

Loggerhead sea turtle bycatch data in artisanal fisheries within a marine protected area: fishermen surveys versus scientific observations

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Lozano, M., Baro, J., García, T., Frías, A. Rey, A. & Báez, J. C., 2011. Loggerhead sea turtle bycatch data in artisanal fisheries within a marine protected area: fishermen surveys *versus* scientific observations. *Animal Biodiversity and Conservation*, 34.1: 31–34.

Abstract

Loggerhead sea turtle bycatch data in artisanal fisheries within a marine protected area: fishermen surveys versus scientific observations.— Loggerhead sea turtles can be incidentally captured by artisanal gears but information about the impact of this fishing is inconsistent and scarce. Recent studies have observed that the bycatch, or incidental catch rate, in fishermen surveys is irregular. The aim of this study was to compare direct data (onboard observers) concerning the incidental catch of loggerhead sea turtles by the artisanal vessels *versus* data from fishermen surveys. The study area was the Cabo de Gata–Níjar marine protected area, situated in the western Mediterranean (southeast of the Iberian peninsula). We observed two loggerhead turtles that were incidentally caught in a total of 165 fishing operations. According to fishermen surveys, a total of nine loggerheads were incidentally caught in 861 fishing operations. The differences between the loggerhead sea turtle bycatch reported by fishermen surveys and scientific observations *versus* random distribution ($\chi^2 = 0.3146$, $P = 0.575$, $df = 1$) were not significant. We conclude that the surveys are useful but that findings should be interpreted with caution.

Key words: Fishermen surveys, Marine protected area, Mediterranean, Sea turtle.

Resumen

Análisis de los datos de capturas accidentales de tortugas bobas por la pesca artesanal en una área marina protegida: notificaciones de pescadores encuestados frente a observaciones científicas.— La tortuga boba puede ser capturada accidentalmente por la flota de pesca artesanal, pero la información del impacto de estas pesquerías sobre esta especie es escasa e inconsistente. En trabajos recientes, se ha observado que las capturas fortuitas, o tasas de captura accidental, según las cuestras realizadas a los pescadores, son irregulares. El objetivo de este estudio fue comparar los datos directos (de observadores a bordo) de capturas fortuitas de tortugas bobas, frente a los datos recogidos mediante encuestas en pesquerías artesanales. La zona de estudio fue el área marina protegida de Cabo de Gata–Níjar, situada en el Mediterráneo occidental (sureste de la península ibérica). Observamos dos capturas accidentales de tortuga boba en 165 operaciones de pesca. El total de capturas fortuitas de tortugas bobas controlado mediante las encuestas fue de nueve de un total de 861 operaciones de pesca. No se observaron diferencias significativas entre las capturas accidentales de tortugas bobas reportadas por los pescadores mediante encuesta, con respecto a las observadas de forma científica ($\chi^2 = 0,3146$, $P = 0,575$, $gl = 1$). Llegamos a la conclusión de que las encuestas podrían ser consideradas útiles, pero deberían interpretarse con prudencia.

Palabras clave: Encuestas a pescadores, Áreas marinas protegidas, Mediterráneo, Tortuga marina.

(Received: 26 XI 10; Acceptació condicional: 2 II 11; Acceptació definitiva: 21 III 11)

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Introduction

Fisheries bycatch has been identified as a primary driver of population decline in marine turtles (Lewison et al., 2004). For this reason, studies on the impact of marine fishing have increased. Many of these studies are not scientific surveys but are based on fishermen bycatch-reports. Artisanal fishing makes up the largest sector of the industry worldwide, employing more than 90% of the fishermen in the world. Moreover, on a worldwide level, almost half the landings are estimated to originate from artisanal fisheries (FAO, 2003). Artisanal fisheries are characterized by a large number of small vessels that exploit a wide variety of species using multiple fishing gears.

