International Bottom Trawl Survey (IBTS2021-Q1)

- French cruise report –

Unité Halieutique Manche Mer du Nord - Laboratoire Ressources Halieutique
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Date : April 2021

Fiche documentaire

Titre du rapport : International Bottom Trawl Survey (IBTS2021-Q1) - French cruise report.	
Référence interne : RBE/HMMN/RH 2021-1 **Diffusion :** ☒ libre (internet) ☐ restreinte (intranet) – date de levée d'embargo : AAA/MM/JJ ☐ interdite (confidentielle) – date de levée de confidentialité : AAA/MM/JJ	**Date de publication :** **Version :** 1.0.0 **Référence de l'illustration de couverture** Crédit photo/titre/date **Langue(s) : English**
Résumé/ Abstract : In 2021, 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 56° N) from 19th January to 9th February 2021. During daily time, 56 hauls, lasting 30 minutes, have been carried out with a GOV bottom trawl. A total of 82 fish species have been collected, determined and measured, and 2605 otoliths (for age estimation) have been collected for 13 species. This year, whiting (*Merlangius merlangus*) represented 30% of the total biomass caught followed by herring (*Clupea harengus,* 26%). During the night, 107 MIK net have been deployed to calculate an index for herring and sprat 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, beam trawl, MIK, abundance, stock assessment.	
Comment citer ce document : **Lazard Coline**, **Vérin Yves, Auber Arnaud** (2021). International Bottom Trawl Survey (IBTS2021-Q1) - French cruise report.	

Disponibilité des données de la recherche : publique
DOI : http://dx.doi.org/10.17600/18001237

Commanditaire du rapport :	
Nom / référence du contrat : ☐ Rapport intermédiaire (réf. bibliographique : XXX) ☐ Rapport définitif (réf. interne **du rapport intermédiaire** : R.DEP/UNIT/LABO AN-NUM/ID ARCHIMER)	
Projets dans lesquels ce rapport s'inscrit (programme européen, campagne, etc.) : International Bottom Trawl Survey	
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Encadrement(s) :	
Destinataire : Direction de la Flotte Océanographique Française et pays participants à la campagne IBTS.	
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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 about 4 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.

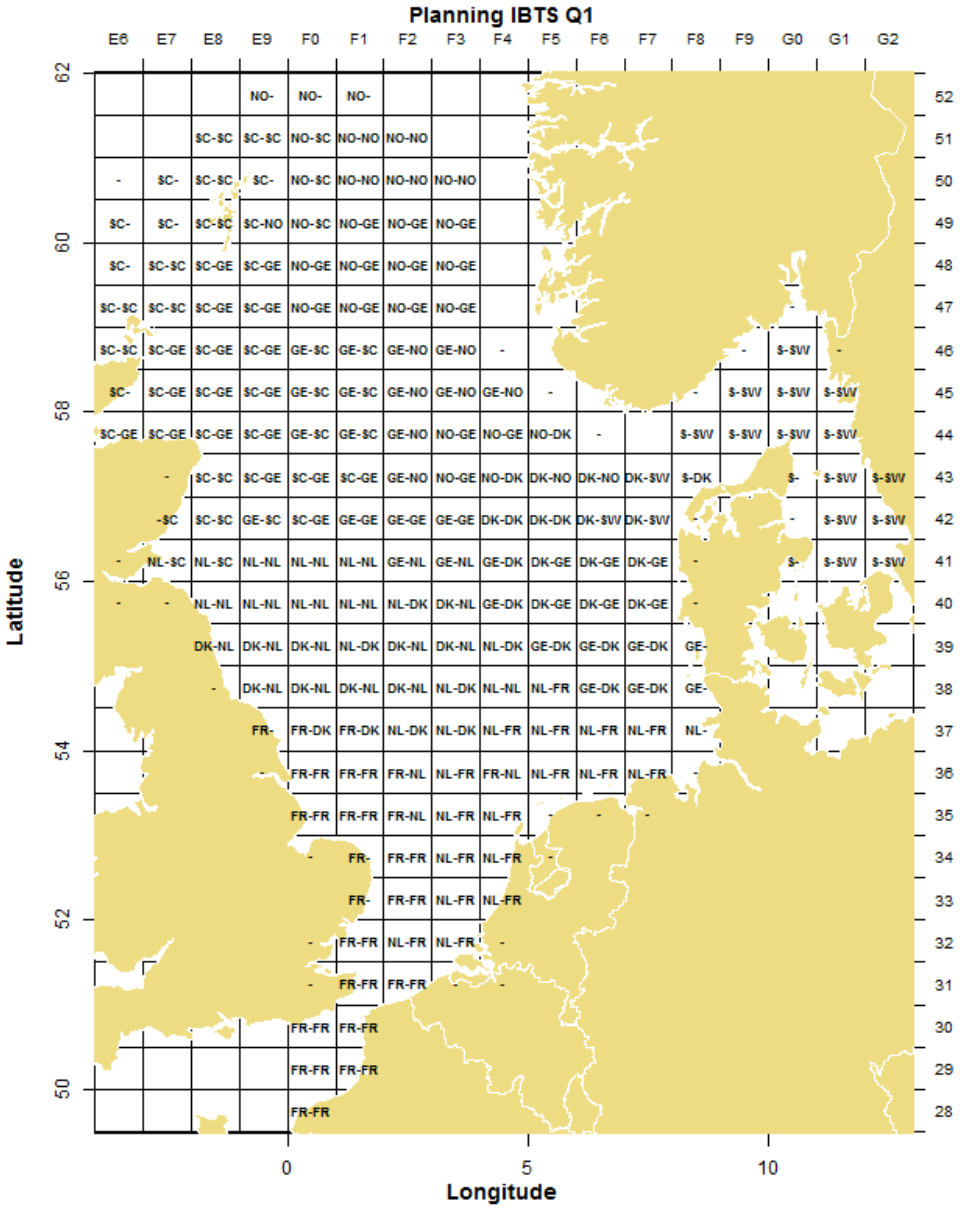


Figure 1: Allocation map for all participants (FR: France, NL: Netherlands; GE: Germany, DK: Denmark, SW: Sweden, SC: Scotland, NO: Norway)

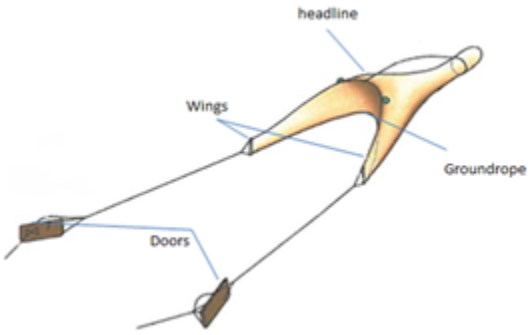


Figure 2: Illustration of a standard ground gear. To record trawl parameters, sensors are fixed on the doors, on the wings and on the middle of the headline.

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 nautic miles. Hauls should only be made during the period between 30 minutes past sunset to 30 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 meter. 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).

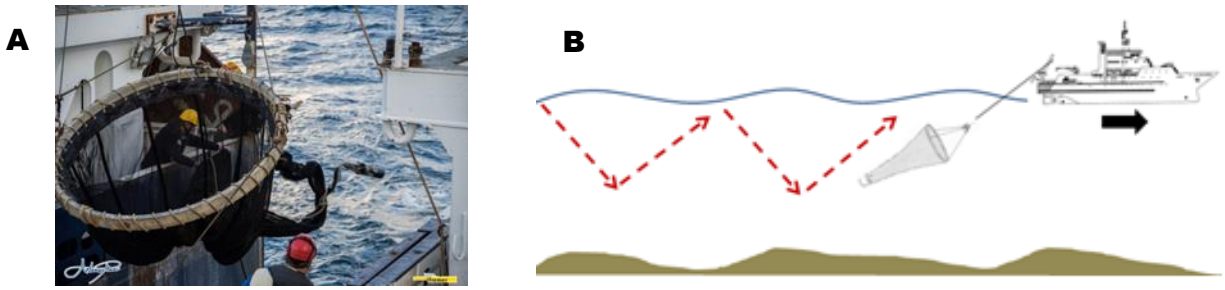


Figure 3: A. MIK net used during the Survey (13 meters long) B. During at least 10 minutes, the net goes down near the bottom (5 meters) and it is retired immediately in order to have an oblique haul.

2 International preliminary results of the 2021 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 2021, the fleet consisted of six vessels: "Dana" (Germany), "GO Sars" (Norway), "Scotia III" (Scotland), "Thalassa" (France), "Svea" (Sweden), "Tridens II" (Netherlands) and "Walter Herwig" (Germany). The survey covered the period from 19th January to 26th February 2021 (Table 1). A total of 384 GOV hauls (10 of which were invalid) and 683 valid 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	2-Feb – 19-Feb
France	Thalassa II	19-Jan – 9-Feb
Germany	Walter Herwig	25-Jan – 26-Feb
Netherlands	R.V. Tridens II	25-Jan – 26-Feb
Norway	G.O. Sars	17-Jan – 12-Feb
Scotland	Scotia III	23-Jan – 12-Feb
Sweden	R/V Svea	19-Jan – 5-Feb

Table 1: Overview of the surveys performed during the North Sea IBTS Q1 survey in 2021

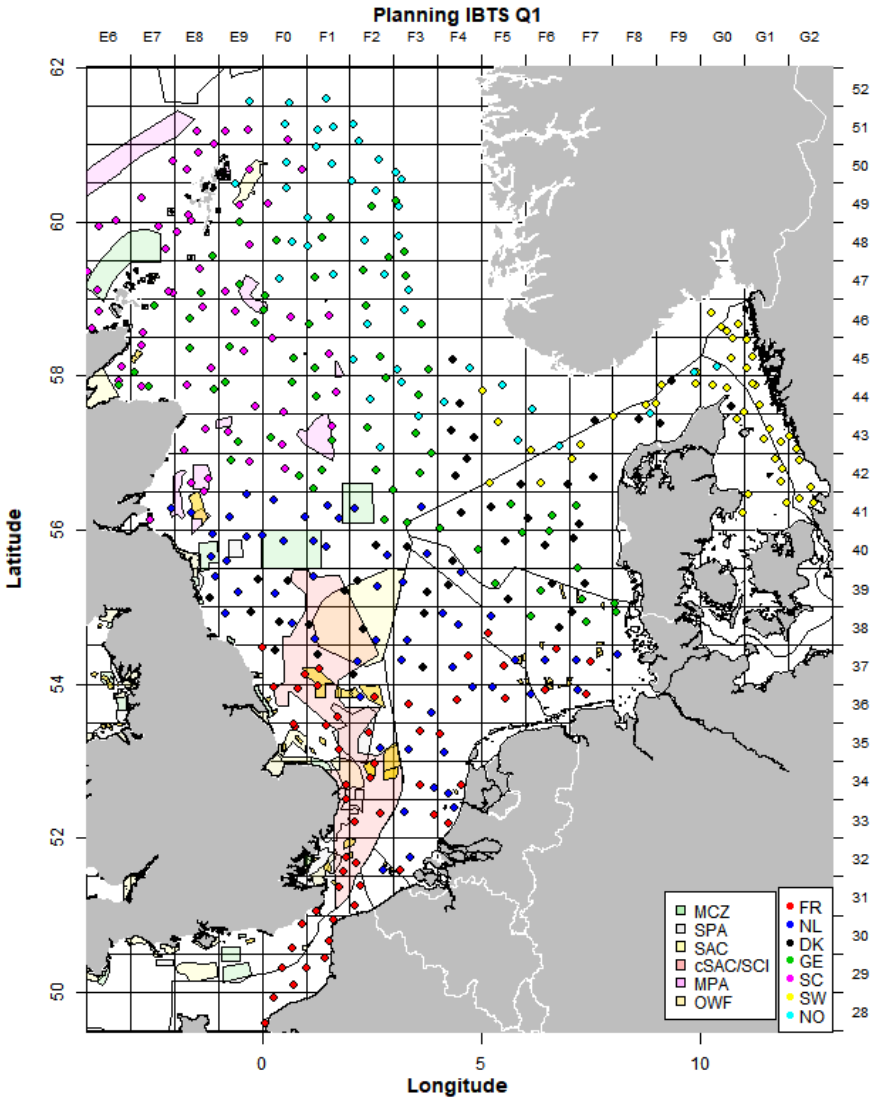
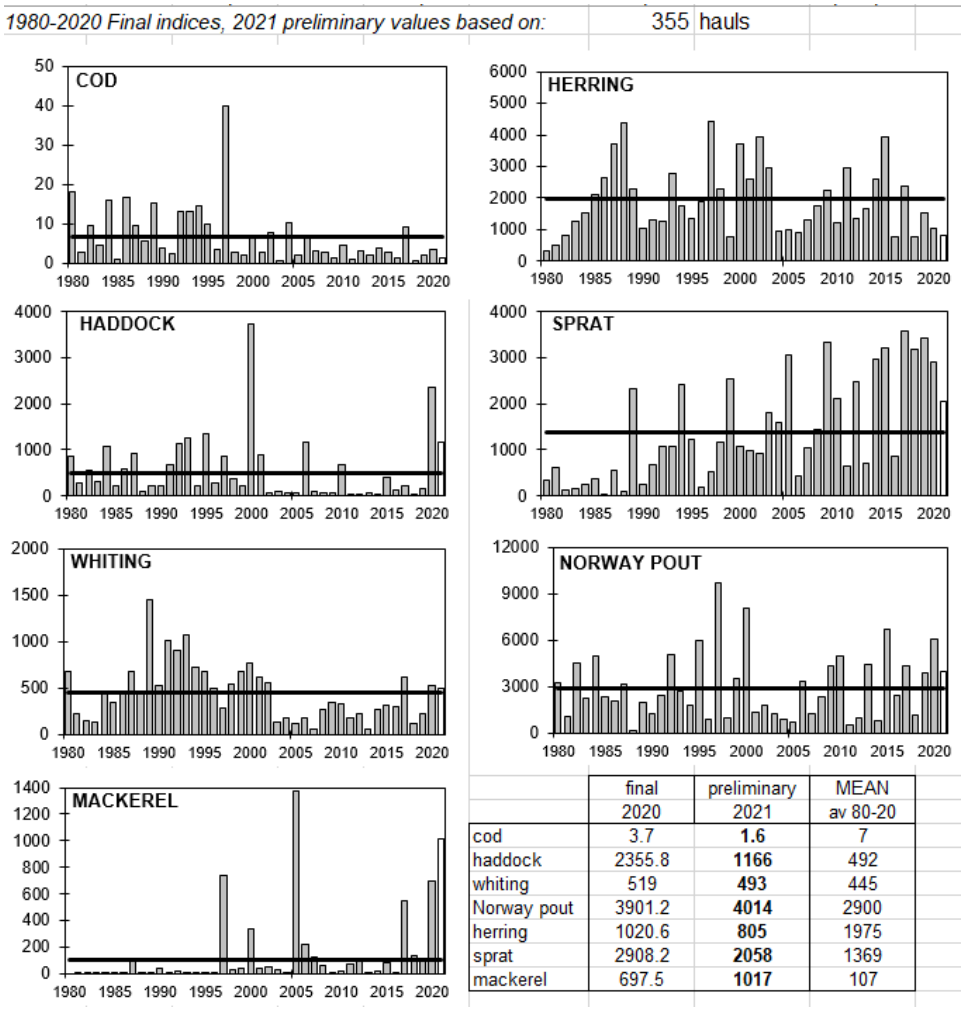


