

Intended for  
**Energinet.dk**

Document type  
**Report**

Date  
**December 2022**

# ENERGY ISLAND BORNHOLM SCOPING REPORT - FISHERIES



# ENERGY ISLAND BORNHOLM SCOPING REPORT - FISHERIES

Project name **Energy Island Bornholm**  
Project no. **1100048531**  
Recipient **Energinet.dk**  
Document type **Report**  
Version **3.0**  
Date **2022.12.06**  
Prepared by **SJN**  
Checked by **LODK, MAJH**  
Approved by **EKLN**  
Approved by client by **Morten Bak (MOB)**  
Description **Scoping report for Work Package J - Fisheries**

Ramboll  
Hannemanns Allé 53  
DK-2300 Copenhagen S  
Denmark

T +45 5161 1000  
F +45 5161 1001  
<https://ramboll.com>

## CONTENTS

<b>1.</b>	<b>Summary</b>	<b>2</b>
<b>2.</b>	<b>Introduction</b>	<b>2</b>
<b>3.</b>	<b>Area of investigation</b>	<b>3</b>
<b>4.</b>	<b>Methodology</b>	<b>4</b>
4.1	Data - Denmark	4
4.1.1	VMS data for relevant ICES squares divided into gear and type of fishery	5
4.1.2	Landings from ICES rectangles divided in weight/value by species	6
4.1.3	Detailed mapping of sand eel fishing grounds	8
4.1.4	Interviews with fishermen	9
4.1.5	Delivery of collected and processed data	9
4.2	Data – Sweden, Germany and Poland	9
4.2.1	Sweden	10
4.2.2	Germany	11
4.2.3	Poland	12
4.3	Proposed analyses - Sweden	12
4.3.1	Landings from ICES rectangles divided in weight/value by gear type	12
4.3.2	VMS data for relevant ICES squares divided into gear and type of fishery	13
4.4	Proposed analyses – Germany	13
4.4.1	Landings from ICES rectangles divided in weight/value by species	13
4.4.2	VMS data for relevant ICES squares	14
4.5	Proposed analyses – Poland	14
4.5.1	Landings from ICES rectangles divided in weight by gear type	14
4.5.2	VMS data for relevant ICES squares	14
<b>5.</b>	<b>Deliverables</b>	<b>14</b>
<b>6.</b>	<b>Milestones</b>	<b>15</b>

## 1. SUMMARY

This report defines the scope of work for WP J, concerning the fisheries sector in relation to the Energy Island Bornholm. The scoping report includes a detailed proposal for the investigations of the commercial fisheries in the investigation area and its nearby surroundings, as relevant.

The analyses will concern ICES rectangles that contain the investigation area and the surrounding rectangles i.e., 39G3, 39G4, 38G3, 38G4, 38G5, 39G2 and 40G2. Mapping and analyses of the baseline situation concerning fishery within and around the project area will be based on data acquisition from relevant sources (The Danish Fisheries Agency, the International Council for the Exploration of the Sea (ICES) and the Danish fishermen associations) and interviews with fishermen within relevant harbours and other organisations.

Vessel Monitoring System (VMS) and logbook data covering the past decade will be purchased from the Danish Fisheries Agency and be included in the assessment. The purchased data represents Danish fisheries activity.

The following analyses and interviews will be conducted:

- VMS data for relevant ICES squares divided into gear and type of fishery
- Landings from ICES rectangles divided in weight/value by species
- Detailed mapping of sand eel fishing grounds
- Interviews will be carried out in agreement with the relevant fisheries organisations with fishermen in the nearest harbours

The proposed analyses will provide clarity on commercial fishing activity.

The analysis will form the basis for the Strategic Environmental Assessment (SEA). However, the main purpose of the analysis is to support a future Environmental Impact Assessment (EIA).

A proposed variation order (VO) has been included in the scope of work, following the meeting with Energinet on the 24<sup>th</sup> of September 2021. The VO covers the gap between the best and final offer (BAFO) presented in the contract and the scope of work presented in this document.

## 2. INTRODUCTION

The energy islands mark the beginning of a new era for the generation of energy from offshore wind, aimed at creating a renewable energy supply for Danish and foreign electricity grids. Operating as renewable power plants at sea, the islands are expected to play a major role in the phasing-out of fossil fuel energy sources in Denmark and Europe. One energy island is planned in the North Sea and one in the Baltic Sea.

After political agreement on the energy islands has been reached, the Danish Energy Agency plays a key role in leading the project that will transform the two energy islands from a vision to reality. The energy island projects are pioneer projects that will necessitate the deployment of existing knowledge into an entirely new context.

The Plan for Programme Energy Island Bornholm ("The plan") sets the framework for the construction of Energy Island Bornholm - one of the first energy islands in the world and a pioneering offshore wind energy hub in the Baltic Sea (see Figure 2-1).

The plan includes offshore planning areas for an offshore wind farm ("OWF") 15 km from Bornholm, and for subsea cables in Danish waters between Bornholm and Zealand as well as between Bornholm and German waters. The plan also includes onshore planning areas for cables and high voltage stations on Bornholm and Zealand.

