ANALYSIS OF LARGE SETS OF THE TROPICAL PURSE-SEINE FISHERIES IN THE INDIAN AND ATLANTIC OCEANS.

by

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Key words: Purse seine fishery, big sets, Floating objects, Yellowfin, Skipjack, Bigeye, Tropical Tuna

ABSTRACT

This document analyzes the frequency of large sets (more than 100 t) in the European and NEI associated purse seine fleets in the Indian and Atlantic oceans. The analysis includes a comparison of various characteristics (species composition, fishing mode, fleets, etc.) and trends from 1991 to 2000 between the two oceans .

INTRODUCTION

The occurrence of large sets, defined as those larger than 100 t, is a relatively common fact in the tropical purse-seining fishery. This document analyses this type of sets for the different purse seine fleets that have operated in both the Atlantic and Indian Oceans during the last ten years (1991-2000).

DATA USED

The analyses have been performed based on the detailed catch information contained in the logbooks that provide, set by set, the position and type of association of the catches. The catch by species is then corrected, based on the sampling data, following the procedure described by Pianet (1998) for the Indian Ocean and Pallares (1998) for the Atlantic. For the scope of this document, large sets are defined as those where the total catch, all species included, is equal or larger than 100 t. For records showing catches bigger than that amount and more than one set, the mean catch per set was calculated and those records for which mean catch-per-set was less than 100 t were excluded. The data comprise the totality of the European purse seining fleets (French, Spain and Italy) and NEI that operate in the Atlantic and Indian Ocean during the period 1991-2000.

RESULTS AND DISCUSSION

Exploratory analyses were carried out with the purpose of verifying whether the large sets were actual sets or the result of errors in the information recorded (e.g. several sets are recorded as a single set). The verification procedure consisted in identifying the boats with the largest number of sets of those characteristics and assessing the reliability of the data using existing knowledge about the quality of the information provided by the different skippers. These first analyses allowed us to confirm that, although there might be some bias in the dataset, most of the information could be considered reliable.

Figures 1 and 2 show the annual evolution in the number of large sets, catches, and the percentages relative to the total number sets by fleet and ocean. The catches and the number of sets shows opposite trends in the two oceans. The Indian Ocean shows stability during the first eight years of the series with a large increase in the last two years, while the largest values for the Atlantic Ocean occurred during the first years of the series (1991-1993). Regarding the evolution by fleet, trends of the different fleets are similar in the Atlantic while there are important differences in the Indian Ocean: for the French fleet, the largest values of this type of set occur during the first part of the period, coinciding with the smallest values for the Spanish and NEI fleets. The NEI fleet shows a continuous increase of this type of sets throughout the whole period. However, the three fleets show the largest values in the last two years. Globally, the percentages in catches and large sets from the Indian Ocean (maximum values of 43% and 13% respectively) are twice the maximum values for the Atlantic (25% and 5%).

Figures 3 and 4 illustrate the quarterly evolution of the large sets, total, and by species and type of association for the Spanish, French and NEI fleets in the Atlantic and Indian Ocean. Figure 5 shows the same information on a yearly basis. In the Atlantic Ocean larges sets occur more frequently in the first semester, while in the Indian Ocean large sets occurred mainly during the second semester.

Regarding the type of association, the trends are slightly different between oceans. In the Indian Ocean, the largest percentages of large sets on free schools (around 42%) occurred in the early years of the period. Since 1995 this percentage has decreased to 25%, reaching 20% in the last two years. The trend in this ocean has been similar between the three fleets. Conversely, in the Atlantic Ocean 63% of the catches from larges sets were from log-associated sets

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until 1996. In the last three years, this percentage has decreased to 30% for 1997 and 1998. This change is due to the French and, especially, the Spanish fleets which have completed an important number of large sets on free schools. In the NEI fleet, most of the large sets have occurred in association with logs throughout the whole period.

Regarding the catch by species, in the Atlantic Ocean skipjack has been the predominant species with the exception of 1997 and 1998, when yellowfin was the prevailing species. The biggest proportion of bigeye occurred during the intermediate period (1993-1996). In the Indian Ocean, yellowfin was the prevailing species in 1991 progressively losing its importance in favor of skipjack and bigeye.

