

A Guide to **Turtle Track Beach Monitoring** *in Australia*

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Note: The '[Turtle Monitoring Field Guide](#)' is an essential supplementary handbook for this manual.

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List of Abbreviations

The following abbreviations apply to terms used in this guide.

DEC	Department of Environment and Conservation, Western Australia
CCG	Cape Conservation Group, Exmouth W.A.
GPS	Global Positioning System
NTP	Ningaloo Turtle Program
WWF	WWF Australia

Glossary

Anterior	of or near the head end or toward the front plane of a body
Body pit	See primary and secondary body pit.
Bycatch	Organisms taken in a fishery that are not the species intended for harvest.
Carapace	The thick shell or shield which covers the back of the turtle.
Clutch	A group of eggs laid at the same time.
Costal scales	Large scales down either side of the centre row of scales on the shell of a turtle. Refer to identification key (Appendix 3 – Marine Turtle Identification Key).
Egg chamber	The chamber constructed by a nesting turtle in the sand and into which the eggs will be deposited for incubation.
Emerging track	An incoming turtle track from the sea.
False crawl	A turtle track with no evidence of successful nesting.
Fill-in	The pile of sand a turtle flicks over the nest after laying.
Fore dune	Front of the dune on the seaward side.
Nesting crawl	A turtle track which leads to a successful nest.
Plastron	The ventral shield or shell of turtles. The plastron covers the underside of a sea turtle.
Prefrontal scales	Situated anterior to the frontal bone
Preocular scales	Situated anterior from the eyes
Primary Body Pit	The excavation made by a turtle on the beach just prior to digging the egg chamber.
Returning track	An outgoing turtle track back to the sea.
Secondary Body Pit	An excavation made by a nesting turtle primarily using the front flippers following the deposition of eggs. The sand flicked when digging the secondary body pit covers the primary body pit and the egg chamber.
Ventral	On the lower or bottom side or surface.
Waypoint	A navigational coordinate that has been marked or recoded in the memory of a GPS.

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PREFACE

This guide was designed to aid communities in the development of beach based turtle surveys and monitoring programs. In northern Australia, there is generally limited scientific knowledge surrounding the local nesting turtle population. Conservation of nesting turtles requires an understanding of species distribution, abundance and threats to their survival. This manual provides the necessary tools for community groups to gather information about marine turtle activities on local beaches in a standard, internationally accepted format.

Whilst there are a number of different techniques that may be used to gather data on nesting populations for a variety of purposes, the 'beach track monitoring' technique has a number of benefits and is the most appropriate for the following conditions:

- Long beaches
- Low to moderate nest densities
- Long nesting seasons
- Predominantly volunteer/community effort
- Limited resource and funding capacity
- Limited scientific supervision

Community based turtle monitoring relies predominantly on volunteers and these programs can help to promote the long-term survival of turtle populations by:

- Identifying key nesting beaches
- Monitoring populations and assess trends at key index sites
- Identifying the level of feral predation of important nesting beaches in cooperation with the management agency
- Generating and maintaining community support for the program and for the conservation of marine turtles and their habitats
- Educating visitors and the community about marine turtles
- Potentially manage visitor turtle interactions through education and interpretation and by promoting sustainable ecotourism.

INTRODUCTION

There are a number of community groups currently involved in monitoring turtle nesting beaches throughout northern Australia. Using standardised techniques is vital to ensure that the resulting data is both useful and comparable. Available monitoring techniques can vary significantly and therefore, it is important to establish clear objectives and a good understanding of the resources and funding available before a survey technique is chosen.

This manual outlines the use of the 'beach track monitoring' survey technique. This technique is undertaken at dawn by identifying and counting the tracks left by the female turtles as they crawl up the beach to lay their eggs and subsequently return to the water. Disturbance is minimised by undertaking monitoring after the turtles have left the beach. This method can provide information on the species nesting location, the relative density of the nesting population and disturbance from predators or human activities both throughout the season and between seasons and over various spatial scales.

According to your needs, the 'beach track monitoring' technique can be divided into two types of surveys.

Reconnaissance survey – Monitoring may be irregular or a one-time survey. This survey may be used in particularly remote locations, areas difficult to access, where there is very limited funding or resources or where nothing is known about a potential nesting site. Surveys would be rarely conducted in consecutive days. It is usually used to gain information about a beach during opportunist visits or from regions where little is known.

Multi-seasonal survey – This includes intensive surveys of the same beach or beach section throughout the season and over multiple seasons. The advantage of this technique is that it gives a much more accurate indication of the spatial and temporal variability of the nesting population in that location without the use of predictive modelling.

TURTLE BIOLOGY

Of the seven species of turtle that occur world wide, six are found in Australian waters. The green (*Chelonia mydas*), loggerhead (*Caretta caretta*), hawksbill (*Eretmochelys imbricata*), flatback (*Natator depressus*) and olive ridley (*Lepidochelys olivacea*) are largely found in the tropical and subtropical waters of Western Australia, the Northern Territory and Queensland. However, the leatherback (*Dermochelys coriacea*) is regularly found in the waters of temperate Australia (Commonwealth of Australia, 2003).

Table 1: Nesting distribution of Marine Turtles in Australia

	WA	NT	Qld	NSW
Loggerhead	XXX		XXX	X
Flatback	XXX	XXX	XXX	
Green	XXX	XX	XXX	
Olive Ridley	X	XXX	XX	
Hawksbill	XXX	XXX	XXX	
Leatherback		X	X	X

Key: XXX - Common/Nationally significant; XX – Medium; X – Uncommon.

All species are protected under State/Territory and Commonwealth legislation; however some of these jurisdictions allow the taking of turtles for licensed scientific research, educational pursuits and for traditional use by people of Aboriginal and Torres Strait Islander descent (Commonwealth of Australia, 2003).

Marine turtles use diverse habitats for their different life stages. These include: the nesting beach; mating areas; inter-nesting habitat; feeding areas and open waters. Marine turtles are long-lived, slow to mature (sexual maturity between 30 and 50 years of age) and are subject to a number of human-induced and natural threats in all of these habitats. Female turtles may only breed every two to seven years and return to the same region of their birth to lay consecutive clutches in the one season. If human-induced impacts and feral predation persist, the integrity of wild populations of marine turtles in Australia will be threatened (Commonwealth of Australia, 2003).

The primary threats are identified as:

- the bycatch of marine turtles in fisheries
- unknown levels of harvest by indigenous Australians and unsustainable levels of harvest by people in neighbouring countries of the Asia/Pacific region
- predation of turtle eggs by native and introduced animals
- coastal development
- deteriorating water quality
- marine debris; and
- loss of habitat.

The methodology used in this manual focuses on the nesting beach during the mornings after nesting has occurred as turtles are most vulnerable to human-induced as well as natural impacts during the nesting period.

For more information please refer to: National Recovery Plan for Marine Turtles
<http://www.environment.gov.au> or [NTP Website](#).

CHAPTER 1

MONITORING TECHNIQUES

A number of different methods can be used for beach based turtle monitoring. The type of nesting beach survey conducted will depend on many factors including geography and remoteness of the area, nesting density and available resources. To ensure monitoring programs are sustainable in the long term, surveys must be cost-effective, consistent in approach, scientifically credible and easily taught and undertaken.

The two primary methods used to monitor nesting turtle populations are track monitoring and tagging. Track counts can be conducted using either aerial surveys (1.1 Aerial Surveys) or ground patrols. Alternatively, a combination of these methods can be used. For example, aerial surveys followed up by ground-truthing by land-based patrols. Additionally, tagging studies can be done with track counts as comparisons with other locations or to check for any missed turtles from the night before.

In this manual we describe track count methodology for Reconnaissance and Multi-season Surveys (

Figure 1).

