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Digest of major information collected from May 2008 to August 2009 in the frame of the longline observer program based in La Réunion

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Digest of major information collected from May 2008 to August 2009 in the frame of the longline observer program (SEALOR) based in La Réunion

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Abstract : The observer program of the longline fishery based in La Reunion supported by E.U. funds started in March 2007. Data collected regarding the gear configuration, the fishing tactic, setting and hauling information, fishing strategy regarding maximum fishing depth exploited obtained from time depth recorders deployed on the mainline were presented before. This working document proposes a descriptive view of data collected from May 2008 to 2009 and archived in the database SEALOR. In 2008, the longline fishing activity were observed for 24 geographical square (1°/1°) with a good overlap of the fleet activity. For the same year, the observer program covers the fishing activity at an average level of 1.5% (the level depends on the parameter describing the fishing effort: cruise, sets or number of hooks). For 2008 and 2009, 35 species or group of species were identified and the 10 first dominant species in abundance represents 93% of capture. Surprisingly, the swordfish is not the most abundant in capture. Dominant species are the bigeye tuna and the albacore in 2008 and 2009, respectively. The contribution of species kept on board reaches 68% and 82% in 2008 and 2009 respectively. Two species have a great contribution in discards, the lancetfish (14.7% of global catch) in 2008 and the pelagic stingray (8% of global catch) in 2009. The contribution of the shark and ray group is about 11% and the blue shark shows the highest frequency among sharks. For sharks, the percentage of individuals discarded alive is near 0%. One sea turtle (Caretta caretta) was caught each year (nominal CPUE of about 1 individual per 33 000 hooks) and they were discarded alive. Priorities of studies planned in the next future are briefly mentioned.

Keywords : European Union data collection regulation, observe program, onboard sampling, pelagic longline, La Reunion, bycatch, discards, sharks.

1 - Introduction

The systematic collection of reliable basic data on fisheries is a cornerstone of fish stock assessment and scientific advice, and consequently is of critical importance for the implementation of the Common Fisheries Policy (CFP).

In this view, a legal Community Framework for the collection and management of the data needed to conduct the CFP was established. The first community framework was put in place in 2000 with the adoption of a Council Regulation (EC) N° 1543/2000 of 29 June 2000 and a Council Decision (EC) N° 439/2000 of 29 June 2000, followed in 2001 by a Commission Regulation (EC) N°1639/2001 of 25 July 2001, amended in 2004 by Commission Regulation (EC) N° 1581/2004 of 27 August 2004 laying down the detailed rules of application. In order to implement new approaches to fisheries management a new regulation has been recently adopted (Council Regulation (EC) No 199/2008 of 25 February 2008 concerning the establishment of a Community framework for the collection, management and use of data in the fisheries sector and support for scientific advice regarding the Common Fisheries Policy). Such approaches include the transition from fish stock-based management to a fleet- and area-based management as well as the ecosystem **approach** (EAF).

In this context, since 2000's a national database plan has been implemented by the "Direction des Pêches Maritimes et de l'Aquaculture". This plan aims to collect information about fishery traits that cannot be recorded from fishing logbooks, sampling in port and off-loadings. Classical fishery activitiy data of longliners based in La Reunion was known through the analysis of logbooks delivered by captains principally to follow capture of species targeted by the fishery, i.e. the swordfish (Miossec & Taquet, 2004; Jean *et al.*, 2006; Bourjea & Evano, 2008; Bourjea et al., 2009).

The observer program of longliners based in La Reunion supported by E.U. funds started in March 2007 (Bach et al., 2008). Data collected regarding the gear configuration, the fishing tactic, setting and hauling information, fishing strategy regarding maximum fishing depth exploited obtained from time depth recorders deployed on the mainline were presented before ((Bach et al., 2008). This paper proposes a digest of major archival data describing both target catches and bycatch collected by observers on board from May 2008 to August 2009. Our comments are focused on both the list of species identified and species abundance distributions (SAD) regarding species kept on board and discards (fish, sharks and rays and endangered species). Furthermore, length frequency distributions of the 10 dominant species in capture are presented.

