Effectiveness of Seabird Mitigation Devices

Southern and Eastern Scalefish and Shark Fishery

Shy albatross (*Thalassarche cauta*). Image: JJ Harrison, CC Attribution 3.0

Seabirds can be injured and killed by interacting with fishing gear, including trawl nets and warp cables. Given the threatened and protected classifications of seabirds, these mortalities can be of significant conservation concern. In 2009, the Australian Fisheries Management Authority became aware that interactions between seabirds and fishing gear were occurring in the South East Trawl and Great Australian Bight Trawl sectors of the Southern and Eastern Scalefish and Shark Fishery (SESSF). Seabird Management Plans (SMPs) were developed in response. These Plans included provision for the deployment of bycatch reduction measures intended to limit seabird access to risk areas around trawl warps.

To contribute to assessments of the efficacy of SMP provisions, two bycatch reduction devices were tested at sea: the warp deflector and the warp scarer (Figure 1). The warp deflector comprises a plastic "pinkie" buoy that is attached to the trawl warp by a clip and connected back to the vessel on a rope. The warp scarer is a rope interlaced with semi-stiff streamers that is clipped onto the trawl warp for much of the warp's exposed length.

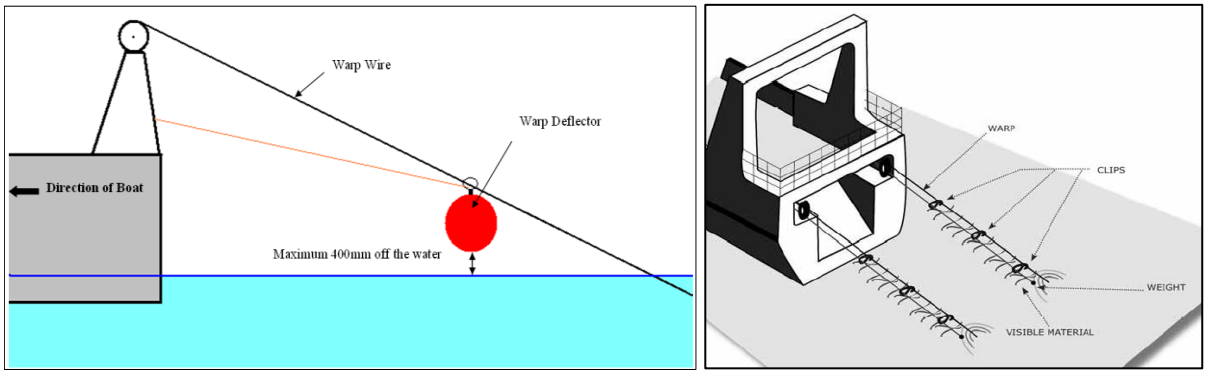

Figure 1. Devices intended to reduce seabird strikes on trawl warps: the warp deflector (left) and the warp scarer (right).

At-sea trials were implemented during 124 shots conducted from mid-2012 to mid-2013 aboard nine trawlers operating in the SESSF. Normal fishing practices were carried out throughout at-sea trials, with the exception of the deployment of mitigation devices. Fish species most commonly targeted by vessels during trials were tiger flathead (*Platycephalus richardsoni*), blue grenadier (*Macruronus novaezelandiae*), silver warehou (*Seriolella punctata*), pink ling (*Genypterus blacodes*), and deepwater flathead (*Platycephalus conatus*). Mitigation devices, and a control treatment of no mitigation, were deployed in accordance with a randomised block design in which a block comprised one shot conducted under each of the three treatments. The performance of the devices was compared to the control based on a series of seabird observations conducted throughout the fishing cycle.

