Impacts of piracy threats in the West Indian Ocean on the activity and yield of the longline and purse seine fisheries

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Paper prepared for the 12th Session of the IOTC Scientific Committee
30th November - 4th December 2009
Victoria, Seychelles

1- Introduction

The piracy threat in the West Indian Ocean (WIO) has exhibited a dramatic and worrying increasing trend during the last 5 years, with numerous piracy acts and aggressions reported against different kinds and of leisure, commercial and fishing vessels cruising in this region. So far, the number of attacks culminated in 2008 with overall 115 events reported and 44 vessels seized. There was almost no single day without any incident and the events increased regularly throughout the year, from 11 attacks during the 1st quarter to 51 in the 4th quarter. The situation is likely to worsen in 2009 as 81 attacks and 19 successful hijackings have already been reported for the first semester (UNOSAT). A number of 14 tuna fishing vessels (12 purse seiners and 2 longliners) were subject to piracy acts from April 2008 to October 2009. Initially confined along the Somali coast and within the Somali EEZ, those acts have dramatically expanded offshore and attacks occurred at long distances off the coast, as far as 2200 km (5°S – 66°E) when the French purse seiner "Talenduic" was attacked on 20th May 2009. All maritime activities are deeply perturbed by this lasting situation, among those industrial tuna fishing.

Therefore, the European tuna fishing companies that operate purse seiners, have taken various mitigation measures such as self-imposing a "fishing exclusion zone" (FEZ) that was extended from 300 to 500 nm (900 km) off the coast of Somalia, using an aircraft for the surveillance of the area (Spain) and boarding military personnel on the purse seiners since July 2009.

Such situation has led to a spatial reallocation of the fishing effort of all tuna fleets in the whole WIO that has been presented through a series of maps at the 2009 Working Party on Tropical Tuna. In order to complement this previous information, the aim of this document is to analyse quantitatively the effects of such spatial shifts in terms of fishing effort, catch and CPUE using high-resolution longline (Japan and Taiwan,China) and purse seine (EC and Seychelles) data.

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2- Data and method

The study area encompasses a large fraction of the West Indian Ocean (35E-75E / 10S-15N). We considered 3 areas, each one being exclusive of the other, as represented in Figure 1. Area 1 corresponds to the EEZs of Somalia and Kenya and the fraction of the Tanzanian EEZ stretching North of 10°S. Area 2 is the fishing exclusion zone as referred above (FEZ) with a boundary at 500 nm off the Somali coast, the Area 3 being the rest of the study area.

The resolution of the catch and effort statistics used to cover those 3 areas is obviously at a fine scale, and the 1° grid resolution was selected for this purpose. Japanese longline data presented are for 1979-2008 whereas statistics from Taiwan,China that are available at such resolution are for a shorter period of time, 1994-2008. It should also be noted that the statistics are still incomplete for the LL fleets in 2008: the coverage rate for the whole Indian Ocean is estimated to 80 and 60% respectively for Japan and Taiwan,China. The purse seine fishery data from EC and Seychelles were pooled at the same 1° resolution and cover the period 1984-2008. The coverage rate of the PS fleet in 2008 is very close to 100%. The fishing effort is given in millions of hooks for LL fisheries and in fishing days for PS fisheries.

When the boundaries of the different areas cross a 1° square, the effort and catch of the relevant square are reallocated according of the proportion of area in each study area.

3- Results

3.1 Longline fleets

The fishing effort of Japan and Taiwan,China has remained rather low in areas 1 and 2 until 2002 (fig. 2 a b). In 2003, the longliners started to increase their activities in those two areas and fishing effort peaked in 2005. This increase was particularly marked in area 1 for Japan (610 % increase from 2002 to 2005) and area 2 for Taiwan,China (210 % increase from 2002 to 2005). Since then, for both longline fleets, the fishing effort has steadily declined to return to its historic low levels. In the area 3, the fishing effort of Japan has largely fluctuated and the highest level was reached in 2007, followed by a sudden decline (- 35%) in 2008. However, the 2008 level remains high compared to the history of the fishery. For Taiwan,China the fishing effort has steadily increased till 2005 then sharply declined (-67% from 2005 to 2008) to return to low levels similar as those of the pre-2000 period. It should be noted that the 2008 decrease might be amplified by the fact that statistics are still incomplete for the last year of the series.

