Agreement on the Conservation of Albatrosses and Petrels

Sixth Meeting of the Seabird Bycatch Working Group

Punta del Este, Uruguay, 10 - 12 September 2014

Kellian Line Setter Sea Trials
Initial Performance Testing

New Zealand

SUMMARY

The Kellian Line Setter (KLS) is an underwater setting device developed by Dave Kellian, a New Zealand fisherman, and further refined by engineers at the Australian Maritime College (AMC), using their flume tank facility. The KLS consists of a stainless steel cowling and funnel arrangement that incorporates two rollers, and which is towed behind a vessel at depth. The mainline is fed through the cowling, under the first roller and over second roller to stop weights pulling the backbone off the bottom of the first roller. Snoods, floats and weights passed beside the rollers, rather than over them. Initial development of the KLS was previously reported to ACAP in SBWG5 Doc10.

Following assessment of hydrodynamic attributes and functionality of the modified prototype in the controlled environment of a flume tank, further testing and evaluation at sea was has been undertaken under normal fishing conditions. A total of 6 trips have been conducted on board the fishing vessel Kotuku, a 10 m bottom longliner fishing from Tauranga, New Zealand. Each trip involved a series of deployments and test runs, generally in calm sea conditions to measure performance. Initial problems in setting led to the installation of two paravanes on the device to maintain an appropriate depth and angle of pitch for effective fishing when the KLS was deployed.

Before commencing further trials under varying sea conditions, further refinement is planned in the flume tank. These include potentially combining or simplifying the design of the two paravanes, refining the funnel shape to prevent the mainline rubbing on its leading edge, and providing a guide to send weights around the side of the rear roller so that weights on ‘dropper’ ropes can be deployed. Further development in the flume tank will also provide the opportunity to fine tune the funnel shape and paravane settings to optimise performance, prior to continuing further sea trials in New Zealand where operational performance and workability of the setter can be assessed under normal fishing conditions.

The KLS is showing great potential to mitigate seabird bycatch in demersal longline fishing operations, and the SBWG will be kept informed on progress. A detailed report on the initial performance testing of the KLS is provided at Annex 1.

Pruebas del lanzador de Kellian en el mar:
Pruebas iniciales de rendimiento

El lanzador de Kellian es un dispositivo de lanzamiento subacuático que fue diseñado por Dave Kellian, pescador de Nueva Zelandia, y perfeccionado por un equipo de ingenieros del instituto marítimo australiano (Australian Maritime College) en su tanque estabilizador. Este lanzador consiste en un dispositivo formado por un carenado de acero inoxidable y un embudo, que tiene incorporados dos rodillos y se remolca sumergido detrás del buque. La línea madre entra por el carenado, pasa por debajo del primer rodillo y luego por encima del segundo para evitar que las pesas alejen el eje de la base del primer rodillo. Las brazoladas, los flotadores y las pesas pasan a lado de los rodillos y no encima. Los primeros avances en el diseño del lanzador de Kellian ya se habían informado al ACAP en el GdTCS Doc 10.

Luego de la evaluación, en el ambiente controlado de un tanque estabilizador, de las características hidrodinámicas y la funcionalidad del prototipo modificado, se realizaron nuevas pruebas y evaluaciones en el mar bajo condiciones normales de pesca. Se efectuó un total de 6 expediciones a bordo del buque pesquero Kotuku, un palangrero de fondo de 10 metros que operaba en las aguas de Tauranga, Nueva Zelandia. Cada expedición consistió en una serie de despliegues y pruebas, en general en condiciones marítimas calmas, para medir su rendimiento. Debido a ciertos problemas iniciales durante el lanzamiento, se incorporaron al dispositivo dos paravanes con el objetivo de mantener la profundidad y el ángulo de lanzamiento adecuados para lograr una pesca efectiva a la hora de implementar el lanzador de Kellian.

Antes de iniciar una nueva serie de pruebas bajo distintas condiciones marítimas, está previsto seguir perfeccionando el dispositivo en el tanque estabilizador. Dicha tarea abarca la posible combinación o simplificación del diseño de los dos paravanes, el perfeccionamiento de la forma del embudo para evitar que la línea madre raspe contra el borde guía y la colocación de una guía para dirigir las pesas al costado del rodillo posterior para que se puedan desplegar las pesas de los espineles. Este mayor perfeccionamiento del dispositivo en el tanque estabilizador también permitirá ajustar la forma del embudo e instalar mejor los paravenes para optimizar el rendimiento antes de continuar con las pruebas en el mar de Nueva Zelandia, donde se podrá evaluar el rendimiento operativo y la funcionalidad del lanzador bajo condiciones normales de pesca.

