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## Leatherback Turtles in Vanuatu

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**ABSTRACT.** – Leatherback turtles, *Dermochelys coriacea*, have not previously been reported nesting in Vanuatu. A review of archival data, unpublished reports, interviews with key informants from coastal communities, and a nesting beach survey indicates that leatherback nesting occurs on a number of islands, including Pentecost, Ambrym, Malakula, Epi, and Efate. Leatherbacks are opportunistically consumed in some areas, particularly Malakula, where 5 have been reported killed in the past 7 years.

Leatherback turtles, *Dermochelys coriacea*, in the Pacific are highly endangered, and there are suggestions that they may be on the verge of extirpation (Spotila et al. 2000). Nesting females have declined precipitously in Malaysia (Chan and Liew 1996), the Pacific coast of Costa Rica (Spotila et al. 2000), and Mexico (Sarti Martínez et al. 2007). Similar long-term data are not available for the western Pacific, but recent estimates suggest a total of ca. 2800 breeding females in the western Pacific Ocean (Dutton et al. 2007).

Nesting of leatherback turtles in Vanuatu has not been previously reported. Pritchard (1981), in a review of turtles in the South Pacific, suggests that turtles of New Hebrides (as Vanuatu was then called) needed further study. He quoted McElroy and Alexander (1979): “Information on the leathery turtle indicates that it occurs in some parts of the group but no nesting beaches were known.” Limpus (2002) stated: “the strip that runs from northwest Irian Jaya out into the Solomon Islands is the last remaining stronghold of leatherback nesting in the western Pacific”. Results from this study indicate that this strip extends further south of the Solomon Islands to Vanuatu.

Recently, there has been considerable effort directed at turtle monitoring and turtle conservation in Vanuatu. Beginning in 1990, a Regional Marine Turtle Conservation Programme (RMTCP) coordinated by the Secretariat of the Pacific Regional Environment Programme (SPREP) was initiated and funded turtle monitoring in Vanuatu through the mid-1990s. The pivotal event occurred in 1995 during the Year of the Turtle when the Vanuatu based

theater group “Wan Smolbag” (WSB) was funded by the RMTCP to develop a play to raise awareness on turtle conservation. The play, entitled *I’m a Turtle*, toured the villages first in the central island of Efate and, subsequently, most of the Vanuatu Islands. This play has had a remarkable impact, resulting in over 150 villages participating in turtle conservation. As a follow-up to the play and turtle awareness workshops sponsored by WSB, most of the villages appointed a knowledgeable person as a turtle monitor (Petro 2002; Johannes and Hickey 2004). These village-based monitors, working voluntarily within their island areas, have subsequently evolved into coastal resource monitors who advise village chiefs and elders on appropriate sustainable management practices. They are now called Vanua-tai (land-sea) resource monitors to reflect their evolving roles. The WSB is currently documenting the impact of this program and has produced a video to promote further awareness regarding village-based turtle management issues. Preliminary results suggest that the program conserved thousands of the 4 marine turtle species present in Vanuatu since its inception in 1995.

Given the critical need for conservation of the highly endangered leatherback, it is important to document information on this species in Vanuatu. To this end, we synthesized the available information to determine the importance of leatherback nesting in Vanuatu.

*Methods.* — We reviewed archival data on traditional knowledge of leatherbacks and unpublished reports on turtle monitoring, and interviewed knowledgeable turtle monitors from Vanuatu coastal communities. In addition, a nesting beach survey was carried out from November to December 2002 in the southwest of Epi Island, with follow-up in January and February 2003.

The nesting beach survey had several objectives and expected outcomes. These included the following: assessing the numbers and species nesting; tagging of nesting turtles and records of subsequent nesting; determining the numbers of hatchlings; an assessment of the threats to nesting turtles, eggs, and hatchlings; and raising community awareness regarding leatherback status. We conducted the research in the following ways, although we found it necessary to modify some of the methods to fit the local conditions: a) surveyed nesting turtles at night; b) surveyed and marked turtle nests during the daytime; c) monitored and counted hatchlings as they swam out to sea; and d) conducted meetings and interviews with villagers regarding turtles in nesting areas.

*Results.* — Archival data and interviews indicated that leatherback turtles were known throughout many islands of Vanuatu. In many cases, they were only seen at sea as they migrated to nesting areas. There was often a name in the vernacular to identify them. For example, on Aneityum, the leatherback was known as *naho yau*, which translates as “whale turtle”, referring to its size. On Akhamb Island off southern Malekula, they were known as *nev marmaj*, which translated as “devil turtle”. It was

**Table 1.** Summary of results of nesting beach survey at Votlo, Southern Epi, Vanuatu.

Activity	Green	Hawksbill	Leatherback	Total
False crawls	10	3	5	18
Nesting	15	2	31	48
Grand total	25	5	36	66
No. tagged	2	0	9	11

said that in this area, leatherbacks were avoided and not eaten because of their unusual appearance and the belief that they were bad spirits. This belief thus conferred protection from the harvesting of leatherbacks in this area. It was reported that the inland Malakula people who had more recently migrated to the coast in this area had no such beliefs and opportunistically harvested nesting females. Hickey (In press) documented a number of other traditional beliefs and practices that assisted with the management of turtles and other marine resources in Vanuatu.

Because of their size and mass, leatherbacks, unlike other turtle species found in Vanuatu, could not be harvested when found swimming in the sea, because they were too large to be hoisted into relatively small coastal canoes. They, therefore, were only harvested when found on nesting beaches.

