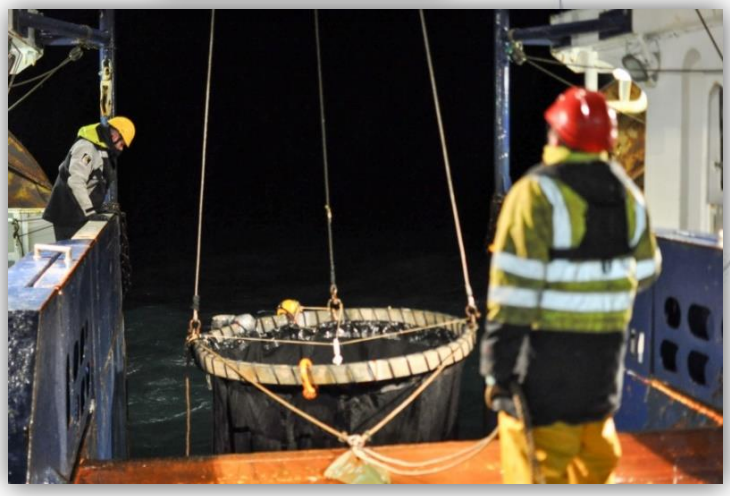
International Bottom Trawl Survey (IBTS2019-Q1)

-

French cruise report



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Résumé/ Abstract :

IBTS surveys (International Bottom Trawl Survey) are carried out within an international framework. Main countries bordering the North Sea participate to it according to the European Community regulations (EC N°1543/2000 and N° 1639/2001) which specify that countries from E.U. have to carry out surveys at sea in order to evaluate abundance and stocks distribution, independently of commercial fisheries data. The first target of the IBTS survey is to have a diagnosis on the main commercial fish stock and to calculate abundances index by age for these species. This survey started in the years 70's and gradually standardised. Since the years 80's, a common protocol is implemented and used by all participants. The same fishing gear and the same working methods are used. In addition, to calculate an index for herring and sprat larvae (0 groups), each participating vessel operates with a MIK net during the night (Methot Isaac Kidd). For 20 years, the southern part of the North Sea has been allocated to the French vessel and since 2007, the Eastern Channel has been integrated to the whole sampled area. As interactions and circulation of stock between these two areas are important, Eastern Channel is often associated the North Sea for stock assessment. Herring for example which is exploited all the year in the North Sea comes into the Channel during November and December for reproduction. More precise information on larvae indices will be obtained when this area is sampled. In order to study the whole marine ecosystem of the North Sea and English Channel, some additional studies are carried out during the Survey on the R/V Thalassa. For example, the Continuous Underwater Fish Eggs Sampler device (CUFES) is used to study fish spawning areas. Abundance and distribution of the winter planktonic community (phyto and zoo plankton) and a monitoring study on the structure and distribution of the benthic macroinvertebrates community are also carried out. At last, more samples are done for the Marine Strategy framework since 2015.

Mots-clés/ Key words: North sea, GOV, beam 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). 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.

In 1981, the survey was renamed the International Young Fish Survey (IYFS). 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 ICES (International Council for the Exploration of the Sea) assessment and science groups with consistent and standardized data for examining

spatial and temporal changes in the distribution and relative abundance of fish and fish assemblages and of the biological parameters for commercial fish species for stock assessment purposes. 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

GOV bottom trawl (fish and 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.

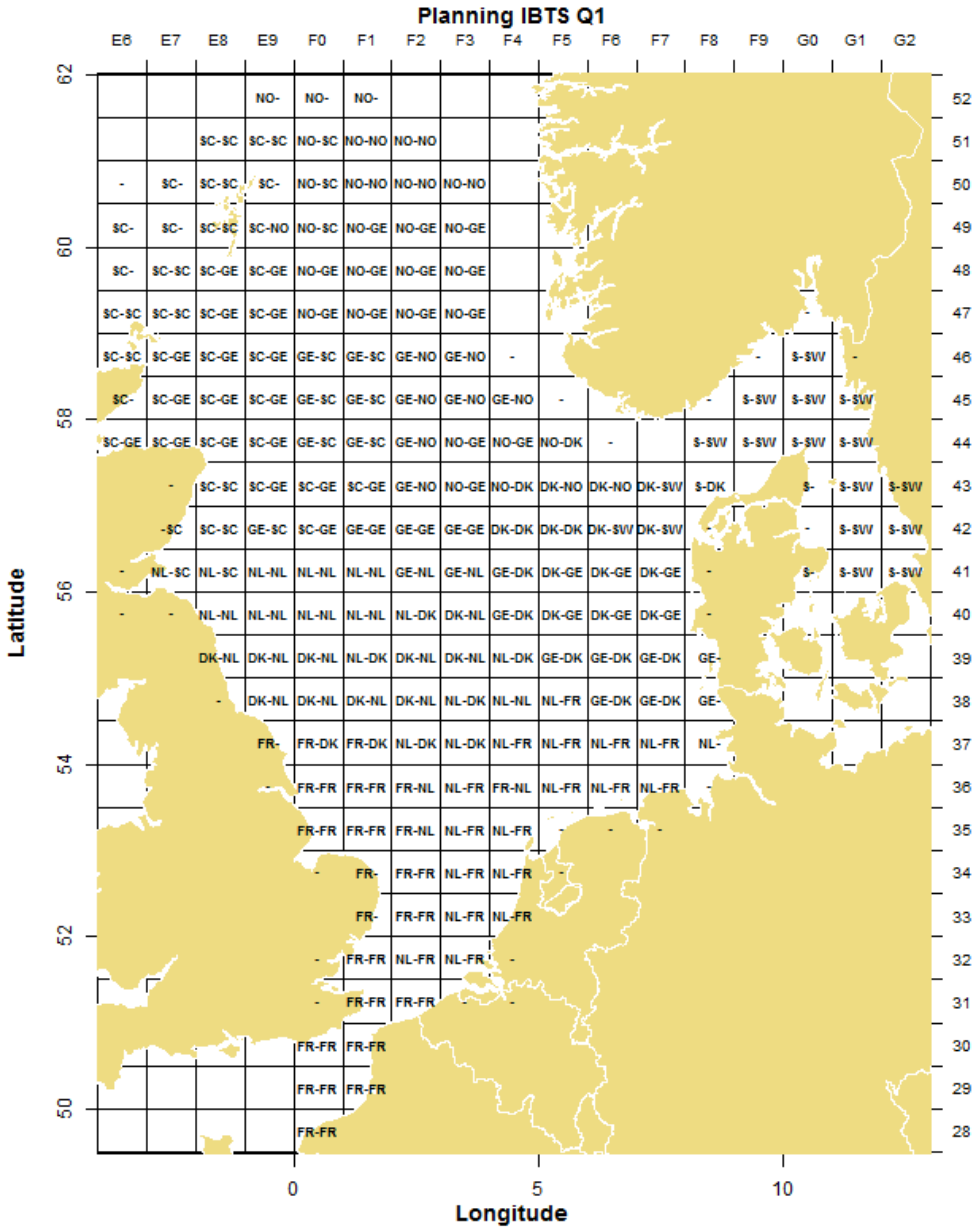


Figure 1: Allocation map for all participants (FR: France, NL: Netherlands; GE: Germany, DK: Denmark, SW: Sweden, SC: Scotland, NO: Norway)

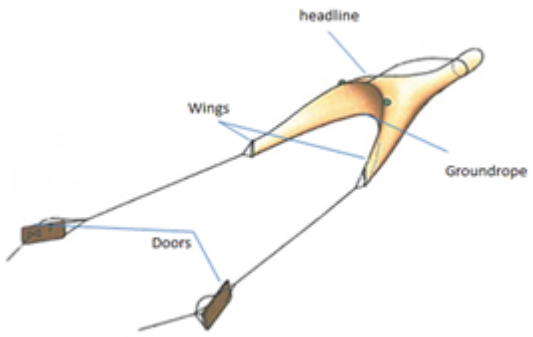


Figure 2: Illustration of a standard ground gear. To record trawl parameters, sensors are fixed on the doors, on the wings and on the middle of the headline.

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 (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 or in 96% ethanol. 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).

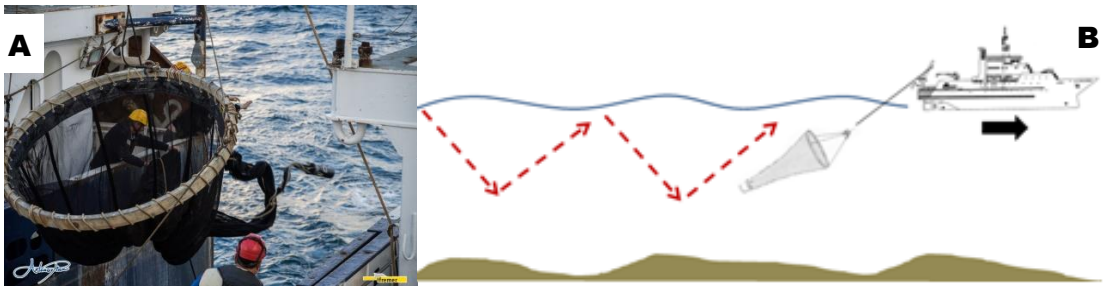


Figure 3: A. MIK net used during the Survey (13 meters long) B. During at least 10 minutes, the net goes down near the bottom (5meters) and it is retired immediately in order to have an oblique haul.

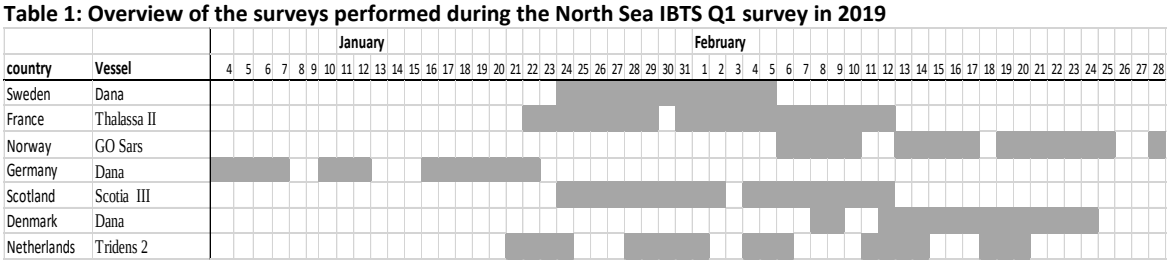
2 International preliminary results of the 2019 IBTS survey

After the survey, all the data from all the participating countries have been stored in the ICES database (DATRAS: http://www.ices.dk/marine-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

The quarter 1 2019 fleet consisted of five vessels: "Dana" (Germany, Sweden and Denmark), "GO Sars" (Norway), "Scotia" (Scotland), "Thalassa" (France), and "Tridens II" (Netherlands). The survey covered the period 4 January to 28 February 2019 (Table 1). A total of 361 GOV hauls (10 of which were invalid) and 667 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.

