INCIDENTAL YELLOWFIN CATCH WITH SWORDFISH LONGLINE FISHERIES IN THE SEYCHELLES PRELIMINARY RESULTS OF AN EXPERIMENTAL LONGLINE FISHING PROGRAM

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ABSTRACT

The local pelagic longline fishery targeting swordfish started in the Seychelles in 1995. Actually 10 vessels are active. In June 2000 a two year research program was set up through partnership of SFA, IFREMER and the French cooperation in Seychelles. Since 2001, 9 longline trips corresponding to 77 sets were conducted with the SFA's research vessel; the longlines were equipped with hook timers and temperature/depth recorders which permitted to estimate the time, depth and the survival rate of the catch. The longlines were set after sunset and hauled after sun rise. Preliminary analysis of the yellowfin tuna data collected shows that most of the fish (were caught during the 4 hours following sunrise (6 to 9 am). Survival rate calculated for yellowfin was 51.2% and the survival period was 4 hours after the time of the catch. Sex ratio for 123 yellowfin tunas sampled was 1.42 (male/female); the mean length for the males was 112.8 cm and 111.35 cm for the females.

INTRODUCTION

The local pelagic longline fishery started in the Seychelles in 1995 with 2 vessels and further vessels were added from 1998, by 2001 there were 11 vessels working. The fishery was aimed mainly at swordfish *(Xyphias gladius*), which were iced or frozen to be sold locally or exported. Catch includes target species, non target species *(Thunnus albacares*, *Thunnus obesus*) and by catch which are generally discarded and not landed. In June 2000 a new scientific program was drawn up in the Seychelles and aimed at supporting the development of longline fishery in the West Indian Ocean. This program was set up through the partnership of three institutions : the Seychelles Fishing Authority (Seychelles), the French Institute for the exploitation of the sea (IFREMER, Reunion Island) and the French cooperation based in Seychelles.

This program was set up during experimental fishing campaigns on board of SFA's Research Vessel "Amitié". These preliminary results are a short summary of our data concerning Yellowfin tuna(*Thunnus albacare*s) incidental catches obtained from February 7, 2001 to April 22, 2002. During this period 9 missions were organised in the Seychelles' Economic Exclusive Zone (EEZ) corresponding to 77 longlines setting. The location of all the fishing operations is shown on figure 1.