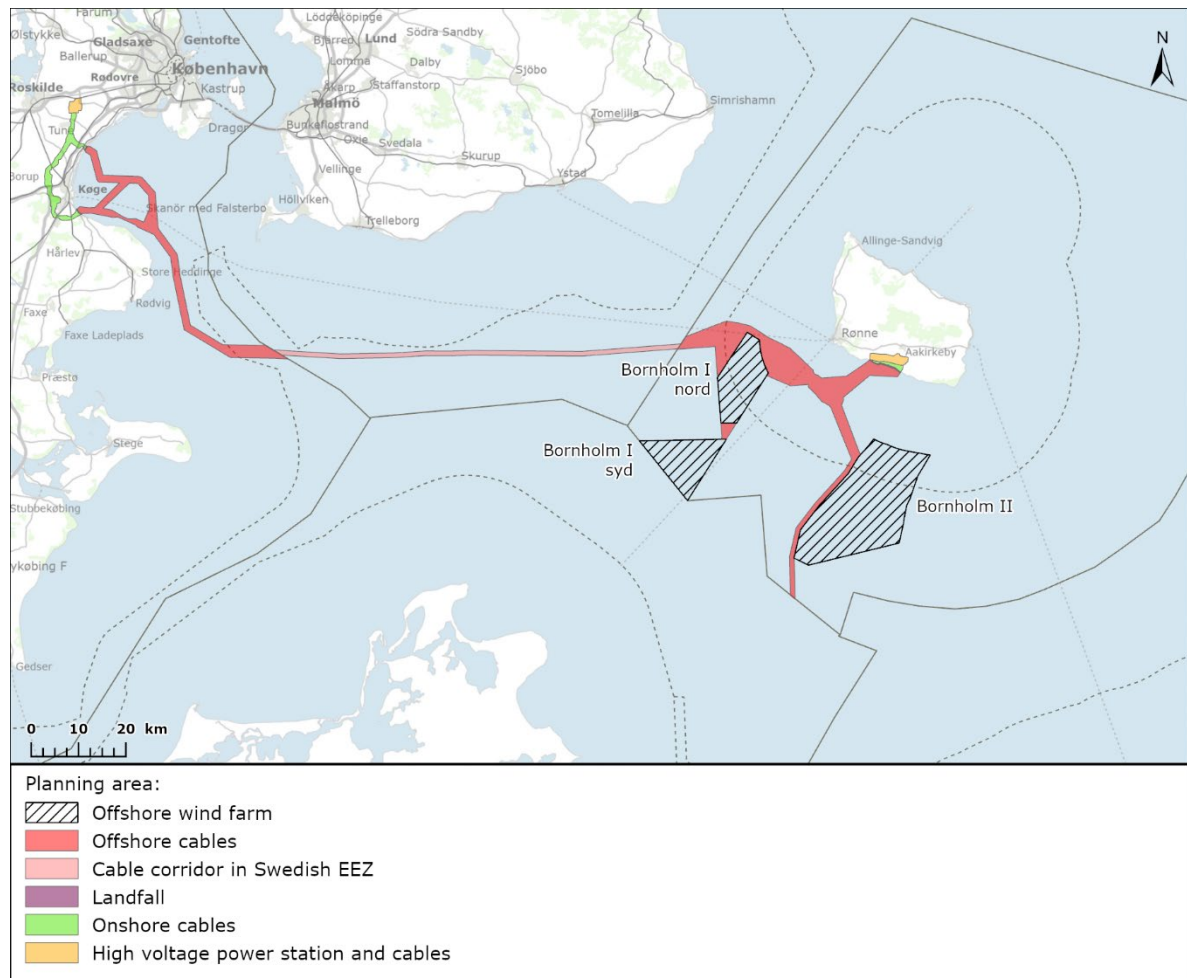


Figure 2-1 Planning areas in the Plan for Programme Energy Island Bornholm.

Inevitably, there will be an impact on the commercial fisheries that operate in the vicinity of Energy Island Bornholm, both in the construction and operating phase. The potential impacts are to be assessed and analysed with the strategic environmental assessment.

This report defines the scope of work for WP J, which concerns the fisheries sector in relation to the Energy Island Bornholm. The scoping report includes a detailed proposal for the investigations of the commercial fisheries in the investigation area and its nearby surroundings, as relevant.

### 3. AREA OF INVESTIGATION

The analysis will cover ICES rectangles that contain the investigation area and the surrounding rectangles i.e., 39G3, 39G4, 38G3, 38G4, 38G5, 39G2 and 40G2, Figure 3-1. This approach ensures that cable corridors from the windfarm to Bornholm and from Bornholm to Zealand are included in the analyses.

Under the Administrative Order on protection of submarine cables and submarine pipelines, cable or pipeline fields are given a 200 m wide restriction zone along and on each side of the infrastructure. Ships may not, without urgent necessity, anchor in the cable and pipeline fields established for such infrastructure, which cover the associated restriction zones. In the restriction zones, suction dredging, fishing for stones as well as any use of tools or other gear that is dragged on the seabed (e.g. bottom trawling) is prohibited. Demersal fisheries may be impacted by the cable corridor going to Zealand and/or Germany if no dispensation has been given from the Order on protection of submarine cables and submarine pipelines.

