

Marine Turtles on the Southern Coast of Bioko Island (Gulf of Guinea, Africa), 2001-2005

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Bioko Island, Equatorial Guinea is the largest of the four Gulf of Guinea islands (2027 km²) and the nearest to mainland Africa, situated 32 km off Cameroon. Four species of marine turtles (leatherback, *Dermochelys coriacea*; green, *Chelonia mydas*; olive ridley, *Lepidochelys olivacea* and, hawksbill, *Eretmochelys imbricata*) nest on the 15 km of black sand beaches along the island's southern coast, which is within the legally protected Gran Caldera and Southern Highlands Scientific Reserve (Figure 1). The remainder of Bioko's 150 km coastline is either structurally unsuitable for nesting (~120 km of cliffs or narrow rocky beaches), or too close to roads and villages (approximately 15 km sandy beaches along the northern and western coast).

Steep terrain, the result of two volcanic peaks (Gran Caldera de Luba, 2260 m a.s.l. and Pico Biao, 2010 m a.s.l.) less than 10 km apart and within 15 km of the turtle beaches, plus the lack of nearby roads and villages protect the southern beaches of the island from most human predation. There is only one settlement, along the southern coast, Ureca, with a population of approximately 100 people. To reach the rest of the island, these villagers must either traverse a 20 km footpath that crosses a 1343m pass between the two volcanoes or wait for intermittent boat service (once or twice per month). However, during the nesting season poachers arrive multiple times per month by boat at Moraka Playa (~12 km west of Ureca and one of two places where boats can land along the southern coast) to harvest turtles, both on the beach (overturning them to prevent escape) and in the waters immediately offshore. Poachers are less interested in turtle eggs, but other predators including drill monkeys (*Mandrillus leucophaeus*), brush-tailed porcupines (*Atherurus africanus*), monitor lizards (*Varanus niloticus*), pied crows (*Corvus albus*), palm nut vultures (*Gypohierax angolensis*), ghost crabs (*Ocypode* spp.), ants, and Ureca village dogs take advantage of this seasonal food source (Tomás *et al.* 1999).

For all four marine turtle species, the nesting season corresponds to the dry season on the island, beginning in late October, peaking in January and extending to the end of March. Bioko's southern coast receives more than 11,000 mm of rain each year (Terán 1962), and even during the dry season, rainfall feeds intermittent streams that wash across the beach destroying turtle nests.

Before the 1990's little was known of the species and magnitude of nesting on Bioko's southern beaches. (Butynski 1996; Castroviejo *et al.* 1994). For example, in January 1963 German naturalist Martin Eisentraut spent two weeks in Ureca and determined that four different species of marine turtles nested on nearby beaches. However only two were common enough to positively identify; the green and the hawksbill. At that time the green turtle was by far the most common species (Eisentraut 1964).

The first systematic study of Bioko Island began in the 1996/1997 season (Tomás *et al.* 1999). Nesting for the following season (1997/1998) was also recorded. Trained locals were responsible for

daily counts of turtles and nests on southern beaches. After a two year hiatus, seasonal nest counts were resumed under the auspices of the Bioko Biodiversity Protection Program (BBPP), an academic partnership between Arcadia University (Glenside PA USA) and the Universidad Nacional de Guinea Ecuatorial (UNGE; Malabo, Equatorial Guinea). Preliminary results from this five-year project (2001-2005) are reported here and compared to results obtained by Tomás *et al.* (1999).

Bioko Island's southern beaches consist of black volcanic sand interspersed with outcroppings of lava and basalt. Loose rocks, rounded by the action of the surf, have accumulated along some of the beaches. Wave action is strong, driven by prevailing winds from the south. Villagers from Ureca, were employed to collect daily information on sea turtles coming ashore on the five major beaches (Figure 1 A-E; total length = 15.64 km) between Punta Oscura (N 3° 16.50, E 8° 26.65) and Punta Santiago (N 3° 12.65, E 8° 40.50). Many of these local people were originally trained by Tomás in 1996. Additional training in turtle census techniques was provided to UNGE and Arcadia personnel during the XI Course on the Biology and Conservation of Marine Turtles at Puy Puy, Venezuela in July 2001 and to local workers on site in January 2002 and November 2004.

Working in five teams, the villagers traversed nesting beaches at least twice nightly. Date, time, weather and tide, presence and width of tracks, evidence of nesting, species of turtle, width and length of carapace, presence of tags, distance between the nest and the high tide line, and distance between the nest and the vegetation line were recorded. Each nest was given a consecutive number, but no attempt was made to follow up on the success of the nest. Records were organized and maintained by personnel at UNGE. BeachES were monitored daily throughout the turtle nesting season (October - April) for five years (2000/2001 season through 2004/2005 season). Turtles typically nested at night, but daytime nests also occurred. Turtles sometimes came ashore and nested at other times of the year, but in small numbers.

