Agreement on the Conservation of Albatrosses and Petrels

Eighth Meeting of the Seabird Bycatch Working Group

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Recommended seabird bycatch research priorities for tuna fisheries operating on the high seas

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RECOMMENDATIONS

Recommendation 1. ACAP encourage a suitable organisation or organisations to conduct a survey of the potential misuse of bait casting machines used on tuna vessels operating on the high seas and report the findings to a future meeting of the SBWG. Misuse pertains to the distance baits are landed outboard of vessels, with landing distances outboard of the streamer line (if in use) position considered dangerous to seabirds. The survey could include the manufactures of bait casting machines and port-based inspection and trialling of machines on vessels. Power output settings and actual bait landing distances from vessels could be the main parameters quantified in the survey.

Recommendation 2. ACAP encourage a collaborative research program between relevant research organisations and a high seas tuna fishing nation to develop and test experimentally a new line weighting regime with greatly improve bait sink rates in surface depths (0-2 m) of the water column. The sink rate of the regime should approximate those promoted by ACAP as best practice. A target mean sink rate of 0.45 m/s to 2 m depth is suggested or 0.4 m/s if the faster rates is deemed technically infeasible. The aim of the experiment is to demonstrate that improved branch line weighting (and sink rates) significantly reduces seabird mortality without affecting fish catch, and therefore safeguards against any non-compliance to streamer line use on unobserved vessels operating on the high seas.

1. INTRODUCTION

The purpose of this document is to present ideas on research priorities of relevance to seabird conservation in tuna fisheries operating on the high seas with a view to stimulating discussion in the SBWG.

2. CONTEXT AND NON-COMPLIANCE INDICATORS

Observations of seabird bycatch in tuna fisheries operating in international waters date back to the late 1980s and early 1990s (Brothers 1991; Murray et al., 1993) with the number of fatalities estimated in the tens-of-thousands of seabirds taken annually in the southern oceans alone. In the 25 years since those early years the likelihood is that little, if anything, has changed in terms of the adoption of effective seabird deterrent measures. The reality is, I suspect, that line setting occurs at times of the day/night cycle that best suit fishing operations with little consideration for seabirds; streamer lines are either not used, used sporadically or used in a manner that compromises effectiveness (e.g., missing streamers, reduced aerial extents); and branch lines are either unweighted or weighted with regimes that fall well short of ACAP requirements. Of course, those allegations cannot be verified because tuna vessels operating on the high seas do not take observers that are independent of fishing operations, so there is no objective record of mortality rates and no reliable record of compliance to agreed conservation measures. Since direct evidence of compliance is lacking, we must look to indirect evidence to gain a measure of the likely realities on the high seas. Two relevant indicators are the difficulties associated with the introduction of mitigation measures in domestic (coastal state) tuna fisheries, and the role of incentives.

Members of the working group will be able to recall their own experiences regarding efforts to introduce mitigation measures in home nation fisheries. My own recollection is one of strong resistance, most of it levelled at line weighting. Any weight added to branch lines, let alone that which would deliver decent sink rates, was anathema to the fishing industry and the issue took years to settle down. This was hardly surprising because once weights are embedded in snoods their use becomes compulsory, including in the absence of on-board observers. This cannot be said for streamer lines and night setting because these measures cannot be embedded in fishing gear and their use is therefore elective, being dependent upon the attitude of fishing masters and deck hands each time the line is set. In the context of non-compliance on the high seas, this attribute (compulsory versus elective) alone sets line weighting apart from the other two measures.

Resistance to night setting stemmed from concerns about fish catch (and still does with some fishers) and time wasted jogging on the fishing grounds waiting for night to fall. The most important observation about streamer lines was (and is) that ‘scientists streamer lines’ and ‘fisher streamer lines’ are two completely different versions of the same thing. The streamer lines used by scientists in seabird deterrent experiments are perfect in terms of aerial extents, design and density of streamers, whereas fisher streamer lines often have aerial extents around half the length required by regulations, are poorly maintained and may be positioned poorly on vessels. These characteristics must significantly reduce effectiveness. Streamer lines are also subject to being ripped off on floats, something that some fishers seem to resolve (or tolerate) and some fishers seem never to resolve.

