TONINAS PROJECT FINAL REPORT

RUFFORD SMALL GRANTS FOUNDATION

IDENTIFYING CRITICAL AREAS OF BOTTLENOSE DOLPHIN POPULATIONS: A COORDINATED REGIONAL CONSERVATION PROJECT

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INTRODUCTION

Regional background: The bottlenose dolphin populations in the South-western Atlantic Ocean

Distributed in tropical and tempered waters of the world the bottlenose dolphin (*Tursiops truncatus*) (Montagu 1821) occupies a variety of marine environments (Leatherwood & Reeves 1983). In the South-western Atlantic Ocean its distribution is discontinuous from the Amazon River estuary, Brazil (Siciliano *et al*. in press) to Tierra del Fuego, Argentina and Falklands Islands (Bastida *et al.* 2007). Along the Brazilian coast, small resident populations are associated to estuaries, rivers mouth, mangroves, bays and coastal islands (Castello & Pinedo 1977, Martuscelli *et al*. 1996, Simões-Lopes & Fabian 1999, Bernardi 2000, Hoffman 2004, Flores & Fontoura 2006, Lodi *et al*. 2008). On the other hand, along Uruguayan coast bottlenose dolphin occurs in open beaches along the coast with a few preference areas (Laporta 2004). In Argentinean coast, the populations are associated to gulfs and bays (Wursig & Wursig 1979, Vermeulen *et al*. 2008).

Although many populations occur along the South-western Atlantic Ocean, the relation between them and their structure still unknown. In particular, the population of Patos Lagoon in southern Brazil and that of the Atlantic Uruguayan coast has been study in a coordinated manner since 2003. The proximity between both areas and the dynamic movements of the species, from 25-65 km (Ballance 1992) to more than 670 km along the coast of California (Wells *et al.* 1990), were the justification to work jointly with a regional background, due to the possibility of being studying the same population or for being sharing individuals between study areas. Since the beginning of Toninas Project we receive the technical and logistic support, as well as, an active communication and collaboration of the southern Brazilian research group of the Museu Oceanografico Prof. Eliézer C. Rios and the Laboratório de Tartarugas e Mamíferos Marinhos of the Universidade Federal de Rio Grande (FURG), RS. In this context, in both study areas,

the Patos Lagoon and the Atlantic Uruguayan coast, we standardized the data collection, photo-identification technique and analyses and habitat use studies, as well as, the sample design in a simultaneous way. This standardization let us accurate comparisons of our results and have a more clear and robust scenario from which take and develop criteria and guide lines to supervise the protection of this species in southern Brazil and Uruguay.

A small population of approximately 85 bottlenose dolphins (Dalla Rosa 1999, Fruet 2008) inhabits the Patos Lagoon estuary (Figure 1) year round and has been studied since the mid 1970s, though not continuously. The area is used for all the population vital activities such as feeding, socializing, reproduction and resting (Möller 1994, Dalla Rosa 1999). Until 2002 by-catch was suspected to be a minor problem to this bottlenose dolphin population. However, during the last few years, there was a great increase in the number of dolphins found dead on the beach, many of which presenting evidences of being caught in fishing nets (*e.g.* net marks on the flukes and/or mutilated body parts) (see also Fruet *et al*. 2005). This threaten is displaying a serious risk in the viability of this population in next 25 years, in case these rates remained in the current levels (Fruet 2008).

The neighbouring population that inhabit the Atlantic Uruguayan coast has been estimated in approximately 40 individuals in its first abundance estimate (Laporta *et al.* 2008a) and presents a high percentage of residents individuals, although highly mobiles along the Uruguayan coast (Laporta *et al.* 2006). Despite the effort of coordinated research to determine the movement patterns of dolphins between southern Brazil and Uruguay and its population structure, only since 2007 we could verify the existence of individual movements between both areas (Laporta *et al.* 2008b). This discovery gather more importance due to the high annual rates of mortality caused by the incidental captures in fishing nets registered since 2002 in

southern Brazil. The consequence of the probable decline in adjacent populations still remains unknown, a time that does not have information on the population structure of bottlenose dolphin in the South-western Atlantic Ocean. However, a negative effect is waited, a time that recently studies with the species in other countries suggest a reduced genetic flow between coastal neighbouring populations locally specialized and habitat dependent (Natoli *et al*. 2005, Sellas *et al*. 2005), fulfilling part of the criteria of a metapopulation structure (Nichols *et al.* 2007).

Long-term estimates of population size and movement patterns are integral components of the necessary information to control human impacts on natural cetaceans' populations (Hooker *et al.* 1999, Wilson *et al.* 1999, Ingram & Rogan 2002, Hastie *et al.* 2003). Furthermore, distribution and movement patterns together with behavioural data of a population can describe the habitat use, which is an important tool that has been used to delimit critical areas for the conservation of cetaceans (*e.g.* Ingram & Rogan 2002, Hastie *et al.* 2004, Parra *et al.* 2006). Critical areas are defined as areas regularly used by a group, population or species to perform activities essential for survival and maintaining a healthy population growth rate (Hoyt 2005). These essential tasks include feeding, breeding, calving and resting.

The information on abundance, movement patterns and habitat preferences for bottlenose dolphin population will be important to elaborate tentative guidelines to orientate the Uruguayan Agency for Environment (DINAMA), currently establishing the National System of Protected Areas (SNAP 2008), in designing local conservation plans for this small population, on the basis of scientific data. On the other hand, it will be important to coordinate efforts regionally aiming at minimizing the fishing related impact in southern Brazil, as well as, others sources of potential impact (*e.g.* vessel traffic, tourism, pollution) that might affect the Patos Lagoon bottlenose dolphin population and adjacent ones.

The conservation status of bottlenose dolphin in the south-western Atlantic Ocean is unknown, mainly for the lack of data on its population dynamics and impacting factors. In this way, it is basic to start and continuous the studies of population size, movement patterns and habitat use of the species in the Uruguayan coast and regionally.

The bottlenose dolphin population in Uruguayan coast

The bottlenose dolphin is the only small cetacean that can be observed from shore in Uruguay. Although its popular knowledge, no systematic studies have been conducted in Uruguay until 2002 when Toninas Project was created. Information on its occurrence was limited to prompt studies during the last 30 years, having involved taxonomy (Pilleri & Gihr 1972), occasional sightings (Brownell *et al.* 1973), incidental captures in fishing nets and stranding (Praderi 1985) and occurrence and behaviour observations (García *et al*. 1994).

Even though the absence of scientific information, some documents and observations suggests that since the last 20 years, a substantial decrease in the occurrence of the species has been observed in the Uruguayan estuarine coast (Lázaro & Praderi 2000), being the currently distribution area (Atlantic Uruguayan coast) smaller than the past one, which seems extending it throughout the entire Uruguayan coast. The cause of the decrease of sightings in this area remains unknown, but it could be explained by overfishing.

Toninas Project background information

Since 2002, Toninas Project has been studying the ecology and behaviour of the bottlenose dolphin population along the Atlantic Uruguayan coast. The studies started with the determination of high frequency occurrence areas of bottlenose dolphin along the estuarine (Maldonado Department) and Atlantic coasts (Rocha Department) of Uruguay, an extension of approximately 250 km. During two years, simultaneous land

observation efforts along nine fixed points between August and November were carried out (Laporta 2004). During this study three areas with high frequency of occurrence of bottlenose dolphin were determined: Cabo Polonio, Valizas-Aguas Dulces and La Coronilla-Cerro Verde (Rocha Department). The area of La Coronilla-Cerro Verde has been continued monitored since 2002 (Laporta 2004), including the area of Cabo Polonio from 2006 (Laporta *et al*. 2006).

Our results during the past seven years indicate that La Coronilla-Cerro Verde (33°38' S, 53°24' W) and Cabo Polonio (34º 23´S, 53º 46´W) are two zones with high presence of this dolphin in Uruguay, showing that currently the oceanic coast is more frequently use by the bottlenose dolphin. Dolphins occur year-round, using the coastal area mainly to develop its vital activities such as feeding, socializing and reproduction. Groups are dynamic in number and age composition between 1 and 30 individuals with bigger groups including calves. The birth season seems to be during spring and summer (Laporta 2004, Laporta *et al.* 2006).

In the last four years photo-identification surveys have been conducted in La Coronilla-Cerro Verde and Cabo Polonio. The results indicate that there are a high percentage of resident individuals, with a high and dynamic mobility along the Uruguayan coast. The first population size estimate indicates that it is small of approximately 40 individuals (Laporta *et al.* 2008a). Our catalogue has been compared with that of the neighbouring population (Patos Lagoon, Brazil) with the objective of determining residence, movement patterns and home range of this population. During winter and spring 2007 we detected that individuals frequently observed in Uruguay also occurred in the adjacent waters of Patos Lagoon, indicating that at least some movement among sites is taking place (Laporta *et al.* 2008b).

Recently, the Uruguayan government approved the law of the natural protected areas Nº 17,234, and the project to execute a National System of Protected Areas (SNAP) is being developed (SNAP 2008). In the coastal-marine zone, the area of Cabo Polonio has been incorporated to the SNAP and the area of Cerro Verde is in process of ingression to the system, as the first MPAs of Uruguay (SNAP 2008). In this context, the franciscana dolphin, *Pontoporia blainvillei*, the bottlenose dolphin and the southern right whale, *Eubalaena australis*, had been determined as conservation priority species in Uruguayan coast (Laporta & Trimble 2008).

