

A photo-identification catalogue of bottlenose dolphins (*Tursiops truncatus*) in Northeast Patagonia, Argentina: A tool for the conservation of the species

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ABSTRACT

A photo-identification study of bottlenose dolphins (*Tursiops truncatus*) was performed in the northern Gulf of San Matías, Patagonia Argentina, during the period 2006-2008. In total, 199 surveys were conducted with an average observation effort of 4.2h (SD=1.5) per survey. These surveys resulted in a total observation effort of 824.7h of which 105.7h was spent with 158 dolphin groups. Over 12,500 pictures were analysed using the automatic identification systems *FinEx* and *FinMatch* (EuroPhlukes Initiative, Leiden University, The Netherlands), resulting in the first identification catalogue of 47 dolphins for the North Patagonian region. The catalogued dolphins were re-identified up to 13 days with 57% ($n=47$) showing a degree of residency for the Natural Protected Area Bahía de San Antonio (NPABSA; resighting frequency (RF) ≥ 4). At least 6 dolphins, including one mother with her calf, were additionally re-identified inside the estuary of the river 'Río Negro', 250km east, indicating that their home-range includes at least the whole northern region of the Gulf of San Matías. Data suggest that it concerns a stable but yet unknown population of bottlenose dolphins with a high touristic potential and an urgent need of conservation measurements. The obtained photo-identification catalogue is meant to serve as a tool for the conservation of the species and the realization environmental education projects in the region.

KEYWORDS: BOTTLENOSE DOLPHIN, PHOTO-ID, CONSERVATION

INTRODUCTION

The common bottlenose dolphin (*Tursiops truncatus*) can be found in all the temperate and tropical marine waters of the world (Perrin *et al.*, 2002). The apparent regional form of *T. truncatus* in the Southwest Atlantic was suggested to be considered as the subspecies *T. t. gephyreus* or even the species *T. gephyreus*, typical for Argentina, Uruguay and South Brazil (Bastida and Rodriguez, 2003; Barreto, 2004). Nevertheless, further research is needed to accurately address this point of discussion.

In Argentina, the bottlenose dolphin can be seen from the Bay of Samborombón (province of Buenos Aires) down to the province of Chubut, although some records have been made more South, in the province of Santa Cruz and Tierra del Fuego (Perrin *et al.*, 2002; Bastida and Rodriguez, 2003). Most research on wild bottlenose dolphins in Argentinean waters were made in the early '70s - '80s (Würsig and Würsig, 1977; Würsig, 1978; Würsig and Würsig, 1979; Würsig and Harris, 1990; Shane, 1986) resulting in the first identification catalogues of this species in Argentina (53 dolphins for the area of Península Valdés (Würsig and Würsig, 1977) and 30 dolphins for the area of the Buenos Aires province) (Bastida and Rodriguez, 2003). Since the '80s, the number of sightings along the coast of the Buenos Aires province declined and nowadays it became even rare to see bottlenose dolphins in this region. Also the presence of this species in the area of Península Valdés has become sporadic (Perrin *et al.*, 2002; Bastida and Rodriguez, 2003).

Only recently, it was revealed that one of the few places in Argentina where bottlenose dolphins can be seen frequently from the shore, is the Natural Protected Area Bahía de San Antonio (NPABSA), Northeast Patagonia (Holsbeek *et al.*, 2008). Populations of bottlenose dolphins are generally known to inhabit coastal areas, including bays and tidal creeks (Leatherwood *et al.*, 1983), and their frequent presence along coastlines has made this one of the best studied cetacean species in the world (Bearzi, 2005). Due to the high frequency of bottlenose dolphin sightings in NPABSA, also this area seems very suitable for a long-term study of ecological and behavioural aspects of the species (Holsbeek *et al.*, 2008).