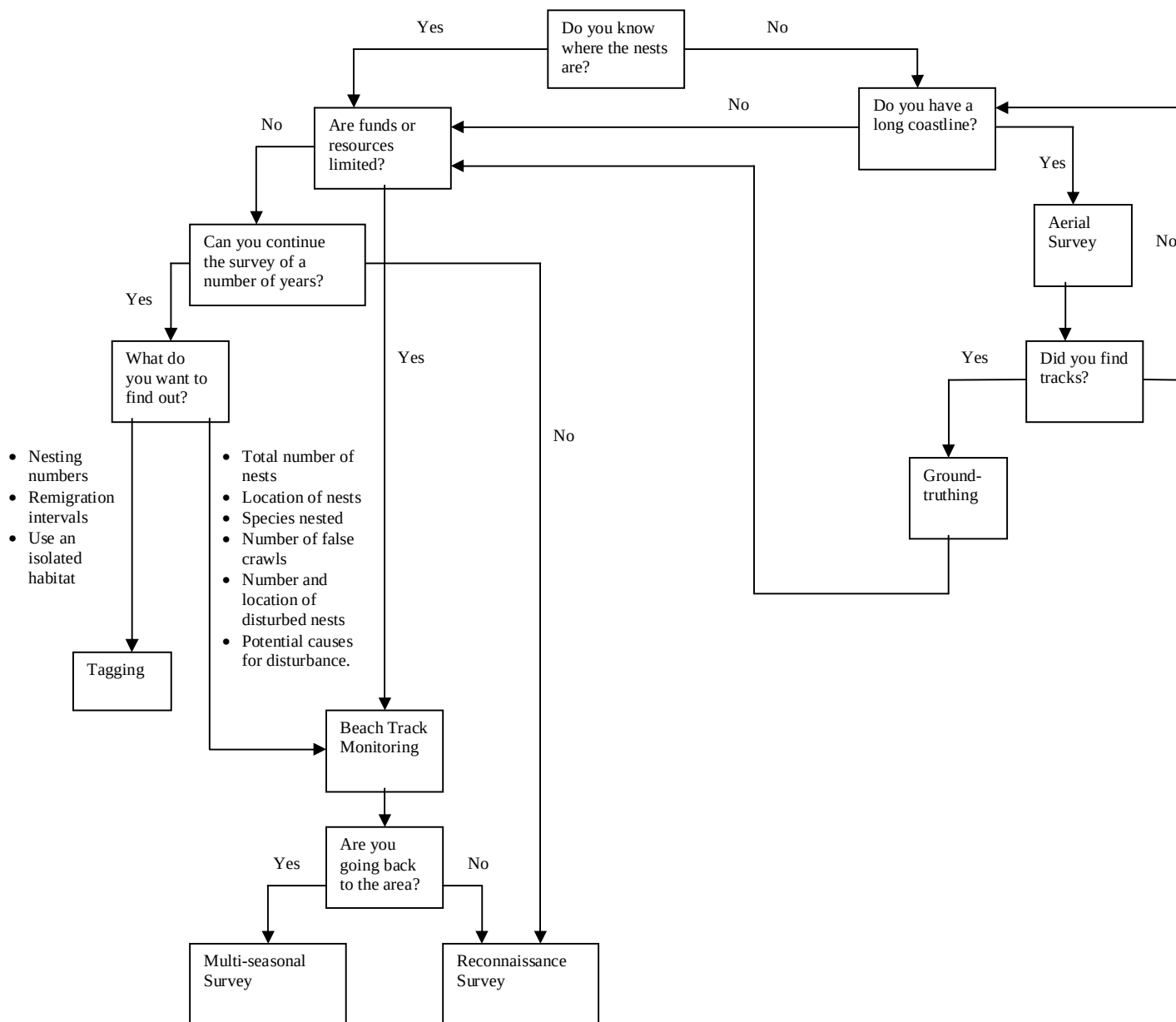


Figure 1: Methodology break down

1.1 AERIAL SURVEYS

If feasible, aerial surveys could be conducted during peak nesting periods and can help to provide an estimation of the numbers of turtles emerging, particularly along more remote beaches. This will provide a good overview of the number and extent of significant turtle rookeries.

Aerial surveys can be a cost effective alternative for surveying large lengths of coastline and searching for new rookeries. If feasible, aerial surveys should form the first stage in the process of identifying rookeries and providing an indication of relative significance for each rookery. Such aerial surveys could also be used to obtain other management information such as human usage patterns.

Aerial surveys should be conducted in the morning at the dawn low tide, to maximize track visibility. Limpus (pers com) recommends using a high winged aircraft flying at 100kts and 100 feet above sea level, with a minimum of three observers – one counting, one navigating and one recording. However, Waayers (2003) recommends just one observer using digital imagery is required. In the latter, the aircraft was positioned at about 45° off the beach at an altitude between 250 and 400 feet and a speed of 50-90 knots (depending on the density of turtle tracks). The position of the tracks was recorded digitally using a GPS and Sea Trak™ GPS Video overlay. Regardless of flight specifics, ground truthing is required to confirm species identification, and to confirm accuracy of the track count.

Aerial surveys are limited in accurately differentiating between alternate and paired track patterns, and other subtle track differences that differentiate species. However, once beaches with high track densities have been identified, beach surveys can then be conducted to identify species and quantify nesting effort and success.

Note: Civil Aviation Safety Authority approval is required to undertake airwork below 500 feet above sea level. Care should also be taken if flying over significant seabird breeding islands so as not to unduly disturb nesting animals.

1.2 THE BASICS - 'BEACH TRACK MONITORING' TECHNIQUE

The method outlined in this manual is the 'beach track monitoring' technique. Surveys can be conducted by patrolling the beach on foot or in the case of long stretches of coast, on an All Terrain Vehicle. Track monitoring has been chosen as the most appropriate technique for community monitoring programs as it can be undertaken during daylight hours (completed before other work commitments) and is effective with limited resources.

The 'beach track monitoring' method is ideal for surveys of long beaches with low nest densities and allows for the collection of opportunistic data on predation and clutch success. This survey technique ensures no interference with turtles or nests and is appropriate for community groups with limited technical support. Beach track monitoring supports collaboration across jurisdictions and aids in the identification of future funding directions (such as feral animal management).

Tagging studies can gather data on nesting numbers and remigration intervals given an isolated nesting habitat, however the resources required to do this are generally not available to community programs. Typically, tagging needs to run for several successive years in order to tag the majority of the population. Given that turtles may breed intermittently this can be quite a significant time before useful data can be gained. Furthermore, tagging is a direct interaction with the turtle and increases the risk of disturbance to nesting females, which adds issues of personnel training and the need for research permits or licences.

Community programs such as the Ningaloo Turtle Program (NTP) use a multi-seasonal, 'beach track monitoring' approach to gather specific information to:

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

A basic run down of the 'beach track monitoring' method is given below:

- Dawn monitoring, every morning during peak nesting season
- Community members walk defined sections of beach
- The following details are recorded;
 - o Total number of nests
 - o Location of nests
 - o Species nested
 - o Number of false crawls
 - o Number and location of disturbed nests
 - o Potential causes for disturbance.
- Data is entered into an analytical database
- Summary reports are generated at the end of each season indicating trends and management issues

The following chapters outline in more detail, how to establish a turtle monitoring survey including monitoring locations and study areas and basic identification techniques for marine turtle species. It is important to remember that this is a community monitoring program and therefore conservation education, training and group dynamics play a role just as important as robust data collection.

Important things to remember during Beach Track Monitoring

- Conduct surveys early in the morning – this reduces track degradation by wind, allows good track detection from shadows
- From the fresh tracks, differentiate between successful nests and false crawls – if possible.
- If possible mark all turtle tracks with a GPS (Appendix 1 – Equipment)
- Identify all tracks to species and record for each section
- Record all hatched nests – if possible.
- If possible record all forms of predation, mortality and disturbance– including on eggs, hatchlings or adults (e.g. tracks of goannas, humans feral dogs, pigs, foxes.
- See Appendix 2 – Datasheets

Limitations to Beach track Monitoring

- Wind can seriously impact tracks detection – “last nights” tracks may not be visible on a windy beach. In addition, on a beach with a point, tracks on one side made be eroded, but still visible on the other side.
- There is some error in identifying tracks to species.
- There is some error in differentiating between fresh and old tracks.
- There is some error in differentiating successful nests and unsuccessful nesting attempt.

1.2.1 LAND HOLDER ACCESS PERMISSIONS AND WILDLIFE PERMITS

Many areas will require permission or permits to access including National Parks, Marine Parks, Protected Area estates, pastoral leases, private property of Aboriginal land. Please ensure that you have permission to access the coast and conduct beach surveys.

Many coastal areas of northern Australia are Aboriginal Land and access is by permit only. The best source of information is the regional Aboriginal Land Council e.g. Kimberley Land Council. Usually any surveys conducted on Aboriginal Land should be conducted in partnership with the local indigenous group.

Permits are also required to conduct any studies that require handling of wildlife. Please contact your local management agency for more details.

CHAPTER 2

BEACH TRACK MONITORING – RECONNAISSANCE VS MULTI-SEASON

Before beginning any surveys ensure that all historical and anecdotal evidence has been gathered. This will give an indication of relevant nesting densities and the physical extent of nesting activity. This information can be obtained from Traditional Owners, literature, local residents, industry, recreational fishermen or visitors to the area.

2.1 RECONNAISSANCE – BEACH TRACK MONITORING TRACK COUNTS

Aims

- Identify important locations for sea turtle nesting by species
- Estimate abundance of nesting turtles
- Estimate ratio of nests to unsuccessful nesting attempts
- Provide an indication of threats – e.g. feral animal predation

Reconnaissance surveys are usually one-time surveys or of sporadic regularity. They are commonly used where there is very little existing information, lack of funding or access is difficult because the location is remote.

Obviously reconnaissance surveys are not the appropriate option when trying to determine trends in nesting turtle populations or create comparisons between long and short nesting seasons (Whiting *et al.* 2008). Data gathered is only a snapshot of the whole picture. However, it is recognised that further monitoring may not be feasible for a variety of reasons and that some information is better than none!

There is likely to be high variability in the number of tracks per night between consecutive nights with maximum variation. Therefore, efforts should be made to reduce sampling error by monitoring several consecutive days for each field trip. If beach access is particularly difficult, then having less sampling periods but sampling for a longer period of time is probably more feasible.

From this information, a broad estimate of the abundance of nesting turtles can be determined using various modelling techniques. Primarily, the data collected during a reconnaissance survey will give an indication of where turtles are nesting in the area, the species nesting and an estimate of nest densities and false crawls (IUCN/SSC Marine Turtle Specialist Group 1999). The number of nests can be converted to the number of females by researching (in the literature) the average number of clutches laid per female for each species during nesting season. An estimate of nesting female turtles per season can then be determined. It should be noted that estimating abundance from a reconnaissance survey will generate considerable error.

Errors in annual abundance estimates are lower when monitoring is spread throughout the season for the same amount of effort. However, if monitoring must be confined to a certain period within the season then including the peak of the season will reduce the error significantly.

Important things to remember during Reconnaissance Surveys

- If these are going to be broad scale surveys or more than one survey use a systematic approach i.e. if you don't know the seasonality space them throughout the year, if you do know seasonality concentrate the surveys during the peak of the season etc.
- Conduct surveys 2-3 days after Spring tide – this ensures that 'last nights' tracks can be distinguished from old tracks.
- Draw a mud-map of the beach or section – noting any large features such as rivers, rocks or trees.
- Differentiate between tracks from last night (FRESH) and all other tracks (OLD)
- See Appendix 2 – Datasheets

Limitations to Reconnaissance Surveys

- Turtle nesting numbers show nightly variation – e.g. 3 turtles could nest one night while 40 could nest the next night. To reduce variability, conduct surveys over 2-3 consecutive nights.

2.2 MULTI-SEASON – BEACH TRACK MONITORING TRACK COUNTS

Aims

- Identify spatial and temporal distribution of turtles.
- Monitor trends in nesting abundance of each species.
- Estimate relative and actual population numbers for each species.
- Identify and monitor mortality and other impacts at the nesting beach.

