

Catch and distribution of bycatch species and discards from Spanish tropical purse-seine fishery

by

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ABSTRACT

This document presents results about tuna discards, and the catch and distribution of several groups of fauna species associated with free schools and floating objects. The data analysed correspond to those obtained from 34 trips with observers of the Spanish Oceanographic Institute. A total of 1054 days and 863 sets were undertaken in the presence of observers.

Data (in weight) for tuna catches, discards and bycatch, separated according fishing mode and year, for the Spanish tropical purse-seine fleet between 2003 and 2006, are included.

KEYWORDS

Indian Ocean, tropical tuna, discards, purse-seine, discards, floating objects, bycatch.

Introduction

The European tropical purse-seine tuna fleet operating in the Atlantic and Indian Oceans provides extremely valuable information about its fishing activity through fishing logs, which are completed along with samplings in port. This information is exclusively directed at commercial tuna catches. However, this fleet discards target species as well as several species of bycatch. These data can only be obtained from observers on board.

Systematic data collection by scientific observers in the European purse-seine fleet in the Indian Ocean is included in the National Database Plan (PNBD).

This document presents results about tuna discards, and the catch and distribution of several groups of fauna species associated with free tuna schools and particularly with floating objects (FADs).

Material and methods

The data analysed correspond to those obtained from 21 trips with observers from the National Database Plan of the Spanish Oceanographic Institute (PNDB-IEO), financed by the EU and carried out between 2003 and 2006, and 13 trips undertaken within a Pilot Project financed by the Secretaría General de Pesca Marítima Española (Spanish General Secretariat of Maritime Fisheries) in collaboration with a shipowning company. A total of 1054 days and 863 sets were undertaken in the presence of observers.

We considered five groups for the data regarding accompanying fauna: billfishes, sharks, turtles, other fishes and cetaceans. There were no catches for the latter group, and, consequently, no mention is made in tables or graphs. Data have been grouped according to fishing mode (object and free school).

The coverage was not ideal for totally reliable extrapolations, but we believe that current coverage provides a closer view of discard and bycatch data. For the aforementioned extrapolations, we considered the number of sets performed by the Spanish purse-seine fleet per fishing mode (object and free school) and year.

Results

Table 1 shows the number of sets, per fishing mode and total, undertaken with observers on board between 2003 and 2006, while Table 2 contains the number of sets, per per fishing mode and total, undertaken by the Spanish tropical purse-seine fleet operating in the Indian Ocean between 2003 and 2006.

Table 3 presents data (in tons) for tuna catches, discards and bycatch, separated according to fishing mode and year, for the Spanish tropical purse-seine fleet between 2003 and 2006. These data are graphically represented in Figure 1. The tons corresponding to the commercial catch, discard and bycatch for object and free school are shown to the left of this figure. The commercial catch has been omitted to the right of this figure in order to appreciate the other two groups in greater detail.

Figure 2 gives the ratio of bycatch species, per fishing mode, undertaken by the fleet between 2003 and 2006. We observed that there is specific variability between the different years considered. Skipjack is the species with the highest rate of discards for fishing over objects for the entire period considered, except for one year, when it was frigate tuna. There is more variability for free school than for object.

Figure 3 shows the discards (in tons) per species, for object and free school, for each year considered. Discards are seen to be normally much higher over objects than over free schools, with values varying between 125 tons (2003) and 2347 tons (2004) over free schools, and between 589 tons (2005) and 4194 tons (2004) over objects. Skipjack is the species with most discards, followed by frigate tuna.

Figure 4 presents the proportion, in weight, of the different groups of fauna (excluding turtles), per fishing mode and year. We observed that the Other Fishes group is the most important in fishing over objects, since the proportion varied between 75% and 58% according to year. This was followed by sharks (between 33% and 17%) and by swordfish (between 4% and 14%). By far the dominant group, over free schools are sharks, except for the last year considered, when swordfish were the highest catch.

Figure 5 shows the different groups of fauna listed according to the main species in each group, separated by fishing mode, but grouped for the entire period considered.

Table 4 gives the number of turtles caught, per fishing mode, during the IEO observer campaigns between 2003 and 2006 in the Indian Ocean, while Figure 6 shows the ratio, in numbers, of the various turtle species per fishing mode. This has not been extrapolated to the fishery in the case of the turtles.

