 <p data-bbox="231 533 470 571">Agreement on the Conservation of Albatrosses and Petrels</p>	<p data-bbox="566 241 1372 324"><b>Twelfth Meeting of the Seabird Bycatch Working Group</b></p> <p data-bbox="901 347 1372 380"><i>Lima, Peru, 5 – 7 August 2024</i></p> <p data-bbox="518 459 1356 593"><b>ACAP Small Grant 2023-10 progress report - Manufacture of a new concept pelagic longline heavy hook</b></p> <p data-bbox="702 616 1173 660"><b><i>Nigel Brothers &amp; Igor Debski</i></b></p>
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## SUMMARY

The 2023-10 ACAP not-so-small Small Grants application, submitted on 29 Sep 2023 was approved on 9 Feb 2024, with funds first available on 09 March 2024. Manufacture of a trial hook was completed in March 2024 and fishing trials in New Zealand commenced in mid-June 2024.

### 1. INTRODUCTION BRIEF HISTORY

The development and testing of the early heavy hook 'Procella', was described in SBWG 10 Inf 09 and SBWG 11 Doc 15. The papers indicated the need for further refinements, particularly in hook design. It had become evident that the fishing industry needed an alternate line weighting option that offered multiple operational and mitigation gains over typical line weighting methods. The evidence of a growing demand for a weighted hook option made it possible to contemplate a new direction for basic pelagic longline hooks.

### 2. LEAD-UP TO MANUFACTURE

Prior to the success of the Small Grants Application, Humane Society International (Australia) had committed to supporting hook development so it was possible to pursue hook development and seek manufacturing options before funds became available. This included extensive consultation from June to Sep 2023, during which vessel operators committed to participation in hook trials were involved directly in refinements of hook design. They were provided with many design variations to choose from, and the eventual choice was unanimous. A 3D computer graphic representation of the final hook design was made and various hook manufacturers in South Korea were contacted. In person factory visits were made in Oct 2023, after which a decision was made about the preferred business prospect. This company, Segye Fishing Hook Co. Ltd in Busan, and its business owners and operators Si-hong Kim and Ji-hun Kim have since become enthusiastic and committed project participants.

### **3. THE MANUFACTURING PROCESS**

Stainless steel was the preferred manufacturing material, but cost and technical complexities (still unresolved), resulted in using lead in the initial manufacturing process. This deviation from stated project intentions was outlined to and subsequently accepted by Small Grants Committee. In consideration of potential lead contamination risks, such as in bite-off hook-loss situations, 'safe' lead coating options were investigated. An outside company was identified for the ceramic-coating product and application process while at the same time, the other necessary fabrication steps in the hook manufacturing process were also under development at the Segye factory. Although at this stage the durability and protective benefit of the 'safe' lead coating compound is untested, it was applied to all of the first hooks produced (Fig 1), to test the viability of the hook design. The coating material itself had already undergone acceptable cytotoxicity testing but resistance to 'real world events' such as hook ingestion by sea creatures is another matter entirely. Any future use of lead will be determined by whether during initial trials, the coating effectiveness is verified, and also whether lead can be superseded by a non-toxic and economical 100% stainless steel option, which would be optimal.

### **4. COSTS AND TIMEFRAME**

To incentivise investment in R&D by hook-makers and associated specialist businesses involved in production, an initial hook order of 10,000 units (total shipping weight 660 kg) was placed in March 2024. That quantity was also the minimum necessary to cover three trial vessel hook requirements and to provide sufficient meaningful performance data.

