Note on the interest to conduct a scientific observer programme on longliners operating around Seychelles waters,

by Vincent Lucas, Pascal Bach and Alain Fonteneau

Summary

Analysing the present major uncertainties in the relationship between the hooks between floats parameters and the species targeted by longliners, the paper makes a recommendation that an ad hoc observer programme should be urgently developed on board of Japanese and Taiwanese longliners in the Western Equatorial Indian Ocean. Such programme should measure on a scientific basis all the parameters in the line configuration and line handling that are conditioning hook depth. They should also measure the real depths reached by the various hooks. It is estimated that such programme could provide highly significant results that would be essential to do the yellowfin and bigeye stock assessments, even with a small numbers of sets observed.

Résumé

Cette note repose sur la conclusion qu'il existe de très sérieuses incertitudes entre le nombre d'hameçons par panier et la profondeur réelle des hameçons, donc l'espèce ciblée. Une recommandation de réaliser au plus vite un petit programme d'observateurs sur les palangriers de Taiwan et du Japon est donc faite. Ce programme devrait mesurer sur une base scientifique tous les paramètres qui conditionnent la profondeur des hameçons, tant dans la configuration des lignes que dans leur déploiement. Ces observateurs devraient aussi mesurer la profondeur réelle atteinte par les hameçons. La conclusion est qu'un tel programme fournirait des résultats très significatifs et fondamentaux pour l'évaluation des stocks d'albacore et de patudo, même s'il n'est mené qu'à petite échelle.

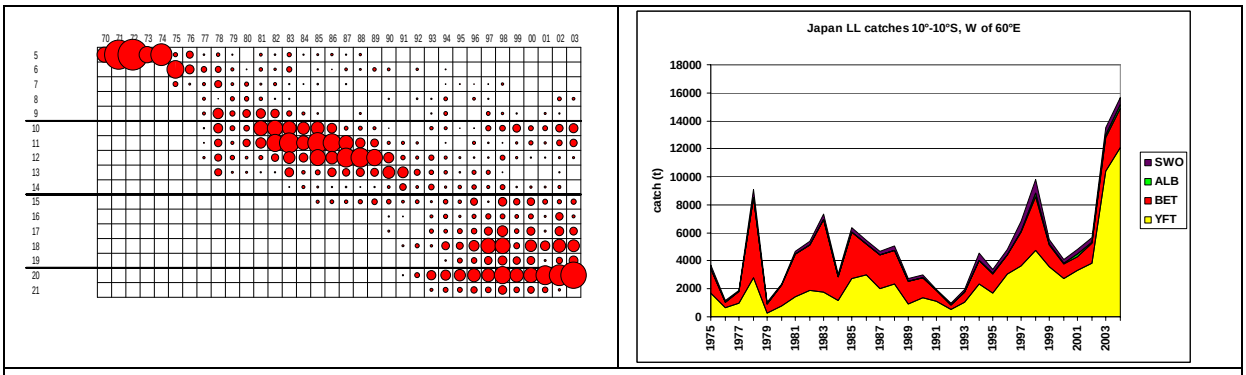
-1- Introduction

Papers recently presented at IOTC and ICCAT meetings by Bach & Fonteneau (2005) and Bach et al. (2005) have widely shown that the number of Hooks Between Floats (HBF), a parameter widely used in all tuna stock assessment as a proxy of hook depth and of the targeted species, was possibly widely misleading. The hypothetical but firm conclusion reached by the study of Bach and Fonteneau (2005) was that Japanese longliners fishing around Seychelles during recent years had been probably fishing in shallow waters (and then targeting yellowfin instead of Bigeye) despite of their large HBF configurations deployed. This paper will discuss the potential interest to run an ad hoc observer program on board of Japanese and Taiwanese longliners fishing in the equatorial waters around Seychelles in order to really observe the fishing behaviour and the species that are really targeted by these two fleets in the area.

-2- HBF and Hook depth

The two working documents recently submitted to the ICCAT and IOTC clearly demonstrate that hook depths can be widely driven by the fishing tactic. HBF is one parameter defining the tactic, but more parameters are needed for estimating the real hook depth distribution at the set level in a given fishing area.

The changes in HBF configuration observed for Japanese longliners during the last 30 years have been well described and they are spectacular: the HBF configurations deployed by Japanese longliners during the last 10 years in the Western Indian Ocean has nothing to do with HBF patterns previously deployed (figure 1). During the same period, large changes in the species composition of the catches taken in the area have been also observed (figure 2).



