On the statistical uncertainties of the Indian Ocean drift net fisheries? the Iranian case.

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Summary

This paper discusses the fact that Iran, Sri Lanka and Pakistan have been reporting large catches of yellowfin and skipjack taken by their gillnet fishery, but never reporting bigeye catches. This is estimated to be totally unrealistic and this paper tries to estimate a potential range of bigeye catches taken by these fleets, based on their still hypothetical fishing zones and in comparison with the species composition of FAD associated catches by purse seiners in the area. The paper also contains a discussion of the potentially significant by-catches probably taken by this fishery. Recommendations are made to solve these major statistical uncertainties that constitute a seious negative factor in the stock assessments and in the conservation of tuna resources and their ecosystems in the Indian Ocean, especially for bigeye.

1- Introduction

The driftnet fisheries, and especially from Iran, are of increasing and now of major importance in the Indian Ocean: the Iranian combined catches of yellowfin and skipjack are amounting for about 10 % of the total catches of these 2 species during the last 5 years.

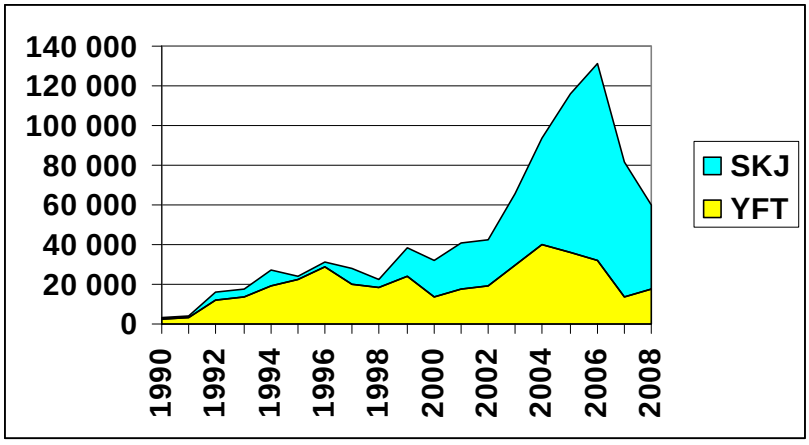

Figure 1: Yearly catches by the drifting net fleet declared by Iran.

These yearly catches by Iran have been caught by a large fleet of vessels, 752 driftnetters being declared by Iran to the IOTC as a fleet fishing outside Iran EEZ (a total of 6000 iranese gillneters being in operation!), in a range of total lengths between 14 and 33 meters and an average length of 22 m , see figure 2.

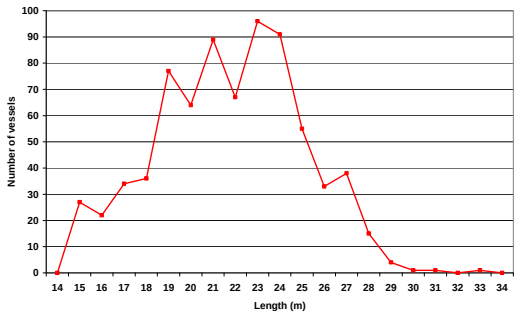

Figure 2: Number of drifnetters as a function of their total length as declared by Iran to the IOTC (an average length of 22 meters)

However, there is still very little information available about the activities of this fleet, for instance on their fishing efforts, the length of their nets, their fishing zones, etc.. The worst uncertainty being that there is no information submitted by Iran and available to the IOTC scientists (at least to our knowledge?) on the fishing zones of this fleet and on its statistical sampling. It is quite clear that the catches by species of such a large fleet of small vessels are difficult to sample, but unfortunately the sampling pattern of his fleet remains totally unknown (to our knowledge). This technical paper will try to describe some of the potential statistical uncertainties in the Iranian gillnet statistics, concentrating the discussion on bigeye tuna taken by Iranian gilnetters, a species never reported by Iran, and a species often taken by the EU purse seiners. This statistical problem is also faced, at least potentially for the various other major gillnet fisheries that are also active in the Northern Indian Ocean, for instance the Sri Lanka and Pakistan gillnet fisheries, and this question will also be examined.

2- Species composition of Iranian driftnet catches?

It should be kept in mind that when the exact fishing zones of this large fleet are still widely questionable, there are good reasons, based on multiple observations done by the EU purse seiners and from other sources of information, that the fishing zone presently exploited by this fleet covers the entire North West Indian Ocean, and the probable fishing zone is qualitatively shown by figure 3.

