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Chiriqui Beach, Panama, the Most Important Leatherback Nesting Beach in Central America

CRISTINA ORDOÑEZ¹, SEBASTIAN TROËNG^{1,5},
ANNE MEYLAN^{2,4}, PETER MEYLAN^{3,4}, AND
ARGELIS RUIZ⁴

¹Caribbean Conservation Corporation, Apdo. Postal 246-2050, San Pedro, Costa Rica [cristinao@ccturtle.org];

²Florida Fish and Wildlife Conservation Commission, Fish and Wildlife Research Institute, 100 8th Avenue SE, St. Petersburg, Florida 33701 USA [anne.meylan@myfwc.com];

³Natural Sciences, Eckerd College, 4200 54th Avenue S, St. Petersburg, Florida 33711 USA [meylanpa@eckerd.edu];

⁴Smithsonian Tropical Research Institute, Apdo. Postal 0843-03092, Balboa, Panamá, República de Panamá;

⁵Present Address: Conservation International, 2011 Crystal Drive, Suite 500 Arlington, Virginia 22202 USA [s.troeng@conservation.org].

ABSTRACT. – Chiriqui Beach, in the Comarca Ngöbe-Buglé on the Caribbean coast of Panama, is the most important nesting beach for leatherback turtles (*Dermochelys coriacea*) in Caribbean Central America. Beach surveys during the 2003 and 2004 nesting seasons documented 3077 leatherback nests in one season and a minimum of 234 individual leatherbacks. Monitoring of nest fate revealed that predation by dogs represents the greatest human-related survival threat to leatherbacks at Chiriqui Beach, although the killing of leatherbacks from the same nesting population on beaches near the Panama–Costa Rica border also is of concern.

Carr (1956) described the 24-km long Chiriqui Beach (09°00.739'N, 081°42.767'W to 08°50.807'N, 081°34.208'W), located in the Comarca Ngöbe-Buglé, Bocas del Toro Province, Panama, as the most important

nesting beach in the Caribbean for the hawksbill turtle, *Eretmochelys imbricata* (Fig. 1). Extensive exploitation of hawksbill turtles from this population for the international tortoiseshell trade has resulted in a severe decline in nesting numbers, estimated at 98% between the 1950s and the 1990s (Meylan and Donnelly 1999).

During 1979–1983, aerial and ground surveys, as well as interviews with local residents, revealed the importance of Chiriqui Beach for leatherback nesting (Meylan et al. 1985). On the night of 24 May 1980, at least 14 leatherback turtles nested on the northern 19 km of Chiriqui Beach, and, on the night of 13 June 1981, at least 16 leatherbacks nested (Meylan et al. 1985). During a ground survey conducted 13–14 June 1981, 834 leatherback tracks or bodypits of varying ages were recorded (Meylan et al. 1985).

Unlike hawksbill turtles, leatherbacks and their eggs are not used by Ngöbe residents and other inhabitants in the communities adjacent to the nesting beach. On other beaches in Caribbean Panama, however, leatherback eggs are actively collected, and some females are killed to allow the collection of their eggs and follicles (Troëng et al. 2002). A survey of 1.6 km of beach south of the Sixaola River (Fig. 1) on 22 May 1987 documented 3 dead females and the majority of the 37 recorded nests poached (A. Meylan and P. Meylan, unpubl. data). Six dead leatherbacks were counted at the northern end of Soropta Beach (Fig. 1) during an aerial survey on 2 May 2001 (S. Troëng, pers. obs.). During the same month, approximately 30 dead leatherbacks were counted during a ground survey of Soropta Beach (C. Ordoñez, pers. obs.).