2 – Presentation of data collected from May 2008 to August 2009

Geographical covering of sets sampled by observers

Despite the low level of cruises observed in 2008, the program succeeded to cover the traditional fishing grounds of the local fleet: in waters surrounding La Réunion, the central east and the south of Madagascar (Figure 1). Finally, a total of 24 geographical square (1°/1°) with fishing set operation were sampled by observers from May 2008 to December 2008.

The program prioritized the geographical activity rather than the fishing intensity in some fishing grounds. It was the best compromise with only one observer competent and to overcome difficulties to embark on small longliners of the fleet (LOA < 15 m). In general for this boat category on board sampling was realisable only for short cruises from one to three sets (from 2 to 5 days at sea). Furthermore, cruise

dates for small boats are very uncertain and consequently the organization of a time schedule of operation on small boats was too time consuming to be efficient.

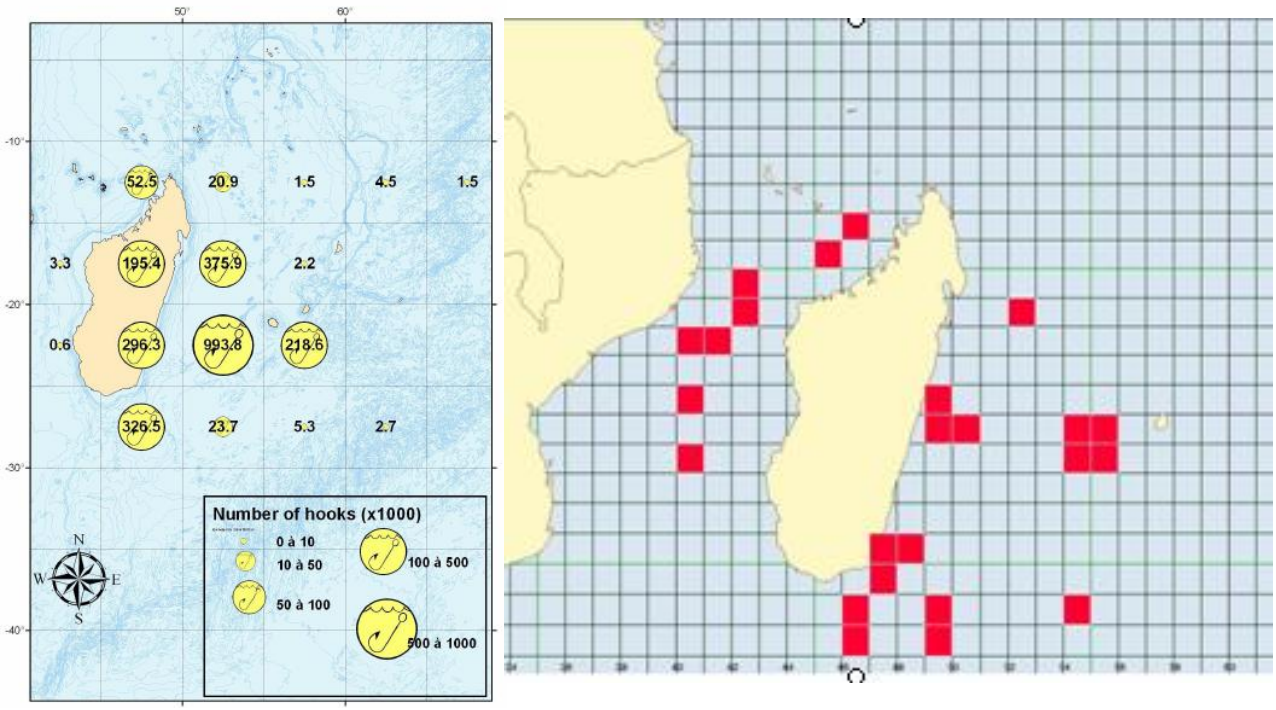


Figure 1 – Geographical activity of the longliner fleet based in La Reunion (left, from Bourjea et al., 2009) and geographical squares (1°/1°) with longline sets sampled by observers.