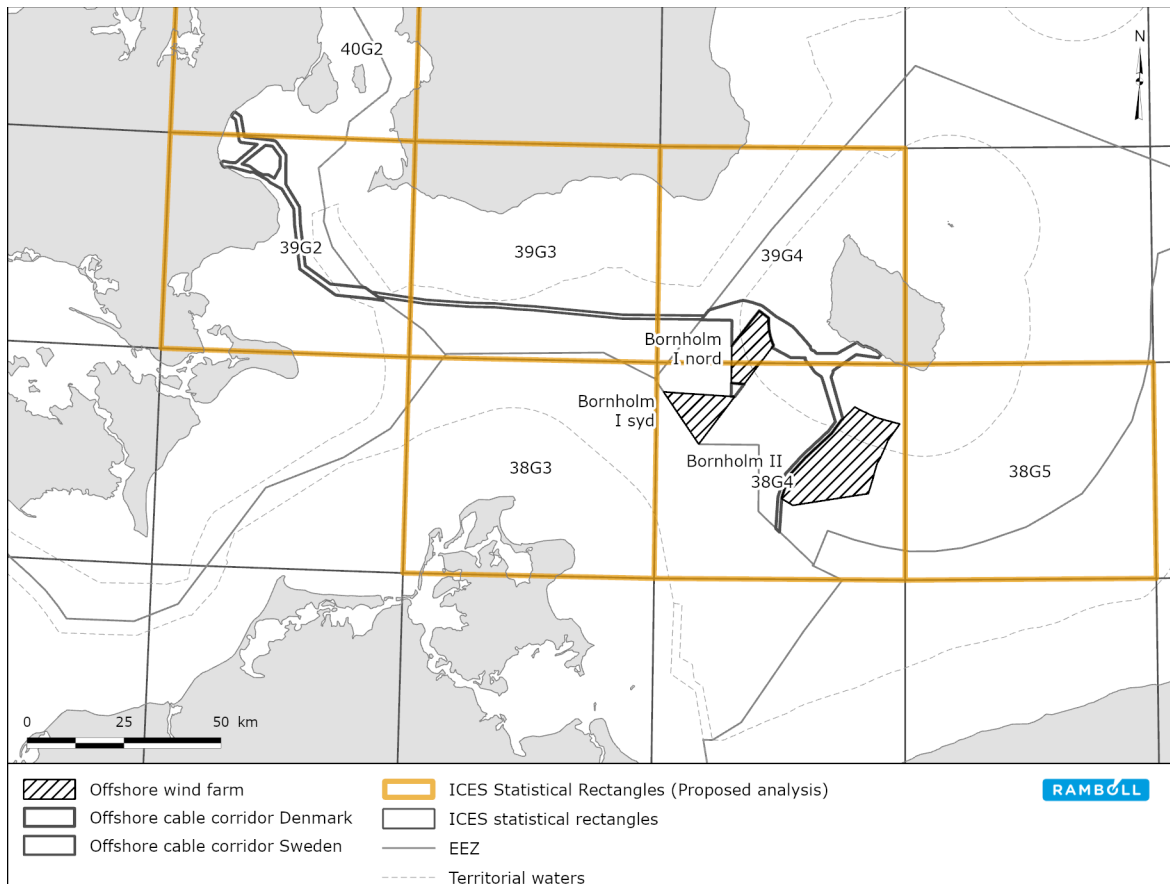


Figure 3-1 Illustration of the area of interest regarding the Energy Island Bornholm.

## 4. METHODOLOGY

### 4.1 Data - Denmark

To properly assess any impacts from an offshore wind farm on fisheries, it is necessary to describe the existing fishery patterns in and around the project area. Mapping and analyses of the baseline situation concerning fishery within and around the project area will be based on data acquisition from relevant sources (The Danish Fisheries Agency, the International Council for the Exploration of the Sea (ICES) and the Danish fishermen associations) and interviews with fishermen within relevant harbours and other organisations. This analysis forms the basis for the SEA.

Vessel Monitoring System (VMS) and logbook data will be purchased for the past decade from the Danish Fisheries Agency and included in the assessment. Baseline data from the commercial

fisheries will include official data from the ICES rectangles (39G3, 39G4, 38G3, 38G4, 38G5, 39G2 and 40G2). These datasets are acquired, as they offer the best resolution in terms of analysing the distribution and extent of the fisheries in and near the project area, including the cable corridors. The exact locations of the cable corridors are yet to be decided. Possible cumulative and transboundary impacts on fishery will be investigated at an overall level. Further contact to similar authorities to the Danish Fisheries Agency for the request of national data in e.g., Sweden, Germany and Poland, has been proposed in chapter 4.2.

The Danish logbook data will include anonymized vessel ID, home country, vessel length, vessel power, tonnage, departure country, departure harbour, departure date, departure time, landing country, landing harbour, arrival date, arrival time, catch date, gear, mesh size, ICES rectangle of the catch, ICES division, landed species, landing weight estimate of species and estimated landing of value of species. The Danish VMS-data includes country of origin, anonymized vessel ID, latitude, longitude, date, hour of set ping, vessel speed, heading, harbour status; (0) in harbour, (1) not in harbour.

#### **4.1.1 VMS data for relevant ICES squares divided into gear and type of fishery**

Logbook and VMS data can yield information on fishing activity from fishing vessels of  $\geq 12$  m. Vessels above 15 m since 2009 and vessels above 12 m since 2012 has been obliged to have a VMS installed. The data provides information on e.g. the development in fisheries for the past decade, the economically most important fish species and where they are caught, but also when and where the different fishing gears are used. This information is relevant when assessing the impact of the windfarm on the fisheries, both in terms of the positioning of the windfarm but also the timing of the construction of project.

The VMS positions will be filtered based on estimated speed and the type of gear the vessel was using. Fishing activity i.e., if the vessel is floating/being in harbour, fishing or steaming will be determined with the R package *VMStools*. *VMStools* is specifically developed for the processing, analysis and visualisation of landings and vessel location data from commercial fisheries and used by ICES. *VMStools* can create segmented regression on the speed profile and automatic detect fishing versus no-fishing. Some gear types may need fixed speeds if there are insufficient information/data points to estimate the different peaks statistically.

The distribution of the fishing activity will be presented by gear type (e.g. single boat bottom otter trawls, twin bottom otter trawls, midwater pair trawls) and type of fishery (e.g. bottom trawl, pelagic trawl, gillnets). The VMS points will be averaged over the investigated period and the frequency will be plotted in a grid. The grid is a  $0.05 \times 0.05$ -degree grid, which is equivalent to what ICES uses in their C-square geocode system. The analysis will concern ICES rectangles that contain the investigation area and the surrounding rectangles i.e., 39G3, 39G4, 38G3, 38G4, 38G5, 39G2 and 40G2. An example of how data may be visualized with *ArcGIS Pro* has been provided, Figure 4-1.

The VMS positions will also be accumulated and presented in a table showing the number of points within and outside the investigation area by ICES rectangle and type of fishery. The table will be produced in *Excel* or *R*.