Average hook per basket statistics for Japanese longliners operating in the Western Indian Ocean, showing during the last 30 years 3 periods of increasing HBF, and yearly catches by species in the Seychelles area

The question of species really targeted (and at what depth?) by the recent 20 HBF Japanese configuration is of course of fundamental importance in all stock assessments, for the IOTC stock assessments as well as for the similar analysis done by other RFOs in the Atlantic and Pacific oceans. It has been most often assumed that the large numbers of hooks between floats were a clear indication that these longline were fishing during recent years in

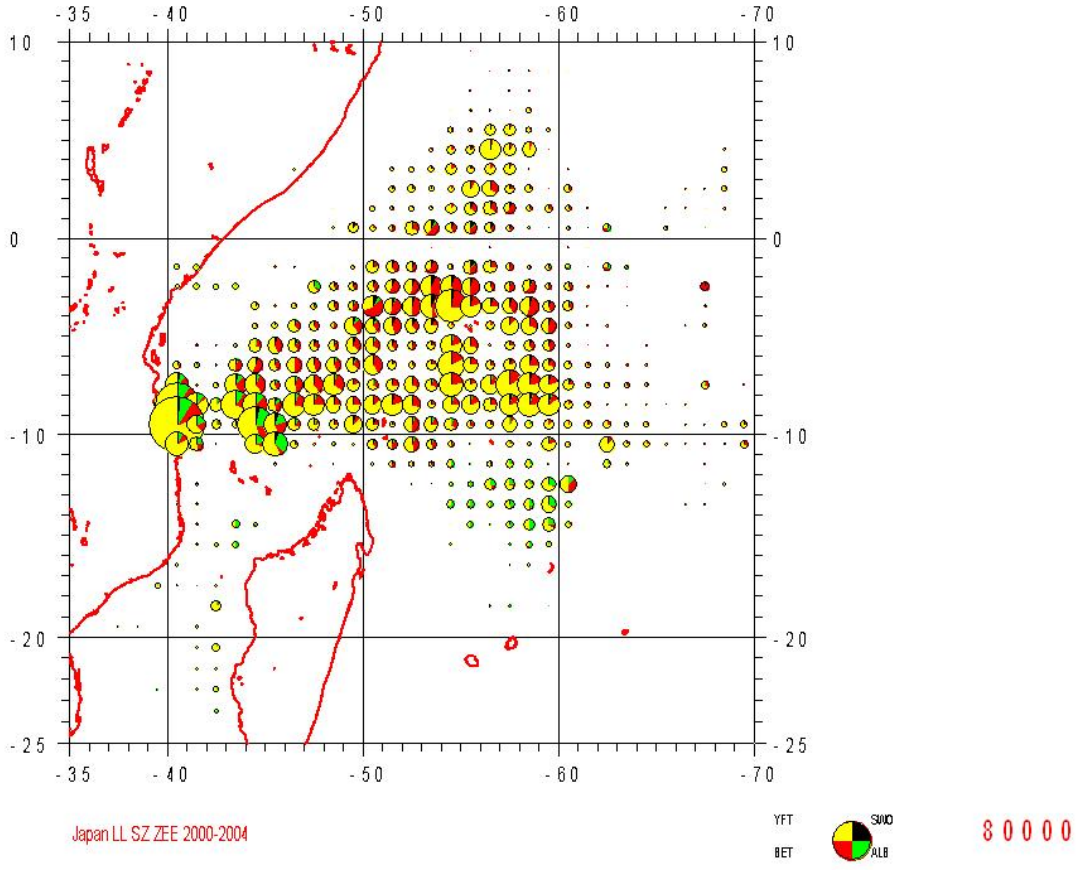
deep waters and targeting Bigeye, but this assumption was widely in contradiction with the catches dominated by yellowfin and also by the CPUE trends.

It appears that this major pending scientific question would be very simple to solve: the present proposal is that it could easily be solved running a well designed *ad hoc* scientific observer programme on board Japanese and Taiwanese longliners fishing in equatorial waters, for instance in the area around Seychelles (keeping in mind that the framework of the fishing agreements and the active scientific cooperation between Japan, Taiwan and Seychelles could be an efficient way to promote such a programme).

This potential observer programme will be discussed thereafter.

-3- An observer programme measuring the real target species

This observer programme should preferably be deployed in the best yellowfin fishing strata around Seychelles waters, for instance during the first quarter in the Northern areas of the Seychelles EEZ.



