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INFOGUIDE

Programmes for monitoring the Belgian commercial fishing fleet

according to the work plan for data collection in the fisheries and aquaculture sectors 2022-2024

ILVO

Flanders research institute for
agriculture, fisheries and food

Date	Version
2021/10/01	1.0

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Introduction

This INFOGUIDE aims to describe the three ILVO programmes (sampling schemes) for monitoring the Belgian commercial fishing fleet that will be in place from 2022 up to and including 2024. The information provided in this document is part of the national work plan for data collection in the fisheries and aquaculture sectors 2022-2024. The full version of this work plan is available on the website of the joint research centre: <https://datacollection.jrc.ec.europa.eu/wps>

MS : BEL
Region: North Sea and Eastern Arctic
Sampling scheme identifier: SciObsAtSea*Commercial fishing trip*Selected species/stocks
Sampling scheme type: Commercial fishing trip
Observation type: SciObsAtSea
Time period of validity: 2022-2024

Summary

The SciObsAtSea*Commercial fishing trip*Selected species/stocks sampling scheme is aiming at collecting information related to catch quantities, length frequency distributions and biological parameters of several commercial species. The data collection is performed by ILVO observers onboard of commercial beam trawl vessels active in areas 4, 7d, 7e-h, 7a and 8ab. There are 2 sampling frames within the sampling scheme SciObsAtSea*Commercial fishing trip*Selected species/stocks: beam trawlers with a maximum power of 221 kW targeting demersal species (TBB_DEF_<=221kW) and beam trawlers with a capacity of more than 221 kW targeting demersal species (TBB_DEF_>221kW). The obtained information is mainly used for stock assessment purposes.

Description of the population

Population targeted:

The PSU for the TBB_DEF_<=221kW sampling frame is vessel*trip.
The population targeted = all vessel*trips in the TBB_DEF_<=221kW sampling frame.

The PSU for the TBB_DEF_>221kW sampling frame is vessel*trip.
The population targeted = all vessel*trips in the TBB_DEF_>221kW sampling frame.

Population sampled:

The vessels that are taking observers onboard and those that are suited, from a logistic point of view, to have an observer onboard are included in the vessel list used for sampling. The rest of the vessels is excluded from this list. This applies to both to the TBB_DEF_<=221kW sampling frame and to the TBB_DEF_>221kW sampling frame.

Stratification:

The population is not stratified, either for the TBB_DEF_<=221kW sampling frame or for the TBB_DEF_>221kW sampling frame

Sampling design and protocols

Catch information (all catch fractions are covered) is obtained through on-board observation or 'at sea

sampling'. The sampling effort targets for one year are set at 6 euro cutter trips for the TBB_DEF_<=221kW sampling frame and 40 trips for the TBB_DEF_>221kW sampling frame. The sampling effort is proportionally to the fleet effort of the last available year. For both sampling frames, the primary sampling unit (PSU) is vessel*trip (as a proxy for trip) and the haul (within a trip) is defined as the secondary sampling unit (SSU). The PSU selection for both sampling frames can be defined as a Non-Probabilistic Convenience Sampling (including Quota sampling) and the SSU selection for both sampling frames can be defined as a Systematic Sampling Without replacement because every other haul is sampled by an observer. The crew is sorting the marketable fish from the conveyor belt and stores it per species for the observer to sample later on. In the meantime, the observer is sampling the other catch fractions by species. The total weight per species (all commercial species) per catch category in each sampled haul is determined by the observer and lengths are measured for the species/stocks referred to in table 2.1. (column 'Covered by a commercial sampling scheme for length'). When a species is extremely abundant, a smaller representative subsample (TSU) is measured. During each trip, minimum 3 fish per cm-size class (except for *Gadus morhua* 1 fish per cm-size class and for *Raja Brachyura* and *Raja Clavata* 1 fish per 5 cm-size class) per species, per catch category and per area, are collected for estimations of biological parameters in the ILVO lab.

