

Status of hawksbill turtle nesting in Samoa, 2003/2004

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Abstract

Globally marine turtles are experiencing serious threats to their survival and are considered internationally as species of conservation concern. Due to this status, they are listed in the World Conservation Union “Red List of Threatened Animals”; listed in the Appendix 1 of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES); and are a priority for conservation under the Convention on the Conservation of Migratory Species of Wild Animals. Over-hunting for their shells and meat and the collection of eggs from turtle nests are some factors attributing to the endangered status of turtles. In the South Pacific, turtle declines are worsened by the breakdown of traditional conservation practices, the use of powered boats in turtle hunting, commercial sale, large scale harvesting of eggs in the rookeries and habitat destruction. Of the seven species of turtles found worldwide, three occur in Samoan waters. The most common species are the hawksbill turtle (*Eretmochelys imbricate*) and the green turtle (*Chelonia mydas*), while only a few specimens of the leatherback turtle (*Dermochelys coriacea*) have been caught tangled in long-line fishing lines for tuna in Samoan waters. The Hawksbill turtle is the only species known to nest in Samoa. Records from previous surveys indicate its nesting season in Samoa to occur from September to July, with most nesting activity occurring in January and February. A study conducted in 1994 noted that turtles in Samoa waters have declined.

Background

During the 2003/2004 nesting season the Division of Environment & Conservation conducted the third ever survey on turtle nesting at the Aleipata Islands. In addition, a preliminary national survey was conducted on the extent and current status of nesting sites for turtles through-out Samoa. Results of these surveys are presented in this paper. The paper compares results of previous surveys and the 2003/2004 survey, and analyses methodologies used. It also discusses factors, such as development and natural, which are impacting on the suitability and extent of turtle nesting sites in Samoa. The paper also provides recommendations for turtle conservation in Samoa.

Globally, populations of sea turtles are declining. All species of sea turtles are listed in Appendix I of the CITES. This means that all turtle species are considered endangered by international trade to such an extent that if commercial trade is not eliminated with respect to these species, they will become extinct. Nesting density of hawksbill turtles is low throughout its range.

Over-hunting of marine turtles for their shells, meat and over-collecting of eggs from nests are some factors attributing to the endangered status of turtles. It is believed that the declining turtle populations in the South Pacific has been accelerated by the breakdown of traditional conservation practises, the use of powered boats in turtle hunting, commercial sale, habitat

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degradation, incidental by-catch in fishing gear, and the large scale harvesting of eggs in rookeries.

A study conducted in 1994 noted that turtles in Samoa waters have declined (Schuster *et al*, 1994). The lack of statistics concerning the utilization of the turtle resource in the country has made it impossible to trace trends in effort and landings, thus the status of turtles. However, anecdotal information from catches made by villages that traditionally fish for turtles indicate declining catches.

Three species of marine turtles have been recorded to occur in Samoa waters. The most common species are hawksbill and green turtles while only a few specimens of leatherback turtles have been caught tangled in longline fishing lines for tuna in Samoan waters. The Hawksbill turtle is the only species known to nest in Samoa although the green turtles forage within Samoan waters but migrate elsewhere to nest.

Previous nesting turtle surveys in Samoa

Two surveys have been conducted in Samoa involving hawksbill turtle track and nest counts. These were during the breeding season periods in 1971/72 and 1993/94. Records from these surveys indicate the hawksbill turtle nesting season in Samoa to be from September to July, with most nesting activities occurring in January and February (Witzell & Banner, 1980).

The survey on the Aleipata islands during the 1993/1994 nesting season did not find any “measurable decline in nesting activity over this period of time with a total of 94 tracks/nests in 1971-72 and 109 tracks/nests in 1993-94” (Schuster *et al*, 1994). However, it is noted that October and November data for the 93/94 survey were “calculated from their first track and nest count totals (December) using the proportions derived from the 1971-72 data” (Schuster, *et al*, 1994). However, the accuracy of this method is questionable.

The 2003/2004 survey

Very limited effort has been specifically directed to turtle nesting surveys with only two so far conducted within a period of 30 years. While this reflects the irregularity of gathering turtle information, the 2003/2004 survey was initiated in an effort to continue assessment and monitoring of the status of turtles nesting in Samoa.

