The Fisheries Information System of Ifremer:
a multidisciplinary monitoring network and an integrated approach for the assessment of French fisheries, including small-scale fisheries

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Abstract

Since 2000, Ifremer has been implemented a Fisheries Information System (FIS), in strong collaboration with the DPMA (Direction of fisheries and aquaculture of the French Ministry of Agriculture and Fisheries). The FIS aims at building an operational and multidisciplinary monitoring network for scientific purposes, allowing a comprehensive view of fishery systems including their biological, technical, environmental and economical components.

The objectives of the FIS are (i) to provide the specifications and methodologies for the collection, storage and processing of fisheries data, with the constant concern to harmonise all these procedures on a national scale, (ii) to improve data management system and access to data for a wide-spread public, and (iii) to produce and distribute relevant datasets, indicators and synthesis, for understanding and evaluation, including bio-economic diagnostics of the fisheries, and assessment of the short and long-term impacts of fisheries management scenario and measures.

The FIS covers all the French fisheries, including overseas territories and small-scale fisheries, for which data are often hardly available or missing, whereas two thirds of the French vessels are less than 12 meters long. The challenge was to establish a statistical and an integrated approach supporting bio-ecological and economic issues.

To further an integrated analysis of the fishery systems, the wide range kinds of data - including acoustic surveys, biological in-situ observations, environmental observations, as well as fishing statistics (landings and efforts) or economic data - are managed in a single data management system, based on an integrated relational data base with geographical facilities.

Keywords: information system, fisheries, fishing fleet, indicators, integrated database, small-scale

Introduction

The analysis done at both European and national level shows that the achievement of quality data implies to strengthen the collection of data, especially close to fishermen, on shore by survey or sampling, but also aboard fishing vessels. In addition, it is advisable to further associate the fishermen to the collection for a better appropriation of the results.

Another priority consists in continuing the rationalisation of the observation function: strengthen and make durable an observation network, consolidate the economic information as well as the biological information, and encourage a quality approach. The needs of collection and qualification of data are diversified. They are going to increase with the development of an ecosystem approach to fisheries (EAF).

To meet one of the Ifremer's public interest missions consisting in "*identifying, evaluating, enhancing marine resources and enabling their sustainable exploitation*", the Fisheries Information System (FIS) has been developed by Ifremer, in strong collaboration with the French Ministry of Agriculture and Fisheries. The FIS is a permanent, operational and multidisciplinary national network for the observation of marine resources and their associated uses.

Like any other information system, the FIS set oneself general objectives to achieve this mission:

o To provide and implement the specifications and methodologies for the collection, storage and processing of fisheries data, with the ongoing concern to harmonize and standardize all these procedures at a national scale, and to organize the monitoring of fisheries;
o To improve data management system. This entails not only ensuring entry and regular update of data bases and validation of fisheries data, but also improvement of access to centralized data base;
o To supply data to the researchers, and thus to provide support for fisheries research projects and assessment on marine living resources;
o To develop indicators and produce reports for a widespread public, from the researchers to the stakeholder, fishermen, administration and general public, including bio-economic diagnostics of fisheries and assessment of impacts of fisheries management scenario and measures.

This paper presents the objectives, characteristics and organization of the FIS carried out by Ifremer.

A comprehensive view of the fishing system

The FIS aims to provide a comprehensive view of fishing system including their biological, technical, environmental and economical components, for scientific purposes. The objective of the FIS is then the collection of relevant data to assess the total activity of the French fleet and understand the dynamics of the fishing system.

The whole kinds of vessels are taken into account, whatever the length, the range of activity, the gears used or the fishing zones exploited. Thus, the FIS is one of the rare fisheries information system that is interested in the whole French fleet, including small scale vessels, with a gradual enlargement to recreational fisheries.

The FIS approach is national: the monitoring network covers the whole coasts of North-Sea, Channel, Atlantic and Mediterranean Sea (Corsica excepted) and has recently expended to the overseas "départements"[1].

Source:
http://europa.eu/abc/maps/members/france_fr.htm

Source: http://www.outre-mer.gouv.fr/

Figure 1: France - metropolitan and overseas territories
(left map : metropolitan and overseas "départements" ; right map : the whole overseas territories).

A multidisciplinary and statistical approach of the FIS

To reach a comprehensive view of fishing system including their biological, technical, environmental and economical components, the FIS has adopted a multidisciplinary and statistical approach (Figure 2) relying on the collection of different kings of data by different processes.

