INdIGO

INnovative fIshing Gear for Ocean

DELIVERABLE T1.1.1

Inventory of plastics used in the fishing and aquaculture industry

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EUROPEAN UNION

Interreg

France (Channel Manche) England

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Université Bretagne Sud ubs

NaturePlast L'expert en Bioplastiques

Smel Synergie Mer Et Littoral Recherche & développement

filt 1860 Fabricant de filets et de cordons

UNIVERSITY OF PORTSMOUTH

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IRMA INSTITUT REGIONAL DES MATERIAUX AVANCES

Ifremer

marine south east

INVENTORY OF PLASTICS USED IN THE FISHING AND AQUACULTURE INDUSTRY - MARCH 2021.

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Introduction :

The **INdIGO** (INnovative fIshing Gear for Ocean) project has been selected by the European Interreg VA France (Channel) England (FCE) programme, funded by the European Regional Development Fund (**ERDF**). The project has a total budget of €4.2 million (including €2.9 million from the ERDF) and is due to be completed in June 2023.

Fishing gear (nets, traps, etc.) is made from **plastic materials** with an estimated lifespan of several hundred years, which is problematic if the gear is lost at sea. To address this problem, the INdIGO project will help reduce the total amount of plastic in the CFE area by 3% through the development of **biodegradable** fishing gear, helping to improve water quality and maintain biodiversity. INdIGO will also work to improve the prevention and management of pollution generated by gear, identifying existing **recycling channels** and developing an application to locate fishing gear already lost.

The project will cover the fishing gear production chain, from formulation and filament manufacturing to the development of prototype nets. Deployment of the net at sea, sustainability testing, technical and economic analysis will then be undertaken. A life cycle analysis will be carried out to avoid pollution transfer.

The participation of small and medium-sized enterprises will ensure the **economic sustainability** of the project by exploiting the results of the project. This sector expertise will enable INdIGO to develop products that are market-driven and competitive with current alternatives, while reducing their environmental impact.

Calling the objectives of WP1 and WP4, the purpose of their collaboration :

The objective of work package 1 is to assess the **current situation** regarding the pollution generated by the use of plastics in the fishing industry, in order to propose a relevant alternative solution adapted to the needs of the end-users.

Investigation work in different fishing ports was carried out as part of Activity 1 to **identify** the plastics used on board and to **quantify** the waste generated by the industry. In parallel, a mobile application based on participatory science was developed by Ifremer. It allows users of the marine environment (fishermen, yachtsmen, divers) to report lost gear on the coast or at sea and to correlate the results obtained with the surveys. The collection points for used fishing gear in ports and the existing recycling channels are identified in activity 2. The aim is to improve and facilitate the **collection** and **recycling** of fishing gear by pooling knowledge and know-how in order to promote the expansion of these channels in the FMA area. All this data will be used as a basis for Activity 3 to select prototypes, define their specifications and be used to influence policy makers. A market analysis on biodegradable plastics will be carried out to highlight supply, demand, needs and price expectations.

The objective of this activity 1 is to take stock of the presence of plastics in the fisheries sector in order to propose relevant solutions for the **specifications** established in activity 3. UBS, Cefas and SMEL have carried out surveys among fishermen to identify the trades that generate the most plastic waste. In order to be more representative, the partnership ensured that the sampling reflected the activities of the **FMA area** by taking into account the geographical area, the number of professionals surveyed and the types of fishing practiced. The format of the surveys was co-constructed by the partners and the results were used to build a robust database.

This deliverable is a **detailed inventory** of the use of plastics in relation to the fishing industry. The accumulated data allows statistics to be established in the FMA area concerning the type of plastic

used, the waste generated, the fishing gear brought back to port (in collection points) or lost at sea. These results will feed into Activity 3 regarding the type of gear to be redesigned as a priority, in order to support the **development of a new innovative fishing gear** among net manufacturers, and thus influence public decision makers.

The objective of work package 4 is to integrate **end-users** into the design process of the new biodegradable fishing gear. The aim is to **facilitate** the integration of innovation into the professional fishing industry and ultimately facilitate the **transition** to sustainable practices. If an innovation is perceived as **acceptable** by future users, this facilitates its integration into the users' activity. This is why the first work consisted in evaluating the **acceptability** of the innovation. Acceptability refers to the measurement of the *a priori* evaluation of the tool within the fisheries professionals before they use it ; the **objective** being to identify the **obstacles** and **levers** to the use of the innovation.
An initial investigation was carried out using a **pilot questionnaire** sent to a small sample of fishermen (15 French and 12 English). The method used and the results obtained were presented in deliverable MT4.1.2. The pilot questionnaire was used to construct an acceptability questionnaire consisting of 54 questions grouped into 9 acceptability dimensions.

The results should be used to make **recommendations** for the **design** of biodegradable fishing gear and to implement an action plan to **accompany** the transition to sustainable fishing practices.

The objectives of WP1 and WP4 are different, however the target population and the questionnaire method are **similar**. The partners agreed to **join** forces to meet their respective **objectives** by soliciting only once the population likely to use biodegradable fishing gear. The method presented in the relevant section is common to WP1 and WP4. The construction of the pilot questionnaire and the final questionnaire was carried out together.

Fisheries sector in the FMA area [1] :

Before going into more detail on the description of the survey and in order to have an overall view of the target groups to be surveyed for France, the fishing sector in the France Channel England area is detailed by region, using data from Ifremer's **Fisheries Information System** (SIH). This system is a national scientific network for observing resources and all professional fishing fleets on board ships. Identifying the fishing activity of professional vessels is a guide for the use of the data declared by fishermen, as it enables the French fleet to be **characterised**. Thus, the observers in the field reconstruct, for each month of the current year, the **trades practised** by a vessel and its fishing master, specifying the ports and fishing areas frequented. This data is a valuable source for research projects such as **INdIGO**, allowing the partnership, for example, to carry out the **sampling plan** necessary for the survey work carried out in the framework of this deliverable.

Britttany :

Brittany has **1 170** active fishing vessels out of 1 235 registered in the FPC (Community Fishing Fleet), of which 75% are inshore (within 12 miles of the coast), 13% are offshore (outside 12 miles) and 12% are mixed (carrying out between 25% and 75% of their activity on the coast or offshore).

The majority of vessels are between **7 and 10m** in length, followed by those between 10 and 12m, then those under 7m. Of these, 32% are engaged in net fishing, 29% in dredging, 28% in trawling, and 28% in trapping.

Normandy :

The Normandy region has **538** active fishing vessels out of 605 registered with the FPC, of which 62% are inshore, 3% offshore and 35% mixed.

The majority of vessels are between **7 and 10m**, followed by those between 10 and 12m, then those under 7m. Of these, 46% use dredges, 43% use trawls, 43% use traps and 17% use nets.

Hauts-de-France :

The Haut-de-France region has **123** active fishing vessels out of 134 registered in the FPC, of which 69% are coastal, 7% offshore and 37% mixed.

The majority of vessels are between **10 and 12m**, followed by those between 7 and 10m, then those under 7m. Of these, 47% are trawlers, 46% are netters, 24% are trawlers, and 20% are dredgers.

This survey was based on the **2018 SIH**, as the 2019 edition was not yet available at the time the sampling plan was created. However, after reviewing the 2019 edition, it appears that the trends are the same and thus validate the selected sample.

[1] Credit : Système d'Information Halieutique (SIH) IFREMER 2018.

Method :

Pilot questionnaire : interest and objectives

The objective of the **pilot questionnaire** (presented in the appendix) was to obtain information to construct and orient the final questionnaire on the **technical aspects** and **acceptability** of the new biodegradable fishing gear. The results of this first study were used to specify the modalities for answering the questions envisaged in the final questionnaire.
In order to meet the requirements of the project and to optimise the response rate of the fisheries stakeholders, the choice was made to **combine** some aspects of **WP1** and **WP4**. The research topics of tasks 1.1 and 4.1 were merged into one questionnaire, in order to avoid over-soliciting professionals whose access is already a challenge in itself. This study also made it possible to collect the first **elements of language** to address the link between fishing activity, the environment and the preservation of resources. The proposed interview is a **qualitative** survey method based on a few individuals. These individuals were chosen according to their characteristics and types of fishing activity. The objective was to obtain a representative sample of the diversity of fishing and to study the assumed attitudes towards the object of study. Each individual is considered to be **representative** of his or her category, however this sample is not representative of the overall population. SMEL and Cefas were responsible for selecting fishing professionals from each sector of activity (gillnetter, trawler, etc.) on the basis of their professional contacts. The fishing professionals were contacted by **telephone** to ascertain their interest in participating in the study, and were met **face-to-face** to participate in the discussions.
In total, the sample for this study consisted of **30** fishing professionals, 15 from France and 15 from the UK. The dimensions addressed were related to **COVID-19**, the **working environment**, and questioned the vocabulary used. In the context of this study and given the context of the health situation, **telephone interviews** were chosen to administer the pilot questionnaire. The information collected allowed a list of qualities that professionals believe a fishing net should possess to be established.
The **performance**, **cost**, **strength**, **durability**, **price**, **strength** of the threads, water **penetration**, **buoyancy**, **compactness** and **catchability** of the net are all characteristics that should be taken into account in WP1 Activity 3, when developing the specifications for the new INdIGO fishing gear. This information was also used to develop the final questionnaire, presented below, in more detail.

Final questionnaire : content, coding and pre-processing of data, sample design and representativeness.

The questionnaire was co-constructed by UBS for the **psycho-ergonomic** part, and by Cefas and SMEL for the **technical** part. It was distributed to the eligible regions of the programme for France and England.

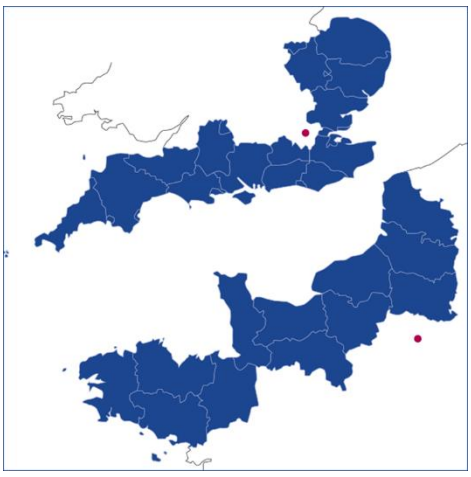


Figure 1 - Eligible area of the FMA programme

The questionnaire (presented in the appendix) is divided into several parts, and asks about the respondent's **activity profile** and **fishing activity**, psycho-ergonomic dimensions related to **acceptability**, annual **costs** related to fishing gear management, **management** of used fishing gear (**UPE**), and the impact of abandoned, lost or discarded fishing gear (**ALDFG**).

The **acceptability** questionnaire consisted of 54 questions in 9 dimensions :

- 4 questions concerned **leadership**
- 8 were about **social influence**
- 14 were about **control**
- 3 concerned **ease of use**
- 4 were about **perceived usefulness**
- 4 concerned **expected image** and **professional identity**
- 12 were about **consistency**
- 1 concerned **adoption intention**
- 4 concerned **socio-demographic characteristics** (age, gender, level of education, number of years in practice).

The dimensions were explained in the previous deliverable « **Deliverable MT4.1.2** », as well as the back-translation carried out and the administration method implemented. A summary of the dimensions, sub-dimensions and the number of associated questions in the questionnaire are presented in the annex.

A total of **227** people participated in the questionnaire. However, 23 participants were excluded from the initial dataset due to significant response **bias** (systematic responses, outliers, missing data) or **abandonment** of the questionnaire during its completion. The results were therefore **processed** on a dataset consisting of a total of **204** participants.

The French partners, SMEL and UBS, classified **net fishing activities** according to the type of net used (exclusive straight net, multipurpose straight net, exclusive trammel net, multipurpose trammel net) to focus the analyses on the main target of the **INdIGO** project.

The **coding** of the English data followed a similar treatment. Incomplete data were removed and the data set was **homogenised** with the French data format for **joint** use.

The analysis was therefore carried out on a dataset composed of a total of **204** respondents and **115** variables :

- **4** socio-demographic variables : gender, age, degree, number of years of experience in fishing.
- **77** variables to study the acceptability dimension.
- **29** technical variables asking about the respondent's activity profile, the associated costs, the management of used fishing gear, the amount of lost, discarded or abandoned gear each year, and some questions about lost, discarded or abandoned fishing gear (ALDFG).

In order to construct the sampling plan, the **Regional and Departmental Fisheries Committees** (CRPs and CDPs) were asked to transmit their anonymised fleet databases. In order to corroborate the figures obtained, these data were compared with the number of active vessels recorded in Ifremer's Fisheries Information System (**SIH**). The concordance of these data allowed the extraction of a robust sampling plan. For the purposes of the study, and in particular to ensure the representativeness of the fleet within the study area, it was decided not to take into account the sifters, boliners, tropical seiners,

bottom seiners and the various inshore trades, as these trades are not very present within the study area. In view of the statistics collected via the Ifremer and CRP/CDP databases, it appears that the four main trades in the FMA-FRANCE area are **net**, **trawl**, **dredge** and **trap**, bearing in mind that these trades may be practised **exclusively** or in a **multipurpose** manner. The **French** sample was therefore based on all active fishermen in the regions of **Brittany**, **Normandy** and **Haut-de-France**. After processing the available database (SMEL database, 01/09/2020) the reference population totalled **1706** fishermen.

To ensure the **representativeness** of the sample, the confidence level was set at **95%** (a value generally chosen in statistics). This means that 95% of the fishermen interviewed are **likely** to behave in the same way as the reference population. The margin of error, or confidence level, was estimated at **8%**. This means that in 92% of cases, respondents will potentially **reflect** the opinion of the reference population. These **parameters** were used to define the sample size, which was set at **139** respondents in France.

The **representativeness** of the sample in relation to the study population **could not** be checked. The **recruitment** method aimed to ensure a **maximum** number of respondents to the questionnaire, which did not allow for the establishment of quotas. However, the representativeness of the sample was studied **a posteriori**, on the basis of **indicators** linked to the type of fishing activity, the region and the size of the vessel.

The methodology chosen was to use the online software **SurveyMonkey**, in order to limit the bias linked to the intervention of the interviewers. The regional and departmental fisheries committees were again asked to distribute the questionnaire, as well as the **Pleine Mer** association. Finally, to complete the technical part, telephone calls and field trips were made.

ACTIVITE	N = 168	%	Population mère (Pm = 1670)	%
Filet	36	21%	415	25%
Drague	12	7%	260	16%
Chalut	17	10%	609	36%
REPARTITION REGION	N = 168	%	Population mère (Pm = 1670)	%
Bretagne	56	33%	1028	62%
Normandie	46	27%	530	32%
Hauts-de-France	8	5%	112	7%
TAILLE DU BATEAU	N = 103	%	Pm = 1316	SIH 2018 façade Manche-Mer du Nord
< 7m	5	5%	158	12%
7-10m	36	35%	474	36%
10-12m	30	29%	368	28%
12-15m	8	8%	79	6%
15-18m	6	6%	118	9%
18-24m	6	6%	79	6%
> 24m	12	12%	26	2%

Figure 2 - Representativeness of the French sample

The table shows that **net fishing** is correctly **represented** in the sample studied, but this is not the case for dredging and trawling, which are under-represented compared to the **parent population**.

The representation of the **Normandy** and **Hauts-de-France** regions is correct in relation to the parent population, but the **Brittany** region is under-represented in the sample.

With regard to boat size, boats **under 24 meters** tend to be correctly represented overall, whereas boats **over 24 meters** are over-represented in the sample.

Data on **age** or **experience** are not available and the representativeness of the sample could not therefore be studied on these indices. Similarly, no data on **gender** was available. However, as fishing activity is predominantly **male**, it can be concluded that the sample follows the **same** overall distribution as the parent population.

The sample therefore has some **flaws** that may need to be **considered** in the analyses (the under-representation of dredge users, for example, could explain certain trends in the responses). However, the sample appears to be fairly **representative** for small and medium-sized vessels and for the net trade.

Results of the technical questionnaire :

The questionnaire was available online from 8.12.2020 to 31.03.2021. On the French side, **212 respondents** were counted for the psycho-ergonomic part, and **103 respondents** for the **technical part**. On the English side, **41** respondents were counted for the psycho-ergonomic part, and **47** respondents for the technical part. The results of the technical part of the inventory of plastics in the fishing industry are presented below.

Figure 3 - Communication made for the survey

Profile of French respondents :

According to the sampling plan presented in this report, the objective of reaching the three regions of the programme, i.e. **Brittany**, **Normandy** and **Hauts-de-France**, was met (Fig. 4). The involvement of the **Pleine Mer** association in the dissemination of this survey should be noted. Indeed, after several weeks of dissemination in the press and on social networks, it was noted that the response rate was rather low in some regions, particularly in the Hauts-de-France. An agreement was reached between the Pleine Mer association and the project partners, agreeing at the same time to open up the scope of the survey to the **national level**, in order to compensate for this low response rate. Thanks to this intervention, **twenty-four** additional respondents answered the survey, respectively from the maritime districts of Les Sables d'Olonne, Ile d'Yeu, Marennes, Bayonne, Bordeaux, Nantes, Toulon, La Rochelle, Noirmoutier, Sète, Saint-Nazaire, and Ajaccio. In total, **103** French and **47** English professionals took part in this survey.

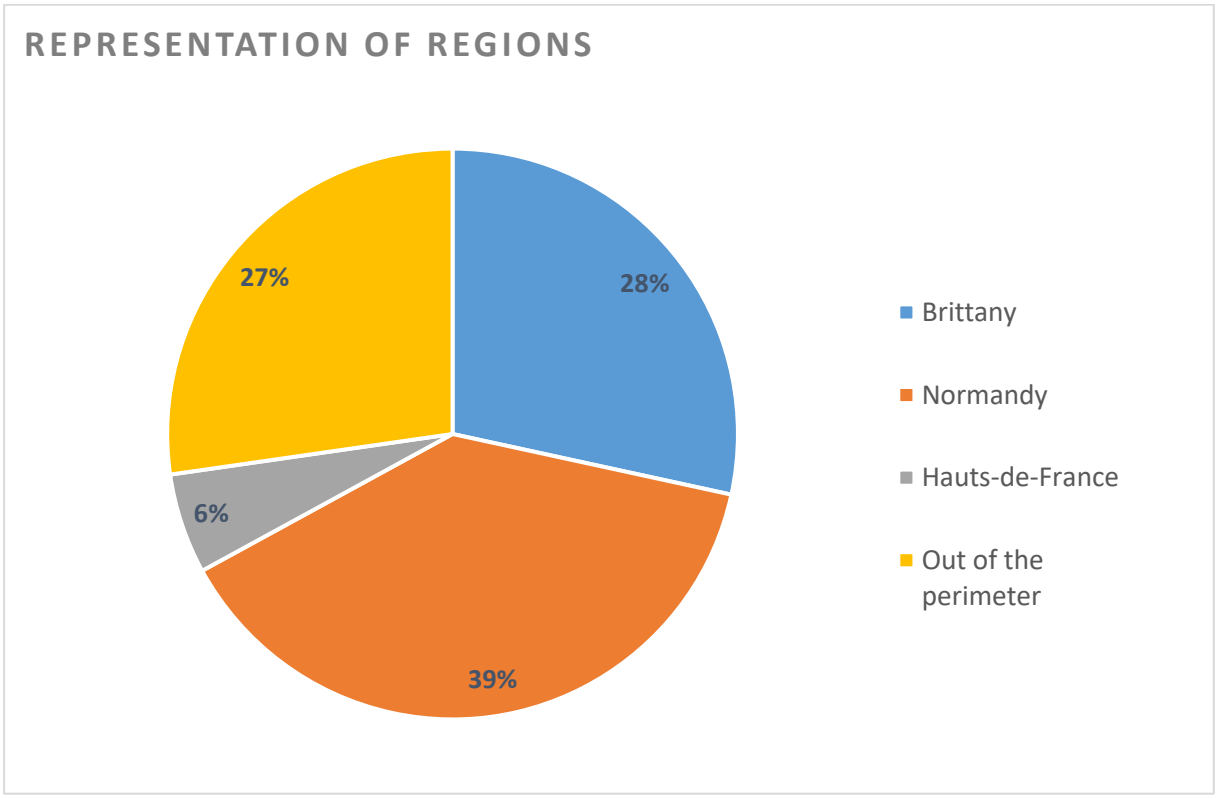


Figure 4 - Representation of French regions

Concerning the distribution of the trades practised, it was decided to group the trades into two main categories called « **active gears** » and « **passive gears** » to facilitate the analyses. According to Ifremer, active gear is moved on the bottom or in the open water to capture the animals sought. Passive gear does not move, hence its name « sleeping » gear. It is the movement of the fish that leads them to be caught ; like a trap. **Active gear** therefore includes **dredges**, **trawls** and **seines**. **Passive gear** includes **traps**, **nets** and **lines**.