Alongside collecting data on commercial species, sea going observers also monitor incidental catches of sensitive species on beam trawlers (TBB_DEF_<=221kW as well as TBB_DEF_>221kW) for the SciObsAtSea programme. Similar to the sampling of commercial species, every other haul is sampled for PETS by an observer. The observer indicates what percentage of the sorting process has been checked. Typically, this is 100% (starboard AND portside) or 50% (starboard OR portside) of the catch. Based on this information, the observation effort can be calculated. The observer checks for sensitive species during sorting of the catch at the conveyer belt. The observer writes down the number per species (no weight info). If the species are still alive, they are put back overboard as quickly as possible to increase survival chances. Additional information related to the list of sensitive species for which data is collected by ILVO is available in Text Box 4.2

Sampling implementation

Recording of refusal rate:

The SciObsAtSea sampling programme at ILVO is defined as Non-Probabilistic Convenience Sampling (including Quota sampling). Therefore, ILVO considers collecting non-responses and refusals on PSU (trip) level not relevant. However, the sea-going observers keep track of the vessels they contact within the sampling frame.

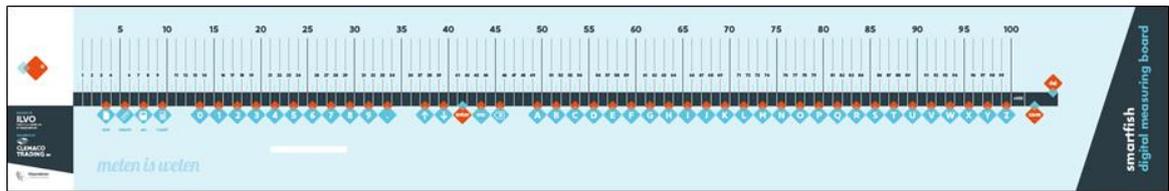
Monitoring of sampling progress within the sampling year:

Adjustments to the initial planning/sampling allocations are avoided. Follow-up of the sampling progress is covered during the weekly observer/scientist meetings. If, due to unforeseen circumstances the initial planning cannot be maintained, the scientist in charge decides upon a change of schedule.

Data capture

Means of data capture:

- ✓ Length data registered on electronic measuring boards (picture below; power supply via power bank, registers lengths using a linear magnetic sensor) coupled to rugged tablets with inhouse developed Smartfish software for easy connection to the Smartfish database



- ✓ Weight data registered on calibrated scales (type Marelec D4/W10)
- ✓ Sex and maturity staging following international standards
- ✓ Age readings using SmartDots software and the SmartLab platform
 - SmartLab application: this in-house developed tool is used to follow up the analysis of samples, processed in the lab to determine biological parameters.
 - SmartDots application: this in-house developed tool for age reading and quality control of age reading is endorsed by WGBIOP and used by the ICES community for exchanges and workshops on age reading. <https://www.ices.dk/data/tools/Pages/smartdots.aspx>
- ✓ All tools and supporting software are developed by ILVO.

Data capture documentation:

- ✓ Smartfish: manual available upon request (W. Allegaert (2015, 2021 in prep), “Smartfish manual”)
- ✓ Weight data: manual online available (<https://manualzz.com/doc/27548711/marelec-d4>)
- ✓ Maturity staging: Report of the Workshop for Advancing Sexual Maturity Staging in Fish (WKASMSF) (www.ices.dk)
- ✓ SmartLab and Smartdots: applications to record lab data and determine and manage age records SmartDots (www.ices.dk)

Quality checks documentation:

The process of QC is described in the national protocol which is available upon request:
<https://smartfisheries.be/data-collection/>

Quality checks are performed at different levels:

- ✓ While recording data:
 - Pop-up messages built into the Smartfish software warning the user when the registered individual weight data deviates from the weight as deducted from general length-weight keys (LWK). This gives the opportunity to correct the weight and reduces outliers.
- ✓ Using Smartfish: the status of the trip must be set from ‘raw’ to ‘validated’ in the Smartfish software as it is coupled with Smartlab and the latter program needs a validated dataset. When changing the status of a trip in Smartfish, certain checks are performed on the dataset such as is end date of the trip being later than the start date, weight of subsample cannot be larger than weight of sample, etc. These checks are described in the Smartfish manual (W. Allegaert, 2015 and 2021 in prep.).
- ✓ Age reading: SmartLab software is used for sample and laboratory management. SmartDots software is used for age reading: images are taken from all otoliths and images are annotated using the SmartDots software, making quality assurance easier and faster. Age reading results are directly included into the SmartLab database, avoiding copying mistakes. After several quality checks, age data is synchronized with the Smartfish database. Following quality checks are done: Readers register the certainty of their reading (age quality (AQ) 1, 2 or 3). Only AQ1 data are synchronized with the final database. All readings are performed by two readers (double reads of the otoliths). If ages match, the reading is registered as “approved” in Smartdots. Reference collections are used on a monthly basis as a tool to monitor possible deviation in age readings in time. Furthermore, a scientist makes stock-based age-length keys using R-scripts as final check before synchronization with the Smartfish database.

