ICES Annual Science Conference 2008, 22-26 September, Halifax (Canada)

Theme K: Small-scale and recreational fisheries surveys, assessment and management.

Re-assessing the French small-scale coastal fisheries: from fleet activity to economic performance

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Abstract:

While the majority of small-scale coastal fisheries are found in developing nations, a considerable number exist in developed nations as well. Indeed, small-scale fisheries are strongly represented in all European Union (EU) Member States, 81% and 87% of the EU 25 whole fleet is composed of vessels less than 12 and 15 meters long respectively. In 2000, European regulation established a fisheries data collection framework including economic information requirements in order to provide the scientific basis for the implementation of the Common Fisheries Policy.

This paper presents the methodology designed to collect the relevant economic data and characterize the status of the French fleets from an economic perspective. Based on stratified sampling plan including the following of small-scale fleets, data collection by field survey is based on a single questionnaire for all the fleets, whatever the size of the vessel, the gear used, the fishing area or the species targeted. It provides a large data set including earnings and costs but also capital, employment, fishing activity figures.

Statistical analysis through a revenue model gives the basis for a re-assessing of the small-scale fisheries contribution to national production. Economic indicators such as gross added value, revenues, and direct employment are derived from the data set. The significant role of small scale fisheries in the French fishing sector is established and the impact of the rising fuel costs in fisheries is discussed.

Keywords: Data collection, sampling schemes, economic data, indicator, revenue model, small-scale fisheries.

INTRODUCTION

This paper is an attempt to assess the economic status of the small-scale coastal fleet in France and to demonstrate its key role in the French fishing sector. Until the end of the eighties, the public policies in the fishing sector provided incentives, through subsidies, to invest in off shore fishing vessels capable to fish beyond the coastal zone. From the beginning of the nineties, the overcapacities of the European fishing fleet became a major concern considering the depletion of the marine resources. Member states were asked to implement specific measures in order to adapt the fleet capacity to the available fishing stocks. The capacity adjustment policies had referred to the entire French fleet, including the small-scale coastal vessels. However, the small-scale coastal fleet remains a major fleet at European level, strongly represented in each member state and all over European fishing areas (Berthou et al., 2005).

The role of the small-scale coastal fleet at national level is still considered as marginal; at least its contribution to local employment is recognized. In 2000, the French Agriculture and Fisheries Ministry ordered a report on the fishing activity in the French coastal zone, which allowed setting up a first picture of the specificities of the small-scale fishing fleet (Bolopion J. et al., 2000). This study highlighted the context of increasing competitive pressure encountered by the coastal fleet from the other commercial fishing fleets on one side, and other economic sectors like recreational fisheries, tourism, aquaculture, extractive industries… on the other side. It also pointed the difficulty of setting up a precise and detailed picture due to the lack of data on this segment fleet. The research project "Management scenarios of fishing activities in the Brittany coastal fleet", funded by the Brittany region, has resulted in the constitution of a certain amount of data, including economic data on costs and earnings, at this regional level (Talidec et al., 2008). Regional analysis was also experimented in some other European countries, for instance in the south of Italy (Colloca et al., 2004).

At the European level since 2000, the data collection regulation (DCR) [1] obliges each member state to implement national programmes to collect biological and economic data on their fisheries including small-scale coastal fisheries. At this time, no precise making-up on the coverage and the quality of data collected through the DCR is provided. But the relevance of the topic is now broadly recognized for the fisheries management, testified by the recent study funded by the European Commission on the "small scale coastal fisheries in Europe". This study gathered six research institutes at European level and has concentrated its analysis on nine specific case studies where data were available (Guyader et al., 2007).

In the recent context of ecosystem approach of fisheries (EAF), the advantages of the small-scale coastal fleet are often underlined. First of all, the gears used are generally passive gears which are environmental friendly techniques compared to active gears. Also, the quality of the landed species is generally higher due to the freshness of the product correlated with the duration of the fishing trips which are mostly daily. Face to the increasing price of fuel and the depletion of some major European fishing stocks, the fleet dynamics raise again the necessity of efficient management systems in the coastal zone. Whatever these dynamics are the consequences of agent behavior in reaction to the economic context or the results of public policies, they suppose a rapid inventory of the current fishing activity in the coastal zone in order to ensure its monitoring within the defined management systems.

[1] Council regulation (EC) N° 1543/2000 of 29 June 2000; Commission regulation (EC) N° 1639/2001 of 25 July 2001; Commission regulation (EC) N° 1581/2004 of 27 August 2004.

