



**DEVELOPMENT OF  
CONSERVATION STRATEGIES  
FOR THE PROTECTION OF  
JUVENILE GREEN TURTLE  
POPULATIONS AT CRITICAL  
FORAGING AREAS IN  
URUGUAY**

Final report

Submitted to the

BP CONSERVATION PROGRAMME

April 2006

## Team members

MSc. Milagros Lopez -Mendilaharsu  
Executive director/ Scientific coordinator

Alejandro Fallabrino  
Executive director

Bsc. Cecilia Lezama  
Artisanal Fisheries coordinator

Teacher Antonia Bauzá  
Education coordinator

Andrés Estrades  
Field coordinator

Mariana Rios  
Education Area

Tec. Melisa Morales  
Ecotourism Area

Bsc. Matias Feijoo

Bsc. Diana Perez

This Final Report should be cited as follows:

López-Mendilaharsu, M., A. Bauzá, C. Lezama, A. Estrades, M. Rios, M. Morales & A. Fallabrino. Development of Conservation Strategies for the Protection of Juvenile Green Turtle Populations at Critical Foraging Areas in Uruguay. Final Report: British Petroleum Conservation Programme 2006. 39 pp.

## TABLE OF CONTENTS

ABSTRACT .....	1
INTRODUCTION .....	2
OBJECTIVES.....	3
OBJECTIVE 1- Activity patterns and movements of green turtles in CV.....	4
METHODS.....	4
RESULTS.....	6
DISCUSSION.....	14
COASTAL-MARINE PROTECTED AREA (CMPA) "CERRO VERDE".....	15
OBJECTIVE 2 – Incidental capture of green turtles at the "Bajos del SoIs"....	17
METHODS.....	17
RESULTS AND DISCUSSION.....	18
OBJECTIVE 3 – Fishermen training.....	21
WORKSHOPS.....	21
SAMPLING.....	22
OBJECTIVE 4 – Education programme.....	23
ENVIRONMENTAL EDUCATION PROGRAMME.....	23
OBJECTIVE 5 – Community development and training.....	26
COMMUNITY MARINE CENTRE (CMC) – Locality of San Luis.....	26
MARINE TURTLE CENTER (MTC) - Locality of La Coronilla.....	27
OTHER ACTIVITIES.....	31
GENERAL CONCLUSIONS.....	34
FINANCIAL REPORT.....	36
ACKNOWLEDGMENTS.....	37
LITERATURE CITED .....	38

## Abstract

Cerro Verde area and adjacent waters in the Atlantic coast of Uruguay serve as developmental habitats for juvenile green turtles and has been highlighted as essential habitats for the protection of these endangered populations. Local fisheries, which utilize set nets along those areas has been identified as an important source of mortality to green turtles.

The paucity of quantitative data on habitat use and preferences of green turtles has been compromised future management plans for the conservation of the species. One objective of our study was to evaluate the activity patterns and movements of juvenile green turtles at a coastal foraging ground in Cerro Verde and adjacent waters. A total of 64 juvenile green turtles were captured in the study area, curve carapace length (CCL) ranged from 33.4 – 61.2 cm (mean = 41.6 cm, SE = 0.8). Four green turtles ranging from 38.6 to 48 cm in CCL and 7 to 15 kg in mass were fitted with a combination of radio and sonic transmitters and released at their captured sites. Turtles remained within the area for extended periods (up to 6 months). Overall mean surface and submergence times were calculated as well as hourly means at dawn (0500-0900 h), day (0900-1700 h), dusk (1700-2100 h) and night (2100-0500 h). Tracking was conducted for a total of 44 hours at dawn, 43 hours during the day, 41 h at dusk and 32 h at night. Two types of diving behavior of juvenile green turtles were noted: Active periods of foraging (dives < 5 min) occurred mostly during the morning/day (from 09:00 to 14:00) and at the end of the afternoon (from 17:00 to 19:00). Resting behavior (submergence > 20 min) was frequently observed at night and in some occasions at dusk.

Another objective was to estimate the incidental capture of green sea turtles at the "Bajos del Solís" area and identify the fishery zones that constitute a real threat to this population. 21 incidental captures of green turtles were recorded during the study period, 38 % of which were found already drowned. Two conflict zones were identified: "Pato Islands" located in front of Playa Verde coast, and "La Tuna Island" including the surrounding areas in front of the locality of San Luis.

The integration of the local community and individuals was performed throughout workshops, informative talks, guided visits to the Marine Turtle Center and during the Second Festival "Let's save the Green Turtle". The response of the local community was very enthusiastic and supportive to the conservation activities developed by our programme.

The integrated information generated over the last years, in combination with other research groups enabled our NGO CID/Karumbé to submit a proposal to the Division of Natural Protected Areas – National Environmental Agency (DI.NA.MA.) with the objective to include the Cerro Verde area within the *National System of Protected Areas*, according to the Decree N°52/2005 (Law 17.234). At the beginning of 2006, the Regulation was effectively approved thus the Cerro Verde has become the first Coastal-Marine Protected Area of Uruguay.

## Introduction

Green turtles *Chelonia mydas* occur in tropical and subtropical regions throughout the world's oceans (Groombridge and Luxmoore 1989) but due to intense human overexploitation, this species is listed as endangered throughout its range (IUCN; Hilton-Taylor 2000). As the other sea turtles the green turtles are very susceptible to the impact of fishing activities, these practices have been recognized for many years as a serious source of sea turtle mortality as a result of incidental capture in fishing gear (Oravetz 2000). In Uruguay, an important number of juvenile green sea turtles are incidentally captured in artisanal fishermen gillnets with an estimated mortality percentage around 50 % (Lezama *et al.* 2004).

*C. mydas* is distributed throughout the coast, mostly in those regions where algae are abundant (rocky and insular areas) which constitute their main food item. The plentiful presence of the green turtles in some areas throughout the year, denote that these areas represent developmental and foraging habitats for the species. Previous studies indicated that an important population of green turtles utilizes the coastal fringe and insular habitats of Cerro Verde and also those comprised between Piriápolis (Maldonado) and San Luis (Canelones) locally known as "Bajos del Solis" (López-Mendilaharsu *et al.*, 2003). In addition, the "Bajos del Solis" area is an important fishery zone where artisanal boats from different ports along the coast operate. Until now, little is known about the impact that this artisanal fishery cause to the green sea turtles population that inhabit in the area. That is why one of our main objectives was to evaluate the incidental capture of green sea turtles in the developmental and foraging habitats of "Bajos del Solis" in order to identify the fishery zones that constitute a real threat to this population.

Preliminary results of mixed stock analysis of juvenile green turtles indicated that the main contributor was the Ascension Island (UK) rookery followed by, among others, Matapica (Suriname) and Aves Island (Venezuela). The sequence obtained provided enough information to presume that Uruguay is an area hosting green turtles from several nesting beaches in the Atlantic Ocean (Caraccio *et al. in press*). Thus, mortality due to fishing activities in Uruguayan waters may be depleting endangered nesting populations elsewhere in the Atlantic.

The difficult economic situation that these coastal communities and adjacent areas are facing linked to the unsustainable resource use practices, menace to endanger the green sea turtle population. The lack of fishing resources and money to support the ships and other materials has favored the secondary use of the turtles for other purposes as consumption and carapace sale. The promotion of newly economic alternatives (using the charismatic image of the turtle) and the local people participation in conservation activities along with the creation of the Community Marine Centre has served as key elements to gain the community support and for the success of the programme. In this project we also studied the activity patterns and local movements of green turtles in order to make grounded decisions and recommendations during the forthcoming development of the management plan for the Cerro Verde Marine Protected Area (AMP).

# Objectives

## OVERALL

Asses and promote conservation strategies in order to protect key foraging/developmental areas for green turtle populations in Uruguayan waters. We pretend to mitigate the mortality of green turtles in those fishing communities by promoting the participation of its members in field work activities and in an environmental education programme to encourage the development of additional beneficial activities.

## SPECIFIC OBJECTIVES

1. Asses short-term foraging ranges, activity patterns and movements of juvenile green turtles near Cerro Verde Islands and adjacent waters.
2. Estimate the number of green turtles incidentally captured by the artisanal fleet that operate from the ports of San Luis, Playa Verde and Piriápolis and determine if there is any seasonality in those captures.
3. Strengthen and consolidate the relationship created with the fishermen (key actors) through their integration in conservation activities of the project at a local level.
4. Implement an innovative environmental educational programme at schools and coastal settlements where the impact of fishing activities on green turtles is high.
5. Create the bases and suitable conditions to encourage the community members of San Luis-Piriápolis and La Coronilla-P. del Diablo to utilize the image of the turtle to produce and sale products allusive to turtles.

## Objective 1- Activity patterns and movements of green turtles in CV

### METHODS

#### Study Area

The area is part of the *Bañados del Este y Franja Costera Biosphere Reserve* established in 1976 and is a RAMSAR site since 1982. This region is located in the Northeastern Atlantic coast of Uruguay, and contains great biodiversity, including many migratory and/or endangered species (e.g. franciscana dolphins, *Pontoporia blainvillei*; bottlenose dolphins, *Tursiops truncatus*; right whales, *Eubalaena australis*; sea lions, *Otaria flavescens* and *Arctocephalus australis*; migratory sea birds, *Thalasseus maximus*, *T. sandivensis eurignatha*, *Sterna hirundinacea*, *Calidris canutus rufa* etc.). The study was conducted within this Coastal Fringe at the Cerro Verde Islands (33°56' S - 53° 29' W; Figure 1) and adjacent costal waters between the localities of La Coronilla and Punta del Diablo. A great variety of ecosystems are present in this area, like sandy dunes, hills and sandy beaches interrupted by rocky shore areas. Abundant algae beds occur along rocky bottoms with depths less than 4 m.



Figure 1: Cerro Verde area

## Green turtle capture and measurements

We captured green turtles with an entanglement net (30 m x 2.5 m; mesh size = 36 cm) placed along the area (islands and coastal waters), next to the shore. The net was set manually from the beach or by boat and monitored continuously until a turtle was captured. Entangled turtles were removed from the net and transported to the beach where they were measured and tagged.



Curve carapace length was measured from the nuchal notch to the posterior tip of the supracaudals using a flexible tape measure (CCL). Turtles were weighted to the nearest kg using a spring scale and tagged on the front flippers; we used Inconel tags (style 681) provided by the Cooperative Marine Turtle Tagging

Program, which belongs to the Archie Carr Center for Sea Turtle Research (ACCSTR).

Based on minimum nesting size at the "Trindade Island" rookery (Brazil) (Moreira *et al.* 1995), we classified all turtles with CCL < 101 cm as immature and all turtles with CCL = 101 cm or more as adults.

