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Preliminary analysis of tuna catches by Purse Seiners fishing in the Western Indian Ocean over the period January to August 2007

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 8 months of 2007 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 catches by the purse seine fleet in 2007 have been at low levels. The paper also analyses the 2007 fishing zones as well as the catches at size observed for yellowfin during the eight first months of 2007. The low levels of catches observed in both the FAD and the free schools fisheries are discussed. These low catches and CPUEs observed during the first 8 months of 2007 could correspond either to a low overfished adult biomass following 4 years of excessive catches, or to an environmental anomaly temporarily reducing the stock catchability (and the the fishing mortality).

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 8 premiers mois de 2007, 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 8 premiers mois de 2007 ainsi que les prises par tailles des senneurs la même année. Ces bas niveaux de prises et de PUE observés tant dans la pêcherie sur DCP que dans celle sur bancs libres sont discutés. Ces bas niveaux de prise et de PUE observées en 2007 pourraient correspondre, soit à une biomasse adulte d'un stock surexploité après 4 années de captures excessives, ou bien à une anomalie de l'environnement qui réduirait temporairement la capturabilité du stock (et donc la mortalité par 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 in the Western Indian Ocean. During the same period, 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 yellowfin catches of 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 eight months of 2007 and to compare these results to the same period of previous years (1984 to 2006). The final goal of the paper is to analyze all the purse seine fishery data during these first eight month of 2007 allowing to incorporate later these results in the IOTC WG stock assessments. This analysis should help the IOTC Scientific Committee to do a more comprehensive discussion of the present status of the yellowfin stock, answering to the basic question: do we have in 2007 a severely depleted yellowfin stock or a biomass poorly available due to environmental reasons.

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. For some analysis the historical data obtained from the IOTC (1984-1999) has been used for comparison purposes. The species composition of catches has been corrected using port sampling data and the logbook data has 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 2007 has remained more or less similar to that of the same period for the previous seven years, and an average of 49 purse seiners was active each month in 2007.

3.2. Fishing effort

The total number of fishing days reported by the sampled fishing fleet of purse seiners during the first eight months of the year has been increasing since 2004. In 2007 the fishing effort for the period January to August was more or less similar to that of the same period in 2006 (figure 1). The nominal effort exerted during this period of 2007 was at the highest level observed since 1999, when several of these vessels active in 2007 being vessels more recent, larger and more efficient than in the 1999 fleet. In 2007 for the period under study, the total number of sets made reduced by 11%. Whilst the number of sets made on FAD's associated schools increased by 25%, the number of sets made on free schools decreased by 28% (figure 4).

3.3. Catches

The total catches recorded by the purse seine fleet during the first 8 months of 2007 is estimated at 156,257 MT, the lowest catch reported for that period since 1996 (Figure 2). This represents a decrease of 29% over the catches reported for the same period of the previous year.

3.4. Species composition

Analysis of species composition reveals that yellowfin catches have been on a decreasing trend since 2005, followed by a very sharp decrease in 2007. Yellowfin catches dropped by 39%, from 99,861 MT in 2006 to 61,329 MT in 2007. This is the lowest yellowfin catches recorded for that period since the year 1999 (figure 2). The catches of skipjack and bigeye tuna have remained more or less constant throughout the period under study, however a significant decrease of 23% in the catches of skipjack tuna was observed in 2007. The decrease was mostly during the period of May to August 2007.

3.5. Catch Rate: nominal CPUEs

The corresponding catch rate expressed in terms of catch per unstandardized fishing day is shown in figure 3. The same fishing days are used in both the FAD and in the free school fisheries. The figure 3 shows that the total CPUE of the January-August periods has been on slowly decreasing since its peak in 2003, reaching a low average of 15.9 tons /fishing day in 2007, after the exceptional 30.8 tons /fishing day in 2003. The last time such low catch rate was reported for the period under review was in 1997 when 15.8 tons/fishing day was reported. A sharp decline can be observed in the yellowfin CPUE from a record of 20.9 tons/fishing day in 2004 to a mere 6.2 t/fishing day in 2007.

3.6. Catches and CPUE by school type/association

Figure 4 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 2007. Catches on free swimming schools decreased by 44%, whereas that of FAD's associated schools dropped by 13%. The corresponding species composition shows a decrease in yellowfin catch on free schools, whilst yellowfin catches on FADs associated schools (predominantly small fishes) has remained more or less stable (figure 6).The decline in the Yellowfin CPUE

is in the same range of declines: the yellowfin CPUEs observed on FADs and on free schools during the first 8 months of each year are shown since 1983 on figure 8. This figure shows that during the first 8 months of 2007, the yellowfin CPUE was very low on free schools (large fishes) and also quite low in the FAD fishery (small and medium size fishes) (a reduction of 51% and 3 % respectively). The average yellowfin catch per positive set (in MT) was also calculated for the free school fishery (figure 10), and this figure shows a sharp decreasing trend since a record of 55.1 tons / positive set in 2004, to a low average of 17.30 MT/ positive set in 2007. The yellowfin catch rate per positive set has remained more or less stable on FADs associated schools.

3.7. Yellowfin Size category

The total catches of large yellowfin (>30kg) have been decreasing since the record catch on these sizes class in 2004 (131,603 MT). During the first eight months of 2007, only 40,971 MT of these large yellowfin was caught, e.g. at levels similar to what was estimated in 2000 (figure 11). The catches of small and medium yellowfin have remained more or less the same as for the previous three years. Analysis of yellowfin nominal catches by size category and by school type reveal no significant difference in the size classes caught by school type in 2007 when compared to the previous seven years. Around 72% of the large yellowfin (>30 kg) were caught on Free swimming school (figure 12).

The changes in the numbers of medium and large yellowfin caught by the purse seine fleet during the first eight months of the period 1991-2007 are also indicative of these changes of the yellowfin sizes caught (see figure 13). No major changes were noticed in the sizes of Yellowfin in 2007.

3.8. Fishing Areas

Figure 14, 15 and 16 shows the fishing zones of the purse seine fleet during the first 8 months of the average 1999-2002 and 2003-2006 periods (a normal period and the period of very high yellowfin catches), and the same efforts in 2007 respectively. These maps show that in 2007 the purse seine fleet did not expand eastward its fishing zone, as in previous years. Furthermore it should be noted that there was very little fishing effort (5 fishing days) in the Chagos area and no catches, when this area has been often producing high yellowfin catches in January of previous years (see Fonteneau 2007). The 2007 fishing zone appears to be a quite typical fishing zone for this season, but with very low fishing effort exerted in the fishing zone east of 60°East, a typical yellowfin area (figure 17).

3.9. Analysis by Month

Figure 18 shows the trend of fishing effort in terms of fishing days made by month for the years 2000 to 2007. The effort for the first 8 months of 2007 was slightly higher than for the same months of the previous year whilst that for the months of May to August were slightly lower. The total catches by month shows that the catches for all the months with the exceptions of April and July 2007 were the lowest when compared to the same period for the years 2000 to 2006 (figure 19). The same was observed for the

catch rate (figure 20). Analysis of yellowfin catches reveals that except for May and July, yellowfin catches in 2007 were the lowest for all the other months under study (figure 21).

4. Discussion

The main question targeted by this paper was: what is happening now in 2007 when low PS YFT CPUEs are observed after 4 years of very high catches and CPUEs. The analysis of 2007 PS data confirms the low levels of both free schools YFT catches, as well as of the FAD associated tunas (mainly SKJ). The observed 2007 catches and CPUE are among the historically lowest levels in the short history of the Indian Ocean PS fisheries, but not the lowest. Scientists now need to conclude if these poor catches/CPUE observed during 2007 are due:

(1) to low biomass, for instance to the overfishing of the yellowfin stock after 4 years of record high catches for the yellowfin stock (and also for skipjack), with YFT catches at levels 60% above the estimated MSY (during 4 years).

(2) or to a temporary low catchability of this stock, for instance due to an environmental anomaly (similar to the anomaly observed during 1998 in the Indian Ocean or during 1984 in the Atlantic). In such case, present biomass of the tuna stocks would be maintained at their "normal" levels of 2006, but these tunas were not fully available during the year 2007 to the purse seine fisheries: being too deep, too scattered, or having moved in other areas (for instance in the Central or Eastern Indian Ocean). The data set and analysis presented by Marsac 2007 would indicate that an environmental anomaly was apparent in the area during the beginning of 2007, but this anomaly was by far weaker than the El Niño observed in the area during the first quarter of 1998. In such hypothesis of low catchability, the present low catches would work as a reduction of fishing mortality upon stocks that are in good shape and suffering reduced exploitation rates during the anomaly. In this case the potential catches and CPUE would be higher when the environmental anomaly will be finished.

In the opposite hypothesis of a widely depressed adult stock biomass, urgent management measures should be possibly recommended by the IOTC in order to reduce the fishing mortality exerted upon a widely reduced YFT adult stock A poor status of the skipjack stock could also be envisaged, based on the quite poor skipjack CPUEs on FADs during the first month of 2007, a potential indicator of low skipjack biomass (as during this period of low catches on free schools, the tendency of the purse seine fishery should have been to concentrate its activities on FADs, at least at the levels observed during the previous years. Surprisingly, this has not been the case in 2007, as the SKJ CPUE on FADs was, only 6.2 tons per fishing day, was at its lowest levels observed since 1997 (figure 9).

These two hypotheses are quite opposite ones. In the context of a precautionary approach, a priority should possibly be given to the pessimistic one of overfished low stocks, as if this hypothesis is a reality, then a lack of management action could have deleterious effects of the conservation of the stock in the present context of very high fishing efforts that are presently exerted in the Western Indian Ocean by a wide range of fisheries (purse seiners, longliners and artisanal ones).

5-Conclusion

The present analysis based on eight months of 2007 purse seine data offers a wide confirmation to the study presented to the July 2007 tropical tuna working group: catches and CPUE of large yellowfin will be very low in 2007. This low level may well correspond to a low biomass of the adult stock following 4 years of catches well in excess of the estimated MSY (keeping in mind that this low level of the adult stock also tend to be estimated by various assessment models). However the hypothesis that the environmental anomaly described by Marsac 2007 could have temporarily reduced the catchability of the stock cannot be eliminated.

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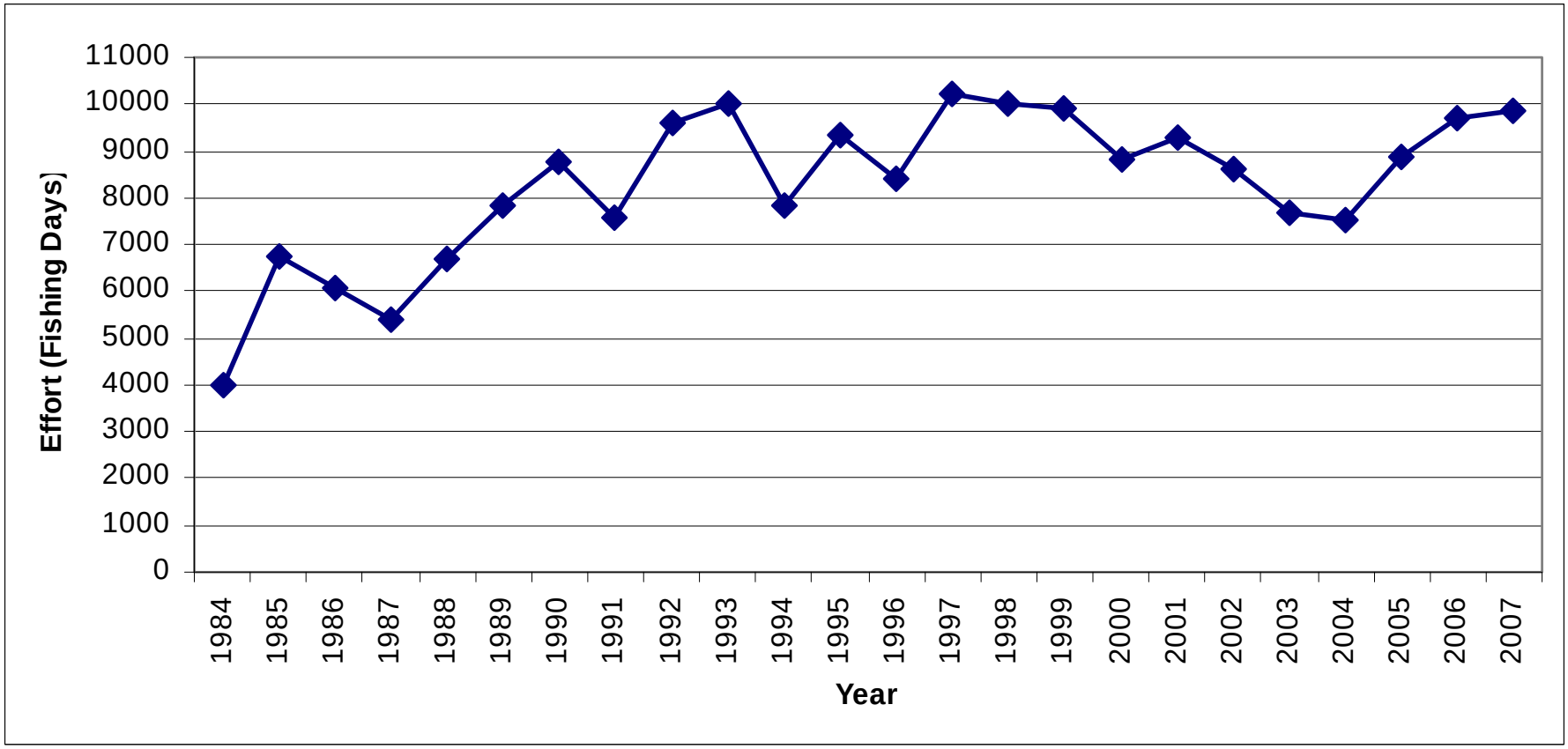


