

A REVIEW OF THE BRITISH INDIAN OCEAN TERRITORY FISHERIES CONSERVATION AND MANAGEMENT ZONE TUNA FISHERY, 1991 - 1995

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ABSTRACT

This paper presents a review of the tuna fishery within the 200-mile Fisheries Conservation and Management Zone (FCMZ) of the British Indian Ocean Territory (BIOT) (Chagos Archipelago), over the period 1991 to 1995. Particular emphasis is placed on the most recent fishing seasons 1993-1994 and 1994-1995.

Fishing inside the BIOT FCMZ has been dominated by distant-water fishing nations. Longliners from Japan, Korea and Taiwan have fished in the area around the Chagos Archipelago for many years. Purse-seine vessels have operated in the area since the early 1980s. Some records of driftnetting also exist prior to the ban on driftnetting in 1992.

*The tuna fishery inside the zone is highly seasonal and highly variable. Longline vessels typically operate during two periods, June to September and November to February. Purse-seine vessels typically operate during a single period from November to February. The seasonality of the fishery is due to the highly-migratory stocks exploited. The situation may be complicated further by the position of the BIOT FCMZ, which may lie in an area of overlap between the western and eastern Indian Ocean stocks of yellowfin tuna (*Thunnus albacares*).*

*Reported longline activity in the zone has increased each year from 1991 to 1995; in 1994-1995 36 longline vessels were active in the FCMZ for a total of 882 days. Reported purse-seine activity was low for 1991-1992 and 1992-1991. In 1993-1994, 34 purse-seine vessels were active for a total of 877 days between December 1993 and February 1994, with a total catch of 31,719 t and an average daily catch of over 35 t/day⁻¹. In the 1994-1995 season, purse-seine vessels spent only 133 days inside the zone, and catches averaged only 12.64 t/day⁻¹. Longline catches are dominated by yellowfin and bigeye (*Thunnus obesus*) tunas, with a significant bycatch of swordfish (*Xiphias gladius*) and marlins typical of longline tuna fisheries. Purse-seine catches are dominated by yellowfin and skipjack (*Katsuwonus pelamis*) tunas.*

INTRODUCTION

The British Indian Ocean Territory Fishery Conservation Management Zone (BIOT FCMZ) lies in the western Indian Ocean, due south of the Maldives, and is centred around the Great Chagos Bank (Figure 1). Figure 2 shows the FCMZ, the 12-mile fishing zone and 3-mile territorial sea in more detail. Fishing for tunas and billfish takes place anywhere outside the 12-mile fishing zone. The fishing season for the BIOT tuna fishery is defined as 1st April to 31st March.

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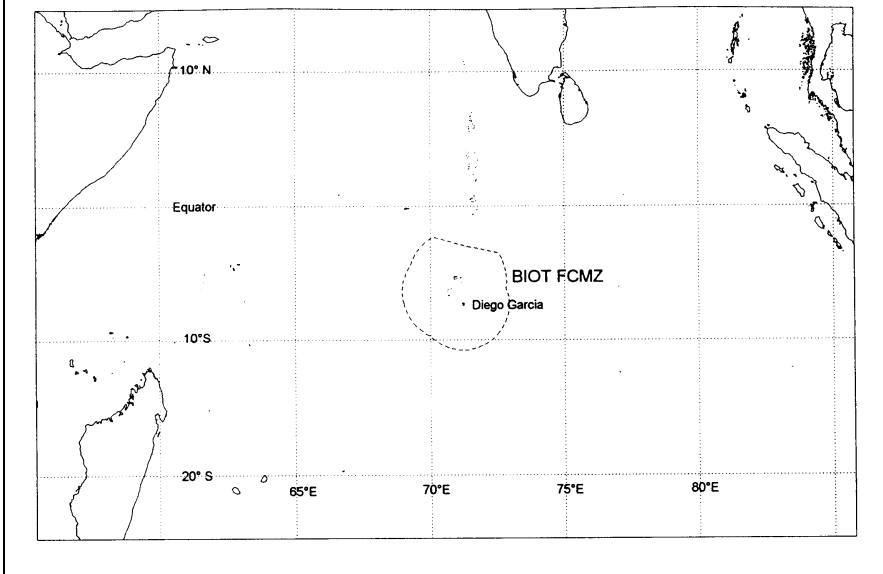
Particular emphasis is placed on the most recent fishing seasons, 1993-1994 and 1994-1995.

