

## An Aggressive Interaction Between Bottlenose Dolphins (*Tursiops truncatus*) and Estuarine Dolphins (*Sotalia guianensis*) in Southern Brazil

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### Abstract

For the first time we report on an aggressive interaction between wild bottlenose dolphins (*Tursiops truncatus*) and estuarine dolphins (*Sotalia guianensis*) observed in Baía Norte, southern Brazil. Three bottlenose dolphins aggressively herded a *Sotalia guianensis* calf, which was the main target of the aggressive and threatening behaviours of the bottlenose dolphins. Another two to four adult *S. guianensis* were involved in the interaction and were constantly chased by the bottlenose dolphins. After approximately two hours, the bottlenose dolphins left the calf and the area, and no dead or wounded animals were seen afterwards. We provide a detailed spatial and temporal description of the interaction, and discuss the potential causes of this event.

**Key Words:** bottlenose dolphin, *Tursiops truncatus*, estuarine dolphin, *Sotalia guianensis*, interspecific interaction, aggressive behaviour, Baía Norte, Brazil

### Introduction

Interactions between cetacean species are common events that generally lead to the formation of mixed-species groups of affiliative nature, which may improve the food-finding capability of at least one of the species involved (Norris & Dohl, 1980). Such a hypothesis is corroborated by the fact that these mixed-species groups are found more often in offshore waters (Scott & Chivers, 1990), where the risk of predation is higher, and prey often aggregate in larger schools (Norris & Dohl, 1980; Wells et al., 1980).

Many authors have verified interspecific encounters that include aggressive and threatening behaviour and also lethal attacks. Such encounters may include predatory and nonpredatory interactions. The reason for this distinction is that some aggression or “harassment” situations

between two species may be more complex than predator-prey interactions (Jefferson et al., 1991). Several apparently isolated situations of complex aggressive interactions involving mainly coastal sympatric species are recorded in the literature (Baird, 1998; Herzing, 1996; Herzing & Johnson, 1997; Patterson et al., 1998; Ross & Wilson, 1996; Wedekin et al., 2004; Weller et al., 1996). The reasons for these conflicts are still poorly known and may vary in each case.

Bottlenose dolphins (*Tursiops truncatus*) are frequently encountered in association with various small cetacean species, including *Globicephala macrorhynchus* (Norris & Prescott, 1961; Scott & Chivers, 1990), *Grampus griseus* (Wells & Scott, 1999), *Stenella frontalis* (Herzing, 1996; Herzing & Johnson, 1997), *Steno bredanensis* (Wells & Scott, 1999), but also with large whales such as *Megaptera novaeangliae* (Wells & Scott, 1999), and *Eubalaena australis* (Würsig & Würsig, 1979).

A resident population of estuarine dolphins (*Sotalia guianensis*) can be observed throughout the year in the waters of the Baía Norte, Brazil (Flores, 1999; Simões-Lopes, 1988), which is the southernmost limit to this species distribution (Simões-Lopes, 1988). The *S. guianensis* resident population concentrates its activities in two distinct areas inside the Baía Norte: the Currais Bay and the São Miguel Bay (Daura-Jorge et al., 2002). Part of *S. guianensis*' range in Baía Norte, including Currais Bay, is covered by the Environment Protection Area of Anhatomirim, a marine-protected area created specifically to protect this *Sotalia* population. The presence of bottlenose dolphins in the Baía Norte is occasional (Simões-Lopes & Ximenez, 1993) and possibly related to the seasonal migration of mullets (*Mugil* spp.), one of their prey species.

The present work is an anecdotal narrative of an aggressive interaction between *S. guianensis* and bottlenose dolphins in southern Brazil. We also

discuss the potential causes of such an interspecific interaction.

### Materials and Methods

The Currais Bay, a small 1-km<sup>2</sup> bay where the interaction described here took place, is located at the entrance to the Baía Norte, near Santa Catarina Island (27° 23' to 27° 35' S and 48° 33' to 48° 30' W) in southern Brazil (Figure 1).

The interaction was observed from a 5-m sailboat. The geographical positions of the interacting mixed-species group were registered at 5-min intervals using a handheld GPS. The geographical positions of the non-interacting *Sotalia guianensis* group was estimated relative to the position of the research vessel and the interacting group of dolphins. All spatial data were plotted on a digitized nautical chart using *ArcView GIS 3.1* (Environmental Systems Research Institute, Inc. – ESRI) and used to create seven different geo-referenced chronological situations of the interaction.

