FACTSHEET: Research surveys ichthyoplankton North Sea (Survey_plankton_NorthSea)
Version: [v1, 27/01/2023]

Sampling protocol: Survey_plankton_NorthSea

Sampling objective(s): data collection for fishery-independent timeseries by sampling ichthyoplankon

Start of sampling: 1977 (larvae sampling during International bottom trawl survey IBTS_Q1 MIK), 1981 (International herring larvae survey IHLS), 2008 (Downs recruitment survey DRS_NLD)

Sampling ongoing: yes

Data use

Primary data use: data from larvae of commercial fish species are used as tuning series in single stock assessments. The data users are stock coordinators in ICES Herring assessment working group (HAWG). The main target species can be found in Table 1 in http://data.europa.eu/eli/dec_impl/2021/1168/oj. The most up to date data use can be found in the advice sheets per species.

Secondary users are OSPAR for the MSFD assessments, as well as the ICES Working Group on Integrated Assessments of the North Sea (WGINOSE).

Other users are individual scientists or institutions interested in the ichthyoplankton composition of the sampled species in the North Sea.

Sampling design and method

The surveys take place annually and are all coordinated by the Working Group on Surveys on Ichthyoplankton in the North Sea and adjacent Seas.

Sampling design is in detail described in the (inter)national survey protocols. Gears are standardised, so the data per survey can be used as a timeseries.

In short, the trawl surveys follow the following stratifications:
DRS_NLD: systematic, two stations per ICES statistical rectangle, at least 10 nm from each other, and 5 nm from the rectangle borders. Only national manual available, although the samples are treated in the same manner as described in the IBTS_Q1 larvae sampling manual.
IBTS_Q1: systematic, four hauls per ICES statistical rectangle. manual
IHLS: fixed, primary sampling unit is one ICES statistical rectangle split into nine squares. The station positions are all located in the centre of an 1/9 ICES rectangle.

Based on the larval stage the survey gear and mesh size are chosen.

- The DRS_NLD and IBTS_Q1 larvae sampling are both conducted with a Midwater ring trawl (MIK). Net opening is 2 meters in diameter, cod-end mesh is 500 µm. Oblique hauls of at least 10 minutes are made, sampling depth ranging from the water surface to 5 m from the bottom, to max. 100 meter depth. Fishing speed is 3 knots, lowering the gear is done at continuous warp speed of 25 meter depth/minute. Hauling in is done at continuous warp speed 15 meter depth/minute.
- The IHLS is conducted with a Gulf7 plankton sampler with a 20 mm nose cone and 280 µm mesh. Oblique hauls of at least 10 minutes are made, sampling depth ranging from the water surface to 5 m from the bottom. Fishing speed is 5 knots, lowering and hauling the gear is done at continuous warp speed: 10 meter/1.5 minute.

Sampling protocol and data capture

In the field

The majority of the trawl information (date, time, position, haul duration, flow meter revolutions) is registered automatically, using the vessel's system information. This information is transformed by in-house developed software (TRIHIP Gulf) to an interoperable file format. On each station a measurement of temperature and conductivity (CTD) is done, using a CTD (Seabird or Valeport) which is attached to the sample gear, registering temperature and conductivity during the haul. The surface and bottom temperature and salinity is automatically added to the same file as the trawl information.

- DRS_NLD: samples are sorted fresh if time and weather allows. The sample is stored cool during processing. After processing, the larvae sorted from the sample and the remainder of the sample are stored in buffered 4% formaldehyde. If it is impossible to sort the sample fresh, the sample is as soon as possible fixed in buffered 4% formaldehyde. Fixed samples are treated similarly on board and ashore (see: 'In the lab').
- IBTS_Q1: samples are as soon as possible fixed in buffered 4% formaldehyde. The number of herring larvae is estimated and noted down. Fixed samples are treated similarly on board and ashore (see: 'In the lab').
- IHLS: samples are as soon as possible fixed in buffered 4% formaldehyde. The number of herring larvae is estimated and noted down. The samples are further processed ashore (see: 'In the lab').