The main aim of the survey was to assess the present nesting levels of marine turtles (hawksbill) in Samoa. It was envisaged that the findings of this survey would indicate trends in turtle populations that nest in Samoa as well as the overall population and likely impacts of other factors on these breeding populations. Furthermore, the outcomes would i) contribute to improving the Samoa National Marine Biodiversity Database through incorporating information on marine turtles as one of the species of conservation concern; ii) provide guidance for developing a monitoring plan that include establishing proper guidelines and methodologies, accommodating specific local situation, etc. to improve the collection, compilation and analysis of data for nesting turtles in Samoa; and iii) serve as a basis for determining effective means of protecting, conserving and managing the population of marine turtles in Samoa.

Methodology

The survey was carried out in two phases of activities – a questionnaire survey of turtle nesting and a field survey at Aleipata. The questionnaire survey was conducted with pulenuu from 101 coastal villages selected throughout Samoa mainly to obtain information on how

widespread turtle nesting occurrences were in the past and that of current. These villages were selected in terms of coastal location and the likeness of the presence of adjacent beaches. The survey would indicate the status and trend of turtle breeding grounds in the country. The questionnaire has 17 basic questions that fall under three main categories on: i) General information on turtle occurrence in village adjacent sea; ii) Current turtle nesting; and iii) Previous turtle nesting (Table 1).

A field survey was conducted on the Aleipata islands from July 2003 to May 2004 mainly to obtain information on the current level of hawksbill turtle nesting. For comparison with previous nesting turtle surveys, the field survey was concentrated on the islands of Aleipata: Nuulua, Nuutele and Namu'a. The beach at the village of Vavau was also visited once.

Daily visits

The original plan was to visit all target beaches on the Aleipata islands once every second week during the nesting period (October 2003 – May 2004) with the field visit frequency increasing to once a week in the peak months of January and February 2004. However, circumstances encountered (e.g. rough weather making it impossible to visit Nuulua/Nuutele, late processing of payment for the hired boat etc) restricted the number of field visits.

Schuster *et al* (1994) reported that turtle tracks through the cover of vines above the high tide mark on beaches at Aleipata remained visible for at least one month. An effort was made to assess the reliability of this assertion. Tracks and nests found during one visit were recorded in the prescribed Form and marked with sticks and stones to avoid re-counting in the next visit.

Overnight visits

Overnight visits were also conducted to look out for turtles that come up to the beach to nest. Any turtles visiting to nest during the field visits were tagged (if untagged) and basic data was recorded. If the turtle was already tagged, the tag identification basic data were also recorded.

The field survey also attempted to assess the suitability of the beaches for turtle nesting. This was prompted after cyclone Heta, which affected Samoa on 3-5 January 2004, and resulted in dramatic change in the beach and nesting area formation. The assessment only looked at the surface level of the beach area at high water mark (through which the turtle would crawl) and the nesting area (above high water mark).

Results of the field survey at Aleipata

Numbers of tracks and nests

The numbers represent the actual tally of records recorded during the surveys, some of which may not represent a good estimate for the month due to limited surveys conducted on some beaches during some months.

Nuulua - For the November survey, of the 13 tracks, only 10 were linked to confirmed nests. Three other tracks were linked to 3 undetermined nests. Three of the confirmed nests did not associate with any tracks. Two additional nests were abandoned (incomplete) ones and were not associated with any tracks. Nests made in December 2003 and January 2004 would have been picked up during these surveys.

Subject	Results
Turtle occurrence	Turtles were found to occur in the marine environment of all the 27 villages surveyed on Savaii island. However, of this total, turtles are often seen or plenty in 25 but reported to be occasionally seen in two villages. On Upolu island, turtles occur in 81 of the 83 surveyed villages. Of the 81 villages, turtles are often seen in only 61.
Turtles caught in fishing	On Savaii island, turtles are often caught in fishing activities in only 23 villages. On Upolu, 54 villages reported that turtles are often caught during fishing activities.
Specific fishing method for turtles	On Savaii, only six of the surveyed villages claimed to have or have had a special fishing method which include nets, spears and loops. Seven villages on Upolu were recorded as having special fishing methods for turtle hunting.
Time of year turtles are abundant	10 villages on Savaii experienced turtles to be abundant all throughout the year, three villages indicated the end of the year (Oct-Dec) while the majority had no idea.
Turtle activities when abundant	The majority of the surveyed villages on Savaii had no idea while only a few indicated nesting as the activity associated with turtle occurrence.
Types of turtles	The vast majority of respondents on Savaii did not know the types of turtles that occur in their waters while only a few know the 2 types. On Upolu, very few know of only 1 or two types while the majority had no idea.
Village rules concerning turtles	On Savaii, most claimed that their villages have no rules concerning turtles while the rest either have rules or had no idea. On Upolu, some villages have while some don't.
Awareness of legislation on turtles	The vast majority of the villages surveyed on both Savaii and Upolu were and are aware of national legislation concerning turtles. Very few were either unaware or had no idea.
Existing beaches and current turtle nesting occurrences	On Savaii, 21 villages have beaches and although turtle nesting activities occurred in the majority of these villages in the past years, only a few have had recent nesting activities. In two villages, it was unknown whether turtle nesting still occur because the beach is quite further off. The majority of villages surveyed on Upolu have beaches and turtle nesting still occur in few villages. Similar to Savaii, turtle nesting activities have been frequently seen in the past in almost all of the villages.
Time of turtle nesting	In both Savaii and Upolu, turtle nesting is mostly observed to occur at the end of the year especially October during the Palolo season. Some villages believe that there is no specific time but this particular turtle activity is associated with a particular type of lightning.
Estimate of nesting turtles	The survey found out that a large number of turtles still come up to nest in the majority of the villages.
Turtle eggs consumption	On both Savaii and Upolu, turtle eggs were and are still consumed in a few villages. Turtle eggs were heavily consumed in the past.
Turtle nesting in the past	On both Savaii and Upolu, turtle nesting occurred in the majority in the past however, this has no longer been observed in some villages. This is attributed to beach modification for tourism, settlement, sea wall construction and cyclones.