Table 1: Overview of the surveys performed during the North Sea IBTS Q1 survey in 2019



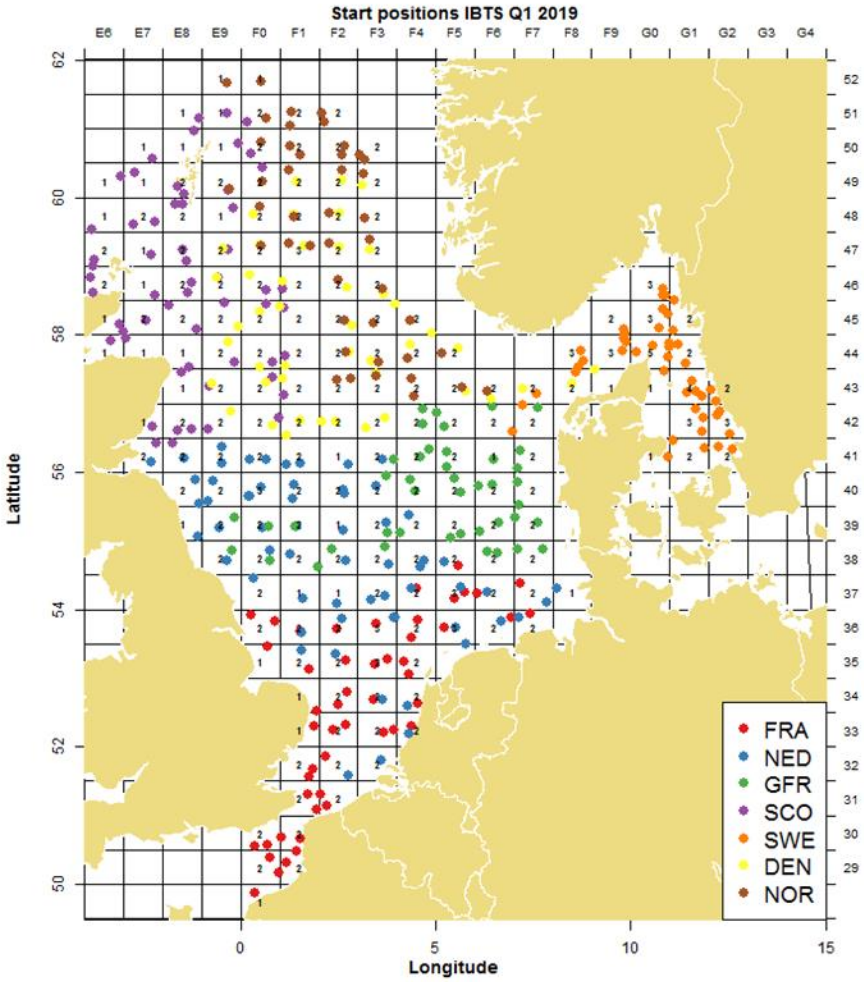
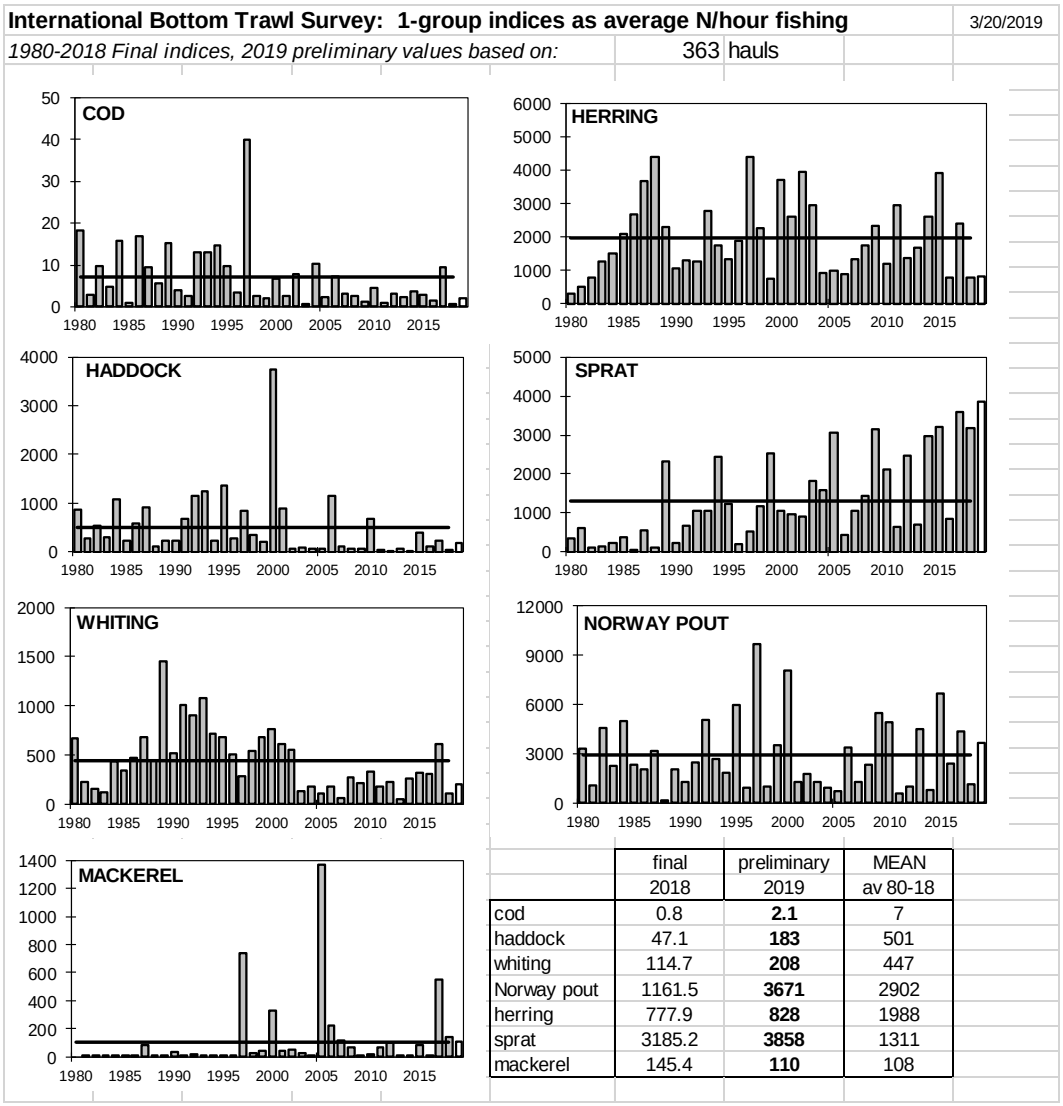


Figure 4: Number of hauls per ICES rectangle with GOV during the North Sea IBTS Q1 2019 and the start positions of the trawl by country.

2.2 Fish recruitment indices

The preliminary indices for the recruits of seven commercial species based on the 2019 quarter 1 survey are shown in Figure 5. According to these preliminary results, Sprat and Norway pout were above average for the last 40 years, with Sprat being the highest of the time series. All other species were below average, with herring being very low for the second time in a row.



	final 2018	preliminary 2019	MEAN av 80-18
cod	0.8	**2.1**	7
haddock	47.1	**183**	501
whiting	114.7	**208**	447
Norway pout	1161.5	**3671**	2902
herring	777.9	**828**	1988
sprat	3185.2	**3858**	1311
mackerel	145.4	**110**	108

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 1980-2019

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, 667 depth-integrated hauls were completed with the MIK-net. The coverage of the survey area was good with at least 2 hauls in most of ICES rectangles in the North Sea as well as in Kattegat and Skagerrak.

Figure 6, shows the length distribution of all herring larvae caught during the 2019 Q1 IBTS.

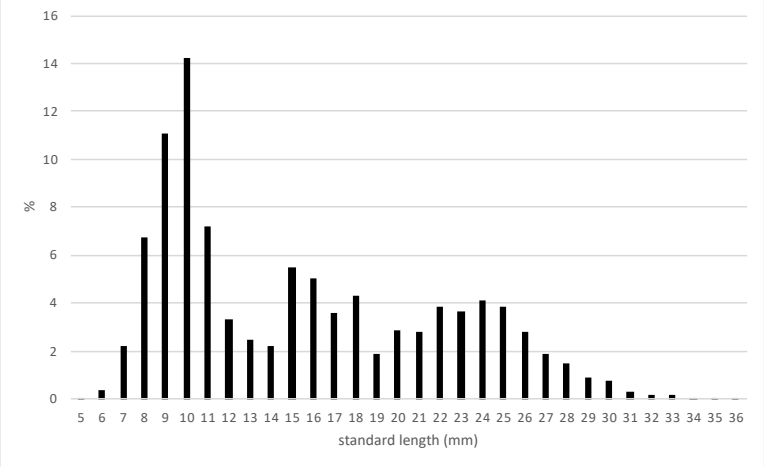


Figure 6: North Sea herring. Length distribution of all herring larvae caught during the 2019 Q1 IBTS.

3 The IBTS 2019 survey on research Vessel Thalassa

3.1 Survey planning

The R/V Thalassa left Boulogne-sur-Mer (France) the 22nd of January (Fig 7) and field work started in the afternoon in the Eastern English Channel. The 25th of January, the Thalassa stopped in front of Boulogne and 3 persons left the vessel using the pilot boat. The R/V Thalassa then moved to the North and came down along the Dutch Coasts. The 30rd of February, the Thalassa vessel stopped in Scheveningen (The Netherlands) for 36 hours. During the second part of the survey, trawling lines were performed in English waters. The survey finished in Boulogne-sur-Mer the 13th of February 2019.

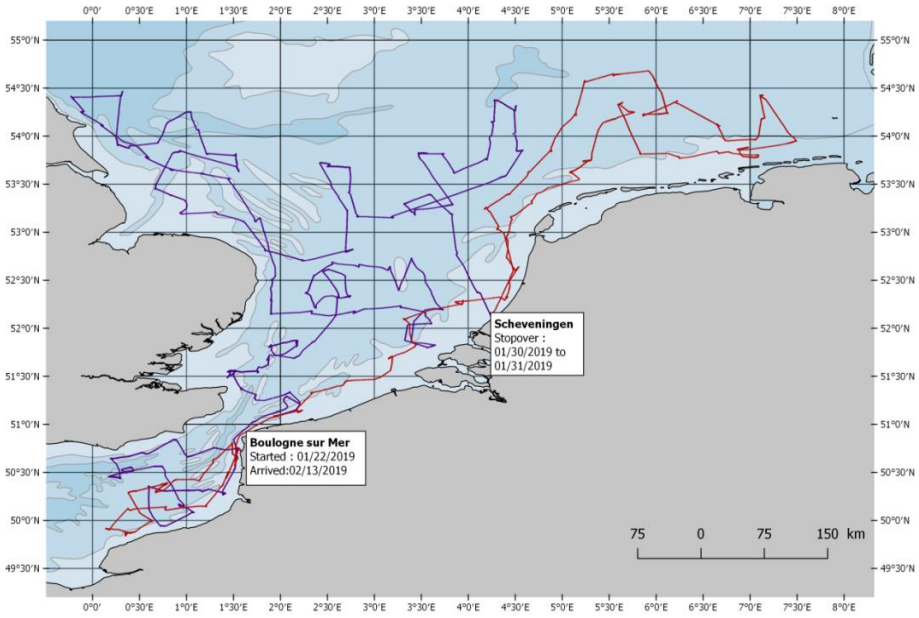


Figure 7: R/V Thalassa navigation during IBTS Q1 2019. First part (red track) between the 22nd and the 30rd of January, second part (purple track) between the 31st of January and the 13th of February

3.2 Participants

The team of was composed of 23 scientists from the Ifremer's Centers of Boulogne, Port-en-Bessin, Brest, Dinard and Sète and from other French Institutes (Anses, MNHN, CNRS, Pelagis), from Universities (ULCO) and from the sea center "Nausicaa". During the first three days a journalist from the Newspaper "Paris Normandie" and one employee from a fisherman association (FromNORD) were on board to observe the different fieldwork activities. During the survey, scientists are divided in different teams. In the fish laboratory, 8 scientists sort, measure the catch, 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, Niskin bottle, WP2, CUFES, Manta and MIK net. Birds and mammals watchers constitute a third team and are posted at the higher level of the ship.

3.3 Results from IBTS2019

Fish communities

10 fishing stations were carried out in the Eastern Channel and 44 in the North Sea. At least one haul of ½ hour was done in each ICES squares during day time. In the English Channel and the Strait of Dover, the sampling level was higher with 2 hauls by rectangles. Figure 8 shows the position of these GOV trawls and the characteristics of these hauls are listed in annex 1. The trawl used was the standard GOV 36/47 as described paragraph 1.3.1.

