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Deep-water Sharks Fisheries from off the Portuguese Continental Coast

(Elasmobranch Fisheries - Oral)

by

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Abstract

Deep-water sharks represent a major percentage of the total annual elasmobranch landings in Portugal mainland, especially Portuguese dogfish *Centroscymnus coelolepis*, Leaf-scale gulper shark *Centrophorus squamosus* and Gulper shark *Centrophorus granulosus.* These species are usually by-catches of fisheries targeting other species.

The present work describes the main characteristics of the fisheries for the three species mentioned above that take mainly place at Sesimbra and Peniche landing ports. Special focus will be put into the comparative analysis of the fishing regimes adopted at these two landing ports.

Introduction

Sharks populations around the world are mostly caught as a by catch of the world's fisheries targeting teleost species. In the past, much of shark catches have been discarded without record (Walker, 1998). Recently elasmobranchs, and sharks in particular, are becoming more and more important and their commercial value has increased accordingly. Reported landings of condrichthyan fishes currently exceeded 700 000 t for year (Walker, 1998).

In the Northeast Atlantic, the majority of shark species are taken as a by-catch of fisheries targeting teleosts. The most of the shark species are not subject to catch controls and there is, therefore, no obligation for fishermen to record catches in the logbooks used for monitoring quota uptake of commercially important teleosts. Moreover, landings data are also limited by a lack of species-specific data reported by most countries. In Europe, for example, French bottom trawl catches of deep-water sharks, Leaf-scale gukper shark; *Centrophorus squamosus* (Bonnaterre, 1788), and the Portuguese dogfish, *Centroscymnus coelolepis* Bocage & Capello 1864, are landed together and under the designation of "siki" (Anon., 2002).

To properly assess the current situation of the sharks, address the various associated with their exploitation and contributed new ideas about their study and management, it is essential to increase the knowledge about the characteristics and diversity of their fisheries, the species exploited and the size of the catches (Bonfil, 1994).

The present contribution aims to describe the exploitation patterns of fishing fleets capturing deep-water sharks off the continental Portuguese continental coast. Two fishing ports from Portugal mainland, Sesimbra and Peniche, with higher values of deep-water shark landings are analysed.

Data and Results

The main data source was provided from statistic landing data on Portuguese commercial deep-water sharks species, routinely compiled by General Directorate of Fisheries (DGPA). DGPA is an institution belonging to the Portuguese Ministry of Agriculture, Rural Development and Fisheries.

The Portuguese coast is divided in 5 statistical zones for national fisheries report, Norte, Centro, Lisboa e Vale do Tejo, Alentejo e Algarve (Figure 1).

Peniche and Sesimbra ports, lying in the Lisboa e Vale do Tejo zone, were chosen for this study since they constitute two important ports with major landings of deep-water species. Sesimbra is undoubtedly the most important port for deep-water sharks, representing ca. 50% of the total landings in Portugal mainland (Table 1), being Lisboa, Viana do Castelo and Peniche other important ports. Figure 2 summarises this information for the years 1999 and 2000. However their fleets have very different characteristics, having Peniche a very diversified fleet in which the artisanal fishery have represented in the last 5 years between 20 and 24% of the total landings. Sesimbra is a fishermen village, essentially devoted to the artisanal fishery (>70% of the landings).

At present, no direct fishery on sharks exist on the Portuguese coast and therefore, all catches of elasmobranch species are by-catches of the trawl or deep-water fisheries. It is worthwhile to be said that sharks are not the most important group of species landed. In fact, the great majority (>60%) of the vessels land only less than 25% of sharks (Figure 3) both in Peniche and in Sesimbra. From this figure, one can also observe the low percentage of vessels that land more than 75% of sharks and this is particularly conspicuous in Sesimbra. In what concerns the deep-water sharks, they are caught essentially with longlines, >99% (Table 2) at depths ranging from 800 to 1600 m. Therefore, all analysis made from this point forward were based on deep-water species captured by longline.

