Assessing the economic status and the viability of the French fishing fleets in the Bay of Biscay from 2000-2007

Daurès, F., S. van Iseghem, O. Guyader, E. Leblond and C. Brigaudeau

Abstract

Management and monitoring of fisheries requires the availability of time series of economic indicators. Traditionally, wages and profits are monitored as they are considered key components for the understanding of fishermen behaviour and fleet dynamics. Furthermore, an ecosystem approach to fisheries can then be applied by integrating economic and ecological indicators and trying to highlight the interactions between these two components.

Such an integrated analysis of the joint dynamics of the fish community and fleets has been undertaken for the Bay of Biscay where exploitation is characterized by a large diversity of species and fleets. Economic indicators were calculated for the time period of 2000-2007 using data collected by Ifremer under the Data Collection Regulation.

Given the specific context of increasing fuel prices, results showed negative relationships between profits and wages and high differences in profitability between fleets, opposing coastal and larger vessels. These first results raise issues on the relevance of these traditional economic indicators and the definition of reference points to provide a diagnostic of the economic status of fisheries. This study also highlights the difficulties to estimate economic indicators given the weakness of the data sources and the specific structure of the fleet where most of the vessels are less than 10 meters. Finally, the use of data made available under the DCR for such integrated analysis is discussed.

Keywords

Economic Indicators, ecosystem approach to fisheries management, Data collection

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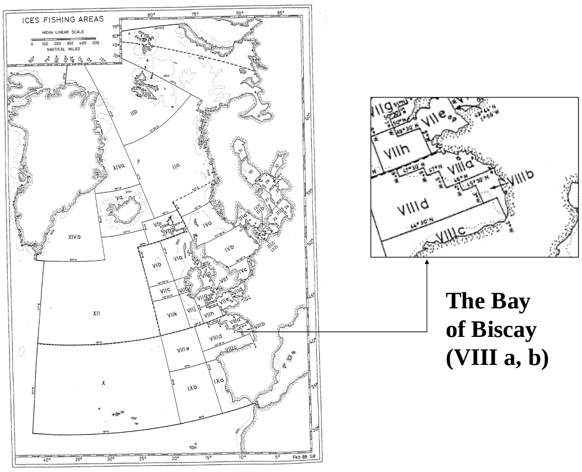
1. Introduction

Management and monitoring of fisheries, in particular to overcome the major issues of overcapitalization and overfishing in many of the world's fisheries, requires the availability of time series of economic indicators (FAO, 1999). This is still accurate under the recent Ecosystem Approach to Fisheries (EAF) paradigm (FAO, 2003; Garcia, 2005), aiming to more integration between economic and ecological indicators and trying to highlight the interactions between these two components.

Such an integrated analysis of the joint dynamics of the fish community and fleets has been undertaken for the Bay of Biscay under several research projects (ANR Chaloupe, EC project Image…). A model of the fleet(s)-stock(s) year-to-year dynamics is currently built (Rochet, 2009). The Bay of Biscay (figure 1) is a relevant case study for the implementation of EAF because of the location of several stocks, in interaction (predator-prey relation ship) and in different biological safety states (see the recent closure of the Anchovy fishery in the Bay of Biscay). Around 200 commercial species are registered in this area and 20 of them contribute to 80% of the total landings. The commercial exploitation of these stocks is made mainly by Spanish and French vessels with a high level of diversity and interaction of fishing strategies within the French national fleet (Daurès, 2009 in press). The management system of the Bay of Biscay is complex and gathers European measures under the current CFP (based on TAC, specific management plans per specie – Hake or Anchovy, selectivity measures…) coupled with national and local measures (licenses…). Under the CFP 2002, a "South Regional Advisory Council" was also implemented; this body expresses advices and submits proposals for the fisheries management in the Bay of Biscay.

Figure 1: The Bay of Biscay



The first step of the integrated analysis of the Bay of Biscay fisheries was the constitution and the analysis of time-series of biological and ecological indicators, derived mainly from fishermen log-books and scientific surveys (Rochet, 2009). These data need to be completed with accurate indicators on economic status and performance of the Bay of Biscay fishing fleets. Such exercises were recently undertaken at regional levels, for example in the Southern Adriatic Sea (Ceriola, 2008), in West African areas (Brinson, 2009) or formerly in the Channel (Boncoeur, 2000). For the Bay of Biscay, very few studies and often on particular fisheries were undertaken using economic indicators (Macher, 2008). To our knowledge, no broad analysis of the economic status and performance of the Bay of Biscay fleets exist at this time. Given the current context of some stocks depletion and the fleet interactions' within the Bay of Biscay, such information at this level becomes essential. The forthcoming CFP reform is another argument for the urgent availability of economic indicators to assess the impact of the future management measures.

Nevertheless, data availability for such exercise still remains an issue. In the middle of the 90's, the EU Concerted action on "Economic assessment of European fleets" was the first attempt at the European level to compile yearly economic data for significant fishing fleets (Anonym, 2005). In

2000, in order to “conduct scientific evaluation needed for the CFP” (p1, (4)), the collection of economic data was made compulsory for all the member states in their minimum programme stated by the Council regulation EC N°1543/2000 and later, through the Council Regulation (EC) No 199/2008 of 25 February 2008 “concerning the establishment of a Community framework for the collection, management and use of data in the fisheries sector and support for scientific advice regarding the Common Fisheries Policy”. Taking advantage of this new context, member states and national research institutes started to compile economic data on fisheries.

This study is an attempt to apply economic information collected under the Data Collection Framework (DCF) to an integrated analysis at a regional scale. Using per vessel transversal and economic data collected by Ifremer under its Fisheries Observatory System (FIS), indicators for the French fishing fleets of the Bay of Biscay were calculated for the time period of 2000-2007. The aim of this paper is to provide a first analysis of the Bay of Biscay fishery from the economic and social perspective and complement the biological and ecological indicators readily available (Rochet, 2009). Following the first results on the fishing methods and fishing fleet typology (Daurès, 2009 in press), the first objective is to describe the Bay of Biscay fisheries with relevant indicators describing the whole fishery but also the competing fishing fleets, their fishing strategies and their economic performance. This global and per fleet analysis aims to provide a better understanding of the current state of the fisheries and could constitute a benchmark for future analyses. In a second step, the trends of profit and wages during the period of 2000-2007 were analysed. The issue of the economic viability of some fishing fleets is addressed and discussed in this specific context of rising gas oil prices, stock depletion and given the heterogeneous strategies developed by the fishing vessels in the Bay of Biscay. Finally, we discuss the questions of the availability and the relevance of traditional economic indicators in this specific case study of heterogeneous vessels under the current Data Collection Framework.

