

# Turtle monitoring field guide

edition 7

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## Introduction

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Thank you for participating in the *Ningaloo Turtle Program*. Your time will help our efforts to conserve marine turtles, which are threatened with extinction world-wide.

The aim of the *Ningaloo Turtle Program* is to predict long-term trends in marine turtle populations along the Ningaloo Coast.

More specifically, the overarching goals are to:

- collect data at key nesting beaches as representative sites for local turtle populations
- monitor turtle activity levels within the Ningaloo region and assess nesting trends through time
- build a culture of awareness and stewardship for marine turtle conservation.

Volunteers, who are the key to the success of the turtle monitoring program, need to be familiar with the *Code of Conduct* for turtle monitoring and turtle observation (see Chapter 7 and Appendix 5). They also need training to:

- identify the species of turtle from tracks left in the sand
- determine suspected nests and non-nesting emergences (false crawls)
- identify nest predation and disturbance
- record and manage data.

An education program will raise community awareness about the biology and conservation of marine turtles, and what community members, as individuals, can do to help.

## Chapter 1: Monitoring method

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The *Ningaloo Turtle Program* (NTP) uses a standard ‘morning after’ beach survey technique (*IUCN/SSC Marine Turtle Specialist Group 1999*). The primary objectives are to:

- estimate the abundance and distribution of turtle nests on key sections of beach over specified time intervals for each species that nests within the area
- identify the relative significance of specific nesting beaches to each species
- identify any temporal changes relating to nesting season and spatial changes in nesting distribution amongst species
- quantify predation and disturbance levels through NTP methodology and external supporting research
- support external research initiatives relating to the goals of the program
- encourage community and wider involvement, through continuous education and the recruitment of volunteers, in order to build interest, skills and knowledge to assist with turtle conservation.

Monitoring involves volunteers walking defined sections of beach at sunrise every morning during the peak turtle nesting period and recording:

- the total number of nests per species and a GPS location for each one
- the number of false crawls per species
- the number and location of disturbed nests
- potential causes of nest disturbance
- presence of foxes, dogs and cats
- tagged turtle sightings
- marine fauna stranding and mortality reports.

The data is entered into a database that allows for analysis. A summary report is generated at the end of each season to monitor trends and focus on management issues of nesting turtles in these areas.

The following chapters give detailed advice for volunteers and outline the important role they play in the program.

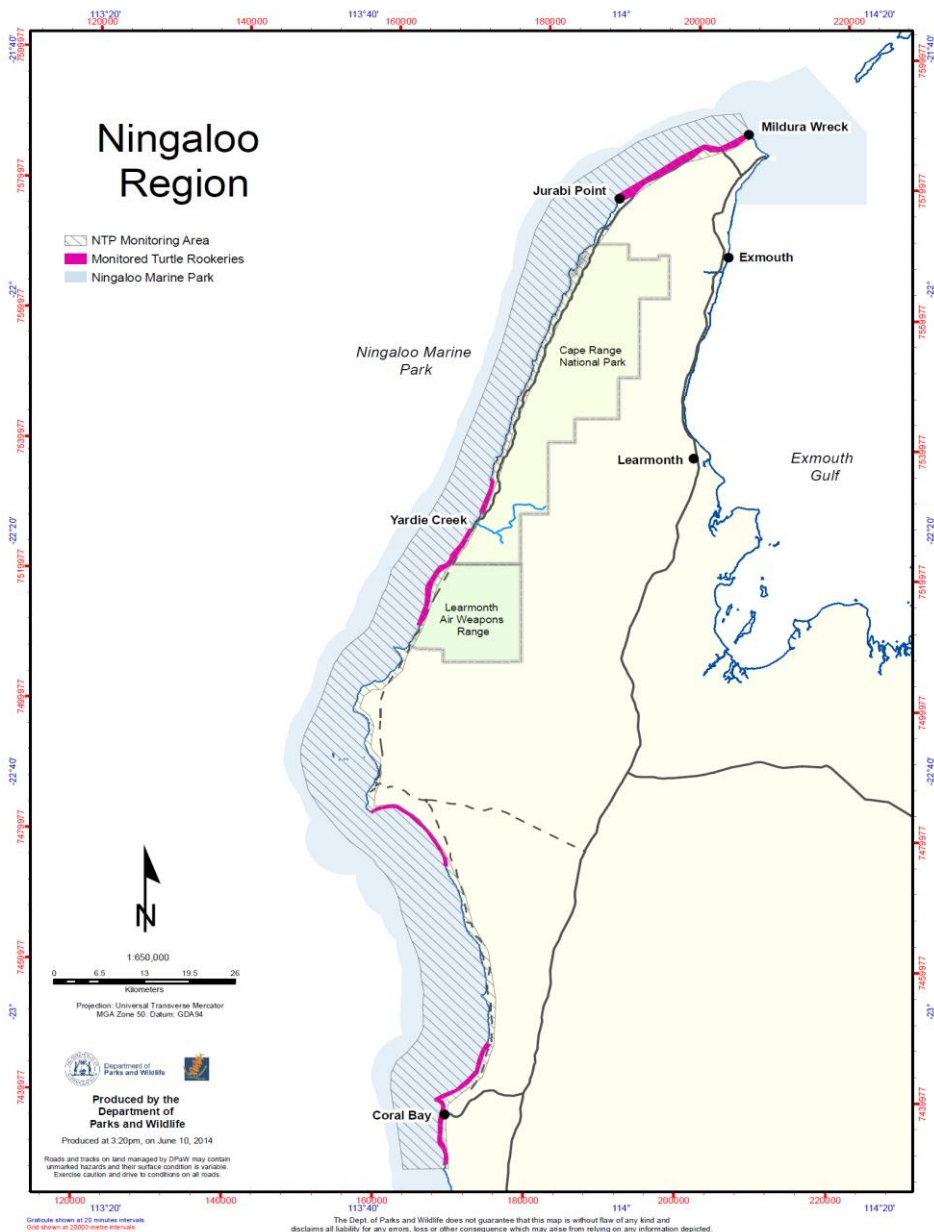
## Chapter 2: Monitoring locations

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The *Turtle monitoring field guide* is designed for the Ningaloo Region (Figure 1, next page) and can be readily adapted to other areas. Volunteers need to become familiar with the location of beaches surveyed during the turtle nesting season.

### 2.1 Hierarchical classification

For the purpose of the *Ningaloo Turtle Program*, the Ningaloo Region is divided spatially into a hierarchical classification (Figure 2). There are four divisions within Ningaloo: North West Cape Division, Cape Range Division, Bundera/Ningaloo Division, and Coral Bay Division. Each division is then further divided into sections and subsections on the basis of turtle nesting activity in the area and accessibility.



**Figure 1: Map of the Ningaloo Region**



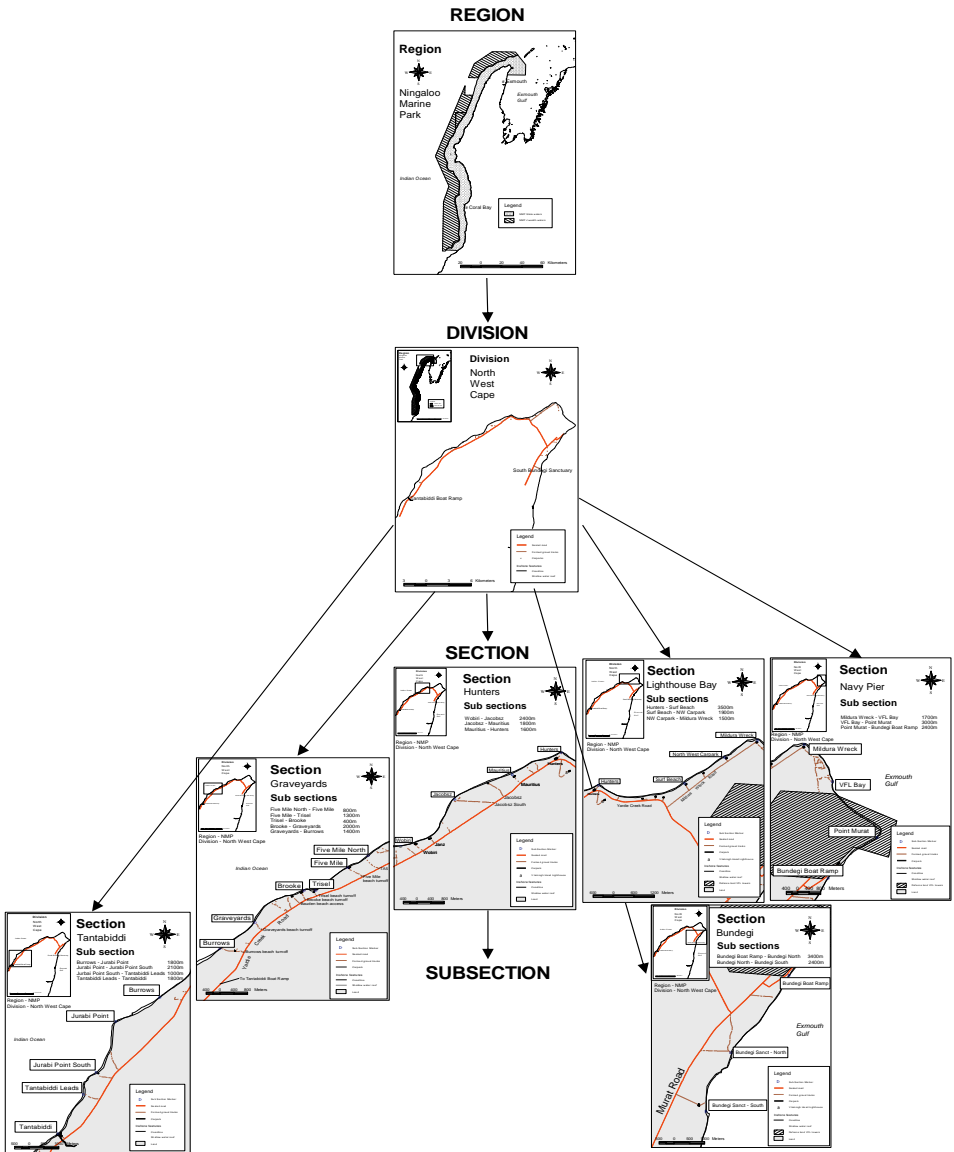


Figure 2: Hierarchical representation of North West Cape Division

## 2.2 Sections and subsections to be monitored

Volunteers monitor subsections or sections varying from 500m to 6km. Sections have been given a priority rating and the coordinator will ensure the higher priority sections and subsections are monitored continuously throughout the season. It is important to have a continuous dataset for each section every season otherwise data analysis may be compromised.

## 2.3 Entry and exit points

In the field, the starting and finishing points for each subsection have been marked with clear identifiable turtle totem markers (Figure 3), usually located at a beach access point. The starting and finishing locations of subsections are identified by the totems – not rocky outcrops or other natural features. Totems are not always directly adjacent to track access points, and in some cases the volunteer is required to walk along a footpath or along the beach to reach the subsection markers. The location of the totem markers are stored in the supplied GPS units and can also be found in Appendix 4 of this guide.



**Figure 3: Example of a turtle totem marker**

## 2.4 Expected duration of monitoring

The average monitoring time for each section is dependent on the amount of turtle activity the previous night and the number of volunteers in a team. The walking distance is provided for each subsection to help estimate monitoring time but volunteers should allow themselves at least two hours for each survey.

## 2.5 Preparing for monitoring

Prior to monitoring, the team leader will advise each volunteer which subsection they are required to monitor (see Appendix 4 for directions to the required subsection/s).

All designated subsections must be walked from start to finish unless other arrangements have been made with the coordinator. Monitoring begins at the subsection shortly after sunrise.

Some subsection totems require a four-wheel-drive vehicle to access the totem at its nearest point, or may only be reached via previous subsection totems and this may require a lengthy walk. Please ensure that you are familiar with the subsections to be monitored by using the directions given in Appendix 4. If you do not have a four-wheel-drive, allow for the extra time it will take to walk to each subsection. Note the access ways of some subsections are not suitable to drive into due to very sandy conditions.

Chapter 3 will illustrate the field methods used by the *Ningaloo Turtle Program* to successfully monitor a subsection/s.

## Chapter 3: Standard monitoring procedures

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Standard monitoring procedures and methods are essential to ensure the success and validity of the turtle monitoring program. This chapter describes in detail the procedures to be adhered to. An example of a correctly recorded data sheet (Figure 23, p. 38) and a checklist of monitoring procedures (Appendix 2) have been included.

### 3.1 Overview of field monitoring methods

An overview of the field monitoring procedure is available as a flow chart (Figure 4, p. 10). It provides a simple example of each step required to complete the data sheet whenever a fresh/new turtle track or an old damaged nest has been found.

### 3.2 Monitoring equipment

To ensure that all equipment and information is readily available to volunteers rostered for turtle monitoring duties, standard kits and clipboards have been prepared and are available to each team.

The numbered monitoring kits are the responsibility of the team leader to sign out and in, after the contents of the kit have been checked and verified as present against the checklist. Each kit includes:

- GPS
- spare batteries for GPS
- disposable camera
- spare pencil
- pencil sharpener
- disposable gloves
- eraser
- tape measure.

Each clipboard contains:

- NTP data sheet
- Turtle Stranding and Mortality Report
- Marine Fauna Stranding and Mortality Report
- Tagged Turtle Resighting Sheet
- Communication log
- Dangerous Fauna Sightings Sheet
- Turtle Rescue Assessment Checklist
- Predator Tracks Identification key
- Turtle Tracks/Data sheet key

- Ningaloo Turtles Identification Sheet
- tide chart
- emergency contacts
- map of section
- attached pencil
- ruler attached to outside of folder.

### **3.3 Step-by-step monitoring procedures**

#### **Step 1: On arrival at monitoring subsection**

1. Record volunteer's name, date, starting time, subsection name, camera number (if used), radio number, and GPS number.
2. If surveying a (sub) section, for example northwards of a totem, draw an imaginary line perpendicular from the totem to the water's edge and do not include any nests or tracks that are south of this line as these will be included in a different (sub) section, thereby avoiding duplicate records. If a track crosses two subsections, only the person with the return track in their subsection is to record it and cross both tracks.
3. Start walking the beach at latest high tide line.