Recent fishing zones (2000-2004) by species of Japanese longliners having an agreement to fish in Seychelles

This observer programme should preferably be conducted by Japanese and Taiwanese technician/scientists in order to fully communicate with the fishing masters of the longliner and to easily obtain the needed information on all its fishing operations.

This programme should be conducted by at least one observer of each country, and preferably by two observers, on board of these longliners, and during a period of at least 3 months.

These observers should collect **5 major types of information**:

1) details on **fishing material**s: mainline, floatline, branchline, buoys
2) details on the **fishing operation**s at the set level: setting time and positions, hauling time and positions, bearing of setting, bait, direction of line settings, etc
3) detailed review of the various parameters describing the main **setting gear configuration, namely: line shooter speed, time between buoys, hook per basket, time between hooks.**
4) the **basic log book types information**: detailed capture (species, size, …) for each hook of each basket.
5) observers should be allowed to equip the long line with some **depth recorders** (1st priority) attached at the middle position of the basket mainline, in order to record for each set, various measures of the maximum fishing depth reached during the fishing operation.

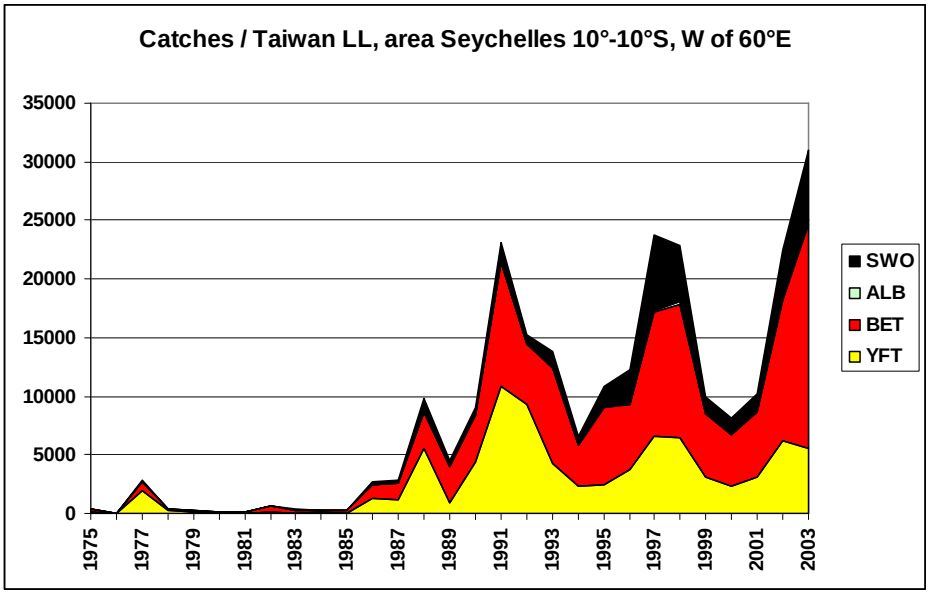
Despite of its small scale, the results of this small scale scientific observer programme should easily and firmly:

- either confirm that the present paradigm that hook depth is proportional to HBF is still a valid hypothesis,
- or if this working hypothesis should be abandoned in the IOTC stock assessment. If this is the case, these results should also show the technological changes developed on the different fleets allowing to target fish either in shallow waters with a large number of HBF or in deep water with a similar or a less number of HBF.

This programme should be a highly valuable investment done in addition to the CAPPES (Seychelles) and CAPPER (La Réunion) research programmes, and with significant connexions between these 2 types of researches.

The highest priority should be given for this present observer programme on the **Japanese fleet** because its important fleet of distant longliners and because this Japanese data base is of major importance in all tuna stock assessments done world wide by scientists and tuna RFOs and because of its very strange pattern of large HBF configuration associated to very high percentages of yellowfin.

A high priority should also be given to observe the hook depth of **Taiwanese longliners,** as this fleet is also of major importance in the Indian Ocean fisheries, and showing very different patterns in its species composition, even in the same zones of the Western Indian Ocean.



Yearly catches in Seychelles area by Taiwanese longliners

-4- Conclusion

The real relationship between the HBF parameter and hook depth/targeted species is nowadays a major source of uncertainty in most tuna stock assessments, especially in the Indian Ocean were tagging and recovery data are still insufficient. Such major uncertainty can be compared by its importance in stock assessment to the uncertainties in the Natural mortality at age or the catch at age matrix, but the very good point is that this uncertainty on the interpretation of HBF could be easily solved and at a relatively low cost running the recommended observer programme.

