

COUNTRY REPORT REUNION SWORDFISH FISHERY (FRANCE)

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The Indian Ocean swordfish longline fishery based in Réunion Island started operating in 1991. Since July 1998, Ifremer has been compiling information on domestic longline fishery operating in the French EEZ. Data are collected from logbooks, from regular at-sea and landing samplings and from on-board scientists. Two of the main aims of this programme (PPR), financed by the European Union and Reunion Local Councils, are to follow the Reunion Swordfish activity and to provide data to IOTC in order to help the management of this fishery and the sustainability of the pelagic marine resources in the southwest Indian Ocean.

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INTRODUCTION

The domestic swordfish (*Xiphias gladius*) longline fishery started in 1991. Two main factors promoted the development of this fishery : (1) the success of the Asian fleet based on the island that inspired a local fisherman to begin longline trials on a 12-meter boat ; (2) a new tax regulation, offering exemption for certain investments in French overseas departments, which encouraged fishing companies to come to Reunion. Four 16-meter longliners based at the «Pointe des Galets » harbour started operating in 1992, initially targeting bigeye tuna, destined for the Japanese market. Information on the success of the fishery rapidly spread. Significant changes in various aspects of the fishery have since been recorded. Boat and gear characteristics, fishing techniques, fishing grounds and seasonal activity, target species, as well as markets have evolved.

Swordfish biology in the Indian Ocean is poorly known and no stock assessment has been performed for swordfish in this area. Since July 1998, Ifremer has been collecting scientific data from voluntary maintenance of logbooks, thanks to regular at-sea and landing samplings, as well as on-board observers. This data collection system is designed to provide information on the different methods of processing swordfish, catches and by-catch, size composition of catches, fishing effort, CPUE, depredation of marine mammals on catches and swordfish biology. All these actions will take part in the «Programme Palangre Réunion » (PPR), an Ifremer programme financed by the European Union and Reunion local Councils. We are in the first phase of this three year program and are still collecting data. All data treatments are not yet completed. The aim of this paper is to provide some signs concerning the situation of the Reunion Swordfish fishery.

French fisheries Administration data base

Responsibility for collecting data on Reunion fisheries for the FAO data base lies with the local fisheries office (DDAM). Every fishing company is requested to provide landing per species at the end of a fishing trip. The number of fishing crafts involved in the different fisheries are recorded by category and gear used. Thus, accurate figures on annual nominal catch by species and gear, annual fishing craft statistics by gear, type and size class of boats are available. The data received are entered into the data base (Access software ®).

Logbook format and IFREMER data base

The Ifremer laboratory in Reunion Island is in charge of the scientific monitoring of the fisheries. A logbook monitoring system has been implemented in association with longlining fishermen. Logbooks provide information on fishing effort expended daily, resulting catches by species, discards and vessel operations. These logbooks are regularly collected from the skippers and company

managers. The whole data, including biology, are computerised and stored in an integrated data base (Access software ®)

We use data from the two on-going data collection programs in our analyses. Logbook data are cross-checked against the landing receipts, and corrections are made when necessary. This system provides basic confirmation of the information received.

Samplings

Landing Sampling

Most of the vessels unload their catch in the «Pointe des Galets » harbour. According to an interview with the captain, the small swordfish which are discarded and destined to «crew share», are measured in the ship's hold.

Thus, we collect length measurements (PAL or/and CKL) and dressed weights (VDK or VAT) from as many individuals as possible during the unloading process. There is no standardised procedure for selecting the number of swordfish to be measured, and it is usually a question of accessibility during processing. When the boats return to port, the fish have lost their identity in terms of time, date and location of catch.

Biological sampling at sea

During campaigns onboard commercial longliners, scientists record length measurements of all swordfish caught. They also determine the sex, collect gonads and the anal fin

As daily catch is rather small, and in order to implement our data set, some captains we are used to working with have been trained to measure and sex swordfish. Up to now, 3 captains have agreed to participate in this operation. This is done during the fishing operation, and if they do not have the possibility to measure every swordfish individual, fish are sampled randomly, regardless of size.

SWORDFISH LONGLINE FISHERY

Fishing gears and methods

All the Reunion vessels use a system of drifting longline utilising a main spool. The main line is a monofilament composed of nylon 3.5 or 4 mm in diameter. It is stored on a large Hydraulic-powered reel, each storing between 20 and 80 km of main line.

The lines with hooks (size 8/0 or 9/0) are 10 fathoms long and 2 mm in diameter. These are attached to the mainline with snaps. The depth of fishing is controlled by branch line and float line lengths, distance between buoys, number of hooks between two floats and speed of the boat during the setting. Weights can also be added to control the line depth in strong currents. In addition a larger float is used to separate the various sections composed of 60 to 100 hooks. Between 300 and 2500 hooks are utilised during each set.