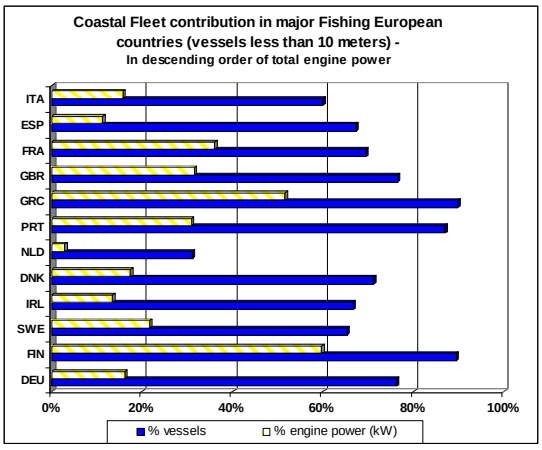
The definition of the small-scale coastal fisheries is difficult to address. “Small-scale” is typically associated with the size of the boat and the level and investment and “coastal” is seen from a geographical perspective, including a wide range of boat sizes (Charles et al., 2007). In this paper, we define the small-scale coastal fleet as the vessels spending more than 75% of their annual fishing time in the coastal zone and it generally refers in France to small size boat. Given the well-known crucial lack of official statistics for this segment fleet in all European countries, Ifremer has implemented a Fisheries Information System (FIS) in order to complement the official data. The FIS includes a large set of data which will be presented in this paper, plus economic data, collected each year by direct surveys on an optimized sample of vessels. These economic data are used to elaborate a “revenue model” in order to estimate the individual earnings of each national registered vessel, particularly useful for the small-scale coastal vessels. Economic performance indicators will then calculated in order to produce a first assessment of the importance of the small-scale coastal fleet in the North-Sea Channel Atlantic coast of France and to compare them with the other fleet segments of the French fisheries.

BACKGROUND

The importance of the small-scale fleet at European level

If we consider the 20 European coastal member states, 81% and 87% of each national fishing fleet is composed with vessels respectively less than 12 and 15 meters. If we consider only the less than 10 meters, it represents 75% of vessels, and finally less than 7 meters, more than half of each fleet.

Figure 1: Coastal fleet (vessels less than 10 meters) contribution in major Fishing European Countries – In descending order of total engine power



Source: based on the Community Fishing Fleet Register by Member State[2] published on the web site: http://ec.europa.eu/fisheries/fleet/, version 16/06/2008.

[2] This directory of vessels contains a description of all vessels Commission Regulation (EC) No 26/2004 of 30 December 2003). The data used from each MS Fleet Register are:

* Administrative identifications: country, vessel code, port.
* Technical characteristics: length, nominal engine power, main and second fishing gear

Fig.1 is focusing on the 12 most important countries in terms of fishing capacities (measured with engine power). In 2006, Italy is the first one with 1.20 millions kW, before Spain (1.12 millions kW) and France (1.09 millions kW). For these 12 countries, with the unique exception of the Netherlands, the vessels less than 10 meters represent at least 60% of the total number of fishing vessels. For Greece, Portugal and Finland, this percentage is over 80%. On the other hand, the less than 10 meters fleet represents a low proportion of the total kW in each country, with the exception of Greece and Finland where this contribution is over 40%.

A crucial lack of data

The Common Fisheries Policy has mainly relied on the available data on vessels over 10 meters. First, the regulations on log books[3] are only mandatory for vessels over 10 meters. And yet, the log books provide precious data on catches and effort (gears used and fishing areas) at the level of the fishing trip. Moreover, the Vessel Monitoring System (VMS) is now only mandatory for vessels over 15 meters. Finally and particularly in France, land in auctions is not mandatory while the Auction Network provides a wide range of sales data. Unfortunelatly, it is well-known that a significant part of outlets of the small-scale vessels are generally direct sales and not cross the channel of auctions.

In 2006, the set of landings available data through logbooks, fishing or other auction sales forms only concerns 80% of the vessels less than 10 meters. Moreover, it often not covers the entire yearly activity of these vessels depending on the species landed or the fishing seasons. Finally, the official dataset only covers 60% of the total fishing effort of this less than 10 meters fleet, measured with the total number of months per vessel. In order to overcome this data issue on small-scale vessels, the European Union is calling for a complete coverage of fleets in its recent Data Collection Regulation, whatever their size or their fishing activity as long as they fish one day per year. It is up to the member states to implement appropriate data collection program to improve their knowledge on small-scale coastal fisheries.

MATERIAL AND METHODS

In 2000, Ifremer implemented a Fisheries Information System (FIS) in order to complement the official data on marine resources and their users and to answer to the DCR. The database belongs to the FIS was used to calculate activity and economic indicators on the status of small-scale coastal fisheries in the beginning of 2000's. The reference period goes from 2000 to 2006.

The Fishery Information System of Ifremer

The Fisheries Information System (FIS) is a permanent, operational and multidisciplinary national network for the observation of marine resources and their associated uses[4]. The FIS aims to provide a comprehensive view of "fishing system" including their biological, technical, environmental and economical components, for scientific purposes. The objective

[3] Commission Regulation (EC) N° 2807/83 of 22 September 1983 ; Commission Regulation (EC) N° 2737/1999 of 21 December 1999 ;

[4] For further details, see Leblond, et al. 2008.

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 FIS approach is national and the monitoring network covers the whole coasts of North-Sea, Channel, Atlantic and Mediterranean Sea (Corsica excepted) and includes the overseas islands. The FIS is one of the rare fisheries information systems interested in the whole French fleet, including small scale vessels. The whole professional fishing fleet is taken into account and the network is spreading out to recreational fishing. A network of observers distributed along the French coasts collect data, in close relationship with the fishermen.

The FIS has adopted a multidisciplinary and statistical approach relying on the collection of different kings of data by different processes:

- Administrative data, fisheries statistics (landings, sales, log-books…) and follow up of the activity of the fleets
- Economics data, collected by survey
- Biological sampling of landings (in auction sales room)
- Observation and sampling of catches (landings and discards) aboard fishing vessels
- Scientific survey aboard oceanographic research vessels

To further an integrated analysis of the fishing system, the FIS is building a single data management system, *Harmonie*. While the data is inherently wide-ranging, 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[5] .

