CGFS 2016 - Survey Report

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1. Rationale of the survey

The English Channel is a sector strongly influenced by fisheries, mostly for France and England but also more widely for Northern European countries. The ecological and economic impacts of the exploitation of fisheries resources must be estimated in order for the fishing activity to stay sustainable while accounting for resources limitation and its effect on the environment. To answer this need, E.U. member states have to carry out sea surveys in order to estimate the abundance and distribution of fish stocks, independently of commercial fisheries data.

To achieve this objective, the CGFS (Channel GroundFish Survey) is part of the European program monitoring fish resources, which gather data relative to the exploited stocks (abundance, spatial distribution, maturity, age/size structure, recruitment index). Each year in autumn, about 74 stations are sampled with a standard high vertical opening bottom trawl (GOV 36/47), and the haul is processed to produce the required data. The time series initiated in 1988 is used every year by European stock assessment working groups to derive the exploitation state of the main commercial fish species.

Realized on the R/V Thalassa since 2015, the CGFS offers now the possibility to sample the entire ecosystem and to have a better understanding of it, answering both the MSFD requirements and the need of an ecosystem approach of fisheries at the European scale. Thus, using punctual sampling and en-route recording devices, the CGFS survey allows measurement and analysis of the physic-chemical properties of the water (hydrological probe), the phytoplankton (niskin bottle) and zooplankton communities (plankton nets), the fish eggs abundance (CUFES egg pump) and the species composition of demersal community (GOV trawls). Dredges sampling combined with bottom videos were also conducted to characterize both the substrate and the benthic invertebrates of the area.

Initially focusing on the eastern Channel, the CGFS might be extended westwards in a close future. In order to prepare a suitable gear and sampling scheme for this area, additional work has been conducted in the western English Channel this year, mostly for finalizing the bottom trawl characteristics.

2. Survey trajectory and sampling stations

The R/V Thalassa left Boulogne-sur-Mer on the 24th of September 2016 to sample the eastern English Channel (between 2°W and 2°E). After the 15 days required to fulfill the sampling program of this survey in the Eastern English Channel, the trawl gear was changed in Cherbourg harbour, from GOV 36x47 to GOV 36x49. Then 5 days were devoted to explore the Western English Channel (between 6°W and 4°W), before heading towards Brest for the end of the survey on the 14th of October 2016.

Weather conditions were good, allowing the following number of stations to be sampled (Figure 1):

- 75 trawls in the eastern English Channel with GOV 36x47
- 22 trawls in the Western English Channel with GOV 36x49, among which 4 were associated with EROC videos to monitor trawl geometry and behavior
- 84 hydrology stations (deploying hydrological probe, niskin bottle and plankton WP2 net)
- 18 stations sampled in the eastern English Channel with the MANTA net, in order to collect microplastics
- 28 stations in the eastern English Channel where dredges and video records of the bottom were realized
- 158 samples of sub-surface water, in order to get fish eggs, along the vessel trajectory in the eastern English Channel

During daylight, two observers were also continuously recording seabirds and marine mammals.

