

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

2019

Updated

Work Plan period 2017-2019

## **Responsible National Bodies for implementation of Work Plan**

*National Institute for Aquatic Resources, DTU Aqua*

*in cooperation with*

*Danish AgriFish Agency, NAER*

*Institute of Food and Resource Economics, IFRO*

*Statistics Denmark, DST*

Copenhagen 31<sup>st</sup> October 2018

**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



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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.*

#### 1. Aim of pilot study

Recreational fisheries are increasingly getting recognized as potential important components of the stock assessment and management, however presently only used in very few stock assessments in the European waters. In the Baltic Sea the only stock assessment implementing recreational fisheries data is the one for western Baltic cod (*Gadus morhua*) which at present, only includes German recreational fisheries data. The probability that Danish and partly the Swedish recreational fisheries contribute significantly to the fishing mortality severely impairs both assessment and management.

In Denmark, marine recreational fishers are subjected to hold a valid license. Anglers - domestic as well as tourists - between 18 and 65 years of age have to purchase a license for a year, week or day. All passive gear fishers have to have an annual license and you are not allowed to fish before the age of 12. The license is personal and non-transferable. However self-reporting and hence information on e.g. gear used, platform or catches (retained and released fish) is not available. Since 2009 Danish recreational catches of cod (*Gadus morhua*), eel (*Anguilla anguilla*) and sea trout (*Salmo trutta*) and since 2015 salmon (*Salmo salar*) and sharks have therefore been estimated based on an interview based recall survey which is conducted by DTU Aqua in cooperation with Statistics Denmark.

The aim of the current pilot study is to improve the accuracy of the catch estimates from the interview based recall survey for western Baltic cod and Baltic salmon. Hereunder verify and potentially tune the estimated reported landings in the recall survey and to include biological parameters (length, weight and age) for cod in the Sound (ICES SD23) and Salmon in the Baltic (ICES SD24-25) to be able to include the data in the respective stock assessments.

[The first pilot study was conducted in the time period from mid 2016 to end of 2018. The results from this study will be evaluated in the ICES WGRFS and in the benchmark WKBALT in 2019. This pilot study has been carried out and funded outside the DCF.](#)

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#### 2. Duration of pilot study

[Relevant part of the pilot study will be included as part of standard DCF in 2019. This is mainly the biological and catch data from on-site survey on cod \(western Baltic\) and salmon \(Baltic\).](#)

[The pilot study runs from 1/1 2019 to 31/12 2021.](#)

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

The catch data used for verification and tuning is collected from different types of on-site surveys and sampling methodologies in 3 different ICES Subdivisions for the 2 target species; cod and salmon. The sampling designs and effort will be evaluated and potentially adjusted throughout the study based on preliminary results. The study is assumed to feed directly into the stock assessment work of western Baltic cod and Baltic salmon and in general contribute to the management for the recreational fisheries of cod and salmon.

**Specific tasks and methods:**

- Sampling design – Cod ICES SD23
  - A combined on-board/access-point survey targeting charter vessels (boats taking up to 70 persons where anglers join by buying a ticket), boat ramps and harbours. The Danish recreational passive gear fishing in the Sound is by the existing recall survey estimated to be negligible regarding cod catches and therefore not included in the pilot study. Charter boats: The sampling design is probability based i.e. sampling is proportional to the number of anglers on the charter vessels.
    - Sampling frame is a list of Danish fishing charter vessels in the Sound.
    - Stratified sampling effort by quarter. Effort, catches (retained and released), length and age information will be collected during on-board surveys.
  - Private boats: The sampling design is probability based i.e. the sampling effort is done proportional to the number of launches from the boat ramps and private boats afloat in the harbours.
    - Sampling frame is a list of the most active access-points in terms of boat ramps and harbours having smaller private boats afloat
    - Stratified sampling effort by quarter. Effort, catches (retained and released), length and age information will be collected on the access-point surveys.
- Sampling design – Salmon ICES SD24 – 25
  - An access-point survey targeting private boats (trolling fishing) boat ramps and harbours. The Danish recreational fishing for salmon in the Baltic is dominated by angling (trolling fishing) The passive gear fishing for salmon in ICES SD24 - 25 is assumed to be negligible and therefore not included in the pilot study. The same is assumed to be the case with land-based angling for salmon.
  - Private boats: The sampling design is probability based i.e. the sampling effort is done proportional to the number of launches from the boat ramps and private boats afloat in the harbours.
    - Local authorities (ports bailiffs) will be questioned with regards to data they make have on seasonal launches from the boat ramps and occupation rates of smaller vessels in the harbours.
    - Sampling frame is a list of access-points in terms of boat ramps and harbours having smaller private boats afloat
    - Effort, catches (retained and released), length and age information will be collected on the access-point surveys

**Outputs:**

The results of the different surveys will be evaluated and methodology and sampling effort adjusted if necessary. The preliminary results will be presented and discussed at WGRFS in 2019 and data from the pilot study will be presented for the ICES assessment working groups WGBFAS and WGBAST in 2019. Off-site recall survey data and on-site data will be compared to try and establish a tuning to the off-site recall catch data time series.

*(max 900 words)*

## 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.*

#### **Salmon spawning-run**

The spawning-run of salmon will be assessed in the four rivers in Denmark with indigenous salmon; River Ribe, River Varde, River Skjern and River Stora. The assessment in each river will be done by the *Mark/recapture* method during November – December. The fish will be caught by electrofishing and tagged with passive integrated tags (PIT) and Panjet. Each river/population will be assessed bi-annually.

#### **Population density of ½ -yearlings and 1+ salmon**

The population density of ½ -yearlings and 1+ salmon will be assessed in the four rivers in Denmark with indigenous salmon; River Ribe, River Varde, River Skjern and River Stora. In the smaller parts of the rivers the assessment will be done by the *removal method*. In the larger parts of the rivers where this method is not feasible the *Mark/recapture* method will be used. The fish will be caught by electrofishing and tagged with Panjet. The investigations will be done during August – September and each river/population will be assessed every fourth year.

#### **Salmon smolt-run**

The salmon smolt-run from River Skjern will be assessed once every fourth year. The *Mark/recapture* method will be used. The smolts will be caught in rotary-screw traps and and tagged with Panjet. The investigation will be done during March – June.

#### **Monitoring of elver-run**

In three sites the elver-run will be monitored. In Hellebækken and River Gudena elvers will be caught by traps, providing a relative index of the size of the run.

In Vester Vedsted assessment will be done by electrofishing, providing a relative index.

The investigation will be done during spring.

#### **Monitoring of Silver eel-run**

In three sites the silver eel-run will be monitored. In two rivers silver eel will be caught in traps; River Gudena (partial trap ~ 40 %) and River Klitmøller (100 %), providing absolute numbers of the runs in these two river systems. The investigation will be done during autumn.

In River Ribe, silver eels will be caught in a fyke-net. The efficiency of the fyke-net is known from previous studies, thus this will provide an absolute number of the silver eel-run in River Ribe.

The investigation will be done during autumn.

## 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.*

#### **Ref: 3.b. Impact of fisheries on marine habitats**

For assessing the impact of fisheries on marine habitats (ref: 2016/1251Chapter 3, 3 (b)), a routine has been set up using a combination of VMS/AIS and logbook, sales notes and vessel register data (DFAD). For creating the DFAD dataset, the sales notes information is distributed on the logbook data using the logbook ID and species information. In addition the vessel register is added using the vessel-id and landing date. For trips from vessels without logbooks, sales notes are available. For these trips, the métiers are estimated using the species composition of the landings, knowledge about the métiers used in the same area and auxiliary data.

