



Non-lethal options for mitigating catch depredation by toothed whales from pelagic longlines

Update #8 – March 2011: Gearing up for sea trials

- Find this and other related documents at: <http://www.marinemammals.gov.au/regional-initiatives/depredation-project>
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8.1 *Design development*

Since this project commenced just over a year ago, there has been considerable progress with the development of two physical depredation mitigation device (PDMD) designs. The *Tuna Guard – Streamer Pod* has been designed collaboratively by Fishtek Marine (Moretonhampstead, Devon, UK; <http://fishtekmarine.com>) and the Australian Marine Mammal Centre (AMMC) and the design has evolved considerably due to extensive consultation with the fishing and manufacturing industries (Figure 15 – Update #7; Figure 17). During the development of the *Tuna Guard – Streamer Pod*, several other alternative designs were tabled for consideration. The *Whale Shield – Jellyfish* was also deemed to be of sufficient merit to warrant continuing development (Figure 16 – Update #7; Figure 18) and has been developed by the AMMC and manufactured by Formero (Hawthorn, Victoria, Australia; <http://formero.com.au>). The recent tank trials (see Update #7) confirmed that both designs were ready for more extensive ‘proof-of-concept’ sea trials. The two designs developed are based on the premise that tangled longline gear deters depredating whales from taking fish caught on the longline hooks. As such, it is now important to prove this concept under full-scale and ‘normal’ fishing conditions aboard commercial longline vessels.

8.2 *Schedule*

The first step in the proof-of-concept trials is to test the devices close to home in the Coral Sea in April-May 2011. The decision to undertake the first trial in Australian waters is predominantly a logistical and financial one. It is likely we will encounter logistical problems in the early stages, so it was deemed prudent to run the first trial close to home, just in case teething problems put an early end to the first trial. The *FV Fortuna* owned by De Brett Seafood at Mooloolaba has been chartered for this purpose. De Brett Seafoods have a sound history of assisting with scientific research, such as Australian Fishery Management Authority (AFMA) stock assessment surveys, Australian Antarctic Division (AAD) seabird by-catch mitigation research and AMMC whale depredation research. The AMMC is confident this collaborative history will provide benefits to the outcomes of the current project.

We are also confident that any unexpected glitches will be identified and dealt with during the Australian trials, thus booting our confidence to undertake subsequent trials, further afield, later in the year. As such, we are currently in negotiations with the local Fijian longline fishery to undertake trials in Fijian waters in July-August 2011 and have commenced discussions with Samoan fishery management officials to do the same there some time during October-November 2011. These dates may vary according to scale of alterations that need to be made to devices after each trial, although they are designed to coincide with perceived peaks in depredation of catch by toothed whales in each region. The main reason for undertaking trials in the different regions is to take into account the differences in (i) vessel size, (ii) gear configuration and (iii) depredating whale species.

8.3 *Sampling objectives and methods*

At this point its worthwhile revisiting some key points about the project that provide context. A typically pelagic longline is comprised of a mainline that runs roughly parallel with the surface and is suspended at 30-300 m depth in the water column by buoys at the surface, with snood lines that hang roughly vertical in the water from the mainline at one end and with baited hooks on the other. Once a fish is caught on a baited hook, the premise is that the PDMD should simulate tangled fishing gear and thus deter depredating whales. In practice, both PDMDs to be trialled are designed to remain close to the mainline end of the snood line, clear of the baited hook, until a fish is caught, whereupon a trigger system allows the PDMD to move toward and ‘shroud’ the caught fish, thus deterring any depredating whales in the vicinity. In order to assess the performance of the PDMDs, it is necessary to determine if they:

- i. mitigate catch depredation rate by toothed whales,
- ii. mitigate by-catch rate of toothed whales, and
- iii. affect catch rate of commercially targeted fish.

The most appropriate way of statistically assessing the effectiveness of the PDMDs is to conduct a ‘controlled experiment’, where the performance of the longline snoods *with* PDMDs attached (known as the ‘treatment’) is compared with the performance of the ‘normal’ longline snoods *without* the PDMDs attached (known as the ‘control’). The most important thing to avoid during the controlled experiment is the occurrence of a Type II error (false negative), where no difference is detected when in fact a difference exists. To help avoid this, it is important to get the *gear configuration* and *sample size* right.

