

Analysis of tuna catches and CPUEs by Purse Seiners fishing in the Western Indian Ocean over the period January to July 2008.

by

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Abstract

The goal of this paper is to analyze the catches and CPUE of the Purse seine fleet active in the western Indian Ocean during the first 7 months of 2008 and to compare these results with the same parameters observed during previous years. This analysis has been mainly targeting yellowfin tunas, taking note that the yellowfin (*Thunus albacares*) catches by the purse seine fleet have been at low levels during 2007. The paper also analyses the 2008 fishing zones as well as the catches at size observed for yellowfin during the first months of 2008. During the first 7 month of 2008, yellowfin catches and CPUEs came back to their historical recent levels, i.e. lower than during the 2003-2006 very high catches and CPUEs, but much higher than in 2007. On the opposite, skipjack catches and CPUE have been at their lowest levels during 2008.

Résumé

Le but de cet article est d'analyser les données de prises et de PUE de la flotte de senneurs actifs dans l'Ouest de l'Océan Indien durant les 7 premiers mois de 2008, et de comparer ces résultats avec les paramètres équivalents récoltés pour la même flottille depuis 1984. Cette analyse vise surtout l'albacore (*Thunus albacares*) du fait que les prises de cette espèce par les senneurs ont été très faibles en 2007. Cet article analyse aussi les zones de pêche exploitées durant les 7 premiers mois de 2008 ainsi que les prises par tailles des senneurs la même année. Les prises et les PUE d'albacore ont été durant les

premiers mois de 2008 aux niveaux habituels observés durant les dernières années, c'est-à-dire à des niveaux bien inférieurs aux niveaux records des années 2003-2006, mais bien supérieurs à ceux de 2007. On note à l'opposé que les prises et les rendements en listao ont été en 2008 à des niveaux parmi les plus bas jamais observés dans la pêche.

1. Introduction

It has been noticed that over a four year period (beginning in December 2002) that there has been a major increase in yellowfin tuna catches by purse seiners and by other gears in the Western Indian Ocean, the total average yellowfin catches reaching during this period a high level of 460000 t., i. e. well above most MSY previously estimated by scientists. During the same period 2003-2006, high catches of skipjack catches, most often associated to FADs, were also noticed. A record of 201,728 MT of yellowfin was reported for purse seiners in 2004. No significant changes were recorded during this period for the catches of the other target species such as skipjack and bigeye tuna. During 2005 and 2006 a slowly decreasing trend was then observed in the yellowfin tuna catches, although the yellowfin catches were still at much higher levels than during the pre 2001 period. This seems to suggest that we were returning to the normal situation. However, it was also noted that in 2007, the total yellowfin catches taken by purse seiners (and also skipjack catches) were at low or very low levels, when the fishing effort exerted by the fishery was at its highest level. This report aims to examine the preliminary catch and effort statistics and sizes of tunas measured, reported for the first seven months of 2008 and to compare these results to the same period of previous years (1984 to 2007). These first 7 months of the year tend to be fully representative of the yearly yellowfin catches, because based on the 1984-2007 catches an average of 61% of the yearly YFT catches have been taken at the end of July. On the opposite, SKJ catches taken during the first 7 months correspond to only 43% of the total yearly catches (a majority of SKJ catches being caught during the last 5 years of the year). The final goal of the paper is to analyze the 2008 purse seine fishery data during these first seven months of 2008, then allowing to incorporate later these results in the IOTC WG stock assessments, concentrating this work on yellowfin tuna, a species mainly targeted by the Bangkok 2008 stock assessment. This analysis should help the IOTC Tropical Tuna WG and its subsequent Scientific Committee to do a more comprehensive discussion of the present status of the yellowfin stock.

2. Materials and methods

The statistics analyzed in this report are information gathered from the mandatory purse seine logbooks system for all vessels licensed to operate in the Seychelles exclusive economic Zone. This database is fully exhaustive during the first 7 month of 2008, and this period has been kept to do the comparison of catches and CPUEs between 2008 and previous years. For some analysis the historical data obtained from the IOTC (1984-

1999) or more recent years (period 2000-2008) have been used for comparison purposes. The species composition of catches has been corrected using port sampling data and the logbook data have also been raised to landing data. Three categories of yellowfin tuna have been considered in this analysis:

- Small YFT at sizes <10kg,
- Medium size YFT at sizes between 10-30kg
- Large YFT at sizes >30kg.

The two types of associations, FAD's associated and free swimming schools, have been also widely kept and used in this analysis.

3. Results

3.1. Vessels active

The number of vessels active during the first eight months of 2008 has decreased compared to the previous seven years (several purse seiners moving to other oceans, probably because of their poor CPUE), and an average of 43 purse seiners was active per month in 2008, compared to 49 vessel active during the same period in 2007. Since 1984, it has been noted that the yearly CPUEs of purse seiners fishing in the Indian Ocean have been always much higher than in the Atlantic during the period 1984-2006, for instance 72% higher during the 1991-2006 period. This was not the case in 2007, as during this year, the total PS CPUEs of the EU purse seiners in the Atlantic have been 6% higher than in the Indian Ocean (figure 26).

3.2. Nominal fishing effort

The total number of fishing days of the sampled fishing fleet of purse seiners during the first seven months of the year has been increasing since 2004 but a decrease was recorded for the same period in 2008. The fishing effort during the period January to July in 2008 was 10% lower than in 2007.

In 2008 for the period under study, the total number of sets made reduced by 9%, and this decrease came mainly from the FAD sets (figure 5).

3.3. Catches

The total catches recorded by the purse seine fleet during the first 7 months of 2008 is estimated at 127000 MT, the lowest catch reported for that period since 1996 (Figure 3). This represents a decrease of 3% over the catches reported for the same period of the already low 2007 catches.

3.4. Species composition

Analysis of species composition reveals that yellowfin catches have been on a decreasing trend since 2005, the lowest level being reached in 2007, but this decline has been followed by a marked increase in 2008: Yellowfin catches increase by 10%, from 55,500 MT in 2007 to 66,400 MT in 2008. This level of yellowfin catches is typical of the yellowfin fishery, at an average of 61,500 t., before its 2003-2006 peak (figure 3). Skipjack catches have remained more or less constant throughout the period under study, however a significant decrease of 28% in the catches of skipjack tuna was observed during the 7 first months of 2008 (keeping in mind that the majority of SKJ catches tend to be caught at the end of each year, figure 1; then it will be necessary to wait the end of 2008 to evaluate the real trend of the 2008 skipjack catches).

3.5. Catch Rate: nominal CPUEs

The corresponding catch rates expressed for each species in terms of catch per unstandardized fishing day is shown in figure 4. The same fishing days are used in both the FAD and in the free school fisheries, because we consider that it is impossible to identify and to distinguish a free school effort from an effort targeting FADs. It appears that the total CPUE of the January-July period has been slowly decreasing since its peak in 2003, reaching a nearly identical low level of about 16 tons /fishing day in 2007 and 2008.

The CPUEs observed for each species show opposite trends (figure 4):

- ⇒ Yellowfin CPUE has been showing a 20 % increase in the first 7 month of 2008, compared to 2007.
- ⇒ Skipjack CPUE has been showing a 18 % decrease.
- ⇒ Bigeye CPUE has been showing a 19 % increase. % decrease.

3.6. Catches and CPUE by school type/association

Figure 5 shows an increase in the number of FADs associated sets and a decrease in the number of sets on free swimming schools during the first eight months of 2008. Catches on free swimming schools increased by 28%, whereas that of FAD's associated schools dropped by 44%. The corresponding species composition shows in 2008 a moderate increase in yellowfin catch on free schools, compared to 2007, whilst yellowfin catches on FADs associated schools (predominantly small fishes) have decreased (figure 7). Changes in the Yellowfin CPUE are in the same range: the yellowfin CPUEs observed on FADs and on free schools during the first 7 months of each year are shown since 1984 on figure 8. This figure shows that during the first 7 months of 2008, the yellowfin CPUE has increased by 71 % on free schools (large fishes) and has very low in the FAD fishery (small and medium size fishes), showing a decline of 36 %.

3.7. Yellowfin Size category

During the first seven months of 2008, 49,000 MT of large yellowfin were caught compared to 39,000 Mt during the same period of the previous years, i.e. an increase of 25% (figure 12). On the opposite, the catch of small yellowfin (<10kg) has decreased by 29 %, whereas for medium yellowfin have remained more or less the same as for the

previous year.

The changes in the numbers of small, medium and large yellowfin caught by the purse seine fleet during the first seven months of the period 1991-2007 compared to the sizes caught in 2008 are also interesting (figure 27). This figure shows the lack of small and medium YFT (for instance juvenile smaller than 1 meter) caught in 2008, when the histogram of larger sizes caught was rather typical. These apparent peculiarities and changes in the size distribution would need further in depth studies, as they may be representative of significant changes in the age structure of the fished biomass.

3.8. Fishing areas and seasons

Figure 15, 16 and 17 shows the fishing zones of the purse seine fleet during the first 8 months of the average years 1999-2002 and 2003-2006 (a normal period and the period of very high yellowfin catches), and the same efforts in 2007 respectively. These maps show that in 2008 (Figure 19, only the first 7 months), the purse seine fishing zones have been mainly targeting 3 main fishing zones: the areas around Seychelles Islands, the Mozambic Channel and the eastern basin of the fishing zone (Chagos area). This 2008 fishing pattern is quite typical of recent fishing patterns observed during the 1999-2002 period. It can also be noted that the seasonality of the fishing activities observed in each of the fishing zones has been also quite typical during the first 7 months of 2008 (figure 28-32) compared to previous years.

3.9. Analysis by month

Figure 20 shows the fishing effort in terms of fishing days made by month for the years 2000 to 2008. The effort for the first 7 months of 2008 was slightly lower than for the same months of the previous year (-11%). Total monthly catches show a marked decline during the first 7 month of 2008 (figure 21). Yellowfin catches were higher for the first five months of 2008 when compared to the same period the previous year whilst the catches of skipjack tuna were lower than the previous year for all the eight months, with the exception of May and June. (figure 25).

4. Discussion

The analysis of the 2008 catch and effort data of the purse seine fishery has been showing that the catch rates of adult yellowfin are now back to their historical levels observed before the anomaly/period of very high catches observed during 2003-2006. This observation may tend to confirm the negative effects on the catchability of the YFT stock, and on the CPUE and catches of the purse seine fishery, of the 2007 environmental anomaly analyzed by Marsac 2007. However, the size structure of the 2008 yellowfin catches appears to be very atypical and showing a lack of small and medium yellowfin that may correspond to low levels of biomass of these age categories. Clearly this question would deserve further in depth study, for instance simply calculating yellowfin GLM CPUEs of the PS fleet by size/age categories.

On the opposite it appears that the skipjack catches and CPUEs are again heavily declining in 2008 (this will be the 4th successive year of such decline). Although this decline cannot be considered as being of major scale, it would also need to be further

studied as this decline of catches at increasing fishing efforts may well be an indicator of a full exploitation of this stock.

Bigeye catches and CPUEs tend to be stable during the studied period, but the relatively high catches of bigeye taken on free schools (and the lower bigeye catches taken on FADs) are rather surprising and they would deserve an in depth study taking into consideration the sizes of bigeye caught and the fished strata.

5-Conclusion

The present analysis based on seven months of 2008 purse seine data tend to confirm that the yellowfin fishery was at a normal level of CPUE, catches and fishing strata during the period. However this analysis has been showing various significant anomalies in the sizes of the yellowfin taken, in the low catches and CPUE of the skipjack fishery, and in the high rates of bigeye caught in free schools. These peculiarities would need to be further studies by scientists.

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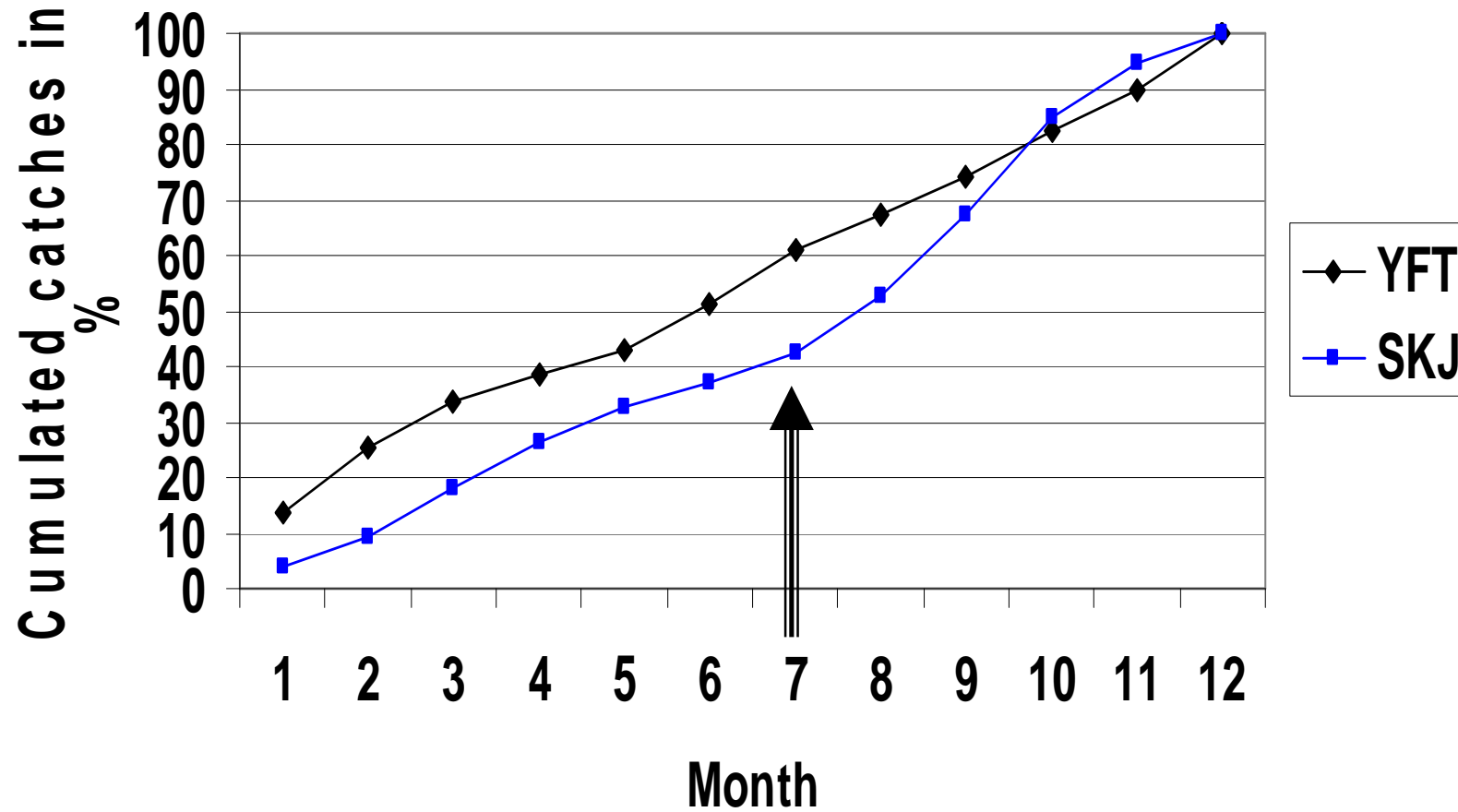


Figure 1: Average cumulated monthly catches of yellowfin and skipjack tuna in the purse seine fishery.

