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# Dolphin ecology and behaviour in the southeastern waters of the Dominican Republic: preliminary observations

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## ABSTRACT

Between June 2004 and April 2006, 381 hours of dolphin surveys were undertaken in the waters off the village of Bayahibe and Parque Nacional del Este on the southeastern coast of the Dominican Republic. This was the first time that dedicated dolphin surveys have been conducted in this area. In the Parque Nacional del Este, six species of cetaceans were identified: bottlenose dolphin (*Tursiops truncatus*), Atlantic spotted dolphin (*Stenella frontalis*), Pan-tropical spotted dolphin (*Stenella attenuata*), humpback whale (*Megaptera novaeangliae*), short-finned pilot whale (*Globicephala macrorhynchus*) and sperm whale (*Physeter macrocephalus*). The two predominant species were the bottlenose dolphins and Atlantic spotted dolphins, which appear to be resident year round in the area. Bottlenose dolphin group sizes ranged from 8 to 33 (mean 14.11, SD 8.05) and Atlantic spotted dolphin group sizes from 8 to 36 (mean 17.33, SD 12.12). Calves of both species were seen throughout the year, indicating that there is no particular season for reproduction. Mixed groups containing both species were also recorded. Animals with dorsal fin injuries suggestive of propeller injuries were observed. Humpback whales, with calves, also were recorded in the area between January and March. In Samana Bay, in the northern Dominican Republic, opportunistic surveys, using whalewatching vessels as platforms of opportunity, were conducted. Both bottlenose dolphins and Atlantic spotted dolphins were again identified and whalewatching operators reported a sighting of short-finned pilot whales. Bottlenose dolphin group sizes ranged from 1-18 (mean 5.16, SD 6.67) and from 2-20 for Atlantic spotted dolphins (mean 12.5, SD 8.43). Dolphins were observed interacting with humpback whales. Further research in the Dominican Republic will improve our understanding of the social structure and ecology of these populations and will allow us to evaluate anthropogenic threats, but coastal development and tourism are increasing rapidly and may pose risks to coastal cetacean populations in the Dominican Republic.

KEYWORDS: DOMINICAN REPUBLIC; BOTTLENOSE DOLPHIN; ATLANTIC SPOTTED DOLPHIN; HUMPBACK WHALE; TOURISM IMPACTS

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## INTRODUCTION

The occurrence of dolphins off the coast of the Dominican Republic has been known since Christopher Columbus noted sightings of dolphins in his logbook off the coast of Hispaniola over 400 years ago. However, dolphins in these waters have never been systematically studied. Instead, for the past two decades the main focus of research on cetaceans in the Dominican Republic has concentrated on the annual migration of humpback whales (*Megaptera novaeangliae*) that use the waters as calving grounds between Jan-Mar each year. The dolphins that use the same waters have been overlooked. In 2003 a multi-organisational, multi-national and collaborative dolphin conservation project was established, one of the first of its kind in the Caribbean region. This project is entitled: “*Proyecto Amigos de los Delfines*” or “*Friends of the Dolphin Project*”. It utilises scientists and students from academic bodies in the Dominican

Republic, United Kingdom and United States of America (e.g., the Academia de Ciencias, DR; George Mason University, USA; University of London, UK), non-governmental organisations (e.g., Fundacion Dominicana de Estudios Marinos [FUNDEMAR], Patronato Amigos De Los Animales [PADELA], Humane Society International, World Society for the Protection of Animals and the Whale and Dolphin Conservation Society), local community groups (e.g., Fundacion para el Desarrollo de Bayahibe, ECOPARQUE), tourism bodies (e.g., Asociacion de Hoteles Romana-Bayahibe) and government officials (including the Subsecretaria de Areas Protegidas y Biodiversidad [Undersecretary of Protected Areas and Biodiversity] and the Subsecretaria de Recursos Costeros y Marinos [Undersecretary of Coastal and Marine Resources]). The Amigos project is ultimately working towards the conservation of cetaceans in the Dominican Republic through research, education, the development of ecotourism and conservation policy.