The starting point of the method consists of a comprehensive characterization of the French national fleet, based on official and administrative data, supplied by the French Ministry of Fisheries. These official data include administrative data related to vessels (i.e. technical characteristics, official number of crewmembers…) and the owners.

Other official data, declarative landings statistics (log-books, sales) are provided by the French Ministry of Fisheries, but are incomplete and their reliability difficult to assess. Therefore, in order to compensate the lack of complete information regarding activity of the vessels, Ifremer has carried out a comprehensive survey consisting of an exhaustive collection of annual activity calendars (Berthou et al, 2008). This consists of a follow up of the métiers practiced by a given vessel (by métier, we mean the use of a gear, to target one or several species, in a given fishing area).

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[1] The Fishing fleet register only covers the vessels of the overseas French "départments" (Lesser Antilles - Guadeloupe and Martinique -, La Réunion, Guyane), and not overseas "territories" (Polynésie, Nouvelle Calédonie…)

Official fishing national registers of vessels and owners:
Exhaustivity

Activity of the fleet
(métiers, characteristics of the gears, fishing effort…)
Exhaustivity or sampling

Statistics of landings
(logbooks, auction data…)
Declarative and incomplete

Scientific surveys aboard oceanographic vessels

Typologies of fleets / Identification of significant gears, métiers or species…

Collection of catches data (landings / discards) aboard fishing vessels
sampling

Survey on commercial trip upon landing
sampling

Biological sampling of landings
sampling

Collection of economic data
sampling

Multidisciplinary analysis of the fishing system :

▪ **Extrapolation (economic situation, catches, fishing effort…)**
▪ **Stock assessments**
▪ **Bio economic diagnostics of fisheries and analysis of the impacts of management measures…**

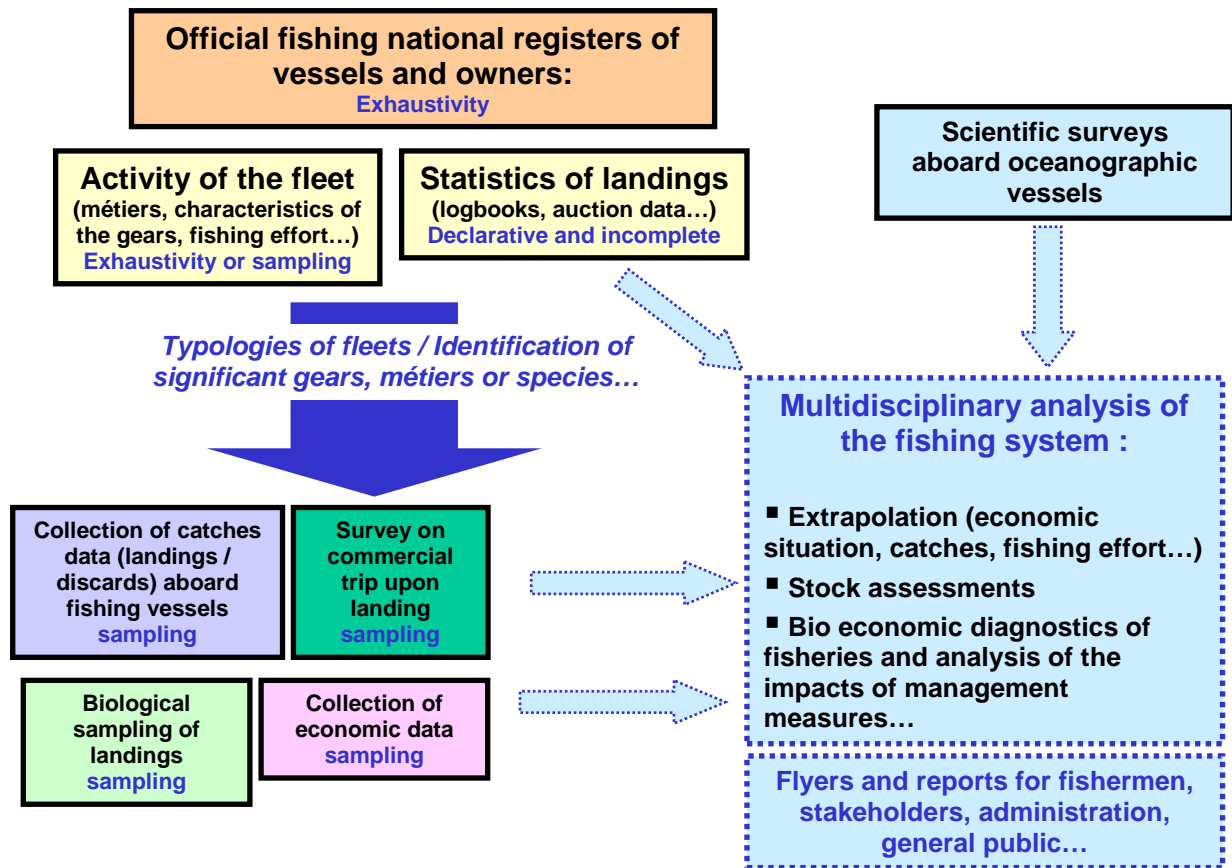**Flyers and reports for fishermen, stakeholders, administration, general public…**