Residents of a number of different islands, from Gaua and Espiritu Santo in the north through Ambae, Efate to Tanna and Aneityum in the south indicated that there were formerly at least small nesting populations of leatherbacks on the black beaches of these islands. Nesting events on these islands were reported to have significantly declined since the 1980s, most probably in response to increasing human population growth, including migration to more remote coastal areas and subsistence pressure on nesting females and eggs. A similar trend was observed with all species of turtles in Vanuatu, with mainly the more remote areas still supporting turtle nesting. Awareness efforts by the Vanua-Tai resource monitors since the mid-1990s, however, significantly assisted to stem this trend, and a number of areas with long-term monitors recently reported an increase in turtles observed in areas protected from harvesting (Johannes and Hickey 2004).

A nesting beach survey on the black sand beaches of Votlo on southwest Epi Island from November 2002 to February 2003 identified leatherbacks nesting along with hawksbill and green turtles (Table 1). The peak of activity was the week of 15–21 December. The survey team left on 22 December, and the resident turtle monitor followed up the survey from then to mid-February. Survey coverage, however, during this period was less intensive.

We recorded 31 nests, and, of the 9 leatherbacks tagged, only one was encountered a second time. It was difficult to determine the number of nesting females, because the survey coverage after 22 December 2002 was much less intense than before; however, because only a single tagged female was reencountered, we believe that

there were ca. 10–15 nesting females. This appeared to be the most important nesting beach in Vanuatu.

A more detailed examination of the time of crawls indicated that leatherback turtles crawled and nested mostly in the evening before midnight. As this was the first nesting beach survey carried out in Vanuatu, there were additional lessons learned related to community-level fieldwork that will be applied to future surveys. Three of the lessons learned were:

- The importance of recording data in the field while surveying the nesting site so as not to miss any data and to minimize the chance of recording wrong data.
- The need to zone the nesting beach so that the area with the highest nesting ratio receives increased surveying to increase the chance of tagging more nesting turtles.
- The need for additional data like clutch sizes, live and dead hatchlings.

Two nests hatched out in late January with 88 and 73 surviving hatchlings, whereas an average of 16 per nest died. Unfortunately, clutch sizes were not recorded. Some other nests were reported to have been destroyed by a storm surge and flooding associated with the fringes of a cyclone in January 2003.

During the course of the research, the team identified possible threats to turtle nests, which included storm surges and floods, as well as crabs and feral animals, such as horses, cows, pigs, dogs. Apart from flooding and storm surges that destroyed some nests during the survey, it was not possible to quantify the other potential threats.

The results of interviews regarding leatherback nesting sites are summarized below. At Ambae, there was only limited nesting habitat but the Devils Rock area in the northwest and the Lolowai area in the east were identified as areas where nesting occurred previously. At Ambrym, all the beaches are black sand. One large nesting female, with a carapace length >2 m, was tagged in the Port Vato area in January 2003. There were a number of good potential nesting beaches along the western side of the island, from Lalinda to Maranata, although these were not well surveyed. Northern beaches in the Ranon area were also occasionally said to have leatherback nesting. At Efate, reports (2 in 1997–1998, 3 in 1999–2000, and 1 in 2003) were mainly confined to the black sand area of Mele Bay just north of Port Vila. In addition, 1 leatherback was reported from Teouma, south of Port Vila. At Malakula, a few nests were reported from a number of beaches right around the island. Turtles were still consumed, and 5 leatherbacks were reported eaten or killed in the past 7 years. At Pentecost, 1 nesting female, from south of the island, was reported eaten in 2000.

*Discussion.* — Vanuatu Island residents from Aneityum and Tanna in the south to Espiritu Santo and the Banks Islands in the north knew of leatherbacks. They suggested that nesting occurred in these areas in the past and indicated that leatherback nesting has decreased over the years. This paper reports current nesting for the islands

of Pentecost, Ambrym, Malakula, Epi, and Efate. All nesting occurred on black sand beaches, often associated with rivers.

On Efate Island, the nesting beaches were in the Mele Bay area adjacent to Port Vila, the capital city, in addition to Teouma Bay, south of the capital. The Mele Bay nesting beaches were in developed areas, including a residential area, a tourist resort, and a golf course. We suggest that there were only 1–2 females nesting but not every year.

Epi Island appears to have the largest number of nests, with 2 nesting areas. The southwest coast probably has 10–15 nesting females. It is considered important that the area be resurveyed, all nesting turtles be tagged, and records obtained on re-nesting. This would establish a good index beach, where long-term monitoring of nesting trends could be carried out. A smaller number, which are probably part of the number of turtles nesting on the southwest coast, appears to nest on the east coast around Big Bay.

Elsewhere, there have been only sparse surveys, but there appeared to be only scattered nesting by a few females. Malakula appeared to have the greatest number of nests after Epi. Of significance was that Malakula was an area where leatherbacks (and other turtles) were still consumed, including 1 leatherback in February 2004. This was apparently because of the lack of awareness regarding leatherback conservation in Vanuatu.

It appears critical that there be a follow-up nesting beach survey on Epi Island to cover the whole nesting period, and this beach offers the best site for a Vanuatu index site. There should also be exploration of the Big Bay area on the east coast of Epi. Some preliminary survey work should also be done on Malakula, but, in particular, there needs to be an expansion of the turtle conservation program there to ensure that leatherbacks and their eggs are no longer consumed.

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## Leatherback Turtles (*Dermochelys coriacea*) in the Gulf of California: Distribution, Demography, and Human Interactions

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**ABSTRACT.** – Since 1943, a total of 40 leatherbacks have been documented in neritic and offshore waters of the Gulf of California, Mexico: 13 as fisheries by-catch, 11 in indigenous ceremonies, 8 coastal strandings, 4 at-sea sightings, 3 observed by fishing fleets, and 1 via