All GPS coordinates of totems and directions to get to the monitoring locations have been recorded in Appendix 4. If you arrive at a location and the totem is missing, revert to using the GPS coordinates to determine where to delineate the boundary of the subsection. In such case, please record missing totem on the communication log, and report to the coordinator.

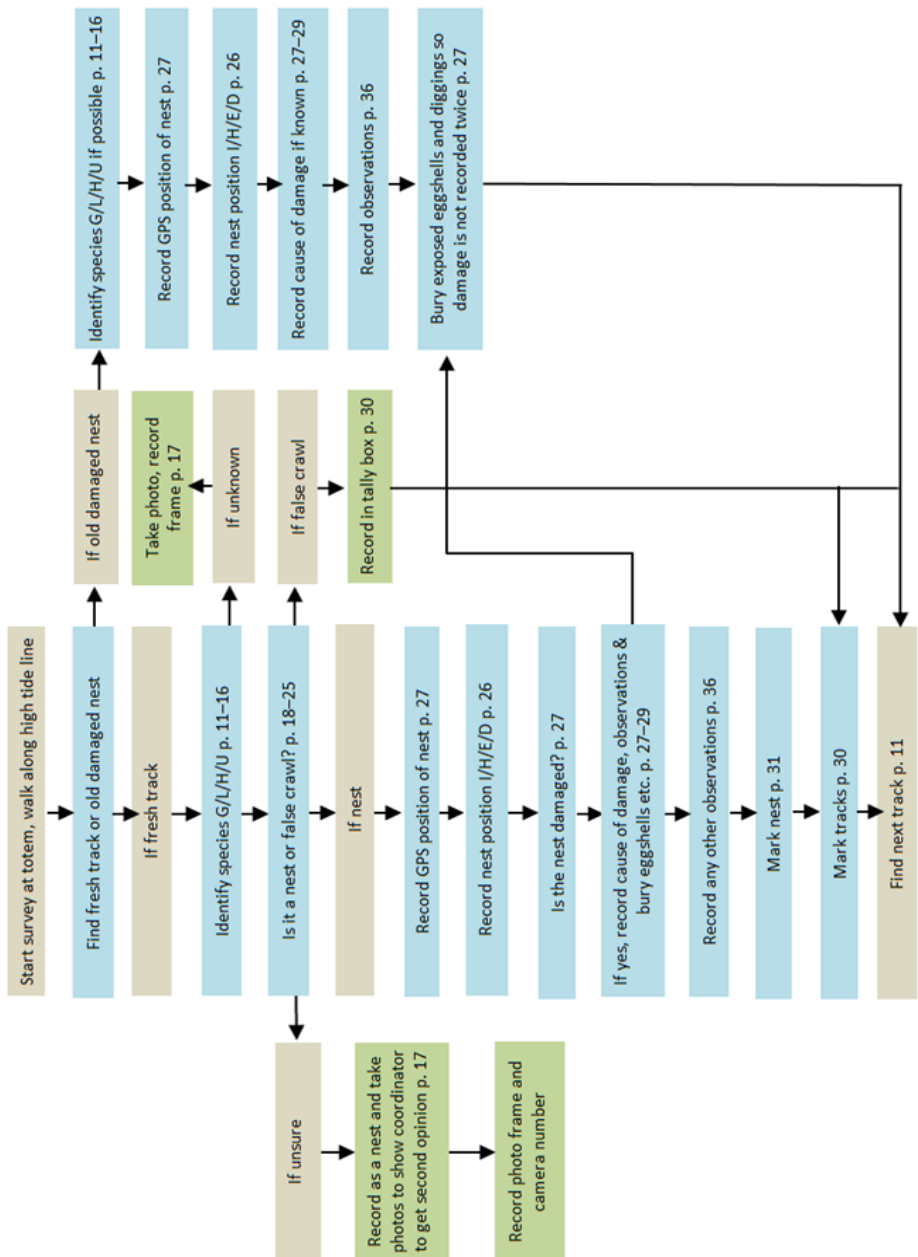


Figure 4: Flow chart overview of the monitoring methods

## **Step 2: Identify the incoming (emerging) track and the outgoing (returning) track**

Identify the emerging and returning tracks by observing which direction the sand is pushed. As a turtle crawls it pushes sand backward with each flipper stroke. There are five observations to assist in determining the direction of the track:

1. As a turtle crawls, it pushes sand backward with each flipper stroke.
2. If one track is shorter it may be the emerging track, depending on the times of the recent high and low tides.
3. If tracks overlap, the returning track will be on top.
4. Sand is always thrown back over the emerging track at a digging site.
5. Arrow theory: for green turtle tracks draw a line along the angle of the front flipper mark to the centre of the track on both sides. The arrow created denotes the direction of travel (Figure 5, p. 12). For loggerhead and hawksbill tracks the arrowhead will be at the top of the “J” shape made by their rear flippers.

## **Step 3: Identify species by track type**

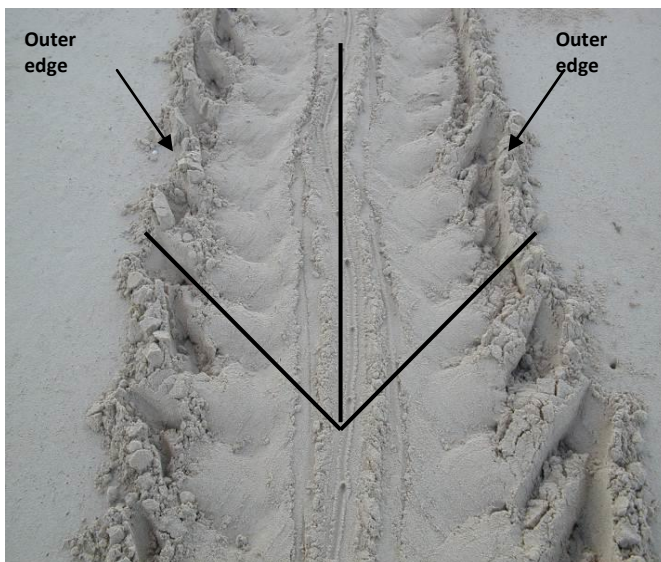
Follow the path taken by the turtle using the clearest parts of a turtle track to identify the species. There are three species of marine turtles that nest on the beaches of the Ningaloo Region: the green turtle (*Chelonia mydas*), loggerhead turtle (*Caretta caretta*) and hawksbill turtle (*Eretmochelys imbricata*). A fourth species, the flatback turtle (*Natator depressus*), may nest occasionally in the Ningaloo Region but is more common further north in the Pilbara. The tracks of each species are distinguished by the patterns of flipper, tail and other drag marks left in the sand as well as width (Figure 6, p. 13; Figure 7, p. 14; Figure 8, p. 15; Figure 9, p. 16). Note that additional factors such as terrain and flipper injuries may alter usual track appearance.

The track made by each species generally falls within a characteristic size range. This can be used as an aid in identifying turtle species when used along with other track features.

<b>Green turtle</b>	<b>95–144cm</b>
<b>Loggerhead turtle</b>	<b>70–124cm (average of 94cm)</b>
<b>Hawksbill turtle</b>	<b>70–85cm</b>
<b>Flatback turtle</b>	<b>90–100cm</b>

When measuring the track with a tape measure, measure between the two outer edges of the track (Figure 5). Note: if measuring hawksbill or loggerhead tracks,

measure from the outer edge of the rear flipper marks (as front flipper marks are not a characteristic feature for these tracks). For green turtle tracks, measure the outer edges of the front flipper marks.






**Figure 5: Measuring track width and arrow theory showing direction (green turtle track)**


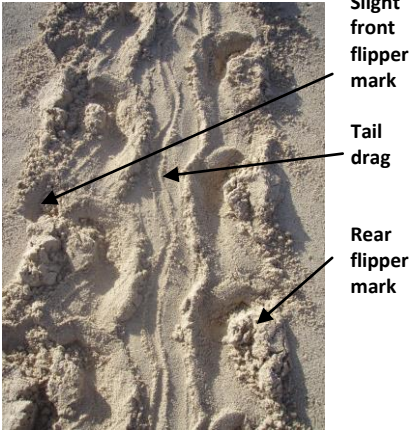


Green turtle track	
<p>Green turtles have simultaneous limb movement. The flipper markings are opposite with a smooth central plastron drag mark between them and a distinct tail drag on top, which will look like a solid or broken line with small dots from where the turtle has used the tail to propel herself forward. Track width typically ranges between <b>95–144 cm</b>.</p> <p>The above features are often more defined in emerge tracks.</p>	
<p><b>Close-up (wet)</b></p> <p>Illustration source: Florida Fish and Wildlife Conservation Commission. <i>Sea turtle Conservation Guidelines</i>.</p>	

**Figure 6: Photographs and illustration showing tracks of a green turtle (*Chelonia mydas*).**

Loggerhead turtle track	
<p>A loggerhead turtle track is made by an alternate gait. Track width typically ranges between</p> <p><b>70–124 cm with an average of 94cm.</b></p> <p>Flipper indents appear more 'swirly' than that of the green (as the rear flipper indents are the main feature of the track), are further apart and are alternate (not in line). Tail drag is not present.</p>	
<p><b>Close-up</b></p>  <p>Illustration source: Florida Fish and Wildlife Conservation Commission. <i>Sea turtle Conservation Guidelines</i>.</p>	

**Figure 7: Photographs and illustration of tracks of a loggerhead turtle (*Caretta caretta*).**

Hawksbill turtle track	
<p>A hawksbill turtle track is very similar to the loggerhead track, made with an alternate gait. Tail drag is however present as a wavy mark near the centre of the track, which may be continuous or broken. Track width is typically narrower, ranging between <b>70–85cm</b>. Imprint is usually lighter and the inner edges of rear flipper marks appear more square than those of the loggerhead.</p>	
<p><b>Close-up</b></p>  <p>Illustration source: Florida Fish and Wildlife Conservation Commission. <i>Sea turtle Conservation Guidelines</i>.</p>	

**Figure 8: Photographs and illustration of tracks of a hawksbill turtle (*Eretmochelys imbricata*).**

Flatback turtle track	
<p>The flatback turtle can leave either an alternate or opposite gait, or a combination of both. The track is similar to green turtles but slightly narrower and the front flippers do not extend as far out from the main track. The track is relatively shallow, as with the body pit. Track width is variable but typically ranges between <b>90-100cm</b>.</p>	
<p><b>Close-up (wet sand)</b></p> <p>Please note: it may be difficult to differentiate between flatback and green turtle tracks without previous experience. Please take photographs and supply to the coordinator if you think you have seen a flatback turtle track.</p>	

**Figure 9: Photographs and illustration showing tracks of a flatback turtle (*Natator depressus*) travelling up the beach in wet sand.**

#### **Step 4: Taking photographs for identification**

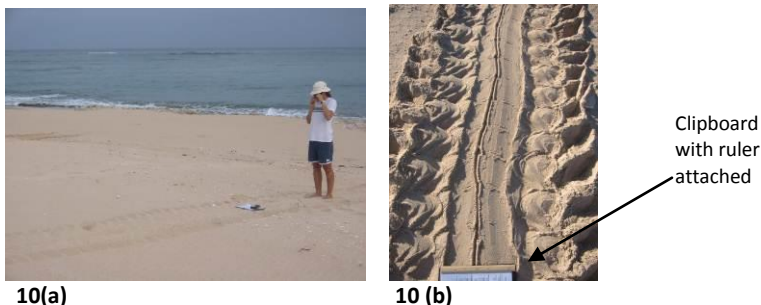
A numbered disposable camera has been included in the monitoring kit to assist with identification. However, using your own digital camera is encouraged (if available) due to faster processing time.

The camera must be used when:

- turtle tracks or animal prints cannot be identified (U – Undetermined)
- you are unable to determine if nesting attempt was successful
- you are unable to determine if nest has been damaged.

#### **Method for photographing track and prints:**

- a) Animal prints: place the ruler (attached to clipboard) next to prints before taking photograph.
- b) Turtle track:
  - Choose the best part of the track for a clear photograph.
  - Photograph to be taken with back to the sea and facing landward (Figure 10a, p. 18).
  - Place clipboard across track, with ruler on landward side, and step back approximately 1m.
  - Turn camera sideways for portrait photo.
  - Line up the ruler with the bottom of the photograph frame so it appears in the photo (Figure 10a and 10b, p. 18).
- c) Record the camera and photograph frame numbers on data sheet. If you used your own camera, please supply the photos to the NTP Coordinator as soon as possible and explain which datasheet they correspond to.



**Figure 10: Images showing (a) the position in which to take photographs for track identification; and (b) what to capture in the camera viewfinder.**

### **Step 5: Determination of nesting or false crawls (non-nesting emergence)**

Although all four turtle species that nest on beaches within the Ningaloo Region share similar nesting habits, there are generally differences in nest sizes. For example:

- Green turtles dig a large, deep body pit (Figure 11a, p. 20 and Figure 14, p. 23), and can have a nest mound several metres long.
- Loggerhead turtles dig a medium-sized, shallower body pit (Figure 11b, p. 20 and Figure 15a, p. 24).
- Hawksbill turtles dig a small, shallow body pit. Hawksbills are small, quick turtles and the size of their nest mound will be much smaller than that of a green (Figure 15b, p. 24).
- Flatback turtles have medium-sized body pits, depending on the position on the beach (lower on the beach = shallow; higher on the beach = deeper).

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 elongated oval shape. Terrain and obstacles may also change the appearance of a nest.

### ***a) Nesting crawl field signs***

Follow the path taken by the turtle and look for the following characteristics:

- Evidence of front flippers misting sand back over emerging track.
- Evidence of a nest mound and an escarpment (the rim around the nest mound). This helps determine the location of the eggs. There must be evidence that the primary body pit has been filled in or covered with sand from the secondary body pit. The secondary body pit is generally shallower and less conical than a primary body pit, as it is the turtle's last throw of sand and her exit point. The amount of sand moved should not be able to fit back into the secondary body pit because some of this sand has also been moved from the primary pit, which is now covered over.
- Sand thrown in the vicinity of the secondary body pit. The sand which is thrown during nest covering generally has higher moisture content and more aeration than the dry sand on the beach surface (not the case after rain).
- Vegetation may have been dug up. However if vegetation is still rooted in the ground above where the egg chamber should be, it can be assumed that no nest is present in that spot.

See illustration (Figure 12, p. 21) and photographs (Figure 14, p. 23; Figure 15(a) and 15(b), p. 24) showing examples of nesting crawl and successful nesting.

