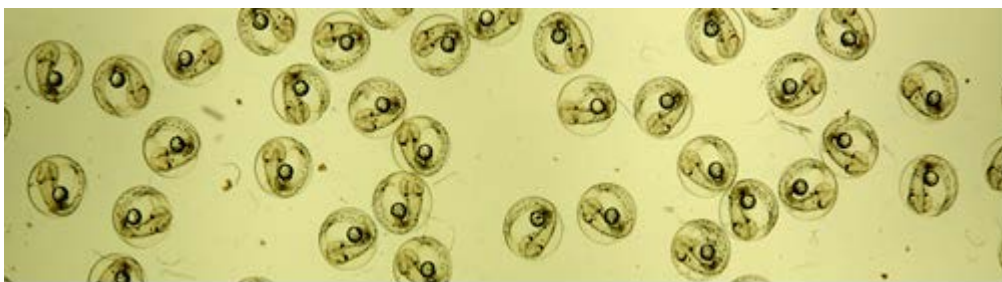


# North Sea mackerel egg survey 2014

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## Summary

After original agreement that both Netherlands and Norway would participate in the North Sea mackerel egg survey in 2014, Norway withdrew the participation in March 2014. At this short notice it was not possible to find another institute to replace the Norwegian participation. IMARES was the only institute to carry out the North Sea mackerel egg survey and planned to cover the North Sea mackerel spawning area and season in four survey weeks. The mackerel egg survey started on 26<sup>th</sup> of May. After one successful plankton sampling survey week, RV Tridens encountered serious engine problems and could not continue the sampling. The second week of the survey was spend trying to fix the engine problems. On the 6<sup>th</sup> of June it became clear that the engine problems of RV Tridens could not be solved and no other vessel was available to continue the egg survey. After consulting various experts, the 2014 North Sea mackerel egg survey was terminated and postponed to 2015.

## 1. Introduction

Every three years an international egg survey is carried out, to monitor the spatial and seasonal distribution of North Sea mackerel. Up till 2011 this survey was carried out by the Netherlands and Norway, but in March 2014 Norway decided to withdraw from the 2014 survey. At this short notice it was not possible to find another institute to replace the Norwegian participation. IMARES was the only institute to carry out the North Sea mackerel egg survey and planned, with help of the Ministry, to cover the North Sea mackerel spawning area and season in four survey weeks, which meant that an extra survey week for Netherlands was added compared to the original plan.

During this survey mackerel eggs are sampled using a Gulf VII plankton torpedo and adult mackerel are sampled to estimate fecundity and atresia. The survey is designed to cover the whole spawning area and season in the central and northern North Sea. The North Sea mackerel egg survey is coordinated by the ICES working group for mackerel and horse mackerel egg surveys (WGMEGS). The Netherlands participates in this survey since 1983.

The method used to estimate mackerel spawning stock biomass is the so-called Annual Egg Production Method (AEPM). The theory behind this method is simple: estimate the total number of eggs produced during the entire spawning season. Dividing the total egg production by the numbers of eggs produced by a single female gives an estimate of the female spawning stock biomass. The ratio between female and male mackerel gives an estimate of the total spawning stock biomass. This method is simple but requires an accurate estimate of the total fecundity (total number of eggs produced by a single female in one spawning period) of a female.

IMARES planned to carry out the survey with one vessel RV Tridens and cover the spawning area and season in 4 weeks (CVO Nota: CVO/14.IMA351.SV.jd). Since at the start of the survey spawning would already have commenced, RV Dana was asked to collect mackerel samples for potential fecundity in May during the International Ecosystem Survey in the Nordic Sea. IMARES planned to sample mackerel adults during the egg survey to collect atresia samples.

## 2. Materials and Methods

### 2.1 Gears for sampling of plankton and adult fish

Fish eggs are sampled with a "High Speed Plankton Sampler Gulf VII" (Fig. 2.1) (referred to as 'torpedo' in the remainder of the report) with a plankton net with 500  $\mu\text{m}$  mesh size. A small skrips-depressor of 35 kg is attached to the torpedo. The volume of water filtered during each haul is measured using an internal Valeport electronic flowmeter. An external Valeport flowmeter is also mounted on the frame, to check for blowing of the net due to large amounts of phyto- and microzooplankton in the water that can clog the net.

On top of the torpedo a Seabird 911plus CTD with a Benthos PSI 916 altimeter is mounted to monitor in live view the depth of the torpedo in the water column and the bottom depth under the torpedo. The CTD also measures temperature and salinity.

Adult fish samples were taken using the pelagic 2000 mesh trawl and fishing rods.



Figure 3.1. Gulf VII plankton torpedo.

### 3.2 Fishing method

The survey was carried out on board 'RV Tridens'. The speed during fishing with the plankton torpedo is 5 knots through the water. At each station a 'double oblique' haul is performed (Fig. 2.2). The Gulf VII sampler is lowered to 5 m above the sea floor or, at deeper stations, to 200 m depth. To ensure enough water is filtered during the haul, haul duration should at least be 10 minutes. At stations with shallow depth a double 'double oblique' is performed without the torpedo breaking the surface of the water. In this way each 10 meters of the water column is sampled 1 minute going down and going up.

In case of a thermocline stronger than 2.5°C over 10 meters the sampler is lowered to 20 meters below the thermocline.

In each period a calibration haul should be carried out to calibrate the flowmeters. During the calibration the torpedo without the cod-end is lowered to 20m depth.

