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Up-date of the La Réunion longline and coastal fisheries data with special focus on billfishes

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NOTE: Longline fishery data set provided by La Réunion to IOTC in 2008 is not exhaustive: not all the 2008 logbooks were provided by fisherman to the Affaires Maritimes. The data set considered here only used the logbooks provided until Mai 2008. In order to estimate the lack of data, we compared the catch weight from the returned logbooks and used to sale the fishes (not complete data set, but real weight) and the catch weight landed (complete data set, real weight): logbooks analysed here only represent 65% of the total catch landed in 2008, meaning that at least a third of the logbooks were not yet returned.

Based on that, CPUE and effort presented here are calculated only on the logbook data that comprises 65% of the total catches.

LA REUNION LONGLINE FISHERY: GLOBAL EVOLUTION IN THE INDIAN OCEAN

1. The longliner fleet: number of boat, size, target species and geographic fishing locations

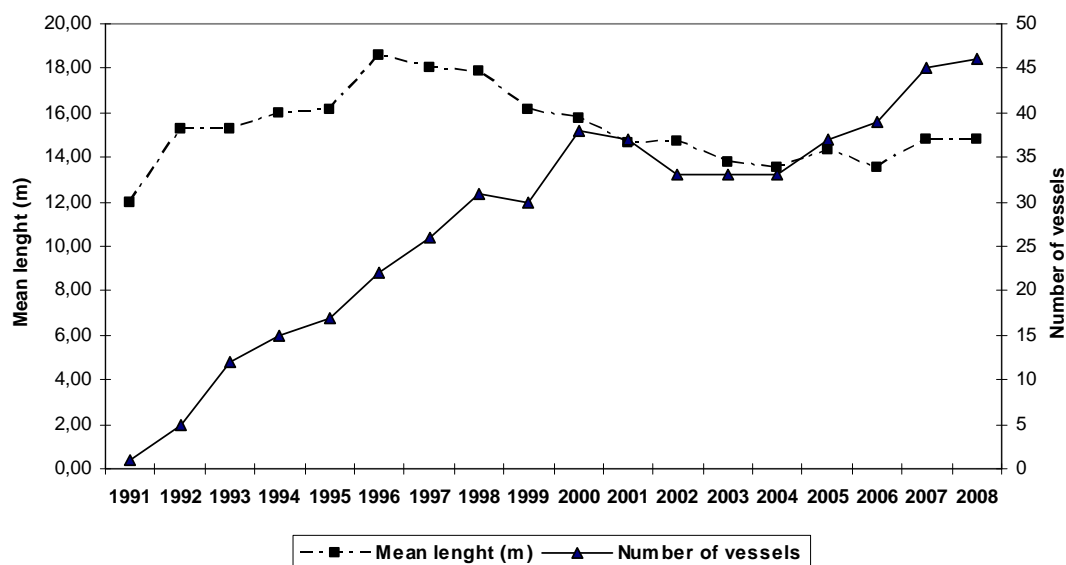


Figure 1: Evolution of the number of longliners and their mean size from 1991 to 2008 (Source : SIH IFREMER)

COMMENTS:

No significant changes from 2007 and no new fishing units arrived in the fleet.

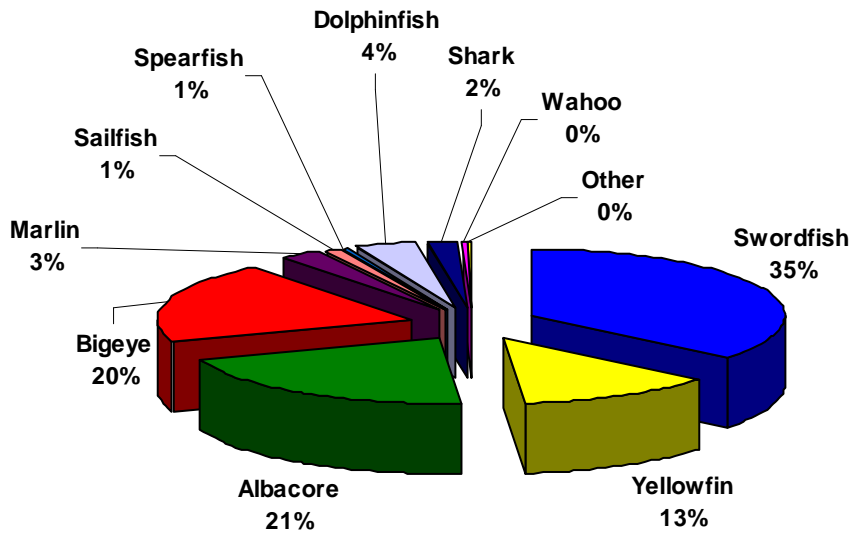


Figure 2: large pelagic species composition in longliners catches in 2008
(Sources: SIH IFREMER)

COMMENTS:

No significant changes in the species composition from 2007 data. The only difference remains to lower catches of Yellowfin (17% (2007) to 13% (2008)) and the equivalent increase in the swordfish catches (31 to 35%).