Figure 4 shows elasmobranch species landings versus total landings (in tonnes) in Peniche and Sesimbra for a nine year period (1992 – 2000). Analysing these figures, it can be seen that Sesimbra has been responsible for much higher landings. Between 1992 and 1997, 10000 to 12000 tonnes were landed while in Peniche the highest value was obtained in 1994 with less than 3000 tonnes. Nevertheless, it must be pointed out that, in both ports, a general decreasing trend can be observed along the studied period with a sharp decrease in 2000. This decrease was much larger in Sesimbra (a reduction of ca. 60%) than in Peniche (30%) and was due to interdiction of fishery off Marocco.

In what concerns elasmobranch species landings, two different patterns can be seen. Sesimbra has shown an increasing trend from 1993 to 1999 while, in Peniche, elasmobranch landings exhibits a similar trend to the one observed for all species combined.

An analysis of the total landings by month (Figure 5) also shows different patterns between Peniche and Sesimbra. In Peniche, a similar trend occurred in both the landings of elasmobranch and all species combined with the highest values obtained between May and July. In Sesimbra, the highest values of elasmobranch species (observed between May and September) corresponds to the lowest landings of all species combined.

The two general patterns observed for Peniche and Sesimbra are the reflex of a different fishing deep-water fishery between them; Sesimbra has larger number of boats involved as well as a more regular activity. The facts are translated into a larger number of monthly landing records at Sesimbra (Figure 6). In Peniche, the patterns of the total number of monthly landing records are similar for all sharks combined and also for the two more important shark species, Gulper shark; *Centrophorus granulosus* (Bloch & Schneider, 1801), and Portuguese dogfish. However, the number of records of Gulper shark is almost the double of that of Portuguese dogfish.

The majority of the sharks landed are deep-water sharks (Figure 7). This figure shows a different pattern in deep-water sharks' landings by month, which are landed in lower percentages between June and September/October. Two different reasons appear to be responsible for this behaviour between the ports. In Sesimbra, the decrease might be related to a lower level of abundance of these species, because no changes on target species - black scabbardfish, *Aphanopus carbo*, are evident. In addition, there is also a decrease on landings on black scabbardfish during the same period to which no reduction on fishing effort is associated (figure 8). In Peniche, the decrease might be due to

a greater interest to capture other species of higher commercial value (Table 3). In fact, forkbeards, *Phycis* spp, and European conger, *Conger conger*; are landed in major quantities during late spring and summer (Figure 9).

Gulper shark, Leafscale gulper shark and Portuguese dogfish are the three most important deep water shark species in terms of total landings. Figure 10 shows the landings of each of these species for the period 1991-2000, respectively in Peniche and Sesimbra. As it can be seen, the relative importance of each species is not the same. In Peniche, the Gulper shark landings represent five times the landings of Portuguese dogfish, the second species in the ranking. However, the landings of Gulper shark shows a decreasing trend along the year, particularly in 2000 when the lowest value is attained. In Sesimbra, Portuguese dogfish has the highest landings, followed by Leafscale gulper shark. The analysis of the data from 1991 to 2000 shows that, between 1995 and 1999, the landings were slightly higher than in the rest of the period, decreasing in 2000 to values similar to the ones observed in 1993.

In terms of income and analysing the information for Peniche (Figure 11a), Gulper shark is the species with the highest commercial value (which is almost twice the value of the other two species) and an increasing trend on the mean price *per* kilo is evident from 1991 to 1998. This trend is also noticed for the other two species, among which Portuguese dogfish has a mean price *per* kg slightly higher than Leafscale gulper shark.

In Sesimbra, the Leafscale gulper shark has slightly higher commercial value, than those of the Gulper shark and the Portuguese dogfish (Figure 11b). Comparing the income behaviour with Peniche, no evident trends are detected on the mean price *per* kilo among these species.

