

Swedish Agency for Marine and Water Management

**Council Regulation (EC) No 199/2008 of 25 February 2008**

concerning the establishment of a Community framework for the collection, management and use of data in the fisheries sector and support for scientific advice regarding the Common Fisheries Policy

**Commission Regulation (EC) No 665/2008 of 14 July 2008**

laying down detailed rules for the application of Council Regulation (EC) No 199/2008

**Commission Implementing Decision (EU) 2016/1251 of 12 July 2016**

adopting a multiannual Union programme for the collection, management and use of data in the fisheries and aquaculture sectors for the period 2017-2019

# **Swedish Work Plan for data collection in the fisheries and aquaculture sectors**

**2017-2019**

Version 1.0 – 2017

Gothenburg, Sweden 31/10/16

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## SECTION 1: BIOLOGICAL DATA

### **Pilot Study 1: Relative share of catches of recreational fisheries compared to commercial fisheries**

*General comment: This Box fulfills paragraph 4 of Chapter V of the multi-annual Union programme and Article 2 and Article 4 paragraph (3) point (a) of this Decision.*

#### **BALTIC SEA**

Recreational fishing data sampling –a pilot on the combination of biological data collection and postal questionnaire to support an ecosystem-based management.

##### **1. Aim of pilot study**

Pilot study in ICES area 23 and 24 on catches, effort and socio-economy of recreational fisheries in an ecosystem-based management with focus on cod management.

The aim of the study is to primarily to collect size-based catch (including released fish) and effort information on cod and give knowledge for an ecosystem-based approach on fisheries management principles of good governance accordingly to best available advice and broad stakeholder involvement. Information on by-catch species and information on the demography of fishermen are also collected as a complement.

##### **2. Duration of pilot study**

The pilot study will start 2017 and run for one year.

##### **3. Methodology and expected outcomes of pilot study**

The pilot study of on-site sampling of catches will be an extension of a yearly postal questionnaire sent to approximately 10,000 randomly selected permanent residents in Sweden. The on-site study on recreational fisheries in ICES area 23 and 24 will enhance the resolution of the questionnaire particularly concerning length composition, catch and catch areas. Normally on-site data sampling is used to validate off-site data sampling but also vice versa. Questionnaires are often used for supporting on-site sampling especially with total effort and socio-economic-related parameters.

###### **A. The postal questionnaire**

A postal questionnaire will be sent to approximately 10,000 randomly selected permanent residents in Sweden, age 18-80 years. The questionnaire will be sent at three occasions during the year with questions regarding fishing activities in the most recent four months. The statistics do not include fishing carried out by visitors to Sweden. In this study, recreational fishery is defined as all fishing activities carried out by those without a commercial fishing license. At sea, this includes fishing activities surrounding recreation, tourism and sports.

The questionnaire will give information on the recreational effort, gear use and expenditures.

###### **B. The on-site survey**

The on-site survey attempts to collect data from recreational fishermen carried out from the shore, private boats and Swedish commercial fishing-tourism vessels in SD 23-24. The study will include both Swedish residents and recreational fisheries carried out by visitors to Sweden. The on-site survey will beside of

information about persons practicing recreational fisheries give information on effort, used gears and expenditures and biological data on individual fish kept (weight, length etc.) and released (numbers and species) necessary for the application in stock assessment.

Sampling will cover:

- Stratification: by area (23 and 24), quarter and day type (weekend, weekday)
- Tourist boats
- Charter boats
- Private boats
- Shoreline anglers

### Outputs

The results of the different components will be evaluated quarterly and methodology and sampling effort adjusted if necessary; Preliminary results will be presented and discussed at WGRFS; In Q1-2018 estimates of the different components will be produced for presentation in 2018 WGBFAS.

### Background

Swedish legislation allows residents to fish with hooks but also with a limited amount of nets and pots. Preliminary literature and field work has indicated four main components in the recreational cod fishery: the tourist boats, the charters, the private boats and shoreline anglers. Jointly, tourist boats and charters constitute the fore-hire sector and develop an essentially for-profit activity. Private boats and shoreline fisheries are likely much more numerous and constitute the non-profit sector.

To meet the challenge of quantifying catches of Western Baltic cod stock for assessment and management purposes, the on-site study will adopt a phased approach in the implementation of data collection for the previously mentioned components. It will start with components where some information is already available, namely a list of companies carrying out the activity (the tourist boats and boats). As a knowledge base is built and first estimates are obtained, the methodology and sampling effort will be adjusted, if possible, to progressively incorporate the sampling of the more complex components (private and shoreline) where, at present, less information exists to inform the design of the sampling plan. The on-site study will be based on voluntary participation of anglers and its execution is entirely dependent on the cooperation of this sector. Consequently, all throughout validation studies will be carried out and the level of response rates and refusals will be monitored, and, if necessary, methodology revised.

## **BALTIC SEA AND NORTH SEA AND EASTERN ARCTIC**

### **Pilot study eel in freshwater and coastal water**

#### **1. Aim of pilot study**

In 2017, the aim is to collect information, plan, and design a pilot study to evaluate the relative share of catches of recreational fisheries compared to commercial fisheries of Eel in freshwater and in coastal waters, ICES IIIa and Baltic (SD 22-31).

#### **2. Duration of pilot study**

Two years.

#### **3. Methodology and expected outcomes of pilot study**

Year one: Data inventory and compilation. Development of sampling design and planning.

Year two: Execution of data collection from recreational fisheries (likely through questionnaire) and data

analysis.

Expected outcome: The expected outcome from 2017 is a well-planned sampling design to fulfil the aim with an acceptable level of certainty. After two years the pilot study will present an assessment of the relative share of catches of recreational fisheries compared to commercial fisheries of Eel in freshwater and in coastal waters, ICES IIIa and Baltic (SD 22-31).

## SECTION 1: BIOLOGICAL DATA

### **Text Box 1E: Anadromous and catadromous species data collection in fresh water**

*General comment: This Box fulfills paragraph 2 points (b) and (c) of Chapter III of the multi-annual Union programme and Article 2 of this Decision.*

#### **BALTIC SEA**

##### **Method selected for collecting data**

###### Salmon

Data collection for salmon consists of annual electrofishing surveys of juveniles (parr), trapping out-migrating smolts and counting ascending spawners in fish ladders in designated rivers. Electrofishing is also undertaken in additional rivers, where these data comprise the main source of information for stock assessment. Fish ladders are also installed in some rivers, and data are collected from some of these annually (Table 1E). Designated rivers are spread among assessment units to comply with end-user (ICES) needs. Estimates of smolt and parr abundance are made through mark-recapture experiments and repeated sampling, by traps and electrofishing, respectively. For smolts, individual length and weight are collected for all individuals, and scale samples are taken from sub-samples stratified by time of capture for age determination. The number of electrofishing sites per river varies with size/length of river to cover areas of salmon reproduction. The suggested number of sites fulfills the minimum requirement for an acceptable level of certainty for each river, with respect to smolt production estimates used for stock assessment. For salmon, data from commercial and recreational fisheries in freshwater are collected from fishing log-books and questionnaires, respectively.

###### Eel

Recruitment of young eels into freshwater is estimated and sampled by electrofishing and by eel counters in a number of rivers. Significant numbers of recruits are artificially stocked as young eels. Introduced yellow eel populations are monitored and sampled using either fyke nets or outlet traps. Silver eels are sampled from selected commercial fishery in three lakes. The fishing mortality and escapement of migrating silver eels is estimated annually through mark-recapture studies at three different and altered sites along the Baltic coast. The recreational fishery is planned to be estimated using a pilot study, starting in 2017. The conditions for one or two designated rivers will be evaluated in 2017.

## SECTION 1: BIOLOGICAL DATA

### **Pilot Study 2: Level of fishing and impact of fisheries on biological resources and marine ecosystem**

*General comment: This Box fulfills paragraph 3 point (c) of Chapter III of the multi-annual Union programme and Article 2 and Article 4 paragraph (3) point (b) of this Decision.*

#### **BALTIC SEA**

##### **1. Aim of pilot study**

The aim of the pilot study is to assess if it is possible and efficient to estimate by-catches, of primarily birds and mammals, in the the gillnet and longline fisheries in southern and central Baltic Sea with sea-going observers.

##### **2. Duration of pilot study**

The pilot study will be carried out during 2017.

##### **3. Methodology and expected outcomes of pilot study**

Sweden have during previous years been running a self-sampling programme for gillnetters and longliners in the Baltic. Within this programme fishermen bring entire catches to shore where it is worked up by samplers. The plan is that during 2017, for the purpose of this pilot study, put the samplers on-board the entire fishing trip instead (see table 4A and 4B). If this is not possible for specific vessels due to lack of space sampling will be carried out on shore instead as previous years. The observers will measure fish as well as potential by-catches of birds and mammals.

If possible will cameras be deployed at some vessels in some areas and during some study seasons. Results from these vessels will be compared to corresponding vessels carrying observers, for evaluation of the cost-effectiveness of the different methods.

The present scheme for sampling passive gears will be redesigned to take into account high-risk areas and seasons for by-catches birds and harbour porpoises.

We intend to investigate:

- a) if it is possible to put observers on sufficient amount of vessels (majority of vessels are small) to generate accurate data;
- b) the occurrence and patchiness of by-catch. Is it efficient to collect this type of data with observer schemes? If so, how shall the schemes be designed and what kind of sampling intensity is needed;
- c) if it is possible to have efficient multi purpose observer schemes (eg. fish and by-catches);
- d) what is the cost-effective way to obtain data on by-catches of birds and harbour porpoises.

## SECTION 1: BIOLOGICAL DATA

### **Text Box 1G: List of research surveys at sea**

*General Comment: This Box fulfills Chapter IV of the multi-annual Union programme and Article 2 and Article 7 paragraph (3) of this Decision. It is intended to specify which research surveys at sea set out in Table 10 of the multi-annual Union programme will be carried out. Member States shall specify whether the research survey is included in Table 10 of the multi-annual Union programme or whether it is an additional survey.*

#### **BALTIC SEA**

##### **BITS Q1 and BITS Q4 – Baltic International Trawl Survey**

###### **1.Objectives of the survey**

To estimate cod recruitment indices, cod abundance and to follow the development of flounder and other flatfish populations in the different Sub-Divisions in the Baltic.