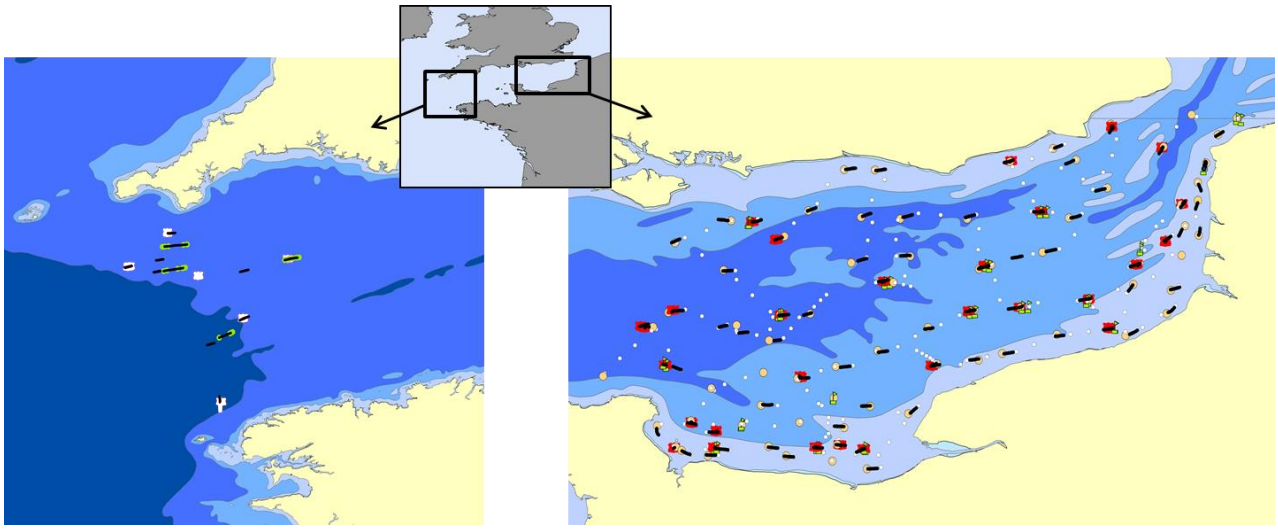

Figure 1*: Bottom trawl sampling stations of the CGFS 2016 survey (in black), associated with EROC videos in the Western English Channel (in white, on the left), and in the Eastern English Channel (map on the right) associated with hydrodynamic sampling (light orange dots), MANTA net sampling (in red), fish eggs sampling (white dots).*

3. Preliminary results

3.1 Fish community

The fish community of the eastern Channel has been sampled with a 36x47 GOV trawl equipped with a groundgear adapted to the area. The trawl geometry was recorded during each haul, and was about 4.7 meters of vertical opening and 16m of horizontal opening. The preliminary results concerning the spatial species composition of the catch are shown in figure 3. They are characterized by a high dominance of horse mackerel, particularly in the central area, while the eastern part was dominated by both horse mackerel and mackerel. Coastal areas show a higher species richness than offshore (from 47 species per haul down to 16 species per haul). When integrated over the area, the dominance shows a similar pattern (figure 4): dominance of horse mackerel both in biomass and abundance; the small forage fish dominate the community in term of abundance (sardine, sprat, anchovy, mackerel), while the large individuals of the elasmobranch species make them important for the biomass dominance. Over the eastern English Channel, 76 species of fish and cephalopods have been identified, and 93 taxa of benthic invertebrates (including commercial ones) and jellyfish have been identified.