Another indicator of the likelihood of compliance on the high seas is the presence/absence of incentives. Table 1 provides examples of fisheries that have adopted seabird friendly gears and practices due to the existence of incentives. Nearly all examples are from fisheries operating in national economic zones where license conditions apply and where high levels of observer coverage, reporting and accountability can be expected. To my knowledge there is not a single example of seabird deterrent gears and practices being adopted in fisheries in the absence of strong incentives.

If the experiences mentioned above typify fisher attitudes to the implementation of mitigation measures in domestic fisheries, where there is a degree of compulsion, and if in every instance incentives are required to drive change, what are the chances of adoption on unobserved vessels operating on the high seas?

Table 1. *List of examples known to the author where incentives have been instrumental in driving the adoption of effective seabird conservation measures in longline fisheries.*

Fishery	**Incentives exist?**	**Types of incentives**	**Pathways and actions**	**Seabird response**	**Assumed fisher response**
Ross Sea (Antarctica), toothfish	Yes	Operational + political in CCAMLR	Min. sink rate imposed led to external weights led to development of integrated weight longline	None locally (absence of LL-vulnerable seabirds) but hugely positive elsewhere (2)	Pragmatism. Desire to protect fishing rights
Kerguelen and Crozet, toothfish	Yes	Political in CCAMLR	Political in CCAMLR	Mortality fell from ~12,500 birds/year to several hundred/year (3)	Pragmatism
South Georgia (Georgias del Sur)(1), toothfish	Yes	Political in CCAMLR	High # of fatalities led to summer closure of fishing grounds (show of force by CCAMLR). Improved line weighting likely helped.	Mortality fell from ~ 5,700 birds/year to <20 (4)	Pragmatism. Desire to protect fishing rights
Chile, toothfish, cachalotera	Yes	Economic/existential (see next column)	By-product of gear changes to reduce toothfish depredation by toothed whales	Mortality fell from ~ 1,500 birds/year to zero (5,6)	Pragmatism – strong incentive to innovate
Chile cachalotera, hook ingestion in discarded fish (grenadiers)	Yes	Political in CCAMLR. Hooks uniquely coded by one fishing company (at least). Economic: crew paid to remove hooks from fish to be discarded.	High hook content in regurgitate of South Georgia wanderers addressed in CCAMLR	Ingestion of hooks owned by one particular fishing company by adult WA albatrosses (and subsequently chicks) plummeted	Pragmatism. Desire to protect fishing rights in CCAMLR
Bering Sea, Pacific cod	Yes	Economic/existential	Threat of fishery closure courtesy provisions of the USA Endangered Species Act	Unsure but likely positive	Pragmatism. Desire to continue fishing
Australia, tuna, high latitude sector	Yes, but weaker than some above	Operational and economic.	Enforceable seabird bycatch limit breached, fishery closed for day setting. Actions of an NGO useful in galvanizing attention	Unknown. Response less clear cut than with other examples	Pragmatism. Closure led to line weighting trials which led to development of lumo sliding leads (7)
High seas tuna in EEZs (e.g., South Africa, NZ)	Yes	Economic.	Enforceable seabird bycatch limits (S. Africa).	Unsure but likely positive	Pragmatism. Desire to be able to fish
High seas tuna on high seas	No	None	Not applicable	None of the above. Likely continued high mortality rates	Zero

(1) A dispute exists between the Governments of Argentina and the United Kingdom of Great Britain and Northern Ireland concerning sovereignty over the Falkland Islands (Islas Malvinas), South Georgia and the South Sandwich Islands (Islas Georgias del Sur e Islas Sandwich del Sur) and the surrounding maritime areas.

(2) Inferred from Robertson et al., 2006; (3) Delord et al., 2005; (4) Croxall 2008; (5) Moreno et al., 2008; (6) Robertson et al., 2014; (7) Robertson et al., 2013.