The presented photo-identification catalogue is aimed to form a base of information to investigate the bio-ecological aspects of this unknown austral bottlenose dolphin population, as a response to their increasing conservation needs caused by increasing human activity. Additionally, the identification of these charismatic animals might serve as a useful tool for various environmental education programs, this way also contributing to the conservation of the species.

METHODS

Study area

Most data were collected in the NPABSA, a shallow bay (maximum depth not reaching more than 30m) located in the northwestern region of the San Matias Gulf ($40^{\circ}50'S$ $64^{\circ}50'W$), Patagonia Argentina (fig. 1). The region is known for its relative warm waters (max temp. in summer reaching up to $22^{\circ}C$) and relative high salinity compared to the waters more South in the gulf (Gagliardini and Rivas, 2004).

Additional data were collected throughout the study in the estuary of the river 'Río Negro' (ERN), located in the northeastern region of the San Matias Gulf ($41^{\circ}03'S$ $62^{\circ}48'W$) and known for its brown and turbid waters, and Bahía Rosas (BR) located between the two regions mentioned above (fig. 1).

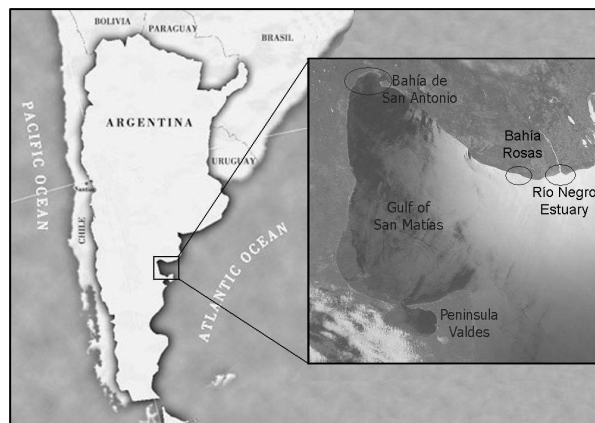


Figure 1: Map of the study area indicating Natural Protected Area Bahía de San Antonio, Bahía Rosas and the Río Negro estuary

Sampling and analysis

Land-based observations were made from August 2006 up to March 2008, using Nikon binoculars 8x40, a Kowa scope TSN-822 20-60x82 and a Kenko Volare scope 20x50. Observations were made in good weather conditions (beaufort ≤ 3 , sea state 'calm') and were cancelled with stormy weather (beaufort > 3 or rainfall).

When dolphins were seen, an attempt was made to photograph the dorsal fins of all individuals using a digital reflex camera Nikon D70 with a 170-500mm 1:5-6.3D Sigma lens. All clear pictures of dorsal fins were analysed using the computer assisted identification systems *FinEx* and *FinMatch* (EC EuroPhlukes Initiative, University of Leiden, The Netherlands) for identification or re-identification of individuals. The naturally occurring marks used in this study are (adapted from Wilson, 1995) (1) dorsal fin cuts (pieces of tissue missing from the edge of the dorsal fin) (2) unusual dorsal shapes (distinctive dorsal fins) (3) mayor scars (large scars and scratches on the dorsal fin or flank) (4) areas of depigmentation (areas on the dorsal fin or flank with a distinctive lighter coloration) and (5) deformations (alterations of the normal body contour). These marks are considered to be unique and permanent. Calves were categorized as those animals that had 2/3 or less the length of an adult and swam mostly in close association with an adult. Neonates were defined by their very small size (less than 1/3 the length of an adult), their foetal folds and their very close association with an adult (Shane, 1990). Identified dolphins closely accompanied by a calf or neonate in at least two sightings were assumed to be females (Grellier *et al.*, 2003). The degree of residency was estimated by the re-identification frequency (RF) following Culloch (2004); non-resident (RF=1-3) - occasional (RF=4-7) - frequent (RF=8-11) - common (RF ≥ 12).

All statistical data were analysed using STATISTICA 6 and Zar (1996).

