International Bottom Trawl Survey (NS-IBTS2024-Q1)

- French cruise report –

Unité Halieutique Manche Mer du Nord - Laboratoire Ressources Halieutique
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Résumé/ Abstract : In 2024, the French NS-IBTS Q1 survey was conducted as part of the International Bottom Trawl Survey program carried out by main countries bordering the North Sea in order to assess abundance and stocks distribution, independently of commercial fisheries data. The first target of the NS-IBTS Q1 survey is to provide a diagnosis on the main commercial fish species by estimating their abundance per age. A standardized protocol is rigorously applied by all participants. The R/V Thalassa sampled the eastern part of the Channel and southern North Sea (until 55° N) from 20th January to 9th February 2024. During daily time, 50 hauls, lasting 30 minutes, have been carried out with a GOV bottom trawl. All collected species have been collected, determined and measured, 1916 otoliths (for age estimation) have been collected for 10 species, and 550 stomach (for trophic informations) have been collected for 4 species. This year, whiting (*Merlangius merlangus*) represented 60% of the total biomass caught followed by herring (*Clupea harengus*; 21%) and mackerel (*Scomber scombrus*; 9%). During the night, 89 MIK net have been deployed to calculate an index for herring, sardine and lemon sole larvae abundance. Within each station, a CTD sensor was deployed to record environmental parameters (e.g., temperature, salinity and oxygen) all along the water column, from surface to bottom. In order to study the whole marine ecosystem, some additional studies were carried out in the context of the Marine Strategy Framework Strategy and for various research projects.	
Mots-clés/ Key words: North sea, GOV, bottom trawl, MIK, abundance, stock assessment.	
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Summary

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1 The International Bottom Trawl Survey (IBTS)

1.1 History of the survey

In spring and autumn of the years 1960 and 1961, a series of four large international research vessel trawl surveys were organized under the auspices of ICES, to map the distribution of juvenile herring *Clupea harengus* in the North Sea and to investigate the links between herring nursery grounds and the adult populations (ICES, 1963). In the following years most of the countries participating in the former exercise continued similar surveys.

From 1966 onwards these surveys were conducted annually with the objective of obtaining annual recruitment indices for the combined North Sea herring stocks. Gradually additional countries started to participate in the survey, which was named the "International Young Herring Survey" (IYHS) in 1981. For the first few years, sampling was restricted to the southern and central North Sea and, beginning in 1969, the Skagerrak and Kattegat. Although the emphasis from the start of the surveys focused mainly on herring, data collected for whiting (*Merlangius merlangus)* were also analyzed. In the course of the 1970s it was realized that the IYHS could be useful for providing recruitment indices not only for herring, but also for roundfish species such as cod (*Gadus morhua)*, haddock (*Melanogrammus aeglefinus)* and whiting. This growing interest resulted in a northwards extension of the survey area and the whole North Sea, Skagerrak and Kattegat have been surveyed since 1974.

Apart from the international IYFS, these surveys were composed of at least seven national surveys. The IYFS working group proposed to combine the IYFS and the national surveys in Quarterly Coordinated Surveys in the North Sea, Skagerrak and Kattegat, which were to be known as the International Bottom Trawl Surveys (IBTS). It was recommended that quarterly surveys should run for a period of five years. These surveys should provide a full description of the seasonal distribution of the stocks sampled, which was considered urgently needed for the further improvement of multispecies assessments and the development of spatially disaggregated assessment models. This proposal resulted in a series of six years with quarterly surveys, which, with a few exceptions, covered the whole survey area in the North Sea, Skagerrak and Kattegat. Subsequently, it has proven impossible to maintain these high levels of research vessel effort, especially as research budgets have decreased in most countries and, from 1997, the majority of countries have only carried out a survey twice a year; a first quarter survey (January-February) and a third quarter survey (August -September). Having evolved from a herring survey, when only pelagic data were collected, the IBTS survey dataset is now made up of data collected on all finfish species. However, survey dataset is now made up of data collected on all fish species. Since 2006, the 1st quarter IBTS survey perform additional tows in the Eastern English Channel as part of the standard IBTS survey.

1.2 Objectives of the survey

The North Sea IBTS Q1 survey aims to provide biological data for stock assessment working groups (International Council for the Exploration of the Sea) and to science groups who notably examine spatio-temporal patterns in fish abundances, community structure or individual parameters. The main objectives are:

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

1.3 Methods

1.3.1 GOV bottom trawl (fish and benthic macroinvertebrate communities)

The current stratification of the survey has always been grid-based, using ICES statistical rectangles of roughly 30 x 30 nautical miles (1 degree longitude x 0.5 degree latitude; see Figure 1). These rectangles were convenient to use for stratification of the survey because they were already being used for fisheries management purposes. Typically, each rectangle is sampled with two hauls, by two different countries/vessels, where logistically possible. The priority is given to sample all rectangles rather than performing the two hauls per ICES rectangle. The rectangle allocation between countries is assigned annually by the IBTS working group and, if necessary, by the international coordinators prior to and during the survey. The vessels are free to choose any position in the rectangles as long as the hauls are separated by at least 10 nautical miles where possible, except where nations take more than two tows per rectangle. Whenever possible, tows in adjacent rectangles should be separated by at least 10 miles.

Since 1983 all nations use the GOV 36/47 (‘Grande Ouverture Verticale’), with a 20 mm stretched mesh size in the codend. Since 1992, it constitutes the recommended standard gear of the IBTS (Figure 2). A standard fishing speed is between 3.4 and 3.8 knots during 30 minutes. Start time is defined as the moment when the vertical net opening and doorspread are stable. Stop time is defined as the start of the winches hauling the net back in. It may be acceptable to fish for less than 30min (for safety reasons or for very large catches), however, tow under 15 minutes should be tagged as non-standard and associated reasons must be given. As a minimum, vertical net opening (distance between the groundrope and the headline) and doorspread should be monitored during the haul (Figure 2), and after appropriate filtering for invalid values, the mean values should be reported. It is also recommended to measure the wing spread distance.

Since 2024, invalids GOV (breaking GOV or tow under 15 minutes) have been studied to have some informations for the presence of diversity and have some fish biological data.

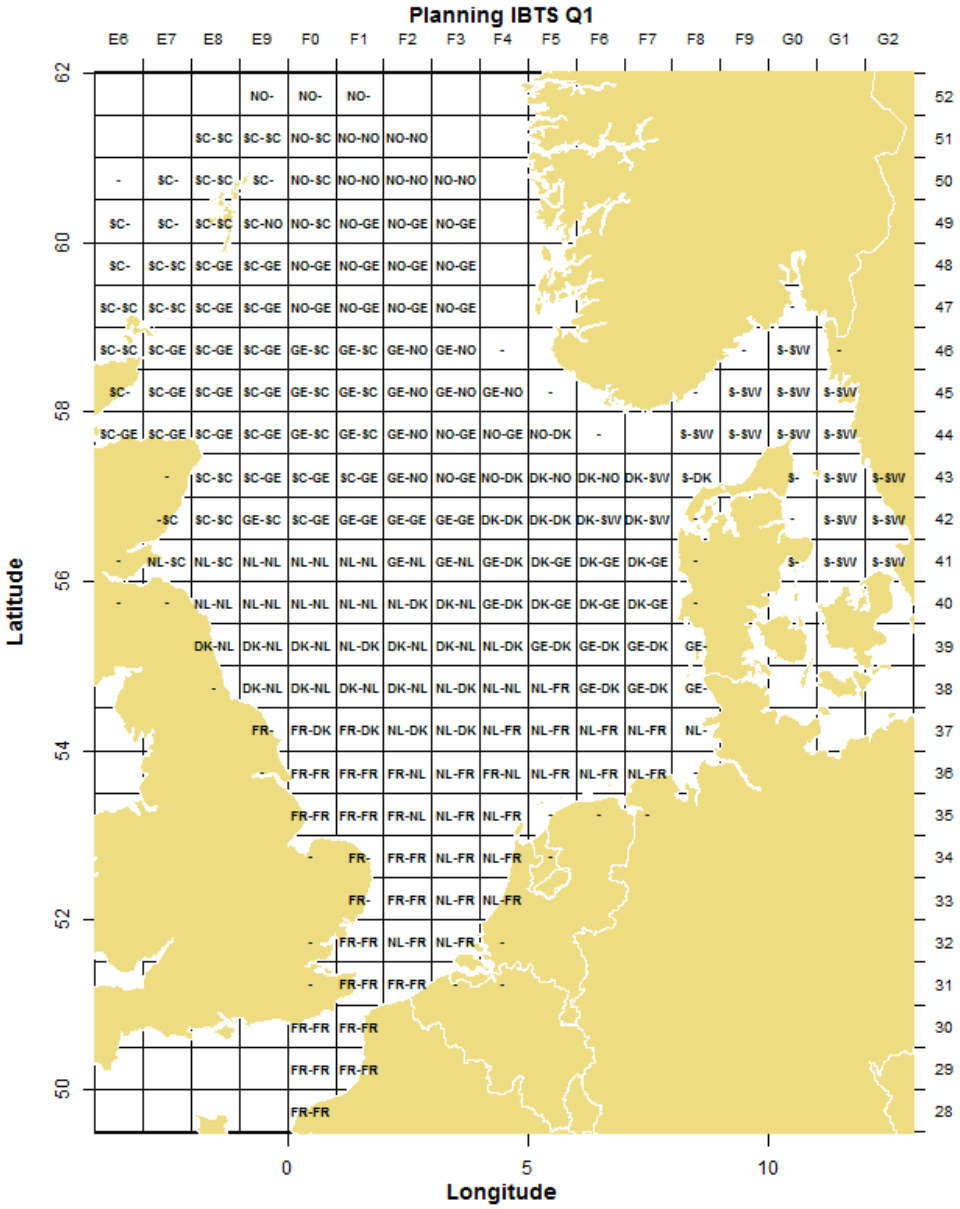

Figure 1: Allocation map for all participants (FR: France, NL: Netherlands; GE: Germany, DK: Denmark, SW: Sweden, SC: Scotland, NO: Norway)

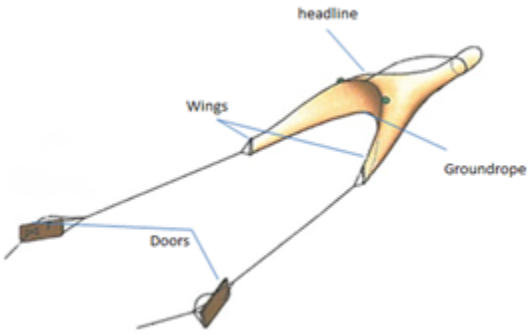

Figure 2: Illustration of a standard ground gear. To record trawl parameters, sensors are fixed on the doors, on the wings and on the middle of the headline.