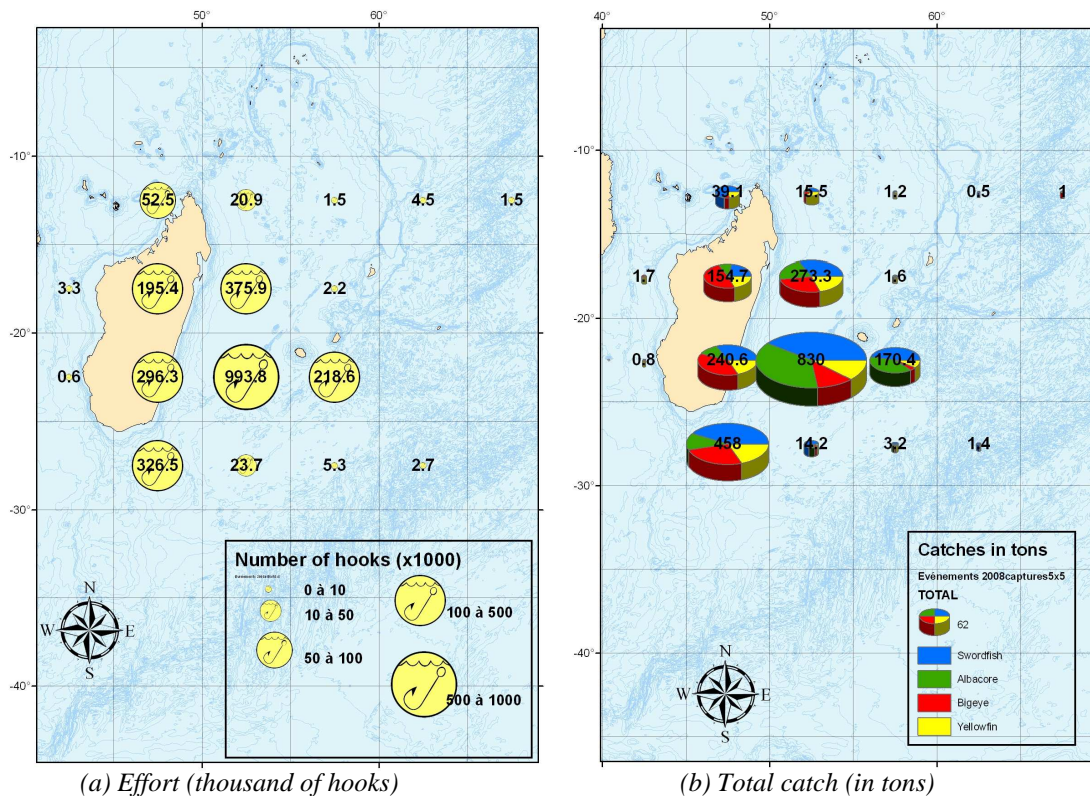


Figure 3: Effort and total catch in La Réunion longline fishery in 2007
(Sources: SIH IFREMER)

COMMENTS:

There is no significant change in fishing location. Because of low catch rates in the East of La Reunion during the winter time, Longliners tend to increase their effort in the North-West, West and South-West of La Réunion compared to 2007.

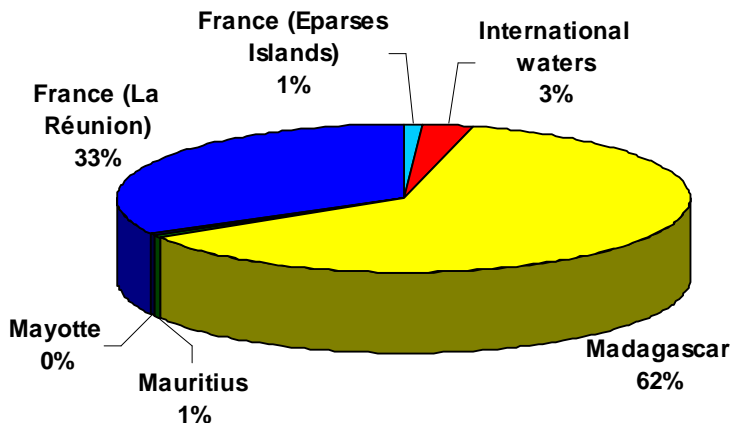


Figure 4: Location of total La Réunion longline fishery catches according to regional countries EEZ in 2008 (Sources: SIH IFREMER)

COMMENTS:

French longliners are still fishing a lot in the EEZ of Madagascar using licences