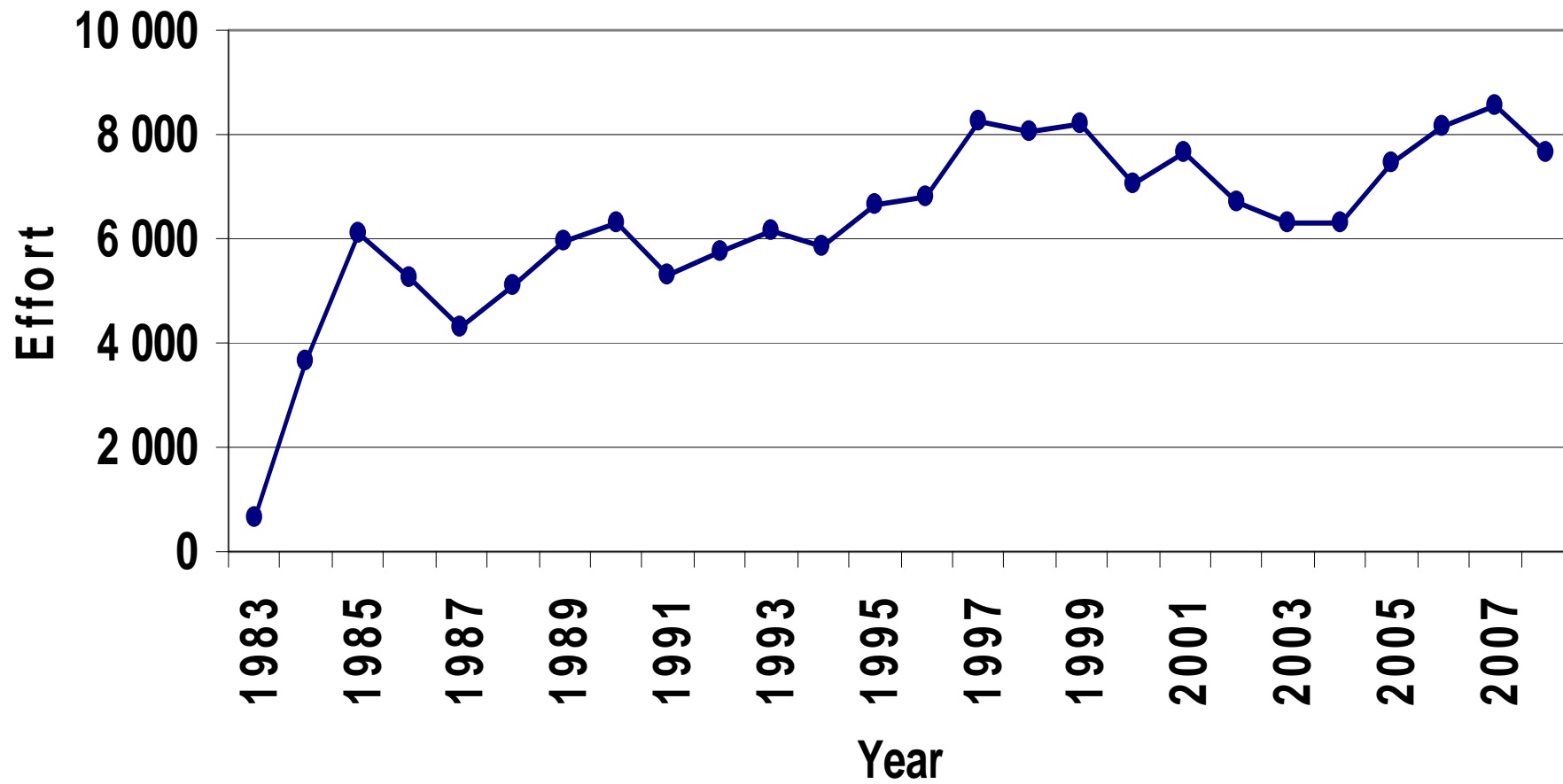


Figure 2: Nominal fishing effort (fishing days), January to July, 1984 - 2008

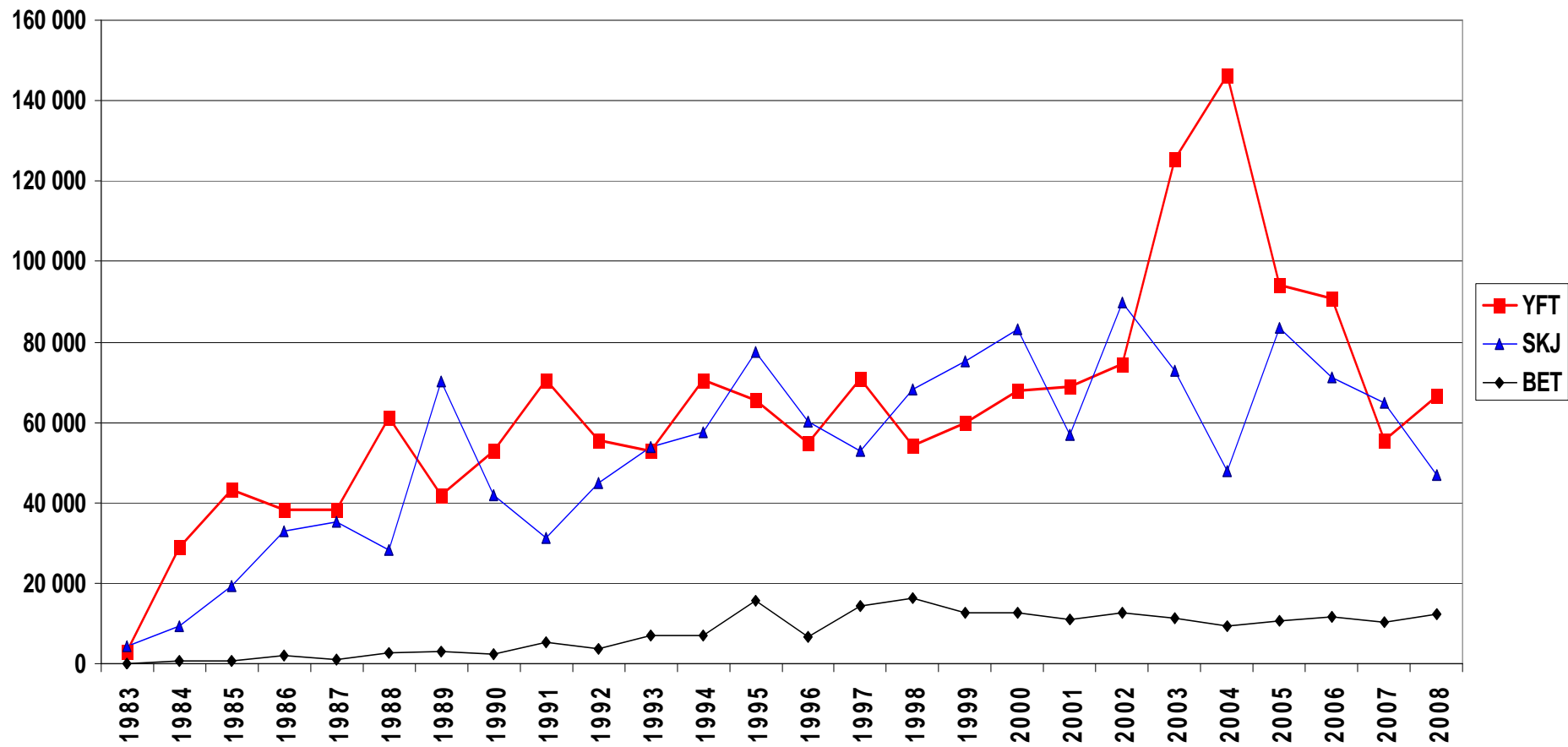


Figure 3: Nominal catches by species, January to July, 1984 - 2008

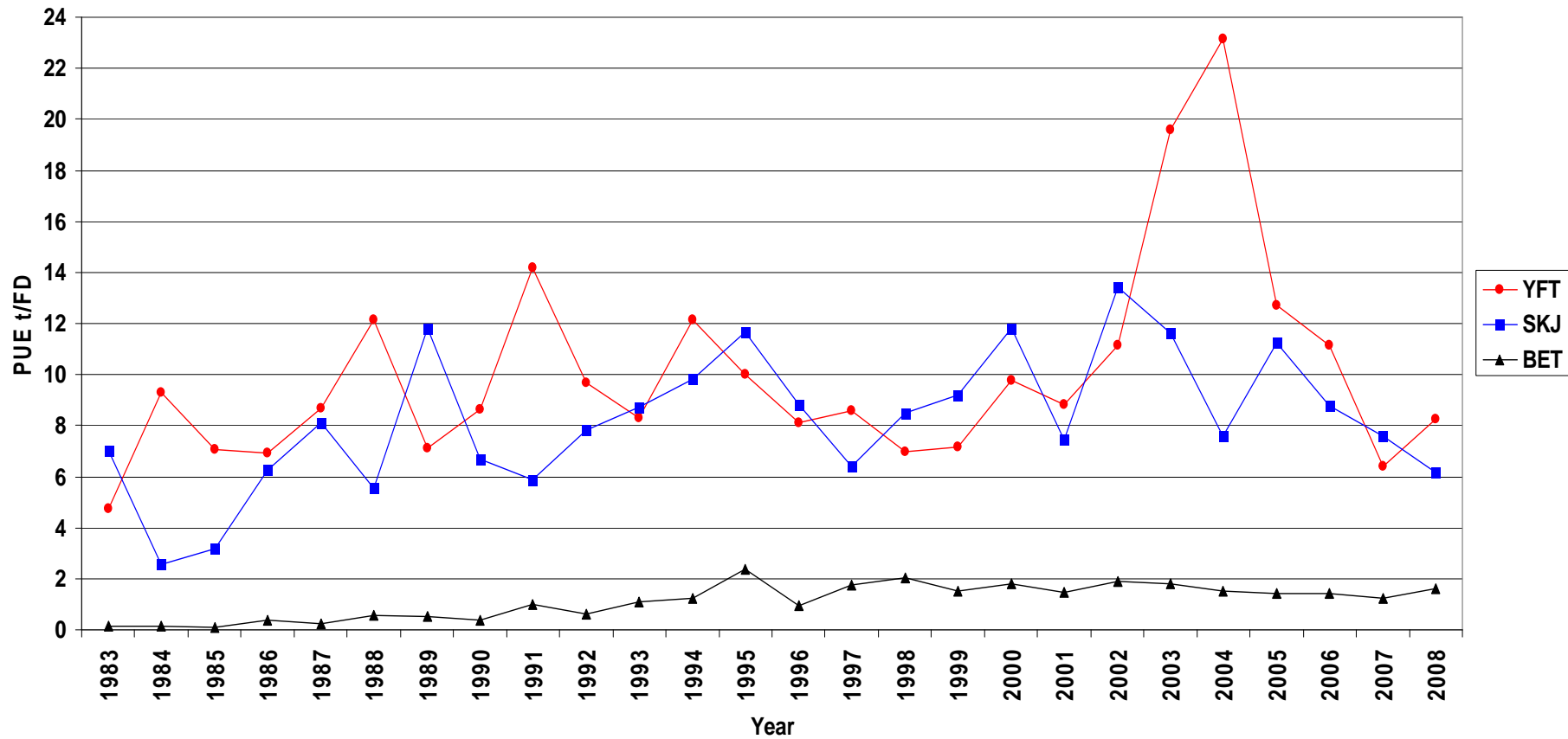


Figure 4: Skipjack, bigeye and yellowfin nominal CPUE (MT/fishing day), January to July, 1984 - 2008

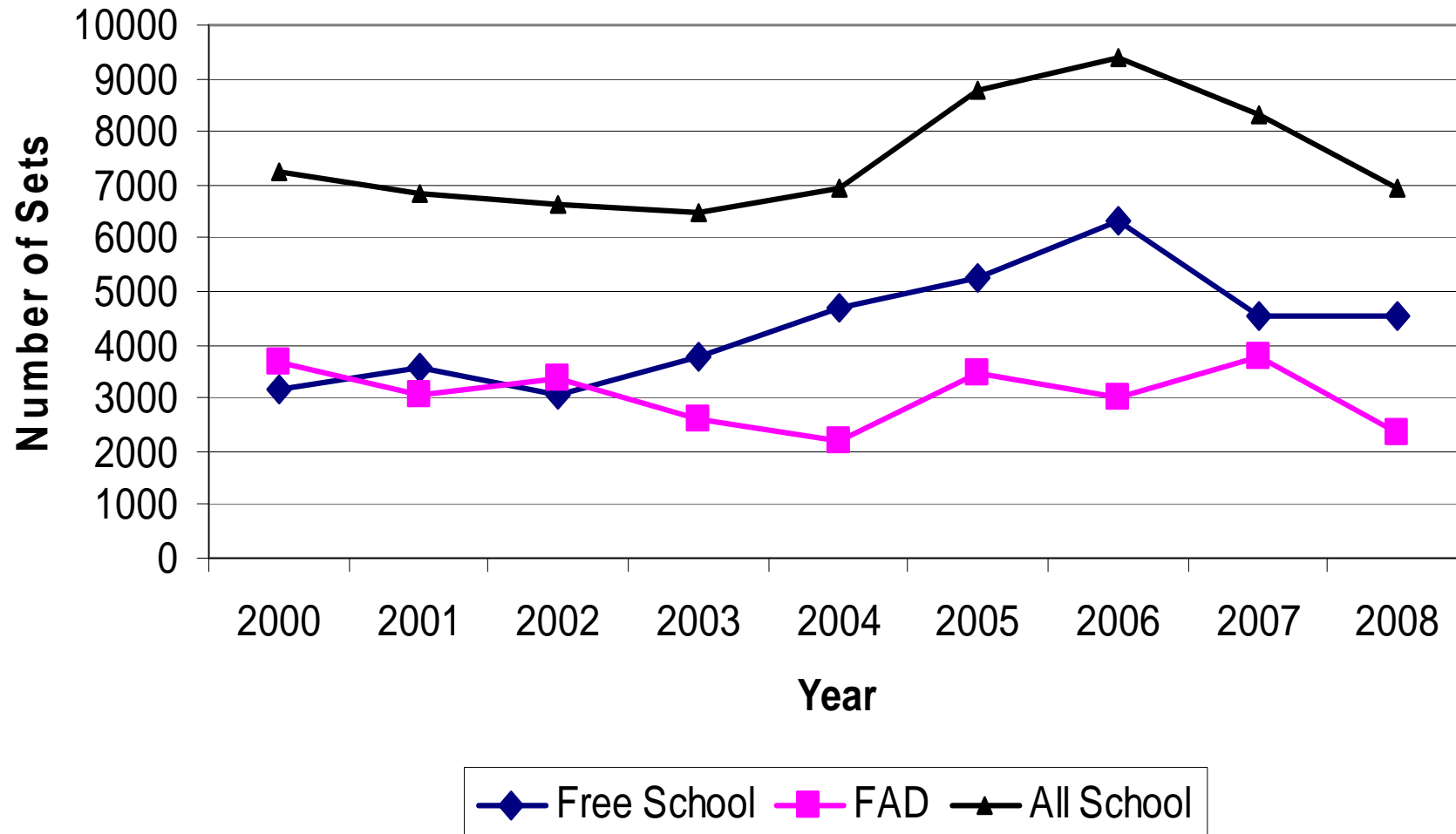


Figure 5: Number of sets made by school type, January to August, 2000 - 2008

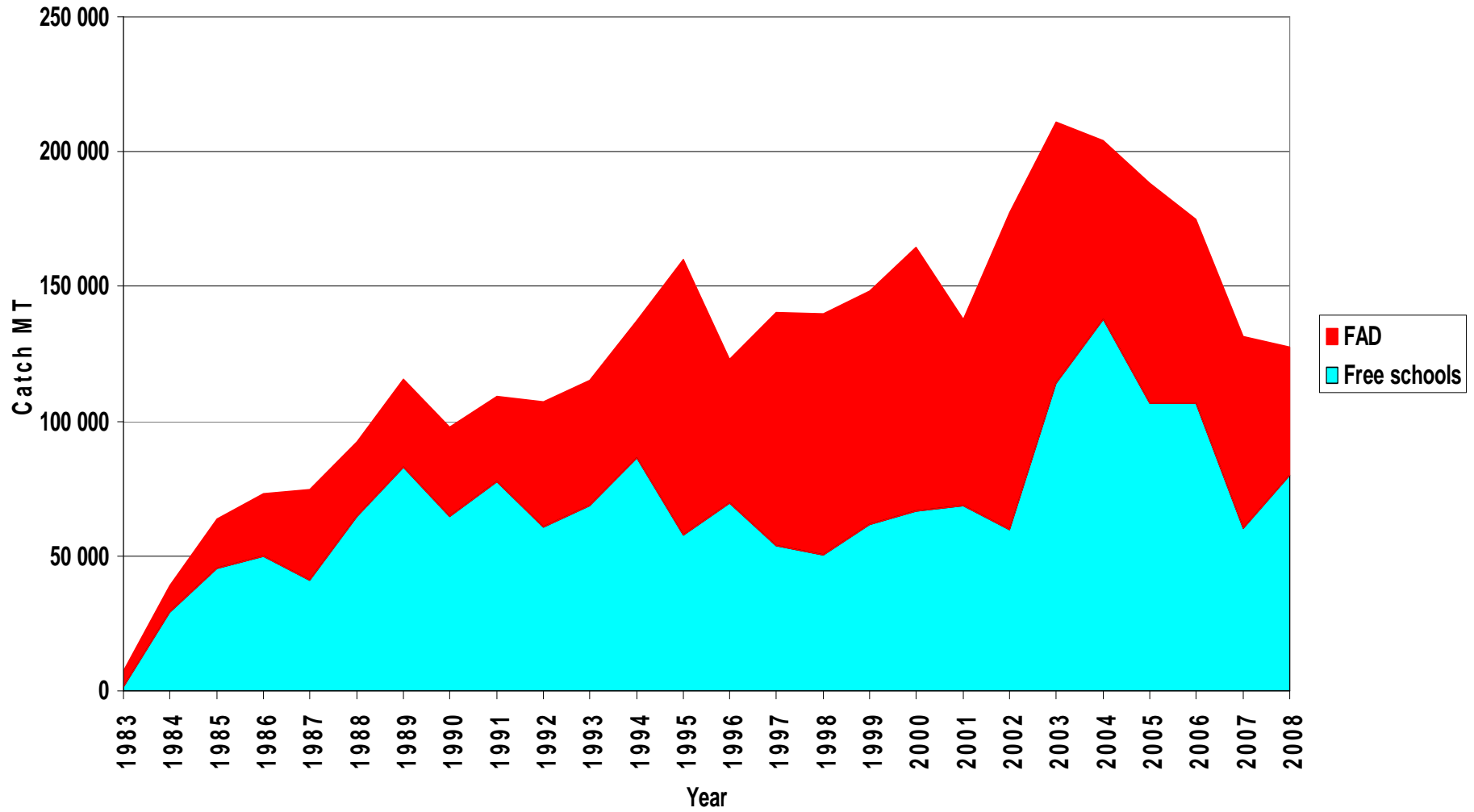


Figure 6: Total nominal catch by school type, January to July, 2000 – 2008

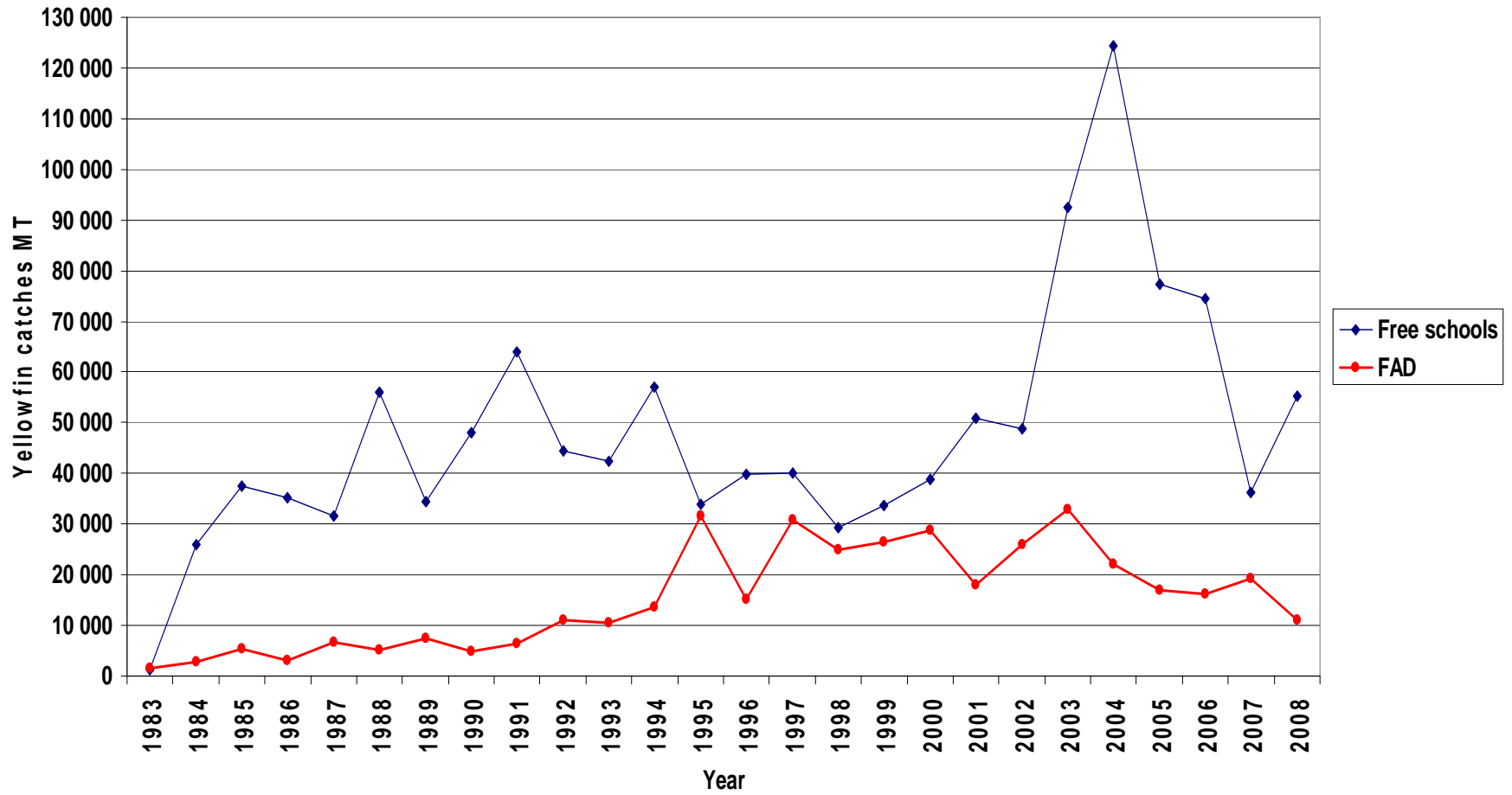


Figure 7: Yellowfin nominal catches by school type, January to August, 1984 - 2008

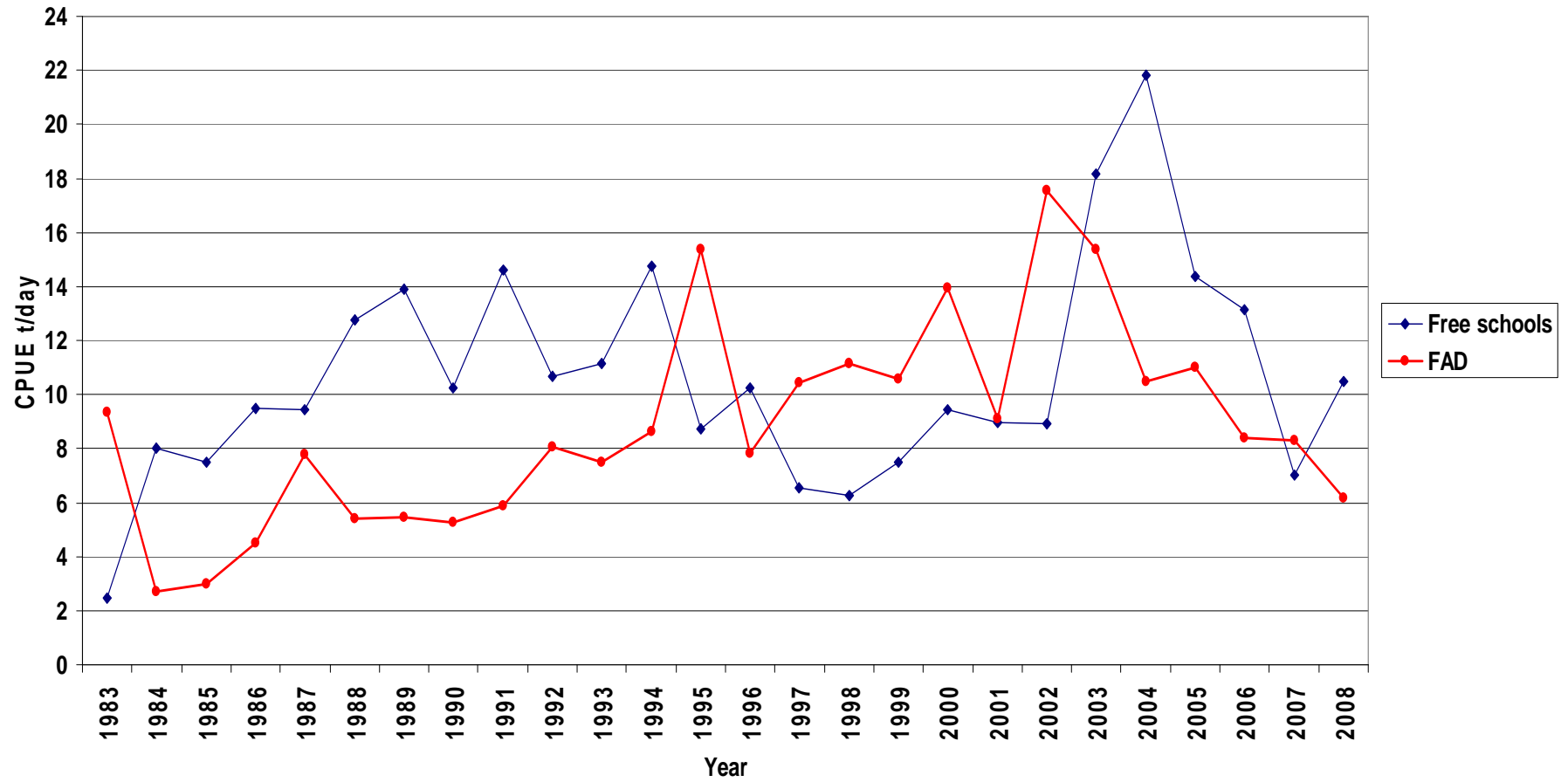


Figure 8: Total nominal CPUE (MT/fishing day) by school type, January to July, 1984 - 2008

