Development of an experimental pilot action by the Spanish surface longline fleet targeting swordfish in the Indian Ocean, employing terminal gear devices known as *lazos* (loops)

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Abstract

We present an experimental pilot action plan aimed at monitoring the use of loops (*lazos* in Spanish language) devices and assessing their effects on bycatch within the Spanish surface longline fishery operating in the Indian Ocean, with particular emphasis on Endangered, Threatened, and Protected (ETP) species. This initiative seeks to evaluate the ecological and operational implications of incorporating loops into fishing practices, providing a scientific basis for determining their potential to enhance swordfish catch efficiency while reducing incidental captures of vulnerable marine fauna.

1. Introduction

Recently, a new technological innovation known as *lazos* ("loops") - another name area: traplines or meka rings - has rapidly emerged in pelagic longline fisheries. The rapid expansion of these loop-based devices represents one of the most recent and challenging developments in the global swordfish (*Xiphias gladius*) fishery. Initially developed by Japanese diamond squid (*Thysanoteuthis rhombus*) fishers around 2010 (Ochi et al., 2025), these ring-based devices—also referred to as Itoman rings or meka rings—have since spread informally to the Mediterranean and Atlantic, and more recently to the Eastern Pacific Ocean (EPO) (Garibaldi et al., 2024; Valastro et al., 2024; Macías et al., 2025; Ochi et al., 2025). Their adoption has been facilitated through informal knowledge exchange among international crews and interactions between fleets operating in shared fishing grounds.

Several captains report that loops are particularly effective for billfishes—especially swordfish—attributing this to their distinctive feeding behavior (personal communications). Moreover, loops reduces bait-related costs.

Recent research by Macías et al. (2025) suggests that loops may also represent a promising innovation for mitigating bycatch of endangered, threatened, and protected (ETP) species, including seabirds, and sea turtles. Experimental sets using loops showed a marked reduction in the number of ETP species caught compared to traditional surface longline sets. Preliminary results from Mediterranean Sea indicate a decrease in bycatch of up to 32.22% in sets employing loops relative to those using traditional hooks (Macías et al., 2025). Moreover, the size distribution of swordfish caught using loops appears skewed toward larger individuals, possibly indicating differential selectivity—though further investigation is required.

The Spanish surface longline fleet operating in the Indian Ocean during 2024 was composed of 17 vessels, with an average length of 32 m and a gross registered tonnage (GRT) of 180. During 2024, the fleet deployed a total of 3,846.107 thousand hooks. The main target species were swordfish (*Xiphias gladius*), which reached 4,057.048 tons (representing 47.6% of total retained catches), and blue shark (*Prionace glauca*), which reached 3,894 tons (45.6% of retained catches). On the other hand, given the potential of loops to significantly reduce bycatch—particularly of marine turtles and other ETP species—and in light of ongoing conservation priorities within the IOTC, we strongly recommend the evaluation of loops use in surface longline fisheries within the IOTC area. The experimental pilot action should aim to assess the ecological, technical, and economic dimensions of this gear modification, ultimately contributing to the development of best practices for its responsible integration into commercial fishing operations.

2. Loops description

The loop device, or lazo, is constructed from nylon or polyamide monofilament, typically with a diameter between 2.0 and 2.5 mm—materials commonly used for secondary branchlines (Figure 1). The structure generally comprises several interconnected loops (typically seven, though numbers may vary between four and eight). Line thickness and loop dimensions depend on material availability aboard each vessel.

