Agreement on the Conservation of Albatrosses and Petrels

Fourth Meeting of the Seabird Bycatch Working Group

Guayaquil, Ecuador, 22 – 24 August 2011

Reducing seabird mortality on trawlers operating in the Falkland Islands

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Abstract

This paper provides a review of seabird mitigation research and management within the Falkland Islands Fishery.

Background

The marine environment around the Falkland Islands is incredibly rich and supports globally important seabird populations and valuable commercial fisheries which don't always interact in a neutral way. In the Falkland Islands high levels of incidental mortality of seabirds were first noticed in the longline fishery (Reid and Sullivan 2004). The development and implementation of effective mitigation measures from 2001, monitored and enforced through a formal observer programme, has reduced seabird by-catch in the longline fishery to near negligible levels. Since 2004 only 16 seabird deaths have been recorded in the longline fishery with zero seabird deaths recorded over the last four years (FIFD unpubl. data). Later, attention was directed at reducing seabird mortalities within the trawl fleet (Sullivan et al. 2006a).

Causes of mortality in trawl fisheries generally occur following entanglements with nets, and collisions with warp cables, netsonde equipment the vessel itself, and even the Bird Scaring Lines (or BSLs) (Black 2005, Bull 2007; 2009). Warp cables are considered to the biggest contributor to seabird mortality in the Falkland Islands (Sullivan et al. 2006b). As the vessel pitches, the steel warps cut through the water. If the warp hits the outstretched wing of a bird foraging on discards at the stern of the vessel, the forward movement of the vessel or rough seas forces the bird underwater, causing serious injury or death by drowning. In the 2002/2003 fishing season, a minimum of 1,500 seabirds, predominantly black-browed albatrosses (*Thalassarche melanophrys*), were estimated to have been killed as a result of warp cable strikes on Falkland Islands licensed demersal finfish trawl vessels (Sullivan et al. 2006a).

In 2003 three devices were trialled experimentally (BSLs, Warp Scarer and Brady Baffler) in order to ascertain their effectiveness at reducing seabird collisions with warp cables in the Falkland Islands trawl fleet. These experiments identified BSLs as the most effective of the measures tested (Sullivan et al. 2006b).

In 2004 the Falkland Islands Fisheries Department introduced a mandatory license condition that requires all stern trawlers operating in the waters of the Falkland Islands to use a standard design BSL adjacent to each warp. In the year following the introduction of BSLs, their use led to a reduction in incidental seabird mortality of c. 90% (Reid and Edwards 2005). In the 2007/08 fishing season seabird mortality associated with trawlers using the current mitigation measures was estimated at a

minimum of 590 birds, predominantly the endangered black-browed albatross (Sancho 2009), highlighting the need for further development and optimisation of the current BSLs designs.

Refining BSLs to further reduce seabird mortality in the Falkland Islands

The effectiveness of the BSLs was assessed during a seven week period in 2008. This investigation identified a number of concerns relating to the practical, effective and safe use of BSLs. These included reduced effectiveness in crosswinds, insufficient tension, both of which reduce protection of the warp cables, entanglement of streamers with the warps during shooting leading to breakages of the streamers and the BSLs, breakages of the BSLs in heavy weather, crew safety during BSL deployment and retrieval, and concerns about seabird interactions with the BSL itself. Various modifications were tested and a refined BSL was then developed. The relative efficacy of the two designs in reducing seabird interactions with the trawl warp cables, the BSL itself, as well as the practical use of the two designs, was compared from 22nd September 23rd October 2008. The specifications of the two designs are described in Table 1 and illustrated in Figure 1.

Table 1: Material and specifications of the two BSLs, TL-2004 and TL-2008, compared in this study

Feature	BSL-2004	BSL-2008
Main line material	polypropylene	polypropylene
Main line diameter (mm)	8 mm 4-ply	8 mm 4-ply
Main line length (m)	50	30
Tow device	600 mm net covered buoy	300 mmnet covered fishing float
No. of double Streamers	8	6
Streamer interval (m)	5	5
Position of 1st Streamer from vessel stern (m)	5	1
Streamer lengths (m)	1 to 7	3 to 8
Streamer flexibility	flexible	semi-flexible
Streamer Colour	Orange	Bright red
Streamer attachment	10 mm swivel	threaded through main line