Fig.1 Nominal fishing effort (fishing days), January to August,1984 - 2007

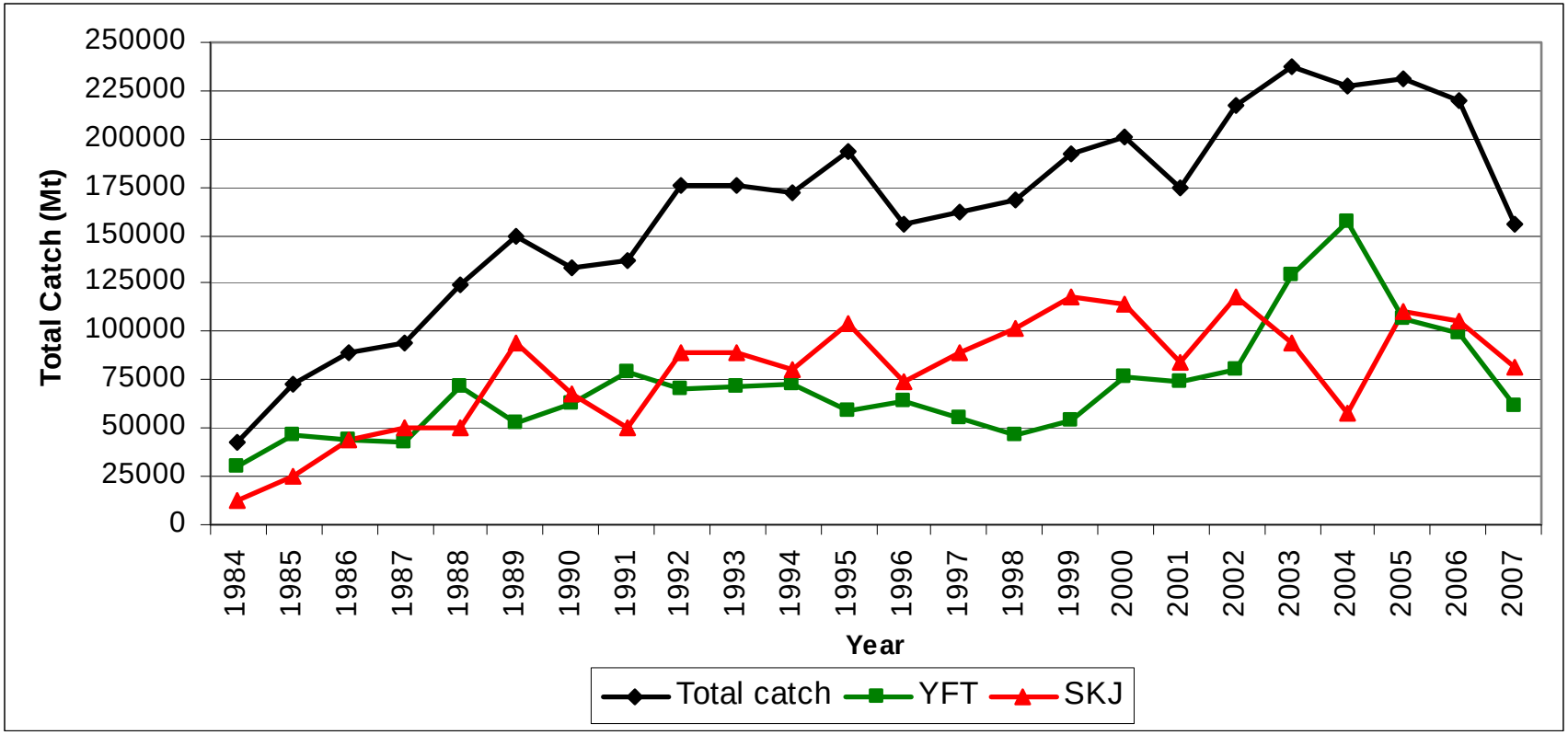


Fig.2 Nominal catches by species, January to August,1984 - 2007

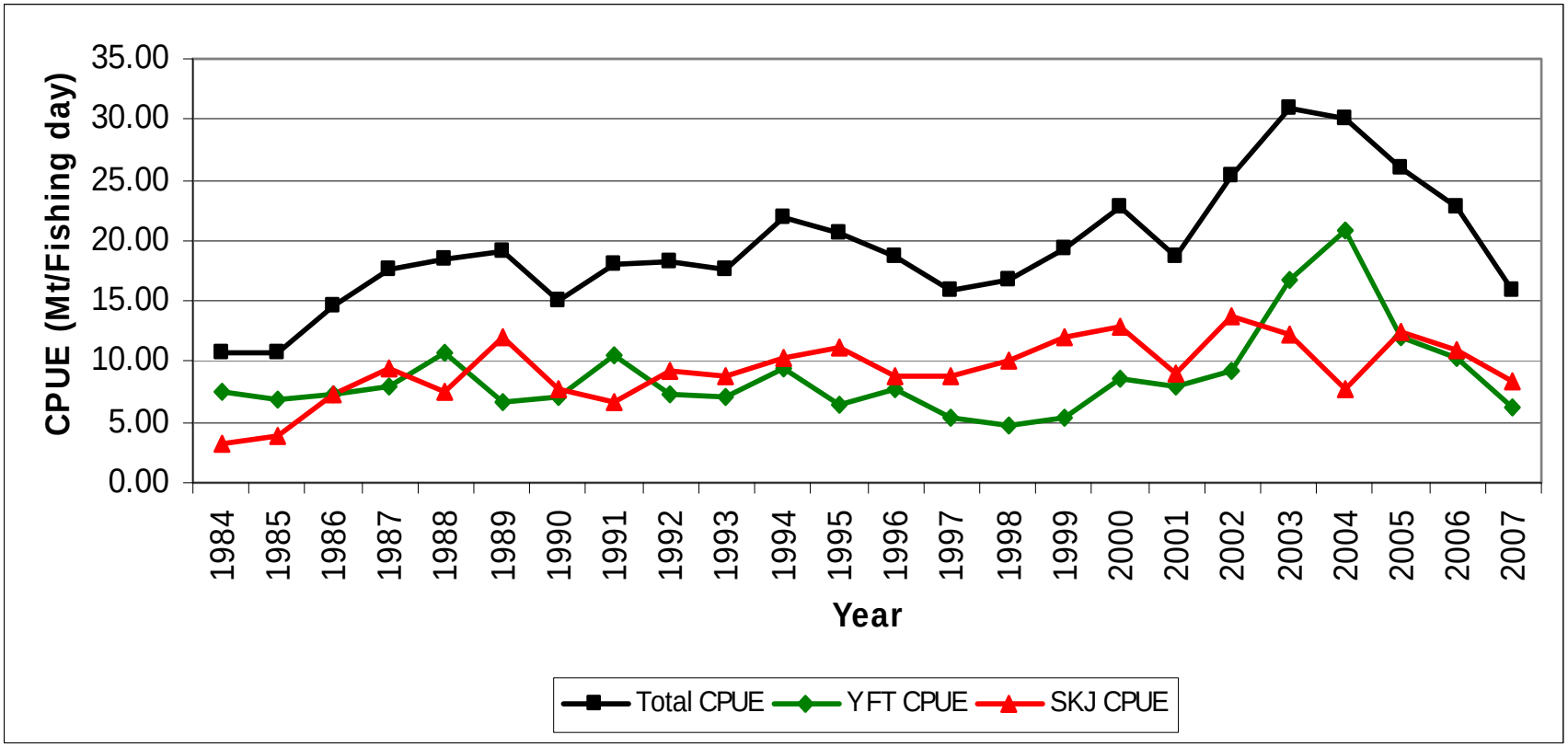


Fig.3 Total and yellowfin nominal CPUE (MT/fishing day), January to August,1984 - 2007