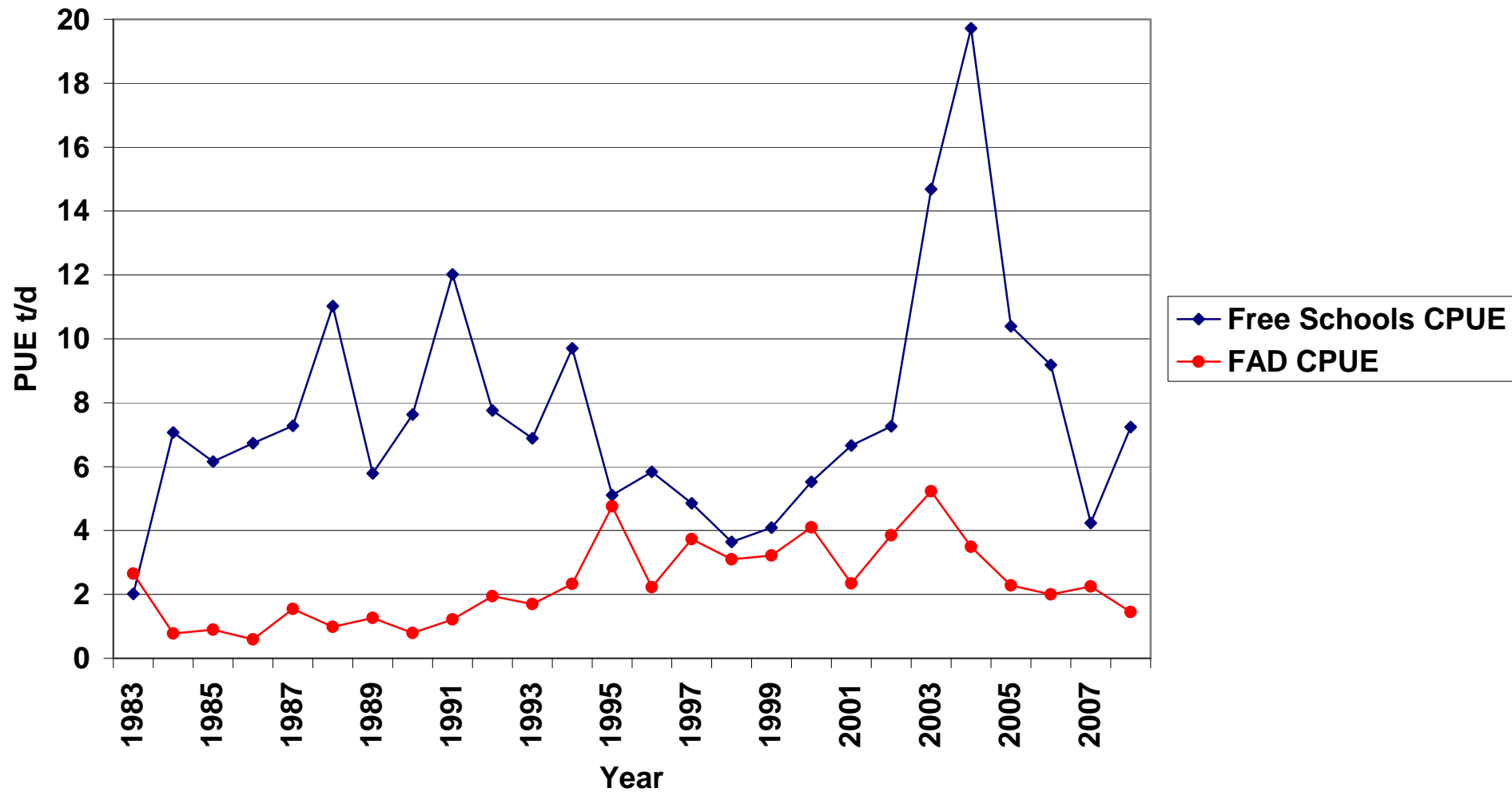


Figure 9: Yellowfin nominal CPUE (MT/fishing day) by school type, January to July 1984 - 2008

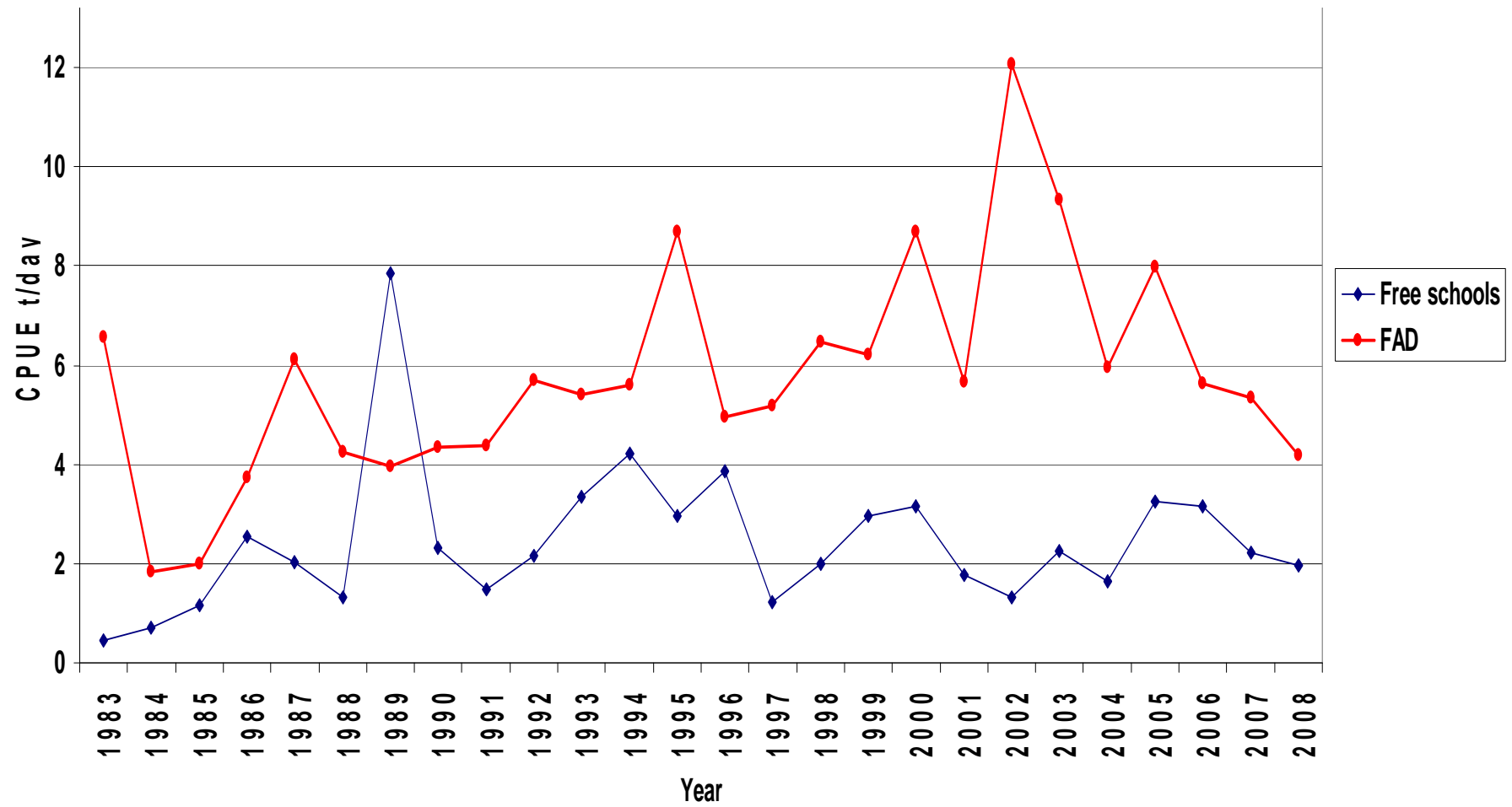


Figure 10: Skipjack nominal CPUE (MT/fishing day) by school type, January to July, 1984 - 2008

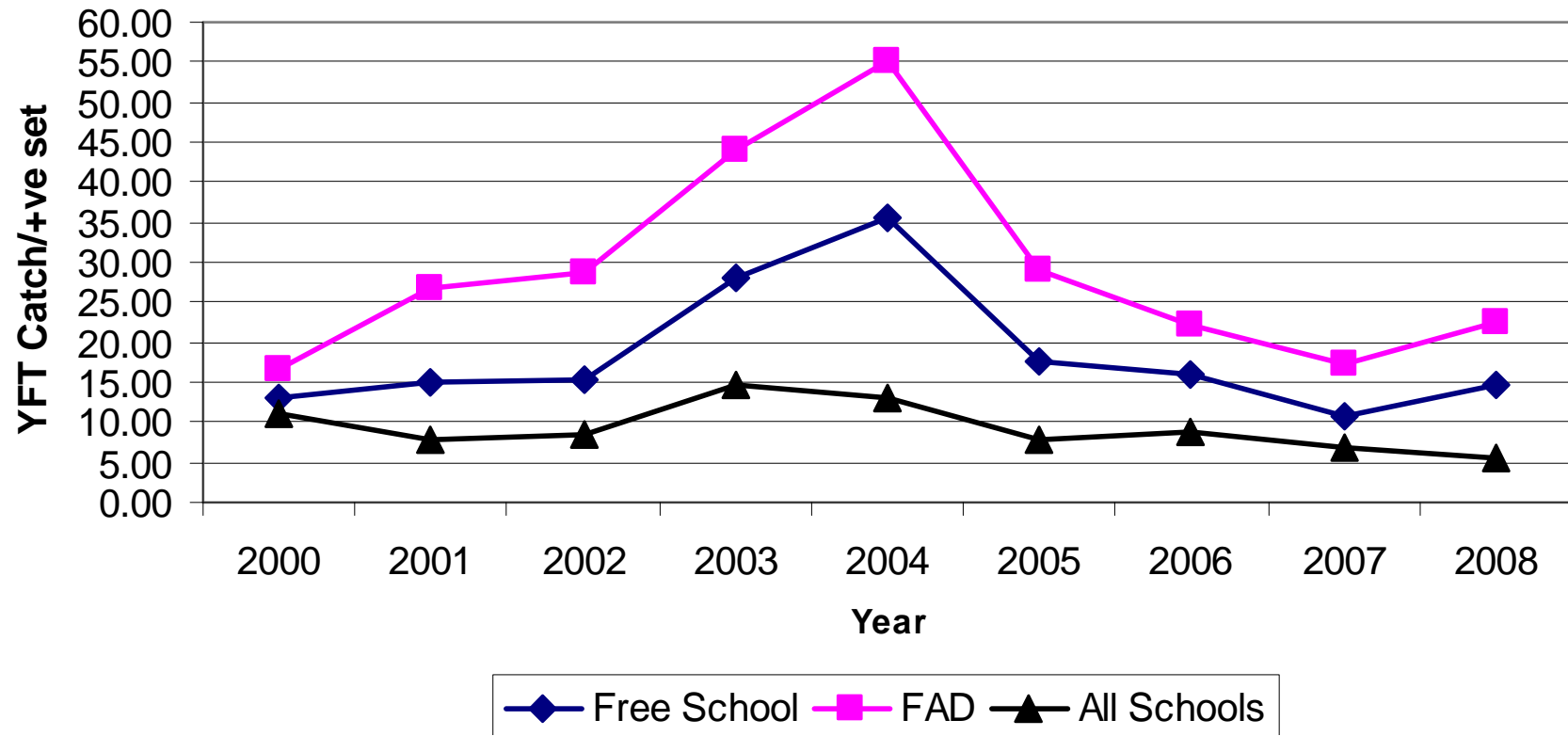


Figure 11: Yellowfin nominal catch/ positive set by school type, January to August,2000- 2008

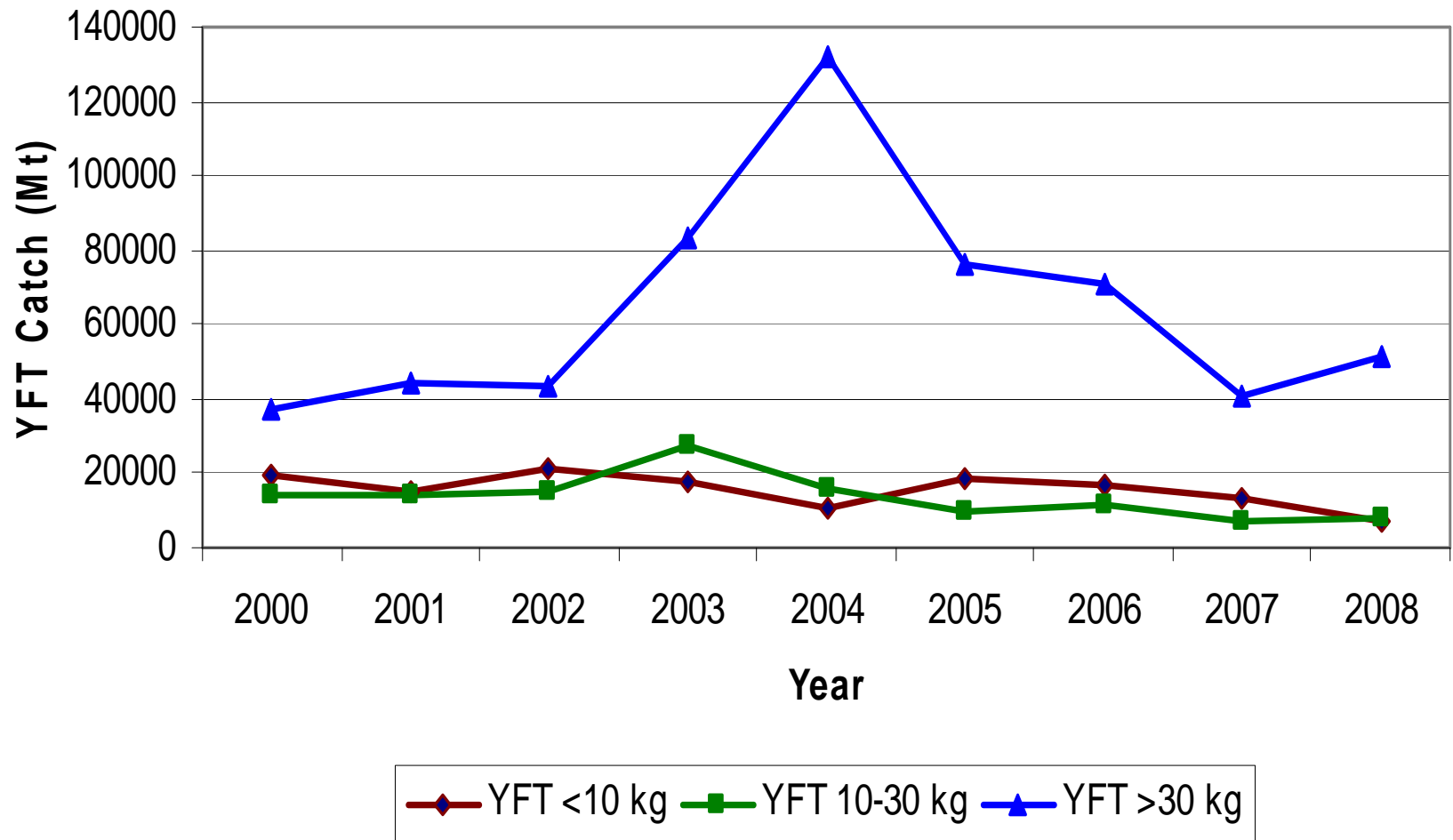


Figure 12: Yellowfin nominal catches taken by size category, January to August, 2000-2008

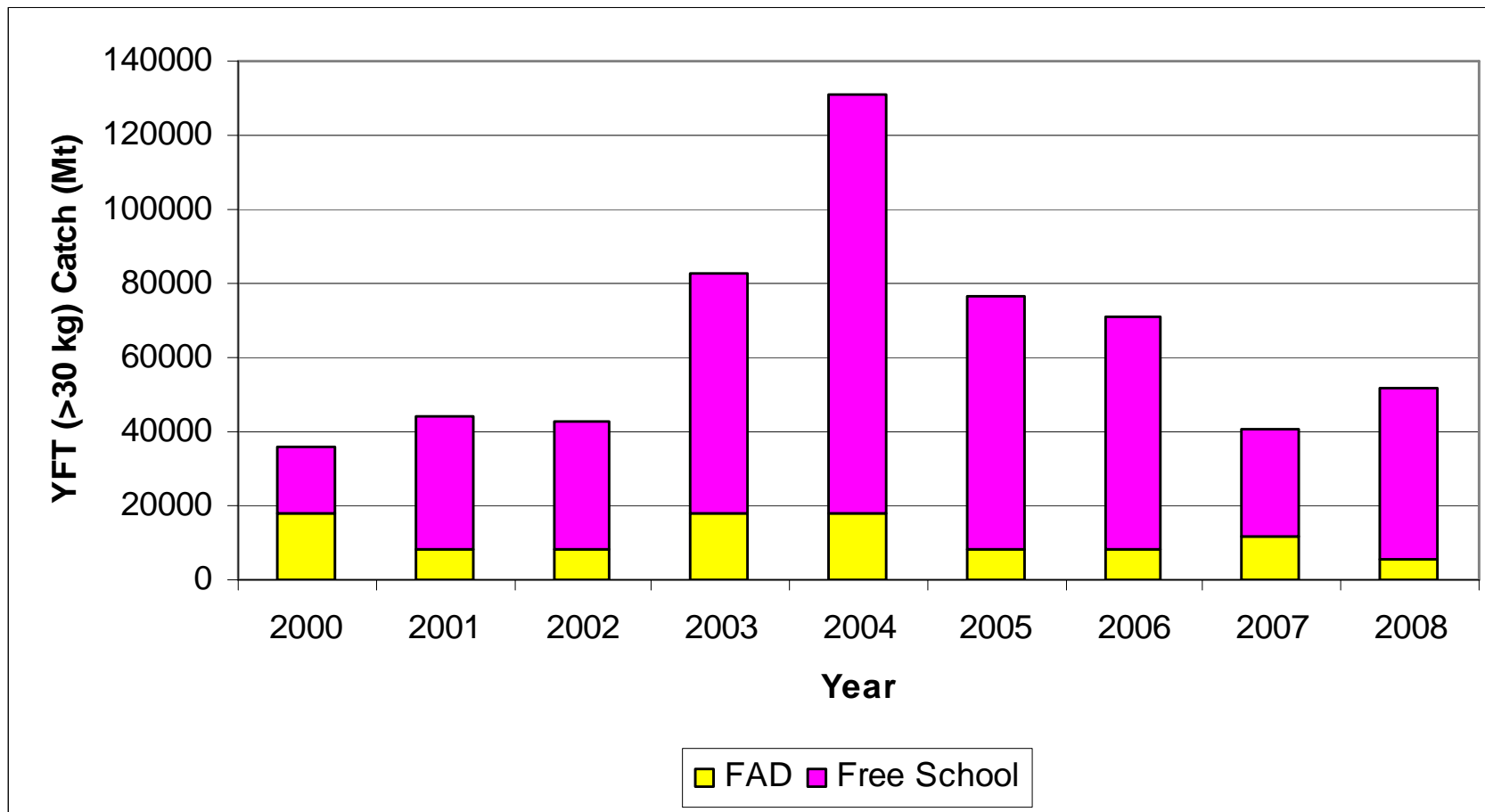


Figure 13: Yellowfin (>30 kg) nominal catches taken by school type, January to August, 2000 - 2008