Table 5 included all the species of bycatch, distinguishing between those caught over floating objects and those over free schools.

Figure 7 presents situations of sets over floating objects, in which some of the groups of fauna appeared in the following order (from top to bottom and from left to right): swordfish (group 1), Selachii (group 2), Other Fishes (group 3) and turtles (group 4). Figure 8 shows the same over free schools.

Figure 9 corresponds to the distribution of swordfish catches (left object and right free school). Figures 10, 11 and 12 correspond to Selachii, the first for this entire group separated per mode of fishing; 11 shows sharks to the left and rays to the right (in both cases, catches were made over floating objects); while 12 presents these same groups over free schools.

Figure 13 corresponds to the distribution of catches of Other Fishes (left, object, and right, free school). The catches of these three groups (swordfish, Selachii and other fishes) are in tons.

Figure 14 shows catches (in numbers) of turtles: on the left of the figure, over objects, and on the right, over free schools.

Table 1. Number of sets per fishing mode and total undertaken with observers between 2003 and 2006.

	Total Observer Sets			
	2003	2004	2005	2006
Free School	15	54	225	93
FAD	51	104	261	60
Total	66	158	486	153

Table 2. Number of sets per fishing mode and total undertaken by the Spanish tropical purse-seine fleet operating in the Indian Ocean between 2003 and 2006.

	Total Fishery Sets			
	2003	2004	2005	2006
Free School	1869	2363	3047	2911
FAD	1932	1884	2768	3333
Total	3801	4247	5815	6244

Table 3. Catch (in tons) of tuna, discards and bycatch per fishing mode and total for the Spanish tropical purse-seine fleet operating in the Indian Ocean between 2003 and 2006.

	Total Fishery 2003		
	Tuna catches	Discards	Fauna
Free School	64403	150	217
FAD	111797	4306	1614
Total	176200	4455	1831

	Total Fishery 2004		
	Tuna catches	Discards	Fauna
Free School	69496	2369	74
FAD	84610	4681	1914
Total	154106	7050	1987

	Total Fishery 2005		
	Tuna catches	Discards	Fauna
Free School	69729	142	43
FAD	112833	589	1936
Total	182562	731	1980

	Total Fishery 2006		
	Tuna catches	Discards	Fauna
Free School	52271	571	41
FAD	148272	2155	1393
Total	200543	2726	1434

Table 4. Number of turtles caught per fishing mode during the IEO observer campaigns undertaken between 2003 and 2006 in the Indian Ocean.

Turtles	Observers' data	
	FAD	Free School
2003	11	0
2004	15	0
2005	30	2
2006	5	0

Table 5. List of species of associated fauna, present or otherwise, according to mode of fishing.

Associated fauna	% Free school	% FADs
BILLFISHES		
<i>Istiophoridae family</i>	x	x
<i>Istiophorus platypterus</i>	x	x
<i>Makaira indica</i>	x	x
<i>Tetrapturus angustirostris</i>	x	x
<i>Tetrapturus audax</i>	-	x
<i>Xiphias gladius</i>	-	x
OTHER FISHES		
<i>Ablennesse hians</i>	-	x
<i>Abudefduf vaigiensis</i>	x	-
<i>Acanthocybium solandri</i>	x	x
<i>Aluterus monoceros</i>	-	x
<i>Aluterus scriptus</i>	x	x
<i>Canthidermis maculatus</i>	x	x
<i>Carangoides orthogrammus</i>	-	x
<i>Carangoides orthogrammus</i>	-	x
<i>Caranx crysos</i>	-	x
<i>Caranx sexfasciatus</i>	-	x
<i>Coryphaena equiselis</i>	-	x
<i>Coryphaena hippurus</i>	x	x
<i>Decapterus macarellus</i>	-	x
<i>Diodon hystrix</i>	x	x
<i>Elagatis bipinnulata</i>	x	x
<i>Balistidae family</i>	-	x
<i>Belonidae family</i>	x	x
<i>Bramidae family</i>	x	x
<i>Carangidae family</i>	x	x
<i>Coryphaenidae family</i>	x	x
<i>Diodontidae family</i>	x	-
<i>Echeneidae family</i>	x	x
<i>Ephippidae family</i>	-	x
<i>Exocoetidae family</i>	x	-
<i>Fistularidae family</i>	x	-
<i>Molidae family</i>	x	-
<i>Pomacentridae family</i>	-	x
<i>Tetraodontidae family</i>	-	x
<i>Kyphosus cinerascens</i>	-	x
<i>Kyphosus sectator</i>	x	x
<i>Kyphosus sp.</i>	-	x
<i>Kyphosus vaigiensis</i>	-	x
<i>Lagocephalus lagocephalus</i>	x	-
<i>Lobotes surinamensis</i>	x	x
<i>Naucrates ductor</i>	x	x