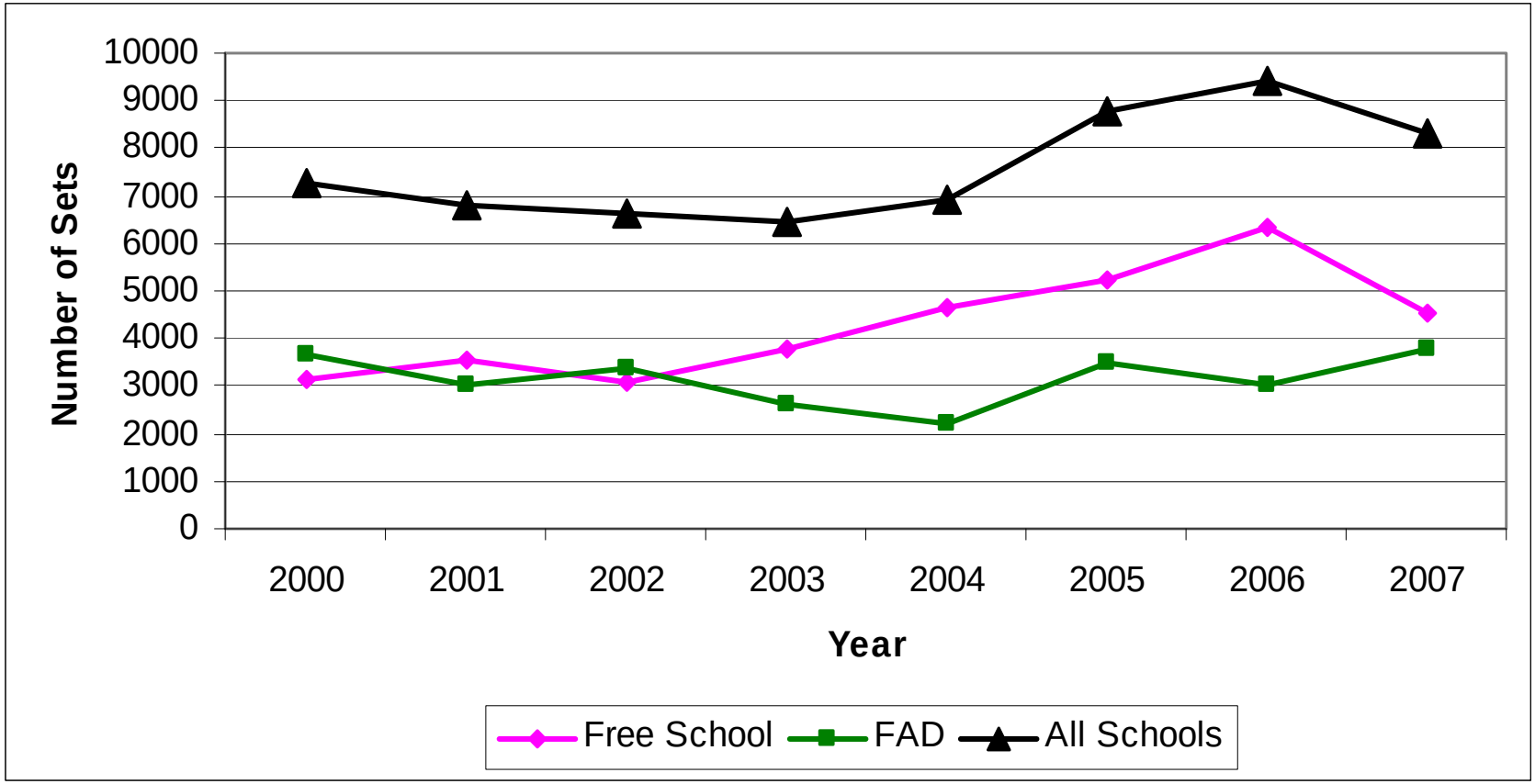


Fig.4 Number of sets made by school type, January to August, 2000 - 2007

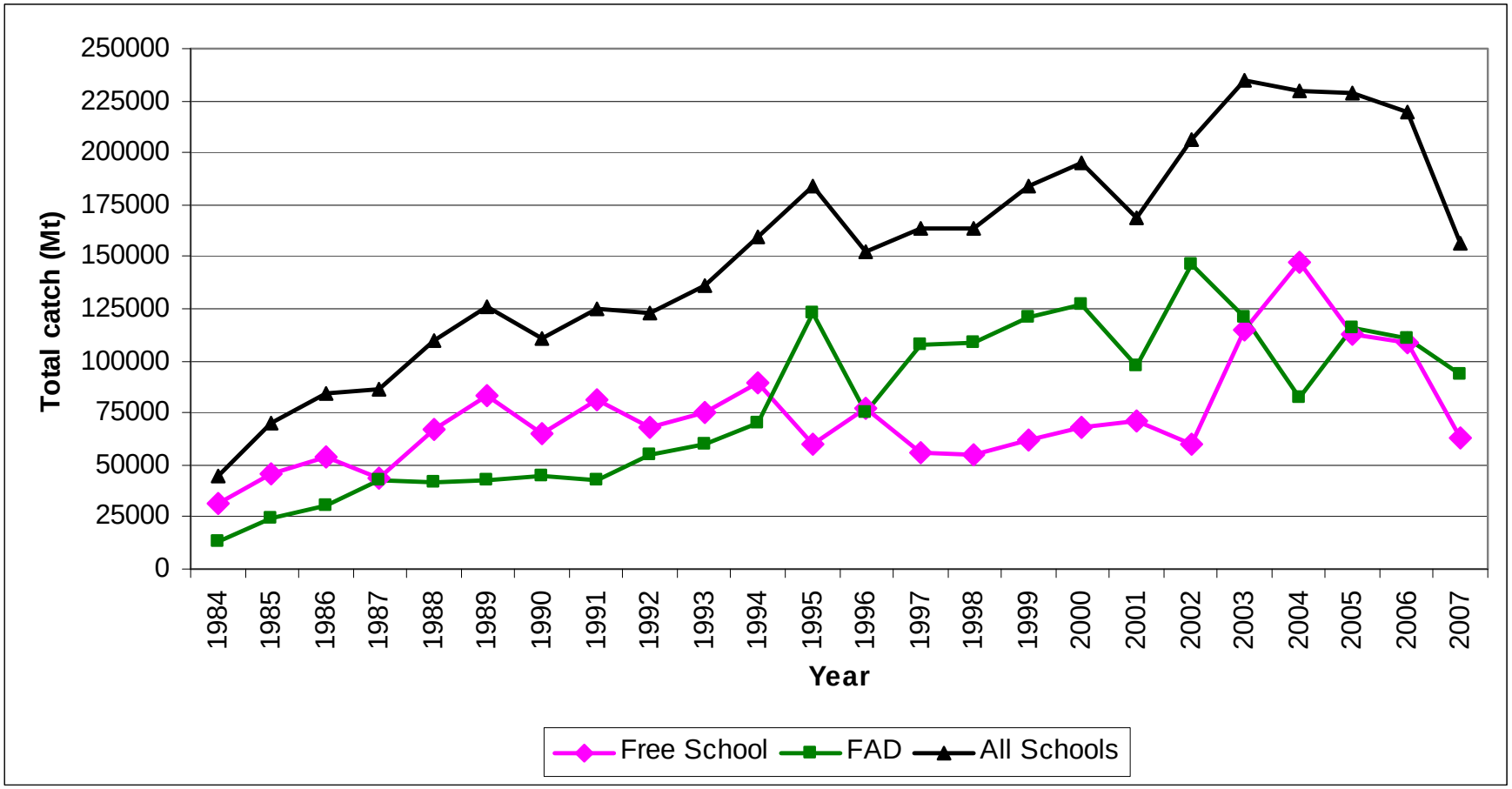


Fig.5 Total nominal catch by school type, January to August,2000 – 2007

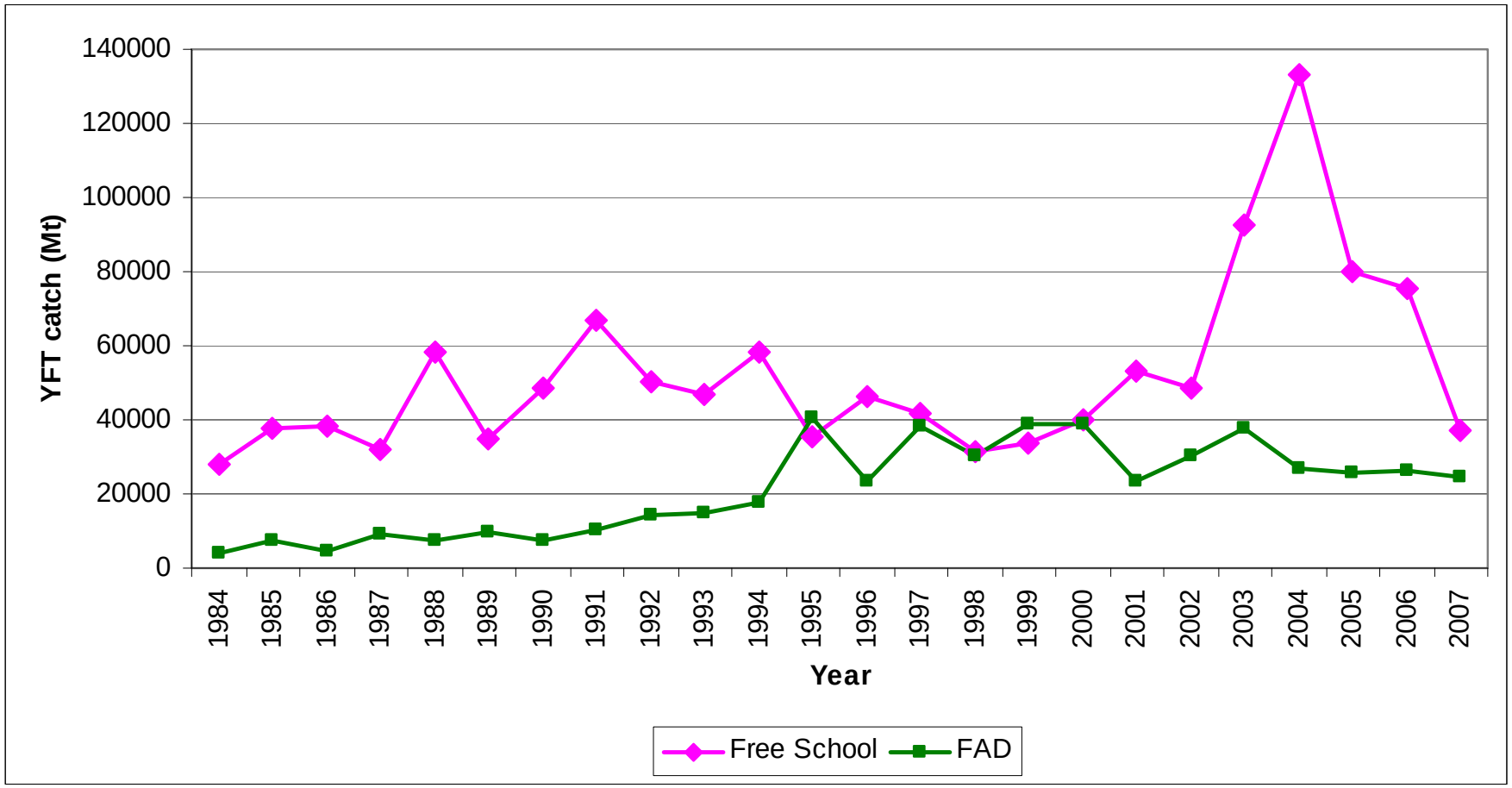


Fig.6 Yellowfin nominal catches by school type, January to August, 1984 - 2007

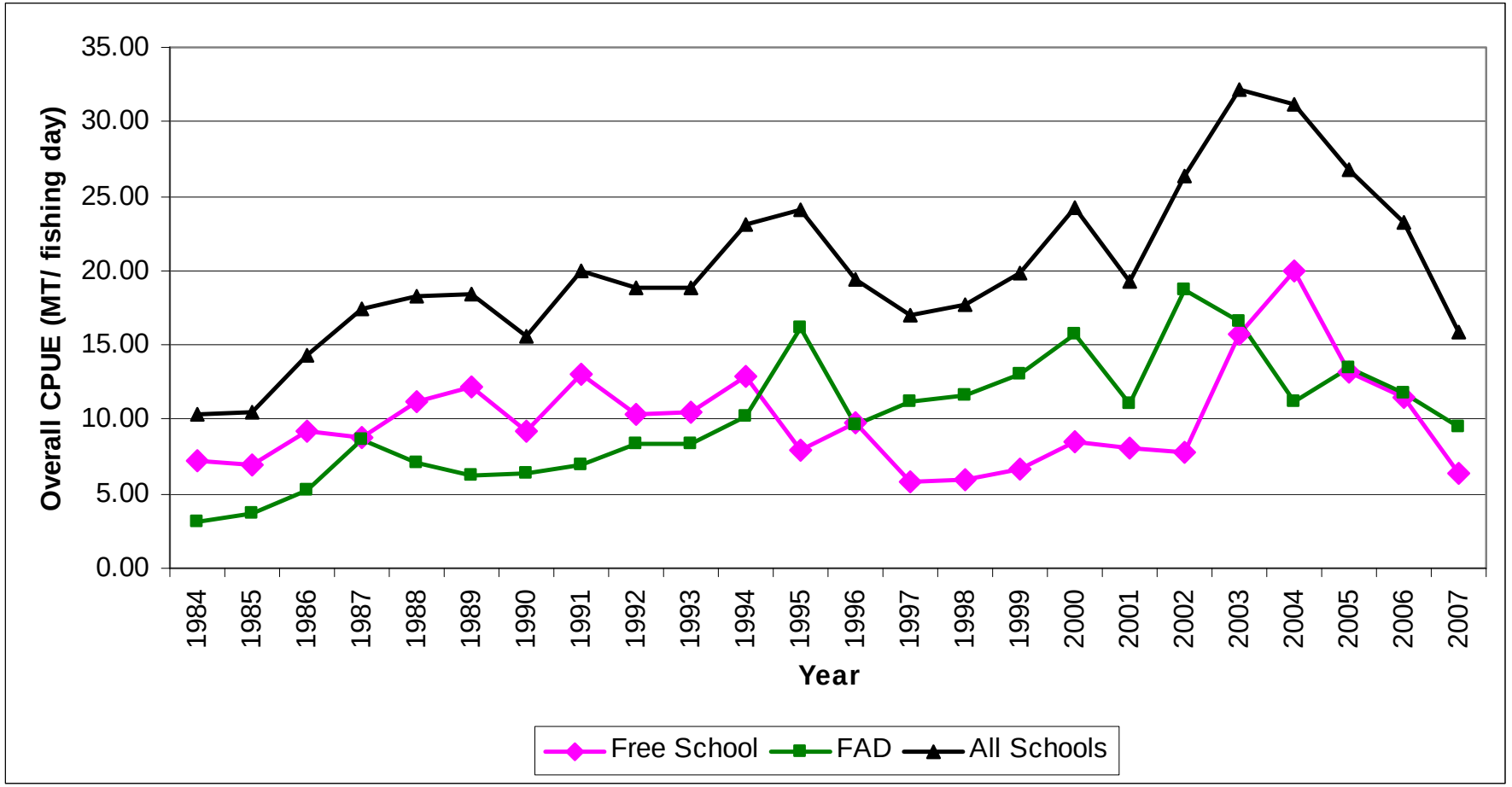


Fig.7 Nominal CPUE (MT/fishing day) by school type, January to August, 1984 - 2007

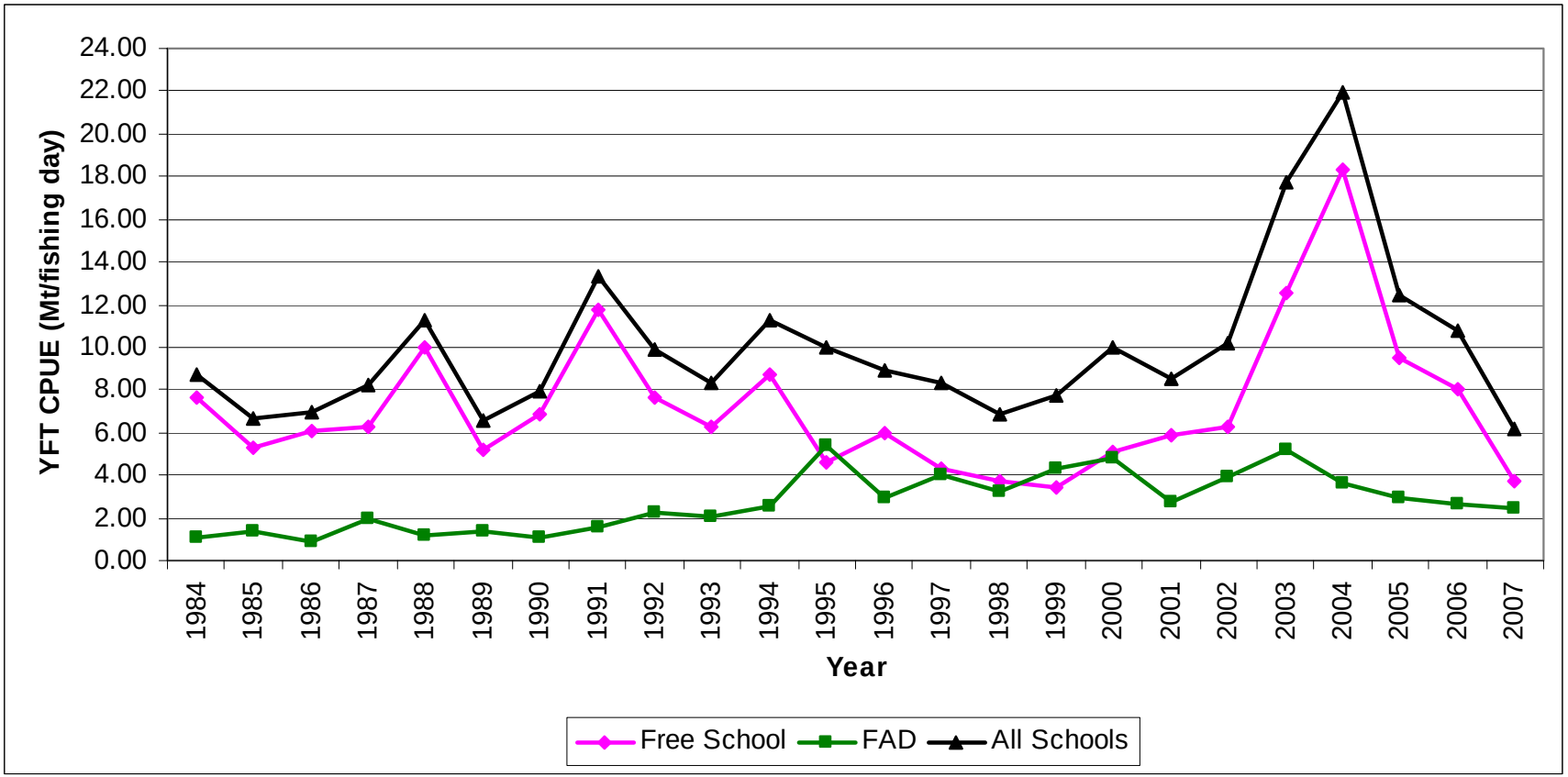


Fig.8 Yellowfin nominal CPUE (MT/fishing day) by school type, January to August,1984 - 2007

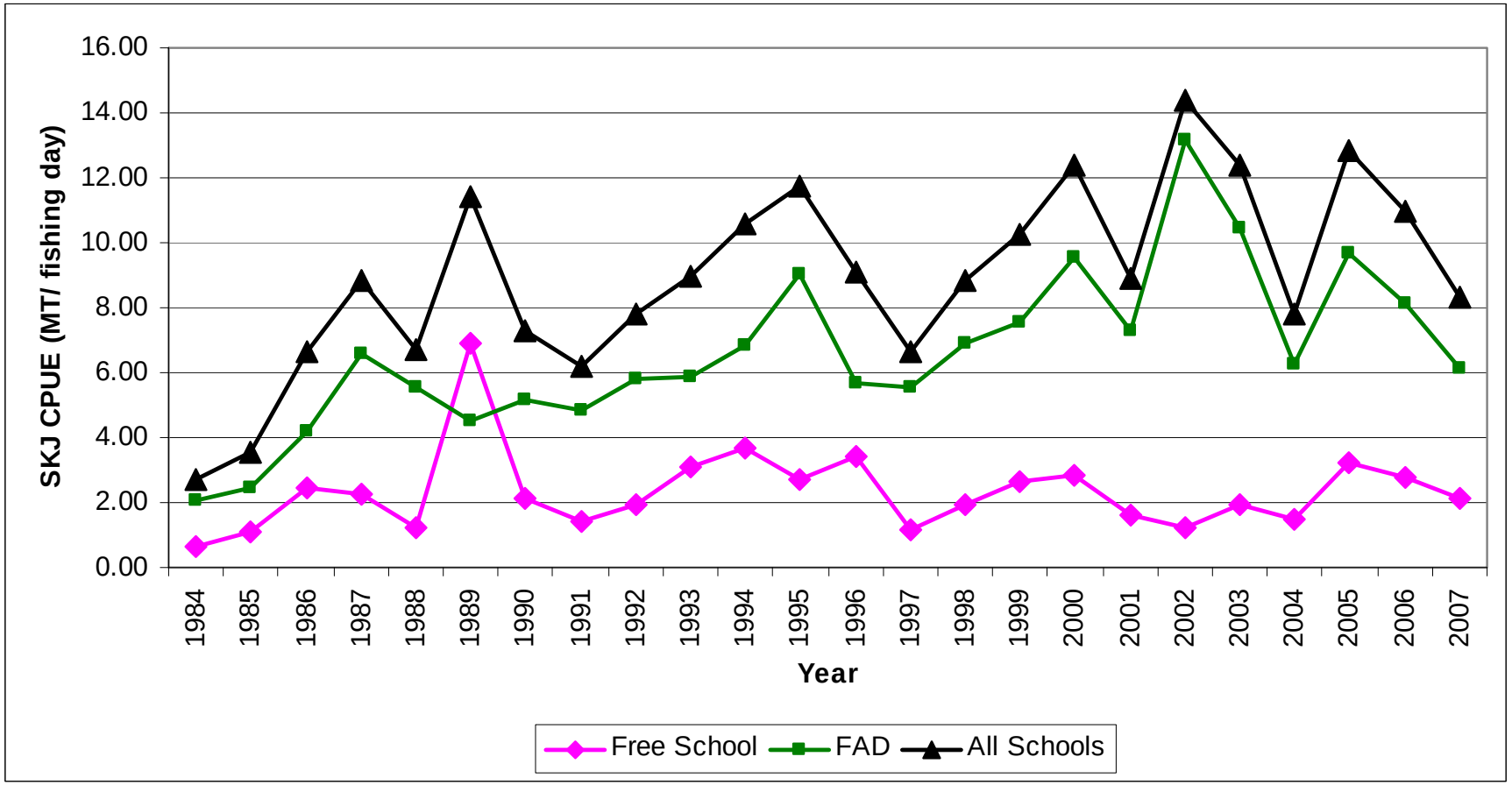


Fig.9 Yellowfin nominal CPUE (MT/fishing day) by school type, January to August,1984 - 2007

