

Challenges Confronting Sea Turtle Conservation on Bioko Island, Equatorial Guinea

Author(s): Daniel B. Fitzgerald, Elsa Ordway, Shaya Honarvar, and Gail W. Hearn

Source: *Chelonian Conservation and Biology*, 10(2):177-180.

Published By: Chelonian Research Foundation

DOI: <http://dx.doi.org/10.2744/CCAB-0889.1>

URL: <http://www.bioone.org/doi/full/10.2744/CCAB-0889.1>

BioOne (www.bioone.org) is a nonprofit, online aggregation of core research in the biological, ecological, and environmental sciences. BioOne provides a sustainable online platform for over 170 journals and books published by nonprofit societies, associations, museums, institutions, and presses.

Your use of this PDF, the BioOne Web site, and all posted and associated content indicates your acceptance of BioOne's Terms of Use, available at www.bioone.org/page/terms_of_use.

Usage of BioOne content is strictly limited to personal, educational, and non-commercial use. Commercial inquiries or rights and permissions requests should be directed to the individual publisher as copyright holder.

Challenges Confronting Sea Turtle Conservation on Bioko Island, Equatorial Guinea

DANIEL B. FITZGERALD¹, ELSA ORDWAY¹, SHAYA HONARVAR¹, AND GAIL W. HEARN¹

¹Drexel University, Department of Biology, 3141 Chestnut Street, Philadelphia, Pennsylvania 19104 USA
[dbf23@drexel.edu; elsa.ordway@gmail.com; sh333@drexel.edu; gwh26@drexel.edu]

ABSTRACT. – Bioko Island, part of Equatorial Guinea, has been classified as a critically important nesting site for sea turtles in the Gulf of Guinea. However, construction of a road through a previously undeveloped scientific reserve is set to dramatically alter human interactions with nesting turtle populations. This article reports on the current status of sea turtle conservation and research on Bioko Island as well as recent economic considerations that affect local turtle conservation and use.

KEY WORDS. – Bioko Island; green turtle; Moka; Ureca

Africa's Gulf of Guinea contains one of the world's largest nesting populations of the critically endangered leatherback turtle (*Dermochelys coriacea*) as well as important feeding and nesting grounds for green (*Chelonia mydas*), olive ridley (*Lepidochelys olivacea*), and hawksbill (*Eretmochelys imbricata*) turtles (Formia et al. 2003; Sounguet et al. 2004; Witt et al. 2009). The region also has seen rapid economic expansion due to more than a decade of offshore petroleum exploration and development (Witherington et al. 2008). Growing pollution problems and the potential threat of an environmental disaster from these practices, direct and incidental capture in fisheries, and high demand for sea turtle meat have led to increased concern about the conservation of turtle populations in this region.

Bioko Island is the largest (2017 km²) of the 4 Gulf of Guinea Islands and the closest to mainland Africa, lying approximately 37 km offshore from Cameroon (Fig. 1). Bioko's southern coast, with roughly 19 km of sandy beaches, has been classified as one of the most important nesting areas for the 4 species of sea turtles within the Gulf of Guinea (Butynski 1996; Tomás et al. 1999; Fretey et al. 2007). These beaches are thought to support the second highest densities of both green turtles (940 ± 430 nests/season during 2000–2008) and leatherback turtles (3280 ± 1780 nests/season during 2000–2008) on the Atlantic coast of Africa behind Guinea Bissau and Gabon, respectively (Rader et al. 2006; S. Honarvar, unpubl. data, 2007–2011). Although these beaches are part of the Gran Caldera and Southern Highlands (GCSH) Scientific Reserve (510 km²), 1 of the 2 designated protected areas on the island, onsite enforcement of the reserve's protected status is limited.

Regardless, the nesting beaches on Bioko have remained relatively protected from human approach. The village of Ureca (population, < 100), located 2 km away from the nesting beaches, is the only settlement along the southern coast of Bioko Island. The rugged topography and lack of safe harbor have resulted in low levels of human use of the beaches and surrounding forest. However, the current construction of a road between the villages of Belebu and

Ureca is set to remove any protection once offered by isolation (Fig. 1). This road, which will bisect the GCSH Scientific Reserve, has already been cleared and is scheduled for completion in 2012. This development will afford easier access to the southern portion of the island and is likely to dramatically alter human use of the biological resources in this area, including the nesting sea turtle populations. With plans for infrastructure development on the nesting beaches already underway, including the clearing of a second road along the coast (D. Fitzgerald and S. Honarvar, *pers. obs.*), the threats to Bioko's sea turtles will likely increase as has been the case with beach development elsewhere (Lutcavage et al. 1997).