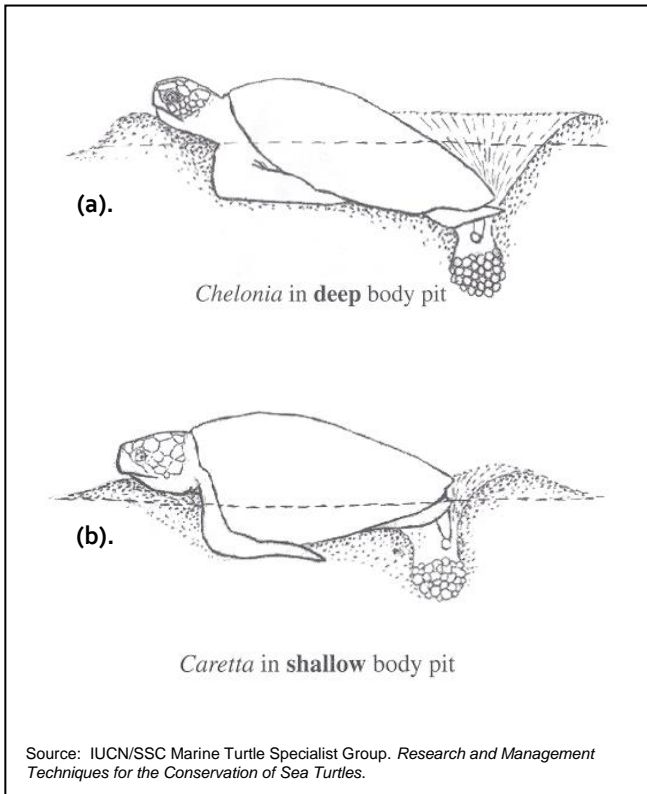
### ***b) Signs of false crawl (non-nesting emergence)***

Observe the entire crawl carefully and look for any of the following characteristics:

- very little or no sand disturbed, other than the crawl itself; or
- U-shaped or a simple arc shape crawl with no digging; or
- considerable sand disturbed from digging and evidence of body pitting but no evidence of covering; or
- considerable sand disturbed from a digging effort, but with a smooth-walled or abandoned/open egg chamber (15–25 cm diameter) in the centre of a pit within the disturbed area – this is often deeper and more conical-shaped in appearance than the secondary body pit of a successful nest.

See illustration (Figure 13, p. 22) and photographs (Figure 16, p. 25) showing examples of false crawls and body pits (unsuccessful nesting attempt).

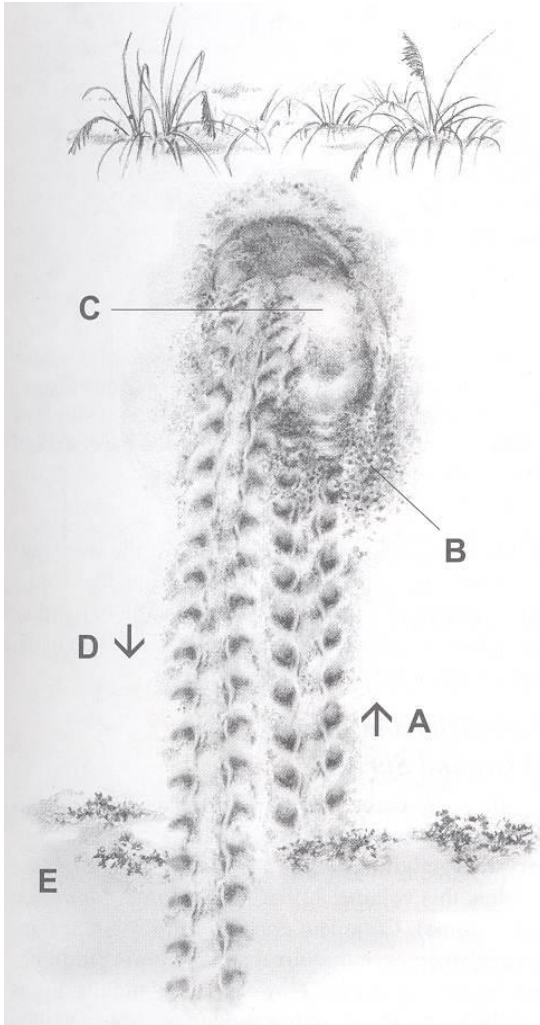




**Figure 11: Illustration of two typical nesting positions of marine turtles, (a) green (*Chelonia mydas*) and (b) loggerhead (*Caretta caretta*) turtle, showing the differences in depth of body pits.**



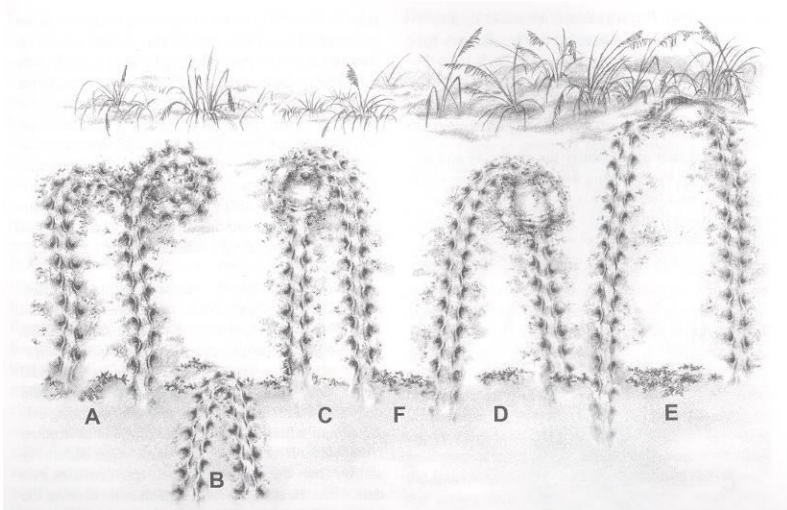
## Stages of successful nesting



**Figure 12: Illustrated example showing stages of successful loggerhead (*Caretta caretta*) nesting, with (A) emerging crawl; (B) sand misted or thrown back over the emerging crawl; (C) a secondary body pit, nest mound and escarpment, with sand thrown in the vicinity; and (D) returning crawl. (E) marks the high tide line.**

Source: IUCN/SSC Marine Turtle Specialist Group. *Research and Management Techniques for the Conservation of Sea Turtles.*

## False crawls



**Figure 13: Illustrated examples of false crawls (non-nesting emergences) made by loggerhead turtles (*Caretta caretta*) including: (A) extensive wandering with no body pitting or digging; (B) U-shaped crawl to the high tide line; (C) considerable sand disturbance, evidence of body pitting and digging with a smooth-walled egg chamber and no evidence of covering; (D) considerable sand disturbance and evidence of body pitting and digging and no evidence of covering; (E) marks the site of a crawl where the relative lengths of the emerging and returning crawls are the same; (F) marks the high tide line.**

Source: IUCN/SSC Marine Turtle Specialist Group. *Research and Management Techniques for the Conservation of Sea Turtles*.

### Examples of nests

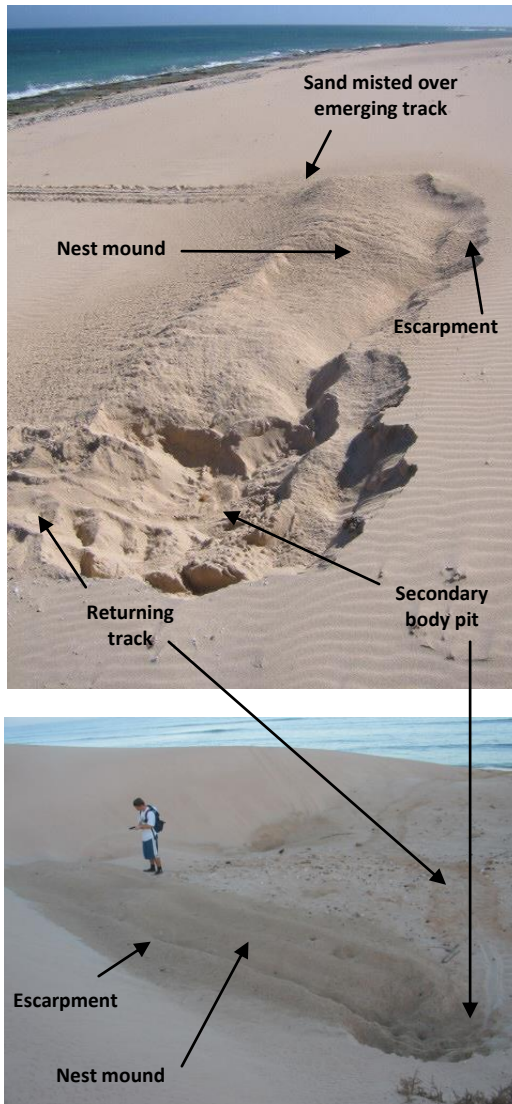


Figure 14: Photographs of green turtle nests

15(a)



15(b)



Figure 15: Photographs of (a) loggerhead and (b) hawksbill turtle nests



### Examples of primary body pits (false crawls)



Figure 16: Photographs of abandoned primary body pits (false crawls)

### **Step 6: Position of nest on the beach**

Once the nest has been identified, the position needs to be recorded. There are four zones from the edge of the water to the fore dune in which nests and body pits are found:

#### **1. Intertidal (I)**

From the water's edge to below the high tide line. The high water mark can be found by looking up the beach for watermarks or where fresh debris and seaweed have been deposited.

#### **2. High water mark to edge of vegetation (H)**

From above the high tide line to the edge of the vegetation. To determine where the edge of the vegetation is, stand at the nest and draw a visual line either side along the vegetation. Be aware that there may be some bushes within the H area but they are distinctly removed from the actual dune vegetation.

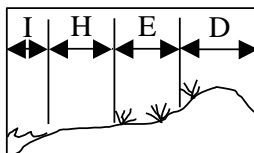
#### **3. Edge of vegetation to base of dune (E)**

From the vegetation line back to the base of the fore dune.

#### **4. Base of dune and beyond (D)**

From the base of the fore dune's seaward face and beyond (towards land).

Record the position that the actual egg chamber is in, rather than the secondary body pit. If the nest appears to be on the boundary of two positions, ***choose the position that is closest to the sea***. Nesting position information is important for determining where different species prefer to nest and potential nest loss rates after storm surge.



**Figure 17: Diagram showing the four zones for identifying where the position of a nest is located**

### **Step 7: Recording the GPS location**

It is essential that the GPS location of nests be recorded. This must be done using the following steps:

1. Turn on GPS at nesting site and allow GPS time to acquire satellite signals – must be accurate within 0–8m. Check GPS is in decimal degrees (Chapter 6, p. 53).
2. Hold GPS over the egg chamber.
3. Record GPS coordinates on the datasheet.

For more instructions on using a GPS, refer to Chapter 6.

### **Step 8: Nest damage**

A predated nest is generally characterised by fresh yolky eggshells or partially consumed eggs littering the nesting site (please count the number of fresh eggshells strewn around). They may have claw or teeth marks on them. There may also be whole eggs on the surface that have been exposed by storm surge/tide or dug up by another turtle while nesting in the same spot. However, even a significant hole dug in the immediate vicinity of the egg chamber needs to be recorded as it can lead to egg mortality due to a change in nest microclimate (unless it is a ghost crab hole, in which case do not record it).

Foxes, dogs, goannas and humans can cause significant impacts when it comes to damage of turtle nests. To assist with identification of prints, refer to photographs in Figure 19 (p. 29). Note ghost crab predation is not recorded and neither are old eggshells present without any signs of disturbance (they can get windblown or naturally exposed after hatching).

Record the nest as damaged, attribute the cause if known, and write a good description of what you can see (e.g. 20 eggshells scattered around, digging into the nest and fox prints next to dig). The nest may be new (laid last night) or old (laid any time prior to last night). You may be able to identify the turtle species if the turtle track is still present or if hatchling remains are present and can be identified. Cover over the shells and any holes before you leave so they are not recorded twice.

## Signs of predation



Digging and fresh eggshells



Exposed whole eggs



Digging into nest and predator prints



Hatchling remains and fresh broken eggshells



Digging and hatchling remains



Fresh eggshell

**Figure 18: Examples of different signs of turtle nest predation**



## Identification of prints – predator



Fox



Dog



Cat



Goanna



Human (knees and handprint)

Figure 19a

## Identification of prints – other



Kangaroo



Echidna



Rabbit

Figure 19b

**Figure 19: (a) Photographs of predator prints; and (b) other fauna prints that are commonly seen in localised coastal areas**

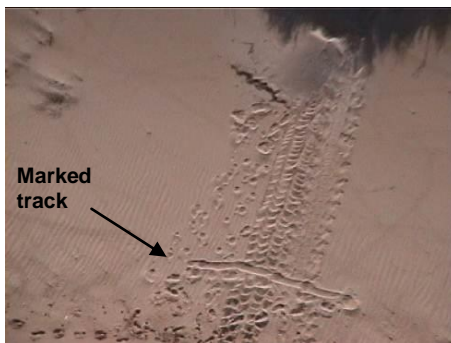
### **Step 9: False crawl tally**

When a crawl is determined not to lead to a nest, it should be recorded as a false crawl. It is essential that each pair of tracks (return + emerge = pair) is documented accurately on the data sheet as either a nest or a false crawl in order to identify species, general density of beach use, and ratio of nests to false crawls.

Each track should be assessed to determine species and each false crawl (emerging plus returning track = crawl) marked down in the false crawl tally box as one stroke (Figure 23, p. 38). At the end of the survey, false crawl tallies from all pages should be totalled together on the last data sheets.

### **Step 10: Marking the tracks**

After each crawl is evaluated and documented, **the tracks must be marked to avoid duplicate reporting** by volunteers monitoring on successive mornings. To accomplish this, a section of the upper track should be marked by making a deep 3m long line in the sand parallel to the sea **well above the high tide mark** using your foot across both the emerge and return tracks (see Figure 20). If many tracks are overlapping in dense activity areas or a turtle has travelled a considerable distance, you may need to cross the tracks in several places to make it less confusing for subsequent monitoring.