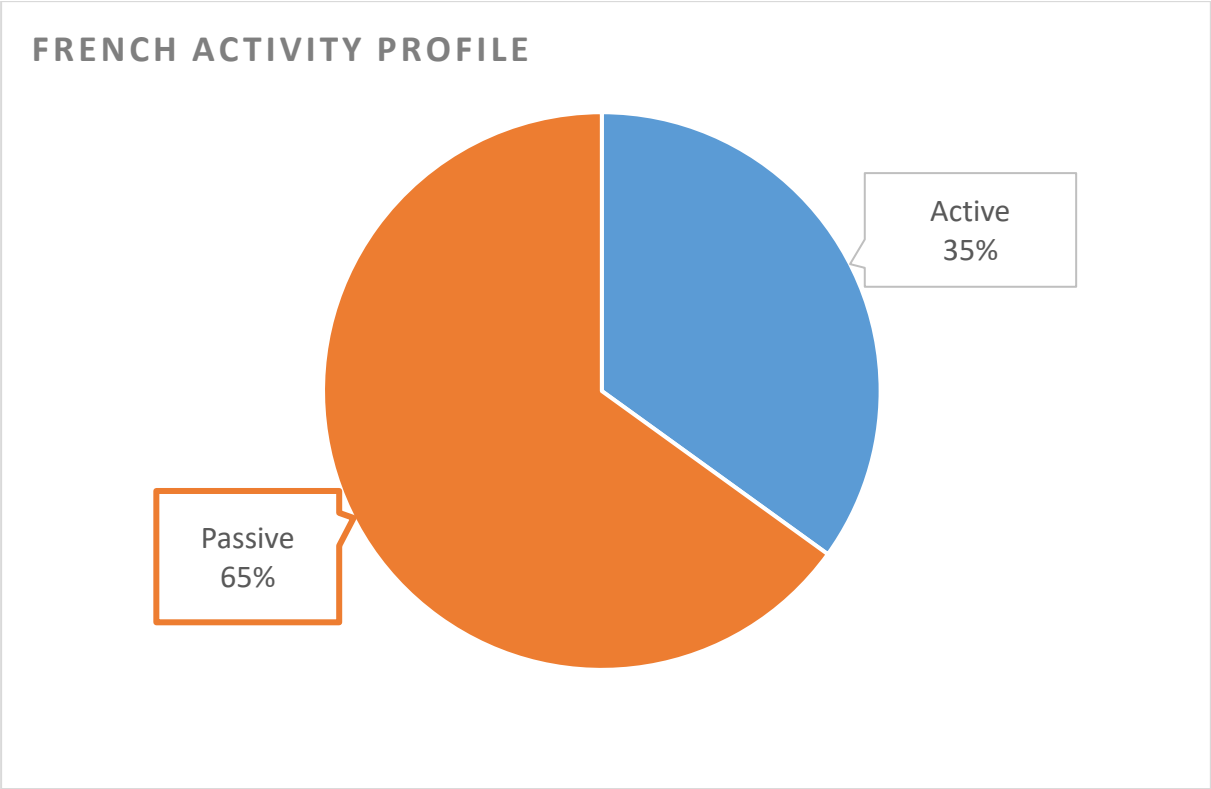


Figure 5 - Activity profile of French respondents

Passive gear is predominantly represented among the survey respondents (Fig. 5), and this is reflected in an analysis of the representation of trades by surveyed region (Fig. 6).

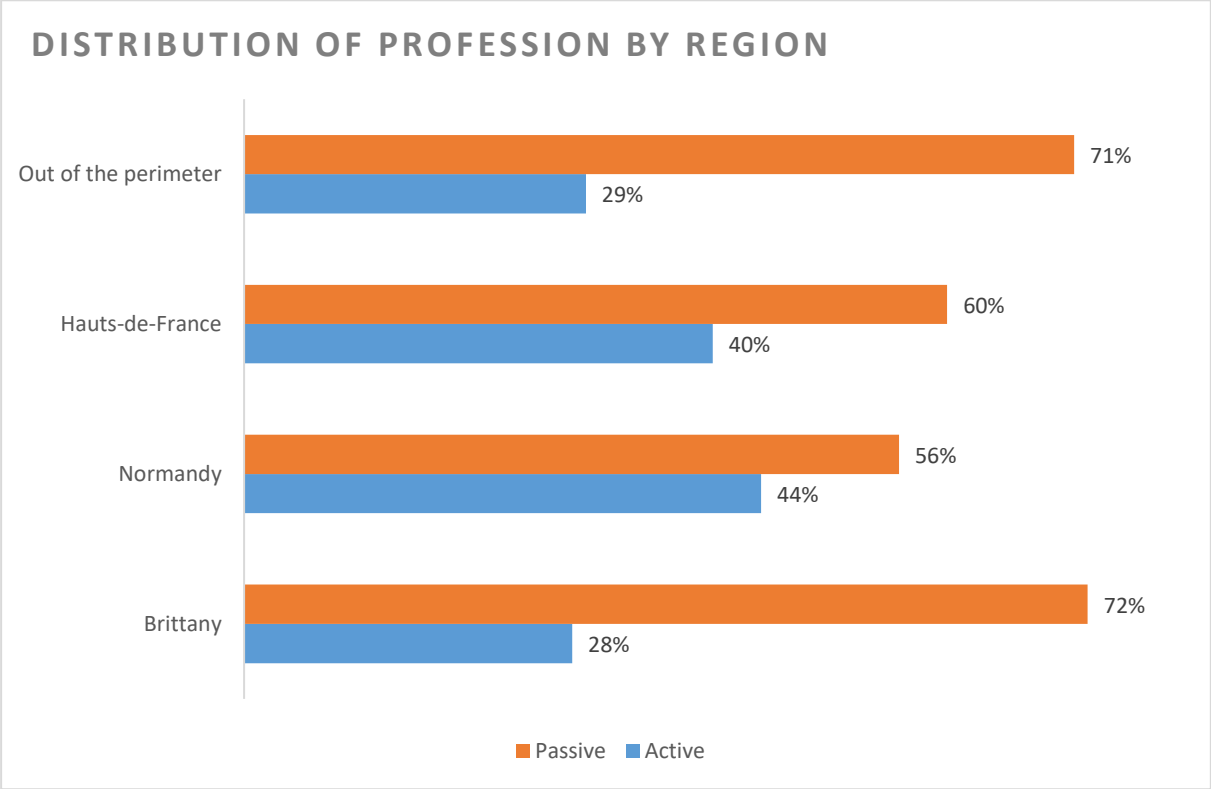


Figure 6 - Distribution of occupations by French regions

More than half of the respondents hold the position of **Shipowner AND Skipper** (Fig.7). The shipowner being the owner of the vessel, and the skipper its captain. It is common, as the results show, for the owner and the skipper to be the same person. In order to be able to exercise this position, it is necessary to obtain certificates allowing one to skipper a fishing vessel. A **Master 200** certificate allows the holder to be taken on board a vessel of less than 200 gross tons, with a propulsive power of less than 250 kW and going not more than 100 miles from the coast. A **Master 500** certificate allows the holder to be taken on board a ship of less than 500 gross tons and going no further than 200 miles from the coast. Of the respondents to the questionnaire, **62%** indicated that they held a Master 200 certificate, and **26%** held a Master 500 certificate. It was not possible to confirm the equivalence of the English certificates, so it is not possible to make comparisons between countries in this respect.

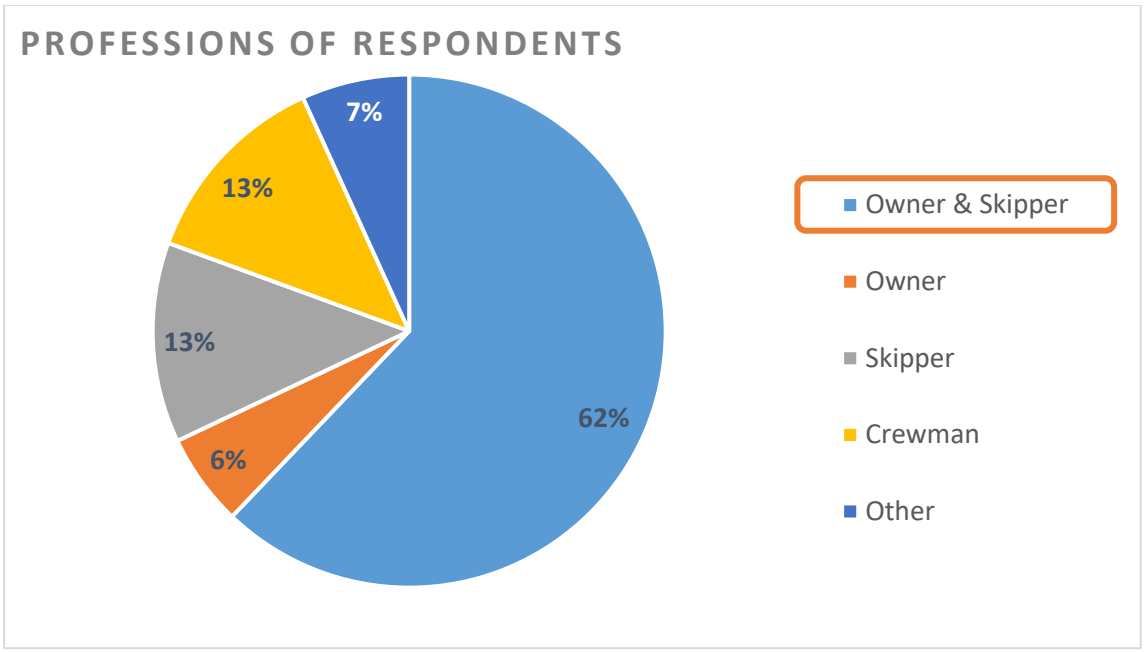


Figure 7 - Status of French respondents

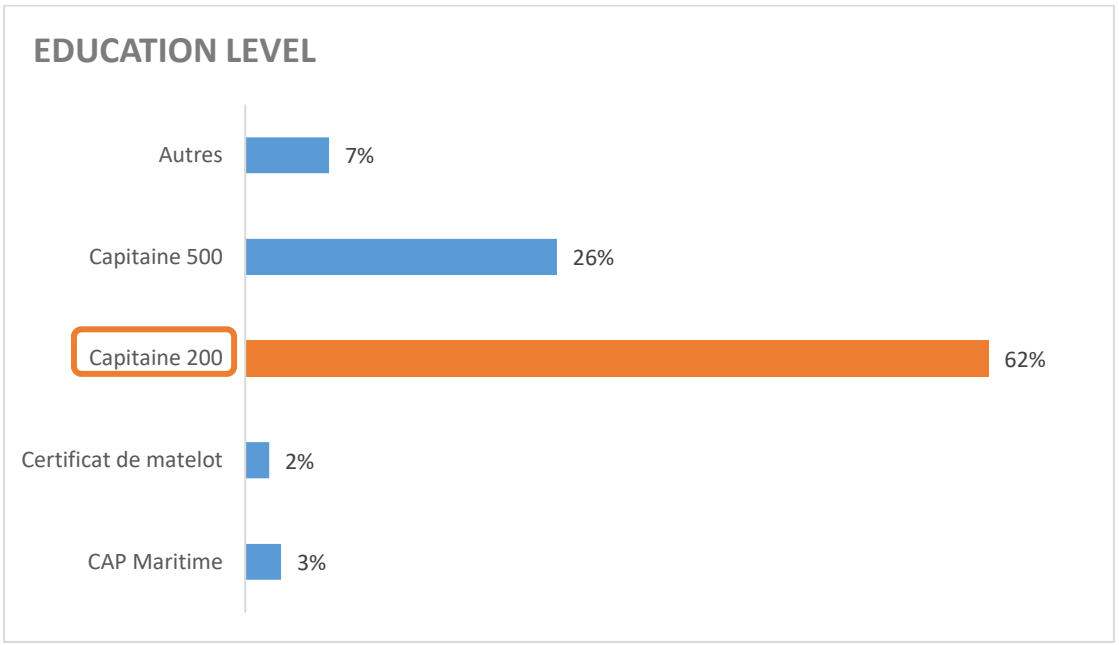


Figure 8 - Education level for French respondents

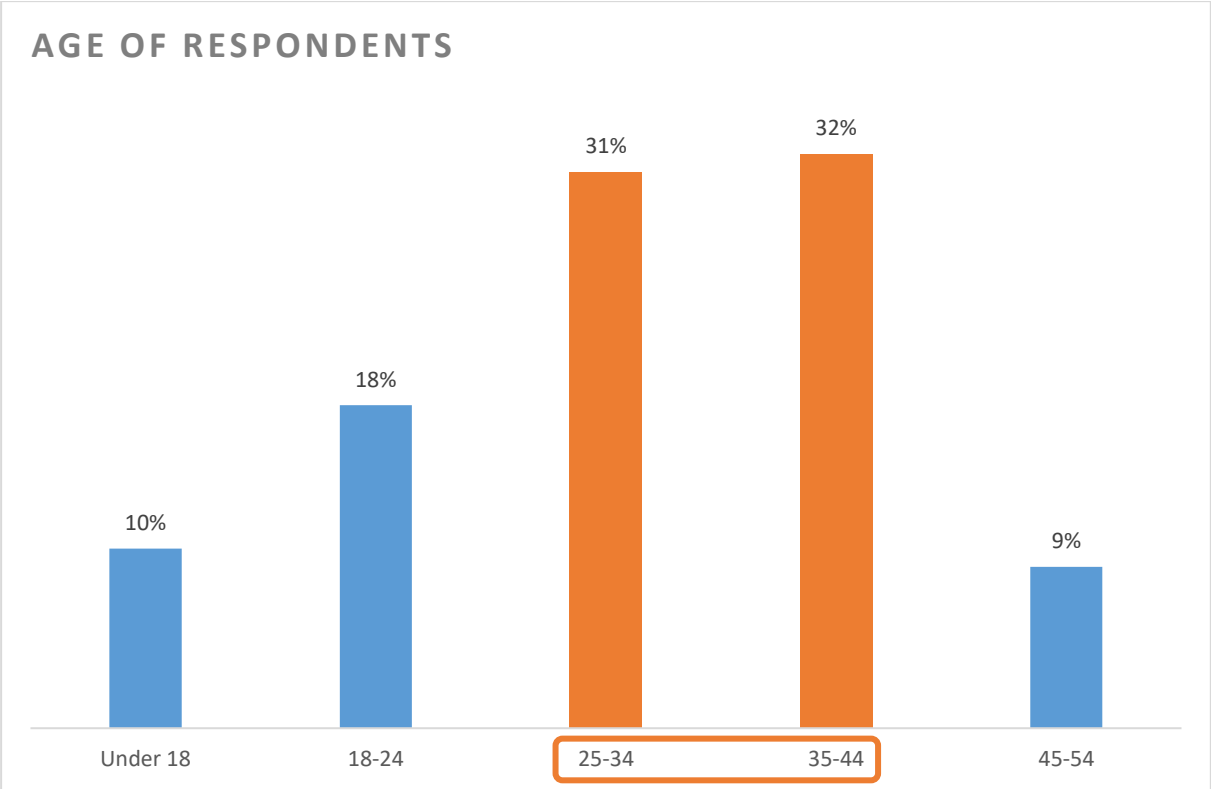


Figure 9 - Age of French respondents

31% of the respondents indicate that they are between **25 and 34 years old**, and **32%** indicate that they are between **35 and 44 years old** (Fig.9). **52%** have been practising their profession for more than **twenty years** (Fig.10).