The fluctuations of YFT and BET catches mimic those of the fishing effort. The largest YFT catches were recorded in 2005 in all areas (Fig. 3). Then catches declined sharply in all areas for both fleets. As a consequence, Japanese YFT nominal CPUEs show a sharp and continuous decline in all areas since 2001 or 2003 (depending on the areas): -66% in area 1 (2003-2008), -95% in area 2 (2001-2008), -78% in area 3 (2003-2008). The YFT nominal CPUE of Taiwan,China also exhibit substantial declines of ca 80% from 2005 to 2008.

The BET catches by Japan remain very minor in areas 1 and 2 since the early 90s (Fig. 4). In area 3, they have largely fluctuated over time with a recent peak in 2007 (6300 t). The BET catches of Taiwan,China increased in all three areas since the early 2000. After a peak in 2005, they have largely declined to return to historic low levels in 2008. Because of the concomitant decline in catch and effort during the recent years, BET nominal CPUEs are rather stable for Japan since 1999 (after a steady decline since the early 80s). The BET nominal CPUEs for Taiwan,China have slightly declined since 2004 in the areas 1 and 2, and showed large fluctuations in area 3.

3.2 Purse seine fleets

The purse seine fishing effort started to increase in 1996 in Area 1 where it peaked in 2003-2004 then declined to historic low levels from 2005 onwards (Fig. 2 c). This decline was compensated by an increase of fishing effort in area 2 that peaked in 2006, then dramatically declined after that (-50 % from 2007 to 2008). In area 3, the PS fishing effort remained stable (about 6000 fishing days/yr) until 2001. After a big trough in 2002, it started to increase steadily to reach a record of 8000 days in 2008.

Record YFT catches were obtained by the PS fleets from 2003 to 2006 in the whole region (Fig. 5 a). In Area 1, the peak occurred only in 2003-2004 when it extended to 2006 in areas 2 and 3, then declined sharply in area 2 to an historic pre-1990 low level in 2008. The YFT production by PS declined in area 3 till 2007 then rose again (from increases catches of adult YFT on free schools). The YFT PS CPUEs declined substantially from 2003-2005 to 2007 then slightly increased in 2008 (Fig. 5 b).

SKJ is the dominant species taken at FADs by PS. As from 2003, the decline of SKJ catches in area 1 was compensated by an increase of catches in areas 2 and 3. Within the core of the FAD fishery, mostly the area 2, catches had an increased trend up to 2006 then dropped suddenly in 2007 and 2008, whereas catches were slightly increasing in area 3 (Fig. 5 c). The CPUE declined sharply and continuously during the last 4 years in area 1, whereas it increased again in 2008 in area 2. The CPUE in area 3 has fluctuated without trend during the whole period considered (Fig. 5 d).

Juveniles BET taken at FADs dominate PS BETcatches. Similarly to SKJ, the decline of catch in area 1 after 2003 was accompanied by an increase of catches in areas 2 and 3 (Fig. 6 a). BET PS CPUEs have shown a declining trend since 1999 in area 1 and they have substantially increased in area 2 in 2008 compared to 2007. (Fig. 6 b)

4- Discussion

The piracy threats have undoubtedly impacted the tuna fishing activities in the WIO as the effort trends of LL and PS fleets have all declined during the recent period in the areas 1 and 2 that are the most susceptible to pirates attacks. It should be noted that several purse seiners have left the Indian Ocean in 2008 and 2009 to operate in the Atlantic Ocean, and this may also be the case for longliners migrating to the Pacific or the Atlantic oceans. It is not so obvious that the early decline in 2006 was due to piracy acts, as it might result from a shift towards other fishing grounds after the record catches of 2005. Nevertheless, the trend did not reverse of even stabilize in 2007 and 2008, which could be interpreted as an escaping response to the piracy threat. Japanese longliners relocated their activities in area 3 whereas the fishing effort by the Taiwan,China fleet still declined in area 3.