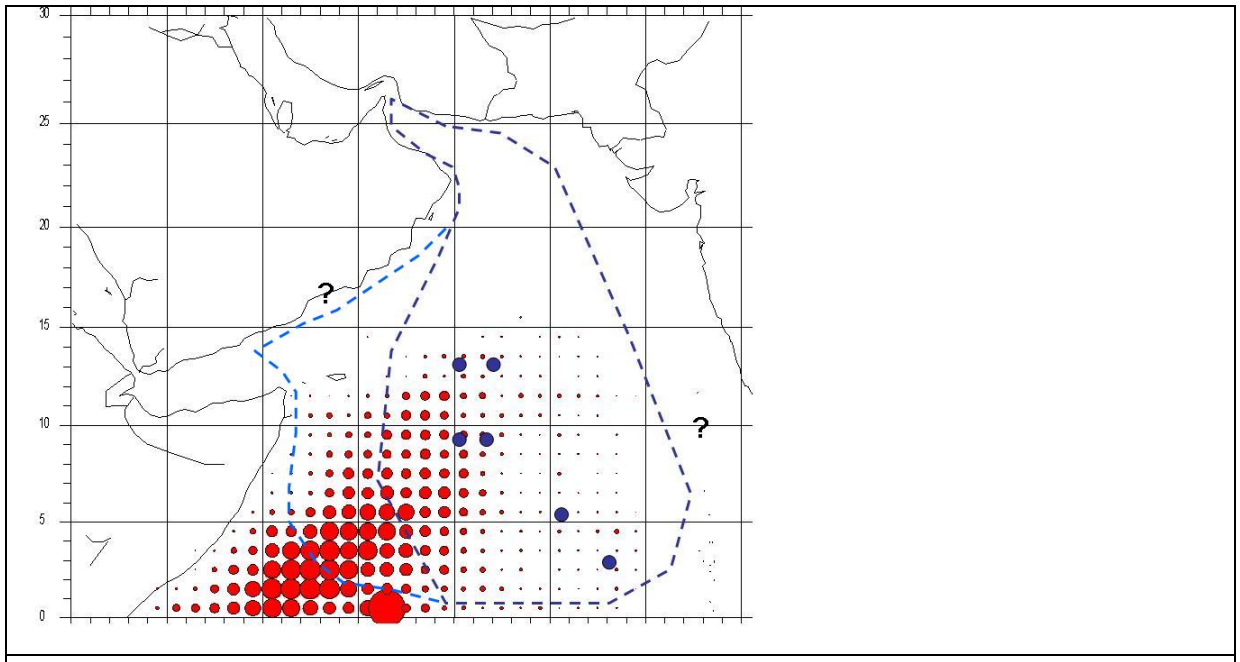

Figure 3: Potential fishing zones of Iranian drift net fleets (dotted line) and bigeye PS catches by 1° during the 2002 2008 period. Blue point are positions of drifnets from the Iranian fleet observed in October 2009.

In particular, the observations done in 2009 by various EU purse seiners tend to show that dense concentrations of driftnetters (figure 9) and dense networks of these large driftnets (a length of nets estimated by EU skippers between 3.5 and 5.5 nautical miles?) have been observed during recent years. The fishing zones were these nets have been observed was north of the Equator between 2° N and 14° N, i.e. in fishing zones where bigeye catches tend to be significant in most FAD associated schools, showing an average of 7.0 % of bigeye at latitude south of 10°N, and a low variability of this species composition (figure 4). This result of a high and stable % of BET is highly significant, as it has been obtained on 1500 multispecies samples, each one based on about 500 tunas.

