MARINE TURTLE CONSERVATION IN REKAWA TURTLE ROOKERY IN SOUTHERN SRI LANKA

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ABSTRACT

There are seven species of marine turtles living in the world and five come ashore to nest in Sri Lanka. All those five species are nesting on Rekawa beach and they are under threat of egg poaching. For a long time Rekawa villagers have collected all the turtle eggs for sale or local consumption. The main objective of this programme was conserving the marine turtle population nesting on Rekawa while providing alternative income for the villagers. At the same time we have conducted research on the turtles and observed their nesting frequencies. Over approximately four years, grants to the project provided employment to villagers that resulted in protection of 827 nesting female marine turtles and to the resulting 3328 nests containing 372,107 eggs. Successful incubation resulted in 305,128 hatchlings being released to the sea.

Keywords

Marine turtles, Green turtle, Loggerhead turtle, Hawksbill turtle, Olive ridley turtle, Leatherback turtle, Nesting frequency

INTRODUCTION

Marine turtles represent an ancient and distinctive component of the world's biological diversity. It is believed that they first appeared more than 100 million years ago (IUCN, 1995). There are seven species of marine turtles living in the world representing two families, Cheloniidae and Dermochelyidae. These are the only living families of marine turtles descending from the large diverse marine radiation of cryptodiran turtles. Cheloniidae is characterised by an extensively roofed skull with well-developed rhamphothecae while Dermochelyidae is characterised by the extreme reduction of bones of the carapace, plastron and the neomorphic epithecal shell layer consisting of a mosaic of thousands of small polygonal bones (Prichard, 1997). The seven species include green turtle (*Chelonia mydas*), loggerhead turtle (*Caretta caretta*), hawksbill turtle (*Eretmochelys imbricata*), olive ridley turtle (*Lepidochelys olivacea*) Kemp's ridley turtle (*Lepidochelys kempii*), flatback turtle (*Natator depressus*) and leatherback turtle (*Dermochelys coriacea*). There is an eighth species, the black turtle or east pacific green turtle (*Chelonia agasszii*) recognised

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by some biologists, but morphological, biochemical and genetic data published to date are conflicting. Therefore, the black turtle is currently treated as a sub species of *Chelonia mydas.*

Because of the threats they face today marine turtle population is declining rapidly in many parts of the world (IUCN, 1995). Therefore, conservation efforts should initiate to protect the animals and their habitat. This could be protection of nesting areas, nesting activities, as well as the eggs and hatchlings. Conservation activities of turtles could be done in two ways: *in-situ* and *ex-situ*. *In-situ conservation* is the conservation of animals within their natural habitat and *ex-situ conservation* is the conservation of animals outside their natural habitat. Where turtle conservation is considered, probably the best conservation action on the nesting beach is to leave the eggs *in-situ* and to reduce the impact of predators and poachers (Miller, 1997). In certain circumstances, relocating of eggs to protect them from flooding, predation and poaching is more effective than leaving them in the nesting place. The places where the eggs are relocated outside the nesting areas are called hatcheries. This movement of the eggs can reduce hatching success (Parmenter, 1980; Miller, 1997). When it is necessary to move the eggs to safe place on the beach or to the hatcheries, Parmenter (1980) stated the eggs should be moved within three hours of laying. According to Miller (1997) the eggs should be moved and reburied within four hours of laying. The best action is moving the eggs immediately after laying. Habitat protection is necessary for the conservation of marine turtles. These habitats include nesting areas, foraging areas and also the mating, inter nesting areas and migratory routes. This could be done by limiting the human access on the beaches with high nesting activities by declaring them as national parks, sanctuaries and other protected areas.