The buoys at the end of the longline are equipped with a strobe light and a radio assistance system in retrieval. So longlines can be rigged many ways.

Because swordfish is the target species, the longline is always set in the evening. Kume and Joseph (1969) have shown that lines set at night are more productive for capturing swordfish than lines sets during the day. Squid is used as bait in addition to a light stick placed one meter above the hook. Light sticks increase efficiency in catching

swordfish either by attracting swordfish prey or swordfish itself (Berkeley *et al.*, 1981). The longliners set about 6-10 hooks between floats and attach generally one light stick for every 3 branch lines. This whole operation requires three crewmen on deck for baiting the hooks and clipping buoys and branch lines on the mainline and one at the helm. The longline is set in 3 to 6 hours cruising down wind. The line is hauled after sunrise. The duration of the haul depends on the catch and sea conditions.

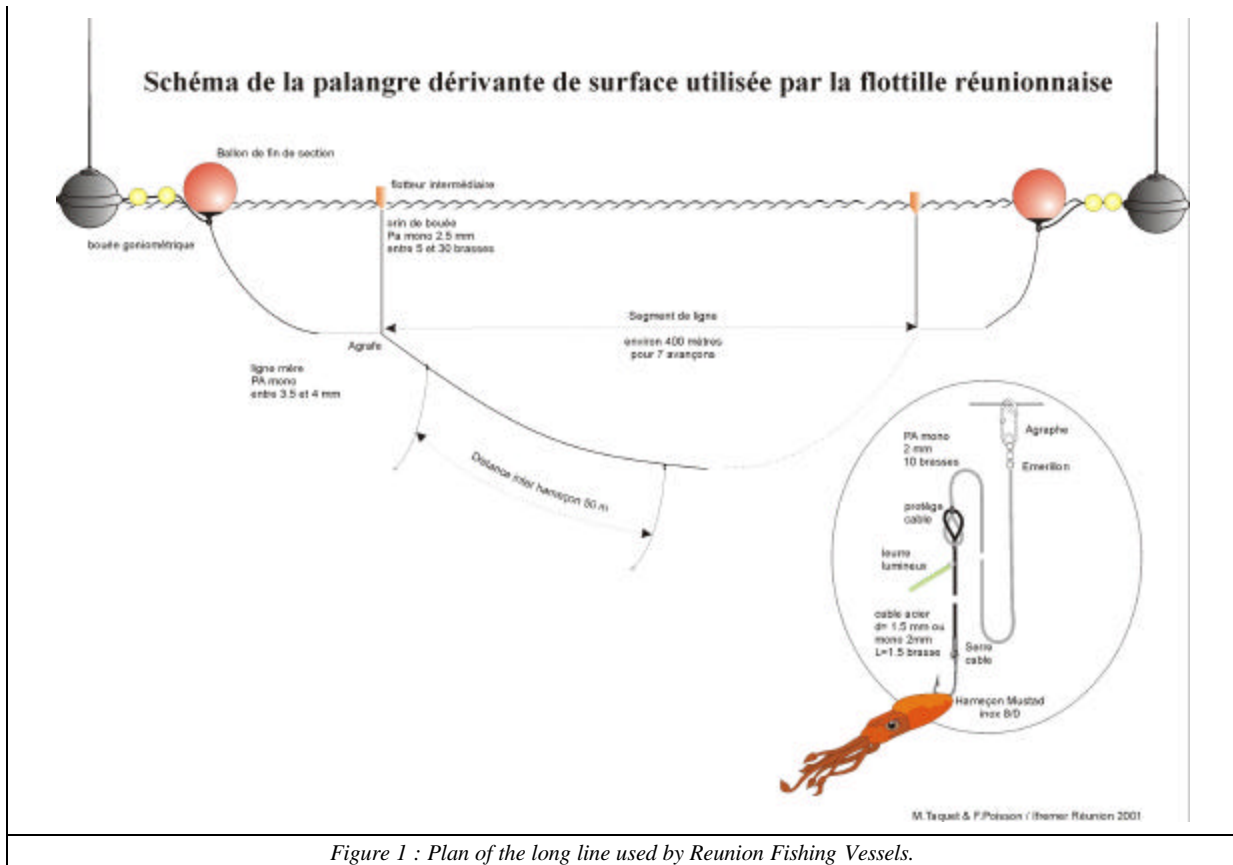


Figure 1 : Plan of the long line used by Reunion Fishing Vessels.

Domestic fleet

The rapid development of the domestic swordfish longline fishery has been widely described (Poisson *et al.*, 1998 ; Poisson et René, 1999). We have categorised vessels into two classes of overall length (1) less than 16 meters (small or medium boat class) (2) and over 16 meters (large boat class). The number of days at sea varies according to vessel size and capacity and weather conditions. The smallest boats stay at sea 2 or 3 days, whilst vessels from the medium class stay 6 to 8 days and the greater up to 30 days.

