

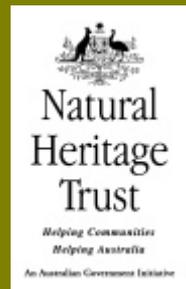
# Ningaloo Community

## Turtle Monitoring

### Interim Annual Report 2003-2004



Written and prepared for the Commonwealth Department of Defence and  
Coastwest Coastcare  
July 2004



The Threatened Species Network is a community-based program of the Australian Government's Natural Heritage Trust and WWF Australia.

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**Australian Government**  

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**Department of Defence**



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## EXECUTIVE SUMMARY

The Ningaloo Community Turtle Monitoring Program (NCTMP) conducted in the 2003/2004 turtle monitoring season was an outstanding success. Turtle activity during the months of December 2003– February 2004 was monitored with a high level of monitoring effort in the Graveyards and Hunters Sections in the North West Cape Division . A dedicated team totalling 63 volunteers participated and contributed to the 2003/2004 NCTMP.

The employment of a Coordinator in July 2003 was instrumental in the successful recruitment and coordination of volunteers, and organisation of the daily business of the NCTMP. Based on the experiences of the 2003/2004 monitoring season, key recommendations for the program are:

- The delegation of responsibilities to dedicated Team Leaders for the 2004/2005 monitoring season;
- The provision of volunteer accommodation separate to the Coordinator's residency; and
- The expansion and consolidation of a partnership with the Commonwealth Department of Defence.

The sourcing of ongoing funding and the investigation into establishing a community driven self-sustaining, long-term monitoring program will continue in the 2004/2005 financial year. WWF Australia will continue to remain committed to the program over the 2004/2005 financial year through the provision of funds and inkind support to the program. It is envisaged that Murdoch University will play less of a role in the coming season and that, in conjunction with the Program Coordinator, the Cape Conservation Group and Department of CALM will continue to drive the program from their offices in Exmouth.

The amalgamation of a volunteer program with the operation of the Jurabi Turtle Centre will be piloted in the 2004/2005 turtle nesting season.

# BACKGROUND

## Ningaloo Region

The Ningaloo - Carnarvon area encompasses a gulf, a range, cave systems, a wetland, and an extensive coastline adjacent to the Ningaloo Reef which provides a plethora of habitats for globally significant species and communities. The area is currently under consideration for World Heritage nomination by the West Australian government. Unfortunately, the area is also under increasing pressure from a variety of pressures sources largely associated with unsustainable landuse, uncontrolled tourism growth and infrastructure development.

Ningaloo Reef, which stretches approximately 260km along the Ningaloo Gascoyne Coast, is Australia's largest fringing reef system. It provides habitat for over 250 species of coral which form a complex coral ecosystem that provides habitat for over 500 species of fish and 600 species of molluscs. The diversity of fish and colourful coral, combined with the accessibility of the coral reef system, makes Ningaloo Reef a prime tourism location. The presence of charismatic mega-fauna such as the world's largest fish, the elusive whale shark, as well as whales, dugongs, turtles and manta rays provides prime conservation and tourism opportunities.

Increasing growth and tourism also brings about threats to turtles and their habitat through impacts from overfishing, boat strikes, inappropriate coastal development, habitat degradation and water quality problems.

It is imperative that local communities in the Ningaloo-Carnarvon Region work in collaboration with management agencies, scientists, conservation organisations and industries to bring about coordinated and effective measures for the conservation of the values that make the Ningaloo Region so highly valued by the general public and local communities especially marine turtles which are threatened on a worldwide basis.

The Ningaloo Community Turtle Monitoring Program (NCTMP) was established in recognition of the need to take a locally driven/community-led collaborative approach to turtle conservation and knowledge in the region, whilst promoting the principles of ecologically sustainable development.

## Marine turtles of the Ningaloo Region

The Ningaloo Region has been identified as having relatively important coastlines for turtle nesting. There are three species of marine turtles that nest on the coast of Ningaloo Reef:

- Green turtle (*Chelonia mydas*)
- Loggerhead turtle (*Carretta carretta*)
- Hawksbill turtle (*Eretmochelys imbricata*)

All three of these species are listed under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* as "threatened" and are listed on the IUCN Redlist.

Presentations provided by Dr Bob Prince, Department of Conservation and Land Management, at the Ningaloo Marine Turtle Conference in 2003, indicate that green turtles that nest on the beaches of Ningaloo reef are known to migrate to the Kimberley coast, and loggerhead turtles that

have nested on North West Cape have been recorded off the coast of Java, in Indonesia. This indicates that that the conservation of marine turtles in the Ningaloo Region will contribute to marine turtle global conservation efforts. Marine turtles are under immense pressure from a range of activities including illegal trade and harvest; unsustainable harvest; some forms of commercial fishing such as trawling and long-lining; and loss of habitat such as seagrass beds, coral reef ecosystems and intact coastlines. In the Ningaloo regions specifically, marine turtles face the following threats:

- Inappropriate coastal development
- Unsustainable and uncontrolled recreational and tourism activities such as inappropriate turtle interactions and four-wheel driving on beaches
- Light pollution from developments both marine and land based
- Fox predation
- Boat strikes
- Loss of feeding and nesting habitat
- Specific fishing practices

In an attempt to provide a coordinated and concerted effort in the conservation and management of marine turtles and their associated habitats, the local conservation group – the Cape Conservation Group, the Department of Conservation and Land Management (CALM), Murdoch University and WWF Australia have worked towards the development and implementation of the Ningaloo Marine Turtle Program (NMTP).

## **The Ningaloo Marine Turtle Program**

At present, there are four main components to the Ningaloo Marine Turtle Program which include:

- The development of the Ningaloo Community Turtle Monitoring Program;
- The development of a framework for the management of turtle tourism;
- The formation of the Ningaloo Turtle Advisory Group to provide advice on issues pertaining to turtle conservation and management and develop an action plan for the conservation, and capacity building in relation to marine turtle conservation in the Region; and
- The operation of the Jurabi Turtle Centre to aid in the provision of a model for sustainable tourism and provide a means of information, education and interpretation of the general public and the local community.

This report has been prepared with a focus on one component of the Ningaloo Marine Turtle Program - the Ningaloo Community Turtle Monitoring Program, and provides an overview of the highlights, learnings and monitoring results from the 2003/2004 turtle monitoring season with a suite of recommendations for the improvement and enhancement of NCTMP for monitoring season 2004/2005

## **The Ningaloo Community Turtle Monitoring Program**

### **Background**

The Cape Conservation Group (CCG), Department of Conservation and Land Management (CALM) Exmouth District and David Waayers, PhD Candidate, Murdoch University (MU) formally established the Ningaloo Community Turtle Monitoring Program in 2002, with the

assistance of a Threatened Species Network<sup>1</sup> Grant. Since then, it has grown with a high level of interest from the local community of Exmouth, Western Australia and even overseas. The Program has become an excellent example of a collaborative conservation initiative with a high level of community involvement.

## Purpose and objectives

The NCTMP is a community-based monitoring program, that is designed to provide high standard marine turtle nesting information through the collection of data on successful nesting emergences, false crawls, disturbance and spatial and temporal distribution of the three main species nesting in the Ningaloo Region: green, loggerhead and hawksbill turtles.

The NTCMP can also aid in informing future management, planning and development along the Ningaloo Coast through the identification of key breeding habitats for marine turtles and providing guidance on the relative significance of these habitats. It can also assist in informing the management agency on the need to address issues such as fox predation, beach access management, and turtle tourism and interpretation/education requirements. This is gained through the collection of disturbance information such as human, fox and vehicles tracks, and recording the number of disturbed nests.

The principal aim and objectives of the Program are:

***Aim:*** To promote the long-term survival of turtle populations.

### ***Overarching goals:***

- Assess the conservation status of marine turtle populations
- Identify key breeding and nesting beaches
- Regularly monitor populations and assess trends
- Identify the level of feral predation threats on nests
- Implement effective protection of important nesting beaches
- Generate and maintain community support for the program and for the conservation of marine turtles and their habitats
- Educate visitors and the community about marine turtles

### ***Core monitoring objectives:***

- Determine the abundance of nests on specific sections of beach over specified time intervals for each species
- Identify the relative significance of nesting beaches to each species
- Establish the level of predation on nests
- Determine the impact of human interaction on the nesting success of each species.

## The partnership

The Turtle Team, an effective and close partnership between CCG, CALM, Murdoch University and WWF, has allowed for the successful implementation of the NCTMP in 2003/2004 turtle nesting season. This partnership has proven effective as each partner contributes substantially to the program and understands the values of partnership approaches to long-term programs such as this.

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<sup>1</sup> The Threatened Species Network is a joint program between WWF Australia and the Australian Government's Natural Heritage Trust

In 2003/2004 a number of funding bodies and organizations contributed financial support to the program. These include the Commonwealth Department of Defence, Perpetual Trustees, the Threatened Species Network through the Natural Heritage Trust, and Department of Planning and Infrastructure's Coastwest Program. As a result of fundraising efforts, a Turtle Monitoring Coordinator was employed by the program to coordinate volunteers, ensure priority sections were monitored, and manage data entry and the overall coordination of the program.

The following report provides detail on the 2003/2004 NCTMP with a focus on volunteer involvement, scientific results and recommendations for next season.

# TURTLE MONITORING PROGRAM OUTCOMES 2003/2004

## Coordinator's Report

In general terms, the 2003/2004 turtle monitoring program was a success with a marked increase in the number of volunteers involved and their consistency of effort with data collection. The employment of a coordinator allowed for an increased focus on volunteer recruitment, coordination of training and facilitation and organisation of workshops.

The refinement of the methodology in the 2003/2004 season from the 2002/2003 season reduced the overall on-site volunteer hours required. This has been achieved largely due to the reduction in effort spent on recording the details of false crawls and body pits without compromising data quality.

During the morning beach monitoring, volunteers often encountered turtles that were lost in the dunes, trapped in rocks or had fallen on their backs. The introduction of Turtle Rescue Procedure and the turtle rescue mat were successful strategies and should be continued throughout future monitoring seasons.

With increased volunteer numbers, volunteer hours and the provision of accommodation, the Program has been able to expand into other areas. The provision of funds by the Commonwealth Department of Defence has also resulted in the monitoring of an additional section, VLF Bay, and acknowledgement of the past and continuing monitoring effort of Defence portion of Lighthouse Bay.

A number of issues arose during the implementation of the NCTMP. Specifically, these were:

Provision and management of volunteer accommodation and coordinator's office space;  
Insufficient time to meet all duties and responsibilities of the Coordinator position; and  
Meeting volunteer expectations.

These three points are discussed in more detail below.

### **1. Volunteer accommodation**

In the 2003/2004 season of NCTMP, volunteers were provided accommodation at a discounted rate of \$60/night at Turtle Head Quarters which was shared with the Coordinator's residency. This proved difficult with a high degree of disturbance to the coordinator and difficulties in dividing working hours from personal life. It was obvious that for future seasons it is preferable for volunteers to be housed separately to the Coordinator and for the Coordinator to have a separate office space from residency to avoid workplace disruptions.

**Recommendation 1:** Volunteer accommodation to be leased separately by NCTMP

**Recommendation 2:** Office space for Coordinator investigated in township and at Navy Base.

**Recommendation 3:** Development of a Code of Conduct for volunteers accommodated at Turtle Head Quarters

**Recommendation 4:** The development of Occupational Health and Safety Guidelines for the Ningaloo Community Monitoring Program.

## **2. Part-time position**

The employment of a part-time Coordinator's position was trialed during the 2003/2004 monitoring season. This trial has demonstrated that the Coordinator's role is a full-time position largely due to the demands of volunteer recruitment, daily preparation and volunteer facilitation commitments.

**Recommendation 5:** Development of a Team Leader position to be responsible for the day-to-day maintenance of monitoring kits and quality assurance to ensure that data will be entered regularly.

**Recommendation 6:** Coordinator's position to be made full time for one year. In the event that funds fall short of providing for a full time position, a full time position between the months of November 2004 and March 2005 is prioritised.

## **3. Volunteer expectations**

During certain times of the season, volunteer expectations of the Coordinator's role became unrealistic. These ranged from expectations of use of vehicles for recreational purposes, to entertainment expectations. This created an increased workload for the Coordinator and unnecessary responsibility.

**Recommendation 7:** the development of a volunteer package which includes all protocols and expectations of the Program and of volunteers. This package should also include Occupational Health and Safety Policy documents and a volunteer agreement form.

**Recommendation 8:** Volunteers are thoroughly briefed about the code and expectations, and provided with an information package on the NCTMP prior to arrival in Exmouth.

## **Outcomes - Volunteer Activities**

### ***Numbers, hours and demographics***

A total of 63 volunteers were involved in the program in the 2003/2004 monitoring season, contributing 2847 monitoring hours with an additional 100 data entry hours.

There was a marked increase in Program enquiries from around the state, inter-state and overseas as the program profile has continued to increase through communication on websites and from newspaper/newsletter articles. Volunteers were also recruited from the general tourism sector via posters on local notice boards and visitor centres. The volunteers that participated were from a broad age range, which ranged from 17 to 60 years of age.

### ***Volunteer monitoring***

Local volunteers were pleased with the flexibility within the monitoring program and the modified methodology with shorter monitoring times, enabling local volunteers to return to town in time for work commitments. The daily designation of vehicles and volunteer car-pooling to transport volunteers to monitoring sites became problematic at times when local volunteers were obliged to return to Exmouth for work purposes immediately after monitoring. This conflicted with the preferences on non-local volunteer desires to take opportunities to view hatchlings. A shortage of volunteer vehicles and issues arising from the use of vehicles, in relation to car accidents (especially due to kangaroo collision), was also identified as potential problems.

The coordination of volunteers in the mornings and communication between different volunteers on successive days became time-consuming and could be streamlined to allow for increased time efficiency. The lack of Occupational Health and Safety guidelines for volunteers was identified as a gap in the Program. An example of a risk to volunteers that needs to be addressed is the ability of volunteers to reach first aid or medical assistance in the event of an injury or ill health.

Due to interest from other regions and other locations within the region, the Ningaloo Community Turtle Monitoring Program will be extending to the Pilbara Region through the Care for Hedland Environmental Interest Group. A partnership being developed with the Commonwealth Department of Defence will enable additional land under the jurisdiction of the Commonwealth Department of Defence in the Cape Range Region to be monitored (Bundera Coastal Protection Area). This area has been identified through aerial surveys undertaken by David Waayers in 2003 (see attached maps) as an indicatively significant area for loggerhead turtle nesting. Monitoring will ground truth this section of coastline and allow for recommendations on the relative significance of the area as a rookery as well as provide management advice and guidance to the Commonwealth Department of Defence will be essential for conservation management.

**Recommendation 9:** Prior arrangements must be made with the Coordinator by volunteers wanting to undertake leisure or recreational activities after monitoring to minimize conflicts between local and non-local volunteers.

**Recommendation 10:** The Coordinator should attempt to provide increased opportunities to view hatchlings, and provide volunteers with a schedule of hatchling watching dates.

**Recommendation 11:** The use of designated volunteer vehicles and hire cars is investigated. All volunteers that provide vehicles as an in-kind contribution to the Program must be made fully aware that insurance and the risk of vehicle damage is the responsibility of the vehicle owner and not of the NCTMP

**Recommendation 12:** When volunteers are allocated a Section (sub-section), relevant folder is provided which should relieve time spent in morning coordination and vehicle allocation sessions. These folders should include communications forms which allow relevant information from previous days to be communicated to following volunteers e.g. mortality report has been filed for dead turtle, marker is missing and has been reported etc)

**Recommendation 13:** Development of a NCTMP OH&S Policy and the purchase of UHF radio systems are essential for future monitoring season

### ***Volunteer training***

In mid-November 2003, a two-day training workshop was conducted, followed by a week of field training activities. The purpose of the training workshops was to induct volunteers into the Program, outline the purpose and objectives of the project and recruit volunteers into the Program.

Workshops were successful in attracting over 40 participants from all over the region, including from the Pilbara Region, specifically from Wickham and Port Hedland. As a result of these workshops and training days, the Care for Hedland Environmental Interest Group and community members from Wickham subsequently applied for funds to undertake a similar monitoring program for Flatback turtles (*Natator depressus*) turtles in the Pilbara Region. The Turtle Team has endeavored to assist with training and the provision of monitoring manuals for the monitoring, in the 2004/2005 monitoring season. In addition, interest from Carnarvon and Red Bluff was stimulated over the training workshop and field days. This resulted in the establishment of monitoring at Red Bluff. The Turtle Team is awaiting results from this monitoring.

Training in the first three weeks of monitoring was generously provided by Murdoch University PhD Candidate David Waayers. Additional training and competency assessment were provided by Susie Bedford (Cape Conservation Group) and Roland Mau (Department of CALM). All members of the NCTMP and Coordinator have received competency certificates.

Nearly all of the 63 volunteers were awarded with competency certificates in the 2003/2004 monitoring season. All volunteers must be assessed as competent prior to monitoring in absence of a trainer.

Considerable training needs to be invested in volunteers. For this Project, a minimum of 3 weeks commitment for non-local volunteers was considered necessary.

Turtle observation is a major draw-card for volunteer involvement in the NCTMP. To this end, it was noted that volunteers, particularly those that are non-local, should undergo appropriate training on codes of conduct for turtle observation (nesting process and hatchlings) in order to set standards and minimise potential impacts to turtle activities.

As there is a strict protocol in place for the training of volunteers it is recommended that a similar protocol/procedure be established in order to “train-the-trainers” to appropriate standards. The protocol is currently in draft form and was trialed during the 2003/04 season to eliminate any potential issues. A full package including train-the-trainer video, program brochure and volunteer training CD Rom should be available for the 2004/2005 nesting season.

**Recommendation 14:** The Turtle Team work with interested community groups in the Pilbara and assist in the establishment of a similar community monitoring program in this region through the provision of training and advice

**Recommendation 15:** Turtle Observation and Codes of Conduct protocols be integrated into the monitoring and competency training and certification procedure for all volunteers

**Recommendation 16:** Continue to recommend a minimum 3 week commitment to the program for non-local volunteers

**Recommendation 17:** Develop a Train-the-Trainer Package

**Recommendation 18:** Develop a training video/DVD/CD Rom for volunteers

#### ***Volunteer accommodation***

Accommodation for volunteers proved to be an issue over the season due to the greater than expected number of non-local volunteers involved in the 2003/2004 monitoring season. A major compounding problem was the lack of adequate funding to set up specific accommodation for these volunteers.

It transpired that three private houses, Turtle Head Quarters and CALM volunteer quarters were utilised over the season to accommodate the volunteers, with all volunteers paying a standard \$60 per week for rent and utilities. All accommodation was on a shared basis and a booking system was implemented in advance. Volunteers were expected to clean premises and keep facilities in good condition.

Initially, the system worked smoothly, however, due to unexpected changes in volunteer arrival schedules, pre-booked volunteer accommodation schedules were disrupted, which had a flow-on effect for the rest of the season. There was a period of approximately six days where volunteer accommodation was at a shortfall and the Coordinator had to provide space in their personal residency for volunteers. Volunteers were also moved around too frequently at one stage, which

was disruptive and inconvenient for both non-local and local volunteers. In addition, volunteer accommodation shortages became time-consuming for the coordinator and difficult to manage.

**Recommendation 19:** Separate volunteer accommodation is arranged for the 2004/2005 nesting season with an advance booking protocol. Late arrivals and those that change booking dates may not be able to be accommodated at times when volunteer accommodation is at full capacity.

**Recommendation 20:** A local rental property large enough to host 10 people or more be leased by NCTMP. Use of CALM Head Quarters a second option and designated local residents are a third option. Once the accommodation is at full capacity, additional non-local volunteers will be required to arrange their own accommodation means.

### *Volunteer Social Events*

To encourage volunteers to remain enthusiastic and to integrate with the local community, a number of social events for volunteers were held. These included turtle season celebrations, breakfast functions at the Sailing Club, BBQs at volunteer head quarters, and an end of season celebration.

**Recommendation 21:** Continue to provide a means of integrating non-local volunteers with local volunteers through the provision of social event opportunities.

## **Communication**

Communication of the Program has taken the form of a newsletter and newspaper articles (WWF Wildlife News, CALM Landscape, Northern Guardian, The West Australian), posters, workshops and through the Ningaloo Turtle Conference held in September 2003 (proceedings available on request). Communication has also been undertaken through email networking, particularly via the Coordinator, during volunteer recruitment. The development of a website and a volunteer package and brochures for the NCTMP will aid substantially in increasing the profile of the program, educating the general public about the plight of marine turtles, informing interested individuals and groups about the project, and disseminating results and other relevant information on the Program.

In addition, the Department of Defence funded CALM in 2003 to conduct a public education program on 1080 fox control with a focus on the protection of turtle nests from fox predation.

**Recommendation 22:** That a NCTMP Brochure and information package for volunteers be developed.

**Recommendation 23:** Information to be placed on website to direct interested participants and reduce demands on the coordinator's time commitments.

## **Growth and expansion of the NCTMP**

Scoping and consideration of the expansion of the Ningaloo Marine Turtle Program and the NCTMP was carried out over the course of the past year. The following extensions are recommended to occur in the 2004/2005 monitoring season:

- Extension to the Bundera Coastal Protection Area
- Extension to the Pilbara Coast through collaborative work with the Care for Hedland Environmental Interest Group
- Expansion of volunteer opportunities to include aiding in the operation of the Jurabi Turtle Centre through the provision of interpretative guides and scouts.

Further negotiations with relevant stakeholders and the success of funding applications will be vital to ensuring that the above mentioned extensions of the NCTMP can occur in the 2004/2005 monitoring season.

**Recommendation 24:** NCTMP Managers and Coordinator plan for the expansion of the program (pending successful funding application outcomes) for the 2004/2005 turtle monitoring season.

# Monitoring Results – 2003/2004 Turtle Nesting Season

## Methods

The Ningaloo Community Turtle Monitoring Program (NCTMP) has been undertaken in a formal capacity for the past two years. Results from the monitoring effort for the 2002/2003 Turtle and the 2004/2005 turtle nesting seasons are outlined in the section below.

The following steps outline the general protocol used to ensure that sufficient data of high quality is acquired and analysed:

### *Volunteer recruitment*

Volunteers are vital to the successful implementation of the NCTMP. These include local volunteers and non-local volunteers. Volunteers were recruited through the Cape Conservation Group (local membership); local media including newspaper articles; posters and through workshops and information days such as the Ningaloo Turtle Conference in September 2003.

Volunteers have also been recruited through universities, in particular Murdoch University, websites and newsletters including WWF's Wildlife News and the Threatened Species Network Newsletter, The Web.

### *Volunteer Training*

New volunteers participate in a robust training and competency assessment, including provision of a field manual and field based on-the-job training. Once volunteers felt confident in the application of the monitoring method, competency-based assessments were applied with extensive experience and knowledge. Once certified, volunteers were able to conduct surveys without supervision. See Turtle Monitoring Handbook and the volunteer assessment forms.

### *Data collection*

The Ningaloo-Carnarvon area was divided into a spatial hierarchy of Divisions, Sections and sub-Sections to assist in the management and distribution of resources. Beaches were divided up predominantly based on pragmatic considerations such as geographical barriers that separate beaches, the location of carparks and the time required to monitor a section of beach. Sections and Sub-sections were prioritised based on previous data collection in 2002/2003 and 2001/2002 turtle nesting seasons and from aerial surveys undertaken by David Waayers in 2003.

The turtle coordinator rostered volunteers for each morning and allocated sections of beach to be monitored largely based on the number of volunteer availability. Volunteers were required to meet at a central nominated location each morning for a briefing session from the coordinator. Sections were allocated to competent volunteers and kits and GPSs were handed out for each sub-section to be monitored.

Once at the designated Section, competent volunteers followed the standard monitoring methodology. Monitoring typically commenced with locating the marker at the beginning of the subsection. Volunteers then commenced the monitoring of beach through walking at high tide level in search of evidence of turtle nesting from the previous night. Successful nesting activity (and GPS coordinates) false crawls, disturbed nests, evidence of prints, and the location of nests in context of beach topography were recorded.

Once sections had been completed, volunteers returned to Exmouth and submitted monitoring forms to Coordinator for data entry.

### ***Data entry***

Data entry was carried out on a central Microsoft Access database hosted by the Department of CALM Exmouth District. The database allows for standard queries and the output of report summaries to improve the ease and efficiency of data analysis.

Data was entered under the following categories on data sheets and in the data base. These categories and their definitions are outlined below:

**Species type** – Green (G), Loggerhead (L), Hawksbill (H), Unidentified (U)

**GPS Position** – the longitudinal and latitudinal coordinates for the position of a successful nest only (note: successful nest refers to a successful emergence of adult turtle in laying nets and does not refer to the success of hatchling emergence from nests)

**Fresh/old nest:** Fresh (F), Old (O)

**Position of nests – Intertidal (I)** – nests found in the intertidal zone – high risk of inundation, High (H) – nests found between High tide mark and the edge of vegetation, Edge (E) - nests found between the edge of vegetation and the base of dune, Dune (D) nests found between the base of the dune and beyond.