- ✓ Using Power BI: using graphs and tables to check species composition, sampling locations, duration and distance of trawls, outliers in length-weight-keys and age-length-keys, positions in otolith blocks, etc. A description of what is checked by Power Bi is available on demand (in Dutch).
- ✓ Using R-scripts: extra quality checks are performed. Scripts are available on demand.

Data storage

National database:

Data is stored in the national Smartfish database (SQL Server). The database has different user access rights and is not publicly accessible through a website. Laboratory data is stored in the SmartLab database.

International database:

National data are uploaded in The Regional DataBase (RDB). ICES is hosting the database and the database is accessible through this website:

<https://www.ices.dk/data/data-portals/Pages/RDB-FishFrame.aspx>

Quality checks and data validation documentation:

Belgium uses a well-documented protocol to ensure high quality data from sampled trips (documentation is stored at the ILVO-ICT intranet web portal). When seagoing observers return from sampling a commercial fishing trip, collected data are immediately transferred from their ruggedized tablet to the SmartFish database (Sync Trip). Metadata of the trip are added to the database and all data are checked by a second observer. Before the trip can be validated, an internal quality control is run within the database. In the next step, a R-markdown script is run by a scientist and a vessel report is produced. This vessel report is checked by the seagoing observer of that specific trip and the report is sent to the vessel owner. Next, scientists run an intensive quality control in which the raw data is checked in a set of consecutive steps (among which outlier detection) using PowerBi. When no quality issues arise, the trip is given a status 'consolidated'. If quality issues arise, the observer is requested to check the raw data and to correct where needed. Finally, the trip receives status done, and data can be used for analysis and raising.

To track the data flow for each trip, the in-house developed tool 'Plan-it' is used. Plan-It application is an in-house developed tool for project and time management and implemented since 2016 and continuously used up to date. The status of each trip is visible in 'Plan-it' and provides an efficient overview for both observers and scientists. This procedure has been in place since 2017 and has proved to be very efficient.

Sample storage

Storage description:

- ✓ Fish for which biological variables are to be determined are sometimes stored overnight in the refrigerator/freezers of ILVO ahead of analysis.
- ✓ After biological sampling, otoliths are stored in otolith containers and vertebrae are stored in the freezer before they enter the flow of age reading.
- ✓ After age reading, otoliths and vertebrae are stored in paper bags at ILVO's archive for an indefinite period.

Sample analysis:

- ✓ Determination of biological parameters of target species:
 - National protocol, internally available: K. Bekaert (2021), “Beproevingprocedure VSL001” for biological parameters.
 - “Werkvoorschrift WV001 VSL001” for maturity determination of flatfish based on Report of the Workshop for Advancing Sexual Maturity Staging in Fish (WKASMSF) (www.ices.dk)
- ✓ Age readings: are performed in ILVO’s accredited ANIMALAB (ISO17025). National protocols are used “Beproevingprocedure OTL001” for otoliths and “Beproevingprocedure OTL003” for vertebrae.

Data processing

Evaluation of data accuracy (bias and precision):

During and ahead of the data collection, care is taken to collect the data as accurately as possible:

- ✓ Sea going observers are trained and they follow an annual refresher on species determination in ILVO's yearly “Species Determination Workshop” (which is open for public as well).
- ✓ WGBIOP assures consistency regarding the collection of biological parameters across member states and regularly organizes exchanges and workshops in which Belgium participates.

Editing and imputation methods:

When outliers or mistakes are encountered during the quality check procedure, editing and imputation takes place. Corrections are then made directly in the Smartfish database.

Validation of the final dataset:

National checks are performed prior to submission of data to ICES data calls in InterCatch and RDB. Scripts used for raising observer data to fleet level consist of a thorough data check including outlier detections, verifying length-weight and age-length relationships and the checks included in the COST library package. Scripts are available on demand.