Regarding the fleets, in the Indian Ocean, the NEI fleet landed the biggest percentage of sets with catches over 100 t (Figure 6), while the French fleet shows the smallest percentage of sets of those characteristics since 1993. There is a significant positive linear relationship between vessel size (Figure 7) and the catch rates in large sets. Therefore, those differences could be explained based on the structure of the fleets (Figure 8), since the average capacity of a French boat has remained well below the average for the other fleets. In the Atlantic Ocean, the characteristics of the different fleets are more similar and the situation is not so clear. Only in the most recent two years, it is possible to observe a smaller percentage of this type of sets in the French fleet when compared to the other fleets.

Catches of large sets concentrate in certain areas (Figures 9 and 10). In the Atlantic Ocean, the 'Picolo' area and South Equator area are the ones that concentrate the biggest catches of this type of sets. Skipjack is the most common species in the first area while yellowfin is the dominant species in the second area. In the Indian Ocean, most large sets take place in the Somali area, with skipjack as the dominant species during the whole period. Inter-annually the volume of the catches from these sets and their distribution is more stable in the Indian Ocean than in the Atlantic. Within these areas, the distribution of the catches is not homogeneous, for instance, in the Atlantic Ocean, 50% of the catches were taken from six five-degree squares. Five of those squares are close to the equator (squares 300010, 400000, 400005, 400010 and 400015), and the remaining one (square 415015) contains a sea mountain, being an important target for the Spanish fleet (Figure 11). In the Indian Ocean, 50% of the catches from large sets are also concentrated around the equator (squares 100045, 200055, 100055, 200045 and 100050). The catch distribution of the different fleets within these areas demonstrates that the fishing strategies are more distinct in the Atlantic Ocean than in the Indian Ocean.

CONCLUSIONS

- The occurrence of sets larger than 100 t is a common fact in the operations of tropical purse seining fleets operating in the Atlantic and Indian Oceans.

- The percentage of this type of sets is larger in the Indian Ocean (average 7%, exceeding 12% in the last two years) than in the Atlantic (average 4%). Similarly, catches from this type of sets in the Indian Ocean account, on average, for 28% of the total catch, compared with 19% in the Atlantic.

- In the Atlantic, most of these sets are carried out during the first semester, while in the Indian Ocean occur during the second semester.

- In the Atlantic Ocean, most of these sets were log-associated during the first years of the series, while since 1997 they have been free school sets. In the Indian Ocean, the evolution has been the opposite.

- In both oceans, most of these sets take place in equatorial waters. In the Atlantic, some of the sets occur around sea mountains.

- The main species in the catches of these sets is skipjack. However, in the Atlantic and for the years 1997 and 1998, yellowfin tuna has been the dominant species in the catches of large sets.

