

Norwegian special request on the production of spatial data layers of fishing in areas relevant to future extraction of deep-sea minerals

Service summary

ICES collects and processes vessel monitoring system (VMS) and logbook data of fishing activity in the Northeast Atlantic. As a technical service to Norway, a set of spatial data layers has been prepared from this data, showing fishing activity for demersal and pelagic mobile gears (hours fished, total landings, swept area ratio) within the area being studied for potential deep-sea mineral extraction. Standardized methods were used to produce the requested data layers*.

The requested data layers in the format requested by Norway can be accessed at <https://doi.org/10.17895/ices.advice.21602769>.

Request

Norway requests ICES to produce maps similar to the figure below, showing fishing activity as mW fishing hours for foreign fishing vessels operating the area covered by the study. Fishing activity should be shown on a quarterly basis in the period 2013 – 2019. All nationalities may be shown in the same map without separating them.

The study should cover all available data from fisheries in the area and should separate between pelagic and demersal fishing and it would benefit from including information on catches, both volumes and species. ICES is requested to include aggregated information on this with a timely resolution of at least one year, although quarterly resolution is preferred if possible. Since there will be some challenges to separate catches taken inside the area from those taken outside estimates may be produced.

- Maps to be produced in formats that can be imported into regular GIS tools.
- Maps to be delivered approx. autumn 2022.
- Maps showing the area to be covered will be provided to ICES once desired fileformat is made known.

Elaboration on the service

Shapefile datasets and CSV files with WKT (well-known text) geometry columns, are available for download at <https://doi.org/10.17895/ices.data.21602802>.

Basis of the service

Background

From the Norwegian request:

In waters under Norwegian jurisdiction and on the extended continental shelf adjacent to these waters exploration activities has been taking place for some time. Mineral deposits have been identified in some of the explored areas. The Norwegian government has initiated a legally required study on consequences of any future extraction activities. The study is in its initial phase and this special request to ICES aims to address the need for knowledge on fishing activity in the area covered by the study as shown in figure 1.

* The code is available at: https://github.com/ices-taf/2022_sr.2022.16_TechnicalService