MS : BEL
Region: North-East Atlantic
Sampling scheme identifier: SelfAtSea*Commercial fishing trip*Selected species/stocks
Sampling scheme type: Commercial fishing trip
Observation type: SelfAtSea
Time period of validity: 2022-2024

Summary

The SelfAtSea*Commercial fishing trip*Selected species/stocks sampling scheme is aiming at collecting information related to the quantities of the catch of *Solea solea* in area 7a and 8ab and the length frequency distributions as well as the biological parameters of the discarded part of the catch of *Solea solea* in area 7a and 8ab. The data collection is performed by trained fishermen onboard of commercial beam trawl vessels with a capacity of more than 221 kW targeting demersal species (TBB_DEF_>221kW), active in areas 7a and 8ab. The information obtained through this self-sampling programme is mainly used for stock assessment purposes.

Description of the population

Population targeted:

The PSU for SelfAtSea*Commercial fishing trip*Selected species/stocks is vessel*trip. The population targeted = all vessel*trips in the TBB_DEF_>221kW in area 7a and 8ab.

Population sampled:

Only the vessels crews that are willing to carry out the self-sampling protocol will deliver sampling information (voluntary).

Stratification:

The population is not stratified

Sampling design and protocols

The sampling effort targets for one year are set at 4 trips for the TBB_DEF_>221kW sampling frame (vessels active in 7a and 8ab). Since this is a voluntary programme, the timing of the data collection is dependent on the industry. It should be noted that TBB_DEF_>221kW activity in 8ab is limited to the summer period (with licenses).

Information on *Solea solea* is obtained through on-board observation by the industry. All catch fractions are covered in the data collection process because the crew is asked to collect total catch weights of this species by haul and by catch fraction. When it comes to sampling, only the sampling of the discarded part of the catch is performed by the fishermen. The crew is asked to collect a representative *Solea solea* discard sample (more details below). The *Solea solea* landings (all landing fractions) on the other hand are sampled by ILVO in the fish auction/harbour (more information: see SciObsOnShore*Commercial fishing trip*Selected species/stocks sampling scheme).

The primary sampling unit (PSU) is vessel*trip (as a proxy for trip). The PSU selection can be defined as a Non-Probabilistic Convenience Sampling (including Quota sampling) since the self-sampling programme is a voluntary programme and as a consequence the sampling takes place when the opportunity arises.

The secondary sampling unit (SSU) is a basket of 30 kg *Solea solea* discards (within a trip). The 30 kg discard sample is collected randomly throughout the trip and contains fish from at least 3 hauls spread out over the entire trip (beginning, middle and end part of the trip are covered). The discard sample is stored on ice, brought ashore by the crew and further analysed in the ILVO lab: the entire discard sample is measured and 5 fish per cm-size are randomly selected for estimations of biological parameters.

Sampling implementation

Recording of refusal rate:

The SelfAtSea sampling programme at ILVO is a voluntary programme so the sampling takes place when the opportunity arises. Therefore ILVO considers collecting non-responses and refusals on PSU (trip) level not relevant.

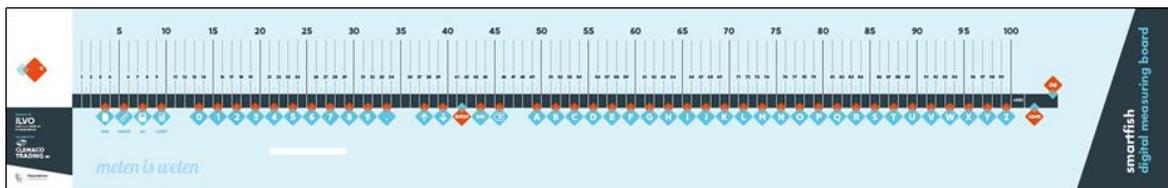
Monitoring of sampling progress within the sampling year:

The SelfAtSea sampling programme at ILVO is a voluntary programme so the sampling takes place when the opportunity arises. Follow-up of the sampling progress is covered during the weekly observer/scientist meetings and the industry is motivated in different ways in order to achieve the annual planned number of PSUs.