Harmonie has been used for the present assessment of the French Coastal fleet and specifically official data from the French ministry of Fisheries and surveys data from Ifremer observers):

- Capacity and features of vessels from the Fishing fleet register
- Annual landings per vessel from Auction sales
- Monthly Fishing activity and Effort per vessel from Ifremer Activity surveys (exhaustive data collected for each vessel belonging to the Fishing fleet register)
- Economic data from Ifremer Economic surveys

Regarding Ifremer Activity surveys, Ifremer has carried out a comprehensive survey consisting of an exhaustive collection of annual activity calendars for each vessel present in the Fishing fleet register[6]. This census aims to compensate the lack of complete information regarding activity of the vessels in the official declarative landings statistics. Month per month, the métiers practiced by a given vessel during the year are registered and followed up. By métier, we mean the use of a gear, to target one or several species, in a given fishing area. This set of information allows the elaboration of fleet typologies, whose principle consists in bringing together vessels that have similar exploitation strategies (same metier or same combination of metiers).

[5] For further details, see Harscoat, V., et al. 2008.

[6] For further details, see Berthou, P., et al. 2008.

The collection of Economic data

Since 2000, the Ifremer Fisheries Information System makes yearly surveys on a sample of 800 fishing vessels to collect individual data on costs, earnings but also capital and employment. The vessel owners are questioned on their fishing activity, the related earnings and costs but also more specifically on the features of their fishing vessel (s) and its components (hull, engine, gear and winches, electronics, storage) and their related prices (historical, replacement or market).

The questionnaire is organized in 9 parts:
1/ General information about the respondents (ownership of the vessel, maritime qualification, level of schooling and family implication in the fishing activity…)
2/ Fishing activity (métiers, fishing areas, duration and number of trips…)
3/ Vessel Equipment (cost of acquisition and maintenance of fishing gears and desk machinery)
4/ Earnings and costs (landings in value, operational costs in detail – fuel, oil, food, landings, insurance premiums, repairs and maintenance…)
5/ Detailed information on the vessel (physical features, purchasing price, insurance value, estimated second-hand market value…)
6/ Equipment aboard (engine, electronic, storage…)
7/ Crew and salaries
8/ Diversification of activities
9/ Conflicts of use

To get reliable economic indicators covering the whole French fishing fleet, the sampling plan is optimized[7]. This "Sampling plan optimization" is a fundamental step to ensure a minimum precision level for economic indicators. It estimates the optimal size of the sample per group of vessels or segments considered [8] and define which vessels have to be interviewed in each group.

Under some statistical assumptions not detailed here, the minimum size of the sample can be estimate with the following equation.

Equation 1: The minimum size of the sample for the collection of economic data per fleet segment

$$n = \frac{4S^2}{(LY)^2 + \frac{4S^2}{N}} = N\frac{1}{1+\frac{N(LY)^2}{4S^2}} N\frac{1}{1+\frac{NL^2}{4CV^2}} \quad \textbf{(Eq.1)}$$

With n, the sample size, N, the population or segment size, CV, the coefficient of variation of the parameter of interest Y, S, its standard deviation, L, the required precision.

[7] This optimized sampling plan is also described in Van Iseghem and al. (2004).
[8] Vessels are regrouping in strata regarding their exploitation strategies and their sizes. This information belongs to the Fleet Register and the Ifremer activity surveys.

A rapid analysis of the formula shows some aspects of interest; “greater” precision implies a larger sample rate, higher variability of the parameter of interest leads also to a larger sample rate. Finally, smaller segment implies a larger sample rate. The coefficient of variation is an estimated with the results of the Revenue Model. The total sample size is then estimated each year before the start of the data collection. It represents about 15% of the population but is very variable between segments. Indeed, in each group of vessels this percentage is all the more important as the coefficient of variation is important and all the more important as the group is small.

In order to determine which vessel has to be interviewed in each group of vessels, the systematic random sampling algorithm is applied inside each segment to ensure spatial and length representatively of the sample (Tillé, 2001). The list of vessels is firstly ordered by maritime districts to ensure spatial coverage and by vessels length inside each maritime district to ensure length coverage. The sample size inside each group of vessels has been estimated (Eq.1). A random number is pulled to identify the first vessel of the sample. Vessels are then pulled at regular intervals so that the number of vessels pulled at the end of the list equals the sample size estimated with equation 1 (Eq.1).

The resulting theoretical sample is representative of the French fishing fleet in terms of spatial and vessel length distribution. Even if some differences appear each year between theoretical and collected sample, the collected sample remains satisfactory to get reliable estimations of economics indicators.

The “Revenue” model

Based on the data from the FIS, a model is built to estimate the Revenue of each fishing vessel, called “Revenue model”. A first version of the Revenue Model has been described in Daurès et al. (2003). Additional variables and the stability of the model over years are here apprehended.

The “Revenue” model is based on explanatory variables available for each vessel in the Fishing fleet register and the Ifremer activity database; the production factor considered is the Capacity (length of vessel x crew size) multiplied by the Intensity of fishing in months. The other explanatory variables are the age of the vessels, a polyvalence indicator of the vessel, the group of vessels (fleet) to which it belongs and the geographic location (Region) of the vessel. The stepwise procedure has been used to estimate the parameter relative to each variable. Results are presented on table 1.

