COLLECTION OF STATISTICAL AND BIOLOGICAL INFORMATION ON THE RÉUNION ISLAND SWORDFISH FISHERY

Poisson, F., D. Guyomard, F. René[1]

ABSTRACT:

*During the last five years, the local swordfish (*Xiphias gladius*) longline fishery has experienced rapid growth and development. The longline catches reached more than 2,300 t in 1997. Responsibility for collecting data on Réunion fisheries for submission to FAO lies with the local fisheries office "Direction Départementale des Affaires Maritimes" (DDAM). Moreover, since 1993, IFREMER has been collecting and compiling scientific and technical information on longline fisheries operating in the French EEZ and international waters. Data are collected from voluntary maintenance of logbooks thanks to regular at-sea and landing samplings, as well as on-board scientific observers. This paper presents the characteristics of this new longline fishery, describes the different data collection procedures on the domestic fleet, set up by DDAM and IFREMER. The first results (conversions between measurements) and the guidelines of IFREMER's program are presented.*

Introduction

The local swordfish (*Xiphias gladius*) fishery was virtually nonexistent 8 years ago around Réunion Island, an overseas department of France in the south-western Indian Ocean. It started in 1991, and 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 Réunion. 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, targeted species, as well as markets have evolved.

Responsibility for collecting data on Réunion fisheries for the FAO data base lies with the local fisheries office, the *Direction Départementale des Affaires Maritimes* (DDAM). Every fishing company is requested to report landed weights of each species at the end of a fishing trip. This information is very useful for the administration, industries and scientists.

Moreover, since 1993, the *Institut Français de Recherche pour l'Exploitation de la Mer* (IFREMER - French Institute for Oceanography and Fisheries Sciences) has been collecting and compiling scientific and technical information on longline fisheries operating in the French EEZ and international waters. Data are collected from voluntary filling of logbooks, from regular at-sea and landing sampling, and on-board scientific observers. This data collection system is designed to provide information on the different methods of processing swordfish, swordfish biology, catches and by-catch, size composition of catches, fishing effort, and predation of marine mammals on catches. All these actions will form part of the *Programme Palangre Réunion* (PPR), the new IFREMER programme financed by the European Union and Réunion local Councils. One of the aims of this programme is to contribute to the management and conservation of the species caught by SWIO fisheries, in the framework of a future larger scale project monitored by the IOC (*Commission de l'Océan Indien*, which includes the Comoros, Madagascar, Mauritius, Seychelles and Réunion/France).

The aims of this paper are (1) to rapidly present the characteristics of the new domestic longline fleet, (2) to describe the different data collection procedures for the domestic longline fishery, set up by DDAM and IFREMER, (3) to present both databases, their particularities and the different links established between those two different sources of data, and (4) to present the first results and guidelines of IFREMER's program.

Brief description of the domestic longline fishery

Domestic longline fleet

The domestic longline fleet has been classified into three overall length categories: (1) under 16 m "coastal vessels"; (2) between 16 and 20 m "offshore vessels" and (3) over 20 m distant-water vessels, depending on the size of the boat and the duration of trip. The number of Réunion-based longline vessels increased from 1 vessel in 1991 to 24 in 1997. Since 1994, this fleet has undergone various developments : parts of those are an intensification in the segment of vessels shorter than 16 m (9 to 14 m vessels, working 3 to 6 days at sea per trip), an intensification in fishing operational terms, as well as a progressive replacement of certain first generation vessels (25 m single-hull) by new better designed vessels (20 to 25 m catamarans), equipped with processing facilities on-board. For the larger boats, the transition to a year round activity is now clearly established and they operate, according to the season, from the equator to 40° S.

From 1993 to 1997 the catch of swordfish and albacore has sharply increased, and for the first time in 1996, the longline fishery landings have exceeded those of the local artisanal fishery (1,500 t compared to 1,330 t) (Poisson and René, 1997 ; René *et al*., 1998).

Fishing gear and methods

Every Réunion vessel is equipped with a semiautomatic drifting longline system. The fishing techniques and methods used, described by Poisson *et. al.* (1994), have changed very little since, only with the installation of a "beeper" system (regular sound signals for adjusting line manipulations),

[1] IFREMER Réunion, BP 60,97822 Le Port Cedex, France, Réunion Island

tested on 2 vessels and now operational on at least one of the vessels.

