SCIENTIA MARINA 77(1)
March 2013, 81-93, Barcelona (Spain)
ISSN: 0214-8358
doi: 10.3989/scimar.03691.04A

An analysis of fishing gear competition. Catalan fisheries as case studies

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SUMMARY: An asymmetric index was developed to measure the competition relationships among fishing fleets (or gears or *métiers*) in a multispecies fishery. This index can be used to measure the degree of dominance of each fleet and its level of independence from competition. To illustrate the concepts, the index is applied to two case studies using two datasets, both from Catalonia, NW Mediterranean. The results show that in both case studies the dominance of bottom trawl over most other gears (especially small-scale ones) is evidenced and quantitatively measured. Bottom trawl is also highly independent of the others. Purse seine appears to be quite independent, but not dominant over the other gears. A practical use of these asymmetric indices is to assist fisheries managers in the decision-making process to optimize the allocation of fishing effort, including energy efficiency, and to reduce environmental impact.

Keywords: gear competition, asymmetric index, Mediterranean fisheries.

RESUMEN: ANÁLISIS DE LA COMPETENCIA ENTRE ARTES DE PESCA. LAS PESQUERÍAS CATALANAS COMO EJEMPLO. – Se desarrolló un índice asimétrico para medir las relaciones de competencia entre flotas pesqueras (o artes de pesca o métiers) en el caso de pesquerías multiespecíficas. Este índice permite medir el dominio de una flota sobre otra u otras, y su nivel de independencia. Estos conceptos se ilustran con dos conjuntos de datos de Cataluña, Mediterráneo noroccidental. En estos ejemplos se pone de manifiesto el dominio de arrastre de fondo sobre la mayoría de los otros artes (en especial sobre la pesca artesanal) y se mide cuantitativamente. El arrastre de fondo es también altamente independiente de los demás. El cerco de pequeños pelágicos parece ser muy independiente, pero no dominante en los otros artes. Un uso práctico de estos índices asimétricos es ayudar a los gestores de la pesca en el proceso de toma de decisiones para optimizar la asignación del esfuerzo pesquero.

Palabras clave: competencia entre flotas, índice asimétrico, pesquerías Mediterráneas.

INTRODUCTION

Most Mediterranean fisheries are characterized by the activity of several different gears working on a multispecies environment (*métiers*, Pelletier and Ferraris 2000). Each gear exerts a different selectivity pattern on each species, so different *métiers* may affect a fish population in different stages of its life history. This pattern may be due to the technical aspects (i.e. mesh or hook size) of specific gear, and also to the environment (depth, habitat) where a particular gear is deployed or the skipper's knowledge or local tradition (Maynou *et al*. 2011).

The management of multispecies, multigear fisheries is a problem typical of mixed fisheries. This problem has often been approached from the perspective of technological interactions in the capture of particularly important species (e.g. Aldebert *et al*. 1993 and Aldebert and Recasens 1996 for hake; Demestre *et al*. 1997 for red mullet; Stergiou *et al*. 1996 and Erzini *et al*. 2003 for multispecies fishery). These studies show, for instance, that trawling with low selectivity and high catches of juvenile European hake (*Merluccius merluccius*) negatively affects the profitability of set gear fleets (longliners and gillnetters) (Lleonart *et al*. 2003, Merino *et al*. 2007). The technical interactions between fishing gears is also important in the study of fisheries-induced evolution (Kuparinen *et al*. 2009).

Here we propose a multivariate approach based on an asymmetric index to identify and quantify the relationships of dominance and competition among fishing fleets or *métiers* sharing resources in a mixed fishery.

Competition is an asymmetric relationship because competitors are unequal. There are generalist (or opportunistic) vs specialized fleets and gears; large fleets and small ones; highly mobile and less mobile fleets; and gears targeting large fish and gears targeting small fish. In ecology, different types of asymmetric indices have been developed either to assess the predator-prey relationships in trophic webs (Gallopín 1972) or to measure niche overlap among species (Mouillot *et al*. 2005, Pledger and Geange 2009). These indices are usually appropriate to field collected data in which the relative abundance of species in their environment is usually related to preference of trophic resources or gradients of environmental variables. Their applicability to fisheries landing data is limited because these data do not inform about the environment in which a fish was caught and the species fished are a collection of items selected based on their commercial importance, regardless of their ecological role.

The objective of this paper is to introduce an asymmetric index that is easily applicable to fisheries landing data and can be used to quantify the competition relationships among fleets or métiers for common fish resources. This index introduces the concept of dominance of one fleet over another, meaning the impact of the first fleet on the common resources of the two fleets. It can also be used to calculate overall dominance and dependence indices (a measure of shared resources) for each fleet.

The approach is illustrated with two case studies from data of Catalan fisheries for the 10-year period 2000-2009.

MATERIALS AND METHODS

Data source

Two different data sets were used, one for each case study. The first one was the official statistics of Catalonia from 2000 to 2009 (the daily fish sales database of the General Fisheries Directorate of the Catalan Government, not published). The data come from the daily auctions by boat and species. Boats are classified according to fishing gear into five classes, following the official types of license issued by the local Fisheries Department: bottom trawl, purse seine, bottom longline, surface longline and small-scale vessels. These five types correspond to otter bottom trawl, purse seine, set longline, drifting longline and passive gear for vessels 0-12 m length, according to the classification used in the EU Data Collection Framework (Commission Regulation (EC) No. 665/2008). The total number of species (or species groups) reported in the statistics is 198, although 37 make up 90% of the catch. As shown in Appendix 1, the trawl fleet and the purse seine fleet produce the highest catches, although the former is more diverse and depends on a higher amount of species than the latter.

Taxa such as Osteichthyes and Invertebrata could be included or excluded from the analysis, although it is not clear whether this inclusion or exclusion would be advantageous. This uncertainty reflects the inaccuracy of species identification of commercial landing reports. In this paper these species groups have been included in the analysis. In the data set there are 26 groups in the 198 taxa. Of these groups, 10 are genera without species definition (such as *Lophius* sp. or *Mullus* sp.), 7 are families (such as Gobiidae or Labridae) and 9 represent higher taxonomic groups (such as Crustacea or Chondrichthyes). Since there is no objective criterion for including or excluding species groups, we chose to follow the FAO reporting standards and include them.

The second case study refers to a single harbour, Vilanova i la Geltrú, during the same period (2000-2009), for which data were taken from the daily fish sales database of the General Fisheries Directorate of the Catalan Government (not published). The raw data also include the daily catch by boat and species, but in this case the vessels were divided into 11 *métiers* according to the multivariate analysis published by Maynou *et al.* (2011). The number of species, or taxonomic units, reported was 132. The two main fishing types, in terms of catches, are bottom trawl and purse seine, as in the previous case, but nine other small-scale *métiers* were revealed in the multivariate analysis: trammel nets targeting cuttlefish (a *métier* known as "cuttlefish"), gillnets targeting European hake ("g-hake"), bottom longlines targeting European hake ("l-hake"), clay pots targeting octopus ("octopus"), trammel nets targeting striped red mullet ("redmullet"), trammel nets targeting sole ("sole") and trammel nets targeting striped seabream and other sparids ("varied"), towed dredges targeting coastal bivalves ("dredge") and toothed beam trawl targeting sea snails ("beam trawl") (Appendix 2).

The data used in this second case study show some apparent inconsistencies, such as the fact that the octopus clay pot fishery accounts for only 78% of octopus. This is not because of data errors but rather inaccuracies in the commercial reports, which have a minimum resolution of one day. Small-scale fishers often use different gears (i.e. pots and small longlines) in the same day and they report the whole catch for only one gear. These inaccuracies have been respected in order to keep the approach realistic with real inaccurate data.

The reason for using these two data sets is to analyse different scales. The first case study covers a wide geographical range with few great gear groups, while the second one is much finer in grouping gears (actually *métiers*) although it only refers to a single harbour.