El lanzador de Kellian está demostrando tener un gran potencial para mitigar la captura secundaria de aves marinas en la pesca con palangre demersal, y se mantendrá informado al GdTCS sobre todo avance logrado al respecto. En el Anexo 1 se incluye un informe detallado sobre las pruebas iniciales de rendimiento del lanzador de Kellian.

Essais en mer sur le poseur de palangres Kellian
Essai de performance initial

Essai de performance initial Le poseur de palangres Kellian (KLS, Kellian line setter) est un dispositif sous-marin développé par Dave Kellian, un pêcheur néo-zélandais, puis amélioré par des ingénieurs du collège maritime australien (Australian Maritime College, AMC), en utilisant leur dispositif à citerne antiroulis. Le système KLS est constitué d'un boîtier en acier inoxydable et d'un système d'entonnoir, qui comporte deux roues, et qui est remorqué derrière le navire, en profondeur. La palangrepasse au travers du boîtier, sous la première roue et sur la deuxième roue, pour empêcher les lests de faire sortir la tente de fune du dessous de la première roue. Les avançons, les flotteurs et les lests passent à côté des roues et non pas sur les roues. Le développement initial du KLS a été présenté précédemment à l'ACAP dans le document GTCA5 Doc10.

Suite à l'évaluation des attributs hydrodynamiques et de la fonctionnalité du prototype modifié dans l'environnement contrôlé d'une citerne antiroulis, des essais et des évaluations supplémentaires ont été réalisés en mer dans des conditions normales de pêche. Un total de 6 voyages ont été menés à bord du navire de pêche Kotuku, un palangrier de fond de 10 m de long provenant de Tauranga, en Nouvelle-Zélande. Chaque voyage a comporté une série de déploiements et d'essais, généralement dans des conditions de mer calme pour mesurer la performance du système. Les problèmes initiaux de mise en place ont conduit à l'installation de deux paravanes sur le dispositif pour le maintenir à une profondeur et avec un angle de calage adéquats, permettant une pêche efficace lorsque le KLS était déployé.

Avant de commencer de nouveaux essais dans différentes conditions de mer, des améliorations supplémentaires sont prévues dans la citerne antiroulis. Il s'agit potentiellement de combiner ou de simplifier la conception des deux paravanes, d'affiner la forme de l'entonnoir pour empêcher la palangre de frotter sur son bord d'attaque, et de fournir un guide pour envoyer les lests sur le côté de la roue arrière et permettre de déployer les lests sur des cordes « d'écartement ». La poursuite du développement dans la citerne antiroulis sera également l'occasion de peaufiner la forme de l'entonnoir et les paramètres de la paravane pour optimiser les performances, avant de poursuivre les essais en mer en Nouvelle-Zélande, où la performance opérationnelle et la maniabilité du poseur de palangre peuvent être évaluées dans des conditions normales de pêche.

Le KLS possède un grand potentiel pour réduire les captures accessoires d'oiseaux marins lors des opérations de pêche à la palangre de fond, et le GTCA sera tenu informé des progrès accomplis. Un rapport détaillé sur les premiers essais de performance du KLS est disponible à l'Annexe 1.

ANNEX 1

KELLIAN LINE SETTER SEA TRIALS INITIAL PERFORMANCE TESTING

Barry Baker, Dave Goad, Brian Kiddie and Rowan Frost

1. Introduction

In 2011 quantitative seabird risk assessment work (Richard et al 2011) highlighted the high degree of potential risk that small vessel (inshore) bottom longline fisheries in New Zealand posed to a number of protected species, including the black petrel *Procellaria parkinsoni* and flesh-footed shearwater *Puffinus carneipes*. Although a suite of mitigation measures was mandatory in these fisheries, including the use of streamer lines, line weighting, night setting of longlines and restrictions on offal discharge during setting and hauling, bycatch of protected seabirds still remained a concern (Richard et al 2011). In ongoing experimental work to find solutions Goad et al (2011) and Pierre et al (2013) investigated the efficacy of operational practices in use in these fisheries for reducing seabird bycatch risk, reported on the influence of weighting regimes and float placement on sink rates of hooks, as well as describing some initial sea trials to test and develop a novel mitigation device, the Kellian line setter.

The Kellian Line Setter is an underwater setting device developed by Dave Kellian, a fisherman from Leigh, New Zealand. The initial concept involved running the mainline under a nylon roller towed behind the vessel at depth. The line then ran over second roller, behind and below the first one, to stop weights pulling the backbone off the bottom of the first roller. Snoods, floats and weights pass beside the rollers, rather than over them (Goad 2011; Figures 1 and 2). A lead ball on a wire cable holds the device at depth and allows for deployment and recovery with a small winch. Attached to the lead ball a steel tube holds the rollers behind the cable and a paravane on the steel tube assists in maintaining stability during towing. Once deployed, setting depth can be adjusted by increasing or decreasing the cable length.

