

## **Fibropapillomatosis in Sea Turtles from South America – Brazil, Uruguay, and Argentina**

Cecília Baptistotte

E-mail: cecilia@tamar.org.br

Centro TAMAR/ICMBio, Espírito Santo, Brazil

Since 1982, Projeto TAMAR-ICMBio, the Brazilian Sea Turtle Conservation and Research Program, has been studying and protecting the marine turtles that occur in Brazil. It has progressively established a national network of 21 field stations located across nine Brazilian states, covering 1100 km of the Brazilian mainland coast and oceanic islands. Most of these stations are operated year-round and are located in the main sea turtle nesting areas or in nearby major coastal foraging grounds, where historically sea turtles have been reported as incidental catch in coastal fisheries.

We present data on the prevalence and expression of fibropapillomatosis in *Chelonia mydas* found stranded (i.e. washed ashore dead or alive, found floating dead or alive in coastal waters), or incidentally caught in fisheries. Data were collected along the Brazilian coast, from nine States (Santa Catarina – SC, São Paulo – SP, Rio de Janeiro – RJ, Espírito Santo – ES, Bahia – BA, Sergipe – SE, Rio Grande do Norte – RN and Ceará – CE), and from oceanic islands (Rocas Atoll and Fernando de Noronha).

Since 2000, TAMAR has defined a new field named "TUMORS" in its database. Each turtle was thoroughly examined for the detection of external tumors and a standardized protocol was developed for collecting biological data, which included date, species, sex, location, curved carapace length and width (CCL and CCW, respectively), tag number, general condition (dead or alive), and health status, among others. Tumor samples were classified according to size, aspect, shape, contour, and presence of ulceration, and tissue samples were collected for histopathological analysis in the Department of Pathology of the University of São Paulo – USP (Matushima et al., 2001). Decomposed carcasses were excluded from the analysis.

From 2000 to 2005, 10,170 sea turtles were found stranded, alive or dead. The animals were identified, measured, and examined for the presence or absence of tumors. Most records (82.2%; 8359) corresponded to green turtles (*Chelonia mydas*). Analyses were performed only for *Chelonia mydas* (Baptistotte, 2007). Affected animals varied from juvenile (30 cm minimum recorded CCL) to adults (112 cm maximum recorded CCL).

Higher prevalence of FP was recorded in the State of Ceará, followed by Rio Grande do Norte, Espírito Santo, and Sergipe. The disease demonstrated a decreasing trend during the sampled period, and juvenile turtles (40 – 60 cm CCL) were the predominant age/size class among affected individuals. There was no evident seasonality in FP distribution. A total of 501 green turtles from Fernando de Noronha and 486 from Rocas Atoll (where regular in-water surveys are conducted) were examined, and no evidence of the disease was found.

The mean FP prevalence among the species was 15.4% (1,288/8,359) (0% – 36.9% ± 13.3). Mean CCL for turtles with FP was 47.9 cm (30 – 112 ± 10.8cm); apparently healthy individuals measured 45.7 cm (8 – 140 ± 15.8 cm). Tumor prevalence and size-class distribution (Fig. 2 and

Fig. 3) were significantly different among States (Kruskall-Wallis:  $H = 910.66$ ;  $DF = 9$ ;  $p = 0.000$ ), with smaller individuals and lower tumor prevalence in southern States (SP, SC, RJ). On the other hand, the states with higher proportions of turtles with CCL between 40 and 60 cm (CE, SE e BA) showed higher tumor prevalence (Fig. 1).

Tumors were recorded primarily in eyes, neck, flippers, axillary and inguinal areas, and cloaca – rarely in carapace and plastron; no tumors were recorded in the oropharynx.

Sea turtle fibropapillomatosis in Brazil was detected only in coastal regions, which are most affected by human activities and are constantly exposed to pollutants from different origins, such as domestic, agricultural, and industrial effluents (Santos et al., 2010). The disease has shown low to moderate frequencies in Brazilian populations when compared to studied populations elsewhere. Results demonstrate that there is an increase in FP prevalence up to sub adult stages, followed by a decrease in adult turtles documented within the affected size classes.

Comparisons of FP frequency between stranded and intentionally captured turtles (through either cast nets or set nets) in ES showed significant differences, with higher tumor proportion in turtles captured in the industrial discharge area (chi-square,  $p < 0.05$ ); groups did not differ in size-class (Mann-Whitney U-test,  $p > 0.05$ ) During a study in this area carried out from August 2000 to July 2006, a total of 640 individual green turtle were captured and 34.4% had tumors (Torezani et al., 2010). The region is densely populated and suffers from several environmental problems, such as solid wastes, domestic wastewater, and industrial wastes (Jesus et al., 2004).

The average prevalence of FP in sea turtles in Brazil between 2000 and 2014 is presented in Fig. 2. These data were collected by TAMAR, NEMA (Núcleo de Educação e Monitoramento Ambiental, located in Rio Grande do Sul state), and Guajiru located in Paraíba state (Mascarenhas and Iverson, 2008). Data from Uruguay were published by Ferrando et al., (2015) and data from Argentina were obtained through personal communication with Laura Prodoscimi (Programa Regional de Investigación y Conservación de Tortugas Marinas de la Argentina – PRICTMA).