**Prints** - refers the presence of prints within the vicinity of a successful nest. Prints can be categorised into Fox (F), Human (H), Vehicle (V), Dog (D), Cat (C) and Goanna (G).

**False Crawls (FC)** refers to a non nesting emergence. No GPS coordinates are taken for false crawls.

All data forms are entered into the database, usually within once week of acquisition. Data was recorded in Sub-Sections and results for Sub-Sections within the Northwest Cape Division has been the focus of this report.

### ***Data analysis***

#### ***Adjusting effort – Number of nests for each species***

In the 2003/2004 monitoring season, it was not possible to gain 100% effort in each sub-section due to a shortage of volunteers and available vehicles. In order to analyse data and provide results that reflect the nesting success of each sub-section, it was important that data for each sub-section was adjusted for effort. A moving average statistical approach was used to fill in gaps, however, it should be noted that the more gaps there are in data sets, the less accurate this approach will be. A moving average projects values in the forecast period, based on the average value of nests over a specific number of preceding periods. A moving average provides trend information that a simple average of all historical data would mask. Data sets with significant gaps were displayed as raw data in tables and were not subject to statistical analysis.

#### ***Nesting Success (Proportion of successful nests of total emergence)***

To determine the nesting ratios, successful emergences to non-successful emergences, a percentage was used which was calculated based on the number of days monitored and the number of false crawls to successful nests of non-adjusted data. This provided ratios of successful to non-successful nests. The number of successful nests to non-successful nests was calculated by adding all emergences and presenting successful nests as a percentage of total emergences.

### ***Significance of potential disturbance***

To determine the relative significance of foxes and humans in each sub-section, the number of recorded fox and human prints was divided by the number of total days monitored for each sub-section for each month which provides a daily average of prints/nests. The lower the monitoring days, the less accurate the results.

### ***Green turtle nesting peaks and intervals between peaks***

Adjusted data was used to developed histograms for green turtles in each sub-section. This was then combined to provide nesting peaks and intervals at a Section and Division level. Peaks were determined by identifying the highest peak in any one cluster of high nesting activity. The methodology for this analysis might need review and reform.

## **Results - Analysed data and recommendations**

Table 1. Monitoring weeks and corresponding dates

Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10	Week 11	Week 12	Week 13
1/12/03 7/12/03	8/12/03 14/12/03	15/12/03 21/12/03	22/12/03 28/12/03	29/12/03 4/1/04	5/1/04 11/1/04	12/1/04 18/1/04	19/1/04 25/1/04	26/1/04 1/02/04	2/2/04 8/2/04	9/2/04 17/2/04	16/2/04 23/2/04	24/2/04 29/2/04

### **Abbreviations and definitions for the purposes of this report:**

**G** = Green

**L** = Loggerhead

**H** = Hawksbill

**U** = Unidentified/unknown

**Successful nest:** an emergence that has resulted in a nest

**False crawl:** an emergence that has not resulted in a nest

**Successful nesting:** the number of successful nests as a percentage of total emergences

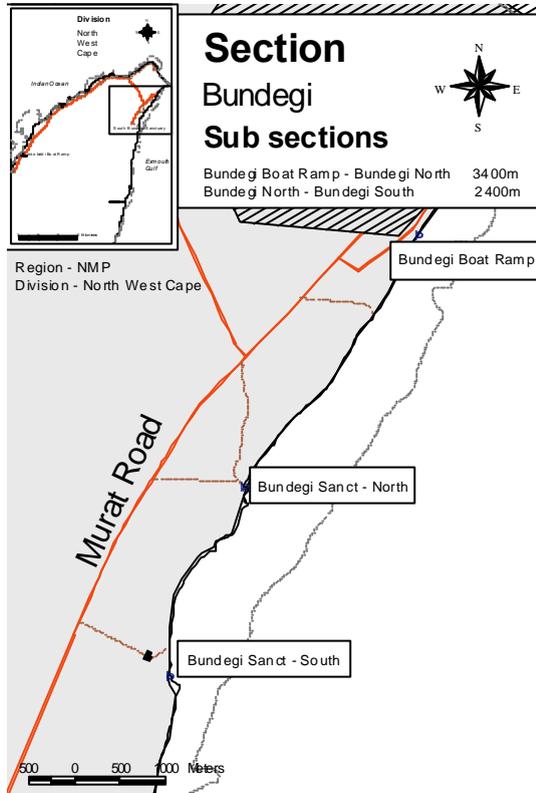
**Effort:** the number of days or percentage of days monitored throughout the duration of the 2003/2004 program

**Actual disturbance:** Nests that show evidence of physical disturbance

**Potential disturbance:** areas that exhibit evidence of potential disturbances such as the presence of fox and human prints around nests, not necessarily physically disturbed.

## North West Cape Division

### BUNDEGI Section

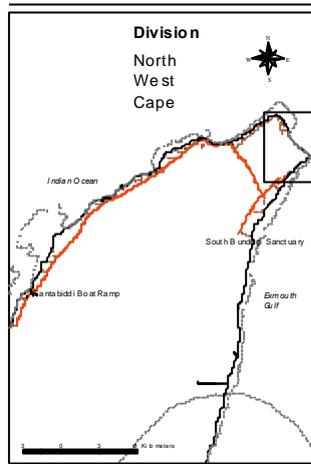


**Map 1 Bundegi Section**

Although this Section was highlighted as a monitoring Section in the 2003/2004 Ningaloo Community Turtle Monitoring Manual, records indicate that no monitoring took place in this Section during the 2003/2004 monitoring season. Given the low levels of nesting activity in adjacent Sub-Section, this Section is not a priority for 2004/2005 turtle-nesting season.

**Recommendation 1:** Do not apply effort to monitor Bundegi Sub-Section in 2004/2005 season.

## SECTION: NAVY PIER



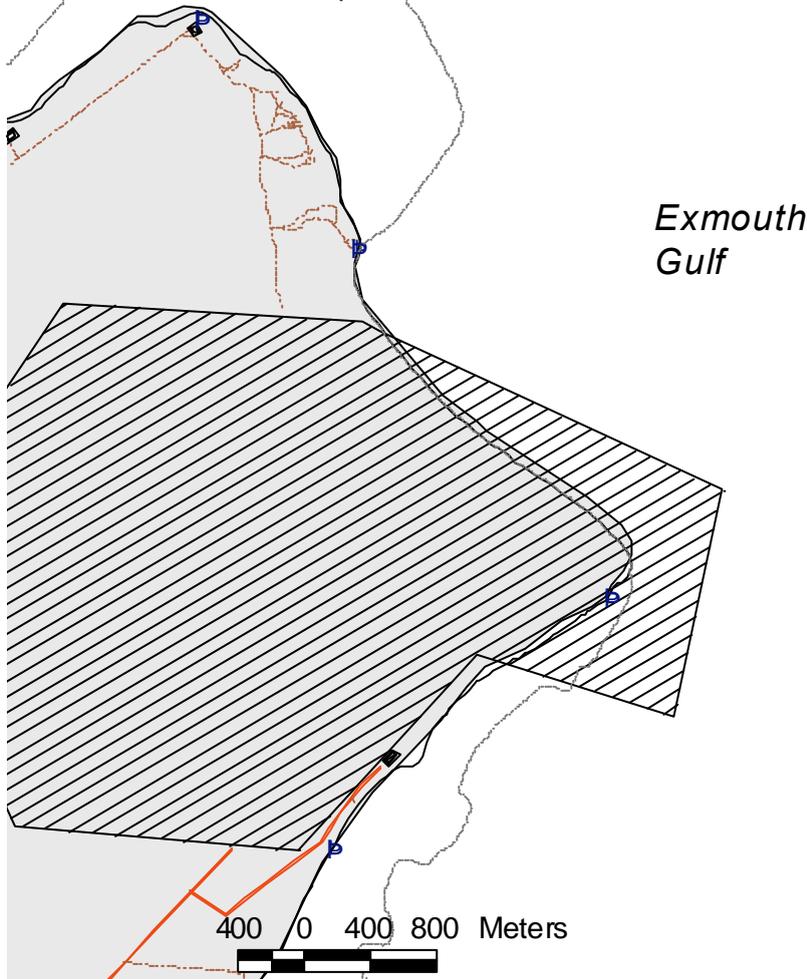
Region - NMP  
Division - North West Cape

# Section

## Navy Pier

# Sub section

Mildura Wreck - VFL Bay  
VFL Bay - Point Murat  
Point Murat - Boat Ramp North  
Boat Ramp North - Bundegi Boat Ramp



Map 2. Navy Pier Section and associated Sub-sections Sub-Section: Bundegi Jetty – Point Murat

### **Bundegi Jetty – Point Murat Sub-Section**

**Table 2. Summary of results Bundegi Jetty – Point Murat**

Sub-Section	Coordinates	G	H	L	U	Total nests	Successful nesting emergence %	Effort (no. of days)
Bundegi Jetty – Point Murat	21.82592 S, 114.17741 E 21.81638 S, 114.19002	1	0	1	0	2	Could not be calculated	19

Results indicate that this sub-section has very little turtle nesting activity. Due to the minimal days monitored, a moving average was not used for data analysis in this sub-section. Nesting success could not be calculated.

**Recommendation 2:** Monitoring is discontinued in Sub-Section Bundegi Jetty – Point Murat.

### **Point Murat – VLF Bay Sub-Section**

**Table 3. Summary of results Point Murat – VLF Bay**

Sub-Section	Coordinates	G	H	L	U	Total nests	Nest success % (Degree of accuracy: L)			Effort (no. of days)
							G	H	L	
Point Murat – VLF Bay	21.81636 S 114.19002 E to 21.79872 S 114.17418 E	6	1	1	2	10	54	50	100	26

#### ***Number of nests***

Table 3 and Figure 2 indicate that Point Murat – VLF Bay Sub-section had the highest number of successful nests that any other sub-section within Navy Pier Section. This sub-section also had the highest effort of any subsection in Navy Pier Section. A moving average technique was used to fill gaps in monitoring effort and provide an overall estimate for the number of nests in this sub-section.

There were only six successful Green nests, one Hawksbill, one Loggerhead and two unidentified successful nests in this sub-section.

#### ***Nesting success***

This sub-section presents a high degree of nesting success. The nesting success for Green, Loggerhead and Hawksbill turtles were 54%, 50% and 100% respectively (Table 3) Note that the low levels of turtle activity make it difficult to present accurate percentages of nesting success.

#### ***Comparison to other sub-sections***

VLF Bay is the most significant sub-section within the Navy Pier Section, however, when compared to other sub-sections in Lighthouse Bay, Hunters and Graveyards, Point Murat – VLF Bay is insignificant.

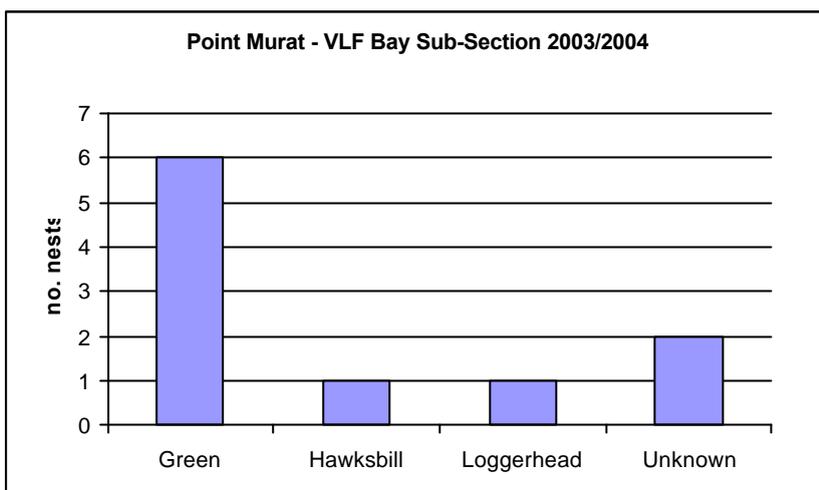


Figure 2. Number of successful nests in Point Murat – VLF Bay Sub-Section

**Recommendation 3:** Monitoring in this section is discontinued and monitoring efforts are concentrated in recommended subsections.

### VLF Bay – Mildura Wreck Sub- Section

Table 4. Summary of results VLF Bay – Mildura Wreck

Sub-Section	Coordinates	G	H	L	U	Total nests	Nest success % (Degree of accuracy: L)			Effort (days)
							G	H	L	
VLF Bay – Mildura Wreck	21.7982 S, 114.17418 E 21.78634 S, 114.16460 E	1	1	1	0	1	Could not be calculated			22

#### *Number of nests*

Table 4 indicates that there are low levels of turtle nesting in this sub-section. A total of three turtle nests were located during monitoring over nineteen days. A moving average could not be used in this sub-section due to low levels of nesting activity.

#### *Nesting success*

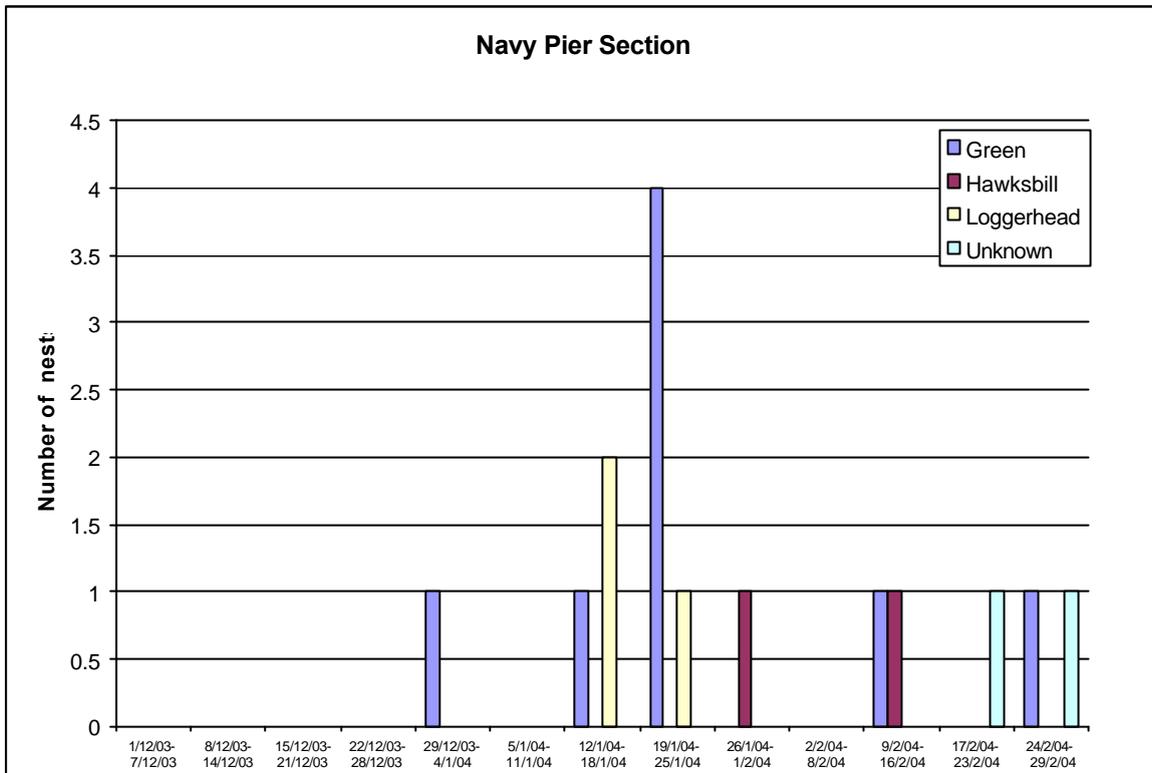
Only one false crawl was recorded in this sub-section. Given the low numbers of emergences, it is difficult to provide nesting success ratios for each species in this sub-section. In general, there seems to be a high degree of nesting success with up to 100% for each species. It should be noted that only three successful nests were recorded in this sub-section.

#### *Comparison between other sub-sections*

There was very low levels of emergences in this sub-section when compared with sub-sections in other Sections such as Hunters, Graveyards and even Lighthouse Bay.

**Recommendation 4:** Monitoring in this section is discontinued and monitoring efforts are concentrated in recommended subsections or sub-section boundaries are reduced to only include the sandy section of several hundred metres adjacent to Mildura Wreck.

## Overall Results for Section Navy Pier



**Figure 3** Number of successful nests for each species in Navy Pier Section 2003/2004 Turtle Nesting Season.

### *Number of nests*

Figure 3 indicates that Navy Pier Section has relatively low turtle nesting when compared to other Sections in the North West Cape Division (see results for Hunters and Graveyards Sections). The most abundant species of turtle is Green followed by the Loggerhead and Hawksbill turtles (with only two successful nests recorded).

### *Nesting success*

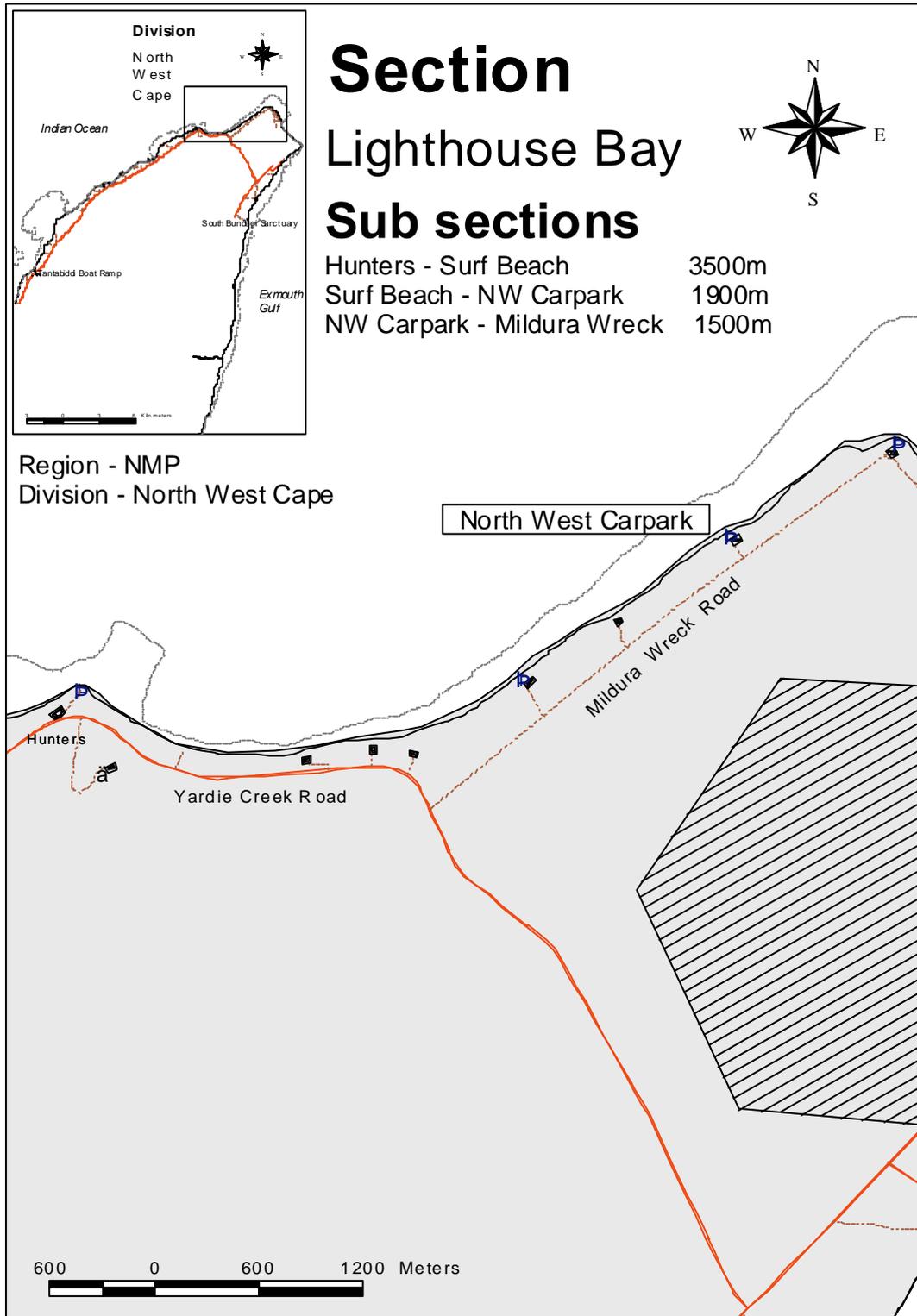
Overall, nesting success in this Section is high, with hawksbill and loggerhead turtles presenting up to 100% nesting success and green turtles over 50% nesting success.

### *Comparison to other Sections*

Figure 32 in the summary of results for Northwest Cape Division indicates that that the Navy Pier Section is insignificant relative to other Sections monitored in North West Cape Division 2003/2004 turtle monitoring season.

**Recommendation 5:** Monitoring in all sub-sections of the Navy Pier Section is discontinued for 2004/2005 turtle nesting season.

## SECTION: LIGHTHOUSE BAY



Map 3. Section Lighthouse Bay

## Mildura Wreck – Northwest Carpark Sub-Section

**Table 5. Summary of results Mildura Wreck – Northwest Carpark Sub-Section**

Sub-Section	Coordinates	G	H	L	U	Total nests	Nest success % (Degree of accuracy: M)			Effort (days)
							G	H	L	
Mildura Wreck – Northwest Carpark	21.78571 S, 114.16519 E 21.79186 S 114.15406 E	23	0	1	1	24	66	0	33	44

### *Number of nests*

Figure 4 indicates that Green turtles are the most abundant with 23 successful nests. There was no Hawksbill nests recorded and only one Loggerhead nest recorded on 11/2/2004.

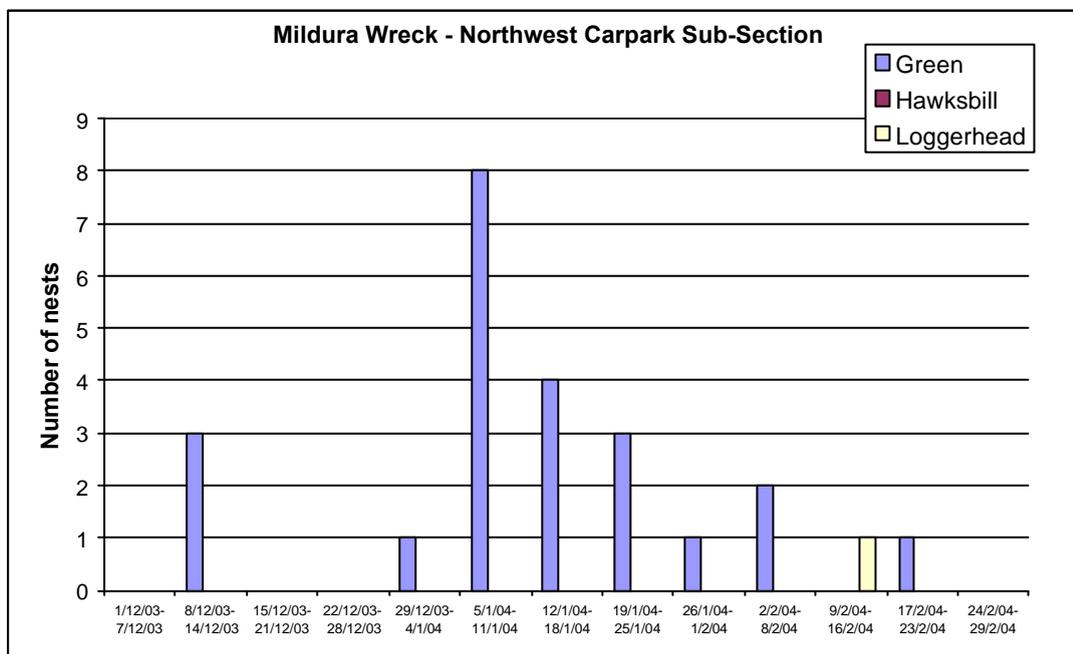
There was a peak in nesting for green turtles in Week 6 (5/1/2004 –11/1/2004) of the monitoring program which was the second week of January 2004.

### *Nesting success*

The nesting success of Green turtles was high (66%) in this subsection (Table 5). The nesting success of loggerhead turtles was 33% whereas hawksbill turtle tracks were not observed.

### *Comparison to other sub-sections*

When compared to other sub-sections within Lighthouse Bay Section, Mildura Wreck to Northwest Carpark Sub-Section has the least number of nests of all species (Figure 8).



**Figure 4 Number of successful nests for each species in sub-section Mildura Wreck – Northwest Carpark in 2003/2004 Turtle Nesting Season.**

**Recommendation 6:** Continue to monitor Sub-Section Mildura Wreck – Northwest Carpark in 2004/2005 nesting season.

**Sub-Section: Northwest Carpark – Surf Beach**

**Table 6 Summary of results for Northwest Carpark Surf Beach**

Sub-Section	Coordinates	G	H	L	U	Total nests	Nest success % (Degree of accuracy: M)			Effort (days)
							G	H	L	
Northwest Carpark Surf Beach	21.79186 S, 114.15406 E 21.80162S, 114.1355E	61	2	4	1	32	32.5	66.66	80	45

***Number of nests***

There was a low abundance of Hawksbill and Loggerhead nests in Northwest Carpark – Surf Beach Sub-Section with a maximum of one nest per week for each species. Loggerhead nesting was slightly higher than Hawksbill nesting in this Sub-Section.

