

## ***BEACHED SEA TURTLES ON THE COAST OF FORTALEZA, CEARÁ, BRAZIL, AND IMPLICATIONS FOR CONSERVATION OF THE TÁXON***

Tartarugas marinhas encalhadas na costa de Fortaleza, Ceará,  
Brasil, e implicações para a conservação do táxon

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### **ABSTRACT**

The Ceará's state coast belongs to one of the most important areas of the South Atlantic for migration and feeding of sea turtles. Thus, the present study observed (1) which species occur in Fortaleza, (2) which species and sex are beached the most, (3) the life stage and (4) season that they most strand. We aimed to update existing information regarding the occurrence of sea turtles in Fortaleza, evaluate if seasonality influences beaching behavior, register the beached species on the coast of Fortaleza, and investigate the beaching behavior. This study was carried out in Fortaleza, Brazil. Data were obtained through monitoring and reports provided by the local community, from January/16 to December/19. A total of 112 beached turtles of four species were observed, and younger specimens were more observed. No significant differences appeared between the years, months, and the rainy/dry seasons on the number of the strandings. Females were observed more than males for all species, perhaps due to the use of the region as a migratory route

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for breeding and foraging. This is the first data for Ceará State published in a scientific paper, which can be used as the basis to raise awareness in the general population, and government, regarding the vulnerability of these organisms.

**Keywords:** *Chelonia mydas*, juvenile turtles, female turtles, human activities, northeastern.

## RESUMO

O litoral cearense pertence a uma das áreas mais importantes do Atlântico Sul para a migração e alimentação de tartarugas marinhas. Assim, o presente estudo observou (1) quais espécies ocorrem em Fortaleza, (2) quais espécies e sexo encalham com maior frequência, (3) o estágio da vida e (4) a estação em que mais encalham. Objetivamos atualizar as informações sobre a ocorrência de tartarugas marinhas em Fortaleza, avaliar a influência da sazonalidade nos encalhes, registrar quais espécies encalham no litoral de Fortaleza e investigar o comportamento dos encalhes. Este estudo foi realizado em Fortaleza, Brasil, sendo os dados obtidos por meio de monitoramento e relatos da comunidade local, no período de janeiro/16 a dezembro/19. Um total de 112 tartarugas encalhadas de quatro espécies foram observadas, sendo a faixa etária juvenil a mais observada. Não houve diferenças significativas entre os anos, meses e as estações chuvosa/seca no número de encalhes. As fêmeas ocorreram mais frequentemente que os machos para todas as espécies, talvez devido ao uso da região como rota migratória para procriação e forrageamento. Este é o primeiro dado disponível em periódico indexado para o estado do Ceará e que pode ser utilizado como base para a conscientização da população em geral e do governo sobre a vulnerabilidade desses organismos.

**Palavras-chave:** *Chelonia mydas*, *tartarugas juvenis*, *tartarugas fêmeas*, *atividades humanas*, *Nordeste*.

## INTRODUCTION

Seven species of sea turtles are distributed worldwide, five of which occur in Brazil for breeding and feeding purposes (Marcovaldi & Marcovaldi, 1999; Baptistotte; Thomé & Bjorndal, 2003): loggerhead turtle (*Caretta caretta*, Linnaeus, 1758), hawksbill turtle (*Eretmochelys imbricata*, Linnaeus, 1766), green turtle (*Chelonia mydas*, Linnaeus, 1758), olive ridley (*Lepidochelys olivacea*, Eschscholtz, 1829) and leatherback turtle (*Dermochelys coriacea*, Vandelli, 1761). Only the *D. coriacea* does not occur in the state of Ceará for feeding and reproduction purposes, but there are records of its sighting near the coasts of this region (Marcovaldi & Marcovaldi, 1999), as well as records of incidental capture by fish fixed traps and strandings of a living individual (Barata *et al.*, 2004).

