Swedish Agency for Marine and Water Management

Regulation (EU) 2017/1004 of the European Parliament and of the Council of 17 May 2017

on the establishment of a Union framework for the collection, management and use of data in the fisheries sector and support for scientific advice regarding the Common Fisheries Policy and repealing Council Regulation (EC) No 199/2008 (recast)

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

Version 1.1 – 2018-2019

Gothenburg, Sweden 31/10/17

CONTENTS

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

Sampling of data from recreational fisheries – a pilot study based on the combination of biological data collection and a postal questionnaire to support an ecosystem-based management.

1. Aim of pilot study

Pilot study in ICES subdivision 23, 24, 25 to 27 on catches, effort and socio-economy of recreational fisheries with focus on cod, salmon and sea trout management. The aim of the study is primarily to collect size-based catch (including released fish) and effort information on cod but data on all species (including salmon, sea-trout and the by-catch of those fisheries) will be collected. Such information is input knowledge for an ecosystem-based approach to fisheries management and governance according to best available advice and broad stakeholder involvement. Socio-economic information and demographics on fisher´s population will also be collected as a complement.

2. Duration of pilot study

The pilot study initiated in subdivisions 23 and 24 in 2017 will continue during 2018 with an extension to subdivisions 25 and 27. First estimates for subdivisions 23 and 24 will be available in early 2018. If the pilot is successful, first estimates for all the subdivisions are expected for early 2019.

3. Methodology and expected outcomes of pilot study

In the study, recreational fishery is defined as all fishing activities carried out by those without a commercial fishing license. The pilot study will encompass three main components: a) the adjustment and extension of a yearly nation-wide postal questionnaire that presently sent to approximately 10,000 randomly selected permanent residents in Sweden. b) the continuation of the current on-site pilot study taking place in subdivision 23 and 24 with an adjusted sampling effort, and c) the testing of two cost-efficient alternatives for effort quantification. Questionnaires are often used for estimating total effort and socio-economic-related parameters The on-site study on recreational fisheries in ICES subdivision 23 and 24 is enhancing, validating and extending the present coverage of the questionnaires particularly in what concerns the temporal and spatial distribution of catch and its length composition. On-site data sampling can be used to validate and improve cost-efficiency of off-site data sampling but also vice versa.

A. The postal questionnaire

A postal questionnaire will be sent to randomly selected permanent residents in Sweden, age 16-80 years. The minimum number of questionnaires that will be sent is 10 000. Statistical analyses will be carried out to analyse the impacts of increasing the number of questionnaires and adjusting their spatial coverage as this is necessary to attain higher precision in the estimates of catches from target stocks at subdivision level. The

questionnaire will be sent at three occasions during the year with questions regarding fishing activities and targeted species in the most recent four months. The questionnaire does not target fishing carried out by visitors to Sweden but will give information on the recreational effort, catches gear use and expenditures of Swedish residents which comprise most of the population of fishers. In particular, the questionnaire will be evaluated as a means of cost-efficiently estimating catch and effort in regions not yet covered by on-site surveys (subdivisions 25 and 27).

B. The on-site survey

The on-site pilot collecting data from recreational fishers acting from the shore, private boats and Swedish commercial fishing-tourism vessels in subdivision 23-24 24 will proceed. Adjustments to selection probabilities will be considered to improve cost efficiency of this survey. Pilot trials will be carried out to evaluate the possibility of extending the survey to subdivision 25 and 27 in 2019.

The study covers recreational fishing activity of both Swedish residents and visitors to Sweden. The on-site survey provides information about the persons practicing recreational fisheries alongside quarterly estimates of effort, gears and biological data on individual fish kept (weight, length etc.) and released (numbers and species) that are necessary for the application in stock assessment. Both weekdays and weekends/holiday-periods are covered in the pilot.

C. New methodologies for improving cost-efficiency and monitoring remote areas

A trial experiment involving continuous monitoring of effort using passive acoustics and cameras will be conducted. If effective and well calibrated with camera observations, the passive acoustic methodology constitutes a non-intrusive privacy-friendly methodology should be able to quantify effort and bring about significant increases to cost efficiency and precision of on-site surveys for catch. Furthermore, it will facilitate effort quantification in areas of Sweden where marinas, ramps and anchoring points are spread out but boat routes known to aggregate in particular geographical points (e.g., several areas of subdivision 25 and 27).

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 2018; In Q1-2018 estimates of the different components in Subdivision 23 and 24 will be produced for presentation in 2018 WGBFAS and WGBAST. In Q1-2019 there will be estimates of all subdivisions.

Background

Swedish legislation allows residents to fish with hooks but also with a limited amount of nets and pots. Typically, four main components are considered in the recreational fisheries: the tourist boats, the charters, the private boats and shoreline anglers. Tourist boats and charters constitute the fore-hire sector and develop an essentially for-profit activity. Private boats and shoreline fisheries are much more numerous and constitute the non-profit sector. Field work in 2017 did not identify any significant charter boat activity in the area. The piers and entrances of local ports and marinas appear to be the main access points for shoreline fishers.

Quantifying recreational effort and catches is a challenge in Sweden because no register exists of fishers or private boats. To meet the challenge of quantifying effort and catches of cod salmon and sea trout stocks for

assessment and management purposes, the pilot study will combine both direct (field interviews and counts of arrivals) and indirect methods (postal questionnaire). Results to date (Sept-2017) indicate the pilot randomized field survey currently in place in subdivision 23 and 24 is able to provide catch and effort information from tourist boats and private boats at the necessary temporal and spatial resolution. However, this field survey is presently quite expensive and inefficient due to insufficient knowledge on between day and within day variability in private boat effort. In 2018 the field work will be maintained and final results evaluated against those of an adjusted mail survey with regards to costs involved and precision of the estimates obtained.