Figure 4: Number of hauls per ICES rectangle with GOV during the North Sea IBTS Q1 2021 and the start positions of the trawl by country.

2.2 Fish recruitment indices

The figure 5 shown the preliminary indices for the recruits of seven commercial species based on the 2021 quarter 1 survey. According to these preliminary results, Sprat, Mackerel and Haddock were substantially above the average of the last 40 years. Cod and herring were below the average and very close to the lowest values observed in the entire time series. Whiting and Norway Pout are just above the average.



	final 2020	preliminary 2021	MEAN av 80-20
cod	3.7	**1.6**	7
haddock	2355.8	**1166**	492
whiting	519	**493**	445
Norway pout	3901.2	**4014**	2900
herring	1020.6	**805**	1975
sprat	2908.2	**2058**	1369
mackerel	697.5	**1017**	107

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 1980-2020.

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. This year, 683 depth-integrated hauls were completed with the MIK-net which is 117 MIK hauls more than in 2020. For the index, all hauls north of 51° N were used, in total 663 hauls, 111 more than in 2020. Due to severe weather during the second week of February, some participants could not take their stations, but these gaps could be successfully filled by other participants. Coverage of the survey area was good, mostly achieving the desired 4 hauls per ICES rectangle.

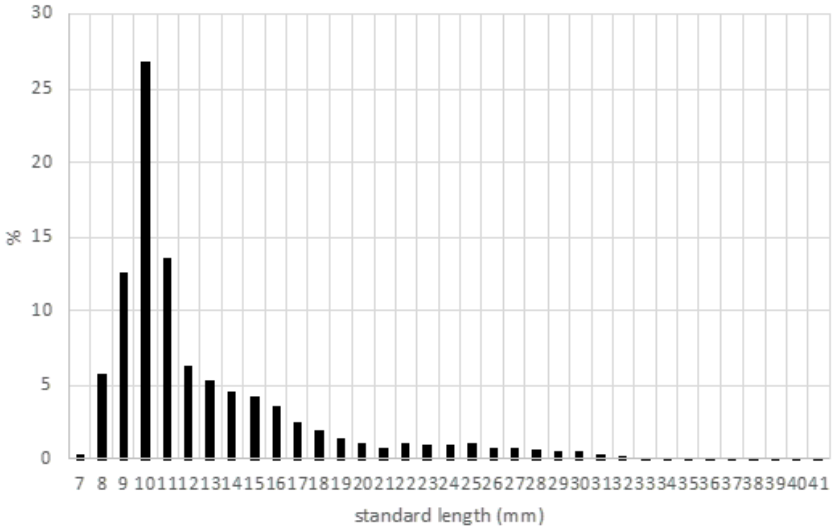


Figure 6: North Sea herring. Length distribution of all herring larvae caught during the 2021 Q1 IBTS.

Larvae measured between 7 and 41 mm standard length (SL). Again, and as in most years, the smallest larvae < 12 mm were the most numerous (Figure 6). Larger larvae >18 mm SL were rarer but were caught in higher densities than last year. The smallest larvae were chiefly caught in 7.d and in the Southern Bight. The large larvae appeared in moderate to high quantities in both, the central western and southern parts of the North Sea. In the southeastern and eastern part of the North Sea, the potential nurseries, abundance of large herring larvae was lower than last year.

Again, many sardine larvae were found in the samples. With an abundance of 7.9 * 10^9, sardine larvae made up 8.3 % of herring larvae abundance in the entire North Sea, Channel and Kattegat/Skagerrak. Most sardine larvae occurred in the southern and south-eastern North Sea, and in the Skagerrak. Again, sardine larvae were also recorded in small amounts in the Kattegat and west of Scotland area.

3 The IBTS 2021 survey on research Vessel Thalassa

3.1 Survey planning

The R/V Thalassa left Boulogne-sur-Mer (France) the 19th of January (Fig 7) and cruise work started in the North Sea along the German and Dutch coasts, pending the bottom trawl permit in UK waters. The 28th of January, the permit was finally obtained and the survey therefore continued in western North Sea.

Works in the North Sea were finished the 4th of February, and the program continued in the Eastern Channel from 5th to 8th February before coming back to Boulogne-sur-Mer.

Because of the Covid 19 pandemic, there was no stop in Scheveningen (Netherland) as previous years for scientific team turnover.

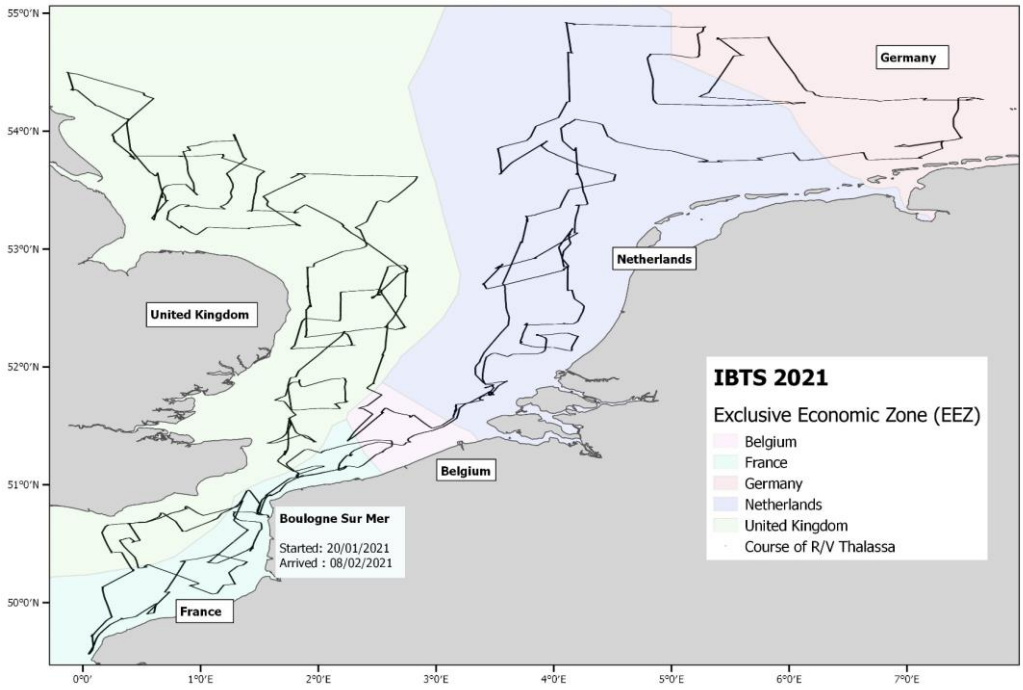


Figure 7: R/V Thalassa navigation during IBTS Q1 2021.

3.2 Participants

The team was composed of 20 scientists from the Ifremer's Center of Boulogne-sur-Mer, Port-en-Bessin, Brest, Lorient and Sète and 3 students from Université de la Côte d'Opale. During the survey, scientists were allocated in different teams. In the fish laboratory, 10 scientists sort and measure catches, collect fish otoliths and various biological samples. In the hydrological laboratory, 7 scientists take turns during day and night to carry out the various devices as SBE probe, Niskin bottle, WP2 (for zooplankton), CUFES (for fish eggs), Manta (for microplastics) and MIK net (for fish larvae). Two scientist get inboard for the Eastern Channel part to strengthen the hydrological team.

3.3 Results from IBTS2021

3.3.1 Fish communities

Au total of 10 fishing stations were carried out in the Eastern Channel and 46 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 8 shows the position of GOV hauls and their characteristics are listed in annex 1. The trawl used was the standard GOV 36/47 as described paragraph 1.3.1.

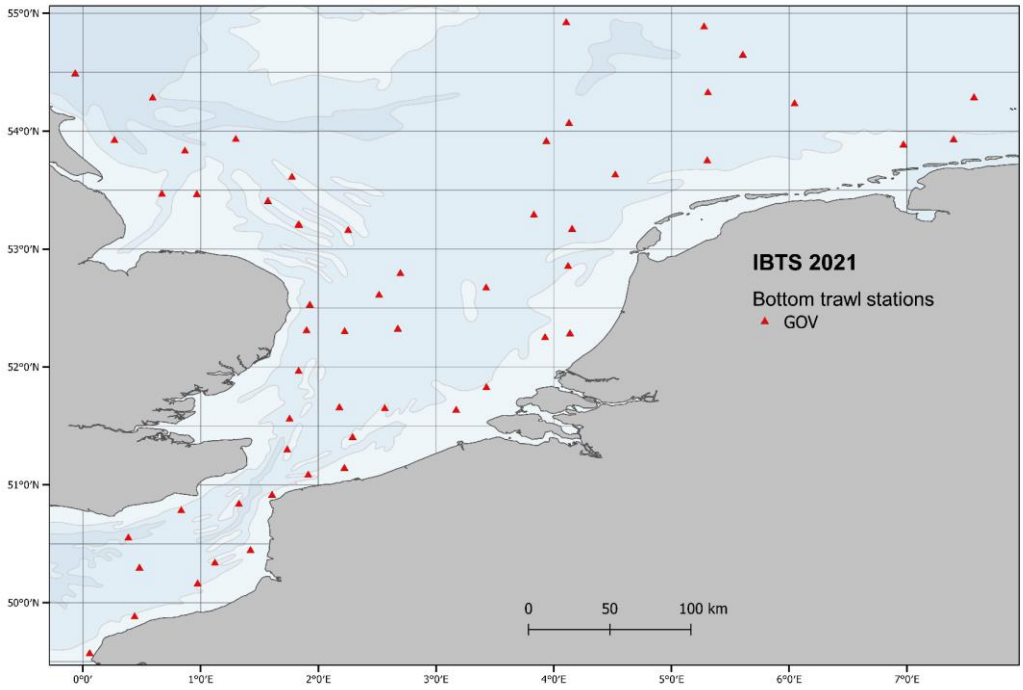


Figure 8: Positions of GOV hauls

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 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 gives the number of otoliths collected on the main commercial species as herring, sprat mackerel, cod, haddock, whiting, and also for other species. Sex, maturity and weight data were also reported for all the target species for which age data are collected.

Species	Number of biological samples
Chelidonichthys cuculus	14
Clupea harengus	451
Dicentrarchus labrax	16
Gadus morhua	50
Melanogrammus aeglefinus	65
Merlangius merlangus	763
Mullus surmuletus	96
Pleuronectes platessa	541
Scophthalmus maximus	9
Scophthalmus rhombus	1
Solea solea	96
Sprattus sprattus	418
Trisopterus luscus	100

Table 2 : Number of biological samples

3.3.2 Species distribution and community structure

During this survey, 82 fish species (included sharks, rays and cephalopods) and 10 species of commercial mollusc and crustacean were caught and measured. The whole list is presented in Annex 3.

Figure 9 shows the main species caught: As usual, whiting (*Merlangius merlangus*) was the most dominant species (in biomass) and represented 30 % of the total catch, superior to 2019 with 25 %. In 2021, herring (*Clupea harengus*) represented 26% of the total catch (16% in 2020). Finally, the sardine (*Sardina pilchardus*), represented 14% of the total catch, which is particularly high compared to previous years (4% in 2020). This can be explained in part by an important catch in one tow in the Eastern Channel. Thus, the percentage of dab (*Limanda limanda*) declined from the third to the fourth place representing 6% of that catch against 9% in 2020. The sprat (*Sprattus sprattus*) is only in the fifth position representing 4% of the total catch. The “others” category is composed of all others species find in the haul (Annex 3).