## Transmitter attachment and tracking

Green turtles were fitted with radio transmitters (MOD-305, Telonics) attached to crown of the carapace using fibreglass, cloth and resin (Balazs *et al.* 1996). CHP-87-L sonic transmitters were affixed to the carapace with electrician "tie-wraps" fit through two 3 mm diameter holes drilled in the marginal scutes (Renaud *et al.* 1995). Radio transmitter frequencies ranged from 148.020 to 148.080 MHz. Sonic transmissions were 36 to 39 kHz, a frequency that is outside the hearing capacity of green turtles (30 Hz to 1 kHz; Ridgeway *et al.* 1969).

Instrumented turtles were released at their capture sites within 24 hours and tracking began after 24 h acclimation period. Turtles were released within 1 km of their capture site, and tracking began after 24 hours acclimation period. Radio transmitters were monitored from a distance of up to 11-12 km, using a Telonics TR-4K receiver connected to a 3-element Yagi antenna. Sonic transmitters were monitored with a sonic receiver (USR-96, Sonotronics) with a DH-4 directional hydrophone and a DH-3 omni-directional hydrophone. A tracking boat was used in order to record the signals systematically. Radio telemetry was used to achieve long distance tracking and to provide surface times and dive durations, while sonic telemetry was used to pinpoint the location of the turtles. We monitored by radio from land when weather prohibited tracking on water.



## Submergence and surface durations

Surface and submergence times were calculated for each turtle with radio transmitter. Surface time was considered to be the interval between the beginning and ending of radio signals. Submergence time was defined as the interval between the end of a radio signal and the beginning of the next signal. Overall mean surface and submergence times were calculated as well as hourly means and dawn (0500-0900 h), day (0900-1700 h), dusk (1700-2100 h) and night (2100-0500 h) means. A surface or submergence interval overlapping 2 time periods was included in the period containing the majority of the interval.



## Analysis or statistical methods

Distribution of variables (surface and submergence times) were tested with the Shapiro-Wilk test for normality ( $\alpha = 0.05$ ). The Kruskal-Wallis analysis was used to test for differences in mean surface or submergence times by time period (dawn, day, dusk and night) at  $\alpha = 0.05$ , when the null hypothesis (normal distribution) was rejected. If a significant difference was detected, a nonparametric multiple comparisons test described by Dunn (Zar 1999) was used to determine which means differed ( $\alpha = 0.05$ ).

## RESULTS

### Capture and tagging of green turtles



A total of 64 juvenile green turtles were captured in Cerro Verde and adjacent waters during the period of study, two of which were captured by artisanal fishermen from Punta del Diablo. Three of the turtles tagged during the field season were also recaptured (Table 1). All the turtles captured were immature individuals (CCL < 101 cm). Two turtles were found drowned on fishermen's gill nets, one of the turtles was a turtle already tagged by Karumbé (Table 2). Curve carapace length (CCL) of the green turtles captured ranged from 33.4 – 61.2 cm (mean = 41.6 cm, SE = 0.8; n = 64). We also recorded the number of turtles stranded on the beach (Table 3) to collect valuable information regarding the species. In those cases where turtles were found alive they were kept in the center to improve their condition, and released back to the sea after treatment.

Table 1. Number of turtles captured alive during the period of study in Cerro Verde and and Punta del Diablo.

Specie	First Capture	Recaptures	Total N° of Captures
<i>C. mydas</i>	64	3	67

Table 2. Green turtles recaptures during the period of study in Cerro Verde and nearby localities.

Life stage	Tagging site	Date	Recapture site	State	Method	Date
Juvenil	Coronilla (Rocha, Uruguay)	18/2/05	Cerro Verde (Rocha, Uruguay)	alive	Karumbé net	21/2/05
Juvenil	Punta Coronilla (Rocha, Uruguay)	10/2/05	Punta Coronilla (Rocha, Uruguay)	alive	Karumbé net	3/3/05
Juvenil*	Cerro Verde (Rocha, Uruguay)	22/02/05	Cerro Verde (Rocha, Uruguay)	alive	Karumbé net	18/3/05
Juvenil	Cerro Verde (Rocha, Uruguay)	21/12/04	Valizas (Rocha, Uruguay)	dead	Fisherman net	29/12/04

\* turtle GT44 with radio transmitter

Table 3. Number of turtles stranded during the period of study.

Specie	Dead	Alive	Total
<i>C. mydas</i>	12	3	15
<i>C. caretta</i>	11	2	13

### Tracking effort and movement patterns

Four green turtles were tracked from 25 January 2005 to 13 August 2005. Most of the tracking effort was performed from January to the end of March. Attempts to monitor the turtles and verify their presence within the area was performed also during fall and winter or until the cessation of radio signals. No further contact was detected after August 13, probably due to the cessation of radio signals. Radio signals from three of the four transmitters were detected for a period of two months, the other one (GT73) was detected during almost 6 months (Table 4). Differences in tracking periods were due to different capture dates and variable operational life, tag retention or departure of the feeding area. In addition, the inclement weather suffered during the tracking season prevented us to relocate the turtles underwater (using the sonic equipment) so little data was obtained regarding their movements. However, turtle GT44 was recaptured one month later of it's inicial capture at the same site.

Table 4. Capture and release dates, location, measurements and tagging information for 4 juvenile green turtles tracked in Cerro Verde and adjacent waters, Rocha, Uruguay. (CCL = curve carapace length; CCW = curve carapace width; W = weight; LF = left flipper and RF = right flipper).

Turtle #	Capture Date/ Location	Release Date/ Location	Length (cm) Weight (Kg)	Tag numbers	Radio Freq.	Last Contact
GT84	23/01/2005 Verde Island	24/01/2005 Cerro Verde	CCL – 38.6 CCW – 1.0 W – 7.0	LF: TTE432 RF: TTE433	148.840 Mhz	01/04/2005
GT15	23/01/2005 Verde Island	24/01/2005 Cerro Verde	CCL – 47.6 CCW – 8.0 W – 13.0	LF: TTE431 RF: TTE448	148.150 Mhz	26/03/2005
GT73	21/02/2005 Cerro Verde	22/02/2005 Cerro Verde	CCL – 48.0 CCW – 44.1 W – 15.0	LF: TTE453 RF: TTE454	148.730 Mhz	13/08/2005
GT44	21/02/2005 Cerro Verde	22/02/2005 Cerro Verde	CCL – 39.6 CCW – 5.5 W – 7.0	LF: TTE455 RF: TTE456	148.440 Mhz	23/04/2005

### Submergence and surface behavior

Surface and submergence times were calculated for each turtle with radio transmitter. Surface time was considered to be the interval between the beginning and ending of radio signals. Submergence time was defined as the interval between the end of a radio signal and the beginning of the next signal. Overall mean surface and submergence times were calculated as well as hourly means at dawn (0500-0900 h), day (0900-1700 h), dusk (1700-2100 h) and night (2100-0500 h) means.



Tracking was conducted for 44 hours at dawn, 43 hours during the day, 41 h at dusk and 32 h at night. Time spent submerged ranged from 94% to 97.2%. Submergence time ranged from 0.01 to 68.2 minutes. Surface time varied from 0.8 to 156 seconds (Table 5). Overall mean, maximum and minimum submergence and surface times for each one of the turtles at the different time periods are presented in Table 5.

Table 5. Overall mean, maximum and minimum submergence (minutes) and surface (seconds) times by time period, for the four green turtles tracked near Cerro Verde area, Rocha, Uruguay. SD = standard deviation, SE = standard error, n = number of events.

GT84	DAWN		DAY		DUSK		NIGHT	
	Surface (sec)	Subm. (min)						
Mean	12.1	9.9	16.6	7.8	23.3	9.4	59.1	18.8
Min	0.8	0.03	0.8	0.01	0.8	0.01	21.6	1.05
Max	115.2	68.3	64.8	25.2	115.2	35.1	92.0	38.3
SD	23.7	15.5	18.9	7.5	34.0	11.2	27.5	17.3
SE	3.1	2.2	2.3	1.0	4.2	1.5	9.7	7.7
N	58	52	65	59	66	58	8	5
GT15	DAWN		DAY		DUSK		NIGHT	
	Surface (sec)	Subm. (min)						
Mean	8.5	4.5	2.9	2.7	8.7	5.0	37.0	18.3
Min	0.8	0.01	0.8	0.01	0.8	0.01	4.8	0.23
Max	100.8	44.4	53.6	29.3	54.4	22.1	66.4	38.0
SD	17.1	10.1	4.0	4.4	12.0	5.9	16.4	13.3
SE	1.8	1.1	0.2	0.3	1.2	0.6	2.7	2.4
N	92	87	305	299	94	90	36	31
GT73	DAWN		DAY		DUSK		NIGHT	
	Surface (sec)	Subm. (min)						
Mean	3.1	2.3	1.7	2.7	8.6	3.0	70.3	14.2
Min	0.8	0	0.8	0.04	0.8	0	4.8	0.07
Max	120.8	48.32	6.4	14.44	88	27.31	156	24.18
SD	9.4	4.5	0.7	2.4	16.6	5.1	32.0	5.9
SE	0.5	0.3	0.1	0.2	1.4	0.4	4.4	0.8
N	297	294	211	207	148	144	54	49
GT44	DAWN		DAY		DUSK		NIGHT	
	Surface (sec)	Subm. (min)						
Mean	13.9	4.3	7.6	3.4	46.3	11.3	66.7	17.7
Min	0.8	0.02	0.8	0.04	2.4	0.01	19.2	9.32
Max	98.4	19.34	74.4	16.24	83.2	35.25	98.4	19.41
SD	21.9	4.4	16.0	3.3	23.4	6.4	16.8	2.5
SE	1.9	0.4	1.2	0.3	3.4	1.0	3.1	0.6
N	134	132	173	167	48	43	30	17

The mean length of submergence and surface times, by hour of the day, for all turtles was quite variable (Fig. 2a, 2b, 2c, 2d).

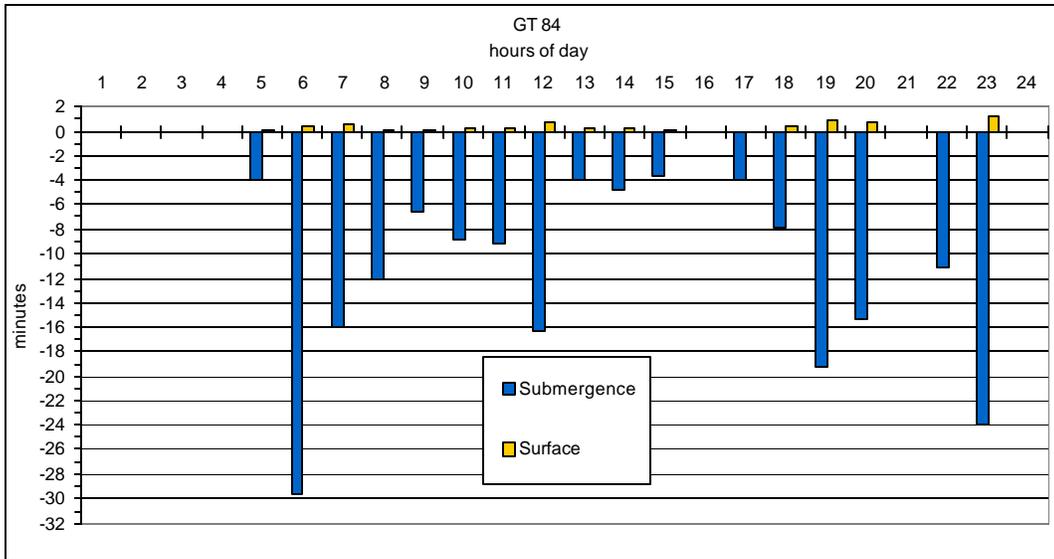


Figure 2a. Overall mean surface and submergence times by hour of the day for juvenile green turtles in Cerro Verde and adjacent waters, Rocha. A surface or submergence interval overlapping 2 time periods was included in the period containing the majority of the interval.