Effort

The effort of the fleet is represented by the yearly estimated number of hooks set by the two segments of the fleet. Since 1991 effort has been steadily increasing except in 1997. The contribution of the largest vessels to the fishing effort decreased slowly especially from 1999. Thus for the first time, in 1999, the number of hooks set by the first segment overtook the number of hooks set by the largest vessels.

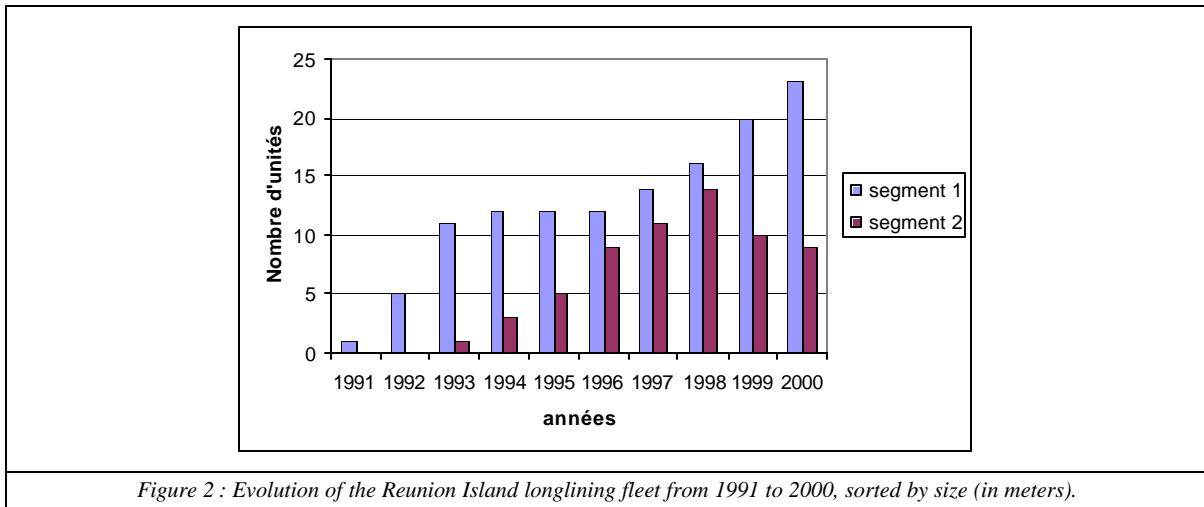


Figure 2 : Evolution of the Reunion Island longlining fleet from 1991 to 2000, sorted by size (in meters).

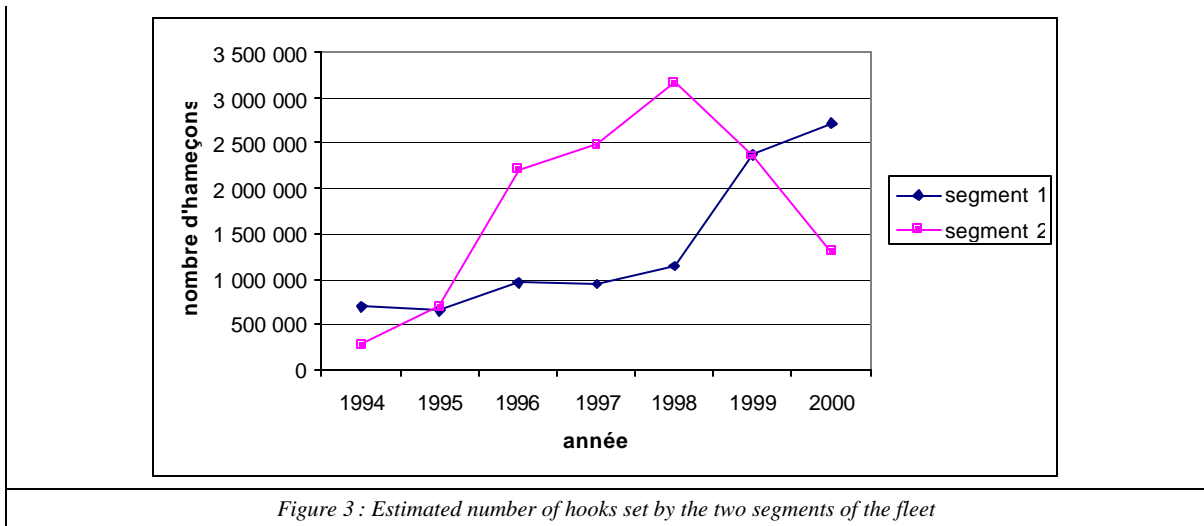


Figure 3 : Estimated number of hooks set by the two segments of the fleet

Catches

The longline catch of swordfish was 278 mt in 1991, increased to a high of 2076 mt in 1998 and decreased to an estimated 1741 t in 2000 (Tableau I). The swordfish component of total longline landings (by weight) ranged from 54% in 1993 to 71 % in 1994, and averaged 66 % over the 8 year-period. Albacore tuna (12 %), yellowfin tuna (11 %) and bigeye tuna (3 %) contributed about 26% of the total catch of the pelagic fish

during the same period. The percentage contribution by billfish and sharks were respectively 4 and 2 %. The NCAD category is mostly composed of dolphin fish (*Coryphaena hippurus*).