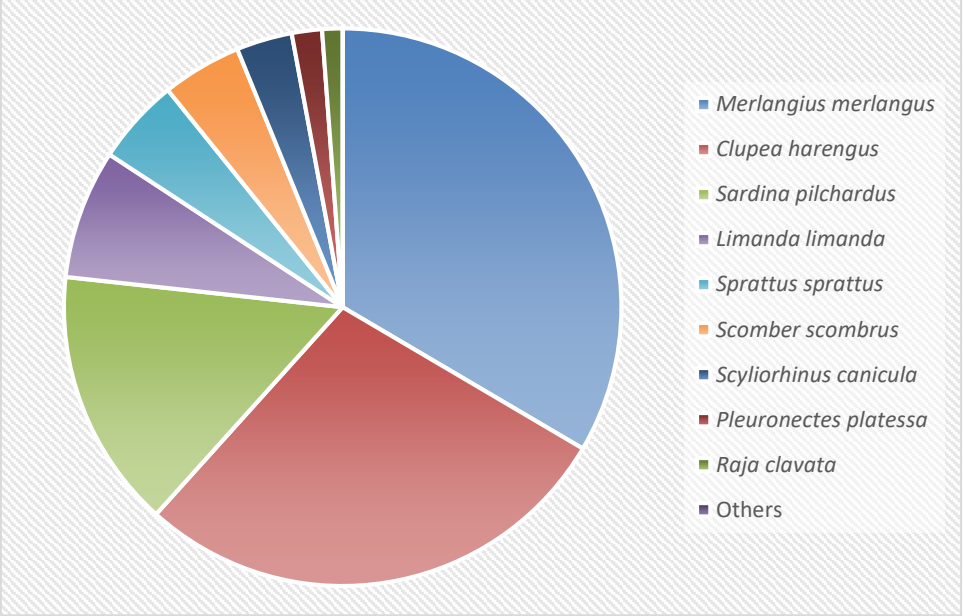


Figure 9: Main species biomass in the total catch

Figure 10 shows the spatial distribution of the main species (biomass by haul). As usual, whiting, sprat and dab are mostly present in the southern North Sea. Whiting biomass was especially located along the west coast and in the Strait of Dover. More various species were found in the English Channel in lower quantity: the catch was mainly composed of various species as rays, plaice, sardine, and dogfish.

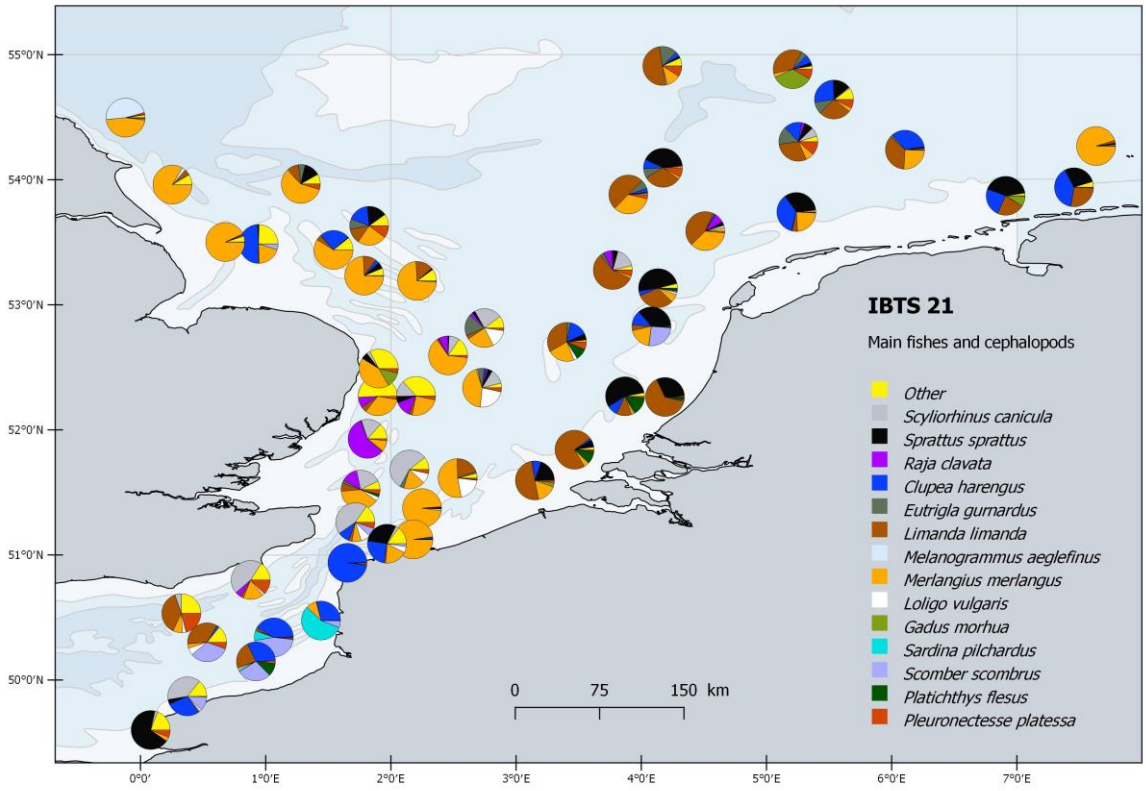


Figure 10: Biomass distribution of the main caught species

3.3.2.1 *Clupea harengus (Herring)*

The length distribution (Fig. 11) clearly shows the separation between juveniles (less than 20 cm) and adults cohorts. This year, juveniles were less abundant in the French caught than 2019 but quite similar than 2020, and this observation is in accordance with the preliminary recruitment indice. In opposite, adults are more abundant than the two previous year. The German Bight (off the German coast) is a feeding area for herrings and most of small herring were found (Fig 12). Adults were found in the English Channel, where the "Downs" herring population spawns between November and January along the French coasts (Bennet D. et al, 1993). Because of huge schools of herring observed on the echosounder in the Strait of Dover one hauls have been shortened to not damage the gear.

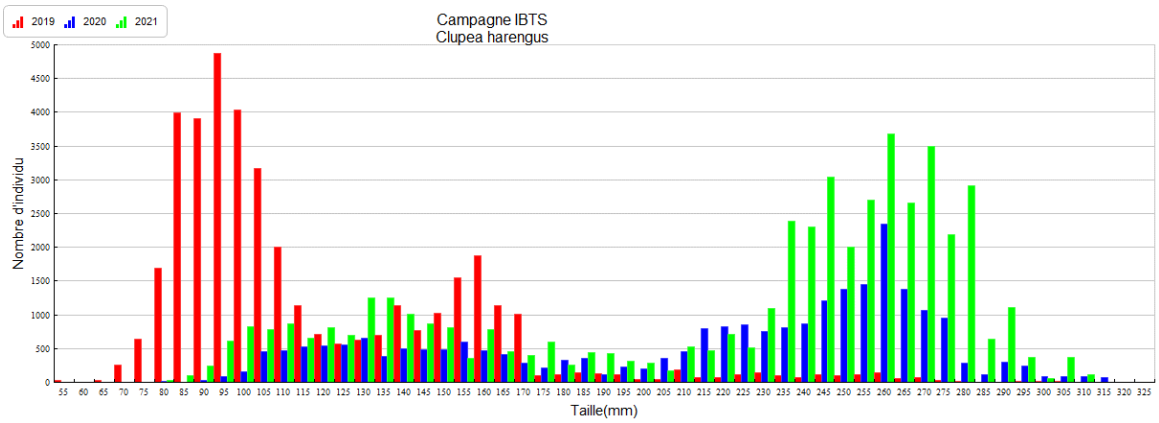


Figure 11: Herring length distribution

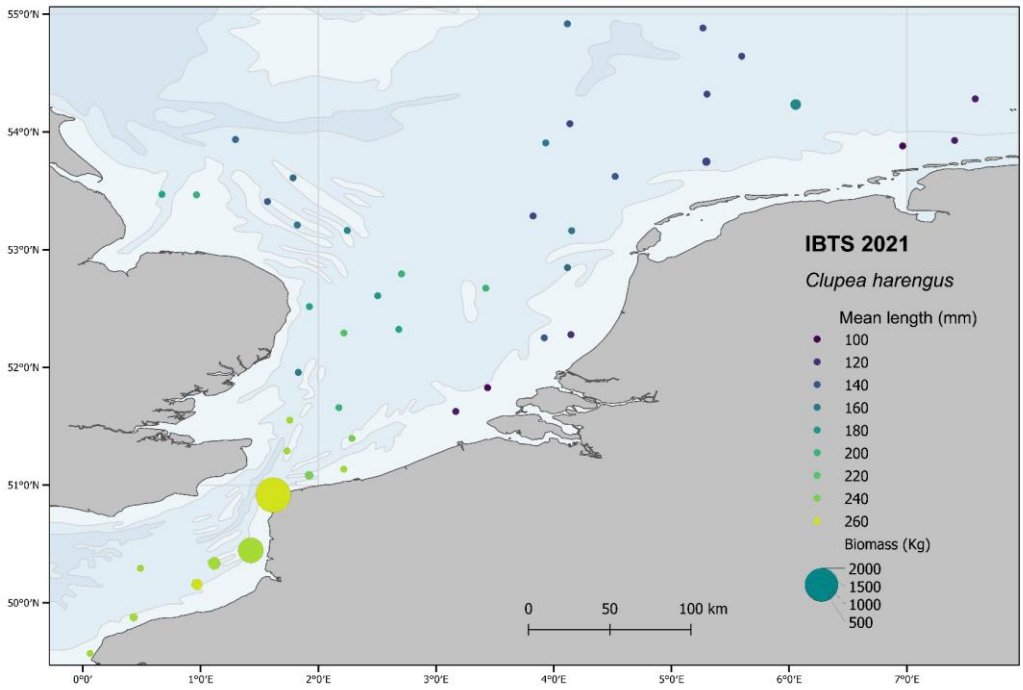


Figure 12: Herring distribution map (Biomass by hauls and length class in mm)

3.3.2.2 *Sprattus sprattus (Sprat)*

Adults were especially observed in central North Sea and in the Channel. 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. The length distribution on Figure 13 shows that the mean length is at 11 cm, and corresponds to 2-year old sprat. On the map distribution (Fig. 14), sprat was present on the whole area and was particularly abundant in the east part of the North Sea and in the Strait of Dover.

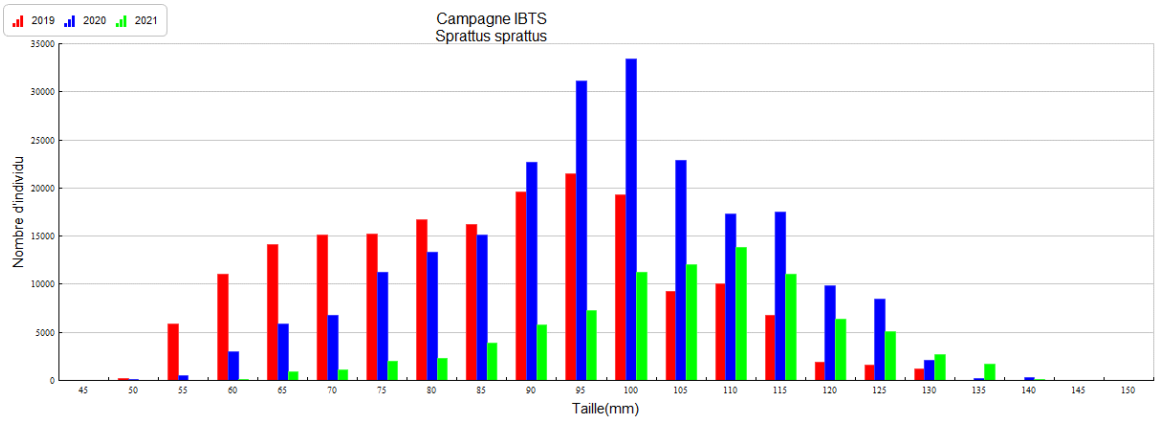


Figure 13 : Sprat length distribution

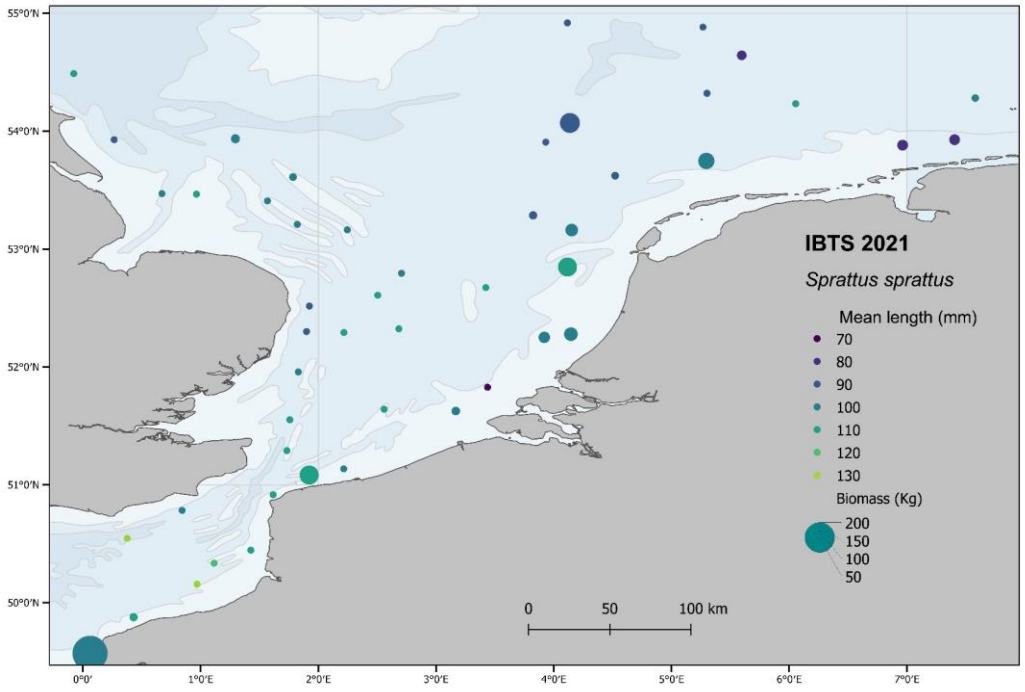


Figure 14 : Sprat distribution map (biomass in kilos per haul and length class in mm)

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 30% of the total biomass caught by the Thalassa vessel. The length distribution (Fig. 15) is grouped around 17 cm and 20 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 2019 and 2020, an increase has been observed in the juvenile's cohort and in young adults (until 29 cm). The whiting was present on 98% of total hauls, highest quantities were noticed in the west of the North Sea and in the Eastern Channel (Fig. 16).

