# BALTIC INTERNATIONAL FISH SURVEY WORKING GROUP (WGBIFS)

VOLUME 5 | ISSUE 70

ICES SCIENTIFIC REPORTS

RAPPORTS SCIENTIFIQUES DU CIEM

ICES INTERNATIONAL COUNCIL FOR THE EXPLORATION OF THE SEA

CIEM CONSEIL INTERNATIONAL POUR L'EXPLORATION DE LA MER

International Council for the Exploration of the Sea
Conseil International pour l'Exploration de la Mer

H.C. Andersens Boulevard 44-46
DK-1553 Copenhagen V
Denmark
Telephone (+45) 33 38 67 00
Telefax (+45) 33 93 42 15
www.ices.dk
info@ices.dk

ISSN number: 2618-1371

ICES Scientific Reports

Volume 5 | Issue 70

# BALTIC INTERNATIONAL FISH SURVEY WORKING GROUP (WGBIFS)

## Recommended format for purpose of citation:

ICES. 2023. Baltic International Fish Survey Working Group (WGBIFS).
ICES Scientific Reports. 5:70. 90 pp. https://doi.org/10.17895/ices.pub.23675049

## Editors

Olavi Kaljuste • Elor Sepp

## Authors

Elena Aleksejeva • Patrik Börjesson • Jose Antonio Canseco Rodriguez • Nicolas Goñi • Stefanie Haase
Olavi Kaljuste • Niklas Larson • Juha Lilja • Olof Lövgren • Hjalte Parner • Jukka Pönni
Krzysztof Radtke • Beata Schmidt • Elor Sepp • Ivo Sics • Vaishav Soni • Marijus Spegys
Marie Storr-Paulsen • Guntars Strods • Anders Svenson • Andrés Velasco • Adriana Villamor

ICES
CIEM
International Council for the Exploration of the Sea
Conseil International pour l'Exploration de la Mer

# Contents

# i Executive summary

The Baltic International Fish Survey Working Group (WGBIFS) plans, coordinates, and implements demersal trawl surveys and hydroacoustic surveys in the Baltic Sea including the Baltic International Acoustic Survey (BIAS), the Baltic Acoustic Spring Survey (BASS), and the Baltic International Trawl Surveys (BITS) in the 1st and 4th quarter on an annual basis. The group compiles results from these surveys and provides the herring, sprat, cod and flatfish abundance indices for the Baltic Fisheries Assessment Working Group (WGBFAS) to use as tuning fleets.

In 2023, WGBIFS completed the following tasks: (1) compiled survey results from 2022 and the first half of 2023, (2) planned and coordinated all Baltic fish stocks assessment relevant surveys for the second half of 2023 and the first half of 2024, (3) updated the common survey manuals according to decisions made during the annual WGBIFS meeting. Data from the recent BITS was added to the ICES Database of Trawl Surveys (DATRAS). The Tow-Database was corrected and updated. The Access-databases for aggregated acoustic data and the ICES database of acoustic-trawl surveys for disaggregated data were updated. All countries registered collected litter materials to DATRAS.

The area coverage and the number of control hauls in the BASS, BIAS and GRAHS in 2022 were considered to be appropriate to the calculation of tuning indices and the data can be used for the assessment of Baltic herring and sprat stocks. The number of valid hauls accomplished during the 4th quarter 2022 and 1st quarter 2023 BITS were considered by the group as appropriate to tuning series and the data can be used for the assessment of Baltic and Kattegat cod and flatfish stocks. BIAS and BASS survey sampling variance calculation questions were discussed and standard deviation for Central Baltic herring acoustic index series calculated.

In comparison exercises between the StoX survey computational method and traditional IBAS calculation methods it was found that the StoX project, developed for the WGBIFS, has small methodological differences compared to the standard calculation method used by the group, as specified in the Manual for the International Baltic Acoustic Surveys (IBAS), and is thereby causing a small difference in the total number of herring and sprat., The work with transition to a more transparent calculation software (e.g. StoX) will continue during the next period with more thorough analysis of calculation methodologies.

A further comparison exercise between the StoX method and traditional Gulf of Riga Herring Survey calculation method was performed using data from 11 last years. It showed no major differences in herring total abundance estimates for most of the years. However, notable differences were in the age compositions of those two methods. Some errors and differences in input data (uploaded into the ICES database) were found and therefore the further analysis was postponed until these issues are fixed.

WGBIFS is planning to continue with analogical comparison exercises in the coming years before the final transition to a transparent reproducible pathway into the ICES Transparent Assessment Framework (TAF) can be done. Work towards transitioning to TAF will continue during the next 3-year period until all methodological and database differences are resolved.

Inquiries from other ICES expert groups were discussed and addressed.

# ii Expert group information

| | |
|---|---|
| **Expert group name** | Baltic International Fish Survey Working Group (WGBIFS) |
| **Expert group cycle** | Multiannual fixed term |
| **Year cycle started** | 2021 |
| **Reporting year in cycle** | 3/3 |
| **Chair(s)** | Elor Sepp, Estonia |
| | Olavi Kaljuste, Sweden |
| **Meeting venue(s) and dates** | 20-24 March 2023, Cadiz, Spain (22 participants) |

# 1 Terms of Reference

| TOR | Description | Background | Science plan codes | Duration | Expected deliverables |
|---|---|---|---|---|---|
| **a** | Combine and analyse the results of spring and autumn acoustic surveys and experiments | Acoustic surveys provide important fishery-independent stock estimates for Baltic herring and sprat stocks | 3.1 | Annually<br>Year 1, 2 and 3 | Updated acoustic tuning index for WGBFAS |
| **b** | Update the BIAS, BASS and GRAHS hydroacoustic databases and ICES database for acoustic-trawl surveys | The aim of BIAS, BASS and GRAHS databases is to store the aggregated data. The aim of ICES database is to ensure that the standardized and quality-controlled scrutinized data from the acoustic-trawl surveys will be stored centrally in a safe way and enables easy access to the data, which will facilitate usage for many different analyses by a wider range of users. | 3.1 | Annually<br>Year 1, 2 and 3 | Updated databases with acoustic and biotic data for WGBIFS |
| **c** | Coordinate and plan acoustic surveys including any experiments to be conducted | Acoustic surveys provide important fishery-independent stock estimates for Baltic herring and sprat stocks | 3.1 | Annually<br>Year 1, 2 and 3 | Finalized planning for the surveys for WGBIFS |
| **d** | Review the results of BITS surveys and evaluate the characteristics of TVL and TVS standard gears used in BITS | Demersal trawl surveys provide important fishery-independent stock estimates for Baltic cod and flatfish stocks | 3.1 | Annually<br>Year 1, 2 and 3 | Updated BITS data in DATRAS database for ICES Data Centre and WGBFAS |
| **e** | Coordinate and plan demersal trawl surveys and experiments to be conducted, and update and correct the Tow Database | Demersal trawl surveys provide important fishery-independent stock estimates for Baltic cod and flatfish stocks | 3.1 | Annually<br>Year 1, 2 and 3 | Finalized planning for the surveys for WGBIFS, updated and corrected Tow Database |
| **f** | Conduct the analyses related to the improvement of quality of acoustic indices and estimation of the uncertainty in the acoustic surveys coordinated by WGBIFS | Acoustic surveys provide important fishery-independent stock estimates for Baltic herring and sprat stocks | 3.1, 3.2, 3.3 | Year 1-3 | Improved quality of acoustic indices with estimates of the uncertainty for WGBFAS |
| **g** | Update on progress in development of the StoX software and implementation of it for the calculation of WGBIFS acoustic stock estimates. | StoX software produces fish abundance estimations in a transparent and reproducible way. Planned development of the StoX post-processing program should allow implication this software by WGBIFS using the acoustic and biotic data from ICES database for acoustic-trawl surveys. Comparisons will be performed to validate whether the StoX software provides us similar results as the current IBAS calculation method in order to allow WGBIFS to use it as a new standard tool for the calculation of annual acoustic survey estimates. | 3.1, 3.2 | Year 1-3 | Improved transparency and reproducibility of acoustic indices, improved pace of work on the level of national data compilation and verification |

| | | | | | |
|---|---|---|---|---|---|
| **h** | Coordinate the marine litter-sampling programme within the Baltic International Trawl Survey and registering the data in the ICES database. | Collected and registered information about the marine litter (mostly anthropogenic origin), occasionally appeared in the ground trawl fish control-catches, are additional source of data about present ecological status of marine seabed in investigated areas of the Baltic. | 3.1 | Annually<br>Year 1, 2 and 3 | Coordinated the marine litter sampling programme in the Baltic International Trawl Survey (BITS). |
| **i** | Agree a standard pelagic trawl gear used the acoustic surveys | Acoustic surveys provide important fishery-independent estimates for Baltic herring and sprat stocks size and possible uncertainties, which result from, e.g. different type of fishing gears applied for fish control-catches, should be eliminated. | 3.1, 3.2 | Year 1-3 | Agreement on the standard pelagic fishing gear which will be used in the BIAS and BASS surveys |
| **j** | Review and update the manual for International Baltic Acoustic Surveys (IBAS; former SISP 8) and address methodological question raised at the last review of the SISP | Acoustic surveys provide important fishery-independent stock estimates for Baltic herring and sprat stocks | 3.1, 3.2 | Year 3 | Updated IBAS manual for publication in TIMES |
| **k** | Review and update the manual for Baltic International Trawl Survey (BITS; former SISP 7) and address methodological question raised at the last review of the SISP | Demersal trawl surveys provide important fishery-independent stock estimates for Baltic cod and flatfish stocks | 3.1, 3.2 | Year 3 | Updated BITS manual for publication in TIMES |
| **l** | Conduct analyses related to the uncertainties in the Gulf of Riga Acoustic Herring Survey (GRAHS) in order to improve the quality of the GRAHS and subsequent indices. | Until now, the preparation of the survey data for stock assessment is the responsibility of the Latvian and Estonian national laboratories. The methodology and consistency of results of this survey should be evaluated by the wider international scientific expertise available. | 3.1, 3.2 | Year 1-3 | Improved quality, transparency and reproducibility of acoustic indices, updated databases with acoustic and biotic data from GRAHS |
| **m** | Evaluate if there are methodological and/or environmental reasons for different survey catchabilities in different ICES Subdivisions and what may be magnitude of these differences | Within the INSPIRE project assessments of herring and sprat stocks were conducted by former assessment units (AUs) instead of currently used central Baltic herring (CBH) and sprat in the entire Baltic. It was dis-covered in these assessments that catchabilities (q) (understood as ratio between the acoustically estimated and the model assessed stock sizes in given area/AU) of acoustic surveys estimated by applied assessment models differed by AUs, and usually q's were higher in northern than in southern waters. The question is if these differences may to some extent be caused by "environmental" differences, acoustic methodologies, area coverages etc. in the surveyed areas. This information is important to have if ICES is asked to develop/evaluate a spatial management plan for sprat and herring, as has been suggested for several years in the sprat advice. | 3.1, 3.2 | Year 1-3 | Improved quality and transparency of acoustic indices |

# 2 Summary of the Work Plan for Year 3

- Compilation the survey results from 2022 and the first quarter of 2023 and reporting to WGBFAS. (ToR a and d).
- Updated databases with acoustic and biotic data (ToR b).
- Finalized coordination and planning for the BASS, BIAS, GRAHS and BITS surveys in 2023 and first half of 2024, updated and corrected Tow Database (ToR c and e).
- Questions related to BIAS and BASS survey uncertainties estimates were discussed and standard deviation for Central Baltic herring acoustic index series calculated (ToR f).
- Uploading the data from the Gulf of Riga Acoustic Herring Survey into the ICES database for acoustic and trawl surveys and screening of the data. Analyses related to the uncertainties in the Gulf of Riga Acoustic Herring Survey. (ToR g and l).
- Coordinated marine litter sampling programme in the BITS surveys and registered data in the ICES database (ToR h).
- Progress towards an agreement in the standard pelagic fishing gear to be used in the acoustic surveys (ToR i).
- Review and update of the IBAS and BITS manuals (ToR j and k).
- Possible reasons for different survey catchabilities were listed. (ToR m)

# 3 Summary of outcomes and achievements of the WG during 3-year term

Indices for the pelagic and demersal fish stocks in the Baltic Sea from annual surveys as fishery-independent data for analytical assessment purposes in WGBFAS:

- Calculated BASS tuning fleet index for Baltic sprat in SDs 24–26 and 28.2 (abundance per age in the age groups 1-8+).
- Calculated BIAS tuning fleet index for Baltic sprat in SDs 22–29 (abundance per age in the age groups 1-8+).
- Calculated BIAS tuning fleet index for Baltic sprat recruitment in SDs 22–29 (abundance at age 0).
- Calculated BIAS tuning fleet index for Baltic sprat in SDs 22–29 and 32 (abundance per age in the age groups 1-8+).
- Calculated BIAS tuning fleet index for Baltic sprat recruitment in SDs 22–29 and 32 (abundance at age 0).
- Calculated BIAS tuning fleet index for Baltic herring in SDs 25–29 (abundance per age in the age groups 1-8+).
- Calculated BIAS tuning fleet index for Baltic herring recruitment in SDs 25–29 (abundance at age 0).
- Calculated BIAS tuning fleet index for Baltic herring in SDs 25–29 and 32 (abundance per age in the age groups 1-8+).
- Calculated BIAS tuning fleet index for Baltic herring recruitment in SDs 25–29 and 32 (abundance at age 0).
- Calculated BIAS tuning fleet index (in StoX) for Baltic herring in SD 30 (abundance per age in the age-groups 0-15+).
- Calculated standard deviations for the Central Baltic Herring BIAS tuning indices.
- Uploaded data from the 1st and 4th quarter BITS surveys to the DATRAS database to be used for the calculation of survey indices for the relevant cod and flatfish stocks.
- Updated IBAS and BITS manuals.

Other survey-derived products:

- Annual maps of BASS and BIAS area coverage.
- Annual geographical distribution maps of sprat abundance in the Baltic Sea (May-June; BASS surveys).
- Annual geographical distribution maps of sprat, herring and cod abundance in the Baltic Sea (September-October; BIAS surveys).
- Geographical CPUE distribution map of cod and different flatfish species in the Baltic Sea based on the recent BITS surveys.
- Updated Access-databases for aggregated acoustic data (BASS_DB.mdb, BIAS_DB.mdb, BIAS_HERR_SD30_DB.mdl and GRAHS_DB.mdb).
- Updated ICES database of acoustic-trawl surveys for disaggregated data.
- Updated and corrected the Tow-Database which allows planning the spatial distribution of hauls in the areas, where the seabed is suitable for safety trawling.
- Alternative acoustic index series for the pelagic fish stocks in the Baltic Sea as fishery-independent data for benchmark assessment purposes in WKBALTPEL.

Other outcomes and achievements:

- Agreed plans (time and spatial coverage by countries) for the next standard acoustic surveys.
- Agreed plans (time and number of planned stations by countries) for the next standard BITS surveys.
- 2 recommendations (Annex 4) were made to other ICES Working Groups.
- Updated action list (Annex 5) for WGBIFS members.

# 4 Final report on ToRs and Work Plan

## 4.1 ToR a) Combine and analyse the results of acoustic surveys and experiments

### 4.1.1 Combined results of the Baltic International Acoustic Survey (BIAS)

In September – November 2022, the following acoustic surveys were conducted in the ICES Subdivisions 21-32 (excl. ICES Subdivision 31). Some subdivisions were only partly covered.

| Country | Data | Vessel | ICES SDs | Length of acoustic transects [NM] | Number of hauls | Number of hydrological stations |
|---|---|---|---|---|---|---|
| Finland | 20.09-03.10.2022 | Aranda | 30, parts of 29 and 32 | 1406 | 44 | 44 |
| Poland | 12-27.09.2022 | Baltica | Parts of 25 and 26 | 774 | 26 | 41 |
| Latvia | 06-17.11.2022 | F/V Albatros 3 | Parts of 26 and 28 | 615 | 17 | 17 |
| Estonia-Poland | 11.10-22.11.2022 | Baltica | Parts of 28, 29 and 32 | 623 | 24 | 24 |
| Sweden | 02-22.10.2022 | Svea | 27, parts of 25, 26, 28 and 29 | 1295 | 53 | 53 |
| Lithuania | 24-25.10.2022 | F/V Palanga NZ55 | Part of 26 | 112 | 7 | 7 |
| Germany | 05-24.10.2022 | Solea | 22, 23, 24 and parts of 21 | 1208 | 49 | 74 |

#### 4.1.1.1 Area under investigation and overlapping areas

Each of the ICES statistical rectangles of the area under investigation was allocated to one country during the WGBIFS meeting in 2022. Thus, each country has a mandatory responsible area. Each rectangle should be covered by an acoustic transect of about 60 NM per 1000 $NM^2$ area and at least two fishing hauls. Nations can also cover areas outside their mandatory areas but the results from the responsible country are used in these cases.

During the BIAS 2022 survey, almost all rectangles were covered as planned during the WGBIFS 2022 meeting (Fig. 4.1). Overall, 121 statistical ICES rectangles were inspected and reported. 120 ICES rectangles were investigated by one country. One ICES rectangle was inspected and reported by two countries, namely 48H4 by Estonian and Finland. Also, one ICES rectangle (48H5) was additionally inspected by Finland, however, these data were not considered in the final analysis. ICES statistical rectangle 39H0 in ICES Subdivision 26 was not investigated as Russia did not take part in the BIAS 2022 sampling. Rectangles 38G9, 39G9 and 40G9 were inspected only partly, i.e. inside the Polish and Lithuanian EEZ but included in the final analyses. Investigations in the eastern part of ICES Subdivision 32 (the Russian zone) were not planned. Compared to the BIAS 2021, the survey area was extended to the Gulf of Riga area, however, these data were not included into the final analysis asthe measurements in the Gulf of Riga were realised by Estonia and Latvia in slightly different time periods. The obtained results thus were not classified as representative.

In total, 6033 NM of acoustic transects were recorded. Moreover, 220 and 260 catch and hydrological stations, respectively, were performed.

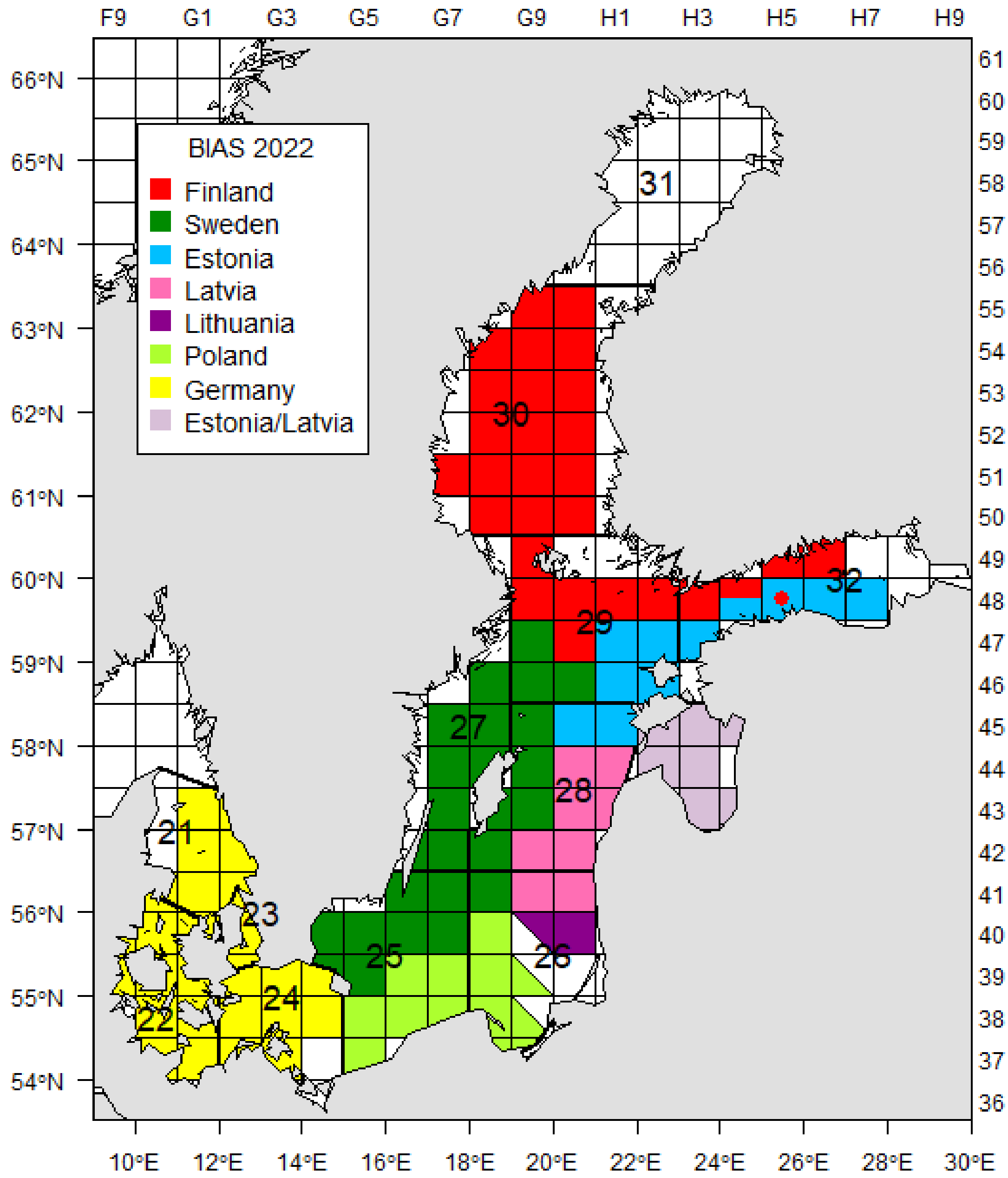



**Figure 4.1. Map of the BIAS survey conducted in September-November 2022. Various colours indicate the responsible countries for that ICES rectangle which finally also delivered data to the BIAS-database. Dots with different colours within a rectangle indicate that the rectangle was partly or completely covered by another country and data are available in the BIAS-database (but not included in the final analysis).**

#### 4.1.1.2 Total results

Geographical distribution of herring, sprat and cod abundance in the Baltic Sea, accordingly to the ICES rectangles inspected in September-November 2022, is illustrated in Figures 4.2 - 4.6.

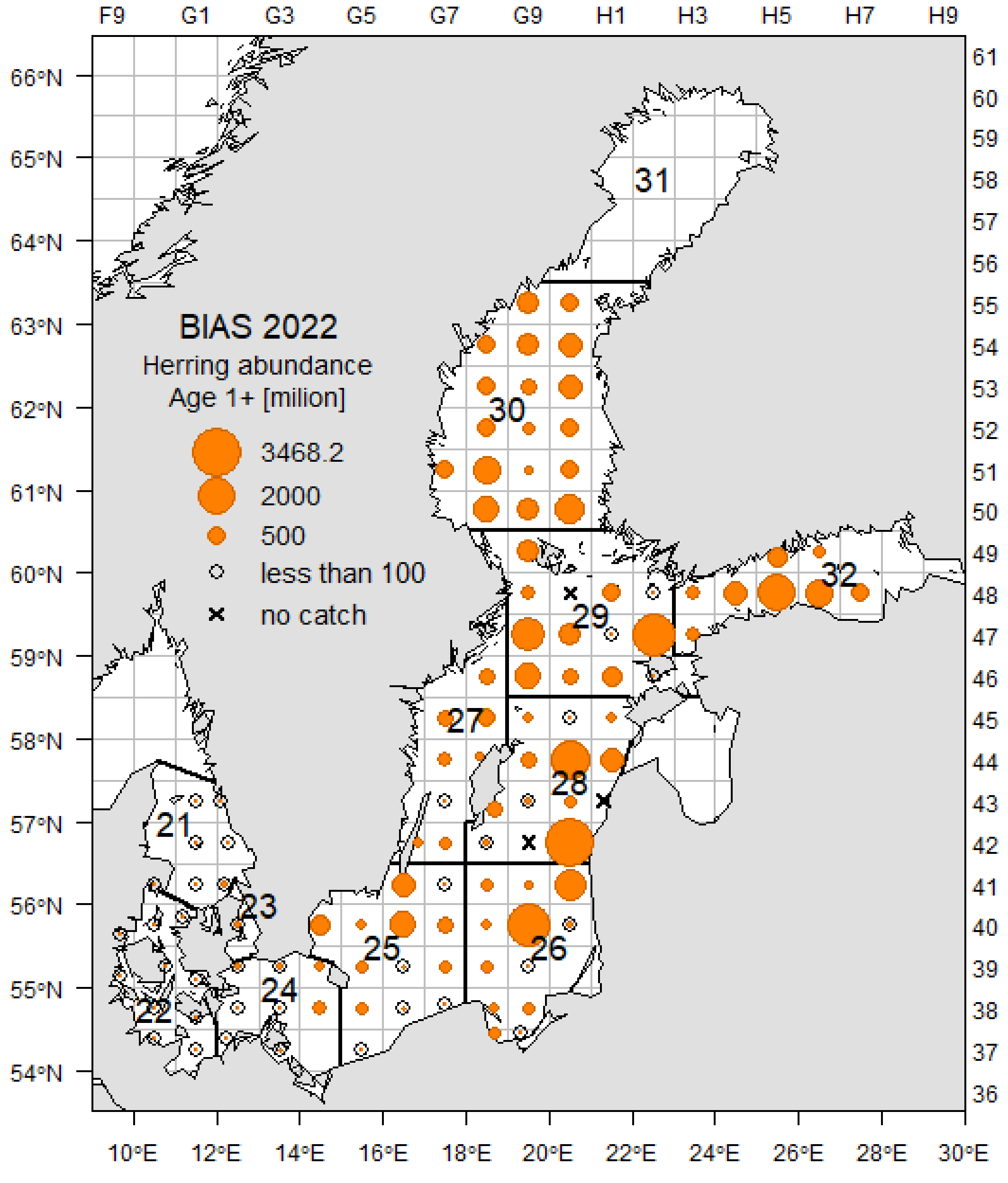



**Figure 4.2. The abundance of herring (age 1+) per ICES rectangle monitored in September-November 2022 (the size of a circle indicates estimated numbers of specimens x10^6 in a given rectangle).**

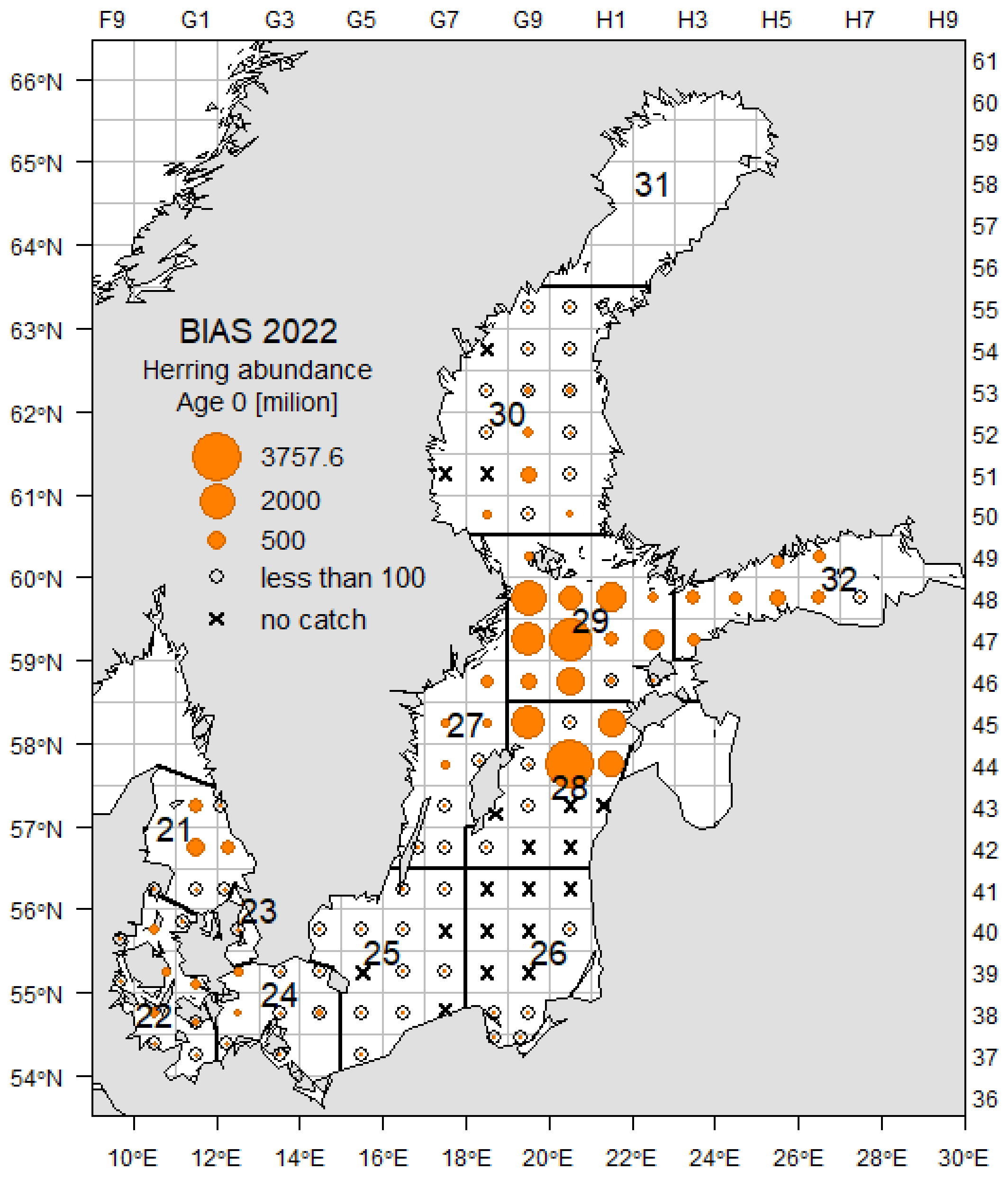



**Figure 4.3. The abundance of herring (age 0) per ICES rectangle monitored in September-November 2022 (the size of a circle indicates estimated numbers of specimens x10^6 in a given rectangle).**

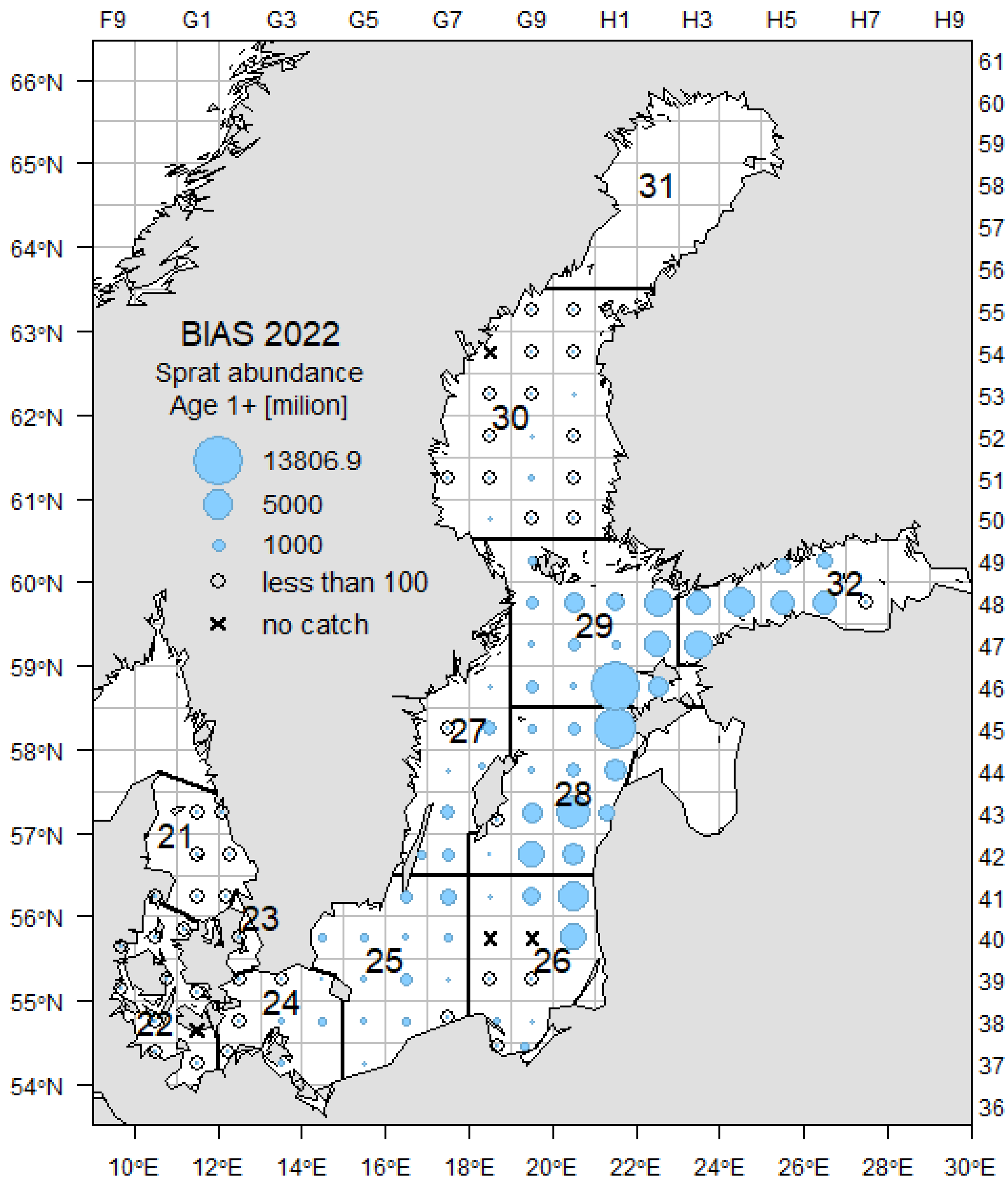



**Figure 4.4. The abundance of sprat (age 1+) per ICES rectangle monitored in September-November 2022 (the size of a circle indicates estimated numbers of specimens x10^6 in a given rectangle).**

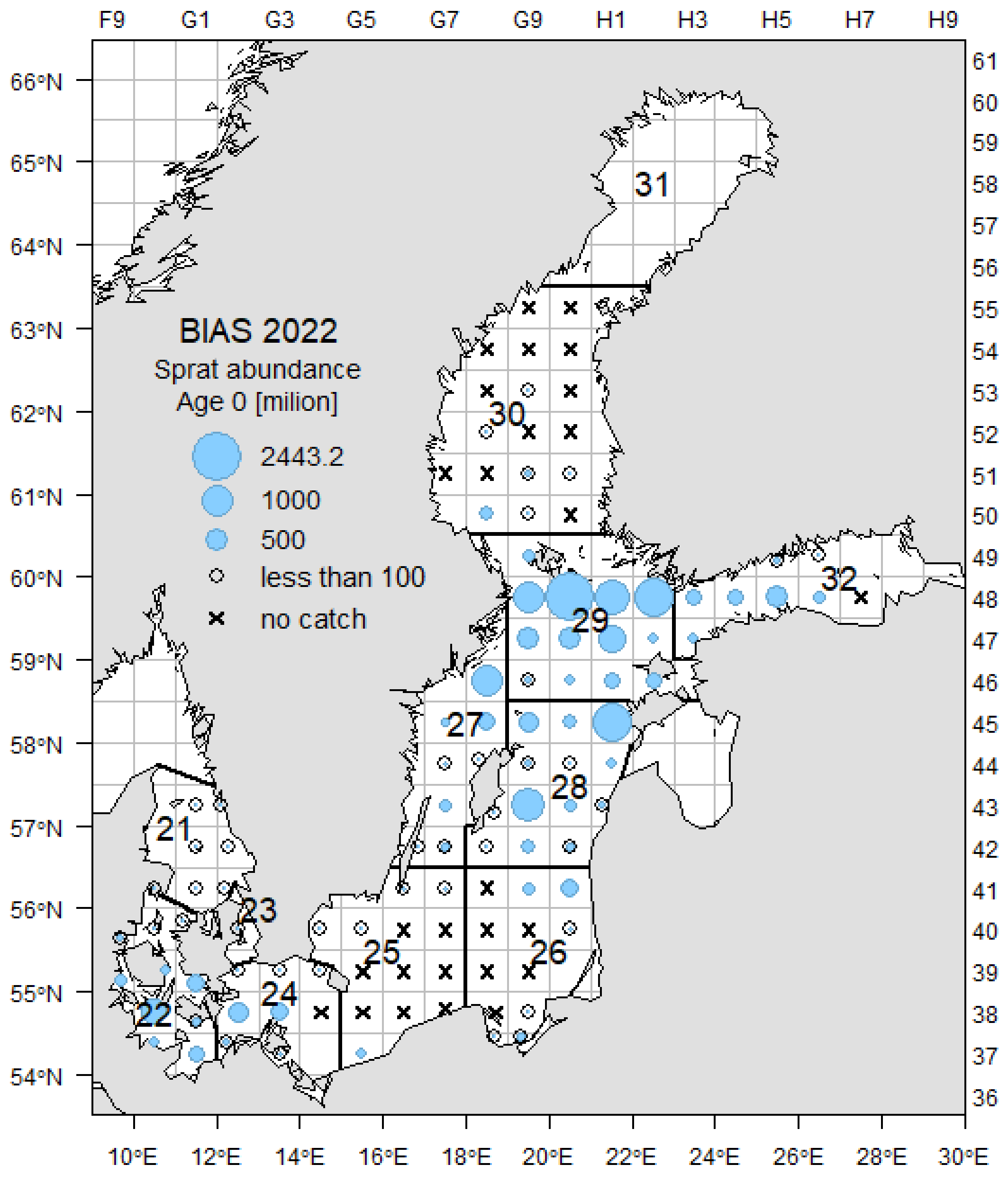



**Figure 4.5. The abundance of sprat (age 0) per ICES rectangle monitored in September-November 2022 (the size of a circle indicates estimated numbers of specimens x10^6 in a given rectangle).**

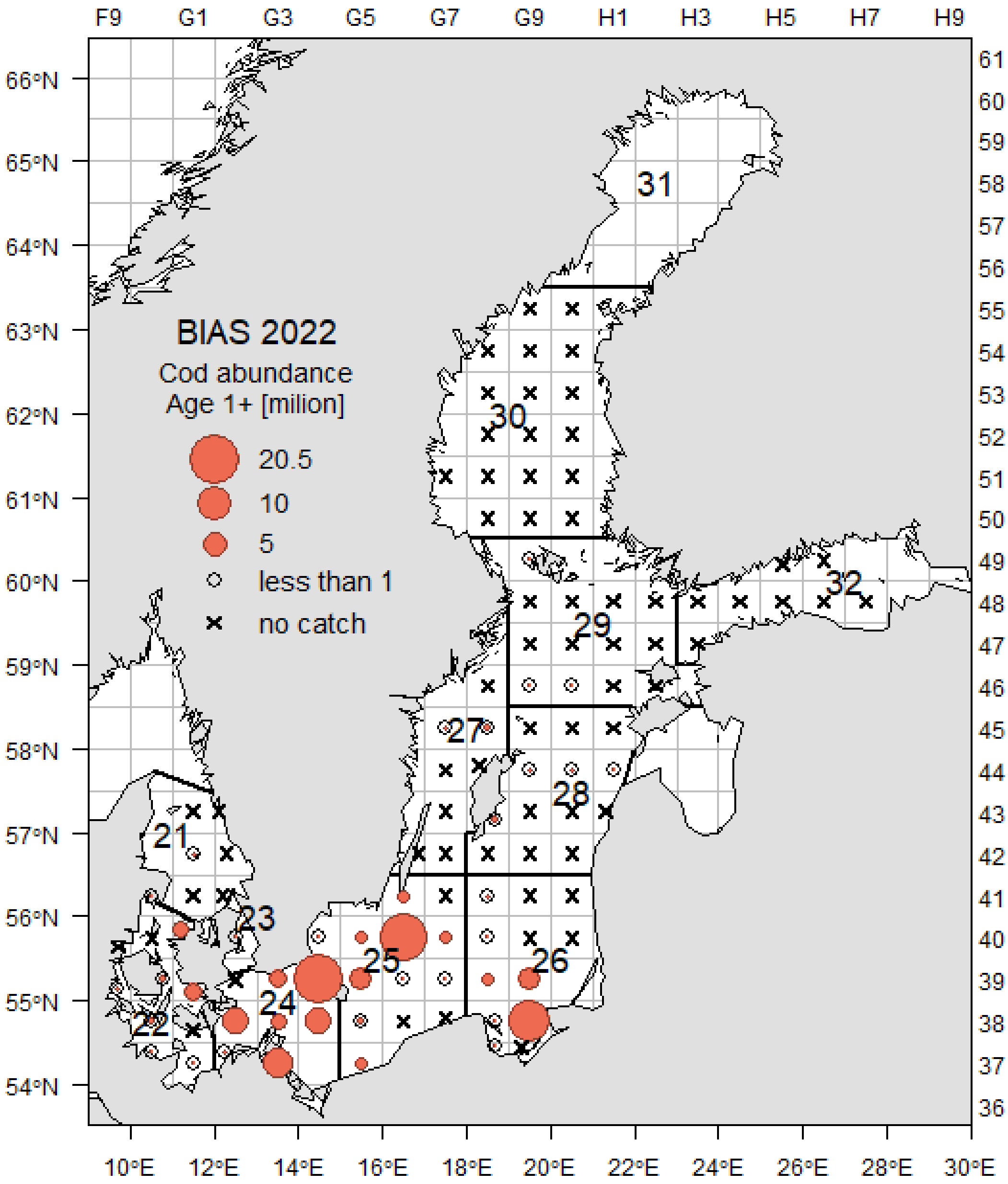



**Figure 4.6. The abundance of cod (age 1+) per ICES rectangle monitored in September-November 2022 (the size of a circle indicates estimated numbers of specimens x10^6 in a given rectangle).**

The fish abundance estimates, which are based on the BIAS survey in September-November 2022 are presented per ICES rectangle and age-group and are specified in Tables 4.1, 4.2 and 4.3 for herring, sprat and cod, respectively. In addition, the abundance estimates for herring and sprat aggregated per ICES Subdivisions and fish age-groups are presented in Tables 4.4 and 4.5.