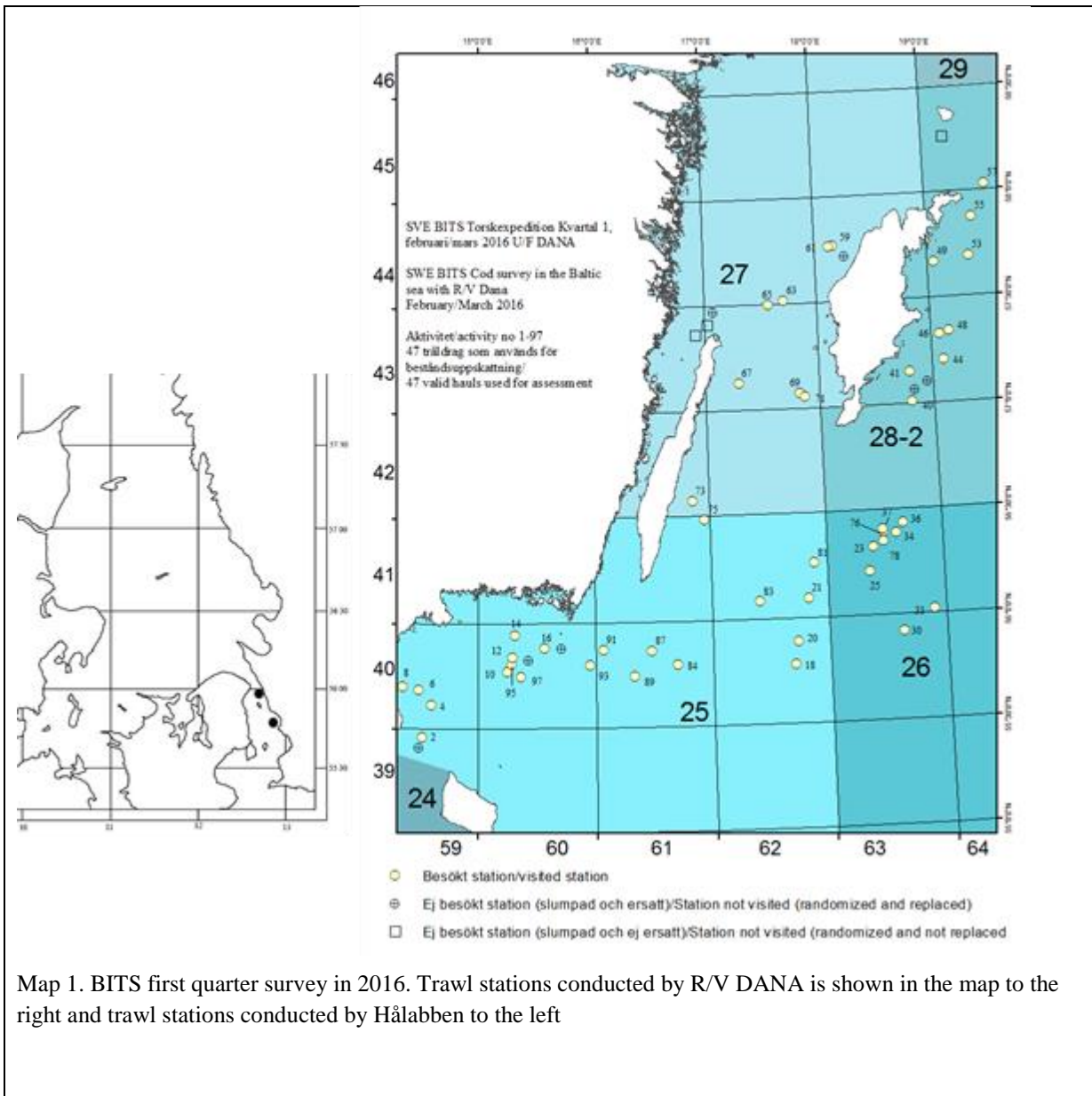
###### **2. Description of the methods used in the survey. For mandatory surveys, link to the manuals. Include a graphical representation (map)**

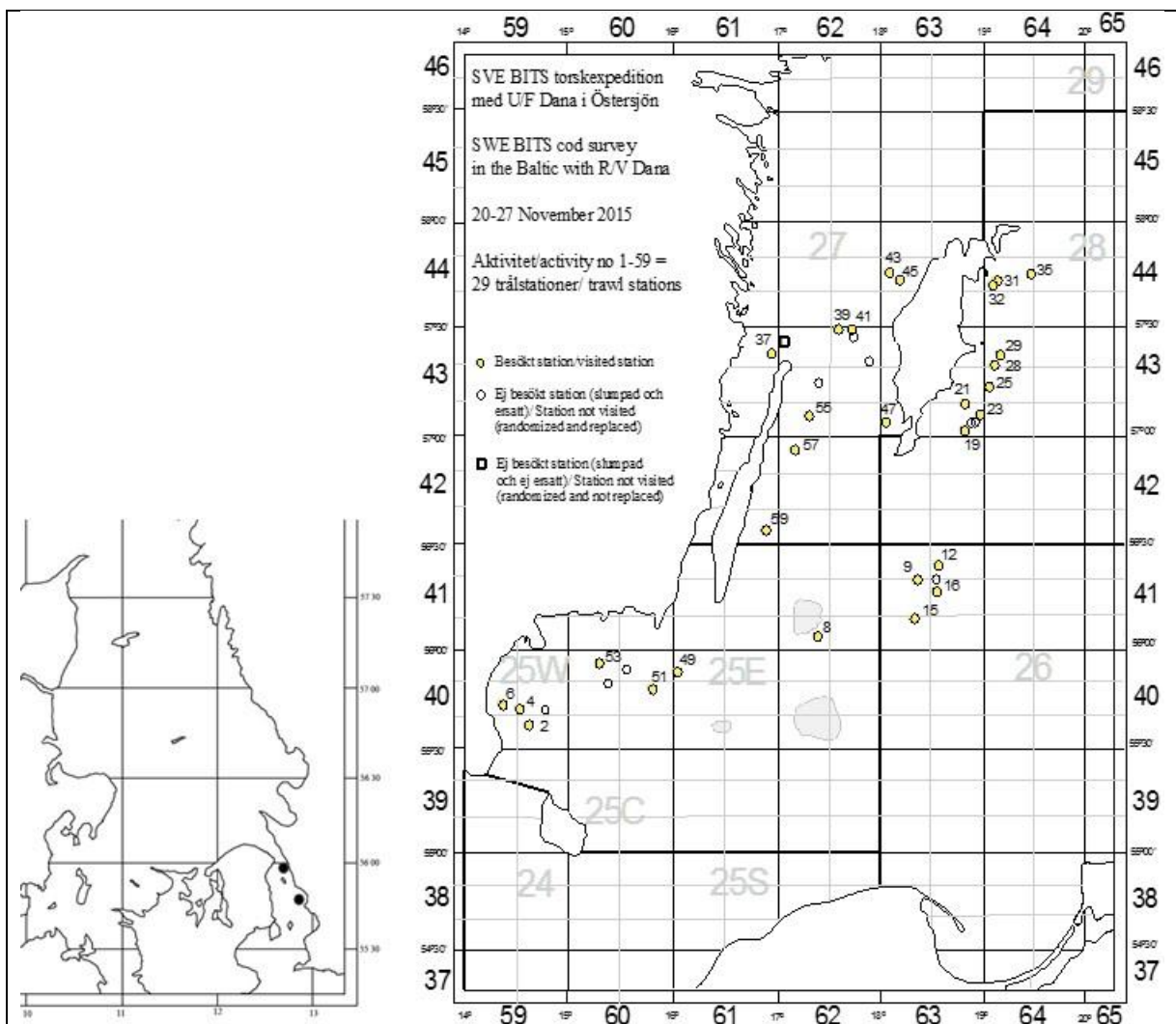
The survey is conducted using a TV3L demersal trawl at day-time. Sweden is assigned 50 randomly selected hauls for the first quarter survey and 30 randomly selected hauls for the fourth quarter survey. For both surveys hydrographical data are collected with a CTD in connection to the trawl hauls and acoustic data were continuously recorded. Each haul are sorted and all species are recorded, length measured and weighted. For target species biological parameters are collected on fish length, age, weight, sex and gonadal maturity. In case of large catches subsampling is performed. Additional sampling like stomach content on cod and flounder is undertaken and from each haul marine litter are registered. The data on marine litter is uploaded to the international ICES database.

Further details are explained in the Baltic International Trawl Survey (BITS) manual:

<http://datras.ices.dk/Documents/Manuals/Manuals.aspx>

In the Sound, two stations with one to two hauls in each station (depending on the size of the catch) is trawled by a small Swedish vessel Hålabben using a down scaled TV3 930 trawl, to 30 % of original size. Except from the small trawl, the biological sampling is following the procedure described above.





Map 2. BITS fourth quarter survey in 2015. Trawl stations conducted by R/V DANA is shown in the map to the right and two trawl stations (three hauls) conducted by Hålabben to the left.

**3. For internationally coordinated surveys, describe the participating Member States/vessels and the relevant international group in charge of planning the survey**

The Danish R/V DANA are chartered for the surveys in the Baltic and is complemented with R/V Hålabben in the Sound (SD23). Participating Member states in the surveys are: Denmark, Germany, Latvia, Poland, Lithuania and Sweden. The BITS survey is coordinated by the ICES Baltic International Fish Survey Working Group (WGBIFS) and the data are uploaded to the international ICES database DATRAS.

**4. Where applicable, describe the international task sharing (physical and/or financial) and the cost sharing agreement used**

Since 2011, Sweden has used the Danish vessel R/V DANA in the BITS surveys and a cooperation agreement between Sweden and Denmark has been established where all the practical details (price, payment, staff etc) for smooth cooperation are described. Latest agreement signed is valid until 31 Dec 2017.

**5. Explain where thresholds apply**

No threshold applies to the BITS surveys.

## BIAS – Baltic International Acoustic Survey

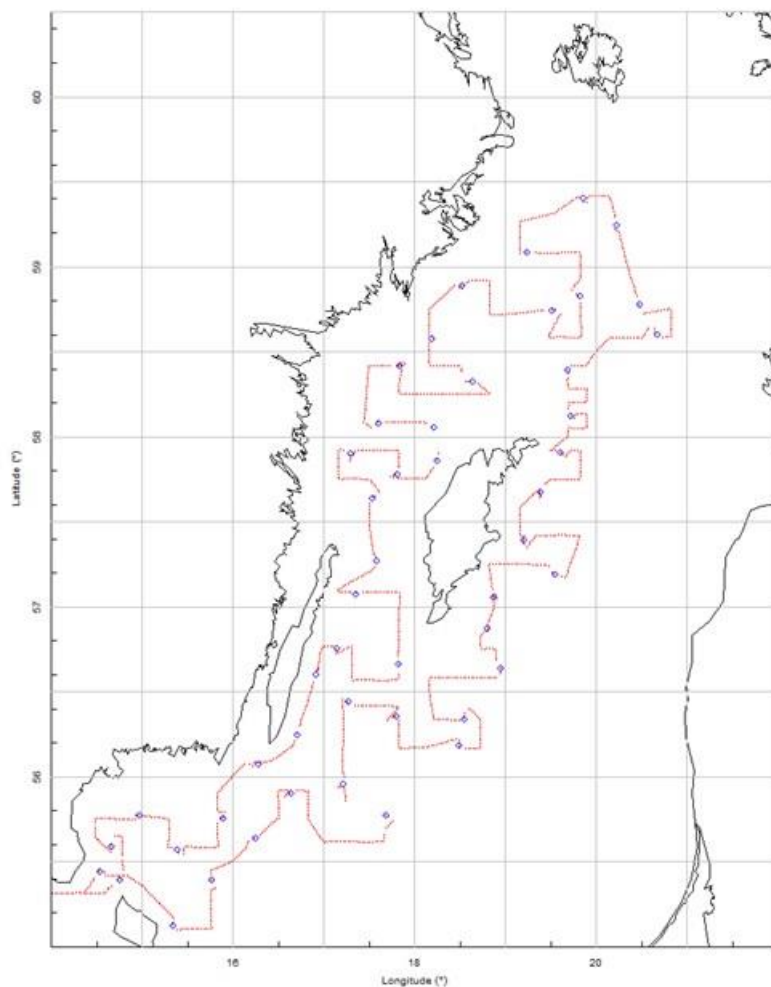
### 1. Objectives of the survey

The aim of the survey is to provide abundance estimates of herring, sprat and pelagic cod in the Baltic Sea.