With regards to subdivisions 25 and 27 significant difficulties are envisioned with regards to the implementation of on-site surveys on the private boat and shoreline components because these take place on a much higher geographical dispersion of access points. Accordingly, the main focus of the pilot study in these subdivisions during 2018 will be on the adjustment of the design and sampling effort of the mail questionnaire. In parallel, an inventory the tourist fishing companies will be carried out alongside trial on-site field work to evaluate and test feasibility of on-site sampling. Based on this information, a larger array of alternatives for estimating recreational fishing in subdivision 25 and 27 may be considered for 2019.

A pilot trial carried out with an alternative method (passive acoustics) in July 2017 evidenced the potential of this method for the quantification of effort at fine temporal resolution. In summary, boat counts can be obtained in a non-intrusive privacy-friendly way through continuous monitoring of underwater sounds. In 2018 the method will be further tested and calibrated with camera images in at least one selected site. If this potential is confirmed, the methodology may be used to quantify effort in areas where access points for private boats are more dispersed (subdivision 25 and 27). Furthermore this method could improve the cost-efficiency of on-site survey.

Both the on-site study and the mail questionnaire are based on voluntary participation of anglers and their 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. The camera trial is dependent on obtaining of necessary approval and licencing.

Pilot study on eel in freshwater and coastal water

The planned two years (2017-2018) pilot study on recreational fishery on eel is no longer relevant. A general ban of recreational fishing for eel were introduced in 2007. There are a few exemptions in inland areas where eel is not able to contribute to spawning migration due to downstream hydro power. The pilot study in 2017 also indicated limited or sparse recreational fishing for eel in the exempted inland areas. Therefore, there is no need for a continuation in 2018.

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 AND IIIA

Method selected for collecting data

Salmon and sea trout

Data collection for salmon consists of annual electrofishing surveys of juveniles (parr), trapping of out-migrating smolts and counting of ascending spawners in fish ladders in designated rivers. These rivers are spread among assessment units to comply with end-user (ICES) needs. Electrofishing and smolt counting is also undertaken in additional rivers, according to stock assessment 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 fisheries in freshwater are collected from fishing log-books. Total recreational river catches of salmon and Baltic sea trout will be estimated annually (enquiries, interviews, catch reports from fishing right owners). Estimates of Baltic salmon trolling catches will be carried out every second year (site studies combined with effort estimates). Recreational fisheries with trap nets will be estimated every 4th year.

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. A general ban of recreational fishing for eel were introduced in 2007. Exemptions to this ban are made in some inland areas where eel is not able to contribute to spawning migration due to downstream hydro power. A pilot study in 2017 indicated that recreational fishing for eel in exempted areas are limited. Thus, there is no need for a continued pilot study in 2018. Conditions for one or two designated rivers will be evaluated in late 2017 and be implemented to a first step during 2018.

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 efficent to estimate by-catches ,of primarely 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 2017-2018.

3. Methodology and expected outcomes of pilot study

During 2017 it became apparent that by catches might be more common in gillnet fisheries carried out close to the shoreline than in the cod fishery with passive gear (table 4A and 4B). The pilot project will thereby during 2018 primary target fisheries carried out at more shallow depth and in risk areas. Observers are planned to do the sampling on-board fishing vessels (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 was done for previous years The observers will measure fish as well as potential by-catches of birds and mammals.

If possible cameras will be deployed at some vessels in some areas and during some study seasons. Results from theses 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 sufficent 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 efficent 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.

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 reseach 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

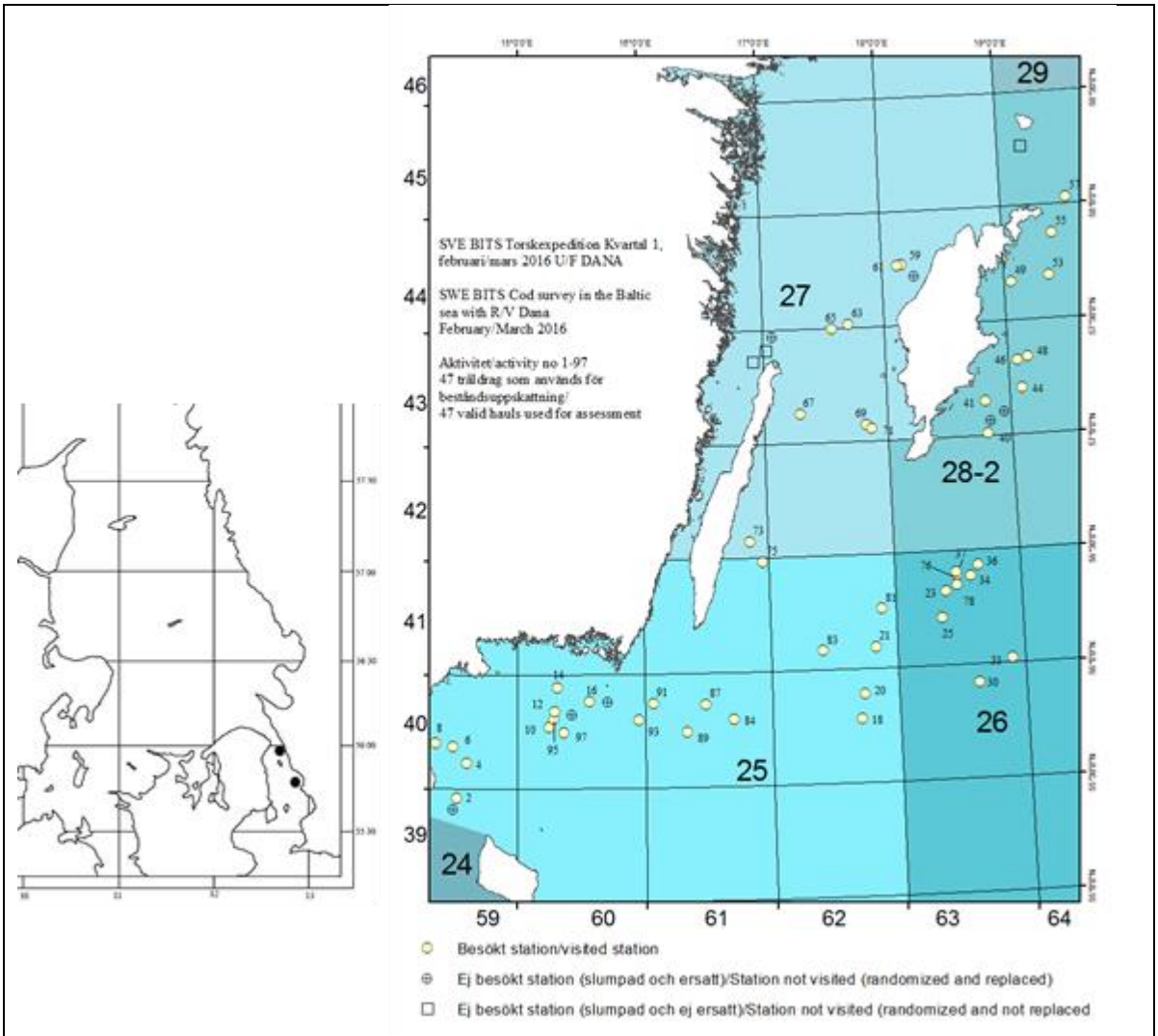
To estimate cod recruitment indices, cod abundance and to follow the development of flounder and other flatfish populations in the different Sub-Divisions in the Baltic.