OBJECTIVES

- We intend to determine the population size, distribution, movements and habitat use of bottlenose dolphins along the Uruguayan coast.

    - Estimate the population size of bottlenose dolphin in the Atlantic Uruguayan coast for year 2009.

    - Determine the distribution and movement patterns of photo-identified bottlenose dolphins along the Atlantic Uruguayan coast.

    - Determine the critical areas and habitat variables that influence its preference by bottlenose dolphin in La Coronilla and Cabo Polonio, Uruguay.

- We looked for share and compare information with neighbouring populations, especially southern Brazil, in order to determine individual movement patterns between areas.

    - Verify the movements of photo-identified individual between Atlantic Uruguayan coast and Southern Brazilian waters.

- As La Coronilla-Cerro Verde and Cabo Polonio are the first two Marine Protected Areas in Uruguay (National System of Protected Areas-SNAP-Law 17.234), we aim to intensify local people's ecological awareness about their identity and the importance of the coastal environment.

    - Develop educational and diffusion activities related to marine environment knowledge and its importance in local communities, as well as, general public.

MATERIAL AND METHODS

Population size estimation

Study area

The study area covers the first two MPAs in Uruguay: La Coronilla-Cerro Verde and Cabo Polonio (34º 23´S, 53º 46´W - 33°38' S, 53°24' W) (Figure 1).

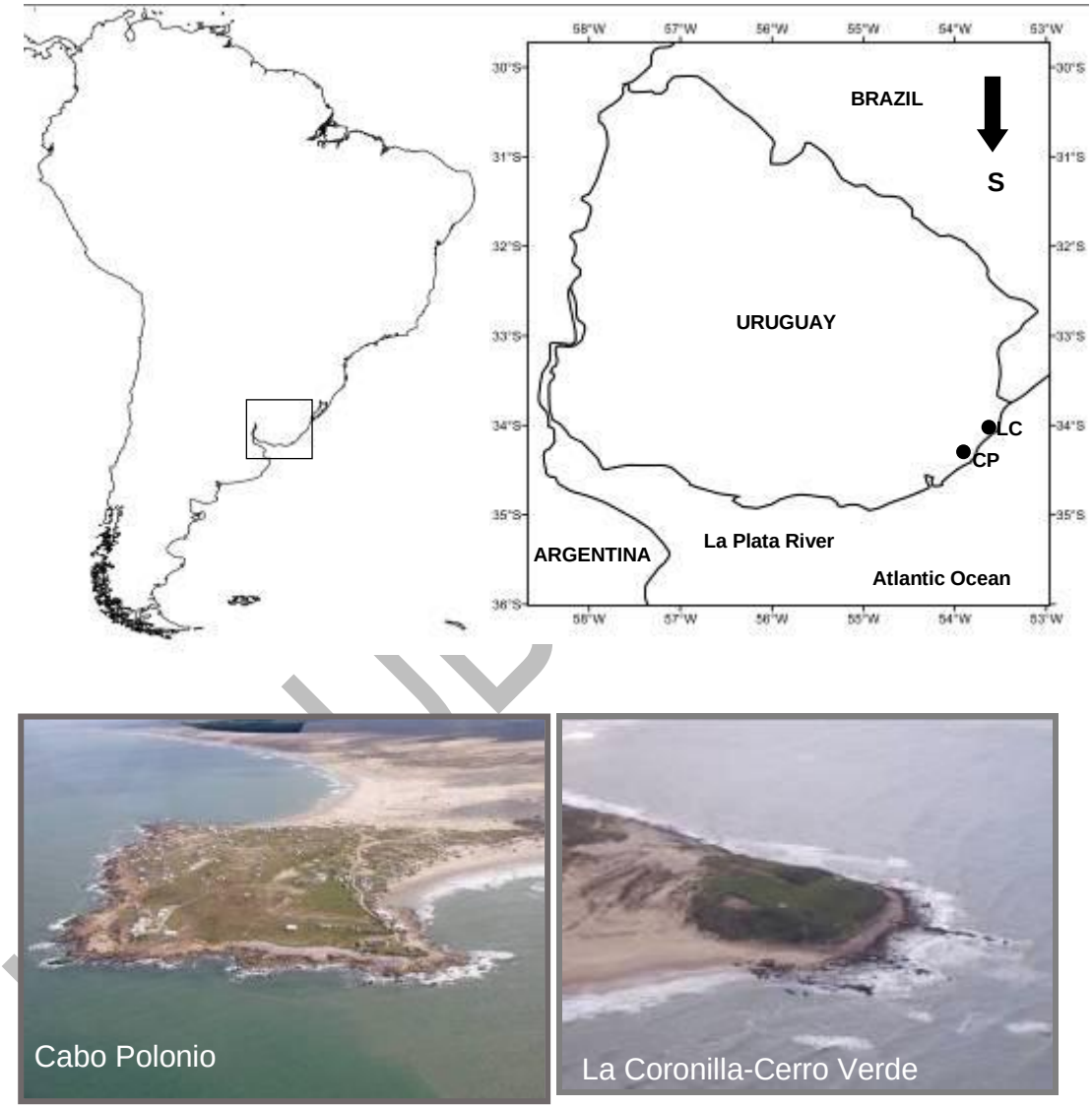

Figure 1. Study areas of the Atlantic Uruguayan Coast: (CP) Cabo Polonio and (LC) La Coronilla-Cerro Verde (Rocha Department).

Survey design

Boats and land surveys were carried out to photo-identify dolphins in both study areas during January and June 2009. The land surveys were from elevated coastal point (the

lighthouse of Cabo Polonio of 23m height and from “El Pesquero” a rocky point in La Coronilla of 7 m height), covering an area of 2 km from the coast. The area was scanned by eye and each 30 minutes using binoculars for looking for dolphin.

Boat photo-id sessions were opportunistic onboard an inflatable boat equipped with a 25 hp outboard engine, with the presence of dolphins and with good weather conditions (Figure 2). If the weather conditions did not permit to navigate, the photo-id session was carried out from land, using rocky points close to the area where dolphins passing by (Figure 2). The area covered by boat totalized 35 km^2, 18 km along LC coast and 17 km along CP coast and 1 km of distance from the coast.

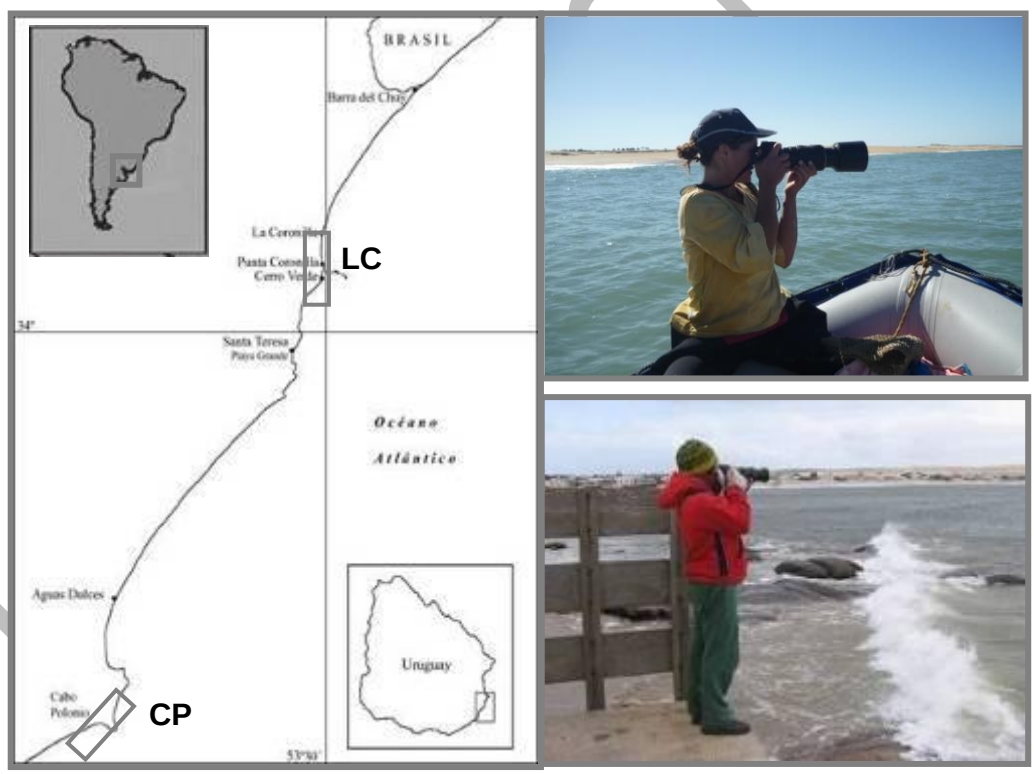

Figure 2. Boat and land bottlenose dolphin photo-identification sessions in La Coronilla-Cerro Verde and Cabo Polonio (Atlantic Uruguayan coast).