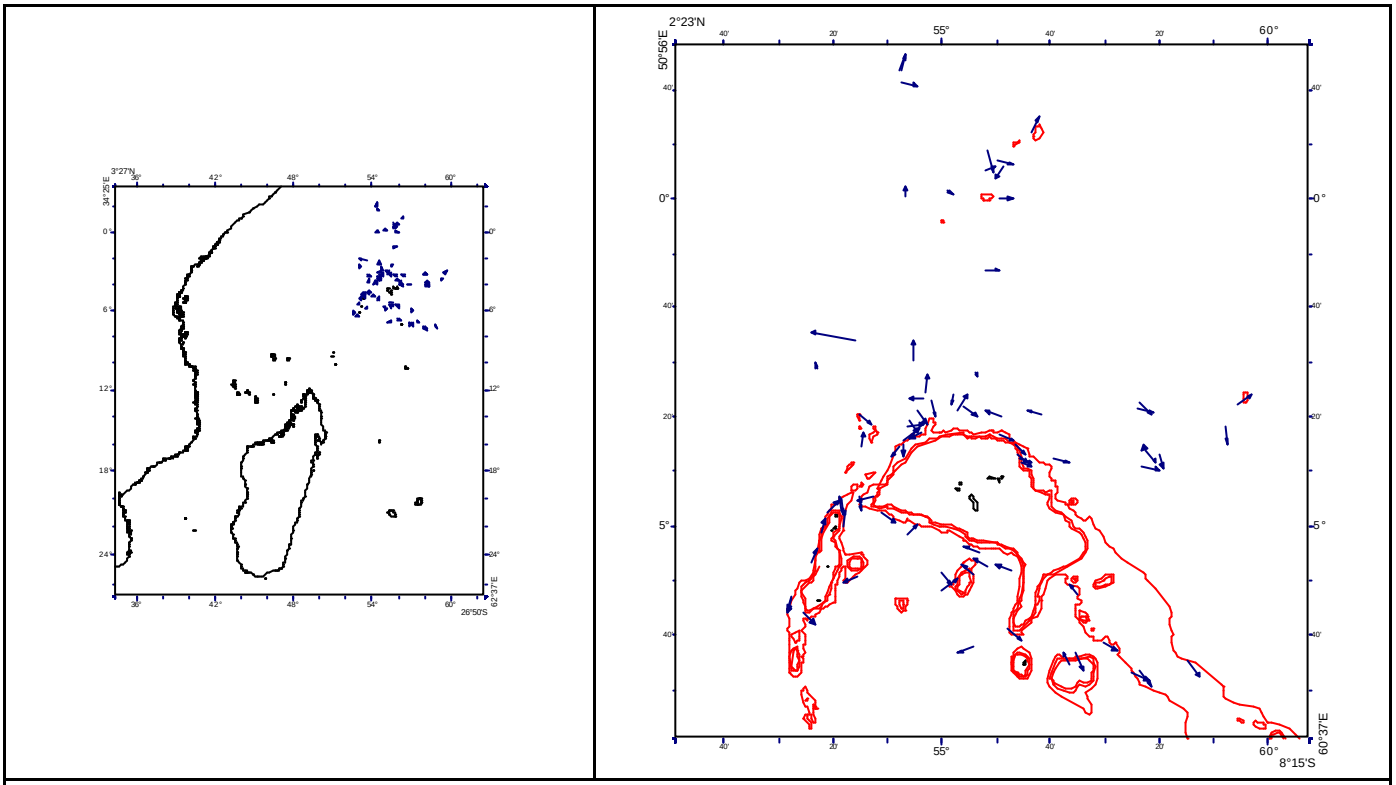


Figure 1: location of the 77 long lines used in the analysis. Each arrow represents the location and the direction of the long lines.

The fishing gear, a traditional longline (Berkeley et al.,1983) was made of polyamide monofilament (2.5 mm diameter) in the main line and 20 km long. It was equipped with 100 to 500 hooks (8/0, Tuna hook or "J" hook) snapped on the main line(gangion line was in polyamide monofilament 0.18 – 0.20 mm diameter). Each segment (or basket) included from 8 to 15 hooks (mean 9) 50 meters apart. Each segment was attached to the main line by 2 ropes (27 or 45 m) and maintained on the surface with buoys. gangion.

The targeted species was Swordfish *(Xyphias gladius*) and in order to maximise its catch (Kume & Joseph, 1969 ; Carey & Robinson, 1981 ; Carey, 1990) the line was generally set after the sunset and hauled after the sunrise. Nevertheless some longlines were set during the day for specific tuna fishing experiments. All hooks were baited with defrosted squid (200 – 300 g). Every 3 to 5 hooks green light sticks (Berkeley et al.,1983) were attached 3 m above the hook to increase the attraction of the bait.

Based on previous experimental longline programs (Boggs C.H., 1992 ; Bach et al., 1999 ; Poisson et Taquet, 2001) each main line was equipped with 100 to 300 hook timers (HT) and 0 to 4 temperature/depth recorders to collect or estimate: the time of the catch, the survival rate, the depth of the catch and the relationships with environmental parameters. The total fishing effort is 8078 hooks including 3191 equipped with hook timers (39.5%). The fishing effort for the hooks equipped with a timer is presented on figure 2.