Then such ad hoc observer programme should be (1) well planned by scientists under the IOTC framework and (2) urgently conducted by Japanese and Taiwanese scientists

Litterature

Bach P., L. Dagorn, A. Bertrand, E. Josse, C. Misselis, 2003. Acoustic telemetry versus monitored longline fishing for studying the vertical distribution of pelagic fish : bigeye tuna (*Thunnus obesus*) in French Polynesia. Fish. Res., 60 (2-3), 281-292.

Bach P., P. Travassos, D. Gaertner, 2005. Why the number of hooks per basket (HPB) is not a good proxy indicator of the maximum fishing depth in drifting longline fisheries ? Doc. ICCAT, SCRS/2005/112, 19 p.

Bach P. and A. Fonteneau 2005. doc SC IOTC

Goodyear C. P., D. Die, D. W. Kerstetter, D. B. Olson, E. Prince, G. P. Scott, 2003 – Habitat standardization of CPUE indices: Research needs. Coll. Vol. Sci. Pap. ICCAT, 55 (2) : 613 – 623.

Koido T., 1985.- Comparison of fishing efficiency between regular and deep longline gears on bigeye and yellowfin tunas in the Indian Ocean. IPTP document TWS/85/25.

Nakano H., M. Okazaki, H. Okamoto, 1997 – Analysis of catch depth by species for tuna longline fishery based on catch by branch lines. Bull. Far Seas Fish. Res. Lab. 34 : 43 – 62.

Suzuki Z., Y. Warashina, M. Kishida, 1977 – The comparison of catches by regular and deep tuna longline gears in the western and central equatorial Pacific. Bull. Far Seas Fish. Res. Lab. 15 : 51 – 89.

Slide 1

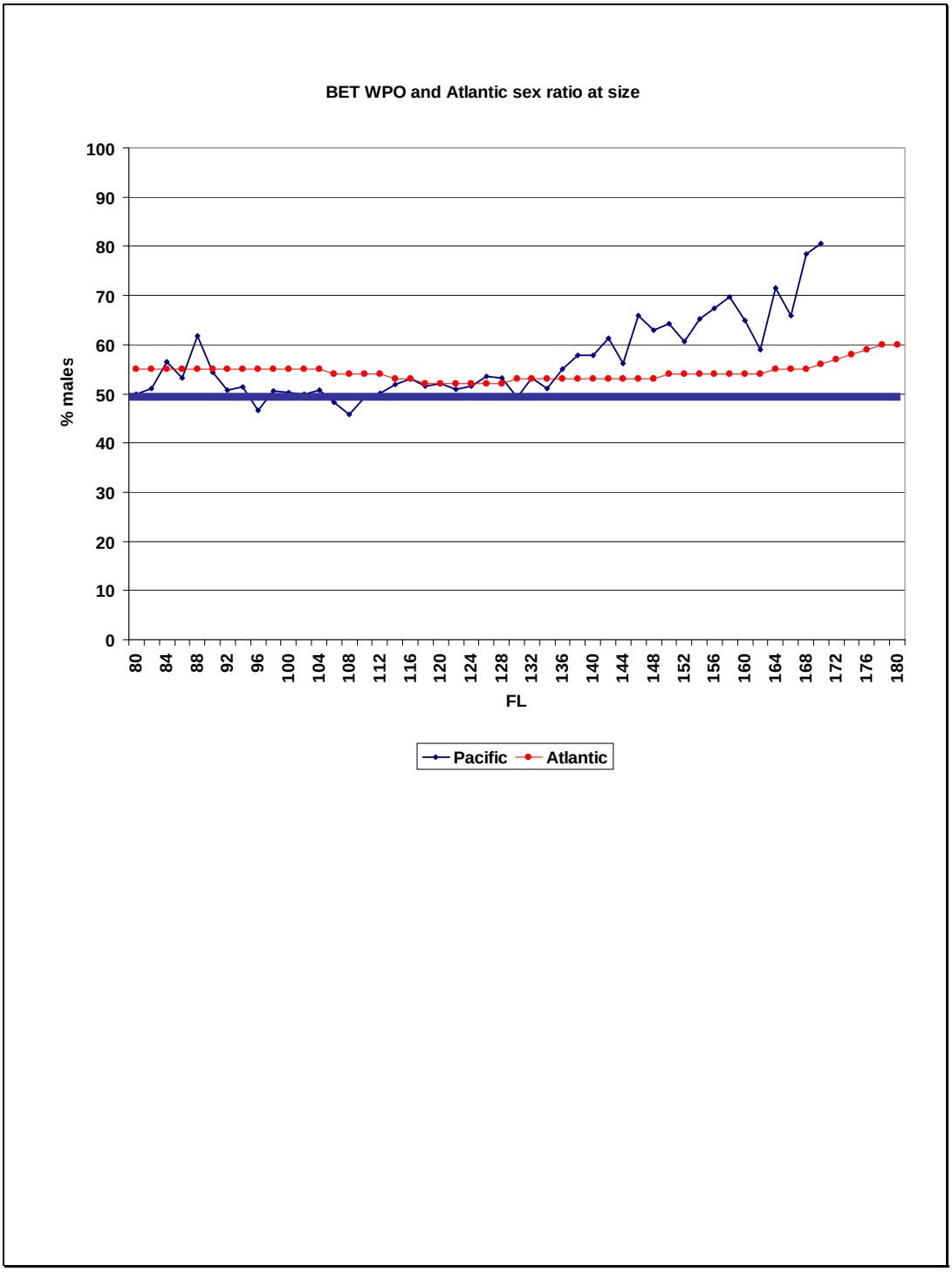
Tableau 1: Daily catches identified in the log book of purse seiners in the area shown by figure 2