The highest herring (age 1+) stock abundance was observed in the south-eastern part of the ICES Subdivision 28, in the ICES rectangle 42H0. A somewhat lower, but still significant abundance of the herring stock was assessed in the ICES Subdivisions 26, 29 and 32. Herring (age 1+) was distributed in all except three ICES rectangles of the inspected area (42G9 and 43H1 in the ICES Subdivision 28 and 48H0 in the ICES Subdivision 28). The highest concentrations of young of the year (YOY) herring (age-group 0, year class 2022) was detected in the northern part of the ICES Subdivision 28, especially in rectangle 44H0. High concentrations of 0-age-group herring were detected in the ICES Subdivision 29. YOY herring occurred also in others inspected waters of the Baltic, however levels were significantly lower (Figure 4.3).

The highest sprat (age 1+) stock abundance was observed at the border of the ICES Subdivisions 28 and 29 (the Estonian inshore waters) (Figure 4.4). The highest concentration of YOY sprat (year class 2022) was detected in the northern part of the ICES Subdivision 29. YOY sprat was not observed in significant amounts in ICES Subdivisions 25, 26 and 30 (Figure 4.4).

The highest cod stock abundance (age 1+) was detected in the ICES Subdivisions 24 and 25 (Figure 4.5). Cod in lower abundances were detected in others areas of the Baltic, but not in ICES Subdivisions 30 and 32. It should be underlined that the cod stock abundance was **several** times lower than herring and sprat stocks abundance.

**Table 4.1. Estimated numbers (millions) of herring in September-November 2022, by ICES rectangle and age-group.**

| YEAR | SD | RECT | TOTAL | AGE 0 | AGE 1 | AGE 2 | AGE 3 | AGE 4 | AGE 5 | AGE 6 | AGE 7 | AGE 8+ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2022 | 21 | 41G0 | 6.0 | 5.9 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 2022 | 21 | 41G1 | 41.6 | 35.6 | 4.2 | 0.9 | 0.3 | 0.2 | 0.3 | 0.0 | 0.0 | 0.0 |
| 2022 | 21 | 41G2 | 50.1 | 50.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 2022 | 21 | 42G1 | 568.9 | 561.0 | 6.4 | 0.1 | 0.7 | 0.3 | 0.5 | 0.0 | 0.0 | 0.0 |
| 2022 | 21 | 42G2 | 357.5 | 353.8 | 2.8 | 0.2 | 0.4 | 0.1 | 0.2 | 0.0 | 0.0 | 0.0 |
| 2022 | 21 | 43G1 | 363.8 | 363.7 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 2022 | 21 | 43G2 | 19.4 | 19.3 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 2022 | 22 | 37G0 | 52.3 | 51.9 | 0.4 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 2022 | 22 | 37G1 | 37.2 | 36.6 | 0.7 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 2022 | 22 | 38G0 | 185.5 | 184.3 | 1.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 2022 | 22 | 38G1 | 83.7 | 82.6 | 0.6 | 0.0 | 0.0 | 0.0 | 0.5 | 0.0 | 0.0 | 0.0 |
| 2022 | 22 | 39F9 | 62.3 | 62.2 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 2022 | 22 | 39G0 | 151.0 | 150.6 | 0.4 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 2022 | 22 | 39G1 | 199.7 | 195.9 | 3.9 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 2022 | 22 | 40F9 | 25.2 | 25.1 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 2022 | 22 | 40G0 | 190.4 | 187.1 | 3.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 2022 | 22 | 40G1 | 22.7 | 22.0 | 0.7 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 2022 | 22 | 41G0 | 4.0 | 3.9 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 2022 | 23 | 39G2 | 146.9 | 88.4 | 44.8 | 2.2 | 4.2 | 2.6 | 2.3 | 0.9 | 1.1 | 0.5 |

| YEAR | SD | RECT | TOTAL | AGE 0 | AGE 1 | AGE 2 | AGE 3 | AGE 4 | AGE 5 | AGE 6 | AGE 7 | AGE 8+ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2022 | 23 | 40G2 | 126.1 | 38.7 | 13.9 | 44.0 | 13.2 | 8.4 | 3.2 | 3.2 | 1.1 | 0.3 |
| 2022 | 23 | 41G2 | 86.7 | 0.0 | 0.5 | 48.2 | 18.0 | 8.0 | 4.4 | 5.5 | 1.7 | 0.4 |
| 2022 | 24 | 37G2 | 64.0 | 52.0 | 11.9 | 0.0 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 2022 | 24 | 37G3 | 58.2 | 2.3 | 10.5 | 8.3 | 10.7 | 8.7 | 6.7 | 3.8 | 3.7 | 3.6 |
| 2022 | 24 | 38G2 | 111.9 | 101.5 | 8.4 | 0.2 | 0.5 | 0.4 | 0.4 | 0.2 | 0.3 | 0.2 |
| 2022 | 24 | 38G3 | 63.2 | 37.5 | 7.0 | 3.2 | 5.4 | 3.5 | 2.7 | 1.5 | 1.1 | 1.3 |
| 2022 | 24 | 38G4 | 444.1 | 82.3 | 79.8 | 47.6 | 67.2 | 55.8 | 45.5 | 20.2 | 26.3 | 19.5 |
| 2022 | 24 | 39G2 | 98.8 | 59.5 | 30.1 | 1.5 | 2.8 | 1.8 | 1.5 | 0.6 | 0.8 | 0.3 |
| 2022 | 24 | 39G3 | 153.9 | 65.0 | 41.8 | 5.9 | 14.0 | 10.6 | 8.0 | 2.3 | 2.5 | 3.7 |
| 2022 | 24 | 39G4 | 71.8 | 20.3 | 13.5 | 7.0 | 9.1 | 7.7 | 6.2 | 2.8 | 2.4 | 2.8 |
| 2022 | 25 | 37G5 | 49.3 | 19.9 | 3.5 | 1.5 | 12.6 | 4.7 | 4.4 | 1.3 | 1.1 | 0.2 |
| 2022 | 25 | 38G5 | 227.9 | 0.8 | 23.5 | 15.1 | 100.0 | 33.6 | 35.2 | 9.7 | 7.3 | 2.7 |
| 2022 | 25 | 38G6 | 66.4 | 26.4 | 4.2 | 3.9 | 17.0 | 5.9 | 5.6 | 1.9 | 1.2 | 0.3 |
| 2022 | 25 | 38G7 | 9.0 | 0.0 | 1.2 | 0.5 | 4.0 | 1.3 | 1.4 | 0.5 | 0.3 | 0.1 |
| 2022 | 25 | 39G4 | 118.6 | 0.6 | 4.9 | 31.0 | 11.5 | 26.3 | 23.9 | 14.9 | 1.1 | 4.4 |
| 2022 | 25 | 39G5 | 213.2 | 0.0 | 8.6 | 16.6 | 29.0 | 84.9 | 20.4 | 28.1 | 14.0 | 11.7 |
| 2022 | 25 | 39G6 | 47.6 | 1.0 | 6.2 | 1.3 | 24.2 | 6.6 | 5.3 | 1.4 | 1.7 | 0.1 |
| 2022 | 25 | 39G7 | 246.0 | 1.1 | 30.5 | 12.3 | 111.4 | 34.1 | 36.0 | 10.6 | 8.2 | 1.7 |
| 2022 | 25 | 40G4 | 571.6 | 12.2 | 43.7 | 45.6 | 58.8 | 136.2 | 58.5 | 86.3 | 69.0 | 61.3 |
| 2022 | 25 | 40G5 | 217.6 | 7.6 | 12.7 | 7.5 | 83.4 | 50.0 | 34.2 | 13.2 | 4.0 | 5.0 |
| 2022 | 25 | 40G6 | 941.6 | 4.8 | 41.9 | 72.3 | 82.2 | 463.5 | 85.9 | 133.4 | 37.6 | 20.0 |
| 2022 | 25 | 40G7 | 365.1 | 0.0 | 13.2 | 20.2 | 104.5 | 137.9 | 47.0 | 11.3 | 13.6 | 17.5 |
| 2022 | 25 | 41G6 | 845.5 | 9.6 | 16.9 | 25.0 | 61.0 | 361.8 | 262.8 | 13.8 | 46.9 | 47.7 |
| 2022 | 25 | 41G7 | 6.8 | 1.7 | 4.8 | 0.0 | 0.0 | 0.0 | 0.4 | 0.0 | 0.0 | 0.0 |
| 2022 | 26 | 37G8 | 264.2 | 7.8 | 16.6 | 16.5 | 47.7 | 45.9 | 41.4 | 29.0 | 26.6 | 32.6 |
| 2022 | 26 | 37G9 | 8.2 | 0.3 | 0.8 | 0.4 | 1.5 | 1.3 | 1.5 | 0.9 | 0.6 | 0.9 |
| 2022 | 26 | 38G8 | 209.4 | 9.4 | 19.1 | 11.9 | 44.7 | 35.7 | 37.6 | 21.5 | 16.7 | 12.7 |
| 2022 | 26 | 38G9 | 219.2 | 0.5 | 6.4 | 14.8 | 36.1 | 41.2 | 44.0 | 29.2 | 22.3 | 24.6 |
| 2022 | 26 | 39G8 | 214.9 | 0.0 | 9.9 | 13.3 | 46.1 | 40.9 | 42.8 | 25.9 | 19.8 | 16.2 |

| YEAR | SD | RECT | TOTAL | AGE 0 | AGE 1 | AGE 2 | AGE 3 | AGE 4 | AGE 5 | AGE 6 | AGE 7 | AGE 8+ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2022 | 26 | 39G9 | 23.8 | 0.0 | 1.0 | 1.7 | 4.5 | 4.7 | 4.7 | 3.0 | 2.0 | 2.1 |
| 2022 | 26 | 40G8 | 166.1 | 0.0 | 14.8 | 9.8 | 46.0 | 30.5 | 33.4 | 16.9 | 11.7 | 2.9 |
| 2022 | 26 | 40G9 | 2 773.8 | 0.0 | 26.7 | 80.0 | 480.1 | 560.1 | 480.1 | 533.4 | 346.7 | 266.7 |
| 2022 | 26 | 40H0 | 99.0 | 0.4 | 6.1 | 5.4 | 21.9 | 26.1 | 17.7 | 9.7 | 8.5 | 3.1 |
| 2022 | 26 | 41G8 | 263.8 | 0.0 | 1.6 | 18.6 | 35.1 | 76.7 | 56.5 | 34.1 | 20.8 | 20.4 |
| 2022 | 26 | 41G9 | 112.0 | 0.0 | 1.1 | 5.6 | 34.2 | 35.7 | 10.6 | 12.1 | 10.0 | 2.7 |
| 2022 | 26 | 41H0 | 1 518.3 | 0.0 | 14.5 | 76.2 | 463.8 | 484.4 | 143.7 | 163.7 | 135.7 | 36.3 |
| 2022 | 27 | 42G6 | 182.4 | 1.1 | 8.6 | 9.6 | 1.3 | 86.9 | 21.2 | 23.3 | 20.8 | 9.6 |
| 2022 | 27 | 42G7 | 252.6 | 1.3 | 1.0 | 8.8 | 63.1 | 98.5 | 29.9 | 24.2 | 25.4 | 0.5 |
| 2022 | 27 | 43G7 | 35.6 | 5.9 | 4.9 | 10.4 | 1.3 | 9.9 | 1.4 | 1.9 | 0.0 | 0.0 |
| 2022 | 27 | 44G7 | 428.0 | 139.9 | 38.8 | 32.8 | 115.0 | 65.3 | 23.1 | 1.9 | 8.5 | 2.6 |
| 2022 | 27 | 44G8 | 171.2 | 36.9 | 16.4 | 16.9 | 27.4 | 47.4 | 17.3 | 5.0 | 4.0 | 0.0 |
| 2022 | 27 | 45G7 | 518.8 | 132.3 | 33.4 | 59.3 | 45.2 | 119.8 | 11.7 | 32.4 | 84.7 | 0.0 |
| 2022 | 27 | 45G8 | 655.0 | 113.6 | 74.2 | 58.2 | 104.2 | 129.4 | 71.7 | 54.7 | 32.8 | 16.2 |
| 2022 | 27 | 46G8 | 597.5 | 231.6 | 79.9 | 38.2 | 15.6 | 149.8 | 24.1 | 20.9 | 25.4 | 11.9 |
| 2022 | 28_2 | 42G8 | 88.8 | 1.6 | 0.0 | 3.2 | 27.1 | 39.5 | 11.4 | 4.1 | 1.4 | 0.6 |
| 2022 | 28_2 | 42G9 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 2022 | 28_2 | 42H0 | 3 468.2 | 0.0 | 101.6 | 88.4 | 795.2 | 499.2 | 1 005.1 | 293.8 | 377.7 | 307.1 |
| 2022 | 28_2 | 43G8 | 384.4 | 0.0 | 0.0 | 29.1 | 159.6 | 65.7 | 34.0 | 38.9 | 34.0 | 23.2 |
| 2022 | 28_2 | 43G9 | 76.2 | 8.1 | 0.0 | 1.0 | 16.5 | 12.1 | 25.8 | 9.5 | 3.2 | 0.0 |
| 2022 | 28_2 | 43H0 | 231.2 | 0.0 | 0.0 | 12.2 | 48.7 | 48.7 | 48.7 | 18.3 | 36.5 | 18.3 |
| 2022 | 28_2 | 43H1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 2022 | 28_2 | 44G9 | 418.7 | 39.9 | 1.2 | 39.2 | 137.2 | 108.1 | 45.0 | 19.9 | 16.9 | 11.2 |
| 2022 | 28_2 | 44H0 | 5 940.0 | 3 757.6 | 303.7 | 167.7 | 846.1 | 346.4 | 254.5 | 87.4 | 109.5 | 67.2 |
| 2022 | 28_2 | 44H1 | 1 902.5 | 1 000.8 | 114.9 | 98.8 | 323.4 | 134.6 | 105.0 | 42.7 | 46.0 | 36.3 |
| 2022 | 28_2 | 45G9 | 1 853.5 | 1 693.0 | 13.3 | 9.9 | 45.7 | 39.8 | 15.9 | 13.8 | 12.3 | 10.0 |
| 2022 | 28_2 | 45H0 | 23.1 | 21.0 | 1.3 | 0.2 | 0.2 | 0.1 | 0.0 | 0.1 | 0.1 | 0.0 |
| 2022 | 28_2 | 45H1 | 1 393.4 | 1 232.1 | 113.0 | 23.1 | 16.4 | 6.5 | 0.0 | 0.0 | 2.4 | 0.0 |
| 2022 | 29 | 46G9 | 1 473.0 | 418.6 | 97.1 | 102.6 | 438.2 | 88.7 | 51.4 | 75.4 | 191.8 | 9.3 |

| YEAR | SD | RECT | TOTAL | AGE 0 | AGE 1 | AGE 2 | AGE 3 | AGE 4 | AGE 5 | AGE 6 | AGE 7 | AGE 8+ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2022 | 29 | 46H0 | 1 600.2 | 1 229.2 | 13.8 | 34.3 | 55.7 | 107.7 | 62.1 | 34.9 | 56.9 | 5.5 |
| 2022 | 29 | 46H1 | 669.3 | 85.8 | 68.0 | 124.1 | 237.7 | 69.8 | 39.7 | 25.3 | 8.2 | 10.7 |
| 2022 | 29 | 46H2 | 9.0 | 6.5 | 2.1 | 0.3 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 2022 | 29 | 47G9 | 3 468.4 | 1 786.2 | 287.9 | 340.0 | 427.4 | 207.0 | 153.2 | 103.3 | 107.9 | 55.5 |
| 2022 | 29 | 47H0 | 3 547.6 | 2 853.9 | 51.5 | 190.4 | 229.9 | 76.3 | 50.3 | 22.0 | 49.7 | 23.6 |
| 2022 | 29 | 47H1 | 355.1 | 330.0 | 20.4 | 1.2 | 2.2 | 0.8 | 0.2 | 0.3 | 0.0 | 0.0 |
| 2022 | 29 | 47H2 | 3 299.9 | 679.6 | 184.8 | 696.1 | 1 270.9 | 230.9 | 124.7 | 85.0 | 7.3 | 20.6 |
| 2022 | 29 | 48G9 | 2 211.8 | 1 879.3 | 68.2 | 116.4 | 98.8 | 25.3 | 10.8 | 2.4 | 4.1 | 6.5 |
| 2022 | 29 | 48H0 | 860.6 | 860.6 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 2022 | 29 | 48H1 | 1 814.5 | 1 340.8 | 117.4 | 151.9 | 108.9 | 33.8 | 21.1 | 8.2 | 20.5 | 11.8 |
| 2022 | 29 | 48H2 | 232.1 | 218.0 | 4.5 | 4.7 | 3.3 | 0.6 | 0.4 | 0.1 | 0.4 | 0.2 |
| 2022 | 29 | 49G9 | 865.6 | 141.3 | 168.5 | 224.7 | 171.3 | 57.2 | 33.0 | 13.8 | 31.8 | 23.9 |
| 2022 | 30 | 50G8 | 1 092.8 | 162.6 | 408.4 | 260.9 | 158.8 | 64.3 | 22.7 | 7.6 | 3.8 | 3.8 |
| 2022 | 30 | 50G9 | 769.5 | 16.7 | 92.6 | 256.0 | 158.8 | 87.8 | 91.4 | 24.5 | 22.1 | 19.7 |
| 2022 | 30 | 50H0 | 1 437.1 | 103.3 | 145.6 | 389.8 | 544.8 | 140.9 | 42.3 | 28.2 | 9.4 | 32.9 |
| 2022 | 30 | 51G7 | 549.0 | 0.0 | 23.6 | 78.2 | 272.7 | 112.7 | 7.3 | 14.5 | 30.9 | 9.1 |
| 2022 | 30 | 51G8 | 1 136.8 | 0.0 | 32.5 | 105.7 | 469.8 | 211.9 | 99.1 | 92.6 | 59.5 | 65.8 |
| 2022 | 30 | 51G9 | 555.4 | 446.1 | 28.2 | 39.5 | 15.0 | 10.1 | 3.4 | 2.6 | 0.0 | 10.5 |
| 2022 | 30 | 51H0 | 469.5 | 0.8 | 4.8 | 105.0 | 188.2 | 78.5 | 48.3 | 11.0 | 7.8 | 24.9 |
| 2022 | 30 | 52G8 | 541.2 | 16.1 | 35.8 | 90.6 | 198.2 | 104.8 | 44.8 | 17.0 | 16.1 | 17.9 |
| 2022 | 30 | 52G9 | 393.1 | 180.6 | 74.3 | 75.6 | 35.6 | 13.1 | 8.2 | 3.1 | 1.3 | 1.3 |
| 2022 | 30 | 52H0 | 533.3 | 43.1 | 24.6 | 37.0 | 153.9 | 126.3 | 33.3 | 27.6 | 26.6 | 60.9 |
| 2022 | 30 | 53G8 | 495.8 | 0.8 | 1.7 | 48.8 | 178.8 | 179.7 | 17.4 | 51.3 | 5.8 | 11.6 |
| 2022 | 30 | 53G9 | 472.0 | 93.0 | 23.1 | 41.5 | 83.8 | 91.8 | 100.6 | 18.4 | 5.6 | 14.3 |
| 2022 | 30 | 53H0 | 886.7 | 76.8 | 12.8 | 128.0 | 385.4 | 135.3 | 41.4 | 64.2 | 14.3 | 28.5 |
| 2022 | 30 | 54G8 | 535.9 | 0.0 | 2.0 | 34.1 | 154.6 | 154.6 | 80.3 | 52.2 | 18.1 | 40.1 |
| 2022 | 30 | 54G9 | 762.6 | 28.8 | 6.2 | 25.0 | 256.5 | 152.9 | 117.7 | 40.2 | 32.5 | 102.9 |
| 2022 | 30 | 54H0 | 795.3 | 2.6 | 4.1 | 169.2 | 367.9 | 114.2 | 41.0 | 54.7 | 12.6 | 29.0 |
| 2022 | 30 | 55G9 | 691.3 | 10.1 | 70.9 | 177.2 | 250.7 | 91.2 | 25.3 | 35.4 | 5.1 | 25.3 |

| YEAR | SD | RECT | TOTAL | AGE 0 | AGE 1 | AGE 2 | AGE 3 | AGE 4 | AGE 5 | AGE 6 | AGE 7 | AGE 8+ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2022 | 30 | 55H0 | 480.6 | 23.4 | 13.3 | 133.5 | 166.9 | 90.1 | 6.7 | 21.7 | 8.3 | 16.7 |
| 2022 | 32 | 47H3 | 565.2 | 251.5 | 39.7 | 75.1 | 123.9 | 42.4 | 23.7 | 5.4 | 2.0 | 1.6 |
| 2022 | 32 | 48H3 | 651.5 | 328.5 | 9.5 | 107.0 | 53.7 | 58.2 | 30.7 | 6.5 | 27.9 | 29.6 |
| 2022 | 32 | 48H4 | 1 074.1 | 277.0 | 89.4 | 385.9 | 116.6 | 75.8 | 41.8 | 9.1 | 36.7 | 41.8 |
| 2022 | 32 | 48H5 | 2 443.9 | 427.4 | 153.6 | 434.1 | 741.7 | 339.3 | 239.8 | 62.5 | 24.8 | 20.7 |
| 2022 | 32 | 48H6 | 1 470.3 | 381.8 | 78.5 | 191.6 | 417.2 | 206.5 | 129.0 | 41.4 | 14.4 | 9.9 |
| 2022 | 32 | 48H7 | 505.1 | 15.5 | 10.5 | 32.3 | 160.6 | 118.4 | 99.5 | 32.1 | 17.1 | 19.0 |
| 2022 | 32 | 49H5 | 917.9 | 270.4 | 61.9 | 335.3 | 94.8 | 62.5 | 35.9 | 6.9 | 27.0 | 23.1 |
| 2022 | 32 | 49H6 | 529.2 | 250.0 | 22.6 | 127.0 | 43.6 | 32.5 | 18.1 | 3.7 | 17.4 | 14.4 |

**Table 4.2. Estimated numbers (millions) of sprat in September-November 2022, by ICES rectangle and age-group.**

| YEAR | SD | RECT | TOTAL | AGE 0 | AGE 1 | AGE 2 | AGE 3 | AGE 4 | AGE 5 | AGE 6 | AGE 7 | AGE 8+ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2022 | 21 | 41G0 | 3.1 | 0.0 | 0.4 | 0.9 | 1.4 | 0.2 | 0.1 | 0.0 | 0.0 | 0.0 |
| 2022 | 21 | 41G1 | 3.4 | 0.1 | 0.7 | 1.0 | 1.2 | 0.4 | 0.1 | 0.0 | 0.0 | 0.0 |
| 2022 | 21 | 41G2 | 7.5 | 0.1 | 1.4 | 2.3 | 2.9 | 0.7 | 0.1 | 0.0 | 0.1 | 0.0 |
| 2022 | 21 | 42G1 | 85.6 | 2.7 | 16.0 | 22.5 | 33.0 | 8.9 | 1.4 | 0.2 | 0.9 | 0.0 |
| 2022 | 21 | 42G2 | 46.5 | 15.4 | 7.0 | 8.3 | 11.7 | 3.3 | 0.5 | 0.0 | 0.2 | 0.0 |
| 2022 | 21 | 43G1 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 2022 | 21 | 43G2 | 0.2 | 0.0 | 0.0 | 0.0 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 2022 | 22 | 37G0 | 122.2 | 119.8 | 1.5 | 0.3 | 0.5 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 |
| 2022 | 22 | 37G1 | 300.9 | 300.2 | 0.4 | 0.2 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 2022 | 22 | 38G0 | 715.3 | 705.8 | 5.9 | 1.1 | 2.1 | 0.3 | 0.0 | 0.0 | 0.0 | 0.0 |
| 2022 | 22 | 38G1 | 85.8 | 85.8 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 2022 | 22 | 39F9 | 154.3 | 152.1 | 0.9 | 0.7 | 0.6 | 0.0 | 0.1 | 0.0 | 0.0 | 0.0 |
| 2022 | 22 | 39G0 | 144.0 | 142.8 | 0.5 | 0.2 | 0.5 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 |
| 2022 | 22 | 39G1 | 347.2 | 344.3 | 1.1 | 0.4 | 1.1 | 0.1 | 0.1 | 0.0 | 0.0 | 0.0 |
| 2022 | 22 | 40F9 | 45.4 | 44.1 | 0.5 | 0.4 | 0.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 2022 | 22 | 40G0 | 15.7 | 5.2 | 1.8 | 3.6 | 3.7 | 0.2 | 0.3 | 0.7 | 0.0 | 0.0 |
| 2022 | 22 | 40G1 | 4.5 | 2.3 | 0.0 | 0.0 | 0.0 | 0.0 | 2.3 | 0.0 | 0.0 | 0.0 |
| 2022 | 22 | 41G0 | 2.1 | 0.0 | 0.4 | 0.7 | 0.8 | 0.1 | 0.1 | 0.0 | 0.0 | 0.0 |

| YEAR | SD | RECT | TOTAL | AGE 0 | AGE 1 | AGE 2 | AGE 3 | AGE 4 | AGE 5 | AGE 6 | AGE 7 | AGE 8+ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2022 | 23 | 39G2 | 30.1 | 2.1 | 3.1 | 5.4 | 7.1 | 5.8 | 3.9 | 1.7 | 1.1 | 0.0 |
| 2022 | 23 | 40G2 | 57.8 | 10.2 | 2.6 | 10.0 | 23.5 | 7.4 | 2.9 | 0.7 | 0.3 | 0.1 |
| 2022 | 23 | 41G2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 2022 | 24 | 37G2 | 59.6 | 57.0 | 1.1 | 0.4 | 0.5 | 0.3 | 0.2 | 0.0 | 0.0 | 0.0 |
| 2022 | 24 | 37G3 | 292.7 | 28.9 | 53.6 | 62.8 | 68.4 | 39.9 | 24.8 | 7.4 | 6.9 | 0.0 |
| 2022 | 24 | 38G2 | 440.6 | 436.7 | 0.0 | 0.2 | 1.4 | 1.0 | 0.6 | 0.6 | 0.2 | 0.0 |
| 2022 | 24 | 38G3 | 703.0 | 343.7 | 66.1 | 90.2 | 93.7 | 56.4 | 34.2 | 9.2 | 9.5 | 0.0 |
| 2022 | 24 | 38G4 | 552.1 | 0.0 | 28.0 | 86.6 | 169.5 | 125.3 | 80.1 | 35.8 | 26.9 | 0.0 |
| 2022 | 24 | 39G2 | 20.2 | 1.4 | 2.1 | 3.6 | 4.8 | 3.9 | 2.6 | 1.1 | 0.7 | 0.0 |
| 2022 | 24 | 39G3 | 49.3 | 2.9 | 2.5 | 9.3 | 12.3 | 9.8 | 7.2 | 3.2 | 2.2 | 0.0 |
| 2022 | 24 | 39G4 | 54.4 | 1.3 | 7.3 | 9.5 | 14.0 | 9.6 | 7.9 | 2.6 | 2.2 | 0.0 |
| 2022 | 25 | 37G5 | 279.3 | 117.0 | 2.1 | 3.1 | 26.1 | 40.8 | 35.6 | 24.1 | 21.1 | 9.3 |
| 2022 | 25 | 38G5 | 279.7 | 0.0 | 1.9 | 8.9 | 49.1 | 74.5 | 60.9 | 40.8 | 29.1 | 14.5 |
| 2022 | 25 | 38G6 | 419.6 | 0.0 | 3.4 | 13.4 | 83.9 | 110.3 | 93.0 | 62.8 | 34.6 | 18.1 |
| 2022 | 25 | 38G7 | 0.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 2022 | 25 | 39G4 | 52.2 | 0.3 | 1.9 | 2.9 | 12.6 | 11.9 | 10.8 | 6.4 | 0.3 | 5.1 |
| 2022 | 25 | 39G5 | 250.8 | 0.0 | 4.9 | 0.0 | 81.4 | 46.5 | 32.8 | 46.4 | 1.9 | 37.0 |
| 2022 | 25 | 39G6 | 892.7 | 0.0 | 12.7 | 51.6 | 197.7 | 240.0 | 182.5 | 128.4 | 50.0 | 29.8 |
| 2022 | 25 | 39G7 | 174.0 | 0.0 | 2.0 | 7.7 | 35.0 | 43.6 | 34.7 | 25.9 | 17.5 | 7.7 |
| 2022 | 25 | 40G4 | 502.1 | 2.6 | 11.6 | 30.5 | 125.8 | 52.4 | 128.9 | 63.7 | 15.3 | 71.2 |
| 2022 | 25 | 40G5 | 435.5 | 0.9 | 5.4 | 52.8 | 134.4 | 94.1 | 71.9 | 28.3 | 1.7 | 46.0 |
| 2022 | 25 | 40G6 | 353.5 | 0.0 | 1.7 | 3.4 | 41.2 | 80.6 | 47.8 | 19.1 | 61.7 | 98.0 |
| 2022 | 25 | 40G7 | 587.8 | 0.0 | 53.0 | 89.0 | 196.2 | 157.4 | 22.5 | 7.7 | 10.5 | 51.5 |
| 2022 | 25 | 41G6 | 988.4 | 36.9 | 280.7 | 166.9 | 349.0 | 40.0 | 72.8 | 32.8 | 2.5 | 6.7 |
| 2022 | 25 | 41G7 | 1 672.8 | 29.8 | 157.2 | 185.4 | 712.4 | 183.5 | 150.1 | 145.8 | 7.4 | 101.2 |
| 2022 | 26 | 37G8 | 57.4 | 1.8 | 4.1 | 9.2 | 13.6 | 18.6 | 4.0 | 3.8 | 2.0 | 0.3 |
| 2022 | 26 | 37G9 | 554.0 | 89.4 | 43.3 | 61.8 | 146.6 | 149.6 | 19.9 | 31.4 | 11.5 | 0.4 |
| 2022 | 26 | 38G8 | 281.9 | 0.0 | 10.6 | 26.1 | 47.0 | 101.5 | 50.2 | 30.7 | 14.0 | 1.7 |
| 2022 | 26 | 38G9 | 131.0 | 1.1 | 10.8 | 15.6 | 38.0 | 42.6 | 9.6 | 10.0 | 3.3 | 0.0 |