Table 1: Variables selection in the "Revenue" Model - Result of the stepwise procedure

	Variables selection in the "Revenue" Model Result of the stepwise procedure				
	2002	**2003**	**2004**	**2005**	**2006**
(Intercept)	***	***	***	***	***
Production Factor (Pfact) : Capacity * Intensity	***	***	***	***	***
AGE	***	***	***	***	***
POLY			*	*	***
Fleets	SE(**);Caha(*)	DR(**);Fiha(*);DI(*)	FI(*);Fica(*);DI(*)	SE(*);TA(**);Fica(**); CAS(**)	SE(***);DR(**);FI(***);Fica(***);CAS(***); Caha(**);HA(*);DI(**)
Sub Region	AQ(***);BN(*);NB(*);NPC(**)	AQ(***)	BN(*)	AQ(*);NB(**)	AQ(**)

***** : 2-tailed Significance < 0.1%; ** : <1%; * <5%**

Production Factor : nb fishermen embarked*length of vessel*indice of activity of the vessel

AGE : age of the vessel ; POLY : indice of the polyvalence of the vessel

SE : seiners, DR : dredgers, TA : glass eel, FI : netters, Fica : netters-potters, Fiha : netters-liners, CAS : potters; Caha : potters-liners; HA : liners; DI : miscellaneous

AQ : AQuitaine ; BN : Basse Normandie ; HN : Haute Normandie ; NB : Bretagne Nord ; NPC : Nord Pas de Calais ; PC : Poitou Charente ; PL : Pays de Loire

ln(CA)=5.34+0.88 ln(Pfact) -0.08 ln(Age)

All coefficient are significant at less than 1%

Multiple R-Squared: 0.8538, Adjusted R-squared: 0.8532

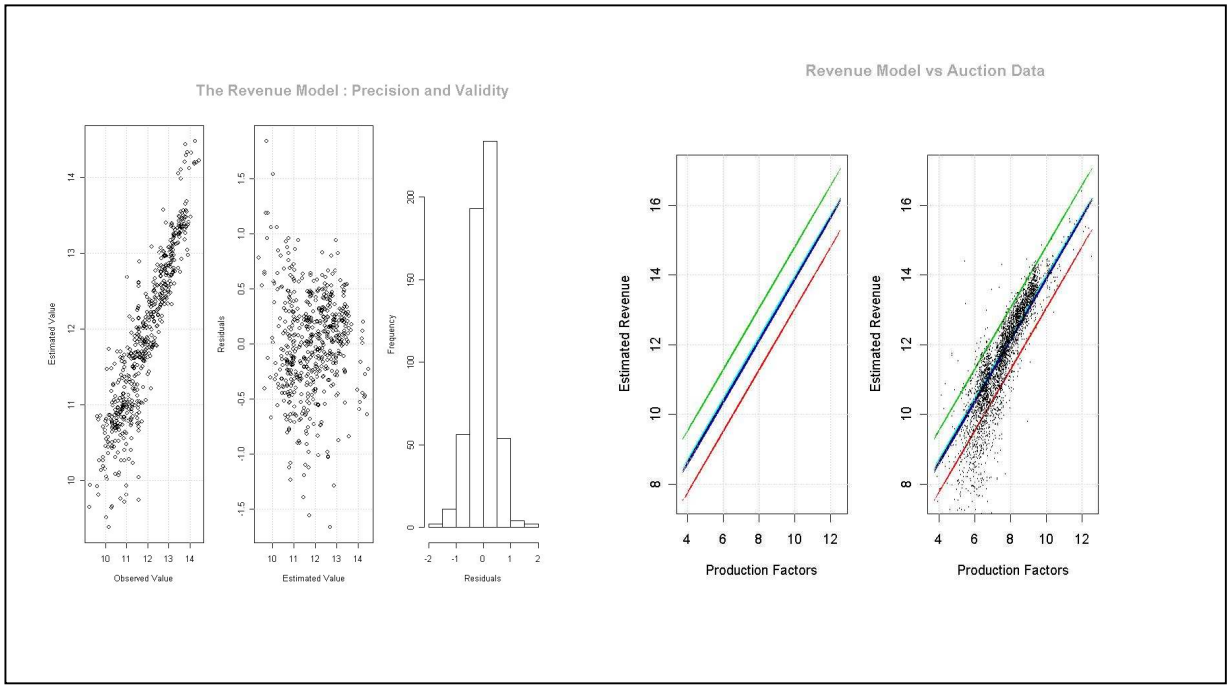
F-statistic: 1454 on 2 and 498 DF, p-value: < 2.2e-16

The precision of the model is improved when fleets and regions are included into the model, especially for group of vessels belonging to the fleet and region considered. Only the two variables production factor and age have a significant effect over years.

Since the stability of the model is considered as a key aspect of the model, the “stable” model has been considered. It includes as explanatory variables the production factor and the age of the vessel. Confidence intervals have been estimated to get an indicator of the precision of the model (cf. fig3 -left). This precision is satisfactory even if it could be improved further.

Figure 2: Revenue Model - Precision and Validity

Figure 3 : Revenue Model vs Auction data



This model is a log-linear model fitted by least squares estimates. Regression diagnostics have been applied to ensure that the fitted regression model adequately represents the data. The normal distribution of the residuals and the stability of the error variance are presented on the figure 2.

The Final Estimation of the annual earnings per vessel is the result of the comparison between auction sale data and the "Revenue" model (cf. fig2 -right). If the annual auction sale data is below the confidence interval of the "Revenue" model, the estimated earning equals the estimation of the model; otherwise it equals the auction sale data.

