Agreement on the Conservation of Albatrosses and Petrels

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Developments in experimental mitigation research – Demersal longline fisheries (Namibia)

Albatross Task Force,
BirdLife International, Global Seabird Programme

The effect of single and paired tori lines on seabird interactions in the Namibian demersal longline fleet

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Introduction

The Albatross Task Force (ATF) was established in 2006 as the world's first international team of seabird mitigation instructors to meet the urgent conservation need to reduce seabird bycatch in longline and trawl fisheries. The work of the ATF originally focused on establishing ATF teams in southern Africa and South America to quantify bycatch and build links with the fishing industry and government agencies and to work at-sea and on-shore towards the adoption of mitigation measures in target fisheries.

At the Second Meeting of the ACAP Seabird Bycatch Working Group (Hermanus, South Africa, 2008) mitigation research priorities for longline fisheries were identified. The report of the Advisory Committee detailed the generic research priorities for demersal longline fisheries, of which further investigation of paired tori lines in demersal fisheries was regarded as a high priority (ACAP, 2008, Annex 7).

In January 2009, the ATF held the First ATF Instructors Workshop (Coquimbo, Chile) to define work programmes and objectives for 2009/10. During this meeting the ACAP mitigation priorities were discussed by country and fishery by ATF teams[1]. Considering the initial levels of bycatch reported in Petersen *et al* (2009) the demersal longline fleet based in Walvis bay was identified as a priority for mitigation adoption in Namibia (BirdLife Global Seabird Programme, 2009). By 2010, the relevant permissions had been granted to begin monitoring seabird mortality and conduct mitigation research into single and paired tori line use on board vessels in this fleet.

The objective of this report is to review the work completed in the demersal longline fishery during 2010/11 and present the objectives for 2012.

The objectives of the study were threefold:

1) Evaluate seabird bycatch associated with the demersal longline fleet;

2) Investigate the effect of a single tori line on seabird mortality;

3) Investigate the effect of paired tori lines on seabird mortality.

A null hypothesis for each objective was tested:

H_0 1= There is no seabird bycatch associated with the demersal longline fleet;

H_0 2= A single tori line has no effect on seabird bycatch in the demersal longline fleet;

H_0 3= Paired tori lines have no effect on seabird bycatch in the demersal longline fleet.

[1] Teams include Argentina, Brazil, Chile, Ecuador, Namibia, South Africa and Uruguay.

Fishing vessels and study area

The experiments were carried out on board Namibian flagged fishing vessels from Walvis Bay that target Cape hake *Merluccious capensis* and deep water hake *M. paradoxus*. Four vessels were included in the study (Table 1). Fishing grounds included the entire Namibian coast from 28° 40' S to 17° 15' S, between the 200 and 600 m depth contour lines.

Table 1: Namibian longline vessels included in this study

Vessel Name	Year Built	Length (m)	Breadth (m)	Gross Registered Tonnage	Net Registered Tonnage
Boston Wayfarer	1965	28.7	7.0	253.4	72.0
Jao N Castro	1985	32.0	7.0	330.7	65.7
Liper	1993	21.7	6.7	149.3	44.8
Westcoast ll	1972	37.9	7.5	265.0	79.0

Fishing gear and operation

The fishing method in the Namibian demersal longline fleet is configured to the Spanish system. This includes a 12 mm polypropylene main line, 23 m connecting (dropper) lines that connect the main line to an 8 mm polypropylene hook line. Dropper lines were attached every 45 m; between each dropper line 30 hooks were attached to the hook line by 0.9 mm monofilament snoods with 0.5 m between snoods. A concrete weight with average mass of 4.9kg (SD ± 1.62kg) was attached to every second dropper line (90 m).

Fishing trips lasted an average of eight days. One to two lines were set each day; where two lines were set, the first line was either set in shallower water and the second in deeper water parallel to the first, or the lines were set one after the other. Each line was approximately 12.08 nautical miles long (range 7 – 23 nm) and included an average of 15,070 baited hooks (range 8,280 – 27,792 hooks).

Setting operations started before dawn and lasted an average duration of 1 hour, 50 minutes. Setting operations were performed from a central position on the aft deck by a team of six crew members. The first crew member was dedicated to deploying hooks from pre-prepared plastic hook boxes (pots), each of which contained 60 baited hooks. A second attached dropper lines and weights. The remaining crew members supported these two roles by ferrying weights, hook boxes and dropper lines as required.

Line hauling began between 08:00 and 11:40 hours and continued until all gear had been retrieved. As the gear was retrieved the snoods were repaired, the hooks baited and hook boxes prepared for the next set. Lines were always hauled from north to south.

Mitigation measure

Tori lines were constructed from a 100 m backbone of 5.0 mm polypropylene cord. Double white plastic streamers were attached at 5 m intervals along the length of the backbone cord.

The first streamer was placed eight metres from the stern of the vessel and streamers decreased in length from 1.95 m to 0.95 m along the extension of the tori line backbone. Tension was provided by a towed device consisting of a buoy tied inside a small road cone attached 12.8 m behind the last streamer at the trailing end of the tori line.