Tableau I : Estimates of the global nominal catch by species are calculated from the DDAM data base.

Année	SWO	ALB	YFT	BET	MAR	NCAD	SFA	SHK	TOTAL
1993	278	94	86	3	31	8	2	12	2507
1994	729	132	93	4	34	10	2	10	3008
1995	767	115	118	9	50	11	2	12	3079
1996	1331	294	212	93	77	20	3	24	4050
1997	1557	244	240	87	65	78	4	64	4336
1998	2076	271	360	108	104	54	11	89	5071
1999	1926	304	236	210	79	100	12	66	4932
2000	1741	502	312	162	85	81	24	58	4965

The first segment has steadily increased and reaches the same level in 1999 (Figure 4).

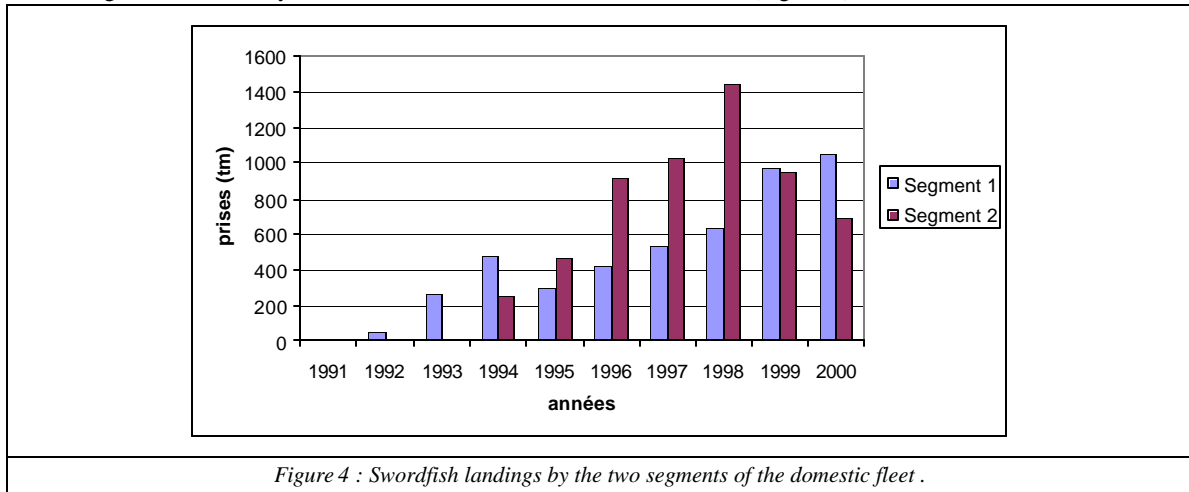


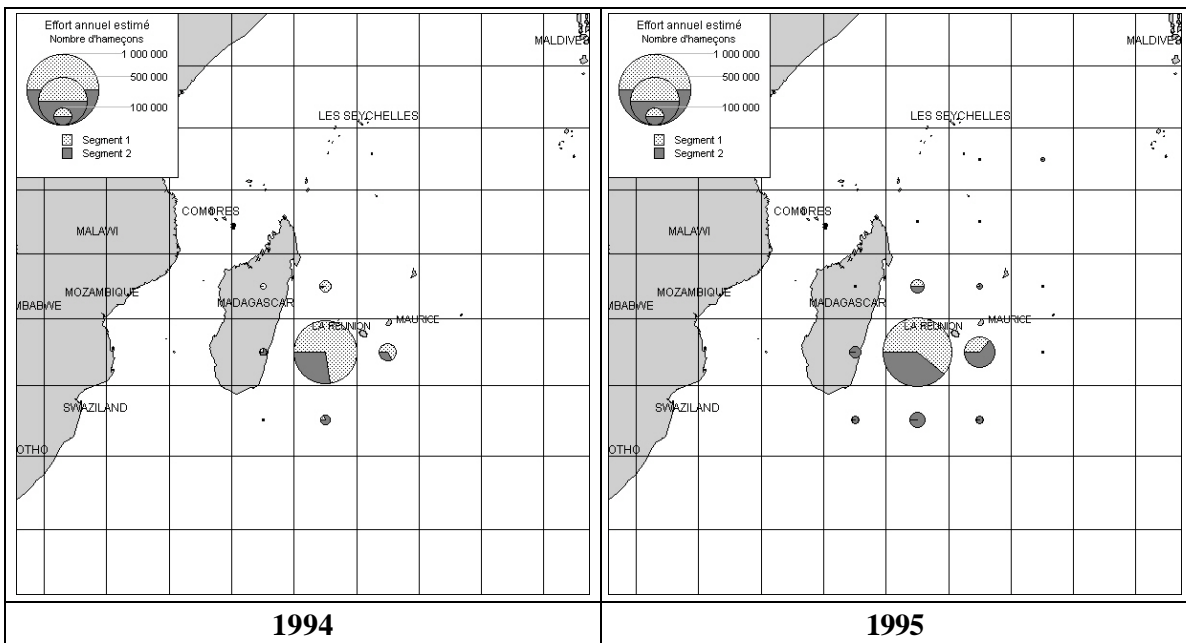
Figure 4 : Swordfish landings by the two segments of the domestic fleet .

