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# METHODOLOGY OF COLLECTING SOCIOECONOMIC DATA ON PROFESSIONAL FISHING

## FRENCH GUIANA AND GUADELOUPE 2020

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# 1. Context and objectives

The production of economic and social indicators on professional fishing in the overseas regions is an important challenge for monitoring the evolution of the fishing situation in these territories and evaluating the consequences of management measures on the sustainability of fisheries. Although they have a specific status regarding the treaty with the EU, the outermost regions are concerned by the Common Fishing Policy<sup>1</sup>. In particular, these regions are subject to the Community framework for the collection of fishing data known as the Data Collection Framework<sup>2</sup> that sets out the long-term data collection programme to be implemented by each Member State in a national work plan.

For France and within the Ministry of Agriculture and Food, the Direction of Maritime Fishing and Aquaculture (DPMA) is responsible for the national data collection programme (DCP) and the Statistics and Prospective Service (SPS)<sup>3</sup> coordinates the collection and production of economic and social indicators relating to fishing fleets. IFREMER is a partner of and contributor to the national programme of the DCP<sup>4</sup>. Regarding the economic and social section, the socioeconomic action<sup>5</sup> of the Fishing Information System of IFREMER<sup>6</sup> contributes to the collection of economic data relating to both mainland France and certain overseas regions. In the framework of coordination organised by the SPS, IFREMER performs surveys directly in the field face-to-face with skippers-owners using a single questionnaire<sup>7</sup>. The Economic and Management Laboratory of Nantes-Atlantique (LEMNA) collects accounting data from a network of management centres. The data collected are presented in the form of indicators by fishing segments in the annual economic report of the CSTEP<sup>8</sup>.

In the overseas regions, and particularly in French Guiana and Guadeloupe, economic field surveys were performed in 2009 and 2011 (on the data of 2008 and 2010). A new campaign of economic surveys in French Guiana and Guadeloupe is in progress in 2020, on the data of 2019. The socioeconomic context of these regions, the specific characteristics of local fisheries and constraints relating to data availability led to adaptations of the data collection and economic indicator calculation methodologies<sup>9</sup>. The approach proposed permits estimating annual economic indicators at the individual scale,

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<sup>1</sup> The overseas regions that have the status of outermost regions are Guadeloupe and Saint Martin, Martinique, French Guiana, Reunion and Mayotte. Within the EU, the Canary Islands (Spain), the Azores and Madera (Portugal) also benefit from this status.

<sup>2</sup> <https://eur-lex.europa.eu/legal-content/FR/TXT/?uri=CELEX%3A32013R1380>

<sup>3</sup> <https://agreste.agriculture.gouv.fr/agreste-web/statisticons/ORGAN-SSP/listeTypeStatisticon/>

<sup>4</sup> <https://sih.ifremer.fr/Le-SIH/Appui-aux-politiques-publiques/Application-en-France>

<sup>5</sup> <https://sih.ifremer.fr/Activite-socio-economie>

<sup>6</sup> <https://sih.ifremer.fr/>

<sup>7</sup> Economic data survey programmes have been implemented by IFREMER since the beginning of the 2000s (Van Iseghem, S., Quillérou, E., Brigaudeau, C., Macher, C., Guyader, O., Daures, F. 2011. Ensuring representative economic data: survey data-collection methods in France for implementing the Common Fisheries Policy. *Ices Journal Of Marine Science*, 68(8), 1792-1799. Publisher's official version: <https://doi.org/10.1093/icesjms/fsr112> , Open Access version : <https://archimer.ifremer.fr/doc/00043/15419/>)

<sup>8</sup> <https://ec.europa.eu/jrc/en/publication/eur-scientific-and-technical-research-reports/2018-annual-economic-report-eu-fishing-fleet-stecf-18-07>

<sup>9</sup> Guyader, O., Bellanger, M. 2011. Méthodologie de calcul des indicateurs économiques pour les flottilles de pêche à partir des différentes sources de données. Guadeloupe - Guyane - Martinique. Rapport Ifremer – SIH.

by using on the one hand data from economic surveys performed on a representative sample of boats/fishermen and other sources of data updated each year. The objective of this document is to present the data collected by the survey programmed in 2020 on the reference year 2019 for both French Guiana and Guadeloupe. The boats concerned are small fishing boats less than 12 metres long.