1.3.2 MIK net (Fish larvae sampling)

The Methot Isaac Kidd (MIK) net is a midwater ring trawl usually deployed to sample fish larvae during the 1st quarter survey (ICES, 2017) illustrate in figure 3A. At least 2 hauls per ship per rectangle are made within each ICES rectangle and the distance between hauls mustn't be less than 10 nautical miles. Hauls should only be made during the period between 60 minutes past sunset to 60 minutes before sunrise. Fishing speed is 3 knots through the water. The haul profile is oblique to 5 meter above the bottom (Figure 3B). Maximum depth of tow should, however, be 100 meters. If the haul duration of a single oblique haul is less than 10 minutes a double oblique haul must be made. The wire is deployed/retrieved at a speed of 25 and 15m/min, respectively. All collected samples must be preserved in either 4% formalin in freshwater. Larvae are then identified and measured. Data are finally included in an International database and used just after the survey by the Herring Assessment Working Group (HAWG).

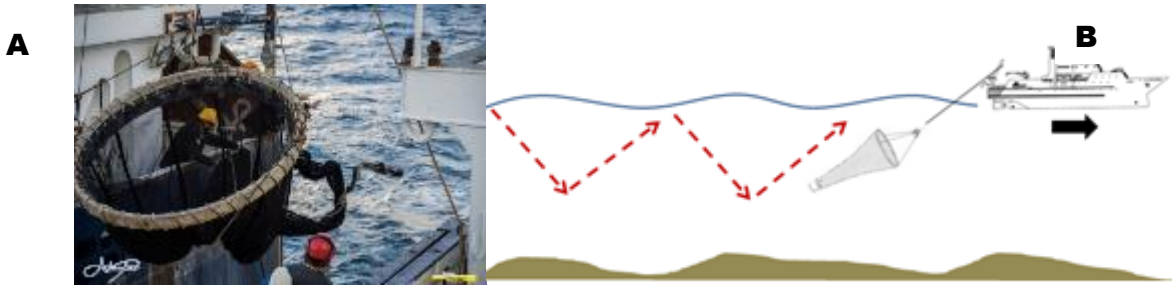

Figure 3: A. MIK net used during the Survey (13 meters long) B. During at least 10 minutes, the net goes down near the bottom (5-7 meters) and it is retired immediately in order to have an oblique haul.

2 International preliminary results of the 2024 IBTS survey

After the survey, all the data from all the participating countries have been stored in the ICES database (DATRAS: https://www.ices.dk/data/data-portals/Pages/DATRAS.aspx). These data are used by the different working groups that are in charge of assessing fish stocks. The first groups which need IBTS survey data are the "Herring assessment working group for the Area South of 62° N" immediately after the survey in March, and the IBTS working group which meets in April to coordinate all bottom trawl survey. In this report, some preliminary data are presented. More results will be available soon in the reports of these groups and available on the ICES website (http://www.ices.dk/community/groups/Pages/default.aspx).

2.1 General overview

For the quarter 1 of 2024, the fleet consisted of six vessels: "Dana" (Germany), "GO Sars" (Norway), "Scotia III" (Scotland), "Thalassa II" (France), "R/V Svea" (Sweden), "R.V. Tridens II" (Netherlands) and "Dana" (Denmark). The survey covered the period from 12th January to 23rd February 2024 (Table 1). A total of 344 GOV hauls and 578 MIK hauls were deployed. Most ICES-rectangles were covered by at least 1 GOV haul (Fig. 4), 1 CTD water-column profiles, and at least 2 MIK hauls. Next to the GOV and MIK tows all countries have collected additional data like sea floor litter from the GOV tows.

country	ship	dates
Denmark	**Dana**	**12-01 to 30-01**
France	**Thalassa II**	**19-01 to 10-02**
Germany	**Dana**	**31-01 to 19-02**
Netherlands	**R.V. Tridens II**	**22-01 to 23-02**
Norway	**G.O. Sars**	**23-01 to 16-02**
Scotland	**Scotia III**	**22-01 to 12-02**
Sweden	**R/V Svea**	

Table 1: Overview of the surveys performed during the North Sea IBTS Q1 survey in 2024

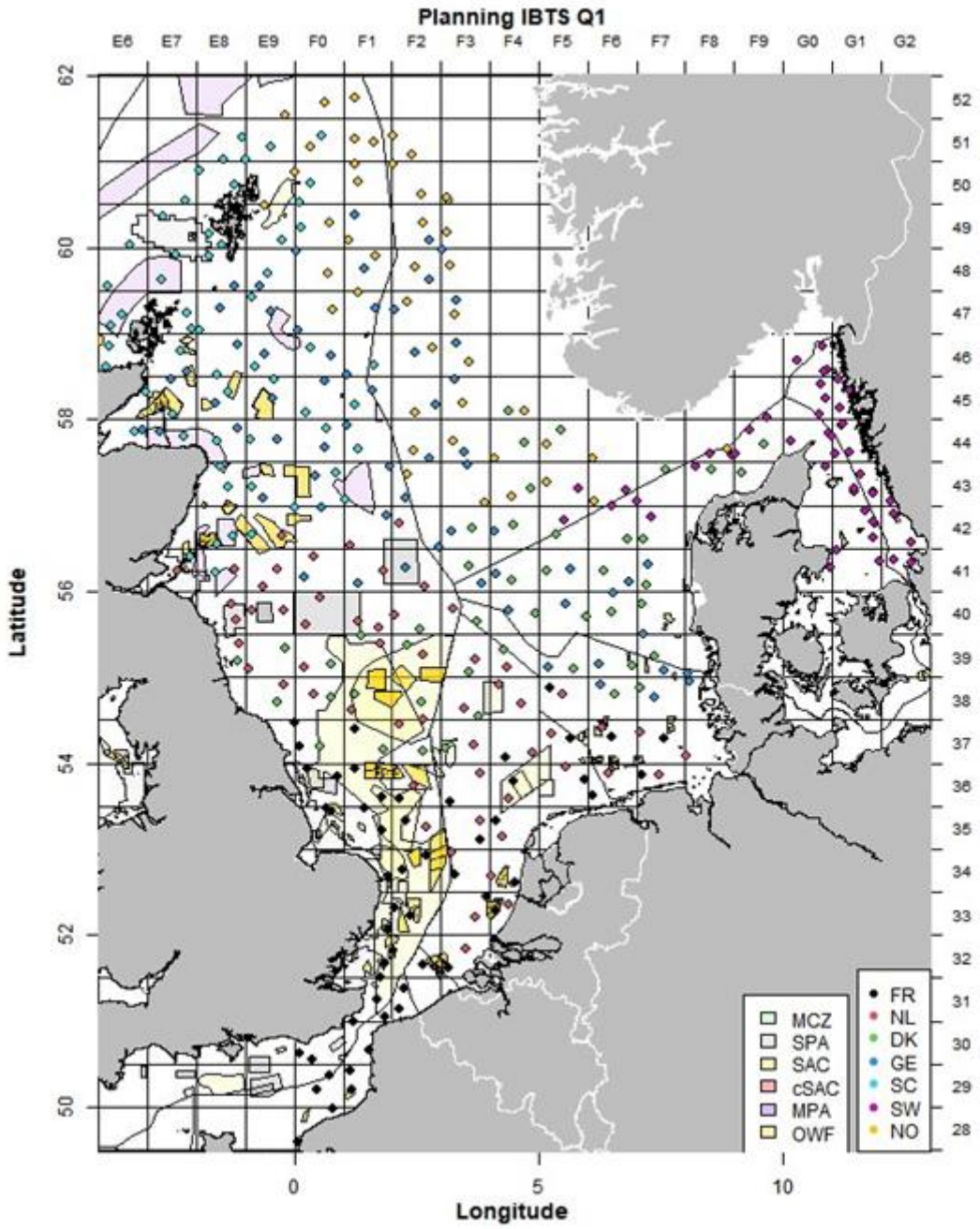

Figure 4: Number of hauls per ICES rectangle with GOV during the North Sea IBTS Q1 2024 and the start positions of the trawl by country.

2.2 Fish recruitment indices

The figure 5 shown the preliminary indices for the recruits of seven commercial species based on the 2024 quarter 1 survey. According to these preliminary results, all densities (number of individuals per haul of trawling) were substantially below the average over the last 40 years. Especially for sprat abundances were particularly high and close to the highest values observed in the entire time series. For cod, herring and haddock, we observed the lowest abundance since 1980.