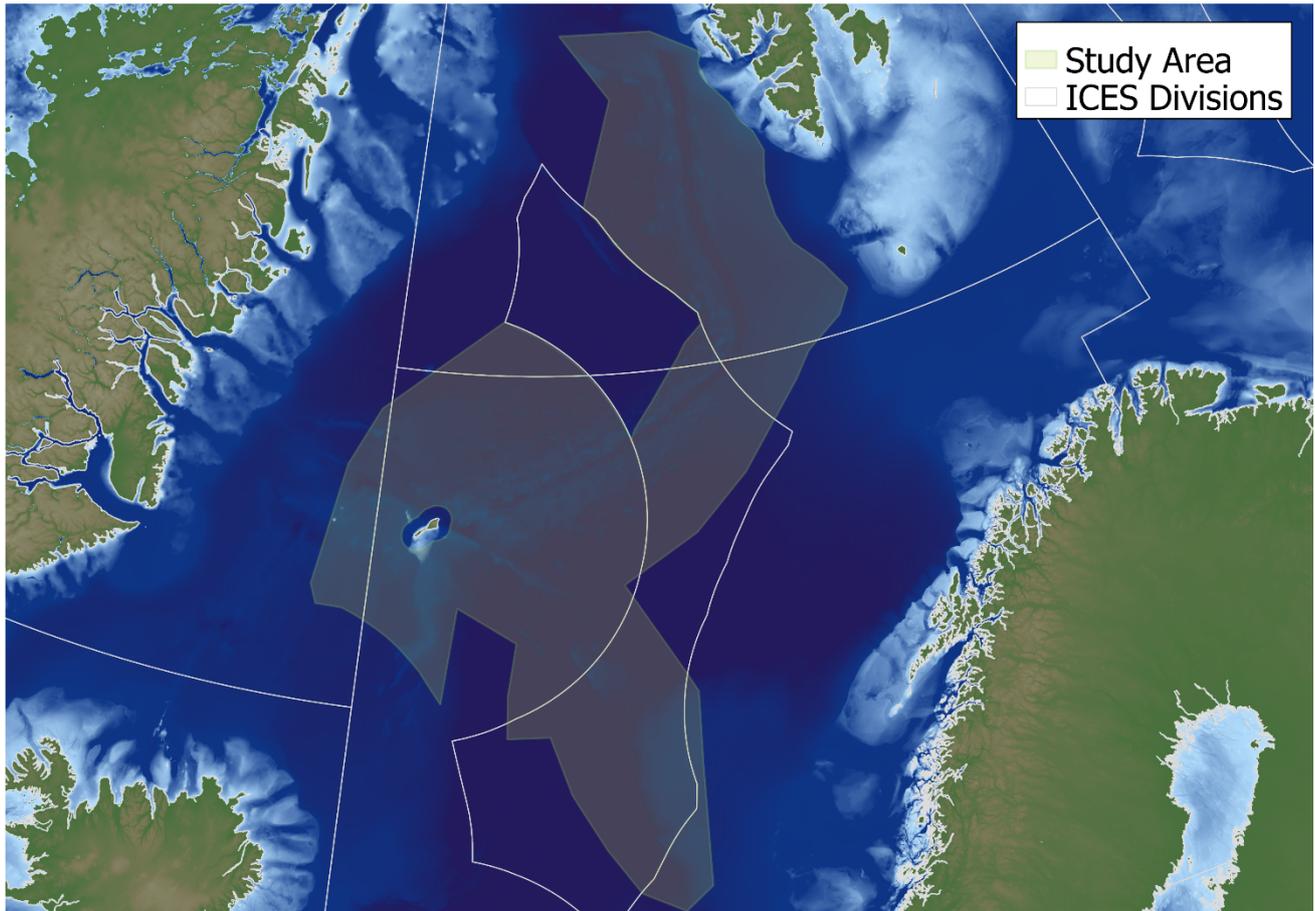


Figure 1 The shaded region, covering parts of the Norwegian EEZ and international waters, is the area covered by the study.

Methods

Post-processing

This technical service was completed using the methods established by ICES in its 2017 advice on the production of spatial data layers of fishing intensity/pressure (ICES, 2017). ICES Secretariat and Advisory Council (ACOM) leadership prepared and guided the process, with the relevant ICES expert groups (the Working Group on Spatial Fisheries Data [WGSFD] and the Working Group on Spatial Fisheries Data Governance [WGSFDGOV]) reviewing the steps taken.

A data call for VMS and logbook data, following ICES VMS data policy, and covering the years 2009–2021, was issued to all ICES Member Countries (EU Data Collection Framework [DCF] contacts and all ACOM delegates) on 25 February 2022, with a deadline for response by 15 April (ICES, 2021).

After the 15 April submission deadline and prior to the WGSFD data review web conference, ICES Secretariat together with the expert group chairs quality checked the submitted data. This involved frequent correspondence with countries to ensure that submission of data complied with the data call specifications. The process included generating a standard quality control (QC) report for each country's submission, with checks undertaken by the expert group chairs. This was done upon submission and, where relevant, for any resubmission, with the aim of detecting discrepancies in the data. Any feedback was communicated back to the data submitters, and countries were either congratulated on a good submission or asked to resubmit corrected data. Table 1 shows the countries that submitted data, the outcome of these QC checks, and subsequent inclusion in the data products. Due to issues with the quality of kilowatt-hours-fished data received from some countries, effort can only be provided in response to this request in terms of hours fished for mobile gears.

Table 1 Responses and data submission status for countries to whom the 2022 ICES data call on VMS and logbook data for 2009–2021 was sent.