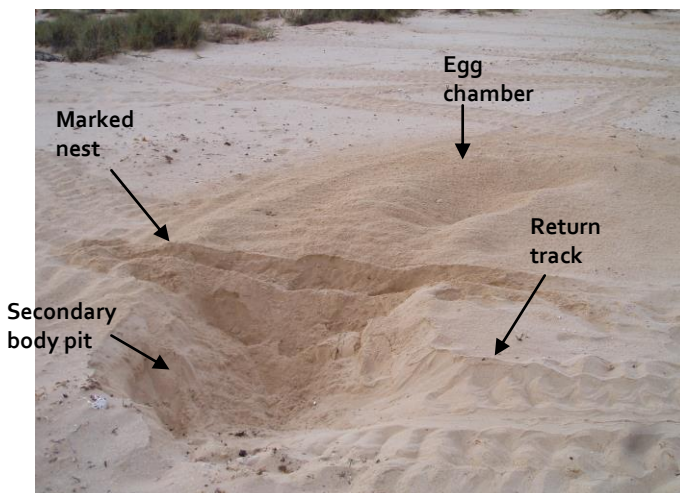


**Figure 20: Aerial photograph of marked turtle tracks**

Note: If tracks have not been crossed the day before monitoring you are only to record the new tracks (and nests) from the previous night (as well as any old damaged nests). You can usually distinguish these from older tracks using the tide line and appearance of the track. However, cross off all old and new tracks and nests you see to make it easier for the next day.

### **Step 11: Marking the nests**

After each nest is evaluated and documented, the nest must be marked. Using your foot, make a deep line in the sand across the nest as close to the secondary body pit as possible (Figure 21).



**Figure 21: Photograph of a turtle nest that has been marked through the 'neck' of the nest to show it has been recorded**

**Note: areas of high activity**

In areas where many turtle tracks are overlapping and it is difficult to follow individual tracks due to congestion, it may be necessary to use the tally trick.

Walk along the high tide mark and count how many emerge and return tracks there are for each turtle species, making a tally as you go. Ensure that you have matching tallies to equate to a total number of track pairs (i.e. 10 emerge and 10 return tracks = 10 turtles that have visited the beach). If the totals don't match you may have missed a track or there may be a turtle still nesting in the area.

Next, walk through the entire area and thoroughly scout for any new turtle nests. Note the species and record the nests as per usual procedures, crossing off as you go. Finally, subtract the number of nests from the total number of turtles that have visited the beach and tally that number of false crawls per species in the false crawl table (e.g. 10 green turtles had visited the beach and 4 nests were seen during scouting and have been recorded. Therefore 6 green false crawls need to be added to the false crawl tally box).



**Figure 22: Area of high track congestion where the tally trick would be used**

## Chapter 4: Data sheet instructions

---

**Please note:** Even if you see no turtle tracks during a survey the top part of a data sheet and the totals boxes must still be filled in and returned to the Parks and Wildlife office. 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.

Following are instructions for completing the data sheet. An example of a completed form (see Figure 23, p. 38) is provided on the following pages, along with an explanation of the data recorded.

Use a **pencil** and **CAPITAL LETTERS** when filling out the data sheet.

### 4.1 Data sheet header

**Date:**

Record the day, month, and year.

**A new form must be used for each subsection surveyed.**

**Recorder:**

Record both your **first** and **last** name (please do not use nicknames).

**Starting subsection:**

Verify that you are at the correct location before starting the survey then record the name of the subsection from the identification plate on the totem.

**Finishing subsection:**

Record the name of the subsection from the identification plate on the totem where you finish the survey or from the front of the monitoring folder.

**Start time:**

Record the time you start the survey of the subsection at the starting totem.

**Finish time:**

Record the time you finish the survey of the subsection at the finishing totem.

These times are important as they assist with the estimation and identification of data accuracy due to the time of day and possible sand

coverage of tracks. It is also helpful for estimating the time required to complete monitoring for each site. Hours worked are reported to Parks and Wildlife to be added to your record of volunteer service.

**GPS no:**

Record the GPS number, which is engraved on the unit.

**Radio no:**

Record the radio number, also engraved on the unit.

**Camera no/s:**

Record the camera number/s (found on back of each disposable camera) if used during monitoring. **If a second camera is in the kit, use up film on older camera first.** If you use your own camera write 'own camera' and provide photos to NTP Coordinator as soon as possible.

**Page number:**

Record the running page number (e.g. 1 of 2, 2 of 2) in the top right hand corner. Ensure this is complete when you finish your subsection!

## 4.2 Data and observations recording columns

### New (N) / Old (O) nest:

N = New nest (from last night) not previously recorded

O = Old nest previously recorded but has since been damaged.

### Species G/ L/ H /U:

Record the turtle species using the **species key** below.

‘Undetermined’ should only be used if the track is physically unidentifiable (i.e. too sand-blown or tide has washed the tracks away) or if it is a suspected flatback turtle. If you are unsure between two species (i.e. loggerhead and hawksbill) record the track as the one you think is most likely and take photographs and seek a second opinion – in this case it is not appropriate to record the track as ‘U’.

Species key:
G = Green turtle
L = Loggerhead turtle
H = Hawksbill turtle
U = Undetermined

### GPS position – latitude (S), longitude (E):

GPS coordinates must be recorded for all successful nests.

Record the latitude and longitude GPS coordinates. For example:

S 21. 55555 latitude

E113. 55555 longitude

(Decimal degrees to 5 decimal places, map datum is WGS 84 – see Chapter 6 for more information)

### Pos. of nest I/ H/ E/ D:

Record the position of the nest, using the **position of nest key** below.

(Also refer to diagram in Figure 17, p. 26).

Position of nest 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

**Is nest damaged? Y/ N:**

**Y** = yes

**N** = no

For example the nest has been dug up, eggs or empty eggshells around the nest or eggs exposed. Count the number of damaged eggs lying around, if possible, and enter this in the 'other observations' column along with other observations (diggings, prints etc).

**Damage cause? A/ D/ F/ G/ H/ Ti:**

If the cause of damage is obvious write it in this column. If not, leave it blank but take photos, write a descriptive detail in the 'other observations' column and speak to the NTP Coordinator.

Prints key:
A = Another turtle
D = Dog
F = Fox
G = Goanna
H = Human
Ti = Tide

**Photo frame no:**

Record the frame number if you have taken a photograph for identification. Make sure you write the camera number down on the top of the data sheet also.

**Any other observations:**

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

- turtle still nesting or on beach. If you have recorded a nest but are not confident of your decision, take a photograph for further analysis (making sure you record the photo number) and write details in this column (refer to Step 4, p. 17)
- possible causes and description of nest damage or disturbance.

**General comments:**

Write in any other important comments here that are relevant to the survey but aren't specific to any one nest, e.g. four-wheel-drive tracks seen on the beach, illegal activity observations, unusual weather conditions etc.



**False crawls tally:**

**Green / loggerhead / hawksbill / unknown** – use a running tally of the number of false crawls within each individual subsection and record total at the end.

**Total** – add up the total false crawls per species and write them in the total box on the last page only (do not record separate totals for each page).

**Prints in subsection:**

If you see fox, dog or cat prints anywhere within your subsection circle 'Y' for the appropriate species to indicate their presence.

At the end of your survey, make sure you circle 'N' against the species for which you did not observe any tracks, to indicate their absence.

**Reminder:**

**Do not forget to mark all turtle tracks and nests before moving on!**

Entry no.:            1    2    3    4    5



Prints in subsection?

Fox

Dog

Cat

Y/N

Y/N

Y/N

TABLE A: FALSE CRAWLS TALLY			
Green	Loggerhead	Hawksbill	Unknown
HHH 11	11	1	
Total		12	1
		2	0

Recorder

JOE CITIZEN

Finish subsection

BURROWS

Finish time

8:25

Radio No

9

Camera No

\* OWN USED

Date

23/1/2014

Start subsection

GRAVEYARDS

Start time

6:10

Equipment Details

GPS No

9

TABLE B: NESTS							
New (N) / Old* (O) Nest	Species Type S/H/U	GPS Position (in decimal degrees) (Datum WGS84)	Nest Position I/H/E/D	Is Nest Damaged? Y/N	Damage Cause? A/D/F/G/H/T/I	Photo Frame No.	Any Other Observations? (e.g. Diglines, Egg shells, hatchlings, Turtle)
N	G	21 86421 latitude (S) longitude (E)	H	N	-	-	
N	L	21 86006	E	Y	F	12/13	23 fresh eggshells, diggings & five prints seen
N	G	21 85946	D	N	-	-	Turtle dug up nest below
O	U	21 85946	D	Y	A	14/15	5 fresh eggs on surface - dug up (in turtle above J)
N	G	21 95719	H	N	-	-	Turtle still on the beach - return tracks not crossed off yet (see communications log)

Comments:

Car-tire tracks seen on the beach at entry to Graveyards driving north towards Burrows access.

131113

~Please complete and return even if no nests are recorded!

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

**Figure 23: Example of a completed NTP data sheet. Nest entry explanations on next page. Note: page heading, false crawl tally and page numbers complete, fox and cat prints observed and general comment written to coordinator.**

## **Interpretation of data sheet examples**

### **Entry 1: New nest**

- Green turtle track (opposite/simultaneous flipper marks)
- Nest GPS coordinates
- Nest located between the high water mark and edge of the vegetation (H)
- The nest has not been damaged

### **Entry 2: New nest**

- Loggerhead turtle track (alternate flipper marks)
- Nest GPS coordinates
- Nest located between edge of vegetation and the dunes (E)
- The nest has been damaged
- Cause of damage attributed to a fox
- Photograph taken (frame no.12-13) for identification
- Comments describing the observed nest damage

### **Entry 3: New nest**

- Green turtle track (opposite flipper marks)
- Nest GPS coordinates
- Nest located in the dune zone (D)
- The nest has not been damaged

### **Entry 4: Old nest**

- Species type unknown
- Nest GPS coordinates
- Nest located in the dune zone (D)
- Nest has been damaged by another turtle
- Photographs taken (frame no.14-15)
- Nest was dug up by the turtle in the previous line

### **Entry 5: New nest**

- Green turtle track (opposite flipper marks)
- Nest GPS Coordinates
- Nest located between the high water mark and edge of the vegetation (H)
- Nest not damaged
- Turtle still on beach – return track not crossed off so needs to be crossed the next day

#### 4.4 Report of stranded or dead marine fauna

You will need to fill out the *Marine Wildlife Stranding and Mortality Report* (Figure 25, p. 42) if deceased or stranded marine mega fauna (i.e. dugong, dolphin, whale, sea snake, or seabird) are observed during turtle monitoring. Inform a team leader/coordinator as soon as possible if the animal is alive.

If a dead or stranded turtle is encountered, the *Marine Turtle Stranding and Mortality Datasheet* (Figure 26, p. 43) should be completed and returned to the Parks and Wildlife office inside the monitoring file.

If the turtle is deceased, a photograph should be taken of the carcass and the camera number and photograph frame number written on the datasheet. An example of a completed report (Figure 26) is provided on page 43. An entry on the communication log in the monitoring kit should also be made so that the mortality isn't recorded more than once.

A pair of disposable gloves, included in the kit, must be used when handling dead animals. Once finished, put these and the tape measure in the front pocket of the backpack so they can be disposed of and cleaned appropriately.

If a stranded turtle is encountered on the beach, use the Turtle Rescue Assessment Checklist to determine whether the turtle is stranded and requires rescuing. If so, please complete the *Marine Turtle Stranding and Mortality Datasheet* (Figure 26, p. 43) and contact the team leader to advise. Do not attempt to move or interfere with the turtle by yourself – rescues generally require a minimum of four people. Complete your monitoring section and return to the site with the team leader and other helpers. You will need to bring the rescue pack, a GPS and a radio with you. All participants are required to be wearing enclosed footwear and gardening gloves (supplied in the rescue pack).

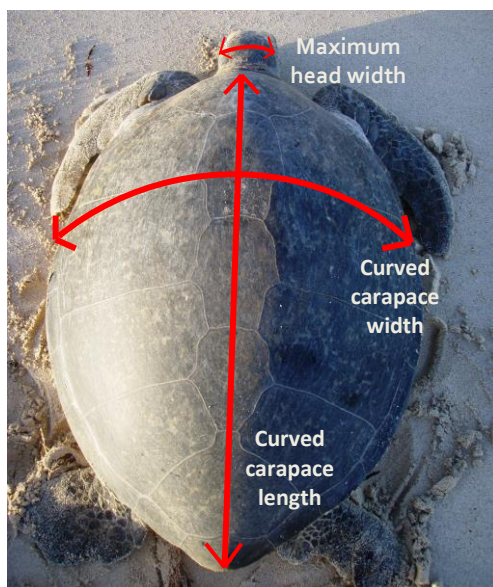
#### 4.5 Curved carapace (shell) measurements

Use the tape measure in the monitoring kit to measure the turtle in millimetres and record on the report.

Standard measurements must be made along the midline from the anterior edge to the posterior edge of the carapace (curved carapace length), holding the tape measure on the surface of the carapace (Figure 24).

The curved carapace width and maximum head width should be taken across the widest part of the head and carapace respectively, as shown in Figure 24.

The tail length should be taken from the edge of the carapace (do not start underneath the carapace) to the tip of the tail.



**Figure 24: Where to measure a turtle for the stranding/mortality report**

**MARINE WILDLIFE STRANDING AND MORTALITY REPORT**  
DOLPHINS, WHALES, DUGONG, TURTLES, SEA BIRDS, SEASNAKES

DATE 23/01/2014

TIME: 07:50

TAG NUMBER:         

**SPECIES**

**Mammal**

dugong ..... ☐  
dolphin ..... ☐  
                    species  
whale ..... ☐  
                    species  
unidentified .... ☐

**Other species**

seasnake ☒  
seabird .....  
other .....