Number of monitoring days during each nesting season varied. All five BBPP-paid seasons ended in April, but the 2003/2004 season began in September, the 2001/2002 and 2002/2003 seasons began in October and the 2000/2001 and 2004/2005 in November. Early season nests (September and October) accounted for less than 1% of the season total for all species. The data collected by Tomás *et al.* (1999; shown in Figure 2) were for the period 7th October – 15th April in 1996/1997, and 15th September – 7th March in 1997/1998.

Tomás *et al.* (1999) recorded, in total, between 2000 and 3000 nests in each of two seasons (1996/97 and 1997/98) with green turtles producing more nests than leatherbacks in both seasons (Figure 2). When counts were resumed by BBPP two years later, a very different picture emerged: more than 6000 nests were recorded in the 2000/2001 season, due to an almost five-fold increase in

leatherback turtle nests. This pattern was maintained for three seasons and then leatherback nests were recorded at lower levels. Because very few leatherbacks were tagged it is impossible to know if the high nest numbers were the result of more frequent visits by the same turtles or by an actual increase in the number of nesting turtles.

The number of green turtle nests fluctuated much less (mean = 1240, S.D. \pm 379 nests/season) and did not appear to be influenced by the number of leatherback nests. Likewise, the number of olive ridley nests remained relatively stable (mean = 68, S.D. \pm 20 nests/season), possibly even increasing since the most recent season had the highest number (100 nests). In contrast, the number of hawksbill nests remained low (mean = 8, S.D. \pm 6), and probably continued to decrease since the earliest season had the highest number of nests (19).

The most surprising change in marine turtle nesting patterns on Bioko Island has been the increase in leatherback nests since 1990. For example, Butynski (1996) reports seeing no leatherback nests when he walked the southern beaches during the nesting season in 1986. Likewise in 1990 when one of the authors (GWH) was present, no leatherback nests were seen but local people were able to identify it as a nesting species (Butynski 1996). Although Tomás *et al.* (1999) identify the green turtle as the most common nesting species on Bioko during their 2 yr study, by the time BBPP surveillance began in the 2000/2001 season, leatherback nests far outnumbered those of green turtles.

One possible explanation for the dramatic increase might be the very heavy rainfall during the 1997 rainy season (an El Niño year), which resulted in numerous landslides on the southern part of Bioko Island. Local helicopter pilots remarked on the plumes of sediment flowing from Bioko's rivers into the Gulf of Guinea. These El Niño-related weather changes might have selectively influenced leatherback turtles (Hays 2000). However, this explanation does not account for the initial appearance and increase in leatherback nests recorded by Tomás *et al.* (1999).

The recent decline in leatherback nests on Bioko Island also seems to be part of a larger Gulf of Guinea pattern with other sites, for example the leatherback nesting beaches at the Gamba Complex in Gabon (Verhage & Moundjim 2005), reporting similar variation.

In contrast to the fluctuating leatherback nesting patterns, the number of green turtle nests has remained relatively stable even though poachers, apparently protected by military officials, continue to harvest approximately 250 green turtles each season. Despite this recent stability, it is clear that green turtle numbers are greatly reduced from the 1985/1986 season, when local people from Ureca reported a capture rate of 100/turtles per night. By 1990, only 200-500 turtles were harvested per season (Butynski 1996), a level

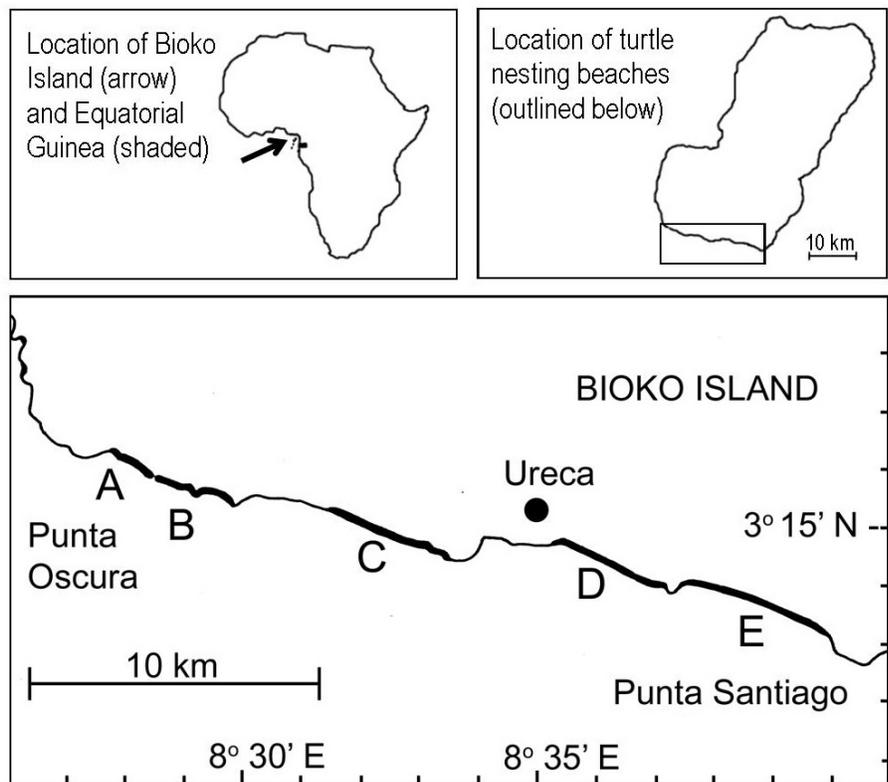


Figure 1. Map of Bioko Island and the turtle beaches on the southern coast.