Day	YFT	SKJ	BET	Total
3	399	48	34	481
4	204	42	10	255
5	494	0	115	609
6	496	21	21	537
7	1086	5	44	1134
8	209	8	25	242
9	1387	148	94	1629
10	850	67	91	1008
11	1162	359	81	1602
12	1950	18	165	2133
13	876	44	129	1049
14	1096	293	114	1503
15	1820	282	176	2277
16	1020	363	72	1454
17	410	314	32	755
18	1430	542	86	2057
19	3374	1002	159	4535
20	1824	91	66	1982
21	291	163	19	474
22	138	229	18	385
23	242	395	31	668
Total	**20758**	**4433**	**1579**	**26770**
Total 9-20th	**17198**	**3523**	**1263**	**21985**

Tableau 2: Numbers of tunas measured, corresponding to each fishing day, on the studied catches, by species

	9	10	11	12	13	14	15	16	17	18	19	20	Total
Yellowfin	509	268	118	0	472	392	315	226	201	936	2081	598	6116
Skipjack	66	0	123	0	0	60	24	219	211	309	162	5	1179
Bigeye	12	4	21	13	22	40	51	25	80	2			270
Total	587	272	262	13	494	492	390	470	492	1247	2243	603	7565

Slide 2


BET WPO and Atlantic sex ratio at size
% males
100
90
80
70
60
50
40
30
20
10
0
80
84
88
92
96
100
104
108
112
116
120
124
128
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180
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Atlantic

Slide 3

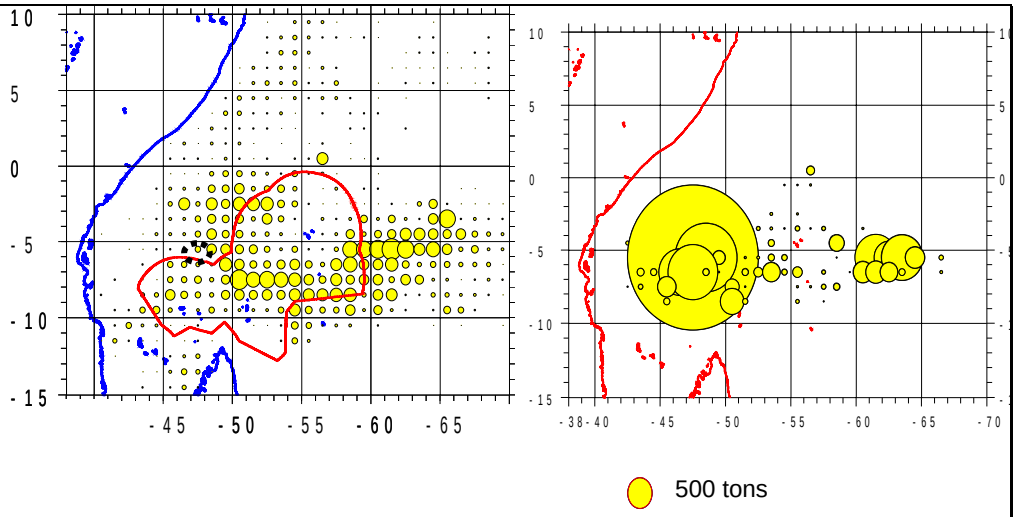


Figure 1: Average catches by species taken by 1° squares by the purse seine fisheries during the month of February (average period 1982-2003) and area of the presently analyzed 2005 fish concentration (doted line).