2. Evolution of effort, Global catches and CPUE

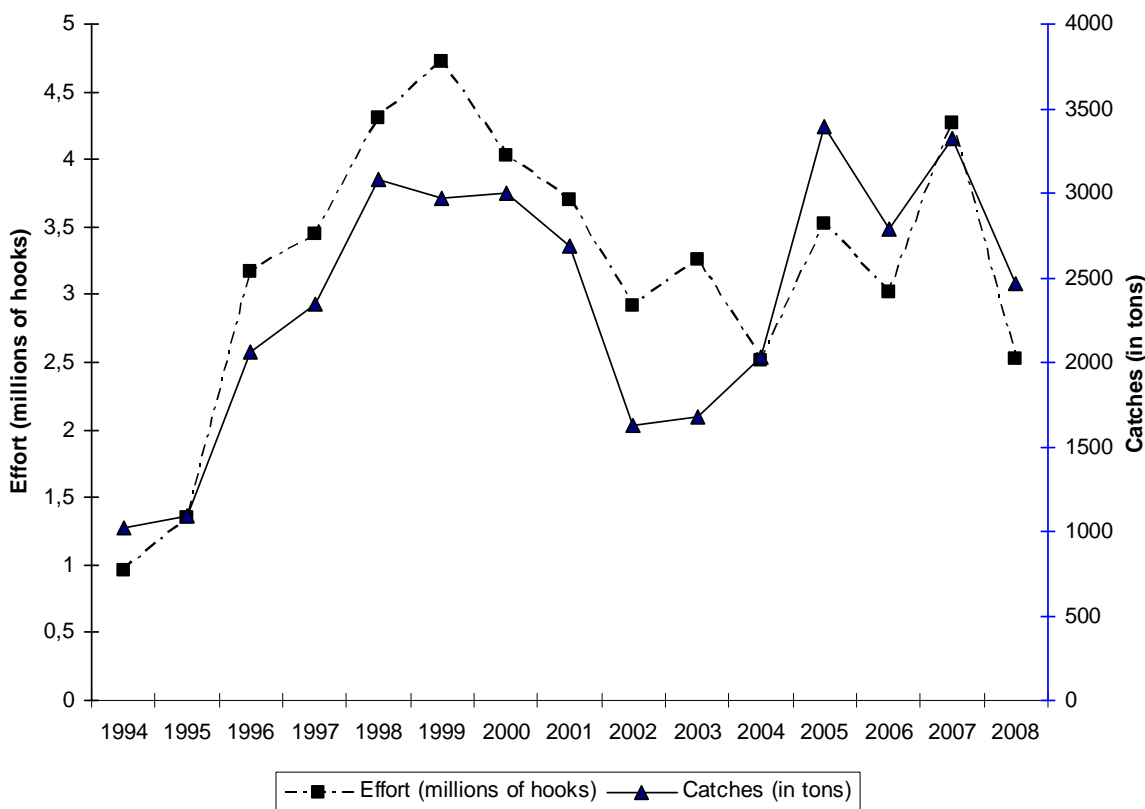


Figure 5: Evolution from 1994 to 2008 of the effort and total catches in La Réunion longline fishery (Sources: SIH IFREMER)

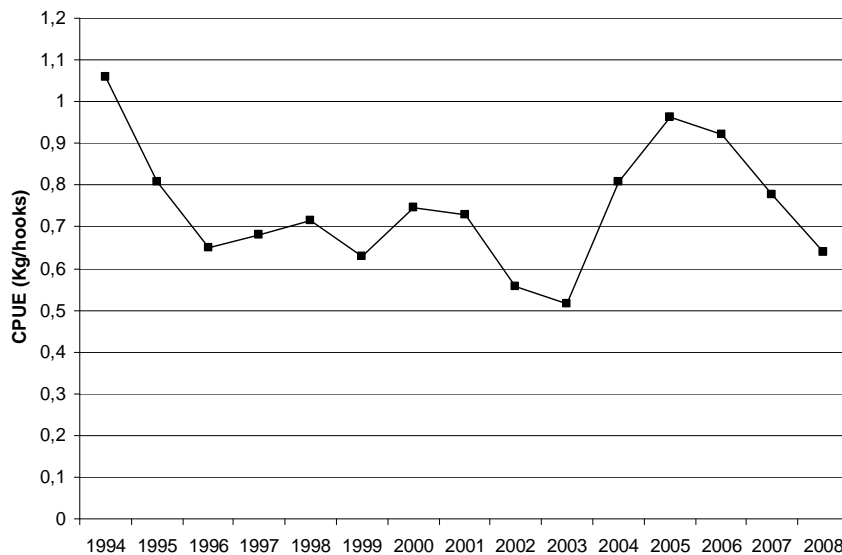


Figure 6: Evolution from 1994 to 2008 of the total CPUE in La Réunion longline fishery (Sources: SIH IFREMER)

COMMENTS:

Effort (Figure 5): Note that the total number of hook does not take into account the unreturned logbooks and it has to be taken here as an information. However, even if we do not know yet the total effort for 2008, longline activity in 2008 decreased because of a 1 month fishermen strike in November 2008

Weight (Figure 5): the total weight landed in 2008 (2467 tons) clearly decreased from 2007 (3319 tons).

CPUE (Figure 6): CPUE follow the same pattern as the last 3 years: a clear decrease.

