



MINOUW

Case study results

3.6 - Aegean Sea drifting longlines

Contact person:

Hellenic Centre for Marine Research
(HCMR)
George Tserpes

<http://minouw-project.eu/>



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RESEARCH & INNOVATION

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SUMMARY

Mediterranean swordfish longline fishing fleets are traditionally employing J-type hooks baited either with mackerel or squid. The fisheries are typically mono-specific but minor catches of sensitive species, such as sharks and sea-turtles occur, depending on the area and season. In certain swordfish fisheries outside the Mediterranean, such as the US longline fisheries in the Atlantic and Pacific Oceans, circle hooks have been shown to be an effective tool to mitigate by-catch of certain unwanted species and the use of such hooks is mandatory. Experimental longline sets using circle and J-type hooks in swordfish targeting fishery were performed. Proportionally less catches of undersized swordfish individuals in circle hooks were observed. Employment of circle hooks seems to be promising, but given the limited number of the current trials and the fact that past works revealed variable results in different fisheries, further field studies are needed to confirm the effectiveness of circle hooks on a Mediterranean-wide level.

CASE STUDY RESULTS

Type of intervention

Experimental fishing trials with circle hooks on longline fisheries targeting swordfish

Aim of the experiment

Comparison between J and circle hooks regarding catch rates of the target species (swordfish), as well as species composition of by-catches, including captures of vulnerable species.

Main activities carried out

Experimental fishing trials on board commercial vessels equipped with longlines having different hook types (both, J and circle hooks) started in April 2016 and were concluded in April 2017 in the South Aegean and Cretan seas. Fishing trials were accomplished on a seasonal basis and the sampling design included fishing with a swordfish targeting longline gear having equal number of Circle and J-type hooks alternating each other (400 hooks in total). A total of 36 longline experimental sets were accomplished following the typical fishing practices of the fishermen, i.e gear setting was done after sunset and hauling at dawn, while the bait used was mackerel. Monitoring included: (a) Catch rates of the target species (both commercial and undersized fractions) in the different hook types, (b) Catch rates of other commercial by-catch species, (c) incidental catches of sensitive species such as sea-turtles and vulnerable pelagic sharks. Following ICCAT notation, catch rates were expressed in terms of kg/1000 hooks and statistical catch rate comparisons among hook types were made by means of Generalized Linear Modeling (GLM) techniques (McCullagh & Nelder, 1983) under the R language environment (R Development Core Team, 2016).

Size comparisons among hook types regarding the captured swordfish individuals were made by means of non-parametric statistical tests.

McCullagh, P. and Nelder, J.A. 1983. *Generalized Linear Models*. Chapman and Hall, London.

R Development Core Team, 2016. *R: A language and environment for statistical computing*. R Foundation for Statistical Computing, Vienna, Austria. ISBN 3-900051-07-0, URL <http://www.R-project.org>.

Main results

Catch rate differences of the target species (swordfish), expressed in terms of kg/1000 hooks, between the traditional (J-hook) and the modified (Circle-hook) gear were not statistically significant.

The modified gear, was capturing proportionally less undersized swordfish individuals (minimum landing size = 100cm LJFL according to ICCAT regulations). However, overall size differences between gear types were not statistically significant.

Regarding catches of “sensitive” species, such as sharks, these were comparable among gear types, representing around 10% of the total catch in terms of numbers. Release of unwanted captures was in most cases easier in the modified gear.

Discussion of the results

Mediterranean swordfish longline fishing fleets are traditionally employing J-type hooks baited either with mackerel or squid. The fisheries are typically mono-specific but minor catches of sensitive species, such as sharks and sea-turtles occur, depending on the area and season.