RESULTS

Considering the reference period from 2001 to 2006, individual data from the FIS provide in a first step some global features of the French Small-scale fleet in the beginning of the 20th century. In addition, the revenue model is used to assess the total earnings provided from the coastal vessels. Finally, the use of the costs data of the FIS makes possible the assessment of total and per fleet gross value added and direct employment in the small scale fisheries.

Global features

A small-scale coastal vessel is defined as a vessel spending more than 75% of its fishing time within the 12 milles coastal area. Sometimes, the term "coastal vessel" is used in place of the "small-scale vessel".

Table 2: Key figures for the North Sea – Channel – Atlantic (NSCA) Coastal fleet in 2006

	Number of vessels	Number of crew members	Engine power
Coastal fleet	2 471	4 462	240 139
% in the NSCA Fleet	71%	46%	36%

Source: IFREMER, DPMA.

In 2006, the French Coastal fleet on the North Sea – Channel and Atlantic (NSCA) coast accounts for 2 471 vessels, 4 462 crew members and 240 139 kW. This contributes to 71% of the total number of the French vessels belonging to the NSCA Coast, 46% of the total crew members and 36% of the total capacity, measured with the engine power developed by the vessels.

The average technical characteristics of the coastal vessel describes a vessel of 9 meters long, with an engine power of 97 kW, 2 crew members on board (including the owner-skipper) and 2 different gears used per year.

Figure 4: Number of vessels per length class and range of activity (2006)

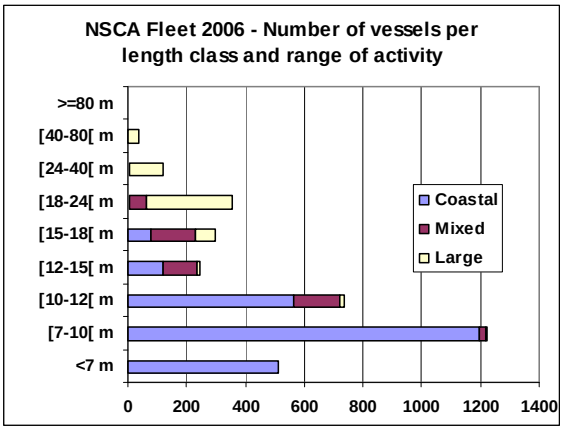
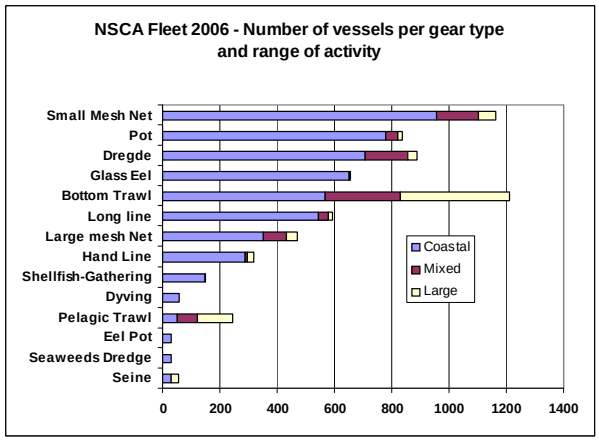


Figure 5: Number of vessels per gear type and range of activity (2006)



Source: IFREMER, DPMA

The NSCA Small-scale coastal Fleet is mostly composed with vessels less than 12 meters while it appears that some vessels between 12 and 18 meters have a coastal activity (fig. 4). The definition of a coastal vessel only on the basis of its length and without information on its range of activity seems very doubtful regarding the figure 4. While it is obvious that vessels less than 7 meters have an exclusive coastal activity, from a boundary of 10 meters, things become more shade.

A major characteristic of the NSCA Coastal fleet is the diversity of gears used by the vessels compared to non coastal vessels (fig. 5). On the basis of the 14 mostly used gears within the French fleet, the figure 5 shows that in number of vessels, the coastal fleet is dominant whatever the gear considered, with the exception of the pelagic trawl. While the large vessels

is mostly concentrated in trawl activity (bottom or pelagic), nets, pots, dredges, glass eel, bottom trawl and long line are used at least once a year by more than 400 coastal vessels along the NSCA coast in 2006.

Earnings

In 2006, the NSCA Coastal Fleet generated total landings for an amount of 282 millions euros, contributing at 29% to the total earnings of the NSCA Fleet. This estimate is derived from the comparison between individual estimates provided by the revenue model and auction data when exist, as explained above.

Economic data from the FIS provide estimates on the intermediate costs[9] for a significant sample of vessels covering all range of activities (coastal, mixed or large). Therefore, the total Gross Value Added (GVA) generated by the NSCA coastal fleet in 2006 is 181 millions euros, representing a contribution of 35% to the total GVA generated by the NSCA Fleet.

