

REPLY COMMENT

# Temporal trends in the by-catch of loggerhead turtles *Caretta caretta* in the Mediterranean Sea: Reply to Báez et al. (2014)

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**ABSTRACT:** In their comment on Álvarez de Quevedo et al. (2013; Mar Ecol Prog Ser 489: 225–234), Báez et al. (2014; Mar Ecol Prog Ser 504:301–302) argued that the annual loggerhead turtle by-catch by the Spanish longline fleet was actually lower than that reported (6060 vs. 10 656 ind.), on the basis of unpublished data on fishing effort collected in 2006–2007. However, the data provided by Álvarez de Quevedo et al. (2013) corresponded to the period 2001–2004, hence the different results are not contradictory. Conversely, they are complementary and support the evidence of a decreasing trend in the number of turtles by-caught by the Spanish fleet throughout the last decade.

**KEY WORDS:** By-catch · Sea turtle · Longline fishery · Mediterranean Sea

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Álvarez de Quevedo et al. (2013) reported an estimate of 10 656 loggerhead turtles accidentally captured by the Spanish fleet, based on the data collected during the period 2001–2004 (Carreras et al. 2004, Álvarez de Quevedo et al. 2010). Likewise, the aerial surveys used to estimate the abundance of sea turtles in the fishing grounds in Álvarez de Quevedo et al. (2013) were conducted during the period 2001–2003 (Gómez de Segura et al. 2006). However, the effort data provided by Báez et al. (2014) were collected in 2006 and 2007, and the disagreement between the estimates of turtle by-catch in Báez et al. (2014) and Álvarez de Quevedo et al. (2013) is likely due to these temporal differences.

The overall evidence indicates a reduction in loggerhead turtle by-catch, as suggested by Álvarez de Quevedo et al. (2013). Thus, during the 1980s and the 1990s, 17 000 to 20 000 loggerhead turtles were estimated to be by-caught annually (Mayol et al. 1988, Aguilar et al. 1995); Subsequent reviews assumed

that the higher by-catch value of 20 000 loggerhead turtles annually during those decades was correct (Lewison et al. 2004, Alessandro & Antonello 2010, Wallace et al. 2010); in the early 2000s, Álvarez de Quevedo et al. (2013) estimated that 10 656 turtles were captured annually; finally, Báez et al. (2014) estimated that total by-catch had decreased to 6060 turtles in 2006–2007. Furthermore, Tomás et al. (2008) reported a steady decline throughout the 2000s in the proportion of loggerhead turtle deaths after interacting with drifting longlines.

Such reduction in loggerhead turtle by-catch may have 2 causes. Firstly, gears used by the Spanish longliners have changed continuously during the past 3 decades, and the use of those with a very high catch per unit effort (Camiñas et al. 2006) might have decreased. Secondly, most of the loggerhead turtles inhabiting the fishing grounds used by the Spanish longliners come from Florida (Carreras et al. 2011, Clusa et al. 2014), where the number of nests de-

creased 50% from 1998 to 2007 (Arendt et al. 2013). Considering the carapace length of the turtles incidentally by-caught in drifting longlines and the growth rate of loggerhead turtles of Atlantic origin while in the Mediterranean (Piovano et al. 2011), the reduced arrival of juveniles from Florida to the eastern Mediterranean was probably the major cause for the recent decline in turtle by-catch reported by Tomás et al. (2008) and Báez et al. (2014).

In conclusion, the discrepancy in the by-catch figures reported by Álvarez de Quevedo et al. (2013) and Báez et al. (2014) are likely because data were collected in different periods. The overall evidence suggests a decreasing trend in the number of turtles by-caught by the Spanish fleet throughout the last decade, but careful monitoring by onboard observers of the actual fishing effort and catch per unit effort is essential to obtain accurate estimates of sea turtle by-catch.

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