SEA TURTLE CONSERVATION AND RESEARCH ON BOKO ISLAND

Conservation efforts by the Asociación Amigos de Doñana (AAD) before 1998 and current efforts by the Bioko Biodiversity Protection Program (BBPP) in partnership with the Universidad Nacional de Guinea Ecuatorial (UNGE) have aided the protection of Bioko's natural resources. From 1996 to 1998, selected Ureca community members were trained to measure and count the turtles that emerge on Bioko's southern beaches, under the direction of the AAD. This represented the first quantitative data available for these populations (Tomás et al. 1999). Data collection by community members (18 men and 16 women) was resumed in 2000 under the direction of the BBPP. Results from the 1996–2004 nesting seasons have previously been summarized (Rader et al. 2006; Tomás et al. 2010).

Since 2007, the BBPP has begun expanding its sea turtle conservation and educational outreach efforts. To obtain an estimate of sea turtle population sizes on Bioko Island, a passive integrated transponder tagging program of the leatherbacks has been initiated on the western-most beaches along with a flipper tagging program of the occasional green, olive ridley, and hawksbill turtles nesting there. While conducting experiments on leatherback physiology and nesting ecology, BBPP researchers

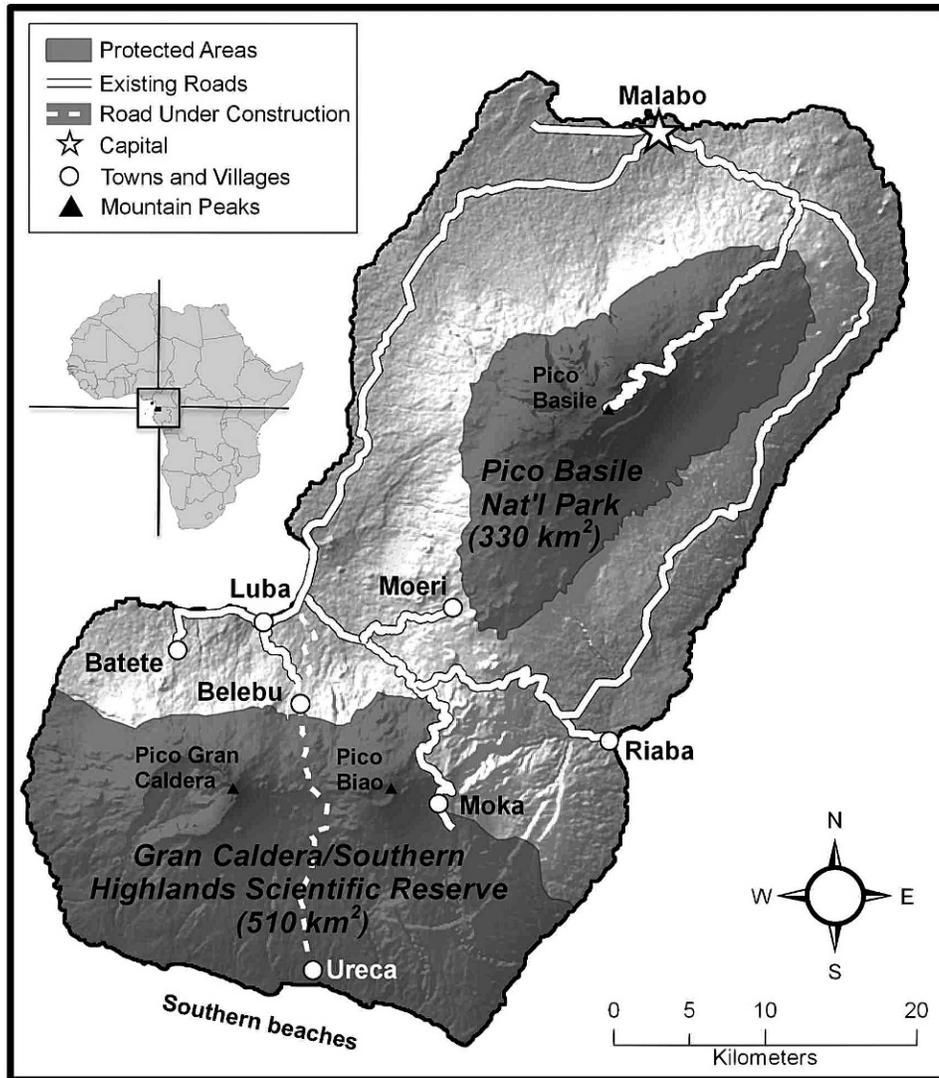


Figure 1. Map of Bioko Island, showing protected areas in relation to existing roads. Inset on left shows Equatorial Guinea, both island and continental portions, shaded in black.

also train and supervise local employees in collection of standard nesting ecology data, including morphometrics and reproductive output, on all species on the remaining nesting beaches. Employees were trained in the use of a global positioning system so that geo-referenced locations are recorded for each nest. Biweekly visits to Ureca to collect the nesting ecology data provide a frequent opportunity for further training and discussion. All data are managed by the BBPP.

The government has already issued law 8/1988 (which regulates hunting of wildlife) and presidential decree 183/87 (which regulates fishing), which offer some protection for sea turtles. Nevertheless, illegal taking of wildlife, including adult sea turtles and eggs, still occurs. Green turtle take has, in the past, been reported as high as 500 individuals per season (Castroviejo et al. 1994). Military officials previously issued commercial hunting permits for approximately 250 green turtles each year,

although actual levels of take were thought to be much less due to the presence of local employees on the nesting beaches (Rader et al. 2006; Tomás et al. 2010). During the 2009–2010 and 2010–2011 nesting seasons, BBPP employees documented permits issued by the Ministry of Defense for at least 25 and 9 turtles, respectively.