<i>Other unidentified fish</i>	X	-
<i>Platax sp.</i>	-	X
<i>Platax teira</i>	-	X
<i>Remora australis</i>	-	X
<i>Remora remora</i>	X	X
<i>Remorina albescens</i>	-	X
<i>Ruvettus pretiosus</i>	-	X
<i>Seriola rivoliana</i>	-	X
<i>Sphyrna barracuda</i>	X	X
<i>Tylosurus crocodilus</i>	-	X
<i>Uraspis helvola</i>	-	X
<i>Uraspis secunda</i>	X	X
<i>Uraspis sp.</i>	-	X
<i>Zanclus cornutus</i>	X	-

SHARKS

<i>Carcharhinus falciformis</i>	X	X
<i>Carcharhinus longimanus</i>	X	X
<i>Carcharhinidae family</i>	X	-
<i>Dasyatidae family</i>	X	X
<i>Sphyrnidae family</i>	-	X
<i>Isurus oxyrinchus</i>	-	X
<i>Manta birostris</i>	X	X
<i>Mobula mobular</i>	X	-
<i>Mobula sp</i>	X	-
<i>Mobula tarapacana</i>	-	X
<i>Prionace glauca</i>	X	-
<i>Pteroplatytrygon violacea</i>	X	X
<i>Rhincodon typus</i>	X	X
<i>Sphyrna lewini</i>	X	-

TURTLES

<i>Caretta caretta</i>	-	X
<i>Chelonia mydas</i>	-	X
<i>Eretmochelys imbricata</i>	-	X
<i>Lepidochelis kempii</i>	-	X
<i>Lepidochelis olivacea</i>	-	X