### 2. Description of the methods used in the survey. For mandatory surveys, link to the manuals. Include a graphical representation (map)

The survey is using a SIMRAD EK607 echo sounder with the 38kHz transducer (ES38b) mounted on a towed body for the acoustic transect data collection and a pelagic trawl, Fotö trawl for collecting biological information. Approximately, 2 hauls are made in each ICES rectangle. For each haul, all species are length measured onboard and parameters such as age, weight, and sex are analyzed on herring and sprat and cod, the gonadal maturity is also analysed on herring. Sweden is responsible to cover area subdivision (SD) 27 and parts of SD 25, 26, 28 and 29. The acoustic data together with the biological information is used in the assessment models. Additional sampling on stomach content on cod is undertaken.

The Manual is available at <http://www.ices.dk/community/groups/Pages/WGBIFS.aspx>



Map 3. Survey grid and trawl positions of R/V Dana during BIAS survey 2015.

**3. For internationally coordinated surveys, describe the participating Member States/vessels and the relevant international group in charge of planning the survey**

The BIAS survey is coordinated by the ICES Baltic International Fish Survey Working Group (WGBIFS) and the data are uploaded to the international data storage, IBAS database. Participating countries in the survey are Estonia, Finland, Germany, Latvia, Lithuania, Poland and Sweden.

**4. Where applicable, describe the international task sharing (physical and/or financial) and the cost sharing agreement used**

Since 2011, Sweden has used the Danish vessel R/V DANA in the BIAS survey and a cooperation agreement between Sweden and Denmark has been established where all the practical details (price, payment, staff etc) for smooth cooperation are described. Latest agreement signed is valid until 31 Dec 2017.

Sweden has also an agreement with Finland regarding the parts run by Finland in SD 30. Sweden is sending two staff for participation during the survey.

**5. Explain where thresholds apply**

No threshold applies to the BIAS survey.

**NORTH SEA AND EASTERN ARCTIC**

**IBTS Q1 AND Q3 – THE INTERNATIONAL BOTTOM TRAWL SURVEY**

**1. Objectives of the surveys**

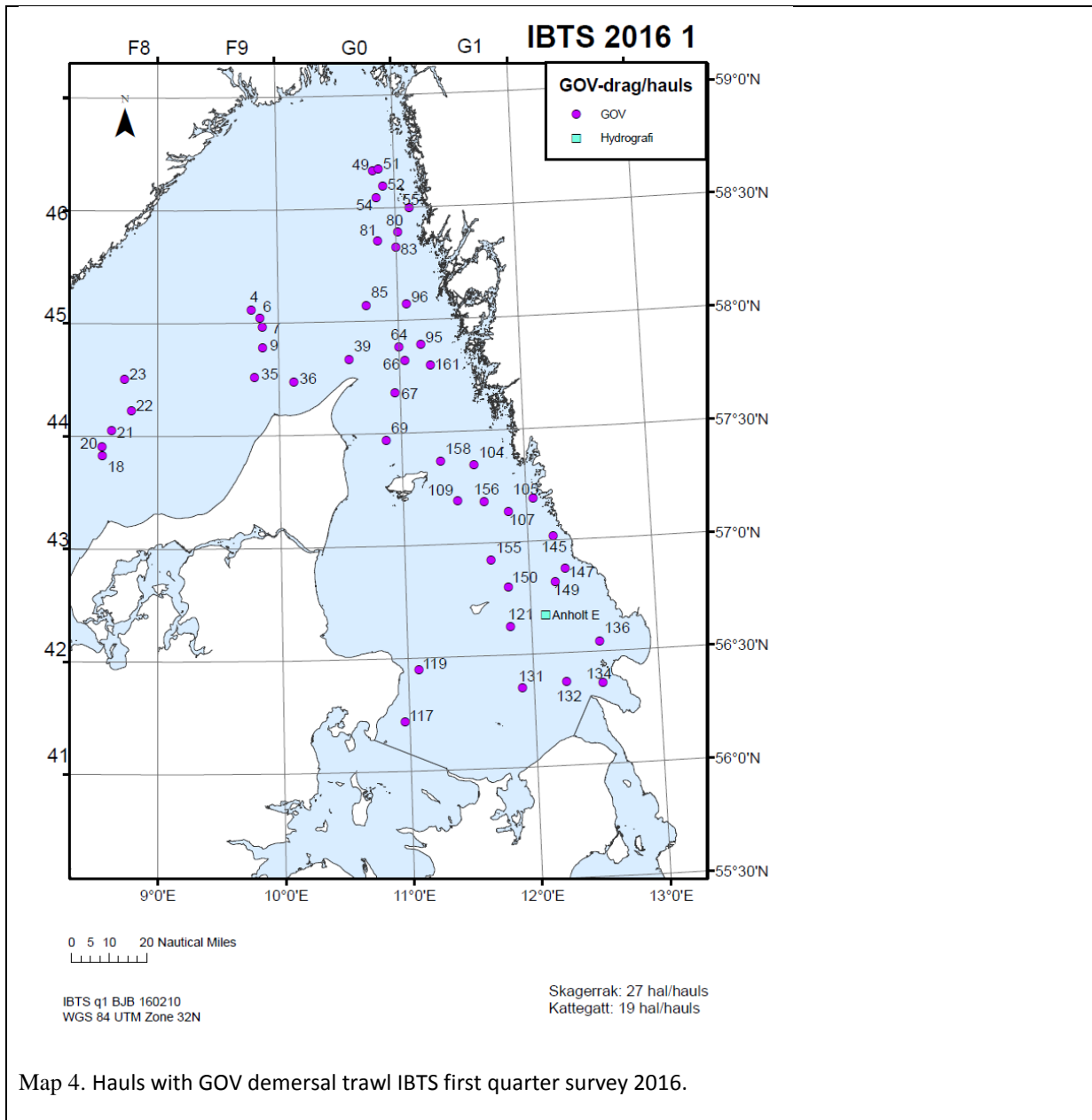
The main aim of the survey is to estimate abundance of recruitment of the target species cod, haddock, whiting, Norway pout, herring, sprat, saithe, plaice, mackerel and also non-commercial fish. Moreover, the otoliths of the commercial species are collected and subsequently analysed in order to assess abundance by age class, in particular for the recruiting year classes in the Skagerrak and Kattegat.

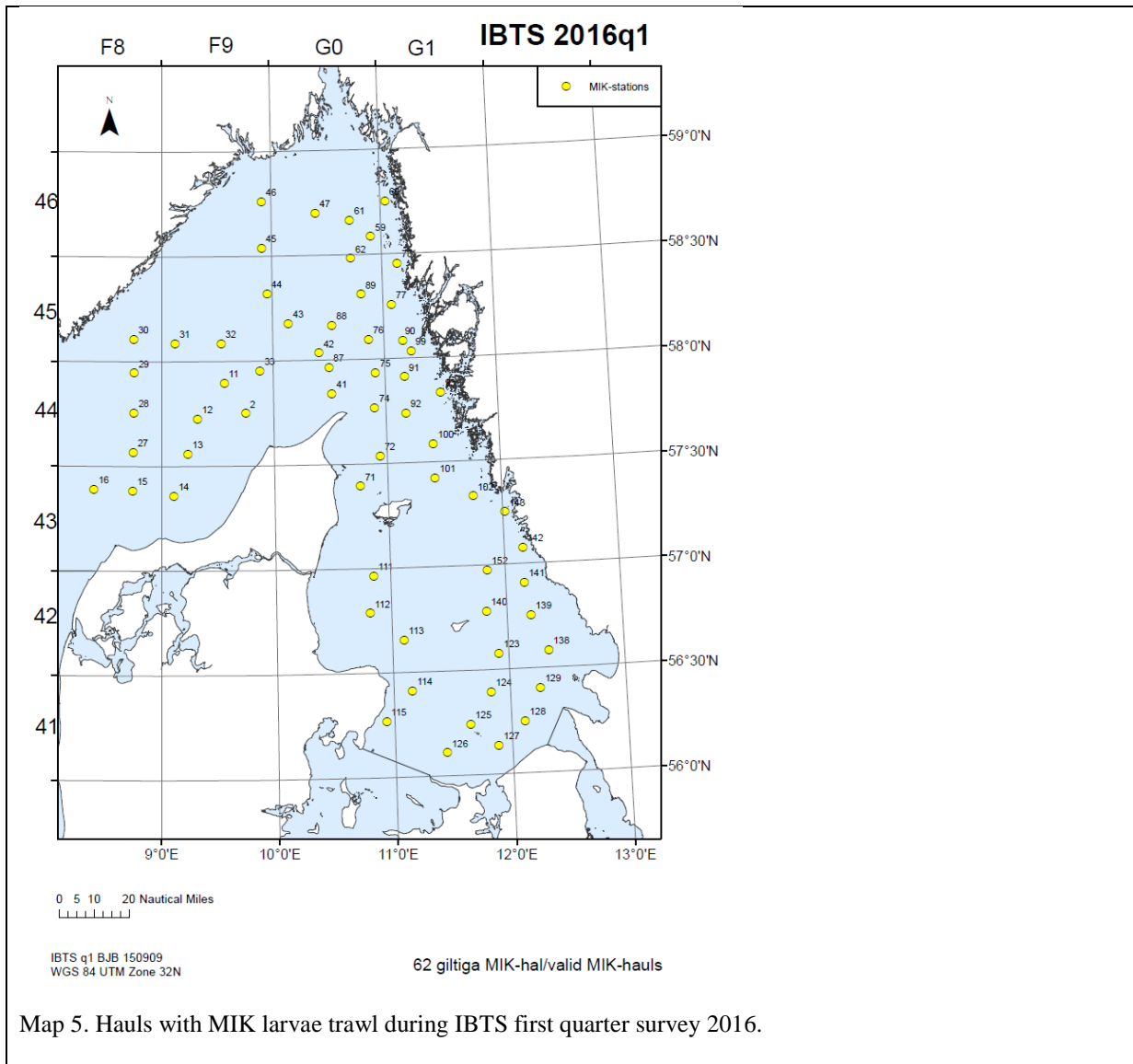
**2. Description of the methods used in the survey. For mandatory surveys, link to the manuals. Include a graphical representation (map)**