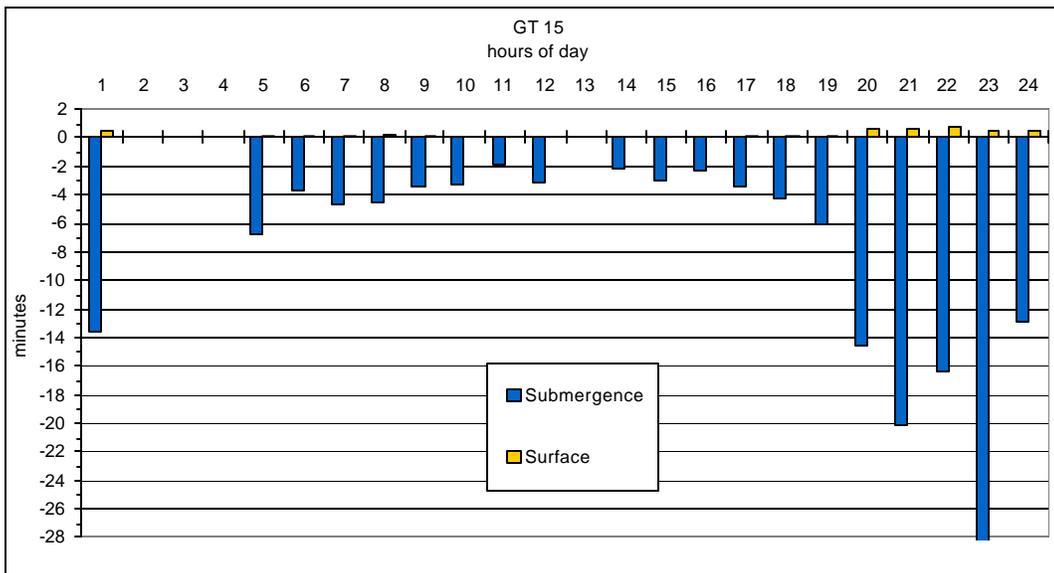


Figure 2b. Overall mean surface and submergence times by hour of the day for juvenile green turtles in Cerro Verde and adjacent waters, Rocha. A surface or submergence interval overlapping 2 time periods was included in the period containing the majority of the interval.

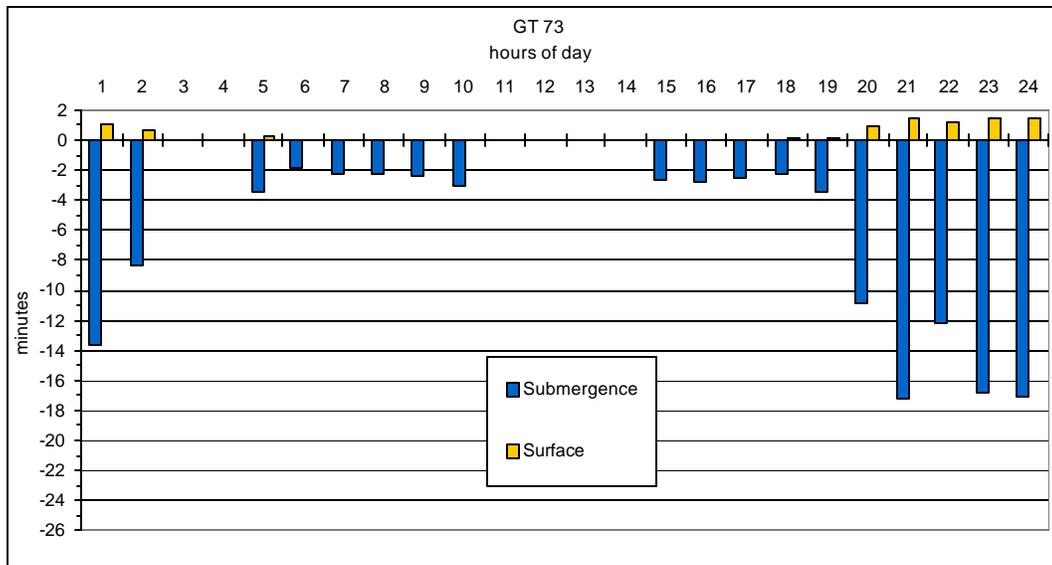


Figure 2c. Overall mean surface and submergence times by hour of the day for juvenile green turtles in Cerro Verde and adjacent waters, Rocha. A surface or submergence interval overlapping 2 time periods was included in the period containing the majority of the interval.

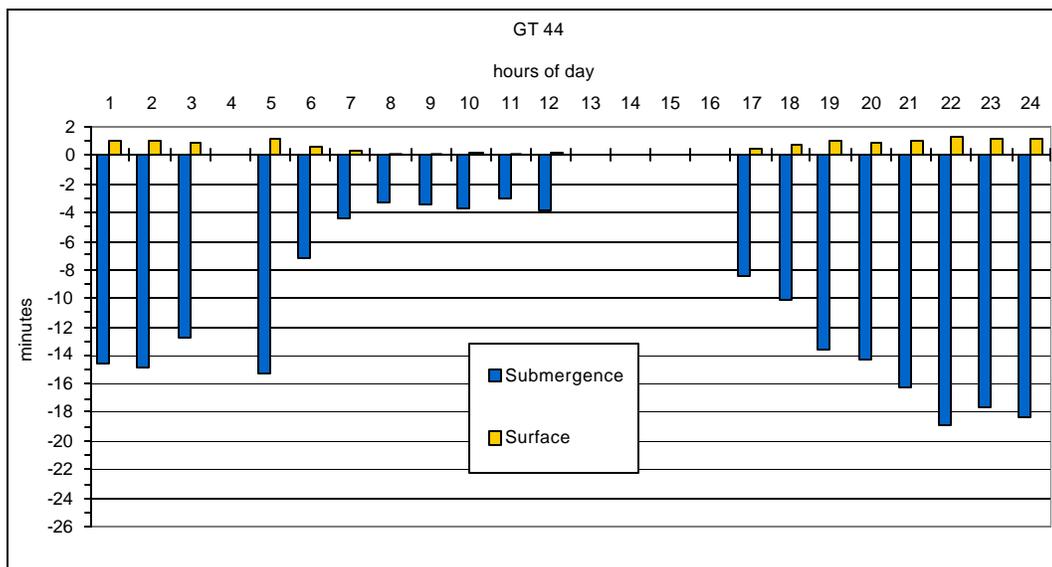


Figure 2d. Overall mean surface and submergence times by hour of the day for juvenile green turtles in Cerro Verde and adjacent waters, Rocha. a) GT84, b) GT15, c) GT73, d) GT44. A surface or submergence interval overlapping 2 time periods was included in the period containing the majority of the interval.

A detailed breakdown of the submergence times, by turtle, revealed that 43.4 % to 64.1 % of the submergence were > 1 - 10 min and that 70.7% to 88.4% were 10 min in duration (Fig. 3a). Submergence patterns were significantly different when analyzed by dawn, day, dusk and night (Table 6). 60% to 94% of the dives monitored at night were greater than 10 min in duration (Fig. 4a). Increased durations of surfacing events at night coincided with fewer but increased mean submergence durations.

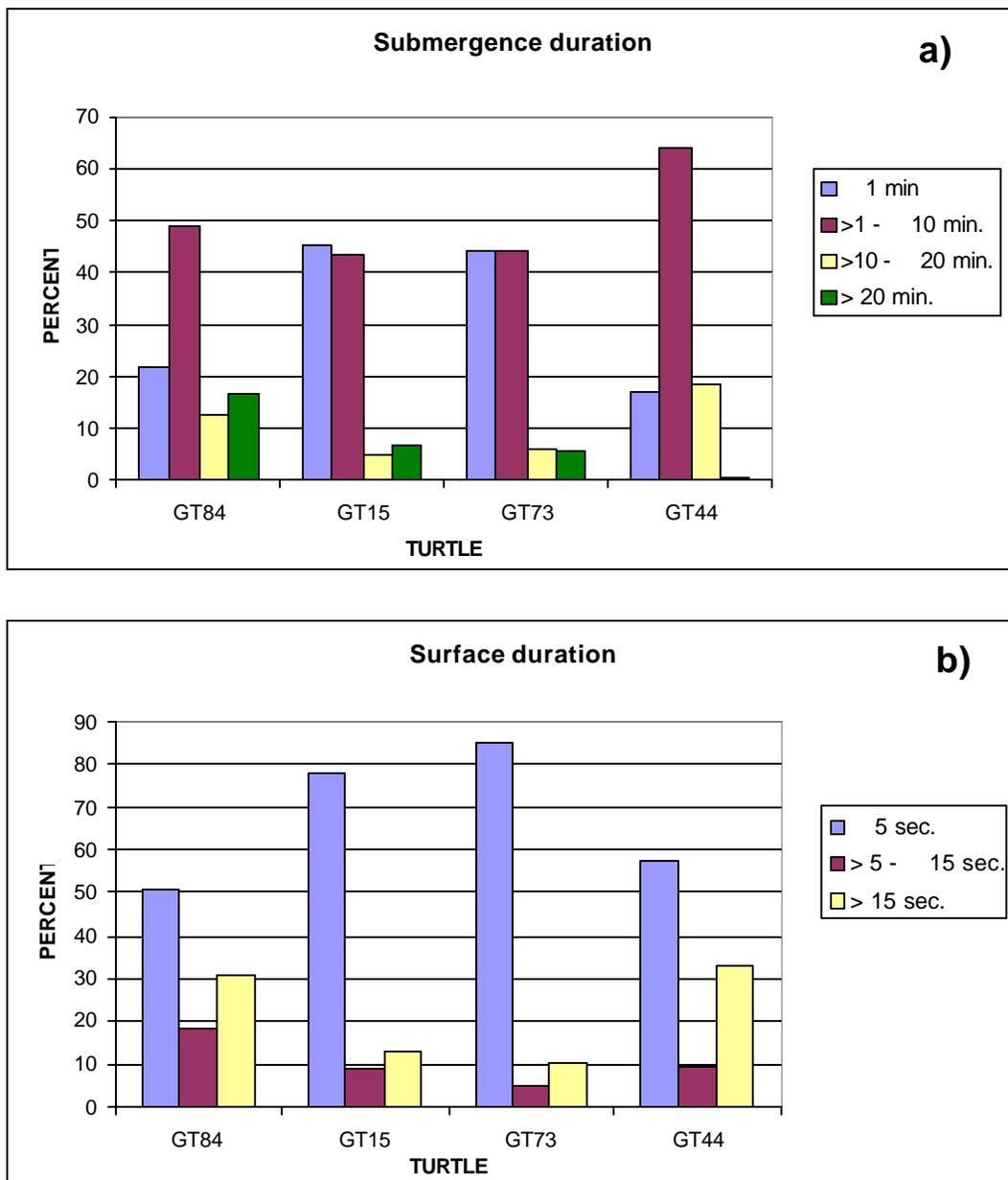


Figure 3. Green turtles (GT84, GT15, GT73, GT44) a) submergence (minutes) and b) surface (seconds) durations by specified time intervals; all time combined.