Although the original data were collected at a daily temporal scale, they have been aggregated at an annual scale to illustrate the application of the metrics described herein. Figure 1 shows the study area and the annual catches of the fleets studied.

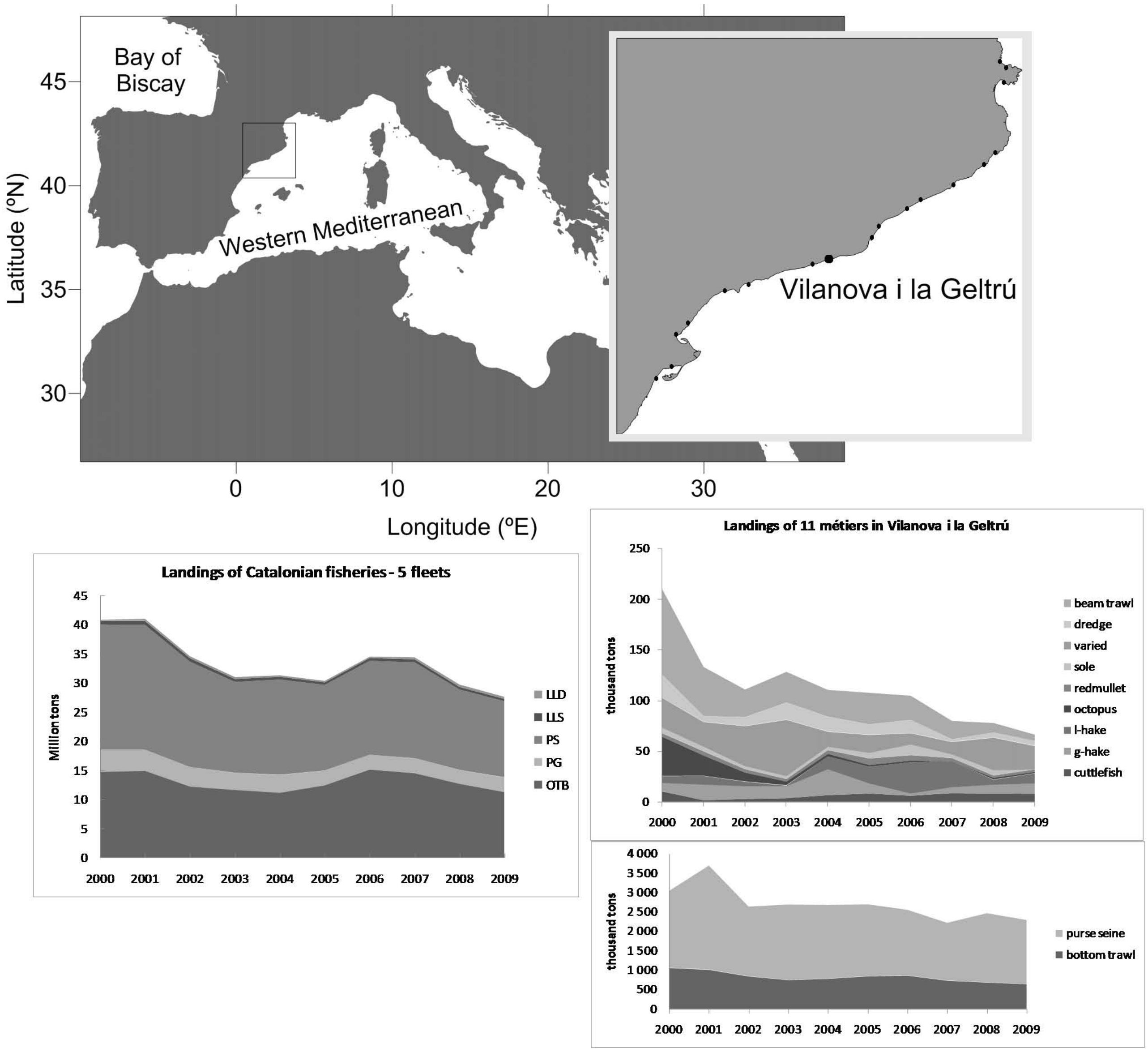

FIG. 1. – Location of the study area. The lower panels show: left, the evolution of catches of the five fishing fleets operating in Catalonia according to the official typologies of license: OTB (otter bottom trawl), PS (purse seine), LLS (set longline), LLD (drifting longline) and PG (passive gear for vessels of 0-12 m length); right, the evolution of the catches of the 11 *métiers* practiced in the Vilanova i la Geltrú fishery.

A metrics for measuring the competition among fleets or métiers

We are dealing with a multispecies fishery in which a number of vessels using several gears are acting. Let us consider a "fleet" to be a group of vessels practising the same *métier*.

Let n be the total number of species (or taxa) and m the total number of fleets working on the fishery. Let [**D**] be an $n \times m$ matrix where each element d_{ij} is the total weight of species i caught by fleet j during a period of time (e.g. one year).

Two new matrices [**P**] and [**Q**], both $n \times m$, can be obtained from [**D**] according to the following definitions of their elements:

$$p_{ij} = \frac{d_{ij}}{\sum_{j}^{m} d_{ij}} \quad \text{and} \quad q_{ij} = \frac{d_{ij}}{\sum_{i}^{n} d_{ij}}$$

p_{ij} is the relative weight that fleet j represents for species i. The effect of species abundance is eliminated.

q_{ij} represents the relative weight of the species i in the catch of fleet j. The effect of fleet size is therefore eliminated.

Given two fleets, A and B, the following index can be defined:

$$r_{iAB} = p_{iA} \cdot q_{iB}$$

The meaning of r_{iAB} is as follows: p_{iA} is the proportion of the total catch of species *i* caught by fleet *A*. If fleet *A* captures most of species *i* it deprives other fleets of this resource, so p_{iA} represents the importance of *A* in the capture of *i*. q_{iB} is the proportion of species *i* in the total catch of fleet B. The higher the value of q_{iB}, the more important this species is for fleet *B*. If p_{iA} and q_{iB} are both high, this means that *A* captures most of *i*, which is an important resource for *B*, so *A* is a strong competitor against *B* regarding species *i*. If p_{iA} is low and q_{iB} is high, the species *i* is important for *B*, and *A* is not a heavy competitor for this resource. If p_{iA} is high and q_{iB} is low, *A* captures a good deal of *i*, but this species is not very important for *B*. Finally, if both p_{iA} and q_{iB} are low, the species *i* is not important either for *A* or *B*, and is probably the target of other fleets.

This index measures the competition of *A* with *B* concerning only species *i*. This index is asymmetric because the competition of *A* with *B* is different than that of *B* with *A* ($r_{iAB} \neq r_{iBA}$).

The interaction of *A* with *B* considering all species is then

$$s_{AB} = \sum_{i}^{n} r_{iAB}$$

where s_{AB} is the index expressing the competition of fleet *A* with fleet *B*. It ranges between 0 and 1. For instance, if a gear *A* is getting high catches on most of the target species of gear *B*, s_{AB} will be close to 1, so *A* must be considered as a strong competitor of, or dominant over, *B*. If the set of species targeted by *A* were different from the set caught by *B*, s_{AB} would be close to 0, so *A* would be an irrelevant competitor of *B*. As expected, the index s_{AB} is asymmetric ($s_{AB} \neq s_{BA}$), as are the competition relationships.

s_{AB} is an element of a new $m \times m$ matrix called [**S**]. This matrix is computed as

$$\mathbf{S} = \mathbf{P}^{T} \cdot \mathbf{Q}$$

Therefore, [**S**] is the matrix of interactions, or competition, between fleets.

The main diagonal of [**S**], or competition of a fleet with itself, can be interpreted as the level of independence of the corresponding fleet. If a fleet captures only species not caught by any other fleet, its value is 1 (the only competitor of a fleet is itself) and there is no interaction with others. If the species composition of a fleet is the same as that of another fleet or fleets but its catch is much lower, that value approaches 0 and the catch composition of this fleet is highly dependent on others.

