SCIENTIFIC COMMITTEE
TWELFTH REGULAR SESSION

Bali, Indonesia
3-11 August 2016

Development and testing of a novel seabird mitigation option, the Hook Pod, in New Zealand pelagic longline fisheries

WCPFC-SC12-2016/ EB-IP-06

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Abstract

Hook Pods are one of the new generation of hook shielding devices used to mitigate the bycatch of seabirds in longline fisheries. The Hook Pod was recently recognized by the Agreement on the Conservation of Albatrosses and Petrels as a stand-alone best practice mitigation option for reducing the impact of pelagic longlines on seabirds. We report on the development and initial testing of a new version of the Hook Pod, known as the 'mini' Hook Pod, designed specifically to meet the operational requirements of New Zealand domestic pelagic longline fisheries for highly migratory fish stocks. The original and 'mini' Hook Pod designs will apply a weight of 68g and 45g, respectively, at the hook on setting. As such, both devices comply with the minimum weight specifications for weighted branchlines as specified in CMMs 2012-07 and 2015-03 to mitigate the impact of fishing for highly migratory fish stocks on seabirds.

This document presents a brief summary of research findings on the effectiveness of the Hook Pod as a seabird bycatch mitigation measure in pelagic longline fisheries. The full paper is currently under review in a peer reviewed journal.

1. INTRODUCTION

The Hook Pod is a polycarbonate capsule that is attached to monofilament branchlines in pelagic longline fisheries to virtually eliminate seabird bycatch. During setting the baited hook is loaded into a polycarbonate pod which encases the point and barb of the hook; preventing seabirds from becoming hooked as they scavenge for baits at the stern of a vessel during line setting operations. The device contains a pressure release system that opens the Hook Pod and releases the baited hook at a predetermined depth (Figs. 1&2). On hauling, the Hook Pod remains attached to the branch line in an open state. The device is rearmed by closing the Hook Pod by hand and it is then simply stored in the setting bin, ready for the next set. The Hook Pod also contains a light-emitting diode (LED) that operates

on a magnetic switch that is triggered when the Hook Pod opens. The LED was incorporated to provide a financial incentive to fishermen by offering an alternative light source that replaces the disposable chemical light sticks that are used in swordfish and many tuna fisheries globally.

An additional feature of the Hook Pod is its manual maneuverability along the branchline. This allows for optimal positioning specific to each fishing operation, providing a safety mechanism and a method by which to improve in water hook motion.

From the outset we were guided by the following key principles:

1. a high degree of effectiveness in reducing seabird bycatch;
2. no reduction in catch rate or size of target species;
3. cost-effectiveness to the end-user (fishermen); and
4. operationally simple and safe to use.

