



**THE DISTRIBUTION
AND STATUS OF
MARINE TURTLE
NESTING IN THE
NORTHERN
TERRITORY**

**Ray Chatto
Bryan Baker**



Parks and Wildlife Service
Department of Natural Resources,
Environment, The Arts and Sport



Northern
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Cover photograph: Nesting Green Turtle. Photo Gary Bell.

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Technical Report 76/2006

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EXECUTIVE SUMMARY

The Northern Territory (hereafter referred to as NT) coast and coastal wetlands are vast and remote, creating particular challenges for documenting wildlife distribution and abundance. Prior to 1990 there had been little systematic or comprehensive attempts to inventory the biodiversity of these systems. From 1990 to 2004 (and incidentally thereafter) numerous aerial and ground surveys were conducted by RC along the NT coastline and throughout the near-coastal wetlands to locate and document the distribution and status of selected wildlife. These surveys focused on aquatic birds (e.g. seabirds, shorebirds and waterbirds), marine reptiles and marine mammals. During this time around 70 000 separate records totalling around 5.6 million individuals were made in the survey area.

A series of four reports detailing the distribution and status of the aquatic birds has been completed. This fifth report in the series details records collected on marine turtle nesting.

Between 1990 and 2004 in excess of 7 000 records were collected relating to marine turtle nesting around the NT coast. Marine turtles were recorded nesting around much of the mainland coast and on the many islands with sandy beaches. Most of the high density areas were located on offshore islands, with only a few high density sites found on the mainland, where egg predation was generally much higher.

Four species of marine turtle were regularly recorded nesting in the NT. These were the Flatback Turtle (*Natator depressus*), Green Turtle (*Chelonia mydas*), Hawksbill Turtle (*Eretmochelys imbricata*) and Olive Ridley Turtle (*Lepidochelys olivacea*). Nesting densities varied among species at different sites. Of the four marine turtle species to regularly nest in the NT, Flatback Turtles were clearly recorded as the most widespread nesting species. This species nested on nearly all beaches where any marine turtle nesting occurred, either on their own or with other species. Flatback Turtles and Green Turtles were the two most abundant nesting species. The range of Green Turtle nesting was much more geographically restricted (mostly occurring along the eastern NT coast) but where they did nest, they often did so in very high numbers. The combined major sites of Green Turtle nesting in north eastern Arnhem Land are likely to be of international significance.

Olive Ridley Turtles were the second most widespread nesting species after Flatbacks, but over most of their range (which included little of the western coast of the NT) they nested in low numbers. However, on some beaches (e.g. along the northern coast of the Tiwi Islands and some islands in north eastern Arnhem Land) they nested in nationally significant numbers.

Hawksbill Turtles were the least widespread of the four most frequent nesting species. Their nesting was concentrated on islands in north eastern Arnhem Land and around Groote Eylandt. The combined nesting of the major Hawksbill Turtle nesting sites in this area is likely also to be of international significance.

Leatherback Turtle (*Dermochelys coriacea*) nesting was confirmed from only one site (on Cobourg Peninsula) although there are a few anecdotal reports of occasional nesting from a small number of other areas. Although Loggerhead Turtles (*Caretta caretta*) are recorded in NT waters, they were not confirmed nesting anywhere in the NT.

Several parts of the NT coast can now be considered as internationally or nationally important nesting areas for marine turtles. The most important areas located during these surveys are: Turtle Point in Joseph Bonaparte Gulf, Bare Sand and Quail Islands near Darwin, the south west of Bathurst Island, a number of beaches along the northern coastline of Melville Island, the Smith Point area of Cobourg Peninsula, the islands to the north and east of Croker Island, the Goulburn Islands, NW Crocodile Island, many of the outer islands of the numerous island chains off north eastern Arnhem Land, the

mainland coast and islands between Cape Arnhem and Blue Mud Bay, the eastern part of Groote Eylandt and its associated islands and some of the outer islands in the Sir Edward Pellew Group. Most of these sites are on Aboriginal Land.

Although some limitations remain due to the largely unsystematic way the data were collected, the outcome of over 15 years of surveys is that the most important areas, and the timing of nesting, have been identified for the four major nesting species of marine turtle in the NT. The collection and collation of this significant number of marine turtle nesting records has provided the baseline information for future research and management of marine turtles across the NT.

As with the many other important fauna sites around the NT coast (documented in previous reports in this series), the significant marine turtle nesting sites are still in a fairly unique position. Many of these sites are still not subject to the pressures associated with large human populations. As such, we should be able to be proactive and ensure the long term security of these sites before problems arise rather than have to seek reactive remedies after damage has occurred. The next step in the process to protect the turtles and their nesting habitat in the NT should be to establish monitoring programs for selected sites and the subsequent drafting of management plans/programs for species and areas. These need to link in with other States, the Commonwealth and regional government plans, and work in with other groups such as indigenous rangers in remote coastal communities. The NT's marine protected areas program and the Commonwealth 'Work on Country' programs supporting Indigenous people to manage resources can provide vehicles for such cooperative programs.

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BACKGROUND AND OBJECTIVES

The NT has a long and diverse coastline which extends from the Western Australian border in the west to the Queensland border in the east. This coastline is complimented by many small and large islands. The NT coast is also referred to in this report as the Top End coast. This is defined as north of latitude 16° 35' S, which is the southern limit of the NT coastline. Much of this coast is sparsely settled and relatively undisturbed.

Prior to 1990 very little work had been done to locate and document fauna values in this area. This gap in knowledge included marine turtle nesting sites.

Initial survey work by RC in 1990 began to locate many significant fauna sites around the coast and near coastal areas of the NT. It was then found that very few of these sites had been documented in any way, let alone considered in relation to their ongoing conservation security. Consequently, a long term project was commenced in three phases. The first, and especially challenging phase, was to find and document significant sites for a range of faunal groups. This included marine turtle nesting sites. The second and third phases were to set up ongoing monitoring at selected important sites and then to instigate longer term management actions/plans of these sites, where necessary.

Results from the first phase of this work are now being used to produce a series of reports detailing the distribution and status of important fauna sites in the Top End of the NT. These reports are intended to help correct the deficiency of information about the Top End coast and major wetlands, which support very large aggregations of feeding, roosting or breeding fauna. The reports were designed to provide broad scale information on the distribution and status of these coastal and wetland species, rather than a precise quantitative assessment. As such, they are written to provide a robust base from which to plan more focussed studies and to develop conservation strategies, at both a regional and national level.

This report is the fifth in the series and is written to provide information on the distribution and status of marine turtle nesting in the NT. Although a brief report documenting marine turtle nesting sites was published previously (Chatto, 1998), this current report presents marine turtle nesting in much greater detail. This report does not detail marine turtle feeding sites. Although occasional references are made to important feeding sites much still remains to be done to locate such sites. The four previous reports in the series detailed waterbird breeding colonies (Chatto, 2000b), seabird breeding colonies (Chatto, 2001), shorebirds (Chatto, 2003) and waterbird feeding and roosting sites (Chatto 2006).

As with the two most recent reports in this series, the main body of this report is divided into two sections – an area based section and a species based section. The first section of this report details nesting information on all marine turtles by the Integrated Marine and Coastal Regionalisation of Australia (IMCRA) Marine Bioregions (Commonwealth of Australia, 2006). The second section summarises each of the individual species on an NT wide basis. In both sections the location, numbers and timing, as well as success, of nesting is detailed.

Further details on background and objectives of the overall project can be found in this section of the previous reports in this series.

STUDY AREA AND ENVIRONMENT

The study area for this report includes mainland and island coasts of the NT (Figure 1). Figure 1 also shows the eight IMCRA Marine Bioregions (IMCRA 1998) covered during these surveys. The NT coast extends for over 10 000 km including its many (>800) islands and large estuaries, and spans some 9 degrees of longitude (129° E to 138° E) and 5.5 degrees of latitude (11° S to 16° 35' S). There are three major parts of the coast adjacent to marine water masses: the western coast abuts the Timor Sea, the northern coast the Arafura Sea and the eastern coast the Gulf of Carpentaria. The NT coastline has a number of different environments, including small cliffs, rocky shores and a number of different types of beaches, some with extensive dune systems. Nevertheless, much of the NT coast, especially along the mainland, is made up of mangrove-backed mudflats, in particular along estuaries, inlets and large protected bays.

In contrast, the islands are much less dominated by mangrove systems. There are some large islands such as the Tiwi Islands (consisting of Melville Island and Bathurst Island) and Groote Eylandt that have many different habitats, but most of the 800 or so islands are small and are geomorphologically and ecologically simple. Most tend to be dominated by sand, rock or coral rubble, and lack permanent water.

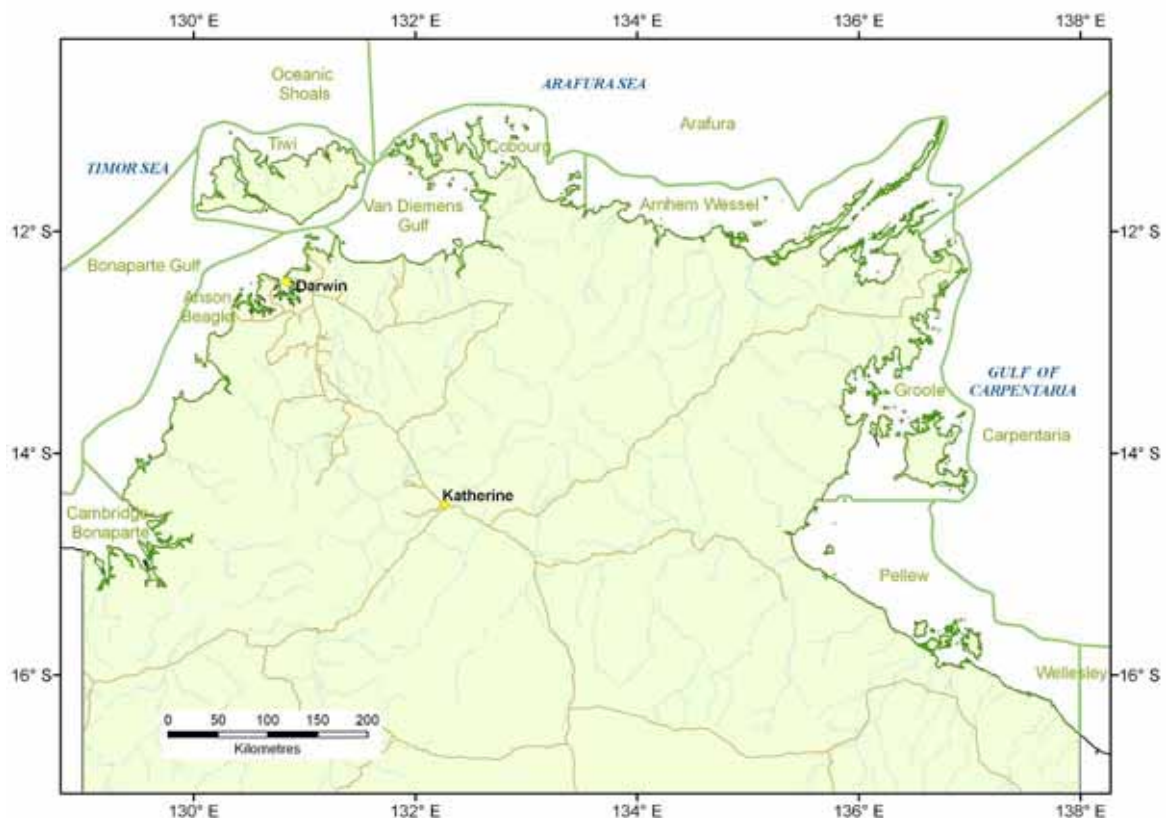


Figure 1. Northern Territory IMCRA Marine Bioregions (with modifications as described on page 13).

In general most of the coast still remains free of major human influence. With the exception of the areas around Darwin, parts of the Tiwi Islands, Nhulunbuy, north-western Groote Eylandt, and the coast near Borroloola, the majority of the NT coastline and islands are very remote and sparsely populated. Levels of human development and disturbance are correspondingly low.

The dominant climatic and hydrological features of the NT coast are the relatively high and intensely seasonal monsoonal rainfall, seasonal shifts in dominant wind direction, and the influence of the large tidal range. Most of the coastal Top End receives an average annual rainfall of 1 200 mm with regions in the north-west receiving more than those to the east and south. This rainfall is also highly seasonal, falling mostly between December and March. Mean spring tidal ranges increase from the eastern NT coast to the west (2.2 to 5.6 m) and then further increases towards Western Australia. Beach development on various parts of the coast is highly dependent on exposure to wave activity and seasonal shifts in wind direction. Generally this is from the south east in the dry season and from the north west in the wet season. Wet season storms and cyclonic activity create high wave energies that may affect beach structure. Dry season winds across the Gulf of Carpentaria contribute to the development of extensive secondary dune systems along the north eastern coast. These winds also carry derelict fishing nets (ghost nets) onto beaches. These nets often bring ashore ensnared, dead and dying marine turtles and other wildlife.



Plate 1. Good Olive Ridley Turtle nesting beach (coast section 3.11) along mid north coast of Melville Is., March 2004. Photo R. Chatto.

METHODS¹

Nesting data

Species

Flatback Turtle (*Natator depressus*)

Green Turtle (*Chelonia mydas*)

Hawksbill Turtle (*Eretmochelys imbricata*)

Olive Ridley Turtle (*Lepidochelys olivacea*)

Leatherback Turtle (*Dermochelys coriacea*)

Loggerhead Turtle (*Caretta caretta*)

Surveys

The NT coast, offshore islands and adjacent coastal wetlands were assessed by RC for selected fauna using aerial and ground surveys on more than 650 days spread over all months of the year between 1990 and 2004, and sporadically thereafter. (NB. Throughout the report the terms of ‘between year/month and year/month’ or ‘from year/month to year/month’ are inclusive of the years/months quoted, i.e. the above statement includes the years 1990 and 2004). In general greater emphasis was placed on obtaining information from a large number of sites in preference to detailed surveys of fewer sites.

Because the Top End has many remote and often difficult to access areas, initial surveys were done from the air using single engine fixed wing aircraft. These surveys were to locate sites that appeared to be significant for aquatic birds, marine mammals and marine turtles, and the times at which they were used. Follow up ground surveys were then done to ground truth apparently significant sites located from the air. The amount of time on the ground in such surveys varied from a few minutes to a couple of hours depending on time restrictions, budgets, weather and other priorities. Ground surveys were done mostly using helicopters, but occasionally by using boats, vehicles or quad bikes. Many of these surveys targeted peak breeding, feeding or migratory periods as well as particular fauna groups or species. Observations were also made during surveys done for specific purposes such as monitoring species under management programs (e.g. Magpie Goose) or incidental site checks (e.g. single marine wildlife strandings or mortalities). Under such circumstances coastlines and wetlands were sometimes able to be flown and surveyed on route to other locations.

The collection of marine turtle nesting data from aerial surveys was nearly always linked to the collection of data on other fauna along the coast, so turtles were rarely specifically targeted. Aerial surveys involving the collection of data on marine turtle nesting usually involved flying along the coast at heights of between 100–300 feet (30-91m) at speeds varying between 40 and 120 knots. These variations reflected the prevailing operating conditions of the aircraft in use and species/areas being targeted. Along with the collection of data on other species of fauna during these flights, approximate counts of track sets and/or nests were made for marine turtles. (NB. Unless otherwise stated, future

¹ Additional information on the methods in general for this project can be found in previous reports in this series (Chatto 2000, 2001, 2003, 2006).

reference to tracks, usually via the term tracks/nests, refers to sets of tracks, which includes the up and down crawl of a nesting). In areas of high density nesting or areas where tracks/nests were not often found, follow up ground surveys were done to better assess species present, numbers, timing, success, predation and other information relating to turtle nesting. Such ground surveys could better target marine turtle data collection.

It should be noted that these surveys did not attempt to find or estimate annual nesting numbers or success rates for marine turtle nesting in the NT. Because of the large area and complexity of mixed species surveys, not all beaches could be surveyed in detail over all months. All the data collected, and presented in this report, are of a broad scale nature designed to provide a robust summary of the general distribution, significance and seasonality of nesting sites for marine turtles around the entire NT coast. As such it provides the base-line data for more detailed studies in the future.

Survey effort

Information presented in this report, and others in the series, is taken from a long term and complex series of surveys incorporating a number of methodologies designed to encompass collection of data on a great deal more wildlife species than just marine turtle nesting. Consequently, it is difficult to accurately quantify survey effort in relation to individual species groups. Nevertheless, an attempt has been made to provide some information on survey effort within each bioregion introduction and within each coast section summary so as to give the reader a very approximate means of standardising counts of tracks/nests. Survey effort is shown using numbers of 'survey days'. A survey day is defined as a unique date on which any wildlife records were obtained as per year, month or specific area. The number of survey days is shown as both a total number (text), and a monthly percentage (bar graph), within each bioregion introduction. It is also shown for each coast section within the bioregion in the summary tables at the end of each bioregion.

Ground and aerial surveys were often made on the same day (usually via helicopter surveys) so that total visits (survey days) appear lower than aerial and ground calculations combined. The time spent surveying during these visits was not calculated because time was spent also collecting other fauna records.

It should be also noted that effort may appear lower in some areas if no wildlife was observed in a survey.

Survey Area

Although the survey area for all of the species recorded in this overall project extended well inland to cover rivers and wetlands, this report only considers surveys from within a defined coastal strip. A coastal record for this report is one made within 250 metres of the coast for ground records and within 500 metres of the coast for aerial records, as defined by an AUSLIG 1:100k GIS coastline feature of the NT. A larger buffer for aerial survey records was used because flight paths for aerial surveys were not always directly over the nesting part of a beach and that there was sometimes a small time lag between observations and noting GPS reading.

Geographical coverage and mapping is further discussed under the 'Mapping coastal Bioregions' section below.

Nesting data recording

Data collected on these mixed-purpose surveys were used in this report in three forms.

1. The vast majority relate to active turtle nesting observations. These were recorded in the field as either tracks or nests.
2. A second form related to specific records of nil nesting at a given site. These were used in assisting to show overall absence of nesting at sites and/or seasonal absence at known nesting sites.

3. The third form related to other fauna observations that were recorded within the coastal strip (as defined above) when turtle nesting was not recorded as either present or absent at that time/location. This may have resulted from an absence of nesting (but not specifically recorded as nil nesting) and/or surveys being within the coastal strip but not over the potential nesting part of the coast (e.g. wetlands behind the dunes or along the tide line at lower tides). These data are also taken as nil nesting at that time and location. Although it is possible that surveys away from the potential nesting sections of beach may have missed small numbers of tracks/nests, it is unlikely that this would have resulted in any significant nesting being missed. Obviously, these data are of limited value but they were also included to assist with estimating survey effort as defined above.

Data considered for this report were recorded predominantly as point data reflecting the site of nesting or nil nesting activity. A single record could be for a single track/nest, or for a count of multiple tracks/nests. A record could relate to a single site or, in some cases, a length of coast or a small island. Where a single record related to a length of coast done during aerial surveys, start and stop points were recorded. This was usually done when wildlife density was high or the accuracy of the GPS equipment made subdivision into small segments difficult. In the consideration of scale for this report and the comparatively small lengths of coast covered when a start and stop point was recorded, all such records were considered in the analysis as located at the starting point latitude and longitude.

All data were checked for locational accuracy using a GIS with a Landsat image backdrop, so points could be attributed to nearest coast section.

Species identification

Tracks and nests were not always identified to species for various reasons. The speed of aerial surveys and the concentration on other fauna assessments made identification difficult from the air. Although species confirmation was obviously better from ground surveys there were still contributing factors that led to species identity not being confirmed from the ground. The weathered condition of remaining nest signs (i.e. tracks or nests) and the time able to be spent on turtle nesting identification on the beach meant some nests could not be separated to species level. All surveys were done during daylight hours so sightings of individuals actively nesting were rare. Tracks were identified by the style of crawl (i.e. paired or alternate) and width. Nests were identified by size, type and placement on the beach. Where possible, further confirmation of nesting species was also done by locating eggs and/or hatchlings still in the nest. Confirmation to species level was only made when one or more of the above methods returned an unambiguous result.

Recording of nesting marine turtles were assigned to individual species level, to paired species level (i.e. 'Flatback and/or Green Turtles', or to 'Hawksbill and/or Olive Ridley Turtles') based on wider, paired tracks being allocated to the former pair and narrower, alternate tracks being allocated to the second pair, or to unknown species ('turtle spp.'). The latter occurred when the species was unknown or not recorded. Most of the paired species or unknown classifications resulted from aerial surveys.

Examples of each of the tracks left by each of the four main species of marine turtles are shown in Plates 4 to 8. Although subject to a number of variables such as sand types, weather, direction of travel, age of turtle and more, the widest tracks were usually made by Green Turtle. These were usually around the 100 to 110 cm range. The next widest tracks were of Flatback Turtles (around 85 to 95 cm), then Hawksbill Turtles (around 70 to 80 cm) and Olive Ridley Turtles (around 65 to 75 cm) in order of decreasing width of track.

Records of adults or immature turtles observed in open water and other observations not related to nesting were not used for this report, although mention is made of very significant aggregations of such turtles.



Plate 2. Large Green Turtle tracks (~115 cm wide) on West Island, October 1996. Photo R. Chatto.



Plate 3. Flatback Turtle tracks (~ 95 cm wide) on Bathurst Island, September 1996. Photo R. Chatto.



Plate 4. Hawksbill Turtle tracks (~ 70 cm wide) on Truant Island. July 1996, Photo R. Chatto.



Plate 5. Olive Ridley tracks (~65 cm wide) being measured by R. Chatto on Melville Island.

Quality of counts

Aerial surveys were mostly done at a speed that prevented recording the exact number of tracks or nests (particularly in high density areas), and estimates were used to provide a relative abundance. It was also not always possible in these estimates to separate nesting pits (the pit left after a completed nesting) from previous seasons. This is further discussed below under 'Seasonal nesting activity'. Ground surveys were better able to provide more accurate counts as opposed to estimates (though over much smaller areas) but the main purpose of the ground surveys was to achieve better identification of species.

Estimates of nests or tracks in these surveys were made as either a specific minimum number, a range estimate (e.g. 50 - 100) or a verbal statement such as 'present', 'few' or 'many'. The midpoint of any range estimate was taken to represent the number counted for that record. Verbal statements were recorded when it was not possible to make a numeric estimation due the many other things being assessed from the air at that time. In most situations the statement of 'present' referred to less than a 'few'. For the purposed of interpreting counts the numbers of 1, 10 and 50 were applied to present, few and many respectively, unless other notes (e.g. many hundreds or hundreds per kilometre) were also recorded in the comments section relating to the particular record. At most sites where a verbal comment was recorded, subsequent or previous surveys suggested the allocated numbers to each of these verbal statements would have resulted in an underestimate rather than an over estimate at that time.

Field counts were recorded in terms of the number of tracks or the number of nests. In the majority of cases tracks were counted as sets of tracks but when the track density became too high to do such, the total number of all tracks was estimated with no attempt to separate sets of tracks from total tracks. As such, when there were more than 50 tracks at a site all tracks were estimated and the figure halved to equate to sets of tracks.

Mixed track and nest counts were not usually recorded in the same survey of the same site. Where both tracks and nests were recorded at the same site in the same survey, counts of tracks were not included where a resultant nest was counted. This was usually a result of a total count of tracks from the air and then a small sample check of nests from the ground. In this case one nest would have two tracks subtracted from the overall track count in terms of what was tallied from that site. Where only the occasional nest was observed scattered along a beach, and it could be seen to have been successful, this was generally recorded as a nest rather than a set of tracks.

Because a full, precise count of tracks or nests was rarely attempted at sites where reasonable amounts of nesting were occurring, neither counts of tracks or nests, or their sum are likely to reflect the true number of nests present. It would therefore be unwise to use this report alone to attempt to compare future counts by other researchers at individual sites. Additional reference to the turtle database compiled from these surveys in conjunction with the extensive field notes may assist in attempting such comparisons, but the counts are primarily to indicate the general significance and timing of nesting in an area and for broad comparisons between different areas within the NT.

Throughout this report tables and graphs have track and nest counts presented separately. However, in the discussions relating to each of the coast sections, tracks and nests are combined as the one figure (tracks/nests) for ease in producing a single comparative figure. Obviously, adding nests (where normally one nest equals two tracks) to tracks is not ideal as a small proportion of tracks sets may have not resulted in a successful nest.

Allocation of nesting counts to coast sections within species distribution and abundance maps

Because survey effort varied greatly and coast sections (described below) varied in length and did not describe discrete beaches, a nesting density or survey effort index was considered an unsatisfactory way to show the relative amount of nesting in different areas. To do this within coast sections, the

highest combined count of tracks/nests recorded in any survey was used. Counts were represented by a series of ranges such as zero, 1-10, 11-20 etc. Each individual range was allocated a separate colour going from dark green (zero), increasing in number ranges through yellow, light blue, dark blue to red, with the last two representing the more important areas due to their higher numbers. Because tracks and nests were counted separately a combined sum was used. Slightly different scales were used on maps with combined species counts compared to those with single confirmed species counts because of the often much greater numbers involved with combined or unknown species counts.

Maps, detailing both individual and combined (unknown) species counts, are included in each of the Appendices (e.g. Figure 74 for Flatback Turtles) relating to each species or species combination rather than each of the actual species summaries in the main part of the report. This is done because there are many areas where species were not confirmed at all or not confirmed in the correct number range, and therefore not included as the appropriate colour shade on the map. Extrapolation of sample counts of confirmed species (e.g. Flatback Turtles) from larger counts of unconfirmed species (e.g. Flatback and/or Green Turtle, or unknown *spp.*) would mean more than one map would be needed to obtain a reasonable appreciation of the numbers of the individual species in the area. Within the individual species summaries in the main body of the report a separate map showing numbered significant areas is shown instead. This is discussed further under 'Significant areas'.

Significant areas

Allocation of significant marine turtle nesting area status has not been attempted in this report by using any pre-set, precise nesting numbers. Apart from the arguability of setting a certain figure and saying counts higher than it are 'significant', the methods of data collection in these surveys would not allow direct comparison between sites based on a set number. Consequently, likely significant nesting areas are suggested by the author to mainly assist in prioritizing the importance of future research or management actions. They are derived by considering higher recorded counts and other verbal comments (e.g. 'high density nesting observed but no count attempted') made by RC over the years on a comparative basis across the whole of the survey area.

Significant nesting areas are suggested by a number of ways in this report. No single way gives a complete 'black and white' answer as to what areas are significant, and all ways should be considered in seeking the location of significant sites. However, the quickest reference to likely significant areas would be by referring to the coast section summary tables (blue background tables located at the end of each coast section summary) and/or the species distribution maps.

Within each individual species summary section, a map (e.g. Figure 35 for Flatback Turtles) is given showing the most significant of the nesting areas for that species on a comparative basis throughout the NT. Sites (numbered) on these maps are also cross referenced to a table (e.g. Table 10 for Flatback Turtles) within each species summary. The summary tables (blue background) at the end of each individual coast section discussion can infer significance by reference to the allocations of very high (4 symbols) and high (3 symbols) for each species.

Significant areas, as illustrated by maps, can also be found on the maps within each Bioregion for all species combined. Here, all red and dark blue shaded coastline should be considered as definite significant 'turtle' nesting area. Also, a number of the higher range light blue sections could also be suggested as significant. Higher range parts of the light blue shading could be deduced by referring to the table totalling all counts for each coast section that is shown at the end of each Bioregion section (e.g. Table 1, for Cambridge/Bonaparte).

At a species level, maps shown in the individual species Appendices can also be used to suggest some of the significant sites, but not all because many sites could not be confirmed to species level. Reference to the same maps in the combined species pairs or unknown species Appendices provide some assistance for further detecting significant areas for individual species. For example, the NW part of West Island in the Pellew Bioregion has large counts (reflected as red shading) on the Unknown

Species map (Figure 108) but only low numbers of confirmed Flatback Turtles (reflected as yellow shading) on the Flatback Turtle map (Figure 74). As this species is clearly the dominant species nesting at this site, combining the two maps suggests the site to be a significant area for Flatback Turtle nesting.

Significant nesting for all species combined in individual coast sections can also be (roughly) inferred from the table totalling all counts for each coast section and shown at the end of each Bioregion section (e.g. Table 1, for Cambridge/Bonaparte). No figure is quoted here as a level for considering significant sites but the higher counts of tracks and nests (averaged per survey) would contain significant sites. In such tables only individual records of 5 tracks/nests or more were considered when totalling all survey counts. A similar approach can be taken with tables in each Appendix related to a particular species (e.g. Table 18 for Flatback Turtles) which list places and total track/nest counts summed across all surveys. Here, only individual records of 20 tracks/nests or more were considered.

Seasonality of nesting activity

Signs of nesting (adult and hatchling tracks or nests) were sometimes recorded with an estimation of their age based on condition of tracks and diggings on the beach, or egg development. When an estimate of age was applied they were recorded as **very fresh** (within previous couple of days), **fresh** (older than a couple of days but within last couple of weeks), **old** (greater than two weeks, but still within this season) or **not within the current season**. However, on most occasions a count or estimate of tracks and/or nests was of those present at that time, which included fresh and older sign of that season. Where nesting signs were predominantly and clearly from a previous season (e.g. old nest pits) they were usually counted and referred to in the text when significant, but such data were not used for the preparation of maps, tables and graphs in this report.

Also, variation in the exposure of individual sites to weather and/or higher spring tides created differences between sites in terms of counts. An aerial survey over a narrow beach after high spring or storm tides may record few or no nesting signs (particularly on Olive Ridley Turtle nesting beaches) when the site may still have reasonable current nesting. However, given the many surveys and long period of this project it is considered unlikely that many if any sites supporting substantial nesting would have been entirely missed as a result of environmentally induced loss of fresh track/nest signs.

Hatchling tracks were also used to estimate laying dates by subtracting an estimated incubation time of 50 days from the estimated date of hatching. Although incubation period varies by species, latitude and time of year (temperature dependent), this figure was used as a rough guide for all records. For example Flatback Turtles have an incubation period of 43-53 days on Casuarina Beach near Darwin (Chatto, *pers. obs.*) and Olive Ridley Turtles an incubation time of 50 days on Bare Sand Island (Whiting, 1997).

Over the NT as a whole, freshly laid and freshly hatched marine turtle nests were recorded in every month of the year for some species and most months for others. Because of the possibility of seasonal variation between areas of different latitude around the NT coast and the inability to relate effort to different areas it would be unwise to produce an individual species graph of all monthly records for the entire survey area. Consequently, no such graphs are shown in the individual species summaries in the main body of the report. However, as possible latitude variations are not likely to be effected at a bioregional level, monthly track and nest totals can be seen for each bioregion in the species and species group Appendices (e.g. Figure 66 to 61, Appendix B for Flatback Turtles).

Predation and Traditional Harvest

Predation and Aboriginal harvesting of eggs was recorded where possible. Usually ground visits were necessary to identify the source of egg predation, although occasionally human or animal tracks at or around excavated nests were identified during helicopter flights. Predation by animals on emerging hatchlings was also sometimes identified by the presence of tracks following emergence.

Nest, track and egg measurements

On some occasions measurements and counts were made of turtle track widths, egg size and clutch size. Track widths were measured at several parts of the crawl and averaged. Egg diameters were occasionally measured when nests were examined. Where an egg was not spherical an average of the shortest and longest measurements was taken for that egg. Usually only 3 or 4 eggs from a clutch were measured. Most of these came from the top part (last laid) of the nest as the entire clutch was rarely dug up because of time constraints and concerns about possibly increasing risk of subsequent predation to nests or harming the eggs through movement.

Mapping coast sections

Coastal bioregions

Due to the extensive area covered by the surveys, a regionalisation was used to reduce the coast into sections for ease of mapping as well as describing areas which might have similar needs for management or monitoring. Previous reports in this series that document coastal fauna in the NT (Chatto 2003, 2006) used a regionalisation based on 'survey blocks' to capture records in near-coastal wetlands as well as the coastal margin. However, for this report on species which nest exclusively within the coastal margin and whose distribution of nesting is related to variation in coastal geomorphology a different approach was used. The Marine Bioregions defined by the Interim Marine and Coastal Regionalisation for Australia version 3.3 (IMCRA Technical Group 1998) was used for this purpose. It is also the regionalisation used for federal marine State of the Environment reporting. Bioregion names based on IMCRA are used in this report. Three modifications to this regionalisation were made so that these areas could be analysed with regard to future monitoring needs: the southern coasts of the Tiwi Islands are included within the Tiwi Bioregion; the Sandy Islands, normally split by the boundary of the Groote and Pellew Bioregions are here wholly included in the Pellew Bioregion; and the small part of the Wellesley Bioregion was also included in the Pellew Bioregion (Figure 1). The marine bioregionalisation mapping includes low lying coastal wetlands, so that maps of the land-sea boundary differ from normal coastline mapping. For this report the coast and beaches are depicted from conventional coastal maps.

Coast sections within bioregions

The coastline was divided into various lengths (coast sections) to map and discuss variation in density of nesting and identify important nesting areas for future monitoring or research. These sections do not always represent single beaches but usually sets of beaches. Individual coast sections were separated by distinct changes in gross geomorphology or coastal aspect, and the presence of headlands, large bays, estuaries, major rivers, or large sections of coastal mangroves or rocks. They were identified using true colour composite Landsat 7 imagery, at a scale between 1:250 000 and 1:500 000 for mainland areas and between 1:100 000 and 1:250 000 for island areas. Island coasts were divided only if the coast had distinctive changes at a scale 1:100 000 to 1:250 000. Small islands with no distinctive features were not divided. Distinct zones of sand (beaches) between coastal vegetation and/or rocks were not mapped or defined for this report due to time constraints.

Sections were recorded in a GIS using AUSLIG 1:100k coastline data. Mainland sections and divided sections on large islands were named on nearby geographic features. Small islands were named according to the AUSLIG data island name field. Where clusters of small nameless islands occurred these were grouped together (depending on precision of records) and named to identify the group (e.g. 'The small islands to the north east of Inglis Island').

Nesting data were assigned to coast sections by manually aligning records to the nearest relevant feature in a GIS. Occasionally when small islands were very close to the coast or to larger islands, ambiguously placed data were assigned to sections based on locations of beaches sighted from the

Landsat imagery or other nesting records, or mainland sections. Methods used to divide coast sections and assign data to coast sections follows similar methods used by Baker (2000).

GIS data used

Marine Bioregions

A digital version of the Marine Bioregions defined by the Interim Marine and Coastal Regionalisation for Australia version 3.3 (IMCRA Technical Group 1998) was obtained from the Marine Group, Biodiversity Conservation, Department of Natural Resources, Environment and the Arts. The modifications were made to this as described above.

Landsat 7 mosaic

An ECW (Enhanced Compressed Wavelet) compressed image (compression ratio of 25:1) of a Landsat ETM mosaic of the NT coast was used to identify coastal features such as rocky shorelines, beaches and vegetation. The mosaic was produced from imagery captured in 2000, by the Land Monitoring Branch, Natural Resource Management, Department of Natural Resources, Environment and the Arts.

Topographical 100k maps

AUSLIG GEODATA 9 1:100k topographic maps were used to assist in the identification of coastal features and locality names.

The following GIS features were obtained from the GIS library of the Biodiversity Group, Biodiversity Conservation, Department of Natural Resources, Environment and the Arts.

Tenure and reserves

A land tenure coverage from 2004 was used to identify tenure boundaries and names of properties. A separate parks and reserves coverage from 2005 was used to identify reserves.

Mangroves

A mangrove feature was used from mapping of mud crab habitats mangrove and saltmarsh communities by de Vries *et al* (2002).

Rivers, roads and tracks

A coverage from AUSLIG GEODATA 250k was used to display major rivers in regional maps. A roads and track coverage (1:1000k) was used for main roads and tracks to show potential access points to the coast.

Towns and Aboriginal communities

Towns and Aboriginal communities were from separate coverages in the Localities section of the GIS library. No metadata were present.

Data Presentation

There are two main sections in this report, which follow the same approach as the previous two reports in the series, except IMCRA Bioregions are used instead of survey blocks to delineate defined areas. The first main section looks at individual areas (the bioregions) and the second looks at each species of turtle separately. A number of 'coast sections' are delineated within each bioregion. Tables with track/nest counts are given for each coast section. Coast sections with reasonable and better turtle nesting are each summarized in text and summary tables. Sometimes these are done individually (e.g. specific islands) and other times they are combined (e.g. lengths of similar mainland coast).

Due to the nature of this report there is a considerable amount of repetition within each bioregion and within each species account. Although this can be repetitive when reading the report as a whole, it is considered that this approach is necessary given that most readers will use the report to seek information on species or areas of particular interest. This approach allows each of the bioregions or species accounts to be read separately on a 'stand alone' basis.

Data Presentation within each coastal bioregion

Data presentation and discussion within each bioregion are divided into sections. These include:

Location and description

This section shows the geographic location of the bioregion within the overall survey area and briefly discusses the main habitats and features within the bioregion. Island sizes (~ha) and brief geology descriptions are taken from Woinarski *et. al.* 2007. (Islands in the Woinarski *et. al.* 2007 report were only detailed when greater than 20 ha). Details of bioregion locations have earlier been discussed in this Methods section.

Survey effort

This section gives an approximate breakdown of the percentage of survey days (an individual date that has at least one record) by month from within the bioregion. (See also discussion in 'Methods').

Species presentation and important nesting areas

This is the main section for each bioregion. For each bioregion the more significant of the coast sections are discussed separately in terms of nesting species, numbers, timing and success. For each coast section a small map is also included at the beginning with a red dot(s) giving the reader a quick view of the general location of that coast section within the NT.

At the conclusion of the text in each coast section the reader is given two summary tables designed to (i) provide a quick summary impression of the amount of nesting for each species and (ii) the timing of combined laying of all species by month for that coast section.

In the first summary table (blue background) a symbol is used to convey the relative (NT) significance of nesting in that area for each species. Although the number of tracks/nests recorded (or inferred) for the species during the surveys is given particular weight in the assigning of one of the categories listed below, it is not drawn just from counts but also from RC's overall observations from extensive surveying of most turtle nesting sites throughout the NT over many years. Symbols used in these tables have the following meanings for each species within that particular coast section.

OOOO	Very high nesting significance within NT.
OOO	High nesting significance within NT.
OO	Medium nesting significance within NT.
O	Low nesting significance within NT.

The use or addition of a hollow symbol (○) indicates 'probable' rather than 'confirmed'. Hollow symbols are used where confirmed species sample counts are extrapolated to larger counts based on higher unconfirmed species counts at the same site and the indication that the particular species is the main species present. They are also used when a species is strongly suspected of nesting but has not been unquestionably confirmed from the ground. This could occur when aerial surveys suggest a certain species, which was not ground confirmed at that site, but was on a similar type of beach in the nearby area. Occasionally two hollow symbols are used when the species could be upgraded two levels of significance based on a probable proportion of counts of tracks/nests not identified to species level.

The second summary table (green background) at the end of each coast section details seasonal laying on a monthly basis for all species combined in that coast section. The table represents actual laying months and does not include the subsequent two months of incubation. There was insufficient data to detail laying months for all individual species for all coast sections but some species nesting seasonality is discussed within the text of each coast section summary. (NB. Referral in the text to ‘between month x and month y’ or ‘from month x to month y’ includes month x and month y in the period stated).

In reality it is likely that coast sections with high density and/or multiple species nesting will have at least some nesting in every month of the year, but there were insufficient surveys for most coast sections to confirm such, and egg laying was only listed in the table when it was confirmed in that coast section for that month. More detailed and specific information regarding the likely additional laying months is discussed within the text of each of the coast section summary.

Recognition of laying in a particular month for individual coast sections is given regardless of whether it occurs throughout the section or only in part of the section. Laying differences between separate sites within that coast section is not seen as a significant factor within the (mostly) small areas discussed and in light of the nature of this report.

The symbols used within this table are:

- O** The coast section was surveyed at least once during that month and fresh tracks and/or freshly laid nest(s) were confirmed.
- X** The coast section was surveyed at least once during that month and fresh tracks and/or freshly laid nest(s) were not located.
- ?** The coast section was not surveyed during that month, or, if it was, the age of the tracks/nests was not recorded, so it is not known if egg laying was occurring at that time.

Tracks rarely remained ‘fresh looking’ for more than a couple of weeks (often much less), and visible at all after about a month. As such, aerial survey observations of fresh looking tracks were taken to represent laying for that month, and observations of older, but still obvious, tracks in the first half of a month were taken to represent laying in the previous month. Old and faint tracks were not considered in allocating months of laying.

As well as fresh nests, laying months were also deduced by backdating freshly hatched or known age eggs from nests using species incubation times observed during the project by RC, from Whiting, (*pers. comm.*) and Limpus (1993).

Unless able to be backdated from hatching or known age eggs, laying was not listed in the tables as occurring in an un-surveyed month even though it is almost certain to have been the case in most situations when months either side of a short unsurveyed period had laying confirmed. However, this is discussed in the text summary of the particular coast section, particularly when laying was confirmed for that month in nearby areas.

In general the months of December and January were poorly surveyed. Even though this significantly reduces the probability of confirming laying within those months, it that laying was less common in this period due to the frequent heavy rainfall at this time of year.

Non-nesting Notes

Although these surveys were not set up to locate or assess important sites other than nesting areas for marine turtles, there were some significant observations made that warranted recording in such a report. These relate mostly to important feeding areas but also include other aspects such as observations of adult mortality. Where included, these comments are at the end of each Bioregion discussion.

Data Presentation within each species section

The second main area of this report deals with discussing each species or species group over the NT as a whole. Each of the confirmed individual species and each of the species groups (i.e. Flatback and/or Green Turtle, Hawksbill and/or Olive Ridley Turtle and Species Unknown) are discussed separately.

As well as the text discussion for each species or species group, there are a number of graphs, tables and maps produced to summarize the data. These include graphs detailing individual bioregion records by month, a table totalling nest and track counts for each bioregion and a map showing total NT distribution for that species or species group. These are presented in a separate Appendix relating to each species or species group. This information is not included within each species section for two main reasons. Firstly, it keeps the species summaries more concise and quickly assessable. Secondly, because the data were not collected systematically or over all months they should only be used to give the reader a guide rather than a complete assessment of all nesting.

Presentation within each of the species sections includes:

Geographic distribution of nesting locations and significant areas

This section discusses the overall distribution of nesting records of each species or species group throughout the NT. It also lists significant nesting areas in a table (e.g. Table 10 for Flatback Turtles). All such significant areas are individually numbered and referenced to an accompanying Top End outline map (e.g. Figure 35 for Flatback Turtles), shown within the section. A map in the relevant Appendix for the species (e.g. Figure 74 in Appendix B for Flatback Turtles) maps a further breakdown of all highest single area counts within specified ranges (e.g. 1-10, 51–100 etc). A table (e.g. Table 18 in Appendix B for Flatback Turtles) also shows the highest counts for each coast section.

The criteria for selecting significant sites have been previously discussed earlier in the Methods section.

Numbers

This section details the number of times each species was recorded (a record = a count of a specified date, time and/or location) and the total number of tracks/nests counted for that species throughout all surveys. Comparison is made with the counts for other species so as to indicate comparative status of each species compared to the others throughout the NT.

Seasonality of nesting

This section summarizes the nesting seasons for each of the species. Comments on seasonality of nesting are based on examining the number of records and the total counts for each species on a monthly basis throughout all surveys, as well as other relevant observations relayed to RC (such as by Indigenous people) during the project. Reference is also made to graphs of monthly counts for each species in each bioregion which are included in Figures in the Appendix relevant to the species being discussed (e.g. Appendix B for Flatback Turtles).

In this section only observations for individually identified species are considered because it is obviously not possible to meaningfully summarize mixed species observations in this way.

Over the full extent of the NT, nesting can occur in every month of the year for each of the four species that commonly nest here, but there is a main or peak period for each species which is identified in the discussion. This period can vary slightly around different parts of the coast. For example, nesting around the south east coast can start and finish a bit later than in northern areas.

Animal predation and traditional harvest of nests and hatchlings.

This section discusses predation of eggs in the nest by animals and humans, and animal predation on emerging hatchlings. Graphs in the appropriate Appendix summarize predation by month and by individual bioregions. These graphs are only produced for the confirmed species.

Other Measurements

During the surveys, a small number of measurements of track widths, clutch sizes and egg diameters were made for individual species. These are given in a table and briefly discussed in this section.



Plate 6 and Plate 7.

R. Chatto recording information during helicopter aerial surveys. Photo (left) I. Morris and (above) N. Smit.

NESTING ACTIVITY WITHIN MARINE BIOREGIONS²

All NT regions

Survey effort

There were around 300 days of surveys done by RC between 1991 and 2004 within the defined coastal zone used for analysis in this report. These surveys recorded over 24 000 observations of coastal wildlife around the NT coastline (10 875 km). There were no records of targeted wildlife species made over approximately 685 km (6%) of this coast. Most of the areas determined as having no records were small islands adjacent to the coast, where survey data were attributed to nearby larger sections of coast, so the length of the coast with no records could be somewhat lower. All parts of the NT coast were surveyed at least once.

Survey effort was concentrated in the early to mid 1990s (Figure 2), with no coastal surveys done in 2002. All months of the year were surveyed, with March, May and September receiving the most and January the least number of surveys (Figure 3). The months of January and February, which includes a substantial part of the wet season, were surveyed considerably less than any other two month period.