Data capture

Means of data capture:

- ✓ Length data registered on electronic measuring boards (picture below; power supply via power bank, registers lengths using a linear magnetic sensor) coupled to rugged tablets with inhouse developed Smartfish software for easy connection to the Smartfish database



- ✓ Weight data registered on calibrated scales (type Marelec D4/W10)
- ✓ Sex and maturity staging following international standards
- ✓ Age readings using SmartDots software and the SmartLab platform
 - SmartLab application: this in-house developed tool is used to follow up the analysis of samples, processed in the lab to determine biological parameters.
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- ✓ Maturity staging: Report of the Workshop for Advancing Sexual Maturity Staging in Fish (WKASMSF) (www.ices.dk)

- ✓ SmartLab and Smartdots: applications to record lab data and determine and manage age records SmartDots (www.ices.dk)

Quality checks documentation:

The process of QC is described in the national protocol which is available upon request:

<https://smartfisheries.be/data-collection/>

Quality checks are performed at different levels:

- ✓ While recording data:
 - Pop-up messages built into the Smartfish software warning the user when the registered individual weight data deviates from the weight as deducted from general length-weight keys (LWK). This gives the opportunity to correct the weight and reduces outliers.
- ✓ Using Smartfish: the status of the trip must be set from 'raw' to 'validated' in the Smartfish software as it is coupled with Smartlab and the latter program needs a validated dataset. When changing the status of a trip in Smartfish, certain checks are performed on the dataset such as is end date of the trip being later than the start date, weight of subsample cannot be larger than weight of sample, etc. These checks are described in the Smartfish manual (W. Allegaert, 2015 and 2021 in prep.).
- ✓ Age reading: SmartLab software is used for sample and laboratory management. SmartDots software is used for age reading: images are taken from all otoliths and images are annotated using the SmartDots software, making quality assurance easier and faster. Age reading results are directly included into the SmartLab database, avoiding copying mistakes. After several quality checks, age data is synchronized with the Smartfish database. Following quality checks are done: Readers register the certainty of their reading (age quality (AQ) 1, 2 or 3). Only AQ1 data are synchronized with the final database. All readings are performed by two readers (double reads of the otoliths). If ages match, the reading is registered as "approved" in Smartdots. Reference collections are used on a monthly basis as a tool to monitor possible deviation in age readings in time. Furthermore, a scientist makes stock-based age-length keys using R-scripts as final check before synchronization with the Smartfish database.
- ✓ Using Power BI: using graphs and tables to check species composition, sampling locations, duration and distance of trawls, outliers in length-weight-keys and age-length-keys, positions in otolith blocks, etc. A description of what is checked by Power Bi is available on demand (in Dutch).
- ✓ Using R-scripts: extra quality checks are performed. Scripts are available on demand.

Data storage

National database:

Data is stored in the national Smartfish database (SQL Server). The database has different user access rights and is not publicly accessible through a website. Laboratory data is stored in the SmartLab database.

International database:

National data are uploaded in The Regional DataBase (RDB). ICES is hosting the database and the database is accessible through this website:

<https://www.ices.dk/data/data-portals/Pages/RDB-FishFrame.aspx>

Quality checks and data validation documentation:

Belgium uses an internal protocol (several steps) to ensure high quality data from sampled trips:

Step 1:

When a crew member that performed the self-sampling returns from a trip, the handwritten data (trip and haul information + total catch weights of *Solea solea* by haul and by catch fraction) is imported in the SmartFish database by an ILVO observer/scientist. If issues arise or data is missing, the observer/scientist will contact the responsible crew member to correct the data. PowerBi and excel is used to check for outliers in the data (a.o. plot of haul positions is made). A discard rate for the trip is calculated and compared to the discard rate of trips with vessels that use similar gear and were active in similar regions and in the same season.

Step 2:

Discard Length frequency distributions and biological parameters of the *Solea solea* discards, imported in Smartfish, are checked for outliers using powerBI and excel. The overall discard length frequency distribution for the self-sampled trip is plotted and compared to the LFD of trips with vessels that use similar gear and were active in similar regions and in the same season. If issues arise in step 2, the scientist will check the raw data and/or contact the responsible crew member to explain the deviation in the data and to adjust accordingly (if possible).

Step 3:

Before the trip can be validated, an internal quality control is run within the database. If the quality of the data was checked and approved the trip is given a status 'consolidated' and data can be used for analysis and raising.