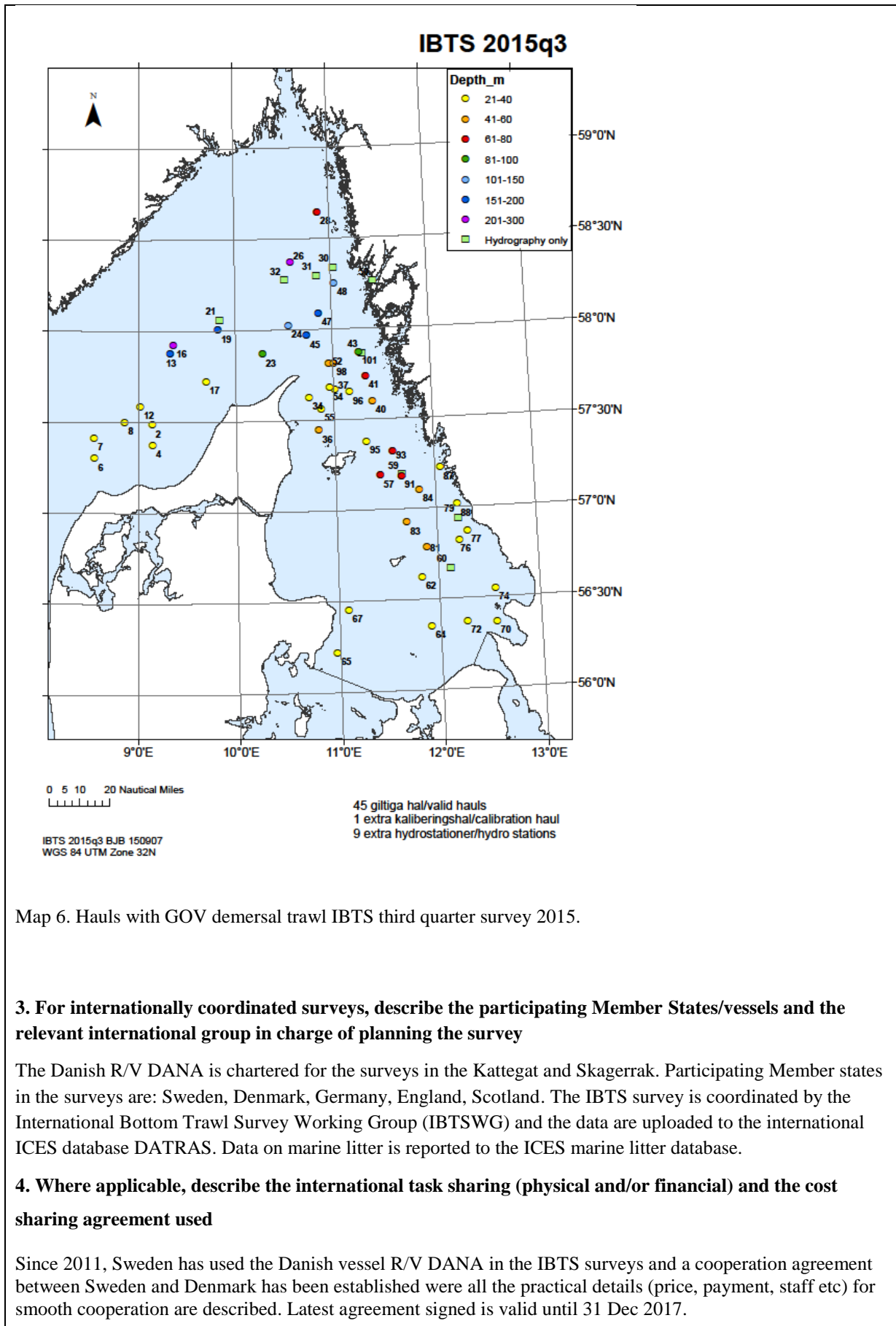
This survey is conducted twice annually, in quarters 1 and 3. The French bottom trawl GOV is used for sampling demersal species in both quarters while in Q1 only, a MIK (Midwater ring net) trawl is used at night for sampling fish larvae. Sweden is assigned 46 hauls for the first quarter survey and 45 randomly selected hauls for the third quarter survey. For both surveys hydrographical data are collected with a CTD in connection to the trawl hauls. Each haul are sorted and all species are recorded, length measured and weighed. For target species biological parameters are collected on fish length, age, weight, sex and gonadal maturity. In case of large catches subsampling is performed. Marine litter is registered from each haul.

Further details are explained in the International Bottom Trawl Survey (IBTS) manual:

<http://datras.ices.dk/Documents/Manuals/Manuals.aspx>







## **5. Explain where thresholds apply**

No threshold applies to the IBTS surveys.

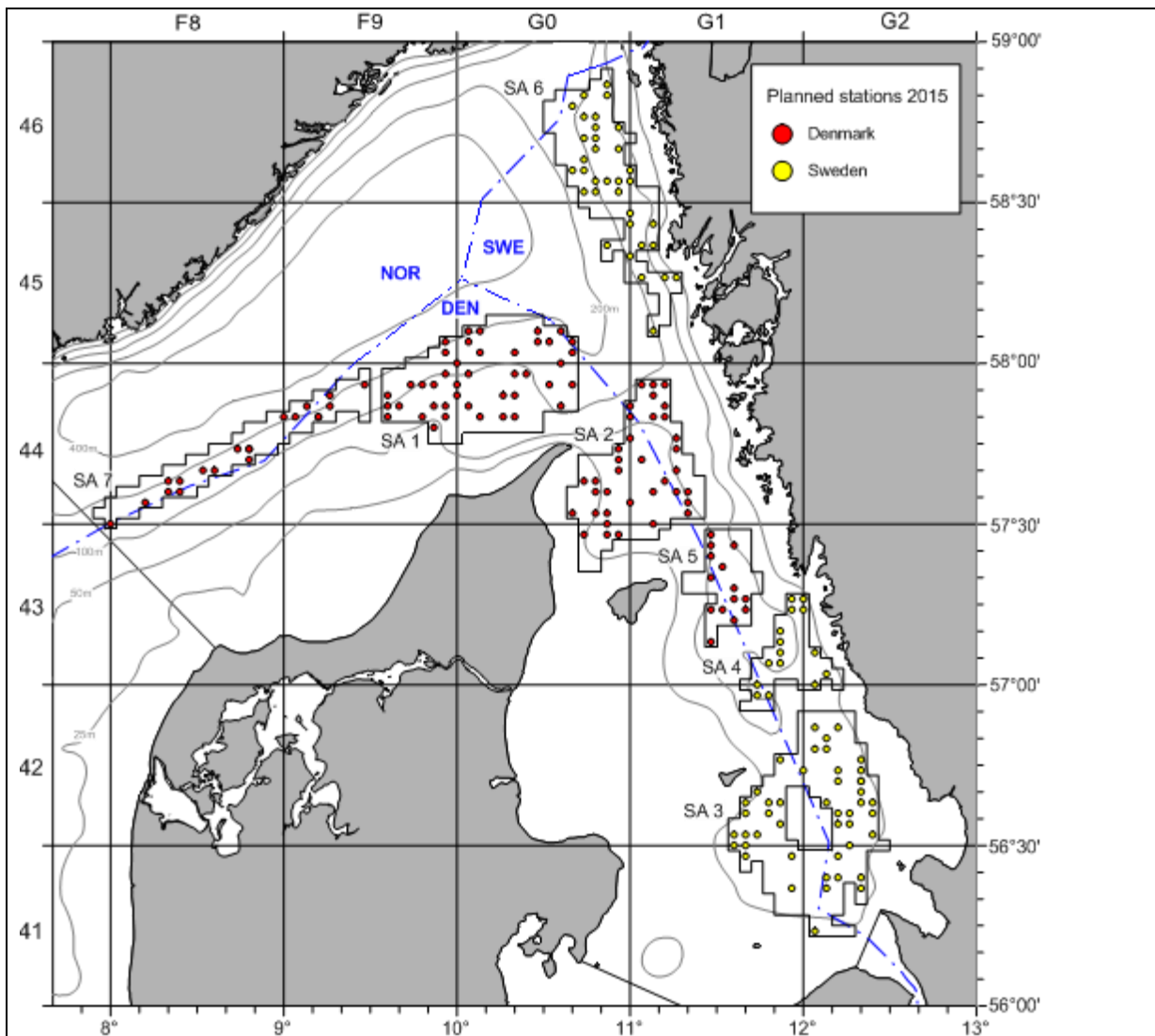
### **NTV 3&4 – NEPHROPS TV SURVEY IN FUNCTIONAL UNIT 3 & 4**

#### **1. Objectives of the survey**

The main objective of the survey is to provide biomass estimates for mud-burrowing animals like *Nephrops*.

#### **2. Description of the methods used in the survey. For mandatory surveys, link to the manuals. Include a graphical representation (map)**

The fishery independent Underwater TV survey is performed by having a video camera mounted on a sledge that is towed slowly (0.5-0.8 knot) on the bottom while recording the bottom substrate. The video recording is analysed and *Nephrops* burrows are counted and converted into densities using information on the width of the view of the camera and length of the tow. Mean weight from biological samplings are used to estimate stock biomass. The manual for the survey can be found at final report of the Working Group on *Nephrops* Surveys (WGNEPS). <http://www.ices.dk/community/groups/Pages/WGNEPS.aspx>



Map 7. Planned sledge stations for Denmark and Sweden for the survey in 2015 in the defined sub areas of the *Nephrops* stock in IIIa.

**3. For internationally coordinated surveys, describe the participating Member States/vessels and the relevant international group in charge of planning the survey**

The survey is a joint survey with Denmark. The survey has so far been run on a Swedish vessel for the Swedish part and a Danish vessel for the Danish part. The aim is to use the Danish vessel for the whole area in 2017, and that Swedish scientific staff will be onboard covering the Swedish share of the survey. Planning and applications are in progress but no agreements are in place. The survey is coordinated by the ICES working group on *Nephrops* surveys (WGNEPS).

**4. Where applicable, describe the international task sharing (physical and/or financial) and the cost sharing agreement used**

The future agreement we are aiming for, will also cover sharing of equipment, payment and staff.