Figure 6: Total earnings per fleet in 2006 (millions euros)

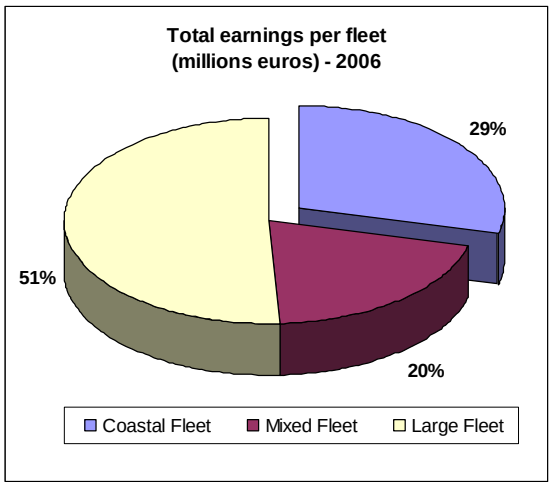
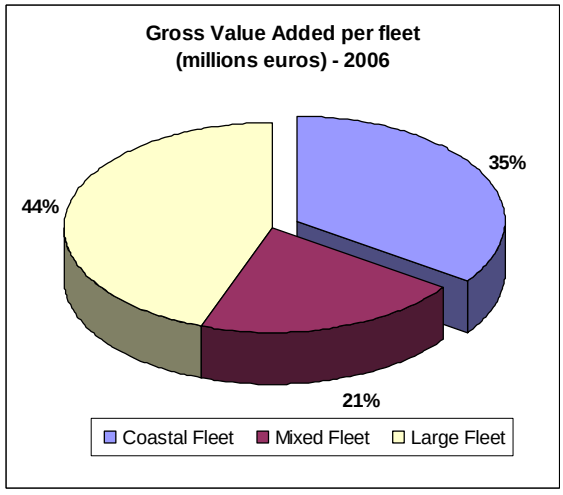


Figure 7: Total gross value added per fleet in 2006 (millions euros)



Source: IFREMER

The relative share of the fleet segments is different according to the economic indicator. The importance of the large fleet is unquestionable considering the total landings. As soon as we are looking to the Gross value added, the contribution of the different segment fleets to the total wealth generated by the fishing sector become more or less similar (fig. 6 and 7).

The "Revenue Model" allows getting a more reliable estimate of the economic status of the whole French fleet. Thus, the official sales data amounts the total earnings of the NSCA fleet at 830 millions euros in 2006 with a contribution of the Coastal fleet estimated at 207 millions euro. According to the revenue model estimates, the total earnings of the NSCA entire fleet are straightened up by 21% and by 30% for the Coastal fleet.

[9] Fuel, Landings, Maintenance and Gear costs are he main intermediate costs.

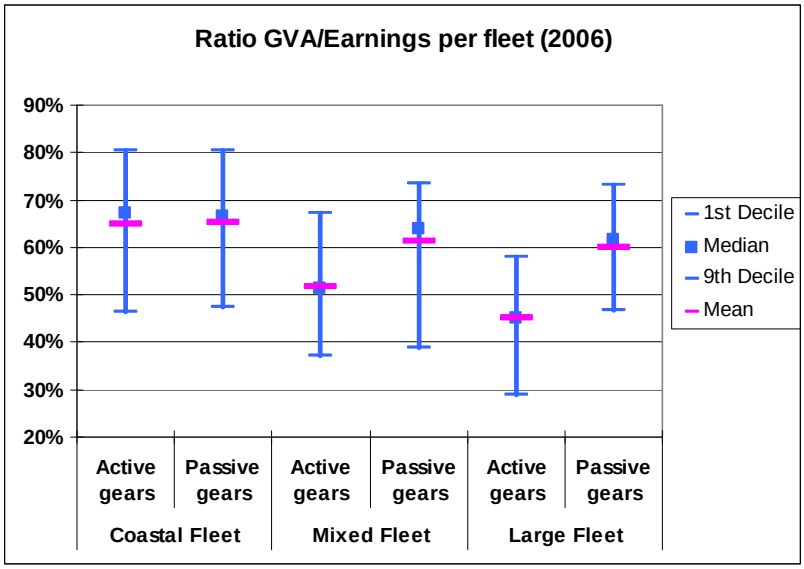
Within the coastal fleet, the re-assessment provided by the revenue model are particularly significant (more than 30%) for the vessels using active gears like dredge and glass eel trawl, and passive gears like pot.

The origins of earnings of the Coastal Fleet are much diversified compared to large vessels where 86% is coming from trawlers. This result is in accordance with the diversity of gears used as shown in the figure 5. However, while nets and pots are the two first gears used, this hierarchy is inverted considering the earnings. Finally, the active gears are generating almost 60% of the total earnings of the NSCA Coastal fleet: 97 millions euros from trawlers, 67 millions euros from vessels using other active gears like dredges or glass eels, 66 millions euros from netters and 52 millions euros finally from seiners and vessels using other passive gears.

Economic performance and Productivity of inputs

A first indicator of the economic performance of a sector is the Gross Value Added per earnings ratio. This ratio has been estimated at 64% for the NSCA coastal fleet in 2006 meaning that 100 euros of landings generated 64 euros of wealth for the rest of the economy, everything equals elsewhere. There is some variability among small-scale coastal vessels as 10% of them are registering a GVA per earnings below 46% (1st decile) and 10% above 80% (9th decile).

Figure 8: Gross Value Added per earnings ration per segment fleet (2006)



Source: IFREMER

Within the NSCA coastal fleet, there is no significant difference between vessels using passive and active gears (fig.8). As long as the range of activity increase and hence the size of the vessels, a strong difference appears between vessels using active and passive gears in terms of productivity. The ratio remains lower for vessels using active gears whatever the range of activity.

The GVA per earnings ratio is decreasing with the range of activity. However, the slope of the GVA per earnings is more accentuated for vessels using active gear compared to those using passive gears.