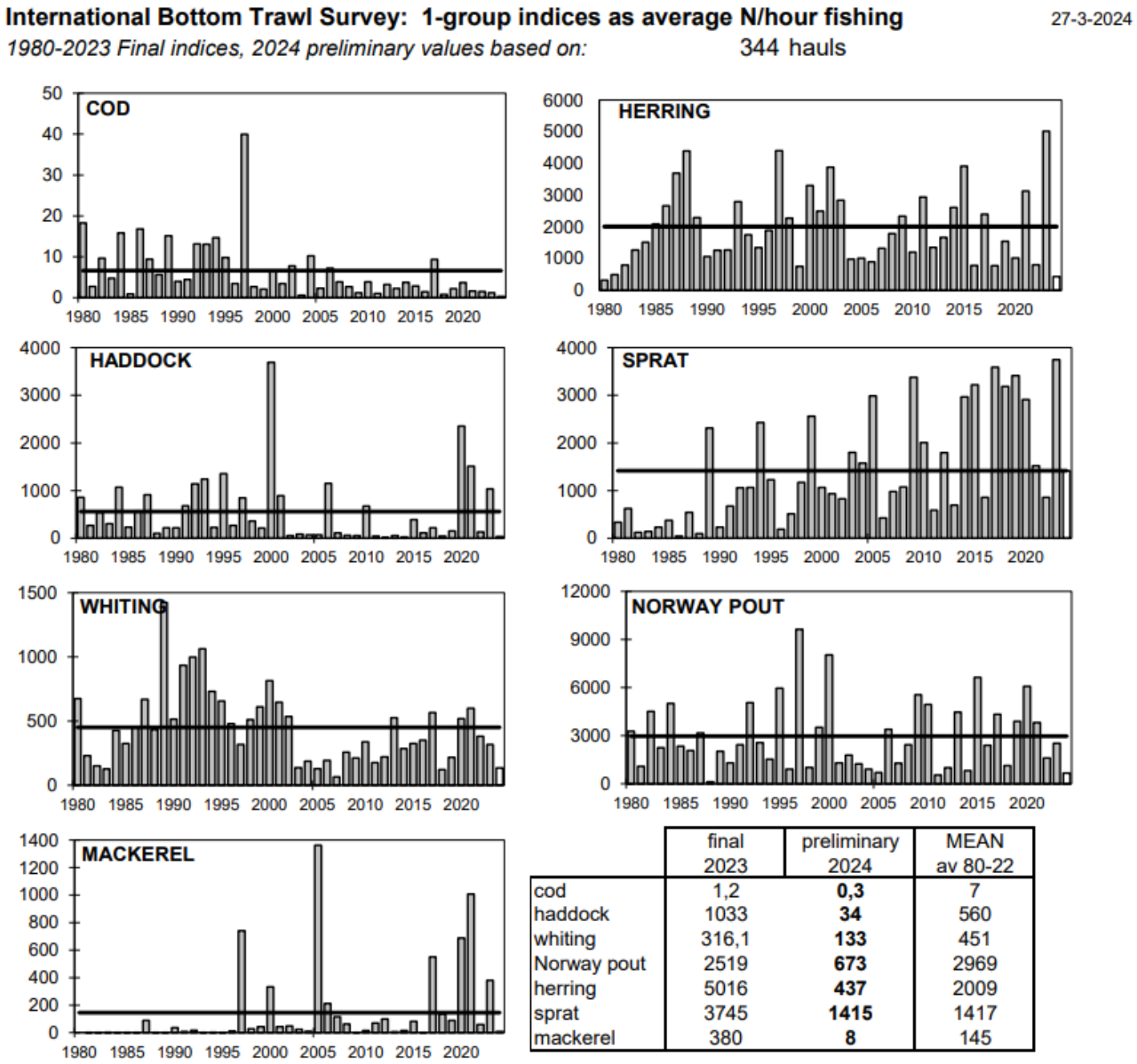

Figure 5: Time-series of indices for 1-group (1-ring) herring, sprat, haddock, cod, whiting, Norway pout, and mackerel caught during the quarter 1 IBTS survey in the North Sea, Skagerrak and Kattegat. Indices for the last year are preliminary, and based on a length split of the catches. Horizontal line is the mean for the period 1980-2024

2.3 Herring larvae indices

For the ICES Herring Assessment Working Group for the area South of 62°N (HAWG), the IBTS survey provides recruitment indices and abundance estimates of adults. Sampling at night with fine meshed nets (MIK; Midwater Ring Net) was implemented from 1977 onwards, and the catch of herring larvae has been used for the estimation of 0 ringer abundance in the survey area. The abundance of 0 ringers in the survey area is used as recruitment index for the North Sea herring stock. The results of this group will soon be available under the following link: https://www.ices.dk/community/groups/pages/hawg.aspx

3 The IBTS 2024 survey on research Vessel Thalassa

3.1 Survey planning

The R/V Thalassa left Boulogne-sur-Mer (France) the 23rd of January (Fig 6) and field work started in the Eastern English channel (EE). Work in EE was finished the 27th of January, and the program continued in the North Sea from 28th January to 14th February before coming back to Boulogne-sur-Mer (France). There was a stop in Scheveningen (Netherland) as previous years for scientific staff turnover on February 3rd.

Figure 6: R/V Thalassa navigation during IBTS Q1 2024.

3.2 Participants

The team was composed of 22 scientists from various institutes and Universities. During the survey, scientists were allocated to different teams. There is one mission chief. In the 'fish laboratory', 10 scientists have sorted and measured catches, collected otoliths and various biological samples. In the 'hydrological laboratory', 8 scientists take turns during day and night to carry out the various devices as SBE probe (temperature, salinity, etc.), Niskin bottle (suspended matters, nutrients, chlorophyll a, etc.), WP2 (for zooplankton), CUFES (for fish eggs), Manta (for microplastics), fluoroprobe and cytocence (algae fluorescence), and MIK net (for fish larvae). Three scientists get inboard for the Eastern Channel part to enumerate marine mammals, seabirds and litter.

3.3 Results from the french part of NS-IBTSQ1 survey

3.3.1 Fish communities

A total of 10 fishing stations were carried out in the Eastern English Channel and 40 in the North Sea. At least one 30 min haul was performed in each ICES rectangle during day time. In the English Channel and the Strait of Dover, the sampling level was higher with 2 hauls per rectangle. Figure 7 shows the position of GOV hauls. The trawl used was the standard GOV 36/47 as described paragraph 1.3.1.

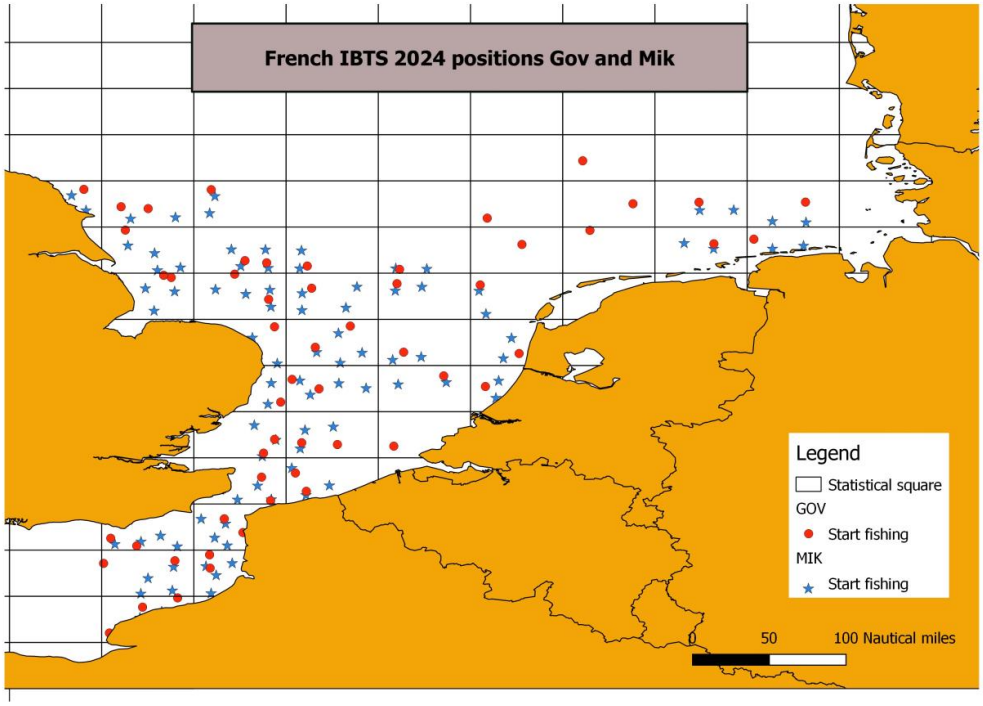

Figure 7: Positions of GOV hauls

After each haul, the catch was treated by the team following successive steps. Firstly, it is recommended to sort the total catch when possible, with fish and shellfish species identified to the lowest taxonomic level (i.e., species). For larger catches of certain species/size categories, subsamples are performed. Invertebrate species ('benthos'), were also sorted even if the GOV is not an effective gear for this kind of organisms. However, the GOV is recognized as a sufficient tool to study the spatial distribution of macroinvertebrates through presence/absence data, abundance data are less reliable to study their biodiversity patterns. The marine litter caught in the net is also counted across several categories by following a standard protocol. Size and weight of various wastes as plastics, clothes, fishing lines, are recorded within each haul.

Length distributions were recorded for all fish species caught. Length is measured to 0.1cm below for shellfish, to 0.5 cm below for herring, anchovy, sardina and sprat, and to 1 cm below for all other species. In order to obtain age-length key, otoliths samples were collected for main commercial species: The otolith is a calcified piece found in the internal ear of the fish and used to estimate the age. Table 2 provides the number of otoliths collected on the main commercial fish species as herring, sprat mackerel, cod, haddock, whiting, and also for other species. In the same time, for species in the table 3, we collected stomachs to better determinate trophic interactions between species. Sex, maturity and weight data were also reported for all the target species for which age data are collected.

Table 2 : Number of otoliths samples

Species	Age	Species	Age
Merlangus merlangius	426	Gadus morhua	67
Clupea harengus	252	Mullus surmuletus	131
Sprattus sprattus	267	Dicentrarchus labrax	73
Pleuronnectes platessa	494	Solea solea	31
Trispoterus esmarkii	0	Melanogrammus aeglefinus	175

Table 3 : Number of stomachs samples

Species	Stomach	Species	Stomach
Pleuronnectes platessa	474	*Scophthalmus rhombus*	3
Chelidonichthys lucerna	64	*Scophthalmus maximus*	9

3.3.2 Species distribution and community structure

During this survey, fish species (included sharks, rays and cephalopods), including commercial mollusc and crustacean were caught and measured. The Figure 8 illustrates the main species caught: As usual, whiting (*Merlangius merlangus*) was the most dominant species (in biomass density) and represented 60 % of the total catch, followed by herring (*Clupea harengus*; 21%), mackerel (*Scomber scombrus*; 9%), Dab (*Limanda limanda*; 3%), sprat (*Sprattus sprattus*; 2%), and small-spotted catshark (*Scyliorhinus canicula*; 3%).