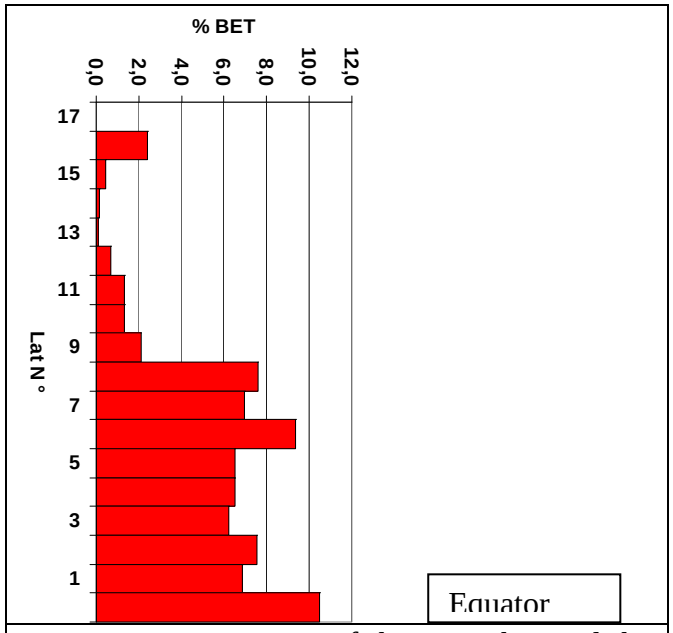

Figure 4: Percentage of bigeye observed by multispecies sampling in the FAD associated

catches of the EU PS fleet, by 1° of latitude.

The observations done by the same EU PS skippers also indicate that the Iranian driftnet fleet has been increasingly targeting the FAD areas and the tunas associated to the EU FADs, or the tunas moving from one FAD to the other in a network of FADs. The sizes of yellowfin caught by Iranian vessels are shown by figure 5, indicating a range of size quite similar to the FAD associated catches taken by the purse fisheries, but with a lower proportion of very small yellowfin under 50 cm and a higher % of yellowfin over 70 cm.

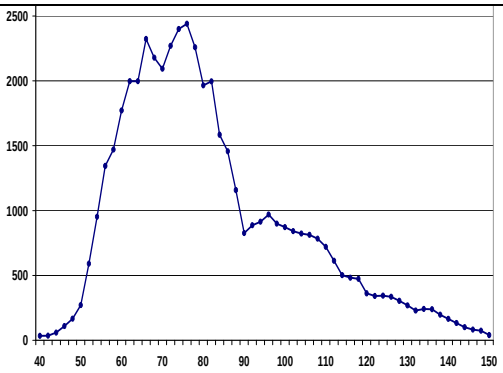

Figure 2a: Average sizes of the yellowfin caught by the Iranian drift net fleet, during the 1992-2007 period

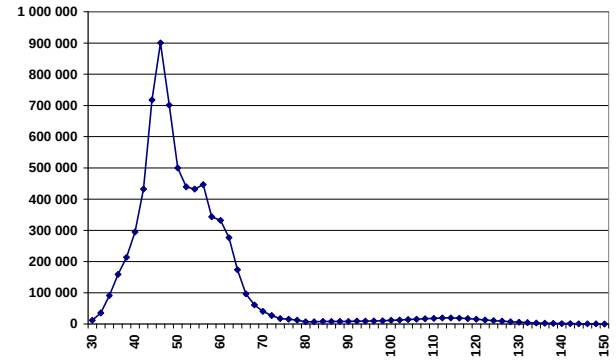

Figure 2b: Average catch at size of yellowfin caught by the EU PS fleet during the 2000-2008 period on FAD north of the Equator.

In this context, the sizes and the species composition of the Iranian fleet should necessarily include a significant amount of bigeye catches. As there is no species sampling routinely done on the species composition of the Iranian catches, there is a serious risk that part of the bigeye catches have been misclassified as being yellowfin catches. Such a statistical problem has often been noticed on purse seiners and in many artisanal fisheries. This is the case in the Maldives, were most bigeye are reported as being yellowfin, unless when there are identified by scientists (and when the 2 species have the same common name for the Maldivians).

3- Potential catches of bigeye by the Iranian driftnet fleet

As these potential bigeye catches by Iranian drifnets are probably taken in increasing quantities due to their increasing activities in their most southern zones, these bigeye being taken at relatively small sizes (probably at the same sizes as in the FAD PS fishery), these catches can be significant in the bigeye stock assessment. It is clearly difficult to estimate potential catches of bigeye by Iranian driftnets without a minimal knowledge of their fishing zones and fishing seasons. This attempt to estimate these potential ghost catches remain interesting, as the today official 0 tons of bigeye caught on a total catch of 875.000 tons during the 1989-2008 period, is at least widely questionable and misleading.

The present estimates of Iranian bigeye catches were based on 3 combined hypotheses:

(1) A 1st hypothesis that total yearly catches reported by Iran for its offshore gillnetters are correct. This hypothesis being questionable, as we know very little on the sampling statistical scheme used by Iran to estimate the total catches of this large and complex artisanal fleet.