**5. Explain where thresholds apply**

No thresholds apply to the survey

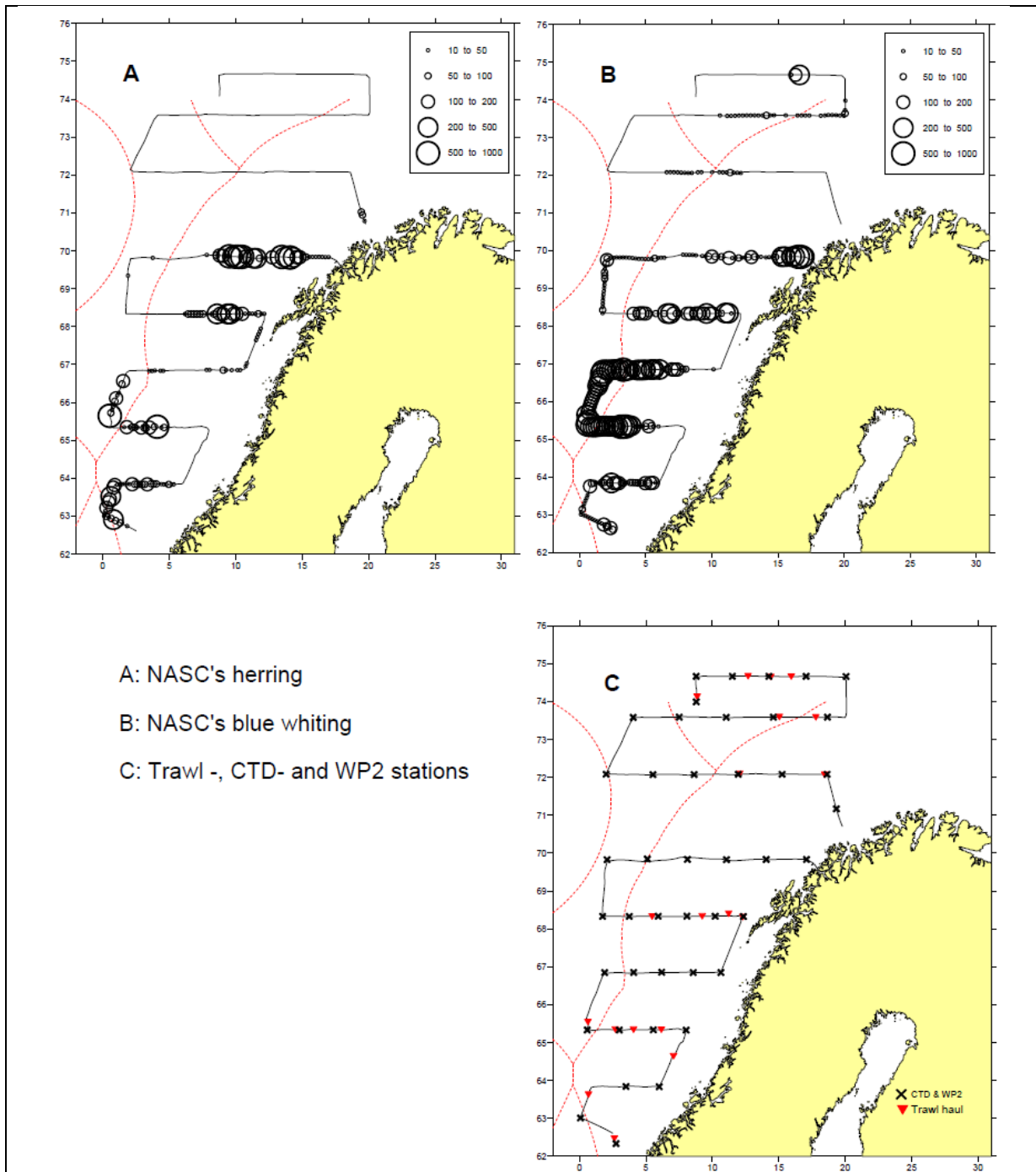
## **ASH – Atlanto Scandian Herring survey**

### **1. Objectives of the survey**

The aim is to investigate distribution and migrations of the Atlanto-Scandian herring, blue whiting and other pelagic fish and to produce a biomass index for herring and a recruitment index for blue whiting. Furthermore, hydrographic conditions and plankton abundance in the Norwegian Sea and adjacent waters are monitored in order to investigate distribution and migration of herring and other pelagic fishes are influenced by environmental conditions.

### **2. Description of the methods used in the survey. For mandatory surveys, link to the manuals. Include a graphical representation (map)**

The survey is collecting acoustic data, biological data like species composition and length measurements. For the target species herring and blue whiting data are collected on length, weight, sex, maturity and age (from scales of herring and otoliths of blue whiting). In addition zooplankton hauls are made using a WP2 net and hydrographical data are collected using a CTD.



Map 8. Example from ASH 2013; Dana survey track, pelagic trawl, CTD and WP2 stations.

**3. For internationally coordinated surveys, describe the participating Member States/vessels and the relevant international group in charge of planning the survey**

The survey is carried out as a joint EU survey using the Danish vessel R7V DANA with participation of UK, Ireland, Netherlands, Germany, Sweden and Denmark. The survey is coordinated by the ICES Working Group of International Pelagic Surveys, WGIPS.

**4. Where applicable, describe the international task sharing (physical and/or financial) and the cost sharing agreement used**

Sweden is contributing by sending two staff participating in the survey as well as a cost-sharing model based on the share of TAC is applied according to an agreement. Denmark is responsible country for reporting of the

results from the survey to the relevant ICES working group.

**5. Explain where thresholds apply**

No thresholds apply to the survey.

## SECTION 2: FISHING ACTIVITY DATA

### **Text Box 2A: Fishing activity variables data collection strategy**

*General comment: This Box fulfills paragraph 4 of Chapter III of the multi-annual Union programme and Article 2, Article 4 paragraph (2) point (b) and Article 5 paragraph (2) of this Decision. It is intended to describe the method used to derive estimates on representative samples where data are not to be recorded under Regulation (EU) No 1224/2009 or where data collected under Regulation (EU) No 1224/2009 are not at the right aggregation level for the intended scientific use.*

#### **1. Description of methodologies used to cross-validate the different sources of data**

Logbook data are automatically checked when filled in regarding completeness and also regarding logic. In addition, random checks are performed later on catches landed compared to those sold and also given geographic positions compared to VMS data. The fishery control also checks and verifies logbook data for the specific trip when a control is performed. Finally there are also computerized routinely performed checks of the complete logbook data to find abnormal and exorbitant values for all trips.

Journal data are automatically checked when filled in regarding completeness and also regarding logic. Since the data is on monthly bases no further checks can be done on administrative or field bases. There are computerized routinely performed checks of the complete journal data to find abnormal and exorbitant values for all trips.

#### **2. Description of methodologies used to estimate the value of landings**

Value by vessel and trip is estimated by estimating average prices per year, month, subdivision, and gear if it exists. If it doesn't exist price it goes one level up in the hierarchy and tries again and so on.

#### **3. Description of methodologies used to estimate the average price (it is recommended to use weighted averages, trip by trip)**

Average prices is calculated from trip data by values (see 2.). Meaning that they are weighted on the amount caught.

#### **4. Description of methodologies used to plan collection of the complementary data (sample plan methodology, type of data collected, frequency of collection etc)**

No complementary data needed.

## SECTION 3: ECONOMIC AND SOCIAL DATA

### **Text Box 3A: Population segments for collection of economic and social data for fisheries**

*General comment: This Box fulfills paragraph 5 points (a) and (b) of Chapter III of the multi-annual Union programme and Article 2, Article 4 paragraphs (1), (2) and (5) and Article 5 paragraph (2) of this Decision. It is intended to specify data to be collected under Tables 5(A) and 6 of the multi-annual Union programme.*

#### **1. Description of methodologies used to choose the different sources of data**

There is no methodology to choose the source of data. Data in registers are available and used and excess data needed, like some costs variables, will be obtained in census by surveys since it is mandatory for the fishery to reply.

#### **2. Description of methodologies used to choose the different types of data collection**

All variables for economic and social data for fisheries will be collected in census. There is no methodology to choose different types of data collection. Data in registers at SwAM are available and used, and excess data needed, like some costs variables, capital values and social variables, will be obtained in two separate census mail-surveys. One survey for economic data and one for social data. It is mandatory for the fishery to reply. The survey will be sent by letter-mail because it is the simplest and cheapest way. No e-mail addresses exist for the complete fishery and collection by phone is too expensive. Data on subsidies is included in the economic survey but also for cross-checking gathered from the databases on the EMFF at the Swedish Board of Agriculture.

Other income, capital values, wages and salaries of crew as well as financial position is also gathered in census from the income tax declarations register of all vessel owners. This data is compiled by Statistics Sweden (SCB).

The inactive fleet will not be covered by the collection since they by definition doesn't have any costs related to fisheries. Data are however gathered on vessel characteristics, effort, which by definition is zero, and capacity (fleet indicators). By experience, the capital value and capital cost of the inactive vessels is similar to capital value and capital cost of active vessels. Therefore capital costs and capital value will be estimated from data of active vessels with the same main gear type as the inactive vessels used when they were last active and fishing.

#### **3. Description of methodologies used to choose sampling frame and allocation scheme**

All variables for economic and social data for fisheries will be collected in census.

#### **4. Description of methodologies used for estimation procedures**

The Swedish fishing fleet are rather small. Clustering is needed due to confidentiality reasons and therefore all estimations are done on clustered segment. Since the survey is done on all vessels, in census, re-clustering for analytical reasons can be done easily.

Missing data, due to vessels sold, vessel owners that passed away etc., will be taken care of by weighting and calculating weighted averages using days at sea.

An allocation key to allocate the total variable cost to the different cost variables will be estimated through the questionnaire (census letter-survey). The concerned cost variables are energy costs, repair and maintenance costs, variable costs and non-variable costs. Total costs from tax declarations are used to calibrate the results at the correct total level of costs to be used for the allocation key.

### **5. Description of methodologies used on data quality**

Logbook data are automatically checked when filled in regarding completeness and also regarding logic. In addition, random checks are performed later on catches landed compared to those sold and also given geographic positions compared to VMS data. The fishery control also checks and verifies logbook data for the specific trip when a control is performed. Finally there are also computerized routinely performed checks of the complete logbook data to find abnormal and exorbitant values for all trips.

Journal data are automatically checked when filled in regarding completeness and also regarding logic. Since the data is on monthly bases no further checks can be done on administrative or field bases. There are computerized routinely performed checks of the complete journal data to find abnormal and exorbitant values for all trips.

Survey data is checked by computerized routines for finding abnormal and exorbitant values. Tax register data are checked in numerous ways at the tax authority.

## SECTION 3: ECONOMIC AND SOCIAL DATA

### **Pilot Study 3: Data on employment by education level and nationality**

*General comment: This Box fulfills paragraph 5 point (b) and paragraph 6 point (b) of Chapter III of the multi-annual Union programme and Article 2 and Article 3 paragraph (3) point (c) of this Decision. It is intended to specify data to be collected under Table 6 of the multi-annual Union programme.*

The pilot study of data on employment by educational level and nationality will be conducted in two separate pilot studies.

#### Fisheries

##### **1. Aim of pilot study**

The aim of the study is to get data to be used in management of the fishery.

##### **2. Duration of pilot study**

The pilot study will be incorporated in the socio-economic data collection of Sweden and therefore also performed in census without time limit.

##### **3. Methodology and expected outcomes of pilot study**

The collection will be done together with other socio-economic data in a mail survey. The survey will be sent to all vessel-owners (active vessels). It will be compulsory to answer. Expected outcomes depends on how the questionnaire is constructed and how education is defined and put forward so it relates to fishing.

#### Aquaculture

##### **1. Aim of pilot study**

The aim of the pilot study is to specify methodology to undertake collection of data on employment by educational level and nationality.

##### **2. Duration of pilot study**

Autumn 2016 – spring 2017

##### **3. Methodology and expected outcomes of pilot study**

Pilot study will be conducted in cooperation with Statistic Sweden. Expected outcome is that data on educational level is possible to attain by existing register, and will be collected in order to examine usability. As a preliminary outcome from discussions with Statistical Sweden there are no register for nationality linked to employment in Sweden. Further examination and discussion on the subject will be a major part of the pilot study.

