Agreement on the Conservation of Albatrosses and Petrels

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Update on EM device for improving compliance with bird scaring line measures in longline and trawl fisheries

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SUMMARY

Bird-scaring lines (BSL) are a best practice mitigation measure for the mitigation of seabird interactions and bycatch in pelagic longline, demersal longline and trawl fisheries. While BSL have proven to successfully reduce seabird deaths and bait loss in fisheries, compliance with their use remains a challenge. The use of electronic monitoring (EM) devices may help ensure implementation and compliance with BSL mitigation measures while vessels are out at sea. A BSL compliance monitoring device has been in development and trialled since 2020, and is currently in its final production stage making it suitable for manufacture for the market. This BSL EM device works by continuously measuring the tension exerted by a BSL when it is dragged through the water and then transmitting real time and tension data wirelessly. Such devices have the potential to cover all fleets that use BSLs, improving the independent monitoring of the deployment and use of BSLs across the world, and reducing workloads and potential work health and safety hazards facing fisheries observers at sea.

1. INTRODUCTION

Bird-scaring lines (BSL) are a best practice measure for the mitigation of seabird interactions and bycatch in pelagic longline, demersal longline and trawl fisheries (ACAP 2021a, 2021b, 2021c).

BSL have been in use as a seabird bycatch mitigation measure since the early 1990s and are proven to successfully reduce seabird deaths and bait loss in fisheries (Brothers 1991). However, ensuring compliance with their use, remains a challenge (Phillips et al., 2016). Monitoring of the deployment and effective use of BSL has been undertaken as part of fisheries observer programs, and more recently through auditing of video imagery captured by electronic monitoring systems in some fisheries.

Conservation and Management Measures developed by Regional Fisheries Management Organisations provide fishing operators with the option of choosing which seabird bycatch mitigation technology or technique will be employed from a suite of mitigation measures including BSL. This may result in BSL use during daytime and/or at night. BSL use occurs during setting of longlines and trawling in all weather and sea state conditions.

Visual observations and capture of video footage of BSL may be problematic in a range of settings, e.g. sunrise/sunset and at night, during fog, and during storms. Conditions at sea may also pose work health and safety issues for fisheries observers when attempting to observe the deployment and use of BSL at the stern of the longliner/trawler. Furthermore, video imagery auditing is extremely data-heavy despite technological advances.

The use of electronic monitoring devices may help ensure implementation and compliance with mitigation measures while vessels are out at sea (Diaz et al., 2019, van Helmond et al., 2020). This includes development of BSL compliance monitoring devices (Angel et al. 2021 SBWG10 Inf 18).

2. UPDATED DEVELOPMENT OF A BSL EM COMPLIANCE DEVICE

Angel et al. (2021) (SBWG10 Inf 18) reported on progress with the development of a pilot-BSL compliance monitoring device and recommendations to support further research and development were made during the 11th Meeting of the Seabird Bycatch Working Group (ACAP 2023). This device represents the first technology or technique allowing independent confirmation that a fishing vessel at sea is complying with its obligations to deploy and use BSL (Angel et al. 2021, SBWG10 Inf 18).

The BSL compliance monitoring device works by continuously measuring the tension (kg) exerted by a BSL when it is dragged through the water. The BSL is attached to the tension sensing element of the device which records the tensile force being exerted onto it by the BSL. The tensile force is thus detected by the computing unit within the device and at set recording intervals. This information is converted into data points associated with the date and time the tensile force was exerted onto the BSL. Each device consists of: a securing mechanism that attaches directly to a BSL; an internal computer (Imvelo computer board) configured to record, store and transmit real time, tension, and battery status data; an independently rechargeable battery system; and a waterproof casing manufactured from rigid material (**Figure 1**).