If incentives do not exist for high seas fisheries it could be argued that further research would be futile, because the results will likely suffer the same fate as those from previous studies and end up in an abyss of non-compliance. Worse, industry could use the possibility of further research to extend the time lines to implementation, a defacto tactic of ‘hurrying up to go slow’. On the other hand, if nothing is done nothing will be achieved and the fishery is too important to give up on. Further research is important and to my way of thinking two projects stand out. The first is a survey of the potential misuse of bait casting machines and the second is an experiment on improved line weighting.

3. POTENTIAL MISUSE OF BAIT CASTING MACHINES

Concern about the potential misuse of bait casting machines has been raised previously in the SBWG (SBWG-3 Doc 4, 2010). Bait casting machines were designed as a seabird conservation tool to land baits in the protection zone of streamer lines under all weather conditions and sea states. There is potential for them to be used instead to straighten the branch line to reduce tangles. Branch lines in high seas fisheries range in length from 30-40 m, more than twice the length of those used in domestic fisheries (which, incidentally, target the same fish species). If bait casters are used to straighten branch lines, baits could be landed about 25 m or so beyond the protection zone of the streamer line. Baits deployed this far outboard and potentially in daylight with no line weighting would be the equivalent of hand feeding baited hooks to seabirds. It is logical, therefore, that the misuse of bait casting machines could be a key contributing factor in the suspected high fatality rates of seabirds in high seas tuna fisheries.

The bait deployment characteristics of bait casting machines are poorly understood, which is situation that must be rectified. It would be helpful, therefore, if a survey could be conducted to examine issues pertaining to power settings of bait casters (basically, bait landing positions outboard of vessels). The survey could involve assessment in the factory as well as assessments of machines fitted to vessels. The latter could be conducted by in-port inspection and testing (not at sea) and involve a sample size large enough to be convincing. The results of the survey should be submitted to a future meeting of the SBWG for assessment and a decision taken on next steps, if required.

4. IMPROVED LINE WEIGHTING

At the 2016 meeting of the SBWG the best practice line weighting advice was revised following the reasoning and recommendations put forward by Barrington et al., (2016) from research conducted in Australia. The reasoning was that improved sink rates in the upper areas of the water column reduce seabird mortality in the absence of other mitigation and therefore act as a safeguard against any non-use of streamer lines and night setting. Improved sink rates are achieved primarily by reducing the length of the leaders, which reduces the time taken for baits to disappear underwater. The decision to adopt the improved line weighting recommendations was based on evidence from studies in Uruguay and Brazil on the effect of leader length on seabird mortality. The salient features of the two studies are as follows:

Jimenez et al., 2013 (Uruguay): preliminary study; relatively small sample sizes; day setting; no streamer (tori) line; line weighting the only deterrent. Compared 75 g at 4.5 m with 65 g at 1 m from hooks (NB: The effect of the 10 g difference in sinker mass was probably minor compared to the 3.5 m difference in leader length). Average sink rate from 0-2 m depth was 75 g/4.5 m = 0.15 m/s compared to 0.27 m/s for 65 g at 1 m (the latter almost twice as fast as the former). The short leader reach 2 m depth in 7.4 s compared to 13 s for the long leader. The short leader reduced seabird mortality by 50%. Recommended a weighting regime of 65 g at 1 m + streamer line for areas with high seabird abundances.

Claudino dos Santos et al., 2016 (Brazil): larger sample size and more complete study; design unbalanced at the treatment level; mix of day and night sets; no streamer line; 60 g sinker at 3.5 m from hooks (two versions) versus 60 g at 1 m. Average sink rate 0-2 m depth range of 60 g/3.5 m = 0.13-0.14 m/s compared to 0.19 m/s for 60 g at 1 m. Baits on the short leader reach 2 m depth in about 10.5 s compared to up to 15 s for the long leader. The short leader was associated with a reduction in seabird mortality of 22%-87%.