Country	Data submission	Country	Data submission
Belgium	✓	Lithuania	✓
Denmark	✓	The Netherlands	✓
Estonia	✓	Norway	(✓)
Faroe Islands	✗	Poland	✓
France	✓	Portugal	~
Germany	✓	Russia	✗
Greenland	✗	Spain	✓
Ireland	✓	Sweden	✓
Iceland	✓	United Kingdom	✓
Latvia	✓		

✓: Suitable data submitted.

✗: No data submitted.

~: Data submitted, QC checks not passed

(✓): Norwegian data successfully passed the QC process, but, as per the request, have not been included in the data product presented here.

An additional QC check was undertaken at the WGSFD meeting to review the combined data set as a whole. All R scripts and SQL code used to access and process the VMS data are available on GitHub[†].

Processing of VMS data

The production of spatial data layers of fishing intensity and pressure are discussed in detail in ICES (2016a, 2016b).

Data which passed the quality control checks were used to produce geographical files (shapefiles) and maps. The production of these spatial data layers of effort (hours fished) and total landings (t) is summed by pelagic or demersal gear grouping (Table 2), at a resolution of c-squares ($0.05^\circ \times 0.05^\circ$, about 15 km² at 60°N latitude), which is the spatial resolution adopted by ICES (Rees, 2003). Swept area ratio has been provided for demersal gears. Landings data resolved by species were not requested in the ICES data call, therefore it is not possible to fulfil this part of the request.

Data can be considered sensitive if the activities of individuals can be inferred from it (ICES, 2019a), and parameters such as fishing hours and total landings are considered by WGSFD as containing potential personally identifying information. Following the provisions made in the ICES VMS data call and the guidelines produced by ICES WGSFD in 2019 (ICES, 2019b), values from c-squares with two vessels or fewer were aggregated into a category and presented as “anonymized c-squares”. Examination of the data revealed that the majority of c-squares were fished by fewer than three vessels and would need to be suppressed (Figure 2). In order to provide a more useful data product, effort and landings have instead been categorized into broad levels, ensuring that there are three or more vessels active in each category, preserving individual anonymity.

The resulting outputs have been evaluated by ICES VMS Governance Group (WGSFDGOV) to ensure the approach used aligns with VMS data policy.

[†] https://github.com/ices-eg/wg_WGSFD.