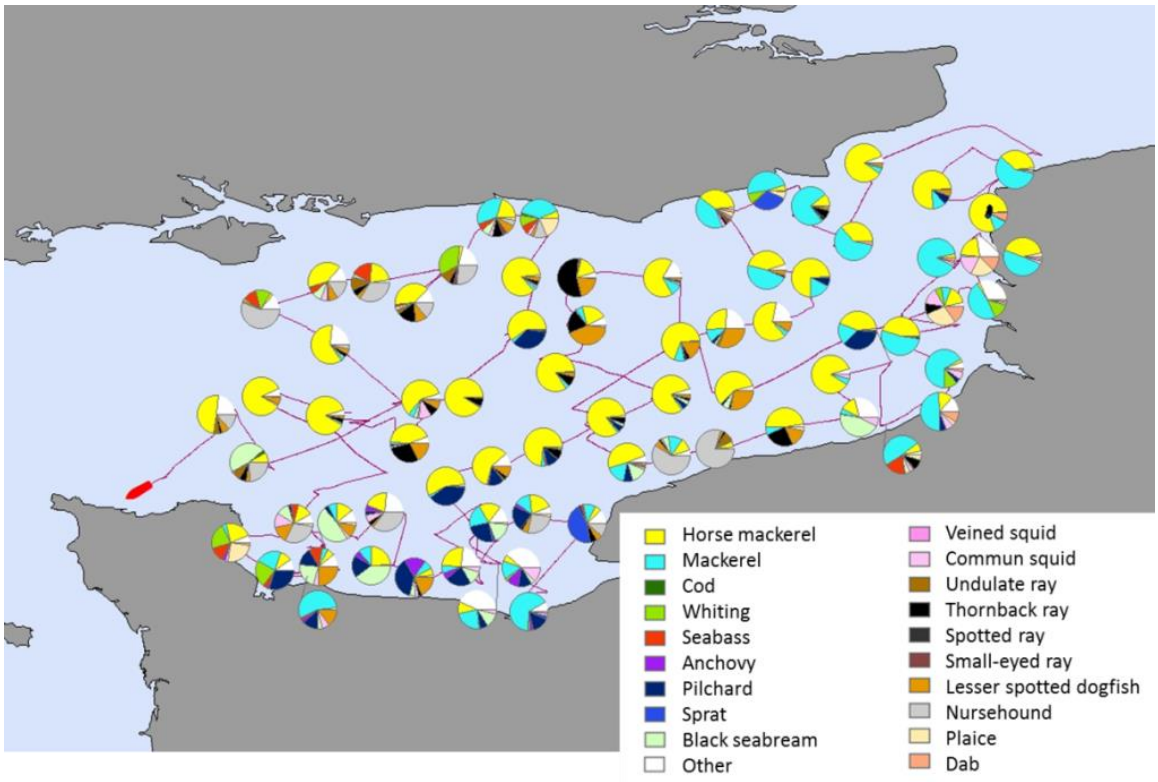

***Figure 3**: Species composition of the catch in the Eastern English Channel*

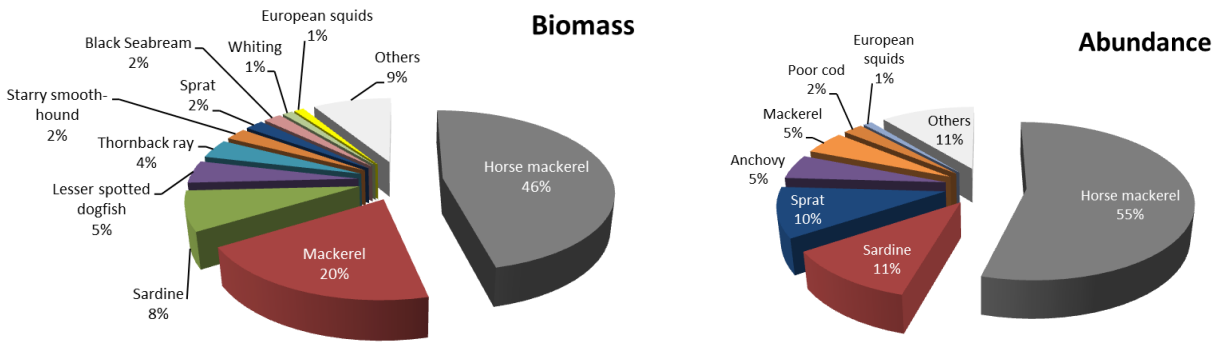

***Figure 4**: Species dominance over the entire eastern English Channel, in term of biomass (on the left) and abundance (on the right)*

At each trawl station, fish were sorted and identified, before being measured to the nearest inferior centimeter. As an example, size distribution of plaice and red mullet average on the entire area are presented in figure 5.