Table 1: Results of the questionnaire survey for both Upolu and Savaii Islands, 2003-2004

For the January surveys, of the 9 tracks, only 5 were associated with confirmed nests, 3 with undetermined nests, and 1 with no nest. Four other confirmed nests were not associated with any track. Three of the tracks recorded during February 2004 were associated with confirmed nests, 2 with no nests and 1 with an abandoned nest. Two other determined nests did not associate with any track (Table 2).

Date	Tracks	Nests
November, 2003	13	13
January, 2004 (2 surveys)	9	9
February, 2004 (2 surveys)	6	5

Table 2: Number of tracks and nests recorded, Namu'a Island

Date	Tracks	Nests
November, 2003	0	5
December, 2003	12	22
January, 2004 (4 surveys)	8	7
February 2004 (4 surveys)	9	5
May 2004	0	0

Table 3: Number of nests and tracks recorded on Vini beach, Nuutele island

Vini Beach (Nuutele Island) - Only 1 survey was also possible on Vini in December given Cyclone Heta and the Xmas holidays. Of the 12 tracks, 11 were associated with nests while 1 did not link to any nest. 11 other nests were found which did not associate with a track. For the January 2004 surveys, four of the tracks were linked to nests, 2 to no nests, 1 to an undetermined nest, and 1 to an abandoned nest (actually the same turtle tried digging at 2 different places before giving up). Three of the 7 nests identified had no links to any tracks. For the February surveys, five of the tracks were linked to the 5 nests located, while 2 tracks linked to no nest, 1 to an undetermined nest, and 1 to an abandoned nest. The survey did not locate any new tracks or nests on Vini beach in May (Table 3).

Nuutele Beach (on Nuutele Island) - Two surveys were possible on Nuutele beach throughout the survey period. A total of 5 tracks and 8 nests were recorded in the one survey in December 2003. Three of the tracks were associated with corresponding nests while the other 2 were linked to undetermined nests. Additionally, five other nests as well as 1 undetermined nest were found that did not have tracks. Only one track and a corresponding nest were recorded in the only survey possible on Nuutele beach in January 2004.

Namu'a Island - Only 2 surveys were conducted on Namu'a island in February, 2004 during which a total of 4 tracks and 4 associated nests were recorded.

Vavau Village - One track and a corresponding nest was recorded in a visit to the village beach on 27 February 2004. In addition, a resident of Vavau village at the time took to the Fisheries Division hawksbill hatchlings which were later on brought to Division of Environment & Conservation by the Fisheries Division. Measurements were taken and hatchlings were released off Vaiala beach.

Beach suitability for turtle nesting - The assessment was very limited in that only the top layer (surface) was considered. It was later discovered that this was insufficient as discussed

under the Discussion section of this report. The results of the assessment, using the surface only, are summarised in Table 4.

Beach Name	Estimated Beach Length (m)	Access Area				Nesting Area			
		Suitable		Unsuitable		Suitable		Unsuitable	
		Length (m)	%	Length (m)	%	Length (m)	%	Length (m)	%
Nuulua	444.3	195.4	44	249.0	56	207.3	47	237.0	53
Vini	711.2	273.8	38.5	437.4	61.5	262.3	37	402.5	57
Nuutele	381.6	289.6	76	92.0	24	160.4	42	221.2	58
Namu'a (north)	201.5	173.5	86	28.0	14	181.5	90	20.0	10
Namu'a (south)	80.0	80.0	100	0.0	0	80.0	100	0.0	0

Table 4: Estimated access and nesting area suitability for turtle on Aleipata Islands

In relation to the total estimated beach length, Namu'a and Nuutele beaches are fairly suitable in terms of access area compared to Vini and Nuulua beaches. In terms of nesting area, Namu'a remains suitable for turtle nesting while Nuutele, Vini and Nuulua have been noted to be degraded hence unsuitable.