2.2.1 IDENTIFYING TURTLE NESTING BEACHES (ROOKERIES)

The multi-seasonal approach is really an extension of the reconnaissance survey, but with the goal of setting up ongoing track monitoring. Multi-seasonal surveys can be used at any location which can be consistently accessed over time and monitored by foot (or All Terrain Vehicle).

In order to establish a time effective community based turtle monitoring program it is important to identify the most significant turtle rookeries in the local area. The easiest way to do this is using a systematic approach. Walk relevant beaches and examine the physical features above the high tide line and into the dunes. The profile of the beach, vegetation, beach composition and shoreline can provide clues to the presence of a turtle rookery. For example, evidence of tracks, large deep pits and disturbed vegetation can indicate beaches that are used by turtles during the nesting season. Rocky shores with steep faces are unlikely to be used by emerging turtles, however rocks may be covered by water at high tide (so make sure you locate the high water mark) thus enabling turtles to nest!

Using a multi-seasonal approach will give an ongoing indication of trends in nest distribution and abundance and estimates of population numbers. Long-term studies will also give a good indication of the impacts of disturbance and predation, information that is important for ongoing conservation by management bodies.

The Important things to remember during Multi-Seasonal Surveys

- For permanent sites – Mark the start and end points using a sign or post
- Cross all tracks by placing a mark through the turtle track – identifies that it has been recorded
- See Appendix 2 – Datasheets

Limitations to Multi-Seasonal Surveys

- See 'Limitations to Beach track Monitoring' in 1.2 The Basics - 'Beach Track Monitoring' Technique.

2.3 DEFINING THE STUDY AREA

One of the most important components of the monitoring program is to clearly define the survey area. In order to collect useful temporal data, at least one standard survey beach must be established, measured and documented. The beach should then be broken down into smaller sections. This can be done in a number of ways using:

- Administrative boundaries - District/region/shire (Figure 2).
- Cultural boundaries
- Biological boundaries - IMCRA bioregions (for more information please see <http://www.environment.gov.au/coasts/mbp/imcra/index.html>)
- Geographical boundaries - shoreline features or physical boundaries e.g. rocky cliffs
- Human boundaries – beach access points, use patterns or distance.

For ongoing studies the following should be considered:

- Good accessibility to the beach – can the beach be accessed in all conditions? Easy access to the survey start and end points along the beach is important and should be taken into account when devising section boundaries.
- If this is to be an index beach for a species for the region – ensure that there is adequate numbers of turtles (usually having near the highest numbers for the region or >5 per night/km).
- Beaches with high nesting activity should be prioritised appropriately and divided into shorter subsections to allow personell to complete a thorough survey in a reasonable amount of time.
- The scale of the survey area is also central in determining the number of sections and subsections involved. The maximum distance recommended for each survey section walked is 1- 2 km. Sections should be completed in around 1-2 hours. Short distances and completion times help to maintain community interest and participation.
- Age demographic of the team members (and whether they have young children with them) should be considered.
- Any areas within the defined beach where turtles could not physically nest should be excluded. For example, sections of coastline with very steep rocky slopes above the high tide line (which prevent turtles from emerging) should not be included in the survey.

- All of the start and ends of beaches and sections should be recorded with a GPS (Appendix 1 – Equipment)
- For permanent surveys - clearly identifiable stakes or marked posts could be used (Figure 3).

It is important to have a continuous data set for each section for each season otherwise the usefulness of the data collected can be limited. Once a sampling methodology is established, a minimum standard is continued consistently to allow for comparison between years. Defining the peak of the season accurately would ensure error is minimised and that monitoring is occurring during the peak of the season.

To correctly recognize population trends at nesting beaches long term standardised surveys are really the only option (IUCN/SSC Marine Turtle Specialist Group 1999). Annual sampling should continue until enough data has been gathered to determine trends. For further information on developing optimal turtle track monitoring surveys please see *Whiting et al. (2008)* (Andrea Whiting's details available in Appendix 5 – Contact list) and *IUCN/SSC Marine Turtle Specialist Group (1999)*.

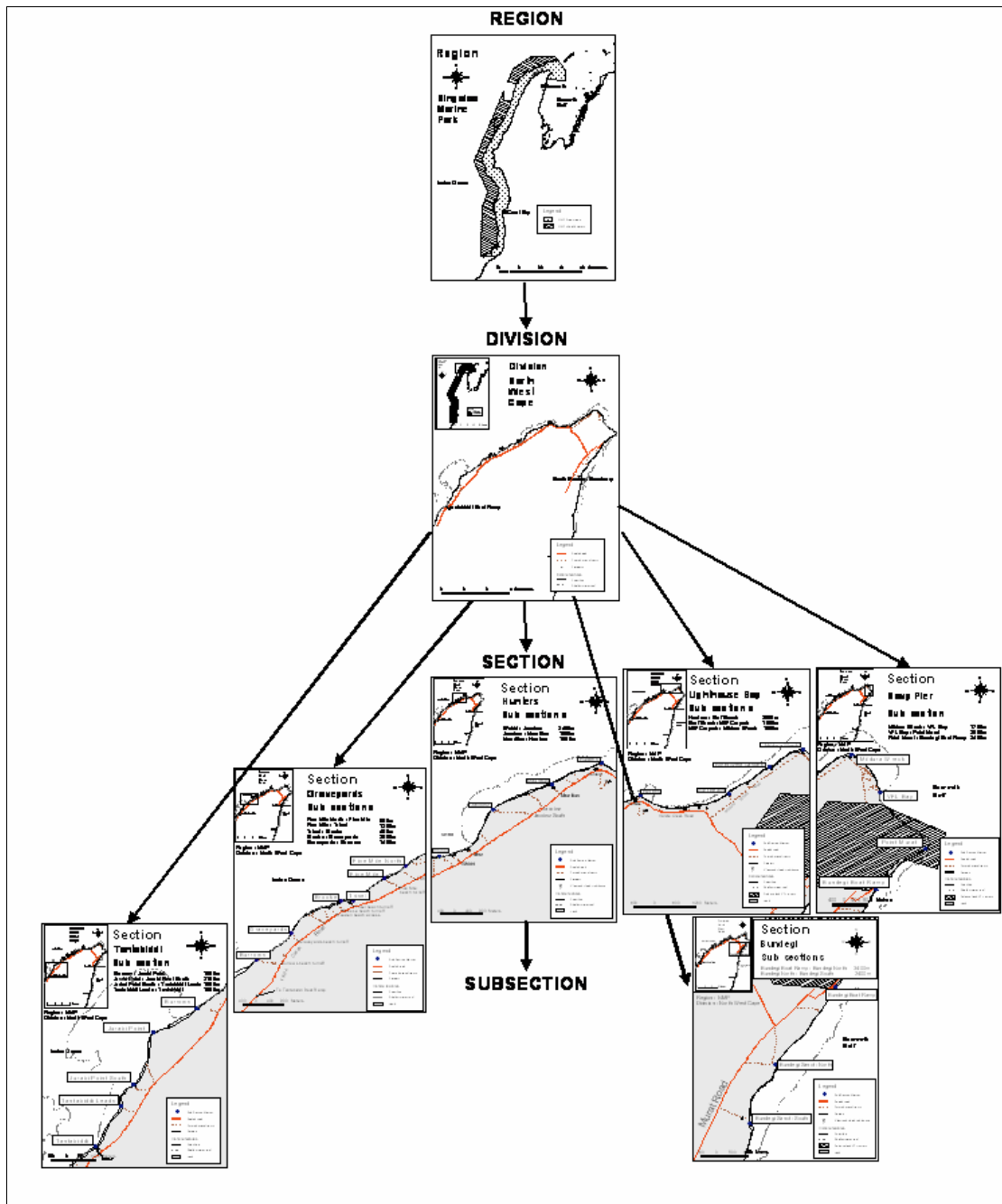


Figure 2: Example of Section classifications for the North West Cape Division on the Ningaloo Coast, Western Australia.

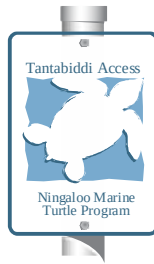


Figure 3: Example of Section totem marker used on the Ningaloo Coast.

2.4 TRAINING & PREPARING FOR MONITORING

To gain support for and successfully implement community monitoring programs, the community (and volunteers) should be involved. To publicise the need for volunteers, local conservation groups are a good place to start. Public information nights, local papers and/or bulletin boards are a good way of getting word out. For a further reaching volunteer demographic or to improve numbers, a website is the best approach.

All members participating in marine turtle surveys will need appropriate training and competency testing. Equally those personnel that provide training will need to be competent and sufficiently experienced in turtle track monitoring. It is also extremely important to discuss any health and safety issues that may arise during monitoring and what team members should do in case of an emergency.

Training manuals have been developed by the NTP in accordance with the *IUCN/SSC Marine Turtle Specialist Group (1999)* which provides a step by step guide in training the 'trainer' and training team members (or volunteers). Additionally an introductory CD has been produced to assist with initial training. Copies of the training manuals and CD can be obtained from the [NTP website](#).

Once track monitoring competency has been gained by each member of the research team, each participant should be advised which section (and subsection if necessary) they are required to monitor. Clear directions to the monitoring locations should be available to ensure safety and program efficiency.

Monitoring begins at dawn and/or close to low tide. If a reconnaissance survey is being undertaken then monitoring should occur 2-3 days after the spring tide. Tracks need to be assessed before the sand dries out and the wind or human traffic can disturb them. During early morning monitoring, shadows remain on the tracks, which can aid in determining track direction and species.

The average time spent on the beach each morning is dependent on the amount of turtle activity the previous night and the number of personnel available. Walking distances for each section should be provided to help estimate monitoring time but it is advisable to allow extra time in case of unforeseen circumstances. In some locations, quad bikes or vehicles may be needed to cover long distances.

Standardised monitoring procedures and methods are essential to ensure the success, validity and comparability of the turtle monitoring program. For details on field methodologies please refer to the '[Turtle Monitoring Field Guide](#)' also available from the

[NTP website](#). These methods are described by the *IUCN/SSC Marine Turtle Specialist Group (1999)*, and have been successfully adopted and implemented by the NTP.