The YFT CPUE of both longline fleets declined during the last 4-6 years. For Japan, a drop of catches mainly drives this decline more than by a decrease of the fishing effort. Indeed, the fishing effort decreased in the areas that are the most threatened by pirates, but this effort relocated in offshore fishing zones. For Taiwan,China, the CPUE decline is concomitant to an overall decline of the effort throughout the region.

At the 2009 WPTT, there was some concern whether the continuous decline of the Japanese LL CPUE index (used as the abundance index in the MFCL assessment) during the last 3 years of the series could be an artefact due to relocation of the fishing effort. This does not seem to be the case from the data compiled in this paper.

The discrepancy between the CPUE trend of Japanese and Taiwan,China for BET, as mentioned during the 2009 WPTT, is also very obvious in the nominal series presented in this

paper. Taiwan,China could maintain rather high levels of catches in 2006 and 2007 when the fishing effort had already declined in all areas, giving fluctuating CPUE at rather high level, a situation not observed in the Japanese CPUE series.

For the purse seine fishery, the relocation of the fishing effort in the area 3 due to piracy acts is very clear, but this did not impacted much the nominal CPUE. The low 2007 CPUE is likely to be partly due to environmental anomaly that reduced catchability (see 2008 and 2009 WPTT reports). This means that the purse seiners could find good fishing grounds outside the main area affected by the pirates. The increase of BET and SKJ nominal CPUE, very obvious in areas 2 and 3 in 2008, when the CPUE was declining in area 1, is a good example of such successful redeployment, which concerns primarily the FAD fishery. It is now necessary to investigate the causes of the smaller sizes of SKJ caught by purse seiners recently, a consequence of the observed spatial shift of the PS fleets or a size truncation of the population.