Processing of the catch

The processing of the catch is principally dependant on market demand and the fishing vessels (duration of fishing trip). Figure 1 presents the different handling and processing methods for swordfish, as well as the processing coefficients at each stage of handling.

Two different types of processing methods aboard are distinguished:

- Either the fish is conserved "H&G" (that is to say headed, gutted, fins and gills discarded - French designation "VDK"), chilled on ice in insulated or refrigerated holds; this is generally the case for billfish, tuna and the few sharks retained.
- Or the fish is conserved "dressed" (gutted with head gills discarded ; French designation "VAT"), which is the case for swordfish weighing less than 20 kg and the other fish.

"H&G" fish can also be frozen at -20°C (for the European market), or at -50°C for tuna destined for the Japanese sashimi market and loins for the European market. This loin processing necessitates an on-board line and concerns mainly vessels over 20m, which stay at sea for a period exceeding 20 days.

Data collections systems

Standard measurements

The most improved and reliable measure of length for swordfish is the lower jaw fork length (LJFL), for conversion to the round weights as required by international conventions.

As swordfish are dressed on board the fishing vessels, different lengths (to the nearest cm) are recorded during on board scientific sampling campaigns, during which every fish caught is available for measurement. Figure 2 and Table 1 show the lengths applied in this study. The goal of this operation is to obtain length-length and length-weight relationships, as well as conversion factors for every other processing method (loins, extra loins...).

Sampling at landing in port

Most of the vessels unload their catch in the Pointe des Galets harbour. After 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 CK) 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 and kinds (length classes) of swordfish to be measured, and it is usually a question of accessibility during processing. When the boats return to port, it is no longer possible to know the time, date and location of catch of each fish.

Biological sampling at sea

IFREMER also conducts regular at-sea samplings on commercial vessels. Four length measurements are usually taken on each swordfish. These are ideal conditions for measuring as associated information, such as geographical position, date, and fishing conditions are known precisely. Gonad samples for reproductive studies and anal fins for analysis of age and growth are removed and collected from each carcass; stomach contents are also usually observed. Every sample is labelled, treated and analysed later on at the IFREMER laboratory. Figure 3 summarises the purposes of each operation. The goal is to obtain, for at least 600 fish, a matrix of the 6 following parameters: geographical location, date, sex, age, length, and fecundity.

During these cruises, scientists record the sex and lengths of as many individuals as possible of other species. The purpose of those cruises is also to document fishing techniques. Precise sampling protocols have been established.

As daily catch is rather small, and in order to improve our data set, some captains we are used to working with have been trained to measure and sex swordfish. Up to now, 5 captains have agreed to participate in this operation. This is done during the fishing operation, and if they cannot measure every swordfish, fish are sampled randomly, regardless of size.

Logbook format and the IFREMER data base

These fishing logbooks are available to every Réunion longline fishing unit. IFREMER has established a "gentleman's agreement " with captains and local fishing companies managers. **The Logbooks remain the captains' property and are kept confidential.**

They provide daily records on the geographical position of the longline setting, the number of hooks per set and the number of light sticks used, the time the line is set and hauled, the gear configuration, the number of fish caught, classified by species and their estimated weight, information on by-catch of protected species such as turtles and discards due to shark and marine mammal damage. The environmental and meteorological conditions are also recorded (see attachment). Identification key sheets for turtles are added to each logbook. Captains are required to notify the number of sharks kept and released (alive or dead) for each set.

These logbooks are regularly collected from the skippers and company managers. All the data, including biology, are computerised and stored in an integrated data base (Access software).

French fisheries Administration data base

In Réunion, fishing statistics are obtained by the voluntary declaration of catches, handed over by skippers and fishing companies to the Fisheries Administration. The available catch data represent the comprehensive results of fishing operations from every registered local company. Companies must declare the departure and return dates for each of their vessels, as well as the tonnage of fish caught landed, by

species (13 species coded) and by product type (loins, extra loins...). The number of fishing craft involved in each fishery is recorded by category and gear used. Thus, accurate figures are available on annual nominal catch by species and gear, annual fishing craft statistics by gear, type and size class of boats. Economic bulletins are also published. This information is required yearly by the Fishery Data and Statistics Service of the FAO. Fishing craft statistics give an indication of trends in fishing power and are used to predict trends for industry planning. The data received are entered into the database (Access software).