The methodology used to process the economic data and the calculation of the indicators is presented in another document (Le Grand et al. 2020)<sup>10</sup>.

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<sup>10</sup> Le Grand, C., Merzeréaud, M., Léonardi, S., Guyader, O. 2020. Socioeconomic indicators on professional fishing: French Guiana and Guadeloupe. Methodological guide, report Ifremer-RBE-SIH-EM, 24 p.

## 2. Survey preparation and organisation

Prior to starting the programme of socioeconomic data collection by a direct survey on fishermen, the actors of fishing in French Guiana and Guadeloupe were contacted by the IFREMER laboratory in French Guiana and by the supervisory committee of the Fishing Information System in Guadeloupe. In Guadeloupe, the responses mainly concerned the questionnaire and the sampling method. In French Guiana, the Fishing Biodiversity Unit of French Guiana was greatly involved in drafting all the methodological documents, ranging from the questionnaire and guides and the sampling plan to the specifications and programming of the acquisition software FESTIF\_OM. An explanatory document was also produced, aimed at professionals and actors in fishing in these territories<sup>1112</sup>.

### 2.1 Single overseas questionnaire and guide

The **single overseas questionnaire** for the outermost regions was **drafted** jointly by UMR 6038 AMURE and the Fishing Biodiversity Unit (BIODIVHAL) of IFREMER French Guiana and above all by UMSR 3456 (CNRS – LEEISA Unit, Coastal and Offshore Ecosystems and Dynamics), taking into account:

- The questionnaires administered historically in Guadeloupe and French Guiana (2011);
- The format of the questionnaire administered in mainland France;
- The need for data to respond to the national programme of the DCP<sup>13</sup> ;
- The need for data for the research works and expertise of the units involved, and data on the existence of environmental impacts and the organisation of the sea products market.

It was submitted for reading by the Fishing Information System in Guadeloupe and by the Statistics and Prospective Service (SSP) of the Ministry of Agriculture and Food, which is the national producer of the national survey on economic data in the maritime fishing sector.

The questionnaire is composed of **26 pages** and presents **specific characteristics** in comparison to the questionnaire administered in mainland France:

- Stronger social dimension (school and maritime diplomas, etc.);
- Detailed physical capital;
- Variable costs by trade;
- Level of fishing activity of the boat (low, moderate, high);
- Sale of swim bladders and gonads;
- Other questions for the needs of research works and expertise.

This questionnaire was administered face-to-face by the survey researchers in the field with the skippers/owners of fishing boats.

A **guide** to the overseas questionnaire aimed at the survey researchers responsible for administering it was drafted on the basis of the guide of the questionnaire administered in mainland France to take into account the specific characteristics of the overseas

<sup>11</sup> Ifremer (2020). Enquêtes socio-économiques en Guyane en 2020 . Plaquette

<sup>12</sup> Ifremer (2020). Enquêtes socio-économiques en Guadeloupe en 2020 . Plaquette .

<sup>13</sup> <https://sih.ifremer.fr/Le-SIH/Appui-aux-politiques-publiques/Application-en-France>

questionnaire. The aim of this guide was to outline what was expected for each question. It is a document intended to be fuelled as and when surveys are performed. The contribution of fishing experts in these outermost regions was determined to integrate pertinent and useful information in this guide.

## 2.2 Local economic data

In addition to the overseas questionnaire used to collect data on the scale of a fishing boat, a “local economic data” form had to be completed by the survey researchers at the beginning of the data collection campaign. The purpose of this form was to collect data on the **scale of fishing ports** or groups of fishing ports, relating to:

- the **services supplied** at ports (refuelling, storage, etc.);
- the **unit prices of** various supplies and materials: fuel, ice and oil, gears, engines, electronics, safety, etc.;
- a **reference of key contacts**: suppliers of material and supplies, fishmongers and other purchasers of sea products.

These data are useful:

- for **completing the overseas questionnaire** (unit prices);
- for **updating the reference annual prices**, since these local economic data must be collected each year, contrary to the questionnaire which is administered only once every several years;
- to better understand **the local socioeconomic context**.