2. Materials and methods

2.1 Data

Fisheries data (capacity, landings, costs and earnings) are made available for the period 2000-2007 under the Fisheries Information System of Ifremer (Leblond, 2008).

Data on capacity, landings and fishing activity

Data on capacity are census data coming from the European commercial fleet register. Capacity refers here to technical capacity, i.e. GRT, length, engine power of the vessel. The data are available at a yearly basis for the whole period and constitutes the base population of fishing vessels of the FIS. The base population for this study is composed with the French commercial vessels fishing (exclusively or mainly) in the Bay of Biscay and registered in the European commercial fleet register. In 2007, it concerns around 1,800 vessels (from 4 to 24 meters long) representing 34% of the French fleet (excluding overseas territories).

Landings data (auctions data and landings data through logbooks and fishing forms) are available for each vessel as far as they are documented by fishermen. Landings data concern here the amounts of landings in volume (kg) and value (euro), total and per specie. Particular attention was carried on the nine major species[1] landed in the Bay of Biscay (Daurès, 2009 in press).

In addition to capacity and landings data, available under the FIS of Ifremer thanks to an agreement with the French administration (The French Ministry of Agriculture and Fisheries), data on fishing activity (mainly information on métier practised by the vessel on a monthly basis) are collected with the help of the FIS harbour observers. These latest data are census data and useful completing capacity and landings data for the elaboration of fleet typologies (Leblond, 2008). According to its fishing distance from the coast and the fishing gears it uses during the year, each vessel is yearly affected to a specific Bay of Biscay fleet over the study period: 30 fishing fleets were already defined, putting in light the high diversity of the French exploitation of the Bay of Biscay fisheries (Daurès, 2009 in press).

Data on costs, earnings and other economic indicators on fishing vessels

In addition to data on capacity, landings, and fishing activity, economic data are collected on a sample of fishing vessels, selected through a systematic random sampling plan (Demanèche, 2004). From 2000, the Council Regulation (CE) N° 1543/2000 made compulsory the collection of economic data within all European member states each year. The methodology used by Ifremer to fulfil the specifications is based on an optimized random sampling plan and a questionnaire[2], organized in 9 parts (Daurès, 2008).

Data are captured in a dedicate software and the quality of the final database is ensured by a step by step cross-validation, using the whole Ifremer's Fisheries Information System database. Around 800 surveys are yearly made at national level and the average annual sample made available for the study accounts 270 vessels (14% of the French Bay of Biscay fishing fleet).

Other data

Fuel prices data as well as all other economic indicators (rates of government bonds, median salaries for instance…) are available through the Web site of the Ministry of Economy, Industry and Finance or the National Statistics Institute (INSEE).

2.2 Indicators and methods for the assessment of economic status and economic performance of the Bay of Biscay Fishery

Indicators used for the assessment of the economic status are detailed in the table 1 and rely on previous studies as Anonym, (2005) and Cériola (2008). They are derived from data available on capacity, effort and production including earnings and costs and present within the FIS of Ifremer. The employment is restricted to the crew on board and is calculated in Full Time Equivalent. The invested capital is measured with the insurance value of the vessel. Effort data (days at sea, number of engine hours per year and fuel consumption in volume) are collected beside costs and earnings data for the same sample of vessels. These questions are part of the economic questionnaire. On the basis of this first set of data, indicators on productivity and performance of inputs are calculated and interpreted to assess the economic status of the fishery.

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[1] Sardine, Anchovy, Hake, Cuttlefish, Nephrops, Sole, Monkfish, Seabass and Squid.

[2] The French version of the questionnaire is available within the Economic data collection module of the web site of the FIS (http//www.ifremer.fr/sih)

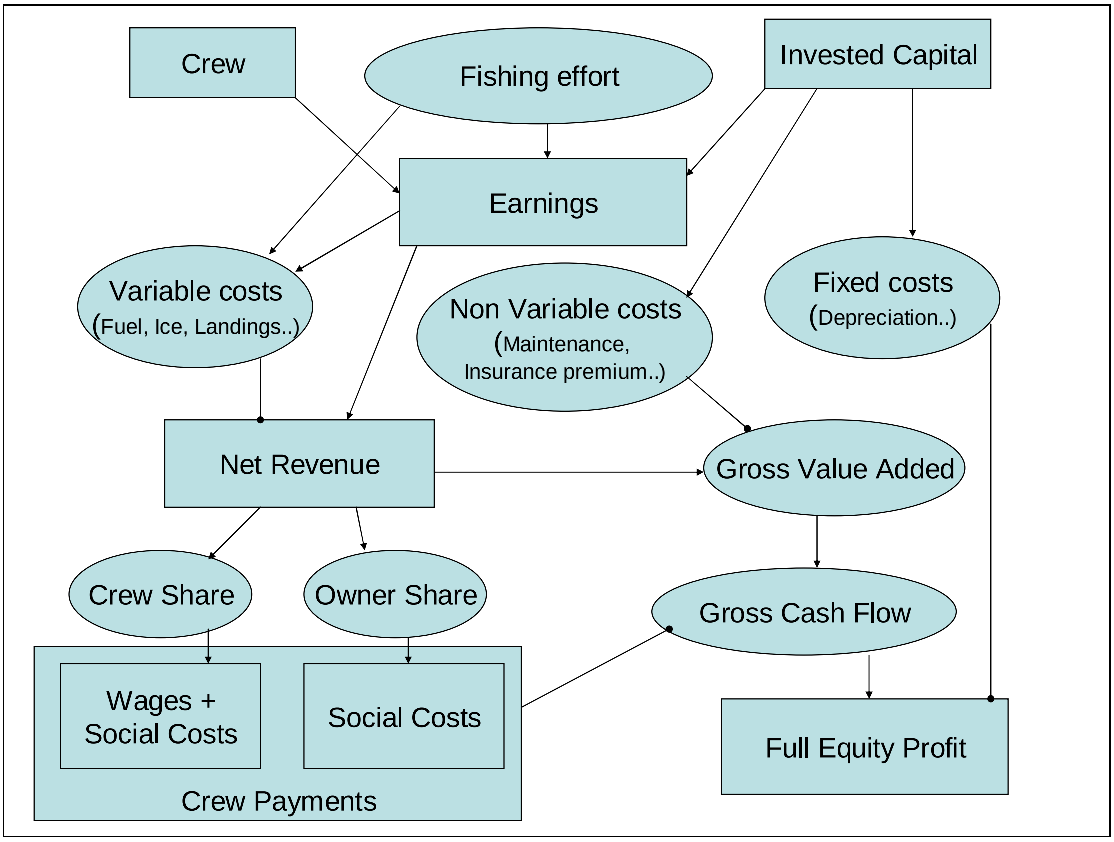
The productivity indicators are referring to the level of wealth created by the input used for the production process. They measure the efficiency in the use of the labour, the capital and the energy and could be comparing to other economic sectors or, within a fishery between alternative fishing fleets in competition. The first profitability indicator is the return on capital, traditional proxy of the attractiveness of an economic sector for investors, as it could be compare with levels available through alternative investments in other sectors (Davidse, 1997). Then, if other sectors provide greater returns on capital given the same level of risk, it would be expected an exit from the fishery (i.e. the opportunity cost of the capital), as far as the capital is easily transferable (Boncoeur, 2000; Withmarsh, 2000). On the employment side, the wage measures the attractiveness of the fishing sector for a person compared to alternative employment given the same level of skills and education and comparable working conditions (Jacobson, 1993). Apart from these usual indicators and according to the specific context of fuel prices increasing trend, specific indicators rely on the energy consumption are measured: the amount of the production in volume per litre of fuel (Land_kG/Fuel_liter) and the productivity of the energy (GAV per litre of fuel consumed). Finally, indicators of contribution per fleet are measured to have a better idea of their weight in the global fishery.