Figure 2: The multidisciplinary and statistical approach of the FIS

These set of information allows the elaboration of fleets typologies, at the scale adapted to the case studied (Berthou *et al.* 2003 and 2008). It also allows the identification of significant gears, métiers or species of the reference population of vessels.

Furthermore, as the annual activity calendars and the typologies of fleets are exhaustive, the construction of sampling plan for collection of other fisheries data (biological, economic…) is made possible.

Finally, this wide-ranging set of data can supply multidisciplinary and integrated analysis of the fishing system, together with a comprehensive and readable overview of the fisheries activities for a widespread pubic (researchers, fishermen, administration, general public…), including integrated indicators, bio-economic diagnostics and assessment of the short and long-term impacts of fisheries management scenario and measures. In the same way, some reports and synthesis are produced through the processing of the data.

Description of the FIS data

To achieve this approach, the FIS has been structured in interacted sub-programs, collecting and managing the following data:
o Fisheries statistics (landings, sales, log-books…) and follow up of the activity of the fleets
o Economic data, collected by survey
o Biological sampling of landings (in auction sales room)
o Observation and sampling of catches (landings and discards) aboard fishing vessels
o Scientific survey aboard oceanographic research vessels

Fisheries statistics and follow up of the activity of the fleets
One of the major subprogram of the FIS, it is in charge of all official data related to fisheries, provided by the French Ministry of Fisheries, especially administrative data (fishing fleet register, owners database…) and declarative landings data (log-books, national fishing forms, auctions sales…). As this dataset doesn't cover the whole activity of the French fishing fleet, this subprogram yearly carries out direct surveys on individual annual activity calendars (Berthou et al, 2008).

Around 8000 vessels are followed up yearly, in each maritime region of the French EEZ, including overseas territories and small scale vessels (Table 1).

Table 1: Reference population of the Fisheries Information System in 2006 by region

Area	North Sea-Channel*	Atlantic*	Mediterranean*	Lesser Antilles**	French Guyana**	Reunion***	Total
Less than 12 meters	1115 **(72%)**	1461 **(70%)**	1391 **(87%)**	2001 **(99.7%)**	110 **(64%)**	261 **(91%)**	6340 **(82%)**
12 meters and more	432 **(28%)**	633 **(30%)**	200 **(13%)**	6 **(0.3%)**	62 **(36%)**	27 **(9%)**	1360 **(18%)**
Total	1547	2094	1591	2007	172	288	7700

Source: French Fishing Fleet Register (Ifremer)

Regarding the status of this survey, aiming at collecting minimum but exhaustive information on the activity of the vessels in a short period of time, it is inconceivable to collect detailed data on landings. However, for specific cases (Mediterranean Sea and overseas territories), landings or declarative data are limited. Thus, an additional survey was recently implemented. It consists in the census of the catches and fishing effort of a commercial trip, carried out by observers when the vessel returns back to harbor.

This subprogram finally concentrates the datasets on capacities, production and effort on the French fishing fleet, useful for the development of fleet typologies and the analysis of their dynamics.

Economic data
In order to improve the knowledge of fishing sector and strengthen scientific analysis of fisheries, the FIS has set up an annual direct survey for the collection of individual data on costs, earnings but also capital and employment, through a standardized questionnaire (Daurès et al, 2008). A stratified sampling plan is elaborated yearly on the basis of the fleet segments provided by the Fisheries statistics subprogram. Around 800 vessels are surveyed yearly, for the time being in the metropolitan France. The sampling plan is optimized and covers all the segments of the French fishing fleet.

