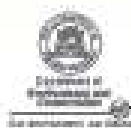
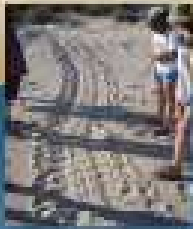




ANNUAL REPORT 2010-2011



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GLOSSARY

Body pit	A depression dug in the sand by a turtle during a nesting attempt.
Carapace	The shell covering the dorsal surface of the turtle.
Costal scales	Large scales lining both sides of the carapace, below the centre row of scales.
Egg chamber	A deep cylindrical hole which a turtle digs into a primary body pit with her back flippers only. The eggs are deposited here.
Emerging track	Track of a turtle emerging from the ocean onto land.
Escarpment	The edge of a ridge which indicates a filled in primary body pit.
False crawl	An abandoned nesting attempt.
GPS unit	Global Positioning System unit: an electronic navigational device which obtains a position on the earth using satellite signals.
Hatchling	A newly hatched turtle.
Nest Damage	The nest has been dug up, eggs or empty egg shells are around the nest or eggs are exposed.
Nesting success	The number of successful nests as a percentage of total turtle activities.
Plastron	The underside of a turtle.
Prefrontal scales	Situated on the head of a turtle, anterior to the frontal bone.
Preocular scales	Situated on the head of a turtle, anterior from the eyes.
Primary body pit	A depression dug in the sand by a turtle during a nesting attempt. The egg chamber is located here.
Returning track	Track of a turtle returning from the land to the ocean.
Rookery	A significant breeding area for a large number of animals.
Secondary body pit	Dug during a successful nesting attempt to cover the primary body pit and egg chamber with sand.
Successful nest/ New nest	A nesting attempt which has resulted in eggs being deposited and the nest completely covered.

Survey Effort	The total number of days and the number of times each subsection was monitored throughout the duration of the program.
Turtle activity	Includes both successful nests and false crawls.
Turtle tracker	A competent volunteer in identifying turtle species and observing activity during monitoring.

LIST OF ABBREVIATIONS

CCG	Cape Conservation Group Inc.
DEC	The Department of Environment and Conservation (formally the Department of Conservation and Land Management (CALM))
EPBC Act	Environmental Protection and Biodiversity Conservation Act 1999
JTC	Jurabi Turtle Centre
NTP	Ningaloo Turtle Program
NW Cape	North West Cape
NMP	Ningaloo Marine Park
WWF	World Wildlife Foundation

1. EXECUTIVE SUMMARY

The Ningaloo Turtle Program (NTP) was established in 2002 as a collaborative project between Cape Conservation Group Inc (CCG), World Wildlife Fund (WWF)-Australia and the Department of Environment and Conservation (DEC)-Exmouth District. The primary aim of the program is to promote and ensure the long-term survival of turtle populations within the Ningaloo Region by collecting long-term trend data on marine turtle population size.

For the purpose of the program, the Ningaloo Region is divided spatially into a hierarchical classification. Within this classification there are four Divisions within the Ningaloo Region: North West (NW) Cape Division, Cape Range Division, Bundera/Ningaloo Division and Coral Bay Division. Each division is then further divided into sections and subsections. In 2010-2011 only the NW Cape and Cape Range Divisions were monitored intensively due to consolidation of the program in 2009-2010 and 2010-2011 (Whiting, 2008). This consolidation is also attributed to capacity constraints and limited funding. Opportunistic monitoring only was carried out in the Bundera/Ningaloo Division and Coral Bay Divisions. However, for the purpose of this report, data collected from these divisions has been omitted from the results.

Since commencement of the program in 2002, volunteers have contributed 42,738 hours to the NTP. This figure alone demonstrates the importance of volunteers for the continuation and sustainability of this community-based program.

The 2010-2011 NTP season proved to be very active not only in terms of turtle activity, with 3295 new nests and 6975 false crawls recorded in the Ningaloo Region (approximately 3 times more than last season), but also in terms of cyclonic activity. At the time of writing, 5 severe weather events (2 monsoonal lows and 3 tropical cyclones) brought heavy rain, flooding, gale force winds and major tidal activity within the areas the NTP operates. Subsequently tidal inundation resulted in 46% of damaged nests.

Please note this report only contains figures up to and including the 30th January 2011. Please also note at time of writing the final three intermittent monitoring operations of the season have yet to be completed. This is due to the NTP Coordinator's contract being shorter than the specified period of monitoring required, which was determined by budgetary constraints.

1.1. Key Program Recommendations¹

Volunteer Participation

- Continue to build capacity among the local community and promote local program participation.
- Increase the volunteer's participation fee to cover a greater proportion of Program costs

¹ Please note this section 1.1 will be finalised once CCG have submitted their recommendations to DEC pending the final NTP Steering Committee meeting of the 2010-2011 season.

Occupational Health and Safety

- Continue to update Job Safety Analyses and improve occupational health and safety standards.
- Continue to improve communication procedures between volunteer accommodation and NTP quarters (located in Exmouth township).
- Consider a full manual license and senior first aid certificate as prerequisites for all the external volunteers.

Field Data Collection

- Continue to ensure accurate data collection and data entry.
- Continue to ensure volunteer accuracy in track and nest identification.
- Continue to improve monitoring techniques and data collection methods.
- Utilise Bungelup research station and adjacent loggerhead rookery during training to expand knowledge base of loggerhead track identification.

Organisation and Procedures

- Continue to build and expand on the current mailing list for the NTP.
- Continue to build upon the professional relations established this season between Australian Universities and the program.
- Consider past experience with the program a highly desired criterion for selection of the Volunteer Coordinator and Team Leader positions.
- Consider a DEC staff member from the Exmouth District with NTP experience taking on the role of the NTP Volunteer Coordinator.
- If an external applicant, consider extending the current NTP Volunteer Coordinator 4 month contract to a 6 month contract.
- Continue to involve the Volunteer Coordinator, NTPSC and DEC staff in field operations as much as possible.
- Continue to encourage feedback from all volunteers.
- Replace missing and old NTP totem markers.

Data Management

- Upgrade the current Microsoft Access database to ensure it is more user-friendly
- Volunteer Coordinator to continue to carry out intermittent checks of data collection equipment.
- Implement a daily data entry roster for external volunteers.
- Ensure data entry is daily and supervised by a Team Leader or the Volunteer Coordinator,
- Provide the volunteer Team Leaders with access to the database password (previously only accessible by the Volunteer Coordinator)
- Continue to ensure accuracy and consistency in data entry and data security.
- Provide more detailed and lengthy data entry training.

Volunteer Education, Information and Communication

- Continue to encourage greater local participation
- Continue with general turtle biology and conservation presentations to external and local volunteers.
- Continue with DEC presentations.

- Encourage local volunteers to give presentations to external volunteers.
- Consider to invite local Indigenous Coral Coast Park Council members to provide information of Indigenous history in the area.
- Continue with program progress updates to all volunteers throughout the season.

Survey Effort and Nesting Abundance

- Continue to monitor turtle activity within the NW Cape and Cape Range Divisions.
- Continue with opportunistic monitoring by DEC staff within the Bundera/Ningaloo and Coral Bay Divisions
- Continue with current reduced length of the NTP survey
- Continue with the centre the block period of monitoring to cover mid-December to mid-January
- Consider determining nesting success for a sample of turtles using night time surveys observing turtles
- Ensure weekend track counts outside of the intensive monitoring period are only counting the tracks from the previous night's nesting.

Training

- Continue to expand local trainer and assessor capacity prior to the arrival of the external volunteers.
- Encourage DEC staff with NTP experience to be trained as trainers.
- Consider updating the 6th edition of the "Turtle Monitoring Field Guide" to reflect changes in recent years (last updated in November 2007).
- Continue to utilise the training week to gain as much practical experience in track monitoring,
- Continue to ensure a minimum of two seasons experience as prerequisite to becoming a trainer.
- Continue to ensure smaller training and assessment groups where possible.

Predation Control

- Continue with the current DEC fox control program within the four Divisions - NW Cape, Cape Range, Bundera/Ningaloo and Coral Bay.
- Further investigate the impacts of ghost crab predation on nesting success within the Ningaloo Region.
- Continue to report opportunistic dingo and fox sightings to DEC Wildlife Officer.
- Report evidence of human damage to nests to DEC Wildlife Officer.

Turtles Rescues

- Continue to conduct opportunistic turtle rescues.
- Continue to provide volunteers with turtle rescue training.
- Notify the DEC Wildlife Officer of areas with considerable numbers of turtle strandings and mortalities.

General Recommendations

- Continue to investigate future funding opportunities for the program.
- Review and update the NTP overarching goals and objectives

- Continue to develop the NTP to match current environmental conditions and resource demands
- Continue to analyse nesting trends annually in future seasons (at time of writing these trends for 2010-2011 have not been analysed).

2. BACKGROUND

2.1. Ningaloo Marine Park

Ningaloo reef is Australia's largest fringing reef, extending 300 km from the North-West Cape to Red Bluff in Western Australia (Department of Conservation and Land Management (CALM) 2005). Over 500 species of finfish, 600 species of mollusc and 90 species of echinoderms inhabit Ningaloo reef, as well as many species of coral, crustacean and worms (CALM 2005). The area is also important habitat for charismatic mega-fauna such as whale sharks, turtles, dugongs, whales, dolphins, sharks and manta rays (CALM 2005). The diversity of marine life combined with the near-shore accessibility of the coral reef system promote Ningaloo reef as a prime tourism and conservation location.

In recognition of its uniqueness and cultural importance to West Australians, approximately 90% of Ningaloo reef was gazetted as a Marine Park in 1987 with the remaining area included within the Marine Park in 2004 (CALM 2005). Ningaloo Marine Park and its surrounding area is a popular holiday destination for Western Australians and increasingly to visitors from other areas of Australia and abroad (CALM 2005).

2.2. Marine Turtles of Ningaloo

Of the seven species of marine turtles recognised internationally, four of the species have breeding populations within Western Australia - the green turtle (*Chelonia mydas*), loggerhead turtle (*Caretta caretta*), hawksbill turtle (*Eretmochelys imbricata*) and flatback turtle (*Natator depressus*) (CALM 2005). Green, loggerhead and hawksbill turtles primarily nest along the coast of the Ningaloo Marine Park with the flatback turtle occasionally nesting within the area (Cape Conservation Group Inc (CCG) 2007).

Green turtles are the most abundant within the area while loggerhead and hawksbill turtles are found in much smaller populations. The Western Australian population of green turtles is thought to be the largest population in the Indian Ocean (Limpus 2007), which highlights the significance of nesting rookeries found within the Ningaloo Region.

Currently all species of marine turtles within Australia are protected under the *Commonwealth Environmental Protection and Biodiversity Conservation Act 1999 (EPBC Act)*, the *Endangered Species Protection Act 1992* and the *Wildlife Conservation Act 1950*. The protection of marine turtles is vested with the Department of Environment and Conservation (DEC) (CALM 2005).

2.3. Marine Turtle Threats

Marine turtles face numerous anthropogenic threats around the world including over-harvesting for food; entanglement in marine debris and commercial fishing nets; nesting beach and foraging area alteration; disturbance to nesting turtles and to emerging hatchlings by humans, egg poaching by

humans; and predation of eggs and hatchlings by feral predators (Lutcavage et al. 1997). Marine turtles undertake long migrations of up to 2500 km from their feeding grounds to their breeding and nesting areas, magnifying their vulnerability to human induced threats (Plotkin 2003; Spotilla 2004). For example, tagged green and loggerhead turtles that nest in Western Australia have been resighted in Arnhem Land and as far north as the Java Sea near Indonesia (Baldwin et al. 2003; Limpus 2007).

The increased anthropogenic threats, coupled with natural threats and the low fecundity of marine turtles, has resulted in many turtle species being threatened with extinction throughout their distribution around the world (Gulko & Eckert 2003). The International Union for Conservation of Nature (IUCN) Red List classifies green and loggerhead turtles as endangered species whereas the hawksbill turtles are listed as critically endangered. The flatback turtle is not classified as there is insufficient data on their population size (IUCN 2007). Historically, turtle populations in Australia are reported to have declined steadily and significantly (Environment Australia 2003).

Marine turtles and their eggs were commercially harvested in the Ningaloo Region from the early 1950s until 1973, with historical reports suggesting that tens of thousands of turtles were harvested (Limpus 2002; Limpus 2007). The size of turtle populations prior to commercial harvesting is not quantified due to a lack of data (Dean 2003), in part because monitoring entire populations of turtles is complex given their migratory nature (Girondot et al. 2006). Consequently, whether turtle populations are recovering within the Ningaloo Region following intensive harvesting is not known. This highlights the importance of collecting data on nesting abundance, to predict long term trends which will assist future conservation and management strategies for turtle populations within the Region.

Post commercial harvesting, a key threat to turtle population recovery within the Ningaloo Region is the predation of eggs and hatchlings by introduced species, in particular the European red fox (*Vulpes vulpes*) (Limpus 2002; Dean 2003; McKinna-Jones 2005). Foxes have been reported to have damaged between 40-70 % of nests on some beaches in the Ningaloo Region (Dean 2003). Predation of turtle nests by foxes could severely reduce the chance of population recovery within the Region.

Growing ecotourism within the Region has led to an increase in people seeking to view nesting female turtles and hatchlings and an increase in turtle interactions. Marine turtles are vulnerable to disturbance during the nesting period as adults aggregate in shallow waters and come ashore to nest (Collins 2000). The presence of people on a nesting beach at night coupled with the use of torch and car light can cause disturbance to nesting females and hatchlings (Waayers 2003; Johnson et al. 1996; Lorne & Salmon 2007). Female turtles are sensitive to any kind of disturbance and can abandon a nesting attempt at any given time and return to the ocean. By doing this, they expend an enormous amount of wasted energy which can potentially reduce their nesting success rate. Hatchlings are also easily disturbed through sources such as artificial light, which causes disorientation from the water's edge. This can lead to dehydration and increase the risk of predation (Lutcavage et al. 1997).

Other threats associated with human interaction with marine turtles include 4WD vehicles driving on the beach, resulting in sand compaction and the formation of wheel ruts in the sand in which hatchlings can become trapped (Limpus 2002).

3. INTRODUCTION

3.1. The Ningaloo Turtle Program

The Ningaloo Turtle Program (NTP) was established in 2002 as a collaborative project between Cape Conservation Group Inc. (CCG), World Wildlife Fund - Australia (WWF) and the Department of Environment and Conservation (DEC) - Exmouth District. The primary aim of the program is to predict long-term trends in marine turtle populations within the Ningaloo Region. This is achieved through the collection of turtle nesting information including nesting abundance and nest disturbance data. The data collected assists DEC in reducing disturbance levels to nesting turtles across the Ningaloo Region.

As a community-based volunteer program volunteers are central to its operations. Based in Exmouth, Western Australia the NTP provides an opportunity for local community members, as well as interstate and international volunteers to actively take part in turtle conservation within the Ningaloo Marine Park.

Participating in the NTP provides volunteers with an opportunity to undertake practical field experience and learn scientific monitoring techniques and skills. Each volunteer is given the opportunity to contribute to localised turtle conservation and further their understanding of fauna conservation management.

The program's overarching goals and objectives are listed below:

NTP Overarching Goals:

- Identify key nesting beaches;
- Monitor populations and assess trends at key index sites;
- Identify the level of threat of feral predators on nests;
- Implement effective protection of important nesting beaches in cooperation with the management agency;
- 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

NTP Primary Objectives:

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

Consolidation of the Ningaloo Turtle Program

The NTP has monitored marine turtle activity along the Ningaloo Coast for the past nine nesting seasons, with the survey effort varying from season to season. In 2008 the program undertook research into consolidating the program. Modelling has shown that trends in marine turtle populations (Ningaloo Region) can still be detected with a reasonable level of error when monitoring/survey effort is substantially reduced. Survey effort would include both intermittent monitoring throughout the

turtle nesting season and intensive monitoring mid-season to increase the confidence in abundance estimates (Whiting, 2008).

As a result, current NTP survey effort is now focused on eight to ten weeks either side of the nesting “peak”. This peak period has been determined by data analysis of previous seasons’ nesting patterns. Intermittent weekend monitoring is also conducted outside of this period throughout the remainder of the turtle nesting season to capture early and late fluctuations in nesting activity.

3.2. NTP Hierarchical Classification

For the past nine consecutive years since establishment, the NTP has recorded turtle nesting activity within Ningaloo Marine Park. Monitoring sites were established from past aerial and on-ground surveys, including:

- Identifying key nesting beaches and nesting turtle species;
- Quantifying the survey effort required by the program to detect trends in marine turtle abundance and;
- Determining the months that turtles nest within the Region.

For the purpose of the program, the Ningaloo Region is divided spatially into a hierarchical classification. There are four Divisions within Ningaloo which are further divided into sections (and subsections). Beaches were originally divided into these subsections based on factors such as geographical barriers that separate beaches, the locations of car parks and the distance and time required to monitor the subsections. Each subsection is defined by labelled NTP totem markers which mark the start and finish of each.

The Ningaloo Coastline is surveyed according to the NTP hierarchical classification to record the turtle activity abundance and nest disturbance. Turtle mortality locations are also recorded and turtle rescues are conducted opportunistically. Monitoring techniques are carried out in conformity with the NTP Turtle Monitoring Field Guide 6th Edition (CCG 2007).

North West Cape Division

The North West Cape (NW Cape) Division encompasses the Lighthouse Bay, Hunters, Graveyards and Tantabiddi Sections, which are further divided into subsections (see Appendix 7.1 for further division information).

Cape Range Division

The Cape Range Division encompasses the one Bungelup Section, which is divided into three separate subsections (see Appendix 7.2 for further Division information).

Bundera/Ningaloo Division

The Bundera/Ningaloo Division encompasses six separate sections. These sections are each classified into one or more subsections. This Division has not been monitored by NTP since the 2007-2008 season. DEC field staff however, have conducted opportunistic monitoring within this Division during monthly fox baiting operations, but for the purpose of this report this data has been omitted from the results.

Coral Bay Division

The Coral Bay Division is divided into two sections: Batemans Bay and Lagoon. These sections are each classified into one or more subsections. This Division has not been monitored by NTP since the 2009-2009 season. DEC field staffs however, have conducted opportunistic monitoring within this Division during monthly fox baiting operations, but for the purpose of this report this data has been omitted from the results.

4. NTP VOLUNTEER COORDINATION

The 2009-2010 NTP was the first season to introduce a partial financial cost recovery for program participation, where volunteers were required to pay a reasonable fee relating to NTP operational costs. This program fee continued to be a requirement of the 2010-2011 season. In return volunteers were provided with accommodation, food, transport to and from the monitoring sites and NTP social activities and airport transfers for the full five week period. The aim of the partial cost recovery is to increase the cost effectiveness of the program subsequently supporting the longevity of the NTP.

4.1. PARTICIPATION, RECRUITMENT AND ACCOMMODATION***NTP Volunteer Coordinator***

The NTP appointed a Volunteer Coordinator for a period of four months from 15th November 2010 to 4th March 2011 (an increase of one month from last season) to manage the seasonal program. This position was employed through DEC-Exmouth District and was responsible to DEC management. Duties included volunteer support and coordination, data management and quality control, field work coordination and general reporting. (Please note this position ended before the final three post-peak season monitoring operations were completed therefore data from these monitoring operations have not been included in this report).