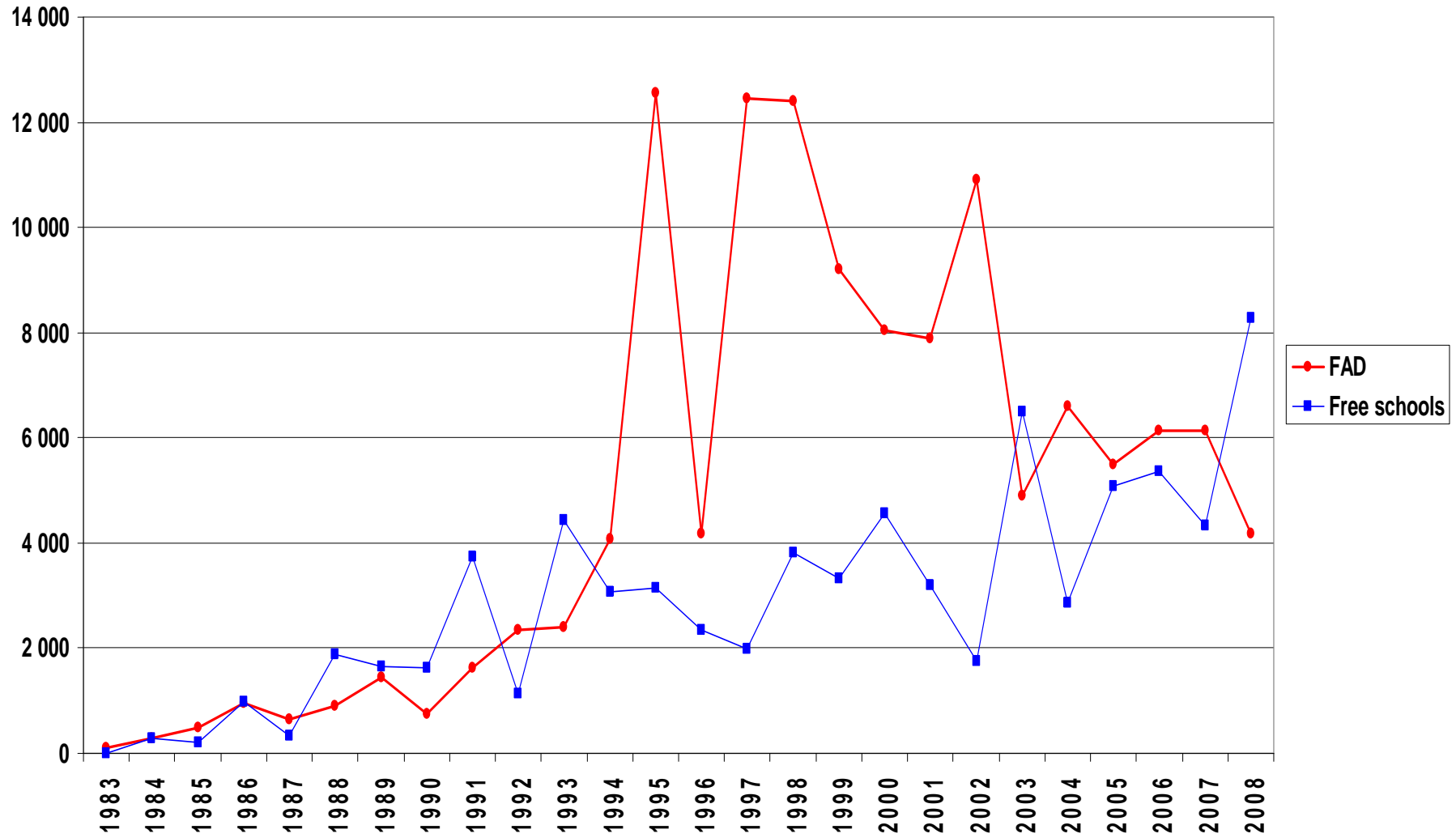
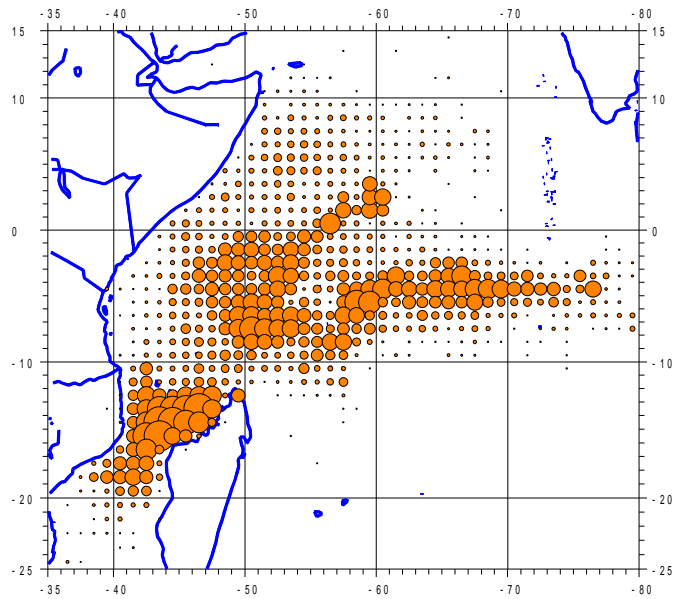


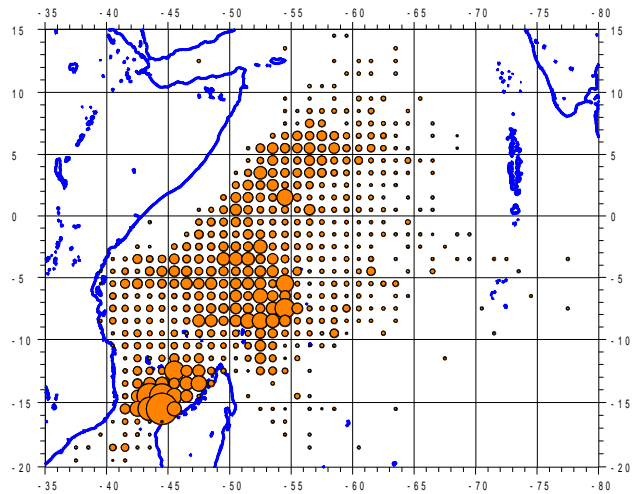
Figure 14: Bigeye nominal catches by school type, January to August, 1984 - 2008



PS Effort Jan-April 1999-2002

1999-2002

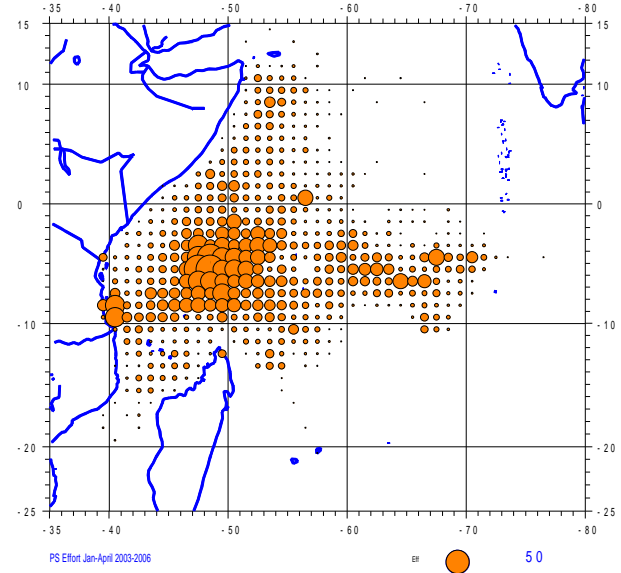
EFF 50



EFF 2007

2007

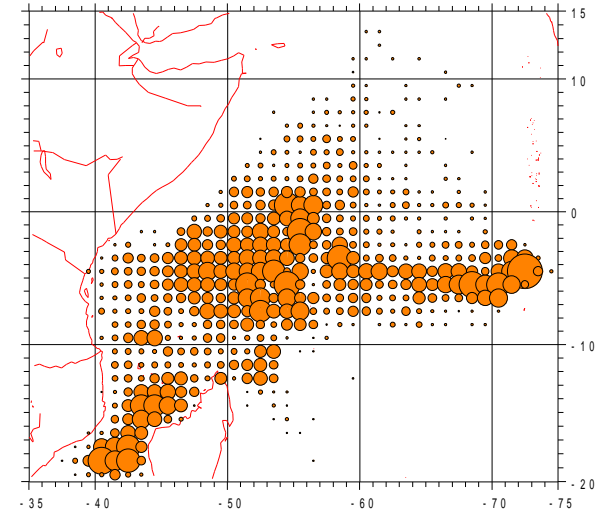
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PS Effort Jan-April 2003-2006

2003-2006

EFF 50



2008

Figure 15. Maps of the fishing efforts exerted by the sampled purse seine fleet during three periods averaging the 8 month of each year: average of the 3 periods 1999-2002 , 2003- 2006, 2007 and 2008.

1999-2002

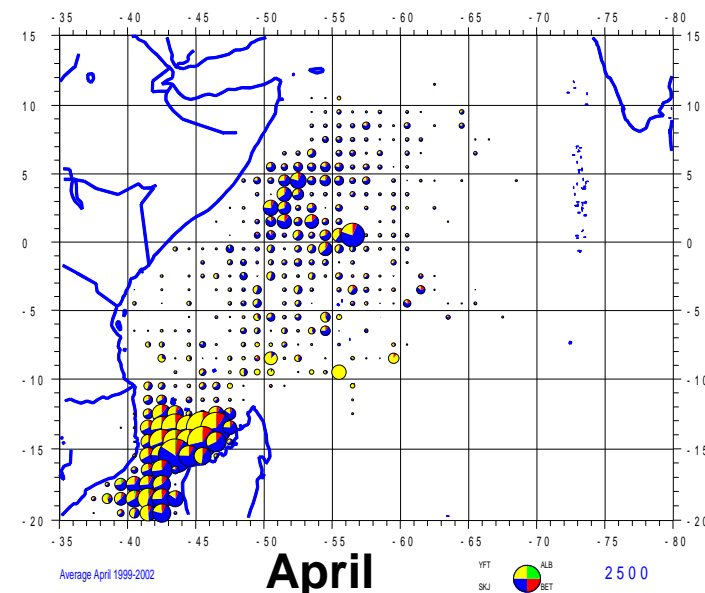
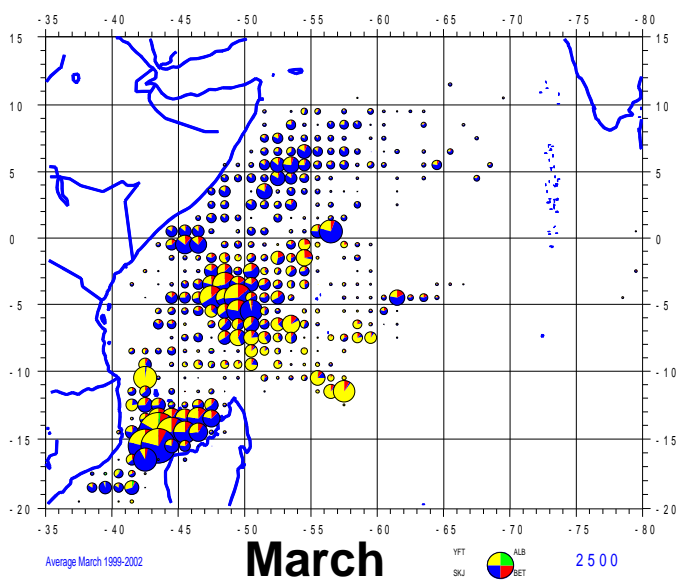
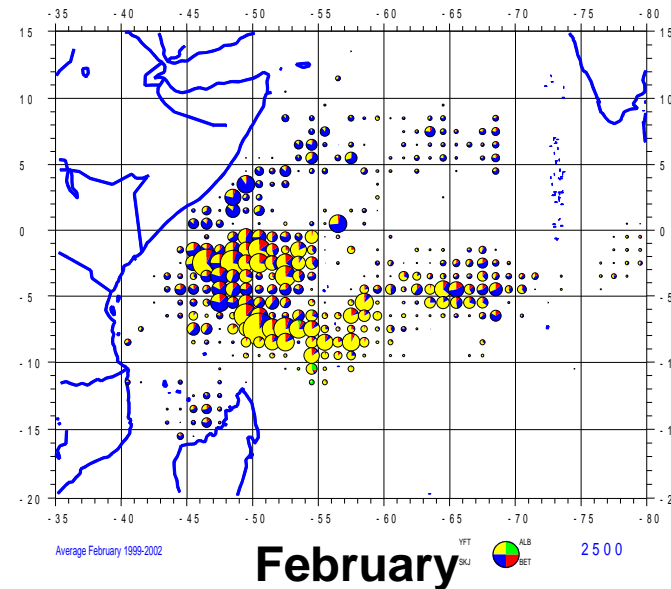
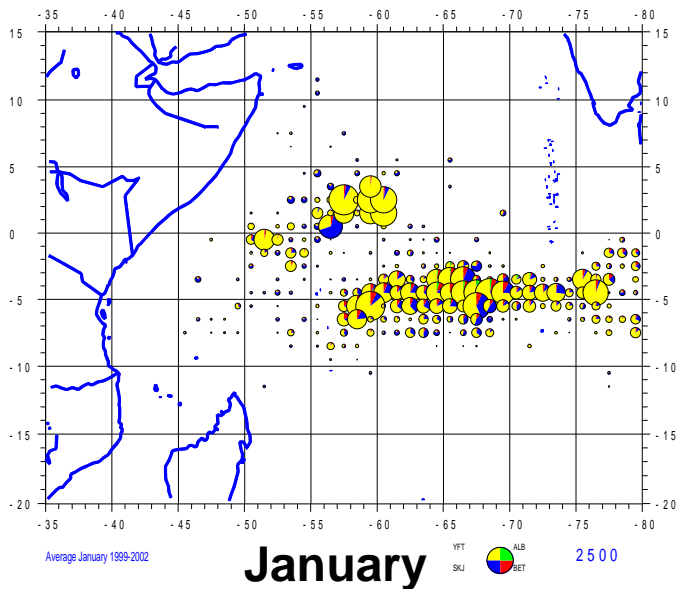
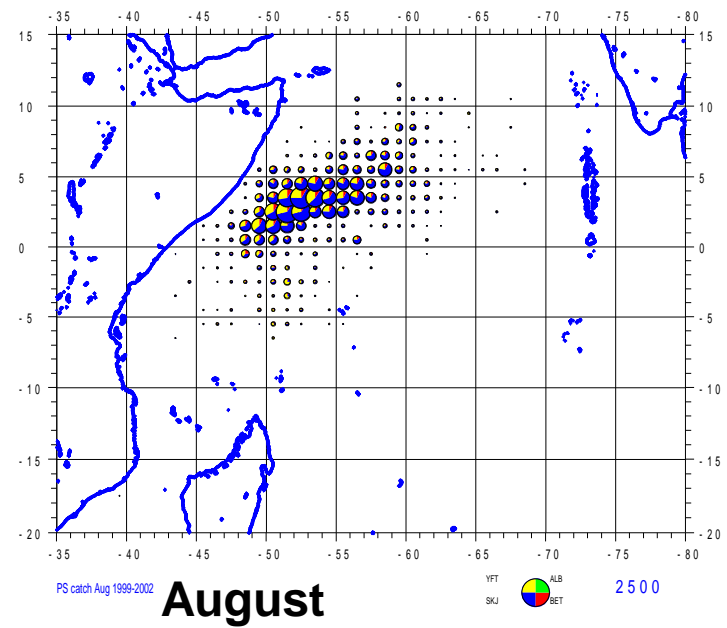
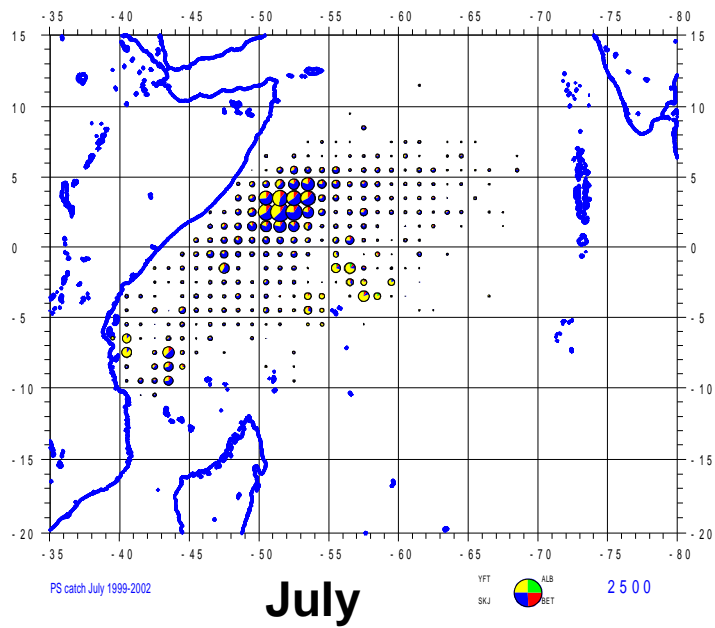
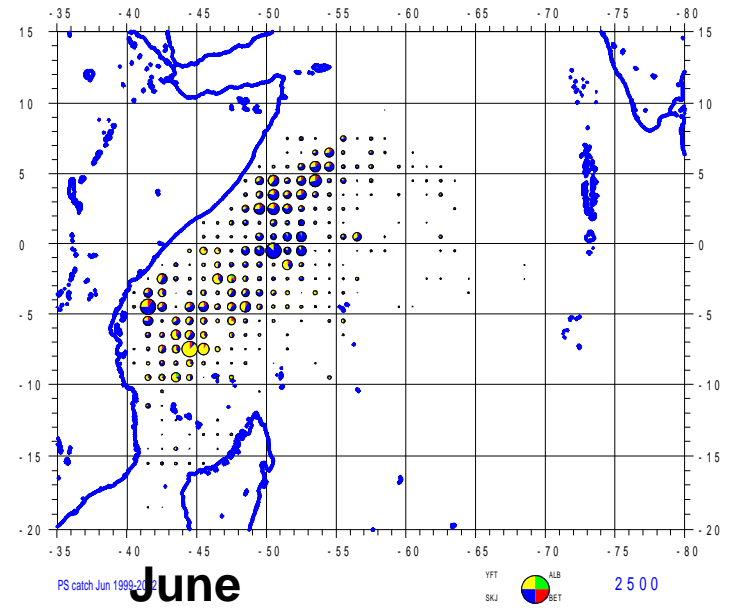
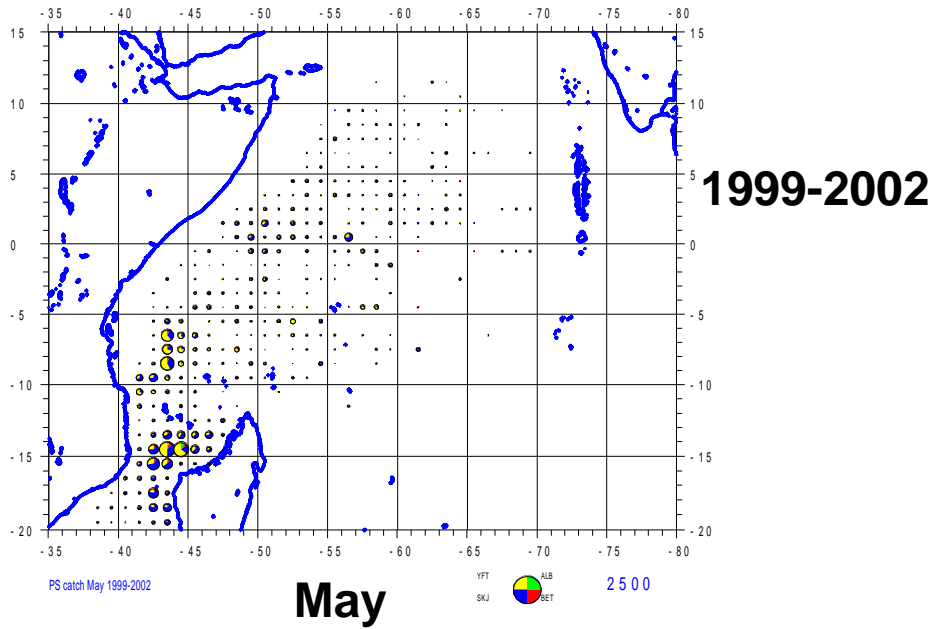


Figure 16: Monthly catches by species, by 1°square, of the sampled purse seine fishery during the first 8 months of the average 1999-2002 period (a period of « normal » catches)