A local organization, Association for the Protection of the Ngöbe-Buglé Natural Resources (APRORENANB), began hawksbill protection efforts at Chiriqui Beach in 1995. During 1999–2002, the Institute for Tropical Ecology and Conservation (ITEC) undertook hawksbill and leatherback monitoring and conservation efforts in collaboration with APRORENANB during mid-March to August. The northern 10 km of beach was monitored on a daily basis, and the remaining 14 km of beach was

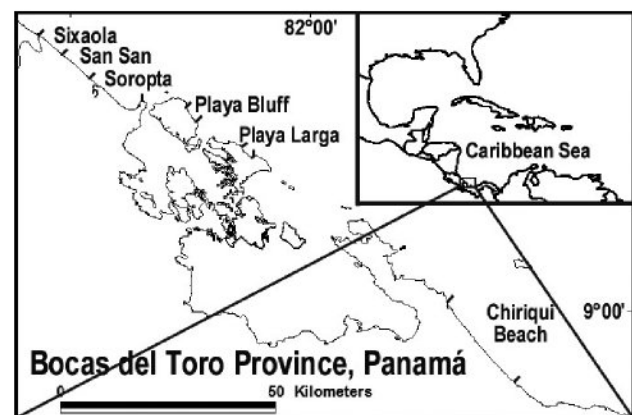


Figure 1. Chiriqui Beach, Comarca Ngöbe-Buglé, and other leatherback nesting beaches in Bocas del Toro Province, Panama.

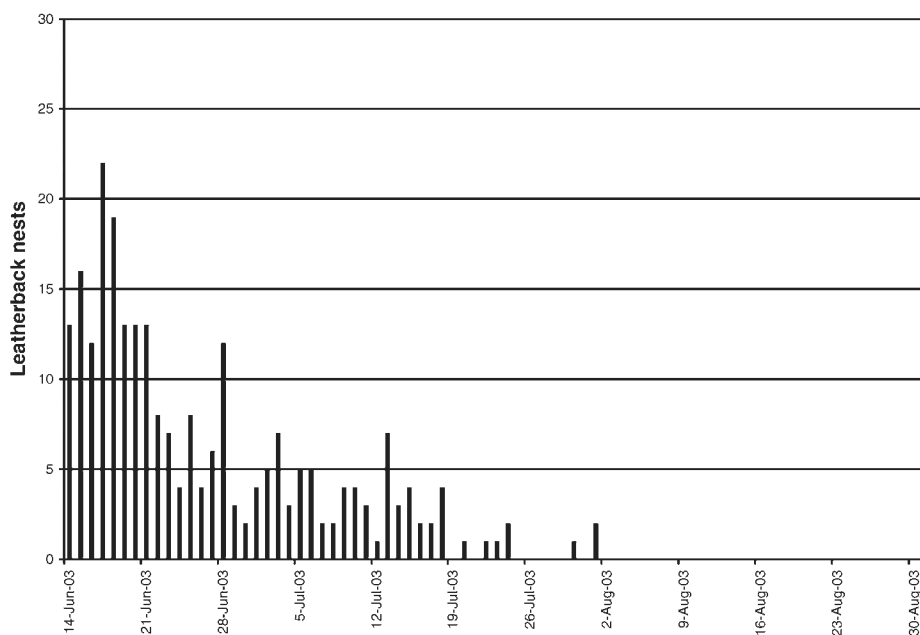


Figure 2. Leatherback nesting at Chiriqui Beach, June–August 2003.

surveyed sporadically. In 2002, a total of 1113 leatherback nests were counted along the northern 10 km of the beach during mid-March to August (Ordoñez et al. 2003). The same year, nesting along the northern 10 km accounted for 67% of all leatherback nests counted during surveys of the entire beach ($n = 3$).

Aerial surveys conducted in March 2002 and February 2003 established that Chiriqui Beach hosts more leatherback nests than any other nesting beach between the San Juan River in Nicaragua ($10^{\circ}56.83'N, 083^{\circ}43.13'W$) and the eastern limit of Bocas del Toro Province, Panama ($08^{\circ}48.72'N, 081^{\circ}05.29'W$) (Troëng et al. 2004). Based on the aerial surveys, it was estimated that Chiriqui Beach hosts 37%–52% of all leatherback nests deposited along the 370 km of Caribbean coast in Nicaragua, Costa Rica, and Panama (Troëng et al. 2004).