## 2.3 Organisation of collection in the field

In the field, the collection was performed in 2020:

- by a **survey researcher** of the Fishing Biodiversity Unit (BIODIVHAL) of **IFREMER** (hired as a civil service volunteer) in **French Guiana**, part of a team of survey researchers responsible for collecting data in the field in the framework of the Fishing information System of IFREMER. It was planned that the survey researcher was dedicated to carrying out these **35 surveys over a period of 3 months**, the time necessary given the geographic distribution of the boats to be surveyed (transport and mission time to be taken into account). A reinforcement is planned (fixed-term contract) for the SIH team of survey researchers over this period;
- two **survey researchers** recruited by **Groupe ECLIPSE ISTECH** responsible for the data collection **contract** in the framework of the fishing information system of IFREMER in Guadeloupe. **A hundred surveys were planned over a period of 5 months**, with the administration of the socioeconomic surveys added to the other field actions planned in the same contract (Observation of catches unloaded, activity logs, biological sampling). It should be noted that the socioeconomic surveys were also planned for the dependencies of Guadeloupe (3 islands), thus the time required for the mission was also taken into account.

The definition of the number of survey researchers needed and the distribution of boats to be surveyed were determined by consultation between the SIH, the BIODIVAL unit of IFREMER and by consultation with the collection service provider.

## 2.4 Collection procedure

The collection procedure was as follows:

- **Collect local economic data** in the field from suppliers and other actors and at relevant geographic scales (fishing port or group of fishing ports) and **enter them** in the dedicated Excel file;
- **Carry out socioeconomic surveys** of fishermen-skippers according to the sampling plan provided by IFREMER and the methodologies formulated, that is to say **a single economic survey by sub-strata** (35 in French Guiana and 106 in Guadeloupe). To do this, it was necessary to contact all the fishermen-operators drawn in priority 1 in each of sub-stratum of the sampling plan and contact them to carry out a survey based on voluntary response. In the case where the skipper of the boat drawn in priority 1 did not volunteer, the skipper of boat substitute 1 was contacted, and so on;
- **Enter** the survey data collected in the **"Festif\_OM" software** made available by IFREMER;
- **Check** the **surveys performed, the refusals**, the surveys in progress in the **"Festif\_OM" software** which is equipped with a tool for following-up the performance of surveys in conformity with the sampling plan. This checking file must be sent **every 15 days** to the IFREMER coordinator starting from the launch of the survey programme and continue until the end of the programme;
- **Validate the consistency** of the **trade variables, the annual number of days at sea and the annual average crew** filled-in in the economic survey with those of the activity survey;
- **Validate the consistency** of the variable **turnover** filled-in in the economic survey with other sources available in the Harmonie database (Observation of catches on unloading, declaration of fishing effort and unloading data:SACROIS) ;
- **Present** to IFREMER the **paper questionnaires** in a legible and usable form, taking care that the data entered in "Festif\_OM" strictly correspond to the information written on the forms;
- **Complete** the **"survey researcher feedback"** file to ensure feedback on the survey campaign for the operational coordinator.

## 2.5 Validation by the 'survey researcher'

The validation of the survey data collected and entered ensures their quality. In addition to the validation phase performed by the team's statistical engineer (Le Grand et al. 2020b), the survey researcher also performs a validation in three steps:

- Preliminary documentation and expert approach of the survey researcher

The preliminary documentation consists in making available to the survey researchers indicators built on the basis of data from sources external to the survey and already available for filling-in, sometimes partially or from the previous year, a certain number of variables collected during the survey. Thus, sources of data available in the SIH enable filling in the following variables prior to carrying out the survey:

- the annual number of days at sea per boat for year N: source from the activity logbooks;
- the annual number of days at sea per boat (and by trade) for year N-1: source from Fuel;
- the quantity and value estimated of annual catches per boat (and by trade): sources ObsDeb and SACROIS.

The availability of these data to the survey researcher allows them to **build a certain expertise** on the scale of each boat and also by segment of fleet. The researcher is then able to see the data transmitted by the survey in perspective, likewise for the quality of the external sources for each boat surveyed. The researcher is then asked to **transmit all the comments relating to data quality** to the engineer responsible for validating the data using this file.

- Acquisition controls

During acquisition with the FESTIF\_OM software, several controls are performed to:

- Check the consistency of the data entered for a boat;
- Identify null or missing values;
- Identify the values entered above and below reference threshold values.

These controls, which block entry or else provide simple informative messages, **alert the survey researcher** responsible for the acquisition of **real or possible acquisition errors or omissions**.

Post-acquisition re-reading

At the end of acquisition, the FESTIF\_OM software makes available to the survey researcher a summary of all the information entered for **immediate re-reading** and **correction of possible errors and omissions**.