Once we encounter a group of dolphins, the boat manoeuvred 3-12 m of the dolphin group, and individual dorsal-fin notch patterns were photographed. Photographic identification of bottlenose dolphins relies on matching unique marks and nicks on dorsal fins and flanks of individual dolphins (Würsig & Würsig 1979; Würsig & Jefferson 1990; Wilson *et al*. 1999). Photographs were taken using a Nikon D70s digital camera equipped with AF 80-400 mm zoom lens. An attempt was made to photograph every dolphin within a group, independently of the presence of marks. Initial estimates of the total numbers of dolphins and calves were revised as necessary, and contact with the group was maintained until photographic effort was completed.

Photographs analyses

Each photograph was categorised as fair, good or excellent and only the good and excellent photographs of each dolphin were compared with the catalogue. Of them, only photographs of distinctive dorsal fins were used to establish a "type specimen" to which all other photographs were compared. Subsequently, only unambiguous matches with the "type specimen" were accepted as re-sightings. All new individuals were included in the catalogue with an ID number, area, year and side of the fin photographed (e.g. #010_LC09_L where #010: ID number; LC: La Coronilla; 09: year 2007; L: left side of the dorsal fin.

Abundance estimate

The abundance estimate of long-lasting marked bottlenose dolphin was obtained using mark-recapture models for closed populations (Otis *et al*. 1978, Seber 1982). Closed populations are those where births, deaths, immigration and emigration do not occur during the study period. To verify the population closure, discovery curves were plotted to analyse the cumulative number of marked individuals along the surveys. Data from the discovery curves levelled off towards the end of the study period, strongly

suggesting that dolphin populations in both the LC and CP were closed (Williams *et al*. 1993).

M_t and M_{th} models selected through *Capture* program (Rexstad & Burnham 1991) were used to estimate the number of marked animals in the population. Only the best 18 surveys were used due to this is the maximum that *Capture* permits. An experiment was carried out to verify the variation of the estimates of the number of marked animals in relation to the platform of photo-identification (boat or land) used. No difference were found, so, we selected surveys again in relation to better photographs quality, no surveys in consecutives days, high number of photo-identified dolphins, and we estimate the population size. Due to the fact that all bottlenose dolphin identified in CP were also identified in LC, we decide to calculate an abundance estimate for both jointly areas, assuming that this represents the abundance estimate for bottlenose dolphin population in the Atlantic Uruguayan coast.

The number of marked individuals in the population that were derived from *Capture* (*N*) was then expanded to incorporate the proportion of marked individuals to give a total population estimate (N_T), as follows: $N_T=N/\theta$, where: *N* is the number of marked animals in the population calculated through *Capture* program; θ is the proportion of marked animals in the population.

To calculate the proportion θ of marked animals in the population, the total number of marked individuals was divided by the total number of individual dolphins identified (Williams *et al*. 1993, Wilson *et al*. 1999, Parra *et al*. 2006). The variance of *N* total was given by:

$$\text{Variance } N = N^2 \left(\frac{\text{var } \check{N}}{\check{N}^2} + \frac{1-\theta}{n\theta} \right)$$

The variance for total population size was calculated through delta method (Seber 1982, Wilson *et al*. 1999):

$$\mathrm{var}(\hat{N}_T) = N_{total}{}^2 \left(\frac{\mathrm{var}\ N}{N^2} + \frac{1-\theta}{n\theta} \right)$$

where, *n* is the total number of animal from which (θ) was estimated. The variation coefficient for total population size was obtained through equation:

$$CV(N_T) = \sqrt{(CV(\hat{N})^2 + (CV(\hat{\theta}))^2}$$

The 95% confidence intervals for the number of marked animal, as well as, for total population size, were obtained by the log-normal approximation (Burnham *et al*. 1987), where the inferior limit of the confidence interval is calculated as: $N_i = N / r$ and the superior limit: $N_s = N \times r$. r, for an 95% interval, is calculated as:

$$r = \exp\{1{,}96\sqrt{\ln(1 + (CV(\hat{N}_T))^2)}\}$$

Movements patterns along Uruguayan coast and southern Brazil

Photo-id catalogue comparison was done to determine individual movements between southern Brazil and Uruguay (Figure 3).

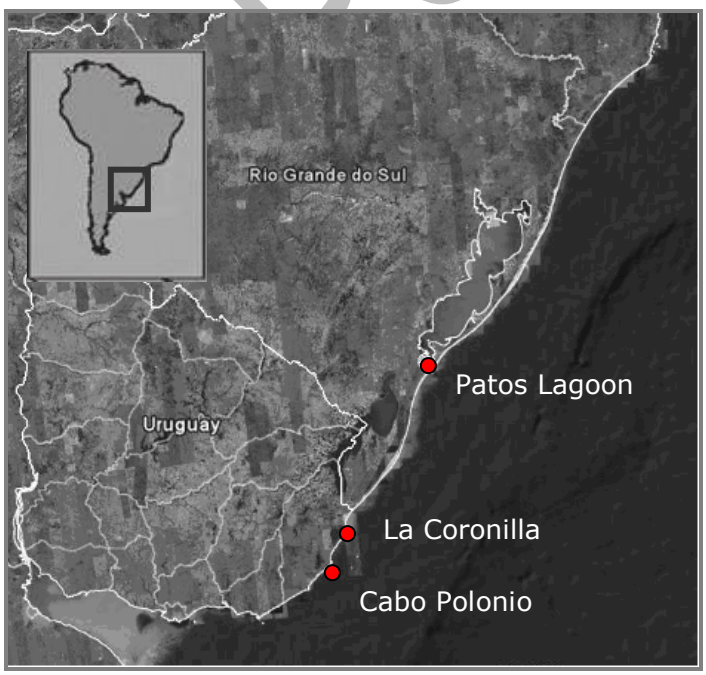

Figure 3. Study locations in Uruguay (Cabo Polonio and La Coronilla) and Brazil (Patos Lagoon) used to compare the bottlenose dolphin photo-identification catalogues.

One hundred twenty two dolphins from Patos Lagoon were compared to 39 ones from Uruguay between 2005 and 2009. Only good quality photographs were used.

Habitat use

Study period and area

At the beginning of the project our aim was to compare the habitat use by season. However, due to the bad weather condition during the winter 2008 we decided to include the summer 2009 and only determine the habitat use during the warm season along the Atlantic coast of Uruguay. For that reason, during summer 2008 and 2009, we conducted surveys onboard an inflatable boat equipped with a 25 hp outboard engine and a VHF radio. The study area were established between Cabo Polonio and Valizas (CP-V) and between La Coronilla and Punta del Diablo (LC-PD), covering 80 Km^2 in each area. Survey design consisted in ten transects perpendicular to the coast (Figure 4). Each perpendicular transect was two kilometres apart and approximately 2.5km long (from the coastline towards the open sea). The lines of two kilometres between perpendicular transect were also include as surveys effort. The starting position of each survey was also alternate between the initial and final transect lines. Both areas (CP-V and LC-PD) were covered on different days.

Habitat Variables

Each study area had pre-defined oceanographic stations, at the both end of every another transect line, where information on the physical and chemical variables were taken. The variables measured were: transparency (Secchi disk), depth (echo-sounder), superficial and deep water temperature (mercury thermometer attached to the Nansen bottle) and salinity (refractometer) (Figure 5).