The catch and effort data presented in this review were collected through a logbook system. Some of the more recent data are taken from radio reports, because the completed logbooks have not yet been received.

HISTORICAL FISHING PATTERNS

Fishing activity has been dominated by distant-water fishing nations targeting tuna and billfish using longline and purse-seine fishing vessels. There are also a few records of driftnetting prior to the ban on driftnetting in

Figure 1. British Indian Ocean Territory Fishery Conservation Management Zone



Figures 4a and 4b show the distribution of longline sets made during 1993-1994 and 1994-1995, respectively. The longlines typically set by a Taiwanese longliner can reach 90 km in length, and the patterns of the sets can vary greatly depending on the target species and the bathymetry. Figures 4a and 4b show that a number of the longliners are setting lines along the edge of the drop-off of the Great Chagos Bank. Other sets have been made around seamounts or other bathymetric features, and are typically made on the down-current side of the feature. These sets are made to target yellowfin; sets made over the abyssal plain (>3000 m) generally target bigeye.

1992. Longliners from several flag states have fished in the waters around BIOT for many years; Japan since 1952, Korea since 1968 and Taiwan since 1975. Purse seiners began to move into the Indian Ocean in the early 1980s after favourable surveys by Japanese and French research vessels. The area around the Maldives / BIOT island chain, known as “Les Rails” after the north-south currents that sweep along each side of the island chain, was recognised by purse-seine fishing masters as a desirable fishing ground. The fishery was highly seasonal, being active mainly in November, December and January.

Purse seine vessels

Figures 5a and 5b show the total number of purse seine vessels operating in the zone during 1993-1994 and 1994-1995, respectively. The main period of activity (roughly November to February) coincides with the time when the migratory yellowfin tuna are thought to pass through the zone. Figures 5a and 5b illustrate a marked difference between the levels of activity in the 1993-1994 and 1994-1995 seasons.

SUMMARY OF FISHING SEASONS FROM 1991 TO 1995

Longline vessels

In 1991-1992, eight Taiwanese longliners were active in the zone, rising to ten vessels in the following year. The catches and number of days actually fished during these seasons are not available. Activity increased significantly in 1993-1994, with 24 vessels active from July to September (184 days fishing) and for a second period from November to January (213 days fishing). The longline effort increased again in the 1994-1995 season, with 36 vessels active in the zone. The first period, running from June to August, was less active than the previous year (124 days fishing). The main period of fishing activity occurred between October and January (758 days fishing). Figures 3a and 3b show the seasonal activity patterns of the longline vessels in the zone for 1993-1994 and 1994-1995, respectively. A summary of the total catch and effort for the longline fishery in the zone from 1991 to 1995 is given in Table 1.

Figure 2. The BIOT FCMZ, 12 mile Fishing Zone and 3 mile Territorial Sea.

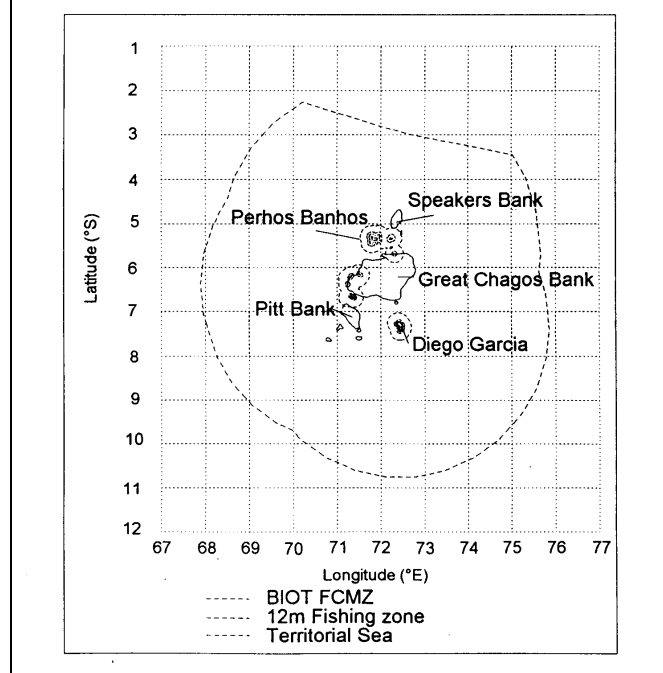


Table 1. Summary of fishing activity and catches (mt) of the longline fleets, 1991-1995

Fishing Season	1991-92	1992-93	1993-14	1994-95
Days Fishing	-	-	339	882
Total Catch	-	-	332.06	694.97

Table 2. Summary of fishing activity and catches (mt) of the purse-seine fleets, 1991-1995

Fishing Season	1991-92	1992-93	1993-94	1994-95
Days Fishing	41	29	877	133
Total Catch	932	451	31719	168

Figure 3a. Longliners active in 1993/1994.