| YEAR | SD | RECT | TOTAL | AGE 0 | AGE 1 | AGE 2 | AGE 3 | AGE 4 | AGE 5 | AGE 6 | AGE 7 | AGE 8+ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2022 | 26 | 39G8 | 30.3 | 0.0 | 0.6 | 2.3 | 3.5 | 9.8 | 7.3 | 3.8 | 2.3 | 0.8 |
| 2022 | 26 | 39G9 | 0.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 | 0.1 | 0.0 | 0.0 | 0.0 |
| 2022 | 26 | 40G8 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 2022 | 26 | 40G9 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 2022 | 26 | 40H0 | 3 768.4 | 27.0 | 0.0 | 13.5 | 994.8 | 1 981.2 | 705.1 | 41.9 | 4.8 | 0.0 |
| 2022 | 26 | 41G8 | 200.3 | 0.0 | 21.5 | 51.5 | 82.1 | 23.7 | 10.3 | 9.6 | 0.7 | 0.7 |
| 2022 | 26 | 41G9 | 2 324.3 | 198.9 | 182.6 | 409.8 | 681.8 | 287.2 | 274.7 | 76.6 | 19.9 | 192.7 |
| 2022 | 26 | 41H0 | 5 213.2 | 331.6 | 355.1 | 590.8 | 1 536.7 | 642.9 | 671.5 | 285.8 | 122.7 | 676.1 |
| 2022 | 27 | 42G6 | 607.2 | 14.0 | 68.9 | 147.9 | 288.6 | 14.4 | 44.6 | 5.3 | 19.6 | 3.9 |
| 2022 | 27 | 42G7 | 1 205.3 | 83.5 | 82.1 | 158.5 | 258.6 | 456.9 | 28.9 | 8.7 | 30.4 | 97.8 |
| 2022 | 27 | 43G7 | 1 605.5 | 166.7 | 198.1 | 590.4 | 461.9 | 68.8 | 94.5 | 0.0 | 10.8 | 14.4 |
| 2022 | 27 | 44G7 | 269.9 | 37.2 | 66.5 | 46.4 | 104.7 | 3.0 | 0.0 | 9.0 | 1.0 | 2.1 |
| 2022 | 27 | 44G8 | 256.9 | 10.7 | 34.8 | 66.9 | 45.4 | 30.2 | 25.0 | 15.9 | 8.6 | 19.3 |
| 2022 | 27 | 45G7 | 185.0 | 105.0 | 8.4 | 27.9 | 19.6 | 5.6 | 2.1 | 8.8 | 3.5 | 4.1 |
| 2022 | 27 | 45G8 | 1 615.3 | 381.0 | 16.3 | 608.3 | 290.5 | 131.9 | 150.4 | 0.0 | 2.2 | 34.8 |
| 2022 | 27 | 46G8 | 1 207.3 | 1 064.6 | 32.7 | 27.9 | 63.8 | 10.0 | 5.2 | 0.0 | 0.0 | 3.2 |
| 2022 | 28_2 | 42G8 | 106.2 | 3.3 | 0.2 | 20.4 | 30.2 | 16.6 | 24.4 | 2.5 | 6.1 | 2.5 |
| 2022 | 28_2 | 42G9 | 3 918.5 | 219.4 | 1 042.3 | 1 571.3 | 305.6 | 343.5 | 0.0 | 41.8 | 83.6 | 310.9 |
| 2022 | 28_2 | 42H0 | 2 942.2 | 93.0 | 249.1 | 606.2 | 1 064.2 | 334.7 | 262.3 | 86.0 | 58.5 | 188.2 |
| 2022 | 28_2 | 43G8 | 30.2 | 16.5 | 0.0 | 4.9 | 6.0 | 1.8 | 0.5 | 0.0 | 0.5 | 0.0 |
| 2022 | 28_2 | 43G9 | 3 366.5 | 1 138.3 | 169.2 | 1 120.2 | 569.7 | 21.7 | 124.5 | 63.5 | 43.4 | 116.1 |
| 2022 | 28_2 | 43H0 | 6 658.4 | 191.4 | 735.5 | 1 472.5 | 2 512.3 | 940.3 | 379.0 | 221.8 | 0.0 | 205.5 |
| 2022 | 28_2 | 43H1 | 1 503.2 | 44.7 | 170.6 | 313.4 | 594.3 | 220.5 | 90.0 | 51.3 | 0.0 | 18.3 |
| 2022 | 28_2 | 44G9 | 409.0 | 46.3 | 26.8 | 48.1 | 211.5 | 41.7 | 22.8 | 7.6 | 4.3 | 0.0 |
| 2022 | 28_2 | 44H0 | 1 325.7 | 18.5 | 76.8 | 161.2 | 551.7 | 183.4 | 178.6 | 69.8 | 0.0 | 85.8 |
| 2022 | 28_2 | 44H1 | 3 190.4 | 109.6 | 269.5 | 555.3 | 1 340.3 | 392.9 | 245.2 | 92.5 | 4.8 | 180.3 |
| 2022 | 28_2 | 45G9 | 841.3 | 401.6 | 3.3 | 135.1 | 166.3 | 89.8 | 0.0 | 30.1 | 1.7 | 13.4 |
| 2022 | 28_2 | 45H0 | 1 269.9 | 206.8 | 13.2 | 215.6 | 267.9 | 210.6 | 144.9 | 46.2 | 60.6 | 104.2 |
| 2022 | 28_2 | 45H1 | 10 752.7 | 1 496.0 | 217.3 | 3 092.0 | 2 290.7 | 1 622.1 | 826.8 | 279.2 | 301.1 | 627.6 |

| YEAR | SD | RECT | TOTAL | AGE 0 | AGE 1 | AGE 2 | AGE 3 | AGE 4 | AGE 5 | AGE 6 | AGE 7 | AGE 8+ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2022 | 29 | 46G9 | 1 170.0 | 52.3 | 9.1 | 474.3 | 387.7 | 174.3 | 9.4 | 5.5 | 5.5 | 51.9 |
| 2022 | 29 | 46H0 | 531.6 | 138.3 | 39.6 | 77.6 | 185.5 | 42.9 | 15.5 | 10.7 | 0.0 | 21.5 |
| 2022 | 29 | 46H1 | 14 089.1 | 282.2 | 316.2 | 4 391.2 | 4 593.0 | 1 936.1 | 591.8 | 547.8 | 453.7 | 977.0 |
| 2022 | 29 | 46H2 | 2 681.3 | 310.9 | 120.4 | 1 089.1 | 772.1 | 216.2 | 32.6 | 42.2 | 21.6 | 76.2 |
| 2022 | 29 | 47G9 | 774.8 | 514.9 | 71.7 | 62.8 | 54.2 | 45.8 | 1.9 | 8.8 | 12.9 | 1.9 |
| 2022 | 29 | 47H0 | 1 505.1 | 515.1 | 102.1 | 397.4 | 185.7 | 99.5 | 59.3 | 35.7 | 29.2 | 81.1 |
| 2022 | 29 | 47H1 | 1 420.2 | 818.7 | 36.4 | 221.5 | 192.7 | 71.2 | 17.2 | 16.7 | 14.3 | 31.3 |
| 2022 | 29 | 47H2 | 4 211.7 | 122.9 | 146.7 | 1 565.0 | 1 389.3 | 456.4 | 103.6 | 119.4 | 77.3 | 231.0 |
| 2022 | 29 | 48G9 | 2 059.9 | 989.0 | 137.3 | 455.0 | 191.2 | 92.9 | 58.2 | 34.7 | 29.6 | 71.9 |
| 2022 | 29 | 48H0 | 4 862.4 | 2 443.2 | 267.0 | 1 058.7 | 453.5 | 222.6 | 129.4 | 66.1 | 56.6 | 165.2 |
| 2022 | 29 | 48H1 | 3 502.4 | 1 305.6 | 290.6 | 932.4 | 398.2 | 197.9 | 109.1 | 61.9 | 52.7 | 154.0 |
| 2022 | 29 | 48H2 | 6 041.3 | 1 573.2 | 553.1 | 1 903.8 | 822.1 | 409.7 | 238.5 | 124.6 | 107.8 | 308.4 |
| 2022 | 29 | 49G9 | 591.0 | 165.3 | 37.7 | 148.2 | 77.7 | 46.1 | 31.1 | 21.7 | 17.0 | 46.3 |
| 2022 | 30 | 50G8 | 438.8 | 203.0 | 44.9 | 89.3 | 25.3 | 23.1 | 13.6 | 8.9 | 4.4 | 26.4 |
| 2022 | 30 | 50G9 | 55.5 | 13.3 | 6.9 | 13.7 | 4.3 | 5.1 | 3.0 | 2.2 | 1.1 | 5.9 |
| 2022 | 30 | 50H0 | 46.7 | 0.0 | 4.6 | 12.6 | 4.1 | 5.7 | 3.6 | 3.3 | 1.8 | 10.9 |
| 2022 | 30 | 51G7 | 11.4 | 0.0 | 0.3 | 1.9 | 0.9 | 1.6 | 1.0 | 1.0 | 0.6 | 4.1 |
| 2022 | 30 | 51G8 | 16.7 | 0.0 | 1.2 | 3.1 | 1.4 | 2.4 | 1.4 | 1.4 | 0.8 | 5.0 |
| 2022 | 30 | 51G9 | 312.9 | 56.1 | 43.2 | 76.1 | 24.7 | 30.4 | 18.0 | 14.1 | 7.5 | 42.9 |
| 2022 | 30 | 51H0 | 22.7 | 0.7 | 5.3 | 7.2 | 2.1 | 2.1 | 1.1 | 0.9 | 0.5 | 2.9 |
| 2022 | 30 | 52G8 | 41.3 | 0.4 | 1.6 | 6.2 | 2.6 | 4.9 | 3.6 | 4.0 | 2.4 | 15.5 |
| 2022 | 30 | 52G9 | 131.2 | 0.0 | 29.4 | 38.2 | 11.1 | 12.8 | 8.2 | 6.7 | 3.2 | 21.6 |
| 2022 | 30 | 52H0 | 88.5 | 0.0 | 14.7 | 25.9 | 8.6 | 10.6 | 6.5 | 5.0 | 2.5 | 14.6 |
| 2022 | 30 | 53G8 | 32.4 | 0.0 | 0.1 | 2.6 | 1.8 | 4.1 | 2.9 | 3.5 | 2.2 | 15.2 |
| 2022 | 30 | 53G9 | 24.7 | 0.2 | 2.0 | 4.3 | 1.8 | 2.7 | 1.8 | 2.1 | 1.5 | 8.3 |
| 2022 | 30 | 53H0 | 130.6 | 0.0 | 25.9 | 42.9 | 12.7 | 13.6 | 8.1 | 5.9 | 3.0 | 18.6 |
| 2022 | 30 | 54G8 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 2022 | 30 | 54G9 | 16.6 | 0.0 | 2.1 | 5.9 | 1.8 | 1.9 | 1.1 | 0.8 | 0.4 | 2.6 |
| 2022 | 30 | 54H0 | 8.3 | 0.0 | 1.3 | 2.1 | 0.8 | 1.0 | 0.6 | 0.5 | 0.3 | 1.8 |

**Table 4.3. Estimated numbers (millions) of cod in September-October 2005-2022, by ICES rectangle.**

| SD | RECT | Area | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 24 | 37G2 | 192.4 | 2.2 | 0.0 | 1.8 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 6.0 | 0.0 | 0.0 | 1.3 | 0.0 | 0.3 | 0.0 | 0.0 | 0.0 | 0.3 |
| 24 | 37G3 | 167.7 | 0.0 | 4.1 | 0.9 | 1.2 | 0.7 | 4.3 | 0.0 | 2.0 | 1.1 | 0.9 | 0.2 | 2.3 | 11.4 | 2.5 | 2.9 | 1.3 | 0.8 | 7.8 |
| 24 | 37G4 | 875.1 | 9.5 | 0.1 | 4.3 | 5.2 | 1.4 | 2.6 | 0.0 | 0.0 | 19.7 | 0.3 | 3.3 | 0.9 | 4.6 | 0.5 | 0.5 | 1.2 | 0.4 | - |
| 24 | 38G2 | 832.9 | 10.9 | 0.0 | 2.0 | 0.0 | 0.0 | 1.9 | 1.1 | 6.0 | 0.5 | 0.0 | 0.0 | 22.8 | 0.0 | 15.9 | 0.0 | 0.5 | 5.8 | 5.5 |
| 24 | 38G3 | 865.7 | 0.3 | 0.0 | 1.6 | 1.1 | 2.0 | 3.6 | 0.4 | 4.4 | 0.9 | 25.8 | 1.2 | 2.1 | 4.5 | 16.3 | 3.0 | 4.5 | 0.6 | 2.5 |
| 24 | 38G4 | 1034.8 | 6.2 | 0.5 | 9.7 | 13.7 | 1.0 | 4.4 | 0.4 | 2.1 | 1.7 | 0.6 | 14.1 | 1.9 | 20.1 | 5.6 | 0.9 | 0.2 | 3.4 | 5.8 |
| 24 | 39G2 | 406.1 | 1.5 | 3.9 | 1.8 | 0.4 | 1.3 | 3.8 | 0.1 | 0.9 | 0.0 | 1.7 | 0.1 | 2.3 | 2.5 | 0.4 | 0.0 | 0.4 | 0.0 | 0.0 |
| 24 | 39G3 | 765.0 | 17.9 | 3.8 | 13.9 | 2.8 | 0.6 | 3.8 | 0.3 | 2.1 | 5.1 | 18.7 | 2.2 | 1.1 | 1.7 | 9.1 | 2.8 | 0.4 | 2.8 | 2.9 |
| 24 | 39G4 | 524.8 | 2.7 | 1.8 | 2.4 | 1.2 | 1.6 | 7.1 | 0.2 | 0.4 | 1.2 | 4.2 | 1.1 | 7.9 | 3.0 | 1.4 | 1.9 | 1.8 | 1.3 | 2.3 |
| 25 | 37G5 | 642.2 | 17.8 | 0.3 | 1.3 | 0.0 | 0.4 | 0.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 2.0 | 0.0 | 0.1 | 0.2 | 0.0 | 1.3 |
| 25 | 38G5 | 1035.7 | 57.3 | 2.1 | 5.2 | 0.7 | 2.9 | 4.5 | 18.4 | 19.9 | 5.0 | 3.4 | 2.9 | 1.0 | 1.7 | 10.0 | 0.5 | 0.3 | 0.9 | 0.5 |
| 25 | 38G6 | 940.2 | 9.5 | 3.0 | 17.1 | 2.5 | 0.3 | 0.2 | 0.0 | 15.5 | 0.0 | 0.0 | 0.0 | 0.4 | 0.0 | 0.3 | 0.1 | 0.2 | 0.4 | 0.0 |
| 25 | 38G7 | 471.7 | 0.0 | 0.1 | 0.0 | 0.9 | 0.4 | 0.8 | 0.0 | 0.2 | 0.0 | 0.0 | 0.0 | - | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 25 | 39G4 | 287.3 | 2.7 | 28.5 | 0.2 | 4.4 | 0.3 | 0.3 | 0.2 | 0.6 | 0.5 | 2.9 | 4.2 | 0.0 | 1.2 | 5.2 | 2.0 | 0.0 | 0.0 | 18.2 |
| 25 | 39G5 | 979.0 | 1.5 | 3.6 | 1.8 | 3.1 | 2.5 | 6.2 | 71.3 | 8.9 | 4.1 | 5.8 | 0.7 | 3.4 | 0.8 | 2.3 | 1.6 | 0.6 | 1.2 | 4.4 |
| 25 | 39G6 | 1026.0 | 0.9 | 6.5 | 0.7 | 4.1 | 0.5 | 16.7 | 3.5 | 0.0 | 0.0 | 0.2 | 0.1 | 0.1 | 0.9 | 0.9 | 0.1 | 0.1 | 0.4 | 0.1 |
| 25 | 39G7 | 1026.0 | 47.4 | 0.5 | 0.4 | 5.8 | 0.3 | 0.2 | 2.2 | 0.0 | 0.0 | 0.5 | 0.1 | 0.0 | 0.7 | 7.6 | 0.0 | 0.1 | 0.1 | 0.0 |
| 25 | 40G4 | 677.2 | 1.4 | 5.5 | 15.9 | 0.2 | 19.2 | 0.3 | 25.3 | 15.2 | 2.1 | 31.0 | 38.3 | 7.4 | 8.4 | 10.7 | 8.8 | 9.5 | 1.6 | 0.0 |
| 25 | 40G5 | 1012.9 | 2.4 | 7.6 | 4.9 | 25.1 | 1.8 | 0.8 | 14.0 | 5.5 | 1.2 | 8.0 | 31.0 | 3.1 | 0.3 | 1.2 | 56.3 | 1.8 | 0.5 | 1.6 |
| 25 | 40G6 | 1013.0 | 1.1 | 6.5 | 0.2 | 5.9 | 6.5 | 7.0 | 30.8 | 5.7 | 0.2 | 53.6 | 17.0 | 1.8 | 4.3 | 0.2 | 16.1 | 0.3 | 6.4 | 18.0 |
| 25 | 40G7 | 1013.0 | 5.7 | 5.8 | 0.0 | 6.3 | 3.5 | 0.5 | 18.6 | 42.7 | 0.3 | 7.8 | 0.0 | 3.1 | 2.7 | 0.0 | 0.0 | 0.0 | 0.1 | 1.3 |
| 25 | 41G6 | 764.4 | 2.7 | 14.8 | 0.0 | 2.5 | 0.6 | 0.4 | 0.0 | 1.0 | 0.0 | 0.8 | 0.2 | 18.9 | 0.0 | 0.2 | 2.2 | 3.1 | 0.1 | 1.6 |
| 25 | 41G7 | 1000.0 | 0.1 | 1.9 | 8.7 | 0.3 | 4.4 | 1.1 | 61.9 | 29.8 | 35.3 | 0.0 | 0.5 | 0.7 | 0.9 | 0.6 | 0.0 | 12.7 | 0.0 | 0.0 |
| 26 | 37G8 | 86.0 | 0.5 | 3.2 | 0.0 | 0.2 | 0.0 | 0.0 | 0.0 | 0.1 | 0.0 | 0.5 | 0.0 | 0.0 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.2 |
| 26 | 37G9 | 151.6 | 37.6 | 0.9 | 1.6 | 1.0 | 0.3 | 0.2 | 0.5 | 0.6 | 0.0 | 0.2 | 0.2 | 0.1 | 2.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 26 | 38G8 | 624.6 | 37.1 | 5.0 | 1.7 | 3.4 | 2.0 | 1.4 | 1.3 | 7.2 | 0.0 | 1.0 | 7.1 | 0.1 | 2.0 | 15.1 | 0.0 | 0.3 | 1.7 | 0.1 |
| 26 | 38G9 | 918.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.5 | 0.0 | 2.6 | 4.5 | 49.2 | 6.5 | 0.3 | 0.6 | 0.5 | 0.1 | 1.7 | 1.9 | 1.0 | 14.6 |
| 26 | 39G8 | 1026.0 | 32.3 | 22.1 | 1.6 | 0.8 | 4.3 | 9.4 | 19.9 | 5.2 | 0.0 | 0.5 | 0.4 | 0.2 | 0.6 | 1.4 | 2.5 | 0.2 | 0.1 | 1.6 |

| SD | RECT | Area | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 26 | 39G9 | 1026.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.7 | 0.0 | 1.8 | 0.0 | 3.1 | 4.7 | 7.3 | 0.3 | 1.2 | 0.4 | 0.2 | 0.7 | 0.0 | 4.1 |
| 26 | 39H0 | 881.6 | - | - | - | - | 0.0 | 0.0 | 0.0 | - | - | - | - | 0.3 | 0.1 | - | 0.0 | - | - | - |
| 26 | 40G8 | 1013.0 | 17.8 | 4.6 | 0.5 | 0.2 | 0.5 | 13.5 | 4.0 | 3.2 | 0.0 | 0.1 | 2.7 | 0.1 | 0.6 | 1.5 | 21.8 | 1.0 | 0.0 | 0.1 |
| 26 | 40G9 | 1013.0 | 0.0 | - | 0.0 | 0.0 | 3.0 | 0.0 | 0.4 | 5.9 | 9.1 | 0.8 | - | 0.8 | 1.4 | 0.1 | 0.1 | 0.0 | 0.0 | 0.0 |
| 26 | 40H0 | 1012.1 | 5.1 | - | 0.0 | 0.7 | 34.6 | 51.7 | 1.1 | 0.2 | 0.1 | 0.1 | - | 5.1 | 0.0 | 107.8 | 0.0 | 0.0 | 0.0 | 0.0 |
| 26 | 41G8 | 1000.0 | 0.0 | 2.6 | - | 0.0 | 2.3 | 3.2 | 21.9 | 19.2 | 0.9 | 1.3 | 0.0 | 1.5 | 0.7 | 1.2 | 9.1 | 5.5 | 2.8 | 0.3 |
| 26 | 41G9 | 1000.0 | 10.0 | 0.1 | 3.2 | 0.2 | 0.0 | 1.0 | 0.0 | 0.0 | 0.3 | 195.8 | 1.6 | 0.0 | 0.0 | - | 0.0 | 0.7 | 0.0 | 0.0 |
| 26 | 41H0 | 953.3 | 54.5 | 0.2 | 3.4 | 1.9 | 0.0 | 0.1 | 0.0 | 0.0 | 0.3 | 0.0 | 0.0 | 0.0 | 0.0 | - | 0.0 | 0.0 | 0.0 | 0.0 |
| 27 | 42G6 | 266.0 | - | 2.2 | 0.0 | 0.0 | 1.1 | 0.0 | 0.0 | 0.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1.7 | 0.0 | 0.0 | 0.0 |
| 27 | 42G7 | 986.9 | 1.0 | 1.1 | 0.5 | 0.0 | 0.9 | 0.0 | 1.6 | 0.6 | 0.7 | 0.9 | 0.0 | 2.7 | 0.0 | 0.0 | 4.0 | 0.0 | 0.0 | 0.0 |
| 27 | 43G6 | 269.8 | - | - | - | 0.0 | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 27 | 43G7 | 913.8 | 0.0 | 22.0 | 0.0 | 0.1 | 0.0 | 0.5 | 0.1 | 0.0 | 1.9 | 2.7 | 0.0 | 3.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 27 | 44G7 | 960.5 | 0.0 | 1.2 | 1.3 | 0.4 | 0.0 | 0.2 | 0.0 | 0.0 | 0.0 | 0.1 | 0.0 | 0.5 | 0.1 | 0.2 | 0.0 | 0.0 | 0.0 | 0.0 |
| 27 | 44G8 | 456.6 | 0.0 | 0.0 | 0.0 | 0.0 | 0.5 | 0.2 | 0.1 | 0.0 | 0.2 | 0.0 | 0.0 | 0.0 | 0.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 27 | 45G7 | 908.7 | 0.0 | 0.0 | 0.0 | 1.6 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 7.9 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.2 |
| 27 | 45G8 | 947.2 | 0.0 | 2.2 | 0.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1.1 | 0.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.5 |
| 27 | 46G8 | 884.8 | 0.0 | 0.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 | 0.0 | 0.0 | 0.4 | 0.0 | 0.0 | 0.2 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 |
| 24 | 37G2 | 192.4 | 2.2 | 0.0 | 1.8 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 6.0 | 0.0 | 0.0 | 1.3 | 0.0 | 0.3 | 0.0 | 0.0 | 0.0 | 0.3 |
| 24 | 37G3 | 167.7 | 0.0 | 4.1 | 0.9 | 1.2 | 0.7 | 4.3 | 0.0 | 2.0 | 1.1 | 0.9 | 0.2 | 2.3 | 11.4 | 2.5 | 2.9 | 1.3 | 0.8 | 7.8 |
| 24 | 37G4 | 875.1 | 9.5 | 0.1 | 4.3 | 5.2 | 1.4 | 2.6 | 0.0 | 0.0 | 19.7 | 0.3 | 3.3 | 0.9 | 4.6 | 0.5 | 0.5 | 1.2 | 0.4 | - |
| 24 | 38G2 | 832.9 | 10.9 | 0.0 | 2.0 | 0.0 | 0.0 | 1.9 | 1.1 | 6.0 | 0.5 | 0.0 | 0.0 | 22.8 | 0.0 | 15.9 | 0.0 | 0.5 | 5.8 | 5.5 |
| 24 | 38G3 | 865.7 | 0.3 | 0.0 | 1.6 | 1.1 | 2.0 | 3.6 | 0.4 | 4.4 | 0.9 | 25.8 | 1.2 | 2.1 | 4.5 | 16.3 | 3.0 | 4.5 | 0.6 | 2.5 |
| 24 | 38G4 | 1034.8 | 6.2 | 0.5 | 9.7 | 13.7 | 1.0 | 4.4 | 0.4 | 2.1 | 1.7 | 0.6 | 14.1 | 1.9 | 20.1 | 5.6 | 0.9 | 0.2 | 3.4 | 5.8 |
| 24 | 39G2 | 406.1 | 1.5 | 3.9 | 1.8 | 0.4 | 1.3 | 3.8 | 0.1 | 0.9 | 0.0 | 1.7 | 0.1 | 2.3 | 2.5 | 0.4 | 0.0 | 0.4 | 0.0 | 0.0 |
| 24 | 39G3 | 765.0 | 17.9 | 3.8 | 13.9 | 2.8 | 0.6 | 3.8 | 0.3 | 2.1 | 5.1 | 18.7 | 2.2 | 1.1 | 1.7 | 9.1 | 2.8 | 0.4 | 2.8 | 2.9 |
| 24 | 39G4 | 524.8 | 2.7 | 1.8 | 2.4 | 1.2 | 1.6 | 7.1 | 0.2 | 0.4 | 1.2 | 4.2 | 1.1 | 7.9 | 3.0 | 1.4 | 1.9 | 1.8 | 1.3 | 2.3 |
| 25 | 37G5 | 642.2 | 17.8 | 0.3 | 1.3 | 0.0 | 0.4 | 0.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 2.0 | 0.0 | 0.1 | 0.2 | 0.0 | 1.3 |
| 25 | 38G5 | 1035.7 | 57.3 | 2.1 | 5.2 | 0.7 | 2.9 | 4.5 | 18.4 | 19.9 | 5.0 | 3.4 | 2.9 | 1.0 | 1.7 | 10.0 | 0.5 | 0.3 | 0.9 | 0.5 |
| 25 | 38G6 | 940.2 | 9.5 | 3.0 | 17.1 | 2.5 | 0.3 | 0.2 | 0.0 | 15.5 | 0.0 | 0.0 | 0.0 | 0.4 | 0.0 | 0.3 | 0.1 | 0.2 | 0.4 | 0.0 |

| SD | RECT | Area | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 25 | 38G7 | 471.7 | 0.0 | 0.1 | 0.0 | 0.9 | 0.4 | 0.8 | 0.0 | 0.2 | 0.0 | 0.0 | 0.0 | - | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 25 | 39G4 | 287.3 | 2.7 | 28.5 | 0.2 | 4.4 | 0.3 | 0.3 | 0.2 | 0.6 | 0.5 | 2.9 | 4.2 | 0.0 | 1.2 | 5.2 | 2.0 | 0.0 | 0.0 | 18.2 |
| 25 | 39G5 | 979.0 | 1.5 | 3.6 | 1.8 | 3.1 | 2.5 | 6.2 | 71.3 | 8.9 | 4.1 | 5.8 | 0.7 | 3.4 | 0.8 | 2.3 | 1.6 | 0.6 | 1.2 | 4.4 |
| 25 | 39G6 | 1026.0 | 0.9 | 6.5 | 0.7 | 4.1 | 0.5 | 16.7 | 3.5 | 0.0 | 0.0 | 0.2 | 0.1 | 0.1 | 0.9 | 0.9 | 0.1 | 0.1 | 0.4 | 0.1 |
| 25 | 39G7 | 1026.0 | 47.4 | 0.5 | 0.4 | 5.8 | 0.3 | 0.2 | 2.2 | 0.0 | 0.0 | 0.5 | 0.1 | 0.0 | 0.7 | 7.6 | 0.0 | 0.1 | 0.1 | 0.0 |
| 25 | 40G4 | 677.2 | 1.4 | 5.5 | 15.9 | 0.2 | 19.2 | 0.3 | 25.3 | 15.2 | 2.1 | 31.0 | 38.3 | 7.4 | 8.4 | 10.7 | 8.8 | 9.5 | 1.6 | 0.0 |
| 25 | 40G5 | 1012.9 | 2.4 | 7.6 | 4.9 | 25.1 | 1.8 | 0.8 | 14.0 | 5.5 | 1.2 | 8.0 | 31.0 | 3.1 | 0.3 | 1.2 | 56.3 | 1.8 | 0.5 | 1.6 |
| 25 | 40G6 | 1013.0 | 1.1 | 6.5 | 0.2 | 5.9 | 6.5 | 7.0 | 30.8 | 5.7 | 0.2 | 53.6 | 17.0 | 1.8 | 4.3 | 0.2 | 16.1 | 0.3 | 6.4 | 18.0 |
| 25 | 40G7 | 1013.0 | 5.7 | 5.8 | 0.0 | 6.3 | 3.5 | 0.5 | 18.6 | 42.7 | 0.3 | 7.8 | 0.0 | 3.1 | 2.7 | 0.0 | 0.0 | 0.0 | 0.1 | 1.3 |
| 25 | 41G6 | 764.4 | 2.7 | 14.8 | 0.0 | 2.5 | 0.6 | 0.4 | 0.0 | 1.0 | 0.0 | 0.8 | 0.2 | 18.9 | 0.0 | 0.2 | 2.2 | 3.1 | 0.1 | 1.6 |
| 25 | 41G7 | 1000.0 | 0.1 | 1.9 | 8.7 | 0.3 | 4.4 | 1.1 | 61.9 | 29.8 | 35.3 | 0.0 | 0.5 | 0.7 | 0.9 | 0.6 | 0.0 | 12.7 | 0.0 | 0.0 |
| 26 | 37G8 | 86.0 | 0.5 | 3.2 | 0.0 | 0.2 | 0.0 | 0.0 | 0.0 | 0.1 | 0.0 | 0.5 | 0.0 | 0.0 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.2 |
| 26 | 37G9 | 151.6 | 37.6 | 0.9 | 1.6 | 1.0 | 0.3 | 0.2 | 0.5 | 0.6 | 0.0 | 0.2 | 0.2 | 0.1 | 2.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 26 | 38G8 | 624.6 | 37.1 | 5.0 | 1.7 | 3.4 | 2.0 | 1.4 | 1.3 | 7.2 | 0.0 | 1.0 | 7.1 | 0.1 | 2.0 | 15.1 | 0.0 | 0.3 | 1.7 | 0.1 |
| 26 | 38G9 | 918.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.5 | 0.0 | 2.6 | 4.5 | 49.2 | 6.5 | 0.3 | 0.6 | 0.5 | 0.1 | 1.7 | 1.9 | 1.0 | 14.6 |
| 26 | 39G8 | 1026.0 | 32.3 | 22.1 | 1.6 | 0.8 | 4.3 | 9.4 | 19.9 | 5.2 | 0.0 | 0.5 | 0.4 | 0.2 | 0.6 | 1.4 | 2.5 | 0.2 | 0.1 | 1.6 |
| 26 | 39G9 | 1026.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.7 | 0.0 | 1.8 | 0.0 | 3.1 | 4.7 | 7.3 | 0.3 | 1.2 | 0.4 | 0.2 | 0.7 | 0.0 | 4.1 |
| 26 | 39H0 | 881.6 | - | - | - | - | 0.0 | 0.0 | 0.0 | - | - | - | - | 0.3 | 0.1 | - | 0.0 | - | - | - |
| 26 | 40G8 | 1013.0 | 17.8 | 4.6 | 0.5 | 0.2 | 0.5 | 13.5 | 4.0 | 3.2 | 0.0 | 0.1 | 2.7 | 0.1 | 0.6 | 1.5 | 21.8 | 1.0 | 0.0 | 0.1 |
| 26 | 40G9 | 1013.0 | 0.0 | - | 0.0 | 0.0 | 3.0 | 0.0 | 0.4 | 5.9 | 9.1 | 0.8 | - | 0.8 | 1.4 | 0.1 | 0.1 | 0.0 | 0.0 | 0.0 |
| 26 | 40H0 | 1012.1 | 5.1 | - | 0.0 | 0.7 | 34.6 | 51.7 | 1.1 | 0.2 | 0.1 | 0.1 | - | 5.1 | 0.0 | 107.8 | 0.0 | 0.0 | 0.0 | 0.0 |
| 26 | 41G8 | 1000.0 | 0.0 | 2.6 | - | 0.0 | 2.3 | 3.2 | 21.9 | 19.2 | 0.9 | 1.3 | 0.0 | 1.5 | 0.7 | 1.2 | 9.1 | 5.5 | 2.8 | 0.3 |
| 26 | 41G9 | 1000.0 | 10.0 | 0.1 | 3.2 | 0.2 | 0.0 | 1.0 | 0.0 | 0.0 | 0.3 | 195.8 | 1.6 | 0.0 | 0.0 | - | 0.0 | 0.7 | 0.0 | 0.0 |
| 26 | 41H0 | 953.3 | 54.5 | 0.2 | 3.4 | 1.9 | 0.0 | 0.1 | 0.0 | 0.0 | 0.3 | 0.0 | 0.0 | 0.0 | 0.0 | - | 0.0 | 0.0 | 0.0 | 0.0 |
| 27 | 42G6 | 266.0 | - | 2.2 | 0.0 | 0.0 | 1.1 | 0.0 | 0.0 | 0.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1.7 | 0.0 | 0.0 | 0.0 |
| 27 | 42G7 | 986.9 | 1.0 | 1.1 | 0.5 | 0.0 | 0.9 | 0.0 | 1.6 | 0.6 | 0.7 | 0.9 | 0.0 | 2.7 | 0.0 | 0.0 | 4.0 | 0.0 | 0.0 | 0.0 |
| 27 | 43G6 | 269.8 | - | - | - | 0.0 | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 27 | 43G7 | 913.8 | 0.0 | 22.0 | 0.0 | 0.1 | 0.0 | 0.5 | 0.1 | 0.0 | 1.9 | 2.7 | 0.0 | 3.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 27 | 44G7 | 960.5 | 0.0 | 1.2 | 1.3 | 0.4 | 0.0 | 0.2 | 0.0 | 0.0 | 0.0 | 0.1 | 0.0 | 0.5 | 0.1 | 0.2 | 0.0 | 0.0 | 0.0 | 0.0 |

| SD | RECT | Area | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 27 | 44G8 | 456.6 | 0.0 | 0.0 | 0.0 | 0.0 | 0.5 | 0.2 | 0.1 | 0.0 | 0.2 | 0.0 | 0.0 | 0.0 | 0.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 27 | 45G7 | 908.7 | 0.0 | 0.0 | 0.0 | 1.6 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 7.9 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.2 |
| 27 | 45G8 | 947.2 | 0.0 | 2.2 | 0.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1.1 | 0.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.5 |
| 27 | 46G8 | 884.8 | 0.0 | 0.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 | 0.0 | 0.0 | 0.4 | 0.0 | 0.0 | 0.2 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 |
| 28_2 | 42G8 | 945.4 | 4.7 | 0.0 | 3.7 | 3.3 | 0.5 | 1.3 | 0.0 | 1.6 | 4.7 | 1.8 | 0.0 | 0.8 | 0.5 | 0.0 | 0.1 | 8.4 | 0.0 | 0.0 |
| 28_2 | 42G9 | 986.9 | 0.0 | 0.2 | 0.6 | 1.3 | 0.0 | 0.0 | 0.0 | 0.0 | 4.9 | 293.8 | 0.0 | 0.0 | 0.2 | - | 0.0 | 0.7 | 0.0 | 0.0 |
| 28_2 | 42H0 | 968.5 | 0.0 | 0.4 | 10.4 | 2.9 | 0.0 | 0.1 | 0.0 | 0.0 | 0.3 | 1.2 | 0.1 | 0.0 | 0.1 | - | 0.0 | 0.1 | 0.0 | 0.0 |
| 28_2 | 43G8 | 296.2 | 0.3 | 0.0 | 0.0 | 0.2 | 0.0 | 0.0 | 0.0 | 5.6 | 0.1 | 0.4 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.5 |
| 28_2 | 43G9 | 973.7 | 0.0 | 0.2 | 12.7 | 2.1 | 1.4 | 0.0 | 0.0 | 8.2 | 11.8 | 0.0 | 0.0 | 0.0 | 3.9 | 0.0 | 0.0 | 11.1 | 0.0 | 0.0 |
| 28_2 | 43H0 | 973.7 | 0.0 | 0.1 | 3.6 | 0.0 | 0.0 | 0.1 | 0.0 | 0.0 | 0.6 | 3.6 | 0.3 | 0.0 | 0.1 | - | 0.0 | 0.2 | 0.0 | 0.0 |
| 28_2 | 43H1 | 412.7 | 0.0 | 0.1 | 0.0 | 0.0 | 0.0 | 0.1 | 0.0 | 0.0 | 0.1 | 0.0 | - | 0.0 | - | - | 0.0 | 0.1 | 0.0 | 0.0 |
| 28_2 | 44G9 | 876.6 | 0.0 | 0.0 | 0.5 | 0.6 | 0.0 | 0.9 | 2.3 | 2.6 | 2.7 | 2.9 | 0.0 | 3.3 | 0.1 | 0.1 | 0.0 | 0.0 | 0.0 | 0.3 |
| 28_2 | 44H0 | 960.5 | 0.0 | 0.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 238.7 | 11.7 | 0.0 | 0.2 | - | 0.0 | 0.0 | 0.0 | 0.2 |
| 28_2 | 44H1 | 824.6 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 | 0.0 | 0.0 | 0.4 | 0.0 | 0.0 | 0.0 | - | - | 0.0 | 0.0 | 0.0 | 0.1 |
| 28_2 | 45G9 | 924.5 | 0.3 | 0.0 | 0.1 | 0.0 | 0.4 | 0.0 | 0.0 | 0.6 | 0.6 | 0.0 | 0.0 | 0.9 | 0.1 | 0.6 | 0.3 | 24.9 | 0.2 | 0.0 |
| 28_2 | 45H0 | 947.2 | 0.0 | 0.0 | 0.2 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.3 | 13.2 | 0.0 | 0.1 | 1.1 | 0.0 |
| 28_2 | 45H1 | 827.1 | 0.0 | 0.0 | 0.1 | 0.0 | 0.0 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 1.7 | 0.6 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 29 | 46G9 | 933.8 | 0.0 | 0.0 | 0.5 | 0.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.7 | 0.0 | 0.1 | 0.3 | 0.0 | 0.0 | 0.2 |
| 29 | 46H0 | 933.8 | 0.0 | 0.0 | 0.0 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1.7 | 0.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 |
| 29 | 46H1 | 921.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.4 | 0.0 | 0.7 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.9 | 0.0 |
| 29 | 46H2 | 258.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 29 | 47G9 | 876.2 | 2.8 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 | 0.0 | 0.0 | 0.0 | 1.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 29 | 47H0 | 920.3 | 0.0 | 0.0 | 1.3 | 0.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.4 | 0.0 | 0.0 | 0.0 | 0.1 | 0.0 |
| 29 | 47H1 | 920.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 8.8 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1.1 | 0.0 | 0.8 | 0.0 | 0.0 | 0.0 |
| 29 | 47H2 | 793.9 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.7 | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 |
| 29 | 48G9 | 772.8 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 29 | 48H0 | 730.3 | - | - | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 2.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 29 | 48H1 | 544.0 | - | - | 0.0 | - | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.2 | 0.0 | 0.0 | 2.8 | 0.0 | 0.0 |
| 29 | 48H2 | 597.0 | - | - | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.2 | 0.2 | 0.0 | 0.0 | 0.0 | 0.0 |

| SD | RECT | Area | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 29 | 49G9 | 564.2 | - | - | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 |

**Table 4.4. Estimated numbers (millions) of herring in September-November 2022 by ICES Subdivision and age-group.**

| YEAR | SD | AGE 0 | AGE 1 | AGE 2 | AGE 3 | AGE 4 | AGE 5 | AGE 6 | AGE 7 | AGE 8+ |
|---|---|---|---|---|---|---|---|---|---|---|
| 2022 | 21 | 1 389.3 | 13.7 | 1.3 | 1.4 | 0.5 | 1.1 | 0.0 | 0.0 | 0.0 |
| 2022 | 22 | 1 002.2 | 11.3 | 0.0 | 0.0 | 0.0 | 0.5 | 0.0 | 0.0 | 0.0 |
| 2022 | 23 | 127.2 | 59.2 | 94.4 | 35.4 | 19.0 | 9.8 | 9.6 | 4.0 | 1.2 |
| 2022 | 24 | 420.4 | 202.9 | 73.6 | 109.8 | 88.4 | 71.1 | 31.3 | 37.0 | 31.4 |
| 2022 | 25 | 85.5 | 215.7 | 252.7 | 699.5 | 1 346.7 | 621.1 | 326.3 | 205.9 | 172.8 |
| 2022 | 26 | 18.4 | 118.6 | 254.2 | 1 261.7 | 1 383.4 | 914.0 | 879.6 | 621.5 | 421.2 |
| 2022 | 27 | 662.7 | 257.2 | 234.1 | 373.0 | 707.0 | 200.5 | 164.3 | 201.6 | 40.7 |
| 2022 | 28_2 | 7 754.1 | 649.0 | 472.6 | 2 416.2 | 1 300.6 | 1 545.4 | 528.4 | 639.9 | 473.8 |
| 2022 | 29 | 11 829.6 | 1 084.1 | 1 986.8 | 3 044.5 | 898.1 | 547.0 | 370.8 | 478.6 | 167.6 |
| 2022 | 30 | 1 204.8 | 1 004.5 | 2 195.7 | 4 040.2 | 1 960.1 | 831.0 | 566.8 | 279.7 | 515.0 |
| 2022 | 32 | 2 202.1 | 465.6 | 1 688.4 | 1 752.2 | 935.5 | 618.5 | 167.7 | 167.3 | 160.0 |

**Table 4.5. Estimated numbers (millions) of sprat in September-November 2022 by ICES Subdivision and age-group.**

| YEAR | SD | AGE 0 | AGE 1 | AGE 2 | AGE 3 | AGE 4 | AGE 5 | AGE 6 | AGE 7 | AGE 8+ |
|---|---|---|---|---|---|---|---|---|---|---|
| 2022 | 21 | 18.3 | 25.5 | 35.0 | 50.4 | 13.5 | 2.2 | 0.3 | 1.2 | 0.0 |
| 2022 | 22 | 1 902.3 | 13.1 | 7.5 | 9.9 | 1.0 | 2.9 | 0.8 | 0.0 | 0.0 |
| 2022 | 23 | 12.3 | 5.7 | 15.4 | 30.6 | 13.2 | 6.8 | 2.4 | 1.4 | 0.1 |
| 2022 | 24 | 872.0 | 160.6 | 262.7 | 364.6 | 246.1 | 157.6 | 59.9 | 48.5 | 0.0 |
| 2022 | 25 | 187.6 | 538.6 | 615.8 | 2 044.8 | 1 175.7 | 944.2 | 632.2 | 253.4 | 496.2 |
| 2022 | 26 | 649.9 | 628.8 | 1 180.6 | 3 544.1 | 3 257.3 | 1 752.8 | 493.7 | 181.2 | 872.6 |
| 2022 | 27 | 1 862.6 | 507.7 | 1 674.2 | 1 533.1 | 720.7 | 350.6 | 47.6 | 76.2 | 179.6 |
| 2022 | 28_2 | 3 985.5 | 2 973.8 | 9 316.1 | 9 910.9 | 4 419.6 | 2 298.9 | 992.2 | 564.4 | 1 852.8 |
| 2022 | 29 | 9 231.6 | 2 128.0 | 12 777.2 | 9 702.9 | 4 011.6 | 1 397.7 | 1 096.0 | 878.3 | 2 217.6 |
| 2022 | 30 | 273.5 | 196.7 | 348.4 | 109.6 | 129.0 | 78.8 | 63.9 | 34.1 | 208.2 |
| 2022 | 32 | 1 480.8 | 1 760.2 | 8 126.8 | 4 878.8 | 2 989.6 | 1 561.4 | 954.2 | 911.2 | 2 111.1 |

#### 4.1.1.3 Area-corrected data

A correction factor for each ICES Subdivision and year was introduced to account for the different coverage of investigated areas between years. This factor is the proportion between the total area of the ICES Subdivision that are presented in the IBAS Manual and the area of the ICES rectangles, which was covered during the survey. The Gulf of Riga (ICES Subdivision 28_1) is excluded from the total area. All other ICES Subdivisions kept their areas as specified in the IBAS manual (Table 2.2).

