Status of the leatherback turtle in Papua New Guinea

1. The legal protection status for leatherback turtles

1.1 Overview

The Department of Environment and Conservation is the government agency responsible for administration of legislation directly related to species conservation. Importantly, natural resources such as marine turtles belong to the people themselves, and as such they are the actual regulatory bodies upholding the DEC's legislation. Conservation of PNG's natural resources and environment, including marine environments is enshrined in the fourth goal of the countries constitution. The main legislative acts that cover leatherback turtles and their habitats are taken from Kisokau and Ambio (2005):

Fauna (protection and conservation) 1982
Crocodile trade (protection) Act 1982
Fisheries (Torres Strait Protected Zone) Act 1984
National Seas Act 1977
Prevention of pollution at seas Act 1981
Dumping of wastes at sea Act 1981
Conservation Areas Act 1992
Environmental Planning Act 1978
Fisheries Management Act 1998
Land Act 1996

Another important government agency with jurisdiction over marine species is the National Fisheries Authority (NFA). NFA is responsible for the Fisheries Management Act of 1998 and is mandated to manage all commercial fisheries within PNG's exclusive economic fishing zone (Kisokau and Ambio 2005).

On a local scale, the Kamiali Integrated Conservation Development Group (KIDCG) is the end result of a process that concluded with the designation of Kamiali as a Wildlife Management Area (KWMA) (Kisokau and Ambio 2005).

1.2. Management agencies responsible for marine turtle conservation

Operational level	**Name and type of agency**
National level	Department of Environment and Conservation
State level	Morobe Fisheries Management Authority
Local level	Kamiali Integrated Conservation Development Group Village Development trust Huon Coast leatherback Monitoring and Conservation Network

2. Nesting populations

2.1 Overview

The nesting locations for leatherback turtles in PNG are shown in Figure 1. According to Spring (1982) leatherback turtle nesting occurred widely along the northern coast of PNG, but in low density. The main nesting areas recorded were; mainland PNG (Bioken to Turubu in East Sepik Province and Aitape in West Sepik Province), Long Island and the mainland coast of Madang Province, Normandy Island in Milne Bay, Tulu and Timonai on Manus Island, Garu, Kimbe Bay and Ganoi in New Britain and the south coast of New Ireland. No information on the numbers of females nesting per year in these locations was given nor were any indications of whether the nesting populations were declining. Quinn and Kojis (1985) [in Hirth et al. 1993] estimated that 10 leatherbacks nested nightly along the southern coast of Morobe Province (near Maus Buang/Piguwa). At an adjacent beach, Bedding and Lockhart (1989) indicate that the nesting population on Labu Tali [spelt Tale by the authors] beach is around 300 nests per year. Hirth et al. (1993) conducted a detailed survey of the Maus Buang/Paiawa nesting beach between December 1 and 15 1989. Each turtle encountered was tagged with conventional metal tags. These authors found on arrival nine old body pits within the turtle reserve (725m long beach adjacent to Paiawa village), 22 body pits between the reserve and Labu Tali and 117 old body pits between the reserve and Buasi. Overall the authors tagged 34 leatherbacks that were ashore nesting between Labu Tali and Buasi, and 76 nests were confirmed. The highest density nesting occurred between the Buang and Buasi Rivers.

Spotila et al. (1996) provide a pers. comm. of 50 to 100 nesting females per year along the entire north coast of PNG.

Community based management at Kamiali Wildlife Management Area (WMA)

In 1998 a community based management project began within the Kamiali WMA (Kisokau 2004; Kisokau and Ambio 2005). The sampling methods used from 1999 to 2004 are summarised by Kisokau (2004) and Benson et al. (in press). Briefly, from November to February nightly beach patrols were conducted along the 2km beach within the Kamiali WMA. Female leatherback turtles ashore for nesting were tagged using conventional flipper tags and PIT tags. The results of these annual surveys are presented in Table 1 (Kisokau 2004 and Kisokau 2005).

Table 1. Results of annual monitoring of the leatherback turtle nesting beach at Kamiali

Nesting season	Remigrants	New turtles	Total turtles
1999/2000	0	42	42
2000/2001	28	20	48
2001/2002	41	48	89
2002/2003	35	29	64
2003/2004	43	21	64
2004/2005	53	8	61

Aerial survey of nesting 2004

An aerial survey of leatherback turtle nesting was conducted between 13 and 20 January 2004 (Benson et al. in press). The survey covered approximately 2800km of coastline including the north coast of PNG from the Indonesian (West Papuan) border eastward through the provinces of Sanduan, East Sepik, Madang and Morobe. In addition the surveys covered the entire coast of New Britain and the northeast coasts of Goodenough, Fergusson and Normandy Islands. For details of the specific methods see Benson et al. in (press). 415 nests were sighted along 363km of beach. Over 71% of nests were found in the Huon Gulf region and only 29% of nests were recorded outside of the two index beaches (Kamiali and Maus Buang). However these aerial surveys did not cover all of the important nesting sites that were identified through surveys by Spring (1982).