The labor productivity, firstly measured with the ratio GVA per crew member, was around 41,000 euros in 2006 for an average NSCA coastal vessel. This ratio increases in average with the range of activity of the vessels from 51,000 euros for mixed vessels to 72,000 euros for the vessels fishing outside the coastal zone. A more accurate measure of the labor productivity should refer to the activity of the labor force instead of its number. Therefore, the denominator should include the work duration and an indicator of the intensity of activity depending on the range of activity. Although no precise data exist on labor intensity and duration, some elements show that it is increasing with the range of activity of the vessels and could modify the labor productivity in favor of coastal vessels.

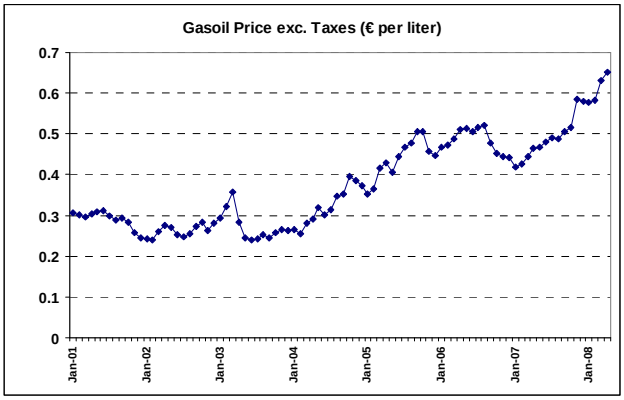
The capital productivity (GVA / Capital invested) is measured based on the insurance value of vessels collected through economic surveys. This insurance value is easy to obtain and is generally used as a proxy of the price of the vessel on the second-hand market. In some specific cases, specifically for relatively new vessels, the insurance value better reflects the historical price (or building price) of the vessel than its estimated price on the second hand market (Daurès, 2006). For very small old vessels, this value could be considerably low and over assessed the capital productivity of the vessel. Hence, the average value of 1.3 euros per euro of capital invested should be considerer with cautious given the high dispersion of the individual values (1st decile=0.3 euros, Median=0.7 euros, 9th decile = 2.2 euros). The results are less variable for the mixed and large fleet, in average around 0.6 euros for both.

DISCUSSION

The effects of the increasing trend of fuel prices

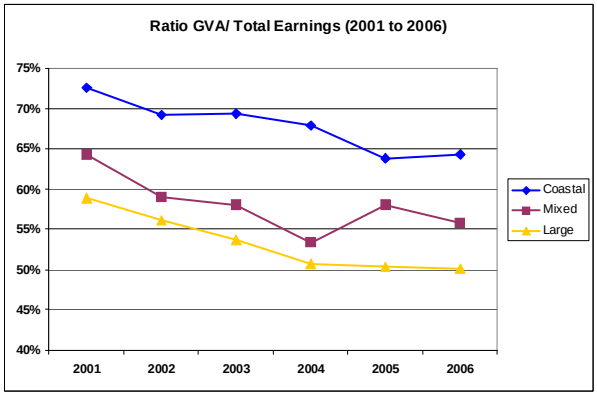
Since the beginning of 2004, the price of fuel registered an increasing trend which has negative consequences on the economic performance of the fishing fleets all over the world.

Figure 9: Trend in fuel prices, excluding taxes from the beginning of 2000 (euro/liter)



Source: Min. Economie, Industrie et Emploi

Figure 10: Trend in GVA per earnings from 2001 to 2006



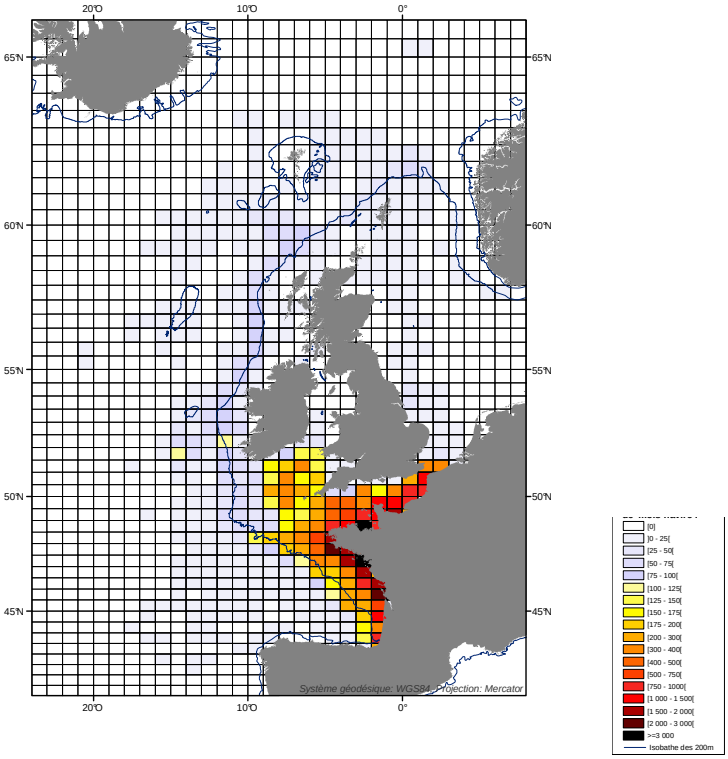
Source: IFREMER

Faced to the increasing fuel prices, the GVA / Earnings ratio is decreasing over the period and goes from 73% in average in 2001 to 64% in 2006 for the coastal fleet. This decreasing trend is registered for each segment fleet notably during the period 2001-2004. In the beginning of 2004, a "Fund for the prevention of risks to fishing" was implemented in France in order to limit the impact of the rising fuel cost in fisheries. Stopped in 2007 because of non consistency with the European common policy, these subsidies explain the observed stable GVA per earnings for the mixed and large fleets from 2004 to 2006.