Of the seven species of marine turtles in the world, five come ashore to nest in Sri Lanka. They are the green turtle, loggerhead turtle, hawksbill turtle, olive ridley turtle and leatherback turtle. Marine turtles are protected under government legislation since 1972 by Fauna and flora protection ordinance of Sri Lanka (1972) and amendment 1993 (Anonymous, 1993). But, marine turtles are still being exploited in Sri Lanka for their eggs and meat. Turtle rookeries are being disturbed by the tourist industry development. At sea, the unsustainable harvesting of coral reefs is leading to the destruction of feeding habitats and many turtles are accidentally caught and drowned in fishing gear each year. There were 5241 turtle entanglements observed during November 1999 and November 2000 from Kalpitiya to Kirinda within 16 fishing sites and it was estimated that about 13,000 turtles were caught per year in Sri Lanka (Kapurusinghe and Saman, 2001). The highly endangered Hawksbill turtle has been hunted to the brink of extinction for its carapace in order to provide raw materials for the illegal "tortoiseshell" trade (Richardson, 1996).

The most widespread form of marine turtle exploitation in Sri Lanka is the illegal poaching of turtle eggs. Our surveys have revealed that for the past 30 years, almost hundred percent of the marine turtle nests occurring on the south and southwest coasts of Sri Lanka have been robbed for their eggs by poachers. Many turtles are slaughtered for meat especially in areas such as Beruwela,

Trincomalee, Jaffna, Negombo, Chilaw and Kalpitiya (Currey and Matthew, 1995; Parsons, 1962). Especially there has been a high demand for turtle meat in Jaffna (Anonymous, 1973). The fishermen of the south and particularly those along the East Coast return turtles accidentally caught in their nets to the collecting centres. From those places the turtles were periodically transported to Jaffna in large lorry consignments in a most cruel manner (Anonymous, 1973). Kalpitiya was the main location for the turtle slaughtering in the last few years after the civil war began in Jaffna 1983 (Thilakasena, 1998). The south west and south stretch of coastline is the location of Sri Lanka's largest marine turtle rookeries.

Our surveys have also revealed that marine turtle populations are on the decline at all the Sri Lankan rookeries. As a result of egg collection alone, TCP predicts that the marine turtle populations of Sri Lanka will decline to extinction within the next few decades.

Our surveys have revealed that Rekawa is the location of one of the most important Green turtle rookeries in Sri Lanka (between 06° 02.702' N, 80° 50.579' E and 06° 02.595' N, 80° 51.634' E). Leatherback turtles, Loggerhead turtles, Hawksbill turtles and Olive ridley turtles also nest at Rekawa (Ekanayake and Kapurusinghe, 2000). Rekawa is a small village on the South coast of Sri Lanka, approximately ten kilometres eastwards along the coast from Tangalle.

The 2km of Rekawa beach immediately westward of the Rekawa headland provides nesting habitats for populations of five species of marine turtles. The undisturbed coastal vegetation and wide, clean sandy beaches provide ideal conditions for female turtles when they come ashore to nest at night. There are many coastal plants in the Rekawa coastal vegetation. About halfway of the study area *Pandanus tectorius* is the main vegetation. Takkada (*Scaevola sericea*) is the other main vegetation behind the beach. Also *Spinifex litoralis* and *Ipomea pescapre* are spread on the beach. Other plants include *Pedalium murex*, *Emilia sonchifolia*, *Phyla nodiflora*, *Crotalaria podocarpa*, *Tribulus terrestris*, *Cyperus arenarius*. In some places well-grown *Opuntia dellinii* plants were observed. There is a coconut (*Cocos nucifera*) plantation behind the vegetation throughout the study area.

For over 30 years local people from the Rekawa village have collected all the turtle eggs laid on Rekawa beach for sale or local consumption, resulting in zero recruitment into the local marine turtle population. Dattari and Samarajeewa (1982) stated that majority of the people in Sri Lanka are Sinhalese Buddhists and they were not eating turtle eggs or meat. However, we have observed (1996-1999) in Rekawa that more than ninety percent of people who collected eggs are Sinhalese Buddhists. Egg collectors from Rekawa interviewed by us have stated that in the 1970's it was not uncommon to take eggs from as many as 40 nests per night on Rekawa beach. But today the number of the nest per night rarely exceeds ten. These egg collectors, or "beach boys", are either dependent or semi-dependent on the sale of marine turtle eggs for income generation. Some nesting female turtles are also occasionally killed for their flesh, which is also sold at

local markets. Before the 1972 approval of Fauna and flora protection ordinance of Sri Lanka, the nesting turtles at Rekawa were collected and transported to Jaffna for their flesh (Rekawa villagers, Per. Comm).

