (Blue: Molva spp; Green: codlike).

5. Concluding remarks

The plankton samples contained very little plankton and few fish eggs. Sampling was carried out correctly since fish eggs were caught. No mackerel eggs were found in the samples. No adult mackerel were collected during the survey. This was supported by the fact that the freezer trawlers in the area did not catch any mackerel either. Mackerel was not spawning in the Bay of Biscay in December. The Celtic Sea was not sampled due to bad weather conditions. But it seems unlikely that mackerel would be spawning in this area, while none were found in the Bay of Biscay.

One can speculate whether the weather circumstances might have delayed mackerel spawning, but there is no proof of that either.

The crew of Nida were very helpful and friendly, but the fact remains that fishing vessels are less ideal platforms to carry out plankton surveys. On one hand collection of samples is suboptimal, and furthermore there is actually no proper area to sort out and identify eggs from the samples.

6. Acknowledgements

Much appreciation is expressed to the captain and crew of the Nida for all their efforts during the survey.

ISO

IMARES utilises an ISO 9001:2008 certified quality management system (certificate number: 124296-2012-AQ-NLD-RvA). This certificate is valid until 15 December 2015. The organisation has been certified since 27 February 2001. The certification was issued by DNV Certification B.V. Furthermore, the chemical laboratory of the Fish Division has NEN-EN-ISO/IEC 17025:2005 accreditation for test laboratories with number L097. This accreditation is valid until 1th of April 2017 and was first issued on 27 March 1997. Accreditation was granted by the Council for Accreditation.

References

Nash RDM, Dickey-Collas M, Milligan SP (1998) Descriptions of the Gulf VII/PRO-NET and MAFF/Guildline unencased high-speed plankton samplers. J. Plankton Res. 20(10): 1915-1926.

Justification

Report : C043/15
Project number : 4302507801

The scientific quality of this report has been peer reviewed by a colleague scientist and the head of the department of IMARES.

Approved: Ing. I.J. de Boois
Project leader WOT surveys

Signature: 

Date: 24 March 2015

Approved: Drs. J.H.M. Schobben
Head of Fish Department

Signature: 

Date: 24 March 2015