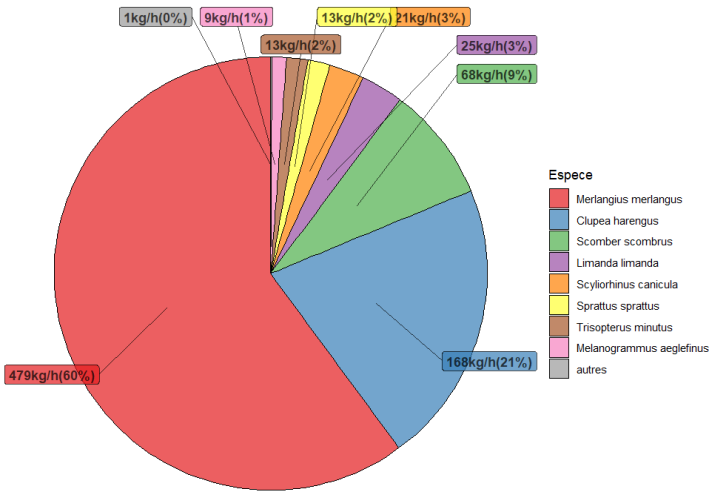

Figure 8: Main species biomass in the total catch

3.3.2.1 *Clupea harengus (Herring)*

The length distribution (Fig. 10) clearly shows the separation between juveniles (less than 20 cm) and adults' cohorts. This year, adults presented substantially higher densities than in 2023. On the map distribution (Fig. 11), herring was distributed on the whole area and was mostly abundant in the English Channel for reproduction.

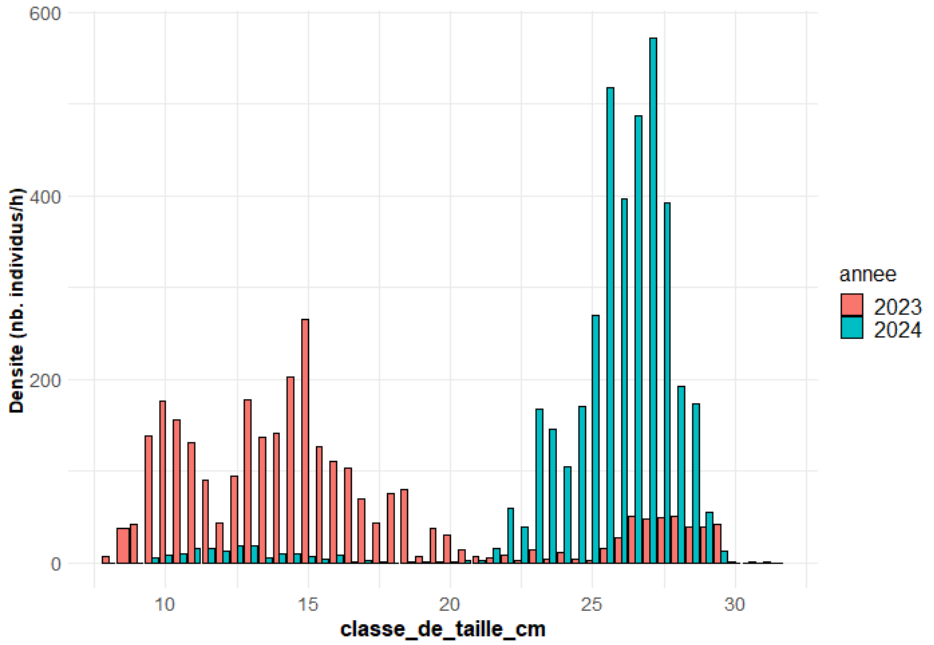

Figure 9: Herring length distribution

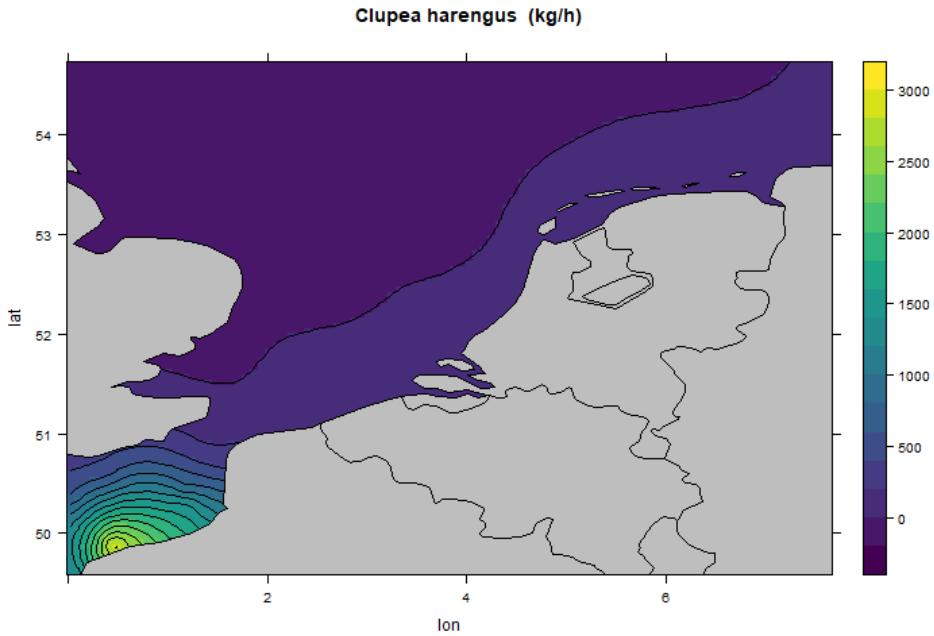

Figure 10: Herring distribution map (Biomass by hauls and length class in mm)

3.3.2.2 *Sprattus sprattus (Sprat)*

Adults were more abundant (Fig. 12) in comparison to 2023. Sprat has a short life (5 years) and is mainly caught by industrial fleets to be processed in animal meal; but there is also a fishing activity in the English Channel for human consumption. On the map distribution (Fig. 13), sprat was present on the whole area and was particularly abundant in the English Channel and the Southern North Sea (SNS), near French and Belgian coast.

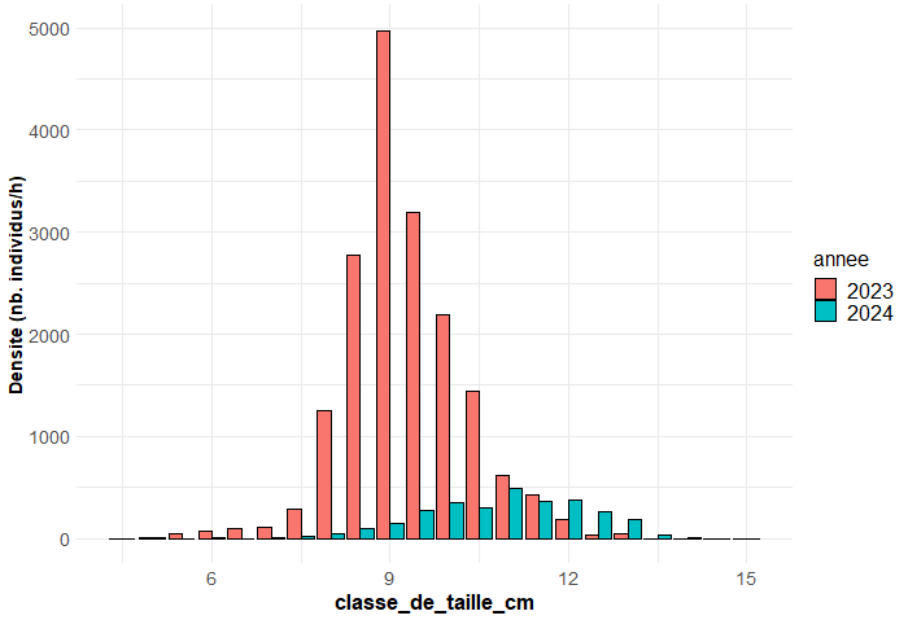

Figure 11 : Sprat length distribution

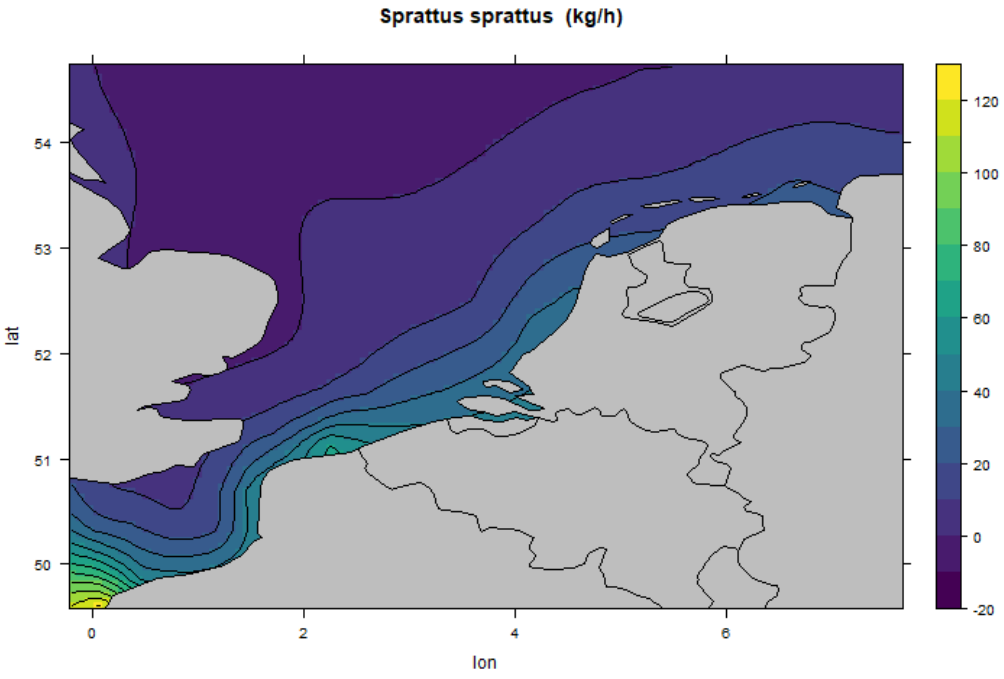

Figure 12 : Sprat distribution map (biomass in kilos per haul and length class in mm)

3.3.2.3 *Merlangus merlangius (whiting)*

The whiting is an important species for french artisanal fisheries and represent near from 90% of international landing in south of North Sea and Eastern Channel (Carpentier et al., 2009). This year, the whiting represented 60% of the total biomass caught by the Thalassa vessel. The length distribution (Fig. 14) is grouped around 15 cm and 32 cm. They correspond to juvenile's cohort, for this species the length of the first maturity is around 25 cm (2 years old). Compared to 2023, the mean density increased whatever the length class. The whiting was present on almost all hauls, highest quantities were noticed in the Strait of Dover and northern SNS (Fig. 15).