The VMS/AIS data are merged with DFAD data using vessel-id and fishing date to get information on the gear used as well as the DCF métier. Depending on the gear type, a speed filter where fishing activity is assumed is applied to the combined DFAD/VMS/AIS data to estimate the fishing activity on a high spatial resolution that can be compared with the habitat mapping. Using these data fishing effort as well as weights and values of species landed within an area can be estimated by gear or métier.

The VMS data are available for vessels larger than 12 m from 2012 and onwards. For the years 2005-2011 it is available for vessels larger than 15 meters.

The AIS data have been provided by the Danish Maritime Agency, and is mandatory for vessels larger than 15 meters, but smaller vessels can have it on a voluntary basis.

DTU Aqua has worked with methods to assess the benthic impact of fisheries through the EU FP-7 BENTHIS project (Eigaard et al, 2016). These methods have also been applied in ICES WGSFD for estimating total fishing impact (Surface and Subsurface swept area ratio's) from ICES member states.

Reference:

Eigaard OR, Bastardie F, Breen M, et al. (2016) Estimating seabed pressure from demersal trawls, seines and dredges based on gear design and dimensions. ICES Journal of Marine Science, 73: i27-i43

#### **Ref: 3.c. Predator-prey relationship**

As no data main user has defined a data need for estimating predator-prey relationship and in accordance to agreements made during the RCM Baltic 2016 and the RCM NS&EA 2016 no stomach sampling will be carried out in 2019.

*(max 900 words)*

## 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.*

Text Box 1G: List of research surveys at sea

The DTU Aqua command three fisheries research vessels. The R/V DANA is a 2483 GRT stern trawler with a length of 78 meters. The other Danish research vessel is R/V HAVFISKEN, a 105 GRT stern trawler with a length of 17 m. The third research vessel is Egon P. having a length of 9.9 m and 8 GRT, and which working area is restricted to coastal and inner Danish waters.

R/V DANA allows in principal 24 hour operation for almost all types of survey whereas this is not possible with R/V Havfisken for trawl surveys and not for R/V Egon P. at all.

The monitoring surveys with research vessel are supplemented with surveys using commercial vessels whenever appropriate.

#### **Baltic International Trawl Survey (BITS Q1, BITS Q4)**

##### 1. Objectives

The main aim of the BITS ground-trawl survey, conducted twice per year, i.e. in February-March and November-December is monitoring of the spatial distribution and abundance of cod, flounder, sprat and herring recruiting year-classes, and other less numerous fish species spatial distribution in a bottom zone of particular the ICES Subdivisions (the Baltic Sea), taking into consideration the principal hydrological parameters vertical and horizontal variations. Moreover, the survey is focused on evaluation of the fishing efficiency (catch per unit of effort; cpue), and analysis of the Baltic ichthyofauna biodiversity as well as on sampling materials for the main species principal biological parameters of main fish species.

##### 2. Methods and survey area

The sampling procedures are described in:

<http://www.ices.dk/sites/pub/Publication%20Reports/ICES%20Survey%20Protocols%20%28SISP%29/SISP%207%20-%20Manual%20for%20the%20Baltic%20International%20Trawl%20Surveys%20%28BITS%29.pdf>.

The survey area allocated to Denmark is shown in Figs. 1G.1 and Figs. 1G.2. However, station allocation may change between years depending on agreements of the international coordination group.

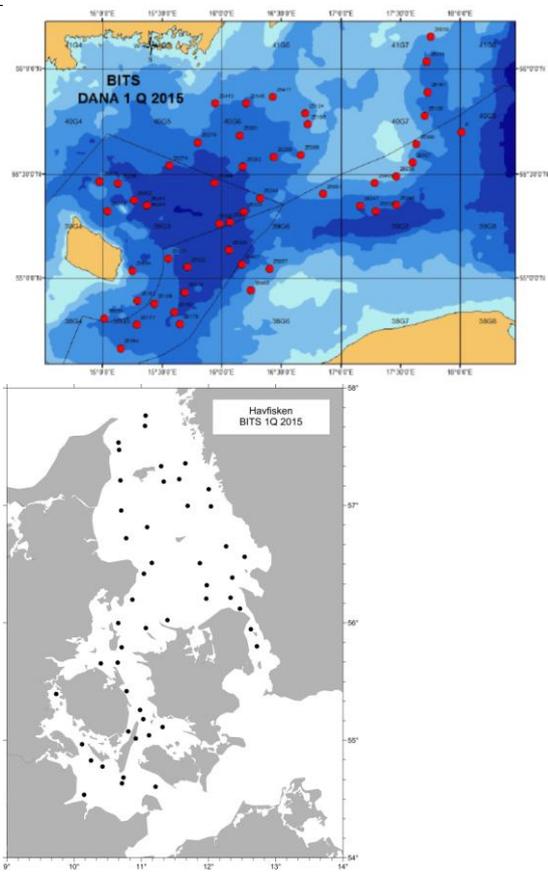
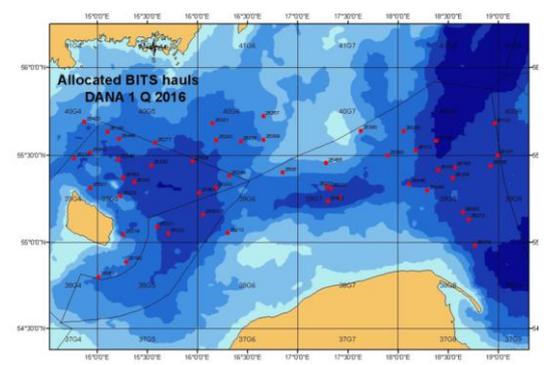


Fig. 1G.1: BITS Q1 Bottom trawl and CTD stations a) RV Dana in ICES area 3d and b) RV Havfisken in areas 3aS, 3b and 3c.



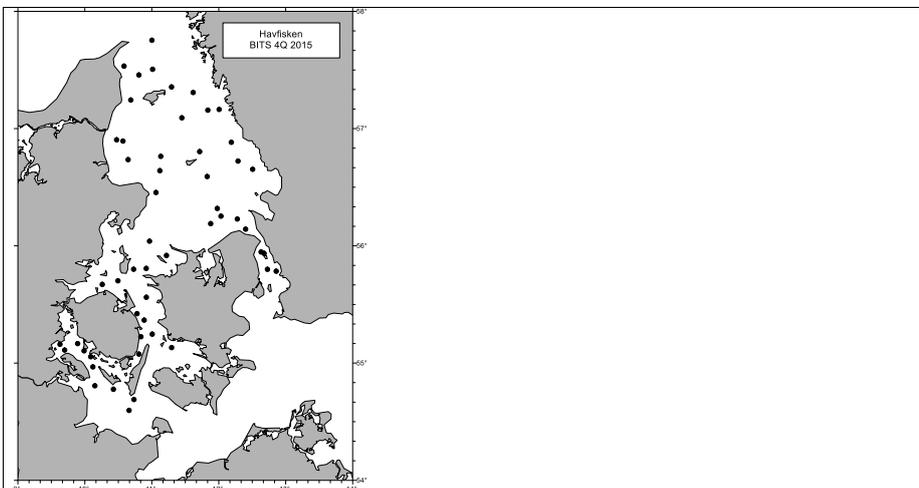


Fig. 1G.2: BITS Q4 Bottom trawl and CTD stations a) RV Dana in ICES area 3d and b) RV Havfisken in areas 3aS, 3b and 3c.