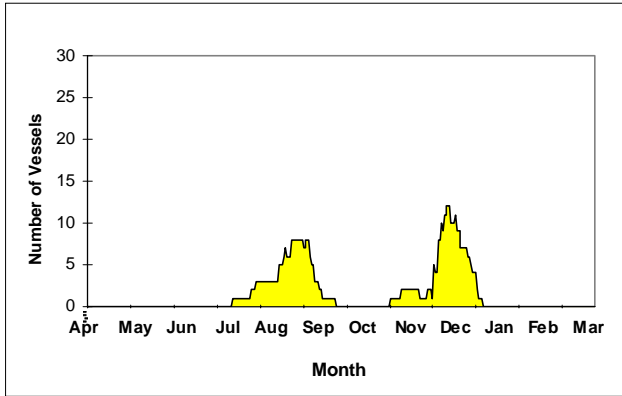
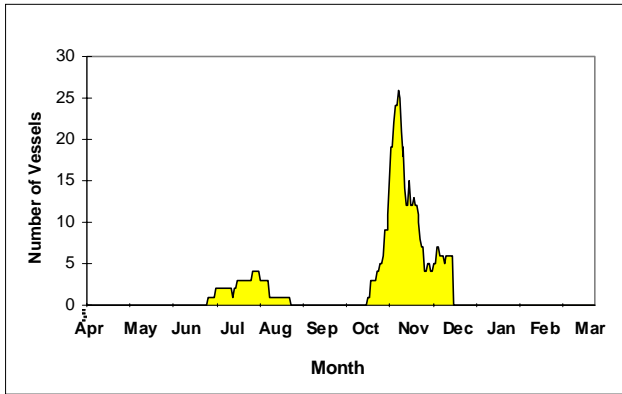


Figure 3b. Longliners active in 1994/1995.



In the 1993-1994 season the European purse-seine fleet operating in the western Indian Ocean started to report activity inside the zone. Thirty-four European purse seiners were active for a total of 877 days between December 1993 and February 1994, and catches in this period averaged over 35 t day⁻¹. In the 1994-1995 season the European purse seiners were again active inside the zone, but spent only a total of 133 days here, with catches averaging 12.64 t day⁻¹. Table 2 summarises the total catch and effort of purse seine vessels in the zone from 1991 to 1995.

It is likely that the data for 1991-1992 and 1992-1993 do not give an accurate picture of the level of purse-seine activity within the zone. In these two seasons the only purse-seine vessels recorded as fishing were three Mauritian vessels. In the 1993-1994 season one of these vessels left the fishery for Indonesia, and the two other

remained in the western Indian Ocean. These three vessels have fished intermittently inside the FCMZ over the period from 1991 to 1995.

Figures 6a and 6b show the distribution of purse-seine effort in the BIOT FCMZ. The effort is concentrated in the northern half of the zone. The vessels operating inside BIOT are at that time of the year mostly transhipping in the Seychelles. During the period they are active in the zone, the vessels leave the Seychelles and steam east towards the zone. During the 1994-1995 season only a few vessels ventured as far as the zone preferring to fish further west where they were guaranteed catches were apparently around 20 t day⁻¹.

CATCHES

Total Cumulative Catch

Figures 7a and 7b show the cumulative catch taken from the BIOT FCMZ by longline and purse-seine vessels during the 1993-1994 and 1994-1995 fishing seasons, respectively.

The catches for the 1991-1992 and 1992-1993 fishing seasons shown in Table 1 are for the Mauritian purse-seine vessels only. The real total catch was probably higher, but some vessels did not report their catches. In the 1993-1994 season the total catch rose to 32,051 t, 31,719 t from purse seine vessels and 332 t from the longliners. The total catch dropped again in 1994-1995 to 2,376 t, 1,681 t from purse seiners and 695 t from longliners. The doubling of the longline catch is due to a rise in reported activity, not to an increase in CPUE.