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

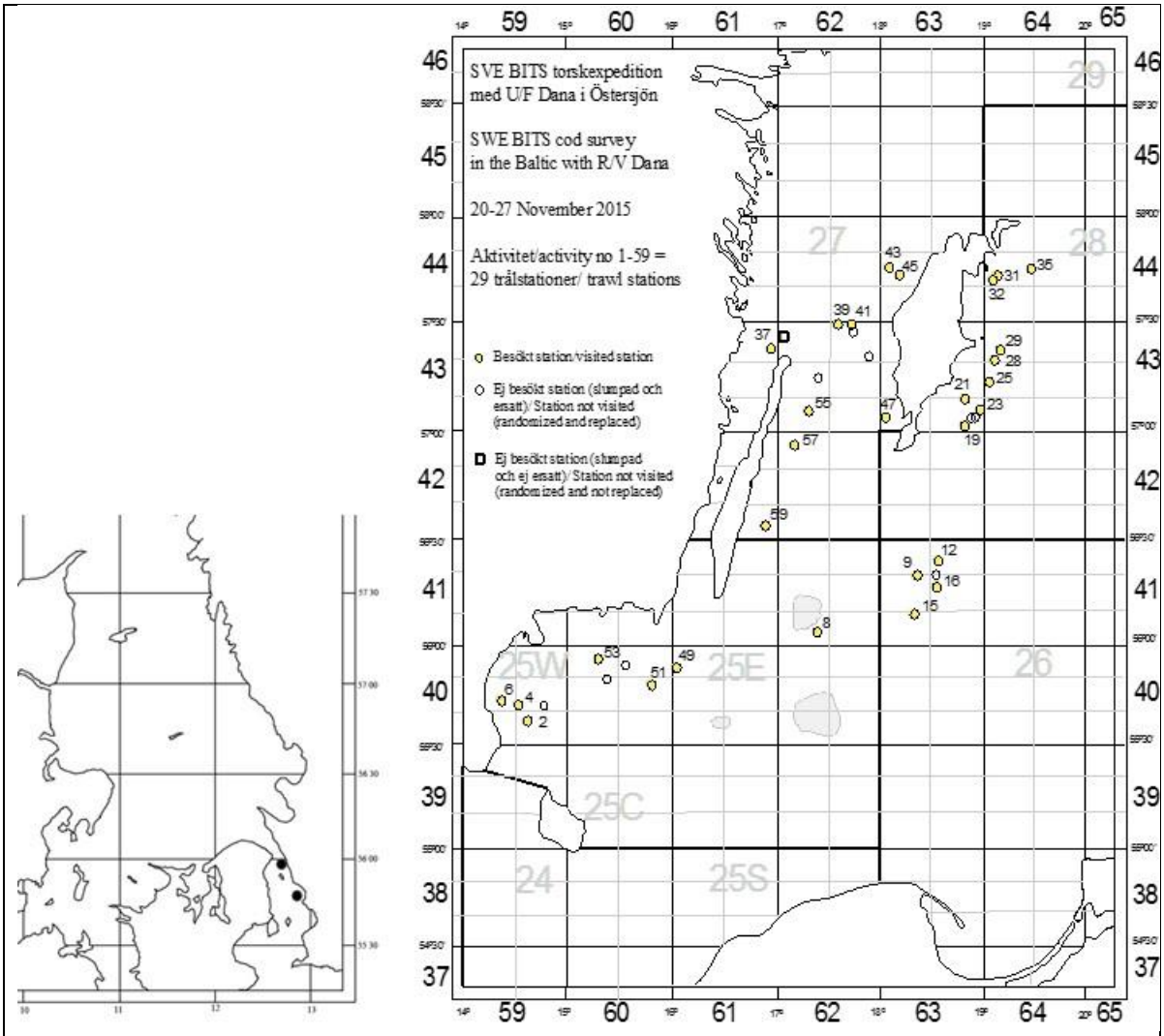
The survey is conducted using a TV3L demersal trawl at day-time. Sweden is assigned 50 randomly selected hauls for the first quarter survey and 30 randomly selected hauls for the fourth quarter survey. For both surveys hydrographical data are collected with a CTD in connection to the trawl hauls and acoustic data were continuously recorded. Each haul is 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 1. BITS first quarter survey (2016) illustrating the approximate spatial distribution of hauls for the surveys in 2018 and 2019 Trawl stations conducted by R/V DANA is shown in the map to the right and trawl sstations conducted by Hålabben to the left.