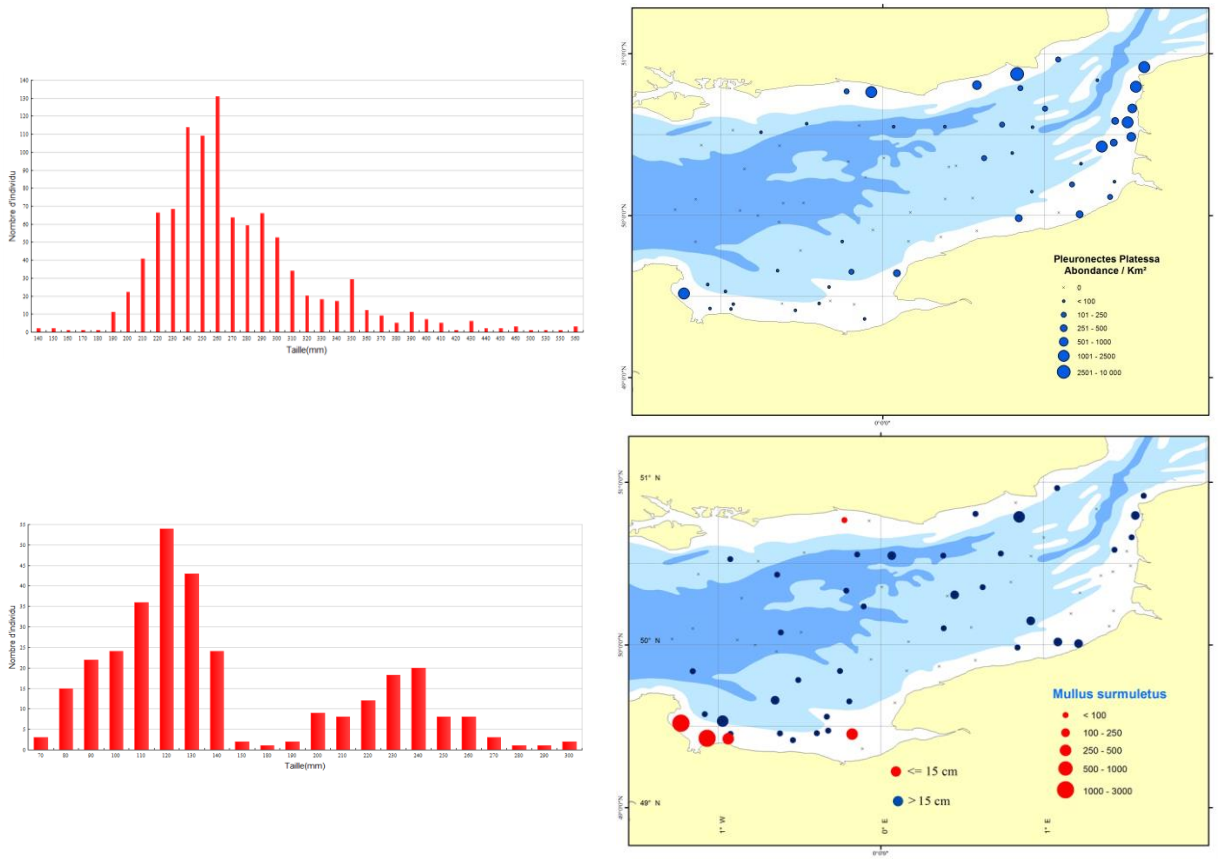

***Figure 5**: Size distribution and spatial distribution (abundance by km²) of the 2 species assessed by WGNSSK[1] in the VIId ICES area: plaice (top) and red mullet (bottom) for which the mean size is also indicated (smaller than 15cm included in blue, i.e. a priori 0-age group; and larger than 16cm in red, i.e. older than 1-year old included).*

[1] *ICES Working Group on the Assessment of Demersal Stocks in the North Sea and Skagerrak*

During the survey, some biological samples were realized on some of the fish caught by the GOW trawl, and consist mostly of otolith sampling. For 15 species, otoliths (scales for seabass, illicium for monkfish) were took off the fish and kept for age determination further at the laboratory (table 1).