The results in Table 6 show similar effort to the Northwest Carpark – Mildura Wreck Sub-Section but significantly more turtle nests. Green turtles are the most significant with 61 nests when compared with 2 Hawksbill nests and 4 Loggerhead nests.

Green turtle nesting peaked in weeks 6 and 10 with 11 success nests recorded (Figure 5).

***Nesting success***

According to Table 6 Green turtles have a nesting success of 32.5% in this sub-section. Loggerhead turtles have a high nesting success with 80% and Hawksbill turtles are estimated at having a 66.66% nesting success in this sub-section.

Note: low numbers of nesting activity for Loggerhead and Hawksbill turtles recorded in this sub-section

***Comparison to other sub-sections***

The Northwest Carpark – Surf Beach Sub-Section is the most significant sub-section for Green turtles in the Lighthouse Bay Section (Figure 8). It is not the most important sub-section for Hawksbill or Loggerhead turtles in this section.

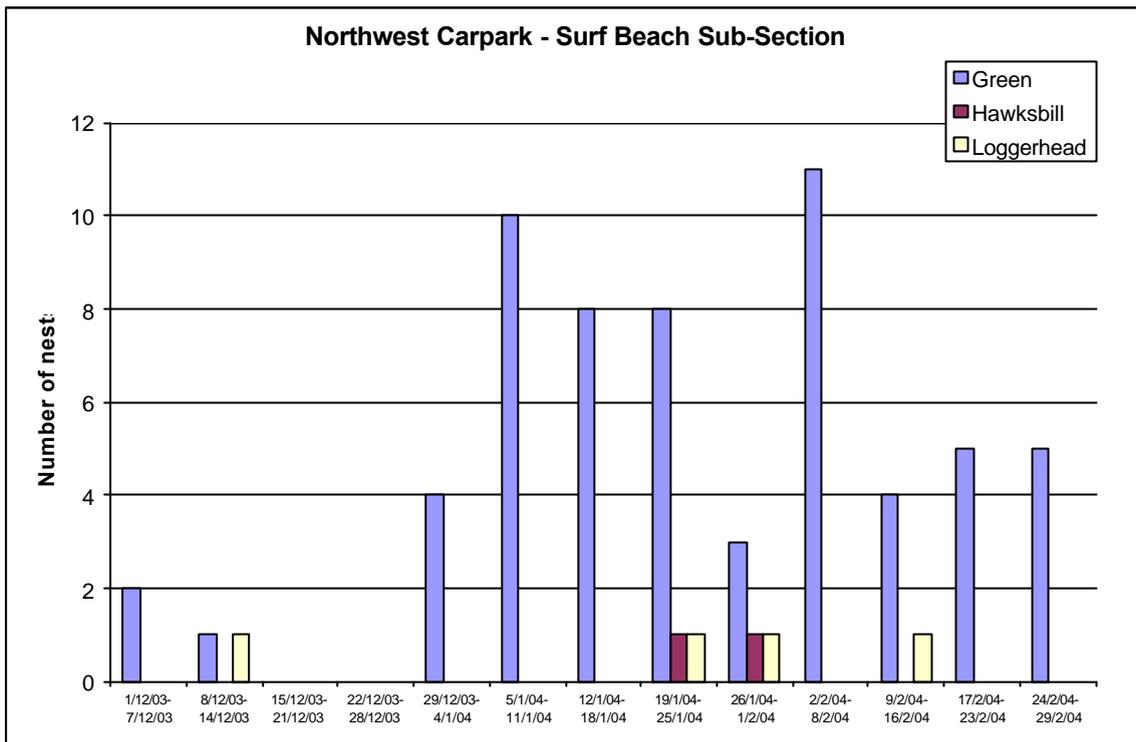


Figure 5 Number of successful nests for each species in Sub-Section Northwest Carpark – Surf Beach 2003/2004 Turtle Nesting Season.

**Recommendation 7:** Continue monitoring of this Northwest Carpark – Surf Beach Sub-Section in the 2004/2005 turtle nesting season.

**Sub-Section: Surf Beach – Hunters**

Table 6. Summary of results for sub-section: Surf Beach to Hunters

Sub-Section	Coordinates	G	H	L	U	Total nests	Nest success % (Degree of accuracy: M)			Effort (days)
							G	H	L	
Surf Beach to Hunters	21.80162S, 114.1355E 21.80279 S, 114.10873 E	46	3	6	4	69	18.88	42.86	57.89	52

***Number of nests***

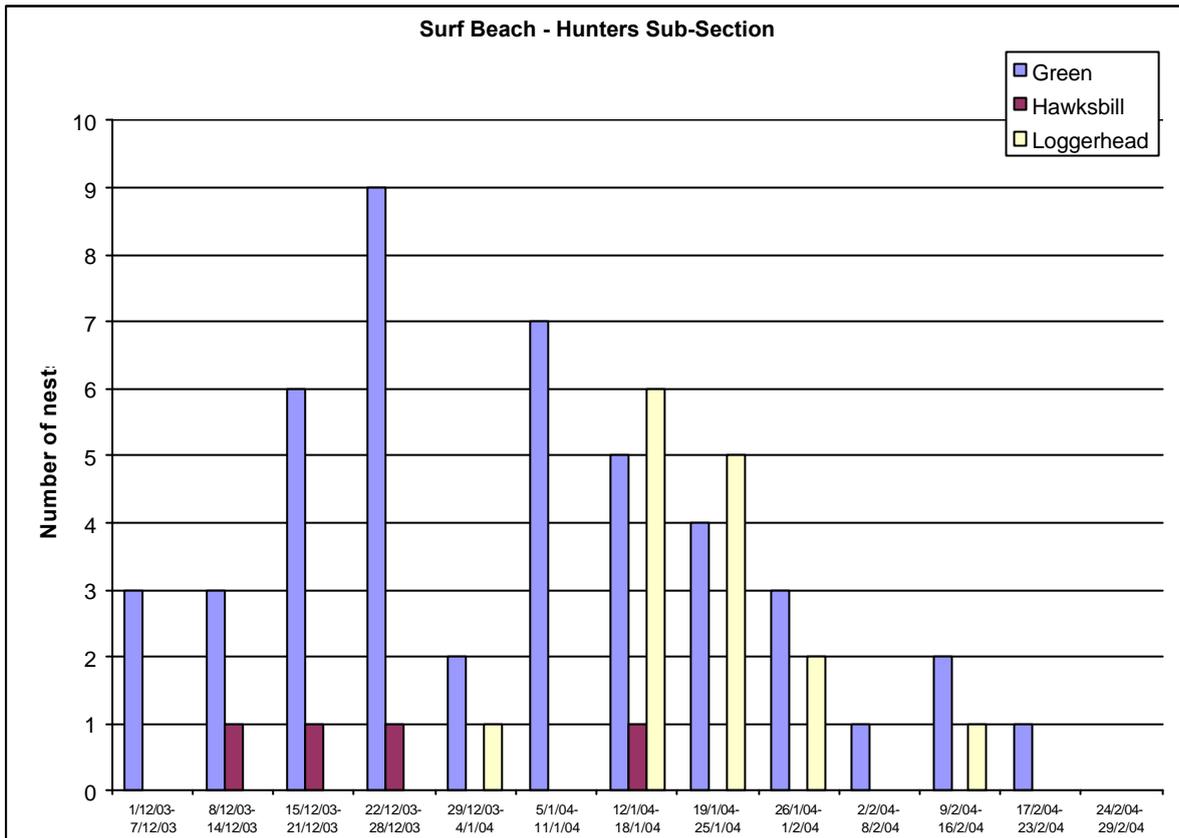
Table 6 indicates that the Surf-Beach to Hunters Sub-Section had a total of 69 successful nests. Of these, 46 were Green, 6 were Loggerhead and 3 were Hawksbill turtle nests. Green turtle nesting peaked in Week 4 (22/12/2003 – 21/12/2003) and Loggerhead turtle nesting peaked in Week 7 (12/1/2004 – 18/1/2004). Figure 6 indicates that Green turtles in this sub-section peaked in December 2003 and Loggerhead turtles peaked in mid-late January 2004. All data in this sub-section has been adjusted for effort using a moving average. Green turtle nesting is the most abundant, followed by Loggerheads and finally by Hawksbills (with only 4 nests recorded over the entire season).

***Nesting success***

Green turtles had the lowest nesting success (19%) followed by Hawksbills (43%) with the highest nesting success in Loggerheads (58%).

***Comparison to other sub-sections***

Figure 8 indicates that the Surf Beach – Hunters Sub-Section is the most significant sub-section in the Lighthouse Bay Section for Loggerhead turtles and Hawksbill turtles.



**Figure 6 Number of successful nests for each species in Sub-Section Surf Beach - Hunters 2003/2004 Turtle Nesting Season.**

**Recommendation 8:** Continue monitoring of Surf Beach – Hunters Sub-Section in 2004/2005 turtle nesting season (Note that Surf Beach – Hunters is within Jurabi Coastal Park which is jointly managed by the Department of CALM and Shire of Exmouth).

## Overall results for Lighthouse Bay Section

### *Number of nests*

Figure 7 illustrates that the peak green turtle nesting took place in Week 6 (5/1/2004 – 11/1/2004). Overall, January is the most significant month for Green turtle nesting in the Lighthouse Bay Section.

Weeks 7 and 8 (see table 1 for dates) are peak nesting events for loggerhead turtles with 6 Loggerhead nests recorded in each week. Hawksbill turtles have the lowest nesting abundance with a maximum of 1 turtle nesting per week.

### *Peak nesting month*

Figure 7 indicates that peak nesting month for all species in this Section is January and the first week of February.

### *Species composition*

A total of 130 green turtle nests were estimated for Lighthouse Bay Section. Figure 9 also demonstrates that green turtles are most predominant in this Section followed by loggerhead and hawksbill turtles. The Lighthouse Bay section can be considered as a relatively important mainland green turtle rookery, however, it is less important than the rookeries at Hunters and Graveyards Sections (Figures 18 & 30).

### *Comparison of sub-sections*

The Northwest Carpark – Surf Beach Sub-Section is the most significant for Green turtles, and Surf Beach – Hunters Sub-Section is the most important for Hawksbill and Loggerhead Turtles.

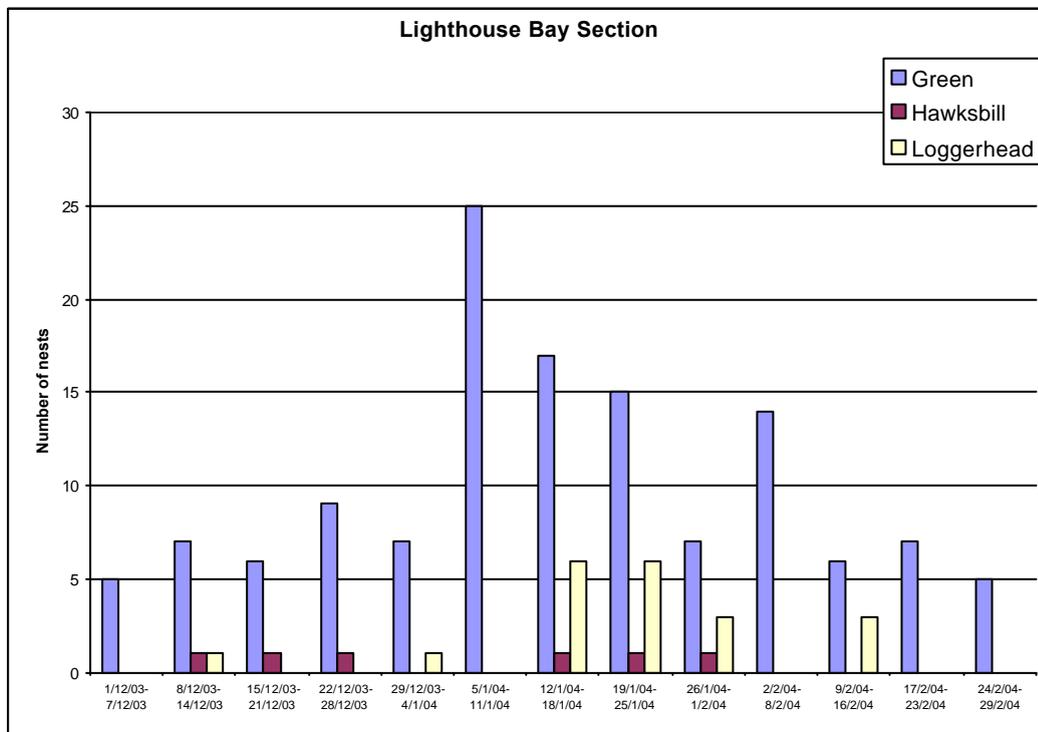
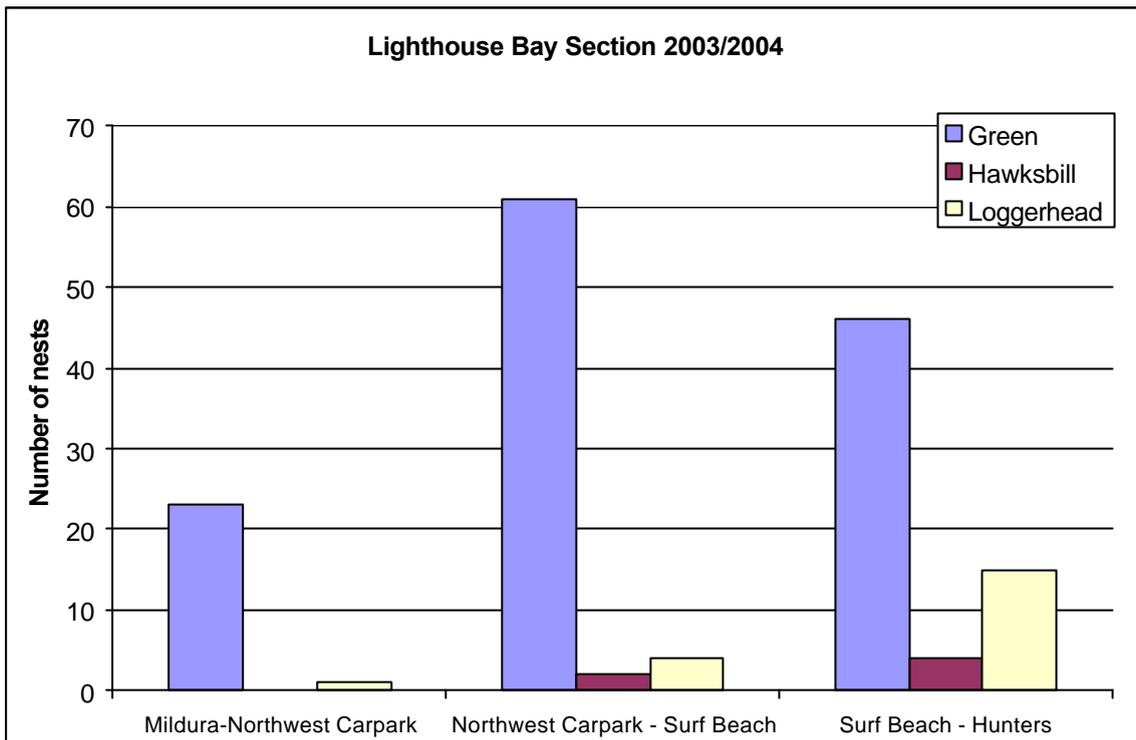
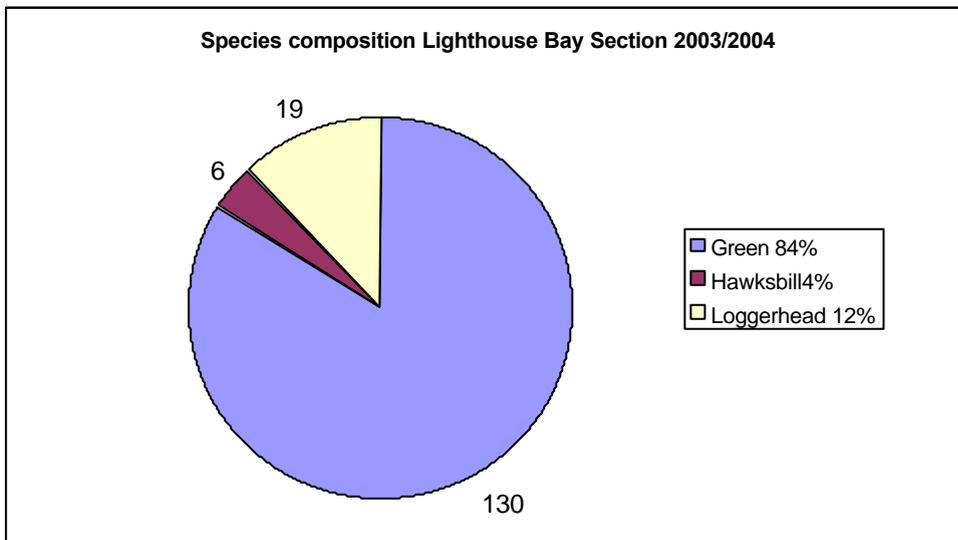


Figure 7. Number of successful nests for each species in Section: Lighthouse Bay



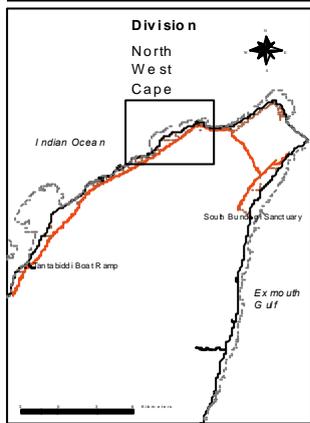
**Figure 8. Comparison between successful nests in sub-sections of Lighthouse Bay Section 2003/2004 Monitoring Season.**



**Figure 9. Species composition and total nests for each species: Light House Bay Section 2003/2004 Turtle Nesting Season.**

**Recommendation 9:** Continue the monitoring program over the three-month period for the Lighthouse Bay Section in 2004/2005 nesting season or, monitor the Section in January (peak nesting month) only.

# SECTION HUNTERS



Region - NMP  
Division - North West Cape

**Map 4 Hunters Section and associated Sub-Sections**

## **Sub-Section: Hunters - Mauritius**

**Table 7. Summary of results for sub-section: Hunters – Mauritius**

Sub-Section	Coordinates	G	H	L	U	Total nests	Nest success % (Degree of accuracy: H)			Effort (days)
							G	H	L	
Hunters - Mauritius	21.80279 S, 114.10873 E 21.80938 S, 114.09532 E	163	12	23	2	200	37.35	57.89	51.11	81

### ***Number of nests***

Monitoring results as shown in Figure 10 indicates that green turtle nesting is the most significant in this sub-section. Green turtle nesting peaked in week 7 (12/01/2004 – 18/01/2004). Loggerhead turtle nesting also peaked in week 7 and Hawksbill nesting peaked in week 10 (2/02/2004 – 8/02/2004).

Results in Table 7 show that 81 days were monitored, which equates to 89% effort. Green turtle nests were significantly the highest, followed by Loggerhead and Hawksbill turtles.

A total of 163 green turtle nests, 23 Loggerhead turtle nests and 12 Hawksbill turtle nests were estimated in this sub-section (Table 7).

### ***Nesting success***

Hawksbill turtles have the highest nesting success with 57.89% nesting success. Loggerheads also have a relatively high nesting success (51.11%) and Greens turtles have the lowest nesting success in this sub-section with only 37.35% of total emergences recorded as successful.

### ***Comparison with other sub-sections***

When compared with other sub-sections in the Hunters Section (Figure 18), the Hunters – Mauritius Sub-Section has the highest recorded nests for Loggerhead and Hawksbill turtles and the lowest for Green turtles.

### ***Nesting Peaks***

**Table 8 Nesting peaks and intervals between peaks for Green turtles in Sub-Section Hunters - Mauritius**

Peaks	11/12/03	27/12/03	1/1/04	12/1/04	21/1/04	2/2/04	10/2/04	17/2/04	22/2/04
Intervals		15	5	11	9	12	8	7	5

Figure 11 indicates that Green turtle nesting peaks occurred at 8 different days in the 13 weeks of monitoring. The highest peak was recorded on 10 February 2004 with 8 successful nests. The highest interval between peaks is 12 days and the lowest is 5 days. There average time between peaks is estimated at 9 days (1-2 weeks).

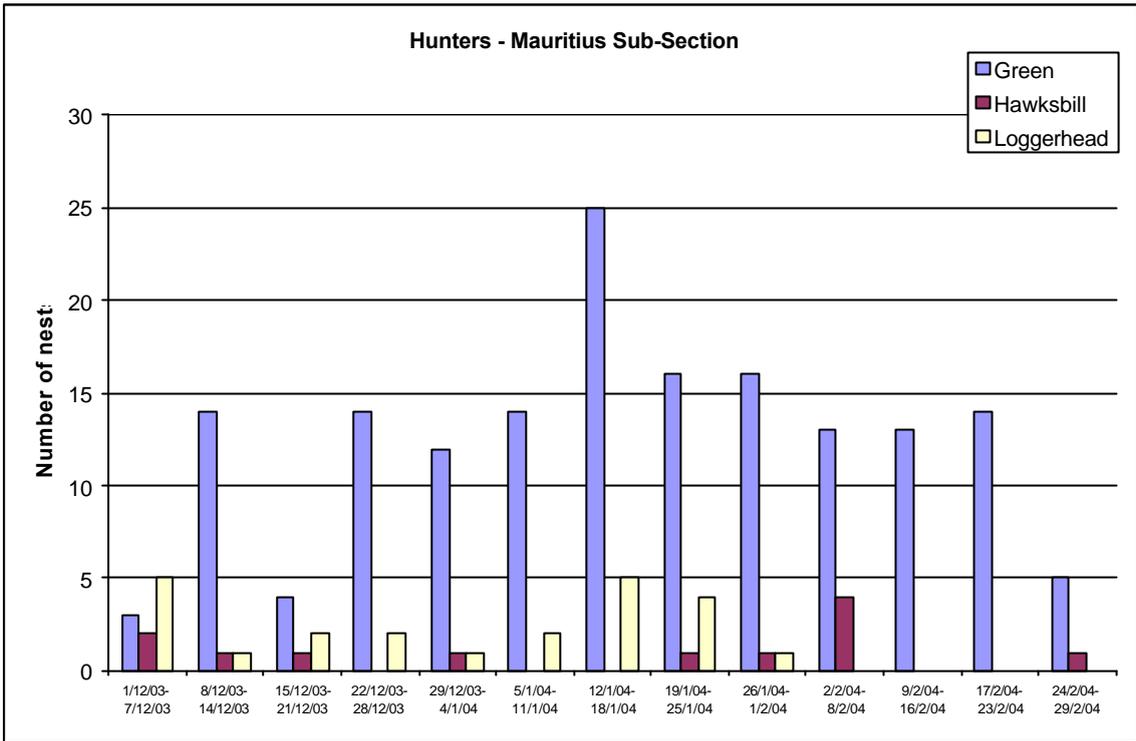


Figure 10. Number of successful nests for each species in Sub-Section Hunters - Mauritius

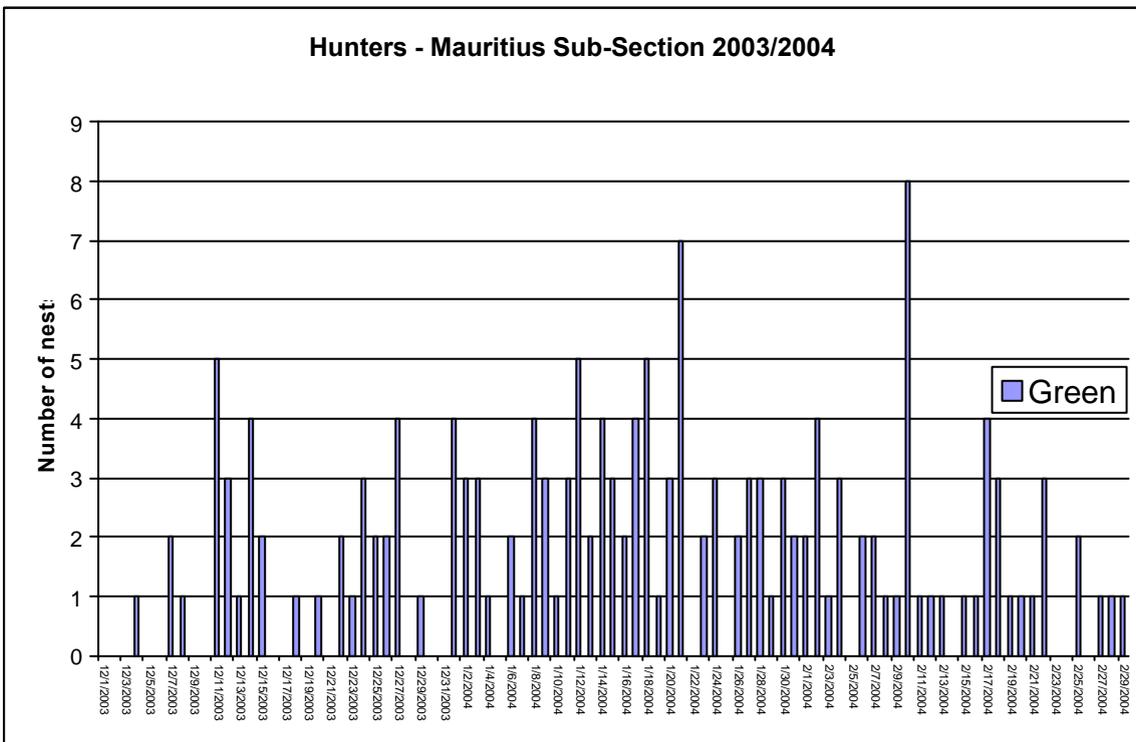


Figure 11 Green turtle nesting per day in Sub-section: Hunters – Mauritius 2003/2004 indicating peaks in nesting success.