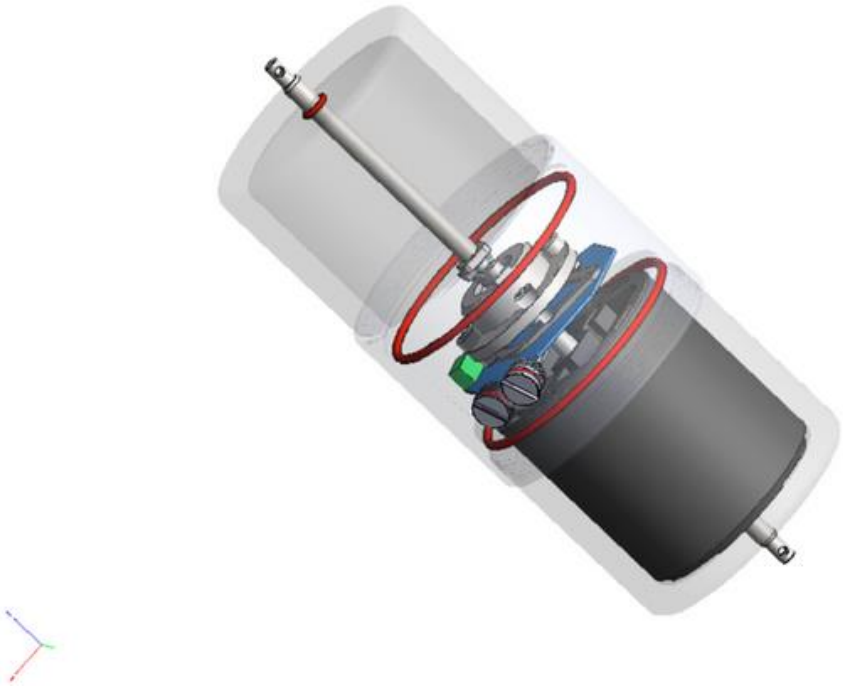

Figure 1. Diagram showing the updated design of the BSL EM compliance device.

Data are sampled and stored by the device's internal mechanisms at set intervals and converted to data points associated with the date and time of capture. A specific period when captured tension data indicates the BSL is in use is referred to as 'Measured Event' and can be further analysed. A 'Tension Profile' captured during a 'Measured Event' is the expression of the tension in kg produced by the pull of the BSL over time (**Figure 2**).

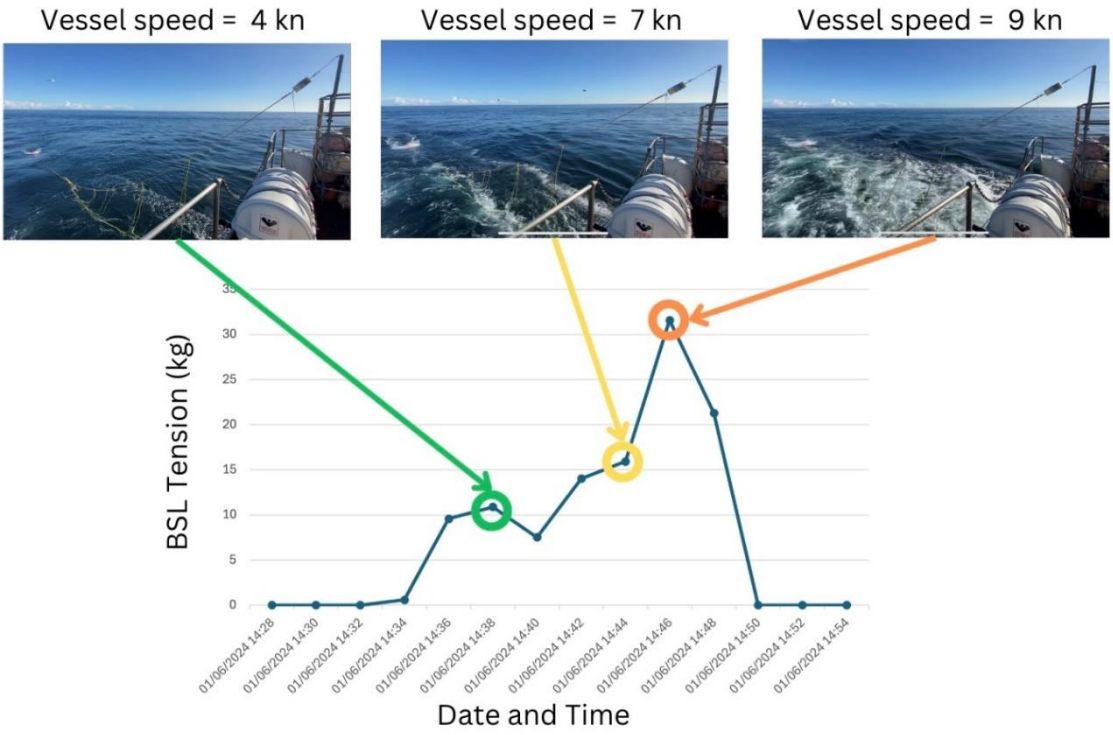

Figure 2. Graph of a 'Measured Event', expressed as a 'Tension Profile', showing the fluctuations in tension, produced by the pull of the BSL while deployed and towed by a vessel at increasing speeds during a sea trial.