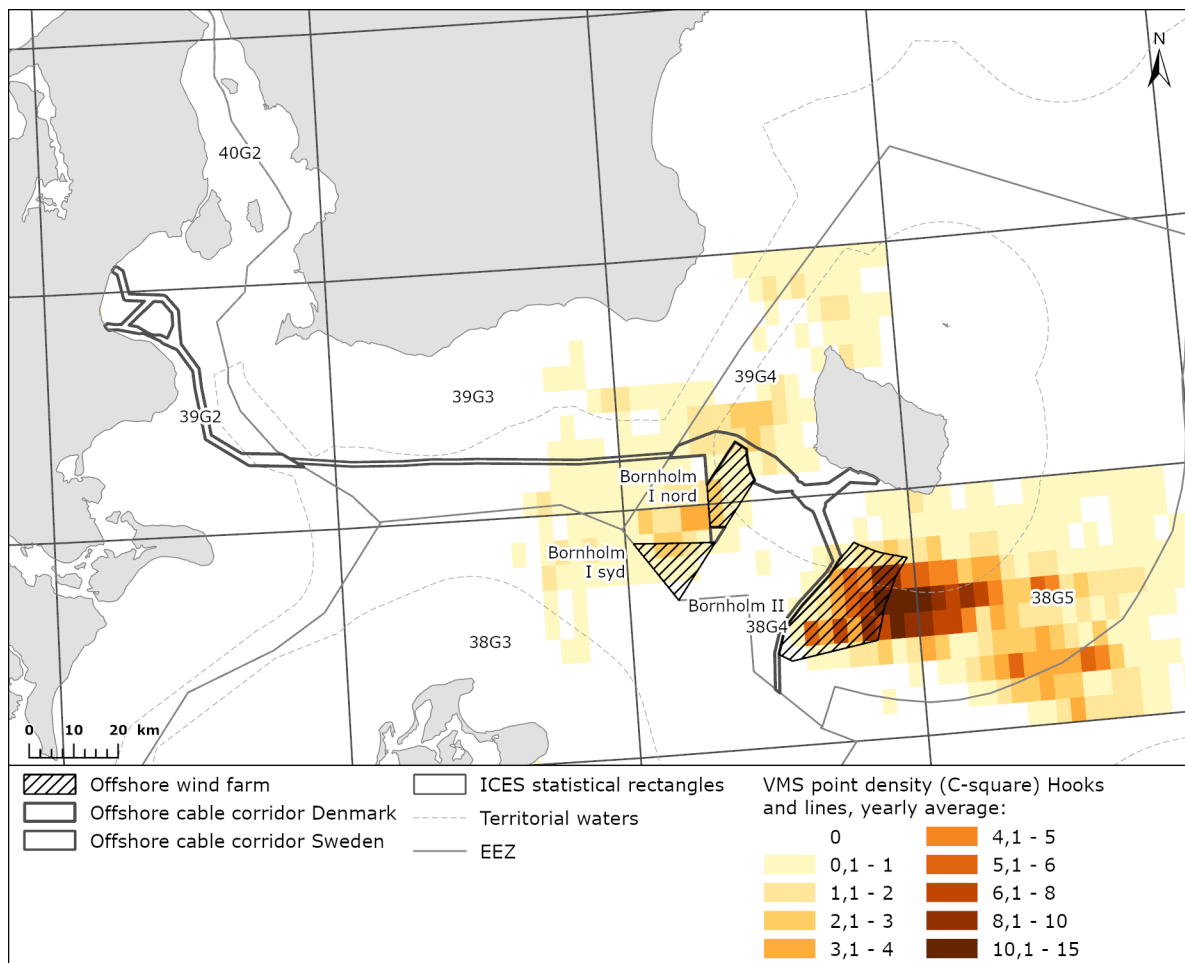


Figure 4-1 An example of how the distribution of commercial fishing for gear or type of fishery could be presented.

#### 4.1.2 Landings from ICES rectangles divided in weight/value by species

##### 4.1.2.1 Vessels $\geq 12$ m

Logbook data will be used to divide weight/value by species for vessels  $\geq 12$  m. The analysis will concern ICES rectangles that contain the investigation area and the surrounding rectangles i.e., 39G3, 39G4, 38G3, 38G4, 38G5, 39G2 and 40G2. The data will be analysed in the computational statistical software *R*. Here the package *dplyr* will be used to solve the beforementioned task. *Dplyr* is a grammar of data manipulation, that provides a consistent set of verbs that can solve common data manipulation challenges. Once data has been processed, it will be presented as figures created with the *R* package *ggplot2*. *Ggplot2* is a system for declaratively creating graphics. An example has been provided to give an idea of how the figures will be presented for the individual rectangle, Figure 4-2. Tables related to the plots will be presented as tables in an appendix.