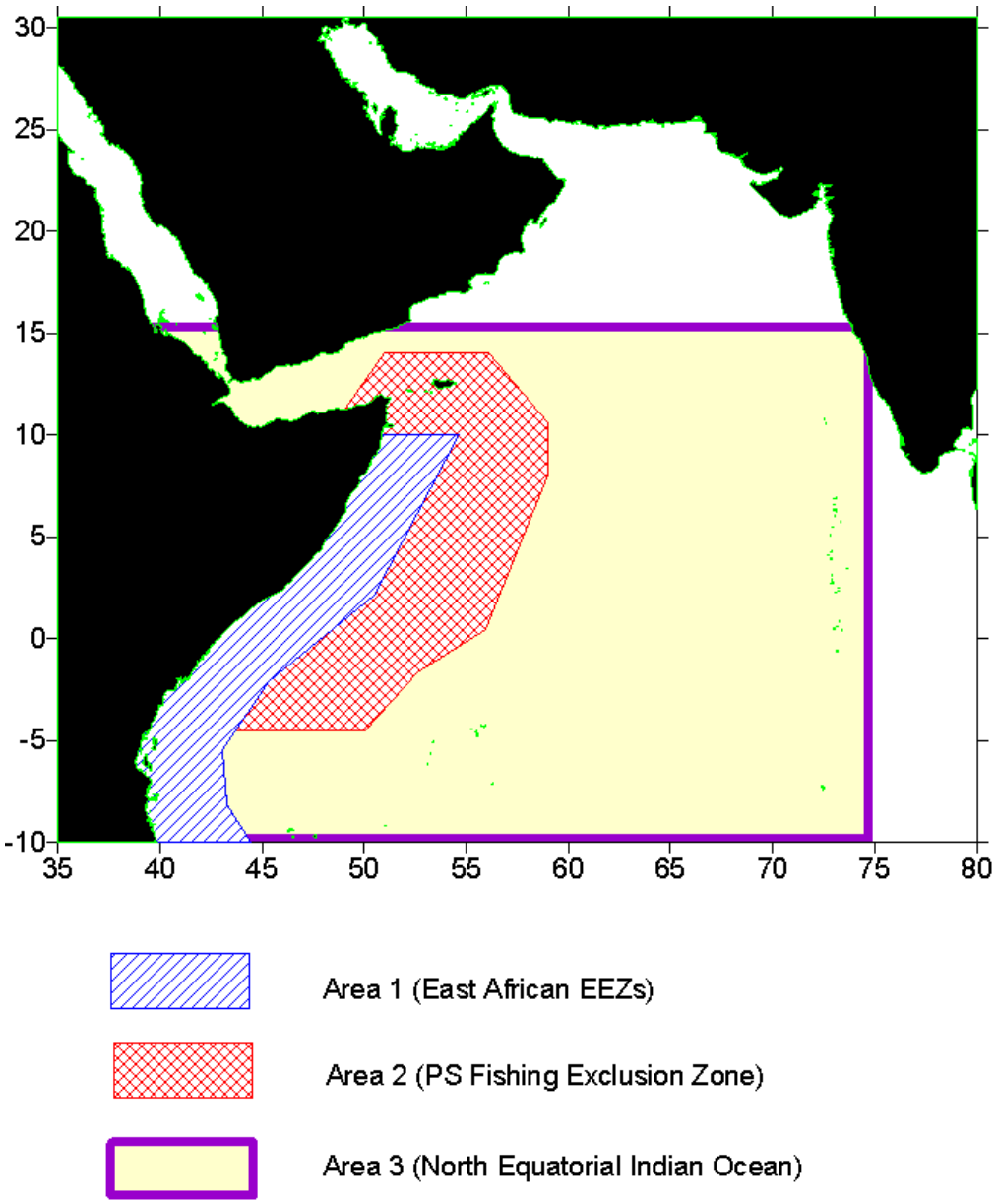
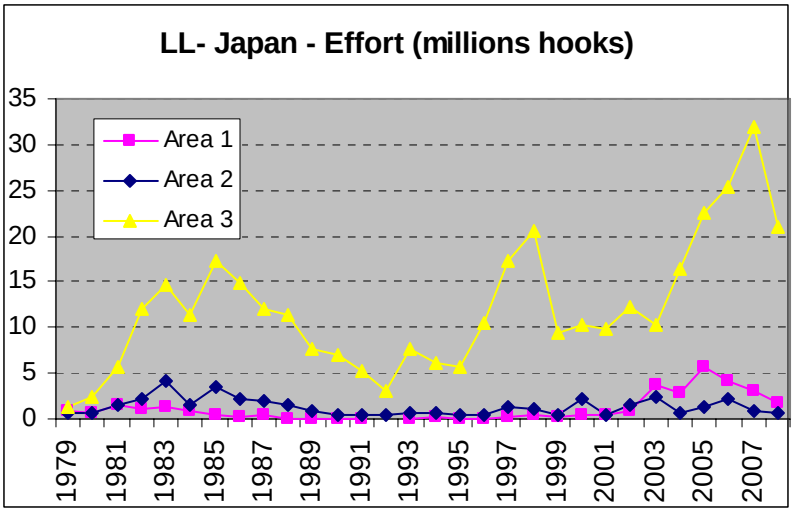
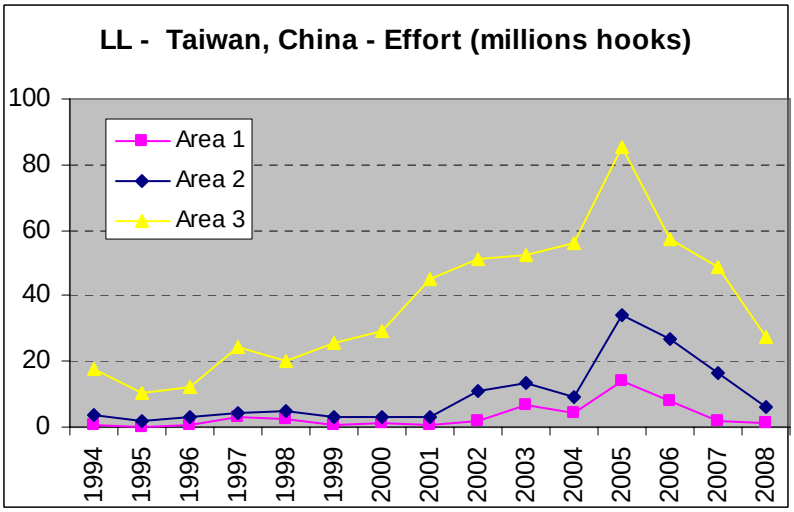