## 2.6 FESTIF\_OM acquisition software

The FESTIF\_OM software and its user manual are downloadable on the SIH website (restricted access). The specifications<sup>14</sup> were drafted internally at IFREMER on the basis of the FESTIF software (mainland version) and the Overseas questionnaire. The software was developed by an external partner (ALTRAN) and the programme was validated at IFREMER. This software is used to acquire survey data and follow-up the application of the sampling plan. The survey researcher is asked to export these data every fifteen days and they are automatically archived on IFREMER's servers.

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<sup>14</sup> Ifremer (2019). Cahier des charges. Développement du logiciel de saisie FESTIF Outre-Mer. Programme de collecte 2020 .

The export of the follow-up data permitS feeding the bi-monthly report of the SIH. The export of the data acquired is used for validation routines and data processing.

## 2.7 Training

The purpose of training the survey researchers is to get them to **familiarise themselves** with the questionnaire and the different tools and technical documents used **by the survey researchers** to ensure they are clearly understood. To achieve this, the following steps are organised:

- **Theoretical training** (questionnaire, procedure, technical documents and acquisition software) which took place in a workshop alongside the SIH seminar at the end of December 2019 and through a videoconference at the end of January 2020;
- **'Field' training** given via a mission by the UMR AMURE team based in Brest, in February 2020, to French Guiana and then Guadeloupe. Several surveys were performed collegially during this mission, allowing the Brest team to learn about and become aware of specific local characteristic, and for the survey researchers to handle the tools/protocols and adjust their comprehension.

## 2.8 Monitoring and reporting

**Regular monitoring** of the surveys being carried out from the start to the end of the campaign was ensured by the IFREMER coordinator of socioeconomic surveys.

This permitted:

- Monitoring the **efficient performance of the surveys** in line with the sampling plan;
- **Answering the survey researchers' questions** and providing details to ensure the good quality of the data collected;
- **Identifying possible difficulties** (logistical, contacts in the field, etc.) and solve them.

A **bi-monthly report** taking stock of the national assessment of the collection performed in the framework of the SIH was drafted by the latter and sent internally and externally to partners responsible for the data collection. The follow-up files entered and exported bi-monthly by the survey researchers carrying out the socioeconomic surveys supplied the relevant follow-up indicators:

- The number of boats contacted (vs total number of boats) by overseas region;
- The number of boats surveyed (vs number of boats to be surveyed) by overseas region;
- In an overseas region, the number of boats surveyed, contacted, with an appointment made, with refusal, etc. per survey researcher, by strata or by municipality.

## 2.9 Communication

In order to favour the lasting participation of professional fishermen in the socioeconomic survey, several communication actions were carried out or planned:

- Before the survey
  - Several months before the survey was started, **local actors in fishing were informed** by the IFREMER unit in French Guiana and the Supervisory Committee of the SIH in Guadeloupe, through direct exchanges, by email;
  - Several weeks beforehand, a two-page **information note** was sent relating to carrying out socioeconomic surveys by overseas region intended for professional fishermen and actors in the sector;
  - **Drafting of an information and request letter** aimed at professional fishermen sent to the regional and departmental fishing committees or sent directly by the survey researchers present in the field.
- During the survey
  - Transmission to the survey of the **first page of the questionnaire** informing on the right of access to the data collected (RGPD), the links to the websites of the SIH and the CSTEP;
  - **Goodies** labelled SIH to thank the survey for its participation;
- After the survey
  - A **thank you letter** and a **synthetic document** presenting the data collected intended for the respondents and more widely to the actors in the fishing sector.

## 2.10 List of technical documents

The technical documents are available to the survey researchers on the SIH website and include:

- The **questionnaire**<sup>15</sup> and its user **guide**<sup>16</sup>;
- The **portfolios of boats** by survey researcher (sampling plan);
- The collection<sup>17</sup> (pdf) and acquisition (Excel) **forms of local economic data**;
- A two-page **information note**<sup>18 19</sup> on the implementation of socioeconomic surveys by overseas region intended for fishing professionals and actors in the sector;
- The **information and request letter** intended for fishing professionals;
- The **'Survey researcher\_feedback' questionnaire** intended for the survey researchers to obtain their opinions and proposals at the end of the survey campaign;

<sup>15</sup> IFREMER (2020). Enquête socio-économique annuelle sur le secteur de la pêche en Outre-Mer. Année de référence 2019 . Questionnaire Économique - N°2020-01 . <https://archimer.ifremer.fr/doc/00636/74848/>

<sup>16</sup> Ifremer (2020). Guide du questionnaire socio-économique SIH. Aide au remplissage du questionnaire " Enquête socio-économique annuelle sur le secteur de la pêche en Outre-Mer " .