Table 1: List of fishery indicators for the economic assessment: on the left, the data provided from the Ifremer FIS database, available per vessel; on the right, the derived indicators.

Capacity	*Label*	*Productivity*	*Label*
Number of vessels	N	Gross value added per earnings (euros)	GAV/EAR
Engine Power (kW)	kW	Gross Value added per crew (euros)	GAV/CRE
Crew (in Full Time Equivalent)	CRE	Gross Value added per capital (euros)	GAV/KAL
Invested Capital (euros)	KAL	Gross Value added per crew (per day at sea) (euros)	GAV/CRE per Day
Invested Capital per Crew Member	KAL/CRE	Gross Value added per crew (per engine hour) (euros)	GAV/CRE per Hour
Effort		Gross Value added per litre of fuel (euros)	GVA/Fuel_liter
Days at Sea (Days)	DAY	*Profitability*	
Engine Hours (Hours)	Hour	Full Equity Profit / Invested Capital	PRO
Fuel consumption (litres)	Fuel_liter	Wage per crew member (euros)	WAG
Production		Other	
Earnings (euros)	EAR	Share in Total BB Earnings	EARShareBB
Landings (in tonnes)	Land_kG	Share in Total BB Gross Added Value	GAVShareBB
Average Price (euros/kg)	PRI	Share in Total BB Fuel Consumption	Fuel_lShareBB
Detailed costs (euros)		Landings per litre of Fuel	Land_kG/Fuel_liter

The derivation for the calculation of productivity, profitability and wages indicators is explained in Figure 2. Variable costs refer usually to operational costs depending on effort, for instance fuel Costs, Ice, Food and Bait costs. The costs from landings sea products in harbour are also comprised in this item (Anonym, 2005). Non variable costs are also operational costs and comprised repairs and maintenance expenses, insurance premium, gear costs and other miscellaneous operational costs. Fixed costs refer here to economic depreciation, not including the interest paid on the borrowed capital, in order to obtain the full equity profit, i.e. the profit that the boat owner would have received if there were no debt (Boncoeur, 2000). Crew and owner shares on the net revenue are the results of social agreements between the crew and the vessel owner. The crew wage is an average wage per crew member and not a seaman wage. This last indicator would have been preferable given the high diversity of the crew composition, but is not available at this time.

Figure 2: Derivation of measures of economic indicators – The arrow represents the relationship between two nodes. Positive links are expressed with a head and negative with a round.



Net revenue = Earnings – Variables costs
Crew payments = Wages + Social costs (paid both by the crew and the vessel owner)
Gross Value added = Net revenue – Non Variable costs
Gross Cash Flow = Gross Value Added – Crew payments
Full equity profit = Gross Cash Flow – Fixed Costs

The first step of the analysis is the global Bay of Biscay economic status. For that, all indicators of the table 1 were calculated per fishing fleets for the year 2007 in order to have the more recent information. Given the weakness of the samples for which economic information is available, it has been preferable to work at an aggregated fleet level and leave back the typology in 30 fleets issued from Daurès (2009 in press). The 30 fleets were aggregated into 12 fleets, named “aggregated fleets” according to the closeness between the vessels features in terms of gear used, distance of fishing grounds and length (table 2). At this aggregation level, the “economic” samples are always more than 4 vessels per fleet and the sample rate more than 10%. Moreover, the representativity of the population is confirmed by the results of Ttest on average technical features (engine power).

Table 2 List of fleets operating in the Bay of Biscay. 1 coastal fleets (<12 nm from coast), 3 offshore fleets (beyond 12 nm), 2 mixed coastal and offshore. For the calculation of aggregated indicators, fleets were grouped into twelve ‘aggregated fleets’.

