

## Short Communication

# First census of the green turtle at Poilão, Bijagós Archipelago, Guinea-Bissau: the most important nesting colony on the Atlantic coast of Africa

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**Abstract** The island of Poilão in the Bijagós Archipelago, Guinea-Bissau, is known to be an important nesting site for the green turtle *Chelonia mydas*, but until recently there were no quantitative estimates of the number of clutches deposited annually. In 2000 a survey was carried out to assess the magnitude of nesting, and an estimated 7,400 green turtle clutches were deposited. Four nesting hawksbill turtles *Eretmochelys imbricata* were also encountered. This study confirmed that Poilão is one of the most important nesting sites for green turtles in the Atlantic, and the largest known nesting colony on

the west coast of Africa. Traditionally Poilão has been regarded as a sacred site by the Bijagós people, and this has contributed to the conservation of these turtles. However, the development of fisheries in this region is an emerging threat. To conserve this site a National Marine Park was designated in August 2000.

**Keywords** Africa, *Chelonia mydas*, *Eretmochelys imbricata*, green turtle, Guinea-Bissau, hawksbill turtle, Poilão, sea turtle.

The Bijagós Archipelago of Guinea-Bissau, West Africa, is recognized as an important nesting area for green turtles *Chelonia mydas*, although detailed studies are few (Limoges & Robillard, 1991; Barbosa *et al.*, 1998; PNUE/CMS, 2000; Fretey, 2001). Preliminary surveys have indicated that the majority of green turtles nesting in the archipelago do so on the island of Poilão (Limoges & Robillard, 1991). In 1994 and 1995, respectively, 314 and 1,651 adult female green turtles were tagged there (Fortes *et al.*, 1998), although no estimates were made of the number of nesting females or clutches deposited. Poilão is small (43 ha), remote (Fig. 1), covered by

undisturbed tropical forest, and surrounded by a rocky subtidal zone. Sandy beaches comprise a total of 2.3 km of the c. 4 km coastline. The climate is tropical, with a rainy season from May to November. Recently there have been unconfirmed reports of itinerant fishermen visiting Poilão and systematically capturing green turtles, and during preliminary visits in April and May 2000 we found signs of temporary settlement by fishermen, including large quantities of dried fish, water reserves and fresh adult green turtle remains. This threat and the need for empirical data prompted this study. Our objectives were to assess the importance of the nesting green turtle population, obtain baseline data for future monitoring, and provide basic surveillance and protection.

Surveys of nesting beaches are often used to assess the status of marine turtle populations; by counting tracks of nesting turtles it is possible to infer how many adult female emergences have occurred. In the present study we made systematic track counts between 19 July and 14 December 2000 on 128 days (85% of the total). During this period the beach was not left unsurveyed for more than 2 consecutive days. We estimated the number of adult female emergences for each unsurveyed day as the average of the prior and successive counts (Godley *et al.*, 2001).

Because not all adult female emergences result in clutch deposition it is important to estimate the proportion that result in egg laying. Around the island and at different times throughout the study period we

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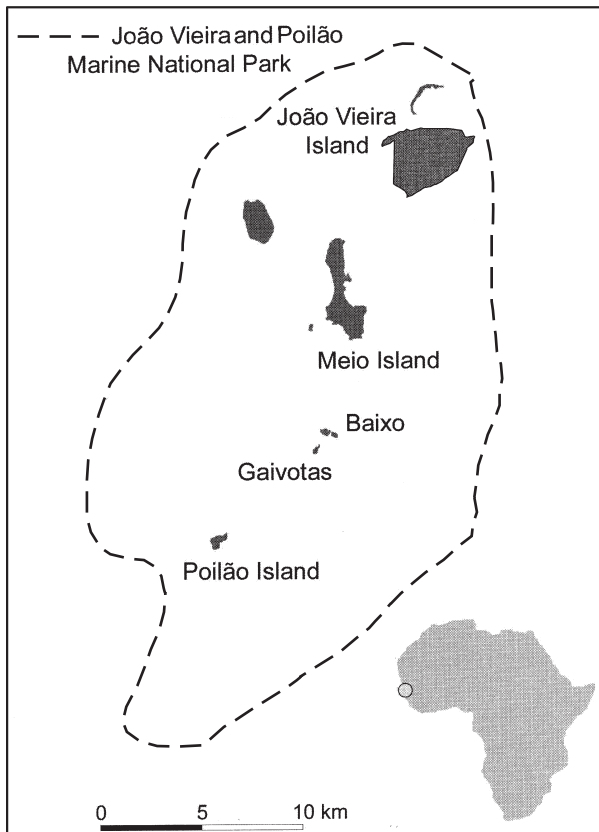
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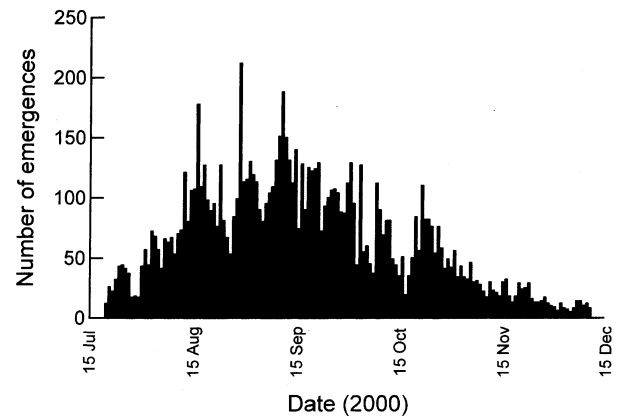