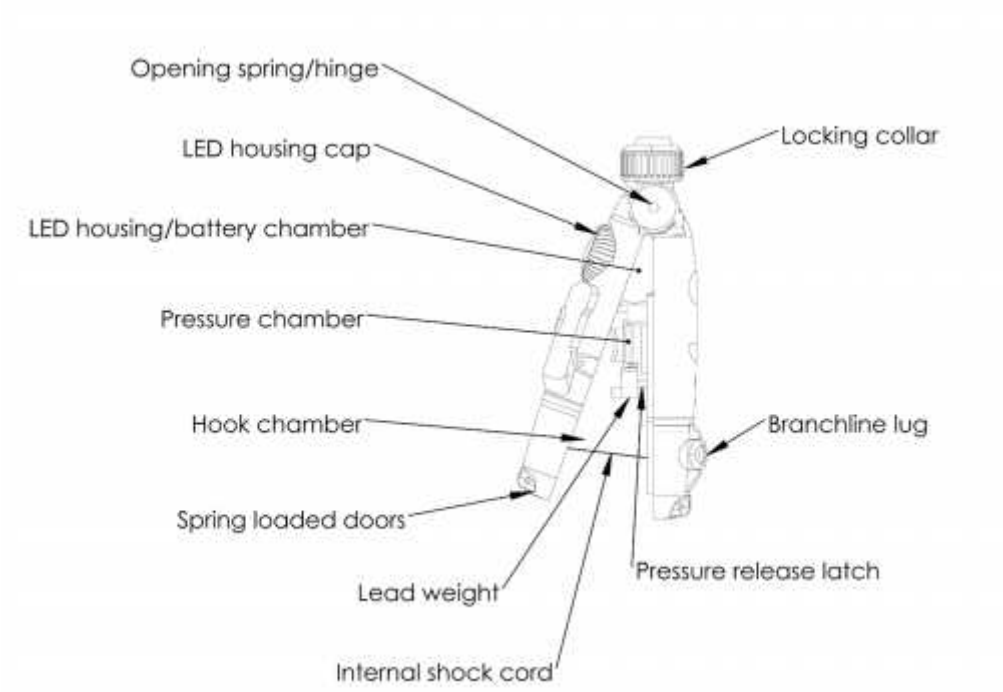

Figure 1. Components of the Hook Pod

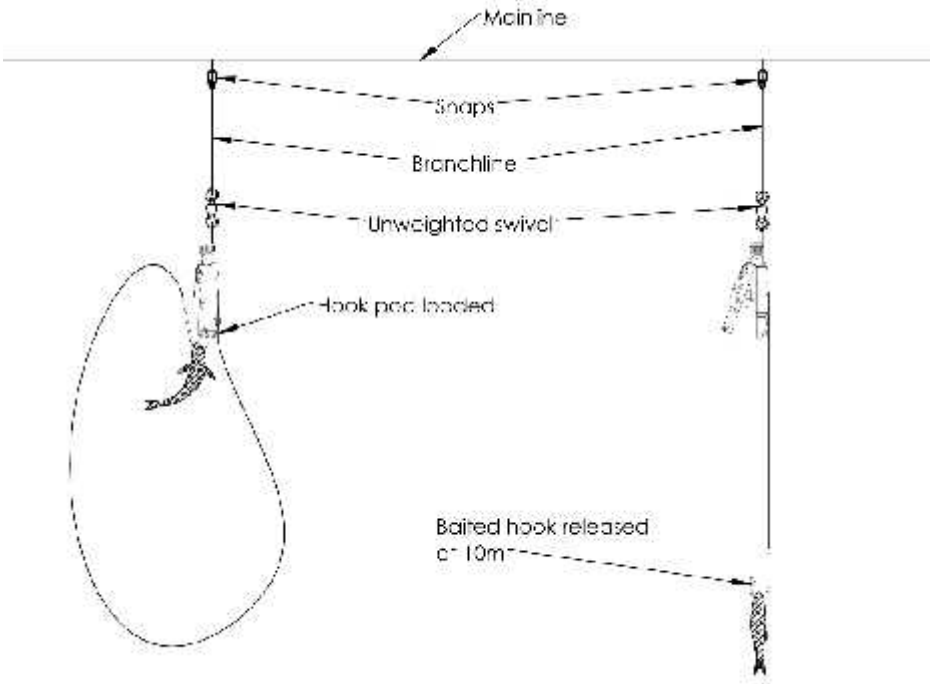

Figure 2. The Hook Pod *in situ* prior to and after the pressure release mechanism opens the pod

2. METHODS

Hook Pod trials

The Hook Pod has been under development for 8 years. From 2011 to 2015 the pod was trialed in three geographically distinct regions (Australia, Brazil and South Africa). Two treatments were applied: (1) branchlines with Hook Pods and an unweighted swivel; (2) control branchlines with a 65g swivel (the position of the weighted swivel varied between fisheries). Data was collected from 127 sets on 19 individual at-sea trips.

Seabird bycatch - 100% observer coverage was achieved for all experimental branchlines and all seabird mortalities were recorded.

Target catch rate and length - The total number of fish caught was recorded and divided into family cohorts , which included; ‘tuna’, ‘swordfish’, ‘sharks’ and ‘other’. Continuous length data (in cm) were available from individual fish caught in the tuna and swordfish family cohorts in all three regions.

Length data for sharks was categorical in South Africa ("small", "medium" and "large"), and continuous in Brazil and Australia; these datasets were treated differently in subsequent statistical analyses. Generalised linear mixed models were fitted to these data.

Sink Rate - The Hook Pod contains a 15 g lead weight and in total weighs 68g, which ensures a rapid sink rate of the baited hook when it is loaded in the pod. During trials in Australia we investigated the sink rate of baited hooks with Hook Pods (Treatment 1) and standard gear (Treatment 2 – 60 g lead swivel placed 3.5 m from the hook) using Time-Depth-Recorders (TDRs, Wildlife Computer MK9) added to a selection of branchlines.

