Leatherback turtles at South Bay, Little Andamans (2007-2010)

Naveen Namboothri, Manish Chandi, Devi Subramaniam and Kartik Shanker

Compiled report submitted to the Andaman and Nicobar Forest Department

by

Centre for Ecological Sciences (CES), Indian Institute of Science, Bangalore

Dakshin Foundation, Bangalore

Andaman and Nicobar Environmental Team (ANET), A division of Madras Crocodile Bank Trust (MCBT), Tamil Nadu

September 2010

Introduction

Summary:

Dermochelys coriacea (the leatherback turtle) is the only extant species of the family Dermochelyidae (Bustard 1972). Leatherback turtles are the largest of living reptiles, growing up to 2 metres and weighing as much as 900 kg. It is also the only sea turtle that lacks a bony shell. (Zug and Parham 1996). The adult leatherback is also the widest-ranging reptile migrating longer distances than all other sea turtles (Pritchard and Trebbau 1984). It is found in tropical and temperate waters of the Atlantic, Pacific, and Indian Oceans (Gulliksen 1990; Ernst and Barbour 1989). The leatherback is listed as Critically Endangered by the IUCN and listed under Schedule I of the Indian Wildlife Protection Act (1972). There is great concern over the drastic declines in the nesting populations of this species throughout the world, especially the Pacific. When both Pacific and Atlantic stocks are considered, the global number of nesting female leatherbacks fell from an estimated 115,000 in 1980 to 34,500 by 1995. This alarming decline is unevenly distributed, with nesting falling off more severely in Pacific populations, where some beaches had annual adult mortality as high as 33%. The Malaysian rookeries have undergone a well-documented decline from approximately 5000 nests per year in the 1960s down to less than 10 nests per year in the 2000s (Chan, 2001). Very little is known about the status of leatherback populations from the Indian waters, barring from recent work by the Andaman and Nicobar Environment Team (ANET) on Great Nicobar Islands, and ANET and Indian Institute of Science, Bangalore on Little Andaman Island.

Based on the recent lessons learned from the population declines in the Pacific and Atlantic, it is imperative to understand where these turtles from the Andaman & Nicobar Islands range and the mortalities to which they are subject. We are in the process of conducting preliminary observations and monitoring of the major leatherback nesting populations of the Andaman group of islands to plan, design and coordinate the telemetry programmes. During January – April 2008, a monitoring programme was initiated on Little Andaman Island. We have successfully completed monitoring of the most important nesting beaches of the Andaman group of islands (viz., the West Bay and South Bay of Little Andaman Island) for three consecutive nesting seasons. We propose to initiate monitoring and tagging during the current season and based on these results, initiate telemetry studies.

Information on leatherback populations from India is still very patchy. Though there are earlier records of sporadic leatherback nesting from the Indian mainland (Kar and Bhaskar, 1982), current nesting populations are entirely restricted to the Andaman and Nicobar islands.

Andrews *et al*., (2006) reviewed leatherback nesting sites along the Andaman and Nicobar islands. Some of the major nesting beaches in the Andaman group of islands are

- Rutland Island (off South Andaman Island)
- Cuthbert Bay (Middle Andaman Island)
- North Cinque Island
- South Cinque Island
- West Bay, South Bay and two beaches between Ekiti Bay and Jackson Creek on the Little Andaman Island

Some of the important nesting beaches in the Nicobar group of islands are

- Galathea Bay, South Bay and Safeth Balu on the east coast of the Great Nicobar Island, Kopenheat, Alexandria Bay, Casuarina Bay and Pilokunji on the west coast of the Great Nicobar Island and Trinket Bay on the North east of the Great Nicobar Island

- Beaches off the Nicobari hamlets viz., Pilo Kiyang, Dahaya, Pulo Baha and Akupa Beaches on Little Nicobar Island are also important leatherback nesting sites
- Other important leatherback nesting sites in the Nicobar islands are at Teressa Island and West Bay in Katchal