We use data from both on-going data collection programs in our analyses. Logbooks data are cross-checked against landings receipts and corrections are made when necessary. This system provides basic confirmation of the information received. Figure 4 sums up the functionality of the two databases described above and the different links existing between them and other databases.

Results

Conversions between measurements

Length-length relationships

For fish measured only by PAL, CK, EOF, and PFL, Lower Jaw-Fork Length (LJFL) can be estimated using the appropriated linear regression (Table 2).

Length-weight conversions

Lengths can be converted to dressed weights, using the allometric length-weight conversion formula ($y = a * x^b$) developed from swordfish sampling in Réunion (Table 3).

Weight conversions

Dressed into round weights using formula previously established in the Atlantic Ocean (Table 4).

Logbook coverage rate

As logbooks record a fraction of the fishery, an estimated coverage must be applied. We use data from the two databases presented above and estimate the rate for each vessel category as the equation below. It is defined by the ratio between the number of trips listed in the fishing logbooks and the total number of estimated trips by the entire fleet

$$\text{Coverage rate} = \frac{\text{Number of trips covered by logbooks (IFREMER data base)}}{\text{Total number of trip (Fisheries Administration Data base)}} \times 100$$

Coverage rates were 23 % in 1992, 40 % in 1993, 84 % in 1994, 99 % in 1995, 57 % in 1996, and 45 % in 1997 (provisional figure due to a delay in the collection of logbooks from vessels still at sea). Table 5 shows the number of trips and the number of sets recorded in the IFREMER database.

The fishing logbook collection system, set up since 1993, has been widely accepted by the large majority of fishing companies and captains, as they benefit in return from the data and information, enabling them to observe the evolution of their global fishing characteristics.

It is regrettable however, that despite our repeated requests, one single company, the COMATA, has not followed our programme. This company was targeting the Southern bluefin tuna (*Thunnus maccoyii*) with a 33-meter longliner, the Erebus II.

Composition in size

The average lengths and weights of swordfish directly removed from the water on the one hand, and of swordfish unloaded from boats on the other hand, are not similar because the nominal catch from the DDAM data base do not include discards. In consequence, annual size composition and average lengths are estimated from the IFREMER database. The entire measurements data set is used to estimate the size composition of the swordfish population exploited by the Réunion Island-based longline fishery.

Between 1993 and 1997, a total of 11,895 individual swordfish have been measured (Table 6).

The size composition coverage rates are estimated by dividing the number of fish measured by the number of fish reported in logbooks (Table 7).

Up to now, at least 10 % of the estimated total number of swordfish caught by the entire fleet have been sampled each year. The sizes of swordfish sampled every year roughly range from 63 cm (LJFL) to 280 cm. It has been shown that the smaller swordfish are caught during the first quarter of the year. This recruitment phenomenon has been observed every year (Poisson and Macé, 1997).

Problems encountered and recommendations

The rapid expansion of the Réunion longline fishery and its increasing economic importance necessitate an understanding of the dynamics of those fisheries and a better knowledge of the biology of targeted species, both of which are poorly documented in the Indian Ocean. Nevertheless, obstacles still exist in the implementation of such objectives.

The IFREMER database

As has been stated above, it is difficult to estimate the most efficient coverage rate for logbooks, concerning the effective number of fishing trips achieved by the longline fleet. With no global statistical survey having been conducted up to now, it is impossible to say whether or not the sampling effort is sufficient or even superfluous. In particular, every biological parameter estimated is thus skewed, and even if evolution is more important than absolute values, it can be discouraging for such a programme to be conducted elsewhere.

Besides, the Réunion longline fleet is still quite a small fleet, in comparison to the huge area it is exploiting. Hence, heterogeneity in data from one ship to another is to be expected.

The DDAM database

The Fisheries Administration DDAM has virtually no possibility due to tax regulations to obtain really precise data on fishing results. Besides , its role is not to collect data on biology, nor on fishing efficiency. Also, landings data are collected, discards are missed. This database is a good reference for comparing global trends, but is of no use for any other study on fisheries and resource biology.

Conversion factors

Round weights are only estimated, owing to the fact that it is impossible to weigh fish when just hauled on board, and because it is processed at sea (see section 23). The only possibility for Réunion swordfish is thus to apply international references on weight conversions (see section 413).

Concerning lengths / lengths and lengths / weight equations, it is important to keep on sampling at sea, so that validation may be better. The PPR will permit collecting more data for this purpose, as well as the future IOC Programme.