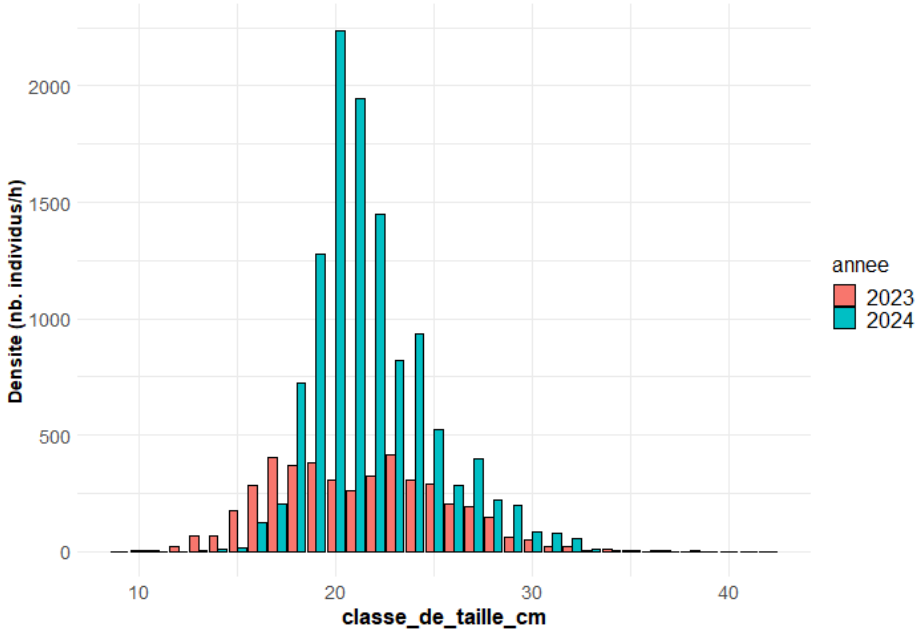

Figure 13 : Whiting length distribution

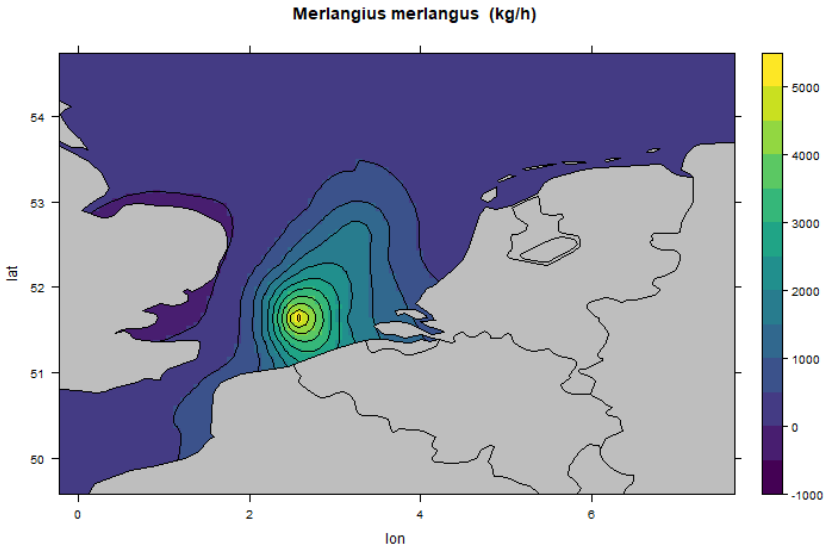

Figure 14 : Whiting distribution map (biomass in kilos per haul and length class in mm)

3.3.2.4 *Limanda Limanda (Dab)*

The dab length distribution in 2024 was quite similar than 2023 but a small dicrease was observed for smallest dab (individuals smaller than 18 cm; Fig. 16). Dab was widely distributed on the whole SNS but particularly on the northeastern part (Fig 17).

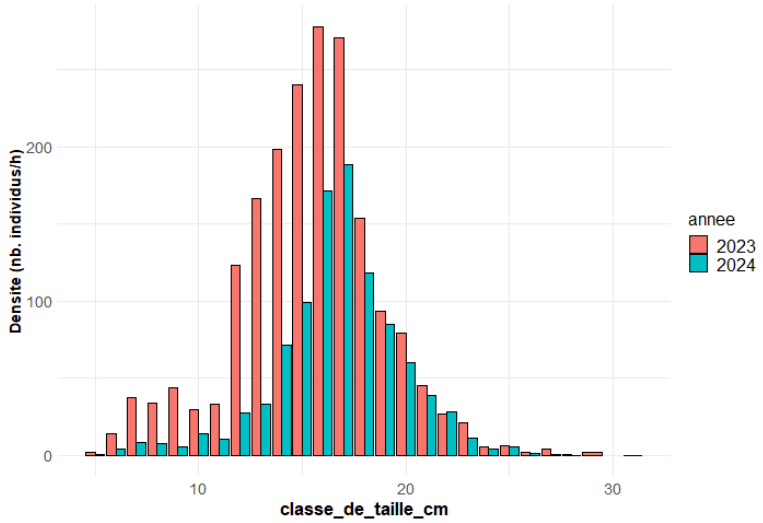

Figure 15: Dab length distribution

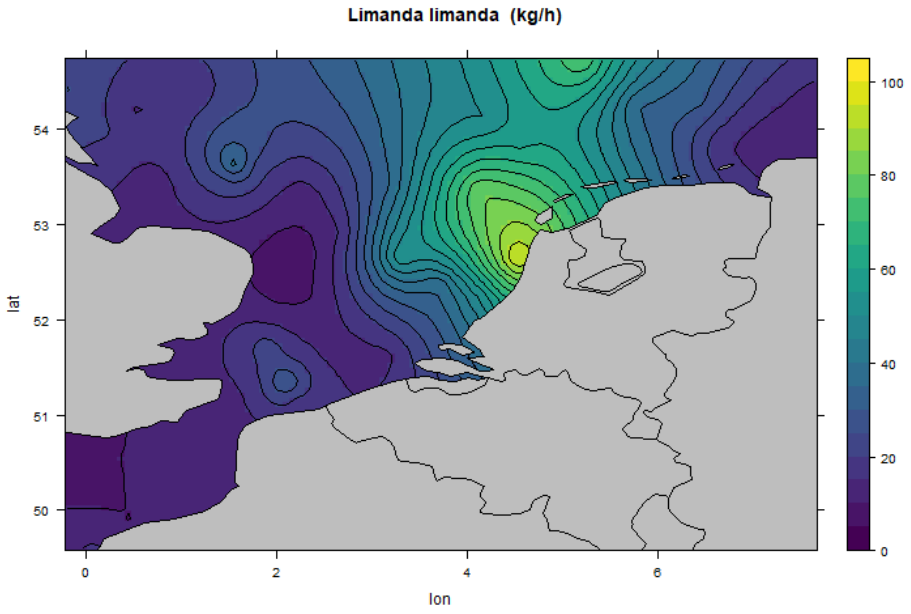

Figure 16 : Dab distribution map (biomass in kilogram per haul and and length class in mm)

3.3.2.5 *Gadus morhua (Cod)*

The cod was often present in all hauls but in very small quantities. The highest quantities were observed in the Strait of Dover (Fig. 19).

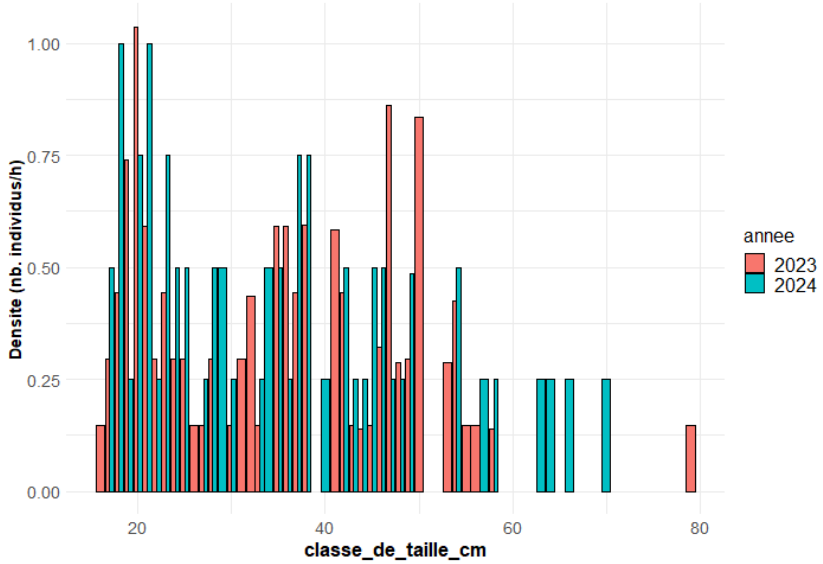

Figure 17 : Cod length distribution

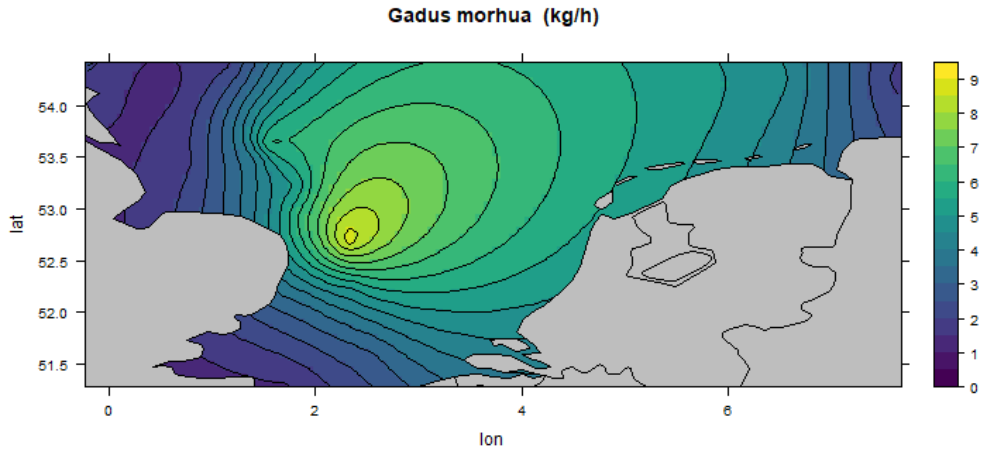

Figure 18 : Cod distribution map ((biomass in kilos per haul and mean length class per haul)

3.3.2.6 *Mullus surmuletus (Red mullet)*

The red mullet is an economically important species for trawlers and seiners working in the Channel and in the southern North Sea. The length distribution is characterized by two distinct cohorts (Fig 20). This year, abundance densities were slightly superior to those measured in 2023 for adults. As the spatial distribution shown in figure 21, red mullet was mostly present on the Eastern English Channel.