**SEX**

female .... ☐  
male ..... ☐  
unknown ☒

**MATURITY**

immature ... ☐  
adult ..... ☒  
unknown ... ☐

LATITUDE 21° 08'00" S

LONGITUDE 114° 01'23" E

**Dugong Protection Area**

**LOCATION:** exact description required

500m str of Graveyards across on the shoreline

**ALIVE**

☐

Condition/behaviour:

**DEAD**

☒

The following coding can be used to code beach washed carcasses

- |   |  |
|---|--|
| <input type="checkbox"/> 1 Live but subsequently died                             | <input type="checkbox"/> 4 Carcass poor (advanced decomposition)           |
| <input type="checkbox"/> 2 Carcass in good condition (fresh/edible)               | <input type="checkbox"/> 5 Mummified carcass (skin holding bones)          |
| <input checked="" type="checkbox"/> 3 Carcass fair (decomposed but organs intact) | <input type="checkbox"/> 6 Disarticulated bones (no soft tissue remaining) |

**NOTES:**

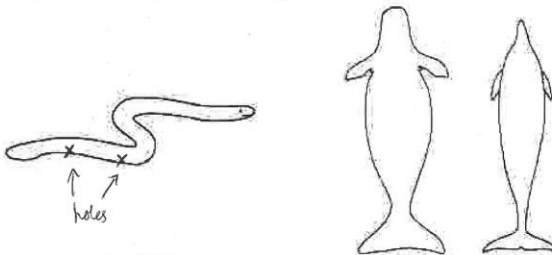
**SECURITY/DISPOSAL of animal:** Left on shoreline to wash away with tide.

**EXPERT ASSESSORS:** WPA Marine Park Coordinator informed

**MEASUREMENT:**

Seabird Body length \_\_\_\_\_ cm wingspan \_\_\_\_\_ cm  
Mammal body length \_\_\_\_\_ cm  
Seasnake body length 45 cm

**Sketch damage & distinguishing marks or include photos**



**Contact : Name** Joc Cullen

**Address** 20 Nimitz St, Exmouth WA 6707

**Phone** (08) 9400 0000

j.cullen@hotmail.com

**Return immediately to:** Department of Parks and Wildlife  
20 Nimitz St, PO Box 201, Exmouth 6707  
Phone: (08) 9947 8000 Fax: 08 9947 8050

**Figure 25: Example of a completed Marine Wildlife Stranding and Mortality Report**

# 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 Parks and Wildlife office (see overleaf for addresses).

DATE: 23/01/2014 (DD/MM/YYYY) TIME: 08:40 (24 hour)

LOCATION: BURROWS - 50m. into of ocean

Latitude: 21 . 85799 ° S

Longitude: 114 . 02065 ° E

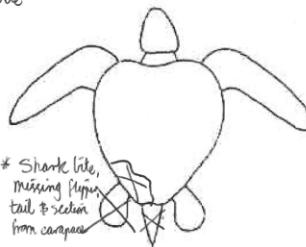
STATUS: ☐ Alive ☒ Condition/Behaviour: \_\_\_\_\_

☒ 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 checked="" 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): **DISTINGUISHING FEATURES: (please also indicate on diagram)**

- |   |   |
|---|---|
| <input checked="" type="checkbox"/> Green | <input checked="" type="checkbox"/> Obvious damage/injuries - <i>Shark bite</i> |
| <input type="checkbox"/> Loggerhead       | <input checked="" type="checkbox"/> Missing limbs                               |
| <input type="checkbox"/> Flatback         | <input type="checkbox"/> Barnacles  |
| <input type="checkbox"/> Hawksbill        | <input type="checkbox"/> Algal growth on carapace                               |
| <input type="checkbox"/> Olive Ridley     | <input type="checkbox"/> Tagging scars  |
| <input type="checkbox"/> Leatherback      |   |
| <input type="checkbox"/> Unknown          |   |



TAG NUMBERS: Left flipper WA 69241

Right flipper -

## MEASUREMENTS:

Curved Carapace Length:	<u>906</u> mm	<input type="checkbox"/> Measured	<input type="checkbox"/> Estimated
Curved Carapace Width:	<u>898</u> mm	<input type="checkbox"/> Measured	<input type="checkbox"/> Estimated
Tail Length (from Carapace):	<u>?</u> mm	<input type="checkbox"/> Measured	<input type="checkbox"/> Estimated <i>Tail missing</i>
Maximum Head Width:	<u>130</u> mm	<input type="checkbox"/> Measured	<input type="checkbox"/> Estimated

SEX: ☐ Male ☐ Female ☒ Unknown

MATURITY: ☐ Juvenile ☒ Adult ☐ Unknown

PHOTOGRAPHS\* (see overleaf): On own camera #20-25 - Supplied to NTP Volunteer Coordinator

SECURITY/DISPOSAL/RELEASE of turtle: Located in dunes in unpopulated area so left there to

NOTES: decompose.

## CONTACT DETAILS:

Name: Joe Cullen

Phone number: (08) 9400 0000

Address: 20 Nimbley St, Exmouth, WA, 6707

Email: J.Cullen@hotmail.com

**Figure 26: Example of a completed Marine Turtle Stranding and Mortality Datasheet**

## 4.6 Report of a tagged turtle

The Department of Parks and Wildlife and external researchers sometimes run tagging programs whereby they tag adult turtles using titanium metal tags (Figure 27) attached to the trailing edge of one or both of the turtle's fore-flippers. Sea turtles are tagged to identify individuals for research purposes. Tagging is most often conducted to obtain information on reproductive biology, movements, strandings, residency and growth rates.

If a tagged turtle is encountered during turtle monitoring activities, a *Tagged Turtle Resighting Sheet* should be completed (Figure 28, p. 45). Please record the letters and number on the tag, date, time, place and circumstances. If the turtle is alive please leave the tag on. Tags can be removed from dead turtles and forwarded with your information. If you find turtles carrying different tags, it would be appreciated by the relevant tagging agency if a similar reporting procedure is followed. Parks and Wildlife would also appreciate advice of your find.



Figure 27: Examples of marine turtle flipper tags



West Australian Turtle Research - Nesting Turtles

# **TAGGED TURTLE RESIGHTINGS**



Department of  
Parks and Wildlife



Locality: \_\_\_\_\_ Date: \_\_\_\_\_ Observer: \_\_\_\_\_

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

Tag position: Please record tag number for both left and right flippers and include all letters and numbers on the tag. 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
- F: Excavating egg chamber
- G: Laying eggs
- H: Covering eggs (filling in)
- I: Returning to water

## **Nest Location Key:**

- A: Above high tide mark
- B: At high tide mark
- C: Below high tide mark
- D: Edge of vegetation

**Figure 28: Tagged Turtle Resighting Sheet**

## **Chapter 5: Turtle and hatchling identification**

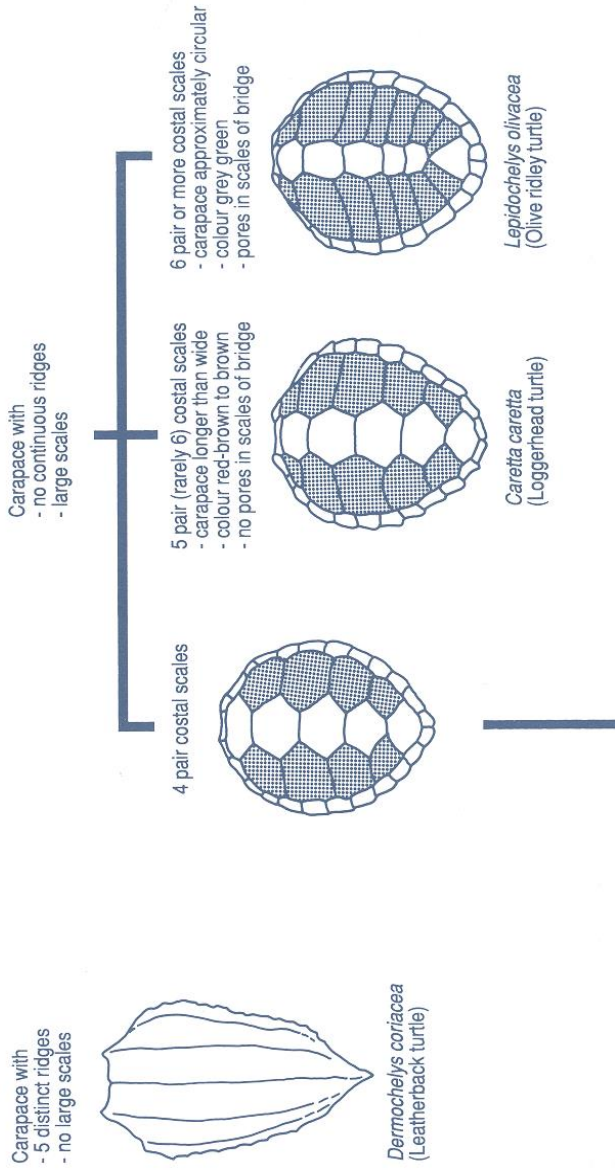
---

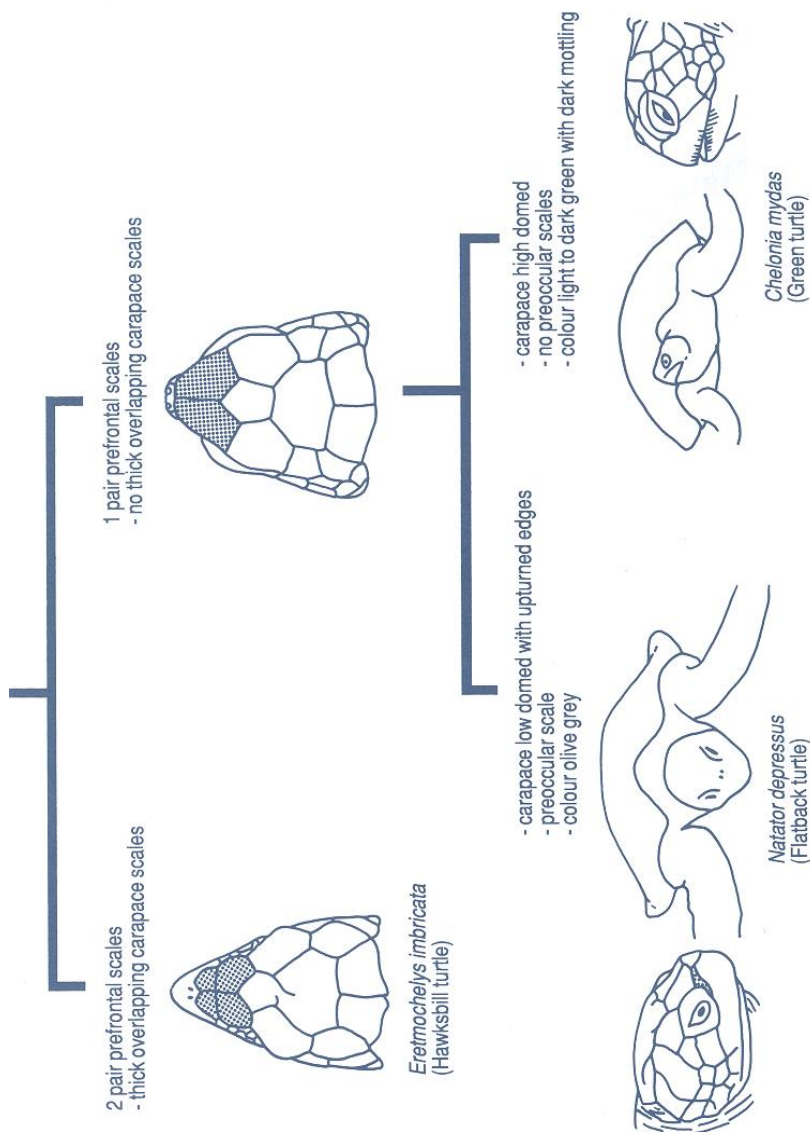
During turtle monitoring, you may encounter turtles returning to the sea or hatchlings on the beach. Use the identification key (Figure 29, p. 47–48), the turtle species photographs (Figure 30, p. 49), hatchling photographs (Figure 31, p. 50) and hatchling illustrations (Appendix 3, p. 60–61) to assist with species identification.

# 5.1 Identification key

## Indo-Pacific marine turtles

### IDENTIFICATION KEY





Produced by Queensland Department of Environment and Heritage, PO Box 155, BRISBANE ALBERT STREET, QLD 4002 • BP587-4 June 1995

**Figure 29: Identification key to marine turtles of the Indo-Pacific region.**  
(Source: Environmental Protection Agency. Copyright © Col Limpus, Queensland Parks and Wildlife Service).

## 5.2 Turtle identification photographs



Green turtle (*Chelonia mydas*)



Loggerhead turtle (*Caretta caretta*)



Hawksbill turtle (*Eretmochelys imbricata*)



Flatback turtle (*Natator depressus*)



Olive Ridley turtle (*Lepidochelys olivacea*)



Leatherback turtle (*Dermochelys coriacea*)

**Figure 30: Photograph identification of the six turtle species found in Australian waters and the Indo-Pacific region.** Source: Adapted from Environmental Protection Agency. Copyright © Col Limpus, Queensland Parks and Wildlife Service. *Indo-Pacific marine turtles*. BPS87-4June1995.

### 5.3 Hatchling identification photographs



#### Green turtle hatchling

- 4 pairs of costal scales
- 1 pair of prefrontal scales
- prominent white margins along the flippers and carapace



#### Loggerhead turtle hatchling

- 5 pairs of costal scales
- 2 pairs of prefrontal scales
- 3 distinct ridges on carapace
- dark all over
- 4–5cm long



#### Hawksbill turtle hatchling

- 4 pairs of costal scales
- 2 pairs of prefrontal scales
- overlapping carapace scales
- dark all over



#### Flatback turtle hatchlings

- 4 pairs of costal scales
- 1 pair of prefrontal scales
- prominent white margins along the flippers and carapace
- dark margins around the carapace scales creating a honeycomb appearance

**Figure 31: Photograph identification of hatchlings that may be found emerging in the Ningaloo Region**

## Chapter 6: How to use a GPS

---

A GPS (Global Positioning System) is an electronic navigational device which uses satellite signals to gain a fix on a location on the ground, or to navigate a course. This is based on a geographical latitude and longitude coordinate system. Hand-held GPS units are generally battery operated and have a liquid crystal display screen.

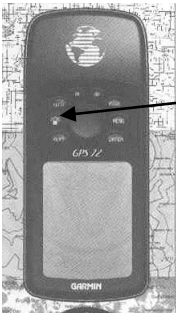
There are a variety of GPS brands and models on the market, all of which have similar basic functions and some that are more advanced. Basic operating procedures are essentially the same but there may be minor variations.


Below are instructions for operating the Garmin brand GPS units, which are used in the monitoring program.



6.1 Garmin GPS 72

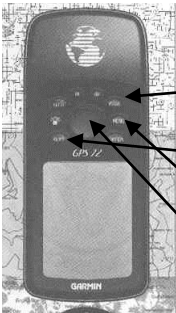
Turn GPS on



Press  until receiver turns on.