Sample storage

Storage description:

- ✓ Fish for which biological variables are to be determined are sometimes stored overnight in the refrigerator/freezers of ILVO ahead of analysis.
- ✓ After biological sampling, otoliths are stored in otolith containers before they enter the flow of age reading.
- ✓ After age reading, otoliths and vertebrae are stored in paper bags at ILVO's archive for an indefinite period.

Sample analysis:

- ✓ Determination of biological parameters of target species:
 - National protocol, internally available: K. Bekaert (2021), "Beproevingprocedure VSL001" for biological parameters.
 - "Werkvoorschrift WV001 VSL001" for maturity determination of flatfish based on Report of the Workshop for Advancing Sexual Maturity Staging in Fish (WKASMSF) (www.ices.dk)
- ✓ Age readings: are performed in ILVO's accredited ANIMALAB (ISO17025). National protocols are used "Beproevingprocedure OTL001" for otoliths.

Data processing

Evaluation of data accuracy (bias and precision):

During and ahead of the data collection, care is taken to collect the data as accurately as possible:

- ✓ Crew members that are willing to perform the self-sampling are properly trained by ILVO before they start collecting the requested information. They get instructions on how to collect the data and the discard sample and how they are supposed to deal with the paper work. They also get contact information in case something goes wrong during data collection.

- ✓ WGBIOP assures consistency regarding the collection of biological parameters across member states and regularly organizes exchanges and workshops in which Belgium participates.

Editing and imputation methods:

When outliers or mistakes are encountered during the quality check procedure, editing and imputation takes place. Corrections are then made directly in the Smartfish database.

Validation of the final dataset:

National checks are performed prior to submission of data to ICES data calls in InterCatch and RDB. Scripts used for raising data to fleet level consist of a thorough data check including outlier detections, verifying length-weight and age-length relationships and the checks included in the COST library package. Scripts are available on demand.

MS : BEL
Region: North-East Atlantic
Sampling scheme identifier: SciObsOnShore*Commercial fishing trip*Selected species/stocks
Sampling scheme type: Commercial fishing trip
Observation type: SciObsOnShore
Time period of validity: 2022-2024

Summary

The SciObsOnShore*Commercial fishing trip*Selected species/stocks sampling scheme is directly linked to the SelfAtSea*Commercial fishing trip*Selected species/stocks sampling scheme (related to TBB_DEF_>221kW vessels, active in areas 7a and 8ab) and is aiming at collecting information related to landing (all fractions) quantities, length frequency distributions and biological parameters for *Solea solea* in area 7a and 8ab. The data collection is performed by ILVO observers/scientists in the fish auction and is only focusing on those trips where the self-sampling protocol onboard was performed (see sampling design description of the SelfAtSea*Commercial fishing trip*Selected species/stocks sampling scheme). The obtained information is used for stock assessment purposes.

Description of the population

Population targeted:

The PSU for SciObsOnShore*Commercial fishing trip*Selected species/stocks is vessel*trip. The population targeted = all vessel*trips in the TBB_DEF_>221kW in area 7a and 8ab.

Population sampled:

The data collection is performed by ILVO observers/scientists in the fish auction and is only focusing on those trips where the self-sampling protocol onboard was performed (see sampling design description of the SelfAtSea*Commercial fishing trip*Selected species/stocks sampling scheme). Only the vessels crews that are willing to carry out the self-sampling protocol will deliver sampling information (voluntary).

Stratification:

The population is not stratified

Sampling design and protocols

The sampling effort targets for one year are set at 4 trips for the TBB_DEF_>221kW sampling frame (vessels active in 7a and 8ab). Since this onshore sampling programme is only focusing on those trips where the self-sampling protocol onboard was performed (see sampling design description of the SelfAtSea*Commercial fishing trip*Selected species/stocks sampling scheme) and the fact that the SelfAtSea*Commercial fishing trip*Selected species/stocks sampling scheme is a voluntary programme, the timing of the data collection is dependent on the industry. It should be noted that TBB_DEF_>221kW activity in 8ab is limited to the summer period.

Landing (all fractions) information of *Solea solea* is obtained through onshore observation by ILVO observers/scientists in the fish auction/harbor.

The primary sampling unit (PSU) is vessel*trip (as a proxy for trip). The PSU selection can be defined as a Non-Probabilistic Convenience Sampling (including Quota sampling) since the self-sampling

programme to which this onshore sampling programme is linked, is a voluntary programme so sampling takes place when the opportunity arises.