Payment for the initial hook order of US\$12,900 occurred in two instalments, one at the commencement of manufacturing on 05 March 2024 with the balance on completion on 20 March 2024. Not including shipping and import costs, the per hook cost is US\$1.29, which is quite competitive with a regular hook plus line weighting cost. This does not factor in the additional potential cost-benefit potential of these hooks, such as losing less bait to birds, catching more fish or having fewer bin tangles etc. Nevertheless, the hook alone is double the cost of the equivalent standard 22 g hook, which is an issue for fishers who are currently avoiding using any weight. Cost is ultimately a crucial factor in the viability of any new product, with this influenced heavily by materials and freight components. The outstanding question of final product weight is yet to be clarified (SBWG 12 Doc 09) concerning current ACAP line weighting guidelines and the CMM weighting requirements of RFMOs – the legitimacy of the use, if product weight was to be 50 g as opposed to 62 g. Although a line weighting at-the-hook reduction of 10 g has negligible impact on mitigation performance, it will markedly improve the prospect of product acceptance. Product acceptance, at least until performance has been measured, will likely contend with high relative hook price alone dictating hook choice, because in some fishing grounds typical daily hook losses can be high.

The shipment of the new hooks departed Busan 25th April, and arrived in Auckland 26<sup>th</sup> May 2024 on the container ship Navios Miami. Delivery from there was by road initially to three vessels at different NZ fishing ports. Subsequently, one vessel relinquished the hook-test opportunity and a last-minute re-route resulted in the two remaining trial vessels receiving 5,000 hooks each.

### **5. MONITORING OF HOOK PERFORMANCE**

Having successfully produced an initial product involving lead, it is now important to verify the catch capability of this hook; without establishing this, any further advancement in design cannot be justified. Further expenditure of funds for manufacturing purposes will remain on hold until this question and other practical operational ones have been answered. This stage aligns with initial project expectations and the uncertainties over the economic viability of materials options and fabrication processes.

While vessels trialling hooks are EM-observed, they will also complete a dedicated hook performance logbook which was produced with input from the vessel operators, John King and Josh Mower. Since fishers will be using a variety of hooks, the focus of this logbook will be on comparing catch rates and ease of use of the new hook with those of the typical hook types. The durability of 'safe' lead coating will be assessed. The hook performance logbooks were produced by Dept of Conservation NZ and delivered to vessels in advance of hook delivery. It is hoped that hook sink rate performance information can also be obtained, in addition to the environment-controlled sink rate performance measurements already made in May 2024 (**SBWG 12 Doc 09**).

## 6. WHAT'S NEXT

Trials of hooks commenced by two vessels on 15<sup>th</sup> June 2024 (Fig 2) and at the end of their first fishing trip around 1,900 Procella hooks had been in use, with initial reporting of acceptable performance and good fish catch. Hook quantities in use are therefore likely to progressively increase and by 21<sup>st</sup> June, vessels were starting their second Procella trip. There are sufficient hooks aboard vessels to cover up to one year of fishing operations, although there is generally a pause in fishing of several months from November.

In anticipation of a satisfactory result from initial performance monitoring, and hopefully vessel operator endorsement, there will be ongoing efforts together with the hook manufacturer to improve the product (cost reduction and improved materials). To date, this has involved a second in-person factory meeting on 03 June 2024 in Korea, during which the issue of production cost and alternate fabrication methods and materials were the main discussion topics. It was agreed to resolve the materials and manufacturing method options by August 2024.

Although test hooks could potentially be ordered by others interested in first-hand evaluation, the ultimate aim is to replace the test version with a modified final product. The timing of that process will in part be determined by the progress of the trial through the remainder of 2024 and beyond. Justification for proceeding with final product manufacturing will primarily depend on endorsement from vessel operators of the initial trial hook's satisfactory performance. A good result is anticipated, contrary to performance results reported by Gilman et al (2020 and 2022), which suggested a negative impact on commercial catch from a weighted hook.

## 7. REFERENCES

Brothers, N. (2024) Minimum weight at the hook allowance of 50 g inclusive of the hook weight for Pelagic longlines. SBWG12 Doc 09.

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Gilman, E., Musyl, M., Wild, M. *et al.* (2022) Investigating weighted fishing hooks for seabird bycatch mitigation. *Sci Rep* **12**, 2833 (2022).

Brothers, N. (2021) *In Pursuit of Procella—A Heavy Hook for Pelagic Longlines to Reduce Procellariiforme Bycatch*. SBWG 10 Inf 09. (Agreement on the Conservation of Albatrosses and Petrels, 2021).