Bait type and hook position - During the course of our experimental trials a range of bait types, sizes and hooking positions were trialed. These included Argentine shortfin squid (*Illex aregntinus, Ommastrephidae*), slimy mackerel (*Scomber australasicus, Scombridae*), chub mackerel (*S. japonicas*), yellow-tailed mackerel (*Trachurus novaezelandiae, Carangidae),* Brazilian sadinelle *(Sardinella brasileiensis, Clupeidae)* and pilchard (*Sardinops sagax, Clupeidae)*. The type of bait used in each set was proportionally equal between the two treatments. In addition, we trialed 'eye hooking', 'back-hooking' and during trials in Australia in 2014 we also trialed 'live bait' using slimy mackerel and yellow-tailed mackerel, all of which worked well with the Hook Pod.

In August 2014, preliminary operational trials were conducted (one 5 day at-sea trip) of the Hook Pod onboard the *FV Commission*. Only a small number of pods were tested, largely to give the fishermen a sense of how they fitted into their operation.

Mini Hook Pod trials

In 2015, Hook Pod Ltd worked with the Ministry of Primary Industries and the Department of Conservation to fund the development of a Hook Pod specifically for trials in the New Zealand surface longline fishery. This version of the Hook Pod ('mini' Hook Pod) had the LED removed to create a pod that is 30% smaller and 25% lighter (45g) than the LED version.

3. RESULTS

Hook Pod trials

Seabird bycatch - Twenty-four of the 25 bird deaths occurred on control branchlines. The paper under review will compare the capture rates between Hook Pods and control branchlines.

Target catch rate and length – No statistical difference was identified between the catch rate and size of target fish (tuna and swordfish) caught between the Hook Pod and control treatment branchlines. Although there was large variability in catch rates between individual trips for 'sharks' and 'other' (non-target and non-shark species) a meta-analysis identified no significant difference in the catch rates between treatments of these family cohorts. Likewise there was no significant difference in the size of target species caught between the two treatments.

Sink rate - The TDRs indicated that the baited hook inside the Hook Pods sank to two metres at 0.47 m/sec, which is around twice the speed of the 'standard' gear (0.24 m/sec), and to five metres at slightly less than twice the speed of the 'standard' gear (0.51 m/sec vs 0.31 m/sec).

Mini Hook Pod trials

The results of trials conducted onboard the FV Commission in April 2016 showed no significant difference in catch rate or size of target species was recorded. A comprehensive report on the results of this trial are available in a separate report (Sullivan & Potts 2016).

Based on a cost-benefit analysis of the economics of the Hook Pod for fishermen, we established an *a priori* threshold rate for device failure of 1% per set. During this trial we recorded a total failure rate (broken Hook Pods and those that failed to open) of 15 Hook Pods from a total of 3320 repetitions at a rates of 0.452, which is less than half our threshold failure rate. In addition we lost 8 Hook Pods (assumed to shark bite-offs) which gives a total failure/loss rate of 0.693, which is still well below our threshold rate. [An approximate pricing list is contained in Appendix II].

Importantly, the vessel owner, skipper and crew were pleased with the performance of the 'mini' Hook Pods both in terms of catch rate and also their durability and the ease in which they fitted into their fishing operation.

The results and positive feedback from the skipper and crew of the first at-sea trails of the 'mini' Hook Pod has created an opportunity to undertake more extensive trails of the mini pod in the New Zealand surface longline fishery in the coming months.

4. AGREEMENT ON THE CONSERVATION OF ALBATROSSES AND PETRELS (ACAP)

The 9th Meeting of the ACAP Advisory Committee (ACAP 2016) adopted the recommendation of the ACAP Seabird Bycatch Working Group to recognise the Hook Pod as a stand-alone mitigation measure for pelagic longline fisheries, noting that it also meets revised ACAP minimum standards for line weighting. This followed extensive review of at-sea trials of the Hook Pod in multiple fisheries (Sullivan et al. 2016).

ACAP's recognition of the Hook Pod provides an excellent opportunity for Hook Pod Ltd to work with pelagic longline fisheries around the world to achieve wide-spread adoption of the Hook Pod to reduce seabird bycatch in pelagic longline fisheries to near zero levels.

5. CONCLUSION

The results show that the Hook Pod is highly effective at reducing seabird bycatch and does not have a negative impact on target catch rates. Although further data is required to demonstrate that the 'mini' Hook Pod is equally effective, these trials are planned for the New Zealand surface longline fishery in the coming months and we expect a similarly positive outcome. There has long been a desire to find a 'single' mitigation solution for seabird bycatch in pelagic longline fisheries. This research has shown that the Hook Pod is such a device and with widespread uptake in coastal and high seas pelagic longline fleets, it should make a major contribution to halting the decline of albatross and petrel populations.