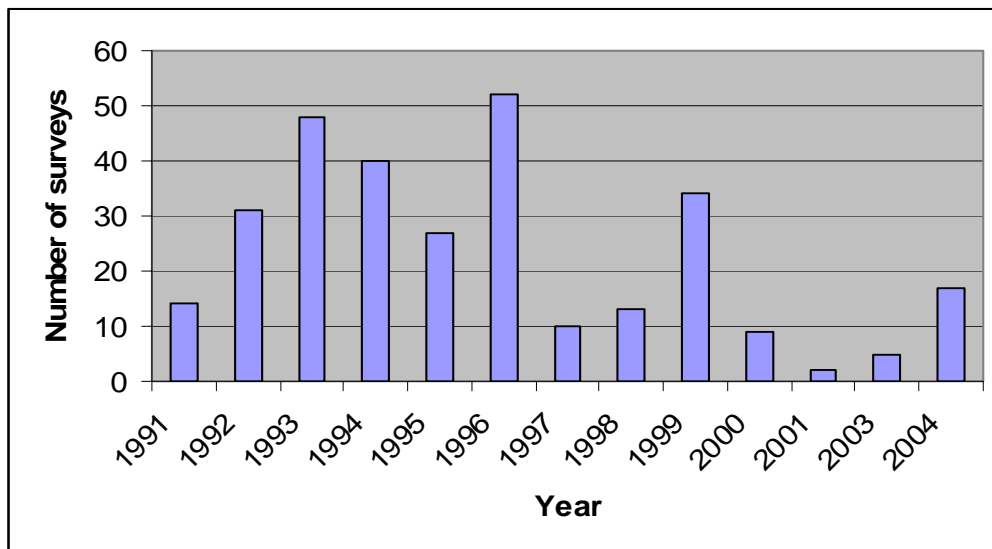


Figure 2. Survey effort per year as the total number of days of survey visits to coastal areas between 1991 and 2004 for the entire NT coast. A day of survey is considered as at least one wildlife record on a unique date. No surveys were done in 2002.

² Names used here are based on IMCRA Bioregion names and do not necessarily refer to geographic features alone.

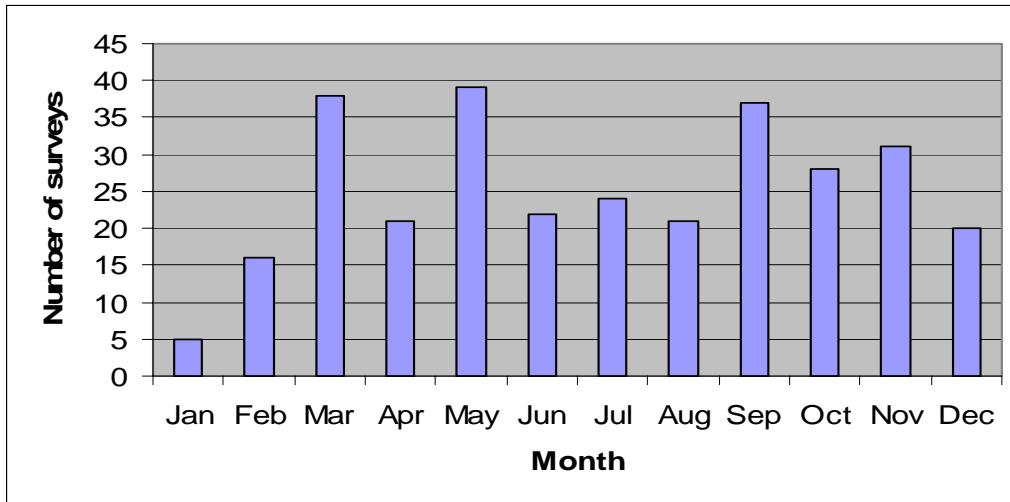


Figure 3. Survey effort per month as the total number of days of survey visits between 1991 and 2004 for the entire NT coast. A day of survey is considered as at least one record on a unique date.

Survey effort was generally equally distributed between bioregions as a proportion of coast length surveyed, except that the Anson Beagle Bioregion received more surveys as the areas near to Darwin were easier and cheaper to survey, and were often examined en route to other areas (Figure 4). The Cambridge-Bonaparte Bioregion received a lower proportion of surveys due to fewer specific purpose surveys in that area.

Numbers of surveys of islands and mainland areas were generally similar (Figure 5), except in the Anson Beagle Bioregion where almost twice as many mainland surveys were done compared to island surveys, partly due to fewer islands in that bioregion. The Tiwi Bioregion is wholly island.

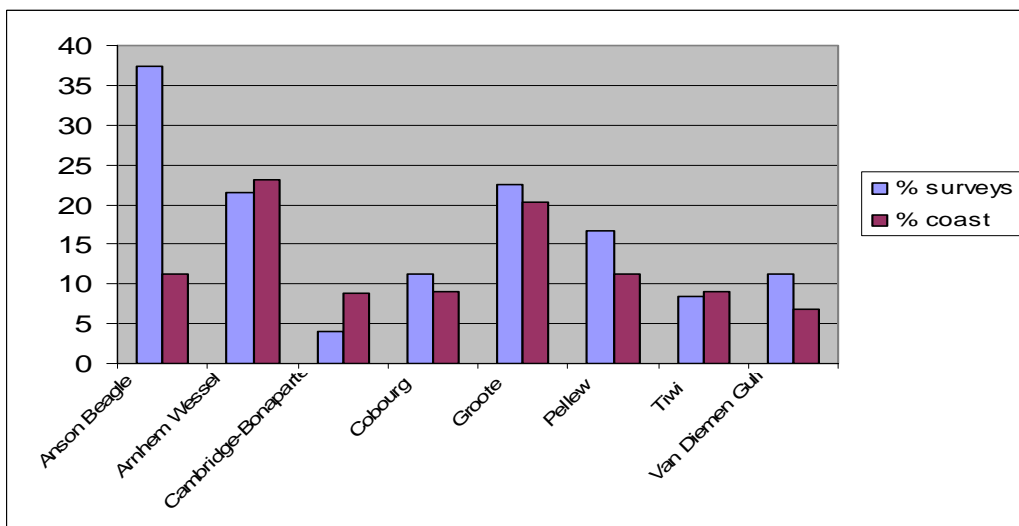


Figure 4. Proportion of total NT survey effort along coastal areas between 1991 and 2004 in the NT.

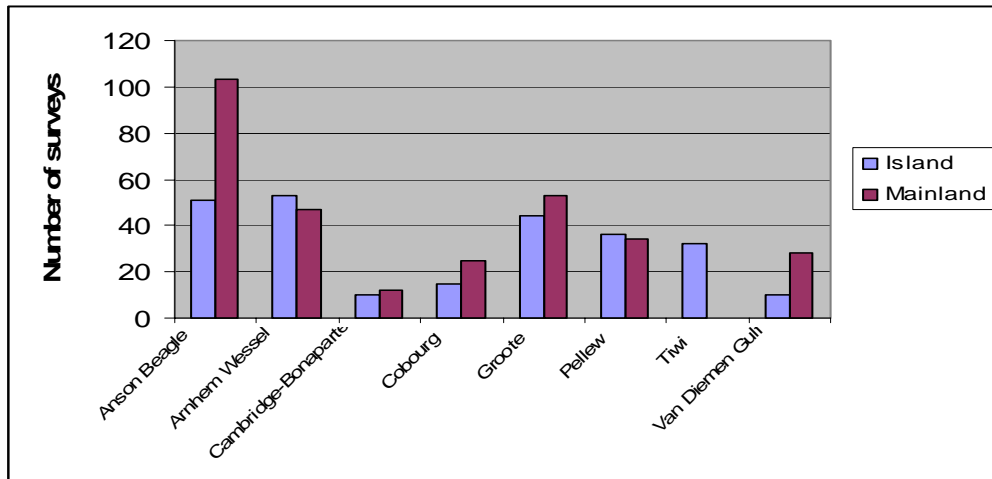


Figure 5. Number of days of survey for islands and mainland areas in each bioregion surveyed between 1991 and 2004 in the NT. Surveys are number of unique dates with at least one record.

Aerial surveys were more common than ground visits (Figure 6), particularly in more remote bioregions such as Groote and Arnhem Wessel where ground access was difficult.

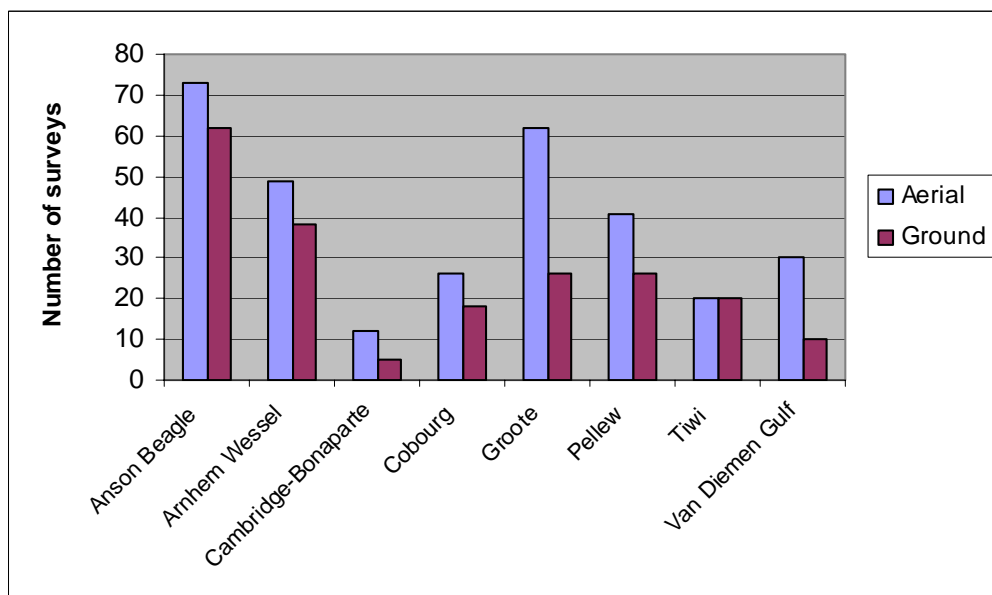


Figure 6. Number of days of survey by survey type in each bioregion between 1991 and 2004. Surveys are number of unique dates with at least one record.

Using records of all wildlife along the coast as a surrogate for survey effort for marine turtle nesting, over 8 000 km of coast (75%) was surveyed more than three times and almost 20% surveyed more than 10 times (Figure 7).

Using the highest counts of tracks and nests for any survey and allocating ranges for counts a map can be produced showing nesting by all species combined throughout the NT (Figure 8). This is a very significant map as it summarizes the relative importance of different sections of the coast for marine

turtle nesting. The count ranges used in this map are zero nesting (dark green), low density nesting (yellow), medium density nesting (light blue), high density nesting (dark blue) and very high density nesting (red).



Plate 8. Nesting Hawksbill Turtle, NE Isles (coast section 7.29), September 2004. Photo S. Whiting.



Plate 9. Leatherback Turtle tracks and beach-surveying quad bike, Danger Pt. (coast section 5.5), January 2007. Photo P. Fitzgerald.

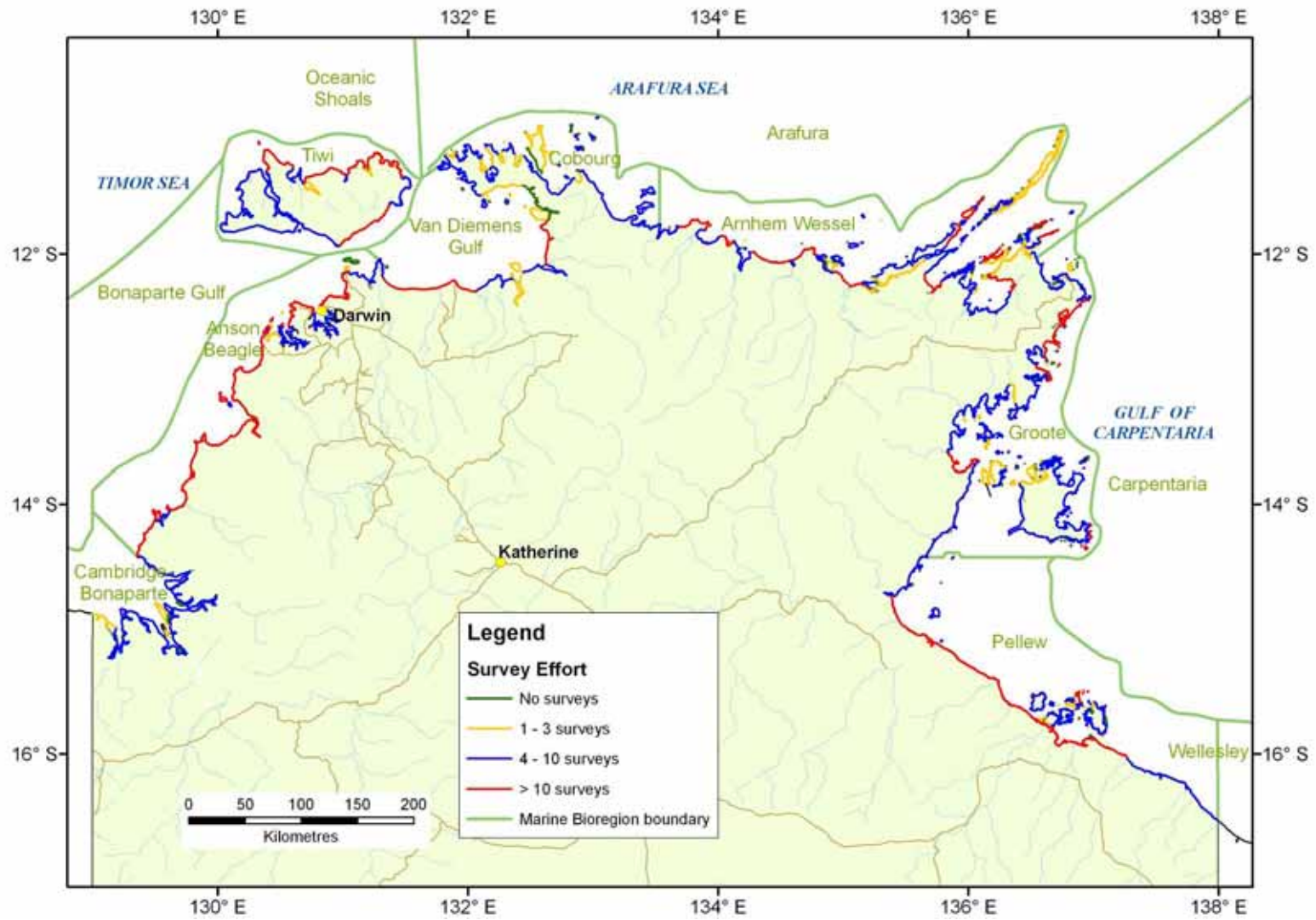


Figure 7. Number of days of surveys of coastal margins using aerial and ground surveys between 1991 and 2004 in the NT.

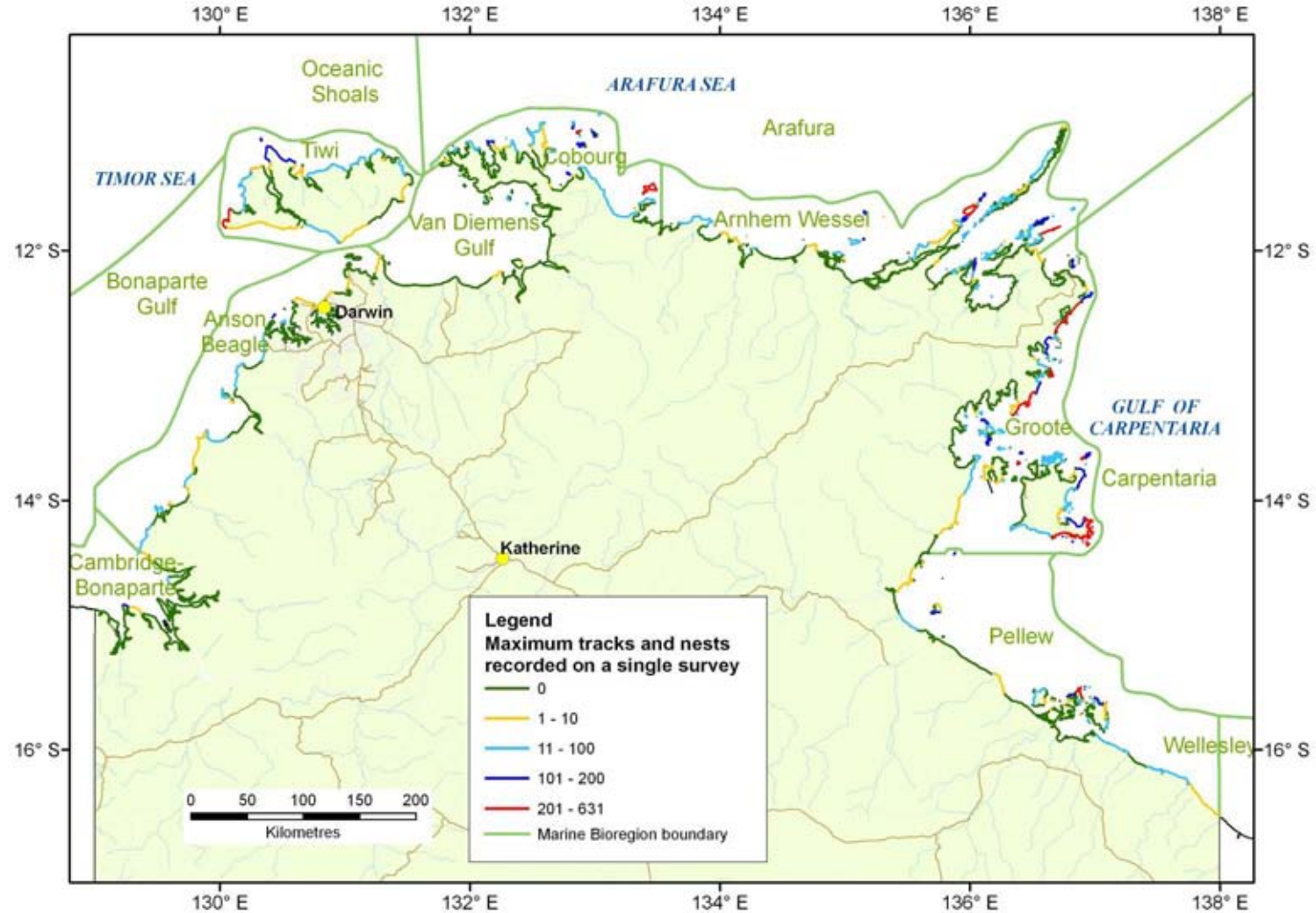


Figure 8. Nesting activity in all bioregions represented as the maximum number of nests and tracks (all species combined) recorded in any aerial or ground survey between 1991 and 2004 in the NT.

Cambridge-Bonaparte

Location and description

The Cambridge Bonaparte IMCRA Bioregion extends from Pearce Point south of Wadeye (Port Keats) into Western Australia (WA) and includes both Cambridge and Bonaparte Gulfs. The climate is semi-arid monsoonal with rainfall varying between 700 and 1 200 mm. Tidal variation is up to 6-7m. The bioregion comprises part of Joseph Bonaparte Gulf, a broad, open marine gulf straddling the WA/NT border. The area contains two major seasonal estuarine systems - Cambridge Gulf (Ord, Pentecost and Durack Rivers) on the WA side, and a complex of three estuaries (Keep, Victoria and Fitzmaurice Rivers) on the NT side. They are separated by stretches of low profile shore, backed by salt flats. Waters are generally turbid due to large tides and a predominance of fine sediments.

The area considered in this report includes only the NT portion, which extends from Pearce Point to the NT/WA border at the 129 degree longitude line. Most of the coastline in this area is of intertidal mudflat, backed by mangroves. There are some narrow sandy stretches but very little sandy beach suitable for marine turtle nesting, and the small number of suitable beaches are consequently well used.

Survey effort

A total of 12 survey days were done between 1992 and 1999 in the Cambridge Bonaparte Bioregion. Surveys covered nine months but a large proportion of surveying was done in March (Figure 9). Higher surveying time in March was dictated by linking coastal surveys to the regular wet season nesting surveys of Magpie Geese. March surveys would have, in general, been prior to the normal nesting period of the dominant nesting turtle for the area – the Flatback Turtle. The length of coast is 830 km (7.5% of the NT coast) and the length of coast where wildlife records were not obtained on any survey was 100 km (12% of the bioregion).

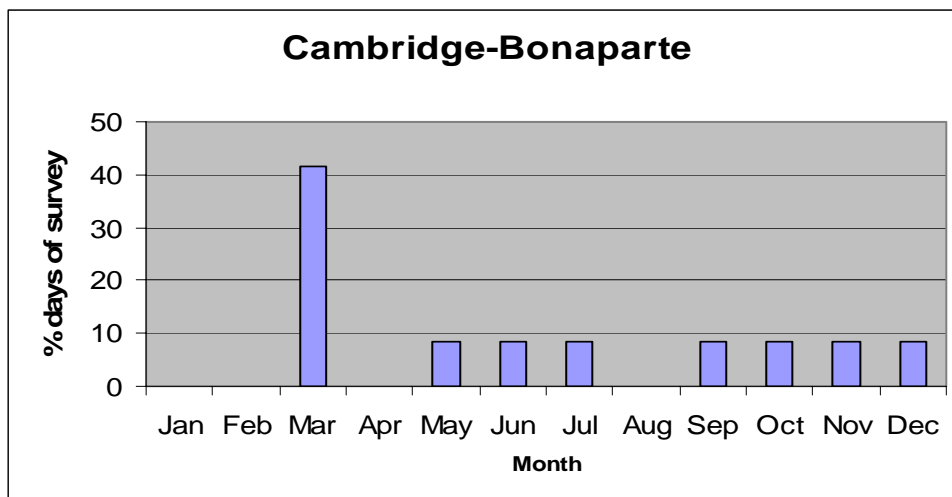


Figure 9. Survey effort by month between 1992 and 1999 in the Cambridge Bonaparte Bioregion.

Nesting Summary

This bioregion as a whole does not have many suitable nesting sites for marine turtles. As with all the marine turtle nesting beaches between the WA border and Darwin (i.e. all of the western coast of the NT) the dominant nesting species by far is the Flatback Turtle. No other species was confirmed breeding in the Cambridge Bonaparte Bioregion during these surveys.

Nesting within this bioregion was concentrated in two main areas (discussed below) but was also recorded in lower densities in a couple of other locations. The highest densities of tracks/nests for the bioregion were located on the beach associated with, and to the east of Turtle Point. All tracks/nests confirmed to species level at this site were of Flatback Turtles, and it is likely this is the only species to nest here.

Nesting areas throughout this bioregion are mapped, by the highest counts for any single survey, in Figure 10, at the end of the bioregion's coast section summaries.

Total numbers of tracks and nests per month for all nesting on islands and mainland beaches in the bioregion are shown in Figure 58, Appendix A.

Coast Section Discussions

Two individual coast sections (1.1 and 1.2) are listed within this bioregion. Both are discussed below. All track and nest counts for each of these sections are given in Table 1 and the numbered coast sections are shown in Figure 10.



Plate 10. Fresh Flatback Turtle nest in a good nesting area near Turtle Point (coast section 1.1), June 1999. Photo R. Chatto.

Coast Sections 1.1 and 1.2

Main Site(s): Turtle Point area (14° 50' S. 129° 13' E.)
Whale Flat (14° 40' S. 129° 36' E.)



The two important coast sections identified for this bioregion are Turtle Point and Whale Flat. Both are small, low islands adjacent to mostly mangrove and mudflat coastline. Each island has a small length of beach that is well used by nesting Flatback Turtles, particularly Turtle Point. No other species were recorded nesting in this bioregion.

Aerial surveys were conducted part or all of this bioregion in the months of March, May to July and September to December between 1993 and 1999. Surveys in May, October and December concentrated on bird sites. Ground surveys of turtle sites were done in June and July of 1999. Tracks and/or nests were recorded in all surveyed months except the months of May, October and December, but May and October surveys did not fly over the main turtle nesting areas. A freshly hatched nest was recorded in late June.


The highest number of turtle tracks/nests recorded from these two combined coast sections was around 100 in a September (1993) survey. This count probably included an accumulation of tracks/nests throughout the earlier part of the season, but the number of fresh tracks/nests suggested significant nesting was still occurring into September at least. This amount of Flatback Turtle nesting is comparable with other important NT nesting beaches for this species, even though the limited nesting in the rest of this bioregion means the overall amount is lower in this bioregion than all other bioregions in the NT.

Laying in this bioregion could be confirmed to cover all months from February to November. There was no laying confirmed after November but the month of January was not surveyed.



Plate 11. Very large *V. panoptes* goanna near Turtle Pt., June 1999. Not in good condition but recently filled up on Flatback Turtle eggs. Photo R. Chatto.

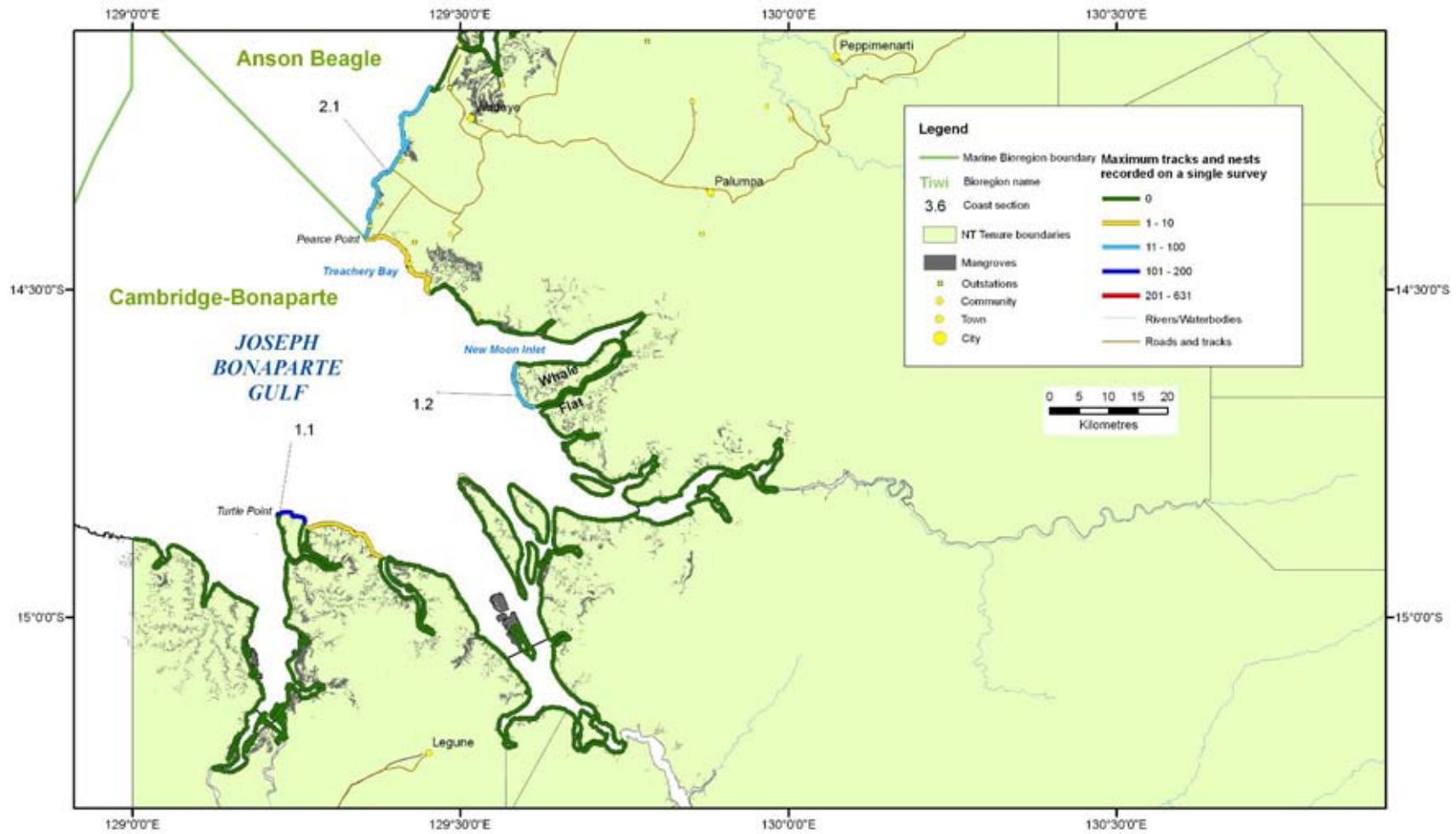
Even though both of the main nesting areas in this bioregion are islands both of them experienced considerable predation by goannas. Easily the largest specimen of *V. panoptes* (of many hundreds seen by RC during these surveys) was seen near Turtle Point eating Flatback Turtle eggs in June 1999. This specimen, which at a distance was assumed to be a crocodile, had no fear of humans and continued about its business when approached. It is likely that such goannas may swim across to the island in the dry season to eat Flatback Turtle eggs. A single incidence of pig predation on a nest was also recorded at Whale Flat. This was one of few examples of pig predation on turtle eggs observed in the NT despite large numbers of pigs in areas adjacent to many turtle nesting sites, suggesting it is a learned behavior and pigs in most areas are yet to exploit this food source. Where they have learnt to dig into turtle nests (e.g. Bathurst Island) they then cause major losses.

APPROX. SUMMATION OF SPECIES NESTING SIGNIFICANCE IN COAST SECTIONS 1.1&1.2			
[Very High (OOOO), High (OOO), Medium (OO), Low (O) numbers;			
O = Certain,  = Probable]			
Flatback	Green	Hawksbill	Olive Ridley
OOO			

OCCURENCE OF LAYING (ALL SPECIES COMBINED) BY MONTH												
IN COAST SECTIONS 1.1&1.2												
O = Egg laying confirmed; X = Nil egg laying recorded;												
? = Not surveyed or presence of current laying not assessed												
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
?	O	O	O	O	O	O	O	O	O	O	X	

Table 1. Locations of significant nesting activity in the Cambridge-Bonaparte Bioregion with combined sum of nests and tracks >5 for all surveys between 1992 and 1999 and number of surveys (number of unique visit dates) for each coast section.

Coast section	Observation	Flatback Turtle	Green Turtle	Mix of Flatback or Green	Hawksbill Turtle	Olive Ridley Turtle	Mix of Hawksbill or Olive Ridley	Unknown species	No. of surveys
1.1 Turtle Point area	Nest	22							5
	Tracks							154	
1.2 Whale Flat Is seaward	Nest	13						10	7
	Tracks	2		25				70	



3

Figure 10. Relative importance of nesting beaches using maximum sum of nests and tracks of all species in a single survey between 1992 and 1999 in the Cambridge-Bonaparte Bioregion.

Anson-Beagle

Location and description

The Anson Beagle Bioregion extends from Pearce Point at the northern extent of Joseph Bonaparte Gulf to Cape Hotham east of the Adelaide River mouth. The area includes most of the western coast of the Top End of the NT. The climate is monsoonal, with rainfall varying between 1 200 mm in the south to over 1 700 mm in the north. Prevailing winds vary seasonally with northwest monsoons in November to March and southeast winds from May to September. Waters are generally turbid due to the dominance of fine terrigenous sands and muds, a large tidal range (to 8m), and wet season sediment input from the Daly, Finnis and Adelaide Rivers.

The coastline can be categorised into two distinct types: in the south, exposed north-western facing sandy coasts with scattered low lateritic cliffs; and in the Darwin and Bynoe Harbour area, drowned river valleys (ria shoreline) with extensive intertidal mudflats. Mangroves are concentrated in extensive stands in the Adelaide River mouth, Darwin Harbour and Bynoe Harbour, with narrow strips fringing Anson Bay and Fog Bay. These bays and the harbour areas are dominated by extensive intertidal mudflats which compromise turtle nesting because of potentially long crawling distances at lower tides on the parts of these bays that do have narrow sandy beaches. Coralline reefs are sparse although two extensive sand cays form the Peron Islands, an important area for turtle nesting.

There are few coastal reserves in this bioregion that contain beaches. Most notable are the Indian Island Reserve and Casuarina Coastal Reserve, the latter being a suburban recreation area in Darwin.

This bioregion is the most populated in the NT, with Darwin and its relatively large urban and rural population occurring here. There are many public access points to the coast and a number of pastoral properties and some Aboriginal Communities also have accesses to the coast. The risk of significant disturbance to coastal areas, particularly by recreational four wheel drive vehicles and boats having access to beaches, is high in some places along this bioregion's coastline. A small community at Dundee is very close to significant nesting beaches in Fog Bay and on Bare Sand Island.

Survey effort

A total of 110 survey days were done between 1991 and 2004 in the Anson Beagle Bioregion. Surveys were done in every month of the year with most done in March and September, and fewest in January and April (Figure 11).

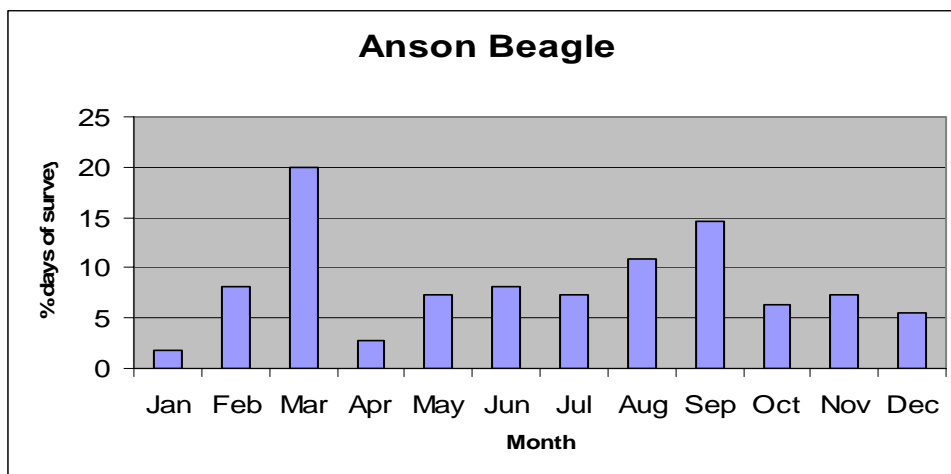


Figure 11. Percent days of survey by month between 1991 and 2004 in the Anson Beagle Bioregion.

The length of coast is 1 240 km (11% of the NT coast) and the length of coast where wildlife records were not obtained on any survey was 82 km (6% of the bioregion). Aerial surveys were conducted of at least part of the coastline of this bioregion in every month of the year over the period of the project. Ground surveys were done in most months but the proportion of the area covered in these surveys was lower. The southern part of the bioregion received less survey time.

Nesting Summary

Marine turtle nesting occurs at scattered locations throughout this bioregion. Although most nesting is at low densities on scattered sandy beaches, there are some areas that have significantly dense nesting. The most significant nesting areas in this bioregion are North Peron, Bare Sand and Quail Islands and the mainland coast adjacent and just to the south of the latter two islands.

Flatback Turtles were by far the most commonly encountered nesting species within this bioregion. There were many aerial survey records of Flatback and/or Green Turtle tracks/nests and unknown species track records, but each of many follow up ground checks invariably confirmed these to be Flatback Turtle tracks/nests.

Nesting areas throughout this bioregion are mapped, by the highest counts for any single survey, in Figure 12 (northern half) and Figure 13 (southern half).

Total numbers of tracks and nests per month for all nesting on islands and mainland beaches in the bioregion is shown in Figure 59 , Appendix A.

Coast Section Discussions

Eleven individual coast sections (2.1 to 2.11) with good nesting are listed within this bioregion. Track and nest counts for each of these sections are given in Table 2 and the numbered coast sections are shown in Figure 12 and Figure 13.

The most significant of these coast sections are discussed in more detail below. Long sections of mainland coast with low to medium density scattered nesting are lumped together in this discussion



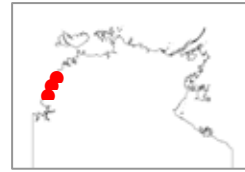
Plate 12. Flatback nesting beach north of Pearce Pt. (coast section 2.1), July 1999. Photo R. Chatto.

Coast Sections 2.1, 2.2, 2.3, 2.4, 2.5 & 2.7.

Site(s): Mainland coast,

Pearce Point (14° 25.3' S, 129° 21.4' E) to

Point Jenny (12° 54.5' S, 130° 11.6' E).



These coast sections cover approximately 200km of coastline along the western coast of the NT. The coastline consists of a mixture of mangrove-backed sand or mudflats, rocky points and a scattering of beaches. There are only three islands, Dorcherty (discussed this section) and the North and South Peron Islands (discussed separately below) along this section of coast. Apart from a single Olive Ridley Turtle nest taken by goannas near Cape Hay on Dorcherty Island, all of the 300+ tracks/nests confirmed to species along these coast sections were Flatback Turtles (Table 2).

With the exception of Hyland Bay (south of Cape Dombey) and Anson Bay, which both had almost no turtle nesting, most of the rest of the coast of these coast sections had lower (mostly) to medium density nesting on the beaches scattered along its length.

The coastline was surveyed from the air extensively (every month) through the 1990s. Although most concentration was on aquatic birds, all months except April, July and August also covered a reasonable proportion of turtle nesting beaches. Ground surveys were also done on five occasions. Turtle tracks/nests were recorded in surveys of part or all of these combined coast sections on 16 occasions between 1993 and 2000. All records were between March and November.

Highest track/nest counts were around 55 and 25 in the Tree Point/Cape Hay area (~14° 02' S 129° 33' E) in November (2000) and September (1995) respectively; 40 and 20 for the Wadeye section (~14° 01' S 129° 21' E) in July (1999) and May (2000) and 20 for the Capes Ford and Scott area (~13° 28' S 129° 51' E) in July (1993).

Fresh laying was confirmed in all months between March and October, with most being in the May to September period. Surveys in November revealed a freshly hatched nest but no fresh nests. Surveys in December, January and February recorded no tracks/nests.

All turtle nesting beaches in these coast sections were subject to heavy goanna predation and most also additionally subject to human harvest. No hatched nests were recorded, largely due to such predation.

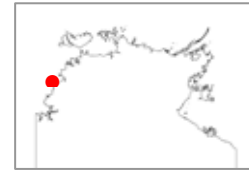
APPROXIMATE SUMMATION OF SPECIES NESTING SIGNIFICANCE IN COAST SECTIONS 2.1-2.7			
[Very High (OOOO), High (OOO), Medium (OO), Low (O) numbers;			
O = Certain, ⚡ = Probable]			
Flatback *	Green	Hawksbill	Olive Ridley
OO			O

* Refers to the main nesting areas only. These are discussed in the text above. Other areas would have a single symbol representing low numbers.

OCCURENCE OF LAYING (ALL SPECIES COMBINED) BY MONTH											
IN COAST SECTIONS 2.1-2.7											
O = Egg laying confirmed; X = Nil egg laying recorded;											
? = Not surveyed or presence of current laying not assessed											
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
X	X	O	O	O	O	O	O	O	O	X	X

Coast Section 2.6

Site(s): North Peron Island (13° 09' S, 130° 01' E).




North Peron Island (~ 2 000 ha) and South Peron Island (~500 ha) are two predominantly sand and mud islands about half way along the western coast of the NT, which has relatively few islands. The southern of these two nearby islands has only a small amount of marine turtle nesting and is not individually discussed. The northern island has appreciably more and is one of the three or four best areas for turtle nesting along the NT western coast. All nesting on North Peron Island occurs along the western half of the southern shoreline and along the entire western shoreline of the island. Together these shorelines include approximately 12 km of unbroken turtle nesting beach. The only species recorded nesting in this coast section was the Flatback Turtle.

Turtle nesting was recorded on 16 of the 32 surveys of North Peron Island between 1992 and 1996. These surveys covered every month of the year except April and November. On five of these occasions ground surveys were also included. These were also well spread in terms of monthly coverage.

Track/nest records, including observations of fresh laying, were made in every surveyed month from February to September. Hatched nests in June confirmed laying in April. No tracks/nests were recorded in surveys in the months of October (but this was done very late in that month), December and January.

Highest track/nest counts of 50-100 were recorded between June and September. No surveys were done between mid September and late October, so nesting could have continued into October as was found on adjacent parts of the mainland coast.

North Peron Island has a number of large goannas (*Varanus panoptes*) living on the island. As there are no dogs or Indigenous people living on the island these days there is little to prey on these goannas, which now predate heavily on the turtle eggs. It was rare to find a nest more than a few days old not dug into by goannas, sometimes from multiple angles by possibly different goannas. Despite numerous nest checks not a single successfully emerged nest was recorded on this island, although prevailing dry season winds would likely remove signs of hatchling trails very quickly.

APPROXIMATE SUMMATION OF SPECIES NESTING SIGNIFICANCE IN COAST SECTION 2.6			
[Very High (OOOO), High (OOO), Medium (OO), Low (O) numbers;			
O = Certain,  = Probable]			
Flatback	Green	Hawksbill	Olive Ridley
OOO			

OCCURENCE OF LAYING (ALL SPECIES COMBINED) BY MONTH											
IN COAST SECTION 2.6											
O = Egg laying confirmed; X = Nil egg laying recorded;											
? = Not surveyed or presence of current laying not assessed											
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
X	O	O	O	O	O	O	O	O	?	?	X



Plate 13. *V. panoptes* disturbed while eating Flatback Turtle eggs on North Peron Island (coast section 2.6), July 1997. Photo R. Chatto.

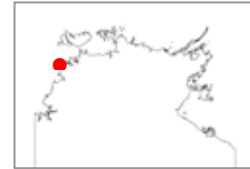


Plate 14. Flatback Turtle nesting beach on the north side of Cape Scott (coast section 2.4), May 2000. Photo R. Chatto.

Coast Section 2.7 – See coast section 2.1.

Coast Section 2.8

Site(s): Mainland coast, Five Mile Beach
 (12° 51.7' S, 130° 20.4' E) to Native
 Point (12° 40.3' S, 130° 21.3' E).



This coast section extends northwards for about 20km from just north of the mouth of the Finnis River, northward to Native Point. This is the only mainland coast section of this bioregion that has reasonably high density turtle nesting. Most occurs in the northern third of this coast section. All of the tracks/nests confirmed to species level (72) were Flatback Turtles.

Turtle nesting was recorded on 17 of the 33 surveys of this coast section between 1992 and 1998. Surveys were done in all months except April, May and November. Ground surveys were only included on two of these occasions. These were done in July (1998) and September (1996). Tracks/nests were recorded in all surveyed months between January and October.

Highest track/nest counts of 50+ were recorded from March through to September, although the March record included some nest pits remaining from the previous season. Surveys in each of January and February recorded only a single track/nest, but numbers began to increase from March onwards.

Fresh laying could be confirmed from in all months from late January to late October, except April. Laying would have almost certainly continued through this month, but there was a lack of surveys at the appropriate time to confirm such. No surveys were done in November, and a December survey did not record any tracks/nests, suggesting nesting had finished by December at the latest but may have finished by November.

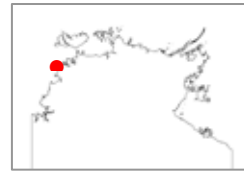
Goanna predation on turtle eggs was found to be very high in this coast section. Being close to the township of Dundee Beach, the beaches are also subject to considerable vehicle traffic, although most of this was away from the dunes and dune bases where most of the nests were laid. One nest was recorded as being taken by humans.

APPROXIMATE SUMMATION OF SPECIES NESTING SIGNIFICANCE IN COAST SECTION 2.8			
[Very High (OOOO), High (OOO), Medium (OO), Low (O) numbers; O = Certain, ⚡ = Probable]			
Flatback	Green	Hawksbill	Olive Ridley
OOO			

OCCURENCE OF LAYING (ALL SPECIES COMBINED) BY MONTH IN COAST SECTION 2.8											
O = Egg laying confirmed; X = Nil egg laying recorded; ? = Not surveyed or presence of current laying not assessed											
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
O	O	O	?	O	O	O	O	O	O	?	X

Coast Section 2.9 & 2.10

Site(s): Bare Sand Is. (12° 32.2' S, 130° 25.2' E)
 Quail Is. (12° 31.1' S, 130° 26.1' E).



Bare Sand and Quail Islands are two fairly small sand islands off the northern end of a chain of islands extending northward from Native Point on the mainland. These islands are only 50km south west of Darwin and have always been a popular destination for boating people.

The only species confirmed nesting on these islands during these surveys was the Flatback Turtle, and both islands, but particularly Bare Sand, are important Flatback Turtle nesting sites.

One or both of these islands were surveyed in every month of the year except April, May and November. Turtle nesting data were recorded on 16 occasions on these islands between 1993 and 2004. Ground surveys were done on five of these occasions, in the months of February, August and September. Tracks/nests were recorded in every surveyed month, except December.

Track/nest counts of 50+ on each island were regularly recorded in surveys from June through to September, but consistent strong winds through the main nesting period in the dry season obscured signs of nesting that would otherwise be observable from surveys. Counts were probably markedly lower than true numbers. Mick Guinea and Scott Whiting (*pers. comms.*) who have both conducted intensive long-term marine turtle studies on these islands recorded 5-10 Flatback Turtles nesting on average each night in June and July.

Fresh laying could be confirmed in every month from December through to late October. Although no tracks were recorded in the December (1992) survey a recently hatched nest located in a February (1996) survey confirms late laying in this month in some years at least.

The good number of turtles nesting on the islands, and the lack of egg predation, rate these islands as one of the more important Flatback Turtle nesting areas in the NT. Both islands, however, had many birds (for example Nankeen Night Herons, Eastern Reef Egrets, Black-necked Storks and Beach Thick-knees) preying on emerging hatchlings at night, as evidenced by examining tracks left overnight.

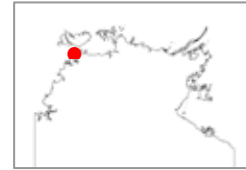
Although no other species of turtles were recorded nesting on these islands during these surveys, Mick Guinea and Scott Whiting (*pers. comms.*) have also recorded occasional Olive Ridley Turtle nesting.

APPROX. SUMMATION OF SPECIES NESTING SIGNIFICANCE IN COAST SECTIONS 2.9&2.10			
[Very High (OOOO), High (OOO), Medium (OO), Low (O) numbers;			
O = Certain, ⚡ = Probable]			
Flatback	Green	Hawksbill	Olive Ridley
OOO			O

OCCURENCE OF LAYING (ALL SPECIES COMBINED) BY MONTH											
IN COAST SECTIONS 2.9&2.10											
O = Egg laying confirmed; X = Nil egg laying recorded;											
? = Not surveyed or presence of current laying not assessed											
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
O	O	O	O	O	O	O	O	O	O	?	O

Coast Section 2.11

Site(s): Indian Is. (12° 34.6' S, 130° 30' E).