Gilman, E., Beverly, S., Musyl, M., & Chaloupka, M. (2020). Commercial viability of locating pelagic longline branchline weights at the hook to reduce seabird bycatch. *Endangered Species Research*. 43. 223-233. 10.3354/esr01070.



Fig 1. Procella Hooks

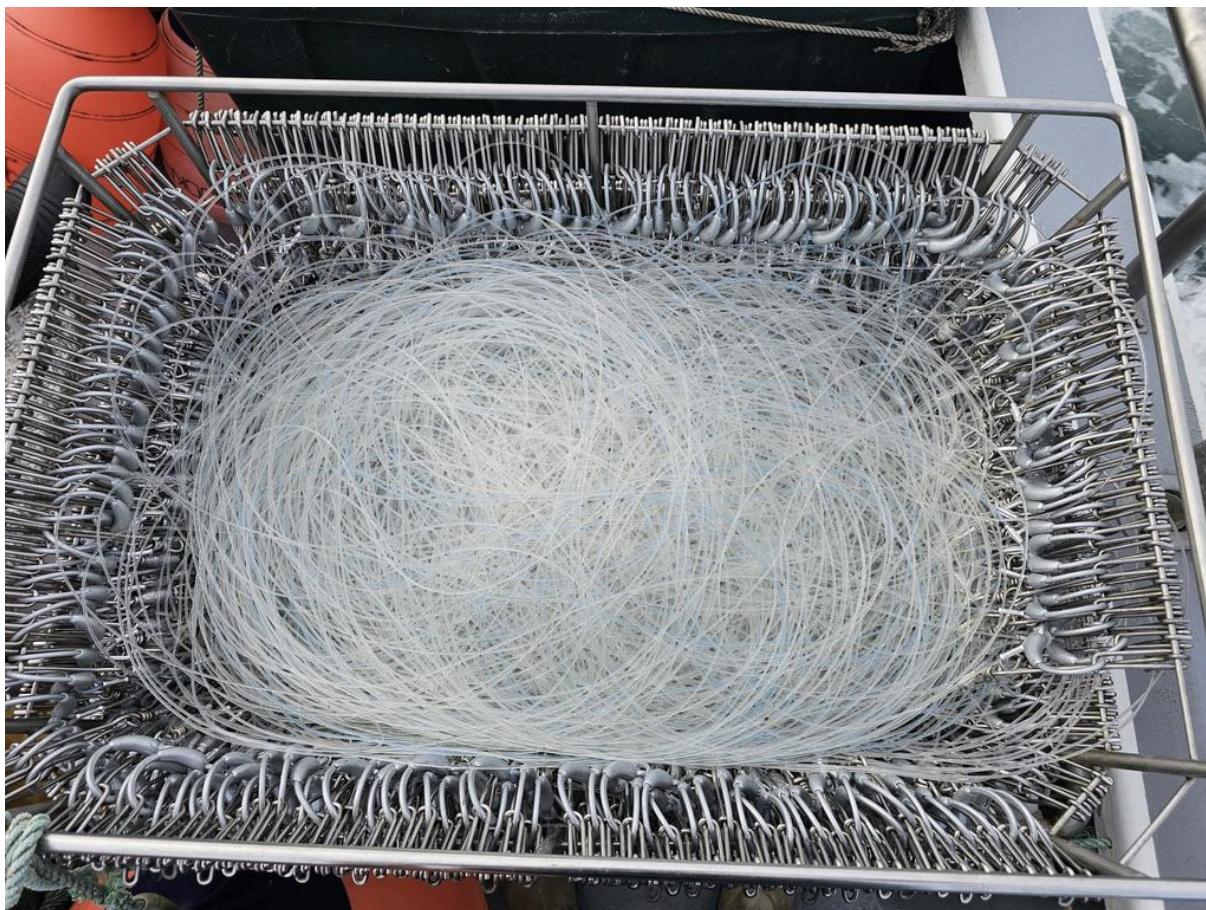


Fig 2 Newly constructed Procella hook box ready for the first fishing trip. Photo Josh Mower