Green turtle meat is available in restaurants throughout the island during the nesting season and has even been found in freezer cases in Malabo supermarkets (D. Fitzgerald and S. Honarvar, *pers. obs.*). Interestingly, it is generally absent from the major bush meat market in Malabo. Detailed market surveys from 1997–2010 revealed a total of only 9 green, 3 leatherback, and 4 hawksbill turtles. In contrast, 3521 carcasses of the hingeback tortoise (*Kinixys erosa*; shipped from mainland) were recorded during the same survey period. The community members of Ureca opportunistically take eggs from all the species and have been observed attempting to sell turtle

Table 1. Economic value of green turtle meat trade on Bioko Island.

Y	Estimated no. of turtles taken	Price paid per turtle (XAF)	Market price per kg (XAF)	Estimated income (XAF) ^a
1994	500	15,000	1000–1500	65,000–130,000
2010	50	250,000	3000–3500	115,000–230,000

^a Calculated by dividing the total revenue ([number taken × price per turtle] – 1,000,000 XAF tax) by the number of participants; it was assumed that 50–100 people participated in the trade (1 USD ≈ 450 XAF; Castroviejo et al. 1994).

eggs to visitors in the village. When asked about the absence of eggs in the urban markets, they mentioned the logistical difficulties of transporting the eggs. Occasionally, military officials stationed in Ureca take turtles, including leatherbacks, for consumption (D. Fitzgerald and S. Honarvar, *pers. obs.*). While these activities have been reduced due to recent conservation initiatives, their well-documented occurrence in the past may already have impacted nesting numbers (Tomás et al. 2010). However, limited data on the population size of each species make it difficult to assess long-term trends.

Capacity Building. — To raise local awareness of sea turtle conservation issues, classes for primary school children have been held on the nesting beach near Ureca and at the BBPP's Moka Wildlife Center. These classes, held in collaboration with local teachers, emphasized the importance of protecting both the turtles and their nesting beaches for the long-term survival of these species. In addition, reports have been provided to the Ministry of Information, Culture, and Tourism, and a documentary about sea turtle conservation efforts on Bioko has aired on local television channels.

Scientific presentations that detail our research on the island have been presented to faculty and students at UNGE. Internship programs through UNGE have facilitated student participation in fieldwork for school credit. Multiple faculty members from UNGE also participate in the research. These collaborations with the national university aim to develop a cadre of Equatoguineans capable of rising to the conservation challenges of increased development on the southern coast of Bioko.