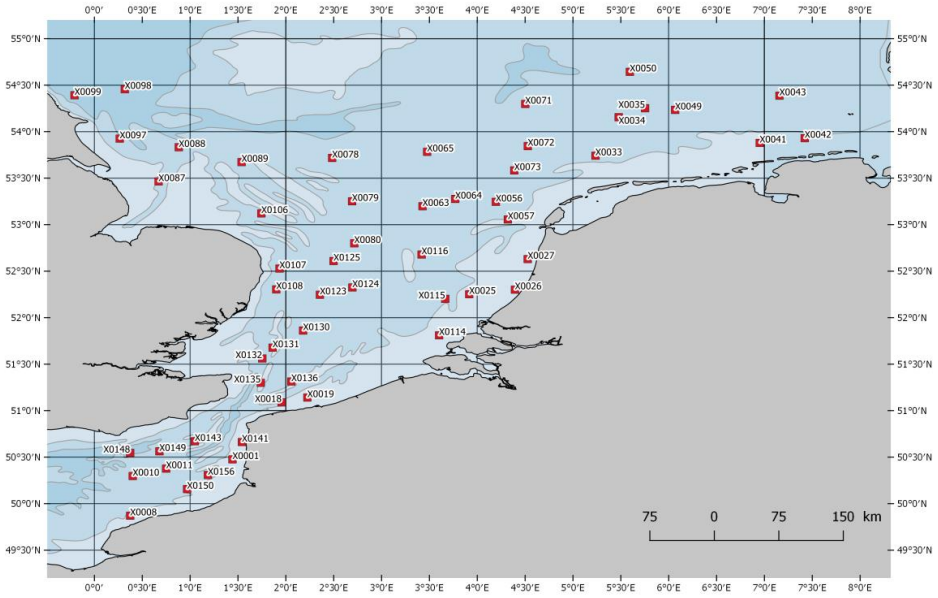


Figure 8: Positions of GOV trawls

After each trawl, the catch was sampled. It is recommended to sort the fully catch when possible from all valid hauls, with fish and shellfish species identified to the lowest taxonomic level possible. For larger catches a selection of species/size categories of species may be identified as being sufficiently abundant that they can be subsampled, appropriately. Invertebrate species ('benthos'), was also sorted even if the GOV is not an effective gear for catching benthos for quantitative sampling. But it can be used for some distribution information, remembering the limitation of the gear, given the ground gear set up and the size of the meshes within the net make-up. Wastes caught in the net are also counted by category. The size and the weight of various wastes as plastics, clothes, fishing lines etc. are recorded at 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 1 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.

Table 2 : Number of biological samples

Species	Number of biological samples
Chelidonichthys cuculus	26
Clupea harengus	439
Dicentrarchus labrax	8
Gadus morhua	28
Melanogrammus aeglefinus	2
Merlangius merlangus	973
Mullus surmuletus	176
Pleuronectes platessa	672
Scophthalmus maximus	10
Scophthalmus rhombus	6
Solea solea	224
Sprattus sprattus	588
Trisopterus luscus	94

3.3.1.1 Species Distribution and community structure

During this survey, 77 different fish species were caught. The whole list is presented in Annex 3. Figure 9 shows the main species found: As last year, the whiting (*Merlangius merlangus*) was the most dominant (in biomass) species and represent 27 % of the total catch , compared with 54 % in 2018. This year, the dab (*Limanda limanda*) just got ahead the sprat (*Sprattus sprattus*) with respectively 18% and 16%. As 2018, the sprat is more abundant than herring (*Clupea harengus*), which represent 9% of the total catch.

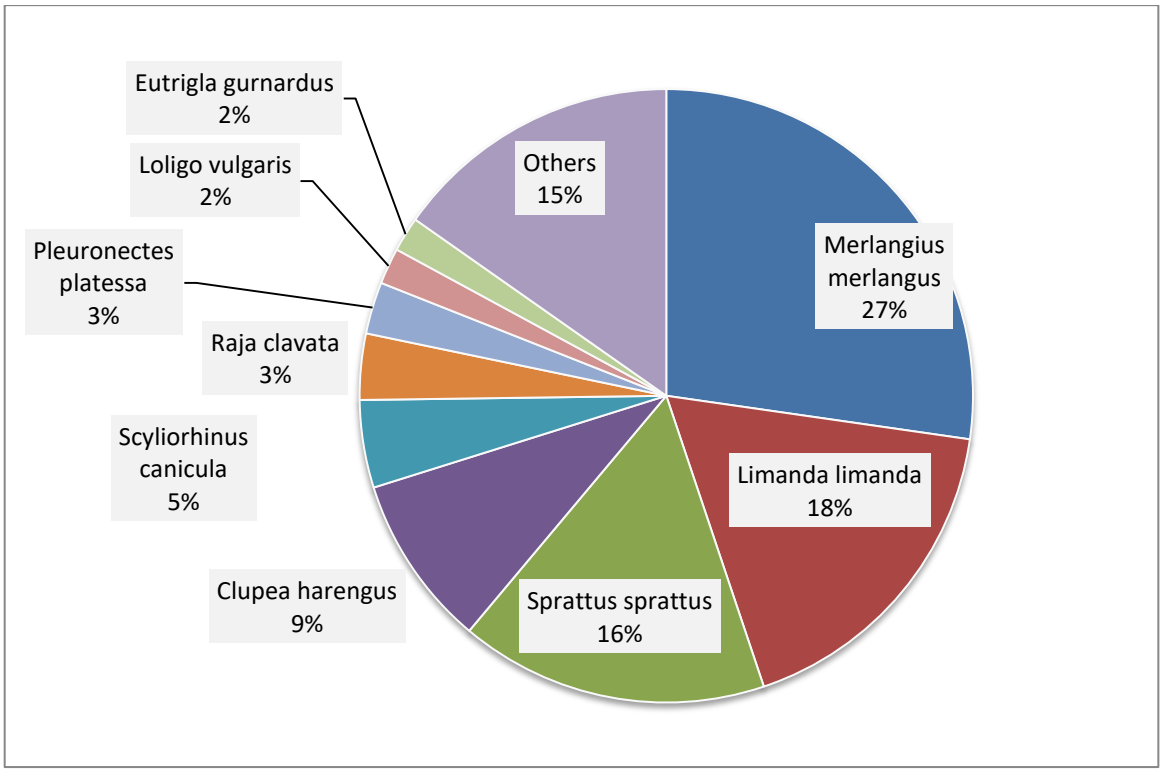


Figure 9: Main species biomass in the total catch

Figure 10 shows the spatial distribution of the main species (biomass by hauls). As usual, whiting, sprat and dab are mostly present in the 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 composed of various species as rays, red mullet, dogfishes, etc.

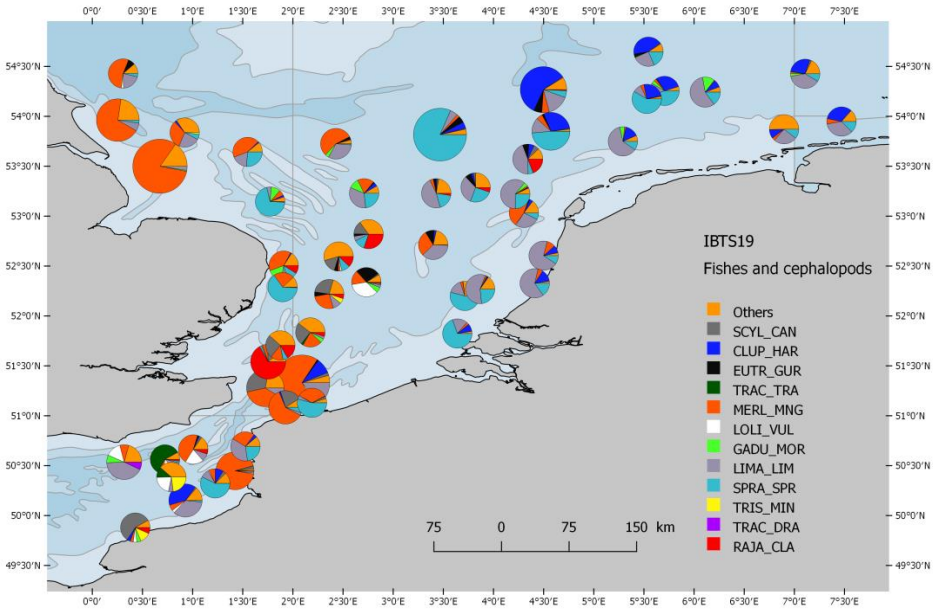


Figure 10: Biomass distribution of the main caught species

Benthic macroinvertebrate taxa collected by the trawl were also identified, counted and weighted (if possible) within each haul. This year, 133 taxa were identified and the main spatial distribution (in number of individuals in the total catch) is shown in Figure 11.

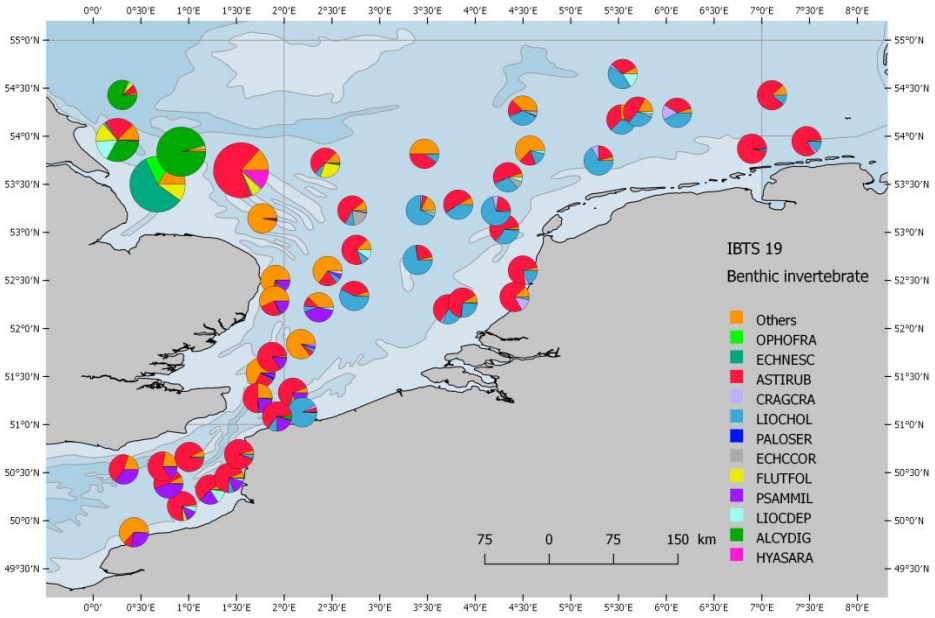


Figure 11 : Distribution map of benthic macroinvertebrates

3.3.1.2 *Clupea harengus (Herring)*

The length distribution (Fig. 12) clearly shows the separation between juveniles (less than 20 cm) and adults cohorts. This year, juveniles were more abundant than 2018 but less than 2017. The German Bight (off the German coast) is a feeding area in the North Sea for herrings. It is in this area where most of small herring were found (Fig 13). Adults were found in the English Channel, where the "Downs" herring population spawns between November and January along the French coasts. Because huge schools of herring were observed on the echosounder in the Strait of Dover it was decided to not fishing for preventing any gear damage.