Size composition

Sampling effort is not constant throughout the year, but this system gives an estimation of the size distribution of the population of swordfish exploited by the domestic longline fleet. It is nevertheless well known that male and female swordfish have significantly different growth rates, and the number of swordfish sampled up to now is insufficient to determine the actual growth rate for both males and females. Other factors such as spatial distribution and sex-ratio are not yet well estimated, but there is a strong hope that professional involvement and regional co-operation (in the framework of the IOTC) will allow collection of more reliable and better distributed data.

Biological parameters

A stronger sampling effort in the sub-equatorial area (around Seychelles especially) will be of great interest to obtain missing strata of data for estimating ageing and fecundity of swordfish.

Data collection

The IFREMER/DDAM hybrid data collection system has to be better established, so that both data users (such as the IOTC) and fishermen may be satisfied.

Conclusion

From 1991 to 1998, the swordfish longline fishery has been evolving from a small coastal experiment to a widely developed southwest Indian Ocean fishery. Significant changes have occurred concerning boats, fishing areas and seasonality. This development continues today at a regional scale (COI), thanks to the development of regional longline fleets, initiated in Seychelles and soon in Mauritius, and due to a technical transfer from Réunion and a development project, financed by the European union EDF, within the context of the COI Regional Tuna Programme (PTR II).

Legally, the management of the fishing activity is principally carried out by the Fisheries Administration for the collection of basic data (catch), which are sent to authorities, such as the FAO and IFREMER's European laboratories for sorting, processing, reproduction and interpretation.

From a practical point of view, due to its external position as regards regulations and the tax control system, and thanks to its technical and scientific support to the profession, IFREMER has clearly established agreements while respecting the confidentiality of logbooks data. This confidentiality is crucial to maintain the entire co-operation of the local fishery industry. This mode of data collection is efficient only if excellent relations of confidence and respect exist between IFREMER and the local fishing industry.

The goal should be to develop standardised data collection procedures designed to obtain these data, including biological as well as fishery data to initiate working groups. These working groups would review the current form and status of data that are collected by national Research Centres, with interest in swordfish fisheries, and develop recommendations and co-operation through COI and IOTC. This work has been already done during the regional Research Programme PTR II (Anonymous, 1994 ; Anonymous, 1995 ; Anonymous, 1996).

This co-operation is most necessary, as the analysis of data collected during the PTR II in the area shows rapid extension and uncontrolled exploitation, in and outside the ZEE, of foreign fleets.

Acknowledgements

We would like to thank all the captains, crews and local fishing companies' staff for their participation to this programme. We would like to thank Emmanuel Tessier (CRPMEM Réunion) and Mr François Gangnant (Direction Départementale des Affaires Maritimes) for their comments on this paper. Thanks to Pierre Houchois for his help in translation.

References

Anonymous, 1994. Rapport du groupe de travail sur le traitement des Statistiques thonières de 1993 dans l'océan Indien, Albion (Ile Maurice), du 4 au 10 juillet 1994.

Anonymous, 1995. Rapport du groupe de travail sur le traitement des Statistiques thonières dans l'océan Indien, Victoria, Seychelles, du 17 au 22 avril 1995.

Anonymous, 1996. Rapport du groupe de travail sur le traitement des Statistiques thonières dans l'océan Indien, Albion (Ile Maurice), du 28 avril au 4 mai 1996.

Mejuto J. Iglesias S., Rey J.C., Alot E., Garcia b, 1988. Relacioes talla-peso del pez espada (*Xiphias gladius,* L) en las areas BIL-94 y BIL-95, por estratos espacio-temporales. ICCAT Coll. Vol. Sci. Pap., XXVII : 214-221.

Poisson F., Macé N., 1997. Biométrie de l'espadon (*Xiphias gladius*) dans la zone Sud-ouest de l'Océan Indien. Série de documents scientifiques de l'Association Thonière n° 32, 31 p.

