 <p>Agreement on the Conservation of Albatrosses and Petrels</p>	<p>Twelfth Meeting of the Seabird Bycatch Working Group</p> <p><i>Lima, Peru, 5 – 7 August 2024</i></p> <p>Advances in mitigating seabirds interactions with the net monitoring cable</p> <p><i>Leandro L. Tamini, Leandro N. Chavez, Rubén F. Dellacasa, Cristian J. Marinao & Esteban Frere</i></p>
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SUMMARY

The net monitoring cable (NMC) have a particular risk to albatrosses and petrels. Despite recommendations against its use, it is widely spread in most fishing grounds around the world. While there are specific mitigation measures for this cable such as snatch blocks or bird scaring lines (BSL), their search, experimentation, and refinement are more complex than for warp cables for several reasons like inaccessibility and cost of the NMC. The objectives of this paper are to continue investigating mitigation measures to reduce mortality caused by this cable from two sources and in collaboration with the crews:

1. Inquire about the potential of a new material for constructing the NMC.
2. Evaluate in logistical terms and crew acceptance for overcoming configuration of the BSL intending to efficiently cover the cable entry point into the water and reduce cable entanglements.

From 2015 to the present and over 296 days of fishing, we made 673 surveys of interactions between seabirds and the NMC were conducted. A total of 886 and 293 collisions were recorded in steel and Dynlce, respectively. The collision rate per total hour in steel and Dynlce was 6.45 col/h and 3.01 col/h, respectively, for the entire period. Additionally, we present a new alternative design of a BSL adapted for the NMC that met the stated objectives but still needs to be tested in terms of mortality reduction.

RESUMEN

El cable de monitoreo de red (CMR) representa un riesgo particular para los albatros y petreles. A pesar de las recomendaciones en contra de su uso, está ampliamente extendido en la mayoría de los caladeros de pesca alrededor del mundo. Aunque existen medidas específicas de mitigación para este cable, como el *snatch block* o líneas espantapájaros (LEP), su búsqueda, experimentación y perfeccionamiento son más complejos que para los cables de arrastre, debido a varias razones como la inaccesibilidad y el costo del cable. Los objetivos de este informe son continuar investigando medidas de

mitigación para reducir la mortalidad causada por el CMR proveniente de dos fuentes y en colaboración con las tripulaciones:

1. Investigar el potencial de un nuevo material para construir el cable.
2. Evaluar, en términos logísticos y de aceptación de la tripulación, una configuración superadora de la LEP con la intención de cubrir eficientemente el punto de entrada del cable al agua y reducir los enredos con el mismo.

Desde 2015 hasta el presente y durante 296 días de pesca, se realizaron 673 censos de interacciones entre aves marinas y el CMR. Se registraron un total de 886 y 293 colisiones en el acero y el Dynlce, respectivamente. La tasa de colisiones por hora en el CMR de acero y de Dynlce fue de 6.45 col/h y 3.01 col/h, respectivamente, para todo el período de estudio. Además, presentamos un nuevo diseño alternativo de una LEP adaptada para el CMR que cumplió con los objetivos establecidos pero que aún necesita ser probada en términos de reducción de impacto.

1. INTRODUCTION

The net monitoring cable (NMC), which electronically monitors various fishing variables during trawling, poses a particular risk, as it has a greater aerial extent compared to warp cables (WC) (Løkkeborg 2011, Tamini *et al.* 2016). Several authors have identified a high risk of incidental catch from the NMC compared to the WC alone in trawl fisheries worldwide (Weimerskirch *et al.* 2000, Adasme *et al.* 2019, Tamini *et al.* 2023). In 1991, the Convention for the Conservation of Antarctic Marine Living Resources adopted Conservation Measure prohibits the use of net monitoring cables in trawl fishing in the Convention Area due to concerns about seabird mortalities resulting from collisions with this cable in these fisheries (CCAMLR-X 1991). The following year, the same decision was made in New Zealand waters, considering that the number of deaths was sufficient to have an impact on the population status of albatrosses species, mentioning the possibility of switching to wireless equipment for information transfer (Fisheries New Zealand 2022). In 2021, the Uruguayan government took a similar measure for all its trawling fleets in its platform waters (Dirección Nacional de Recursos Acuáticos 2020). Despite these prohibitions and the recommendation of avoid the use from this Working Group, this cable remains in use in various fishing grounds worldwide (*i. e.*, Argentine and Chilean fishing grounds), and even the mentioned prohibitions are being reviewed with the aim of revoking them.