- The catch rate in sets larger than 100 t increases with the size of the boat.
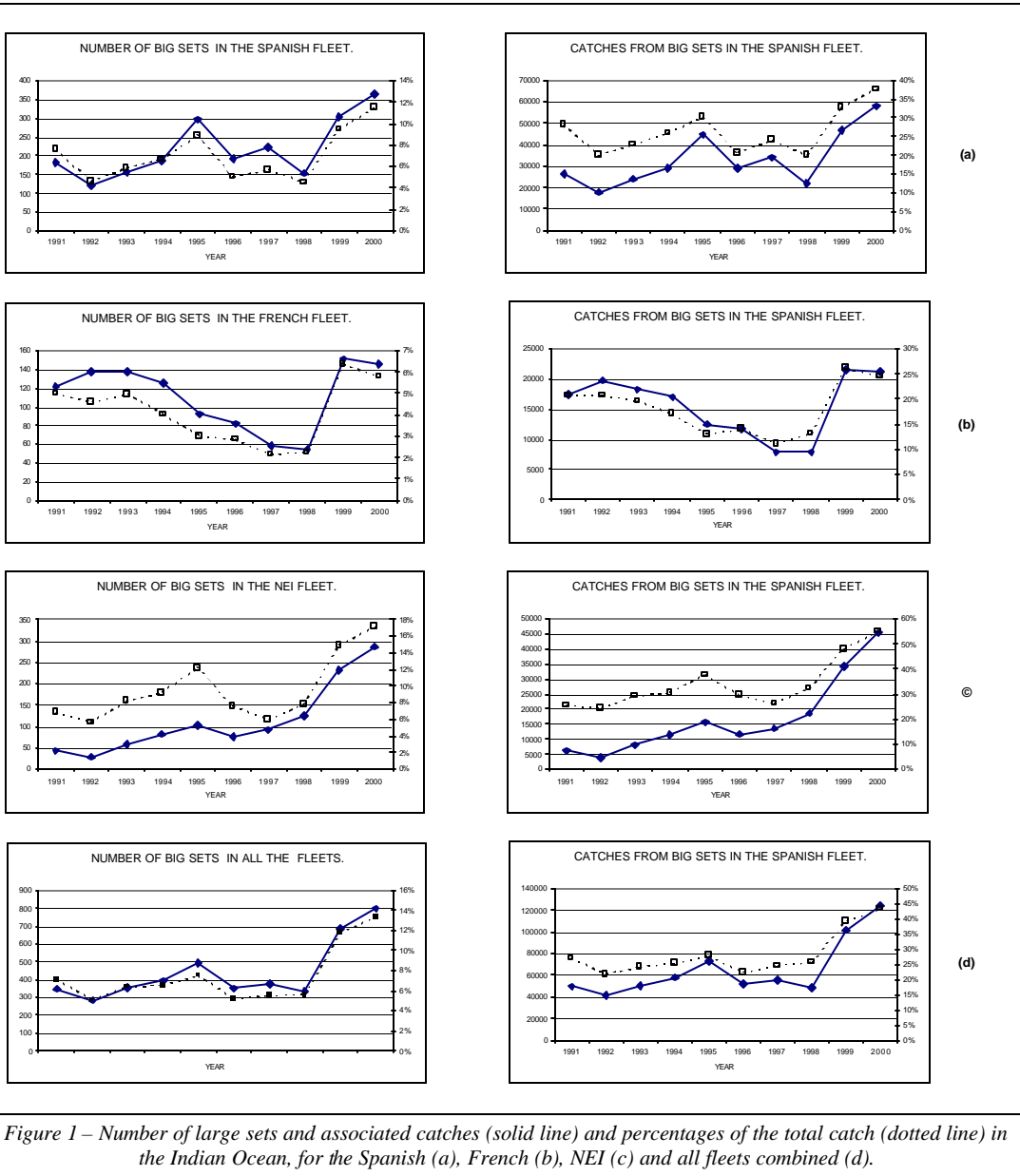
Figure 1 – Number of large sets