"Tension profiles" are used to identify discrepancies as well as validate actual deployments. Each "tension profile" is unique because it is affected by multiple variables (e.g. BSL configuration and associated drag coefficient, vessel type and speed, environmental conditions such as weather and current). The device operates autonomously, has inbuilt tamper-proof systems (e.g. data encryption, security seals) and an existing dataset is used to match and validate patterns corresponding to actual deployments. However, deployments are also further validated by observer programmes. Thus, the collection of "tension profile" data over time contributes to an increasingly powerful model for the detection of a wide variety of discrepancies (e.g. malfunction, tampering or sub-optimal deployments) and the validation of deployments in different fleets and environments.

Data packages are light: data collected by the BSL EM device over a full year can take up only a few megabytes of memory. The device is capable of transmitting data using wireless technologies (IoT, Internet of Things). This device therefore has the potential to cover all fleets that use BSLs and to provide the information necessary to assess the status of the deployment and use of BSLs across the world in real time (Figure 3).

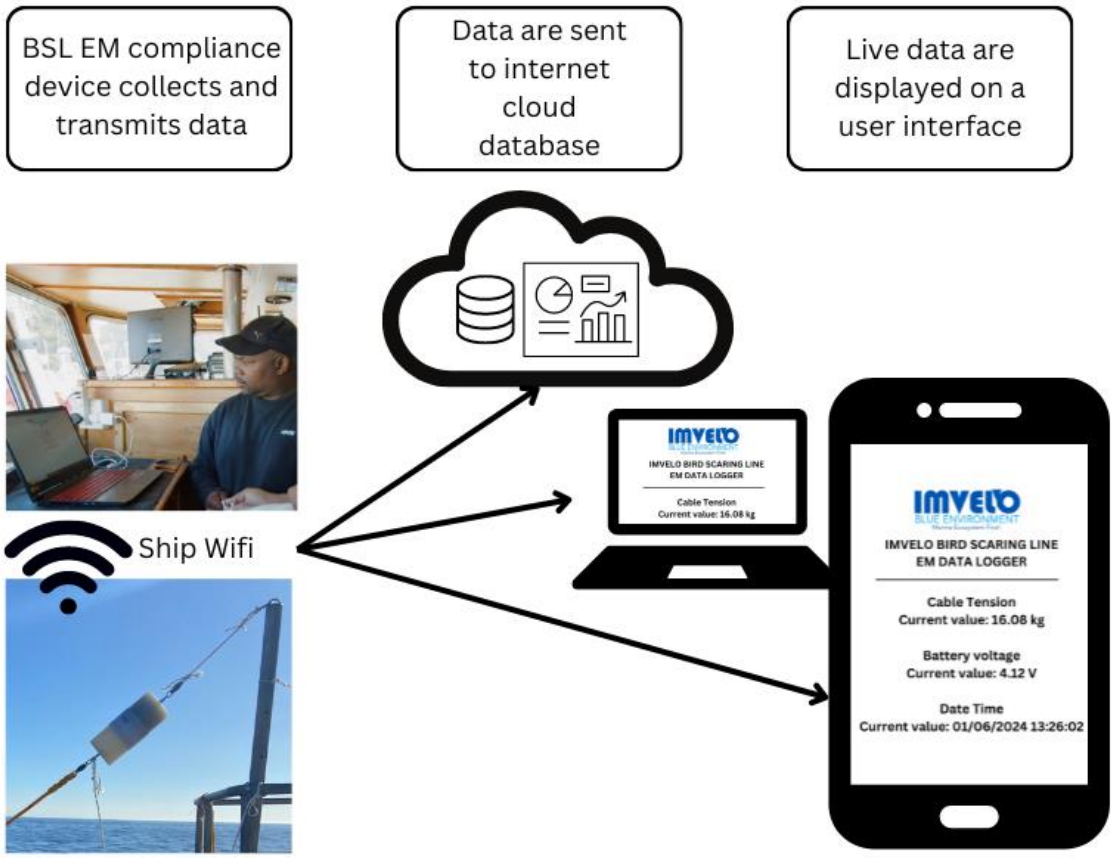

Figure 3. Conceptual diagram showing how data are collected and transmitter wirelessly by the BSL EM compliance device using ship wifi. This enables users to monitor the deployment of BSLs via live interface on the ship. Data from multiple vessels can also be transmitted to a cloud database enabling remote monitoring of BSL deployments across different fleets.

3. NEXT STEPS

The technology has direct application in domestic and high seas pelagic longline, demersal longline and trawl fisheries, including to confirm that fishing vessels are complying with mandatory BSL requirements under Conservation and Management Measures developed by RFMOs. Data recorded and collected from such devices also allow for confirmation of fishing vessel logbook entries about the use of BSL.

The work undertaken so far in developing a BSL EM compliance device demonstrates the utility of the device to independently verify the deployment and use of BSL during fishing operations. Consideration has been given to the conditions the device would ordinarily operate under, including high-tension events and line entanglement. The technology also has the potential to reduce workloads and potential work health and safety hazards of fisheries observers.