Monitoring equipment should be stored in a plastic container for protection. Ensure that all equipment and information is readily available to team members with one monitoring pack designated to each monitoring team which may include:

- GPS unit
- Disposable/Digital camera
- Pencil (and spare) and sharpener
- Ruler
- Eraser
- Disposable gloves (1 pair)
- Tape measure
- A4 Clipboard with ruler
- Data recording sheets
- Data sheet key
- Rescue assessment check list
- Marine Wildlife Stranding and Mortality report
- Marine Turtle Rescue Report
- Tagged Turtle Resighting sheet
- Tide chart
- Subsection map and waypoints
- Communication log
- Hatchling ID sheet
- First aid kit
- Communication radio
- Spare batteries for radio and GP

2.4.1 OCCUPATIONAL HEALTH & SAFETY (OH&S)

It is important to be aware of and educate your research team about the various OH&S conditions that may arise during the survey. If possible, assess survey sites for potential hazards before undertaking field work. Always have a plan of action in place in case of emergency. Things to consider include:

- Sun Exposure
 - o Sunscreen
 - o Hats and protective clothing (long sleeves)
- Dehydration/Exhaustion
 - o Fitness levels of members
 - o Drink water (have extra on hand)
 - o Short breaks if necessary
 - o Communication (radios) in case of emergency
- Tripping over/ Cuts/Bruises
 - o Wear enclosed shoes
 - o First aid kits including bandages and band aids

- o Watch out for obstacles in the sand
- Bites/Stings
 - o Insects – mosquitos, sand flies etc.
 - o Insect repellent
 - o Turtles can bite during rescues etc.
 - o Keep away from head of the turtle
 - o Be vigilant
- Sprains/strains
 - o Use knees when lifting turtles or heavy items
 - o 4-5 people minimum per turtle
 - o Where possible use a turtle sling to lift the turtles
- Disease exposure
 - o Wear enclosed shoes
 - o Use gloves when touching turtles or digging nests
- Other hazards
 - o Look for dangers specific to your local area e.g. crocodiles and make sure you minimise possible issues and have emergency procedures in place to ensure safety in the field.

2.5 DATASHEETS

Examples of datasheets to be completed and descriptions of the information required during morning monitoring are in Appendix 2 – Datasheets.

2.6 OTHER INFORMATION TO COLLECT

2.6.1 STRANDED OR DEAD TURTLES

If a turtle is encountered on the beach, the *Turtle Rescue Assessment Checklist* needs to be consulted to determine whether the turtle is dead, stranded and/or requires rescuing. The *Marine Turtle Stranding and Mortality Datasheet* and the *Communication Log* should be completed (Appendix 2 – Datasheets, Figure 7) and returned to the local wildlife agency office when the monitoring kit is returned.

2.6.2 TAGGED TURTLES

Many studies incorporate the tagging of adult turtles using titanium metal tags (Figure 4). The tags are attached to one or both of the turtle's fore-flippers. If a tagged turtle is encountered during turtle monitoring activities, a *Tagged Turtle Resightings Sheet* should be completed (Appendix 2 – Datasheets, Figure 8).

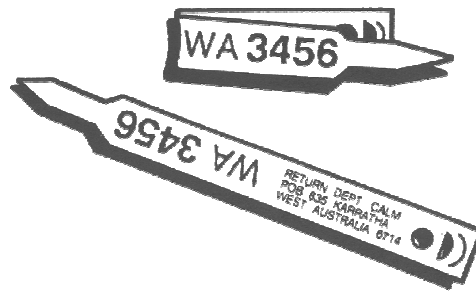


Figure 4: Examples of marine turtle tags

Note: See the '[Turtle Monitoring Field Guide](#)' for further information on datasheets, stranded or dead turtles and tagged turtles.

2.6.3 HATCHING SUCCESS

Studies can include measurements of hatching success. The following methodology will require animal ethics approval from an approved institution and wildlife approvals from the state agency.

Hatching and emergence success is the ultimate end measure of the success of nesting. Track counts and counts of adult females can produce estimates of the egg production from the beach.

Usually when walking along a turtle beach doing a track count survey, recently hatched turtle nests can be identified. They appear as a mass of hatchling tracks emerging from a small conical depression in the sand. In most cases the first signs of a nest in the vicinity, is the presence of hatchling tracks on the beach.

To find the nest follow these tracks up into the dry sand until all tracks converge into the depression. Locating the conical depression can be confusing if: there is a lot of human or animal foot traffic, there has been lots of wind, or several nests have hatched over night in the one location. To determine hatching success, all hatched nests should be recorded, even if the nest is not excavated.

The main benefits of excavating a nest are to obtain a positive species identification, especially on beaches with multiple species, and to obtain hatching and emergence success. Rubber gloves should be worn when excavating a nest because the nests usually contain rotting eggs and dead hatchlings.

The contents of the nest is carefully removed and divided into categories which help to identify at what stages of development any problems may have occurred (Table 2).

Table 2: Categories and definitions of nest contents (Miller 1999).

E	Emerged	Hatchlings leaving or departed from nest.
S	Shells	Number of empty shells counted (>50% complete)
L	Live in nest	Live hatchling left among shells (not those in neck of nest)
D	Dead in nest	Dead hatchlings that have left their shells
UD	Undeveloped	Unhatched eggs with no obvious embryo
UH	Unhatched	Unhatched egg with obvious embryo
UHT	Unhatched term	Unhatched apparently full term embryo in egg shell or pipped (with a small amount of external yolk material)
P	Depredated	Open, nearly complete shells containing egg residue

Incubation success is a combination of both hatching and emergence success (Miller 1999). Hatching success refers to the number of hatchlings that hatch from the eggs, while emergence success is the number of hatchlings that emerge from the surface of the sand. The following formulas allow each to be calculated.

Hatching Success (%) =

$$\frac{\text{\# empty shells}}{\text{\#empty shells} + \text{\#undeveloped eggs} + \text{\#unhatched eggs} + \text{\#Unhatched full-term eggs} + \text{\#predated eggs}} \times 100$$

Emergence Success (%) =

$$\frac{\text{\# empty shells} - (\text{\# Live} + \text{\# Dead})}{\text{\#empty shells} + \text{\#undeveloped eggs} + \text{\#unhatched eggs} + \text{\#Unhatched full-term eggs} + \text{\#predated eggs}} \times 100$$

2.6.4 GENETIC MATERIAL

Material for genetic analysis can easily be collected from dead animals. A piece of flesh can be collected from dead hatchlings or dead turtles on the beach and stored in a strong salt solution (table salt and water) or dried. This could then be sent to one of the universities for analysis. Appropriate permits will be required to hold parts of endangered animals.

2.6.5 ENVIRONMENTAL ELEMENTS

If access to data loggers such as ibuttons (www.ibutton.com) is available, these can be used to map temperature against seasonal nesting peaks to determine whether there is any correlation between the two.

2.7 DATA MANAGEMENT

The project coordinator will need to set up both paper files (to keep hard copy data) and an electronic database. The electronic program used to store data e.g. Microsoft Excel or Microsoft Access will need to both store data and enable statistical analysis. Alternatively, data could be stored in one program and analysed in another. It is strongly recommended that copies of datasheets are made and kept in a separate location. Databases and spreadsheets should be backed-up daily after data entry. It is important to remember that data integrity is extremely important and that moving data from one place to another can easily result in errors. Data integrity should also be kept in mind when assigning data entry duties. It is suggested that only those personnel that are interested in doing this job are asked to do so, as lack of interest in the repetitive work can also result in unreliable data.

CHAPTER 3

MARINE TURTLE SPECIES IN AUSTRALIA

Marine turtle species can be distinguished in a number of ways. The tracks of each species are unique in width (although there is some overlap) and the patterns of flipper, tail and other drag marks left in the sand. However, it is important to note that flipper injuries to turtles may alter track appearance.

To determine the width of a track, measure the track with a tape measure from outer edge of the track to the opposite outer edge (Figure 5).

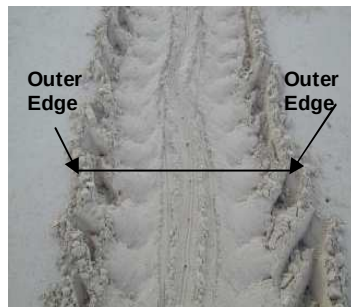


Figure 5: Measuring track width

Although all six turtle species share similar nesting habits, there are generally differences in nest sizes as well. It is important to remember that all marine turtles are individuals and will never produce the same nest twice. The shape of the nests can vary from circular to elongate to oval.

During turtle track surveys, adult or hatchling turtles may be encountered. Following are identification photographs for each species, their track, nest and body pits to aid in identification. For an adult turtle identification key see Appendix 3 – Marine Turtle Identification Key.

3.1 ADULT MARINE TURTLES

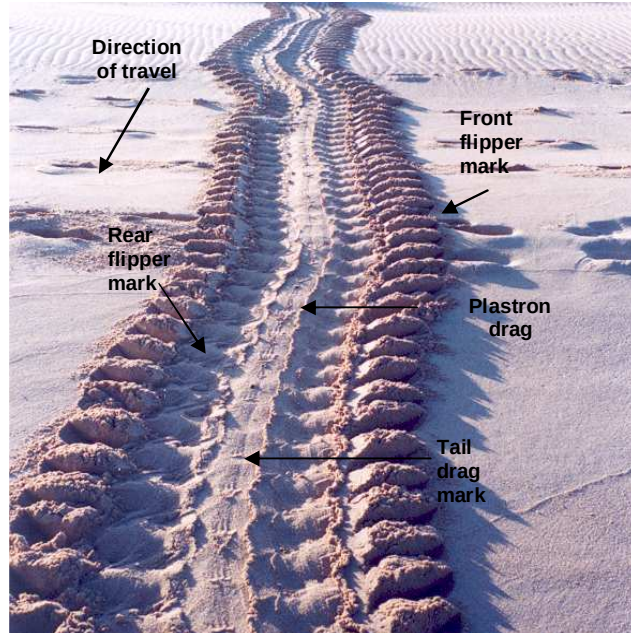
GREEN TURTLE (*Chelonia mydas*)

Emerging track

- Simultaneous limb movement
- Centre drag mark from tail (either a solid or broken line)
- Front flippers cut sand deeply

Return track

- Opposite front flipper marks
- Wide plastron drag (belly scrape) not as obvious.