An overall measure of the dominance of a fleet (*A*) over all the other fleets (minus itself) could be calculated as

$$T_A = \sum_{j}^{m} s_{Aj} - s_{AA}$$

Asymmetric indices are not as easy to represent as symmetric ones, which can be managed through a series of multivariate statistical tools, mainly cluster analysis and diagonalization methods such as principal component analysis and similar procedures, which allow meaningless dimensions to be removed and cluster structures to be synthesized. As far as we know, there is no statistical tool for representing asymmetric relationships; only “sociograms”, a type of non-quantitative graphs showing the asymmetric relationships between “individuals” used in social sciences, appear to be commonly used in such studies.

A sociogram consists in representing the elements (fleets) as circles. The diameter could represent any feature of the fleet. In the present case we use two concentric circles: the independence and the overall dominance. The circles are connected by asymmetric arrows with the width of the ends proportional to s_{AB}, near to fleet A, and s_{BA}, near to fleet B. When the pairs s_{AB}, s_{BA} are both smaller than a given value (i.e. 0.05), they are not represented to improve readability. This simplification was applied only to the case of 11 fleets, involving 55 pair relationships. The software used for sociogram representation can be found in Lewejohann (2005).

RESULTS

Catalonia five-fleet data set

Catches with purse seine and bottom trawl were far greater than those with the other three gears (Fig. 1) throughout the time series.

The structure of matrix [**S**] was very similar across years. Linear correlation between pairs of years was 0.98 or higher, so [**S**] mean is shown, as an example, in Table 1.

This table also shows the standard deviation matrix of the ten annual [**S**] matrices. The standard deviation of the matrix elements across years confirms the relative temporal stability, with a possible single exception

TABLE 1. – Five-fleet results for Catalonia. 2000-2009 average [S] and standard deviation matrices. For each element S_{AB}, A correspond to the rows and B to the columns (for instance $S_{OTB,PG}$=0.40). The main diagonal of the matrix corresponds to the level of “independence” of each fleet. T is the measure of dominance. OTB, otter bottom trawl; PG, passive gear; PS; purse seine; LLS, stet longline; LLD, drifting longline.

	OTB	PG	PS	LLS	LLD	T
Average [S]						
OTB	0.80	0.40	0.07	0.53	0.14	1.14
PG	0.09	0.43	0.02	0.25	0.19	0.55
PS	0.09	0.10	0.91	0.08	0.04	0.31
LLS	0.02	0.04	0.00	0.10	0.09	0.15
LLD	0.00	0.02	0.00	0.05	0.54	0.07
Standard deviation						
OTB	0.02	0.03	0.02	0.06	0.07	
PG	0.01	0.03	0.00	0.03	0.09	
PS	0.02	0.03	0.01	0.04	0.04	
LLS	0.00	0.01	0.00	0.02	0.03	
LLD	0.00	0.01	0.00	0.02	0.16	

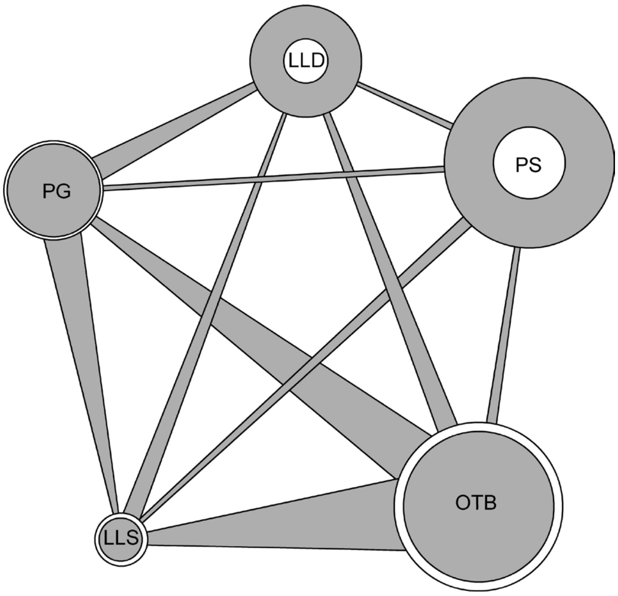

Fig. 2. – Sociogram of five fleets in Catalonia. The white circle is proportional to T (dominance) the grey one to the main diagonal (independence).

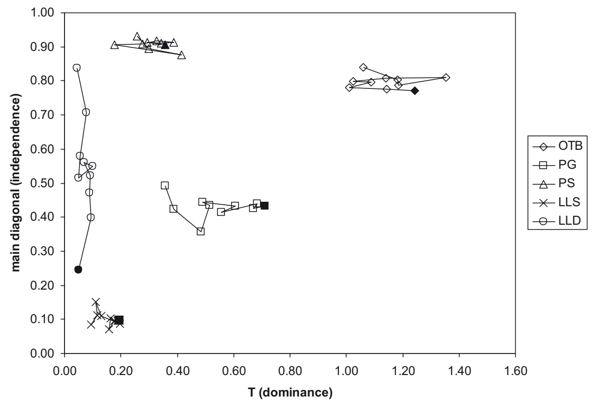

Fig. 3. – Independence vs dominance plot of five fleets in Catalonia, showing the annual trends. The first year of the series (2000) is indicated by a solid dot.

in the main diagonal element for surface longline. A sociogram of the average [**S**] is presented in Figure 2.

It must be noted that the first three higher values are found in the main diagonal, and correspond to purse seine, trawl and drifting longline, which means that they were the least dependent fleets in terms of species composition, though drifting longline was really very small in terms of catches. Bottom trawl is a strong competitor of the bottom longline (0.53) and small-scale fleets (0.40). The rest of the interactions were quite small, although some dominance of the small-scale fleet over longlines and of bottom trawl over drifting longline were observed.

The analysis of the trends of the main diagonal, as an indicator of independence (or self-dependence) among fleets (Fig. 3), shows that purse seine is the most independent fleet. This is because its target species, mainly sardine and anchovy, are not significantly targeted by any other fleet. Bottom trawl is also quite independent, while passive gear and bottom longline fleets have a fairly low independence level. This means that their catch composition is shared with other fleets, but bottom trawl takes a higher share. Among those

Table 2. – Eleven-fleet results for Vilanova i la Geltrú. 2000-2009 average [S] and standard deviation matrices. For each element S_{AB}, A correspond to the rows and B to the columns (for instance $S_{bottom\ trawl,\ cuttlefish}$ =0.43). The main diagonal of the matrix corresponds to the level of "independence" of each fleet. T is the measure of dominance.

