

OUTCOMES OF THE CIRCLE HOOK SYMPOSIUM 4–6 MAY 2011, MIAMI, USA

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PURPOSE

To inform the Working Party on Ecosystem and Bycatch (WPEB) of the outcomes of the Circle Hook Symposium that was held in Miami, USA from the 4th to the 6th May 2011. This paper focuses on key outcomes related to longline fisheries targeting tuna and tuna-like species under the mandate of IOTC.

BACKGROUND

At the 15th Session of the Commission, the Commission recommended that the Secretariat attend the 2011 International Symposium on Circle Hooks that was organized by the National Oceanic and Atmospheric Administration (NOAA) in May 2011 in Miami, USA.

The Commission requests that the Secretariat attend the Circle Hook symposium that will be held in May in Miami and report the key findings to the Scientific Committee.”(para.42 of the S15 report).

Subsequently, one representative from the Secretariat attended the 2011 International Symposium on Circle Hooks in Miami, USA with the aim of gathering key pieces of information for presentation to the WPEB and the Scientific Committee.

OUTCOMES

The 2011 International Symposium on Circle Hooks was the first symposium ever organised on the effect of circle hooks in commercial and recreational fisheries, and its objective was to assess the management and conservation utility of circle hooks.

Around 150 participants attended the symposium and more than 50 presentations were made during the three days of the meeting. In these presentations, the following topics were addressed:

1. What is a circle hook?
2. Effect of circle hooks on bycatch species, mainly turtles and sharks.
3. Effect of the use of circle hooks on target species.

1) What is a Circle Hook?

There is no internationally agreed definition of a circle hook, and so-called circle hooks can have very different characteristics.

However, it was recognized that a circle hook is a hook with the point being at least 90° from the shank. It can be of different type, size, point angle and in particular it can be offset or not. Most of the hook manufacturers are producing circle hooks today although with very different specifications.

In general, the size of a hook is determined by the gap of the hook, however there is no standard for hook size and such sizing depend on the manufacturer. The main objective of using a circle hook is to reduce deep hooking and subsequent hooking mortality, the circle hook generally setting itself in the corner of the mouth. However, it seems that some characteristics such as the offset may reduce the effectiveness of a circle hook.

2) Effect on circle hooks on bycatch species

Today, circle hooks are regarded as an effective method to reduce incidental bycatch, and in particular for marine turtles. In this respect, in 2004, the US National Marine Fisheries Service (NMFS) passed a regulation that make the use of circle hooks mandatory in the Atlantic swordfish and tuna pelagic longline fishery.

Moreover, circle hooks have been proven to reduce the post-hooking mortality of the hooked animal, as it is less prone to deep hooking in the throat or in the oesophagus in comparison to J hooks or other types. This was shown in different studies presented during the symposium, in particular for sharks and marine turtles, where it could increase post-release survival, but also for target species, i.e. swordfish and tuna, where post-hooking survival would increase the quality of the fish.

In particular it was shown that:

- In the Canadian pelagic longline fleets, odds of survival for common bycatch species were shown to be 2 to 5 times higher when using circle hooks in comparison to J hooks.
- Compared to circle hooks, J hooks increased CPUE of bycatch species by 47% in the western equatorial Atlantic pelagic longline fishery.

On Marine Turtles

Most of the studies dealing with pelagic longlines that were presented at the symposium confirmed that the use of circle hooks can mitigate incidental catches of marine turtles in longline fisheries by reducing catch rates of marine turtle on both bottom and pelagic longlines. This was shown for different longline fleets, artisanal as well as industrial, in the three oceans:

- In longline fisheries (from Indonesia, Ecuador, Brazil, Uruguay, Mexico, Costa Rica, the north east Atlantic US longline fishery, the Spanish and Portuguese longline fleets and in longline fleets operating in the bay of Bengal and in the Andaman sea) trials and experiments showed that circle hooks could result in significant reduction of marine turtle bycatch (reductions of 78% in the case of Indonesia, 60% in Ecuador longline fleets).

However, some results indicate that the mitigation effect of the circle hook for marine turtle would decrease if the sizes of the circle hooks were too small. In particular:

- Studies in the Mediterranean sea showed that catch rates of marine turtles when using 13/0 circle hooks are similar than when using 9/0 J hook, or that the use of 12/0 circle hooks would have similar marine turtle catch rates as 3/0 J hooks. However, circle hooks could result in a lower mortality as they result in shallow hooking depth.