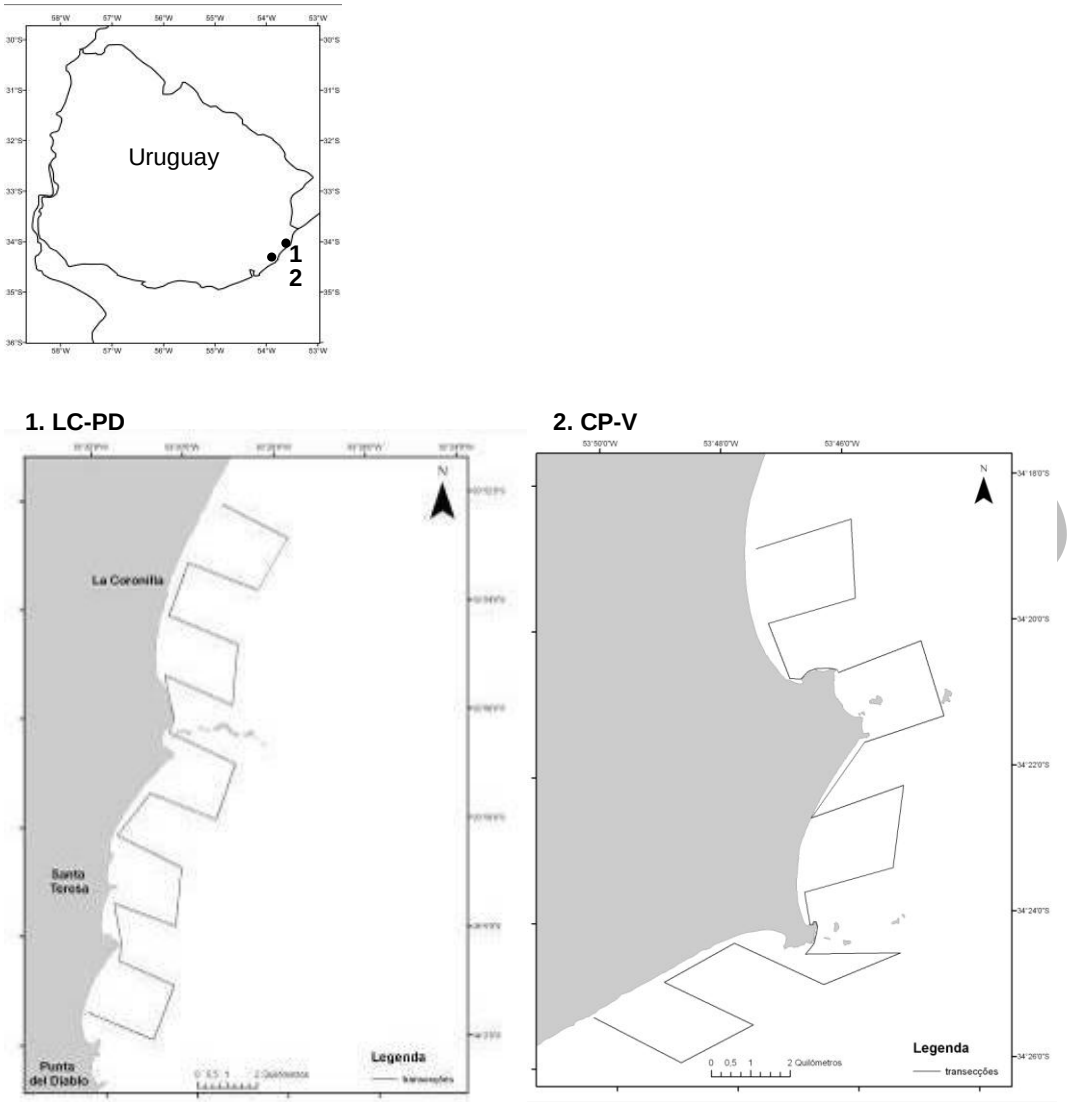

Figure 4. Transects lines in (a) LC-PD: La Coronilla-Punta del Diablo and (b) CP-V: Cabo Polonio-Valizas, used for spatial analyses of bottlenose dolphin habitat use.

Figure 5. Environmental variables recording during the habitat use survey design.

Dolphin sightings

Whenever a dolphin or group of dolphins were sighted we stopped the transect navigation and follow the group recording time, group size and composition before approaching. Then, the boat approached the group to record the position, depth and to take photographs. A group of dolphins was defined as dolphins with relatively cohesion that were involved in similar behavioural activities (*e.g.* Shane 1990).

Data Analyses

A georreferenciated database of the coastal line and raster of distances to geographic features like the coast, rocky points, rivers bars and islands were created using the GIS ESRI®ArcMap™ 9.2, 2006. Due to the absence of dolphin sighting in the offshore parallel transects and in the offshore half of perpendicular transects, we analysed only the inshore transect lines, splitting both study areas in cells of variable size with data of oceanographic variables and geographic features (Figure 6).

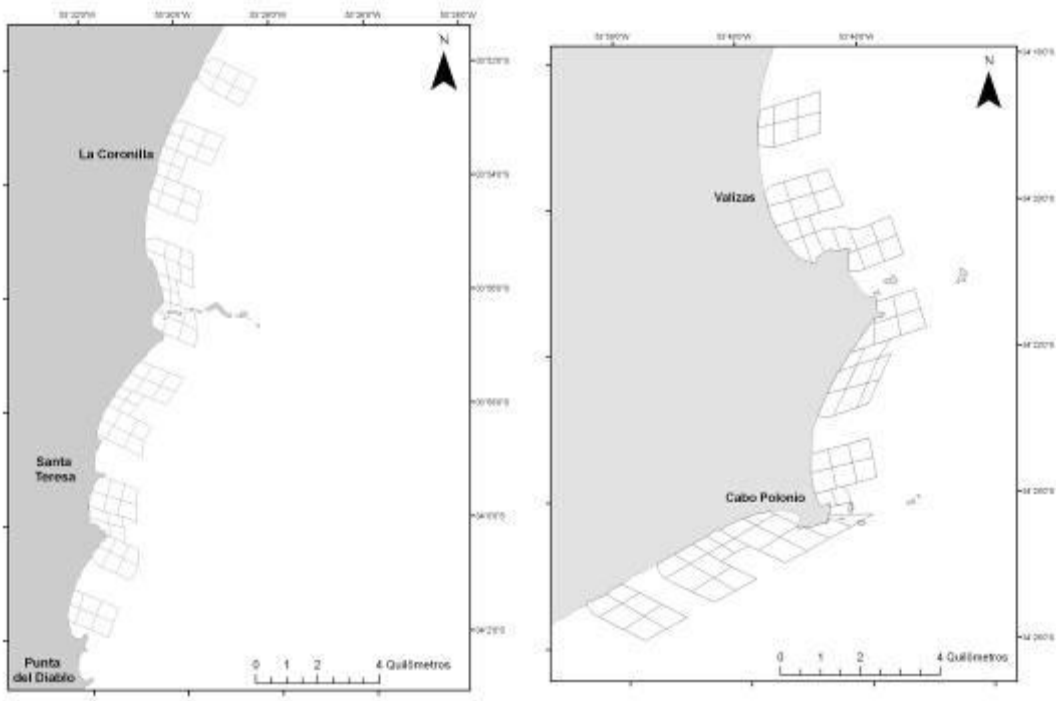

Figure 6. Cell division of the study area for GLM analyses, using only the parallel transects closest to coast and the half inshore part of the perpendicular transects. (a) LC-PD: La Coronilla-Punta del Diablo and (b) CP-V: Cabo Polonio-Valizas.

The relationship between environmental variables and dolphin distribution was investigated using General Liner Models (McCullagh & Nelder 1989). The variables incorporated in the models are shown in table 1.

Table 1. Habitat variables used in GLM and its measurements and class description.

Variables	Description
Área	La Coronilla-Punta del Diablo (LC-PD) and Cabo Polonio-Valizas (CP-V)
Distance from coast	From central point of each cell to the line coast (km)
Distance from islands	From central point of each cell to closest island: Torres and Castillo Grande Island group (CP-V) and Coronilla Island (LC-PD) (km)
Distance from river bars	From central point of each cell to the mouth bar: Valizas Stream (CP-V) and Andreoni Channel (LC-PD) (km)
Distance from rocky points	From central point of each cell to closest rocky point (km)
Surface and bottom temperature	(°C)
Surface and bottom salinity	(0/00)
Water transparency	(m)

The Negative Binomial distributions was use to verify which of the variables fit better to the data (McCullagh & Nelder 1989).

Negative Binomial distribution

$Y_i \sim$ Negative Binomial (λ_i, θ)

where:

Y_i: number of dolphin sighted in cell i

λ_i: average number of dolphins per area of cell i

θ: parameter of over-dispersion

The general formula is:

$\log(\mu_i) = \log(f_i) + \beta_0 + \beta_1\chi_{1i} + \beta_2\chi_{2i} + \ldots$

where:

- $\log(\mu_i)$: link function of the model: logarithm of the average number of dolphins per area in cell i;
- $\log(f_i)$: *offset*, logarithm of the area of cell i;
- $\beta_0 + \beta_1\chi_{1i} + \beta_2\chi_{2i} + \ldots$: linear model;
  - β_0: intercept estimated from number of dolphins;
  - β_1: coefficient estimated for the variable 1;
  - χ_{1i}: value of variable 1 in cell i.

The better model, defined as those who better fit to the data, were selected using the Akaike Information Criteria (AIC) (Burnham & Anderson 2002). At the beginning each variable was incorporated into a simple model, considering only the density of dolphins as response variable. The variable which presented the smallest AIC value was combined with all variables, one each a time, and those with minor AIC value stayed in the model. When the model with smallest AIC value was achieve, the variables were remove, each one a time, to verify the contribution of them in the AIC value. This process was carried out analysing both areas jointly and separately. The GLM analyses were performed using the software R version 2.7.2 (R. Development Core Team 2008).

RESULTS

Population size estimation

From January to June 2009 58 surveys were carried out in study areas, being 34 in LC (19 from boat and 15 from land) and 24 in CP (9 from boat and 15 from land) (Table 2).

Table 2. Survey effort of photo-identification sessions from boat (B) and land (L) in La Coronilla-Cerro Verde (LC) and Cabo Polonio (CP) between January and June 2009.

Month	Jan		Feb		Mar		Apr		May		Jun		Total	
	B	L	B	L	B	L	B	L	B	L	B	L	**B**	**L**
LC	3	0	3	2	8	3	1	4	3	3	1	3	**19**	**15**
CP	3	10	3	0	0	0	3	5	0	0	0	0	**9**	**15**

Bottlenose dolphins were encounter in 72% (n=42) of the surveys, being the sighting success (proportion of surveys with sightings in relation of total number of surveys) higher in LC than in CP. A total of 69 groups were photographed (52 in LC and 17 in CP) (Table 3).

Table 3. Number of surveys, surveys with sightings (sighting success), number of photo-id sessions and number of groups photographed in both study areas: LC, La Coronilla-Cerro Verde and CP, Cabo Polonio between January and June 2009.

	N surveys		Surveys with sightings		Sighting success (%)		N photo-id sessions		N of groups photographed	
Area	LC	CP	LC	CP	LC	CP	LC	CP	LC	CP
	34	24	31	11	92	45	28	10	52	17

Thirty two dolphins were identified with long-last marks during the study period. Due to the fact that all dolphins identified in CP were also identified in LC, the abundance

estimates were calculated for both areas jointly, representing the Atlantic Uruguayan coast bottlenose dolphin population.