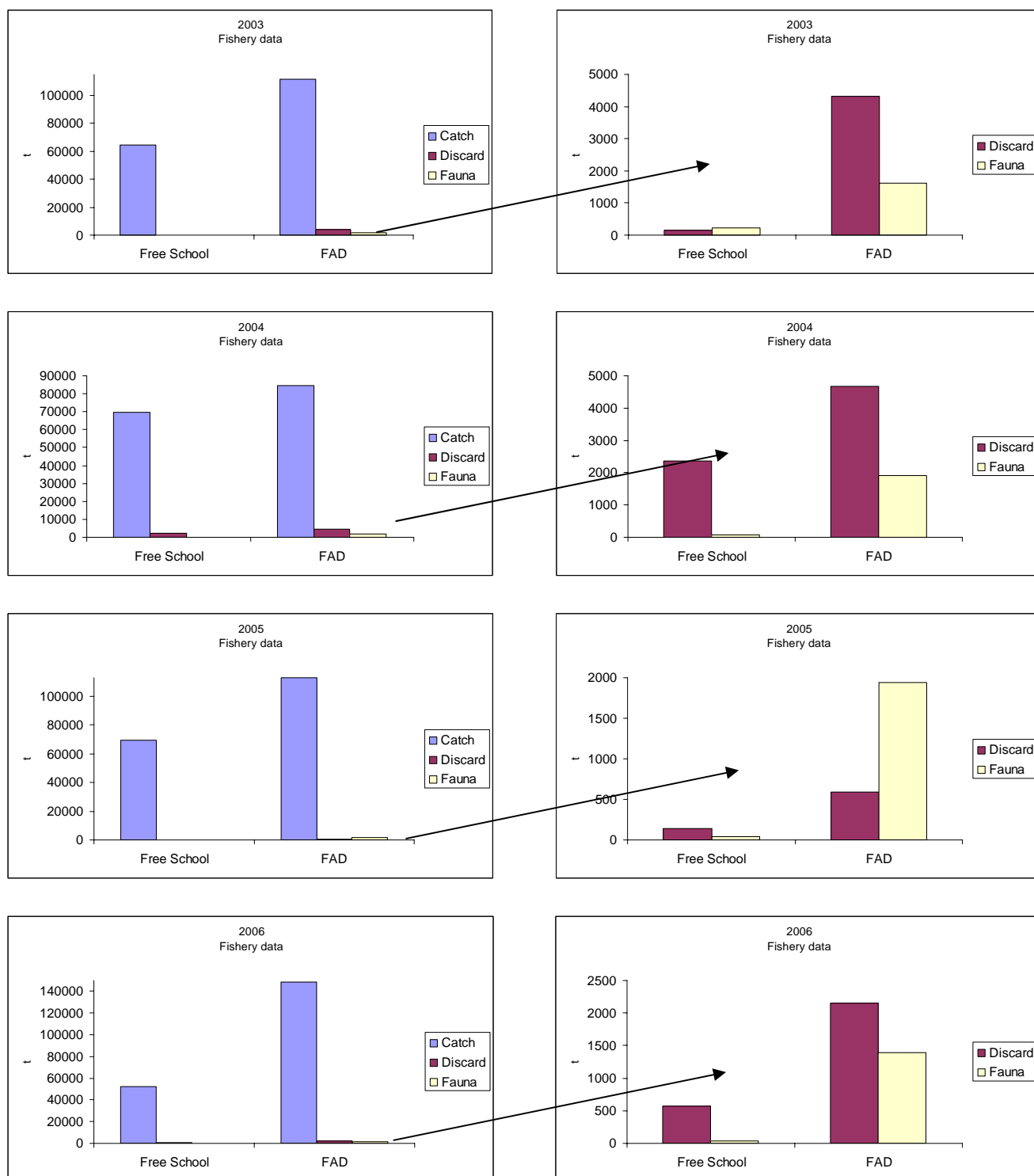


Figure 1. Catches, discards and fauna (in tons), per fishing mode, for the Spanish tropical purse-seine fleet between 2003 and 2006 (left). Catches have been omitted on the right of the figure.



Figure 2. Proportion of discard species, per fishing mode, for the Spanish tropical purse-seine fleet operating in the Indian Ocean between 2003 and 2006.