Sea turtle populations have experienced drastic reductions when considering historical records of the past few centuries. Hence, all living sea turtle species are classified with some level of threat and vulnerability (Lutcavage *et al.*, 1996; ICMBio, 2018). The decline of sea turtle populations is mainly due to anthropogenic activities that interfere with their life cycle, such as from the loss of spawning and foraging areas, to mortality from fishing activities, and the ingestion of debris from discarded materials and other pollution (Lutcavage *et al.*, 1996).

In Brazil, efforts to conserve sea turtles include measures of protection, management, research, and environmental education at the coastal communities that are in constant

contact with these species (Silva *et al.*, 2010). These efforts are and was carried out through Government entities (e.g. Tamar Project which was maintained by ICMBio and had its activities terminated in 2014) or Non-Governmental Organizations, such as the Tamar Project Foundation (private non-profit organization) and the Gtar-Verdeluz Project (of the Verdeluz Institute). In the state of Ceará, the Tamar Project had one facility located in the municipality of Itarema (Marcovaldi, 1993, 2016). The *C. mydas* is known to occur in this region for feeding and development, whereas the other four species pass through this region as a part of their migration pattern. Nevertheless, activities at the Itarema facility focused on the protection and rehabilitation of captured and beached animals, as well as the environmental education of the local fishermen (Marcovaldi *et al.*, 2016). However, the center was closed in the year 2018.

The coast of Ceará state is one of the most important areas in the South Atlantic for feeding and development of the *C. mydas* (Ferreira, 1968; Lima *et al.*, 2003; Marcovaldi *et al.*, 2001). due to its extensive macroalgae beds, which is the preferred food of this species.

In general, sea turtles in the nesting period prefer isolated beaches that have no external interference (ICMBio, 2011). Some beaches near the city of Fortaleza (urban center and capital of Ceará state) have these characteristics, including the Sabiaguaba beach. The Management Plan of the Natural Municipal Park of Sabiaguaba Dunes and the Sabiaguaba Environmental Protection Area (Fortaleza, 2010) include providing refuge for wildlife and a place for the reproduction of sea turtles.

The Gtar-Verdeluz Project was created in 2014 as part of the “Verdeluz Sustainability Program”, an extension initiative of the Federal University of Ceará, due to the scarcity of information and lack of knowledge of the local populations regarding beached turtles along the Fortaleza coast. The Verdeluz Program is now the Verdeluz Institute, which is a non-profit Organization of Civil Society of Public Interest (OSCIP) and has environmental conservation projects in addition to the Gtar-Verdeluz. The project currently includes activities that involve environmental education and coastal monitoring of spawning and beaching turtles and necropsies of dead turtles on the shores of Fortaleza.

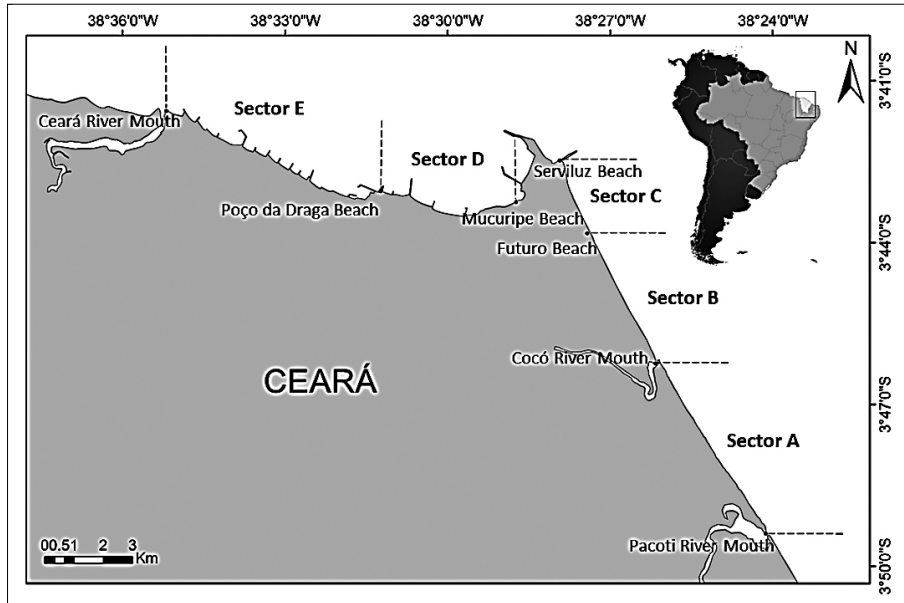
The conservation of sea turtles depends on international efforts by governments, non-governmental organizations and the civil society given that these animals migrate over long distances, reach late sexual maturity, have a high longevity and are vulnerable to anthropogenic activities in marine and coastal ecosystems (ICMBio, 2011). Thus, the present study observed (1) which species occur in Fortaleza; (2) which species and sex are beached the most; (3) the stage of the life cycle that beaches most frequently; (4) and the season of the year that beaching is most frequent. The objective of this research was to update existing information regarding the occurrence of sea turtles in Fortaleza, evaluate if seasonality influences beaching behavior, register the species of beached turtles on the coast of Fortaleza, and determine the cause of beaching behavior. In addition, this manuscript describes the importance of efforts of non-governmental organizations in the conservation of endangered species.