The discovery curve shows that all individual of the population were indentified from survey #16 as of (Figure 7), indicating that the population were close during the study period.

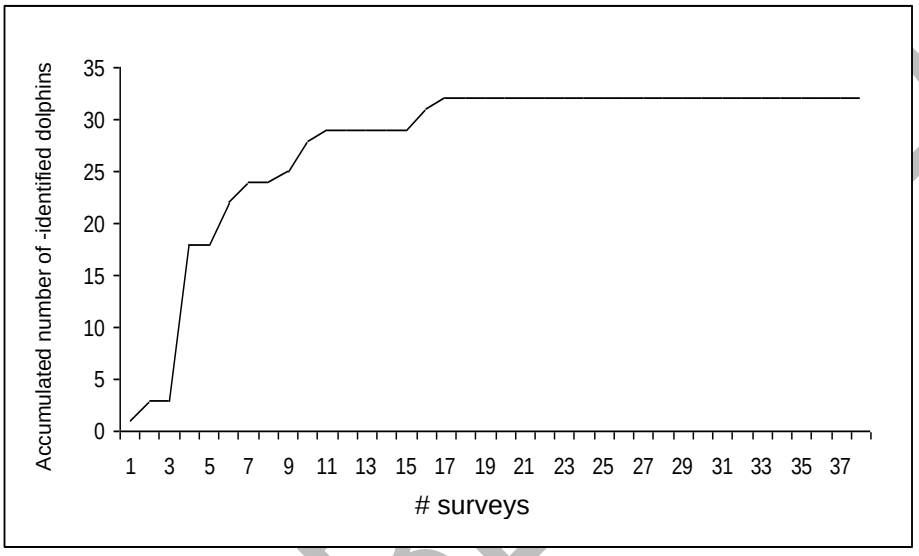

Figure 7. Discovery curve of identified dolphins in the Atlantic Uruguayan coast.

The number of marked individual estimated through mark-recapture models was 33 in the Atlantic Uruguayan coast (Table 4).

Table 4. Number of marked individual estimate in the Atlantic Uruguayan coast. M_{t+1}: total number of distinct marked individuals during experiment; N: number of marked dolphin estimate in the population; CI (95%): confidence interval of 95%; *p*: average probability of capture of animals; SE(N):standard error; VC(N): variation coefficient.

Suveys	M_{t+1}	Model	*N*	CI(95%)	p	SE(*N*)	VC(*N*)
18	29	M_{th}	33	30-43	0,18	2.98	0.09

The proportion of long-lasting marked animals in the population (*θ*) was estimated in 60% (Table 5).

Table 5. Estimate of proportion of long-lasting marked animals (θ) in the Atlantic Uruguayan coast. *n*: number of individual from which θ was estimated; Var (θ): variance; SE (θ): standard error; VC(θ): variation coefficient.

n	θ	Var(θ)	SE(θ)
262	0.598	0.001	0.024

The total population size of the Atlantic Uruguayan coast bottlenose dolphin was estimated in 55 individuals for 2009 (Table 6).

Table 6. Estimates of total population size of bottlenose dolphin in the Atlantic Uruguayan coast for year 2009. Estimates of marked animals (*N*) obtained through model M_{th}. Estimates of total population size (N_t) and proportion of marked animals in the population (*θ*). Est.: estimator; SE(*N*): standard error, VC(%): variation coefficient; CI (95%): confidence interval of 95%.

Est.	*N*	SE(*N*)	VC(*N*)	CI(95%)	*θ*	N_t	VC(N_t)	CI(95%)
M_{th}	33	2.98	0.09	30-43	0.60	55	0.10	49-63

Movement patterns

Movements along the Uruguayan coast

Considering photo-identification sessions carried out during the entire year 2009 it was possible to demonstrate that of the total identified dolphins in LC, 16 were re-sighted in CP (50%) (Table 7). Nine (28%) and four (25%) animals were observed only once in LC and in CP, respectively.

Table 7. Occurrence of photo-identified animals (n=31) in 2009, in La Coronilla-Cerro Verde and Cabo Polonio. The black areas represent the presence of the animals. Number between brackets indicates the surveys number in each month. Total: total number of sighting of each individual.

	LA CORONILLA											CABO POLONIO							
	J	F	M	A	M	J	J(6)	S	O	D		J	F	A	Jl	A	S	D	
Id-Nº	(3)	(5)	(11)	(5)	(6)	(3)		(3)	(2)	(8)	Total	(13)	(3)	(8)	(1)	(3)	(1)	(2)	Total
001	■		■							■	3	■				■	■		2
002								■			1								5
003	■		■	■	■						4								0
004	■	■	■	■							5			■			■		2
005			■								1						■		1
006	■	■	■		■						5			■		■			2
007	■	■	■		■		■				6			■		■			3
008											0								0
009	■			■							3			■	■		■		4
010	■	■	■	■	■		■			■	9								0
011	■	■	■		■					■	8					■	■		2
012	■	■	■				■			■	6								0
013	■										1								0
015											0								0
016			■								1								0
017					■						1								0
018			■				■				4			■					1
019	■	■	■	■			■				6			■					3
020		■							■		2			■					3
021			■								3			■					1
022	■		■	■	■				■		9			■					1
023	■	■		■							3								0
027	■	■		■	■						5	■		■		■			3
029											0								0
031	■										1								0
037	■			■							2								0
038				■	■						2								0
039	■				■		■				3								0
042	■										1								0
043			■	■	■				■		9			■					2
044	■		■	■	■						5								0
045				■							1								0
046	■			■			■				4			■			■		2
047				■							1								0
048	■	■	■								5								0

A total of 94 movements were documented between both areas, with individual movements between 1 and 9 times (x=4,7; SE=0,59). 10% of individuals move only once between both areas.

Movements between the Atlantic Uruguayan coast and Southern Brazil

Sixteen dolphins previously identified in Uruguayan Waters were identified in adjacent Waters of Patos Lagoon, in Rio Grande do Sul, Brazil (Anexo I), and only one

individual identified in LP since 2005 were identified in Uruguay. Five sightings occurred in 2009 between March and October, but if we compared the photo-id catalogues since 2007, there are more resightings for 2007 (n=8), and 2008 (n=10) (Table 8). In relation to sex of the identified animals, eight were females (five R, two L-R and one T), two were males (both PA-R) and seven individuals of undetermined sex (two R, two PA-R, one of them a JUVENIL, one L-R and two T) (Table 8).

Table 8. Number of sightings of photo-identified bottlenose dolphins in the Atlantic Uruguayan coast and adjacent Waters of Patos Lagoon between 2007 and 2009. Information of sex (M: male; F: female; U: Undetermined) and ID number of both catalogues are shown.

				Months																			
UY	LP			Atlantic Uruguayan coast													Adjacent Waters of Patos Lagoon							
#ID		Sex	Year	J	F	M	A	M	J	J	A	S	O	N	D	M	A	M	J	J	A	S	O
001	075	M		4	1	-	-	-	-	2	-	1	-	-	2	-	-	-	1	-	1	-	-
010	081	F		1	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	3	1	-	-
017	083	U		1	-	-	-	1	-	-	-	1	-	1	-	-	-	-	-	1	-	-	-
020	080	U	2007	-	2	-	1	-	-	-	-	1	-	-	-	-	-	-	-	1	-	-	-
022	073	F		2	1	-	1	-	-	-	-	1	-	1	-	-	-	-	1	-	-	1	-
034	104	U		1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
039	083f	U		-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	1	-	-	-
048	068	U		-	-	-	-	-	-	2	-	-	-	-	1	-	1	-	1	-	-	-	-
003	116	F		1		1	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1
006	122	F		1	1	1	2	1	-	-	1	-	-	-	-	-	-	-	-	-	-	1	-
011	109	F		2	2	2	-	1	-	-	1	1	-	-	1	-	-	-	-	-	1	-	-
012	107	U		1	1	2	-	-	-	1	-	-	-	-	1	-	-	-	-	-	1	-	-
016	115	M	2008	-	-	1	-	-	-	-	-	-	-	-	-	2	-	-	1	-	-	-	-
020	080	U		-	1	-	3	-	-	-	-	-	1	-	-	-	-	-	-	-	1	-	-
034	104	U		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-
040	103	u		1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	1	-
044	071	F		1	-	2	1	1	-	-	-	-	-	-	-	-	-	-	-	1	1	1	-
045	101	F		-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-
001	075	M		-	1	2	1	-	-	-						-	-	-	-	1			
010	081	F		2	2	-	-	-	-	-						-	-	1	-	1			
020	080	U	2009	-	-	-	1	-	-	-						-	1	-	-	-			
039	083f	U		1	1	-	-	-	-	-						-	-	1	-	1			
044	071	F		-	1	-	-	-	-	-						-	2	-	1	-			

Of the 17 individuals identified in both areas, eight are residents (R) of the Uruguayan waters, being observed in all seasons along the three study years; four animals are

partially residents (PA-R); two are little residents (L-R) and only three are considered transients (T).

All individuals observed in autumn and winter of 2007 in adjacent waters of Patos Lagoon were identified later in Uruguayan waters during spring and summer. With the exception of individual #034 and the female #45 with calf, that was observed only once in Uruguayan Waters, all individuals observed in Brazil in 2008 and 2009, were re-sighted in Uruguay.