**Recommendation 10:** Continue monitoring of Hunters to Mauritius Sub-Section as a priority.

**Recommendation 11:** Use environmental data to look at relationships between peaks and environmental variables

**Sub-Section: Mauritius – Jacobz Sth**

**Table 9. Summary of results for sub-section: Mauritius Jacobz South**

Sub-Section	Coordinates	G	H	L	U	Total nests	Nest success % (Degree of accuracy: H)			Effort (days)
							G	H	L	
Mauritius	21.80938 S, 114.09532 E	258	7	21	5	291	37.03	66.66	65.63	83
- Jacobz	21.81683 S, 114.06835 E									

***Number of nests***

Table 9 indicates that Green turtles are the most predominant in this Sub-Section, with a total of 258 nests, followed by Loggerhead turtles with 21 successful nests, and Hawksbill turtles with only 7 successful nests.

Figure 12 indicates that there are two major green turtle nesting weeks. Weeks 7 and 8 represent peak turtle nesting in this season with 38 successful nests recorded. Week 13 also represents a major green turtle nesting event with 28 turtles nesting successfully in the final week of monitoring.

Loggerhead turtles only nested at a maximum of 4 successful nests per week in 4, 5, 6, 7 with the most loggerhead activity occurring in this sub-section. Hawksbill turtles peaked in Week 12 with only 3 successful nests recorded.

***Nesting success***

Table 9 indicates that Hawksbill and Loggerhead turtles have the highest nesting success (greater than 65%). Green turtles are not as successful with only 37% nesting success recorded.

***Comparison between other Sub-Sections***

Figure 18 indicates that Mauritius – Jacobz South Sub-Section was the most significant green turtle nesting sub-section in the Hunters Section. This sub-section is not the most significant for Loggerhead and Hawksbill turtles.

***Nesting peaks***

**Table 10 Nesting peaks and intervals between peaks for Green turtles in Sub-Section s – Mauritius – Jacobz South**

Peaks	17/12/03	2/1/04	11/1/04	18/1/04	27/1/04	3/2/04	8/2/04	15/2/04	22/2/04	27/2/04
Intervals		16	9	7	9	7	5	7	7	5

Figure 13 indicates that Green turtle nesting peaks occurred at 10 different days in the 13 weeks of monitoring. The highest peak was recorded on 22 February 2004 with 12 successful nests which was the highest turtle nesting event recorded in one day in the entire Northwest Cape Division in the 2003/2004 monitoring season. Table 10 shows the highest interval between peaks is 16 days and the lowest is 5 days. There average time between peaks is estimated at 8 days (approximately 1 week).

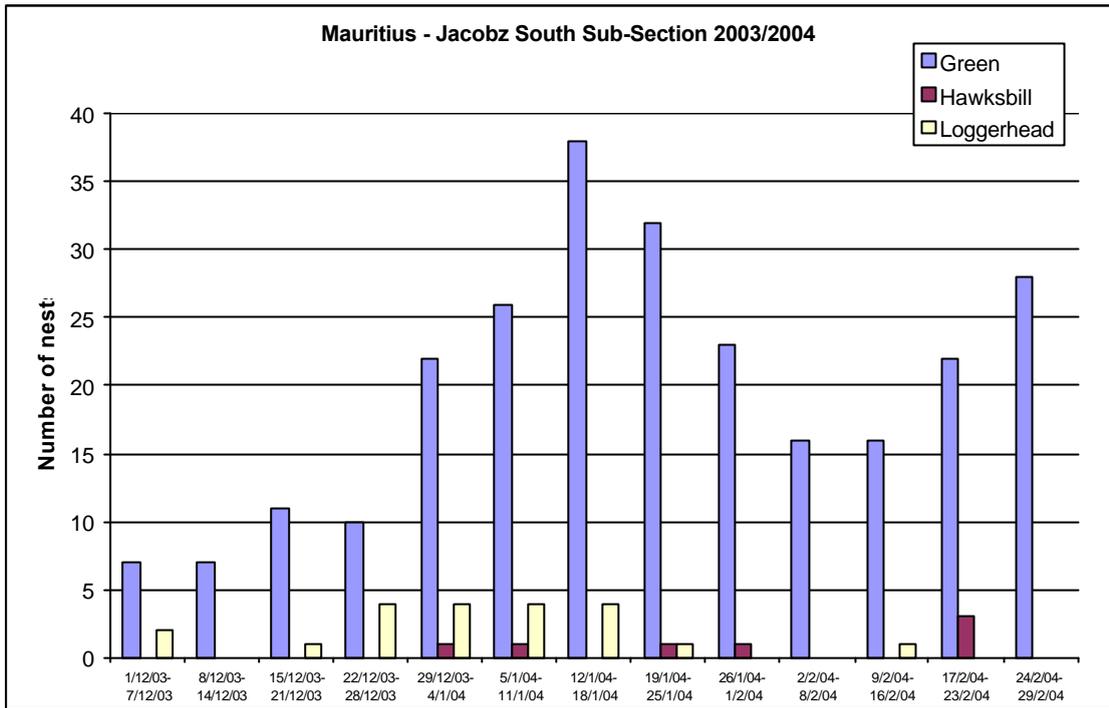


Figure 12. Number of successful nests for each species in Sub Section: Mauritius – Jacobz South

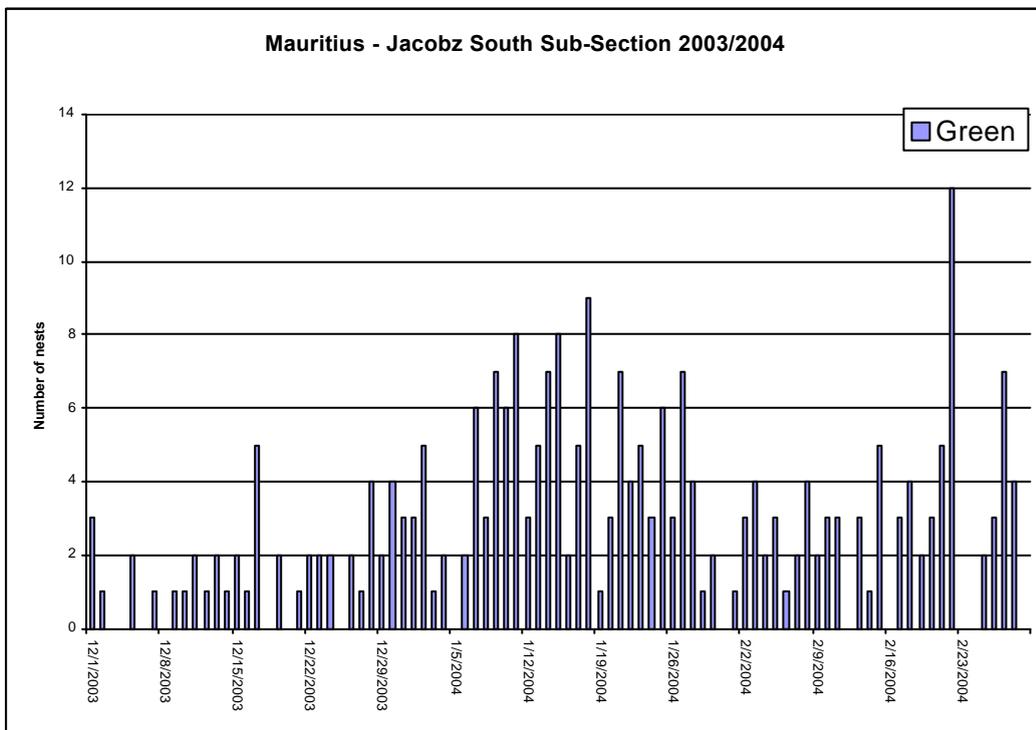


Figure 13 Green turtle nesting per day in Sub-section: Mauritius – Jacobz South 2003/2004 indicating peaks in nesting success.

**Recommendation 12:** Continue to monitor Mauritius – Jacobz south as a high priority monitoring beach

**Recommendation 13:** Use environmental data to determine relationships between peak nesting events and environmental variables, particularly for 22 February 2004.

**Sub-Section: Jacobz South - Wobiri**

**Table 11. Summary of results for sub-section: Jacobz South - Wobiri**

Sub-Section	Coordinates	G	H	L	U	Total nests	Nest success % (Degree of accuracy: H)			Effort (days)
							G	H	L	
Jacobz South – Wobiri	21.81683 S, 114.06835 E 21.83027 S, 114.06484 E	174	3	15	2	194	25.24	50	43.33	85

***Number of nests***

Summary of results in Table 11 indicates that Green turtles had the most successful nests with a total of 174 successful nests recorded. There has been intensive effort at this sub-section with a total of 85 monitoring days. This equates to 93% effort in this sub-section.

Figure 14 shows that there were two Green turtle peak nesting events in Jacobz South – Wobiri Sub-Section in Weeks 3 and 7. During both weeks, Green turtle nests peaked at 24. Loggerhead turtles also peaked in Week 3 with 4 successful nests and Hawksbill nests remained low with a total of 3 for the entire sub-section.

***Nesting success***

There was extremely low green turtle nesting success with four times as many green turtle false crawls than successful nests, which results in only 25.24% nesting success. Hawksbill turtles had the highest nesting success 50% (note low numbers of Hawksbill turtles) and Loggerhead turtles had a 43.44% nesting success in this sub-section.

***Comparison with other sub-sections***

Jacobz – Wobiri Sub-Section is the second most significant sub-section for green turtles in the Hunters Section (Figure 18).

**Table 12 Nesting peaks and intervals between peaks for Green turtles in Sub-Section: Jacobz South - Wobiri**

Peaks	4/12/2003	13/12/2003	21/12/2003	3/1/2004	10/1/2004	18/1/2004	1/2/2004
Intervals		9	8	13	7	8	14

***Nesting peaks and intervals***

Significant nesting peaks occurred on 7 different days in the Jacobz South – Wobiri Sub-Section. The highest Green turtle nesting peak occurred on 18 January 2004 with a total of 7 successful nests. The longest interval between peak nesting events was 14 days and the lowest was 7 days. The average number of days between peak nesting events in the Jacobz South – Wobiri Sub-Section is 10 days (between 1 and 2 weeks).

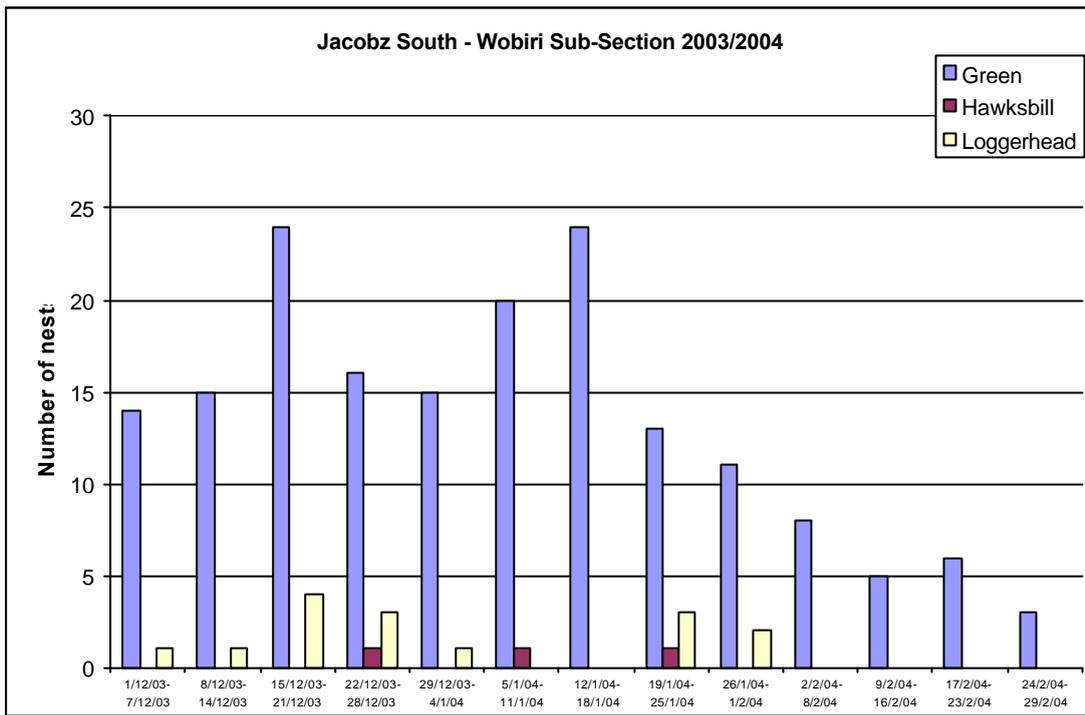


Figure 14. Number of successful nests for each species in Section: Lighthouse Bay

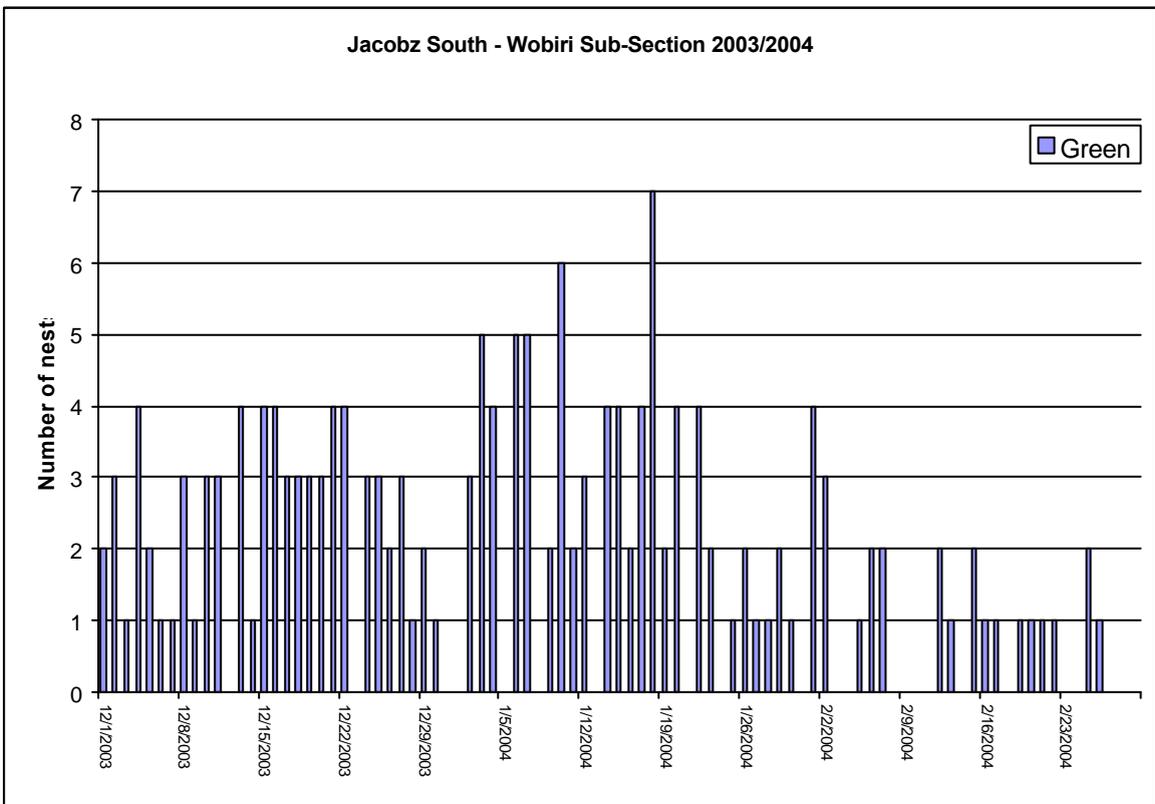


Figure 15 Green turtle nesting per day in Sub-section: Jacobz South – Wobiri 2003/2004 indicating peaks in nesting success.

**Recommendation 14:** Continue to monitor Jacobz South – Wobiri as a priority sub-section in 2004/2005 nesting season.

**Recommendation 15:** Use environmental data to determine relationships between peak nesting events and environmental variables.

## Overall Results for Hunters Section

### *Total number of nests*

Figure 16 clearly indicates that there were two peak weekly green turtle nesting events in the Hunters Section, one in Week 7 and one in week 12. Week 7 had a total of 88 successful green turtle nests, followed by Week 6 with 66 successful green turtle nests. Note that the Green turtle nesting peak in Week 11 is largely attributed to the unusual peak nesting event in the Mauritius – Jacobz Sub-Section (12 nests successful on 22 February 2004). Loggerhead nesting is consistent across Weeks 1 – 9 with only 1 Loggerhead track recorded between Weeks 10 – 13. Hawksbill turtles also present consistent nesting in this Section, with between 1-4 nests per week.

Figure 17 shows that a total of 595 Green turtle nests were recorded in the Hunters Section, followed by 59 Loggerhead turtle and 22 Hawksbill turtle nests. Green turtles represent 88% of the total successful nests in this Section.

The total number of successful nests in Hunters Section is 684 (including unidentified/unknown nests).

### *Comparison with other Sections*

When compared to the Lighthouse Bay Section, the Hunters Section is a more significant turtle rookery supporting more than 4 times the number of Green turtle nests, 3 times more Loggerheads nests and 2 times more Hawksbill nests. It is less significant in terms of total nests than the Graveyards Section (Figure 32).

Figure 19 clearly indicates that Mauritius – Jacobz South is the most significant nesting beach for Green turtles in the Hunters Section in 2003/2004. It is followed by the Jacobz – Wobiri Sub-Section and then Hunters – Mauritius Sub-Section for Green turtles. In relation to Loggerhead turtles, Hunters – Mauritius is the most significant followed by Mauritius –Jacobz South and Jacobz South – Wobiri. The Hunters – Mauritius Sub-Section is the most significant for Hawksbill turtles.

### *Nesting peaks*

**Table 13 Nesting peaks and intervals between peaks for Green turtles in Sub-Section: Jacobz South - Wobiri**

Peaks	11/12/03	2/1/04	18/1/04	27/1/04	2/2/04	10/2/04	22/2/04
Intervals		22	16	19	6	8	12

### *Peaks nesting and nesting intervals*

The highest green turtle nesting peak occurred on 18 January 2004 with a total of 21 successful green turtle nests in the Hunters Section. Peak nesting intervals ranged between 6 and 22 days with an average of 14-day intervals.

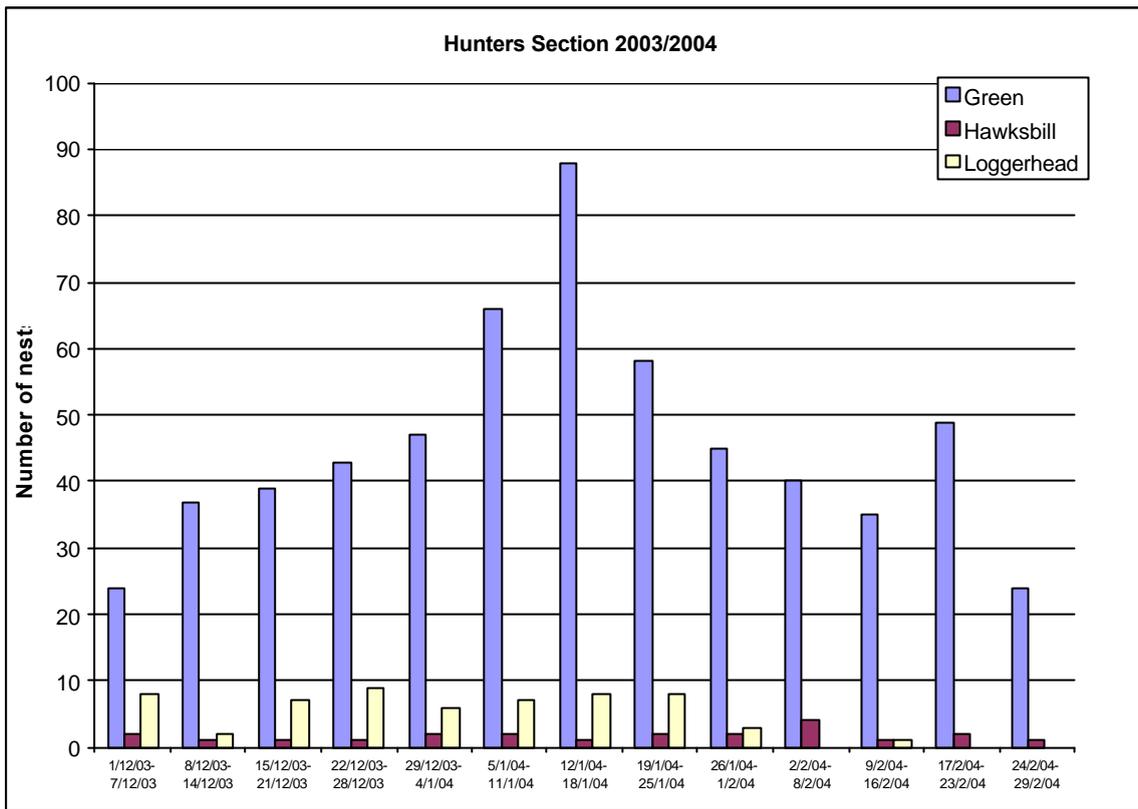


Figure 16 Number of successful nests for each species in Section: Hunters

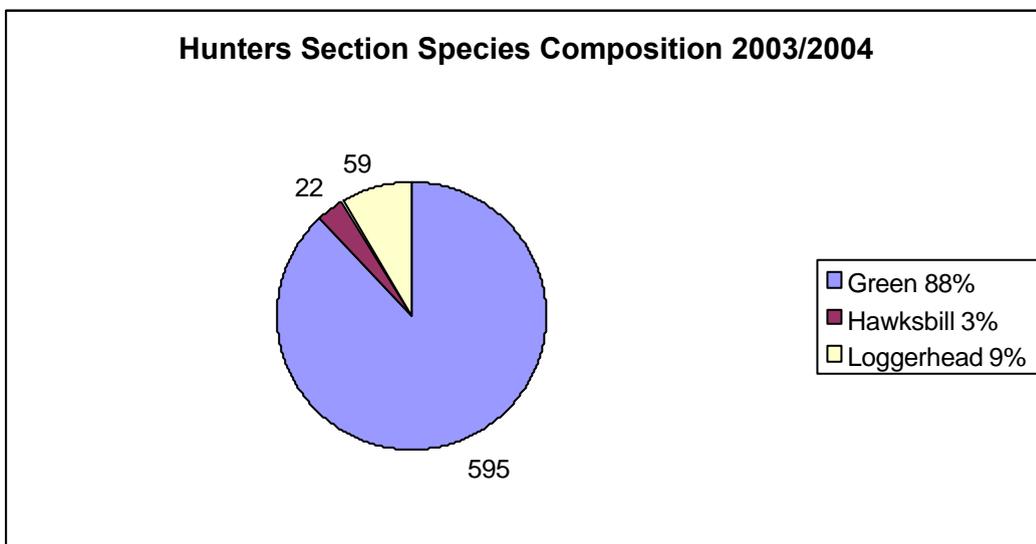
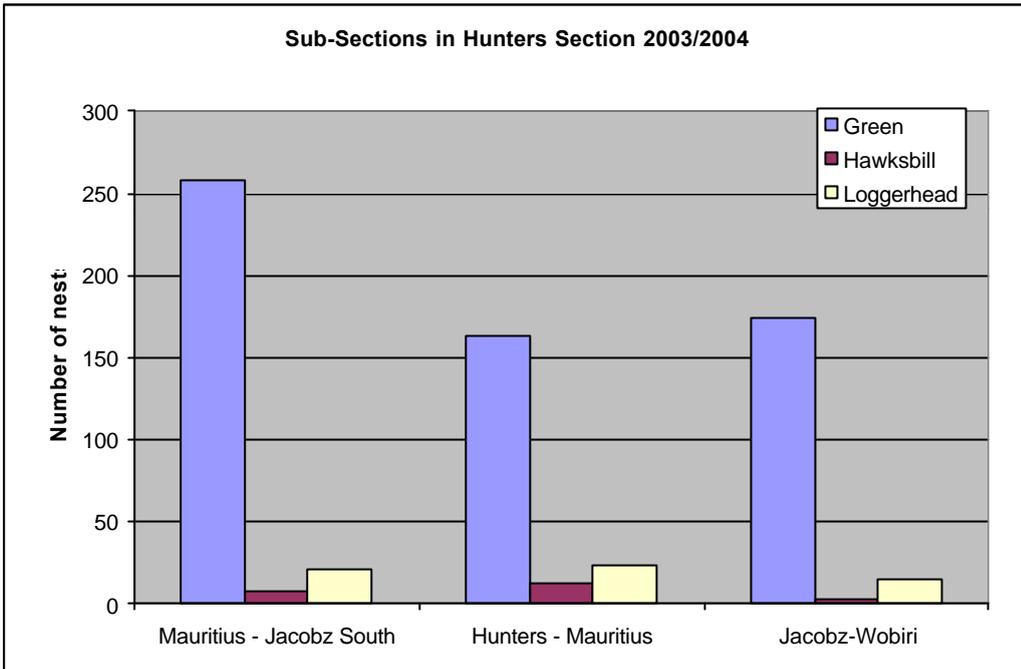
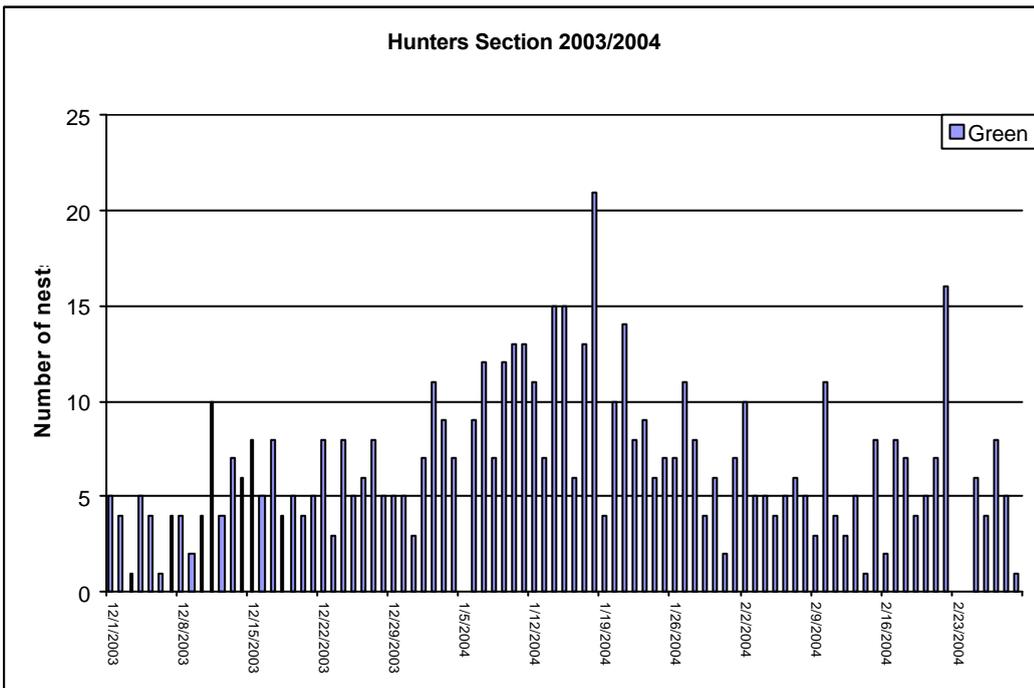


Figure 17 Species composition and the total number of successful nests for each species in Hunters Section 2003/2004 nesting season.