Although both studies reported sink rates to deeper depths, in the summaries above the sink rates in the 0-2 m depth range are emphasized because this is where differences in the lag time (time taken to start sinking) at the surface are most evident. With no streamer line in use and with the same (or very similar) sinker masses, the observed reduction in seabird mortality must be explained by differences in lag time at the surface. The take home message is that in the absence of streamer lines, short leaders are good for seabirds. This finding is important because it means that if streamer lines are not in use, as suspected with unobserved vessels on the high seas, seabird mortality could be reduced substantially with branch lines configured with short leaders (1 m) and lead sinkers of about 60 g mass (this configuration is one of the options considered best practice by ACAP).

5. NEXT STEPS

In terms of future research, it would be useful if a line weighting study could be conducted in collaboration with a high seas fishing nation along the lines of those in Uruguay and Brazil but with a more balanced design and far greater sample sizes. To simplify the design so the experiment is more manageable, I'd envisage something along the lines of the Uruguayan study, involving a head-to-head comparison of the catch rates of fish and seabirds by 'standard' (unweighted) branch lines and branch lines configured to approximate in the 0-2 m depth range the sink rate of the 60 g at 1 m regime recommended by ACAP. The 60 g weight would not necessarily have to be a point source of weight (single lead sinker). Other options, such as a beefed-up version of the double weight system, could be developed, perhaps with inputs from marine engineers, and trialled *a priori*. However, in the development of any new line weighting regime the key performance specification must be the *sink rate of baits in the surface areas of the water column,* to be consistent with the idea of shrinking the window of availability of baits near the surface. There are technical issues in determining what the exact weighting regime and sink rate should be (see Annex) and these would have to be resolved and agreed to by the collaborating parties. Admittedly, such and experiment would be ambitious and operationally difficult to execute, but hopefully not impossible. The rewards to seabird conservation could be worth the effort and expense.

6. REFERENCES

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ANNEX 1. LINE WEIGHTING FOR HIGH SEAS

To enable gear to sink fast in the shallow depths the simplest approach would be to adopt one of ACAPs best practice weighting regimes – 60 g at 1 m or 80 g at 2 m – which achieve about the same sink rates to 2 m depth. However, these regimes infer (if for no other reason that the type of leads available) use of a single sinker in branch lines. This may not be acceptable to high seas fishers, as indicated by their development of the double weight system. Be that as it may, the critical factor with the development of an experimental line weighting regime is that it must deliver seabird conservation outcomes consistent with those in the Uruguayan and Brazilian studies, which were instrumental in the decision to upgrade the advice on best practice. Therefore, as problematic as it is, the development of any new branch line weighting must conform to a prescribed sink rate standard.

Use of sink rates, as against line weighting, is problematic because the sink rates of identical weighting regimes are not necessarily consistent among studies. This is especially the case with estimates in the shallow depths (0-2 m) where even slight errors greatly reduce accuracy. In the seabird deterrent studies by Uruguay and Brazil, and the sink rate study of by Australia (Barrington et al., (2016), the mean sink rates of 60 g at 1 m in the 0-2 m depth range were 0.27 m/s (Uruguay), 0.19 m/s (Brazil) and 0.45 m/s (Australia). In the Australian study even 60 g at 3.5 m sank faster (0.29 m/s) than the 60 g at 1 m regime in the other two studies. (There are numerous possible reasons for the differences, chief among them being the rise and fall of the sea, propeller turbulence, accuracy in recording the *exact* time of water entry and, perhaps the most important of all, failure to calibrate the zero depth offsets of the TDRs).

Keeping in mind the necessity to derive a sink rate to guide the development of a new branch line weighting regime, I would prefer to be guided by the findings from the Australian study which was conducted under controlled conditions on a chartered vessel in relatively calm conditions with exact recording of water entry times and data correction using known TDR zero offsets. I therefore suggest an aspirational goal of 0.45 m/s in the 0-2 m depth range with 0.4 m/s to be considered if the faster rate is deemed technically unachievable.