ECONOMIC CONSIDERATIONS

Although some Ureca community members appreciate local conservation issues, their participation in the research is clearly dependent on the financial incentives offered by the program. These drivers are especially noticeable in a country that is developing as quickly as Equatorial Guinea, due to the recent discovery of oil reserves (Witherington et al. 2008). Maintaining competitive wages and developing alternative means of income are critical but increasingly difficult in Equatorial Guinea's rapidly growing economy.

Potential income from commercial green turtle use has increased dramatically since previous estimates (Table 1). To facilitate comparison with Castroviejo et al. (1994), incomes were calculated when assuming 50–100 people (working in groups of 10) participate in the trade and a

100,000 XAF tax (1 USD ≈ 450 XAF) is paid per group. Information on the current amount of this tax is unavailable. Exact numbers of green turtles currently taken are unknown but when using an estimate of 50 turtles per season based on reports from local employees of both permitted and nonpermitted take yields a range almost twice that in 1994 (Castroviejo et al. 1994). This number does not consider hawksbill or olive ridley turtles, which currently sell for 100,000 XAF per turtle. No data are available for prices of leatherback eggs or meat. Male community participants currently earn 65,000 XAF per month by conducting nightly turtle patrols for the BBPP (14 days per month), and women earn 36,000 XAF per month by conducting morning walks (7 days per month). Although this wage is competitive with potential incomes generated from commercial turtle use, the BBPP only employs 34 of roughly 100 villagers for the turtle project.

Approached about possible funding limitations in the future, many community members explicitly stated that they would return to the turtle trade if wages were decreased below current amounts. Fortunately, a few options are available to supplement income in the non-nesting season as well as buffer future funding limitations. A basket-weaving project has been implemented by the BBPP in which traditional Ureca baskets and fishing nets woven from local materials are sold in the Moka Wildlife Center. Opportunities exist to assist with BBPP primate censuses during the non-nesting season. In addition, many men from the village live and work in the port city of Luba during the off-season. Future opportunities for the development of markets for fish and agricultural products, which are currently harvested for subsistence, also may exist due to increased access from the new road.

STRATEGIES FOR SUCCESSFUL CONSERVATION

There are many cogent reasons for the decision to develop access to Bioko's southern beaches. Opportunities to increase the standard of living in Ureca and better access for Equatoguineans to visit this part of the island for the first time are 2 potentially beneficial outcomes. Indeed, a greater awareness of turtle conservation issues may arise from increased exposure of the area. Many of the children in our classes at Moka had never seen a turtle. From a governmental standpoint, increased security and communications on this coast is a major consideration due to numerous coup attempts in the past.

Although conservation efforts on Bioko Island have their own unique challenges in light of the recent economic development, unexpected opportunities also have arisen. Equatorial Guinea's income from oil reserves is expected to decline within the next decade, and this has sparked some discussion within the government of the future potential of ecotourism. The government could be encouraged to develop sustainable employment opportunities by highlighting to the public likely economic and resource conservation benefits. With some Ureca community members already qualified to serve as guides for ecotours, sensitive ecotourism development may present alternative livelihood options for local people.

Employment opportunities to properly manage and administer the GCSH Scientific Reserve could also be developed, with the added benefit that sea turtle conservation can indirectly aid protection of other wildlife in the area. The GCSH Scientific Reserve is home to a unique assemblage of 11 nonhuman primates, which makes it an important area for primate conservation as well (Butynski and Koster 1994). Having already designated the area as a scientific reserve, the government of Equatorial Guinea is in a good position to demonstrate its concern by beginning to enforce the reserve's boundaries and the wildlife's protected status.

Although limited data make quantitative evaluations of the threats to Bioko's sea turtle populations difficult, the need for action is clear. Beach development in other regions has drastically influenced sea turtle populations (Lutcavage et al. 1997), and, without preventative measures, Bioko's turtles will face the same problems. The immediate concern is that easier access and the absence of sound enforcement may accelerate commercial turtle use by lowering the operational costs (i.e., boat and gasoline). This includes a potential increase in the amount of turtles taken as well as the potential opening of a market for turtle eggs, which historically have only been consumed locally (Castroviejo et al. 1994). The integrity of the nesting sites will remain for the time being, because major beach development is likely a few years off.