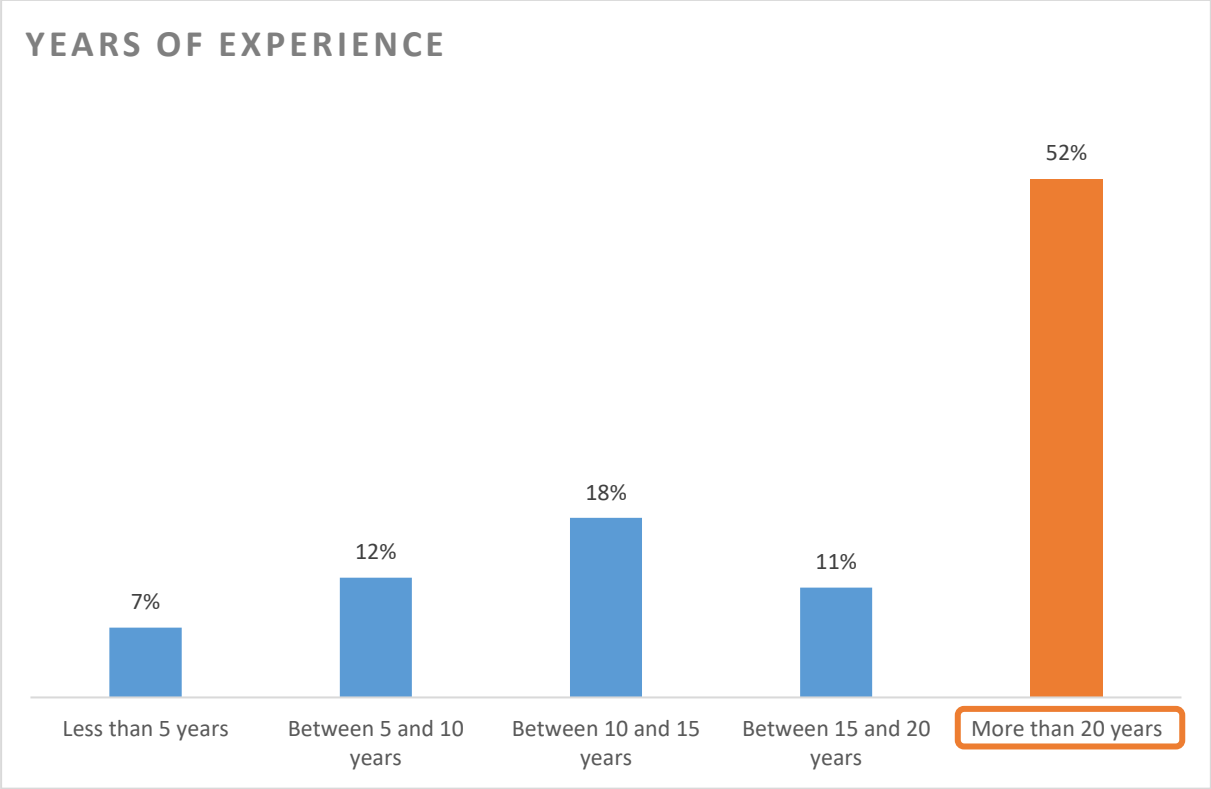


Figure 10 - Years of experience of French respondents

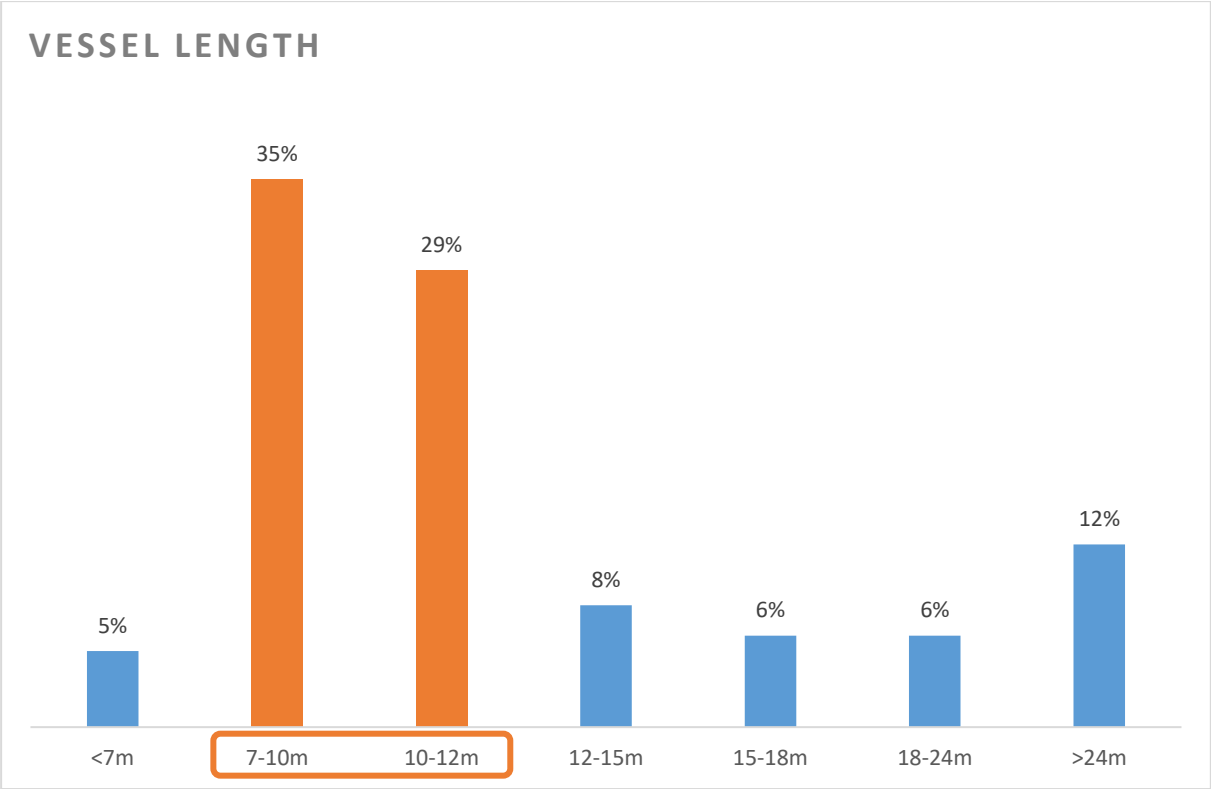


Figure 11 - Size of French respondents' boats

The average size of the vessels is between **7 and 10 metres**, or between **10 and 12 metres** (Fig.11). These indications are fairly representative of the French fleet, the average size of fishing vessels on the **Atlantic - Channel - North Sea coast** being **12 metres**[2].

More than half of the respondents (**59%**) make trips lasting **less than one day**, generally less than 12 hours (Fig.12). These data are consistent with the results of a study on small-scale coastal fishing[3] in France, which questioned 2 089 vessels. The latter essentially declare day tides, with an average duration of between 0 and 24 hours.

[2] Ifremer. Système d'Informations Halieutiques (2020). Océan Mer du Nord - Manche - Atlantique. 2019. Activité des navires de pêche.

[3] FranceAgriMer, 2020. OCEANIC DEVELOPPEMENT, VERTIGO LAB, EUREKA MER. Rapport Final Population A : Eléments d'analyse et enjeux pour la petite pêche côtière en France métropolitaine. 323p.

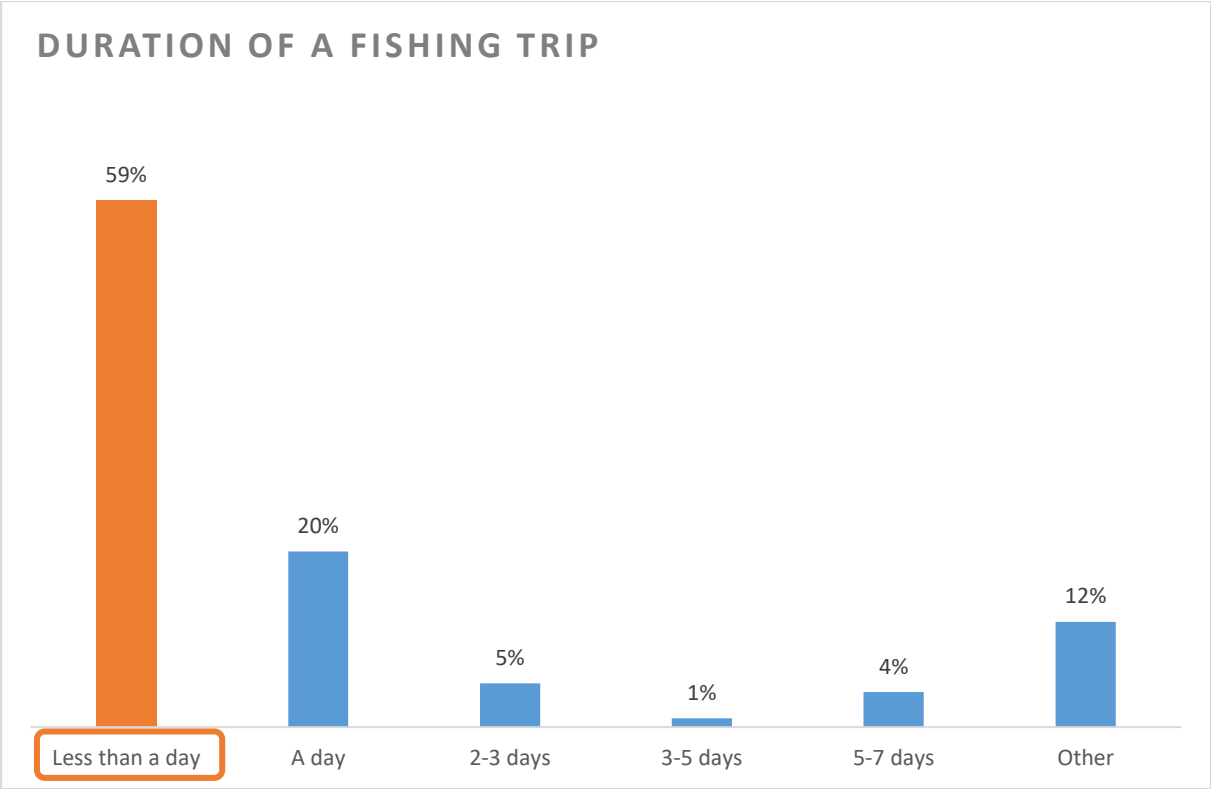


Figure 12 - Duration of a fishing trip for French respondents

Lastly, the majority of the vessels were **gillnetters** (**35%**). Trawlers, caseyeurs and dredgers also participated in the study (Fig. 13). Since the objective of INdIGO is mainly to reach gillnetters, it was important that this category be the first to be reached when the survey was distributed.

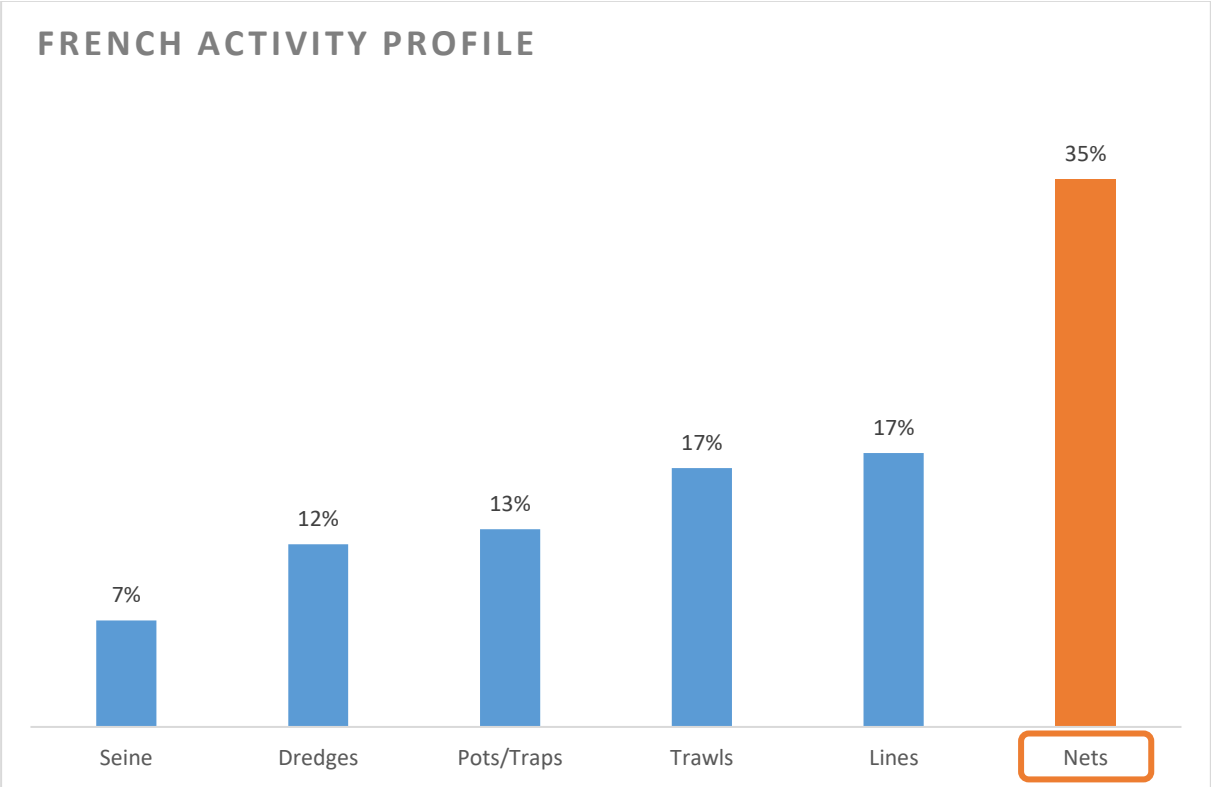


Figure 13 - Details of the activity profile of French respondents

Profile of English respondents:

The initial target was 314 respondents for the French and English parts of the survey to ensure a representative sample. This target was revised downwards to **139 respondents** on the **French side** and around **80 respondents** on the English side (95% confidence level, 8% margin of error).

Respondents for the technical survey in England were targeted within the Interreg eligible area and included: the South West area (Brixham, Plymouth, Cadgwith, Newlyn, Helford, Mevagissey, Mylor, Newquay and Looe), the South East area (Newhaven, Hastings, Shoreham, Eastbourne, Rye) and the East of England area (Southwold, Kings Linn and Lowestoft). The technical questionnaire was delivered by **Cefas observers** by telephone (Microsoft Teams) and recorded. As in France, the low response rate to the technical survey a few months after the start of data collection led to the geographical scope of the survey being **extended** to include the North East of England. Additional telephone interviews were conducted by Cefas observers with fishermen based in Bridlington and Maryport. Despite this, the target of 80 respondents was not achieved.

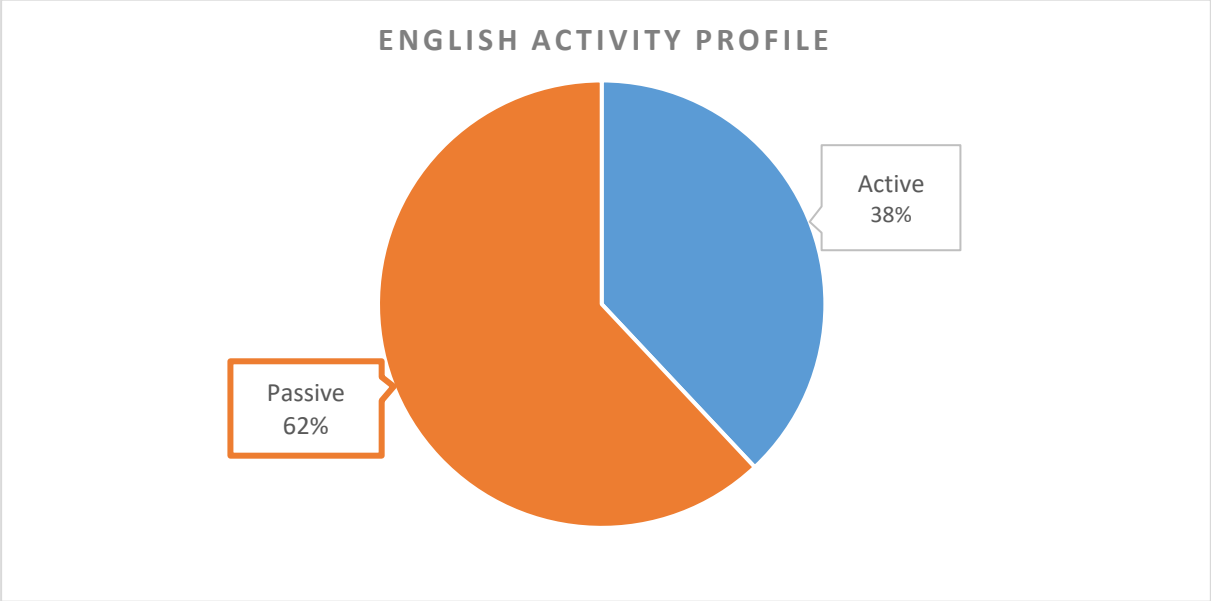


Figure 14 - Activity profile of English respondents

The vast majority (almost **80%**) of the English fishermen surveyed are **owners AND skippers** of their boats (Fig.15), and fish with **passive** gear (Fig.14). More than **45%** of respondents work on boats of **7-10 m** in length and are at sea for the most part (**42%**) for **less than a day**, followed by respondents who are at sea for a day (**23%**) (Fig.18).

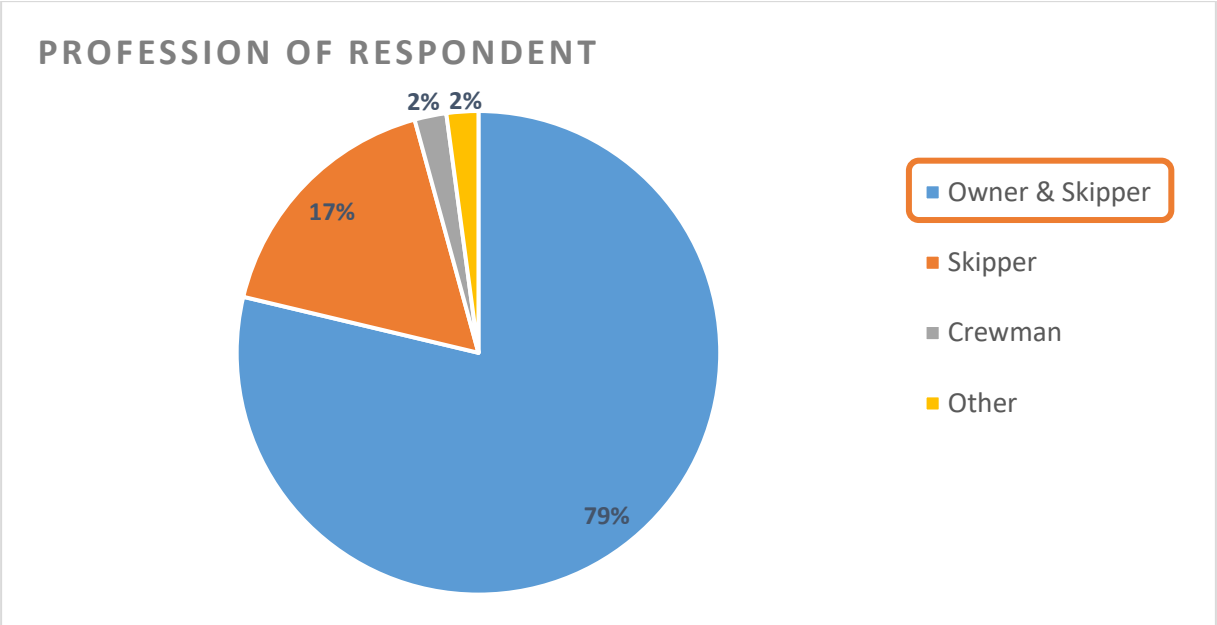


Figure 15 - Status of English respondents

With regard to the demographic characteristics of the respondents, all the fishermen contacted were **male** and mainly represented the **45-54 age group** (**40%**). Two age groups, **55-64** and **over 65**, were also represented (**15.2%**), while the least represented age category was **35-44** (**6.3%**) (Fig. 16).