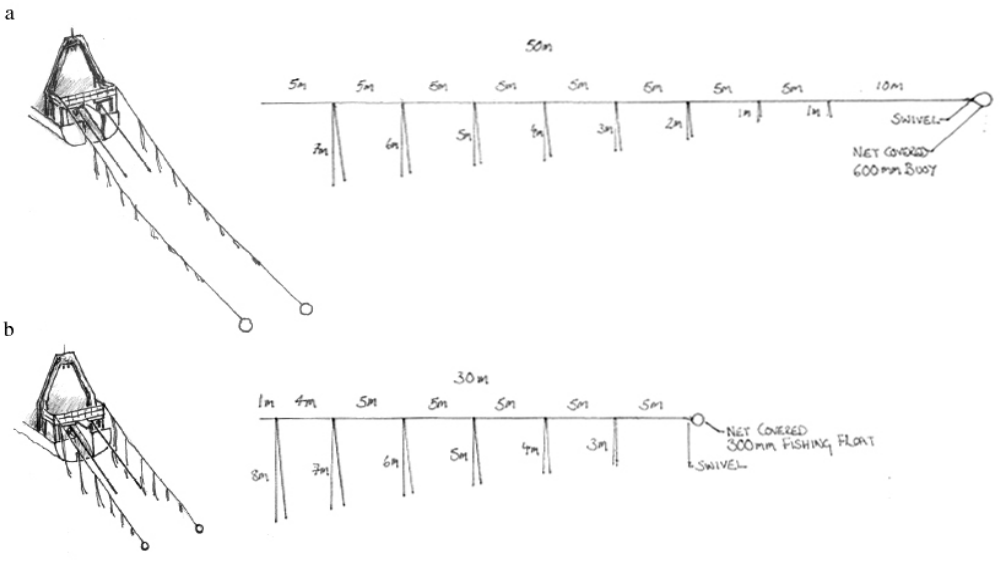

Figure 1: Schematic and dimensions of BSL designs (a) BSL-2004 and (b) BSL-2008

The modified design resulted in 28% and 33% fewer warp contacts than the 2004 design for all species, and high risk species (black-browed albatross and giant petrels), respectively (Figure 2). Surprisingly, these differences were not found to be statistically significant. However, the modified design was more effective at reducing interactions with the BSLs themselves, showing significant reductions in both light and heavy contacts for all bird species and high risk seabird species (Figure 3).

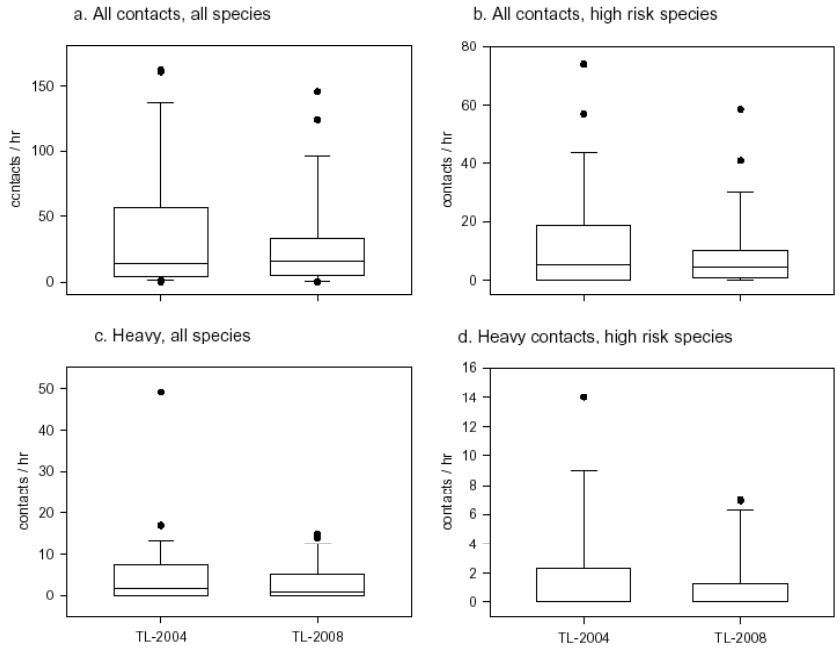

Figure 2: Warp contact rates (no./hour) during trawling for BSL-2004 and BSL-2008 for (a) all contacts, all species (b) all contacts, black-browed albatross/giant petrels (c) heavy contacts, all species and (d) heavy contacts, black-browed albatross/giant petrels. Box plots indicate median and variance, whiskers represent 95% confidence intervals and outlying points are shown

