INSIGHTS ON THE OCCURRENCE, RESIDENCY, AND BEHAVIOR OF TWO COASTAL DOLPHINS FROM GANDOCA-MANZANILLO, COSTA RICA: *SOTALIA GUIANENSIS* AND *TURSIOPS TRUNCATUS* (FAMILY DELPHINIDAE)

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Abstract

Although 30 cetacean species are expected to occur in Costa Rica, only six of these have been confirmed to the Costa Rican Caribbean. The two most common species are the bottlenose dolphin and the Guyanese dolphin, which appear to have resident populations. The purpose of this study is to generate baseline information on these two species in occurrence, residency, and habitat use in the Gandoca-Manzanillo Wildlife Refuge. Sixty-five groups were observed between 2003-2005. *Sotalia guianensis* was the most commonly of the two dolphin species. However, both species have individuals that are regularly observed in the study area. About 26.8% of the animals surveyed were photo-identified and had been frequently observed in the study area. Both species varied in how they used the habitat in the refuge, but when are found in mixed-species group both spend most of the time interacting with each other. Based on occurrence, habitat used and photo-identification we propose that *S. guianensis* holds a resident population in the area, whereas *T. truncatus* seems to be a common visitor to the refuge which home range appears to go beyond the refuge limits. The government should consider expand the marine limits of the refuge to protect this other specie. Bottlenose dolphins are regularly observed interacting sexually with *S. guianensis* the genetics and conservation consequences of this possibility are unknown.

Key words: dolphins, residence, photo-identification, ecology, Central America

INTRODUCTION

About 30 cetacean species are expected to occur in Costa Rican waters, nineteen of those are confirmed to the Pacific exclusive economic zone (PEEZ) (May-Collado *et al.* 2005) and six species to the Caribbean: *Sotalia guianensis, Tursiops truncatus, Orcinus orca, Stenella attenuata, S. frontalis, Globicephala macrorhynchus,* and *Physeter macrocephalus* (May-Collado *in press,* DiBerardinis *et al.* 1997).

The coastal dolphins *S. guianensis* and *T. truncatus* are the most commonly observed and studied species in the Caribbean of Costa Rica. The bottlenose dolphin, *T. truncatus* is a cosmopolitan species that occurs in oceans and peripheral seas in tropical and temperate latitudes (Reeves *et al.* 2002). In contrast, the Guyanese dolphin, *S. guianensis* distribution is restricted to tropical waters of the Caribbean and Atlantic coast of Latin America (da Silva 2002). Previously the species was considered as the marine ecotype of the monotypic *Sotalia fluviatilis*, but recent evidence Cunha *et al.* (2005) strongly suggest that it is a separate species. *S. guianensis* is distributed in coastal waters from Santa Catarina in southern Brazil to Honduras and *S. fluviatilis* is restricted to the Amazon River and Orinoco rivers across South America (Borobia *et al.* 1991; da Silva and Best 1996; Flores 2002). In Costa Rica the Guyanese dolphin presence was first confirmed by DiBerardinis *et al.* (1997), where it appears to be restricted to the coastal waters of Gandoca-Manzanillo Wildlife Refuge. Here the species has been observed in mixed groups with bottlenose dolphins. Forestell *et al.* (1999) reported interspecies mating between the species.

Since 1997, dolphin watching has become an important source or income for the Manzanillo´s community. Unlike other places of Costa Rica, dolphin watching has not yet become a threat to these populations. However, there is evidence that engine noise affects dolphin whistle production, particularly when boats approach too close to them (May-Collado *et al.* 2005). Furthermore, other factors such as water pollutants may be a reason of concern since the Sixaola river brings contaminants from the adjacent banana plantations (Chacon 1999).

This is the first long term study on *S. guianensis* and *T. truncatus* in the Caribbean coast of Costa Rica. Here we present preliminary information on their occurrence, habitat use, and residency.

Material and Methods

The Gandoca-Manzanillo Wildlife Refuge is located in the South Caribbean of Costa Rica, and has a maritime area close to 5,000 Ha. The Caribbean coast of Costa Rica is characterized by habitats like mangroves, swamps, rain forest, coral reefs, and is known to be one of the last natural tarpon's hatchery of the country (La Gaceta, 1985).

The study area was boat-surveyed following strip transects during 32 days from 2003 and 2005 approximately from 7 a.m. to 4 p.m. Once a group of dolphins was encountered the boat engine was turned off about 50 m distance of the group from which observations were made. The following standard data was collected for each sighting: group size, group composition, GPS location, and behavioral state at the moment and during the encounter. To obtained a good estimate of habitat use, groups were followed a minimum of 20 min and a maximum of two hours

We used the technique of photo-identification to individually identify group members (Hammond *et al.* 1990). To photo-identify the animals we positioned the boat in a parallel with respect to the group and kept the same speed as the groups. This same procedure was done for behavioral follows. The dorsal fin of each animal in the group was photograph at each side when possible using two digital cameras Canon EOS Rebel, 8.0 Megapixel set with 300 mm zoom lenses.