**Figure 18. Comparison of Sub-Sections within Hunters Section in 2003/2004 Monitoring Season**

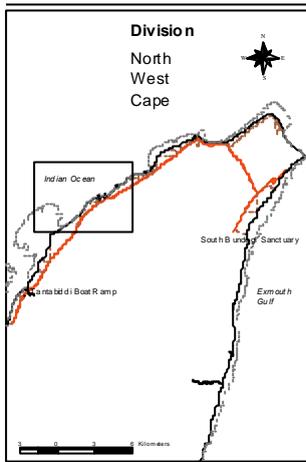


**Figure 19 Green turtle nesting per day in Section: Hunters 2003/2004 indicating peaks in nesting success.**

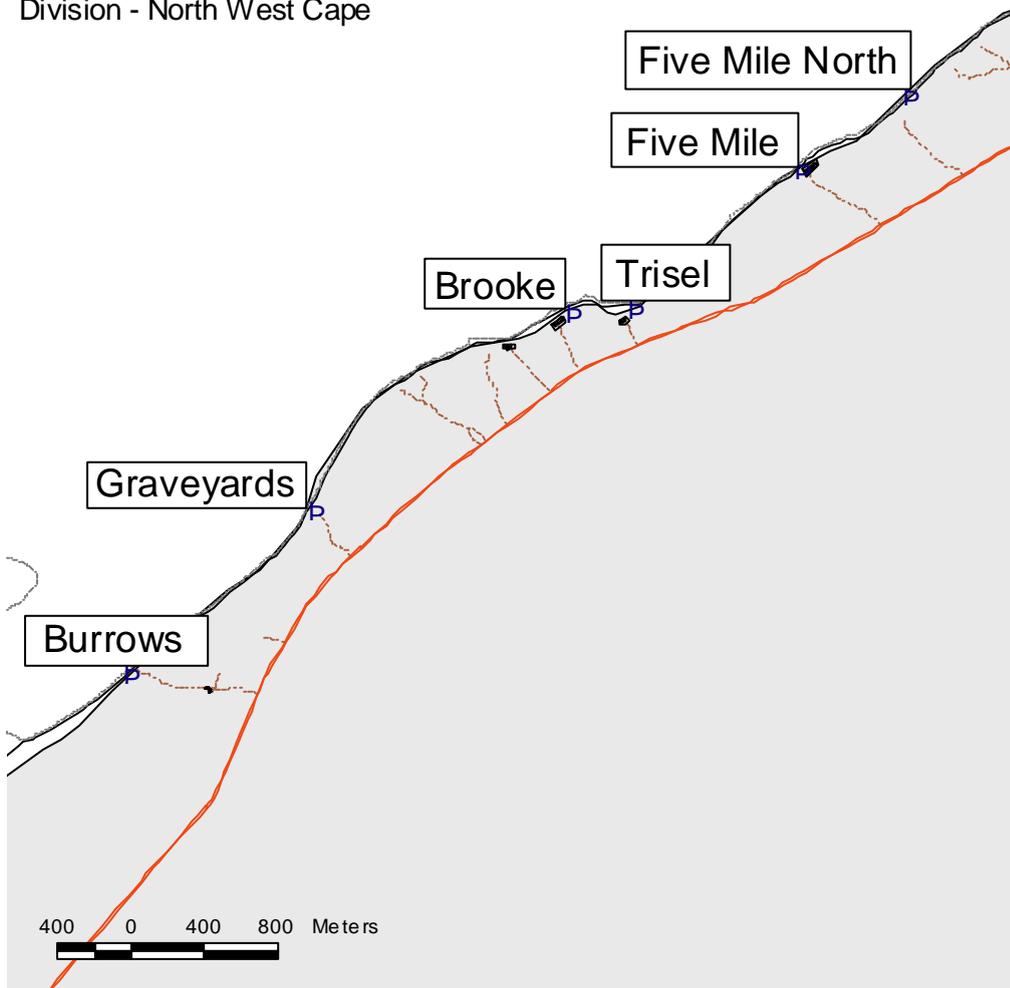
**Recommendation 16:** Continue to monitor all sub-section of this Section as the highest priority Section in North West Cape Division.

**Recommendation 17:** Use environmental data to determine relationships between peak nesting events and environmental variables

# SECTION: GRAVEYARDS



Region - NMP  
Division - North West Cape



Map 5 Graveyard Section

## **Five Mile North – Five Mile Sub-Section**

**Table 14. Summary of results for Five Mile North – Five Mile Sub-Section**

Sub-Section	Coordinates	G	H	L	U	Total nests	Nest success % (Degree of accuracy: H)			Effort (days)
							G	H	L	
Five Mile North – Five Mile Carpark	21.83539 S, 114.05388 E 21.83935 S, 114.04781 E	233	2	16	1	252	47.74	60	61.54	87

### ***Numbers of nests***

According to Table 14, approximately 252 successful turtle nests were recoded in the 2003/2004 nesting season in the Five Mile – Five Mile Carpark Sub-Section. This area has also been subject to intensive effort with 96% effort in this sub-section

Figure 20 indicates that green turtle nesting peaked in Week 7 with a total of 40 nests recorded. Loggerhead turtle nesting is low, with consistent nesting between Weeks 4 – 12 when 1-3 nests were recorded. Hawksbill nesting in this subsection is not significant, with a total of 2 recorded nests.

Green turtles were the most significant in this sub-section, followed by loggerhead turtles and minimal nesting by hawksbill turtles.

### ***Nesting success***

Loggerhead and Hawksbill turtles have a high nesting success with over 60% nesting success. Green turtle nesting success is high in this sub-section compared with other Sub-Sections in the Northwest Cape Division with almost 50% successful nests of total emergences.

### ***Comparison with other sub-sections***

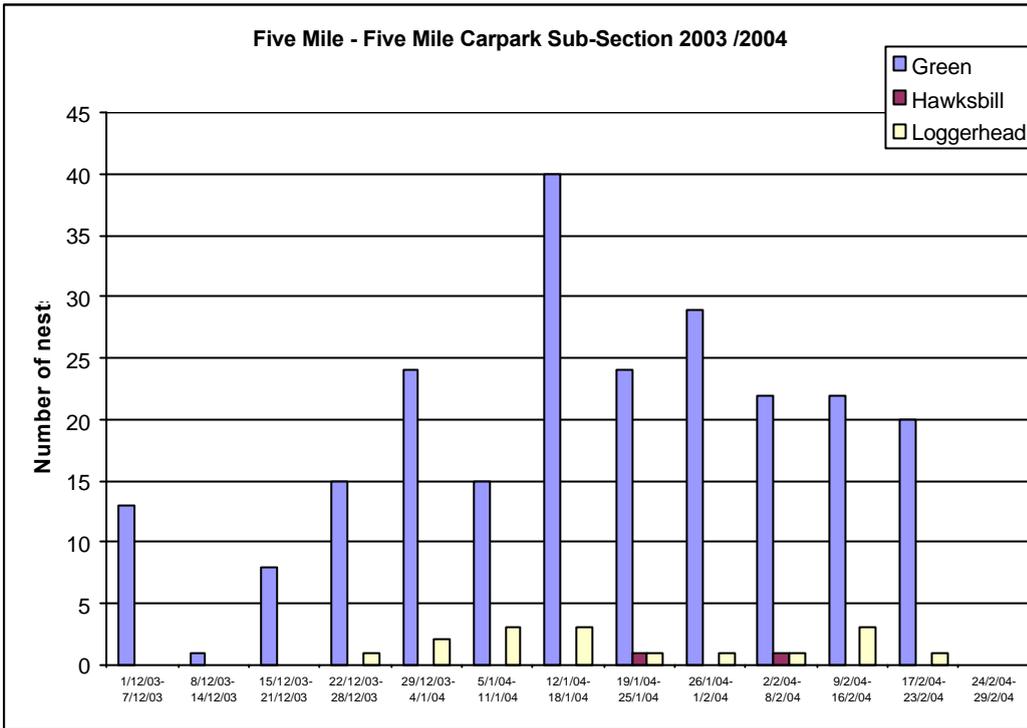
The Five Mile – Five Mile Carpark Sub-Section represents the most significant Green turtle nesting beach in the Graveyards Section. It is also the most significant sub-section in the Graveyards Section for Loggerhead turtles, however is not the most significant for Hawksbill turtles.

### ***Nesting peaks and intervals***

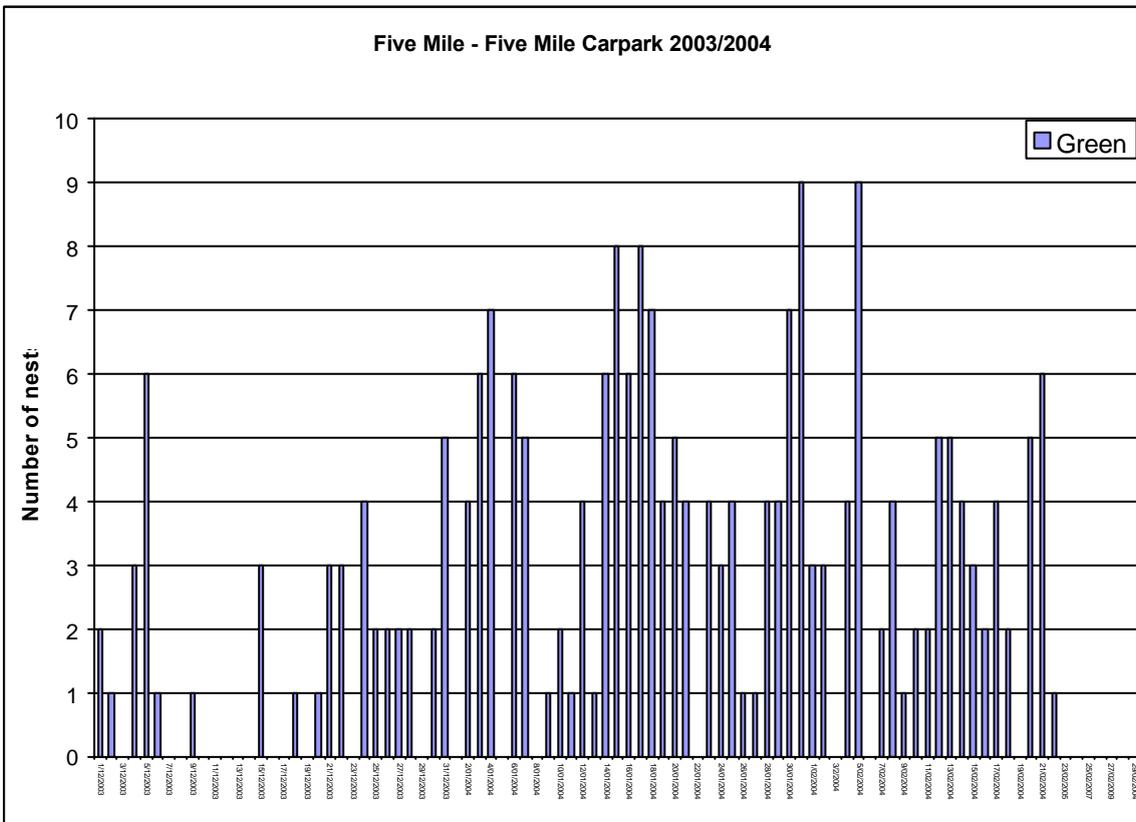
**Table 15 Nesting peaks and intervals between peaks for Green turtles in the Five Mile – Five Mile Carpark Sub-Section**

Identified peaks	5/12/2003	24/12/2003	4/1/2004	15/1/2004	31/1/2004	5/2/2004	12/2/2004	21/2/2004
Intervals		19	11	11	16	5	7	9

Table 15 and Figure 21 indicates that there are 8 significant green turtle nesting peaks. The most significant peaks occurred on 31 January and 5 February 2004 with 9 nests recorded on both days. The longest interval between peaks is 19 days and the shortest is 5 days. The average peak nesting interval for Green turtles in the Five Mile – Five Mile Carpark Sub-Section was 11 days.



**Figure 20** Number of successful nests for each species in Five Mile – Five Mile Carpark Sub-Section



**Figure 21** Green turtle nesting per day in Five Mile – Five Mile Carpark Sub-Section in 2003/2004 indicating peaks in nesting success.

## **Five Mile – Trisel Sub-Section**

**Table 16. Summary of results for Five Mile – Trisel Sub-Section**

Sub-Section	Coordinates	G	H	L	U	Total nests	Nest success % (Degree of accuracy: H)			Effort (days)
							G	H	L	
Five Mile - Trisel	21.83935 S, 114.04781 E 21.84635 S, 114.03833 E	178	9	11	3	201	30.26	36	29.73	87

### ***Number of nests***

The total number of successful nests in this sub-section is 201 (Table 16). The majority of nests were green turtles (178), followed by loggerhead turtle (11) and hawksbill turtles (9).

There was outstanding monitoring effort in this subsection amounting to 96% effort (Table 16). Figure 22 shows that peak turtle nesting for Green turtles occurred in week six with 26 nests. Other peak events, both equating to 20 nests, were in weeks 1 and 4.

### ***Nesting successes (successful emergences)***

Loggerhead and Hawksbill nesting success was relatively low compared with other sub-sections in Hunters and Lighthouse Bay Sections. Loggerhead turtles had the lowest nesting success and Hawksbills appear to have the highest of the three species in this sub-section with 36% nesting success.

### ***Comparison with other Sub-Sections***

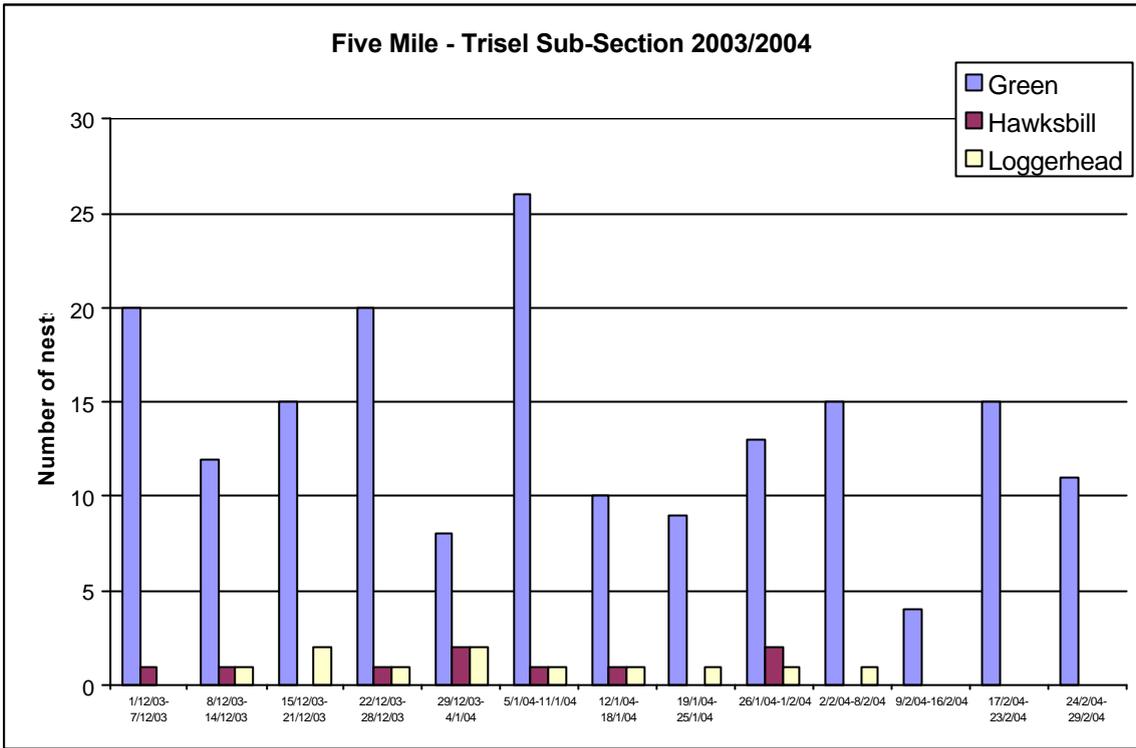
The Five Mile – Trisel Sub-Section has the highest Hawksbill nesting of any other sub-section in the Graveyards Section. When compared to the average nesting success for each species across all monitored sub-sections in North West Cape Division (Table 23), nesting success is low for Loggerhead and Hawksbill turtles in Five-Mile – Trisel Sub-Section.

### ***Nesting peaks and intervals***

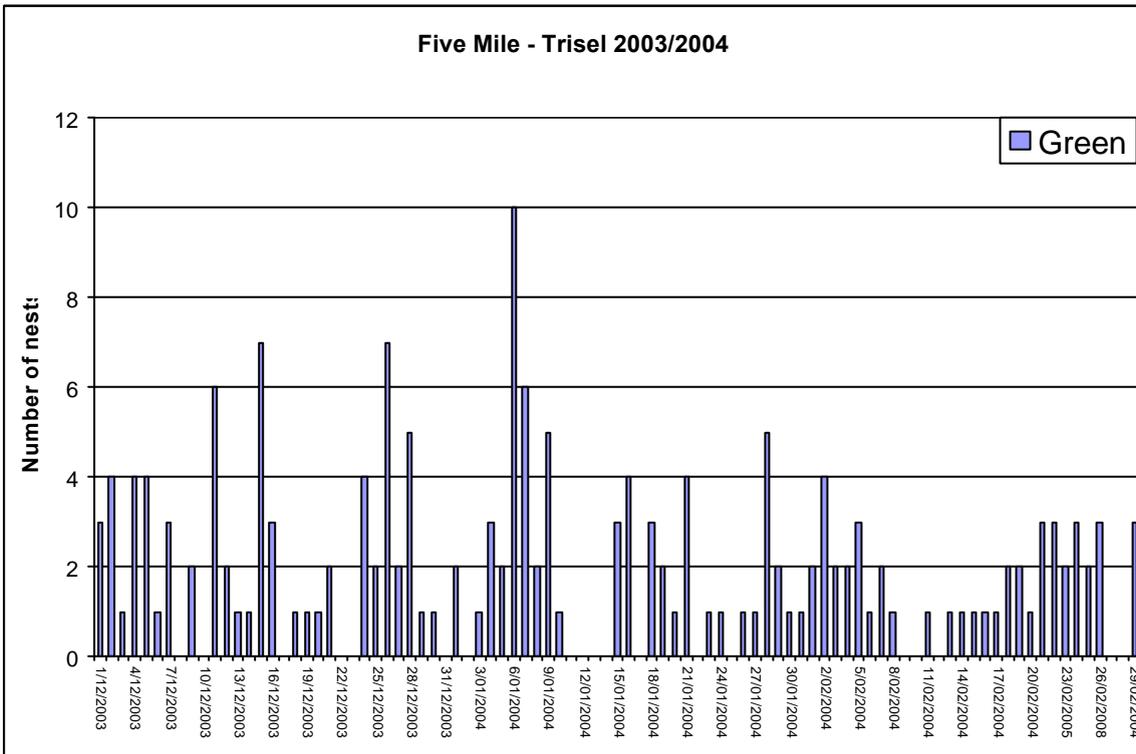
**Table 17 Nesting peaks and intervals between peaks for Green turtles in the Five Mile – Trisel Sub-Section**

Identified peaks	15/12/2003	26/12/2003	6/1/2004	28/1/2004
Intervals		14	11	22

Only four significant peaks were identified in Trisel – Five Mile Sub-Section. 6 January 2004 represents the highest peak with 10 recorded nests. The longest interval between peak green turtle nesting events was 11 and the longest was 22 days. The average interval between peak nesting events in Five Mile – Trisel Sub-Section is 16 days.



**Figure 22** Number of successful nests for each species in the Five Mile – Trisel Sub-Section



**Figure 23** Green turtle nesting per day in Five Mile – Trisel Sub-Section 2003/2004 indicating peaks in nesting success.

**Recommendation 18:** Continue to monitor this section in 2004/2005.

## **Brooke - Graveyards Sub-Section**

**Table 18. Summary of results for Brooke – Graveyards Sub-Section**

Sub-Section	Coordinates	G	H	L	U	Total nests	Nest success % (Degree of accuracy: H)			Effort (days)
							G	H	L	
Brooke-Graveyards	21.84695 S, 114.03435 E 21.85662 S, 114.02096 E	160	1	8	1	170	31.54	33.33	40	81

### ***Number of nests***

Approximately 160 Green turtle successful nests were recorded in Brooke – Graveyards Sub-Section. Loggerhead nesting is low in this sub-section and hawksbill nesting is insignificant with only one recorded nest. Peak nesting events were recorded in weeks 5 and 6 with 19 green turtles recorded each week.

Total number of successful nests in this sub-section is 170 (Table 18). Green turtles are the most abundant followed by Loggerhead turtles and Hawksbill turtles with only 1 recorded successful nest in this subsection. The total monitoring effort is relatively high with 90% effort.

### ***Nesting success***

Table 18 indicates that Loggerhead turtles had the highest nesting success than any other species with 40% nesting success, followed by Hawksbill turtles with 33.33% and Green turtles with 31.54% success.

### ***Comparison with other sub-sections***

Figure 24 shows that turtle nesting was somewhat lower in the Brooke – Graveyards Sub-Section when compared with other subsections such as Five Mile – Five Mile Carpark. This section is also slightly lower than Five Mile – Trisel for green turtles. The Brooke – Graveyards Sub-Section has the lowest number of Green turtle nests compared to any other sub-section in the Graveyards Section.

### ***Nesting peaks and intervals***

**Table 19 Nesting peaks and intervals between peaks for Green turtles in Brooke - Graveyards Sub-Section**

Identified Peaks	5/12/2003	24/12/2003	4/12/2003	15/1/2004	31/1/2004	5/2/2004	12/2/2004	21/2/2004
Intervals		19	11	11	16	5	7	9

There were 8 significant Green turtle nesting peaks identified in the Brooke – Graveyards Sub-Section. The two highest peaks were 9 nests per day which occurred on 31 January and 5 February 2004. The longest period between peak nesting intervals was 19 days and the shortest was 5 days. The average interval between peak nesting events is 11 days.