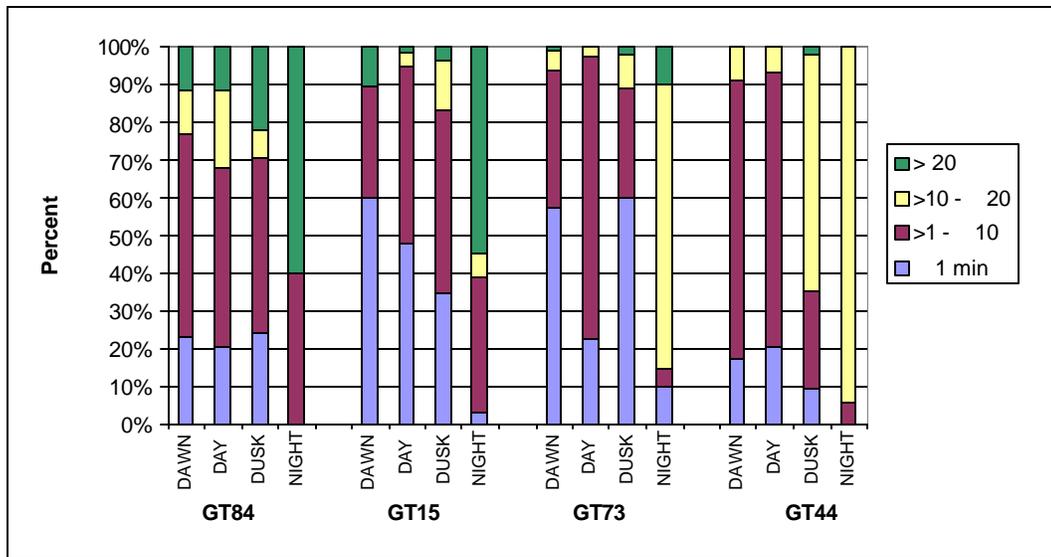


Figure 4a. A detailed breakdown of the a) submergence times, by turtle and by time period (dawn, day, dusk and night).

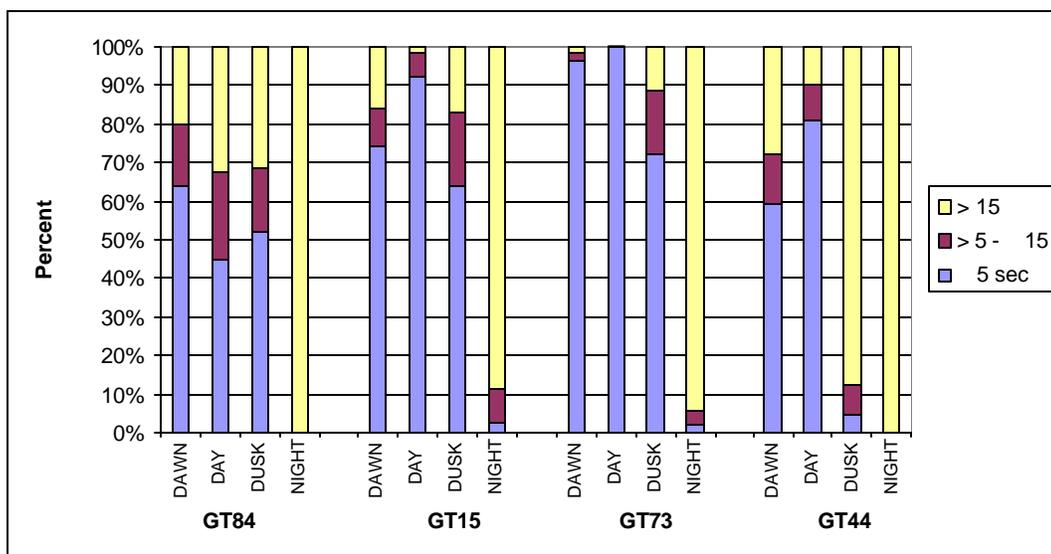


Figure 4b. A detailed breakdown of the surface times, by turtle and by time period (dawn, day, dusk and night).

A breakdown of the surface times, by turtle, revealed that 51% to 85% of the surfacings were 5 sec and in duration (Fig. 3b). Surface patterns were significantly different when analyzed by dawn, day, dusk and night (Table 6). The number of surfacing events > 15 sec (between 89 % to 100 %) were higher at night than at any other time periods for every turtle tracked at night (Fig. 4b).

Table 6. Mean surface (seconds) and submergence (minutes) times by time period, for the four green turtles tracked near Cerro Verde area, Rocha, Uruguay. Mean values are significantly different (Dunn test) from each other if time periods are not connected by horizontal lines.

<b>Turtle</b>	<b>Time of the Day</b>				
<b>TG84</b>	Surface	NIGHT 59.1	DAWN 12.1	<u>DUSK</u> 23.3	<u>DAY</u> 16.6
	Submergence	<u>NIGHT</u> 18.8	<u>DAWN</u> 9.4	<u>DUSK</u> 9.9	<u>DAY</u> 7.8
<b>TG15</b>	Surface	NIGHT 37.0	DUSK 8.7	<u>DAWN</u> 8.5	<u>DAY</u> 2.9
	Submergence	<u>NIGHT</u> 18.3	<u>DUSK</u> 5.0	<u>DAWN</u> 4.5	<u>DAY</u> 2.7
<b>TG73</b>	Surface	NIGHT 70.3	DUSK 8.6	DAWN 3.1	DAY 1.7
	Submergence	<u>NIGHT</u> 14.2	<u>DUSK</u> 3.0	<u>DAWN</u> 2.3	<u>DAY</u> 2.7
<b>TG8</b>	Surface	NIGHT 66.7	DUSK 46.3	DAWN 13.9	DAY 7.6
	Submergence	<u>NIGHT</u> 17.7	<u>DUSK</u> 11.3	<u>DAWN</u> 4.3	<u>DAY</u> 3.4

## **DISCUSSION**

### **Movements and habitat utilization**

Radio telemetry indicated that the turtles were very resident as they were detected within the area (distance radio of 11-12 km) almost during the entire tracking season. Moreover, one of the turtles, GT73, was present within the area during 6 months which is consistent with previous studies where tracked turtles remained in the area from 4-6 months (Mendilaharsu et al. in press). The abundance of food extensive algal mats present in the study area may account for the high site fidelity. Previous analyses of diet samples support the utilization of those algal food resources. Moreover, numerous sighting of green turtles carrying the transmitters close to the Cerro Verde costal habitats were documented during different times of the year supporting the fact that insular and coastal rocky shores in Cerro Verde are the preferred habitats for juvenile green turtles.

### **Submergence behavior**

Two types of submergence behavior of juvenile green turtles were noted, foraging and resting. Active periods of foraging and feeding (submergence < 5 min) occurred during the day and also in the morning and early dusk

(from 17:00 to 19:00). Resting behavior (submergence 10 min) was observed at night, in some occasions at dusk from 19:00.

## **COASTAL-MARINE PROTECTED AREA (CMPA) "CERRO VERDE"**

### **National System of Protected Areas– SNAP Project.**

In February 2000, the Law 17.234 was approved, declaring of general interest the creation of a *National System of Protected Areas* (SNAP) as an essential tool for the conservation of Biodiversity in Uruguay. This law is regulated by the Decree N°52/2005, approved in February 2005, with the demand of implementing gradually the *National System of Protected Areas* by the National Environmental Agency (DINAMA) supported by SNAP Project, DINAMA/UNDP/GEF URU/05/001 - [www.snap.gub.uy](http://www.snap.gub.uy).

Until the date, Uruguay was the only Latin-American country lacking a *National System of Protected Areas*.

The SNAP includes experimental experiences which will allow the government to test and adjust politics and management plans for all the Protected Areas (PAs) defined generally in the Strategic Plan, which includes different management models, diverse financial mechanisms, and communication and educational strategies.

The experimental experiences are key elements because they contribute at different levels: a) strengthening institutions and capacitating individuals through its own action; b) contributing to the effective implementation of PAs, which are included in the SNAP during the period of execution of the Project, or in certain cases, in later periods; c) generating knowledge that will feedback the SNAP's Strategic Plan, as well as replicating successful solutions in other PAs of the country or other parts of the world. In this way, these strategies end up to be highly cost-effective.

### **Implementation**

Since 1999 many research and conservation groups have been working in Cerro Verde to fortify the information about the ecological, social and economical relevance of this area. In 2004, all the information generated, was unified in two theses for the Science College (Universidad de la República, Uruguay), in order to characterize and set the most outstanding facts about the area following the IUCN statements.



Something to highlight is the fact that, since the beginning, all the information collected was possible through key local people from nearby towns that have been supporting all the research and conservation activities (fishermen, local authorities, artisans, teachers, local military groups, local traders, tourist guides and farmers).

This integrated information enabled the NGO CID/Karumbé to write a report for DINAMA, according to the Decree N°52/2005 (Law 17.234), asserting the priority of the inclusion of the Cerro Verde area within the *National System of Protected Areas*, and becoming the first Coastal-Marine Protected Area (CMPA) of Uruguay. This zone was indicated due to its biogeographical, ecological, scientific, economical and social relevance, unique landscapes and also because its importance at a national and international level. All these features justified that the area must be included within the SNAP.

The Environmental Project for the River Plate and its Maritime Front: Prevention and Control of Pollutants and Restoration of Habitats – FREPLATA (UNDP/GEF RLA/99/G31 - [www.freplata.org](http://www.freplata.org)) through its Biodiversity National Strategy, also has selected Cerro Verde as an experimental experience of their project to be one of the new Marine Protected Areas in Uruguay.

The Uruguayan government, through the Project: Strengthen Capacities for the Implementation of the *National System of Protected Areas* (SNAP), chose 5 areas as experimental experiences. Recently, the 18th of November 2005, CID/Karumbé was invited to be the representative organization to introduce Cerro Verde to the Protected Areas Advisory National Commission.