Discussion

The joint analysis of the two fishing ports (Peniche and Sesimbra) allowed us to conclude that: a) the Portuguese fishery on deep-water sharks is conducted by longlines, being the artisanal fishery the one that contributes to the major landings; b) deep-water sharks are not targets of this fishery. In Sesimbra they are a by-catch of the black scabbardfish fishery and in Peniche a by-catch of multispecies artisanal fisheries.

Apart from these common aspects, Peniche and Sesimbra represent two distinct realities that comprehend 4 issues:

1. Fleet. Peniche is the landing port for several fishing fleets components (trawl, purse-seine and international fishery) that include large and small boats allowing different approaches to the fishery grounds. In this deep-water speies landings represent a small fraction of overall landings (ca 20%). In Sesimbra, the artisanal longline fleet is very important and its landings represent more than 70% of the total landings: It is mainly constituted by small commercial boats with an overall length range from 8.6 to 22.2 m and the power of the main engine from 78Kw to 272Kw. The fleet can be characterised by an average overall length of 16.4m and with an average main engine power of 135Kw.
2. socio-economic reality. Peniche has a diversified fishery community associated with different fishing fleet components. This fact can explain the reduced number of boats involved in the fishery and the lower landings of deep-water species, when compared to Sesimbra. On the contrary, Sesimbra is a very closed fishing community that depend on the sea for their livelihood. It is a traditional fishery with few technological innovations and is also based on the family labour force. It is embedded in the cultural activity of the community where the economic, social, political and ecological aspects contrast with those to be found in the highly developed trawl fisheries of northern European countries: e.g, traditional vs. modern, artisanal vs. industrial, family vs. company and conservation vs. over-exploitation.
3. Deep-water shark ranking. In Peniche, the Gulper shark is, by far, the most important one landed, followed by the Portuguese dogfish and the Leafscale gulper shark. In Sesimbra, Portuguese dogfish is the first species in the rank, followed by the Leafscale gulper shark. Gulper shark has a very low representation in the landings when compared with the former two species.
4. income. In Peniche, as a major city, the price of the species *per* kilo is highly dependent on supply and demand. From 1991 to 2000, the decreasing trend in landings resulted in an increasing trend in the price of Gulper shark. The other two species have comparatively much lower landings but, despite of that, an increase of their price is still evident for more recent years. In Sesimbra, both the landings and the prices do not show any marked trend, with the exception of the price *per* kilo for all the species, which shows a slightly increase from 1991 to 2000.

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Table 1. Annual landings (tons) of deep-water sharks at the most important landing ports of Portugal Mainland.

	1992	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**
LISBOA	184	197	187	192	206	144	144	265	130
PENICHE	92	74	34	38	48	33	49	82	14
SESIMBRA	715	579	794	956	850	951	909	1226	853
VIANA DO CASTELO	153	130	61	75	59	61	38	103	65
OTHERS	501	545	575	562	636	654	627	931	647

Table 2. Annual landings (tons) of deep-water sharks by fishing fleet from Portugal Mainland.

	1992	1993	1994	1995	1996	1997	1998	1999	2000
Trawl	4,84	3,00	2,77	2,27	8,52	7,58	3,01	0,75	3,86
Longline	1907,73	1588,82	1358,51	1579,42	1325,90	1631,12	1433,06	698,47	569,93
Purse-seine	0,30	0,05	0,01	0,01	0,04	0,02	0,03	0,08	0,03
TOTAL	1912,86	1591,88	1361,28	1581,71	1334,46	1638,73	1436,09	699,31	573,82

Table 3. Ranks, by decreasing order of importance, assigned to the most important fish species landed at Peniche and Sesimbra between June and September/October.