Many of these prime nesting sites of the Andaman and Nicobar islands were badly affected by the December 2004 earthquake and the subsequent tsunami. Not much is known about the impacts of this calamity on the populations of leatherbacks here. Further, there is little information for the turtles once they leave the coast of Andaman and Nicobar Islands, especially on their migratory patterns, feeding and foraging behaviour, breeding/mating aggregations and many other parts of their life cycles. Recently, new approaches using satellite telemetry and molecular genetics have been used to gain insights into some aspects of the leatherback's life cycle. Long term spatio-temporal monitoring of leatherbacks using conventional tagging, satellite telemetry and genetic analysis is therefore imperative.

The islands, particularly the Nicobar group of Islands lie close to the epi-center of the earthquake that triggered the tsunami. The coastline and the shore topography have been severely altered in many of these islands, with the Nicobar group of islands undergoing submergence (Ramachandran *et al.*, 2005), while coastal plates in some of the Andaman islands have been uplifted (Kulkarni, 2005; Alfred *et al.*, 2006; CORDIO/IUCN, 2005). The impact of these drastic changes on the shape and structure of the coast and on the nesting patterns of sea turtles are poorly understood (Ramachandran *et al.*, 2005; Alfred *et al.*, 2006). Preliminary studies have indicated that the southern and western coasts of Little Andaman are key nesting sites for leatherback turtles in the Andaman group (Andrews *et al.*, 2006). The island underwent an upheaval of 1 metre and the coastline underwent considerable changes. The beach at South Bay of the Little Andaman Islands which was a major nesting site for the leatherback turtles above was badly affected by the tsunami and turtle nesting was very poor in the subsequent years (in 2005 and 2006).

A paragraph quoted below from Andrews *et al.*, (2006) gives an idea of the post-tsunami trends in some of the major nesting sites in Little Andaman Island:

> "The three major sea turtle nesting beaches (of Little Andaman Island) surveyed during March 2005, West Bay, South Bay on the west coast and Butler Bay on the eastern coast, were all affected. These beaches were washed away partially and submerged during the high tide. There was no evidence of turtle nesting on these beaches in 2005, but observations and indications during the 2006 survey suggest significant visitation and nesting by turtles, especially leatherbacks and that these beaches are reforming. Two other large beaches were formed after the tsunami, one starting at the northern side off the mouth of Jackson Creek measuring a length of 5 km. Turtle tracks and nests of three species, green turtles (four nests), olive ridleys (three nests) and leatherback (two nests), were recorded from this beach. Another 2 km long beach had formed, situated 4 km south of Jackson Creek and four nests of green turtles and two olive ridley nests were found on this beach."

In December, 2007, a rapid survey of the South Bay beach was carried out by two of the authors (KS and MC). It was found that some parts of the beach had recovered considerably and some leatherback tracks and nests were observed. Subsequently, a project was initiated to monitor leatherback turtle nesting at South Bay (January-March, 2008). Since the initiation of the project, the South Bay beach has been monitored for the last 3 years from 2007-2010. Every year, a camp has been established on the South Bay beach and daily monitoring of leatherback nesting has been carried out roughly between the months of January to the month of March.

Objectives:

The objectives of the surveys were to monitor post-tsunami leatherback nesting recovery. In the long term, we propose to address these issues by using satellite telemetry to track the movements of female leatherbacks after they depart from their nesting beaches in the Andaman and Nicobar Islands, and by studying the population genetics of this regional nesting population. Initially, this pilot research program consisted of the following components:

(1) beach monitoring
(2) tagging and tissues

The surveys were carried out under the auspices of the Forest Department, Andaman and Nicobar Islands and other appropriate agencies, and in coordination with ongoing research activities in the region. The Andaman and Nicobar Islands biologists and managers will receive training in genetic sampling, PIT tagging, and leatherback ecology (e.g., migratory behavior, threats, hatchling behavior).