Figure 1 – Study area and area stratification

(a)



(b)



(c)

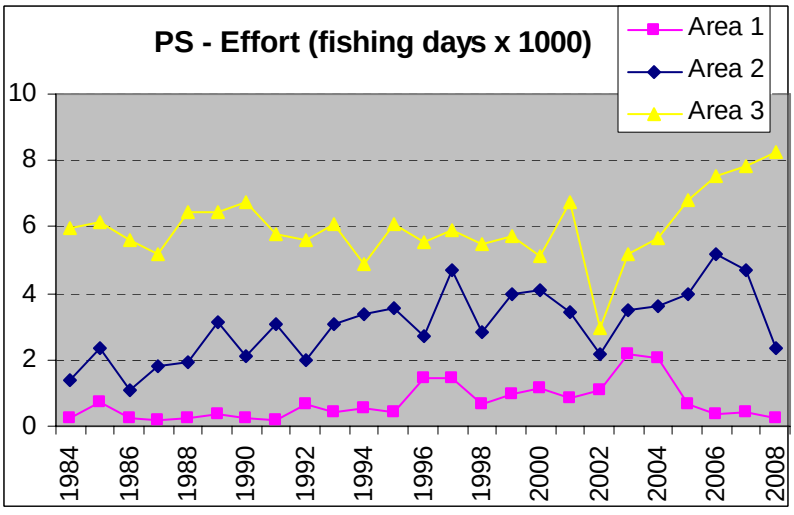


Figure 2 – Trends of fishing effort over time in each of the three areas by the longline and purse seine fleets

