SHORT COMMUNICATION

Presence of fibropapillomatosis in green turtles *Chelonia mydas* at Príncipe Island in the Gulf of Guinea

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Fibropapillomatosis is a transmissible and life threatening disease associated with one or more herpesviruses that are afflicting sea turtles worldwide (Herbst 1994). First documented on green turtles *Chelonia mydas* (Quackenbush et al. 1998), since the 1990's it has been found on other species, like hawksbills *Eretmochelys imbricata* (D'Amato & Moraes-Neto 2000; Williams & Bunkley-Williams 1996), olive ridleys *Lepidochelys olivacea* (Herbst 1994), loggerheads *Caretta caretta* (Aguirre 1998; Harms et al. 2008), and leatherbacks *Dermochelys coriacea* (Huerta et al. 2000). The etiology and prevalence of fibropapillomatosis are not fully understood and further research is needed. Even so, it is accepted that pelagic juveniles are free of the disease when recruiting to coastal foraging grounds (Ehrhart et al. 2000). Neritic juveniles and sub-adults appear to be the most affected life-history stages (George 1997; Murakawa et al. 2000), but the occurrence of the disease in adults is atypical (George 1997). There is evidence that the severity of the disease is correlated with the level of sea water pollution and rising temperature (Milton & Lutz 2003; Lafferty et al. 2004), abnormal clinical parameters (Aguirre & Balazs 2000) and immunosuppression (Work et al. 2001), as well as toxic cyanobacteria (Arthur el al. 2008) and/or marine-biotoxins (Landsberg et al. 1999) on the feeding areas. Aguirre & Lutz (2004) stated that the occurrence of fibropapillomas is not only an indicator of the sea turtle health, but also of the ecosystem health in the near-shore marine environment.

Recently, Formia et al. (2007) described fibropapillomatosis in green turtles foraging in Corisco Bay, Equatorial Guinea, and indicated that no other cases of fibropapillomas had been reported elsewhere in the Gulf of Guinea. In this paper, we report the first known cases of sea turtle fibropapillomatosis at Príncipe Island, Democratic Republic of São Tomé and Príncipe.

In December 2008, during an exploratory mission to Príncipe Island, on two nights at Praia Grande beach (1º40'15" N, 7º26'48" E), six green turtles were observed laying eggs. To keep down anthropogenic disturbance, these nesting females were only briefly observed. None of them seemed to have abnormal growths on the upper parts of their bodies. In May 2009, a CMR (capture-mark-recapture) study was launched on Príncipe Island. A total of 50 animals, involving 37 green and 13 hawksbill turtles were randomly captured by hand, at their foraging grounds during daylight hours.