Description of the Nesting Beach

The South Bay leatherback nesting beach lies on the south west tip of the Little Andaman Island. The main nesting beach begins west of the Benyabol River and extends nearly five kilometers up to the Tothibue River. Many small creeks and rivers that were inundated by tides had to be crossed during the low-tides in order to access the entire nesting beach. The nesting beach west of Benyabol begins with a steep (reflective) profile, with slightly coarse sand, which later flattens out and becomes a dissipative to ultra dissipative beach with very fine sand towards the western end.

The nesting beach for most of the stretch was found to be quite wide (50-250 m from the high tide line), with very little vegetation on the beach. Vegetation on the nesting beach was sparse, though a lot of plastic floatsam and other debris were encountered. Crocodile, monitor lizard, palm civet, wild boar and feral dog tracks were frequently encountered on the beach.

Figure 1. Beach at South Bay, Little Andaman Island

Figure 2. Beach at West Bay, Little Andaman Island

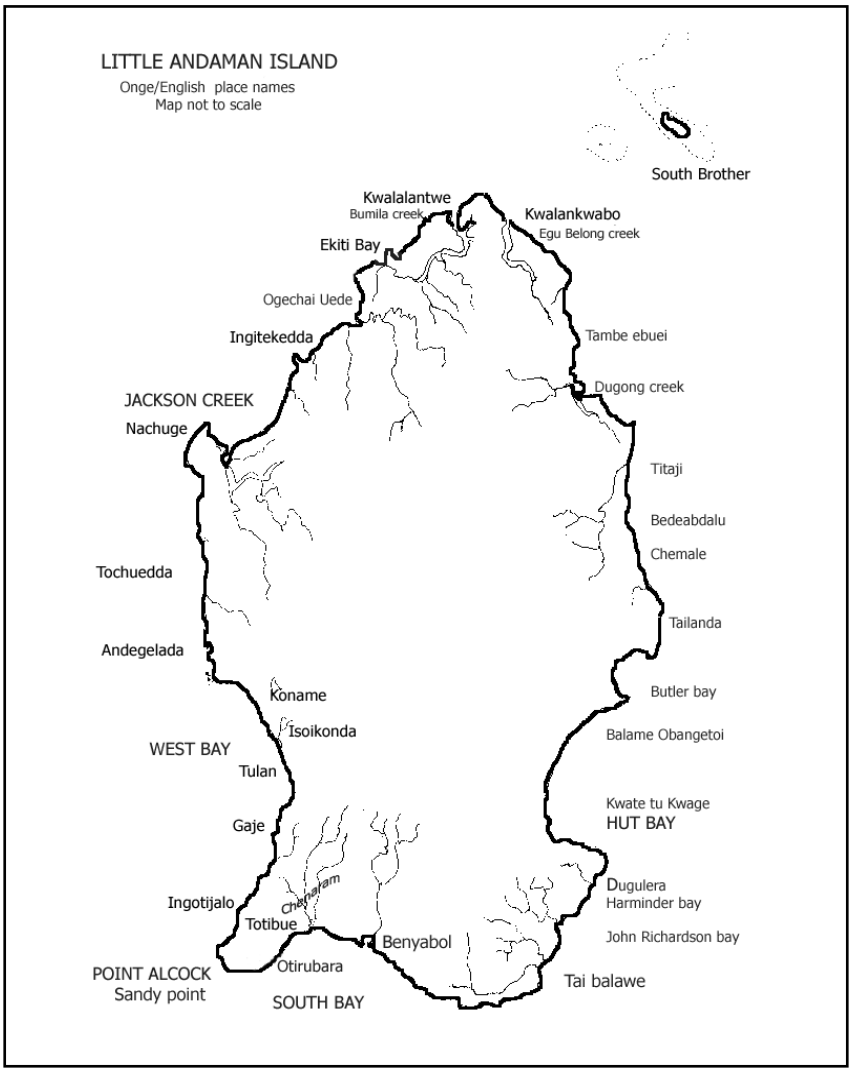

Figure 3. Map of Little Andaman Island

Methodology:

(1) Nesting beach monitoring

The nesting surveys commenced in January 2008 and continued till March 2010. The study had a two tiered approach: apart from the collection of biological data, there was a secondary emphasis on laying the groundwork for the following years in terms of planning and logistics, establishing relationships and building rapport with the local community, field assistants and support staff.