The average time between observations of each individual between Uruguayan and Brazilian waters is shown in table 9.

Table 9. Number of movements and time (in days) of identified dolphins between Atlantic Uruguayan coast and adjacent Waters of Patos Lagoon during 2007-2009. N: number of movements; x: average time elapsed of sightings between both areas; Max.; maximum time and Min.: minimum time between subsequent sightings.

# ID_UY	# ID_BR	N	x	Min.	Max.
001	075	5	57	10	116
003	116	2	123	109	137
006	122	2	101	38	164
010	081	6	113	82	164
011	109	2	50	17	82
012	107	2	74	23	125
016	115	3	160	6	307
017	083	2	85	53	117
020	080	3	79	3	182
022	073	2	21	48	57
034	104	1	550	-	-
036	038	1	138	-	-
039	083f	2	139	93	185
040	103	2	146	113	178
044	071	3	86	65	135
045	101	1	122	-	-
048	068	1	42	-	-

The number of times an indentified individual in Uruguayan Waters were observed in Brazilian ones varied between 1 and 6 times (x=2.3; SE=0.33; n=40). The longest movement in the minor time was performed by individual #20, making a minimum of 300 km in only three days.

Habitat use

Survey effort

Between January-May 2008 and 2009 36 surveys were carried out in both areas, being 18 complete surveys in each one. We covered a total of 1241.11 km^2 (162.4 h of navigation under survey effort) within both study areas and sighted a total of 54 groups of dolphins (Table 10).

Table 10. Survey effort in both study areas. N gpos.: number of dolphins groups, N ind.: number of individual, Area: monitored area in km^2.

Year/month	LC			CP		
2008	**N gpos.**	**N ind.**	**Area**	**N gpos.**	**N ind.**	**Area**
January	3	17	16.16	3	4	96.49
February	2	10	38.76	-	-	-
March	8	71	131.26	-	-	-
April	6	41	38.76	4	21	184.26
May	3	28	77.52	-	-	-
2009	**N gpos.**	**N ind.**	**Area**	**N gpos.**	**N ind.**	**Area**
January	2	28	77.52	-	-	-
February	15	126	132.44	-	-	-
March	-	-	-	4	30	184.26
April	-	-	-	4	27	147.40
May	-	-	116.28	-	-	-

Habitat variables influence on distribution patterns of dolphins

Fifty four dolphin groups were observed in both areas, 15 in CP-V and 39 in LC-PD. For CP-V the best model presented the following variables: distance from coast, transparency, bottom temperature and distance from rocky points, islands and bars (Table 11). According to this model, the probability of encounter higher density of dolphins occurs with smallest distance from coast, in muddy and higher bottom temperature waters and in proximity of rocky points.

Table 11. Results of selected model for Cabo Polonio-Valizas (GLM with negative binomial distribution and log as link function) relating selected variables with dolphin density. *** significant in p<0.001, **significant in p<0.01 and *significant in p<0.05. Null deviation: 664.24 in 1199 degrees of freedom. Residual deviation: 471.98 in 1187 degrees of freedom. AIC: 541.17.

Variables	Variable estiamte	SE	z	p
Intercept	-6.87504	2.80780	-2.449	0.014343 *
Distance from coast	-4.18028	0.83080	-5.032	4.86e-07 ***
Transparency	-0.75904	0.22817	-3.327	0.000879 ***
Bottom temperature	0.41383	0.10126	4.087	4.37e-05 ***
Distance from rocky points	-2.16038	0.43997	-4.910	9.09e-07 ***
Distance from islands	1.91741	0.41319	4.640	3.48e-06 ***
Distance from bar	0.10955	0.04464	2.454	0.014132 *

In LC-PD the best model presented the distance from coast, bars and rocky points and bottom salinity as the variables set that better explain the distribution patterns of dolphins (Table 12). This model suggest that the probability of encounter higher densities of dolphins occurs in areas close to the coast and bars and with higher bottom salinity.

Table 12. Results of selected model for La Coronilla-Punta del Diablo (LC-PD) (GLM with negative binomial distribution and log as link function) relating selected variables with dolphin density. *** significant in p<0.001, **significant in p<0.01 and *significant in p<0.05. Null deviation: 139.08 in 1471 degrees of freedom. Residual deviation: 82.54 in 1466 degrees of freedom. AIC: 503.4.

Variable	Variable estiamate	SE	z	p
Intercept	-19.81941	3.93961	-5.031	4.88e-07 ***
Distance from coast	-6.96717	1.20088	-5.802	6.56e-09 ***
Bottom salinity	0.44897	0.11244	3.993	6.53e-05 ***
Distance from bar	-0.23167	0.08091	-2.863	0.00419 **
Distance from rocky points	0.43247	0.17721	2.440	0.01467 *

CONCLUSIONS

Although it seems to be increasing in it size in the last two years, the bottlenose dolphin population that inhabits the Atlantic Uruguayan coast is still small, with approximately 55 individuals. This increasing could be the effect of an improvement in the photographs quality or a possible increase in the population. However, it is not possible to confirm the last reason due to the short duration of the study. The small size of the Atlantic Uruguayan coast bottlenose dolphin population indicates an important vulnerability to non natural mortality (*e.g.* incidental captures in fisheries), sub-optimal sub-optimal food availability, habitat degradation, environmental stochasticity and demographic effects.

The information of individual movements along the Uruguayan coast indicates that dolphins are using a large area along Uruguayan coast, showing a possible dynamic related to displacement for food, due to the time of the year that they occur (autumn and winter), which could reflect environmental heterogeneity and patchy resources. Moreover, recent information from artisanal fishermen and lifeguards shows that several groups of dolphins are occurring occasionally in the estuary of Río de la Plata (San Luis and Playa Malvín), more than 150 Km south of Cabo Polonio, in Montevideo the capital city.

Regional movements of identified individual between Uruguay and southern Brazil were established and it will be possible to visualize management units among the countries involved, if both research projects continues whit an annual monitoring of the populations and movements. Because these movements may change as the years pass, it is important to maintain continuous investigations. This continuity its turns more important considering the high mortality of bottlenose dolphin in fishing nets that occur in Patos Lagoon and the small size of the Uruguayan population. If there really is an exchange of individuals between these two populations, fishing-related mortality of

individuals from the Patos Lagoon population will have a “source-sink” effect, potentially affecting the Uruguayan population.

On the other hand, the area comprising up to 500m off the coastline presented the highest density of bottlenose dolphin both Cabo Polonio and La Coronilla. Furthermore, rocky point and river or channel bars were identified as critical areas for bottlenose dolphin population in the Atlantic Uruguayan coast. Those areas are use for feeding and socializing (Laporta 2004, Laporta *et al*. 2006). Although the importance of other coastal areas is unknown and should not be ignored, applying effective conservation action to the La Coronilla-Cerro Verde and Cabo Polonio dolphins should serve to improve the status of the whole population.

Implication for conservation management

The small size of the Uruguayan population indicates that a great vulnerability to environmental random effects and to non-natural removals, as the incidental capture in fishing nets, which can cause irreversible reductions and population collapse. Populations consisting of less than 100 animals possess high probabilities of extinction, even when non-natural mortality rates are low (Thompson *et al.* 2000, Burkhart & Slooten 2003, Slooten 2007). While population size decreases, the extinction risk increases due to loss of genetic diversity caused by endogamy, as well as, due to environmental and demographic random effects (*e.g*., Fowler & Baker 1991, Burnham 1993, Caswell 2001). A period of 15 years is necessary to detect a 5% annual rate of population decline, carrying out abundance estimates each five years (Wilson *et al.* 1999). On the other hand, information on important population parameters as the birth interval and survival rate can be obtained if photo-identification sessions are continued in medium or long stated period, allowing to understand the population dynamics, to monitor its trends and to evaluate its viability.

The traditional boarding of management requires empirical evidences of population decline before taking mitigation measures (Thompson *et al.* 2000). Some factors can make it difficult the detection of decline in a population, as the low statistical power to detect trends, uncertainties in the abundance estimates and the identification of decline causes (Taylor & Gerrodette 1993, Thompson *et al.* 2000). Therefore the population decline does not have to be an exclusive criterion to initiate conservation measures (Taylor & Gerrodette 1993). The Precaution Principle (Gray & Bewers 1996) would have to be applied, especially when the population is small (Thompson *et al.* 2000). Under the Precaution Principle must be implemented measures to reduce potentials threats. Considering its small size, no information of its historical abundance, apparent change of historical distribution area, reduction of feeding resources due to high exploitation of bottlenose dolphin prey species (*M. furnieri and C. guatucupa*) (Norbis *et al.* 2006, Galli 2007), expansion of human activities throughout the coast which can impact it negatively, as the future effect of the cellulous plants (Panario *et al.* 2006), the possible construction of a deep water port (Viera 2009), the degradation of the water quality due to the discharge of effluent with unknown concentrations of agro toxics (Lercari & Defeo 1999), the expansion of coastal infrastructure with industrials and urban centers (Menafra *et al.* 2009), we recommend the application of the Precaution Principle and to take conservation measures for the bottlenose dolphin population in the Atlantic Uruguayan coast.