### 3. Planning

Eight countries are participating in BITS survey: Denmark, Germany, Poland, Sweden, Latvia, Lithuania, Estonia and Russia. The planning and coordination is done by ICES WGBIFS.

#### **International Bottom Trawl Survey (IBTS Q1, IBTS Q3)**

##### 1. Objectives

The main objectives of the North Sea IBTS are:

- To determine the distribution and relative abundance of pre-recruits of the main commercial species with a view of deriving recruitment indices;
- To monitor changes in the stocks of commercial fish species independently of commercial fisheries data;
- To monitor the distribution and relative abundance of all fish species and selected invertebrates;
- To collect data for the determination of biological parameters for selected species;
- To collect hydrographical and environmental information;
- To determine the abundance and distribution of late herring larvae (February North Sea survey).

##### 2. Methods and survey area

The sampling procedures are described in:

[http://www.ices.dk/sites/pub/Publication%20Reports/ICES%20Survey%20Protocols%20\(SISP\)/SISP%2010%20-%20Manual%20for%20the%20International%20Bottom%20Trawl%20Surveys%20-%20Revision%20IX.pdf](http://www.ices.dk/sites/pub/Publication%20Reports/ICES%20Survey%20Protocols%20(SISP)/SISP%2010%20-%20Manual%20for%20the%20International%20Bottom%20Trawl%20Surveys%20-%20Revision%20IX.pdf).

for the trawl catches, and:

[http://www.ices.dk/sites/pub/Publication%20Reports/ICES%20Survey%20Protocols%20\(SISP\)/SISP%202%2](http://www.ices.dk/sites/pub/Publication%20Reports/ICES%20Survey%20Protocols%20(SISP)/SISP%202%2)

[OMIK2.pdf](#).

for the sampling of herring larvae. However, both manuals are currently under revision to adopt changes implemented in the most recent years.

The survey area allocated to Denmark is shown in Fig. 1G.3 and Fig. 1G4. However, area and station allocation may change between years depending on agreements of the international coordination group.

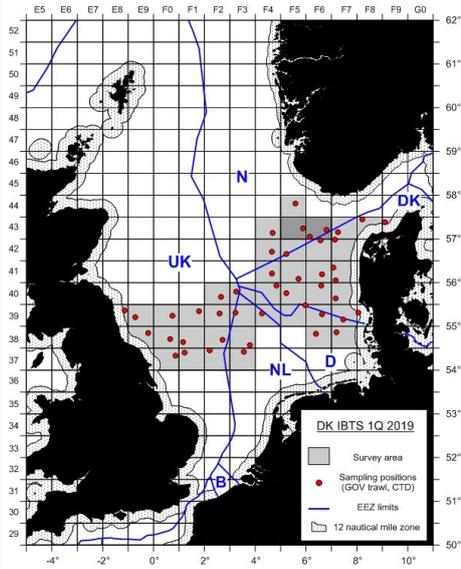


Fig. 1G.3: IBTS Q1 survey area for RV Dana in ICES areas 3a, 4a and 4b (2 MIK stations per rectangle for collecting herring and sprat larvae are not shown on the map).

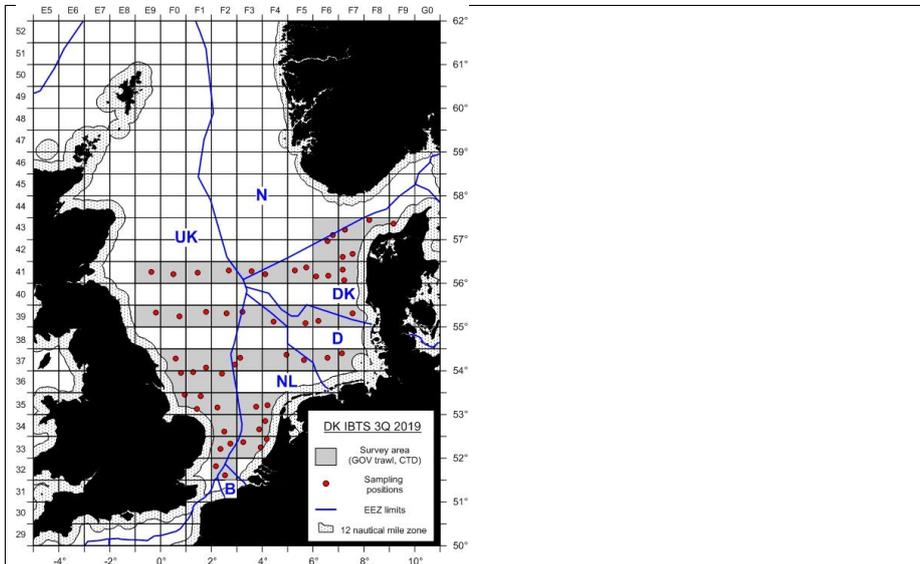


Fig. 1G.4: IBTS Q4 survey area for RV Dana in ICES areas 3a, 4a and 4b.

### 3. Planning

Seven countries (Denmark, France, Germany, Netherlands, Norway, Scotland and Sweden) are participating in the NS IBTS Q1 and six countries (Denmark, England, Germany, Norway, Scotland and Sweden) are participating in the NS IBTS Q3. The planning and coordination is done by ICES IBTSWG.

#### North Sea Sandeels Survey (NSSS)

##### 1. Objectives

Improve the scientific advice on sandeel scientific advice on sandeel and should be the basis for setting a preliminary index for the sandeel fishery for the coming year. Data from the dredge survey is the basis for calculating a 0-group index, which is used in stock assessment. The survey is conducted with a commercial fishing vessel.

##### 2. Methods and survey area

The sampling of sandeels is conducted with a modified scallop dredge and sediment samples are taken with a Van Veen grab. The sampling locations are shown in Fig. 1G.5.

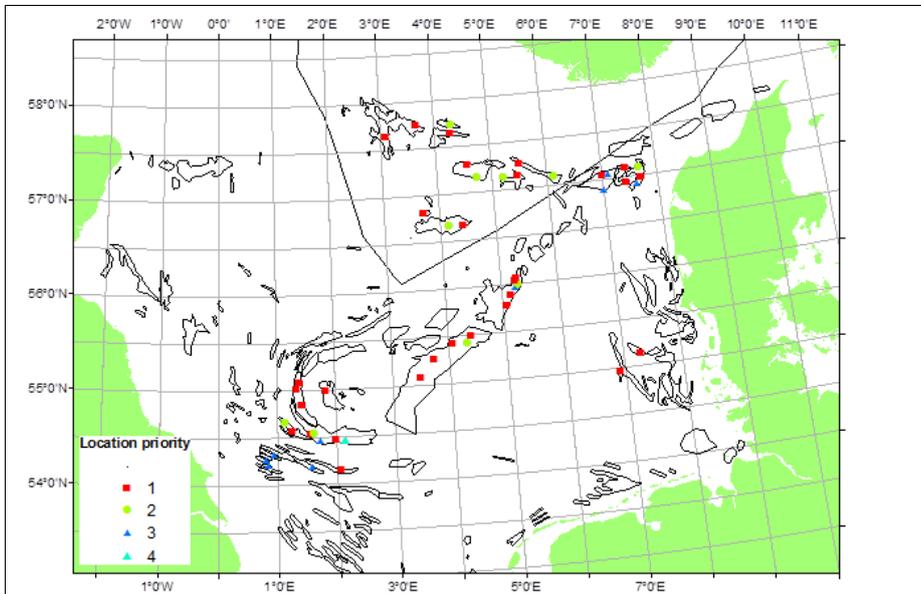


Fig. 1G.5: Danish sandeel survey sampling locations in ICES areas 4a and 4b.