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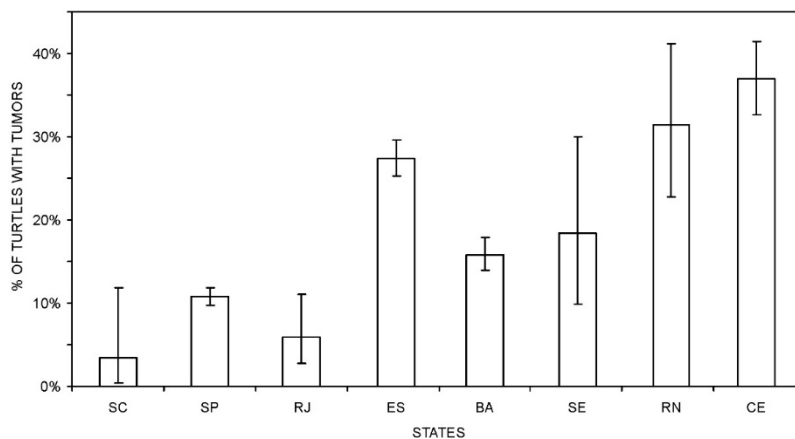


Figure 1.--Percentage of turtles with tumors in each Brazilian State between 2000 and 2005.

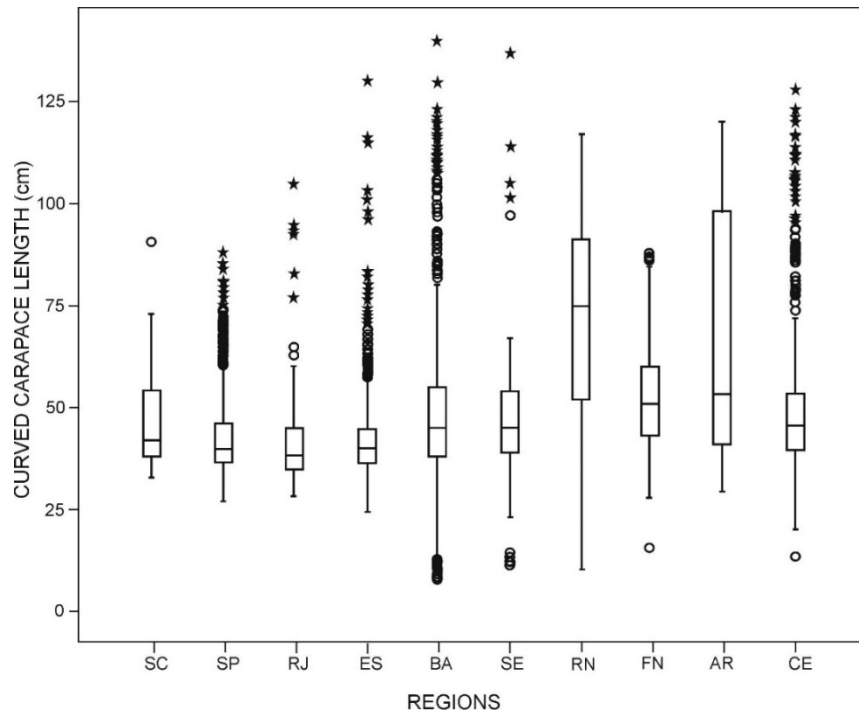


Figure 2.--Curved carapace length (CCL) of both healthy and sick turtles in each State, between 2000 and 2005.

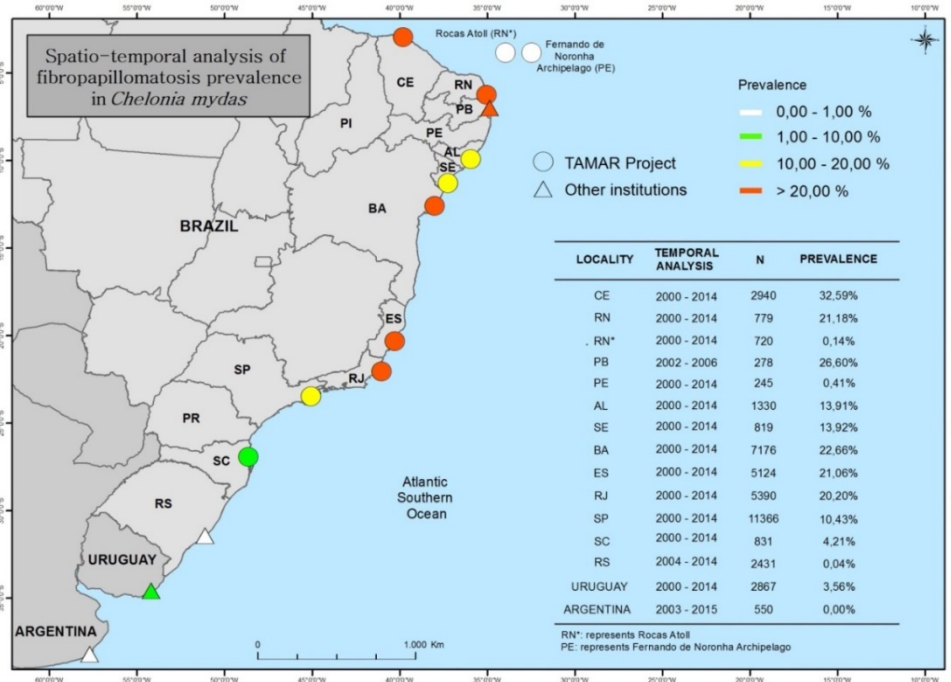


Figure 3.--Average prevalence of FP in green turtles for all Brazilian states, as well as for Uruguay and Argentina. TAMAR 2000-2014; Uruguay 2000-2014; Guajiru (PB) 2002-2006; NEMA (RS) 2004-2014; Uruguay 2000-2014; Argentina 2003-2015.