<sup>17</sup> Ifremer (2020). Formulaire pour la collecte des données économiques locales dans le cadre de l'enquête socio-économique sur le secteur de la pêche maritime en Outre-Mer. Année 2019 - Programme de collecte SIH 2020 .

<sup>18</sup> Ifremer (2020). Enquêtes socio-économiques en Guyane en 2020 . Plaqueette . <https://archimer.ifremer.fr/doc/00640/75162/>

<sup>19</sup> Ifremer (2020). Enquêtes socio-économiques en Guadeloupe en 2020 . Plaqueette . <https://archimer.ifremer.fr/doc/00640/75161/>

- The **training manual**<sup>20</sup>;
- **The executable version of the acquisition and follow-up software** FESTIF\_OM and its user **guide**<sup>21</sup>;
- A **validation report** (Excel format) to be completed at the end of the survey acquisition.

The synthetic list of survey questions (level 2 of the plan) is available in the annex.

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<sup>20</sup> Leonardi Sophie, Le Grand Christelle, Merzereaud Mathieu, Guyader Olivier (2019). Atelier préparatoire au lancement des enquêtes socio-économiques 2020 en Outre-Mer . Séminaire du SIH. 10 décembre 2019, Nantes .

<sup>21</sup> Ifremer (2020). Guide utilisateur du logiciel de saisie FESTIF Outre-Mer. Action socio-économie du SIH

## 3. Sampling plan

### 3.1 Reference population

The reference population of the boats of Guadeloupe and French Guiana is described below using several key indicators. In 2019, the fleet registered in Guadeloupe was exclusively composed of boats less than 12 metres long. This fleet numbered 703 boats (excluding Saint-Martin and Saint Barthélemy) including 507 active boats with a total onboard engine power of 87,877 kW for an onboard crew of 888 sailors. The estimated turnover for 2018 was €23.4M. The fleet registered in French Guiana was composed of 155 boats including 116 active vessels with an engine power of 7540 kW and an onboard crew of 307 sailors. The population concerned by the survey is limited to boats less than 12 metres in length, since IFREMER is not involved on the segment of shrimp trawlers of 18-24 metres.

**Table 1: Reference populations in Guadeloupe and French Guiana (2019).**

Region	Length category	Boats registered in fleet file	Active boats	Crew onboard	Gauge (GT)	Engine power (kW)	Estimated turnover * (M€)
Guadeloupe	< 10 m	674	491	888	145 952	83 504	22.4
Guadeloupe	[10-12[ m	29	16	37	13 936	4 373	1.0
<b>Total Guadeloupe</b>		703	507	925	159 888	87 877	23.4
French Guiana	< 10 m	62	43	108	13 059	2 508	2.1
French Guiana	[10-12[ m	74	60	099	44 317	5 032	3.9
French Guiana	[18-24[ m	19	13	65	154 511	4 157	NA
<b>Total French Guiana</b>		155	116	372	211 887	11 697	NA

(\*) Values 2018

### 3.2 Basis of the survey and stratification

If we consider for the two regions, French Guiana and Guadeloupe, a survey carried out in year N on the indicators bearing on year N-1, the criteria selected for the inclusion of a boat in the survey base are the following:

- the boat did not leave the fleet during year N-1;
- it was present on 31/12 of year N-2 in the fleet file;
- it was not subject to a change of owner or seaboard during year N-1;
- it was not considered inactive in year N-1. In order to establish this criterion, the most updated typology-segment of the fleet is used initially for the boat. Then, we focus on boats defined as active; they are considered inactive if the value associated with a variable used in the calculation of the allocation is null. Thus, the boats of Guadeloupe (and French Guiana) considered inactive are those whose variable "annual turnover" (respectively "number of days at sea" according to the source OBSDEB) is equal to zero for year N-1. This characterisation in two stages permits reducing the boats drawn that are finally identified as non-surveyable (since they were not active during year N-1) or else not exploitable since atypical due to their

very low activity (this first limits the number of false calculations of allocations during the phase of building the sample (see following paragraph), and then the potential biases affecting the aggregated estimators built using the individual data collected).