Poisson F., Tessier E., Roos D., René F., Conand F, 1994. Recent development of longline fishery in the Southwest tropical Indien Ocean. Proceedings of the International Symposium on Pacific swordfish, Ensenada, B. Cfa., Mexico.(in press)

Poisson F., René F., 1997. The development of the longline fishery targeting swordfish (*Xiphiuas gladius*) in Réunion island waters -Processing and marketing Proceedings of the International Symposium on Pacific swordfish, Kahuku, Hawaï, 3-6 March.(sous presse)

René F., Poisson F. et Tessier E., 1998. "Evolution de la pêcherie palangrière ciblant l'espadon (Xiphias gladius)

à partir de La Réunion". In Cayré P. et Le Gall J.-Y. éd. : Le thon, enjeux et stratégies pour l'océan Indien. Tuna prospects and strategies for the Indian Ocean. Actes de la Conférence thonière internationale 1996. Proceedings of the International Tuna Conference 1996, 27, 28, 29 nov. 1996, Maurice. COI/ORSTOM, Paris, collection Colloques et Séminaires : 287-312.

Rey J.C. et Gonzalez Garces A., 1979. Nuevos datos sobre la pesqueria Espanola de pez espada, *Xiphias gladius,* biologia y morfometria. ICCAT Coll. Vol. Sci. Pap., VIII(2) : 504-509.

Turner S, 1987. Length to weight and weight to length conversions for swordfish in the western north Atlantic and gulf of Mexico. Doc. Presented at the SEFC Swordfish AssessmEnt Workshop. 86/11.

Table 1: Definition of the different lengths applied in this study

Length	Definition
Lower Jaw-Fork Length - LJFL	curved-body distance between the extremity of the lower jaw to the fork of the tail
Pectoral-Anal Length - PAL	Projected straight distance between the most anterior insertion of the pectoral fin to the most posterior rim of the anal sphincter
Cleithrum-Keel Length - CK	curved-body distance between the cleithrum and anterior edge of the keel
Eye-Fork Length - EOFL	curved-body distance between the most posterior insertion of the eye orbit to the fork of the tail
Pectoral-Fork Length - PFL	curved-body distance between the most posterior insertion of the pectoral fin to the fork of the tail

Table 2: Linear regression parameters for the different lengths of swordfish caught by the Réunion longline fleet (Poisson and Macé, 1997)

				Range			
x (cm)	y (cm)	a	b	x mini (cm)	x maxi (cm)	sample size	R^2
PAL	LJLF	2.6098	18.8818	21	90	990	0.926
CK	LJLF	1.5312	20.0175	37	135	271	0.973
EFL	LJLF	1.0758	7.7119	51	215	430	0.988
PFL	LJLF	1.2386	11.2878	60	157	54	0.991

Table 3: Length-weight conversion formula ($y = a * x^b$) developed from swordfish sampling in Réunion (Poisson and Macé, 1997)

				Range			
x (cm)	y (kg)	a	b	x mini (cm)	x maxi (cm)	n	R^2
PAL	vdk	9.9518x10-4	2.6586	22	109	2395	0.878
LJLF	vdk	5.8641x10-6	3.0849	90	250	334	0.926
LJLF	vat	1.753x10-6	3.3433	51	215	430	0.959
CK	vdk	1.5762x10-4	2.7297	50	158	773	0.924

Table 4: weight conversions established in the Atlantic Ocean

Weight	Relation	Area	Authors
round weight	vdk x 1.3333	Atlantic (North-West)	Turner, 1987
round weight	vdk x 1.3158	Atlantic (East)	Mejuto, *et al*, 1988
round weight	vat x 1.14.	Atlantic (South-East)	Mejuto, *et al*, 1988

Table5: Number of trips and number of sets recorded in IFREMER data base

	1993	1994	1995	1996	1997
Number of trips	55	154	204	182	170
Number of sets	194	744	1162	1653	1173

Table 6: Number of swordfish sampled during unloading at port and sampling campaigns

year	1993	1994	1995	1996	1997
sample size	156	3408	3088	4202	2354

Table 7: Monthly number of swordfish sampled and size composition coverage rates

Month	1993	1994	1995	1996	1997
January		102 (15 %)	248 (40 %)	479 (46 %)	151 (20 %)
February		46 (10 %)	312 (32 %)	408 (33 %)	162 (19 %)
March		262 (63 %)	143 (20 %)	449 (33 %)	171 (10 %)
April		300 (39 %)	93 (7 %)	309 (22 %)	277 (27 %)
May		140 (28 %)	122 (18 %)	331 (21 %)	169 (11 %)
June		398 (85 %)	197 (18 %)	357 (33 %)	109 (7 %)
July		155 (15 %)	512 (35 %)	-	212 (35 %)
August		411 (60 %)	289 (20 %)	95 (7 %)	189 (27 %)
September		402 (22 %)	210 (18 %)	333 (11 %)	131 (7 %)
October	28 (6 %)	482 (24 %)	182 (13 %)	197 (5 %)	313 (24 %)
November	37 (3 %)	260 (12 %)	255 (10 %)	130 (5 %)	229 (19 %)
December	91 (13 %)	450 (41 %)	295 (32 %)	31 (1 %)	241 (34 %)
TOTAL	156 (7 %)	3408 (28 %)	2858 (24 %)	3119 (12 %)	2354 (17 %)