Catch Composition

Figures 8 to 10 show the average species composition of the catch taken from inside the BIOT FCMZ in the 1993-1994 and 1994-1995 fishing seasons by longliners (Figures 8a and 8b), European purse seiners (Figures 9a and 9b) and Mauritian purse-seiners (Figures 10a and 10b). It should be noted that the catch composition for the longliners for 1994-1995 is based on log sheet returns only, which account for only 22% of the total catch notified via radio reports.

Figure 4a. Distribution of longline effort 1993/1994.

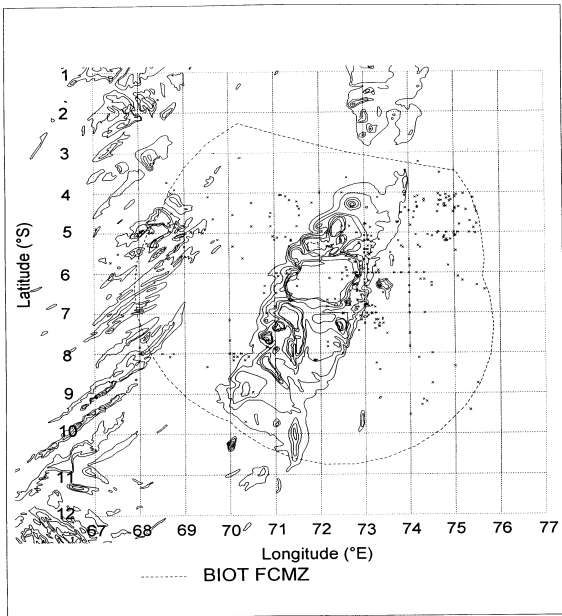


Figure 4b. Distribution of longline effort, 1994/95.

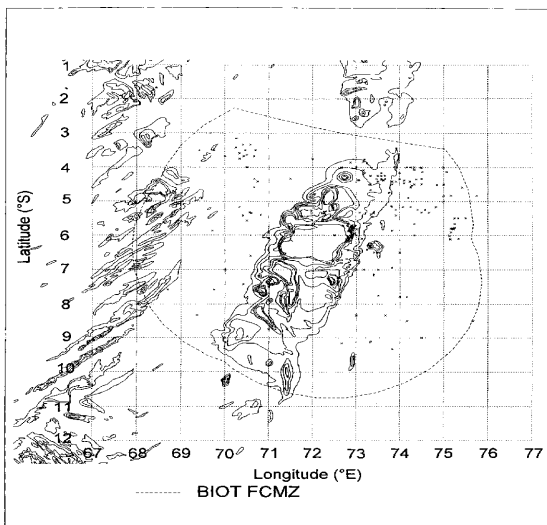


Figure 6a. Distribution of purse seine effort, 1993/94.

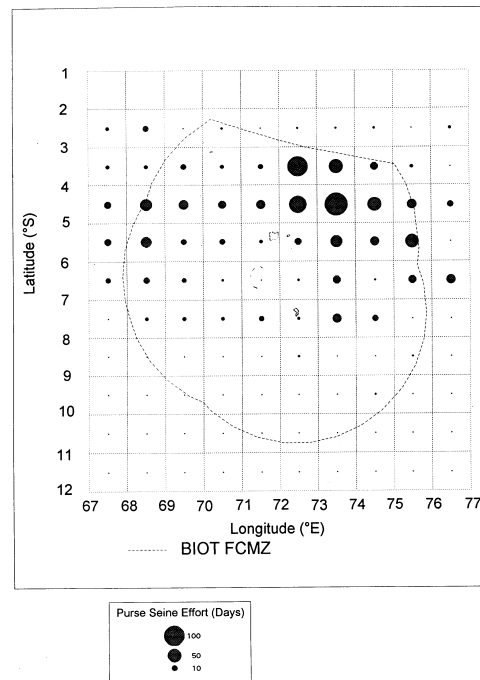
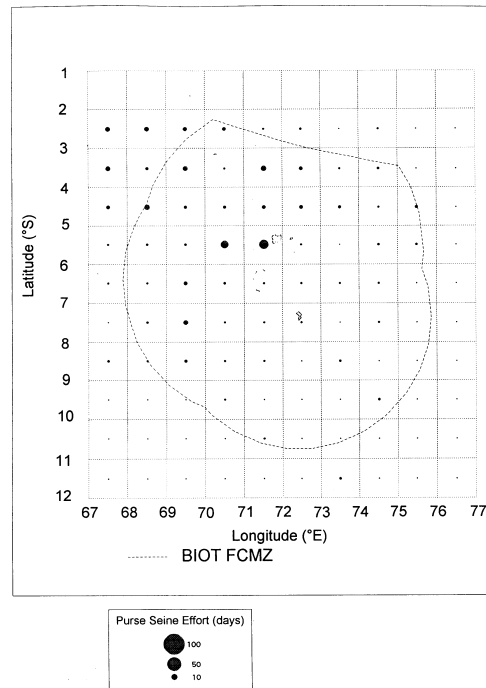