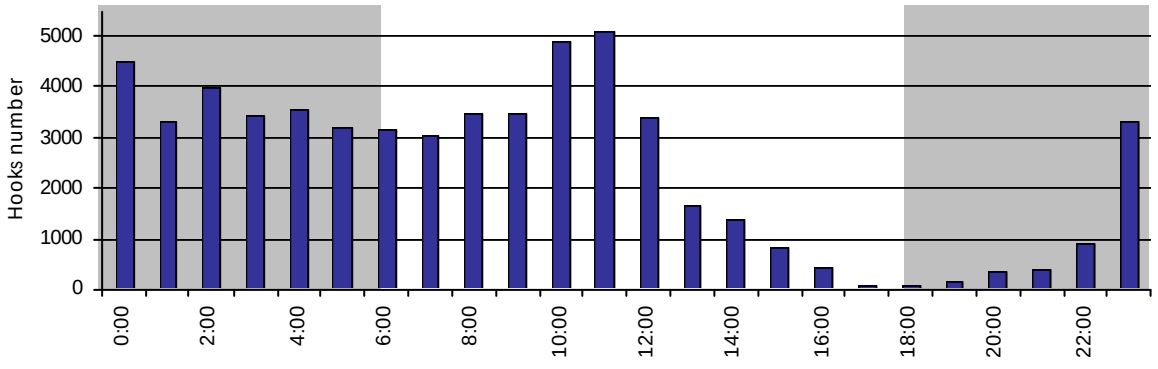


Figure 2: fishing effort in hooks according to the time of the day for hooks equipped with an hook timer (n=3191) used on the 77 longlines between February 2001 and April 2002 around Seychelles' islands. Dark areas represent night period.

Swordfish is the principal species caught (table 1) with 390 other fishes (59%) and yellowfin tuna represents 24.4% of the total commercial catch. These results are similar to the ones obtained at La Reunion (French department, Indian Ocean) with 46.5% for swordfish and 10.3 % for big eye tuna except for yellowfin tuna that represents 7.8% of the long line catch at La Reunion (Poisson F. and Taquet M., 2001). This could be the consequences of several factors as: repartition of a significant fishing effort after the sunset, oceanographic regional pattern (Longhurst A.,1998) and tuna behaviour within the environment (Holland et al., 1990 ; Marsac et al.,1996 and Dagorn et al., 1999).

Table 1: commercial catch for the 77 long lines and relative proportion for each species.

Species	Number of catch	Percentage	Catch rate (number of fish.1000 hooks)
Xiphias gladius	390	59.0 %	48
Thunnus albacares	161	24.4 %	20
Thunnus obesus	65	9.8 %	8
Other commercial species	45	*6.8 %*	6

A total of 64 yellowfins were caught on lines equipped with hook timers and a primary analysis shows that most tuna were fished during the 4 hours following the sunrise (figure 3). To avoid bias due to the fishing effort (un-constant repartition according to the time of the day, figure 2), the number of catch by hour has been divided by fishing effort (in hooks by hour).

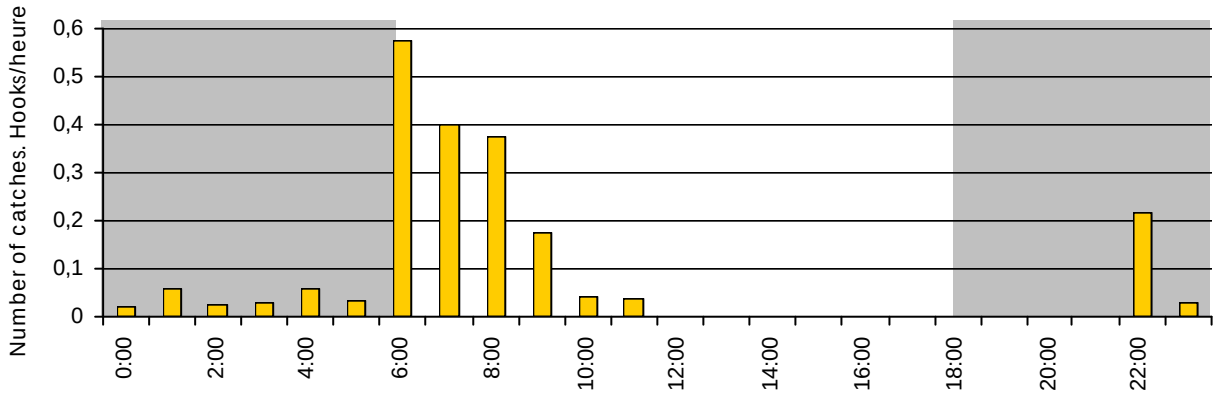


Figure 3: number of yellowfins caught by unit of fishing effort for the 3191 equipped with hook timers used on the 77 longlines between February 2001 and April 2002 around Seychelles' islands. Dark areas represent night period.