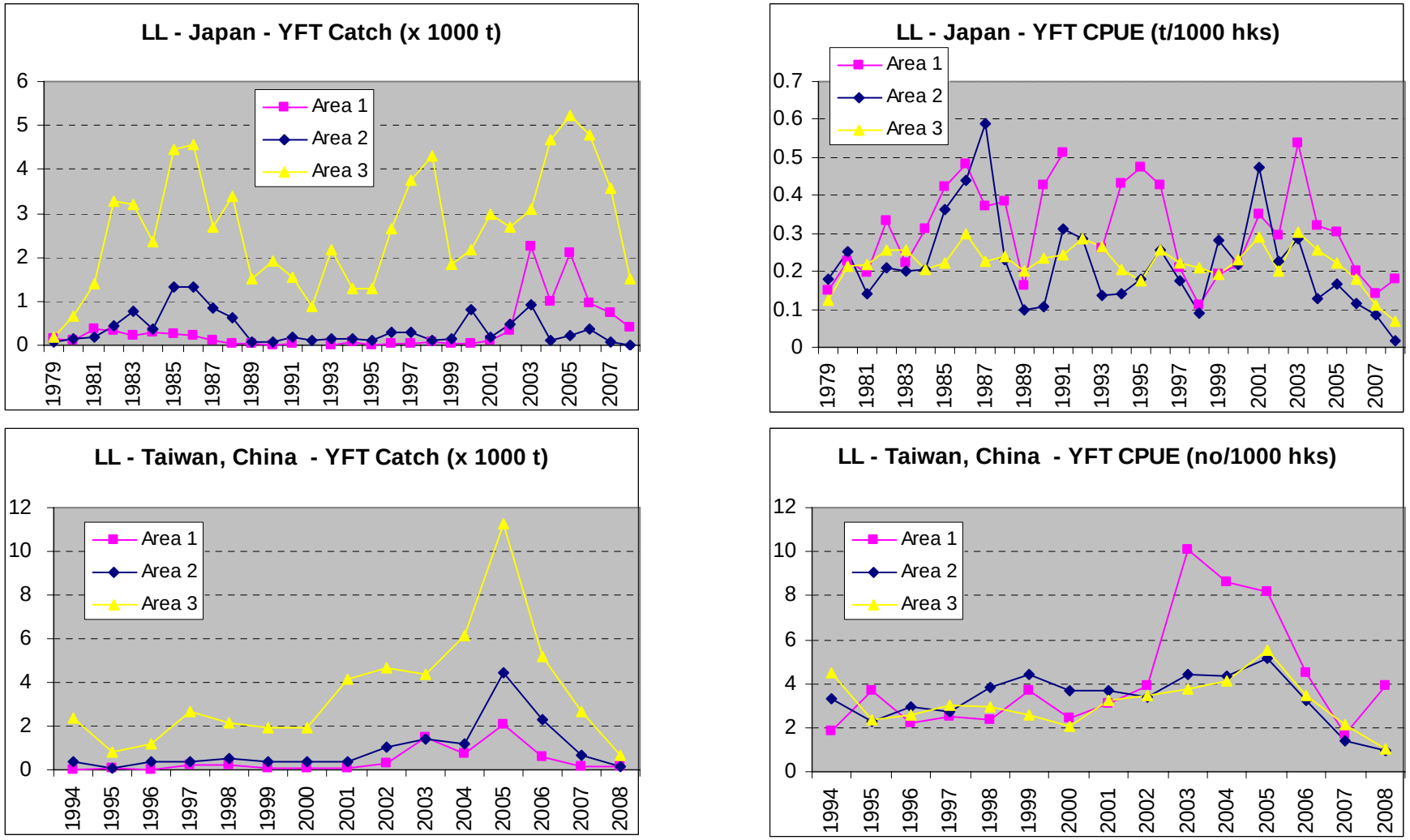


Figure 3 – Trends of yellowfin catch and CPUE over time in each of the three areas by the longline fleets (Japan & Taiwan,China)