In certain swordfish fisheries outside the Mediterranean, such as the US longline fisheries in the Atlantic and Pacific Oceans, circle hooks have been shown to be an effective tool to mitigate by-catch of certain unwanted species and the use of such hooks is mandatory. However, as Amorim et al (2014) have pointed out, despite the conservation benefits of circle hooks in some fisheries, there are conflicting results among studies conducted at several locations, over various seasons, and different experimental protocols. In line with the above authors, Gilman and Huang (2016) mention that research designed to assess single factor effects is needed to identify the effectiveness of various hook types in mitigating catches of unwanted species. The conflicting results of past studies have probably hindered the development of regulations by Regional Fisheries Management Organizations (RFMO) regarding the wide employment of circle hooks.

In the current study it was attempted to compare the performance of circle hooks vs the J-type ones in swordfish targeting longlines. Generally, the results did not show statistically significant differences among hook types, with regards to the catch rates of target and by-catch species. It seems, however, that the circle hooks capture proportionally less undersized swordfish individuals. This finding is particularly important given that one of the main problems of the Mediterranean swordfish fisheries is the capture of relatively high number of juvenile individuals (ICCAT, 2016). Given however, that past studies have generally shown that the efficiency of such gear modifications depends on the particular characteristics of the fishery and the fishing fleet (Read, 2007) further studies in different Mediterranean regions are necessary to verify the potential advantages of circle hooks over the J-type ones.

The employment of circle hooks seems to favor the reduction of catches of undersized

swordfish individuals without affecting the overall catch rates in terms of weight; thus it would contribute towards the reduction of discards. Regarding the capture of sensitive by-catch species, such as sharks, the current study did not reveal important catch rate differences between circle and J-type hooks. Additionally, as not any accidental sea-turtle captures occurred during the experimental fishing trials, conclusions cannot be made regarding the efficiency of circle hooks on reducing such catches. In any case, given that the longline gear performance, depends on the particular characteristics of each fishery, further field studies are needed to confirm potential advantages of circle hooks over the J-type ones on a Mediterranean-wide level. Finally, it is estimated that potential replacement of J-hooks with circle ones would not have substantial financial implications as hook prices do not differ much and not any change in fishing practices is necessary.

Amorim, S., M. N. Santos, R. Coelho, and J. Fernandez Carvalho. 2015. Effects of 17/0 circle hooks and bait on fish catches in a Southern Atlantic swordfish longline fishery. *Aquat. Conserv.* 25:518–533.

Gilman, E., Huang, H. 2016. Review of effects of pelagic longline hook and bait type on sea turtle catch rate, anatomical hooking position and at-vessel mortality rate. *Rev Fish Biol Fisheries*, DOI 10.1007/s11160-016-9447-9.

ICCAT. 2015. Report of the 2014 ICCAT Mediterranean swordfish stock assessment meeting. *Collective Volume of Scientific Papers ICCAT 71:1870-1979.*

Read AJ. 2007. Do circle hooks reduce the mortality of sea turtles in pelagic longlines? A review of recent experiments. *Biological Conservation* 135: 155–169.

How practical is it for a fisherman to implement this improvement, technically and financially?

They do not seem to exist any substantial technical or financial difficulties

Is there sufficient evidence to support wider adoption of the method/technology?

Further field studies are needed to confirm potential advantages of circle hooks over the J-type ones on a Mediterranean-wide level.

CONCLUSION

The employment of circle hooks seems to favor the reduction of catches of undersized swordfish individuals without affecting the overall catch rates in terms of weight; thus it would contribute towards the reduction of discards. Regarding the capture of sensitive by-catch species, such as sharks, the current study did not reveal important catch rate differences between circle and J-type hooks. Additionally, as not any accidental sea-turtle captures occurred during the experimental fishing trials, conclusions cannot be made regarding the efficiency of circle hooks on reducing such catches. In any case, given that the longline gear performance, depends on the particular characteristics of each fishery, further field studies are needed to confirm potential advantages of circle hooks over the J-type ones on a Mediterranean-wide level. Finally, it is estimated that potential replacement of J-hooks with circle ones

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The MINOUW Consortium



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