### 3. Planning

Planning is done on a national level. The survey results are presented to ICES WGSSK.

#### **International Ecosystem Survey in the Nordic Seas (ASH; alternative abbr. IESSNS)**

##### 1. Objectives

This survey is carried out in order 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 for the ICES Working Group on Widely Distributed stocks (ICES WGWIDE). 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. Methods and survey area

The sampling procedures are described in:

[http://www.ices.dk/sites/pub/Publication%20Reports/ICES%20Survey%20Protocols%20\(SISP\)/SISP%209%20Manual%20for%20International%20Pelagic%20Surveys%20\(IPS\).pdf](http://www.ices.dk/sites/pub/Publication%20Reports/ICES%20Survey%20Protocols%20(SISP)/SISP%209%20Manual%20for%20International%20Pelagic%20Surveys%20(IPS).pdf).

The survey area allocated to Denmark is shown in Fig. 1G.6.

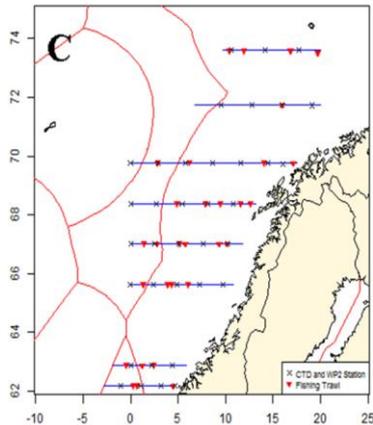


Fig. 1G.6: RV Dana 2015 sailed transects, pelagic trawl, CTD and WP2 stations in ICES area 2a.

### 3. Planning

The survey is coordinated with Norway as an international survey with participation of Norway, Iceland, Faroe Islands and EU, where the Danish R/V Dana conducted the EU survey part. Planning and coordination is done by ICES WGIPS.

### NS Herring Acoustic Survey (NHAS)

#### 1. Objectives

The purpose is to provide acoustic abundance estimates of herring and sprat in the North Sea (eastern part), Skagerrak and Kattegat.

#### 2. Methods and survey area

The sampling procedures are described in:

[http://www.ices.dk/sites/pub/Publication%20Reports/ICES%20Survey%20Protocols%20\(SISP\)/SISP%209%20Manual%20for%20International%20Pelagic%20Surveys%20\(IPS\).pdf](http://www.ices.dk/sites/pub/Publication%20Reports/ICES%20Survey%20Protocols%20(SISP)/SISP%209%20Manual%20for%20International%20Pelagic%20Surveys%20(IPS).pdf).

The survey area allocated to Denmark is shown in Fig. 1G.7.

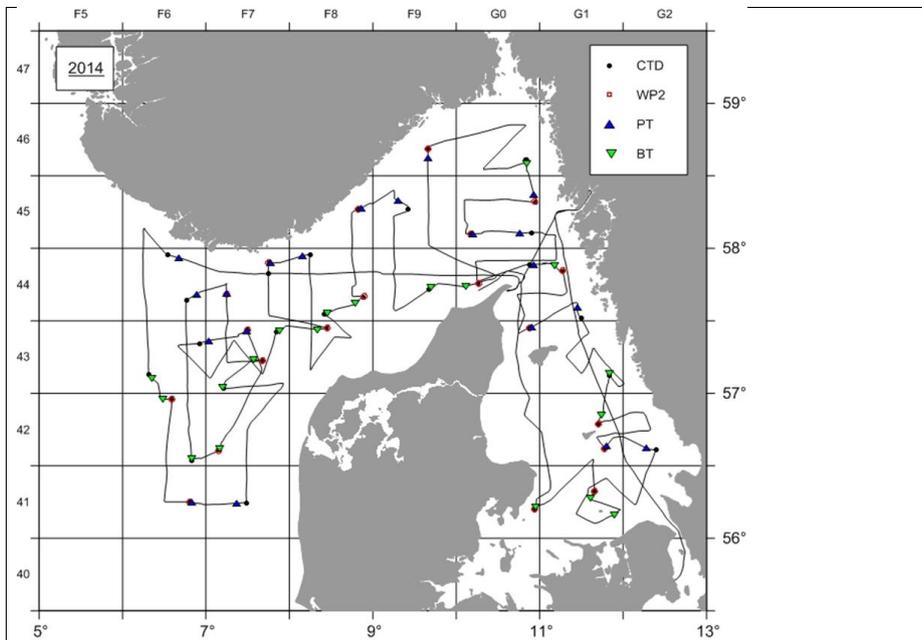


Fig. 1G.7: RV Dana NHAS 2014 survey track, trawl locations (blue triangles: pelagic trawl, green triangles: bottom trawl) and CTD as well as plankton (WP2) sample positions in area 3a, 4a and 4b.

### 3. Planning

The survey is coordinated by the ICES Working Group for International Pelagic Surveys, WGIPS, and is a part of the international acoustic survey of the North Sea and adjacent areas which are covered by Germany, Ireland, the Netherlands, Norway and Scotland.

#### **Nephrops TVsurvey in FU 3 & 4 (NTV3&4)**

##### 1. Objectives

The purpose of the survey is to estimate the abundance of Nephrops in the Skagerrak and the Kattegat (Functional units 3 and 4).

##### 2. Methods and survey area

An underwater video technique is used and later the video footage is analysed in laboratory to estimate the Nephrops abundance in selected subareas. The survey area allocated to Denmark is shown in Fig. 1G.8.

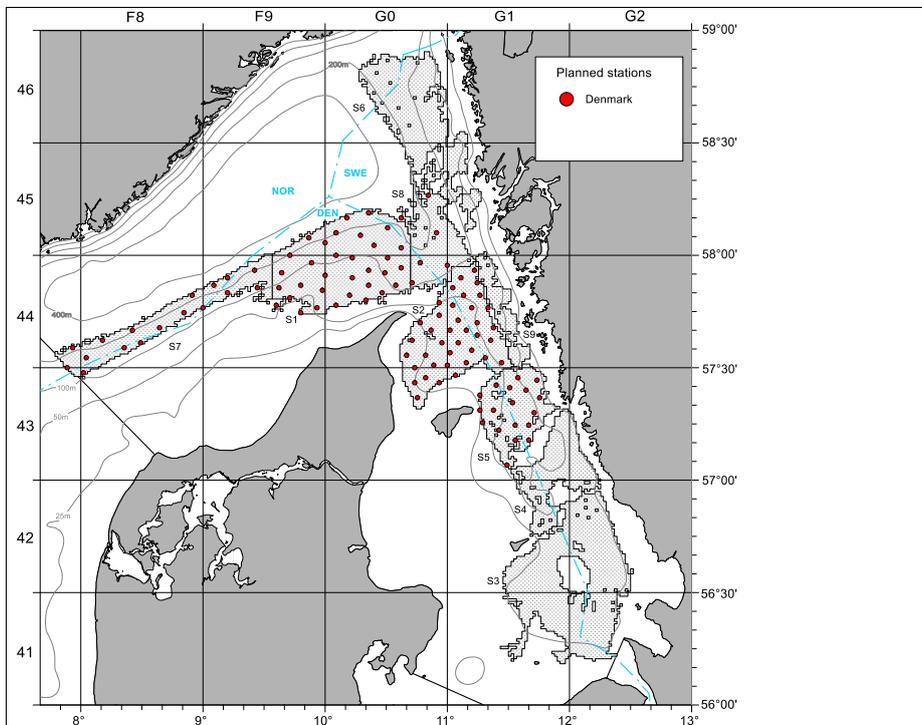


Fig. 1G.8: NTV3&4 sampling locations covered by Denmark with RV Havfisker in area 3a (Strata S3, S4, S6 and S9 are currently allocated to Sweden).