It is furthermore important to note that, while the probability of deep hooking of marine turtles is lower with circle hook, they can still injure sensitive parts of the mouth of the animal. However, most of the time, severe injuries are generated by the handling and de-hooking practices rather than the hooks themselves. It is therefore important to develop clear handling and de-hooking protocols and insure that longline vessels have the appropriate equipment, i.e. de-hooker and line cutter.

Several studies presented also noted that, in longline fisheries, not only the hook type could decrease incidental catch of marine turtles but that the combination of hook type and bait was also important. In particular, it was shown in the northwest Atlantic, the combination of circle hooks and mackerel bait reduced the catch of loggerhead turtles and leatherback turtles while it increased the catch of swordfish, while the combination of circle hooks and squid bait increased the catch of bigeye tuna.

On sharks

Among the studies presented, there was no clear evidence that the use of circle hooks would reduce CPUE for pelagic sharks commonly caught within longline fisheries. On the contrary, results from trials, experiment and observation onboard longline vessels seemed to indicate that shark CPUE can be increased by the use of circle hooks. In particular it was shown that:

- In the southwest Atlantic near Brazil, CPUE of pelagic sharks such as blue shark (*Prionace glauca*) and silky shark (*Carcharhinus falciformis*) would be increased by the use of circle hooks.
- Similar results were shown in the longline fisheries of Ecuador and Uruguay where catches of blue shark were increased with the use of circle hooks.
- During surveys conducted by the Instituto Espanola de Oceanografia (IEO) in the southwest Indian Ocean onboard longliners targeting tropical tuna, the use of circle hooks produced higher nominal shark CPUE than that obtained when using J hooks.

A few studies had different results showing a decrease of shark catch rate with the use of circle hooks, in particular in southeast Asia and in the Mediterranean sea on longliners targeting swordfish.

However, most of the results presented indicated that the proportion of deep hooking and of mortality at haul back for sharks was reduced when using circle hooks. This is linked to an increased chance of survival if the sharks are released. Moreover, the leader material also needs to be considered as a study showed that CPUE were higher for some pelagic sharks, e.g. oceanic whitetip shark (*Carcharhinus longimanus*) and shortfin mako shark (*Isurus oxyrinchus*), when using wire leaders on the longline.

On seabirds

One study presented focused on the effect on circle hooks on the incidental catch of seabird in the U.S. Atlantic longline fishery, and the results seems to show that circle hooks, in comparison to J hooks, reduced seabird catch rates, however these results were not statistically significant and further work is needed.

3) Effect on circle hooks on target species

In general the use of circle hooks seems to have little negative effects on the CPUEs of the target species in the various pelagic longline fisheries studied around the world. In most of the studies presented, catch rates of large tropical tuna species, i.e. yellowfin tuna and bigeye tuna, were similar or higher when using circle hooks compared to J hooks.

- Results from trials in the Taiwan, China and Chinese longline fleets showed that there is no effect of the hook type on the catch rates of the target species and in particular for tuna.

- In Brazil and Uruguay, large circle hooks showed an increase in the catch of bigeye tuna and yellowfin tuna.
- In the north east Atlantic and in the Gulf of Mexico, the use of circle did not affect the catch rates of bigeye tuna
- In the Pacific coast of Mexico and in Costa Rica, the use of circle hooks in the artisanal longline fleet did not affect target species catch rates.
- Trials on the Indian Ocean Spanish longline fleet operating in the southwest Indian Ocean did not show any effect of the hook type on tuna catch rates.

Within the pelagic longline fisheries targeting swordfish, it has been shown that the use of circle hook can significantly decrease catch rates. However, other experiments showed no effect of the hook type and that a reduction of the catch rate could also be influenced by the bait used and the combination of hook/bait.

- In the Spanish longline fleet, the use of circle hooks reduced swordfish catches by 23% in the southeast Pacific. However, in the longline Spanish fleet operating in the southwest Indian Ocean and in the northeast Atlantic US longline fishery, the hook type had no effect on swordfish CPUE which was found to be dependent on the bait type used.
- In the southwest Atlantic, in Uruguay and in Hawaii, the use of large circle hooks showed significant decreases of catch rates for swordfish.