	cuttlefish	g-hake	l-hake	octopus	redmullet	sole	varied	dredge	beam trawl	bottom trawl	purse seine	T
Average												
cuttlefish	0.11	0.01	0.00	0.04	0.02	0.10	0.02	0.01	0.05	0.00	0.00	0.25
g-hake	0.01	0.04	0.04	0.01	0.01	0.02	0.02	0.00	0.01	0.01	0.00	0.12
l-hake	0.00	0.04	0.08	0.00	0.00	0.01	0.01	0.00	0.00	0.01	0.00	0.08
octopus	0.03	0.00	0.00	0.07	0.01	0.04	0.01	0.01	0.01	0.01	0.00	0.11
redmullet	0.01	0.01	0.00	0.01	0.14	0.01	0.01	0.00	0.00	0.00	0.00	0.07
sole	0.07	0.01	0.00	0.04	0.01	0.21	0.02	0.00	0.03	0.00	0.00	0.19
varied	0.07	0.05	0.01	0.05	0.08	0.09	0.16	0.02	0.02	0.01	0.00	0.41
dredge	0.02	0.00	0.00	0.01	0.01	0.01	0.01	0.78	0.01	0.00	0.00	0.07
beam trawl	0.16	0.01	0.00	0.06	0.02	0.15	0.02	0.01	0.66	0.01	0.00	0.45
bottom trawl	0.43	0.68	0.83	0.64	0.57	0.28	0.39	0.14	0.22	0.83	0.05	4.23
purse seine	0.10	0.15	0.03	0.07	0.11	0.08	0.32	0.03	0.00	0.11	0.94	1.02
Standard deviation												
cuttlefish	0.10	0.01	0.00	0.03	0.02	0.06	0.02	0.01	0.03	0.00	0.00	
g-hake	0.01	0.01	0.02	0.01	0.01	0.02	0.01	0.00	0.00	0.00	0.00	
l-hake	0.01	0.03	0.07	0.00	0.00	0.01	0.01	0.00	0.00	0.01	0.00	
octopus	0.03	0.00	0.00	0.08	0.01	0.03	0.01	0.01	0.01	0.01	0.00	
redmullet	0.00	0.01	0.00	0.01	0.06	0.01	0.01	0.00	0.00	0.00	0.00	
sole	0.03	0.01	0.00	0.03	0.01	0.07	0.02	0.00	0.02	0.00	0.00	
varied	0.03	0.03	0.01	0.04	0.04	0.04	0.11	0.02	0.02	0.01	0.00	
dredge	0.01	0.00	0.00	0.01	0.00	0.01	0.01	0.11	0.00	0.00	0.00	
beam trawl	0.09	0.01	0.00	0.03	0.01	0.04	0.01	0.01	0.15	0.00	0.00	
bottom trawl	0.08	0.05	0.07	0.09	0.07	0.05	0.12	0.07	0.09	0.03	0.01	
purse seine	0.07	0.07	0.01	0.05	0.05	0.06	0.12	0.02	0.00	0.04	0.01	

fleets, it is interesting to observe that drifting longline displays a temporal trend of increasing independence (from approximately 0.25 to 0.85 in Fig. 3), possibly related to its progressive specialization. In terms of dominance, bottom trawl appears to be the most dominant, thus being the most competitive (highly independent and dominant) of the fleets, followed by the small-scale fleet. Set longline is the most affected by competition because it is highly dependent and less dominant (Fig. 3).

Vilanova i la Geltrú, 11 métier data set

As in the previous case study, the correlation between matrices [**S**] of successive years is higher than 0.95. Table 2 shows the average and standard deviation of the elements of the annual [**S**]. The sociogram of [**S**] is presented in Figure 4.

Regarding independence, four fleets show values above 0.5: bottom trawl, purse seine, beam trawl and dredge. The other seven are quite dependent, below 0.4. Bottom trawl is by far the most dominant fleet with T values around 4, purse seine has T values around 2 and all the other fleets have T values below 1 (Fig. 5). Dredge shows a trend to become more independent although it is not dominant because it is very specialized, targeting only bivalves. Beam trawl shows the opposite trend towards increasing its dependency on competitors. The remaining seven gears are both dominated and dependent and do not show significant trends over time.

DISCUSSION

The analyses carried out have quantified a set of relationships that are more or less qualitatively known by fisheries experts. However, it is also known that the lack of quantification could mislead the interpretation of relationships because of prejudices or preconceptions. The asymmetric index presented here helps the analyst to better understand the quantitative relationships between fishing gears or *métiers* in competitive multispecies fisheries. For instance, in the fisheries analysed here (as elsewhere in the Mediterranean) bottom trawl fleets are clearly dominant, in the sense that they produce large catches of species which are shared with other fleets, and they are independent of small-scale fleets that cannot compete in terms of landings. On the other hand, the Mediterranean purse seine fleet has low dominance and high independence because of its specialized target resource (small pelagics). In general, small-scale fisheries in the Mediterranean show an asymmetric relationship with bottom trawl and their long-term viability can be ensured only if they become more specialized (e.g. more independent, like surface longline in Catalonia and dredges in Vilanova i la Geltrú) or if market differentiation of the fish product can be enhanced (e.g. added value of high-quality large fish from small-scale *métiers* in Vilanova i la Geltrú).

Computing the indices over a time series should help to display trends and changes in dominance among fleets and their independence level over time. A practi-

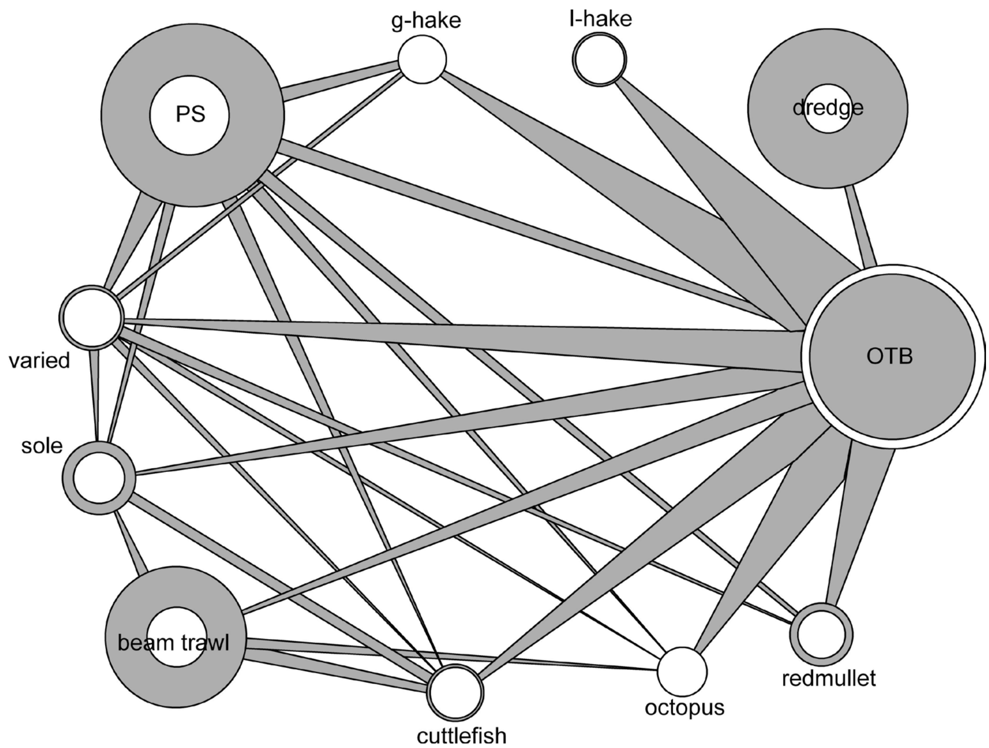

FIG. 4. – Sociogram of 11 fleets in Vilanova i la Geltrú. The white circle is proportional to T (dominance) the grey one to the main diagonal (independence). The arrows corresponding to values smaller than 5% of the interval of [S] have been eliminated for clarity. Of the 55 total pair relationships only 25 have been retained.