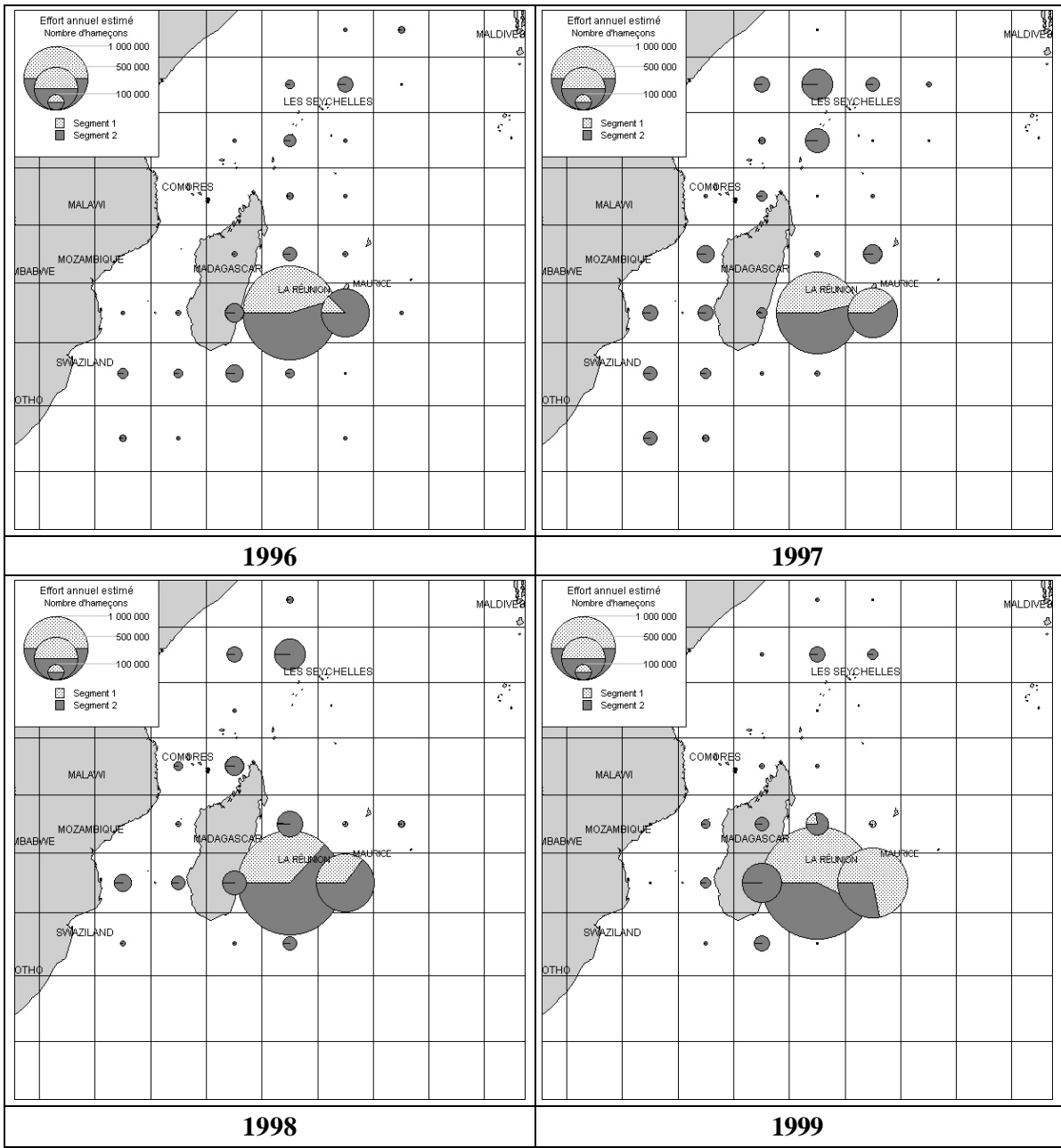
Precise data on the effort and catches are not available for the entire domestic fleet, so the effort and catch data were adjusted upward with a monthly segment coverage rate. The following maps show the estimated yearly swordfish catch by five-degree square from 1995 to 2000. The size of the circle is proportional to the catch in that square (root scale).