Tori lines were attached to extension poles to achieve a height above sea level of at least 8 m. Extension poles were attached to the aft quarters of the vessel, as far astern as possible. The aerial extension of the tori line was consistently 90 m.

Onboard protocol

The use of tori lines (Treatment 1, 2 or 3) was allocated on a random basis for each set. As the majority of setting operations began before dawn, seabird counts were carried out at first light for all species within a 250 m hemisphere from the stern of the vessel. Environmental information was noted including wind speed (Beaufort scale), cloud cover and sea surface temperature.

Seabird bycatch was recorded to species level during the haul. Observation effort during the haul was estimated by counting weights to give a total number of hooks observed per haul.

Data analysis

Seabird mortality was calculated as a factor of fishing effort and reported as bycatch per unit effort (BCPUE: birds / 1,000 hooks). Observation effort and recorded seabird mortality was separated by treatment (single tori line, paired tori line and control) and period of setting operation (daylight / nocturnal sets). Daylight sets were taken as all hooks set after 06:00 hours.

Results

Three trips were carried out between January and June 2011, making a total of nine trips conducted since the research began, representing a total effort of 1,236,450 hooks over 64 fishing days and 82 setting operations (15,070 ± 4,814 hooks per set), of which 1,164,515 hooks (94%) were observed.

The first three of these nine trips trips were performed to monitor seabird mortality and to generate the support required for the ATF to obtain permission to commence experimental work within the fleet. The subsequent six trips included the experimental treatments. Of this total observed effort (1,164,515 hooks) Treatment 1 (single tori line) accounted for 211,940 hooks over 15 sets, 18.2 %; Treatment 2 (paired tori line) accounted for 179,344 hooks over 13 sets, 15.4 %; and Treatment 3 (control) for 773,231 hooks over 54 sets, 66.4%.

Seabird abundance

Of the total number of hooks set, 136,557 (11.0 %) were deployed during daylight setting operations after 07:00 hours, which allowed seabird censuses to be performed. A total of 26 seabird censuses were carried out over 26 daylight setting operations. These censuses indicated that a total of eight species attended the vessels during setting operations. Most frequently recorded were White-chinned petrel and Atlantic Yellow-nosed albatross, which were recorded in 100% and 80.7 % of censuses, respectively (Table 1).

Table 1: Total number of birds, average and frequency of observation (F.O.) of species recorded during seabird abundance counts aboard vessels in the Namibian demersal longline fishery

Species	**Maximum**	**Mean ± SD**	**F.O. (%)**
White-chinned petrel *Procellaria aequinoctialis*	105	36.27 ± 27.89	100
Atlantic yellow-nosed albatross *Thalassarche chlororhynchuos*	100	30.18 ± 28.03	80.77
Black-browed albatross *Thalassarche melanophrys*	98	25.50 ± 32.90	30.77
Shy albatross *Thalassarche cauta*	90	30.33 ± 32.06	26.92
Wilson's storm petrel *Oceanites oceanicus*	130	23.50 ± 47.63	23.07
Cape gannet *Morus capensis*	22	09.67 ± 06.97	23.07
Sabine's gull *Xema sabini*	60	36.50 ± 36.50	15.38
Sub-Antarctic skua *Catharacta antarctica*	81	28.09 ± 29.76	38.46

Seabird mortality

During the study period a total of 504 seabirds were recorded killed. This equates to a total bycatch rate of 0.433 birds / 1,000 hooks.

The majority of seabirds killed were White-chinned petrels (77%) whereas there was also capture of Sub-Antarctic skua, Atlantic Yellow-nosed albatross, Black-browed albatross, Sabine's gull and Sooty shearwater[2] (Table 4).

Table 4: Seabird mortality by species recorded per trip on Namibian demersal longline vessels between June 2009 and June 2011.

	1	2	3	4	5	6	7	8	9	**Total**	BCPUE
Procellaria aequinoctialis	5	3	215	1	61	59	28	18		**390**	0.335
Catharacta Antarctica	54									**54**	0.046
Thalassarche chlororynchos	28		8			4		1		**41**	0.035
Thalassarche melanophrys	8		4							**12**	0.010
Puffinus griseus	6									**6**	0.005
Xema sabini			1							**1**	0.001
Total	**101**	**3**	**228**	**1**	**61**	**63**	**28**	**19**	**0**	**504**	**0.433**

More birds were killed during setting operations with no tori line (0.63 birds/ 1,000 hooks) than during sets with a single tori line (0.08 birds / 1,000 hooks) or paired tori lines (0.01 birds / 1,000 hooks) (Table 5). This indicates a reduction in seabird mortality rate when

[2] This species was not recorded during daylight abundance counts.

comparing sets with a single tori line or paired tori line to the control by, 86.4 % and 98.2 %, respectively.

However, our data also indicate that time of setting (daylight / nocturnal) was an important factor in determining seabird mortality in this fishery. We found that the mortality rate was very low when using single or paired tori lines during nocturnal sets, compared to the nocturnal control sets when bycatch rates remained high (Table 5, Figure 1). A complete data analysis will be conducted when we have a full years experimental data in October 2010.