In 2003, a project to monitor and recover the Chiriqui Beach hawksbill population commenced as part of a collaborative effort of several local, national, and international organizations and agencies. Continuous monitoring of sea turtle nests by local beach monitors began on Chiriqui Beach in June 2003 and was extended to the entire year in 2004. In 2004, Chiriqui Beach was included in a protected area declared by the National Environmental Authority of Panama (ANAM 2004). The objectives of this paper are to report on results of leatherback monitoring in 2003 and 2004, and suggest research and conservation priorities for the Chiriqui Beach leatherback population.

Methods. — Track surveys to record all leatherback nesting activity were conducted daily from 13 June to 31 August 2003 and from 1 March to 31 August 2004. In addition, track surveys were conducted weekly during January 2004 and every 2 days in February 2004. Tracks

associated with a body pit and with large amounts of sand displaced were classified as nests and continuous tracks, without sand displacement, were recorded as non-nesting emergences.

Sporadic night patrols to tag nesting leatherbacks were conducted from 13 June to 23 July 2003 and from 9 March to 18 July 2004. Monel no. 49 flipper tags (National Band & Tag Company, Newport, Kentucky, USA) were attached to both rear flippers of nesting leatherbacks. The tags have a unique tag number and carry a message rewarding the finder (US\$5.00) for returning the tag by mail to the University of Florida.

A subset of leatherback nests were marked and monitored in 2003 ($n = 81$) and 2004 ($n = 243$). Marked nests were inspected daily until they were predated, washed out, or hatchling tracks were observed. The nests were excavated after hatchling tracks were observed or after a maximum of 65 days.

Results. — During the night patrols in 2003, 9 leatherbacks tagged in previous years or on other nesting beaches were observed, and 58 untagged leatherback females were seen and subsequently tagged. In 2004, 56 previously tagged leatherbacks were observed, and 234 turtles were newly tagged. Previously tagged leatherbacks were originally tagged on Chiriqui Beach and beaches in Colombia (Playona), Costa Rica (Gandoca, Pacuare, and Tortuguero), and Panama (Playa Bluff, Playa Larga, San San, and Soropta). Also, a leatherback captured in-water and tagged by researchers off Nova Scotia, Canada, nested on Chiriqui Beach in 2003 (M. James, *pers. comm.*). A leatherback tagged on Chiriqui Beach on 28 June 2002 was observed nesting on Levera Beach, Grenada ($12^{\circ}13.656'N, 061^{\circ}36781'W$), on the night of 12 April