Loggerhead sea turtles can be incidentally captured by artisanal gears, but information on the impact of this fishing is inconsistent and scarce, as shown by Báez et al., (2006). Interviews surveys have been widely used in the characterization of sea turtle capture (e.g. Álvarez de Quevedo et al., 2010; Báez et al., 2006). Moore et al. (2010) proposed a protocol that consists of in-depth interaction with fishermen to collect data and to use this to map the sea turtle bycatch of artisanal fishing, concluding that interview surveys are an inexpensive and fast means to achieve coarse-level information for large areas. However, Báez et al. (2006) found that the rates of incidental turtle catch in fishermen surveys was irregular. Studies to verify data from fishermen surveys are lacking. The aim of this study was to compare direct data (onboard observers) concerning loggerhead sea turtles incidentally caught by the artisanal vessels *versus* data from fishermen surveys in these vessels within a marine protected area.

This study was part of a Spanish Research Project (PARCGA, Monitoring Artisanal and Recreational Fisheries in the Marine Reserve of Cabo de Gata-Níjar) whose objective is to obtain a reliable picture of fishing activities in the marine reserve through the description of the fishing fleet and the estimation of catches.

Material and methods

The study area is located within Cabo de Gata-Níjar Marine Reserve (southwestern Mediterranean, Spain). This protected area covers 16,853 ha. Waters are mainly shallow (< 50 m) and characterized by a typical Mediterranean ecosystem with rocky reefs, sandy bottoms and seagrass beds (*Posidonia oceanica*). Fishing grounds are exploited by a small artisanal fleet of 14 units. As boats are generally small (< 12 m length, two fisherman per boat), fishing grounds are located in shore areas. In this artisanal fishing *Sepia* sp. and *Mullus* sp. trammelnets are the most common used fishing gear.

This study was carried out from March 2008 to April 2010. We sampled eight of the trammel net vessels. Catch and effort data (fishing trips), which are shown in table 1, were collected in two ways: through weekly phone calls, and through observers on board for five days each month.

A total of 576 telephone interviews were made and 165 boarding trips were done. In each interview, fishermen were asked about number of fishing days, haul location and catches, and during the surveys, observers accompanied fishermen for one full-day fishing trip. Net length, haul location, depth and fishing time data were collected on every trip. The observer identified, measured (total length) and weighed all retained individuals (commercial catches and discards).

We tested the differences in loggerhead sea turtle bycatch data reported by fishermen surveys *versus* scientific observations using the chi-squared (χ^2) test. Expected values in the χ^2 tests were calculated according to the number of fishing operations controlled for each case (data from fishermen surveys and from onboard observations). Thus, we tested the observed turtle bycatch distribution per surveys and scientific observations *versus* weighted random distribution total of turtle bycatch.

Table 1. Turtle bycatch taken from data collected from fishing trips with onboard observers and from telephone surveys during the study period: T. Total for the year; TBr. Turtle bycatch report.

Table 1. Capturas accidentals de tortugas a partir de datos recogidos durante los viajes de pesca con observadores a bordo y mediante informes telefónicos llevados a cabo durante el periodo de estudio: T. Total del año; TBr. Capturas fortuitas.

	2008	2009	2010	T	TBr
Onboard observations	53	102	10	165	2
Fishermen surveys	289	411	161	861	9
Total	342	513	171	1026	11