**Table 2: Survey base for Guadeloupe.**

Fleet	Size	Activity	Num. boats	Total value	Num. days at sea	% nav.	% val.	% days at sea
Passive gears and others	VL0006	inf50	14	142 473	378	3%	1%	1%
		50-100	9	204 549	610	2%	1%	2%
		sup100	6	473 597	1 091	1%	2%	3%
	VL0608	inf50	45	492 939	1 220	11%	2%	3%
		50-100	41	1 305 785	2 910	10%	6%	8%
		sup100	51	3 129 560	7 541	12%	15%	20%
	VL0810	inf50	15	131 435	302	4%	1%	1%
		50-100	26	780 394	1 873	6%	4%	5%
		sup100	30	1 931 138	4 677	7%	9%	12%
	VL1012	inf50	3	15 898	45	1%	0%	0%
		sup100	4	551 144	941	1%	3%	2%
	Line fishing	VL0008	inf50	27	403 760	652	6%	2%
50-100			19	1 057 006	1 440	5%	5%	4%
sup100			33	3 058 128	5 001	8%	15%	13%
VL0810		inf50	18	322 255	457	4%	2%	1%
		50-100	26	1 505 226	1 867	6%	7%	5%
		sup100	46	5 044 185	6 920	11%	24%	18%
VL1012		inf50	6	74 067	134	1%	0%	0%
		sup100	2	264 088	279	0%	1%	1%
<b>Total</b>				<b>421</b>	<b>20 887 627</b>	<b>38 338</b>	<b>100%</b>	<b>100%</b>

**Table 3: Survey base for French Guiana.**

	Num. boats	Total value	Num. days at sea	% Nav	% Val	% days at sea
Improved creole canoe_Cayenne/Rémire Montjoly	27	1 469 256	2 962	30%	30%	29%
Improved creole canoe_Iracoubp-Organabo/Sinnamary	21	1 659 241	2 072	23%	33%	21%
Improved creole canoe_Kourou	3	147 913	278	3%	3%	3%
Improved creole canoe_Saint Georges	17	763 584	2 608	19%	15%	26%
Creole canoe_Cayenne/Rémire Montjoly	9	153 915	491	10%	3%	5%
Creole caboe_Kourou	7	147 755	717	8%	3%	7%
Tapouille_Cayenne/Rémire Montjoly	7	618 908	969	8%	12%	10%
<b>Total</b>	<b>91</b>	<b>4 960 572</b>	<b>10 097</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>

SM (Saint-Martin) and BH (Saint-Barthélemy) boats are excluded from the Guadeloupe survey base, and boats over 12 metres long are not included in the French Guiana survey base as they are not monitored by IFREMER in the framework of the national data collection protocol coordinated by the SSP.

### 3.3 Calculation of sampling allocations

A sampling stratification for each region was built using individual characteristics filled in the respective survey bases. For Guadeloupe, this segmentation is defined as the

combination of a binary typology of boats (offshore line fishing boats on the one hand, and passive gears and others on the other hand), size classification, and a qualitative descriptor of the intensity of the activity. For French Guiana, it is based on the association of type of boat and a zone defined on the basis of grouping fishing ports.

It is then possible to calculate the sampling allocations attributed to each of the strata built in this way. A Neymann method was used as it allows adjusting allocations by stratum as a function of the target precision set (coefficients of variation of a variable of relevant interest, called optimisation) and optionally an upper bound of total allocation (otherwise known as budgetary constraint). This methodology is implemented in R form in a program that requires the entry of a certain number of parameters, including:

- N: the number of boats by stratum at the level of the population. Consistent with the preparatory stages, our population is considered as all the boats considered "surveyable", that is to say included in the survey base.
- MOY: the average by stratum of individual total values taken by the optimisation variable chosen for each region (the turnover for Guadeloupe, the effort in number of days at sea for French Guiana) for year N-2.
- SH: the standard deviation by stratum of value taken by the optimisation variable for year N-2.
- CONT\_LOC: the level of precision (coefficient of variation applied to the optimisation variable) targeted for each stratum.