## MATERIAL AND METHODS

The present study was conducted throughout the entire coast of Fortaleza, Ceará state (Brazil). The region is characterized by coastal plains, coastal plateaus, and marine fluvial plains with mangroves. Much of the mangrove habitats have been eradicated by urbanization in small river mouths, which are the Ceará river in the western extremity of

the city and the Cocó and Pacoti rivers in the east (Godoy; Meireles & Lacerda, 2018; Maia *et al.*, 2005) (Figure 1).

Figure 1 – Monitored areas by the Gtar-Verdeluz project at Fortaleza coast, Ceará state, Brazil



The annual rainfall in the region of Fortaleza is characterized as a rainy season from December to May, and a dry season from June to November (Funceme, 2009). The air temperature is influenced by trade winds, showing a small variation of between 26.2 and 27.5° C (Baptista; Ponzi & Sichel, 2004).

Sabiaguaba Beach, which is located within the area of the present study, is approximately 7 km long and has two Conservation Units (CU) or Marine Protected Areas (MPA) created in February 2006 and managed by the Fortaleza city hall, of which one of the CUs is the Dunes of Sabiaguaba Municipal Natural Park and Environmental Protection Area (APA) of Sabiaguaba. Furthermore, a small portion of the Sabiaguaba beach is within the Pacoti River MPA and Cocó State Park (Figure 1). Serviluz and Futuro beaches are also located within the studied area and represent a significant portion of the Fortaleza coast, totaling 7 kilometers combined. These beaches are expected to become CUs according to the Participative Master Plan of the Municipality of Fortaleza (Complementary Law No. 062, of February 2, 2009) (Fortaleza, 2009).

Beached sea turtle data of Fortaleza were acquired through monitoring activities of the beaches and communications with the local community, from January 2016 to December 2019. The information regarding sectors A, B and C (Figure 1) were sampled by monitoring the beach and by communications with the local residents, workers, and police. Data of beached turtles in sectors D and E were obtained only through communications with the local community.

Monitoring was carried out each month during the years 2016 and 2019 at the Sabiaguaba beach (Sector A, Figure 1), a region located between the estuaries of Cocó river and Pacoti river. The frequency of monitoring varied between years: in 2016 and 2017 it was biweekly while in 2018 and 2019 it was weekly. In order to avoid any bias in the data due to differences in effort, the results presented here refer to average values.

In 2017, the sampled area included the Serviluz and Futuro beaches (Figure 1), and monitoring was carried out in partnership with the Ceará Military Fire Department. All individuals were identified at the species level, using the identification key (Pritchard *et al.*, 1983), classified according to the estimated size/age (young, adult and undetermined) (Table I), sex (male, female and indeterminate), and a photo was taken to verify these analyses (Wyneken, 2001; ICMBio, 2011). Geographic location (GPS device, Garmin Etrex 10; accurate to 5 m2) and date were recorded as well for each sighting.