Fishing activity covering

The average of the fishing activity covering in 2008 is about 1.5%. The value depends on the parameter considered for the estimation. Thus, the covering is 1.92% for cruise, 1.55% for sets and 1.26% for the number of hooks deployed (Table 1). Despite the low level of this covering an analysis of the sampling power to reach according to the representativeness and the accuracy of data collected is necessary. It will allow to optimize the time spent to collect data at sea compared to the time necessary to archive the data in SEALOR database and to control the quality of inputs.

For 2009, an objective of 80 sets observed was defined to reach an estimated covering of 3.5% of longline sets operated by the fleet.

		Fleet	Observer	Covering (%)
2008	Hooks	2525407	32006	**1,27**
	Set	2127	33	**1,55**
	Cruises	313	6	**1,92**
2009	Hooks	NA	37173	NA
	Set	NA	27	NA
	Cruises	NA	3	NA

Table 1 – Fishing activity covering by the observer program and observation effort deployed in 2009 (from January to August).

Species and group of species observed

A total of 36 species and group of species was identified in 2008. However, if we consider that the group of unidentified tuna species concerns species already present in the list, the number of species and group of species becomes 35. The group unidentified tuna gathers individuals of small size sometimes difficult to identify on board and depredated tunas. At the present time, the same number of species and group of species was collected in 2009 (Table 2).

These 35 species concerns a number of fish caught of 1320 and 1096 individuals in 2008 and 2009, respectively (Table 3). Species contributions in the global catch differ from one to another and the 10 dominant species in number in 2008 represent 93% of the total number of capture (Table 3, Figure 2). It is interesting to point out that a similar result is obtained for capture sampled in 2009. Furthermore, the index of similarity between the two lists of species reaches 90%. This value of the similarity would suggest a homogeneity of the large predator community vulnerable to longline according the target species (swordfish) at the scale of the South West Indian Ocean. However further data are needed to explore deeply this hypothesis (Table 3).

Surprisingly, the target species is not the most abundant (rank 1) in the species abundance distributions (SAD) in 2008 as well as in 2009. For these two periods it has the second rank with about 15% and 18% of capture in number in 2008 and 2009, respectively. However the dominant species differs, it is the bigeye tuna in 2008 and the albacore tuna in 2009. Finally, the level of the contribution of the lancetfish in capture in 2008 (rank 3 with 14.5%) must be noted. The fishing strategy (fishing grounds, maximum fishing depth) could be an explaining factor to test in further studies.

