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Plastic Debris in a Nesting Leatherback Turtle in French Guiana

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ABSTRACT. – We report a field observation of an adult female leatherback turtle (*Dermochelys coriacea*) expulsing 2.6 kg of plastic debris from her cloaca while nesting in French Guiana. This field report sustains concerns about plastic ingestion by this endangered species and, further, the impacts of plastic debris to marine wildlife, and points out the needs for effective waste management in both terrestrial and marine habitats.

Plastic pollution is a major threat for marine environments and biodiversity already at risk due to climate change, habitat loss, resource overexploitation, and other anthropogenic disturbances (Derraik 2002). Despite their relatively short history of use on a global scale, plastics represent the main constituent of marine debris worldwide (Ivar do Sul and Costa 2007; Hofer 2008) and will likely remain so for decades to come due

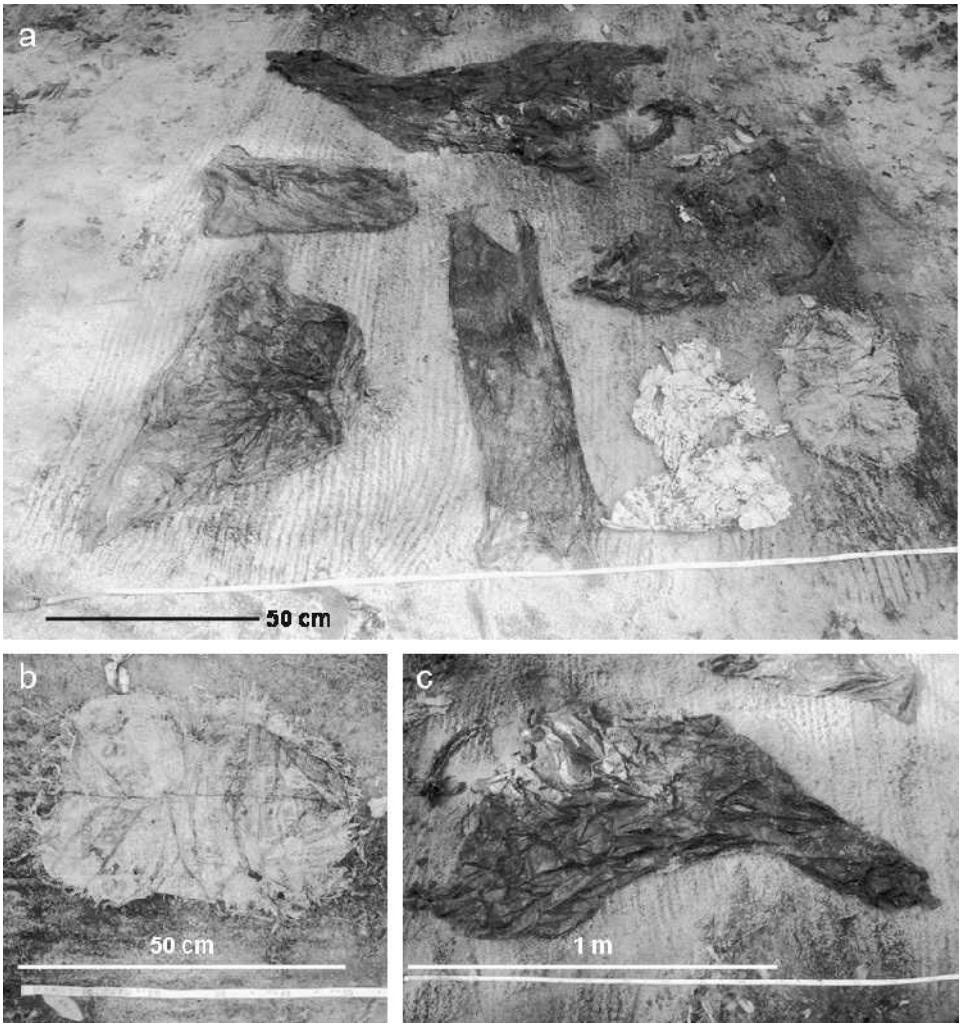

Figure 1. View of the total plastic items (a), including plastic meshed rice bags (b) and plastic domestic rubbish bags (c) extracted from a leatherback turtle attempting to nest in French Guiana (Photo by J.-Y. Georges).

to their slow degradation (Derraik 2002; Hofer 2008). For example, in marine habitats of the wider Caribbean region and Atlantic coast of South America, plastics represent 55% to 70% of marine debris (Ivar do Sul and Costa 2007). Plastic debris affects marine organisms ranging from plankton to large vertebrates (Derraik 2002; Hofer 2008), the latter via entanglement and ingestion (Wallace 1985; Laist 1997; Bugoni et al. 2001; Derraik 2002). Ingestion of plastic debris may occur either because of ''mistaken identity'' as natural prey by predators or due to incidental ingestion during feeding (Hofer 2008). Debris ingestion has been reported to reduce stomach capacity, feeding stimulus, and growth (Azzarello and Van-Vleet 1987). Plastic ingestion has also been reported to cause internal injuries and intestinal occlusion with potential lethal consequences (Derraik 2002). Partial digestion of plastic items may also result in chemical contamination with detrimental consequences on health, even at low concentrations (Derraik 2002; Hofer 2008).