The initial phase of the project was based in the coastal waters of the village of Bayahibe and the Parque Nacional del Este (National Park of the East) in the southeastern region of the Dominican Republic (Fig 1), with dedicated boat-based surveys starting in June 2004. In September 2005, the project expanded to include the Samana Bay region (Fig. 1), in the northeastern region of the Dominican Republic, with information on dolphins being collected via sightings reports from whalewatching tour operators and opportunistic surveys using whalewatching vessels as platforms of opportunity. Humpback whales have been studied in Samana Bay for many years, so the Amigos project is concentrating on other year-round resident cetacean species in Dominican waters. In both areas (Parque Nacional del Este and Samana Bay) the main emphasis of the project is the populations of bottlenose dolphins (*Tursiops truncatus*) and Atlantic spotted dolphins (*Stenella frontalis*)



**Figure 1. Map of the Dominican Republic showing the location of Parque Nacional del Este and Samana Bay.**

## **METHODS**

A local *jolla* (fibreglass boat) measuring 6m in length with a 70hp outboard engine was used for dedicated surveys, which cruised at an average speed of 15km h<sup>-1</sup>. Due to the bathymetry of the study area, transect routes were split into three categories: inner, middle and outer. Inner transects were within 0.5 mile of the shore, middle transects were from 0.5 mile to 1.5 miles from the shore, and outer transects were between 1.5 miles and 3 miles from shore. The depth of the seabed in this area varies widely, ranging from 5m to 50m deep at 100m distance from the shore. At a distance of 5 km from the shore, the seabed depth can vary from 10m to 100m+. There are typically three main “drop-offs” within the survey area, where one might expect local upwelling of nutrients. Anecdotal information gathered from fishermen and tour boats prior to the surveys suggested that these drop-off areas and associated upwellings are utilised by cetaceans.

When cetaceans were encountered their positions was recorded with a handheld GPS, the species identified and confirmed by crew members, group size estimated, behaviour recorded and standard photo-identification pictures were taken using a Canon Rebel EOS 300D digital camera. Once sighted, cetacean

groups were followed and their track recorded. The encounters ended either through the animals being lost from sight, lack of fuel or due to adverse weather conditions.

In Samana Bay, local tour boat operators provided opportunistic sightings. The position of these sightings were recorded with handheld GPS, the species identified where possible, and group size and direction of travel estimated. No photographs were taken of these animals, as the whalewatching boats could not deviate from their routes. During January to March humpback whalewatching operations were also involved in collecting data for the project.

## RESULTS

Between June 2004 and March 2006, 99 surveys occurred in the coastal waters of the Parque Nacional del Este, with a total survey effort of 381 hours over 63 days. Surveys were timed to occur during different periods of the year to investigate whether there were seasonal changes in cetacean distribution or presence. Cetaceans were encountered during approximately 29 of the 381 survey hours. Four species of cetacean were identified: bottlenose dolphins (*Tursiops truncatus*), Atlantic spotted dolphins (*Stenella frontalis*), humpback whales (*Megaptera novaeangliae*) and pan-tropical spotted dolphins (*Stenella attenuata*). Possible sightings of two other species were also reported by local fishermen or tour boat operators: sperm whales (*Physeter macrocephalus*) and short-finned pilot whales (*Globicephala macrorhynchus*). However, the predominant species occurring in the waters of the Parque Nacional del Este were the bottlenose dolphin and Atlantic spotted dolphin.

Sightings of a single school of cetaceans per day were most common (n=18) (on 89% of encounter days), whilst the maximum was two sightings per day (n=2). Total time spent in encounters varied depending on the species: 14.08 hours (51% of total encounter time) were spent with bottlenose dolphins, 2.44 hours (8.8%) were with Atlantic spotted dolphins, 3.58 hours (13%) were with mixed groups of dolphins and 7.50 hours (27.2%) were spent in the company of humpback whales.

These surveys have determined that bottlenose and spotted dolphins use these waters year round, with identifiable individuals of both species seen regularly; possibly indicating residency. A total of 129 bottlenose dolphins were encountered during the surveys. Twenty-five individuals were identified via photographs and dorsal fin analysis using the FINSCAN image analysis software (Hillman *et al.*, 2003). A total of 104 Atlantic spotted dolphins were encountered, with 17 individuals identified. Discovery curves for the rate of identifying individuals for both species have not yet reached a plateau, indicating that more individuals will almost certainly be identified as the project proceeds.

The range of group sizes for both species were similar, ranging from 8 to 33 (mean = 14.11, SD = 8.05) in bottlenose dolphins and 8 to 36 (mean = 17.33, SD = 12.12) for Atlantic spotted dolphins, although spotted dolphin groups tended to be larger than those of bottlenose dolphins. The modal group size for bottlenose dolphins was 9 and 75% of the groups contained calves (mean = 1.75 calves per group, SD = 1.165). Calves were present at all times of the year both for spotted and bottlenose dolphin groups, indicating that there is no particular season for reproduction in either species. In two encounters, mixed groups were observed, *i.e.*, bottlenose and spotted dolphins were seen together. The predominant behaviours of animals in these mixed groups were “travelling” or “feeding”. There have, as yet, been no observations of obvious interspecific competition or interspecific mating, although the sample size is small. Mixed groups contained approximately 40 individuals, but specific numbers for each species in such a mixed group were undetermined, due to the difficulty of distinguishing between juveniles of each species.