The area-corrected abundance estimates for herring and sprat per the ICES Subdivision and age-group are summarized in Tables 4.6 and 4.7, respectively. Biomass for herring and sprat per ICES Subdivision and age-group are summarized in Tables 4.8 and 4.9, respectively.

**Table 4.6. Area-corrected numbers (millions) of herring by ICES Subdivision and age-group (September-November 2022).**

| YEAR | SD | AREA CORR FACTOR | AGE 0 | AGE 1 | AGE 2 | AGE 3 | AGE 4 | AGE 5 | AGE 6 | AGE 7 | AGE 8+ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 2022 | 21 | 1.22 | 1 690.5 | 16.7 | 1.5 | 1.8 | 0.7 | 1.3 | 0.0 | 0.0 | 0.0 |
| 2022 | 22 | 1.02 | 1 022.9 | 11.6 | 0.0 | 0.0 | 0.0 | 0.5 | 0.0 | 0.0 | 0.0 |
| 2022 | 23 | 1.00 | 127.2 | 59.2 | 94.4 | 35.4 | 19.0 | 9.8 | 9.6 | 4.0 | 1.2 |
| 2022 | 24 | 1.18 | 497.2 | 240.0 | 87.0 | 129.8 | 104.6 | 84.0 | 37.1 | 43.7 | 37.1 |
| 2022 | 25 | 1.03 | 88.3 | 222.6 | 260.8 | 721.8 | 1 389.8 | 641.0 | 336.8 | 212.5 | 178.3 |
| 2022 | 26 | 1.10 | 20.3 | 130.8 | 280.2 | 1 390.8 | 1 525.0 | 1 007.5 | 969.6 | 685.1 | 464.3 |
| 2022 | 27 | 1.23 | 815.6 | 316.5 | 288.1 | 459.1 | 870.2 | 246.8 | 202.2 | 248.1 | 50.1 |
| 2022 | 28_2 | 1.01 | 7 855.7 | 657.5 | 478.8 | 2 447.9 | 1 317.6 | 1 565.6 | 535.3 | 648.3 | 480.0 |
| 2022 | 29 | 1.04 | 12 299.7 | 1 127.2 | 2 065.8 | 3 165.5 | 933.8 | 568.7 | 385.5 | 497.7 | 174.3 |
| 2022 | 30 | 1.15 | 1 382.9 | 1 153.0 | 2 520.2 | 4 637.3 | 2 249.8 | 953.8 | 650.6 | 321.0 | 591.2 |
| 2022 | 32 | 1.42 | 3 129.7 | 661.8 | 2 399.6 | 2 490.3 | 1 329.5 | 879.1 | 238.3 | 237.7 | 227.4 |

**Table 4.7. Area-corrected numbers (millions) of sprat by ICES Subdivision and age-group (September-November 2022).**

| YEAR | SD | AREA CORR FACTOR | AGE 0 | AGE 1 | AGE 2 | AGE 3 | AGE 4 | AGE 5 | AGE 6 | AGE 7 | AGE 8+ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 2022 | 21 | 1.22 | 22.3 | 31.0 | 42.5 | 61.3 | 16.4 | 2.7 | 0.3 | 1.5 | 0.0 |
| 2022 | 22 | 1.02 | 1 941.5 | 13.3 | 7.6 | 10.1 | 1.0 | 3.0 | 0.8 | 0.0 | 0.0 |
| 2022 | 23 | 1.00 | 12.3 | 5.7 | 15.4 | 30.6 | 13.2 | 6.8 | 2.4 | 1.4 | 0.1 |
| 2022 | 24 | 1.18 | 1 031.3 | 189.9 | 310.7 | 431.2 | 291.1 | 186.3 | 70.8 | 57.4 | 0.0 |
| 2022 | 25 | 1.03 | 193.6 | 555.8 | 635.5 | 2 110.2 | 1 213.3 | 974.4 | 652.4 | 261.5 | 512.1 |
| 2022 | 26 | 1.10 | 716.3 | 693.1 | 1 301.4 | 3 906.7 | 3 590.5 | 1 932.1 | 544.2 | 199.7 | 961.9 |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 2022 | 27 | 1.23 | 2 292.4 | 624.8 | 2 060.5 | 1 886.8 | 887.0 | 431.5 | 58.6 | 93.8 | 221.1 |
| 2022 | 28_2 | 1.01 | 4 037.7 | 3 012.7 | 9 438.3 | 10 040.8 | 4 477.5 | 2 329.0 | 1 005.2 | 571.8 | 1 877.1 |
| 2022 | 29 | 1.04 | 9 598.5 | 2 212.5 | 13 284.9 | 10 088.5 | 4 171.0 | 1 453.2 | 1 139.5 | 913.2 | 2 305.8 |
| 2022 | 30 | 1.15 | 314.0 | 225.8 | 399.9 | 125.7 | 148.0 | 90.4 | 73.3 | 39.2 | 239.0 |
| 2022 | 32 | 1.42 | 2 104.5 | 2 501.7 | 11 550.1 | 6 933.9 | 4 249.0 | 2 219.2 | 1 356.2 | 1 295.1 | 3 000.3 |

**Table 4.8. Estimated biomass (in tons) of herring in September-November 2022.**

| YEAR | SD | AREA CORR FACTOR | AGE 0 | AGE 1 | AGE 2 | AGE 3 | AGE 4 | AGE 5 | AGE 6 | AGE 7 | AGE 8+ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 2022 | 21 | 1.22 | 37 579 | 744 | 93 | 81 | 33 | 56 | - | - | - |
| 2022 | 22 | 1.02 | 9 725 | 155 | - | - | - | 19 | - | - | - |
| 2022 | 23 | 1.00 | 1 994 | 1 529 | 11 557 | 4 490 | 2 309 | 1 409 | 1 506 | 599 | 161 |
| 2022 | 24 | 1.18 | 6 251 | 6 470 | 4 237 | 5 709 | 4 923 | 4 180 | 1 851 | 2 388 | 1 869 |
| 2022 | 25 | 1.03 | 1 181 | 6 792 | 10 538 | 26 142 | 50 784 | 26 291 | 15 600 | 9 745 | 8 567 |
| 2022 | 26 | 1.10 | 229 | 3 694 | 9 455 | 42 442 | 51 907 | 41 933 | 41 803 | 30 178 | 23 977 |
| 2022 | 27 | 1.23 | 4 943 | 5 493 | 6 520 | 10 622 | 24 475 | 7 929 | 6 770 | 8 195 | 1 755 |
| 2022 | 28_2 | 1.01 | 48 143 | 10 639 | 11 002 | 62 741 | 38 139 | 52 428 | 18 486 | 22 123 | 18 456 |
| 2022 | 29 | 1.04 | 67 785 | 17 646 | 41 188 | 69 209 | 23 741 | 15 645 | 11 170 | 14 333 | 5 522 |
| 2022 | 30 | 1.15 | 6 514 | 18 067 | 51 228 | 103 503 | 54 695 | 25 505 | 18 251 | 9 894 | 20 495 |
| 2022 | 32 | 1.42 | 17 603 | 9 683 | 43 203 | 52 670 | 31 148 | 21 606 | 6 524 | 6 005 | 6 309 |

**Table 4.9. Estimated biomass (in tons) of sprat in September-November 2022.**

| YEAR | SD | AREA CORR FACTOR | AGE 0 | AGE 1 | AGE 2 | AGE 3 | AGE 4 | AGE 5 | AGE 6 | AGE 7 | AGE 8+ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 2022 | 21 | 1.22 | 109 | 407 | 687 | 1 135 | 346 | 52 | 7 | 29 | - |
| 2022 | 22 | 1.02 | 8 785 | 145 | 107 | 148 | 16 | 54 | 15 | - | - |
| 2022 | 23 | 1.00 | 59 | 83 | 273 | 591 | 262 | 133 | 47 | 27 | 3 |
| 2022 | 24 | 1.18 | 4 351 | 2 503 | 4 523 | 6 733 | 4 676 | 3 010 | 1 187 | 945 | - |
| 2022 | 25 | 1.03 | 810 | 4 967 | 7 167 | 27 949 | 17 657 | 14 636 | 9 981 | 4 389 | 7 794 |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 2022 | 26 | 1.10 | 3 461 | 7 098 | 13 982 | 43 762 | 42 521 | 24 068 | 6 905 | 2 484 | 12 100 |
| 2022 | 27 | 1.23 | 9 693 | 5 708 | 21 539 | 23 377 | 11 797 | 5 932 | 774 | 1 339 | 3 161 |
| 2022 | 28_2 | 1.01 | 19 241 | 31 107 | 99 021 | 112 551 | 51 708 | 28 407 | 12 392 | 7 329 | 23 649 |
| 2022 | 29 | 1.04 | 34 786 | 19 550 | 130 371 | 107 258 | 47 021 | 17 357 | 13 663 | 11 118 | 27 088 |
| 2022 | 30 | 1.15 | 1 387 | 2 422 | 4 808 | 1 573 | 1 958 | 1 213 | 1 031 | 566 | 3 487 |
| 2022 | 32 | 1.42 | 8 280 | 22 448 | 108 012 | 69 776 | 43 804 | 24 237 | 15 395 | 14 494 | 32 023 |

### 4.1.1.4 Tuning fleets for WGBFAS

#### 4.1.1.4.1 Herring in the ICES Subdivisions 25–29 and 32

The tuning fleet for the assessment of the Central Baltic herring (CBH) abundance in the ICES Subdivisions 25-29 and 32 per age-group and for the years 1999-2022 (BIAS) is presented in Figure 4.7. The area-corrected combined results (for age 1+ CBH) of the above-mentioned ICES Subdivisions are presented in Table 4.10. The recruitment index for herring (age 0) in the ICES Subdivisions 25-27, 28_2, 29 and 32 is presented in Table 4.11.

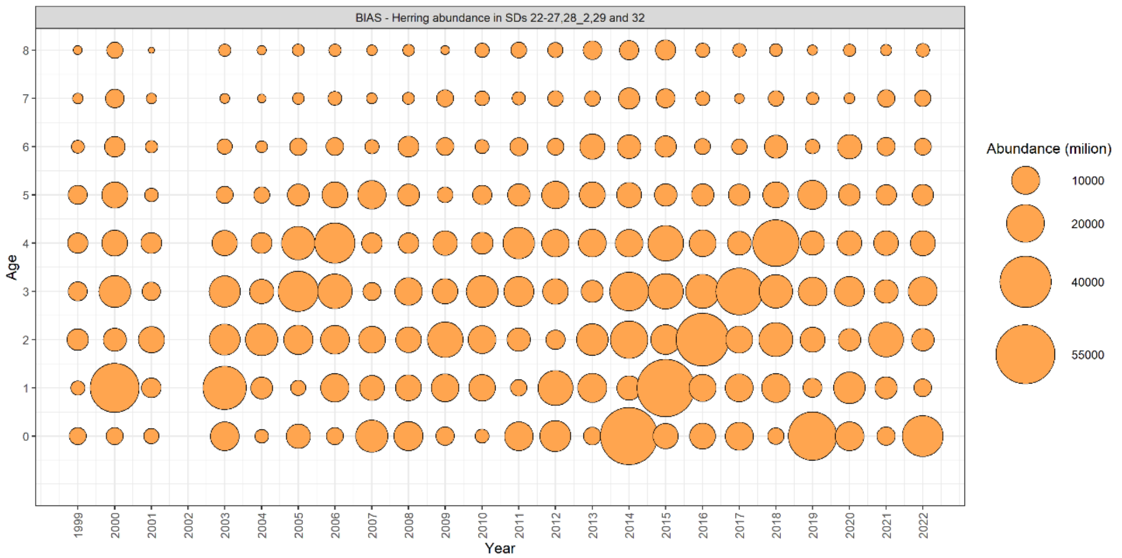



**Figure 4.7. Autumn (BIAS) tuning fleet index (abundance per age-groups and years 1999-2022) for herring in the ICES Subdivisions 25-27, 28_2, 29 and 32.**

**Table 4.10. Whole time-series of tuning indices. Autumn acoustic (BIAS) tuning fleet index (numbers in millions) for the Central Baltic herring (the ICES Subdivisions 25–27, 28_2 ,29 and 32).**

| YEAR | TOTAL AGE 1+ | AGE 1 | AGE 2 | AGE 3 | AGE 4 | AGE 5 | AGE 6 | AGE 7 | AGE 8+ |
|---|---|---|---|---|---|---|---|---|---|
| 1999 | 21 838 | 1 797 | 5 129 | 3 729 | 4 469 | 3 755 | 1 458 | 851 | 650 |
| 2000 | 83 056 | 36 325 | 6 175 | 13 326 | 8 230 | 8 309 | 4 622 | 3 610 | 2 460 |
| 2001 | 24 961 | 4 101 | 8 453 | 3 476 | 4 738 | 1 598 | 1 252 | 872 | 471 |
| 2022 | - | - | - | - | - | - | - | - | - |
| 2003 | 67 368 | 27 502 | 12 483 | 12 639 | 7 678 | 2 913 | 2 121 | 762 | 1 271 |
| 2004 | 35 713 | 5 270 | 13 824 | 6 960 | 4 735 | 2 508 | 1 132 | 604 | 680 |
| 2005 | 61 842 | 2 138 | 10 933 | 23 335 | 14 982 | 5 203 | 2 981 | 1 096 | 1 175 |
| 2006 | 74 433 | 10 308 | 10 385 | 16 353 | 23 178 | 8 094 | 3 161 | 1 719 | 1 234 |
| 2007 | 37 650 | 7 507 | 8 773 | 3 208 | 4 522 | 10 112 | 1 760 | 925 | 843 |
| 2008 | 42 084 | 8 043 | 7 888 | 9 323 | 4 613 | 5 218 | 4 716 | 1 173 | 1 112 |
| 2009 | 51 018 | 9 623 | 17 587 | 7 738 | 7 083 | 2 377 | 3 080 | 2 878 | 652 |
| 2010 | 46 331 | 8 600 | 9 595 | 13 496 | 5 273 | 3 879 | 1 738 | 1 924 | 1 827 |
| 2011 | 46 213 | 2 633 | 6 274 | 11 532 | 13 037 | 5 606 | 3 278 | 1 495 | 2 357 |
| 2012 | 54 244 | 16 761 | 3 839 | 7 847 | 9 425 | 9 275 | 2 711 | 2 271 | 2 115 |
| 2013 | 60 519 | 10 835 | 13 216 | 5 464 | 9 559 | 8 053 | 7 532 | 2 239 | 3 620 |
| 2014 | 79 860 | 6 994 | 19 549 | 21 194 | 9 356 | 7 370 | 6 584 | 4 929 | 3 885 |
| 2015 | 116 661 | 51 982 | 11 236 | 17 027 | 17 420 | 5 774 | 5 192 | 3 678 | 4 352 |
| 2016 | 88 025 | 9 117 | 42 808 | 15 590 | 8 932 | 5 681 | 2 384 | 1 756 | 1 756 |
| 2017 | 68 079 | 9 687 | 9 173 | 33 042 | 6 607 | 5 037 | 2 195 | 764 | 1 574 |
| 2018 | 91 182 | 10 512 | 15 556 | 15 017 | 32 380 | 8 093 | 6 045 | 2 268 | 1 311 |
| 2019 | 43 101 | 3 669 | 7 463 | 10 455 | 6 825 | 10 655 | 1 937 | 1 294 | 803 |
| 2020 | 51 466 | 12 953 | 5 642 | 11 333 | 7 287 | 5 091 | 6 948 | 929 | 1 283 |
| 2021 | 47 709 | 5 525 | 16 464 | 6 519 | 7 179 | 4 625 | 3 369 | 2 960 | 1 068 |
| 2022 | 38 611 | 3 116 | 5 773 | 10 675 | 7 366 | 4 909 | 2 668 | 2 529 | 1 574 |

**Note: In the years, 1999, 2001-2005 and 2008 the coverage was very poor. It is recommended that these data should not be used. These values are marked in red.**

**Table 4.11. Autumn acoustic (BIAS) recruitment index (age 0; numbers in millions) for the Central Baltic herring (the ICES Subdivisions 25-27, 28_2, 29 and 32).**

| YEAR | AGE 0 |
|---|---|
| 1999 | 2 794 |
| 2000 | 2 841 |
| 2001 | 2 149 |
| 2002 | - |
| 2003 | 10 376 |
| 2004 | 1 600 |
| 2005 | 6 989 |
| 2006 | 2 847 |
| 2007 | 13 583 |
| 2008 | 10 748 |
| 2009 | 3 462 |
| 2010 | 1 667 |
| 2011 | 10 575 |
| 2012 | 12 420 |
| 2013 | 3 143 |
| 2014 | 51 138 |
| 2015 | 7 623 |
| 2016 | 8 016 |
| 2017 | 10 004 |
| 2018 | 2 524 |
| 2019 | 35 406 |
| 2020 | 10 346 |
| 2021 | 3 381 |
| 2022 | 24 209 |

**Note: In the years, 1999, 2001-2005 and 2008 the coverage was very poor. It is recommended that these data should not be used. These values are marked in red.**

### 4.1.1.4.2 Sprat in the ICES Subdivisions 22–29 and 32

The tuning fleet for the assessment of sprat abundance in the ICES Subdivisions 22-27, 28_2, 29 and 32 per age-group and for the years 1991-2022 (BIAS) is presented in Figure 4.8. The area-corrected combined results (for age 1+ sprat) of the above-mentioned ICES Subdivisions are presented in Table 4.12. The recruitment index for sprat (age 0) in the ICES Subdivisions 22-29 and 32 is presented in Table 4.13.

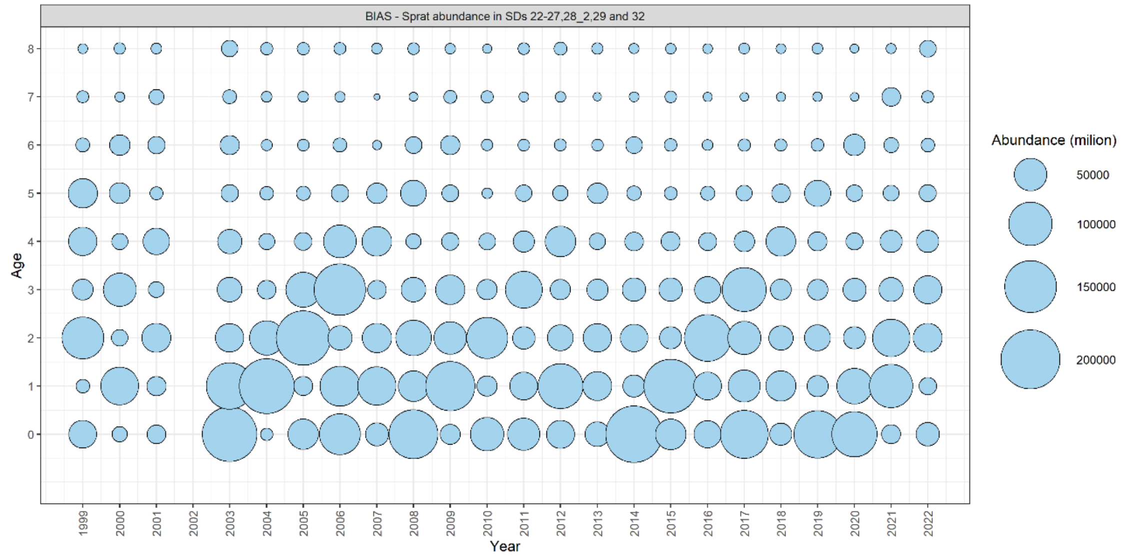



**Figure 4.8. Autumn (BIAS) tuning fleet index (abundance per age-groups and years 1999-2022) for sprat in the ICES Subdivisions 22-27, 28_2, 29 and 32.**

**Table 4.12. Whole time-series of tuning indices. Autumn acoustic (BIAS) tuning fleet index (numbers in millions) for Baltic sprat (ICES Subdivisions 22-27, 28_2, 29 and 32).**

| YEAR | TOTAL AGE 1+ | AGE 1 | AGE 2 | AGE 3 | AGE 4 | AGE 5 | AGE 6 | AGE 7 | AGE 8+ |
|---|---|---|---|---|---|---|---|---|---|
| 1999 | 198 805 | 4 901 | 91 682 | 16 654 | 36 136 | 39 064 | 5 275 | 3 339 | 1 754 |
| 2000 | 179 117 | 72 295 | 8 611 | 53 087 | 8 052 | 16 597 | 15 982 | 1 739 | 2 753 |
| 2001 | 113 000 | 12 990 | 38 116 | 7 766 | 30 756 | 4 306 | 10 175 | 6 480 | 2 412 |
| 2022 | - | - | - | - | - | - | - | - | - |
| 2003 | 239 388 | 116 750 | 35 764 | 25 611 | 24 155 | 10 042 | 13 306 | 5 077 | 8 684 |
| 2004 | 261 821 | 170 345 | 58 120 | 11 981 | 8 019 | 4 887 | 2 518 | 2 391 | 3 560 |
| 2005 | 263 066 | 12 592 | 165 847 | 59 588 | 10 643 | 5 471 | 3 011 | 2 364 | 3 550 |
| 2006 | 327 851 | 83 120 | 24 175 | 147 488 | 52 014 | 10 143 | 5 143 | 2 278 | 3 491 |
| 2007 | 188 002 | 75 613 | 39 491 | 12 088 | 40 276 | 15 871 | 1 516 | 768 | 2 379 |
| 2008 | 180 451 | 43 600 | 62 492 | 25 534 | 6 913 | 28 474 | 8 951 | 1 383 | 3 105 |
| 2009 | 261 814 | 134 253 | 49 826 | 39 347 | 9 935 | 9 111 | 13 065 | 4 102 | 2 176 |
| 2010 | 137 720 | 15 367 | 88 035 | 14 904 | 9 019 | 2 161 | 2 967 | 3 707 | 1 560 |
| 2011 | 155 994 | 34 095 | 20 175 | 68 118 | 17 115 | 8 393 | 3 072 | 1 838 | 3 188 |

| YEAR | TOTAL AGE 1+ | AGE 1 | AGE 2 | AGE 3 | AGE 4 | AGE 5 | AGE 6 | AGE 7 | AGE 8+ |
|---|---|---|---|---|---|---|---|---|---|
| 2012 | 212 116 | 108 251 | 28 703 | 15 212 | 43 526 | 6 640 | 3 453 | 2 135 | 4 196 |
| 2013 | 122 484 | 38 416 | 35 889 | 17 151 | 8 465 | 15 537 | 3 171 | 1 116 | 2 739 |
| 2014 | 105 288 | 19 021 | 33 428 | 22 062 | 11 957 | 5 857 | 9 166 | 1 771 | 2 026 |
| 2015 | 230 152 | 162 639 | 18 894 | 22 417 | 12 790 | 4 198 | 3 964 | 3 086 | 2 164 |
| 2016 | 205 802 | 33 849 | 119 884 | 29 659 | 11 196 | 5 441 | 2 461 | 1 506 | 1 805 |
| 2017 | 236 228 | 48 761 | 52 739 | 103 922 | 15 961 | 7 473 | 3 698 | 1 230 | 2 445 |
| 2018 | 141 317 | 41 907 | 24 557 | 16 383 | 39 840 | 11 997 | 3 293 | 1 434 | 1 905 |
| 2019 | 111 898 | 17 161 | 28 807 | 15 797 | 12 692 | 29 391 | 4 002 | 1 642 | 2 404 |
| 2020 | 141 614 | 62 659 | 19 408 | 21 467 | 9 689 | 8 402 | 17 421 | 1 226 | 1 343 |
| 2021 | 241 994 | 100 173 | 70 693 | 23 649 | 19 445 | 7 632 | 6 306 | 12 185 | 1 910 |
| 2022 | 129 385 | 9 810 | 38 604 | 35 439 | 18 894 | 9 536 | 4 830 | 3 394 | 8 878 |

**Note: In the years, 1999, 2001-2005 and 2008 the coverage was very poor. It is recommended that these data should not be used. These values are marked in red.**

**Table 4.13. Autumn acoustic (BIAS) recruitment index (age 0; numbers in millions) for sprat (ICES Subdivisions 22-27, 28_2, 29 and 32).**

| YEAR | AGE 0 |
|---|---|
| 1999 | 34 354 |
| 2000 | 6 762 |
| 2001 | 12 157 |
| 2002 | - |
| 2003 | 168 681 |
| 2004 | 3 673 |
| 2005 | 42 975 |
| 2006 | 86 431 |
| 2007 | 21 061 |
| 2008 | 131 972 |
| 2009 | 14 528 |
| 2010 | 53 562 |
| 2011 | 49 130 |
| 2012 | 34 941 |
| 2013 | 25 347 |
| 2014 | 182 073 |
| 2015 | 43 534 |
| 2016 | 32 784 |
| 2017 | 126 748 |
| 2018 | 19 371 |
| 2019 | 122 062 |
| 2020 | 111 155 |
| 2021 | 12 442 |
| 2022 | 21 928 |

**Note: In the years, 1999, 2001-2005 and 2008 the coverage was very poor. It is recommended that these data should not be used. These values are marked in red.**

### 4.1.1.4.3 Herring in ICES Subdivision 30

A comparison exercise between the StoX and traditional BIAS calculation methods was performed for the SD 30 herring acoustic abundance index during the WGBIFS meeting in 2020. It was found that the StoX project, developed for WGBIFS, has small methodological differences compared to the standard calculation method used by the group, as specified in the Manual for the International Baltic Acoustic Surveys, (IBAS) and is thereby causing a minor difference in the total number of herring. Nevertheless, WGBIFS decided to change to the StoX calculation method and recommended a new herring abundance time-series for the assessment purpose.

In 2022, the Finnish BIAS survey was realized on board of the r/v "Aranda". The distance of the acoustic transects and the numbers of realized fish control-hauls were conducted more or less as planned.

Tuning fleet data from October 2007-2022 BIAS surveys for the assessment of the Gulf of Bothnian herring stock (the ICES Subdivisions 30-31) are presented in Table 4.14. Estimates from the StoX calculations for the surveys covering the years 2007-2022 are presented in Figure 4.9.

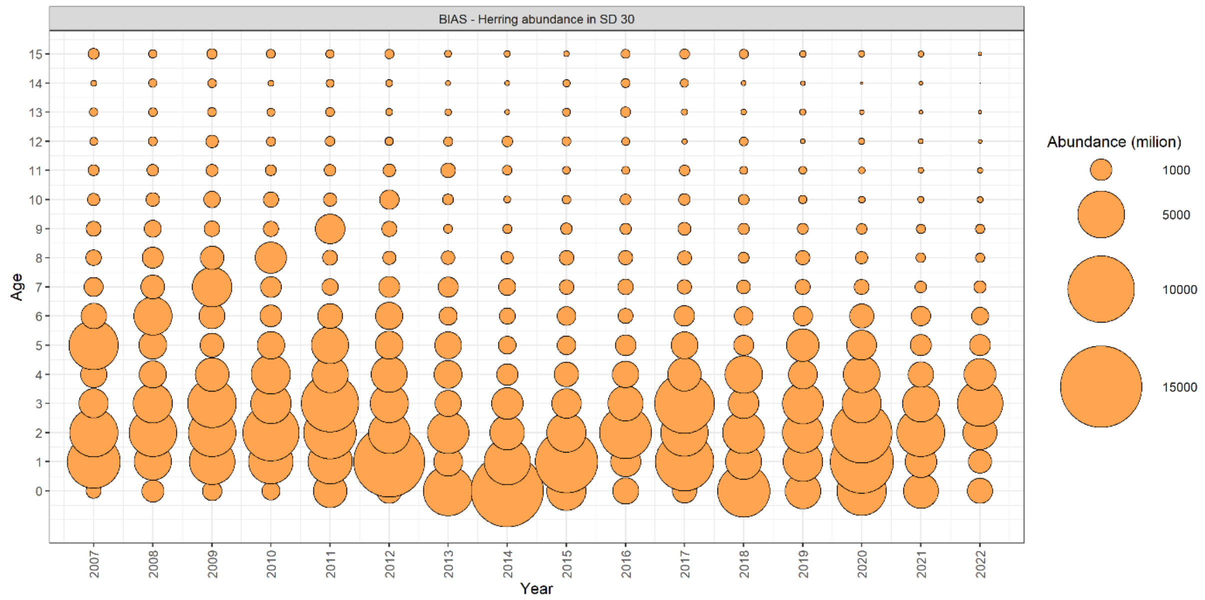



**Figure 4.9. Autumn (BIAS) abundance of herring (per age-group for the years 2007-2022) in ICES Subdivision 30.**

**Table 4.14. Correction factor and area corrected numbers (millions) of herring per age-groups in the ICES Subdivision 30 (2007-2022) based on the StoX calculations.**

| YEAR | AREA CORR FACTOR | AGE 0 | AGE 1 | AGE 2 | AGE 3 | AGE 4 | AGE 5 | AGE 6 | AGE 7 | AGE 8 | AGE 9 | AGE 10 | AGE 11 | AGE 12 | AGE 13 | AGE 14 | AGE 15 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2007 | 1.04 | 480 | 6346 | 5228 | 1902 | 1492 | 5449 | 1420 | 786 | 536 | 490 | 322 | 253 | 139 | 145 | 75 | 260 |
| 2008 | 1.21 | 1069 | 3074 | 5105 | 3478 | 1649 | 1707 | 3285 | 1235 | 987 | 630 | 396 | 292 | 173 | 155 | 145 | 147 |
| 2009 | 1.06 | 819 | 4667 | 5074 | 5358 | 2491 | 1259 | 1458 | 3525 | 1210 | 544 | 575 | 316 | 336 | 172 | 152 | 221 |
| 2010 | 1.06 | 712 | 4465 | 7189 | 3611 | 3424 | 1669 | 1055 | 931 | 2145 | 505 | 519 | 261 | 184 | 128 | 72 | 173 |
| 2011 | 1.06 | 2504 | 4412 | 6285 | 7406 | 2942 | 3127 | 1360 | 587 | 497 | 1949 | 379 | 288 | 202 | 164 | 133 | 149 |
| 2012 | 1.08 | 1398 | 11389 | 3905 | 3271 | 2902 | 1695 | 1627 | 962 | 382 | 504 | 817 | 344 | 140 | 104 | 103 | 178 |
| 2013 | 1.08 | 5567 | 1849 | 3889 | 1503 | 1717 | 1597 | 711 | 884 | 408 | 172 | 260 | 477 | 188 | 92 | 49 | 104 |

| | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2014 | 1.08 | 11845 | 4839 | 2637 | 2193 | 1012 | 687 | 554 | 626 | 322 | 180 | 102 | 204 | 237 | 52 | 50 | 81 |
| 2015 | 1.22 | 3446 | 8863 | 3462 | 1912 | 1334 | 763 | 764 | 458 | 472 | 284 | 156 | 121 | 176 | 129 | 109 | 65 |
| 2016 | 1.08 | 1502 | 2003 | 6118 | 2778 | 1544 | 956 | 499 | 540 | 438 | 276 | 263 | 138 | 138 | 223 | 173 | 171 |
| 2017 | 1.08 | 1287 | 7732 | 5065 | 8105 | 2444 | 1595 | 927 | 449 | 426 | 368 | 294 | 238 | 62 | 82 | 148 | 207 |
| 2018 | 1.08 | 6174 | 2882 | 3937 | 2087 | 3158 | 869 | 767 | 412 | 262 | 275 | 245 | 137 | 161 | 68 | 48 | 190 |
| 2019 | 1.08 | 2798 | 3538 | 3682 | 3780 | 1834 | 2333 | 838 | 492 | 440 | 261 | 148 | 125 | 50 | 84 | 47 | 94 |
| 2020 | 1.08 | 5444 | 9016 | 8361 | 3422 | 2987 | 1993 | 1299 | 483 | 319 | 241 | 92 | 91 | 79 | 46 | 18 | 86 |
| 2021 | 1.16 | 2732 | 2202 | 5200 | 3046 | 1449 | 963 | 811 | 299 | 199 | 181 | 79 | 69 | 49 | 32 | 33 | 75 |
| 2022 | 1.16 | 1393 | 1162 | 2539 | 4672 | 2266 | 961 | 655 | 323 | 185 | 177 | 73 | 62 | 34 | 30 | 7 | 27 |

*** The abundance indices for age-groups 0 and 1 is underestimated in the survey and should therefore not be used for the assessment.**

## 4.1.2 Combined results of the Baltic Acoustic Spring Survey (BASS)

In May 2022, the following acoustic surveys were conducted:

| Country | Data | Vessel | ICES SDs | Length of acoustic transects [NM] | Number of hauls | Number of hydrological stations |
|---|---|---|---|---|---|---|
| Latvia-Poland | 20-27.05.2022 | Baltica | Parts of 26 and 28 | 604 | 17 | 19 |
| Estonia-Poland | 28.05-02.06.2022 | Baltica | Parts of 28, 29, 32 | 370 | 11 | 11 |
| Poland | 03-15.05.2022 | Baltica | Parts of 25 and 26 | 772 | 26 | 37 |
| Germany | 02-27.05.2022 | Walther Herwig III | 24 and parts of 25, 26, 28 and 29 | 1053 | 48 | 105 |
| Sweden | 10-16.05.2022 | Svea | Parts of 27 and 28 | 432 | 17 | 17 |

### 4.1.2.1 Area under investigation and overlapping areas

The BASS surveys were realized in May 2022 by the above-mentioned five countries in the ICES Subdivisions 24-32 (excl. ICES Subdivisions 28_1, 30, 31), however, some ICES Subdivisions were not fully covered (Figure 4.10). The two rectangles in the ICES Subdivision 28_2, (45H0 and 45H1) was not investigated due to survey planning problems in Latvia, and two rectangles in the ICES Subdivision 26 (40G9 and 40H0) was not monitored as Lithuania did not take part in the BASS 2022 cruise. Also ICES statistical rectangle 39H0 in ICES Subdivision 26 was not investigated as Russia did not take part in the BASS 2022 sampling. Compared to the previous BASS survey, in 2022 the investigated area was extended to the northern part of Subdivision 29, i.e. rectangles 48G9 - 48H0. Only two ICES rectangles (47H3 and 48H3) were inspected in the ICES Subdivision 32. In May 2022, a total of 63 ICES rectangles were covered with acoustic and biotic monitoring. 62 ICES rectangles were investigated by one country. One ICES rectangle was inspected and reported by two countries, namely 42G7 by Sweden and Germany. Also, six ICES rectangles were additionally inspected by another country (i.e. 42G9, 43G9 and 44G9 by Latvia and 38G5, 39G6 and 40G8 by Germany), however, these data were not considered in the final analysis. Echo-integration was recorded at a total linear distance of 3231 NM, moreover, 119 and 189 catch and hydrological stations, respectively, were inspected. The BASS surveys design only covers the sprat distribution area representatively hence only a sprat abundance index is calculated.