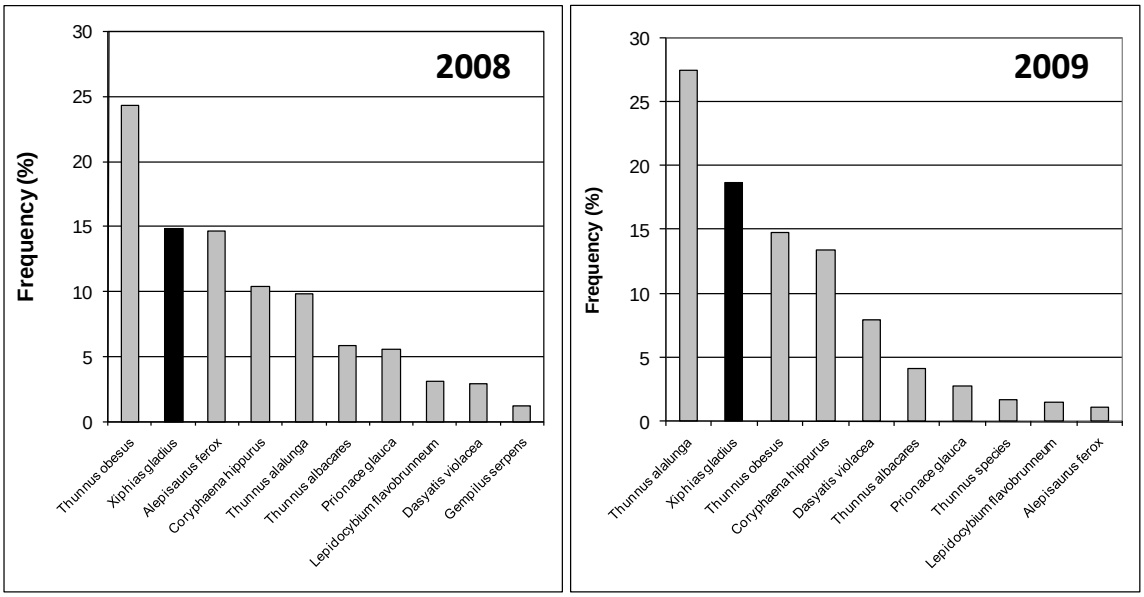


Figure 2 – Species abundance (%) distribution of the 10 dominant species in the global catch.

Code FAO	Scientific name	2008	2009
ALB	Thunnus alalunga	+	+
ALV	Alopias vulpinus	+	+
ALX	Alepisaurus ferox	+	+
AML	Carcharhinus amblyrhynchos	+	
BET	Thunnus obesus	+	+
BSH	Prionace glauca	+	+
BTH	Alopias superciliosus		+
BUM	Makaira nigricans	+	+
CBG	Cubiceps gracilis	+	+
CCP	Carcharhinus plumbeus	+	
DOL	Coryphaena hippurus	+	+
DRR	Grampus griseus		+
EUT	Euthynnus affinis affinis	+	+
FAL	Carcharhinus falciformis	+	+
GBA	Sphyraena barracuda	+	
GES	Gempilus serpens	+	
LEC	Lepidocybium flavobrunneum	+	+
LGH	Lagocephalus lagocephalus	+	
LMA	Isurus paucus		+
MOX	Mola mola	+	+
MRW	Masturus lanceolatus	+	+
NEN	Nesiarchus nasutus	+	
NXI	Caranx ignobilis	+	
OCS	Carcharhinus longimanus	+	
OIL	Ruvettus pretiosus	+	+
PLS	Dasyatis violacea	+	+
POA	Brama brama	+	+
PTH	Alopias pelagicus	+	
PSK	Pseudocarcharias kamoharai		+
RRU	Elagatis bipinnulata	+	
RZV	Ranzania laevis		+
SFA	Istiophorus platypterus	+	+
SKJ	Katsuwonus pelamis	+	
SMA	Isurus oxyrinchus	+	+
SNK	Thyrsites atun		+
SPK	Sphyrna mokarran		+
SSP	Tetrapturus angustirostris	+	+
SWO	Xiphias gladius	+	+
TRI	Trachipterus ishikawae		+
TST	Taractichtys steindachneri	+	+
TTL	Caretta caretta	+	+
TUS	Thunnus species		+
UNBIL	Unidentified billfish		+
UNFISH	Unidentified fish		+
UNSH	Unidentifed shark	+	
WAH	Acanthocybium solandri	+	+
YFT	Thunnus albacares	+	+

Table 2 – List of species identified during longline fishing operations by observers in 2008 and 2009.

	2008	2009
N. species or group of species	36	35
N. capture	1320	1096
Contribution of 10 first species (%)	93	93.3
% similarity between year for the 10 first species (%)	90	

Table 3 – Synthesis of species abundance distributions sampled in 2008 and 2009

Contributions and nominal CPUE of fish kept on board

The tuna group is dominant in capture in 2008 and 2009 with ~40% and ~48% of capture, respectively. Corresponding nominal CPUE was 1.65 fish and 1.41 fish per 100 hooks in 2008 and 2009 respectively. The swordfish as the target species in the fishery shows a low level of CPUE with 0.62 and 0.55 individuals per 100 hooks, in 2008 and 2009. The other group of marketable species kept on board is essentially represented by the dolphinfish for which the contribution in global capture is 10.45% and 13.41% in 2008 and 2009 respectively. The nominal CPUE for this group is 0.5 fish per hooks on average.