and associated catches (solid line) and percentages of the total catch (dotted line) in the Indian Ocean, for the Spanish (a), French (b), NEI (c) and all fleets combined (d).
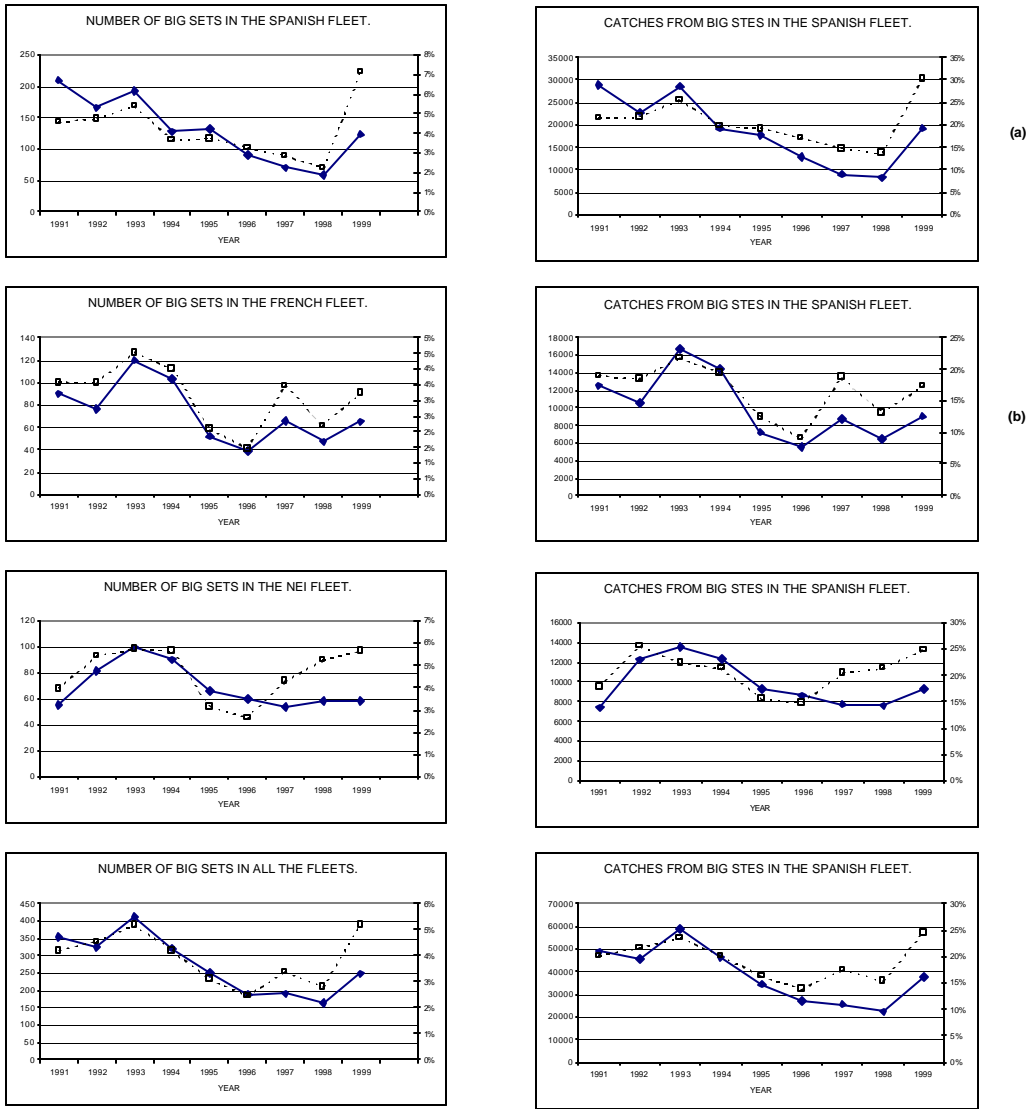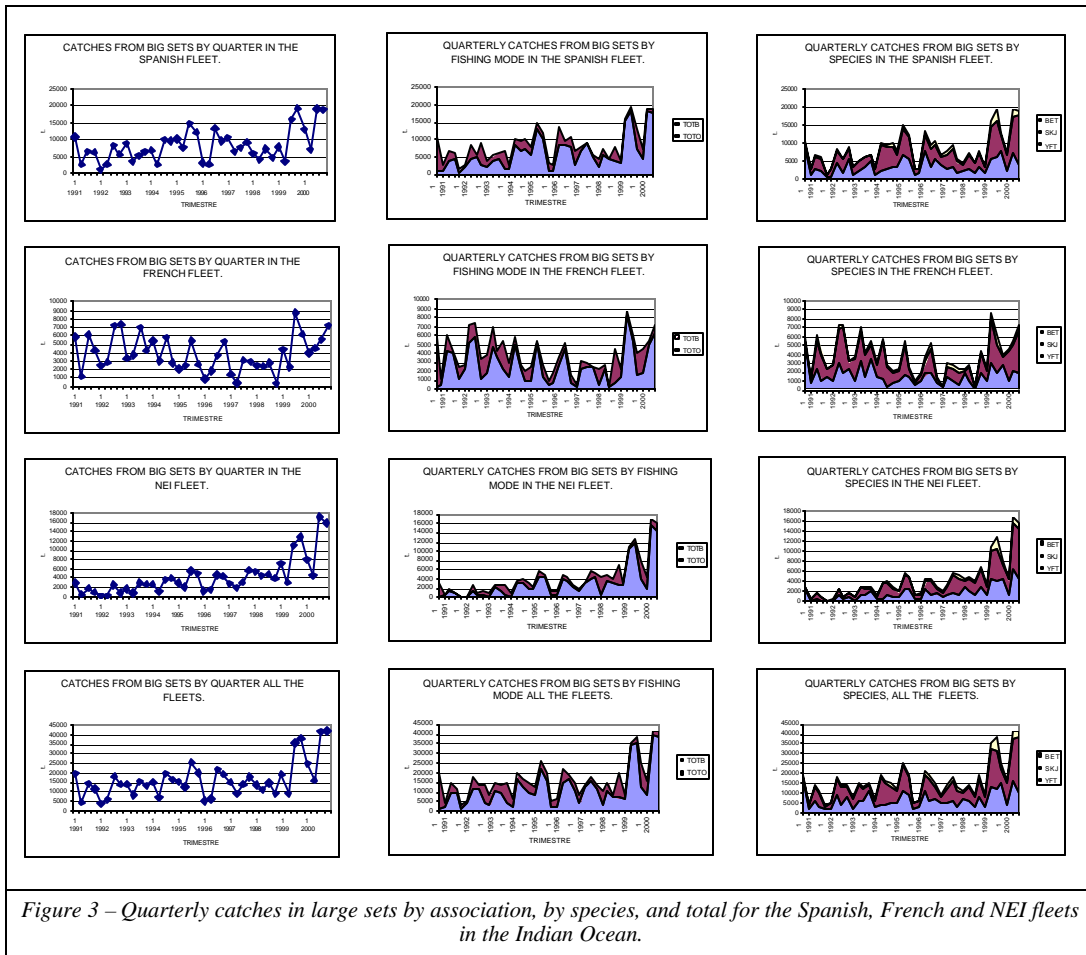
NUMBER OF BIG SETS IN THE SPANISH FLEET.