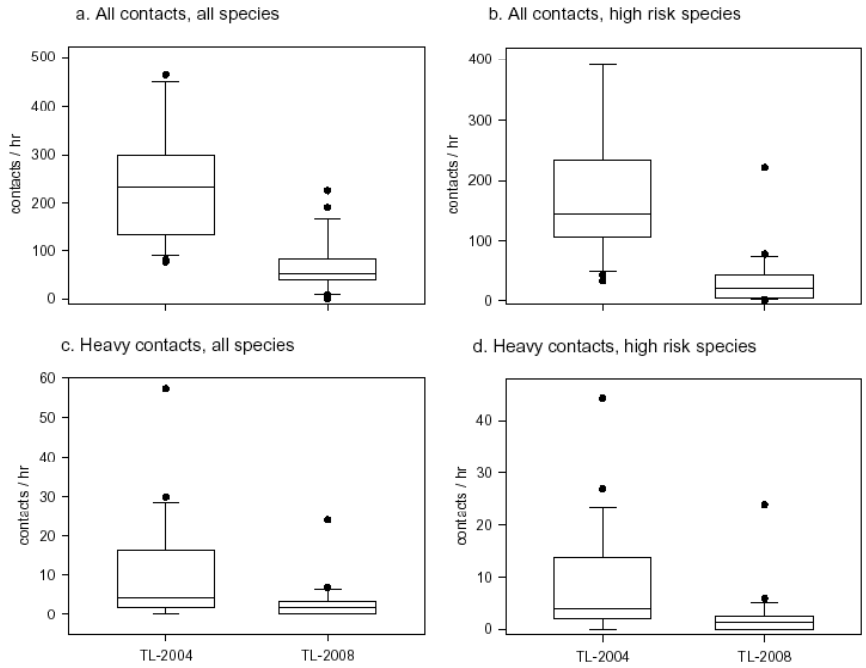

Figure 3: BSL contact rates (no./hour) during trawling for BSL-2004 and BSL-2008 for (a) all contacts, all species (b) all contacts, black-browed albatross/giant petrels (c) heavy contacts, all species and (d) heavy contacts, black-browed albatross/giant petrels. Box plots indicate median and variance, whiskers represent 95% confidence intervals and outlying points are shown.

The modified design also provided better coverage and protection of the warps, particularly in crosswinds, and was safer for the crew to use. Consequently, since 2009 the BSL-2008 has been prescribed as a mandatory requirement for all trawl vessels in the Falkland Islands. It was deemed important that the efficacy of mitigation measures being used to minimise seabird mortality is monitored on an ongoing basis to inform further improvements.

Trawl fishery internal review – An assessment of seabird by-catch in Falkland Islands trawl fisheries 2009/2010

This review covered the period from July 2009 to June 2010 during which seabird observations were conducted on 17 different finfish trips. Seabird observations were conducted over 88 observed days, which represents 2.4% of the total fishing days. Over this period nine seabird deaths were recorded but only three of these were attributed to warp strike. The recorded warp strike by-catch rate was very low (overall 0.030 birds per observed day). Assuming the recorded by-catch rate is representative of the fishery as a whole, this equates to 110 black-browed albatross mortalities for the combined finfish and ray fleets.

Hauling observations were made on eight *Loligo* trips (on eight different vessels) covering 62% of hauls on 41 fishing days (equivalent to 2.4% of total fishing effort). No seabird mortalities were recorded during this period.

Hauling observations took place on seven days on trawlers fishing with pelagic gear (equivalent to 5.8% of total fishing effort), no seabird mortality was recorded.

The main objectives of the current seabird by-catch observer programme are to quantify seabird bycatch associated with the trawl fishery, and monitor the effectiveness of the BSLs. Although contacts with the warps are still recorded, only three bird carcases (from two stations) were recovered that could definitely be attributed to warp strike. These were the only records that are comparable with previous estimates of seabird by-catch (Sullivan et al 2006a, Reid and Edwards 2005).