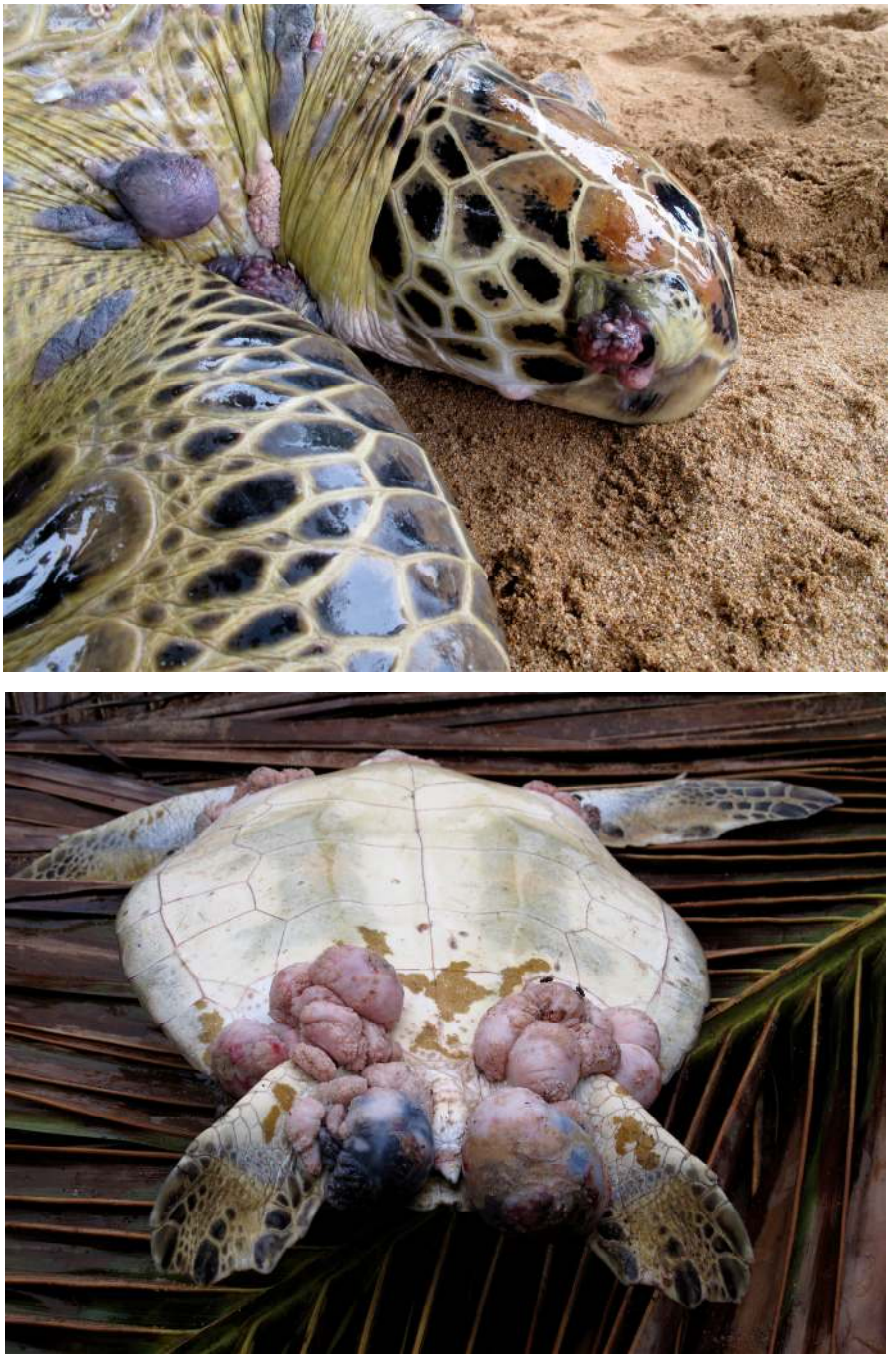

Fig. 1 & 2. Neritic juvenile green turtles afflicted by fibropapillomatosis

Neritic juveniles, sub-adults and males of both hawksbill and green turtles are found throughout the year around Príncipe Island, and adult females migrate to unknown destinations during the nonbreeding period. Nesting takes place between October and March (Fretey 2001; Graff 1996).

A second campaign was conducted in August 2009 and 47 more individuals, that is, 13 green and 34 hawksbill turtles, were captured. All captured individuals were measured, weighed, tagged, and visually examined for epibionts, diseases, sores and malformations; blood samples were also collected. Life-history stage and gender (i.e. neritic juvenile, sub-adult, adult; undetermined sex, male, female) were assigned based on curved carapace minimum length (CCL_{min}) and reproductive traits described in Chaloupka & Limpus (2005).

Different size tumors were found on the skin of several green turtles around the neck, the ventral and dorsal parts of the anterior and posterior flippers, the tail and the periocular tissues. Leeches were observed on some of the tumors. Figures 1 and 2, concerning two different individuals (both during the neritic juvenile life-history stage), illustrate the typical degree of affliction that we discovered. None of the examined hawksbill turtles exhibited fibropapillomatosis or external symptoms of other diseases. Based on the appearance and location of the tumors we hypothesize that fibropapillomatosis is attacking the green turtle population. The height of the tumors could reach up to 8.0 cm above normal skin level. No tumors or healthy skin biopsies were collected during the May 2009 campaign for later analyses. However, research related to fibropapillomatosis in the foraging and breeding populations of Príncipe Island began in July 2009, and biopsies have been performed since August 2009. About one third of the neritic juvenile and sub-adult green turtles was attacked by fibropapillomatosis. Conversely, none of the captured adults showed signs of the disease (Table 1).

Table 1. Incidence of fibropapillomatosis in the green turtles captured in the coastal waters of Príncipe Island, in May and August 2009. Curved carapace lengths are given as [A] CCL_{min} < 65 cm, [B] CCL_{min} 65 - 85 cm, [C] CCL_{min} > 85 cm; values for Males and Females are given separately.

	neritic juveniles [A]	**sub-adults** [B]	**adults** [C]	
	undet. sex	undet. sex	M	F
Total	25	22	2	1
with fibropapillomatosis	8	8	0	0
% of fibropapillomatosis	32%	36%	0%	0%

Our preliminary data is consistent with previous reports concerning the prevalence of the disease among the different life-history stages (George 1997; Murakawa et al. 2000), and do not inevitably contradict the observations made by Formia et al. (2007) because the hypothesis of a very recent arrival of the disease cannot be rejected. The causes of its emergence in the green turtles foraging and growing around Príncipe Island are unknown. Although there are no sources of pollution locally, near-surface oceanic currents are very strong in the Gulf of Guinea, so that pollutant transportation over large distances might be possible. However, this hypothesis needs further support. Indeed, the part played by other possible factors, like immunosuppression and/or marine biotoxins remains unknown and the foraging and growing areas of the green turtle population from Príncipe Island, as well as the migratory destinations of the sub-adults, remain poorly known. Answers to these questions require a multidisciplinary research program, focused not only on Príncipe Island but enlarged to the foraging zones off central Africa, mating areas at sea and nesting beaches.

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