The secondary sampling unit (SSU) is a representative number of fish boxes (randomly selected from all *Solea solea* landings from the trip. All the fish in this sample are measured and 4 fish per cm-size are randomly selected for estimations of biological parameters in the ILVO lab (reimbursement is provided for the shipowner). It should be noted that the *Solea solea* landings are sampled before the sorting process takes place in the auction.

Sampling implementation

Recording of refusal rate:

The SciObsOnShore sampling programme is directly linked to the SelfAtSea sampling programme. The SelfAtSea sampling programme at ILVO is a voluntary programme so the sampling takes place when the opportunity arises. Therefore ILVO considers collecting non-responses and refusals on PSU (trip) level not relevant.

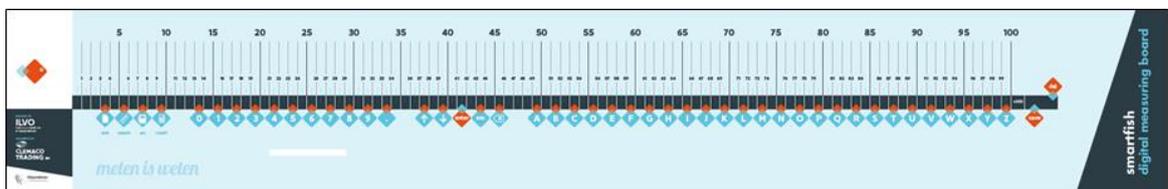
Monitoring of sampling progress within the sampling year:

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Means of data capture:

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Data is stored in the national Smartfish database (SQL Server). The database has different user access rights and is not publicly accessible through a website. Laboratory data is stored in the SmartLab database.

International database:

National data are uploaded in The Regional DataBase (RDB). ICES is hosting the database and the database is accessible through this website:

<https://www.ices.dk/data/data-portals/Pages/RDB-FishFrame.aspx>

Quality checks and data validation documentation:

Belgium uses an internal protocol (several steps) to ensure high quality data from sampled trips:

Step 1:

When observers/scientists return from sampling a commercial fishing trip in the auction, collected data are immediately transferred from their ruggedized tablet to the SmartFish database (Sync Trip).

Step 2:

Length frequency distributions and biological parameters of the *Solea solea* landings, imported in Smartfish, are checked for outliers using powerBI. If issues arise, the scientist will check the raw data and adjust accordingly.

Step 3:

Before the trip can be validated, an internal quality control is run within the database. If the quality of the data was checked and approved the trip is given a status 'consolidated' and data can be used for analysis and raising.

Sample storage

Storage description:

- ✓ Fish for which biological variables are to be determined are sometimes stored overnight in the refrigerator/freezers of ILVO ahead of analysis.
- ✓ After biological sampling, otoliths are stored in otolith containers are stored in the freezer before they enter the flow of age reading.
- ✓ After age reading, otoliths and are stored in paper bags at ILVO's archive for an indefinite period.

Sample analysis:

- ✓ Determination of biological parameters of target species:
 - National protocol, internally available: K. Bekaert (2021), "Beproevingprocedure VSL001" for biological parameters.
 - "Werkvoorschrift WV001 VSL001" for maturity determination of flatfish based on Report of the Workshop for Advancing Sexual Maturity Staging in Fish (WKASMSF) (www.ices.dk)
- ✓ Age readings: are performed in ILVO's accredited ANIMALAB (ISO17025). National protocols are used "Beproevingprocedure OTL001" for otoliths.

Data processing

Evaluation of data accuracy (bias and precision):

During and ahead of the data collection, care is taken to collect the data as accurately as possible:

- ✓ Observers/scientists are trained and they follow an annual refresher on species determination in ILVO's yearly "Species Determination Workshop" (which is open for public as well).
- ✓ WGBIOP assures consistency regarding the collection of biological parameters across member states and regularly organizes exchanges and workshops in which Belgium participates.

Editing and imputation methods:

When outliers or mistakes are encountered during the quality check procedure, editing and imputation takes place. Corrections are then made directly in the Smartfish database.

Validation of the final dataset:

National checks are performed prior to submission of data to ICES data calls in InterCatch and RDB. Scripts used for raising data to fleet level consist of a thorough data check including outlier detections, verifying length-weight and age-length relationships and the checks included in the COST library package. Scripts are available on demand.