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Final Report of Working Group 2 on Cod and Plaice Egg Surveys in the North Sea (WGEGBS2)

24 March 2015

Bergen, Norway



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H. C. Andersens Boulevard 44-46
DK-1553 Copenhagen V
Denmark
Telephone (+45) 33 38 67 00
Telefax (+45) 33 93 42 15
www.ices.dk
info@ices.dk

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Executive summary

From 2012 to 2015, the Working Group 2 on Cod and Plaice Egg Surveys in the North Sea (WGEAGS2) developed and tested a new net called the MIKey-M net in order to collect fish eggs in winter alongside with the IBTS-MIK (International Bottom Trawl Surveys-Midwater ring sampler) sampling. In 2015, all the countries participating in the IBTS-MIK sampling have incorporated the MIKey-M net. The MIKey-M sampling has been shown to allow for sampling fish eggs properly without costing extra time during the IBTS-MIK survey. Fish eggs have been collected throughout the North Sea with the same coverage and spatial resolution, based on ICES statistical rectangles, as the MIK hauls.

Norway, the Netherlands and France have analysed MIKey-M net samples collected in 2012 to 2015 using either traditional microscopy or semi-automated methods based on image-analyses. Among analysed samples, three main groups of eggs belonging to plaice, 'cod-like' and 'other' eggs have been identified and staged. Whereas sample analysis is still in progress, preliminary results revealed that MIKey-M net samples are very useful to depict winter spawning grounds location. Sample analysis will be pursued during the next three years through the continuation of the WGEAGS2 in order to study the interannual variation of spawning ground locations and habitats. Knowledge of the spawning grounds is also of primary interest in terms of management, e.g. to properly define future implantation of oilrigs.

Based on the MIKey-M net samples, WGEAGS2 started a new time-series of winter spawning grounds monitoring in the English Channel and North Sea. MIKey-M net samples analysis ends up with a huge amount of data that needs to be standardized and stored. Once the data is finalized, it will be uploaded and stored in the ICES Eggs and Larvae database.

A TaqMan probe has been designed for saithe (*Pollachius virens*) but has not been tested on field caught eggs.

1 Administrative details

WORKING GROUP NAME: Working Group 2 on Cod and Plaice Egg Surveys in the North Sea (WGECCS2)

Year of Appointment: 2013

Reporting year concluding the current three-year cycle: 2015

Chair(s)

Christophe Loots, France

Meeting venue(s) and dates

10th October 2013, Bergen, Norway, (6 participants)

2nd October 2014, Boulogne-sur-Mer, France, (3 participants)

24th March 2015, Bergen, Norway, (5 participants)

2 Terms of Reference a) – e)

- a) Review results of the 2013–2015 surveys.
- b) Plan for the 2014–2016 survey.
- c) Review archiving of the WGECCS and WGECCS2 data time-series in the ICES Eggs and Larvae database, including testing and commenting on the trial egg and larvae database <http://eggsandlarvae.ices.dk/>
- d) Review results on molecular identification of fish eggs.
- e) Discuss the implementation of MIKey-M net sampling alongside the standard MIK sampling undertaken during the IBTS.

3 Summary of Work plan

Year 1	Discuss results of the 2013 survey and plan for the 2014 survey
Year 2	Discuss results of the 2014 survey and plan for the 2015 survey
Year 3	Discuss results of the 2015 survey and plan for the 2016 survey

4 Summary of Achievements of the WG during 3-year term

- WGECCS2 demonstrated the feasibility of collecting fish eggs during the IBTS-MIK survey with negligible extra time and money and with the same spatial coverage, resolution and stratification.