Indian Island is a long, narrow, well forested island (~2 700 ha) which has a 2 km turtle nesting beach at the north end and another much smaller nesting beach on the northern part of the eastern side of the island. This latter beach had only a single record of six tracks/nests so discussion for this coast section will relate only to the northern beach on the island. The island, which is about 17km by 3km is located at the entrance to Bynoe Harbour and is within 10km of the two islands (Bare Sand and Quail) discussed in the previous section.

Indian Island is mostly used by Flatback Turtles, but has considerably fewer nests than Bare Sand and Quail Islands. It is also subject to considerable egg predation by goannas. The single other species recorded nesting on this island, the Olive Ridley Turtle, was also the subject of such goanna predation when located in March (1995).

Turtle nesting data were recorded in nine surveys of this island between 1993 and 1997. These records were made in most months between late March and mid October. No surveys were done between November and February. Ground surveys were done on four of these occasions, in the months of March (1995) and August (1995 and 1997).

Tracks/nests were recorded on every survey between late March (1995) and late October (1995), with fresh laying able to be confirmed in each month throughout this time period. The highest single track/nest count in June (1996) was around 30. A higher count of 41 nests predated by goannas in August (1997) was recorded. This count could have included nests predated from the previous season because predated nests remain obvious for a long period compared to nests that have not been dug into and hatch naturally. Two surveys six days apart at this time (in August) recorded six new Flatback Turtle nests, or an average of one per night, in the time period.

APPROXIMATE SUMMATION OF SPECIES NESTING SIGNIFICANCE IN COAST SECTION 2.11			
[Very High (OOOO), High (OOO), Medium (OO), Low (O) numbers;			
O = Certain, O = Probable]			
Flatback	Green	Hawksbill	Olive Ridley
OO			O

OCCURENCE OF LAYING (ALL SPECIES COMBINED) BY MONTH											
IN COAST SECTION 2.11											
O = Egg laying confirmed; X = Nil egg laying recorded;											
? = Not surveyed or presence of current laying not assessed											
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
?	?	O	O	O	O	O	O	O	O	?	?

Additional Site Note – Casuarina Beach, Darwin (12° 20.6' S. 130° 52.8' E.).

Casuarina Beach is one of the popular Darwin beaches. One of us (RC) has been monitoring this beach (of approximately eight km in length) for turtle nesting each year since the mid 1990s, with all nests being recorded from the 1999 season to the 2006 season. As well as ensuring the security of turtle nests laid on this beach, the nesting of turtles has formed part of a large public education and viewing program, particularly focused on the hatchlings. Because of the dual aspects of the Casuarina Beach turtle nesting program, it will be written up in a separate publication at a later stage.

Of 107 nests recorded during this program, 104 have been Flatback Turtles, two Olive Ridley Turtles and a single Green Turtle. (This Green Turtle nest was the only one recorded between Darwin and the West Australian border during the survey period). Once consistent monitoring of Casuarina Beach began in 1999, the number of Flatback Turtle nests recorded during each dry season (between March and November) varied from seven (in 2000 & 2005) to 20 (2006). Between the 1999 and 2006 seasons nests were laid in all months of the year from March to November. Most nesting occurred in the month of September (n=27), followed by August (n=15), May (n=14), June (n=12) and October (n=11). Fewer nests were found in April (n=1), March (n=3) and July (n=7). The July counts are of interest. This is usually the coldest month of the year in Darwin and may signal a bit of a separation period between May/June nesting individuals and August to October nesting individuals. This may also be a consideration with Flatback Turtle nesting in other parts of the NT.

Clutch sizes varied with individual turtles and the number of the clutch the individual was laying for the season, but in total varied from 27 to 68, with an average of 48.5 (n=74). Nests monitored and protected through to hatching showed incubation periods from around 53 days in the earlier, cooler (Apr-Jun) part of the year, though to around 43 days in the later, warmer (Aug-Sept) part of the year. Hatching emergence of relocated nests was in excess of 80% of eggs overall.

Only a sample of the records from this program were used in this report so as to indicate species breeding range on an NT basis. Using all records of this much more intensively monitored area compared to the rest of the coast would considerably bias this site as appearing a high density nesting site, when it is not. Casuarina Beach would rate a 'low' rating (i.e. single turtle symbol) for numbers on the summary table system used for other coast sections in this report. Rather than density of nesting, its significance derives from the education program and the fact that this beach is the only capital city beach in the world to have Flatback Turtles nesting right on a city beach.

Non-nesting Notes

The waters of Fog Bay in the northern part of this bioregion were found to be a very important feeding area for Olive Ridley Turtles. This was initially discovered via an investigation into reports of some dead turtles that washed ashore in late November/early December 1991 (Guinea and Chatto, 1992). Investigations suggested between 200 and 300 marine turtles had been killed in a shark netting operation. The operation involved the use of very large mesh sizes of 17 inch (43cm) or possibly 27 inch (68.5cm) which are much more likely to catch turtles than small meshed gill nets. The operation also involved leaving the nets set on the bottom for periods of 30 hours or longer. (Subsequent to this incident legislative changes were made to prevent use of these gear types and fishing methods).

Of 100 turtles found washed ashore dead in a 20 km section of coast, 86 were adult Olive Ridley Turtles. (Of 59 sexed, 34 were male and 25 female. The average curved carapace length was 66cm and curved carapace width 64cm). The other dead turtles examined consisted of eight Flatback Turtles, five Loggerheads and one Hawksbill Turtle. Only Flatback Turtles and very rarely Olive Ridley Turtles nest in this general area, so it is likely the large number of Olive Ridley Turtles were using this bay as a

feeding area. This was confirmed by examination of stomachs of a few specimens. These were full of small gastropods including *Turritella terebra* and *Nassarius crematus*. The time of year during which these deaths occurred is also well outside the known nesting time for Olive Ridley Turtles in the NT. The nearest major nesting site for this species is the Tiwi Islands (see Tiwi Bioregion section of this report).

Also within this bioregion a significant feeding area for sub-adult Green Turtles (mostly) and Hawksbill Turtles is located on the reefs between the northern tip of the mainland at the northern end of Fog Bay and the island chain commencing in the south with Dum In Mirrie Island. In excess of 150 sub-adult turtles were located during an aerial survey to investigate the above incident. Many of these turtles have been tagged over a number of years and the site is a study site of Mick Guinea of Charles Darwin University from whom more information can be obtained.



Plate 15. Sub adult Green Turtle from the Dum In Mirrie Island area mentioned above. Photo S. Whiting.

Table 2. Locations of significant nesting activity in the Anson Beagle Bioregion with combined sum of nests and tracks >5 for all surveys between 1991 and 2004 and number of surveys (number of unique visit dates) for each coast section.

Coast section	Observation	Flatback Turtle	Green Turtle	Mix of Flatback or Green	Hawksbill Turtle	Olive Ridley Turtle	Mix of Hawksbill or Olive Ridley	Unknown species	No. of surveys
2.1 Wadeye coast	Nest	50							11
	Tracks	6		3				1	
2.2 Dorcherty Is	Nest	18		40		1			11
	Tracks							22	
2.3 Mangrove creek to Cape Dombey	Tracks	1						27	15
2.4 Cape Ford to mangrove creek	Nest	6							17
	Tracks							19	
2.5 Anson Bay south	Tracks							21	25
2.6 Perron Is North	Nest	169		2				50	32
	Tracks	65		7				143	
2.7 Point Jenny to near Channel Point	Nest	7							28
	Tracks	7		14				27	
2.8 Native Point to Five Mile Beach	Nest	8						109	33
	Tracks	63		1				384	
2.9 Bare Sand Is	Nest	103						50	14
	Tracks	52						287	
2.10 Quail Island	Nest	33						53	15
	Tracks	31						220	
2.11 Indian Is north end	Nest	55		1			1		15
	Tracks	6						61	

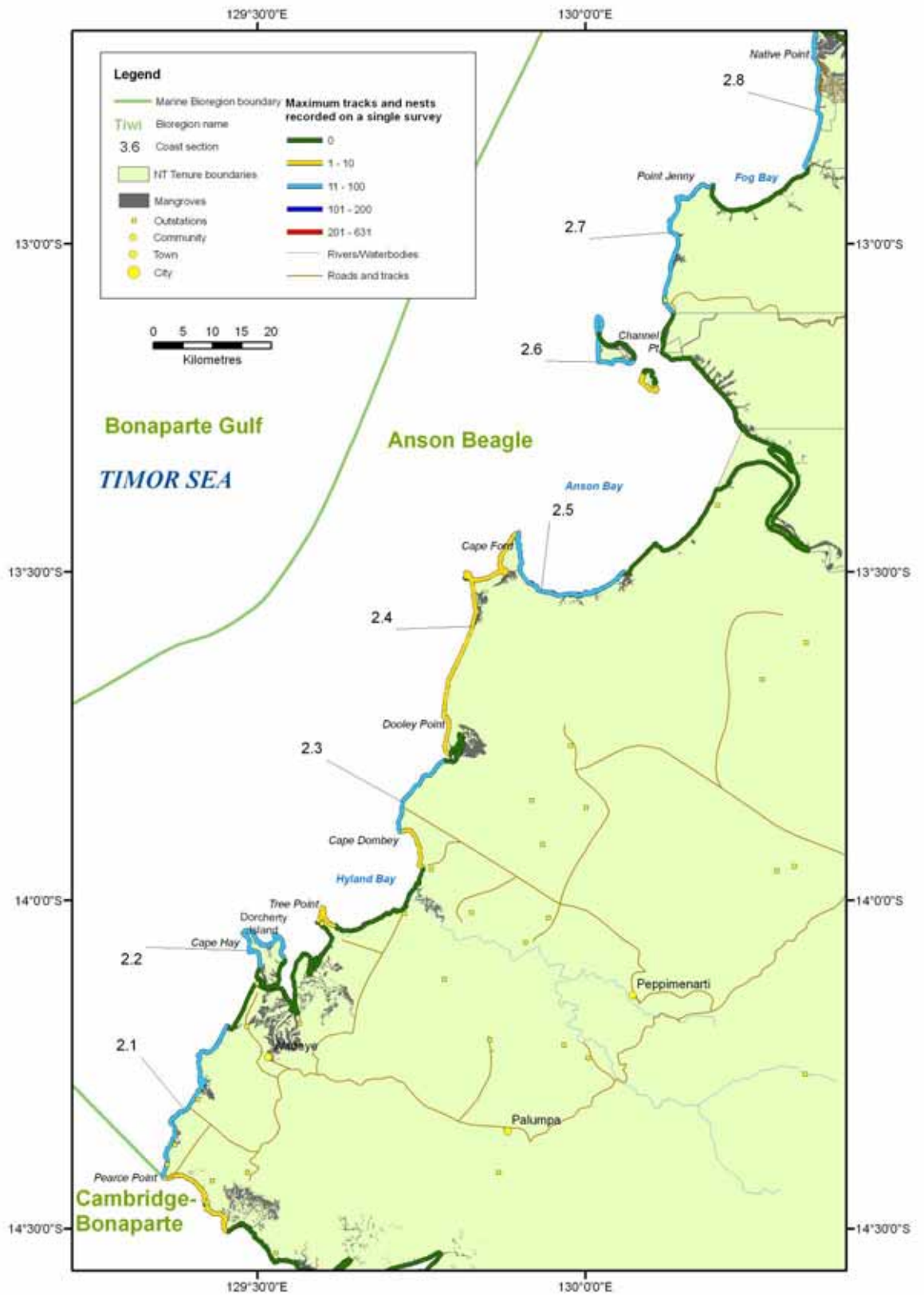


Figure 12. Relative importance of nesting beaches using maximum sum of nests and tracks of all species in a single survey between 1991 and 2004 in the Anson Beagle Bioregion (southern section).

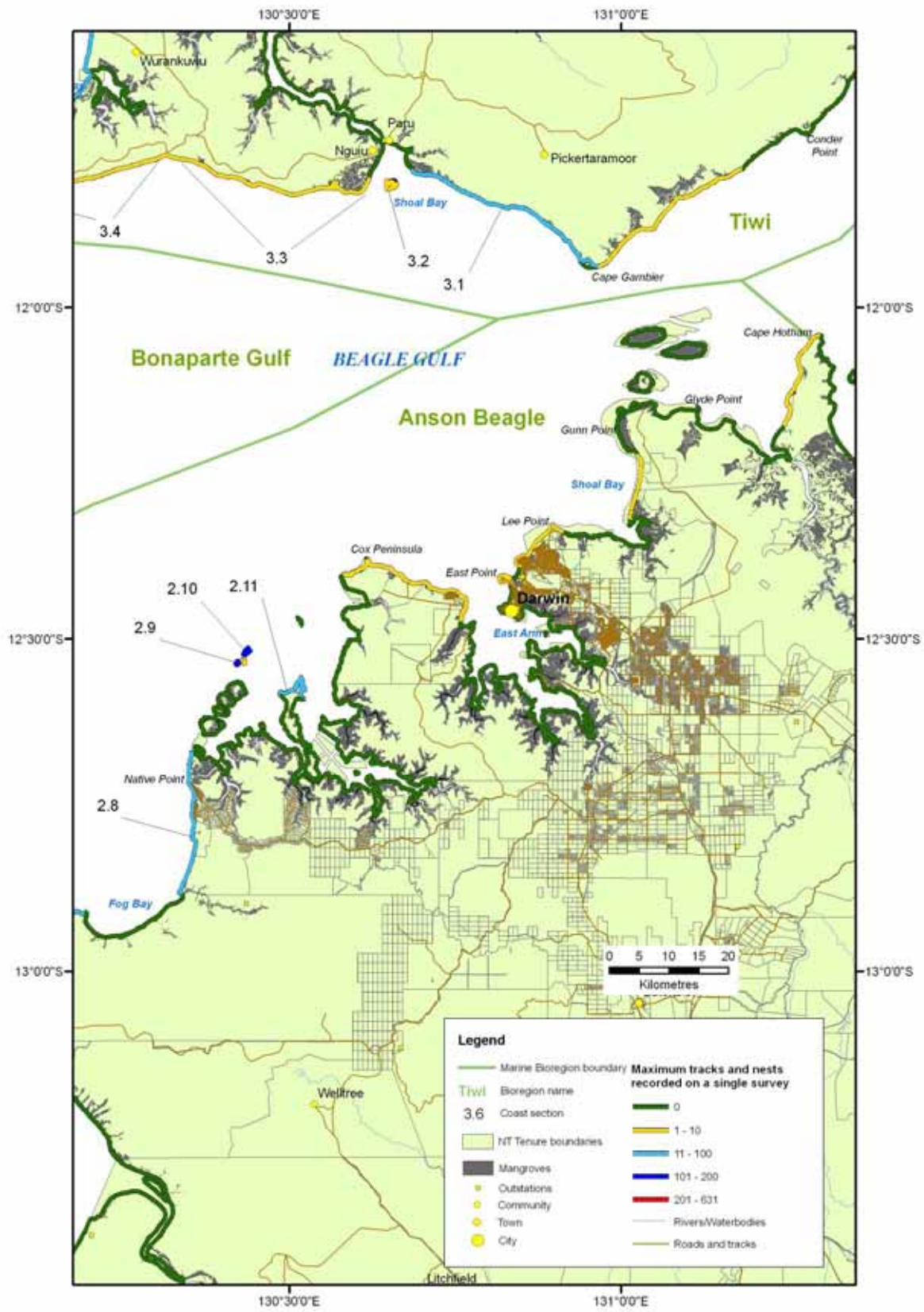


Figure 13. Relative importance of nesting beaches using maximum sum of nests and tracks of all species in a single survey between 1991 and 2004 in the Anson Beagle Bioregion (northern section).

Tiwi

Location and description

The Tiwi Bioregion includes the Tiwi Islands. These are located approximately 80km to the north of Darwin. They include the main islands of Melville (second largest in Australia) and Bathurst, and two smaller islands at either end of the Apsley Straits which separates the two larger islands. There are four main settlements on the Tiwi Islands which are home to around 2 500 people.

For simplicity this report includes the southern coasts of the Tiwi Islands in the Tiwi Bioregion. These are usually included within the Anson Beagle and the Van Diemens Gulf Bioregions. Annual rainfall within the Tiwi Bioregion varies between 1 400 and 1 800 mm, and tidal ranges vary from 2-4 m. The northern coasts include numerous, deeply indented bays and inlets with sandy beaches at the bases of some. The northern coast also includes exposed sections of coast. There are extensive areas of mangroves around the island, particularly in sheltered inlets and creeks. There are also a number of intermittent fringing reefs occurring off prominent headlands. The south eastern coast of Melville Island is dominated by reasonably large areas of intertidal mud and sand flats that are exposed at low tides, while the southern coast of Bathurst Island has some fairly extensive sand dunes for the western side of the Top End.

There are a small number of coastal community outstations on the islands, most around the coast, but the three main population centres are in the north west of Melville Island and the south east of Bathurst Island. The Tiwi Islands are all Aboriginal land and consequently the population is mostly Aboriginal. Turtle hunting and turtle egg collecting are important activities.

Survey effort

A total of 25 survey days were conducted between 1993 and 2004 in the Tiwi Bioregion. Surveys were more frequently done in June than any other month (Figure 14). No surveys were done in the months of January, July, November and December.

The length of coast is 965 km (9% of the NT coast) and the length of coast where wildlife records were not obtained on any survey was 25 km (2.5% of the bioregion).

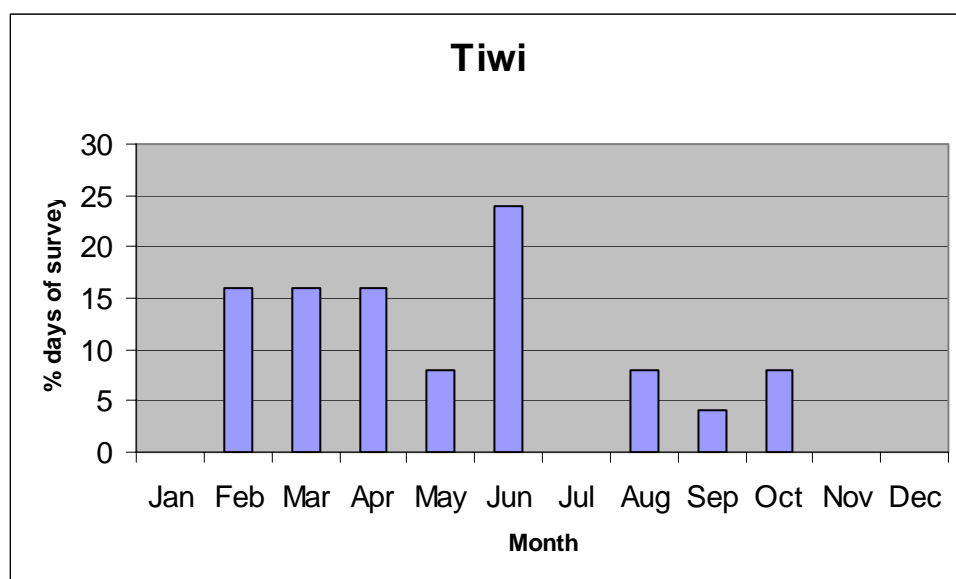


Figure 14. Survey effort by month between 1993 and 2004 in the Tiwi Bioregion.

Nesting Summary

The Tiwi Islands are very important for marine turtle nesting. The most important nesting areas are along the western coast of Bathurst Island (particularly in the south, and to a lesser extent the north) and in numerous spots along the northern coast of Melville Island. All four species of marine turtle known to regularly breed in the NT were recorded breeding in this bioregion, with nesting dominated by Flatback and Olive Ridley Turtles. The large amount of Olive Ridley Turtle nesting at some sites suggests they are likely to be of national significance.

Nesting areas throughout this bioregion are mapped, by the highest counts for any single survey, in Figure 15, at the end of the bioregion's coast section summaries.

Total numbers of tracks and nests per month for all nesting on islands and mainland beaches in the bioregion is shown in Figure 60, Appendix A.

Coast Section Discussions

Thirteen individual coast sections (3.1 to 3.13) are listed within this bioregion. Track and nest counts for each of these sections are given in Table 3 and the numbered coast sections are shown in Figure 15. The most significant of these coast sections are discussed in more detail below. As this bioregion has nesting around most of its coast, this section of the discussion will look at the main areas moving clockwise around the coast from the south east of Melville Island.

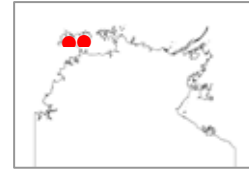


Plate 16. Dingo/dog digging into nest on NE Melville Island, February 1994. Photo R. Chatto.

Coast Sections 3.1, 3.2, 3.3, 3.4 & 3.13**Site(s):** Southern coast Melville & Bathurst Islands

from 11° 49.3' S, 130° 02.7' E

to 11°28.1' S, 131° 30.8' E.



The southern coast of Melville Island (west of Cape Gambier) and the southern coast of Bathurst Island have fairly continuous sandy beaches. Marine turtle nesting along this area is fairly continuous but at low densities. Most of the south eastern coast of Melville Island to the east of Cape Gambier is not very suitable for marine turtle nesting because of the lack of beaches and large areas of intertidal mud and/or sand leading up to a mangrove-lined shoreline. The small amount of nesting that does occur along this part of Melville Island is at the far northern and southern ends. There was also a small amount of nesting on Buchanan Island (coast section 3.2). This is the only island in these coast sections and is located at the southern end of the Apsley Straits that separate Melville and Bathurst Islands. The shallowness of the sand on this island led to many more failures than successful nestings.

Aerial surveys of part or all of these combined coast sections were conducted in the months of February, March, June, August, September and October between the years of 1996 and 2004. There was only a single day (in June, 1996) in which ground surveys were done, but eight separate nesting sites were checked on this day. Turtle tracks/nests were recorded in each of the survey months except October.



Plate 17. Coast in the SW area of Bathurst Island, June 1999. Photo R. Chatto.

Counts of tracks/nests along these combined coast sections varied between four (February, 1996) and 47 (September, 1996). The higher track/nest counts were in June and September, although there would be some accumulation of nesting efforts in these figures. Even the highest count still represents a low density of nesting because of the long length (~200 km) of coast in these combined coast sections. Tracks/nests were nearly always recorded as scattered single events, rarely were two or three recorded within 100 m or so of each other.

Twenty-two out of 24 ground checks of nests or nesting attempts confirmed Flatback Turtles involved, with the remaining two listed as probably Flatback Turtles. There was no indication from the aerial surveys to confirm any other species, although it would be surprising if the occasional Olive Ridley Turtle did not nest along here given records of them nesting in other nearby areas.

Fresh laying could be confirmed in all months from February to September, except the month of April. Laying would have almost certainly continued through this month, but there was a lack of surveys at the appropriate time to confirm such. The October survey was done very late in the month so nesting could have continued into the earlier parts of October given the dominant species was the Flatback Turtle which was recorded breeding through until this time and later along other nesting beaches in the adjacent Anson-Beagle Bioregion.

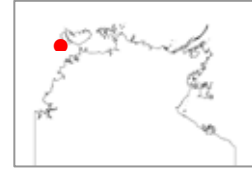
No predation of eggs was recorded in these coast sections, but ground checks were very limited. Vehicle tracks were observed along the beach and on tracks behind the dunes or mangroves.

APPROXIMATE SUMMATION OF SPECIES NESTING SIGNIFICANCE IN COAST SECTIONS			
3.1, 3.2, 3.3, 3.4 & 3.13			
[Very High (OOOO), High (OOO), Medium (OO), Low (O) numbers;			
O = Certain, O = Probable]			
Flatback	Green	Hawksbill	Olive Ridley
O			

OCCURENCE OF LAYING (ALL SPECIES COMBINED) BY MONTH											
IN COAST SECTIONS 3.1, 3.2, 3.3, 3.4 & 3.13											
O = Egg laying confirmed; X = Nil egg laying recorded;											
? = Not surveyed or presence of current laying not assessed											
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
?	O	O	?	O	O	O	O	O	X	?	?

Coast Section 3.5

Site(s): SW Bathurst Is, from 11° 48.5' S, 130° 02' E
to 11° 40.2' S, 130° 05' E.



The density and diversity of marine turtle nesting increases dramatically moving around the south western tip of Bathurst Island from the southern to the western coasts. The approximately 20 km of coast on the south western tip of Bathurst Island, between Capes Fourcroy and Helvetius, was recorded to have very significant marine turtle nesting (mostly Flatback Turtle), particularly in the south. Nesting was widespread along nearly all beaches of this part of Bathurst Island, with a number of the smaller bays along this rocky and sandy coastline having high density nesting. Many of the bays have protection from the dry season south easterly winds and this may affected the persistence of older tracks and nest signs and so have influenced counts.

Species confirmed nesting in this coast section were Flatback, Green and Olive Ridley Turtles.

Aerial surveys of part or all of these coast sections were conducted in the months of February, March, June, August, September and October between the years of 1994 and 2004. Five ground surveys were also conducted in three separate areas covering each of the above mentioned months except February. Ground checks were concentrated on the southern part of this coast where the denser nesting bays were located.

Turtle tracks/nests of all species combined were recorded in each month of survey, except in the (late) October aerial survey. The highest count of tracks/nests for all species combined was 290+ in a June survey. The June and the (early) September surveys revealed considerably higher counts than February and March surveys.



Plate 18. Good nesting beach near Point Fawcett (coast section 3.5) in the SW area of Bathurst Island, June 1999. Photo R. Chatto.

Although small numbers of Olive Ridley Turtle tracks/nests, and the odd Green Turtle track/nest was located in this coast section, the dominant nesting species recorded was clearly the Flatback Turtle. In a March ground survey, 16 of 19 tracks/nests confirmed to species level were Flatback Turtle, with the remaining three being Olive Ridley Turtle. A September ground check revealed 13 of 14 nests were confirmed as Flatback Turtle, with the remaining one confirmed as a Green Turtle.

Survey results showed that laying of all species combined could be confirmed in all months from January to September, except April. This is almost certainly due to a lack of surveying rather than lack of nesting, particularly considering the species involved. There was significantly more Flatback Turtle nesting recorded between June and September suggesting this period, at least, to be part of their primary nesting period. The presence of tracks/nests in early September, but not by late October suggests laying ceased or dropped markedly during this period. Olive Ridley Turtle nests were recorded in February, March and June, but not after this latter month. There was not enough Olive Ridley Turtle nesting recorded to suggest a primary nesting period within these months. Single Green Turtle nests were recorded in June and September.

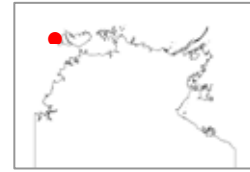
These beaches were all subject to extensive egg predation from dogs, goannas and traditional harvesting – dogs being the most frequent/successful, largely due to their nocturnal hunting before the daylight goanna predation or harvesting could get to the nests. The June (1999) ground survey of one of the high density nesting bays in the northern half of this coast section recorded in excess of 100 nests taken. There was no count of nests that had avoided predation but examples of these were hard to find in a beach covered in tracks and egg shells.

APPROX. SUMMATION OF SPECIES NESTING SIGNIFICANCE IN COAST SECTIONS 3.8&3.9			
[Very High (OOOO), High (OOO), Medium (OO), Low (O) numbers;			
O = Certain, O = Probable]			
Flatback	Green	Hawksbill	Olive Ridley
OOO	O		O

OCCURENCE OF LAYING (ALL SPECIES COMBINED) BY MONTH											
IN COAST SECTIONS 3.8&3.9											
O = Egg laying confirmed; X = Nil egg laying recorded;											
? = Not surveyed or presence of current laying not assessed											
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
O	O	O	?	O	O	O	O	O	X	?	?

Coast Sections 3.6 & 3.7

Site(s): Western coast of Bathurst Island from just south of Port Hurd (11° 40.5' S, 130° 11.4' E) to Brace Pt. (11° 19.3' S, 130° 20.5' E).



These two coast sections cover the remainder of the western and northern coast of Bathurst Island. With the exception of the southern part of Gordon Bay, widespread nesting of varying density was recorded along the full length of this coast. The main nesting areas are either side of Port Hurd and between Rocky and Deception Points. Other parts of this coastline, such as the coast for a few kilometres to the west of Brace Point and to the south of Rocky Point had only occasional nests recorded.

Species confirmed nesting in these coast sections were Flatback, Green and Olive Ridley Turtles. Flatback Turtles were the most frequently recorded overall (particularly in the south), followed by Olive Ridley Turtles which increased in numbers in the more northern parts of these coast sections. Only the occasional Green Turtle was recorded.

Aerial surveys of part or all of these coast sections were conducted between 1993 and 2003. These surveys covered most months between February and October. Ground surveys covering seven well spread sites were done in May, June and September. No surveys were done from November to January. Turtle tracks/nests of all species combined were recorded in each of the surveyed months.

Counts of 50 to 100 tracks/nests for all species combined were recorded in May, June and September surveys for the two combined coast sections. February and March counts were considerably fewer, suggesting less nesting in this early part of the year. There was also a big drop in numbers between September and October.



Plate 19. Olive Ridley and Flatback Turtle nesting beach near Brace Point (coast section 3.7) on the NW of Bathurst Island, September 1996. Photo R. Chatto.

Survey results showed that laying of all species combined was confirmed in all months from January to October, except April and July. This is almost certainly due to a lack of surveying rather than lack of nesting, particularly considering the species involved.

Within the confirmed laying period for all species, Flatback Turtle laying was confirmed in May, June, August and September, and likely also in February. This suggests laying in all months from February and September. Fresh Olive Ridley Turtle nests were confirmed in the same months as for Flatbacks indicating a similar laying season, but the highest numbers being in June suggesting that June and the previous two months at least may have formed part of their main laying period for Olive Ridley Turtle, whereas the larger percentage of the June to September period was more likely to be Flatback Turtles.

Most nesting in these coast sections was subject to considerable predation by goannas, dogs, pigs and humans. In one June ground check just north of Rocky Point 28 of 36 nests had been predated at egg stage. The signs of dug up nests and chewed eggs scattered around tend to remain visible for longer periods of time compared to untouched nests, but it still appeared the chances of hatchlings successfully emerging were not high for the majority of nests in these coast sections. Bandicoot tracks at previously dug up nests were observed at a number of locations, but it could not be shown that they did the initial digging into the nests. It could be shown from tracks however that bandicoots were active among hatchlings moving down the beach, and being the only tracks present when a hatchling trail suddenly ceased.

APPROX. SUMMATION OF SPECIES NESTING SIGNIFICANCE IN COAST SECTIONS 3.6 & 3.7			
[Very High (OOOO), High (OOO), Medium (OO), Low (O) numbers;			
O = Certain, ⚡ = Probable]			
Flatback	Green	Hawksbill	Olive Ridley
OOO	O		OO⚡

OCCURENCE OF LAYING (ALL SPECIES COMBINED) BY MONTH											
IN COAST SECTIONS 3.6 & 3.7											
O = Egg laying confirmed; X = Nil egg laying recorded;											
? = Not surveyed or presence of current laying not assessed											
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
O	O	O	?	O	O	?	O	O	O	?	?

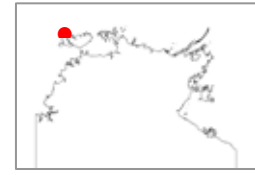
Coast Sections 3.8 & 3.9

Site(s): Melville coast either side of Cape Van Diemen

from 11° 16.5' S, 130° 23.3' E

to 11° 19.3' S, 130° 36.3' E, and

Seagull Is. (11° 07.1' S, 130° 20' E).



These two coast sections cover the north western area of Melville Island and a small island, locally known as Seagull Island. This island is about 1 km long by 150 m wide and is about 5 km off Cape Van Diemen, which is the NW tip of Melville Island. Nesting occurs all around Seagull Island and from about 15 km south of Cape Van Diemen around to about 35 km along the coast to the south east of this point. Most nesting is concentrated within about 10 km either side of Cape Van Diemen and on Seagull Island. This whole area is particularly important for Olive Ridley Turtles, but there are also reasonable numbers of Flatback Turtles nesting on the same beaches. It is also one of the few sites within the NT where all four of the marine turtle species regularly breeding in the NT were confirmed nesting, albeit including only a small number of Green Turtles and a single Hawksbill Turtle.

Twenty-one aerial surveys were done of all or parts of these two combined coast sections between 1993 and 2004. These surveys covered all months from February to October, except July. For all species combined and for each separate coast section, counts of in excess of 40 tracks/nests were made in February and in excess of 75 for all other surveyed months. Counts in excess of 120 were made in each month from March to June and in October. The high counts early in the year are influenced by the large numbers of Olive Ridley Turtles nesting in this area. This species has an earlier nesting peak than the Flatback Turtles.

Ground surveys were also conducted in each of the above mentioned aerial survey months, except October. These surveys showed Olive Ridley Turtles to be clearly the dominant nesting species. Tracks/nests identified to species level throughout all surveys recorded Olive Ridley Turtles a total of 371 times to 102 for Flatback Turtles. The percentage of Olive Ridley Turtles is even higher in the main Cape Van Diemen and Seagull Island nesting parts of these coast sections. Flatback Turtles were recorded as more numerous in the eastern parts of this coast section.

Throughout the area as a whole, fresh Olive Ridley or likely Olive Ridley Turtle tracks/nests were recorded in all surveyed months between February and September. Highest counts were recorded from February to June. Freshly hatched nests were recorded in March, April, June and August.


Fresh Flatback Turtle tracks/nests were recorded in all survey months between February and October. Highest counts were recorded between May and September. Freshly hatched Flatback Turtle nests were recorded in March, August and September. Laying of all species combined was confirmed from these surveys to occur in all months from January to October.

The likely national importance of this area for Olive Ridley Turtles had not been recognised prior to these surveys. Once this information was passed onto WWF turtle researcher Dr. Scott Whiting he commenced further and more detailed studies on this area. The specific studies done over the 2004 and 2005 seasons estimated there were around 2 500 Olive Ridley Turtle nests per annum in this area, with nightly numbers varying between 2 and 59 over a 10 km section of beach, which included Cape Van Diemen. He also found that both Olive Ridley and Flatback Turtles nested in all months between February and November, and that the peak for Olive Ridley Turtles was around April/May. He was not able to suggest a peak for Flatback Turtles because of insufficient records for this species in his study area, which is not as heavily used by Flatback Turtles as other parts of the NW of Melville Island.

More detailed information on the nesting biology of Olive Ridley Turtles in this area can be found in Whiting (2007).

Although there were three other small beaches across the north of Melville Island (coast sections 3.10 & 3.11) where Olive Ridley Turtles concentrated in fairly dense nesting efforts, they were not consistently used each season. Of seven seasons these beaches were checked at the appropriate time of the year (April to June) there was substantial nesting in four of the seasons, but only in small numbers in the other three years. However, the north western tip of Melville Island and Seagull Island were used in each of the six years (1993, 1996, 1999, 2001, 2003 and 2004) RC visited the site, and were also recorded nesting in good numbers by Whiting in two other seasons (2005 and 2007) in which RC did not visit the site. Thus it appears this site is used every year. Although Olive Ridley Turtles have a fairly widespread nesting range around the NT there are few places where they nest in concentrated numbers. Melville Island and a few of the islands off north eastern Arnhem Land (discussed in the Arnhem/Wessel Bioregion) are the only such places where this was found in the NT.

An important observation regarding the mainland part of these coast sections relates to the predation of turtle eggs by dogs. All dogs observed were dingo/dog crosses. With the number of domestic dogs in Aboriginal Communities on the islands it is unlikely that many, if any, dogs predated turtle eggs on the Tiwi Islands would be pure dingos. Although there is some egg predation by goannas and traditional harvest by Aboriginals, the predation by dogs is much greater and appeared at each visit to be having a major impact on the success of the turtles nesting on Cape Van Diemen. (There is no animal predation of turtle eggs on Seagull Island). After a number of years of observing such predation on this beach and other similarly effected, important Olive Ridley Turtle nesting beaches along the north of Melville Island, it was decided to apply for Federal funding to control dogs with 1080 baits on these beaches. Previous baiting of dogs on Wigram Island off north eastern Arnhem Land (see Arnhem/Wessel Bioregion discussion) in 1996 had proven a huge success in stopping turtle egg predation. Baiting of the Melville Island sites, with Traditional Owner permission, was carried out in 2003 and 2004. Baiting in 2003 was not totally successful. In this year RC used a concentrated bait stations approach (to which a large resident Cape Van Diemen crocodile took a liking for – eating at least 15 baits in one night without being obviously effected). Using a different technique (scattered single baits) in 2004 resulted in a 100% reduction of dogs at Cape Van Diemen with good success also at the other beaches. Follow up monitoring of the other beaches along the north of Melville Island was restricted to a couple of days after the baiting, at which no dog tracks were recorded after the first night of baiting. However, follow up checks of Cape Van Diemen showed a subsequent total lack of dog predation for a couple of months at least. Further details of this baiting can be found in Chatto (2004).

APPROX. SUMMATION OF SPECIES NESTING SIGNIFICANCE IN COAST SECTIONS 3.8&3.9			
[Very High (OOOO), High (OOO), Medium (OO), Low (O) numbers;			
O = Certain,  = Probable]			
Flatback	Green	Hawksbill	Olive Ridley
OOO	O	O	OOOO

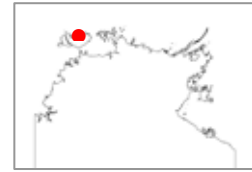
OCCURENCE OF LAYING (ALL SPECIES COMBINED) BY MONTH											
IN COAST SECTIONS 3.8&3.9											
O = Egg laying confirmed; X = Nil egg laying recorded;											
? = Not surveyed or presence of current laying not assessed											
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
O	O	O	O	O	O	O	O	O	O	?	?

Coast Sections 3.10 & 3.11

Site(s): Nth Melville Island coast from Johnson Pt.

(11° 23.5' S, 130° 42' E) to Brenton Bay.

(11° 16.2' S, 131° 10.0' E).



These two coast sections represent the majority of the central northern coast of Melville Island. They cover the coast from the Aboriginal community of Snake Bay (Milikapiti) to just west of the north eastern tip of Melville Island. With the exception of Lethbridge and Brenton Bays and some rocky areas on parts of Point Jahleel, turtle nesting in these coast sections is virtually continuous along the many beaches of this area. Better nesting beaches within these two coast sections were located in the area from just west of Radford Point east to Smokey Point, which is just west of Brenton Bay.

Nesting in these coast sections was again recorded to be dominated by Olive Ridley and Flatback Turtles. Olive Ridley Turtles clearly nested in the highest numbers overall in years when the high density nesting beaches were used (see below), but were not a lot more numerous than Flatback Turtles in other years. No Hawksbill Turtle or Green Turtle nesting was confirmed in these coast sections.

Within these coast sections there are a number of small beaches which, in some years at least, are nested on by large concentrations of Olive Ridley Turtles. Although they also nested along most of these coast sections, three particular (~ ½ km) beaches were found to be heavily used in certain years (e.g. 1996, 1999) but then hardly used in other years (e.g. 2003, 2004). One of these sites was just to the east of Lethbridge Bay, and the other two were between Lethbridge and Brenton Bays. Each site consisted of a short, steep, but narrow beach of the type that Olive Ridley Turtles prefer, and most nests were, as usual, within a few metres of the spring high tide line. Why they nested in large numbers on these beaches in some years but not other years is not known, particularly when they nested in large numbers on Cape Van Diemen in every season surveyed.

Another higher density aerial record of unknown species was recorded just to the west of Radford Point. As both Olive Ridley and Flatback Turtle tracks/nests were observed from the air it is likely that both species use this site.

Despite Flatback Turtle nesting along much of the northern Melville Island coast, there was only one high density Flatback Turtle nesting beach confirmed. This was on the beach immediately to the west of Point Jahleel.

Aerial surveys were done of all or parts of these combined coast sections between 1993 and 2004. These surveys covered all months between February and October, except July. Ground surveys were also conducted in each of the months of aerial surveys except February and October. No surveys of any type were done in the months of November, December or January. Tracks/nests were recorded in months surveyed.

The highest counts of tracks/nests of all species for these combined coast sections were made in May 2000 (150+), June 1999 (120+) and October 1993 (100+). The May and June counts reflected good Olive Ridley Turtle nesting on the high density nesting beaches in the years they were used. Coast section 3.11 had slightly higher numbers of tracks/nests even though a shorter section of coast.

Throughout the area as a whole fresh Olive Ridley or likely Olive Ridley Turtle tracks/nests were recorded in February, March, April, May, June and August. Highest counts were recorded in April, May and June. Freshly hatched nests were recorded in June and August.

Fresh Flatback Turtle tracks/nests were recorded in all survey months between February and October. Highest counts were recorded between May and September. Freshly hatched Flatback Turtle nests were recorded in March and August.

Laying of all species combined was confirmed for all months from January to October.

As was found at Cape Van Diemen (coast sections 3.8 and 3.9), turtle nesting along these coast sections was also heavily predated by dogs and goannas. All ground checks during these surveys showed most nests had been dug up and eaten. Even though dug up nests are more obvious, and remain so for longer periods than surviving untouched nests, it still appeared that the contents of most nests were consumed before hatching. Dr. Mick Guinea (*pers. comm.*) of the Charles Darwin University found a similar situation near Lethbridge Bay in August 2005. Here, he located one untouched nest and 58 dug up and eaten nests

The 2003 and 2004 season dog baiting of important Olive Ridley Turtle ‘hot spots’ on Melville Island also included sites within these coast sections (Chatto, 2004). As with Cape Van Diemen, this led to a marked increase in successful hatching of nests after baiting. Although not examined in depth, general observations of a large drop in the number of Agile Wallaby tracks seen on beaches in surveys in the early to mid 1990s compared to later surveys may have been due to a continuing increase in dog numbers. When the dogs were baited on Wigram Island (see coast section 6.43 summary) not only did a follow up survey two years later show the predation on turtle eggs had ceased, but also that other mammal and reptile tracks on beaches had increased markedly.

Predation of nesting female Olive Ridley Turtles by large crocodiles was also recorded on at least two occasions in these coast sections. Throughout my surveys the few instances of crocodiles killing adult nesting turtles always involved the smaller Olive Ridley Turtles. The northern coast of Melville Island has quite a good population of 5m+ crocodiles for a largely open sandy beach coastline, and this needs to be kept in mind for anyone considering turtle research along these beaches. Another potential conservation issue, although it was not confirmed, was the possible threat to the shallow Olive Ridley Turtle nests by the large numbers of buffalo that walk on some of the beaches.

APPROX. SUMMATION OF SPECIES NESTING SIGNIFICANCE IN COAST SECTIONS 3.10& 3.11			
[Very High (OOOO), High (OOO), Medium (OO), Low (O) numbers; O = Certain, X = Probable]			
Flatback	Green	Hawksbill	Olive Ridley*
OOX	O		OOO

*High numbers in years when high density beaches were used, medium - low numbers in other years.

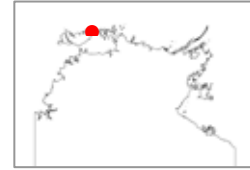
OCCURENCE OF LAYING (ALL SPECIES COMBINED) BY MONTH IN COAST SECTIONS 3.10& 3.11												
O = Egg laying confirmed; X = Nil egg laying recorded; ? = Not surveyed or presence of current laying not assessed												
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
O	O	O	O	O	O	O	O	O	O	?	?	

Coast Section 3.12

Site(s): NE Melville Is. from Brenton Bay

(11° 13.3' S, 131° 13.4' E) to

Tinganoo Bay (11° 24.0' S, 131° 28.9' E).



This coast section represents the remainder of the northern and north eastern coast of Melville Island. It extends from the eastern side of Brenton Bay around to the southern side of Tinganoo Bay. Most of this coast section is more important as a feeding area for turtles than breeding, as discussed in the non-nesting notes at the end of this Tiwi Bioregion summary. Most of the coastline in this coast section is mangrove, rocks and reef habitat and the only turtle nesting occurred in the inner parts of some of the small bays which had sandy beaches. This section of coast is, like most of the north coast of Melville Island, used for nesting mainly by Flatback and Olive Ridley Turtles, with the occasional Green Turtle.

Aerial surveys were conducted of part or all of this coast section between 1993 and 2004. They were carried out in the months of February to June, August and October. Ground surveys at four different sites were done in all of the above months mentioned in relation to aerial surveys, except October. Marine turtle tracks/nests were recorded in all survey months. A record of 11 sets of turtle tracks was also supplied by a Coastwatch flight for the month of September (2003).

The highest combined species count of tracks/nests for the nesting beaches in this coast section was 100+ in an October survey and around 90 in a June survey. In one February ground survey there were in excess of 100 Flatback Turtle tracks/nests recorded, but comment was made that many of the nest pits looked to be from the previous season, even though freshly laid and hatched nests were also present.

Throughout the area as a whole, fresh Flatback Turtle tracks/nests were recorded in all survey months, except October. High counts of tracks recorded in October that were not identified to species level likely included Flatback Turtles given the normal seasonality of the main species nesting in this area. Highest counts were recorded from June to September. Freshly hatched nests were recorded in February and April.



Plate 20. Good Olive Ridley Turtle nesting beach near Harold Point (coast section 3.12) on NE Melville Island, March 2004. Photo R. Chatto.

Fresh Olive Ridley or likely Olive Ridley Turtle tracks/nests were also recorded in all surveyed months except October, but highest counts were recorded earlier, in March, May and June. No freshly hatched nests were recorded for Olive Ridley Turtles in this coast section.

Laying was confirmed for all species combined to have occurred in all months from January to October.



Higher density nesting was recorded on a small beach just to the west of Point Jahleel and three bays, (Boradi, Pulloloo and Tinganoo) in the more southerly part of this coast section.

The first of these areas, the site in the vicinity of Pt. Jahleel, was found to have mostly Flatback Turtles nesting throughout the February to October surveyed months, but with some Olive Ridley Turtles earlier in the season as per their normal higher nesting time of the year in the NT. Olive Ridley Turtle nesting at this site was also subject to variation in numbers between years as it was in the two previous coast sections, though it was never found to have the very high density nesting like the other sites along the north of Melville Island.