NTP Volunteer Team Leader Internship

Volunteer Team Leaders were appointed in a supervisory role for the external volunteer participants. Successful applicants were required to participate for a period of eight weeks and provided a subsidy for accommodation, food and air travel from Perth to and from Exmouth.

The NTP Team Leader positions were advertised as an internship this season. Two team leaders, both university students, were appointed for the 2010-2011 season for a period of 8 weeks from 26th November 2010 to 16th January 2011. One of the Team Leaders used the NTP internship for a work placement unit to contribute towards their undergraduate university studies.

NTP Indigenous Internship

The NTP encourages the participation of local indigenous people within the program in a supervisory capacity similar to that of the Volunteer Team Leader role including the provision of a subsidy for accommodation, food and travel. No indigenous Team Leader interns or volunteers were recruited this season.

NTP Local Volunteers

The local community plays an integral role in the longevity of the NTP. Community volunteers continued to participate in the program through a flexible monitoring schedule. Local involvement was primarily on weekends due to prior work commitments.

NTP External Volunteers

External volunteers are vital to the operation of the NTP and include both Australian and International participants. External volunteers were required to commit to the 2010-2011 program for a period of 5 weeks (1 week more than the 2009-2010 season) involving 1 week of training and 4 weeks of intensive daily monitoring.

This season a total of 42 volunteers, including both local and external, assisted with NTP operations - monitoring, training, data entry and administration, contributing 2300 hours equating to \$46, 000 (based on a pay rate of \$20/hour) (Table 1).

Table 1: Summary of volunteer contribution and associated monetary value, NTP 2010-2011

Volunteer type	Number of Volunteers	Hours	Survey Effort	Volunteer Hours at \$20 p/hr
Local	28	504	126	\$10, 080
Internship	2	764	87	\$15, 280
Externals	12	1560	312	\$31, 200
Total	42	*2300	*460	\$46, 000

*Please note the above table includes hours for only one of the four post-peak season monitoring operations. The remaining three post-peak monitoring operations had not been completed at time of writing.

Volunteer Origin and Demographics

42 volunteers participated in 2010-11 season including both local and external volunteers. 58% were residents of Exmouth, 10% were external volunteers from other areas in Western Australia, 17% came from interstate, and the remaining volunteers (15%) were from overseas. The age of volunteers ranged from 18 to 70.

Volunteer Contribution 2002-2011

From the commencement of the NTP (2002-2003) to date, volunteers have participated in the NTP and are extremely vital to its success. Volunteers have contributed at total of 42,863 hours since monitoring began (Figure 1). In comparison to previous seasons both volunteer time contributions and volunteer numbers have significantly reduced in the past two seasons.

This is due to the fact that the past two seasons included monitoring within North West Cape and Cape Range Divisions only (and did not include the Bundera/Ningaloo and Coral Bay Divisions) therefore fewer volunteers were necessary to fulfil the monitoring requirements and with only a 4 week intensive block of monitoring rather than a 3 month block (as in previous seasons).

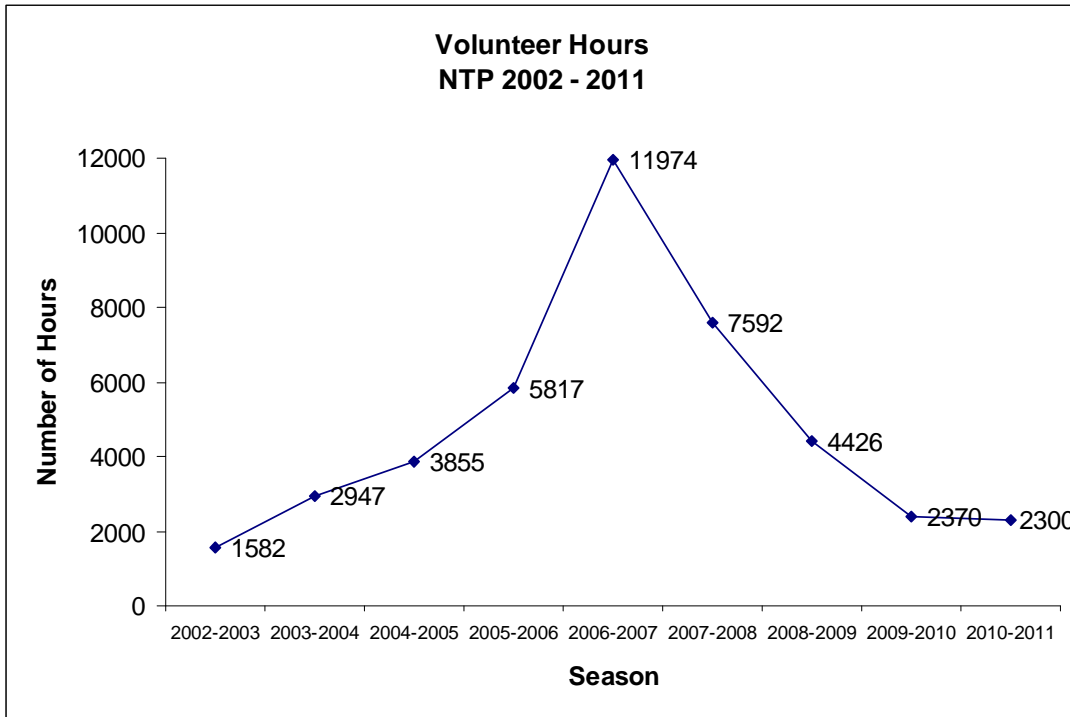


Figure 1: NTP volunteer contribution per year 2002-2011. Please note the above graph includes hours for only one out of the four post-peak monitoring weekends. The remaining three post-peak monitoring weekends have not been completed at time of writing.

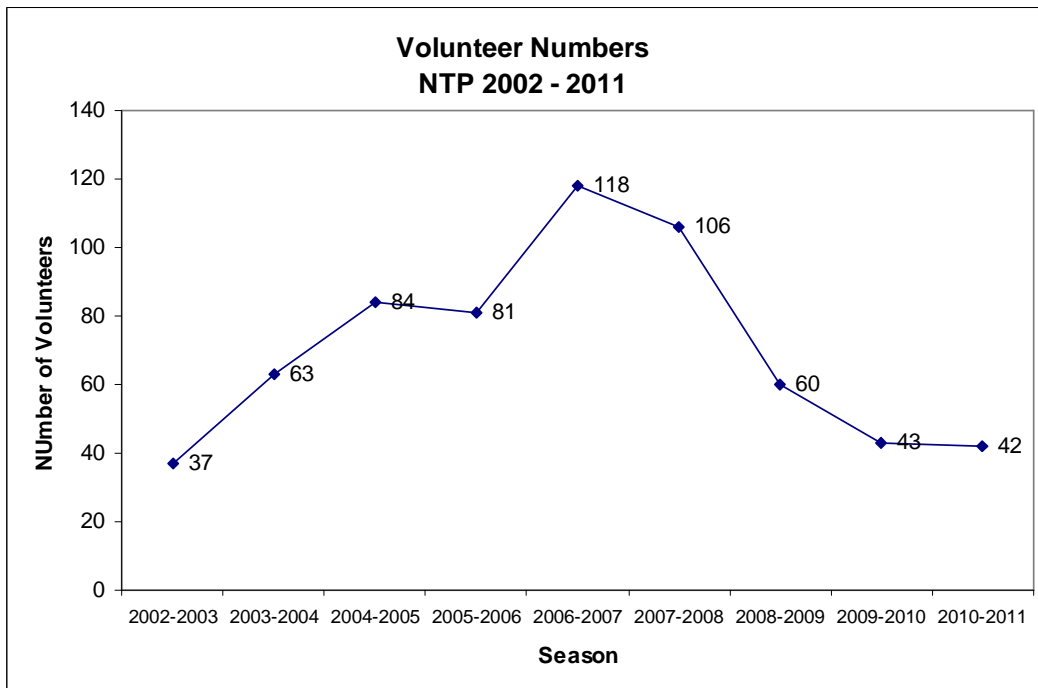


Figure 2: The number of NTP volunteers per year 2002-2011

Recruitment

- The NTP Volunteer Coordinator and volunteer positions were advertised through the NTP website (www.ningalooturtles.org.au), NTP workshops and information days in Exmouth, the CCG Newsletter, Northern Guardian News paper, EELIS (Exmouth Emails for Local Information Service) and Exmouth community notice boards..
- The Team Leader internships were also advertised through the NTP website, NTP workshops and information days in Exmouth, the CCG Newsletter, EELIS (Exmouth emails for local information service), Exmouth community notice boards and a number of Australia Universities.
- Previous local and external volunteers were invited to participate in this season's program. These volunteers were contacted via email prior to the commencement of the new season.
- Individuals enquiring about the program throughout the year were also contacted by email prior to the commencement of the new season.

Accommodation

- NTP external volunteers were provided accommodation for a five week period at the DEC research stations in Cape Range National Park, Exmouth, Western Australia. All 2010-2011 external volunteers were required to pay a fee of \$1000 which contributes to the cost of their accommodation, food, transport and all official NTP activities.
- External volunteers also had the opportunity to participate in remote camping at the Bungelup Camp, located 6km north of Yardie Creek in Cape Range National Park. Volunteers rotated between the two camp stations on a four day, three night roster.
- Team Leaders were provided accommodation in Exmouth Township for dates outside of the intensive 5 week monitoring period.. During the block monitoring period they were housed with the external volunteers within the Cape Range National Park
- The NTP Volunteer Coordinator was not provided with accommodation for the length of the 4 month contract.

4.2. MONITORING OPERATIONS

From the 21st December 2010 – 16th January 2011 the monitoring was conducted seven days a week by external volunteers, with the occasional local volunteer or NTP staff member. Outside of this period, from the 6th November 2010 – 30th January 2011, monitoring was undertaken solely by local volunteers and on weekends only. Please note at time of writing only the first of the four scheduled post-peak intermittent monitoring weekends was completed (29th-30th January 2011). The second post-peak weekend was rescheduled (19th- 20th February 2011) due to cyclonic activity. The dates of the remaining three post-peak monitoring weekends of the season coincide with cyclone season hence their completion is also weather dependent.

North West Cape Division

- A minimum of 12 volunteers was required to adequately survey each of the twelve subsections within the NW Cape Division and Cape Range Division (Bungelup).

- The 4 week block monitoring period was conducted mainly by the external volunteers on a rotational basis between NW Cape and Cape Range Divisions. Outside of this 4 week period local volunteers intermittently monitored on weekends in NW Cape Division only.
- A 12-seater minibus was required for the duration of the block monitoring period to transport external volunteers to and from the NW Cape monitoring sites (hired from Hertz).
- Several DEC vehicles were required to transport local volunteers to and from monitoring both during and outside of the block monitoring period, including the training week.
- On numerous occasions volunteers chose to use their own vehicle without receiving any reimbursement for fuel costs or additional expenses relating to their vehicle.
- Monitoring hours were approximately between 5:30am - 9:00am depending on amount of nesting activity and number of turtle strandings.

Cape Range Division

- One team leader accompanied by a maximum of two volunteers was required to monitor the Bungelup Section.
- A DEC 4WD vehicle was used at the Bungelup remote camp throughout the 4 week block monitoring period.

Bundera/Ningaloo Division and Coral Bay Division

- Due to continued reductions in survey effort this 2010-2011 season, monitoring did not occur within the Bundera/Ningaloo Division and the Coral Bay Division, in line with the 2009-2010 season.
- DEC field staff however conducted opportunistic turtle monitoring during monthly fox baiting operations in these Divisions, but for the purpose of this report this data has been omitted from the results.

4.3. Volunteer Training and Assessment

NTP participants are required to have a high level of knowledge of monitoring techniques and sound understanding of turtle nesting activity in order to adequately record findings. Volunteers undertake an induction which includes the following:

- A briefing on NTP and its operations, Exmouth Township and surrounding area including Ningaloo Marine Park and Cape Range National Park.
- Occupational health and safety procedures.
- NTP monitoring procedures.
- Participation in a Jurabi Turtle Centre (JTC) tour and a briefing on the DEC Code of Conduct for beach based marine turtle observations.
- A temporary copy of the NTP Turtle Monitoring Field Guide (CCG 2007).
- A practical training session by DEC staff in hand held and vehicle radio protocols and use of a hand held Global Positioning System (GPS).

NTP volunteers were trained and assessed throughout the turtle nesting season, with the majority taking place in the week before the 4 week intensive monitoring period. Each participant was required to undertake a minimum of three practical training sessions followed by a practical competency-based

assessment. Once qualified, they became competent “Turtle Trackers” and were provided with a certificate of competency and a NTP uniform. Additional training sessions were available if required to ensure volunteers were confident to accurately survey a subsection unaccompanied.

This season training and assessment for the program was carried out by 9 NTP staff & local volunteers who awarded competency to 10 local volunteers and 14 external volunteers. 2 local volunteers (with past NTP competency) were promoted to trainers.

5. MONITORING METHODS AND DATA COLLECTION

5.1. Identification of Successful Nests and False Crawls

- To determine turtle nesting activity, volunteers survey beaches along the Ningaloo Coast at sunrise. Turtle tracks and nest markings in the sand from the previous evening are recorded. Species-specific track and nest markings allow volunteers to identify the presence of green, loggerhead, hawksbill or flatback female turtles.
- Successful nesting is determined by the presence of a nest mound and additional key nest features such as an escarpment and a shallow secondary body pit and (CCG 2007).
- The position of the nest is recorded using a GPS and its specific location on the beach is noted: (I) Intertidal, (H) High tide area, (E) edge of vegetation, or (D) dunes and beyond.
- If a nest is not located with the associated turtle track and the turtle has abandoned any nesting attempt and returned to the water, this activity is recorded as a false crawl.
- Once the turtle activity is identified and recorded as either a nest or a false crawl, volunteers mark off the activity by drawing a line in the sand (across the neck of the nest away from the egg chamber, or through the track in the case of a false crawl) to avoid double counting of turtle activities on subsequent beach surveys.
- All turtle activity is recorded on the NTP monitoring data sheet, to be entered into the NTP database at a later stage (Appendix 7.4).
- Other observations and general comments such as: a turtle still nesting on the beach, presences of hatchlings, comments relating to a photograph taken, illegal activities sighted on the beach are also recorded on the data sheet.

5.2. Identification of Predation and Predator Prints

- Evidence of damage to new and old nests and the potential cause of damage are recorded on the NTP monitoring data sheet. This includes the presence of eggshells, partially consumed eggs, and significant holes dug in the immediate locality of the egg chamber (CCG 2007).
- Any prints within a 5m radius of the nest, including dog (D), fox (F) or human (H) prints are recorded.
- Fox and/or dog presence in any subsection are also recorded. Please note a single dog or fox could walk along a stretch of beach for many kilometres, subsequently leaving prints on a number of subsections within a single evening. Therefore, the presence or absence of fox and dog prints is recorded and does not indicate the number of individual animals present on a beach in one evening.

- This season volunteers were required to complete a DEC “Dangerous Fauna Record Sheet” for every dingo sighting. The locality, date, time and observer are recorded, along with the identifying characteristic of the animal and observed behaviour, if relevant.

5.3. Data Entry

- All data recorded on NTP data sheets is entered into a Microsoft Access database managed by DEC - Exmouth District. The database allows for information to be retrieved via standard queries and through the output of summary reports.
- Data is entered according to the date, division, section and subsection on the data sheet.
- All activity details are entered including species type, nest location coordinates, details of predation, general comments and the confidence level associated with the accuracy of the GPS coordinates, the presence of fox and dog tracks and the number of false crawls (Appendix 7.4).

5.4. Rescues and Mortalities

- Volunteers will occasionally encounter stranded turtles, which they assist back to the ocean. Nesting turtles are likely to become stranded in either the rocky shoreline or behind the sand dunes. The NTP has purpose-made turtle stretchers which are kept in the two NTP vehicles throughout the season. Volunteers are required to complete a DEC form “Marine Turtle Stranding or Mortality Datasheet” for every stranded or deceased turtle.
- Volunteers are also required to complete a DEC “Marine Wildlife Stranding and Mortality Datasheet” for all other deceased wildlife – i.e. dolphins, whales, dugongs, sea birds, sharks and sea snakes that they may encounter.

5.5. Tagged Turtles

- During the 1986/87 turtle nesting season the Western Australian Marine Turtle Project (WAMTP) was introduced by DEC (formally known as CALM) in order to gather information on the distribution and abundance of Western Australian marine turtle populations and the movements of individual turtles. Turtles were tagged at several locations in WA such as the Lacepede, Muiron, Barrow, Varanus, and Rosemary Islands, the North West Cape, Exmouth Gulf and Cape Thouin. Tagging was conducted over several intermittent turtle nesting seasons with varying intensity at the tagging locations.
- Turtles encountered on the beaches during NTP monitoring activities are checked for tags wherever possible, without disturbing the turtle (preferably when the turtle is returning to the waters edge). Tagged turtles are recorded on the Tagged Turtle Resighting datasheet for DEC’s West Australian Turtle Research Program (Appendix 7.6) The locality, date and observer are recorded, along with the left and right tag numbers, turtle species, time of observation, turtle activity and nest location if relevant.

5.6. Survey Effort 2010- 2011

North West Cape Division

Within the NW Cape Division monitoring occurred between the 6th November 2010 and the 30th January 2011. (Please note for the purpose of this report only figures up to and including the first post-peak season monitoring weekend (29th-30th January 2011) has been included). A four week block period of monitoring occurred between the 21st December 2010 and the 16th January 2011. No monitoring was conducted on Boxing Day (26th December 2010) and New Years Day (1st January 2011); counts of tracks on 27th December 2010 included tracks from 26th December and 27th December and counts of tracks on 2nd January 2011 included tracks from 1st January and 2nd January. In these instances the track counts were averaged over the two days.

Outside of this four week block period weekend monitoring was conducted in the NW Cape Division on the following dates: 6th -7th and 27th - 28th November 2010, 11th -12th December 2010 and 29th- 30th January. The weekend of the 19th -20th February 2011 was cancelled due to cyclonic activity and rescheduled for the following weekend. This weekend and the weekends of the 12th -13th and 26th -27th March 2011 had not been completed at time of writing.

All subsections were monitored between 26-36 days, depending on the availability of volunteers and favourable weather conditions (Table 2). In the case of insufficient volunteers to cover all sections, the most northern three subsections (between Mildura Wreck and Hunters) were omitted from monitoring. This is due to the northern subsections having lower turtle nesting density.

Table 2: Number of days monitored of each NW Cape and Cape Range Division Subsection, 2010-2011. Please note the above table includes only one of the four scheduled post-peak period monitoring weekends.

Division	Section	Subsection	Number of Days Monitored		
North West Cape	Lighthouse	Mildura Wreck – North West Carpark	30		
		North West Car park - Surf Beach	30		
		Surf Beach - Hunters	33		
	Hunters	Hunters - Mauritius	36		
		Mauritius – Jacobsz South	36		
		Jacobsz South - Wobiri	36		
		Graveyards	Five Mile - Five Mile North	36	
	Cape Range	Bungelup	Five Mile - Trisel	36	
			Brooke - Graveyards	36	
			Graveyards - Burrows	36	
			Tantabiddi	Burrows - Jurabi Point	36
			Bungelup North - Neils North	26	
			Bungelup South - Bungelup North	26	
		Rollys- Bungelup South	27		
TOTAL			460		

Cape Range Division

Within the Cape Range Division, monitoring occurred between the 21st December and the 16th January 2010. All three Bungelup subsections were monitored daily for 26 days with one subsection monitored an extra day (Table 2). No monitoring was conducted on New Years Day (1st January

2011); counts of tracks on 2nd January 2011 included tracks from both 1st January and 2nd January so track counts were averaged over the two days.