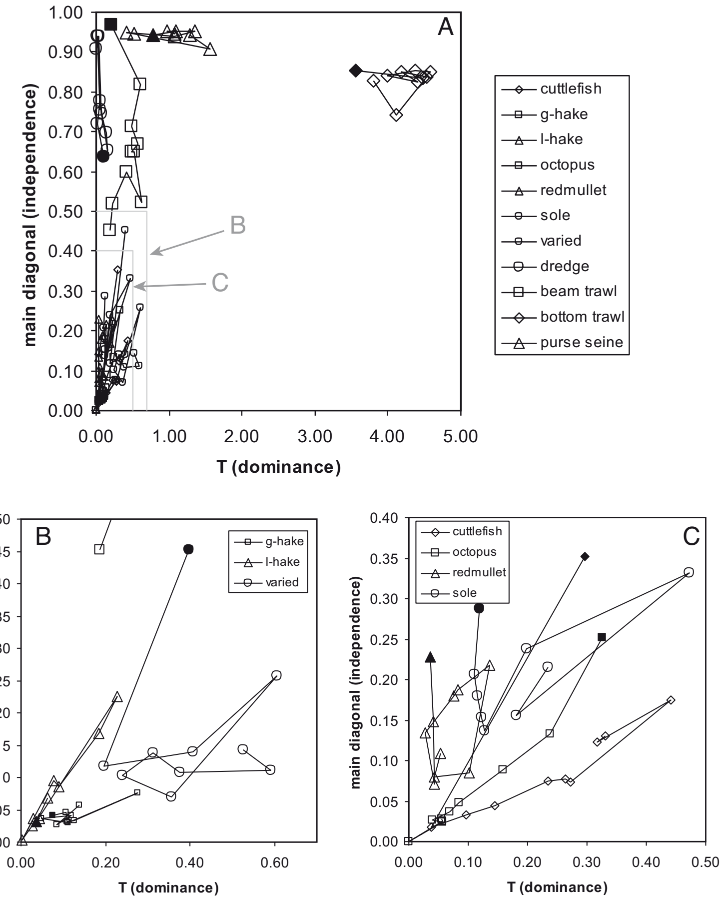

FIG. 5. – Independence vs dominance plot of 11F Catalonia, showing the annual trends. The first year of the series (2000) is indicated by a solid dot. In A the whole plot to note the positions of bottom trawl, purse seine, beam trawl and dredge is presented. The other seven fleets are presented in plots B and C to discriminate them.

cal use of these asymmetric indices is to assist fisheries managers in decision-making to optimize the allocation of fishing effort, i.e. to increase the independence of fleets and decrease the dominance, thus reducing a kind of competition that yields benefits in the short term and to the less selective fleets and also helping to minimize social conflict. For instance, Lleonart *et al*. (2003), under a bioeconomic perspective, show that reducing the effort allocated to bottom trawl would enhance the productivity of small-scale longliners, which compete with bottom trawl for European hake (*Merluccius merluccius*).

Although the purpose of this paper is limited to studying competition between gears in a strict technical interaction scenario, these asymmetric indices could also be useful for examining other aspects of fisheries, such as unwanted by-catch that is ultimately discarded, fisheries employment and efficiency in fuel consumption (Suuronen *et al*. 2012). In particular, the application of such indices to the study of economic competition could be useful and the object of possible future expansion. Indeed bottom trawl, the dominant gear, uses large amounts of fuel and its competitiveness and even economic sustainability is dependent on the fuel tax exemption.

In the NW Mediterranean the classification of fleets as industrial or artisanal (or small-scale) is not as clear as that in other parts of the world. Following the multivariate definition of "artisanal fishery" proposed by Coppola (2006) and Griffiths *et al*. (2007), not a single fleet can be identified as fully artisanal (or industrial) in this area of the Mediterranean. The equipment of these small-scale fleets is "modern" or "intermediate" (sensu Misund *et al*. 2002) and in some cases (some longliners or netters) the small-scale fleets are technically more advanced than the dominant industrial bottom trawl or purse seine fleets.

Different gears often target different sizes of a species. For example, trawl and longline fleets can compete for the same species but over different size ranges. In Mediterranean fisheries, a classic example is European hake: juvenile hake (10-30 cm TL) are mainly caught by trawlers, while large juveniles and adults (larger than 30 cm TL) are caught by longliners or gillnetters, raising the problem of technical interaction within the same species (Lleonart *et al*. 2003). In cases in which the commercial catch reports are disaggregated according to size (the commercial categories "small hake" and "large hake"), the different sizes could be taken as different species for competition analysis using the index developed here. However, our index is not dynamic and does not take into account delayed competition (i.e. the effect of present catches of juveniles on future abundance of spawning adults).

In another possible expansion, the use of these indices can be extended to assess the competition (dominance/independence continuum) of fleets from different countries or world regions or to assess the relationship between different seafood producing sectors (fisheries vs aquaculture) from readily available data such as the FAO fish production data sets.

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Scient. ed.: B. Roel.
Received July 2, 2012. Accepted November 27, 2012.
Published online February 4, 2013.

Appendix 1. – Official landing statistics in Catalonia. Total catches in the period (2000-2009), in kg, by species according to five main gears. OTB, otter bottom trawl; PG, passive gear; PS, purse seine; LLS, stet longline; LLD, drifting longline.

	OTB	PG	PS	LLS	LLD	TOTAL
Sardina pilchardus	1 301 717	546 540	94 823 605	96 162	4 170	96 772 194
Engraulis encrasicolus	1 510 504	362 664	38 778 963	67 195	319	40 719 645
Merluccius merluccius	14 743 399	3 323 898	16 601	1 905 810	247 818	20 237 526
Micromesistius poutassou	15 490 461	261 094	5 387	23 030	1 359	15 781 331
Scomber scombrus	6 806 130	479 864	6 709 665	44 348	898	14 040 905
Trachurus trachurus	8 276 997	352 119	4 200 165	83 926	806	12 914 013
Eledone cirrhosa	9 720 859	139 163	4 688	13 843	16	9 878 569
Osteichthyes	5 703 179	849 431	666 274	140 577	53 741	7 413 202
Sardinella aurita	21 192	53 740	7 128 198	368	0	7 203 498
Octopus vulgaris	3 288 375	3 694 013	4 856	162 187	479	7 149 910
Squilla mantis	4 182 022	452 079	12	8 035	0	4 642 148
Trachurus mediterraneus	1 200 527	41 956	2 785 326	11 953	872	4 040 634
Lophius piscatorius	3 859 639	158 719	1 151	14 628	467	4 034 604
Trisopterus minutus	3 940 599	43 473	1 264	5 219	600	3 991 155
Aristeus antennatus	3 837 619	59 798	2 373	1 314	0	3 901 104
Scomber japonicus	66 598	129 875	3 527 483	36 258	3 782	3 763 996
Nephrops norvegicus	3 193 394	25 888	1 344	533	0	3 221 159
Sparus aurata	1 406 809	771 464	815 290	34 080	34	3 027 677
Pagellus acarne	2 095 930	252 016	437 616	57 144	5 510	2 848 216
Mullus surmuletus	2 461 347	333 707	1 370	12 733	587	2 809 744
Conger conger	1 745 224	620 452	11 055	388 879	28 757	2 794 367
Citharus linguatula	2 548 220	128 464	438	16 126	6	2 693 254
Mullus barbatus	2 516 169	110 500	1 580	4 280	9	2 632 538
Phycis blennoides	2 270 395	152 061	1 949	91 123	5 024	2 520 552
Gymnammodytes cicerelus	55 575	2 317 108	13 097	124 402	0	2 510 182
Sarda sarda	33 154	870 708	1 316 618	96 180	106 971	2 423 631
Loligo vulgaris	2 186 054	115 277	115 754	2 611	1	2 419 697
Pagellus erythrinus	1 564 126	613 544	98 660	76 720	1 366	2 354 416
Sepia officinalis	1 058 942	1 005 465	5 232	55 614	89	2 125 342
Liocarcinus depurator	1 724 093	7 955	164	1 599	0	1 733 811
Boops boops	678 192	29 385	946 797	9 784	118	1 664 276
Cepola rubescens	1 600 695	25 111	932	90	11	1 626 839
Thunnus thynnus	18 933	233 546	21 828	107 341	1 084 901	1 466 549
Bolinus brandaris	340 786	1 008 489	379	85 684	15	1 435 353
Gobius niger	1 319 409	51 662	30 554	6 036	295	1 407 956
Lepidopus caudatus	498 433	354 604	24 043	341 488	176 741	1 395 309
Xiphias gladius	45 465	381 329	41 669	158 449	756 285	1 383 197
Dicentrarchus labrax	686 695	493 493	37 927	23 041	1 180	1 242 336
Solea vulgaris	264 785	908 941	25 481	26 026	8	1 225 241
Chelidonichthys lucerna	784 297	210 398	590	137 166	22 517	1 154 968
Illex coindetii	1 070 468	4 875	4 924	822	2	1 081 091
Lophius budegassa	916 564	33 627	552	3 176	135	954 054
Brachyura	911 997	6 257	26	176	0	918 456
Seriola dumerili	293 459	231 391	376 418	3 082	174	904 524
Pomatomus saltator	185 023	374 441	263 186	59 607	1 435	883 692
Trachurus picturatus	179 506	9 356	681 937	886	2 035	873 720
Mugil cephalus	535 172	169 045	141 895	10 861	6	856 979
Lithognathus mormyrus	198 712	325 907	312 659	7 066	9	844 353
Mullus sp.	728 593	56 063	662	102	0	785 420
Todarodes sagittatus	697 725	24 381	3 289	1 473	136	727 004
Nassarius mutabilis	81	715 376	4	10 011	0	725 472
Diplodus sargus	214 408	288 744	168 810	33 050	953	705 965
Liza ramada	32 016	55 560	582 752	774	0	671 102
Penaeus kerathurus	326 967	329 617	791	10 294	0	667 669
Trachinus draco	584 635	69 360	944	9 549	140	664 628
Sphyraena sphyraena	350 463	43 463	239 234	356	12	633 528
Donax trunculus	8	628 516	673	1 145	0	630 342
Mugilidae	221 811	99 491	248 276	1 216	0	570 794
Auxis rochei	9 083	110 867	402 772	11 165	2 225	536 112
Trisopterus luscus	498 529	16 218	87	9 288	10	524 132
Parapenaeus longirostris	465 990	21 674	2 410	25	0	490 099
Sarpa salpa	13 731	138 979	311 586	925	14	465 235
Helicolenus dactylopterus	236 105	109 619	246	101 278	8 538	455 786
Cephalopoda	383 042	48 962	26	5	0	432 035
Trigla lyra	400 415	12 988	104	11 490	250	425 247
Raja asterias	213 561	193 630	355	9 451	871	417 868
Lepidorhombus boscii	401 203	4 143	132	7	0	405 485
Murex sp.	53 536	301 187	5	43 565	54	398 347
Diplodus annularis	212 411	70 612	100 775	2 146	0	385 944
Thunnus alalunga	2 528	24 037	37 246	3 249	305 486	372 546
Chamelea gallina	226	355 995	29	2 729	0	358 979