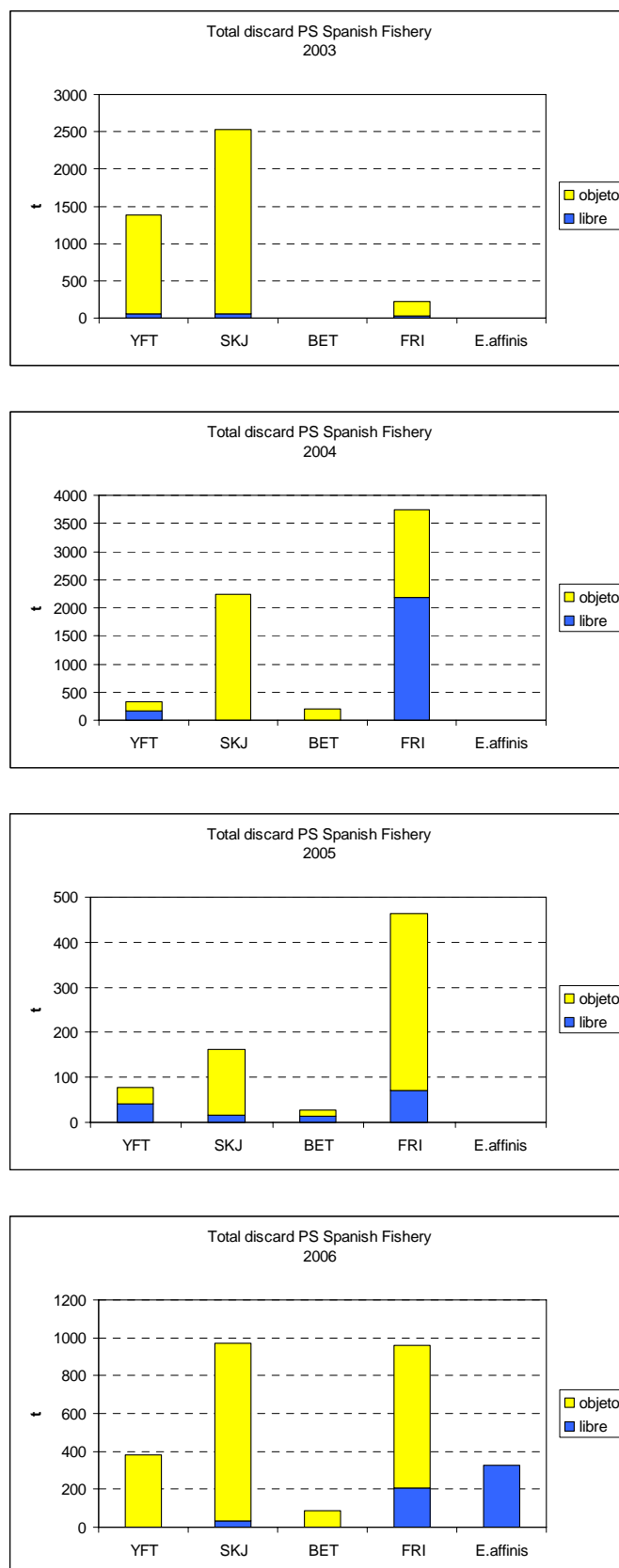


Figure 3. Discards, per species and fishing mode, undertaken by the Spanish tropical purse-seine fleet between 2003 and 2006.