Marine turtles are believed to reach sexual maturity in about 30 to 50 years of age (Mrosovsky, 1983). We must presume that, there has been little or no recruitment into the Rekawa populations in the last 30 years due to past egg collection, and that there will only be a further ten to twenty year period where first-time nesting turtles will arrive at Rekawa i.e. up to about 2020. After this , in the absence of new recruits to the nesting population, the nesting population will decline due to mortality of the older turtles from natural and man-made factors (e.g. fishing by-catch, pollution, slaughtering for meat etc). To prevent the extinction of this turtle population, immediate action is needed to reduce turtle mortality, to reduce the harvest of eggs and to ensure the successful incubation of large numbers of turtle eggs and the successful escape of large numbers of healthy hatchlings from our beaches.

Previous instances have shown that if action is taken to stop the over-exploitation of natural resources in Rekawa without the provision of any alternative income generation activities, the Rekawa community will either resist the action or begin to exploit other resources. Therefore the Turtle Conservation Project (TCP) decided to initiate a marine turtle in-situ nest protection, by tagging and a research programme while giving alternative non-destructive income generation method for the egg poachers.

MATERIALS AND METHODS

About 2050m stretch of beach on the project site (Rekawa beach) was marked by wooden posts at 50-meter intervals starting from 0 to 41. Numbering of the posts started from the east to west side of the beach. Each post was marked with a number and the distance in meters that the post represents. While the survey was in progress, it was noticed that some turtles were laying eggs to the right of the beach from the post zero. Therefore, another post was erected as beach post -1, thus extending the survey area by another 50 m.

The beach was patrolled 24 hours per day and 365 days per year. The daytime patrolling was conducted to protect the nests from the villagers and predators such as dogs, lizards and mongoos. The night patrolling was conducted to find the nesting turtles when they emerge from the sea and to record information on the turtles.

The former egg poachers were employed as the nest protectors. Nesting activities were recorded from the time a turtle emerges from the sea until the turtle entering back to the sea. The number of eggs was counted at the time of laying. If a turtle selected an unsuitable place for nesting then all the eggs in the nest were collected and moved to a safe place where they were reburied. The nesting turtles were tagged and the numbers of nests recorded according to the species. The best time for the tagging of turtles was when they were covering their egg chamber.

Two kinds of tags were used: Dalton Flexi Rototags (plastic; made by the Dalton Supplies Ltd., England) and Titanium tags (metal; made by the Stockbrands Co (Pvt.) Ltd., Western Australia). A number and the address of TCP were printed on both tags. Initially we used the Dalton's flexi tags for tagging the hind flippers of the turtles. However, these tags could be easily removed from the turtles when they get entangled in fishing nests. The numbers also could be erased. Therefore, titanium tags were used to tag the front flippers of the turtles. With leatherbacks both tags were placed between the tail and hind flippers.

During the daytime, the previous night's nests were located and a 'nest screen' was place over the nest. The nest screen was a one metre square piece of steel cable mesh. The mesh size was small enough to prevent animal predators from excavating the nest, yet large enough to enable emerging hatchlings to escape.

RESULTS

From September 2nd 1996 to July 24th 2000, 827 turtles nested on the Rekawa beach. Of this 752 (90.93%) were the green turtles and 75 (9.07%) individuals were from the other four species (Fig. 1). Three thousand three hundred and twenty eight nests were laid by five species of turtles during the study period. From that, 3218 nests (96.7%) were laid by the green turtles and the other species laid only 95 (3.3%) nests (Table 1). Only 0.36% of the turtles were hawksbills (three individuals) and only one of these nested within the study area while the other two laid eggs about one kilometre from the eastward boundary of the study area. While some turtles nested only once on Rekawa beach, others laid several times during the same nesting season and also during the following nesting season. Green turtles laid a maximum of 12 clutches per season and an average of four clutches per season (Ekanayake *et al.*, 2001).