***Table 1**: Number of fish used for otolith, scale or illicium sampling, per species and ICES area*

Species	Eastern Channel (VIId)	Western Channel (VIIe)
Whiting	227	149
Cod	11	2
Haddock		173
Pouting	29	21
Blue ling	1	
Hake		18
Pollack		7
Monkfish		4 (illicium)
Red gurnard	165	23
Red mullet	104	
Seabass	103 (scales)	
Plaice	336	
Sole	51	
Brill	1	
Turbot	1	

3.2 Gear selectivity in the western English Channel

In order to test the effects of a tickler chain added to the GOV 36x49 trawl, paired tows have been conducted and the catch of species living on the sea floor have been compared (figure 6). Overall, the number of fish caught in the 30 minutes tow is not large for the benthic species selected. These preliminary results do not indicate a strong effect of the presence of a tickler chain on the catchability of most species, except for *Arnoglossus imperialis*. However, the number of valid paired tows is too small to allow for robust statistical analysis.

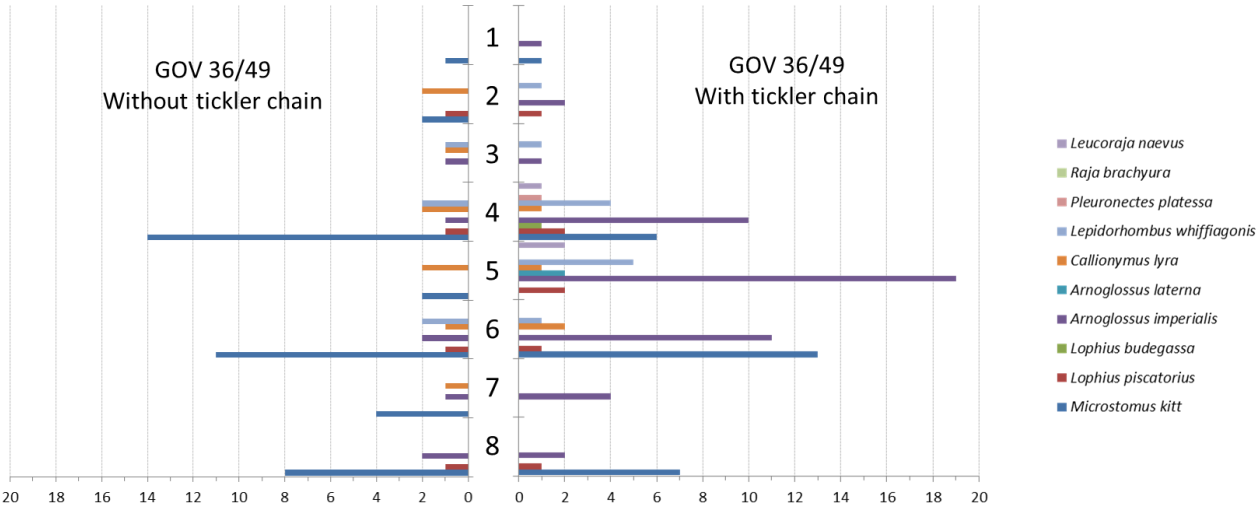

***Figure 6**: Number of fish caught without and with tickler chain for the 8 paired tows realized in the western English Channel, for a set of species living on the sea floor. NB: for paired tow n°1 realized on hard bottom, the tickler chain broke before the end of the tow.*

3.3 Plankton community

The pelagic environment has been sampled at each trawling station using CTD probe, Niskin bottle and plankton net. The water and organisms collected will be analyzed at the laboratory. However, gelatinous organisms, and more specifically the ctenophore *Mnemiopsis leidyi*, have been identified and counted alive onboard, as they are partially destroyed when fixed with formaldehyde. Spatial distribution of this invasive species is thus already available and presented in figure 7. Similarly to previous years, this species is only present in the Bay of Seine.