When nesting turtles were encountered, biometric measurements and information on time of nesting, tide and clutch size was also obtained. Measurements such as CCL (Curved Carapace Length), CCW (Curved Carapace Width) were recorded using a standard flexible metal tape along with any other identifying marks, such as bite marks, injuries or barnacle growth. Where tracks and excavations were observed, the area was marked and information on the location of the nest viz. distance from the High Tide Line was noted. In addition, nests were regularly monitored to determine trends in nest depradation on the nesting beach.

(2) Tagging and genetics

(a) Adults were tagged with a miniature PIT tag (USD 4.00 per tag) and an external metal tag (USD 1.00 per tag) in order to identify individuals (see McDonald & Dutton 1996). All adults nesting on the monitored beach were tagged during the season in order to estimate total individuals, nesting intervals and remigration intervals.

(b) A small skin biopsy sample was collected from the tagged leatherbacks following standard procedures described in Dutton (1996). For the genetic analysis, the haplotypes of the animals will be compared with data from other key nesting populations from the Pacific and Indian oceans in order to determine whether the Andaman and Nicobar Islands populations are distinct from other regional populations.

Results:

Year one (January 2008-April 2008):

A total of 41 nests and tracks were observed, of which 3 did not nest (false crawls) (Fig. 2). 9 nesting emergences were observed. The monitoring effort this season showed that depredation rates are extremely high, mostly by monitor lizards and occasionally by feral dogs. Of the 9 nests observed, 8 were depredated (88.8%). Older nests (nesting unobserved) also showed remnants of egg shells and monitor tracks in the same area, indicating that they were depredated as well. Poaching however seems to be less of a threat, as many communities do not favour leatherback meat as well as eggs, due to the strong odour. 4 depredated nests were examined for eggs remaining, and had 42, 26, 28 and 9 eggs.

The nesting intensity of leatherbacks in the South Bay beach showed a clear peak during end December and the first week of January and abruptly declined towards the 3rd week and remained within the narrow range of 2-10 till the 9th week (Fig.1).

Year two (December 2008 to February 2009)

Monitoring commenced at the South Bay beach on the December 16, 2008. A total of 21 old nests were encountered on 16th morning. During the subsequent monitoring during the period from December 16, 2008 to March 1, 2009, 38 tracks and nests were observed. Thus a total of 59 leatherback turtles nests

were observed on the South Bay beach (Fig. 2). Monitor lizard predation on the leatherback turtle nests, though not quantified, was observed to be quite high. Three nests hatched during the monitoring period on 25/01/09, 26/02/09 and 28/01/09 and produced 58, 38 and 53 hatchlingsA total of 8 individuals were tagged. Three recaptures occurred within the season.

The nesting intensity of leatherbacks remained approximately between 4-8/week during the first eight weeks of monitoring and showed a clear fall in the final three weeks (Fig. 1).

A rapid survey of the beach of West Bay was conducted on March 2, 2009. A total of 70 nests/tracks were encountered, 65 of which were old (2-3 months old) and 5 fresh (less than a week old). Excepting a few, all the nests were predated by monitor lizards.

Year three (December 2009, March 2010)

The number of leatherback nests observed during the third year of the project was very low in comparison to the two previous years (Fig. 2). A total of 7 nests and 1 false crawl were observed during the 4-month period. Out of the 7 nests that were laid, one nest was predated by monitor lizards. Two new leatherback turtles were tagged, while one leatherback was recaptured. Three nests from hawksbills and 8 nests from olive ridley turtles were also observed.

The nesting intensity of leatherbacks was evenly spread out over January and the second week of February. No tracks were observed after the February 16, 2010 (Fig. 1).