Figure 6b. Distribution of purse seine effort, 1994/95.



The longline catch is dominated by the target species yellowfin (about 50%) and bigeye (about 35%). However, there is a significant bycatch typical of longline fisheries. Species recorded as bycatch in the fishery include swordfish (*Xiphias gladius*), striped marlin (*Tetrapturus audax*), Indo-Pacific sailfish (*Istiophorus platypterus*) and

albacore (*Thunnus alalunga*). Some shark species are caught and discarded by longliners and are not recorded: they include bigeye thresher shark (*Alopias superciliosus*) and blue shark (*Prionace glauca*). A significant bycatch of snake mackerel (*Gemplydae* spp.) has also been observed

Figure 5a. Purse seiners active, 1993/94.

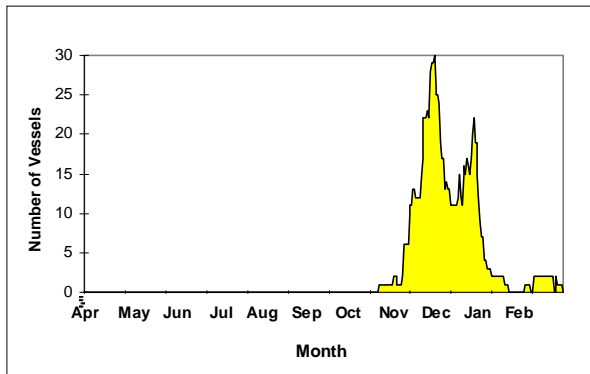


Figure 5b. Purse seiners active, 1994/95.

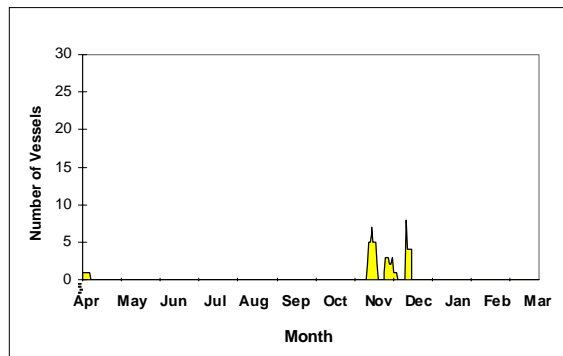


Figure 7a. Cumulative catch, 1993/94.

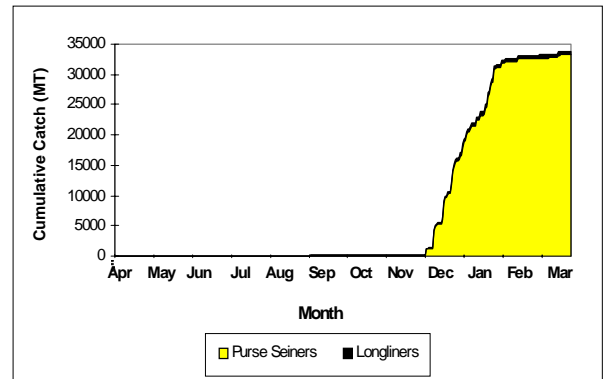
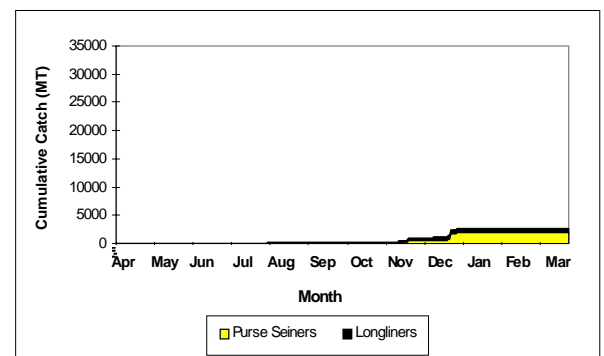


Figure 7b. Cumulative catch, 1994/95.



but is not recorded, often due to the fish falling off the hooks before they reach the vessel.

