ICES Technical Service
Baltic Sea and Greater North Sea ecoregions
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Swedish request on the production of yearly (2009–2018) swept-area ratio (SAR) values in the Swedish EEZ

Service summary

ICES has produced, as a technical service to Sweden, a time-series (2009–2018) of fishing intensity in the Swedish EEZ according to the customized gear grouping of surface and subsurface swept-area ratio (SAR) aggregate values.

The calculation of SAR values, performed by ICES Data Centre, is standardized such that these values provide a quality-checked data output.

Request

The Swedish Agency for Marine and Water Management has requested ICES to provide a time-series of trawling impact in Swedish EEZ. The specific data requested would be to:

Prepare fishing intensity/pressure spatial layers for the Swedish EEZ part of ICES region Baltic and subdivisions 20 and 21 (Skagerrak and Kattegat by year (2009-2018) according to customised gear grouping of the surface and subsurface swept-area ratio (SAR) aggregate values. To assess the quality and relevance of this data to the total fishing in the Swedish EEZ logbook data will be used to derive the proportion of vessels in the relevant gear groupings that have VMS enabled.

Elaboration on the service

Shape file datasets are available at https://doi.org/10.17895/ices.data.7447

Basis of the service

In their request Sweden offered the following explanations:

The intended use of the requested output is to calculate trawling intensity indicators in Swedish EEZ in support of the marine strategy frame work directive.

Supplementary information to assist in the interpretation of the advice

*Only parts of the times-series are provided through the OSPAR and HELCOM and lately anonymity issues have made some data unavailable. In this case only yearly SAR values are requested with no information on fishing hours, kW*hours or any landing information.*

The alternative to a request directly to ICES would be a country specific data call where each country are asked to provide the metier specific SAR values, this time consuming process could be avoided by the direct request to ICES. SAR values are also calculated in a standardized way by the ICES Data Centre and hence provide a quality checked output.

Methods

Post-processing

An ICES VMS/Logbook data call covering the years 2009–2018 was issued to all ICES Member Countries (EU Data Collection Framework [DCF] contacts and all ACOM delegates) on 21 February 2019 (ICES, 2019a). The call followed the ICES VMS data policy (ICES, 2019b). Countries were asked to submit data from 2009 to 2018, using a new exchange format described in the data call.

ICES Secretariat, together with the WGSFD chairs, quality-checked the submitted data. This involved frequent correspondence with submitting countries to ensure that the submission of data complied with the specifications in the data call. The process included generating a standard quality control (QC) report for the submission of each country, with checks undertaken by expert group chairs. This is carried out upon submission and, where relevant, for any resubmission,

with the aim of detecting discrepancies in the submitted data. Any feedback was communicated to the data submitters, and countries were either congratulated on a good submission or asked to resubmit the corrected data.

An additional QC was undertaken on the full VMS dataset (all countries combined) to produce an overview QC report. All R scripts and SQL code used to access and process the VMS data are available on GitHub*.

ICES Secretariat filtered for countries with bottom-fishing activity in the Swedish EEZ by year (2009–2018), and requested for permission to use the VMS and logbook data submitted to ICES to answer the request from Sweden. A summary of the responses by data submitters is shown in Table 1.

Table 1 Countries with fishing activity using bottom-contacting gear in the Swedish EEZ from 2009 to 2018.

Country	Data request	Country	Data request
Sweden	Accepted	Finland	Accepted
Denmark	Accepted	Latvia	Accepted
Germany	Accepted	Lithuania	No response
Poland	Accepted	United Kingdom	No response
Estonia	Accepted	France	No response
Norway	Accepted		

Processing of VMS data

Data that passed the quality control checks were used to produce geographical files (shape files) and maps. The production of these spatial data layers of swept-area ratio is based on the fishing pressure estimated by métier, following the approach of Eigaard *et al.* (2016) at a resolution of c-squares (0.05° × 0.05°).

ICES (2016) defines the swept area as the cumulative area contacted by a fishing gear within a grid cell over one year. The swept-area ratio (SAR, also defined as fishing intensity) is the swept area divided by the surface area of the grid cell. The area contacted by the fishing gear is provided by geographically distinct vessel monitoring system (VMS) points, for which speed and course are available at intervals of maximum two hours, coupled with information on vessel size and gear used, derived from EU logbooks (Eigaard *et al.*, 2016; ICES, 2018).

Vessel speeds representing fishing activity are assigned to a 0.05°× 0.05 grid, about 15 km² at 60°N latitude, which is the spatial resolution adopted by ICES, known as the c-square approach (Rees, 2003).

A list of métier level 6 codes was produced, by country with bottom fishing activity in the region of interest and by year. Based on this list, customized gear groupings were defined by Sweden. Estimates of total surface and subsurface SAR within each grid cell were calculated by métier and aggregated according to gear groupings. The data sources and code are available on GitHub†.

The resulting shape files contain surface and subsurface SAR values with no information on fishing hours, kW × hours, or any landing information that could breach the anonymity of fishing vessels according to recent work by WGSFD (ICES, 2019c).

Data outputs

Yearly SAR values for 2009–2018 are provided for the Swedish EEZ, in addition to a table of the proportion of vessels with VMS enabled within each gear group. Both are available at ICES (2020).