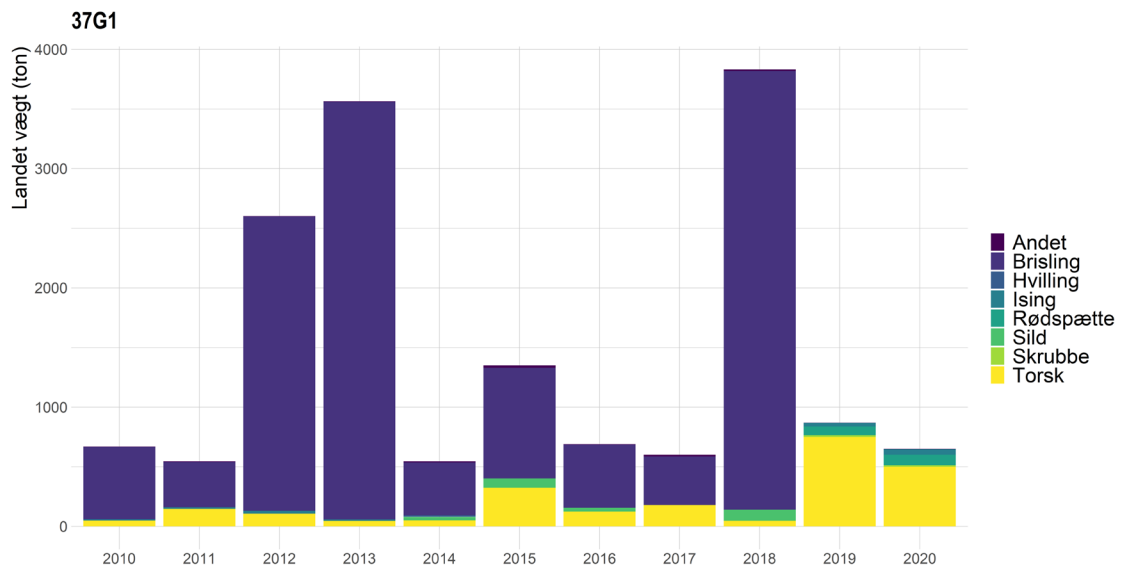


Figure 4-2 Example of a figure showing landed weight [t] by vessels (> 12 m) in the period 2010 to 2020 in the ICES rectangles 37G1. The group *andet* is a coupled group. *Andet* contains landings for species where the catch constituted less than 10 [t] the respective year.

#### 4.1.2.2 Vessels < 12 m

The analysis includes mapping of landings of fish species by weight and value for vessels < 12 m within and around the investigation area (nearest harbours). Vessels < 12 m are not obliged to hand in VMS data; therefore, the analysis will be set to a spatial resolution of ICES rectangles. The dataset should include the ICES rectangles 39G3, 39G4, 38G3, 38G4, 38G5, 39G2 and 40G2. Processing and manipulation of data will follow the same procedures presented in 4.1.2.1. Catches will most likely not be relevant for all of the rectangles in question, due to the meters for vessels < 12 m. Tables related to the plots will be presented as tables in an appendix.

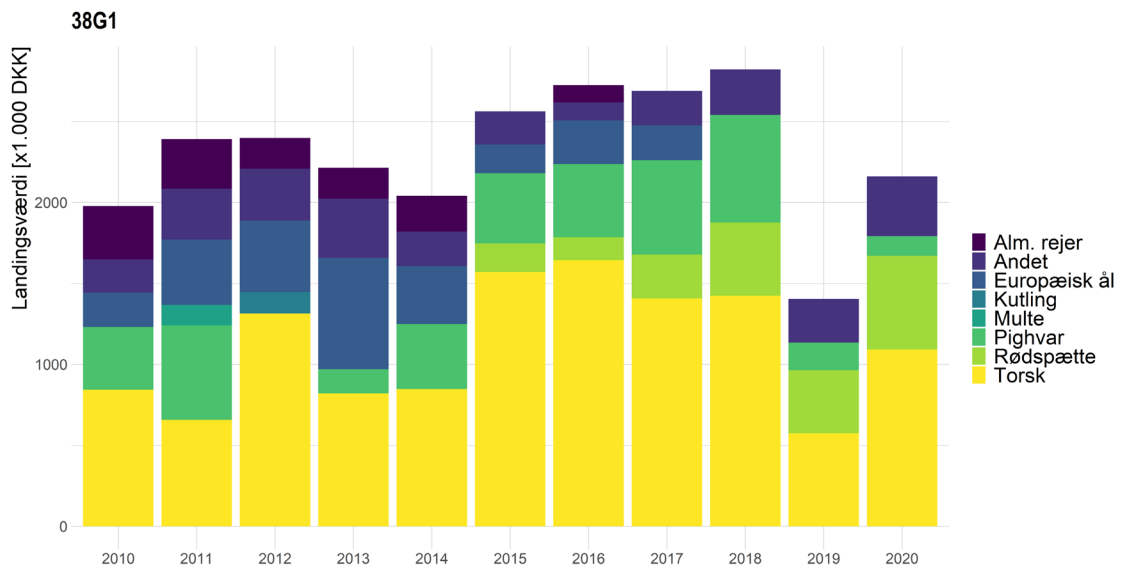


Figure 4-3 Example of a figure showing landed value [x1.000 DKK] by vessels (< 12 m) in the period 2010 to 2020 in the ICES rectangles 38G1. The group *andet* is a coupled group. *Andet* contains landed value for species where the catch constituted less than 5 [x1.000 DKK] the respective year.

#### 4.1.3 Detailed mapping of sand eel fishing grounds

Once the logbook and VMS data are coupled with the *R* package *VMStools*, we will be able to make a detailed mapping of sand eel fishing grounds. With the analysis presented in 4.1.2.1, we can concentrate the effort to years where sand eel was landed. Figures of sand eel fisheries activities will be produced in *ArcGIS Pro*, Figure 4-4. The dataset will include the ICES rectangles 39G3, 39G4, 38G3, 38G4, 38G5, 39G2 and 40G2. The analysis will only concern vessels  $\geq 12$  m, as they have a VMS installed.