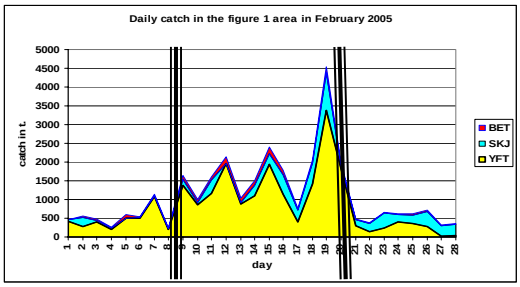


Figure 2 : Daily catches by species recorded in the area shown by figure 2 during February 2005

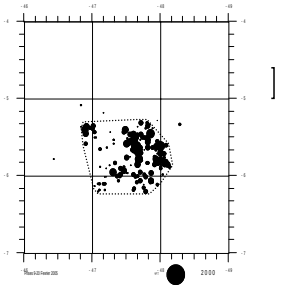


Figure 3: Geographical location of all positive sets registered between February 9th and 20th in the 4°S-7°S and 46°-49°E area

Slide 4

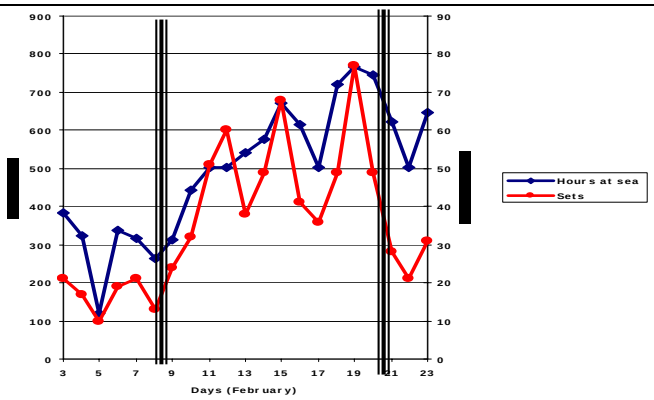


figure 4: Daily fishing activities by the purse seine fleet in the figure 2 area between the 3rd and the 23rd of January 2005, as shown by the number of fishing days and by the total numbers of sets recorded in the log books.

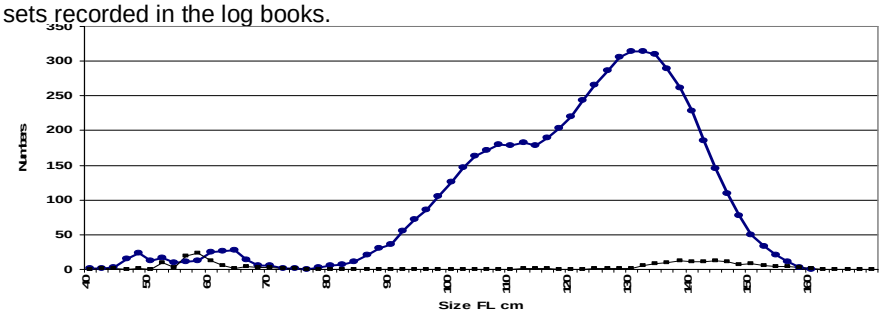


Figure 5: Size distribution of the yellowfin and bigeye caught and sampled from the studied fishing event as shown by the numbers of fished measured at each 2 cm size

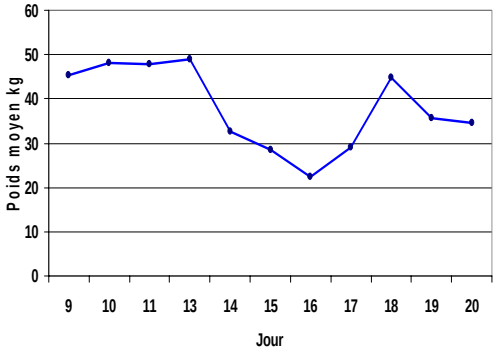


Figure 6: Average weight of yellowfin caught daily on free schools during the fishing event