The initial prototype had been developed through a series of at-sea trials which were conducted during 2011. While these trials had been encouraging, the issue of fouling on the rollers was identified as needing resolution before further testing should be considered (Goad 2011). In 2012, using funding from the New Zealand Department of Conservation's Conservation Services Programme, we refined the initial prototype at the Australian Maritime College (AMC), using the skills and expertise of engineers at the Circulating Water Channel (flume tank) facility of the College. This permitted critical examination of the hydrodynamic characteristics of the device, and re-design to eliminate operational impediments (line fouling) that were inhibiting proof of concept and the potential for uptake of the device by industry.

The new prototype (KLS 2) consisted of a stainless steel cowling and funnel arrangement that incorporated two rollers, and which was towed behind a vessel at depth. The mainline was fed through the cowling, under the first roller and over second roller to stop weights pulling the backbone off the bottom of the first roller. Snoods, floats and weights passed beside the rollers, rather than over them (Baker and Frost, 2013). The hydrodynamic attributes and functionality of the modified prototype were assessed in the controlled environment of a flume tank but further testing and evaluation at sea was required under normal fishing conditions.

Figure 1: Kellian Line Setter Prototype 2 in the flume tank.

Figure 2: Kellian Line Setter Prototype 2.

In December 2013 Latitude 42 Environmental Consultants was awarded Contract 4529 to conduct seat trials of the Kellian Line Setter 2. The overall objective of this project is to test the at-sea feasibility, and to the extent possible, the effectiveness, of reducing the availability of hooks to seabirds by using the improved Kellian line setter, in inshore bottom longline fisheries.

Specific Objectives are:

1. To identify the range of bottom longline gear configurations and conditions that allow effective and safe use of the device by conducting experimental at-sea trials

2. To describe line sink profiles of bottom longlines set through the device, as a proxy for mitigation effectiveness.

3. To provide recommendations on any further development and refinement of the device that may be required to enable reliable, effective and safe use in commercial bottom longline fishing operations.

Here we report on initial performance testing of the KLS 2, which has been carried out over the last six months near Tauranga, New Zealand.

2. Progress with Sea Trials

Review of Prototype 1

A total of 6 trips were conducted on board the fishing vessel *Kotuku*, a 10 m bottom longliner fishing from Tauranga. Each trip involved a series of deployments and test runs, generally in calm sea conditions. GoPro cameras were employed to record the attitude of the setter in the water and the passage of fishing gear through the setter.

Initial performance: trip 1

The setter was deployed and vessel speed was gradually increased from 2 - 4.5 knots, and the tow rope was gradually payed out to a maximum length of 15m. The linesetter sat reasonably straight at low speeds (< 2 knots), pulling slightly to starboard. With a longer tow rope and at higher speeds the setter ran progressively further off to starboard and at a shallower angle, before breaking the surface at about 4 knots. The KLS 2 also appeared to roll over at speed, such that the ball was further out to starboard than the top.

Modifications and developments: trips 2-5

Over the following four trips a series of systematic changes were made to the setter to improve its performance. Changes included adding an adjustable paravane beside the funnel, increasing the weight of the ball, increasing the length of the stud above the ball, moving the towing point, and adding a second paravane above the ball.

For each of the trips a series of test runs were performed with different settings. Speed through the water (4.5 knots) and tow rope length (10 m) were kept consistent for all runs. The horizontal angle of the setter behind the boat, the depth it was running at, its attitude in the water (angle of pitch and roll) and the loading on the towline were recorded. Following each trip data was analysed, modifications to the setter made, and a ‘run sheet’ or test plan was formulated to trial different settings for the subsequent trip.

This iterative approach involved balancing of the various forces acting on the line setter so that it ran at depth and straight behind the boat. The extra weight further below the setter also provided more stability, making it less sensitive to small adjustments and less susceptible to towing at large angles of roll. During trip 5 a small amount of gear was deployed through the setter with a couple of momentary hook catch ups, and on examining the video footage it was thought that a more normal set with a longer longline, and more tension in the backbone, would produce a more representative and consistent indication of performance.

	
Port side	**Starboard side**

Figure 3: Kellian Line Setter with modifications used to improve performance during initial performance testing. Modifications included:

- an adjustable paravane beside the funnel;
- increasing weight of the ball;
- increasing length of the stud above the ball;
- moving the towing point; and
- adding a second paravane above the ball

Setting a longline – trip 6.