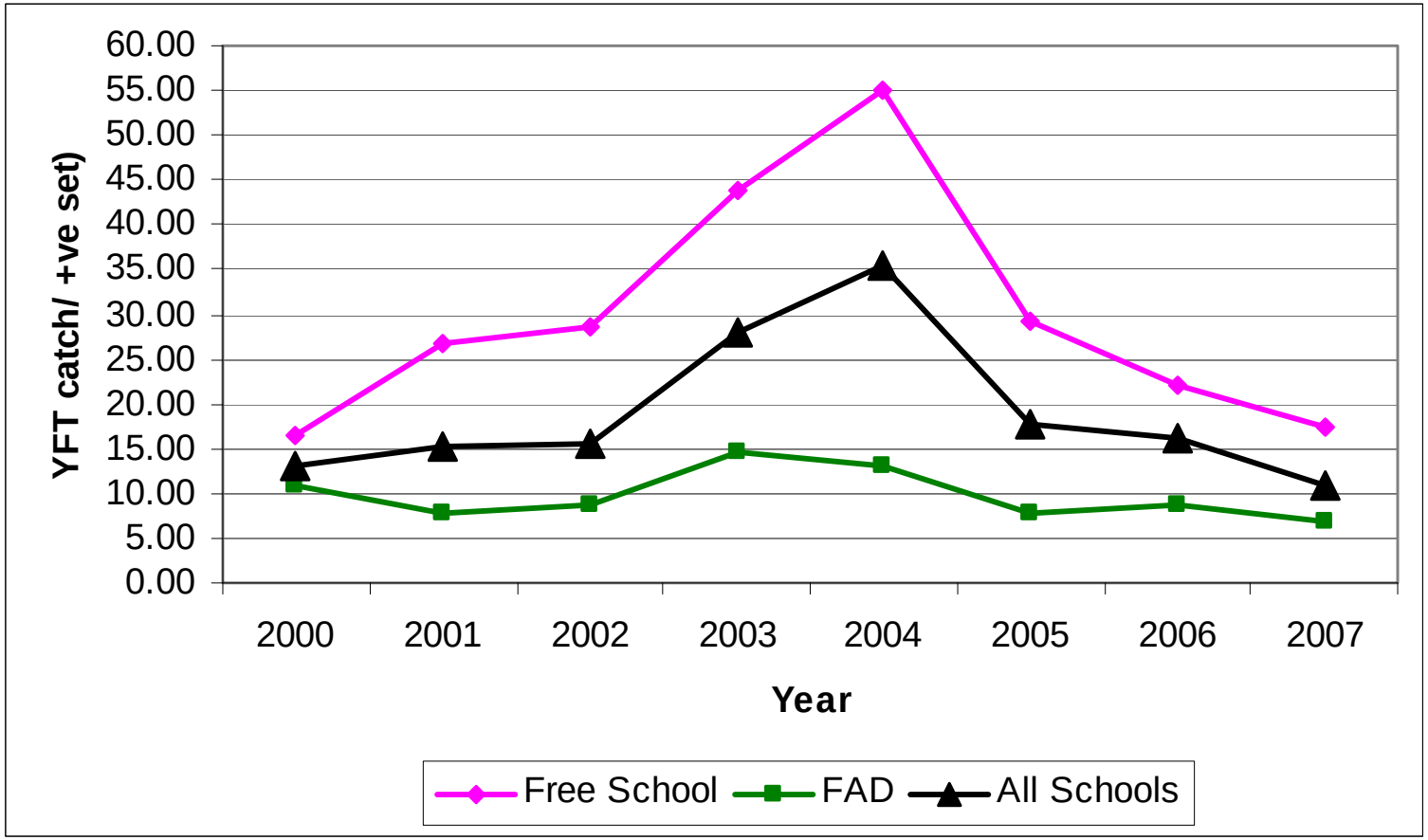


Fig 10. Yellowfin nominal catch/ positive set by school type, January to August,1984 - 2007

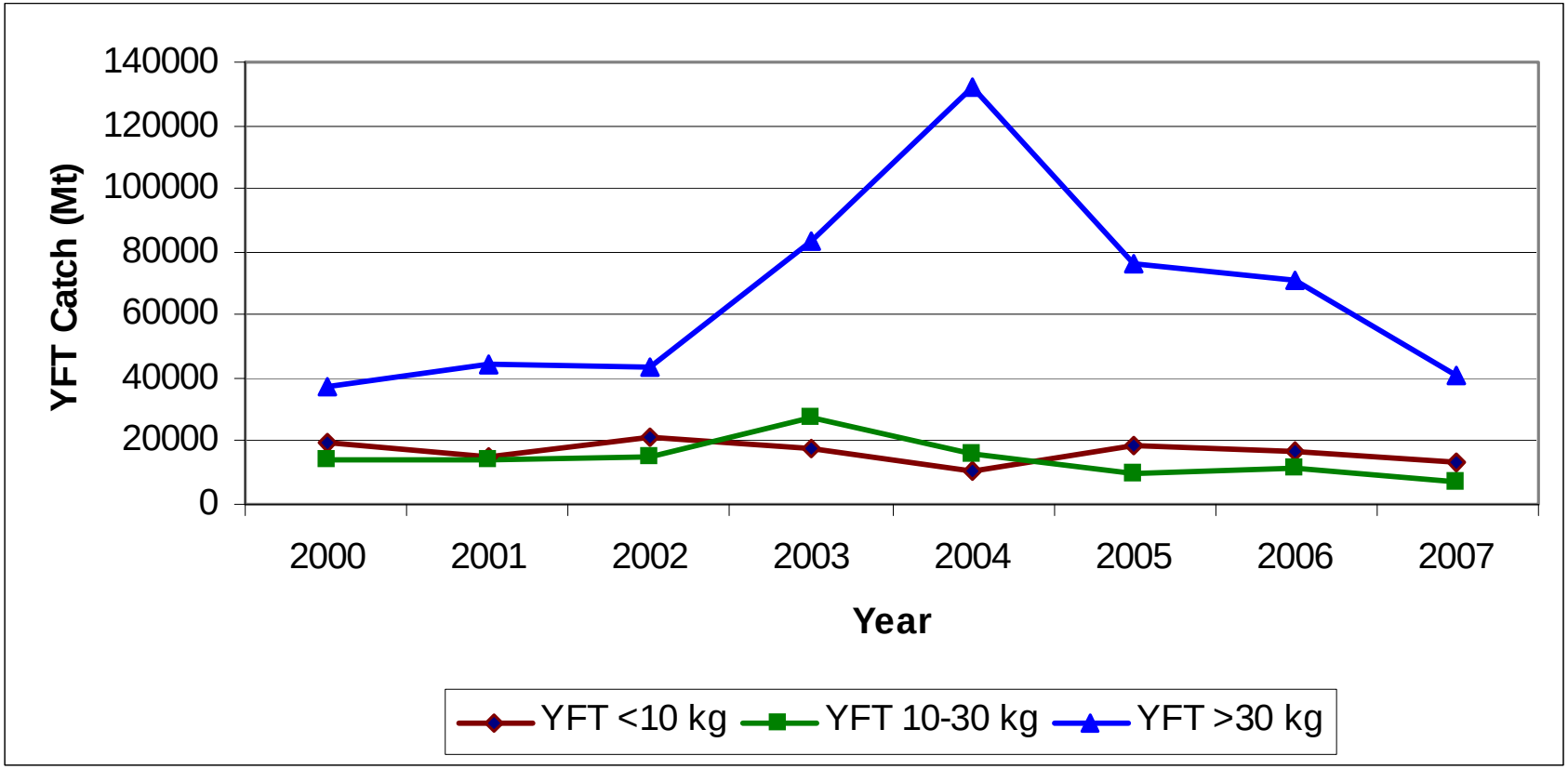


Fig.11 Yellowfin nominal catches taken by size category, January to August,1984 - 2007

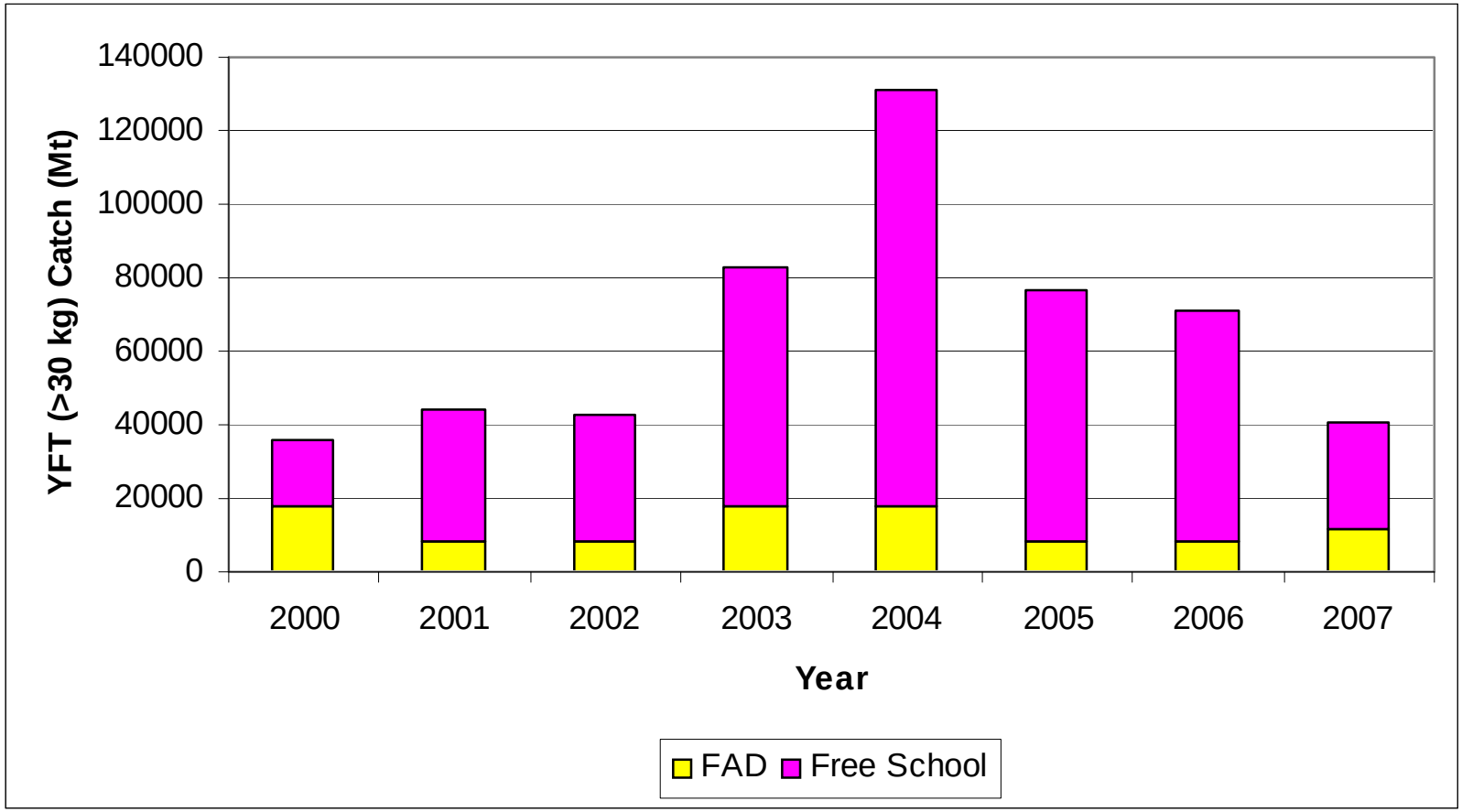


Fig.12 Yellowfin (>30 kg) nominal catches taken by school type, January to August, 1984 - 2007