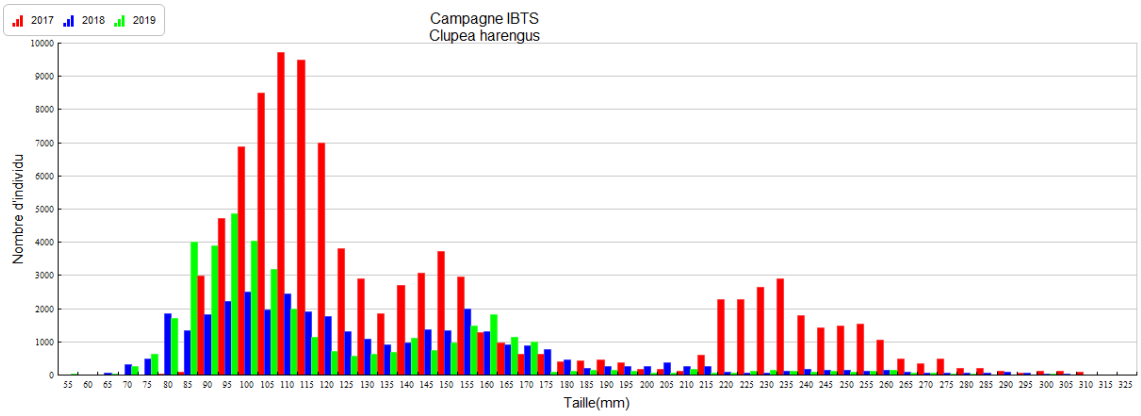


Figure 12: Herring length distribution

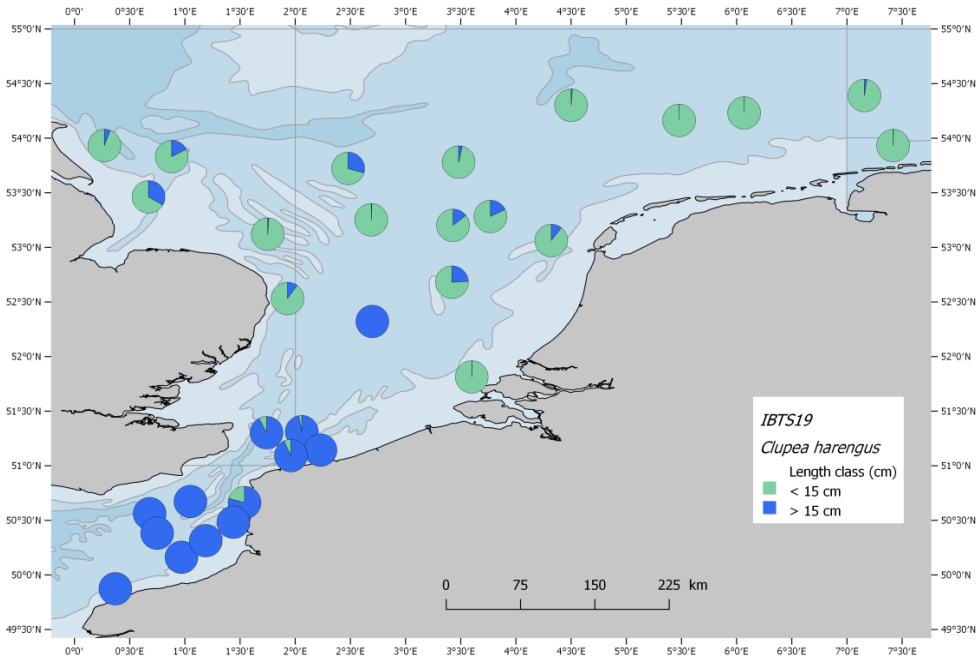


Figure 13: Herring distribution map (number by length class)

3.3.1.3 *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 14 shows that the mean length is between 9.0 and 10.0 cm contrary to last year which was at 9.0 cm, and corresponds to 1-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.

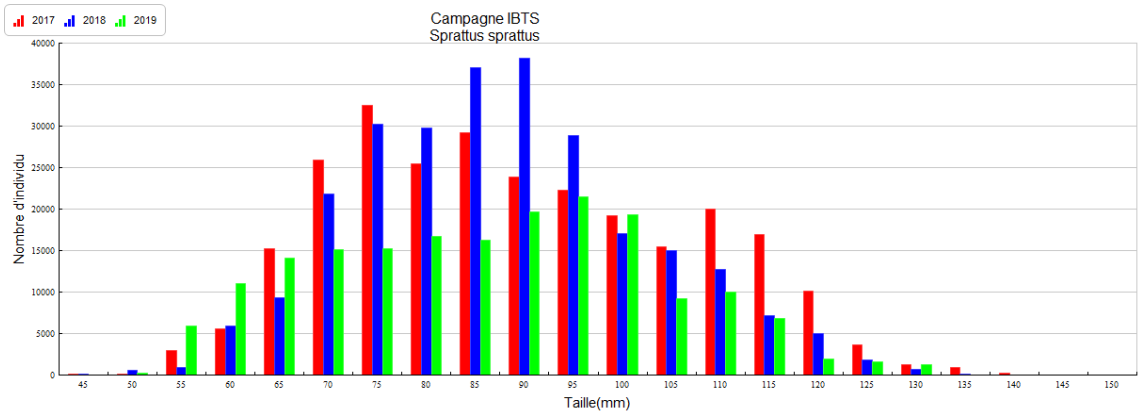


Figure 14 : Sprat length distribution

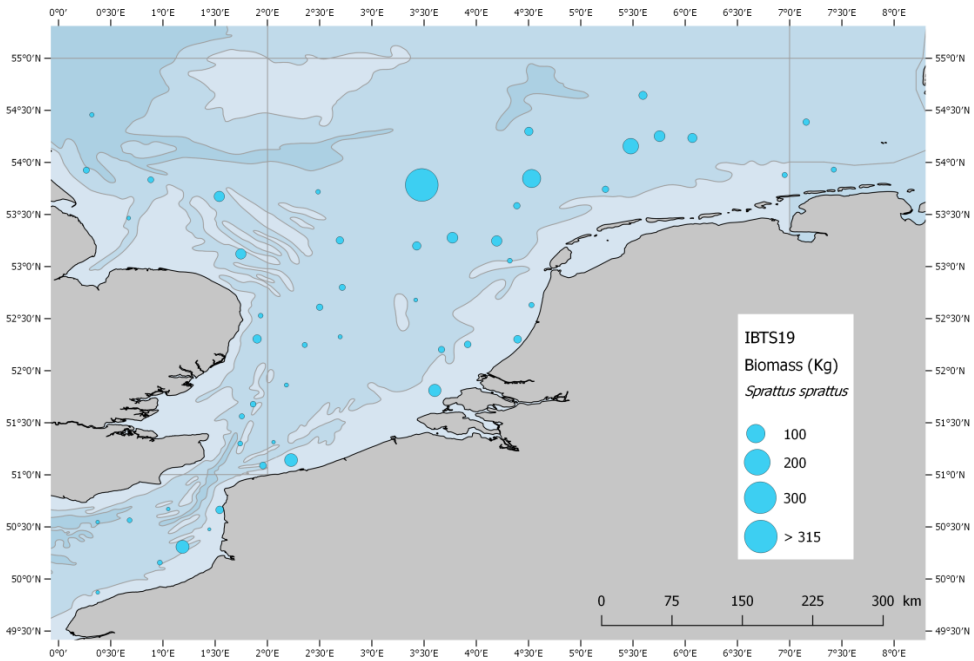


Figure 15 : Sprat distribution map (biomass in kilos per haul)

3.3.1.4 *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 27% of the total biomass caught by the Thalassa vessel (compared to 51% in 2018). The length distribution (Fig. 16) shows a low catch for each size class in 2019. Compared to 2017 and 2018, a consistent decrease has been observed, especially within the juvenile's cohort. The whiting was present in each haul, highest quantities were noticed in the southwest of the North Sea and in the Eastern Channel (Fig. 17).

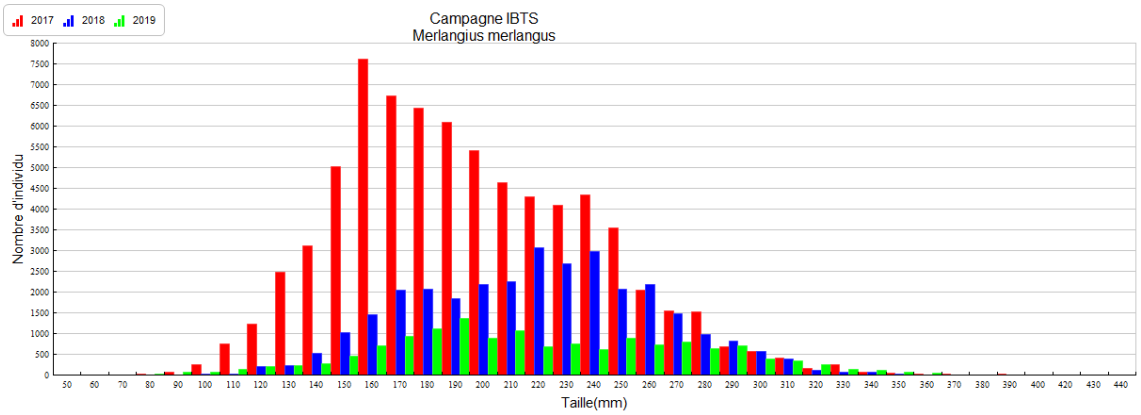


Figure 16 : Whiting length distribution

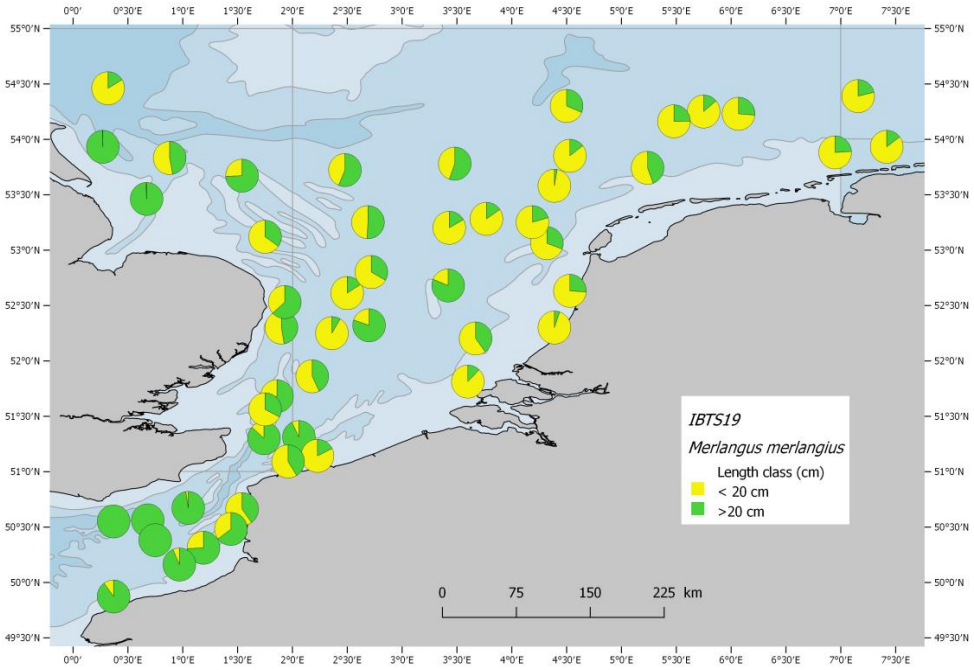


Figure 17 : Whiting distribution map (biomass in kilos per haul)

3.3.1.5 *Limanda Limanda (Dab)*

In comparison to the last 2 years, individuals smaller than 10 cm (i.e., juveniles), were found in rather large quantities (Fig. 18). In 2019, the mean length was about 16 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 area mainly in the central North Sea and on the Dogger Bank (western part), on shallow waters (Fig 19). It is also present in the English Channel.