Surveys of West Bay conducted on January 13, 2010 and February 3, 2010 revealed far higher nesting compared to South Bay. During the first survey, a total of 30 nests were observed (25 leatherback nests and 5 olive ridley nests), while the second survey revealed a total of 20 nests (13 leatherback nests and 7 olive ridley nest).

There were a few hawksbill and olive ridley nests in each of the years (Fig. 4 and 5), and a few green turtle nests during 2008 and 2009, but none during 2010 (Fig. 3).

Discussion:

Many important leatherback nesting sites along the Andaman and Nicobar islands were severely impacted by the 2004 tsunami, leading to drastic drops in their nesting along these sites. The actual impact of this on the world leatherback population still remains to be understood. South Bay is one such site which was severely affected in the tsunami and a rapid survey in 2006 and 2007 revealed tracks. The leatherback nesting monitoring programme over the first two years (2007-2009) showed a distinct increase of leatherback nesting compared to the poor nesting reported for 2005 and 2006. However, fewer leatherbacks nesting during the most recent survey (2009-2010).

From the past three years of survey, there is a clear peak in the nesting during late December and early January. This gradually reduces towards end of January and by end February, most of the nesting is over (Fig. 1). The bulk of the nests laid are clearly during the first 2 months of the nesting season in all three years of monitoring and very low numbers are found after February.

There has been a small population of green turtles and olive ridleys nesting on the south beach, averaging eight nests a year, though no green turtle nests were observed during the surveys from 2009-2010. Hawksbill nests have been very rare and only total of 4 nests have been observed.

High rates of depredation of nests by monitor lizards and occasionally by feral dogs were observed in the study area. A majority of the old and fresh nests were depredated. More studies quantifying the effects of depredation need to be carried out to understand what long term effects this high rate of depredation might have on the population.

Year	Number of leatherback turtles tagged	Number of recaptures in the same season	Number of recaptures in subsequent years	Total number of nests
2007-2008	**6**	**3**	**0**	**38**
2008-2009	**5**	**3**	**0**	**59**
2009-2010	**2**	**1**	**0**	**7**

Recommendations

We recommend the following actions for the conservation and management of leatherback turtles in the Andaman and Nicobar Islands.

1. Monitoring

a) Long-term monitoring is required at an index beach such as South Bay, Little Andaman Island, which is relatively accessible and has a small nesting population of leatherback turtles.
b) West Bay has considerably more nesting of leatherback turtles and there is a need to initiate monitoring programmes in the West Bay beach too. However, lack of accessibility makes this more difficult to monitor through the season.
c) Surveys of the sites of Great and Little Nicobar islands re required to assess if the beaches are accreting and if leatherback turtles have started nesting again

2. Nesting beach studies

At South Bay, it is necessary to monitor different factors such as internesting periods, clutch size, hatchling success, nest temperatures, sex ratio of hatchlings, depredation rates, etc. In order to do this, it will be necessary to tag adult females. Nest temperatures can be monitored using data loggers. It will be necessary to place a few nests in hatcheries to collect biological data, and this will serve in reducing depredation, albeit temporarily.

3. Satellite telemetry and genetics

Satellite telemetry of at least a few leatherback turtles needs to be carried out to trace their post nesting migratory routes and assess their exposure to fishery related threats in the high seas. Genetic studies can also be carried out to assess the stock to which the Andaman and Nicobar leatherback turtles belong.

4. Capacity building and training

The long term conservation and management of the leatherback turtles in the Andaman and Nicobar Islands depends on the involvement and support of local civil society and government. Funds need to be mobilized to provide support to initiate monitoring, for conducting training and awareness programmes for the Forest Department staff and for local groups. Since the leatherback turtle nesting beaches are currently in areas not accessible to the general public, the main focus of training needs to be forest department field staff. In addition, awareness programmes can inform the public about leatherback turtles and their value as a natural heritage of the islands.

Publications:

Poster presentation titled “Post Tsunami leatherback nesting in South Bay, Little Andamans, India” presented at the International Sea Turtle Symposium, Brisbane, 2009.
Authors: Devi Subramaniam, Kartik Shanker and Naveen Namboothri.