It shows no major changes in the sizes of yellowfin catch in 2007

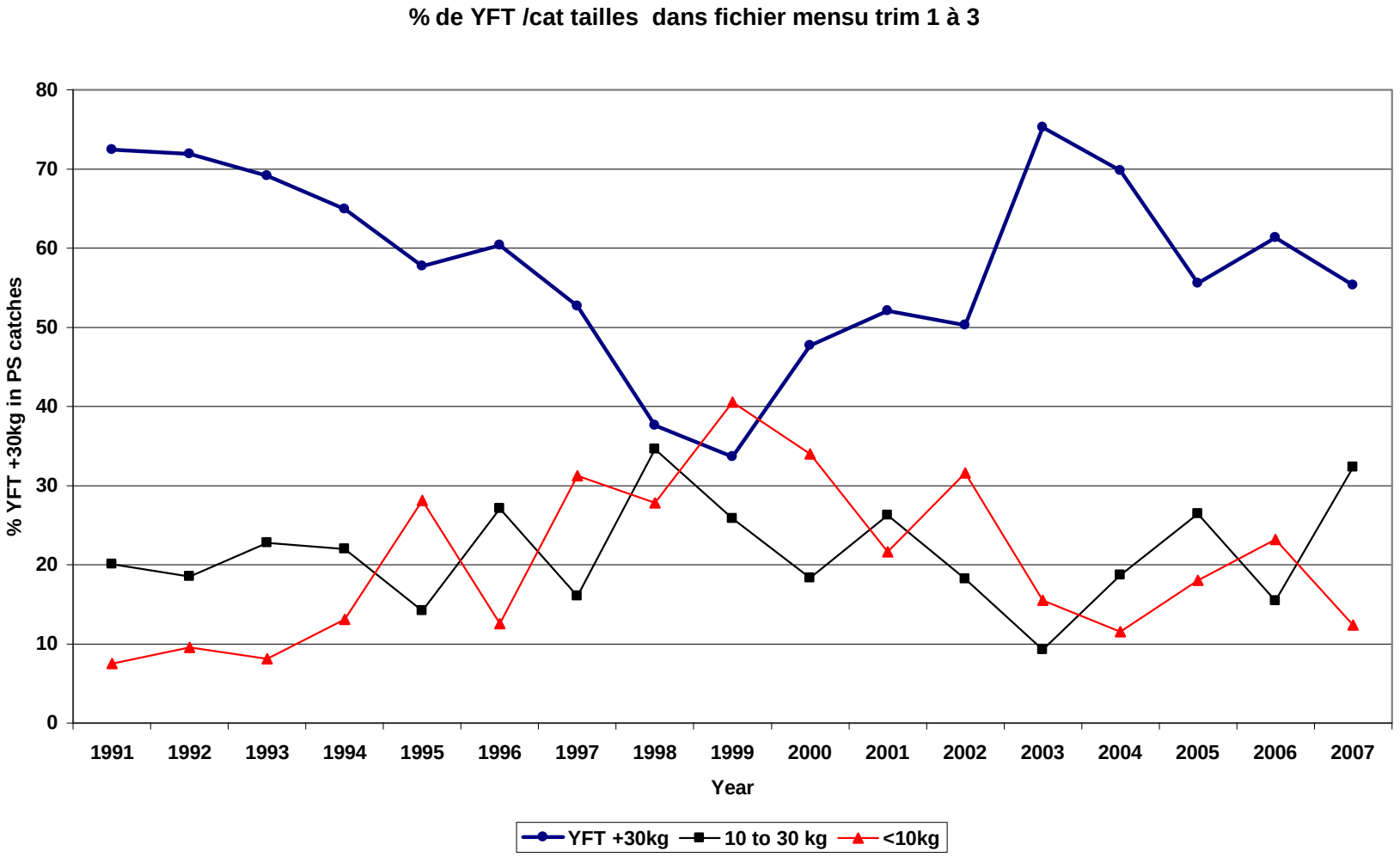
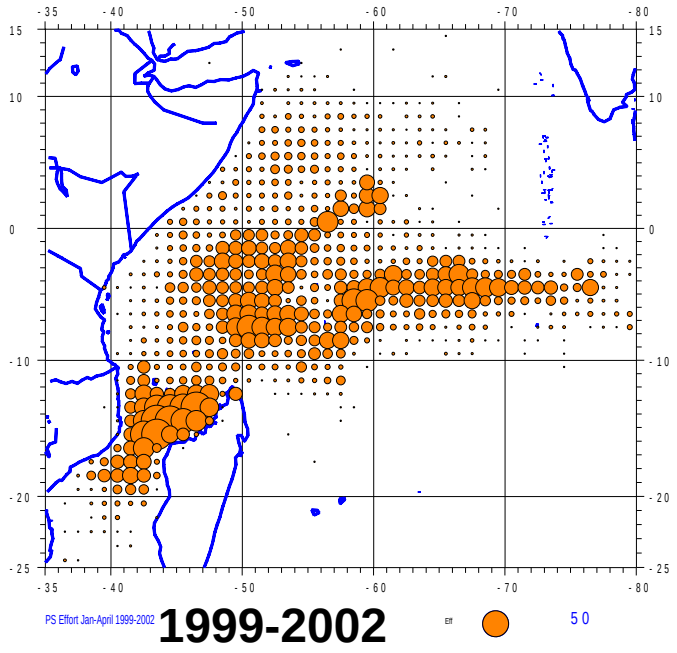
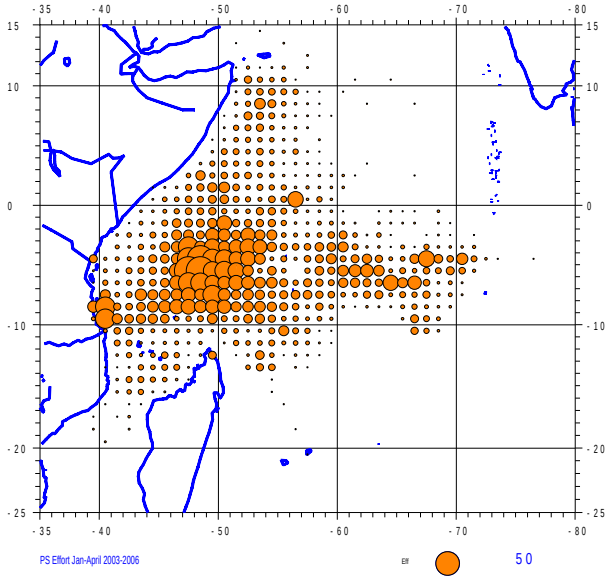


Fig 13. Percentage of YFT Catches by size category taken yearly in the Indian ocean during the first quarters of each year,1991-2007



1999-2002



2003-2006

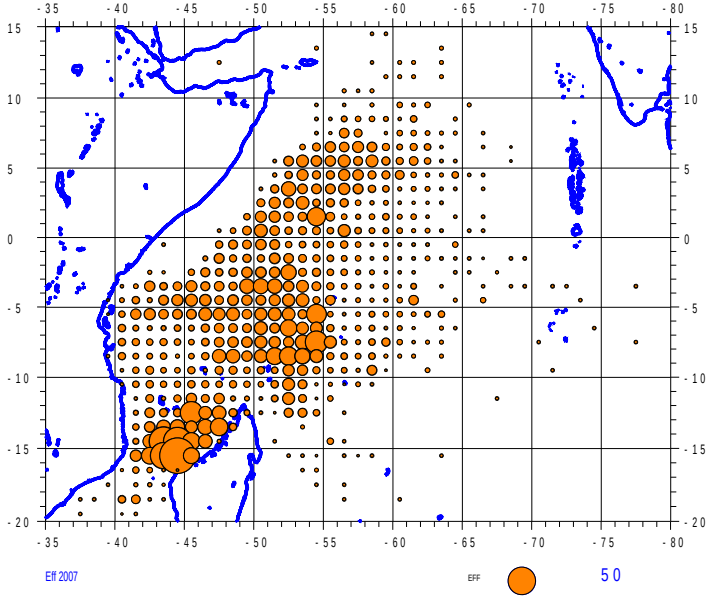
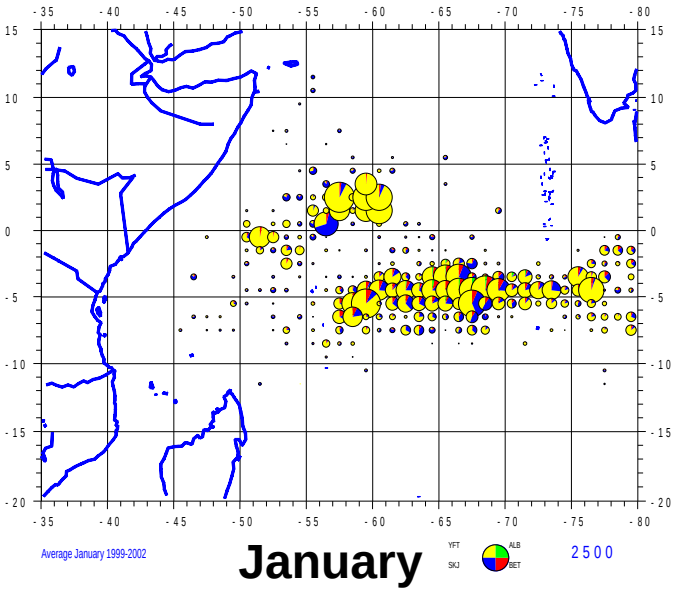
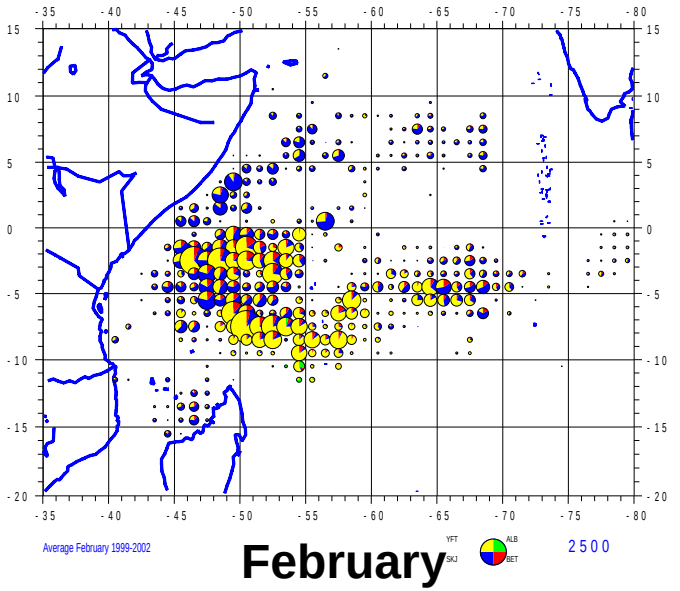
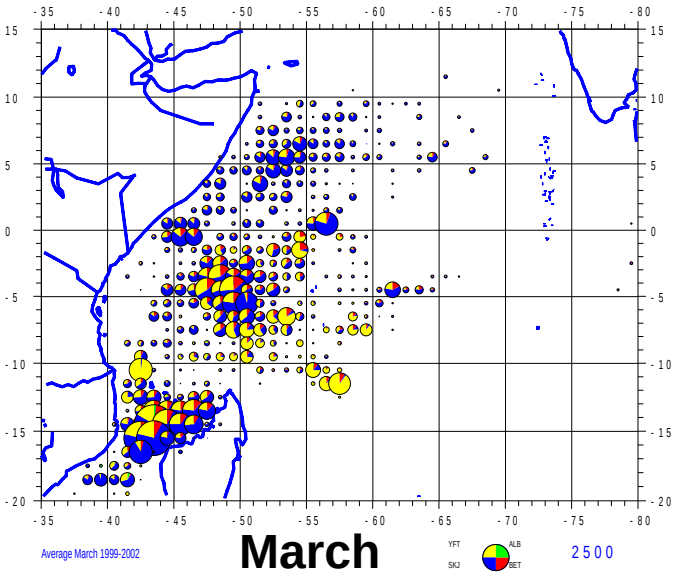


Fig 14. Maps of the fishing efforts exerted by the sampled purse seine fleet during three periods averaging the 8 month of each year: average of the 3 periods 1999-2002 , 2003- 2006 and 2007



1999-2002





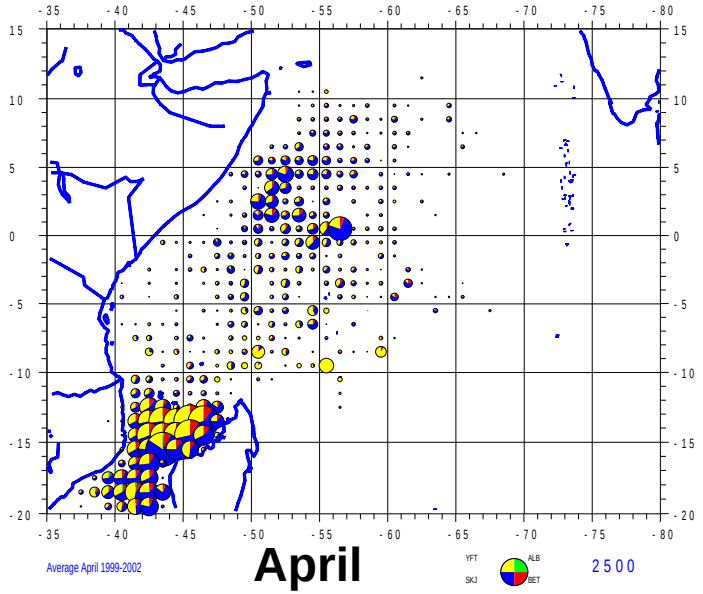
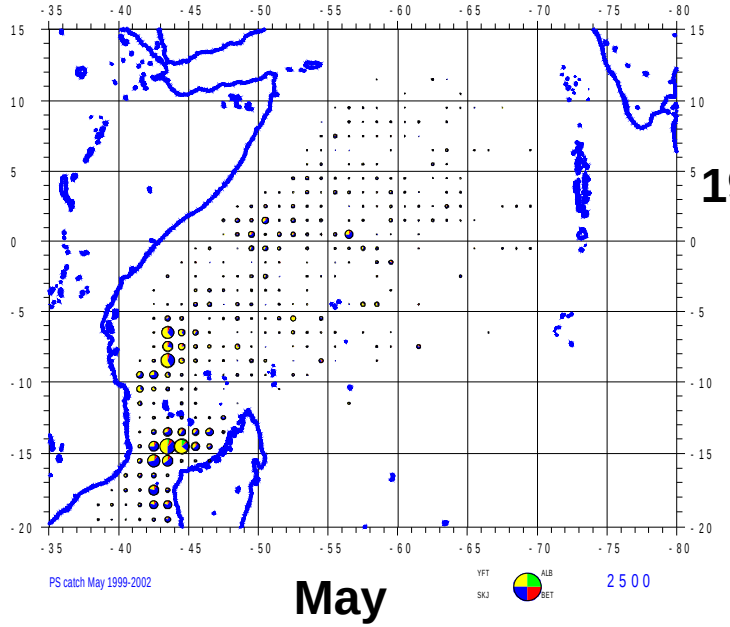


Figure 15: Monthly fishing catches by species, by 1°s quare, of the sampled purse seine fishery during the first 8 months of the average 1999-2002 period (a period of « normal » catches)