The SNAP Project has proposed the management of the Cerro Verde area, as a co-management between CID/Karumbé and the government, this will contribute to the sustainability of the PANS and to increase links between the conservation of biodiversity and local development.

The most adequate management category approved for Cerro Verde CMPA was **“Habitat and/ or species management area”**, that establish:

- 1°. Maintain the habitat in the necessary conditions to protect important species, group of species, biotic communities or physical characteristics of the environment, when certain type of human concrete manipulation is required for an optimum management;
- 2°. Facilitate scientific research and environmental monitoring as principal activities associated to the sustainable management of resources;
- 3°. Establish limited areas for educational purposes and for the appreciation of the characteristics of these habitats and the management activities of the wildlife, by the general public;
- 4°. Exclude (and prevent), the overexploitation or hostile occupation to the designation intention; and,
- 5°. Contribute to the local populations that live inside the designated area, with the benefits derived from the different activities that are compatibles with the other management objectives.

At the beginning of 2006, the Regulation was effectively approved thus the Cerro Verde has become the first Coastal-Marine Protected Area of Uruguay (CMPA). To implement and develop effectively this CMPA, as mentioned in the Decree N°52/2005, it is necessary to develop a “Management Plan” to guide the conservation actions and sustainable development of the area, promoting the coordination and active participation of all sectors.

## **Objective 2 – Incidental capture of green turtles at the “Bajos del Solís”**

### **METHODS**

#### **Study Area**

The area known as “Bajos del Solís” (Fig. 6) comprise the coastal fringe between San Luis (34°46'47"S-55°34'51"W) and Piriápolis (34°54'09"S-55°14'13"W) ports. More than 100 artisanal boats from different ports along the coast may operate in this area during the fishing season. We worked in San Luis (Canelones), Playa Verde (Maldonado) and Piriápolis (Maldonado) ports because in previous studies the interaction between artisanal fishery and sea turtles was more frequent than in others (Lezama *et al.*, 2004).

#### **Samples**

To evaluate the incidental capture of sea turtles at the “Bajos del Solís” area we performed monthly (from August 2004 to July 2005) on board observations from artisanal boats that operate from the ports of San Luis and Piriápolis. A total of 107 “fishing events” were observed. We define a “fishing event” as a fishing activity in a particular area, because during one trip fishermen are used to explore more than one fishing area, thus the effort performed by the gears in each one of the fishing areas is different, therefore the data should be treated separately.



Also, in the localities of San Luis, Playa Verde and Piriápolis a group of fishermen (the ones that showed a great commitment with the aims of our project) were trained on turtle handling and data collection methods. Thus, they became our key fishermen in those areas. They registered data about the incidental capture of turtles in each one of their fishing activities, totalizing 85 fishing events sampled.

The following information was recorded during each embark: presence and number of sea turtles incidentally captured, characteristics and soak time of gillnets used, the geographic position of the fishing zone and the sea surface temperature. From each sea turtle captured, the following data was recorded: species, cause of death, presence and number of metallic tags, weigh and morphometric measures.

#### **Data Analysis**

For each fishing event the capture per unit of effort (CPUE) of sea turtles was calculated as the number of turtles captured divided by gillnets area

(m<sup>2</sup>) and the number of hours those gillnets were set underwater. The geographical position of incidental captures was recorded, and then using the tools provided by ARCMAP program, we identified the fishing zones with greater incidental captures.

## RESULTS AND DISCUSSION

During the study period, we sampled 192 fishing events at the “Bajos del Solís” area during which 21 incidental captures of green turtles were recorded. The 38 % of the turtles captured were found drowned in gillnets while the 62 % were found alive and then released. Most of the captures occurred during summer season (n=15) when the superficial sea temperature is greater (Fig. 5). During this period, algae proliferation increase (mainly in rocky and insular areas), some of which constitutes the main food items of *C. mydas* in Uruguay (López-Mendilaharsu *et al.*, 2003).

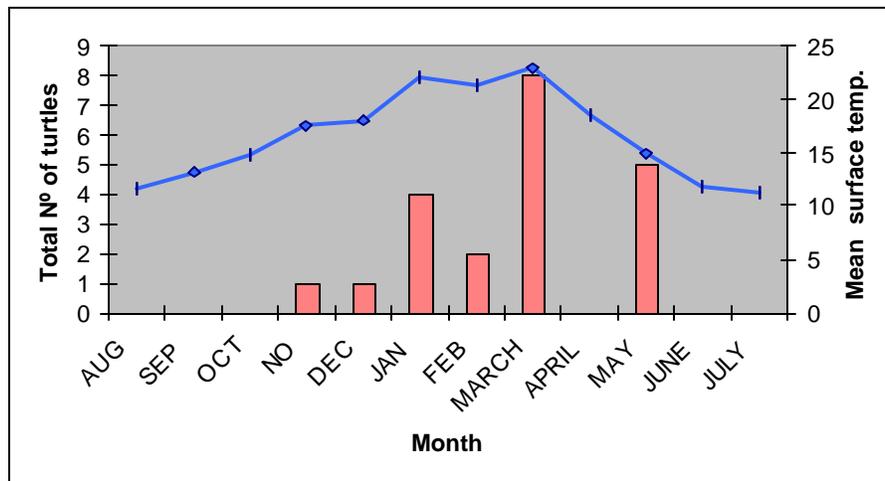


Figure 5. Number of turtles captured per month and mean sea surface temperatures registered during the study months.

All the incidental captures occurred in shallow waters of insular and rocky areas (Fig. 6). We identified two conflict zones. One of them corresponded to a rocky area known as “Pato Islands” located in front of Playa Verde coast, and the other to “La Tuna Island” and surrounding areas in front of the locality of San Luis.

The CCL n-t for the green turtles captured averaged 42.85 cm ± 8.58 and the CCW averaged 39.72 cm ± 8.43. Based in these morphometric measures the green turtles captured were classified as juveniles (Estrades & Achaval, 2002), which coincides with what was found in previous works that identified the “Bajos del Solís” as a developmental and foraging area for *C. mydas* in Uruguay (López-Mendilaharsu *et al.*, 2003). Due to the

fact that juveniles are an extremely valuable life stage for the recovery and stability of populations (Crouse et al., 1987), we considered of great importance that the “Bajos del Solis” area will be included in future management plans to minimize the incidental capture of individuals in this area.

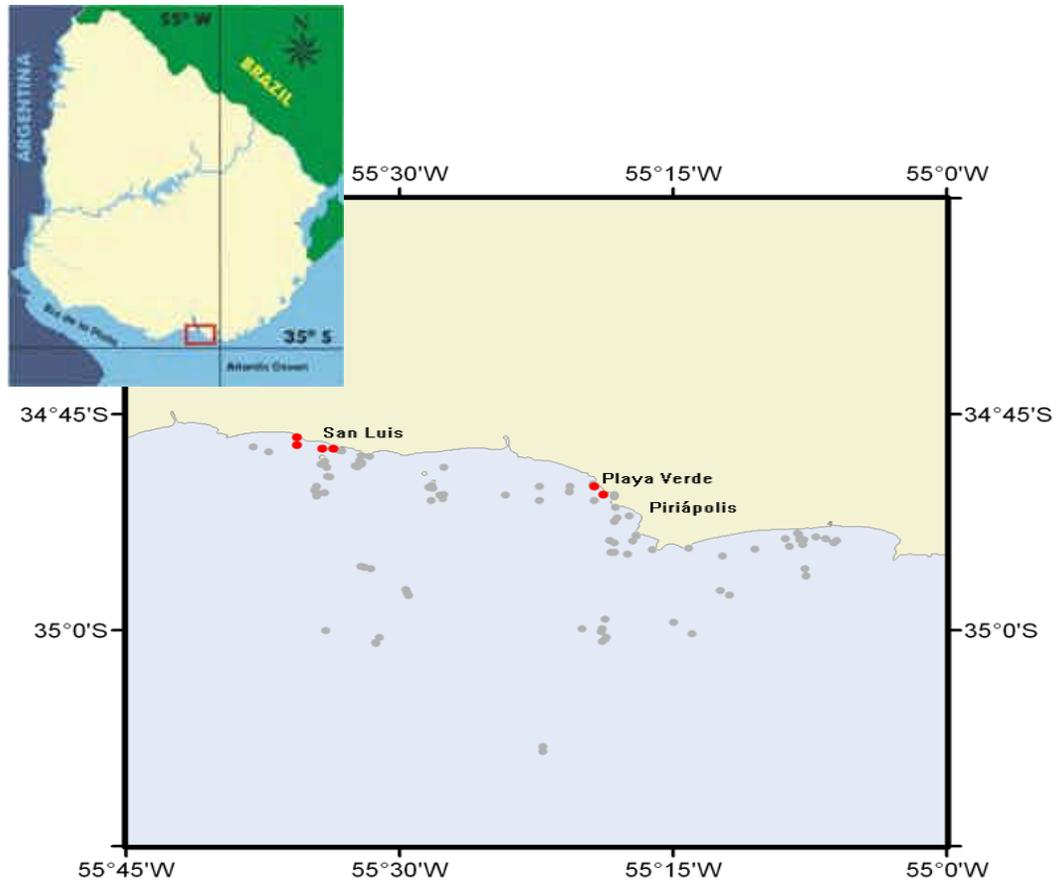


Figure 6. Fishing zones corresponding to the events sampled during the study period at the “Bajos del Solis” area (gray dots). The red dots correspond to the areas where incidental captures of turtles were registered.

We should note that the sampling effort performed during the study period, constitutes only the 2 % of the whole activity of the fishery fleet that operated in “Bajos del Solis” area between August 2004 and July 2005. Therefore, we estimated that the real number of green turtles incidentally captured by this artisanal fishery fleet was probably considerably greater than the observed. That’s why we consider of great importance to keep our work in the area, not only increasing the sampling effort but also having a greater number of artisanal fishermen collaborating with the project. As they are the



ones that interact daily with this species, we consider of vital importance to involve them in the conservation of the green turtle. Our short-term goal is to mitigate the mortality of juvenile green turtles in this critical developmental and foraging area, along with the support and participation of the local communities of artisanal fishermen.

Finally, during this study a new kind of interaction, never recorded before, between *C. mydas* and an alien gastropod (*Rapana venosa*), was observed during May 2005 in "Bajos del Solis" area. 12 green sea turtles were found either stranded or entangled in gillnets with rapa whelks attached to their carapace at the "Bajos del Solis" area. Three of them were already drowned at the time they were found while the other nine were still alive. After removing the alien gastropod, the individuals were released back to the sea. The number of rapa whelk attached to turtle's carapaces varied



from 2 to 49 individuals. To our knowledge, this is the first report on the interaction between *C. mydas* and *R. venosa*, and the first documentation of this kind of interaction among green turtles and gastropods. We consider that this negative interaction constitutes a real threat to green turtles mainly because it affects turtles swimming hydrodynamics because of the drag forces and buoyancy due to the

extra weight that they have to carry on their backs, but also because these voracious gastropod cause severe injuries to their carapaces.