3. Evolution of effort, catches and CPUE per species

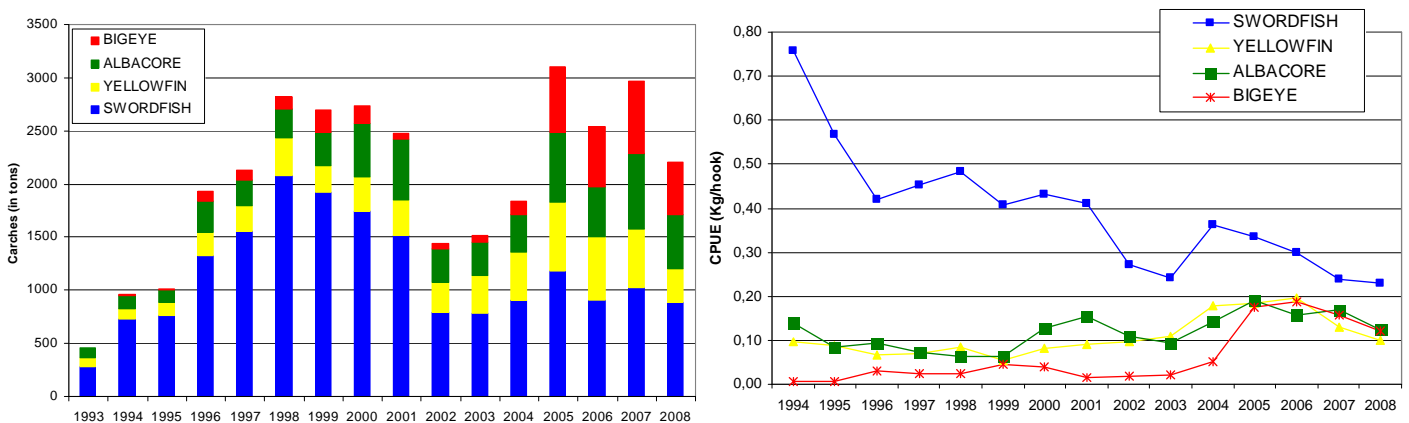


Figure 7: Evolution from 1994 to 2008 of the catches and CPUE per species caught by La Réunion longline fishery (Sources: SIH IFREMER)

COMMENTS:

No significant changes from 2007 in the evolution of catch composition and CPUE per species. After an increase of tunas CPUE from 2003 to 2006, these CPUE follows the same pattern of the global CPUE trend: a decrease

FOCUS ON THE SWORDFISH (XIPHIAS GLADIUS)

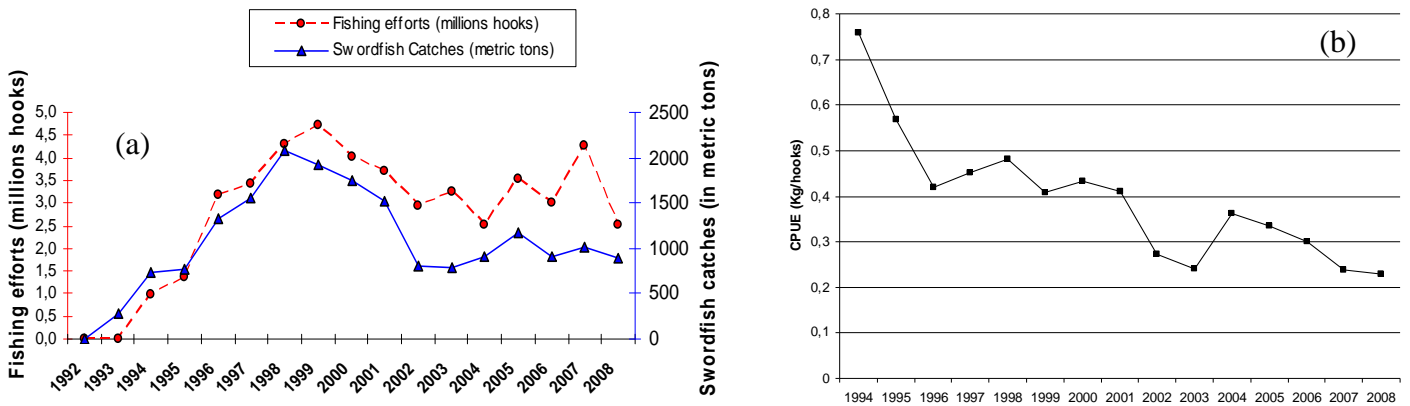


Figure 8: Evolution from 1994 to 2008 of the catches and effort (a) and CPUE (b) of swordfish caught by La Réunion longline fishery (Sources: SIH IFREMER)

COMMENTS:

Effort (Figure 8a): Note that the total number of hook does not take into account the unreturned logbooks and it has to be taken here as an information. However, even if we do not know yet the total effort for 2008, longline activity in 2008 decreased because of a 1 month fishermen strike in November 2008

Weight (Figure 8a): the total weight landed in 2008 (883 tons) slightly decreased from 2007 (1022 tons).

CPUE (Figure 8b): After a constant decrease since 2004, CPUE of swordfish is stabilized in 2007-2008 at a level of 0.23Kg/hook)