Speed talk presentation titled “An overview of leatherback turtle conservation and research in India” at the 30th International Sea Turtle Symposium, Goa, April 2010.
Authors – Naveen Namboothri and Kartik Shanker.

Tables and Charts:

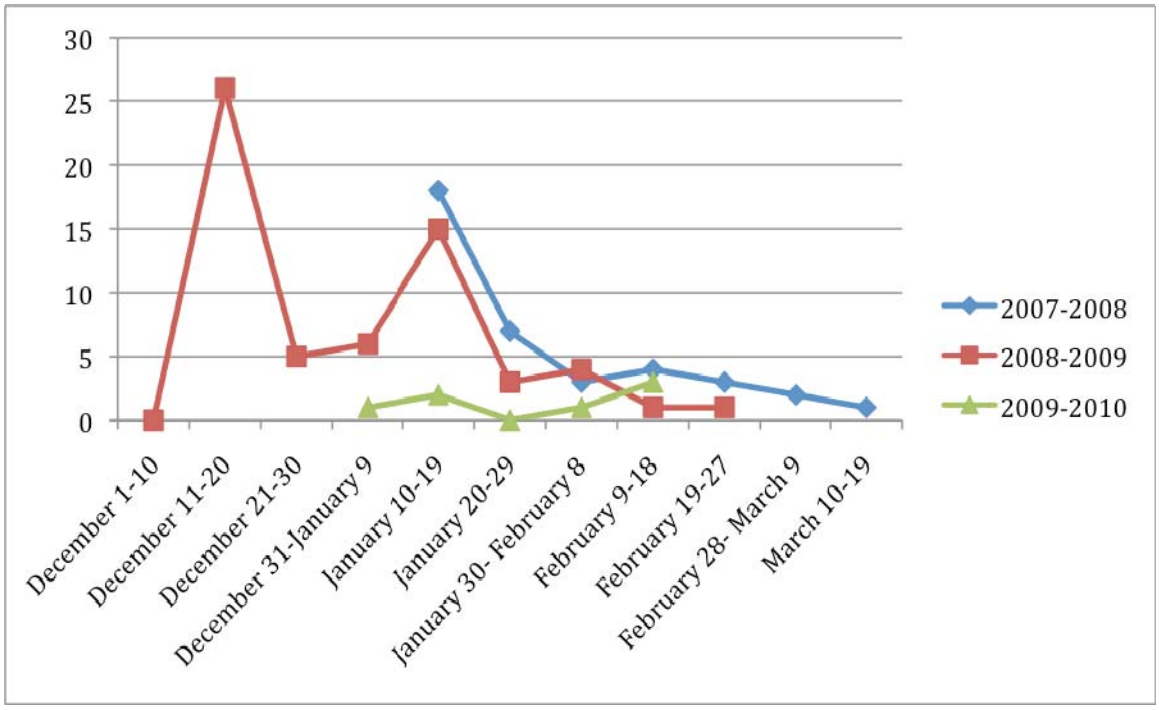

Fig. 1. Leatherback turtle nesting patterns (December-March) shows a clear peaking around mid January, and a rapid fall towards the end of the season (the high numbers of nests in the first week of 2008 is because old nests from before the monitoring began have been incorporated into the 1st week)