A short set through the linesetter was performed with reasonable tension in the backbone, slightly more than would be used under normal fishing conditions, as it was thought that this would help keep the line in the setter. A 15 m tow rope was used, such that the setter ran at an estimated depth of 4 - 4.5 m, and speed through the water was initially 4, and then increased to 5, knots. Hooks were initially set slowly but as no problems were noted they were clipped on at normal (4 m) spacing for the majority of the set. Three hundred baited hooks were set through the device with three weights and 2 floats added to the line after the hooks. On examination of the video footage from the set the line came out of the back roller as the setter was lowered into the water. Therefore the set was conducted with the line running under the back roller. The setter tracked straight behind the boat with minimal (< 5 degrees) clockwise roll and a pitch angle of approximately 15 degrees nose down. The longline rubbed the front edge of the funnel but generally the passage of hooks was clean, either under or beside the funnel. A couple of traces were lost, and a couple of baits were seen coming off on the video, but overall the setter performed well and allowed the line to be set at depth and to catch some fish.

3. Discussion and Recommendations

Modifications to improve performance

- The iterative approach taken has resulted in two paravanes on the device, and these could potentially be combined, or at least simplified while still providing the desired forces to maintain an appropriate depth and angle of pitch for effective fishing. Retaining some adjustment in the paravanes would allow for fine tuning of the device in further sea trials.

- The funnel shape could be refined slightly to stop the line rubbing on its leading edge and to guide the traces around the outside of the funnel. This would also help when deploying floats, particularly intermediate surface floats, through the setter.

- Similarly, a guide needs to be made to send weights around the side of the rear roller so that weights on 'dropper' ropes can be deployed. Modifying the rear roller cheek could also help the passage of weights through the setter.

The developments outlined above may be best achieved by taking the setter back to the Australian Maritime College where modifications could be made and subsequent performance assessed in the flume tank. Ideally the setter could then be briefly taken to sea in Australia to confirm that the results from the flume tank can be then be achieved behind a vessel at speeds of 5 - 6 knots. Further development in the flume tank would also provide the opportunity to fine tune the funnel shape and paravane settings to optimise performance, prior to continuing further sea trials in New Zealand where operational performance and workability of the setter can be assessed under normal fishing conditions.

4. Acknowledgements

Alan Faulkner, Dave Kellian, Graham Robertson, Igor Debski and Kris Ramm provided advice and encouragement during the various phases of the development of this project.

We are also grateful to Janice Molloy and members of the Southern Seabirds Solution Trust Mitigation Mentor Programme's Technical Advisory Group for advice on the initial prototype and how to progress further development of the device.

The Australian Maritime College provided facilities and support which was essential to developing and refining Prototype 2 and developing solutions during the initial performance testing.

Funding was provided by New Zealand Department of Conservation's Conservation Services Programme (http://www.doc.govt.nz/csp), principally through a levy on the quota owners of relevant commercial fish stocks.

5. References

Baker, G.B., Frost, R. 2013. Development of the Kellian Line Setter for Inshore Bottom Longline Fisheries to reduce availability of hooks to seabirds. Research report for Department of Conservation. Available for download from: http://www.doc.govt.nz/Documents/conservation/marine-and-coastal/marine-conservation-services/mit-2011-04-kellian-line-setter-development.pdf

Goad, D. 2011. Trialling the 'Kellian Device'. Setting bottom longlines underwater. Unpublished report by Vita Maris to New Zealand Department of Conservation. Vita Maris Ltd: Papamoa, New Zealand.

Goad, D., Ramm, K. and Debski, I. 2011. Development of mitigation strategies for inshore demersal longline fisheries in New Zealand: progress report. ACAP SBWG-4 Doc 46 www.acap.aq downloaded 28 August 2011.

Pierre, J. P., Goad, D., Thompson, F.N., Abraham, E. R. 2013. Reducing seabird bycatch in inshore bottom longline fisheries. Draft Final Report. Conservation Services Programme Projects MIT2011-03 and MIT2012-01. Downloaded from http://www.doc.govt.nz/Documents/conservation/marine-and-coastal/marine-conservation-services/mit-2011-03-mit-2012-01-draft-final-report.pdf on 20 May 2014.

Richard, Y., Abraham, E.R., Filippi, D. 2011 Assessment of the risk to seabird populations from New Zealand commercial fisheries. Final Research Report for projects IPA2009/19 and IPA2009/20 and draft Aquatic Environment and Biodiversity Report. Ministry of Fisheries, Wellington.