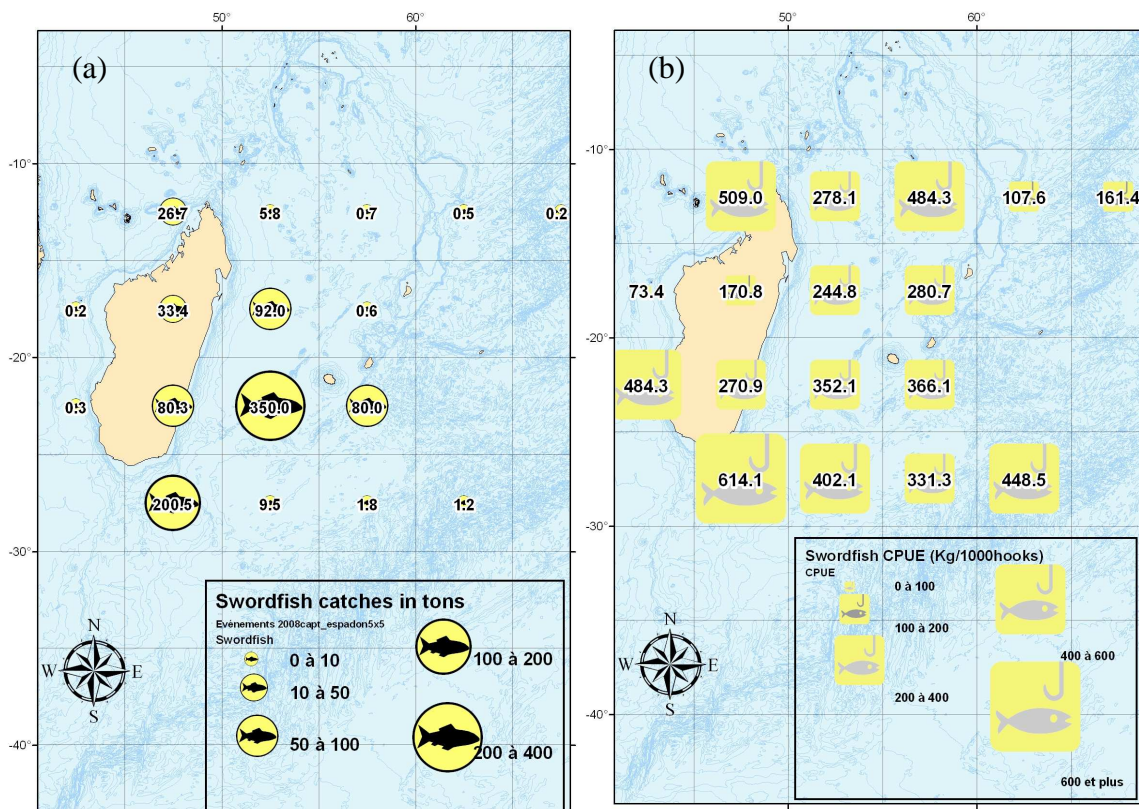


Figure 9: Catches (a) and CPUE (b) of swordfish caught in 2008 by La Réunion longline fishery (Sources: SIH IFREMER)

COMMENTS:

Even if not all effort is taken into account in the CPUE map, it seems that, as for 2007, CPEU varies a lot according to location and probably season, with higher CPUE in the North and South of Madagascar

SIZE

Since 1994, Ifremer has to follow for France/IOTC/UE the size of swordfish caught by French longliners fleet operating in the Indian Ocean. In 2008, 1654 swordfishes were measured (Lower Jaw Fork length – LJF) either directly onboard or during the landing. In 2008, the average LJF size of swordfish was 161.6 cm (SD = 30.36; Figure 10).

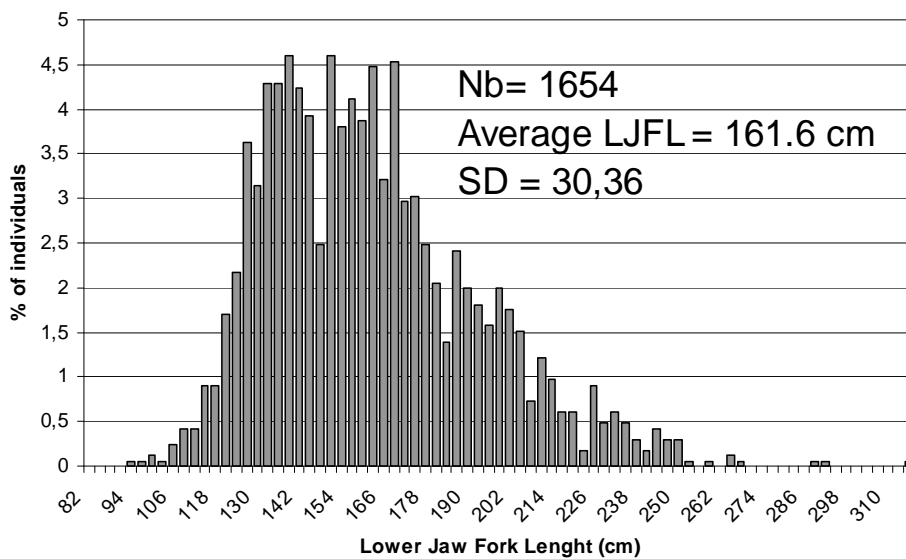


Figure 10: Distribution of size (LJF length) of swordfish caught by La Reunion's longliners in 2008 (Sources: SIH IFREMER)