These results are different from those obtained at la Reunion where the efficiency did not vary between 0:00 and 10:00 AM, and most important, during the first part of the night with a clear peak of efficiency at around 8:00 PM. The survival rate of the yellowfin tuna calculated from the several campaigns is 51.2% (table 2, figure 4) and depends on the time of catch (after the sunrise) i.e. the main period where the line is hauled.

Table 2: Survival rate obtained from several long line studies for yellowfin tuna.

Species	Number of fish	Number of fish alive	Survival rate
Seychelles *(SFA)*	121	62	51.2%
Reunion *(Poisson F., Taquet M., 2001)*	66	23	34.8 %
French Polynesia *(Bach et al. 1999)*	176	-	55 %
Hawaii *(Boggs, 1992)*	-	-	63 %

The maximum survival period is four hours (figure 4) after the time of catch, nevertheless some yellowfin tuna caught during the night were still alive after more than nine hours.

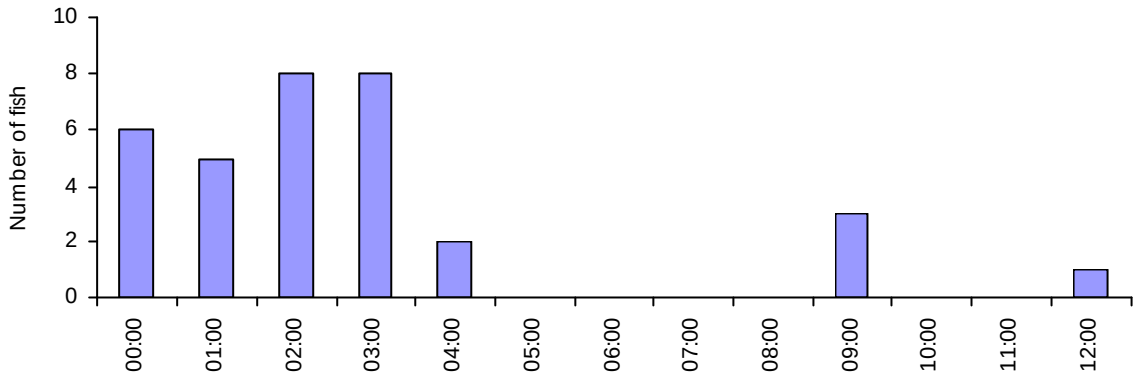
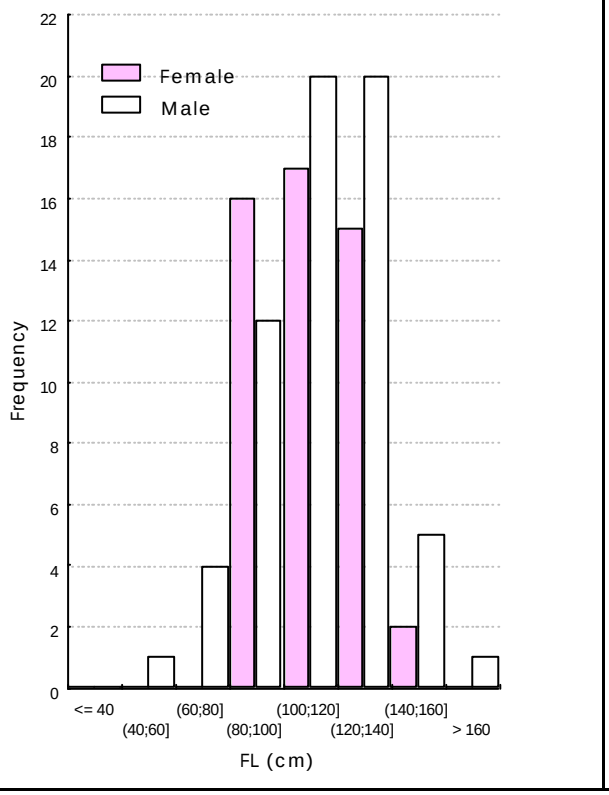


Figure 4: survival period for Yellowfin obtained in the experiment (n=33).