Among marine megafauna, the leatherback turtle (*Dermochelys coriacea*) is commonly known to face major threats from plastic pollution because individuals of this species are prone to misidentify clear plastic items as jellyfish, their natural prey (Mrosovsky 1981). Here we report a field observation of an adult female leatherback turtle from which a large quantity of plastic debris was extracted from the cloacae during a nesting attempt.

This event occurred during the 2009 nesting season at Awala Yalimapo beach (5°42′N, 53°54′W), French Guiana, a major nesting area for critically endangered leatherback turtles (Fossette et al. 2008b). From March to August, nocturnal patrols were conducted daily to monitor leatherback nesting activity and identify individual turtles (through use of uniquely coded ID tags; Fossette et al. 2008b). On 6 May 2009, we observed a leatherback turtle in apparent distress during nesting: after she excavated her nest chamber, the turtle appeared to be preparing to lay eggs, although instead of eggs, this individual exuded

a greenish liquid with strong odor from the cloaca. Closer inspection revealed that plastic debris was obstructing the cloacal opening. At that point a decision was made to attempt to remove this plastic material. To do so, we gently but firmly pulled by hand these plastic items out of the cloaca. Our efforts yielded a notable quantity of plastic bags and plastic fragments, including those from domestic rubbish bags commonly used in the area as well as woven nylon rice bags (Fig. 1). Once the last of the recoverable plastic material was extracted from the cloaca, the turtle started to deposit white, apparently fresh eggs, as well as rotten eggs. With these 2 egg types also came an abundance of white-colored liquid, and some fresh blood, perhaps indicating that the distal tractus was injured either due to pressure exerted internally by the plastic items or by our manual intervention

Upon recovery, the plastic material was transported to our field station, where it was weighed (± 0.1 kg) using an electronic spring scale and gingerly spread out on sand to determine overall size. In total, 2.6 kg of uncleaned plastic were recovered, including 14 pieces of plastic bag fragments ranging from a few centimeters up to 1.5 m in maximum diameter.

Examination of nesting records for this turtle revealed that it was initially tagged in French Guiana in 2001. This individual was also observed nesting at this beach in 2005 and in 2009 (this study). In 2009, the turtle was observed nesting normally on 15 April and 26 April (V. Plot and J.-Y. Georges, *pers. obs.*, 2009); it was observed again on 6 May when this incident occurred. The turtle was not sighted again after the last event.

Ingestion of plastic debris is a major threat to sea turtles, and leatherback turtles in particular (Mrosovsky 1981), because this species has been known to mistake floating plastic bags for their main prey, jellyfish (Mrosovsky 1981; Mrosovsky et al. 2009). Reports of the occurrence of plastic debris in leatherbacks have increased since the 1960s in the North Atlantic Ocean (Mrosovsky et al. 2009) where leatherbacks feed during their long distance migrations (Ferraroli et al. 2004; Fossette et al. 2010). Because previous reports of plastic ingestion by leatherbacks only concern dead turtles, it has been suggested, perhaps wrongly, that plastic ingestion leads to mortality. Our finding suggests that the ingestion of significant quantities of plastic debris may not be lethal for leatherbacks, and probably for sea turtles in general, as long as it can be expulsed. However, because the turtle was not observed afterward, we cannot discuss the actual effects plastic ingestion and manual extraction had on the individual's health and future reproduction.

In sea turtles, intestinal transit time (time between ingestion and first defecation) of soft plastic items has been experimentally estimated to be 9 days in a captive loggerhead turtle *Caretta caretta* (Valente et al. 2008). If this holds for wild leatherbacks, this suggests that the 2.6 kg of plastic bags expulsed from the study animal were ingested a few days before our observation. In French Guiana, gravid leatherbacks spend about 10 days at sea between 2 consecutive nesting events. Then, they remain in French Guiana and Suriname waters, close (< 100 km) to the nesting beach, where they swim continuously over 600 km while performing continuous dives (Fossette et al. 2007; Georges et al. 2007). This suggests that plastic ingestion occurred in regional waters, as supported by the fact that the observed turtle laid several times normally before she expulsed plastic debris. This observation additionally supports a recent hypothesis that in French Guiana, gravid leatherback turtles may feed during the nesting season (Fossette et al. 2008a, 2009).

As far as plastic debris is concerned, sea turtles feeding in coastal waters, either during migration (Mrosovsky et al. 2009) or during the nesting season (this study), are of major concern because plastic debris is abundant in these coastal areas due to intensive human activities (e.g., land-based run-off, ship-loading activities; Moore et al. 2001). Their presence in local marine habitats is further concentrated due to local surface currents and bathymetry (Moore et al. 2001; Lattin et al. 2004). The observation described in this account underscores the need for mitigation of plastic pollution in marine ecosystems and points to the need for better environmental management and sustainability.

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