Comparison of the 71/72, 93/94 and 03/04 survey results

The first two surveys only recorded tracks while the third one was able to identify tracks, nests, undetermined and abandoned nests. In comparison, more tracks were recorded during the second and first surveys (Figure 1).

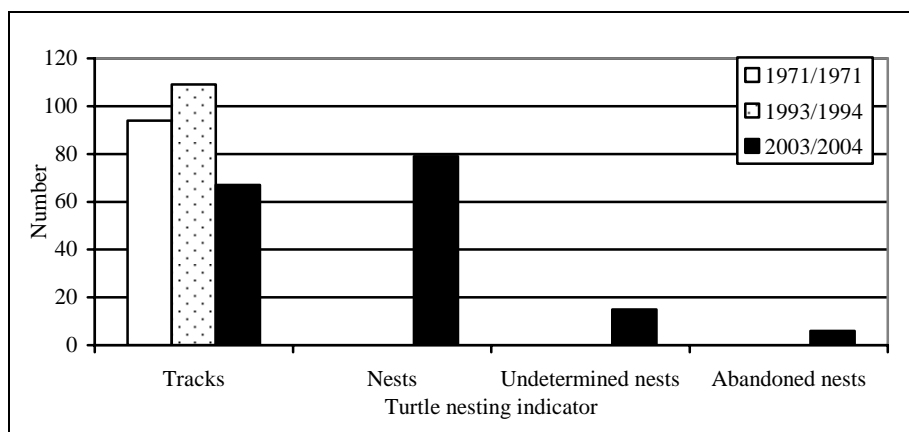


Figure 1: Comparison of the three turtle nesting surveys, 1971-2004

Discussion

National turtle nesting survey

Turtle occurrence: Turtles still occur in the marine environment of most villages and are seen frequently in higher numbers in some depending on the village beach locations and conditions. Turtle occurrence is widespread in Savaii compared to Upolu which is further supported by the fact that turtles are often caught in fishing activities. Unfortunately it was not possible to quantify this in terms of the estimated number of turtles caught per month or year.

Special fishing method for turtles: Having a special fishing method for turtles can be used as a measure of the traditional value placed on turtles by a specific community. It can also be an indication of the abundance of turtles in the area. Special fishing methods for catching turtles include nets (including special nets made of local materials and have been used in the olden days), spears and bamboo poles with large hooks. With the technological changes, some of these are no longer used.

Current turtle nesting: Turtle nesting currently occurs on beaches in villages on both Savaii and Upolu that were included in the survey. Although this seems to be more than previously recorded, this is limited given the small sizes of most of the beaches and the dramatic decline in the number of beaches where nesting occurs. It is believed that there are other beaches where turtle nesting may still exist in villages not included in the survey, e.g. Asau as reported in Schuster *et al.* (1994).

In villages where turtles currently nest, people know that turtle nesting occurs towards the end of the year. However, the respondents that did not know when turtle nesting occur is most probably a reflection of the unfamiliarity of the individuals with the subject. An interesting belief, as recorded for Savaii is that turtle nesting is associated with a particular type of lightning. This belief is common through-out the country as also relayed by respondents in Aleipata (Upolu).

Diminishing turtle nesting areas: The results of the national survey, using the questionnaire, clearly confirm the diminishing areas available for turtles to nest in Savaii. The data indicates that, in terms of numbers, half of the turtle nesting areas have been “eliminated” as nesting areas due mainly to infrastructural activities along the coast involving developments such as seawall construction, tourism facilities and settlement.

Field survey at Aleipata

Numbers of tracks: The highest number of turtle activities (tracks and nests) recorded on Vini beach indicates that turtles more often visit this particular beach to nest during the season although it was noted to be at a diminishing state. Nuulua beach is also known to be another favorable and major nesting area given its location (easy access) and white sand. There are also turtles visiting to nest on Nuutele, Namu'a and Vavau beaches meaning these are also favourable nesting sites. Tracks and associated nests were found amongst the bush, vines, clear sand and areas with some rubbles.