CATCHES FROM BIG STES IN THE SPANISH FLEET.

(a)

NUMBER OF BIG SETS IN THE FRENCH FLEET.

CATCHES FROM BIG STES IN THE SPANISH FLEET.

(b)

NUMBER OF BIG SETS IN THE NEI FLEET.

CATCHES FROM BIG STES IN THE SPANISH FLEET.

NUMBER OF BIG SETS IN ALL THE FLEETS.

CATCHES FROM BIG STES IN THE SPANISH FLEET.

Figure 2 – Number of large sets and associated catches (solid line) and percentages of the total catch (dotted line) for the Spanish, French, NEI and all fleets combined, in the Atlantic ocean.

Figure 3 – Quarterly catches in large sets by association, by species, and total for the Spanish, French and NEI fleets in the Indian Ocean.
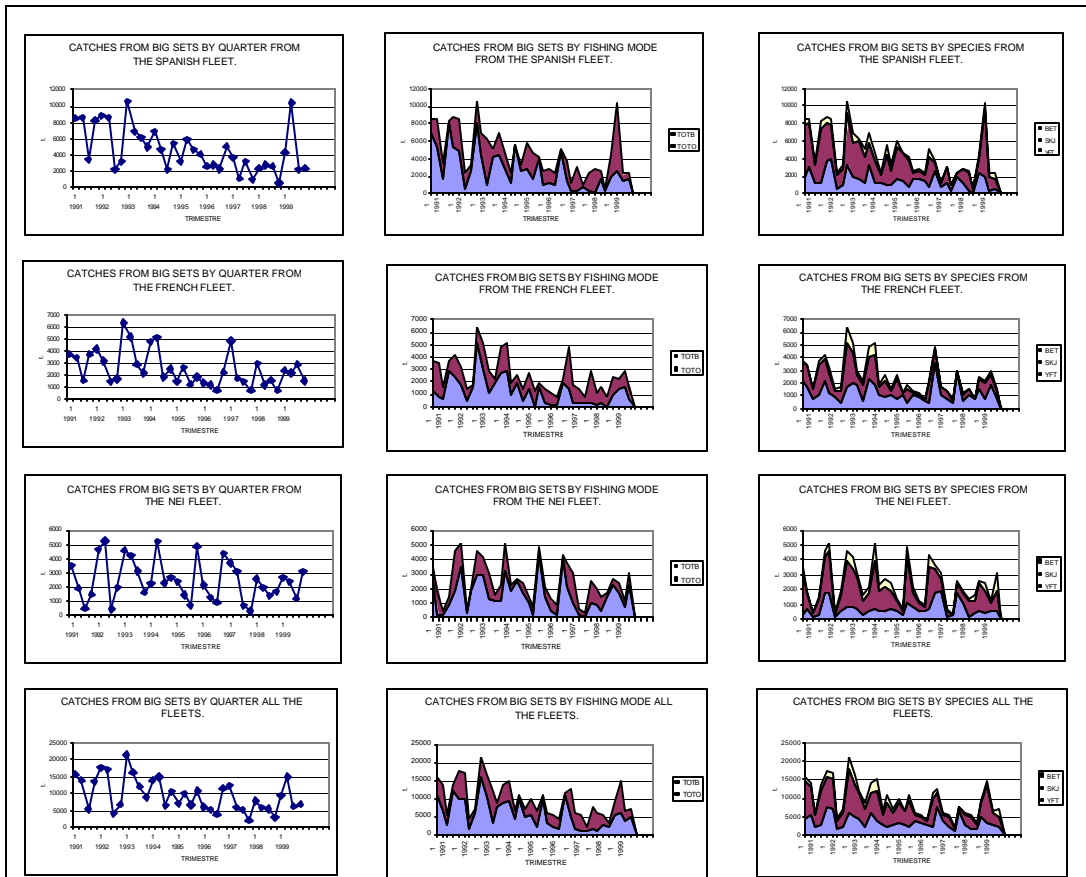