1999-2002



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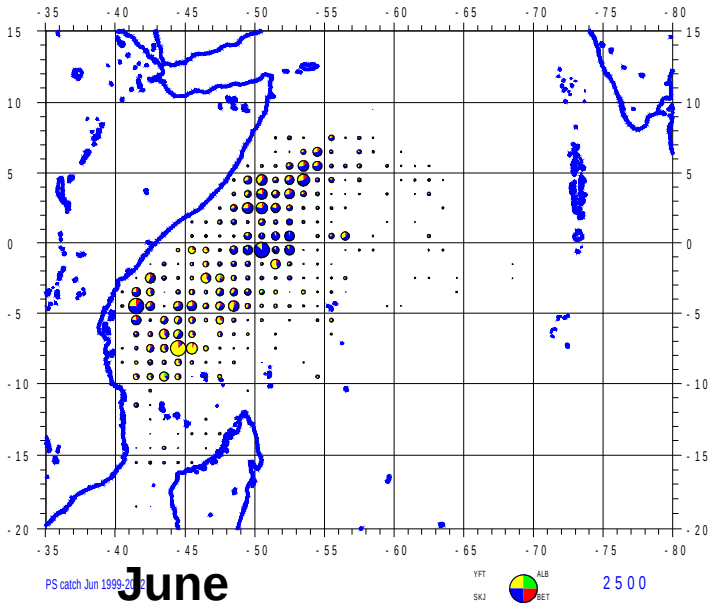
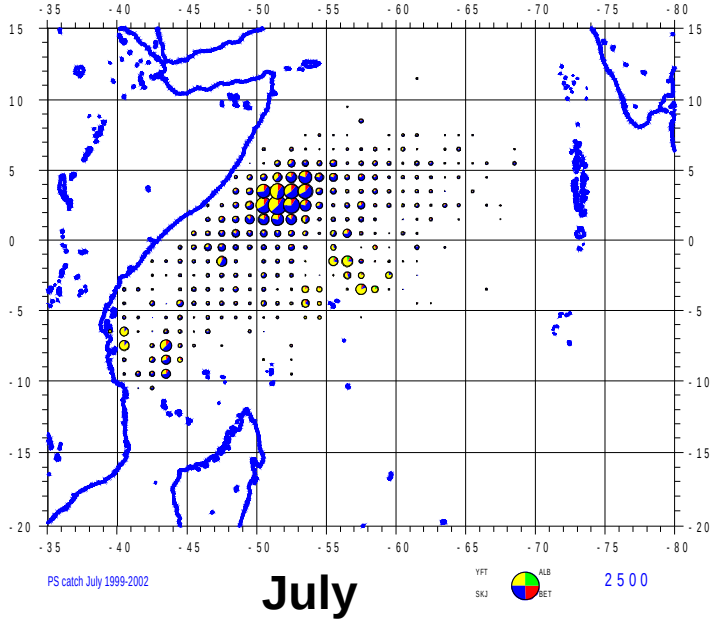
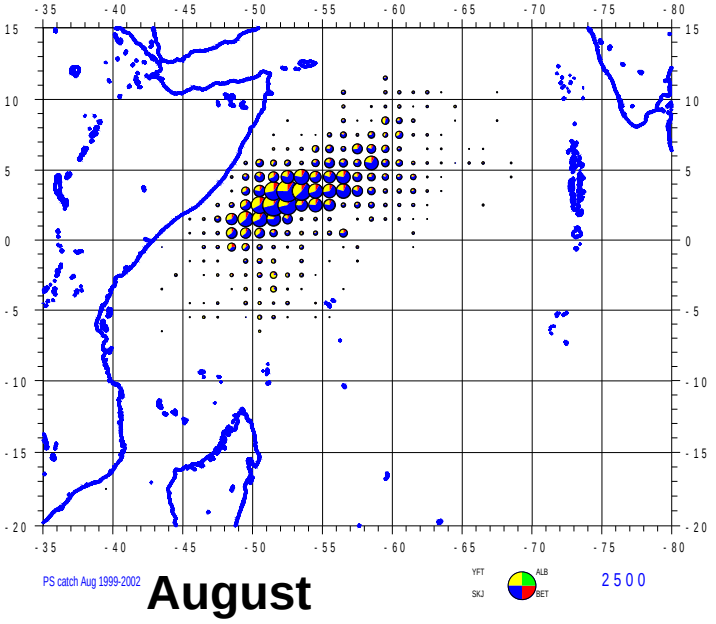


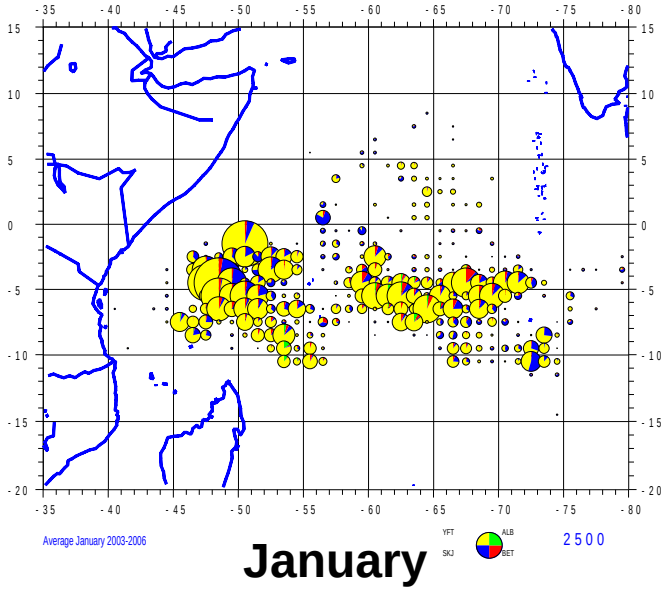
June



July

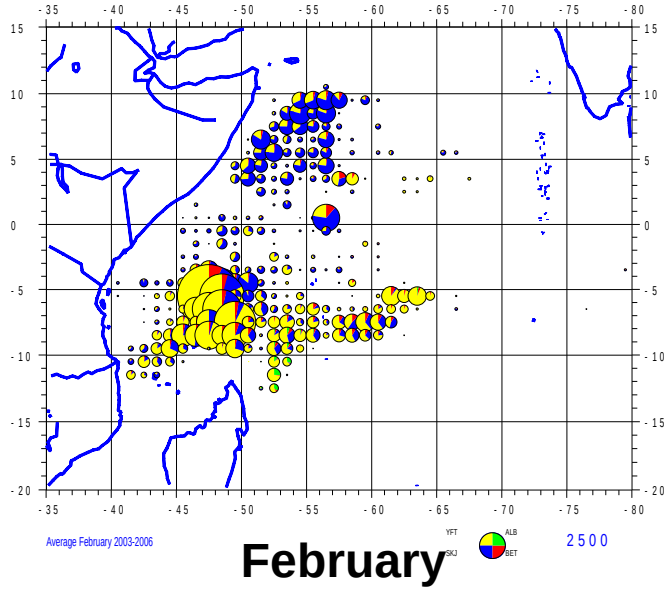


August



2003-2006

January



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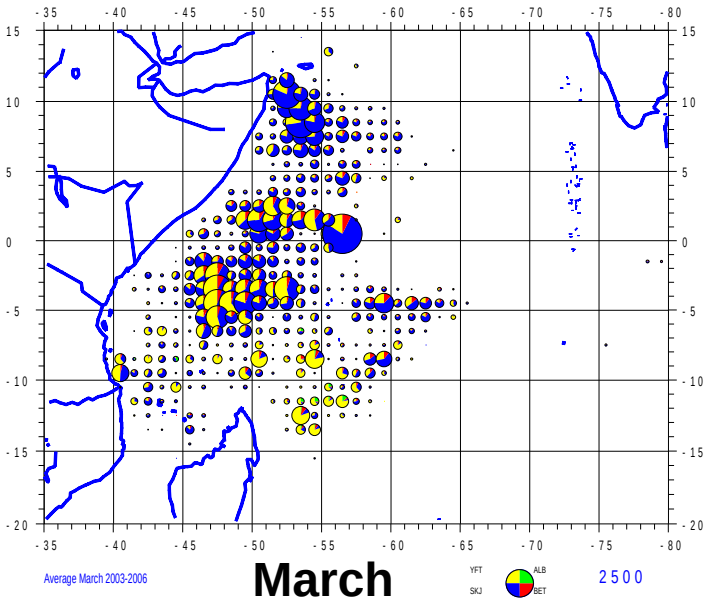
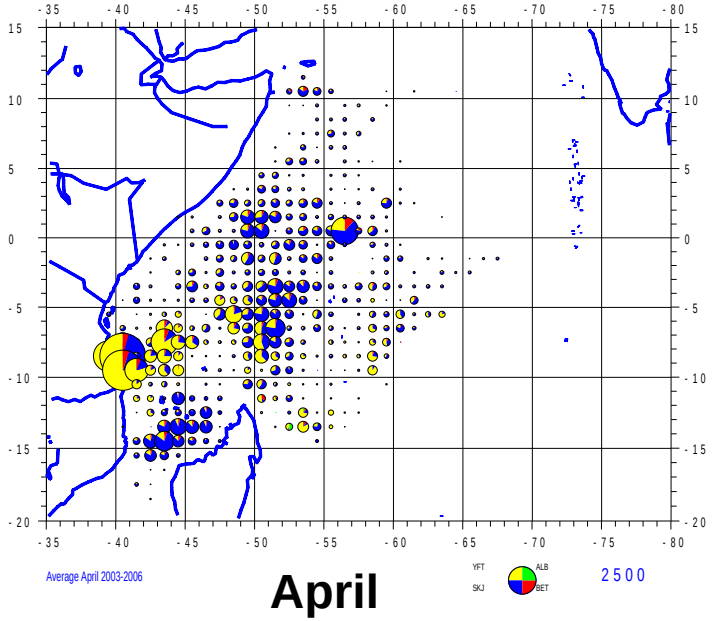


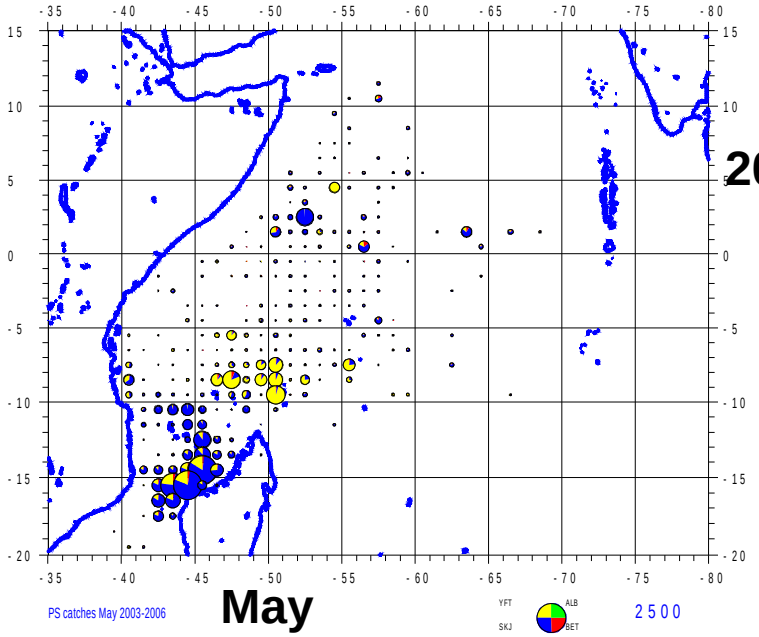
March



April

Figure 16: Monthly fishing 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



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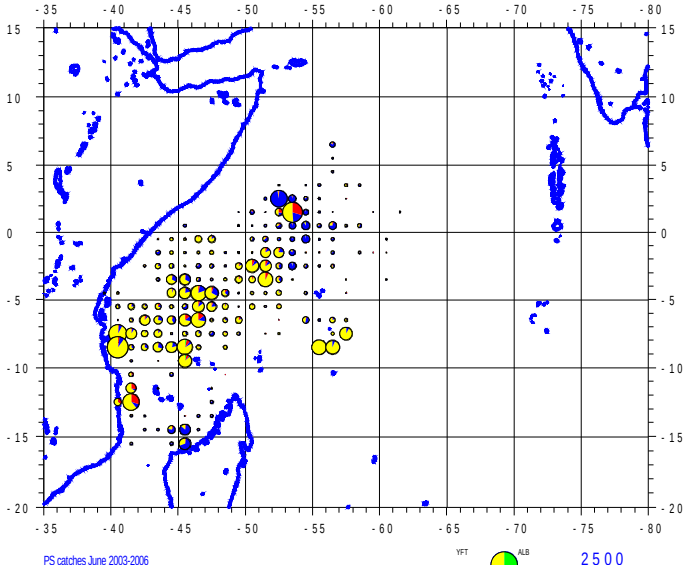

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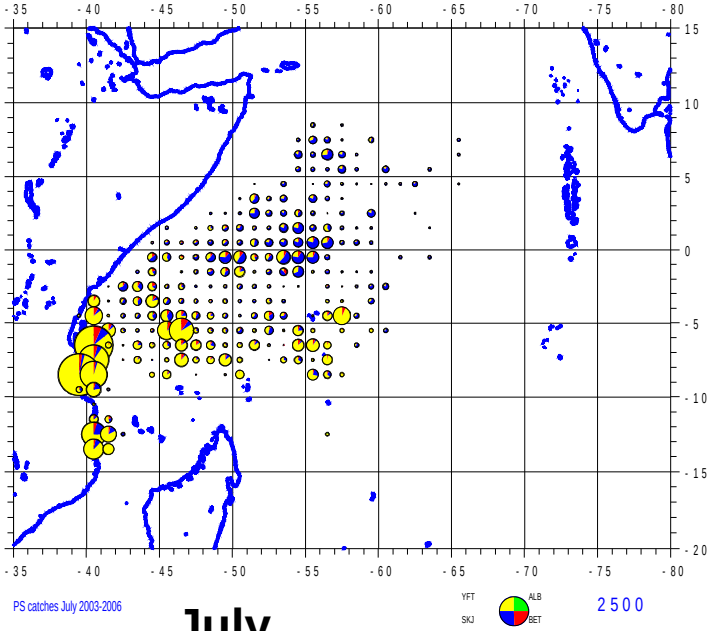
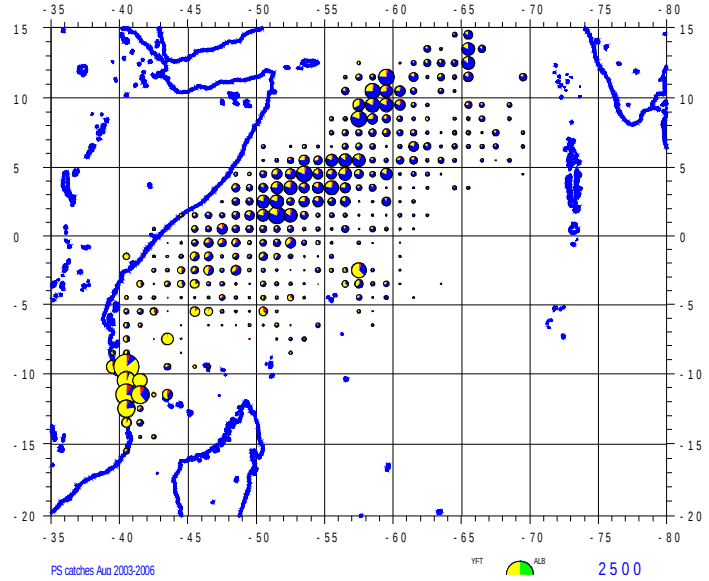