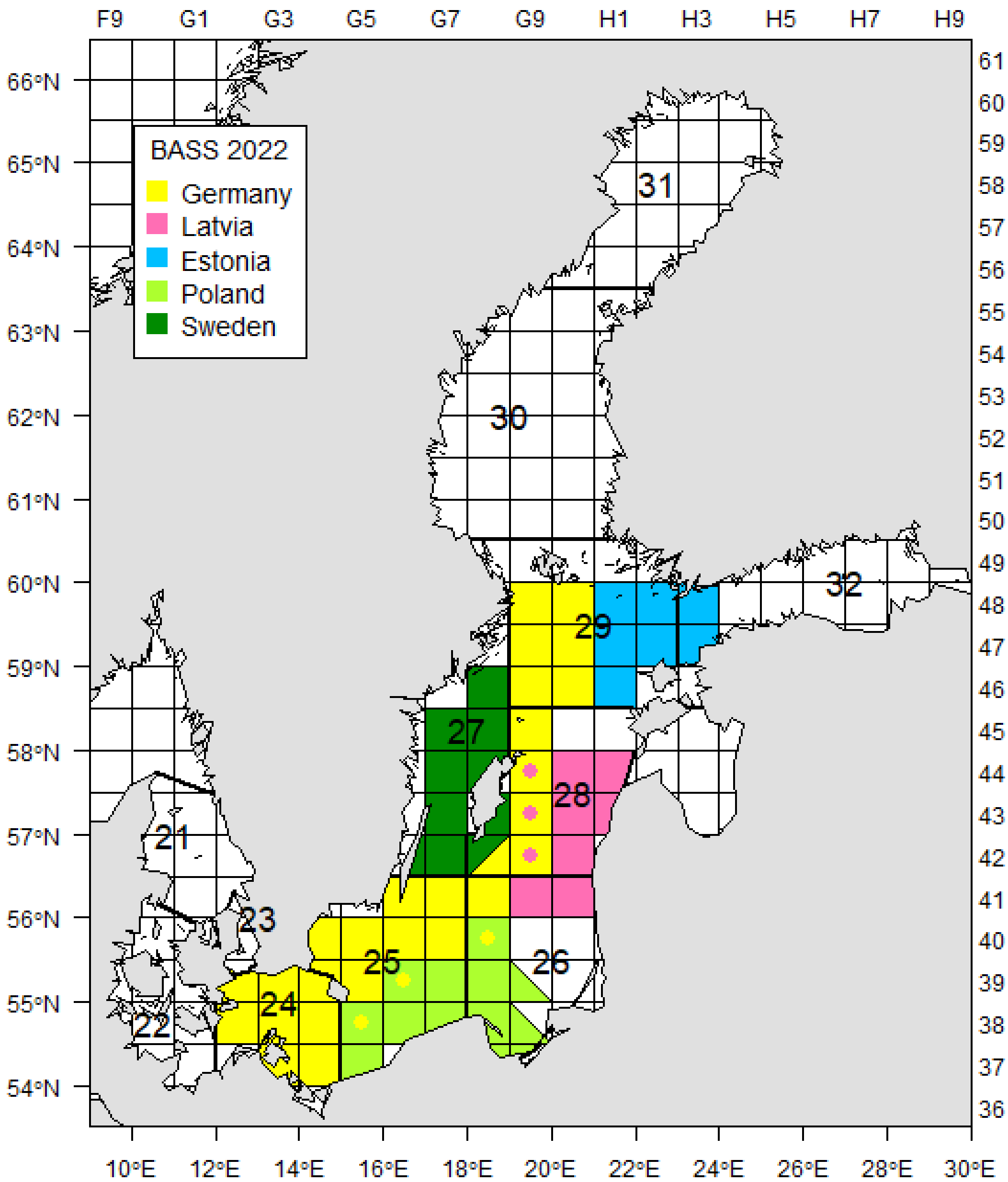



**Figure 4.10. Map of the BASS survey conducted in May 2022. Various colours indicate the responsible countries for that ICES rectangle which finally also delivered data to the BIAS-database. Dots with different colours within a rectangle indicate that the rectangle was partly or completely covered by another country and data are available in the BASS-database (but not included in the final analysis).**

#### 4.1.2.2 Combined results and area corrected data

The geographical distribution of the sprat abundance per ICES rectangles monitored in May 2022 is demonstrated in Figure 4.11. The Baltic sprat stock abundance estimates per ICES rectangles and ICES Subdivisions according to age-groups are presented in Tables 4.15 and 4.16. A correction factor for each ICES Subdivision and year is used to account for the difference in coverage between years. This factor is the proportion to the total area of the ICES Subdivision (see the IBAS Manual) and the area of rectangles covered during the survey. The correction factors, calculated by covered ICES Subdivisions for 2022 was applied.

In May 2022 sprat was very widely distributed in the Baltic Sea and occurred in each monitored ICES rectangle (Figure 4.11). The highest sprat (age 1+) stock abundance was observed in the central part of the Baltic Sea (the ICES Subdivisions 25, 26 and 28).

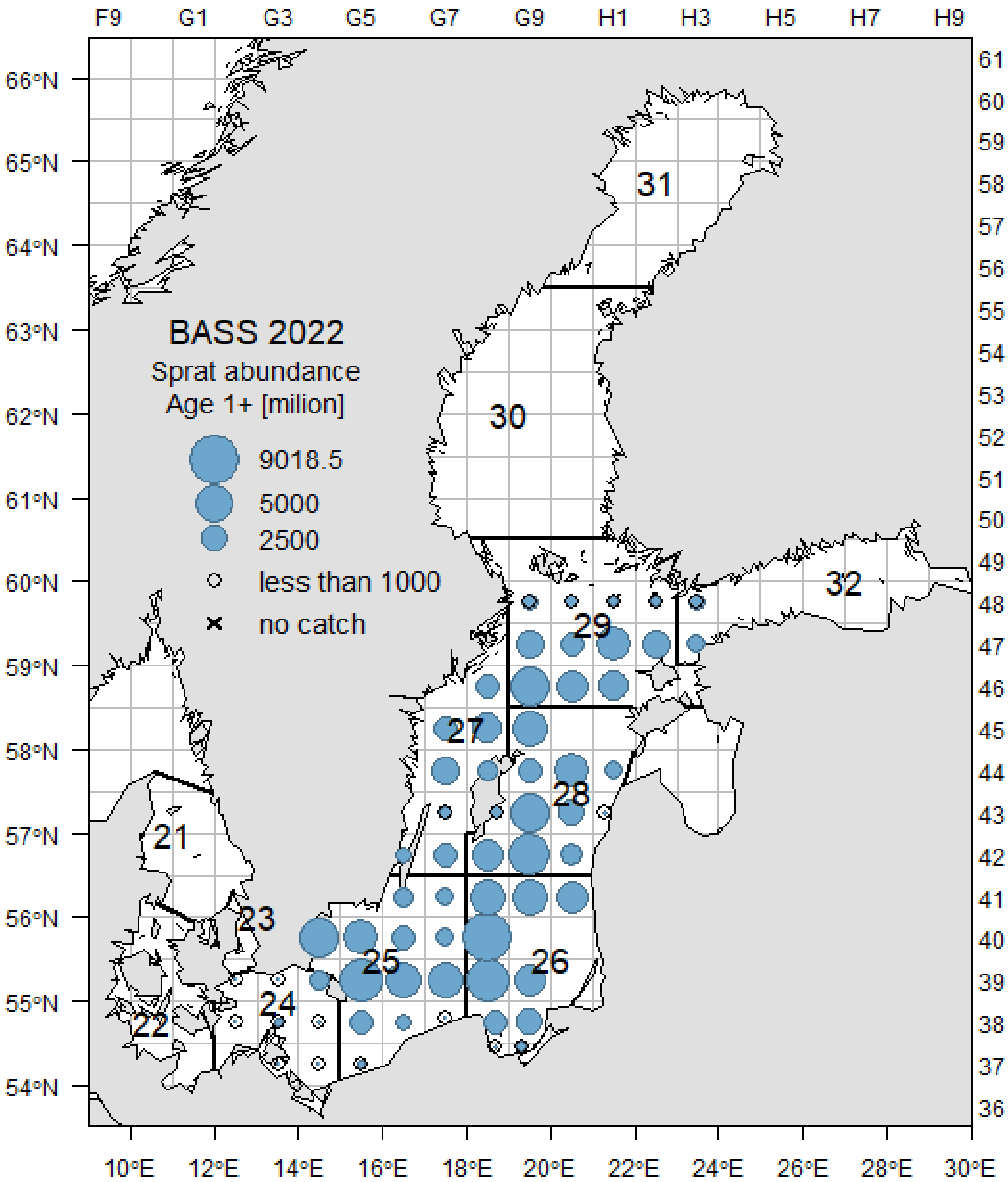



**Figure 4.11. The abundance of sprat per ICES rectangles monitored in May 2022 (the size of the circle indicates the estimated numbers of specimens x10^6 in the given rectangle).**

**Table 4.15. Estimated abundance (millions) of sprat in May 2022 per age-group and ICES-rectangle in the given ICES Subdivisions.**

| YEAR | SD | RECT | TOTAL | AGE 1 | AGE 2 | AGE 3 | AGE 4 | AGE 5 | AGE 6 | AGE 7 | AGE 8+ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 2022 | 24 | 37G3 | 53.25 | 19.25 | 5.91 | 7.46 | 5.84 | 4.07 | 5.33 | 4.58 | 0.81 |
| 2022 | 24 | 37G4 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 2022 | 24 | 38G2 | 12.50 | 4.52 | 1.39 | 1.75 | 1.37 | 0.96 | 1.25 | 1.07 | 0.19 |
| 2022 | 24 | 38G3 | 342.70 | 123.91 | 38.01 | 48.00 | 37.60 | 26.21 | 34.31 | 29.45 | 5.21 |
| 2022 | 24 | 38G4 | 85.90 | 0.04 | 14.70 | 19.72 | 15.17 | 11.12 | 12.77 | 11.05 | 1.33 |
| 2022 | 24 | 39G2 | 0.63 | 0.00 | 0.06 | 0.19 | 0.16 | 0.06 | 0.10 | 0.06 | 0.00 |
| 2022 | 24 | 39G3 | 36.73 | 1.60 | 4.58 | 7.50 | 7.80 | 3.95 | 5.02 | 5.64 | 0.64 |
| 2022 | 24 | 39G4 | 474.18 | 37.18 | 151.19 | 131.67 | 51.59 | 50.68 | 26.08 | 24.45 | 1.34 |
| 2022 | 25 | 37G5 | 309.48 | 10.71 | 39.25 | 47.62 | 56.88 | 58.31 | 37.07 | 48.09 | 11.54 |
| 2022 | 25 | 38G5 | 2 246.76 | 13.06 | 399.17 | 632.15 | 387.31 | 390.50 | 188.54 | 204.71 | 31.32 |
| 2022 | 25 | 38G6 | 1 112.97 | 0.80 | 152.51 | 245.80 | 220.79 | 224.77 | 116.24 | 131.68 | 20.38 |
| 2022 | 25 | 38G7 | 23.30 | 0.16 | 5.31 | 7.25 | 3.69 | 3.32 | 1.72 | 1.63 | 0.22 |
| 2022 | 25 | 39G4 | 1 093.93 | 0.33 | 177.02 | 388.40 | 166.45 | 154.76 | 156.34 | 45.10 | 5.53 |
| 2022 | 25 | 39G5 | 7 008.74 | 85.46 | 2 414.58 | 2 489.95 | 904.24 | 658.94 | 331.18 | 124.39 | 0.00 |
| 2022 | 25 | 39G6 | 4 515.74 | 77.75 | 1 230.01 | 1 532.11 | 624.02 | 557.79 | 261.94 | 212.32 | 19.81 |
| 2022 | 25 | 39G7 | 4 929.43 | 237.74 | 1 808.00 | 1 826.97 | 485.14 | 309.81 | 174.90 | 82.69 | 4.18 |
| 2022 | 25 | 40G4 | 5 680.94 | 28.25 | 1 869.25 | 2 046.86 | 821.01 | 524.13 | 290.76 | 95.41 | 5.27 |
| 2022 | 25 | 40G5 | 4 193.18 | 149.26 | 1 709.88 | 1 369.15 | 501.98 | 288.70 | 115.28 | 57.26 | 1.67 |
| 2022 | 25 | 40G6 | 2 208.32 | 49.14 | 897.14 | 738.84 | 264.26 | 173.17 | 64.35 | 20.62 | 0.80 |
| 2022 | 25 | 40G7 | 1 314.07 | 3.67 | 416.23 | 505.89 | 194.32 | 122.48 | 51.26 | 20.22 | 0.00 |
| 2022 | 25 | 41G6 | 1 698.22 | 236.93 | 657.47 | 438.73 | 150.89 | 107.73 | 74.45 | 29.00 | 3.02 |
| 2022 | 25 | 41G7 | 1 232.59 | 73.50 | 542.73 | 378.76 | 124.23 | 73.82 | 27.07 | 12.19 | 0.29 |
| 2022 | 26 | 37G8 | 84.99 | 3.22 | 34.89 | 26.57 | 11.37 | 4.83 | 2.64 | 1.33 | 0.14 |
| 2022 | 26 | 37G9 | 551.00 | 12.07 | 159.11 | 162.45 | 101.66 | 59.09 | 23.50 | 26.22 | 6.89 |
| 2022 | 26 | 38G8 | 2 235.37 | 5.80 | 489.76 | 665.01 | 513.18 | 292.30 | 90.06 | 149.10 | 30.16 |
| 2022 | 26 | 38G9 | 2 704.83 | 7.58 | 518.73 | 782.45 | 636.91 | 387.17 | 140.74 | 186.76 | 44.48 |
| 2022 | 26 | 39G8 | 6 710.02 | 23.01 | 1 528.39 | 1 970.64 | 1 489.86 | 882.84 | 337.15 | 383.78 | 94.36 |
| 2022 | 26 | 39G9 | 3 686.07 | 1.45 | 573.79 | 987.46 | 899.02 | 599.25 | 248.76 | 275.61 | 100.73 |

| YEAR | SD | RECT | TOTAL | AGE 1 | AGE 2 | AGE 3 | AGE 4 | AGE 5 | AGE 6 | AGE 7 | AGE 8+ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 2022 | 26 | 40G8 | 9 018.47 | 193.73 | 2 994.64 | 2 711.68 | 1 563.28 | 825.61 | 329.90 | 330.55 | 69.07 |
| 2022 | 26 | 41G8 | 4 740.46 | 117.73 | 2 178.60 | 1 336.81 | 432.61 | 205.77 | 138.43 | 265.11 | 65.40 |
| 2022 | 26 | 41G9 | 4 788.34 | 339.17 | 2 346.36 | 1 039.44 | 255.41 | 187.50 | 133.41 | 67.03 | 420.03 |
| 2022 | 26 | 41H0 | 3 587.45 | 419.56 | 2 146.36 | 501.21 | 147.44 | 92.86 | 74.17 | 11.83 | 194.02 |
| 2022 | 27 | 42G6 | 1 062.18 | 59.69 | 809.36 | 158.01 | 17.56 | 8.78 | 0.00 | 8.78 | 0.00 |
| 2022 | 27 | 42G7 | 2 160.35 | 43.96 | 743.29 | 924.56 | 112.42 | 67.43 | 33.77 | 146.15 | 88.77 |
| 2022 | 27 | 43G7 | 562.16 | 5.12 | 270.70 | 178.74 | 13.35 | 24.38 | 28.21 | 13.35 | 28.32 |
| 2022 | 27 | 44G7 | 2 982.20 | 322.02 | 1 803.32 | 383.63 | 117.61 | 260.42 | 30.80 | 16.80 | 47.60 |
| 2022 | 27 | 44G8 | 1 698.52 | 97.46 | 902.17 | 242.25 | 370.33 | 27.84 | 30.63 | 0.00 | 27.84 |
| 2022 | 27 | 45G7 | 2 353.28 | 461.26 | 1 239.94 | 561.41 | 51.21 | 0.00 | 20.67 | 11.16 | 7.63 |
| 2022 | 27 | 45G8 | 3 205.09 | 363.74 | 1 912.70 | 578.70 | 72.75 | 115.44 | 9.50 | 64.29 | 87.98 |
| 2022 | 27 | 46G8 | 2 076.41 | 228.58 | 1 132.25 | 358.89 | 181.21 | 45.49 | 25.65 | 104.33 | 0.00 |
| 2022 | 28_2 | 42G8 | 3 621.08 | 98.04 | 1 684.57 | 1 215.08 | 296.87 | 224.32 | 64.59 | 6.36 | 31.23 |
| 2022 | 28_2 | 42G9 | 6 321.78 | 348.93 | 3 090.11 | 2 296.37 | 326.19 | 115.08 | 94.12 | 11.36 | 39.62 |
| 2022 | 28_2 | 42H0 | 1 746.55 | 61.54 | 585.72 | 476.17 | 125.51 | 97.54 | 95.73 | 30.37 | 273.97 |
| 2022 | 28_2 | 43G8 | 884.13 | 7.82 | 323.92 | 303.58 | 184.65 | 0.00 | 18.78 | 0.00 | 45.38 |
| 2022 | 28_2 | 43G9 | 6 024.28 | 219.13 | 3 044.24 | 2 080.76 | 322.26 | 159.74 | 131.48 | 18.22 | 48.45 |
| 2022 | 28_2 | 43H0 | 2 685.73 | 70.21 | 1 118.03 | 760.71 | 171.85 | 258.76 | 86.58 | 44.98 | 174.63 |
| 2022 | 28_2 | 43H1 | 128.43 | 2.09 | 37.87 | 39.18 | 10.92 | 15.43 | 5.26 | 4.42 | 13.25 |
| 2022 | 28_2 | 44G9 | 2 338.54 | 52.79 | 885.41 | 982.43 | 155.88 | 117.15 | 96.99 | 13.85 | 34.04 |
| 2022 | 28_2 | 44H0 | 4 337.47 | 98.96 | 1 792.67 | 1 446.75 | 192.94 | 317.33 | 71.84 | 70.61 | 346.37 |
| 2022 | 28_2 | 44H1 | 1 289.20 | 36.12 | 542.76 | 397.85 | 90.83 | 110.41 | 21.03 | 25.21 | 64.99 |
| 2022 | 28_2 | 45G9 | 4 823.66 | 346.62 | 2 475.20 | 1 646.87 | 240.06 | 51.19 | 41.84 | 5.59 | 16.29 |
| 2022 | 29 | 46G9 | 5 702.92 | 482.67 | 3 455.81 | 1 332.25 | 190.79 | 160.59 | 64.60 | 2.30 | 13.91 |
| 2022 | 29 | 46H0 | 3 565.58 | 252.85 | 2 089.84 | 936.62 | 124.19 | 113.71 | 42.17 | 1.01 | 5.18 |
| 2022 | 29 | 46H1 | 3 257.29 | 208.59 | 1 257.60 | 983.72 | 179.87 | 183.92 | 122.60 | 195.49 | 125.50 |
| 2022 | 29 | 47G9 | 2 897.86 | 236.27 | 1 804.51 | 633.79 | 98.55 | 81.79 | 34.37 | 1.12 | 7.46 |
| 2022 | 29 | 47H0 | 2 289.34 | 170.86 | 1 149.86 | 633.26 | 142.44 | 110.29 | 62.11 | 3.68 | 16.84 |
| 2022 | 29 | 47H1 | 4 162.34 | 387.07 | 1 584.50 | 1 202.38 | 228.64 | 223.32 | 139.67 | 246.70 | 150.07 |

| YEAR | SD | RECT | TOTAL | AGE 1 | AGE 2 | AGE 3 | AGE 4 | AGE 5 | AGE 6 | AGE 7 | AGE 8+ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 2022 | 29 | 47H2 | 3 022.58 | 291.08 | 856.03 | 953.12 | 210.44 | 207.67 | 125.29 | 235.40 | 143.54 |
| 2022 | 29 | 48G9 | 945.19 | 19.98 | 475.91 | 200.26 | 134.65 | 59.61 | 29.47 | 0.11 | 25.20 |
| 2022 | 29 | 48H0 | 845.55 | 17.88 | 425.74 | 179.15 | 120.46 | 53.32 | 26.36 | 0.10 | 22.54 |
| 2022 | 29 | 48H1 | 472.36 | 11.43 | 117.12 | 159.99 | 37.05 | 43.57 | 29.81 | 45.27 | 28.13 |
| 2022 | 29 | 48H2 | 425.53 | 10.30 | 105.51 | 144.13 | 33.37 | 39.25 | 26.85 | 40.78 | 25.34 |
| 2022 | 32 | 47H3 | 1 323.46 | 58.56 | 430.16 | 386.70 | 134.60 | 87.10 | 61.08 | 94.18 | 71.08 |
| 2022 | 32 | 48H3 | 963.15 | 28.54 | 294.68 | 252.82 | 100.47 | 77.24 | 61.09 | 76.34 | 71.97 |

**Table 4.16. Estimated numbers of sprat (millions) by ICES Subdivision and age-group (May 2022).**

| YEAR | SD | AGE 1 | AGE 2 | AGE 3 | AGE 4 | AGE 5 | AGE 6 | AGE 7 | AGE 8+ |
|---|---|---|---|---|---|---|---|---|---|
| 2022 | 24 | 186.50 | 215.84 | 216.29 | 119.53 | 97.05 | 84.86 | 76.30 | 9.52 |
| 2022 | 25 | 966.76 | 12 318.55 | 12 648.48 | 4 905.20 | 3 648.24 | 1 891.09 | 1 085.29 | 104.04 |
| 2022 | 26 | 1 123.32 | 12 970.63 | 10 183.73 | 6 050.74 | 3 537.22 | 1 518.77 | 1 697.32 | 1 025.26 |
| 2022 | 27 | 1 581.83 | 8 813.74 | 3 386.19 | 936.43 | 549.78 | 179.24 | 364.85 | 288.15 |
| 2022 | 28_2 | 1 342.25 | 15 580.50 | 11 645.74 | 2 117.96 | 1 466.96 | 728.24 | 230.97 | 1 088.22 |
| 2022 | 29 | 2 088.98 | 13 322.43 | 7 358.68 | 1 500.45 | 1 277.04 | 703.30 | 771.97 | 563.70 |
| 2022 | 32 | 87.10 | 724.84 | 639.52 | 235.08 | 164.34 | 122.17 | 170.51 | 143.04 |

### 4.1.2.2.1 Sprat in the ICES Subdivisions 24 – 28

**Tuning Fleets for WGBFAS**

The area-corrected abundance estimates for sprat per ICES Subdivision are summarized in Table 4.17. The corresponding biomass estimates of sprat are given in the Table 4.18. The complete time-series (2001 - 2022) of the area-corrected sprat abundance of the ICES Subdivisions 24, 25 26 and 28_2 is given in the Table 4.19.

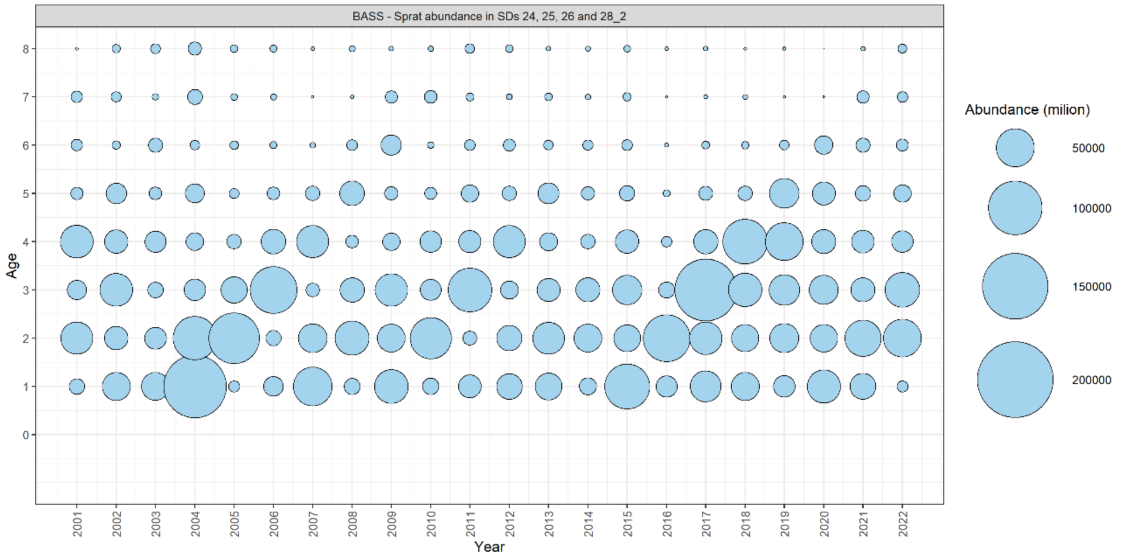



**Figure 4.12. Spring (BASS) tuning fleet index (abundance per age-group and year 2001-2022) for sprat in the ICES Subdivisions 24, 25, 26 and 28_2.**

**Table 4.17. Area-corrected numbers (millions) of sprat by ICES Subdivision and age-group (May 2022).**

| YEAR | SD | AREA CORR FACTOR | AGE 1 | AGE 2 | AGE 3 | AGE 4 | AGE 5 | AGE 6 | AGE 7 | AGE 8+ |
|---|---|---|---|---|---|---|---|---|---|---|
| 2022 | 24 | 1.04 | 193.06 | 223.43 | 223.90 | 123.73 | 100.46 | 87.84 | 78.98 | 9.85 |
| 2022 | 25 | 1.03 | 997.68 | 12 712.61 | 13 053.09 | 5 062.11 | 3 764.94 | 1 951.58 | 1 120.01 | 107.37 |
| 2022 | 26 | 1.39 | 1 559.79 | 18 010.39 | 14 140.64 | 8 401.77 | 4 911.61 | 2 108.90 | 2 356.82 | 1 423.63 |
| 2022 | 27 | 1.23 | 1 946.82 | 10 847.40 | 4 167.51 | 1 152.50 | 676.63 | 220.59 | 449.03 | 354.64 |
| 2022 | 28_2 | 1.21 | 1 623.73 | 18 847.82 | 14 087.92 | 2 562.11 | 1 774.59 | 880.96 | 279.41 | 1 316.43 |
| 2022 | 29 | 1.14 | 2 371.66 | 15 125.24 | 8 354.46 | 1 703.50 | 1 449.85 | 798.47 | 876.43 | 639.98 |
| 2022 | 32 | 6.51 | 566.90 | 4 717.67 | 4 162.33 | 1 530.01 | 1 069.58 | 795.17 | 1 109.80 | 931.00 |

**Table 4.18. Area-corrected sprat biomass (in tonnes) according to ICES Subdivision and age-group (May 2022).**

| YEAR | SD | AREA CORR FACTOR | AGE 1 | AGE 2 | AGE 3 | AGE 4 | AGE 5 | AGE 6 | AGE 7 | AGE 8+ |
|---|---|---|---|---|---|---|---|---|---|---|
| 2022 | 24 | 1.04 | 1782.0 | 3441.0 | 3726.9 | 2351.7 | 1839.0 | 1831.4 | 1648.7 | 233.3 |
| 2022 | 25 | 1.03 | 6505.6 | 122730.4 | 146755.0 | 61715.1 | 49024.4 | 28649.0 | 16627.4 | 1845.1 |
| 2022 | 26 | 1.39 | 8469.1 | 147728.6 | 139261.0 | 89082.7 | 54980.8 | 23848.3 | 27593.3 | 17122.7 |
| 2022 | 27 | 1.23 | 7944.5 | 74454.3 | 38769.6 | 11879.3 | 6524.3 | 2367.5 | 4910.3 | 3826.5 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 2022 | 28_2 | 1.21 | 8062.1 | 146728.9 | 133593.5 | 25827.7 | 19388.5 | 10067.7 | 3118.8 | 14503.6 |
| 2022 | 29 | 1.14 | 10578.5 | 114957.0 | 74893.8 | 18125.6 | 14906.5 | 8467.6 | 8913.3 | 6660.2 |
| 2022 | 32 | 6.51 | 2194.3 | 33863.7 | 35723.7 | 14423.3 | 10692.4 | 8191.3 | 10827.8 | 9971.5 |

**Table 4.19. Whole time-series of tuning indices. Spring acoustic (BASS) tuning fleet index (numbers in millions) for Baltic sprat (ICES Subdivisions 24, 25, 26 and 28_2).**

| YEAR | TOTAL AGE 1-8 | AGE 1 | AGE 2 | AGE 3 | AGE 4 | AGE 5 | AGE 6 | AGE 7 | AGE 8+ |
|---|---|---|---|---|---|---|---|---|---|
| 2001 | 109 404 | 8 225 | 35 735 | 12 971 | 37 328 | 5 384 | 4 635 | 4 526 | 600 |
| 2002 | 125 783 | 27 412 | 18 982 | 36 814 | 19 045 | 14 759 | 2 517 | 3 670 | 2 585 |
| 2003 | 84 987 | 26 469 | 16 471 | 8 423 | 15 533 | 5 653 | 7 170 | 1 660 | 3 607 |
| 2004 | 258 607 | 136 162 | 65 566 | 15 784 | 11 042 | 12 655 | 3 271 | 7 806 | 6 321 |
| 2005 | 134 374 | 4 359 | 88 830 | 23 557 | 7 258 | 3 517 | 2 781 | 1 830 | 2 243 |
| 2006 | 130 287 | 13 417 | 7 980 | 76 703 | 21 046 | 5 702 | 1 970 | 1 526 | 1 943 |
| 2007 | 132 637 | 51 569 | 28 713 | 6 377 | 36 006 | 7 481 | 1 261 | 533 | 698 |
| 2008 | 102 723 | 9 029 | 40 270 | 20 164 | 5 627 | 21 188 | 4 210 | 757 | 1 477 |
| 2009 | 139 641 | 39 412 | 26 701 | 36 255 | 10 549 | 6 312 | 14 106 | 5 341 | 964 |
| 2010 | 112 785 | 9 387 | 58 680 | 15 199 | 15 963 | 5 062 | 1 654 | 5 566 | 1 273 |
| 2011 | 128 154 | 18 092 | 6 791 | 66 160 | 16 689 | 10 565 | 4 077 | 2 399 | 3 382 |
| 2012 | 107 661 | 22 700 | 22 080 | 11 274 | 35 541 | 7 515 | 5 025 | 1 367 | 2 158 |
| 2013 | 111 419 | 24 877 | 35 333 | 18 393 | 11 358 | 14 959 | 3 385 | 2 164 | 950 |
| 2014 | 76 549 | 10 145 | 26 907 | 19 857 | 7 458 | 6 098 | 3 810 | 1 217 | 1 058 |
| 2015 | 160 549 | 70 752 | 24 660 | 29 744 | 18 935 | 8 081 | 4 074 | 2 581 | 1 721 |
| 2016 | 108 392 | 15 555 | 75 824 | 9 121 | 3 990 | 1 895 | 791 | 514 | 703 |
| 2017 | 233 353 | 32 701 | 36 292 | 132 939 | 20 630 | 6 790 | 2 250 | 809 | 942 |
| 2018 | 171 723 | 27 209 | 25 642 | 38 632 | 69 259 | 7 251 | 2 086 | 1 025 | 619 |
| 2019 | 161 411 | 15 958 | 28 778 | 32 532 | 49 495 | 30 131 | 3 384 | 487 | 647 |
| 2020 | 144 015 | 38 096 | 26 252 | 29 054 | 19 630 | 18 377 | 11 756 | 473 | 376 |
| 2021 | 128 876 | 23 212 | 45 545 | 20 134 | 18 028 | 8 525 | 7 160 | 5 361 | 911 |
| 2022 | 134 097 | 4 374 | 49 794 | 41 506 | 16 150 | 10 552 | 5 029 | 3 835 | 2 857 |

**Note: In year 2016, the coverage was very poor. It is recommended that these data should not be used.**

### 4.1.3 Combined results of the Gulf of Riga Herring Survey (GRAHS)

In July - August 2022, the joined Latvian-Estonian survey in the Gulf of was conducted. The total area of the Gulf of Riga was covered with acoustic transect (area corrected factor=1).

| Country | Data | Vessel | ICES SDs | Length of acoustic transects [NM] | Number of hauls | Number of hydro-logical stations |
|---|---|---|---|---|---|---|
| Latvia-Esto-nia | 27.07-01.08.2022 | F/V Urga | 28_1 | 484 | 17 | 17 |

The geographical distribution of the Gulf of Riga herring abundance per ICES rectangles monitored in July-August 2022 is demonstrated in Figures 4.13-4.14. The Gulf of Riga herring abundance and biomass per ICES rectangles according to age-groups are presented in Tables 4.20 and 4.21. The highest herring (age 1+) stock abundance was observed in the central part of the ICES Subdivision 28_1, in the ICES rectangle 44H3, whereas the highest concentrations of young of the year (YOY) herring (age-group 0, year class 2022) was detected in the northern part of the Gulf of Riga, in rectangle 45H3.