**Fig. 1** Location of Poilão Island within the João Vieira and Poilão National Marine Park in Guinea Bissau. The inset shows the position of the Park off the coast of West Africa.

randomly chose 50 turtles emerging from the sea and followed them from a distance (without disturbance) until they deposited their eggs or returned to the ocean.

To estimate clutch size and hatching success, on most nights from July to October a single turtle was chosen whilst it was excavating its egg chamber and closely observed to allow eggs to be counted as they were laid. The clutch was then marked and followed throughout its incubation until hatching. Two days after hatching, nest contents were excavated and examined to assess hatching success. From 8 August most turtles (1,400 individual females) were double tagged after clutch deposition using Inconel flipper tags.

We estimated that there was a total of 9,733 green turtle nesting activities (from 8,251 recorded) from 19 July to 14 December 2000. The seasonal distribution of activities suggests that few turtles came ashore outside the period of survey; the majority of the turtles nested during August–October (Fig. 2). The proportion of adult female emergences resulting in egg laying was 0.76 (38/50). Multiplying the number of emergences by this correction factor, the estimated number of clutches was



**Fig. 2** The observed and estimated adult female emergences (see text for details) at Poilão on each day from 19 July to 15 December 2000.

7,397. We used a standard binomial equation to calculate the 95% confidence limits of the estimate of the number of female emergences resulting in laying (Zar, 1999) as 0.64–0.86. The resultant 95% confidence limits on the estimate for the total number of clutches are 6,229–8,273.

Seventy-six egg clutches were marked to assess their fate. In seven cases the markers were lost and the fate of the nest is unknown. Of the remaining 69, 58 (84%) produced hatchlings, four (6%) were destroyed by other turtles during the nesting process, two (3%) suffered predation by monitor lizards *Varanus* sp., and one (1%) by ghost crabs *Ocyropsis cursor*. In addition, four (6%) clutches failed to hatch. Mean clutch size was  $124 \pm \text{SD } 26$  (range 62–183,  $n = 68$ ) and mean hatching success for successful nests was 93.6% (range 69–100%, 95% CI = 91.7–95.3%,  $n = 58$ ; 95% confidence limits were calculated after arcsine transformation, Zar, 1999).

The only other turtle species detected during our survey was the hawksbill turtle *Eretmochelys imbricata*. Four individual females were seen and six clutches recorded. It is likely that these data underestimate the nesting of this species at Poilão because a clutch frequency of 1.5 clutches per female is low and hawksbill tracks would have been indiscernible among the many tracks of green turtles.

Other than the signs of fishermen found during our preliminary visits, no additional signs were detected after the arrival of our research team in mid July 2000. Up to our departure there were no attempts by other people to land. On five occasions fishing boats placed their nets a few hundred metres offshore, and on one occasion a recently dead green turtle was found on the beach the following morning.

Because of the limited temporal coverage of our work and the fact that track counts after heavy rainfall or

in densely nested areas are only minimum estimates, our estimate of the number of females emerging was probably conservative. The estimate of 76% of adult female emergences that resulted in egg-laying was based on a small sample ( $n = 50$ ) and is high compared to other studies on Atlantic green turtle nesting colonies (Bjorndal *et al.*, 1999; Godley *et al.*, 2001). These data could not be augmented by assessments based on track characteristics because nesting was too dense to allow retrospective evaluations. This will need to be investigated as part of future monitoring. Nevertheless, our results confirm that Poilão is one of the most important nesting sites for green turtles in the Atlantic Ocean, and is certainly the largest on the Atlantic Coast of Africa. There are few estimates from other important sites for comparison, but recent figures for major Atlantic nesting colonies include 1,681 (1996/1997) and 1,255 (1997/1998) clutches for Bioko, Equatorial Guinea (Tomas *et al.*, 1999), 13,092–14,660 (1998/1999) clutches for Ascension Island (Godley *et al.*, 2001), and *c.* 20,000 for Tortuguero, Costa Rica, in each year of the early 1990s (Bjorndal *et al.*, 1999). Given that green turtle populations display high annual variability in nesting (Broderick *et al.*, 2001), additional surveys will be needed to better assess the importance of Poilão.