Code FAO	Scientific name	2008	2009
SWO	Xiphias gladius	14.92	18.7
ALB	Thunnus alalunga	9.85	27.46
BET	Thunnus obesus	24.32	14.78
TUS	Thunnus species	*	1.64
YFT	Thunnus albacares	5.91	4.11
BUM	Makaira nigricans	0.15	0.36
DOL	Coryphaena hippurus	10.45	13.41
EUT	Euthynnus affinis affinis	0.08	0.18
NXI	Caranx ignobilis	0.08	*
POA	Brama brama	0.08	0.09
RRU	Elagatis bipinnulata	0.08	*
SFA	Istiophorus platypterus	0.98	0.64
SKJ	Katsuwonus pelamis	0.08	*
SSP	Tetrapturus angustirostris	0.38	0.18
UNBIL	Unidentified billfish	*	0.09
WAH	Acanthocybium solandri	0.3	0.09
	TARGET	14.92	18.7
	TUNA	40.08	47.99
	OTHER MARKETABLE	12.66	15.04
	TOTAL MARKETABLE	67.66	81.73
	Nominal CPUE swordfish (/100 hooks)	0.62	0.55
	Nominal CPUE tuna group (/100 hoks)	1.65	1.41
	Nominal CPUE other fish (/100 hooks)	0.52	0.44
	Nominal CPUE global (/100 hooks)	2.79	2.4

Table 4 – Contributions in capture and nominal CPUE calculated for fish kept on board

Contributions and nominal CPUEs of discarded fish, sharks and rays and endangered species

Even if some shark species such mako sharks (*Isurus sp.*)are in general kept on board to be commercialized the global data presented in the Table 5 can be considered as representative of effective discards observed during fishing operations. The level of discards differs between 2008 and 2009. Discards represent about 32.4% of the total catch in 2008 and 18.2% in 2009. For 2008, discards are principally composed by the lancetfish (14.7% of the total catch), the blue shark (5.6% of the total catch) and the escolar (3.1% of the total catch). For 2009, the pelagic stingray has the highest contribution with about 8%. For this year the contribution of blue shark decreases to 2.7% (Table 5).

The nominal CPUE for discards is about 1.34 fish per 100 hooks in 2008 and 0.54 fish per hooks in 2009. Regarding the group of endangered species, 1 sea turtle (*Caretta caretta*) was caught each year . This capture corresponds to a nominal CPUE of 1 individual per 30 000 hooks in 2008 and 1 individual per 37 000 hooks in 2009.

Status of sharks and endangered species

As mentioned previously carcasses of some shark species are kept in board to be commercialized or use as bait in artisanal fisheries. This explains the 0% level of discarded for some shark species. However, for other species discarded the level of fish discarded alive is very low, the fish being dead while hauling. However it must be noted that sea turtles caught in 2008 and 2009 were discarded alive.

Length frequency distributions of dominant species in capture

The sampling of lengths (curved fork length for fish or lower jaw fork length for billfish) started in 2008. Furthermore, some additional biological information (sex, gonad maturity) are collected.

In 2008, 92% of fish caught were measured and 97% in 2009. All data are recorded in the SEALOR database and we present length distributions (2008 and 2009 gathered) for the 10 most abundant species in capture (Figure 3).

3 – Activities planned for 2010

Two years after the start of the longline observer program in La Reunion it is reasonable to consider the project being well on the rails. In 2008, the covering of the fishing activity only attains an average level 1.5% (the level depends on the fishing parameter takes into account: cruises, sets or number of hooks deployed). However, in 2009 a level of 2.5% can be expected and the objective of 3.5% (representing an average number of sets of 100 – 120 observed per year) could be reached for the next years.