Figure 4 – Quarterly catches in large sets by association, by species, and total for the Spanish, French and NEI fleets in the Atlantic Ocean.
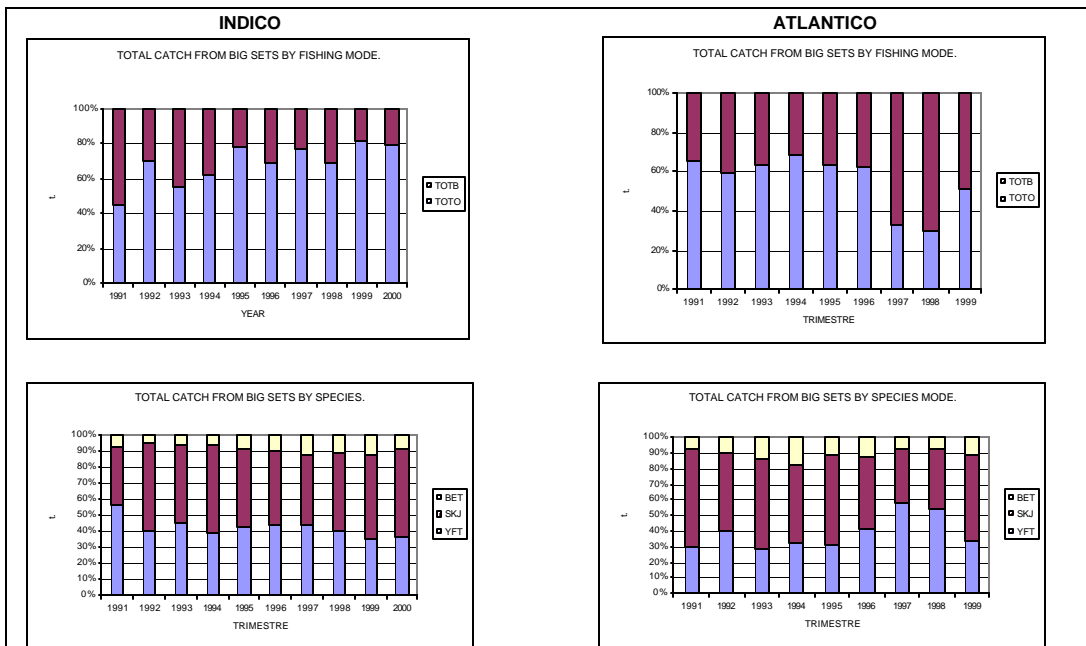
Figure 5 – Annual total catches and number of large sets by type of association and species in the Atlantic and Indian Ocean.
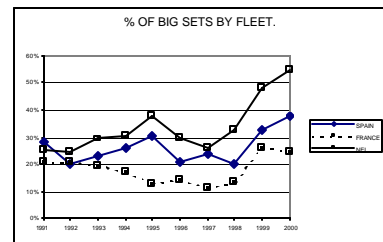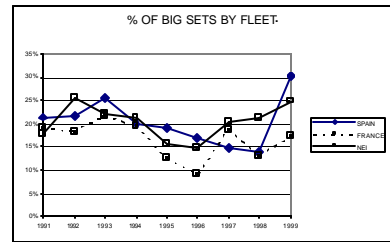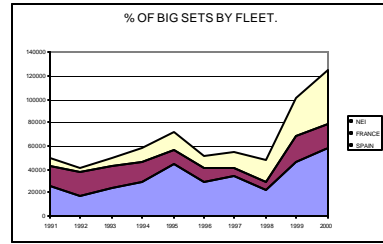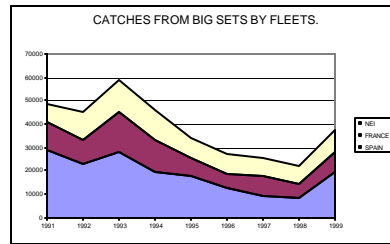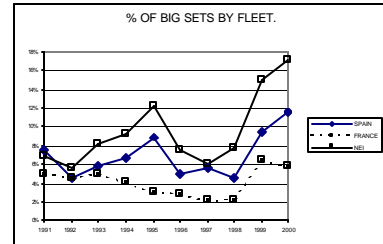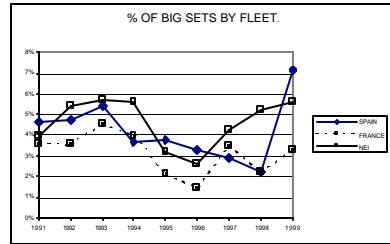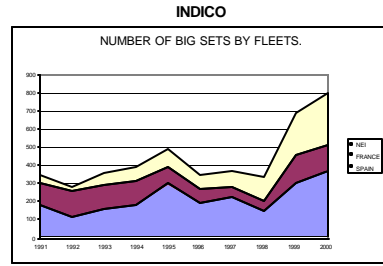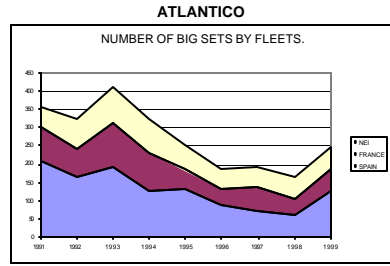
Figure 6 – Annual catches and large sets by fleet in the Atlantic and Indian Ocean.