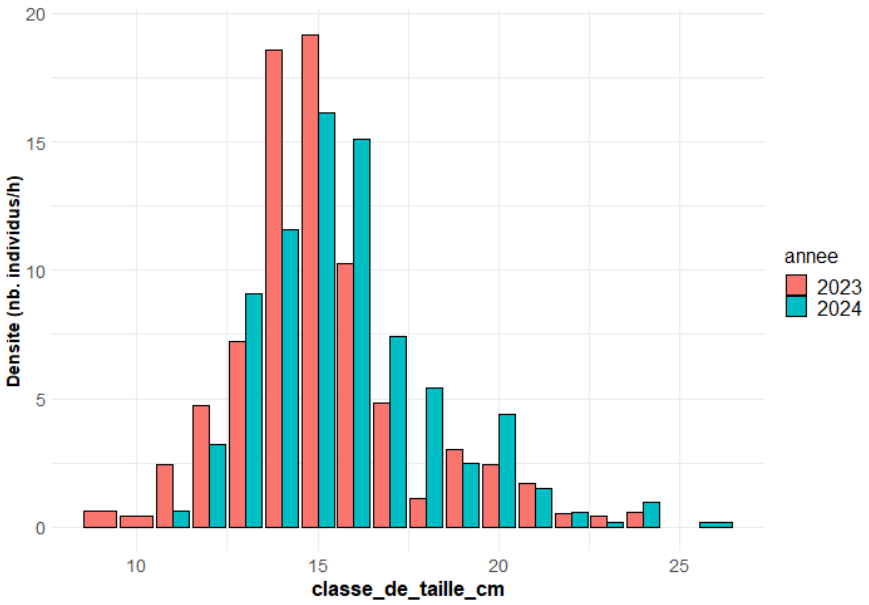

Figure 19 : Red mullet length distribution

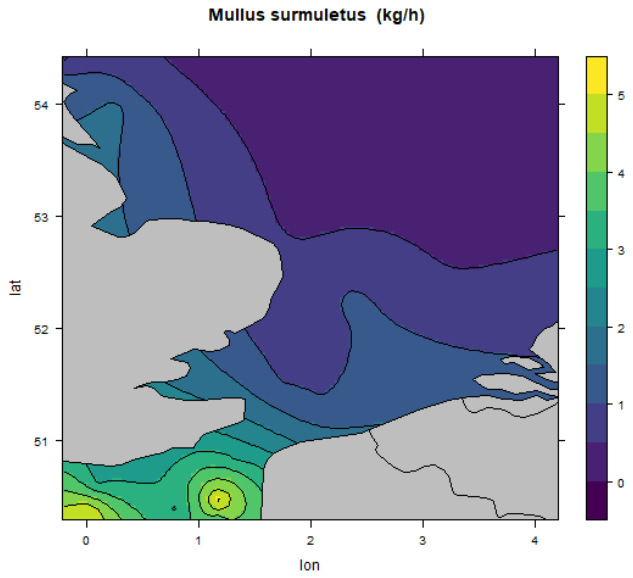

Figure 20 : Red mullet distribution map ((biomass in kilos per haul and mean length class per haul)

3.3.2.7 *Pleuronectes platessa (Plaice)*

Plaice is mainly caught in bottom trawl fisheries, especially as a bycatch for undersized plaice, or even target by gill net in the eastern channel. Fishes around 11 cm, representing plaice juveniles (1 years old), were particularly less abundant than 2023. For adults, the representation in length is similar compared to 2023 (Fig. 22). Plaice were present on the whole area, as well in the North Sea as the English Channel, and juveniles were mainly located along the English coast (Fig. 23).

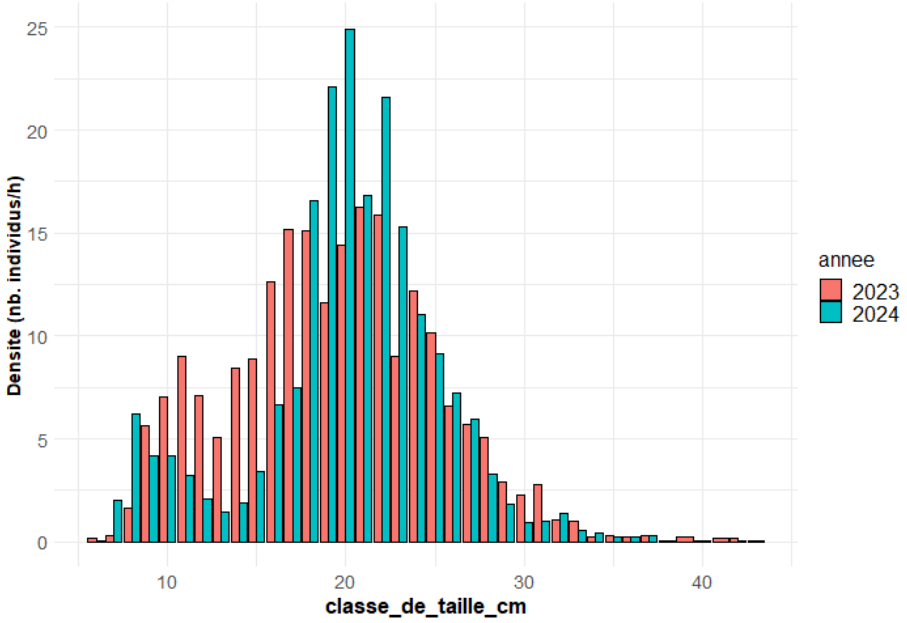

Figure 21 : Plaice length distribution

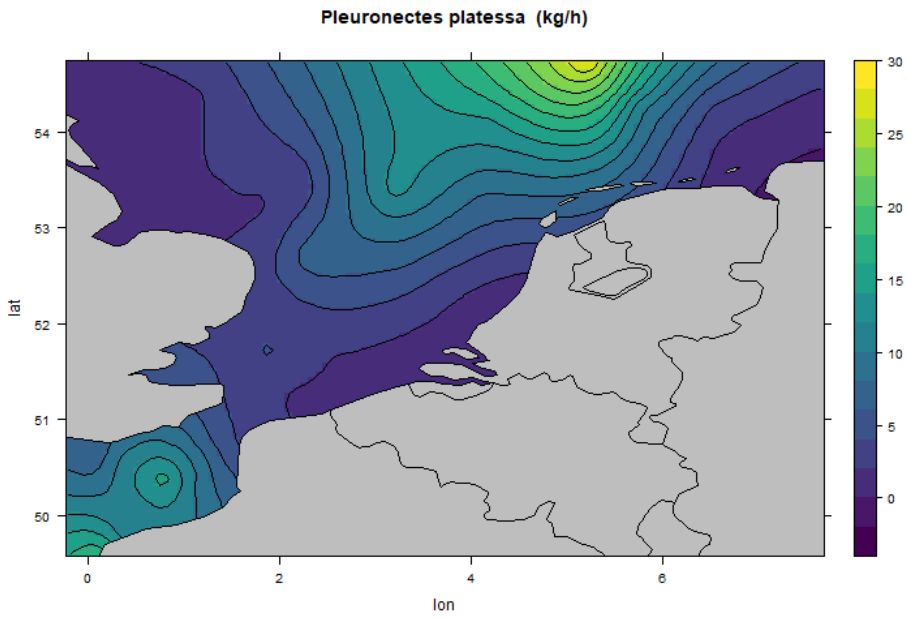

Figure 22 : Plaice distribution map (biomass in kilos per haul and length class in mm)

3.3.3 Fish larvae

A MIK net was used to sample herring larvae and thus assess their abundances (see paragraph 1.3.2). At each station (with 2 stations within each ICES rectangle), an oblique haul of at least 10 minutes duration (depending on the depth) was performed during the night. In the Eastern English Channel 20 stations were made and 87 in the North Sea (Fig 24). Clupeids larvae were sorted and measured at the laboratory ashore.