2003-2006

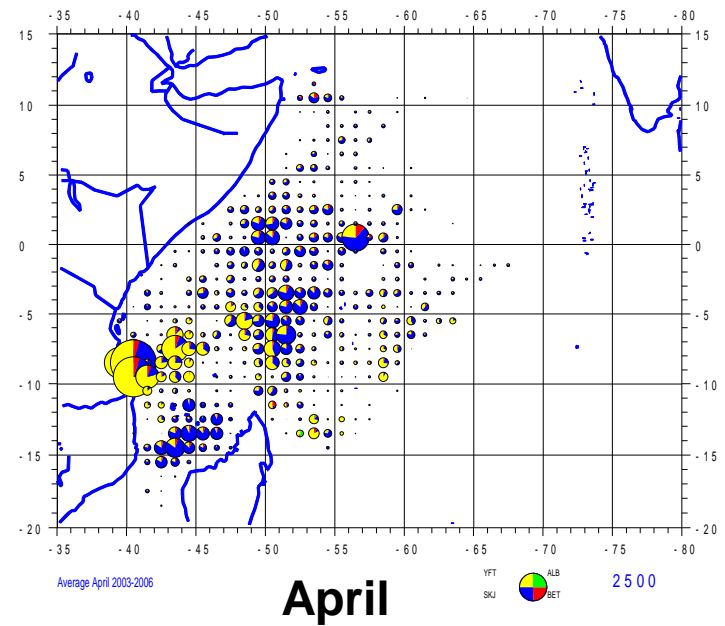
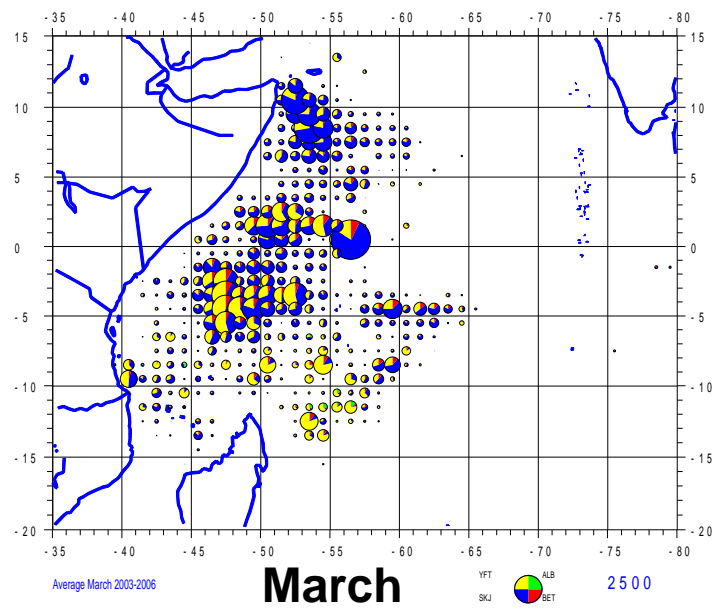
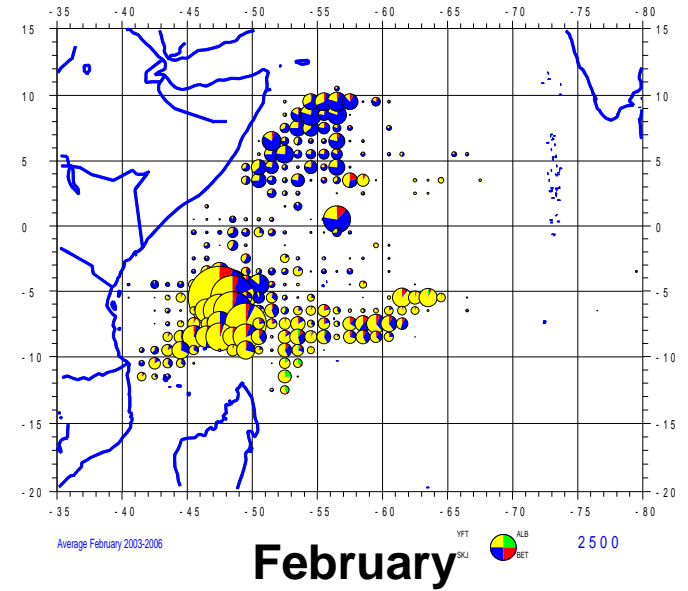
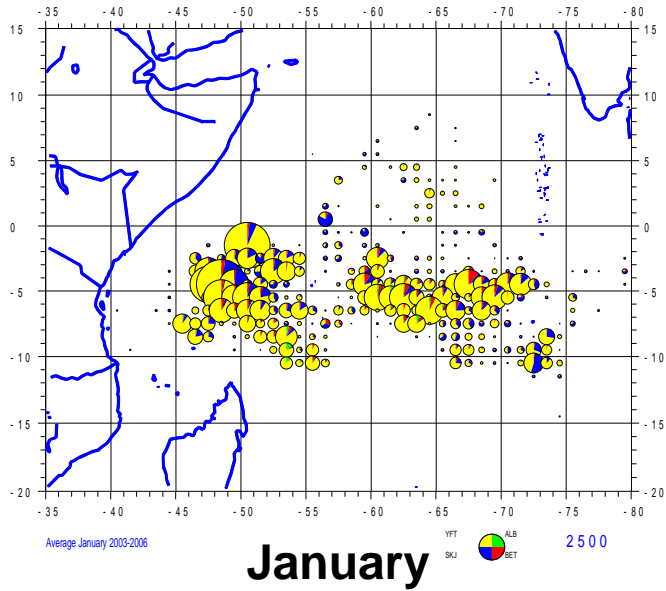
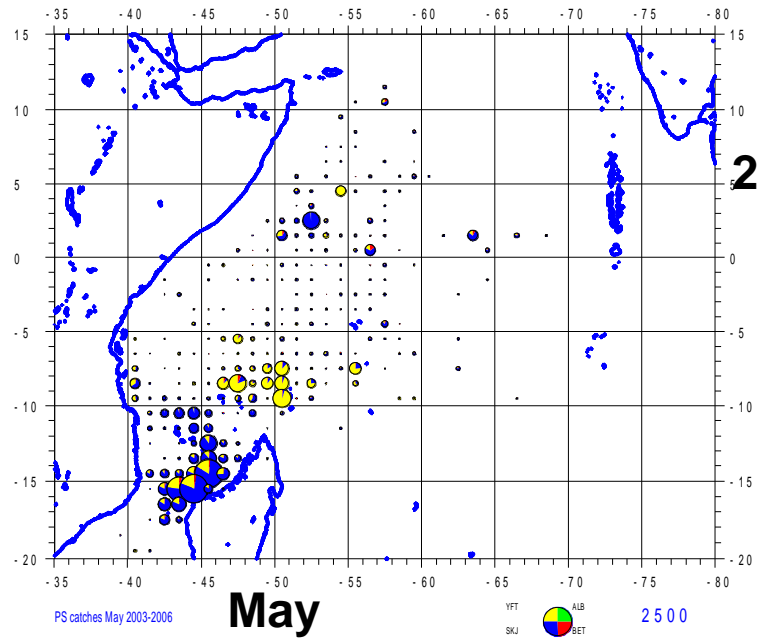
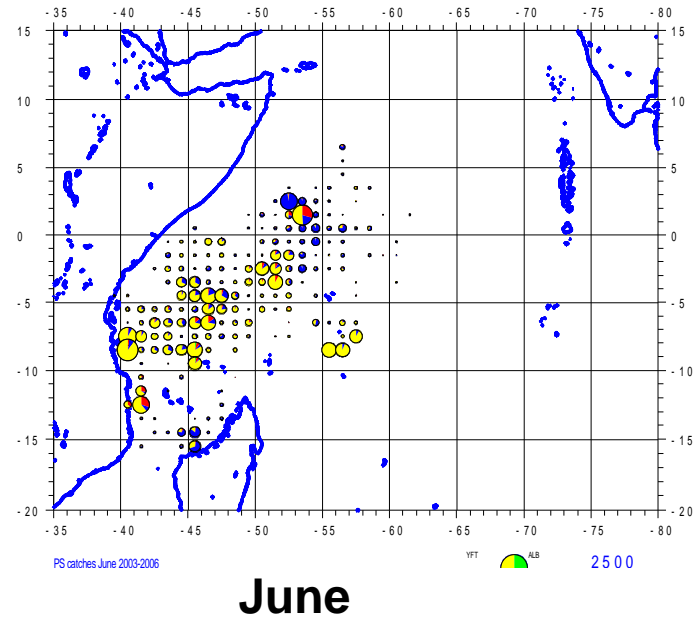


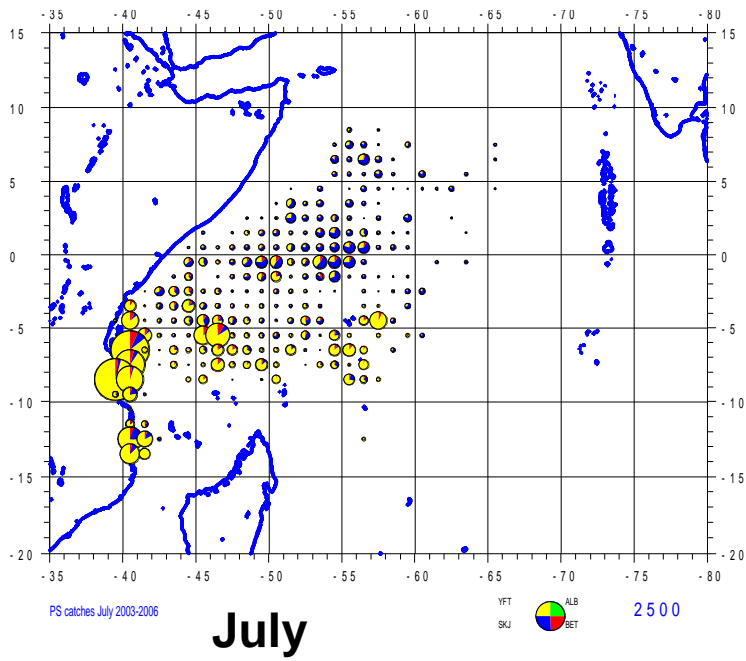
Figure 17: Monthly catches by species, by 1° square, of the sampled purse seine fishery during the first 8 months of the average 2003-2006 period (a period of « high » catches)



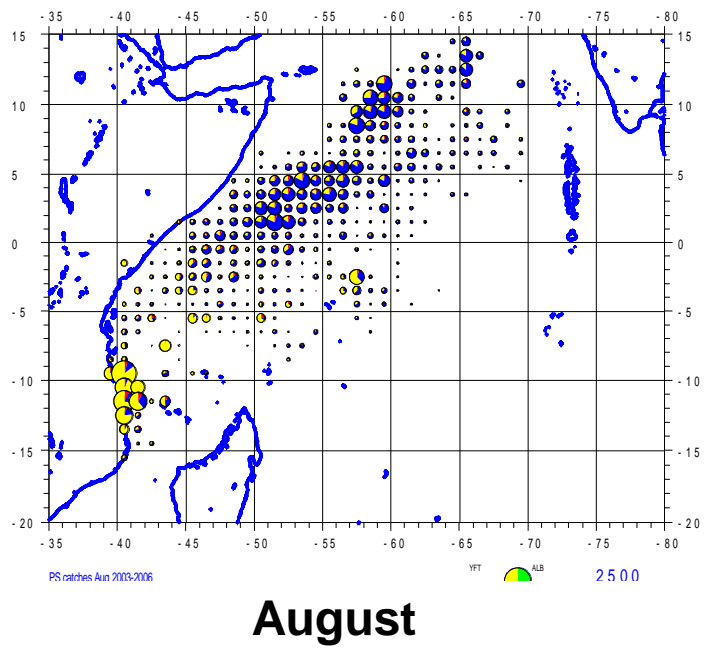
2003-2006



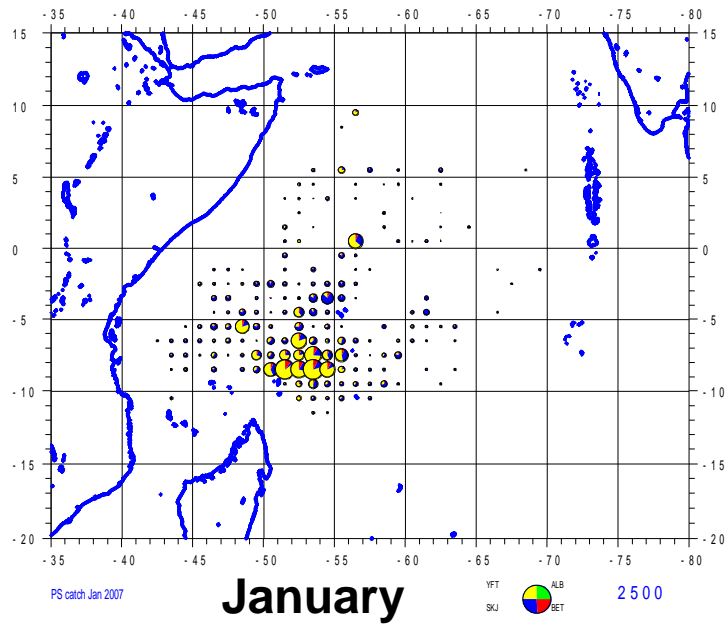
June



July



August



2007

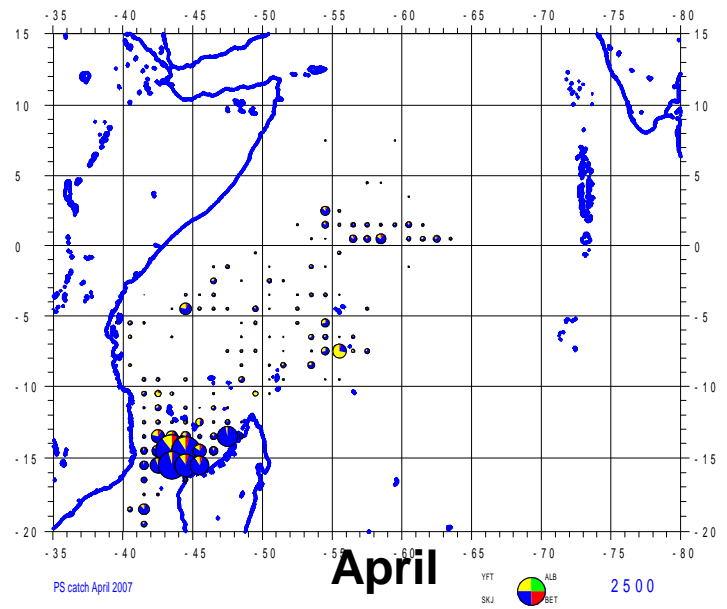
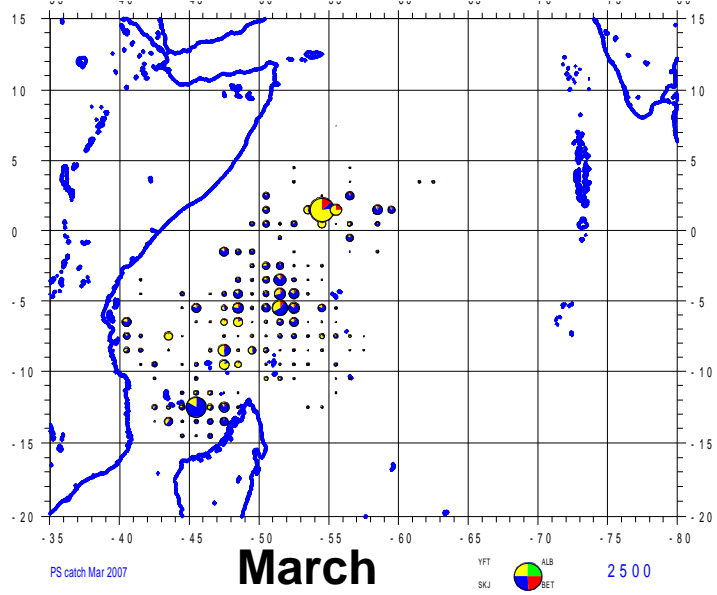
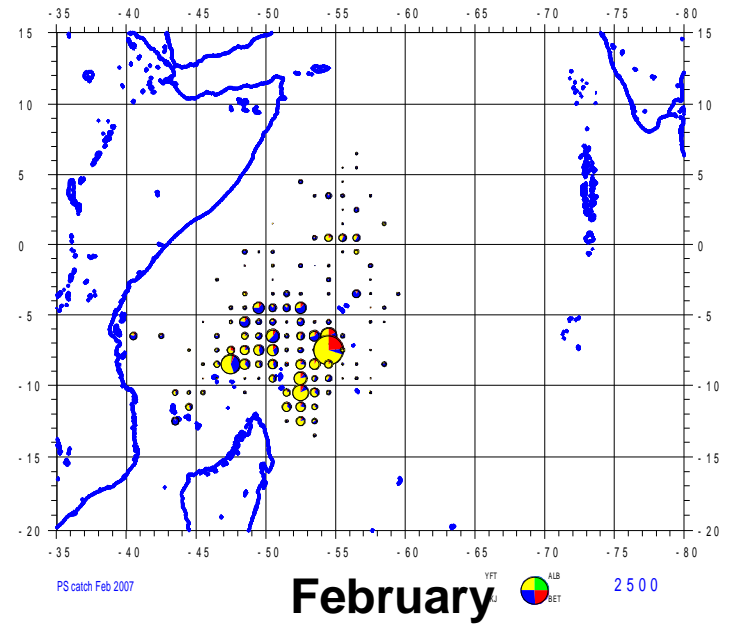
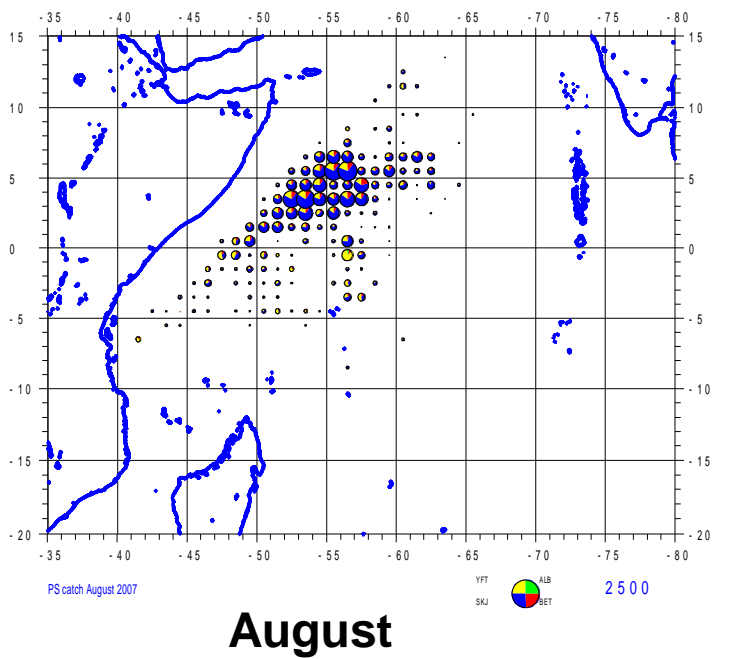
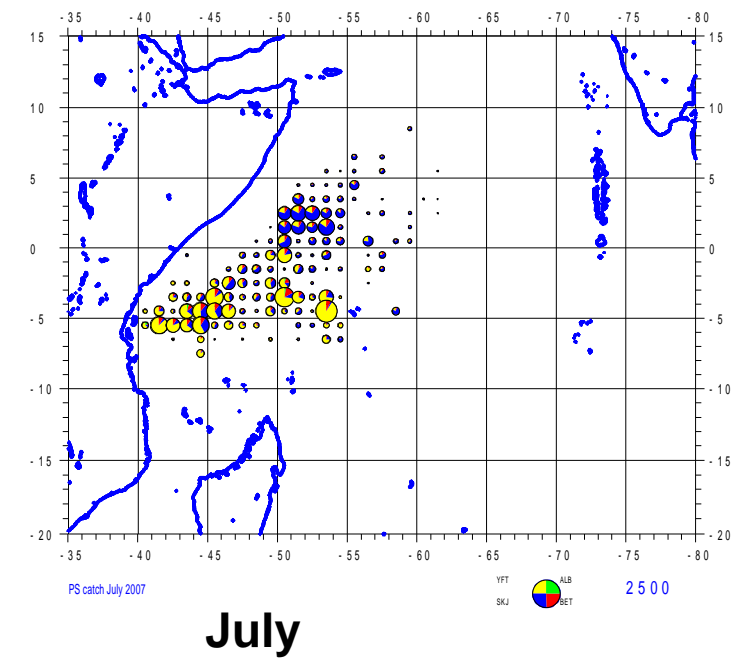
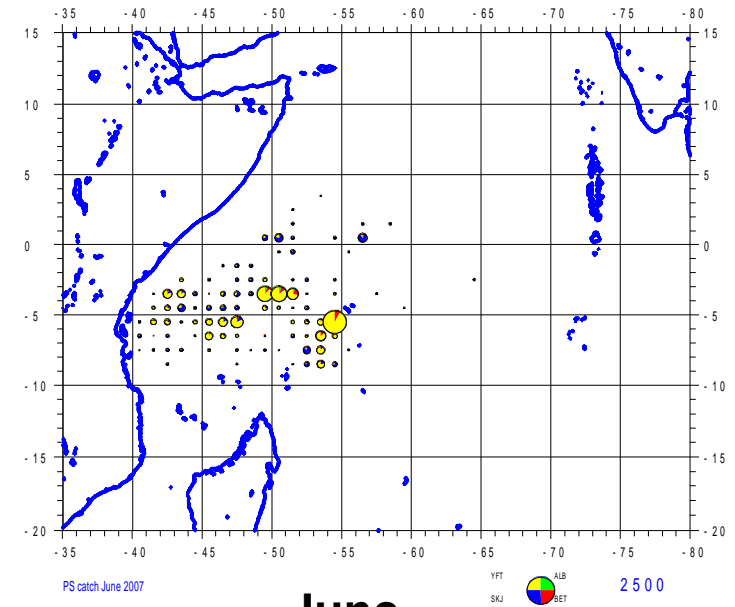
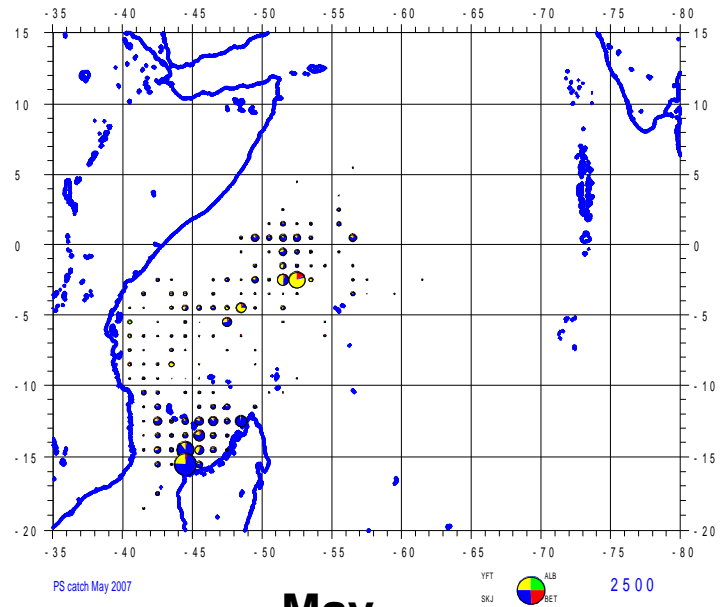


Figure 18: Monthly catches by species, by 1° square, of the sampled purse seine fishery during the first 8 months of the year 2007.