## Objective 3 – Fishermen training

### WORKSHOPS

#### Workshop for the fishermen community

At the locality of Piriápolis an interactive workshop regarding the biology and conservation of sea turtles in Uruguay was held on the 3rd. of July of 2004. This workshop, which was directed to artisanal fishermen and their families, took place in the facilities provided by the Navy of Piriápolis.



The workshop consisted of 4 thematic modules:

#### 1. *Biology and life cycle of Sea Turtles*

During this module, topics such as species identification, life cycle, foraging habits and migrations were presented to fishermen in a simple language.

#### 2. *Threats that face sea turtles in our country and the world*

In this module we talked about the incidental capture of sea turtles by both the artisanal fishery fleet and the commercial fishery fleet as one of the mainly problems that face sea turtles in Uruguay. We discussed the interaction of turtles with the different gears. Fishermen were encouraged to share their own experiences, thus an enriched discussion was generated.

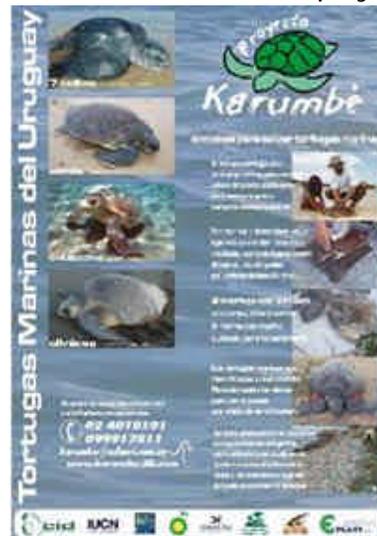
#### 3. *Why to conserve sea turtles and how to achieve it*

The aim of this module was to make fishermen understand why and how to conserve sea turtles, and why they have a fundamental role to play. Also, the conservation status of sea turtles was discussed with the fishermen.

#### 4. *The aims of Karumbé Project for the current year*

The Karumbé Project was introduced to the participants. The Onboard Data Collection Programme was explained in detail to the attendants. We remarked the importance of their help for the Project success.

Audiovisual materials, videos and slides were shown using a projector to support the workshop. Tags and tag applicators also were tested by the fishermen. During the workshop we distributed printed materials to the fishermen. A total of 2.000 posters, 1.000 stickers and 30 “technical sheets” with



instructions about how to proceed in case a turtle is captured (for example rehabilitation techniques, tag review, etc.), were distributed to the participants.

For the locality of San Luis we weren't able to perform a workshop congregating the whole community due to the fact that San Luis is a community with a complex social organization where some families have problems with the others. Taking this in consideration, we decided to carry out the workshops at each family home in an interactive way. To achieve this purpose two members of our team stayed in San Luis from January to April 2005 being able to strengthen the relationship with the families.

### **Workshop for key fishermen**

At the middle of June of 2004 we performed 2 training workshops, one in San Luis (for San Luis "key family") and the other in Piriápolis (for Playa Verde and Piriápolis key fishermen). In these workshops key fishermen were instructed about the turtle handling and data collection methods of turtles captured in nets. We also gave them a specific field equipment kit for the collection of data (tape measure, tags, pliers, etc.) and a detailed notebook to record their fishing activity. This notebook resulted to be a useful tool to record the daily activities of the fishermen, not only because it help them to have a control of their captures but also because they were able to identified the best fishing periods and zones.



## **SAMPLING**

### **Collection of data by key fishermen**

The localities of San Luis, Playa Verde and Piriápolis were visited monthly to gather the data collected by the fishermen. It is important to underline the great commitment that the key fishermen and their families demonstrated regarding the Project and the conservation of sea turtles. During the sampling period, key fishermen worked a total of 24 sea turtles that got entangled in their nets, or were found almost drowned in the sea or stranded in the surrounding beaches. From these turtles, 54 % (n=13) were found alive and released afterwards by the fishermen, while the rest 46% (n =11) were found drowned. A total of 19 turtles corresponded to the species *Chelonia mydas*, 3 were *Dermochelys coriacea* and 2 were *Caretta caretta*.

## **Objective 4 – Education Programme**

### **ENVIRONMENTAL EDUCATION PROGRAMME**

#### **Prepared Material**

Specific designed material was prepared for the educational activities with the kids:

- 2000 Books: "Playing, coloring and learning with Sea Turtles"; A booklet was designed with games and texts about basic biology of sea turtles in Uruguay and their threats.
- 2000 brochures including actions to save the sea turtles
- 100 Recycled games with plastic bottles.
- 100 Puzzles: Turtle with transmitter.
- 200 different kind of drawing sheets for coloring.

#### **Diffusion of the Project in different media**

Radio and TV

At a local level: "Cerro Señalero" Community Radio (San Luis); "Ecos de la Costa" Newspaper (San Luis); Coronilla Radio 104.3; Chuy Radio; "La Voz del Cordon" Newspaper; Channel 8 of Rocha.

At a National level: Channel 4; Radio 1410; "TV Libre" Channel; "Entre Amigos" Magazine; "Viento en Popa" (exhibition stand at the LATU-Technological Lab of Uruguay); Municipal Council of Montevideo (IMM).

The radio program "Produccion Nacional" 1410 AM interviewed Karumbé specifically about the BP Conservation Programme.

#### Local Web pages

[www.puntadeldiablo.com](http://www.puntadeldiablo.com)

[www.diarioeleste.com/archivo/05-08-04/index.shtml](http://www.diarioeleste.com/archivo/05-08-04/index.shtml)

[rochatotal.com/index.php?id=karumbe](http://rochatotal.com/index.php?id=karumbe)

[www.destinorocha.com/home/estatico/proyecto.karumbe.html](http://www.destinorocha.com/home/estatico/proyecto.karumbe.html)

[www.diarioeleste.com/archivo/04-01-05/index.shtml](http://www.diarioeleste.com/archivo/04-01-05/index.shtml)

#### International Web pages

[www.vanaqua.org/aquanews/features/projectkarumbe.html](http://www.vanaqua.org/aquanews/features/projectkarumbe.html)

#### Lectures

At the NGO "Vida Silvestre" (Uruguayan Society for the Conservation of Wildlife).

#### **Documentary film**

Thanks to the support of "Contraviento Productions" in March, 2004 a documentary film regarding Karumbé's research and conservation activities in the Cerro Verde area, was shot. The film entitled **'Ancient Navigators'** was ready to be exhibited at the end of 2005. The documentary film resulted in a great success among the community

members of La Coronilla and Punta del Diablo. We also received very good reviews by other conservation projects and international colleagues.

### Visits to schools and coastal communities

In every school visited, games were performed in order to get kids' attention and make them feel comfortable with our presence in their classroom. The main objective of our visit was to explain the threats that sea turtles are facing nowadays, and demonstrate the importance of working together for a purpose: to conserve the marine ecosystems, being the sea turtles an essential part of it.



School /High school	Nº of children/ teenagers	Field trip to watch sea turtles and Karumbé's work	Presentation "I Love my Sea Turtle"	Kids activities (games, stories about sea turtles)
San Luis, Canelones*	200	√	√	√
Piriápolis, Maldonado*	200	√	√	√
La Paloma, Rocha	459	--	√	√
Costa Azul, Canelones	260	--	√	√
Cabo Polonio, Rocha	8	--	√	√
Valizas, Rocha	67	--	√	√
P. del Diablo, Rocha*	90	√	√	√
La Coronilla, Rocha*	250	√	√	√
Chuy, Rocha*	90	√	√	√

\* Project key areas

The interaction between fishermen and sea turtles, as well as other marine life incidentally captured, was discussed as part of these school activities. In particular, we highlighted the respect shown by the fishermen for nature, and the importance of the cooperation between scientists and fishermen to find solutions to reduce sea turtles mortality in the feeding areas of Uruguay.



Cooperative drawing and games were carried out with kids and teachers to clarify the idea of how essential is every part of any ecosystem. This experience of working with school age children was much more enriching than we expected. As we had previously visited these schools, we found that we were able to build upon the children's previous knowledge of sea turtles to explain more complicated concepts involved in conservation issues. We found that children talked to their parents about our visit and the topics discussed, which enabled us to disseminate our message even further into the coastal community.



San Luis children's

## **Objective 5 – Community development and training**

### **COMMUNITY MARINE CENTRE (CMC) – Locality of San Luis**

Our work in San Luis started in July, 2004 where two members of the project performed didactic activities with the children every week.

At the beginning we found certain problems that did not allow us to do the activities in a quiet and orderly way as the kids were very aggressive among them and did not respect the rules of the games. This situation forced us to reconsider the activities we had in mind in the first place.



We decided to propose cooperative and more dynamic games to reduce the violence, teaching them to play respecting the rules.

It took us months of work to obtain cooperative work among the children, respecting and sharing of the materials. But they are very receptive children and the change was very notorious and substantial. A total of 30 children participated in these activities, from very small children to teenagers of around fourteen and fifteen years old. We performed a total of 18 activities:

- Projection of movies
- Karumbito drinking yerba-mate ( material)
- Ball games (caño goal, manchado, monito, soccer)
- Paint, cut and fit together a turtle with a transmitter
- Clay modeling of turtles and decoration
- Children’s Day celebration: games, gifts and snacks
- Cooperative games
- Center surroundings cleaning and transportation of the plastic materials to a woman in charge of it sale
- Sketches made by groups
- Cut and assemble paper leatherback turtles
- Flowers made by decorated plastic bottles
- Decoration of the saloon with the kids stuff
- Mural painting
- Construction of kites with the shape of turtles
- Pajama Party with the girls
- Craft workshop for the kids
- Paint with different techniques
- Sand sea turtles in the beach

## **School Support**

In winter and spring of 2004 the San Luis local School was visited in many opportunities. We noticed several problems as for example the lack of neither extracurricular nor recreational activities of any kind. Children were motivated to do their homework at the Community Centre where we had bibliographic material previously obtained through donations.

## **Strengthening bonds with the community**

Between January and March, 2005 two members of the project lived in the community which led them to create new bonds and a strong union with the children and their families.

The children demonstrated a great involvement in the conservation of sea turtles as they persuaded the fishermen to get in contact with Karumbé each time a turtle was caught in their nets.



## **Women training in screen printing**



Workshops about t-shirt screen printing were imparted to a group of women at the Community Marine Centre in San Luis. During one week those women learned the bases of the technique using Karumbé logos and sea turtles images. As a result of their interest they started to produce good quality products that are being sold at the Centre and at stores in Montevideo, to

contribute with our awareness program and generate new incomes for their benefit. They shared with us their willingness to perform these kind of activities due to the fact that their role in the community is relegated to take care of their children and clean the fishing boats. Thus, we believe the results were very positive because they were able to valorize their work and be happy and exited with the results.