Name Aggregated fleet [a)]	Aggregated fleet	Number of vessels	Economic sample	Sampling rate	Fleet Name	Code Fleet	Number of vessels	Economic sample	Sampling rate
Coastal Exclusive Trawlers	1T	71	11	15%	Coastal Exclusive Trawlers	1T	29	8	28%
					Coastal NephropsTrawlers	1NT	42	3	7%
Coastal Non Exclusive Trawlers *	1U	202	32	16%	Coastal Non Exclusive Trawlers [b)]	1U	202	32	16%
Coastal Dredgers *	1D	96	13	14%	Coastal Dredgers [b)]	1D	96	13	14%
Coastal Eel Sieves *	1G	342	45	13%	Coastal Eel Sieves [b)]	1G	342	45	13%
Coastal Seiners *	1S	28	7	25%	Coastal Seiners [b)]	1S	28	7	25%
Coastal Netters With Sole *	1F	83	10	12%	Coastal Netters With Sole [b)]	1NS	83	10	12%
Coastal Other Passive gears *	1X	526	98	19%	Coastal Netters	1N	43	1	2%
					Coastal Mixed Nets and Pots [b)]	1Q	102	21	21%
					Coastal Mixed Nets and Hooks	1E	26	5	19%
					Coastal Mixed Nets With Sole and Hooks [b)]	1ES	70	17	24%
					Coastal Potters [b)]	1P	56	10	18%
					Coastal Mixed Pots and Hooks [b)]	1F	47	7	15%
					Coastal Liners [b)]	1H	114	21	18%
					Coastal Others	1O	68	16	24%
Shelf Exclusive Trawlers *	2T	138	15	11%	Shelf Nephrops Trawlers	2NT	74	7	9%
					Shelf Bottom Trawlers [b)]	2BT	41	6	15%
					Shelf Mixed Bottom Pelagic Trawlers	2MT	20	2	10%
					Shelf Pelagic Trawlers	2PT	3		
Shelf Netters *	2F	58	7	12%	Shelf Netters With Sole [b)]	2NS	58	7	12%
Shelf Other vessels *	2X	83	17	20%	Shelf Non Exclusive Trawlers	2U	32	5	16%
					Shelf Liners	2H	16	1	6%
					Shelf Others	2O	35	11	31%
Offshore Exclusive Trawlers *	3T	83	11	13%	Offshore Nephrops Trawlers	3NT	20		
					Offshore Bottom Trawlers	3BT	46	8	17%
					Offshore Mixed Bottom Pelagic Trawlers	3MT	12	2	17%
					Offshore Pelagic Trawlers	3PT	5	1	20%
Offshore Other vessels *	3X	38	6	16%	Offshore Netters With Sole	3NS	14	1	7%
					Offshore Netters Other	3N	10	1	
					Offshore Others	3O	14	4	
Inactive vessels		79	0		Inactive vessels	I	79		

The Bay of Biscay global economic status in 2007 is derived from these per aggregated fleet indicators, given their respective weight in the global fishery. Global indicators are first of all provided and completed with data analysis per fleet. Specifically, a principal components analysis on per fleet indicators is made in order to identify similarities and/or dissemblance between fleets and their indicators. Given the high diversity of fishing methods (fishing fleets) in the Bay of Biscay, this analysis firstly aims to reveal how far the productivity and/or the economic performance of these fleets are similar or not. In addition, this kind of data analysis is also a useful mean to understand the relationships between all the variables.

The trends analyses from 2000-2007 are made on the basis of the former segmentation in 30 fleets according to the results on Bay of Biscay fleet dynamics analysis in Daurès (2009 in press). It was shown in this paper that between two years, most of vessel movements are concentrated among vessels which belong to the same “gear family” and use to go in the same distance range. Apart from revealing the apparent difficulty to transfer the capital anywhere in the fishery, it also point out some different trends in economic performance between fleets which were grouping in the same aggregated fleet in the former step. While this was not problematic for snapshot exercises, it would be not suitable for trends analysis. According to detailed 30 fleets’ level, the economic sample allows the calculation of indicators only for 12 fleets (10 coastal fleets, 2 shelf fleets but no offshore fleet) and among the thirty. The analysis is concentrated on the profitability indicators: profit and wages. Extreme values observed over the period were eliminated for the analysis.

First of all, the economic viability of fleets is measured by analysing the trends in the medians over the period 2000-2007. In parallel, traffic lights approach (Caddy, 2005; Ceriola, 2008) is used by using reference values on opportunity costs of capital and labour from the rest of the economy. The reference values differ among fleets, differentiating coastal fleets from the others. For the capital, the reference value is 4% for the non coastal fleets and 12% for coastal fleet. For the crew (in average), the reference value is the median wage of skilled worker (18,000 euros) for coastal fleets and of building site team leader (23,400 euros) for non coastal fleets.

3 Results

3.1 Economic status of the Bay of Biscay Fishery (table 3)

The total earnings generated by the 1,748 French active vessels fishing in the Bay of Biscay were estimated to 325 millions euros in 2007, with a boundary of +/- 20%. The total capital invested and the total crew deployed were respectively 226,000 kW and 3,827 persons. This capital invested was accounting around 350 millions euros. The average price of the 86,384 tonnes of sea products landed by the French Bay of Biscay vessels is 3.8 euros per kg in 2007, higher than the average national price of the fresh sea products estimated at 2.8 euros per kg in 2007 by OFIMER. The French Bay of Biscay landings represented around 30% of the national fresh landings in value and volume.

Table 3: The global status of the Bay of Biscay French fishing fleet (2007)

Number of vessels (active)	1 748
Total earnings (m€)	325
Invested Capital (m€)	352
Gross added value (m€)	188
Total crew (on board)	3 827
Total engine power (1,000kW)	226
Added Value/ Earnings (€)	0.58
Average price (€/kg)	3.8
Landings in tonnes	86 384
Added Value/ kW (€)	830
Added Value/Inv. Capital (€)	0.5
Added Value / Crew member (€)	49 099
Per day Added value / Crew member (€)	266
Per hour Added Value/Crew member (€)	24
Added Value / Fuel (€/litres)	2.1
Tonnes / Fuels (kg/litres)	0.9
Invested Capital/Crew (m€)	91 958

The gross value added per earnings rate is close to 60% which means that variable costs (including fuel costs) representing 40% of the total earnings. The table 3 presents some productivity indicators which can be compared with the rest of economy. For instance, the productivity of labour (estimated at almost 50,000 euros per man) or the capital intensity (almost 92,000 euros per man) are very close to the levels observed in some industries like car industries or outfit goods.