Bundera/Ningaloo Division and Coral Bay Division

Due to continued reductions in survey effort this 2010-2011 season, monitoring did not occur within the Bundera/Ningaloo Division and the Coral Bay Division, in line with the 2009-2010 season. DEC field staff however conducted opportunistic turtle monitoring during monthly fox baiting operations in these two Divisions, but for the purpose of this report this data has been omitted from the results.

NW Cape Division

A total of 2883 nests and 6610 false crawls were recorded within the NW Cape Division during the 2010-2011 NTP. The green turtle had by far the greatest number of nesting activity (both new nests and false crawls) recorded (95.8%), followed by the loggerhead turtle (2.6%) and hawksbill (1.5%) (Table 3 and Table 4 Table 4) 0.1% of nests were recorded as unidentified.

Turtle activities by section – NW Cape Division

Overall successful nesting activity was greatest within the Graveyards Section (1235), followed by Hunters Section (1107), Tantabiddi Section (354) and Lighthouse Bay Section (187). Unsuccessful nesting activity (false crawls) was greatest within the Graveyards Section (2672) followed by Hunters Section (2308), Lighthouse Bay Section (822) and Tantabiddi Section (811) (Figure 3). For individual nest locations see maps in Appendix 11.6, 7.8, 7.9 and 7.10.

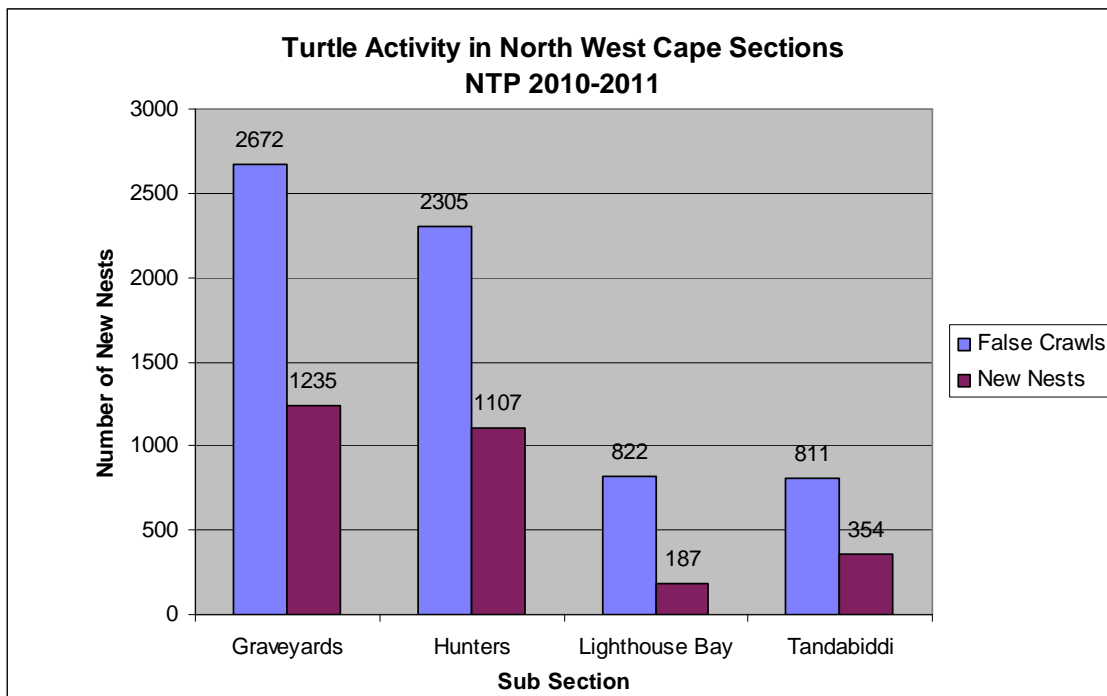


Figure 3: Comparison of nesting activity (new nests and false crawls) recorded in each NW Cape Section NTP 2010-11

Percentage of nests laid for each species per section - NW Cape Division

The greatest percentage of green turtle nests were laid within the Tantabiddi Section (98.3%), followed by Graveyards Section (95.2%), Hunters Section (90.1%), and Lighthouse Bay Section (86.1%). Whereas the hawksbill turtle laid the greatest number of nests within the Hunters Section (4.8%), followed by Lighthouse Bay Section (3.7%), Graveyards Section (1.8%) and Tantabiddi Section (0.8%). Loggerhead nests were greatest within the Lighthouse Bay Section (9.1%), followed by Hunters Section (5.0%), followed by Graveyards Section (2.8%), and Tantabiddi Section (0.8%). Lighthouse Bay Section had 1.1% of new nests recorded as unknown, followed by the Hunters and Graveyards Sections (0.2%) with no nest recorded as unidentified within the Tantabiddi Section (Figure 4).

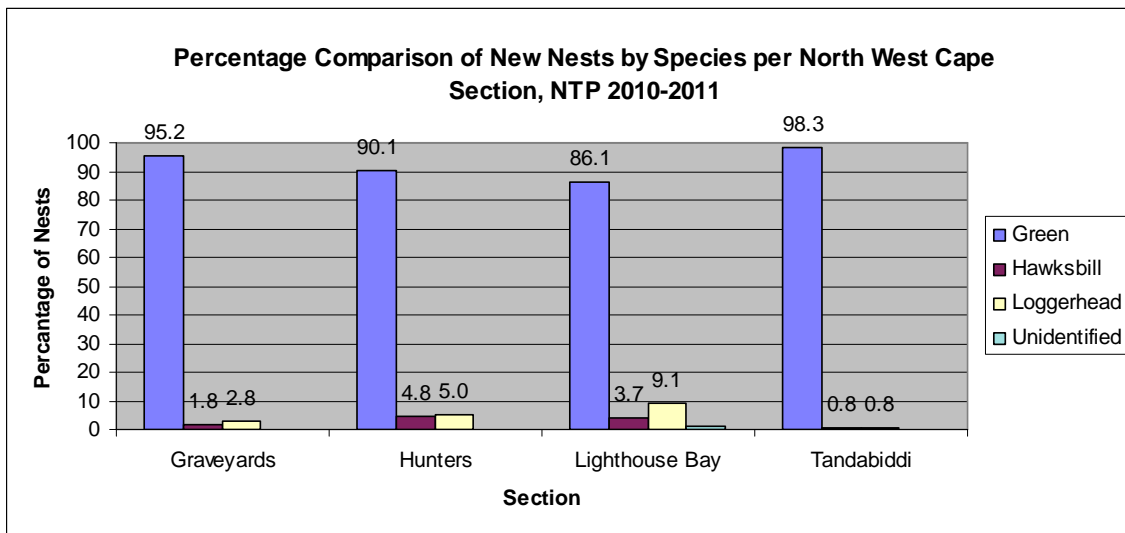


Figure 4: Percentage comparison of new nests laid for each species per NW Cape Section 2010-2011

Cape Range Division

A total of 412 new nests and 365 false crawls were recorded in the Bungelup Section (Cape Range Division) during the 2010-2011 NTP (Table 3 and Table 4). The loggerhead turtle had the greatest number of new nests recorded in the Bungelup Section (69.4%), followed by hawksbill (25.2%), and green (2.9%). 2.4% of new nests were unidentified.

Turtle activities by subsection –Bungelup Section, Cape Range Division

Turtle activity (both new nests and false crawls) was the highest in the Rolly Beach Subsection (147 and 143 respectively), followed by Neils Beach Subsection (132 and 140 respectively) and Bungelup Beach Subsection (82 and 133 respectively). For individual nests locations see Appendix 7.11.

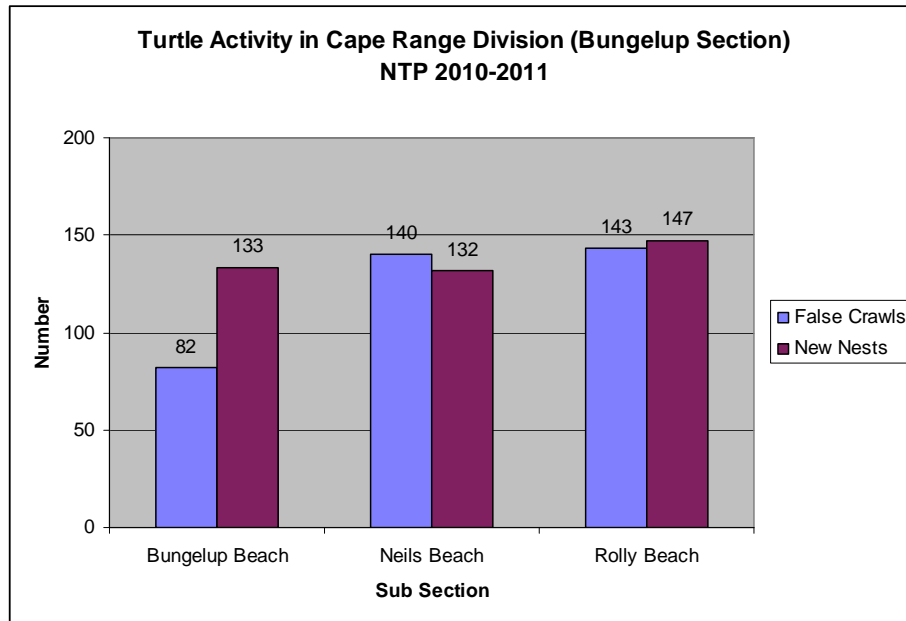


Figure 5: The total number of nests and false crawls recorded within the Cape Range Division (Bungelup Section), NTP 2010-2011

Percentage of new nests laid for each species per section - Cape Range Division

The loggerhead turtle had the greatest percentage of new nests within the Neils Beach Subsection (78.0%), followed by Bungelup Beach Subsection (69.9%) and Rolly Beach Subsection (61.2%). Whereas the hawksbill had the greatest number of new nests within the Rolly Beach Subsection (34.0%), followed by the Bungelup Subsection (25.6%) and the Neils Beach Subsection (15.2%). Green turtle activity was minimal within the Cape Range Division ranging from 0.7% to 5.3% (Figure 6).

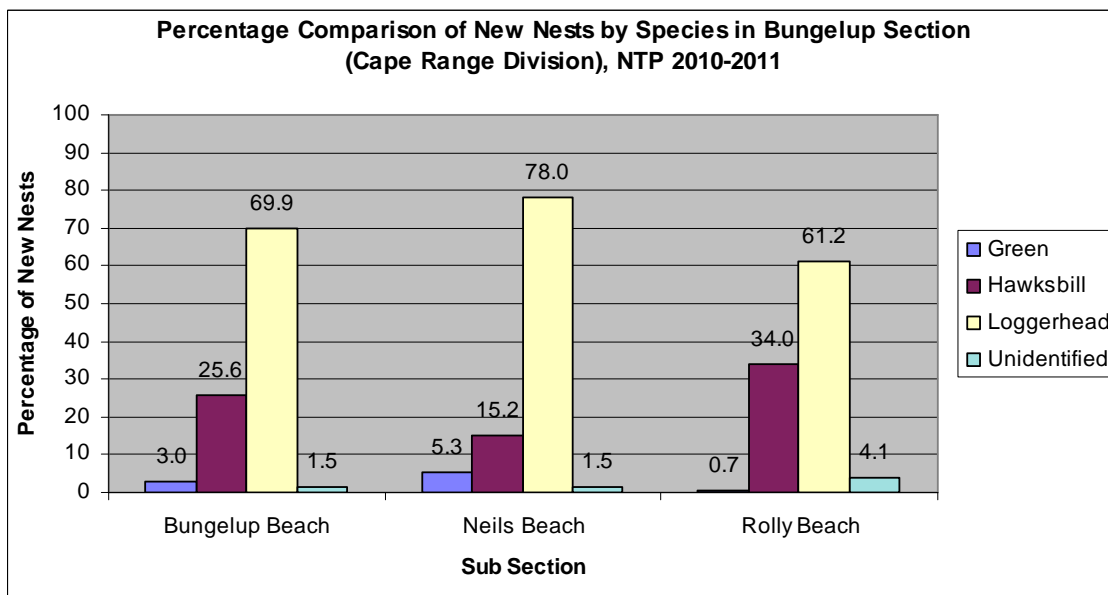


Figure 6: Percentage comparison of total new nests by species within Cape Range Division (Bungelup Section), NTP 2010-2011

5.7. Summary of Turtle Activity, Ningaloo Region 2010-2011

A total of 3295 new turtle nests and 6975 false crawls were recorded for the Ningaloo Region during the 2010-2011 season (Table 3 and Table 4).

Table 3: The total number of nests recorded for each species within the Ningaloo Region (NW Cape and Cape Range Divisions), NTP 2010-2011

Division	Turtle Species				Total
	Green	Hawksbill	Loggerhead	Unidentified	
Cape Range	12	104	286	10	412
North West Cape	2682	85	109	7	2883
Grand Total	2694	189	395	17	3295

Table 4: The total number of false crawls recorded for each species within the Ningaloo Region (NW Cape and Cape Range Divisions), NTP 2010-2011

Division	Turtle Species				Total
	Green	Hawksbill	Loggerhead	Unidentified	
North West Cape	6415	58	134	3	6333
Cape Range	43	74	242	6	353
Total	6458	132	376	9	6975

Comparison of new nests by species

Green turtles accounted for 81.8% of recorded new nests in the Ningaloo Region, followed by loggerhead (12.0%) and hawksbill turtles (5.7%). A small percentage of nesting activity was recorded as unknown (0.5%) and no flatback nests were identified during the 2010-2011 season (Figure 7).

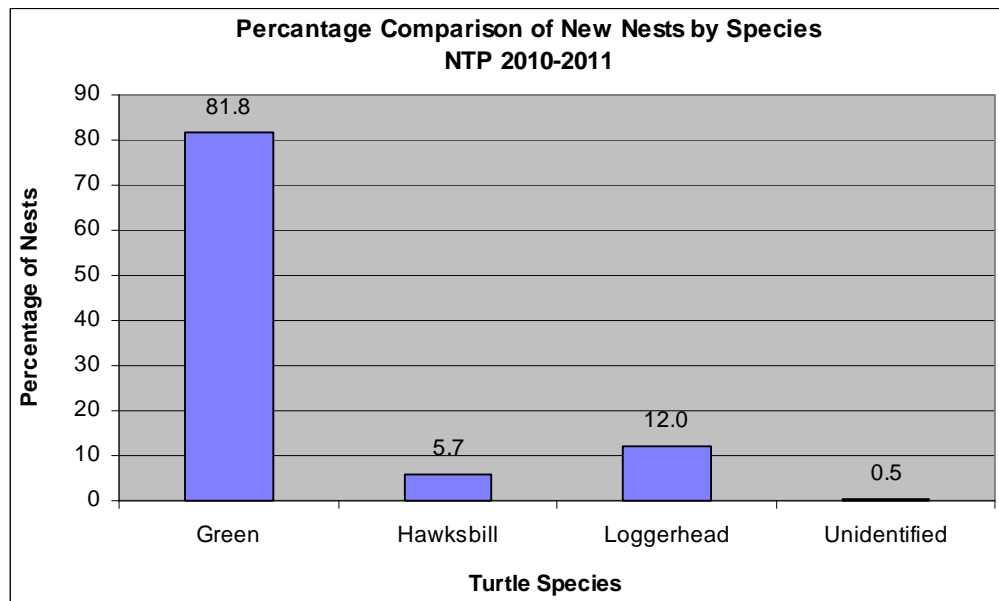


Figure 7: Percentage comparison of new nests recorded for each species within the Ningaloo Region (NW Cape and Cape Range Divisions), NTP 2010-2011

5.8. Summary of Turtle Activity, Ningaloo Region 2002-2011

The NTP has recorded 34,695 new nests and 75,878 false crawls since commencement of the program in 2002 within the Ningaloo Region (including all divisions). The combined survey effort (2002-2011) for the number of subsections surveyed is 9360 and a total of 813 days has been collated for when monitoring actually occurred (Table 12). For a further breakdown of season survey effort and turtle activity see Table 12 in Appendix 10.13.

Figure 8 shows the number of new nests, false crawls and total turtle activity during the peak nesting period (mid December- mid January) for each of the NTP seasons since the Ningaloo Turtle Program began. The 2008-2009 peak season had the highest number of new nests and the highest total turtle activity on record at 9681. In contrast, last season (2009-2010) recorded the lowest numbers during the peak period for both new nests and false crawls, with a total turtle activity of 1855. This 2010-2011 season ranks the second highest for recorded new nests and third highest for number of false crawls and total turtle activity (behind the 2008-2009 and 2006-2007 seasons respectively). Worldwide evidence suggests a cyclical nature of marine turtle populations due to their non-annual breeding behaviour (Miller 1997; Plotkin 2003) but NTP data from the past nine seasons does not support this (Figure 8).

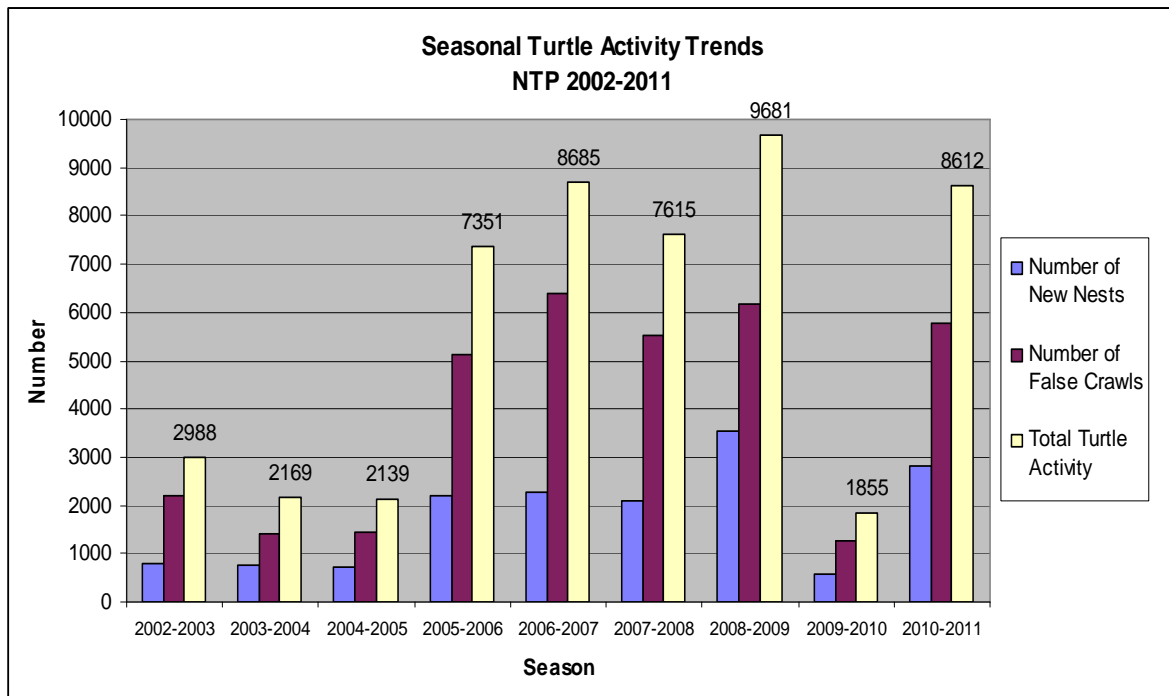


Figure 8: Comparison of seasonal turtle activity (total number of new nests and false crawls) over the peak nesting period (21st December- 16th January) for all NTP seasons, Ningaloo Region, NTP 2002-2011

5.9. Summary of Nest Damage

Nest Damage 2010-2011

A total of 13 nests were recorded as damaged in the Ningaloo Region, 12 of which were located in the NW Cape Division - Graveyards Section (5), Hunters Section (3), Tantabiddi Section (2), and Lighthouse Bay Section (2). Only 1 nest was recorded as damaged in the Cape Range Division (Bungelup Section) (Table 5). Damaged nests amounts to 0.4% of the total nests recorded for the 2010-2011 season

The majority of nest damage this season was a result of tidal inundation (46%) caused by unusually high tides resulting from cyclonic and monsoonal low activity (see section 6.8 for more detailed climatic information). This was followed by ghost crabs (23%), foxes/ dogs (23%) and humans (8%) (Figure 9).