However, at the same time, the gross fuel costs have greatly increased for all the fleets, particularly the large fleet, where the share of the fuel costs in total earnings exceeds 20% for large trawlers (Le Floc'h et al, 2007; Planchot et al., 2008).

Without compensation and in this context of increasing trend of fuel prices, one is expected some fleet dynamics towards the coastal zone where the fishing activity is already intensive as shown in the figure 11.

Figure 11: Spatial distribution of the NSCA fleet's fishing effort, in number of vessels * month (2006)



Source: IFREMER, DPMA

Based on the total number of activity per vessels and per fishing areas collected through the annual activity calendar, cartography of the spatial distribution of the fishing effort was produced highlighted the intensity of the fishing activity close to the French coast (fig.11, dark red).

An obvious consequence of the increasing of fuel costs should be in the increase of the intensity of the fishing activity in the coastal zone compared to the large seas. The increasing competition will certainly lead to overcapacity and rapid degradation of economic performance for all vessels, including small-scale vessels. The key and urgent issue seems to be found in the definition of appropriate fisheries management systems (Guyader, 2007) and particularly in the introduction of rights based management in order to overcome the overcapacity problem (Beddington, 2007).

REFERENCES

Bolopion, J., A. Forest, et al. (2000). « Rapport sur l'exercice de la pêche dans la zone côtière de la France », Ministère de l'Agriculture et de la Pêche**:** 113 p.

Beddington, J. R., D. J. Agnew, et al. (2007). "Current problems in the Management of Marine Fisheries." Science **316**: pp 1713 - 1716.

Berthou, P., F. Daurès, et al. (2005). « Some considerations about Small-scale Coastal Fisheries in Europe ». European Commission Workshop on Small-scale Fisheries, 12-16 September. Kavala (Greece).

Berthou, P., C. Talidec, et al. (2006). « Coastal fishing fleets of Brittany (France): characteristics and evolutions since 1990 ». International Workshop on Regulating Access to Marine Fisheries in the Coastal Zone - AMURE Research Group, Brest, January.

Berthou, P., O. Guyader, et al. (2008), “From fleet census to sampling schemes: an original collection of data on fishing activity for the assessment of the French fisheries”, Communication to ICES Annual Science Conference 2008, 22-26 September, Halifax (Canada), session K.

Charles, A. T., S. Salas, et al. (2007). "Evaluation and management of coastal fisheries in Latin America and the Caribbean Preface." Fisheries Research 87(1): pp 1-4.

Colloca, F., V. Crespi, et al. (2004). "Structure and Evolution of the artisanal fishery in a Southern Italian coastal area." Fisheries Research **69**: pp 359-369.

Daurès, F., S. Demanèche, et al. (2003). « Methodology for the assessment of aggregated economic indicators in the fishing sector: estimation of a revenue function ». XVth Annual EAFE Conference, Brest.

Daurès, F., J. Bihel, et al. (2006). « Estimating capital value and depreciation of fishing fleets: application to french fisheries ». Proceedings of the 13th biennal conference of the IIFET, Porstmouth, July.

Guyader, O., P. Berthou, et al. (2007). « Small-scale coastal fisheries in Europe ». e. b. IFREMER, EC Report, FISH/2005/10**:** 440 p.

Harscoat, V., E. Leblond, et al. (2008). « A GIS interface to the French Fisheries Information System of Ifremer ». Communication in ICES Annual Science Conference 2008, 22-26 September, Halifax (Canada), session R

Leblond, E., F. Daurès, et al. (2007). « La Synthèse des Flottilles de pêche 2005 - Flotte Mer du Nord - Manche – Atlantique », IFREMER, SIH**:** 58 p. (http://www.ifremer.fr/sih)

Leblond, E., F. Daurès, et al., (2008). « The Fisheries Information System of Ifremer - a multidisciplinary monitoring network and an integrated approach for the assessment of French fisheries, including small-scale fisheries ». Communication to ICES Annual Science Conference 2008, 22-26 September, Halifax (Canada), session K.

Le Floc'h, P., F. Daurès, et al. (2007). « Analyzing fishermen behaviour face to increasing energy costs – A French case study ». ICES Annual Science Conference, Helsinki.

Planchot, M. and F. Daurès (2008). « Le secteur français des pêches maritimes face à l'augmentation du prix du gasoil », IFREMER, SIH**:** 19 p. (http://www.ifremer.fr/sih)

Talidec, C. et al. (2008). « Scénarios d'aménagement des activités de pêche dans la bande côtière bretonne », Ifremer - UBO (CEDEM) - Agrocampus Rennes**:** 245 p., première partie

Tillé, Y. (2001). « Théorie des sondages. Echantillonnages et estimation en populations finies », Dunod.

Van Iseghem, S., S. Demanèche, et al. (2004). « Optimization of a Sampling Plan for Economic Data Collection: Application to the Atlantic French Fleet ». XVIth EAFE Annual Conference, Rome.

Acknowledgments to the observers team of the FIS and the operational team of Harmonie database. Thanks also to Michele Jezequel for the maintenance of the specific economic database.