No longliners are authorised to fish within a zone of 12 nautical miles from Reunion in order to avoid conflicts with the artisanal tuna fishery (Tessier et Poisson, 2000).

The fishing grounds of the Reunion longliners are located to the West and South of Reunion in the French EEZ and in international waters. The arrival of more powerful vessels, a mastership and an improvement of techniques as well as

the discovery of new zones of exploitation, have brought notable changes to fishing strategies after 1994. This is illustrated by Figure 5 that shows the progressive spatial extension of the activity. A catch zone westward of the island in 1993, evolves to a SW zone in 1994. This trend continued with an extension to the Southwest in the 200 nautical mile zone, in the Mozambique channel and Seychelles waters. But the maximum catches are made every year in a zone close to the island (between 30 and 60 nautical miles in the West and the Southwest). Thanks to the shift of the fleet's configuration, catches in 2000 are therefore made mainly around Reunion island between 50 E and 60 E and 20 S and 25 S. Only a few vessels can venture as far as these zones.





1996

1997

1998

1999

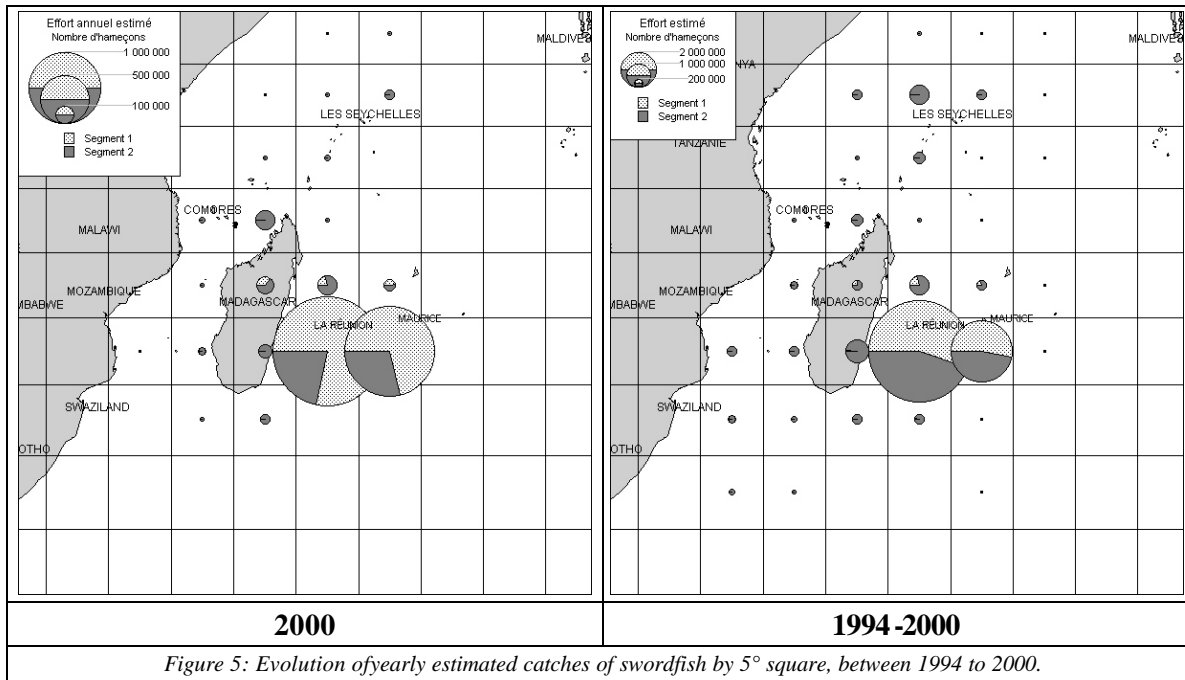


Figure 5: Evolution of yearly estimated catches of swordfish by 5° square, between 1994 to 2000.

The transition to an all year round operation is now established, but the climatic hazards must be taken into consideration, as they can stop the vessels putting to sea and modify the catch possibilities. Thus, the very active cyclone season of 1995, with its 14 cyclones and associated storms, limited the Reunion fleet expeditions and explains the stagnation of the catches in 1995 over three to four months. The period of the most intensive activity corresponds to the Southern Hemisphere summer.