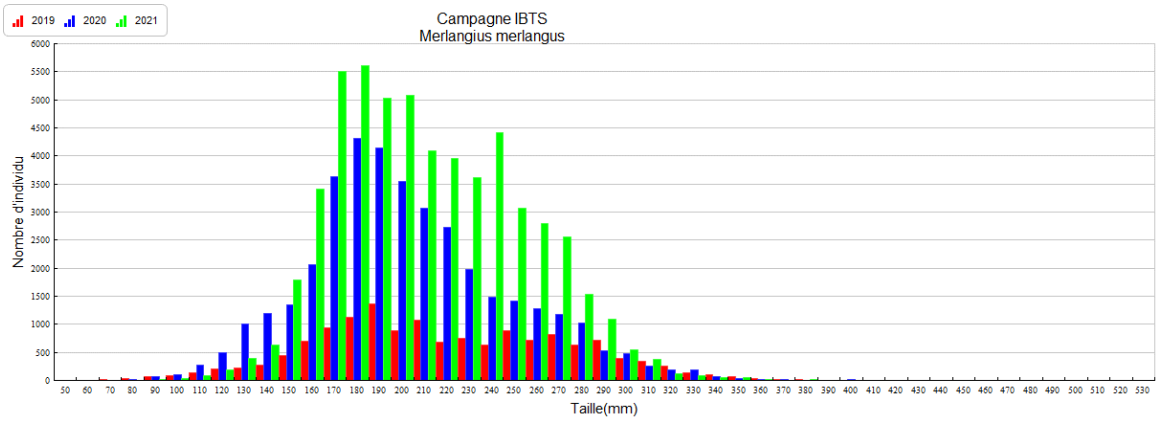


Figure 15 : Whiting length distribution

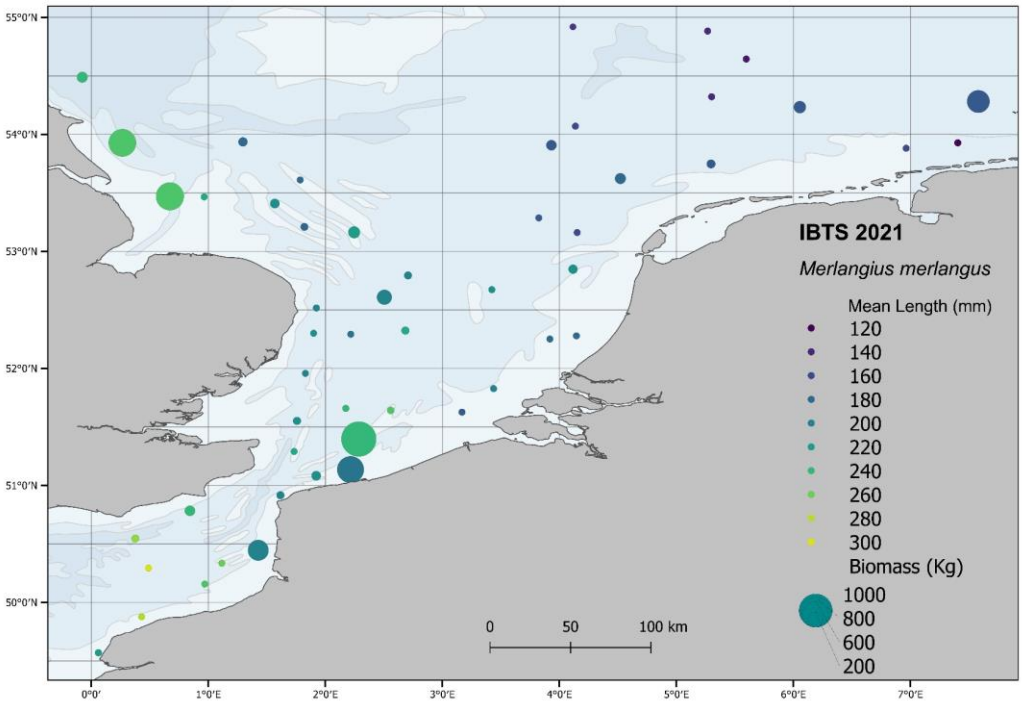


Figure 16 : Whiting distribution map (biomass in kilos per haul and length class in mm)

3.3.2.4 *Limanda Limanda (Dab)*

The dab length distribution in 2021 is quite similar than 2020. Individuals smaller than 10 cm (i.e., juveniles under 21 cm), were found in similar quantities as last year but up to 2019 (Fig. 17). In 2021 the mean length was about 17 cm. Even if it is not an important commercial species, dab is exploited by beam trawlers in the German Bight. Dab is well distributed on the whole southern North Sea but particularly on the eastern part (Fig 18) and it is also present in the English Channel.

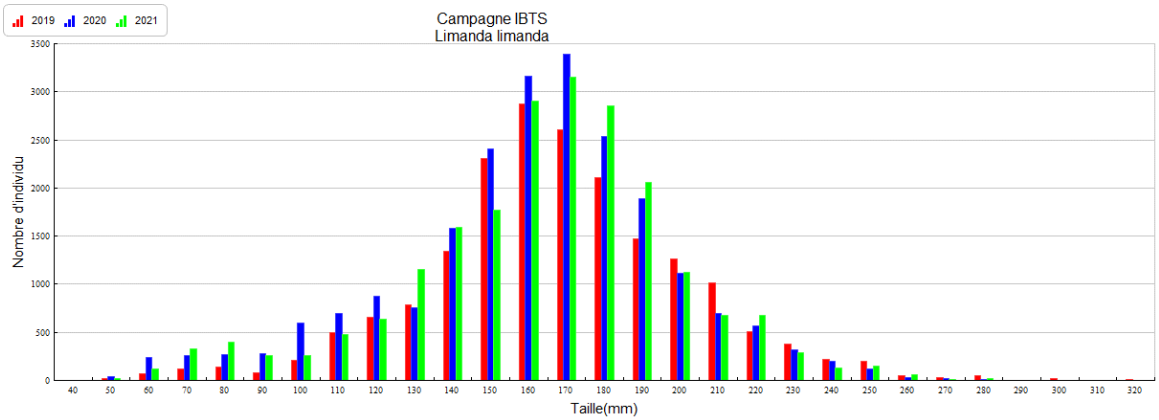


Figure 17: Dab length distribution

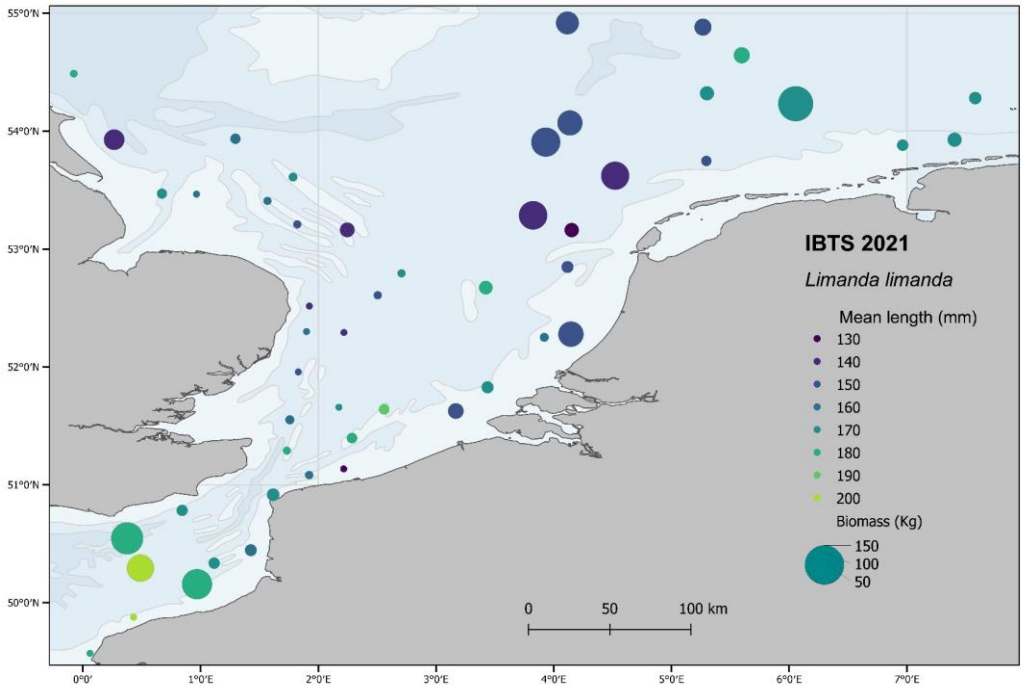


Figure 18 : Dab distribution map (biomass in kilogram per haul and and length class in mm)

3.3.2.5 *Gadus morhua (Cod)*

The recruitment indice in 2021 is above than last years and significantly lower than the mean of over the last 39 years. Juveniles (less than 25 cm) were less important than 2020 (Fig 19). In fact, fishes between 16 cm and 21 cm, which were found in large quantity last year, there were not found this year in the upper size classes. The spatial cod distribution presented in Figure 20 show the smallest individuals caught along the English coast, some in the southeast of the North Sea but none in the Eastern Channel, where they often made be caught.

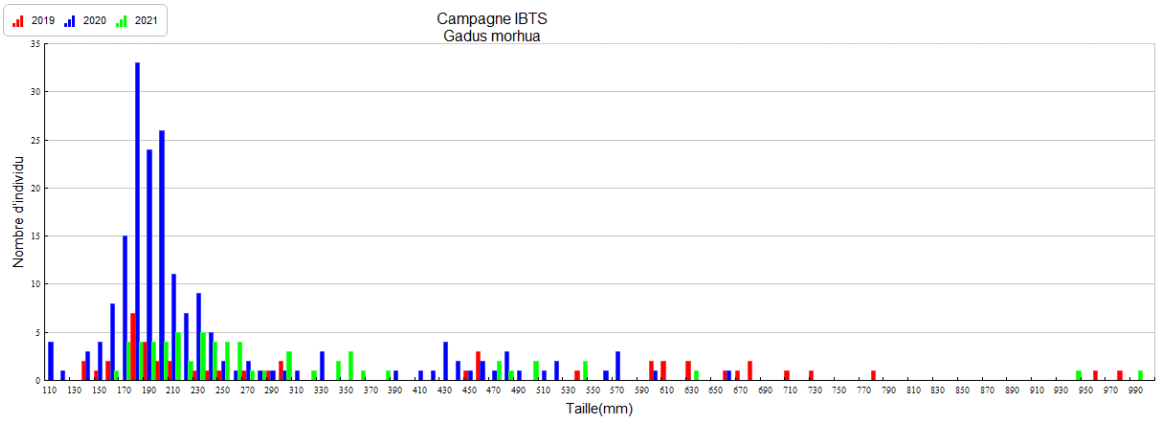


Figure 19 : Cod length distribution

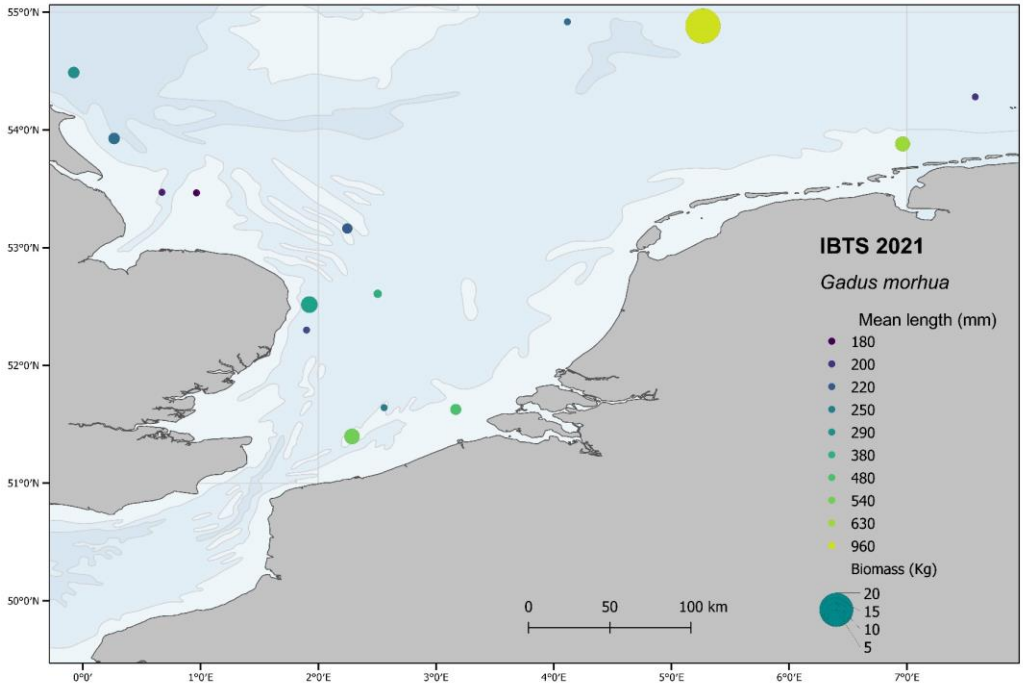


Figure 20: Cod distribution map (biomass in kilos per haul and length class in mm)

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. As the spatial distribution shown in figure 22, red mullet was present on the Eastern Channel and in southern North Sea, along the English coasts. The length distribution is characterized by two cohorts (Fig 21). This year, juveniles (inferior to 16 cm, less than 2 year old) were slightly less abundant than the two previous years, but the difference is much more significant for adults (superior to 16 cm) compare to 2020.