In the lab

The samples that have not been sorted on board, are processed in the lab ashore. After being fixed for at least 12 hours the sample can be sorted in a black tray after washing out the formaldehyde and using a sorting solution to prevent evaporation of the remaining formaldehyde fumes. All fish larvae are sorted from the sample. Larvae of herring, sprat, anchovy and pilchard are identified to species, and individually measured if the sample contains less than 25 larvae per species. In case of large numbers of larvae the sample may be subsampled, using a Folsom splitter (Griffiths *et al*. 1984). From samples containing 25-100 larvae at least 25 larvae have to be measured by species. If samples contain more than 100 larvae at least 50 larvae per species have to be measured. Length measurements are done to the mm below, using an analogue measuring board. Initials of the person(s) sorting the sample, identifying and measuring the larvae are noted down.

Measurements and subsampling factor are noted down on the printed lists with trawl information, and entered in the file with sampling information using the in house developed software Billie Turf.

Post-processing data

Billie files are not post-processed, only quality checked (see Data quality)

Post-processing of CTD information is described in a separate factsheet Surveys_CTD.

Data quality

Quality assurance procedure

Flow meters are calibrated at the start of the survey or during the survey. When a new flowmeter is installed, it is calibrated. During the survey, the relation between haul duration and flow meter revolutions is checked after each haul.

All persons sorting the samples and identifying the species are trained via (inter)national exchange workshops. The national workshop is organised annually. Quality assurance of sorting is done by routinely re-sorting five samples per person sorting the samples. If more than 5% of the larvae has remained in the samples, all samples sorted by that person will be resorted. Species identification is checked by letting a second person identify the larvae of two samples per person. If there is more than

5% discrepancy in identification other (if needed: international) colleagues may have to identify larvae as well to reach agreement.

Data quality checks are conducted upon processing at the institute, and before entry into the national database FRISBE. Standardised SAS scripts are used for the data quality checks (available upon request). Essentially, the trawl haul data are checked for outliers on numerical values (either by plotting or by providing minimum, mean, and maximum values), consistency in text variables (e.g. station coding, crew members).

Quality checked parameters
DRS_NLD, IBTS_Q1 larvae sampling, IHLS:

- Haul information: survey code, vessel name, gear type, sampling date, time, shooting and hauling positions (map), crew members, station code, sample number, haul duration, flow meter revolutions, duration vs. flow meter revolutions, temperature, salinity, sample fixation coding;
- Species information: species list (expert judgement), maturity coding, subsampling type coding, minimum and maximum length, subsampling factor, number measured, measurement unit by species.

Data storage
National database: Billie files are submitted to the national database FRISBE. The relevant aspects of this database are described in Proc_databases.

International database: IHLS and IBTS_Q1 MIK data is stored in the ICES eggs and larvae database (https://www.ices.dk/data/data-portals/Pages/Eggs-and-larvae.aspx). DRS_NLD data will be stored in the same database as soon as it is decided to use the survey data in the stock assessment.

Data availability
Institutional availability: accessibility of the national database FRISBE is described in Proc_databases, data is made available as soon as possible after the survey, mostly within 2 months after the sampling has finished.

Public availability: data submission deadlines for submission to ICES eggs and larvae database are driven by the end user's meeting. In general, the IHLS data are publicly available before 31 January in year N+1, the IBTS_Q1 larvae data before 10 March of the sampling year.

Reference to full documentation:
National manual: CVO_h_003: Damme, C. van, U. Beier, I. de Boois, D. Burggraaf, B. Couperus, R. van Hal, T. Pasterkamp, J. Vrooman, 2023. Handboek bestandsopnamen en routinematige bemonsteringen op het water. Versie 17, maart 2023. CVO rapport 23.002

International manuals:
Links to the latest version of the manuals can always be found via https://www.ices.dk/community/groups/Pages/WGSINS.aspx --> Links to manuals

- DRS_NLD: ICES. 2013. SISP 2 - Manual for the Midwater Ring Net sampling during IBTS Q1. Version 2. Series of ICES Survey Protocols. 18 pp. https://doi.org/10.17895/7578
- IBTS_Q1 MIK: ICES. 2013. SISP 2 - Manual for the Midwater Ring Net sampling during IBTS Q1. Version 2. Series of ICES Survey Protocols. 18 pp. https://doi.org/10.17895/7578
- IHLS: in prep.

- Folsom splitter: Griffiths, F. B., Brown, G. H., Reid, D. D., and Parker, R. R. 1984. Estimation of sample zooplankton abundance from Folsom splitter sub-samples. Journal of Plankton Research 6(5): 721-731.

Review frequency full documentation: national manual is annually reviewed; the reviewing frequency of the international manuals is unknown

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