The original and 'mini' Hook Pod designs apply a weight of 68g and 45g, respectively, at the hook on setting. As such, both devices comply with the minimum weight specifications for weighted branches lines as specified in WCPFC's CMMs 2012-07 and 2015-03 to mitigate the impact of fishing for highly migratory fish stocks on seabirds. As such, both versions of the Hook Pod could be utilised in pelagic longline fishing under the current Conservation Management Measures as line weighting. However, to meet the CMM the fishers would also need to use another form of approved mitigation.

6. RECOMMENDATIONS

We recommend the Scientific Committee:

1. note the research on a new method to mitigate the bycatch of seabirds in longline fisheries using hook shielding devices;

2. note that further at-sea trials of the mini Hook Pod are planned in the New Zealand pelagic longline fishery;
3. note that both the Hook Pod and mini Hook Pod comply with the minimum weight specifications for weighted branches lines as specified in WCPFC's CMMs 2012-07 and 2015-03 to mitigate the impact of fishing for highly migratory fish stocks on seabirds;
4. note that research reported to date suggests that Hook Pods have potential as a stand-alone measure to achieve best practice mitigation of seabird bycatch in pelagic longline fisheries, and we invite SC12 to consider these findings in their evaluation of the effectiveness of the seabird CMMs 2012-07 and 2015-03.

7. REFERENCES

ACAP 2016. Agreement on the Conservation of Albatrosses and Petrels. Report of the Ninth Meeting of the Advisory Committee. La Serena, Chile. http://www.acap.aq/en/documents/advisory-committee/ac9/2845-ac9-report/file.

Sullivan, B.J., Kibel B., Kibel, P., Yates, O., Potts, J. M., Ingham, B., Domingo, A., Gianuca, D., Jimenez, S., Lebepe, B., Maree, B.A., Neves, T., Peppes, F., Rasehlomi, T., Silva-Costa, A., Wanless, R., 2016. Hook Pod: development and at-sea trialling of a 'one-stop' mitigation solution for seabird bycatch in pelagic longline fisheries. Abstract only. Agreement on the Conservation of Albatrosses and Petrels. Seventh Meeting of the Seabird Bycatch Working Group. La Serena, Chile, SBWG7 Inf 06.

Sullivan, B. J. and Potts, J. M. 2016. Hook Pod trials in the New Zealand Surface Longline Fishery, Report to the Ministry of Fisheries and Department of Conservation.

Appendix 1

The operational characteristics of the Hook Pod are as follows:

Attachment – Hook Pods are attached to each individual branchline using a simple, locking collar mechanism that grips the monofilament at any desired distance from the hook. The collar has spring loaded plastic ball-bearing that applies pressure on the monofilament to hold the Hook Pod in place without damaging the monofilament. The monofilament then passes through a lug at the bottom of the Hook Pod to ensure the branchline remains flush with the pod in order to reduce potential snag points in the setting bin (Fig. 1).

Loading – Once the hook is baited the crew simply holds the Hook Pod and pushes the point of the hook through the spring loaded doors at the terminal end of the pod and hook is loaded/disarmed (Fig. 2). This operation takes around one second, which is less time than it takes to attach chemical light sticks to the branchline, as is common practice in many pelagic longline fisheries.

Retrieval – During hauling the Hook Pod is returned in an open state and the crew simply closes it using one hand and handles and stores the branchline in the normal manner.

Hook Pod storage - Two systems of storing Hook Pods in the setting bins have been trialled, which varied between country and vessel and was largely determined by the crew's preference. (1) Fleeting them in the base of the bin worked well with few entanglement issues. This technique enabled pods to be placed between 1 m (Australia) and 7 m (Brazil) from the hook, which the crews found operationally easiest to handle during line setting (Fig. 3a). (2) The Hook Pod was positioned within 30-45 cm of the hook allowing it to 'hang' in the setting box, when the hook is slotted into the top section of the clip (Fig. 3b). Using either technique once the hook is baited the pod is simply loaded and cast outside the propeller wash (Fig.3c)

a)

b)

c)

Figure 3 (a) Hook Pods fleeted in a setting bin ready for line setting; (b) Hook Pods hanging from the swivel; (c) Baited hook with hook pod *in situ* being cast astern during line setting

Appendix II

Mini Hookpod Ltd 2016 approximate price list (NB these will vary slightly with exchange rate fluctuations)

Price per unit	£7.00 / US $10/ NZD 14+
Price per unit (1500+)	£6.65 / US $9.50 / NZD 13+
Price per unit (10,000+)	£6.30 / US $8.90 / NZD 12+