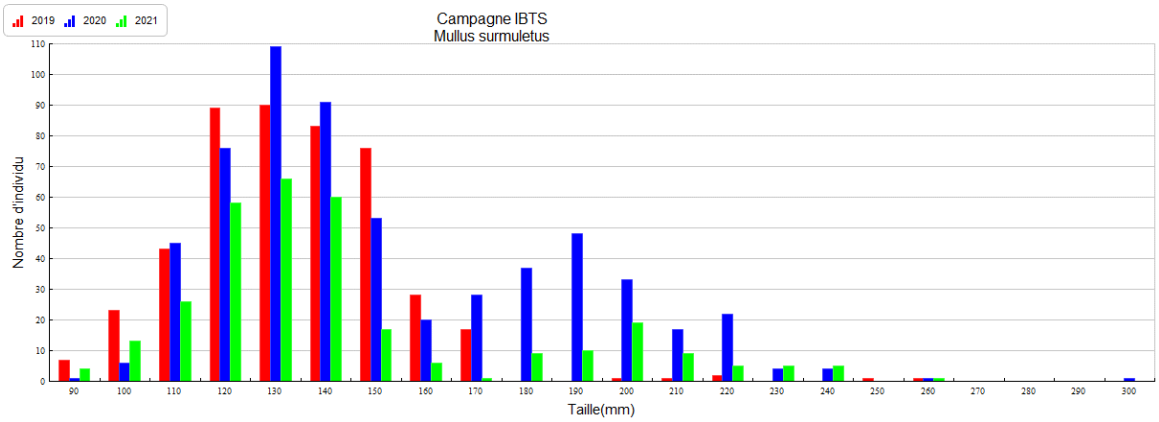


Figure 21 : Red mullet length distribution

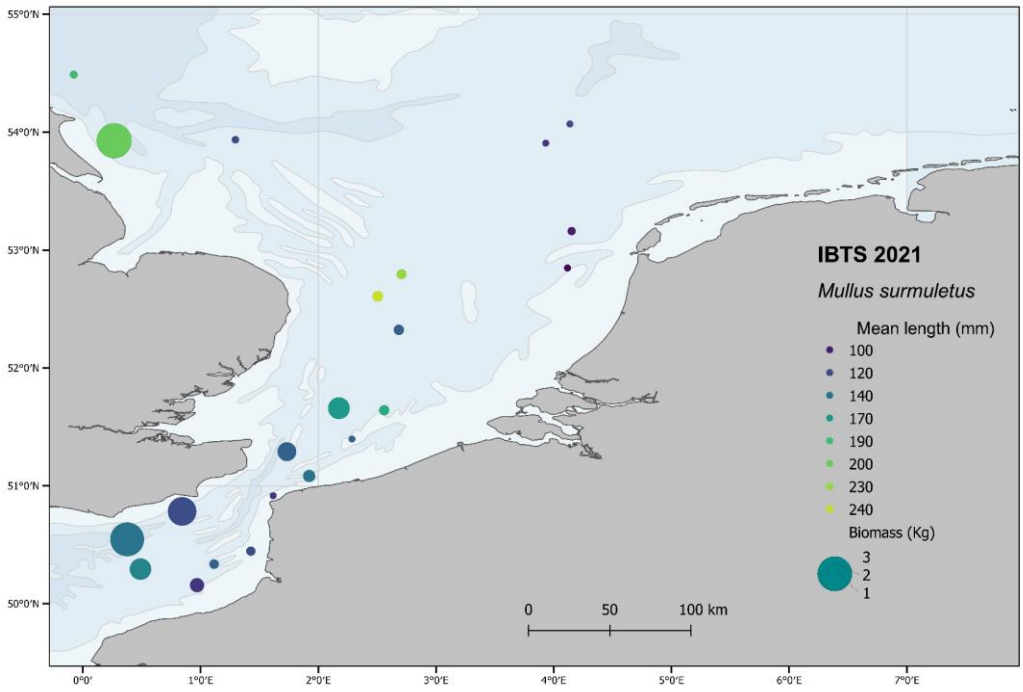


Figure 22 : Red mullet distribution map ((biomass in kilos per haul and mean length class per haul)

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. As dab, the plaice length distribution in 2021 is quite similar than 2020. Individuals are spread from 6 cm until 50 cm. Fishes around 11 cm, representing plaice juveniles (1 years old), are less abundant than 2019 but the most part of the population is young adults regrouped around 18 cm (Fig. 23). Plaice were present on the whole area, as well in the North Sea as the English Channel, and juveniles have been mainly located along the coast (Fig. 24).

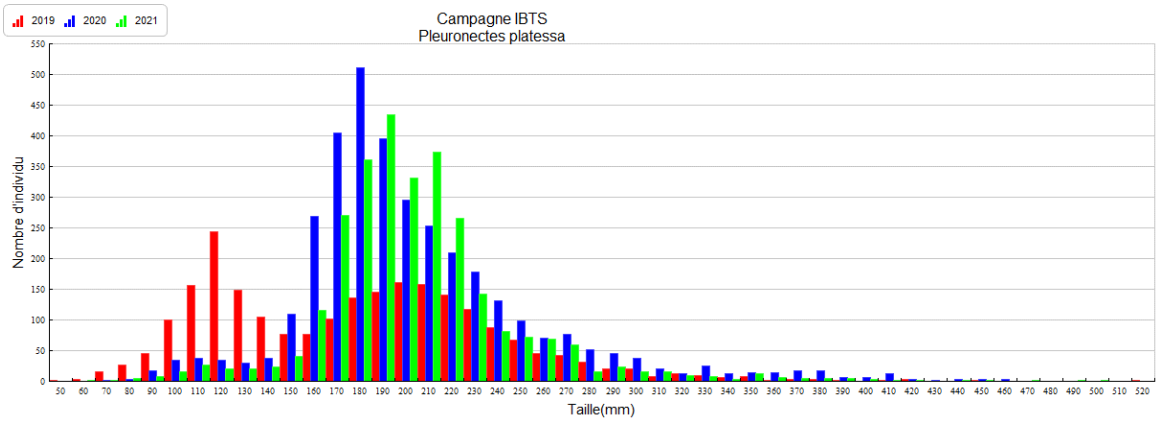


Figure 23 : Plaice length distribution

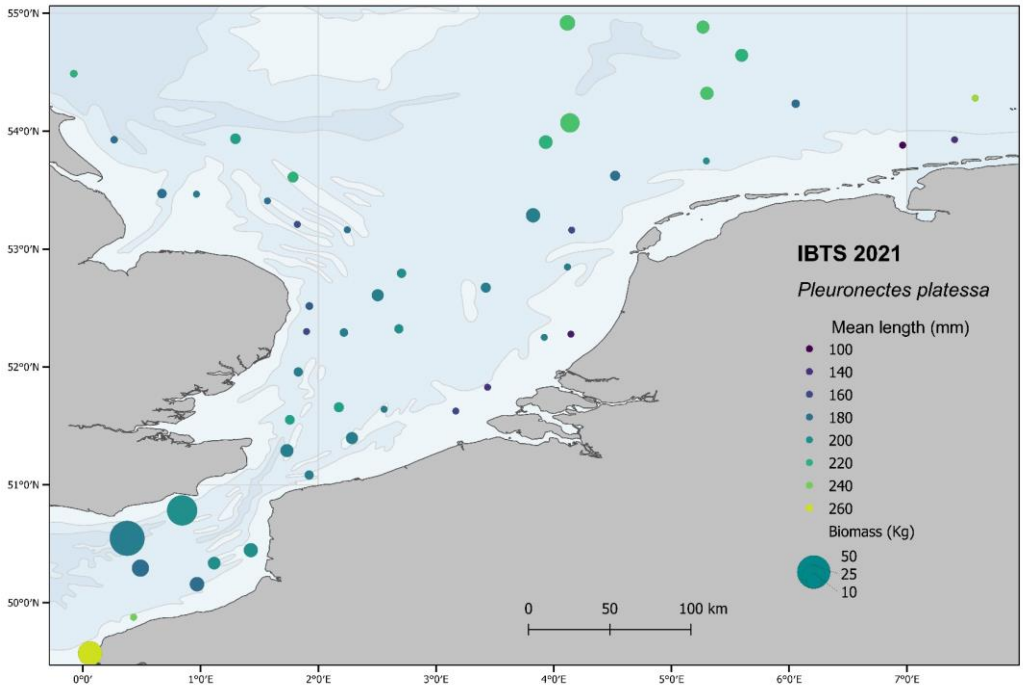


Figure 24 : Plaice distribution map (biomass in kilos per haul and length class in mm)

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 25), their positions are given in Annex 2. Clupeids larvae were sorted and measured at the laboratory ashore.

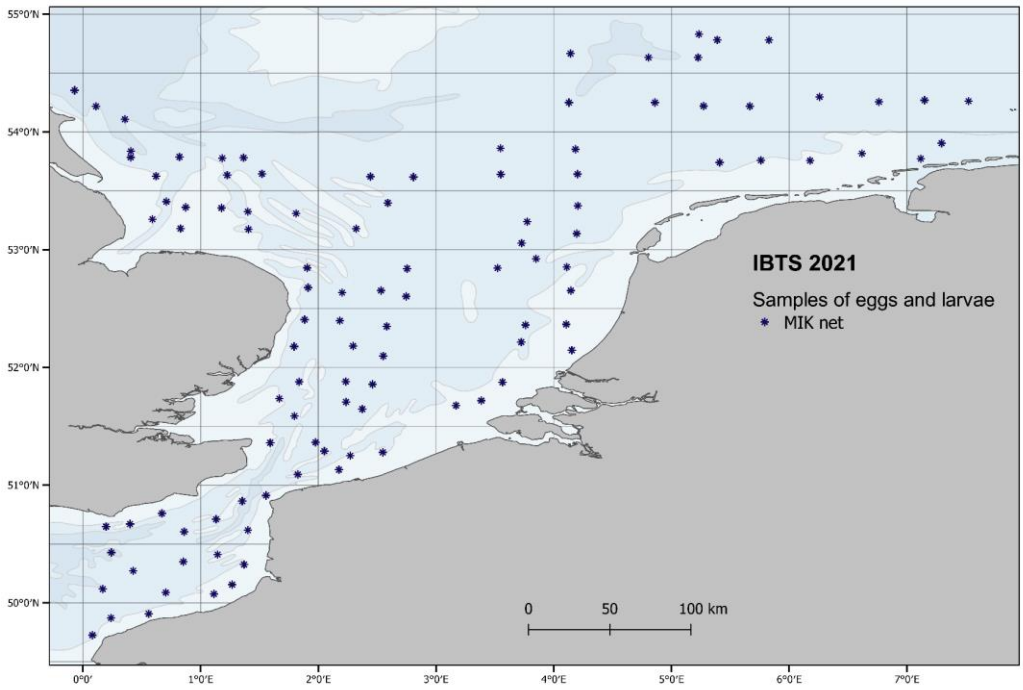


Figure 25 : positions of MIK net stations

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

The Figure 26 present the length distribution of all herring larvae caught in the area. They were distributed on a large range of length (between 7 mm and 36 mm) that can explain because larvae are from different stocks who have not the same spawning periods.