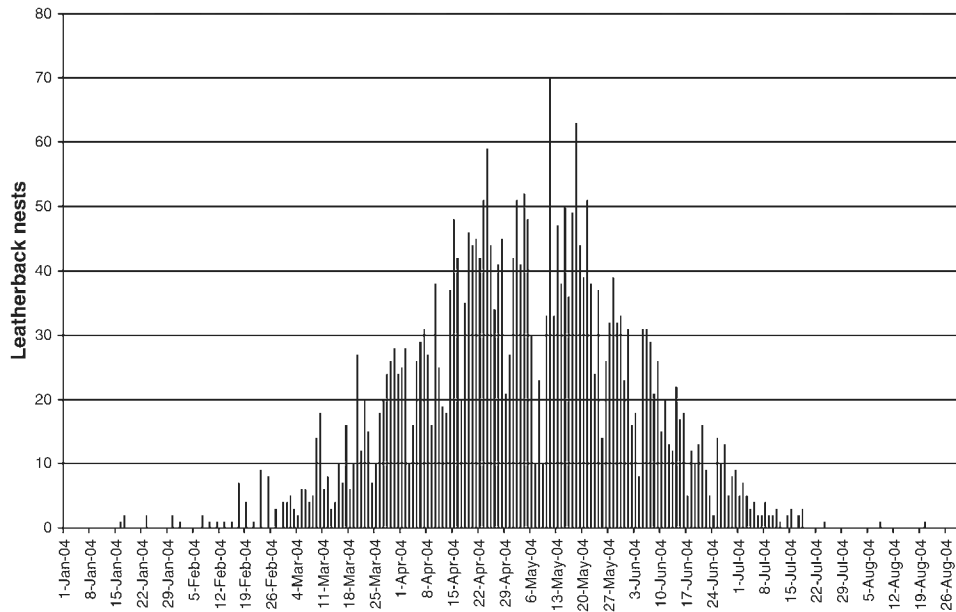


Figure 3. Leatherback nesting at Chiriqui Beach, January–August 2004.

2004 (C. Lloyd, *pers comm.*). Levera Beach is located approximately 2260 km from Chiriqui Beach.

A total of 250 leatherback nests were recorded between 13 June and 31 August 2003 (Fig. 2). In 2004, 3077 leatherback nests were recorded between 1 January and 31 August (Fig. 3). Of these nests, 241 were deposited between 13 June and 31 August, the same interval as was monitored the previous year. The leatherback nesting levels recorded for the northern 19 km of the beach on the nights of 24 May 1980 and 13 June 1981 are similar to the levels of nesting recorded in 2004 (Table 1).

No poaching of leatherback nests was observed in 2003. The major non-natural survival threat was predation of nests by domestic dogs, which affected 54.3% of the monitored nests (Table 2). Preliminary results from 2004 suggest no poaching, but 7.8% of leatherback nests were predated by dogs (Table 2). Dogs often dug up the nests after hatching, and it is not known if any hatchlings managed to emerge before dog predation took place.

Discussion. — Observations at Chiriqui Beach of leatherbacks tagged elsewhere demonstrate that the nesting aggregation forms part of a population that nests along the Caribbean coast of Central America and Colombia. The observation of a leatherback tagged on Chiriqui Beach nesting at Levera Beach, Grenada, suggests that the population’s nesting distribution may even be more wide-

ranging. However, more tag returns and genetic information are necessary before concluding that there is substantial exchange between nesting beaches in Central America and the eastern Caribbean. The exchange between nesting beaches in Central America and Colombia means that activities negatively impacting leatherback survival on other beaches in the region may have negative consequences for the Chiriqui Beach nesting aggregation. The killing of leatherback turtles for their eggs on the beaches close to the Panama–Costa Rica border continued in 2004 and 2005 (C. Ordoñez, *pers. obs.*) and is of particular concern. Detailed information on the migratory routes and marine habitat use of Chiriqui Beach leatherback turtles is currently not available. The leatherback tagged in Canada and later seen nesting on Chiriqui Beach shows the considerable migrations undertaken by leatherback turtles from the Chiriqui nesting aggregation. Tag returns and satellite telemetry of turtles from nesting beaches in Caribbean Costa Rica revealed that the leatherbacks travel through the Caribbean, Gulf of Mexico, and the North Atlantic, and range at least as far as from 2° to 50°N and 9° to 97°W (Troëng et al. 2004; Troëng et al. 2007). Thus, fisheries by-catch in these waters may also impact Chiriqui leatherbacks. It would be desirable to

Table 1. Leatherback nests recorded along northern 19 km of Chiriqui Beach during nights with complete surveys.

Date	1980	1981	2004
24 May	14		
13 June		16	16
Reference	Meylan et al. 1985	Meylan et al. 1985	This study

Table 2. Fate of monitored leatherback nests at Chiriqui Beach, Panama (2003–2004).

Fate	June–July 2003 (n = 81)	March–July 2004 (n = 243)
Undisturbed	44.4%	71.1%
Predated by dogs	54.3%	7.8%
Poached	0%	0%
Washed out	1.2%	21.0%
Reference	Ordoñez et al. 2004	This study

conduct postnesting satellite telemetry to determine the exact movements of Chiriqui Beach leatherback turtles. There are plans to fit at least 2 leatherback turtles with transmitters during future nesting seasons.