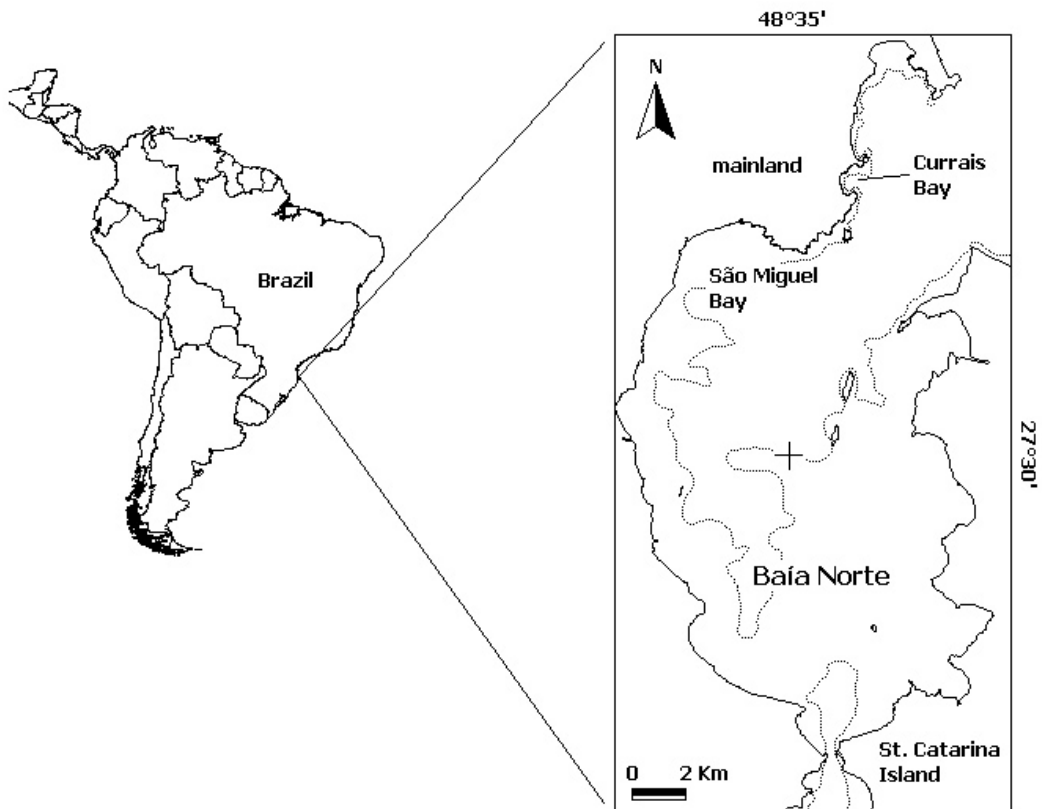
The conditions for observation were excellent, with the sea state equivalent to Beaufort 1 and

good visibility. The distance between the research vessel and the interacting dolphins varied from 1 to 30 m. Approximately 140 photographs were taken during the encounter. The boat was under sails throughout the interaction, and the dolphins did not show any apparent reaction to the boat. Due to the poor underwater visibility, we could not conduct any underwater observations.

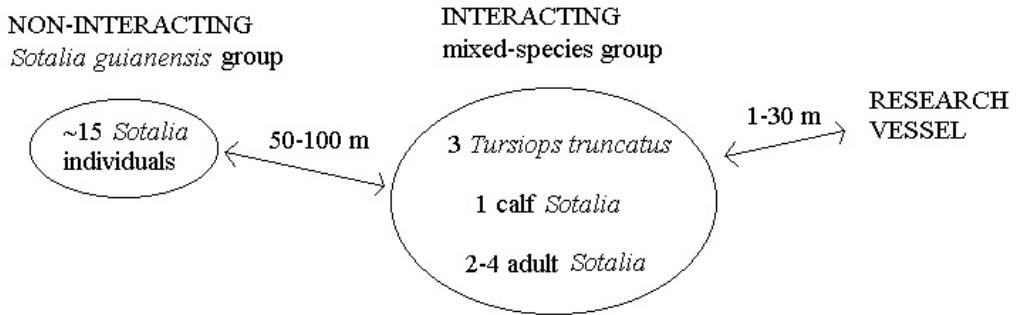
The term “interaction” was used here to denote any occurrence of *S. guianensis* and bottlenose dolphins in close proximity, independent of whether or not a change in the behaviour of either species was observed (see Jefferson et al., 1991).