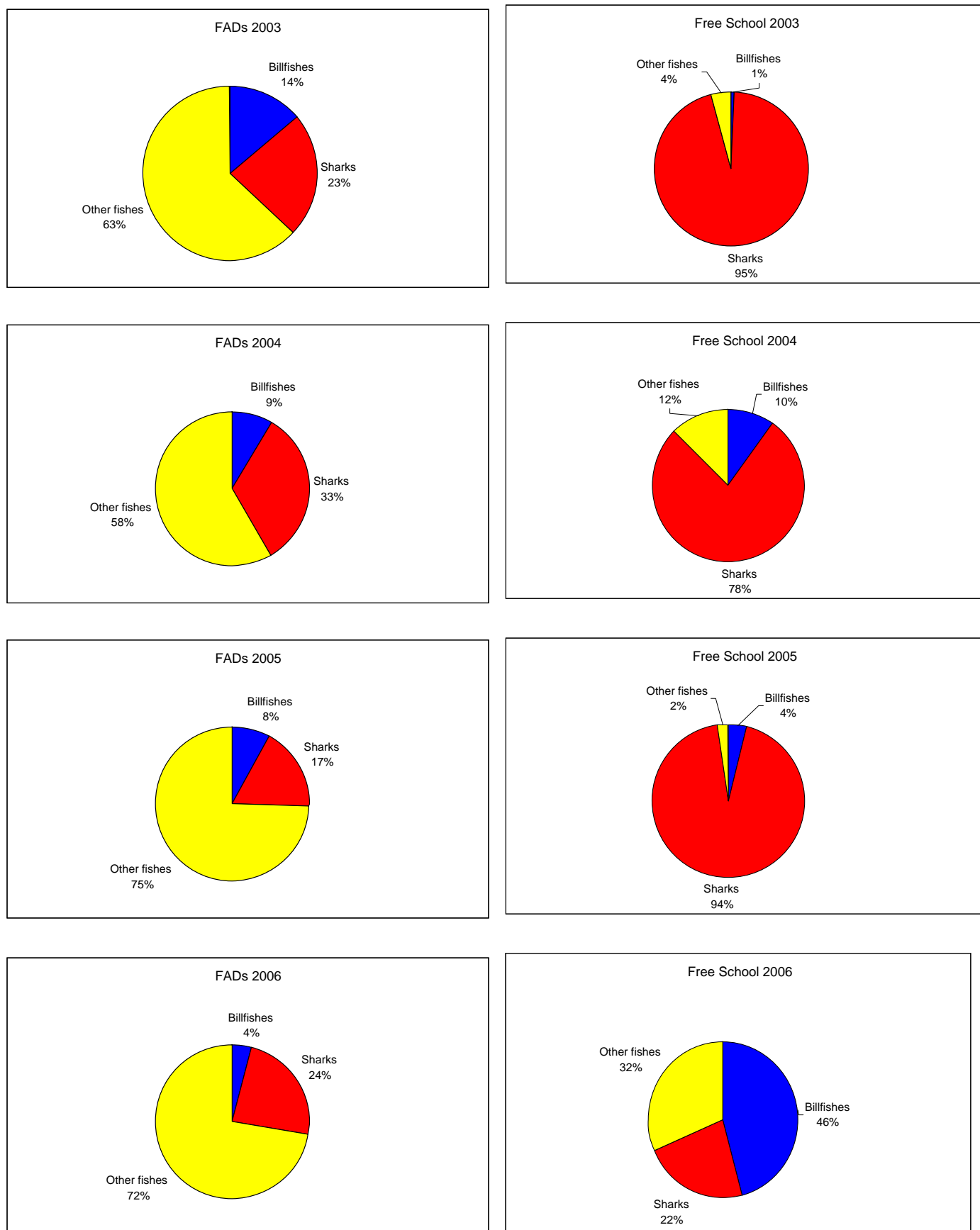


Figure 4. Proportion in weight of the various groups of fauna (excluding turtles), per fishing mode, between 2003 and 2006.