95-144cm

CLOSE-UP (WET)

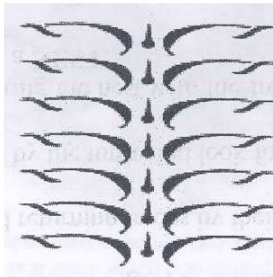
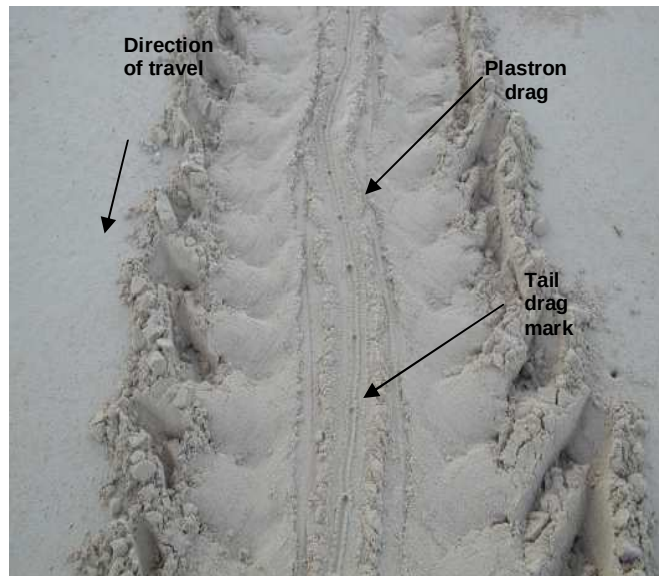


Illustration source: Florida
Fish and Wildlife

Conservation Commission.
*Sea turtle Conservation
Guidelines.*



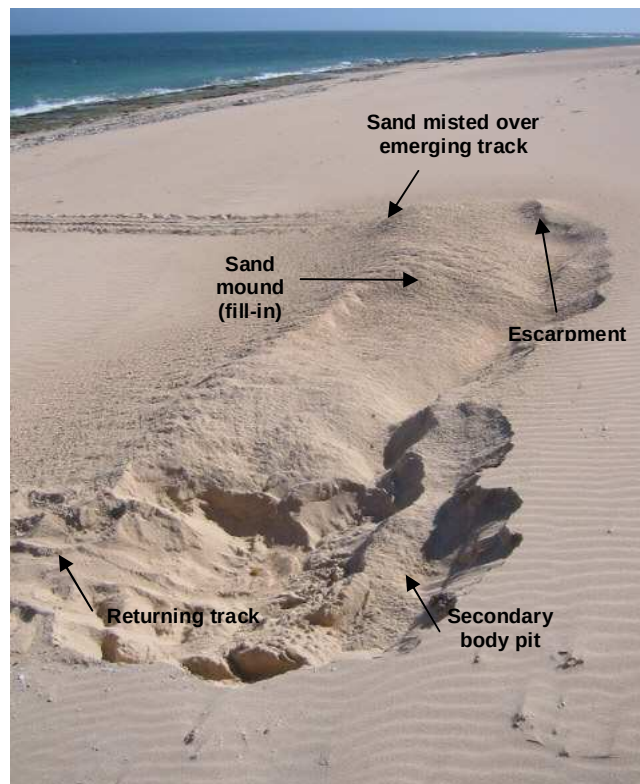
GREEN TURTLE (*Chelonia mydas*)

Nesting



Body Pit

- Large
- Deep
- Fill-in several metres long



LOGGERHEAD TURTLE (*Caretta caretta*)

Tracks

- Alternate gait
- Tail drag may be present or absent (not as common or as defined as Green turtle)
- Wide plastron drag (belly scrape) not as obvious
- More 'swirly' and further apart than Green turtle



70 – 120cm
(Av. 95cm)

CLOSE-UP

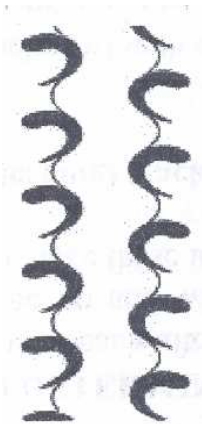


Illustration source: Florida Fish and Wildlife Conservation Commission. *Sea turtle Conservation Guidelines*.



LOGGERHEAD TURTLE (*Caretta caretta*)

Nesting



Body Pit

- Medium
- Shallow



HAWKSBILL TURTLE (*Eretmochelys imbricata*)

Tracks

- Similar to loggerhead track with alternate gait
- Tail-drag mark may be absent, but when present is a wavy mark near the track centre
- Typically narrower than loggerhead track



70 – 85cm

CLOSE-UP

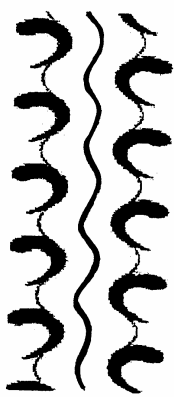
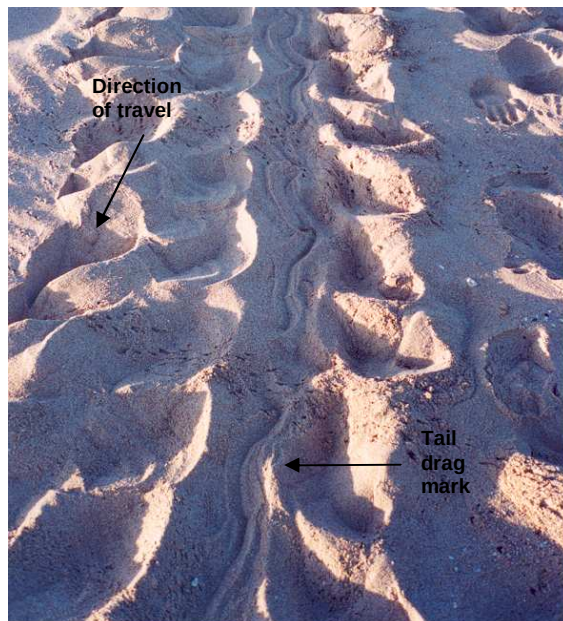


Illustration source: Florida Fish and Wildlife Conservation Commission. *Sea turtle Conservation Guidelines*.



HAWKSBILL TURTLE (*Eretmochelys imbricata*)

Nesting



Image: Keely Markovina

Body Pit

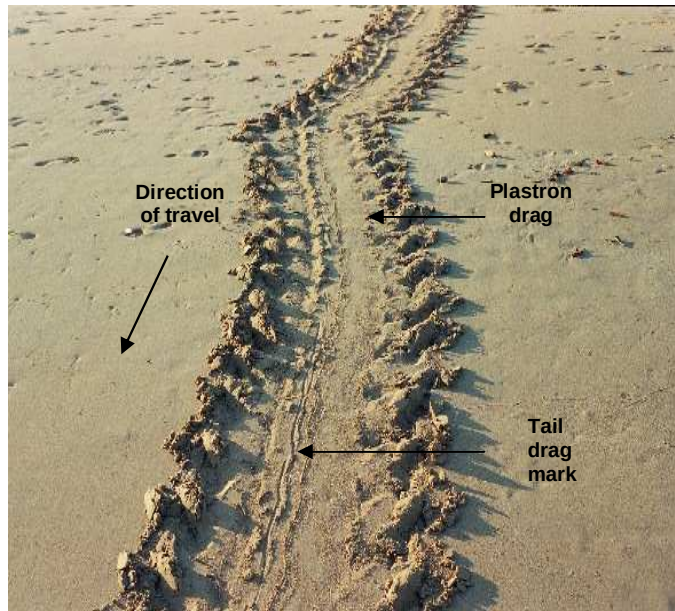
- Small
- Shallow
- Fill-in is much smaller than green turtles



FLATBACK TURTLE (*Natator depressus*)

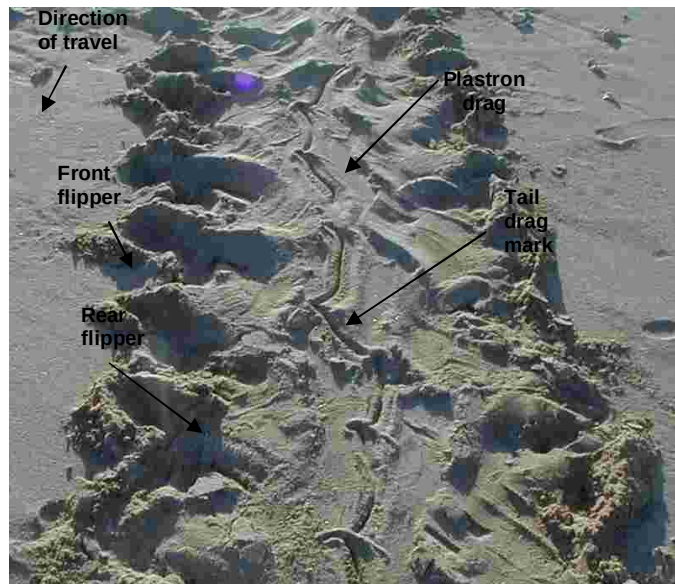
Tracks

- Alternate or opposite gait, or a combination of both.
- Similar to green turtles but slightly narrower and the front flippers do not extend as far out from main track
- Track relatively shallow as is body pit.



|-----|
90 – 100cm

CLOSE-UP (WET)



FLATBACK TURTLE (*Natator depressus*)

Nesting



Body Pit

- Medium
- Depth depends on beach position
 - lower = shallow
 - higher = deep



OLIVE RIDLEY TURTLE (*Lepidochelys olivacea*)

Tracks

- Lightly cuts sand
- Alternating marks by forelimbs
- Tail drag lacking or inconspicuous



70-80cm

Image: Scott Whiting

CLOSE-UP (WET)



Image: Scott Whiting

OLIVE RIDLEY TURTLE (*Lepidochelys olivacea*)

Nesting



Body Pit



Image: Scott Whiting

LEATHERBACK TURTLE (*Dermochelys coriacea*)

Tracks

- Very deep and broad
- Symmetrical diagonal marks
- Deep tail drag



150-230cm

Image: Alejandro Fallabrino

CLOSE-UP

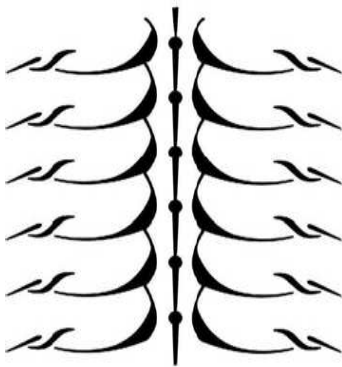


Illustration source: Florida Fish and Wildlife Conservation Commission. *Sea turtle Conservation Guidelines*.