RESULTS

Observation effort

Data were collected in NPABSA, BR and ERN during 199 land-based surveys with an average observation effort of 4.2 hours (SD=1.5) per survey ranging between 15min and 7.3h. In total, 824.7h were spent searching for bottlenose dolphins of which 105.7h were spent with 158 dolphin groups.

Photo-identification and site fidelity

Over 12,500 clear pictures of dorsal fins were analysed using the computer assisted identification systems *FinEx* and *FinMatch* (EC EuroPhlukes Initiative, University of Leiden, The Netherlands). As a result, a total of 47 dolphins could be identified and classified into an identification catalogue, based on the natural marks on their dorsal fins and flanks (Annex I). Of the identified animals, at least 17% ($n=47$) were catalogued as females sighted several times with their calves (including 2 neonates). Figure 2 shows the rate at which dolphins could be identified throughout this study. Only re-identifications proven by pictures were used for analysis; although dolphins could be recognized on the field, these data of ‘re-captures by eye’ were excluded for analysis.

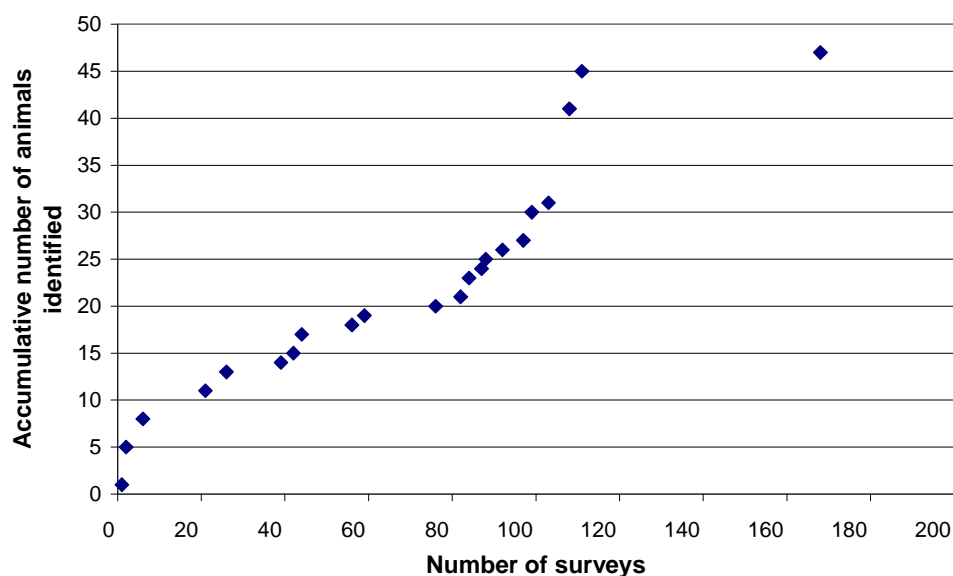


Figure 2: Identification rate of bottlenose dolphins along the northeastern coast of Patagonia.

The re-identification frequency ranged up to 13 days (fig. 3) days with an average RF of 4.6 (SD=3.4). Of the identified dolphins ($n=47$), the vast majority (81%) was photographed only in NPABSA whereas only 4% was photographed exclusively in ERN and 2% exclusively in BR. The other 13% of the catalogued dolphins (including one female with her calf) could be photographed in both NPABSA and ERN.

In general, the highest re-identification frequencies were found in NPABSA, where 57% ($n=47$) were re-identified at least four times over different months, and therefore prudently suggested as being ‘resident’ in this area throughout the first study year. Of these ‘resident’ animals ($n=27$), 48% might be categorized as being ‘occasional’ in the area (RF=4-7), 41% as ‘frequent’ (RF=8-11) and 11% as being ‘common’ (RF \geq 12) in NPABSA during the first study year. Up to now, no hypothesis can be drawn on the residency of bottlenose dolphins in the other areas of the Northeast Patagonian coast (e.g. ERN and BR) due to the relative low effort outside NPABSA. Nevertheless, no more than 15% of all the identified dolphins ($n=47$) were seen only once.