APPENDIX 1 (cont.). – Official landing statistics in Catalonia. Total catches in the period (2000-2009), in kg, by species according to five main gears. OTB, otter bottom trawl; PG, passive gear; PS, purse seine; LLS, stet longline; LLD, drifting longline.

	OTB	PG	PS	LLS	LLD	TOTAL
Eutrigla gurnardus	350 489	1 841	51	1 819	13	354 213
Uranoscopus scaber	214 386	100 636	352	12 265	0	327 639
Oblada melanura	2 995	19 246	302 504	2 591	0	327 336
Diplodus vulgaris	225 392	54 472	34 262	3 182	67	317 375
Coryphaena hippurus	24 470	226 700	16 833	17 435	30 944	316 382
Lichia amia	120 657	159 750	31 981	3 244	206	315 838
Octopodidae	230 027	71 986	57	254	10	302 334
Lophius sp.	296 795	2 604	4	2 668	51	302 122
Gobiidae	270 489	8 280	12 509	615	81	291 974
Zeus faber	238 807	25 536	404	6 940	564	272 251
Brama brama	1 832	58 005	383	23 237	167 238	250 695
Pagellus bogaraveo	74 793	107 075	662	64 021	2 333	248 884
Sepia elegans	238 048	683	9	1	0	238 741
Argentina sphyraena	237 404	964	20	4	0	238 392
Liza aurata	3 764	5 349	202 074	359	23	211 569
Trachinus sp.	122 365	62 785	58	2 271	100	187 579
Scyliorhinus canicula	169 816	10 344	123	4 682	1 475	186 440
Phycis phycis	132 880	35 752	10	13 207	3 899	185 748
Pagrus pagrus	54 685	109 532	4 553	14 960	1 643	185 373
Eledone moschata	177 309	491	3	90	0	177 893
Spicara smaris	47 398	22 328	98 923	17	20	168 686
Hexaplex trunculus	2 965	147 507	44	7 543	0	158 059
Dentex dentex	53 593	82 758	11 134	6 837	196	154 518
Arnoglossus thori	149 904	752	171	42	0	150 869
Raja sp.	71 545	56 605	27	10 728	1 122	140 027
Trigla sp.	119 648	12 730	0	16	0	132 394
Plesionika heterocarpus	129 377	3 379	247	0	0	133 003
Euthynnus alletteratus	193	84 623	37 796	206	4 215	127 033
Scophthalmus rhombus	41 470	77 408	117	4 683	45	123 723
Acanthocardia tuberculata	28	121 992	5	275	0	122 300
Triglidae	117 150	3 139	0	1 326	7	121 622
Galeus melastomus	95 977	10 321	0	9 736	3 934	119 968
Scorpaena scrofa	23 385	83 096	315	10 308	398	117 502
Crustacea	110 214	1 812	28	73	0	112 127
Munida sp.	102 712	631	37	0	0	103 380
Phycis sp.	82 128	10 723	13	2 205	1 211	96 280
Serranus cabrilla	63 815	23 181	379	6 284	53	93 712
Lepidotrigla cavillone	80 070	684	0	20	0	80 774
Scorpaena sp.	21 049	41 032	724	14 976	85	77 866
Plesionika edwardsii	71 665	1 416	18	0	0	73 099
Octopus macropus	70 927	58	6	63	0	71 054
Elasmobranchii	33 572	13 966	5 529	6 849	6 654	66 570
Callista chione	1 002	61 420	772	1 795	0	64 989
Sepiidae, Sepiolidae	63 629	1 148	14	0	17	64 808
Palinurus elephas	14 505	44 781	27	2 677	72	62 062
Paromola cuvieri	53 515	2 925	94	29	13	56 576
Spondyliosoma cantharus	8 619	9 091	32 869	819	21	51 419
Crystallogobius linearis	56	50 800	0	0	0	50 856
Scorpaena porcus	7 734	40 809	34	1 643	0	50 220
Lepidorhombus whiffiagonis	45 651	771	147	0	0	46 569
Belone belone	1 730	1 922	38 775	369	3	42 799
Sciaena umbra	5 990	29 862	1 474	1 567	7	38 900
Raja clavata	22 887	8 736	14	6 363	863	38 863
Scorpaena notata	6 619	29 141	906	1 314	93	38 073
Stichopus regalis	30 001	436	6 140	57	0	36 634
Psetta maxima	16 151	19 432	166	365	33	36 147
Bothus podas	5 491	29 350	37	368	0	35 246
Umbrina ronchus	16 747	17 910	1	39	41	34 738
Serranus sp.	16 556	16 242	257	724	19	33 798
Etmopterus spinax	30 769	391	65	30	13	31 268
Geryon longipes	26 380	2 820	10	0	0	29 210
Squalus acanthias	16 585	8 747	2 613	669	42	28 656
Polipryon americanus	3 162	5 646	7 357	6 217	3 680	26 062
Littorina littorea	1	21 069	0	0	0	21 070
Paracentrotus lividus	3 598	11 105	358	5 369	0	20 430
Diplodus puntazzo	3 693	3 108	13 252	368	0	20 421
Necora puber	19 052	1 223	1	81	0	20 357
Anguilla anguilla	16 797	3 087	30	23	99	20 036
Myliobatis aquila	8 959	8 680	90	842	0	18 571
Dasyatis pastinaca	11 460	6 974	0	0	0	18 434
Carcinus aestuarii	243	17 393	0	0	0	17 636

APPENDIX 1 (cont.). – Official landing statistics in Catalonia. Total catches in the period (2000-2009), in kg, by species according to five main gears. OTB, otter bottom trawl; PG, passive gear; PS, purse seine; LLS, stet longline; LLD, drifting longline.