Table 5: The total number of damaged nests and causes, NTP 2010-2011

Division	Section	Cause of Nest Damage				Total
		Ghost Crab	Fox/ Dog*	Human	Tide	
Cape Range	Bungelup				1	1
North West Cape	Graveyards		2		3	5
	Hunters	1	1	1		3
	Lighthouse Bay				2	2
	Tandabiddi	2				2
Total		3	3	1	6	13

*Please note fox and dog prints have been totalled together to minimise human error in identification of animal tracks.

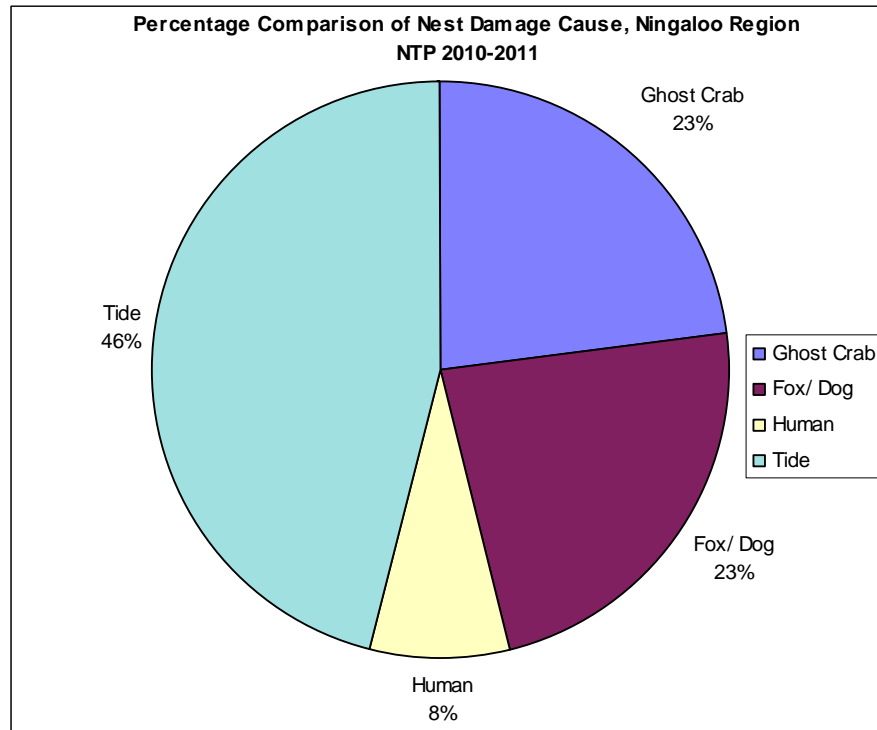


Figure 9: Percentage comparison of nest damage cause, Ningaloo Region 2010-2011. Please note fox and dog prints have been totalled together to minimise human error in identification of animal tracks.

Nest Damage 2002-2011

Since monitoring began in 2002 a total of 732 nests have been recorded as damaged within the Ningaloo Region (Table 6). This equates to 2.1% of total nests recorded within the Ningaloo Region 2002-2011 (please note that survey effort within the region varies for each NTP season, see Table 12 for detailed survey effort data).

Table 6: Total number of damaged nests and cause per season NTP 2002-2011.

Season	Unknown	Dog	Ghost				Human	Seagull	Tide	Another		Total
			Fox	Crab	Goanna	Turtle				Vehicle		
2002-03	14	0	58	14	3	9	2	2	3	0	105	
2003-04	53	0	95	4	2	11	2	4	2	0	173	
2004-05	10	0	26	2	1	1	0	2	1	2	45	
2005-06	0	0	4	12	0	0	2	2	4	1	25	
2006-07	5	5	30	22	1	0	0	1	13	0	77	
2007-08	9	9	13	96	4	2	3	9	13	0	158	
2008-09	31	7	57	1	0	0	0	0	1	0	97	
2009-10	15	2	15	2	4	1	0	0	0	0	39	
2010-11	0	1	2	3	0	1	0	6	0	0	13	
Total	137	24	300	156	15	25	9	26	37	3	732	

5.10. Summary of Nest Predation

Nest Predation 2010-2011

Predation of nests by foxes and dogs

Damage by foxes/dogs has accounted for 23% of damaged nests in 2010-2011 and 0.09% of the total new nests in the 2010-2011 NTP (Table 5 and Figure 10).

Nest Predation 2002-2011

Predation of nests by foxes and dogs

Damage by foxes and dogs has accounted for 44.3% of the total damaged nests recorded (2002-2011). Nest predation by foxes/dogs has remained below accepted level of 5% (see red line on Figure 11) for all recorded nests (Figure 11). The highest record of fox/dog predation since monitoring began is 4.6% in 2003-2004 and was primarily within the Five Mile Subsection (Figure 11). As this subsection is a significant green turtle rookery, fox control measures were introduced by DEC in the following season (2004-2005) (Halkyard, 2008) and as a result fox/dog predation has declined significantly in subsequent NTP seasons and has maintained a very low level (less than 1.59%) due to continued fox baiting in turtle rookery areas.

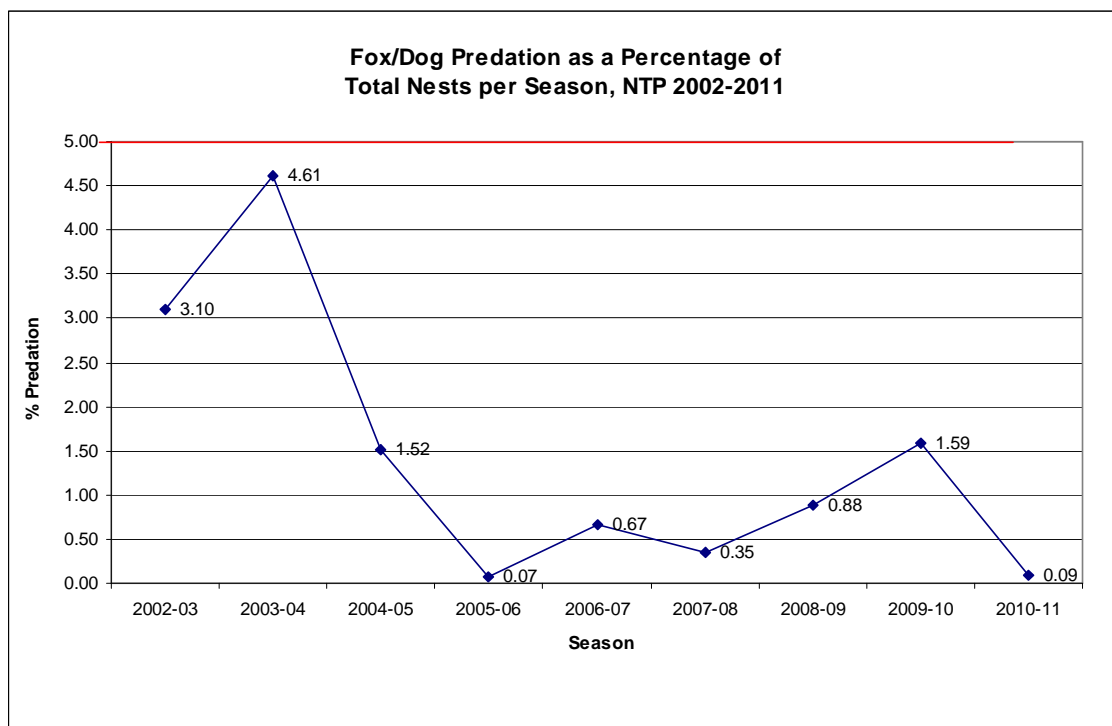


Figure 11: Fox/dog predation as a percentage of total nests per season, NTP 2002-2011 (Note 2009-10 and 2010-11 season data includes NW Cape and Cape Range Divisions only, other seasons include an additional two divisions).

Note: Fox and dog prints have been totalled together to minimise human error in identification of animal tracks.

5.11. Summary of Turtle Rescues

Turtle Rescues 2010-2011

8 successful turtle rescues carried out during the 2010-2011 NTP season. All rescued individuals were female green turtles within the North West Cape Division (Table 7).

Table 7: The number of turtles and location rescued, in 2010-2011

Division	Subsection	Species	Maturity	Sex	Number
North West Cape	Five Mile- Trisel	Green	Adult	Female	1
North West Cape	Brooke- Graveyards	Green	Adult	Female	1
North West Cape	Burrows- Jurabi Point	Green	Adult	Female	1
North West Cape	Jacobsz- Wobiri	Green	Adult	Female	1
North West Cape	Graveyards- Burrows	Green	Adult	Female	1
North West Cape	Jacobsz- Wobiri	Green	Adult	Female	1
North West Cape	Brooke- Graveyards	Green	Adult	Female	1
North West Cape	Five Mile- Five Mile North	Green	Adult	Female	1
Total					8

Turtle Rescues 2002-2011

NTP volunteers have rescued a total of 187 stranded marine turtles from 2002-2011. The number of turtles rescued has fluctuated greatly over the seasons, with the highest number of turtles rescued in the 2005-2006 season (40) (Figure 11).

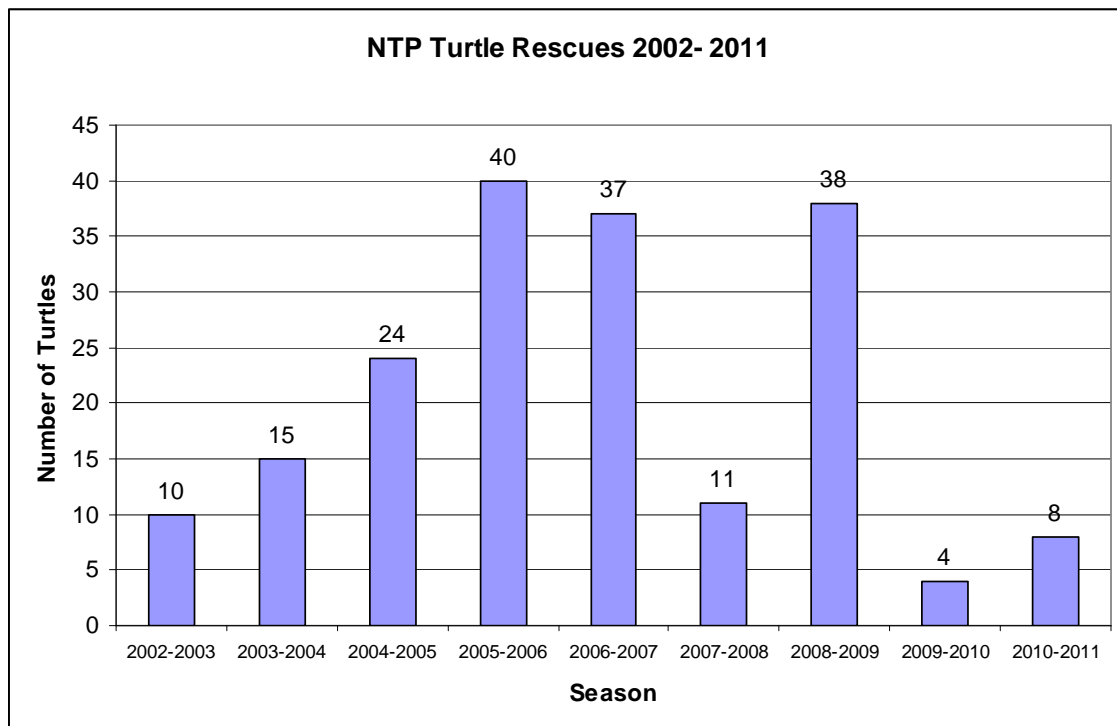


Figure 11: The number of turtles rescued in each NTP season, 2002-2011. Note 2009-10 and 2010-11 season data includes NW Cape and Cape Range Divisions only, other seasons include an additional two divisions.

5.12. Turtle Mortalities 2010-2011

A total of 6 turtle mortalities were recorded during the 2010-2011 season (compared to 9 in 2009-2010). All were green turtles in the North West Cape Division and the majority found were adults (Table 8). Detailed mortality reports can be obtained from DEC Exmouth District.

Table 8: The location, species and number of deceased turtles recorded in the Ningaloo Region 2010-2011

Division	Subsection	Species	Maturity	Sex	Number
North West Cape	Five Mile- Trisel	Green	Adult	Male	1
North West Cape	Burrows- Jurabi Point	Green	Unknown	Unknown	1
North West Cape	Burrows- Jurabi Point	Green	Unknown	Female	1
North West Cape	Burrows- Jurabi Point	Green	Juvenile	Unknown	1
North West Cape	Brooke- Graveyards	Green	Adult	Female	1
North West Cape	Jacobsz - Wobiri	Green	Adult	Female	1
Total					6

5.13. Weather Events 2010-2011

The 2010-2011 NTP season proved to be very active in terms of cyclonic and major tidal activity, in contrast to the past 2 seasons where no such weather events occurred. At the time of writing, 5 severe weather events, 2 monsoonal lows and 3 tropical cyclones (Category 3 Tropical Cyclone Bianca, Category 2 Tropical Cyclone Dianne and Category 2 Tropical Cyclone Carlos) in December 2010, January and February 2011 brought heavy rain, minor flooding, gale force winds and major tidal activity within the areas the NTP operates.

The cyclonic activity produced large storm surges well past the high tide level up to the base of the dunes in some sections within both the NW Cape and Cape Range Divisions. Large amounts of sand were eroded and underlying rocks exposed, dramatically changing the structure of the beaches and leaving few areas suitable for nesting. As a result, the northern sections of the NW Cape Division were devoid of any nesting activity in the days following the cyclones. On subsequent monitoring weekends a large number of nests were observed destroyed, having been inundated by the tide and leaving eggs exposed or washed away.

Tropical cyclones, Dianne and Carlos, interrupted scheduled monitoring in February resulting in the weekend of the 19th-20th February not materializing and having to be rescheduled. This weekend in February and the two scheduled monitoring weekends in March had not been completed at time of writing are all dependant on absence of cyclonic activity for successful monitoring.

5.14. Tagged turtle re-sightings 2010-2011

Only one tagged turtle was sighted during the 2010-11 season. It was a female green turtle but unfortunately her tag number was unreadable, therefore no information about her could be obtained from it.

On a separate occasion a loose tag was recovered on top of a green turtle's nest. Analysis of the tag (WA34875) revealed it belonged to a large green female originally tagged in the North West Cape

Division in December 13 years ago (in 1997). She had been observed only once since then, also in December 1997. This was the only tag that had ever been attached to her so there will be no future data on this individual.

6. NTP 2010-2011 SUMMARY

6.1. Volunteer Participation

The introduction of a financial cost associated with Program participation in 2009-2010 increased the cost effectiveness of the NTP. The fee of \$990 per volunteer partially covered the Program costs including accommodation, food, transport to and from monitoring and NTP social activities for the full four week period. The NTP partial cost recovery continued in 2010-2011 with a slight increase in fee (to \$1000) and aims to assist with the financial sustainability of the program and subsequently the longevity of the program.

This season 9 of the 14 external volunteers participated in the NTP on a \$5000 Australian National Network in Marine Science (ANNiMS) grant, through the three supporting universities (University of Tasmania, James Cook University, and University of Western Australia), hence their participation was fully funded as part of their tertiary marine studies.

Since commencement of the program in 2002, volunteers have contributed **42,863** hours towards the NTP. This figure alone demonstrates the importance of volunteers for the continuation and sustainability of the community program. Over the years there has been a noticeable reduction in volunteer contribution. This can be attributed to the reduction in NTP survey effort both spatially and temporally in 2009-2010 and 2010-2011 and the discontinuation of the Jurabi Turtle Centre (JTC) program as an element of NTP operations from 2007-2008 onwards.

6.2. Survey Effort

Since the commencement of the NTP in 2002, there has been a reduction in the program survey area. This can be attributed to capacity constraints and limited funding availability. In 2008, research was undertaken to determine the minimum amount of survey effort required to adequately predict long term trends in the marine turtle population within the Ningaloo Region, therefore providing a sustainable cost effective approach. Results have indicated that survey effort can be drastically reduced compared to that of previous seasons. Based on these findings, the 2009-2010 NTP season was the first to operate on a reduced survey period. This was repeated again with the 2010-2011 season operating on a block of intensive monitoring and intermittent weekend monitoring outside of the intensive period.

As per the 2009-2010 NTP season, the 2010-2011 season included the NW Cape and Cape Range Divisions only. Monitoring within the NW Cape occurred between 6th November 2010 and 27th March 2011 and included an intensive four week block of monitoring between 21st December 2010 and 16th January 2011 with intermittent pre and post peak season weekend monitoring outside of this period. Please note this report only contains figures up to and including the weekend of 29th-30th January 2011 and for the purpose of this report data collected from the NW Cape Division on the final three post-peak season weekends of the monitoring period has been omitted from the results. This is due to the NTP Coordinator's contract period being shorter than the specified period of monitoring required,

which was determined by budgetary constraints. The intermittent weekend monitoring outside of the intensive four week block period is designed to pick up any early or late fluctuations in breeding activity.

Monitoring for the Cape Range Division also occurred during the NW Cape intensive four week block period of monitoring between 21st December 2010 and 16th January 2011. As per 2009-2010 NTP season, the 2010-2011 NTP operations did not include monitoring within both the Bundera/Ningaloo and Coral Bay Divisions due to the considerable reduction the NTP survey area.

Nesting Abundance 2010-2011

A total of **3295** new nests and **6975** false crawls were recorded for the Ningaloo Region during the 2010-2011 season (up to the 30th January 2011). 2883 nests and 6610 false crawls were recorded within the NW Cape Division. The greatest nesting activity (both new nests and false crawls) recorded in the NW Cape is attributed to the green turtle (93.0%), followed by the loggerhead turtle (3.8%) and the hawksbill (2.9%). 412 nests and 365 false crawls were recorded within the Bungelup Section (Cape Range Division). The loggerhead turtle had the greatest nesting activity (69.4%), followed by the hawksbill (25.2%) and the green (2.9%). 2.4% of new nests were unable to be identified (Table 3 and Table 4).