### 3. Planning

Survey planning and data analysis is conducted in close cooperation with Sweden and coordinated by ICES WGNEPS.

#### Flatfish survey in the Kattegat and Skagerrak (FFS)

##### 1. Objectives

Establish a time series of catch and effort data independent of the commercial fishery for sole and plaice in the Kattegat and the southern Skagerrak. The survey has been initiated in 2004 and provides currently the main input data set for the 3a sole assessment.

##### 2. Methods and survey area

So far, the survey has been conducted using two commercial fishing vessels in parallel. In the future, the survey shall be conducted with RV Havfisker using the same commercial flatfish trawl as before. The survey area is indicated in Fig. 1G.9.

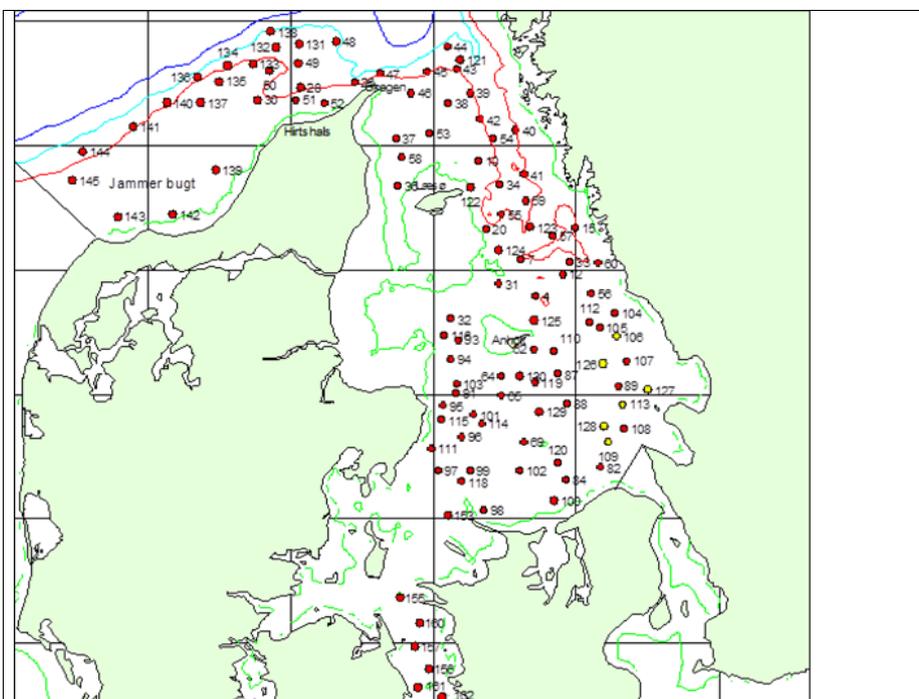


Fig. 1G.9: Survey area and provisional station allocation for the flatfish survey with RV Havfisken in area 3a.

### 3. Planning

Planning occurs on a national level and the survey results are provided to WGBFAS.

#### **Nephrops TVsurvey in FU 33 (NTV33)**

##### 1. Objectives

The purpose of the survey is to estimate the abundance of Nephrops off Horns Rev (Functional unit 33). The survey has been stated in 2017 as no fishery-independent information existed for this area.

##### 2. Methods and survey area

An underwater video technique is used and later the video footage is analysed in laboratory to estimate the Nephrops abundance. The survey area is indicated in Fig. 1G.10.

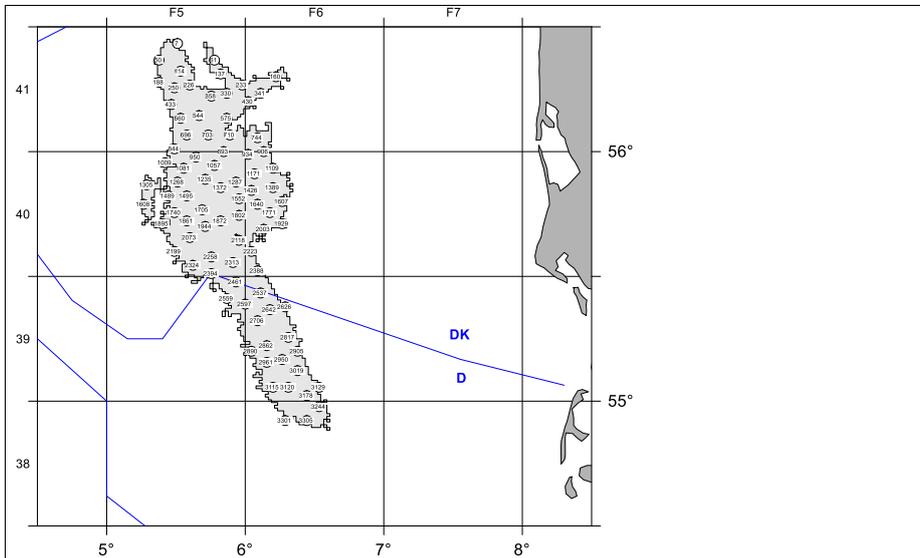


Fig. 1G.10: NTV33 survey area to be covered by Denmark with RV Havfisken in area 4b.

### 3. Planning

Survey planning and data analysis is coordinated by ICES WGNEPS.

#### Mussel and oyster surveys in Danish coastal waters (MO-SUR)

##### 1. Objectives

Stock surveys for blue mussels (*Mytilus edulis*) and flat oysters (*Ostrea edulis*) in the Limfjorden and the Little Belt. The surveys have been initiated 1993 and provide the main input data for the environmental impact assessments for mussel and oyster fisheries in Natura 2000 sites.

##### 2. Methods and survey area

The survey in Limfjorden has been conducted using DTU Aquas old RV “Havfisken”, whereas a commercial fishing vessel has conducted the survey in The Little Belt. Since 2017 the surveys has been conducted with new RV Egon P using the same fixed station grids as before.

##### 3. Planning

Planning occurs on a national level and the survey results are provided for the management of the shell fish stocks in the Limfjorden and the Little Be In 2017, the Limfjorden was surveyed as planned but no sampling was carried out in the Lille Belt. Instead sampling was conducted in Horsens Bight in order to follow a change of the distribution of the commercial fishery. The current survey area is indicated in Fig. 1G.11.

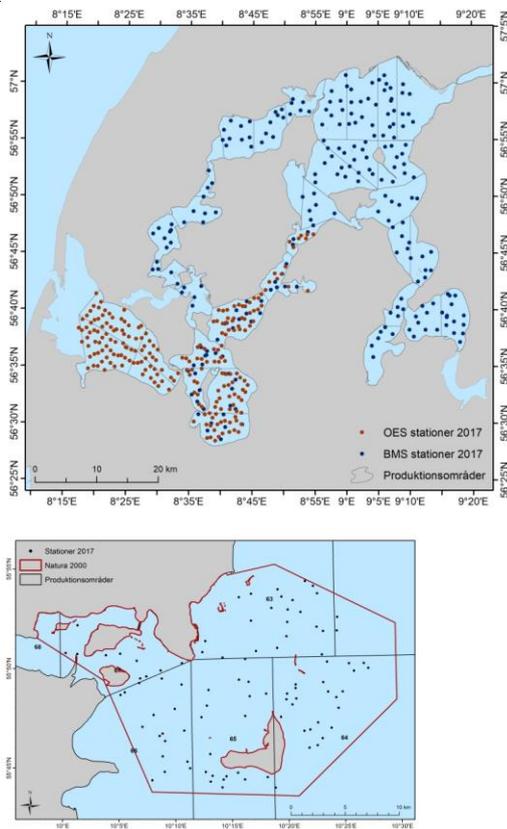


Fig. 1G.11: Area for the Danish MO-SUR survey with RV Egon P (OMS: oyster, BMS: blue mussel).