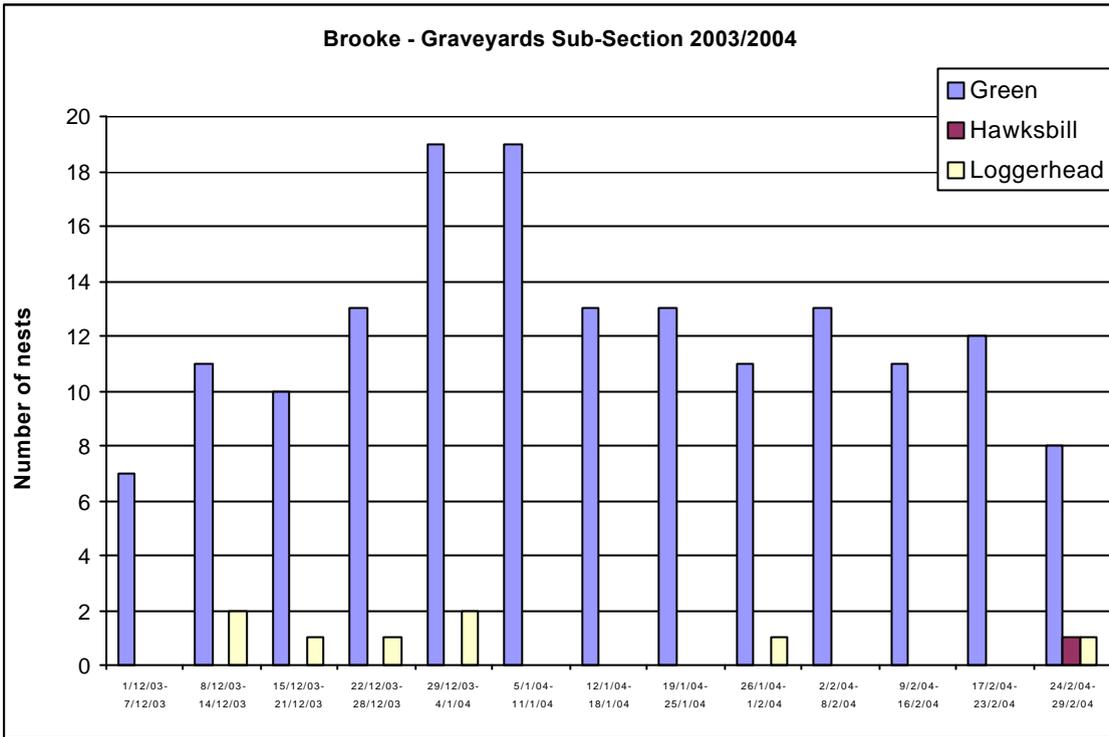


Figure 24 Number of successful nests for each species in Brooke – Graveyards Sub-Section 2003/2004

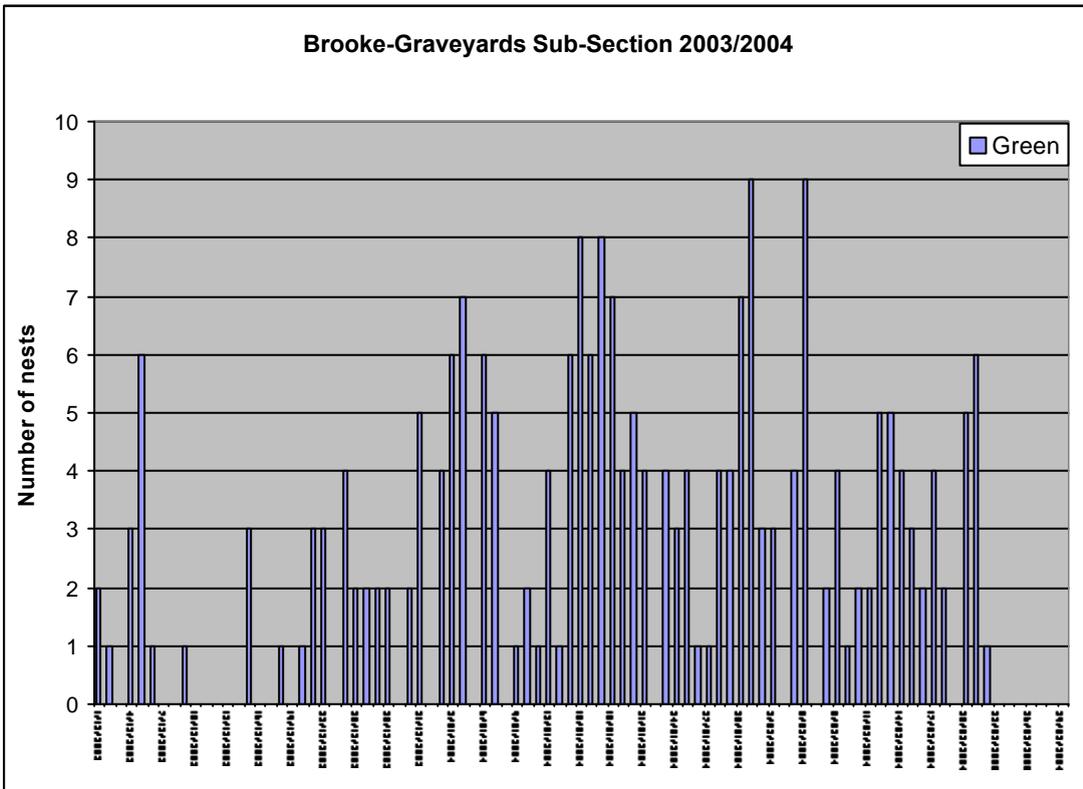


Figure 25 Green turtle nesting per day in Brooke - Graveyards Sub-Section 2003/2004 indicating peaks in nesting success.

**Recommendation 19:** Continue to monitor this section as a priority Sub-Section

## **Sub-Section: Graveyards - Burrows**

**Table 20. Summary of results for Graveyards – Burrows Sub-Section**

Sub-Section	Coordinates	G	H	L	U	Total nests	Nest success % (Degree of accuracy: H)			Effort (days)
							G	H	L	
Graveyards - Burrows	21.85662 S, 114.02096 E	182	2	6	1	191	23.09	28.57	23.09	79
	21.86352 S, 114.01308 E									

### ***Number of nests***

Figure 26 indicates that there were several significant Green turtle nesting weeks beginning with week 2 and followed by weeks 4, 7 and 12. The most significant peak week for green turtles was in week 7 when 28 nests were recorded.

Hawksbill nests are negligible with only two nests recorded. The maximum number of nests for Loggerheads is 3, which occurred in week 8.

Over the monitoring season, the Graveyards to Burrows Sub-Section supported 191 nests. Green turtles were strikingly the most predominant species, followed by significantly low numbers of Loggerheads and Hawksbills. Only 2 hawksbill nests were recorded in this section.

Effort was 87% for this sub-section, which was slightly lower than the effort in other sub-sections in the Graveyards Section.

### ***Nesting success***

All species have a low nesting success in this sub-section. Loggerheads and Hawksbill turtles are significantly low when compared with other sub-sections and the average nesting success for the Division (Table 23), with less than 30% nesting success for all species recorded.

### ***Comparison to other Sub-Sections***

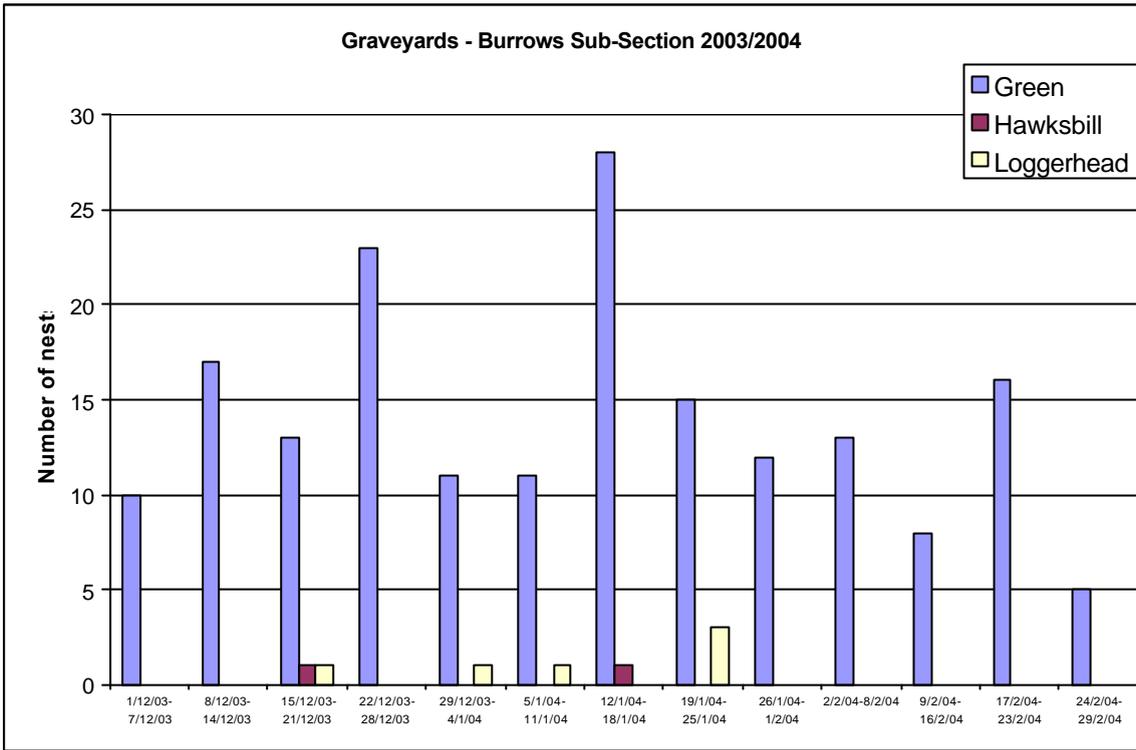
The Graveyards – Burrows Sub-Section had similar numbers of Green turtle nests compared to the Trisel to Five Mile Sub-Section. The low levels of nesting success should also be noted as somewhat significantly different for Loggerhead and Hawksbill turtles than at any other Sub-Section in the Northwest Cape Division.

### ***Nesting peaks and intervals***

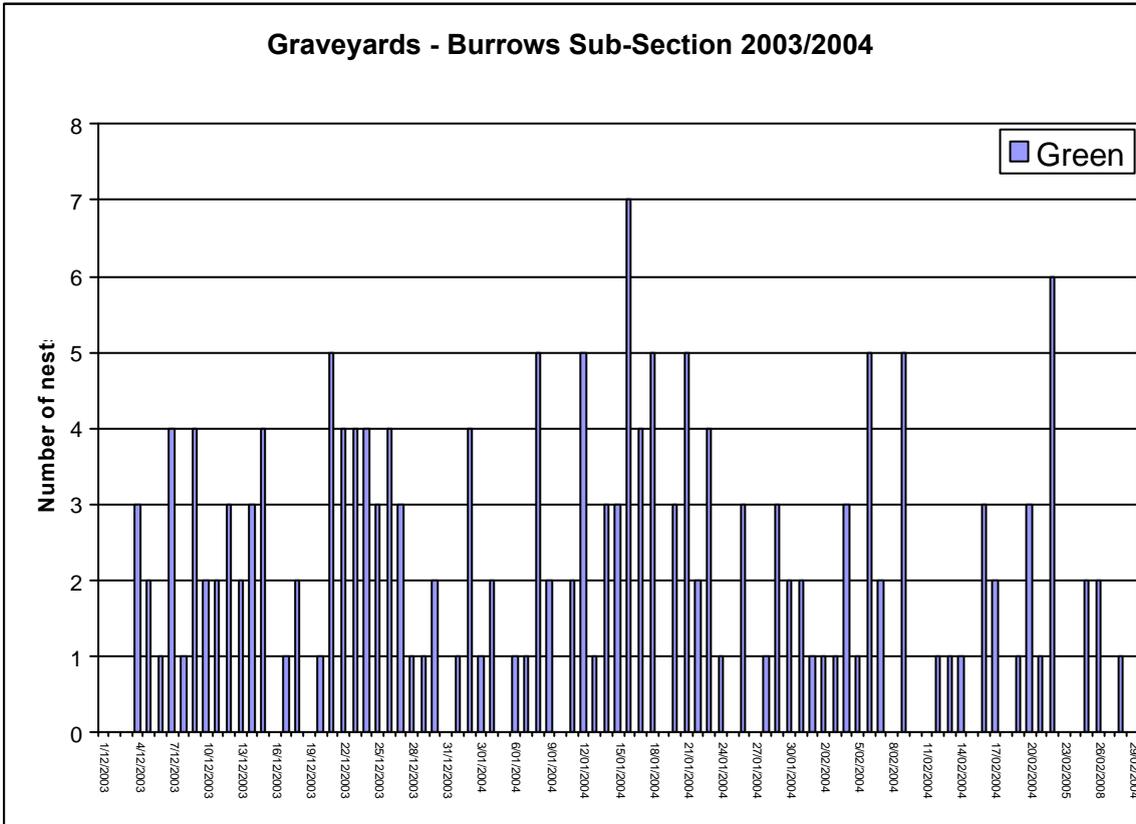
**Table 21 Nesting peaks and intervals between peaks for Green turtles in Graveyards - Burrows Sub-Section**

<b>Identified peaks</b>	7/12/2003	21/12/2003	8/1/2004	16/1/2004	6/2/2004	22/2/2004
<b>Nesting intervals</b>		14	18	8	21	16

6 significant Green turtle nesting peaks were identified in the Graveyards – Burrows Sub-Section. There are two main nesting peaks, one on 16 January (7 nests) and the second on 22 February (6 nests) 2004. The largest interval between identified peaks is 18 days and the smallest interval is 8 days. The average interval between peak Green turtle nesting days in the Graveyards – Burrows Sub-Section is 15 days.



**Figure 26** Number of successful nests for each species in the Graveyards – Burrows Sub-Section



**Figure 27** Green turtle nesting per day in Graveyards to Burrows Sub-Section 2003/2004 indicating peaks in nesting success.

**Recommendation 20:** Continue to monitor this sub-section in 2004/205 nesting season

**Recommendation 21:** Compare peaks with environmental data

**Recommendation 22:** Low levels of nesting success should be compared to levels of potential disturbance to determine whether the low percentages of nest success as a proportion of total emergences in this Sub-Section Graveyards – Burrows, can be attributed to disturbance

## Overall results for Graveyards Section

### *Number of nests*

Figure 28 indicates that the two most significant weeks for green turtle nesting were Weeks 4 and 6 – both 71 nests and Week 7 – 92 nests in the Graveyards Section. Loggerhead turtle nesting peaked in Week 5 – 7 nests and Hawksbill turtle nesting remained consistently low throughout the monitoring season.

Figure 29 indicates that Green turtles are significantly the most predominant nesting species in this Section, followed by Loggerheads with 5% of total nests, and Hawksbill turtles with only 2% of total nests.

### *Comparison to other Sections*

Figure 30 indicates that Five Mile – Five Mile Carpark is the most significant Green and Loggerhead rookery in the Graveyards Sub-Section. Results also show that the Trisel – Five Mile Sub-Section is the most significant for Hawksbill turtles in Graveyards Section.

The Graveyards Section is the most significant Green turtle rookery on the North West Cape mainland with 754 nests successfully laid in the 2003/2004 nesting season.

### *Peak nesting events*

**Table 22 Nesting peaks and intervals between peaks for Green turtles in Graveyards - Burrows Sub-Section**

Peaks	5/12/2003	15/12/2003	24/12/2003	6/12/2004	16/1/2004	31/1/2004	5/2/2004	13/2/2004	21/2/2004
Intervals		10	9	13	10	15	5	8	8

Results in Table 22 and Figure 31 indicate that peak Green turtle nesting in the Graveyards – Burrows Sub-Section occurred on 6 December 2003 with 23 nests recorded. The average interval between peak events is approximately 7 days.

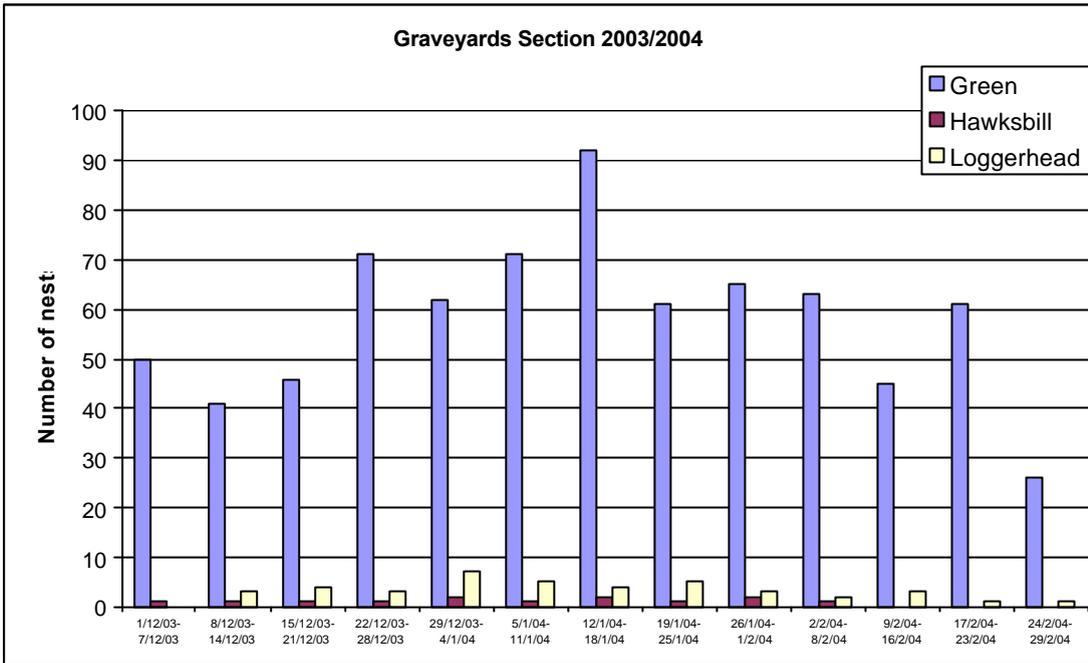


Figure 28 Number of successful nests for each species in Graveyards Section

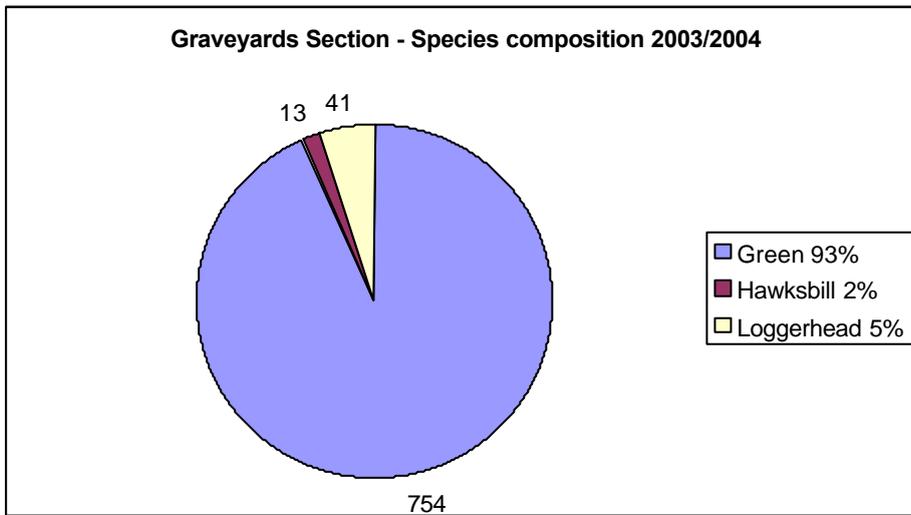
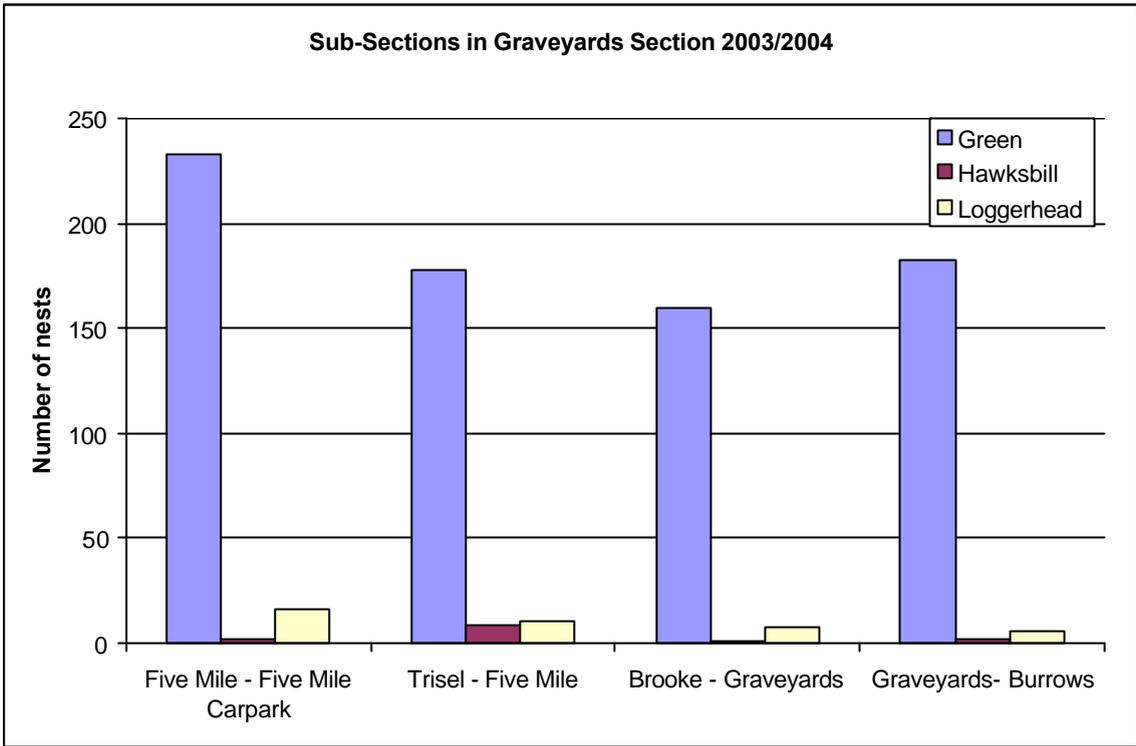
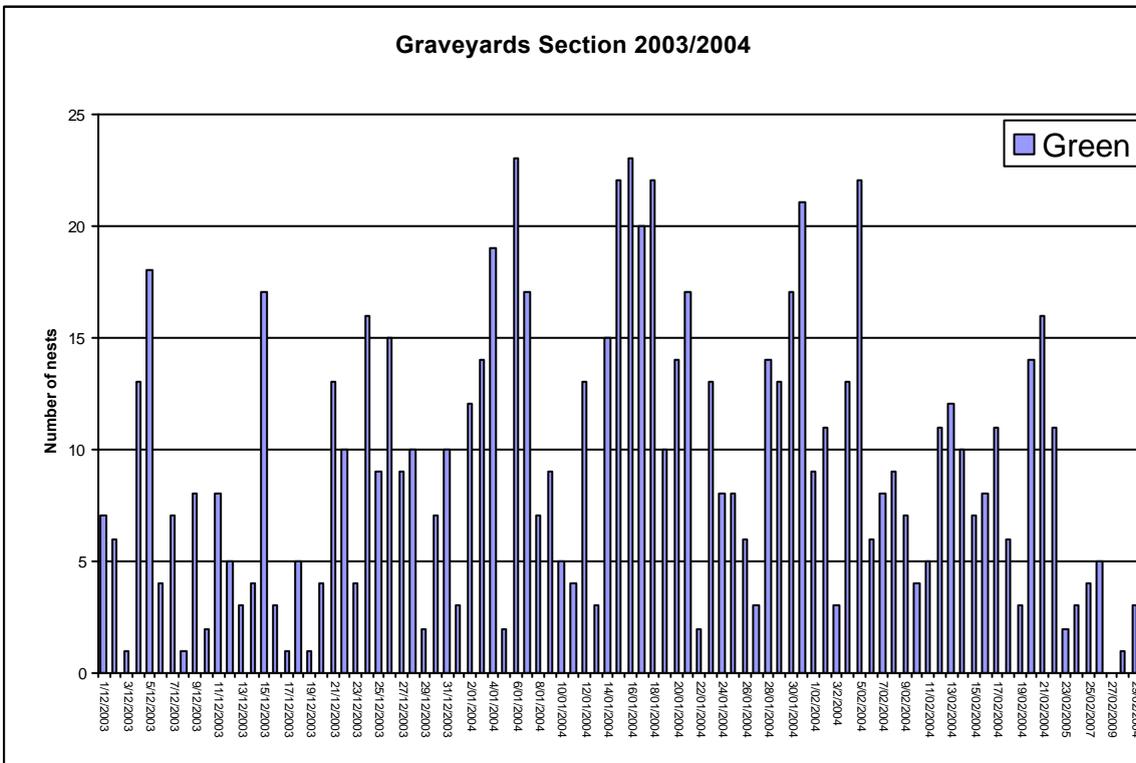


Figure 29 Species composition and total number of nests for all species in Graveyards Section.