2007



2008

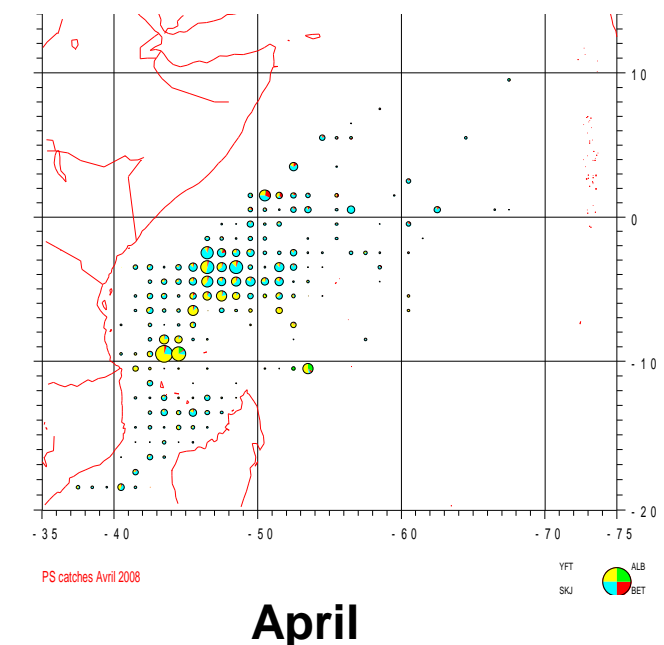
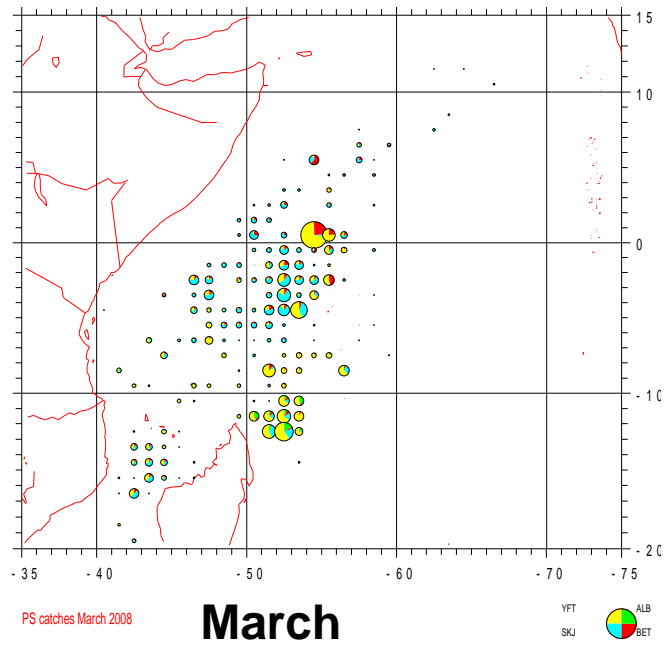
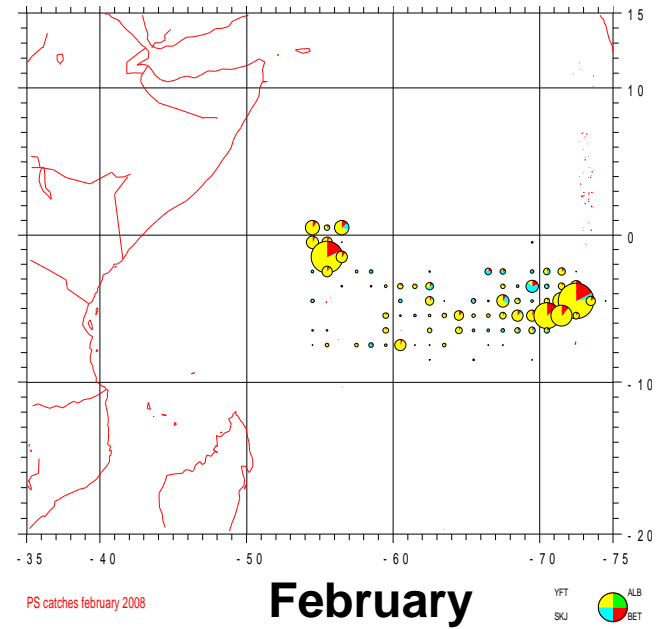
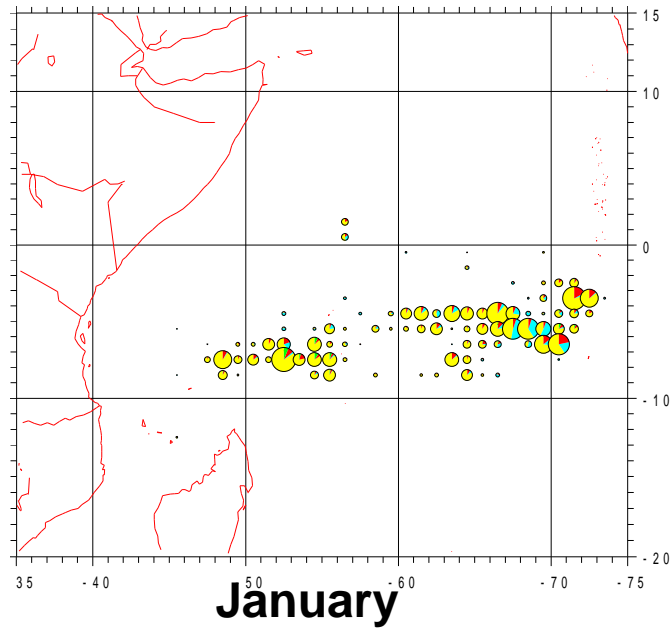
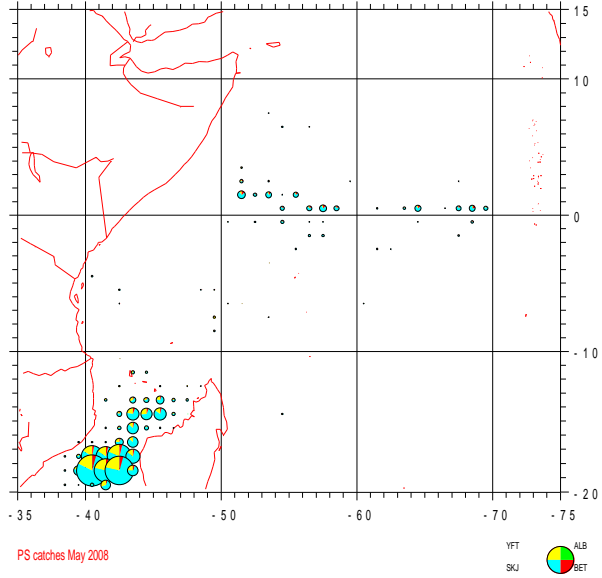
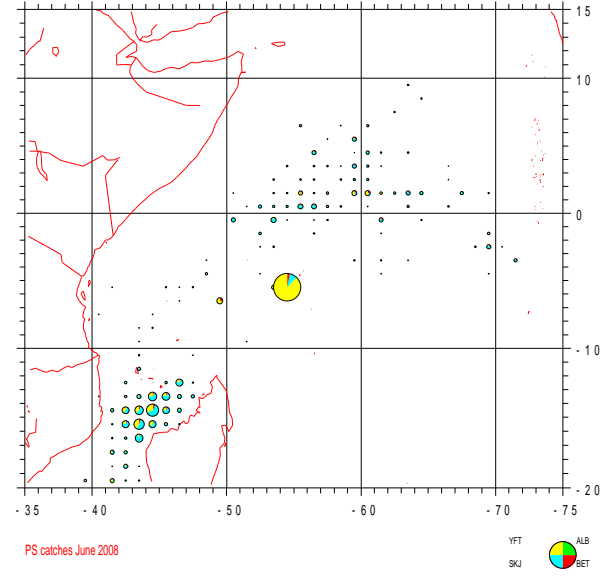


Figure 19: Monthly catches by species, by 1°square, of the sampled purse seine fishery during the first 7 months of 2008.

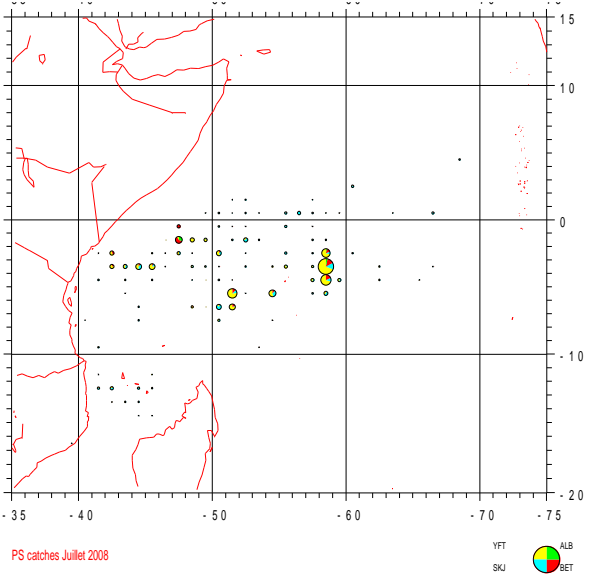
2008



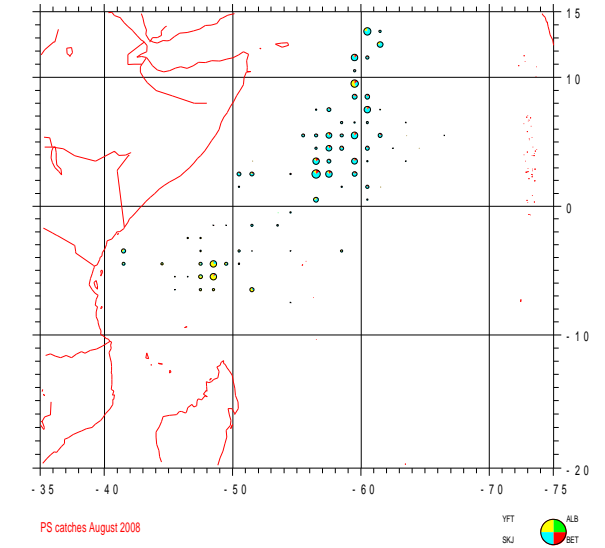
May



June



July



August

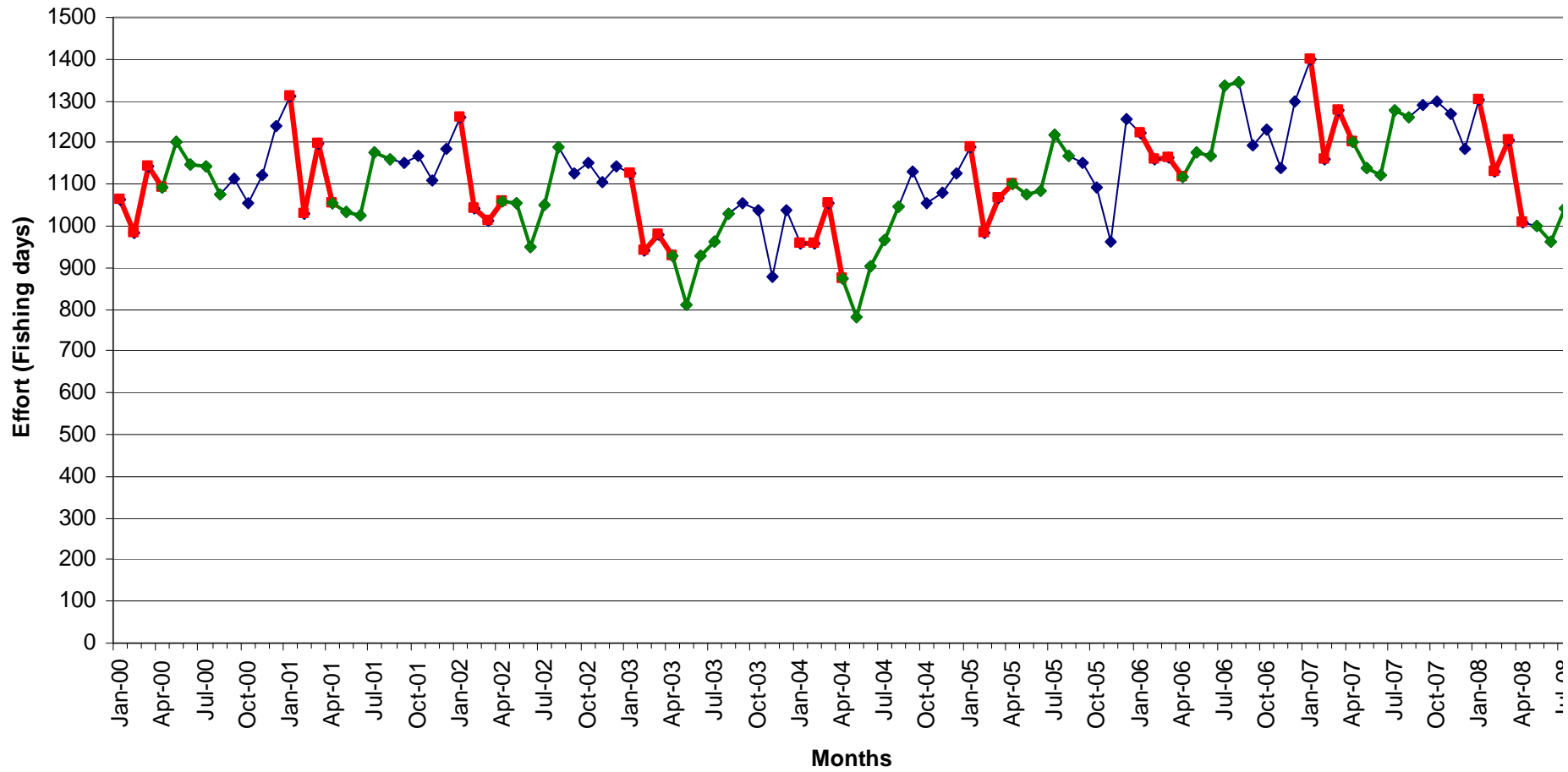


Figure 20. Monthly nominal efforts exerted by the sampled purse seine fishery during the 2000 –2008 period

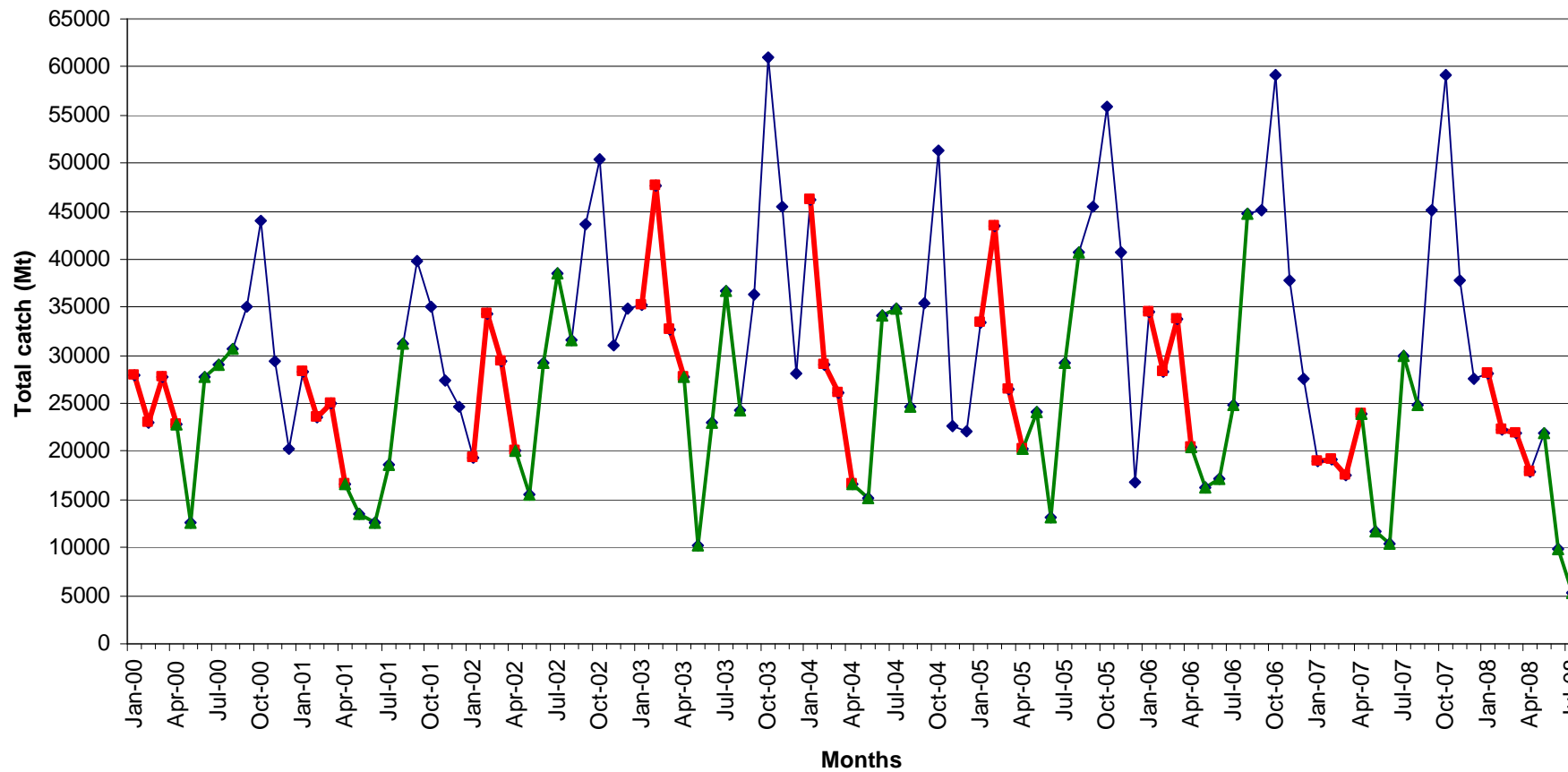


Figure 21. Monthly total catch of the sampled purse seine fishery during the 2000 – 2008 period