Table I - Curvilinear carapace length (CCL) associated with the sexual maturity of the sea turtles at the Atlantic Sea

Species	Age and size (CCL) of sexual maturity for females	References
<i>E. imbricata</i>	25 years / > 75 cm	Meylan and Donnelly, 1999; NMFS and US FWS, 1998
<i>C. caretta</i>	Between 25 and 35 years / > 83 cm	Chaloupka and Musick, 1997; NMFS and US FWS, 2008
<i>D. coriacea</i>	Between 13 and 29 years / INA*	Zug and Parham, 1996; Avens <i>et al.</i> , 2009
<i>L. olivacea</i>	Between 10 and 18 years / > 55 cm	Zug, Chaloupka and Balazs, 2006; NMFS and US FWS, 1991
<i>C. mydas</i>	Between 25 and 50 years / > 83 cm	Baptistotte <i>et al.</i> , 2003

Legend: E: Eretmochelys, C: Caretta, D: Dermochelys, L: Lepidochelys, C: Chelonia.

The specimens were subjected to biometrics analyses (curvilinear carapace length – CCL and curvilinear carapace width – CCW), which were estimated using a measuring tape, according to the methods described by Pritchard *et al.* (1983).

The presence of tumors, cuts, amputations, fractures and signs of interaction with fishing were observed according to the guidelines described in the license granted for the project (Sisbio – Sistema de Autorização e Informação da Biodiversidade) (number 53083-6). Living individuals were evaluated externally and attempts were made to reintroduce the sea turtles to the ocean. The debilitated animals were sent to the Wild Animal Sorting Center (CETAS – Centros de Triagem de Animais Silvestres) of Brazilian Institute of the Environment and Renewable Natural Resources (IBAMA – Instituto Brasileiro do Meio Ambiente e dos Recursos Naturais Renováveis). The animals that have died were classified as Dead in Advanced Decomposition (DAD), Dead in Intermediate Decomposition (DID), or Fresh or recently Dead (FD) (Marcovaldi *et al.*, 2016).

The data were tabulated in spreadsheets to make estimates of frequency of occurrence regarding the number of strands per sector, species record, and destination given to the stranded specimen. The results were given in percentages.

The biometrics data were analyzed through descriptive statistics. Only the green sea turtle (*C. mydas*) was considered in the statistical analysis because it was the species with the highest occurrence. The data were tested for normality (Shapiro-Wilk test) and homoscedasticity (Levene test) of variances. The Mann-Whitney test was used to test the differences between the CCL of adults and young specimens. The chi-square test was used to check for disparities between the observed versus expected proportions of young and adult beached *C. mydas*, as well as between young specimens with lengths less and greater than 50 cm. It's imperative to quote that youthful green turtles less than 50 cm CCL living at the coast of the south of Brazil, Uruguay and Argentina are omnivorous and stays in neritic habitats, but are in move between a carnivorous and herbivorous diet (Bugoni; Krause e Petry, 2003; Carman *et al.*, 2012; Vélez-Rubio *et al.*, 2016). In these regions, green

turtles bigger than 45 cm CCL show a gradual modification on their diet preferences, being so in the recruitment stage, making not only a diet, but a gradual habitat transition (Vélez-Rubio *et al.*, 2016).

Data of the beached specimens were analyzed for variation between years, months and between rainy and dry seasons. Only the sightings in sectors A, B, and C were considered for comparisons due to regular monitoring being conducted only in these areas. At each sector, the density of beached sea turtles was calculated as:

$$\text{Beached Sea Turtle Density} = N/(FL)$$

where N is the number of beached sea turtles, F is the monthly monitoring frequency, and L is the total length of the sector (km). The densities of each sector were combined to represent the number of beached sea turtles per kilometer for each month. These data were then tested for normality and homoscedasticity of variances. The nonparametric Kruskal-Wallis test was used to evaluate variations in beached specimen density between all years from 2016 to 2019, as well as between all months.