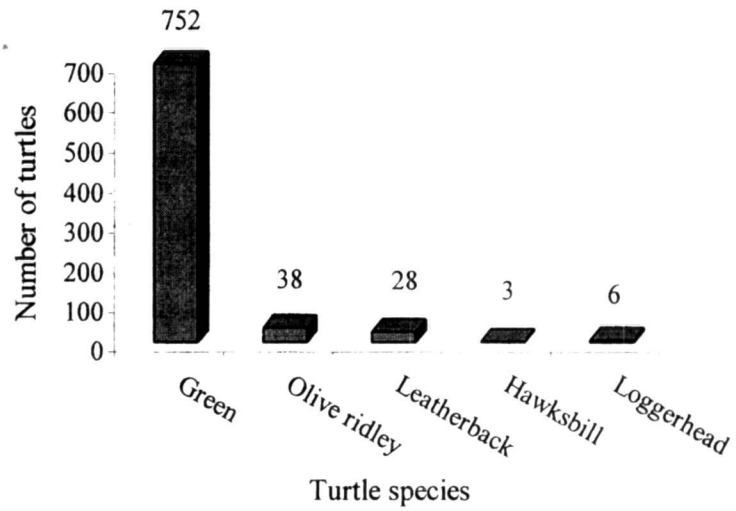

Figure 1. Number of individual turtles nested (tagged) at Rekawa beach

Table 1

The number of nests laid by the five species of turtles from September 1996 to July 2000.

Species	Number	Percentage
Green turtle	3218	96.70
Olive ridley	42	1.26
Leatherback	55	1.65
Hawksbill	6	0.18
Loggerhead	7	0.21
Total	**3328**	**100.00**

The average number of eggs per clutch for the Rekawa turtle population is green turtles 112.1, olive Ridley 105.1, leatherback turtle 100.5, hawksbill turtle 115.2 and loggerhead turtle 105.2 (Ekanayake and Ranawana 2001). As a result of this turtle conservation project, local people were employed and instead of removing the eggs, they provided protection to a total number of 372,107 turtle eggs laid on Rekawa beach over approximately four years of this study (Table 2). With the protection afforded to the eggs, 82 percent of the turtle eggs were hatched successfully on Rekawa beach (Ekanayake and Kapurusinghe, 2000) and 305,128 hatchlings were released to the sea during the study period.

Table 2

Total number of eggs laid by five species of turtles during the study period

Species	Average egg count	Number of nests	Total number of eggs
Green turtle	112.1 (x = 1985)	3218	360,738
Olive Ridley	105.1 (x = 30)	42	4,414
Leatherback turtle	100.5 (x =30)	55	5528
Hawksbill turtle	115.2 (x =6)	6	691
Loggerhead turtle	105.2 (x = 5)	7	736
Total			**372,107**

(x = number of nests observed)

According to the available literature there was no *in-situ* conservation and research programs in the world conducting beach patrolling 24 hours per day and 365 days per year. Because of the regular patrolling we observed the turtle nesting throughout the year on Rekawa beach. There was a distinct peak-nesting season from March to July. The minimum of four nests per month was recorded in October 1999 and the maximum of 172 nests per month was recorded in April 1999 (Fig. 2). The average number of 70 turtle nests per month was recorded in the Rekawa beach.