Benson et al. (in press) report that the numbers of turtles recorded by the nightly patrols in the Kamiali WMA and the numbers estimated by the aerial surveys are lower than the estimates of Quinn and Kojis (1985) and Bedding and Lockhart (1989). More systematic long term data is needed to determine population trends.

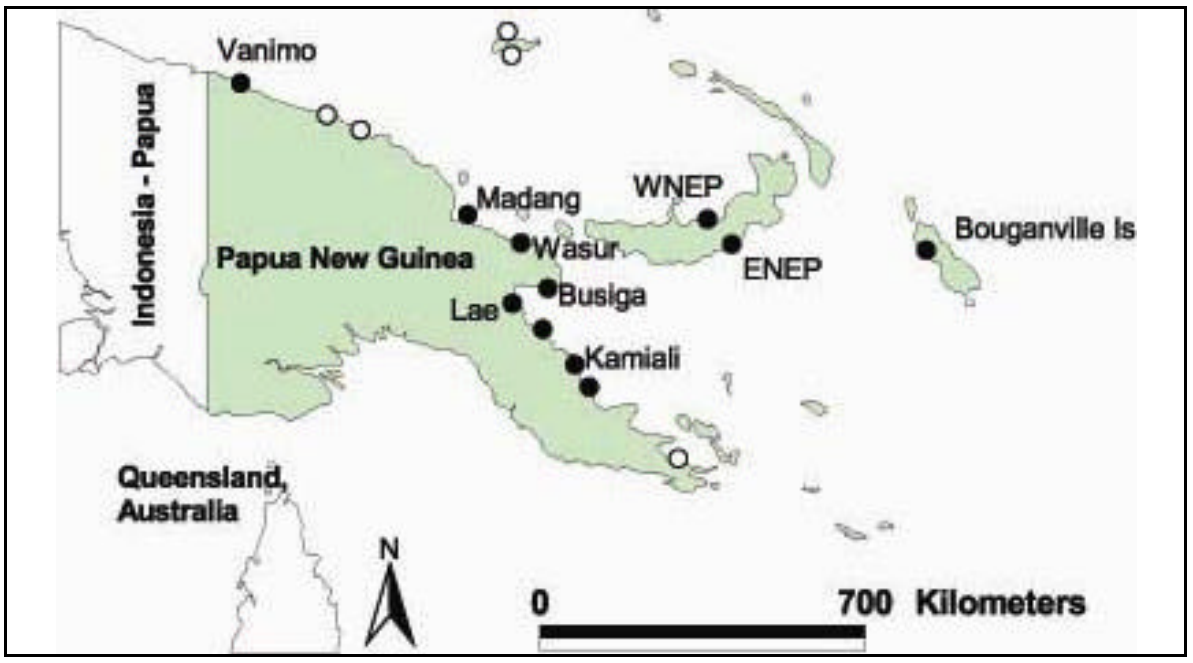

Figure 1. Location of leatherback turtle nesting beaches in Papua New Guinea

2.2) Seasonality of leatherback turtle nesting

The leatherback turtle nesting season occurs during the austral summer (October to March) with peak nesting in December and January (Hirth et al. 1993; Benson et al. in press). However, community based surveys by Rei (2005) indicate that there may also be a sub-population that nest during the mid year period (June to August) along the Wasur and Busiga coast.

2.3 Genetic studies on nesting populations of leatherback turtles

Genetic analysis of skin samples indicates that the leatherback turtles that nest in PNG are part of the western Pacific metapopulation that includes the Solomon Islands, and West Papua (Indonesia) (Dutton et al. 1999; Dutton et al. in press). This metapopulation is estimated to be in the order of 2000 females nesting annually (Dutton et al. in press). The lack of differentiation between rookeries of the south Pacific could reflect high rates of gene flow between rookeries or a lack of power in the analysis that used only mitochondrial markers (Dutton et al. in press).

2.4) Biological parameters

See details in Table 2.

2.5) Pivotal temperature studies

No studies on pivotal temperatures have been conducted for the PNG rookeries

Table 2. Summary of biological data on nesting leatherback turtles from Papua New Guinea

Category of data	Average & standard deviation	Range	Sample size
Size of nesting females (cm)	169.48 (±8.74)*	155 to 186.1	34
	165.0 [1]	110 to 190	-
	163.0 (±16.62)[4]	67 to 181	54
Number of eggs per clutch	88.2 (20.15)*	42 to 118	37
	92.3 [1]	12 to 145	-
	61[2]	-	-
	94.6 (±27.28)[4]	16-150	44
Clutches per season	5	-	-
	2.2 (±1.59)[4]	1 to 6	25
Re-nesting interval (days)	10[3]	-	1
	11[2]	-	-
	14.7 (±10.01)[4]	2 to 45	31
Number of years between breeding seasons (years)	No data available		
Size of eggs (cm)	52.2 cm (2.34)	46 to 58	340 eggs (17 clutches)
Size of hatchlings (cm)	No data available		
Hatchling emergence success (%)	58%[2]	5.4 to 88	10 nests

1. Quinn and Kojis (1985)
2. Kisokau and Ambio (2005)
3. Hirth et al. (1993)
4. Kisokau (2005)

2.6) Migration records of nesting leatherback turtles

Data from the satellite telemetry of post nesting females has shown internesting movements, which include a turtle that was initially caught in PNG and then came ashore in the Solomon Islands (Bougainville Island), presumably to lay a subsequent clutch (NOAA and WPRFMC unpublished data). From 2001 to 2004 Benson et al. (in press) attached satellite transmitters to 19 adult female leatherbacks as they were ashore nesting at Kamiali WMA (Benson et al. in press) to map their post nesting migration. For detailed results of this study see (Benson et al. in press). To summarise, these authors found that all tracked turtles spent the majority of time between nesting events within the Huon Gulf region. Nesting was not restricted to a single beach although they did find some site fidelity to Kamiali nesting beach.