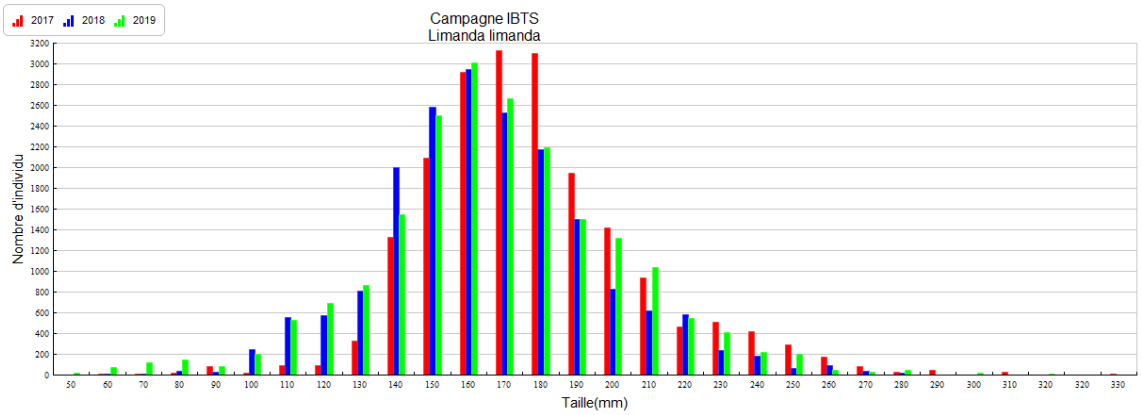


Figure 18: Dab length distribution

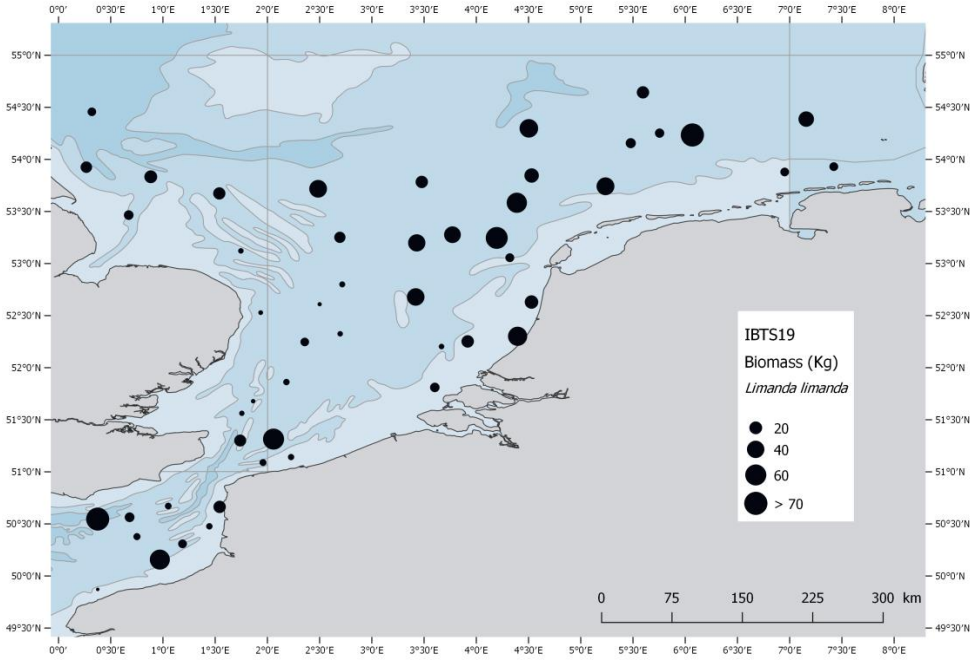


Figure 19 : Dab distribution map (biomass in kilogram per haul)

3.3.1.6 Gadus morhua (Cod)

The recruitment indice in 2019 was upper than last years but still lower than the mean of over the last 39 years. This year, juveniles (less than 25 cm) were present but the total biomass for this species is still low (Fig 20). We can notice that individuals with higher length (> 40 cm) sensitively increased in abundance since last year. In a general way, cods were found in the Eastern English Channel and in the Southeast North Sea (Fig 21), particularly on the German Bight.

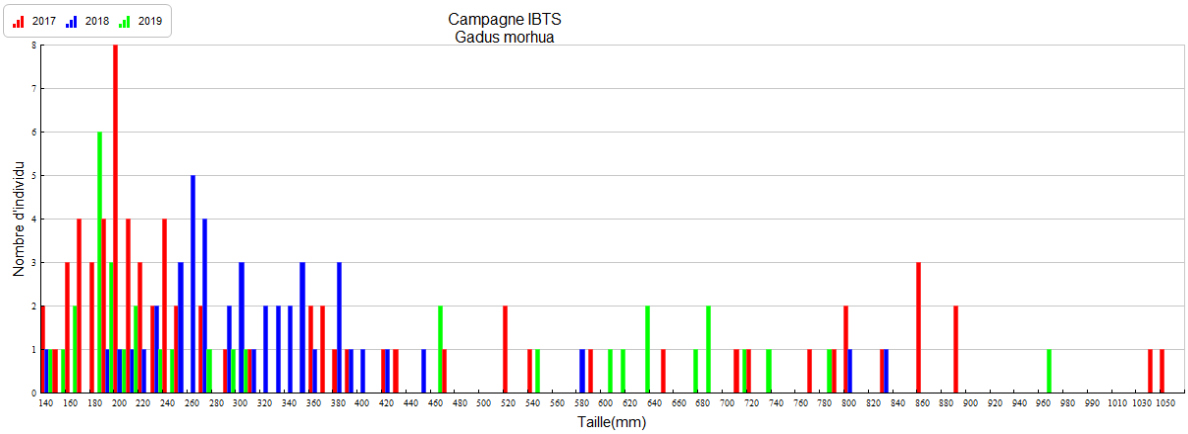


Figure 20 : Cod length distribution

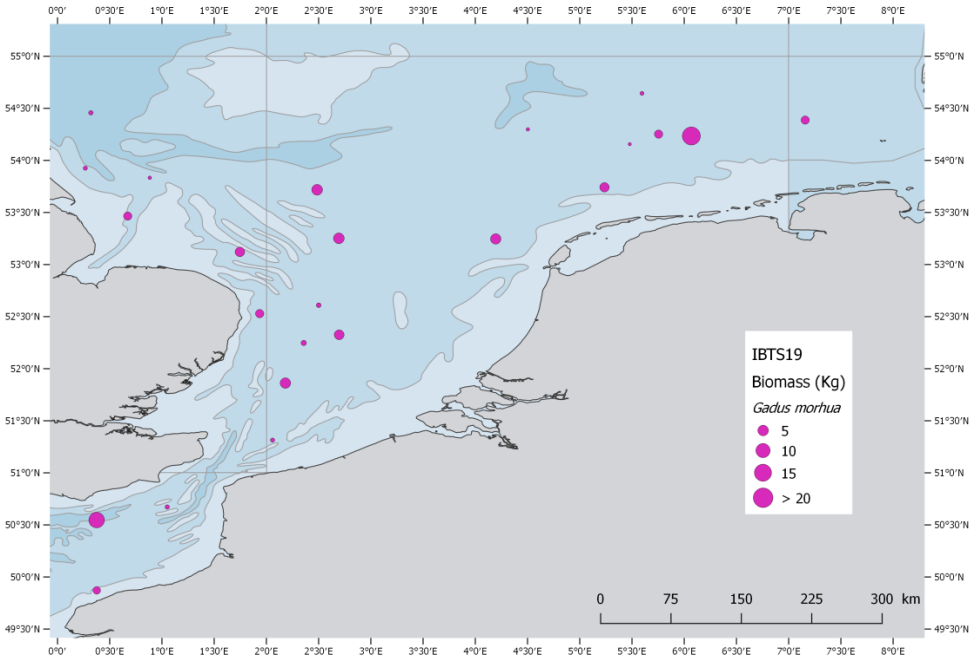


Figure 21: Cod distribution map (biomass in kilos per haul)

3.3.1.7 Mullus surmuletus (Red mullet)

In the late 1990s, the red mullet has become a target species in the Channel and in the southern North Sea. As the spatial distribution shown in figure 23, 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 22). This year, juveniles (less than 16 cm, less than 1 year old) were substantially more abundant than the two previous years. However, adults were in very low quantity.

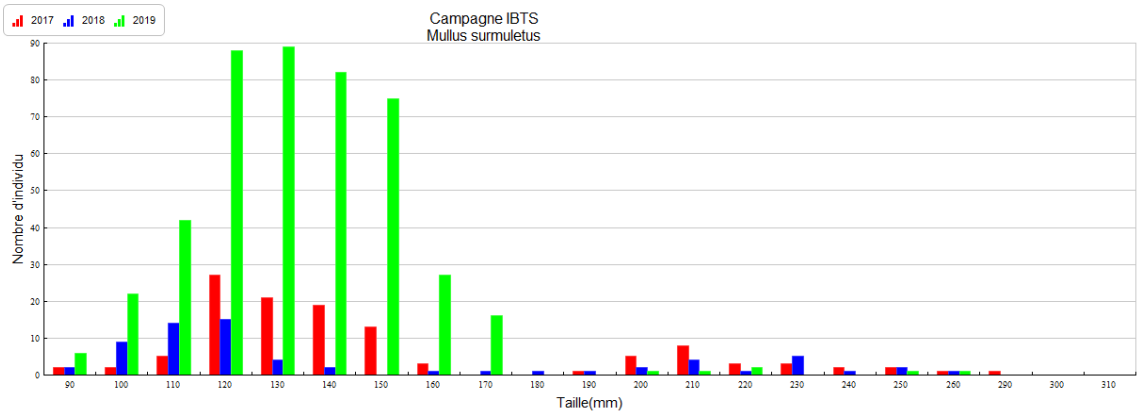


Figure 22 : Red mullet length distribution

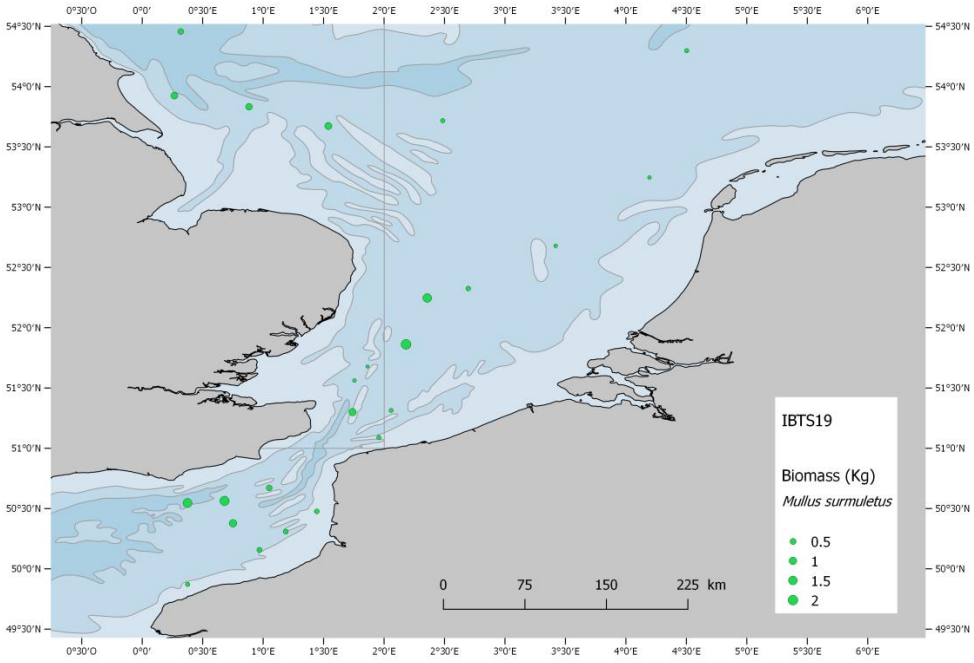


Figure 23 : Red mullet distribution map (biomass in kilos per haul)

3.3.1.8 Pleuronectes platessa (Plaice)

Plaice are mainly caught in bottom trawl fisheries, especially as a bycatch for undersized plaice, or even target by gill net in the eastern channel. The length distribution is spread from 5 cm until 52 cm with two peaks. The first one at 12 cm represents plaice juveniles (0 years old) and the second at 20 cm, are young adults (Fig. 24). In 2019, juveniles were more abundant than in 2017 and 2018 whereas adults were relatively stable over the years. 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. 25).