Map 2. BITS fourth quarter survey (2015) illustrating the approximate spatial distribution of hauls for the survey in 2018 and 2019 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 Öresund (SD23). 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 were all the practical details (price, payment, staff etc.) for smooth cooperation are described. Agreement for 2018 and 2019 is under development and will be signed before 1st January 2018. 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

See table 7C.

5. Explain where thresholds apply

No threshold applies to the BITS surveys.

BIAS – Baltic International Acoustic Survey

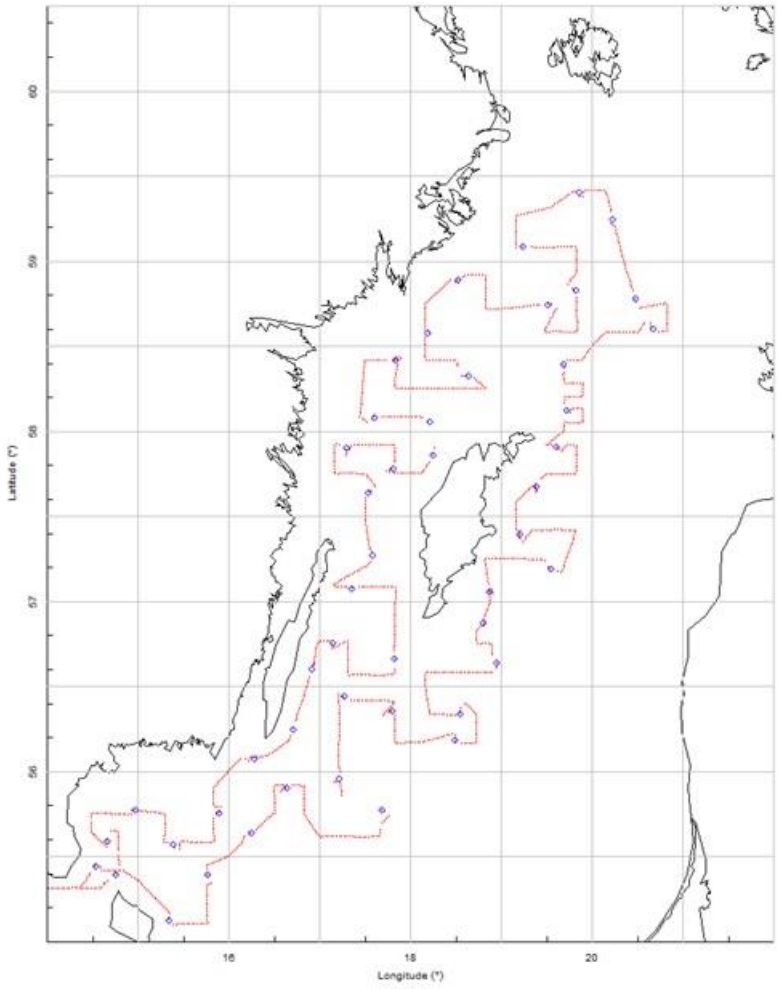
1. Objectives of the survey

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 on-board and parameters such as age, weight, and sex are analysed on herring, 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), illustrating the approximate coverage of the survey in 2018 and 2019.

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

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 were all the practical details (price, payment, staff etc.) for smooth cooperation are described. Agreement for 2018 and 2019 is under development and will be signed before 1st January 2018. 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

See table 7C.

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

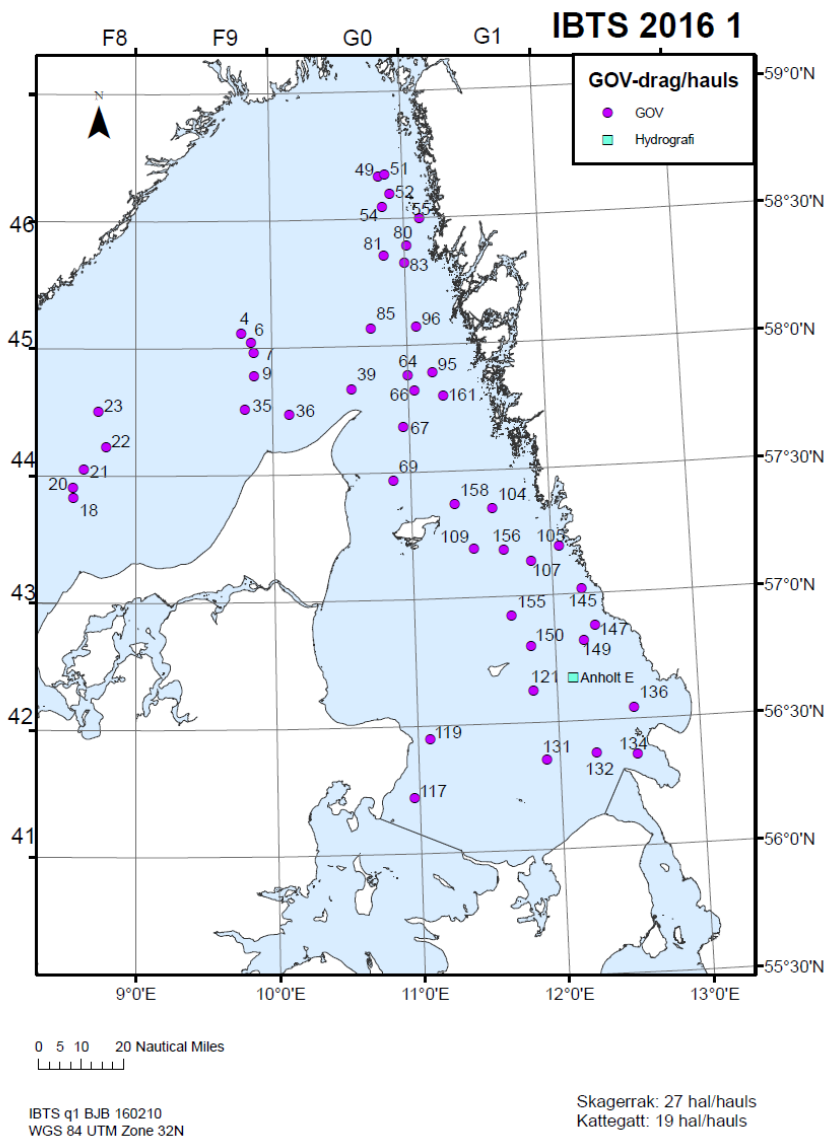
1. Objectives of the surveys

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.