PENICHE

	Jun	Jul	Aug	Sep	Oct
Forkbeards	2	1	1	2	3
Conger eel		2		3	
Monkfish	1				1
Black scabbardfish	3		3		2
Rays		3	2		
Wreckfish				1	

SESIMBRA

	Jun	Jul	Aug	Sep
Forkbeards	3	2		2
Conger eel	2	3	3	3
Black scabbardfish	1	1	1	1
Rays			2	

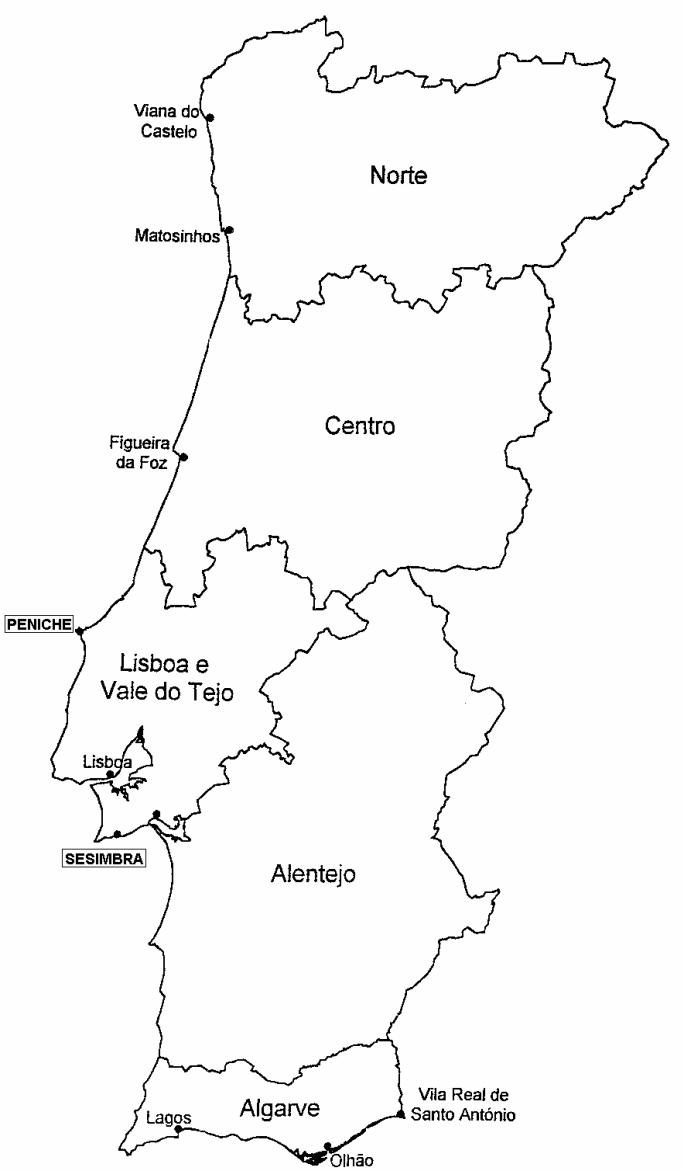

Fig.1. Geographic zones adopted by the Portuguese Statistical Institute for landing reports.

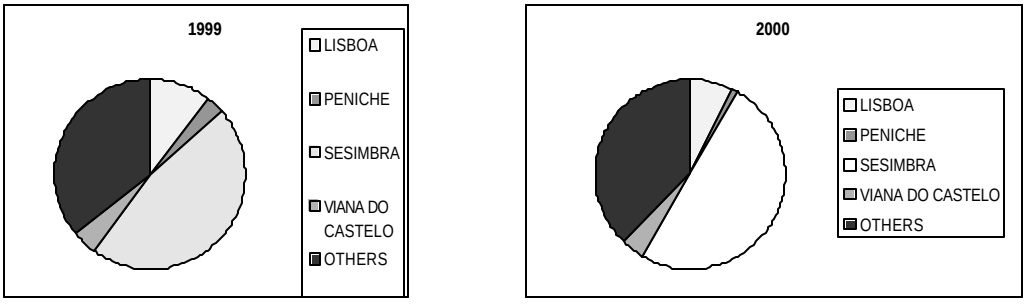

Fig. 2. Landings of deep-water sharks in major ports of Portugal Mainland in 1999 and 2000.