Of the catalogued individual bottlenose dolphins, two (8.33%) have been re-sighted on 3 separate occasions, and two (8.33%) have been re-sighted on two separate occasions, but the remaining 21 have been sighted only once, albeit during a relatively short period of study. In comparison, one (5.88%) identified Atlantic spotted dolphin has been re-sighted three times, a further two (11.76%) have been re-sighted twice with the remaining 14 only being sighted once. Wounds and lacerations suggestive of propeller injuries, *i.e.*, cuts on the leading edge of the dorsal fin or missing sections of fin entirely (Fig. 3), have been observed, and data on such wounds are also being collected.

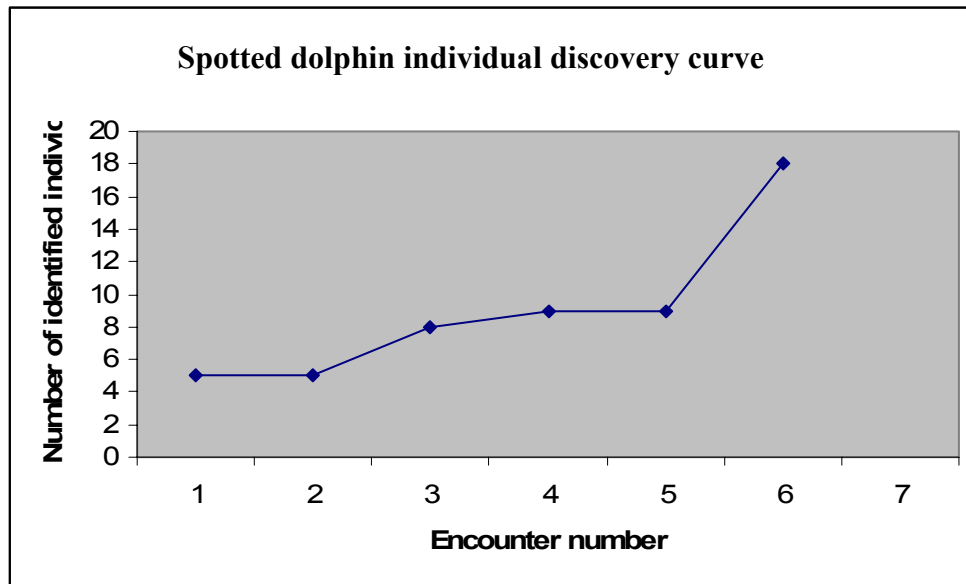
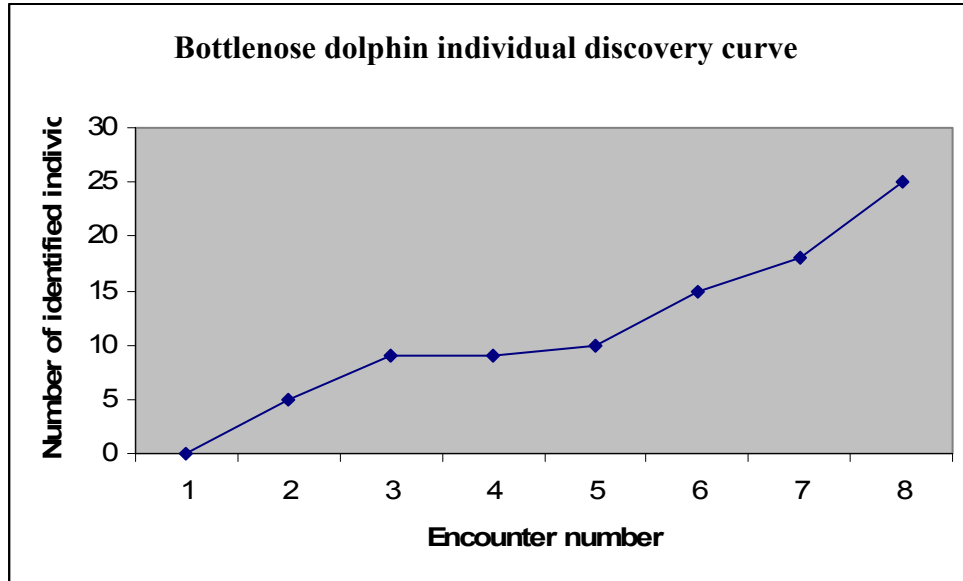