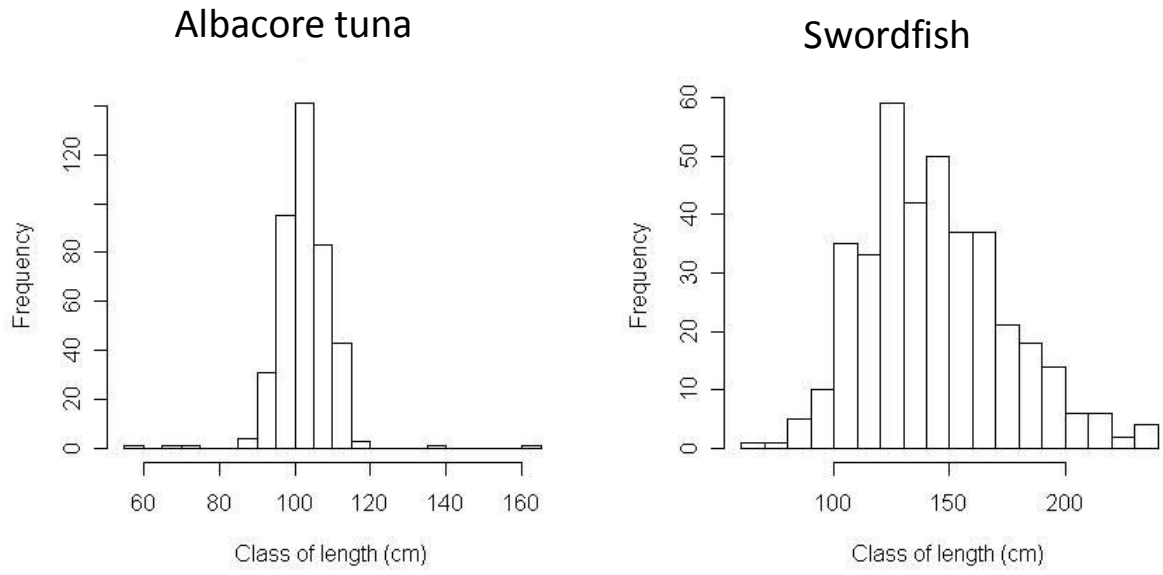
Now, studies focused on both the representativeness of data collected and the accuracy of bycatch estimations at the level of the longline fishery based in la Reunion must be undertaken in priority. In particular the effect of the size of boats on the specific composition of capture, on the nominal CPUE and on the level of discards will be managed soon.

