Lethal lesions and amputation caused by plastic debris and fishing gear on the loggerhead turtle *Caretta caretta* (Linnaeus, 1758). Three case reports from Terceira Island, Azores (NE Atlantic)

João P. Barreiros a,⇑, Violin S. Raykov b,1

*Azorean Biodiversity Group (CITA-A) and Platform for Enhancing Ecological Research & Sustainability (PEERS), Universidade dos Açores, 9700-042 Angra do Heroísmo, Portugal*

*Institute of Oceanology, Bulgarian Academy of Sciences, 40 parvi mai str., 9000 Varna, Bulgaria*

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**Abstract**

In this note we report and discuss three cases involving two serious injuries and one death on three specimens of the loggerhead turtle *Caretta caretta*, found in Terceira Island, Azores (NE Atlantic). Plastic debris and lost/discard fishing gear caused these accidents. In fact, these types of marine litter are known to cause several accidents all over the world involving many taxa. However, we think that this issue has probably a much wider impact and detected cases such as those reported here are but just a small sample of the whole unknown dimension of this serious marine pollution problem.

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1. Introduction

Plastic in the seas is a dramatically increasing problem and has been described as a serious pollution aspect that also includes nylon debris coming from either discarded or lost fishing gear (Butterworth et al., 2012). Some of the most affected animals include cetaceans, pinnipeds, seabirds and marine turtles and certainly fish (Barreiros and Guerreiro, 2014) although the real impact is certainly underestimated.

A recent paper from Pham et al. (2014) does show that the impact of these debris do extend to several marine habitats including deep canyons at depths where those were never before documented.

In this note we report three case-studies of sea turtles (*Caretta caretta*) affected by plastic debris and discarded fishing gear. While two of them survived albeit amputated in one of their forelimbs, the other did die since it swallowed a piece of swordfish long line that included hooks which became stuck in its digestive tube. Due to their highly opportunistic foraging strategy, loggerheads are more prone to ingest debris (Lazar and Gracan, 2011; Hardesty et al., 2012), but the quantity of ingested debris is generally low, expressed either as absolute mass/volume, or as a mass/volume percentage of the diet content (e.g. Plotkin et al., 1993; Bjorndal et al., 1994; Bugoni et al., 2001; Casale et al., 2008). A previous report from this same island on a leatherback turtle (*Dermochelys coriacea*) found to have swallowed plastic debris was published by Barreiros and Barcelos (2001).

2. Materials and methods

Three specimens of the loggerhead turtle *C. caretta* were studied after being found entangled in either plastic debris or discarded/lost nylon fishing gear.

All three specimens were measured (curve carapace length to the nearest mm) but it was not possible to accurately weigh them.

The specimens were collected stranded in Terceira Island, Azores (NE Atlantic) on the following dates: specimen (a) a piece of a nylon long line strangled the right forelimb of this specimen causing a necrotic process and a necessary amputation (Fig. 1a and b) – 13 September 2004, (b) a piece of swordfish long line, with hooks, swallowed and causing the specimen's death (Fig. 2a and b) – 02 February 2008 and (c) bowl of floating plastic lines entangled the left forelimb of this specimen that was already amputated when found (Fig. 3) – 25 October 2008.

3. Results

Specimen a) was tagged and released under the cooperation agreement between the University of the Azores and the University of Florida Archie Carr Center for Sea Turtle Research (http://accstr.ufl.edu/research-conservation/collaborators/).

While specimen (c) had its amputated area already cicatrized and was ready to be released, specimen (a) had to be amputated...
and cared for 48 h with prophylactic antibiotics. After that recovery period it was successfully released and swam in apparent good health.

Specimen (b) had a far worse scenario since it swallowed a large piece of long line with hooks that gave no chance of surgery and lead us to the only viable solution which was euthanasia. After a period it was necropsied and the whole extent of the internal lesions was revealed. The digestive tract of this specimen was fully examined also for stomach contents but revealed to be empty of either inert or food items.

Curve carapace lengths were: specimen (a) 641 mm, specimen (tag number for left forelimb N5841), specimen (b) 530 mm and specimen (c) 373 mm.

4. Discussion

The presence of marine debris was first addressed by Carr (1987). Marine debris or more specifically, plastic ingestion by sea turtles is a global phenomenon, affecting populations worldwide. The vast majority (nearly 90%) of all ingested items in the study of Campani et al. (2013) were plastic, a finding common to most other studies, including the present one, reporting debris ingestion by turtles. The data of these same authors indicate that oceanic-stage loggerheads are opportunistic predators, feeding upon a variety of planktonic and nectonic organisms, as well as animals commonly occurring 100 m or more below the surface (Frick et al., 2009). The main sources of marine debris are litter from ships, fishing and recreational boats, and garbage carried into the sea from land-based sources in industrialized and highly populated areas (Derraik, 2002). Similar to leatherbacks, most marine debris consumed by loggerheads, as it was the case of the present study, fall into the category of floating debris especially plastics (Plotkin et al., 1993; Casale et al., 2008). Lost and discarded marine debris, particularly items made of persistent synthetic materials, are widely recognized as a major form of marine pollution (Laist, 1997). Solid wastes in the marine environment have only recently

Fig. 1. A specimen of Caretta caretta found in 13 September 2004 in Terceira Island, Azores. (a) With a piece of nylon long line that caused a necrotic process, (b) after amputation and under a 48 h recovery process. Photos by JPB.
Fig. 2. A specimen of *Caretta caretta* found in 25 October 2008 in Terceira Island, Azores. (a) With a piece of long line swallowed and ultimately causing its death, (b) the digestive tract shown during the necropsy. Extensive fatal lesions are clearly visible. Photos by JPB (2a) and Beatriz Lourenço (2b).

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*Fig. 2*. A specimen of *Caretta caretta* found in 25 October 2008 in Terceira Island, Azores. (a) With a piece of long line swallowed and ultimately causing its death, (b) the digestive tract shown during the necropsy. Extensive fatal lesions are clearly visible. Photos by JPB (2a) and Beatriz Lourenço (2b).
been treated as a complex scientific problem (Ivar do Sul and Costa, 2007). The importance of mitigation measures was stressed by Stokes et al. (2011) and more particularly the bait type and possibly baiting technique alone or in combination with larger hooks may also be important factors in minimizing serious injury (Casale et al., 2004).

Plastic debris and discarded/lost nylon fishing gear are part of a serious pollution problem affecting all the world’s oceans. The real effects of this impact will probably remain understudied both because not every affected animal is reported or reaches researchers and certainly a vast number will die without even being detected.

This note presents just three case studies that might help increase the awareness toward marine pollution in general and plastic, fishing gear related problems in particular.

Conflict of interests

The authors declare that this manuscript does not have any conflicts of interest.

Contributors

JPB conducted the collection of data from all three specimens and performed the necropsy described below. Outlined the first version of the manuscript. VSR completed the discussion and developed its bibliographic references. Both of us read and finished this revised version in full agreement.

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