Image: Alejandro Fallabrino

LEATHERBACK TURTLE (*Dermochelys coriacea*)

Nesting



Image: Alejandro Fallabrino

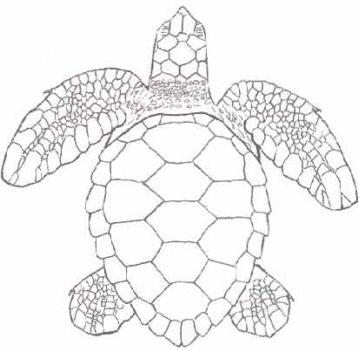
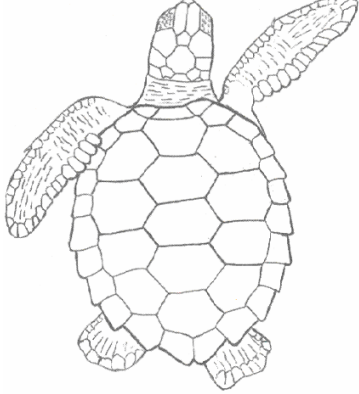
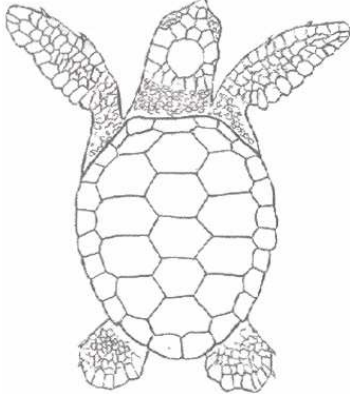
Body Pit

- Large



Image: Scott Whiting

3.2 JUVENILE MARINE TURTLES

		Green Turtle • 4 costal scales • 1 pair prefrontal scales • White margins on flippers & carapace
		Flatback Turtle • 4 costal scales • 1 pair prefrontal scales • Off-white margins on flippers & carapace • Black margins around carapace scales
		Loggerhead Turtle • 5 costal scales • 2 pairs prefrontal scales • 3 ridges down carapace • Dark all over • 4 – 5cm long

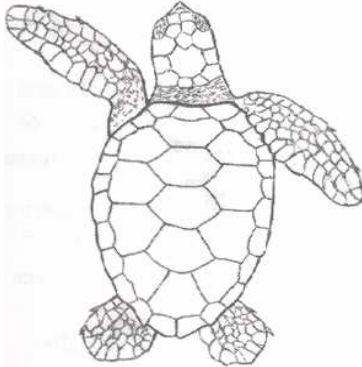
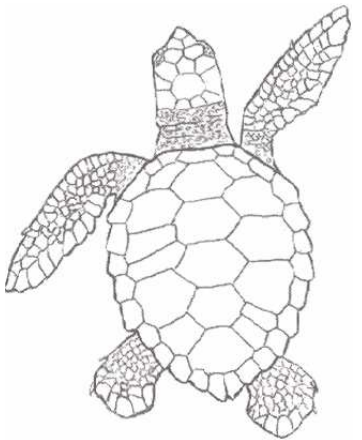
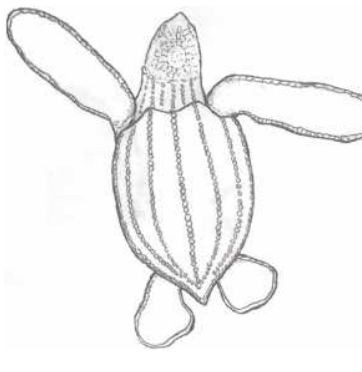
		Hawksbill Turtle • 4 costal scales • 2 pairs prefrontal scales • Overlapping carapace scales • Dark all over
		Olive ridley Turtle • 6-9 coastal scales (sometimes 5) • Dark all over
		Leatherback Turtle • Small soft polygonal scales all over • 7 white carapace ridges (including shell edges) • Long front flippers

Image: Scott Whiting

Image: Scott Handy

3.3 OTHER TRACKS & PREDATION EVIDENCE

 Fox	 Dog	 Cat
 Kangaroo	Crocodile	 Goanna
 Silver Gulls	Dingos	
Dog/Dingo Predation	 Disturbed Nest	

CHAPTER 4

INTERACTING WITH TURTLES

A nationally applicable Turtle Tour Guide Training Course has been developed for commercial operators interested in leading guided tours for tourists during the turtle nesting season. Tours are typically run in the evening and national qualifications have been developed to ensure that the Turtle Watching Code of Conduct (CoC) is adhered to ensuring minimal disturbance and interference with the nesting females. For more information please see [NTP website](#) or contact Exmouth TAFE on Ph: +61 8 9949 2624 or Toll Free (within Australia) 1800 672 700.

Any activity that may interfere with, disturb or harm marine turtles may be illegal if conducted without an appropriate licence. If any activities are observed which are considered inappropriate, community members should be encouraged to report it to the local wildlife protection agency as soon as practical. For contact details see Appendix 5 – Contact list.

Table 3 and
Table 4 outline the National Code of Conduct.

Table 3: Interactions with nesting marine turtles

Note: As a general principle, people should walk along the beach with their lights out, unless there is a specific need or safety reason requiring the use of lights. Management authorities should assess the suitability of tours on beaches that require the use of lights to walk along the beach.

Level 1: Provisions/requirements for all areas	Level 2: Location-specific provisions/requirements	Comments/explanation
B.1 Pre-nesting phase (emergence & body pit)		The turtle emerges from the water and makes its way up the beach to dig a pit for laying her eggs
B.1.1 On sighting a turtle emerging from water, all movement should stop, lights out.	An appropriate minimum approach distance to a pre-nesting turtle may need to be established at the local level.	(i) If you can clearly see the turtle moving up the beach, you should not approach any closer. (ii) If you find yourself in front of a turtle moving up the beach, it is best to sit down and remain still rather than move away until the turtle has moved up the dune to begin nest building.
B.1.2 Allow turtle to move unimpeded.		
B.1.3 Do not use a torch before egg-laying begins.	Only do so if directed or authorised by suitably trained guides or management staff.	
B.1.4 Flash photography <u>not</u> allowed.		
B.2 Nest-building phase		The turtle digs a nest in the sand to deposit her eggs.
B.2.1 Remain behind nesting turtle at all times.		(i) Lights or movement in front of the turtle at this stage can cause her to abort the nesting attempt and return to the sea.
B.2.2 Do not use a torch before egg laying begins.	An appropriately trained and qualified guide may use a light (in a controlled manner from behind the turtle) to determine when nest-building ends and egg-laying begins.	
B.2.3 Flash photography <u>not</u> allowed during this phase.		
B.2.4 Do not touch turtle.		
B.2.5 Observe minimum approach distance to a nesting turtle.	An appropriate minimum approach distance to a nesting turtle needs to be established at the local level.	(i) This distance may vary between species and environmental conditions; existing codes vary between 1 – 10 metres.

B.3 Egg-laying phase		
B.3.1 <u>Minimise</u> use of lights.	The maximum number of torches and time limitations of their use may vary between different sites, depending on the environmental conditions, turtle nesting density and size of the tour group.	(i) A trained guide may use a small torch under the rear of the carapace (with the light shielded by the turtle's body) to illuminate the eggs in the chamber. (ii) Guides should control the time that lights should be turned on/off. This ensures minimal disturbance to the turtle being viewed and potentially other turtles that may approach the beach to nest. (iii) Lights should be limited to 2 cells/batteries (3V) maximum.
B.3.2 Flash photography <u>not</u> allowed until it is established that the turtle has settled into laying. Once this is established, keep flash photographs to an absolute minimum and only from behind the egg-laying turtle or off to one side (not from in front).	This should only be done under directions from suitably trained guides or management staff.	(i) Guides should scan the beach for any other turtles before allowing flash photography. (ii) For larger groups of visitors, the guide should allow photography during a brief period of time (e.g. for 10 minutes) or during a particular activity (e.g. when turtle is filling in the egg chamber) only, to minimise disturbance. (iii) Flash photography for an extended time by large numbers of people in a group can decrease visitor enjoyment of the experience. In these situations selling photographs to visitors may be a preferred option.
B.3.3 No close up flash photography or lights near turtle's head.	In some circumstances, authorised researchers/management staff may need to photograph the turtle's head for research purposes.	(i) Turtles have been known to retain eggs, which are later lost at sea, if disturbed by bright lights near the eyes during the egg-laying phase.
B.3.4 Do not touch nesting turtles or the eggs.	Only do so if directed or authorised by suitably trained guides or management staff.	(ii) In specific cases where researchers are involved as guides they may be measuring nesting turtles and counting and measuring eggs, etc. Specific ethics approval should be required for a permit to handle turtle eggs.
B.4 Nest covering & return to sea		The turtle buries her eggs in the sand and returns to the sea
B.4.1 Stand back from turtle during nest covering.		(i) When covering their nests, turtles can move quite a lot of sand. Suggest standing back at least 10m from the turtle.
B.4.2 Minimal use of flash photography during nest covering and then only from behind or side of the turtle. No close up flash photos or lights near turtle's head.		
B.4.3 Allow turtle to move unimpeded.		(i) Allow turtle to cover the nest and return to the sea without disturbance or obstructions.
B.4.4 No lights or flash photography when turtle returns to sea.	Only do so if directed or authorised by suitably trained guides or management staff.	(i) To avoid disorienting the turtle on its return to the sea.