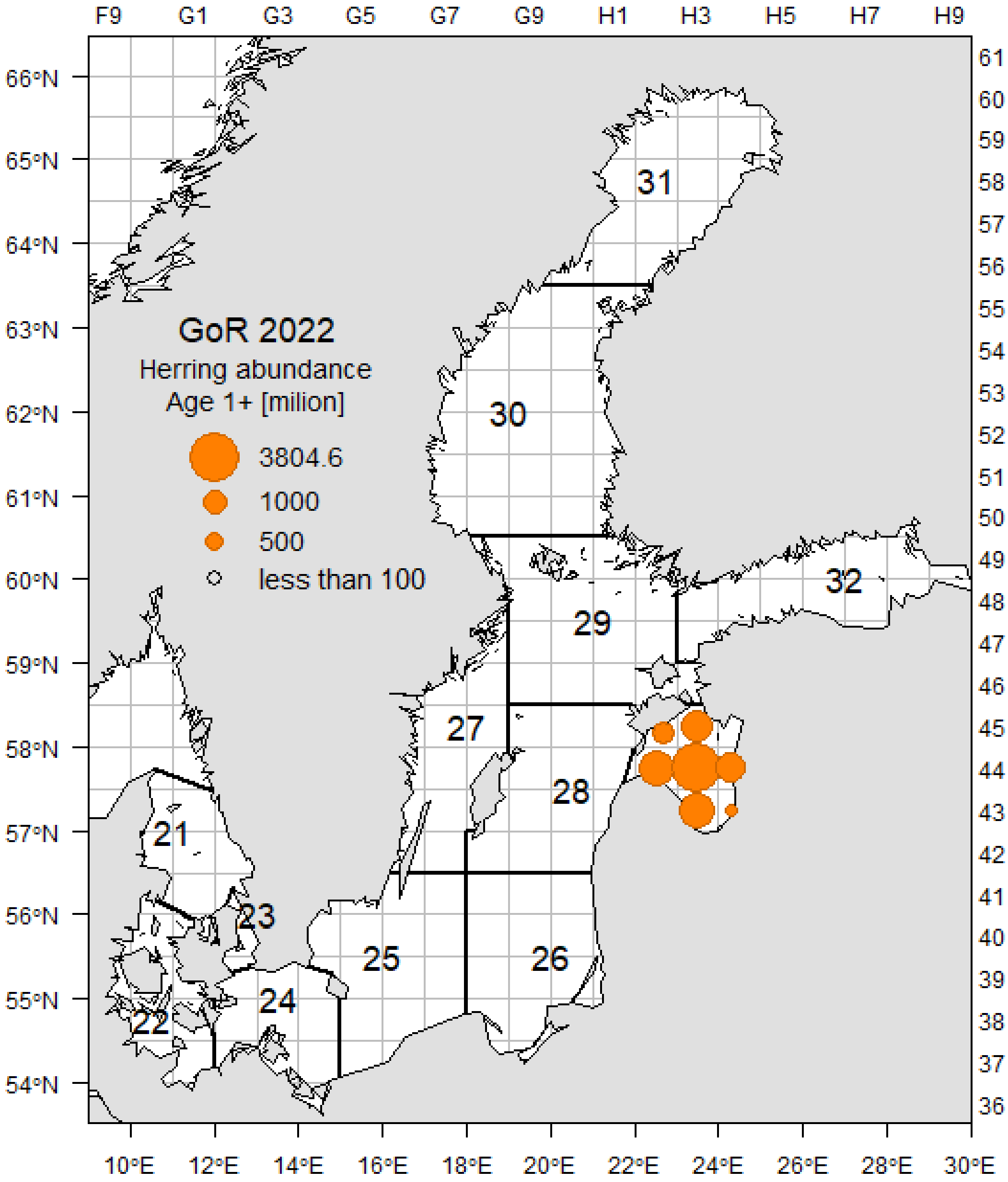



**Figure 4.13. The abundance of the Gulf of Riga herring (age 1+) per ICES rectangle monitored in July-August 2022 (the size of a circle indicates estimated numbers of specimens x10^6 in a given rectangle).**

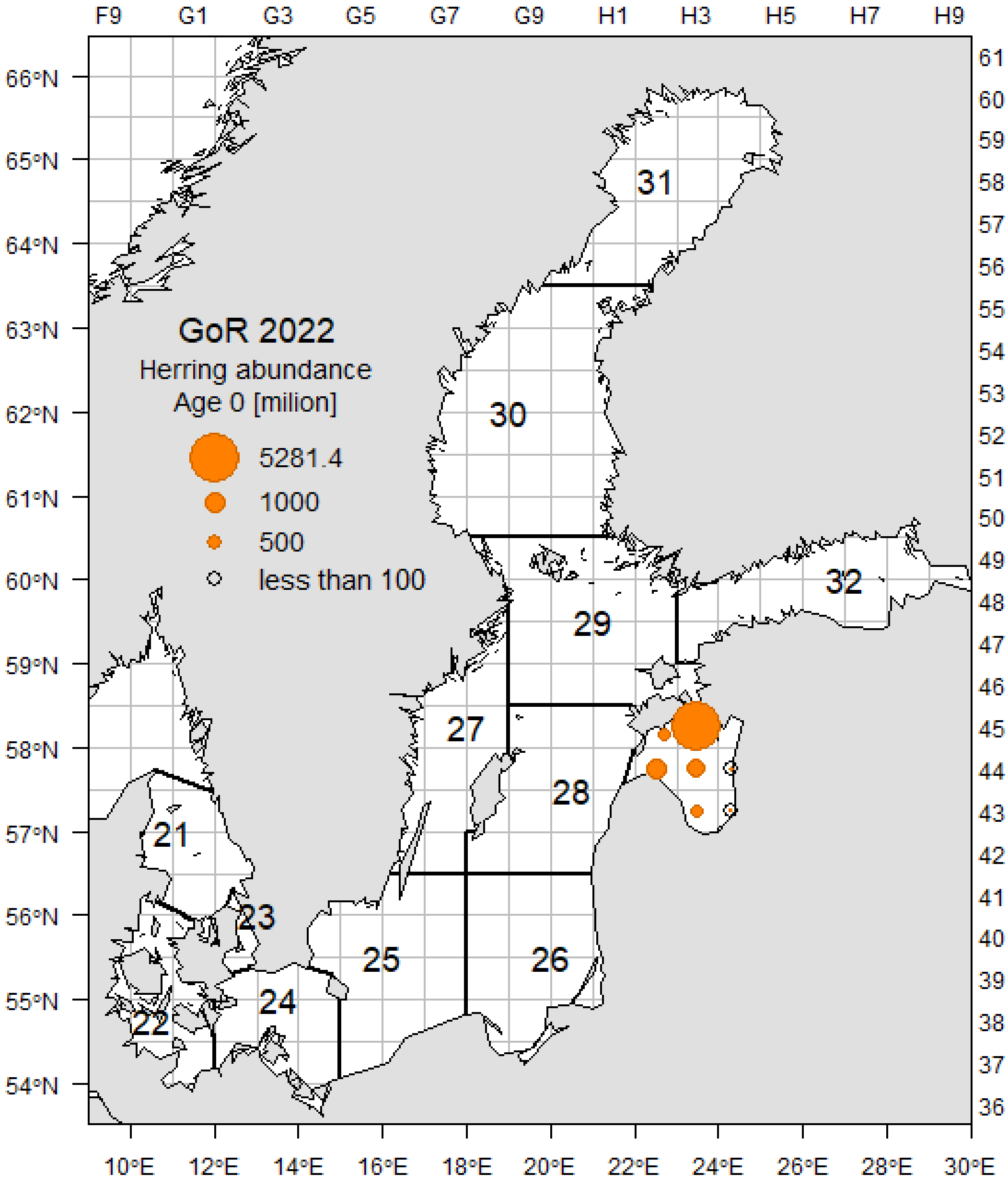



**Figure 4.14. The abundance of the Gulf of Riga herring (age 0) per ICES rectangle monitored in July-August 2022 (the size of a circle indicates estimated numbers of specimens x10^6 in a given rectangle).**

**Table 4.20. Numbers (millions) of Gulf of Riga herring stock in July-August 2022.**

| YEAR | RECT | AGE 0 | AGE 1 | AGE 2 | AGE 3 | AGE 4 | AGE 5 | AGE 6 | AGE 7 | AGE 8+ |
|---|---|---|---|---|---|---|---|---|---|---|
| 2022 | 43H3 | 337.40 | 744.38 | 314.43 | 430.82 | 173.28 | 125.81 | 50.90 | 30.79 | 22.45 |
| 2022 | 43H4 | 5.85 | 134.81 | 42.90 | 39.57 | 16.84 | 22.46 | 5.67 | 4.28 | 4.64 |
| 2022 | 44H2 | 985.29 | 1 265.26 | 345.10 | 230.55 | 50.47 | 22.54 | 4.39 | 7.89 | 7.67 |
| 2022 | 44H3 | 787.68 | 1 285.26 | 625.90 | 947.00 | 438.02 | 305.85 | 124.53 | 36.34 | 41.69 |
| 2022 | 44H4 | 59.25 | 498.44 | 179.79 | 265.44 | 209.95 | 159.08 | 58.01 | 13.75 | 26.69 |
| 2022 | 45H2 | 370.84 | 566.37 | 115.75 | 84.84 | 14.05 | 5.62 | 0.00 | 0.00 | 11.24 |
| 2022 | 45H3 | 5 281.44 | 752.20 | 218.43 | 261.01 | 119.80 | 92.15 | 54.31 | 8.87 | 16.31 |

**Table 4.21. Biomass (in tonnes) of Gulf of Riga herring stock in July-August 2021.**

| YEAR | RECT | AGE 0 | AGE 1 | AGE 2 | AGE 3 | AGE 4 | AGE 5 | AGE 6 | AGE 7 | AGE 8+ |
|---|---|---|---|---|---|---|---|---|---|---|
| 2022 | 43H3 | 1067.89 | 12419.76 | 6442.11 | 9817.96 | 4367.53 | 3254.51 | 1410.85 | 861.03 | 650.65 |
| 2022 | 43H4 | 30.90 | 2230.66 | 845.59 | 915.97 | 415.59 | 581.09 | 150.65 | 117.45 | 132.88 |
| 2022 | 44H2 | 3649.13 | 19635.94 | 7080.15 | 5222.83 | 1032.46 | 570.51 | 104.02 | 226.34 | 205.84 |
| 2022 | 44H3 | 2670.16 | 20474.69 | 12761.33 | 21298.25 | 10610.22 | 7602.55 | 3218.72 | 1035.42 | 1301.41 |
| 2022 | 44H4 | 316.04 | 7732.15 | 3403.48 | 5811.65 | 4907.15 | 3904.95 | 1451.35 | 380.36 | 807.55 |
| 2022 | 45H2 | 1491.79 | 8613.61 | 2382.37 | 1764.30 | 286.56 | 126.42 | - | - | 306.22 |
| 2022 | 45H3 | 17094.73 | 11312.26 | 4279.34 | 6001.83 | 2880.58 | 2288.71 | 1420.38 | 276.19 | 546.26 |

## Tuning Fleets for WGBFAS

The tuning fleet for the assessment of the Gulf of Riga herring (CBH) abundance in the ICES Subdivisions 28_1 per age-group and for the years 1999-2022 is presented in Figure 4.15. The combined results (for age 1+ GoR herring) of the above-mentioned ICES Subdivision are presented in Table 4.22.

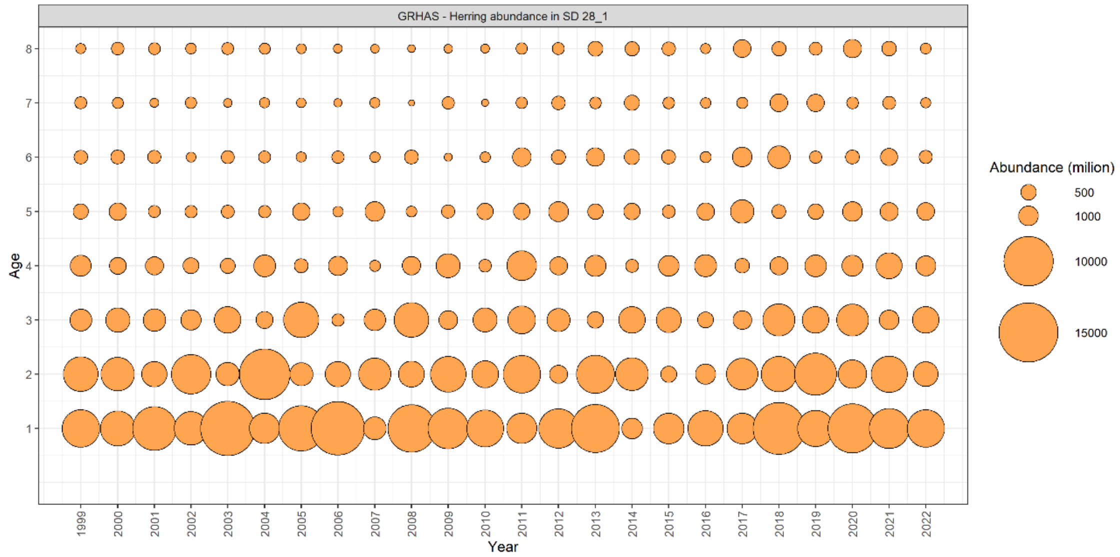



**Figure 4.15. Gulf of Riga tuning fleet index (abundance per age-group and year 1999-2022) for herring in the ICES Subdivision 28_1.**

**Table 4.22. Whole time-series of tuning indices. Gulf of Riga Acoustic Herring Survey (GRAHS) index (numbers in millions) for the Gulf of Riga herring (the ICES Subdivision 28_1).**

| YEAR | TOTAL AGE 1+ | AGE 1 | AGE 2 | AGE 3 | AGE 4 | AGE 5 | AGE 6 | AGE 7 | AGE 8+ |
|---|---|---|---|---|---|---|---|---|---|
| 1999 | 13 245 | 5 292 | 4 363 | 1 343 | 1 165 | 457 | 319 | 208 | 98 |
| 2000 | 12 310 | 4 486 | 4 012 | 1 791 | 609 | 682 | 336 | 151 | 243 |
| 2001 | 12 516 | 7 567 | 2 004 | 1 447 | 767 | 206 | 296 | 56 | 173 |
| 2022 | 12 187 | 3 998 | 5 994 | 1 068 | 526 | 221 | 87 | 165 | 128 |
| 2003 | 17 495 | 12 441 | 1 621 | 2 251 | 411 | 263 | 269 | 46 | 193 |
| 2004 | 16 542 | 3 177 | 10 694 | 675 | 1 352 | 218 | 195 | 94 | 137 |
| 2005 | 15 564 | 8 190 | 1 564 | 4 532 | 337 | 691 | 92 | 75 | 83 |
| 2006 | 15 638 | 12 082 | 1 986 | 213 | 937 | 112 | 223 | 36 | 49 |
| 2007 | 7 774 | 1 478 | 3 662 | 1 265 | 143 | 968 | 116 | 103 | 39 |
| 2008 | 17 070 | 9 231 | 2 109 | 4 398 | 816 | 134 | 353 | 6 | 23 |
| 2009 | 14 287 | 6 422 | 4 703 | 870 | 1 713 | 284 | 28 | 223 | 44 |
| 2010 | 10 124 | 5 077 | 2 311 | 1 730 | 244 | 593 | 107 | 12 | 50 |
| 2011 | 15 690 | 3 162 | 5 289 | 2 503 | 2 949 | 597 | 865 | 163 | 162 |
| 2012 | 10 936 | 5 957 | 758 | 1 537 | 774 | 1 035 | 374 | 308 | 193 |
| 2013 | 18 739 | 9 435 | 5 552 | 592 | 1 240 | 479 | 827 | 187 | 427 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 2014 | 9 303 | 1 109 | 3 832 | 2 237 | 276 | 570 | 443 | 466 | 370 |
| 2015 | 7 876 | 3 221 | 539 | 1 899 | 1 110 | 255 | 346 | 181 | 325 |
| 2016 | 8 560 | 4 542 | 1 081 | 504 | 1 375 | 690 | 152 | 113 | 103 |
| 2017 | 11 452 | 3 231 | 3 442 | 874 | 402 | 1 632 | 982 | 137 | 752 |
| 2018 | 23 041 | 11 216 | 4 529 | 3 607 | 776 | 338 | 1 439 | 755 | 381 |
| 2019 | 17 141 | 4912 | 7007 | 2237 | 1335 | 475 | 228 | 681 | 265 |
| 2020 | 19 664 | 9947 | 2637 | 3571 | 1189 | 985 | 344 | 186 | 805 |
| 2021 | 16 256 | 6171 | 4885 | 990 | 2085 | 793 | 670 | 257 | 405 |
| 2022 | 11 635 | 5247 | 1842 | 2259 | 1022 | 734 | 298 | 102 | 131 |

## 4.2 ToR b) Update the BIAS, BASS and GRAHS hydroacoustic databases and ICES database for acoustic-trawl surveys

After validation, the data from the Baltic International Acoustic Survey (BIAS), the Baltic Acoustic Spring Survey (BASS) and the Gulf od Riga Acoustic Herring Survey (GRAHS) carried out in 2022 were added to the BIAS_DB.mdb, the BIAS_HERR_SD30_DB.mdl, the BASS_DB.mdb, and the GRAHS_DB.mdb access-databases, respectively. The specification of these databases is as following:

1. BIAS_DB is based on the country level made calculations according to IBAS methodology (fish up to 8+ age group), note: in SD30 the StoX calculation has been used for herring since 2020.
2. BIAS_HERR_SD30_DB for herring based on StoX calcualtions (using StoX project for IBAS calculations, fish up to 15+ age group)
3. BASS_DB for sprat based on the country made calculations according to IBAS methodology (fish up to 8+ age group).
4. GRAHS_DB for the Gulf of Riga herring based on the country level made calculations using the nearest haul method (fish up to 8+ age group).

All these databases also include queries with the used algorithms for the creation of report tables and the calculation of the different tuning fleets. The updated versions of the databases are located in the folder "Data" of the ICES WGBIFS 2023 SharePoint.

The results of the next international acoustic surveys (BIAS, BASS, GRAHS) should be summarized in table format according the IBAS Manual and latest one month before the next year meeting uploaded to the ICES WGBIFS-SharePoint. O. Kaljuste from Sweden and B Schmidt from Poland were assigned as the above-mentioned (BAD1) acoustic-trawl data coordinators, responsible to control that the acoustic survey results are uploaded in the right format to the SharePoint of WGBIFS. Moreover, B. Schmidt was assigned as the manager of the BIAS, BASS and GRAHS databases for aggregated data (BIAS_DB.mdb, BIAS_HERR_SD30_DB.mdb, BASS_DB.mdb and GRAHS_DB.mdb). B. Schmidt will in cooperation with the national data submitters check the provided data for errors and preliminary analysis will be performed in order to present the data to the WGBIFS meeting for further evaluations and discussion. If the countries do not submit the data to the database manager in the agreed time, this work cannot be done during the WGBIFS annual meeting with the required quality.

## 4.3 ToR c) Coordinate and plan acoustic surveys including any experiments to be conducted

All the Baltic Sea countries intend to take part in the BASS and BIAS (except Russia, for which no information is available) acoustic surveys and experiments in 2023 (Figures 4.16 – 4.17). There is also an intention to conduct a Latvian/Estonian survey in the Gulf of Riga (GRAHS) in July-August 2023. The list of participating research vessels and initially planned periods of particular surveys are given in the following tables:

*BASS/2023 surveys*

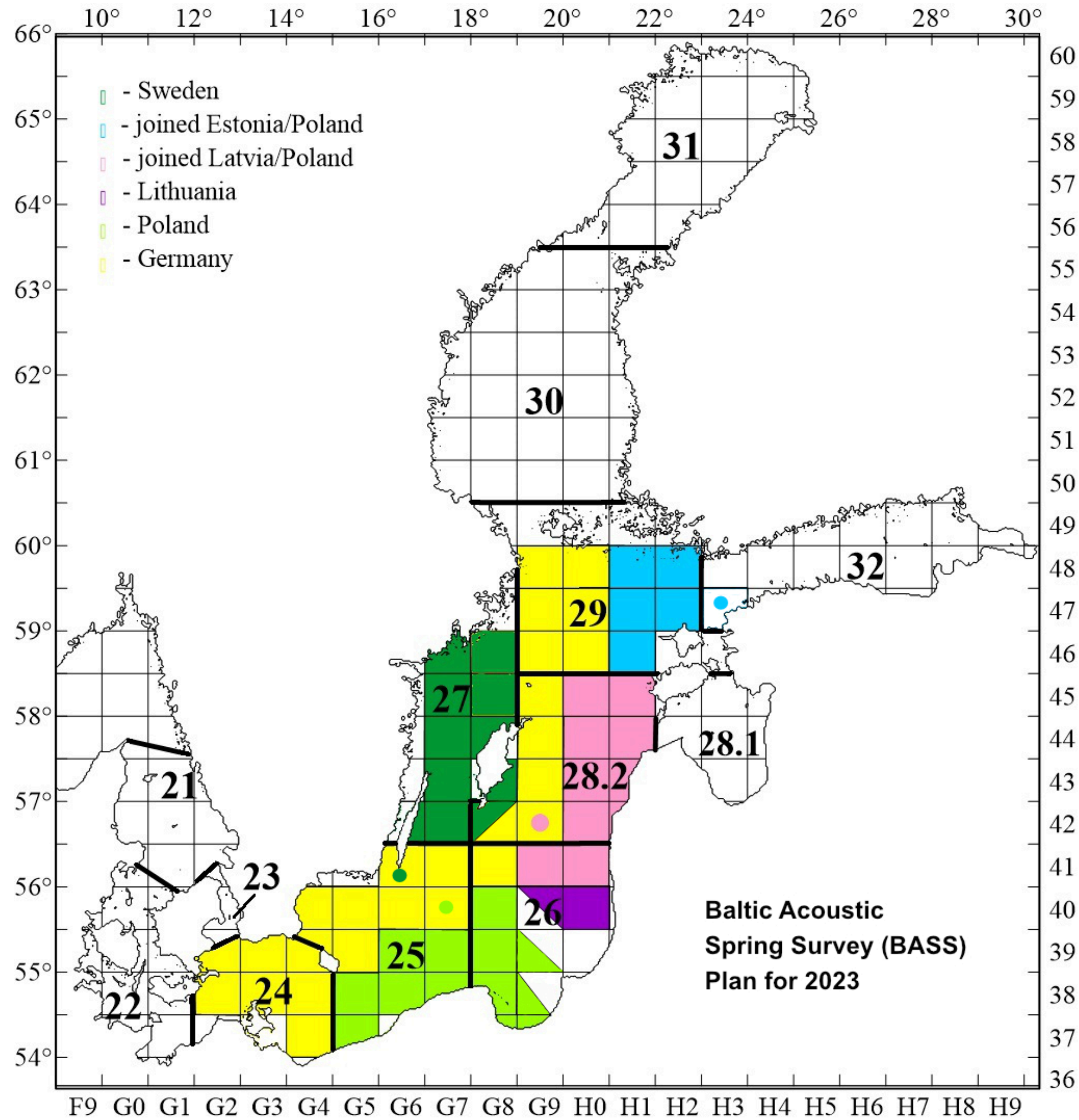
| Vessel | Country | Area of Investigation (ICES Subdivisions) | Period of Investigations | Duration (Days) |
|---|---|---|---|---|
| Svea | Sweden | 27, partly 28 | 16-24.05.2023 | 9 |
| Baltica | Estonia/Poland | 28.2, 29 partly 32 | 30.05-04.06.2023 | 6 |
| Walther Herwig III | Germany | 24, 25, 26, 27, 28, 29 (for all SD: only part monitored) | 2-27.05.2023 | 26 |
| Baltica | Latvia/Poland | 26 partly, 28 partly | 22-29.05. 2023 | 8 |
| Commercial Vessel | Lithuania | Part of 26 | 08-09.05.2023 | 2 |
| Baltica | Poland | 25 and 26 | 04-17.05.2023 | 14 |

*GRAHS/2023 survey*

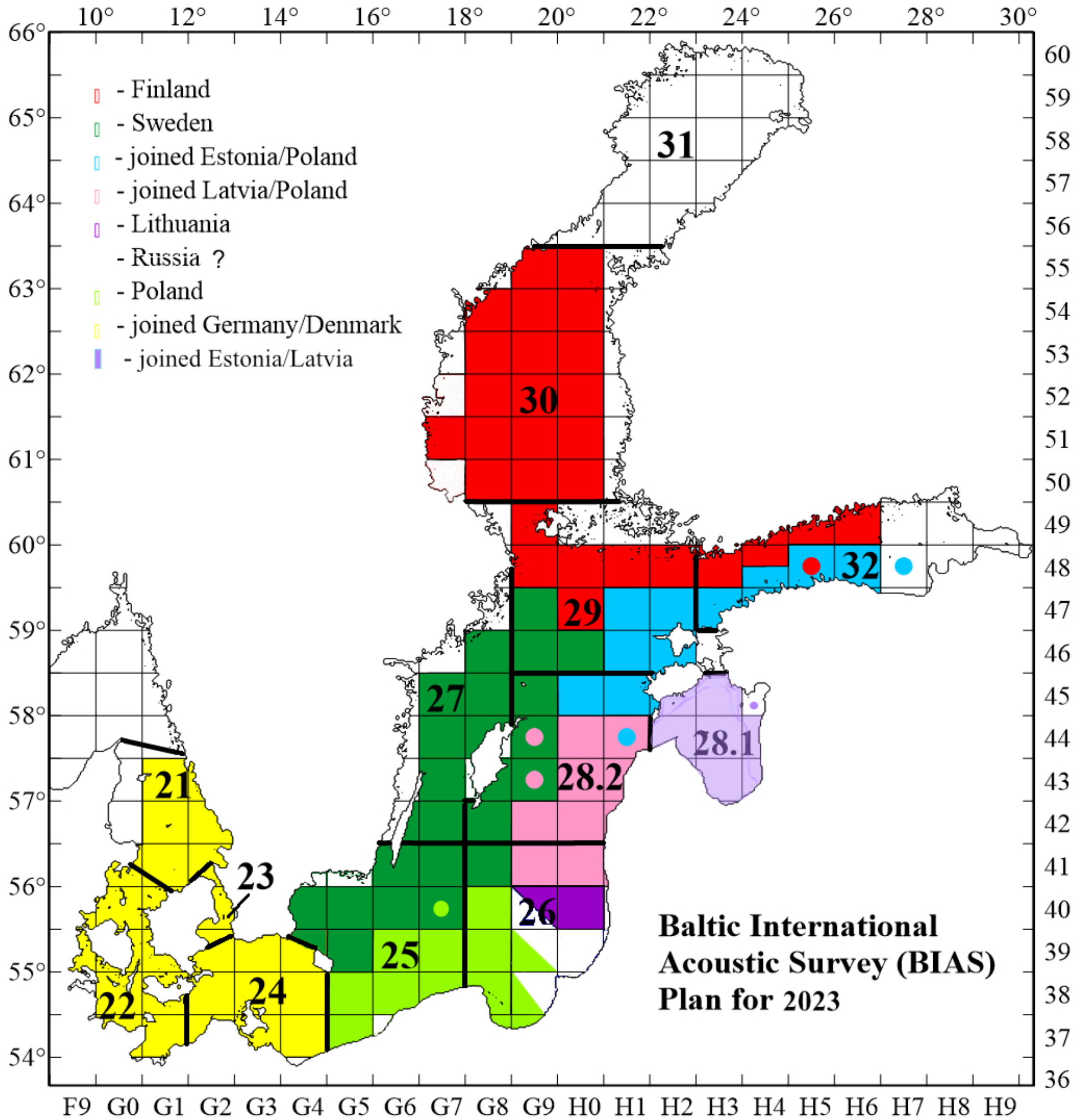
| Vessel | Country | Area of Investigation (ICES Subdivisions) | (Preliminary) Period of Investigations | Duration (Days) |
|---|---|---|---|---|
| Ulrika | Latvia/ Estonia | 28.1 | July/August 2023 | 7 |

*BIAS/2023 surveys*

| Vessel | Country | Area of Investigation (ICES Subdivisions) | (Preliminary) Period of Investigations | Duration (Days) |
|---|---|---|---|---|
| Svea | Sweden | 27 and parts of 25,26,28,29 | 2 – 16.10 2023 | 15 |
| Baltica | Estonia/Poland | 28,29,32 | 22.10-03.11.2023 | 13 |
| Aranda | Finland | 29N, 30 and 32N | 20.9.-4.10.2023 | 16 |
| Baltica | Latvia/Poland | 26 partly, 28 partly | 9-21.10 2023 | 13 |
| Commercial Vessel | Lithuania | Part of 26 | 15-17.10.2023 | 2 |
| Baltica | Poland | Parts of 25 and 26 | 20.09-05.10.2023 | 16 |



- Sweden
- joined Estonia/Poland
- joined Latvia/Poland
- Lithuania
- Poland
- Germany
Baltic Acoustic Spring Survey (BASS) Plan for 2023
10° 12° 14° 16° 18° 20° 22° 24° 26° 28° 30°
66° 65° 64° 63° 62° 61° 60° 59° 58° 57° 56° 55° 54°
60 59 58 57 56 55 54 53 52 51 50 49 48 47 46 45 44 43 42 41 40 39 38 37 36
F9 G0 G1 G2 G3 G4 G5 G6 G7 G8 G9 H0 H1 H2 H3 H4 H5 H6 H7 H8 H9
21 22 23 24 25 26 27 28.1 28.2 29 30 31 32




**Figures 4.16.–4.17. The planned coverage of the Baltic Sea and the assignment of the national/joint acoustic surveys to the ICES rectangles during the May 2023 and September/October 2023. Base colours of rectangles indicate the country or joint survey, which is responsible for given ICES-rectangle. Coloured dots indicate overlapping coverage by other countries (sometimes only parts of rectangle are covered).**

## 4.4 ToR d) Review the results from BITS surveys and evaluate the characteristics of TVL and TVS standard gears used in BITS

### 4.4.1 4th quarter 2022 BITS.

During Autumn 2022, the level of realized valid hauls represented 99.4 % of the total planned stations (Fig. 4.18). Unfortunately, data from Russian EEZ was not available.

The coverage by depth stratum is as follows (depth stratum, coverage in %): 1, 97; 2, 97; 3, 100; 4, 115; 5, 86 and 6, 100).

The number of valid hauls was considered by WGBIFS as appropriate for tuning series, and it is recommended that the data are used for the assessment of the Baltic and Kattegat cod and flatfish stocks.

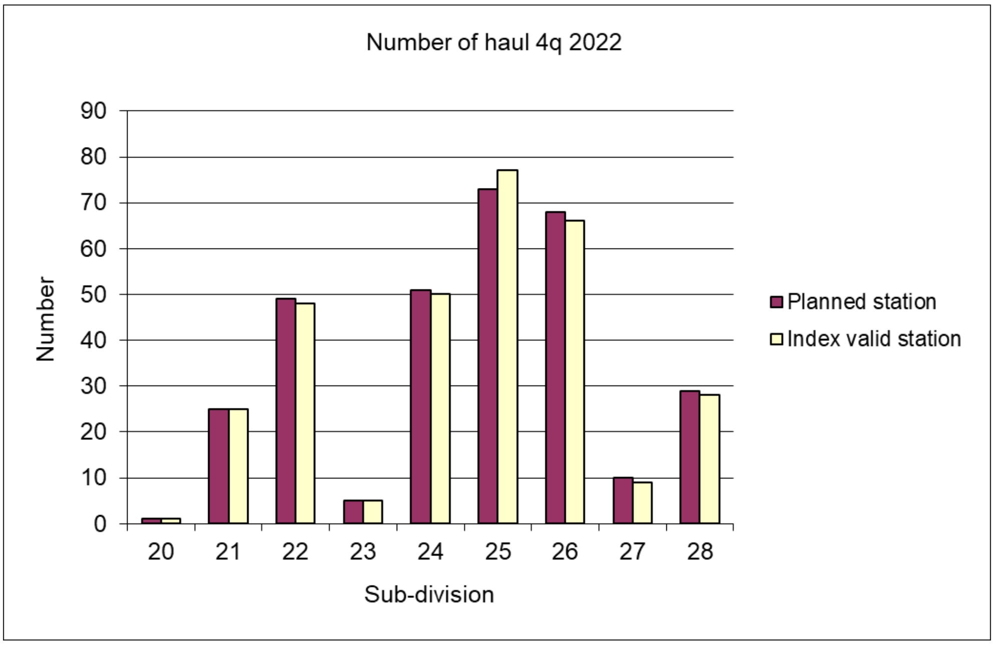



**Figure 4.18. Comparison of the planned and the index-valid fishing stations by ICES Subdivisions and depth layers during BITS 4th quarter 2022.**

## 4.4.2 1st quarter 2023 BITS.

The overall coverage in Spring 2023 was 98% (Fig. 4.19). The coverage by depth stratum is as follows (depth stratum, coverage %): 1, 100; 2, 98.2; 3, 88.3; 4, 91.8; 5, 102.6; and 6, 100

The number of valid hauls accomplished during the BITS Q1 2023 was considered by WGBIFS 2023 as appropriate for tuning series (e.g. CPUE indices) and the data can be used for the assessment of Baltic and Kattegat cod and flatfish stocks.

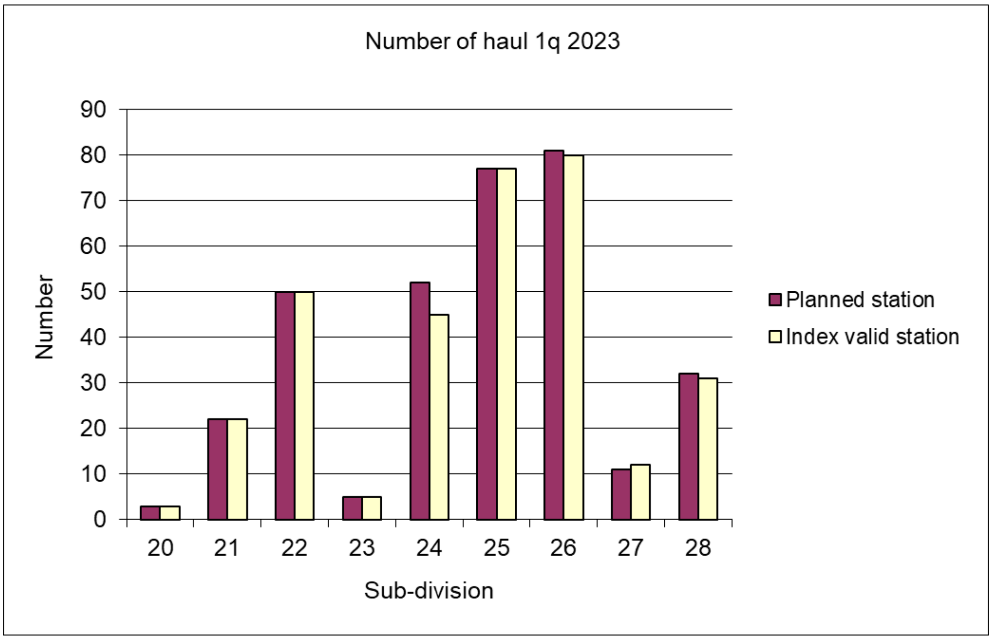



**Figure 4.19. Comparison of the planned and the index-valid fishing stations by ICES Subdivisions and depth layers during BITS 1st quarter 2023.**

## 4.4.3 CPUE in 4th quarter 2022 and 1st quarter 2023 BITS.

Figures 4.20 to 4.25 show the distribution of cod, flounder, plaice, dab, turbot and brill during the BITS surveys in Autumn 2022 and Spring 2023.

Some concentrations of cod were observed in Q4 2022 with hot spots in East Gotland Sea (LV) in SD26, west and northwest of the Isle of Bornholm (DK) in SD24 and SD25, northwest and south-west of Słupsk Furrow (PL) in SD25, in Øresund (DK) in SD23 and in Little Belt in SD22. In Q1 2023 cod showed big spots in Słupsk Furrow (PL) and south of Öland (S) in SD25, in Øresund (DK) in SD23 and East of Gotland (S) in SD28. Flounder showed hot spots in Q4 2022 East of Gotland Sea (LV) in SD28, in the Gulf of Gdańsk (PL) in SD26 and in Øresund (DK) in SD23. In Q1 2023 were observed big hot spots of flounder west of Bornholm (DK) and in Słupsk Furrow (PL) in SD25 and in East Gotland Sea (LV) in SD28 and SD26. A plaice hot spot in Q4 2022 occurred in Fehmarnbelt (D, DK) in SD24 an in Little Belt (DK) in SD22. Plaice hot spots were observed also in Q1 2023 in the Kiel and in the Mecklenburg Bight (D) in SD22, and west of Djursland (DK) in SD21. Dab showed in Q4 2022 big hot spots west of Djursland (DK) in SD21, in the Great Belt (DK) in SD22 and in Øresund (DK) in SD23 and in Q1 2023 were observed also big spots west of Djursland (DK) in SD21 and in the Great and the Little Belt (DK) in SD22. Turbot showed hot spots in Q4 2022 in Kriegers Flak (DK) in SD24, northeast of Słupsk Furrow (PL) in SD25 and in Q1 2023 in Hanö Bay (S), northeast of Słupsk Furrow (PL) in SD25, southwest of Bornholm and in Kriegers Flak (DK) in SD24, in Køge Bugt (DK) in SD23 and in Fehmarn Belt (D, DK) in SD22. Brill concentrations were observed in Q4 2022 in Kattegat (DK) in SD21, in Øresund and in Køge Bugt (DK) in SD23 and and in Q1 2023 also in Øresund (DK) in SD23..