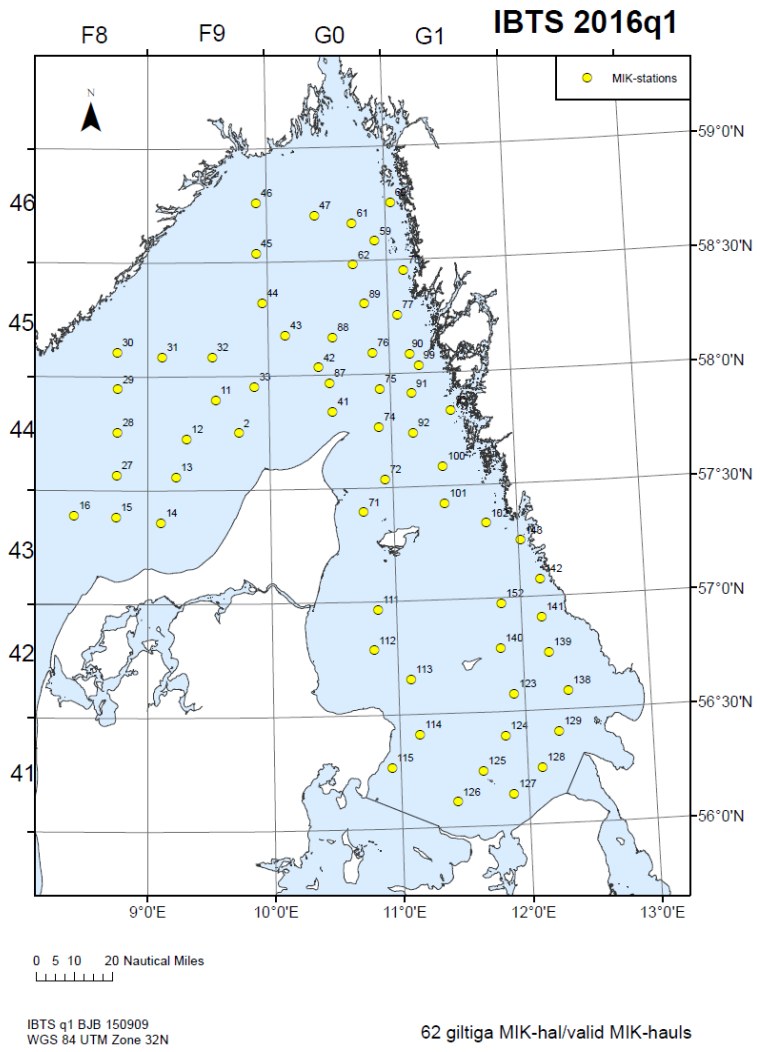
2. Description of the methods used in the survey. For mandatory surveys, link to the manuals. Include a graphical representation (map)

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 is 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.

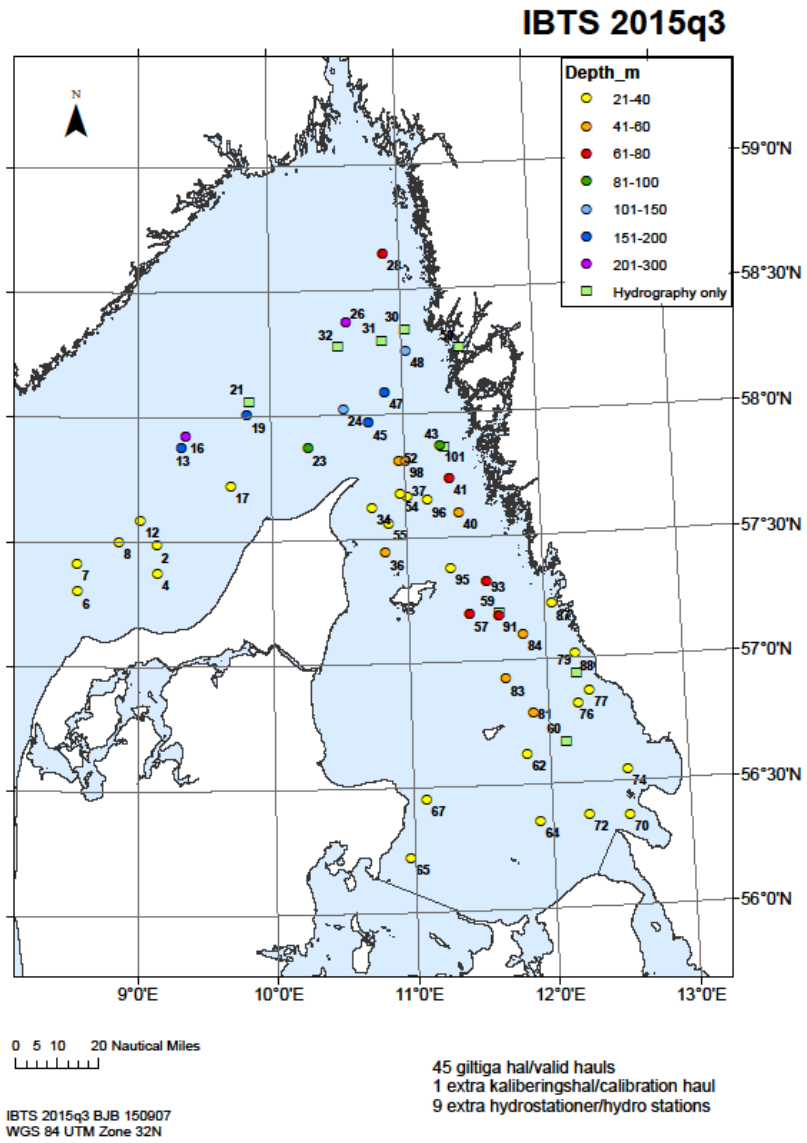
Further details are explained in the International Bottom Trawl Survey (IBTS) manual: http://datras.ices.dk/Documents/Manuals/Manuals.aspx



Map 4. IBTS first quarter survey (2016), illustrating the approximate spatial distribution of GOV demersal hauls for the survey in 2018 and 2019



Map 5. Hauls with MIK larvae trawl during IBTS first quarter survey 2016, illustrating the approximate spatial distribution of hauls in 2018 and 2019.