Slide 5

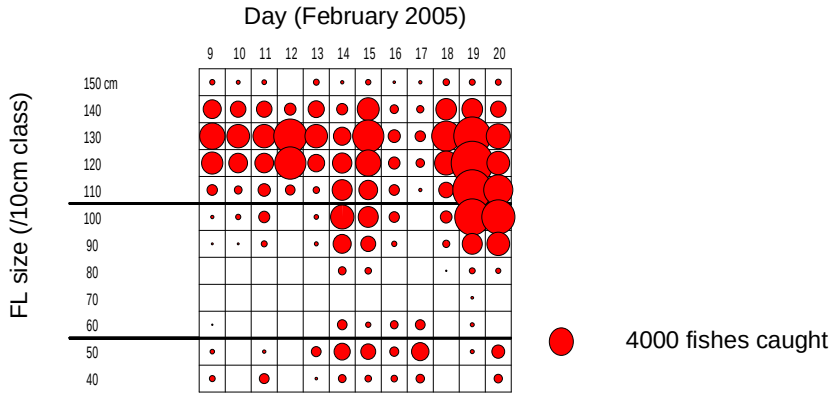


Figure 7: Diagram of daily catches at size of yellowfin tuna taken on free schools, by 10 cm classes,

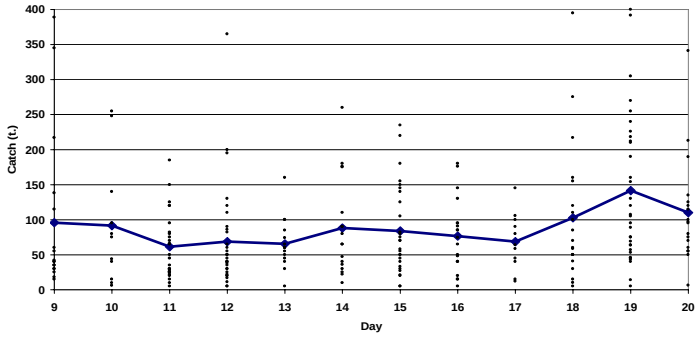


Figure 8: Catch per set of the 224 positive sets on free schools observed during the fishing event, observed catches, and average daily catch per set..

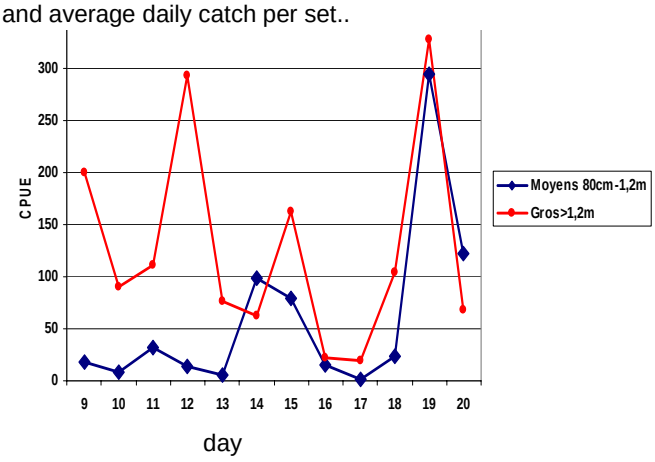


Figure 9: Daily yellowfin CPUE (free schools) expressed by size categories for small (90 to 120 cm) and large adults (120 to 160 cm) (expressed in number of yellowfin caught by fishing hour)

Slide 6

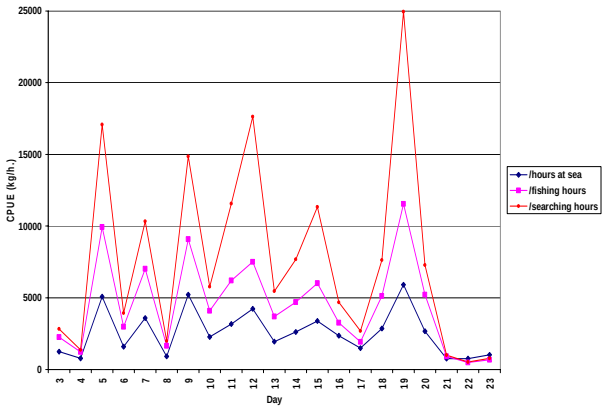


Figure 10: Daily CPUE of purse seiners on large yellowfin during the fishing event , as expressed in various units of CPUE: catch per hour at sea, per fishing hour and per searching hour.