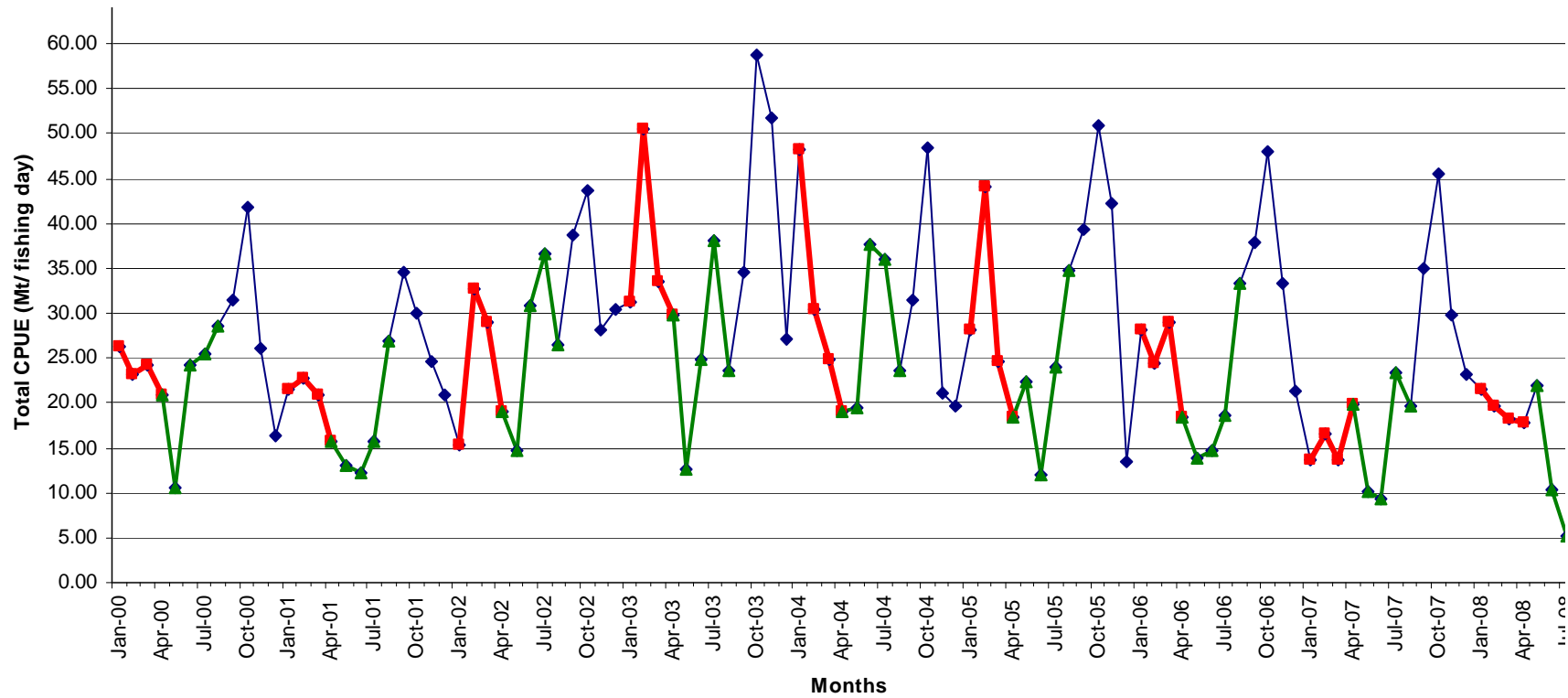


Figure 22. Monthly total nominal CPUE (MT/fishing day) of the sampled purse seine fishery during the 2000 –2008 period

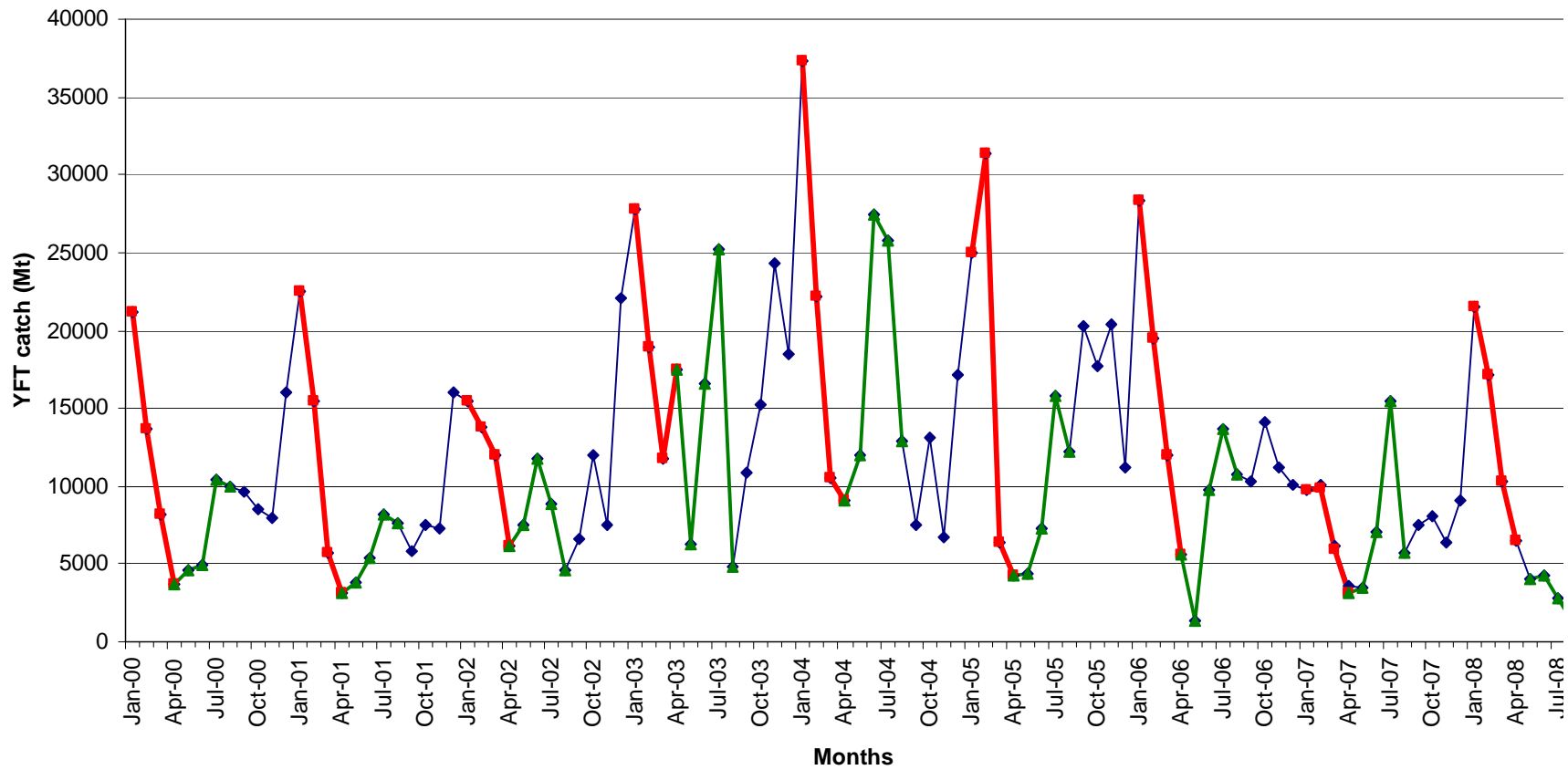


Figure 23. Monthly nominal YFT catch (MT) of the sampled purse seine fishery during the 2000 –2008 period

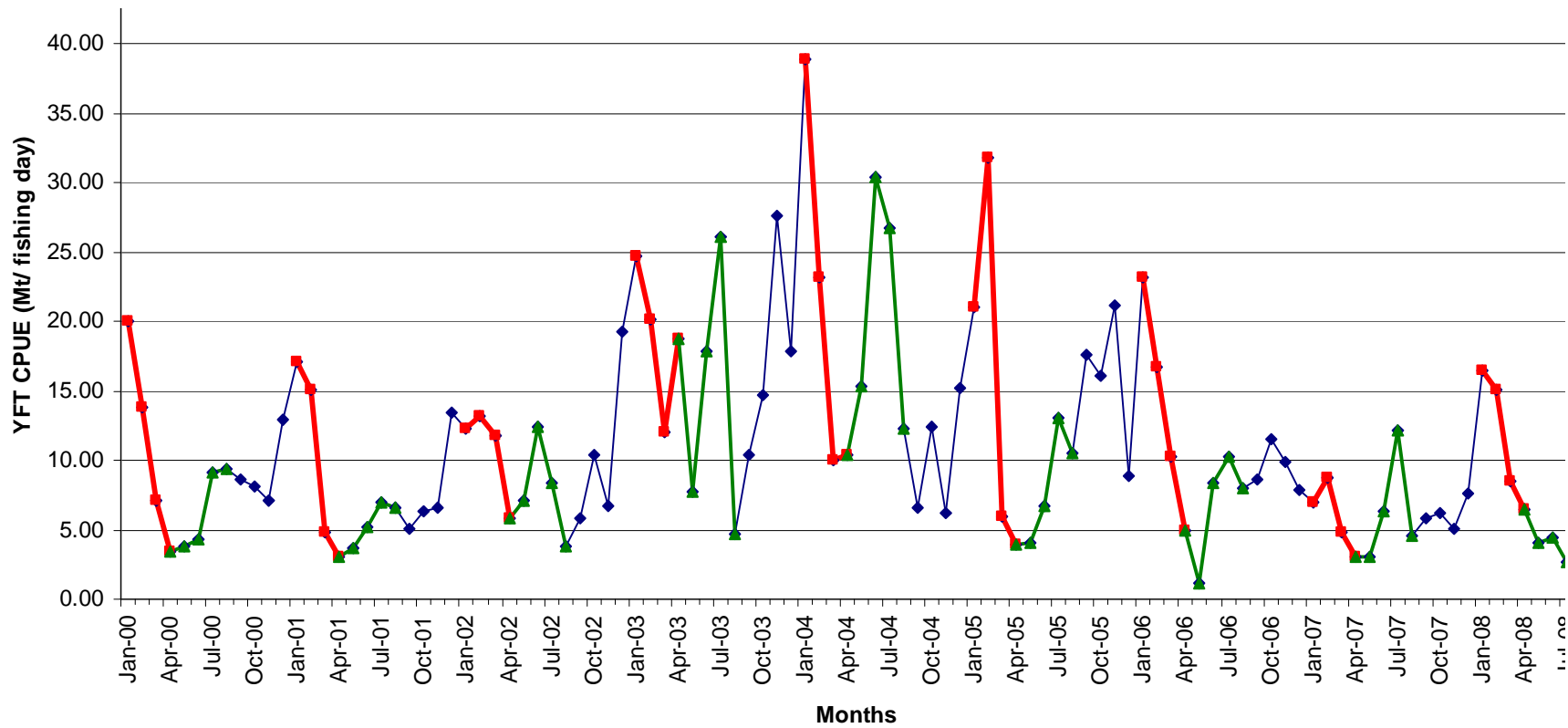


Figure 24. Monthly nominal YFT CPUE (MT/fishing day) of the sampled purse seine fishery during the 2000 –2008 period

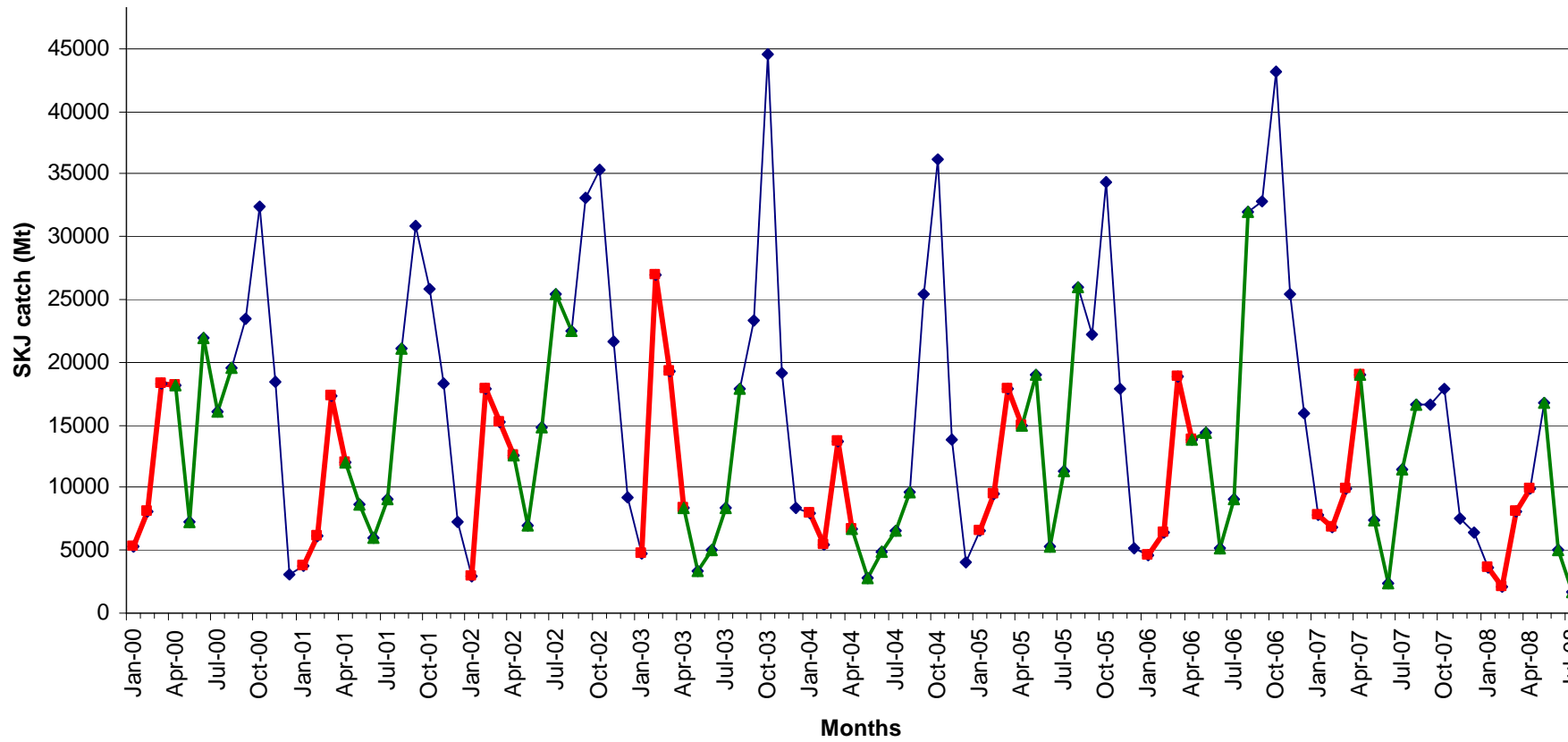


Figure 25. Monthly nominal SKJ catch (MT) of the sampled purse seine fishery during the 2000 –2008 period

Total catch rates t/day of EU PS in the Atlantic and Indian oceans

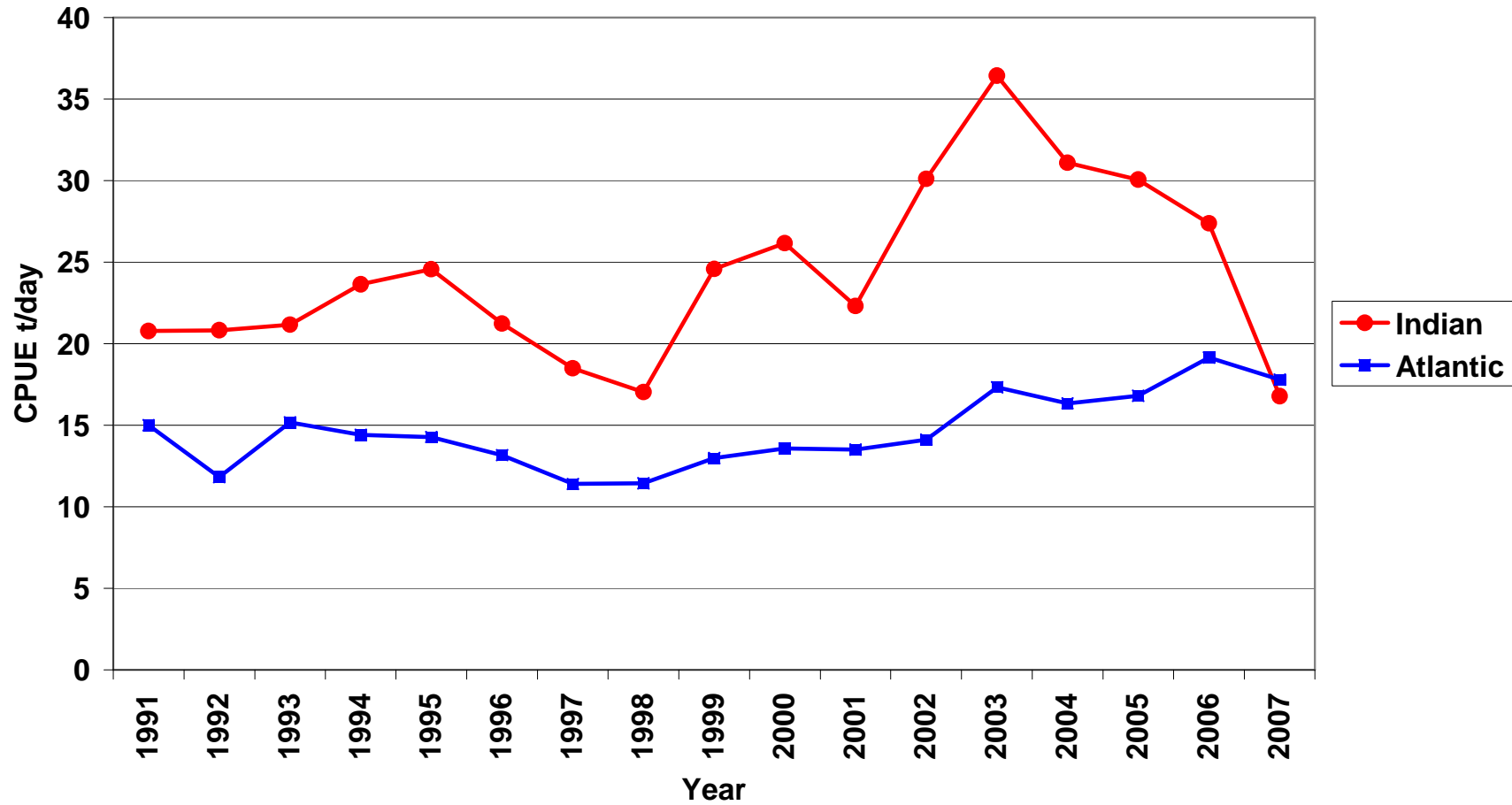


Figure 26: Yearly total CPUEs of EU purse seiners fishing in the Indian and in the Atlantic oceans