A comparison of results from track surveys conducted on the ground at Chiriqui Beach in 2004 with nesting levels on other beaches (Troëng et al. 2004) confirms that Chiriqui Beach hosts more nests than any other beach in Caribbean Central America. In 2004, the Chiriqui Beach hosted more than twice the combined number of leatherback nests laid at Gandoca, Pacuare, and Tortuguero beaches in Costa Rica (Troëng et al. 2004).

The number of tagged females recorded at Chiriqui Beach should be interpreted with care. Firstly, night patrols were not conducted throughout every night of the nesting season, so many nesting females were missed. Secondly, tag loss in leatherbacks is high (Rivalan et al. 2005), so some females could have been tagged more than once. Even with these methodological limitations, the leatherback nesting levels at Chiriqui Beach clearly establish it as a priority area for conservation efforts. Comparison of the nesting activity in 1980 and 1981 with that of 2004 suggests very similar levels. However, the limited number of data points from the 1980s prevents any firm conclusions regarding the long-term nesting trend for leatherback turtles at this site. The decline in leatherback nesting on beaches in Caribbean Costa Rica between 1995 and 2003 is a cause for concern, because it suggests that the leatherback population is in decline (Troëng et al. 2004). Several more years of complete nesting data are needed to determine the trend of leatherback nesting activity at Chiriqui Beach, and it is hoped that the current project partners will be able to continue monitoring efforts for at least 10 years.

It is encouraging that no leatherback nests were observed to have been destroyed by poaching at Chiriqui Beach in 2003 and 2004. Local residents, mainly Ngöbe indigenous people, do not consume leatherback turtles or their eggs for traditional reasons. Dog predation represents the main human-related threat to this species at Chiriqui Beach. In 2004, 2 dogs were captured by beach monitors, and the local organization APRORENANB demanded a reward to return the dogs to their owners. This resulted in many local residents tying up their dogs (*pers. obs.*) with a subsequent drop in nest predation. A long-term strategy for dealing with dog predation of leatherback and hawksbill nests at Chiriqui Beach is urgently needed.

In August 2004, the National Environmental Authority (ANAM) declared the Damani-Guariviara Wetland of International Importance, which includes Chiriqui Beach and adjacent areas (ANAM 2004). Local response to sea turtle conservation and monitoring efforts has been great. Hopefully, the protected area designation and future conservation efforts of authorities, local communities, and conservation organizations will serve to provide adequate management for the Chiriqui leatherback nesting aggregation, at least on the beach. Local conservation

efforts, however, will be insufficient if survival threats to leatherback turtles on other nesting beaches in the region and in-water are not successfully addressed.

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Leatherback, *Dermochelys coriacea*, Nesting Along the Atlantic Coast of Africa

JACQUES FRETEY¹, ALEXIS BILLES², AND
MANJULA TIWARI³

¹IUCN-France, Muséum national d'Histoire naturelle, 36 rue Geoffroy Saint-Hilaire – 75005 Paris, France [jfretey@imatech.fr];

²Cellule de Coordination ECOFAC, BP 15 115, Libreville, Gabon [protomac_lbv@yahoo.ie];

³NOAA-National Marine Fisheries Service, Marine Turtle Research Program, Southwest Fisheries Science Center, 8604 La Jolla Shores Drive, La Jolla, California 92037 USA [manjula.tiwari@noaa.gov]

ABSTRACT. – Leatherback nesting along the Atlantic coast of Africa extends from Mauritania in the north to Angola in the south, with a globally important nesting concentration located in Gabon in Central Africa. Provisional estimates of nesting numbers from Gabon indicate that this nesting population may be among the largest in the world.