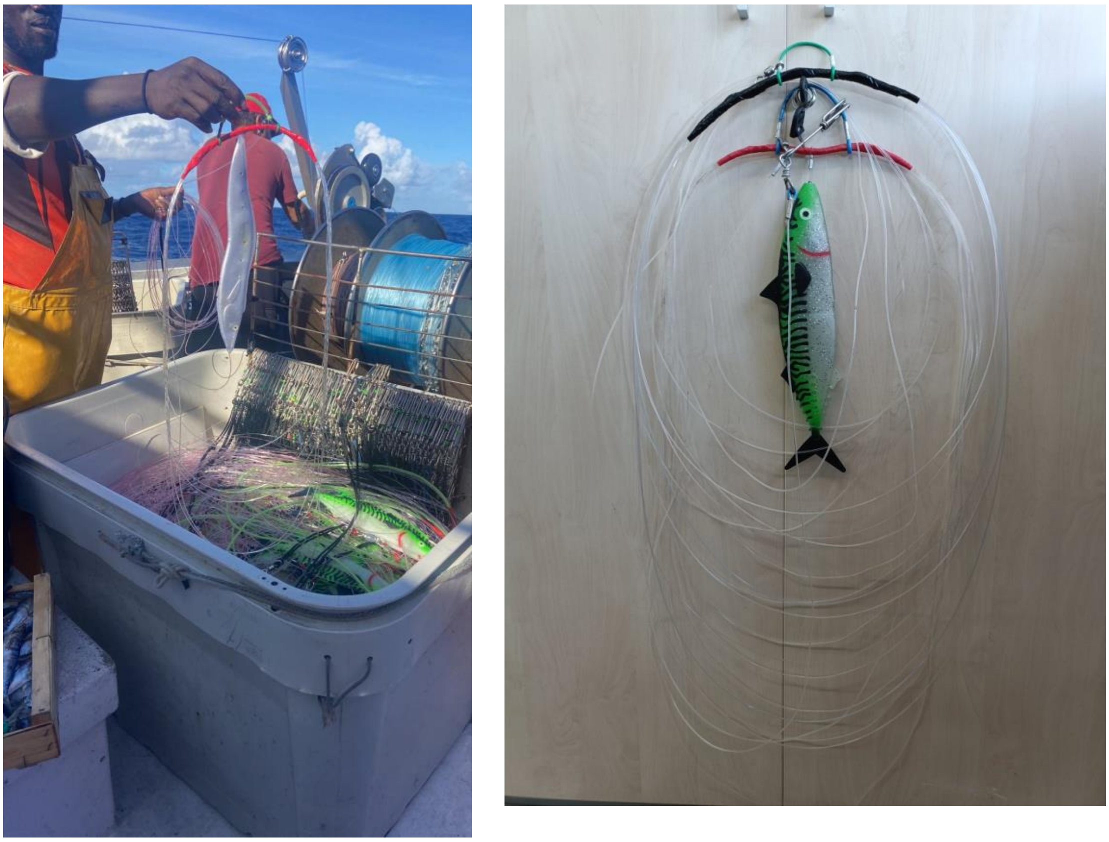

Figure 1. General appearance of two different loops with artificial bait.

At each end of the artificial bait, and at the midpoint of the strap that binds the loops, a small monofilament ring is attached and secured with crimps, sometimes covered by a protective sheath. This ring serves as the attachment point between the loop device and the branchline, and subsequently to the mainline. Artificial bait (commonly made of plastic) is consistently used, typically imitating squid, mackerel, or similar prey species, together small light-emitting devices (battery-powered or chemical).

Various attachment methods have been observed. One approach involves a secondary line—of the same dimensions as those used for hooks—terminating in a snap clip that connects to the loop. Alternatively, a fixed snap clip is attached directly to the ring joining the loop structure, which is then clipped onto the branchline hook, effectively replacing the bait.

Garibaldi et al. (2024) did not report any vessels fully equipped with loop systems but noted that several, particularly in Sicily, have begun using them as partial hook replacements. Interviews with Atlantic captains suggest that some vessels now deploy substantial numbers of loop devices, sometimes exceeding the number of traditional hooks.

The loop mechanism activates when a fish attempts to seize the artificial bait. The slipknot and multiple loops of varying diameters entangle the fish—typically around the head, bill, fins, or gills—making escape unlikely unless the connection between loop and branchline fails.

3. Objectives of the Monitoring Plan

The main objectives of the proposed monitoring plan are:

1. To describe the different types of loop devices use and propose a standardized, homogeneous definition.

2. To determine the catchability of swordfish by loops, including a comparative description of size and species composition relative to traditional hook catches.

3. To quantify associated bycatch and describe the corresponding size distributions.

4. To identify the optimal ratio between loops and hooks to maximize fishing efficiency while ensuring sustainability.

4. Methodology and Resources

Fishing associations and producer organizations will be asked to provide a list of volunteer vessels operating in the IOTC area willing to use loops under a “free-use” experimental framework. This list will be communicated to inspection and control services to ensure awareness of participation in the scientific and experimental activity.

All participating vessel captains will be required to complete a supplementary catch log specifically designed to record comparative information between loop and hook catches, including hook types used. In addition, each volunteer vessel must host at least one observer from the General Secretariat for Fisheries' Scientific Observer Program during one fishing trip within the study period. Observers will receive specific training and standardized reporting materials tailored to this experimental action.

To maximize the effectiveness and representativeness of the experimental trials, the General Secretariat for Fisheries will provide participating vessels with an observation schedule to ensure adequate spatial and temporal coverage of fishing effort.

5. Duration

The experimental action will take place from 15 January 2026 to 15 December 2026.

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