Although the frequency of visits to the targeted sites varied, the results have indicated that Vini has served to be the major nesting beach for the hawksbills followed by Nuulua, Nuutele, Namu'a and Vavau beaches. At the same time, these beaches had some areas unsuitable for nesting as indicated by the discovery of few abandoned and undetermined nests.

Human-related and natural events such as cyclones can significantly affect the physical make up of the beaches and thus its suitability for nesting. As a result, turtles from time to time move from one beach to another until it finds a suitable area to nest. In other words, the environmental conditions are one of the major determinants of turtle nesting activities. This explains why turtle activities vary with nesting beaches and season.

The attempt to assess the suitability of beaches for turtles to nest was initiated after observation of the impacts of cyclone Heta which affected Samoa on 3-5 January 2004. The

assessment noted that using the surface area only is insufficient to determine the suitability of the nesting area. This was obvious after discovery of an abandoned nest in an area where the surface was rated as suitable but beneath were coarse rubble making it impossible for the turtle to dig a deep enough nest.

Combination of the questionnaire and field survey in 2003/2004

The questionnaire and field surveys as one obviously shows the following major trends:

- i) There have been more turtle nesting occurrences in the past than that of current both on Savaii and Upolu Islands.
- ii) The number of nesting beaches has declined and thus possibly turtles nesting activities as a result of some destructive human activities as well as natural impacts on the coastal environment, and
- iii) Turtle nesting mostly occur on the beaches at Aleipata district and vicinity but there are some other possible ones on both islands.

Comparison of the 71/72, 93/94 and 03/04 survey results

The first two surveys only recorded tracks compared to the more detailed 03/04 which spells out tracks, nests, abandoned and undetermined nests. This prevents an accurate comparison however based on the data obtained so far, it is possible to say that tracks and nests have declined over the years hence turtle nesting activities due to the impacts of a combination of human and natural related factors on the marine environment which subsequently affect the turtle population.

Conclusion

The 2003/2004 nesting turtle survey shows that although there is seasonal variation as per survey findings, there are still nesting turtles within the waters of Samoa which are utilizing the beaches of Aleipata for nesting activities. Besides, there are still but very few other possible nesting beaches on both Savaii and Upolu Islands.

It is becoming clear that turtle (hawksbill) nesting in Samoa is declining mainly as a result of human activities causing degradation of the coasts and nesting beaches.

The Survey overall suggests the need for a more site/beach specific or site-level approach to turtle conservation in Samoa.

Recommendation

For the improvement of the survey in terms of methodology and the quality of the data collected, as well as the conservation of turtles in Samoa, it is recommended that:

- The national nesting beaches survey via questionnaire needs to be expanded to cover all coastal villages and interviewing more than 1 person in each village. The high number of “don’t know” answers provided by those interviewed indicates the level of knowledge of the person interviewed on the subject or of the village. Either the number of people be interviewed in each village be increased, or a knowledgeable older fisherman be sought to obtain more complete data.
- Survey methodology, including frequency of surveys on nesting beaches, needs adjustment to obtain more reliable and accurate data. This survey confirmed that not all nests associate with turtle tracks and vice versa. The former assertion that tracks remain visible for up to a month through the vines is unreliable to be used for the number of nests and/or nesting females. Both tracks and nests in the sand can be obscured due to rain,

wind, tide etc, after even a short time. Thus the more often the surveys are conducted, the higher the possibility of obtaining accurate and wholesome data.

- Turtle nesting grounds be a factor for consideration in development and EIAs involving the coastline. The loss of turtle nesting sites in several areas both on Upolu and Savaii due to development has been confirmed by this survey.
- Turtle nesting surveys need to be repeated and expanded. Given the nature of the breeding cycle of turtles, the need to obtain an accurate estimate of the numbers and trend of breeding turtle population in Samoa, as well as the need to tag and take measurements of turtles to determine their migratory routes, repeated surveys are required. Effort should also be made to target other areas confirmed to be nesting sites for turtles in Samoa.
- Conservation arrangement with traditional landowners. Most of the turtle nesting areas in Samoa are on traditional lands making it difficult to conservation effort to be enforced. Traditional landowners can be encouraged to be involved in conservation effort and in enforcing existing legislation.
- Increase turtle education and awareness campaign. The high responses of “don’t know”, e.g. on the types of turtles, is an indication of the need to increase public awareness. In addition, it was noted that some of the respondents were not aware of the turtle subject. It is important to conduct education and awareness programs in the communities and should involve the different groups.
- It is necessary to link local researches and surveys results to regional and international efforts to collaborate and share information on these valuable but threatened resources.

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