Table 5: Summary of seabird BCPUE (birds / 1,000 hooks) recorded per treatment and setting period (daylight / nocturnal)

	Single		**Paired**		**Control**	
Sets:	**# birds**	**BCPUE**	**# birds**	**BCPUE**	**# birds**	**BCPUE**
Daylight	13	0.26	2	0.03	138	0.66
Nocturnal	5	0.03	0	0.00	346	0.61
All	18	0.08	2	0.01	484	0.63

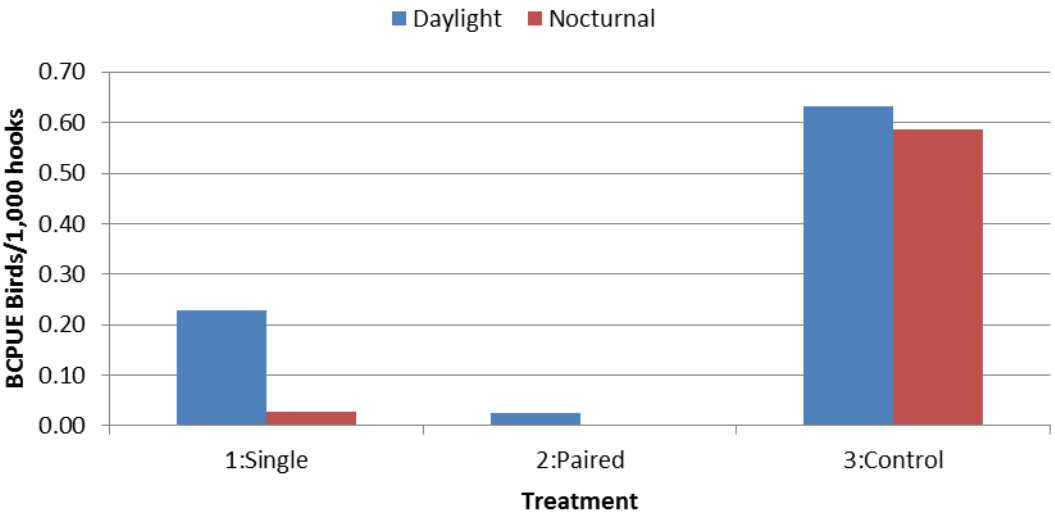

Figure 1: Seabird mortality rate (birds / 1,000 hooks) recorded for single and paired tori line use compared with a control (no tori line) for daylight and nocturnal sets on demersal longline vessels.

Discussion

Our results indicate high levels of seabird mortality associated with the Namibian demersal longline fishery. The overall observed bycatch rate of 0.63 birds / 1,000 hooks in the absence of a tori line represents one of the highest mortality rates observed in demersal longline fisheries in recent years. Furthermore, based on three times the observed effort, our results indicate a seabird mortality rate over 65 % higher than those previously reported by Petersen (2009) for the Namibian fleet.

This fishery is of relevance for Southern Hemisphere seabird species, particularly the White-chinned petrel which represented 77.3 % of total bycatch. While albatross species such as the Atlantic Yellow-nosed and Black-browed were also present in similar numbers during abundance counts, the mortality of these species was considerably less, most probably due to the nocturnal foraging abilities of the White-chinned petrel and the early morning setting routine employed by this fishery.

The majority of observations were on board vessels utilising gear configured according to the description of 'light gear' (*sensu* Petersen 2009), with weights placed once every 90 m. Only three sets were observed with 'heavy gear', with weights placed every 45 m, and as such no comparisons can be made at this time.

Our initial findings indicate that the use of single or paired tori lines during setting operations reduce the seabird mortality rate compared with a control of no tori line. Paired tori lines were the most efficient measure as they reduced mortality rate by over 95% during both daylight and nocturnal setting operations.

A large proportion of seabird bycatch was recorded during the winter months in 2010 when seabird abundance is highest. Our experimental data needs to be completed over 12 months in order to more fully understand the effectiveness of tori line use in this fishery.

As a direct result of our work in this fishery, mitigation measures are included in the Namibian draft National Plan Of Action – Seabirds (NPOA-S) and the Hake Management Plan (HMP). Both the NPOA-S and HMP call for a seabird bycatch reduction to 0.03 birds / 1,000 hooks in this fishery. Following stakeholder consultation the HMP has recently been accepted by the Minister of Fisheries.

Objectives for 2011/12

The main objectives for Namibia ATF are to complete a full years data set on the effect of single and paired tori lines on the seabird bycatch rate in the demersal longline fishery to understand the seasonal nature of bycatch in the fishery and to produce an initial annual bycatch estimate.

The experimental design includes three treatments:

1) A single tori line;

2) Paired tori lines;

3) No tori line (control).

H_0 = The use of a single or paired tori lines has no effect on seabird bycatch in the Namibian demersal longline fishery.

Additionally, in 2012 we will investigate the effect of added line weighting on line sink rate, seabird bycatch and target species catch.

The experimental design includes two treatments:

1) Steel 6 kg line weights placed at 45 m;

2) Concrete 5 kg line weights placed at 90 m (control).

H_0 = Line weighting has no effect on seabird bycatch in the Namibian demersal longline fishery.

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