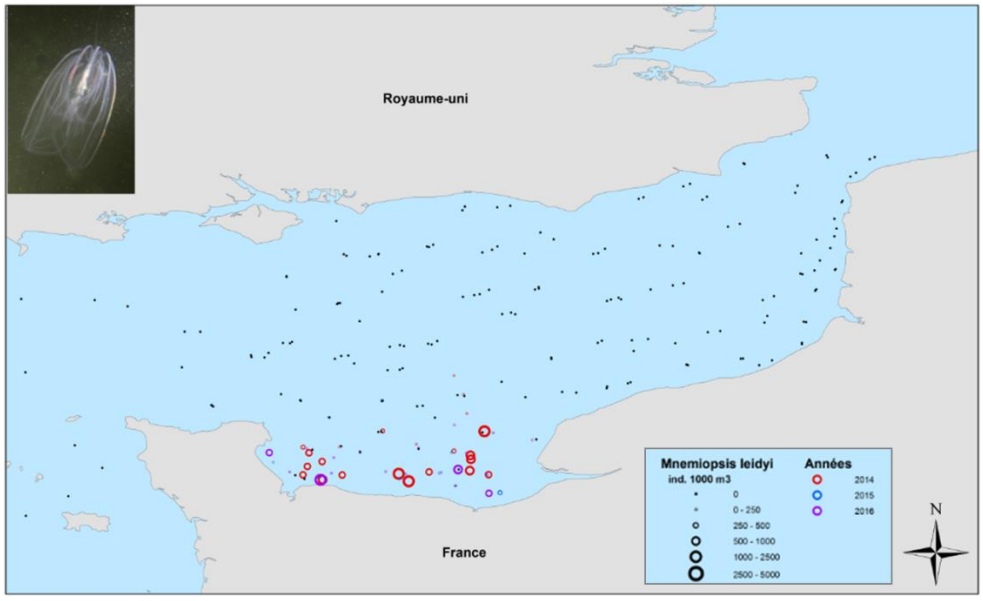

***Figure 7**: Density of* Mnemiopsis leidyi *in the eastern English Channel, during CGFS 2014, 2015 and 2016.*

Subsurface sampling has also been carried out along the vessel track using the CUFES device (Continuous Underway Fish Egg Sampler). Thus, fish eggs and other zooplankton organisms have been collected, processed and identified onboard using a semi-automatic imaging system, that allows to produce distribution maps of the main zooplankton groups in the Eastern English Channel (Figure 8). Zooplankton community is mostly composed of copepoda in the central area, and of malacostrata (mainly decapoda) in coastal waters. Fish eggs are mostly sardine eggs.