- WGEAGS2 designed a new net called the MIKey-M net that can be attached to the MIK net and that can collect fish eggs at the same time as the larval MIK sampling.
- WGEAGS2 implemented and coordinated the use of the MIKey-M net during the first quarter of the IBTS from 2012 to 2015. Progressively, the MIKey-M net has been set up on all the Research Vessels participating to the IBTS-MIK sampling.
- WGEAGS2 started to analyse MIKey-M net samples using classical visual identification methods and also image analyses like the zooscan and ObjectJ. A zooscan learning set based on 2012 samples has been built in order to facilitate the samples analysis of following years based on semi-automatic recognition methods.
- WGEAGS2 started a new time-series of 4 years-data on winter spawning grounds monitoring in the North Sea based on MIKey-M net sampling. The North Sea was partially sampled from 2012 to 2014 and was fully sampled in 2015.
- WGEAGS2 started to build a new dataset of fish eggs abundances by species from the MIKey-M net sampling. These data will be uploaded to the ICES Eggs and Larvae database and will thus be made available to the whole scientific community.
- A TaqMan probe has been designed for saithe (*Pollachius virens*); however, this has not been tested on field caught eggs.

5 Final report on ToRs, workplan and Science Implementation Plan

5.1 Plan for the 2014–2016 survey and Review results of the 2013–2015 surveys (ToRs a and b)

In 2012, as recommended by the previous WGEAGS, a new net called ‘the MIKey-M net’ was designed to be put onto the MIK net. Several trials with various configurations of the net (net position, one or two nets, different sizes, etc.) were performed by the Netherlands, Norway and France during the 2012 IBTS-MIK survey. Results revealed that the MIKey-M net was able to accurately sample fish eggs without any influence of the MIK net (ICES, 2013).

From 2013 to 2015, WGEAGS2 coordinated the MIKey-M net sampling during the IBTS-MIK survey and the MIKey-M net was used by a growing number of countries including Germany, Denmark and Scotland. The North Sea was covered with more or less success depending on the weather conditions (ICES, 2014). In 2015, all the countries participating in the North Sea IBTS-MIK sampling (except Sweden) undertook MIKey-M net sampling which allowed for a complete coverage of the North Sea with a quite good spatial resolution. Four years of egg samples are now available and some years like 2012 have already been partially or completely analysed. Samples analysis revealed that at least three main groups of eggs (plaice, cod-like and others) belonging to different species and different development stages can be easily identified by either visual means (binocular) or semi-automatic recognition (zooscan). Preliminary maps of fish eggs spatial distribution have been produced for 2012 and allowed to distinguish particular areas of eggs aggregation corresponding to fish spawning grounds (ICES, 2014). Samples from 2013–2015 have been partially worked up, but some remain to be analysed in order to see how the spatial location of spawning grounds vary from year-to-year.

Preliminary results on Mikey-M net were presented at the ICES ASC in 2013 (van Damme *et al.*, 2013) and at the Larval Fish Conference in 2014 (van Damme *et al.*, 2014).

5.2 Review archiving of the WEGEGGS and WEGEGGS2 data time-series in the ICES Eggs and Larvae database, including testing and commenting on the trial egg and larvae database <http://eggsandlarvae.ices.dk/> (ToR c)

The ICES Eggs and Larvae database was installed during the first year of the WEGEGGS2. There is an international agreed input format for the ICES Eggs and Larvae database (ICES 2015, WKIELD). The WEGEGGS data have been checked and uploaded to the ICES database. Once the MIKey-M samples have been analysed and the results finalized and published, the data will be uploaded to the ICES Eggs and Larvae database.

5.3 Review results on molecular identification of fish eggs (ToR d)

Whereas eggs have been collected using the MIKeyM nets, funding has not been available to undertake any molecular identification of these samples. A saithe probe for the TaqMan procedure (Nash *et al.*, 2012) has been developed but there has not been an opportunity to test it on field caught eggs thus far.