Map 6. IBTS third quarter survey 2015, illustrating the approximate spatial distribution of GOV demersal hauls for the survey in 2018 and 2019.

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 is chartered for the surveys in the Kattegat and Skagerrak. Since 2011, Sweden has used the Danish vessel R/V DANA in the IBTS surveys and a cooperation agreement between Sweden and Denmark has been established were all the practical details (price, payment, staff etc.) for smooth cooperation are described. Agreement for 2018 and 2019 is under development and will be signed before 1st January 2018. Participating Member states in the surveys are: Sweden, Denmark, Germany, England, Scotland. The IBTS survey is coordinated by the International Bottom Trawl Survey Working Group (IBTSWG) and the data are uploaded to the international ICES database DATRAS. Data on marine litter is reported to the ICES marine litter database.

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

See table 7C.

5. Explain where thresholds apply

No threshold applies to the IBTS surveys.

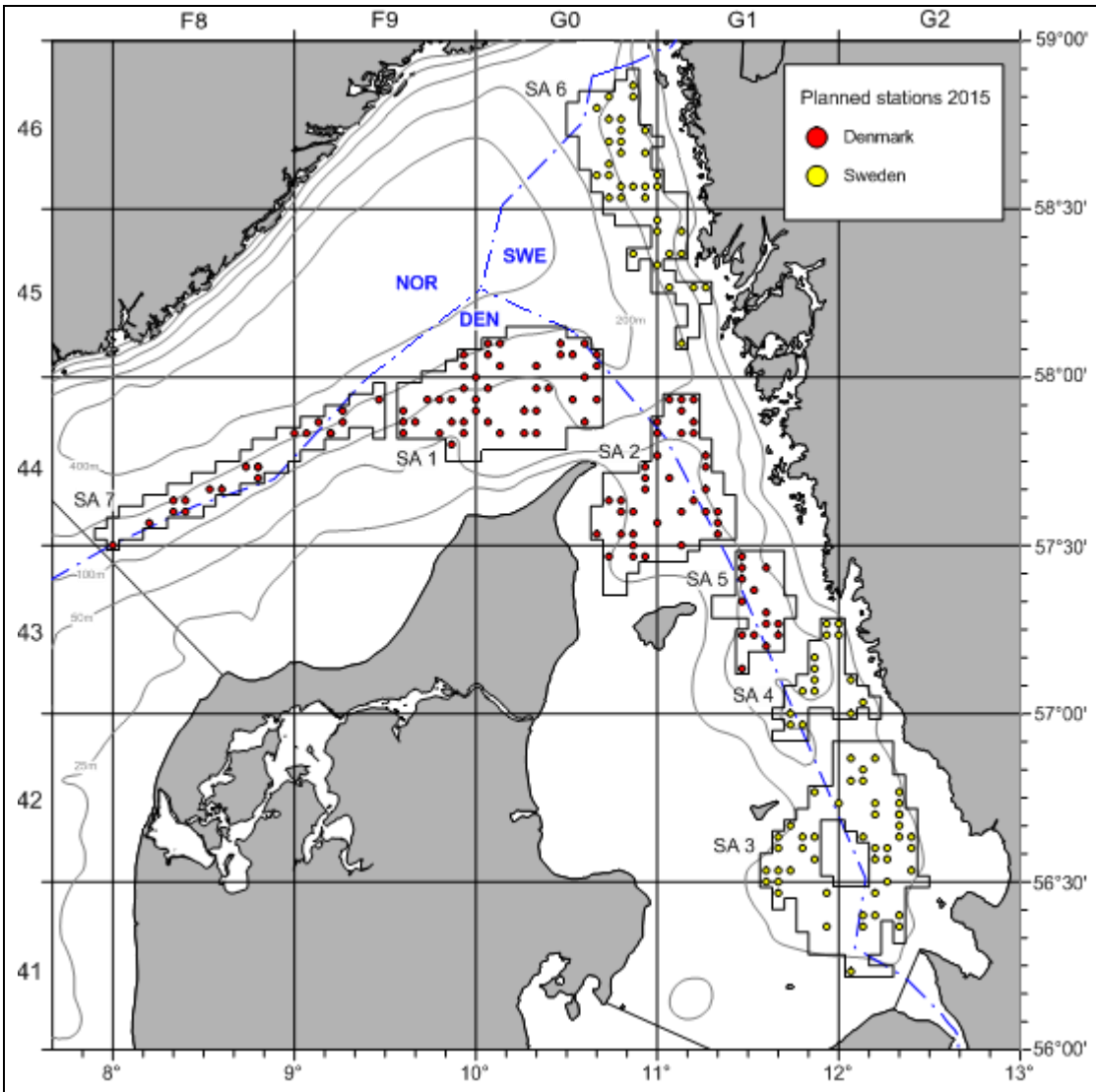
NTV 3&4 – NEPHROPS TV SURVEY IN FUNCTIONAL UNIT 3 & 4

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 is illustrating the approximate spatial distribution for the survey in 2018 and 2019.

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 2018, and that Swedish scientific staff will be on-board 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

See table 7C.