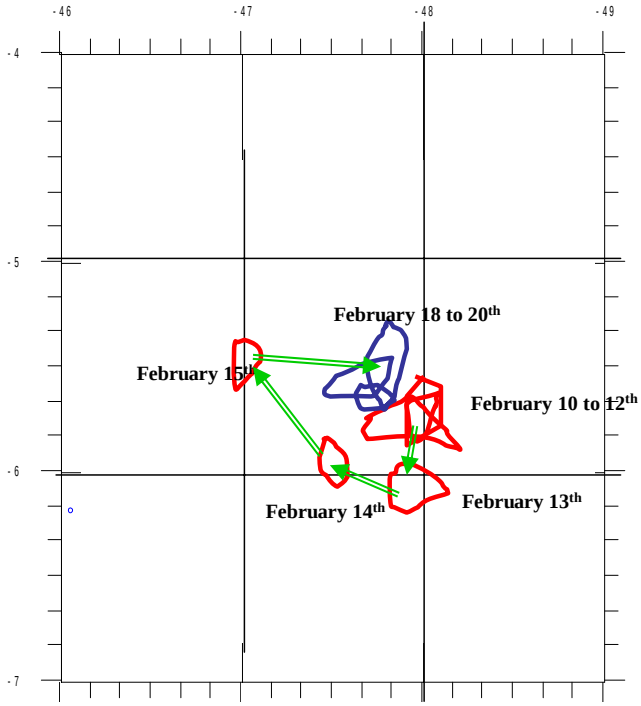


Figure 11: Daily sizes and positions of the areas fished by purse seiners during the concentration (contour estimated by eye)

Slide 7

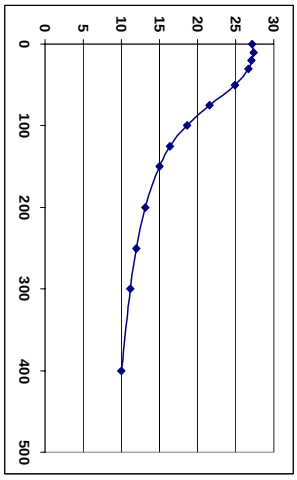


Figure 12: Average environmental condition observed in the fished area during the first quarter: temperature as a function of depth (from Boyer et Levitu world atlas)

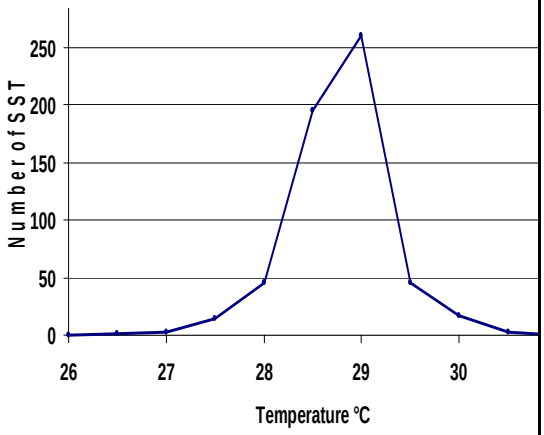
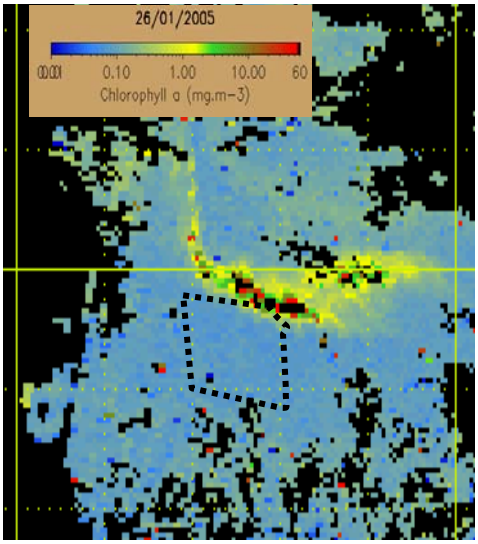


Figure 13 : Frequency of sea surface temperatures taken by purse seiners during the fishing operations (average SST=26,6°C)



5°S

45°E 50°E

Figure 14: Map of chlorophyll concentration estimated from water color (Sea Wiff) taken on January 26th and showing high concentration of chlorophyll north of the area that will be fished by purse seiners 11 days later (this fishing zone being shown by the dotted line).

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