Gear configuration in this context refers to the order in which treatment snoods and control snoods are attached to the mainline. We have chosen to use *individually alternated* (Figure 19a) gear in this trial for two reasons. Firstly, it deals with the equal chance that potentially depredating toothed whales will encounter the longline at any point along its entire length (i.e. random encounter). This situation presents depredating whales with both treatments and a control in close proximity and simultaneously, thus exposing them to a ‘feeding choice trial’. This is the metric we will use to score and assess the effectiveness of the PDMDs in mitigating toothed whale catch depredation (see point i. above). Secondly, with *individually alternated* the treatments and controls, each snood constitutes an ‘observation’ that can be scored, thus allowing us to quickly reach a sample size that is statistically robust or sufficiently statistically powerful (i.e. the chance of a Type II error occurring is below an unacceptable

level). In contrast, if the gear were *group alternated* (Figure 19b), a much greater sample size would be required before becoming statistically robust. This is because each grouping of like snoods becomes an observation, rather than each individual snood, thus requiring a much greater sample size before the same statistical power would be reached.

Although the sample size will be boosted by using the *individually alternated* gear configuration, the number of observations will be limited by the number of hooks that can be set each day, by the number of days available for the trial and the number of trials that can be conducted during the life of the project. Given that incidences of depredation are relatively rare (despite the economic cost to industry), it will be necessary to set a greater number of sets in order to reach the same level of statistical power than if depredation events were more common. Although we have little control over this, it is useful to know what can be achieved during each trip. A typical fishing event involves 2,400 hooks and a typical trip involves 13 fishing events. If we assume that delays associated with attaching and removing the treatment gear slow us to approximately one third of the speed of 'normal' operational speed, then we can expect to set around 750 hooks each day, giving us a total of 9,750 hooks for the trip. As such, we will attach 250 units of each of the two device designs, or 500 in total, to run in conjunction with 250 control snoods.