## RESULTS

Four of the five sea turtle species that occur in Brazil were observed beaching on the Fortaleza shores. Only the leatherback turtle (*D. coriacea*) was not observed during the present study. A total of 112 beached turtles were recorded at Fortaleza from January 2016 to December 2019, of which four were *C. caretta*, seven *L. olivacea*, eight *E. imbricata*, and 75 were *C. mydas*. The remaining specimens (n = 18) were unidentifiable due to the advanced state of decomposition. There were 55 females and nine males, and 48 were undetermined. Six of the undetermined specimens were neonates, 35 young, and one was an adult. A total of 46 animals were classified as Dead in Advanced Decomposition (DAD), 23 were Dead in Intermediate Decomposition (DID), 18 were Fresh or recently Dead (FD), and 25 were beaching but alive. Sector A, B and C had the most sightings of beached specimens at 44.64% (n = 50), 25.89% (n = 29), and 13.39% (n = 15), respectively (Figure 2), while the sectors D and C, which were not monitored, had the lowest number of beached sea turtles recorded (Figure 2).

There were 37 (32.74%) individuals with abrasions, petroleum, amputated limbs from sharp objects, boat impact marks and/or visible interaction with fishing gears (e.g. fishing nets and ghost fishing material). Of these, 18.58% (21) were classified as having interacted with fisheries activities, seven of which had at least one amputated limb.

Regarding injuries from non-anthropogenic causes, only six individuals were recorded with signs of predation as indicated by irregular lacerations and nine had fibropapillomatosis tumors.

After the recording data of the beached sea turtles, dead specimens were buried (n = 32) or left in place (n = 39). Living specimens were sent to rehabilitation centers (n = 16) or returned to the sea (n = 9). Only 26 specimens could be necropsied, of which six died after admission to rehabilitation centers and were later necropsied.

The green turtle (*C. mydas*) presented the highest frequency of occurrence at 66,96% of the sightings (Figure 3) (n = 75). Of these, 44 individuals were young (being 21 of this group smaller than 50cm), 28 were adults, and there was one neonate. Two specimens were undetermined due to the lack of size information.

Figure 2 - Frequency of occurrence (%) of beached turtles from January 2016 to December 2019 at each sector established along the coast of Fortaleza, Ceará, Brazil

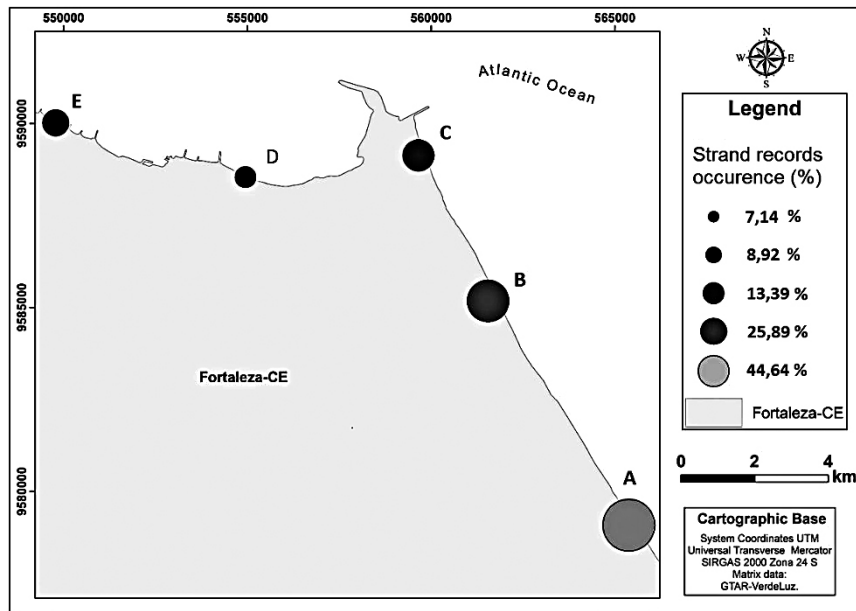
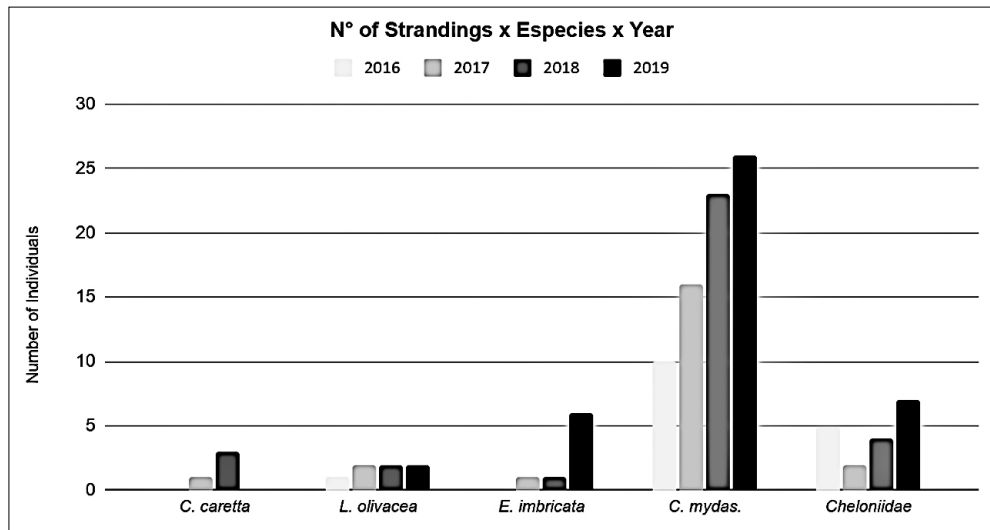