	OTB	PG	PS	LLS	LLD	TOTAL
Aphia minuta	67	16 990	0	0	0	17 057
Molva dipterygia	14 065	258	8	1 357	58	15 746
Epinephelus marginatus	3 994	9 397	38	1 341	172	14 942
Homarus gammarus	2 737	8 700	12	353	2	11 804
Umbrina cirrosa	2 164	9 506	39	88	3	11 800
Tapes decussatus	771	9 869	707	144	0	11 491
Pecten jacobaeus	1 553	7 106	0	1 943	0	10 602
Aristeidae	8 367	303	931	0	0	9 601
Thais haemastoma	4 368	3 393	0	137	0	7 898
Deltentosteus quadrimaculatus	24	7 634	14	0	0	7 672
Calappa granulata	4 541	2 449	0	490	0	7 480
Labridae	118	7 087	6	193	0	7 404
Veneridae	51	6 772	100	328	0	7 251
Circomphalus casinus	5 233	1 458	0	0	0	6 691
Torpedo marmorata	1 265	4 289	0	0	0	5 554
Diplodus cervinus	1 755	2 047	1 588	72	0	5 462
Condrichthyes	4 665	374	26	4	293	5 362
Cerastoderma glaucum	0	4 940	0	0	0	4 940
Naticarius cruentatus	1 526	2 909	0	20	0	4 455
Coris julis	48	3 124	708	188	0	4 068
Muraena helena	231	3 203	12	595	5	4 022
Carcinus maenas	8	3 926	0	0	0	3 934
Mora moro	3 494	7	0	5	2	3 508
Galeorhinus galeus	1 658	810	833	135	18	3 454
Lamna nasus	290	283	16	292	552	1 433
Invertebrata	825	439	0	0	61	1 325
Glycymeris insubrica	0	1 041	0	0	84	1 125
Mactra corallina	31	1 083	0	0	0	1 114
Serranus hepatus	328	648	0	0	0	976
Holothurioidea	930	0	0	0	0	930
Dactylopterus volitans	186	641	0	0	0	827
Maja squinado	698	5	0	0	0	703
Spicara sp.	398	231	0	0	0	629
Tapes philippinarum	0	458	0	0	0	458
Oxynotus centrina	433	0	0	0	0	433
Glycymeris pilosa	7	407	0	0	0	414
Bivalvia	26	243	0	0	0	269
Raja miraletus	126	134	0	5	0	265
Cetorhinus maximus	251	0	0	0	0	251
Scyllarus arctus	50	186	0	7	0	243
Ostrea edulis	30	181	0	0	0	211
Mollusca	141	42	0	0	0	183
Somniosus rostratus	0	143	0	0	39	182
Capros aper	141	0	0	0	0	141
Balistes carolinensis	33	102	0	0	0	135
Scyllarides latus	38	68	0	7	0	113
Mola mola	22	31	0	0	0	53
Mytilus edulis	40	7	0	0	0	47
Microcosmus vulgaris	29	16	0	0	0	45
Chimaera monstrosa	32	6	0	0	0	38
Acanthocardia echinata	35	0	0	0	0	35
Ensis siliqua	0	17	0	0	0	17
Aristaeomorpha foliacea	13	0	0	0	0	13
Atrina fragilis	12	0	0	0	0	12
Torpedo nobiliana	0	11	0	0	0	11
Crassostrea gigas	0	4	0	0	0	4
Total	130 586 525	29 284 543	167 362 065	5 116 415	3 061 129	335 410 677

Appendix 2. – Official landings at Vilanova i la Geltrú. Annual average values (2000-2009), in kg, by species, according to 11 *métiers*.

	cuttlefish	g-hake	l-hake	octopus	redmullet	sole	varied	dredge	beam trawl	bottom trawl	purse seine	Total
Sardina pilchardus	0	0	0	0	0	0	0	0	0	4 048	976 524	980 571
Engraulis encrasicolus	0	0	0	0	0	0	0	0	1	3 558	273 487	277 045
Trachurus mediterraneus	35	314	165	15	99	5	885	6	3	47 522	88 995	138 045
Merluccius merluccius	64	4 403	8 940	43	2	97	1 105	2	26	101 082	5	115 767
Micromesistius poutassou	0	0	0	0	0	0	0	0	0	110 878	95	110 973
Sardinella aurita	0	0	0	0	0	0	0	0	0	61	70 208	70 269
Scomber scombrus	9	855	97	1	1	0	207	1	1	18 465	38 702	58 339
Eledone cirrhosa	0	0	0	0	0	0	0	0	124	53 733	0	53 857
Osteichthyes	123	571	216	64	117	59	1 406	21	252	37 799	7 242	47 871
Octopus vulgaris	415	97	10	6 193	287	277	796	589	1 083	30 759	219	40 724
Pagellus acarne	84	539	68	44	52	11	1 544	1	11	31 297	6 950	40 602
Scomber japonicus	0	24	1	1	2	0	43	0	0	440	39 189	39 699
Mullus barbatus	9	12	2	12	28	9	98	5	4	37 473	27	37 677
Sparus aurata	74	73	25	35	5	9	1 051	9	2	2 300	28 433	32 015
Liza ramada	67	55	7	35	6	25	571	1	0	1 118	22 636	24 521
Lophius piscatorius	35	145	35	4	6	20	187	1	84	23 444	15	23 977
Aristeus antennatus	0	0	0	0	0	0	0	0	0	22 817	0	22 817
Seriola dumerili	87	285	33	120	22	26	2 878	6	2	2 678	15 998	22 137
Lithognathus mormyrus	327	193	23	119	93	330	2 274	451	36	659	16 903	21 409
Sepia officinalis	1 670	72	21	191	102	316	339	1 267	1 518	14 613	48	20 156
Loligo vulgaris	0	0	0	0	0	0	0	0	1	16 110	3 780	19 891
Trachurus trachurus	8	18	3	1	6	0	38	2	0	6 284	12 571	18 934
Phycis blennoides	3	83	34	0	1	1	46	0	2	18 116	0	18 287
Citharus linguatula	8	126	46	7	0	5	56	0	463	16 189	0	16 900
Sarda sarda	47	453	31	38	5	2	3 110	0	2	138	12 046	15 873
Pagellus erythrinus	49	460	70	22	53	8	937	0	20	9 902	3 121	14 641
Nephrops norvegicus	0	0	0	0	0	0	0	0	0	14 514	0	14 514
Sarpa salpa	7	11	3	8	4	3	131	11	1	64	12 985	13 228
Bolinus brandaris	858	12	9	140	21	173	160	14	10 990	327	0	12 704
Trisopterus minutus	1	37	30	1	0	9	11	0	4	11 538	0	11 632
Pomatomus saltator	3	8	2	16	1	3	210	2	2	60	11 142	11 451
Trachinus draco	43	59	11	26	12	101	186	1	95	9 972	3	10 509
Mullus surmuletus	55	77	12	16	1 576	2	286	13	3	8 242	19	10 304
Diplodus sargus	64	103	14	60	13	14	899	15	2	1 050	8 015	10 249
Liocarcinus depurator	0	0	0	0	0	0	0	0	14	9 234	7	9 255
Chelidonichthys lucerna	195	297	181	49	8	69	326	1	50	7 925	2	9 104
Boops boops	0	0	0	0	0	0	0	0	0	5 444	3 319	8 763
Sphyraena sphyraena	1	4	0	13	163	0	73	5	0	1 297	6 897	8 454
Oblada melanura	0	0	0	0	0	0	0	0	0	0	7 603	7 603
Conger conger	6	16	3	22	6	2	195	23	14	7 269	26	7 582
Eledone moschata	0	0	0	0	0	0	0	0	7 059	257	0	7 316
Solea vulgaris	895	142	62	288	70	2 343	753	16	1 180	598	12	6 359
Dicentrarchus labrax	83	40	19	106	7	22	615	43	28	4 045	1 222	6 230
Donax trunculus	0	0	0	0	0	0	0	5 936	0	0	0	5 936
Cepola rubescens	0	0	0	0	0	0	0	0	0	5 846	0	5 846
Mugilidae	0	0	0	0	0	0	0	0	0	63	4 649	4 712
Brachyura	0	0	0	0	0	0	0	0	1	4 238	2	4 242
Diplodus annularis	18	67	10	11	24	2	339	3	1	2 443	1 182	4 098
Pagrus pagrus	24	52	15	48	124	13	767	0	1	2 895	117	4 056
Lepidorhombus boscii	0	0	0	0	0	0	0	0	0	3 804	0	3 804
Uranoscopus scaber	17	26	12	2	19	8	51	1	232	2 794	1	3 161
Parapenaeus longirostris	0	0	0	0	0	0	0	0	0	3 081	0	3 081
Diplodus vulgaris	5	11	2	3	10	2	126	0	2	1 495	1 088	2 745
Raja asterias	147	104	9	29	20	39	145	1	489	1 425	0	2 407
Trisopterus luscus	0	0	0	0	0	0	0	0	0	2 125	0	2 125
Squilla mantis	27	3	1	13	0	32	13	0	316	1 620	0	2 025
Illex coindetii	0	0	0	0	0	0	0	0	0	1 564	139	1 702
Scorpaena notata	21	45	9	13	536	30	302	3	8	500	88	1 555
Scophthalmus rhombus	269	21	4	87	39	89	175	4	334	406	4	1 431
Galeus melastomus	0	0	0	0	0	0	0	0	0	1 370	0	1 370
Scyliorhinus canicula	0	0	0	0	0	0	0	0	0	1 289	0	1 289
Helicolenus dactylopterus	0	46	26	0	0	0	16	0	1	1 178	0	1 267
Penaeus kerathurus	33	5	2	2	0	16	38	0	813	240	11	1 159
Dentex dentex	6	48	16	4	15	2	231	0	1	383	420	1 126
Nassarius mutabilis	39	0	0	1	0	0	798	287	0	0	0	1 126
Plesionika heterocarpus	0	0	0	0	0	0	0	0	0	1 094	0	1 094
Hexaplex trunculus	0	0	0	0	0	0	0	2	1 010	43	0	1 055
Xiphias gladius	1	37	58	0	0	0	19	0	0	422	435	973
Dactylopterus volitans	0	0	0	0	0	0	0	942	23	0	0	964
Lophius sp.	0	0	0	0	0	0	0	0	1	902	0	902
Spicara smaris	0	0	0	0	0	0	0	0	0	224	636	860