## SECTION 3: ECONOMIC AND SOCIAL DATA

### **Text Box 3B: Population segments for collection of economic and social data for aquaculture**

*General comment: This Box fulfills paragraph 6 points (a) and (b) of Chapter III of the multi-annual Union programme and Article 2, Article 4 paragraphs (1) and (5) and Article 5 paragraph (2) of this Decision. It is intended to specify data to be collected under Tables 6 and 7 of the multi-annual Union programme.*

#### **1. Description of methodologies used to choose the different sources of data**

Data will be collected by Statistics Sweden and Swedish board of Agriculture in four ways:

- a. Statistics Sweden: Income tax declarations from every enterprise whose main source of income (more than 50 %) comes from aquaculture will be compiled.
- b. Statistic Sweden: A questionnaire (Q1) about farming techniques, investments, production value and volume will be sent to all aquaculture farms. The questionnaire will give additional information that makes it possible to cluster farming units to enterprises in cases when several farming units are equal to one fiscal enterprise. It will also make it possible to compare information on value of aquaculture production with declared income from income tax declarations. These comparisons are needed to be able to classify the aquaculture farming as main activity of the enterprise or not.
- c. Statistics Sweden in cooperation with Swedish board of Agriculture: A second questionnaire (Q2) will be sent to all of the aquaculture enterprises in order to create a cost allocation key for costs that are not specified in the income tax declaration.
- d. Swedish board of Agriculture: Data on subsidies will be collected from the Swedish board of Agriculture existing systems, the managing authority of the European Maritime and Fisheries Fund (EMFF), and will be compiled by Swedish board of Agriculture.

#### **2. Description of methodologies used to choose the different types of data collection**

Data is collected, estimated and checked by Statistics Sweden which ensures the consistency of final data. Quality of the data collected by Swedish board of Agriculture is secured by using existing system for disbursement.

#### **3. Description of methodologies used to choose sampling frame and allocation scheme**

Data is collected, estimated and checked by Statistics Sweden which ensures the consistency of final data. Data on variables of production and data on the economic variables not included in the financial accounts (imputed value of unpaid labour, energy cost, livestock volume and cost, feed volume and cost, repair and maintenance, other operational cost, extraordinary cost) will be collected from answers from questionnaires conducted by Statistics Sweden which ensures the consistency of final data. Data on subsidies will be compiled from existing system of disbursement, whereafter an allocation will be made to distribute subsidies to appropriate segment.

#### **4. Description of methodologies used for estimation procedures**

A questionnaire (Q1) about farming techniques, investments, production value and volume will be sent to all aquaculture farms. The questionnaire will give additional information that makes it possible to cluster farming units to enterprises in cases when several farming units are equal to one fiscal enterprise. It will also make it possible to compare information on value of aquaculture production with declared income from income tax declarations. These comparisons are needed to be able to classify the aquaculture farming as main activity of the enterprise or not. Questionnaire 2 is used for make estimations on costs not included in tax declaration. Respondents result will be assigned to proper segment by Statistical Sweden for producing a cost allocation key by using means from each segments.

## **5. Description of methodologies used on data quality**

Data is collected, estimated and checked by Statistics Sweden which ensures the consistency and quality of final data. Questionnaire Q1 is evaluated by Statistics Sweden. They conduct telephone interviews with aquaculture enterprises when there are incomplete answers, unreasonable answers or non-responses. Due to experience there will not be necessary to assess the likely impact of non-response bias on survey estimates since the response rate on these types of questionnaires is nearly 100 % due to legislative reasons.

Questionnaire Q2 is conducted and evaluated by Statistics Sweden in cooperation with Swedish board of Agriculture every third year to create an updated cost allocation key. Statstic Sweden conduct this questionnaire by sending out questionnaires with several reminders. Response rate is around 60 percent. The quality of data on subsidies is evaluated by Swedish board of Agriculture by comparison with previous years disbursements and programme budget.

## SECTION 3: ECONOMIC AND SOCIAL DATA

### **Pilot Study 4: Environmental data on aquaculture**

*General comment: This Box fulfills paragraph 6 point (c) of Chapter III of the multi-annual Union programme and Article 2 and Article 4 paragraph (3) point (d) of this Decision. It is intended to specify data to be collected under Table 8 of the multi-annual Union programme.*

#### **1. Aim of pilot study**

Aim of the pilot study is to explore the possibilities to collect environmental data on aquaculture by develop existing data collection on production.

#### **2. Duration of pilot study**

Autumn 2016 – spring 2017

#### **3. Methodology and expected outcomes of pilot study**

Development of existing data collection on aquaculture production to include environmental data there will be a reliable and easily attainable data source on the subject with well establish routines. Data collection on aquaculture production is an annual questionnaire to all enterprises in aquaculture sector.

## SECTION 3: ECONOMIC AND SOCIAL DATA

### **Text Box 3C: Population segments for collection of economic and social data for the processing industry**

*General comment: This Box fulfills footnote 6 of paragraph 1.1(d) of Chapter III of the multi-annual Union programme, Article 2, Article 4 paragraphs (1) and (5) and Article 5 paragraph (2) of this Decision. It is intended to specify data to be collected under Table 11 of the multi-annual Union programme.*

#### **1. Description of methodologies used to choose the different sources of data**

The data presented comes mainly from official statistics that has been collected and processed by Statistics Sweden through the SRU register which is maintained by Statistics Sweden and consists of income tax declarations in Sweden. Part of the data will be collected from the Statistical Business Register which is a central register consisting of information on all registered enterprises in Sweden. It is also maintained by Statistics Sweden. Another part of the data will be collected from Labour market statistics, which is a central register that is maintained by Statistics Sweden.

#### **2. Description of methodologies used to choose the different types of data collection**

All data is collected, estimated and checked by Statistics Sweden which ensures the consistency of the final data.

#### **3. Description of methodologies used to choose sampling frame and allocation scheme**

All data is collected, estimated and checked by Statistics Sweden which ensures the consistency of the final data. Data on two variables (energy costs and subsidies) will be collected from answers from a questionnaire sent out by Statistics Sweden based on PPS-selection in the Statistical Business Register. The questionnaire is used as a base for estimating an allocation key for variables not included in the financial accounts. The sampling method for the variables collected with probability sample survey is Probability Proportional to Size (PPS sampling) where the sum of total income and total costs is used to select which enterprises that will be sampled.

#### **4. Description of methodologies used for estimation procedures**

All data is collected, estimated and checked by Statistics Sweden which ensures the consistency of the final data. Data on two variables (energy costs and subsidies) will be collected from answers from a questionnaire sent out by Statistics Sweden based on PPS-selection in the Statistical Business Register. The questionnaire is used as a base for estimating the variables (including energy costs and income from subsidies) not included in the financial account.

#### **5. Description of methodologies used on data quality**

All data is collected, estimated and checked by Statistics Sweden which ensures the consistency of the final data. The data quality evaluation is carried out by Statistics Sweden before delivering it to the Board of Agriculture, who conducts a macro evaluation upon delivery to ensure no abnormal or implausible changes have occurred by comparing the new data with previous years.

Sampled data is reviewed on a micro level by Statistics Sweden regarding summations, plausibility and relationships between variables. Outliers that may have a large effect on the estimation are checked and evaluated. Census data from the Swedish Tax Agency and the Statistical Business Register is evaluated by Statistics Sweden although not to such a large extent as sample data. The evaluation of census data mostly consists of reviewing suspiciously extreme values that may be small or large. After reviewing the data on a micro level the data is processed to correct for non-responses. After merging the census and sample data the

aggregate is checked and evaluated at a macro level. In the last step no difference is made between sample and census data.

For variables, such as subsidies and energy costs, collected through the probability sample survey CV values are estimated to display the uncertainties due to sampling. A possible shortfall is that although data is collected, processed and ensured by Statistics Sweden, some variables are not available through financial accounts. The variables affected by this possible shortfall are subsidies and energy costs. The reason for this is that those variables were solely collected through questionnaires and there is a certain range of uncertainty of these variables and it is also difficult to control if they are correct. There are some shortfalls when it comes to subsidies, but it is not a good solution to obtain subsidies from the administrative records. The reason is that we are using Statistic Sweden's standardized method to obtain the financial information for the processing industry and we do not see that we have any option to change this method.

## SECTION 4: SAMPLING STRATEGY FOR BIOLOGICAL DATA FROM COMMERCIAL FISHERIES

### Text Box 4A: Sampling plan description for biological data

*General Comment: This Box fulfills Article 3, Article 4 paragraph (4) and Article 8 of this Decision and forms the basis for the fulfilment of paragraph 2 point (a)(i) of Chapter III of the multi-annual Union programme. This Table refers to data to be collected under Tables 1(A), 1(B) and 1(C) of the multi-annual Union programme.*

Sweden is currently in the process of moving towards 4S in the commercial sampling. Preparation of detailed descriptions of the sampling design for the different sampling schemes is one important part in this process.

Evaluation, development and improvement of the remaining sampling schemes are underway and Sweden aims to have a fully developed 4S data collection running in 2018.

This goal applies for all sampling with the exception of cases where end users may set other requirements. For example, eel sampling may have to be performed in a different way. This holds if the data needs are not possible to meet by commercial 4S sampling. This could be due to either fisheries management measures related to the Swedish national eel management plan or in case there are other objectives in the stock assessment that needs to be taken into account.

#### **BALTIC SEA**

##### **Scheme: Baltic at-sea**

Purpose: At-sea Observer Programme for length, age, weight data of landings and discards of demersal species in the Baltic Sea (Subdiv 22-32)<sup>1</sup>

Main end-users: ICES WGBFAS; National fisheries management agency; Scientific research projects;

Design: Multi-stage

Main stratification: 1 fishery stratum (see details in Table 4A)

Temporal Stratification: Quarterly

Spatial Stratification: none

Stratum: SWE - Balt (at-sea) - Act - 24/25 – DemTrawl

	Sampling frame	Sampling unit	Stratification	Selection Method	Sampling effort
1SU	List of vessels active in the Demersal trawl fishery in subdiv 24 or 25 during 2016	Vessel	Quarterly	random draw from vessel list with unequal probability (probability proportional to number of trips)	6 (per quarter)
2SU	Hypothetical list of trips from vessel	Fishing Trip	---	ad-hoc (dependent on staff availability)	1 (per vessel)

<sup>1</sup> The sampling scheme complements sampling carried out in schemes “Baltic self-sampling” and “Baltic at-sea or self-sampling” by extending data collection to additional stocks and discards of demersal trawlers

3SU	Hypothetical list of hauls in trip	Haul	---	Census	Census
4SU	Hypothetical list of individuals caught in haul	Individuals	Species x Catch Fraction x Commercial Size Category  Biology: also 1cm length classes	Length: Census (random sample if too large)  Biology: Census (random sample if too large); sampling stops when trip goals are achieved	Length: all individuals  Biology:  COD discards: 5 otoliths and individual weights (per size class and trip)  FLE discards: 5 otoliths and individual weights (per size class and trip)

Main limitations: Quota sampling for ages and weights may not ensure proper spatial coverage of the most abundant size classes;

Expected difficulties: There is risk for refusals related to landing obligation and other management measures; usage of random vessel lists in sampling the demersal trawl strata is statistically sound but may bring about low coverage in some subdivisions.