July



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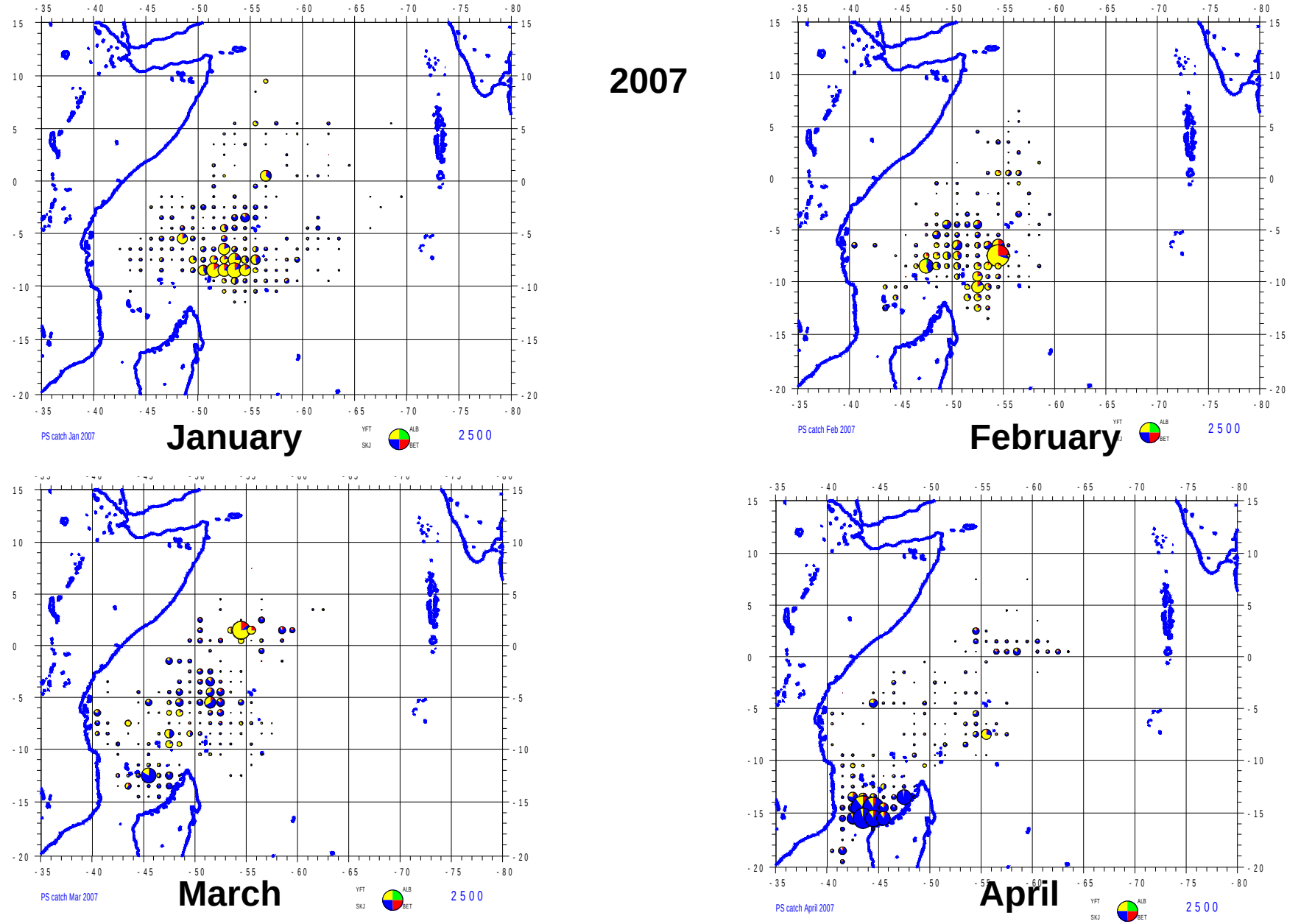
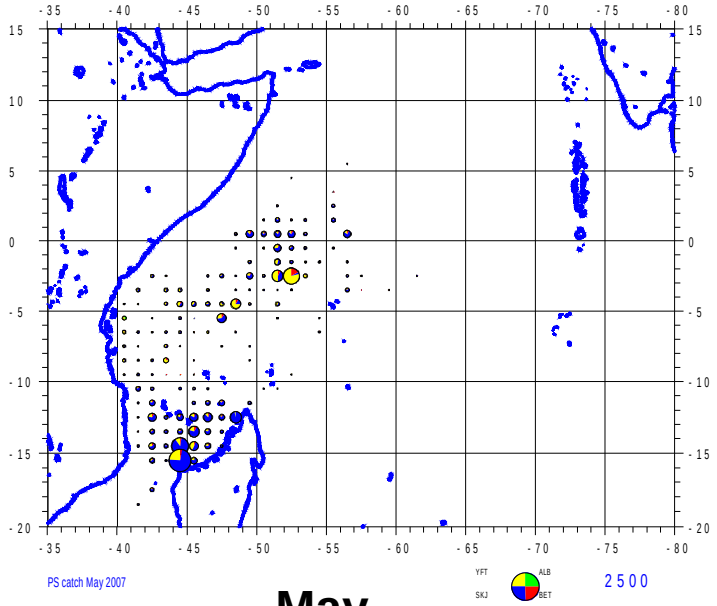


Figure 17: Monthly fishing catches by species, by 1° square, of the sampled purse seine fishery during the first 8 months of the year 2007.

2007



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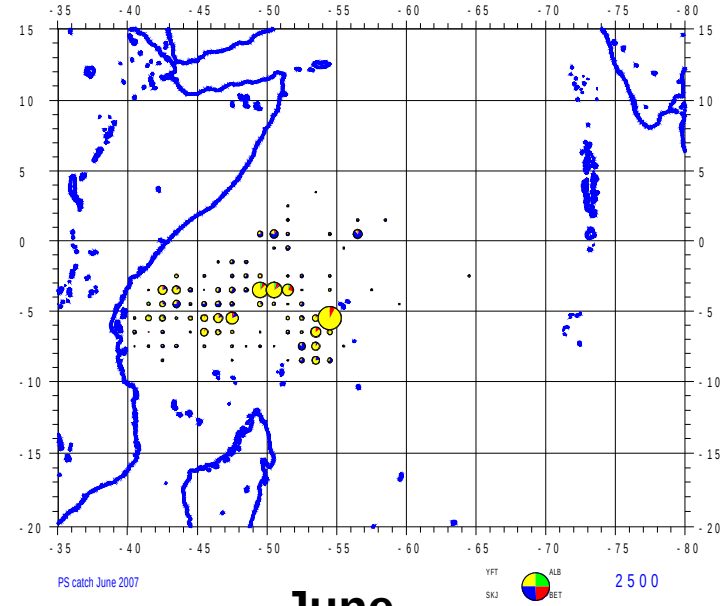

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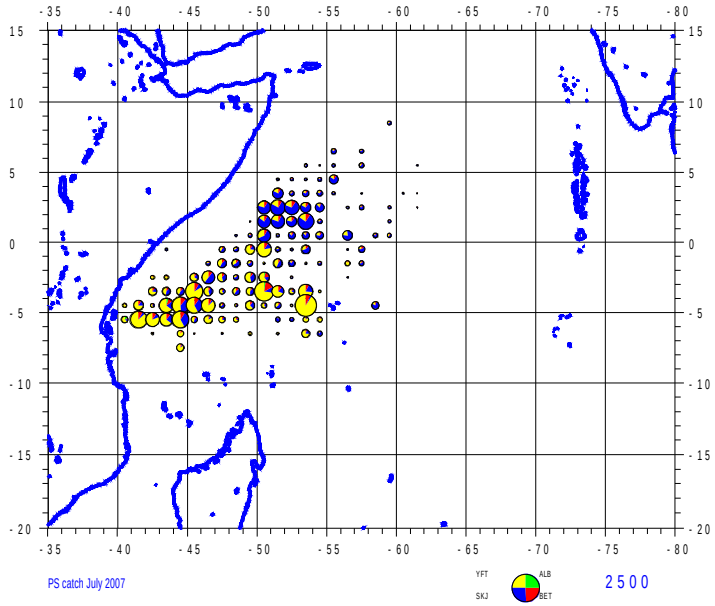

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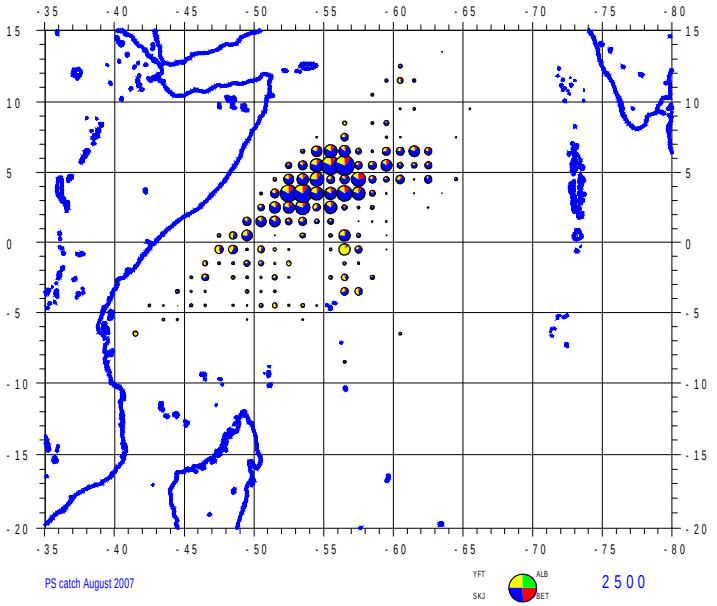

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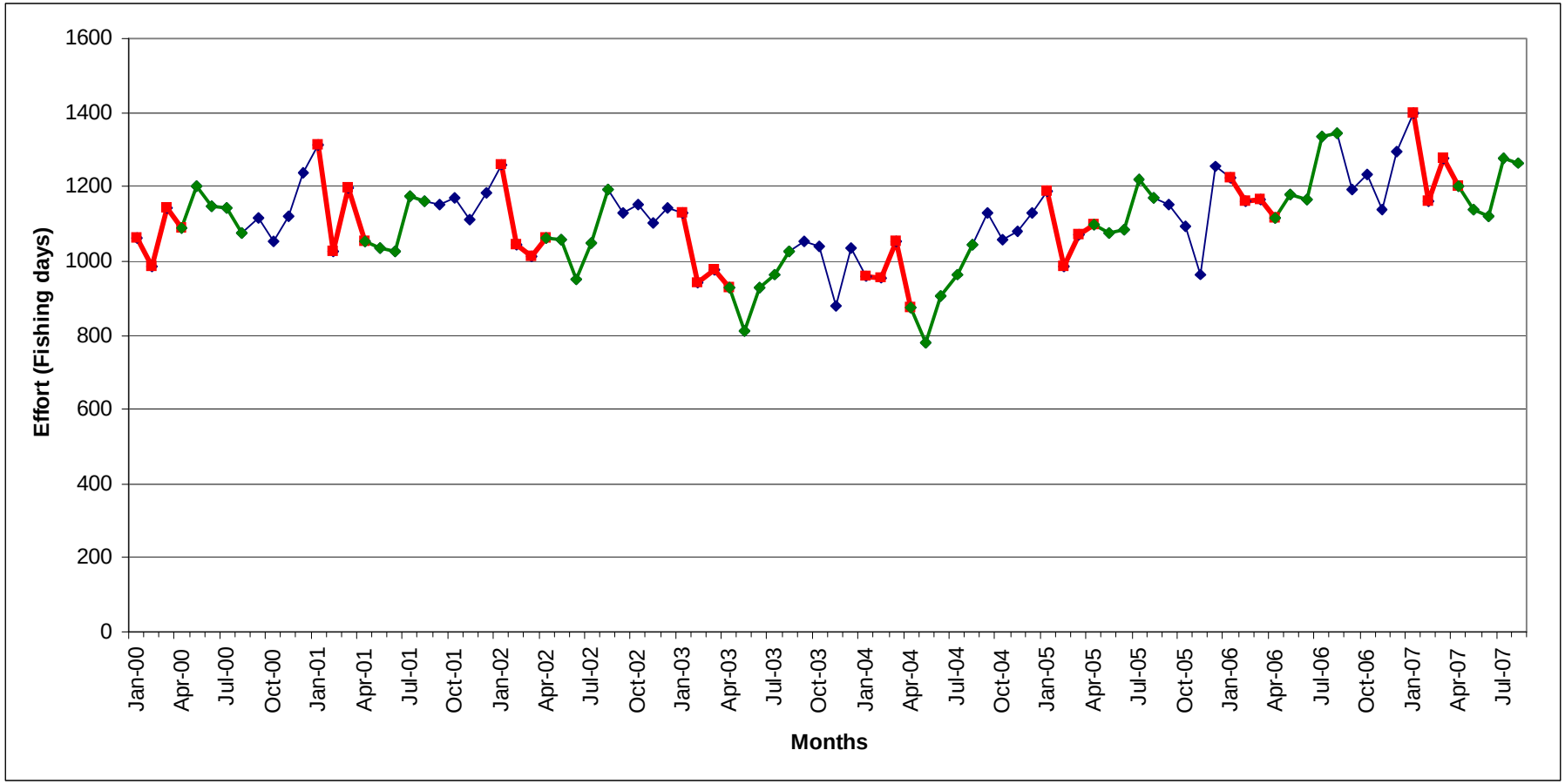

Fig 18. Monthly nominal efforts exerted by the sampled purse seine fishery during the 2000 –2007 period