Figure 2. Discovery curves showing the rate of identification of new individual dolphins via photo-identification



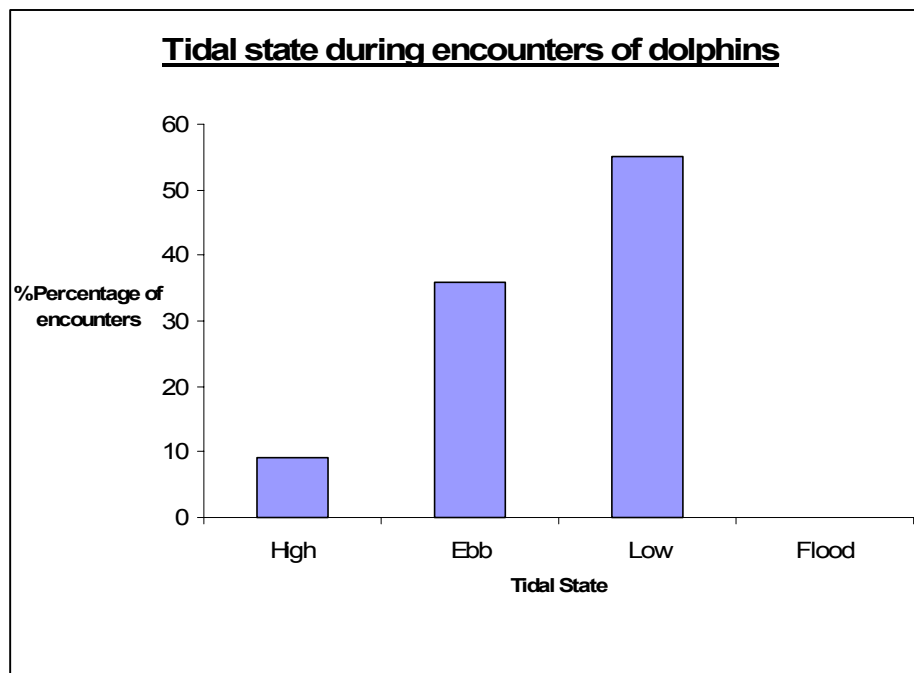
**Figure 3. Photographs of the dorsal fins of bottlenose dolphin sighted in the southeastern waters of the Dominican Republic showing evidence of boat propeller damage.**

Both species of dolphin displayed some interesting behaviours, the most unusual being that during rough weather (Beaufort sea state  $>5$ ) they came within 20m of shore, in waters less than 5m deep. This is perhaps the reverse of what would be expected, considering the risk of being washed against the shore or stranding in rough weather. Also of note is that both species performed very little aerial display.

The area in front of the village of Catuano and the mouth of the Catuano canal has an extremely high level of usage (Fig. 4). This area is a horseshoe-shaped, deep water (50m +) channel with a visible upwelling 5m from the surface. The Catuano canal is a narrow passage running between Isla Saona and the mainland of the Dominican Republic. On the far side of the island, the channel meets a reef; on the other side of the reef, the sea bed descends rapidly down to 100m. During ebb tide, the speed of the water passing through the Catuano canal is rapid. Sixty percent of all dolphin encounters have occurred in this area, although there have not yet been any sightings of dolphins in the canal itself. The majority of the dolphin sightings in this area were during ebb or low tide (Fig. 5), although this may be an artefact of observer effort.



**Figure 4. Map of the survey region showing the location of the Catuano Canal.**



**Figure 5. Chart showing the occurrence of dolphins at the mouth of the Catuano canal, in relation to tidal state.**

As for the dolphins' prey, we have thus far been unable to identify any particular species. On five occasions where the dolphins were witnessed feeding, flying fish (*Exocoetidae* sp.) were present, but the dolphins were not necessarily feeding upon these.

In March 2005, pan-tropical spotted dolphins (*Stenella attenuata*) were identified during a single encounter. This was the first time that they had ever been identified in the southeastern region of the Dominican Republic, with only two other records existing in the literature; one sighting occurred in the southwestern coast near the Haitian border (Roden & Mullin, 2000) and the second in Banco de la Plata, a marine mammal sanctuary 60 miles north of the Dominican Republic (Vásquez *et al.*, 2005).