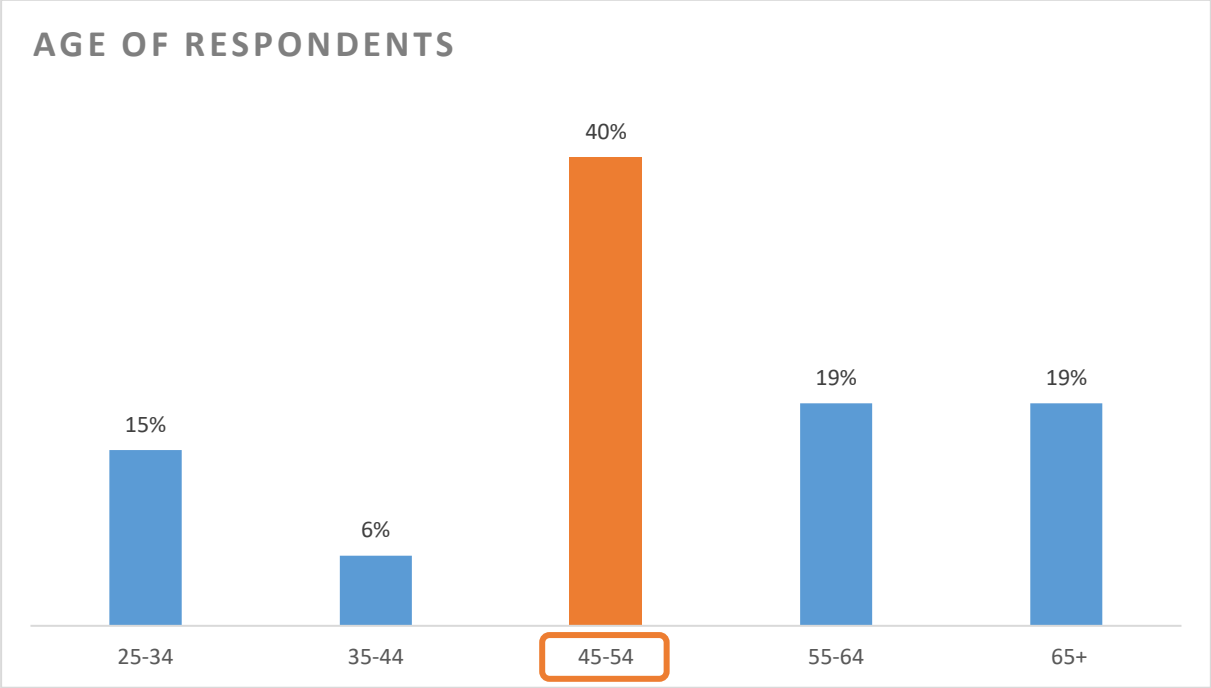


Figure 16 - Age of English respondents

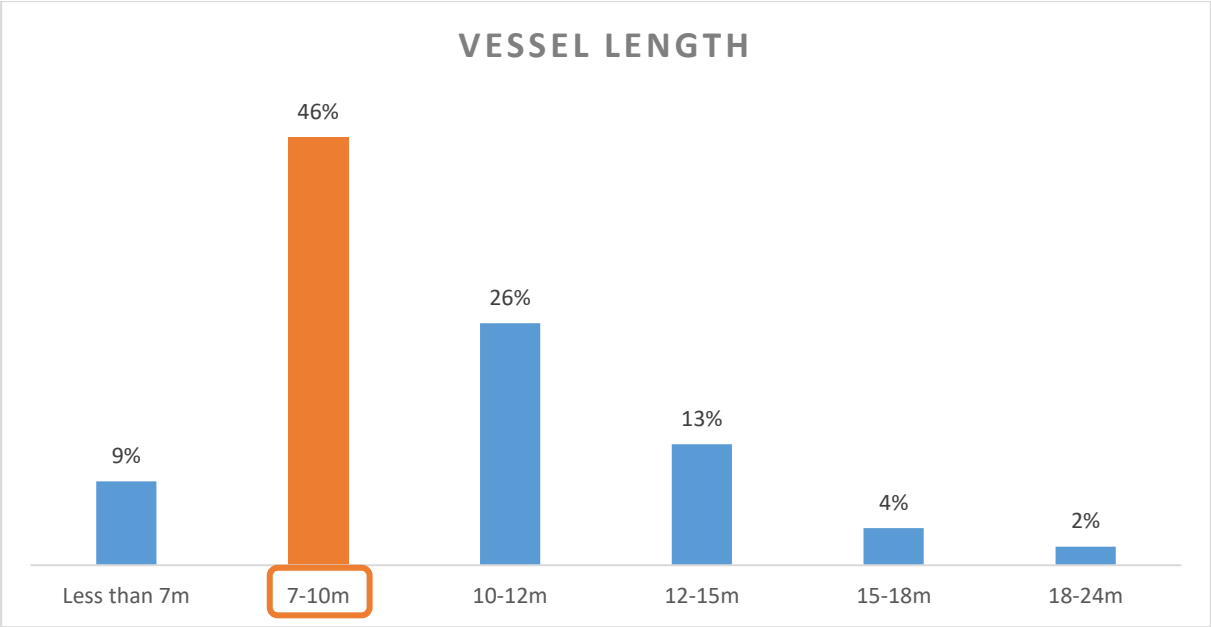


Figure 17 - Size of English respondents' boats

The length of the fishing vessels (Fig. 17) and the duration of the fishing trips indicate that the type of fishing practiced is mainly **small-scale coastal fishing**.

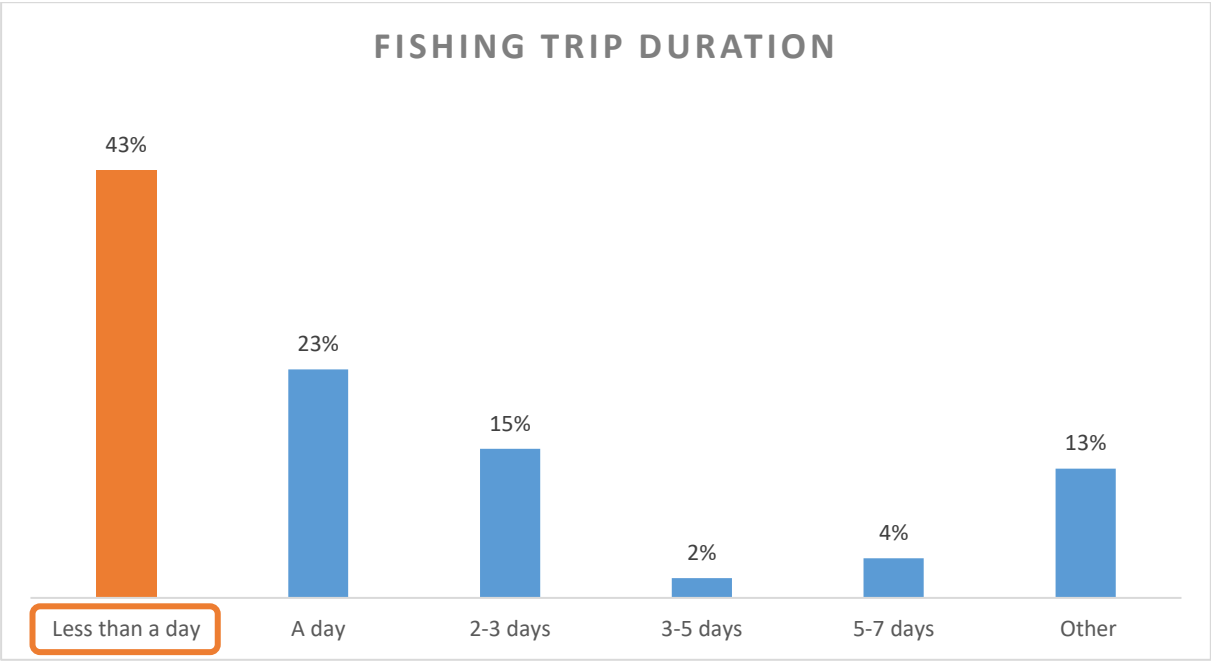


Figure 18 - Duration of a fishing trip for English respondents

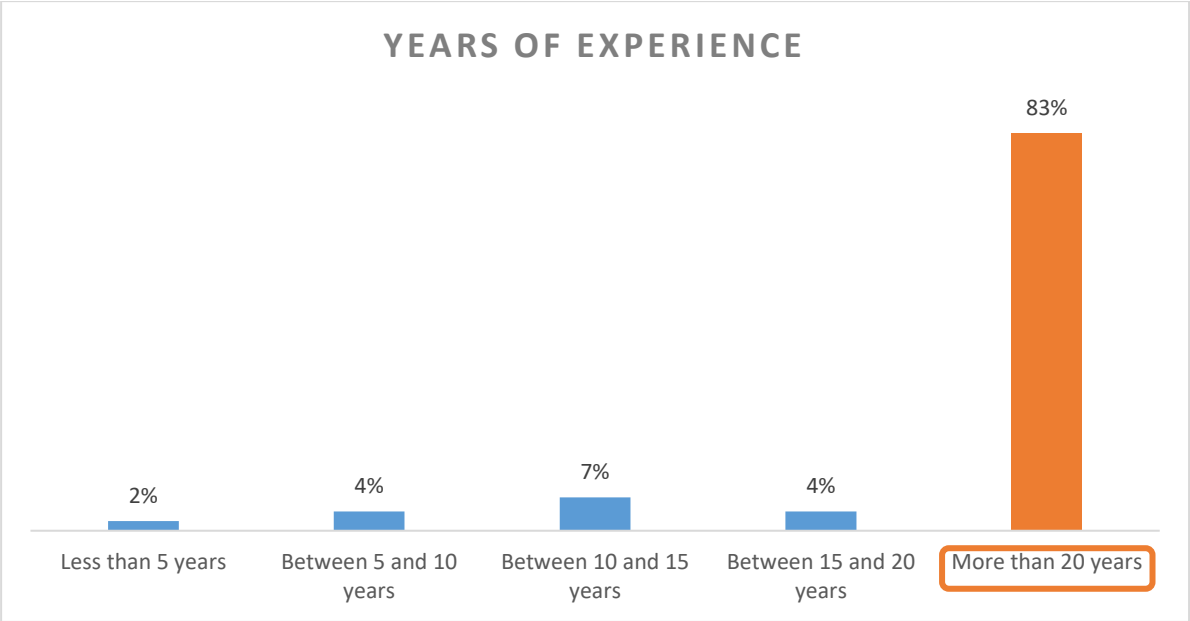


Figure 19 - Years of experience of English respondents

Figure 19 shows that the majority of the English fishermen interviewed have **more than 20 years** of experience. When asked about their level of education, most respondents (**53%**) indicated "**other**" (Fig. 20). Of these, **56%** stated that they had received basic **safety** training (STCW certification[4]), while **36%** had obtained a **master's degree for vessels under 16.5m**[5]. Less than **20%** of the respondents stated that they had completed **GCSE** (General Centrifugate of Secondary Education), followed by a total of **10%** of the fishermen surveyed who indicated that they were **Deck Officer Certificate of Competency** certified and **9%** of the respondents who preferred not to disclose their level of education.

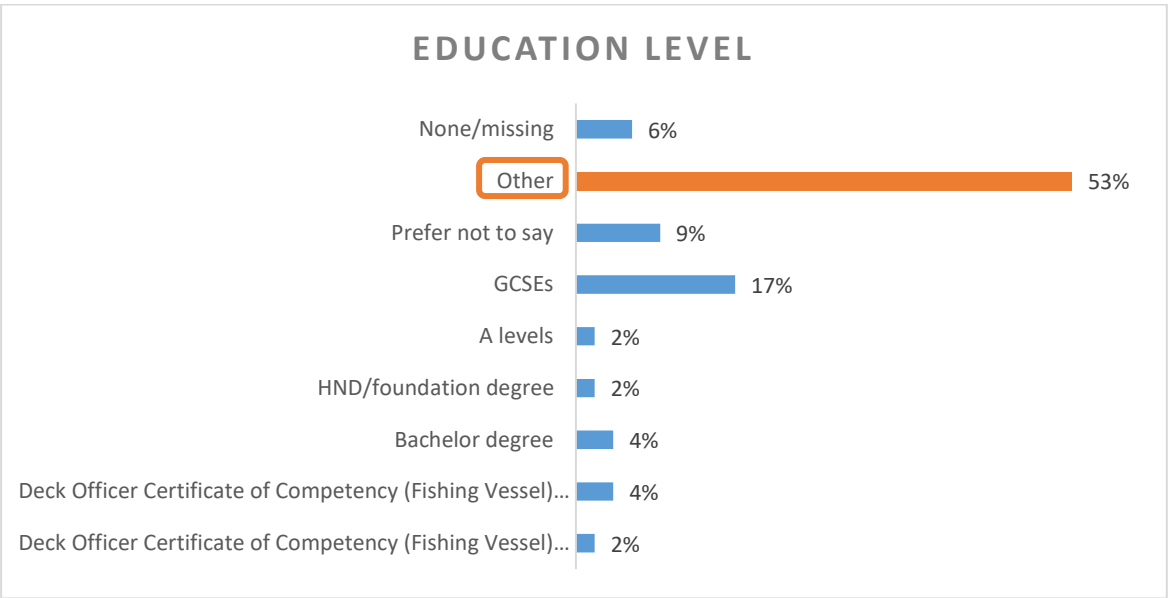


Figure 20 - Education level of English respondents

[4] Standards of Training, Certification and Watchkeeping for Seafarers

[5] The <16.5m skippers ticket entitles the holder to skipper a UK-registered commercial fishing vessel of less than 16.5 metres. It is not a mandatory requirement to possess this certificate

Management of used fishing gears :

The responses of all fishermen in England and France regarding gear disposal facilities or processes are presented in Figure 21. Respondents could choose more than one option for this question. The results indicate that more than half of the fishermen (**56%**) chose the option "**bins for general waste**", followed by the options "**dedicated gear containers**", which was chosen by almost **40%** of the fishermen in our sample, and "**handling equipment**", chosen by **33%** of the fishermen.

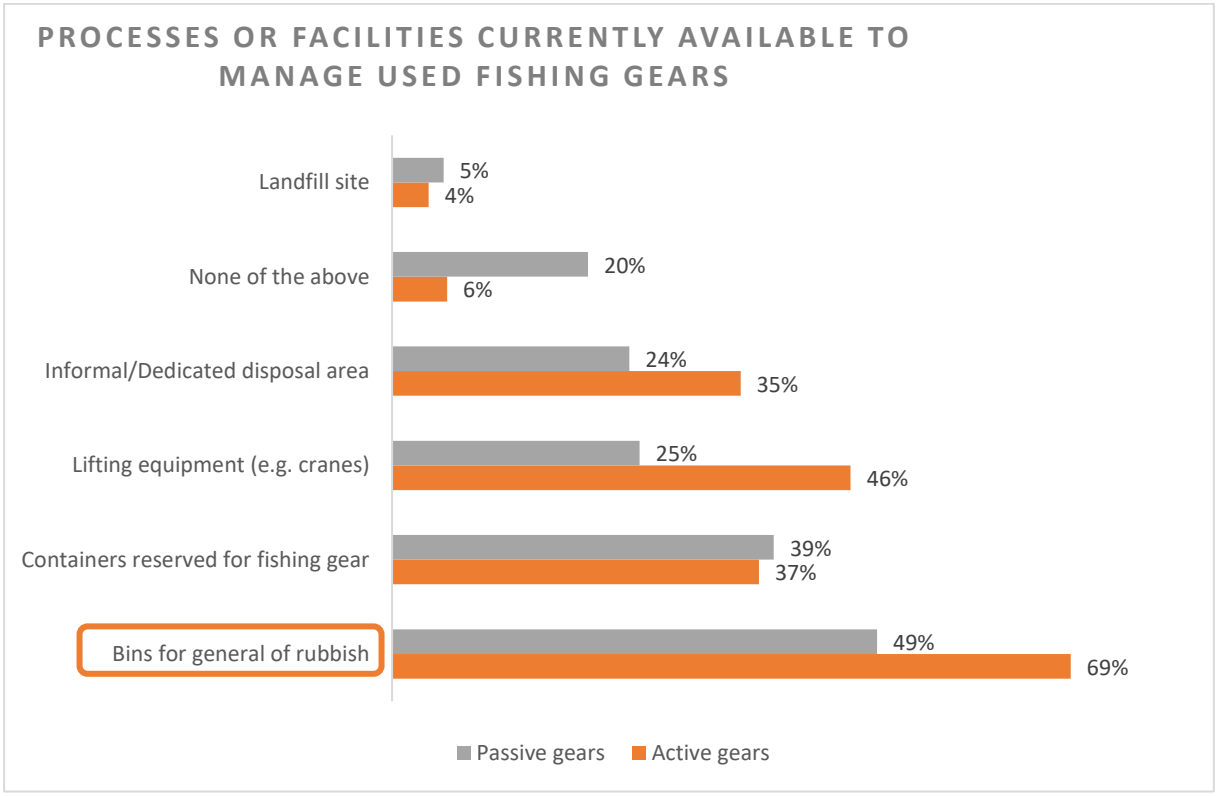


Figure 21 - Facilities used by professionals according to their activity.

With regard to knowledge of regulations concerning the management of end-of-life fishing gear, **78%** of respondents stated that they were **not aware** of the regulations concerning used fishing gear. However, it is interesting to focus on this knowledge according to the age of the respondents. It appears that, despite a still high rate of ignorance of the regulations, the **younger generations** are more aware of the existence of regulations on the management of UPE than previous generations (Fig. 22 and 23). This is in line with the **mobilisation** and **awareness** of the younger generations on the notions of ecology and environmental preservation that can be observed in society. Almost all of the sample of fishermen interviewed (**93%**) would be in **favour** of setting up a system of selective sorting of your used fishing gear, and the creation of a specific recycling channel to have fishing gear removed.

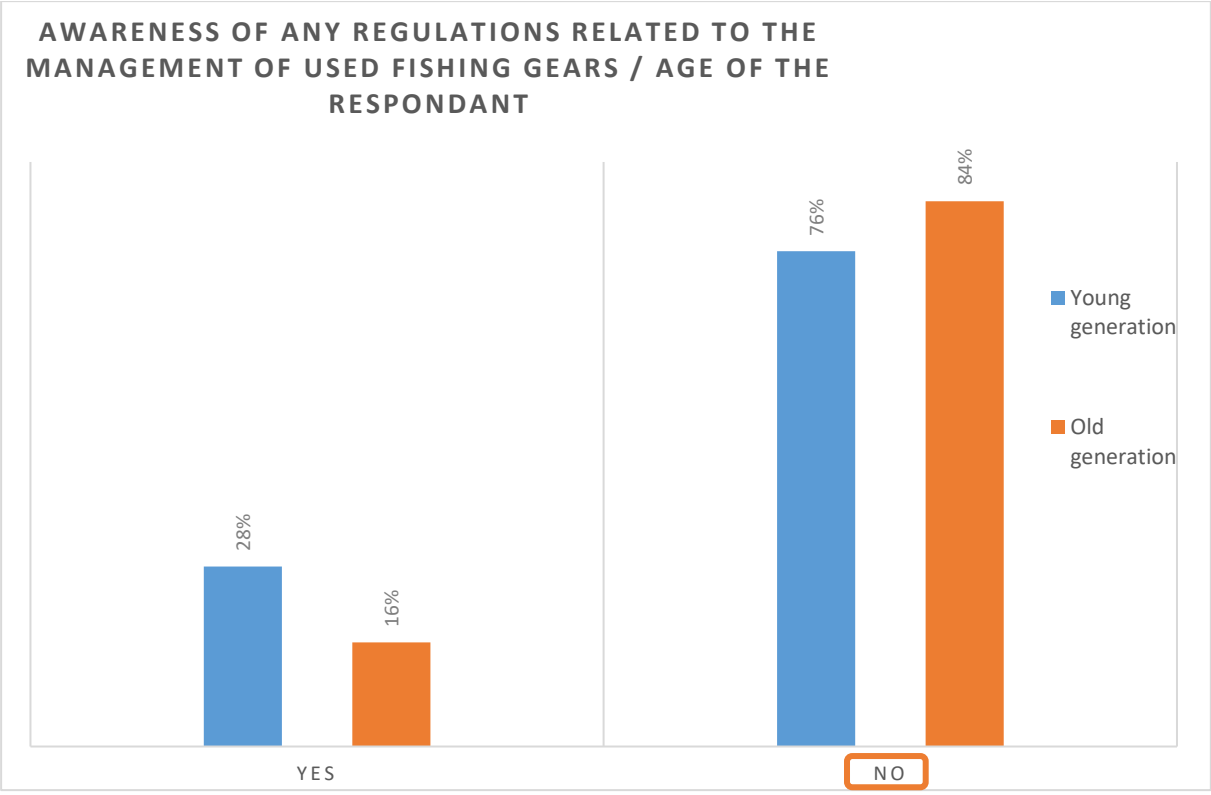


Figure 22 - Awareness of EPU regulations according to their generation

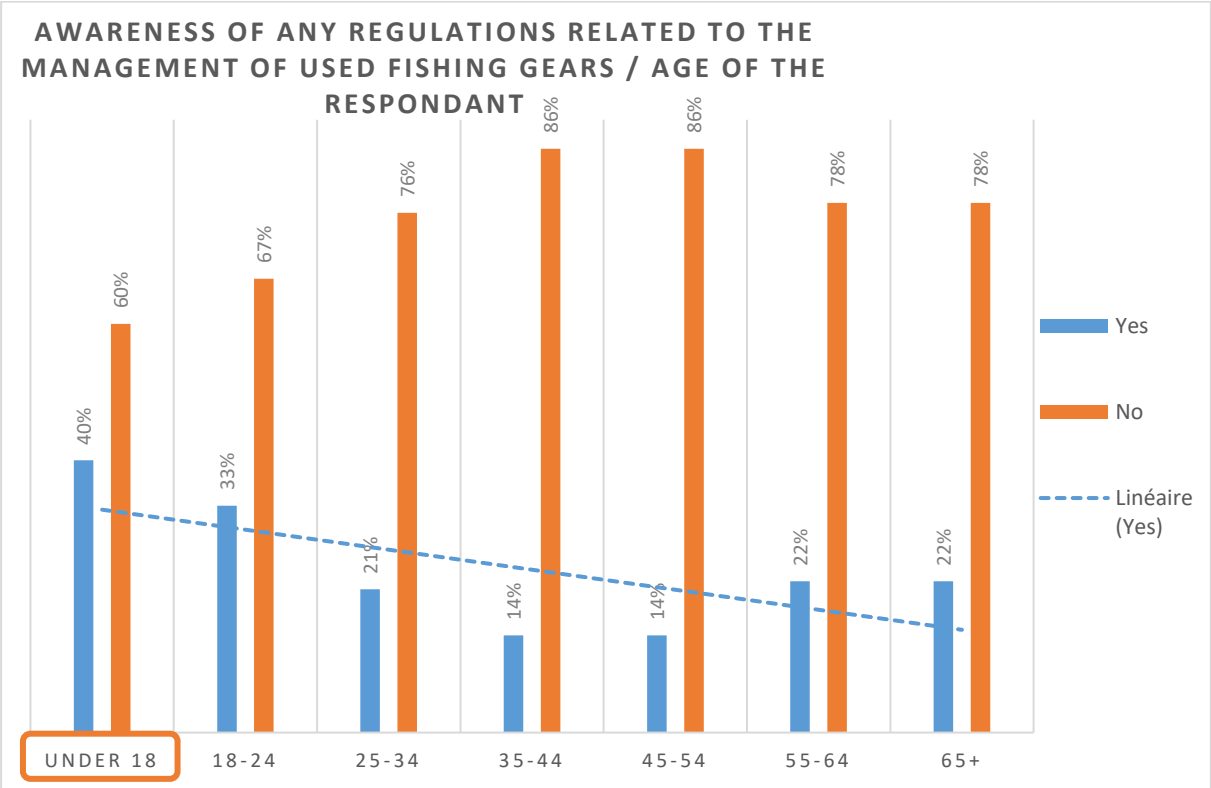


Figure 23 - Awareness of EPU regulations by age of respondents

Annual costs of fishing gear for French professionals :

In order to be able to offer an innovative fishing gear on the market, it is first necessary to know the different costs related to the **purchase** and **management** of conventional fishing gear, in order to be able to offer the new fishing gear at a price that corresponds to the reality of the market. This part of the survey was therefore constructed with a view to collecting data on the **costs of purchasing** new materials, as well as the costs of **repairing**, **renewing** or **losing** gear at sea.