5.4 Discuss the implementation of MIKey-M net sampling alongside the standard MIK sampling undertaken during the IBTS (ToR e)

All countries participating in the North Sea IBTS-MIK sampling have agreed to collect MIKey-M samples during the MIK sampling. In 2012 and 2013 Norway, The Netherlands and France undertook MIKey-M sampling, in 2014, Germany and Denmark also collected MIKey-M samples and in 2015, Scotland also participated. In 2015, this ensured a full coverage with MIKey-M sampling of the North Sea. WEGEGGS2 has shown that MIKey-M net sampling can be done alongside the IBTS-MIK sampling with no or very little extra expenses. The analyses of the samples though does require extra financial support.

5.5 References

- ICES. 2013. Interim Report of the Working Group2 on North Sea Cod and Plaice Egg Surveys in the North Sea (WEGEGGS2), 10 October 2013, Bergen, Norway. ICES CM 2013/SSGESST:16. 15 pp.
- ICES. 2014. 2nd Interim Report of the Working Group 2 on North Sea Cod and Plaice Egg Surveys in the North Sea (WEGEGGS2), 2 October 2014, Boulogne-sur-Mer, France. ICES CM 2014/SSGESST:18. 12 pp.
- Nash, R. D. M., Wright, P. J., Matejusova, I., Dimitrov, S. P., O'Sullivan, M., Augley, J., and Höf-
fle, H. 2012. Spawning location of Norway pout (*Trisopterus esmarkii*) in the North Sea. ICES
Journal of Marine Science, 69: 1338–1346.
- van Damme *et al.*, 2013. Can the standard IBTS-MIK survey provide reliable data on herring
recruitment and spawning locations? ICES CM 2013/P:05.
- van Damme *et al.*, 2014. Can the standard ICES coordinated IBTS-MIK survey provide reliable
data on herring recruitment and spawning locations in the North Sea? American Fisheries
Society 144th Annual Meeting; 08/2014. Vienna (Austria)

6 Cooperation

WGEAGS2 highly collaborates with WGALES (Working Group on Atlantic Fish Larvae and Eggs surveys). Preliminary results of the MIKey-M net sampling have been presented during the last WGALES meeting in San Sebastian (Spain, December 2014).

WGEAGS2 collaborates with the IBTSWG as the IBTS supports the MIK sampling and hence the MIKey-M net sampling. In 2015, WGEAGS2 met at the same time as the IBTSWG in order to gain a closer cooperation and exchange between the two groups. This resulted in WGEAGS2 members participating in the MIK-sampling discussions of IBTSWG. However, only MIK-sampling participants, which are involved in the MIKey-M sampling and are members of WGEAGS2, participated in the WGEAGS2 meeting.

7 Summary of Working Group evaluation and conclusions

Between 2013 and 2015, WGEAGS2 achieved several important outcomes such as implementing a new monitoring of North Sea fish spawning grounds using a new net called the Mike-M net. This net was designed and tested by the group alongside with the IBTS-MIK sampling and allowed for collecting fish eggs without extra time. WGEAGS2 also tested for new ways of fish eggs identification such as automatic recognition and molecular tools. In this context, a new TaqMan probe has been designed for saithe (*Pollachius virens*).

WGEAGS2 needs to continue for another three years in order to deepen and publish preliminary results. Many fish eggs samples were collected during the 2013–2015 period and several still remain to be analysed. Pursue of fish eggs sampling in the North Sea using the Mikey-M net for another three years is also required in order to study mid-term and interannual fluctuations of winter spawning grounds location in the North Sea. This would help for a better management of fish stocks.

Annex 1: List of participants

Name	Address	Phone/Fax	E-mail
Christophe Loots Chair	Ifremer, 150 Quai Gambetta. 62200 Boulogne sur Mer France	+33 321 995635 +33 321 995601	Christophe.Loots@ifremer.fr
Cindy van Damme	IMARES, PO Box 68 1970 AB IJmuiden Netherlands	+31 317 487078 +31 317 487326	Cindy.vandamme@wur.nl
Richard D.M. Nash	Institute of Marine Research PO Box 1870 Nordnes 5817 Bergen Norway	+47 480 36416 +47 552 38584	Richard.Nash@imr.no
Matthias Kloppmann	Thünen-Institut für Seefischerei Palmaille 9 22767 Hamburg Germany	+49 403 8905196 +49 403 8905263	matthias.kloppmann@ti.bund.de
Hannes Höffle	Institute of Marine Research PO Box 1870 Nordnes 5817 Bergen Norway		hannes.hoeffle@imr.no