Figure 3 - Number of beached individuals of sea turtle species per year recorded along the coast of Fortaleza, Ceará (Brazil), from January 2016 to December 2019



Legend: C: Caretta, L: Lepidochelys, E: Eretmochelys, C: Chelonia.

The Mann-Whitney test showed statistical significance between the numbers of juvenile and adult green turtles ( $Z = 8,653$ ;  $p = 5.0182E-18$ ). The chi-square test showed a significant difference between the observed and expected proportions of young and adult specimens ( $X^2 = 3,169$ ,  $p = 0.075$ ) of which young individuals were significantly more frequent. The proportions between young individuals that were larger than 50 cm of CCL were also compared using the chi-square and no statistical significance was observed ( $X^2 = 0$ ,  $p = 1$ ).

When considering all identified and unidentified beached specimens, the Kruskal-Wallis test showed no significant differences for the density of individuals recorded between the years 2016 to 2019 ( $H = 1.599$ ;  $p = 0.5996$ ), and no differences were shown

during the months of January to December ( $H = 9.225$ ;  $p = 0.3989$ ). The month of August of all years was excluded from this analysis due to the absence of beached turtles. Furthermore, no significant differences were observed between the rainy and dry seasons ( $t = 0.58656$ ;  $p = 0.5705$ ).

## DISCUSSION

The occurrence of the four sea turtle species corroborates the existence of a shared migratory corridor for these animals, of which the *C. caretta* species has been tracked along the Brazilian coast. Movement of the *C. caretta* was monitored with telemetry on the north coast of Bahia and was shown to migrate during the reproductive season (November to May) throughout the Brazilian northeast coast, of which the ocean environment near Ceará state is noted to be a feeding grounds for this species (Marcovaldi *et al.*, 2009).

Most of the unidentified animals had an advanced state of decomposition, amputated limbs and head, and damaged or absence of plates in the carapace and plastron. Hence, it was impossible to identify animals using the methods described in the National Action Plan for the Conservation of Sea Turtles (ICMBio, 2011).

Beached *C. mydas* is common throughout the Brazilian coast, mainly in the southeastern and southern coasts of the country (Bugoni; Krause & Petry, 2001; Guebert-Bartholo *et al.*, 2011). In Paraíba state, the predominance of beached *C. mydas* was recorded (Mascarenhas; Santos & Zeppelini, 2005), which was also observed in the present study for the same species in Ceará state. It is noteworthy that the migration behavior of all sea turtle species varies according to the life phase. For *C. mydas*, the neonates are commonly observed in the open ocean while juveniles and adults are closer to the shore due to the availability of food sources (Bugoni; Krause & Petry, 2003; ICMBio, 2011; Carman *et al.*, 2012; Vélez-Rubio *et al.*, 2016).