Post nesting leatherback turtles initially traveled east and southeast as they moved away from the Huon Gulf and into the Solomon Sea and thereafter into the Coral Sea. Only six transmitters remained active to 20 degrees of latitude. Four of these moved southeast between New Caledonia and Vanuatu and the other two moved south through the Coral Sea. A single female was tracked south into the southern transition zone (adjacent to New Zealand) before heading northwards and ending her track close to Tonga.

2.7) Protection of nesting beaches (e.g. national parks)

The majority of leatherback turtle nesting occurs within the Huon Gulf area. In this area most nesting occurs within the Kamiali WMA, the Buang-Buasi region, at Labu Tale and at Paiawa. Kamiali WMA is a 47 000ha park that includes 11km of coast and coastal wetlands. The leatherback turtle study site is located on the north of Nasau Bay within the KWMA. The nesting beach is around 11km long. The sampling plot within this is now 3km long and it starts just north of the Kamiali village. The collection of turtle eggs or killing of turtles is not permitted in the WMA.

2.8) Use of hatcheries to protect marine turtle nests

Hatcheries are not used to protect nests of leatherback turtles. However bamboo grids are now used to protect nests *in situ* from dog predation.

2.9) Threats to nesting leatherback turtles

The two main threats for nesting leatherback turtles, the collection of eggs for subsistence or commercial use, although it has occurred for decades it has never been quantified (Spring 1982, Bedding and Lockhart 1989, Hirth et al. 1993, Kisokau and Ambio 2005 and Benson et al. in press) and the depredation of eggs by dogs. Although the collection of eggs is now banned within the 10km nesting area of the Kamiali WMA, it is not yet known what proportion of a female's nests are laid in this area, nor how much site fidelity female leatherback turtles show towards laying multiple clutches in the one season on the same section of beach (as opposed to laying some clutches in and out of the protected zone). Both Benson (2005) and Benson et al. (in press) present results on nesting abundance from aerial surveys. In both papers the author(s) state that 71% of nests are laid within the Huon Gulf and within Huon Gulf 29% of nests were laid outside of Kamiali WMA and Maus Buang. However, the numbers of nests found during the aerial surveys that are presented in tables in the same reports indicate that a larger number of nests are laid outside of protected zones.

In addition, while it has not been empirically linked to increased mortality of PNG leatherback turtles, long line fishing in the Pacific Ocean has been documented as a large threat to multiple stocks of leatherback turtles in the northern and southern Pacific oceans (see Spotila et al. 1996). Leatherback turtles have been caught by fishers in southern Australia, however, genetic stock analysis has not been conducted on these turtles (see Australia report in this section and Col Limpus pers. comm.).

2.10) Impacts of coastal development and/or sand mining on leatherback turtle nesting

Unknown

2.11) Major existing threats to nesting leatherback turtles

Egg collection, fisheries bycatch and egg depredation (Spring 1982, Bedding and Lockhart 1989, Hirth et al. 1993, Spotila et al. 1996, Kinch 2006; Dutton et al. in press).

2.12) Other biological studies conducted on leatherback turtles

Unknown

2.13) Other activities being undertaken to improve the conservation of leatherback turtle nesting populations

The Huon Coast leatherback turtle network has been formed to address general threats to marine ecosystems, provide awareness and education to local communities and integrate local people into conservation activities (Senego 2005). In addition the Western Pacific Regional Fishery Management Coucil employ an anthropologist to work with communities and streamline the link between donors/scientists and the communities. They also employ a sea turtle biologist to strengthen the scientific approach to data collection and help with programme development. They also fund all of the current work going on along the Morobe Coast.

3. Foraging populations

3.1) Details on any leatherback turtle census or tagging results such as tag recovery data

There has been no tagging census of leatherback turtles in foraging areas

3.2) Seasonality of leatherback turtles in coastal and offshore waters

Unknown

3.3) Approximate size range of leatherback turtles

Unknown

3.4) Information on the diet of leatherback turtles

Unknown

3.5) Other biological studies conducted on leatherback turtles in foraging areas

Unknown

3.6) Threats to foraging populations of leatherback turtles

Unknown

3.7) Fisheries bycatch of leatherback turtles and the fisheries involved

Unknown, however the National Fisheries Authority is currently implementing a project to expand outreach efforts in mitigating sea turtle fishery interactions in some PNG commercial fisheries (see McCoy 2005 for details).

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