The difference in the two purse-seine catch compositions reflect the difference in the fishing methods employed by the Mauritian and European fleets. The European vessels tend to target large free-schooling yellowfin (82%) with a bycatch of skipjack (*Katsuwonus pelamis*) (17%) and bigeye (*T. obesus*). The Mauritian vessels tend to target skipjack and juvenile yellowfin and bigeye associated with logs, and their catch is 85% skipjack, 9% yellowfin and 6% bigeye.

VARIABILITY IN THE TUNA FISHERIES AROUND BIOT

The tuna stocks exploited in the FCMZ are highly migratory. Studies of yellowfin tuna indicate that catch variability in the FCMZ may be complicated further by the existence of two stocks. One is thought to exist in the western Indian Ocean and another in the eastern Indian Ocean, with the FCMZ lying in the overlap of the two stocks. The western stock exploited by the European purse-seine fleet is thought to migrate in a clockwise pattern around the western Indian Ocean. The BIOT zone is at the easternmost limit of this putative pattern, the fish being most abundant in the area between November and February.

The cause of the fluctuations in the fishery around BIOT is uncertain, but it is likely that oceanographic conditions play a large part. For instance, the sea-surface temperature during 1994-1995 was significantly higher than in the previous year. Tuna tend to be found in waters within a certain temperature range (approximately 27-28°C), which directly affects their availability for capture. If the water temperature at the surface is above this range the tuna tend to swim below the surface, where they are not available to purse-seine gear. There is also a possible direct action of environmental fluctuations on the level of recruitment of juveniles into the exploitable stock. However, the nature of this relationship is extremely difficult to establish, partly because the reproduction and larval development of tunas takes place in offshore areas, away from the main focus of fishing activity.

The main period of purse-seine activity falls during the northeast monsoon period. In the 1993-1994 season the Chagos Archipelago was heavily influenced by the eastward-flowing Equatorial Counter-Current, reported to be flowing at over 3 knots (Anderson, 1995). One possible effect of this was to create an area of divergence between that current and the South Equatorial Current to the south. Areas of divergence such as this create upwelling of cool, nutrient-rich water, which can increase the local productivity.

Figure 8a. Catch composition of Taiwanese longliners, 1993/94.

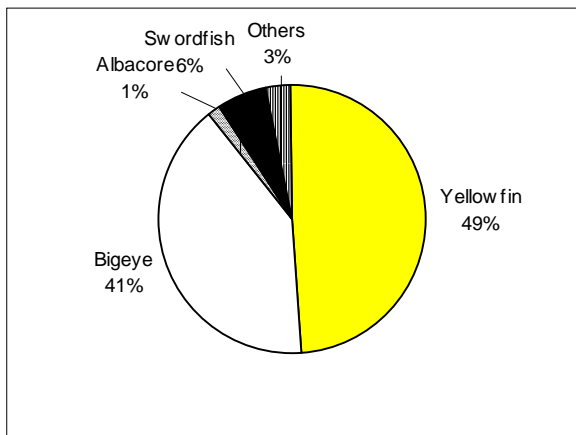


Figure 8b. Catch composition of Taiwanese longliners, 1994/95.

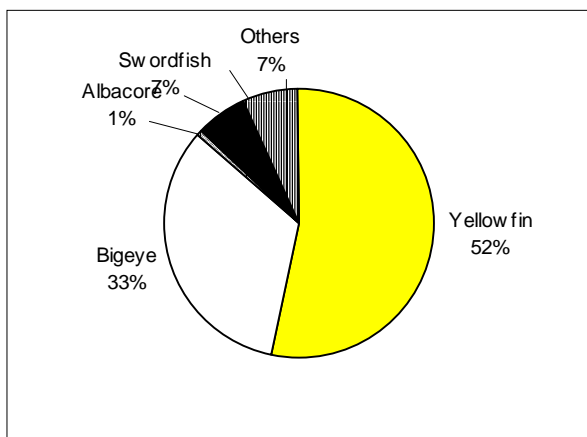


Figure 9a. Catch composition of European purse seiners, 1993/94.