Since commencement of the program in 2002 the NTP has recorded 34,695 new nests and 75,878 false crawls within the Ningaloo Region. For a detailed summary of season survey effort and turtle activity see Table 12.

The Ningaloo Turtle Program's four primary objectives are outlined below:

Objective 1: Determine the abundance of nests on specific sections of beach over specified time intervals for each species

Nesting Abundance

Nesting abundance for the 2010-2011 season was the second highest on record since monitoring began in 2002 (Figure 9) highlighting last season's particularly low nesting abundance. This season's results are not however indicative of an increase in population, as marine turtle populations fluctuate considerably between years (Broderick et al. 2001).

Nesting Trends

Nesting trends were not analysed this 2010-2011 season as were conducted in the 2008-2009 and 2009-2010 seasons (see section 7 "Turtle Nesting Within the Ningaloo Region, 2009-10: Statistical Analyses and Graphical Presentation of Data" in the 2009-2010 NTP Annual Report) .

The 2008-2009 modelling indicated a positive nesting trend for green and hawksbill turtles, but it was uncertain as to whether this increase was an artefact of survey error or an actual increasing population of nesting turtles (Whiting, 2009). If the apparent increase was due to a real increasing population of nesting turtles, then this would be apparent in the following years of monitoring (Whiting,

2009). To determine this, the statistical analysis was conducted again at the conclusion of the 2009-2010 season, which showed a discontinuation of the positive nesting trend for green turtles, but a continuation of the positive nesting trend in hawksbills, although the magnitude of the trend was lower (Whiting, 2010).

Further analysis of nesting trends should be completed annually to continue the long term analysis of nesting trends.

Nesting Success

Nesting success in the 2010-2011 season, as per the 2009-2010 season, was only calculated using visual assessment of the nest after the turtle left the beach which is not an accurate method of determining nesting success (Whiting, 2010). If nesting success is to become part of the *quantifiable* data collected in future NTP seasons, there needs to be night time studies of a sample of nesting turtles conducted in conjunction with the current track counts and post nesting observations which would enable more accurate estimates of hatchling success and annual number of nesting turtles (Whiting, 2010).

Objective 2: Identify the relative significance of specific nesting beaches to each species

Nesting Locations

At the commencement of the program significant turtle nesting locations found along the Ningaloo coastline were identified. NTP data (2002-2011) indicates that the turtle nesting locations originally identified remain important within the region:

- The NW Cape Division is an important rookery for the green and hawksbill turtles.
- The Cape Range Division (Bungelup Section) is an important rookery for the loggerhead turtle.
- Gnaraloo Bay is also a significant loggerhead rookery. (The Gnaraloo Turtle Conservation Program (GTCP) has adapted the NTP monitoring procedures to collect nesting abundance and nest disturbance data. 2010-2011 data is to be provided to the NTP for comparison).

No planned research was carried out during 2010-2011 NTP to identify additional significant turtle nesting locations within the Ningaloo Region but high levels of nesting activity was observed opportunistically by DEC staff on both south and north Murion Islands during offshore patrols and an aerial survey this season.

Objective 3: Establish the level of disturbance on nests

Nest Disturbance

Since NTP monitoring began in 2002, 2.1% of the total nests recorded have been recorded as disturbed by various disturbance factors (Table 6). In the 2010-2011 season 0.4% of nests recorded were disturbed within the Cape Range and NW Cape Divisions.

The level of predation on turtle nests by the European red fox

Foxes have been present along the beaches of the Ningaloo Coastline since the 1960s and destroy turtle nests and predate upon hatchlings each nesting season (Limpus 2002; Dean 2003; Mckinna Jones 2005). Consequently, the implementation of fox control programs has been flagged as a key management strategy under the Ningaloo Marine Park Management Plan 2005-2015. This includes the controlled distribution of 1080 poison (sodium fluoroacetate) in the form of dried meat baits. The aim is to reduce the number of foxes within the area thereby reducing the number of nests predated on by foxes and increasing nest success. *Nest disturbance data collected by the NTP greatly assists DEC to target fox control in areas of high nest predation and supports the District's fox control strategy.*

Loss of up to 5% of nests to foxes and dogs/dingoes is considered a non threatening level of nest predation (Flakus 2002). 5% or less is therefore acknowledged by management as the acceptable limit of nest predation within this program.

During 2010-2011 foxes and dogs were recorded as accounting for 23% of all damaged nests within NW Cape Division. No fox/dog damaged nests were recorded within Cape Range Division. This equates to 0.09% of total nests recorded within the entire Ningaloo Region being damaged by foxes/dogs in the 2010-2011 NTP (Figure 9).

Since monitoring began in 2002 fox and dog predation of total recorded nests has remained well below the 5% threshold, at 0.93%. This percentage can not only be used as an indicator of fox and dog presence but also an indicator of effectiveness of fox control.

It is important to note however that during the 2003-2004 season fox predation along the Five Mile Beach Subsection (NW Cape Division) was at its highest during March (McKinna-Jones, 2005). Between the 2005/06-2008/09 season monitoring was not carried out during March (Table 12). This indicates that the level of fox predation may in fact be higher for these seasons.

Ghost crabs: natural predators of marine turtle eggs

The level of predation by ghost crabs and the impact on clutch success are not known within the Ningaloo Region. Determining ghost crab predation by visual assessment of a nest alone is prone to uncertainty, as the presence of a ghost crab hole into the egg chamber does not necessarily indicate that ghost crabs predated the nest, nor does it give an indication if predation *has* occurred how many eggs within a clutch were depredated. For this season crab damage to a nest was determined by: the presence of fresh crab tracks and holes accompanied by fresh egg shells and/or eggs at the surface of the nest. Ghost crabs are natural predators within the area and research is required to determine the dynamics of ghost crab predation on nesting turtle populations at Ningaloo over space and time. For further studies on ghost crab predation on the Ningaloo Coast please contact the GTCP.

Objective 4: Determine the impact of human interaction on nesting success of each species

Human Interaction with Nesting Turtles

Since the commencement of the NTP (2002), human disturbance to nests has been recorded as minimal (0.07% of total recorded nests) (Table 6). This is done by recording human prints within a 5 metre radius of the nest. The data however does not necessarily indicate the level of disturbance to nesting female turtles by human interactions, because it does not include visual observation of visitor interacting with nesting turtles. The presence of people on nesting beaches are likely to cause disturbance to nesting females and hatchlings if they do not follow appropriate interaction protocols (Waayers 2003; Johnson et al. 1996; Lorne & Salmon 2007). Disturbance by humans can lead to the female abandoning her nesting attempt prior to the laying of eggs and returning to the ocean, resulting in a failed nesting attempt. Further research into visual assessments of turtle-visitor interactions is required to determine the level of impact on new nests within the Ningaloo Region and subsequent impact on local turtle populations.

The development of the DEC Jurabi Turtle Centre (JTC) program in 2008-2009 was supported by Woodside Energy Ltd and Mitsui Ltd (2009 to 2011) through the Community Partnerships Program. The program operates along the NW Cape and provides a supervised interaction experience with nesting turtles using TAFE accredited turtle tour guides, giving visitors an opportunity to observe turtles nesting in their natural environment and contribute to turtle conservation within the Region. DEC encourages visitors to participate in a guided experience with JTC staff but those wishing to observe nesting turtles independently are required to abide by DEC's Turtle Watcher's Code of Conduct (available online at the DEC website).

Turtle Rescues and Mortalities

During 2010-2011 NTP there was a significant decrease in the number of turtles stranded on land from 39 in 2008-2009 to a total of 8 turtles this season, comparable to the total of 4 in 2009-2010. This can be attributed to the continued considerable reduction in survey effort over the 2009-10 and 2010-11 seasons (approximately half the survey effort of 2008-2009 season). The number of deceased turtles found this season has reduced to 6 turtles compared with 9 in 2009-2010 and 27 in 2008-2009.

Additional Achievements NTP 2002-2011

- Ongoing distribution of the NTP monitoring field guide and monitoring training videos to community turtle projects worldwide.
- Continual support for marine turtle monitoring programs throughout Western Australia.
- Continual collection of nesting data to assist with the implementation of visitor management strategies such as beach accesses and 4WD vehicle restrictions.
- Continual collection of nest distribution data to assist government agencies in future tourism development planning.
- Continual collection of nesting habitat locations to improve Oil Spill Contingency Atlas (OSRA) information and support potential oil spill response planning.
- Continual collection of nesting habitat encroachment data to assist in the removal of existing car parks within the Jurabi Coastal Park.
- The rescue of 187 stranded female turtles within the Ningaloo Region (Figure 11).

In the coming years the program will continue to collect data on nesting female turtles within the Ningaloo Region and continue to predict long term trends in turtle populations. This will assist management in identifying turtle population recovery targets within the region.

6.3. Key Program Recommendations

Volunteer Participation

- Continue to build capacity among the local community and promote local program participation. Encourage greater local participation in the program prior to the commencement of the 2011-2012 NTP season. Local volunteer involvement outside of the block monitoring period and with NTP social activities remains limited despite all efforts to date.
- Ensure external volunteers are provided with detailed climatic information for the duration of the program prior to them accepting the positions. In particular, inform about cyclone season and associated weather events that may impact their ability to monitor (this season involved two evacuations of the volunteers out of the National Park into the Exmouth Township).
- Improve the level of interaction between external volunteers and local volunteers and the NTPSC throughout the program.
- Increase the volunteer's participation fee to cover a greater proportion of Program costs (bearing in mind the \$5000 ANNiMS grant that is available to University of WA, University of Tasmania and James Cook University marine science students).

Occupational Health and Safety

- Continue to update Job Safety Analyses and improve occupational health and safety standards for activities volunteers conduct as part of the program and provide these documents to all volunteers.
- Continue to improve communication procedures between volunteer accommodation and NTP quarters (located in Exmouth Township).
- Consider a full manual license and senior first aid certificate as prerequisites for all the external volunteers. These qualifications are currently only required by the NTP Team Leaders and Coordinator.

Field Data Collection

- Emphasise to volunteers the importance of accurate data collection and data entry. Ensure volunteers fill in data sheets accurately, cross-check data sheets on a daily basis and maintain daily communication with the volunteer coordinator regarding any data collection or entry issues
- Continue to ensure volunteer accuracy in track and nest identification by carrying out concurrent cross-checks of beach surveys and data collection.
- Continue to improve monitoring techniques and data collection methods with all trainers and volunteers prior to the start of the monitoring. This will provide consistent methodology and accurate data collection.
- Continue to provide additional volunteer training on species-specific track identification – especially how to distinguish between loggerhead and hawksbill turtle tracks. Utilise Bungalow research station and adjacent loggerhead rookery during training to expand knowledge base of loggerhead track identification.
- Continue to encourage volunteers to use their own digital cameras (rather than the supplied disposable cameras) to take photos of turtle tracks, deceased and stranded turtles for quicker identification and more cost effective reporting.

Organisation and Procedures

- Continue to build and expand on the current email mailing list for the NTP.
- Continue to build upon the professional relations established this season between Australian Universities and NTP to encourage student research projects. This year 13 out of the 14 external volunteers were university students (undergraduate, Masters and PhD) and 9 participated in the NTP on a \$5000 Australian National Network in Marine Science (ANNiMS) grant, through the three supporting universities (University of Tasmania, James Cook University, and University of Western Australia)
- Consider past experience with the program a highly desired criteria for selection of both the Volunteer Coordinator and Team Leader positions to minimise retraining every season, assist in streamlining NTP procedures and maintaining consistency with seasonal NTP operations.
- Consider a DEC staff member from the Exmouth district with NTP experience taking on the role of the NTP Volunteer Coordinator to internalise operations within DEC (as marine turtle conservation is a key performance indicator for both marine and terrestrial management plans) and will further assist in consistency with seasonal NTP operations.
- If an external applicant, consider extending the current NTP Volunteer Coordinator 4 month contract to a 6 month contract to allow completion of all post-peak season intermittent monitoring operations and inclusion of this data into the annual report.

- Continue to involve the Volunteer Coordinator, NTPSC and DEC staff in field operations as much as possible throughout the intensive four week block of monitoring to support the external volunteers and build capacity.
- Continue to encourage feedback from all volunteers throughout the entirety of the program.
- Replace missing and old NTP totem markers to ensure clearly identifiable starting and finishing subsection points.

Data Management

- Continue to carry out intermittent checks of GPS settings and waypoints during the season as they can be accidentally changed by volunteers.
- Reinforce the importance of accurate data entry to those volunteers entering the data: ensure data is entered on a *daily* basis (consider a daily data entry roster)
- Continue ensuring data entry by volunteers is supervised by a Team Leader or the Volunteer Coordinator, or ensure a Team Leader or the Volunteer Coordinator readily accessible if assistance is required, to ensure accuracy and consistency in data entry.
- Provide the Team Leaders with access to the database password (previously only the Volunteer Coordinator had access), and additional database training, so any data entry issues or mistakes can be rectified quickly and at the time of entry.
- Continue with ensuring back up copies of the ‘live’ database in Cape Range National Park are saved in town at least once a week to ensure data security.
- Continue to ensure data entry training consists of clear procedures and provides a process for correcting mistakes.
- Ensure regular cross-checking of the database by the Volunteer Coordinator throughout the period of daily data entry.
- Upgrade the database with minor modifications to ensure it is more user-friendly, hence reducing human errors. Add “tide” as an option for cause of nest disturbance in the database
- Add “A” for another turtle, “G” for goanna, “C” for ghost crab and “T” for tide onto the datasheet as options for causes of nest damage under the heading “Cause of Damage?” instead of “Any Prints?”
- Ensure the “Mauritius to Jacobsz” and “Jacobsz to Jacobsz South” data (this season collected by two different people) is combined in order to be entered into the database as the “Mauritius to Jacobsz South” Subsection in the database for consistency of data entry procedures.

Volunteer Education, Information and Communication

- Continue to encourage local participation in social activities prearranged for external volunteers for more social interaction and opportunities for knowledge exchange between the two groups of volunteers.
- Continue with general turtle biology and conservation presentations to external and local volunteers.
- Continue with DEC Wildlife Officer and Education Officer presentations on wildlife management within the area
- Encourage local volunteers to give presentations to external volunteers relating to the Ningaloo region and their NTP experiences.
- Consider to invite local Indigenous council members (Coral Coast Park Council) to provide information of Indigenous history in the area.
- Continue with program progress updates to all volunteers throughout the season.

Survey Effort and Nesting Abundance

- Continue to monitor turtle activity along the NW Cape and Cape Range divisions. Opportunistic monitoring should continue within the Bundera/Ningaloo and Coral Bay Divisions where possible to provide ongoing data collection.
- Continue with current length of the NTP survey period - an intense 5 week block period including 1 week of training (5 days) and 4 weeks of monitoring with intermittent weekend monitoring outside of this period.
- Continue with the centre the block period of monitoring to cover mid-December to mid-January capture the peak period of nesting.
- Consider determining nesting success for a sample of turtles using night time surveys observing turtles. Nesting success has previously been calculated using visual assessment of the nest after the turtle has left the beach, which is not a very accurate method of determining nesting success. Quantifying true nesting success will give an indication of the accuracy in assessing nesting success from morning track counts and will reduce error in converting between track counts and clutch counts.
- Ensure track counts outside of the intensive period are only counting the tracks from the previous night's nesting. I.e. ensure the entire subsection is walked and tracks are crossed off prior to the census day.

Training

- Continue to expand local trainer and assessor capacity prior to the arrival of the external volunteers. This will greatly reduce the workload of the other key trainers. Provide more encouragement to new local volunteers to work towards this.
- Encourage all DEC staff with NTP experience to be trained as NTP trainers, this will also help to reduce the workload of the other key trainers and reduce the reliance on external sources.
- Ensure a trainer refresher meeting is held prior to commencement of monitoring training. This will improve consistency in training information and techniques.
- Consider updating the 6th edition of the "Turtle Monitoring Field Guide" to reflect changes in recent years (last updated November 2007).
- Continue to provide volunteers with the 6th edition of the "Turtle Monitoring Field Guide" (on loan) in volunteer induction packs and encourage frequent use of the Field Guide, especially during the training week. Encourage all volunteers to become familiar with the glossary of terms (in Appendix 1). E.g. costal scales, prefrontal scales and false crawl definitions.
- Continue to utilise the training week to gain as much practical experience in track monitoring, including identifying loggerhead and hawksbill tracks, as well as a night time JTC tour, to give volunteers the full picture of turtle nesting for a greater understanding of the overall process.
- Continue to ensure a minimum of two seasons experience as prerequisite to train volunteers in monitoring techniques to ensure accurate and consistent methods.
- Continue to ensure smaller training and assessment groups where possible. Ideally a maximum of four volunteers per trainer/assessor.
- Continue to provide training on turtle rescues.
- Train the Gnaraloo Turtle Conservation Program (GTCP) manager in NTP methodologies to enable the GTCP to train their own volunteers in house.

Predation Control

- Continue with the current DEC fox control program within the four divisions - NW Cape, Cape Range, Bunda/Ningaloo and Coral Bay. This will assist in maintaining the current low level of fox predation on nests within the Ningaloo Region.
- Ensure fox control within Cape Range Division (Bungelup Section) is adequate to maintain predation levels at less than 5 percent of recorded nests.
- Further investigate the impacts of ghost crab predation on nesting success within the Ningaloo region.
- Continue to report opportunistic dingo and fox sightings to DEC Wildlife Officer.
- Report evidence of human damage to nests to DEC Wildlife Officer to enable immediate action to be taken and prevent further occurrences.

Turtles Rescues

- Continue to conduct opportunistic turtle rescues.
- Continue to provide volunteers with turtle rescue training.
- Notify the DEC Wildlife Officer of areas with considerable numbers of turtle strandings and deaths recorded within previous seasons for follow up outside of the block monitoring period.

General Recommendations

- Continue to investigate future funding opportunities for the program to ensure the longevity and sustainability of the Program.
- Review and update the NTP overarching goals and objectives to reflect the progression of the program and changes which have occurred since the commencement of the program in 2002.
- Continue to develop the NTP to match current environmental conditions and resource demands through the Ningaloo Turtle Program Steering Committee.
- In future years of monitoring, further analysis of nesting trends should be completed annually to continue the long term analysis of these trends and fulfil the first primary objective of the NTP.