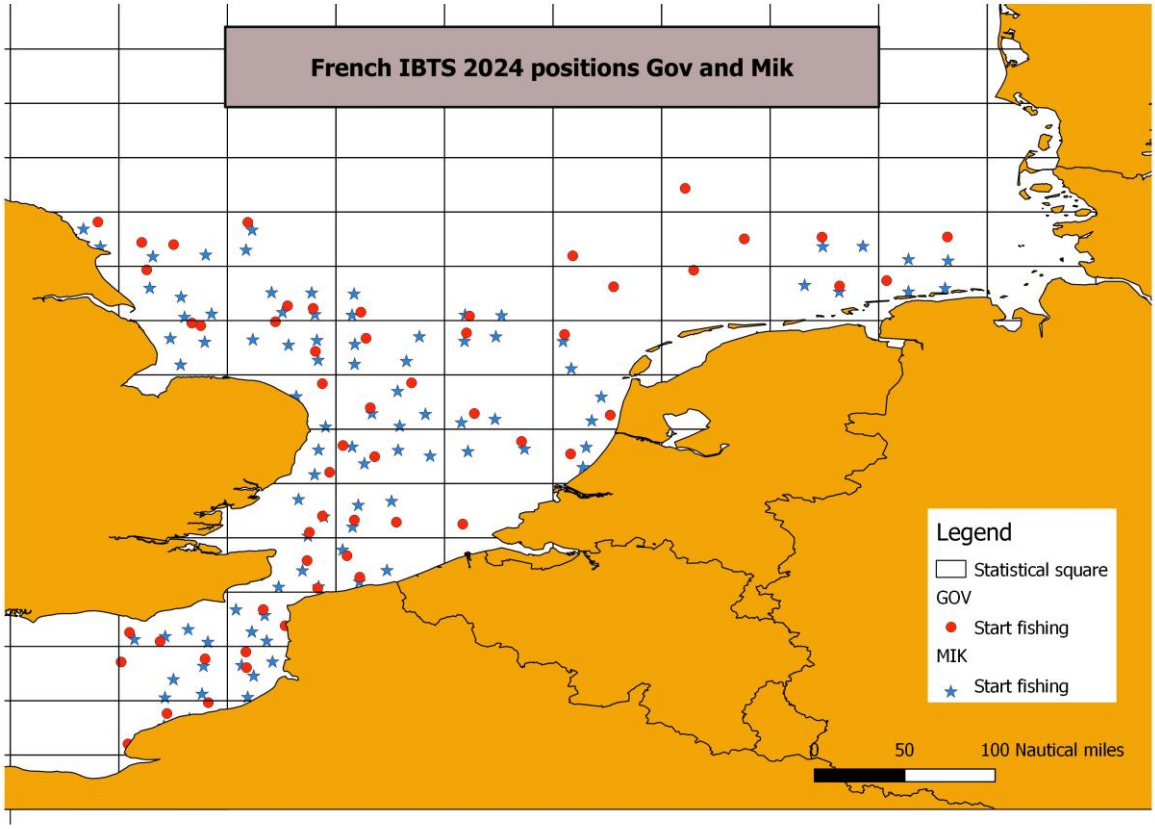

Figure 23 : positions of MIK net stations

Because the assessment Working Group for herring stock in the North Sea is early after the survey, it is essential to prepare data rapidly. So, for MIK samples, clupeids larval are firstly removed and determined. The other larval are sorted latter. Generally, two clupeids are caught during this survey: sardine and herring.

3.3.3.1 Herring's larvae

Herrings larvae (median length=11mm; Fig. 25) were caught mainly in the English Channel and along the Dutch coasts (Fig. 26) and correspond to the Downs herring (Dickey-Collas 2010) born during the winter. We can observe this year a low abondance of herring larvae

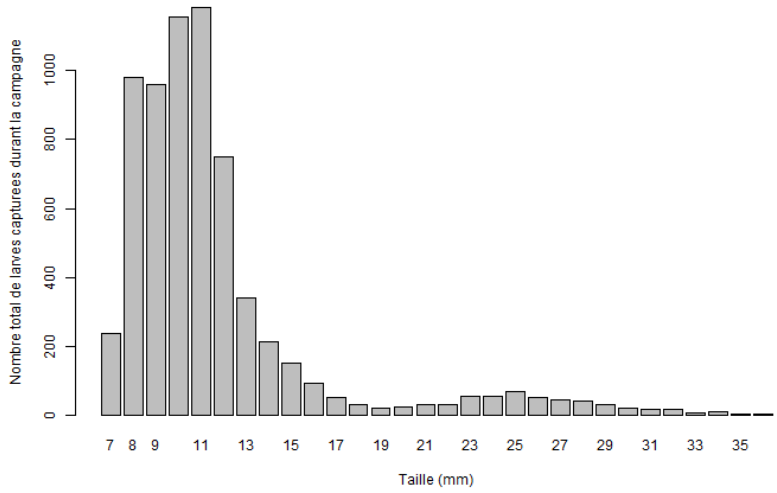

Figure 24 : Herring size distribution during french IBTS-Q1 2024

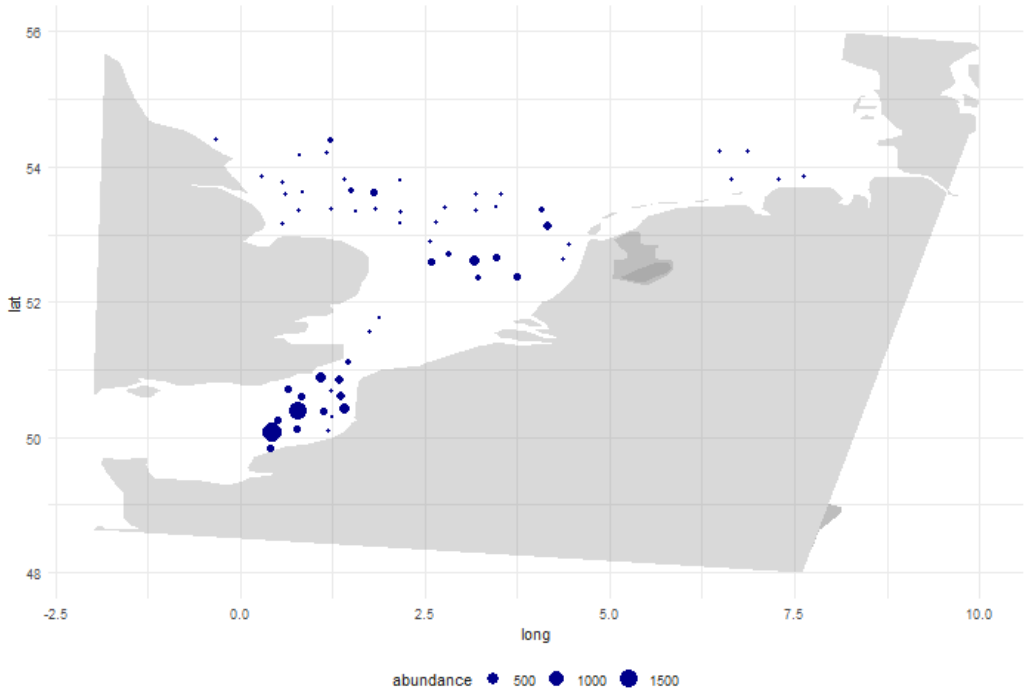

Figure 25 : Herring larvae distribution during french IBTS-Q1 2024

3.3.3.2 Sardine's larvae

Sardines larvae (Fig. 27) were mainly caught around the Straight of Dover and northern SNS (Fig. 28).

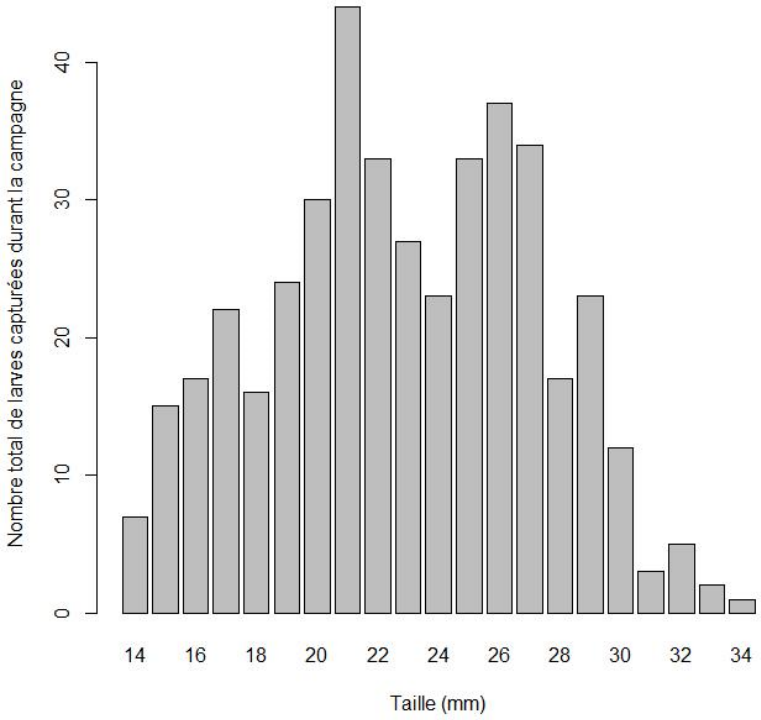

Figure 26 : Sardine size distribution during french IBTS-Q1 2024

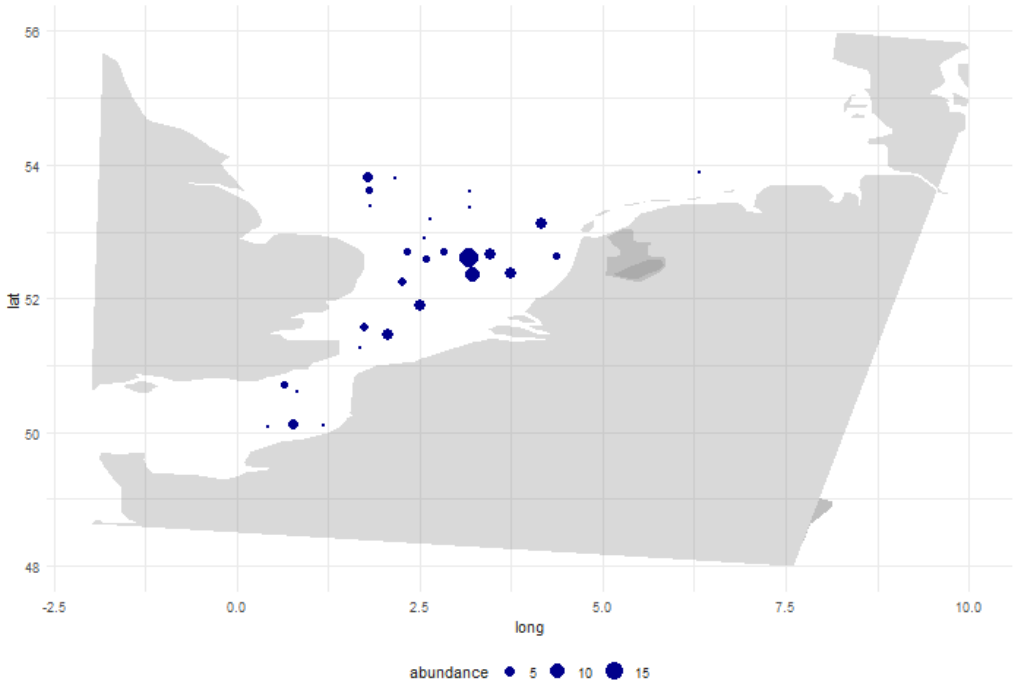

Figure 27 : Sardine larvae distribution during French IBTS-Q1 2024

3.3.4 Sea water parameters

A CTD sensor (Seabird19) was submerged after each GOV and MIK hauls to measure in priority temperature and salinity in the whole water column (Fig 29). Several sensors included in the CTD allowed measuring also other parameters as dissolved oxygen, turbidity, pH, conductivity, radiance, fluorescence and density.