Caveats

- Only data from countries that accepted the data request have been used in the current technical service (see Table 1). The bottom fishing activity of the countries whose data have not been used represents a 0.5% of the total Kw fishing hours from 2009 to 2018.

* https://github.com/ices-eg/wg_WGSFD.
† https://github.com/ices-taf/2020_sr.2020.08_TechnicalService.

- Fishing pressure (SAR, swept-area ratio) depends on the spatial resolution of the fishing pressure data. Pressure is calculated at a resolution of 0.05° × 0.05°.
- Data on fishing locations for vessels less than 12 m are not available and are therefore not included in the technical service. The effect of this bias in the assessment is expected to be strongest in coastal areas.
- Data outputs in this technical service assume a uniform distribution of trawling within each c-square. When using the data products of this technical service, it should be noted that the above assumption will apply when trawling is evaluated over longer time periods (e.g. 2012–2015). However, at shorter yearly time-scales, the proportion of the seafloor trawled will be overestimated because trawling is randomly distributed at small spatial scales (Rijnsdorp *et al.*, 1998; Ellis *et al.*, 2014; Eigaard *et al.*, 2016).

Additional information

VMS and logbook data quality control checks

A quality control (QC) template (coded in SQL and R) was run on the aggregated dataset to calculate and check the most important variables (number of submitted records, fisheries effort, landings, etc.) for each year, so that any questionable deviations could be identified. Secondly, maps were created from the aggregated data, showing any differences by c-square (VMS data) or by ICES rectangle (logbook data). The values for the most recent year 2018, submitted in the 2019 data call, were compared with the data for the previous year 2017, as well as against the mean of all years. The underlying data were then checked in more detail in areas that showed larger deviations.

Differences detected during these checks were analyzed in more detail. In some cases, a reasonable explanation for the difference (e.g. known changes in fishing effort) could be found. In other cases, errors were identified; hence, the data could be corrected and resubmitted. Based on the analyses run during the meeting, WGSFD finally concluded that the data for all BENTHIS métiers are correct to the extent possible. The rigorous quality control procedures imposed on the submitted VMS and logbook data served to increase the reliability of the data used to produce the requested data products, as well as the reliability of future advice outputs.

Sources and references

Eigaard, O. R., Bastardie, F., Breen, M., Dinesen, G. E., Hintzen, N. T., Laffargue, P., Mortensen, L. O., Nielsen, R., Nilsson, H. C., O'Neill, F. G., Polet, H., Reid, D. G., Sala, A., Sköld, M., Smith, C., Sørensen, T. K., Tully, O., Zengin, M., and Rijnsdorp, A. D. 2016. Estimating seabed pressure from demersal trawls, seines, and dredges based on gear design and dimensions. ICES Journal of Marine Science, 73 (supplement 1): i27–i43. https://doi.org/10.1093/icesjms/fsv099.

Ellis, N., Pantus, F., and Pitcher, C. R. 2014. Scaling up experimental trawl impact results to fishery management scales — a modelling approach for a "hot time". Canadian Journal of Fisheries and Aquatic Sciences, 71: 733–746. https://doi.org/10.1139/cjfas-2013-0426.

ICES. 2016. OSPAR request for further development of fishing intensity and pressure mapping. *In* Report of the ICES Advisory Committee, 2016. ICES Advice 2016, Book 1, Section 1.6.6.4. 27 pp.

ICES. 2017. OSPAR request on the production of spatial data layers of fishing intensity/pressure. *In* Report of the ICES Advisory Committee, 2017. ICES Advice 2017, ICES Technical Service, sr.2017.17. 8 pp.

ICES. 2018. Report of the Working Group on Spatial Fisheries Data (WGSFD), 11–15 June 2018, Aberdeen, Scotland, UK. ICES CM 2018/HAPISG:16. 79 pp.

ICES. 2019a. Data call: VMS/Log book data for fishing activities in the North East Atlantic and Baltic Sea for the provision of ICES management advice on the spatial distribution and impact of fisheries 2009 to 2018. 9 pp. https://community.ices.dk/admin/DataCalls/2019/Data%20Calls/VMS%20Data%20Call%202019/amended%20VMSlogbook%20data%20call_21%20Feb.pdf.

ICES. 2019b. Conditions for detailed VMS/log book data use. Guidelines and Policies. 3 pp. http://doi.org/10.17895/ices.data.5756.

ICES. 2019c. Working Group on Spatial Fisheries Data (WGSFD). ICES Scientific Reports, 1:52. 144 pp. http://doi.org/10.17895/ices.pub.5648.

ICES. 2020. Yearly SAR values for the years 2009 to 2018 in the ICES Subdivision 20 and 21: ICES data product release. Version 2: Reference updated. https://doi.org/10.17895/ices.data.7447.

Rees, T. 2003. "C-squares", a new spatial indexing system and its applicability to the description of oceanographic datasets. Oceanography, 16(1): 11–19. https://doi.org/10.5670/oceanog.2003.52.

Rijnsdorp, A. D., Buys, A. M., Storbeck, F., and Visser, E. G. 1998. Micro-scale distribution of beam trawl effort in the southern North Sea between 1993 and 1996 in relation to the trawling frequency of the sea bed and the impact on benthic organisms. ICES Journal of Marine Science, 55: 403–419. https://doi.org/10.1006/jmsc.1997.0326.

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