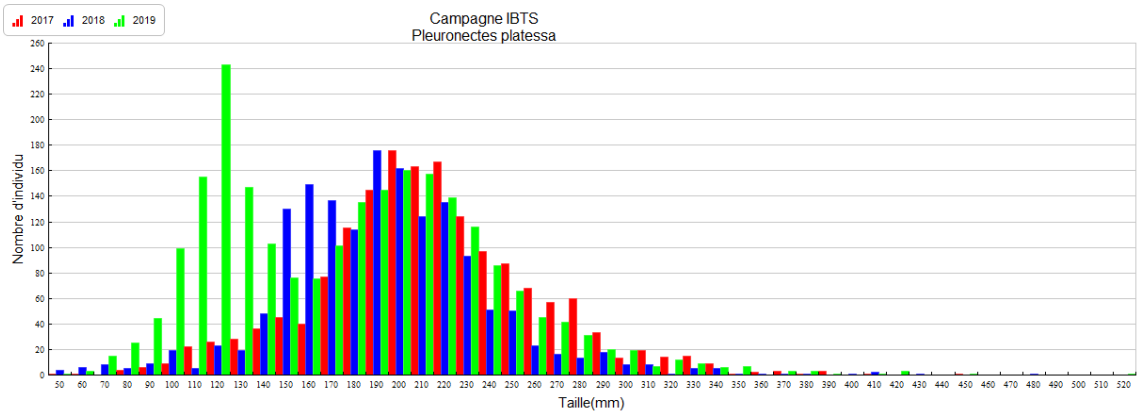


Figure 24 : Plaice length distribution

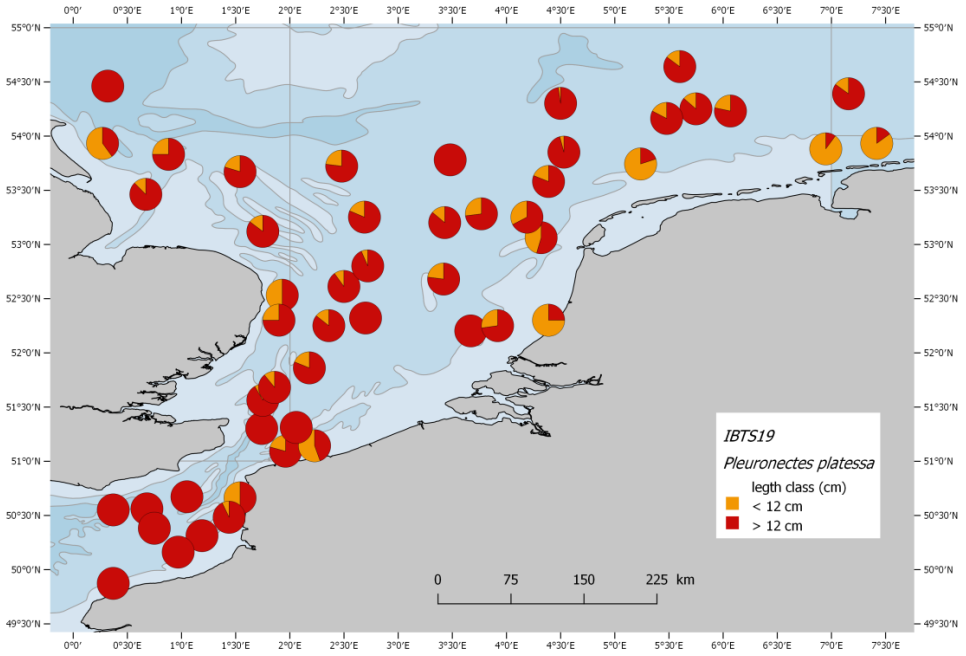


Figure 25 : Plaice distribution map (biomass in kilos per haul)

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 83 in the North Sea (Fig 26). Positions are given Annex 2. After each station, clupeids larvae were sorted before being measured at the laboratory.

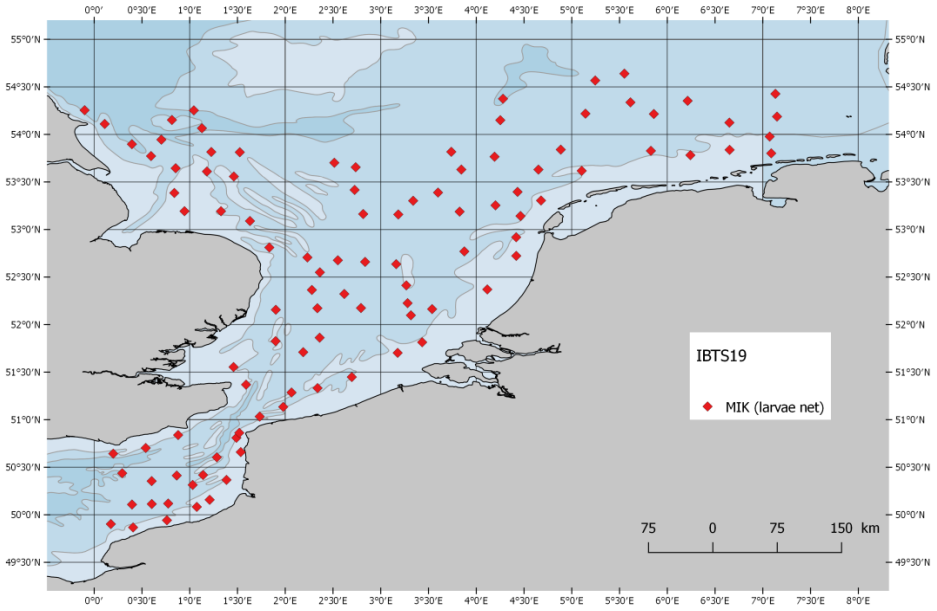


Figure 26 : positions of MIK net stations

3.3.1.9 *Fish larvae distribution*

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. Herring was caught mainly in the English Channel, and along the Dutch coasts (Figure 27).

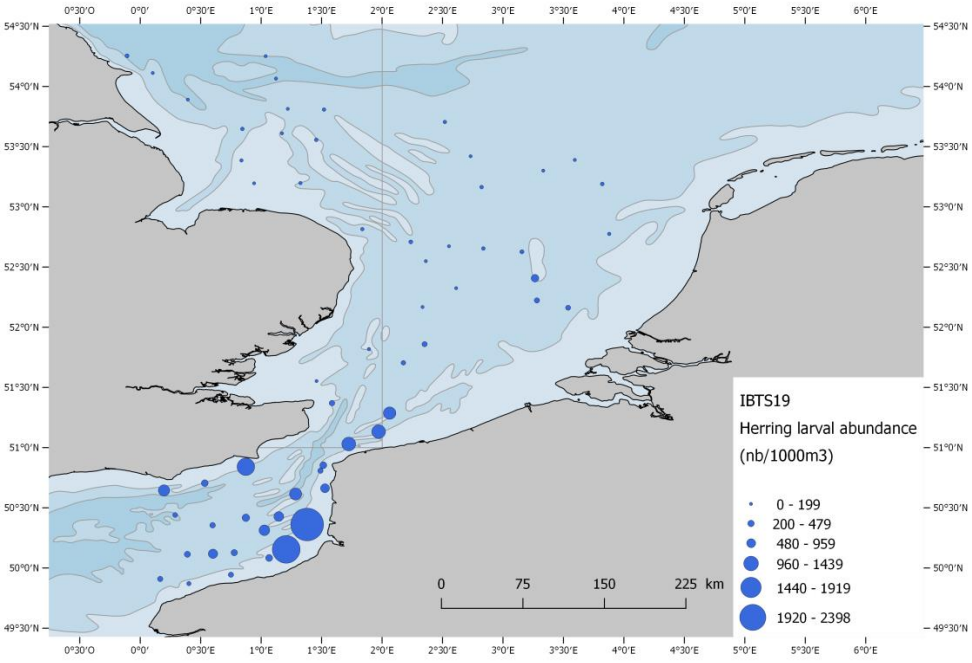


Figure 27 : Herring larvae distribution

Sea water parameters

A CTD sensor (Seabird19) was submerged after each GOV and MIK hauls to measure in priority temperature and salinity on the whole water column (Fig 28). Several sensors included in the CTD allowed measuring also other parameters as dissolved oxygen, turbidity, pH, conductivity, etc. After each station, niskin bottle samples were filtered and finally used to measure concentrations of suspended matter, chlorophyll a and nutrients. A part of water and fixed with lugol to be identified in a second time.

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

3.3.1.10 Spatial distribution of environmental parameters

Figures 29A, 29B and 29C respectively show temperature, salinity and the algae concentration measures at the sea surface in the English Channel and in the North Sea for 2019 survey. These 3 parameters were automatically recorded along the ship route every 30s with the Ferrybox. For the year 2019, the sea surface temperature was comprised between 4.9 and 11.3°C (Fig. 29A), salinity between 24.3 and 34.8‰ (Figure 29B), total algae concentration between 0.7 and 11 µg.L^{-1} (Fig. 29C). The rivers and estuaries influence on salinity is well identified by looking at Belgium, Netherland and German areas (Escaut, Rhin and Elbe River, respectively).

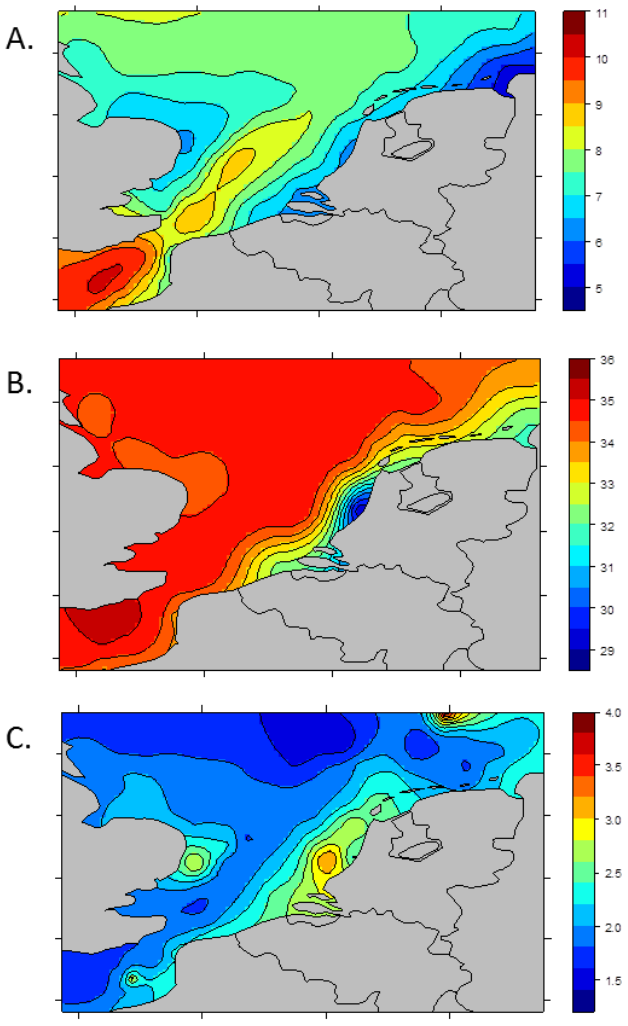


Figure 29A. Sea Surface temperature (°C) during IBTS19, 29B. Sea Surface Salinity (‰) during IBTS1, 29C. Total algae concentration (µg.L-1) during IBTS19.

3.3.4 Fish eggs

Sea water was pumped at 3 meters under sea surface by the CUFES device (Continuous Underway Fish Egg Sampler) and filtered (Fig 30). Every hour, along the ship route a sample was taken during all the survey (day and night). 216 samples were collected in the English Channel and the North Sea (Fig 31). Each sample was analyzed by the Zoocam. It is a device which allows taking picture of each particle in the samples (eggs, copepods, dirts, etc.)

Figure 30: The Continuous Underway Fish Eggs Sampler.

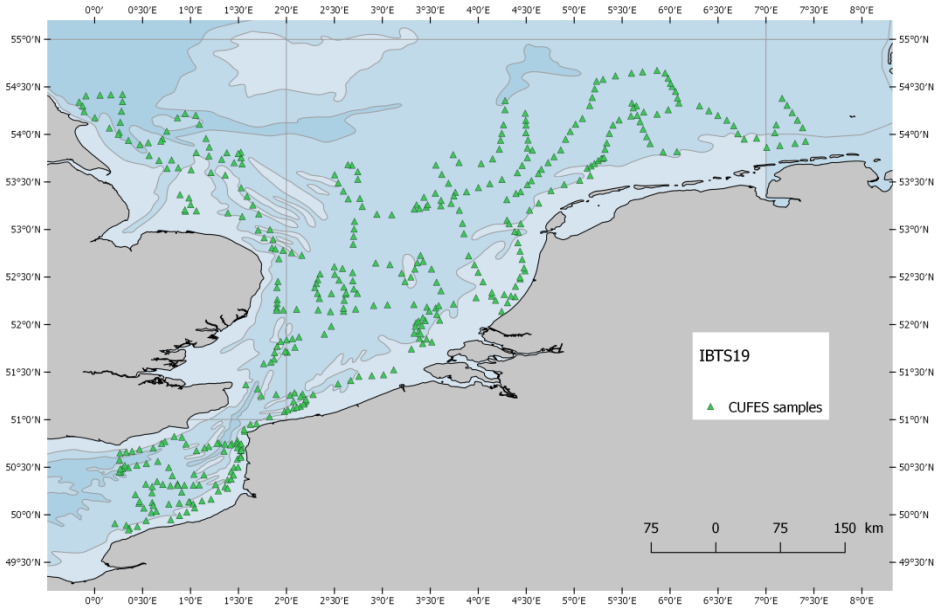


Figure 31 : Eggs samples during the IBTS 18 survey. One sample (blue point) is taken every hour.