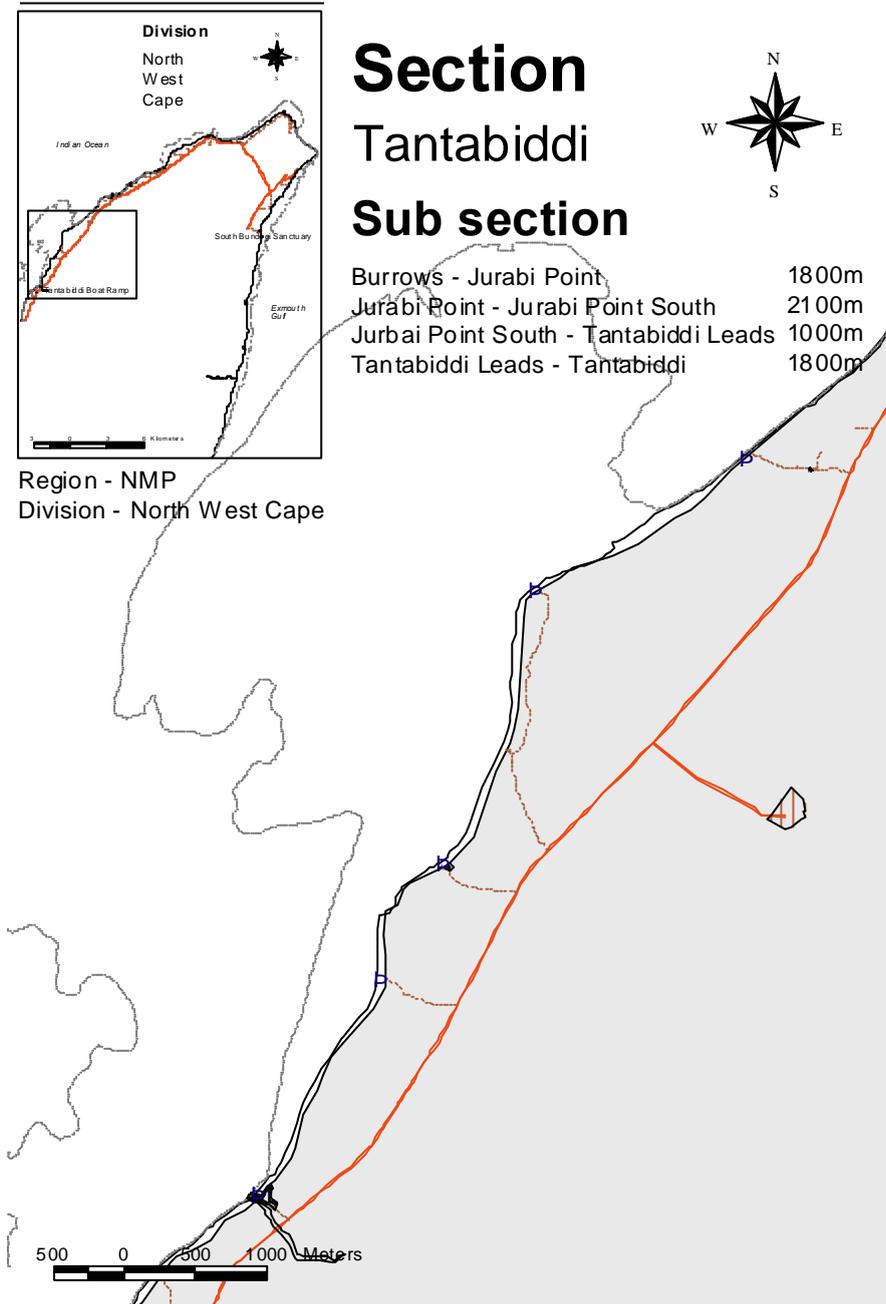
**Figure 30. Comparison of successful nests in Sub-Sections within Graveyards Section 2003/2004 turtle monitoring season.**



**Figure 31 Green turtle nesting per day in Graveyards to Burrows Sub-Section 2003/2004 indicating peaks in nesting success.**

**Recommendation 23:** Compare nesting peaks with Environmental Data  
**Recommendation 24:** continue to monitor all Sub-Sections of Graveyards Section as a priority in North West Cape Division.

**SECTION: TANTABIDDI**



Only 1 day of monitoring for each subsection occurred in the 2003/2004 season for Tantabiddi Section. There are no results available from the 2003/2004 monitoring season

## Summary of results for North West Cape Division

### *Number of nests*

Figure 32 summarises the significance of turtle nesting in each Section within the North West Cape Division. It clearly articulates that the Graveyards Section is the most significant beach for Green turtles, followed by the Hunters Section. Figure 32 also shows that Hunters Section may be slightly more significant for Loggerhead turtles than Graveyards Section. In comparison to other Sections, the Navy Pier Section is the least significant turtle rookery for any species.

### *Nesting success*

Figure 32 and Table 23 shows that Loggerhead and Hawksbill turtles have a consistently higher nesting success than Green turtles throughout the Northwest Cape Division. Green Turtles exceeded Loggerheads and Hawksbills in the Mildura Wreck to Northwest Carpark Sub-Section only.

Table 22 indicates that overall, Loggerhead turtles have the highest nesting success with 55.04% success, followed by Hawksbill turtles with 44.72% and Green turtles with 36.52%. Environmental conditions, biological factors and/or disturbances may have influenced nesting success of all species in the North West Cape Division.

### *Potential disturbance*

Figure 33 indicates that fox prints increase frequency in a southerly direction from the tip of Northwest Cape to Graveyards – Burrows Sub-Section. This seems to indicate that the 1080 baiting program conducted in Defence antennae field has had an impact on the reduction of foxes numbers in that surrounding area. It should be noted that that Point Murat to VLF Bay and VLF Bay to Mildura Wreck Sub-sections have undergone a baiting program and that public access to these areas is restricted. The most significant month for foxes is January which is also the peak nesting month for Green turtles in most sub-sections. There were fox prints recorded in the vicinity of 321 emergences in Graveyards – Burrows Sub-Section in 2003/2004 monitoring season. This sub-section is one of the furthest away from baiting areas, therefore it is likely that the baiting programs that take place on Defence land in the northern sub-sections of the North West Cape Division, would not be effective in these southern sub-sections.

Figure 34 shows the most significant time of the year for potential human disturbance to nests is January in the Hunters – Mauritius, Mauritius – Jacobz South and Five Mile North – Five Mile Carpark Sub-Sections. The most significant sub-sections for human disturbance in December are Five Mile – Trisel, Jacobz South to Wobiri, Surf Beach – Hunters and VLF Bay – Mildura Wreck Sub-Sections. February was not the most significant month for potential human disturbance in any Sub-Section.

In general, the potential for human disturbance was the most significant at Sub-Sections: Hunters-Mauritius, Mauritius – Jacobz South, Jacobz South – Wobiri, Five Mile North – Five Mile Carpark and Five Mile – Trisel. Brooke to Graveyards and Graveyards to Burrows Sub-Sections did not indicate significant human disturbance potential. It should be noted that these sections with the highest potential human disturbance are open to public access. It is anticipated that the Jurabi Turtle Centre will aid in reducing impacts to marine turtles during nesting through fostering appropriate codes of conduct and sustainable tourism ethics.

**Actual disturbance**

Table 24 indicates that the Graveyards Section had the most recorded fox predated nests, followed by the Hunters and Lighthouse Bay Sections. The Hunters Section is had the most number of nests disturbed by human intervention. Hunters and Graveyards Sections seem the most prone to natural predation from ghost crabs and gulls. Goannas do not appear to be a significant disturbance to turtle nests. Nests position between the base of the dune and the high water mark are most likely to be disturbed.

**Green turtle nesting peaks and nesting intervals**

**Table 22 Nesting peaks and intervals between peaks for Green turtles in the Northwest Cape Division**

Peaks	4/12	11/12	15/12	26/12	2/1	7/1	18/1	28/1	5/2	17/2	22/2	25/2
Intervals		7	4	11	6	5	11	10	8	12	5	3

Figure 35 shows that there are 12 identified peaks in successful Green turtle nesting. These peaks are recorded in Table 22. Of the 12 identified peaks, the highest peak occurred on the 18 January 2004 with a total of 39 Green turtle nests. The highest interval between peak events is 12 days and the lowest is 3 days. Overall the average interval between Green turtle nesting in the Northwest Cape Division is 7 days.

**Table 23 Nesting Success (Successful nests as a proportion of total emergences) for all Sections in Northwest Cape Division 2003/2004 turtle monitoring season**

Sub-Section	Level of Accuracy	Nesting Success North West Cape Division (%)		
		Green	Hawksbill	Loggerhead
Species				
Point Murat – VLF Bay	Low	54.5	50	100
Mildura Wreck – Northwest Carpark	Medium	66.6	0	33.33
Northwest Carpark – Surf Beach	Medium	32.5	66.66	80
Surf Beach – Hunters	Medium	18.88	42.86	57.89
Hunters - Mauritius	High	37.35	57.89	51.11
Mauritius – Jacobz Sth	High	37.03	66.66	65.63
Jacobz South - Wobiri	High	25.24	50	43.33
Five Mile North – Five Mile	High	44.71	60	61.54
Five Mile - Trisel	High	30.26	36	29.73
Brooke - Graveyards	High	31.54	33.33	40
Graveyards - Burrows	High	23.09	28.57	42.86
<b>Average</b>		<b>36.51818</b>	<b>44.72455</b>	<b>55.03818</b>

**Table 24 – Summary of all recorded actual disturbed nests in North West Cape Division**

Section	Sub-Section	GPS Coordinates	Date	Species	Position of nest	Likely disturbance
Hunters	Hunters - Mauritius	21.80459 S 114.10570 E	2/12/2003	Hawks-bill	High water mark to edge of vegetation	Human
Lighthouse Bay	Surf Beach to Hunters	21.80499 S 114.13353 E	4/12/2004	Green	Edge of vegetation to base of dune	Fox
Hunters	Jacobz South - Wobiri	21.82974 S 114.06687 E	13/12/2004	Green	High water mark to edge of vegetation	Tide inundation
Hunters	Jacobz South - Wobiri	21.82945 S 114.06770 E	15/12/2003	Green	High water mark – edge of vegetation	Human
Hunters	Hunters - Mauritius	21.80704 S 114.09888 S	22/12/2003	Green	High water mark – edge of vegetation	Tide inundation

						Ghost crabs also noted
Lighthouse Bay	Surf Beach - Hunters	21.80395 S 114.11037 E	23/12/2003	Green	High water mark – edge of vegetation	Human
Graveyards	Brooke - Graveyards	21.84995 S 114.02747 E	16/12/2003	Green	High water mark – edge of vegetation	Another turtle
Hunters	Mauritius – Jacobz South	21.81404 S 114.08319 E	1/1/2004	Green	Edge of vegetation – base of dune	Human
Hunters	Mauritius – Jacobz South	21.81026 S 114.09269 E	6/1/2004	Green	Edge of vegetation – base of dune	Fox
Lighthouse Bay	Surf Beach - Hunters	21.80472 S 114.13406 E	6/1/2004	Unknown	Intertidal	Tide inundation
Graveyards	Graveyards – Burrows	21.86256 S 114.01592 E	8/1/2004	Green	Dune and beyond	Ghost crabs
Hunters	Mauritius – Jacobz South	21.81422 S 114.08313 E	10/1/2004	Green	Edge of vegetation – base of dune	Another turtle
Hunters	Jacobz South - Wobiri	21.82904 S 114.06915 E	18/1/2004	Green	Edge of vegetation – base of dune	Human
Hunters	Hunters - Mauritius	21.80528 S 114.10352 E	21/1/2004	Unknown	Intertidal	Goanna
Hunters	Hunters - Mauritius	21.80541 S 114.10308 E	21/1/2004	Green	Edge of vegetation – base of dune	Gulls
Graveyards	Trisel – Five Mile	21.84105 S 114.04515 E	23/1/2004	Green	Edge of vegetation – base of dune	Gulls
Graveyards	Graveyards - Burrows	21.86191 S 114.01574 E	24/1/2004	Green	High water to edge of vegetation	Fox
Graveyards	Brooke - Graveyards	21.85097 S 114.02508 E	28/1/2004	Green	Edge of vegetation to base of dune	Fox
Graveyards	Brooke – Graveyards	21.84907 S 114.02873 E	1/2/2004	Green	High water mark – edge of vegetation	Fox
Lighthouse Bay	Surf Beach - Hunters	21.80684 S 114.11640 E	13/2/2004	Unknown	Unknown	Gulls
Hunters	Mauritius – Jacobz South	21.81536 S 114.08067 E	16/2/2004	Unknown	Edge of vegetation – base of dune	Gulls and ghost crabs
Graveyards	Five Mile North – Five Mile Carpark	21.83602 S 114.05317 E	22/2/2004	Loggerhead	High water mark - edge of vegetation	Fox

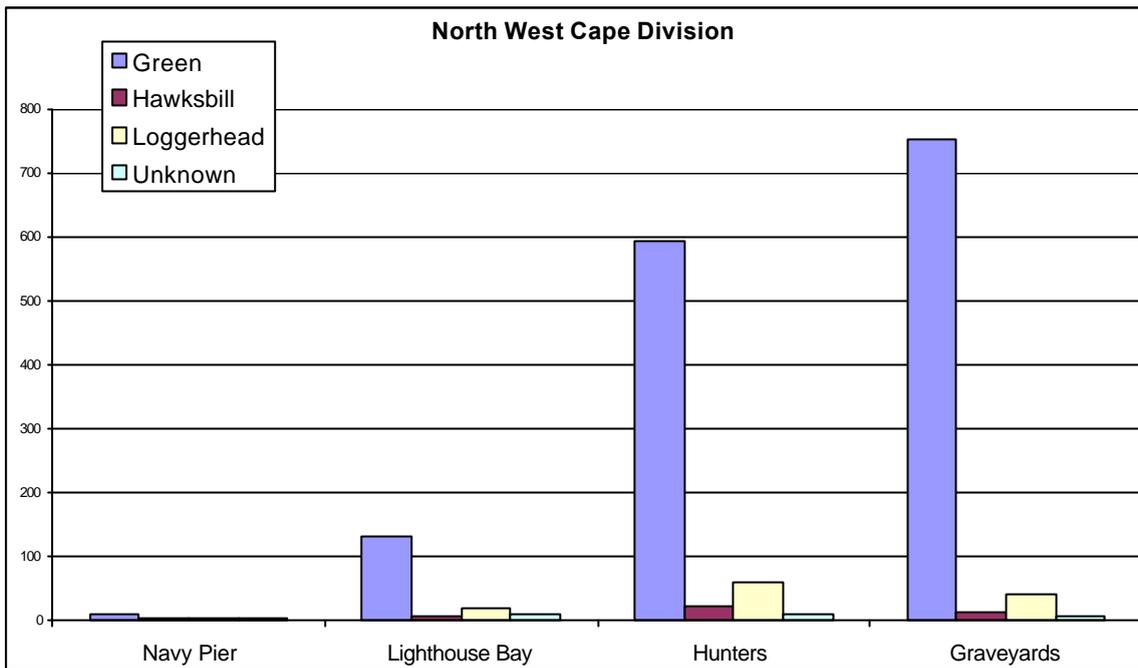


Figure 32 Comparison between nesting abundance in each Section of the North West Cape Division.

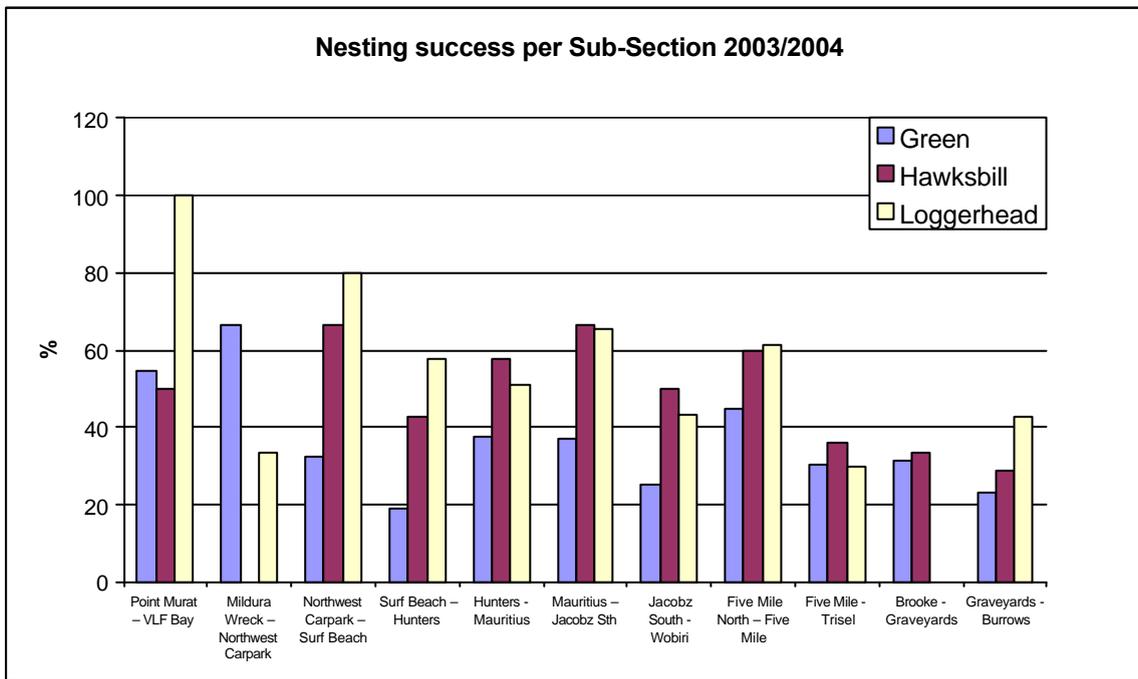
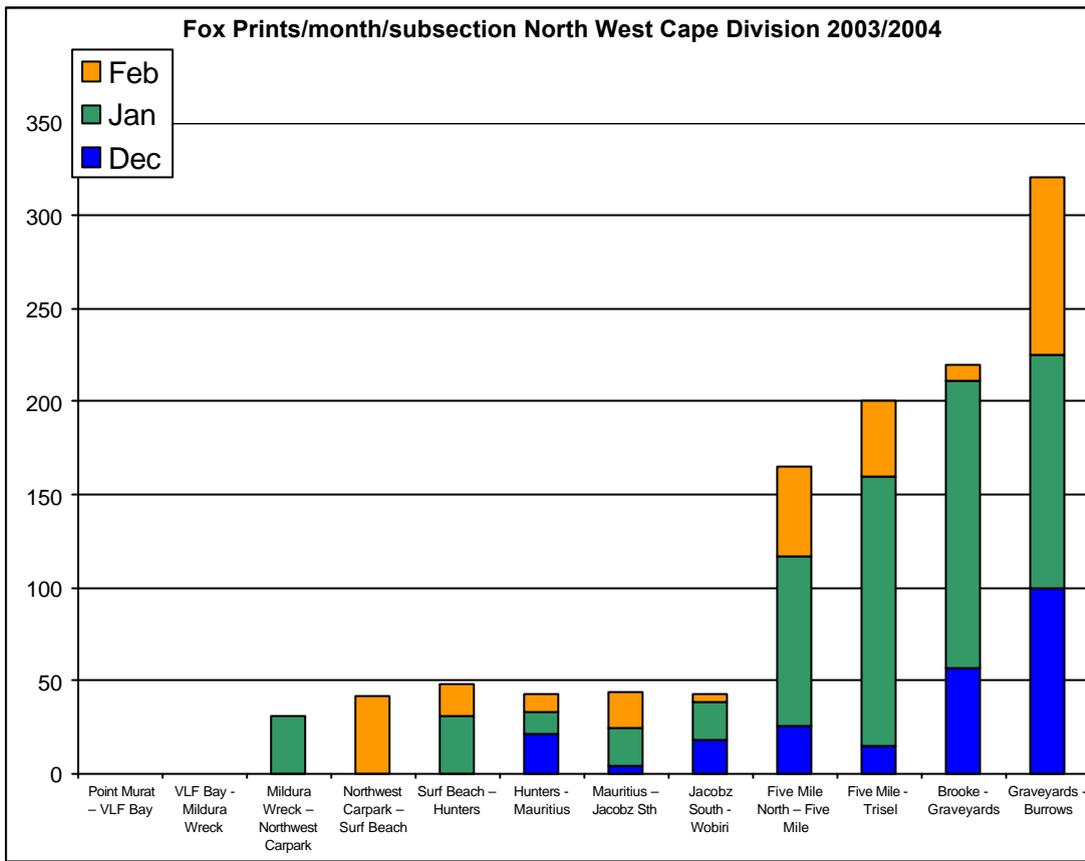


Figure 32 Successful nests for all species in all Sub-Sections Northwest Cape Division 2003/2004 monitoring season



**Figure 33. Fox print significance in all sub-sections of North West Cape Division 2003/2004 Turtle nesting season**

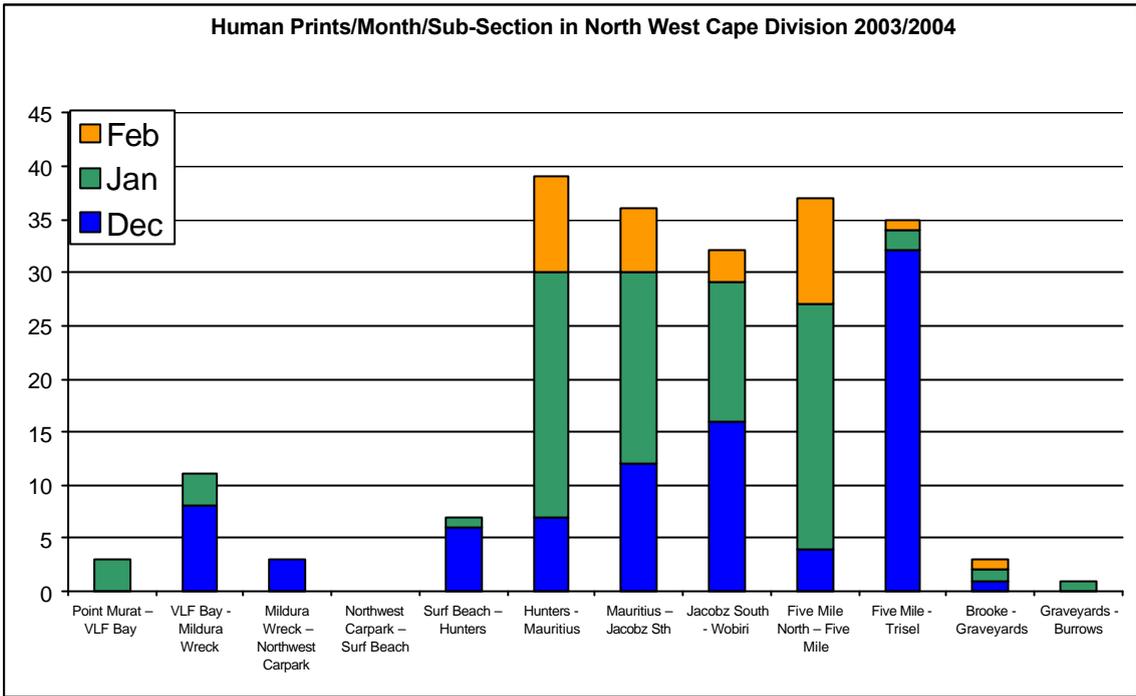


Figure 34. Human prints significance in all sub-sections of North west Cape Division 2003/2004 Turtle nesting season

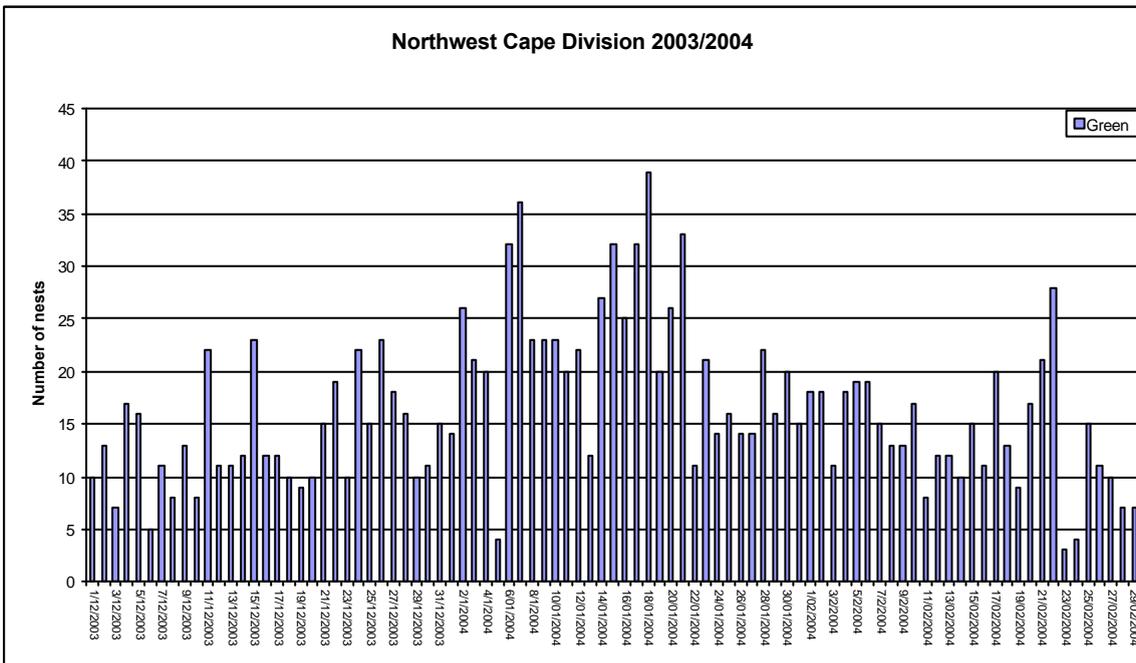


Figure 35 Green turtle nesting per day in the North West Cape Division 2003/2004 indicating peaks in nesting success.