Only the costs for **traps** (FPO), **trawls** (TRAWLS), and **nets** (GILLNET/TRAMMEL NET) are presented in this section. For the sake of simplification of the study and the readability of the results, the costs relating to **trawls** include **pelagic otter trawls** (OTB), **bottom otter trawls** (OTM), **twin otter trawls** (OTT), and **nephrops trawls** (TBN). The nets themselves are presented respectively in the category of **gillnets**, which includes **set gillnets** (GNS) and **combined gill and trammel nets** (GTN), and the category of **trammel nets** (GTR).

These results are **indicative** and should be used with **caution**. It is possible that respondents did not fully understand the question, and thus sometimes gave **global prices** including all their material, i.e. plastic and other components. A preliminary sorting was necessary to **reject** outliers.

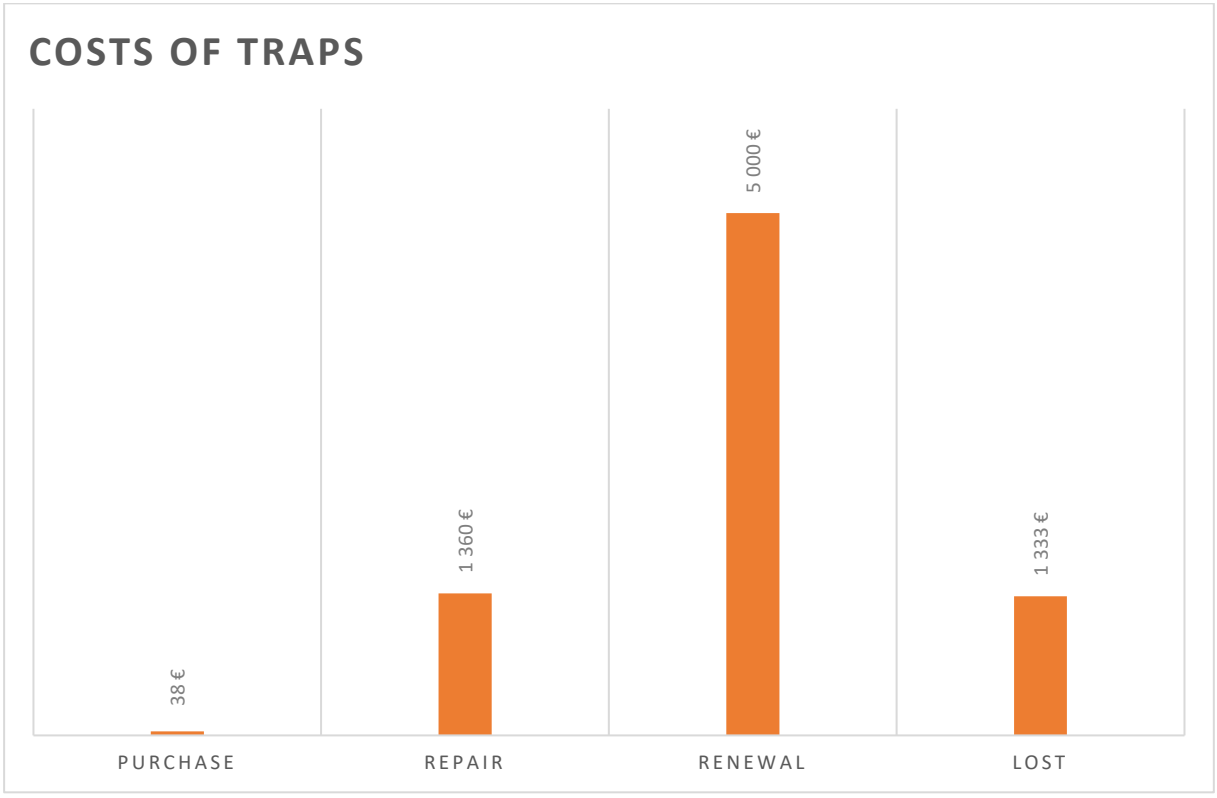


Figure 24 - Global costs of traps

Concerning **traps** (Fig. 24 and 25), the respondents numbered **11**. The purchase price per unit does not differ according to the size of the boat. However, it should be noted that **whelk** traps are the least expensive, between **€15** and **€25** per unit, while **lobster** traps are the most expensive, up to **€90** per unit. The species fished and the trap used will therefore vary in price. The professionals have given prices here covering their **complete stock** of equipment, and generally in this cost are included the price of the ends, the iron frames, that is to say the totality of the fleet attached to the boat.

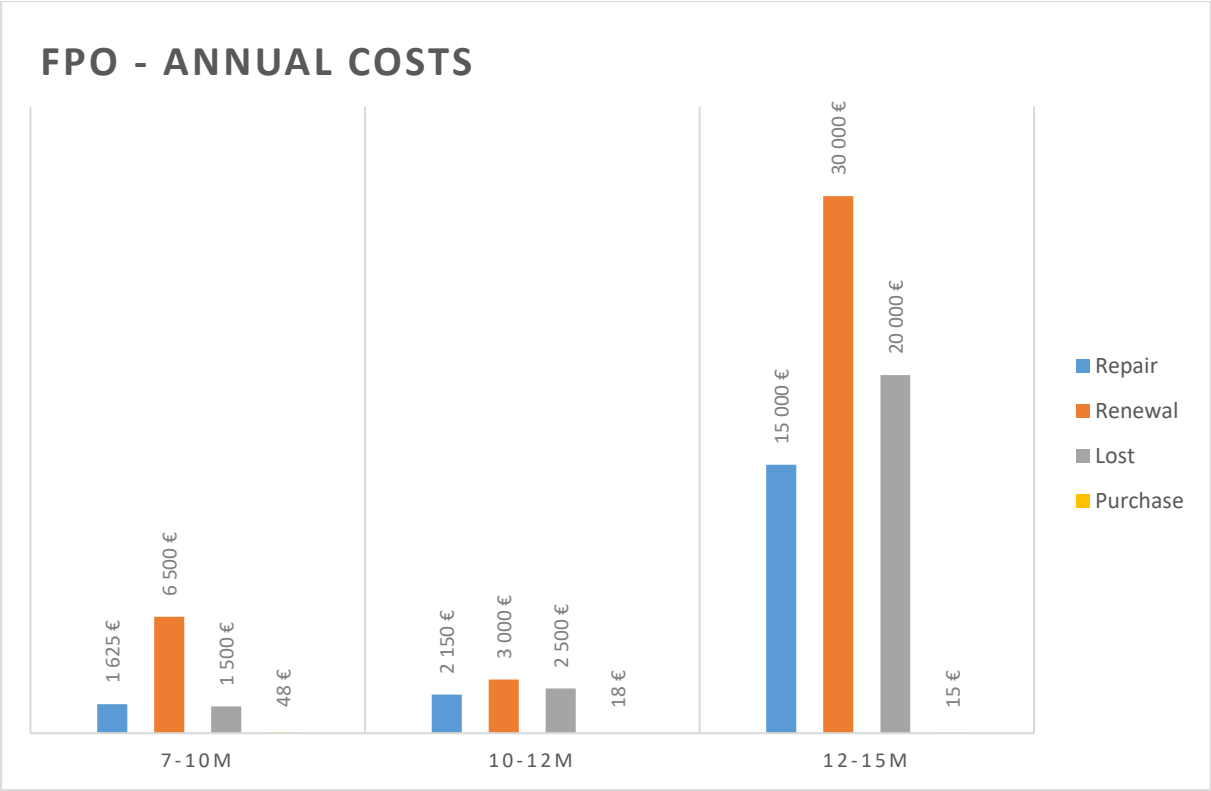


Figure 25 - Costs for pots and traps

Figure 26 - Whelk pot with iron plate

Figure 27 - Cuttlefish trap

Figure 28 - Lobster trap

Figure 29 - English whelk pot

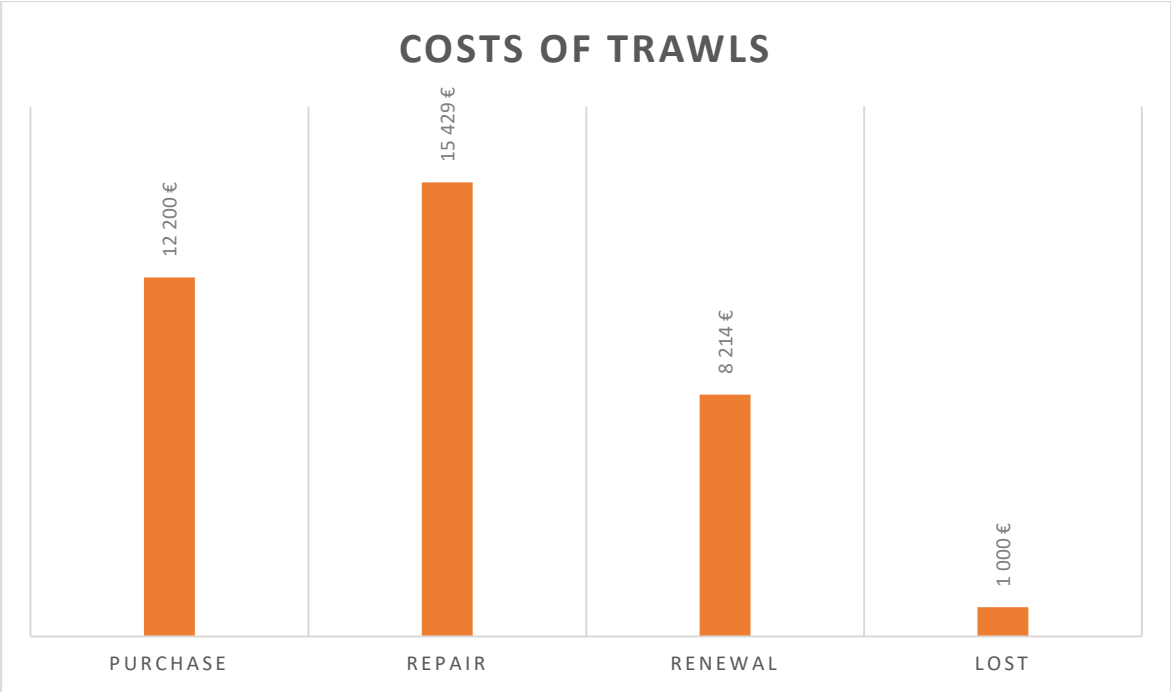


Figure 30 - Global costs of trawls

Concerning **trawls** (Fig. 30 and 31), there were **10** respondents whose answers were used. These figures are indicative in the sense that the responses sometimes concern only the price of the **sheet**, i.e. around 700€ for a 75kg bale of polyethylene sheet, but the responses may also concern a **complete trawl assembled**, i.e. with rubber weatherstrips, ropes etc., ready to be deployed at sea. In this case, a complete pelagic trawl can cost up to **€30,000**.

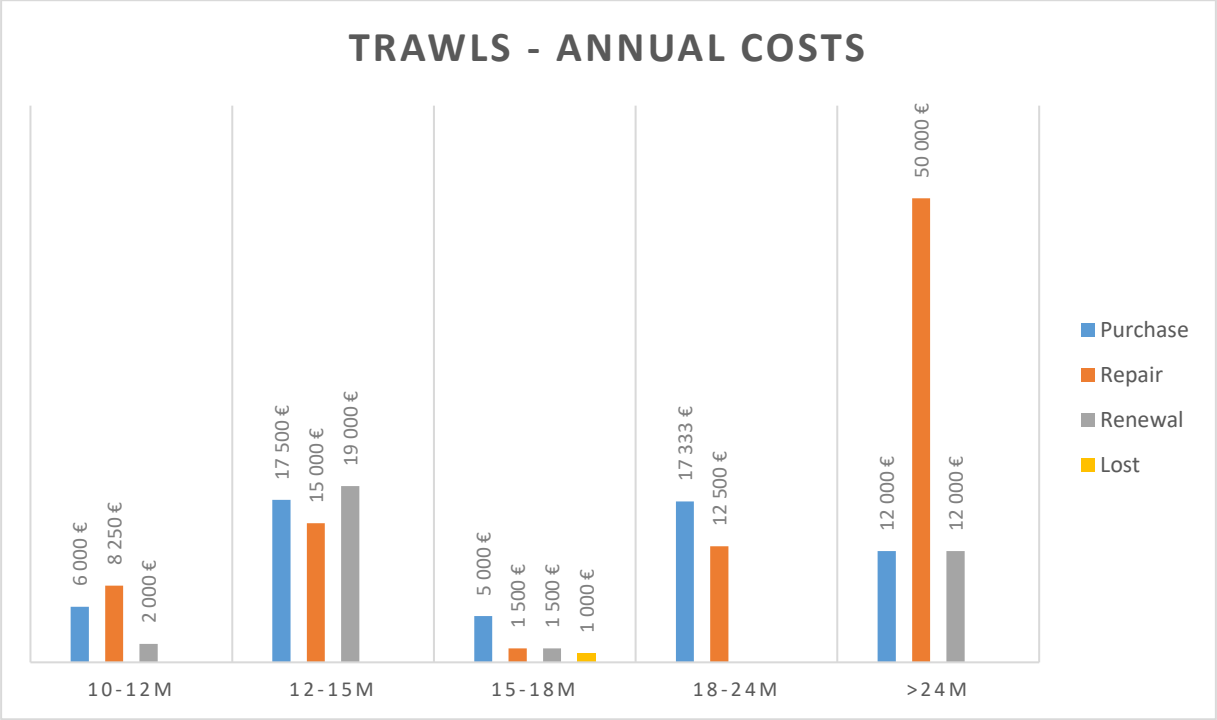


Figure 31 - Costs for trawls

Figure 32 – Beam trawl ready for fishing

Figure 33 - Trawl ready for fishing

Figure 34 - Trawl on a quay being repaired

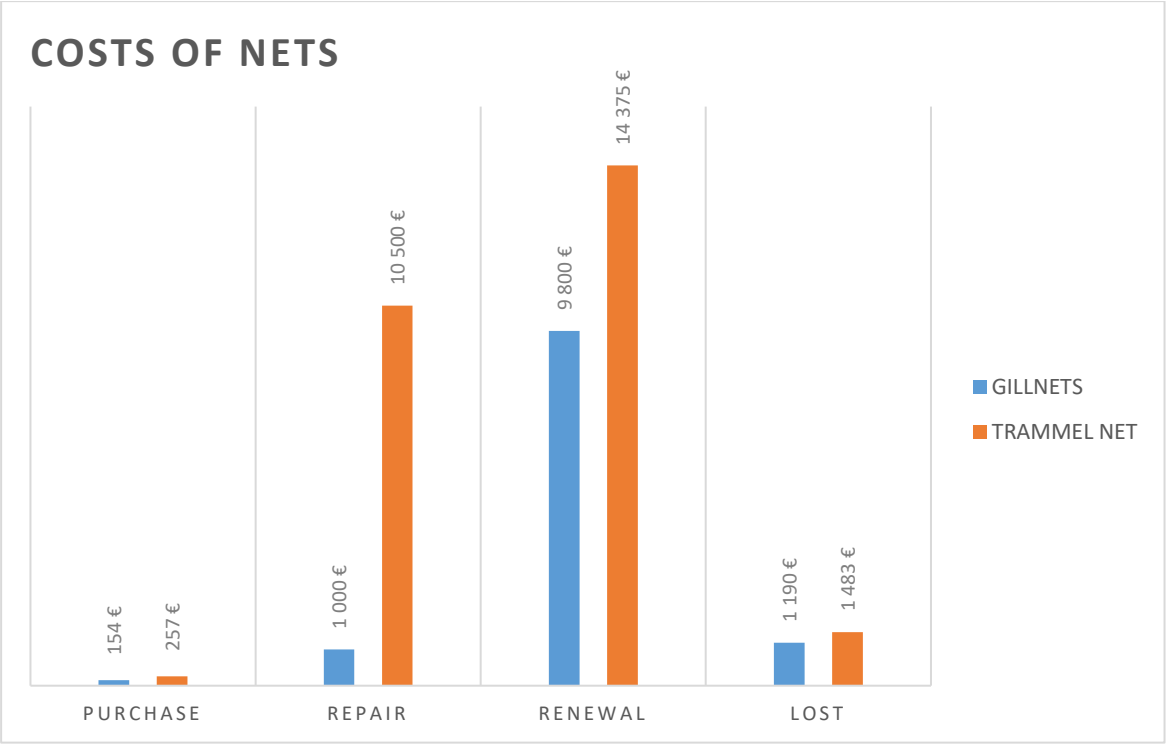


Figure 35 - Global costs of nets

As regards **nets** (Fig. 35, 36 and 37), **35** respondents indicated that the cost of **renewing** the equipment was the most important item of expenditure. It should be noted that the **lifespan** of a net is relatively **short**, due to the species fished. At its most extreme, a gillnetter fishing for **spider mackerel** can renew his net at each tide because of the damage caused to the equipment. Concerning the purchase price, it should be noted that professionals usually express it per **100 metres**, sometimes per 100 metres **mounted**, i.e. including the leaded and floating ropes allowing the net to be held in place while fishing.