Another important potential threat for the bottlenose dolphin of the Uruguayan Atlantic coast, is the incidental mortality in artisanal fishing nets in the Patos Lagoon estuary (southern Brazil) and, mainly in adjacent waters. Given that these displacements occur, the probability of dolphins be captured incidentally is low, therefore highest mortality occur in summer, coinciding with the highest fishing effort (Fruet 2008). However, the establishment of mitigation and management measures to diminish the incidental mortality of dolphins in fisheries will be beneficial for both populations, as a result that

to keep healthful the population of southern Brazil increases the interchange possibilities, promoting the increase of genetic variability. Di Tullio (2009) considers to delimiting a conservation area in adjacent waters of Patos Lagoon, where the fishing activities were regulated or forbidden. This area mainly includes the first kilometre of distance of the coast and the 5 km next to the estuary mouth, that area the areas where the highest densities of bottlenose dolphins had been found and where it has intense fishing activity during the summer.

Given the recent effort for the implementation of Marine Protected Areas (MPAs) in Uruguay it is important to know diverse ecological aspects of the bottlenose dolphin population before establishing and prescribed management guidelines for the area and species. The areas of La Coronilla-Cerro Verde and Cabo Polonio are the first MPAs to be established in Uruguay. The information on spatial distribution and the variable that influence the distribution pattern of bottlenose dolphin, determined in this study as rocky point and river or channel bars feeding areas for bottlenose dolphins, can contribute to the development of management guidelines of the population and to the delimitation of the areas.

The bottlenose dolphin is the only species of small cetacean that can be observe from coast, therefore, it is the most known dolphin by the local coastal communities and tourist. Considered a charismatic and flag species, the assignment of MPAs and the elaboration of plans for its conservation can help to protect effectively not only cetaceans, but also other species of the same ecosystem (Hoyt 2005). Applying the Precaution Principle and considering the small population size, coastal habits, high mobility and neighbouring threatens as by-catch in artisanal fishing nets in southern Brazil, the SNAP accepted to include the bottlenose dolphin as a priority conservation species in Uruguay (Laporta & Trimble 2008).

After the protected marine area is established in Uruguay, it will be essential to continue working on a year basis, in order to closely follow the dolphin population and to update and improve the settled management guide lines.

CONSERVATION ACTIVITIES

In our proposal we planned to conduct educational activities in La Coronilla and Cabo Polonio main schools focusing on the role of small cetaceans in the marine ecosystem and the importance of their conservation. In addition, we considered the organization of workshops with local communities and tourist to promote their ecological awareness.

A great confusion about bottlenose dolphin in coastal village and cities

When we start to talk about bottlenose dolphin and our project with local people of Cabo Polonio and La Coronilla-Cerro Verde, as well as, other small coastal village, we realised that existed a great confusion about the species. In our country, the bottlenose dolphin is known as "*tonina*". This common name, has been generated a big public confusion, involving also beach inhabitants like fishermen, lifeguards and also biologist. The public think that *tonina* is not a dolphin or is a different kind of dolphin, in other words they think that the *tonina* is not the bottlenose dolphin. When we say to them that the tonina is the popular "flipper" then the people react with happiness, realising that dolphins exist in Uruguay. This confusion made to change our ideas about the priority educational activities to carry out. So, we decide to make a small campaign called *¿La tonina es un delfín?* (The tonina is a dolphin?) in order to show that there are dolphins in Uruguay and the *tonina* is the same that the bottlenose dolphin. For this purpose, we elaborate seven vinyl banners or posters with many photographs and explanations about morphology, coloration, behaviour and ecology of bottlenose dolphin in Uruguay (Annex 2). These posters were exposed in many events that are described below.

Diffusion activities

- **Exposition "Lo nuestro" organized by LATU (Technological Laboratory of Uruguay)** from 21th to 30th November**.** This event was organized to promote and valorise our identity, our things, from our native production of artisanal food to our ecosystems. Approximately more than 25.000 people visited the exposition. Seven didactic posters as vinyl banners were exposed to show information about bottlenose dolphin in Uruguay. We emphasized the problematic and quasi mythological topic of the common name of the bottlenose dolphin in Uruguay: *tonina*. (Photographs in Annex 3)

- **Certification of La Coronilla as a "Natural Beach".** On January 2009, local inhabitants from La Coronilla celebrate the Certification of their beach as a *Natural Beach* by the Sport and Tourism Ministry. **Natural Beach – Certificated Environmental Management** is a trademark of certification that incorporates continues improvements as a requisite of environmental management of the beach in the framework of the general conditions of "sun and beach tourism" and ecotourism and the responsible use of recreations areas. Toninas Project participated in this event accompanying the initiatives of the inhabitants and sharing information about the importance of the area for bottlenose dolphin and other marine life.

- **2nd Festival Arte en las Loberías** ("*Art at the sea lion rookery Festival*"). We were invited to develop an interactive oral exposition directed to local and tourist

people in Cabo Polonio on 28th February 2009 at DINARA (National Direction of Aquatic Resources), Cabo Polonio. We also exposed the posters mentioned above and artistic photographs of bottlenose dolphin in Uruguay in a big screen (Photographs in Annex 4).

- Facultad de Ciencias Universidad de la República **Environmental day celebration** (5th June 2009) at Faculty of Science, Montevideo. We also exposed the posters mentioned above and carried out many activities related to the protection of the environment and assit in the reception and involvement of children from the faculty's neighbourhood (Photographs in Annex 5).

- **Rede Globo TV video report** (Brazil)**.** We were invited to participate in a Rede Globo TV channel series called "Globo reporter". This video report was carried out with Brazilian colleagues, showing the regional situation of bottlenose dolphin in southern Brazil and Uruguay. Link: http://g1.globo.com/globoreporter/0,,MUL1395404-16619,00-GOLFINHOS+AMEACADOS+SE+REFUGIAM+NA+FRONTEIRA+COM+O+URUGUAI.html

- suite101.net Colaboraciones y Contenidos de Calidad **Journal article** "Save the dolphins of La Plata River and Atlantic coast". We were interviewed by Walter Raymond, a journalist interested in conservation and environment from the Suite 101.net. Link: http://espaciosprotegidos.suite101.net/article.cfm/para_salvar_los_delfines_del_rio_de_la_plata.

- Collaboration in the **Traveling Exhibition "Cerro Verde in Motion".** Bottlenose dolphin information was provided to elaborate the exposition that is part of the project "Strengthening and impelling the implementation and the participative management on the first Coastal-Marine Protected Area in Cerro Verde, Uruguay", organized by the non-governmental organization KARUMBÉ and is being exhibiting in several cities of Uruguay (Example posters in Annex 6).

Participative research

- **Lifeguards involving in research and conservation of bottlenose dolphin in Uruguay.** We invite lifeguard service to collaborate with our project in the collection of bottlenose dolphin sightings along the coast of Uruguay. For this purpose, three workshops with lifeguards at the capital city Montevideo and in the estuarine coast were carried out. We exposed oral presentations about the projects objectives and knowledge obtained about bottlenose dolphin in Uruguay and we received the personal experiences and ecological knowledge from the lifeguards. Their information will be very important to know the occurrence of dolphin in other areas than the studies ones. If necessary, we will incorporate some estuarine area to monitor systematically.

Management and Conservation activities

- **National System of Protected Areas (SNAP).** Participation in the National System of Protected Areas Workshops in La Coronilla-Cerro Verde and Cabo Polonio.

  - May 2008: two members of Toninas Project (Paula Laporta and Micaela Trimble) presented the report "Priority conservation species of marine mammals

in Uruguay" to the SNAP Project "Fortalecimiento del Proceso de Implementación del Sistema Nacional de Áreas Protegidas".

- June 18th 2008: Cetáceos Uruguay participated of the workshop "Identification of priority species for conservation in Uruguay" organized by the SNAP Project "Fortalecimiento del Proceso de Implementación del Sistema Nacional de Áreas Protegidas". Hotel NH Columbia, Montevideo. After the report and during this workshop bottlenose dolphin (*Tursiops truncatus*) was included in the list of the "priority species for conservation in Uruguay".

- September 2008: The report "Currently status of the bottlenose dolphin (*Tursiops truncatus*) in Cerro Verde and Cabo Polonio (Rocha, Uruguay)" was done to contribute with the non-governmental organization KARUMBÉ, which is responsible of a project for "Strengthening and impelling the implementation and the participative management on the first Coastal-Marine Protected Area in Cerro Verde, Uruguay". The project is funded by the Conservation Leadership Program.

- **Experiences working with local people of MPAs**

Regarding social interests and needs in the designation of a MPA in La Coronilla-Cerro Verde, our experience during this year study was difficult. When the government came to the area to inform local people about the designation of a MPA in La Coronilla-Cerro Verde, the community started to worry about activities that they could or could not keep doing. Such activities included: tourism, sport and artisanal fisheries, surf, extraction of aquatic resources, beach rides in vehicles, getting charged for the entrance to the beach, among others. The government could not satisfy the people's questions and until there is a big wondering regarding this issue. Toninas Project got interested in explaining and listening to the local people's worries about the designation of the MPA. We had many non formal meetings with different persons and we intend to show our idea about the MPA and to include the people's needs and interest in the management plan of the area.

Since the first formal meeting between government and local community of La Coronilla-Cerro Verde, no more activities were carried out in relation to the designation of the

MPA, due to the conflicts between local inhabitants. However, these not stop the implementation of the MPA in the next year.