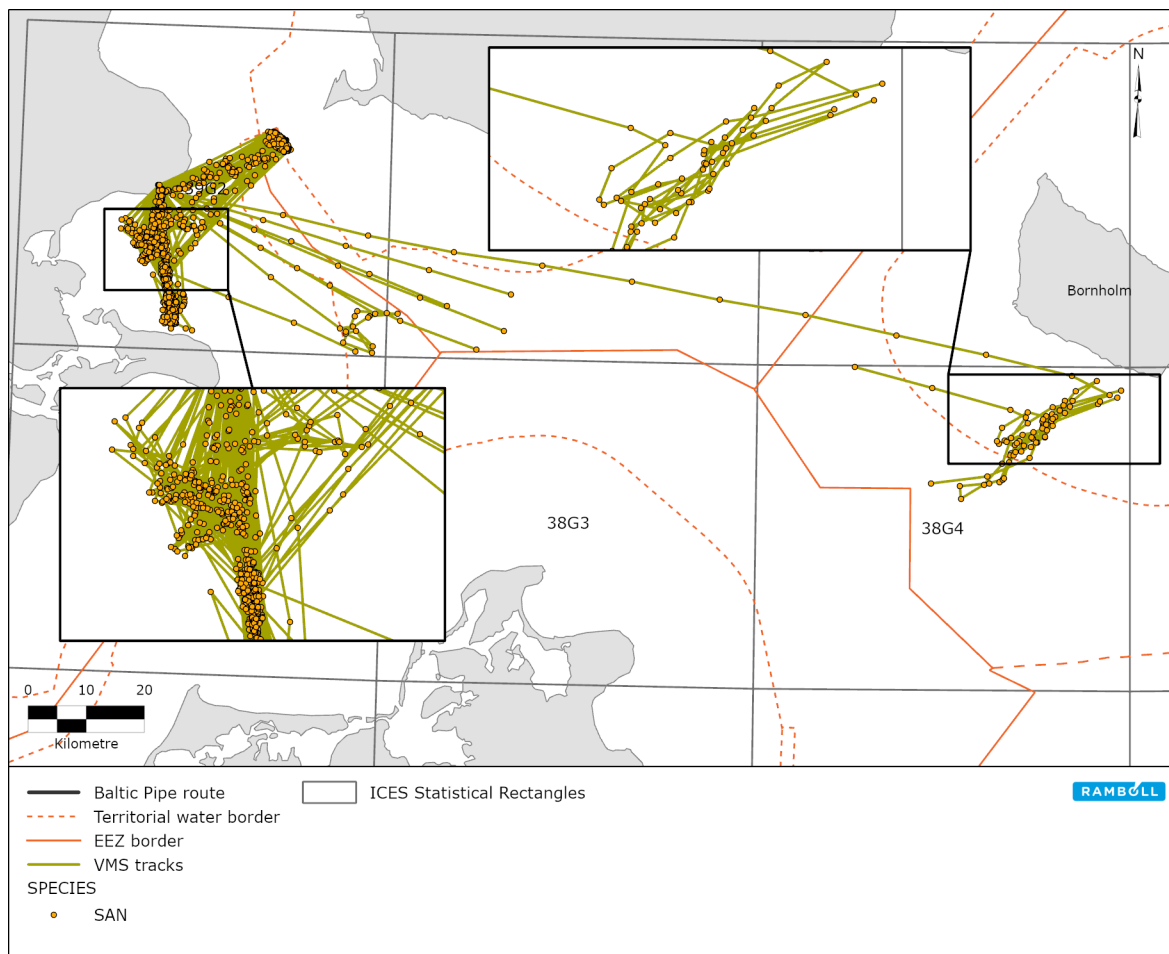


Figure 4-4 An example of fishing activity for sand eel in the Baltic Sea in 2016 by Danish fisheries.

#### 4.1.4 Interviews with fishermen

Interviews will be carried out in agreement with the relevant fisheries organisations with fishermen in the nearest harbours, who will provide supplemental information about the distribution and characteristics of the different fisheries in the investigation area and its region. Before the meetings, Rambøll will deliver a short presentation about the project. With the presentation we can introduce the area of interest. With the presentation the stakeholder may have an opportunity to collect relevant information about the fisheries within and around the investigation area.

#### 4.1.5 Delivery of collected and processed data

The field surveys mentioned in the Scope of services, will be conducted in the computational statistical software *R* and *ArcGIS Pro*. Acquired and processed data will be delivered in Excel, R-scripts and geodatabase formats.

#### 4.2 Data – Sweden, Germany and Poland

After the bilateral meeting regarding the scope of work with Energinet the 24<sup>th</sup> of September, it was decided that the analyses should include data from Sweden, Germany and Poland. It was acknowledged by the client that the methodology will differ from the one proposed for Danish fisheries. This change in methodology is due to different format and level of parameters in the datasets, as can be seen in the chapters 4.2.1, 4.2.2 and 4.2.3. A separate methodology for each country has been proposed in 4.3, 4.4 and 4.5.

#### 4.2.1 Sweden

A single dataset for vessels < 12 m, will be acquired from the Swedish University of Agricultural Sciences (SLU), Table 4-1. As vessels < 12 m, are not obliged to hand in VMS data, it is set to a spatial resolution of ICES rectangles. The dataset will include the ICES rectangles 39G3, 39G4, 38G3, 38G4, 38G5, 39G2 and 40G2 for a ten-year period. It is highly likely that there won't be activity for vessels < 12 m in all the investigated ICES rectangles.

**Table 4-1 Parameters, variables and their formats for the Swedish dataset. Vessels < 12 m.**

Parameter	Variable	Format/Unit
Year	Year	YYYY
Month	Month	MM
ICES_Square	ICES rectangle	4-character string
Effort_FishingDays	Fishing effort hours	##
Gear_type	Gear	3-character string. DCF metiér level 4.
EU_Level6_metier	Under the DCF, fishing activity (metier) by region follows the aggregation at various levels. The complete schema is reported in Appendix IV of Commission Decision 2010/93/EU.	String. DCF metiér level 6.
Landed_weight_kg	Landed weight	Kg
Landed_value_EURO	Landed value	EUR
Target_species_group	Demersal or pelagic fisheries	String.

A similar request is made for vessels  $\geq 12$  m, but this dataset includes VMS data, Table 4-2. Unlike the Danish dataset, the coupling of VMS and logbook data has been done, making the tedious task of coupling in *VMStools* redundant.

**Table 4-2 Parameters, variables and their formats for the Swedish dataset. Vessels  $\geq 12$  m.**

Parameter	Variable	Format/Unit
Lat	Latitude	Decimal degrees
Lon	Longitude	Decimal degrees
Year	Year	YYYY
Month	Month	MM
Effort_Hour	Fishing effort in hours	##
Gear_type	Gear	3-character string. DCF metiér level 4.
EU_Level6_metier	Under the DCF, fishing activity (metier) by region follows the aggregation at various levels. The complete schema is reported in Appendix IV of Commission Decision 2010/93/EU.	String. DCF metiér level 6.
Landed_weight_kg	Landed weight	kg
Landed_value_EURO	Landed value	EUR
Target_species_group	Demersal or pelagic fisheries	String.