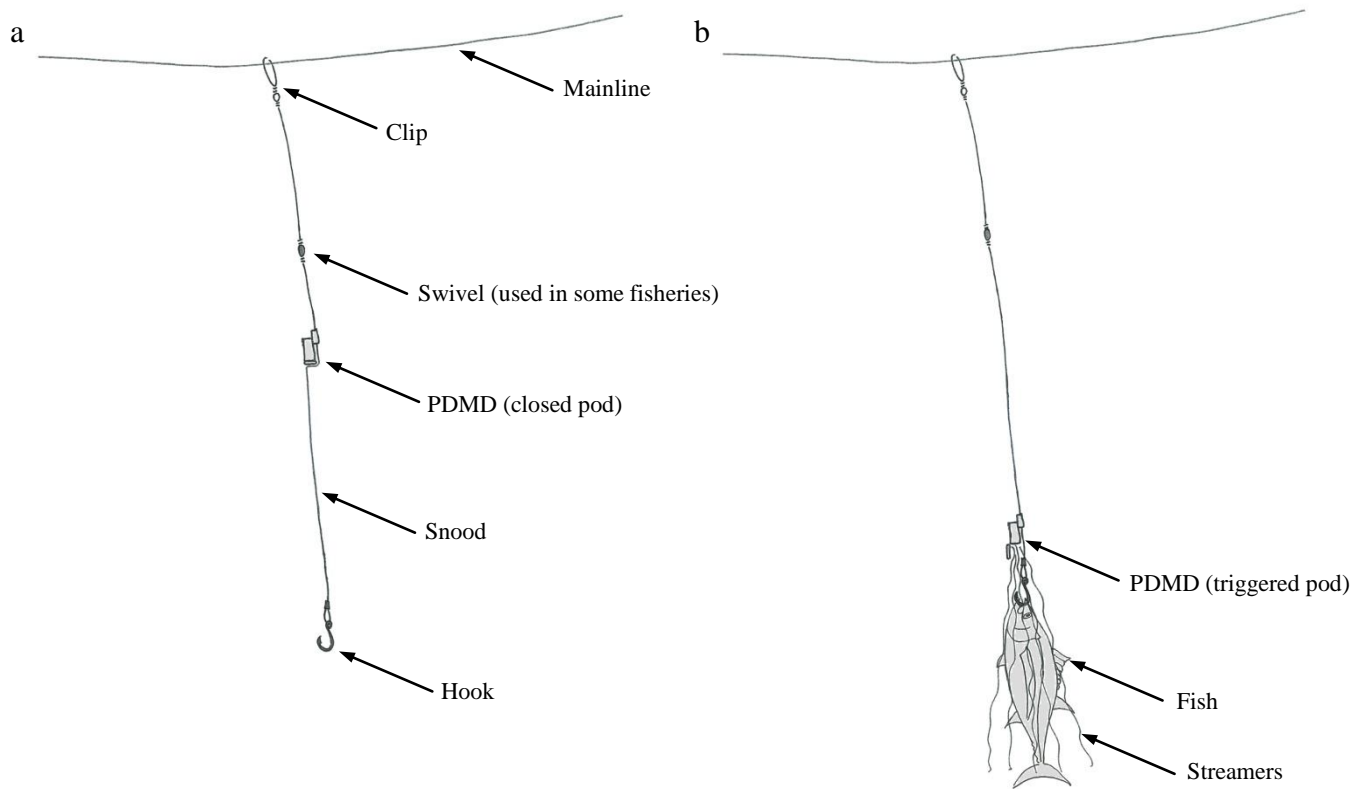


Figure 17 Schematic diagram of the *Tuna Guard - Streamer Pod* fitted to a pelagic longline snood. The device remains clear of the baited hook by 4 to 15 m (a) until a fish is caught (b). The pressure of the caught fish fighting against the hook causes the device to release the streamers and descend the snood toward the hook.