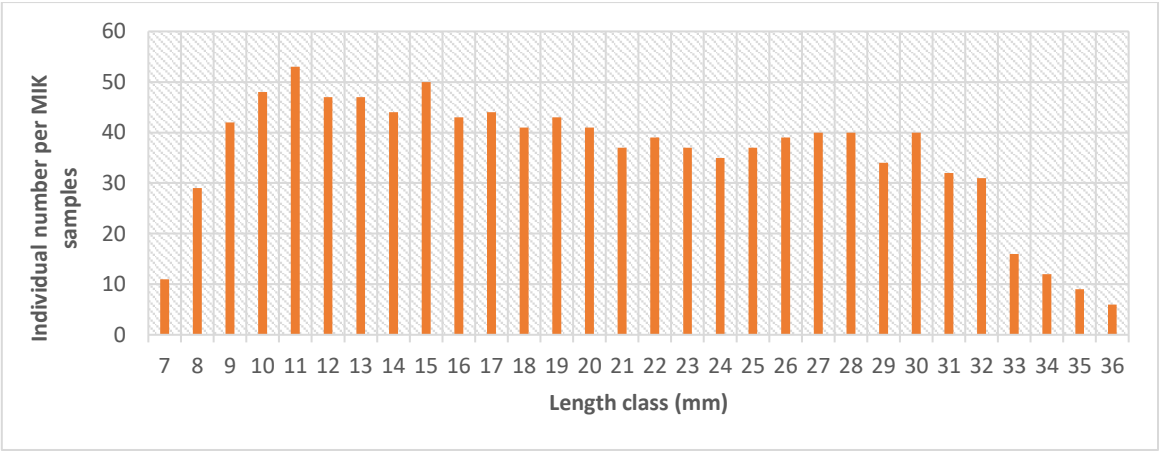


Figure 26: Length distribution of all herring larvae caught during the 2021 Q1 IBTS.

Smalls herrings larvae were caught mainly in the English Channel and along the Dutch coasts (Fig 27) and correspond to the Downs herring (Dickey-Collas 2010) born during the winter. Biggest larvae are from another stocks (Buchan, Banks, Shetland/Orkney) and were born in September and October.

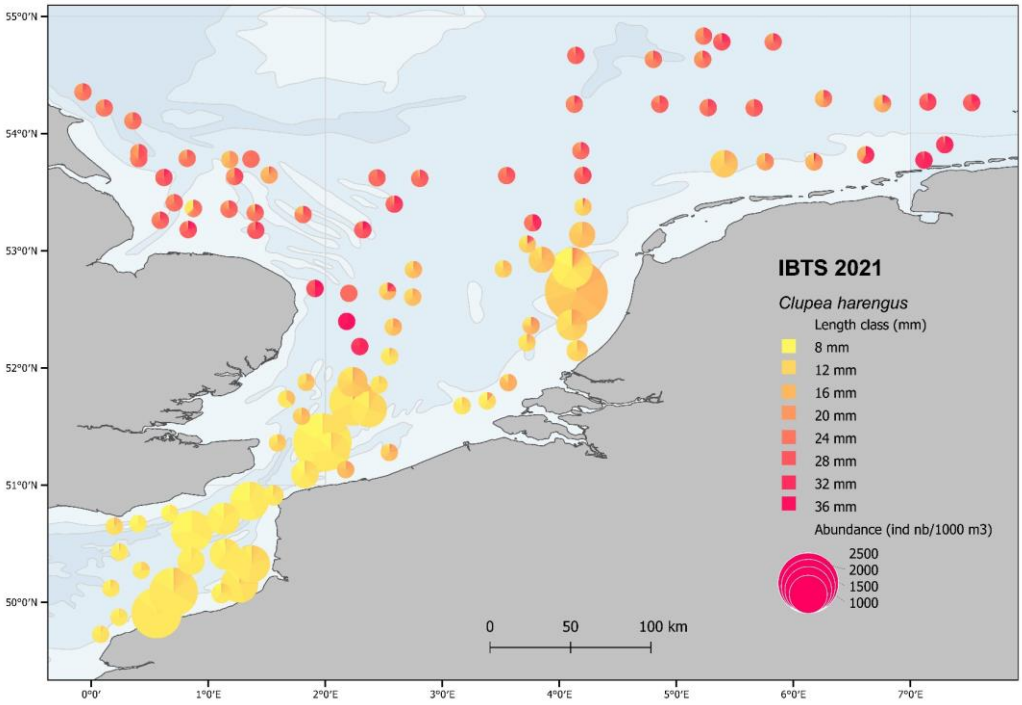


Figure 27 : Herring larvae distribution during french IBTS-Q1

3.3.3.2 Sardine's larvae

The sardine spawning period in the English Channel and southern North Sea occurs all along the summer (Bennet et al., 1993). That's why, sardine's larvae were caught in different size, between 18 mm and 39 mm, on the area (Fig 28 and 29).

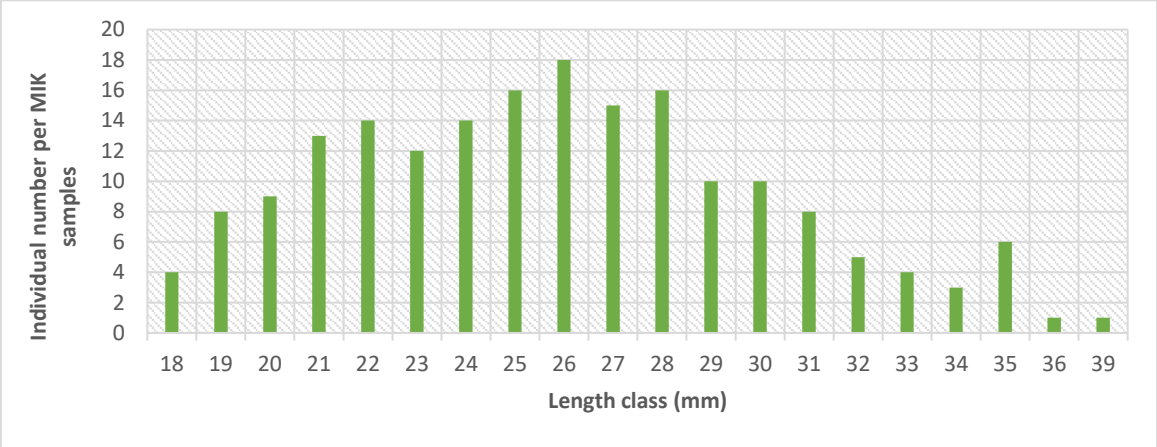


Figure 28: Length distribution of all sardine larvae caught during the 2021 Q1 IBTS.

Sardines larvae were mainly caught in the Eastern Channel and in the south west of the North Sea (Fig 29).

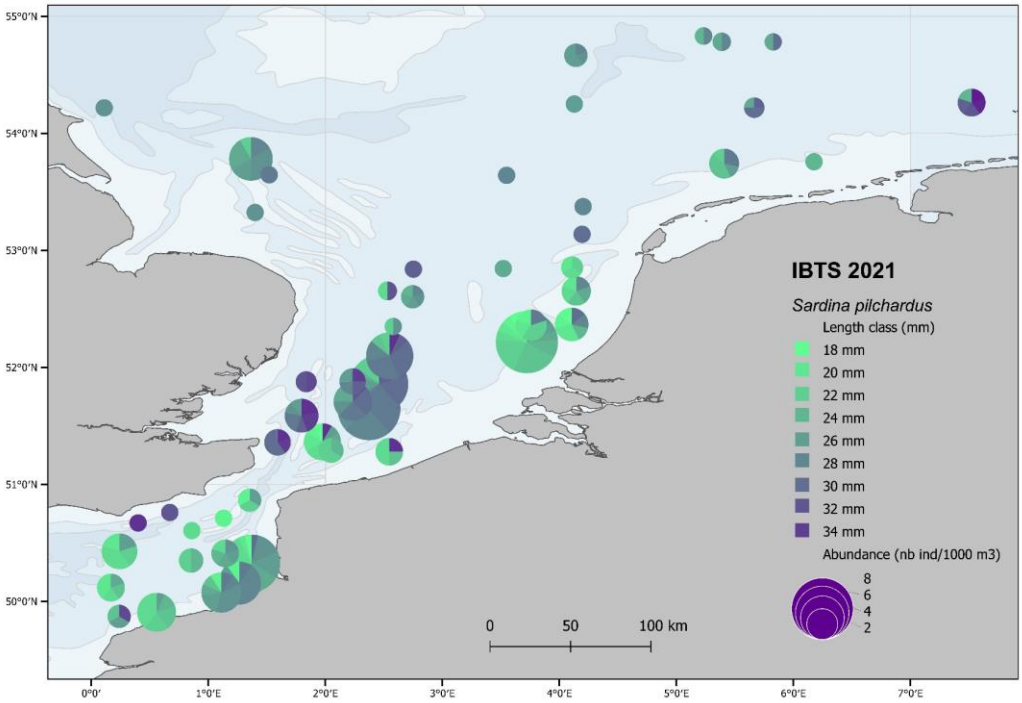


Figure 29: Sardine larvae distribution during French IBTS-Q1

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 30). 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. A sample of water was fixed with Lugol to identify phytoplankton and two samples are collected then frozen to analyses nutrient at the laboratory ashore.

Figure 30 : Hydrological station. The SBE 19 sensor and the Niskin Bottle

Figures 31A and 31B respectively show temperature and salinity measures at the sea surface in the English Channel and in the North Sea for 2021 survey. These 2 parameters were automatically recorded along the ship route every 30s with the Ferrybox. For the year 2021, the sea surface temperature was comprised between 4.8 and 10.2°C (Fig. 30A), salinity between 29.9 and 35.1‰ (Figure 30B). The rivers and estuaries influence on salinity is well identified by looking at Belgium, Netherland and German areas (Escaut, Rhin and Elbe River, respectively).

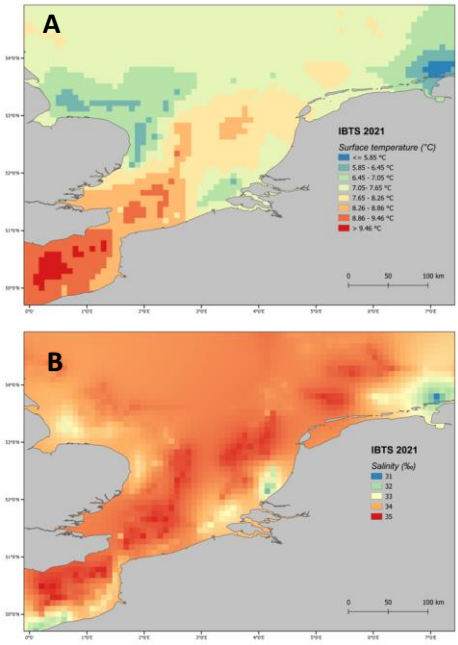


Figure 31 : 31A. Sea Surface temperature (°C) during IBTS21, 31B. Sea Surface Salinity (‰) during IBTS21,

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 32A). Every hour, along the ship route a sample was taken during all the survey (day and night). 203 samples were collected in the English Channel and the North Sea (Fig 33). Each sample was analyzed by the Zoocam (Fig 32B). This device allows taking picture of each particle in the samples (eggs, copepods, dirts, etc.) and the images are analyses on

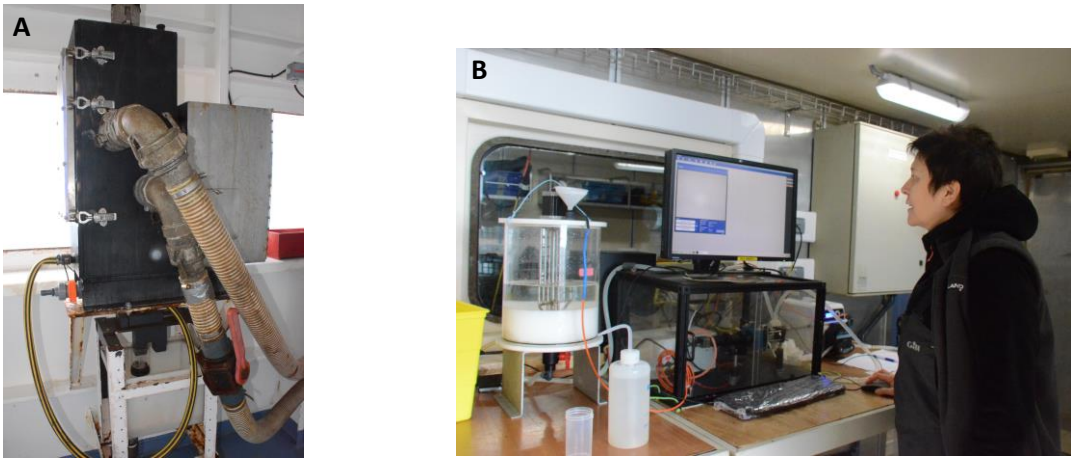


Figure 32 : 32A The Continuous Underway Fish Eggs Sampler. 32B Samples identification by the Zoocam device

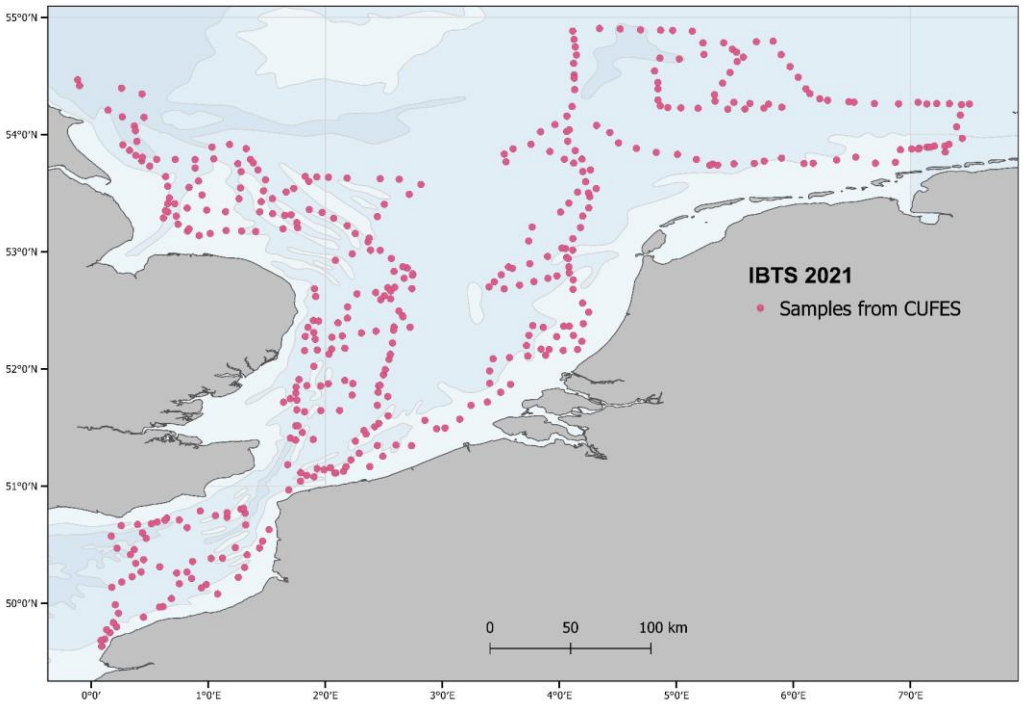


Figure 33 : CUFES Samples during the IBTS 21 survey. One sample (pink point) is taken every hour.