For other target species of longline fleets, e.g. mahi-mahi (*Coryphaena* spp.), it seems that the hook size has more influence than the hook type, and that large circle hooks could decrease catch rates as much as large J hooks could. Moreover, in the troll-line fishery of north Carolina, USA, trials with use circle hooks generated lower catch rates of two of the three main species caught, i.e. dolphin fish and yellowfin tuna, in comparison to J hooks.

For all species, deep-hooking and post-hooking mortality was reduced with the use of circle hooks. Therefore, the quality and value of the fish could be enhanced with the use of circle hooks over J hooks.

In terms of stock assessment, the changes induced in the selectivity and the catchability of the gear should be incorporated in order to take into account the management implication of the use of circle hooks.

CONCLUSIONS

- Circle hooks increase the proportion of animals being brought alive to the fishing vessel for all species, implying better quality and value for the target species and better chance of survival for the bycatch species to be released.
- Circle hooks have a positive impact on the mitigation of incidental catches of marine turtle by reducing catch rate and deep hooking of the animals, and this could be further enhanced by using whole fish baits instead of squid baits. However, handling and de-hooking protocols needs to be well designed and accessible, together with the necessary equipment for fishers and observers to use.
- Regarding sharks, the use of circle hooks was likely to result in an increase in CPUE, although their use would result in a reduction in post-release mortality. However, in terms of management options to reduce shark catch rates, the use of circle hook should be combined with the use of monofilament leaders instead of wire leaders.
- The use of circle hooks seems to have little effect for most of the target species in longline fisheries, except in some fisheries for swordfish. However, in troll-line fisheries catch rates using circle hooks would be decreased significantly for most target species.
- Offset, in particular an offset of more than 10°, can counteract the positive impacts of using circle hooks, in particular on reducing deep hooking.
- The proceedings of the 2011 International Symposium on Circle Hooks are in preparation and will be published in a special issue of the Bulletin of Marine Science (BMS).
- Although research will continue on the impact of using circle hooks in longline, handline and troll-line fisheries, it will be important for each research project conform to the definition of a circle hook being “the point being at least 90° from the shank” and precisely record all the specifications of the hooks used.

RECOMMENDATIONS

That the Working Party on Ecosystems and Bycatch:

- 1) **NOTE** the outcomes of the 2011 International Symposium on Circle Hooks, which was attended by the Secretariat at the request of the Commission.
- 2) **AGREE** that based on the results of the scientific studies presented at the International Symposium on Circle Hooks in 2011, and other research previously presented to the WPEB, the use of circle hooks in longline fisheries:
 - a. is not likely to have a negative effect on the catch rates for most tuna and tuna-like species;
 - b. will increase the proportion of animals being brought alive to the fishing vessel, implying better quality and value for target species and an improved chance of survival for bycatch species which are to be released;
 - c. is likely to significantly reduce the incidental catch of marine turtles and improve the survivorship of hooked marine turtles if handled correctly immediately before, during and after the de-hooking process;

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- d. may reduce the incidental catch of seabirds;
 - e. is likely to result in an increase in catches of sharks when using wire trace, although their use would also result in a reduction in post-release mortality;
 - f. should be combined with the use of monofilament leaders instead of wire leaders, thereby reducing shark catch rates and likely post-bite-off mortality, as the use of circle hooks will result in less gut hooking of sharks.
- 3) **RECOMMEND** that the use of circle hooks in combination with monofilament leaders be mandated or encouraged for use in all longline vessels targeting tuna and tuna-like species in the IOTC area of competence, with the aim of reducing the incidental catch of marine turtles, seabirds and sharks.
- 4) **RECOMMEND** that all CPCs comply with the requirements of Resolution 09/06 *on Marine Turtles* which states that “*CPCs with longline vessels that fish for species covered by the IOTC Agreement shall: Ensure that the operators of all longline vessels carry line cutters and de-hookers in order to facilitate the appropriate handling and prompt release of marine turtles caught or entangled, and that they do so in accordance with IOTC Guidelines to be developed. CPCs shall also ensure that operators of such vessels are required to carry and use, where appropriate, dip-nets, in accordance with guidelines to be adopted by the IOTC.*” and that the IOTC Secretariat develop guidelines for handling and de-hooking marine turtles caught on longliners, and for these to be distributed to all CPCs before the next WPEB meeting.