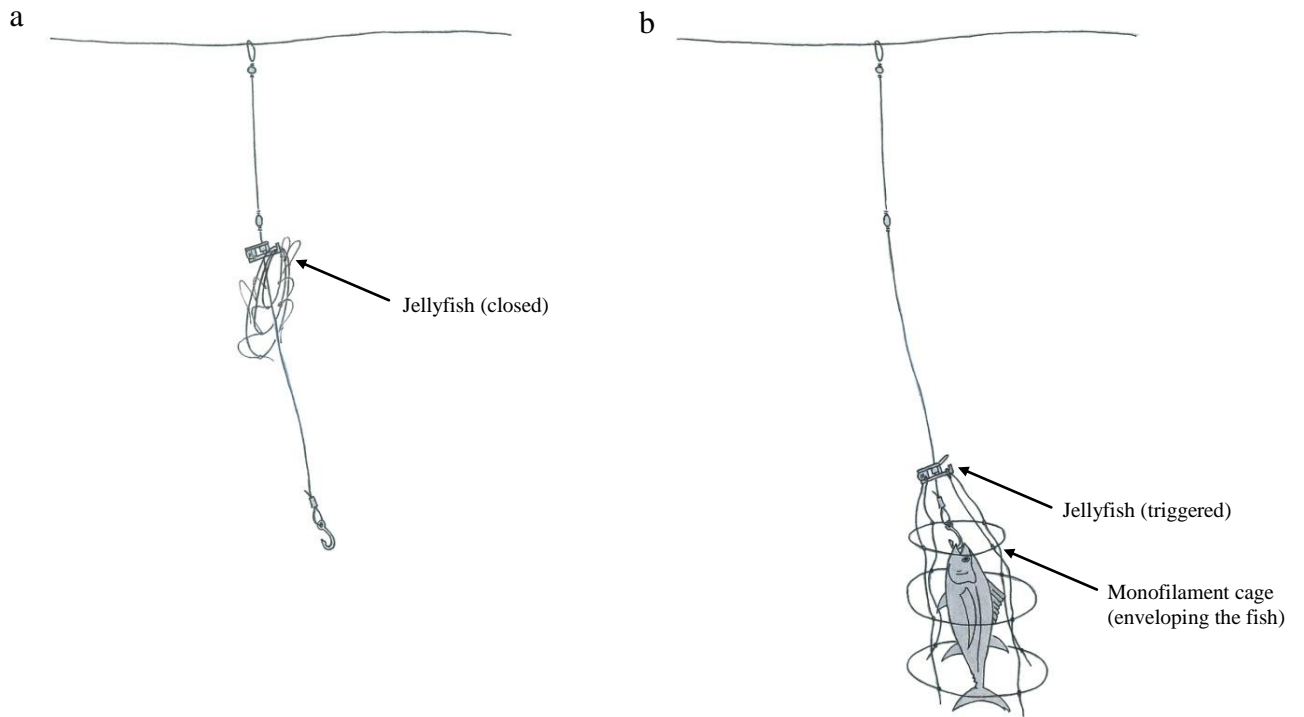


Figure 18 Schematic diagram of the *Whale Shield – Jellyfish* fitted to a pelagic longline snood. The device remains clear of the baited hook by 4 to 15 m (a) until a fish is caught (b). The pressure of the caught fish fighting against the hook causes the device release the shrouding ‘jellyfish’ and descend the snood toward the hook.

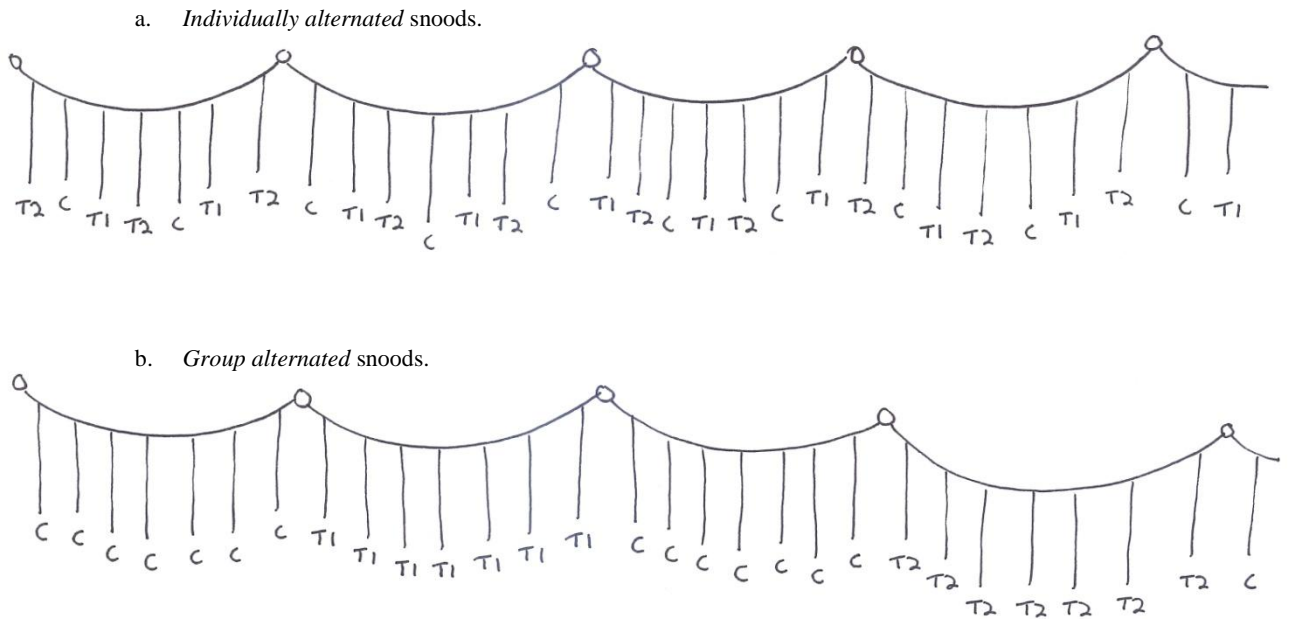


Figure 19 Schematic diagram of the gear configuration during the proof-of-concept trials in the Coral Sea, depicting the location of the snoods *with* treatments, *Fish Guard - Streamer Pod* (T1) and *Whale Shield – Jellyfish* (T2), and *without* treatments, the control (C). The *individually alternated* gear configuration (a) was chosen for the trial, because it accounts for random encounter by depredating whales and provides a much higher sample size than if treatments were *group alternated* (b).