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>2000
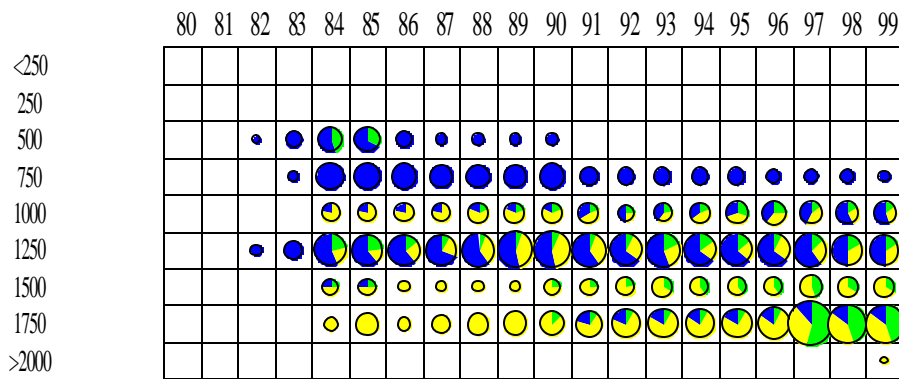
Ocean Indien

Fra — NEI   10
Esp

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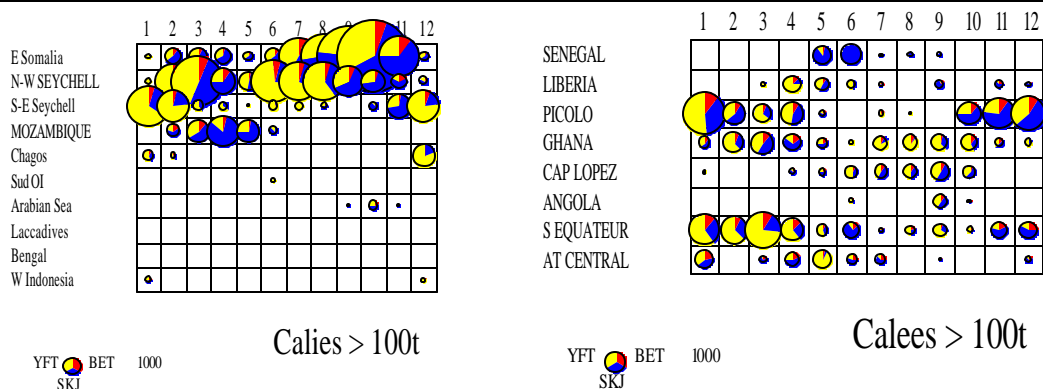
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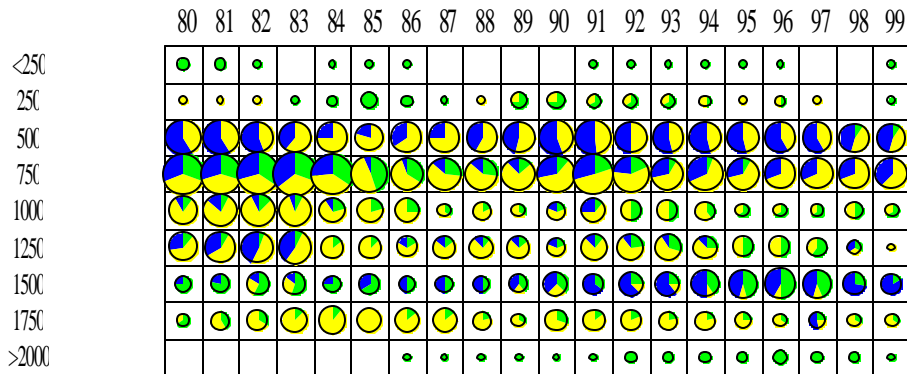
Atlantique

Fra — NEI   10
Esp

Figure 7 – Distribution for the Spanish, French and NEI fleets in the Atlantic and Indian Oceans by carrying capacity categories (expressed in m^3).

1 2 3 4 5 6 7 8 9 10 11 12

E Somalia
N-W SEYCHELL
S-E Seychell
MOZAMBIQUE
Chagos
Sud OI
Arabian Sea
Laccadives
Bengal
W Indonesia

Calies > 100t

YFT — BET   1000
SKJ

1 2 3 4 5 6 7 8 9 10 11 12

SENEGAL
LIBERIA
PICOLO
GHANA
CAP LOPEZ
ANGOLA
S EQUATEUR
AT CENTRAL

Calees > 100t

YFT — BET   1000
SKJ

Figure 8 – Distribution of average catches in large sets by species, area and month in the Atlantic and Indian Oceans.

Figure 9 – Distribution of catches in large sets by species, area and year in the Atlantic and Indian Oceans.

Figure 10 – Catches by fleet in the 5ºx5º squares that concentrate 50% of the total catches from large sets in the Atlantic and Indian Ocean.

Figure 11 – Relationship between the catch rate in large sets and the boat's carrying capacity.