The second area of three small bays in the south east of the coast section was not ground checked until 2004. Prior to this, aerial surveys had not often recorded tracks/nests to species level but had recorded some high counts in the area, for example June 1996 and March 2004. A ground survey of Pulloloo Bay in late March 2004 in response to these latest higher counts confirmed it to be mainly a Flatback Turtle nesting beach, while a ground survey of Boradi Bay in early April 2004 located what may be another very significant area for Olive Ridley Turtle nesting along the northern coast of Melville Island. Some Flatback Turtle nesting was also present at this latter site. At this time, which is before peak nesting and accumulated nest signs are at their highest for Olive Ridley Turtles, this bay had more Olive Ridley Turtle nesting than the other sites (except Cape Van Diemen) along the northern coast of Melville Island.

Although Pulloloo and Boradi Bays are close together, small differences in their beach structures (e.g. Boradi Beach having a shorter, steeper beach) may account for the difference in dominance of the two different species in the two different bays. These sites have not been visited since and needs to be checked in future years.

Fairly frequent nest predation of eggs was again recorded throughout most of this coast section, both by dogs and goannas.

APPROXIMATE SUMMATION OF SPECIES NESTING SIGNIFICANCE IN COAST SECTION 3.12			
[Very High (OOOO), High (OOO), Medium (OO), Low (O) numbers; O = Certain,  = Probable]			
Flatback	Green	Hawksbill	Olive Ridley
OOO	O		OO 

OCCURENCE OF LAYING (ALL SPECIES COMBINED) BY MONTH IN COAST SECTION 3.12												
O = Egg laying confirmed; X = Nil egg laying recorded; ? = Not surveyed or presence of current laying not assessed												
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
O	O	O	O	O	O	O	O	O	O	?	?	

Coast Section 3.13 – Included with Coast Section 3.1.

Non-nesting Notes

Within this bioregion the mangrove and inshore adjacent reef areas along the north eastern coast of Melville Island may be an important seasonal feeding area at high tide. Observations of low hundreds of mostly adult turtles were made at around midday on a February 1996 fixed wing survey (essentially a non-nesting month), but few were observed on a similar midday survey of the same area at high tide in June 1996 (a heavy nesting month). The majority of the individuals could not be confirmed to species from the air, but individuals of Green and Hawksbill Turtles at least were identified. Most specimens appeared to have their carapaces covered in mud and/or growth, making identification more difficult. When present there appeared to be many more turtles than could be accounted by levels of nesting on neighbouring beaches later in the season. There is another similar area east of here on Cobourg Peninsula, which is on the other side of the fast flowing tidal Dundas Straits. This is mentioned in the summary for that bioregion as well.



Plate 21. Good high tide turtle feeding area near Cape Fleeming (coast section 3.12) on the NE of Melville Island, February 1996. Photo R. Chatto.

Table 3. Locations of significant nesting activity in the Tiwi Bioregion with combined sum of nests and tracks >5 for all surveys between 1993 and 2004 and number of surveys (number of unique visit dates) for each coast section.

Coast section	Observation	Flatback Turtle	Green Turtle	Mix of Flatback or Green	Hawksbill Turtle	Olive Ridley Turtle	Mix of Hawksbill or Olive Ridley	Unknown species	No. of surveys
3.1 E. of Cape Gambier to Shoal Bay	Nest	4							6
	Tracks	3		20				20	
3.2 Buchanan Is	Nest	1							8
	Tracks			1				4	
3.3 Shoal Bay to west	Nest	3							8
	Tracks	8		5				1	
3.4 Mitchell Point to east	Tracks	2		17				5	7
3.5 West end Bathurst Is	Nest	78	1	1		3	1	74	7
	Tracks	57	1	22			2	230	
3.6 Gordon Bay to Rocky Pt	Nest	1				1		4	10
	Tracks			20			1	22	
3.7 Rocky Pt to Dudwell Ck	Nest	22	4	5		22	1	87	8
	Tracks	1		9			4	51	
3.8 NW tip Melville Is	Nest	38	5	4	1	181	10	124	19
	Tracks	16	2	68		7	1	444	
3.9 Seagull Is	Nest	43	1			145		80	12
	Tracks	5	1	10	14	38	1	211	
3.10 Johnson Pt to Lethbridge Bay	Nest	13				40	26	6	12
	Tracks	14		36		2	13	188	
3.11 Lethbridge Bay to Brenton Bay	Nest	18				112	77	52	14
	Tracks	1		12		2		81	
3.12 Brenton Bay to Tinganoo Bay	Nest	91	1	2		33		20	13
	Tracks	16	1	10		5	1	244	
3.13 Napier Bay	Tracks							11	8

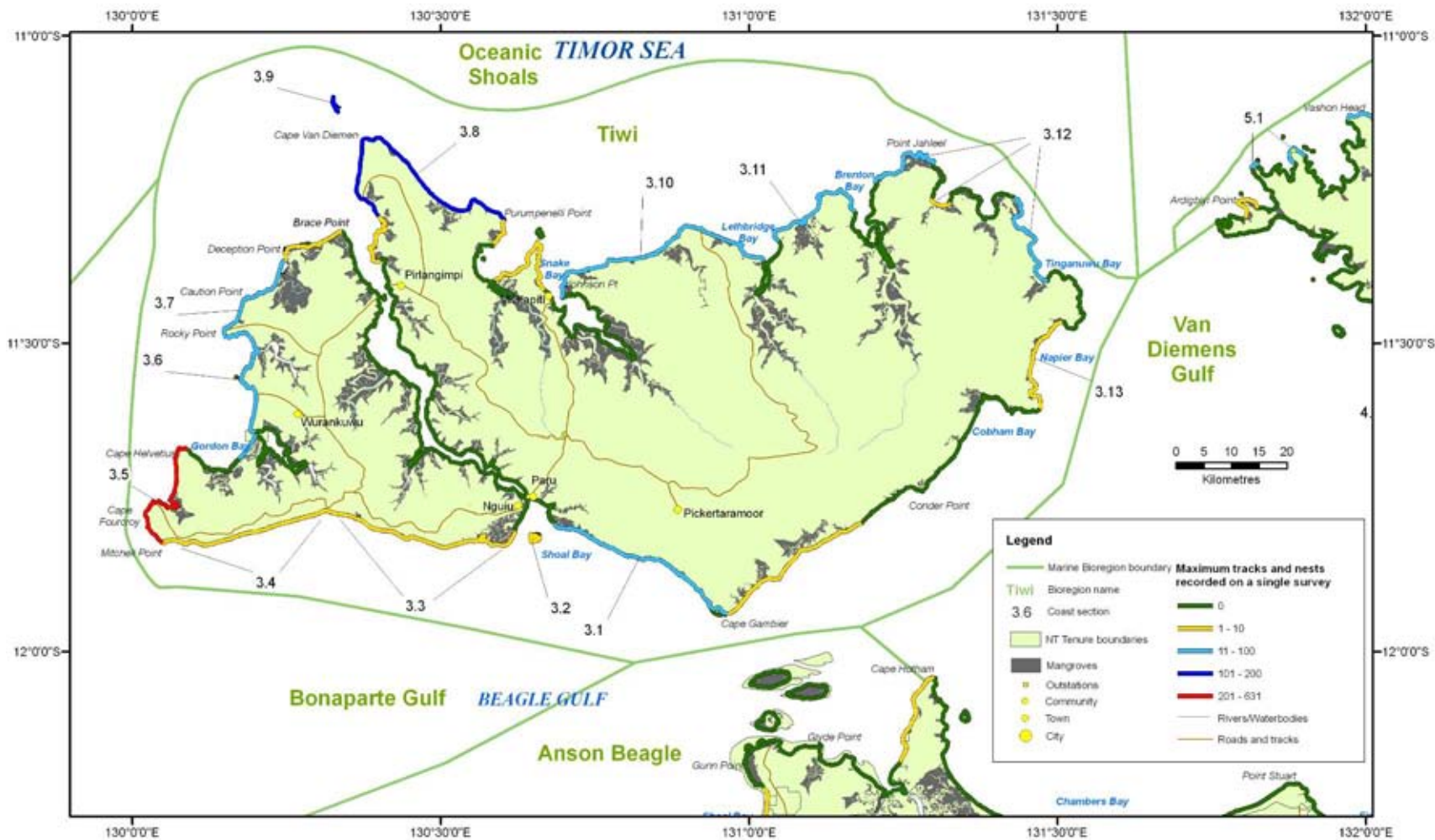


Figure 15. Relative importance of nesting beaches using maximum sum of nests and tracks of all species in a single survey between 1993 and 2004 in the Tiwi Bioregion.

Van Diemens Gulf

Location and description

This bioregion extends from Cape Hotham, just east of the Adelaide River, to Cape Don at the western-most point of Cobourg Peninsula. It includes several islands of relevance to marine turtle nesting that are situated to the south of Cobourg Peninsula and adjacent the mouth of the South Alligator River. As previously mentioned the south eastern coast of Melville Island, normally included in this bioregion, has been considered in the Tiwi Bioregion section.

The climate of the Van Diemens Gulf Bioregion is monsoonal with rainfall ranging from 1 200 to 1 400 mm. The tidal range is 4-6 m. The coast is relatively sheltered from south-easterly dry season winds but is exposed to north-west monsoons. The coast can be categorised into two types: (1) low, flat, alluvial, deltaic estuarine floodplains, with associated chenier dunes and narrow mangrove fringes, particularly in the south; (2) intermittent fringing reefs backed by well developed mangrove forests along the southern coasts of the Cobourg Peninsula. The vast majority of the mainland coast of this bioregion has little sandy beach suitable for marine turtle nesting. Waters are always turbid due to dominance by fine terrigenous sediments, and high wet season discharges occur from the Mary River and the Alligator rivers system.

Most of the coast lies adjacent to Conservation Reserves (Kakadu and Garig Gunak Barlu) or to pastoral properties. There are no permanently occupied towns or settlements around the coast or the islands, but the bioregion's proximity to Darwin and popularity of fishing in and out in front of the rivers sees regular boat usage.

Survey effort

A total of 33 survey days were done between 1991 and 2004 in the Van Diemens Gulf Bioregion (Figure 16). This majority of this bioregion's coast is of little significance for nesting marine turtles but it does have many highly significant areas for waterbirds and shorebirds. It was these species groups that much of the survey effort concentrated on within this bioregion. Surveys that covered the islands in which nearly all the bioregion's marine turtle nesting occurred were done in the months of February, April, May, June, October and November.

The length of coast is 750 km (7% of the NT coast) and the length of coast where wildlife records were not obtained on any survey was 25 km (3% of the bioregion). All months were surveyed with most surveys occurring in August.

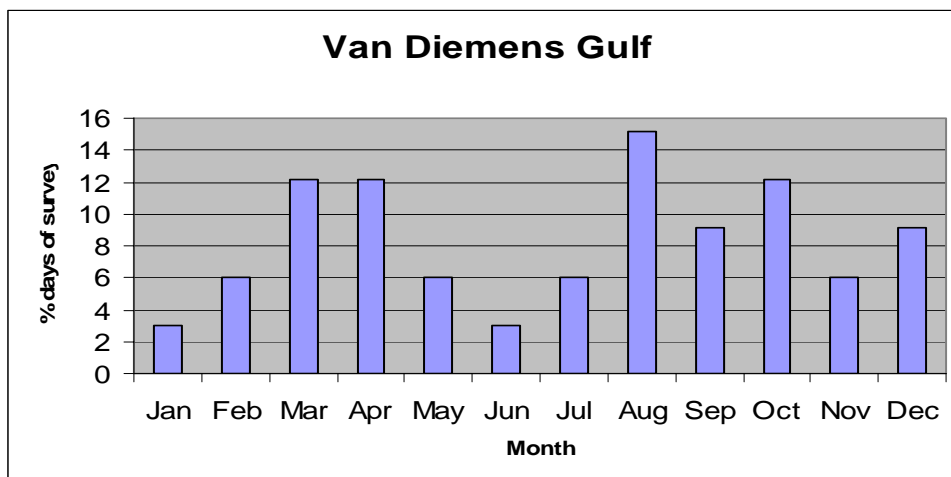


Figure 16. Survey effort by month between 1991 and 2004 in the Van Diemens Gulf Bioregion.

Nesting Summary

Most of the islands in the Van Diemens Gulf Bioregion that have any suitable sandy beach present were recorded to have some nesting activity, but several are quite important for marine turtle nesting. These include Greenhill Island, Mogogout Island and Wangoindjung Island in the north and Field Island in the south. Greenhill Island is the most significant of these.

The only mainland nesting for this entire bioregion was located on one of the very few beaches. The site was located between the West Alligator and Wildman Rivers along the southern shoreline of Van Diemen Gulf. As numbers of tracks/nests were less than five it is not recorded in the accompanying tables for this bioregion.

Apart from the occasional Olive Ridley Turtle, nesting in this bioregion was recorded as dominated by Flatback Turtles.

Nesting areas throughout this bioregion are mapped, by the highest counts for any single survey, in Figure 17, at the end of the bioregion's coast section summaries.

Total numbers of tracks and nests per month for all nesting on islands and mainland beaches in the bioregion is shown in Figure 61, Appendix A.

Coast Section Discussions

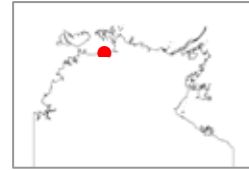
Five individual coast sections (4.1 to 4.5) are listed within this bioregion. Track and nest counts for each of these sections are given in Table 4 and the numbered coast sections are shown in Figure 17. The most significant of these coast sections are discussed in more detail below.



Plate 22. High tide along Chambers Bay (to the east of coast section 4.1), August 1992. At low tide there is half to 1km of exposed mudflat and this is typical of the coast along most of the southern shoreline of Van Diemen Gulf, which is unsuitable for marine turtle nesting. Photo R. Chatto.

Coast Section 4.1

Site(s): Field Is. (12° 06.8' S, 132° 25.1' E)



Field Island (4 438 ha) is one of only three islands along the southern shoreline of Van Diemen Gulf. It is situated near the mouth of the South Alligator River, and is part of Kakadu National Park. It has a single small beach on the south eastern side of the island. This beach is one of the few suitable turtle nesting beaches in the area along the southern shoreline of Van Diemen Gulf so is reasonably well used, but as it is only a small beach there are not large numbers of turtles involved.

The only records from this site were from a ground survey done in April 2003. On this visit there were two fresh nests and around 20 old nests, most likely to have been from last season. All were Flatback Turtle nests. One of the fresh nests and most of the older nests had been predated by goannas.

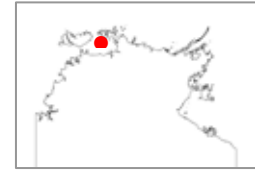
This area will not be discussed any further because of the limited work done on the site in this project and the studies done by the federal Department of Environment, Water, Heritage and Arts in varying months between June and August since 1990 (e.g. Schauble *et. al.*, 2006). In summary they observed between zero and 16 turtle emergences (averaging 4-5) on each night over those months.



Plate 23. The small Flatback Turtle nesting beach on Field Island (coast section 4.1), April 2003. Photo R. Chatto.

Coast Sections 4.2

Site(s): Greenhill Is. (11° 35.7' S, 132° 07.3' E).



Greenhill Island (1 766 ha) is one of several small islands along the southern shoreline of Cobourg Peninsula and part of Garig Gunak Barlu National Park. Although most of shoreline of these islands is mangrove or reef, some have at least one beach on them. Greenhill Island has the most extensive beach (most of the western side) and the most nesting of these islands. This island also had the most surveys and is discussed individually.

Aerial surveys were conducted over the beach on this island in the months of February, April, June, October and November. These were done over a three year period between 1993 and 1996. The island was also ground checked in the months of February and April. Tracks/nests were recorded in all surveyed months. No surveys were done within this project for the months of January, March, May, July, August, September or December. However, other Parks and Wildlife marine turtle tagging surveys (see below) were done in the July and August period, when continual nesting was recorded.

Track/nest counts were consistently between 20+ and 65+ in each survey. Nesting was dominated by Flatback Turtles, with a small number of Olive Ridley Turtles also being recorded. Recently hatched Flatback Turtle nests (5) were recorded in a February (1996) ground survey, indicating nesting had occurred in early January. Fresh Flatback Turtle tracks/nests were also observed in each of the other survey months through to late November. This, and the other Parks and Wildlife surveys, confirm nesting in all months of the year from January to November at least, and may mean nesting all year round. Although the peak of this nesting is likely to be through the May to October months, as seen in other Flatback Turtle nesting beaches in the NW of the Top End, the survey data from Greenhill Island was unable to confirm a peak season for this beach.



Plate 24. Looking along the single beach along the west side of Greenhill Island (coast section 4.2) which is dominated by Flatback Turtle nesting, April 1994. Photo R. Chatto.

The small number of Olive Ridley Turtle records suggests nesting from January to June at least, but there were insufficient records to establish a seasonal peak. Nevertheless, it should be similar to other Ridley Turtle nesting on beaches on Melville Island about 60 km to the west.

No egg predation was recorded although tracks of small goannas were observed. Bird and crocodile predation of hatchlings was indicated by tracks.

During the 1995-1997 Flatback Turtle nesting seasons a tagging and research program was conducted on Greenhill Island for a 2-4 week period each year (Hope and Smit, 1998). In this program 181 Flatback Turtles (from 187 nesting attempts), three nesting Olive Ridley Turtles (from three nesting attempts) and a single nesting Hawksbill Turtle were tagged and various biological data collected. No other nesting species were recorded. A good Green Turtle feeding area was located off the south west of the island, and ten turtles were tagged at this site. These monitoring programs failed to find any animal predation on turtle eggs on Greenhill Island.

APPROXIMATE SUMMATION OF SPECIES NESTING SIGNIFICANCE IN COAST SECTION 4.2			
[Very High (OOOO), High (OOO), Medium (OO), Low (O) numbers; O = Certain, ⓧ = Probable]			
Flatback	Green	Hawksbill	Olive Ridley
OOO			O

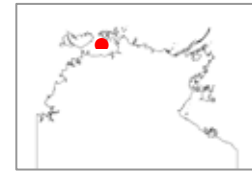
OCCURENCE OF LAYING (ALL SPECIES COMBINED) BY MONTH IN COAST SECTION 4.2												
O = Egg laying confirmed; X = Nil egg laying recorded; ? = Not surveyed or presence of current laying not assessed												
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
O	O	O	O	O	O	O	O	O	O	O	?	



Plate 25. The main Flatback Turtle nesting beach on Mogogout Island (coast section 4.3), April 1994. Photo R. Chatto.

Coast Sections 4.3 & 4.4

Site(s): Mogogout Is. (11° 34.8' S, 132° 18.4' E)
 Morse Is. (11° 37.4' S, 132° 27.2' E).



Mogogout Island (106 ha) and Morse Island (781 ha) are two other of the small islands along the southern shoreline of Cobourg Peninsula which have reasonable turtle nesting on small single beaches on them. They were not surveyed as much as Greenhill Island and so are discussed together.

Mogogout Island had two small nesting beaches but most nesting was on the southern side of the island. Morse Island has just the single sand spit on the eastern side.

Three aerial surveys were conducted over Mogogout Island in the months of April, October and November and four over Morse Island in the months of February, April, June and October. Both islands were only ground checked once, both in April 1994. All surveys were in the years between 1993 and 1996.

All surveys recorded the presence of tracks/nests. The highest count for Mogogout Island was 60+ tracks/nests from an aerial survey in November 1996 and the highest for Morse Island 20+ from the April ground survey. The only species confirmed nesting on either of these islands was the Flatback Turtle.

Laying was confirmed to occur in the months of January to April, June, October and November, but could not be confirmed in the remaining months between January and November. Nevertheless, given that continual laying was confirmed for the same species on the nearby Greenhill Island it is likely that that laying would be continuous throughout this full 11 months at least on these two islands as well. As with Greenhill Island there is insufficient information to suggest the peak months, but should be typical of other Flatback Turtle nesting in the NW Top End of the NT, that is, mostly between May and September.

No egg predation was recorded on either island.

APPROX. SUMMATION OF SPECIES NESTING SIGNIFICANCE IN COAST SECTIONS 4.3 & 4.4			
[Very High (OOOO), High (OOO), Medium (OO), Low (O) numbers; O = Certain, = Probable]			
Flatback	Green	Hawksbill	Olive Ridley
OO			

OCCURENCE OF LAYING (ALL SPECIES COMBINED) BY MONTH IN COAST SECTIONS 4.3 & 4.4											
O = Egg laying confirmed; X = Nil egg laying recorded; ? = Not surveyed or presence of current laying not assessed											
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
O	O	O	O	?	O	?	?	?	O	O	?

Coast Section 4.5. Not discussed due to the low importance for turtle nesting.

Non-nesting Notes

As mentioned in the Tiwi Bioregion summary, the inshore mangroves and reef around Cape Don were observed from aerial surveys to be important feeding areas for marine turtles, even though little nesting occurred in the immediate area.

Table 4. Locations of significant nesting activity in the Van Diemens Gulf Bioregion with combined sum of nests and tracks >5 for all surveys between 1991 and 2004 and number of surveys (number of unique visit dates) for each coast section.

Coast section	Observation	Flatback Turtle	Green Turtle	Mix of Flatback or Green	Hawksbill Turtle	Olive Ridley Turtle	Mix of Hawksbill or Olive Ridley	Unknown species	No. of surveys
4.1 Field Is	Nest	2							1
4.2 Greenhill Is	Nest	67				1	1	1	6
	Tracks	1		50			2	91	
4.3 Mogogout Is	Nest			50					3
	Tracks	15		11				10	
4.4 Morse Is	Tracks	16		18				21	4
4.5 Wangoindjung Is	Nest							10	3
	Tracks							2	

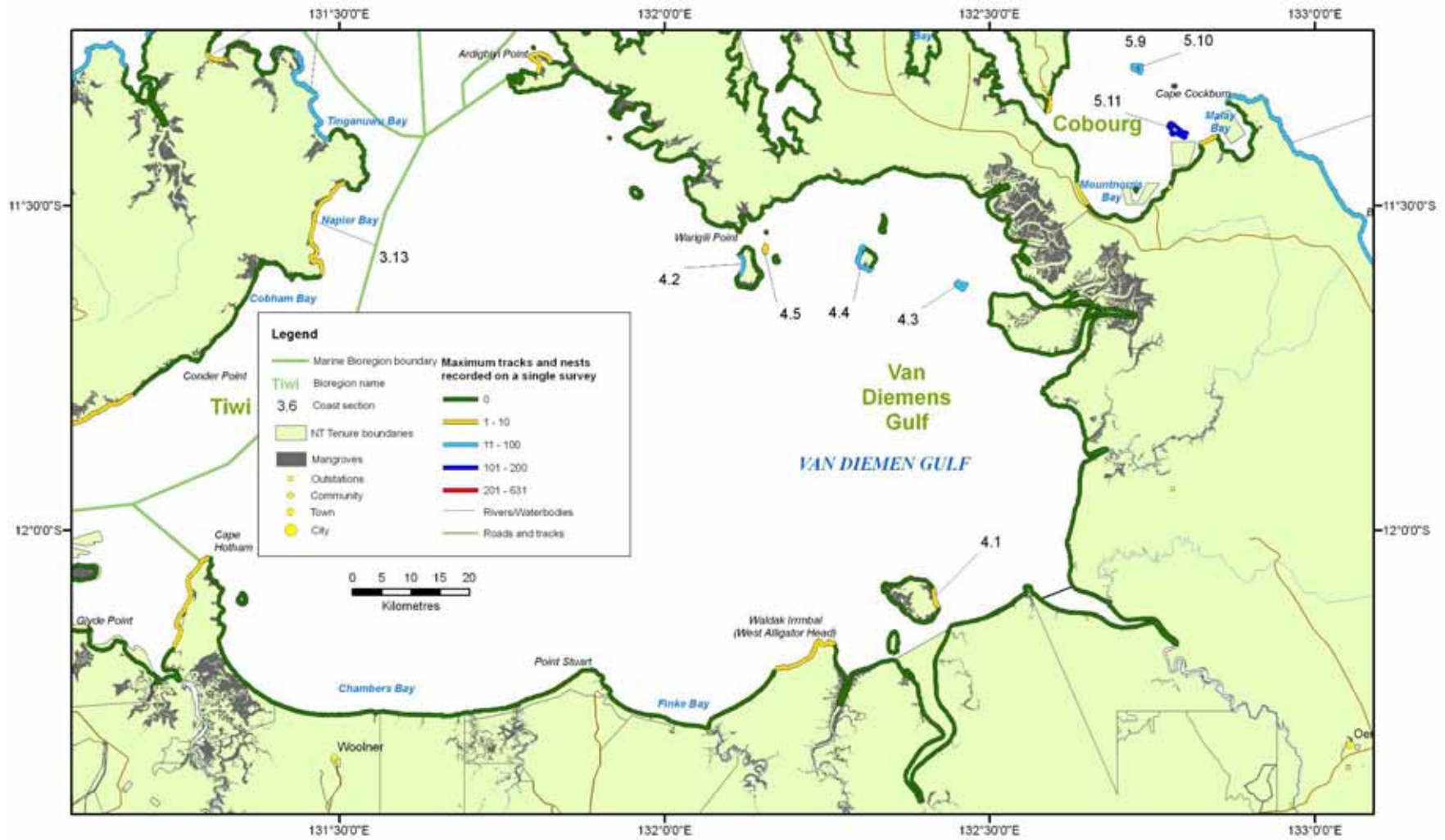


Figure 17. Relative importance of nesting beaches using maximum sum of nests and tracks of all species in a single survey between 1991 and 2004 in the Van Diemens Gulf Bioregion.

Cobourg

Location and description

This bioregion extends from Cape Don, the western most point of the Cobourg Peninsula, to Turner Point, on the mainland to the south east of the South Goulburn Island. It includes the northern side of Cobourg Peninsula and mainland to its east, Croker Island and the numerous small islands to its east and the Goulburn Islands (North and South). The climate is monsoonal with rainfall between 1200 and 1400 mm. The coast has numerous bays and inlets lined by sandy beaches, some of which are deeply incised and provide substantial shelter from strong seasonal winds. A lack of larger rivers and a small tidal range (2–3 m) means minimal sediment debouchment and relatively low turbidity throughout the bioregion. Mangroves are restricted to narrow strips along bays and creek inlets. There are numerous islands in the eastern part of the bioregion. Many are rocky, continental islands with fringing reefs, with some coral cays such as New Year Island.

The bioregion is made up of the western part of Arnhem Land (Aboriginal Land), the Garig Gunak Barlu National Park and Cobourg Peninsula. Apart from the park, which has controlled visitor numbers, the main Aboriginal communities are Murgnella and those on Croker and South Goulburn Islands. There are also many small outstations that are seasonally used along the northern coast, but in general the majority of this bioregion is relatively undisturbed by people.

This bioregion, particularly the islands, has a large amount of marine turtle nesting, involving all of the four species that regularly nest in the NT.

Survey effort

A total of 33 survey days were done between 1991 and 2004 in the Cobourg Bioregion. Surveys were consistently spread throughout the year between February and November but none were done in the months of January, March, July and December (Figure 18). November had the most surveys.

The length of coast is 995 km (9% of the NT coast) and the length of coast where wildlife records were not obtained on any survey was 60 km (6% of the bioregion).

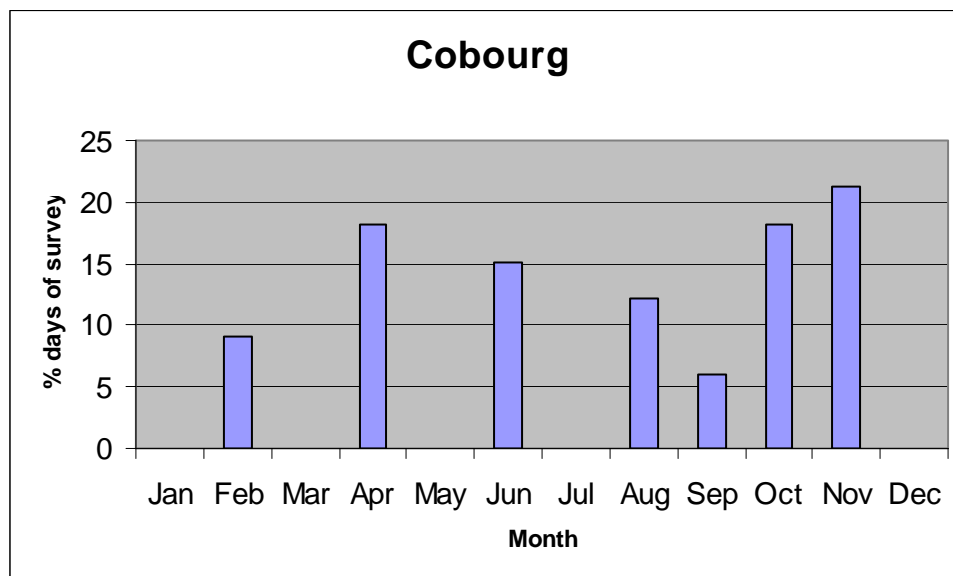


Figure 18. Survey effort by month between 1991 and 2004 in the Cobourg Bioregion.

Nesting Summary

This bioregion is extremely important for marine turtle nesting, particularly the Black, Smith and Danger Point areas on Cobourg Peninsula, North Goulburn Island, parts of South Goulburn Island and the islands to the east of Croker Island. All four of the species that regularly nest in the NT were recorded as breeding in the area, as well as several nests of the Leatherback Turtle which nests very infrequently in the NT.

The majority of the marine turtle nesting in this bioregion occurs on the islands to the east and north east of Croker Island. There is no animal predation of eggs on any of the islands, highlighting their significance. There was however, frequent evidence of a number of species of birds visiting the islands to feed on emerging hatchlings. Most of the islands are also well out to sea and do not appear to be visited frequently for turtle or seabird egg collection by Indigenous people.

Nesting areas throughout this bioregion are mapped, by the highest counts for any single survey, in Figure 19, at the end of the bioregion's coast section summaries.

Total numbers of tracks and nests per month for all nesting on islands and mainland beaches in the bioregion is shown in Figure 62, Appendix A.

Coast Section Discussions

Twenty-one individual coast sections (5.1 to 5.21) are listed within this bioregion. Track and nest counts for each of these sections are given in Table 5 and the numbered coast sections are shown in Figure 19. The most significant of these coast sections are discussed in more detail below.



Plate 26. Coast south of Smith Point (within coast section 5.3) on Cobourg Peninsula, November 1991. Photo R. Chatto.

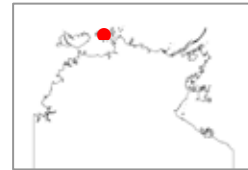
Coast Section 5.1 - Not discussed due to the low importance of the area for nesting.

Coast Section 5.2

Site(s): Vashon Head on the northern Cobourg Peninsula

from 11° 8.4' S, 131° 58.2' E to

11° 11.1' S, 132° 2.0' E.



Across the northern mainland coast of the Cobourg Peninsula most of the marine turtle nesting was located on the northern points of the many peninsulas. Two main nesting areas along this section are the Black/Smith Point area, and the Danger Point area. Vashon Head, in the west, is of lesser importance but is also discussed, albeit only briefly because of limited surveys. The only species confirmed nesting in this area were Green Turtle (7) and Flatback Turtle (3), but a single previously raided nest of a Hawksbill or Olive Ridley Turtle was also observed in a February ground survey.

Vashon Head was surveyed from the air in the months of April, August, October and November. It was ground surveyed at three sites (all in the east) in February, August and November. Surveys were done in the years of 1993, 1996 and 2004. All surveys except the October survey recorded tracks/nests, though mostly small numbers. The October survey only crossed the coast at a small number of points while doing east/west transects counting Bantang (*Bos sp.*) and therefore missed the majority of beaches. Hence, it was not a true representation of likely nesting at that time.

The highest count of tracks/nests was around 70 in a November (1996) survey. All other surveys recorded only the occasional track/nest. A huge increase in numbers from an August survey to a November survey, combined with most being recorded as the wider tracks, suggests (on the basis of seasonality which is discussed in more detail in coast section 5.5) good numbers of Green Turtles nesting in this area, in the 1996 season at least.

Due to the limited number of surveys, laying could only be confirmed for the months of April, July, August and October to December. With both Flatback and Green Turtle nesting in this area, it is likely that some laying could occur in all months of the year.

Significant goanna predation was confirmed, and human predation suspected, in some ground surveys.

APPROXIMATE SUMMATION OF SPECIES* NESTING SIGNIFICANCE IN COAST SECTION 5.2			
[Very High (OOOO), High (OOO), Medium (OO), Low (O) numbers; O = Certain, ☒ = Probable]			
Flatback	Green	Hawksbill	Olive Ridley
O	O☒		

OCCURENCE OF LAYING (ALL SPECIES COMBINED) BY MONTH IN COAST SECTION 5.2											
O = Egg laying confirmed; X = Nil egg laying recorded; ? = Not surveyed or presence of current laying not assessed											
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
?	?	?	O	?	?	O	O	?	O	O	O

Coast Section 5.3 - Discussed below in combination with 5.5 & 5.6

Coast Section 5.4

Site(s): Sandy Is No 2. (11° 0.6' S, 132° 17.4' E).



Sandy Island No. 2 is the larger of two very small sandy islands adjacent Smith Point on the Cobourg Peninsula. A small amount of turtle nesting was recorded on both Sandy Island Nos. 1 (east) & 2 (west), but only Sandy Island No. 2, which has the most, is briefly discussed here.

Sandy Island No. 2 is a fairly significant seabird breeding colony and was checked on a number of occasions in which turtle nesting was not considered. Surveys in which turtle tracks/nests were recorded included a November (1996) aerial survey and two ground surveys done in April and October of 1994. There were no surveys where nil tracks/nests were recorded.

The highest track count was around 30 in the April ground survey, while the other two surveys both recorded between 10 and 20 tracks. The only species confirmed to use the island was the Flatback Turtle, although occasional Olive Ridley and Green Turtle nesting was also suspected.

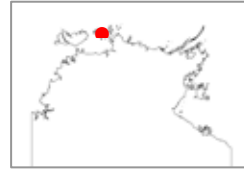
Because of the exposed nature of the island, tracks recorded in each of the survey months can confirm laying in the months of April, October and November, but laying cannot be confirmed in any other months even though this is likely, based on other nearby sites with these species. As such a laying summary table has not been produced for this coast section.

No egg predation was recorded on this island.

APPROXIMATE SUMMATION OF SPECIES* NESTING SIGNIFICANCE IN COAST SECTION 5.4			
[Very High (OOOO), High (OOO), Medium (OO), Low (O) numbers;			
O = Certain, ⚡ = Probable]			
Flatback	Green	Hawksbill	Olive Ridley
O	⚡		⚡

Coast Sections 5.3, 5.5 & 5.6

Site(s): Northern Cobourg Peninsula from Black Pt.
(11° 09.3' S, 132° 08.5' E) to SE of Danger Pt.
(11° 10.7' S, 132° 21.6' E).



The two main nesting areas along northern mainland coast of the Cobourg Peninsula are the Black and Smith Point area, and the Danger Point area, with the former area having considerably more nesting. Species recorded nesting at these sites included Green and Flatback Turtles and the occasional Olive Ridley and Leatherback Turtles.

Cobourg Peninsula was surveyed a number of times over the period of the project but some of these surveys targeted other species and did not include turtles, or at best, only in small parts of this area. Six full or partial aerial surveys that included turtle track/nest searching were carried out in these coast sections between 1992 and 2004. These covered the months of February, April and August to November. The highest track/nest count was of at least 150 in November (1996). This only involved the Black/Smith Points area. All other high track/nest counts (50+) for these combined coast sections were in the September to November months.

Very little ground work was done during these surveys on these points and most records were aerial records of either Flatback or Green Turtle *spp.*, or unknown *spp.* Nevertheless, records confirmed to species level from aerial or ground surveys showed the Black and Smith Point area (particularly to the east of Smith Point) to be mainly used for nesting by Green Turtles. A February 1996 ground survey noted at least 85% of approximately 125 nests were Green Turtles. A small number of Flatback Turtles and the occasional Olive Ridley Turtle were also recorded in this area. In contrast the nearby Danger Point area was found to be numerically dominated by Flatback Turtles, but also had nests of Green, Olive Ridley and Leatherback Turtles (see further discussion below).



The limited ground surveys of these coast sections meant that nesting seasonality, particularly in relation to a peak nesting period, was not able to be confidently shown. Laying from all species combined was confirmed from these surveys to occur at least in the months of February to April and July to November. These months are indicated in the summary table below, but observations of other Parks and Wildlife staff (discussed below) suggest nesting from one or other species can occur in all months of the year.

More detailed research on the Black and Smith Point area by Parks and Wildlife Research Scientist Victor Gomelyuk (*pers. comm.*) while stationed at Black Point between 1999 and 2003, noted that during the dry season (May to September) most nests were of Olive Ridley Turtles, with the occasional Flatback Turtle. From late September onwards nests were dominated by Green Turtles. He suspected that Green Turtle nesting here peaked in around mid October to end November and then began to gradually drop off, finishing in around February. He also suspected that a big decline in the number of nests started in the 2001 season.

Irregular monitoring surveys of seven kilometers of the Black Point to Smith Point beach were also carried out by Park Rangers between December 1995 and November 1996. These findings are summarized and reported in Hope and Smit (1998). During this program, 132 nesting events were recorded from examination of 246 tracks. The majority of these nests were predated by goannas. Although the species were not always recorded, track widths and egg diameter measurements taken suggested most of these nests were Green Turtles. Although there is no information on the survey effort they recorded 230 of the 246 laying events to be in the months of January and February, with the remainder spread in low numbers over the months of April to June, and September to December.

It is also possible that the very occasional Hawksbill Turtle may nest in these areas. Although there were no Hawksbill Turtle nests confirmed during these surveys, very new Hawksbill Turtle hatchlings were noted by RC when they were attracted to the light of the Black Point Ranger station boat ramp on one occasion.

Probable Leatherback Turtle tracks were recorded in the Danger Point area during an aerial survey in December (1996). These were unable to be investigated further at the time. Leatherback nesting was not able to be confirmed until a ground visit was carried out in April 2004 which located several old nests and some remaining tracks. These nest sites, which likely involved three or more turtles, had not been predated upon and there was no evidence of hatchling trails, but time did not permit searching for the egg chambers. The nests were originally reported by the local Park Ranger, Peter Fitzgerald, to have been fresh in December of 2003, but were not examined in detail then either. Further observations by Scott Whiting (*pers. comm.*), following reports again from Fitzgerald, also confirmed this species nesting in January 2006. On this visit Whiting confirmed 11 nests and although he did not dig into any, suspected there were at least five and at most 11 individuals involved. Fitzgerald suspected all nests or nesting attempts had occurred within a week or so around the beginning of January 2006. Although there a few anecdotal records of Leatherback nesting in other parts of the NT (e.g. Croker Island, F. Woerle, *pers. comm.*), this site is the only Leatherback breeding site located in the NT during these surveys. It may be the only current Leatherback nesting in Australia (Limpus, 2004).

APPROXIMATE SUMMATION OF SPECIES* NESTING SIGNIFICANCE IN COAST SECTIONS			
5.3, 5.5 & 5.6			
[Very High (OOOO), High (OOO), Medium (OO), Low (O) numbers;			
O = Certain,  = Probable]			
Flatback	Green	Hawksbill	Olive Ridley
OO	OOO		O

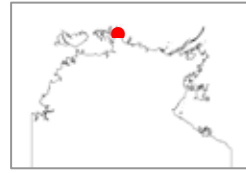
* NB. A small number of Leatherback Turtles were also recorded breeding in this bioregion.

OCCURENCE OF LAYING (ALL SPECIES COMBINED) BY MONTH											
IN COAST SECTIONS 5.3, 5.5 & 5.6											
O = Egg laying confirmed; X = Nil egg laying recorded;											
? = Not surveyed or presence of current laying not assessed											
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
?	O	O	O	?	?	O	O	O	O	O	?

Coast Sections 5.7 & 5.8

Site(s): Croker Island* (11° 03.1' S, 132° 32.2' E).

* Including beaches not in 5.7 & 5.8 (see Fig. 19).

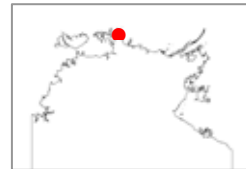


Croker Island (32 589 ha) is a large island with numerous sand beaches around its coastline. It is located immediately to the east of Cobourg Peninsula. Croker Island was not ground surveyed during this project, and only flown around once, in November 1996. Turtle nesting was recorded in low densities around most of the northern half of the island, but little in the southern half. Most nesting was recorded as tracks of Flatback and/or Green Turtles, or unknown turtle species, but Green Turtle tracks were confirmed from the air in a number of places in the north east. Further species breakdown is not possible.

Because of the limited work done on these coast sections no attempt has been made to summarize species or nesting seasonality for Croker Island, although fresh Green Turtle tracks in November may indicate nesting aligned to similar beaches on the nearby Black and Smith Points.

Coast Section 5.9

Site(s): Darch Is. (11° 12.2' S, 132° 40.1' E).



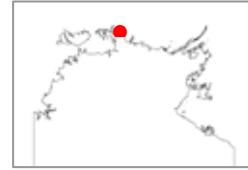
Darch Island (600 ha) is one of a series of small islands to the east and north east of Croker Island. Most of these islands have considerable amounts of marine turtle nesting. Darch Island is the closest one to Croker Island, being only a few kilometres off its eastern coast.

Darch Island was surveyed from the air in October (1993) and partially in November (1996). The island was not ground surveyed during the project. In the only total count of the island, around 100 tracks were recorded in the October survey. Tracks were recorded around most of the island but in highest densities in the north east and south west. Tracks were only recorded to Flatback and/or Green Turtle, or to unknown species.

As with Croker Island, the limited work done means no attempt has been made to summarize species or nesting seasonality for Darch Island.

Coast Section 5.10

Site(s): Templer Is. (11° 17.7' S, 132° 43.8' E).



Templer Island (116 ha) is another of the group of small islands to the east of Croker Island, and one that is reasonably important for marine turtle nesting. Most nesting on Templer Island occurs on the fairly extensive beaches around the northern and western shores. Two species, the Flatback Turtle and the Olive Ridley Turtle, were confirmed nesting on this island.

Aerial surveys were conducted of this island in the months of February, April, June, October and November, between 1993 and 1996. Ground surveys were done in the months of June (1996) and October (1994), but the latter was very brief in relation to marine turtle nesting. Fresh marine turtle nesting was recorded in all surveys, but only as a small percentage by November.

With all species combined the highest count of tracks/nests was around 100 tracks. This was recorded in an aerial circuit before landing for an October (1994) ground survey at one site on the island. Counts through all surveyed months February to November were consistently in the vicinity of 50 tracks/nests for each survey, but tended to be higher from June to October. Some of these higher counts could have involved some recent seasonal accumulation of tracks/nests.

Surveys confirmed both Flatback and Olive Ridley Turtles were nesting in reasonable numbers on this island. There were no tracks or nests confirmed of Green or Hawksbill Turtles, but this is not to say none were present, given nesting on adjacent islands.



Plate 27. Sand spit and beach along the mid western side of Templer Island (coast section 5.10) that is used by Flatback and Olive Ridley Turtles, October 1994. Photo R. Chatto.

There was no separation of tracks to species level in the February survey, but Olive Ridley Turtle nesting was confirmed in June and October ground surveys. Fresh Olive Ridley Turtle nesting was recorded in the April aerial survey, while fresh nesting and freshly hatched nests were recorded in the June survey. By October only fresh hatching was recorded. The April aerial survey noted the narrower (Olive Ridley Turtle) tracks in higher numbers compared to the wider (Flatback Turtle) tracks, but surveys in months after June noted the reverse. (A sample checked on a section of beach on the western end of the northern coast of the island in the June ground survey confirmed 15 Flatback Turtle nests to four Olive Ridley Turtle nests). These observations suggest Olive Ridley Turtle nesting from at least April to October. There were not enough records to confirm a primary or peak nesting period for Olive Ridley Turtle on this island but April to June would be suggested.

Flatback Turtle nesting was confirmed in June and October ground surveys but is also likely to have been represented among the wider fresh tracks recorded in April and November aerial surveys. Freshly hatched Flatback Turtle nests were recorded in June. By October the only Olive Ridley Turtle nests were hatched nests whereas un-hatched Flatback Turtle nest were located. These observations suggest Flatback Turtle nesting continues after most Olive Ridley Turtle nesting has finished. There were not enough records to confirm a primary or peak nesting period for Flatback Turtles on this island but some time around June through to October is suggested.

As is found in other locations where these two species nest, there was some mixed nesting at given sites on the island but also some beaches or sections of beach in which one or the other dominated.

When all species are combined, laying was confirmed occurring in all months of the year with the exception of March, July and December. Each of these latter three months had no surveys done and hatching or track condition backdating was not able to be used to confirm laying in these months. Nevertheless, considering the species confirmed and the amount of laying either side of each of these months, it is likely that laying occurred in all months of the year on this island.

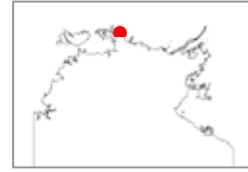
There was no egg predation recorded from this island.

APPROXIMATE SUMMATION OF SPECIES NESTING SIGNIFICANCE IN COAST SECTION 5.10			
[Very High (OOOO), High (OOO), Medium (OO), Low (O) numbers;			
O = Certain, O with slash = Probable]			
Flatback	Green	Hawksbill	Olive Ridley
OO O with slash			OO

OCCURENCE OF LAYING (ALL SPECIES COMBINED) BY MONTH											
IN COAST SECTION 5.10											
O = Egg laying confirmed; X = Nil egg laying recorded;											
? = Not surveyed or presence of current laying not assessed											
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
O	O	?	O	O	O	?	O	O	O	O	?

Coast Section 5.11

Site(s): Valencia Is. (11° 23.5' S, 132° 47.1' E).



Valencia Island (291 ha) to the south east of Templer Island, has a higher percentage of reef, rock and mangrove surrounding the island and as such is not as significant for marine turtle nesting as Templer Island. Most nesting on Valencia Island occurs on the south eastern section of the island. Flatback Turtles were the only species confirmed but Olive Ridley Turtles are also likely to nest here in smaller numbers, due to them being confirmed on similar beaches on nearby islands.

Aerial surveys of this island were conducted during the months of February, April, October and November, between 1993 and 1996. A single ground survey only was done on this island in October, 1994. Turtle tracks/nests were recorded in all surveyed months except February.