## **MARINE TURTLE CENTER (MTC) - Locality of La Coronilla**

For second consecutive year the Marine Turtle Center (MTC) opened in La Coronilla from the 3<sup>rd</sup> of January to the 27<sup>th</sup> of March, 2005 with the purpose of disseminate our work and basic information about sea turtles through guided visits. Since its opening the MTC was a success being visited for more than 4000 people (tourists, school children and neighbors of the surrounding localities). Visitors were able to see and identify the sea turtles species that are frequently found in coastal and oceanic

waters, as well as the threats that they have to face in our country and around the world. The public was able to familiarize with the activities developed by Karumbé in Cerro Verde research area, saw a photo gallery, mounted parts and osseous material of sea turtles. A "kids corner" decorated with colorful posters was also created, so the children had their own table with draws of sea turtles, color sheets and materials to paint and create their own designs. We also count with material from other projects which are working together in the same area as Freplata (GEF-PNUD-BID) and the Dolphin project. Also we received a generous support from the National Environmental Agency (DINAMA) who donated framed photos of our project for the center. A total of 1740 visitors was recorded for January, 1352 for February and 938 for March (Fig. 7). Tourists were mainly from Uruguay, but also from Argentina, Brazil, Spain, and Chile (Fig. 8).

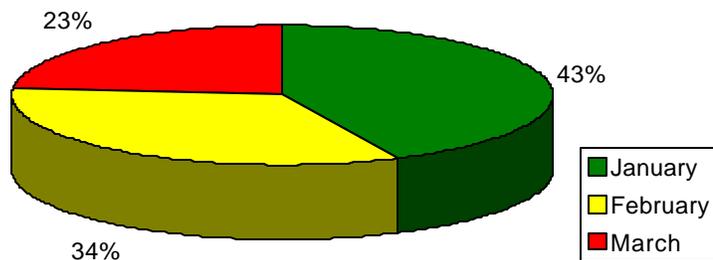


Figure 7. 4030 persons visited the MTC during the field season, most of them during the summer vacations (January and February)

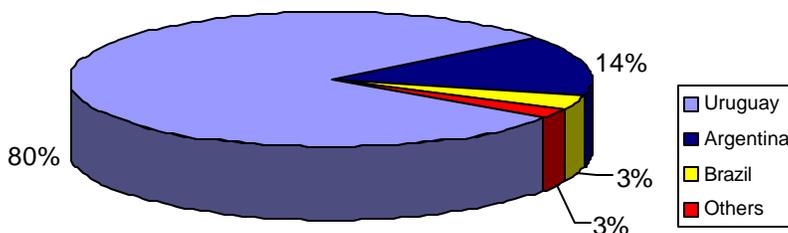


Figure 8. Distribution of MTC visitors per country

## 2<sup>nd</sup> Festival "Saving the Sea Turtle"

The second festival entitled "Saving the Sea Turtle" was held at the locality of "La Coronilla", in Rocha, from March 14 – 20, 2005. The activities undertaken during the event with the secondary school students included a story contest (theme sea turtles), guided visit to the Marine Turtle Center (MTC) and release of sea turtles after share our field work activities. An introductory lecture including slides of the Project and the creation of a puzzle with the shape of a sea turtle were organized for kindergarten children from 3 to 4 years old. And for school students the activities performed were: a drawing contest in regard to sea turtles and their habitats; the creation of a cooperative collage and a guided visit to the MTC and further release of a sea turtle. A total of 430 children and students participated in the activities performed during the week.



Over the weekend a Treasure Hunt and a Soccer Championship was carried on with the children of the community. On the last day of the festival, a sea turtle cake contest took place involving the women of the community. The party and awards ceremony for the winners took place at the closing day of the festival. It included also a dance and the election of Miss and Mister "Tortuguero" along with jugglers and traditional drums. Local people felt that the Festival was a very positive event. Thanks the collaboration and donations received from 62 shops and stores of La Coronilla, Punta del Diablo and Chuy for the awards ceremony the party resulted in a great success. This demonstrated an increasing level of credibility and trust of these localities in our project activities.

## Training course to local students



From March 21 to 26, 2005 a training course on sea turtles was imparted to a chosen group of students from the secondary school of La Coronilla. They were trained on 12 different activities applied in the sea turtle working protocols. After the end of the course each one of the students received a diploma, a t-shirt, a sticker and a 2005 calendar of Karumbé.

### **Craftsmen instruction**

The workshop was held on December 15th, 2004 at the "Market of Craftsmen" in Punta del Diablo, a total of 8 craftsmen assisted to the workshop. Folders containing basic information about sea turtles, designs and samples of sea turtle crafts and the use of different materials were handed out in order to promote the generation of new crafts. The problem of the illegal sale of turtle carapaces



was discussed during the workshop in order to demonstrate that use of the turtle image could help to stop the illegal trade.

### **Tourism Commission of La Coronilla**

On December 16, 2004 the Tourism Commission hosted an event with the participation of 40 persons as tourist operators, merchants and members of the Tourism Ministry, as well as neighbors of the locality.

During the meeting, Karumbé presented and review some topics, and updated the local people about the future Marine Protected Area, since they were uncertainties and doubts regarding this matter. Also Karumbé highlighted the importance of the MTC for the promotion of the ecotourism in the area and the economic benefits that this will bring to the community.

## Other activities

### National exhibitions

On the 5th of June, the World Environmental Day, Karumbé made an exhibition of their activities during the entire month at the facilities of the Municipal Council of Montevideo.

At the *Science Space*, LATU (Technological Lab of Uruguay) a specific exhibition sector of marine biodiversity was mounted including the sea turtles as a flagship species. Visited for 50.000 between 2004 and 2005.

### Regional Integration

The Second Meeting on Research and Conservation of Sea Turtles in the Southwestern Atlantic Ocean (ASO) was held in San Clemente del Tuyú, Buenos Aires, Argentina, from September 31 to October 2,



2004. Around 70 specialists from Brazil, Uruguay, Argentina and colleagues from Chile attended to the meeting with the special participation of Dr. Jack Frazier (Conservation and Research Center, Smithsonian Institution), Dr. Carlos Drews (Regional Coordinator for Marine Turtle Conservation in Latin America and the Caribbean WWF) and Dr. Alonso Aguirre (Wildlife Trust).

The main objective of the meeting was to implement the bases for the creation of a regional plan for the conservation of the sea turtles in the region; share new scientific information on the biology, conservation and rehabilitation of marine turtles; standardize the working methodologies and scientific protocols among the projects that work in the area; and to improve the data management and investigations. As a result of the meeting two resolutions were generated: "Resolution to Mitigate the Impacts of the Incidental Fishing on Sea Turtles" and "Resolution to Support the Regional Participation in the Interamerican Convention for the Protection and Conservation of the Sea Turtles". These are available at <http://tmaso.s5.com> Another result of the meeting was a detailed document about the impact of the fisheries on the Southwestern Atlantic Ocean. Valuable information was exchanged regarding sea turtle rehabilitation procedures and also an evaluation of the different strategies of environmental education applied in the region. To download the Proceedings, visit the web page:

[www.seaturtle.org/pdf/Resumenes\\_2004\\_AS02.pdf](http://www.seaturtle.org/pdf/Resumenes_2004_AS02.pdf)

Seven papers were presented in the Second Meeting:

- Karumbé 2004
- Preliminary Mixed Stock Analysis of Green Turtles in Uruguay using Sequences of mt DNA
- Implementation and Advances of the First National tagging Plan of Sea Turtles in Uruguay.
- I Meeting on the Research and Conservation of Sea Turtles in the Southwestern Atlantic (ASO)
- Description of the industrial fisheries that interact with sea turtles and review of the incidental capture reported for the SW Atlantic Ocean
- Sea turtles and the coastal trawl fishery in Del Plata Estuary: what is going on here?
- Rehabilitation Programme of Sea Turtles in Uruguay

### International events

*Milagros López Mendilaharsu* participated as an invited instructor of the XIV COURSE ON THE BIOLOGY AND CONSERVATION OF SEA TURTLES at the University of Zulia (LUZ), Maracaibo, Venezuela (Coordinators: Hedelvy Guada and Jim Hernandez). October 25-30, 2004.



*Cecilia Lezama* participated in a Workshop promoted by the BPCP that joined all the conservational projects of Argentina and Uruguay supported by the programme, held the 1st of December 2004 at Buenos Aires, Argentina.

*Milagros Lopez-Mendilaharsu* attended to the 19th Annual Meeting of the Society for Conservation Biology held in Brasilia, Brazil. 15-19 July 2005, Invited by the BPCP participated in the workshop "Building Capacity for Biodiversity Conservation Through Training, Field Experience and Networking as Demonstrated by the BP Conservation Programme"

### Publications

Castro-Prieto J. and M. J. Andrade-Nuñez. Case Study: Proposal of *Cerro Verde Area* as the First Marine Protected Area in Uruguay. *Managing the World's Protected Areas*. IUCN Books. (In press)

López-Mendilaharsu, M., A. Estrades, N. Caraccio, V. Calvo, M. Hernandez and V. Quiricci. Biología, ecología y etología de las tortugas marinas en aguas costeras del Uruguay. *In*: Menafrá, R., L. Rodríguez, F. Scarabino y D. Conde (eds.). *Bases para la conservación y manejo de la costa Uruguaya*. (In press)

Laporta, M., P. Miller, M. Ríos, C. Lezama, A. Bauzá, A. Aisenberg, V. Pastorino, P. Sánchez and A. Fallabrino. Tortugas marinas en la costa uruguaya: conservación y manejo. *In*: Menafrá, R., L. Rodríguez, F. Scarabino y D. Conde (eds.). *Bases para la conservación y manejo de la costa Uruguaya*. (In press)

Laporta M & P Miller 2005. Sea Turtles In Uruguay: Where Will They Lead Us...? Maritime Studies (MAST) Special Issue 3(2): Sea Turtles as a Flagship Species. Mast 2005, 3(2) and 4(1): 63–87. Guest Editor: Jack Frazier, Smithsonian Institution.

Bauzá, A., M. Morales and I. Lopez. 2004. "Saving the Sea Turtle" Festival: Uruguay. Marine Turtle Newsletter 105: 18.

Prosdocimi, L., A. Fallabrino, M. Laporta and G. Sales. 2005. Second meeting on research and conservation of sea turtles in the Southwestern Atlantic (ASO). Marine Turtle Newsletter 110: 11.

### **National and International Presentations (Meetings & Congresses)**

XII Latin American Meeting on Sea Turtles, January 17-18, 2005. The Hyatt Regency Hotel, Savannah, Georgia, USA.

III Jornadas de Conservación y Uso Sustentable de la Fauna Marina, September 14-17, 2005. Escuela Naval, Montevideo, Uruguay,.

III Symposium of Protected Areas, October 16-20, 2005, Pelotas, RS-Brasil.