WELCOME PAGE briefly displayed.  
Press PAGE button to go to first page.

Pages



Move between pages:

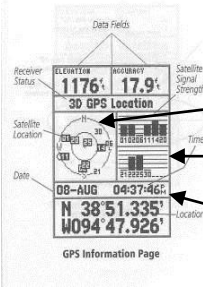
PAGE To go forward.

QUIT To go backward.

MENU Other menu Options

Large round cursor button to scroll through menus

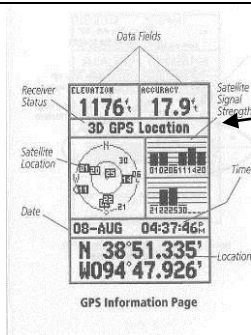
Satellites



Satellite page

- Shows satellite position overhead (skyview display).
- Number of satellites and signal strength.
- Shows date and time



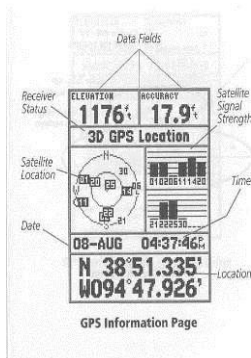


### Satellite page

When satellite page displays '3D' then a reading of the coordinates can be taken.

NB: 3D acquired when at least 4 satellites are locked onto position which is then calculated in latitude, longitude and altitude.

## Position coordinates



### Satellite page

Shows your longitude, latitude, date and time.

### Signal strength

This needs to read 8m or less before you record a coordinate for accuracy of location.

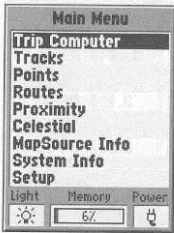
### Latitude and longitude

Coordinates displayed on lower half of screen.

e.g. S 21.55555°  
E114.33333°

The Garmin GPS coordinates will be displayed in decimal degrees (if not you will need to change it to this format – press the middle cursor up or down to toggle between formats, or see further instructions in next section: 'Navigation').

## Navigation



Main Menu

### Navigation setup

If the GPS coordinates are not displayed with five decimal degrees, you need to change format. Press the MENU button twice until you obtain the MAIN MENU screen.

Scroll down to SETUP. Press ENTER. In setup menu scroll across the tabs to LOCATION. Scroll down once to LOCATION FORMAT and press ENTER. Scroll through formats until the screen shows:

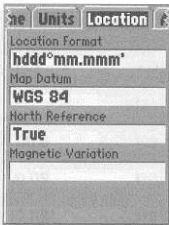
**Hddd.ddddd**

Press ENTER to save.

The MAP DATUM should be:

**WGS 84**

Scroll through to change. Press ENTER to save and PAGE to exit



Setup Menu — 'Location' Tab

## 'Go to' function

### To go to a pre-entered waypoint



Press the GO TO button, press ENTER on waypoint, scroll through to the desired waypoint, and press ENTER twice.

PAGE through to the compass page and follow the direction of the arrow with the top of the GPS pointing away from you (note this only works correctly once you are moving around).

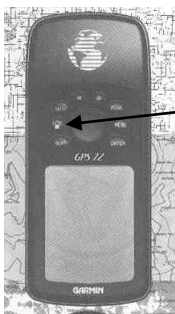
The distance to your waypoint will be displayed in the top right hand corner.

## Battery level



To check battery level press MENU twice to get to MAIN MENU and check symbol in lower right hand corner.

## Turn GPS off



Press and hold  for 3 seconds or until screen turns off.

## Install batteries

### 2 x AA batteries



Remove battery cover at back of unit by turning the thumb loop ¼ turn anti-clockwise then pulling outwards. Insert batteries. Match the symbol (+ or -) marked on the case.

Replace and secure the battery cover by turning the thumb loop ¼ turn clockwise. Make sure you use the same type of batteries – i.e. only two rechargeable batteries or two non-rechargeable batteries together. Place dead batteries in the front pocket of the backpack.

## **Chapter 7: Code of Conduct**

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### **7.1 Turtle Watchers' Code of Conduct**

This *Code of Conduct* is designed to ensure that anyone interacting with female turtles in Ningaloo Marine Park has an enjoyable and educational experience with minimal disturbance to nesting turtles. The code has been adapted from the one used at Mon Repos in Queensland and from previous studies at the Jurabi Coastal Park near Exmouth.

Once you arrive at the car park keep lights to a minimum. Let your eyes adjust to the available moonlight before walking down the access path, then stand quietly on the beach, with little or no movement as turtles have very good eyesight and are more sensitive to movement than noise.

The current best practice for turtle observation is as follows:

1. Walk along the beach just below the high tide mark, near the water (the tide will wash foot prints away) looking for tracks in the wet sand or turtles.
2. Avoid using any lights, torches or flash photography as this will disturb the turtles. Do not approach or shine lights on turtles leaving the water or moving up the beach. If a turtle is encountered, calmly stop where you are, sit down, and stay very still whilst you wait for her to start digging – 'Stop, drop, rock'.
3. Avoid excess noise and sudden movement at all times.
4. When approaching a nesting turtle crawl up behind her on your stomach ('commando crawl') (see Appendix 5 to see at which stages of nesting you can approach the turtle).
5. Always position yourself behind the turtle and stay low (sit, crouch or lie on the sand). If you are getting covered in sand as she digs you are too close!
6. Be patient. She may abandon the nest and dig another one for a variety of reasons including hitting an obstacle or the sand being too dry.
7. Wait until she is laying the eggs before moving closer. She will be quite still when laying her eggs - if sand is spraying or she is using her flippers, she is not laying.

8. Give her enough space to camouflage the nest
9. Let her return to the ocean without interruption or getting between her and the ocean.
10. Depart all beaches by 11pm.

See Appendix 5 for more detailed information on each stage of turtle nesting and how to interact accordingly.

## **7.2 Emerging hatchlings**

All the processes that a hatchling endures from the time it hatches from the egg to emerging from the nest and making its way to the sea are important to its development. It is extremely important that hatchlings are not handled or interfered with in any way during this time. Doing so will interrupt the completion of various developmental stages of the hatchling, thereby threatening its very existence.

During hatchling emergence you should:

- a) Stand back from the nest – do not compact the sand.
- b) Don't use lights or flash photography as this will disorientate the hatchlings.
- c) Do not touch the hatchlings.
- d) Do not get between the hatchlings and the ocean.
- e) Let the hatchlings make their own way down the beach- they need to do this to exercise their lungs.
- f) Hatchlings can get stuck in footprints so stand to the side rather than crossing their path.

## **7.3 Interfering with turtles**

All marine turtles are protected in Western Australia under the *Wildlife Conservation Act 1950*. Any activity that may interfere, disturb or harm them may be illegal if conducted without an appropriate permit.

If you observe any activities which you consider is of concern, please report the incident to the local Parks and Wildlife office on (08) 9947 8000 as soon as possible.

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## Appendix 1: Glossary

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<b>Carapace</b>	The shell of a turtle.
<b>Costal scales</b>	Large scales down either side of the centre row of scales on the shell of a turtle. Refer to identification key Figure 29, p 48.
<b>Egg chamber</b>	The deep, hand span-size hole a turtle digs into the primary pit with her back flippers.
<b>Emerging track</b>	Track of a turtle coming up the beach from the sea.
<b>False crawl</b>	An unsuccessful nesting attempt. Primary body pit/s may be present but no eggs have been deposited.
<b>Foredune</b>	First dune in a system, on the seaward side.
<b>GPS</b>	Global Positioning System. An electronic navigational device, operating on satellite signals.
<b>Nest microclimate</b>	The local climate within the nest/chamber, including temperature and moisture, which effects the incubation of the eggs.
<b>Nest mound</b>	The pile of thrown sand a turtle leaves over her nest.
<b>Nesting crawl</b>	A turtle track which leads to a successful nest.
<b>Plastron</b>	The underside of a turtle. The plastron may leave a belly drag mark in the sand centred between flipper markings of tracks.
<b>Primary body pit</b>	The pit dug by a turtle at the start of a nesting attempt with the intention of laying eggs into it. This is covered over in a successful nest, or left as an exposed pit after a false crawl.
<b>Returning track</b>	Track of a turtle returning to the sea.
<b>Secondary body pit</b>	The final (shallower) pit left by a turtle once she finishes covering her nest.
<b>Successful nest</b>	A turtle nest in which eggs have been deposited.
<b>Unsuccessful nest</b>	See <i>false crawl</i> .
<b>Waypoint</b>	A navigational coordinate that has been marked or recoded in the memory of a GPS.
<b>Preocular scales</b>	Scales on a turtle's head situated anterior from the eyes.
<b>Pre frontal scales</b>	Scales on a turtle's head situated anterior to the frontal bone.

## Appendix 2: Checklist of monitoring procedures

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Have you:

- ☐ got your handheld radio ON and on Channel 1?
- ☐ done a radio check?
- ☐ verified that you are at the correct starting totem and heading the right way?
- ☐ entered all details on the top of the data sheet?
- ☐ located the latest high tide mark?

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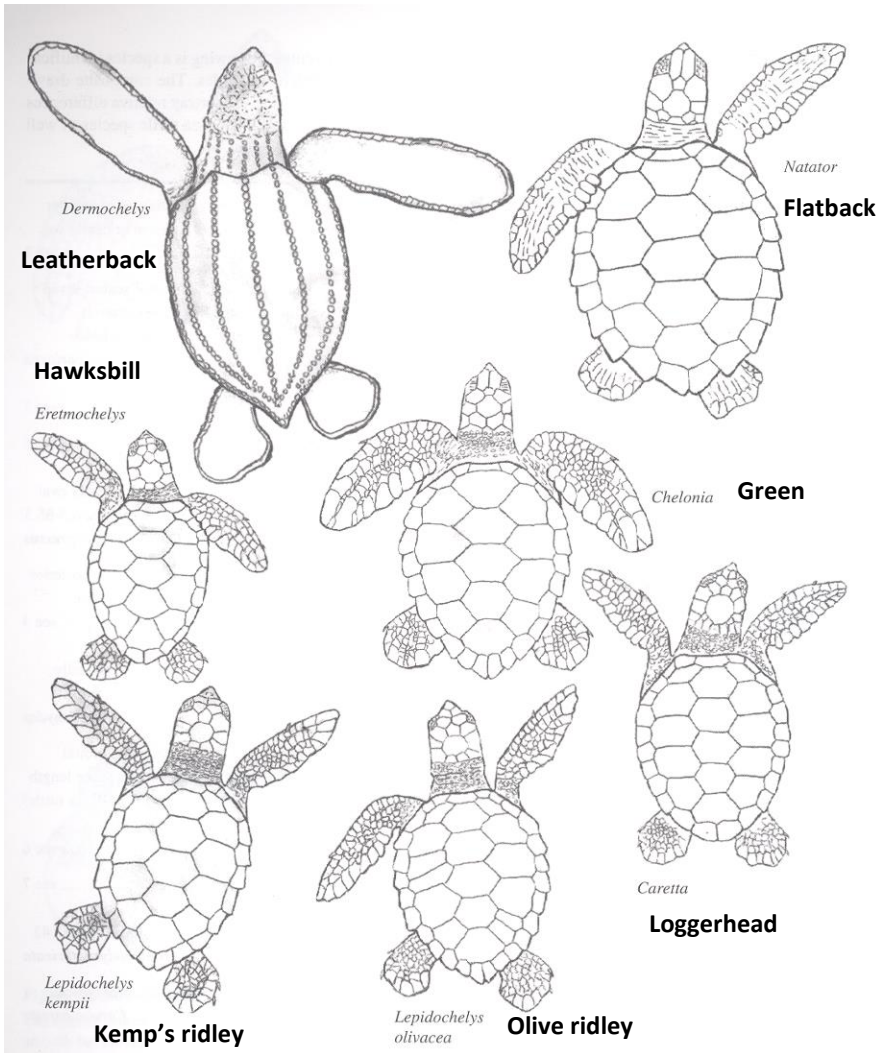
- ☐ identified a fresh/new track?
- ☐ identified the turtle species or taken a photograph if unable to?
- ☐ identified the emerging and returning track?
- ☐ determined if nest is successful?
- ☐ recorded GPS coordinates for the nest?
- ☐ recorded all necessary details in all columns of data sheet?
- ☐ **marked the tracks?**
- ☐ **marked the nest, if applicable?**

.....