The highest count of tracks/nests was just over 100 tracks. This was recorded in October 1994. October/November counts were higher than the April count, but would have likely have included tracks/nests accumulated during the dry season nesting period.

Surveys of this island suggested a similar nesting situation to Templer Island, but with less nesting area and lower total numbers of nests, and a greater dominance of Flatback Turtles. This was the only species positively confirmed on this island, but narrow tracks and nests with the small eggs were thought more likely to have been Olive Ridley Turtles than Hawksbills Turtles. It is also possible, based on observations on Cobourg Peninsula, that five fresh wider tracks recorded along the northern coast in a late November aerial survey may have included Green Turtles.



Plate 28. NE shoreline of Valencia Island (coast section 5.11), October 1994. The beaches in upper part of the photo are nested on by mainly Flatback Turtles. Photo R. Chatto.

Considering all species, laying was confirmed in April, and August to November. Failure to confirm laying in the gap months was more likely due to a lack of survey coverage, rather than it not occurring.

The only records that can show individual species laying times are from the October survey. At this time there were mixed aged older hatched Flatback Turtle nests through to fresh Flatback Turtle tracks/nests suggesting this species laying here from about July to October at least. This could likely be extended to as early as April and into November if fresh tracks of unconfirmed species at these times were Flatback Turtles.

Little can be said in relation to laying time for Olive Ridley Turtles, except that the small amount of likely Olive Ridley Turtle nesting observed was prior to October. The lack of recorded tracks/nests in February and the low count in April, which is more prime Olive Ridley Turtle nesting time than Flatback Turtle nesting time, suggests much lower numbers of Olive Ridley Turtles on this island compared to Flatback Turtles and compared to the further offshore Templer Island discussed in the previous coast section.

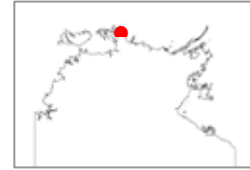
There was no egg predation recorded from this island, but evidence of hatchling predation by.

APPROXIMATE SUMMATION OF SPECIES NESTING SIGNIFICANCE IN COAST SECTION 5.11			
[Very High (OOOO), High (OOO), Medium (OO), Low (O) numbers; O = Certain, ⚡ = Probable]			
Flatback	Green	Hawksbill	Olive Ridley
OO⚡	⚡		⚡

OCCURENCE OF LAYING (ALL SPECIES COMBINED) BY MONTH IN COAST SECTION 5.11											
O = Egg laying confirmed; X = Nil egg laying recorded; ? = Not surveyed or presence of current laying not assessed											
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
?	X	?	O	?	?	?	O	O	O	O	?

Coast Section 5.12

Site(s): Grant Is. (11° 09.5' S, 132° 53.1' E).



Grant Island (1 281 ha), the largest (~6 km x 3 km) of all the smaller islands off Croker Island, is another very significant island for turtle nesting. Flatback, Olive Ridley and Green Turtle nests were confirmed on this island. Hawksbill Turtle nesting was not confirmed, but could have been among 'narrow track' aerial records given this species was confirmed on a nearby island. Most nesting was recorded along the northern and western coasts of this island, with a little on the western end of the southern coast. The east coast has an extensive coral reef running along its length impeding access at lower tides and is not suitable for turtle nesting. The exposed coral rubble of these eastern side reefs are important seabird roosting and breeding sites.

Grant Island was surveyed from the air in the months of February, April, June, October and November, between 1993 and 1996. The island was landed on to do ground surveys on three of these occasions, February 1996 (northern coast), June 1996 (western coast) and October 1994 (southern coast). Tracks/nests were recorded in all ground and aerial surveys, though lower numbers were recorded in surveys earlier in the year.

The highest single count of tracks/nests on this island was around 150 in a late November 1996 aerial survey. Most of these, particularly along the northern coast were recorded as Flatback/Green Turtle size and about 15% were recorded as fresh at the time. The time of the year suggest these may have been mainly Green Turtles. Around 75 tracks/nests were recorded in a June survey, as the next highest count.



Plate 29. Site of a Green Turtle nest (at base of She-oak tree) along north side of Grant Island (coast section 5.12), February 1996. Photo R. Chatto.

Although ground surveys covered three well spaced months, each was done on a different part of the island. Further, there were only limited individual nest confirmations from sample sections of each beach. Nevertheless, a February ground check of the northern coast confirmed four Flatback nests, four Green Turtle nests and one Olive Ridley Turtle nest, suggesting nesting at this time was mostly of Green and Flatback Turtles, for this part of the island at least. At this time both fresh nests and freshly hatched nests were observed for Flatback and Green Turtles, while a fresh nest, but no fresh hatching was observed for the Olive Ridley Turtle.



In the June check of the west coast all three species were again confirmed but comment was made that it appeared to be predominantly an Olive Ridley Turtle nesting beach at that time. This finding was supported by a count done on the island in June 1989 recording 32 Olive Ridley and two Flatback Turtle nests (Guinea, 1990).

The October survey of a site on the southern coast confirmed only a single Flatback and Olive Ridley Turtle, but observations of the other tracks suggested nesting at this site was predominantly by Flatbacks by this time of the year.

The results also suggest varying species dominance on different parts of this fairly large island.

Observations confirm laying by all species combined in all months of the year except March and July, but this was likely due to a lack of appropriately timed surveys rather than it not occurring.

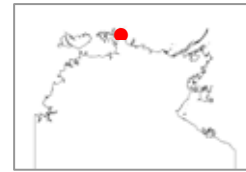
Crabs, Beach Thick-knees and Black-necked Storks were recorded as predated on hatchlings, but no predation of eggs was recorded.

APPROXIMATE SUMMATION OF SPECIES NESTING SIGNIFICANCE IN COAST SECTION 5.12			
[Very High (OOOO), High (OOO), Medium (OO), Low (O) numbers;			
O = Certain,  = Probable]			
Flatback	Green	Hawksbill	Olive Ridley
OOO	O 		OOO

OCCURENCE OF LAYING (ALL SPECIES COMBINED) BY MONTH											
IN COAST SECTION 5.12											
O = Egg laying confirmed; X = Nil egg laying recorded;											
? = Not surveyed or presence of current laying not assessed											
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
O	O	?	O	O	O	?	O	O	O	O	O

Coast Section 5.13

Site(s): Little Lawson Is. (11° 05.0' S, 132° 52.6' E).



“Little” Lawson Island (46 ha) is a small (~1 km x 1 km) un-named island just to the south of Lawson Island. Similar to many of the islands in the area it is surrounded by reef which is most prominent on its eastern side. Most turtle nesting was recorded on the western side. There were no individual species confirmed from this island but Flatbacks and Olive Ridley Turtles at least are suspected as nesting here.

Aerial surveys in the months of February, April, June, October and November, were done over this island but no ground surveys were done in relation to turtle nesting. Tracks/nests were recorded in all surveyed months except February.






The highest count of tracks/nests recorded on a single survey was around 30, in a late November (1996) survey, which included fresh nesting. Comments recorded in an April (1994) were that most of the 20 or so tracks were of the narrower type while in November (1996) most were of the wider type.

The lack of recorded tracks/nests in February and the low count in April, which is more prime Olive Ridley Turtle nesting time than Flatback nesting time, suggests lower numbers of Olive Ridley Turtles on this island compared to Flatback Turtles.

Without regular ground surveys it is difficult to confirm a laying season for turtles on this island. However, information from the aerial surveys confirms laying in the months of April to June, and October and November. Although laying was likely to have been continuous in the un-surveyed July-September period it cannot be confirmed from these results.

There are insufficient records to suggest a primary nesting period for either species individually or both species combined, although March/April and September/October would likely be part of this period.

No egg predation was recorded but as mentioned there were no ground surveys of this island.

APPROXIMATE SUMMATION OF SPECIES NESTING SIGNIFICANCE IN COAST SECTION 5.13			
[Very High (OOOO), High (OOO), Medium (OO), Low (O) numbers; O = Certain,  = Probable]			
Flatback	Green	Hawksbill	Olive Ridley
 			 

OCCURENCE OF LAYING (ALL SPECIES COMBINED) BY MONTH IN COAST SECTION 5.13											
O = Egg laying confirmed; X = Nil egg laying recorded; ? = Not surveyed or presence of current laying not assessed											
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
?	X	?	O	O	O	?	?	?	O	O	?



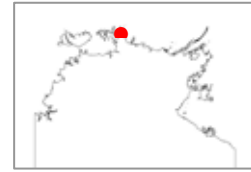
Plate 30. Sand spit on the west side of 'Little' Lawson Island (coast section 5.13), June 1996. Photo R. Chatto.



Plate 31. Emerging Olive Ridley Turtles. Photo R. Chatto.

Coast Section 5.14

Site(s): Lawson Island (11° 03.3' S, 132° 51.7' E).



Lawson Island (328 ha) is one of the medium sized (~2 km x 2 km) of the group of small islands off Croker Island. It is surrounded by reef but this is less prominent on the southern and western sides where the majority of turtle nesting was located. Like Grant Island, the reef on the eastern coast makes this side of the island largely unsuitable for turtle nesting. The western and southern coasts of Lawson Island, particularly the large sand area on the south western tip, were specifically noted as having the densest turtle nesting of all the islands in this area in October (1994) and November (1996) aerial surveys when all the islands in the area were surveyed.

As with many of the islands in this area, the species confirmed nesting were Flatback, Olive Ridley and Green Turtles. Hawksbill Turtle nesting was not confirmed, but could have been among 'narrow track' aerial records given this species was confirmed on a nearby island. Because the track/nest counts on this island were very high but the species confirmations were low the summation of species significance table (below) includes hollow symbols for each species as indicating probable categories of significance rather than definite. However, it seems that all three confirmed species nest in considerable numbers on this island.

Aerial surveys of this island were conducted in the months February, April to June, and October and November, between 1993 and 1996. Ground surveys of turtle nesting were conducted on four occasions, February (1996), April (1994), June (1996) and October (1994). All ground surveys were on the extensive beach and sand dune area on the south and south west of the island. Fresh tracks/nests were recorded in all aerial and ground surveys.



Plate 32. Predominantly Flatback Turtle nesting beach along the south side of Lawson Island (coast section 5.14), February, 1996. Photo R. Chatto.

The highest track/nest counts around the island were between 130 and 180+. These were recorded in three surveys, November 1993 and 1996, and October 1994. These undoubtedly would be an accumulation of tracks over some time rather than all being fresh. Slightly lower numbers were recorded in the earlier months but there were never less than 80 tracks/nests recorded around the island. The known nesting periods of the three recorded species (see species accounts and numerous other references through out the bioregional coverage) suggests good nesting by all three species.

Data collected in all surveys confirmed laying from all species combined occurred at least in the months of January, February, April to June, and September to November. Surveys of un-surveyed months would likely fill and the gaps and show laying by one species or another is throughout the year on this island.

In regard to individual species, the February ground sample was further to the east along the southern coast than the June and October checks and showed Flatbacks to be the dominant nesting species on this part of the island when old nests, as well as fresh nests were considered. At this time of year this is perhaps surprising because it is expected that Green Turtles would be dominant, but this may be a reflection of individual beach types around the island being preferred by a particular species. That this is likely the case is shown by the April ground check. Although this brief visit did not confirm tracks/nests to individual species level it did record that narrow track nesters were the dominant nesting species here at this time. Given other confirmed nesting on similar nearby islands this is likely to be mostly if not all Olive Ridley Turtles. The aerial survey at this time also recorded that most of the 150 or so tracks around the island were along the southern coast and many were smaller tracks probably belonging to Olive Ridley Turtles, suggesting another likely important nesting beach for this species in the NT.

Flatbacks were observed to be the main nesting species in June on the south western point, but both other species were also recorded. In October Green Turtles were the main nesting species at this same place, but both other species were again recorded.

Again, due to the largely all year round nesting of each of the species (particularly Flatback and Green Turtles) and the lack of species confirmations from ground surveys at certain times, it is not possible to confidently state the full primary laying periods or peaks for each individual species.

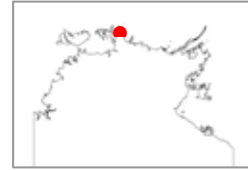
No egg predation was recorded on this island.

APPROXIMATE SUMMATION OF SPECIES NESTING SIGNIFICANCE IN COAST SECTION 5.14			
[Very High (OOOO), High (OOO), Medium (OO), Low (O) numbers; O = Certain, X = Probable]			
Flatback	Green	Hawksbill	Olive Ridley
OOXX	OOOX		OOX

OCCURENCE OF LAYING (ALL SPECIES COMBINED) BY MONTH IN COAST SECTION 5.14											
O = Egg laying confirmed; X = Nil egg laying recorded; ? = Not surveyed or presence of current laying not assessed											
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
O	O	?	O	O	O	?	?	O	O	O	?

Coast Section 5.15

Site(s): Oxley Is. (11° 00' S, 132° 49.8' E).



Oxley Island (331 ha) consists of a pair of narrow north/south aligned islands (totaling ~7 km x 0.5 km) towards the northern part of the group of islands off Croker Island. The island is surrounded by reef which is more prominent on the eastern side, where there is no turtle nesting. Most nesting is at the southern end of the southern island of the pair.

The island was recorded as an important nesting area for Flatbacks and Olive Ridley Turtles. Other species recorded nesting included Green and Hawksbill Turtles. Each of these species was recorded via a single confirmed nest but both could have also been among mixed species track records from aerial surveys around November. The allocation of individual species significance is imprecise because of the large percentage of unconfirmed species records.

Aerial surveys spanning the months February to June (less March), and October and November were done of this island. Two ground checks were also done relating to turtles, one in February (1996) and the other in June (1996). Turtle tracks/nests were recorded in all aerial and ground surveys done of this island.

The largest estimations of track/nest numbers were around 180 in November 1996, 115 in November 1993 and 100 in February 1996. Normally all such counts would be expected to have included older tracks from earlier in the season, as explained with the previous islands. This may not have been totally the case with at least one of these surveys. Timing of surveys with regard to weather and tides can have a large effect on the number of tracks observed, particularly on narrow beaches, such as occur on parts of Oxley Island. Aerial surveys in October 1993 along the western coast of the southern island



Plate 33. SW side of Oxley Island (coast section 5.15), February 1996. Photo R. Chatto.

recorded very few turtle tracks but another aerial survey of the same area about seven weeks later in November recorded the 165 tracks. Given that strong winds and high tides occurred before the October survey a completely different and incorrect impression may have been obtained at this time. Further, the greatly increased number of tracks between the two surveys suggests this site had considerable numbers of nesting or at least nesting attempts made in this period. A lot of these tracks at the southern part of the southern island were recorded as wide tracks and were suspected to be Green Turtles. However, further to the north along the western side the beach narrows considerably and would have seemed unsuitable as a typical Green Turtle nesting beach. Given this beach type in conjunction with the time of year, considerable Hawksbill Turtle nesting is a possibility. This site should be ground surveyed again around November to determine its potential significance as another important NT Hawksbill Turtle nesting site.

Both ground surveys of this island were fairly short checks on two locations close to each other at the southern end of the southern island. The ground survey done in February (1996) confirmed nesting of all four species that normally nest in the NT, with Flatbacks most numerous. The ground survey done in June (1996) again showed Flatback Turtle nesting to be the most numerous, but there was a higher percentage of Olive Ridley Turtle nesting.

Although nesting by one species or another is likely to have occurred all year round on this island the results can only confirm laying of all species combined to have occurred in January, February, April to June, and September to November.

In terms of individual species laying months, the lack of surveys between July and September and the lack of ground surveys in the second half of the year compromises identification of site-specific nesting seasons or peak nesting months. Nevertheless, it was confirmed that Flatback Turtle laying occurred at least in February, May and June, and is likely to have continued into the later part of the year as part of the many unconfirmed species track/nest records. Olive Ridley Turtle laying was confirmed to occur in February and between April and June at least, with higher numbers likely in the May/June period. Green Turtle nesting was confirmed to occur January and February, and was likely to have been represented in fresh unidentified tracks/nests in October and November. The single confirmed Hawksbill nest was located in the month of February.

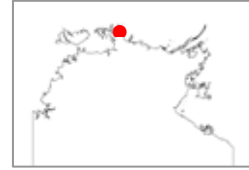
No egg predation was recorded on this island.

APPROXIMATE SUMMATION OF SPECIES NESTING SIGNIFICANCE IN COAST SECTION 5.15			
[Very High (OOOO), High (OOO), Medium (OO), Low (O) numbers; O = Certain, O = Probable]			
Flatback	Green	Hawksbill	Olive Ridley
OOO	O O	O O O	OO O

OCCURENCE OF LAYING (ALL SPECIES COMBINED) BY MONTH IN COAST SECTION 5.15												
O = Egg laying confirmed; X = Nil egg laying recorded; ? = Not surveyed or presence of current laying not assessed												
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
O	O	?	O	O	O	?	?	?	O	O	?	

Coast Section 5.16

Site(s): New Year Is. (10° 54.9' S, 133° 02.2' E).



New Year Island (78 ha) is the most northerly of the group of islands in this area, and one of the smaller ones. It is also the most northerly island in the NT. It has less sand than the other islands, instead having a lot of coral rubble/shingle on the shoreline and the beaches, which makes tracks and nests more difficult to see. Most nesting was observed on the western half of the island.

Aerial surveys of this island were done in February, April, June, October and November. The island was landed on for a ground check in November 1993 but this was for a seabird survey and turtle nesting was not examined. Tracks/nests were recorded in all aerial surveys.

Track/nest numbers recorded on this island were fairly consistent (between 55 and 80) for most surveys. The highest estimate of track numbers was in November 1996. Tracks and nest pits in coral rubble covering sand such as on this island are conspicuous for considerably longer than on pure sand so it less clear how much of each count would be fresh nesting attempts. Additionally, more attempts would fail where the coral rubble was deep, particularly for shallow digging species such as Olive Ridley Turtles.

The absence of any ground surveys to assess turtle nesting on this island means species confirmation is difficult. Comments recorded during aerial surveys indicated that tracks appeared to include both the narrower Hawksbill/Olive Ridley Turtle types and the wider Flatback/Green Turtle types.



Plate 34. New Year Island (coast section 5.16) showing the coral rubble covering sand along the shoreline, April 1994. Photo R. Chatto.

Limpus (1992) visited the island in July 1992 and recorded Hawksbill (mostly), Flatback and Green Turtle nesting. The fact that he recorded Hawksbill Turtles as the main nesting species, and at that time of the year, is not consistent with the findings of my surveys of other islands in the area. However, Limpus did base this on assigning all alternate tracks to Hawksbill Turtles after sighting a nesting Hawksbill Turtle, a dead one and an emerging nest on his single visit.

Guinea (1990) visited the island in June 1989 and he recorded 38 Olive Ridley Turtle nests as the only species he observed.

Records from my surveys combined with observations of Limpus and Guinea can confirm more than one species nesting on this island, and combined laying extending from at least February to July (less March which was not surveyed) and September to November. It would be surprising if surveys timed to assess each of the three single months in which nesting could not be confirmed would not show continuous nesting through them as well.

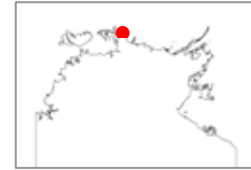
No egg predation was recorded from this island.

APPROXIMATE SUMMATION OF SPECIES NESTING SIGNIFICANCE IN COAST SECTION 5.16			
[Very High (OOOO), High (OOO), Medium (OO), Low (O) numbers;			
O = Certain, O = Probable]			
Flatback	Green	Hawksbill	Olive Ridley
O	O	O O	O O O

OCCURENCE OF LAYING (ALL SPECIES COMBINED) BY MONTH											
IN COAST SECTION 5.16											
O = Egg laying confirmed; X = Nil egg laying recorded;											
? = Not surveyed or presence of current laying not assessed											
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
O	O	?	O	O	O	O	?	O	O	O	?

Coast Section 5.17

Site(s): McCluer Is. (11° 04.2' S, 133° 00' E).



McCluer Island (806 ha) is one of the largest of the mostly small islands off Croker Island. It is also a very significant marine turtle nesting island. It is surrounded by reef but this is less prominent on the western side where the majority of turtle nesting occurs, particularly at the northern and southern ends. There was also some nesting along the north western side of the island but beaches here are short and high tides cover most of the sand. Consequently, aerial track observations are more likely to miss evidence of nesting here than on the western side beaches.

As with many of the islands in this area, the species confirmed nesting were Flatback, Olive Ridley and Green Turtles. Most nesting is likely to be attributable to Flatbacks and Olive Ridley Turtles. Hawksbill Turtle nesting was not confirmed from ground observations, but could have been among 'narrow track' aerial records given this species was confirmed nesting on a nearby island. Narrow track observations made during November are considered likely to be Hawksbill Turtles because very little Olive Ridley Turtle nesting normally occurs in the NT at this time.

Aerial surveys of McCluer Island were done in the months of February, April, June, October and November, between 1993 and 1996. Ground surveys were done on three visits to the island. These were in the months of February (1996), April (1994) and June (1996). Two of these surveys (April and June) were on the south western point of the island, while the third (February) was about 1 km north along the western side of the island. Tracks/nests were recorded in all ground and aerial surveys.



Plate 35. NE corner of McClure Island (coast section 5.17), April 1994. Photo R. Chatto.

The highest track/nest count (included fresh and older signs) around the island was 190+ in November 1996. Other high counts of between 70 and 110 were frequently recorded in the survey months between April and November. This suggests good nesting of at least the three confirmed species, based on known timing of their main nesting periods in the area.

The mid February ground survey recorded fresh nests of all three species with Flatbacks the more numerous at the particular site. However, an aerial survey of the island a couple of weeks previously recorded several references to likely Green Turtle tracks in a number of other places along the western coast.

The April aerial survey confirmed good numbers of tracks/nests around the island. The ground sample of one of these areas confirmed good nesting by Flatbacks and Olive Ridley Turtles, with both species having fresh and hatched nests present. There was also a single Green Turtle nest recorded in this sample.

The June aerial survey again recorded many tracks/nests and a ground sample of one area again confirmed nesting by Flatbacks and Olive Ridley Turtles, but this time the percentage of Olive Ridley Turtles had dropped. Nevertheless, both species again had fresh and hatched nests present.

Although both Flatback and Olive Ridley Turtles would nest in each of the different types of beach habitat present, Flatbacks tended to be more dominant on the dune and tree backed beach sections, while the Olive Ridley Turtles preferred the sand spit and short steeper parts of the beach.

Laying of all species combined was confirmed from January to June (less the un-surveyed month of March) and in the September to November period at least. Given the species confirmed on this island it is also fairly likely that laying would have continued between these two periods. It is also not possible from the data to state primary laying periods for each species. It is likely that Flatback and Olive Ridley Turtles accounted for most of the nesting between February and June, and it is likely the Flatback laying, in particular, continued to be part of the unconfirmed species records after June. The higher counts in October and November may represent the commencement of laying by Green Turtles which mostly nest later in the season (from September onwards), and the later parts of the finishing Flatback nesting season. If Green Turtles are laying in reasonable numbers on this island, as suspected, then it is likely that their laying would continue though December.

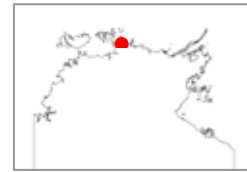
No observations of egg predation were recorded from this island.

APPROXIMATE SUMMATION OF SPECIES NESTING SIGNIFICANCE IN COAST SECTION 5.17			
[Very High (OOOO), High (OOO), Medium (OO), Low (O) numbers; O = Certain, O = Probable]			
Flatback	Green	Hawksbill	Olive Ridley
OO O	O O		OO O

OCCURENCE OF LAYING (ALL SPECIES COMBINED) BY MONTH IN COAST SECTION 5.17											
O = Egg laying confirmed; X = Nil egg laying recorded; ? = Not surveyed or presence of current laying not assessed											
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
O	O	?	O	O	O	?	?	?	O	O	?

Coast Section 5.18

Site(s): Mainland coast Cape Cockburn
 (11° 20.3' S, 132° 52.9' E) to
 Aurari Bay (11° 42.4' S, 133° 18.7' E).



The last of the mainland coast to be discussed in this bioregion is around Mount Norris Bay (not detailed in table 5) and the coast between Cape Cockburn and the eastern end of the bioregion. Low density nesting occurs on the scattered beaches spread along much of this coastline. Some of these beaches have slightly higher (medium) density nesting. The only confirmed species was the Flatback Turtle.

Aerial surveys were conducted of part or all of this coast section in February, April, June, August and November. Tracks/nests were recorded in each of these surveys, but increased in total number throughout the year from occasional in February to at least 22 in November. Further, the number of individual nesting sites along the coast also increased over the year. Ground surveys were done in August and November at three separate sites.

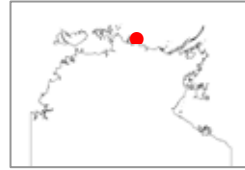
As Flatback Turtles were the only species confirmed here, laying is likely to be continuous from February to November along this coast section, albeit at a low density. However, the limited survey results cannot confirm fresh laying in May, July and September. No hatched nests were found in ground surveys to backdate laying times, largely because of the dog and goanna predation on most nests. There are also insufficient records to suggest primary or peak nesting months, but this is likely to be from around April to September.

APPROXIMATE SUMMATION OF SPECIES NESTING SIGNIFICANCE IN COAST SECTION 5.18			
[Very High (OOOO), High (OOO), Medium (OO), Low (O) numbers; O = Certain, ⚡ = Probable]			
Flatback	Green	Hawksbill	Olive Ridley
OO			

OCCURENCE OF LAYING (ALL SPECIES COMBINED) BY MONTH IN COAST SECTION 5.18											
O = Egg laying confirmed; X = Nil egg laying recorded; ? = Not surveyed or presence of current laying not assessed											
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
O	O	O	O	?	O	?	O	?	O	O	?

Coast Section 5.19

Site(s): North Goulburn Is. (11° 31.1' S, 133° 24.3' E).



The remaining three islands yet to be discussed for this bioregion are at the far eastern end of the bioregion and about 60 km from the group of islands off Croker Island discussed above. The islands in the east of the bioregion include the large islands of North and South Goulburn, and the smaller Sims Island. Sims Island has very little turtle nesting and will not be discussed separately. Of the two Goulburn Islands, North Goulburn had by far the most turtle nesting recorded during these surveys.

North Goulburn Island (3 993 ha) is a large island (~15 km long by 8 km wide) with considerable turtle nesting on all but the mid-southern section. A lot of the beaches around this island are heavily wind-blown in the dry season. This quickly removes tracks and some nest sign and thus generally lowers counts during surveys, particularly aerial surveys.

The highest density of nests was recorded along the beaches of the western end of the southern coasts of the island, but the western end of the northern coast and the northern part of the eastern coast were also high density nesting areas. Flatback (mostly) and Green Turtles were confirmed nesting on the island. Occasional narrow tracks and nests of small (predated) eggs were also recorded. These were thought to be Olive Ridley Turtles rather than Hawksbill Turtles because of the smallness of the tracks and the location nesting sites on the beach.



Plate 36. Flatback Turtle tracks and nest on North Goulburn Island (coast section 5.19), June 1996. Photo R. Chatto.

Aerial surveys of this island were conducted in February, June and November, between 1996 and 2000. Three ground surveys were done in the months of June (2) and November between 1996 and 2004. Turtle nesting was recorded in all ground and aerial surveys. The highest track/nest count recorded was 200+ in a February (1996) aerial survey. The exposed nature of most of these beaches meant that nesting sign observed in February is likely to be from then or January rather than all signs remaining from the previous season. The timing of this large amount of nesting would suggest Green Turtles are involved.



The next highest counts were 180+ November (1996) and 160+ in June (1996) aerial surveys. These indicate the island also has good dry season nesting, which are more likely to involve Flatback Turtles.

Ground surveys sampled four separate sites around the island. June surveys sampled three sites, one each in the south west, the mid north and the east. All sites in June showed Flatback Turtles to be the main nesting species, with an occasional Green Turtle nest and two probable (predated) Olive Ridley Turtle nests. At this time Flatback nests were observed in all stages from very fresh nests to hatched nests, confirming laying back to at least April. Considerable goanna predation and some Aboriginal harvest on eggs were recorded.

The November ground survey was in the same general area as one of the June surveys, but at a different site. In November only Flatback and Green Turtle nesting was recorded. Flatback nesting still dominated, but the percentage of hatched and older nests was higher compared to June. In November there were no really fresh Flatback nests recorded, and note made that the laying season appeared finished. The small amount of Green Turtle nesting did indicate some November laying of at least this species. Goanna predation was still significant at this time.

As there were no ground surveys between December and May it is not possible to state primary nesting months for Green Turtles.

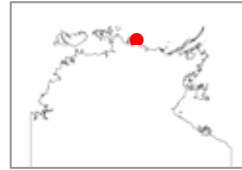
With all species combined, laying was confirmed in January, February, April to June, October and November. Further observations in months that were not surveyed would likely show nesting in all months given that good numbers of both Flatback and Green Turtles were involved.

APPROXIMATE SUMMATION OF SPECIES NESTING SIGNIFICANCE IN COAST SECTION 5.19			
[Very High (OOOO), High (OOO), Medium (OO), Low (O) numbers;			
O = Certain,  = Probable]			
Flatback	Green	Hawksbill	Olive Ridley
OOO	OO		

OCCURENCE OF LAYING (ALL SPECIES COMBINED) BY MONTH											
IN COAST SECTION 5.19											
O = Egg laying confirmed; X = Nil egg laying recorded;											
? = Not surveyed or presence of current laying not assessed											
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
O	O	?	O	O	O	?	?	?	O	O	?

Coast Section 5.20

Site(s): South Goulburn Is. (11° 36.4' S, 133° 23.6' E).



South Goulburn Island (6 229 ha) is a slightly larger island than North Goulburn Island and has a resident Aboriginal population living at Warruwi in the south west. It also has considerably less turtle nesting than North Goulburn Island, with all records for the southern island being along the northern coast. No higher density sites were located on this island. Green Turtles were the only species confirmed, but Flatbacks are very likely as well based on their presence on similar type beaches on North Goulburn Island and fresh, wider tracks recorded in June.

There were only three aerial surveys of the island. These were done in the months of February, June and November. Most coverage was of the northern shoreline. There were no ground surveys done to check turtle nesting.

Fresh and older turtle tracks/nests were recorded in each of the three aerial surveys of parts of the island. As such confirmed laying can only be attributed to these periods, which includes January because of the early time in the month of the February survey.

Green Turtle tracks (in the November survey) were the only species confirmed. There were no records of the narrow tracks of Hawksbill or Olive Ridley Turtles so it is likely that nesting on this island, which mostly occurs on parts of the northern and eastern coast, is predominantly Flatback or Green Turtle, with Flatback Turtles dominating.

Predation of nests by an unknown source was recorded in a November survey. With community dogs present it is likely that ground surveys would have confirmed both animal and human predation/harvesting of eggs.

APPROXIMATE SUMMATION OF SPECIES NESTING SIGNIFICANCE IN COAST SECTION 5.20			
[Very High (OOOO), High (OOO), Medium (OO), Low (O) numbers;			
O = Certain, X = Probable]			
Flatback	Green	Hawksbill	Olive Ridley
X	O		

OCCURENCE OF LAYING (ALL SPECIES COMBINED) BY MONTH											
IN COAST SECTION 5.20											
O = Egg laying confirmed; X = Nil egg laying recorded;											
? = Not surveyed or presence of current laying not assessed											
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
O	O	?	?	?	O	?	?	?	?	O	?

Coast Section 5.21 – Not discussed due to the small amount of nesting on this island.

Table 5. Locations of significant nesting activity in the Cobourg Bioregion with combined sum of nests and tracks >5 for all surveys between 1991 and 2004 and number of surveys (number of unique visit dates) for each coast section.

Coast section	Observation	Flatback Turtle	Green Turtle	Mix of Flatback or Green	Hawksbill Turtle	Olive Ridley Turtle	Mix of Hawksbill or Olive Ridley	Unknown species	No. of surveys
5.1 Lingi Point to Araru Point	Tracks							11	2
5.2 Vashon Head to Walford Point	Nest	3	7	13			1	2	7
	Tracks			39		0		16	
5.3 Black Point to Port Bremer	Nest	5	5					14	7
	Tracks	3	2	131				66	
5.4 Sandy Is No1 and Sandy Is No2	Tracks	10		4				69	3
	Nest	8						7	6
5.5 Port Bremer to Danger Point	Tracks			2				2	
	Nest	7				1		3	5
5.6 Danger Point to Raffles Bay	Tracks	4		22				171	
	Tracks			2				11	1
5.7 Palm Bay Croker Is	Tracks								
5.8 North side Croker Is	Tracks	2							1
	Tracks		14	41				7	
5.9 Darch Is	Nest	1							5
	Tracks			6				100	2
5.10 Templer Is	Nest	15		36		5		25	8
	Tracks	3		21			2	309	
5.11 Valencia Is	Nest	2					10	55	7
	Tracks	1		20			5	83	
5.12 Grant Is	Nest	8	4			6	1	10	10
	Tracks		1	32	7	1		214	

Coast section	Observation	Flatback Turtle	Green Turtle	Mix of Flatback or Green	Hawksbill Turtle	Olive Ridley Turtle	Mix of Hawksbill or Olive Ridley	Unknown species	No. of surveys
5.13 "Little Lawson" Is. (Unnamed Is S of Lawson Is.)	Nest			10			2		6
	Tracks							81	
5.14 Lawson Is	Nest	13	3	1		4	1	151	9
	Tracks	1	23	58			15	633	
5.15 Oxley Is	Nest	10	1			5	2	11	9
	Tracks		1	9			3	447	
5.16 New Year Is	Nest							10	7
	Tracks			1			1	265	
5.17 McCluer Is	Nest	13				3	5	75	10
	Tracks	2	2	42			17	453	
5.18 Cape Cockburn to Aurari Bay	Nest	19						10	9
	Tracks	10		8				17	
5.19 North Goulburn Island	Nest	166	7	50	0	0	2	89	7
	Tracks		5	165				152	
5.20 South Goulburn Island	Nest	1						4	7
	Tracks		2	4				23	
5.21 Sims Is	Nest							10	3
	Tracks						1		

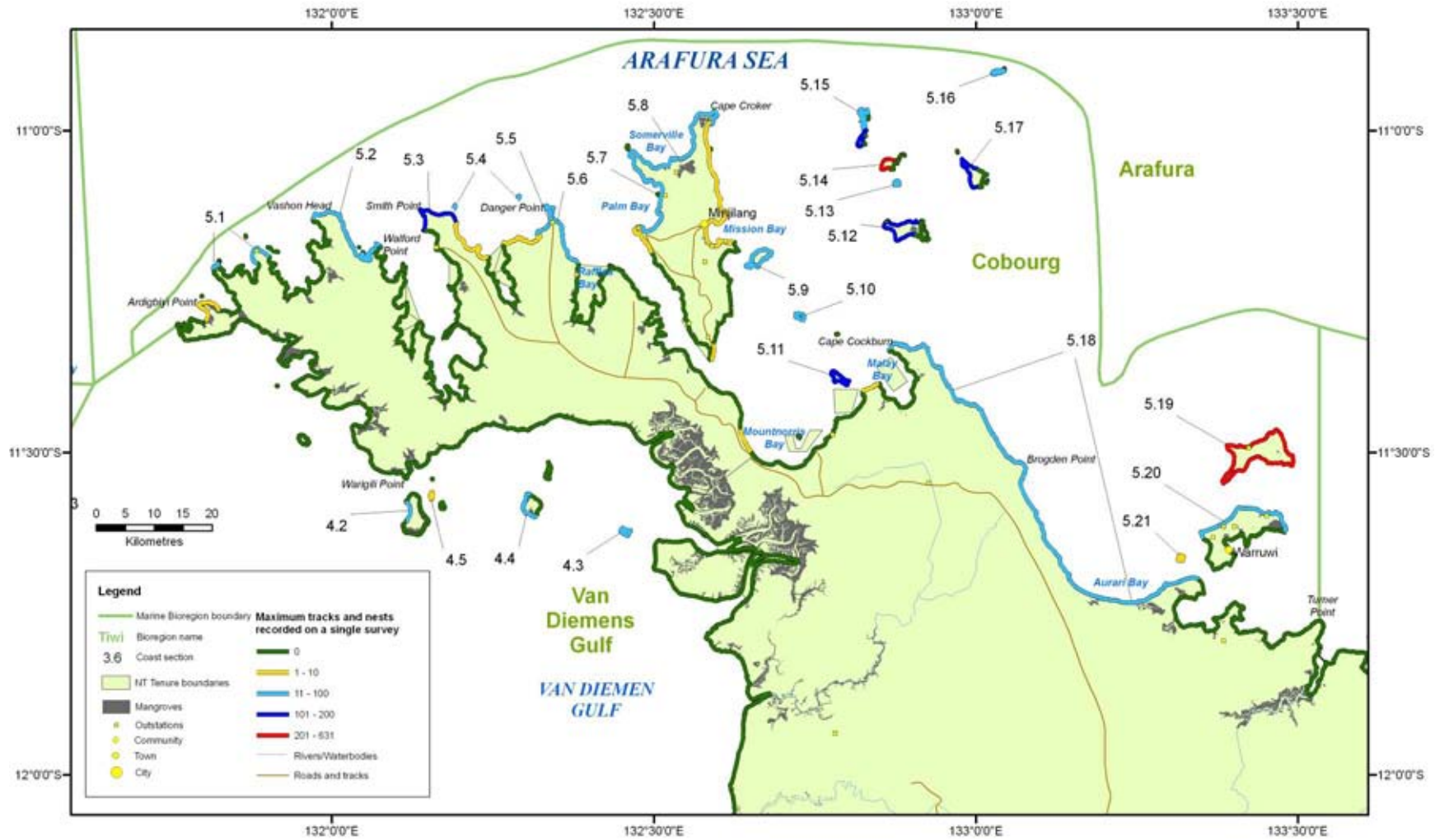


Figure 19. Relative importance of nesting beaches using maximum sum of nests & tracks of all species in a single survey between 1991 & 2004 in the Cobourg Bioregion.

Arnhem-Wessel

Location and description

The Arnhem Wessel Bioregion includes the Arnhem Land coast from Turner Point east of the Goulburn Islands to Cape Wilberforce north of Nhulunbuy. The climate is monsoonal with rainfall between 1 200 and 1 400 mm. The coastline is complex encompassing a variety of bays, inlets, rivers and extensive islands. Tidal range generally increases eastwards from 3 m to 5 m at Arnhem Bay. Coasts with northerly or easterly exposures generally consist of bare rock or sand barriers and mangrove is absent or restricted between and behind sand ridges. Coral reefs are generally absent except for fringing reefs off the north eastern coast.

This bioregion has a large number of islands, particularly in the north east. These include the major island chains of the Cunningham, Wessel, English Company and Bromby Islands.

The bioregion is wholly contained within Aboriginal-owned Arnhem Land. Larger coastal communities include Maningrida, Millingimbi and Galiwinku (on Elcho Island). There are also numerous coastal outstations which are occupied for varying times of the year.

The bioregion is of considerable importance for the nesting of all four species that regularly breed in the NT.

Survey effort

A total of 63 survey days were done between 1991 and 2004 in the Arnhem Wessel Bioregion. Surveys were done in every month of the year within this bioregion with most done in March, May and November, and fewest in January and February (Figure 20).

The length of coast is 2 550 km (23% of the NT coast) and the length of coast where wildlife records were not obtained on any survey was 203 km (8% of the bioregion).

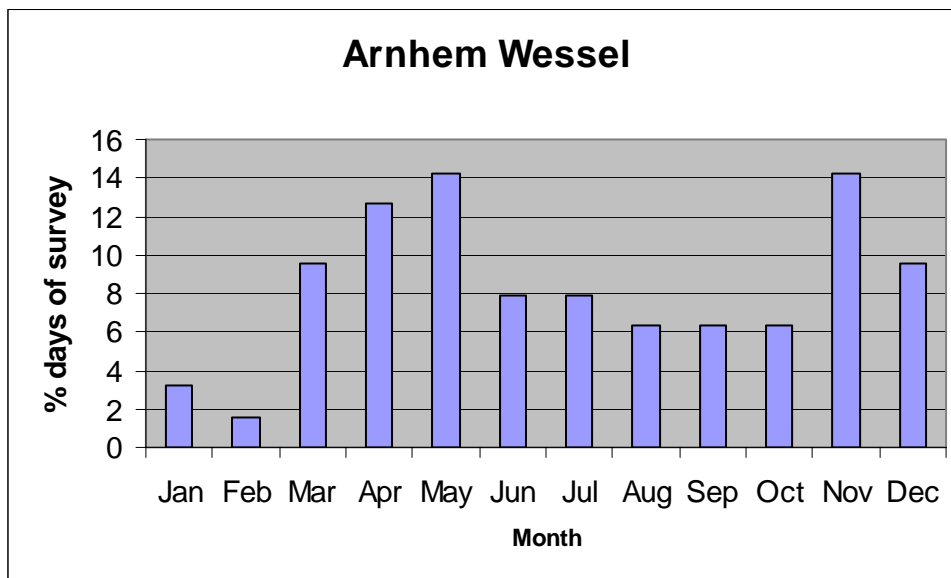


Figure 20. Survey effort by month between 1991 and 2004 in the Arnhem Wessel Bioregion.

Nesting summary

This bioregion, along with the Grootte Bioregion, are the most important for marine turtle nesting in the NT. With the exception of some mangrove-lined bays, turtle nesting occurred throughout the bioregion. The vast majority of the significant turtle nesting beaches in this bioregion are located on islands, mostly the smaller islands. All four of the marine turtles that regularly nest in the NT were recorded in this bioregion, and there were many significant nesting sites for each of these species.

Nesting areas throughout this bioregion are mapped, by the highest counts for any single survey, in Figure 21 (west) and Figure 22 (east), at the end of the bioregion's coast section summaries.

Total numbers of tracks and nests per month for all nesting on islands and mainland beaches in the bioregion is shown in Figure 63, Appendix A.

Coast Section Discussions

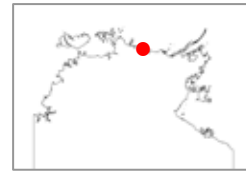
Forty-eight individual coast sections (6.1 to 6.48) are listed within this bioregion. Track and nest counts for each of these sections are given in Table 6 and the numbered coast sections are shown in Figure 21 (west) and Figure 22 (east). The most significant of these coast sections are discussed in more detail below.



Plate 37. Flatback Turtle nesting site on NW Crocodile Island (coast section 6.8), June 1996, Photo R. Chatto.

Coast Section 6.1

Site(s): Guion Pt. (11° 46.8' S, 133° 40.2' E) to
 Braithwaite Pt. (Junction Bay).
 (11° 46.2' S, 133° 56.4' E).



The mainland coast and some of the large islands within this bioregion predominantly have very low density nesting along their scattered beaches. As very few tracks/nests were recorded per survey, they are mainly discussed in this one combined summary (next). Two coast sections within this (6.1 and 6.29) have slightly higher numbers of nesting turtles so are discussed as individual coast sections.

This coast section, the coast between Guion and Braithwaite Points, has a considerable proportion of sandy beach along its approximately 35 km length.

Part or all of this coast section was surveyed from the air in February, April to June, October and November, between 1993 and 2000. Tracks/nests were recorded in each of these months. No ground surveys were done within this coast section. Although most records were not able to be confirmed to species, tracks/nests of both Flatback (throughout the coast section) and Green Turtles (concentrated to two larger dune-backed beaches in the centre and east of the coast section) were confirmed from the air. And it is likely that one or both are the main nesting species in this coast section.

The largest track/nest count was 43 in November 1993 and 28 in November 1996, while all counts in the February to June surveys were all of less than 5 tracks/nests.

Although no ground surveys were done, track/nest observations from the air confirm laying to have occurred in the months of February, April to June and September to November.

Goanna predation was recorded in one June survey.

APPROX. SUMMATION OF SPECIES NESTING SIGNIFICANCE IN COAST SECTIONS 6.1			
[Very High (OOOO), High (OOO), Medium (OO), Low (O) numbers;			
O = Certain, O = Probable]			
Flatback	Green	Hawksbill	Olive Ridley
O O	O O		

OCCURENCE OF LAYING (ALL SPECIES COMBINED) BY MONTH											
IN COAST SECTIONS 6.1											
O = Egg laying confirmed; X = Nil egg laying recorded;											
? = Not surveyed or presence of current laying not assessed											
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
?	O	?	O	O	O	?	?	O	O	O	?

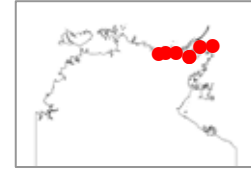
Coast Sections 6.2, 6.4, 6.9, 6.10, 6.11,

6.26, 6.28, 6.47 & 6.48.

Site(s): Mainland (and large island) coast from

Goomadeer Pt. (11° 51.6' S, 134° 02.4' E)

to just south of Cape Wilberforce (12° 04.7' S, 136° 33.8' E).



These coast sections are discussed together because they all contain scattered, low density, mainland (and large island) nesting sites that were relatively poorly ground surveyed. All sites involved mostly Flatback Turtle nesting, with occasional Olive Ridley and Green Turtle nesting.

The area discussed here extends from Goomadeer Point in the western part of the bioregion to just south of Cape Wilberforce in the eastern part of the bioregion. It includes all of the mainland beaches of the bioregion that are not discussed within coast sections 6.1 and 6.29. It also includes the large islands of Howard and Elcho Islands.

There are considerable lengths of mangrove or reef coast within these coast sections. Much of this has a wide intertidal zone which restricts turtle nesting access to the scattered small beaches which punctuate this type of coast. The coast also has numerous bays which include the larger bays of Boucaut, Castlereagh, Buckingham and Arnhem Bays. Many of the turtle nesting beaches that are scattered along the mainland of this bioregion are located on points. There were only a small number of sites where slightly higher density nesting (i.e. low tens of tracks/nests per survey) was recorded. These include near Goomadeer and North East Points in the west, and the north eastern areas of Howard and Elcho Island.