3.4 Additional works

3.4.1 The Marine Strategy Framework Directive (MSFD)

Since 2015, in addition to the international program, the French IBTS Q1 survey contributes to collect data for The Marine Strategy Framework Directive (MSFD) in French waters. That concern several items described below.

- *Jellyfish and detritus from the GOV catch*

At each hauls, jellyfish and detritus are sorted, determined measured and weight.

- *Observations of birds, marine mammals and floating macro waste*

Two 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.

- *Plankton's samples (zoo and phyto) and environmental data*

Figure 34 : WP2 net

The WP2 net (Fig 34) was used to sample zooplankton. The mesh size for this net is 200 microns and at each station it is submerged from the surface until 3 meters upper the bottom. Samples were conditioned with Bataglia sauce and were analysed ashore for zooplankton abundance estimation.

Phytoplankton was sample with the Niskin bottle (3.3.4 water parameters) and environmental data recorded by the CTD Sbe.

- *Microplastics*

In the context of MSFD (Marine Strategy Framework Directive), surface water samples are collected each year since 2015, in order to assess plastic particle's concentrations (300µm<size<20mm). In 2021, 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 35 : Manta net

- *Noise of the vessel*

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

3.4.2 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 2021, these additional works are presented in Table 3.

Name	Theme	Scientist in charge	Research Institute
PATROFLU	Isotopic analysis of whiting (Merlangius merlangus) and its parasites	Sarah Werquin Pierre Cresson	IFREMER Boulogne sur Mer
In'Obs	Development of a mobile observation platform to weigh, measure and take samples from the taxa (fish, etc.) studied	Vincent Badts	IFREMER Nantes
ICEFish	Characterization of the genotype of the Marine stickleback (Gasterosteus aculeatus) population from the Eastern Channel and North Sea	Véronique Loizeau	IFREMER Brest
FORESEA	Characterization of the nutrition potential (essential fatty acids) of zooplankton and transfer bottom-up	Paul Marchal Carolina Giraldo	IFREMER Boulogne sur Mer
Clupeids and flatfishes larvae	Study of larval condition	Christophe Loots Carolina Giraldo	IFREMER Boulogne sur Mer
Zero Minute hauls	To determine the catchability of the trawl during the shooting and the hauling	IBTSWG	

Table 3 : Research project participating to French IBTS Q1

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Dickey-Collas, M., Nash, R. D. M., Brunel, T., van Damme, C. J. G., Marshall, C. T., Payne, M. R., Corten, A., Geffen, A. J., Peck, M. A., Hatfield, E. M. C., Hintzen, N. T., Enberg, K., Kell, L. T., and Simmonds, E. J. 2010. Lessons learned from stock collapse and recovery of North Sea herring: a review. – ICES Journal of Marine Science, 67: 1875–1886.

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ICES. 2017. Manual for the Midwater Ring Net sampling during IBTS Q1. Series of ICES Survey Protocols SISP 2. 25 pp. http://doi.org/10.17895/ices.pub.3434

ICES. 2020. Manual for the North Sea International Bottom Trawl Surveys. Series of ICES Survey Protocols SISP 10-IBTS 10, Revision 11. 102 pp. http://doi.org/10.17895/ices.pub.7562

Annexes

ANNEX 1: IBTS TRAWLS POSITIONS 2021

StNo	HaulNo	Year	Month	Day	Stratum	ShootLat	ShootLong	HaulLat	HaulLong	Depth	HaulVal
Z0001	1	2021	1	20	30F1	50.9161826	1.6161211	50.9373094	1.6547287	25	V
Z0002	2	2021	1	20	31F1	51.0832202	1.9218329	51.0900699	1.971288	32	V
Z0003	3	2021	1	20	31F2	51.1352826	2.2153835	51.1234138	2.1812773	25	V
Z0005	4	2021	1	21	32F3	51.8275128	3.437574	51.8392603	3.4683342	30	V
Z0006	5	2021	1	21	33F3	52.2512315	3.9192383	52.2680493	3.8722831	25	V
Z0007	6	2021	1	21	33F4	52.2782176	4.1455568	52.2628299	4.1913774	20	V
Z0014	7	2021	1	22	35F4	53.1611292	4.1521591	53.1320806	4.134322	30	V
Z0015	8	2021	1	22	34F4	52.8480214	4.1164835	52.8267931	4.0820165	29	V
Z0016	9	2021	1	22	34F3	52.6729727	3.4227426	52.7029842	3.4059421	29	V
Z0023	10	2021	1	23	37F4	54.0700172	4.1371195	54.0940731	4.1757638	48	V
Z0024	11	2021	1	23	36F5	53.7474661	5.2962424	53.741886	5.239735	31	V
Z0033	14	2021	1	24	36F6	53.881325	6.963897	53.8706503	6.9122115	24	V
Z0034	15	2021	1	24	36F7	53.9277917	7.4053968	53.9401857	7.4572438	26	V
Z0035	16	2021	1	24	37F7	54.2807552	7.5806885	54.2691328	7.63368	39	V
Z0044	19	2021	1	25	38F5	54.6436208	5.59694733	54.6394137	5.5404263	44	V
Z0045	20	2021	1	25	37F5	54.3213482	5.3013776	54.3027737	5.2566732	43	V
Z0046	21	2021	1	25	37F6	54.232924	6.0553382	54.2407732	6.108316	39	V
Z0054	23	2021	1	26	38F5	54.8827403	5.26734617	54.8832777	5.21004517	41	V
Z0055	24	2021	1	26	38F4	54.9184939	4.1158753	54.9106275	4.1700939	49	V
Z0062	27	2021	1	27	36F3	53.9072067	3.93188	53.8810655	3.8979646	40	V
Z0063	28	2021	1	27	36F4	53.6222758	4.5215031	53.5893204	4.5118302	29	V
Z0064	29	2021	1	27	35F3	53.2861563	3.8243188	53.2769324	3.7739228	27	V
Z0070	30	2021	1	28	32F3	51.6259863	3.16772833	51.5948775	3.1524824	26	V
Z0071	31	2021	1	28	32F2	51.6412218	2.5587369	51.6142078	2.5357522	42	V
Z0072	32	2021	1	28	31F2	51.3967018	2.2856527	51.3740241	2.2501599	37	V
Z0079	33	2021	1	29	34F2	52.6084113	2.5042786	52.5938778	2.4568948	50	V
Z0080	34	2021	1	29	34F2	52.7943748	2.7065971	52.8126753	2.7493466	40	V
Z0081	35	2021	1	29	35F2	53.1629452	2.245815	53.1894055	2.2105632	41	V
Z0088	36	2021	1	30	36F0	53.9276364	0.2650754	53.9603161	0.2565335	52	V
Z0089	37	2021	1	30	37F0	54.2836144	0.5817467	54.2997588	0.532757	61	I
Z0090	38	2021	1	30	37E9	54.4881053	-0.0778705	54.495405	-0.1177101	59	V
Z0098	39	2021	1	31	35F0	53.4703657	0.6713042	53.5020004	0.6778619	92	V
Z0099	40	2021	1	31	35F0	53.4657857	0.9643649	53.4849677	0.94410667	21	V
Z0100	41	2021	1	31	36F0	53.8313512	0.8749664	53.8349657	0.9088505	40	I
Z0101	42	2021	1	31	36F1	53.9358008	1.29553883	53.9659977	1.2833227	41	V
Z0108	43	2021	2	1	35F1	53.2026901	1.8313387	53.2083334	1.8224674	38	I
Z0108	44	2021	2	1	35F1	53.2097036	1.8210012	53.2312948	1.7882361	36	V
Z0109	45	2021	2	1	35F1	53.4086175	1.5678156	53.4369739	1.5429644	30	V
Z0110	46	2021	2	1	36F1	53.6105305	1.7848098	53.6303645	1.8268791	24	V

StNo	HaulNo	Year	Month	Day	Stratum	ShootLat	ShootLong	HaulLat	HaulLong	Depth	HaulVal
Z0117	47	2021	2	2	34F1	52.5164729	1.923525	52.488729	1.9039433	29	V
Z0118	48	2021	2	2	33F1	52.3004923	1.8994359	52.268835	1.8971735	27	V
Z0119	49	2021	2	2	33F2	52.323266	2.68394733	52.3370648	2.73013317	44	V
Z0128	52	2021	2	3	33F2	52.2921446	2.2172581	52.26921	2.2017172	41	V
Z0129	53	2021	2	3	32F1	51.9576615	1.8296362	51.9279179	1.8150916	32	V
Z0130	54	2021	2	3	32F2	51.6583149	2.1742019	51.6820089	2.1493481	49	V
Z0138	55	2021	2	4	32F1	51.5517176	1.7574533	51.5202488	1.7581482	39	V
Z0139	56	2021	2	4	31F1	51.290082	1.733038	51.2604062	1.7170844	41	V
Z0150	59	2021	2	5	29F1	50.4460216	1.4261648	50.4747575	1.4419787	26	V
Z0151	60	2021	2	5	29F1	50.335637	1.115007	50.3403045	1.0659663	41	V
Z0158	61	2021	2	6	30F0	50.5463189	0.3756366	50.5332702	0.3272947	48	V
Z0159	62	2021	2	6	29F0	50.293625	0.4884182	50.3001316	0.5344241	54	V
Z0160	63	2021	2	6	29F0	50.1572107	0.969065	50.1482943	0.9233149	32	V
Z0169	64	2021	2	7	28F0	49.8774499	0.4300721	49.8693879	0.3756338	30	V
Z0170	65	2021	2	7	28F0	49.5706194	0.0602676	49.5986263	0.0815788	21	V
Z0177	66	2021	2	8	30F0	50.7831516	0.8424595	50.7987887	0.8807862	41	V
Z0178	67	2021	2	8	30F1	50.8390466	1.3291366	50.8446715	1.3337522	30	I

ANNEX 2: IBTS MIK POSITIONS 2021

StNo	HaulNo	Date	Stratum	ShootLat	ShootLong	HaulLat	HaulLong
Z0004	IBTSMIK1	20/01/2021	31F2	51,2502151	2,270883	51,2452486	2,2751041
Z0008	IBTSMIK2	21/01/2021	33F4	52,1461737	4,1531128	52,1402813	4,1514637
Z0009	IBTSMIK3	21/01/2021	33F3	52,2149568	3,7234226	52,2083422	3,7230456
Z0010	IBTSMIK4	21/01/2021	33F3	52,3602282	3,7596261	52,3555606	3,7531352
Z0011	IBTSMIK5	21/01/2021	33F4	52,3658613	4,1059448	52,3680896	4,0939077
Z0012	IBTSMIK6	22/01/2021	34F4	52,6523486	4,1448756	52,6523108	4,1311435
Z0013	IBTSMIK7	22/01/2021	34F4	52,8527033	4,1100535	52,852475	4,093832
Z0017	IBTSMIK8	22/01/2021	34F3	52,8440194	3,5223349	52,8379555	3,5088177
Z0018	IBTSMIK9	22/01/2021	34F3	52,9229173	3,8499631	52,918349	3,8347606
Z0019	IBTSMIK10	22/01/2021	35F4	53,1364558	4,1949157	53,136047	4,1811678
Z0020	IBTSMIK11	22/01/2021	35F4	53,3729864	4,2041604	53,3715636	4,1933191
Z0021	IBTSMIK12	23/01/2021	36F4	53,64184	4,20168	53,638478	4,1953469
Z0022	IBTSMIK13	23/01/2021	36F4	53,853148	4,1844278	53,8415227	4,1796347
Z0027	IBTSMIK14	23/01/2021	36F5	53,7409154	5,408996	53,745754	5,3974402
Z0028	IBTSMIK15	23/01/2021	36F5	53,7587856	5,7597515	53,7654595	5,7416748
Z0029	IBTSMIK16	23/01/2021	36F6	53,7565756	6,1774722	53,759807	6,194198
Z0030	IBTSMIK17	23/01/2021	36F6	53,8167785	6,6181989	53,818273	6,62728
Z0031	IBTSMIK18	24/01/2021	36F7	53,772965	7,1174786	53,7761694	7,1082257
Z0032	IBTSMIK19	24/01/2021	36F7	53,9042191	7,2946316	53,9123182	7,3029764
Z0038	IBTSMIK20	24/01/2021	37F7	54,2623036	7,524151	54,262992	7,5415851
Z0039	IBTSMIK21	24/01/2021	37F7	54,2695579	7,1497159	54,2759448	7,1588756
Z0040	IBTSMIK22	24/01/2021	37F6	54,2555978	6,7628296	54,2574471	6,7438062