(2) 2nd basic hypothesis that the % of bigeye in the PS and gillnet catches in the area south of 10°N is identical and at average rate of 7%, also assuming 0% of bigeye north of 10°N. Even if this hypothesis may underestimate bigeye catches, it is clear that bigeye is rare in all tuna fisheries fishing north of 10°N, probably due to environmental reasons (high temperature and low oxygen). This area can be fished only by the larger Iranese gillnetters, but they are not necessarily very large vessels (see photos)

(3) 3rd hypothesis assuming the % of the Iranian catches that have been taken yearly at latitude south of 10°N, this percentage ranging in a potential range between a minimum of 5% and a maximum of 50%.

The following table 1 shows the potential ranges of bigeye catches that can be estimated following this set of hypotheses.

Table 1: Yearly potential catches of small bigeye by the Iranian driftnet fleet estimated as a function of tuna caught south of 10°N.

	% of catches south of 10°North in the bigeye areas									
Year	*5*	*10*	*15*	*20*	*25*	*30*	*35*	*40*	*45*	*50*
1990	11	22	32	43	54	65	76	86	97	108
1991	15	31	46	61	77	92	107	123	138	154
1992	57	115	172	230	287	344	402	459	516	574
1993	62	124	185	247	309	371	432	494	556	618
1994	94	188	282	376	470	564	658	752	846	940
1995	83	165	248	331	413	496	579	662	744	827
1996	108	216	325	433	541	649	757	866	974	1082
1997	99	198	297	396	495	594	693	792	890	989
1998	79	159	238	318	397	477	556	636	715	795
1999	134	267	401	534	668	801	935	1068	1202	1335
2000	112	224	336	448	559	671	783	895	1007	1119
2001	144	288	432	576	720	864	1008	1152	1296	1440
2002	147	295	442	589	736	884	1031	1178	1325	1473
2003	229	458	688	917	1146	1375	1604	1834	2063	2292
2004	326	653	979	1306	1632	1958	2285	2611	2938	3264
2005	405	810	1215	1620	2025	2430	2836	3241	3646	4051
2006	459	918	1377	1836	2295	2754	3213	3672	4131	4589
2007	285	571	856	1142	1427	1713	1998	2284	2569	2855
2008	209	418	627	837	1046	1255	1464	1673	1882	2091

There is a high probability that the percentages of catches by Iranian gillnetters have been increasing during the period: being very low during the early period, and higher during recent years. These percentages are also widely dependent of the % of small and large gillnetters in the Iranian fleet, as larger vessels may tend to fish in more offshore areas. Unfortunately, the lack of detailed catch statistics by area of the Iranese fleet does not allow to estimate these geographical changes.

This table would show that the unreported catches of small bigeye by the Iranian gillnet fleet are very difficult to estimate but they are potentially significant due to the size of the fleet and to its now wide fishing zone. Recent bigeye catches could have been easily reaching a range between 1000 and 4500 tons of small bigeye caught (these bigeye catches being probably mis-classified as being yellowfin and thus correspondingly overestimating the yellowfin catches). There are also some potential questions on the sizes of fishes caught by Iran Gillnet vessels in the FADs areas: it could be hypothesized that tunas caught should have similar sizes, and this is not the case. This difference may be real, for instance due to mesh selectivity, it could also be artificial and due to sampling bias.

4- Statistical uncertainties in the species composition of other Gillnet fisheries.

The declared species composition of the Sri Lankan and Pakistanese gillnet fleets are also showing the same potential statistical problem, reporting large catches of yellowfin and skipjack, especially for Sri Lanka, but most often null catches or very small amount of bigeye (see figure 6 and 7).