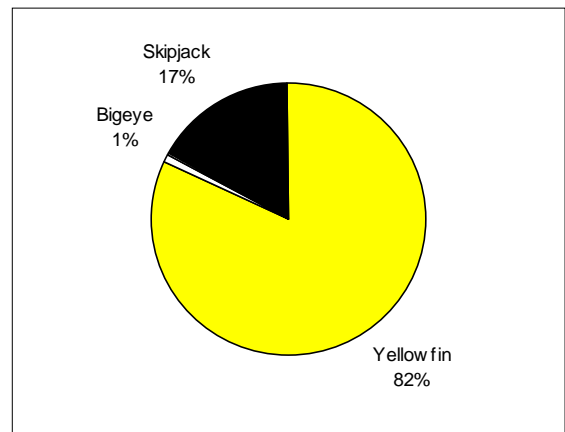
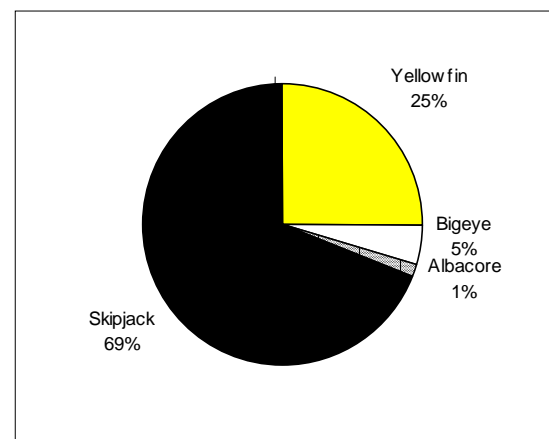


Figure 9b. Catch composition of European purse seiners, 1994/95.



Another possible effect of this upwelling of cool water is to reduce the depth of the thermocline, effectively forcing the deep-swimming tunas into the surface waters, thereby increasing their availability to the purse-seine fleet. It should be noted that the average size of the yellowfin caught in the 1993-1994 fishing season was around 50 kg, which is similar to that of the individuals caught by the longliners targeting deep-swimming tuna (Anderson, 1995; Beeching & Essen, 1994).

FUTURE WORK

The information presented in this review has been collected through a comprehensive data-reporting system and a fisheries observer programme. Observers will continue to be placed aboard both longline and purse-seine vessels

during the main periods of fishing activity. Data will be collected on the catches, effort and fishing patterns of both types of fishing vessel. The data from the observer programmes will hopefully lead to an understanding of the fluctuations in the tuna fishery around the Chagos Archipelago.

ACKNOWLEDGEMENTS

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Figure 10a. Catch composition of Mauritian purse seiners, 1993/94.

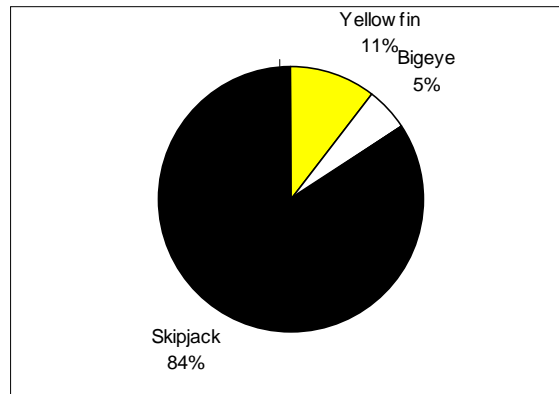
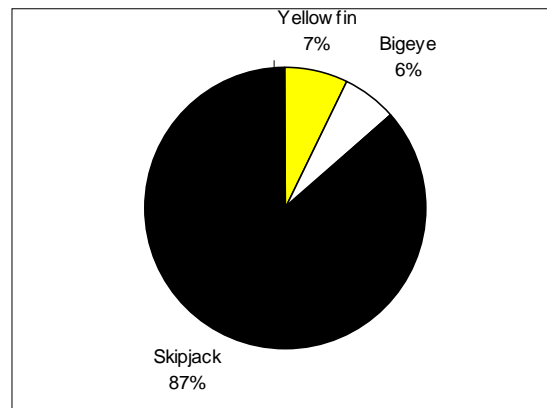


Figure 10b. Catch composition of Mauritian purse seiners, 1994/95.



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