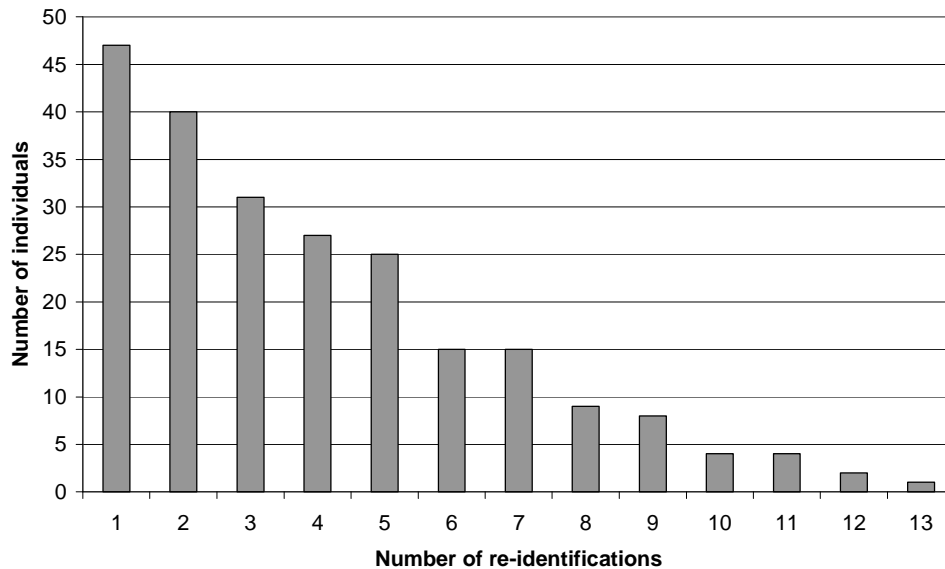


Figure 3: Re-identification frequency of identified bottlenose dolphins in Northeast Patagonia.

DISCUSSION

This study resulted in one of the most extended and recent photo-identification catalogues of bottlenose dolphins in Argentina. Although the study was land-based, this catalogue could be obtained as the result of the high presence of bottlenose dolphins in Northeast Patagonia and their closeness to the coast, making this area an excellent place to study this species on a long term. The apparent slower rate at which dolphins were identified over the last 50 surveys (fig. 2), bearing in mind that the observation effort was relatively constant in time, might suggest that the catalogue contains a considerable amount of dolphins compared to the total amount of animals in the area. On the other hand, this might also be discussed by the difficulty to conduct a photo-identification study with land-based observations only. It is therefore suggested that extensive boat-based observations should be carried out in the near future, to estimate precisely the abundance of dolphins in the region.

The greater amount of re-identifications in the NPABSA might be a mere reflection of the greater effort in this area compared to the other observation sites. Although no conclusions can be drawn due to the lack of multiple year observations, the number of re-identifications in NPABSA over different seasons might indicate a form of residency in this area of at least 27 dolphins (57%). Even more, the difficulty to photo-identify during land-based observations will inevitably underestimate the overall re-identification frequency. Nevertheless, the variations in time between many of the resightings of identified dolphins might suggest that the NPABSA represents only part of a larger home-range¹ in Northeast Patagonia (Bearzi, 2005). This is further confirmed by the re-identification of 6 individuals in the Río Negro Estuary, 250km East, possibly indicating that the home-range of these dolphins comprises at least the whole northern region of the Gulf of San Matías. This may not seem surprising as bottlenose dolphins are known to swim large distances (Würsig and Würsig, 1977; Würsig, 1978; Wells *et al.*, 1990; Defran *et al.*, 1999; Bastida and Rodriguez, 2003). Moreover, estuarine areas and river mouths have repeatedly been found to be sites of high bottlenose dolphin occurrence (Scott *et al.*, 1990; Berrow *et al.*, 1996; Gubbins, 2002; Zolman, 2002), as they are often characterised by high levels of primary productivity and prey abundance (Acevedo, 1991). In any case, the fact that the study is land-based and the relative low observation effort outside NPABSA, might underestimate the total home-range of these dolphins and their site-fidelity to the distinct areas.