### Results

The observation took place on 16 March 2002, starting at 0640 h and ending at 0850 h, when the bottlenose dolphins left Currais Bay, totaling 2.16 h of direct observation. During the entire period, three adult bottlenose dolphins kept a calf *Sotalia guianensis* apart from a non-interacting *S. guianensis* group comprising approximately 15 individuals (Figure 2). This calf was the main target of the



**Figure 1.** General view of the Baía Norte study area and Currais Bay; dotted lines show 3-m isobath.



**Figure 2.** Schematic representation of the interaction between *Tursiops truncatus* and *Sotalia guianensis* in southern Brazil, showing how individuals of both species were involved

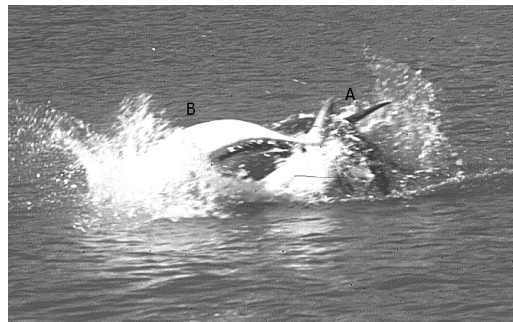
aggressive and threatening behaviours of the bottlenose dolphins. Any attempt by the calf to leave was prevented by the bottlenose dolphins who chased or blocked the calf with their larger bodies. Another two to four adult *S. guianensis* were involved in the interaction and were constantly chased by the bottlenose dolphins as well. The large group of *S. guianensis* always kept a minimum distance of 50-100 m from the interacting animals.

Between birth and physical maturity, many age classification may exist, but this could not be accurately defined for the calf *S. guianensis*. Calf classification was defined based on the individual's smaller size (compared to an adult *S. guianensis*) and its paler coloration (according to Randi et al., in press). We discarded the possibility of the calf being a neonate based on the absence of fetal folds, size, and behaviour.

The calf was the only animal we were able to identify individually; the other adult individuals of both species could not be reliably recognized through scars, marks, or pigment from surface observations. We also were not sure whether the adult *S. guianensis* involved were always the same, or if they changed during the interaction. The highly dynamic nature of the interaction between *S. guianensis* and bottlenose dolphins and the movements of the adult *S. guianensis* around the interaction suggested that different adult *S. guianensis* individuals were constantly moving in and out of the interaction, while the same calf was always herded by the bottlenose dolphins.

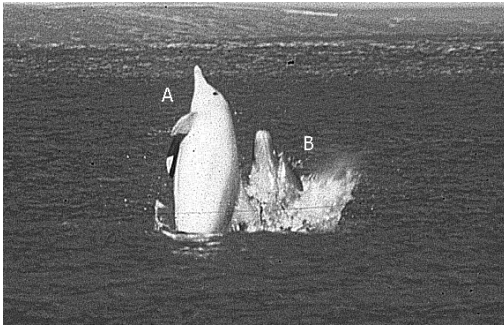
The definition of the interacting (mixed-species) and non-interacting groups was arbitrary and based on the distance among individuals of both species (see Jefferson et al., 1991, and description above). We could not affirm with certainty if the non-interacting group was or was not participating in the interaction, either acoustically or through any other form.

The aggressive behaviours of the bottlenose dolphins included charging, downward-pointed head and flukes, and even physical violence, such as head strikes (Figure 3) and slaps of the pectoral fins and flukes. The escape behaviour displayed by the adults and calf *S. guianensis* involved in the interaction included high vertical breaches and rapid swimming. The most unusual behavioural event was performed by the calf, who often put more than half its body vertically above the water, remaining in this position for some seconds (1-3 s) (Figure 4). This might have been an escape behaviour in response to the underwater aggressive behaviour directed at it by the bottlenose dolphins.



**Figure 3.** Physical contact between *Tursiops truncatus* (A) and the calf *Sotalia guianensis* (B)

The seven situations presented below describe the spatial dynamics of the interacting and non-interacting dolphin groups chronologically. We also include a brief description of the singular events observed at each situation. The distances between the different groups described in the situations below could not be accurately estimated, and we could only provide relative distances (see Figure 5).