The coast of Atlantic Africa extends over 14,000 km of coastline and consists of 29 geopolitical units. Sea turtle research and conservation initiatives are relatively young in this region, making it difficult to establish an accurate picture of the status and trends for African leatherback, *Dermochelys coriacea*, populations. However, some challenging fieldwork carried out in the last few years in several countries has indicated a globally significant nesting population of leatherbacks on the beaches of Gabon, with widely dispersed but fairly regular nesting between Mauritania in the north and Angola in the south (Fig. 1; Fretey 2001). The objective of this paper is to summarize current knowledge of leatherback nesting along the Atlantic coast of Africa in Macaronesia (Azores, Madeira, Canaries, and Cape Verde), North Africa (Morocco), West Africa (Mauritania to Nigeria), Central Africa (Cameroon to Angola, including Sao Tome and Principe), and Namibia and South Africa (Fig. 1). Because sea turtle work in this region is relatively young and challenging, nesting information from many countries is often more descriptive than quantitative.

Macaronesia, North Africa, and West Africa. — No nesting was recorded during recent surveys in Morocco (Tiwari et al. 2001, 2006), and there appears to be no confirmed records of nesting in Macaronesia (López-Jurado et al. 2000; Fretey 2001). Leatherbacks are rare around the waters of the Azores and Morocco, although occasional captures of turtles from French Guiana, Grenada, and Costa Rica have been reported (Fretey and Girondot 1996; Hays et al. 2004; Troëng et al. 2004). Some nesting was reported in Mauritania and Senegal (Maigret 1978, 1983; Dupuy 1986), but whether nesting is regular in these countries remains to be confirmed. Leatherbacks are rare in the Gambia and occasional nesting in the Gambia is yet to be determined (Barnett et al. 2004). No leatherback nests were recorded during a recent assessment in the Gambia (Hawkes et al. 2006).

Leatherback nesting was reported in the Bijagos Archipelago of Guinea-Bissau by Agardy (1993) and Barbosa et al. (1998). Barbosa (*pers. comm.* in Fretey 2001) estimated that ca. 4 leatherback nests were observed each season on the island of Adonga in the Bijagos Archipelago. In Guinea, leatherbacks are sometimes captured at sea, but nesting has not yet been documented (Fretey 2001). Nesting on continental Sierra Leone is yet to be determined, but nesting occurs on the offshore Turtle Islands and Sherbro Island (Fretey and Malaussena 1991; Siaffa et al. 2003); extensive work is currently being undertaken by the Conservation Society of Sierra Leone to determine the status of leatherbacks in the country. Liberia supports leatherback nesting (M. Tiwari, *pers. comm.*) and recent extensive monitoring activities undertaken by the local nongovernmental organization (NGO) Save My Future (SAMFU) will help establish a better estimate of the nesting population. In Cote d'Ivoire, nesting by leatherbacks is quite common, and 218 nests were counted over 41 km of beach in February 2001 (Gomez 2005). Despite political unrest since 1999 in Cote D'Ivoire, sea turtle projects and conservation activities persist in the country (Gomez et al. In press). In Ghana, leatherbacks appear to be the second most common species to nest; between August 1998 and April 2000, 319 leatherback nests were counted along a 14-km stretch, which lies within the core nesting area for sea turtles in Ghana (Amiteye 2000). At the time of writing (2006–2007 season), a daily monitoring program was underway along a 45-km stretch near Ada Foah, Ghana. A leatherback tagged at Bigisanti Beach, Suriname, in May 1970 was recaptured in the waters of Ghana in April 1971 (Pritchard 1973). Along the 177-km coastline of Togo and Benin, nesting activity is low and sporadic (Fretey 2001). Segniagbeto (2004) reported 27 nests during the 2002–2003 season on the beaches of Togo. Nesting was confirmed in Nigeria (Fretey 2001), although more surveys are needed to determine the importance of the population.

Central Africa. — Low, but regular nesting occurs in southern Cameroon. On a 15-km beach in Cameroon, the mean number of nests counted between the 1998–1999 and