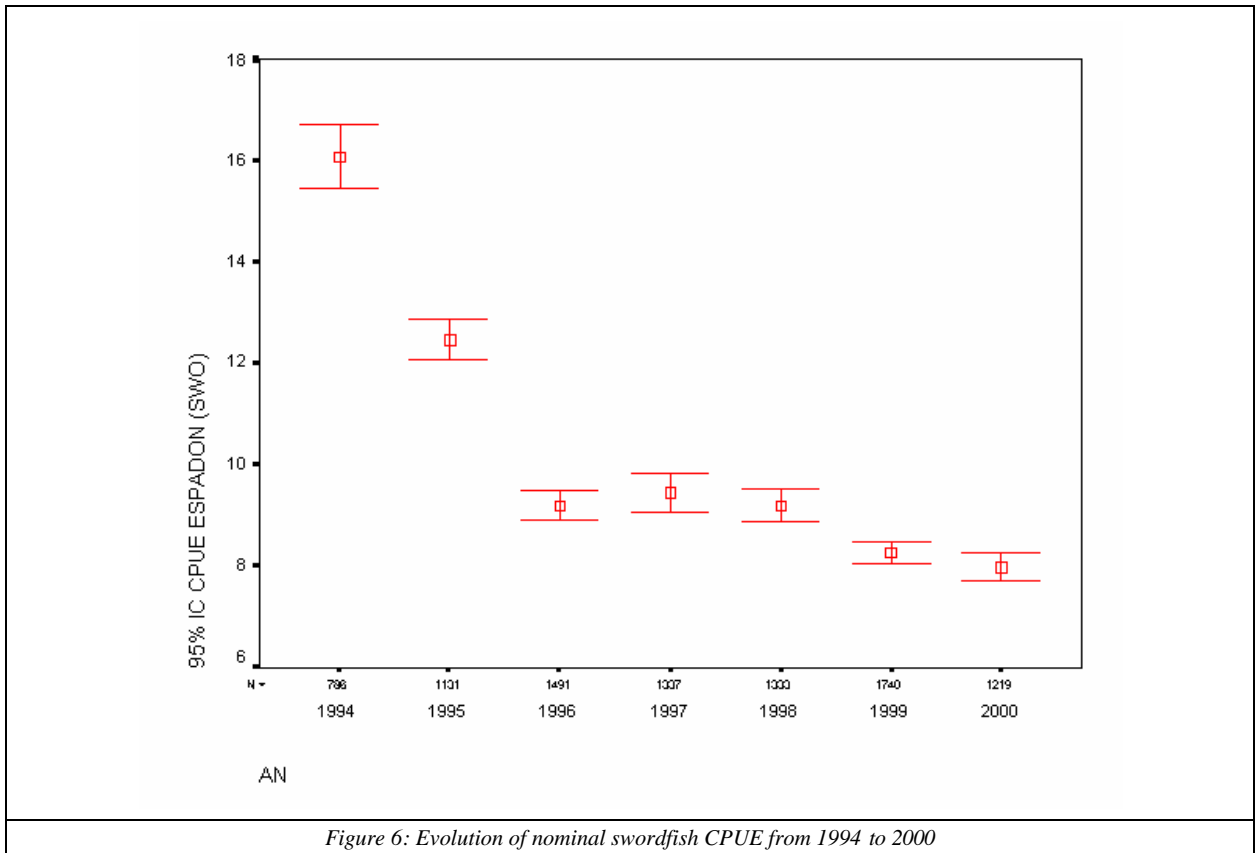
Catch occurs mainly at the end of the year. The violent trade winds that characterise the southern winter (June to August) could limit the activity of the smallest boats of the domestic fleet which prefer to careen during this period.

Other billfish

Swordfish is by far the most dominant component of billfish catch. Marlins (*Makaira mazara* and *Makaira indica*) catch peaked at 104 mt in 1998 and dropped to .. mt in 2000. Catch of sailfish (*Istiophorus platypterus*) and short-billed-spearfish (*Tetrapterus angustirostris*) is very low compared to that of marlins.

Catch -per-Unit of effort

Figure 6 shows the evolution of the monthly swordfish CPUE for the total fleet between 1994 and 1999. The most prominent change in CPUE (number of fish caught per 1 000 hooks) is a significant decrease (down to 8-9 individuals) after 1994.



Other billfish

After a sharp decrease from 1995 to 1996, the nominal yearly marlins CPUE appears to be quite stable around 0.3 fish per 1000 hooks. Short-billed spearfish and sailfish CPUE remain, for the most part, around 0.1 fish per 1000 hooks.