In addition to existing national legislation, the government of Equatorial Guinea has recently demonstrated its intent to manage and conserve the country's marine turtle populations by becoming a party to the Convention on the Conservation of Migratory Species of Wild Animals in 2010 and by signing the Memorandum of Understanding Concerning Conservation Measures for Marine Turtles of the Atlantic Coast of Africa. However, sufficient support needs to be generated through institutions such as UNGE, communities such as Ureca, and both civil and military authorities to push for effective enforcement. UNGE provides strong potential for generating this support, and collaborations with the university are a key component of the BBPP's conservation efforts. The future of these nesting populations will rely heavily on the presence of well-trained and educated Equatoguineans working to protect their resources.

The construction of the new road presents critical conservation challenges on Bioko Island, not only for sea turtles but also for the island's unique terrestrial biodiversity. Ultimately, the government must provide the impetus to develop strategies to deal with these challenges, strategies that may well build on the ongoing efforts and experience of the BBPP, its partners, and the Ureca community.

ACKNOWLEDGMENTS

We are grateful to UNGE, A. Formia, H. Ruffler, F.R. Entingue, and D.B. Meñe for their help. D. Cronin provided the figure. Funding for local employees was provided by the U.S. Fish and Wildlife Service. Additional funding was provided by the Exxon Mobil Foundation.

LITERATURE CITED

- BUTYNSKI, T.M. 1996. Marine turtles on Bioko Island, Equatorial Guinea. *Oryx* 30:143–149.
- BUTYNSKI, T.M. AND KOSTER, S.H. 1994. Distribution and conservation status of primates in Bioko Island, Equatorial Guinea. *Biodiversity and Conservation* 3:893–909.
- CASTROVIEJO, J., JUSTE, J., PÉREZ DEL VAL, J., CASTELO, R., AND GIL, R. 1994. Diversity and status of sea turtle species in the Gulf of Guinea islands. *Biodiversity and Conservation* 3:828–836.
- FORMIA, A., TIWARI, M., FRETTEY, J., AND BILLES, A. 2003. Sea turtle conservation along the Atlantic coast of Africa. *Marine Turtle Newsletter* 100:33–37.
- FRETTEY, J., BILLES, A., AND TIWARI, M. 2007. Leatherback, *Dermochelys coriacea*, nesting along the Atlantic coast of Africa. *Chelonian Conservation Biology* 6:126–129.
- LUTCAGE, M.E., PLOTKIN, P., WITHERINGTON, B., AND LUTZ, P.L. 1997. Human impacts on sea turtle survival. In: Lutz, P.L. and Musick, J.A. (Eds.). *The Biology of Sea Turtles*. Volume 1. Boca Raton, FL: CRC Press, pp. 387–409.
- RADER, H., ELA MBA, M.A., MORRA, W., AND HEARN, G. 2006. Marine turtles on the southern coast of Bioko Island (Gulf of Guinea, Africa), 2001–2005. *Marine Turtle Newsletter* 111:8–10.
- SOUNGUET, G., MBINA, C., AND FORMIA, A. 2004. Sea turtle research and conservation in Gabon by Aventures Sans Frontières, an organisational profile. *Marine Turtle Newsletter* 105:19–21.
- TOMÁS, J., CASTROVIEJO, J., AND RAGA, J.A. 1999. Sea turtles in the south of Bioko Island (Equatorial Guinea). *Marine Turtle Newsletter* 84:4–6.
- TOMÁS, J., GODLEY, B.J., CASTROVIEJO, J., AND RAGA, J.A. 2010. Bioko: critically important nesting habitat for sea turtles of West Africa. *Biodiversity and Conservation* 19:2699–2714.
- WITHERINGTON, B., PENDOLEY, K., HEARN, G.W., AND HONARVAR, S. 2008. Ancient mariners, ancient fuels: how sea turtles cope with our modern fossil fuel dependency. *State of the World's Sea Turtles* 4:38–41.
- WITT, M.J., BAERT, B., BRODERICK, A.C., FORMIA, A., FRETTEY, J., GIBUDI, A., MOUNGUENGUI, G.A.M., MOUSSOUNDA, C., NGOUESSONO, S., PARNELL, R.J., ROUMET, D., SOUNGUET, G., VERHAGE, B., ZOGO, A., AND GODLEY, B.J. 2009. Aerial surveying of the world's largest leatherback turtle rookery: a more effective methodology for large-scale monitoring. *Biological Conservation* 142:1719–1727.

Received: 3 October 2010

Revised and Accepted: 9 June 2011