

## POPULATION STATUS AND BEACH STUDIES - AFRICA

### The Reproductive Biology of *Caretta caretta* on the Island of Boavista (Republic of Cabo Verde, Western Africa)

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Nesting areas of *Caretta caretta* are well-known in the western Atlantic (Sternberg 1981; Márquez 1990) and the Mediterranean (Brongersma 1981; Bowen *et al.* 1993; Margaritoulis 2000). With respect to the Atlantic coast of Africa, the information available regarding the abundance and distribution of marine turtle species and the location of their possible breeding and foraging areas remains scarce and, often, unreliable (Fretey 1998).

The occurrence of *C. caretta* in the Cape Verde archipelago, although already known, has been more accurately defined with the finding of an apparently important nesting population on Boavista island. Here we present preliminary data on its reproductive biology. In the subsequent abstract the distribution of sea turtles within Cape Verde will be discussed.

#### Materials and Methods

From July to September 1998, the shores of Boavista island were regularly surveyed. Most of the effort focused on the eastern beaches since all evidence (turtle remains, tracks on the sand, interviews held with local people) indicated that they supported the largest nesting populations (Fretey 1998, and references therein).

The beaches were patrolled almost every night. On their return to the sea, the animals were restrained and double-tagged on their forelimbs, using monel metal tags labeled with an official inscription of the Cape Verde Government and an identification number. A Passive Integrated Transponder (PIT) tag was inserted into the intramuscular region of the right forelimb. PIT tags contain an individual code consisting of 10 digits. Morphological data were also collected before release (only 7 specimens were weighed). In case of egg-laying, the location of the clutch was marked with a visual marker, and the eggs were counted, measured and weighed. Diurnal patrols were also carried out on the less visited beaches, looking for tracks and clutches.

Due to the preliminary character of this study, detailed information on the incubation period and hatching success were not recorded. Because of the large extension of the beaches and the logistics available at particular times and places, total cover of the study area was not possible.

#### Results

During the sampling period, 92 nesting females were tagged on Boavista and a total number of 142 emergences were recorded, including recaptures.

The female activity appears to start in mid June (the first record of an emergence occurred on June 21<sup>st</sup>) and likely extends up to late October (last emergence was recorded on

October 21<sup>st</sup>). On the sampled beaches, the activity was most pronounced in August.

Emergences occurred more often on the eastern beaches of the island. The most activity appeared to occur on Ervatão beach, decreasing as one moved north or south away from that site. Based on data collected at Ervatão beach, 54.6% of the emergences resulted in a nest, whereas the other 45.4% were non-productive.

Turtles nesting on Boavista shore are relatively small [77.1 cm straight carapace length (SCL) and 66.3 kg in weight] compared to those of the eastern populations of the USA [ $>90$  cm SCL (see Le Buff, 1990)]. South African populations (see Bjørndal *et al.* 1983) are more similar in size. However, the Mediterranean population of Cyprus is even smaller in size [ $<70$  cm SCL (Broderick & Godley 1996)] (Table 1).

**Table 1.** Average, standard deviation (SD), sampling size (N), and Range, of straight carapace length (SCL), straight carapace width (SCW), weight, clutch size, and egg size of *C. caretta* nesting females in Boavista.

	Mean	SD	N	Range
SCL(cm)	77.1	5.3	85	63-96
SCW(cm)	60.7	3.7	83	54-74
Weight (kg)	66.3	6.5	7	56.6-74.7
Clutch size	90.6	16.2	80	60-137
Egg diameter (mm)	39.5	1.6	60	32.2-42.7
Egg weight (g)	35.6	4.1	47	26.8-44.8

At Boavista clutch size ranged from 60 to 137 eggs with an average of 90.5 (Table 1). There was a positive correlation between clutch size and female size ( $F=38.69$ ,  $p<0.0001$ ,  $N=38$ ).

The eggs are practically spherical with an average diameter of 39.7 mm ( $SD=1.50$ ,  $N=27$ ) and weight of 36.1 g ( $SD=4.62$ ,  $N=22$ ). There with no significant differences between the largest and smallest ( $t=-0.16$ ,  $p=0.86$ ,  $N=27$ ) nor between the first and the last, though the later eggs were slightly larger ( $t=-1.70$ ,  $p=0.09$ ,  $N=27$ ).

#### Discussion

A continuing effort in the future may provide further information to make a more accurate estimate of the *C. caretta* population size at Boavista, as well as provide new insights into the biology of this species in Cape Verde.

The continuation of the tagging campaign, which started during the 1998 breeding season, and a thorough assessment of the sea turtle take and egg harvest will be

essential to evaluate the population dynamic. The islanders take a large number of turtles.