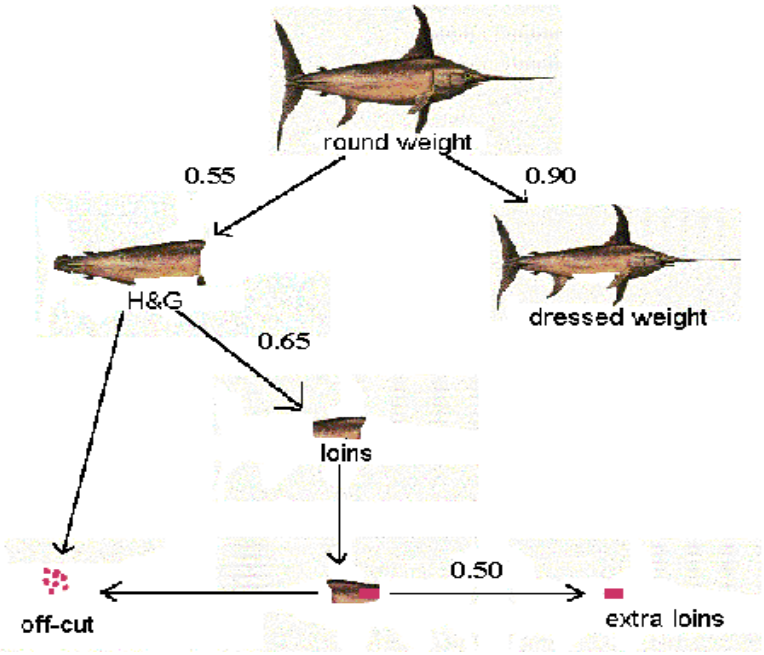

Figure 1: Principal handling and processing techniques for swordfish landed at Réunion, and corresponding processing coefficients (Poisson and Macé, 1997)