7. REFERENCES

- Baldwin, R., Hughes, G.R. and Prince, R.I.T. (2003). Loggerhead turtles in the Indian Ocean. In, *Loggerhead sea turtles*, Bolten, A.B. & Witherington, B.E., Smithsonian Institution: Washington, D.C.
- Bjorndal KA, Wetherall JA, Bolten AB, Mortimer JA (1999) Twenty-six years of green turtle nesting at Tortuguero, Costa Rica: an encouraging trend. *Conservation Biology* 13, 126-134.
- Bool, N., Whiting, A., Gourlay, T., and Mau, R. (2009). 'Ningaloo Turtle Program Annual Report 2008-2009'. Ningaloo Turtle Program, Exmouth, Western Australia.
- Broderick, A.C., Godley, B. J. and Hays, G.C. (2001). "Trophic status drives inter-annual variability in nesting numbers of marine turtles." *Proceedings of the Royal Society of London* 268: 1481-1487.
- Cape Conservation Group Inc. (2007). *Turtle monitoring field guide: Edition 6*, Cape Conservation Group, Western Australia.
- Collins, P. (2000). 'Ningaloo Marine Park (Commonwealth Waters): Literature review', Report for Environment Australia. LeProvost Dames and Moore, East Perth, Western Australia.
- Dean, J. (2003). *Ningaloo Fox Control Project: Final Report*. Department of Conservation and Land Management, Western Australia. Unpublished report.
- Department of Conservation and Land Management. (2005). *Management plan for the Ningaloo Marine Park and Muiron Islands Marine Management Area 2005-2015*. Management Plan Number 52. Marine Parks and Reserves Authority and Department of Conservation and Land Management, Western Australia.
- Environment Australia. (2003). *Recovery plan for marine turtles in Australia*. Marine Species Section Approvals and Wildlife Division, Environment Australia, Canberra.
- Girondot, M., Rivalan, P., Wongsopawiro, R., Briane, J.P, Hulin, V., Caut, S., Guirlet, E., Godfrey, M.H. (2006). Phenology of marine turtle nesting revealed by statistical model of the nesting season, *BMC Ecology*, 6:11.
- Gnaraloo Turtle Conservation Program (2009). *2008-2009 Final Report*. Gnaraloo Turtle Conservation Program, Western Australia. Unpublished report. Retrieved: 14th February 2011 from <http://www.gnaraloo.com/main/scientific-data/gnaraloo-fox-control-program---final-report-09/10.html>
- Gulko, D.A. & Eckert, K.L. (2003). *Sea turtles an ecological guide*, Mutal Publishing, Honolulu, HI.

- Halkyard, B. (2008). Progress Report: Fox Control for Turtle Conservation in Ningaloo Marine Park 2007-08 Nesting Season. Department of Environment and Conservation, Exmouth District, Western Australia. Unpublished report.
- Hastie, T.J., and Tibshirani, R.J. (1990). 'Generalized additive models.' (Chapman and Hall: London)
- IUCN 2007, 2007 IUCN Red List of threatened species. Retrieved: 13th March 2008 from <http://www.iucnredlist.org>
- Johnson, S.A., Bjorndal, K.A. & Bolten, A.B. (1996). Effects of organized turtle watches on loggerhead (*Caretta caretta*) nesting behaviour and hatchling production in Florida, Conservation Biology: 10, 2.
- Limpus CJ (2007) 'A Biological Review of Australian Marine Turtles. 2. Green Turtle *Chelonia mydas* (Linnaeus).' Queensland Environmental Protection Agency, Brisbane.
- Limpus, C.J. (2002). Western Australian Marine Turtle Review. A study commissioned by Western Australian Department of Conservation and Land Management.
- Lorne, J.K. & Salmon, M. (2007). Effects of exposure to artificial lighting on orientation of hatchling sea turtles on the beach and in the ocean, Endangered Species Research: 3, 23-30.
- Lutcavage, M.E., Plotkin, P, Witherington, B, Lutz, P.L. (1997). Human impacts on sea turtle survival. Lutz, P.L & Musick, P.L. In, The biology of sea turtles Volume I. CRC Press LLC.
- McKinna-Jones, S. (2005). The need for fox control measures along the beaches of the North West Cape. Department of CALM, Exmouth. Unpublished report.
- Miller, J., D. (1997). Reproduction in sea turtles. The Biology of Sea Turtles. P. L. Lutz and J. A. Musick. Boca Raton, Florida, CRC Press: 51-81
- Plotkin, P.T. (2003). Adult migrations and habitat use. The Biology of Sea Turtles Volume 2. P. L. Lutz, J. A. Musick and J. Wyneken. Boca Raton, CRC Press: 225-241.
- Spotilla, J.R. (2004). Sea turtles a complete guide to their biology, behaviour and conservation. The John Hopkins University Press and Oakwood Arts, Baltimore.
- Waayers, D. 2003, 'Developing a wildlife tourism optimisation management model based on marine turtle tourism on the Ningaloo Region: draft version subject to further consultation with stakeholders 2003 – 2008'. Murdoch University, Western Australia.
- Whiting, A. U. (2008). 'Consolidation of the Ningaloo Turtle Program: Development of a statistically robust and cost efficient survey design'. Report to the Ningaloo Turtle Program.
- Wood, S.N. (2006). 'Generalized Additive Models: An Introduction with R.' (Chapman and Hall / CRC: Boca Raton)

APPENDIX

7.1. NW Cape Division

Figure 10: Hierarchical representation of the NW Cape Division.

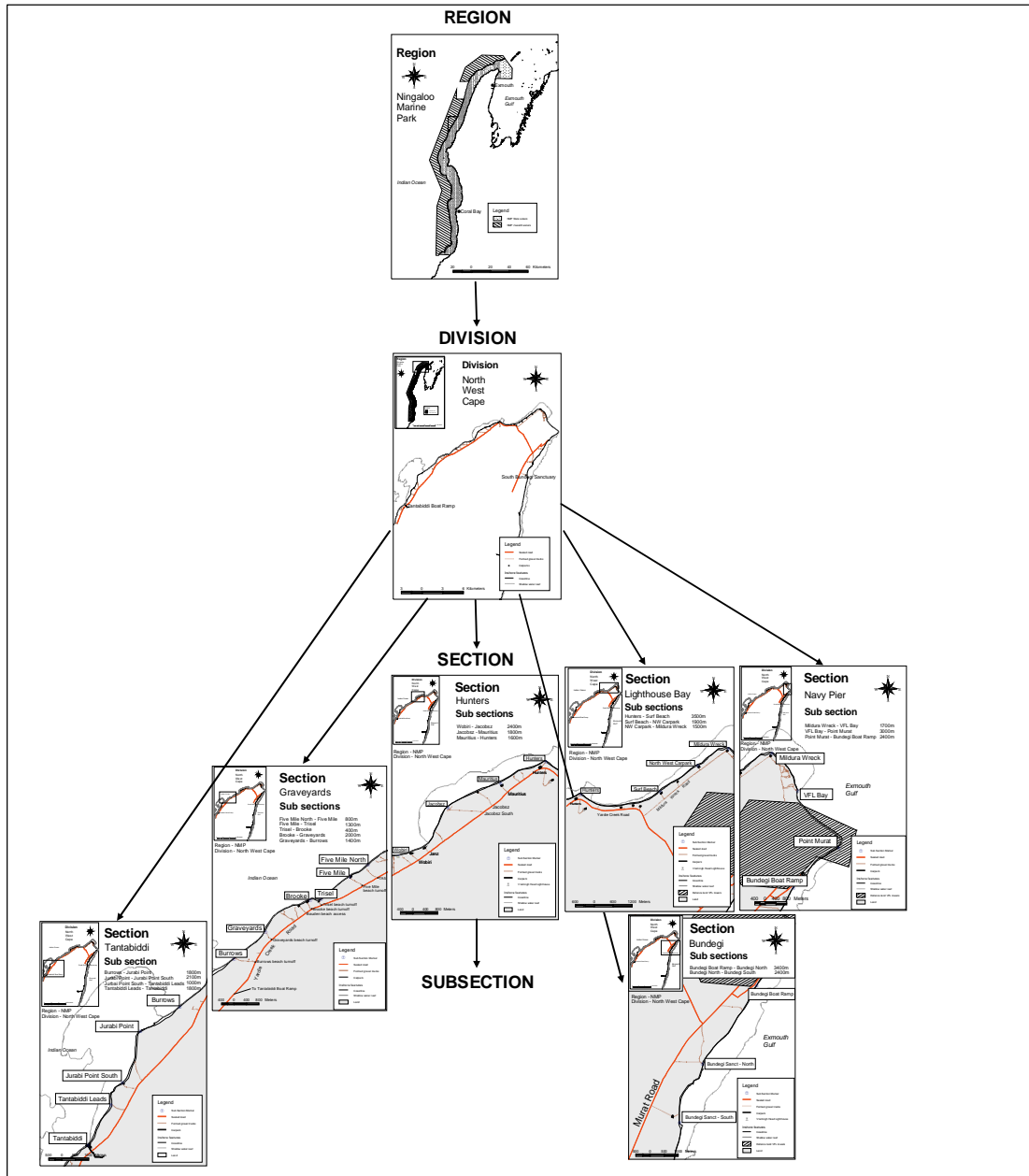


Table 9: Location and distance of each subsection within NW Cape Division.

Subsection	Location of northern totem	Location of southern totem	Distance (m)
Mildura Wreck - North West car park	21.78568 S; 114.16518 E	21.79174 S; 114.15402 E	1500
North West car park - Surf Beach	21.79174 S; 114.15402 E	21.81590 S; 114.13930 E	1900
Surf Beach - Hunters	21.81590 S; 114.13930 E	21.80287 S; 114.10873 E	3500
Hunters - Mauritius	21.80287 S; 114.10873 E	21.80938 S; 114.09532 E	1600
Mauritius - Jacobsz South	21.80938 S; 114.09532 E	21.81638 S; 114.07927 E	1800
Jacobsz South - Wobiri	21.81638 S; 114.07927 E	21.83038 S; 114.06505 E	2400
Five Mile North - Five Mile	21.83485 S; 114.05431 E	21.83928 S; 114.04766 E	800
Five Mile - Trisel	21.83928 S; 114.04766 E	21.84658 S; 114.03836 E	1300
Brooke - Graveyards	21.84733 S; 114.03389 E	21.85660 S; 114.02085 E	2000
Graveyards - Burrows	21.85660 S; 114.02085 E	21.86595 S; 114.01052 E	1400
Burrows - Jurabi Point	21.86595 S; 114.01052 E	21.87348 S; 113.99803 E	1800

7.2. Cape Range Division

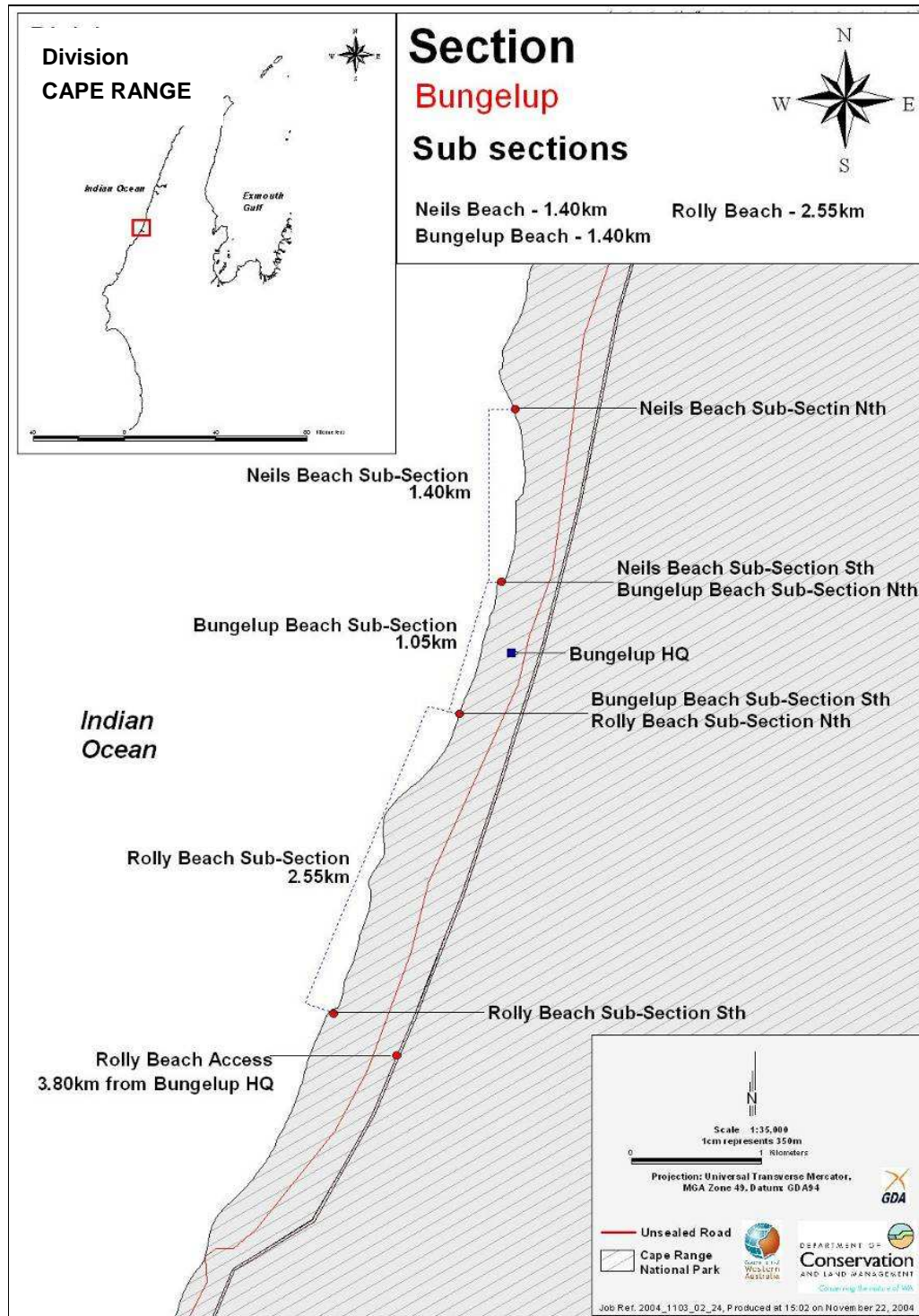


Figure 11: Location of subsections within Bungelup Section (Cape Range Division).

Table 10: Location and distance of each subsection within Cape Range Division.

Subsection	Location of northern totem	Location of southern totem	Distance (m)
Neils Beach North - Bungelup Beach North	22.26489 S; 113.83277 E	22.27674 S; 113.83231 E	1400
Bungelup North – Bungelup Beach South	22.27674 S; 113.83231 E	22.28613 S; 113.8292 E	1400
Bungelup Beach South – Rolly Beach	22.28613 S; 113.8292 E	22.30650 S; 113.82062 E	2550

7.3. Coral Bay Division

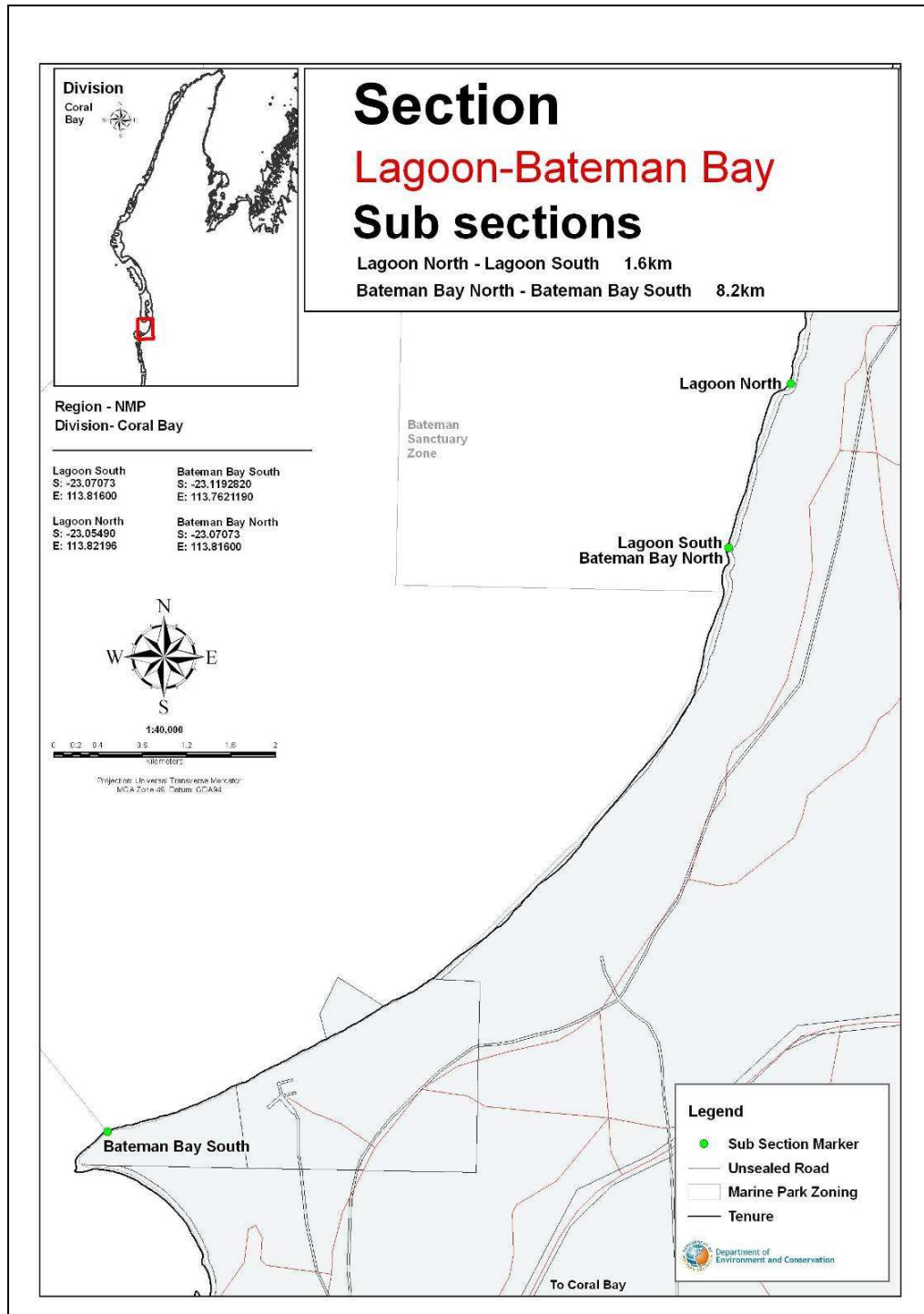


Figure 12: Location of subsection within the Lagoon-Bateman Bay Section (Coral Bay Division), (Lagoon South - Lagoon North; Batemans South – Batemans North).

Table 11: Location and distance of each subsection within the Coral Bay Division.

Subsection	Location of northern totem	Location of southern totem	Distance (m)
Batemans South - Batemans North	23.07073 S; 113.81600 E	23.11928 S; 113.76211 E	8200
Batemans North – Lagoon North	23.05490 S; 113.82196 E	23.07073 S; 113.81600 E	1500

7.4. NTP Data Sheet



Ningaloo Community TURTLE MONITORING PROGRAM DATASHEET

Daily Report

Page....of.....

Date: _____ Starting Subsection: _____
Recorder: _____ Finishing Subsection: _____
Start Time: _____ Finish Time: _____
GPS No: _____ Camera No: _____
Radio No: _____

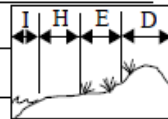


TABLE A: FALSE CRAWLS / NON-NESTING EMERGENCES TALLY

	Green	Loggerhead	Hawksbill	Unknown	Fox & Dog Prints
					Fox Y / N
					Dog Y / N
Total					


TABLE B: NESTS

Species Type G/L/H/U	GPS Position (in decimal degrees) (Datum WGS84)		New (N) / Old* (O) Nest?	Pos. of Nest I/H/E/D	Is Nest Damaged? Y/ N	Any Prints? C/D/F/G/H	Photo Frame No.	Any Other Observations/ Cause of Damaged Nest? (eg: Diggings, Egg shells, Hatchlings/ Another turtle, Tide damage)
	latitude (S)	longitude (E)						
Comments:								

* Only record old nest data if it has been disturbed. ~Please complete and return even if no nests are recorded! 110211

7.5. Tagged Turtle Re-sightings Datasheet

West Australian Turtle Research – Nesting Turtles


 DEPARTMENT OF
Conservation
 AND LAND MANAGEMENT
Caring for the nature of WA

TAGGED TURTLE RESIGHTINGS

Locality: _____ Date: _____ Observer: _____

Tag Left	Tag Right	Time	Turtle Activity	Nest Location	Egg Count	Turtle Species

Tag Position:

- Please record tag information for both left and right flippers. If single tagged put 'NIL' in the column as needed.

