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REPLY COMMENT

Tracking turtles to their death — reply to Hays et al.

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We welcome the opportunity to respond to the comments of Hays et al. (2004, this volume) on our comprehensive analysis of satellite telemetry and its use to estimate post-hooking mortality in marine turtles (Chaloupka et al 2004). Our paper was the first to provide robust estimates of post-hooking mortality for any sea turtle sample. We raised a number of concerns about the applicability of the platform terminal transmitter satellite telemetry used by Hays et al. (2003) to derive estimates of fishery-specific mortality. None of these concerns have been addressed in the Hays et al. (2004) Comment.

However, Hays et al. (2004) believe that we possibly misunderstood 2 aspects of their study. Specifically, they suggest — contrary to our assertion otherwise — that they did in fact know the cause of each transmitter failure. This is incorrect. They state that:

> To reiterate, we used the data relayed by *fully functioning* transmitters to infer that mortality had occurred. These data included: (1) the quality of locations sent by transmitters, (2) location data showing transmitters had moved inland, (3) submergence data showing the transmitter was out of the water. (Hays et al. 2004, p. 299)

While we agree that using submergence data combined with tracking information, as outlined in Hays et al. (2003), might lead some researchers to believe that a turtle was removed from the water, those data do not confirm that the mortality was due to 'fisheries bycatch' or was fisheries induced.

In fact, Hays et al. (2004, p. 299) advise: The most likely explanation for such data is that the turtle had been captured and taken to a village'. But unfortunately, no confirmed cause of death was presented in Hays et al. (2003).

Specifically, 6 of the 50 transmitters in the Hays et al. (2003) study failed, but the cause of failure could not be confirmed for 3 of these 6. The remaining 3 failed transmitters were apparently recovered onshore by unconfirmed sources. Although the 3 turtles were reported as dead, the cause of the mortality for these 3 turtles is speculative. For instance, the 3 apparent deaths could have been attributable to direct harvest, shark attack, natural mortality, boat strike, disease or any other number of reasons.

The small sample of 3 apparently dead turtles, each turtle from a different species, in their sample of 50 satellite tracked turtles, as well as other deficiencies in the Hays et al. (2003) study were discussed in Chaloupka et al. (2004). Hays et al. (2004, p. 300) themselves concede that:

> To reiterate, we fully appreciate that the sample size in our original study was small and our results tentative.

The second point that Hays et al. (2003, p. 308) raise is that

> we therefore do not suggest that an annual mortality rate of 0.31 applies universally across regions and species.

Although this is stated in a single sentence near the conclusion of Hays et al. (2003), we draw the reader's attention to Fig. 2 in Hays et al. (2003). The sole purpose of this figure is to depict the annual mortality estimate of 0.31 (note also the 95 % confidence estimate in the 'Results'). Also most of the 'Results' section and a significant part of the 'Discussion' in Hays et al. (2003) were devoted to this estimate.

Further, Hays et al. (2003, p. 308) claimed that:

> ... our estimate of turtle annual mortality rates derived from satellite transmitters ($M = 0.31$) is not surprising and confirms that fisheries bycatch is a pressing concern.

Clearly, it is impossible to derive any sound estimate of sea turtle mortality attributable to fishery by-catch from only 3 turtles apparently dead from unknown causes (let alone fishery by-catch related causes).

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