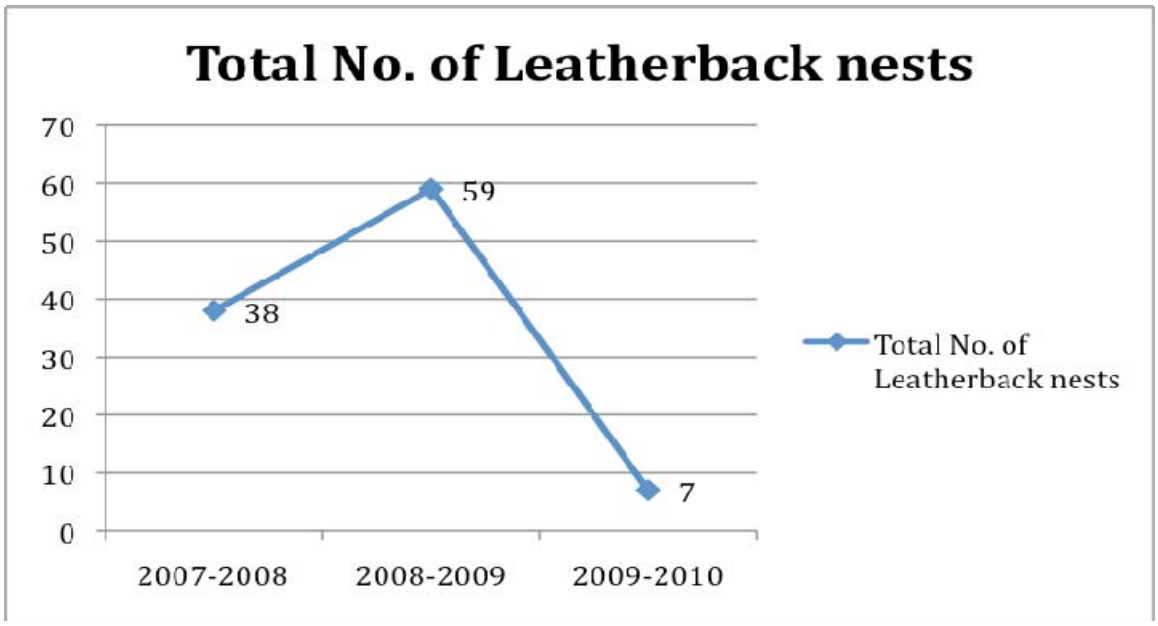

Fig. 2. Nesting trend of leatherback turtles over the three years of observation at South Bay.

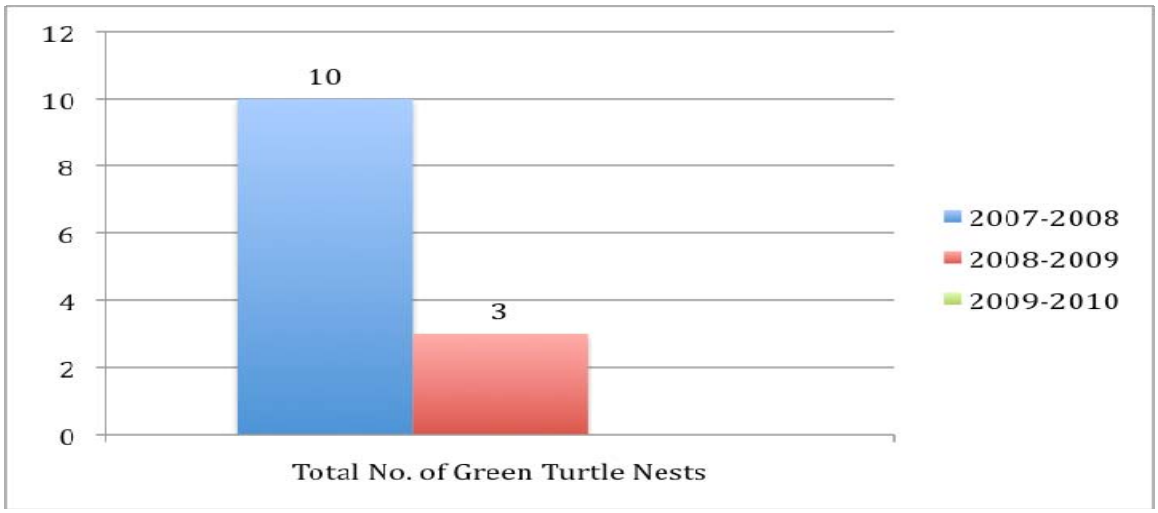

Fig. 3. Nesting trend of green turtles over the three years of observation at South Bay.