This BSL EM compliance device has undergone many improvements and is has reached its final production stage making it suitable for manufacture for the market.

2. REFERENCES

ACAP, 2023. Improving compliance with bird scaring line measures in longline and trawl fisheries. In: ACAP - 11th Meeting of the Seabird Bycatch Working Group. SBWG11 Doc 24, Edinburgh, UK.

ACAP, 2021a. ACAP Review of Mitigation Measures and Best Practice Advice for Reducing the Impact of Demersal Longline Fisheries on Seabirds. Agreement on the Conservation of Albatrosses and Petrels, Twelfth Meeting of the Advisory Committee Virtual meeting, 31 August – 2 September 2021.

ACAP, 2021b. ACAP Review of Mitigation Measures and Best Practice Advice for Reducing the Impact of Pelagic and Demersal Trawl Fisheries on Seabirds. Agreement on the Conservation of Albatrosses and Petrels, Twelfth Meeting of the Advisory Committee Virtual meeting, 31 August – 2 September 2021.

ACAP, 2021c. ACAP Review of mitigation measures and Best Practice Advice for Reducing the Impact of Pelagic Longline Fisheries on Seabirds. Agreement on the Conservation of Albatrosses and Petrels, Twelfth Meeting of the Advisory Committee Virtual meeting, 31 August – 2 September 2021.

Angel, A., Miranda, N.A.F., Ngcongo, S.V., Nyengera, R. and McInnes, A., 2021. Development of a bird-scaring line compliance monitoring device. Agreement on the Conservation of Albatrosses and Petrels, Tenth Meeting of the Seabird Bycatch Working Group Virtual meeting, 17–19 August 2021, SBWG10 Inf 18.

Brothers, N., 1991. Albatross mortality and associated bait loss in the Japanese longline fishery in the Southern Ocean. *Biological Conservation* **55**: 255–268.

Dias, M.P., Martin, R., Pearmain, E.J., Burfield, I.J., Small, C., Phillips, R.A., Yates, O., Lascelles, B., Borboroglu, P.G. and Croxall, J.P., 2019. Threats to seabirds: a global assessment. *Biological Conservation* **237**: 525–537.

Phillips, R.A., Gales, R., Baker, G.B., Double, M.C., Favero, M., Quintana, F., Tasker, M.L., Weimerskirch, H., Uhart, M. and Wolfaardt, A., 2016. The conservation status and priorities for albatrosses and large petrels. *Biological Conservation* **201**: 169–183.

van Helmond, A.T., Mortensen, L.O., Plet-Hansen, K.S., Ulrich, C., Needle, C.L., Oesterwind, D., Kindt-Larsen, L., Catchpole, T., Mangi, S., Zimmermann, C. and Olesen, H.J., 2020. Electronic monitoring in fisheries: lessons from global experiences and future opportunities. *Fish and Fisheries* **21**: 162–189.