Turtle Activity Key:

A = resting at waters edge	F = excavating egg chamber
B = leaving water	G = laying eggs
C = climbing beach slope	H = covering eggs (filling in)
D = moving over bare sand	I = returning to water
E = digging body pit	

Nest Location Key:

A = above high water mark
B = at high water mark
C = below high water mark
D = edge of Spinifex
E = in Spinifex

7.6. Marine Turtle Stranding and Mortality Datasheet

MARINE TURTLE STRANDING AND MORTALITY DATASHEET – Pilbara Region

Please record the following information for all sick, injured or dead marine turtles and send it to the nearest Department of Environment and Conservation office (see overleaf for addresses).

DATE: _____ (DD/MM/YYYY) TIME: _____ (24 hour)

LOCATION: _____

Latitude: _____ ° _____ S

Longitude: _____ ° _____ E

STATUS: Alive Condition/Behaviour: _____

Dead The following coding can be used to code beach washed carcasses:

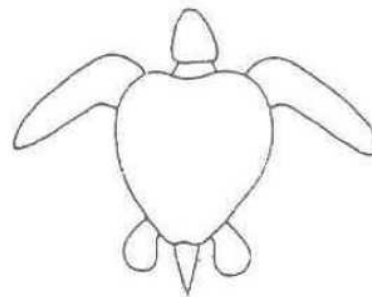
- | | |
|--|--|
| <input type="checkbox"/> Live but subsequently died | <input type="checkbox"/> Carcass poor (advanced decomposition) |
| <input type="checkbox"/> Carcass in good condition (fresh/edible) | <input type="checkbox"/> Mummified carcass (skin holding bones) |
| <input type="checkbox"/> Carcass fair (decomposed but organs intact) | <input type="checkbox"/> Disarticulated bones (no soft tissue remaining) |

SPECIES (see key overleaf):

- Green
- Loggerhead
- Flatback
- Hawksbill
- Olive Ridley
- Leatherback
- Unknown

DISTINGUISHING FEATURES: (please also indicate on diagram)

- Obvious damage/injuries
- Missing limbs
- Barnacles
- Algal growth on carapace
- Tagging scars



TAG NUMBERS: Left flipper _____

Right flipper _____

MEASUREMENTS:

Curved Carapace Length:	_____ mm	<input type="checkbox"/> Measured	<input type="checkbox"/> Estimated
Curved Carapace Width:	_____ mm	<input type="checkbox"/> Measured	<input type="checkbox"/> Estimated
Tail Length (from Carapace):	_____ mm	<input type="checkbox"/> Measured	<input type="checkbox"/> Estimated
Maximum Head Width:	_____ mm	<input type="checkbox"/> Measured	<input type="checkbox"/> Estimated

SEX: Male Female Unknown

MATURITY: Juvenile Adult Unknown

PHOTOGRAPHS* (see overleaf): _____

SECURITY/DISPOSAL/RELEASE of turtle: _____

NOTES: _____

CONTACT DETAILS:

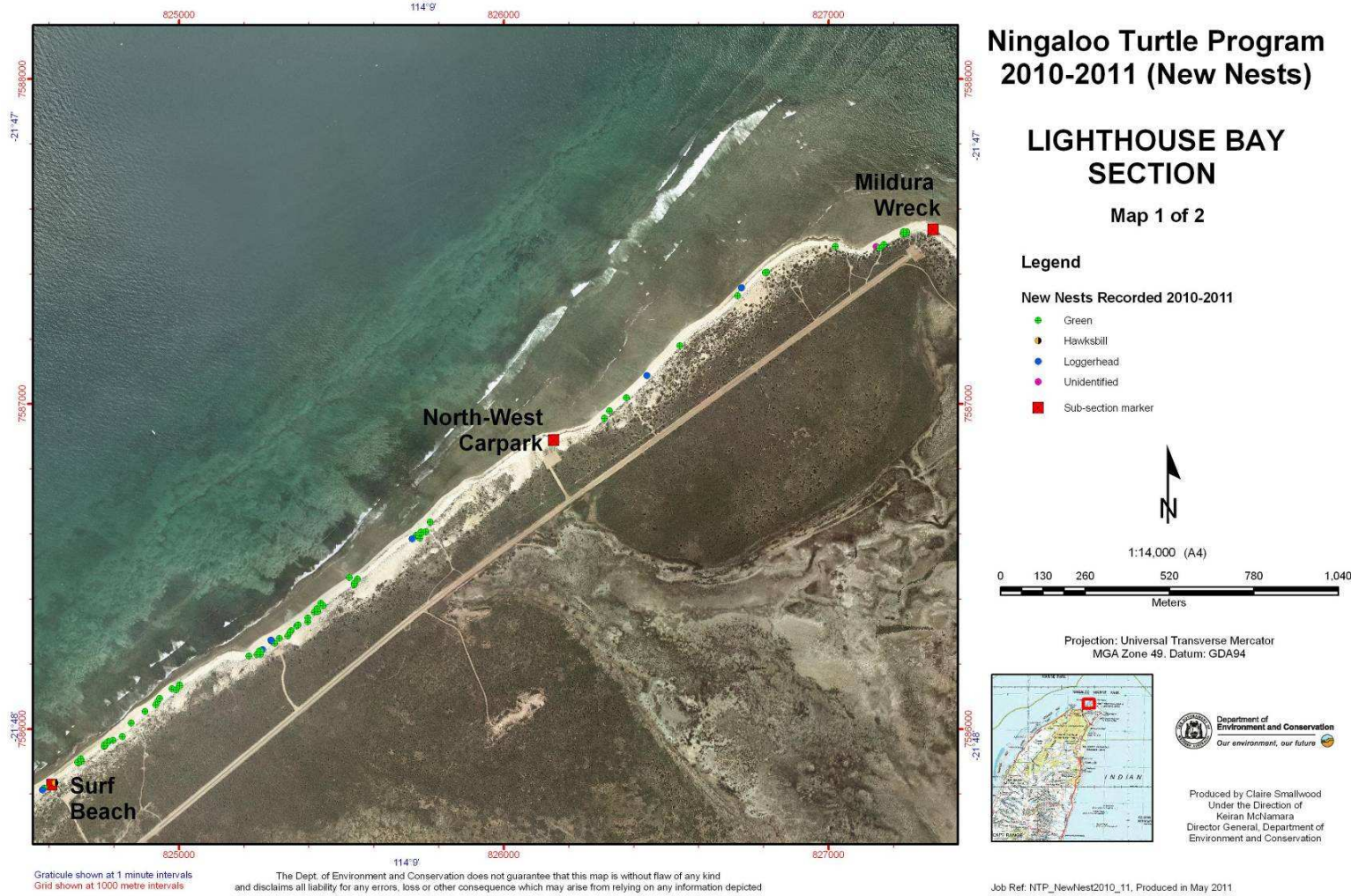
Name: _____

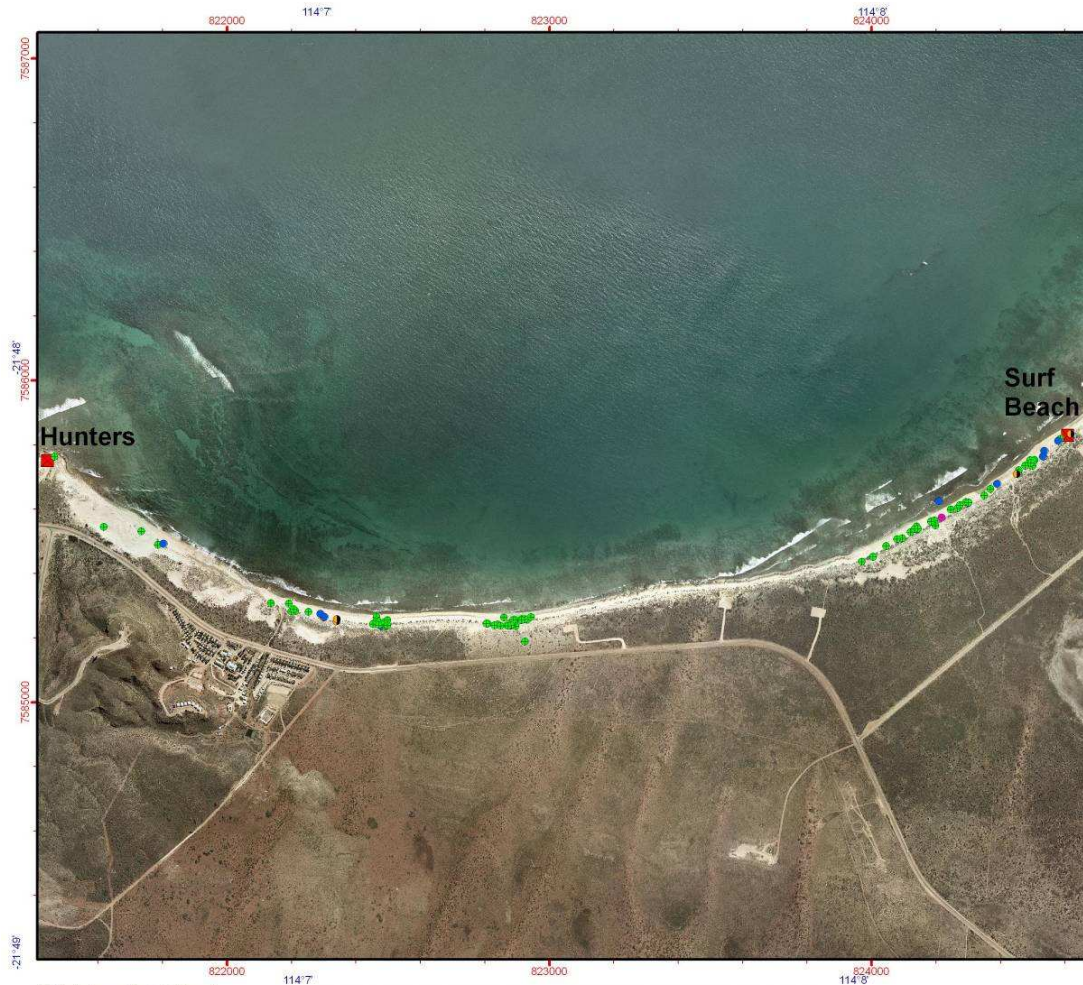
Phone number: _____

Address: _____

Email: _____

7.7. Lighthouse Bay Section: Location of New Nests (NTP 2010-2011) Map 1 & 2





Graticule shown at 1 minute intervals
Grid shown at 1000 metre intervals

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Ningaloo Turtle Program 2010-2011 (New Nests)

LIGHTHOUSE BAY SECTION

Map 2 of 2

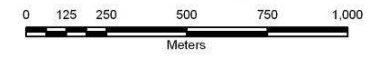
Legend

New Nests Recorded 2010-2011

- Green
- Hawksbill
- Loggerhead
- Unidentified
- Sub-section marker



1:16,000 (A4)



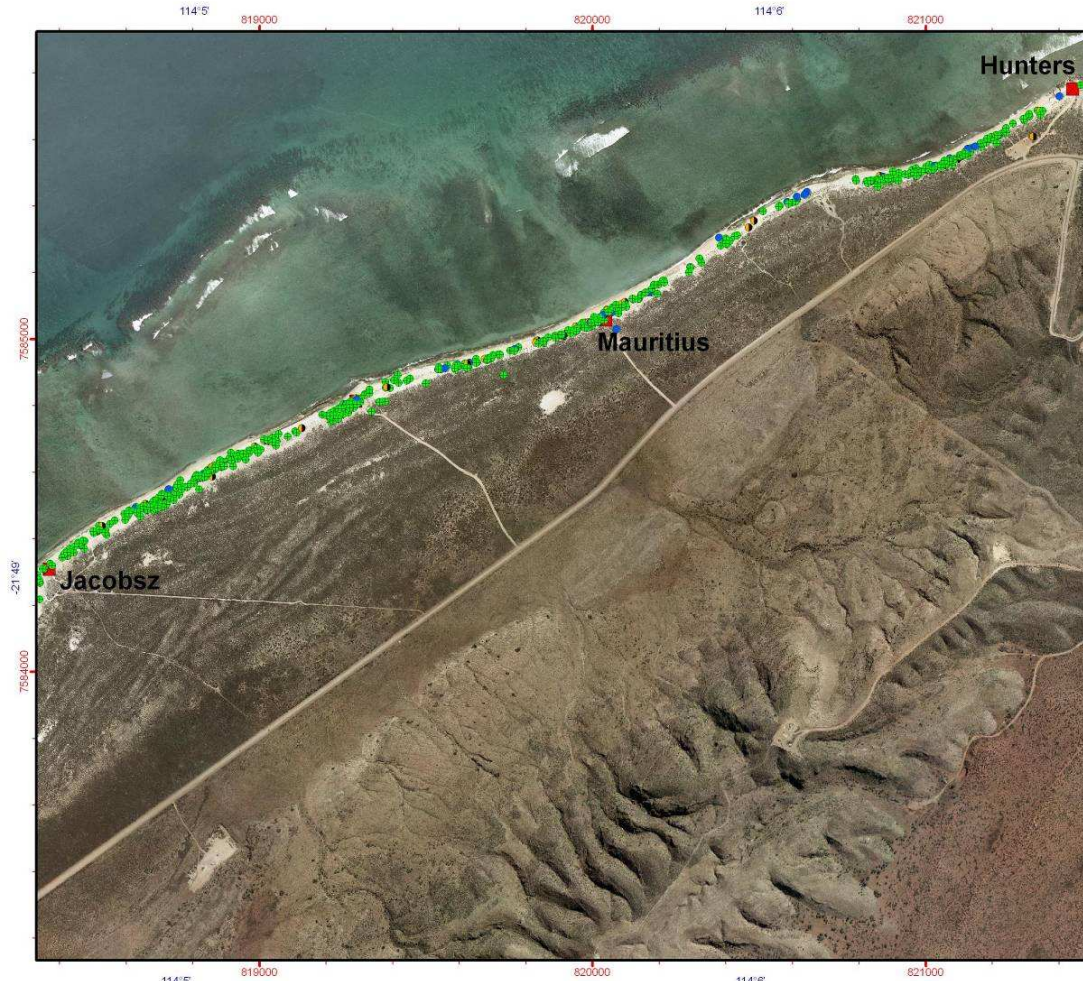
Projection: Universal Transverse Mercator
MGA Zone 49. Datum: GDA94



Produced by Claire Smallwood
Under the Direction of
Keiran McNamara
Director General, Department of
Environment and Conservation

Job Ref: NTP_NewNest2010_11, Produced in May 2011

7.8. Hunters Section: Location of New Nests (NTP 2010-2011) Map 1 & 2



Graticule shown at 1 minute intervals
Grid shown at 1000 metre intervals

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Ningaloo Turtle Program 2010-2011 (New Nests)

HUNTERS SECTION

Map 1 of 2

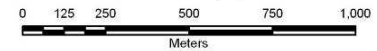
Legend

New Nests Recorded 2010-2011

- Green
- Hawksbill
- Loggerhead
- Unidentified
- Sub-section marker



1:15,500 (A4)



Projection: Universal Transverse Mercator
MGA Zone 49. Datum: GDA94



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Kaيران McLamara
Director General, Department of
Environment and Conservation

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Ningaloo Turtle Program 2010-2011 (New Nests)

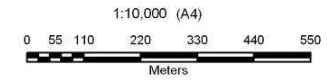
HUNTERS SECTION

Map 2 of 2

Legend

NewNests_2010_2011

- Green
- Hawksbill
- Loggerhead
- Unidentified
- Sub-section marker



Projection: Universal Transverse Mercator
MGA Zone 49, Datum: GDA94



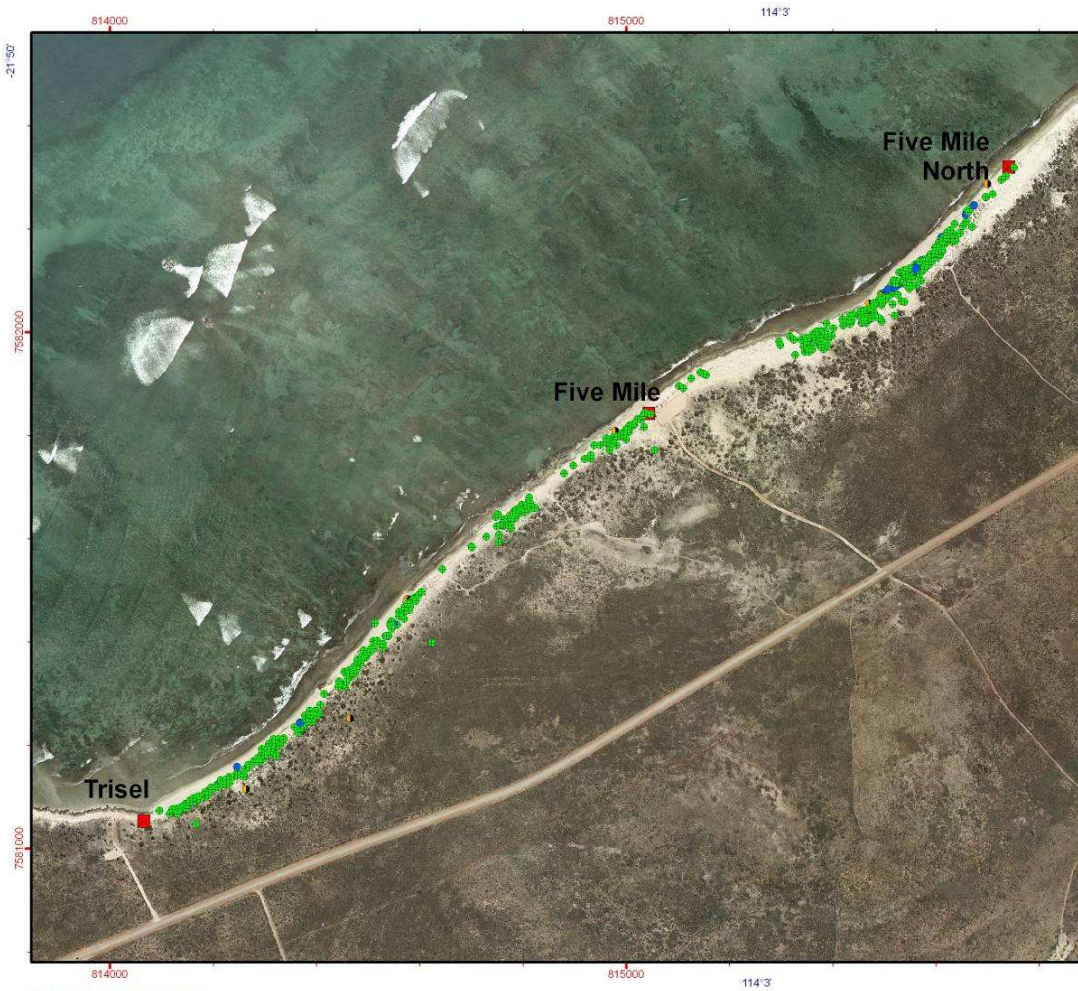
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Grid shown at 1000 metre intervals