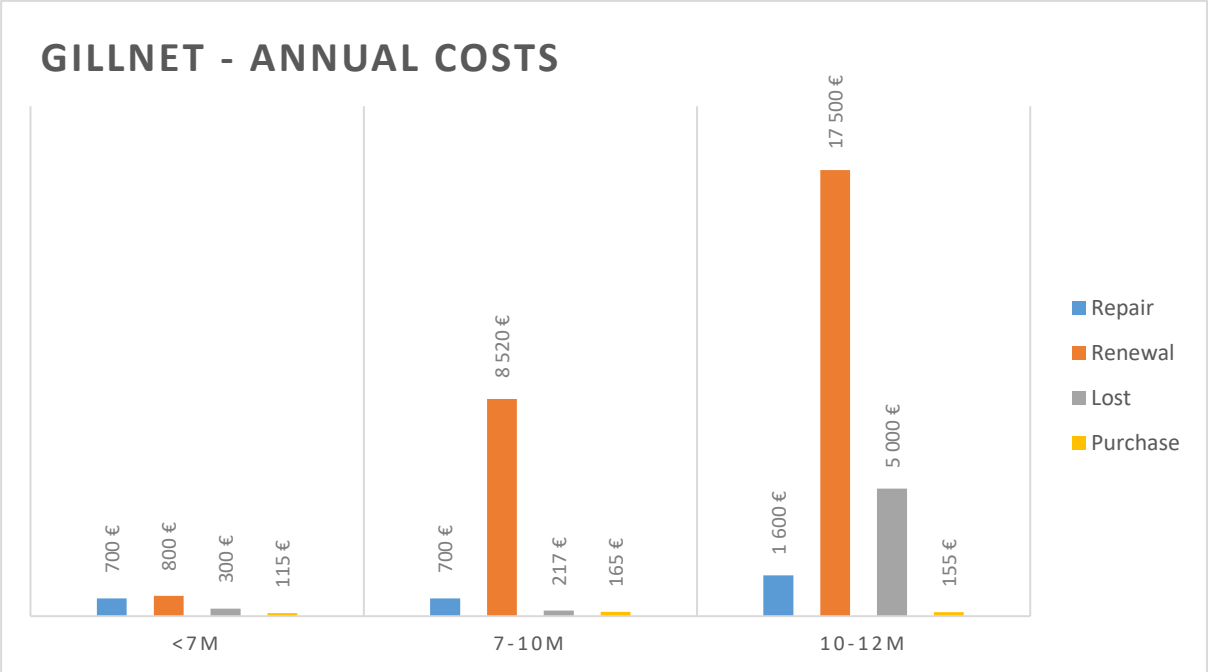


Figure 36 - Costs for gillnets

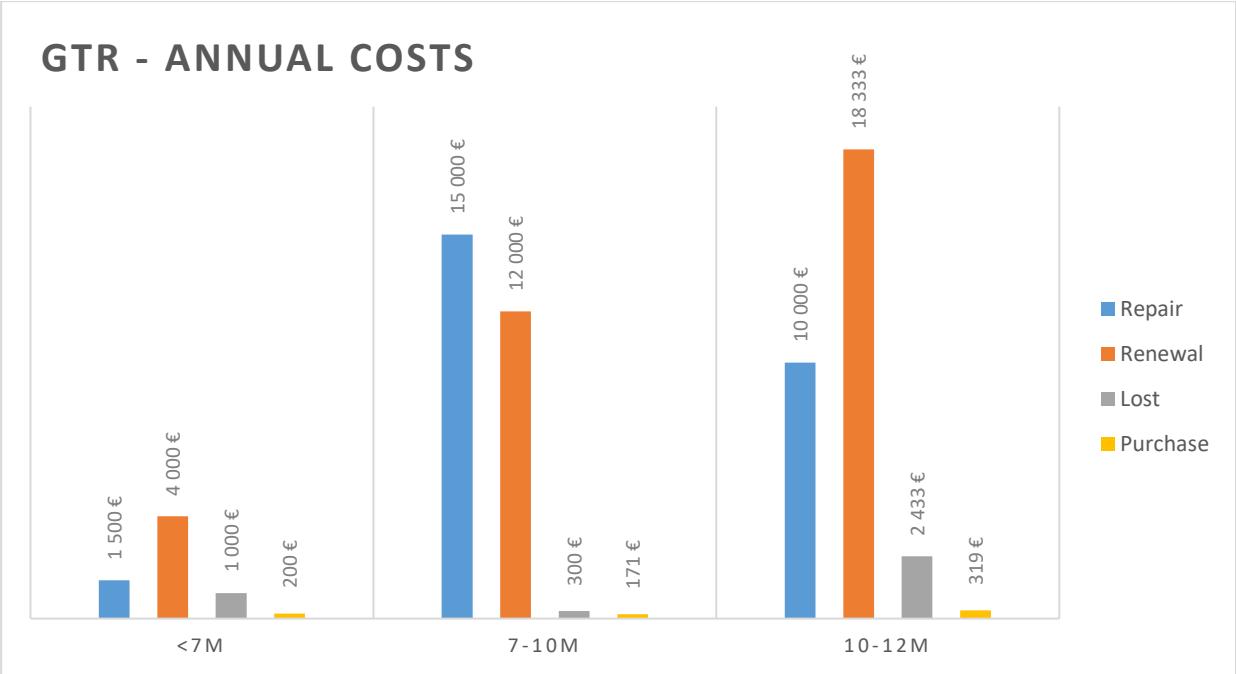


Figure 37 - Costs for trammel nets

The price of **trammel** nets is a little higher because of their **composition**. As trammel nets are made up of **three layers**, it is logical that their price is higher.

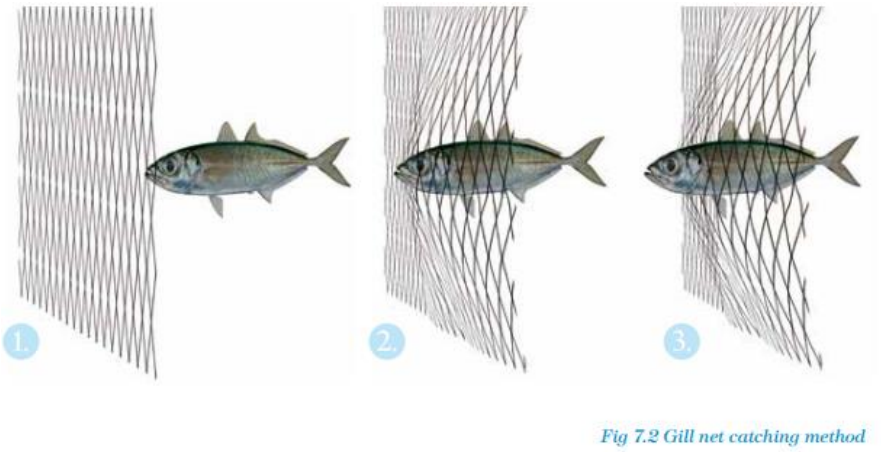


Fig 7.2 Gill net catching method

Figure 38 - Crédit : Seafish : a comprehensive guide to commercial fishing methods

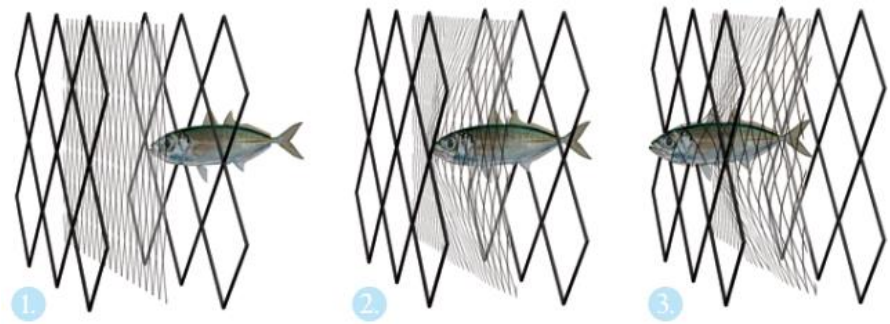


Fig 7.4 Trammel net catching method

Annual costs of fishing gear for English professionals :

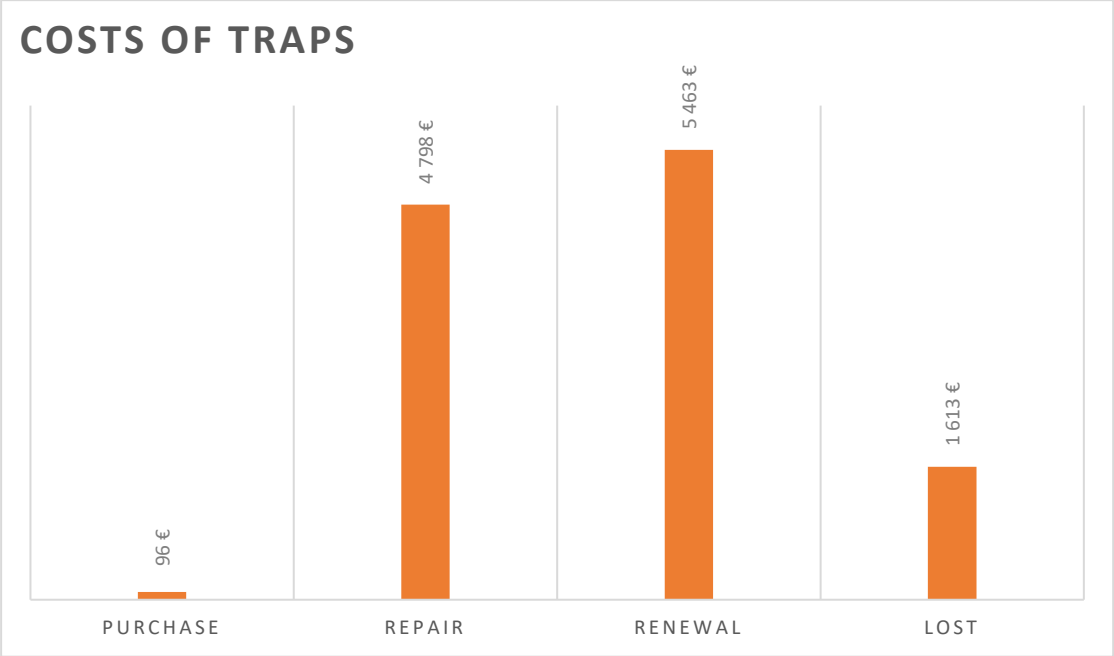


Figure 39 - Global costs of traps

Concerning **traps** (Fig. 39 and 40), the respondents are **7** in number. The trends are relatively the same as for the French professionals, however the **average** purchase price is a little **higher** here. It should be noted that in some cases English fishermen use **different** traps from French fishermen (see Fig. 29).

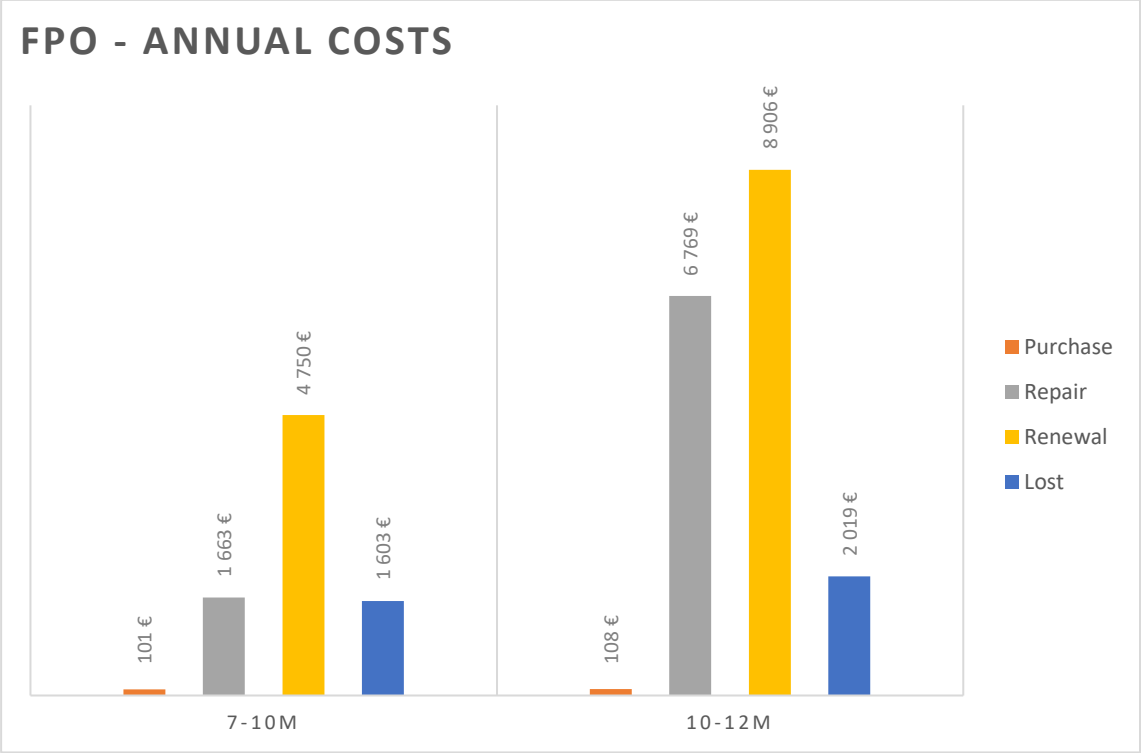


Figure 40 - Costs for traps

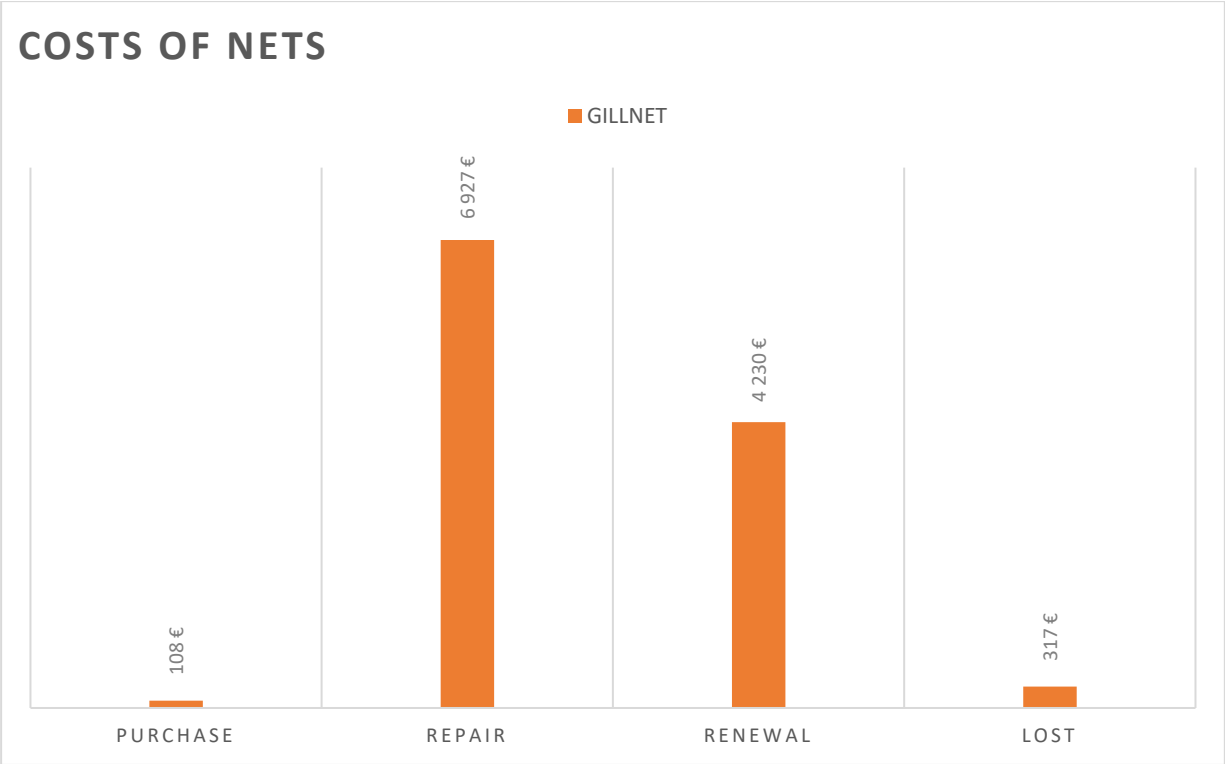


Figure 41 - Global costs of nets

For **nets** (Fig. 41 and 42), there were **18** respondents. Once again, price trends are **similar** to French costs. However, the **trammel** net category is **not** detailed here, as the respondent was the **only one** in his category, and his data was not used in order to ensure that the sample was **representative**.

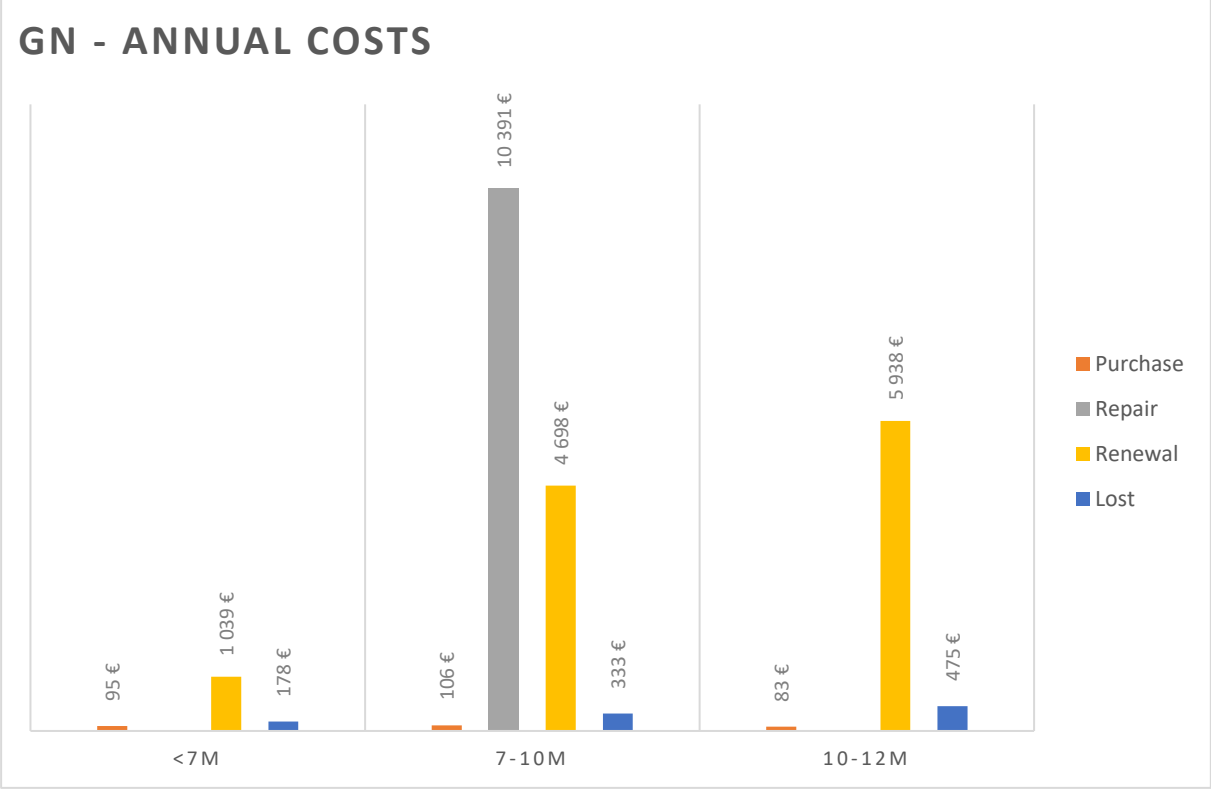


Figure 42 - Costs for gillnets

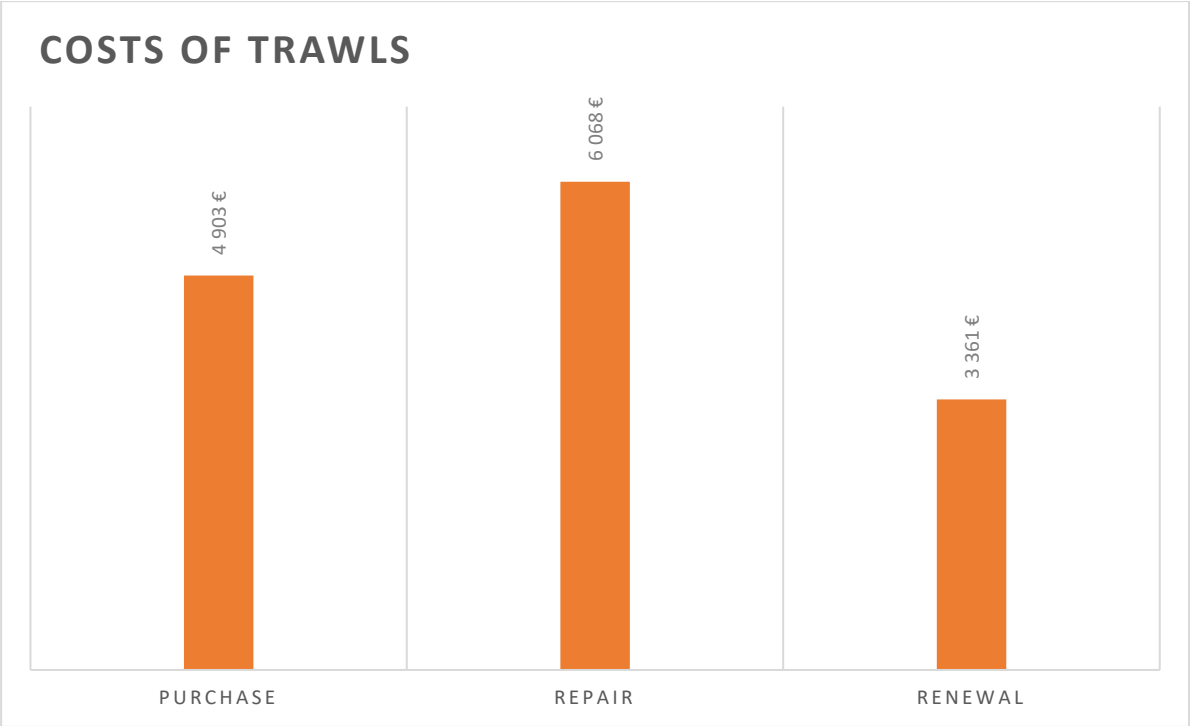


Figure 43 - Global costs of trawls

Concerning **trawls** (Fig. 43 and 44), there were **16** respondents. Once again, the trends are **similar** to the responses from French professionals. **Pelagic trawls** and **beam trawls** are represented here. The cost of **loss at sea** is low in relation to the purchase price, but it is very **rare** that fishermen lose a whole trawl. Usually the belly of the trawl is torn and **pieces** of the hake are lost, which explains this difference.