There were numerous aerial surveys done over parts of this long coastline but none done to compile total counts for the whole coast length in the one survey. Further, there were only three brief ground surveys to examine marine turtle nesting. Most of the tracks recorded during aerial and ground surveys were of the wider track species of Flatback or Green Turtle. Both of these species, as well as Olive Ridley Turtles were confirmed as nesting in these coast sections. There were only a small number of records in total but Flatback Turtles were the most frequently confirmed nesting species.

Further survey on suitable beaches to the west of Maningrida (e.g. in the vicinity of 11° 55.8' S, 134° 09' E) may show an increased importance for Olive Ridley Turtles as the area of coast seemed to appear more suitable for turtle nesting than was recorded at the time of the limited surveys.

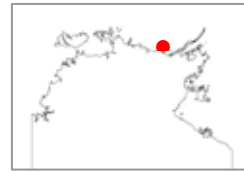
Because of the long coast and the few records of marine turtle nesting, no summary tables are produced for these coast sections. However, details of individual nesting sites can be found in the individual species sections later in this report.

Coast Section 6.3 – Not discussed due to small amount of nesting.

Coast Section 6.4 – Included with Coast Section 6.2.

Coast Section 6.5

Site(s): North coast of Yabooma Is.
 from (12° 1.2' S, 134° 54.6' E)
 to (12° 2.4' S, 134° 59.4' E).



The north coast of Yabooma Island is briefly discussed on the basis of one detailed ground survey done in early December 2004. This survey recorded signs of 34 Flatback and four Green Turtle nests. There were no freshly laid nests at that time, but most had hatched or been taken by goannas during the previous couple of months. One Flatback Turtle nest was in the process of emerging, even though goannas were still digging into it. Six turtles had hatched but had not emerged and six more eggs were about to hatch, the remainder (not counted) had been progressively eaten by goanna raids throughout the incubation period. A species summary table has been included for this coast section, but there is insufficient data to warrant a nesting season table.

APPROX. SUMMATION OF SPECIES NESTING SIGNIFICANCE IN COAST SECTIONS 6.1			
[Very High (OOOO), High (OOO), Medium (OO), Low (O) numbers;			
O = Certain, O with slash = Probable]			
Flatback	Green	Hawksbill	Olive Ridley
O with slash	O		

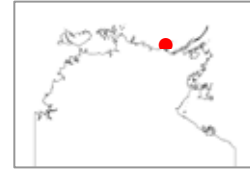


Plate 38. North coast of Yabooma Island (coast section 6.5), July 1998. Photo R. Chatto.

Coast Sections 6.6 & 6.7

Site(s): Moorroongga Is. (11° 55.8' S, 135° 04.9' E)

'Little Moorroongga' Is. (11° 54.7' S, 135° 08.9' E).



The more significant of the islands of this bioregion will now be discussed individually starting in the west and working to the east. The first of these is Moorroongga Island and the small island (here called 'Little Moorroongga' Island) just to its north east. Moorroongga Island (2 074 ha) has a small permanent Aboriginal outstation on the northern side. Flatback, Olive Ridley and Green Turtles (in order of numbers) were confirmed nesting on both islands.

Moorroongga Island was surveyed from the air in the months of June, November and December (partial) but had only one ground check in December (2004). "Little Moorroongga" Island (65 ha) was surveyed from the air in the months of April, June and November, and had ground checks done in June (1996) and November (2000). Tracks/nests were recorded on both islands in each of the surveyed months.

"Little Moorroongga" Island had the highest track/nest counts, recording in excess of 100 in June 1996. Moorroongga had in excess of 50 in November 1993 as its highest single count.

Ground surveys in June confirmed fresh and old nesting for Flatback Turtles (most) and Olive Ridley Turtles on both islands. No hatched nests were observed at this time. The November ground survey recorded Flatback Turtles only, and more so as hatched nests than fresh nests. The December survey recorded nests of four Flatback, three Green and one Olive Ridley Turtle. The Flatback Turtle and Olive Ridley Turtle nests were all older hatched nests but the Green Turtle nests were currently incubating. These results suggest Flatback Turtle nesting from at least May to November, Olive Ridley Turtle nesting from May onwards and Green Turtle nesting from November onwards.



Plate 39. Flatback Turtle nest on Little Moorroongga Island (coast section 6.7), June 1996. Photo R. Chatto.

A long term resident on Mooroongga Island, Bentley James (*pers. comm.*) confirmed these three species nest on the islands at a breakdown of approximately 60% Flatback Turtle, 35% Olive Ridley Turtle and 5% Green Turtle nests over the year. He also said that Flatback Turtles nest throughout the year but most in the May to September period, that Olive Ridley Turtles nest from March to December, with a short sharp burst of most of them in April/May, and that Green Turtles also can nest throughout the year but mostly from May to August. He also said that Green Turtles concentrate at the north east of Mooroongga Island and at one or two sites to the south west of where the higher dunes and wider beaches are located. This latter area is the only location where Green Turtle nesting was recorded during my surveys.

These comments were largely supported by my surveys in relation to Flatback Turtle and Olive Ridley Turtle nesting, but not so for Green Turtle nesting. My surveys suggested Green Turtle nesting beginning later in the year. This anomaly needs to be clarified in the future.

Even though there is extensive Hawksbill Turtle nesting approximately 100 km to the east, no evidence was found of this species nesting on these islands. Bentley James (*pers. comm.*) says that in the 10 years he has been there he has only seen one Hawksbill Turtle nest in this area.

Aboriginal harvesting of eggs was common on both islands but more so on Mooroongga Island, but no predation by dogs or goannas was recorded. Dogs were present on Mooroongga Island but none were involved in digging up turtle nests during the survey period. Bentley James (*pers. comm.*) said that there used to be one dog that had learned to do this but it had died. It is also likely that the larger goanna species (*V. panoptes*) normally responsible for turtle egg predation, if ever present on the island, would struggle to survive given its popularity as food and also because of the presence of dogs. Water Pythons found sheltering under fallen vegetation on the beach of the smaller island may have preyed on turtle hatchlings at night, and both islands showed evidence of bird predation (e.g. Beach Thick-knee and Black-necked Stork) on hatchlings. The smaller Olive Ridley Turtle hatchlings are more susceptible to predation by Silver Gulls because they are smaller than the Flatback Turtles and can be swallowed whole. Silver Gulls were recorded breeding on the nearby North West Crocodile Island.

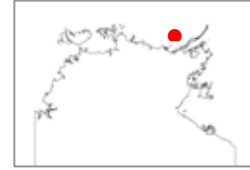
The following tables are done in conjunction with information from B. James.

APPROX. SUMMATION OF SPECIES NESTING SIGNIFICANCE IN COAST SECTIONS 6.6 & 6.7			
[Very High (OOOO), High (OOO), Medium (OO), Low (O) numbers;			
O = Certain, X = Probable]			
Flatback	Green	Hawksbill	Olive Ridley
OOO	O		OOX

OCCURENCE OF LAYING (ALL SPECIES COMBINED) BY MONTH												
IN COAST SECTIONS 6.6 & 6.7												
O = Egg laying confirmed; X = Nil egg laying recorded;												
? = Not surveyed or presence of current laying not assessed												
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
O	O	O	O	O	O	O	O	O	O	O	O	O

Coast Section 6.8

Site(s): NW Crocodile Is. (11° 42.1' S, 135° 09.4' E).



North West Crocodile Island (286 ha) is one of NT's more offshore islands. It is approximately 3 km long by 1 km wide and is located about 50 km north east of the nearest mainland point of Cape Stewart. Although it used to be inhabited for part of the year by Aboriginals who paddled canoes from Mooroongga Island 25 km to the south, it is now only occasionally visited to collect turtle and seabird eggs. The islands remoteness and resultant low predation on eggs or hatchlings make it a very successful turtle nesting island. It is of particular significance for Olive Ridley Turtles.

Like a number of smaller islands off the NT coast it is significant for both marine turtle and seabird breeding. Flatback and Olive Ridley Turtles are clearly the dominant nesting species, with the only other species confirmed being a much smaller number of Green Turtles. Even though there is extensive Hawksbill Turtle nesting approximately 100 km to the east, no evidence was found of this species nesting on this island. Beaches surround most of the island and turtles nest on all of them, though the highest usage areas were generally found to be in the north eastern and south western parts of the island.

This island was surveyed from the air in April to June, October and November, between 1993 and 2004. Unfortunately no surveys were done in the July to September period. Four ground surveys were done in May (1994), June (1996), October (1994), and December (2004). These involved surveys of three areas in the north east and south west of the island. Tracks/nests were recorded in all surveys.

The highest track/nest counts around the island were consistently between 70+ and 130+. These were recorded in every month where a full aerial estimate of tracks/nests was done; i.e. April, May, November and December. These estimates would undoubtedly have included some accumulation of tracks over at least the last few weeks, particularly on more sheltered parts of the island, but they certainly suggest regular nesting throughout most of the year.

The May and June ground surveys showed both fresh and hatched nests of both Flatback and Olive Ridley Turtles, indicating laying from March at least for both species. It is likely that surveys done earlier in the year would have shown these two species to have been nesting prior to March as well, based on other records in the bioregion. The May survey also showed 64% of 17 fresh nests were Olive Ridley Turtle but by the June survey 70% of 17 fresh nests were Flatback Turtle, suggesting that Olive Ridley Turtle nesting was decreasing and/or Flatback Turtle nesting was increasing by June. This is supported by Guinea (1990) who, in 1989, found more Olive Ridley Turtles nesting in an April survey, but more Flatback Turtles nesting in a July survey.

The December ground survey showed the vast majority of nests were old, with no fresh Olive Ridley Turtle nests and only a very occasional current Flatback Turtle nest. This suggests that the Olive Ridley Turtle nesting period was well finished by early December and that only a very small percentage of Flatback Turtles were still nesting at this time on this island.

The only Green Turtle nests were recorded in December. One of these was freshly laid. It was also noted in this December survey that one of the recently hatched Flatback Turtle nests had poor success with young dying in the egg just before hatching. It is possible that the additional heat in the sand at this time of year causes the death of the embryos through oxygen depletion unless the eggs are buried deeply. This would be part of the reason for the naturally lower nesting rates of marine turtles (except

the deeper nesting Green Turtle and the tree shade nesting Hawksbill Turtle) in most of the NT in the latter November to January time of the year.

Although these surveys, and observations by Mic Guinea in July, can show that nesting for all species combined is likely to occur from at least March to December, it cannot be confirmed for the month of August. However, this is probably only because of a the lack of an appropriately timed survey. The lack of ground surveys before May and then between July and September mean it is not possible to state a primary or peak nesting period within this range.

As with most areas where more than one species nests, there is some habitat partitioning for different species. A ground survey of the northern two thirds of the eastern coast of the island showed Flatback Turtles to nest along the whole length of coast but less densely in a smaller section of the north east where most of the Olive Ridley Turtles for that side of the island were concentrated. There were also other sections of the island where more Olive Ridley Turtles concentrated. Although an aerial circuit of the island in May (1994) recorded that most of the tracks were the wider (Flatback and/or Green Turtle) tracks, the ground check at a beach on the mid western coast showed more Olive Ridley Turtle tracks/nests than of Flatback Turtles.

No animal predation of turtle nests was recorded on this island traditional harvest of nests was noted, along with the previously cooked carapaces of adult and sub-adult turtles.

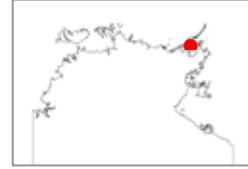
APPROXIMATE SUMMATION OF SPECIES NESTING SIGNIFICANCE IN COAST SECTION 6.8			
[Very High (OOOO), High (OOO), Medium (OO), Low (O) numbers; O = Certain, ⚡ = Probable]			
Flatback	Green	Hawksbill	Olive Ridley
OOO	O		OOO

OCCURENCE OF LAYING (ALL SPECIES COMBINED) BY MONTH IN COAST SECTION 6.8											
O = Egg laying confirmed; X = Nil egg laying recorded; ? = Not surveyed or presence of current laying not assessed											
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
?	?	O	O	O	O	O	?	O	O	O	O

Coast Sections 6.9, 6.10 & 6.11 – Discussed with Coast Section 6.2.

Coast Section 6.12

Site(s): Graham Is. (11° 45.2' S, 135° 57.2' E).



Graham Island (926 ha) is the first of a chain of small islands to the north east of Elcho Island. Most of these islands have significant marine turtle nesting. Limited survey work was done on this island so not a lot can be said about nesting here except that fairly significant marine turtle nesting was recorded on the eastern side of the island.

Graham Island was surveyed (with at least some emphasis on marine turtle nesting) from the air in October (1997) and from the ground (mid eastern coast) in June (1996). Other aerial surveys crossing from Elcho to Drysdale Island flew over the general area of Graham Island but concentrated on the exposed reefs off the island.

The October aerial survey recorded in excess of 100 tracks/nests in a high density nesting area along the eastern side of the island but only a small number along the western side. Both the narrower and the wider tracks were observed on the island, but most were noted as being the narrower Olive Ridley Turtle (most likely) or Hawksbill Turtle tracks. There was at least one overnight Flatback Turtle nest confirmed on the eastern side during this survey.



Plate 40. Olive Ridley (mostly) and Flatback (occasional) turtle nesting beach along the east side of Graham Island (coast section 6.12), June 1999. Photo R. Chatto.

A ground survey of a site on the mid eastern part of the island in June, confirmed good numbers of Olive Ridley Turtle (mostly) and Flatback Turtle nests. Both species had old and new nests present at the time. There was also a single Green Turtle nest confirmed on this ground survey.

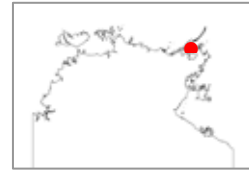
Col Limpus (*pers. comm.*) who was present on an October (1997) aerial survey identified a small number of old Hawksbill Turtle nest pits from the air, but nests of this species were not located on the June ground survey.

Although nesting for Flatback and Olive Ridley Turtles can be shown to occur from April to June, the full nesting season and peak nesting periods for any individual species cannot be stated because of the limited surveys. Confirmation of laying months for all species combined is also limited by the lack of surveys and can only be confirmed from April to June, September and October. Given the species confirmed nesting, additional surveys would almost certainly extend these months, particularly with respect to the two months between the two periods.

Goanna predation of turtle nests was recorded on this island.

APPROXIMATE SUMMATION OF SPECIES NESTING SIGNIFICANCE IN COAST SECTION 6.12			
[Very High (OOOO), High (OOO), Medium (OO), Low (O) numbers;			
O = Certain, O = Probable]			
Flatback	Green	Hawksbill	Olive Ridley
O O	O	O	OO O

OCCURENCE OF LAYING (ALL SPECIES COMBINED) BY MONTH											
IN COAST SECTION 6.12											
O = Egg laying confirmed; X = Nil egg laying recorded;											
? = Not surveyed or presence of current laying not assessed											
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
?	?	?	O	O	O	?	?	O	O	X	?

Coast Section 6.13**Site(s):** Drysdale Is. (11° 41.1' S, 135° 59.8' E).

Drysdale Island (5 014 ha) is the second island in a chain of small islands running north east from Elcho Island. Most of the islands in this chain have significant marine turtle nesting and Drysdale Island, largely by being the biggest island and with nesting all around it, had the most nesting recorded. Large numbers of tracks/nests were recorded from aerial surveys on the eastern side on most occasions, but only some of these surveys also showed significant nesting on the western and southern sides. Observable nesting sign on the western and southern sides is more likely to be obscured by high tides (along with wind and rain in the wet season) because these beaches are more exposed and narrower compared to the eastern side. This is particularly the case with surveys earlier in the season when Olive Ridley Turtles are likely to be the main nesting species. This species often nests just above the high tide line and does not leave an obvious body pit so there are few signs from the air when their tracks have been covered by the tide.

All four of the marine turtles that regularly nest in the NT were recorded nesting on this island. Flatback and Olive Ridley Turtles were confirmed in the greatest numbers. Flatback Turtles nested all around the island, whereas the southern and south eastern parts of the island were more suitable for Olive Ridley Turtles. Green Turtles, which also nested in quite good numbers on this island, preferred the northern end where the beaches were wider and deeper, and had bigger dune systems.



Plate 41. Confirmed Flatback and Green Turtle nesting area along north side of Drysdale Island (coast section 6.13), September 1996. Photo R. Chatto.

This island received ten aerial surveys between 1993 and 1999. These surveys spanned most months between January and November. Ground surveys were conducted on four of the ten visits. These were in the months of April (1996), June (1999), September (1996), and October (1999). Fresh tracks/nests were recorded on all surveys associated with this island.

The highest track/nest counts around the island were between 165+ and 260+. Higher counts were in aerial surveys between September and November, which probably involved some accumulation of previous nesting signs, particularly on the eastern side of the island.

Dr. Colin Limpus (*pers. comm.*) who was present on an October (1997) aerial survey identified all four of the marine turtles that regularly nest in NT, with the narrow track species (most likely Olive Ridley Turtles) being more numerous at that time. Most of these were older tracks. All species except Hawksbill Turtles were later confirmed from ground surveys.

The April ground survey was only a quick stop to check out an Olive Ridley Turtle nesting in the middle of the afternoon. At this time Olive Ridley Turtles (mostly) and Flatback Turtles were confirmed with fresh nests in the vicinity of the nesting turtle.

The June ground survey recorded low density nesting but by then it was mostly Flatback Turtles. The September and October surveys recorded Flatback Turtles as still the dominant nesting species, but by then a reasonable percentage of Green Turtle nests were present as well.

Laying of all species combined on this island was confirmed in all months except February and December. It is likely that appropriately timed surveys would also confirm laying in these two single month gaps. There were insufficient records confirmed to species level to positively state primary laying months for each species. Nevertheless, combined counts during the latter months of September to November were clearly higher than the earlier months. However, this could have been affected by the aerial surveys done early in the year happening to coincide with recent spring tides that came up to the base of the dunes and thus possibly wiped out nesting signs, particularly for Olive Ridley Turtles.

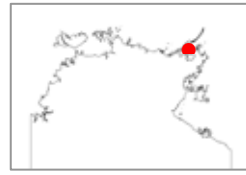
Goanna predation was very prevalent on this island, with some surveys (e.g. September, 1996) recording most nests as raided by goannas. Evidence of Aboriginal egg harvest was also seen on two ground checks. There is a small outstation on this island which is used irregularly by Aboriginals from nearby Elcho Island.

APPROXIMATE SUMMATION OF SPECIES NESTING SIGNIFICANCE IN COAST SECTION 6.13			
[Very High (OOOO), High (OOO), Medium (OO), Low (O) numbers;			
O = Certain, O = Probable]			
Flatback	Green	Hawksbill	Olive Ridley
OO O	O O O	O	OO O

OCCURENCE OF LAYING (ALL SPECIES COMBINED) BY MONTH											
IN COAST SECTION 6.13											
O = Egg laying confirmed; X = Nil egg laying recorded;											
? = Not surveyed or presence of current laying not assessed											
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
O	?	O	O	O	O	O	O	O	O	O	?

Coast Section 6.14

Site(s): Yargara Is. (11° 38.3' S, 136° 03.6' E).



Yargara Island (158 ha) is a small island just to the north east of Drysdale Island. There is not as much nesting area on this island as the others in the local chain of islands. Nesting observed on this island was mainly on the northern and eastern sides.

It was flown on four occasions but never ground checked. Aerial surveys were in March, July, September and October. No species could be confirmed so a species nesting summary table is not included for this coast section.

The highest count of tracks/nests were clearly in September and October with around 30 in the September (1994) survey and around 50 in the October (1997) survey, which noted most to be old and of the narrow Olive Ridley/Hawksbill Turtle type.

Although possible laying can be implied by tracks/nests recorded in surveys spanning March to October, in absence of information on the age of tracks/nests no meaningful summary of laying months can be given.



Plate 42. North end of Yargara Island (coast section 6.14) and small islands to north, April 1996. Photo R. Chatto.



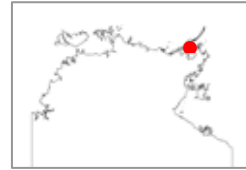
Plate 43. Important Olive Ridley Turtle nesting beach along the NW side of Raragala Island (coast section 6.21), September 1996. Photo R. Chatto.



Plate 44. Multiple tries from nesting Olive Ridley Turtle on the NW side of Raragala Island (coast section 6.21), September 1996. Photo R. Chatto.

Coast Section 6.15

Site(s): Burgunngura Is. (11° 35.4' S, 136° 04.9' E).



Burgunngura Island (264 ha) is the second outermost of the islands in the chain of islands to the north east of Elcho Island in NE Arnhem Land. It is another very significant turtle nesting island. Nesting occurs all around the island but particularly on its southern two thirds. All four of the marine turtle species that regularly nest in the NT were recorded nesting on this island.

This island was surveyed from the air and/or ground in all months except February, August and December, between 1993 and 1999. Tracks/nests were recorded on all surveyed months. The highest track/nest counts were 100+ in April (1996) just under 200 in October (1997). However, this island is another in which the timing of the survey in relation to weather and tides can have a large effect on the persistence of signs of previous nesting. Colin Limpus (*pers. comm.*) who was present on an October (1997) aerial survey identified all four of the marine turtle species that regularly nest in the NT. All species except Hawksbill Turtles were later confirmed from ground surveys.

The island was ground surveyed in late April (1996) in which the mid eastern coast was sampled, and late September (1996) in which the south eastern coast was checked. In the April ground survey reasonable numbers (10's) of Flatback and Olive Ridley Turtles were recorded on the mid eastern side of the island. At this time there were both fresh and hatched Olive Ridley Turtle nests indicating that they had been nesting for at least two months prior to this, but no hatched Flatback Turtle nests suggesting this species mainly started later. There were no other species confirmed as fresh nesting in this survey, but a few old Green Turtle nest pits were also present.



Plate 45. Flatback Turtle nest just above the high tide line on Burgunngura Island (coast section 6.15), April 1996. Photo R. Chatto.

In the September ground survey Flatback Turtle (mostly) and Green Turtles (small numbers) were confirmed as active at this time. There were no longer any active Olive Ridley Turtle nests. Flatback Turtles eggs were mainly hatched or in late incubation and there was little fresh nesting at this time. Green Turtles were recorded as fresh eggs but there was no sign then of any nests that had hatched from this season.

These results are consistent with other sites in the northern Top End in regard to primary or peak nesting timing for each species. Olive Ridley Turtles commence early in the year then overlap with Flatback Turtles which overlap with the later-starting Green Turtles, by which time most of the Olive Ridley Turtles have finished.

It is also worth noting that the highest count of tracks/nests for the island was recorded in an October aerial survey. The September ground survey suggested Olive Ridley Turtle (in particular) and Flatback Turtle nesting had passed their peaks. Consequently, the large numbers of tracks recorded in October (which included both wide and narrow types) may have represented Green Turtle and Hawksbill Turtle nesting getting underway in earnest. Both these species have been recorded at other sites in NE Arnhem Land as having primary or peak nesting periods to include this time of year. As there were no ground surveys done until the following April, which had seen a wet season come and go, only the deeper pits of the Green Turtles would have been likely to remain (partially) visible. Clearly this area needs to be ground surveyed in the November/December period in the future to confirm suggestions about Green and Hawksbill Turtle nesting.

Laying of all species combined on this island was confirmed in all months except February and December. It is likely that appropriately timed surveys would also confirm laying in these two months.

There were insufficient ground surveys to confidently state primary nesting periods for each species but for Olive Ridley Turtles the period would include March and April at least; for Flatback Turtles, April to August; and for Green Turtles, September and October at least.

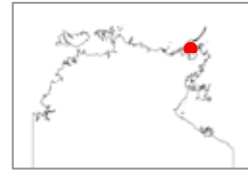
Goanna tracks or predation were not recorded on this island, but there was evidence of egg harvest by visiting Aboriginal people.

APPROXIMATE SUMMATION OF SPECIES NESTING SIGNIFICANCE IN COAST SECTION 6.15			
[Very High (OOOO), High (OOO), Medium (OO), Low (O) numbers; O = Certain, ⚡ = Probable]			
Flatback	Green	Hawksbill	Olive Ridley
OO⚡	O⚡⚡	O	OO⚡

OCCURENCE OF LAYING (ALL SPECIES COMBINED) BY MONTH IN COAST SECTION 6.15											
O = Egg laying confirmed; X = Nil egg laying recorded; ? = Not surveyed or presence of current laying not assessed											
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
O	?	O	O	O	O	O	O	O	O	O	?

Coast Section 6.16

Site(s): Stevens Is. (11° 33.1' S, 136° 06.8' E).



Stevens Island (289 ha) is the outermost of the islands in the chain running north east from Elcho Island. It is another highly significant marine turtle nesting island, both in terms of numbers and the absence of animal predation on the eggs. Nesting occurs around most of the island. Flatback and Olive Ridley Turtles were again recorded as the main nesting species on this island, both in numbers of significance. Green and Hawksbill Turtles were recorded from only one or two confirmed nests of each but may have been part of large counts of unconfirmed nesting recorded in October and November surveys.

This island received a similar survey effort to Burgungura Island, except for two fewer aerial surveys and one additional ground survey. Aerial surveys spanned all months from January to November, and were done between 1993 and 1999. The island was ground surveyed on three visits. These were in the months of April (1996), June (1999) and September (1996). Each of the three ground samples were between the mid and southern parts of the eastern coast of the island.

Tracks/nests were recorded in all surveys. High track/nest counts (50+) were consistently recorded from all months surveyed between March and November, with the highest being just under 200 in an October (1997) aerial survey.



Plate 46. East side of Stevens Island (coast section 6.16), September 1996. All four species were confirmed nesting on this island at some time during all surveys. Photo R. Chatto.




The April ground survey on the mid eastern side of the island recorded good numbers of Flatback and Olive Ridley Turtles, but no other species were confirmed at this time. Both species had incubating nests in the area but nothing was found to confirm recently hatched nests at this time. Although there were some hatched Flatback Turtle nests they could not all be confirmed as being from the current season.

In the June ground survey, a little further to the south, all four species were confirmed as nesting at this time. Flatback Turtles and Olive Ridley Turtles dominated the currently incubating nests. Only these two species had evidence of recent hatching, but the windy conditions made it hard to establish how much hatching had occurred in this season.

The September ground survey on the south eastern part of the island was of an area of high density nesting. Windblown, and with tracks and nests mixed over the top of each other it was difficult to gain an accurate understanding of the situation in the short survey time. At this time there was a complex mixture of mostly hatched and incubating nests, but with not a lot of very fresh nesting evidence. All species were confirmed nesting at this site, though most currently active nesting related to Flatback Turtles.

Having three spaced ground surveys between April and September allows a little more confidence to suggest minimum primary laying periods for some of the species. For Olive Ridley and Flatback Turtles good nesting appeared underway by at least as early as March. Olive Ridley Turtles continued to at least June. Flatback Turtles continued to nest in numbers for longer, and into August at least. Little can be said on primary nesting periods for Green and Hawksbill Turtles. Both may have begun around September, but no ground surveys were done after this month to confirm the dominant nesting species among high track/nest counts in October and November.

Across all species laying was confirmed in all months from to November. Although it could not be confirmed from these surveys it is likely that Green and/or Hawksbill Turtle laying would continue into December.

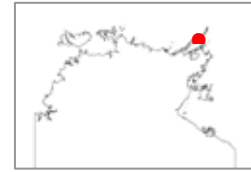
APPROXIMATE SUMMATION OF SPECIES NESTING SIGNIFICANCE IN COAST SECTION 6.16			
[Very High (OOOO), High (OOO), Medium (OO), Low (O) numbers;			
O = Certain,  = Probable]			
Flatback	Green	Hawksbill	Olive Ridley
OOO	O 	O 	OOO

OCCURENCE OF LAYING (ALL SPECIES COMBINED) BY MONTH											
IN COAST SECTION 6.16											
O = Egg laying confirmed; X = Nil egg laying recorded;											
? = Not surveyed or presence of current laying not assessed											
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
O	O	O	O	O	O	O	O	O	O	O	?

Coast Sections 6.17, 6.18, 6.19, 6.20, 6.21, & 6.22**Site(s):** Outer Wessel Is. chain from Rimbija Is.

(11° 0.8' S, 136° 45.2' E) to Jirrgari. Is.

(11° 43' S, 136° 07.7' E)



The outer islands of the Wessel chain in far north eastern Arnhem Land are very isolated. These islands, which include Rimbija (246 ha), Marchinbar (20 996 ha), Guluwuru (4 114 ha), Raragala (9 399 ha) and Jirrgari Islands (747 ha), extend as a long narrow island chain for ~100 km to the north east beyond the other islands in this area. The eastern and western sides of this chain have very different coastline habitats. The eastern sides consist of high cliffs abutted by oceanic waters and waves, with only the very occasional and tiny sandy cove. These were not checked but it is unlikely that much, if any, marine turtle nesting would occur at these small beaches at the bases of gaps in the cliffs. The western sides are mainly rocky but have no cliffs, and the seas are much shallower and with little swell normally. Along its length are many scattered bays with sandy beaches.

There are few records from these islands because surveys were limited to between only one and three aerial surveys (varying with the island) and two ground surveys at the same location on Raragala Island, and two at different locations on Marchinbar Island. These surveys were done in May, June (partial), October and November.

Marine turtle nesting was recorded at low densities (except for one site) in most of the many scattered small sandy bays throughout the length of the western side. Species confirmed nesting on these islands were Olive Ridley, Flatback and Hawksbill Turtles, but most of the records were of unidentified tracks from aerial surveys. These track records included both the narrower and wider types, but mostly the former.

The species confirmed with most consistency in ground surveys along these islands was the Olive Ridley Turtle. Although data are too limited to say much, parts of these islands at least are likely to be important for this species. Only three Flatback Turtle nests and one Hawksbill Turtle were confirmed in the far south, but as mentioned, ground surveys were extremely limited. It is possible that the narrower track calls from aerial surveys could have included more Hawksbill Turtles as some of their major confirmed NT Hawksbill Turtle nesting islands are within 10 km of this location. No Green Turtle nesting was confirmed and it is likely that most beaches were not large enough and deep enough for this species.

The only site to be sampled on more than one occasion was a single beach (11° 38.9' S 136° 11.2' E) towards the south western end of Raragala Island. This site was checked in June (1999) and September (1996). Tracks/nests of both Olive Ridley and Flatback Turtles were recorded in both months, but each time Olive Ridley Turtle use dominated the site. In the June survey both species were recorded as currently nesting. At this time Olive Ridley Turtles were recorded as having fresh and older active actively incubating nests, as well as recently hatched nests. A sample of 23 Olive Ridley Turtle nests recorded 13 that were less than about 2 two weeks old, five older than two weeks and five hatched. However, wind effects to the beach made detection of older nests and hatchling trails less likely than fresh nests.

The September survey of the Raragala Island site recorded only old Flatback Turtle tracks and hatched Olive Ridley Turtle nests, suggesting most laying had ceased prior to this time for these species at this site. This small section of narrow, steep beach at this site clearly suited Olive Ridley Turtles and densities were much higher than noted at other beaches along the island chain although, as stated, surveying of these outer islands was limited.

The completion of Olive Ridley Turtle nesting by this stage (September) is supported by Bill Panton (*pers. comm.*). In mid October (2004) he observed only several older hatched nests in two locations along the western side of Marchinbar Island.

Laying of all species combined was confirmed to occur from April to November at least at one place or another within these coast sections. There were no surveys conducted to confirm laying between December and March, although laying through this period by one or another of the three confirmed species was recorded in other areas within the bioregion.

There are insufficient records to suggest individual species nesting seasons or primary nesting periods for combined species nesting in these coast sections. But for Olive Ridley Turtles this would likely include at least April, May and June.

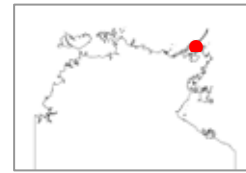
No animal predation of eggs was recorded in these limited surveys, but Guinea (1990) recorded goanna predation on an Olive Ridley Turtle nest at Jensen Bay on the north of Marchinbar Island in late June 1989 and Bill Panton (*pers. comm.*) reported Olive Ridley Turtle nests taken by dogs on Marchinbar Island in October 2004. Dogs were subsequently baited on this island during 2005.

APPROXIMATE SUMMATION OF SPECIES NESTING SIGNIFICANCE IN COAST SECTIONS 6.17, 6.18, 6.19, 6.20, 6.21, & 6.22			
[Very High (OOOO), High (OOO), Medium (OO), Low (O) numbers; O = Certain, O = Probable]			
Flatback	Green	Hawksbill	Olive Ridley
OO		O	OOO

OCCURENCE OF LAYING (ALL SPECIES COMBINED) BY MONTH IN COAST SECTIONS 6.17, 6.18, 6.19, 6.20, 6.21, & 6.22											
O = Egg laying confirmed; X = Nil egg laying recorded; ? = Not surveyed or presence of current laying not assessed											
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
?	?	?	O	O	O	O	O	O	O	O	?

Coast Section 6.23

Site(s): Bumaga Is. (11° 45.4' S, 136° 05.2' E)



The three remaining islands not yet discussed in the chain connecting Napier Peninsula to the Wessel Islands are Bumaga (376 ha), Warnawi and Alger Islands. Alger Island is the largest of the three but none are very large, all being less than 1 km long and 100-200 m wide. These are also known as the Cunningham Islands. The first to be discussed is Bumaga Island.

On Bumaga Island nesting was mostly recorded along the western side. The eastern side has cliffs (though smaller) as along the eastern side of the Wessel Islands discussed above.

Bumaga Island was surveyed from the air in January, April, May, July, and September to November, between 1993 and 1997. A single ground survey was done in late April (1996). Tracks/nests were recorded in all surveyed months.

The highest single total track/nest count of around 75 tracks/nests was in October (1997) but counts between 20 and 43 were recorded in all other months except January in which a ‘small number’ was recorded.

The single ground survey was conducted on the western beach of the island. The site was only briefly checked due to large storm activity at the time. Of the small sample, Olive Ridley Turtles (6 out of 8 nests) were the main species recorded as currently incubating at this particular site, which appeared to be more of an Olive Ridley Turtle (short, steep) type beach. A single Green and Flatback Turtle were also recorded currently incubating, but comment was made during aerial surveys that the island in general appeared more of a Flatback Turtle nesting island.

A small number of Hawksbill Turtle tracks were noted by Colin Limpus in an October (1997) aerial survey to complete the list of all four species nesting on this island.

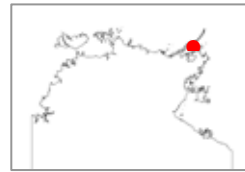
Laying by all species combined was confirmed in January, April to July, and September to November. There were no surveys that could confirm or deny laying outside of this period, but is likely to occur in all other months given all four species were recorded nesting on this island. There are insufficient records to suggest peak laying times for individual species. No animal predation of eggs was recorded.

APPROXIMATE SUMMATION OF SPECIES NESTING SIGNIFICANCE IN COAST SECTION 6.23			
[Very High (OOOO), High (OOO), Medium (OO), Low (O) numbers;			
O = Certain, ⚡ = Probable]			
Flatback	Green	Hawksbill	Olive Ridley
O ⚡ ⚡	O	O	O ⚡

OCCURENCE OF LAYING (ALL SPECIES COMBINED) BY MONTH											
IN COAST SECTION 6.23											
O = Egg laying confirmed; X = Nil egg laying recorded;											
? = Not surveyed or presence of current laying not assessed											
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
O	?	?	O	O	O	O	?	O	O	O	?

Coast Section 6.24

Site(s): Warnawi Is. (11° 47.9' S, 136° 02.5' E)



Most turtle nesting on Warnawi Island (242 ha) occurred along its western. Little nesting occurred along the eastern coast which was mostly rocky. Flatback, Olive Ridley and Green Turtle nesting were confirmed nesting on this island.

Warnawi Island was surveyed from the air in January, March to May, July and September to November, between 1993 and 1997. A single ground survey was done in April (1996). Tracks/nests were recorded in all surveyed months.

The highest single total track/nest count of around 50 tracks/nests was in September (1994) and the lowest of around 10 was in January (1996).

The April ground survey of this island was at a site on the western side. The small sample confirmed fresh Olive Ridley and Flatback Turtle nesting. An October aerial survey confirmed a third species, namely a single (old) Green Turtle nest. There are insufficient records to confirm the most frequently nesting species was on this island but it is likely that Flatback and/or Olive Ridley Turtles nest in at least medium numbers given the overall track/nest counts.

Laying of all species combined was confirmed in January, April to July, and September to November. There were no surveys that could confirm or deny laying outside of this period, but is likely to occur in all other months given the normal nesting seasons of the three species recorded on this island. There are insufficient records to suggest peak laying times for individual species on this island.

No human or animal predation of eggs was recorded.

APPROXIMATE SUMMATION OF SPECIES NESTING SIGNIFICANCE IN COAST SECTION 6.24			
[Very High (OOOO), High (OOO), Medium (OO), Low (O) numbers; O = Certain, ⚡ = Probable]			
Flatback	Green	Hawksbill	Olive Ridley
O⚡	O		O⚡

OCCURENCE OF LAYING (ALL SPECIES COMBINED) BY MONTH IN COAST SECTION 6.24											
O = Egg laying confirmed; X = Nil egg laying recorded; ? = Not surveyed or presence of current laying not assessed											
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
O	?	?	O	O	O	O	?	O	O	O	?



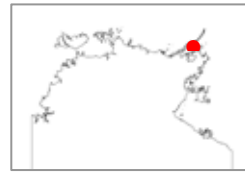
Plate 47. West side of Warnawi Island (coast section 6.24), April 1996. Photo R. Chatto.



Plate 48. An Olive Ridley Turtle nesting in the mid afternoon on Drysdale Island (coast section 6.13), April 1996. Photo R. Chatto.

Coast Section 6.25

Site(s): Alger Is. (11° 52.5' S, 135° 57.8' E).



Turtle nesting occurred around most of Alger Island (848 ha), but not as much as on Warnawi and Bumaga Islands just to the north east. The only species confirmed on Alger Island was the Green Turtle.

Part or all of Alger Island was surveyed from the air in January, March, July, October and November between 1993 and 1997. Tracks/nests were recorded in all of these months, except November, and nests recorded in early October appeared to be from the previous month. Counts varied from a 'small number' in January (1996) to the highest count of around 40 in April (1996).

Brief ground surveys of Alger Island were done on the far northern and southern tips of the island in April 1996. These were only able to confirm two Green Turtle nests, but Olive Ridley and Flatback Turtle nesting was also suspected among the many nests subject to goanna predation on this island.

Laying for all species combined on this island was confirmed for January, March, April, June July and September.

APPROXIMATE SUMMATION OF SPECIES NESTING SIGNIFICANCE IN COAST SECTION 6.25			
[Very High (OOOO), High (OOO), Medium (OO), Low (O) numbers; O = Certain, ⚡ = Probable]			
Flatback	Green	Hawksbill	Olive Ridley
⚡	O		⚡

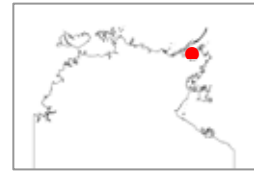
OCCURENCE OF LAYING (ALL SPECIES COMBINED) BY MONTH IN COAST SECTION 6.25												
O = Egg laying confirmed; X = Nil egg laying recorded; ? = Not surveyed or presence of current laying not assessed												
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
O	?	O	O	?	O	O	?	?	O	X	?	

Coast Section 6.26 – Included with Coast Section 6.2.

Coast Sections 6.27 & 6.30

Site(s): Islands in Buckingham Bay

(12° 09.2' S, 135° 48.7' E) and along the nth side of Flinders Peninsula from 12° 08.6' S, 135° 54.8' E to 12° 06.3' S, 135° 59.3' E.



There are nine small islands along the northern side of Flinders Peninsula and east into Buckingham Bay. Some of these islands do not have sand beaches on them but those that do all have small amounts of marine turtle nesting. Flatback Turtles were the only species confirmed nesting on these islands but only one island was ground checked.

Aerial surveys were conducted over some or all of these islands in the months of January, March to May, July, and September to November, between 1993 and 1996. A single ground survey was done on one of the islands in May (1994). This island was the one in the centre of Buckingham Bay and the most westerly of the islands discussed in these coast sections.

Tracks/nests were recorded in all surveyed months except October and November. (In the early October survey nests were likely to have been laid in September, but there were occasional fresh tracks recorded on the nearby adjacent mainland at this time). Fresh tracks/nests were specifically noted in all surveys recording nesting sign. The highest track/nest count of around 55 for these two coast sections was in a July (1996) survey. The majority of these were on the island which was ground surveyed.

The ground survey confirmed only Flatback Turtles nesting on this island. Many of the approximately 50 tracks/nests were old, having remained in the coral rubble covering the beach, but some fresh nesting was also observed. Most nesting was along the southern shore and the south western point of the island. Recent Aboriginal harvest of eggs was also recorded at this time.

Surveys confirmed laying in the months of January, March to July, and September. As Flatback Turtles were involved, further appropriate surveys would likely confirm laying throughout this period.

There are insufficient surveys and records to state the peak nesting times for these islands.

APPROX. SUMMATION OF SPECIES NESTING SIGNIFICANCE IN COAST SECTIONS 6.27 & 6.30			
[Very High (OOOO), High (OOO), Medium (OO), Low (O) numbers;			
O = Certain, O with slash = Probable]			
Flatback	Green	Hawksbill	Olive Ridley
O with slash			

OCCURENCE OF LAYING (ALL SPECIES COMBINED) BY MONTH											
IN COAST SECTIONS 6.27 & 6.30											
O = Egg laying confirmed; X = Nil egg laying recorded;											
? = Not surveyed or presence of current laying not assessed											
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
O	?	O	O	O	O	O	?	O	X	X	?

Coast Sections 6.28. Discussed with coast section 6.2.

Coast Section 6.29

Site(s): Flinders Peninsula North (12° 4.4' S, 136° 2.4' E)



Part of the northern end of the Flinders Peninsula is the exception to the generally lower density nesting on the mainland of this bioregion. Nesting here occurs in scattered bays around the peninsula but the majority is confined to two small bays along the eastern coast, just south of the north east tip of Flinders Peninsula.

Part or all of this coast section was surveyed from the air in March (1995), and April and July (1996). Both of the above mentioned bays were also ground surveyed in September (1996). Tracks/nests were recorded in all surveyed months, although note was made that in the months of April and March most sign was of older nest pits.

Highest counts of tracks/nests were recorded during the July and September surveys. Both were of 100+. A ground survey done in September (1996) confirmed the nesting beaches to be mainly of Flatback Turtles but little that was really fresh at that time. The nests here had suffered heavy predation by goannas.

Laying was confirmed to occur from June to September, but it is likely that nests observed from the air in April included some that had been laid in March and April, suggesting a laying season that extended from at least March to September.

APPROX. SUMMATION OF SPECIES NESTING SIGNIFICANCE IN COAST SECTIONS 6.29			
[Very High (OOOO), High (OOO), Medium (OO), Low (O) numbers;			
O = Certain, = Probable]			
Flatback	Green	Hawksbill	Olive Ridley
O			

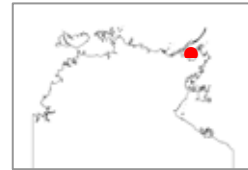
OCCURRENCE OF LAYING (ALL SPECIES COMBINED) BY MONTH											
IN COAST SECTIONS 6.29											
O = Egg laying confirmed; X = Nil egg laying recorded;											
? = Not surveyed or presence of current laying not assessed											
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
?	?	?	?	?	O	O	O	O	?	X	?

Coast Sections 6.31, 6.32 & 6.33

Site(s): Probable Is. (12° 06' S, 136° 02.4' E)

Gwakura Is. (12° 11.3' S, 136° 01.5' E)

Rekala Is. (12° 13' S, 136° 01' E).



Probable Island (738 ha), Gwakura Island (87 ha) and the smaller Rekala Island form a north south chain of three long and narrow islands running into Ulundurwi Bay on the eastern side of the Flinders Peninsular. These islands are larger than those discussed previously in coast section 27 and 30. All tracks recorded on each of these three islands appeared to be the wider Flatback and/or Green Turtle size, but the Flatback Turtle was the only species confirmed.

Marine turtle nesting on Probable Island, the largest and most northerly of the islands, is mainly along the eastern side (scattered beaches) and the northern end. On the other two islands nesting occurs along both sides, although mostly at the southern end in the case of Gwakura Island.

One or more of the islands were surveyed from the air in the months of January, July, September, October and November. The only ground count done was on a beach at the northern end of Probable Island in late September (1996).

Tracks/nests were recorded on each survey except the November survey, and at least some evidence of fresh laying was observed in each of the surveys that recorded tracks/nests.

Probable Island was the most significant for turtle nesting and was examined in all surveys. The highest count for this island was around 120 tracks/nests in a July (1996) survey. The next highest count (~70) was in the September ground survey. The combined nesting on the beaches at the northern end of this island and the fairly good nesting on the nearby northern tip of Flinders Peninsula form a quite significant Flatback Turtle nesting area for the region.





Plate 49. Confirmed Flatback Turtle nesting beach on NE end of Probable Island (coast section 6.31), September 1996. Photo R. Chatto.

As mentioned, Probable Island was the only island of the three that was ground checked. Of 10 nests sampled from a 2 km beach on the eastern side at the northern end of the island in September (1996), all were Flatback Turtles. The other 50 or so nests were recorded as Flatback and/or Green Turtle but most also seemed to belong to Flatback Turtles, suggesting that nesting at this beach was definitely dominated by Flatback Turtles, as was found to be the case with adjacent mainland beaches. The sampled Flatback Turtle nests on Probable Island at this time did include freshly laid and hatched nests from the current season, but most nest sign was of older nests. Some of the nesting pits were likely to have been from last season but evidence from this season's nests suggested the peak had finished a short time ago. Buffalo/cattle dung was recorded on the beach at this site. The island is approximately 1 km from the mainland at its closest point, suggesting possible occasional crossing to the island at times by these animals. Goanna tracks were also recorded on the beach but no nests were seen to have been predated. Recent Aboriginal harvest of eggs was observed.

Aerial counts of Gwakura and Rekala Islands recorded highest track/nest counts of around 50. For Rekala Island these were recorded in both a January and a July survey, but for Gwakura Island the January count was considerably lower. The January differences could relate to different beach habitats, namely the amount of coral rubble present. Nesting pits from the previous season are likely to remain more visible on the more coral rubble beaches of Rekala Island, compared the sandier beaches of Gwakura Island that would more likely have had nesting signs weathered away.