VIII Jornadas de Zoología. October 24-28, 2005. Science Faculty, University of the Republic, Montevideo, Uruguay.

### **Agreements**

Karumbé performed agreements with the University of Antofagasta (Chile), Autónoma de Madrid University (Spain) and Bandeirante de São Paulo University – UNIBAN (Brasil), to host students that wanted to develop their thesis work and/or field course at the Cerro Verde area in Uruguay.

In 2005 a technical cooperation agreement was approved between Karumbé and the NGO NEMA (Núcleo de Educação e Monitoramento Ambiental – RS - Brasil).

### **Thesis**

Nine bachelor's thesis (Universidad de la Republica Oriental del Uruguay and Universidad Salvador de Buenos Aires) and a PhD thesis (Universidad Autónoma de Madrid) were developed under Karumbé's direction and /or support.

At the present two members of Karumbé (Lic. Cecilia Lezama y Lic. Ma. Noel Caraccio) are developing their master thesis at the Universidad de la Republica (Uruguay).

## General conclusions

### CERRO VERDE

From the studies developed by Karumbé in 2001-2003 (Lopez-Mendilaharsu *et al.*, 2003) the importance of Cerro Verde as a critical developmental and foraging ground for juvenile green turtles has been clearly established at a national and international level.

The results of the present study strengthen and demonstrate the need of protection of this marine ecosystem that comprise a great diversity of fauna and flora in Uruguay. Considering the forthcoming creation of the first marine protected area (MPA) we recommend to increase the research, surveys, and monitoring projects -as conservation actions are generally initiated based on research findings- in order to succeed in preserving the biodiversity of the area. These measures would allow developing a management plan according to the reality and needs of the area. The participation of the community at each one of these steps is essential for the implementation and effective development of the MPA.



### BAJOS DEL SOLIS

During Karumbé first studies between 2001-2003, the area of Bajos del Solís was established as another critical developmental and foraging area for the green turtle (Lopez-Mendilaharsu *et al.*, 2003), one in which the impact of the artisanal fishery activities was highlighted (Lezama *et al.*, 2004).

During the present work we determined that the number of green turtles incidentally captured by the artisanal fishery was probably considerably greater than thought as our sampling effort was small compared to the number of boats that operate in the "Bajos del Solis" area. But this study also demonstrates that it's possible to mitigate the mortality of turtles when having the support and participation of the local fishermen. That is why it is of great importance to keep working in the area, not only to increase the sampling effort but also to involve a greater number of fishermen within the conservation cause of the project.

## **EDUCATION PROGRAMME**

Definitively the work performed with some coastal schools should be expanded to the rest of the coastal communities, in order to achieve the dialogue and information flow of many essential values and ideas that kids should take under consideration. We believe that it is very important to capacitate teachers in diverse topics, facilitating material and information about the threats that many of our wildlife is facing. Workshops should be performed to them, assuming their multiplying roll in the diffusion of information and educational techniques.



## **COMMUNITY DEVELOPMENT**

Involving fishermen communities in different alternative activities (away from the typical fishery) has signified an opportunity for them to produce their own socio-economic benefit, contributing at the same time with the marine conservation. In addition, this has promoted a new connection between these communities and the rest of the society separated by their different lifestyle. Even though we have made a first step in capacitating and encouraging the local production of handcrafts and screen-printing as well as the sell of merchandise allusive to marine life, the success of these initiatives depends on the creation of "ecological" micro enterprises. If these initiatives gain support from national and/or international organisms during the first stages of development they may be able to attain the auto-sustainability, which is the key to remain over time. We believe that it is very important that the products and initiatives performed by these communities be recognized by the rest of the society, in order to reinforce the links between them and revalorise our forgotten culture.

## Financial report

Items	BP Conservation funds July 2004 to June 2005 (£)	CID/CEUR NGO funds July 2004 to June 2005 (£)	Total (£)
<b>Equipments</b>	6720	3818	<b>10538</b>
<b>Education materials</b>	2962	560	<b>3522</b>
<b>Travel Expenses</b>	4059	1512	<b>5571</b>
<b>Accommodation and subsistence</b>	2162	512	<b>2674</b>
<b>Salaries</b>	- - - -	- - - -	
<b>Administration and communication</b>	840	1120	<b>1960</b>
<b>Total (£)</b>	<b>16743</b>	<b>7522</b>	<b>24265</b>

£ 1 – US\$ 1.786 (july 2004)

## **Acknowledgments**

This work would not been possible without the collaboration from many Karumbé members, Carlos Romero, Alfredo Hargain, Francisco Meirana, Paula Laporta (Dolphin Project), Elsa Peña and family, Piriapolis and San Luis fishermen's and all the volunteers from Uruguay, Argentina, Brazil, Chile, Spain, Australia, Canada & England. We also would like to thank the Direccion de Fauna (RENARE), SEPAE, local "Junta" of La Coronilla, Titina, Toto Veiga, Luis and Susana Romero for their invaluable support.

The Second Festival "Saving the Sea Turtle" was possible thanks to the support from CONAPROLE; stores from Chuy, La Coronilla and Punta del Diablo.

We also would like to thank the BP team (Marianne & Robyn).

*This report is in honor to Kate Stokes memory.*

## Literature cited

- Balazs, G. H., K. M. Russell & S.C. Beaver. 1996. Procedures to attach a satellite transmitter to the carapace of an adult green turtle, *Chelonia mydas*. Pp. 21-26. In: Keniath, J.A., D.E. Barnard, J.A. Musick and B.A. Bell (eds). Proceedings of the Fifteenth Annual Symposium on Sea Turtle Biology and Conservation. NOAA Tech. Memo. NMFS-SEFSC-387.
- Baptista, L.R.M. 1977. Flora Ilustrada do Rio Grande do Sul. Bol. Inst. Biociências n° 37. 248 pp.
- Calvo, V., C. Lezama, M. López-Mendilaharsu, A. Fallabrino & J. Coll. 2003. Stomach content analysis of stranded juvenile green turtles in Uruguay. Pp. 203-204. In: J.A. Seminoff (comp.). Proceedings of the Twenty-second Annual Symposium on Sea Turtle Biology and Conservation, Miami, Florida. NOAA Tech. Memo. NMFS-SEFSC-503.
- Caraccio M. N., A. Formia, M. Hernandez, A. Fallabrino & M. Bruford. *In press*. Preliminary mixed stock analysis of juvenile green turtles in Uruguay using mitochondrial DNA sequences. Proceedings of the 23° International Symposium on Sea Turtle Biology and Conservation, Kuala Lumpur, Malaysia. U.S. Dep. Commer. NOAA Tech. Mem.
- Crouse, D.T. Crowder, L. B. & Caswell, H. 1987. A stage-based population model for loggerhead sea turtles and implications for conservation. Ecology. 68 (5): 1412-1423.
- Estrades, A. y F. Achaval. 2002. A Sea Turtle Century in Uruguay: Antecedents & Geographic Distribution. Proceedings of the 22° Annual Symposium on Sea Turtle Biology and Conservation. U.S. Dep. Commer. NOAA Tech. Memo. (En prensa).
- Estrades, A., M. Laporta, N. Caraccio, M. Hernández, V. Quirici, V. Calvo, C. Lezama, A. Fallabrino & M. López. 2002. Sea turtle research and conservation in Uruguay - Karumbé Group 1999. Pp. 338-339. In: Mosier Andrea, Allen Foley, and Beth Brost (comps). Proceedings of the Twentieth Annual Symposium on Sea Turtle Biology and Conservation. NOAA Tech. Memo. NMFS-SEFSC-477.
- Forbes, G. & C. Limpus. 1993. A non-lethal method for retrieving stomach contents from sea turtles. Wildlife Research 20: 339-343.
- Groombridge, B. & R. Luxmoore. 1989. The Green Turtle and Hawksbill (Reptilia: Cheloniidae): World Status, Exploitation and Trade. Secretariat of CITES, Lausanne, Switzerland. 601 p.
- Hilton-Taylor, C. (comp.).2000. IUCN Red List of Threatened Species. IUCN, Gland, Switzerland and Cambridge, UK. xviii + 61 pp.
- Jolly, A.B. 1965. Flora Marinha do Litoral Norte do Estado de São Paulo e Regiões Circunvizinhas. Bolm. n° 294. Fac. Fil. Ciênc. Univ. S. Paulo, ser. Bot. 21, São Paulo. 393 pp.
- Lezama, C., Miller, P. y Fallabrino, A. 2004. Incidental Capture of Sea Turtles by the Artisanal Fishery in Uruguay. Proceedings of the 24° Annual Symposium on Sea Turtle. San José, Costa Rica. Febrero 22-28, (In press).
- López-Mendilaharsu, M., A. Estrades, N. Caraccio, V. Calvo, M. Hernandez and V. Quiricci. Biología, ecología y etología de las tortugas marinas en aguas costeras del Uruguay. In: Menafra, R., L. Rodríguez, F. Scarabino y D.

- Conde (eds.). Bases para la conservación y manejo de la costa Uruguaya. (In press)
- López-Mendilaharsu, M., A. Bauzá, M. Laporta, M.N. Caraccio, C. Lezama, V. Calvo, M. Hernández, A. Estrades, A. Aisenberg & A. Fallabrino. 2003. Review and Conservation of Sea Turtles in Uruguay: Foraging habitats, distribution, causes of mortality, education and regional integration. Final Report: British Petroleum Conservation Programme. 109 pp.
- Mohan M.V. & T.M. Sankaran. 1988. Two new indices for stomach content analysis of fishes. *Journal of Fish Biology* 33: 289-292.
- Moreira, L., C. Baptistotte, J. Scalfone, J.C. Thomé & A.P.L.S. de Almeida. 1995. Occurrence of *Chelonia mydas* on the Island of Trindade, Brazil. *Marine Turtle Newsletter* 70:2.
- Oravetz, C. A. 2000. Reducción de la Captura Incidental en Pesquerías. Pp. 217-222. In: Eckert, K.L., K.A. Bjorndal, F.A. Abreu-Grobois and M. Donnelly (eds.). *Research and Management Techniques for the Conservation of Sea Turtles*. IUCN/SSC Marine Turtle Specialist Group Publication N° 4.
- Renaud, M.L., J.A. Carpenter, J.A. Williams & S.A. Manzella -Tirpak. 1995. Activities of juvenile green turtles, *Chelonia mydas*, at a jettied pass in south Texas. *Fish. Bull.* 93:586-593.
- Ridgeway, S.H, B.L Scronce & J. Kanwisher. 1969. Respiration and deep diving the bottlenose porpoise. *Science* 166:1651-1654.
- Sokal, R.R & F. Rohlf 1995. *Biometry*. 3<sup>rd</sup> ed. W. H. Freeman and Co., New York.
- Zar, J. H. 1999. *Biostatistical Analysis*, 4<sup>th</sup> ed. Prentice may, Englewood Cliffs, New Jersey. 929 p.