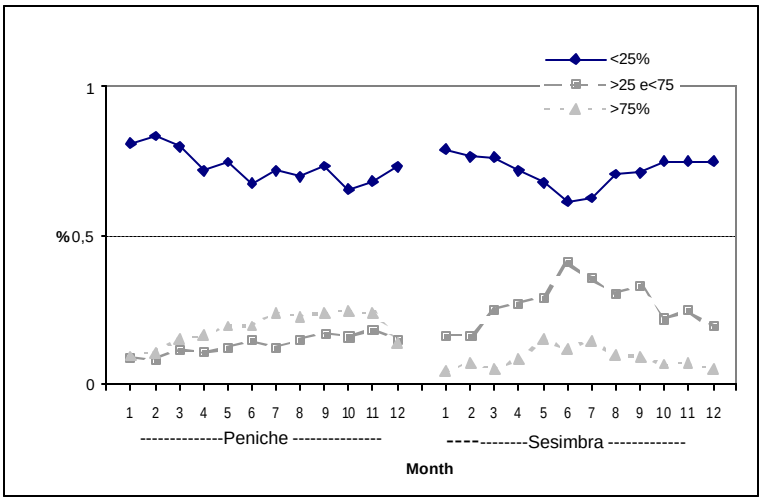

Fig. 3. Monthly percentage of vessels that landing sharks in Peniche and Sesimbra.

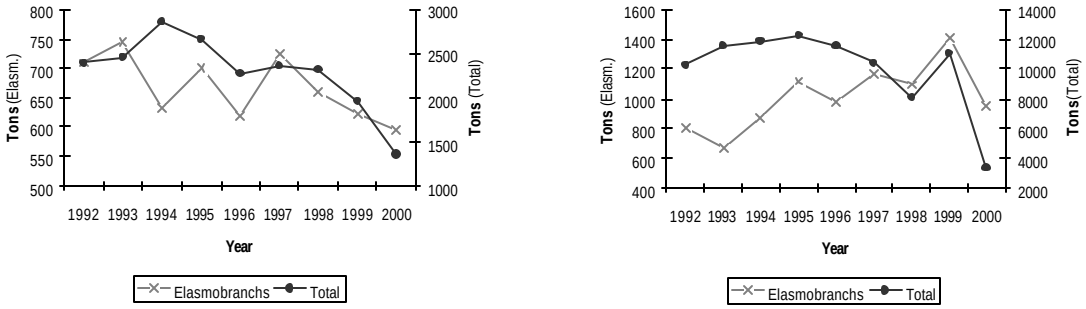

Fig. 4. Elasmobranch species landings versus total landings (tonnes) in Peniche (a) and Sesimbra (b) between 1992 and 2000.

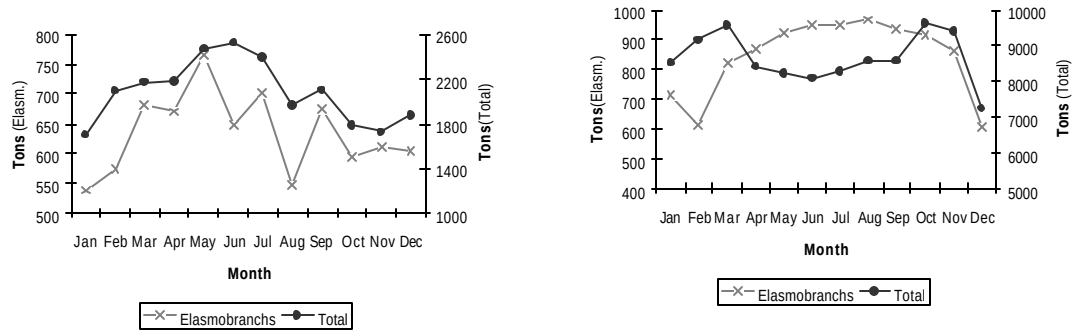

Fig. 5. Monthly evolution of landings (tonnes) of elasmobranch species versus total landings in Peniche (a) and Sesimbra (b).