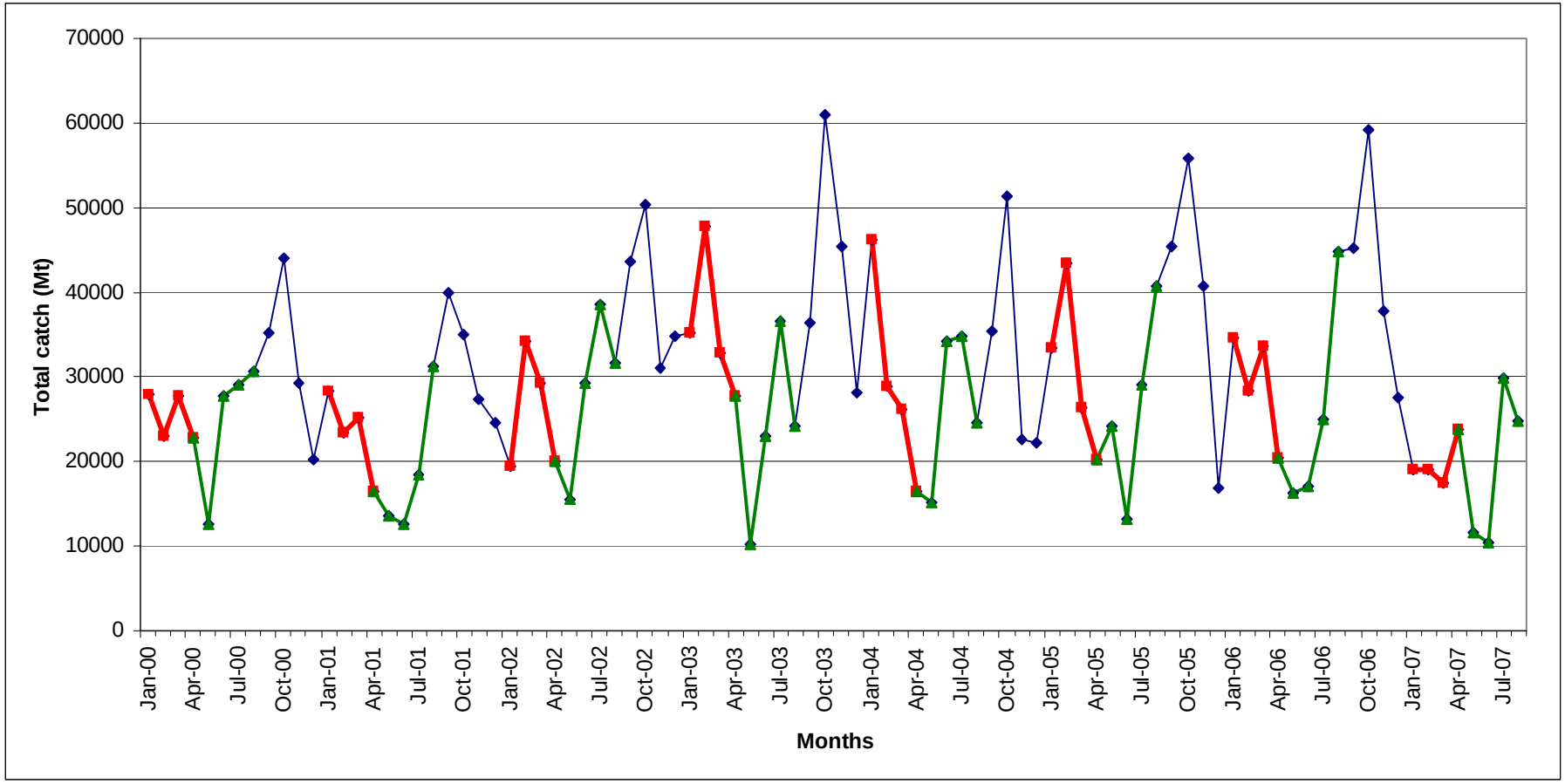

Fig 19. Monthly catch of the sampled purse seine fishery during the 2000 – 2007 period

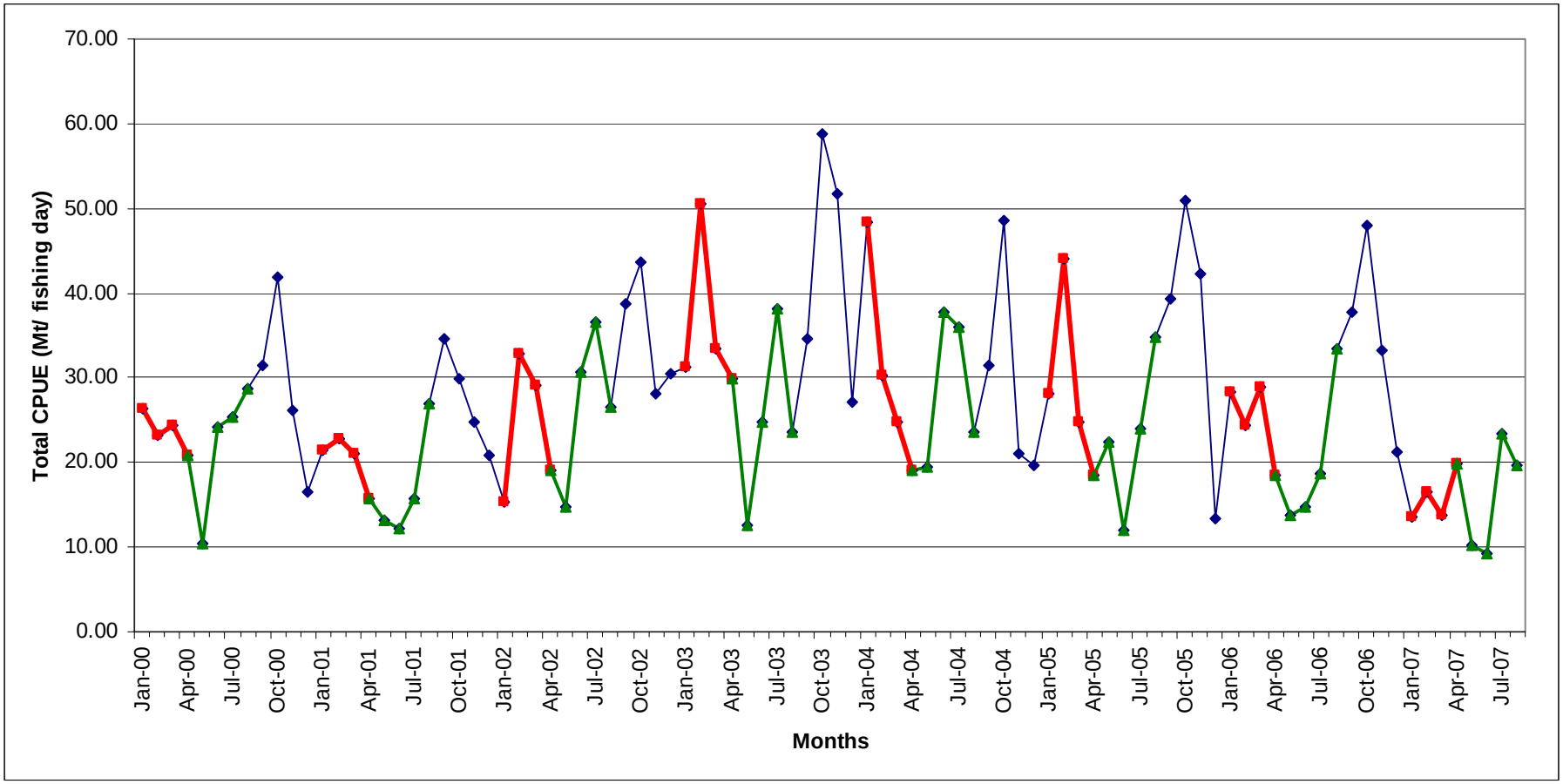

Fig 20. Monthly nominal CPUE (MT/fishing day) of the sampled purse seine fishery during the 2000 –2007 period

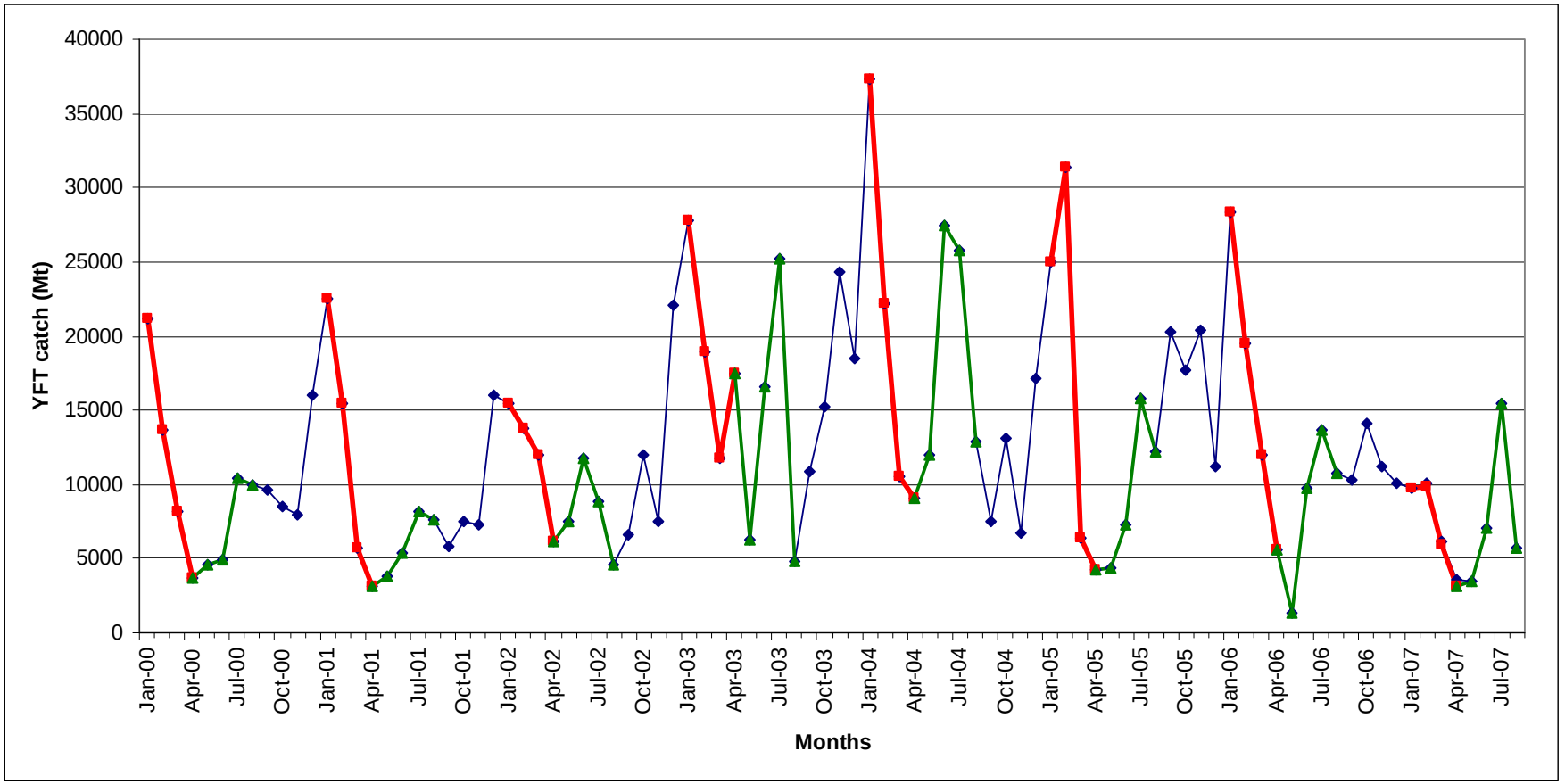

Fig 21. Monthly nominal YFT catch (MT) of the sampled purse seine fishery during the 2000 –2007 period

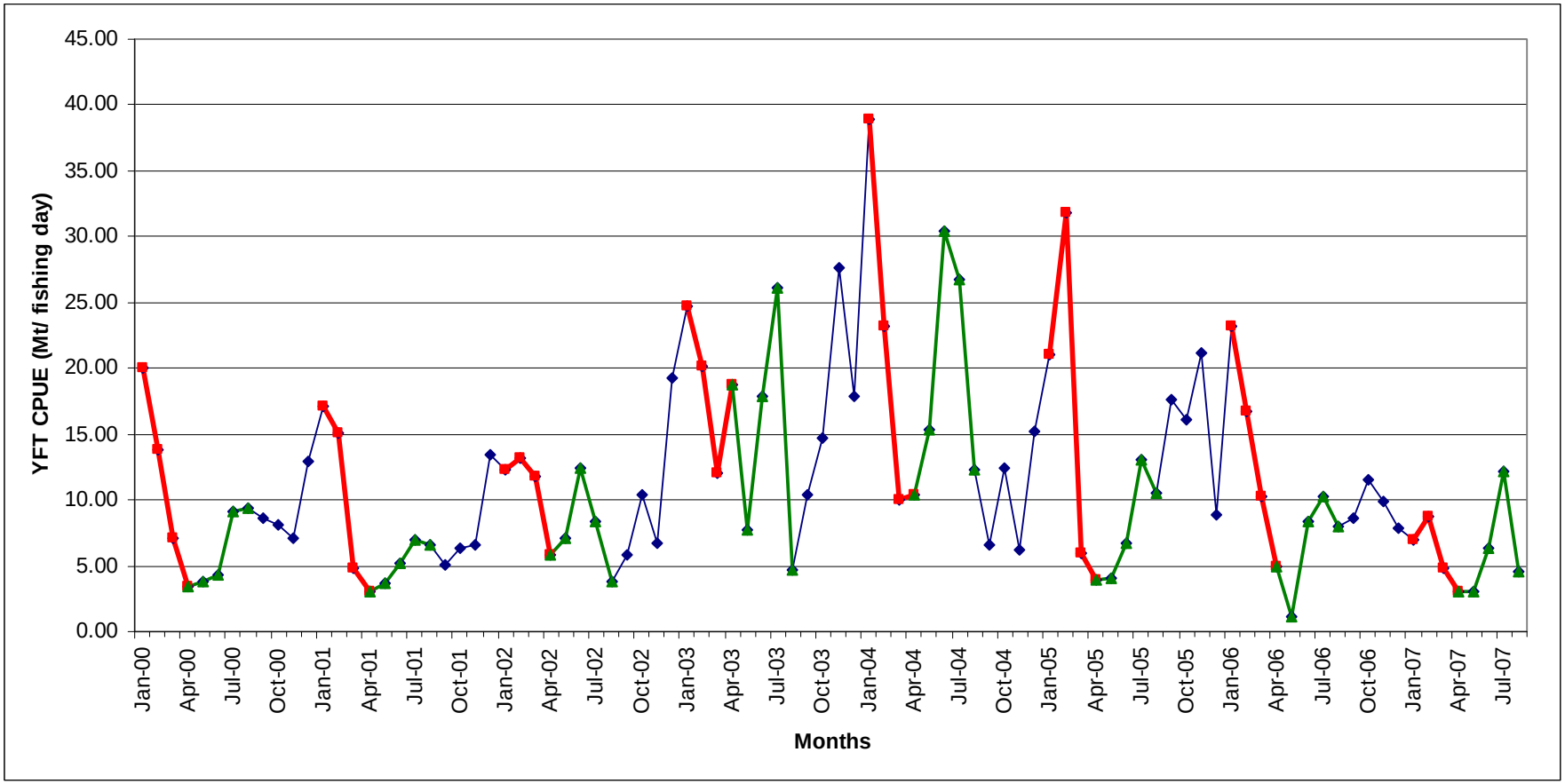

Fig 22. Monthly nominal YFT CPUE (MT/fishing day) of the sampled purse seine fishery during the 2000 –2007 period