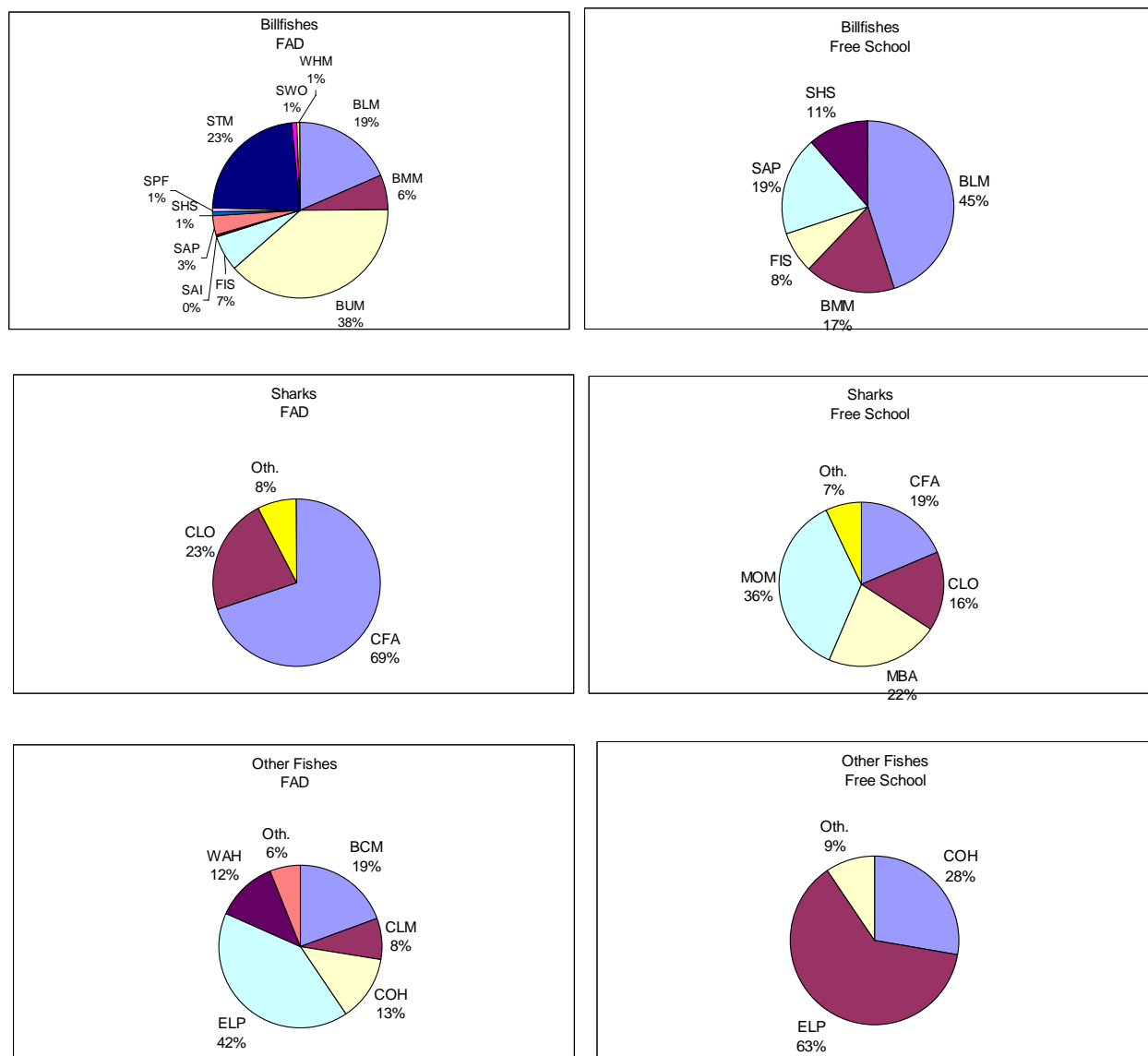


Figure 5. Proportion (in weight) of the main species within each group of fauna (excluding turtles) per fishing mode between 2003 and 2006.

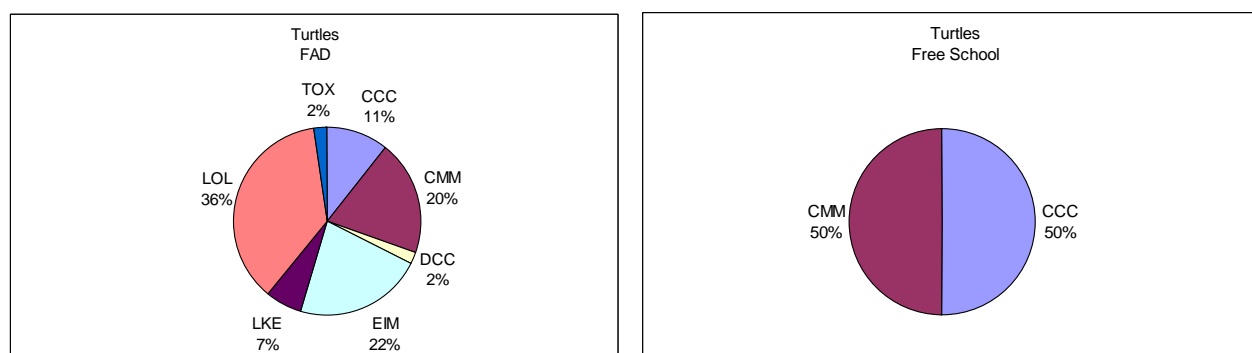


Figure 6. Proportion in numbers of the different species of turtles per fishing mode for the period 2003-2006.