Annex 2: WGECCS2 terms of reference

The **Working Group 2 on North Sea Cod and Plaice Egg Surveys in the North Sea** (WGECCS2), chaired by Matthias Kloppmann*, Germany, will meet in Hamburg, Germany, 25–26 October 2016, to work on ToRs and generate deliverables as listed in the Table below.

WGECCS2 will report on the activities of 2016 by 1 December 2016 to SSGIEOM, SCICOM and ACOM.

ToR descriptors

ToR	Description	Background	Science Plan topics addressed	Duration	Expected Deliverables
a	Review results of the 2016–2018 surveys and plan for the 2017–2019 Survey	In 2017–2019, the MIKey-M net sampling will be conducted during the IBTS-MIK sampling	4.28, 4.30	Year 1, 2, 3	Report : reviewing survey results, need for improvement and plan for potential collaborative publications
b	Study the spatio-temporal distribution of winter spawning habitats	Spawning grounds are of primary relevance for fish stock renewal. They experienced interannual and long-time spatial variations that need to be quantified and related to environmental/biotic variations.	1.1, 4.28, 4.30	Year 3 : Samples will be collected every year, but will be analysed every three years.	Report : review current and past spatial distribution of winter spawning grounds in the North Sea.
c	Write the MIKey-M Net manual	In 2012, a new net called the MIKey-M net was developed to collect fish eggs alongside the MIK sampling during the IBTS. Since 2012 it has been used each year, there is a need for a standard manual as recommended by ICES.	4.28, 4.30	Year 1	SISP : describe the MIKey-M Net, its implementation during the IBTS since 2012 and instructions for sampling
d	Prepare WGECCS2 data for archiving	WGECCS2 data need to be prepared and uploaded in the ICES Eggs and Larvae database	4.28, 4.30	Yearly, once the data are published	Data uploaded to the ICES Eggs and Larvae database by the ICES data centre and WGECCS2 coordinator
e	Review results on molecular	There is a potential problem in the visual	4.28, 4.30	Year 1, 2, 3	Report : review methods for

	identification of eggs	identification of stage I gadoid eggs and in some areas it will be necessary to utilize genetic techniques for species identifications where spawning locations of gadoids exist. The means to undertake genetic identifications should be sought were possible			genetically identifying eggs
f	Publish first results of 2012–2015 surveys	MIKey-M net samples represent a huge amount of data and scientific insights on winter fish spawning grounds in the North Sea that need to be published.	4.28, 4.30	Year 3	Report : list of scientific publications based on 2012–2015 surveys

Summary of the Work Plan

Year 1	Discuss results of the 2016 survey and plan for the 2017 survey
Year 2	Discuss results of the 2017 survey and plan for the 2018 survey
Year 3	Discuss results of the 2018 survey and plan for the 2019 survey