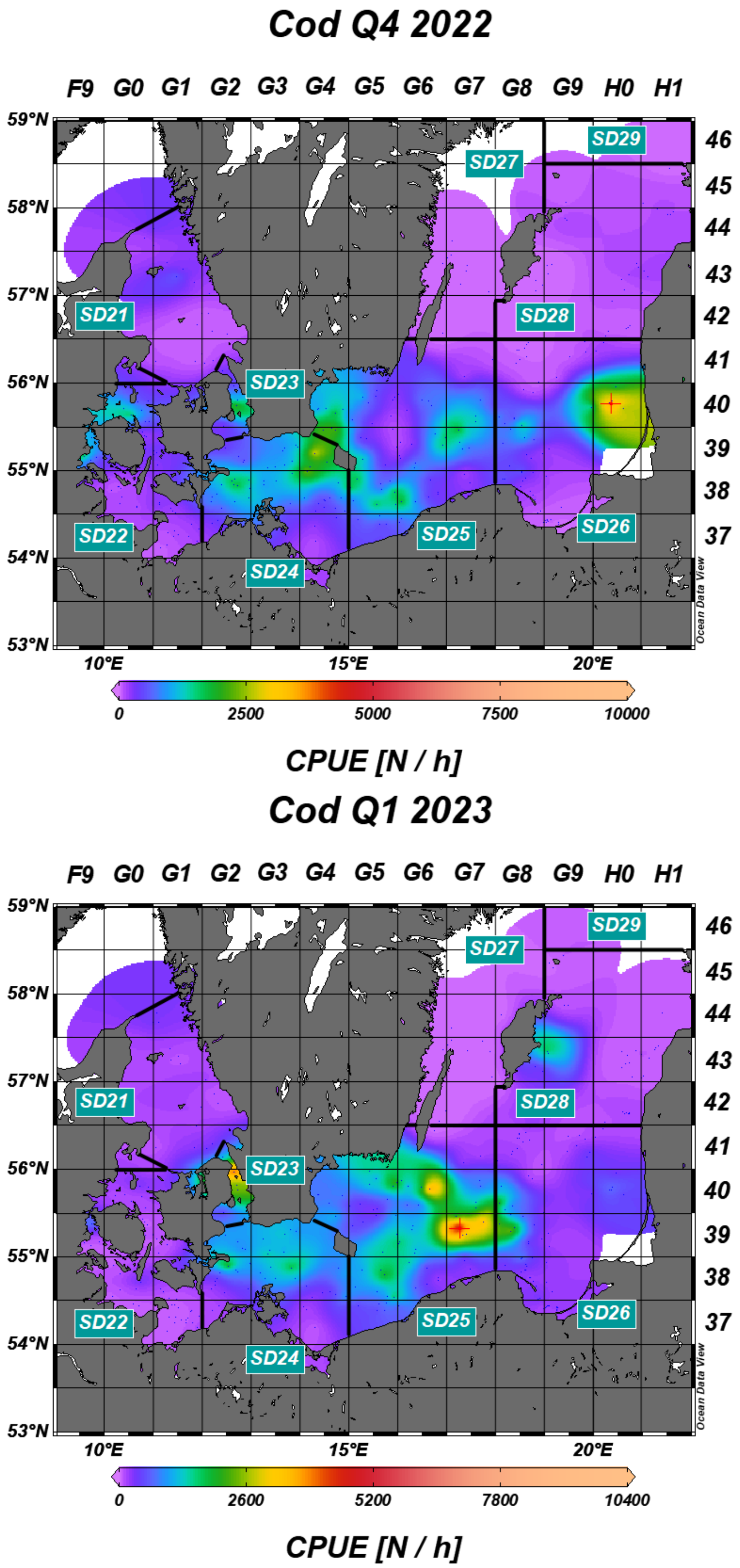
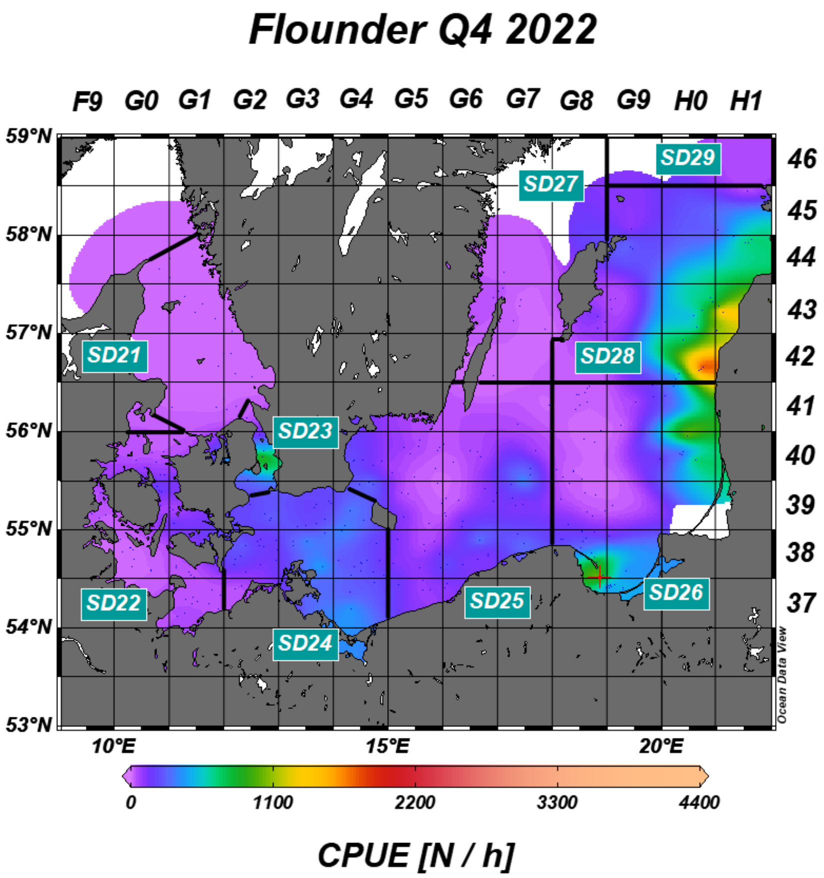



**Figure 4.20. CPUE (N/per hour) for cod during BITS 4th quarter 2022 and 1st quarter 2023**



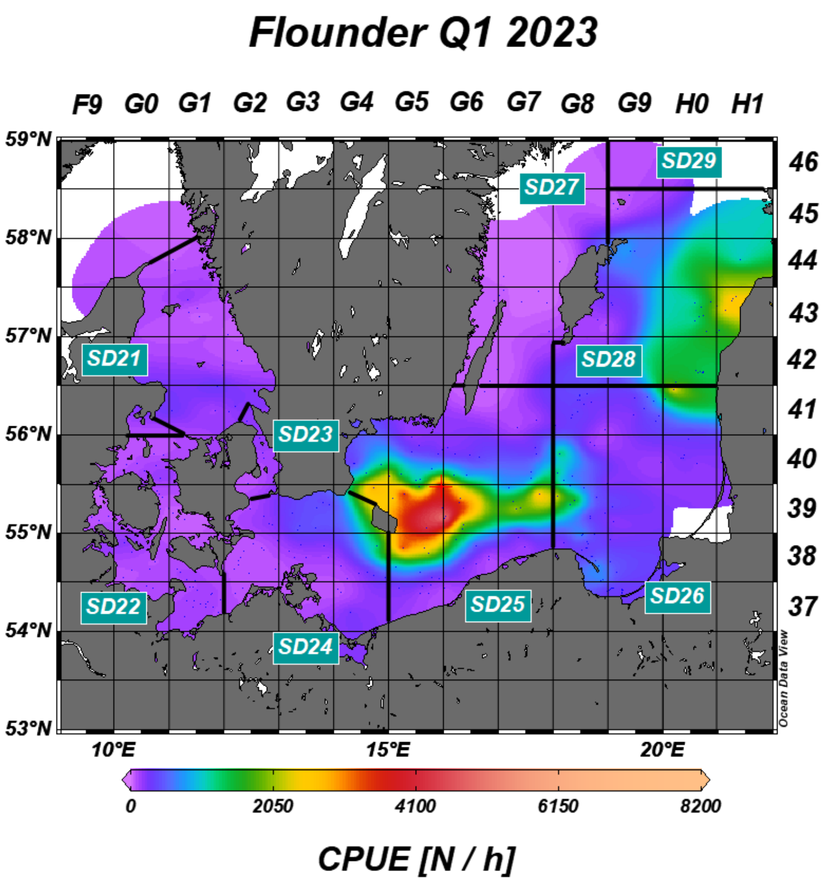




**Figure 4.21. CPUE (N/per hour) for flounder during BITS 4th quarter 2022 and 1st quarter 2023.**

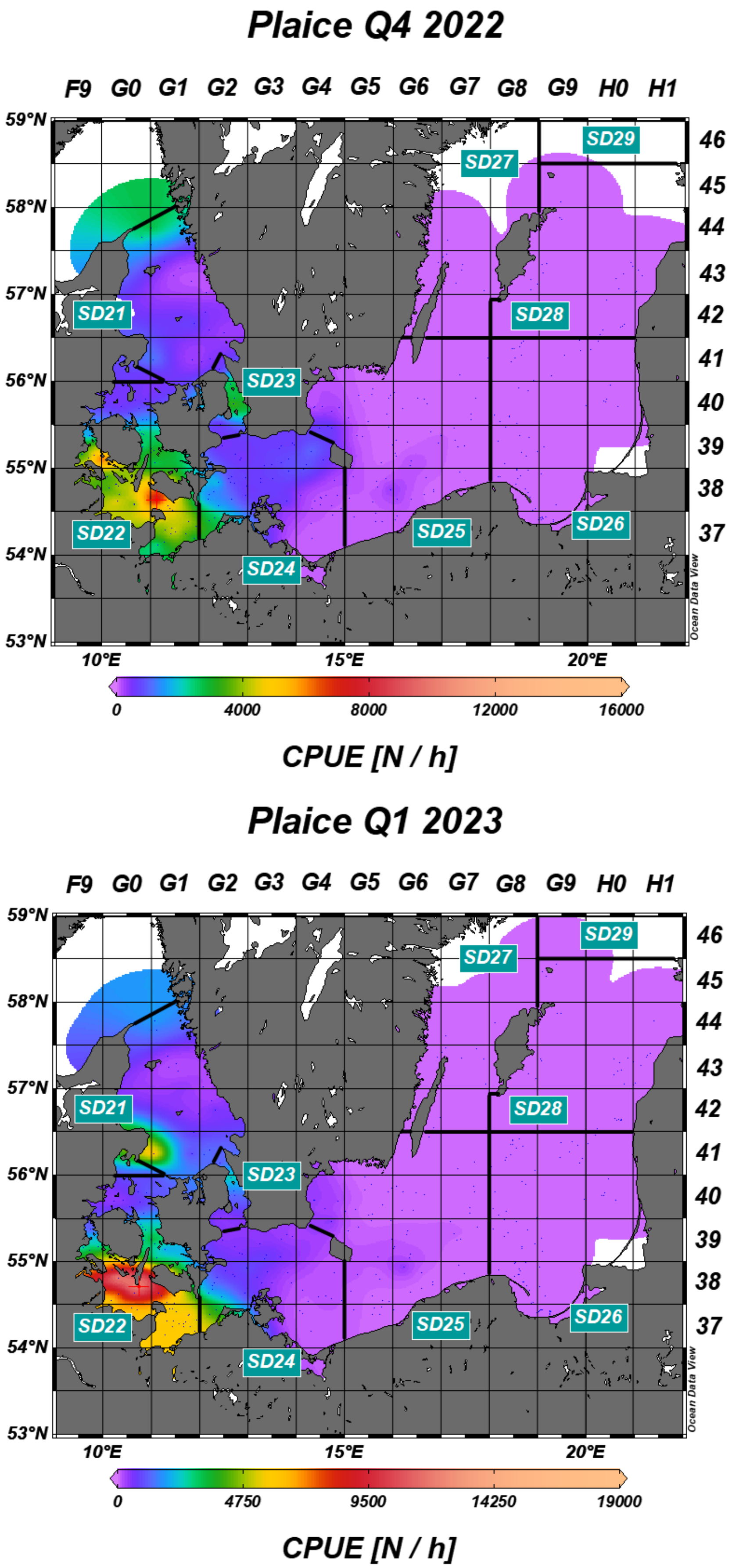



**Figure 4.22. CPUE (N/per hour) for plaice during BITS 4th quarter 2022 and 1st quarter 2023.**

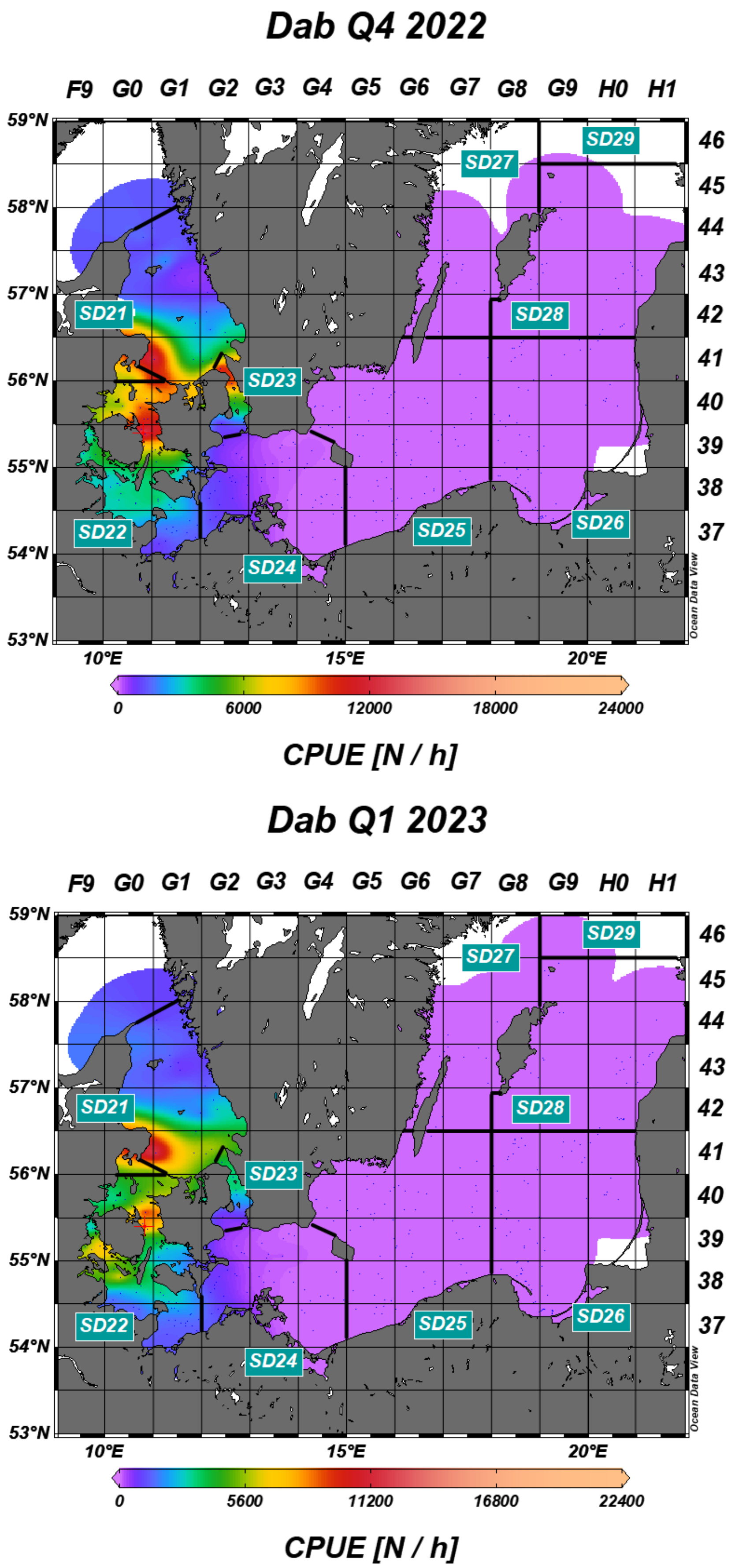



**Figure 4.23. CPUE (N/per hour) for dab during BITS 4th quarter 2022 and 1st quarter 2023.**

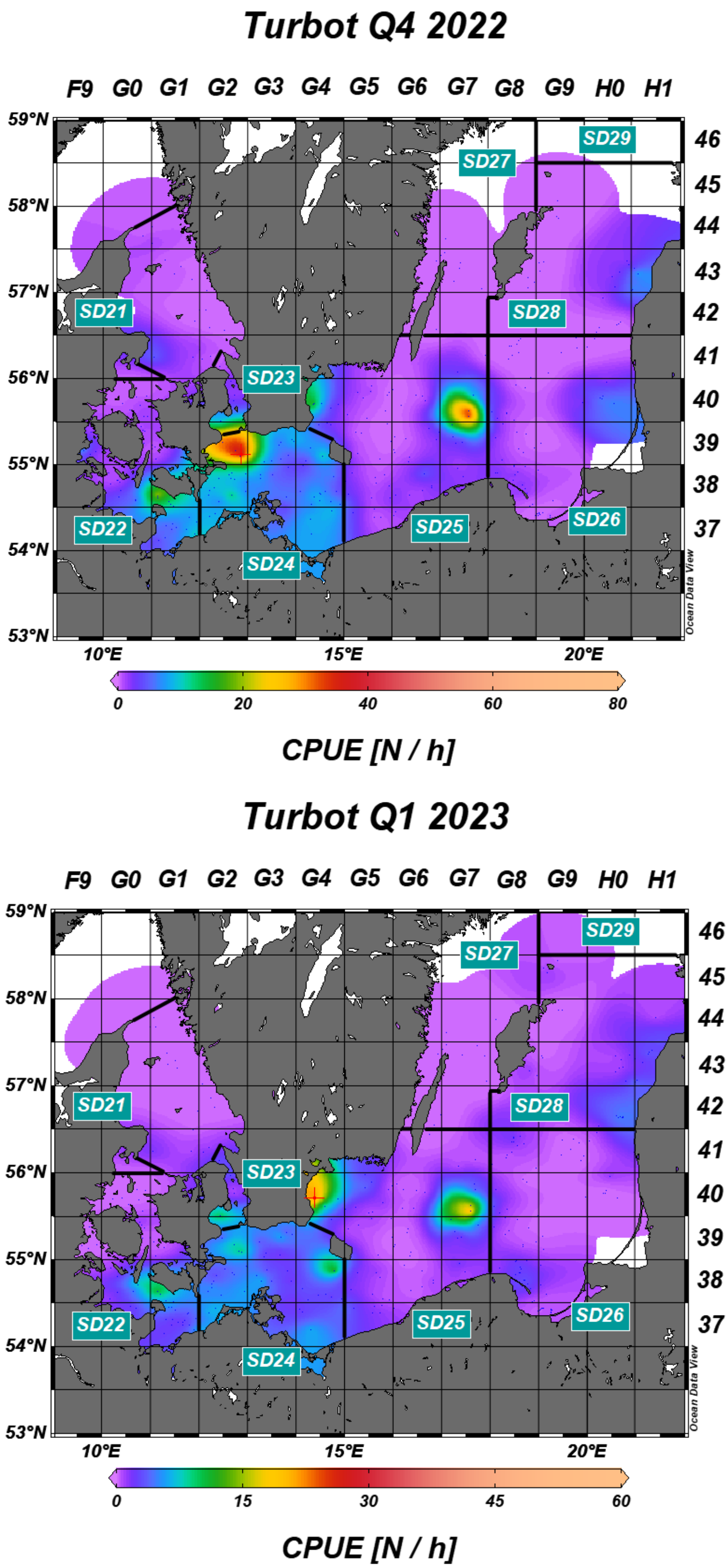
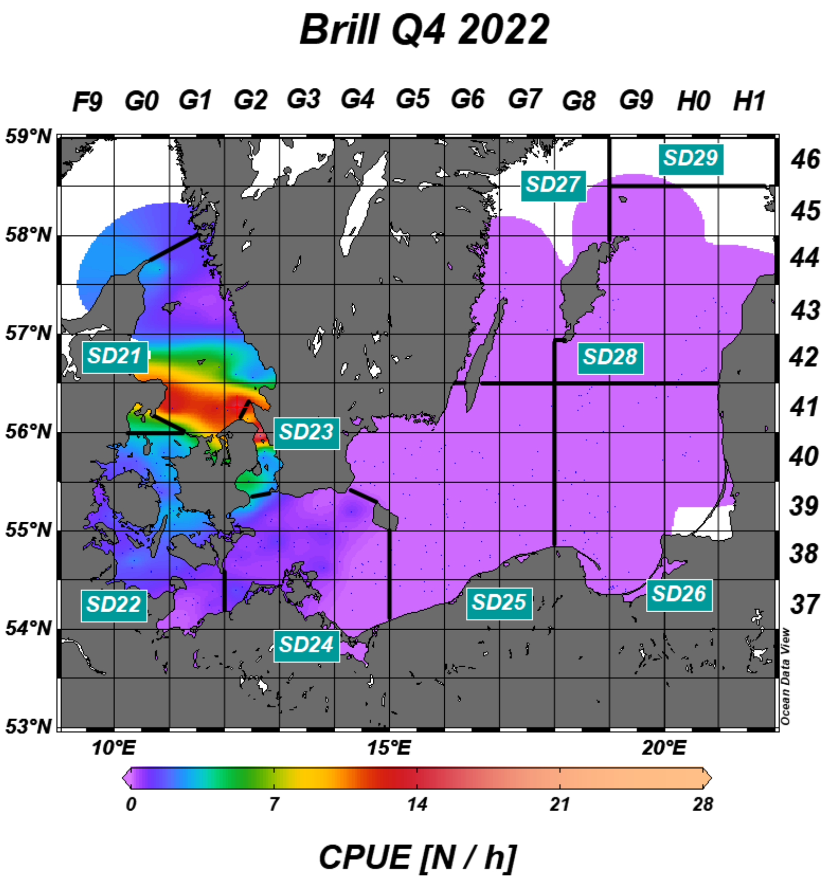



**Figure 4.24. CPUE (N/per hour) for turbot during BITS 4th quarter 2022 and 1st quarter 2023.**



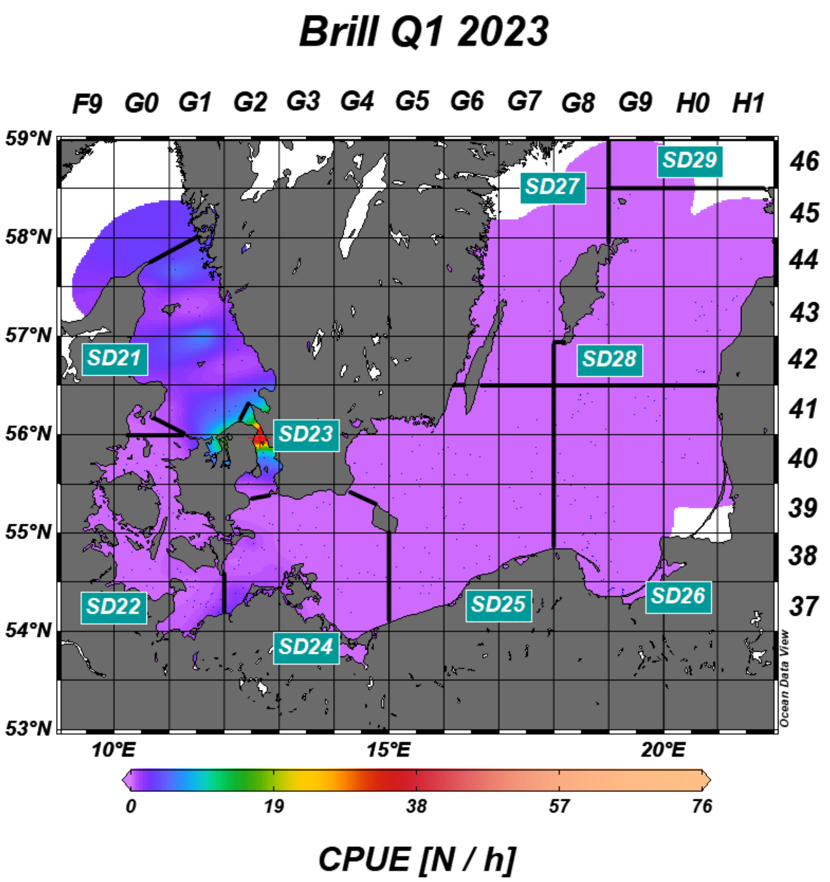




**Figure 4.25. CPUE (N/per hour) for brill during BITS 4th quarter 2022 and 1st quarter 2023.**

### 4.4.4 Standard fishing-gear checking.

WGBIFS has implemented a complete and accurate measurement of technical parameters (the geometry, mesh sizes, rope lengths of the trawl, etc.) of the exploited demersal trawls (type TV-3L and TV-3S) as a standard procedure. This procedure must be performed at least once a year for each gear used during the survey by each country involved in the BITS surveys realization. In addition, prior to each BITS survey, also a smaller scale measurement of the trawl should be made. All the measurements should follow the Manual of the construction and use of the International Standard Trawl for the Baltic Demersal Surveys. It is recommended that the measurements of TV-3L and TV-3S trawl technical parameters is done by professional experts in fishing gear technology or experienced crew members. Results of the measurements must be uploaded to the WGBIFS SharePoint using the standard protocols.

Most countries have not been able to do net checks of their standard TV-3L and TV-3S trawls after the pandemic, before WGBIFS meeting in 2023 due to the absence of personnel but is expected to do so during the course of the current year.

## 4.5 ToR e) Coordinate and plan demersal trawl surveys and experiments to be conducted, and update, and correct the Tow-Database

All the participating institutes plan the same numbers of hauls during BITS surveys in autumn 2023 and spring 2024 as in the year before.

The total number of stations planned by countries during BITS in autumn 2023 and spring 2024 is given in the following table:

| Country | Vessel | Number of planned stations in autumn 2023 | Number of planned stations in spring 2024 |
|---|---|---|---|
| **Germany** | Solea | 57 | 60 |
| **Denmark** | Havfisken | 27+30* | 27+30* |
| | **Total in SD 20 - 24** | **84** | **87** |
| **Denmark** | Dana | 55 | 55 |
| **Estonia** | Commercial vessel | 10** | 0 |
| **Latvia** | Chartered vessel | 25 | 25 |
| **Lithuania** | Commercial vessel | 6 | 6 |
| **Poland** | Baltica | 61 | 69 |
| **Russia** | Atlantniro/Atlantida | ? | ? |
| **Sweden** | Svea | 30 | 50 |
| | **Total in SD 25 - 28** | **187** | **205** |
| | **Total in SD 20 - 28** | **271** | **292** |

* Including hauls in Kattegat

** Only in Estonian EEZ

There is no information available about the participation of Russia in the next two BITS surveys. Since other ICES Member Countries will not be able to get permission to work in the EEZ of Russia, these potential gaps in the dataset can affect the quality of survey results based on the BITS survey.

All countries have added data from 4th quarter 2022 and 1st quarter 2023 BITS surveys to the DATRAS.

After each survey, each country gives feedback on the information given in the Tow Database. The Tow-Database, which allows planning of the spatial distribution of hauls was updated bases on the feedbacks of the participants.

## 4.6 ToR f) Conduct the analyses related to the improvement of quality of acoustic indices and estimation of the uncertainty in the acoustic surveys coordinated by WGBIFS

When the uncertainty of the WGBIFS's acoustic surveys is evaluated, a bootstrap over the survey results in each square from the whole survey area is used. Further discussion on the topic can be found in previous WGBIFS reports. The method aimed to derivate an estimation of the variation of the results by resampling the calculated index results, thus we are looking at both the internal errors as well as the natural fluctuation in the measurements. Discussions at WGBIFS led to the conclusion that with the current survey design and the available data it is difficult to differ the natural variance from the uncertainty variance. Earlier years was delivered to WGBFAS last year, the figures for 2022 was delivered this year and can be found below.

SD 25-29

| year | mean | sd |
|---|---|---|
| 2022 | 28485.719 | 5542.342 |

SD 25-29+32

| year | mean | sd |
|---|---|---|
| 2022 | 34438.208 | 5752.102 |

## 4.7 ToR g) Update on progress in development of the StoX software and implementation of it for the calculation of WGBIFS acoustic stock estimates

Initial objective of that ToR was that WGBIFS would reach an agreement about the possibility to implement StoX as a new standard tool for the calculation of WGBIFS acoustic stock estimates. Several steps have been taken to reach the goal of this ToR. For example, in 2020 WGBIFS recalculated the whole time series of the Gulf of Bothnia herring abundance with StoX software and decided to continue this time series updates using only StoX calculations.

During the WGBIFS 2021 meeting ICES Data Centre presented 3 alternative strata files for the Baltic Sea to be used in StoX program instead of the previous one that contained several errors. WGBIFS decided to use the EMODnet_2020 strata file. After that the Group was waiting for the new updated version of StoX, which would enable testing of StoX even for the calculation of herring and sprat indices in the Baltic proper. Finally, in mid-August 2022 StoX version 3.5.0 was released and the BIAS project updated, that met all the requirements for further analyses. As a next step WGBIFS StoX task subgroup was organizing a 3-day meeting (30. August – 1. September) in Lysekil, Sweden to exchange the first experiences with StoX 3.5.0 and to present the first results to calculate abundance estimates for Central Baltic herring, Baltic sprat, and Gulf of Riga herring stocks. Totally 7 WGBIFS members participated in that subgroup meeting: Stefanie Haase (Germany), Olavi Kaljuste (Sweden), Niklas Larson (Sweden), Juha Lilja (Finland), Tiit Raid (Estonia), Elor Sepp (Estonia),) and Beata Schmidt (Poland). Further analyses were done after the subgroup meeting and these results were presented during the WGBIFS meeting in November 2022.

**Central Baltic herring**

WGBIFS calculated herring abundance estimates using the StoX software for years 2016-2021 – the years where BIAS acoustic and biotic data was available from all participating countries in the ICES database for acoustic-trawl surveys. A comparison exercise between the StoX and traditional BIAS calculation methods was done. It revealed that StoX herring total abundance estimates are somewhat higher for most of the years, but the trend of the BIAS tuning series was not so well represented in StoX estimates. This might suggest that the results are not fully comparable because StoX software is not designed to fully replicate the current IBAS calculation procedure. Additionally, different settings were tested in StoX projects for herring abundance calculation. Instead of the standard IBAS trawl assignment method the nearest haul method was used. These results showed much better agreement between the two calculation methods. Still a huge difference remained for the year 2018 results. Also, large differences in abundance estimates at the ICES Subdivision and rectangle level and in age composition existed. Additionally, some errors and differences in input data (uploaded into the ICES database) were found and therefore the further analysis was postponed until these issues are fixed.

**Baltic sprat**

WGBIFS calculated BASS sprat abundance estimates using the StoX software for years 2018-2021 – the years where acoustic and biotic data was available from all participating countries in the ICES database for acoustic-trawl surveys. Data for 2016 and 2017 are also available from all countries, but 2016 was excluded because of the low survey coverage and data from year 2017 gave an internal error in StoX. Sprat abundance estimates for BIAS were also calculated in the StoX for the years 2016-2021. Comparison between StoX results and BIAS and BASS estimates showed no major differences in sprat total abundance estimates for most of the years and trend of the BIAS and BASS tuning series was quite well represented also in StoX estimates. However, large differences in ICES Subdivision and rectangle level and in age composition existed. Additionally, some errors and differences in input data (uploaded into the ICES database) were found and therefore the further analysis was postponed until these issues are fixed.

**Gulf of Riga herring**

WGBIFS calculated Gulf of Riga herring abundance estimates using the StoX software for years 2011-2021 – the years where GRAHS acoustic and biotic data were available from in the ICES database for acoustic-trawl surveys. Data for the years 1999-2010 were not available prior to the meeting. Comparison analysis, between StoX and traditional calculation method that is used so far, showed no major differences in herring total abundance estimates for most of the years. Notable differences were in the age compositions of those two methods. Some errors and differences in input data (uploaded into the ICES database) were found and therefore the further analysis was postponed until these issues are fixed.

At the WGBIFS meeting in March 2023 there were no new analyses presented regarding the comparison between the standard IBAS calculation method and the StoX. Group members expressed concern about the poor support from StoX developers which sometimes forces one to wait for a long time with the analyses as the feedback is often very slow. For example, WGBIFS chair reported the issue with an internal error in StoX when the 2017 BASS data were analysed in September 2022. But until the WGBIFS meeting in March 2023 there was no solution yet proposed from StoX developers. All the comparison exercised so far have showed that StoX is not designed to fully replicate the current IBAS calculation procedure, and the StoX developers have expressed their intention that StoX will not do so in the future either. As a result, the StoX abundance estimates differ from the IBAS estimates (especially at the ICES Subdivision and rectangle level), and the age compositions are also different. Therefore, the only possibility to implement StoX software for the calculation of WGBIFS acoustic stock estimates is in the cases, where acoustic and biotic data are available in the ICES database for acoustic-trawl surveys for the whole index time series and all the years can be recalculated. This is theoretically possible for the Gulf of Riga herring index when the GRAHS data from the first 5 years (1999-2004) are also uploaded into the ICES database for acoustic-trawl surveys. In the case of herring and sprat indices in the Baltic proper this is not a realistic option. WGBIFS decided to continue with the evaluation of alternative tools and methodologies for the calculation of acoustic stock estimates while using the data for the input directly from ICES database for acoustic-trawl surveys during the next 3-year ToR period. Comparison exercises will be performed to validate whether they allow WGBIFS to use them as a new standard tool for the calculation of annual acoustic survey estimates. In this process StoX software is considered as one, but not as the only, alternative tool.

## 4.8 ToR h) Coordinate the marine litter-sampling programme within the Baltic International Trawl Survey and registering the data in the ICES database

The WGBIFS in 2015 agreed that the marine litter data will be collected during the BITS-Q1 and BITS-Q4 surveys as regular procedure obeyed by all participated countries. The standard protocol, which was developed for the IBTSWG was adapted for WGBIFS purposes and is used for the exchange of marine litter data sampled in the Baltic Sea. The running, indispensable information about sampling will be noticed by the cruise leader during surveying. All countries participating in the BITS surveys started to collect the marine litter in autumn 2015, according to the proposed format, described in the BITS Manual 2017 (see also Annex 12). Standard form is accessible from the WGBIFS-2022 SharePoint. Data submitters will transfer data using the DATRAS Trawl litter format, described in the suitable manual, downloadable here:

https://www.ices.dk/data/data-portals/Pages/DATRAS-Docs.aspx. Submitters will transfer the data using the new standard format specifically developed for DATRAS users, implementing ICES vocabulary and classification coding, or via the Litter Reporting Format (ERF3.2; vide Annex 12), which are in line with the ICES Manual for seafloor litter data collection and reporting from demersal trawl samples and Photograph guide for ICES manual for seafloor litter data collection and reporting from demersal trawl samples (ICES 2022). https://doi.org/10.17895/ices.pub.21435771.v1.

The sheet and description of the categories that need to be collected at each catch-station are attached. Each type of litter that is collected will be submitted in the format mentioned below (Table X) and then uploaded to DATRAS. Once collected, these data can be sent by each institutes delegate to the WGBIFS or by the marine litter co-coordinator. All data should be uploaded by haul, number, weight and size. (Table 4.23).

**Table 4.23 Exchange format of marine litter data uploaded within the DATRAS structure.**

| Column | Column definition | Options | Mandatory | Format |
|---|---|---|---|---|
| RecordType | Record identification | "LT" | Yes | Fixed value "LT" |
| Quarter | Quarter | http://vocab.ices.dk/?ref=12 | Yes | See options |
| Country | Country | http://vocab.ices.dk/?ref=4 | Yes | See options |
| Ship | Ship | http://vocab.ices.dk/?ref=3 | Yes | See options |
| Gear | Gear | http://vocab.ices.dk/?ref=2 | Yes | See options |
| Survey | Survey type | http://vocab.ices.dk/?ref=102 | Yes | See "datasets" abbreviations |
| Reserved1 | Reserved field | report -9 | | |
| Reserved2 | Reserved field | report -9 | | |
| StNo | Station number | | Yes | National coding system, not defined by ICES. |
| HaulNo | Haul number | | Yes | Sequential numbering by cruise |
| Year | Year | | Yes | "1900-2099" |
| LTREF | Litter reference list | http://vocab.ices.dk/?ref=1381 | Yes | "C-TS-REV" |
| PARAM | Parameter | | Yes | |
| LTSZC | Litter size | http://vocab.ices.dk/?ref=1380 | No | |
| UnitWgt | Weight units | Restricted units: g/haul, kg/haul, kg/km$^2$ | *Yes* | Request other units from accessions@ices.dk |
| LT_Weight | Weight value | | Yes | |
| UnitItem | Item units | Restricted units: items/haul, items/km$^2$ | Yes | Request other units from accessions@ices.dk |
| LT_Items | Number of items | | Yes | |
| LTSRC | Litter source | http://vocab.ices.dk/?ref=1382 | No | See options |
| TYPPL | Type of polymer | http://vocab.ices.dk/?ref=1385 | No | See options |
| LTPRP | Litter properties | http://vocab.ices.dk/?ref=1403 | No | See options. Multiple options possible (separate multiple entries with "~" (ascii 126)) |
| ERF3.2 format linkage | | Values obtained from DATRAS | In DATRAS | |

| | | | | |
|---|---|---|---|---|
| LATIT | Latitude | Shooting latitude | Yes | Shooting latitude in decimal degrees |
| LONGI | Longitude | Shooting longitude | Yes | Shooting longitude in decimal degrees |
| SDATE | Sampling date | Year/Month/Day | Yes | |
| STIME | Sampling time/start (UTC) | TimeShot | Yes | |
| ETIME | Sampling end time (UTC) | Calculated | No | |
| MXDEP | Maximum (lower) depth of gear (m). | Depth | Yes | in metres |
| | | Default values | | |
| MATRX | Matrix | http://vocab.ices.dk/?ref=56 | No | Determined by gear |
| POSYS | Positioning system | http://vocab.ices.dk/?ref=40 | No | "HLS" |
| PURPM | Purpose of Monitoring | http://vocab.ices.dk/?ref=42 | No | "F" |
| MPROG | Monitoring Programme | http://vocab.ices.dk/?ref=147 | No | "FS" |

**References:**

ICES. 2022. ICES manual for seafloor litter data collection and reporting from demersal trawl samples. ICES Techniques in Marine Environmental Sciences Vol. 67. 16 pp. https://doi.org/10.17895/ices.pub.21435771

## 4.9 ToR i) Agree a standard pelagic trawl gear used in acoustic surveys

In 2016, WGBIFS requested support from WGFTFB to standardize the pelagic trawl for the international Baltic acoustic surveys (BASS and BIAS). Several meetings were held in until 2019 between the Chairs of WGBIFS and WGFTFB and between the members of these two groups to discuss this topic. Based on the discussions, the needs for the possible standard pelagic trawl gear were identified and the next steps in the gear standardization process were agreed. It was decided that the Chair of WGFTFB will present the topic at their next meeting to ask the gear technologists for their participation for addressing this ToR.