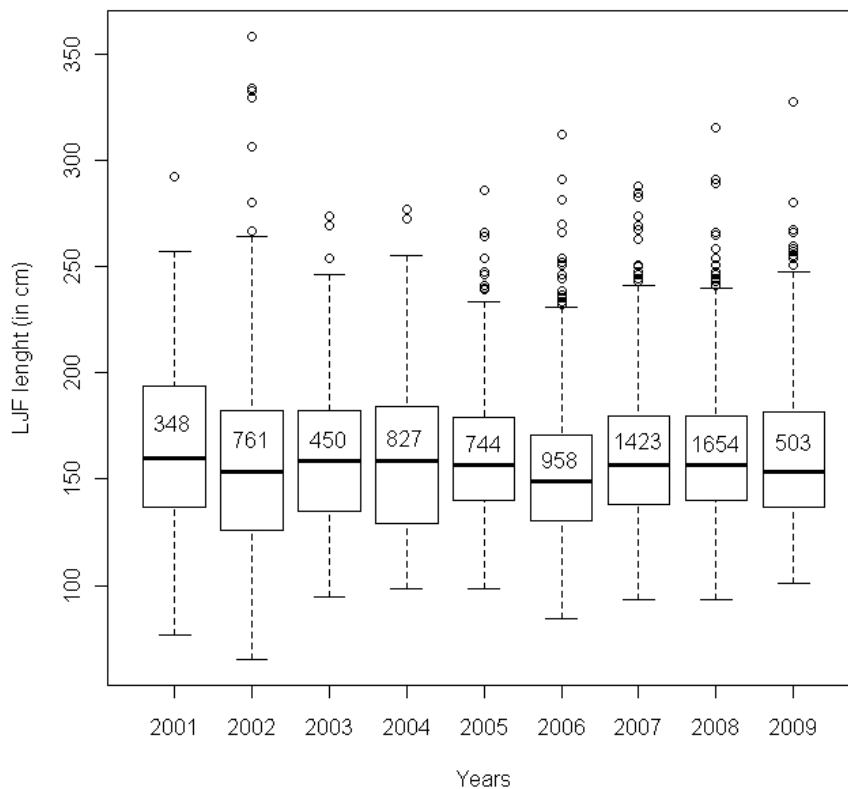


Figure 11: Boxplot of the size of swordfish caught by La Reunion's longliners from 2001 to 2009 (Sources: SIH IFREMER)

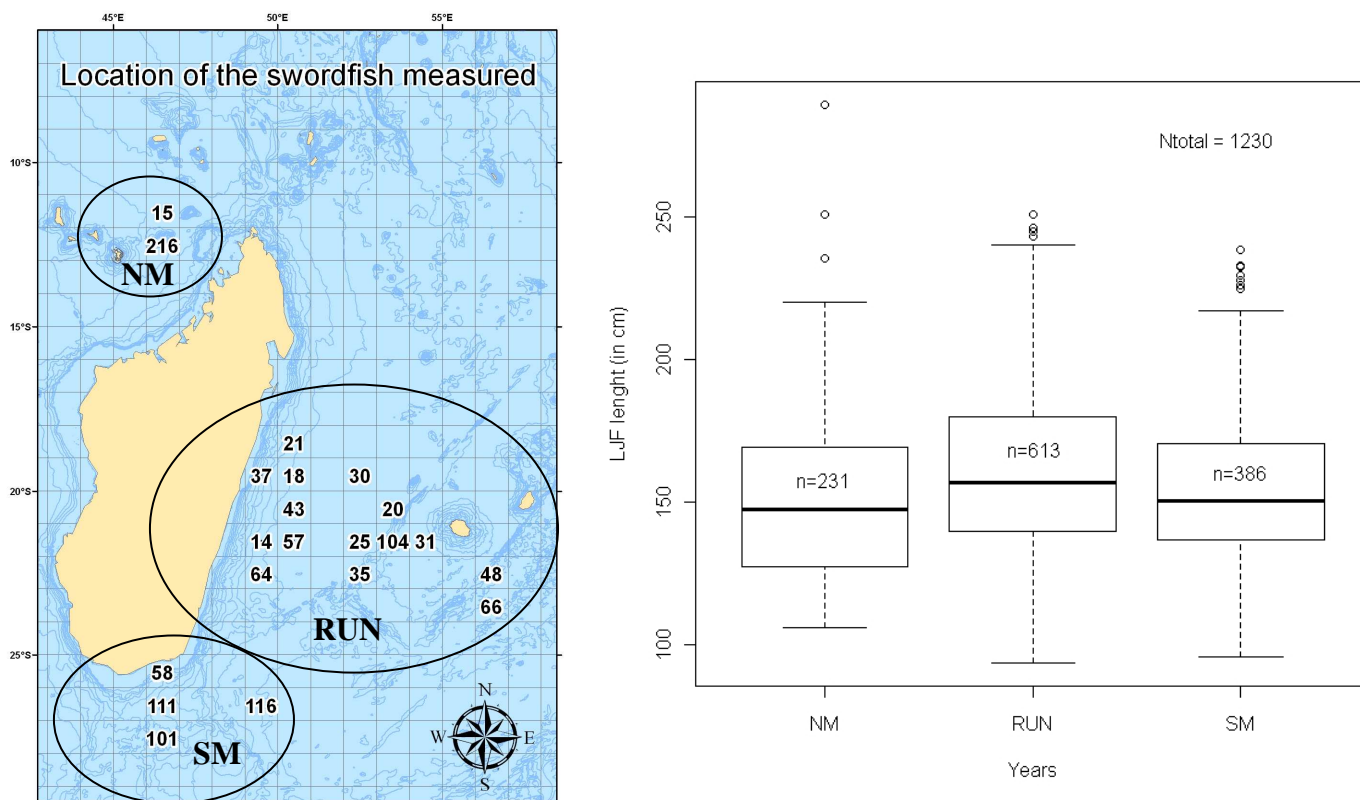


Figure 12: Location and level of sampling (left) and boxplot (right) of the size (LJF length) of swordfish caught by La Réunion longline fishery according to the area sampled. NM=North Madagascar, SM=South Madagasacar, RUN=La Réunion (Sources: SIH IFREMER)