Table 4: Interactions with marine turtle hatchlings

Note: Hatchlings usually emerge at night. To find the sea, hatchlings orient towards the brightest source of light (traditionally in the direction of the sea). If artificial lighting is used near turtle nesting beaches, it can disrupt the hatchling turtles' normal behaviour and cause them to head inland away from the sea and hence be more exposed to danger. Crossing and swimming away from the beach are believed to imprint the hatchlings with the cues to find their way back to nesting beaches when preparing to breed.

Level 1: Provisions/requirements for all areas	Level 2: Location-specific provisions/requirements	Comments/explanation
C.1 Do not use torch / lights on hatchlings.	Only do so if directed or authorised by suitably trained guides or management staff.	(i) Hatchlings become disorientated by artificial lights.
C.2 Do not disturb nest or assist emerging hatchlings.	Only do so if directed or authorised by suitably trained guides or management staff.	(i) Staff must be trained to determine when assistance may be needed.
C.3 Minimal use of camera flash, and <u>only</u> when hatchlings are emerging from nest.	Only do so if directed or authorised by suitably trained guides or management staff.	(i) Guides should scan the beach for any other turtles before allowing flash photography. (ii) For larger groups of visitors, the guide should allow photography during a brief period of time only (e.g. for 10 minutes), to minimise disturbance. (iii) Flash photography for an extended time by large numbers of people in a group can decrease visitor enjoyment of the experience. In these situations selling photographs to visitors may be a preferred option.
C.4 Do not touch or handle hatchlings.	Only do so if directed or authorised by suitably trained guides or management staff.	(i) Specific ethics approval should be required for a permit to handle turtle hatchlings.
C.5 Allow hatchlings to run to the sea without disturbance or assistance.	If you find a hatchling <u>obviously heading away</u> from the sea <u>towards an artificial light source</u> , rescue it by picking it up, carrying it to a dark section of beach and letting it run to the sea by itself; notify the State Wildlife Management Agency of this event (e.g. QLD EPA, WA CALM, NT Parks and Wildlife) within 72 hours. Guides/management staff should facilitate/supervise this event if it occurs.	(i) Allowing hatchlings to run to the sea without assistance is important for their natural imprinting of the nesting beach and its surrounds.
C.6 Stand still when hatchlings are running down the beach to avoid stepping on them.		
C.7 No flash photography of hatchlings as they move down the beach.		
C.8 Do not illuminate hatchlings in the water.		(i) This is important to avoid confusion and possible return to the beach.

APPENDICES

APPENDIX 1 – EQUIPMENT

GPS Coordinates

Individual GPS units will have different displays, however it is important to make sure team members are comfortable with using the GPS units provided. If coordinates will be entered into specific computer software packages e.g. ARCVIEW, then the most appropriate format is decimal degrees (not decimal minutes). Some GPS units will not automatically display the coordinates in this format. It is essential that personnel understand and can reliably read and record coordinates. For further information, please see the [Turtle Monitoring Field Guide](#).

APPENDIX 2 – DATASHEETS

Even if there are no tracks identified during a survey the top part of a data sheet must still be filled in and returned. No observation is also important data. It indicates the lack of turtle activity for that location and time. Such data is critical for the monitoring program.

Data Columns

See example of completed data sheet for more information (Appendix 2 – Datasheets, Figure 6).

Species Type G/ L/ H/ F/O/?/U:

Species Key:
G = Green turtle
L = Loggerhead turtle
H = Hawksbill turtle
F = Flatback turtle
O = Olive ridley turtle
B = Leatherback turtle
U = Undetermined

GPS Position - Latitude (S), Longitude (E):

GPS coordinates must be recorded for all successful nests. Standardised display used in community databases usually requires the use of decimal degrees to 5 decimal places and a set map datum. See individual GPS unit instructions for more information on how to change displays.

New (N) / Old (O) Nest:

Species Key:
N = New nest not previously recorded
O = Old nest previously recorded but has been damaged overnight

Pos. of Nest I/ H/ E/ D:

Position Of Nest / Pit Key:
I = Intertidal
H = High water mark to edge of vegetation
E = Edge of vegetation to base of dune
D = Base of Dune and beyond

Any Prints D/ F/ G/ H:

If animal or human prints are found within a 5 metre radius of the nest or last body pit of a false crawl record on the data sheet.

Prints Key:

D = Dog

F = Fox

G = Goanna

H = Human

Any Other Observations:

Note anything that may be relevant or useful to the survey, for example:

- Turtle still nesting or on beach. Also record which species.
- Photograph for further analysis
- Tagged turtle (tags found on front flipper/s)*
- Stranded or dead turtles*

* Additional relevant forms also need to be completed in this case.

Community Based TURTLE MONITORING PROGRAM DATASHEET

Daily Report

Page.....of.....

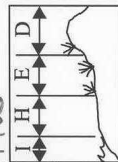
Date: 5/12/05 Starting Sub/Section: HUNTERSRecorder: SALLY SMITH Finishing Sub/Section: MAURITIUSStart Time: 6:05am Finish Time: 7:10amGPS No: # 4 Camera No/s: # 6

TABLE A: FALSE CRAWLS / NON-NESTING EMERGENCES TALLY				
Green	Loggerhead	Hawksbill	Flatback	Fox Prints
##	11			111
Total				3

TABLE B: NESTS

Species Type G/I/H/U	~GPS Position (Datum WGS84) latitude (S)	longitude (E)	New (N)/ Old* (O) Nest?	Pos. of Nest I/H/E/D	Is Nest Damaged? Y/N/U	Any Prints? D/F/G/H	Photo Frame No.	Any Other Observations?
G	21.80462	114.10505	N	H	N	-	-	TURTLE STILL ON BEACH
L	21.80954	114.10281	N	E	N	H	1	HUMAN PRINTS AROUND NEST
G	21.81233	114.10302	N	I	N	-	-	
U	21.81259	114.09534	O	H	Y	F	2	5 EGG-SHELLS AROUND NEST
Comments:								

* Only record old nest data if it has been disturbed.

~Please fill in and return even if no nests are recorded!

111202

Figure 6: Example of a completed Community Based Turtle Monitoring data sheet (for 4 different nests).

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: 16/12/2007 (DD/MM/YYYY) TIME: 0924 (24 hour)

LOCATION: Grave yards

Latitude: -21° 58' 998" S

Longitude: 114° 01' 278" E

STATUS: Dead Condition/Behaviour: _____

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

Live but subsequently died

Carcass in good condition (fresh/edible)

Carcass fair (decomposed but organs intact)

Carcass poor (advanced decomposition)

Mummified carcass (skin holding bones)

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)

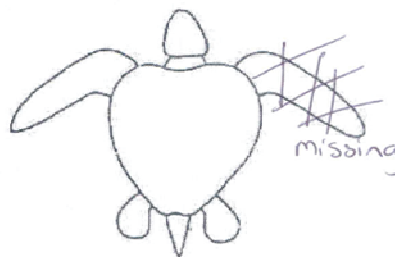
Obvious damage/injuries

Missing limbs

Barnacles

Algal growth on carapace

Tagging scars



TAG NUMBERS: Left flipper no tags

Right flipper no tags

MEASUREMENTS:

Curved Carapace Length: 10420 mm

Curved Carapace Width: 578 mm

Tail Length (from Carapace): 50 mm

Maximum Head Width: 90 mm

Measured

Estimated

Measured

Estimated

Measured

Estimated

Measured

Estimated

SEX: Male Female Unknown

MATURITY: Juvenile Adult Unknown

PHOTOGRAPHS* (see overleaf): Carapace, head and injury photos

SECURITY/DISPOSAL/RELEASE of turtle: Buried turtle in sand dunes

NOTES: Lower half, right side front flipper missing. No other signs of injury.

CONTACT DETAILS:

Name: Joe Smith

Phone number: 9949 9999

Address: 20 Nimble St, Exmouth

Email: _____

Figure 7: Example of a completed Marine Turtle Stranding and Mortality datasheet.

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

Nest Location Key:

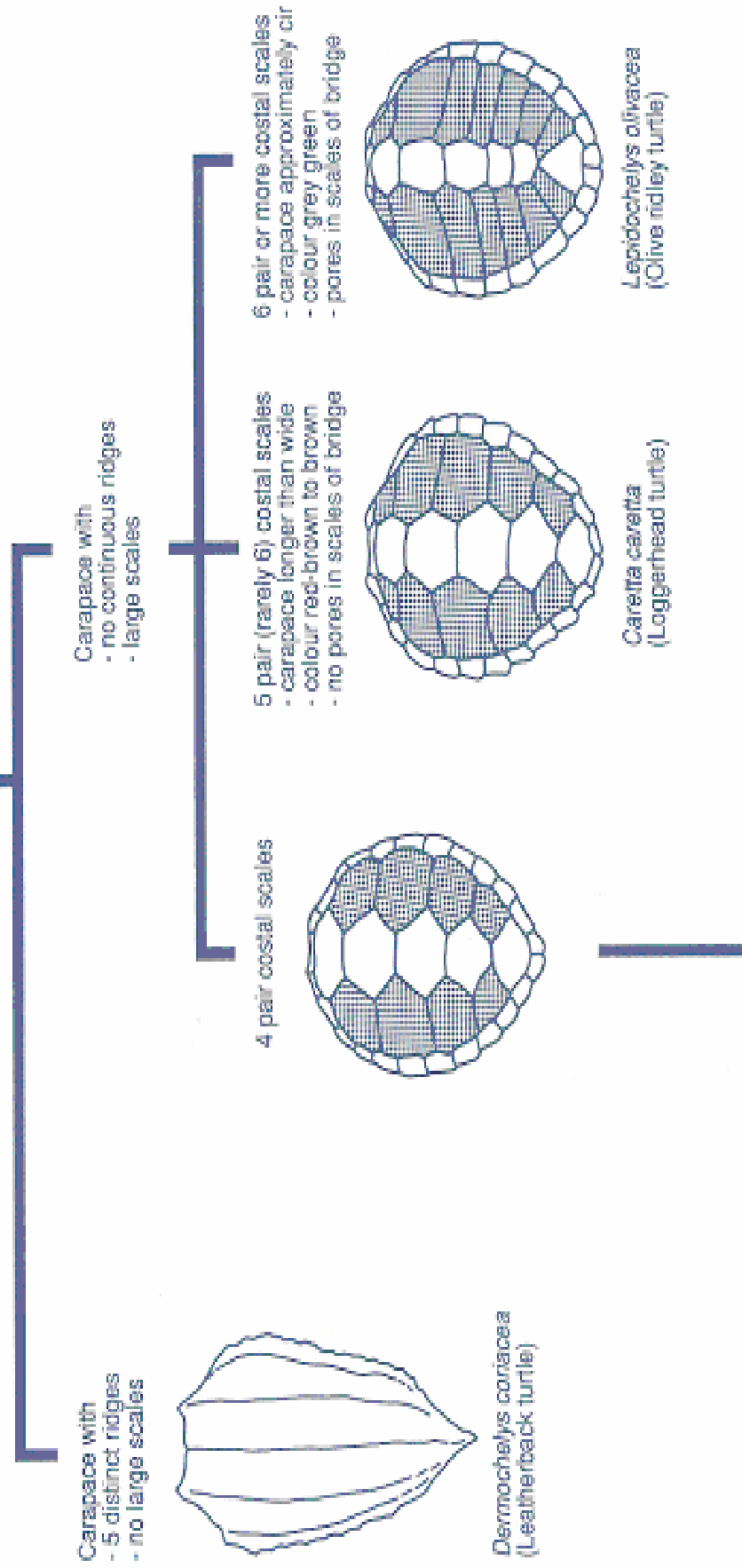
A = above high water mark
B = at high water mark
C = below high water mark
D = edge of Spinifex
E = in Spinifex

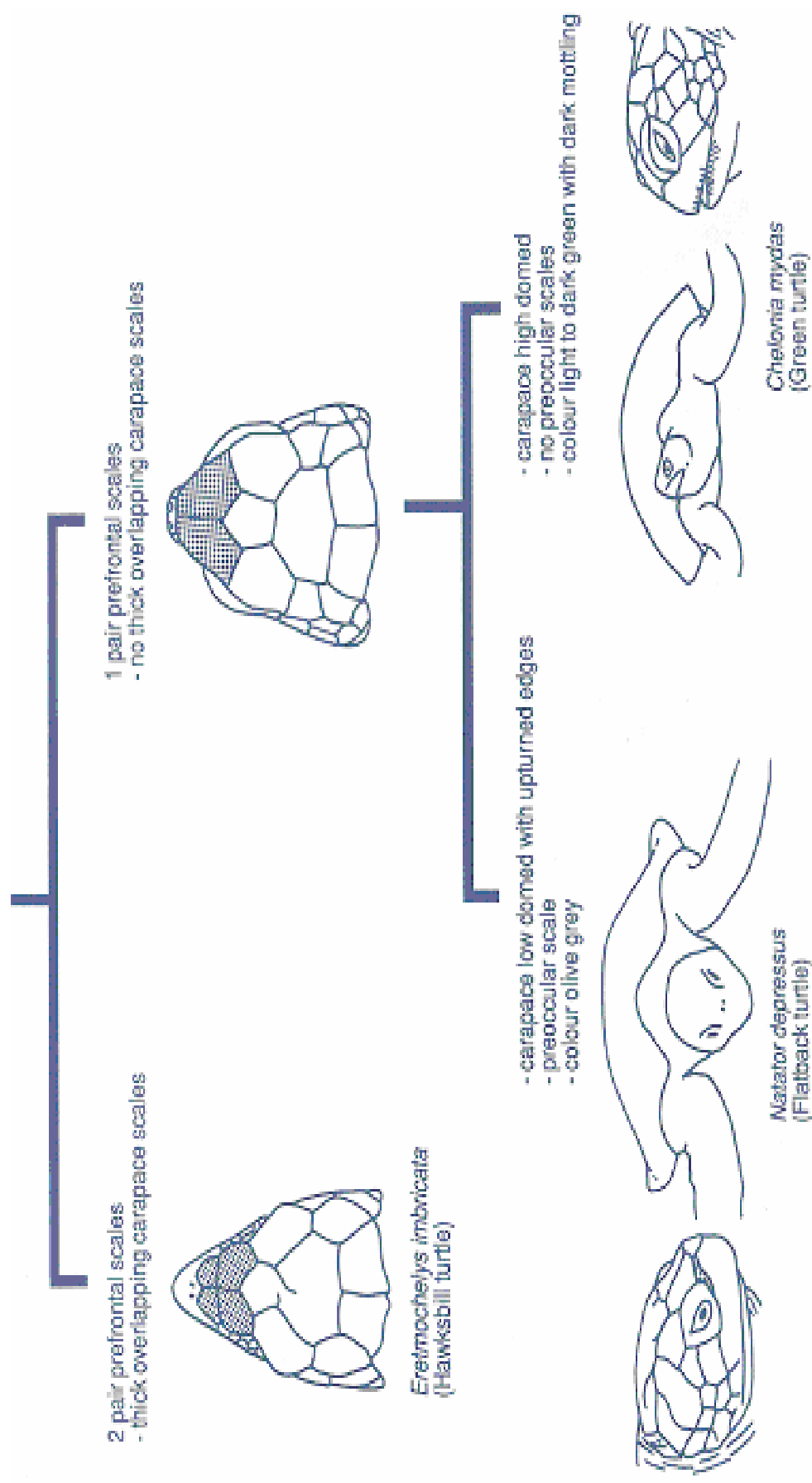
Figure 8: Example of a Tagged Turtle Resightings sheet.

APPENDIX 3 – MARINE TURTLE IDENTIFICATION KEY

Indo-Pacific marine turtles

IDENTIFICATION KEY





Produced by Queensland Department of Environment and Heritage, PO Box 155, BRISBANE ALBERT STREET, QLD 4002 • 075597-4 June 1995

Figure 9: Identification key to marine turtles of the Indo-Pacific region.

(Source: Environmental Protection Agency. Copyright © Col Limpus, Queensland Parks and Wildlife Service)

APPENDIX 4 – CHECKLIST

HAVE YOU:

- ☐ Chosen your survey type i.e. reconnaissance or multi-seasonal?
- ☐ Identified key nesting beaches?
- ☐ Defined monitoring sections?
- ☐ Marked monitoring locations with GPS coordinates (and if possible visible posts)?
- ☐ Determined desired monitoring outcomes?
- ☐ Established what variables are required for desired outcomes to be achieved?
- ☐ Recruited a program coordinator (and assistant if required)?
- ☐ Established paper files to store hard copy data?
- ☐ Developed a database to store data electronically and undertake statistical analysis?
- ☐ Determined length of survey required including how long each beach walk will be?
- ☐ Advertised for and established a community monitoring team?
- ☐ Made field guides readily available?
- ☐ Trained trainers and volunteers (all team members) and tested competencies?
- ☐ Designed clear datasheets?
- ☐ Created monitoring kits for each team?
- ☐ Given directions to each monitoring section?
- ☐ Discussed health and safety?

Then you're ready to go!

APPENDIX 5 – CONTACT LIST

Australian Marine Turtle Contacts	Organisation	Phone	Email/Website
Col Limpus	Environmental Protection Agency (Queensland Parks and Wildlife), QLD		col.limpus@epa.qld.gov.au
Scott Whiting	Department of Natural Resources, Environment and the Arts, NT	08 89209221	scott.whiting@nt.gov.au
Mick Guinea	Charles Darwin University, NT & AusTurtle	0438 192 507	austurtle@austurtle.org.au
Andrea Whiting	Charles Darwin University, NT	08 8932 7607	andrea.whiting@cdu.edu.au
Kellie Pendoley	Pendoley Environmental Pty Ltd Marine Conservation Biology Consultants	08 9227 0090	kellie.pendoley@penv.com.au
Bob Prince	Department of Environment and Conservation, WA	08 94055115	Bob.prince@dec.wa.gov.au
Commonwealth Departments			
	Department of Environment, Water, Heritage and the Arts (DEWHA)	02 6274 1111	www.environment.gov.au
	Department of Agriculture, Fisheries and Forestry (DAFF)	02 6272 3933	www.daff.gov.au
State/territory Departments			
Qld	Environmental Protection Agency (Queensland Parks and Wildlife)	1300 130 372	www.epa.qld.gov.au
WA	Department of Environment and Conservation	08 6467 5000	www.dec.wa.gov.au
NT	Department of Natural Resources, Environment and the Arts	08 8999 5511	http://www.nt.gov.au/nreta
Australian Volunteer Organisations			
Exmouth (WA)	Cape Conservation Group (CCG)		
Exmouth (WA)	Ningaloo Turtle Program (NTP)	02 9947 8000	www.ningalooturtles.org.au

Darwin (NT)	AusTurtle	0438 192 507	austurtle@austurtle.org.au
Cape York (QLD)	Cape York Turtle Rescue	07 4069 9978	www.capeyorkturtlerescue.com
Mackay (QLD)	Turtle Watch Association Inc	07 49447800	http://www.mackayturtles.org.au/about_us.htm
Broome (WA)	Chelonia (birds, Reptile & Turtle Rescue)	08 9193 5409	N/A
Ballina (NSW)	Australian Seabird Rescue	02 66862852	www.seabirdrescue.org/sea-turtles.html
Australia Wide	Conservation Volunteers Australia	1800 032 501	www.conservationvolunteers.com.au
Other			
International	WWF		www.worldwildlife.org

Please ensure you check the [website](#) for the most recent contact list.

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