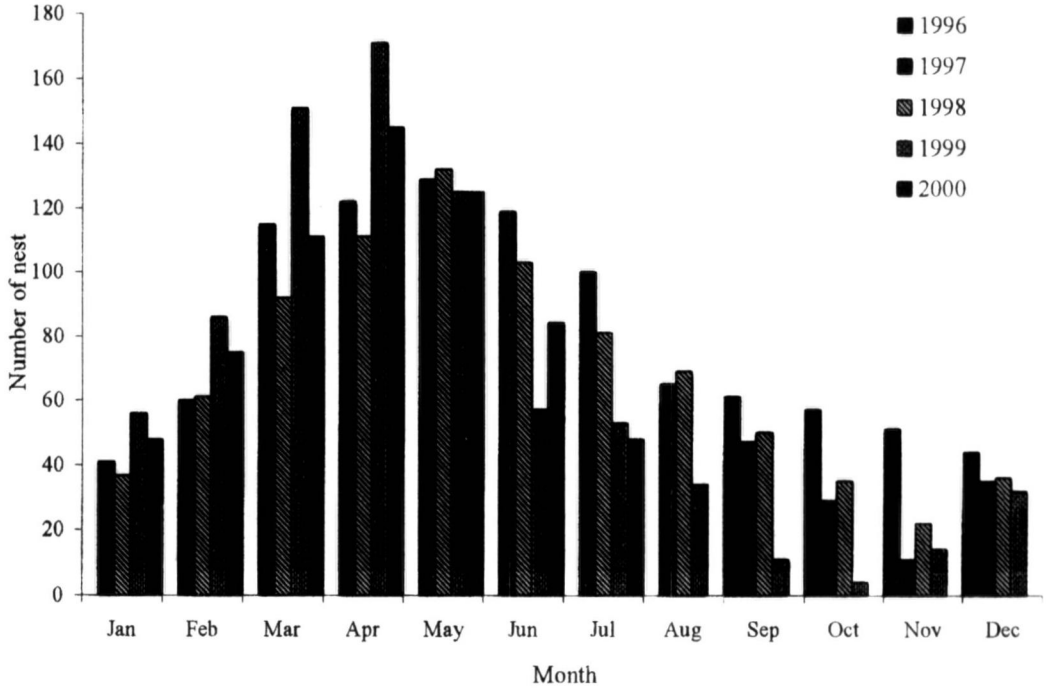

Figure 2. The number of nests laid by the five species of turtles in each month from September 1996 to December 1999.

DISCUSSION

All seven species of marine turtles are included on the IUCN Red List of Threatened Animals (IUCN, 2000). While Kemp's ridley, hawksbill and leatherback are considered critically endangered, the loggerhead, green turtle and olive ridley are listed as endangered. The flatbacks are considered as vulnerable (IUCN, 2000). All marine turtles are included in Appendix I of CITES (the Convention on International Trade in Endangered Species of Wild Fauna and Flora), and all species are listed in Appendix I and/or II of CMS (the Convention on the Conservation of Migratory Species of Wild Animals; IUCN, 1995.

Of the seven species of marine turtles, five species come to nest on Sri Lankan beaches. During our study all five species of turtles were encountered on the Rekawa beach. Using tags we were able to identify 827 individual turtles that came to nest during the study period. Of these, 90.93% were green turtles. A total of 3328 nests were laid by the five species of turtles, out of which 96.7% were green turtle nests and 3.3% were by the other four species. Green turtles were the most common species nesting on Rekawa beach.

Turtle nesting took place throughout the year on the Rekawa beach. However, there was a remarkable peak season for turtle nesting during the months of March to July. While the green turtles were the most frequent the other four species laid only a few nests per year on Rekawa beach. The Rekawa turtle rookery is a minor nesting site for green turtles when compared with the other

turtle nesting beaches around the world (Hirth, 1997) but a significant nesting beach within the Indian sub-continental region. In various beaches around the world, turtles have nesting seasons lasting only part of the year with the duration ranging from two to three months up to five to six months. In Tortuguero, Costa Rica July to September is the nesting season for the green turtles (Fowler, 1979; Hirth, 1980). February to July is the nesting season for green turtles in Surinam and they have a peak season during the months of April and May (Hirth, 1980). There are many places around the world that green turtles have a year round nesting: Europa Island, Aldabra Atoll, Hawke's Bay in Pakistan, Sarawak Islands and Naranjo beach in Costa Rica (Hirth, 1980). Most of these places have an identifiable peak season for the green turtle nesting while having a year round nesting as occurs at Rekawa beach.

The project has been highly successful in achieving its primary goal of increasing hatchling production from this regionally significant turtle rookery. The grants to the project made it possible to offer alternate sources of income to people who would have otherwise been earning a living from turtle egg poaching. The presence of the tagging and egg protection teams on the beach ensured the survival of the nesting turtles and the vast majority of their eggs. The release of over 300,000 hatchling turtles represents a major first step towards the recovery of these threatened species in Sri Lanka.