Expected coverage of target population (based on expected trips and 2013-2015 average number of trips per strata):

- SWE - Balt (at-sea) - Act - 24/25 – DemTrawl: 1.9%

**Scheme: Baltic self-sampling**

Purpose: Self-sampling programme for length, age, weight data of landings of demersal fisheries in the Baltic Sea (Subdiv 22-32)<sup>2</sup>

Main end-users: ICES WGBFAS; National fisheries management agency; Scientific research projects;

Design: Multi-stage

Main stratification: 1 fishery stratum (see details in Table 4A)

Temporal Stratification: Quarterly

Spatial Stratification: None

**Stratum: SWE - Balt (self) - Act - 22/32 - DemTrawl**

	Sampling frame	Sampling unit	Stratification	Selection Method	Sampling effort
1SU	List of weeks of the year	Week	Quarterly	random draw from week list without replacement	8 (per quarter)
2SU	List of vessels active in the Demersal trawl fishery in all Baltic subdivisions	Vessel	---	Random selection from quarterly vessel list	4 (per week) (*)

<sup>2</sup> The sampling scheme complements sampling carried out in schemes “Baltic at-sea” and “Baltic at-sea or self-sampling” by supplementing data collection of trawl catches of cod stocks

	during 2016				
3SU	Hypothetical list of daily landings of cod from vessel in week	Daily landing of cod	---	ad-hoc (performed by buyer)	1 (per vessel)
4SU	All boxes of cod landed in fishing trip	Boxes of cod	Commercial Size Category	ad-hoc (performed by buyer)	1 box (**)
5SU	All individuals in the box	Individuals (individual length, weight and age)	None	Length: Census Biology: Random sample or census (depending on size category)	Length: all individuals in box Biology: Sizes 1-3: all otoliths and weights Size 4: 20 otoliths and weights + 20 fish only weight Sizes 5-7: 10 otoliths and weights + 10 fish only weight

(\*) to ensure coverage of areas with less activity, buyers are also instructed to deliver full samples from additional landings from subdivision 24 whenever fleet activity occurs in that subdivision and vessels are not on the list;

(\*\*) n=1 additional box is requested from sizes 1-3 from another vessel to ensure less frequent size classes are sampled.

Main limitations: Reduced control over the selection of box(es) within size category;

Expected difficulties: There is risk for refusals or reduced fleet activity related to landing obligation and other management measures (e.g., temporal closures); usage of random vessel lists in sampling the combined subdivisions (e.g., 22-32) is statistically sound but may yield low sample size in some of the subdivisions.

Expected coverage of target population (based on sampling targets and 2013-2015 average number of trips per strata):

- SWE - Balt (self) - Act - 24/25 – DemTrawl: 9.9%

#### **Scheme: Baltic “at-sea or self-sampling”**

Purpose: At-sea observer or self-sampling programme for length, age, weight data of landings and discards of demersal species in the Baltic Sea (Subdiv 22-32)<sup>3,4</sup>.

Main end-users: ICES WGBFAS; National fisheries management agency; Scientific research projects;

Design: Multi-stage

Main stratification: 6 fishery strata (see table 4A)

Temporal Stratification: Quarterly

Spatial Stratification: Subdivision

<sup>3</sup> Priority will be given to at-sea data collection. Self-sampling will be used if logistics, safety issues or refusals do not allow the implementation of at-sea sampling.

<sup>4</sup> The sampling scheme complements sampling carried out in schemes “Baltic at-sea” and “Baltic self-sampling” by extending data collection to landings and discards of passive gears fishing demersal species.

All strata (if at-sea)

	Sampling frame	Sampling unit	Stratification	Selection Method	Sampling effort
1SU	List of weeks of the year	Week	Quarterly	random sample from week list without replacement	Gillnets: 8 (per quarter) Longlines: 6 (per quarter)
2SU	List of vessels active in the gillnetter or longlines fisheries for demersal species in specific subdivisions during 2016	Vessel	---	Random sample from quarterly vessel list without replacement	2 (per week)
3SU	Hypothetical list of weekly trips from vessel	Fishing Trip	---	ad-hoc (dependent on staff availability)	1 (per vessel)
4SU	Hypothetical list of hauls in trip	Haul	---	Census	Census
5SU	Hypothetical list of individuals caught in haul	Individuals	Species x Catch Fraction x Commercial Size Category  Biology: also x 1cm length classes	Length: Census (random sample if too large)  Biology: Random sample or census (within length class) sampling stops when trip goals are achieved	Length: all individuals  Biology: COD discards: 5 otoliths and individual weights (per size class and trip)  FLE discards: 5 otoliths and individual weights (per size class and trip)

All strata (if self-sampling)

	Sampling frame	Sampling unit	Stratification	Selection Method	Sampling effort
1SU	List of weeks of the year	Week	Quarterly	random sample from week list without replacement	Gillnets: 8 (per quarter) Longlines: 6 (per quarter)
2SU	List of vessels active in the gillnetter or longlines fisheries for demersal species in specific subdivisions during 2016	Vessel	---	random sample from quarterly vessel list without replacement	2 (per week) until 4 trips in quarter are achieved
3SU	Hypothetical list of weekly trips from vessel	Fishing trip	---	ad-hoc (dependent on staff availability)	1 (per vessel)
4SU	All boxes of catch	Boxes	Species x Catch	Census or "random"	Cod Landings:

	kept during fishing trip		fraction x Commercial Size Category	sample by observer	size (1-3): all boxes (or a sample of boxes) size (4-7): 1 box Other species landed and discarded: all boxes
5SU	All individuals in the box	Individuals (individual length, weight and age)	None	Length: Census Biology: Random sample or census (depending on size category)	Length: all individuals in box Biology (per size): COD Sizes 1-3: all otoliths and weights COD Sizes 4-5: 20 otoliths and weights + all remainder fish only weight COD Sizes 6-7: 20 otoliths and weights + 20 fish only weight

Main limitations: lack of control over the sampling requires significant *a posteriori* checks for sampling biases; Quota sampling for ages and individual weights in at-sea sampling jeopardizes spatial coverage of the most abundant size classes

Expected difficulties: There is risk for refusals or reduced fleet activity related to landing obligation and other management measures (e.g., temporal closures); usage of random vessel lists in the sampling of combined subdivisions (e.g., 27-29) is statistically sound but may yield low sample size in some of the subdivisions.

Expected coverage of target population (based on expected trips and 2013-2015 average number of trips per strata):

- SWE - Balt (sea/self) - Pass - 23 – Nets: 0.6%
- SWE - Balt (sea/self) - Pass - 24 – Nets: 1.2%
- SWE - Balt (sea/self) - Pass - 25 – Nets: 0.5%
- SWE - Balt (sea/self) - Pass – 27-29 - Nets: 0.7%
- SWE - Balt (sea/self) - Pass - 24 - Longlines: 7.6%
- SWE - Balt (sea/self) - Pass - 25 - Longlines: 1.7%

**Scheme: Baltic at-sea 2**

Stratum KBWE2 and KBEE2/KBEE3

Scheme: Sampling is set up by contacting preselected fishermen. In connection with their silver eel pound net fishery, the fishermen sign up on a yearly basis for 1) a number of métier sampling trips and 2) collection of eel for stock sampling. Additionally, it is possible to sign up for recording effort and eel landings in a voluntary daily logbook. These data are a complement to the official landing statistics and may also include discards and seal- and bird-induced damage. Each fisherman can have several vessels. Observers choose which trip they visit the fishermen to perform the métier sampling. Preliminary 2017 set-up: 1 fisherman in SD 23, SD 25 and SD 27 respectively. In total, 8 métier sampling trips are planned.

**Scheme: Baltic onshore sampling**

### Stratum KBN3

Scheme: Sampling is set up by contacting preselected vessels (fishermen). In connection with their herring trawl fishery, the fishermen sign up on a yearly basis for a number of métier sampling trips. The fishermen choose randomly (by themselves) which trip (haul) they collect samples from<sup>5</sup>. These samples are later processed by staff at SLU Aqua. Depending on how many vessels that are trawling for herring in SD30 there can be 1 to 4 fishermen involved. Preliminary 2017 set-up: 1 trawler active. In total, 12 métier sampling trips are planned.

### Stratum KBN4

Scheme: Sampling set up by contacting preselected fishermen. In connection with their herring gill net fishery, the fishermen sign up on a yearly basis for 1) a number of métier sampling trips and 2) collection of herring for stock sampling. Each fisherman can have several vessels. The fishermen choose randomly (by themselves) which trip they collect samples from<sup>5</sup>. These samples are later processed by staff at SLU Aqua. Preliminary 2017 set-up: 3 fishermen in SD 30 and in SD 31 respectively. In total, 12 métier sampling trips are planned.

### Stratum KBN5

Scheme: Sampling from preselected vessel pairs (fishermen) assumed to be a good subsample of the total vendace fishing fleet. Fishing is not randomly distributed throughout the whole fishing ground. Instead, it takes place in different areas that are separated from each other and therefore, the sampling is stratified on 5 predefined local fishing areas. Trips are chosen haphazardly, where samples are collected in the beginning of the 1st, 3rd and 5th fishing week. Sampling is performed by sub-contractor County administrative board of Norrbotten. Preliminary 2017 set-up: In total, 9 vessel pairs participate in the sampling (the vessels that form pairs are always the same). Before going out sampling, 1 out of the 5 predefined fishing areas within the SD is chosen and then one of the preselected vessel pairs is contacted. The sampling staff will then collect samples in the harbour where the fish is landed. In total, 4 métier sampling trips are included in the WP. The bulk of the Swedish vendace sampling programme is financed nationally.

### **Scheme: Baltic other (market stock specific)**

Purpose: Stock-specific programmes for length, length-weight relationship, age, maturity and stock composition of commercial landings from Herring and Sprat stocks in the Baltic

Design: Multi-stage

Main end-users: ICES HAWG, ICES WGBFAS; National fisheries management agency; Scientific research projects.

### Herring

	Sampling frame	Sampling unit	Stratification	Selection Method	Sampling effort
1SU	Hypothetical list of fishing trips with landings of herring or sprat from target subdivision during 2017	Fishing trip x species	Quarter and Subdivision (24-29S; 29N-31)	ad-hoc selection by first hand buyer; it is requested that samples are spread out in quarter	8 to 10 Trips,
2SU	Individuals landed on fishing trip	Box	---	ad-hoc selection by first hand buyer	1 Box

<sup>5</sup> according to written contract, the fishermen have the same responsibility regarding the sampling, as if observers would have been making decisions aboard

3SU	Herring individuals in box	Biology of individuals (individual length, weight, age, sex maturity, intestinal fat, nematodes ichthyophonus)	---	Census or subsamples (50-150 per box when boxes are large and many boxes are available) until sampling targets are achieved	400 individuals per Quarter and Subdivision 800 individuals per Quarter and Subdivision (29N-31)
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### Sprat

	Sampling frame	Sampling unit	Stratification	Selection Method	Sampling effort
1SU	Hypothetical list of fishing trips with landings of herring or sprat from target subdivision during 2017	Fishing trip x species	Quarter and Subdivision (24-29S)	ad-hoc selection by first hand buyer	Variable
2SU	Individuals landed on fishing trip	Box	---	ad-hoc selection by first hand buyer until sampling targets are attained	1 Box
3SU	Herring individuals in box	Biology of individuals (individual length, weight, age, sex maturity)	---	Census or subsamples (50-150 per box when boxes are large and many boxes are available) until sampling targets are achieved	500 individuals per Quarter and Subdivision

### Herring/sprat landings of Danish vessels landing in Sweden

Danish vessels landing herring or sprat in Swedish ports are sampled whenever possible.