APPENDIX 2 (cont.). – Official landings at Vilanova i la Geltrú. Annual average values (2000-2009), in kg, by species, according to 11 *métiers*.

	cuttlefish	g-hake	l-hake	octopus	redmullet	sole	varied	dredge	beam trawl	bottom trawl	purse seine	Total
Auxis rochei	0	0	0	0	0	0	0	0	0	208	525	733
Octopodidae	0	0	0	0	0	0	0	0	0	631	0	631
Capros aper	0	0	0	0	0	0	0	0	0	588	0	588
Raja sp.	78	12	1	7	0	7	20	0	42	365	0	534
Serranus cabrilla	0	0	0	0	0	0	0	0	2	504	0	505
Murex sp.	0	0	0	0	0	0	0	2	398	94	0	495
Pagellus bogaraveo	0	0	0	0	0	0	0	0	3	457	21	481
Belone belone	0	0	0	0	0	0	0	0	459	0	0	459
Chamelea gallina	0	0	0	11	0	0	162	237	29	0	0	439
Diplodus puntazzo	0	0	0	0	0	0	0	0	0	42	373	416
Lophius budegassa	0	0	0	0	0	0	0	0	1	385	0	386
Pecten jacobaeus	0	0	0	0	0	0	0	0	339	39	0	378
Sciaena umbra	0	0	0	0	0	0	0	0	374	0	3	377
Gobius niger	0	0	0	0	0	0	0	0	1	350	0	350
Lepidorhombus whiffiagonis	0	0	0	0	0	0	0	0	0	299	0	299
Palinurus elephas	4	89	14	0	0	0	83	0	0	96	0	288
Scorpaena sp.	6	9	1	3	58	1	34	0	0	117	32	264
Gobiidae	0	0	0	0	0	0	0	0	0	248	0	249
Phycis phycis	2	70	15	1	0	2	55	0	0	75	1	221
Thunnus thynnus	0	40	54	0	0	0	1	0	12	8	92	207
Stichopus regalis	0	0	0	0	0	0	0	0	0	183	0	183
Lepidopus caudatus	0	0	0	0	0	0	0	0	0	166	0	166
Arnoglossus thori	0	0	0	0	0	0	0	0	0	137	0	137
Callista chione	0	0	0	0	0	0	0	0	111	0	0	111
Argentina sphyraena	0	0	0	0	0	0	0	0	109	0	0	109
Sepiidae, Sepiolidae	0	0	0	0	0	0	0	0	0	104	0	104
Serranus sp.	0	0	0	0	0	0	0	0	1	101	0	102
Geryon longipes	0	0	0	0	0	0	0	0	0	100	0	100
Plesionika edwardsii	0	0	0	0	0	0	0	0	0	90	0	90
Zeus faber	0	0	0	0	0	0	0	0	0	80	0	81
Todarodes sagittatus	0	0	0	0	0	0	0	0	0	77	0	77
Thunnus alalunga	0	0	0	0	0	0	0	0	0	0	58	58
Spondyliosoma cantharus	0	0	0	0	0	0	0	0	0	1	45	46
Homarus gammarus	0	0	0	0	0	0	0	0	1	44	0	44
Gymnammodytes cicerelus	0	0	0	0	0	0	0	32	0	0	0	32
Polipryon americanus	0	0	0	0	0	0	0	0	0	30	2	32
Cephalopoda	0	0	0	0	0	0	0	0	28	0	0	28
Trachinus sp.	0	0	0	0	0	0	0	0	0	26	0	26
Tapes decussatus	0	0	0	0	0	0	0	22	0	0	0	22
Acanthocardia tuberculata	0	0	0	0	0	0	0	19	3	0	0	21
Mactra corallina	0	0	0	0	0	0	0	19	0	0	0	19
Brama brama	0	0	0	0	0	0	0	0	0	17	0	17
Natantia	0	0	0	0	0	0	0	0	10	0	0	10
Psetta maxima	0	0	0	0	0	0	0	0	0	6	0	6
Littorina littorea	0	0	0	0	0	0	0	6	0	0	0	6
Coris julis	0	0	0	0	0	0	0	0	5	0	0	5
Spicara sp.	0	0	0	0	0	0	0	0	0	4	0	4
Acanthocardia echinata	0	0	0	0	0	0	0	0	4	0	0	4
Coryphaena hippurus	0	0	0	0	0	0	0	0	0	0	4	4
Circomphalus casinus	0	0	0	0	0	0	0	0	3	0	0	3
Veneridae	0	0	0	0	0	0	0	3	0	0	0	3
Epinephelus marginatus	0	0	0	0	0	0	0	0	0	2	0	2
Munida sp.	0	0	0	0	0	0	0	0	0	2	0	2
Glycymeris insubrica	0	0	0	0	0	0	0	0	2	0	0	2
Galeorhinus galeus	0	0	0	0	0	0	0	0	1	0	0	1
Ensis siliqua	0	0	0	0	0	0	0	0	1	0	0	1
Molva dipterygia	0	0	0	0	0	0	0	0	0	1	0	1
Diplodus cervinus	0	0	0	0	0	0	0	0	0	0	0	1
Scorpaena scrofa	0	0	0	0	0	0	0	0	1	0	0	1
Lichia amia	0	0	0	0	0	0	0	0	0	1	0	1
Paromola cuvieri	0	0	0	0	0	0	0	0	0	1	0	1
Total	6 020	10 271	10 425	7 930	3 615	4 184	24 790	10 021	28 250	740 440	1 678 374	2 524 321