Biological sampling of landings
In order to supply stock assessment, this subprogram aims to characterize the length and/or age composition of landings of the major targeted species by the French fisheries, as well as the biological parameters. This subprogram intends to sample the whole species, but the priority is given to those assessed by the international bodies (ICES, NAFO, GFCM, ICCAT…). The landings are sampled in auction sales rooms, quarterly, per fishing areas and per fishing gear (nets, lines, long lines, bottom trawl, pelagic trawl…).

Observation and sampling of catches (landings and discards) aboard fishing vessels
In order to improve stock assessment and contribute to the set up of an Ecosystem Approach of Fisheries (EAF), the objective is to sample the total catches, especially discards. The

sample is carried out by observers aboard commercial fishing vessels. All the species, landed or discarded during a fishing trip and for several fishing operations, are identified and measured.

Scientific survey aboard oceanographic research vessels
This surveys aim to provide the indicators allowing characterizing the status and the dynamics of the commercial and non-commercial species (e.g. abundance and distribution, characterization of the key-stages of their life cycle, description of the populations…). These campaigns supply the implementation of the EAF: CGFS Channel Groung Fish Survey, IBTS International Bottom Trawl Survey in the South North Sea, MEDITS International bottom trawl survey in the Mediterranean, EVHOE Fisheries resources assessment of Bay of Biscay and Celtic Sea, PELGAS Small pelagics of the Bay of Biscay, PELMED Small pelagics of the Mediterranean Lion Gulf …

Organization

The FIS relies on a multidisciplinary management team, including scientists from each discipline, statisticians and also computer engineers. The FIS has developed common methodologies and standardized at a national scale, i.e. sampling plans, questionnaires, surveys and technical documents.

In the same way, the FIS has developed innovative automatic data acquisition techniques, with the ongoing concern to enhance the available data, improve their quality and ensure their reliability. The Multibeam Echo Sounder is an example (Trenkel et al., 2008), and more recently, the project Recopesca (Leblond et al., 2008), which consists in the setting up of a sensor network on voluntary commercial fishing vessels in order to measure fishing effort, catches and environmental parameters (salinity, temperature).

To further an integrated analysis of the fishery systems, the FIS is building a single data management system, *Harmonie*, based on relational data base with geographical facilities to allow direct interface with Geographical Information Systems (GIS). While the data is inherently wide-ranging – including acoustic surveys of water columns, biological in-situ observations, environmental observations, as wall as fishing efforts, landings or economic data -, the database is completely integrated. The different components of the FIS combined in *Harmonie* are linked to common referential data and some fields are common to different components (Harscoat et al., 2008). Cross-referencing is of paramount importance. The access to the data is possible by means of web portal. This portal displays the data, and, according to the user, provides an access to the source data or only aggregated data, including tables of indicators, charts and maps. A GIS for the FIS is currently on development (Harscoat et al., 2008).

A network of observers distributed along the French coasts collect data, in close relationship with the fishermen. About sixty observers, in metropolitan France and in the overseas "départements" (Guadeloupe, Martinique, La Réunion, Guyane), collect data on shore, but also aboard professional fishing vessels and oceanographic vessels.

To carry out its fisheries information system, Ifremer benefits from a significant partnership with the French Ministry of Agriculture and Fisheries and the fishermen. Most often,

collection of data of the FIS is supported by European (Data Collection Regulation[2] especially), national or regional co-financings.

Perspectives

Regarding its concern to cover all the fleet segments and the whole French territories, the FIS is consistent with the objectives of the European Data Collection Regulation (DCR). Thus, it contributes to the constitution of a European information system under the auspices of the EU, through the Data Collection Regulation. Through the DCR, the Member States are required to implement national programs to collect biological and economic data on their exhaustive fisheries.

Moreover, the FIS is in constant evolution and is extending gradually to new data collection, such as economic data, direct assessment of catches onboard, by-catches, or environmental parameters, especially to answer the issue of the EAF and of the socio-economic stakeholders' demands, and to be in the vanguard of the DCR. Thus, the FIS is already designed to answer to the requirements of the new DCR[3] (2009-2010), and notably the métier/fleet based approach[4] and the environmental indicators.

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[2] Council regulation (EC) No 1543/2000; Commission regulation (EC) No 1639/2001 modified by Commission regulation (EC) N° 1581/2004.
[3] Council Regulation (EC) No 199/2008 and Commission Regulation (EC) No 665/2008
[4] STECF SGRN-SGECA 08-01.

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