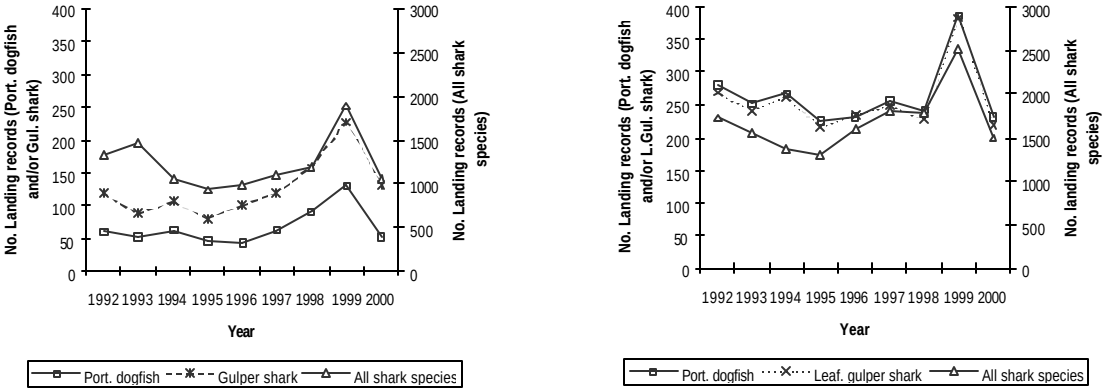

Fig. 6. Total number of landing records for the three most important deep-water sharks versus the total number of landing records for all shark species combined in Peniche (a) and Sesimbra (b).

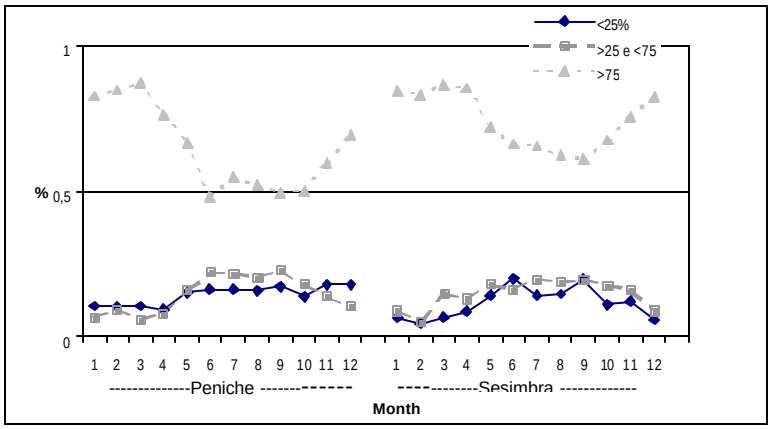

Fig. 7. Percentage of vessels landing deep-water sharks by month in Peniche and Sesimbra.