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7.9. Graveyards Section: Location of New Nests (NTP 2010-2011) Map 1 & 2



Ningaloo Turtle Program 2010-2011 (New Nests)

GRAVEYARDS SECTION

Map 1 of 2

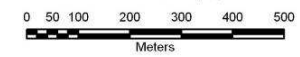
Legend

New Nests Recorded 2010-2011

- Green
- Hawksbill
- Loggerhead
- Unidentified
- Sub-section marker



1:10,000 (A4)



Projection: Universal Transverse Mercator
MGA Zone 49. Datum: GDA94

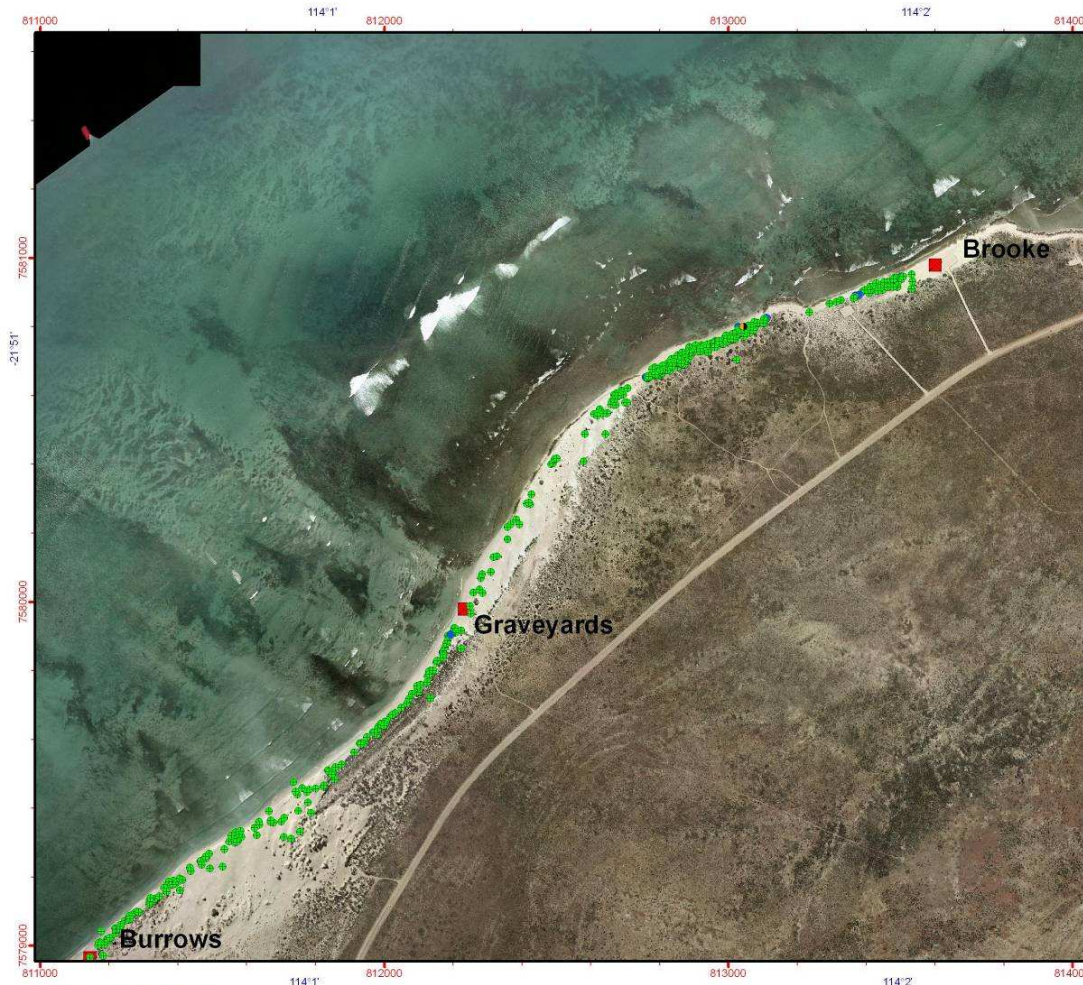


 **Department of
Environment and Conservation**
Our environment, our future
Under the Direction of
Keiran McNamara
Director General, Department of
Environment and Conservation

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Job Ref: NTP_NewNest2010_11, Produced in May 2011



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Grid shown at 1000 metre intervals

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Ningaloo Turtle Program 2010-2011 (New Nests)

GRAVEYARDS SECTION

Map 2 of 2

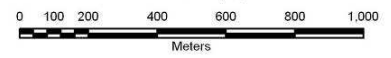
Legend

New Nests Recorded 2010-2011

- Green
- Hawksbill
- Loggerhead
- Unidentified
- Sub-section marker



1:15,000 (A4)



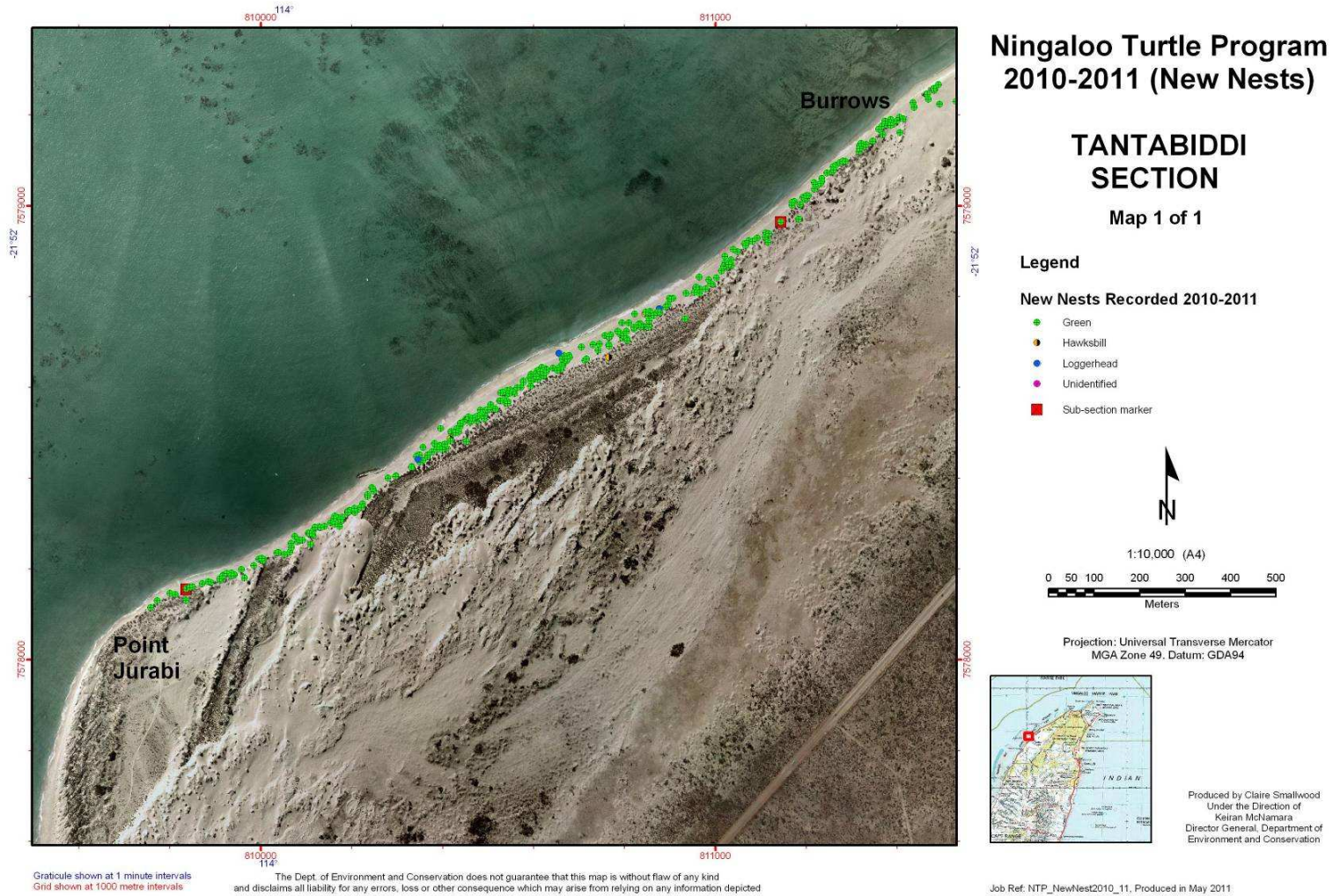
Projection: Universal Transverse Mercator
MGA Zone 49, Datum: GDA94



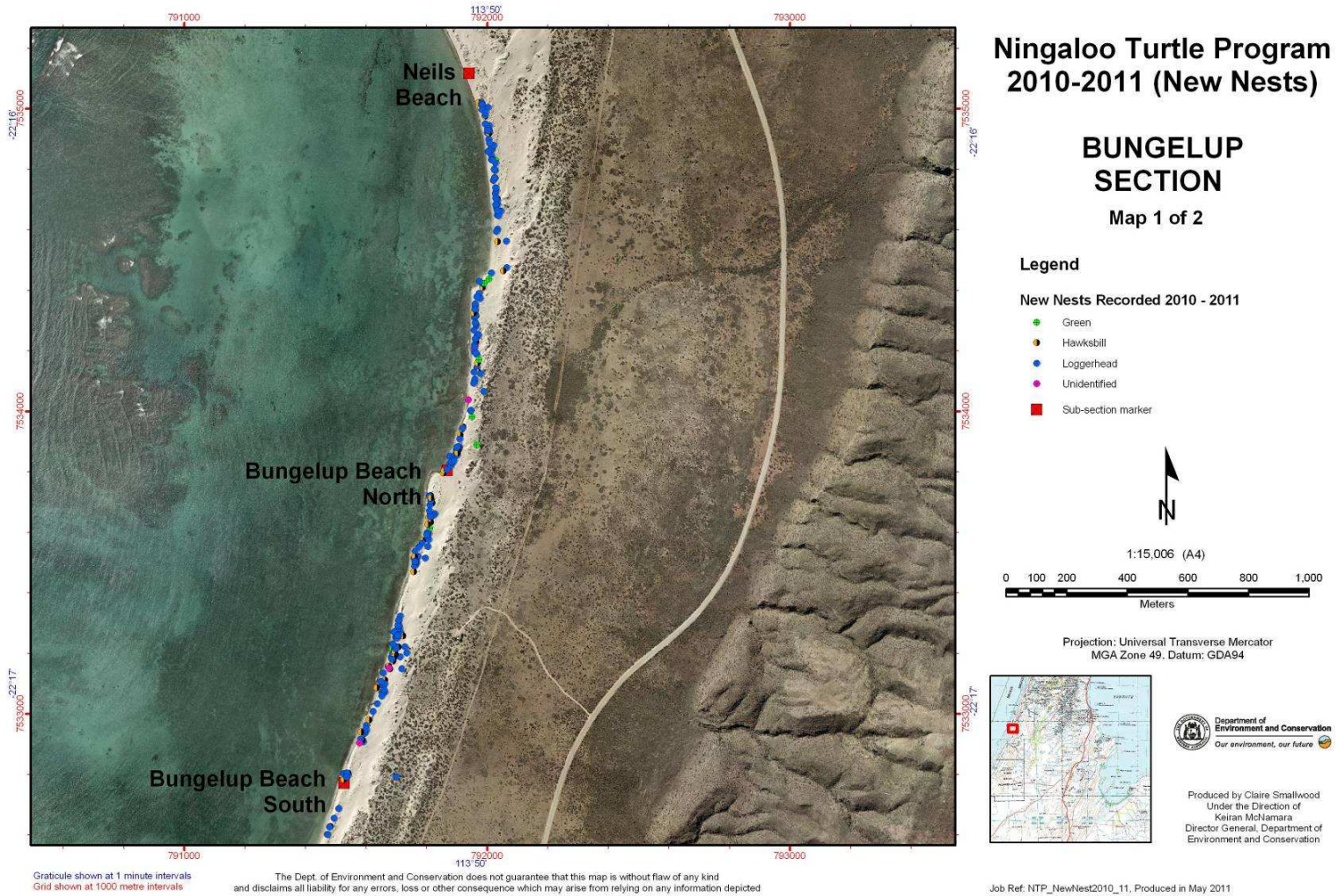
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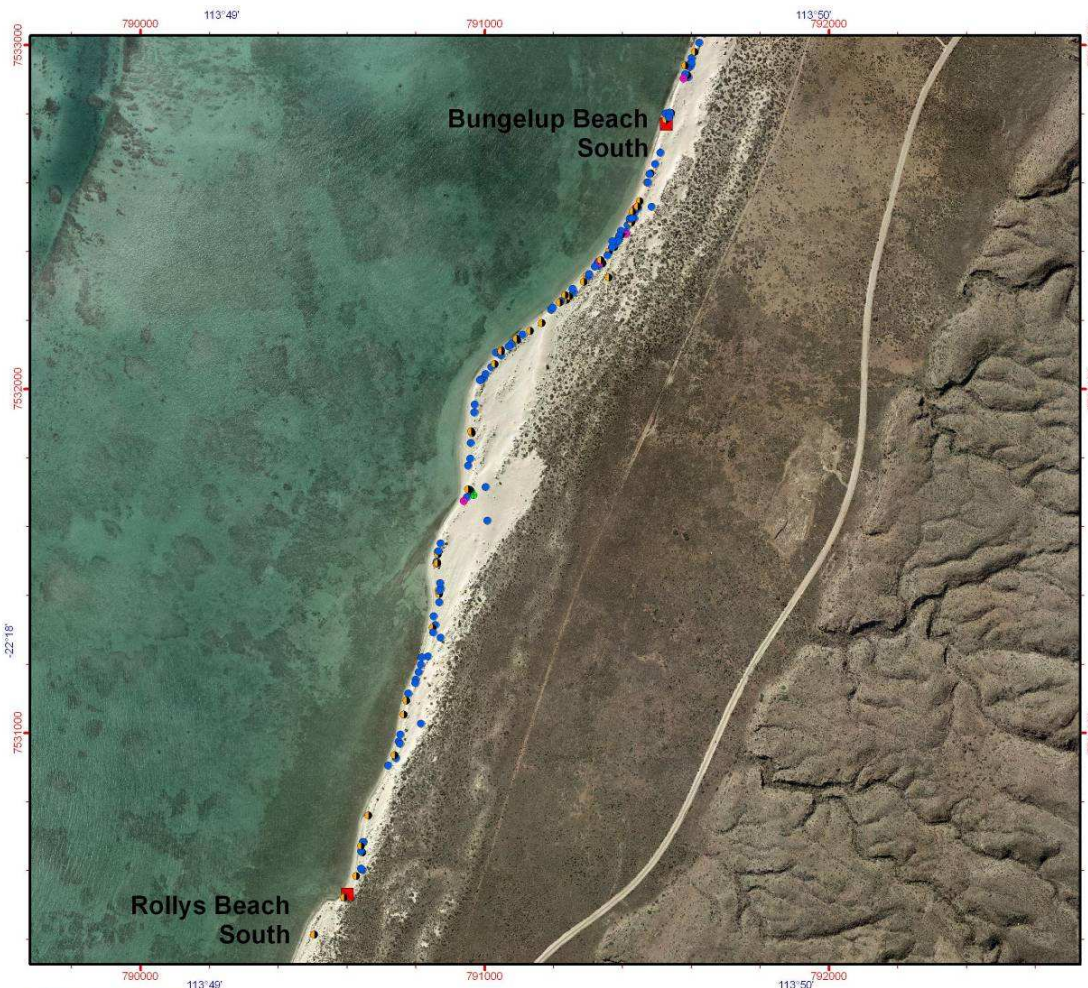
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7.10. Tantabiddi Section: Location of New Nests (NTP 2010-2011) Map 1



7.11. Bungelup Section: Location of New Nests (NTP 2010-2011) Map 1 & 2





Ningaloo Turtle Program 2010-2011 (New Nests)

BUNGELUP SECTION

Map 2 of 2

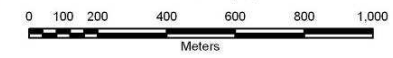
Legend

New Nests Recorded 2010-2011

- Green
- Hawkbill
- Loggerhead
- Unidentified
- Sub-section marker



1:15,000 (A4)



Projection: Universal Transverse Mercator
MGA Zone 49. Datum: GDA94



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Grid shown at 1000 metre intervals

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Job Ref: NTP_NewNest2010_11, Produced in May 2011

7.12. NTP Survey Effort and Turtle Activity 2002-2011

Table 12: NTP survey effort (divisions, sections and subsections) and turtle activity, 2002-2011 [at time of writing]

NTP Season		2002-2003	2003-2004	2004-2005	2005-2006	2006-2007	2007-2008	2008-2009	2010-2011	2010-2011	TOTAL
Survey Dates		18/11/2002 - 16/04/2003	11/11/2003 - 30/03/2004	03/11/2004 - 18/03/2005	21/11/2005 - 28/02/2006	01/12/2006 - 28/02/2007	01/12/2007 - 28/02/2008	07/12/2008 - 01/03/2009	07/11/2009 - 27/03/2010	06/11/2010 - 27/03/2011	
Division	Section										
North West Cape	Unknown	0	0	0	0	0	0	1	0	0	1
	Graveyards	165	376	374	368	341	336	234	160	160	251
	Hunters	248	263	271	271	256	252	173	117	120	197
	Lighthouse Bay	127	137	215	260	222	251	147	83	105	154
	Navy Pier	1	86	N/A	N/A	N/A	N/A	N/A	N/A	N/A	87
	Tandabiddi	115	3	N/A	85	86	84	58	38	40	509
Cape Range	Bloodwood	N/A	4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	4
	Bungelup	N/A	N/A	N/A	N/A	N/A	N/A	124	72	76	272
	Turquoise Bay	N/A	16	N/A	N/A	N/A	N/A	N/A	N/A	N/A	16
Bundera/Ningaloo	Boat Harbour	N/A	N/A	203	N/A	N/A	N/A	N/A	N/A	N/A	203
	Bungelup	1	49	152	114	120	140	N/A	N/A	N/A	576
	Carbaddaman	7	N/A	204	N/A	N/A	N/A	N/A	N/A	N/A	211
	Janes Bay	13	24	12	29	22	5	N/A	N/A	N/A	105
	Norwegian Bay	2	1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	3
	Whaleback Beach	N/A	7	8	N/A	N/A	N/A	N/A	N/A	N/A	15
Coral Bay	Batemans Bay	103	100	117	51	76	47	34	N/A	N/A	528
	Lagoon	103	100	116	51	76	47	34	N/A	N/A	527
	Turtle Beach	56	100	66	49	N/A	N/A	N/A	N/A	N/A	271
Total Survey Effort (# of visits)		941	941	1266	1738	1278	1199	1162	805	501	936
Number of Subsections Monitored		22	29	28	20	19	19	18	14	14	183
Number of Days of Monitoring		132	147	124	97	87	84	66	40	35*	812
New Nests		1904	2180	1724	5913	5479	6266	7252	1069	3295	3469
False Crawls		5925	3536	3794	10989	15766	14288	13314	2134	6975	7587