During the at-sea trials, observers assessed four elements of seabird interactions with trawl gear: what birds made contact with (warp, net), the location of the interaction (air, water), the severity of the contact (heavy, light), and the likely outcome of the contact (e.g., bird unharmed, injured or killed). In addition, observers recorded information on factors potentially influencing the risk of seabird interactions with trawl gear, such as the number of birds attending vessels, weather, fish catch, and the presence of other vessels in the vicinity. Data describing shy-type albatross (*Thalassarche*) interactions with trawl warps were analysed using exploratory methods, and by developing Bayesian statistical models with poisson distributions while accounting for the zero-inflated nature of the data. Interactions between seabirds and trawl warps were considered when seabirds were feeding aggressively, and when birds were feeding in a more relaxed manner.

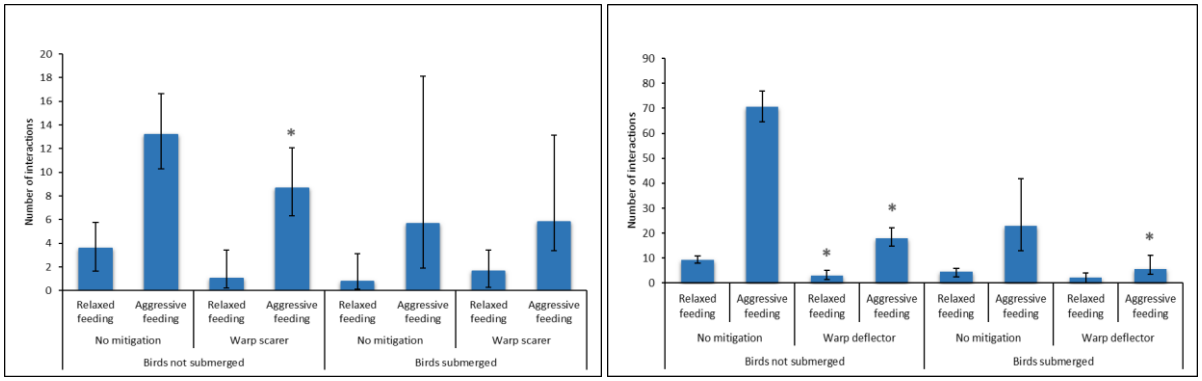

Figure 2. The number of interactions between shy-type albatross and trawl warps during at-sea trials of the warp scarer (left) and warp deflector (right), during periods of relaxed and aggressive feeding. The median number of interactions and 95% credible intervals are shown. Significant reductions ($P < 0.05$) in interactions when mitigation devices were deployed, compared to when no mitigation was in place, are marked *.

Shy-type albatross interactions with trawl warps were largely restricted to daylight hours when processing waste was being discharged.

Preliminary analyses showed that for shy-type albatross, warp scarers (Figure 2):

- were effective in reducing interactions with trawl warps that did not result in birds being pushed underwater when they were feeding aggressively, and,
- were not effective in reducing warp contacts when birds were feeding in a more relaxed manner, or when warp interactions led to birds being submerged.

In contrast and again considering shy-type albatross, warp deflectors (Figure 2):

- were effective in reducing warp interactions that did not result in birds being submerged, during periods of both relaxed and more aggressive feeding.

During at sea trials, none of the 176 interactions observed between seabirds and trawl nets were considered likely to cause injury to birds.

This study is the first to evaluate the efficacy of the warp deflector in reducing seabird strikes on trawl warps. It is the second to examine the performance of the warp scarer, and broadly concurs with the findings of previous work on that device. In addition, the results of this work are aligned with previous studies showing that the discharge of processing waste increases warp interactions.

While exploring the efficacy of devices intended to reduce seabird bycatch on fishing gear, considering the safety of vessel crew is paramount. In this study and previous work, concerns have been raised relating to the safety of deploying and retrieving physical mitigation devices from the stern of trawl vessels. Modifications to deployment methods may address this issue.

The development of effective bycatch reduction measures such as those tested in this study facilitates the continuation of fishing while reducing its broader ecological impacts. Minimising the impacts of fishing on non-target species is a key component of global best practice and is central to Australia's fishery management framework.