1. A fishing trip in the VMS-data is identified by departure and arrival dates for the corresponding trip in the fishermen logbook.

2. The VMS data is filtered to identify potential fishing by a speed filter 1.4-4 knots and a spatial filter, deselecting "fishing speeds" within 3 nm from any harbour (corresponds well to Swedish trawling limit)
3. Price for each species is calculated from sales notes, if the trip is not identified different averages are sequentially applied.
4. Price information is added to the logbook trip and total value and weight is aggregated over a fishing trip.
5. Total weight and values are distributed evenly on the remaining "fishing activity" VMS pings for a trip (actually weighted by time difference between consecutive VMS pings – but typically one hour between pings).
6. All pings are aggregated over, in this case, the factors ICES rectangles // months // gear classification.

#### 4.2.2 Germany

A request for data will be sent to the Federal Office for Agriculture and Food in Germany (BLE). The dataset will include the ICES rectangles 39G3, 39G4, 38G3, 38G4, 38G5, 39G2 and 40G2 for a ten-year period. The level of parameters available from German authorities are quite limited, especially concerning the vessel métiers, due to data protection concerns. We will make an enquiry for VMS and logbook data. Please note that Rambøll has previous experiences with data deliverances from BLE. Datasets has in some cases differed from original inquiry. This difference from original inquiry, can potentially influence the methodology. Furthermore, the processing time is highly dependent on the availability of staff and amount of data requested. Costs associated with data from BLE starts with a 500 € fee and further expenses may be added depending on the effort. This makes the costs of data challenging to assess. A table with the enquired logbook data can be seen in Table 4-3.

**Table 4-3 Parameters, variables and their formats for the German logbook dataset. The listed parameters may differ once data is delivered.**

Parameter	Variable	Format/Unit
LE_CDAT	Catch date	DD/MM/YYYY
LE_GEAR	Gear	3-character string. DCF Metiér level 4.
LE_MSZ	Mesh size	Mm stretched mesh
LE_RECT	ICES rectangle	4-character string.
SPECIES	Species	3-character string.
LE_KG	Landing weight estimate of species SP1 (FAO species codes)	Kg
LE_EURO	Landing value of species SP1 (FAO species codes)	EURO

A table with enquired VMS data can be seen in Table 4-4.

**Table 4-4 Parameters, variables and their formats for the German VMS dataset. The listed parameters may differ once data is delivered.**

Parameter	Variable	Format/Unit
Vessel_ID	Vessel ID (Pseudonymized ID)	String
LATITUDE	Latitude	Decimal degrees
LONGITUDE	Longitude	Decimal degrees
DATE	Date	DD/MM/YYYY
TIME	Time	HH:MM
INSTANT SPEED	Instant speed delivered	Knots

Parameter	Variable	Format/Unit
INSTANT HEADING	Instant heading delivered	Degrees
SQUARE	ICES rectangle	4-character string.
YEAR	Year	YYYY

### 4.2.3 Poland

Polish data will be acquired from the Ministry of Agriculture and Rural Development (Fisheries Monitoring Centre). The dataset will include the ICES rectangles 39G3, 39G4, 38G3, 38G4, 38G5, 39G2 and 40G2 for a ten-year period. Rambøll will make an enquiry for both VMS and logbook data. A table with the enquired logbook data can be seen in Table 4-5.

**Table 4-5 Parameters, variables and their formats for the Polish logbook dataset. The listed parameters may differ once data is delivered.**

Parameter	Variable	Format/Unit
YEAR	Year	YYYY
MONTH	Month	MM
ICES	ICES rectangle	4-character string
UNIT	Vessel ID (Pseudonymized ID)	Jednostka-### (Vessel-###)
FISHING DATA	Log event start time	DD/MM/YYYY HH:MM
DURATION OF FISHING	Duration of trip	HH:MM
GEAR	Gear	3-character string. DCF Metiér level 4.
MESH SIZE	Mesh size	Mm stretched mesh
CATCHES LIVE WEIGHT KG	Landed weight	Kg
CATCHES (PIECES)	Applicable for species with a quota on pieces rather than t.	Pieces

A table with enquired VMS data can be seen in Table 4-6.

**Table 4-6 Parameters, variables and their formats for the Polish VMS dataset. The listed parameters may differ once data is delivered.**

Parameter	Variable	Format/Unit
UNIT	Vessel ID (Pseudonymized ID)	Jednostka-### (Vessel-###)
UTC Time	Date and time	DD/MM/YYYY HH:MM
Course	Instant heading delivered	Degrees
Speed	Instant speed delivered	DD/MM/YYYY
Latitude	Time	HH:MM
Longitude	Instant speed delivered	Knots
ICES	Instant heading delivered	Degrees
EEZ	EEZ Zone	3-character string

## 4.3 Proposed analyses - Sweden

### 4.3.1 Landings from ICES rectangles divided in weight/value by gear type

#### 4.3.1.1 Vessels $\geq 12$ m

Logbook data will be used to divide weight/value by gear type for vessels  $\geq 12$  m. Note that the difference from the Danish analysis is that the presented data is by gear type (e.g. OTT, OTB, GNS etc.). The analysis will concern ICES rectangles that contain the investigation area and the

surrounding rectangles i.e., 39G3, 39G4, 38G3, 38G4, 38G5, 39G2 and 40G2. Processing and manipulation of data will follow the same procedures presented in 4.1.2.1. An example has been provided to give an idea of how the figures will be presented for the individual rectangle in the Danish analysis, Figure 4-2. Tables related to the plots will be presented as tables in an appendix.