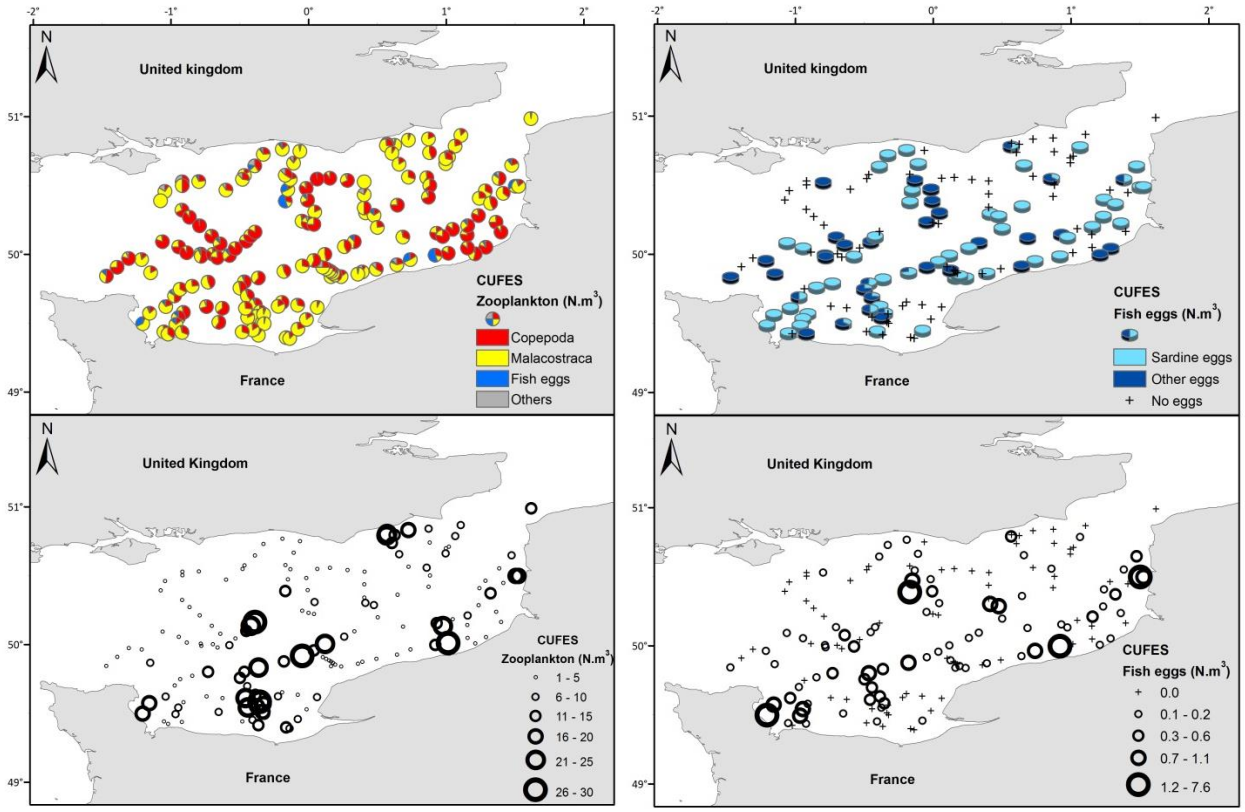

Figure 8: *Taxonomic composition and density of subsurface zooplankton (on the left) and particularly on fish eggs (on the right), collected with the CUFES device and processed onboard using the ZooCam device and associated software.*

3.4 Sea bottom observations

Pictures and videos have been recorded in different stations in the eastern English Channel (associated with dredges) and in the western English Channel (alone). Image analysis will be realized on land, but some snapshot are presented in figure 7 for illustrative purpose only.