Regarding mitigation measures to reduce mortality that this cable may cause, in Alaska, Melvin *et al.* (2011) demonstrated that collisions with seabirds by the NMC can be reduced by combining the use of paired bird scaring lines (BSL) deployed on the port and starboard sides of the WC along with the use of a pulley that works to bring the NMC closer to the water at the stern. This means that BSL can reduce collisions with both types of cables. However, this can be challenging to manage in strong winds, and in some cases, individual tapes can deform the NMC, compromising the mitigation potential (Melvin *et al.* 2011). Additionally, entanglements with the BSL can damage the expensive and sensitive NMC. Therefore, captains and crew often resist mitigation measures that could interfere with the NMC. This is a substantial barrier to the implementation of mitigation measures that support increased operatory efficiency (Melvin *et al.* 2011, Tamini *et al.* 2023).

The objectives of this report are to continue investigating mitigation measures to reduce mortality caused by the NMC from two sources and in collaboration with the crews:

- inquire about the potential of a new material (at least for the Argentine fishing ground) for constructing the cables (both NMC and WC) and
- evaluate in logistical terms and acceptance of the crews for overcoming configuration of the BSL for the NMC presented in document SBWG9 Inf. 24 (Tamini *et al.* 2019) intending to efficiently cover the cable entry point into the water.

2. METHODS

2.1. Data source and statistical analysis for NMC Steel vs. Dynlce

Assessment of seabird interactions on cables with a single factory trawler was conducted by Albatross Task Force instructors from 2015 to the present. The vessel operates south of 52°S in the Argentine Sea using both mid-water (monitored by a NMC) and bottom trawl nets. The vessel primarily targets demersal and sub-Antarctic species like Hoki (*Macruronus magellanicus*), Southern blue whiting (*Micromesistius australis*), and Patagonian toothfish (*Dissostichus eleginoides*). Depending on the target species, discards may include whole fish, or processing offal (heads, tails, and guts), which may be thrown overboard “as is” or after mincing. No storage or other forms of discard management are used in this vessel. The target vessel has been working for a year with a new NMC made with a co-axial data transfer cable enclosed in a synthetic material, named Dynlce (see <https://hampidjan.com/>). Overall, WC with this type of construction technology weigh around 15% of the weight of steel cables, increasing trawl net opening, enhancing handling, reducing cable sinking, and decreasing fuel consumption during fishing according to its manufacturer. This technology started to be used a decade ago in pelagic trawl fisheries and then transitioned to bottom trawl fishing. Currently, two vessels in the Argentine trawlers fleet are working with this technology on WC and NMC.

During 296 days of fishing, 673 surveys of interaction between seabirds and the NMC were conducted in periods ranging from ten to 120 minutes. The total observation effort was 138.1 hours and 96.7 hours on steel and Dynlce Data NMC respectively. The impact counts of steel NMC covered most months of the year, while those of Dynlce NMC were only conducted in December-January. For each observation period, seabird collisions with each cable were recorded as collision outcome (not injured, injured, possibly dead, and dead).

2.2. Statistical analysis

To evaluate the effect of the type of NMC (steel vs. Dynlce) on the number of collisions per hour, a Generalized Linear Model (GLM) with Negative Binomial distribution was fitted. First, this effect was evaluated for all hauls with counts conducted during the entire study period (n=291), including those where seabird collisions with the cables were not observed. Then, considering the possible temporal variability in seabird assemblages, the effect was evaluated for the months of November to January exclusively (n=184) including two trip with steel NMC and two with Dynlce NMC.

Model selection was carried out using analysis of variance (ANOVA) for deviance analysis against degrees of freedom (Burnham and Anderson 2002). Considering that observation periods within the same fishing set are not independent of each other, the number of collisions per hour was calculated for each fishing set.

Subsequently, we used an odds ratio (OR) to indicate how many times a level of a factor increases based on a unit increase in another level of that same factor. The OR represents odds, but on a different numerical scale. We used the OR (exponential function of the regression coefficient) to indicate how many times a level of a factor increases based on a unit increase in another level of that same factor (Zuur *et al.* 2009). Additionally, we present confidence intervals (CI) for the OR, where a wide CI implies that the number of events tested is quite small, while if the CI includes the number 1, the calculated OR is not statistically significant (Bland and Altman 2000).

2.3 Adaptation of BSL design for net monitoring cable

Between December 2023 and January 2024, experiments were conducted on a BSL design for the Dynlce NMC. The aim was to efficiently cover the area where the cable enters the water, as well as to work with the crew to gain acceptance of the design from the outset.