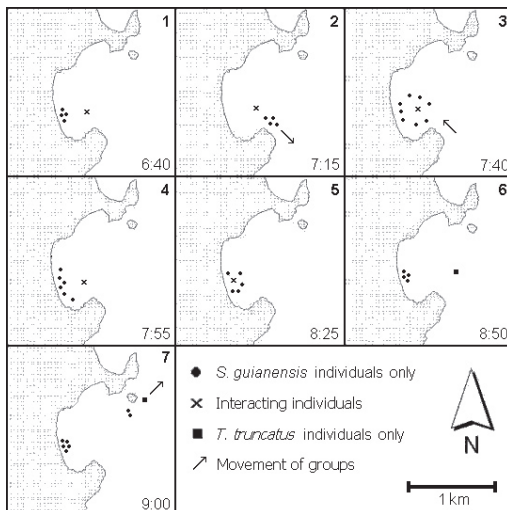
**Figure 4.** Escape behaviour of the calf *Sotalia guianensis* (A) in close proximity with *Tursiops truncatus* (B)

#### Situation 1

At 0640 h, the observers first noted that three adult bottlenose dolphins and four *S. guianensis* (2 adults and 2 calves) were interacting, while approximately 15 *S. guianensis* remained near the beach in a tight cluster. After 0705 h, only one calf continued interacting to the end of our observation. The second calf was not observed further during our observations of these dolphins.

#### Situation 2

At 0715 h, the large *S. guianensis* group left the bay, while the bottlenose dolphins and three *S. guianensis* (including the calf) continued to interact inside the bay. On many occasions, for



**Figure 5.** Different moments of the interaction between *Tursiops truncatus* and *Sotalia guianensis* in Currais Bay, southern Brazil; the symbols in the maps do not correspond to the quantity of individuals in the groups but only to their spatial position. The distances between the groups are relative and could not be accurately estimated.

brief intervals, the calf remained still and horizontally near the surface. This event was interpreted by observers as a possible sign of distress and was observed repeatedly throughout the interaction.

#### Situation 3

At 0740 h, the large non-interacting *S. guianensis* group returned to the interior of the bay and remained dispersed around the interacting dolphins.

#### Situation 4

At 0755 h, the large non-interacting *S. guianensis* group moved away from the interaction, closer to the beach.

#### Situation 5

At 0825 h, the interacting individuals moved closer to the beach. The large non-interacting *S. guianensis* group remained near the beach and moved around the interaction again. This time, the non-interacting *S. guianensis* group was closer to the interaction, and it was difficult to distinguish the two groups. Two adult individuals of the interaction group, one of each species, were observed to collide in the air, and a bottlenose dolphin was observed throwing the calf out of the water with a strong and rapid upwards movement of the tail.

#### Situation 6

At 0850 h, the bottlenose dolphins left the interaction and engaged in feeding behaviour for approximately 10 min at the entrance of the bay, while the large *S. guianensis* group stayed close to the beach. The calf *S. guianensis* was not observed again.

#### Situation 7

At 0900 h, after a dive of approximately one min, the bottlenose dolphins began to move away from the Currais Bay. Two adult *S. guianensis* were observed swimming at a distance of approximately 50 m behind them.

At 0915 h, the researchers began a focal-group observation of the large *S. guianensis* group. At this time, the group showed a typical feeding behaviour pattern and occupied the same areas as those usually concentrated upon by the resident population. The large group was observed for 2 h, and neither wounded nor dead animals were observed from the boat or at the surface.

## Discussion

Recently, records of aggressive interactions between cetacean species have received more attention in the literature. These include a wide array of contexts that range from threat, like



vigorous tail slapping, which may lead to competitive exclusion (Shane, 1995), to physical violence with lethal consequences (Patterson et al., 1998; Ross & Wilson, 1996). Between these two extremes are several specific cases involving many species.

A majority of these confrontations involve the bottlenose dolphin, which according to Connor et al. (2000) is also one of the very few mammals known to direct lethal, nonpredatory aggression to other marine mammal species.

Records of interactions between *Sotalia guianensis* and bottlenose dolphins are scarce. Terry (1984) described an aggressive interaction between *S. guianensis* and bottlenose dolphins in captivity. From the wild, Monteiro-Filho et al. (1999) described one single interaction of cooperative feeding between a lone bottlenose dolphin and three *S. guianensis* (two adults and one calf) in southern Brazil. Other mixed species groups have been reported from Costa Rica's Caribbean coast (Forestell et al., 1999).