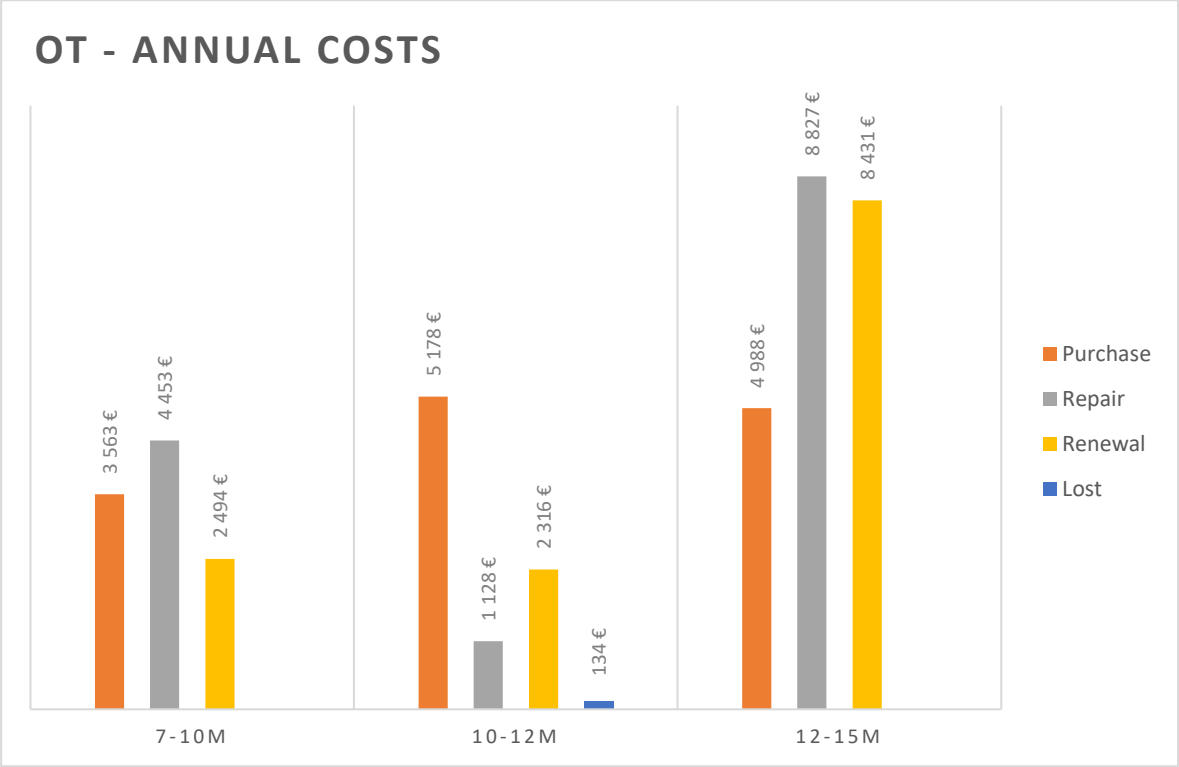


Figure 44 - Costs for otter trawls

This part of the survey provides initial data on the **costs associated** with fishing equipment. It would be relevant to compare the results with the **market analysis** carried out in the framework of this work package. In addition, field surveys carried out in the context of other studies can be used to **confirm** this information and to identify outliers in the responses.

In the context of **INdIGO**, these indications will enable the partnership to propose a new innovative device based on figures that **reflect** the reality of the market, but also its **complexity**. Indeed, as previously stated, these figures are to be taken as **indicative**. Professionals **often** do not express themselves in the same **unit**, as was the case for nets (i.e. 100 metres, 100 metres mounted, 1 kilometre etc.). This considerably **slowed down** the work of exploiting the data, since it was first necessary to **harmonise** the figures in order to be able to compare them. In addition, it should be noted that the costs for the **English** part were **converted** into euros before the data was processed.

Finally, with a view to a more detailed **economic** study on this subject, it will be necessary to pay attention to the wording and form of the questions, and above all not to hesitate to **specify** the information required several times in detail.

Abandoned, Lost or Discarded fishing gears (ALDFG) :

As a reminder, fishing gear that is lost, abandoned or discarded at sea is known as **ALDFG** (*Abandoned, Lost or Discarded Fishing Gears*). The **factors** that lead to the abandonment, loss or discarding of fishing gear are numerous and include: bad weather; various operational factors relating to the fishery, such as the cost of retrieving gear; fishing gear conflicts; illegal, unreported and unregulated (IUU) fishing; vandalism and theft; and the ease of access to shore-based collection facilities and the cost of that access[6].

To the question "*What do you think are the main causes of abandoned, lost or discarded fishing gear (ALDFG) ?*"(Fig.45), **42%** of the fishermen agreed that **bad weather conditions** cause net losses, followed by fishermen who agreed that **lack of awareness and training** causes gear losses. An almost equal percentage of respondents agreed that **inadequate collection facilities** (e.g. insufficient number of bins) (**32%**) and **deliberate discarding** (**31%**) were factors causing gear loss. On the contrary, respondents disagreed about the **excessive cost of recovery** (**34%**) and the **poor organisation of waste management by the port services** (**31%**) as determining factors for the loss of fishing gear.

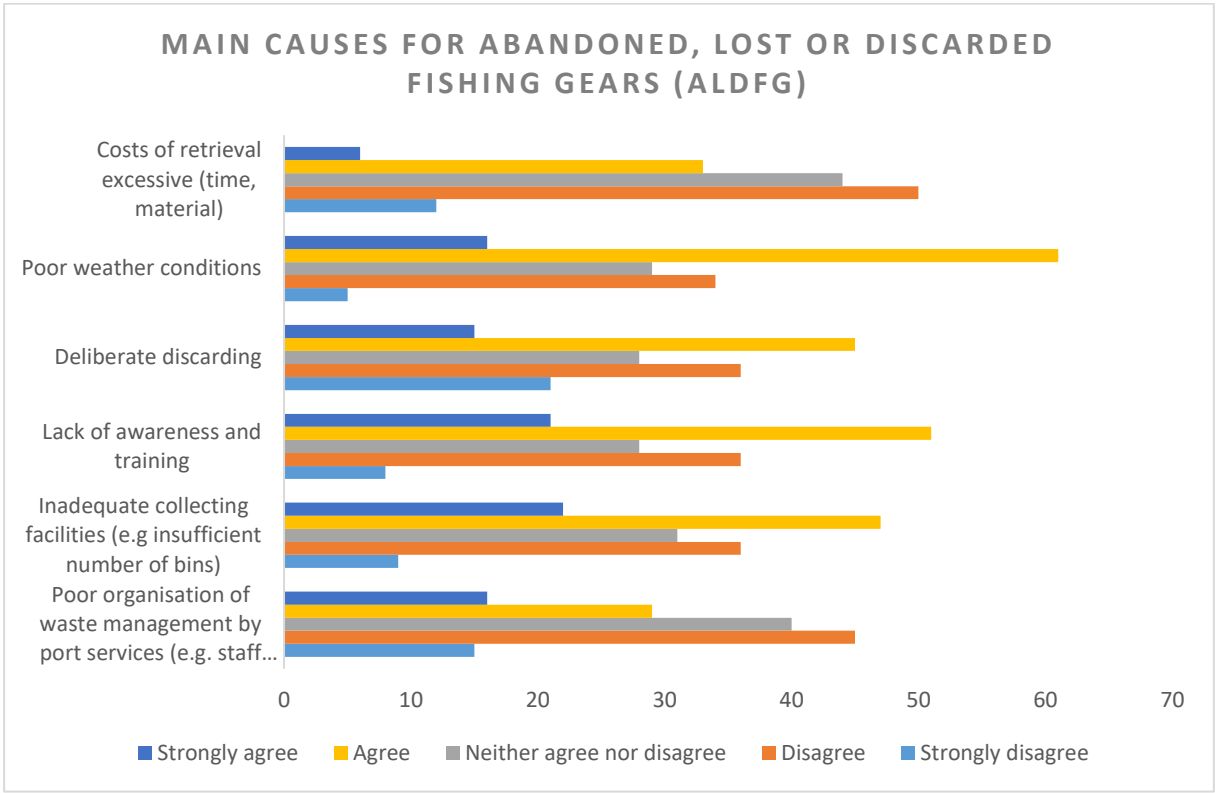


Figure 45 - Causes for ALDFG

[6] Macfadyen, G. ; Huntington, T. ; Cappell, R. Engins de pêche abandonnés, perdus ou rejetés. PNUE Rapports et études des mers régionales, No. 185 ; FAO Document technique sur les pêches et l'aquaculture, No. 523. Rome, PNUE/FAO. 2010. 137p.

Unsurprisingly, the vast majority (almost **90%**) of English and French respondents indicated that they encounter derelict fishing gear at sea (Fig.46). When derelict fishing gear is encountered, almost all the fishermen in the sample (**90%**) reported **bringing it ashore** for disposal; a very small number of respondents reported leaving it where they found it (2%) or that they could not bring it ashore and therefore dumped it at sea (5%). Similarly, a small percentage of fishermen (4%) indicated that they report the location of ALDFGs to the relevant authorities (Fig.47).

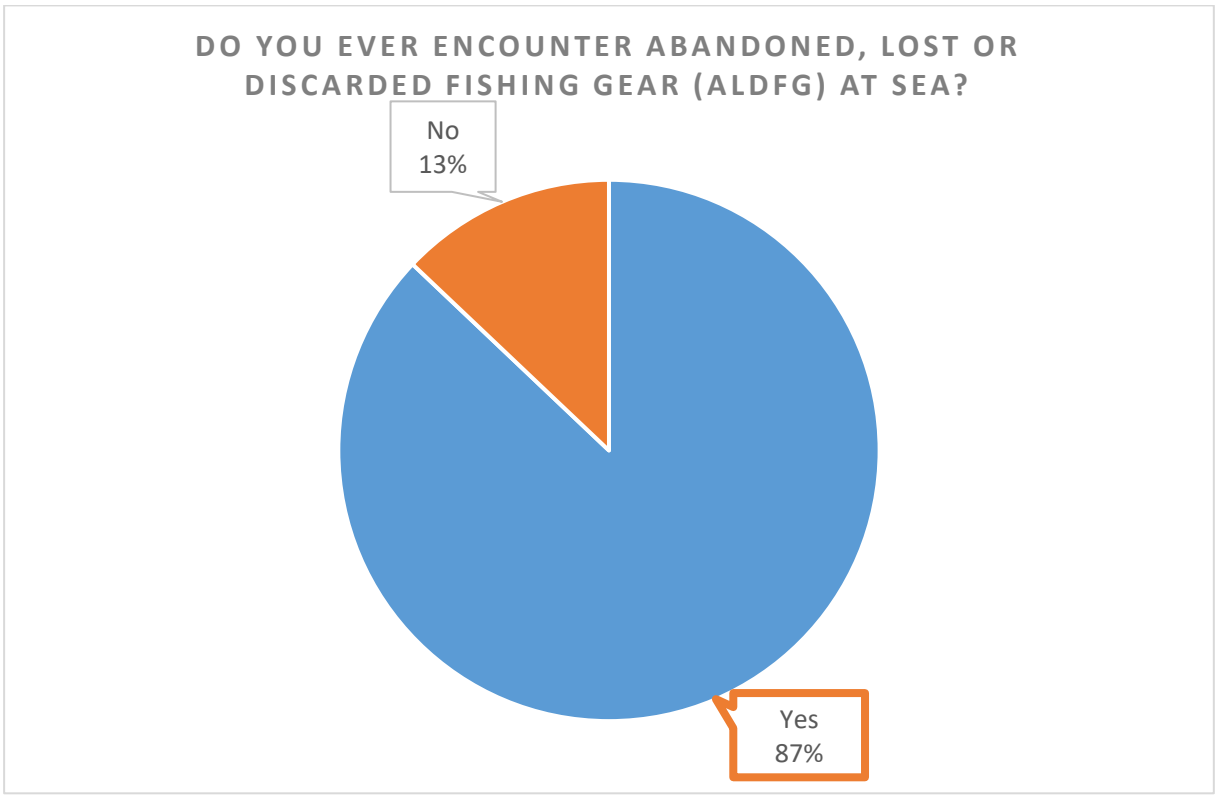


Figure 46 - Proportion of professionals encountering ALDFGs

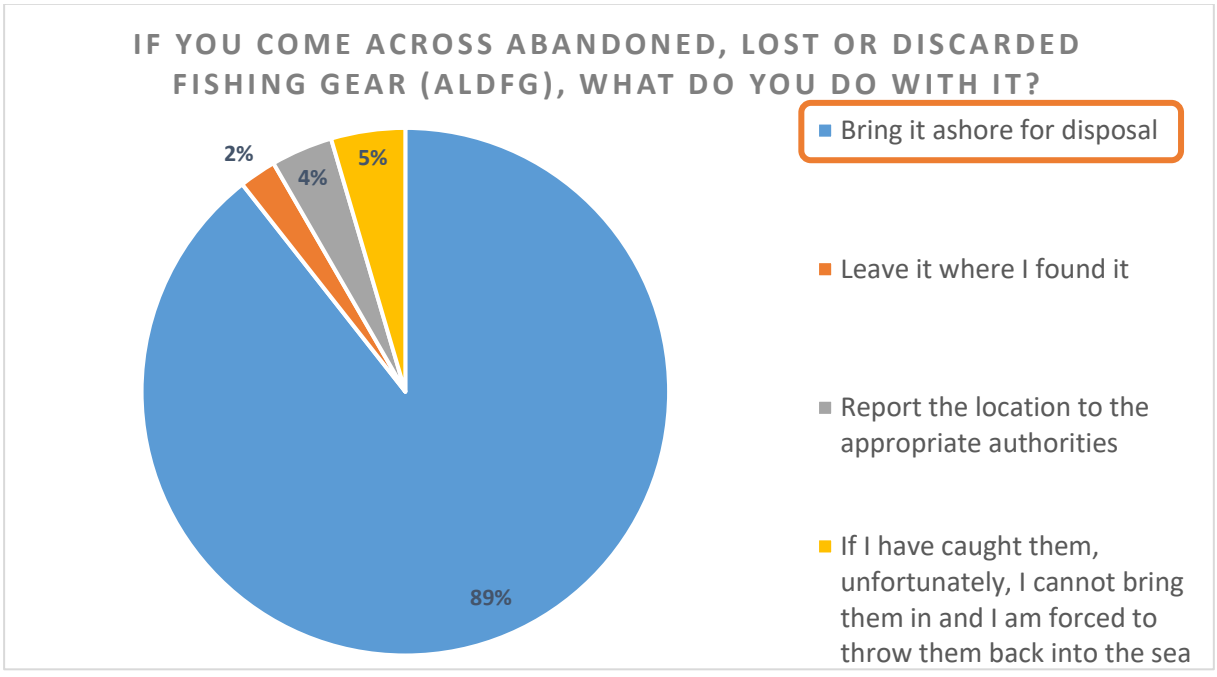


Figure 47 - Outlet for ALDFGs encountered at sea

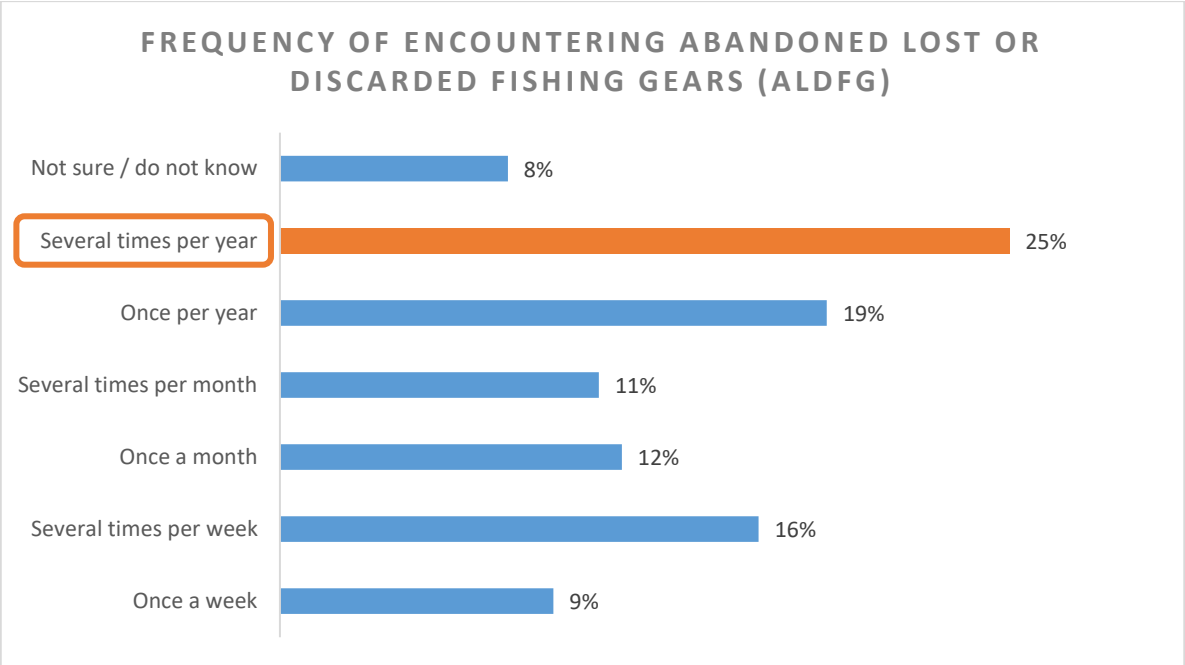


Figure 48 - Frequency of ALDFG encounters at sea

In terms of frequency (Fig. 48), according to **19%** of the professionals interviewed, ALDFGs are met with at least **once a year**, or even **several times a year** for **25%** of the sample, but also **several times a week** for **16%** of respondents.