similar to that “permitted” in recent seasons.

Hawksbill turtles, once the second most common species nesting on Bioko Island (Eisentraut 1964), are now very rare and rapidly declining with only 6 nests recorded in 2003/2004 and only 3 in 2004/2005. The olive ridley, always a rare species on Bioko Island, may be experiencing a slight increase in nests although the numbers remain too low to be conclusive.

These results demonstrate the value of multi-season longitudinal studies in assessing the relative importance of marine turtle nesting sites, particularly for leatherback turtles. These conclusions also support the previously established status of Bioko Island's southern coast as an important breeding ground for marine turtles in the Gulf of Guinea and underscore the need for greater protection (Formia *et al.* 2003; Fretey 2001; Tomás *et al.* 2001).

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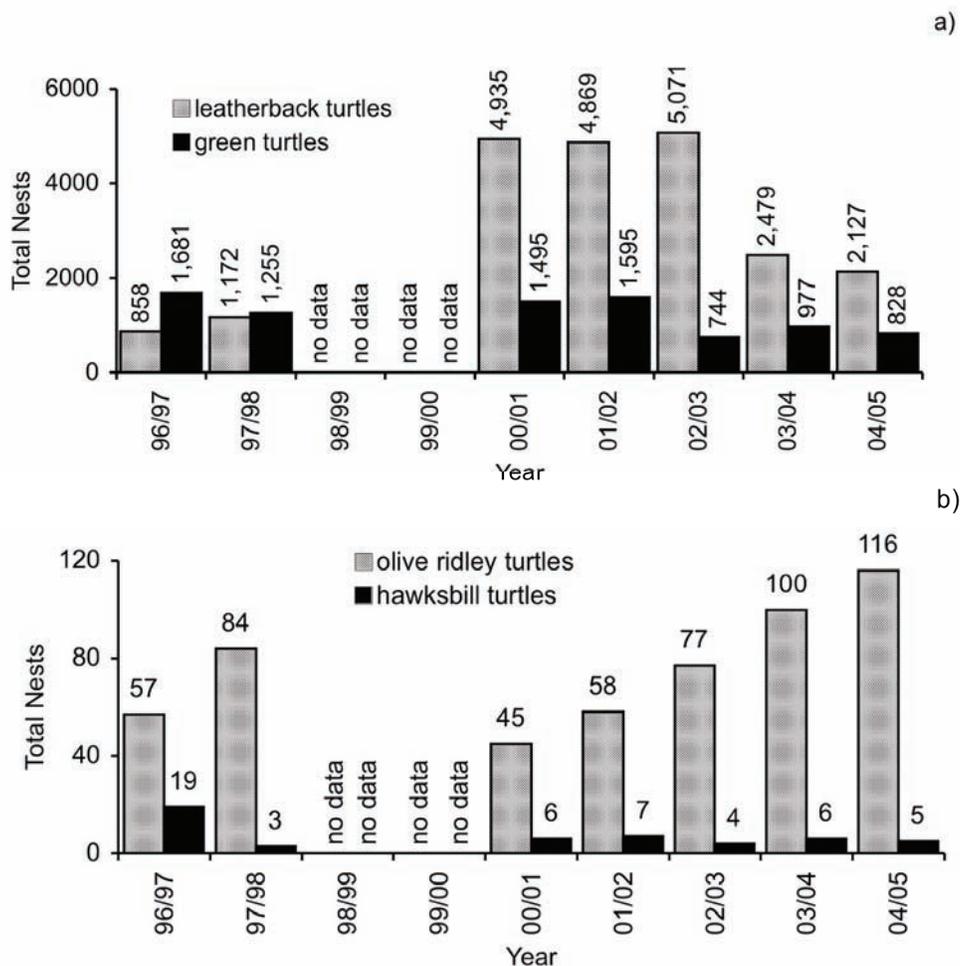


Figure 2. Total number of turtle nests recorded on the southern beaches of Bioko Island between 1996/1997 and 2004/2005. The 1996/1997 and 1997/1998 nesting seasons are reported in Tomás *et al.* (1999), and the seasons since 2000/01 are reported in this study. a) leatherback and green turtles; b) olive ridley and hawksbill turtles.

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