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

Not applicable.

5. Explain where thresholds apply

No threshold has been applied.

#### Cod survey in 3aS (CODS\_Q4)

1. Objectives

The survey is a combined Danish- Swedish fisherman-scientist survey. The goal of the Kattegat cod survey is to estimate the abundance, biomass and distribution of cod and to establish a fisheries independent time series of catch and effort series. Furthermore, a recruitment index is established. The results has for the first time in

2015 been used, together with commercial catch and effort data, to strengthen the scientific advice on the cod stock in Kattegat.

## 2. Methods and survey area

Initially, 4 commercial trawlers (2 Swedish and 2 Danish vessels) participated in the survey. In 2016, Sweden continued to use commercial vessel whereas Denmark used the new research vessel RV Havfisker but with the same trawl as previously on the commercial vessels.

In 2017, the Danish part of the survey was combined with the BITS Q4 survey but in the future it will be kept separate again to allow better overlap in the timing with the Swedish part of the survey. The survey area is shown in Fig. 1G.12.

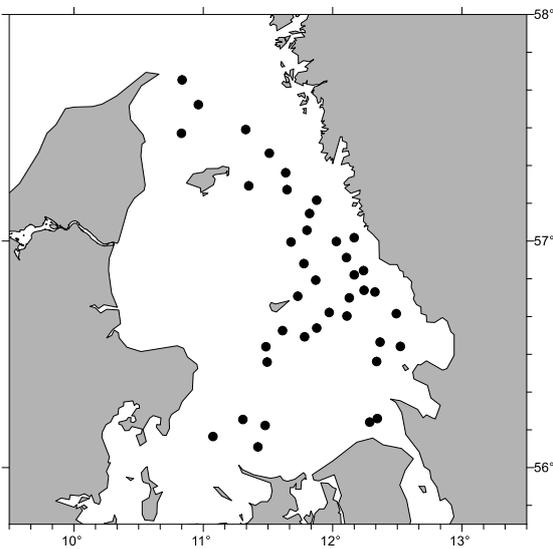


Fig. 1G.12: Area for the Danish CodS\_Q4 survey with RV Havfisker.

## 3. Planning

Survey planning and data analysis is conducted in close cooperation with Sweden and the survey results are provided to WGBFAS.

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

Not applicable.

5. Explain where thresholds apply

No threshold has been applied.

*(max 450 words per 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.**

Every night, Logbook-, Sales notes and VMS data are transferred from the Danish AgriFish Agency to DTU Aqua via a secure FTP connection. Therefore these data are available immediately for data checking and cross validating with the sampled data.

From at-sea sampling trips, the logbook sheet number is registered. Information from the observer trip can then be cross-validated with the data entered in the logbooks and the sales notes. From at market sampling, the vessel-id and the landing date is registered, and is used for cross-validating with sales notes and logbook data, e.g. if the gear, mesh size and ICES rectangle are correct or if information are missing.

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

The value of landings are taken from directly from the sales notes data register (census data). The sales notes are merged with the logbook data by trip and vessel register to estimate values of landings by e.g. gear.

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

Average prices can be calculated directly from the sales notes register as the sales notes are census..

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

As census data are collected, not additional data collection is needed.

*(max 900 words per Region)*

## 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**

Data on landings (sales notes, species, quantity and value), fishing vessels (type, size, etc.) fishing activity (logbook, days, gear and fishing area), and vessel owners (fishermen, fishing firms) are registered continuously during the year. During the first quarter of the year after recording the administrative registers are combined and corrected for mismatch and errors. At the beginning of April the Danish Agrifish Agency produces a final “frozen” version of the registered data, where all data for a vessel version (vessel with same owner) is combined and aggregated. The aggregated data is delivered to Statistics Denmark for statistical use. Thus information on fishing activity and production for the year is available for each vessel version, that is a vessel with the same owner/fisherman from date of purchase until sale/decommission. Statistics Denmark combines the vessel versions to form the production units, which is a “vessel” from January 1<sup>st</sup> to December 31<sup>st</sup>. These units constitute the total fishery population for the year.

Data on fishing rights is also registered. All transactions of ITQ’s (Individually Transferable Quota) and VQS’s (Vessel Quota Share) are registered by date and vessel identity on the Register on fishing rights. That information is used together with estimated shadow prices for each quota stock to calculate the capital value of fishing rights for each production unit.

Economic data is collected by Statistics Denmark using a harmonized accounting form for fisheries.

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

The legal entity/person responsible for economic data is the fisherman or fishing firm, who usually use an authorized accountant to produce their yearly account and balance. In order to get the most reliable economic data we confide in the fisherman’s accountant to complete the harmonized accounting form, and compensate her for the performance.

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

The entire population is segmented according to the DCF requirement (Supra region, Fishing technique, Length class) and each segment stratified into 7 groups on economic size. Group 0 (inactive) and 1 (revenue below threshold) are treated separately, as there are no accounts to be collected for these units. For group 2 to 6, the commercially active vessels (about 550 production units), a sample of 275 accounts are collected on a voluntary basis. The sample is not stochastically drawn from the stratified publication, because most of the bigger companies have great variation in economic terms which makes it difficult to represent them by other companies. We get a better sample by using a panel which consists of the 100 biggest production units plus a representative sample of the rest of the population. About 10 per cent of the sample is renewed each year.

The large sample, about half of the units in the population over the threshold, covers more than 80% of the total revenue, which means that estimation of cost etc. is limited to less than 20% of the production. For instance for

the year 2015 the 277 accounts in the sample had a total revenue of 380 Mio Euro, which was 84 per cent of the total value of landings for Danish fishery in 2015.

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

Individual accounts are simulated for each unit in the population that is not in the sample. These simulations are done by selection of one to three “donors” from the sampled accounts, that are valued to be best possible replacement for the simulated unit, and calibrate the average of the one to three selected matching units, to equal the registered revenue of the simulated unit.

The simulations are performed using a BANFF MASSIMPUTATION model in SAS. Donors are matched according to known registered data for catches on selected species, crew size, engine power and days at sea in Ices III and Ices IV. Some accounts for units in the sample that had extraordinary events during the year may be excluded from the basis for simulation.

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

The most important quality check lies in the scrutinized analysis of the individual accounts for each production unit. All variables have to be right to balance the account correctly. Also the contents of all variables are assessed and evaluated by comparing with related variables and last years account for the same unit.

*(max 900 words per Region)*

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.*

**1. Aim of pilot study**

To fulfil the requirements of the Commission decision (EU) 2016/1701 of 19. August 2016 by collecting data on employment in fisheries and aquaculture by education level and nationality.

**2. Duration of pilot study**

During 2018 (possibly April to September)

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

Methodology to be decided. Possibly a questionnaire distributed by the Danish Agrifish Agency to all Danish fishing firms and fishermen that are employers. The obligation to complete the questionnaire should be laid on the legal person responsible for the fishing firm or aquaculture company.