COMMENTS

Figure 11: Based on the comparison of LJF length collected since 2001, there is only one difference in the average mean size of swordfish caught by year: the 2006 average size of swordfish is smaller than of the other years sampled (Tukey test, $p < 0.01$). For all the other years, there is no difference in the average size of the swordfish caught.

However, such kind of comparison has to be performed not in the whole fishing area, but within specific location and period. The current sampling size do not allows performing the analysis between months and clearly need to homogeneously increase per fishing zone as well as per month.

Figure 12, 13: Comparison per fishing location was performed. As for 2007, we can note that there is a significant difference between the average size of swordfishes caught in the North (NM) an the South of Madagascar (SN) that are smaller (Tukey test; $p < 0.001$) from those caught in the La Reunion (RUN) area (Figure 12,13), North and South of Madagascar beeing similar ($p > 0.05$). However, this result need to be taken with caution as the repartition of our sampling is not homogeneous through the year and there may have an important temporal effect on the mean size observed per zone.

FOCUS ON OTHER BILLFISHES (MARLINS, SAILFISH, SPEARFISH)

The other billfishes caught by the French longline fishery are the sailfish – *Istiophorus platypterus*, the shortbill spearfish – *Tetrapturus angustirostris*, the blue marlin – *Makaira mazara*, the black marlin – *Makaira indica* and the striped marlin – *Tetrapturus audax*. Unfortunately, we are not able at this stage to provide data per species of marlins.

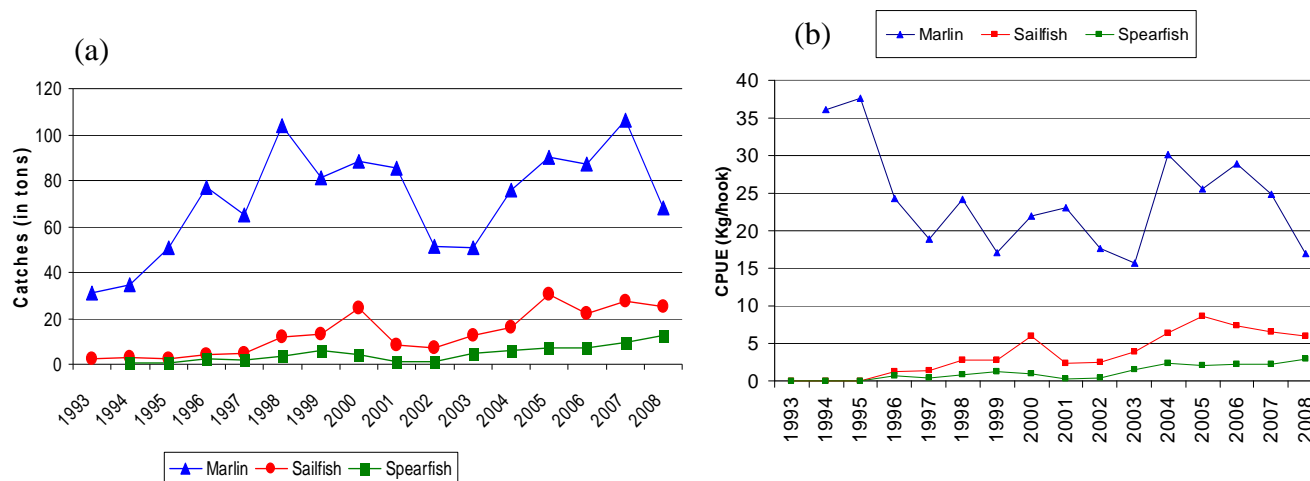


Figure 13: Evolution of the catches (a) and CPUE (b) for other billfishes (marlins, sailfishes and shortbill spearfishes) caught by La Reunion’s longliners from 1993 to 2007 (Sources: SIH IFREMER)

COMMENTS

In 2008, this fleet caught 42.9 tons of marlins, 15.1 tons of sailfish and 7.5 tons of spearfish (Figure 13a). Whether sailfish and spearfish CPUE kept stable these last 3 years, CPUE of marlin decreased from 24Kg/1000hooks to 17Kg/1000hooks in 3 years.

THE COSTAL FISHERY

La Reunion coastal fleet is currently composed of 203 boats in activity in 2008 (203 in 2007, Table 1). Almost all of them use hand-line and troll-line gears. The coastal fishery that fishes large pelagic fishes can be separated in 2 fleets: the one targeting only large pelagic fishes (30 boats in 2008) and the other one targeting benthic fishes and large pelagic fishes (170 boats in 2008). The last one uses to fish billfishes using troll-line gear when the boats go to benthic fishes sites and the estimation on real effort on large pelagic fishes remain extremely difficult to estimate.