## Coral Bay Division

### **Batemans Sub-Section**

#### *Number of nests*

Figure 36 indicates that Loggerhead and Hawksbill turtles are more dominant in the Batemans Sub-Section than any other sub-section in the Northwest Cape Division. Green turtle nesting is insignificant. There is insufficient information to be able to analyse the data for this Sub-Section further.

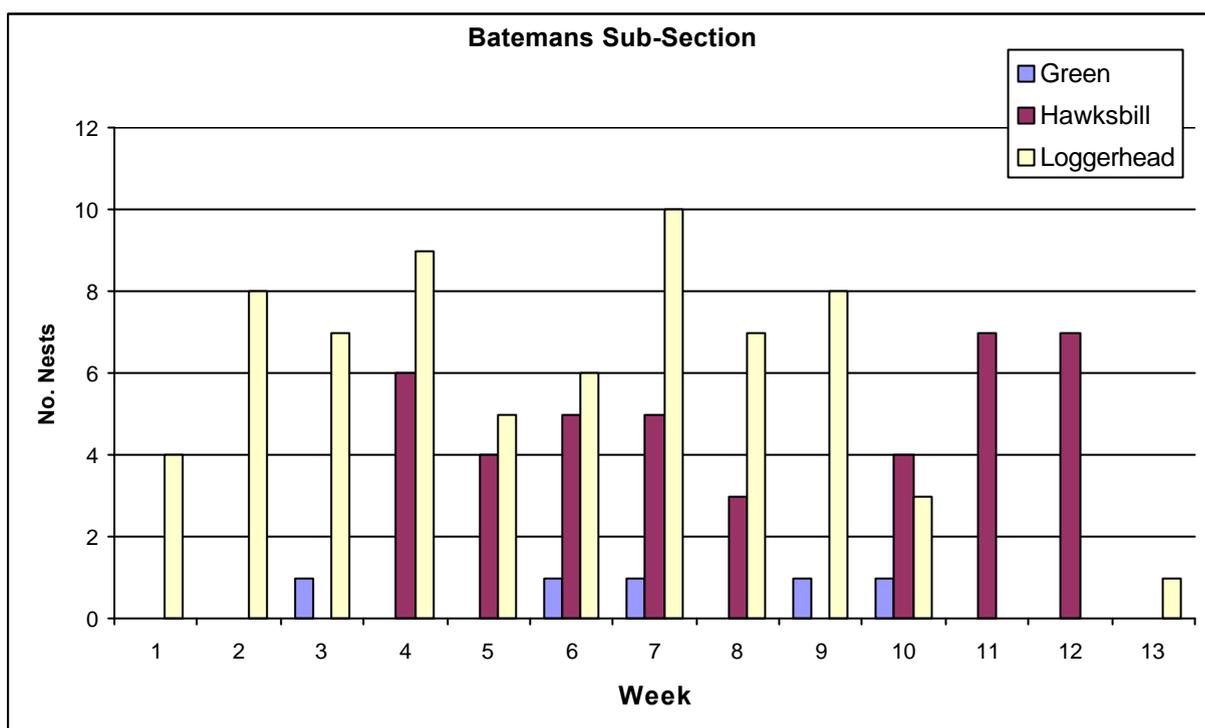


Figure 36 Monitoring results for the Bateman’s Sub-Section

### All other Sub-Sections in Coral Bay and Cape Range Divisions

Table 25 Raw data for other Sub-Sections monitored in the 2003/2004 Turtle Monitoring Season in the Cape Range and Coral Bay Divisions

Sub-section	Green nests	Hawksbill	Loggerhead	Unknown	False crawls
Bungelup (No data available)	-	-0-	--	-	-
Carbaddaman (No data available)	-	-	-	-	-
Dotties (no data available)	-	-	-	-	-
Janes Bay (minimal days monitored)	3	2	15	0	
Kurrajong (few days monitored)	0	0	1	1	
Lagoon (few days monitored)	0	5	0	0	
Norwegian Bay (No data available)	-	-	-	-	-
Turquoise Bay (Few days monitored)	0	1	4	0	

Turtle Beach (few days monitored)	2	0	1	0	
Whale Beach	0	0	4	0	
Pilgramunna	3	0	0	0	

Table 25 presents the results for the monitoring days that took place in the Cape Range and Coral Bay Divisions. At the time of data analysis, not all datasets had been entered, therefore results could not be analysed for the purposes of this report.

## Overarching monitoring recommendations for season 2004/2005

**Recommendation 1:** Graveyards and Hunters Sections should be considered as the priority monitoring Sections within the North West Cape Division. Lighthouse Bay and associated Sub-Sections should be considered as second priority and the Navy Pier and associated Sub-Sections should not be considered as a monitoring priority for 2004/2005 turtle monitoring season.

**Recommendation 2:** Tantabiddi Section should be monitored in the 2004/2005 turtle-monitoring season with an effort of 3 – 4 days/week which is necessary to be able to utilize moving average techniques for adjusting effort effectively.

**Recommendation 3:** Comparisons between nesting success, number of nests and emergences with environmental data should be undertaken prior to 2004/2005 turtle monitoring season

**Recommendation 4:** Discontinue monitoring Department of Defence lands at VLF Bay, continue to monitor Defence land in Lighthouse Bay and negotiate monitoring of lands owned by Department of Defence in Cape Range Section, Bundera Coastal Protection Area.

**Recommendation 5:** Baiting should be conducted as a priority in the Graveyards Section.

**Recommendation 6:** A comparison between human disturbed nests from 2004/2005 monitoring season and 2003/2004 monitoring season is undertaken to measure the effectiveness of Jurabi Turtle Centre in preventing human disturbance to nests.

**Recommendation 7:** Monitoring of Sub-Sections in Cape Range Division and Coral Bay Division should be undertaken in 2004/2005. Results that are currently available for these Divisions should be integrated into this Report.

**Recommendation 8:** A comparison between the nesting success of all species in other Divisions is compared with the nesting success of Northwest Cape Division. Disturbance and nesting success for each species should also be compared.

**Recommendation 9:** Priority Sections for monitoring in Cape Range and Coral Bay Divisions for 2004/2005 should be identified to ensure that monitoring takes place in more consistently over the nesting season to ascertain some further recommendations for these areas.

**Recommendation 10:** Results from Coral Bay and Cape Range Divisions are collated and analysed further then integrated into this Report

**Recommendation 11:** Data from 2001/2002 and 2002/2003 turtle monitoring seasons is analysed in a similar format to 2003/2004 data and seasonal comparisons are undertaken and integrated into this report.

## FINANCE REPORT

The 2003/2004 Ningaloo Community Turtle Monitoring Program was funded by a number of organisations and trusts, including Coastwest/Coastcare, the Commonwealth Department of Defence, and Perpetual Trustees. Inkind support was provided by Murdoch University and WWF Australia. WWF has been primarily responsible for the sourcing, management and acquittal of funds on behalf of the Turtle Team.

**Table 1 Income received and Expenditure of the Ningaloo Community Turtle Monitoring Program in the 2003/2004 Financial Year.**

Project expense	Funds budgeted	Funds spent	Balance
Project management	5000	5000	0.00
Salaries and wages and superannuation	21482	21482	0.00
Data analysis and evaluation	1000	1000	0.00
Consultant expenses	5000	3000	2000
Workshops travel accommodation (including workshops)	9650	6852.98	2797.02
Kilometre reimbursement (volunteer and coordinator)	8000	3877.17	4122.83
Communications and printing and production (includes a sign at JTC)	10,000	3224.84	6775.15
Coordinator office running costs and volunteer accommodation, general expenses	6818	3516.18	3301.82
Computer expenses (including GPS)	2960	2900.94	59.07
	69,910	50,854.11	19,055.89

Note: \$12,128 in carry-forward costs apply only to Coastwest Funds and must be spent on specific activities such as communication tools, workshops and volunteer travel. \$500 of Department of Defence Funds remain for the production of spatial turtle distribution maps for the 2003/2004 nesting season and the remaining funds have been received from Perpetual Trustees which will contribute towards the salary for the NCTMP Coordinator.

<p><b>Recommendation 1:</b> \$40,000 must be budgeted for full-time coordinators position  <b>Recommendation 2:</b> Devise a budget based on the outcomes of Coastwest Proposal and Department of Defence Proposal</p>
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## CONCLUSION

The Ningaloo Community Monitoring Program has resulted in significant capacity building, management and scientific outcomes that will aid in the long-term conservation and management of the Ningaloo Coast. Volunteers and the local community are vital to the longevity and effectiveness of this anticipated long-term program.

Overall, the Program has been very successful through covering a large geographical area of nesting habitat and in providing information that will be useful for managing agencies in the context of coastal planning and development and conservation management. Having a Coordinator position has proved essential in providing a conduit between partners, recruiting volunteers and organizing and coordinating the operation of the program.

Results between the 2003/2004 monitoring season and previous monitoring seasons in 2001/2002 and 2002/2003 should be compared to provide for temporal and seasonal comparisons. Sub-sections in Coral Bay and Cape Range Divisions and the Tantabiddi Section in Northwest Cape Division will need to be monitored more intensely in future seasons. Extension of the Program to the Pilbara through developing partnerships with the Care for Hedland Environmental Interest Group, monitoring of Bundera Coastal Protection Areas and the integration of the volunteer management component with the operation of the Jurabi Turtle Centre have been earmarked as priorities for the expansion of the NCTMP in the 2004/2005 turtle nesting season.

The partnership between Cape Conservation Group, Murdoch University, Department of Conservation and Land Management and WWF has been strengthened and has provided a model in demonstrating the importance of partnerships in the area of biodiversity conservation and management. Long-term commitments from funding bodies, agencies and the community will be crucial to the overall and long-term success of the NCTMP.

## ATTACHMENT 1 – Summary of Recommendations

### Recommendations for Coordination and Management

**Recommendation 1:** Volunteer accommodation to be leased separately by NCTMP

**Recommendation 2:** Office space for Coordinator investigated in township and at Navy Base.

**Recommendation 3:** Development of a Code of Conduct for volunteers accommodated at Turtle Head Quarters

**Recommendation 4:** The development of Occupational Health and Safety Guidelines for the Ningaloo Community Monitoring Program.

**Recommendation 5:** Development of a Team Leader position to be responsible for the day-to-day maintenance of monitoring kits and quality assurance to ensure that data will be entered regularly.

**Recommendation 6:** Coordinator's position to be made full time for one year. In the event that funds fall short of providing for a full time position, a full time position between the months of November 2004 and March 2005 is prioritised.

**Recommendation 7:** the development of a volunteer package which includes all protocols and expectations of the Program and of volunteers. This package should also include Occupational Health and Safety Policy documents and a volunteer agreement form.

**Recommendation 8:** Volunteers are thoroughly briefed about the code and expectations, and provided with an information package on the NCTMP prior to arrival in Exmouth.

**Recommendation 9:** Prior arrangements must be made with the Coordinator by volunteers wanting to undertake leisure or recreational activities after monitoring to minimize conflicts between local and non-local volunteers.

**Recommendation 10:** The Coordinator should attempt to provide increased opportunities to view hatchlings, and provide volunteers with a schedule of hatchling watching dates.

**Recommendation 11:** The use of designated volunteer vehicles and hire cars is investigated. All volunteers that provide vehicles as an in-kind contribution to the Program must be made fully aware that insurance and the risk of vehicle damage is the responsibility of the vehicle owner and not of the NCTMP

**Recommendation 12:** When volunteers are allocated a Section (sub-section), relevant folder is provided which should relieve time spent in morning coordination and vehicle allocation sessions. These folders should include communications forms which allow relevant information from previous days to be communicated to following volunteers e.g. mortality report has been filed for dead turtle, marker is missing and has been reported etc)

**Recommendation 13:** Development of a NCTMP OH&S Policy and the purchase of UHF radio systems are essential for future monitoring season

**Recommendation 14:** The Turtle Team work with interested community groups in the Pilbara and assist in the establishment of a similar community monitoring program in this region through the provision of training and advice

**Recommendation 15:** Turtle Observation and Codes of Conduct protocols be integrated into the monitoring and competency training and certification procedure for all volunteers

**Recommendation 16:** Continue to recommend a minimum 3 week commitment to the program for non-local volunteers

**Recommendation 17:** Develop a Train-the-Trainer Package

**Recommendation 18:** Develop a training video/DVD/CD Rom for volunteers

**Recommendation 19:** Separate volunteer accommodation is arranged for the 2004/2005 nesting season with an advance booking protocol. Late arrivals and those that change booking dates may not be able to be accommodated at times when volunteer accommodation is at full capacity.

**Recommendation 20:** A local rental property large enough to host 10 people or more be leased by NCTMP. Use of CALM Head Quarters a second option and designated local residents are a third option. Once the accommodation is at full capacity, additional non-local volunteers will be required to arrange their own accommodation means.

**Recommendation 21:** Continue to provide a means of integrating non-local volunteers with local volunteers through the provision of social event opportunities.

**Recommendation 22:** That a NCTMP Brochure and information package for volunteers be developed.

**Recommendation 23:** Information to be placed on website to direct interested participants and reduce demands on the coordinator's time commitments.

**Recommendation 24:** NCTMP Managers and Coordinator plan for the expansion of the program (pending successful funding application outcomes) for the 2004/2005 turtle monitoring season

## Recommendations for Monitoring

### Sub-Sections and Sections

**Recommendation 1:** Do not apply effort to monitor Bundegi Sub-Section in 2004/2005 season

**Recommendation 2:** Monitoring in is discontinued in Sub-Section Bundegi Jetty – Point Murat.

**Recommendation 3:** Monitoring in this Navy Pier Section is discontinued and monitoring efforts are concentrated in recommended subsections.

**Recommendation 4:** Monitoring in this section is discontinued and monitoring efforts are concentrated in recommended subsections or sub-section boundaries are reduced to only include the sandy section of several hundred metres adjacent to Mildura wreck

**Recommendation 5:** Continue to monitor Sub-Section Mildura Wreck – Northwest Carpark in 2004/2005 nesting season.

**Recommendation 6:** Continue monitoring of this Northwest Carpark – Surf Beach Sub-Section in the 2004/2005 turtle nesting season.

**Recommendation 7:** Continue monitoring of Surf Beach – Hunters Sub-Section in 2004/2005 turtle nesting season.

**Recommendation 8:** Continue the monitoring program over the three-month period for the Lighthouse Bay Section in 2004/2005 nesting season or, monitor the Section in January (peak nesting month) only.

**Recommendation 9:** Continue monitoring of Hunters to Mauritius Sub-Section as a priority.

**Recommendation 10:** Continue to monitor Mauritius – Jacobz south as a high priority monitoring beach

**Recommendation 11:** Continue to monitor Jacobz South – Wobiri as a priority sub-section in 2004/2005 nesting season.

**Recommendation 12:** Use environmental data to determine relationships between peak nesting events and environmental variables.

**Recommendation 13:** Continue to monitor all sub-sections in Hunters Section as the highest priority Section in North West Cape Division.

**Recommendation 14:** Use environmental data to determine relationships between peak nesting events and environmental variables in Hunters Section

**Recommendation 15:** Continue to monitor Five Mile – Trisel Sub-Section in 2004/2005

**Recommendation 16:** Continue to monitor this section as a priority Sub-Section

**Recommendation 17:** Continue to monitor this sub-section in 2004/2005 nesting season

**Recommendation 18:** Compare peaks with environmental data in Graveyards – Burrows Sub-Section

**Recommendation 19:** Low levels of nesting success should be compared to levels of potential disturbance to determine whether the low percentages of nest success as a proportion of total emergences in this Graveyards – Burrows Sub-Section, can be attributed to disturbance

**Recommendation 20:** Compare nesting peaks with Environmental Data in Graveyards Section

**Recommendation 21:** Continue to monitor all Sub-Sections of Graveyards Section as a priority in North West Cape Division.

## **Overarching monitoring recommendations**

**Recommendation 1:** Graveyards and Hunters Sections should be considered as the priority monitoring Sections within the North West Cape Division. Lighthouse Bay and associated Sub-Sections should be considered as second priority and the Navy Pier and associated Sub-Sections should not be considered as a monitoring priority for 2004/2005 turtle monitoring season.

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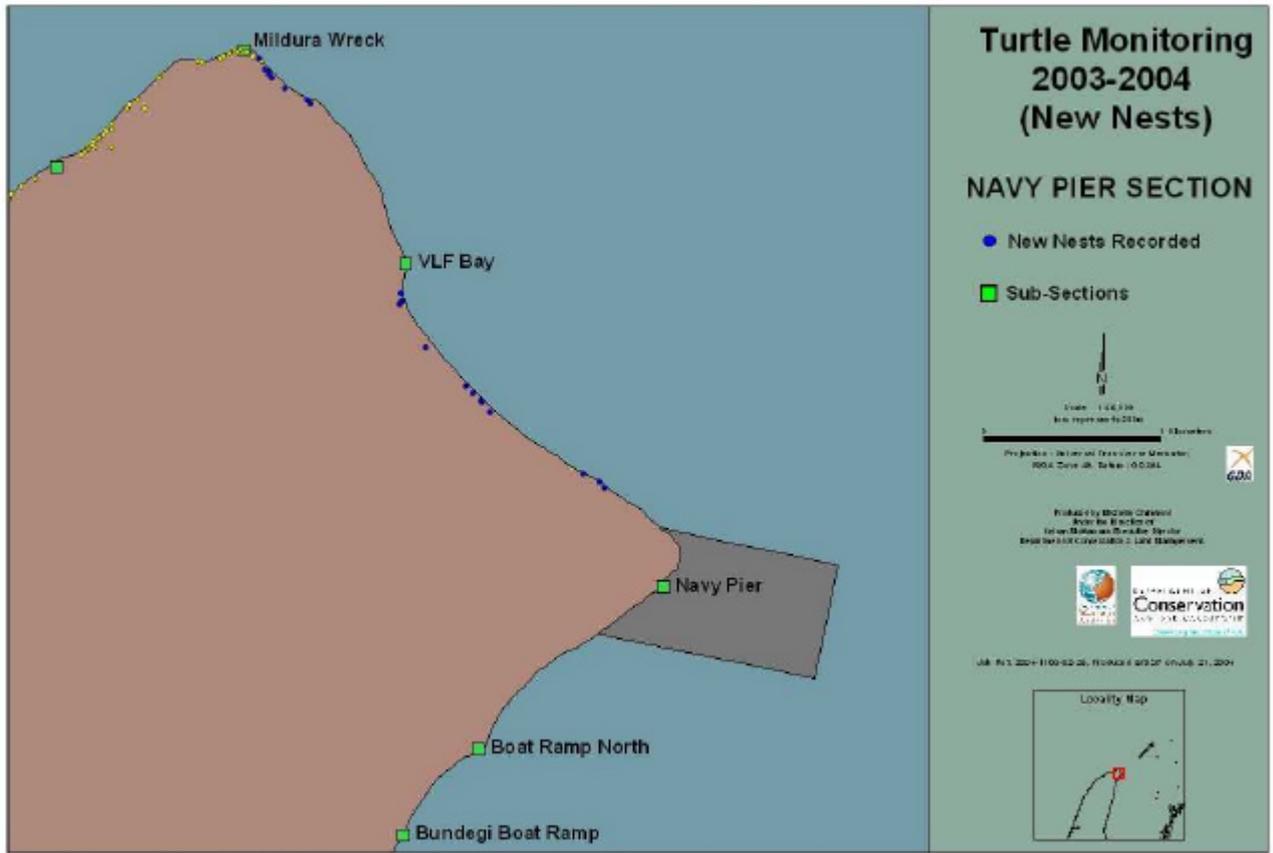
**Recommendation 11:** Data from 2001/2002 and 2002/2003 turtle monitoring seasons is analysed in a similar format to 2003/2004 data and seasonal comparisons are undertaken and integrated into this report.

## **Recommendations for Budget Consideration**

**Recommendation 1:** \$40,000 must be budgeted for full-time coordinators position

**Recommendation 2:** Devise a budget based on the outcomes of Coastwest Proposal and Department of Defence Proposal

## Attachment 2 – Aerial Maps of recorded turtle nests in Sections within North West Cape Division

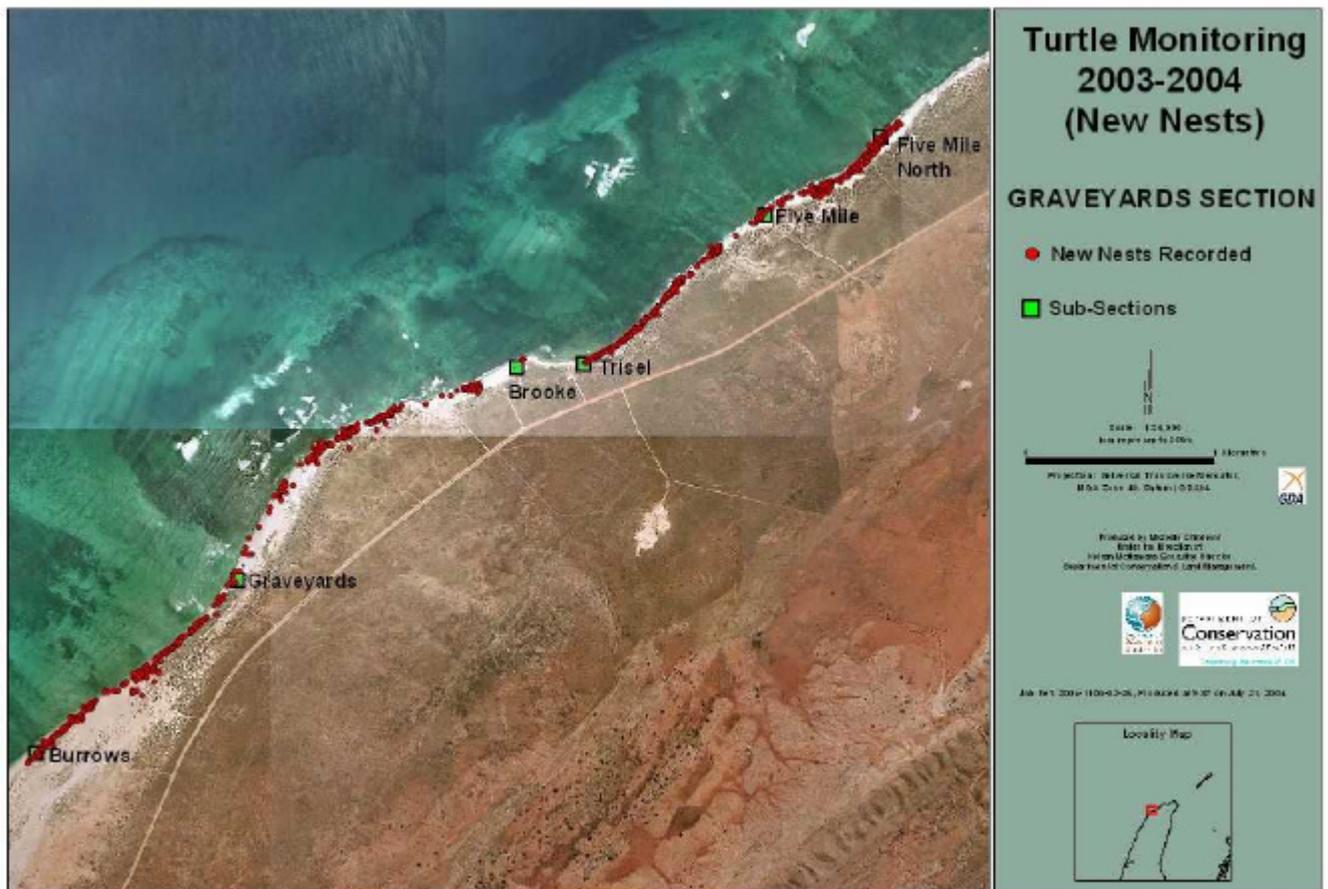


**Map A: New recorded nests in the 2003/2004 Turtle Monitoring Season in Navy Pier Section**



**Map B: New recorded nests in the 2003/2004 Turtle Monitoring Season in Lighthouse Section**





**Map D: New recorded nests in the 2003/2004 Turtle Monitoring Season in Graveyards Section**