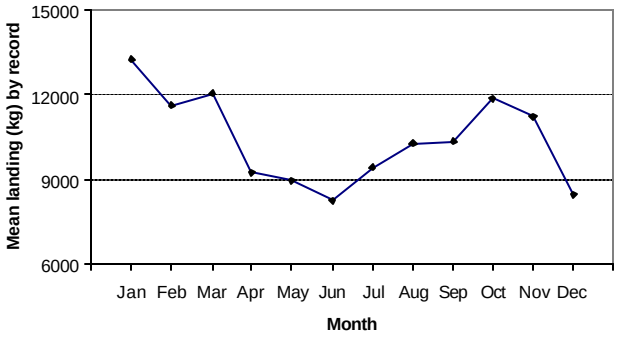

Fig. 8. Monthly mean landings by record of black scabbardfish in Sesimbra

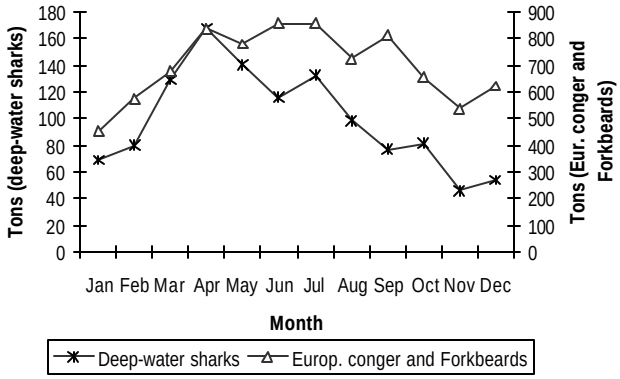

Fig. 9. Landings of the Forkbeards plus European conger versus deep-water sharks in Peniche by month.

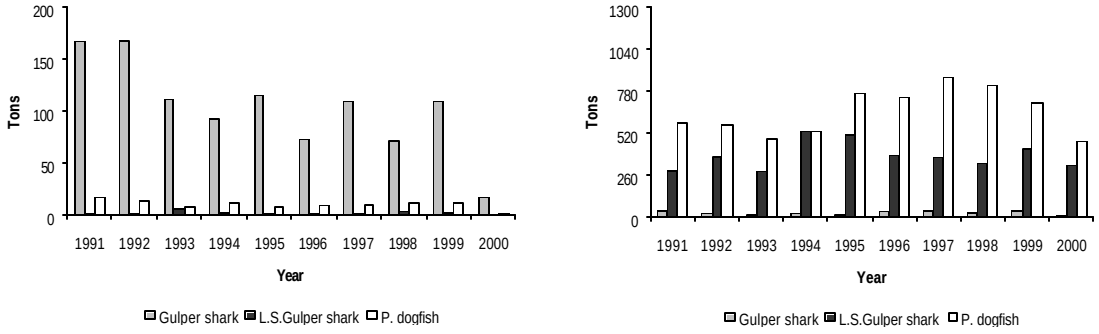

Fig. 10. Landings of Portuguese dogfish, Leafscale gulper shark and Gulper shark in Peniche (a) and Sesimbra (b).

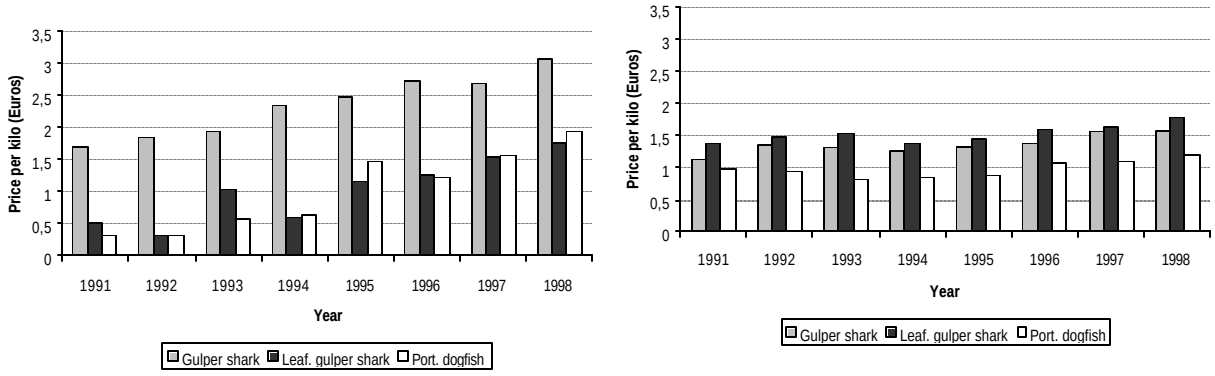

Fig. 11. Annual income values for Portuguese dogfish, Leafscale gulper shark and Gulper shark in Peniche (a) and Sesimbra (b).