3.3.5 Zooplankton

The WP2 net (Fig 32) 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 2 meters upper the bottom. Fresh samples were analyzed by the zoocam. So during the survey most of samples from the CUFES and the WP2 were analyzed on board (Fig 33).

Figure 32 : WP2 net

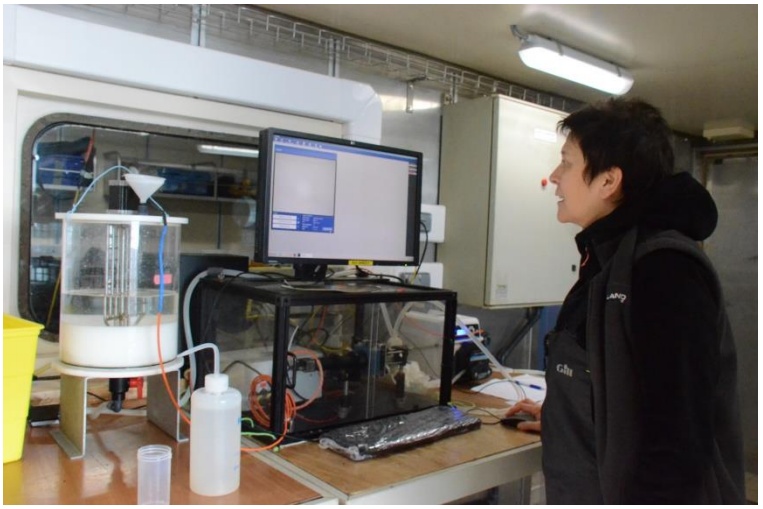


Figure 3328 : Samples identification by the Zoocam device

3.3.6 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 2019, because of bad weather conditions, only six 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 34 : Manta net

3.3.7 Marine mammals and birds

Information has been collected during the first part of the survey in the English Channel and Southern North Sea by several mammal and bird watchers. Posted on the higher 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.

Annexes

ANNEX 1: IBTS trawl positions 2019

StNo	HaulNo	Year	Month	Day	Stratum	ShootLat	ShootLong	HaulLat	HaulLong	Depth	HaulVal
X0001	1	2019	1	22	29F1	50.4757852	1.4430384	50.4448629	1.425119	28	V
X0008	2	2019	1	23	28F0	49.8700778	0.3743468	49.8776182	0.4292471	28	V
X0010	3	2019	1	23	29F0	50.2966475	0.400680833	50.3069185	0.448627333	49	I
X0011	4	2019	1	23	29F0	50.37672417	0.7496805	50.38448817	0.789179167	38	V
X0018	5	2019	1	24	31F1	51.0887084	1.9566519	51.0837569	1.9282683	37	V
X0019	6	2019	1	24	31F2	51.14083033	2.225652167	51.12694917	2.1930445	26	V
X0025	7	2019	1	25	33F3	52.2516993	3.9167705	52.2687666	3.8696392	24	V
X0026	8	2019	1	25	33F4	52.30099617	4.394659333	52.32533617	4.414817667	17	V
X0027	9	2019	1	25	34F4	52.6299395	4.527941833	52.6028225	4.501608333	17	V
X0033	10	2019	1	26	36F5	53.7415391	5.2362855	53.7471778	5.2939569	31	V
X0034	11	2019	1	26	37F5	54.1557119	5.4782969	54.1737312	5.5323313	40	V
X0035	12	2019	1	26	37F5	54.2520946	5.7543361	54.2549738	5.7071702	40	V
X0041	13	2019	1	27	36F6	53.8789506	6.952406	53.8680503	6.8995556	22	V
X0042	14	2019	1	27	36F7	53.9303517	7.4225392	53.9459104	7.4724764	26	V
X0043	15	2019	1	27	37F7	54.3869011	7.1584296	54.4085452	7.1225246	40	V
X0049	16	2019	1	28	37F6	54.2342967	6.068355	54.2417067	6.1148671	38	V
X0050	17	2019	1	28	38F5	54.6436459	5.5953316	54.6400238	5.54921	44	V
X0056	18	2019	1	29	35F4	53.2456006	4.1949213	53.2192008	4.2192455	29	V
X0057	19	2019	1	29	35F4	53.0556329	4.3202547	53.0313357	4.304612	32	V
X0063	20	2019	1	31	35F3	53.1979727	3.4290652	53.2285741	3.4307446	33	V
X0064	21	2019	1	31	35F3	53.2765528	3.770956	53.2857937	3.8232845	26	V
X0065	22	2019	1	31	36F3	53.7832817	3.4770903	53.81542367	3.470250333	36	V
X0071	23	2019	2	1	37F4	54.2980579	4.5024787	54.266677	4.5007439	49	V
X0072	24	2019	2	1	36F4	53.8450716	4.528999	53.8499841	4.5758889	40	V
X0073	25	2019	2	1	36F4	53.5833258	4.3874891	53.5706642	4.3451567	28	V
X0078	26	2019	2	2	36F2	53.7176055	2.4846024	53.7236988	2.4326621	33	V
X0079	27	2019	2	2	35F2	53.2513699	2.6928648	53.2265062	2.7135583	32	V
X0080	28	2019	2	2	34F2	52.7993862	2.7157656	52.8170297	2.7575969	39	V
X0087	29	2019	2	3	35F0	53.4648404	0.6709477	53.4987224	0.6770728	89	V
X0088	30	2019	2	3	36F0	53.8328964	0.8822224	53.83645117	0.922754667	40	V
X0089	31	2019	2	3	36F1	53.6730348	1.5383922	53.6426276	1.55012	88	V
X0097	32	2019	2	4	36F0	53.9250138	0.265121	53.958847	0.2580968	51	V
X0098	33	2019	2	4	37F0	54.456935	0.3180168	54.4276391	0.3077564	65	V
X0099	34	2019	2	4	37E9	54.39169217	-0.207300667	54.411892	-0.226434833	60	I
X0106	35	2019	2	5	35F1	53.1209998	1.7450457	53.1445155	1.7748624	36	V
X0107	36	2019	2	5	34F1	52.5280664	1.9345414	52.5018647	1.910537	30	V
X0108	37	2019	2	5	33F1	52.3040968	1.9004856	52.2860585	1.8987411	28	V
X0114	38	2019	2	6	32F3	51.8097673	3.6019619	51.8230595	3.6422677	23	V

X0115	39	2019	2	6	33F3	52.2024513	3.6662024	52.1971787	3.7170639	27	V
X0116	40	2019	2	6	34F3	52.6786814	3.4191405	52.7107937	3.401196	29	V
X0123	41	2019	2	7	33F2	52.2464043	2.3565414	52.218147	2.364429	42	V
X0124	42	2019	2	7	33F2	52.3247929	2.6957035	52.3359437	2.735672	44	V
X0125	43	2019	2	7	34F2	52.6088494	2.4994137	52.5943924	2.4572373	50	V
X0130	44	2019	2	8	32F2	51.86126	2.180951	51.8346735	2.1764355	49	V
X0131	45	2019	2	8	32F1	51.677615	1.862381	51.7020123	1.8759425	48	V
X0132	46	2019	2	8	32F1	51.5610947	1.7541617	51.5390507	1.7561508	43	V
X0135	47	2019	2	9	31F1	51.2994132	1.7386143	51.275027	1.725182	40	V
X0136	48	2019	2	9	31F2	51.313318	2.057708333	51.3301005	2.092512167	37	V
X0141	49	2019	2	10	30F1	50.6623997	1.5416263	50.690037	1.5294132	22	V
X0143	50	2019	2	10	30F1	50.67059	1.0495845	50.6616201	1.0097184	50	V
X0148	51	2019	2	11	30F0	50.545371	0.3736282	50.5314768	0.3202483	46	V
X0149	52	2019	2	11	30F0	50.5627763	0.6794086	50.5618148	0.7277391	41	V
X0150	53	2019	2	11	29F0	50.1561277	0.9688602	50.1493896	0.9299195	34	V
X0156	54	2019	2	12	29F1	50.3076416	1.1863169	50.3205063	1.2260097	31	V

Annex 2 : IBTS MIK positions 2019

StNo	HaulNo	Date	Stratum	ShootLat	ShootLong	HaulLat	HaulLong
X0003	IBTSMIK1	22/01/2019	29F1	50,3665065	1,3853283	50,3541878	1,3736887
X0004	IBTSMIK2	22/01/2019	29F1	50,1572909	1,2091238	50,1500064	1,2039521
X0005	IBTSMIK3	22/01/2019	29F0	50,1179362	0,7750335	50,1345123	0,7784596
X0006	IBTSMIK4	23/01/2019	29F0	50,1076545	0,3960113	50,118473	0,3819115
X0007	IBTSMIK5	23/01/2019	28F0	49,9023006	0,1744058	49,9128491	0,1541887
X0008	IBTSMIK6	23/01/2019	28F0	49,8665796	0,4073581	49,8726485	0,3948773
X0012	IBTSMIK7	23/01/2019	29F0	50,4123433	0,8643257	50,4195423	0,8803365
X0013	IBTSMIK8	23/01/2019	29F1	50,4179283	1,140514	50,4360198	1,1504095
X0014	IBTSMIK9	24/01/2019	30F1	50,6040677	1,2843836	50,6213721	1,2848421
X0015	IBTSMIK10	24/01/2019	30F1	50,8091316	1,4891585	50,8048795	1,4899477
X0020	IBTSMIK11	24/01/2019	31F2	51,3322253	2,3386765	51,3288922	2,3277013
X0021	IBTSMIK12	24/01/2019	31F2	51,4483727	2,6975804	51,4529851	2,705155
X0022	IBTSMIK13	25/01/2019	32F3	51,7025028	3,1775192	51,6937435	3,1612552
X0023	IBTSMIK14	25/01/2019	32F3	51,8143001	3,434399	51,8242714	3,4414748
X0024	IBTSMIK15	25/01/2019	32F3	52,0978731	3,3163395	52,0955196	3,3336323
X0028	IBTSMIK16	25/01/2019	34F4	52,7226612	4,4194474	52,7320606	4,4099913
X0029	IBTSMIK17	25/01/2019	34F4	52,9186591	4,4187881	52,9314597	4,4072389
X0030	IBTSMIK18	25/01/2019	35F4	53,1422179	4,4638025	53,1529943	4,453873
X0031	IBTSMIK19	25/01/2019	35F4	53,3050088	4,678763	53,319827	4,6734493
X0032	IBTSMIK20	26/01/2019	36F5	53,6173681	5,104852	53,6216581	5,0891618
X0036	IBTSMIK21	26/01/2019	37F5	54,3372642	5,6150772	54,3304532	5,5972539
X0037	IBTSMIK22	26/01/2019	36F5	53,8274998	5,8292123	53,8200856	5,826491
X0038	IBTSMIK23	26/01/2019	36F6	53,7821139	6,2428311	53,7736674	6,2459306
X0039	IBTSMIK24	27/01/2019	36F6	53,8377515	6,6534825	53,8271027	6,6615972