As a function of this information, the optimal allocation is calculated for the two next collection campaigns, assuming theoretically the objectives reached precisely for all the strata (no over-sampling considered). The level of precision set for French Guiana is equal to 15% for all the strata, except the tapouilles (small coasters specific to French Guiana) for which the value is set at 5%. For Guadeloupe, distinct targets of precision are set according to level of activity of the boats: 33% for those active less than 50 days a year, 10% for those more active.

### 3.4 Drawing samples

In conformity with the allocations estimated, systematic random draws were carried out on all the strata and according to a gradient crossing the coastal zones belonging to them (municipalities, ports and groups of municipalities and ports), then the numerical sizes of the boats by increasing order. This drawing method ensured a homogeneous coverage of the individuals drawn according to these two axes of distribution, since the lists of surveyable elements are ordered before being examined to select them according to an approximately regular frequency of an individual every  $N_i/n_i$  ( $n_i$  individuals to be chosen among  $N_i$ ).

Once the draw has been made, each individual drawn is associated with a group of substitutes. According to a simple criterion of distancing between ordered individuals, the substitutes are assigned to the closest draw, then ranked according to their distance from it. Thus, if the P-th element is drawn, the first substitute will be P+1, the second P-1, the third P+2, the fourth P-2, etc. The list of individuals drawn, their respective substitutes, and their order of priority are finally itemised and communicated to the teams of survey researchers before starting the collection campaign. The following maps show the results of the sampling plans with the distribution of boats drawn by municipality.

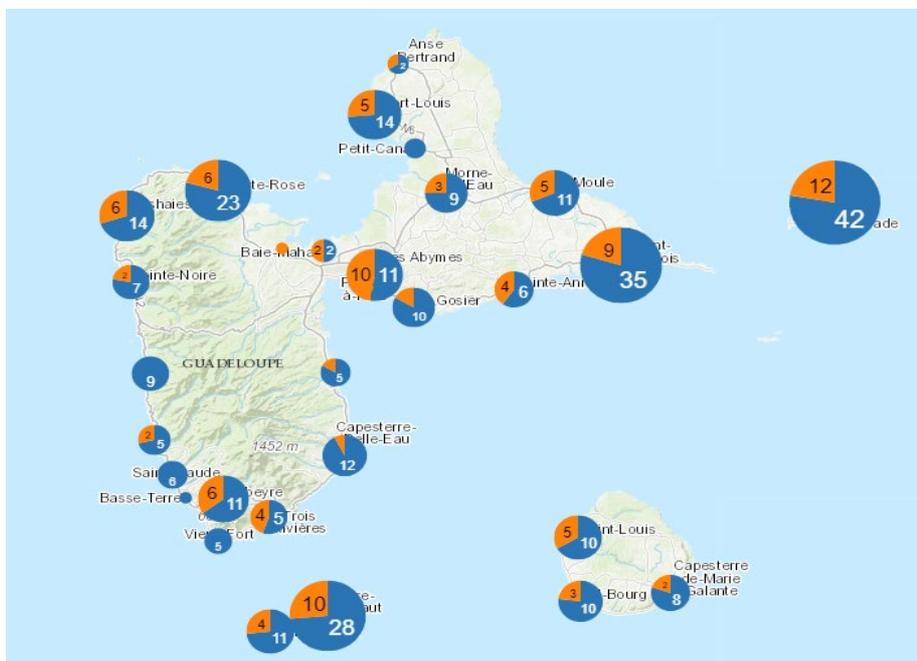


Figure 1: Geographic distribution of boats drawn in the sampling plan for Guadeloupe (orange number of individuals drawn by municipality).