Group behavioral data was collected from onboard by using a group instantaneous scan sampling method every 3 minutes (Martin and Bateson 1993). The following behavioral categories were defined as May-Collado and Morales-Ramirez (2005): *feeding* were animals showed changes in direction related to prey pursue, vertical diving, long dives, and production of rapid broadband clicks; *socializing* was defined as any interaction between the animals and with the research and passing boats, interactions included aerial behavior (e.g, tail slapping, leaps, etc.), reproductive interactions, and whistles production; *traveling* moving in a particular direction slow or fast; *resting or milling* was defined as animals not executing any of the above activities or stayed motion less in a particular area and were quiet.

Results

A total of 65 dolphin groups accounting for 545 individuals were observed between 2003 and 2005 in Gandoca-Manzanillo Wildlife Refuge. *Sotalia guianensis* was observed in 43% (n=183 individuals) of time, *Tursiops truncatus* 31% (n= 128 individuals), and in 26% (n=234) of the time both species were observed in mixed groups. Group size varied between single and mixed groups. Mean group size for *S. guianensis* was 7.32 ± 4.63, *T. truncatus* 15.06 ± 3.46, and mixed-species groups were 13 ± 4.34 in size.

We photo-identified a total of 82 individuals of *T. truncatus* and 64 individuals of *S. guianensis*. Overall, 26.8% of the surveyed individuals (in single and mixed groups) were photo-identified (44.8% for *S. guianensis* and 50.0% o *T. truncatus*). Animals have been regularly "re-captured", 77.2% of the total photo-identified *S. guianensis* and 43.9% of *T. truncatus* were re-sighted throughout the study period in more than one occasion in the study area (Fig 2).

In terms of habitat use, *S. guianenesis* invested 45.7% of the time traveling, 38.17% on feeding activities, and 16.03% of the time socializing. No resting activities were observed in this species. Socializing included aerial behaviors, such as leaps, tail slaps, and spy hopping and reproductive behaviors. In contrast, *T. truncatus* habitat used vary considerably from that of *S. guianensis*, animals were engaged 52.89% of the time in traveling, 33.1% in social activities, 10.74% in feeding, and resting 3.31%. As in *S. guianensis*, social activities were characterized by aerial behaviors (e.g., tail slapping, leaps) and reproductive behaviors. When the animals were in mixed-species groups 62.89% of the time were engaged in social activities, followed by 29.56% traveling, and 7.55% feeding. No resting activities were observed in these groups (Fig.3).

Discussion

Both dolphin species *Sotalia guianensis* and *Tursiops truncatus* are regularly seen in Gandoca-Manzanillo Wildlife Refuge. However, only *S. guianensis* appear to have a resident population in the study area, this is based on their high investment in there travel pattern, foraging and social activities. Animal activities such as finding food, mating and caring for young has shown to be defining of home ranges and residency (Gubbins, 2002).

Contrasting *S. guianensis* habitat use, *T. truncatus* spend more time engaged on traveling and social behaviors. We suggest that *T. truncatus* is a common visitor to the refuge because its social activities and traveling are the only behavioral categories observed. Furthermore, of all 82 photo-identify animals, only 23 of those have been observed in more than one occasion at the study site. Nine of these are regularly observed interacting with *S. guianensis*. This is also supported by our accumulative figure, which shows that we have not reach an asymptote for this species. Instead, we propose that *T. truncatus* has a resident population in the area but that covers a larger range of that we covered in this study, where just a small of the population are regularly seen in the refuge interacting with *S. guianensis*. Furthermore, a side project in Bocas del Toro (located at 35 km from the refuge) on bottlenose dolphins has not found overlap yet between identify individuals, suggesting the population in Costa Rica is a separate population from that in Bocas (May-Collado unpublished data). Thus it appears that the refuge maritime limits do not include an important portion of the bottlenose population.

A number of interactions between bottlenose dolphins and other species have been documented. Both affiliative and aggressive behavior has been seen between bottlenose dolphins and Atlantic spotted dolphins in the Bahamas (Herzing and Johnson 1997, Herzing *et al.* 2003). In the Moray Firth, Scotland, groups of bottlenose dolphins have been observed harassing and killing harbor porpoises (Ross and Wilson 1996). In the Galápagos Islands, false killer whales and bottlenose dolphins have been seen jointly harassing a group of sperm whales (Palacios and Mate 1996). In Gandoca-Manzanillo Wildlife Refuge the interactions observed between these two species are affiliative and not aggressive. The existence of hybrid animals between *S. guianensis* and *T. truncatus,* was proposed by Forestell *et al.* (1999), based on behavioral data. Although we agree that some animals reveal intermediate morphological traits particularly in rostral features and fin shape further genetic reassurance is need it to support this observation.