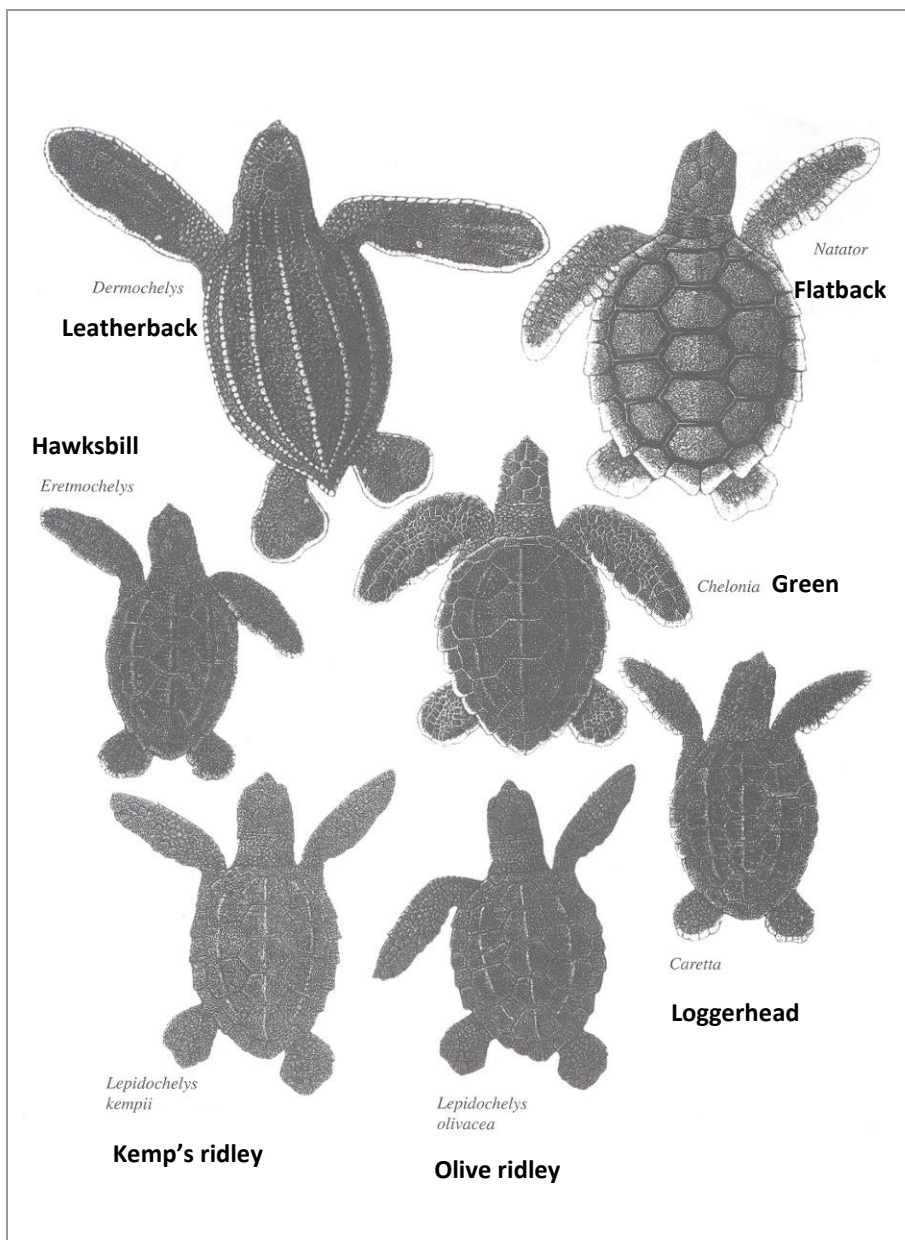
- ☐ identified the end totem and entered the identification details on the data sheet?
- ☐ entered the finish time of the survey on the data sheet?
- ☐ entered all page numbers on data sheets?
- ☐ circled Y/N for fox, dog and cat prints?
- ☐ totalled all false crawls on the final data sheet?
- ☐ turned off the GPS?
- ☐ checked that all the contents of the kit are present?  
(note on communication log if not)
- ☐ picked up fellow volunteers travelling with you?
- ☐ turned OFF hand held radio?
- ☐ returned the monitoring kit and vehicle keys to the Parks and Wildlife office?

Appendix 3: Hatchling identification illustrations

Hatchling identification illustrations

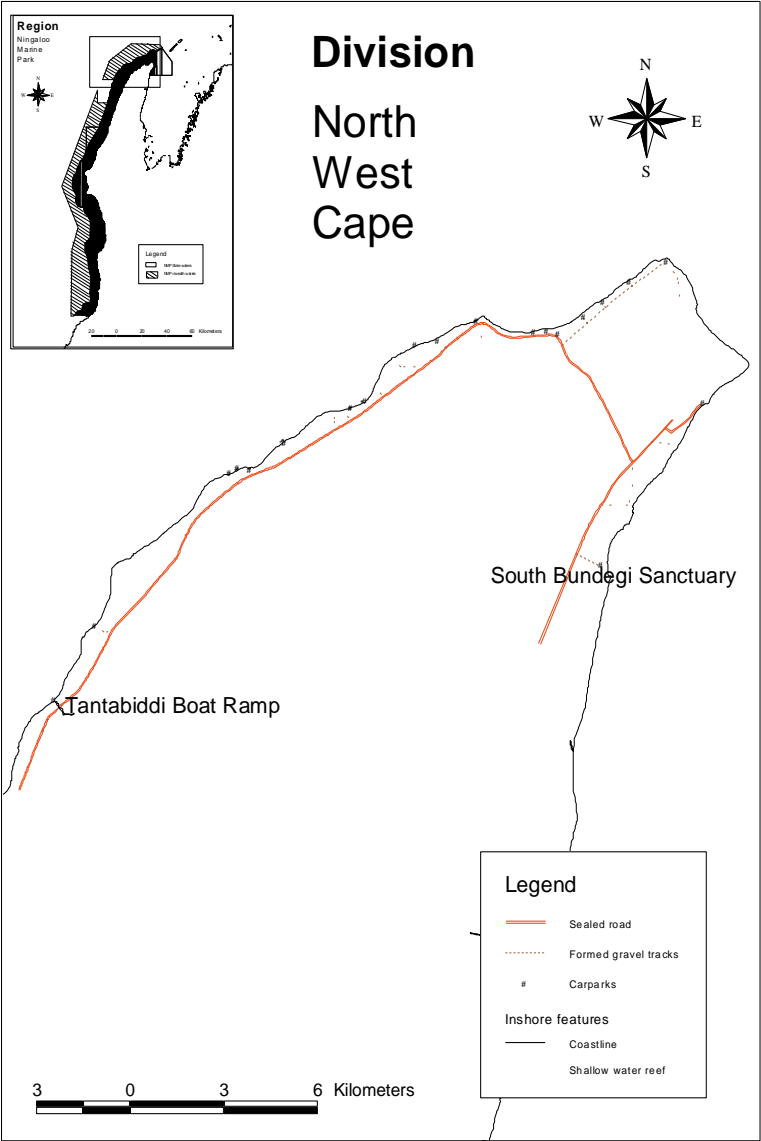




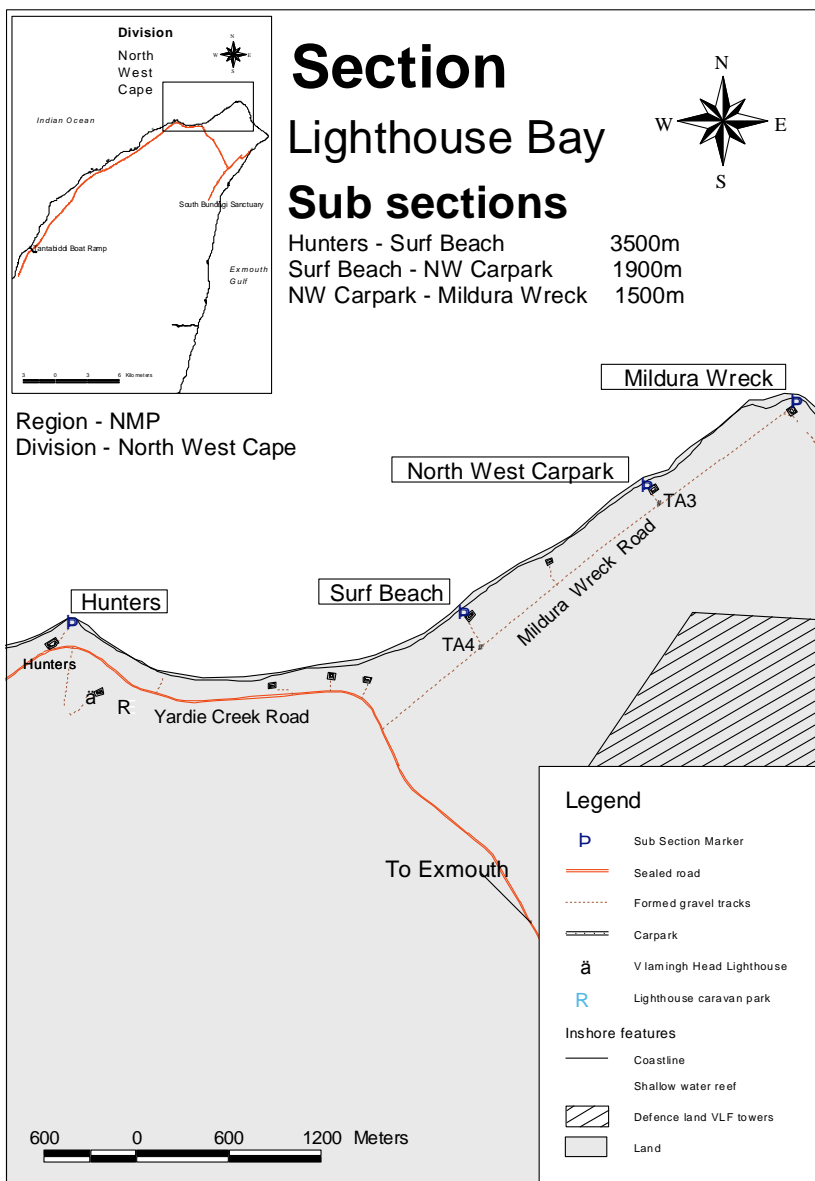


**Figure 32: Turtle hatchling identification illustrations**

Appendix 4: North West Cape turtle totem directions



Map 1: North West Cape Division



**Map 2: Lighthouse Bay Section**

## **Lighthouse Bay Section: Turtle Marker Access Directions (MAP 2) – from Mildura Wreck to Hunters**

**Note:** To reach Mildura Wreck Road from Exmouth, travel north-east along Murat Road, turn left at Yardie Creek Road. Mildura Wreck Road is the first sealed road on the right.

To access Mildura Wreck turtle marker:

Travel the sealed Mildura Wreck Road to the end carpark (lat 21.78634 S, long 114.16460 E). The Mildura Wreck turtle marker is found at the end of the walking track which is in line with the road from the car park (lat 21.78568 S, long 114.16518 E).

To access North West car park turtle marker:

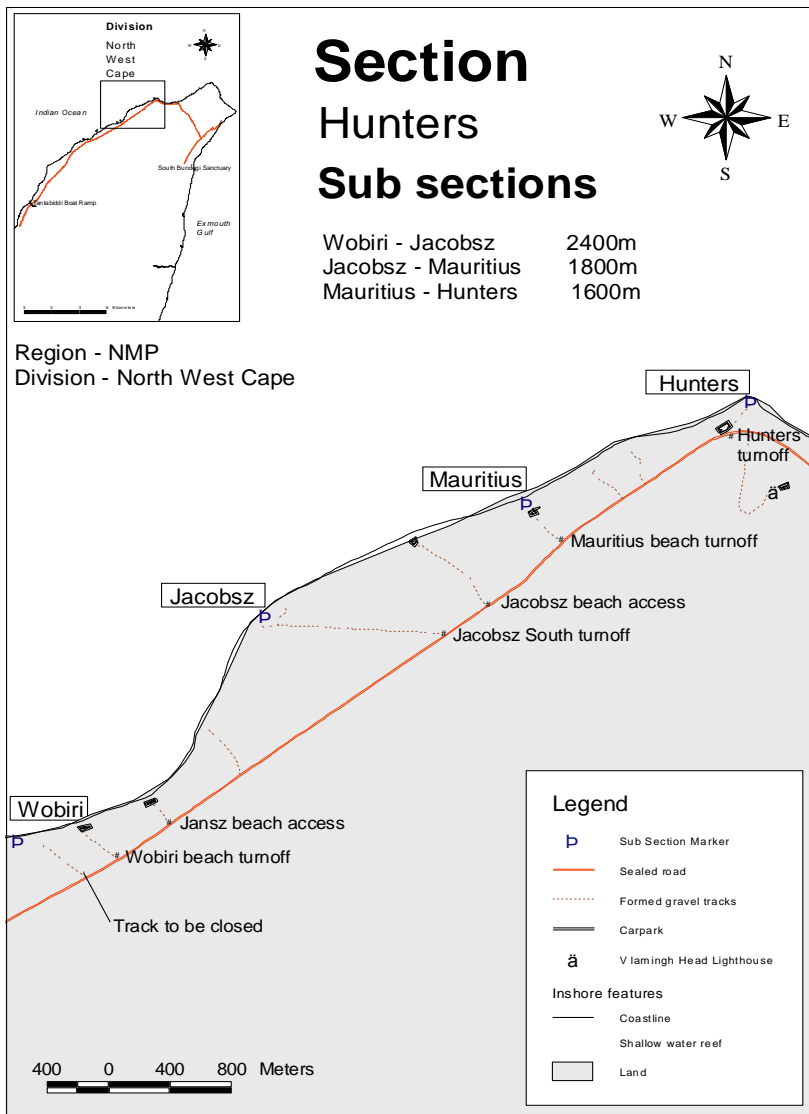
From the Mildura Wreck Road turn-off, turn left at the third unsealed grated gravel road TA3 (lat 21.79341 S, long 114.15459 E) to the car park (lat 21.79216 S, long 114.15401 E). The turtle marker is found on the left at the end of the beach access track (lat 21.79174 S, long 114.15402 E).

To access the Surf Beach turtle marker:

From the Mildura Wreck road turn-off, turn left into the first unsealed grated gravel road TA4 (lat 21.80396 S, long 114.14092 E) to the car park (lat 21.80191 S, long 114.13982 E). The turtle marker is situated at the end of the walking track heading west from the car park opposite the shack (lat 21.80159 S, long 114.13930 E).

To access Hunters turtle marker:

Follow Yardie Creek Road past the Lighthouse Caravan Park. Turn into the sign-posted Hunters carpark which is situated just past Vlamingh Head Lighthouse turnoff (lat 21.80465 S, long 114.10705 E). The turtle marker (lat 21.80287 S, long 114.10873 E) is located at the western edge of the northern-most car park at the tip of the headland.



**Map 3: Hunters Section**

### **Hunters Section: Turtle Marker Access Directions (MAP 3) - from Hunters to Wobiri**

**Note:** Directions for Hunters Section, Graveyards Section and Tantabiddi Section are based from Vlamingh Head Lighthouse, 25km from Exmouth as the point of origin. Refer to MAPS 2 and 3 to find Vlamingh Head Lighthouse.

To access **Hunters** turtle marker:

Refer to previous page for directions to find **Hunters** Access turtle marker.