Data suggest that it might concern a stable but unknown bottlenose dolphins population in Northeast Patagonian waters, with a high ecological value, a high commercial potential and an urgent need for conservation. Further systematic research, both land- and boat-based, is therefore highly necessary to obtain more information concerning these dolphins for the implementation of conservation

¹ Home-range, as defined by Burt (1943), is the area traversed by the individual in its normal activities of food-gathering, mating and caring for young.

measurements. The identification catalogue presented in this study should serve as a tool for the continuous research of this species in Argentinean waters and the implementation of environmental education programs to consequently preserve the species and learn to value their different habitats.

ACKNOWLEDGMENTS

Many thanks go to the people of Cota Cero Buceo (C. Barbieri and S. Leal) for their support. Other thanks are for the Consejo de Ecología y Medio Ambiente de Río Negro (CODEMA) and the Dirección de Fauna Silvestre de Río Negro for the field permits.

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Annex I: Identification catalogue of bottlenose dolphins (*Tursiops truncatus*) in Northeast Patagonia.



RN - BSA-M1/06

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RN - BSA-M2/06



RN - BSA-M3/06



RN - BSA-M4/06



RN - BSA-M5/06



RN - BSA-M6/06



RN - BSA-M7/06



RN - BSA-M8/06



RN - BSA-M9/06

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RN - BSA-M10/06

ERN







RN - BSA-M21/07 ♀



RN - BSA-M23/07



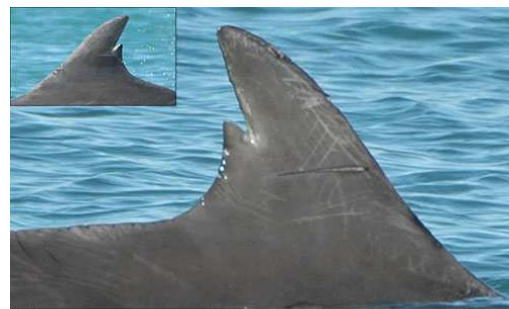
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RN - BSA-M22/07 ERN



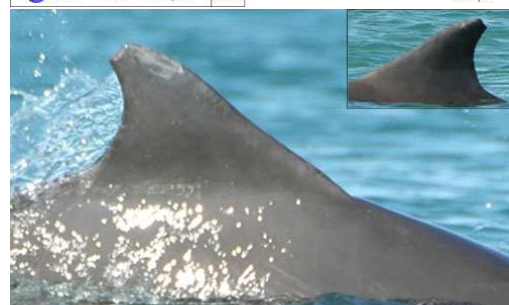
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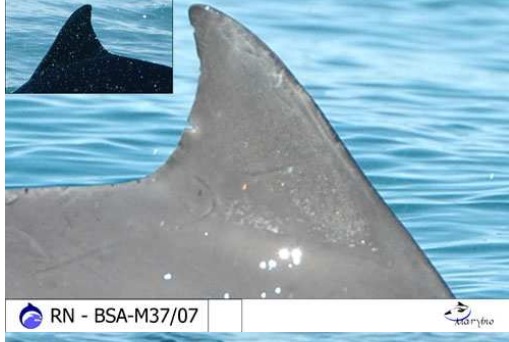
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RN - BSA-M28/07 ERN



RN - BSA-M30/07 ERN





RN - BSA-M41/07



RN - BSA-M42/07



RN - BSA-M43/07 ♀ ERN



RN - ERN-M44/07



RN - ERN-M45/07



RN - BR-M46/08



RN - BSA-M47/08