In January 2020 there was a short meeting between the Chair of WGBIFS, and the 2 new Chairs of WGFTFB (Daniel Stepputtis and Antonello Sala) to discuss the gear standardization topic. It revealed that WGFTFB has changed their position on this issue and are no longer planning to assist WGBIFS in gear standardization process. Chairs of WGFTFB recommended instead WGBIFS to launch a new EU project for the development of a new standard survey gear (as it was for example done for the TV3 type of demersal trawl for BITS surveys) and advised to search partners for cooperation within other ICES survey groups, who might have similar needs.

During the WGBIFS 2020 meeting in March this new information was discussed, and the Group found that there is a lack of knowledge within our WG for launching such project alone. At the same time majority of the WG members still supported the continued search for possible solutions in this topic. Therefore, it was decided to take contact with WGIPS in this question. After the meeting the Chair of WGBIFS contacted the Chairs of WGIPS (Bram Couperus and Michael O'Malley) for possible cooperation in this matter and got a response that WGIPS will raise this question at their meeting in January 2021 to see, whether there are members in their group that would be interested in this issue and are willing to take it forward with the potential of getting involved in a more formal project. WGIPS discussed this question very briefly at the meeting in January 2021. Members of the group were in the opinion that this would be better dealt with as a recommendation to a gear group like WGFTFB. Also, if this question came to WGIPS as a recommendation, then it would be allocated more time at the meeting, as it was an online meeting that year, it was difficult to gauge whether there was real interest or not. Therefore, WGBIFS decided in the 2021 meeting to address this standard pelagic trawl gear question to WGIPS as a recommendation.

Based on discussions during the WGIPS 2022 meeting they replied to our recommendation the following way: "Survey sampling trawls are a key component of acoustic trawl reporting, providing biological samples used to determine age stratified abundance. Discussions within the group in response to this request included; consistency in the existing time series using the existing survey gear, gear design tailored to target species (multiple spp in some ecosystem surveys), geographical area as well as scrutiny and species partition methods used. In summary, development of new survey trawl is welcomed. However, due to the issues described above the adoption of a standard trawl design across all WGIPS survey may not be possible." After this decision it became clear to WGBIFS that we have to give up the plan to launch a new EU project for the development of a new standard survey gear. During the WGBIFS meeting in November Sweden presented an overview about their new pelagic trawl that has been used recently in BIAS and BASS surveys. Namely Sweden has changed their old traditional Fotö trawl against a new Gloria Helix pelagic trawl. Comparison of those two trawl gears has revealed that the Gloria trawl is easier to handle on deck, resulting in almost no need for a re-shooting the hauls. Also, the shoot and hive time is shorter. As the catches are higher, the haul time can be shortened, and it saves some survey time. According to the manufacture's info the drawings of that gear are available for free, and the size can be scaled easily up or down to fit the vessel properties and sampling needs. During the 2023 meeting the Group members decided to recommend this Gloria Helix trawl to be used as a standard pelagic trawl gear in acoustic surveys. There will be a transition period for trawl gear replacement for all countries participating in the international Baltic acoustic surveys. Trawl gears, that have been in use until now, will be replaced with a new type of trawl gear when they are worn out.

## 4.10 ToR j) Review and update the manual for International Baltic Acoustic Surveys (IBAS; former SISP 8) and address methodological question raised at the last review of the SISP

The International Baltic Acoustic Surveys (IBAS) manual was reviewed during the WGBIFS 2021-2023 meetings and several changes and corrections were implemented. The updated manual will be published in the ICES publication series Techniques in Marine Environmental Science (TIMES) in 2023.

## 4.11 ToR k) Review and update the manual for Baltic International Trawl Survey (BITS; former SISP 7) and address methodological question raised at the last review of the SISP

The Baltic International Trawl Survey (BITS) manual was reviewed during the WGBIFS 2021-2023 meetings and several changes and corrections were implemented. The updated manual will be published in the ICES publication series Techniques in Marine Environmental Science (TIMES) in 2023.

## 4.12 ToR l) Conduct analyses related to the uncertainties in the Gulf of Riga Acoustic Herring Survey (GRAHS) in order to improve the quality of the GRAHS and subsequent indices

Acoustic and biotic data of GRAHS surveys from years 2011-2021 were available in the ICES database for acoustic-trawl surveys prior to the meeting. Comparison analysis based on that data gave promising results with no major differences in abundances of most year-classes which indicates to no large differences in current and StoX calculation methodologies. Some errors in uploaded data were found and further analysis was postponed until these are fixed. Notable differences were in the abundances of young herring individuals which suggests that probably the results are not fully comparable due to the fact that StoX program is not designed to fully replicate the current procedure. Further investigation into the matter is needed and the group is still waiting for the full time series of data to be uploaded by the responsible Latvian scientists.

A pilot study was conducted in Gulf of Riga to evaluate whether BIAS methodology and timing would improve the quality of the GRAHS index. First survey in October 2022 had some planning issues, but the pilot will be repeated in 2023. The work in improving the indices will be continued during the next 3-year period of working group under several ToRs.

## 4.13 ToR m) Evaluate if there are methodological and/or environmental reasons for different survey catchabilities in different ICES Sub-divisions and what may be magnitude of these differences

This ToR investigates if there are differences in survey catchabilities in different ICES subdivisions. Currently, sprat is assessed as a single stock in the Baltic Sea with no spatial component in the model. In the INSPIRE project it was tested, if there is a difference if the stock is assessed as a single stock or in two stock units separated into a southern and northern component. Currently, there is one survey index estimated for the whole survey area. A split of stock units would also result in separate stock indices for each unit which might lead to different assessment outcomes for stock biomass.

There are several reasons, why these differences may occur:

a) Dependent of the area, herring and sprat might differ in their target strength due to differences in salinity. There is a strong gradient in salinity from the southwest to north-eastern Baltic Sea. Differences in target strength as a result of this salinity gradient are, however, minor and might only have a minor impact on the abundance estimates.

b) As the survey is covered by different vessels, there might be a vessel effect in the different areas. Most parts of the BASS are covered by FRV "Baltica" and FRV "Walther Herwig III". As the "Baltica" is mostly covering the eastern part and "Walther Herwig III" the western part, we would expect to see an east-west gradient in estimates, while there was a south-north gradient observed. Similarly, are most parts of the BIAS covered by FRV "Baltica" and FRV "Svea". As the "Baltica" is mostly covering the eastern part and "Svea" the western part, we would rather expect to see here an east-west gradient in estimates.

c) Changes in the stock distribution are observed between years. While the interannual variation in distribution of sprat is minor during the BASS, larger differences have been observed during the BIAS. Interannual variation will most likely increase when smaller areas are used to estimate individual indices.

d) Landings of commercial fishing vessel are not distributed equally over the year and areas (Fig 4.13.1). The largest catches of sprat are accumulated in quarter 1. Catches are generally accumulated in the southern Baltic Sea. The distribution of sprat as observed in the BIAS and in the landings of quarter 4 are similar. There is, however, a certain mismatch of stock distribution in quarter 2, when the catches are accumulated in the southern part, but the distribution of the survey looks more homogeneously. As most landing harbours are located in Denmark, skippers of the fishing vessels try to target sprat accumulations in the southern part of the Baltic to avoid long transfers between fishing grounds and landing location. This might lead to a mismatch of signals from the landings and the survey and is particularly noticeable if assessed in separate stock units separated into a northern and southern component.

In summary, there are several reasons which explain the difference, if the sprat stock is assessed in a single unit compared to two units. The effects of survey design appear minor compared to differences in the stock distribution and the resulting catchabilities of the surveys and commercial samples. As a result, differences are more likely an artefact of the spatially resolved stock assessment compared to the survey design.

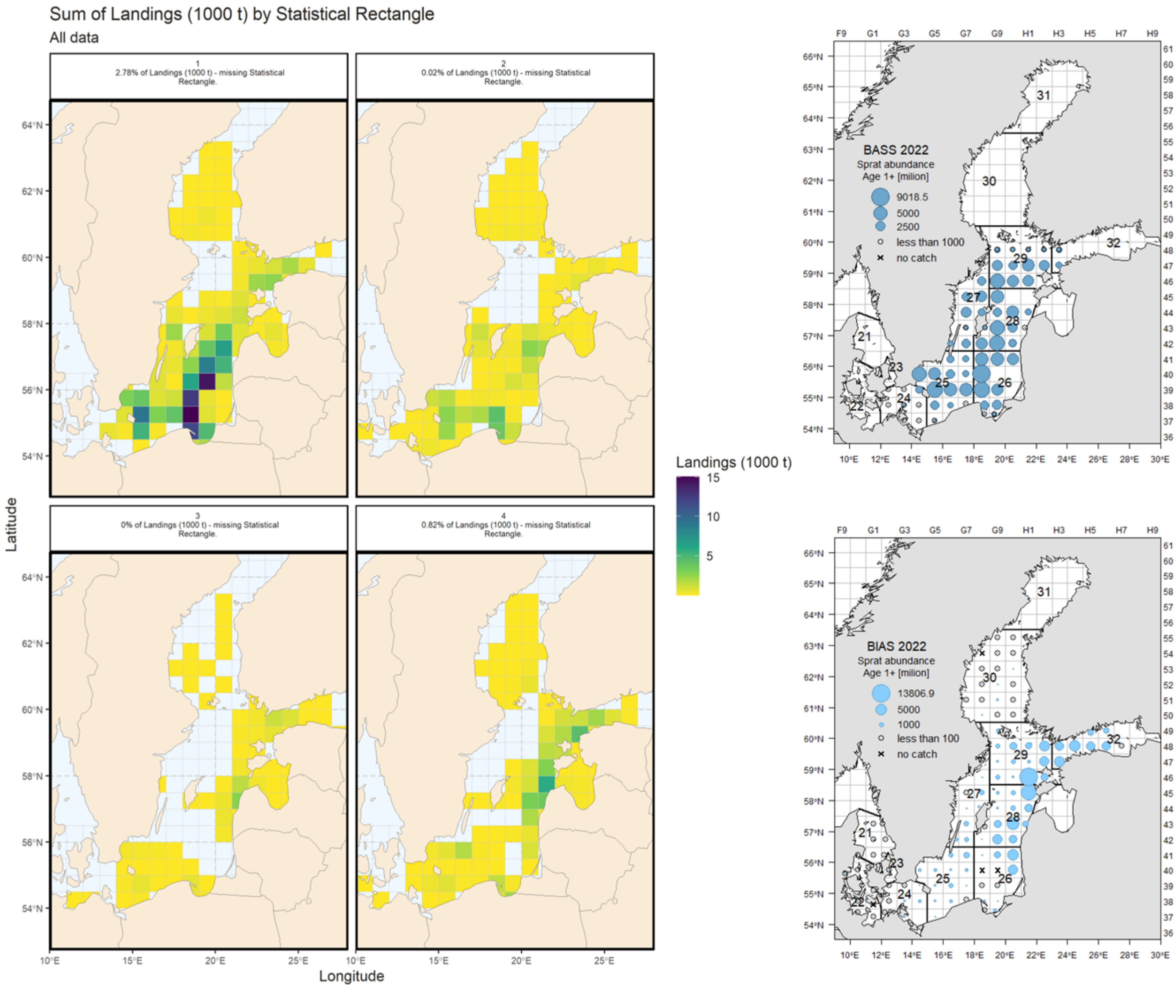



**Figure 4.26. Comparison of the landings in the per quarter (left) and the spatial distribution of sprat abundance during the BASS, May, and BIAS, October (right).**

# 5 Inquiries Besides of the Fixed ToRs

## 5.1 Establish quality control checks for door- and wing-spread during the upload process to DATRAS (organize a workshop under responsibility of IBTSWG and WGBIFS). (Rec. by WKSAE-DATRAS)

The ICES workshop on the production of swept-area estimates for all hauls in DATRAS for biodiversity assessments (WKSAE-DATRAS) was held 31 May–4 June 2021. It aimed to harmonize the procedures to develop swept-area estimates to support biodiversity assessments using the ICES online database of trawl surveys (DATRAS). As a result, a recommendation was made to both the IBTSWG and WGBIFS to organize a workshop to establish quality control checks during the upload process to DATRAS. At the current WGBIFS meeting the BITS subgroup members reviewed the content of Table 2.1 in the WKSAE-DATRAS report. Some quality parameters were handled differently in the DATRAS screening procedure. To ensure robust data quality for the swept area estimation product, the BITS subgroup carefully examined the suggested checks and discussed their relevance to the Baltic data in the DATRAS database. The subgroup also explored potential improvements in the checks to minimize incorrect and missing values.

The outcomes of the subgroup's discussions are as follows:

| Issue | Outcome of the discussion |
|---|---|
| Missing sweep-length data (40% of samples). | NA |
| Extreme haul duration values. | Additional checks are needed, such as range checks and the addition of latitude and longitude versus ground speed checks. |
| Missing groundspeed data (38% of samples). Incorrect groundspeed value recorded. | NA |
| Missing/incorrect towed distance data. | DATRAS distance checks are well-defined in the quality procedure and do not require any changes. |
| Missing/incorrect wing-spread values (44% of samples). | NA |
| Missing/incorrect door-spread values (29% of samples). | NA |
| Missing/incorrect net opening values (20% of samples). | NA |
| Mix of accepted and historic species names and/or synonyms. | Covered in DATRAS checks, so no changes are needed. |
| Species recorded outside known geographic range. | Introduce a check to determine if the species has been caught for the first time. |
| Multiple length measurement types (total length, fork length, pre-anal length, etc.) and length measurement units (cm, mm) used. | The existing DATRAS length code serves the purpose for fork length or pre-anal length check new length code type is required. |

| | |
|---|---|
| Recorded length outside known minimum and maximum length range for the species recorded. | A minimum-maximum check is needed based on historical data to identify anomalies in the length data. |
| Recorded species ID code is not a species level code, is either a genus-level or family level code. | DATRAS already covers the Aphia check, but it is better to restrict it at the species level. If it is not possible to identify the species level, only then use the family-level code. |
| No numbers at length data recorded, just a species count. | The usage of SpecValiditycode needs improvement, and aligning the codes will lead to better understanding. |

## 5.2 Ensure that all hydrographic data, collected during the surveys, are uploaded to the ICES Oceanographic Database at the same time as the fish data are uploaded to DATRAS and the Acoustics survey database. (Rec. by WGBFAS)

WGBFAS requested that all hydrographic data that is collected during the survey to be uploaded to the ICES Oceanographic Database. The same request was also raised by Hjalte Parner from the ICES Data Centre just before the meeting. The group discussed this issue with his participation during the meeting. It revealed that in some countries there are different institutions responsible for hydrographical data collected during the WGBIFS coordinated surveys. Hjalte Parner informed the Group that he has the access to the list of all national data uploaders of the ICES Oceanographic Database and promised to share it with WGBIFS. After that can WGBIFS members contact the data uploaders of their countries and ensure that all available data also from the WGBIFS coordinated surveys is uploaded to the ICES Oceanographic Database.

## 5.3 Review and Enhancement of DATRAS Data Product Descriptions. (Req. by ICES Data Centre)

The DATRAS data portal offers various data products with different fields and outcomes based on the submitted data. However, some of the product names may not be self-explanatory, leading to confusion for first-time users. To address this, the DATRAS team sought the assistance of the BITS subgroup of WGBIFS to review and propose improved descriptions. The subgroup members examined the existing product descriptions, aiming to make them clearer and more informative. Their feedback included suggestions such as clarifying acronyms, expanding abbreviations, and refining technical language.

The subgroup's efforts focused on enhancing the accessibility of the product descriptions. Their valuable feedback served as a comprehensive reference, capturing the collective input that shaped the improved DATRAS data product descriptions. These enhancements contribute to the overall usability and accessibility of the DATRAS data portal. Table below are the outcome of the suggested descriptions.

| Data products | Description |
|---|---|
| Exchange Data | This is the raw data following the unified data format. For further detail on each survey please visit the SISPs library. |
| CPUE per length per haul per hour | Provides Catch in numbers per length class per haul per hour. Available for all species. Uses LngtClass in mm. |
| CPUE per age per haul per hour | Provides Catch in numbers per age class per haul per hour. Available for standard species only. For further detail on each survey please visit the SISPs library. |
| CPUE per length per area | Provides Catch in numbers per length class per hour of haul per Area. Available for all species. Uses LngtClass in mm. This Data product can be requested per Survey Area. https://gis.ices.dk/sf/?widget=datras# (*Average CPUE per length class per Area) |
| CPUE per length per subarea | Provides Catch in numbers per length class per hour of haul per survey DepthStratum or ICES statistical Rectangle. Available for all species. Uses LngtClass in mm. This Data product can be requested per Survey Area.# (*Average CPUE per length class per Sub Area( DepthStratum or ICES statistical Rectangle)) |
| CPUE per age per haul per area | Provides Catch in numbers per age class per hour of haul per Area. Available for all species. This Data product can be requested per Survey Area. https://gis.ices.dk/sf/?widget=datras# (*Average CPUE per age class per Area) |
| CPUE per age per haul per subarea | Provides Catch in numbers per age class per hour of haul per survey DepthStratum or ICES statistical Rectangle. Available for all species. This Data product can be requested per Survey Area.# ( *Average CPUE per age class per Sub Area( DepthStratum or ICES statistical Rectangle)) |
| SMALK | Sex Maturity Age Length,Weight, Provides Catch in numbers (CANoAtLngt) per Area, Age, Sex, Maturity and LngtClass (in mm). Available for all species. For Beam Trawl Surveys CANoATLngt per Age is provided in short format. For the other surveys CANoATLngt per Age is provided in long format and calculated per survey Area. (SMALK rewording) |
| ALK | Age Length Key. Provides Catch in numbers (CANoAtLngt) per Age and LngtClass (in mm) in short format. Available for standard species only. This Data product is provided per Area. (https://gis.ices.dk/sf/?widget=datras#) |
| Indices | Abundances indices for standard species by Index area (https://vocab.ices.dk/?ref=162) |
| Litter Exchange Data | Combined haul (HH) and litter raw data |

# 6 Revisions to the work plan and justification

No changes in ToRs have been proposed.

No any significant revisions to the work plan were made.

# 7 Next meeting and election of a new Chair

As the Easter holidays in 2024 is during the same week that WGBIFS usually meets, it was decided to split the 2024 meeting into 2 shorter consecutive meetings. 21–22 March 2024 will be a web meeting to discuss the survey results and 3-5 April 2024 will be a physical meeting. There was one proposal for the venue of that physical meeting: Gdynia, Poland. Majority of WGBIFS members supported the idea to organize the next WGBIFS physical meeting in Gdynia in the period of 3-5 April 2024.

The group elected Tiit Raid, Estonia and Olavi Kaljuste, Sweden to be the new Chairs of WGBIFS.

# Annex 1: List of participants

| Name | Institute | Country (of institute) | Email |
|---|---|---|---|
| Aleksejeva Elena | Marine Research Institute, Klaipeda University | Lithuania | jelena.aleksejeva@ku.lt |
| Börjesson Patrik | Swedish University of Agricultural Sciences, Department of Aquatic Resources, Institute of Marine Research | Sweden | patrik. borjesson@slu.se |
| Canseco Rodriguez Jose Antonio | Instituto Español de Oceanografia (IEO) | Spain | jantonio.canseco@ieo.csic.es |
| Goñi Nicolas | Natural Resources Institute Finland (Luke), Natural Resources and Bioproduction | Finland | nicolas.goni@luke.fi |
| Haase Stefanie | Thünen-Institute of Baltic Sea Fisheries | Germany | stefanie.haase@thuenen.de |
| Kaljuste Olavi (chair) | Swedish University of Agricultural Sciences, Department of Aquatic Resources, Institute of Coastal Research | Sweden | olavi.kaljuste@slu.se |
| Larson Niklas | Swedish University of Agricultural Sciences, Department of Aquatic Resources, Institute of Marine Research | Sweden | niklas.larson@slu.se |
| Lilja Juha | Natural Resources Institute Finland (Luke), Natural Resources and Bioproduction | Finland | juha.lilja@luke.fi |
| Lövgren Olof | Swedish University of Agricultural Sciences, Department of Aquatic Resources, Institute of Marine Research | Sweden | olof.lovgren@slu.se |
| Parner Hjalte | International Council for the Exploration of the Sea | | hjalte@ices.dk |
| Pönni Jukka | Natural Resources Institute Finland (Luke), Natural Resources and Bioproduction | Finland | jukka.ponni@luke.fi |
| Radtke Krzysztof | National Marine Fisheries Research Institute | Poland | radtke@mir.gdynia.pl |
| Schmidt Beata | National Marine Fisheries Research Institute | Poland | bschmidt@mir.gdynia.pl |
| Sepp Elor (chair) | Estonian Marine Institute, University of Tartu, Center of Lake Peipsi Fisheries | Estonia | elor.sepp@ut.ee |
| Sics Ivo | Institute of Food Safety, Animal Health and Environment (BIOR), Fish Resources Research Department | Latvia | ivo.sics@bior.lv |
| Soni Vaishav | International Council for the Exploration of the Sea | | vaishav@ices.dk |
| Spegys Marijus | Marine Research Institute, Klaipeda University | Lithuania | marijus.spegys@apc.ku.lt |
| Storr-Paulsen Marie | DTU Aqua | Denmark | msp@aqua.dtu.dk |
| Strods Guntars | Institute of Food Safety, Animal Health and Environment (BIOR), Fish Resources Research Department | Latvia | guntars.strods@bior.lv |
| Svenson Anders | Swedish University of Agricultural Sciences, Department of Aquatic Resources, Institute of Marine Research | Sweden | anders.svenson@slu.se |
| Velasco Andrés | Thünen-Institute of Baltic Sea Fisheries | Germany | andres.velasco@thuenen.de |
| Villamor Adriana | International Council for the Exploration of the Sea | | Adriana.villamor@ices.dk |

# Annex 2: Draft resolutions for the next meeting

The Baltic International Fish Survey Working Group (WGBIFS), chaired by Tiit Raid, Estonia and Olavi Kaljuste, Sweden, will work on ToRs and generate deliverables as listed in the table below.

| | Meeting dates | Venue | Reporting details | Comments (change in Chair, etc.) |
|---|---|---|---|---|
| Year 2024 | 21–22 March and 3-5 April 2024 | Web/Gdynia, Poland | Interim report by 15 May 2024 to, SCICOM and ACOM | Tiit Raid and Olavi Kaljuste appointed as chairs |
| Year 2025 | TBD | TBD | Interim report by 15 May 2025 to, SCICOM and ACOM | |
| Year 2026 | TBD | TBD | Final report by 15 May 2026 to, SCICOM and ACOM | |

## ToR descriptors

| ToR | Description | Background | Science plan codes | Duration | Expected deliverables |
|---|---|---|---|---|---|
| a | Combine and analyse the results of acoustic surveys and experiments | Acoustic surveys provide important fishery-independent stock estimates for Baltic herring and sprat stocks | 3.1 | annually<br>Year 1, 2 and 3 | Updated acoustic tuning indices for WGBFAS |
| b | Update the BIAS, BASS and GRAHS hydroacoustic databases and ICES database for acoustic-trawl surveys | The aim of BIAS, BASS and GRAHS databases is to store the aggregated data that are used for the calculation of the survey indices. The aim of ICES database is to ensure that the standardized and quality-controlled scrutinized data from the acoustic-trawl surveys will be stored centrally in a safe way and enables easy access to the data, which will facilitate usage for many different analyses by a wider range of users | 3.1 | annually<br>Year 1, 2 and 3 | Updated databases with acoustic and biotic data for WGBIFS |
| c | Coordinate and plan acoustic surveys including any experiments to be conducted | Acoustic surveys provide important fishery-independent stock estimates for Baltic herring and sprat stocks | 3.1 | annually<br>Year 1, 2 and 3 | Finalized planning for the surveys for WGBIFS |
| d | Review the results of BITS surveys and evaluate the characteristics of TVL and TVS standard gears used in BITS | Demersal trawl surveys provide important fishery-independent stock estimates for Baltic cod and flatfish stocks | 3.1 | annually<br>Year 1, 2 and 3 | Updated BITS data in DATRAS database for ICES Data Centre and WGBFAS |

| | | | | | |
|---|---|---|---|---|---|
| **e** | Coordinate and plan demersal trawl surveys and experiments to be conducted, and update and correct the Tow Database | Demersal trawl surveys provide important fishery-independent stock estimates for Baltic cod and flatfish stocks | 3.1 | annually<br>Year 1, 2 and 3 | Finalized planning for the surveys for WGBIFS, updated and corrected Tow Database |
| **f** | Coordinate the marine litter-sampling programme within the Baltic International Trawl Survey and registering the data in the ICES database | Collected and registered information about the marine litter (mostly anthropogenic origin), occasionally appeared in the ground trawl fish control-catches, are additional source of data about present ecological status of marine seabed in investigated areas of the Baltic | 3.1 | annually<br>Year 1, 2 and 3 | Coordinated marine litter sampling programme within the Baltic International Trawl Survey (BITS). |
| **g** | Conduct the analyses related to the improvement of quality of acoustic indices and estimation of the uncertainty in the acoustic surveys coordinated by WGBIFS | Acoustic surveys provide important fishery-independent stock estimates for Baltic herring and sprat stocks | 3.1, 3.2, 3.3 | Year 1-3 | Improved quality of acoustic indices with estimates of the uncertainty for WGBFAS |
| **h** | Evaluate the survey methodology and alternative tools for the calculation of WGBIFS acoustic stock estimates | Alternative tools and methodologies for the calculation of acoustic stock estimates using the data directly from ICES database will be evaluated. Comparison exercises will be performed to validate whether they allow WGBIFS to use them as a new standard tool for the calculation of annual acoustic survey estimates. | 3.1, 3.2 | Year 1-3 | Improved quality, transparency and reproducibility of acoustic indices, improved pace of work on the level of national data compilation and verification |
| **i** | Evaluate the effect of possible survey effort reduction on the indices, caused by the increase of restricted sea areas | Planned expansion of "no go" areas caused by the increase of offshore wind power plants would affect WGBIFS-coordinated surveys in the Baltic Sea | 3.1, 3.2, 3.3 | Year 1-3 | Quality assurance of the survey indices. |
| **j** | Conduct analyses related to the uncertainties in the Gulf of Riga Acoustic Herring Survey (GRAHS) in order to improve the quality of the GRAHS and subsequent indices | Until now, the preparation of the survey data for stock assessment is the responsibility of the Latvian and Estonian national laboratories. The methodology and consistency of results of this survey should be evaluated by WGBIFS | 3.1, 3.2 | Year 1-3 | Improved quality, transparency and reproducibility of acoustic indices, updated databases with acoustic and biotic data from GRAHS |
| **k** | Review and update the manual for International Baltic Acoustic Surveys (IBAS) | Acoustic surveys provide important fishery-independent stock estimates for Baltic herring and sprat stocks | 3.1, 3.2 | Year 3 | Updated IBAS manual for publication in TIMES |
| **l** | Review and update the manual for Baltic International Trawl Survey (BITS) | Demersal trawl surveys provide important fishery-independent stock estimates for Baltic cod and flatfish stocks | 3.1, 3.2 | Year 3 | Updated BITS manual for publication in TIMES |

# Annex 3: Agenda of WGBIFS 2023

**Introduction**

1. Opening of the meeting
- Welcome and introduction
- Households' remarks

2. Adoption of the agenda and organization of the meeting
- Discussion and adoption of the agenda
- Allocation of tasks between participants
- Presentation of time schedule

**Acoustic surveys and data**

3. Combine and analyse the results of acoustic surveys and experiments. (ToR a)
• Status of BIAS and BASS standard survey reports.
4. Update the BIAS, BASS and GRAHS hydroacoustic databases and ICES database for acoustic-trawl surveys. (ToR b)
5. Coordinate and plan acoustic surveys including any experiments to be conducted. (ToR c)
6. Conduct the analyses related to the improvement of quality of acoustic indices and estimation of the uncertainty in the acoustic surveys coordinated by WGBIFS. (ToR f)
7. Update on progress in development of the StoX software and implementation of it for the calculation of WGBIFS acoustic stock estimates. (ToR g)
8. Agree a standard pelagic trawl gear used in the acoustic surveys. (ToR i)

9. Review and update the manual for International Baltic Acoustic Surveys (IBAS; former SISP 8) and address methodological question raised at the last review of the SISP. (ToR j)

10. Conduct analyses related to the uncertainties in the Gulf of Riga Acoustic Herring Survey (GRAHS) in order to improve the quality of the GRAHS and subsequent indices. (ToR l)

11. Evaluate if there are methodological and/or environmental reasons for different survey catchabilities in different ICES Sub-divisions and what may be magnitude of these differences. (ToR m)

**Bottom trawl surveys and data**

12. Review the results of BITS surveys and evaluate the characteristics of TVL and TVS standard gears used in BITS. (ToR d)
- Status of BITS standard and extended survey reports.

13. Coordinate and plan demersal trawl surveys and experiments to be conducted, and update and correct the Tow Database. (ToR e)
14. Coordinate the marine litter-sampling programme within the Baltic International Trawl Survey and registering the data in the ICES database. (ToR h)
15. Review and update the manual for Baltic International Trawl Survey (BITS; former SISP 7) and address methodological question raised at the last review of the SISP. (ToR k)

**Inquiries besides of the fixed ToRs**

16. **Recommendations from other Expert Groups**
16.1. Establish quality control checks for door and wingspread during the upload process to DATRAS (organize a workshop under responsibility of IBTSWG and WGBIFS). (Rec. by WKSAE-DATRAS)

16.2. Ensure that all hydrographic data, collected during the surveys, are uploaded to the ICES Oceanographic Database at the same time as the fish data are uploaded to DATRAS and the Acoustics survey database. (Rec. by WGBFAS)

**Final issues**

17. Selection of the venue for the next meeting
18. Selection of the new Chair(s)
19. New 3-year period ToRs

# Annex 4: Action List

1. The feedback of the recent catch-stations realized in the framework of BITS surveys should be submitted to Olof Lövgren (Sweden; e-mail: olof.lovgren@slu.se), using the proposed standard format (Annex ToR e, Ch. 5.5.2.2; WGBIFS 2016 Report) not later than 20 December (autumn survey) and immediately after winter-spring survey. The above-mentioned Swedish delegate is a coordinator of the reprogrammed Tow-Database, responsible for storage old control-hauls location with remarks concern realization - and for planning new catch-stations distribution for the next BITS surveys. All problems with realization of designated single control-hauls or part (whole) of survey should be promptly transferred (by e-mail or mobile phone) to O. Lövgren with c/c to the WGBIFS chair. The updated version of the trawl database will be made available after submission the full set of data from the current BITS surveys by all countries.

Olavi Kaljuste (Sweden) and Beata Schmidt (Poland) were assigned as coordinators of acoustic-trawl (IBAS) surveys, responsible among-others for controlling that the acoustic surveys results are uploaded in the right format. Beata Schmidt (Poland; e-mail: bschmidt@mir.gdynia.pl) was assigned as the coordinator of BIAS and BASS national databases aggregated data uploading and compilation to international level, moreover she is responsible also for all kind of input data preparation, before and during the ongoing WGBIFS meeting. The recently collected aggregated acoustic-trawl surveys (BASS, BIAS) data (in already agreed Excel format) should be uploaded to the latest WGBIFS SharePoint site at least one month before beginning of the annual WGBIFS meeting. At the same time, the latest disaggregated acoustic and biotic data from national BASS and BIAS surveys should also be uploaded to the new database for acoustic trawl surveys at the ICES Data Centre (http://acoustic.ices.dk/submit), using the ICES acoustic data format.

2. After each BITS survey data upload, the marine litter data from seabed should be uploaded to the DATRAS database (the ICES Data Centre). The upload data format is described in the manual accessible at the ICES web page: https://www.ices.dk/data/data-portals/Pages/DATRAS-Docs.aspx

3. WGBIFS suggested performing in every year, as obligatory - the technical checking of standard parameters, i.e. measurements of the TV-3 ground trawl elements. The measurements results should be reported to next WGBIFS meeting, using the agreed format of protocols.

4. It's important for precise values of the LFI and MML indicators to inspect that both doors and wingspread indices are included in DATRAS uploads. This should be analysed by all WGBIFS members involved in the BITS surveys accomplishment. This information will facilitate the ability calculate the swept area, one of the much-needed parameter in calculation of the a.-m. indicators. Therefore, WGBIFS suggest that all vessels involved in the BITS surveys realization are encouraged to have suitable equipment (sensors) for measuring horizontal and vertical trawl opening during fishing.

5. WGBIFS recommends that all remaining data from the GRAHS surveys will be uploaded to the ICES database for acoustic trawl surveys and the errors found in uploaded data fixed before the WGBIFS meeting in 2024.

6. WGBIFS recommends that, if possible, Estonia and Latvia should continue extending the BIAS survey into the Gulf of Riga due to the high uncertainty of abundance estimates of younger ages from GRAHS.

7. WGBIFS recommends that all countries that have provided BIAS and BASS data into the Access databases will check the herring and sprat mean weight data quality and provide the missing and corrected values to Beata Schmidt.

8. When StoX calculations are done in parallel with standard IBAS calculations and all these StoX projects shall be uploaded into the WGBIFS SharePoint.

9. WGBIFS will analyse the potential effect of environmental factors on the abundance estimates of herring during the BIAS survey in the Bothnian Sea. Some inconsistencies identified in the Bothnian herring time-series suggest a possible environmental effect on the spatial distribution and/or catchability. Would a significant effect be identified; we should propose a corrected version of the abundance index before the next benchmark assessment. The results of the study will be discussed and addressed.

# Annex 5: List of presentations made at the WGBIFS 2023 meetings

1. BASS presentation of Estonia, made by Elor Sepp (Estonia);
2. BASS presentation of Latvia, made by Guntars Strods (Latvia);
3. BASS presentation of Poland, made by Beata Schmidt (Poland);
4. BASS presentation of Germany, made by Stefanie Haase (Germany);
5. BASS presentation of Sweden, made by Anders Svenson (Sweden);
6. BIAS presentation of Finland, made by Juha Lilja (Finland);
7. BIAS presentation of Estonia, made by Elor Sepp (Estonia);
8. BIAS presentation of Latvia, made by Guntars Strods (Latvia);
9. BIAS presentation of Lithuania, made by Marijus Spegys (Lithuania);
10. BIAS presentation of Poland, made by Beata Schmidt (Poland);
11. BIAS presentation of Germany, made by Stefanie Haase (Germany);
12. BIAS presentation of Sweden, made by Niklas Larson (Sweden);
13. GRAHS presentation of Latvia, made by Guntars Strods (Latvia);
14. BITS presentation of Estonia, made by Elor Sepp (Estonia);
15. BITS presentation of Latvia, made by Ivo Sics (Latvia);
16. BITS presentation of Lithuania, made by Marijus Spegys (Lithuania);
17. BITS presentation of Poland, made by Krzysztof Radtke (Poland);
18. BITS presentation of Denmark, made by Marie Storr-Paulsen (Denmark);
19. BITS presentation of Sweden, made by Olof Lövgren (Sweden);
20. BITS presentation of Germany, made by Andrés Velasco (Germany);
21. CODS Q4 2022 presentation, made by Patrik Börjesson (Sweden);
22. SSS Q1 2023 presentation, made by Patrik Börjesson (Sweden);
23. Presentation about the effect of thermal parameters on the abundance of juvenile Bothnian herring, made by Nicolas Goñi (Finland);
24. DATRAS team status and updates, made by Vaishav Soni and Adriana Villamor (ICES);
25. Presentation about ICES acoustic data portal and ICES Oceanography Data Portal, made by Hjalte Parner (ICES);
26. Presentation about the outcomes from WGAG, made by Elor Sepp (Estonia);
27. Presentation about the GoR pilot study, made by Elor Sepp (Estonia);
28. Presetation about latest TS studies, made by Jonas Hentati-Sundberg (Sweden);

29. Presentation about how expansion of offshore wind farms challenges the reliability of surveys, made by Stefanie Haase (Germany);
30. Presentation about the outcomes of WKUSER2 relevant for WGBIFS, made by Lewis Barnett (USA);
31. Presentation about an alternative method "balanced sampling",(made by Annica de Groote (Sweden);
32. Presentation about ToR a outcomes, made by Beata Schmidt (Poland);
33. Presentation about WGBIFS 2023 acoustic tuning series, made by Olavi Kaljuste (Sweden).

All these presentations are available in the folder “Presentations” in the WGBIFS 2023 SharePoint site.

# Supplementary Document 1: Standard and Cruise Reports of BITS surveys at the WGBIFS 2023 annual meeting

Please see Supplementary Document 1 at https://doi.org/10.17895/ices.pub.23675049 for the Standard and Cruise Reports of BITS surveys at the WGBIFS 2023 annual meeting.

# Supplementary Document 2: Cruise reports of BASS and BIAS surveys at the WGBIFS 2023 meeting

Please see Supplementary Document 2 at https://doi.org/10.17895/ices.pub.23675049 for the Cruise reports of BASS and BIAS surveys at the WGBIFS 2023 meeting.