Provisional suggested draft of Questionnaire on employment by education level and nationality.

<b>Fishing firm or fisherman</b>					
<b>Number in Central Business Register:</b>					
<b>Fill in a column for each person</b>					
<b>working in the fishing firm during 2017 :</b>	<b>Person 1</b>	<b>Person 2</b>	<b>Person 3</b>	<b>Person 4</b>	<b>Person 5 ...</b>
Gender F/M/Unknown					
Age (July 1st 2017)					
Nationality DNK/EU/EEA/other					
Education level ?/?					
Paid /unpaid					
Number of hours worked					
Employment status ?					

Note: The criteria for data on education level and employment status are not yet specified in the DCMAP.

The allocation of all data from the questionnaire to a specific vessel segment will not be straightforward, as we know, that 16 fishing firms operates more than one active vessel in different vessel segments in 2015. Those firms may have employees working on different vessels during the year. Also some persons may be working in several fishing firms during the year.

(max 900 words)

## 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**

Whenever register data are available for a variable these are preferred as they originate from a census type data collection scheme and contain information on all elements of the population. This is the case for the economic variables *Gross sales* and *Weight of sales*. All other economic variables are collected by Statistics Denmark by non probability sample survey using a harmonized accounting form for aquaculture enterprises.

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

The economic variables *Gross sales* and *Weight of sales* are submitted mandatorily as they are also used for other statistical purposes. All other economic variables are collected on a voluntary basis. Theoretically a probability sample survey would be preferable, but as the population is quite small, particularly in some segments, all volunteers are accepted even though that results in a non probability sample survey.

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

The sampling frame consists of all commercially active aquaculture companies in Denmark. The population is allocated into segments by production method and produced species. This forms four internally homogenous segments and one smaller rest segment.

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

Register data are combined with the data obtained from the sampled accounts to estimate the value of the economic variables for companies that is not included in the sample. The stratified imputation based on linear regression enables us to impute complete accounts for all members of the population.

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

The register data for *Gross sales* and *Weight of sales* are checked for outliers and compared to the data obtained from the sampled account sheets. The data for all other economic variables are submitted in balanced account sheets. This in itself constitutes a quality control, as the account sheets are not easily balanced if one or more values are reported falsely. Even so, the submitted accounts are checked for outliers in important variables. Accounts containing such outliers are then excluded from the basis for imputation of the missing accounts.

*(max 1000 words)*

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**

To fulfil the requirements of the Commission decision (EU) 2016/1701 of 19. August 2016 by collecting environmental data on the aquaculture sector.

**2. Duration of pilot study**

One year, possibly 2018.

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

Methodology to be decided. Possibly register data combined with a questionnaire distributed to Danish aquaculture companies.

*(max 900 words)*

## 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 Danish fish processing sector consisted of approximately 100 enterprises employing 3000 people in 2013. The enterprises are segmented on 3 segments in terms of size measured on employment, where 50% has less than 10 employees, and the last 50% is equally distributed on the segments with between 10-50 employees and 50-250 employees, respectively. The Danish fish processing industry is defined by the Business Register using NACE code 10.20. Enterprises engaging in fish processing in Denmark are highly specialized and cover more than 95% of the value and volume of fish processed in Denmark.

In order to avoid a duplication of data collection, data collected by Statistic Denmark is used as primary data. In collaboration with Statistics Denmark, data from the Industry Commodity Statistics and Account Statistics are combined to comply with the variables listed in Table 11 in European Commission (2016) EC 2016/1251 of 12 July 2016. The type of data collection used for collection of the economic data is all based on census. Additional social parameters like gender, age etc. are collected as well, and will be added to the economic data.

The raw material input for the processing industry by species and origin has earlier been estimated using the output (Commodity Statistics) from the enterprises as a proxy for the raw material base. In order to enhance the quality of data on the raw material used, a pilot study will expectedly be conducted. The aim is to make use of data already stored for traceability purposes in the sector or from enterprise accounts. It is intended to check the quality and availability of these data, and if possible conduct a survey to get an improved picture of the raw material input by species and origin in the industry. Cooperation with the industry and meeting with representatives could form a starting point.

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

The already existing data collections by Statistic Denmark are well established and provide reliable and validated time series. Quality reports are available on the website of Statistics Denmark. To combine the different statistics to form groups of enterprises relying on different species for raw input, IFRO's expertise from former work on this issue will be used. For the volume of raw material by species and origin, no data collection scheme is established. To further investigate how this information could be collected and how the collection could be conducted, a separate description of a pilot study is attached.

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

The Danish data collection covering the processing industry is based on data from the Account Statistics and the Industry Commodity Statistics collected by Statistics Denmark. In collaboration with Statistics Denmark, data from the Industrial Commodity- and Account Statistics are combined to make sure that all enterprises processing fish are covered by this data collection and to comply with the data variables listed in Table 11 in European Commission (2016) EC 2016/1251 of 12 July 2016.

The Account Statistics collected by Statistics Denmark are essentially aggregations of items of the annual accounts of business enterprises, notably items of the profit and loss account, the balance sheet and the statement of fixed assets. The accounts statistics are a reliable indicator of the activity level and of the structure of the Danish business sector. The highest data quality is achieved at the enterprise level, primarily because the enterprises prepare their annual accounts at that level. The Statistics are based on questionnaires, the Central Customs and Tax Administration (SLS-E data), and the business register. The population is defined on the basis of Statistics Denmark's Central Business Register covering all businesses in Denmark (ESR). The data collected from all sources are combined in such a way that a complete set of accounting items is obtained for each business enterprise.

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

The Account Statistics covers the whole population defined by the Business Register NACE 10.20. Data for the Account Statistics is collected from different sources and combined in such a way that a complete set of accounting items is computed for each business enterprise. No estimation is therefore necessary because data are based on census and a full set of account for all business enterprises are created.

For the raw material volume, the procedure to estimate the sector totals will depend on the result of the planned study, whether full data sets are available or estimation is necessary and meaningful.

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

The data collected for the processing industry give a complete coverage of all enterprises covered by NACE 10.20. The accounts statistics are a reliable indicator of the activity level and of the structure of the Danish processing industry sector. The highest data quality is achieved at the enterprise level, primarily because the enterprises prepare their annual accounts at that level.

Data for the processing industry concerning the year 2015 will be available in September 2017 (1½ years of time lag). Data for 2016 will be available in September 2018, and data for 2017 will be available in September 2019.

For the data collected from the pilot study, quality will be assessed by coverage, response rate and the sampling errors which will be expressed by standard error and coefficient of variation.

#### Used references

European Commission (2016) EC 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. Official Journal of the European Union, L 207/113, Brussels.

#### **Pilot Study on the Danish Processing Industry: Collection of raw material volume by species and origin**

The aim of the pilot study is to evaluate the possibility and constraints of a regular collection of data on raw material volume by species and origin.

##### 1. Duration of pilot study

The pilot study is expected to start in 2017 and to end with final results in 2018.

##### 2. Methodology and expected outcome of pilot study

To achieve the aim of the pilot study, meetings with sector representatives will be organized in order to access the availability of the raw material data and the willingness of the industry to provide these data. Furthermore, it will be discussed with the industry if it is possible to collect these data without increasing the workload of

reporting data for the industry and the necessary effort to collect and process the data will also be evaluated. If data can be collected, a database for storage and sharing of data will be established. A first step in terms of data collection could be a survey questionnaire sent out with the support of the industry representatives of the producers association.