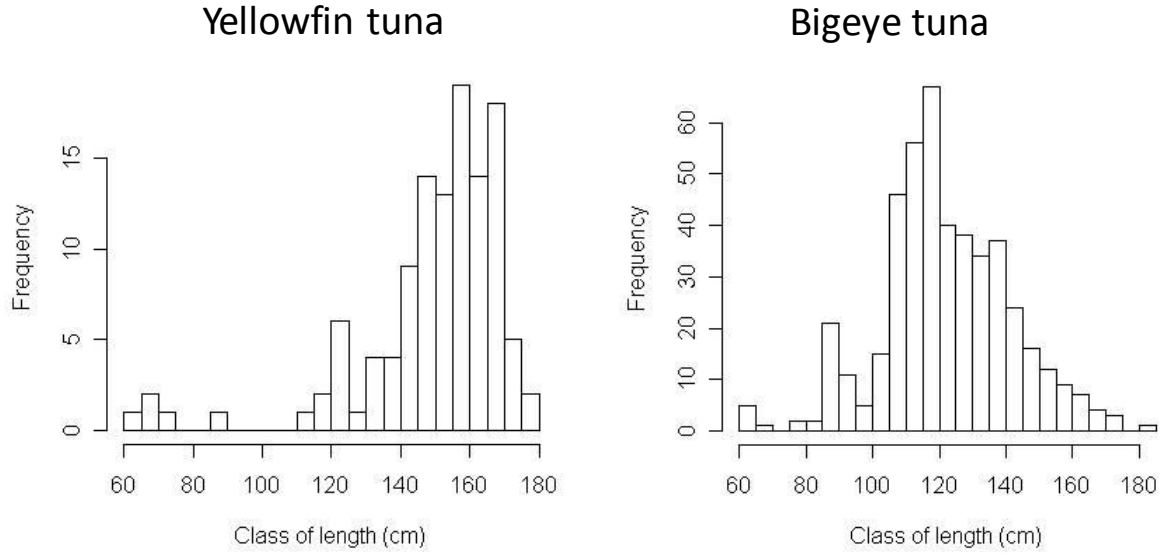
Code FAO	Scientific name	2008	2009
ALX	Alepisaurus ferox	**14.7**	**1.09**
CBG	Cubiceps gracilis	**0.08**	**0.09**
GBA	Sphyraena barracuda	**1.06**	*
GES	Gempilus serpens	**1.21**	*
LEC	Lepidocybium flavobrunneum	**3.11**	**1.46**
LGH	Lagocephalus lagocephalus	**0.08**	*
MOX	Mola mola	**0.3**	**0.09**
MRW	Masturus lanceolatus	**0.3**	**0.27**
NEN	Nesiarchus nasutus	**0.08**	*
OIL	Ruvettus pretiosus	**0.68**	**0.55**
RZV	Ranzania laevis	*	**0.09**
SNK	Thyrsites atun	*	**0.27**
TRI	Trachipterus ishikawae	*	**0.82**
TST	Taractichtys steindachneri	**0.38**	**0.55**
UNFISH	Unidentified fish	*	**0.09**
ALV	Alopias vulpinus	**0.08**	**0.09**
AML	Carcharhinus amblyrhynchos	**0.3**	*
BSH	Prionace glauca	**5.61**	**2.74**
BTH	Alopias superciliosus	*	**0.09**
CCP	Carcharhinus plumbeus	**0.08**	*
FAL	Carcharhinus falciformis	**0.53**	**0.64**
LMA	Isurus paucus	*	**0.09**
OCS	Carcharhinus longimanus	**0.23**	*
PLS	Dasyatis violacea	**2.95**	**7.94**
PSK	Pseudocarcharias kamoharai	*	**0.36**
PTH	Alopias pelagicus	**0.08**	*
SMA	Isurus oxyrinchus	**0.23**	**0.36**
SPK	Sphyrna mokarran	**0**	**0.09**
UNSH	Unidentifed shark	**0.23**	*
DRR	Grampus griseus	*	0.36
TTL	Caretta caretta	0.08	0.09
	DISCARDED FISH	**21.98**	**5.37**
	SHARKS and RAYS	**10.32**	**12.4**
	ENDANGERED SPECIES	**0.08**	**0.45**
	TOTAL	**32.38**	**18,22**
	Nominal CPUE discarded fish (/100 hooks)	**0.91**	**0.158**
	Nominal CPUE sharks and rays (/100 hooks)	**0.43**	**0.366**
	Nominal CPUE endang. species (/100 hooks)	**0.003**	**0.013**
	Total nominal CPUE	**1.343**	**0.537**

Table 5 – Contributions in capture and nominal CPUE calculated for discards

		2008				2009			
Code FAO	Scientific name	C	Length	%discarded	% alive	C	Length	%discarded	% alive
ALV	Alopias vulpinus	1	1	0		1	1	0	
BSH	Prionace glauca	74	33	100	55.4	30	19	90	30
BTH	Alopias superciliosus					1	1	0	
CCP	Carcharhinus plumbeus	1	1	100	0				
FAL	Carcharhinus falciformis	7	7	0		7	7	28.6	0
LMA	Isurus paucus					1	1	0	
OCS	Carcharhinus longimanus	3	3	100	0				
PLS	Dasyatis violacea	39	13	100	0	87	84	100	0
PTH	Alopias pelagicus	1	1	0					
PSK	Pseudocarcharias kamoharai					4	4	100	0
SMA	Isurus oxyrinchus	3	2	33.3	100	4	4	0	
SPK	Sphyrna mokarran					1	1	100	0
TTL	Caretta caretta	1	0	100	100	1	0	100	100

Table 6 – Status of sharks and endangered species discarded (C = number of capture, Length = number of fish measured, % discarded = number of discards / number of capture, % alive = number of fish alive/number of discards).