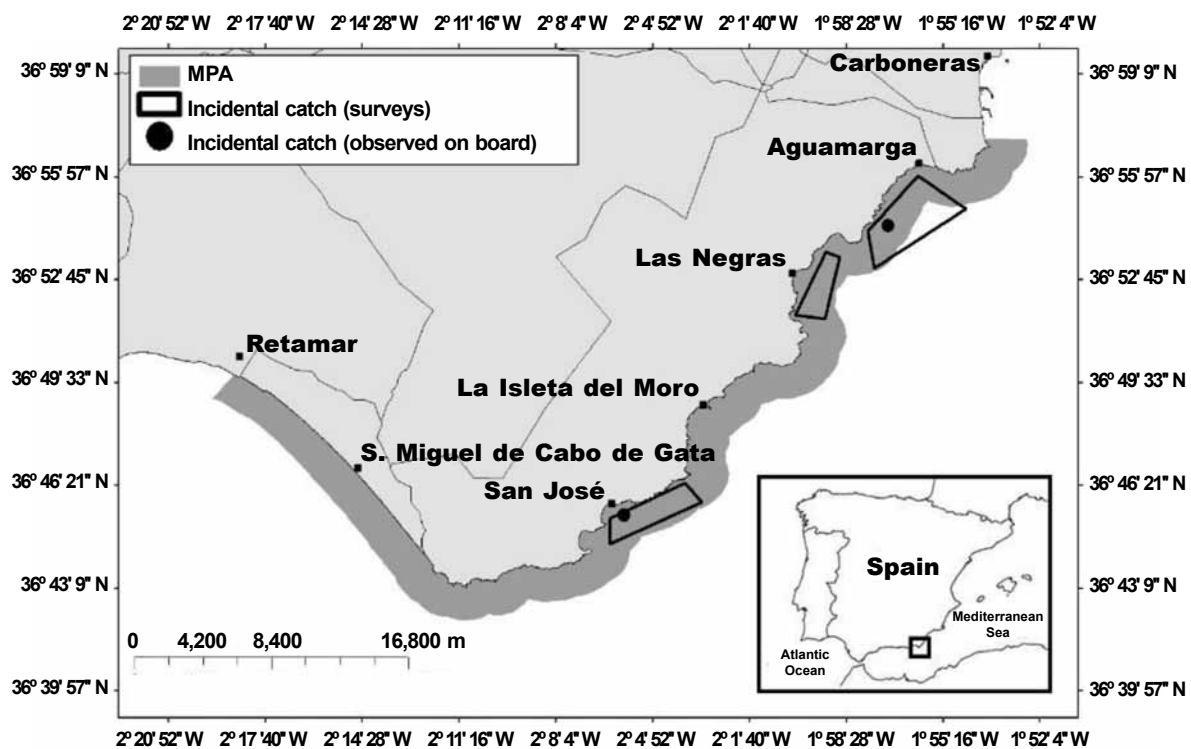


Fig. 1. Map of the marine reserve of Cabo de Gata–Níjar. The black dots show the loggerheads bycatches observed on board, the polygons are defining the areas where the fishermen surveyed say they've caught of loggerheads bycatches: MPA. Marine protected area.

Fig. 1. Mapa de la reserva marina de Cabo de Gata–Níjar. Los puntos negros representan las capturas fortuitas de tortuga boba observadas a bordo, los polígonos delimitan el área donde los pescadores encuestados afirman haber realizado las capturas fortuitas: MPA. Área marina protegida.

Results and discussion

Eleven loggerhead turtles were incidentally caught according to data from fishermen surveys plus the figures from direct observations in a total of 1,026 fishing operations per eight boats controlled in the study period (table 1). We observed directly onboard two loggerheads sea turtles incidentally caught out of a total of 165 fishing operations (fig. 1). In general, we observed a low frequency of the incidental catches of sea turtle in the study area. We did not observe significant differences between the loggerhead sea turtle bycatch reported by fishermen surveys *versus* scientific observations ($\chi^2 = 0.3146$, $P = 0.575$, $df = 1$).

In accordance with Moore et al. (2010), in function of our results we conclude that the interview surveys should be considered useful to obtained rapid information about sea turtle bycatch, but data should be interpreted with caution as interview surveys should be based on previous in-depth interaction with fishermen.

Acknowledgements

This study was partially funded by the Spanish Institute of Oceanography and Sea General Secretary (Ministry of Environment, Rural and Marine). We are grateful to the skippers and fishermen for providing the data from the boats.

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