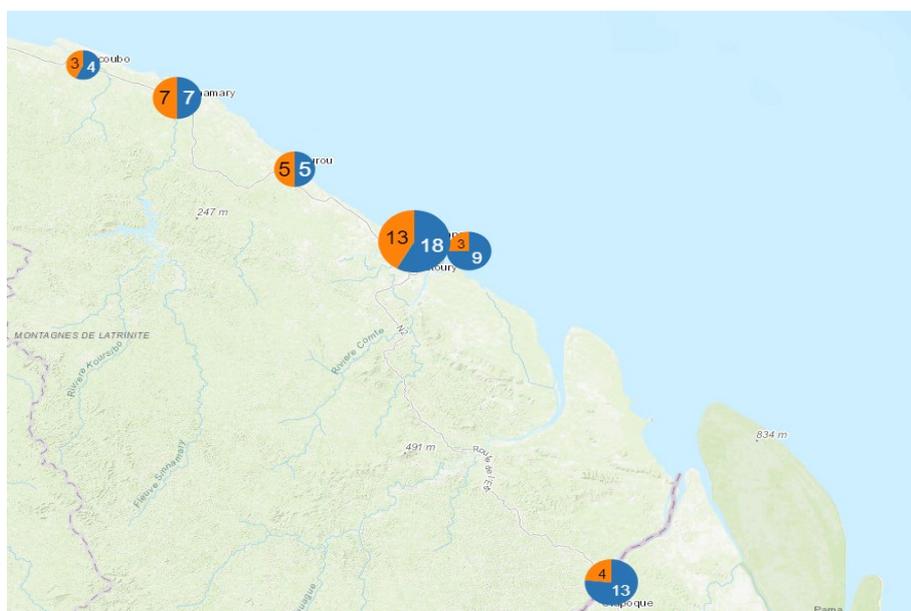


Figure 2: Geographic distribution of boats drawn in the sampling plan for French Guiana (orange number of individuals drawn by municipality).

## 4. Annexes

### 4.1 Survey questions and economic indicators of the DCP

Theme of questionnaire	Number of survey questions	Number of questions used to build the DCP variables	Ratio
1. Information on respondent and their entourage	9	3	33%
2. Information on associated boats	3	2	67%
3. The boat	9	8	89%
4. Activity	3	3	100%
5. variable costs per catch and by trade	1	1	100%
6. fishing gears and rigging	1	1	100%
7. other operating costs	4	4	100%
8. Incomes	9	7	78%
9. Crew and mode of remuneration	10	10	100%
10. Conflicts of use	2	0	0%
<b>Total (1 to 10) excluding 11. Survey researcher assessment</b>	<b>51</b>	<b>39</b>	<b>76%</b>
11. Observer's assessment	5		0%

**Table 4: Survey questions (level 2) and rate of coverage of the questions used to call for DCP data.**

Theme of questionnaire	Questions	DCP variable
1. Information on respondent and their entourage	1.1 Status of skipper	yes
	1.2 Maritime diploma	no
	1.3 Year started in trade	no
	1.4 Other trade before fishing	no
	1.5 Retired	yes
	1.6 Higher level of education	no
	1.7 Fishing family	no
	1.8 Involvement of family	no
	1.9 Trade of spouse/companion	yes
2. Information on associated boats	2.1 Work linked with boats	Yes
	2.2 Operation of other boats	Yes
	2.3 Status of company	No
3. The boat	3.1 Year boat was purchased	Yes
	3.2 new construction	Yes
	3.3 first purchase	No
	3.4 percentage of ownership of boat	Yes
	3.5 purchase price	Yes
	3.6 share of loan to finance boat	Yes
	3.7 Loan reimbursements	Yes
	3.8 Insurance premium and value	Yes
	3.9 Value of boat on second-hand market	Yes
4. Activity	4.1 Level of activity	Yes
	4.2 main trades	Yes
	4.3 licences	Yes
5. Variable costs by catch and by	5. Variable costs by catch and by	Yes
6. Fishing gears and rigging	6 fishing gears	Yes
7. Other operating costs	7.1 maintenance and repair of boat	Yes
	7.2 other equipment expenses	Yes
	7.3 various social charges	Yes
	7.4 Bad weather fund	Yes
8. Income	8.1 turnover	Yes
	8.2 turnover from swim bladders	Yes
	8.3 sales circuit	Yes
	8.4 Detail of turnover by species	Yes
	8.5 Discarded catch at sea	No
	8.6 Subsidies 2015-2019	Yes
	8.7 Diversification without boat use	Yes
	8.8 Diversification with boat use	Yes
	8.9 reasons for diversification	No
9. Crew and mode of remuneration	9.1 skipper alone on board	Yes
	9.2 annual average crew	Yes
	9.3 Crew turnover	Yes
	9.4 number of foreign sailors	Yes
	9.5 remuneration by share of catch	Yes
	9.6 total annual cost of crew	Yes
	9.7 Detail of personnel expenses	Yes
	9.8 Salary of a sailor	Yes
	9.9 ENIM category of crew	Yes
	9.10 Employment of personnel on land	yes
10. Conflicts of use	10.1 conflicts of use	No
	10.2 conflict with who?	No

**Table 5: Details of variables used to build the DCP indicators.**