A total of 123 tunas were sampled on board for some biological measurements such as sex determination, age and weight estimation. The sex ration was 1.42 (Male/Female), the length (forks length) mean for male was 112.81 cm (1SD: 22.39 / median: 109) and 111.35 cm for female (1SD: 15.25 / median: 106.15). Biometric features are presented in table 3, figure 5, 6, 7.



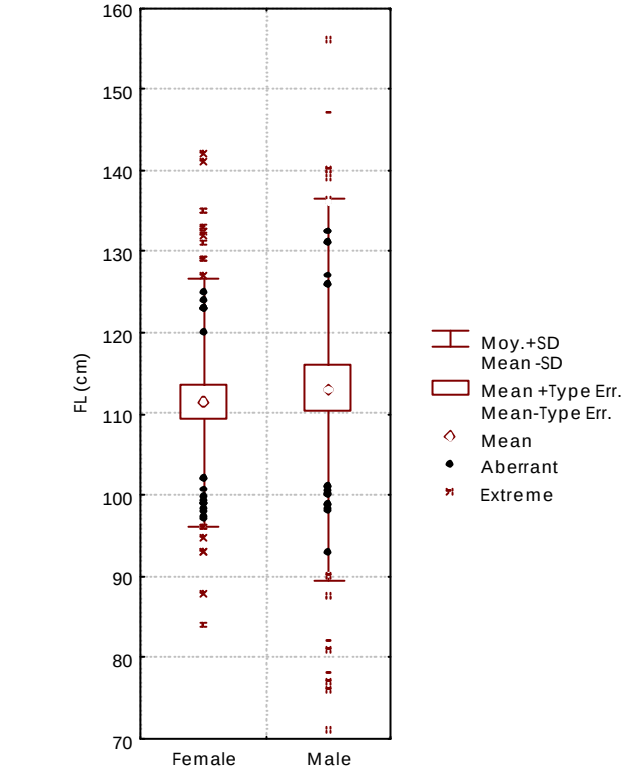


Figure 5 (right) and 6 (left) : size distribution for the 121 yellowfin tunas caught during the campaigns and dispersion data. No statistical difference between male and female length was measured.

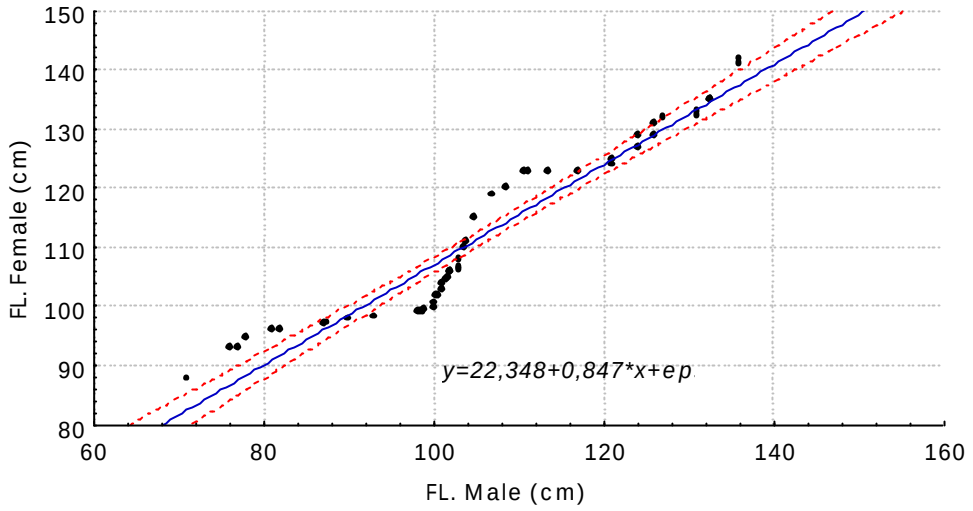


Figure 7: correlation between male and female length for 121 yellowfin tunas sampled during the campaigns (r^2: 0,91843909, t Student: 23,0055749, $p<0.01$). Full line: FL female = a(FL Male) + b; dotted line: interval of confidence at 0.05 %.

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