#### **4.3.1.2 Vessels < 12 m**

The analysis includes mapping of landings by weight/value and gear type for vessels < 12 m within and around the investigation area (nearest harbours). Vessels < 12 m are not obliged to hand in VMS data; therefore, the analysis will be set to a spatial resolution of ICES rectangles. The dataset should include the ICES rectangles 39G3, 39G4, 38G3, 38G4, 38G5, 39G2 and 40G2. Processing and manipulation of data will follow the same procedures presented in 4.1.2.1. Catches will most likely not be relevant for all the rectangles in question, due to the metiers for vessels < 12 m. Tables related to the plots will be presented as tables in an appendix.

#### **4.3.2 VMS data for relevant ICES squares divided into gear and type of fishery**

Logbook and VMS data can yield information on fishing activity from fishing vessels of  $\geq 12$  m. Vessels  $\geq 15$  m since 2009 and vessels  $\geq 12$  m since 2012 has been obliged to have a VMS installed.

The Swedish VMS data has been filtered to identify potential fishing by a speed filter 1.4-4 knots and a spatial filter, deselecting "fishing speeds" within 3 nm from any harbour (corresponds well to Swedish trawling limit).

The distribution of the fishing activity will be presented by gear type (e.g. single boat bottom otter trawls, twin bottom otter trawls, midwater pair trawls) and type of fishery (e.g. pelagic or demersal fisheries). The VMS points will be averaged over the investigated period and the frequency will be plotted in a grid. The grid is a  $0.05 \times 0.05$ -degree grid, which is equivalent to what ICES uses in their C-square geocode system. The analysis will concern ICES rectangles that contain the investigation area and the surrounding rectangles i.e., 39G3, 39G4, 38G3, 38G4, 38G5, 39G2 and 40G2. An example of how data may be visualized with *ArcGIS Pro* has been provided in the Danish analysis, Figure 4-1.

The VMS positions will also be accumulated and presented in a table showing the number of points within and outside the investigation area by ICES rectangle and type of fishery. The table will be produced in *Excel* or *R*.

### **4.4 Proposed analyses – Germany**

#### **4.4.1 Landings from ICES rectangles divided in weight/value by species**

Logbook data will be used to divide weight/value by species for each ICES rectangle. Due to data protection in Germany, there are no vessel information stored in the logbook data. There will therefore be no option of dividing data into groups based on vessel size. The analysis will concern ICES rectangles that contain the investigation area and the surrounding rectangles i.e., 39G3, 39G4, 38G3, 38G4, 38G5, 39G2 and 40G2. Processing and manipulation of data will follow the same procedures presented in 4.1.2.1. An example has been provided to give an idea of how the figures will be presented for the individual rectangle in the Danish analysis, Figure 4-2. Tables related to the plots will be presented as tables in an appendix.



#### **4.4.2 VMS data for relevant ICES squares**

Logbook and VMS data can yield information on fishing activity from fishing vessels of  $\geq 12$  m. Vessels above 15 m since 2009 and vessels  $\geq 12$  m since 2012 has been obliged to have a VMS installed.

The German VMS data must be filtered manually with a speed filter. Rambøll suggests a similar filter used by Swedish authorities i.e., 1.4-4 knots. Note that there can be no analysis of gear type or type of fishery due to data limitations.

The VMS points will be averaged over the investigated period and the frequency will be plotted in a grid. Processing and manipulation of data will follow the same procedures presented in 4.3.2. An example of how data may be visualized with *ArcGIS Pro* has been provided in the Danish analysis, Figure 4-1.

The VMS positions will also be accumulated and presented in a table showing the number of points within and outside the investigation area by ICES rectangle and type of fishery. The table will be produced in *Excel* or *R*.

#### **4.5 Proposed analyses – Poland**

##### **4.5.1 Landings from ICES rectangles divided in weight by gear type**

Logbook data will be used to divide weight by gear type for each ICES rectangle. Note that the difference from the Danish analysis is that the presented data is by gear type (e.g. OTT, OTB, GNS etc.). The analysis will concern ICES rectangles that contain the investigation area and the surrounding rectangles i.e., 39G3, 39G4, 38G3, 38G4, 38G5, 39G2 and 40G2. Processing and manipulation of data will follow the same procedures presented in 4.1.2.1. An example has been provided to give an idea of how the figures will be presented for the individual rectangle in the Danish analysis, Figure 4-2. Tables related to the plots will be presented as tables in an appendix.

##### **4.5.2 VMS data for relevant ICES squares**

Logbook and VMS data can yield information on fishing activity from fishing vessels of  $\geq 12$  m. Vessels  $\geq 15$  m since 2009 and vessels  $\geq 12$  m since 2012 has been obliged to have a VMS installed.

The Polish VMS data must be filtered manually with a speed filter. Rambøll suggests a similar filter used by Swedish authorities i.e., 1.4-4 knots. Note that there can be no analysis of gear type or type of fishery due to data limitations.

The VMS points will be averaged over the investigated period and the frequency will be plotted in a grid. Processing and manipulation of data will follow the same procedures presented in 4.3.2. An example of how data may be visualized with *ArcGIS Pro* has been provided in the Danish analysis, Figure 4-1.

The VMS positions will also be accumulated and presented in a table showing the number of points within and outside the investigation area by ICES rectangle and type of fishery. The table will be produced in *Excel* or *R*.

## **5. DELIVERABLES**

The deliverables for WP J include:

- A Scoping Report (present report)
- A Technical Report

All data will be submitted in accordance with the standards of deliverables.

Participation in meetings with organisations of interests, as required.

## 6. MILESTONES

Table 6-1 Milestones and deadlines for all work packages.

Work package	Milestone No.	Milestone	Deadline
WP J	M51	1 <sup>st</sup> draft - Scope report	Q3, 2021 (Sept)
WP J	M52	Final version - Scope report	Q4, 2021 (Dec)
WP J	M53	1 <sup>st</sup> draft – Technical report	TBD
WP J	M54	Final draft, including appendices and data (input to SEA) – Technical report	TBD
WP J	M55	Final version – Technical report	TBD