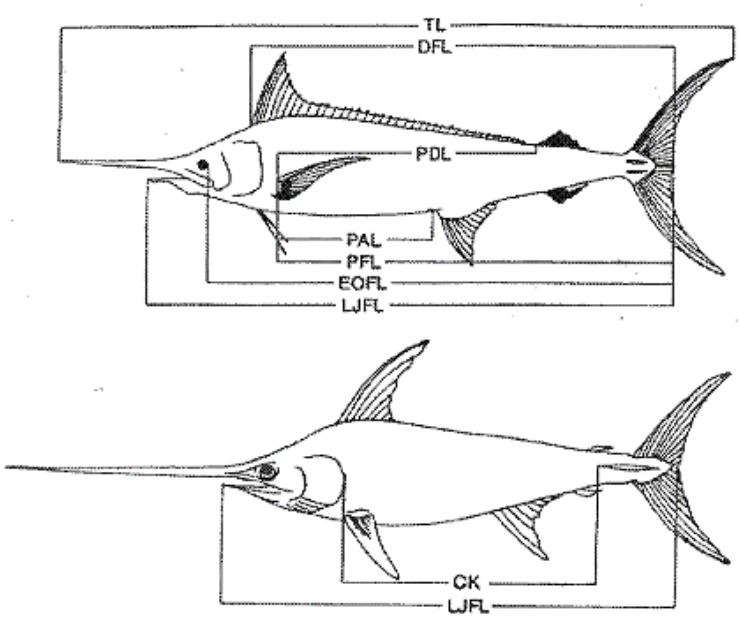

Figure 2: Alternative measurements of billfishes

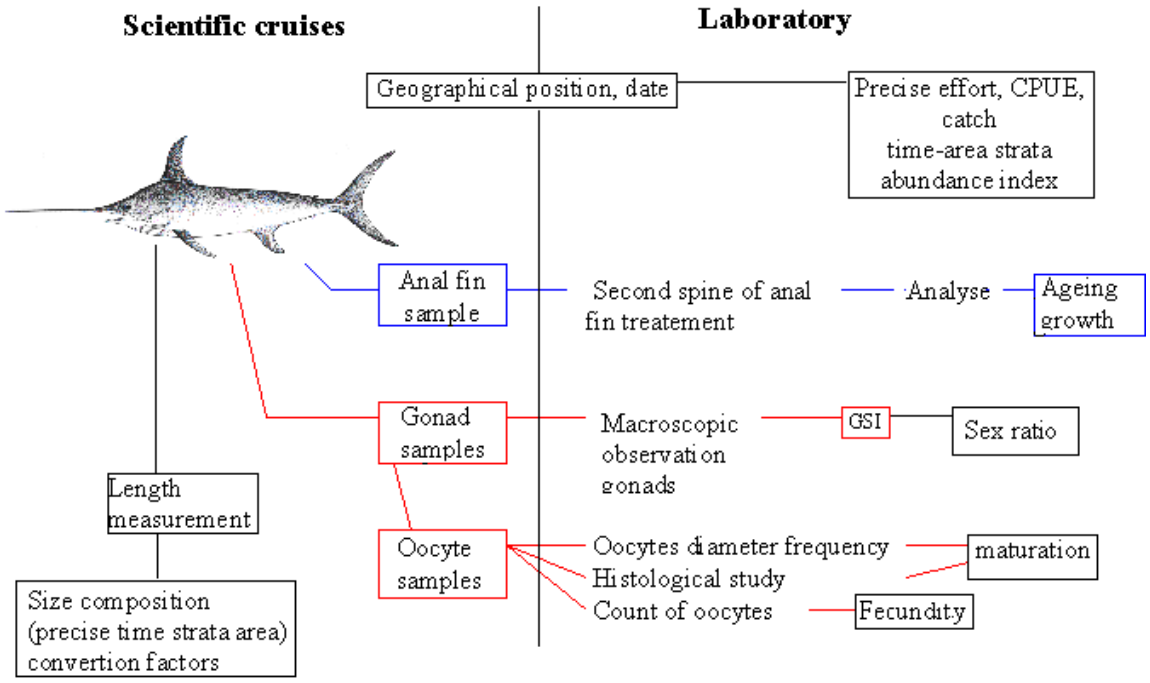

Figure 3: Sampling system scheme

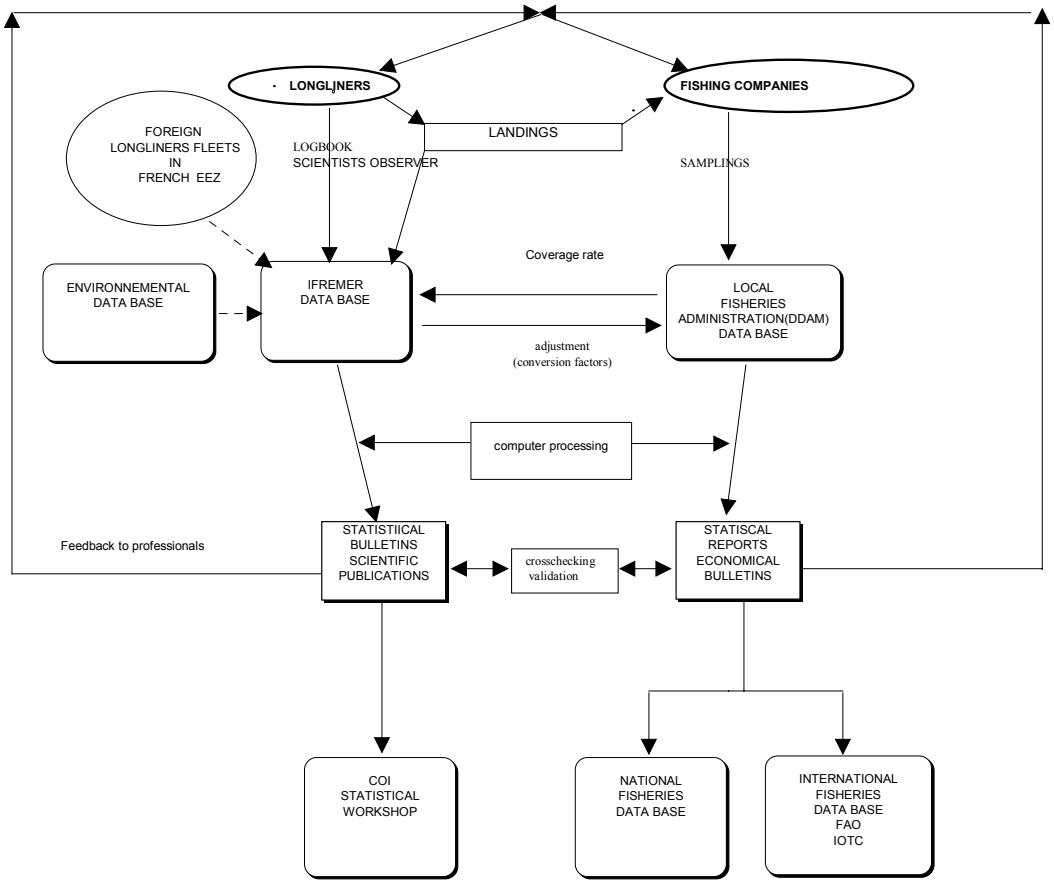

Figure 4: Statistics chart flow (Poisson and Macé, 1997)

Attachements

Réunion Island-based longline logbook data collection forms.

FICHE D'ECHANTILLONNAGE BIOLOGIQUE : FILAGE

O MAREE DU AU FILAGE N° DATE (du filage):

EQUIPAGE : **APPÂTS :**

VENT : **(directionF) FORCE** **(beaufortM)** **TEMPERATURE SURFACE:**

MER : **NBRE D'HAMECONS MOUILLES :**

HOULE : **LONGUEUR DES LEADERS :**

PRESSION ATM **PROFONDEUR**

Choix de la position du filage **Front thermique (amplitude = °C)**

détection au sondeur

Autre (au hasard /lieu déjà prospecté)

'1 CYALUME TOUS LES HAMECONS

HEURE DEBUT FILAGE L **HEURE DEBUT VIRAGE %:**

HEURE FIN FILAGE JJ : **HEURE FIN VIRAGE :**

***LATITUDE DEPART DE FILAGE:** ***LATITUDE DEBUT VIRAGE :**

***LONGITUDE DEPART DE FILAGE :** ***LONGITUDE DEBUT VIRAGE :**

Vitesse de filage **longueur de ligne filée**

-LATITUDE FIN DE FILAGE : **-LATITUDE FIN DE VIRAGE :**

-LONGITUDE FIN DE FILAGE : **-LONGITUDE FIN DE VIRAGE :**

ESPECES	NBRE	**POIDS UNITAIRES** ESTIMES (voir *)		**POIDS** TOT