Main limitations: Lack of control of selection procedures

Expected difficulties: Weather conditions and number of boats fishing can affect sampling in Q1 and Q4

Expected coverage of target population (based on average number of samples obtained and average number of trips per strata in 2013-2015):

- SWE - Balt (stock spec) - Act - 24 – HerSpr: 20.9%
- SWE - Balt (stock spec) - Act - 25 – HerSpr: 3.4%
- SWE - Balt (stock spec)- Act - 26 – HerSpr: 7.0%
- SWE - Balt (stock spec)- Act - 27 – HerSpr: 3.1%
- SWE - Balt (stock spec)- Act - 28 – HerSpr: 4.2%
- SWE - Balt (stock spec)- Act - 29 – HerSpr: <0.1%

Data archiving: Secure SQL database and RDB

Quality assurance: Data entry checks and database internal validation, quarterly and annual checks using R-scripted routines and developments from FishPI WP4

Age reading: Otoliths are aged according to ICES guidelines.

Quality: No bias has been identified so far; Data are routinely used by end-users

Future improvements: The scheme will be peer-reviewed by independent external experts in Nov/2016. A workplan for optimization and better approximating statistical sound sampling and estimation and end-user needs will be put in place. Implementation of a new design is expected for 2018 onwards.

**Scheme:** logbooks & journals, freshwater

**Purpose:** biological sampling for weight, length, sex, maturity, age and endoparasite (*Anguillicola crassus*) from the commercial freshwater eel fishery.

In addition to the biological sampling the official fishery statistics of landings (numbers and total weight) of all commercial freshwater eel fisheries is collected by Swedish Agency for Marine and Water Management (SwAM) from all licensed fishermen. Numbers and weight of caught eel are used in ICES stock assessment models.

**Design:** Multi-stage

**Main stratification:** 1 Strata (see details in Table 4A)

**Temporal Stratification:** annual

**Spatial Stratification:** none

**Strata: Freshwater, Eel-Fresh**

	Sampling frame	Sampling unit	Stratification	Selection Method	Sampling effort
1SU	Commercial eel fishery	fisherman X lake	NA	Representative eel fisherman in three lakes	1 fisherman X lake
2SU	Landings	Individual fish	1 cm length classes	Random sample	125 fish per lake (375 fish in total) are sampled for weight, length, sex, maturity, age and endoparasite <i>A. crassus</i> .

**Main limitations:** The mandatory statistics data are the catch and the corresponding effort, however with different resolution and aggregation depending on the lakes concerned. EU logbooks are not used in freshwater but various journals depending on lake. A part of the “recreational” catch is reported, but only if commercially sold. Eel rescued from mortalities in hydropower installation through a Trap and Transport program are reported to SwAM by the fishers organization on behalf of the industry.

Individual size, stage, sex, age and prevalence of an endoparasite (*Anguillicola crassus*), are collected from eels sampled from the commercial fishery in freshwater as described in Table 1C.

**Expected difficulties:** Unreporting or misreporting of catches occurs to an unknown extent. Since journal reliability is dependent on correct reporting by fishermen, there is potential bias in data.

**Data archiving and quality assurance:** Data archiving and quality assurance procedures for catch data are performed by the responsible authority, Swedish Agency for Marine and Water Management (SwAM). For data on biological variables archiving and quality assurance procedures are performed by SLU Aqua (Table 5A).

Quality: Data are routinely used by end-users (mainly ICES and SwAM).

By altering sampling between different lakes, fishermen and year, most “eel lakes” will be covered within a number of years concerning sampling of biological variables. Expected coverage of the commercial fishery statistics of target population by lake is close to 100% (based on the mandatory fishing journals conducted by licensed fishermen, meaning that all catch and/or landings have to be reported).

Future improvements: Reporting of effort should be mandatory. The reliability of the journal data could be improved by reducing unreported and misreported catches. SwAM is continuously working on improving data reliability.

## NORTH SEA AND EASTERN ARCTIC

### Scheme: Skagerrak/Kattegat at-sea

Purpose: Length, age, weight data of landings and discards of demersal species in Skagerrak (subdiv 20) and Kattegat (subdiv 21)

Main end-users: ICES WGBFAS, ICES WGNSSK, NAFO/ICES NIPAG; National fisheries management agency; scientific research projects

Design: Multi-stage

Main stratification: 7 fishery strata (see details in Table 4A)

Temporal and Spatial Stratification: Quarterly (all fisheries); Subdiv (in some fisheries, see table 4A-B)

#### Per strata

	Sampling frame	Sampling unit	Stratification	Selection Method	Sampling effort
1SU	List of vessels active in the fishery during 2016	Vessel	Quarterly	random draw from vessel list with unequal probability (probability proportional to number of trips; draw with replacement)	3 (per quarter)
2SU	Hypothetical list of trips from vessel	Fishing Trip	---	ad-hoc (dependent on staff availability)	1 (per vessel)
3SU	Hypothetical list of hauls in trip	Haul	---	Census	Census
4SU	Hypothetical list of individuals caught in haul	Individuals	Species x Catch Fraction x Commercial Size Category (*)  Biology: also 1cm length classes	Length: Census (random sample if too large)  Biology: Census (random sample if too large); sampling stops when trip goals are achieved	Length: all individuals  Biology: WIT landings: Otoliths and individual weights from a subsample of 5-10 kg per trip  COD discards: 3 otoliths and individual weights (per size class and trip)  PLE discards: 3 otoliths and

					individual weights (per size class and trip)  WIT discards: 3 otoliths and individual weights (per size class and trip)
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(\*) in at-sea sampling of “SWE - SkaKat (at-sea) - Act - 20/21 – PanTrawlTun” and “SWE - SkaKat (at-sea) - Act - 20/21 - PanTrawlNoTun” reference samples from unsorted shrimps catches from the last haul are collected for validation purposes

Main limitations: Sampling frames used in some strata are defined in terms of both métiers and areas; Quota sampling for ages and weights may not ensure proper spatial coverage of the most abundant size classes;

Expected difficulties: There is risk for refusals related to landing obligation and other management measures; usage of random vessel lists in some strata is statistically sound but may bring about low coverage in some subdivisions.

Expected coverage of target population (based on expected trips and 2013-2015 average number of trips per strata):

- SWE - SkaKat (at-sea) - Act - 20/21 – PanTrawlTun: 1.7%
- SWE - SkaKat (at-sea) - Act - 20/21 – PanTrawlNoTun: 0.6%
- SWE - SkaKat (at-sea) - Act - 20 – NepTrawlGrid: 0.3%
- SWE - SkaKat (at-sea) - Act - 21 – NepTrawlGrid: 0.7%
- SWE - SkaKat (at-sea) - Act - 20 – MixTrawl: 0.9%
- SWE - SkaKat (at-sea) - Act - 21 – MixTrawl: 1.2%
- SWE - SkaKat (at-sea) - Pass - 20/21 – NepPots: 0.2%

**Scheme: Skagerrak/Kattegat other (market stock specific)**

Purpose: Stock-specific programmes for length, length-weight relationship, age, maturity and stock composition of commercial landings from Herring, Sprat and Cod stocks in the Skagerrak and Kattegat

Main end-users: ICES HAWG, ICES WGBFAS, ICES WGNSSK, NAFO/ICES NIPAG; national fisheries management agency; scientific research projects;

Design: Multi-stage

Cod

	Sampling frame	Sampling unit	Stratification	Selection Method	Sampling effort
1SU	Hypothetical list of fishing trips with landings of cod from target subdivision during 2017	Fishing trip x species	Quarter and Subdivision (20, 21)	ad-hoc selection by first hand buyer until sampling targets are achieved. It is requested that trips are spread in time.	Variable
2SU	List of size categories of cod in fishing trip	Size category	---	ad-hoc selection by first hand buyer until sampling targets are achieved. It is requested that size categories are spread across trips (i.e., only 1-2 size	1 size category

				categories are sampled per trip)	
2SU	List of boxes in size category	Box	---	ad-hoc selection by first hand buyer until sampling targets are achieved	1 box (size 1 to 4) ½ to 1 box (size 5)
3SU	Cod individuals in box	Biology of individuals (individual length, weight and age)	---	ad-hoc selection by first hand buyer until sampling targets are achieved	All fish are sampled for weight and otoliths until the following quarter*subdiv targets are achieved:  Size 1: 50 indiv. Size 2: 50 indiv. Size 3: 100 indiv. Size 4: 100 indiv. Size 5: 100 indiv.

### Herring

	Sampling frame	Sampling unit	Stratification	Selection Method	Sampling effort
1SU	Hypothetical list of fishing trips with landings of herring or sprat from target subdivision during 2017	Fishing trip x species	Quarter and Subdivision (20, 21)	ad-hoc selection by first hand buyer	Variable
2SU	Individuals landed on fishing trip	Box	---	ad-hoc selection by first hand buyer	1 Box
3SU	Herring individuals in box	Biology of individuals (individual length, weight, age, maturity, nematodes)	---	Census or subsamples (50-150 per box when boxes are large and many boxes are available) until sampling targets are achieved	650 individuals per Quarter and Subdivision

### Sprat

	Sampling frame	Sampling unit	Stratification	Selection Method	Sampling effort
1SU	Hypothetical list of fishing trips with landings of herring or sprat from subdivision during 2017	Fishing trip x species	Quarter and Subdivision (20, 21)	ad-hoc selection by first hand buyer until sampling targets are achieved	Variable
2SU	Individuals landed on fishing trip	Box	---	ad-hoc selection by first hand buyer until sampling targets are achieved	1 Box
3SU	Herring individuals in box	Biology of individuals (individual length, weight, age, maturity)	---	Census or subsamples (50-150 per box when boxes are large and many boxes are available) until sampling	400 individuals per Quarter and Subdivision

				targets are achieved	
<p><u>Danish landings of Pandalus shrimps</u></p> <p>Danish vessels landing <i>Pandalus borealis</i> in Swedish ports are sampled whenever possible.</p> <p>Main limitations: Lack of control over selection procedures</p> <p>Expected difficulties: None (assuming first hand buyers continue to cooperate and significant landings take place)</p> <p>Expected coverage of target population (based on average number of samples obtained and average number of trips per strata in 2013-2015):</p> <ul style="list-style-type: none"> <li>• SWE - SkaKat (stock spec)- Act - 20 – HerSpr: 33.8%</li> <li>• SWE - SkaKat (stock spec)- Act - 21 – HerSpr: 29.4%</li> <li>• SWE - SkaKat (stock spec)- Act - 20 – Cod: 5.3%</li> <li>• SWE - SkaKat (stock spec)- Act - 21 – Cod: 9.8%</li> </ul> <p><b>All Schemes:</b></p> <p>Data archiving: Secure SQL database and RDB</p> <p>Quality assurance: Data entry checks and database internal validation, quarterly and annual checks using R-scripted routines and developments from FishPI WP4</p> <p>Age reading: Otoliths are aged according to ICES guidelines.</p> <p>Quality: No bias has been identified so far; Data are routinely used by end-users</p> <p>Future improvements: The scheme will be peer-reviewed by independent external experts in Nov/2016. A work plan for optimization and better approximating statistical sound sampling and estimation and end-user needs will be put in place. Implementation of a new design is expected for 2018 onwards.</p>					