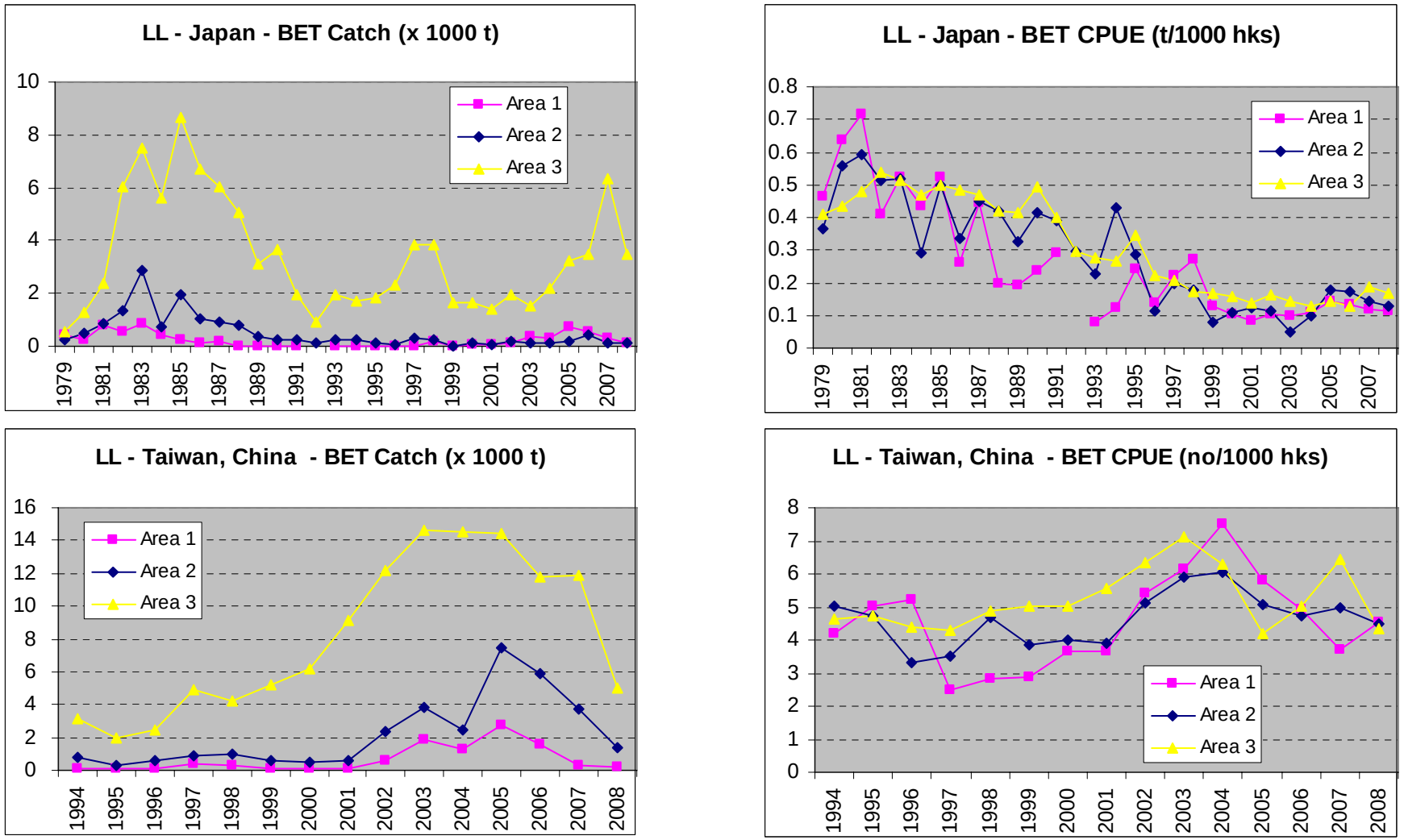


Figure 4 – Trends of bigeye catch and CPUE over time in each of the three areas by the longline fleets (Japan & Taiwan,China)

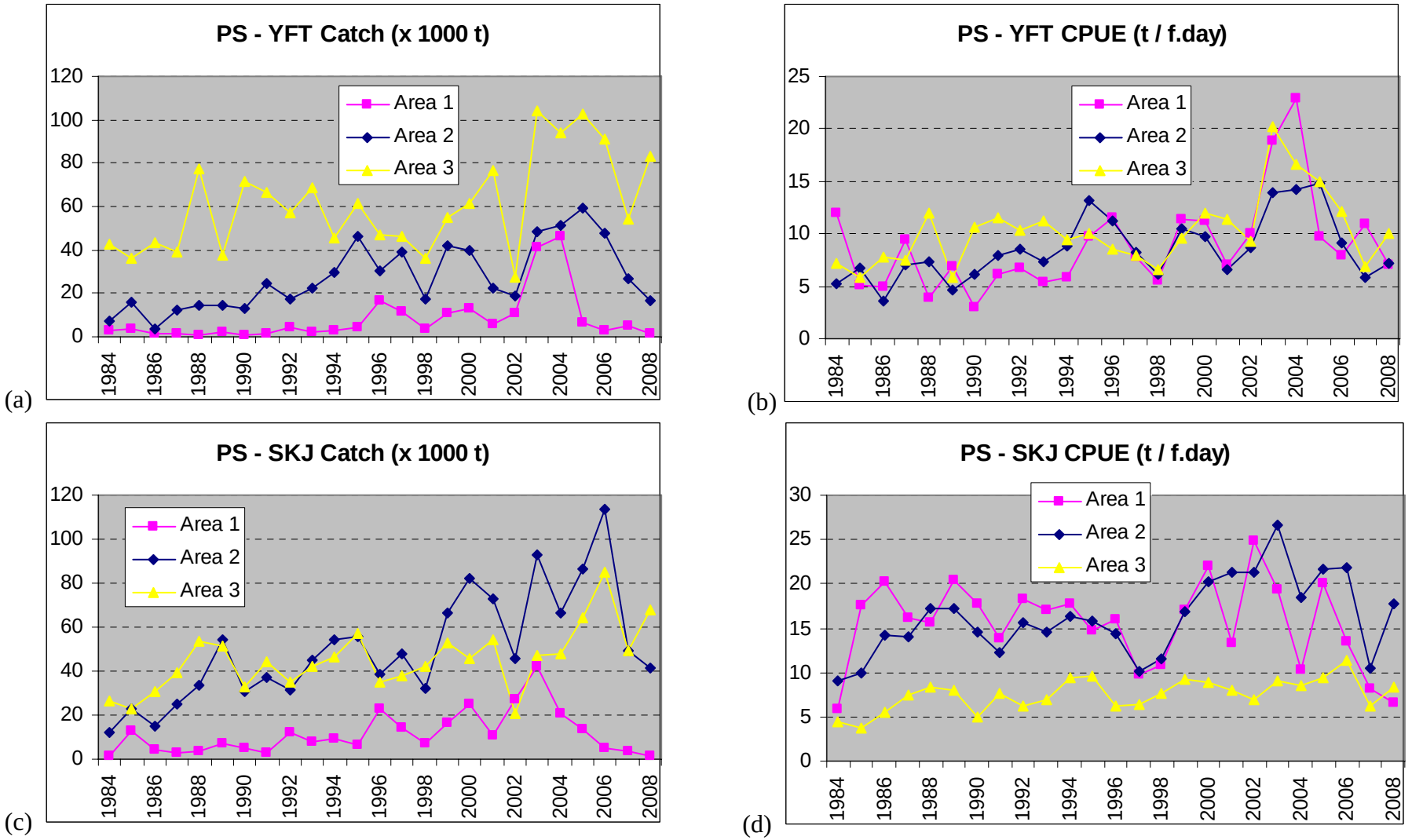
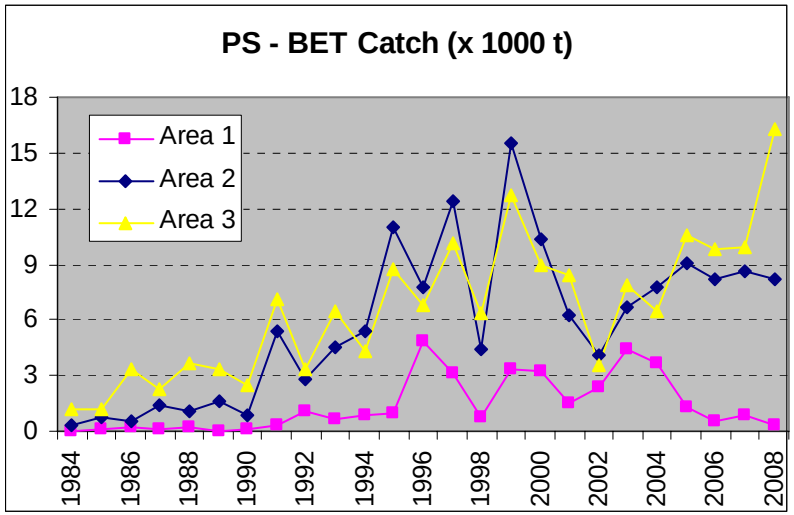