Although the track/nest counts referred to are quite high, the considerable amount of old nest pits remaining from past season(s) means these islands (with the exception of the northern end of Probable Island) are more likely have medium rather than high density nesting. Higher density nesting at the northern end of Probable Island warrants probable inclusion as such for Flatback Turtles in the combined coast sections summary table below.

APPROXIMATE SUMMATION OF SPECIES NESTING SIGNIFICANCE IN COAST SECTIONS 6.31, 6.32 & 6.33			
[Very High (OOOO), High (OOO), Medium (OO), Low (O) numbers; O = Certain,  = Probable]			
Flatback	Green	Hawksbill	Olive Ridley
OO 			

OCCURRENCE OF LAYING (ALL SPECIES COMBINED) BY MONTH IN COAST SECTIONS 6.31, 6.32 & 6.33												
O = Egg laying confirmed; X = Nil egg laying recorded; ? = Not surveyed or presence of current laying not assessed												
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
O	?	?	?	?	?	O	O	O	O	X	?	

Coast Sections 6.34 & 6.35

Site(s): Hardy Is. (12° 17.6' S, 136° 03.3' E)
 Low Is. (12° 22.3' S, 136° 10.3' E)



Hardy Island (380 ha) and Low Island (23 ha) are the only two islands in Arnhem Bay. Hardy Island, is located in the north west and close to the mainland while Low Island is in the centre of the bay. Both had reasonable amounts of turtle nesting recorded on them. All tracks recorded on each of these two islands appeared to be the wider Flatback and/or Green Turtle size, but Flatback Turtles were the only species confirmed.

Hardy Island had two aerial surveys, both in 1996, but no ground surveys. An aerial survey in January recorded fresh tracks and older nests present, but not in large numbers. Most were reported as likely to be Flatback Turtles. A July survey recorded around 70 tracks/nests, an increase in numbers of both tracks and nests which would be expected with Flatback Turtles nesting around the island. Most nesting was on the eastern side.

Low Island had more turtle nesting than Hardy Island and was surveyed from the air on four occasions between 1993 and 1996. Aerial survey records were made in the months of January, April and May. The highest aerial count of over 70 tracks/nests was recorded in May 1994. Nesting occurred around most of the island but was concentrated in the south western section. A ground check was done in November 1993. This confirmed only Flatback Turtles, but current nesting signs were likely to have remained from nesting that occurred in October rather than November. Beaches around this island were covered in coral rubble, and as such some nesting pits may have remained as visible from the previous season. Some of the tracks were noted as going up to 100m across beach and into the bushes on the island, possibly to reduce the amount of digging through coral rubble to get to the sand.

In terms of laying months, these surveys could only confirm January, May to July, and October. As Flatback Turtles were confirmed it is likely that additional surveys would confirm laying to be continuous from January through to October.

No egg predation was recorded from the ground survey on Low Island.

APPROX. SUMMATION OF SPECIES NESTING SIGNIFICANCE IN COAST SECTIONS 6.34 & 6.35			
[Very High (OOOO), High (OOO), Medium (OO), Low (O) numbers; O = Certain, ⚡ = Probable]			
Flatback	Green	Hawksbill	Olive Ridley
OO			

OCCURENCE OF LAYING (ALL SPECIES COMBINED) BY MONTH IN COAST SECTIONS 6.34 & 6.35											
O = Egg laying confirmed; X = Nil egg laying recorded; ? = Not surveyed or current laying not assessed											
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
O	?	?	?	O	O	O	?	?	O	X	?

The English Company chain of islands

The English Company chain of islands (Coast Sections 36-44) is a complex system of approximately 20 islands that extends for about 70 km in a south-west to north-east line from just off the coast north east Arnhem Land. They range in size from the largest, Inglis Island (approximately 23 km long by 5 km wide) through to very small islands less than a football field in size. The other main islands are Wigram, Cotton and Astell Islands. The English Company Islands vary from small sand and rock islands to large, high, well-vegetated islands. Marine turtle nesting over most of this island chain was recorded as being mostly low-density on scattered beaches, though the amount of nesting did increase in a north-easterly direction along the islands. Because the habitat of much of the coast on most of these islands did not seem suitable for significant marine turtle nesting (particularly along southerly coasts of islands) and no good sites were recorded in early surveys, these islands were not surveyed intensely from the air, and there were only a small number of ground surveys done relating to turtles. Because of this it is possible there may be some smaller isolated beaches missed that may have had higher density nesting. It was also noted that nesting numbers of two species also changed in a similar pattern. The numbers of nesting Olive Ridley Turtles was higher on the inner islands toward the south west of this chain, while the higher numbers of nesting Hawksbill Turtles were higher towards the north eastern end of this chain of islands.

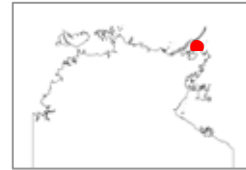
The English Company Islands and the islands associated with Buckingham and Arnhem Bays are a complex group of many islands that will be now be discussed in groups.



Plate 50. Green Turtle tracks with numerous goanna tracks at the north end of Alger Island (coast section 6.25), April 1996. Photo R. Chatto.

Coast Section 6.36

Site(s): Garalja Is. (12° 4.3' S, 136° 5.9' E).




Garalja Island is a small (~1 km by 0.3 km) north/south aligned island at the south western end of the English Company Island Chain. It is predominantly a vegetated sandstone island with a narrow beach and low density nesting around most of its shoreline.

Aerial surveys of this island were conducted in the months of January and May, and ground surveys in the months of April and September. All surveyed months were in the years of 1994 and 1996, and all recorded tracks/nests. The highest track/nest count was 24, in September (1994). Some of the nests recorded here were noted as having been laid prior to September.

The only species confirmed on this island was the Flatback Turtle, which is likely the main nesting species. A single nest of a Hawksbill or Olive Ridley Turtle was observed in the September ground survey.

There were insufficient surveys to detail all laying months but it could be confirmed in the January to May period, and the months of August and September.

No animal predation of eggs was recorded but human collection was confirmed in April (1996).

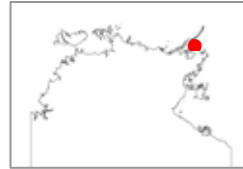
APPROXIMATE SUMMATION OF SPECIES NESTING SIGNIFICANCE IN COAST SECTION 6.36			
[Very High (OOOO), High (OOO), Medium (OO), Low (O) numbers;			
O = Certain,  = Probable]			
Flatback	Green	Hawksbill	Olive Ridley
O			

OCCURENCE OF LAYING (ALL SPECIES COMBINED) BY MONTH											
IN COAST SECTION 6.36											
O = Egg laying confirmed; X = Nil egg laying recorded;											
? = Not surveyed or current laying not assessed											
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
O	O	O	O	O	?	?	O	O	?	?	?

Coast Sections 6.37 – Not discussed due to small amount of nesting.

Coast Section 6.38

Site(s): NW Inglis Is. from 12° 01.7' S, 136° 08' E
to 12° 00' S, 136° 12.1' E.



Much of the coast of the large English Company Islands had little or no turtle nesting. Only the parts of the island with more than the occasional nest will be discussed. In the case of Inglis Island (8 181 ha) this refers to western end of the northern coast. Although there appeared to be a number of apparently suitable turtle nesting beaches in this vicinity, only the one beach (12° 01.8' S, 136° 08.4 E) was recorded with more than the odd track. This beach was recorded during aerial surveys in July of 1996 and November of 1993 as having around 20 tracks/nests. Ten older nest pits were also recorded in January 1996.

Aerial surveys of the general western end of Inglis Island were also done in the months of March, April and May. There were no turtle tracks/nests recorded on any of these surveys but it is possible the particular beach was not covered.

There were no ground surveys of this site and the species involved is not known. As such there is no species summary table for this coast section, but any species involved (suspected as Flatback Turtle) would be allocated a 'low' (single symbol) category. Similarly there are no data on the age of the tracks/nests so a monthly laying summary table is also not shown for this coast section summary. However, nesting sign did look more likely that of Flatback Turtles and hence the likely nesting season would include April to August at least.



Plate 51. Western end of the north side of Inglis Island (coast section 6.38), September 1996. Photo R. Chatto.

Coast Section 6.39

Site(s): Small islands of NE Inglis Is. from

11° 59.6' S, 136° 13.5' E to

11° 55.9' S, 136° 16.5' E.



Two small unnamed islands among this little chain of islands off the north eastern part of Inglis Island were recorded to have reasonable to good turtle nesting on small beaches. The first and most southern island (11° 59.6' S, 136° 13.4' E) has a single sand spit and beach off its southern point. This island was flown over on six occasions in months spanning January to October. Up to 10 tracks/nests were recorded on each occasion. The sand spit was ground checked in May 1994 and the only species confirmed was Flatback Turtle.

The second and more northerly island (11° 57.4' S, 136° 15' E) is larger and had one of the highest recorded nesting densities in the western part of the English Company Island Chain. This island has one main beach, located on the western side. The beach is about 400m long and heavily used by nesting turtles.

Four aerial surveys were conducted of this more northerly island. These were done in the months of March, July, October and November, and three ground surveys in the months of January, May and September. In excess of 50 tracks/nests were recorded in each of these surveys. Ground surveys recorded most nesting was by Flatback Turtles, with the only other species confirmed being Olive Ridley Turtles. These were recorded in much smaller numbers.



Plate 52. The small but important Flatback Turtle nesting beach on one of the small islands (coast section 6.39) to the NE of Inglis Island, January 1996. Photo R. Chatto.

A January (1996) survey recorded mostly old nest pits (probably from last season), but there were also some very fresh Flatback Turtle nests as well. There were also three recently hatched nests of Flatback Turtles, indicating laying in early December. The September survey showed a higher percentage of fresher Flatback Turtle nests, suggesting a more nesting in the months immediately leading up to September than leading up to January. In the September survey a fresh Olive Ridley Turtle nesting attempt was also recorded.

Results from all surveys confirmed laying of all species combined occurred in all months of the year except February and August. It is likely that appropriately timed surveys would show these months were also used and that at least some Flatback Turtle nesting is occurring in every month of the year.

This island is a popular site for Traditional Harvesting of turtle eggs. Indigenous people spoken to on site while collecting eggs on this beach in May (1996) stated that only two types of turtle nest here. Further conversation with them established that these were Flatback Turtles (mostly) and Olive Ridley Turtles (less often). They also said that most of the nesting was a little later in the dry season, but that they visit the island at this time to also collect seabird eggs.

There are insufficient records to confirm a primary laying period but it would appear to be some time within the January to September period for Flatback Turtles.

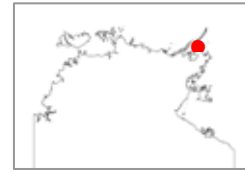
No animal predation of eggs was recorded.

APPROXIMATE SUMMATION OF SPECIES NESTING SIGNIFICANCE IN COAST SECTION 6.39			
[Very High (OOOO), High (OOO), Medium (OO), Low (O) numbers;			
O = Certain, O = Probable]			
Flatback	Green	Hawksbill	Olive Ridley
OOO			O

OCCURENCE OF LAYING (ALL SPECIES COMBINED) BY MONTH											
IN COAST SECTION 6.39											
O = Egg laying confirmed; X = Nil egg laying recorded;											
? = Not surveyed or current laying not assessed											
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
O	?	O	O	O	O	O	?	O	O	O	O

Coast Section 6.40

Site(s): Astell Is. (11° 53.1' S, 136° 24.9' E)



Astell Island (1 268 ha) is one of the larger islands in the English Company Chain. It is a high, forested island with scattered beaches around its coastline. The island is briefly discussed separately because, although it had no high density nesting beaches, its overall size meant reasonable total numbers of nesting. Most nesting was recorded in the south western part of the island. Flatback Turtles were the only species confirmed, but surveys were limited.

Because the relatively long coastline of this island had little targeted wildlife recorded in earlier surveys, it was rarely completely flown all around. Parts of the island (more often sections of the east and north coasts) were surveyed from the air in the months of January, April, July, and September to November, between the years of 1994 and 1997. Tracks/nests were recorded in January, July and October of these surveys. Ground surveys of two nearby sites on the south east of the island were conducted in May (1996). At this time all nesting was recorded as happening prior to this month. Goanna predation prior to this time was also recorded at both of these survey sites.

The highest track/nest count (which would not have been a full count of all beaches on the island) was around 25, in October (1997). This was a mix of fresh and old tracks, with the Flatback Turtle as the only confirmed species.

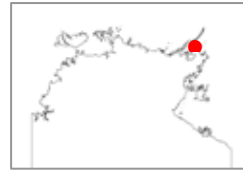
There were insufficient surveys and results to warrant the inclusion of a laying summary table. Laying could only be confirmed in the January, September and October surveys of this island.

APPROXIMATE SUMMATION OF SPECIES NESTING SIGNIFICANCE IN COAST SECTION 6.40			
[Very High (OOOO), High (OOO), Medium (OO), Low (O) numbers;			
O = Certain, ⚡ = Probable]			
Flatback	Green	Hawksbill	Olive Ridley
O			

Coast Section 6.41– Not discussed due to small amount of nesting.

Coast Section 6.42

Site(s): Cotton Is. (11° 51.9' S, 136° 28.5' E).




Like Astell Island, Cotton Island (2 120 ha) is also one of the larger islands in the English Company Chain. It is another of the well vegetated islands, with scattered beaches around its coastline. With the exception of some higher density nesting in the far north of the island, most of the beaches around the island were recorded as having low density nesting. Most records were not confirmed to species, but Flatback, Green and Hawksbill Turtles were all confirmed nesting on this island.

Because the relatively long coastline of this island had little targeted wildlife recorded in earlier surveys, it was rarely completely flown all around. Parts of the island (more often sections of the east and north coasts) were surveyed from the air in the months of January, September, October and November, between the years of 1994 and 1997. Tracks/nests were recorded in each of these surveys. Ground surveys of three well spread sites on the island were conducted in January, May and September of 1996. Goanna predation was recorded at each of these survey sites.

The highest track/nest count related only to the beaches on the far north of the island. This was only recorded as ‘many’ in September (1996). The potential significance of the beaches in the far north of the island was not well established in these surveys and needs to be further investigated.

Laying could only be confirmed in the months of January, April, May, August to October and December for this island.

APPROXIMATE SUMMATION OF SPECIES NESTING SIGNIFICANCE IN COAST SECTION 6.42			
[Very High (OOOO), High (OOO), Medium (OO), Low (O) numbers;			
O = Certain,  = Probable]			
Flatback	Green	Hawksbill	Olive Ridley
O	O	O	

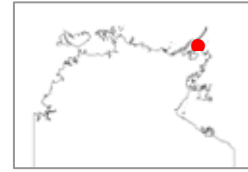
OCCURENCE OF LAYING (ALL SPECIES COMBINED) BY MONTH												
IN COAST SECTION 6.42												
O = Egg laying confirmed; X = Nil egg laying recorded;												
? = Not surveyed or current laying not assessed												
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
O	?	?	O	O	?	?	O	O	O	?	O	

Coast Section 6.43 (part)

Site(s): NE part of Wigram Island from

11° 47.9' S, 136° 30.9' E to

11° 44.4' S, 136° 37.3' E.



Wigram Island (2 285 ha) is the outermost of the larger islands in the English Company Chain. As with most of the English Company Islands, there is considerably more nesting along the northern shoreline of this island. Further, the amount of nesting also increases in a north easterly direction along the island. This site of local significance within this coast section to be discussed here is located at the eastern end of the island, where most of the island's nesting was recorded. Fairly significant nesting was recorded at this site (11° 44.3' S, 136° 37.2' E) and the small islands to the north east of Wigram Island (discussed below in coast section 6.44). Flatback, Hawksbill and Green Turtle nesting was confirmed and Olive Ridley Turtle nesting suspected.

This eastern part of Wigram Island was surveyed by air in January, October and November, and on the ground in January, June and September. All surveys were between 1994 and 1999. November was the only month in which tracks/nests were not recorded, but spring high tides prior to this survey may have affected observations. In all other months except the June survey (in which the surveyed area was heavily wind blown and was not given a total count) there were in excess of 50 tracks/nests recorded. Most nests were recorded as having been dug up and eaten by dogs.

Ground surveys confirmed tracks/nests were dominated at those times by Flatback Turtles (most) and Hawksbill Turtles. Of all records confirmed to species level for this area ~60% were Flatback Turtle, ~35% were Hawksbill Turtle and ~5% were Green Turtle. The more open beach end of the island was mainly used by Flatback Turtles, while the small sandy bays abutting rocky areas were mainly used by Hawksbill Turtles. There were also occasional Green Turtle tracks/nests in the 'Flatback Turtle' area. Olive Ridley Turtles were not confirmed but strongly suspected from the appearance of the nest for at least one May and one June nest. Olive Ridley Turtles were subsequently confirmed nesting more frequently further to the west along this island chain.

Because of the large amount of dog diggings and predation (for example in one September ground survey 40+ nests were recorded as taken and only one surviving) it was not easy to determine the age or the species of the nests.

Fresh laying of all species combined was confirmed on this eastern part of Wigram Island in January, June, and August to October. It was also confirmed on beaches just to the west (but still part of Wigram Island) in April, May and July when the more significant eastern beach discussed here was not surveyed. This suggests combined species laying from January to October at least. Although there is insufficient information to discuss individual species laying months or peak nesting for all species combined, January survey records of mostly old nest pits (though there were still some fresh nests) and September survey records of a higher percentage of fresher nests suggest more laying in the months immediately proceeding September than those pre-January.

The significant dog predation of turtle nests was noted on the first ground survey of the eastern end of Wigram Island in January 1996. At this time the helicopter pilot stated that a Traditional Owner had left "a couple of mongrel dogs out there a couple of years ago". These dogs had quickly learnt to dig up turtle nests and unfortunately were decimating them, along with a lot of other wildlife. It is not

known when these dogs began to cause these problems as the site was not ground surveyed prior to 1996. Limpus (1992) visited the same area in July 1992 and reported no evidence of clutch predation, although he did record *Canis sp.* as present in his species list. He also noted most of the nesting to be successful. Should the extent of nest predation by dogs observed in 1996 been occurring in 1992 it is likely this would have been noted by Limpus. Consequently, the dog predation probably started some time after July 1992. As there are no large goannas on the island there would have been little if any predation of turtle eggs by any animals prior to this time. In September 1996 permission was obtained from the Traditional Owners to bait these dogs. This was done during the aerial survey at this time. A follow up ground survey in June 1999 revealed an amazing transformation. With the dogs successfully removed, there were now no turtle nests dug up by animals. Further, there was a huge and obvious increase in the number of tracks on the beach of other small mammals and reptiles compared to pre-dog control surveys.

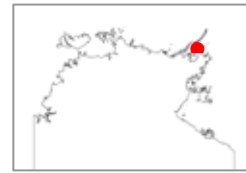
Although not related to marine turtles, another interesting observation was made near this site. In a September 1996 survey 15+ possible *Laticauda sp.* sea snake tracks were observed in one small area, with occasional others scattered in adjacent areas. Tracks were observed going directly from the water's edge to rocks above the beach and back. Such tracks were noted again in the same small location in the June 1999 survey. This was the only location where this has been observed in 15 years of surveying a huge number of beaches around the entire NT coast. Limpus (1992) also recorded such tracks in July 1992.

APPROXIMATE SUMMATION OF SPECIES NESTING SIGNIFICANCE IN THE SELECTED PART OF COAST SECTION 6.43			
[Very High (OOOO), High (OOO), Medium (OO), Low (O) numbers; O = Certain, ⚡ = Probable]			
Flatback	Green	Hawksbill	Olive Ridley
OOO	O	OO⚡	⚡

OCCURENCE OF LAYING (ALL SPECIES COMBINED) BY MONTH IN THE SELECTED PART OF COAST SECTION 6.43												
O = Egg laying confirmed; X = Nil egg laying recorded; ? = Not surveyed or current laying not assessed												
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
O	?	?	?	?	O	?	O	O	O	X	?	

Coast Section 6.44

Site(s): Small island off NE of Wigram Is.
(11° 43.5' S, 136° 39.6' E).



The larger of two small and unnamed islands off the eastern end of Wigram Island was recorded to have nesting along its north eastern shoreline. The nesting area contains a high proportion of coral rubble. The only species confirmed on this island was the Hawksbill Turtle, although Flatback Turtle nesting was also strongly suspected based on tracks observed in aerial surveys.

This island was surveyed by air in January, May, July and September to November, between 1993 and 1997. The island was also ground surveyed in January (1996) and September (1994). Tracks/nests were recorded during all surveyed months.

The highest count of tracks/nests was recorded in the September ground count. At this time there were at least 60 present. These were approximately 75% narrower tracks to 25% wider tracks. The time of the year, the fact that Hawksbill Turtles were the only narrow track species confirmed on this island, and the fact that this general area of NE Arnhem Land is a high density Hawksbill Turtle nesting area, suggests that this was the species responsible for most of the narrow tracks. Although not positively confirmed, it is suspected that Flatback Turtles were the source of most of the wider tracks.

The higher percentage of Hawksbill Turtle nests inferred on this small island also reflects the preference of this species to nest on smaller islands rather than the mainland or beaches on larger islands. This island and the eastern part of Wigram Island represent the north western extremity of one of two highly significant Hawksbill Turtle nesting areas located during these surveys. (The other area is the small islands off the eastern side of Groote Eylandt which is discussed in the next bioregion).

Laying of all species combined was confirmed in January, May, July and September to November. Additional appropriately timed surveys would likely confirm laying in the remaining months between January and November at least. Higher track/nest counts in October and January, compared to lower counts were in May and July would suggest more nesting from the September to January period than through the dry season. This is consistent with nesting mainly by Hawksbill Turtles.

There was no indication of egg predation or harvest recorded.

APPROXIMATE SUMMATION OF SPECIES NESTING SIGNIFICANCE IN COAST SECTION 6.44			
[Very High (OOOO), High (OOO), Medium (OO), Low (O) numbers; O = Certain, O with slash = Probable]			
Flatback	Green	Hawksbill	Olive Ridley
O with slash		OO with slash	

OCCURENCE OF LAYING (ALL SPECIES COMBINED) BY MONTH IN COAST SECTION 6.44											
O = Egg laying confirmed; X = Nil egg laying recorded; ? = Not surveyed or current laying not assessed											
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
O	?	?	?	O	?	O	?	O	O	O	?



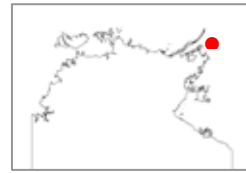
Plate 53. Good turtle nesting beach, where all four species were recorded nesting, on the NE of Wigram Island (coast section 6.43), September 1996. Photo R. Chatto.



Plate 54. Several attempted diggings before final success of Olive Ridley Turtle on Raragala Island, June 1999. Photo R. Chatto.

Coast Section 6.45

Site(s): Truant Is. (11° 40.1' S, 136° 49.6' E).



Truant Island (306 ha) is an isolated small island approximately 20 km to the north east of Wigram Island and about 18 km from any other island. It is about 3 km by 2 km and is a very important nesting site for Hawksbill Turtles. This species dominates the nesting on this island, even though all four marine turtle species that regularly nest in the NT were confirmed breeding on the island. Flatback Turtles were the next most numerous of the nesting turtles.

Truant Island was surveyed from the air in January, March, May, July and October, between 1993 and 1997. The island was also ground surveyed in July (1996) and October (1992). Tracks/nests were recorded during all surveyed months.

Tracks/nests were recorded in lower numbers in March and May aerial surveys (< 40) and in higher numbers in July and October aerial surveys (>60). These would be minimum numbers given the island receives a lot of wind to erase tracks, and as most nests were of Hawksbill Turtles which often nested under trees and therefore are more difficult to see from the air. As an indication of the number of tracks present on the entire island Limpus (1992) in a July survey recorded 265 Hawksbill Turtle, six Flatback Turtle and three Green Turtle sets of tracks that he estimated represented beaching within the previous ten days.



Plate 55. Typical examples of the small, sandy bays on the outer islands preferred by Hawksbill Turtles. This site is on Truant Island (coast section 6.45), October 1997. Photo R. Chatto.

Ground surveys reported here were of sites selected to do species breakdowns and were not full island track/nest counts. The most detailed of these ground samples was the July (1996) ground survey. In this survey 40 nests with un-hatched eggs were identified of which 28 were Hawksbill Turtle, nine Flatback Turtle, two Green Turtle and one Olive Ridley Turtle. At this time there was more evidence or newly laid nests rather than older nests from that season, or recently hatched nests. This suggested that the main Hawksbill Turtle nesting was still to come rather than having been completed at that time of the year, but the wind blown nature to the beaches did make locating fresher nests easier, which may have biased the sample.

In a week spent on the island in October (1992) nests being laid and nests hatching were observed on most nights for Hawksbill Turtles and some nights for Flatback Turtles, although numbers were not accurately recorded. By this stage of the year the percentage of Flatback Turtles compared to Hawksbill Turtles was lower than in July, even though Hawksbill Turtles well out-numbered Flatback Turtles in both months.

The recording of fresh tracks in March, the presence of hatched nests in July and October, and the continuing coming ashore of turtles in October suggests that nesting occurs on this island through most of the year. This is consistent with the normal nesting seasons of Hawksbill and Flatback Turtles. Higher counts in July and October further suggest nesting increases significantly in the second half of the year. This is also consistent with the Hawksbill Turtle being clearly the dominant turtle nesting on the island. However, laying for all species combined could only be confirmed in January, March, May to June, September and October.

There are insufficient records to state the full nesting seasons or primary laying months of each species on this island.

There was no indication of egg predation in nests by animal predators, and Indigenous people do not visit the island very often.

APPROXIMATE SUMMATION OF SPECIES NESTING SIGNIFICANCE IN COAST SECTION 6.45			
[Very High (OOOO), High (OOO), Medium (OO), Low (O) numbers;			
O = Certain, O = Probable]			
Flatback	Green	Hawksbill	Olive Ridley
OO	O	OOOO	O

OCCURENCE OF LAYING (ALL SPECIES COMBINED) BY MONTH											
IN COAST SECTION 6.45											
O = Egg laying confirmed; X = Nil egg laying recorded;											
? = Not surveyed or current laying not assessed											
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
O	?	O	?	O	O	O	?	O	O	?	?

Coast Section 6.46

Site(s): Bromby Island chain from

11° 52' S, 136° 34.4' E to

11° 48.9' S, 136° 42.2' E.



The final location of significant marine turtle nesting in this bioregion comprises the Bromby Islands, a 20 km long chain of approximately 12 islands with the same SW/NE orientation as the other island chains in NE Arnhem Land. The Bromby Island chain commences from the mainland point of Cape Wilberforce which is approximately 30 km to the north west of the town of Nhulunbuy. Some of the islands are composed of rocks and low vegetation and have little if any suitable turtle nesting beaches, but others have beaches with large amounts of turtle nesting.

Most of the very significant marine turtle nesting on these islands is restricted to the many small bays along the northern sides of the islands because much of the southern side consists of rocks and small cliffs with a limited number of beaches. The majority of the nesting occurs on one elongated island at the eastern end of the chain which is much larger than any of the other islands.

The total numbers of tracks/nests recorded on these islands were the highest of any of the coast sections reported here. Although it is likely that the density of nesting in some other places around the NT coast (e.g. south eastern Groote Eylandt) may have been shown to be higher if more surveys were done, the Bromby Islands are demonstrably one of the major turtle nesting areas in the NT. Nesting on the Bromby Islands is dominated by Hawksbill Turtles, but at least two sites were recorded as dominated by Flatback Turtles in May and July surveys. Very small numbers of Olive Ridley Turtles were confirmed but no Green Turtles were confirmed.



Plate 56. Good Hawksbill Turtle nesting beaches on the largest Bromby Island (coast section 6.46), March 1995. Photo R. Chatto.

Parts or all of the Bromby Islands were surveyed from the air in all months of year except February, August and December, between 1993 and 1999. Tracks/nests were recorded in all these surveys except a partial area survey in April, which did not include the main nesting island.

The highest single count during aerial surveys was around 500 tracks/nests in October 1999. Much of this count was due to the number of “50” being applied to calls of “many” tracks as explained in the methods, and so this count could vary either way from the estimated 500 by a considerable margin. Regardless of the true figure, it is still clear that these islands undoubtedly have large numbers of nesting turtles. Higher counts tended to be made in surveys between July and November.

Ground surveys were done at 10 separate locations spread along the island chain. They were done in the months of January (1996), May (1996), June (1999), July (1996) and September (1994). Some fresh nesting of both Hawksbill Turtles and Flatback Turtles was recorded in the January surveys but most nest sign at this time was old, and most of this older sign was of Hawksbill Turtles. The May surveys showed fresh nesting of Flatback Turtles but not of Hawksbill Turtles. By July both species had numerous fresh nests. Unfortunately the September surveys did not detail species or nest ages, but September surveys of other Hawksbill/Flatback Turtle areas (e.g. the north Wigram Island area just to the west) showed Flatback Turtles as a lower percentage of combined nests by this stage. These results suggest that although both species can nest at any time of the year on the Bromby Islands, Flatback Turtles showed a higher percentage of fresh nests in the early part of the dry season. Around mid year both species showed continually increasing percentage of fresher nests, and then as the season progressed Hawksbill Turtles continued to increase their percentage of fresh nests while Flatback Turtles decreased.

For all species combined, laying was confirmed all months of the year except February and August, in which no surveys were done. Surveys conducted in these months would likely confirm laying then as well.

There was no predation of nests by animals recorded on any of the Bromby Islands.

APPROXIMATE SUMMATION OF SPECIES NESTING SIGNIFICANCE IN COAST SECTION 6.46			
[Very High (OOOO), High (OOO), Medium (OO), Low (O) numbers; O = Certain, ⚡ = Probable]			
Flatback	Green	Hawksbill	Olive Ridley
OO⚡		OOOO	O

OCCURENCE OF LAYING (ALL SPECIES COMBINED) BY MONTH IN COAST SECTION 6.46												
O = Egg laying confirmed; X = Nil egg laying recorded; ? = Not surveyed or current laying not assessed												
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
O	?	O	O	O	O	O	?	O	O	O	O	

Coast Sections 6.47 & 6.48 – Discussed with Coast section 6.2.

Table 6. Locations of significant nesting activity in the Arnhem Wessel Bioregion with combined sum of nests and tracks >5 for all surveys between 1991 and 2004 and number of surveys (number of unique visit dates) for each coast section.

Coast section	Observation	Flatback Turtle	Green Turtle	Mix of Flatback or Green	Hawksbill Turtle	Olive Ridley Turtle	Mix of Hawksbill or Olive Ridley	Unknown species	No. of surveys
6.1 Guion Point to Junction Bay	Nest	3		2				5	11
	Tracks		4	8				67	
6.2 Goomadeer Point to Hawkesbury Pt	Nest					2		0	11
	Tracks	1				1		11	
6.3 Haul Round Is	Nest					1		5	10
6.4 North East Point	Tracks							20	12
6.5 Yabooma Is	Nest	34	4						10
								2	
6.6 Mooroongga Is	Nest	5	3			1			8
	Tracks			3				98	
6.7 Unnamed NE of Mooroongga Is	Nest	13		6		3	1	51	6
	Tracks	1						62	
6.8 North West Crocodile Island	Nest	155	4			37	3		7
	Tracks	5		1			14	345	
6.9 Northern side Howard Is	Tracks								7
								12	
6.10 Southern end W side Elcho Is	Nest							2	6
	Tracks	5						10	
6.11 Northern end W side Elcho Is	Tracks								4
						4		12	
6.12 Graham Is	Nest	2	1		1	7	1	50	4
	Tracks	4					2	60	
6.13 Drysdale Is	Nest	6	8	3	1	1	6	151	10
	Tracks	7	1	94	13			711	

Coast section	Observation	Flatback Turtle	Green Turtle	Mix of Flatback or Green	Hawksbill Turtle	Olive Ridley Turtle	Mix of Hawksbill or Olive Ridley	Unknown species	No. of surveys
6.14 Yargara Is	Nest							2	4
	Tracks				1			40	
6.15 Burgunngura Is	Nest	21	2	51	1	53	2	27	12
	Tracks	13	1	55	2		103	306	
6.16 Stevens Is	Nest	29	1	82	13	10	6	180	11
	Tracks	2		1	54	3	2	316	
6.17 Rimbija Is	Tracks							10	1
6.18 NW side Marchinbar Is	Nest					20			3
	Tracks							6	
6.19 North side Guluwuru Is	Tracks							13	3
6.20 NE side Raragala Is	Tracks				1	50		1	4
6.21 NW side Raragala Is	Nest	2				11	5		6
	Tracks	1		1		5		21	
6.22 Jirrgari Is	Nest							20	6
	Tracks							10	
6.23 Bumaga Is	Nest			2			1	84	8
	Tracks	11	1		5		5	110	
6.24 Warnawi Is	Nest	1					1	47	9
	Tracks	11	1	2			1	115	
6.25 Alger Is	Nest		1				2	37	7
	Tracks							14	
6.26 Napier Peninsula south (Buckingham Bay)	Nest							10	6
6.27 Islands in Buckingham Bay	Nest							60	9
	Tracks							4	

Coast section	Observation	Flatback Turtle	Green Turtle	Mix of Flatback or Green	Hawksbill Turtle	Olive Ridley Turtle	Mix of Hawksbill or Olive Ridley	Unknown species	No. of surveys
6.28 Buckingham Bay east	Nest							60	6
6.29 Flinders Peninsula north	Nest	1		104				151	8
	Tracks			51				12	
6.30 Islands on north side Flinders Peninsula	Nest							24	4
	Tracks							2	
6.31 Probable Is	Nest	10		58				112	8
	Tracks							16	
6.32 Gwakura Is	Nest							61	3
	Tracks							11	
6.33 Rekala Is	Nest							100	5
6.34 Hardy Is	Nest							51	2
	Tracks							20	
6.35 Low Is	Tracks			57				105	5
6.36 Garalja Is	Nest	1		22			1	20	9
	Tracks	10		10				6	
6.37 Small Is NW end Inglis Is	Nest							10	7
	Tracks							12	
6.38 North side Inglis Is	Nest							12	14
	Tracks							44	
6.39 Small Is NE end Inglis Is	Nest	115						180	15
	Tracks	1		2				114	
6.40 Astell Is	Nest							27	9
	Tracks	11						22	
6.41 Island west of Cotton Is	Nest							10	7
	Tracks							10	

Coast section	Observation	Flatback Turtle	Green Turtle	Mix of Flatback or Green	Hawksbill Turtle	Olive Ridley Turtle	Mix of Hawksbill or Olive Ridley	Unknown species	No. of surveys
6.42 Cotton Is	Nest	1	1	1	1			11	8
	Tracks	12	1	3				53	
6.43 North side Wigram Is	Nest	11	2	54	3		6	198	13
	Tracks	16		1	13		8	37	
6.44 Small Is off NE of Wigram Is	Nest			1			1	22	9
	Tracks			26	2		49	130	
6.45 Truant Is	Nest	10	2		29	1	3	60	7
	Tracks	13		1	72			205	
6.46 Bromby Islands	Nest	11		50	60	1	8	80	20
	Tracks			50	307		25	577	
6.47 Cape Wilberforce north	Nest							14	10
	Tracks				2			2	
6.48 Bay south of Cape Wilberforce	Nest							10	2

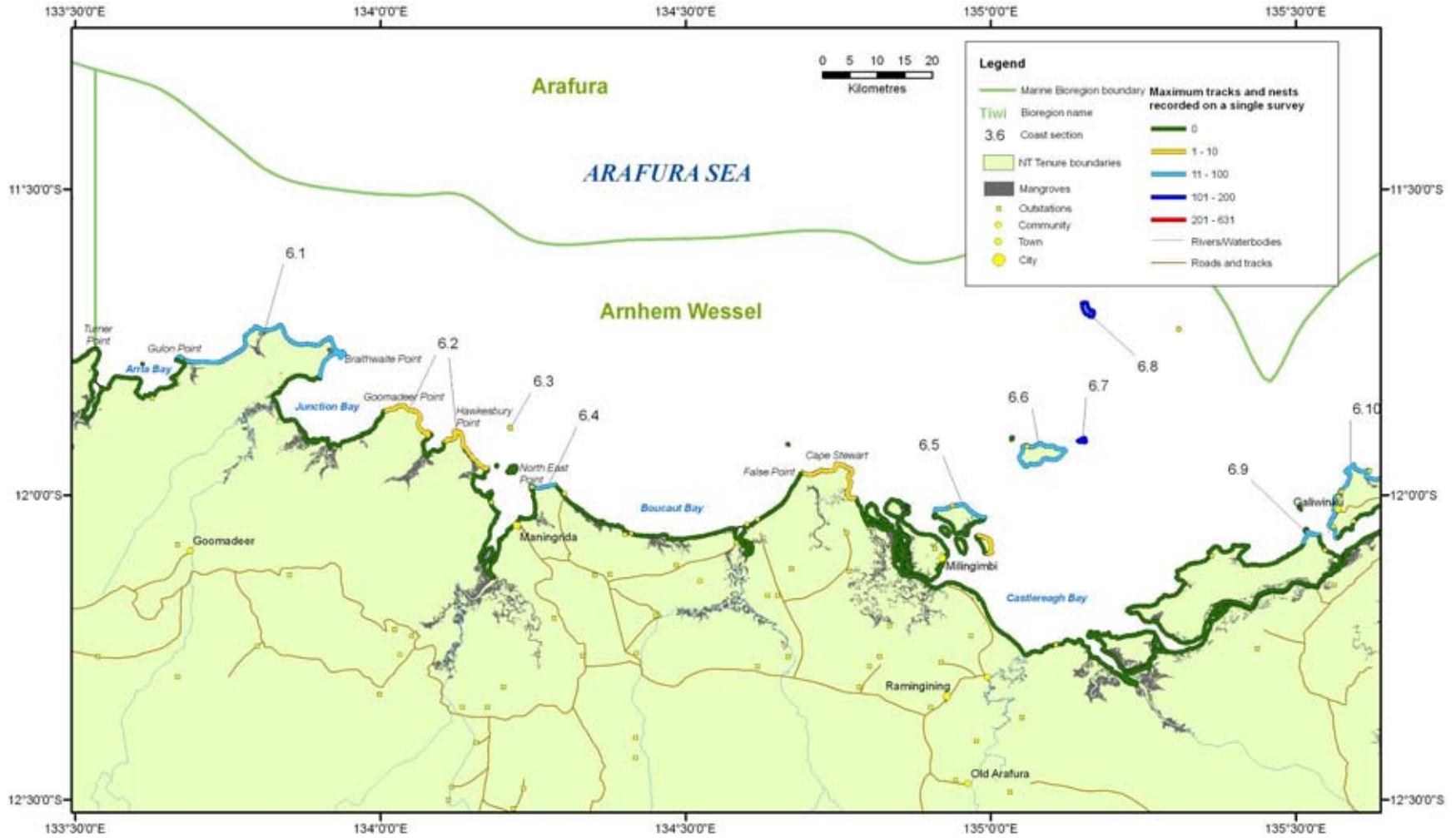


Figure 21. Relative importance of nesting beaches using maximum sum of nests and tracks of all species in a single survey between 1991 and 2004 in the Arnhem Wessel Bioregion (western section).

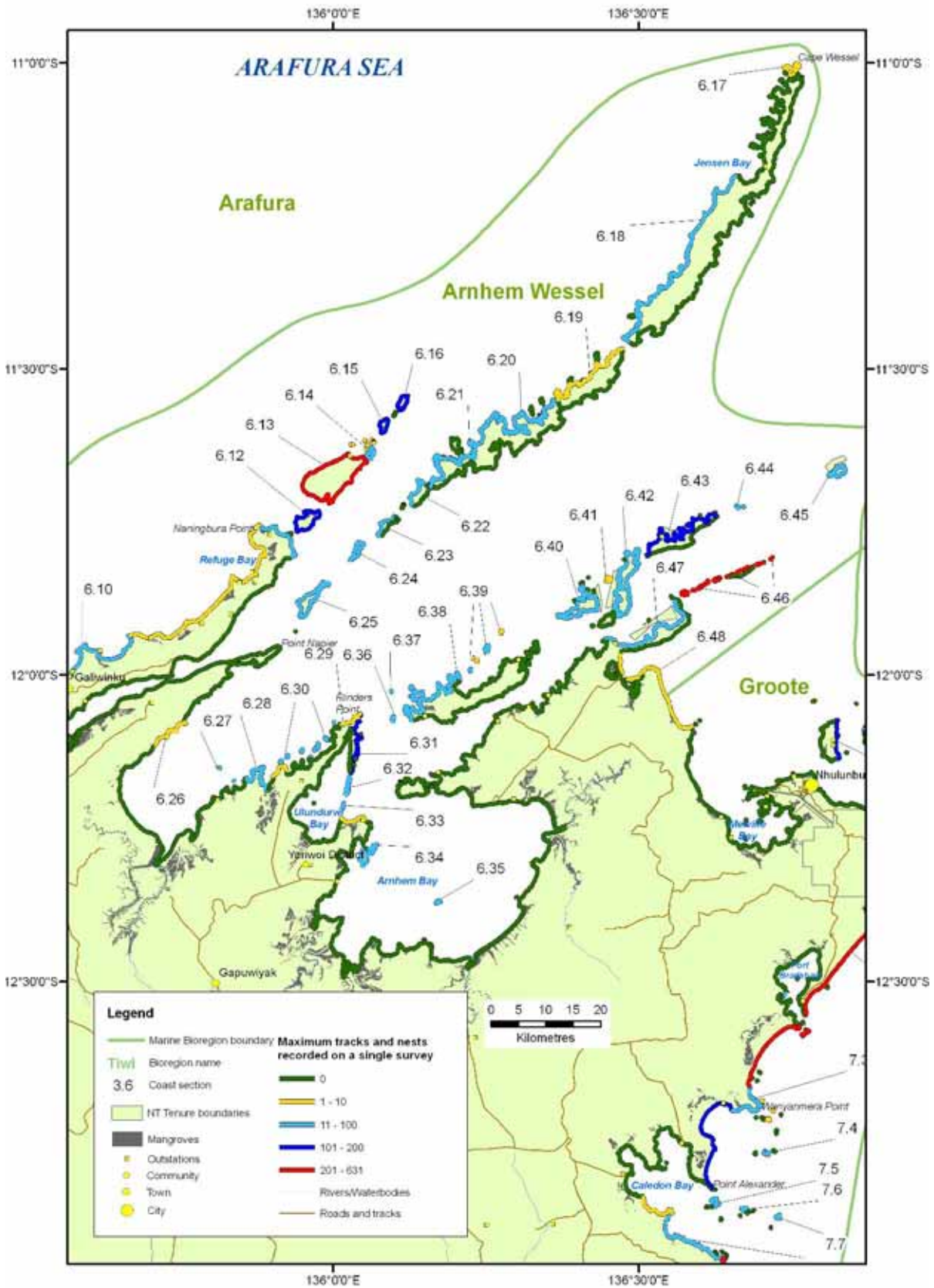


Figure 22. Relative importance of nesting beaches using maximum sum of nests and tracks of all species in a single survey between 1991 and 2004 in the Arnhem Wessel Bioregion (eastern section).

Groote

Location and description

The Groote Bioregion includes the northern part of the western shoreline of the Gulf of Carpentaria. This extends from Cape Wilberforce north of Nhulunbuy to Nyinpinti Point just south of Numbulwar, which is adjacent to the southern shoreline of Groote Eylandt. Groote Eylandt is also included in this bioregion.

The climate is monsoonal with 1 000 – 1 200 mm of rain annually. Tidal range here varies between 2-3 metres, which is less than most of the rest of the NT. A significant internal clockwise current occurs in the Gulf of Carpentaria, with reversal possible after prolonged north-west monsoon winds during the wet season. Apart from Blue Mud Bay, which is sheltered and supports extensive mangroves and mudflats, the shoreline of this bioregion is dominated by rocky and sandy coasts with mangroves restricted to narrow strips along creeks and lagoons. In the north of the bioregion there are well formed and large parabolic dune systems on mainland beaches formed by predominant south-easterly winds. Coral reefs are absent except for parts of Groote Eylandt, where they occur particularly in the north western region.

The Groote Bioregion is all Aboriginal land. In the far north of the bioregion is the large township of Nhulunbuy which is home to both Aboriginals and non-indigenous people associated with a large mining operation. Numbulwar is the other larger community on the mainland but numerous outstations are located along the mainland coast, particularly in the north. Two islands also have permanently inhabited communities. These are Bickerton Island, which has a single community, and Groote Eylandt, which has three permanent communities. Groote Eylandt also has a considerable non-indigenous population associated with a large mining operation on the island.

Survey effort

A total of 66 survey days were done between 1993 and 1999 in the Groote Bioregion. Surveys were done in every month of the year except June and August, with most done in May (Figure 23).

The length of coast is 2 220 km (20% of the NT coast) and the length of coast where wildlife records were not obtained on any survey was 120 km (5% of the bioregion).

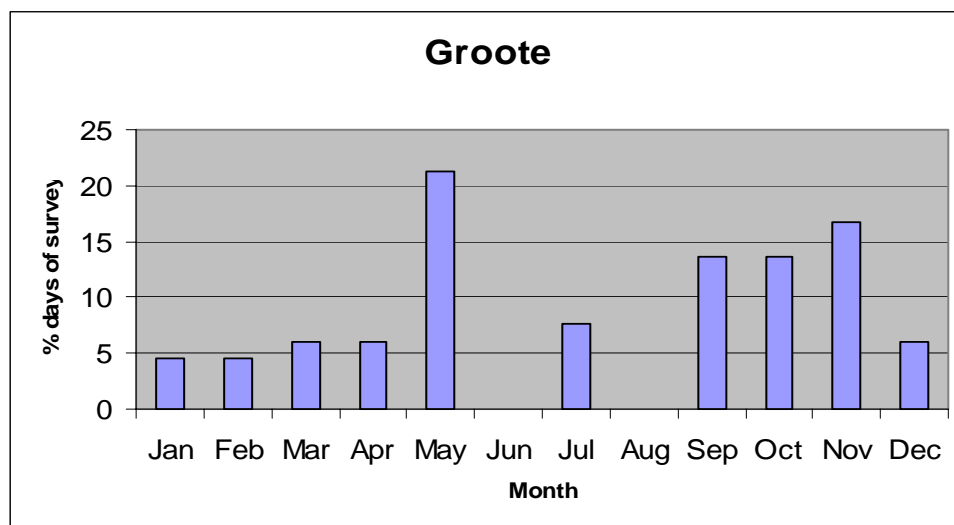


Figure 23. Survey effort by month between 1993 and 1999 in the Groote Bioregion.