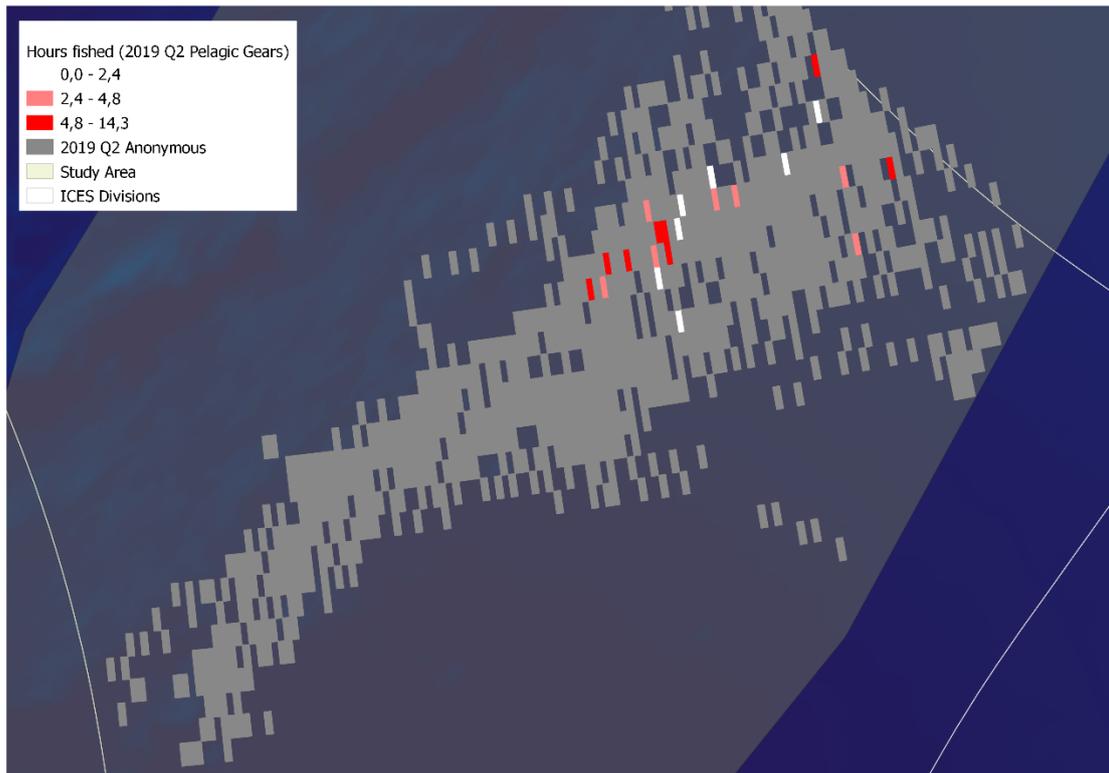


Figure 2 An example of the anonymization rule applied to data for Q2 2019, showing hours fished by pelagic gears, highlighting that the majority of -squares would require suppression.

Table 2 Glossary of terms and BENTHIS métier groupings used to define higher-level “pelagic” and “benthic” groupings.

Pelagic	
Gear code	Description
OTM	Midwater otter trawl
PTM	Midwater Pair Trawl
PS	Purse-seine
Benthic	
BENTHIS métier	Description
OT_CRU	Otter trawl for <i>Nephrops</i> or shrimp
OT_DMF	Otter trawl for cod or plaice
OT_MIX	Otter trawl for other species
OT_MIX_CRU	Otter trawl for mixture of species with focus on shrimp
OT_MIX_DMF_BEN	Otter trawl for mixed benthic fish
OT_MIX_DMF_PEL	Otter trawl for bentho-pelagic fish
OT_MIX_CRU_DMF	Otter trawl for <i>Nephrops</i> and mixed fish
OT_SPF	Otter trawl for sprat or sandeel
TBB_CRU	Beam trawl for <i>Crangon</i>
TBB_DMF	Beam trawl for sole and plaice
TBB_MOL	Beam trawl for molluscs
DRB_MOL	Dredge for scallops and mussels
SDN_DMF	Danish seine for plaice and cod
SSC_DMF	Scottish seine for cod, haddock, and other flatfish

Data outputs

All requested VMS-derived data outputs for this technical service are available for download at <https://doi.org/10.17895/ices.data.21602802>.

Example maps for pelagic fishing effort in 2019 are given in Figure 3.