Figure 5 – Trends of yellowfin (a-b) and skipjack (c-d) catch and CPUE over time in each of the three areas by the purse seine fleets

(a)



(b)

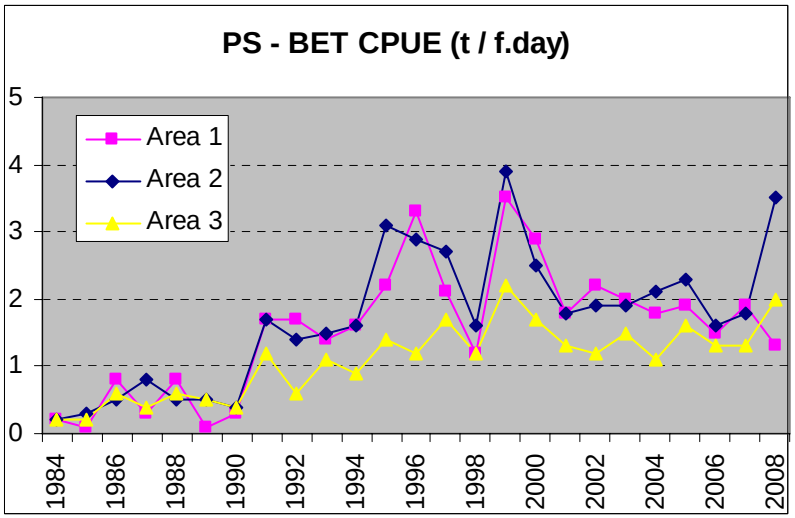


Figure 6 – Trends of bigeye catch (a) and CPUE (b) over time in each of the three areas by the purse seine fleets