Reports to the research team by local people suggest that green turtles have declined in many islands of the Bijagós Archipelago in recent decades. Beaches where turtles were reportedly once common now show virtually no signs of nesting (Catry, 2000). Poilão is the only site in the archipelago where large numbers of turtles still nest. The island is by local tradition sacred; few men are allowed to land there, and then only during particular religious and social ceremonies. Such traditional protection, coupled with the remoteness of Poilão, may be why it is still an important turtle nesting site. However, increasing fishing activities in the archipelago pose threats. Local people feel that fishermen from other areas are unaware of and rarely respect local prohibitions and national laws. Additionally, fishing around Poilão also poses the risk of incidental capture and subsequent mortality of turtles.

In 1998 the Bolama-Bijagós Biosphere Reserve team and other staff from the IUCN programme in Guinea-Bissau launched a process that led to the approval, by the National Government, of the decree that created the João Vieira and Poilão National Marine Park, in August 2000. This process involved biological and socio-economic studies, negotiations with the people of the island of Canhabaque (the traditional owners of the uninhabited islands of the Park), public awareness campaigns and lobbying at government level. The new park covers an area of 495 km<sup>2</sup>, and besides Poilão includes three small islands and three islets. Regular

surveillance associated with the creation of this Marine Park is expected to reinforce the traditional protection granted to this site by the Bijagó people. The plan for the Park proposes the creation of a no-fishing zone around Poilão (Catry & Bouju, 2001). We hope that this recommendation will be incorporated into the management plan of the park and approved by the management board, which includes local people and other stakeholders.

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## References

- Barbosa, C., Broderick, A.C. & Catry, P. (1998) Marine turtles in the Orango National Park (Bijagós Archipelago, Guinea-Bissau). *Marine Turtle Newsletter*, **81**, 6–7.
- Bjorndal, K.A., Whitherall, J.A., Bolten, A. & Mortimer, J.A. (1999) Twenty six years of green turtle nesting at Tortuguero, Costa Rica: an encouraging trend. *Conservation Biology*, **13**, 126–134.
- Broderick, A.C., Godley, B.J. & Hays, G.C. (2001) Trophic status drives inter-annual variability in nesting numbers of marine turtles. *Proceedings of the Royal Society B*, **268**, 1481–1487.
- Catry, P. (ed.) (2000) *Action Plan for the Conservation of Marine Turtles in Guinea-Bissau*. IUCN, Bissau, Guinea-Bissau.
- Catry, P. & Bouju, S. (2001) *Propositions pour la mise en place du Parc National Marin de João Vieira/Poilão*. IUCN, Bissau, Guinea-Bissau.
- Fretey, J. (2001) *Biogeography and Conservation of Marine Turtles of the Atlantic Coast of Africa*. CMS Technical Publication Series No. 6. UNEP/CMS Secretariat, Bonn, Germany.
- Fortes, O., Pires, A.J. & Bellini, C. (1998) Green turtle, *Chelonia mydas*, in the island of Poilão, Bolama-Bijagós Archipelago, Guinea-Bissau, West Africa. *Marine Turtle Newsletter*, **80**, 8–10.

- Godley, B.J., Broderick, A.C. & Hays, G.C. (2001) Nesting of green turtles *Chelonia mydas* at Ascension Island, South Atlantic. *Biological Conservation*, **97**, 151–158.
- Limoges, B. & Robillard, M. (1991) *Proposition d'un plan d'aménagement de la réserve de la biosphère de l'archipel des Bijagós. Vol. 2 – Les espèces animales, distributions et recommandations*. CECI/IUCN, Bissau, Guinea-Bissau.
- PNUE/CMS (2000) *Conservation Measures for Marine Turtles of the Atlantic Coast of Africa*. CMS technical publication series No. 5. PNUE/CMS Secretariat, Bonn, Germany.
- Tomas, J., Castroviejo, J. & Raga, J.A. (1999) Sea Turtles in the South of Bioko Island, (Equatorial Guinea). *Marine Turtle Newsletter*, **84**, 4–6.
- Zar, J.H. (1999) *Biostatistical Analysis*. Prentice Hall, New Jersey, USA.

### Biographical sketches

Paulo Catry is involved in the study and conservation of marine turtles in Guinea-Bissau, and in the management of protected areas. Castro Barbosa has been carrying out field surveys on marine turtles in Guinea-Bissau since 1992. Marine turtle research in Guinea Bissau is carried out by a consortium of organisations including the Centre for Applied Research on Fisheries, the Coastal Planning Office, Ministry of Agriculture and Rural Development, and the National Institute for Research in Guinea Bissau. Technical support is provided by Unidade de Investigação em Eco-Etologia, ISPA – Instituto Superior de Psicologia Aplicada, Portugal, and the Marine Turtle Research Group, University of Wales, Swansea.