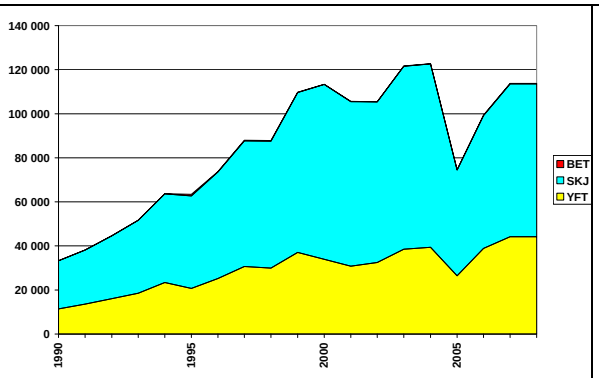

Figure 6 : Yearly catches declared for the Sri Lanka gillnet fleet

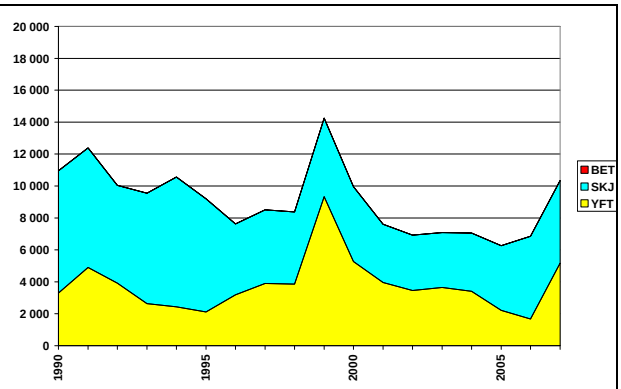

Figure 7: Yearly catches declared for the Pakistan gillnet fleet

The potential catches of bigeye by Sri Lankan and Pakistanese gillnetters are more difficult to estimate, because of the absence of knowledge concerning their fishing mode and zone, and thus to the lack of potential percentage of bigeye caught. It seems that these Gillnet are smaller and shallower than gillnet from Iran, that the fishing vessels are smaller, and that part of this fleet tend to primarily target sharks, but these fishing modes are poorly known by IOTC scientists. However there is a high probability that the bigeye catches reported by these 2 fleets, 0% for Pakistan and 0.1% for Sri Lankan vessels, are also possibly widely underestimated in the same order of magnitude as the Iranian fleet. As a consequence, a potential "ghost" catch of several thousands of tons of small bigeye may easily be lost by scientists in these fisheries.

5- What potential by-catches by Iranian driftnets & other gillnet fisheries?

In the total absence of observer data, nothing is known about the potential by-catches of turtles, sharks and dolphins taken by these very large driftnet fleets. However, as these driftnet are typically fishing in the shallow epipelagic waters in areas rich in sharks, turtles and dolphins, there is a high probability that these driftnets are also a significant source of accidental fishing mortality on those species. This danger of accidental uncontrolled fishing mortality was the main reason leading to the international 1992 ban by the United Nations and later by most RFOs and countries, concerning the use of these large driftnets. Furthermore, when there are no legal measurements or the length of drift nets presently used, there are very little doubts that these driftnets are very large. It should be hypothesized that the large Iranian vessels of 30 meters fishing in equatorial areas are necessarily using large nets: based on various estimated length measured by purse seiners, and based on the fact that large semi industrial vessels, fishing in offshore waters very far from their home ports, cannot profitably fish with small legal driftnets!

6- Conclusion

This paper shows that the official catch statistics from Iran and other countries concerning their drift net fisheries have been widely questionable and probably underestimating their bigeye catches. The lack of seasonal geo-referenced data reported to the IOTC and the lack of knowledge concerning the statistical sampling done on these major fleets, should also be a source of great concern, for the IOTC statistics WG. This structural bias could introduce a significant uncertainty in the bigeye and yellowfin stock assessments done by the IOTC, as it tends to underestimate the increasing catches of small bigeye (and correspondingly to overestimate the quantities of small yellowfin caught). This first work would tend to reach the conclusion that these quantities of “ghost” bigeye caught by Indian Ocean drifnetters are possibly be significant, hey are still impossible to estimate due to the nearly complete lack of catch and effort data by area. The IOTC ecosystem WG should also strongly recommend to estimate the by-catches of sensitive species such as sharks, dolphins and turtles taken by these large gillnet fleets fishing in the Indian Ocean. Firm recommendations should be done by the IOTC SC and its statistical WG to urgently solve this question, at least doing tests of multispecies sampling on the landings of these fleets.

Acknowledgments

The basic at sea information used in this document has been provided by skippers of purse seiners. It is a pleasure to acknowledge Ronan Bargain, French skipper of the Spanish purse seiner Txori Toxi, as he has been my best source of at sea observations & photos used here. Miguel Herrera from the IOTC secretariat was also very helpful providing various information and comments on this complex and cryptic statistical problem.

Figure 8: Photos of Iranian gillnetters active in the purse seine fishing zones

Figure 9: Photo of a radar screen on a purse seiner showing a « typical » concentration of Iranian driftnetters: 24 vessels observed in a radius area of only 15 nautical miles.

Figure 10: Tunas caught by an Iranian driftnetter and stored on the bridge, sorted by sizes: small tunas on the left, medium in the middle, and 1 large billfish (?) on the right