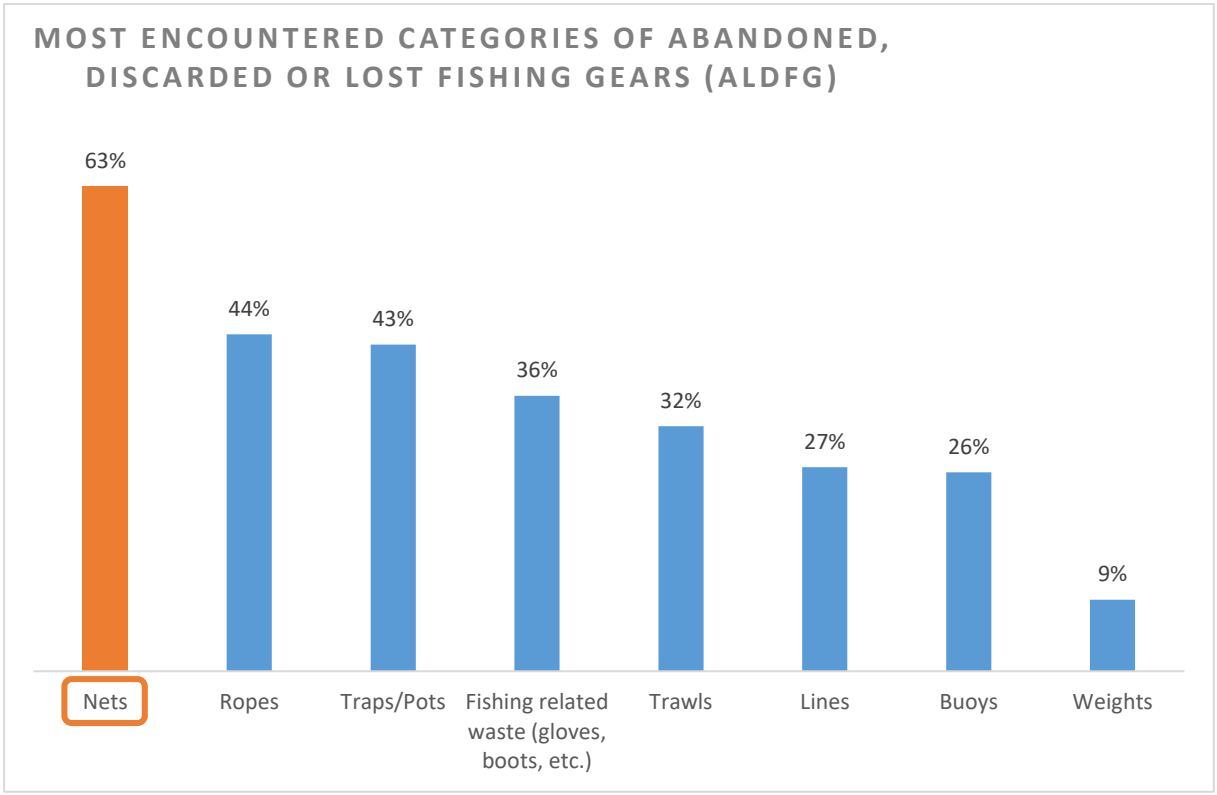


Figure 49 - Typology of the ALDFGs encountered

Figure 49 ranks the most common types of ghost gear found by English and French fishermen. Respondents were allowed to select more than one of the choices given. The results show that **nets** were the most selected by the respondents (**63%**). The second and third most selected categories were **ropes** (**44%**) and **traps** (**43%**). As stated by Link et al. (2019) and Richardson et al. (2018), and as also stated by several respondents, nets are most likely lost due to collisions with active fishing gear.

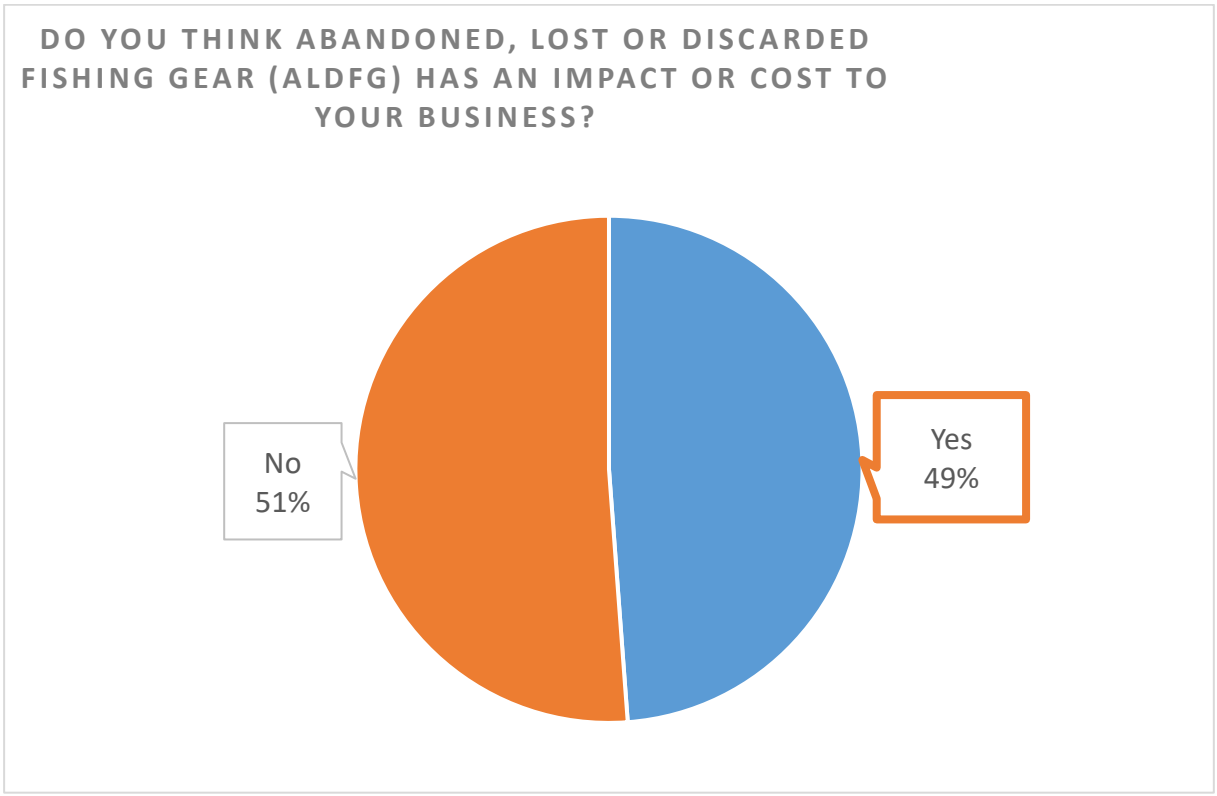


Figure 50 - Impact of ALDFGs on business

Figure 50 reports the answers to the question : « *Do you think that abandoned, lost or discarded fishing gear (ALDFG) has an impact or a cost on your activity ? »*, and shows that responses are very balanced. Indeed, **49%** of the fishermen think that ALFGs have a **negative impact** on their fishing activity while the remaining **51%** of the respondents think the **opposite**.

Limitations and lessons learned :

The question of **access** to professionals was a real **challenge** for this study. It should be remembered that the practice of this profession is **uncertain** and intimately **dependent** on **environmental** conditions, particularly the weather, but also on tide times. It is necessary for the interviewers to **adapt** to these parameters and to show **anticipation** in order to succeed in contacting the professionals, so travel to the field is absolutely **necessary**. However, given the health context due to **Covid-19** at the time of the launch and distribution of the questionnaire, it was imperative to **favour** a massive distribution via **social networks**. The survey was therefore **impacted** by the lack of travel due to the confinement in France and England and the computerised dissemination, as fishing professionals are not the most adept at using online questionnaires. However, the **involvement** of a few **referent** professionals who actively participated in the creation of the questionnaire, tested it several times during meetings, and **contributed** to the validation of the survey as a whole must be highlighted. Moreover, even during the period of travel restrictions, they **supported** the dissemination of the survey via their respective networks, using Facebook or What's App.

The section of the survey aimed at investigating the **management** of end-of-life fishing gear contains a question that was structured **differently** in the two countries. The question "*Would you be in favour of setting up a selective sorting system for your used fishing gear, and the creation of a specific recycling channel to have fishing gear removed ?*" was presented to respondents in England and France as **closed questions** with yes/no response options. However, the French survey continued with an **open-ended** question asking respondents to provide additional details in case they had chosen "yes" as their answer to the previous question. It was therefore decided to present only the **yes/no** results for the two countries combined in order to be consistent with the joint presentation of results in the same section.

In addition, in the same section, the **English** survey includes an additional closed dichotomous question asking respondents if they are aware of a used fishing gear **recycling programme** in their area, complemented by an open-ended question asking respondents to provide additional details in case they answered "yes". As the same question was not included in the French survey, it was decided - consistent with the decision above not to present results applicable to only one country - not to present the results in this report.

One of the major difficulties encountered was the **reformatting** and **harmonisation** of the database extracted from SurveyMonkey. It turned out that the raw data extracted was not usable as it stood, so it was necessary to carry out a long and tedious task of **cleaning up** and putting the database into a **usable format** (matching, homogenisation of terms and recoding, anonymisation of respondents, etc.), carried out by the UBS for the acceptability part and by the SMEL for the technical part.

In terms of **lessons** learned, INdIGO has taught us that open-ended questions have both **advantages** and **disadvantages**. On the one hand, they encourage greater **commitment** from respondents and capture more **specific** and detailed information, but on the other hand, they have a higher non-response rate than closed questions. In addition, we have learned that if the **interviewer** already has an established relationship/connection with members of the study population, this is beneficial if the population to be analysed is selected by purposive sampling, but it increases the risk of bias in the interview process. The risk of bias can, however, be **minimised** by **preparing** interviews through simulations and reviewing procedures (Drabble et al., 2016).

It will be **interesting** to carry out a more detailed analysis of the **activity profile** of the professionals, as well as the **cost** and **management** aspects of the fishing gear, in a subsequent report. Indeed, due to the delay over the months, and the inevitable unforeseen circumstances that any study must face,

it was decided to concentrate on a complete **descriptive** analysis of the survey. However, the database created through the survey contains **valuable** data and would benefit from a more dynamic analysis by cross-referencing certain **variables** in order to highlight **trends** that may not appear in this report. This subject will be **discussed** later by the partners to decide on the **follow-up** to this survey.

Data sheet on the main fishing gears[7] :

NETS (trammel net ; gillnet)	
Profession	Sleeping art ; Gillnetter
Composition	Polyamide (PA) (Monofilament or multifilament straight netting, mono-multifilament mesh netting)
Price of the product in commerce	150€ to 220€ per 100m, depending on the type of net and its weight. Assembly included.
Main manufacturers	Mondiet, Le Drezen, Kerfil, Alprech, Cotesi, Istaskorda
Quantity produced per year [8]	800 tonnes
Species caught	Trammel net: bottom fish (sole, plaice, dab, turbot, skate, etc.) Straight net : Bank fish (cod, haddock, whiting, saithe, etc.)
Volume of waste generated	60 tonnes/year (Normandy)
Outlet	Incinerated or recycled. Filet Recyclage, Fil&Fab, les Recycleurs Bretons ...
Collect	Filet Recyclage : 330 tonnes/year

Figure 51 - Used gillnet, Fécamp, November 2020

[7] Source : rapport SEAPLAST, SMEL, IVAMER, NATUREPLAST, 2017.
[8] Source : rapport PECHPROPRE, Coopération Maritime, 2018.

TRAWL (pelagic ; bottom trawl)	
Profession	Towing art ; Trawler
Composition	PA, PE or PP sheets; PP ropes
Price of the product in commerce	Pelagic : 15 000€ à 20 000€ Bottom : 2 200€ à 3 000€
Main manufacturers	Barbosa et Oliveira (fûnes), Les Docks de Keroman, Naberan
Quantity produced per year [9]	400 tonnes
Species caught	Pelagic: sea bass, sea bream, mackerel, etc. Bottom : species living on the bottom
Volume of waste generated	55 tonnes/year (Normandy)
Outlet	Incinerated or buried
Collect	Plastix Global (Danemark) Odyssey Innovation (Angleterre)

Figure 52 - Beam trawl, Saint-Vaast la Hougue, September 2021

[9] Source : rapport PECHPROPRE, Coopération Maritime, 2018.

DRAGUE	
Profession	Towing art ; Dredger
Composition	Steel reinforcement; PA or PE sheets
Price of the product in commerce	Up to 8 000€
Main manufacturers	Les Docks de Keroman, Naberan
Outlet	Recycling for scrap metal, landfill for slicks

Figure 53 - Dredge fishing, off the coast of Granville, September 2021

POTS/TRAP	
Profession	Sleeping art ; Potters
Composition	Sheet in PA, PE or PP; frame in PP or plastic-coated steel; bell in PP.
Price of the product in commerce	Lobster trap : 90-95€. Whelk trap : 15-25€. Cuttlefish trap : 50-60€. Shrimp trap : 50€.
Main manufacturers	Amateur
Species caught	Crustaceans, whelks, cuttlefish
Volume of waste generated	8 tonnes/year (Normandy)
Outlet	Taken to a waste disposal site

Figure 54 - Lobsters traps, SMEL

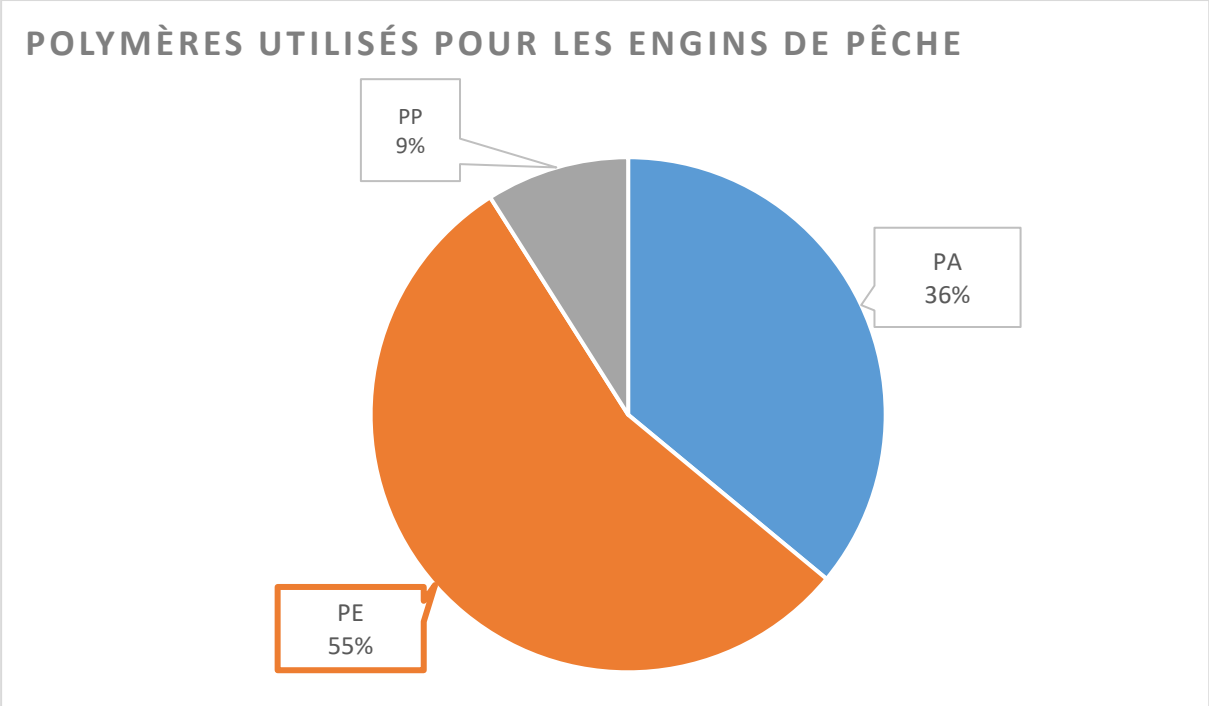
Typologies of the main polymers used[10] :

Polyamide, **Polyethylene** and **Polypropylene** are predominant. These polymers are the most used in the petrochemical sector to produce our everyday objects, as well as the objects we work with.

These polymers are **recyclable**, but their use and assembly with other polymers complicates their recycling, as they require **cleaning** of the organic material present and **disassembly** and **sorting** of the different materials.

Concerning the volumes of waste generated, the **SEAPLAST** study has made it possible to draw up an initial inventory and gives a relatively precise idea of the tonnages concerning Normandy. The survey carried out in the framework of WP1 allows to update and validate these data.

However, it should be noted that these volumes are **variable** and depend on the **seasonality** of the various trades. In addition, various events can modify the tonnages, as is the case with **Covid-19**. As the boats were stopped for several months, the volumes sold and therefore the gear renewed are much lower than in previous years. The data collected during this survey, if it concerns the year **2020**, will not be representative of the actual volumes disposed of in a « normal » year.



[10] Source : rapport SEAPLAST, SMEL, IVAMER, NATUREPLAST, 2017.

Polymère	Caractéristiques techniques
Polyester (PET)	- Couleur : blanc - Résistance aux UV : excellente - Point de fusion : 220-260°C, noircit quand on le brûle - Densité : 1,38 - Flottant/Coulant : coulant - Allongement à la rupture (élasticité): 14-16% - Résistance à la fatigue: excellente - Résistance à l'abrasion : excellente - Résistance aux UV : excellente - Absorption à l'eau : aucune - Rapport qualité/prix : excellent
Polyamide (PA ; Nylon)	- Couleur : toutes couleurs - Point de fusion : +210-220°C°C, brûle avec fumée blanche, possibilité de l'étirer à chaud - Densité : 1,14 - Flottant/Coulant : coulant - Forte élasticité - Allongement à la rupture : 16-20%(supérieur au PES) - Résistance à l'abrasion : excellente - Résistance aux UV : bonne - Absorption à l'eau : mauvaise
Polyéthylène (PE)	- Couleur : vert - Point de fusion : 135°C - Densité : 0,96 - Flottant/coulant : flottant - Allongement à la rupture : environ 26% - Résistance à l'abrasion : bonne - Résistance aux UV : bonne - Absorption de l'eau : aucune - Autres appellations : cristal
PE de masse moléculaire élevée (ou haut module) HMPE PEHD, PEHT	- Couleur : toutes couleurs - Résistant aux UV - Sensible au fluage - Un bout en Dyneema® est une tresse creuse dont les fuseaux sont composés de plusieurs fibres. Quand on le brûle, il s'évase et dégage une odeur de cire - Fibres non soudées entre elles, facile à séparer
Polypropylène (PP)	- Couleur : vert - Point de fusion : 160 à 166°C - Densité : entre 0,89 et 0,94 selon le grade - Flottant/coulant : Léger (flottant) - Allongement à la rupture : Peu élastique - Résistance à l'abrasion : excellente - Résistance aux UV : Très sensible aux UV - Brillance du plastique et raide en main