SIZE OF FISH

At least 2600 fish are measured a year. Swordfish caught by the longline fishery are within a range of 17-116 cm PAL (LJFL: 63-321 cm). Figure 7 shows the yearly swordfish length frequency (PAL) distribution from 1994 to 2000. The size class is generally expressed in 1 cm intervals of pectoral-anal length.

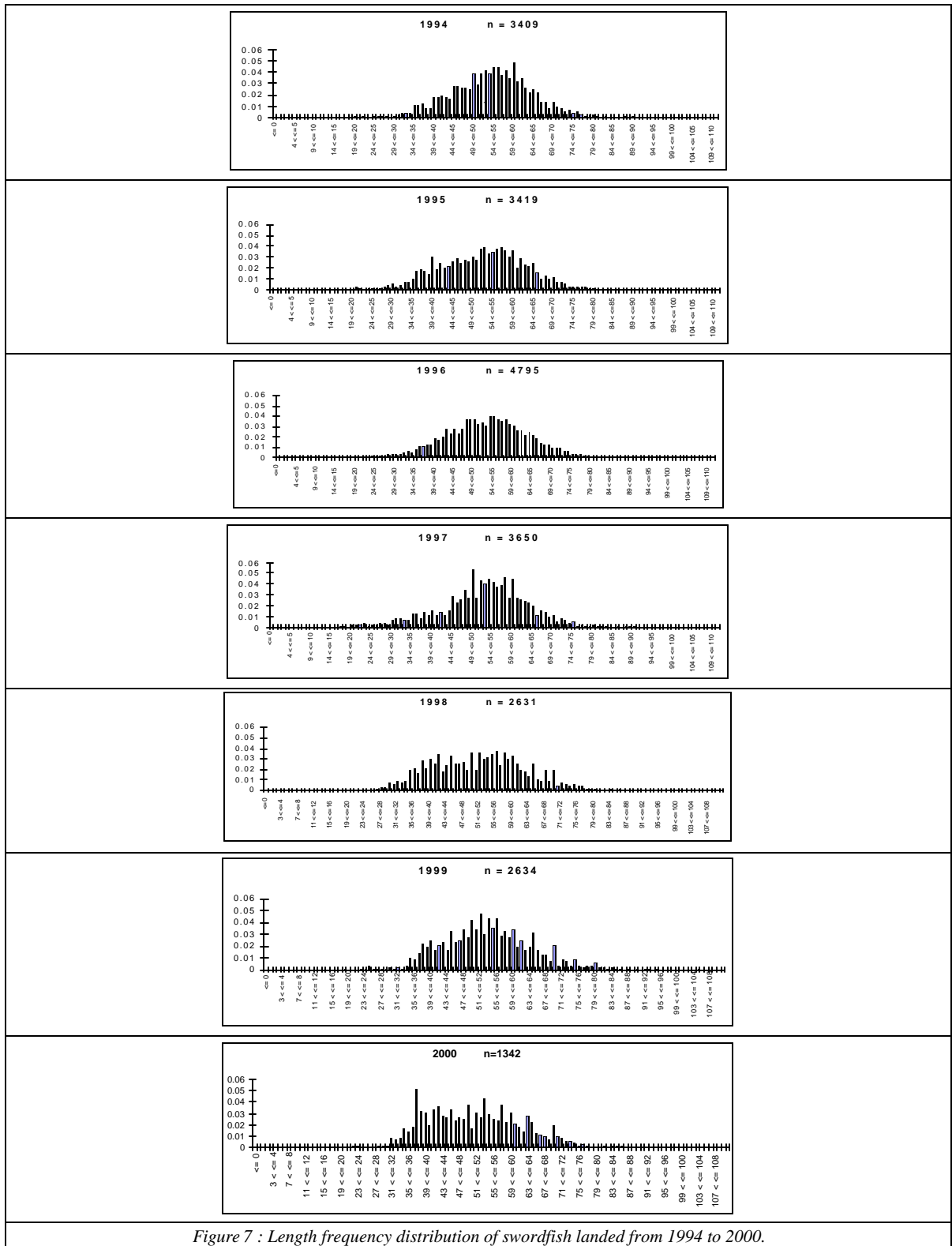


Figure 7 : Length frequency distribution of swordfish landed from 1994 to 2000.

CONCLUSION

As the swordfish longline fishery increases in Reunion the Ifremer laboratory has decided to make an effort to monitor the new fishery and collect relevant data for stock

assessment. All the data on longline catch effort and swordfish biology used in this on-going study were obtained from records of scientific campaigns onboard domestic longliners. It is clear that cooperation among interested nations is required. Seychelles Fishing Authority,

Ifremer and IRD have been collaborating in the preparation of a common "Scientific accompaniment program on the longline fishery targeting swordfish in Southwestern Indian Ocean".

ACKNOWLEDGEMENTS

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