The torpedo is hauled at constant depth for 30 minutes at a speed of 5 knots through the water. During this haul the flowmeter revolutions, water track and bottom track are registered. This is repeated in the exact opposite direction in order to rule out any influence of water and tidal currents on the calibration.



Figure 2.2. Illustration of an oblique haul in the Labview program.

## 2.3 Sampling grid

IMARES planned to cover the entire spawning area in the northern and central North Sea with sufficient coverage in one week. The spawning area would be covered four times in four weeks (CVO Nota: CVO/14.IMA351.SV.jd).

## 2.4 Sample processing on board

### 2.4.1 Plankton samples

As soon as the torpedo is on board the vessel, the sample (Fig. 4.2) is brought to the hydrographic lab. The fresh sample is immediately fixed in 4% buffered formaldehyde. After 24 hours of fixation, the fish eggs are separated from the other plankton using the 'spray method' (Eltink, 2007). If the sample contains a lot of eggs these are all sorted from the sample, and then subsampled using a 'Folsom'-splitter. Eggs are photographed, counted, measured, identified to species and staged. Per sample, at least one hundred mackerel eggs are measured and the development stage is determined. The remaining mackerel eggs are counted.

For quality assurance sorting of the samples is checked.

### 2.4.2 Adult fish samples

In principal all the fish is put on the conveyor belt and all mackerel were collected from the catch. If the catch was large a random sample of 4 baskets of mackerel and horse mackerel is selected. Total weight of mackerel is measured. One hundred mackerel and horse mackerel are taken randomly from the catch. If less than 100 were caught all individuals have been measured. Of each individual length, weight, sex, maturity and otoliths were taken.

From the 100 mackerel, females in development stage 3 to 6 were collected. Of each female, length, weight, maturity, age and ovary weight has been collected. Of the ovary one whole lobe was put in 3.6% formaldehyde for atresia sampling. From the other lobe 2 25 µl and 2 100 µl pipette samples were collected and put in 3.6% formaldehyde for mackerel.

### 3. Results

#### Date and time

From (harbour)	Date	Time (UTC)	To (harbour)	Date	Time (UTC)
Scheveningen	26-05-2014	09:30	Stavanger	31-05-2014	14:00
Stavanger	02-06-2014	04:00	Tananger	02-06-2014	06:00
Tananger	08-06-2014	12:00	Scheveningen	10-06-2014	07:00

**Crew** Kees Bakker (cruise leader)  
Hanz Wiegerinck  
Ineke Pennock (week 22)  
Marcel de Vries (week 23)  
Nathalie Steins (week 23)

#### Volunteers

Sjors Treffers  
Michiel Dammers

#### Survey

Monday 26<sup>th</sup> May: Left Scheveningen harbour at 9:30 (UTC).

The first sampling station was reached at 18:39 (UTC). The station was valid, but due to a break in the winch cable the torpedo was switched to the starboard winch. Egg sorting from the samples started on Tuesday evening.

On Wednesday the wind increased to force 7-8 from the East. Because of this the speed of the vessel needed to be lowered to 8 to 10 knots. Because of the time loss due to the bad weather no pelagic trawl haul was carried out in this week as the time was needed to finalize the plankton sampling.

On Thursday the cable of the starboard winch broke as well. The problem with the portside winch cable had not been solved yet. Thus the starboard cable was repaired immediately, but this took some time and 1 plankton station had to be dropped.

On Friday the problem with the portside winch cable was solved. This day the quality control of the sorting of the eggs from the plankton samples was started.

On Saturday 31<sup>st</sup> May the last station was sampled at 3:15 (UTC). After this RV Tridens started steaming and arrived in Stavanger at 12:00.

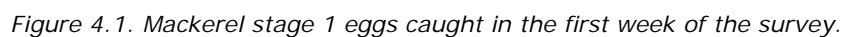
On Monday 2<sup>nd</sup> June RV Tridens left Stavanger at 4:00 (UTC). At 4:30 a total "black out" of the vessel occurred rendering the vessel uncontrollable. After a restart of the engines RV Tridens could move on its own to the nearest harbour of Tananger. After several tries to solve the technical problem it became clear it was not an easy problem to solve. On Friday 6<sup>th</sup> June it was decided to terminate the survey. The majority of the IMARES personnel flew back to Schiphol, one stayed on board to prepare for the next survey during the steam from Tananger to Scheveningen.

#### SampleID's

5400121-5400185 Plankton hauls  
5400112 Pelagic trawl haul (RV Dana)



Plankton sampling was carried out successful in the first week. Mackerel eggs were found at most stations in low numbers (Fig. 4.1). Most eggs were found in the southern part of the spawning area. This was also found in 2011. The survey in 2015 should again start in May. This survey should preferably be carried out by at least two vessels. Two vessels are able to cover the spawning area with every east-west transect, reducing the need for interpolation. If one vessel encounters problems at least a minimal coverage of the spawning area and season is ensured.



## **5. Quality Assurance**

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

Eltink, A. T. G. W. (2007). "The spray technique: a new method for an efficient separation of fish eggs from plankton." *Journal of Plankton Research* 29(10): 871-880.

## Justification

Rapport C106/14

Project Number: 4301211072

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

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

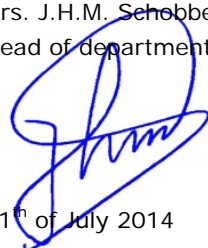
Signature:



Date: 11<sup>th</sup> of July 2014

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

Signature:



Date: 11<sup>th</sup> of July 2014