It was not possible to calculate the seabird by-catch for the entire fishery with any confidence from these two observations. Other sources of mortality including two black-browed albatrosses were drowned in the net, two black browed albatrosses and a giant petrel (*Macronectes* spp) were drowned on the paravane and two Cape petrels (*Daption capense*) were struck by the tori line buoy in the finfish fleet. The value of producing an annual estimate of seabird by-catch from the limited data available to assess the effectiveness of BSLs is questionable. Birds are still regularly recorded coming into heavy contact with trawl warps and therefore it can be assumed that there is still a level of seabird by-catch that has gone undetected. Continued monitoring of the rate of heavy contacts between seabirds and trawl warps is perhaps a better measure of BSL effectiveness, and the relative impact on seabird populations, than the number of mortalities recorded. However, the current observer

programme has some limitations, particularly regarding observer coverage and consistency of data recording.

The following recommendations were made:

Future monitoring

- The results of seabird mortality monitoring by FIFD observers in 2009/2010 indicated that the current level of seabird mortality is very low. However, dedicated seabird trips on two vessels in August and September 2010 found that unacceptably high mortality rates (mean from both vessels of 0.48 birds per day) are still occurring in the finfish fishery. Weather conditions, discard rates, bird behaviour, fishing strategy and bad practice all contributed to the by-catch rate, but mortality on this scale is unlikely to occur on all vessels. However, certain issues were highlighted that should be addressed within the observer programme and the fishing fleet.
- There is a high turnover of inexperienced observers, which leads to inconsistencies in the interpretation of the seabird monitoring protocol. Several key factors have consistently proved to be significantly related to seabird mortality rates, particularly seabird (black-browed albatross) abundance, discharge rates and heavy warp contacts. The categories used to record these variables can be subjective, which makes interpretation of the results difficult. Tighter descriptions and more rigorous training and debriefing would help make the data more consistent.

Dedicated seabird observer

- Currently FIFD observers working on finfish vessels dedicate 25% of their time to seabird observations. This generates a considerable amount of data. Given some of the limitations of the data collected over the first year of the restructured FIFD observer programme, it would be useful to have at least one dedicated seabird observer. The employment of a dedicated seabird observer to coordinate the seabird observer programme and conduct detailed research/trouble shooting at-sea, would help to achieve targeted coverage of the fleet (seasonally and spatially) and improve data consistency.

Recommendations for the operation and design of BSLs

- Some Captains have reported problems regarding entanglements between BSLs or streamers and trawl warps. Some of these issues were probably due to the streamer materials used and could therefore be easily rectified. Feedback from the fishing fleet, regarding the use of BSLs and any problems associated with their use has helped to determine how widespread these issues were and find solutions to them. A short questionnaire, completed by vessel Captains, will help to establish what problems exist and identify possible solutions.

- When constructed and used correctly, BSLs effectively reduce the number of birds killed by warp strike. However, some issues regarding the materials used to construct BSLs and the timing of their deployment have come to light.

1. **Streamer material.** Vessels are still permitted to construct streamers from rubber tubing. However, this material is very flexible, elastic and has an adhesive quality. Once wrapped around the warps two or three times, the streamers become stuck fast and have to be removed manually. This not only slows down hauling but is potentially dangerous. This seems to be a particular issue where long streamers drag in the water close to the point where the trawl warp enters the water. Additionally, birds can become entangled in this type of streamer material and suffer injury or death as a result. This material should be phased out and replaced with Mazzerpur™ (semi rigid) plastic tubing, as recommended in the FIFD regulations.

2. ***Stowing BSLs***. Although Mazzerpur is stiff and less likely to become wrapped around the trawl warps, it is not as easy to handle as the rubber tubing originally used. This can result in a 'bird's nest' of rope and streamers on the deck if the BSL is not stowed efficiently. Just as it is necessary to prepare the net to ensure a smooth shot, the BSLs should be prepared (stowed) so they can be deployed smoothly, reducing the risks of tangles and potential danger to crewmen. A solution to the problem of stowing the lines when not deployed is required. Some sort of drum would seem to be a good idea but it would be preferable for the fishing industry to come up with some solutions themselves. It would appear that Korean vessels have an affective means of stowing BSLs that could be adopted by the rest of the finfish fleet.