After each station, Niskin bottle samples were filtered on board to measure concentrations of suspended matter and chlorophyll a. Two samples are collected then frozen to analyses chlorophyll and nutrient at the laboratory ashore.

Figure 28 : Hydrological station. The SBE 19 sensor and the Niskin Bottle

Figures 30A and 30B respectively show temperature and salinity measures at the sea surface in the English Channel and in the North Sea for 2024 survey. These 2 parameters were automatically recorded along the ship route every 30s with the Ferrybox. For the year 2024, the sea surface temperature was comprised between 5 and 10°C (Fig. 31A), salinity between 0 and 35.5‰ (Figure 31B). The rivers and estuaries influence on salinity is well identified by looking at Belgium, Netherland and German areas (Escaut, Rhin and Elbe River, respectively).

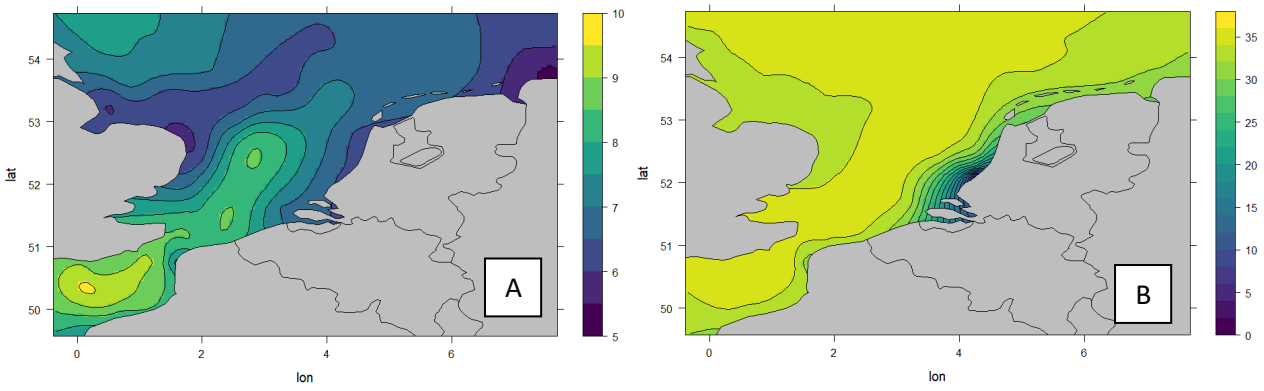

Figure 29 : 30A. Sea Surface temperature (°C) during IBTS2024, 30B. Sea Surface Salinity (‰) during IBTS2024

3.3.5 Fish eggs

Sea water was pumped at 3 meters under sea surface by the CUFES device (Continuous Underway Fish Egg Sampler) and filtered (Fig 31A). Every hour, along the ship route a sample was taken during all the survey (day and night). A total of 181 samples were collected in the English Channel and the North Sea (Fig 32). Each sample was analyzed by the Zoocam (Fig 31B). This device allows taking picture of each particle in the samples (eggs, copepods, dirts, etc.) and the images are analyses on ecotaxa (database).

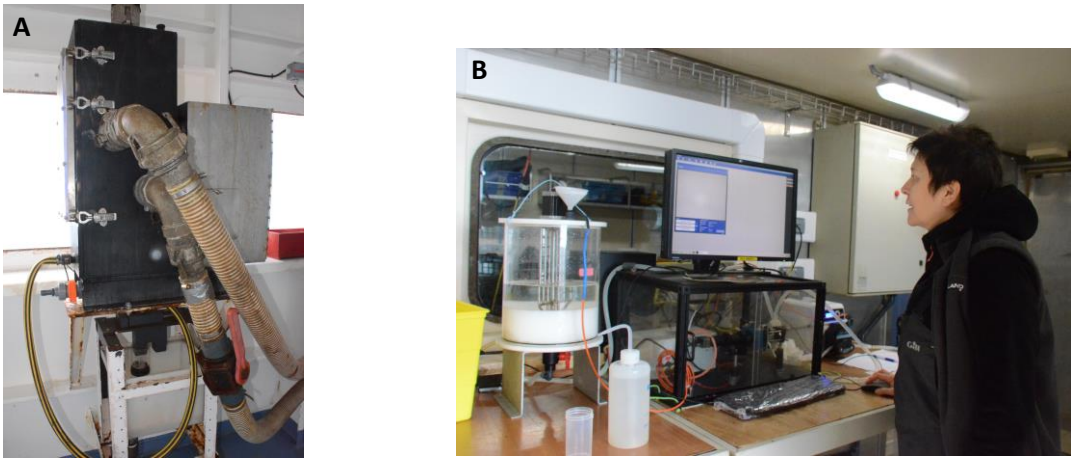

Figure 30 : 31A The Continuous Underway Fish Eggs Sampler. 31B Samples identification by the Zoocam device

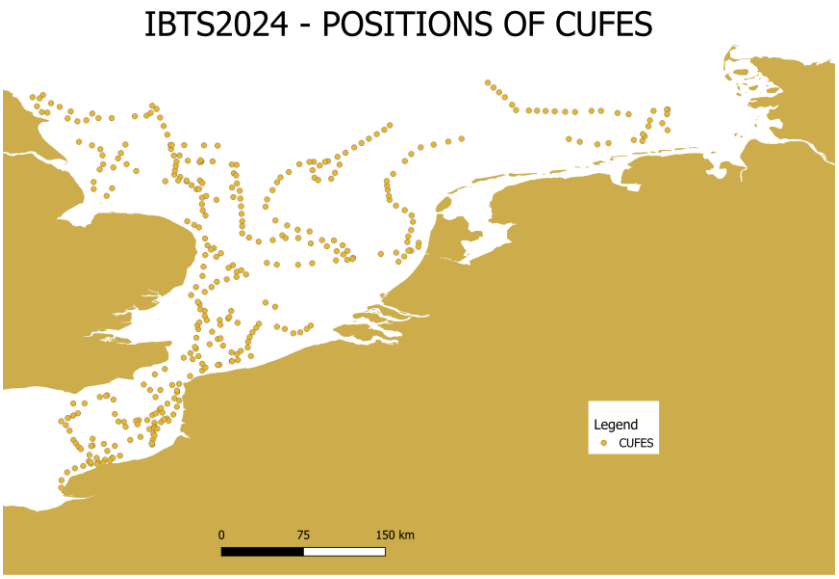

Figure 31 : CUFES Samples during the IBTS 2024 survey. One sample (pink point) is taken every hour.

3.3.6 Marine litter

Litters are collected in GOV and MIK. They have been determined per category, counted and weighed. The survey follow the ICES Manual for Seafloor Litter Data Collection and Reporting from Demersal Trawl Samples (ICES, 2022).

3.4 Additional works

3.4.1 Jellyfish and detritus from the GOV catch

At each haul, jellyfish and detritus are sorted, determined, measured and weighted.

3.4.2 Observations of birds, marine mammals and floating macro waste

Three scientists from Pelagis get in board in Brest to observe during the transit direction to Boulogne sur Mer before the beginning of the survey. Posted on the upper deck of the vessel, they determined and counted mammals and sea birds according to an International protocol. In addition, floating wastes and marine traffic were also assessed.

3.4.3 Microplastics

Surface water samples are collected each year since 2015, in order to assess plastic particle's concentrations (300µm<size<20mm). In 2024, because of bad weather conditions, only two samples were collected by using a 'Manta' net. These data are used to study spatial distribution and temporal variations in the aim to assess the ecological state of marine ecoregions.

Figure 32 : Manta net

3.4.4 Noise of the vessel

At the end of the survey, noise's data are registered from AIS.

3.4.5 Research Project

The French IBTS Q1 is also the opportunity for many researchers (French and not) to collect samples or data in the North Sea and Eastern Channel. In 2024, these additional works are presented in Table 3.

Table 4 : Research project participating to French NS-IBTS Q1

Name	Theme	Scientist in charge	Research Institute
	Liver worms in cod populations	Kai Wieland	Dtu Aqua
	Parasites in whiting, haddock, Norway pout, bib and poor cod populations	Ralf Van Hal	Wageningen University & Research
IRM Bergen	Parasites in pelagic and benthic species	Melanie Gay	Anses Boulogne sur mer
Paperfish	Parasites in whiting	Melanie Gay	Anses Boulogne sur mer
Fish & Click	Marine fishing litter	Sonia Mehault	IFREMER Lorient
Cnam Intechmer	Fishes' samples for marine biology course	Geoffrey Bled Defruit	IFREMER Boulogne sur Mer
	Isotopes of jelly fish	Carolina Giraldo Kirsteen Mackenzy	IFREMER Boulogne sur Mer
Clupeids and flat fishes larvae	Study of larval condition	Christophe Loots Carolina Giraldo	IFREMER Boulogne sur Mer
	Invertebrates' species for marine biology course	Kevin Boutin	ULCO Wimereux
	Cytocence	Felipe Artigas	ULCO Wimereux
	Microorganism for DNA extraction	Felipe Artigas	ULCO Wimereux

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