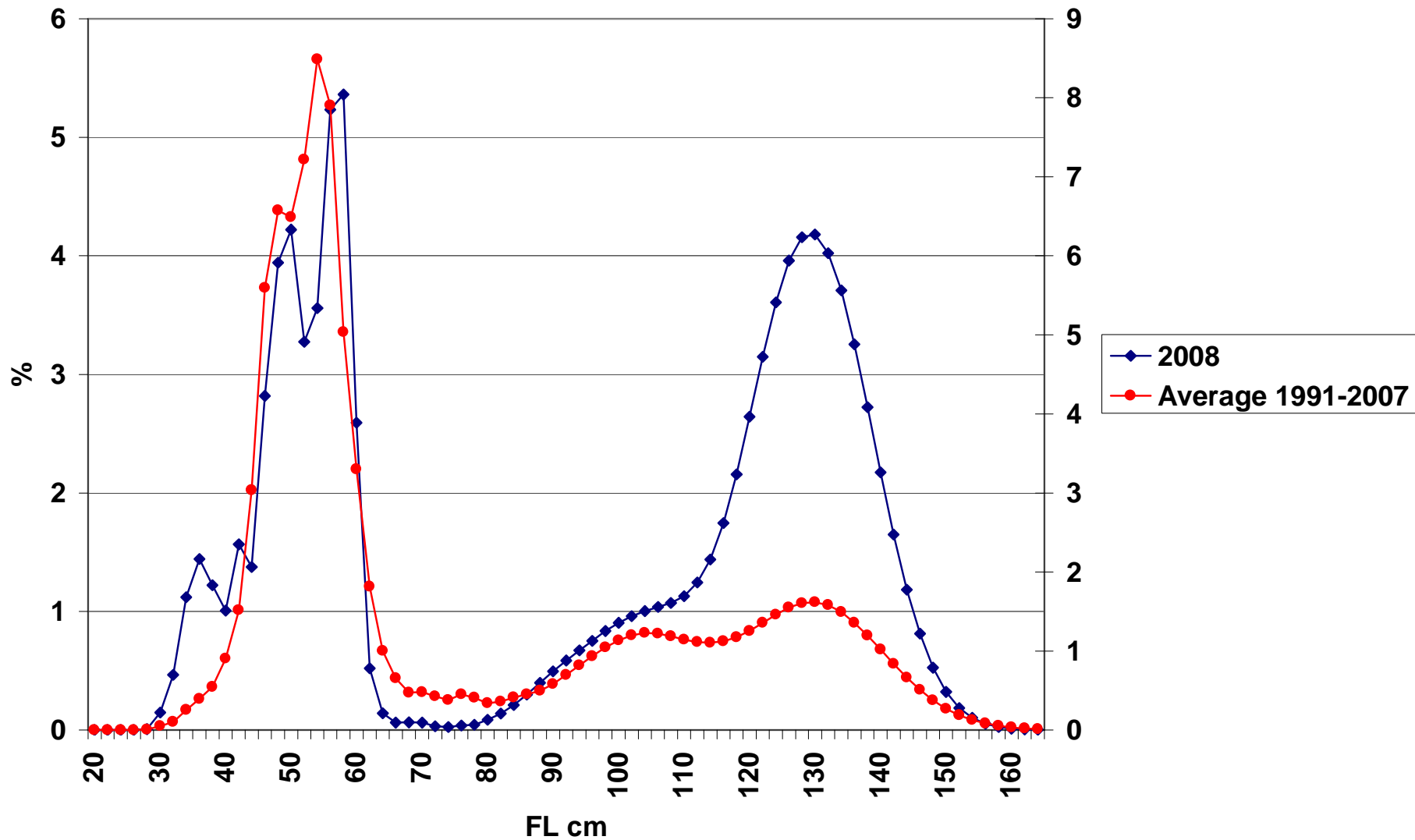
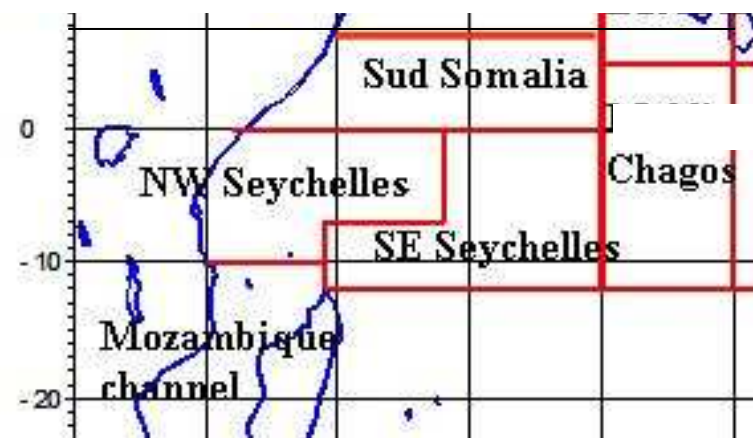
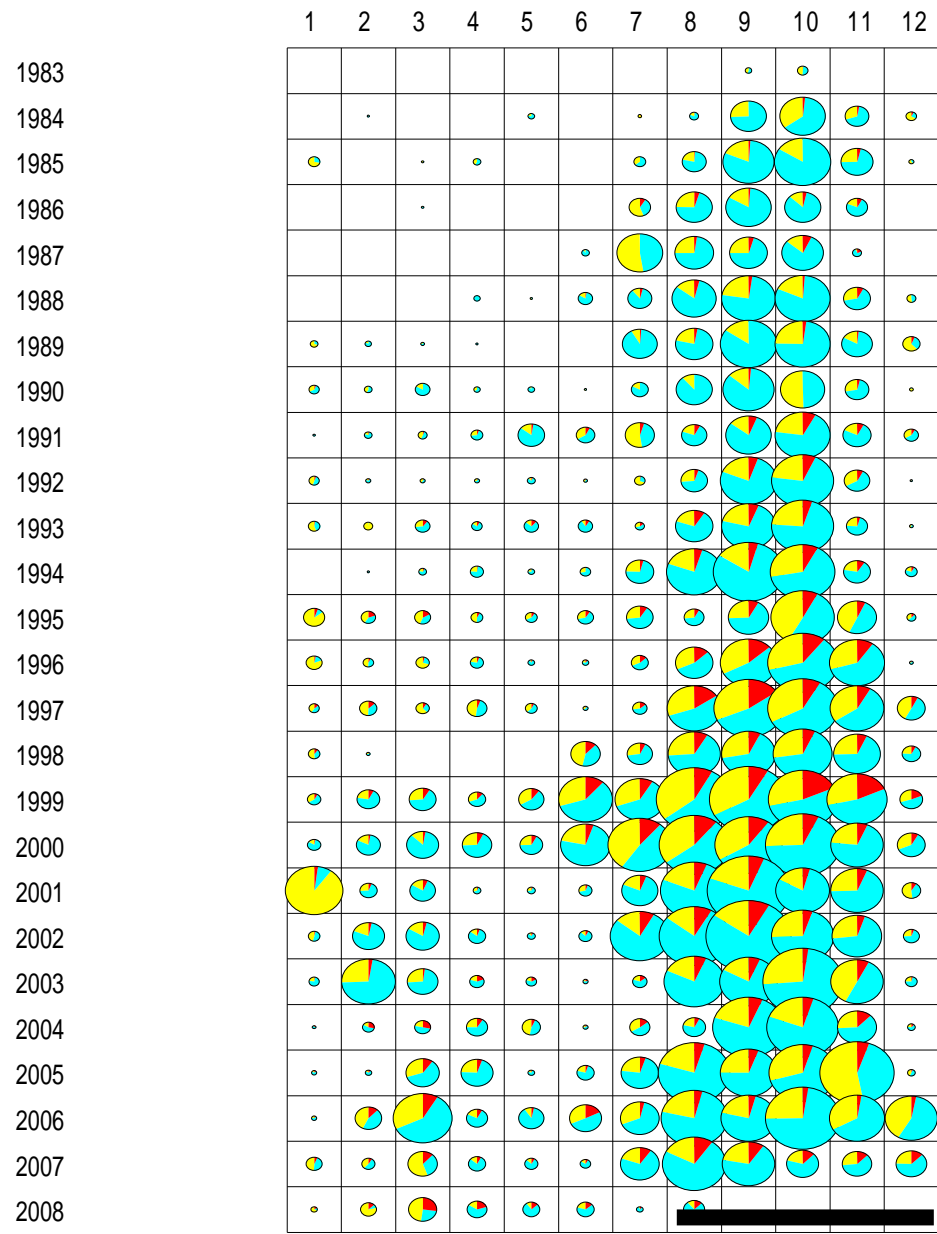


Figure 27: Size distribution of Yellowfin caught during the 2 first quarters of 2008, and same result for the average size distribution during the average period 1991-2007 (in % of the number caught)



Fishing areas used for fig. 28 to 32

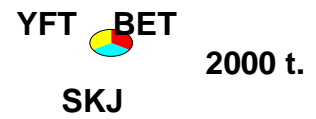


Figure 28: Monthly catches taken by species by the EU purse seine fishery in the Somalia area (8°N-Equator) between January 1983 and July 2008.

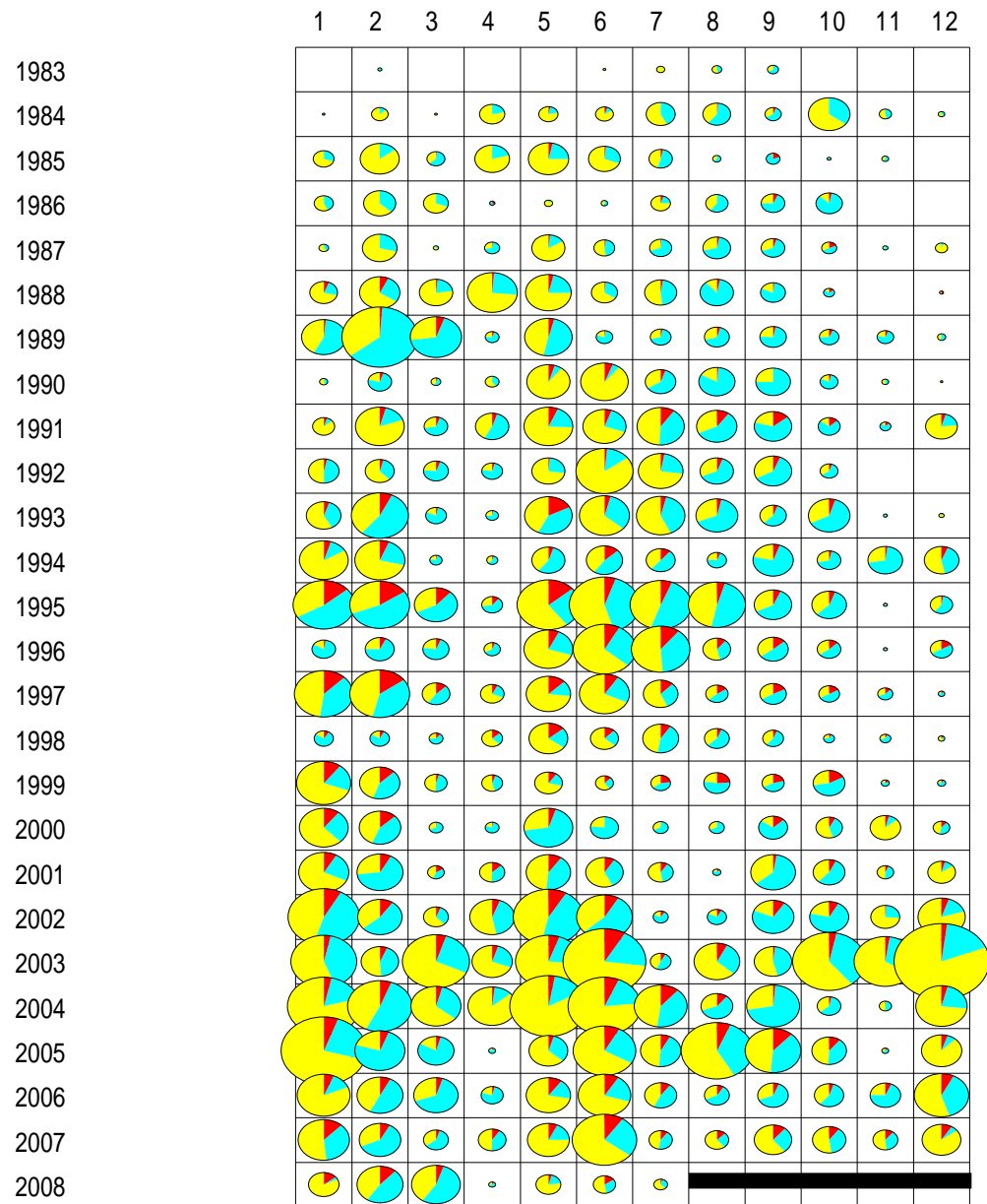


Figure 29: Monthly catches taken by species by the EU purse seine fishery in the West Seychelles area between January 1983 and July 2008.

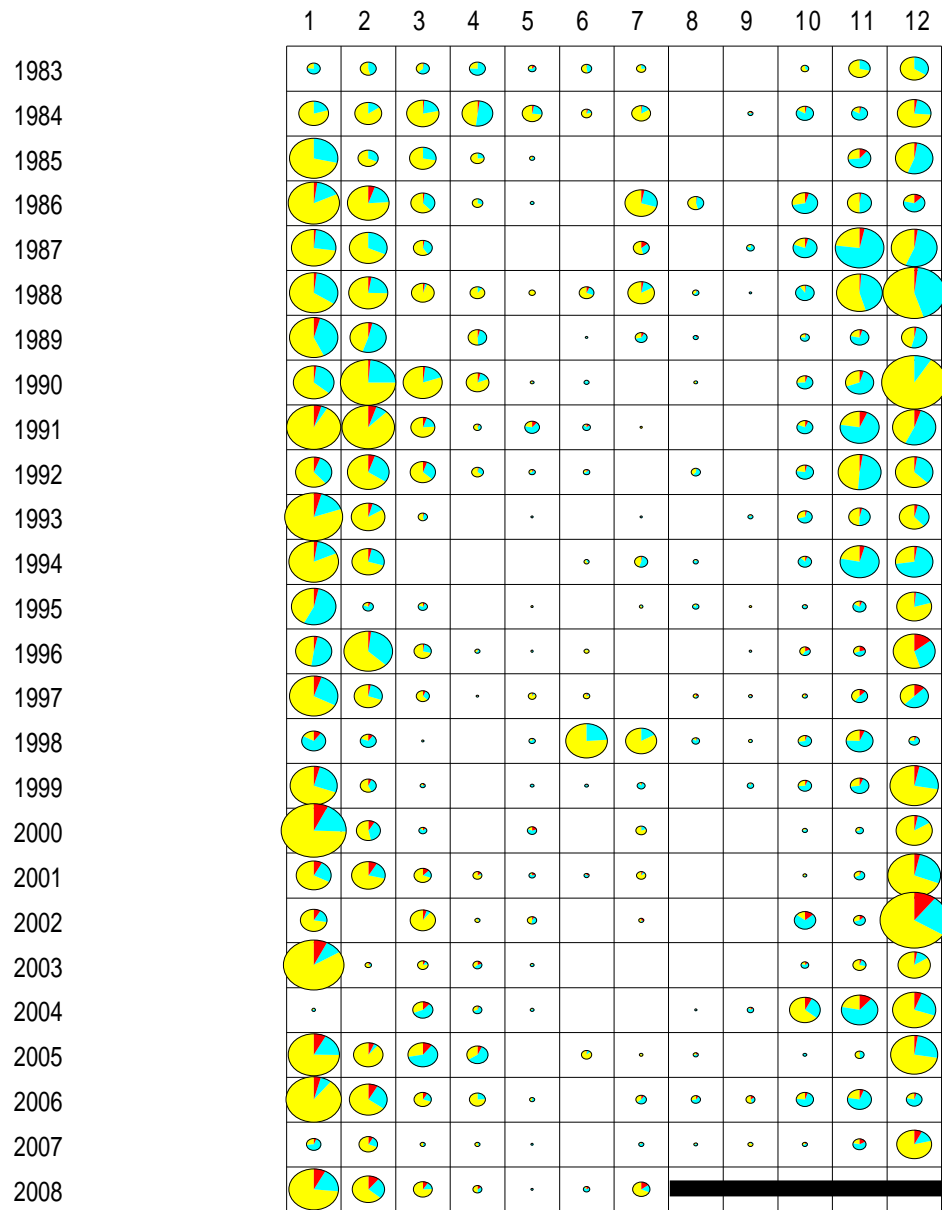


Figure 30: Monthly catches taken by species by the EU purse seine fishery in the East Seychelles area between January 1983 and July 2008.

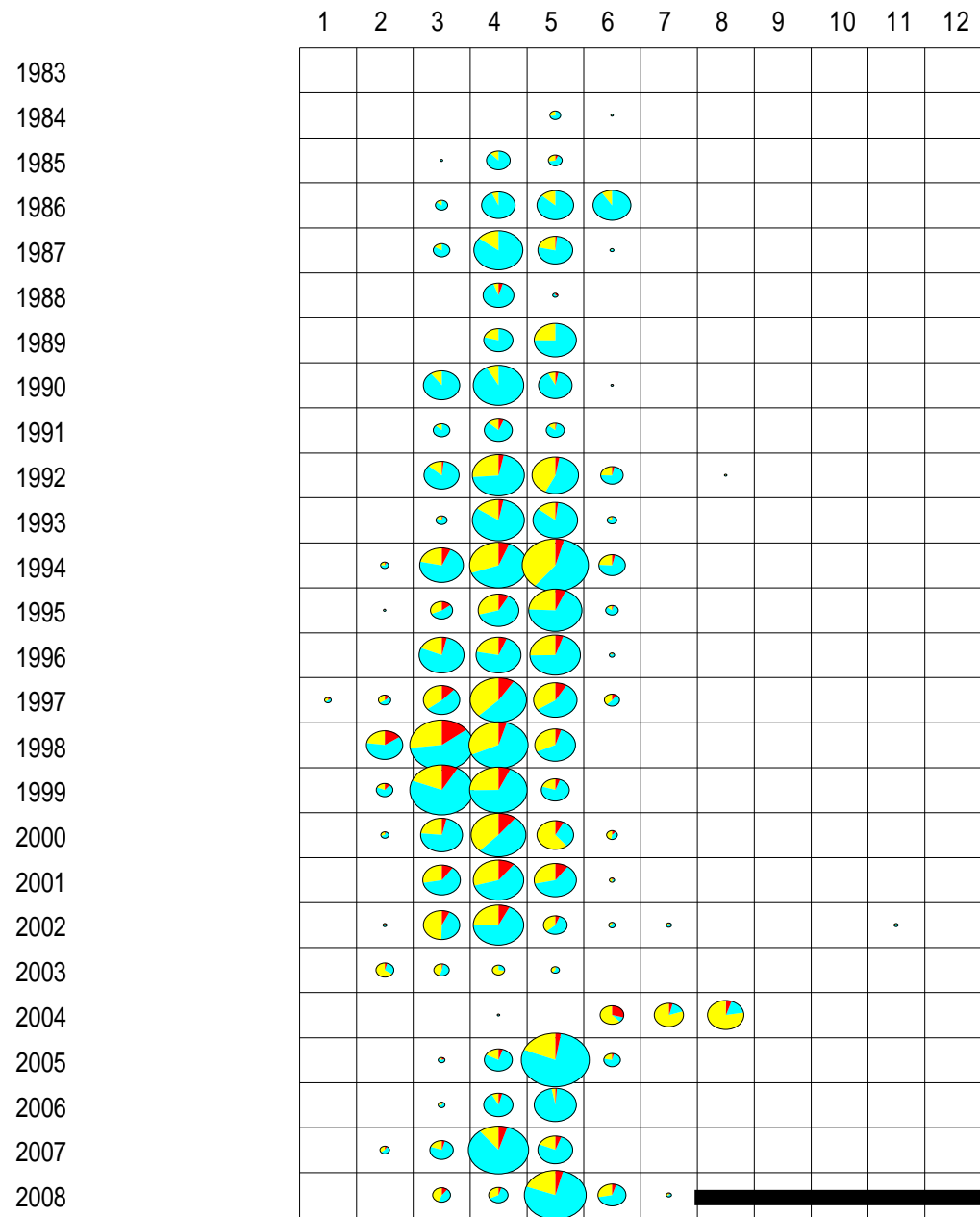


Figure 31: Monthly catches taken by species by the EU purse seine fishery in the Mozambic Channel area between January 1983 and July 2008.

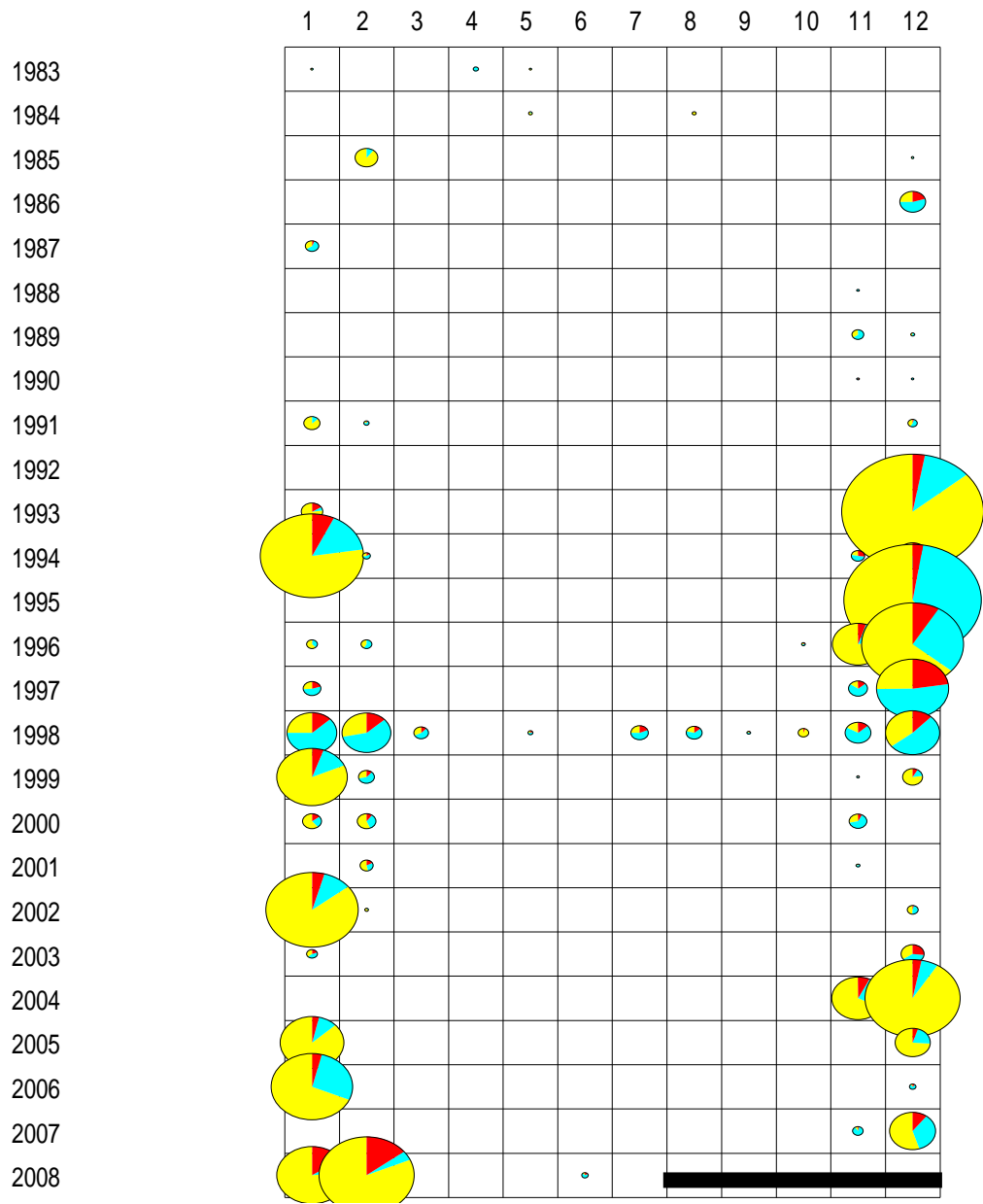


Figure 32: Monthly catches taken by species by the EU purse seine fishery in the Chagos area between January 1983 and July 2008.