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REFERENCES

Anon. (1973). Editorial in Loris . The turtles and us. *Loris* **13**(1): 8.

Anon. (1993). Parliament of the Democratic Socialist Republic of Sri Lanka, Fauna and Flora Protection Ordinance (Amendment). Publication as a Supplement to part II of the Gazette of the Democratic Socialist Republic of Sri Lanka of October 22, 1993.

Currey, D and Matthew, E. (1995). Report on an investigation into threats to marine turtles in Sri Lanka and Maldives. Environmental Investigation Agency Report.Pp 32.

Dattari, S and Samarajeeva, D. (1982). The Status and Conservation of Sea Turtles in Sri Lanka. Unpublished report – March for Conservation, Colombo. Pp 22.

Ekanayake, L. and Kapurusinghe, T. (2000). The nesting frequency of marine turtles on the Rekawa turtle rookery in Southern Sri Lanka. *Report of the South and Southeast Asian Regional Session of the Global Bio diversity forum.* Abstracts. Colombo, Sri Lanka.

Ekanayake, E.M.L., Ranawana, K.B. and Kapurusinghe, T. (2001). Estimation of the average number of nests for green turtle on the Rekawa beach in Southern Sri Lanka. Three year study from September 1996 to September Proceedings of the twenty first annual symposium on marine turtle biology and conservation, Philadelphia, USA (In Press).

Ekanayake, E.M.L. and Ranawana, K.B. (2001). The average egg count for nesting sea turtles on Rekawa beach in Sri Lanka. Abstracts of the Fourth World Congress of Herpetology 3rd – 9th December 2001, Bentota, Sri Lanka. Pp. 29-30.

Fowler,L.E. (1979). Hatching success and nest predation in the green marine turtle, *Chelonia mydas,* at the Tortueguero, Costa Rica, *Ecology* **60**(5): 946-955.

Hirth, H.F. (1997). Synopsis of the Biological Data on the Green Turtle *Chelonia mydas* (Linnaeus, 1758), *Fish and Wildlife Service, U.S. Department of the Interior, Biological report* **97**(1): 120.

Hirth, H.F. (1980). Some Aspects of the Nesting Behaviour and Reproductive Biology of Marine turtles, in *American Zoologist* **20**(3): 507-523.

IUCN, (2000). The IUCN 2000 Red List. Compiler: Taylor,C.H. Published by the IUCN species survival commission. The CD (compact disk) version.

IUCN, (1995). *A Global strategy for the conservation of Marine Turtles,* IUCN/SSC Marine turtle specialist group. Pp. 24.

Kapurusingha, T and Saman, M.M. (2001). Marine turtle by-catch in Sri Lanka. Proceedings of the Twenty first Annual Symposium on Marine turtle Biology and Conservation, Philadelphia,USA. (In Press).

Miller, J.D. (1997). Reproduction in Marine turtles. In: *The biology of marine turtles.* Lutz, P.L.,and Musick, J. A. (Eds.) CRC Press, Washington DC, Pp.51-81.

Mrosovsky, N. (1983). *Conserving marine turtles.* The British Herpetological Society, c/o The Zoological society of London, Regent park, London NW1 4RY. Pp. 174.

Parmenter, C.J. (1980). Incubation of the Eggs of the Green Marine turtle, *Chelonia myda,* in Torres Strait, Australia: the Effect of Movement on Hatchability, *Australian Wildlife Reserves.* 7: 487-491.

Parsons, J.J. (1962). *The Green turtle and man.* Gainesville: University of Florida. Pp 125.

Prichard, P.C.H. (1997). Evolution, Phylogeny, and Current Status. In: *The Biology of Marine turtles.* Lutz, P.L., and Musick, J.A. (Eds.) CRC Press, Washington DC. Pp. 1-28.

Richardson, P. (1996). *Tortoiseshell survey report.* Unpublished TCP report for DWLC and NARA, Pp. 31.

Thilakasena, S. (1998). Viya siduren ahasa balannange kedavachakaya, Kesbavunge jivithaya anature. (Turtles are in danger). *Desathiya* **21**(20-21): 3-9. (In Sinhala)