Boavista beaches vary remarkably in length, energy and slope; nesting females don't appear to show any preference for specific types. The rate of non-nesting emergences is quite similar to that recorded in other Atlantic populations (e. g., Le Buff 1990). Morphological data and nesting behavior of Boavista turtles are not much different from those documented in populations already known (see e. g., Carr 1995).

## References

- Bjorndal, K.A., A.B. Meylan, and B.J. Turner. 1983. Sea Turtles Nesting at Melbourne Beach, Florida, I. Size, Growth and Reproductive Biology. *Biological Conservation*, 26:65-77.
- Bowen, B., J.C. Avise, J.I. Richardson, A.B. Meylan, D. Margaritoulis, and S.R. Hopkins-Murphy. 1993. Population structure of loggerhead turtles (*Caretta caretta*) in the northwestern Atlantic ocean and Mediterranean sea. *Conservation Biology*, 7:834-844.
- Broderick, A.C. and B.J. Godley. 1996. Population and nesting ecology of the green turtle, *Chelonia mydas*, and the loggerhead turtle, *Caretta caretta*, in northern Cyprus. *Zoology in the Middle East*, 13:27-46.
- Brongersma, L.D. 1981. Marine turtles of the eastern Atlantic Ocean. Pp. 407-416 in: *Biology and conservation of sea turtles* (K.A. Bjorndal, ed.), Smithsonian Inst. Press, Washington D. C.
- Carr, A. 1995. Notes on the behavioral ecology of sea turtles. Pp. 19-26 in: *Biology and Conservation of Sea Turtles*, Revised edition (K.A. Bjorndal, ed.). Smithsonian Institution, Washington, D. C.
- Fretey, J. 1998. *Marine Turtles of the Atlantic Coast of Africa*. CMS, Bonn.
- Le Buff, C.R. Jr. 1990. The loggerhead, *Caretta caretta*.
- Margaritoulis, D. 2000. An estimation of the overall nesting activity of the loggerhead turtle in Greece. In: *Proc. 18<sup>th</sup> International Symp. Sea Turtle Biol. Conserv.* 3-7 March 1998, Mazatlán, Mexico. NOAA Tech. Memo. NMFS-SEFSC-436.
- Márquez, R. 1990. Sea Turtles of the World. *FAO Fisher. Synops.*, 125(11):1-81.
- Sternberg, J. 1981. *The worldwide distribution of Sea Turtles Nesting Beaches*. Public. Sea Turtle Rescue Fund., Maps.

## ~~Distribution of Marine Turtles in the Archipelago of Cape Verde, Western Africa~~

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~~Cape Verde archipelago (14°48' - 17°18'N, 22°42' - 25°18'W) is located 500 km off the West Coast of Africa. It includes ten islands and several small islets of volcanic origin. The insular character of Cape Verde, its distance from the continental shore compared to other East Atlantic islands, the water temperature, and the sea currents by which it is affected, make it an important biological area, especially from a bio-geographical point of view. The presence of sea turtles in these islands is evident. However, as in many eastern Atlantic populations, references have always been scarce and not very reliable. It is still unknown whether different species nest in this zone. Here we present preliminary data on the distribution of sea turtles in this archipelago, and their nesting sites.~~

## ~~Methods~~

~~First of all, numerous bibliographical references concerning the presence of sea turtles in the archipelago were reviewed, bear in mind that many of them were never confirmed (Table 1). The bibliography was contrasted with direct observation of marine turtles in the sea and on the beaches from 1996 to 1998. At the same time, different beaches were surveyed to verify the female reproductive activity through recognition of turtle tracks on the sand. Moreover, human predatory activity was assessed by quantifying the remains of slaughtered turtles on the shores.~~

## ~~Results~~

~~*Dermochelys coriacea*. Isolated sightings by fishermen and some non-confirmed references about nesting on Boavista.~~

~~*Eretmochelys imbricata*. It is the second most common species. Only juvenile stages, up to 45 cm in Straight Carapace Length, were observed. The occurrence of the species has been confirmed on the following islands: São Vicente, Santiago, Sal, Boavista and Maio. References not confirmed about nesting.~~

~~*Lepidochelys olivacea*. References related to the islands of Sal and São Nicolau mention stranded animals. References not confirmed about nesting in Maio.~~

~~*Chelonia mydas*. Only small-sized shells from unknown origin have been reported as decorative ornaments. A doubtful record of nesting activity on Santa Luzia island.~~

~~*Caretta caretta*. Its the most widespread species in the archipelago. Its presence is practically confirmed on every island, and their nesting populations remain established in Sal, Boavista, Maio, and São Vicente. References not confirmed in Santa Luzia and Santiago.~~

## ~~Conclusions~~

~~Five species of marine turtles are regularly sighted in Cape Verde. *C. caretta* is likely the most abundant species in these islands. Its nesting areas are located on the islands of Sal, Maio, São Vicente and Boavista. *E. imbricata* (only juvenile~~