The results shall enable an alignment of the raw material volume by species and origin to specific product groups, like fresh and frozen fish, fish filets, and more processed fish products produced in larger quantities in Denmark. Finally, benefits and costs of establishing such a data collection on a regular, not necessarily an annual basis, will be assessed.

*(max 1000 words)*

## 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.*

The commercial sampling in Denmark is conducted by 4 large programs sampling different components of the landings and at sea catches. The 5 main programs are:

1. At sea – Observer programme
2. At market – human consumption
3. At market – small pelagic
4. At sea – self-sampling- small pelagic

The different programs can then again have several different list/ strata.

1. At sea – Observer programme

Denmark has initiated work to improve the sampling design of the commercial sampling following the outcomes of ICES WKACCU, WKPRECISE, WKCATCH, WKPICS and SGPIDS. This outcome has since 2011 led to a gradually change from an ad-hoc sampling programme to a statistically sound sampling (4S) in the observer programme where trips/vessel are the primary sampling unit within some pre-defined fleet lists. The vessel list has been selected according to the home harbour and the main gear type (fleet group) and each lists accounts of unique vessels based on the fishery from the previous year, indicating that the same vessel cannot be present in more than one list. If a vessel is selected by one list and is conducting another fishery that is still part of the observer program, the trip is still conducted. If the vessel is conducting a fishery presently not included in the observer program the trip is not selected. Presently Denmark has applied sex fleet lists (sampling frames) for the at sea observer programme with a similar selection design however, with different target species. The vessel list are presently covering:

- Lyngby, Trawler/Seiner (OTB-SDN: SD 25-32)
- Lyngby, trawler/Seiner (OTB-SDN: SD 21-24)
- Hirtshals, Trawler/Seiner Skagerrak/ Kattegat (OTB-SDN: SD 20-21)
- Hirtshals, Trawler/Seiner North Sea (OTB-SDN: SD IV)
- Hirtshals, Skagerrak and North Sea – shrimp fishery (OTB\_CRU: SD 20- IV)
- Lyngby , Beam trawler, North Sea brown shrimp (TBB: IV)

Effort allocation (observer trips) between the vessel lists are based on the total effort available allocated according to the numbers of trips in each vessel list group. A minimum number of 2 trips have been incorporated by each stratum. Each vessel list is stratified by quarter. Each vessel on a given list has equal change of being selected.

As the vessels are randomly selected in a database based on last years fishery, large changes in fishing pattern between years can affect the sampling in a given year. When a vessel is selected for an observer trip the vessel has to be contacted by the observer and asked for participation on the next conducted fishing trip. The fishermen answers are recorded and refusal rates calculated for each vessel list.

Purpose: At-sea Observer Programme for length, age, weight data of landings of and discards of demersal

species as well as for brown shrimps and deep water shrimp. All species caught are registered for total weight and length but only selected species for the area are collected for age and individual weight.

Temporal Stratification: Quarterly

	Sampling frame	Sampling unit	Stratification	Selection Method	Sampling effort
1.SU	vessel*time. In principal a list of vessel, where the next trip within a quarter is selected.	Fishing Trip	Quarterly	Random draw from vessel list with equal probability and with replacement (probability proportional to number of vessels within a list)	Between list is effort proportional to the total number of trips in the lists
2.SU	Hypothetical list of hauls in trip	Haul	---	Ad-hoc decision	Minimum 1haul per day
3.SU	Hypothetical list of individuals caught in haul	Species and Individuals	Species, Catch Fraction, Commercial Size Category  Biology: length stratified sampling: 1cm length classes	Length: Census (random sub - sample if too large)  Biology: length stratified and only for selected species	Length: all individuals  Biology: For selected species discards: 1-3 otoliths and individual weights (per cm size group and trip – depending on the length of the trip)

## 2. At market – Human Consumption

In 2014 the harbour sampling program was changed from an ad-hoc quota sampling programme to a statistically sound sampling programme. The harbours were grouped in a list with small and large harbours and only harbours where 80% of the landings, trips and value for every stock selected for sampling, was included in the sampling programme. If a harbour is not selected for one of these criteria it is not included in the sampling program. Depending on the size of the harbour (small or large) different effort has been allocated to the harbour site. Each harbour on the list has been given a time period where a visit has to be conducted and sampled for the selected species/stocks. Presently, 23 harbours have been selected and each harbour is considered a separate sampling frame. The 6 largest harbour have been allocated 4 sampling event per quarter and the small harbours 1 sampling event per quarter. Do to the quarterly stratification a harbour can change between being one of the 6 largest harbour and the smaller harbours between quarters. At a harbour visit 1 of each commercial size sorting box per selected species is measured for length, individual weight and age.

- Bønnerup – M DKBNP
- Dragør – M DKDRA
- Fåborg- M DKFAB
- Gilleleje - M DKGLE
- Grenå - M DKGRE
- Hanstholm - M DKHAN
- Hirtshals -M DKHIR
- Hvide Sande -M DKHVS
- Hundested -M DKHUN
- Klintholm – DKKLH
- Korsør – M DKKRR
- København – M DKCPH
- Langø - MDKLNQ
- Nexø - M DKNEX
- Rødvig – M DKRQG
- Rønne - M DKRNN
- Skagen - M DKSKA
- Sletten – M DKSLT
- Strandby - M DKSTD
- Tejn - M DKTEJ
- Thorsminde -M DKTMD
- Thyborøn - M DKTHN
- Vedbæk - M DKVBK

Purpose: At-market Human Consumption Programme for length, age, weight data of landings of selected demersal species

Temporal Stratification: Quarterly

	Sampling frame	Sampling unit	Stratification	Selection Method	Sampling effort
1.SU	Each market site is considered a separate list	Market site* time	Quarterly	Each market site is pre-selected in the beginning of the year	1 visit for every small market and 4 visits for every large market (per quarter)
2.SU	Total sold fish boxes per sorting group and species on the selected day of visit	Commercial size sorting boxes	---	ad-hoc	1 box per selected species per sorting group
3.SU	All fish within a box	individuals	---	Census	Census (for flatfish 2 fish per cm group is selected)

### 3. At Market – small pelagic

For the industrial fishery the sampling program is presently not conducted as a statistically sound sampling but is still sampled according to quota samplings where a sample is collected for every 2000 t landed. For the species an unsorted sample is taken from the landings, often at the factory site. Seven different species are collected in the small pelagic market sampling programme.

- Herring - *Clupea harengus*
- Blue whiting- *Micromesistius poutassou*
- Sand eel - *Ammodytidae* sp.
- Sprat - *Sprattus sprattus*
- Mackerel- *Scomber scombrus*
- Boar fish- *Capros aper*
- Norway Pout - *Trisopterus esmarkii*

### 4. At Sea – self-sampling – small pelagic

The industrial harbour sampling schemes are combined with a self-sampling program conducted on a part of the Danish industrial fleet. Here the fishermen are sampling a random sample from 1. haul per trip that are stored on board and delivered to the landing site with the relevant information attached (a self-sampling scheme has been developed). The self-sampling program is mainly conducted for sand eel and sprat but in a smaller extent also for Norway pout. The vessels participating in the self-sampling for other species than sand eel are not selected randomly but on a voluntary basis. For the sand eel fishery the self-sampling is part of the fishing license. The quality of the samples from the self-sampling program are higher than the quality obtained from the harbour samples as the self samples are frozen just after the fishing event and information on the position are included. However, the combination of the two independent sampling programs (self-sampling of small pelagic and harbour sampling) are assuring quality control on the fisherman collected data.

*(max 900 words per Region)*