On 8 March 2006, a pod of eight cetaceans tentatively identified as short-finned pilot whales (*Globicephala macrorhynchus*) was recorded by a fisherman in the survey area off the eastern tip of Saona Island in the south. Seven days later, a whalewatching boat also recorded a pod of eight short-finned pilot whales in Samana Bay in the north. No pictures are available of either encounter; however, both captains reporting the pilot whales were reliable.

In Samana Bay, opportunistic sightings from tour boats occurred between 7 Jan 2006 and 26 March 2006, during which time 40 trips occurred. A total of 20 encounters with dolphins resulted in seven sightings of bottlenose dolphins, six sightings of Atlantic spotted dolphins and seven sightings of unidentified species of dolphins. Group sizes ranged from 1-18 for bottlenose dolphins (mean = 5.16, SD = 6.67). Atlantic spotted dolphin groups ranged from 2 to 20 (mean = 12.5, SD = 8.43), with three encounters recording 20 animals. Group sizes for unidentified dolphins were between 2 and 6 (mean = 3, SD = 1.73), with pairs being seen on nearly half the occasions (n=3). In total, 30 bottlenose dolphins, 75 Atlantic spotted dolphins and 15 unidentified dolphins were recorded over the 3 month period. In one encounter, bottlenose dolphins were interacting with humpback whales; moreover, Atlantic spotted dolphins were seen interacting twice with humpbacks.

## DISCUSSION

As few studies have been carried out to date in the Caribbean, there is little regional information with which to compare the preliminary findings of this study, although comparisons can be made to coastal regions elsewhere. In the current study, maximum bottlenose dolphin group sizes were larger than recorded

in Drowned Cayes, Belize (range = 1-20; mean = 2.9; Kerr *et al.*, 2005), another Caribbean population, but groups sizes were similar to other coastal areas; for example, Golfo San Jose, Argentina (range = 8-22; mean = 15; Würsig & Würsig, 1977). We did not witness any single dolphins in our survey area; it is reasonable to expect this to change with time, as they have been reported in other parts of the Caribbean. The range of Atlantic spotted dolphin group sizes was comparable to the range of group sizes recorded in Bimini (range=1-30; mean= 2.7; SD =6.5; and range= 1-30; mean=7.8; SD=6.1; both from Brobeil & Dudzinski, 2001), although the minimum and mean group sizes were larger in the Dominican Republic. Group sizes were also larger than the generic figure of 5-15 cited by Jefferson *et al.* (1993) for coastal Atlantic spotted dolphins, although Jefferson (1996) also recorded groups ranging from 3 to 55 (average 20) in the northern Gulf of Mexico. On the West Florida continental shelf, Griffin and Griffin (2004) recorded groups of 1-48 (mean=6.2) for Atlantic spotted dolphins and 1-25 (mean=4.0) for bottlenose dolphins. It should be emphasised, however, that the data presented in this study are still preliminary and a larger sample size of encounters may yield different results.

The high level of use of the area near Catuano by dolphins is interesting, especially considering a possibly tidal influence of their occurrence in this area. It is possible that during tidal changes the dolphins use this area to capture fish concentrated by the high flow rate through the canal. One possible conservation measure for dolphins in the southeastern Dominican Republic might be the designation of a marine protected area. The high level of use of the Catuano area suggests that this might be “critical habitat” for the dolphins, warranting protection, and this issue will be examined more closely as this study progresses.

One of the aims of the Amigos project is to identify and address possible anthropogenic threats to dolphins in the Dominican Republic. Fishing in the area is primarily artisanal, and as yet there has been no perceived competition between the dolphins and fishermen and no reports of any by-catch. Tourism and a high level of coastal development are by far the main anthropogenic activities that might pose a threat. Every day over 100 boats make the trip from Bayahibe to Isla Saona; the boats hold up to 40 passengers and use twin outboard engines between 75hp and 150hp and travel at speeds of approximately 30 knots. They pass across the area in front of Catuano, which, as noted previously, appears to be a hot spot for dolphin sightings. An assessment of the impact of this boat traffic on dolphin behaviour and habitat use is a priority for the Amigos project. There is already some evidence of direct impacts of this boat traffic on dolphins, *i.e.*, photographs of dorsal fin injuries suggesting propeller-inflicted wounds (Fig. 3). Another threat from the growing tourism industry is pollution: untreated sewage is discharged from the many coastal hotels in the Bayahibe region into waters inhabited by dolphins. This issue has yet to be studied, but hopefully will soon be investigated by the Amigos project.

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