5. Explain where thresholds apply

No thresholds apply to the survey

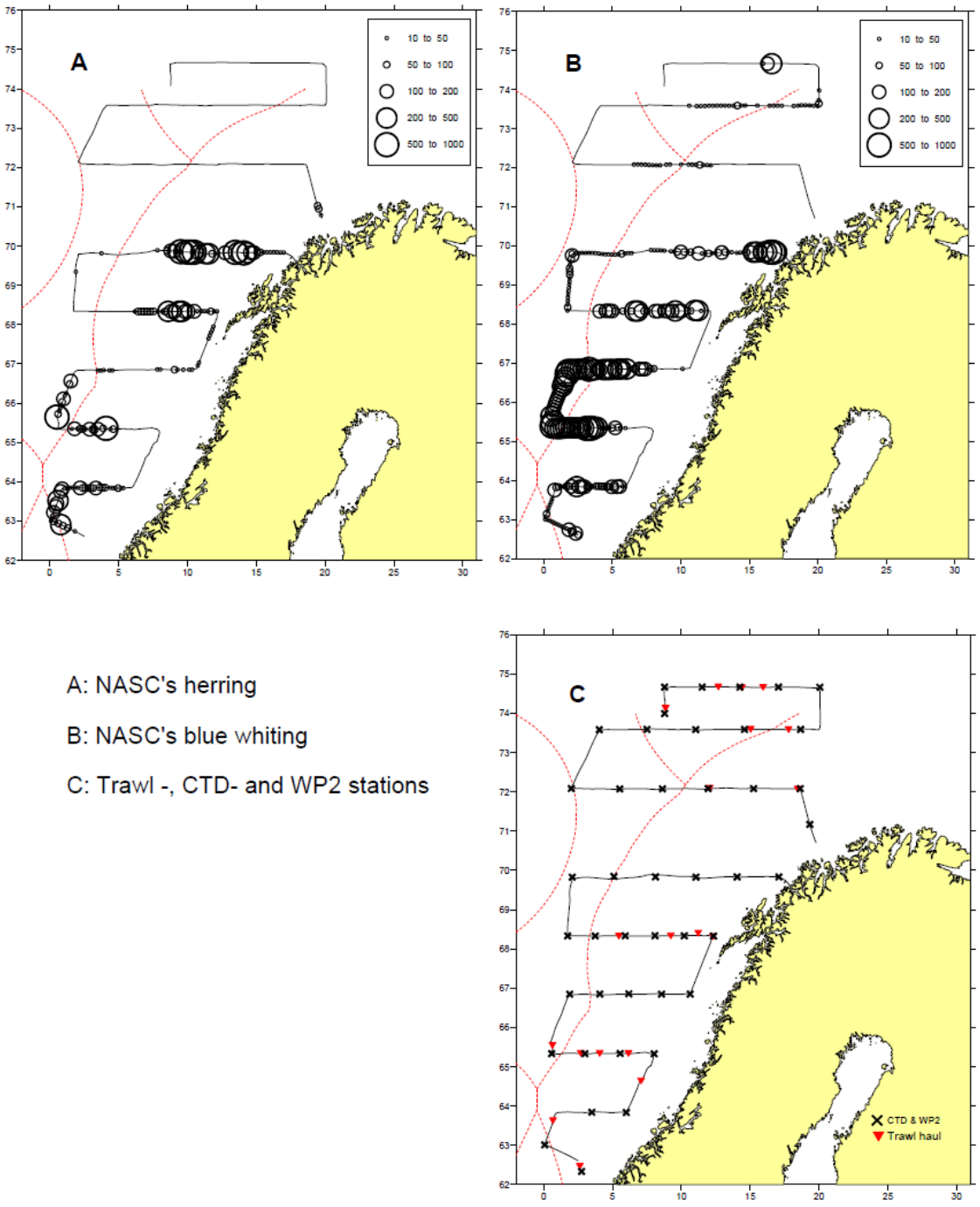
ASH – Atlanto Scandian Herring survey

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 R/V 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

See table 7C.

5. Explain where thresholds apply

No thresholds apply to the survey.

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 port inspection also checks and verifies logbook data for the specific trip when an inspection 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 administrational 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 concluded by estimating average prices per year, month, subdivision, and gear (if available). The system is dynamic in the sense that if a price does not exist on a certain level, e.g. price per gear, price per subdivision is used instead. If a price for the subdivision is not available price per month is used instead.

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

Averages prices is calculated from tripdata by values (see 2.). Meaning that they are weighted on the amout 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.

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 specific methodology when choosing the source of data. Economic data are available via balance sheets for each company. The balance sheet data is complemented by a postal census survey for all fishermen with a license. The survey is mandatory to fill in. Via the survey we obtain data on cost and capital variables as well as socio-economic data.

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. Data in registers at SwAM are available and used, and excess data needed, like some costs variables and capital values will be obtained in a census mail-survey to all fishermen with a license. Furthermore, social variables will be collected every third year, starting 2018, through a census mail-survey-. It is mandatory to reply. The survey will be send by letter-mail because it is the simplest and cheapest way. No e-mail addresses exist for the complete fleet 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. However, data is 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 is 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 is 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 logic. Since the data is on monthly basis no further checks can be done on administrational 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.

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.

Fisheries

The pilot study regarding fisheries is not applicable anymore due to the addition of the full scale socio-economic questionnaire with a census approach. See section 3A:2 for more details.

Aquaculture

1. Aim of pilot study

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

2. Duration of pilot study

Autumn 2016 – spring 2018

3. Methodology and expected outcomes of pilot study

Pilot study will be conducted in cooperation with Statistics Sweden. Expected outcome is that data on educational level is possible to attain by existing register, and will be collected in order to examine usuability. 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. Data will likely be collected through questionnaries (see Q2 in text box 3B).

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 acitivity 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. Q2 will also include a separate section concerning questions about social and environmental variables that are not possible to collect through official databases.
e. 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

Sweden has a production of over 1% of EU's total production but below 2,5% which gives us the possibility to collect social and economic data with a simplified methodology such as pilot studies with a view to extrapolate the data. Environmental data does not need to be collected according to current thresholds but we consider this information important and has decided to collect and report this data.