To access **Mauritius** turtle marker:

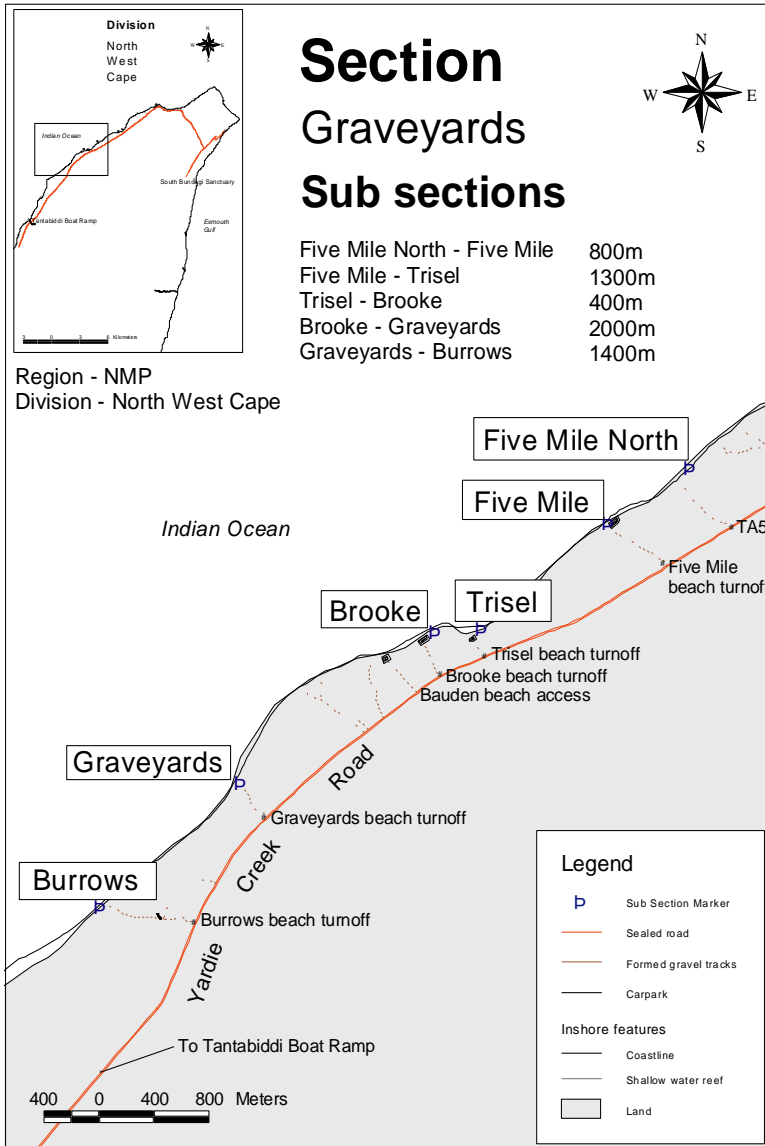
Travel south for 1.4 km along Yardie Creek Road, turn right at the Mauritius beach turnoff (lat 21.86926 S, long 114.09529 E), travel this unsealed grated gravel road to the carpark (lat 21.80998 S, long 114.09548 E). The Mauritius turtle marker (lat 21.80938 S, long 114.09532 E) is located at the end of the beach access walking track.

To access **Jacobsz** turtle marker: 4WD VEHICLE ONLY

Travel south for 2.4 km along Yardie Creek Road, turn right at the first unsealed road: Jacobsz South turnoff (lat 21.81753 S, long 114.09008 E) past the Jacobsz access road. Travel this track for approximately 500m, until you reach a sandy parking area (lat 21.81698 S, long 114.07988 E). The Jacobsz turtle marker is located at the end of the beach access track (lat 21.81644 S, long 114.07932 E). SOME SECTION OF THE ACCESS TRACK MAY BE CLOSED.

To access **Wobiri** turtle marker:

Travel south for 5.0 km along Yardie Creek Road, turn right at the signposted Wobiri beach turnoff (lat 21.83136 S, long 114.07049 E). Travel the length of the unsealed grated gravel road to the carpark (lat 21.82962 S, long 114.06835 E). Walk approximately 300m south along the beach to the rocks where the Wobiri turtle marker (lat 21.83038 S, long 114.06505 E) is located.



**Map 4: Graveyards Section**

**Graveyards Section: Turtle Marker Access Directions (MAP 4) – from Five Mile North to Burrows**

To access **Five Mile North** turtle marker: 4WD ACCESS ONLY

Travel south for 6.7 km along Yardie Creek Road, turn right at the fourth unsealed track TA19 (lat 21.83943 S, long 114.05635 E) past Wobiri access road. Travel this road for approximately 200m, 4WD VEHICLE ONLY. Access the beach and turtle marker (lat 21.83485 S, long 114.05431 E) at the northern end by foot. Note – you will walk from Five Mile marker to Five Mile north marker and back again as the distance is not far.

To access **Five Mile** turtle marker:

Travel south for 7.2 km along Yardie Creek Road, turn right at Five Mile beach turnoff (lat 21.84187 S, long 114.05198 E), and travel the road to the carpark. Access the turtle marker (lat 21.83928 S, long 114.04766 E) at the left corner of the carpark.

To access **Trisel** turtle marker:

Travel south for 8.7 km along Yardie Creek Road, turn right at Trisel beach turnoff (lat 21.84833 S, long 114.03857 E) and travel the road to the carpark. Access the beach via the walk path. The turtle marker (lat 21.84658 S, long 114.03836 E) is located to the right at the interface of the rock platform and the beach.

To access **Brooke** turtle marker:

Travel south for 9.0 km along Yardie Creek Road, turn right at the Brooke beach turnoff (lat 21.84960 S, long 114.03542 E), and travel to the carpark. The turtle marker (lat 21.84733 S, long 114.03389 E) is located at the north-eastern corner of the carpark.

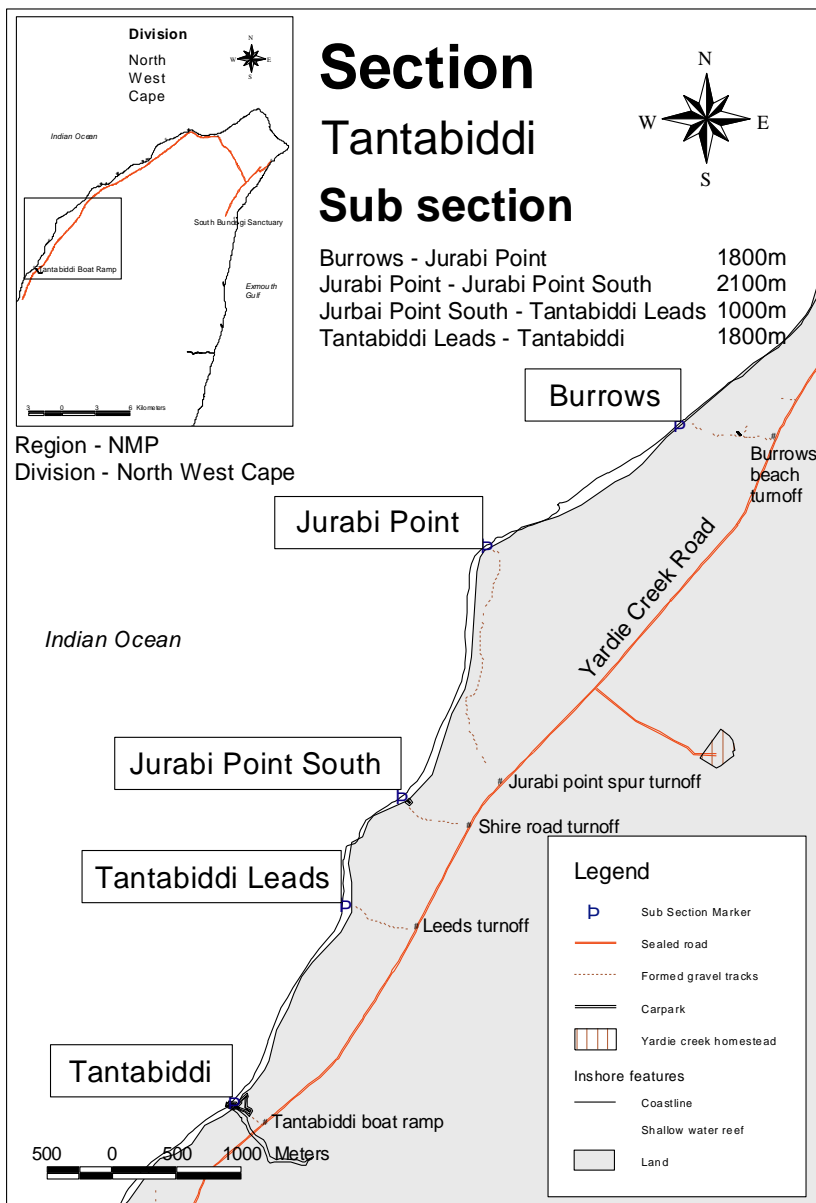
To access **Graveyards** turtle marker:

Travel south for 10.9 km along Yardie Creek Road, travelling south past the Bauden beach access, turn right at the third unsealed track (lat 21.85924 S, long 114.02283 E). Travel the road to the parking area (lat 21.85770 S, long 114.02147 E). Walk to the beach, the marker is located on the right (lat 21.85660 S, long 114.02085 E).



To access Burrows turtle marker: 4WD ACCESS ONLY

Travel south for 11.9 km along Yardie Creek Road, travelling past the Bauden beach access, turn right at the fifth unsealed track for Burrows beach (lat 21.86646 S, long 114.01767 E). Travel this road westerly for approximately 500m until you reach the beach. The turtle marker is located at: lat 21.86595 S, long 114.01052 E. Note: you may need to park before it gets too sandy and walk the rest of the track, as the end of it is extremely sandy.



**Map 5: Tantabiddi Section**

**Tantabiddi Section: Turtle Marker Access Directions (MAP 5) – from Burrows to Tantabiddi**

To access **Burrows** turtle marker: SEE ABOVE

To access **Jurabi Point** turtle marker: 4WD ACCESS ONLY

Travel south along Yardie Creek Road for 15.5 km travelling past the signposted Yardie Homestead Caravan Park, Turn right at the first unsealed track; Jurabi Point spur turnoff (lat 21.89035 S, long 113.99752 E). Travel in a north-westerly direction for 2 km. The turtle marker is located at the beach at the end of this track (lat 21.87348 S, long 113.99803 E). Note: this marker is usually reached by walking from Burrows access and returning.

To access **Jurabi Point South** turtle marker:

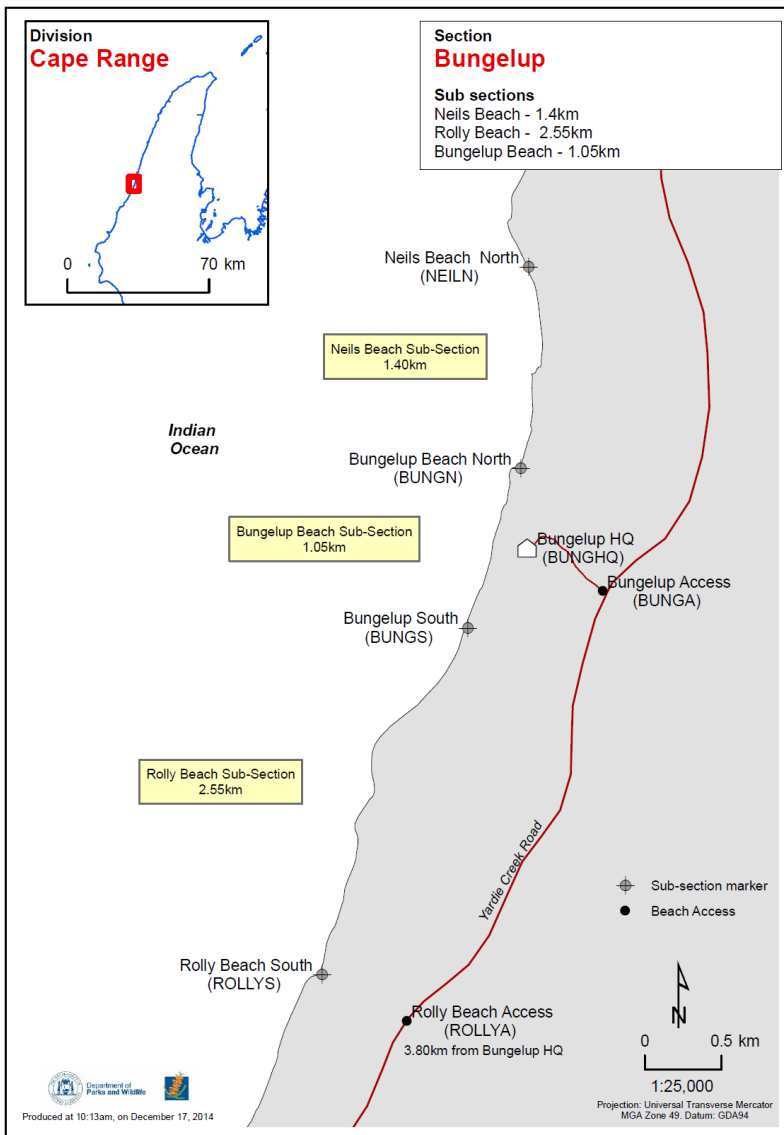
Travel south along Yardie Creek Road for 15.9 km travelling past the Yardie Homestead Caravan Park, turn right at the second unsealed road; Shire road turnoff (lat 21.89318 S, long 113.99560 E). Travel to the carpark, the turtle marker (lat 21.89144 S, long 113.99055 E) is situated on the right at the end of the beach access track leading from the carpark.

To access **Tantabiddi Leads** turtle marker:

Travel south along Yardie Creek Road for 16.6 km travelling past Yardie Homestead Caravan Park. Turn right at the third unsealed road; Leeds turnoff (lat 21.90032 S, long 113.99172 E). This is 4WD ONLY. At the first cross road turn left travelling south of the navigational signs to the end of the track. The turtle marker is located after a short walk west to the beach (lat 21.90272 S, long 113.98422 E).

To access **Tantabiddi** turtle marker:

The Tantabiddi turtle marker is located to the north side of the boat ramp retainer rock wall.



**Map 6: Bungelup Section**

## Appendix 5: Turtle Watcher's Code of Conduct

Stage of nesting	Identification of	Time	Vulnerability	Torch use	Distance from turtle
1. Emerging from the water and crossing the beach	Crawls from the ocean towards the	5-20 mins	HIGH	No	Stay still - at least 15m away
2. Digging the body pit	Large quantities of sand flying through the air. Uses front flippers only.	20-40 mins	HIGH	No	Stay still - at least 15m away
3. Excavating the egg chamber	Uses rear flippers only, creating a rocking motion as she digs.	10-20 mins	MEDIUM	No	3 people at a time maximum. At least 1m away and behind the turtle
4. Laying eggs	Is very still with gentle heaving	3-10 mins	LOW	Red light OK from behind	Stay at least 1m away and behind turtle
5. Covering and camouflaging the nest	Gradually moves forward with large quantities of sand flicked into the air	20-40 mins	LOW	No	Stay still - at least 2m behind turtle
6. Returning to the ocean	Crawls from the dunes/land toward	5-15 mins	LOW	No	Remain 2m behind turtle