The feeding preferences of sea turtles vary by species and age (ICMBio, 2011). The predominance of beached *C. mydas* on the Fortaleza coast is probably associated with the feeding habits of this species, which is mostly herbivorous for the late young and adult turtles, as already mentioned by other Brazilian researchers throughout Brazil (Marcovaldi & Marcovaldi, 1999; Bugoni; Krause & Petry, 2001; Almeida *et al.*, 2011a; ICMBio, 2011). Hence, older individuals of this species are more common in areas with substrates that allow for the fixation of algae (ICMBio, 2011). The Fortaleza coast is shallow and consists of algae beds throughout its entire extension (Pinheiro-Joventino; Dantas & Maraschin, 1998), providing an abundance of food for green turtles. The high occurrence of beached green turtles is likely due to the proximity of these algae beds to ports and anthropogenic activities, pollution and fishing. It is important to note that *C. mydas* is the most frequent species on the Ceará coast (Almeida *et al.*, 2011b) and the occurrence of beached turtles is due to several factors, such as the threat by fishing (e.g. bycatch in fishing gears, collision with boats, amputations by marine engines) and the ingestion of anthropogenic debris. The concentrated human activity and high pollution of debris near a dense urban center such as Fortaleza has increased the vulnerability of these animals (Tommasi, 1987; Santaella *et al.*, 2014), which accounts for the higher number of beached *C. mydas* when compared to other sea turtle species.

The number of beached *C. mydas* juveniles was significantly higher when compared to that of the adults. Other studies in Brazil and around the world obtained similar results with various species (Bugoni; Krause & Petry, 2001; Bolten, 2003; Chaloupka; Limpus &



Miller, 2004). One possible explanation would be the higher number of juveniles, which are more susceptible to predators and anthropogenic activities (solid wastes, fisheries activities, ocean pollution), leading to its already proven low survival rate for the adult phase (e.g. one egg for every 1.000 reaches adulthood) (ICMBio, 2011). In addition, young individuals of *C. mydas*, *E. imbricata*, *L. olivacea* and *C. caretta* usually migrate from the open ocean to the neritic zone, where they continue their development due to the greater abundance of food resources (Bolten, 2003).

The size of adult individuals varies between species and other characteristics of the shell differ between genders. Hence, gender was undetermined for some of the specimens, since necropsy was not viable due to the state of decomposition and the small size of the specimens. The larger size of the tail and nails and the more concave plastron are considered secondary sexual characteristics for males (Miller & Dinkelacker, 2007), but these characteristics are expressed only in adults (Wibbels, 1999). *C. mydas* is considered as an adult with the carapace (CCL) at 90 cm for individuals observed spawning on Trindade Island, Brazil (Almeida *et al.*, 2011a), and for *C. caretta* is 83 cm for individuals observed spawning on the Espírito Santo coast, Brazil (Baptistotte; Thomé & Bjorndal, 2003). Nevertheless, the lack of photographs in the present study that highlight secondary sexual characteristics combined with the decomposition in a significant portion of specimens (76.92%) prevented the identification of gender. In addition, ~13% were less decomposed (fresh) and were considered as adults, but gender was unidentified due to the lack of details and photos from the informant or missing limbs (e.g. fins and tail).

Females are more vulnerable to beaching because they remain close to the coast for reproduction, being more propense to negative direct or indirect human interactions, and are thus more represented in research similar to the present study (Poli *et al.*, 2014). A higher proportion of females of the *C. mydas* was also recorded at Paraíba state (Mascarenhas; Santos & Zeppelini, 2005) and Atol das Rocas (Grossman *et al.*, 2007). However, the fact that only female turtles used to come near the shore, combined to the increase of the female population of sea turtles around the world (Moran; Bjorndal & Bolten, 1999; Laloë *et al.*, 2016), certainly contributes to their higher incidence of strandings. The higher proportion of beached females of this species on Brazilian coasts may also be linked to the high proportion of females observed in natural populations (Mrosovsky; Dutton & Whitmore, 1984; Work & Balazs, 2002; Júnior, 2009; Laloë *et al.*, 2016). However, no studies exist regarding the susceptibility of females to threats as compared to males of this species.