In conclusion, our results suggest that both species have resident populations in the Caribbean of Costa Rica, but only *S. guianensis* population appears to be resident to the Gandoca-Wildlife Refuge. In fact, *S. guianensis* has not been reported anywhere else in the Costa Rica. This makes this population extremely fragile. Habitat use in the refuge is different for both species while one used more as a transit area and for social purposes the

other (*S. guianensis*) uses it for all basic activities e.g. feeding, mating, etc. Finally, like Forestell *et al.* (1999) our behavior data and photo-identification work suggest that there may be some genetic exchange between species. The consequences of these exchanges are unknown, but it seems that it may be limited to a few bottlenose dolphins interacting sexually with *S. guianensis*. Future studies should look into the possible negative effect of hybrids between these two distant species.

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Figures

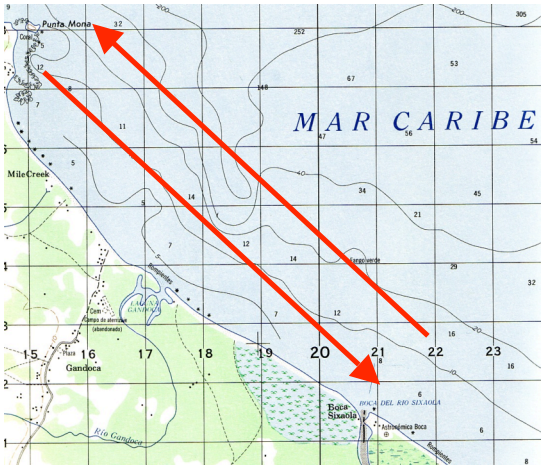
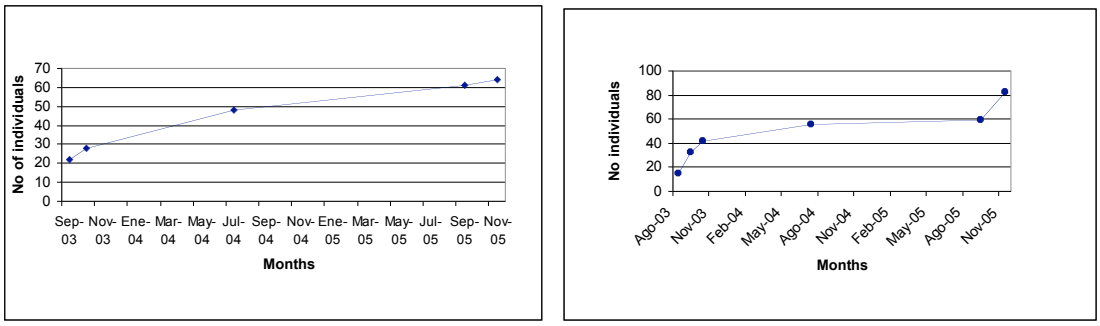


Fig.1. Sixaola´s cartographic map. (Sixaola, Limón, Costa Rica, 1:50 000, Instituto Geográfico Nacional).



a. *S. guianensis* b. *T. truncatus*

Fig. 2. Accumulative number of photo-identified individuals in *S. guianensis* and *T. truncatus* 2003-2005, Gandoca-Manzanillo National Wildlife Refuge, Costa Rica.

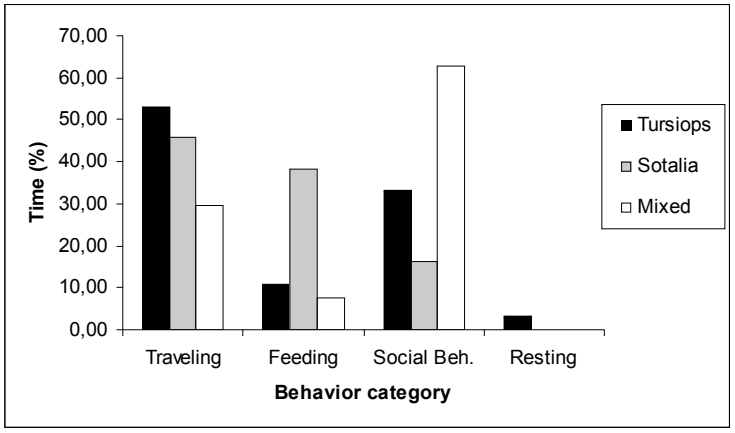


Fig. 3. Percentage of time invested by *T. truncatus* and *S. guianensis* per behavioral categories during the period 2003-2005, Gandoca Manzanillo Wildlife Refuge, Costa Rica.