Supporting information

Priority	<p>The surveys are important in that they provide information on spawning locations of cod, plaice and other commercial (e.g. saithe and Norway pout) and non-commercial species. These results are important in relation to ongoing ecosystem based management issues. Consequently, these activities are considered to have a high priority.</p> <p>Objectives:</p> <ul style="list-style-type: none"> • Describing spawning habitat, in terms of environmental parameters (e.g. temperature, salinity, density) and geographical position, of winter spawning fish species in the North Sea • Changes in ecosystem functioning: Describing temporal variation in the spawning habitats and early detection of changes • Added value to routine surveys: Collecting extra information on ichthyoplankton on the existing IBTS and IHLS surveys. <p>WGECCS2 recommends the continuance of the survey time-series by future surveys through incorporation into the IBTS and IHLS surveys, following the ICES ecosystem approach based surveys plan. The survey can be conducted in accordance with IBTS and IHLS surveys and WGECCS2 recommends undertaking regular surveys for monitoring spawning areas of main fish species, which has been recommended as a high priority for Ecosystem Based Approach to Management by the Bergen Declaration Meeting of Scientific Experts.</p>
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Resource requirements	The research programmes which provide the main input to this group are already underway, and resources are already committed. ICES secretariat support for WGEGBS2 reports only and advice from the ICES Data Centre is required archival of the survey data.
Participants	The Group is normally attended by 5–7 members and guests.
Secretariat facilities	ICES secretariat support for WGEGBS2 reports only.
Financial	No financial implications.
Linkages to ACOM and groups under ACOM	Data are required by the ICES Working Group on the Assessment of Demersal Stocks in the North Sea and Skagerrak.
Linkages to other committees or groups	There is a very close working relationship with the IBTSWG and WGALES.
Linkages to other organizations	No formal linkages.

Annex 3: Copy of Working Group evaluation

1) Working Group name.

Working Group 2 on Cod and Plaice Egg Surveys in the North Sea (WGECCS2)

2) Year of appointment.

2013

3) Current Chairs.

Christophe Loots (Ifremer, France)

4) Venues, dates and number of participants per meeting.

Bergen, 2013, 6 participants.

Boulogne sur Mer, 2014, 3 participants.

Bergen, 2015, 5 participants.

WG Evaluation

5) If applicable, please indicate the research priorities (and sub priorities) of the Science Plan to which the WG make a significant contribution.

Integrated Ecosystem Observation and Monitoring Programme (SSGIEOM)

6) In bullet form, list the main outcomes and achievements of the WG since their last evaluation. Outcomes including publications, advisory products, modelling outputs, methodological developments, etc. *

- **Develop, deploy and test for a new net called the Mikey-M net allowing for collecting fish eggs in the North Sea during the IBTS-MIK sampling without extra time**
- **Start a new series of winter spawning grounds monitoring in the North Sea**
- **A TaqMan probe has been designed for saithe (*Pollachius virens*); however, this has not been tested on field caught eggs (Nash *et al.*, 2012).**

7) Has the WG contributed to Advisory needs? If so, please list when, to whom, and what was the essence of the advice.

No

8) Please list any specific outreach activities of the WG outside the ICES network (unless listed in question 6). For example, EC projects directly emanating from the WG discussions, representation of the WG in meetings of outside organizations, contributions to other agencies' activities.

9) Please indicate what difficulties, if any, have been encountered in achieving the workplan.

The main difficulty was the lack of funding to analyse fish eggs samples collected with the Mikey-M net. This was particularly true for ToR d on the molecular identification of fish eggs.

The other main issue was to stress the attention of the IBTSWG on the interest of the Mikey-M net sampling. During the last meeting, a joint discussion between WGECCS2 and IBTSWG was planned on ToR e about the integration of the Mikey-M net sampling with the IBTS protocol. However, only WGECCS2 members joined in this discussion.

Future plans

10) Does the group think that a continuation of the WG beyond its current term is required? (If yes, please list the reasons)

Yes.

- **WGEAGS2 is the only group of experts working on North Sea fish eggs,**
- **There is a need for a longer monitoring time-series to assess status and spatio-temporal variability of winter North Sea spawning grounds.**
- **There is a need to pursue the development and test of other molecular tools for eggs identification.**
- **There is a need to analyse and publish results of the 2012–2015 surveys.**

11) If you are not requesting an extension, does the group consider that a new WG is required to further develop the science previously addressed by the existing WG.

(If you answered YES to question 10 or 11, it is expected that a new Category 2 draft resolution will be submitted through the relevant SSG Chair or Secretariat.)

12) What additional expertise would improve the ability of the new (or in case of renewal, existing) WG to fulfil its ToR?

13) Which conclusions/or knowledge acquired of the WG do you think should be used in the Advisory process, if not already used? (please be specific).