3. ***BSL buoy***. Several vessels have switched the required plastic net float for an inflatable buoy. This undoubtedly makes it easier to retrieve the lines but it does not generate the required drag when deployed during trawling. The drag is needed to maintain a tight main line without sagging, with vibration generating movement in the streamers, which is key to scaring the birds.

4. ***Swivels for the attachment of streamers.*** Although swivels are permitted in the regulations, they are not really necessary. In some cases, 100g weighted longline swivels are used, which add a considerable amount of weight to the line resulting in a sagging ineffective BSL.

5. ***Timing of BSL deployment***. The timing of BSL deployment is a key issue. It appears that many vessels delay BSL deployment until the net has reached fishing depth. This leaves an approximately 10 minute period when the warps are unprotected. Statistically far more contacts between black-browed albatrosses and the warps are recorded during this unprotected period. Captains have reported that it is dangerous deploying BSLs while the warps are in motion is dangerous for the crew, and the risk of losing the BSL through entanglements is high. There is no doubt that some of these concerns are genuine in which case offal and discard discharge should be outlawed when the BSL is not deployed. This would reduce the number of birds feeding in the

area close to the warps at this critical time. Cessation of discarding would last a period of approximately ten minutes during shooting and 20 minutes during hauling.

Industry consultation and questionnaire 2010

An industry questionnaire on the materials being used, industry perception of the effectiveness of BSLs and a request for suggestions for design improvements was sent out to finfish trawlers in December 2010. The response was adequate with a mixture of views and suggestions. Generally vessels agree that BSLs are effective but a common thread is that they are not always practicable, and are dangerous to use in poor weather conditions, in particular during crosswinds and cross currents. It was clear that there was a real need for some prescription within this particular suite of conditions. Some vessels have been using inappropriate materials and designs resulting in substandard and often ineffective BSLs.

Discussion

Our review clearly highlights the need for continued monitoring and experimental work to improve BSL design. The use of inferior materials reduces the efficacy of BSLs. New conditions within trawl licences are more prescriptive in terms of material used and BSL design. Data collected during the review highlighted a period when the warps are not protected, during shooting and hauling. It has been shown that statistically far more contacts between black-browed albatrosses and the warps are recorded during this unprotected period. The new license conditions now prohibit factory processing and thus discarding during these periods.

Our review highlighted gaps in data collection resulting in reduced confidence within our annual mortality estimates. In order to rectify this a dedicated seabird observer/ecologist was employed in April 2011 to help coordinate the seabird programme and conduct detailed research/trouble shooting at-sea, to achieve targeted coverage of the fleet (seasonally and spatially) and improve data consistency.

One of the biggest issues for the fishery is finding an effective measure of performance with regards to seabird mortality. Actual mortality figures represent a minimum estimate as they rely on the confirmed mortality, based on carcasses seen or dead birds hauled on board. Even with moderate to high observer coverage these numbers are likely to be biased low and are difficult to analyse statistically. Modelling the relationship between heavy contacts and mortality will likely enable a more accurate estimate of mortality to be derived. Additionally, the use of heavy contact rates as an index or proxy for mortality within the fishery may be a better way of measuring performance and setting targets for NPOAs. We plan to investigate this during a suite of experiments in November 2011 that will include personnel on trawlers followed by personnel on a support vessel. The planned experiments include the random allocation of BSLs under differing environmental conditions with personnel in a support vessel noting injured, moribund or dead birds behind the fishing vessel.

Monitoring the performance of seabird bycatch mitigation measures is an ongoing and iterative process. Currently, improvements in the use of the BSL buoy, and possible attachments to the warp to improve performance in crosswind and cross currents, are being investigated.

The finfish fleet discards an unknown but large quantity of undersized rock cod. Actually, reported discard for 2010 was c. 23%, which we consider to be an underestimate. One of the recommendations to come out of the rock cod stock assessment report (Winter *et al* 2010) last year was an investigation into mesh sizes used in the fishery with the objective of increasing the minimum length at capture to one that is commercially utilised. Reducing the discard of rock cod should have a major conservation benefit and result in a more profitable fishery in the future. It will also reduce the significant effort which currently goes into discarding rock cod at present. Reducing the discard of small rock cod will also make reporting easier and will of course have implications for discard management with respect to seabird mortality.

Acknowledgments

We thank the many observers and scientists who, over the years, have been apart of this programme.

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