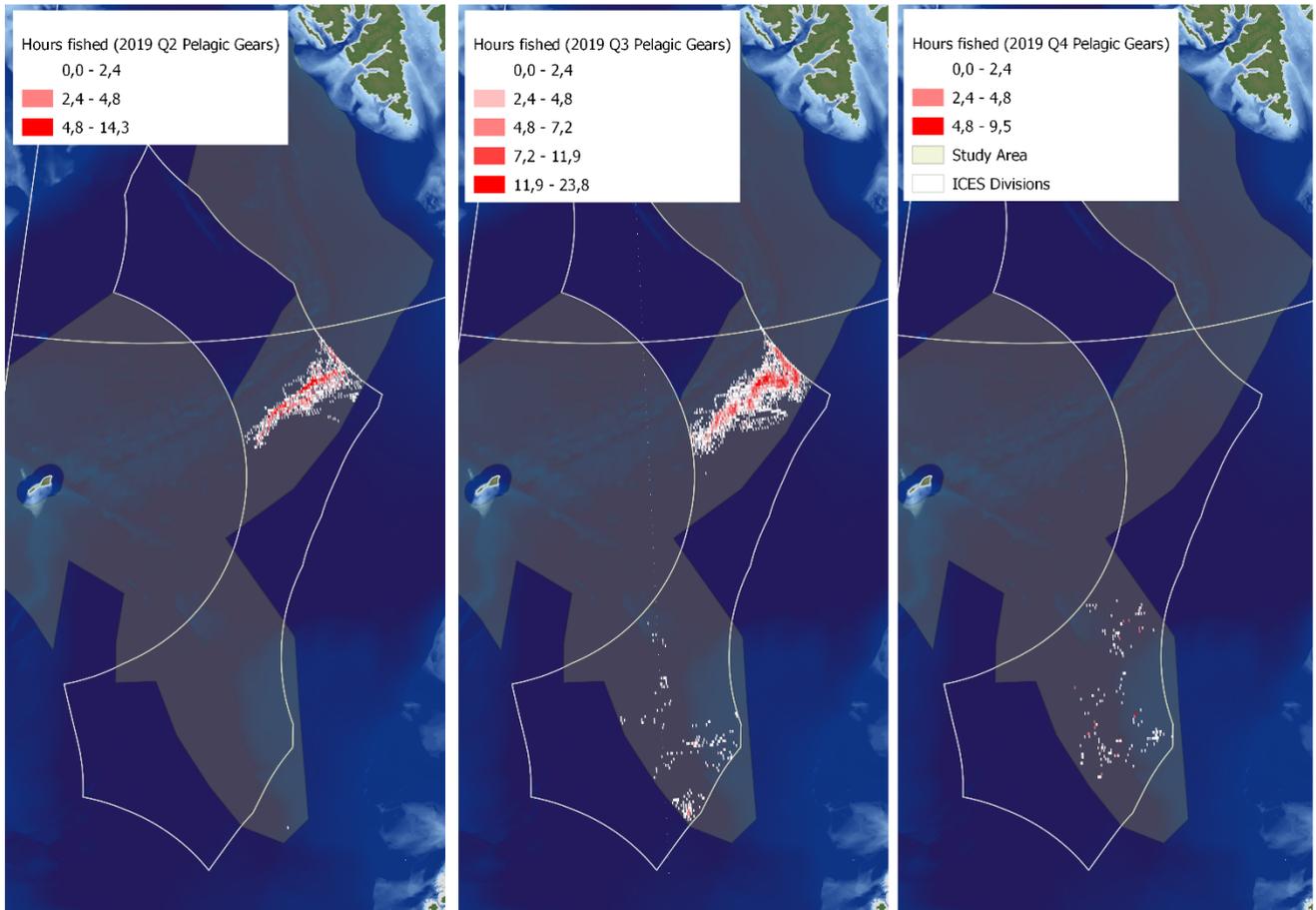


Figure 3 Fishing activity (hours fished) in the study area by non-Norwegian vessels using pelagic gears during Q2–Q4, 2019.

Caveats

Several caveats, listed below, should be taken into account when considering this technical service and its data. These caveats relate to issues concerning the provision of vessel data, their interpretation, and the scale on which data are informative.

- Data on fishing locations for vessels less than 12 m are not available and are therefore not included in the technical service. Given the offshore nature of the study area, the impact of this omission is likely to be small.
- VMS data from several countries were either not submitted or did not pass the quality check process and have not been used in preparation of the data layers. Fishing activity by vessels from these countries is not captured here.
- Hours fished, total landings and swept-area ratio are calculated at a resolution of $0.05^\circ \times 0.05^\circ$. This is an appropriate scale at mid-latitudes, where the dimensions of a c-square are roughly equivalent to the distance a vessel travelling at fishing speeds will cover in the period of the lowest frequency of VMS polling in the data, ensuring that a vessel is unlikely to fish across a c-square without being observed. At higher latitudes, these c-squares become smaller and the risk of a c-square being fished without recording a VMS position increases. Although no fishing activity is lost, it may appear more granular.

Sources and references

ICES. 2016a. 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. 2016b. Interim Report of the Working Group on Spatial Fisheries Data (WGSFD), 17–20 May 2016, Brest, France. ICES CM 2016/SSGEPI:18. 244 pp.

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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>

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