This general status hide the strong heterogeneity of the fishing fleets competing in the Bay of Biscay (Leblond, 2009). These fleets were already described in Daurès (2009, in press) regarding some technical characteristics and their economic dependency to the major commercial specie of the Bay of Biscay. Here, further economic indicators allow deepening the analysis. The table 4 presents average characteristics of these “aggregated” fishing fleets and demonstrate the high heterogeneity in fleets regarding their average earnings, invested capital (and engine power), crew on board and even the average price of their landings. Obviously, coastal fleets (with the code preceded with 1) are the one composed with vessels with the lowest engine power and number of crew and generate the lowest annual earnings than fleet composer with larger vessels. Within the whole coastal fleets, there are however strong differences between a group of seasonal fleets (1G and 1D) and the others. The earnings ratio between coastal vessels using passive gears (1X) and coastal exclusive trawlers (1T) is around 3.

Table 4: Average characteristics of “Aggregated fleets” (2007)

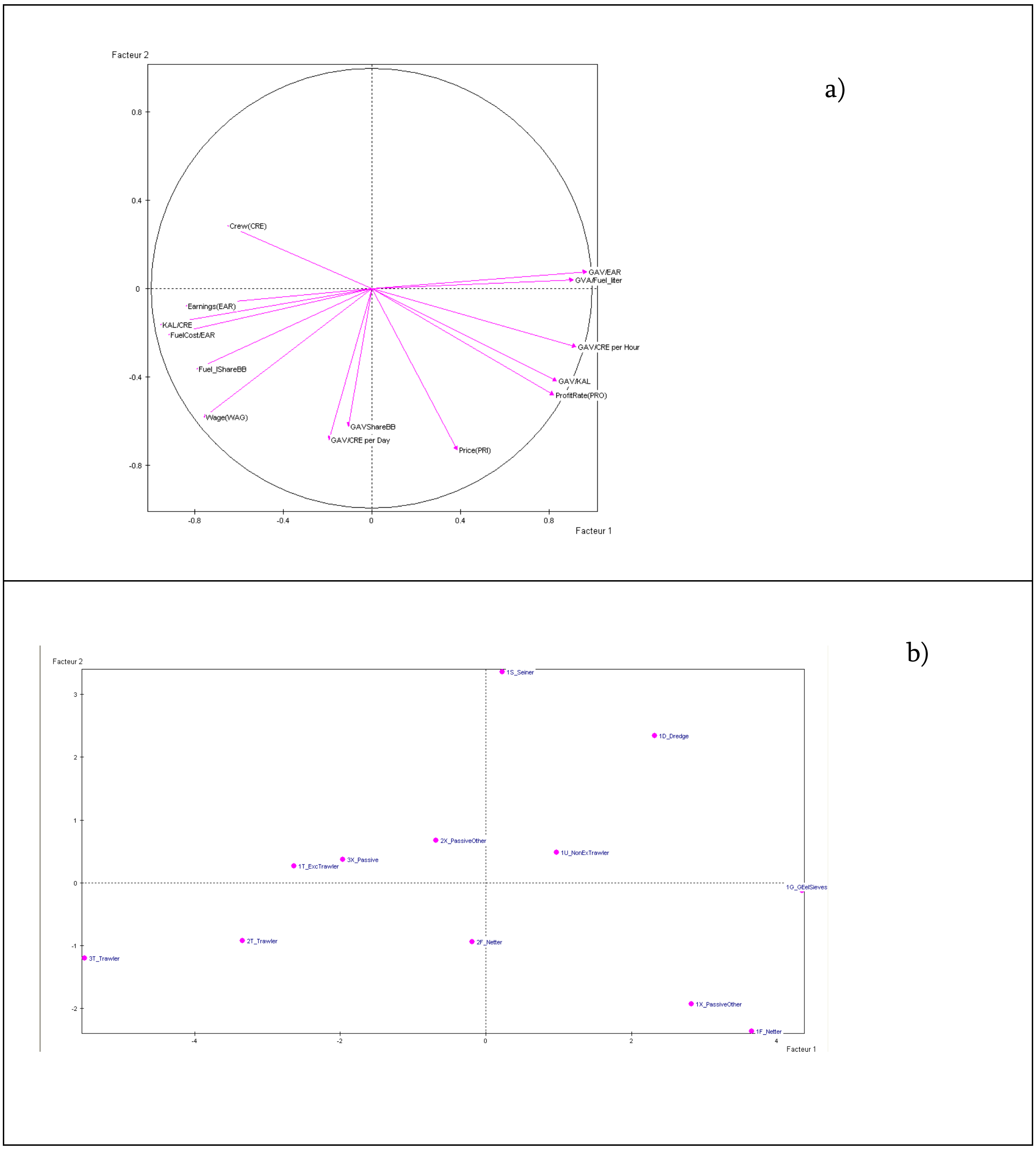
Fleet Name	Earnings (€)	Invested Capital (€)	Crew	kW	Price (€/kg)
1G_EelSieves	64 975	49 487	1	59	5.5
1D_Dredge	82 027	100 462	2	101	4.4
1X_Passive	104 086	100 966	2	85	5.4
1U_TrawlerNonExcl	130 012	140 239	2	99	4.0
1F_Netter	151 800	106 630	2	106	6.9
1S_Seiner	286 157	411 000	5	200	0.5
1T_TrawlerExclusive	333 445	407 455	3	212	3.4
2X_Passive	272 345	332 488	3	163	3.6
2T_Trawler	363 566	466 330	3	256	4.4
2F_Netter	416 864	388 068	4	210	7.1
3T_Trawler	581 076	703 182	4	345	3.5
3X_Passive	635 172	573 225	6	340	4.8

Currently, the invested capital is above the annual earnings with the exception of netters, whatever the distance from the coast of their fishing grounds. Average earnings per fleet show slight differences with annual published data per fleet from the FIS (Leblond, 2009) due to the inexact correspondence between the vessel length and the distance of the fishing grounds from the coast. For instance, the FIS synthesis underlines a significant number of exclusive trawlers less than 12 meters fishing also above the 12 nm and present in our typology in the 2T fleet. Apart from earnings, strong differences exist between the inputs deployed by each fishing method, specifically within the coastal group where more data are available for this study. A ratio of 4 in the capital invested is observed between the a first sub-group of coastal fleets composed with 1D, 1X, 1U and 1F and a second one with 1T et 1S while non such differences are observed in the crew size even if 1S currently requires 5 persons on board in FTE more than 1T (3 persons).