The homogeneity in the density of beached individuals between seasons (e.g. rainy and dry) was contrary to expectations. Considering that the green and hawksbill turtles reproduce in Fernando de Noronha island and Rio Grande do Norte state, respectively (ICMBio, 2011), the general notion was that the density of beached specimens would increase during the reproduction period of the turtles and decrease as the turtles migrate elsewhere to areas that are abundant in food resources. A seasonal pattern was observed for beached sea turtles on the coast of Bahia (Lopes-Souza; Schiavetti & Álvarez, 2015). The difference between the present study and (Lopes-Souza; Schiavetti & Álvarez, 2015) is perhaps due to variations in oceanographic conditions, area and research methods, and that the different locations may vary in their use by the sea turtles.

The number of beached specimens differed between the sectors considered for statistical analysis, in other words, sectors A, B, and C. However, variations were perhaps due to sectors A and B had larger areas and less human activity when compared to sector C. And as for sectors D and E, these were not monitored, as previously explained in the

methodology. The strandings were recorded by third parties, thus justifying the low abundance of strandings.

Nevertheless, a third of all beached specimens observed in the present study had signs of direct interaction with human activities, such as injuries from fishing gear or amputations of body parts with no visible marks from natural predators. A similar proportion of beached specimens with damages from anthropogenic sources was reported (Pupo; Jules & Hanazaki, 2006; Bahia & Bondioli, 2010; Nogueira & Alves, 2016). Injuries from human activities pose a significant problem for the conservation of sea turtles and thus, further analyses are needed to identify the sources of these injuries and implement mitigation strategies to facilitate the conservation of sea turtles.

Fibropapillomatosis is a neoplastic disease of sea turtles caused by the virus Chelonid alphaherpesvirus 5 (ChHV-5) (Rodenbusch *et al.*, 2012) and mainly affects *C. mydas* (Aguirre & Lutz, 2004). The spread of the tumors is caused by multiple factors, including exposure to toxic substances (e.g. organochlorine pesticides, polychlorinated biphenyls-PCBs) and other environmental and genetic factors (Aguirre & Lutz, 2004). Nine individuals in the present study had this condition, indicating that pollution has been one of the factors that corroborate the decrease in the health of these animals, which may indirectly contribute to their subsequent stranding.

## CONCLUSION

Four species of sea turtles (*C. mydas*, *L. olivacea*, *E. imbricata* and *C. caretta*) occur on the coast of Fortaleza. The *C. mydas* was the most observed beached species. The Fortaleza coast is subject to the highest number of beached females of all the aforementioned species due to the use of the coast as a migratory route for breeding and food sources. In addition, the homogeneity of sightings of beached specimens indicates the vulnerability of these animals throughout the year.

The lack of direct and indirect government support for the conservation of sea turtles in the West of the State of Ceará and especially in its Capital, where the Gtar-Verdeluz project operates, has resulted in the mortality of animals that are stranded alive on the beach and run into difficulty and government inertia to be rehabilitated. No government initiative is active in the monitoring of sea turtles at Fortaleza city and the West of Ceará at the moment. Besides this, no mitigation strategies for activities that directly impact these species (e.g. fishing) have been created for this area. Also, environmental education activities to raise awareness of the local population are urgent. Hence, data of the present study provided a robust analysis of sea turtles beaching on the coast of Fortaleza. This report will serve as a communication to the general public and government and non-government entities regarding the vulnerability of sea turtles when near the municipality, and to serve as a basis to create public policies aimed at the conservation of these species.

Furthermore, the creation of a rehabilitation center for sea turtles in Fortaleza is urgent given the significant number of living beached animals and that quick assistance by a specialized staff and transport to rehabilitation centers are critical factors for the survival of debilitated animals.

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