The case presented here is the first aggressive interaction recorded between *S. guianensis* and bottlenose dolphins from the wild, both coastal species of a largely sympatric distribution along the Brazilian coast. Evidence that this aggressive interaction was not an isolated case includes the observation by Flores (2003) of deep bottlenose dolphin tooth rakes in one *S. guianensis*' body, and a displacement situation of *S. guianensis* by bottlenose dolphins in the area. The main target of the violent attacks by the bottlenose dolphins described here was a calf *S. guianensis* that was kept coercively separated from its main group. This was similar to what Connor et al. (1992) observed in western Australia in intraspecific interactions between bottlenose dolphin individuals, where females were aggressively herded by male alliances for sexual/reproduction purposes.

Some interactions involving the bottlenose dolphin and other sympatric small cetacean species may have a sexual nature, such as the one described by Herzing (1996) involving *Stenella frontalis* in the Bahamas. Mixed groups of *S. guianensis* and bottlenose dolphins that were showing sexually related behaviour also have been observed in Costa Rica (Forestell et al., 1999). Forestell et al. concluded that groups of male bottlenose dolphins approach and herd female *S. guianensis* in attempts to mate. These cases corroborate the supposedly isolated cases of natural hybrids involving the bottlenose dolphin (Fraser, 1940) and partly reflect the great behavioural plasticity of the bottlenose dolphin in relation to partners of other species (Cousteau & Diolé, 1975; Lockyer, 1990); however, during the approximately two hours of direct observation of this aggressive

interaction, no sexually related behaviour (such as penile extroversion/intromission or belly-to-belly contact) was observed.

Prey competition has been proposed to explain the violent attacks of bottlenose dolphins on harbour porpoises (*Phocoena phocoena*) in Scotland (Ross & Wilson, 1996), and of pilot whales (*Globicephala macrorhynchus*) on Risso's dolphins (*Grampus griseus*) in California (Shane, 1995). Wilson (2000) cited the occurrence of interspecific dominance among closely related species. The degree to which one species dominates the other may vary depending on the phylogenetic relation between the species involved and their ecological similarity. Generally, the larger species dominates the smaller. This situation was observed by Corkeron (1990) between bottlenose and humpback dolphins (*Souza chinensis*) feeding on trawlers' by-catches in Australia. Clua & Grosvalet (2001) observed mixed-species feeding aggregation in the Azores where sometimes the bottlenose displaced common dolphins (*Delphinus delphis*) away from the prey concentration. Although no aggressive interaction was observed, the substitution of one species by the other was always preceded by specific types of sound. There is not sufficient evidence to support the prey competition hypothesis for the event that we observed in southern Brazil. Although both species may sometimes feed on the same prey items, one limitation to the prey competition hypothesis in this case is the fact that both species are generalists who do not depend on a specific diet (see Borobia & Barros, 1991, for *S. guianensis*; and Barros & Odell, 1990, for *Turstopus truncatus*), with little likelihood for the occurrence of niche overlap. Moreover, many or most organisms that an animal sees or hears do not represent a competitor, even if resources are shared by these organisms (Krebs, 2001).

Infanticide and object play (Baird, 1998; Ciano & Jorgensen, 2000; Patterson et al., 1998) and even practice of predation (Weller et al., 1996) have been proposed as explanations for some of the aggressive interactions among cetacean species. Object play is highly distributed in vertebrates, including turtles, crocodiles, and birds, and for wild or captive mammals (e.g., Burghardt, 1999). It generally is practiced by juvenile individuals, but sometimes also by adults. In juveniles, it may serve as practice for predatory behaviour or as practice for tool use (in primates). Playing may also enable the exploration of stimuli, objects, and environments that are new to juveniles. This last argument is still valid for adult animals that play and that might be better able to adapt skills to new requirements (Hall, 1999).

The various violent interactions involving either the bottlenose or the Pacific white-sided dolphin (*Lagenorhynchus obliquidens*) with the smaller harbour porpoise generally involve yearling individuals (Baird, 1998; Patterson et al., 1998; Ross & Wilson, 1996). The same was observed in the case presented here. The hypothesis that calf individuals are "safer objects" for exploration of stimulus, for practice fighting, or for developing new skills should be considered.

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