Strong differences are also appearing in average prices and the larger range is observed between the 2F with an average price of 7.1 euros per kg in 2007 and the 1S with 0.5 euros per kg. These two fleets are highly dependent on 1 specie, the sole for the first one which is valuable specie and the sardine for the second one, not so valuable specie.

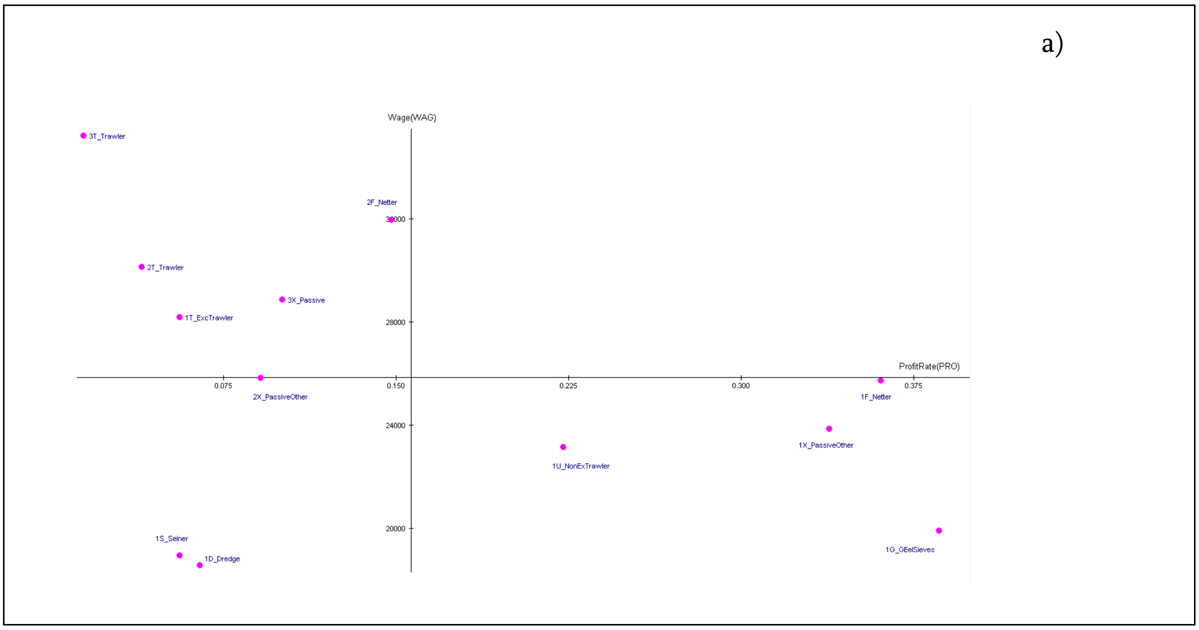
The principal components analysis shows a clear opposition between size of production and inputs variables (EAR, KAL/CRE) and their productivity (GAV per earnings, GAV per capital, GAV per crew per hour, GAV per fuel litre) and profitability (PRO) under the first factor (figure 3a). The first factor explains almost 60% of the inertia. Moreover, high correlations exist between size of production and inputs variables on one side and energy dependency (FuelCost/EAR) on the other. The second factor explains 18% of the inertia and show strong proximities between high prices (PRI), high daily labour productivity (GAV/CRE per Day) and high contribution in the total GAV in the Bay of Biscay (GAVShareBB).

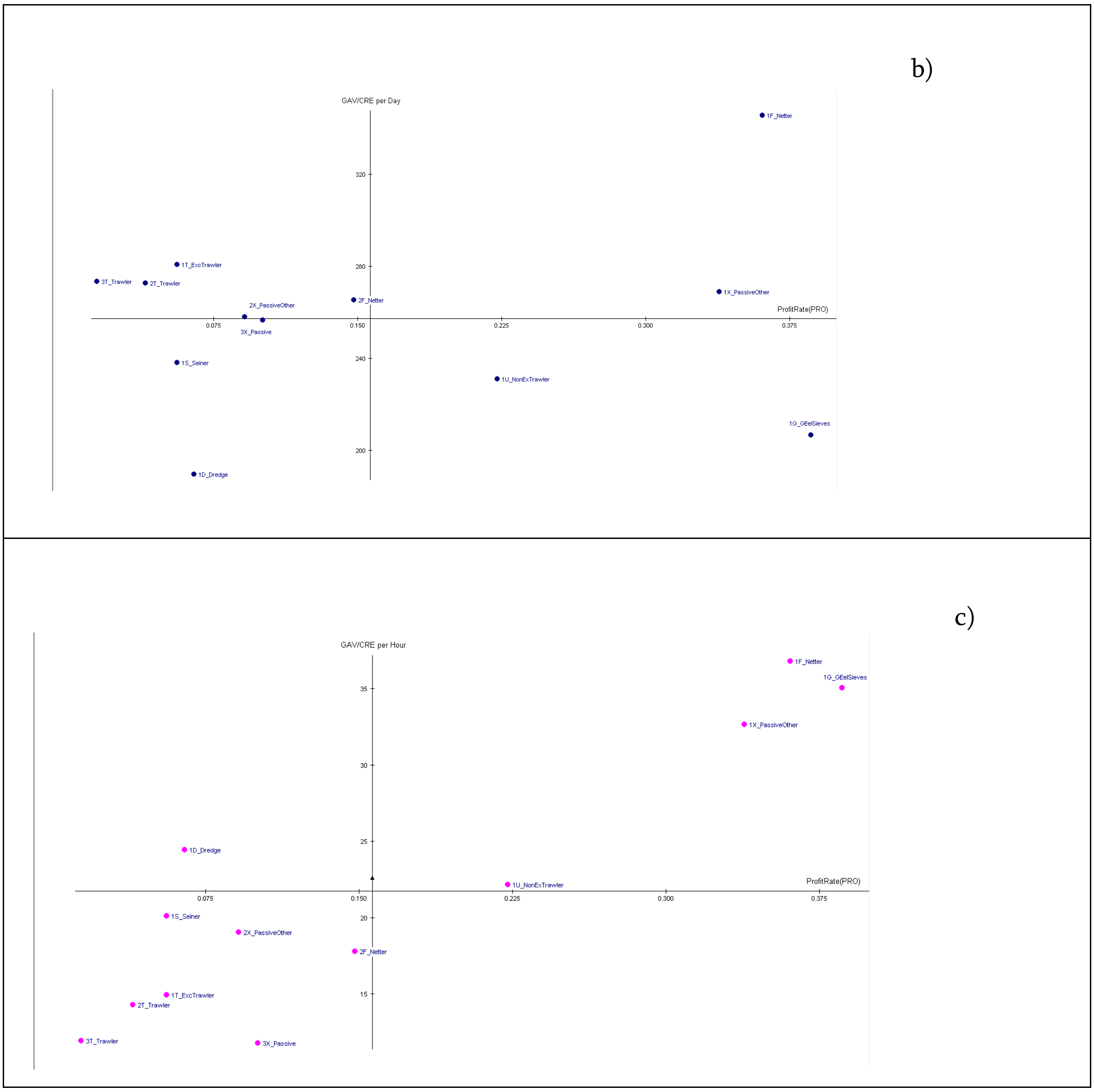
Figure 3 a&b: Principal components analysis – Relationship between Fleet average characteristics and economic performance