StNo	HaulNo	Date	Stratum	ShootLat	ShootLong	HaulLat	HaulLong
Z0041	IBTSMIK23	24/01/2021	37F6	54,2978175	6,2581678	54,3033888	6,2419273
Z0042	IBTSMIK24	25/01/2021	38F5	54,7803453	5,8286218	54,7935328	5,8259554
Z0043	IBTSMIK25	25/01/2021	38F5	54,7818915	5,3891337	54,7894434	5,3920589
Z0048	IBTSMIK26	25/01/2021	37F5	54,2187074	5,665763	54,2219492	5,6520552
Z0049	IBTSMIK27	25/01/2021	37F5	54,2202044	5,2726814	54,2211507	5,2583837
Z0050	IBTSMIK28	25/01/2021	37F4	54,2501072	4,8595176	54,2595113	4,8534992
Z0051	IBTSMIK29	26/01/2021	38F4	54,6320616	4,8046751	54,6448041	4,8175713
Z0052	IBTSMIK30	26/01/2021	38F5	54,6318825	5,2260126	54,6433091	5,235315
Z0053	IBTSMIK31	26/01/2021	38F5	54,8304756	5,2329818	54,8362274	5,2454653
Z0058	IBTSMIK32	26/01/2021	38F4	54,6660658	4,142369	54,6698307	4,1258956
Z0059	IBTSMIK33	26/01/2021	37F4	54,2495605	4,1290164	54,2470728	4,1156066
Z0060	IBTSMIK34	27/01/2021	36F3	53,8611051	3,5472274	53,8552349	3,5337067
Z0061	IBTSMIK35	27/01/2021	36F3	53,640037	3,5496578	53,6363832	3,5414312
Z0065	IBTSMIK36	27/01/2021	35F3	53,2377388	3,7737396	53,2480397	3,7715577
Z0066	IBTSMIK37	27/01/2021	35F3	53,0556163	3,7270278	53,0617502	3,7240912
Z0067	IBTSMIK38	28/01/2021	32F3	51,8741324	3,5642082	51,8734243	3,5839119
Z0068	IBTSMIK39	28/01/2021	32F3	51,7182818	3,3843619	51,7159107	3,3910479
Z0069	IBTSMIK40	28/01/2021	32F3	51,6763865	3,1695774	51,6694526	3,1711915
Z0073	IBTSMIK41	28/01/2021	32F2	51,6462565	2,3730625	51,6475711	2,3511256
Z0074	IBTSMIK42	28/01/2021	32F2	51,8565502	2,4602822	51,8604793	2,4685286
Z0075	IBTSMIK43	28/01/2021	33F2	52,0970469	2,5512507	52,1015319	2,5519624
Z0076	IBTSMIK44	28/01/2021	33F2	52,3483105	2,5810405	52,3415309	2,5699318
Z0077	IBTSMIK45	29/01/2021	34F2	52,6032852	2,7466164	52,5988784	2,74147
Z0078	IBTSMIK46	29/01/2021	34F2	52,8388843	2,7539097	52,8528328	2,7399807
Z0082	IBTSMIK47	29/01/2021	35F1	53,3076845	1,8105289	53,3095524	1,8254983
Z0083	IBTSMIK48	29/01/2021	35F1	53,3235392	1,4013125	53,3265455	1,4167309
Z0084	IBTSMIK49	29/01/2021	36F1	53,6444093	1,5213055	53,6525384	1,5351919
Z0085	IBTSMIK50	30/01/2021	36F1	53,7765949	1,1837771	53,7865882	1,193756
Z0086	IBTSMIK51	30/01/2021	36F0	53,7879709	0,8199426	53,7862797	0,8369988
Z0087	IBTSMIK52	30/01/2021	36F0	53,7845605	0,4057602	53,7761596	0,4220209
Z0091	IBTSMIK53	30/01/2021	37E9	54,3532664	-0,0708305	54,3472905	-0,0519313
Z0092	IBTSMIK54	30/01/2021	37F0	54,2172447	0,111387	54,2128133	0,128537
Z0093	IBTSMIK55	30/01/2021	37F0	54,107686	0,356183	54,1019919	0,3786332
Z0094	IBTSMIK56	30/01/2021	36F0	53,8357022	0,4068176	53,8340469	0,4072235
Z0095	IBTSMIK57	31/01/2021	36F0	53,6239325	0,621177	53,6359274	0,6323062
Z0096	IBTSMIK58	31/01/2021	35F0	53,408429	0,7091516	53,4101839	0,7169175
Z0097	IBTSMIK59	31/01/2021	35F0	53,2587845	0,5901327	53,2523362	0,6013588
Z0102	IBTSMIK60	31/01/2021	36F1	53,7810723	1,3646398	53,7705058	1,3766997
Z0103	IBTSMIK61	31/01/2021	36F1	53,633275	1,2257204	53,6200068	1,2352974
Z0104	IBTSMIK62	31/01/2021	35F1	53,354208	1,1774042	53,3450997	1,1950719
Z0105	IBTSMIK63	31/01/2021	35F0	53,3598502	0,873026	53,3623426	0,8885405
Z0106	IBTSMIK64	01/02/2021	35F0	53,1794873	0,8288968	53,1853927	0,835611
Z0107	IBTSMIK65	01/02/2021	35F1	53,1731334	1,4066234	53,1721324	1,4108991

StNo	HaulNo	Date	Stratum	ShootLat	ShootLong	HaulLat	HaulLong
Z0111	IBTSMIK66	01/02/2021	36F2	53,6209533	2,4426577	53,6209885	2,4570791
Z0112	IBTSMIK67	01/02/2021	36F2	53,6170704	2,8079527	53,6159396	2,8271437
Z0113	IBTSMIK68	01/02/2021	35F2	53,3970691	2,590241	53,3986978	2,5808818
Z0114	IBTSMIK69	01/02/2021	35F2	53,1780223	2,3215737	53,1699563	2,3387417
Z0115	IBTSMIK70	02/02/2021	34F1	52,8454927	1,9047642	52,84195	1,9080058
Z0116	IBTSMIK71	02/02/2021	34F1	52,6775498	1,9125431	52,677551	1,9106872
Z0122	IBTSMIK72	02/02/2021	34F2	52,6528033	2,5323129	52,6558337	2,5200504
Z0123	IBTSMIK73	02/02/2021	34F2	52,6356902	2,2021265	52,6327472	2,1926574
Z0124	IBTSMIK74	02/02/2021	33F2	52,3966174	2,183122	52,3904006	2,1777724
Z0125	IBTSMIK75	02/02/2021	33F1	52,406194	1,8830807	52,3926417	1,8686192
Z0126	IBTSMIK76	03/02/2021	33F1	52,1776058	1,793973	52,1657254	1,7786691
Z0127	IBTSMIK77	03/02/2021	33F2	52,1817622	2,2949892	52,1843485	2,2838778
Z0131	IBTSMIK78	03/02/2021	32F2	51,7066774	2,2351948	51,7183843	2,2298024
Z0132	IBTSMIK79	03/02/2021	32F2	51,8796031	2,2332076	51,8932309	2,2270385
Z0133	IBTSMIK80	03/02/2021	32F1	51,8773442	1,8370469	51,8727817	1,8351998
Z0134	IBTSMIK81	03/02/2021	32F1	51,7350832	1,6685414	51,7261968	1,6482511
Z0135	IBTSMIK82	04/02/2021	32F1	51,5870448	1,7973076	51,5738211	1,7694395
Z0136	IBTSMIK83	04/02/2021	31F1	51,35952	1,5911705	51,3559024	1,5758538
Z0137	IBTSMIK84	04/02/2021	31F1	51,363156	1,9760648	51,36344	1,9624463
Z0144	IBTSMIK85	04/02/2021	31F2	51,1310865	2,1752885	51,1304365	2,1681976
Z0145	IBTSMIK86	04/02/2021	31F2	51,2782539	2,5472618	51,2758241	2,5395016
Z0146	IBTSMIK87	04/02/2021	31F2	51,2886897	2,0510292	51,2810768	2,0345643
Z0147	IBTSMIK88	05/02/2021	31F1	51,0907372	1,8251963	51,0747521	1,8145866
Z0148	IBTSMIK89	05/02/2021	30F1	50,9120417	1,5556798	50,912366	1,5560028
Z0152	IBTSMIK90	05/02/2021	30F1	50,6171056	1,4014638	50,6138541	1,395188
Z0153	IBTSMIK91	05/02/2021	30F1	50,8639987	1,3535699	50,8575772	1,3474559
Z0154	IBTSMIK92	05/02/2021	30F1	50,7103759	1,1313488	50,70418	1,1165529
Z0155	IBTSMIK93	05/02/2021	30F0	50,6043404	0,8599995	50,6046789	0,847282
Z0156	IBTSMIK94	06/02/2021	30F0	50,7599442	0,6712419	50,7602806	0,6629374
Z0157	IBTSMIK95	06/02/2021	30F0	50,670227	0,4000593	50,6688004	0,3870804
Z0161	IBTSMIK96	06/02/2021	29F1	50,0756066	1,112964	50,0779972	1,1344064
Z0162	IBTSMIK97	06/02/2021	29F1	50,15502	1,267076	50,1556506	1,2815453
Z0163	IBTSMIK98	06/02/2021	29F1	50,3254747	1,3689478	50,3328457	1,3786033
Z0164	IBTSMIK99	06/02/2021	29F1	50,4100921	1,1445397	50,412302	1,1572895
Z0165	IBTSMIK100	07/02/2021	29F0	50,34936	0,8530144	50,3501922	0,8618912
Z0166	IBTSMIK101	07/02/2021	29F0	50,0876568	0,7041207	50,0884694	0,7240641
Z0167	IBTSMIK102	07/02/2021	28F0	49,9067297	0,5586387	49,9111549	0,5923728
Z0171	IBTSMIK103	07/02/2021	28F0	49,7256692	0,0806475	49,7331072	0,09198
Z0172	IBTSMIK104	07/02/2021	28F0	49,8721113	0,2377827	49,8789715	0,2451847
Z0173	IBTSMIK105	07/02/2021	29F0	50,1175818	0,1679356	50,125767	0,1697825
Z0174	IBTSMIK106	07/02/2021	29F0	50,2722497	0,427115	50,2809923	0,4270143
Z0175	IBTSMIK107	08/02/2021	29F0	50,4276573	0,2414939	50,4335697	0,242721
Z0176	IBTSMIK108	08/02/2021	30F0	50,6477207	0,1963733	50,6556473	0,209156

ANNEX 3: SPECIES CAUGHT DURING IBTS 2021 (FISHES, SKATES, RAYS, AND COMMERCIALS CRUSTACEAN AND MOLLUSK).

Aequipecten opercularis
Agonus cataphractus
Alloteuthi sp
Amblyraja radiata
Ammodytes marinus
Ammodytes tobianus
Arnoglossus imperialis
Arnoglossus laterna
Atherina presbyter
Blennius ocellaris
Buccinum undatum
Buglossidium luteum
Callionymus lyra
Callionymus reticulatus
Cancer pagurus
Chelidonichthys cuculus
Chelidonichthys lucerna
Ciliata mustela
Ciliata septentrionalis
Clupea harengus
Conger conger
Dicentrarchus labrax
Diplecogaster
Echiichthys vipera
Eledone cirrhosa
Enchelyopus cimbrius
Engraulis encrasicolus
Eutrigla gurnardus
Gadus morhua
Galeorhinus galeus
Gasterosteus aculeatus
Gobius niger
Gobius paganellus
Helicolenus dactylopterus
Hippocampus hippocampus
Hippoglossoides platessoides
Homarus gammarus
Hyperoplus lanceolatus
Labrus bergylta
Limanda limanda
Liparis liparis
Loligo forbesii
Loligo vulgaris
Lophius piscatorius
Maja brachydactyla
Melanogrammus aeglefinus
Merlangius merlangus
Merluccius merluccius

Microchirus variegatus
Microstomus kitt
Mullus surmuletus
Mustelus asterias
Myoxocephalus scorpius
Mytilus sp
Necora puber
Nephrops norvegicus
Nerophis lumbriciformis
Ostrea edulis
Pecten maximus
Pegusa lascaris
Petromyzon marinus
Pholis gunnellus
Platichthys flesus
Pleuronectes platessa
Pollachius virens
Pomatoschistus
Raja brachyura
Raja clavata
Raja montagui
Raja undulata
Sardina pilchardus
Scomber scombrus
Scomberesox saurus saurus
Scophthalmus maximus
Scophthalmus rhombus
Scyliorhinus canicula
Sepia officinalis
Sepiola
Solea solea
Sprattus sprattus
Squalus acanthias
Syngnathus acus
Syngnathus rostellatus
Todaropsis eblanae
Trachinus draco
Trachurus trachurus
Trigloporus lastoviza
Trisopterus esmarkii
Trisopterus luscus
Trisopterus minutus
Zeugopterus punctatus
Zeus faber