GERMON**				
ALBACORE**				
PATUDO**				
MARLIN*				
LANCIER*				
VOILIER*				
DORADE (poids entiers)				
AUTRES				
REQUINS		**RAMENES A BORD**	**PRIS NON EMBARQUES (1)**	
POINTE BLANCHE				
PEAU BLEU				
MAKO				
MARTEAUX				
AUTRES				

1) préciser vivant (VA) ou mort (MO)

* :VDK:

** : avec tête , sans branchies, vidé

Préciser le type de poids retenu (VAT-VDK-ENTIER) si vos estimations ne correspondent pas aux poids estimés prévus.

C PRISES D'ESPADONS (NOMBRE D INDIVIDUS)

·Ne pas oublier d'inscrire les petits espadons

N	POIDS ESTIMES	LPA	POIDS THEORIQUES	N	POIDS ESTIMES	LPA	POIDS THEORIQUES
1				**21**			
2				**22**			
3				**23**			
4				**24**			
5				**25**			
6				**26**			
7				**27**			
8				**28**			
9				**29**			
10				**30**			
11				**31**			
12				**32**			
13				**33**			
14				**34**			
15				**35**			
16				**36**			
17				**37**			
18				**38**			
19				**39**			
20				**40**			

POIDS TOTAUX Q

PREDATION PAR LES **GLOBICEPHALES** : TOTALE OU NOMBRE D'ESPADONS ATTAQUES
NOMBRE DE POISSONS ATTAQUES-(Thons)------->

PREDATION PAR LES **REQUINS** : NOMBRE D'ESPADONS ATTAQUES
NOMBRE DE POISSONS ATTAQUES (THONS,)

NOMBRE DE TORTUES PÊCHEES	**VIVANTES**	**MORTES**
TORTUE VERTE		
TORTUE LUTH		
TORTUE CARET		
AUTRES		