The projection of the fleets on the "factorial design" (figure 3b) shows the strong opposition between fleets composed with large trawlers (on the left side, 3T and 2T) and coastal glass eel sieves vessels, coastal dredgers, small netters and vessels using passive gears (on the right side 1G, 1D, 1N and 1X). Firstly opposed due to the size of the production and inputs, they are also different regarding the productivity and the profitability of these inputs. It appears that trawl fishing method is relatively less efficient and profitable compared to all other fishing techniques especially when this technique is deployed by vessels fishing far from the coasts (3T, 2T). The most efficient and profitable fleets according to the most recent data are the Glass eel sieves fleet (which is a coastal and seasonal activity), the coastal netter fleet and the coastal fleet using other passive gears (hook, pots…). Considering the second axe, the fleets 1N and 1X are also those which registered high levels of price and per day productivity of labour, while 1D are in the opposite situation, with 1S also.

Figure 4 – Bivariate analysis - Profit rate and a/ Wages (Average Wage per Crew), b/ Gross Added Value per Crew per Day at sea (GAV/Crew per gay), c/ Gross Added Value per crew per Engine Hour (GAV/CRE per hour)





The relationship between profitability and wages is not as simple as appear. The figure 3a showed that high wages are much stronger correlated with earnings (EAR), intensity of capital (KAL/CRE) or than profit rate (PRO). This is confirming with the figure 4 where there is a kind of negative linear relationship between wages and profit registered by the French Bay of Biscay fleets. The figure 4a) opposes clearly 2 groups of fleets: the one on the top left with high wages and low profit rates composed all trawlers (3T, 2T, 1T, except IU), and other offshore or shelf fleets (2X, 3X, 2F), the second on the down right with low wages and high profit rates composed with some coastal fleets (1G, 1F, 1X et 1U). Surprisingly, a third group with low levels of wages and profit rates is identified with fleets 1D and 1S. Moreover, it seems that there is strong link between wage and GAV/CRE per day than GAV/CRE per hour.

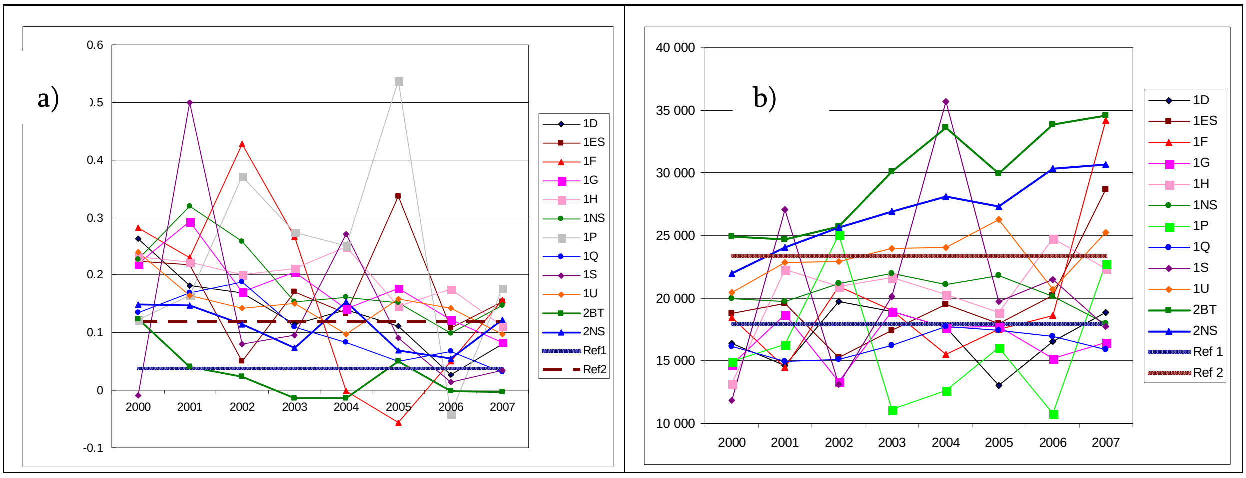
The relationship are not quite modified if we consider the gross value added per man per day at sea (figure 4b). This is good evidence that there is a strong relationship between the wage and the daily productivity of the labour, thanks to the share system prevailing in the fishing sector. Finally, by using the GAV/CRE per hour, we obtain a positive linear relationship between profit rate and labour productivity (figure 4c).

3.2 The trends in profit and wages over the period 2000-2007

The profit rates per fleet over the period 2000-2007 shows a global slight decreasing trend (figure 5a) for the majority of fleets. Exceptions can be found for the 2BT fleet where the decreasing trend stooped in 2004 and the profits are rather stable until this year with a sudden increase between 2004 and 2005. Strong variations are noted for some coastal fleets from one year to another particularly 1S, 1F and 1P. While the profit rates were very varied in the beginning of the period, they tend to get closer at the end of the period and this is particularly noticeable for the years 2006 and 2007.