Some conflicts have the origin in the Canal Andreoni (Andreoni Channel). This channel is a discharge of freshwater from a broad area used for rice agriculture and animal production, which has been increase the sediment and organics charges levels drained to the oceanic waters (Lercari & Defeo 1999). Some inhabitant wants to include this problematic into the MPA, but the government do not. This conflicts leave to a great discussion about the real importance of the MPA designation that until now is under debate.

For the other hand, in Cabo Polonio, others conflicts occur within the local community. Problematic included land possession, fishing areas and fishing restrictions, number of tourist that can enter to the area during summer months, getting charged for the entrance to the area, charge capacity of people in the area, hygiene conditions, among others.

As a result of this problematic we participated in the meetings about the MPA in Cabo Polonio, organized by the SNAP, and discuss with the DINAMA (National Agency of Environment) the next steps to follow regarding the designation of the MPA. To proposal is to create a local advising commission which will be in charge of joining all the interests and needs of the community and to generate discussion meetings to get through a participative and common management plan. This commission will be integrated by all the actors related to the areas. Following this, in September 2009, the MPA of Cabo Polonio entered to the National System of Protected Areas and the advising commission will be form and start to work in the management plan of the area.

In relation to La Coronilla-Cerro Verde, the meetings were took up again currently and it is expected the same situation as in Cabo Polonio, but no more advances were done.

Educational activities

- **ARENAS Project "Uruguayan coastal ecosystems: an environmental education program for teachers".** Members of Toninas Project (Paula Laporta and Micaela Trimble) co-direct this project. It objective is to provide training to school teachers on

the main characteristics of the Uruguayan coastal-marine ecosystem, including its living and non living components, as well as its conservation and the sustainable use of its natural resources. It is also intended to provide information about environmental education techniques and practical activities, as useful tools to stimulate children involvement. We believe that the conservation of the coast will be only assured when a significant portion of the population acquires an ecological knowledge about the different environments in the area. Thus, an Environmental Education program constitutes an important tool to raise awareness, as it contributes to get a better perception of the environment, leading to a sustainable interrelation among ecosystems and local communities. Now we consider essential to focus our environmental education activities on the teachers from coastal communities, since their commitment with education and social community reality make them essential agents for the continuous and systematic spreading of knowledge. Children, who are active participants of the educational activities and potential communicators, are main protagonists, generating a collective awareness about environmental issues, their causes and consequences. To cope with this big project, Toninas Project members are working with partners of other nongovernmental organization: Averaves (http://averaves.fcien.edu.uy) and KARUMBE (www.karumbe.org). The manual will be published in March 2010.

International workshops and congresses

- **XIII Meeting of Specialists in Aquatic Mammals from South America and 7th SOLAMAC meeting (RT).** Members of Toninas Project/Cetáceos Uruguay (Micaela Trimble), together with the ONG PROFAUMA, organized the XIII

Meeting of Specialists in Aquatic Mammals from South America and 7th SOLAMAC meeting (RT). The RTs represent an instance of meeting and tuning into new techniques for all Latin American scientists conducting research on aquatic mammals. This reunion was declared of ministerial interest by the Ministerio de Ganadería Agricultura y Pesca (MGAP, Ministry of Agriculture Livestock and Fisheries).

Toninas Project presented several works during this meeting:

- Laporta, P., P. Fruet, J. and E. Secchi. 2008a. Estimación de abundancia de toninas *Tursiops truncatus* en la costa oceánica Uruguaya. P 75 *in:* 13° Reunión de Trabajo de Especialistas en Mamíferos Acuáticos de America del Sur/ 7° Congreso Solamac. 13th to 17th October, Montevideo, Uruguay (oral).
- Laporta, P., P. Fruet, J. Di Tullio, J and E. Secchi. 2008b. Movimientos de toninas *Tursiops truncatus* entre la costa oceánica Uruguaya y sur de Brasil. P 156 *in*: 13° Reunión de Trabajo de Especialistas en Mamíferos Acuáticos de America del Sur/ 7° Congreso Solamac. 13th to 17th October, Montevideo, Uruguay. (poster).

- Workshop "The role of environmental education in the conservation of aquatic mammals" Toninas Project/Cetáceos Uruguay members organized during the RT, together with MSc. Marila Lázaro, the workshop "The role of environmental education in the conservation of aquatic mammals". This was the first time that in an RT a workshop on Environmental Education is done. The aim of this workshop was to present environmental education activities related to aquatic mammals to emphasize its important role in conservation. During this workshop several projects from Latin America were presented and there was a discussion time involving researchers, educators and public in general.

Members of Toninas Project presented their work of ARENAS Project during this workshop:

- Trimble, M.; Szephegyi, M.; Ríos, M.; Passadore, C.; Nin, M; Laporta, P.; García, F.; Fagúndez, C. & Castiñeira, E., 2008. Desde niños a maestros: ampliando el alcance de la educación ambiental para la conservación de los ecosistemas costeros (oral).

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I South American Meeting of Research and Conservation of Bottlenose dolphin (*Tursiops truncatus*) "Integrating knowledge of the species in the South-western Atlantic Ocean". This workshop gathers all the investigation groups of bottlenose dolphin in the region (Argentina, Brazil and Uruguay). It will be held in May 2010 (18 th to 22th) in conjunction with IV Brazilian Oceanography Congress (CBO) at the Universidad Federal de Rio Grande (FURG). This meeting is being organized by Laboratório de Tartarugas e Mamíferos Marinhos of FURG, Laboratório de Mamíferos Aquáticos of the Museu Oceanográfico Prof. Eliezer C. Rios and Toninas Project/Cetáceos Uruguay of Facultad de Ciencias, Uruguay. During the workshop all the bottlenose dolphin regional research will be presented, and the researchers involved will be work together with the aim of coordinate not only research but also action towards the conservation of bottlenose dolphin in the Southwestern Atlantic Ocean.

FINAL CONSIDERATIONS

Results indicate that the population is small, and therefore, vulnerable to by-catch in fisheries, sub-optimal food availability, environmental and demographic stochasticity

and habitat degradation. Moreover, the population in Uruguayan waters is resident that performs dynamic and long range movements along the coast of Uruguay and southern Brazil, which could reflect environmental heterogeneity and patchy resources. These investigations serve as a basis to develop criteria and guide lines to supervise the protection of this species, before the elaboration of a management plan for the protected areas involved. In this context and applying the Precaution Principle, it was possible to add the bottlenose dolphin in the priority conservation species list in Uruguay. Its small population size, coastal habits, high mobility, neighbouring threatens, as by-catch in artisanal fishing nets in southern Brazil, have been evaluate to select the species as a priority one. On the other hand, this study allow a great advance in the knowledge on this species in Uruguayan waters and regionally enabling us to establish a residence population in Uruguayan coast and the dynamic movements between neighbouring areas including southern Brazil, with the possibility of eventually determine if we are dealing with a metapopulation. This is crucial to make joint decisions and to establish integrated conservation steps with the other countries involved, principally due to the high mortality of dolphins in artisanal fisheries in southern Brazil.

Conservation activities were important to intensify local people's ecological awareness and knowledge about the species and the importance of the coastal environment. We find a big popular confusion related to what kind of dolphin is the bottlenose dolphin, a problem that does not occur only in Uruguay, it is a regional problem also. We started an information campaign about the status of bottlenose dolphin in Uruguay, inviting lifeguard, fishermen and local people to participate and share its knowledge and experiences related bottlenose dolphin in our coast.

FUTURE PLANNED ACTIVITIES

It is very important to continue with this study on a long-term basis. Our future plans are to continue the study of the distribution and movements patterns of bottlenose dolphin population in coordination with Brazilian research group; in order to get a more exact idea of the population dynamics. Additionally, genetic structure studies will be very important to get a more quickly answer about the genetic flux between neighbouring bottlenose dolphin populations and for determine subdivision patterns and stocks populations for management units among the countries involved.

These movements may change as the years pass, making it important to maintain continuous investigations. Since cetaceans are long-lived animals, the most accurate studies must consider many years of investigations. Currently the Brazilian research group is making survey effort in the adjacent waters of the Patos Lagoon, and they are identifying new individuals (Di Tullio *et al.* 2008). Thus, the comparison should continue during the following years.

In brief, our perspectives for the following years are:

1. Continuing with the annual monitoring to estimate population size of bottlenose dolphin along the Uruguayan coast trough mark-recapture techniques, to know the population dynamics in a long lasting period.

2. Continuing with the systematic comparison of photo-id catalogues in order to know the movements and home range of the identified dolphins in Uruguay and Southern Brazil.

3. Analyze the genetic structure of this population and the southern Brazilian population in order to know the stock determination.

4. Start with feeding and diet studies in Uruguayan coast due to the strong relationship with the movements between different areas. This studies will be carry out using stable isotopes and fatty acids techniques due to the absence of stranded animals along the Uruguayan coast.

5. Expand the study area to the estuarine coast of Uruguay with the collaboration of lifeguards to know the occurrence and habitat use of dolphins in that area.

6. Incorporate and valorise the traditional ecological knowledge of fishermen and lifeguards from the Uruguayan coast into scientific research in order to achieve more information of the species in other coastal areas and to involve local people (trained) in data collection.

7. To elaborate an educational and informative material about bottlenose Dolphin in Uruguay for general public, due to limited information and great confusion about the species.

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See RSG Final report RSG39.06.08 archive

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