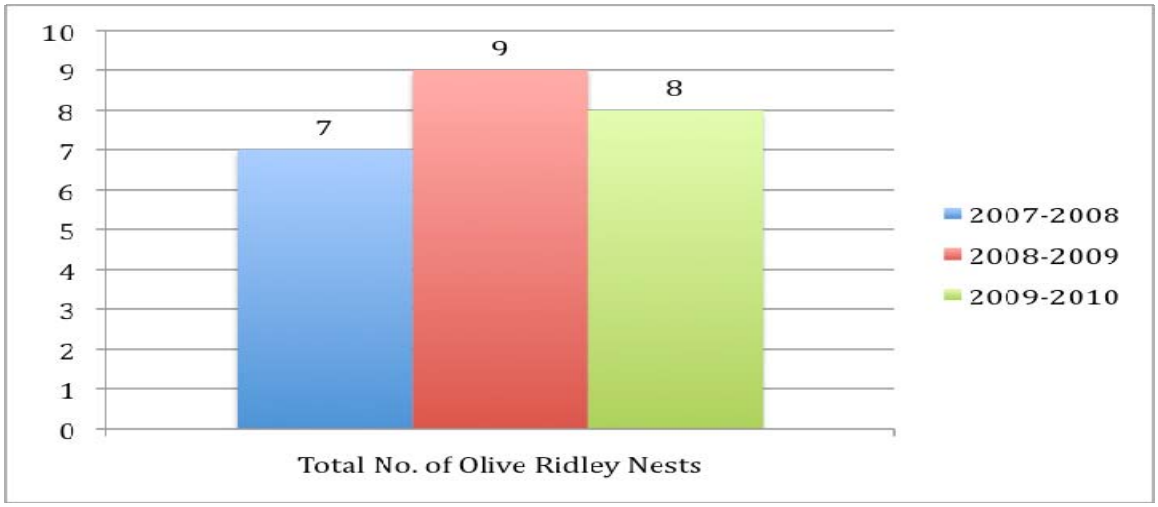

Fig. 4. Nesting trend of olive ridley turtles over the three years of observation at South Bay.

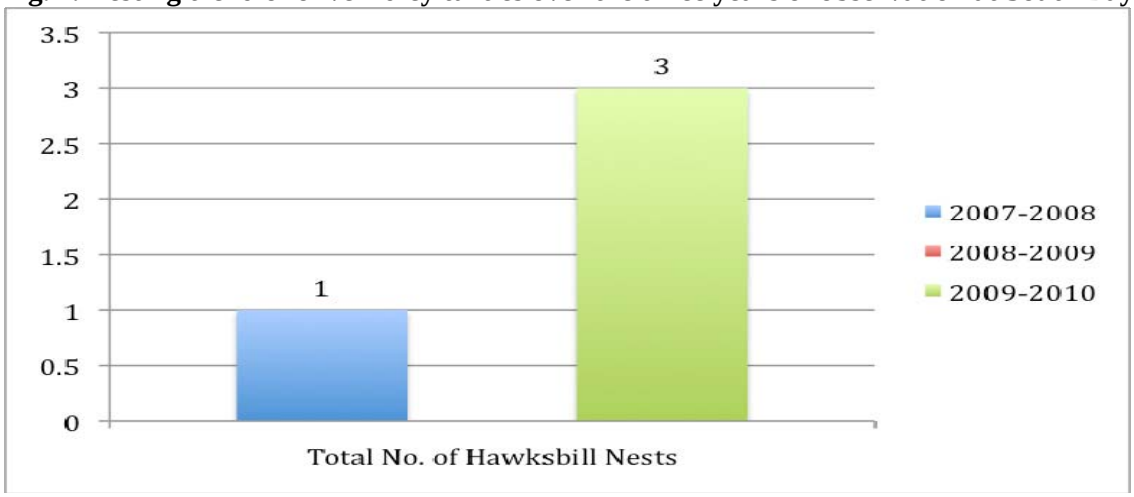

Fig. 5. Nesting trend of hawksbill turtles over the three years of observation at South Bay.

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