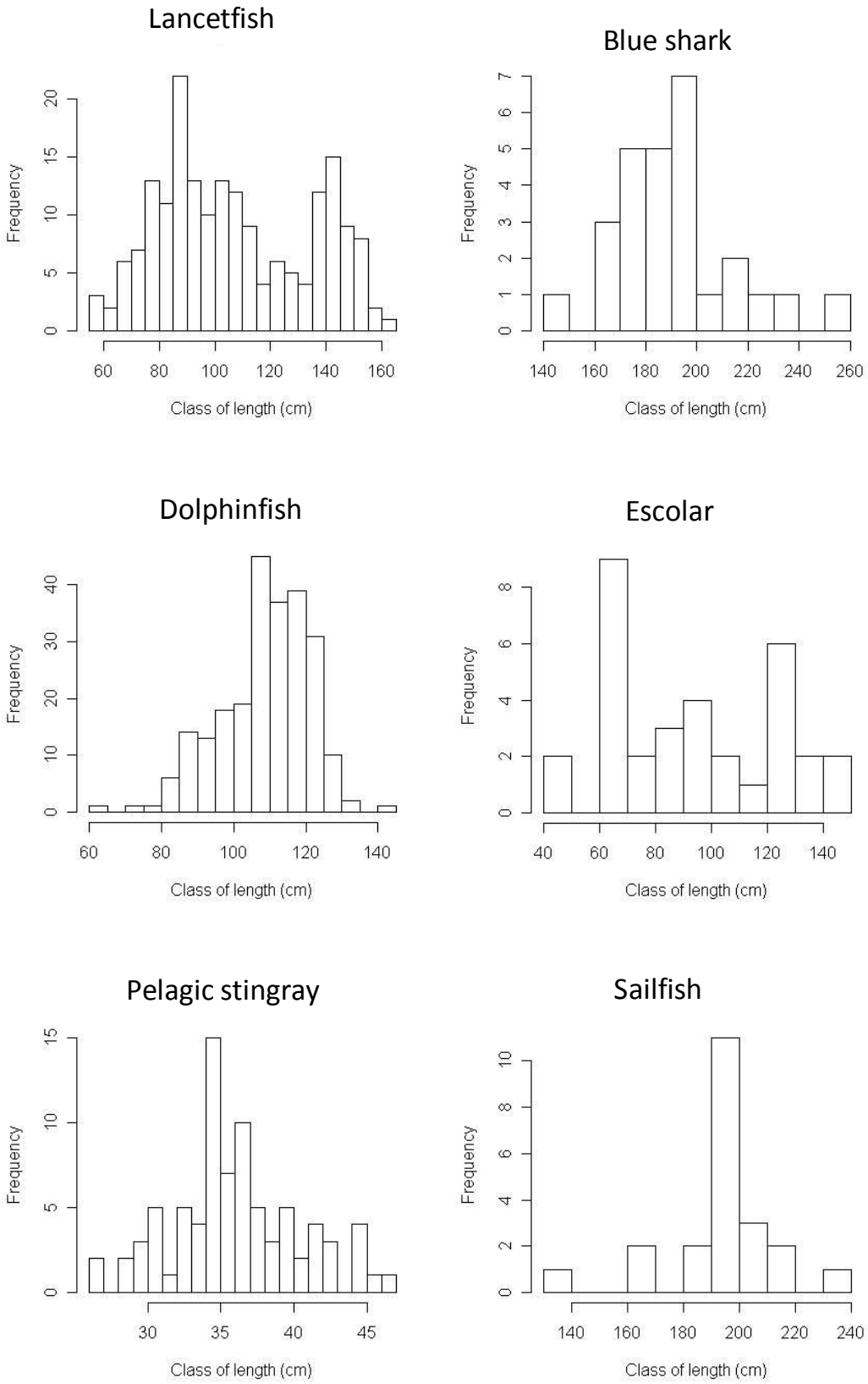


Figure 3 – Length (curved fork length or lower jaw fork length for billfish) frequency distrubitons of the 10 dominant species in cumulated capture of 2008 and 2009.

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