The reference data is Sweden's latest submission under Regulation (EC) No 762/2008 of the European Parliament and of the Council, and corresponding data published by Eurostat.

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 appropiate segment.

Considering the segmentation in table 9 (Commission implementing decision (EU) 2016/1251 adopting a multiannual Union programme for the collection, management and use of data in the fisheries and aquaculture sectors for the period 2017-2019) Statistics Sweden isevaluating which segments will be possible to report. Sweden has a small aquaculture industry and need to group species together. As a preliminary plan we will try to report salmon and trout together under Hatcheries and nurseries (1:8). Other freshwater fish will be reported under Ponds (8:1), Recirculation systems (8:4), Cages (8:6), Polyculture (8:7) and Hatcheries and nurseries (8:8). Mussels and Oysters will be reported together under Other (10:4) and Crustaceans will be reported under Other (13:4).

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 acitivity of the enterprise or not. Questionnaire 2 is used for make estimations on costs and social and environmental variables not included in tax declaration or other official databases. 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 as well as an estimate of the social variables. 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.

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 2017 – spring 2018

3. Methodology and expected outcomes of pilot study

Development of existing data collection on aquaculture production to include enivironmental 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. Data on treatments can probably be collected through official databases. Mortality needs to be included in the estimation questionnaire (Q2) see text box 3B.

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. Data on one variable (unpaid labour) will be based on an expert evaluation made by the component authority Statistics Sweden. The reason for this is that there is not possible to use any regular data collection scheme for that variable.

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 Statistics 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.

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 statistically sound sampling scheme (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 will continue to develop and implement 4S data collection 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)[1]

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 previous year	Vessel	Quarterly	random draw from vessel list with unequal probability (probability proportional to number of trips)	4 (per quarter)

[1] 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

				without replacement	
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: COD 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: 1.3%

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)[2]

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	Vessel	---	Random selection from quarterly vessel list	4 (per week) (*)

[2] 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

	fishery in all Baltic subdivisions previous year				
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)[3,4].

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

[3] In subdivision 23 priority will be given to at-sea data collection. Self-sampling being used if logistics, safety issues or refusals do not allow the implementation of at-sea sampling. Both landings and discards will be sampled. The remaining subdivisions will primarily be sampled through self-sampling. Sampling in 2016-2017 revealed a low percentage of discards in SD 24-29. In these areas cod below minimum landing size is usually landed. The landed BMS cod will be picked up by the self-sampling programme.

[4] 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.

Design: Multi-stage

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

Temporal Stratification: Quarterly

Spatial Stratification: Subdivision

All strata (if at-sea)

	Sampling frame	Sampling unit	Stratification	Selection Method	Sampling effort
1SU	List of vessels active in the gillnetter fisheries for demersal species in specific subdivisions during previous year	Vessel	Quarterly	Random sample from quarterly vessel list without replacement	Gillnets: 4 (per quarter)
2SU	Hypothetical list of weekly 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 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)

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 kept during fishing trip	Boxes	Species x Catch fraction x Commercial Size Category	Census or "random" sample by observer	Cod Landings: 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 weight 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 2018 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. 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 2018 set-up: 1 trawler active. In total, 12 métier sampling trips are planned. A 4S approach will be implemented in 2018 and then this sampling scheme will be replaced.

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. These samples are later processed by staff at SLU Aqua. Preliminary 2018 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 2018 set-up: In total, 15 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. All trips are now included in the sampling program whereas only 4 métier samplings were included previously in the WP.

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 year	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
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)

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 year	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.

Estimation: Estimates are carried out largely following ICES guidelines (e.g., WKDRP, WKPICS)

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

Future improvements: Most schemes were peer-reviewed by independent external experts in Nov/2016. A scheme-by-scheme work-plan for optimization and better approximating statistical sound sampling and estimation and end-user needs is currently being considered. Implementation of new designs is expected for 2019 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 *A. crassus.*

Main limitations: The mandatory statistics data is the catch and the corresponding effort, however with different resolution and aggregation depending on the lakes concerned. EU logbooks made for daily reports are not used for freshwater fisheries, instead freshwater catches are reported on monthly or annually basis depending on lake. Eel rescued from induced mortalities in hydropower installation through a Trap and Transport program are reported to SwAM by each fisherman as well as the fisher's 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 previous year	Vessel	Quarterly	random draw from vessel list with unequal probability (probability proportional to number of trips; draw without 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 (*)	Length: Census (random sample if too large)	Length: all individuals Biology:

			Biology: also 1cm length classes	Biology: Census (random sample if too large); sampling stops when trip goals are achieved	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)

(*) 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 year	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 categories are sampled per trip)	1 size category
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 year	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 year	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 targets are achieved	400 individuals per Quarter and Subdivision

Danish landings of Pandalus shrimps

Danish vessels landing *Pandalus borealis* in Swedish ports are sampled whenever possible.

Main limitations: Lack of control over selection procedures

Expected difficulties: None (assuming first hand buyers continue to cooperate and significant landings take place)

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

- SWE - SkaKat (stock spec)- Act - 20 – HerSpr: 33.8%
- SWE - SkaKat (stock spec)- Act - 21 – HerSpr: 29.4%
- SWE - SkaKat (stock spec)- Act - 20 – Cod: 5.3%
- SWE - SkaKat (stock spec)- Act - 21 – Cod: 9.8%

All Schemes:

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.

Estimation: Estimates are carried out largely following ICES guidelines (e.g., WKDRP, WKPICS)

Quality: No significant biases have been identified so far; Data are routinely used by end-users

Future improvements: Most schemes were peer-reviewed by independent external experts in Nov/2016. A scheme-by-scheme work-plan for optimization and better approximating statistical sound sampling and estimation and end-user needs is currently being considered. Implementation of new designs is expected for 2019 onwards.