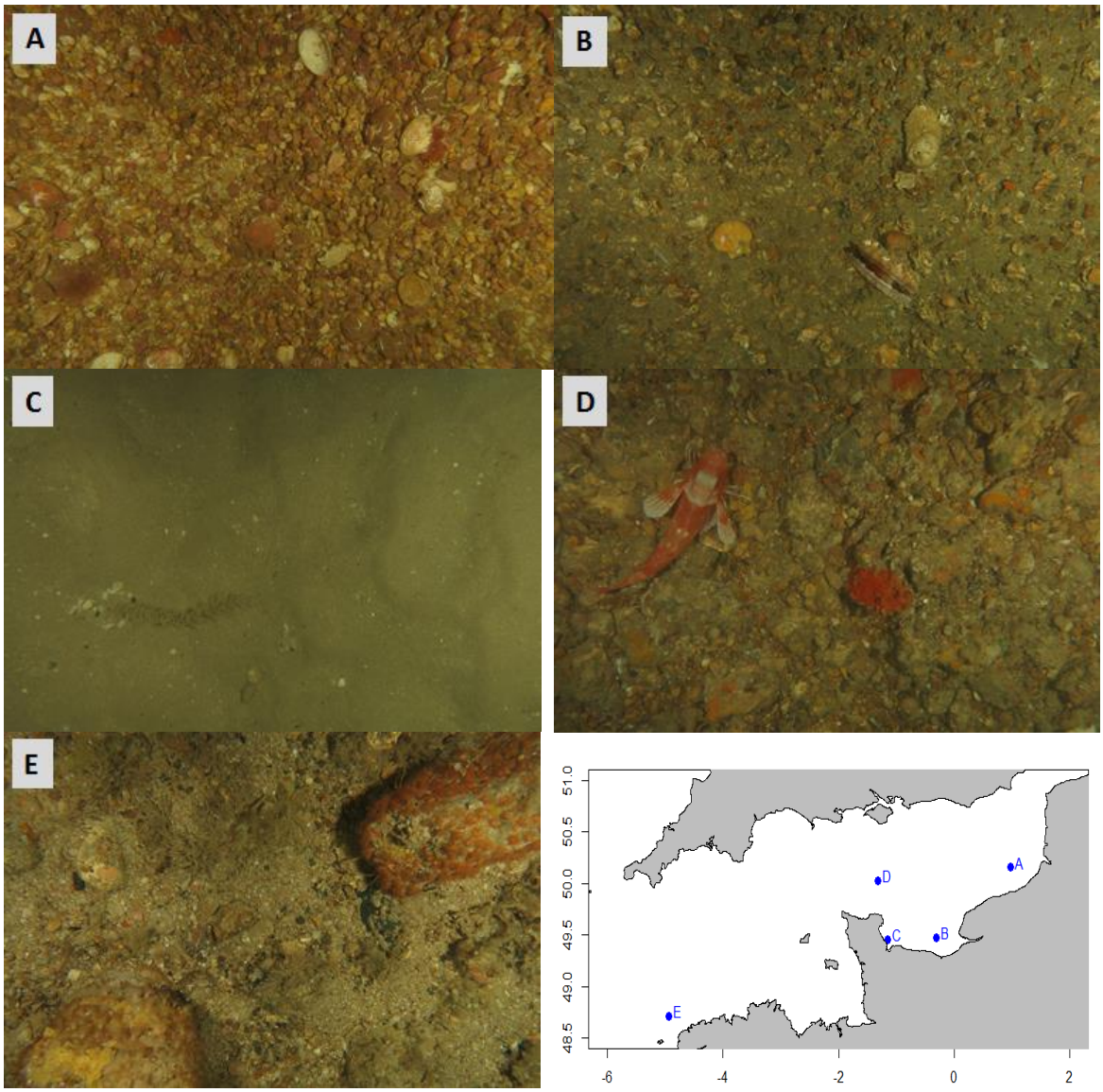

***Figure 7**: Examples of pictures of the sea bottom taken with the Pagure 2, and spatial locations of the corresponding stations*

4. Data collected

Different kinds of data were collected; some of them analyzed onboard, others via samples to be analyzed later in the laboratory. According to the type of data, different scientists are in charge of data storage and analysis gathering:

- Abiotic environment: E. Antajan (IFREMER– Elvire.Antajan@ifremer.fr)
- Phytoplankton: E. Antajan (IFREMER– Elvire.Antajan@ifremer.fr)
- Zooplankton and gelatinous organisms: E. Antajan (IFREMER– Elvire.Antajan@ifremer.fr)
- Fish: M. Travers-Trolet and F. Coppin (IFREMER – Morgane.Travers@ifremer.fr, Franck.Coppin@ifremer.fr)
- Top predators: G. Dorémus (Univ. La Rochelle – gdoremus@univ-lr.fr)
- Benthic invertebrates: N. Desroy (IFREMER – Nicolas.Desroy@ifremer.fr)
- Images of the sea floor and benthic invertebrates: S. Vaz (IFREMER – Sandrine.Vaz@ifremer.fr)
- Microplastics: M. Le Moigne (IFREMER – Morgan.Le.Moigne@ifremer.fr)

For further details on data collected or analysis to come, please contact the corresponding scientist in charge and/or Morgane Travers-Trolet (Morgane.Travers@ifremer.fr) for any queries regarding this survey.