The wages trend (figure 5b) is exactly inverse than the profit rates one. The trend over the period is much more an increasing trend, but a slight increase for coastal fleets and a stronger one for non coastal fleets. While the wages were rather close together on the beginning of the period, they tend to move away at the end. No strong variations are observed from one year to another except for the fleets 1S and 1P.

Figure 5: Trends in Median profit rates and wages per fleet (a/ Profit Rate; b/ Average Wage per Crew member)

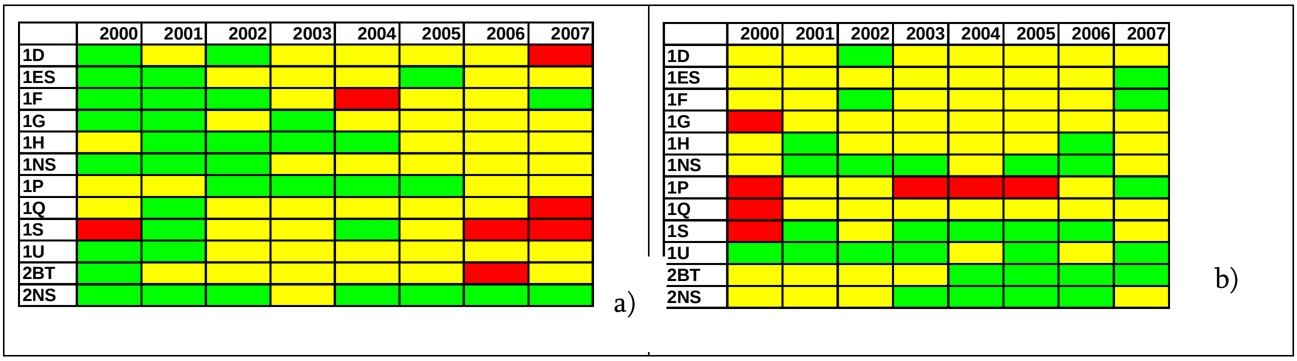


In the specific context of increasing gas oil prices, the Bay if Biscay fleets had faced decreasing profitability but succeed in achieving sufficient level of wages in order to maintain the attractiveness of the fishing sector for the crew. No increasing trend in earnings was observed to justify this. One reason could then the impact of the slight decrease in fishing intensity (Days at sea and engine hours) but overall the positive impact in net revenues and wages of subsidies delivered to vessels strongly dependent on fuel between 2004 and 2006.

Considering some reference values on profitability and wages in the rest of the economy and the median profit rates and wages per fleet over the period (figure 5 a, b), there is an increase number of fleets for which the median profit rate are under the reference value of their category at the end of the period. The inverse result is obtained for the median wages but there are some doubts on the relevance of the reference value chosen for the analysis.

These results are confirmed using the traffic-light approach where the analysis is conducted on individual basis (figure 6 a,b), i.e. the number of vessels in the fleet (%) which are above the reference values.

Figure 6: Historical traffic-light tables displaying profit rates (a) and wages (b) responses for the Bay of Biscay fleets for which economic data are available and sufficient.



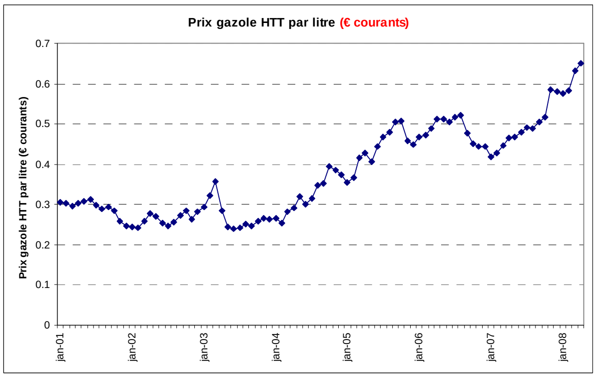
4. Discussion

The available data from the Ifremer FIS allowed to appraise the economic status of the Bay of Biscay fleet today as a benchmark for future analysis or comparison with other fisheries (national, European) or other economic sectors. The total amounts of earnings, capital invested, crew and gross value added estimated in a specific fishing area are dependent from the available data and the method used for selecting vessels fishing exclusively or at least mainly in a fishing area. In theory, VMS data exist for vessels over 15 meters but their availability for scientific purposes are still rare. In parallel, the coverage of logbook data which registering fishing ground locations is not complete. For small vessels and in this specific context, the assumption that their fishing grounds are not very far from harbour is not unrealistic and was confirm, in this study, with fishing calendars available within the Ifremer FIS database. For larger vessels, the assumptions was made that most of trawlers over 20 meters and all other vessels over 24 meters registered in the Atlantic harbours (from Audierne to Bayonne) are not dependant of the Bay of Biscay. Considering that the traditional fishing grounds of these vessels are the United Kingdom coasts (Celtic Sea mainly), they were exclude from the analysis. Further information would help to verify this assumption. In any case, the impact of the situation where some large trawlers (upper 20 meters) registered in the Atlantic harbours were missing in our analysis is need to be assess. The total earnings generated by these vessels (whatever their fishing areas) is estimated to 80 millions euros. Certainly, a part of this amount is missing for this analysis. However, the availability of data would not minimize the issue of the method for defining the vessels considered dependant of a specific area on a yearly basis, among all the areas that they frequent during the year.

The economic indicators analysis showed strong relationship between average size of production inputs and productivity and performance. In the context of high fuel prices (figure 6), the analysis confirm the pregnancy of coastal fleets (fishing close to the coast) and passive fishing methods (less dependent on fuel) if we consider the performance and productivity. In so far as this increasing trend in fuel prices is for sure, these results could be useful in terms of capacity regulation policies in this context of persistent disequilibrium between fishing resources and fishing capacities in the

European fisheries. The negative impact of subsidies for this objective is now well-known (Sumaila, 2008) and particularly in the French context (Mesnil, 2008; Meuriot, 1985).

Figure 7: Fuel prices



Nevertheless, the study suffers from the absence of sufficient sample on large vessels and particularly those fleets appears in the snapshot analysis as the less efficient and profitable ones (compared to the other fishing methods) and the most energy dependent. This would be a strong incentive to extend the analysis of the trends including these non coastal French fleets but also Spanish fleets as far as DCF detailed data are made available at this scale.

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