Data collection is implemented via datasheet declaration to managers. Until 2006, these data sheet were not an obligation, but since then, it remains obligatory. The number of datasheet declarations for this fishery fluctuates and the main problem is that the quality of the data is unknown. Contrary to the longline fishery, the real data of landing based on manufacture declaration are not available.

In order to obtain reliable estimation of the catches of the La Reunion coastal fishery, we followed up the landing of this coastal fishery since 2006 by sampling in the different harbours of the island. As boats do a one day fishing trip, a one boat harbour sampling represents an effort of a one day at sea for this boat.

1- Coastal fishery targeting large pelagic fishes

The sampling Even if the sampling effort represents respectively only 3.4 - 3.5% and 2.8 – 3.0% of the total landing, it is composed of 154 landing samples in 2006 and 110 in 2007 (Table 1). We used the ‘*interviews theory*’ to estimate the mean number of at sea days and a parametrical approach to assess total catches and standard deviation.

	2006				2007				2008			
number of boat in activity	205				203				210			
number of boat targeting large pelagic	32				29				30			
number of boat sampled	26											
number of landing sampled	154				110				265			
total number of landing estimated	4344 à 4511 (3.4 à 3.5 % sampled)				3709 à 3879 (2.8 à 3 % sampled)				3944 à 4115 (6.4 à 6.7%)			
Species	catch sampled (kg)	catch estimated (kg) min	catch estimated (kg) max	mean catch estimated (kg)	catch sampled (kg)	catch estimated (kg) min	catch estimated (kg) max	mean catch estimated (kg)	catch sampled (kg)	catch estimated (kg) min	catch estimated (kg) max	mean catch estimated (kg)
Marlins	1008	9520	49191	28990	72	72	7420	2483	857	5185	21548	12678
Saifish	10	10	857	287	25	25	2576	862	86	488	3635	1947
Spearfish	0				27	27	2280	945	27	27	1195	537
TOTAL catches	5248	73803	248338	150894	2136	38763	118060	73670	7312	92844	180521	132534

Table 1: La Réunion coastal fishery targeting large pelagic fishes sampled at landing (effort used here: one landing = one day at sea) (Sources: SIH IFREMER)

COMMENTS

The 2008 sampling effort increased significantly in 2008 with 6.4 to 6.7% of total landing (3.5% in 2007) and is composed of 265 landing samples (Table 1). We used the ‘*interviews theory*’ to estimate the mean number of at sea days and a parametrical approach to assess total catches and standard deviation. Total catches of this fishery is estimated at 133 tons in 2008 and is composed of 9.5% of marlins, 1.5% of sailfishes and 0.5% of spearfishes.

2- Coastal fishery targeting large pelagic and benthic fishes

Even if the sampling effort represents respectively only 1.2% of the total landing, it is composed of 268 landing samples in 2008 (Table 2). We used the ‘*interviews theory*’ to estimate the mean number of at sea days and a parametrical approach to assess total catches and standard deviation.

	2006				2007				2008			
number of boat in activity	205				203				210			
number of boat targeting large pelagic and benthic	159				168				170			
number of boat sampled	109											
number of landing sampled	391				127				268			
total number of landing estimated	23726 à 24166 (1.6% sampled)				22397 à 23027 (0.6% sampled)				22670 à 23375 (1.2% sampled)			
Species	catch sampled (kg)	catch estimated (kg) min	catch estimated (kg) max	mean catch estimated (kg)	catch sampled (kg)	catch estimated (kg) min	catch estimated (kg) max	mean catch estimated (kg)	catch sampled (kg)	catch estimated (kg) min	catch estimated (kg) max	mean catch estimated (kg)
Marlins	0				146	146	62799	26110	669	13804	82944	41239
Swordfish	48	48	8734	2940	0				0	0	0	0
TOTAL catches	7188	214142	698101	440099	2015	110864	645338	360431	5158	218808	871792	483061

Table 2: La Réunion coastal fishery targeting large pelagic and benthic fishes sampled at landing (effort used here: one landing = one day at sea) (Sources: SIH IFREMER)

COMMENTS

Comparison between years and fleets cannot be performed because of the sampling rate and the estimation method. It was estimated that, marlins represents 8.5% of the 488 tons of fish caught.

Little is known regarding sport-fishing but their catches are included in the statistic presented here. Since 2006, there are 12 boats that practice sport fishing for tourist and that sell the fishes caught.

Regarding the model used based on landing interview (and the low sampling rate), we compared for 2006 the estimation performed using data collected by datasheet declaration and landing interview (Table 3) in order to evaluate the validity of the method. We can note that the order of magnitude remains the same for the total catches. The interview method data shows a clear advantage of being exact when collected while datasheet declaration remains sometime obscure.

	Datasheet declaration (kg)	Estimation of catches (kg) based on datasheet declaration	Estimation of catches (kg) based on landing sampling
billfishes	31 457	72 762	118 156
tunas	245 640	355 743	261 425
other large pelagic	171 731	236 299	223 505
total	448 828	664 804	603 087

Table 3: Comparison for 2006 data between estimation of catches (kg) based on datasheet declaration and landing sampling. Small longliners catches are included in this comparison (Sources: SIH IFREMER)