X0040	IBTSMIK25	27/01/2019	36F7	53,8014908	7,0892805	53,7938746	7,0850293
X0043	IBTSMIK26	27/01/2019	37F7	54,426875	7,1328287	54,4257728	7,1092963
X0044	IBTSMIK27	27/01/2019	37F7	54,1876669	7,149787	54,1823639	7,1291621
X0045	IBTSMIK28	27/01/2019	36F7	53,9772588	7,0729233	53,9679052	7,0605478
X0046	IBTSMIK29	28/01/2019	37F6	54,1241038	6,6511668	54,1118381	6,6648094
X0047	IBTSMIK30	28/01/2019	37F6	54,3532757	6,2137442	54,3643728	6,2243612
X0048	IBTSMIK31	28/01/2019	37F5	54,2150762	5,8601337	54,2253364	5,8617012
X0050	IBTSMIK32	28/01/2019	38F5	54,6394699	5,5517575	54,6459508	5,5473714
X0051	IBTSMIK33	28/01/2019	38F5	54,5673614	5,2461224	54,5752344	5,243448
X0052	IBTSMIK34	28/01/2019	37F5	54,2183932	5,1440239	54,2262027	5,1386322
X0053	IBTSMIK35	29/01/2019	36F4	53,8401969	4,8853674	53,8496661	4,8762915
X0054	IBTSMIK36	29/01/2019	36F4	53,6301582	4,6516564	53,6253945	4,6416102
X0055	IBTSMIK37	29/01/2019	35F4	53,3957397	4,4330333	53,3938469	4,4188543
X0056	IBTSMIK38	29/01/2019	35F4	53,2542927	4,2018678	53,2495941	4,1851375
X0058	IBTSMIK39	30/01/2019	33F4	52,3698311	4,1162318	52,3750203	4,1004197
X0059	IBTSMIK40	30/01/2019	34F3	52,7695598	3,8757438	52,7802548	3,8806232
X0060	IBTSMIK41	31/01/2019	35F3	53,1879995	3,8264052	53,1914362	3,8147672
X0061	IBTSMIK42	31/01/2019	35F3	53,3886403	3,6002858	53,3908302	3,5863752
X0062	IBTSMIK43	31/01/2019	35F3	53,302343	3,3399712	53,2993457	3,3255118
X0066	IBTSMIK44	31/01/2019	36F3	53,817159	3,7393188	53,8160836	3,7227487
X0067	IBTSMIK45	31/01/2019	36F3	53,6305777	3,8443633	53,6211879	3,8463573
X0068	IBTSMIK46	31/01/2019	36F4	53,765504	4,1922379	53,755913	4,1954362
X0069	IBTSMIK47	01/02/2019	37F4	54,1496372	4,2524116	54,1501267	4,2679837
X0070	IBTSMIK48	01/02/2019	37F4	54,3749842	4,2807285	54,3738792	4,2982277
X0074	IBTSMIK49	01/02/2019	35F3	53,1582735	3,1843016	53,1543248	3,1992046
X0075	IBTSMIK50	01/02/2019	35F2	53,1627324	2,8169409	53,1648959	2,8280857
X0076	IBTSMIK51	01/02/2019	35F2	53,4163813	2,7270258	53,4234948	2,7358535
X0077	IBTSMIK52	02/02/2019	36F2	53,6552937	2,7380662	53,6681527	2,7405013
X0078	IBTSMIK53	02/02/2019	36F2	53,7020281	2,5144744	53,7077504	2,5245042
X0081	IBTSMIK54	02/02/2019	34F2	52,706333	2,2325753	52,7103824	2,2406499
X0082	IBTSMIK55	02/02/2019	34F1	52,8108729	1,8338296	52,8183147	1,8390436
X0083	IBTSMIK56	02/02/2019	35F1	53,0893828	1,6312708	53,1021852	1,6191748
X0084	IBTSMIK57	03/02/2019	35F1	53,1923352	1,3278677	53,2030567	1,3199652
X0085	IBTSMIK58	03/02/2019	35F0	53,1927695	0,9455428	53,1981903	0,935656
X0086	IBTSMIK59	03/02/2019	35F0	53,3845178	0,8392875	53,3869857	0,8333925
X0090	IBTSMIK60	03/02/2019	36F1	53,8128834	1,5246543	53,8030373	1,513151
X0091	IBTSMIK61	03/02/2019	36F1	53,8157098	1,2261438	53,8126057	1,2132697
X0092	IBTSMIK62	03/02/2019	37F1	54,0653539	1,1283984	54,0658083	1,1150408
X0093	IBTSMIK63	03/02/2019	37F1	54,2529819	1,0434667	54,2502064	1,0279293
X0094	IBTSMIK64	04/02/2019	37F0	54,1520241	0,813983	54,1440886	0,8039258
X0095	IBTSMIK65	04/02/2019	37F0	53,9447973	0,7036893	53,9353915	0,699376
X0096	IBTSMIK66	04/02/2019	36F0	53,8974582	0,3950845	53,8835394	0,3896948
X0100	IBTSMIK67	04/02/2019	37E9	54,2547171	-0,1000105	54,253961	-0,1205439
X0101	IBTSMIK68	04/02/2019	37F0	54,1102549	0,1101705	54,1133506	0,0949743
X0102	IBTSMIK69	04/02/2019	37F0	53,7724793	0,5952724	53,7808186	0,5759773

X0103	IBTSMIK70	05/02/2019	36F0	53,6444768	0,8532584	53,6506446	0,8341362
X0104	IBTSMIK71	05/02/2019	36F1	53,6103817	1,1804303	53,6105805	1,1634605
X0105	IBTSMIK72	05/02/2019	36F1	53,5575407	1,4625525	53,5549739	1,4478864
X0109	IBTSMIK73	05/02/2019	33F1	52,1558697	1,90183	52,1503288	1,896415
X0110	IBTSMIK74	05/02/2019	33F2	52,1722541	2,3371199	52,1625698	2,3306797
X0111	IBTSMIK75	05/02/2019	33F2	52,1742868	2,7935915	52,1623795	2,7800935
X0112	IBTSMIK76	06/02/2019	33F3	52,2256436	3,2816145	52,2186587	3,2781257
X0113	IBTSMIK77	06/02/2019	33F3	52,1630526	3,5384534	52,1596095	3,5381728
X0117	IBTSMIK78	06/02/2019	33F3	52,4123785	3,2682676	52,4014887	3,2606543
X0118	IBTSMIK79	06/02/2019	34F3	52,6357439	3,1623265	52,6164417	3,1498008
X0119	IBTSMIK80	06/02/2019	34F2	52,6594608	2,8366816	52,6483035	2,8376879
X0120	IBTSMIK81	07/02/2019	34F2	52,6763901	2,551366	52,6685168	2,5537305
X0121	IBTSMIK82	07/02/2019	34F2	52,5495057	2,3632172	52,5475887	2,3590462
X0122	IBTSMIK83	07/02/2019	33F2	52,3644249	2,2794634	52,3676275	2,2681985
X0126	IBTSMIK84	07/02/2019	33F2	52,3223319	2,6189472	52,3256498	2,6047667
X0127	IBTSMIK85	07/02/2019	32F2	51,8622913	2,360817	51,8551091	2,3418823
X0128	IBTSMIK86	07/02/2019	33F2	51,7099984	2,188756	51,6977684	2,1627117
X0129	IBTSMIK87	08/02/2019	32F1	51,8260377	1,899386	51,8105063	1,8833227
X0133	IBTSMIK88	08/02/2019	32F1	51,5537945	1,4592042	51,5503171	1,4551982
X0134	IBTSMIK89	09/02/2019	31F1	51,3682742	1,5903293	51,3694853	1,5795642
X0137	IBTSMIK90	09/02/2019	31F2	51,286083	2,0660791	51,285623	2,0579087
X0138	IBTSMIK91	09/02/2019	31F1	51,1343069	1,9794688	51,1296377	1,9622065
X0139	IBTSMIK92	09/02/2019	31F1	51,0326483	1,7332614	51,0252324	1,7132716
X0140	IBTSMIK93	09/02/2019	30F1	50,8611904	1,5193875	50,8448094	1,5081074
X0141	IBTSMIK94	10/02/2019	30F1	50,6591945	1,5348183	50,6642149	1,5189626
X0144	IBTSMIK95	10/02/2019	30F0	50,8383354	0,8790888	50,8419779	0,8658597
X0145	IBTSMIK96	10/02/2019	30F0	50,7023155	0,5398447	50,7056508	0,5263188
X0146	IBTSMIK97	10/02/2019	30F0	50,6425877	0,1995973	50,6441702	0,1917507
X0147	IBTSMIK98	11/02/2019	29F0	50,4369473	0,2934205	50,4426653	0,2811458
X0151	IBTSMIK99	11/02/2019	29F1	50,0827381	1,0743925	50,081836	1,055996
X0152	IBTSMIK100	11/02/2019	28F0	49,9418887	0,7617184	49,9444623	0,7365653
X0153	IBTSMIK101	11/02/2019	29F0	50,1130026	0,6029406	50,1205373	0,5989849
X0154	IBTSMIK102	12/02/2019	29F0	50,3540386	0,6018182	50,3541138	0,5937068
X0155	IBTSMIK103	12/02/2019	29F1	50,3136763	1,0315828	50,3116303	1,0200966

Annex 3: Species caught during IBTS 2019 (fishes, skates, rays, and commercials crustacean and mollusk).

Nom scientifique	Occurence
Merlangius merlangus	100.00%
Limanda limanda	98.08%
Pleuronectes platessa	98.08%
Sprattus sprattus	98.08%
Clupea harengus	88.46%
Alloteuthis	67.31%
Callionymus lyra	65.38%
Cancer pagurus	65.38%
Eutrigla gurnardus	61.54%
Scyliorhinus canicula	57.69%
Solea solea	55.77%
Buglossidium luteum	55.77%
Agonus cataphractus	53.85%
Echiichthys vipera	53.85%
Pomatoschistus	51.92%
Raja clavata	48.08%
Arnoglossus laterna	48.08%
Platichthys flesus	48.08%
Necora puber	48.08%
Sepiola	46.15%
Mullus surmuletus	46.15%
Gadus morhua	46.15%
Myoxocephalus scorpius	44.23%
Loligo vulgaris	42.31%
Engraulis encrasicolus	40.38%
Trachurus trachurus	40.38%
Buccinum undatum	40.38%
Microstomus kitt	36.54%
Trisopterus minutus	34.62%
Trisopterus luscus	32.69%
Syngnathus rostellatus	32.69%
Raja montagui	30.77%
Enchelyopus cimbrius	30.77%
Ciliata mustela	28.85%
Hyperoplus lanceolatus	25.00%
Chelidonichthys lucerna	23.08%
Mustelus asterias	21.15%
Pecten maximus	19.23%
Maja brachydactyla	19.23%
Alosa fallax	19.23%
Raja brachyura	17.31%
Chelidonichthys cuculus	17.31%
Aequipecten opercularis	15.38%
Sardina pilchardus	15.38%
Ammodytes marinus	15.38%
Scophthalmus maximus	15.38%
Dicentrarchus labrax	13.46%
Ammodytes tobianus	13.46%
Trachinus draco	11.54%
Scomber scombrus	11.54%
Callionymus reticulatus	11.54%
Sepia officinalis	11.54%
Ciliata septentrionalis	11.54%
Liparis liparis	9.62%
Hyperoplus immaculatus	9.62%
Homarus gammarus	9.62%
Lophius piscatorius	9.62%
Atherina presbyter	7.69%
Gasterosteus aculeatus	7.69%
Scophthalmus rhombus	7.69%
Hippoglossoides platessoides	7.69%
Hippocampus hippocampus	5.77%
Raja microocellata	5.77%
Trisopterus esmarkii	5.77%
Nephrops norvegicus	5.77%
Microchirus variegatus	5.77%
Callionymus maculatus	3.85%
Zeus faber	3.85%
Ostrea edulis	3.85%
Pholis gunnellus	3.85%
Blennius ocellaris	3.85%
Phrynorhombus norvegicus	3.85%
Mnemiopsis leidyi	3.85%
Raja undulata	3.85%
Syngnathus acus	3.85%
Parablennius gattorugine	1.92%
Eledone cirrhosa	1.92%
Conger conger	1.92%
Taurulus bubalis	1.92%
Zeugopterus punctatus	1.92%
Alosa alosa	1.92%
Symphodus melops	1.92%
Symphodus bailloni	1.92%
Squalus acanthias	1.92%
Trigloporus lastoviza	1.92%
Gymnammodytes semisquamatus	1.92%
Pegusa lascaris	1.92%
Hippoglossus hippoglossus	1.92%
Leucoraja naevus	1.92%
Melanogrammus aeglefinus	1.92%
Pomatoschistus minutus	1.92%
Syngnathus	1.92%
Petromyzon marinus	1.92%