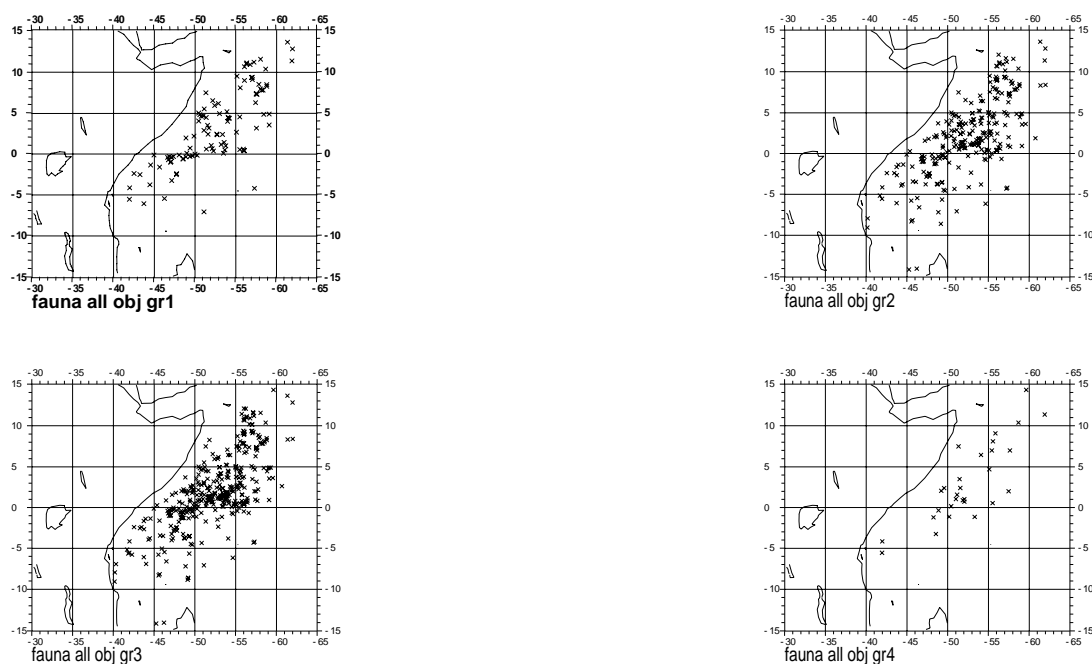


Figure 7. Distribution of sets over objects where some groups of fauna appeared in the following order (from top to bottom and from left to right): swordfish (group 1), Selachii (group 2), other fishes (group 3) and turtles (group 4).

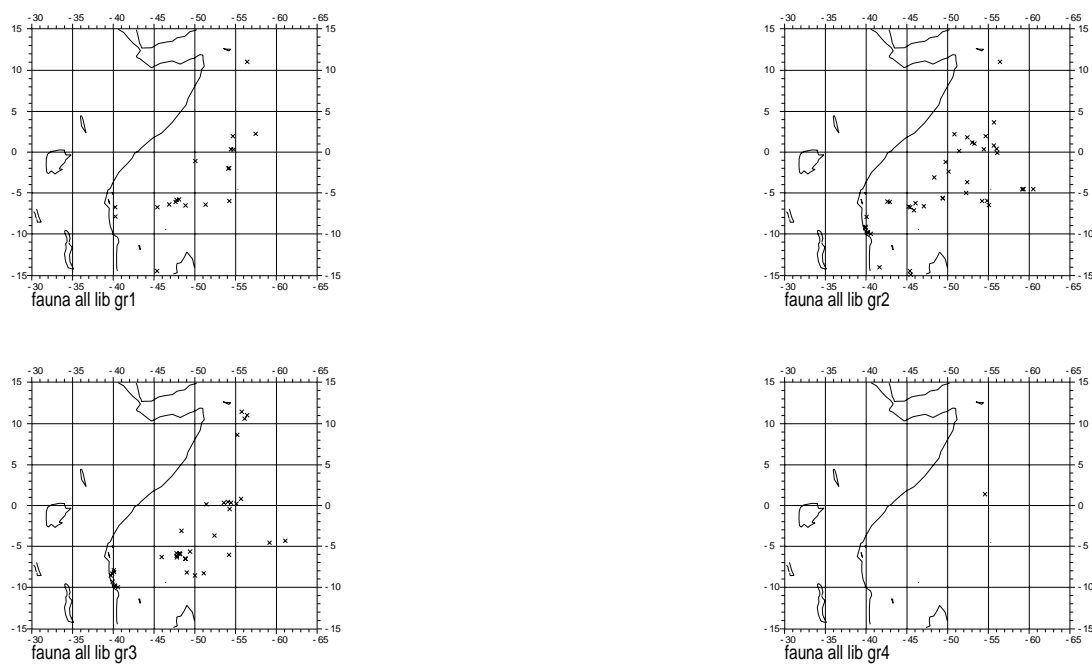


Figure 8. Distribution of sets over free school where some groups of fauna appeared in the following order (from top to bottom and from left to right): swordfish (group 1), Selachii (group 2), other fishes (group 3) and turtles (group 4).



Figure 9. Map of catches of swordfish species over objects (left) and free school (right).



Figure 10. Map of catches of Selachii over objects (left) and free school (right).



Figure 11. Map of distribution of shark (left) and ray (right) catches over objects.



Figure 12. Map of distribution of shark (left) and ray (right) catches over free schools.



Figure 13. Map of catches of other fishes over objects (left) and free school (right).



Figure 14. Map of catches of turtles over objects (left) and free school (right).