3. RESULTS

3.1 Rate collisions per hour for steel vs Dynlce NMC

A total of 886 and 293 collisions were recorded in steel and Dynlce NMC, respectively. 97.7% of the collisions resulted in not injured seabirds, while 0.3% resulted in injuries, and 2% possibly dead (Table 1). Based on the intensity of collisions, 85.6% were light, 10.6% were medium, and 3.6% were heavy. The collision rate per total hour in steel and Dynlce NMC was 6.45 col/h and 3.01 col/h respectively for the entire period. Considering the information corresponding to fishing trips conducted from November to January, the impact rate for the steel NMC was 6.94 col/h (vs 3.01 col/h of the Dynlce). Analysis of all surveys indicated that the material of NMC had a significant effect on the number of collisions per hour (GLM, $Z = -2.396$, $P = 0.0166$). The number of collisions per hour was 1.92 times lower (CI = 1.12-3.27) for the Dynlce NMC compared with the steel NMC. In addition, analysis of hauls from November to January (summer) also indicated that the type of NMC had a significant effect on the number of collisions per hour (GLM, $Z = -2.463$, $P = 0.0138$). The number of collisions per hour during the summer was 2.1 times lower (CI = 1.12-3.27) for the Dynlce NMC compared with the steel NMC.

NMC material	Injured	Not injured	Possibly dead	Observation effort (hours)
Steel (total)	2	863	21	138.1
Steel (summer)	-	273	5	52.9
Dynlce	2	289	2	96.7

Table 1: Number of collisions for two different materials of the net monitoring cable during the study period.

3.2 Adaptation of BSL design for net monitoring cable

The design consisted of three main parts: a rope, a block, and a drag rope (Figure 1, 2 and 3). The following materials were tested: Nylon ropes of 14 and 16 mm, two different steel and Teflon blocks, and two towing Polysteel ropes of 26 and 36 mm with positive buoyancy. Different lengths of the two ropes were also tested to reach the cable's entry point into the water. The final design included a 30m long, 14mm Nylon rope (section from the stern gantry to the Teflon block), a Teflon block with an additional weight of 1.5 kg sliding over the NMC, and a 20m long, 26 mm diameter Polysteel rope (tied to the block) with the last 3 meters frayed.

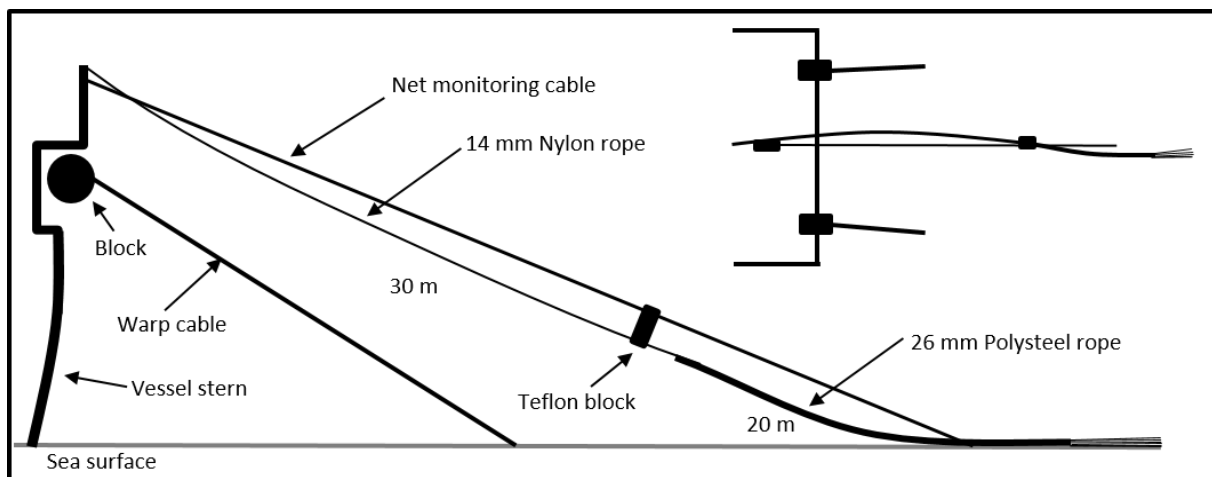


Figure 1: Scheme of the assembly of the bird scaring line specially designed for the net monitoring cable composed of three elements: a Nylon rope, a Teflon block, and a second Polysteel rope with positive buoyancy. Figures 2 and 3: two images showing the operation of the bird scaring line, the first one near the net monitoring cable and the other further away.

4. DISCUSSION

In this document, we present two ideas regarding the mitigation of incidental capture resulting from impacts of seabirds against the net monitoring cable. On one hand, the proposal of a new material that could be mitigating the impact rate. The use of Dynlce on the NMC decreased multiple times the number of bird collisions with cables, as well as bird mortality rates. More data is needed on Dynlce, but this material arises as a potential complementary measure to

mitigate bird mortality on trawler vessels. On the other hand, an adaptation to a BSL design aimed at reducing entanglements (and potential damage) with the net monitoring cable. Additional information is required to substantiate its effectiveness in reducing the impact rate. Factors such as the depth at which the NMC extends into the water, accessibility challenges, and, in certain vessels, the use of delicate materials, all contribute to the complexity of experimenting with mitigation measures for this cable.

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