Nesting summary

The Groote Bioregion is extremely important for marine turtle nesting, with nesting occurring all along the coast and islands with the exception of Blue Mud Bay and some of the other smaller, mangrove-lined bays. All four species were confirmed breeding in this bioregion, with all except Olive Ridley Turtles being recorded in large numbers at many sites.

Nesting areas throughout this bioregion are mapped, by the highest counts for any single survey, in Figure 24 (north) and Figure 25 (south), at the end of the bioregion's coast section summaries.

Total numbers of tracks and nests per month for all nesting on islands and mainland beaches in the bioregion is shown in Figure 64, Appendix A.

Coast Section Discussions

Thirty-nine individual coast sections (7.1 to 7.39) are listed within this bioregion. Track and nest counts for each of these sections are given in Table 7 and the numbered coast sections are shown in Figure 24 (north) and Figure 25 (south). The most significant of these coast sections are discussed in more detail below.



Plate 57. Looking south from Cape Arnhem at the start of many kilometres of significant Green Turtle nesting, July 1996. Photo R. Chatto.

Coast Section 7.1

Site(s): Bremer Island (12° 06.8' S, 136° 48.8' E).
East Bremer Islet (12° 05.5' S, 136° 52' E).



The islands of Bremer Island (1 682 ha) and the small East Bremer Islet (which also can be referred to as Forlsche Rock) are in the far north of the bioregion. They lie just to the north of the town of Nhulunbuy in NE Arnhem Land. Both islands have reasonable turtle nesting although nests have little success on Bremer because of animal predation and harvest by Indigenous people. Most nesting occurs along the eastern side of Bremer Island and on the small Bremer Islet to its east. As Bremer Islet is small there is not a great deal of turtle nesting beach, but the actual density of nesting is higher here than on the more extensive lengths of beach around the main Bremer Island.

One or both islands were surveyed from the air in the months of January, March to May, and September to November, between 1993 and 1997. Bremer Island was not ground surveyed during the project but the smaller Bremer Islet was ground surveyed in January (1996), May (1996) and October (1997). Tracks/nests were recorded in all months surveyed.

The highest count (of 150+ tracks/nests) for Bremer Island was recorded in the October survey, but most of this count was recorded as accumulated signs from old nests. Flatback and Hawksbill Turtles were identified during these aerial surveys as likely to be the dominant species, although Green Turtle tracks/nests were also observed. There were also numerous vehicle tracks on the beaches around most of Bremer Island and most nests appeared to have been harvested by people or taken by animals, possibly including pigs.



Plate 58. Sand spit used by nesting turtles on East Bremer Islet (coast section 7.1), November 1993. Photo R. Chatto.

The highest count (recorded only as ‘many’) on Bremer Islet was recorded in the October (1997) aerial survey of the area. Like Bremer Island, this also consisted mostly of an accumulation of older nesting pits. The ground survey in January confirmed a fresh Hawksbill Turtle nest, two fresh tracks of both Flatback and Green Turtles and a recently hatched Flatback Turtle nest. The ground survey in May confirmed two fresh and one recently hatched Hawksbill Turtle nests, while the October ground survey again confirmed fresh Hawksbill Turtle nests.

An older Traditional owner from Bremer Island who accompanied the May survey to Bremer Islet stated that the main nesting species on this island were Flatback and Hawksbill Turtles but that they nested in greater numbers later in the dry season and not many at this time of year. She also said some Green Turtles nest “all at the one time” in about September, although establishing month names with her was not confidently done.

As there were no ground surveys of Bremer Island during the project there was no confirmation of animal predation on eggs, but information from Indigenous people suggests that pigs may be a problem in this regard. Despite large pig populations in close proximity to turtle nesting beaches in other parts of the NT, this site, along with Bathurst Island and an island in Joseph Bonaparte Gulf, are the only sites where pig predation on turtle eggs was confirmed in these surveys.

Combining the two islands and all of the species, laying was confirmed to occur from at least September to January, then in March to May. Additional appropriate surveys would likely show laying to also occur in the months that were not surveyed.

APPROXIMATE SUMMATION OF SPECIES NESTING SIGNIFICANCE IN COAST SECTION 7.1			
[Very High (OOOO), High (OOO), Medium (OO), Low (O) numbers;			
O = Certain, O = Probable]			
Flatback	Green	Hawksbill	Olive Ridley
O O	O	OO O	

OCCURENCE OF LAYING (ALL SPECIES COMBINED) BY MONTH											
IN COAST SECTION 7.1											
O = Egg laying confirmed; X = Nil egg laying recorded;											
? = Not surveyed or current laying not assessed											
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
O	?	O	O	O	?	?	?	O	O	O	O

Coast south of Cape Arnhem.

The predominantly NE/SW aligned mainland outer coast (i.e. not including the bays and inlets) starting at Cape Arnhem and continuing to Cape Shield (Coast Section 7.10), which is approximately 130 km to the south west, is dominated by Green Turtle nesting. These beaches, along with the beaches on the south east of Groote Eylandt have most of the NT's Green Turtle nesting. These areas contain some beaches that show the densest turtle nesting in the NT for any species. The oceanic beaches here are long, wide and deep and have some of the most extensive sand dune systems in the NT.

Coast Sections 7.2

Site(s): Mainland coast and islands from Cape Arnhem

(12° 22.5' S, 136° 57.2' E) to Port Bradshaw

(12° 32.7' S, 136° 46.4' E).



The coast from Cape Arnhem to Port Bradshaw is dominated by a long, straight, oceanic beach. For most of its length of approximately 35 km it is wide and sandy with an extensive sand dune system. This coast section was recorded to be dominated by Green Turtle nesting. Flatback and Hawksbill Turtles and the one Olive Ridley Turtle were also confirmed nesting.

The small number of islands that are just offshore along this coast section are mostly rocky and only two had small numbers of turtle tracks. These were a double island called Twin Eagles about 12 km south of Cape Arnhem and one of the group of small islands about 5km to the north of Gwamilina Point on the northern entrance to Port Bradshaw. No turtle nesting was recorded inside Port Bradshaw.

Sixteen aerial and/or ground surveys were done in this section between 1993 and 1999. These were spread throughout the year covering all months except April, June and August. Ground counts were done at ten well spread locations during January, May, September and October. Tracks/nests were recorded in all surveyed.

The highest estimates of tracks/nests from aerial surveys were consistently recorded in the October/November period, with the highest single estimate of approximately 300 tracks/nests being in October 1997.



Plate 59. Typical of Green Turtle nesting density over many kilometres of oceanic beach between Cape Arnhem and Blue Mud Bay, October 1999. Photo R. Chatto.

The recording of the large numbers of tracks along this beach was often an underestimate of true numbers. On several occasions records of ‘many’ or ‘100+’ tracks were recorded as 50 or 100 respectively. In many instances the actual numbers would have been higher because it was impossible to sort/separate the many overlaying tracks from the air, especially while also counting other wildlife. (This constraint would also apply to other similar coast sections within this bioregion, such as 7.3 and 7.10).

Even though unconfirmed species records dominated the counts, it was clear from ground checks that Green Turtle tracks/nests dominated the long, wide and sand dune-backed beaches of this coast section. Track/nest densities were highest between approximately 12° 27.3' S, 136° 50.6' E south to Gwapilina Point at the northern entrance to the Port Bradshaw inlet.

There were small numbers of nests of each of the other three main NT nesting species scattered among areas dominated by Green Turtles. These other species mostly nested in areas where the beaches were smaller and narrower (such as around Cape Arnhem) or other beaches backed by short rocky areas. In these few sites Flatback and Hawksbill Turtles were sometimes more numerous than Green Turtles.

With all records combined, laying was confirmed as occurring all year round in this coast section. The seasonality of most nesting (which is numerically dominated by Green Turtles) in this coast section was not easy to accurately assess due to the limited area coverage from ground surveys and the uncertainty from the air as to how long the large and deep nesting signs of Green Turtles persisted in relation to the weather. For example, emerged Green Turtle nests were seen with the adult laying tracks still visible, even though they are often subjected to strong onshore south easterly winds through the dry season. Nevertheless, surveys of this coast section between January and May generally recorded little fresh sign along the large Green Turtle nesting beaches, but by early July good fresh nesting records were beginning to be obtained, particularly in the southern sections. October surveys recorded large numbers of tracks/nests. These observations suggest that most of the Green Turtle nesting in this coast section commenced around the middle of the year and continued through to the commencement of the wet season around December.

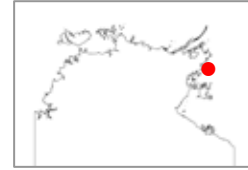
As well as regular traditional harvest of eggs by Aboriginals along most of this coast section, some predation by dogs and goannas was also recorded. Animal predation was more frequently observed around the Cape Arnhem area. Animal predation in areas dominated by Green Turtle nesting is not generally as successful due to the deep nature of their nests and the soft collapsible nature of the sand when digging is attempted on these beaches.

APPROXIMATE SUMMATION OF SPECIES NESTING SIGNIFICANCE IN COAST SECTION 7.2			
[Very High (OOOO), High (OOO), Medium (OO), Low (O) numbers;			
O = Certain, ⚡ = Probable]			
Flatback	Green	Hawksbill	Olive Ridley
OO	OOOO	OO	O

OCCURENCE OF LAYING (ALL SPECIES COMBINED) BY MONTH											
IN COAST SECTION 7.2											
O = Egg laying confirmed; = Nil egg laying recorded;											
? = Not surveyed or current laying not assessed											
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
O	O	O	O	O	O	O	O	O	O	O	O

Coast Section 7.3

Site(s): Mainland coast and islands from Port Bradshaw
(12° 34.5' S, 136° 45.1' E) to Pt Alexander
(12° 49.8' S, 136° 36.8' E).



The approximately 50 kilometres of coast from Port Bradshaw to Point Alexander is very similar to the previous coast section in that it is dominated by sections of long, straight, wide, sandy beaches which are also dominated by Green Turtle nesting. Green Turtle nesting densities are even higher along parts of this coast section than north of Port Bradshaw, particularly along the beach for 10 km south of Port Bradshaw and the beach for 5 km north of Point Alexander. Within this coast section, there was lower density nesting on the shorter beaches around Wanyanmera Point and the bay to its south.

Hawksbill and Flatback Turtle nesting was also confirmed in this coast section, but no Olive Ridley Turtle tracks/nests were confirmed.

Although the islands adjacent the mainland coast are included in this coast section discussion, all had little or no nesting.

Aerial surveys were done of all or parts of this coast section all months of the year except April, June and August, between 1993 and 1997. The highest estimates of tracks/nests from aerial surveys were recorded in the July to November period, with the highest estimate of nearly 500 tracks being in a full survey in October 1997. This is likely to be an underestimate for the reasons explained in the previous coast section summary.

Ground surveys targeting marine turtle nesting in this coast section were restricted to four sites on the mainland (done in May and July surveys) and two islands (done in February and October surveys). The low number of ground surveys meant that species identification was limited, though it was clear that Green Turtle nests strongly dominated this overall coast section, particularly the mainland beaches. Hawksbill Turtles (in much lower numbers) were the main nesting species on the few small islands adjacent the mainland coast. There was also a single mainland nesting site recorded for Hawksbill Turtles, which was just south of Port Bradshaw.



Plate 60. Wanyanmera Point (within coast section 7.3) showing typical good Green Turtle nesting beach in NE Arnhem Land, October 1997. Photo R. Chatto.

Flatback Turtle nesting was confirmed on one island only (the only one of the Three Hummocks group to have a sand beach), but was recorded as likely via aerial surveys in a few places along the mainland beaches.

Although this coast section is not a major area for Flatback Turtle nesting it is possible that more ground surveys, particularly in the early dry season, may have confirmed Flatback Turtle nesting amongst the Flatback and/or Green Turtle records. It is also possible that occasional Olive Ridley Turtle nesting would be recorded as it was confirmed on similar types of beach in coast sections either side of this coast section.

With the three species of turtle confirmed nesting in this coast section, some laying was confirmed in all months of the year. High numbers of Green Turtles meant considerably more nesting in the second half of the year.

With regard to the main nesting species in this coast section, the Green Turtle, fresh and old nests were observed at all times of the year but the main nesting was recorded commencing around the middle of the year and continuing through to the start of the wet season around December. This can be demonstrated by surveys done in particular periods of the year. For example, March and May aerial surveys noted most nesting signs to be old pits likely from the previous season. By July an increasing percentage of fresh Green Turtle nests were noted. A July ground survey of a section of beach about mid way between Port Bradshaw and Wanyanmera Point recorded 21 fresh Green Turtle nests to 58 old. By October tracks/nests had become dominated by fresh ones.

Again, mainland beaches of this coast section are regularly harvested by Indigenous people. No animal predation was recorded in this coast section.

APPROXIMATE SUMMATION OF SPECIES NESTING SIGNIFICANCE IN COAST SECTION 7.3			
[Very High (OOOO), High (OOO), Medium (OO), Low (O) numbers;			
O = Certain, O = Probable]			
Flatback	Green	Hawksbill	Olive Ridley
O O	OOOO	O O	

OCCURENCE OF LAYING (ALL SPECIES COMBINED) BY MONTH											
IN COAST SECTION 7.3											
O = Egg laying confirmed; X = Nil egg laying recorded;											
? = Not surveyed or current laying not assessed											
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
O	O	O	O	O	O	O	O	O	O	O	O

Coast Sections 7.4 & 7.5 – Not discussed due to relatively insignificant amounts of nesting.

Coast Section 7.6

Site(s): Bridgland Is. (12° 52.5' S, 136° 40.4' E).



Bridgland Island (46 ha) is the middle of three named islands running in a south eastern direction from Point Alexander. The other two islands are McNamara Island (minor nesting and not discussed) and Dudley Island (discussed below). Each of these islands has a number of smaller rocky islands around them but these do not have turtle nesting. Most nesting on Bridgland Island occurred along the northern shoreline and in an area of sand that connects two sections of the island on the eastern side. Green, Hawksbill and Flatback Turtles were all confirmed nesting on this island.

Aerial surveys relating to marine turtle nesting were done over Bridgland Island in January to March, May, July, October and November, between 1993 and 1997. Five ground surveys were done in February (1996), July (1996) and October (1997). Fresh and/or old tracks/nests were recorded on all surveys except the May aerial survey. Track/nest counts that were in excess of 50 were recorded in February, March and October surveys. Some of these included some old nesting sign.

Green Turtles were recorded as most numerous followed by Hawksbill Turtles, and then Flatback Turtles. The deeper coralline sands along the north of the island may have partially explained the higher number of Green Turtles compared to Hawksbill Turtles, which is often the reverse on small islands. Limited ground surveying in the April to August period may have effected the assessment of true Flatback Turtle numbers.



Plate 61. Sand spit popular for nesting that links the two main parts of Bridgland Island (coast section 7.6), July 1996. Photo R. Chatto.

Nesting was recorded from the air as mostly Flatback and Hawksbill Turtle prior to landing in the February (1996) ground survey. The small ground sample check confirmed a freshly laid and freshly hatched Flatback Turtle nest and a freshly laid Hawksbill Turtle nest. In addition eggs were collected from three Hawksbill Turtle nests on this island in mid February, 1998 (Pushpa Palaniappan *pers. comm.*) These were reported as very fresh, one being approximately two weeks old and the other approximately five weeks old. These suggest both Hawksbill and Flatback Turtle laying between December and February.

A small amount of Hawksbill Turtle nesting, including a fresh nest, was recorded in the July survey, but by then Green Turtle nesting was dominating. At this time there were 19 fresh Green Turtle nests (three within the last day) and around 30 older (but still the current season) nests. At this time there were also nine Hawksbill Turtle and two Flatback Turtle tracks/nests, which were not fresh but of the current season.

Aerial surveys in March and May recorded no laying and no surveys were done in April and June. As such the records can only confirm laying of all species combined from July through to February.

No egg predation was recorded.

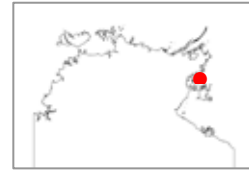
Bridgland Island may also be another site where *Laticauda sp.* sea snakes come ashore. A single track was found in the October (1997) survey. A traditional owner accompanying one of the surveys stated his father had seen black and white banded snakes come ashore on this island many years ago. He did not see them on the other nearby islands.

APPROXIMATE SUMMATION OF SPECIES NESTING SIGNIFICANCE IN COAST SECTION 7.6			
[Very High (OOOO), High (OOO), Medium (OO), Low (O) numbers;			
O = Certain, ⚡ = Probable]			
Flatback	Green	Hawksbill	Olive Ridley
O	OO⚡	O⚡⚡	

OCCURENCE OF LAYING (ALL SPECIES COMBINED) BY MONTH											
IN COAST SECTION 7.6											
O = Egg laying confirmed; X = Nil egg laying recorded;											
? = Not surveyed or current laying not assessed											
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
O	O	X	?	X	?	O	O	O	O	O	O

Coast Section 7.7

Site(s): Dudley Is. (12° 53.1' S, 136° 43.7' E).



Dudly Island (33 ha) is the outer island of the line of the three mentioned in the previous section and has the most marine turtle nesting. The main nesting was recorded on two beaches on the eastern side. Green and Hawksbill Turtles were confirmed nesting. Flatback Turtles were noted as probably nesting.

Aerial surveys relating to turtle track/nest recording were done over Dudley Island in January, March, May, July and October to December, between 1993 and 1996. Three ground surveys were done in July (1996) and October (1994 and 1997). Fresh and/or old tracks/nests were recorded on all surveyed months, with the most (60+) recorded in December 1993.

A ground survey in July checked a small sample of the 50+ tracks/nests noted from the air two days earlier. This ground survey recorded both freshly laid and older incubating nests of both Hawksbill and Green Turtles. No note was made of any species being clearly dominant at this time. In the October (1997) survey, when more nests were present and more sampled, Hawksbill Turtles dominated at a ratio of around two to one over Green Turtles. Of 30 Hawksbill Turtle nests 26 were recorded as prior to the preceding night but still within the present season and four were laid the previous night.



Plate 62. Dudley Island (coast section 7.7) showing the two main nesting beaches on the eastern side, July 1996. Photo R. Chatto.

Hatchling emergence from the older nests also suggested nightly nesting had been occurring since at least August (Colin Limpus, *pers. comm.*). On this survey there were no Green Turtle nests from the preceding night and only one which had recently hatched. This along with the fact that the longer-lasting, larger and deeper Green Turtle nesting pits were showing signs of vegetation growing through them suggested most were likely still there from last season. As October is in the main nesting period for Green Turtles in this area, the numerical dominance of previous season nests over current nests may suggest a variation in numbers of Green Turtles nesting on this island from season to season.

A nest of Hawksbill Turtle eggs was collected from this island in mid February, 1998 (Pushpa Palaniappan *pers. comm.*). This information, coupled with my surveys suggests Hawksbill laying occurring to some degree on this island from June to February at least.

Laying of all species combined was confirmed from June through to February, less January when no survey was conducted. Should Flatback Turtle nesting be confirmed in future surveys of this island, which is likely given it occurs on other islands in this area, laying would then likely also occur through the March to May period.

No egg predation was recorded.

APPROXIMATE SUMMATION OF SPECIES NESTING SIGNIFICANCE IN COAST SECTION 7.7			
[Very High (OOOO), High (OOO), Medium (OO), Low (O) numbers;			
O = Certain, X = Probable]			
Flatback	Green	Hawksbill	Olive Ridley
X	OO	OOX	

OCCURENCE OF LAYING (ALL SPECIES COMBINED) BY MONTH											
IN COAST SECTION 7.7											
O = Egg laying confirmed; X = Nil egg laying recorded;											
? = Not surveyed or current laying not assessed											
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
?	O	?	?	?	O	O	O	O	O	O	O

Coast Section 7.8

Site(s): Mainland, Caledon Bay (13° 51.4' S, 136° 30.4' E)
to Cape Grey (13° 00' S, 136° 40' E).



Caledon Bay to Cape Grey is a section of coast which has scattered high and low density turtle nesting beaches rather than long sections of high density nesting beach as is the case in the two mainland coast sections (7.2 and 7.3) to the north. There is very little turtle nesting inside Caledon Bay and the nesting discussed in this section is southward of an un-named point of land (12° 56.5' S, 136° 35.2' E) which is opposite and to the south east of Point Alexander. Here, most nesting was recorded along the southern 5-6 km of the coast. There are also many small inshore islands along this coast section, particularly in the southern half. Many of these islands are important for seabirds. In order to also over-fly these during surveys some sections of mainland had to be omitted during aerial surveys due to time and fuel constraints.

Aerial surveys for this coast section were done in January to March, July and September to November, between 1993 and 1997. A single ground survey for a turtle nesting check was done in February (1996). Tracks/nests were recorded in all surveyed months.

Highest counts of tracks/nests were made in the October to November period, with the highest being a total count of 300+ tracks/nests in October (1997) when a full survey was done with Dr. Colin Limpus. Although this was an aerial survey, Green Turtles could clearly be identified as clearly the dominant species at this time. Around 10% of tracks/nests were recorded as very fresh but this is likely to be an underestimate as assignments of age could only be made at times when tracks/nests were in low enough density to be studied more closely during the flight.



Plate 63. Part of the good Green Turtle nesting beach north of Cape Grey (within coast section 7.8), July 1996. Photo R. Chatto.

Track/nest counts in the January to (early) July surveys were consistently much lower i.e. around 10% of the October/November counts. Despite a certain accumulation of nesting signs of the deep nesting Green Turtle during the year, this would still suggest more nesting in the later part of the year. As the majority of confirmed nests were of Green Turtles for this coast section, seasonality would be expected to be similar to other nearby mainland coast sections.

Other species confirmed in this coast section were Flatback and Hawksbill Turtles. These were only recorded on one occasion each, but the lack of ground surveys could have led to an under-estimation of these two species on shallower beaches normally less preferred by Green Turtles.

The only ground survey was done in the far south of this section. This February check was not a prime time of the year for turtle nesting. Three old Green Turtle (finishing season) and one old Flatback Turtle (yet to commence) nests were recorded whilst on the ground for a seabird count.

Laying of all species combined was confirmed in January, February, July and September to November. The recording of only old tracks in a March survey suggests the nesting of the dominant species, the Green Turtle, had finished during February, and that nesting of potential small numbers of Flatback Turtles had not started.

Mainland beaches of this coast section are regularly harvested by Indigenous people. No animal predation was recorded in this coast section.

APPROXIMATE SUMMATION OF SPECIES NESTING SIGNIFICANCE IN COAST SECTION 7.8			
[Very High (OOOO), High (OOO), Medium (OO), Low (O) numbers;			
O = Certain, ⚡ = Probable]			
Flatback	Green	Hawksbill	Olive Ridley
O⚡	OOO	O	

OCCURENCE OF LAYING (ALL SPECIES COMBINED) BY MONTH											
IN COAST SECTION 7.8											
O = Egg laying confirmed; X = Nil egg laying recorded;											
? = Not surveyed or current laying not assessed											
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
O	O	X	?	?	?	O	?	O	O	O	?

Coast Section 7.9 – Not discussed due to relatively insignificant amounts of nesting.

Coast Sections 7.10 & 7.11

Site(s): Mainland, Bald Pt (13° 03.7' S, 136° 33.7' E)
to Cape Shield (13° 19.5' S, 136° 20.5' E).
Gooninnah Is (13° 18.9' S, 136° 22.6' E).



These coast sections include the mainland coast from Bald Point to Cape Shield (approximately 50 kilometres), and the only island in this section, Gooninnah Island.

Most of the mainland coast here consists of long, wide beaches with large backing sand dunes. Some of this coastline (along with some of the beaches in coast sections 7.2 and 7.3) has some of the largest coastal sand dunes in the NT. The dune system near Cape Shield is nearly 1 km wide.

Dense nesting, dominated by Green Turtles, was recorded along the majority of the mainland coast of this section. The beaches of this area were recorded as having among the highest density and greatest total numbers of marine turtle tracks/nests in the NT. There was only low density nesting on the western side of the Cape Shield peninsula.

Apart from Green Turtles, the only other species confirmed nesting in this coast section were small numbers of Flatback Turtles. The small number of islands along this length of coast could possibly influence the lack of Hawksbill Turtle nesting recorded in this coast section.

Ten aerial surveys, two involving ground checks, were done between 1993 and 2004. Aerial surveys were done in January to March, May (part), July, October and November. Ground checks, both towards the south of the section, were done in February (1996) and October (1999). Tracks/nests were recorded in all surveys.

Aerial counts of this coast section were consistently in the “hundreds” of tracks/nests for nearly all surveys, but many of these, particularly in the January and March surveys, included old nesting pits of the deep nesting Green Turtle that had remained from the previous season.

The highest count of 400+ tracks/nests for these combined coast sections was in the October (1997) survey. These counts are likely to be somewhat under the true amount. Some of the records for this very dense nesting coast section were recorded as “many” and allocated the number of 50. In some of these cases this will be a significant underestimate (see Methods). Also a number of comments were recorded as ‘hundreds of tracks/nests per kilometre’ but only entered as 50 (i.e. = ‘many’). This was further compounded by the fact that as the season progressed, large numbers of Green Turtles crawled and nested over the top of earlier tracks and nests. Lowest counts of 50 – 70 tracks/nests were recorded in January to March surveys, and mention was made that many of these were old nest pits.

Aerial and ground surveys confirmed Green Turtles as clearly the dominant species on most of the coast along this section. Flatback Turtles were the only other species confirmed nesting. These were recorded in small numbers only from the two ground sites, which were both in the vicinity of Point Arrowsmith. More ground surveys in the first half of the year may show higher numbers of Flatback Turtle nesting.

No evidence was found in this coast section to suggest the timing of the majority of Green Turtle nesting was any different to other nearby sites. Few if any new tracks/nests were recorded from January to March. Then from July there were reasonable numbers of fresh tracks and nests but little hatching. By October and November there was evidence of considerably more recent hatching as well new tracks/nests.

Although most nesting occurred on the beach or within the primary dunes, some animals occasionally wandered considerable distances over the dunes to nest further inland. Both adult and hatchling Green Turtles were occasionally found dead, presumably from heat and dehydration, well into this dune system from the waterline.

Gooninnah Island was surveyed from the air in four months; February, July, October and November. All except the November 1993 survey (which recorded 50+ tracks) recorded only a few tracks present. Most nesting was recorded on the western side of the island. This is adjacent to (and within a kilometre) the extensive mainland beaches north of Cape Grey which have dense Green Turtle nesting. Although this island was ground checked for seabirds it was not assessed at this time for turtle nesting. (The island was also noted to have comparatively large numbers of small lizards compared to other islands along this coast). The only turtle tracks/nests recorded to species level were nine Green Turtle tracks in October (1997).

Unlike the mainland coast section to the north (coast section 7.8), additional surveys for this coast section confirmed laying in March and May. Laying of all species combined was confirmed in all months except April, August and December. With confirmed laying either side of these months, it would be likely that laying would also continue through these months. The lesser numbers of nests in the first half of the year probably relates to the small numbers of nesting Flatback Turtles recorded in this coast section.

Mainland beaches of this coast section are regularly harvested by Indigenous people, but no animal predation was recorded.

APPROX. SUMMATION OF SPECIES NESTING SIGNIFICANCE IN COAST SECTIONS 7.10 & 7.11			
[Very High (OOOO), High (OOO), Medium (OO), Low (O) numbers;			
O = Certain, O = Probable]			
Flatback	Green	Hawksbill	Olive Ridley
O	OOOO		

OCCURENCE OF LAYING (ALL SPECIES COMBINED) BY MONTH											
IN COAST SECTIONS 7.10 & 7.11											
O = Egg laying confirmed; X = Nil egg laying recorded;											
? = Not surveyed or current laying not assessed											
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
O	O	O	?	O	O	O	?	O	O	O	?

Coast Sections 7.12, 7.13, 7.14, 7.15 & 7.16

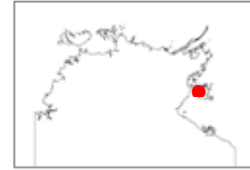
Site(s): Round Hill Is. (13° 18.3' S, 136° 05.3' E)

Orunyah Is. (13° 20.1' S, 136° 03.2' E)

Fowler Is. (13° 19.8' S, 135° 58.1' E)

Morgan & Meringa Is. (13° 27.5' S, 136° 05.2' E)

Marrinan Is. (13° 26.6' S, 136° 06.5' E).



There are a few small islands near the mainland of the southern Blue Mud bay area. Those with some turtle nesting recorded on them include Round Hill (270 ha), Fowler Island (163 ha), a small un-named island between these two islands, Morgan and Meringa Islands (703 ha) and Marrinan Island (31 ha). The limited amount of beach on these islands meant total numbers of nests could not be very high even though they could be quite dense. Morgan Island for example, had a record of 'many' in a January (1996) aerial survey. None of the islands received ground surveys in relation to turtle nesting. The only species confirmed nesting in these coast sections was the Green Turtle, on Round Hill Island.

There are insufficient data from these surveys to warrant summary tables for these coast sections. However, Anindilyakwa Land Council from Groote Eylandt recorded laying in each month July to October during ground surveys done in 1995 of Morgan Island, but did not record species.



Plate 64. Meringa Island (within coast section 7.15), May 1994. Photo R. Chatto.



Plate 65. Good coral rubble and sand nesting beach along the east side of Hawknest Island (coast section 7.22), February 1996. Photo R. Chatto.



Plate 66. Flatback Turtle trails radiating out from a hatched nest on Cool Yal You Ma Island (within coast section 7.18), October 1999. Photo R. Chatto.

Coast Section 7.17

Site(s): Isle Woodah (13° 26.6' S, 136° 09.2' E).



Isle Woodah (6 421 ha) is a north-south aligned island that is wider in the middle and narrow at both the northern and southern ends. It is approximately 15 km long and 5 km wide at its widest point. Nesting is spread around most of the island, but is densest on the northern third of the island. Here nesting occurs on both eastern and western sides but particularly the eastern side. Reasonable nesting also occurs on the eastern side of the far southern part of the island. Least nesting occurs in the three inlets on both eastern and western sides of the southern half of the island. Some of the beaches of this island consisted of relatively shallow sand over rock, and this led to a number of unsuccessful nesting attempts being noted. There was also considerable goanna predation seen at ground sampled sites, which were all in the northern half of the island. Both of these factors considerably reduced the success of the substantial amount of nesting on this island.

Aerial surveys were done around all or part of the island in January to March, May, July, September and October, between 1994 and 1999. Four of these aerial surveys (in February, May, September and October) also involved ground checks. All surveyed months, except March (which covered most of the island) recorded tracks/nests.

The highest track count was 170+ tracks/nests in July (1996). Counts of around 100 were also made in September and October. All estimates included old and new nesting signs, and would also have included unsuccessful nesting attempts for some of the shallow sand beaches due to the factors mentioned above.



Plate 67. Flatback and Green Turtle nesting beaches at the north end of Isle Woodah (coast section 7.17), July 1996. Photo R. Chatto.

Flatback Turtles were recorded as the most numerous nesting turtle on the island. These were recorded in all surveys between February and October. The only other species confirmed was the Green Turtle, and most of these were on the northern tip of the island where the beaches were larger and wider. Green Turtle nesting was only recorded in September and October surveys. The overall ratio of all Flatback Turtle nests/tracks confirmed in ground surveys to Green Turtle nests/tracks was 114 to 43.

Surveys in January and February recorded mostly old signs with only a little fresh nesting. Of two nests confirmed to species in a ground survey, both were Flatback Turtles that had laid in January. A lack of track/nest records in a March survey suggests only the odd Flatback Turtle nests in the first few months of the year and that most nesting starts some time after March. July to October surveys recorded both fresh and old nesting in good numbers. This is consistent with the normal Flatback Turtle nesting season which has most of the nesting through the dry season, even though they can potentially nest in any month of the year.

Records for combined species nesting on this island confirm laying in January and February, and May to October, less August when no surveys were done. Nevertheless, as both Flatback and Green Turtles were recorded in reasonable numbers on this island, it would be expected that laying would occur all year round, with Flatback Turtles likely to be mostly from April onwards, and Green Turtles likely to be mostly from July onwards (including November and December, when no surveys were done).

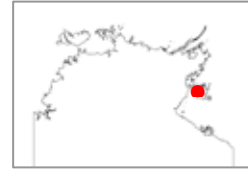
There were no records of human egg harvest on this island but discussions with Groote Eylandt Indigenous people suggested they did visit occasionally but not all that often because of the length of the sea trip and the fact that goannas get so many of the eggs before them.

APPROXIMATE SUMMATION OF SPECIES NESTING SIGNIFICANCE IN COAST SECTION 7.17			
[Very High (OOOO), High (OOO), Medium (OO), Low (O) numbers;			
O = Certain, O = Probable]			
Flatback	Green	Hawksbill	Olive Ridley
OOO	OO		

OCCURENCE OF LAYING (ALL SPECIES COMBINED) BY MONTH											
IN COAST SECTION 7.17											
O = Egg laying confirmed; X = Nil egg laying recorded;											
? = Not surveyed or current laying not assessed											
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
O	O	X	?	O	O	O	?	O	O	?	?

Coast Section 7.18

Site(s): Nicol Is. group (13° 27.1' S, 136° 14.7' E).



Nicol Island (467 ha) lies just to the east of the Isle Woodah. It is much smaller than Isle Woodah and has two even smaller associated islands, one off its north western point (Cool Yal You Ma Island) and the other off its south west (un-named). All islands of this trio in the Nicol Group were recorded to have turtle nesting. Nicol Island, being larger, has the most in total. Most nesting on Nicol Island was recorded on the western side. Cool Yal You Ma Island, with sand all around it, had the highest density of nesting.

The only species confirmed from ground surveys was the Flatback Turtle. No narrower tracks of Hawksbill or Olive Ridley Turtles were seen and the small, narrow beaches were probably unsuitable for Green Turtles.

Aerial surveys were conducted of this group in January, March, July, and September to November, between 1993 and 1996. A single ground survey was done on each of Nicol Island (February, 1996) and Cool Yal You Ma Island (October, 1996). Tracks/nests were recorded on all surveys except the late March (1994) survey which flew all around each island. The highest total track/nest counts of 50+ were recorded in surveys in November, 1993 (mostly tracks) and January, 1996. Records from this (late) January aerial survey were mostly of old nest pits, but a follow up ground survey a few days later (February) recorded a single recently hatched Flatback Turtle nest and a small number of windblown tracks. This confirms laying in both December and January, and that nest pits are remaining but tracks not, which is to be expected.



Plate 68. Nicole Island (background) and Cool Yal You Ma Island (both within coast section 7.18), February 1996. Photo R. Chatto.

The second high track/nest count, in the November survey, counted a higher percentage of tracks. This, along with a lesser, but again high track count in July (1996), suggested significant nesting during the dry season. Unfortunately a lack of surveys in the April to June period mean confirmation of such is not possible, but these observations align more with the area being mainly a Flatback Turtle nesting site, rather than a combined Flatback and Green Turtle nesting site as is the case on the nearby Isle Woodah.

Records for the Nicole Island group, confirm some laying from at least July through to February. Although no surveys were done in the April to June period it is likely, if Flatback Turtles are the main species as suspected, then nesting through this period and up to November may be greater than nesting from December through to February.

No goanna tracks or signs of animal predation were recorded on any of the islands in this group.

APPROXIMATE SUMMATION OF SPECIES NESTING SIGNIFICANCE IN COAST SECTION 7.18			
[Very High (OOOO), High (OOO), Medium (OO), Low (O) numbers; O = Certain, ⚡ = Probable]			
Flatback	Green	Hawksbill	Olive Ridley
OO⚡			

OCCURENCE OF LAYING (ALL SPECIES COMBINED) BY MONTH IN COAST SECTION 7.18											
O = Egg laying confirmed; X = Nil egg laying recorded; ? = Not surveyed or current laying not assessed											
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
O	O	X	?	?	?	O	?	O	O	O	O

Coast Section 7.19

Site(s): Burney Is (13° 35.6' S, 136° 14.3' E).



Burney Island (476 ha) is the first (and second largest) of a chain of around eight small islands which run in a south eastern direction from the southern end of Isle Woodah to the north west of Groote Eylandt. It is an elevated, horseshoe shaped island that is approximately 3 km by 3 km. There is a wide beach on the western side, and a rocky (mostly) or steep sandy beach coast around the rest of the outside part of the island. Most of these beaches have turtle nesting on them. The ‘bay’ area (inside the horseshoe) has mangroves around parts of it and no turtle nesting was recorded within this area.

Four aerial surveys were done around this island between 1993 and 1996. These were done in the months of March, July, September and November. No ground surveys were done of this island. Tracks/nests were recorded in all surveys. There were no individual species identified for this island.

The highest track count was in excess of 50 in a September survey. The next highest was in a July survey where 10 old and 20 newer tracks were recorded. The November count recorded around 20 tracks while the March count was the lowest of all four surveys, and was of only a single fresh track. Given the confirmed nesting on adjacent islands it is likely that Flatback Turtle and possibly Green Turtles would also nest on this island.

Aerial surveys confirmed laying in the months of March, June, July, September and November. It is probable that additional appropriate surveys would confirm laying would be continuous between the months of March and November at least because of the likely presence of Flatback Turtles.

There was no nest predation recorded on this island.

APPROXIMATE SUMMATION OF SPECIES NESTING SIGNIFICANCE IN COAST SECTION 7.19			
[Very High (OOOO), High (OOO), Medium (OO), Low (O) numbers; O = Certain, ⓧ = Probable]			
Flatback	Green	Hawksbill	Olive Ridley
ⓧ	ⓧ		

OCCURENCE OF LAYING (ALL SPECIES COMBINED) BY MONTH IN COAST SECTION 7.19											
O = Egg laying confirmed; X = Nil egg laying recorded; ? = Not surveyed or current laying not assessed											
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
?	?	O	?	?	O	O	?	O	?	O	?

Coast Section 7.20

Site(s): Amagbirra Is. (13° 35.8' S, 136° 16.4' E)).



Amagbirra Island (37 ha) is a roughly circular island of diameter about 1 km. It is a lower and sandier island than Burney Island. Amagbirra Island has reasonable turtle nesting with most tracks located on the north eastern side of the island adjacent to deeper water.

Aerial surveys were done around this island in March, July, October and November, between 1993 and 1996. Brief ground surveys were done in May and October of 1994. Tracks/nests were recorded in all surveyed months.

The highest track/nest count was in excess of 50 in the May ground survey, the lowest of one (fresh) set of tracks, was in March. Most of the May tracks/nests were then noted as old, but by July an approximate 2:1 new to old ratio was noted for approximately 30 examined nests.

Flatback, Green and Olive Ridley Turtles were confirmed nesting on this island. However, most records were of Flatbacks and/or Green Turtles, or species unknown so there are not enough confirmed records to suggest which was dominant. Fresh Flatback Turtle tracks were confirmed during one of two brief ground surveys in May (1994), while in the other ground survey in October of the same year probable Flatback Turtle hatchling trails and confirmed fresh Green Turtle nesting was recorded.

With all species combined laying was confirmed in the months of March to November, less September which was not surveyed. These results suggest continual laying from March to November at least. With the confirmation of three species nesting here it is likely that further surveys would also confirm laying outside of this period.

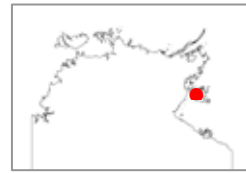
There was no egg predation recorded on this island.

APPROXIMATE SUMMATION OF SPECIES NESTING SIGNIFICANCE IN COAST SECTION 7.20			
[Very High (OOOO), High (OOO), Medium (OO), Low (O) numbers; O = Certain, ⓧ = Probable]			
Flatback	Green	Hawksbill	Olive Ridley
Oⓧ	O		O

OCCURENCE OF LAYING (ALL SPECIES COMBINED) BY MONTH IN COAST SECTION 7.20												
O = Egg laying confirmed; X = Nil egg laying recorded; ? = Not surveyed or current laying not assessed												
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
?	?	O	O	O	O	O	O	?	O	O	?	

Coast Section 7.21

Site(s): Wedge Rock (13° 35.4' S, 136° 19.3' E).



Wedge Rock (24 ha) is the smallest of the islands in the chain linking the southern part of the Isle Woodah and the north west of Groote Eylandt. It is mostly high ground and rock but has a sand spit off its western side. This is not exceptionally large but always had an extremely high concentration of marine turtle nesting signs. Unfortunately no species were confirmed but nesting is certainly dominated by Flatbacks and/or Green Turtles. The deep nature of the sands on the beach suggests the island could be suitable for Green Turtle nesting and at a quite high density, at least in some years.

Aerial surveys were conducted of this island in March, May July, September and November, between 1993 and 1996. A single ground survey was done February (1996). Tracks/nests were recorded in all surveyed months, but most records were only recorded as ‘many’ tracks/nests because of the difficulty of assessing numbers on the small but very heavily used sand spit.

The February ground survey recorded ‘hundreds’ of old nesting pits but nothing fresh at that time. The nesting pits were of a large size normally attributable to Green Turtles but the very high concentration of ‘nesting on top of nesting’ could also have involved Flatback Turtles enlarging previous nest pits.

Laying was confirmed in March, and May to November, less August which was not surveyed. These results suggest continual laying from March to November at least. Surveys also suggested an increasing number of fresher looking Flatback and/or Green Turtle size tracks over the maze of old tracks and pits though the March to November period. However, the regular recording of much more old sign than fresh nesting signs may also suggest the possibility that this island could have large variations in the numbers of nests in some seasons, i.e. pulses of use at high intensity.

No goanna tracks or signs of predation were recorded on this island.

APPROXIMATE SUMMATION OF SPECIES NESTING SIGNIFICANCE IN COAST SECTION 7.21			
[Very High (OOOO), High (OOO), Medium (OO), Low (O) numbers; O = Certain, ⓧ = Probable]			
Flatback	Green	Hawksbill	Olive Ridley
ⓧⓧⓧ	ⓧⓧⓧ		

OCCURENCE OF LAYING (ALL SPECIES COMBINED) BY MONTH IN COAST SECTION 7.21											
O = Egg laying confirmed; X = Nil egg laying recorded; ? = Not surveyed or current laying not assessed											
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
?	X	O	?	O	O	O	?	O	O	O	?

Coast Section 7.22

Site(s): Hawknest Is. (13° 37.7' S, 136° 24.6' E).



Hawknest Island (259 ha) is a low rectangular shaped island about 1 km by 3 km and fringed by sand and coral rubble beach. The island is nested on by large numbers of marine turtles, particularly along the southern and eastern sides. The large amount of coral rubble on the eastern side in particular makes confirmation of the species of nesting turtles and the ages of the nests more difficult to determine. It could also lead to failed nesting attempts being recorded because turtles are not getting deep enough into the sand under the coral.

Aerial surveys were done around this island in February, March, July, and September to November, between 1993 and 1997. Ground surveys were done in February and September of 1996. Tracks/nests were recorded in all surveyed months.

The highest estimates of tracks/nests were in excess of 170+ in July 1996. In general higher counts of 100+ were recorded in July to October surveys compared to the earlier part of the year when counts of 50+ were recorded in February and March surveys. A considerable percentage of these counts refer to old nest pits, but also to old tracks that may remain visible for considerably longer than a few weeks because of their greater persistence in the coral rubble that covers the sand on much of the island.

Estimates of 45 fresh tracks/nests out of 145 in a July aerial survey and six fresh out of a sample of 40 in an October survey compared to two fresh out of 50 in a March survey also suggests more fresher nests in the mid to the latter part of the year.

Hawksbill, Flatback and Green Turtles were confirmed nesting on this island but as most records were not to species level, it cannot be said which was the dominant species. An October survey suggested Hawksbill Turtles were the main nesting species, but another (limited) observation in a February survey suggested more Flatback and/or Green Turtle nesting at that time of year.

With all species combined fresh laying was confirmed in January to March, June, July, and September to November. With three species at least confirmed nesting on this island, additional surveys in months not covered, would likely extend laying confirmation to other months. Egg predation was not recorded.

APPROXIMATE SUMMATION OF SPECIES NESTING SIGNIFICANCE IN COAST SECTION 7.22			
[Very High (OOOO), High (OOO), Medium (OO), Low (O) numbers; O = Certain, ⚡ = Probable]			
Flatback	Green	Hawksbill	Olive Ridley
O ⚡ ⚡	O ⚡ ⚡	OO ⚡	

OCCURENCE OF LAYING (ALL SPECIES COMBINED) BY MONTH IN COAST SECTION 7.22											
O = Egg laying confirmed; X = Nil egg laying recorded; ? = Not surveyed or current laying not assessed											
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
O	O	O	?	?	O	O	?	O	O	O	?

Coast Section 7.23

Site(s): Bustard Is. (13° 42.3' S, 136° 23.3' E).

“Little” Bustard Is. (13° 43.2' S, 136° 22.8 ' E).



Bustard Island (254 ha), and a smaller un-named island (known locally as Little Bustard Island) just off its south western point forms the last (and nearest to Groote Eylandt) of the chain of small islands between Isle Woodah and Groote. Both islands are long, narrow and north/south aligned. The main island is about 3 km long and the smaller one about 1 km long. Both are mostly surrounded by sand and coral rubble, the latter particularly on the western side. Both the Bustard islands have good turtle nesting. The SW and NE parts of the larger island and the western side of the smaller island are the main nesting areas. Hawksbill, Flatback and Green Turtles were confirmed.

Aerial surveys were conducted around these islands between 1993 and 1997, but neither island was surveyed from the ground. Surveys were done in March, July, September, October and November, meaning wet season coverage was not good. Tracks/nests were recorded in all surveyed months.

In excess of 100 tracks/nests were consistently recorded in all of the months except March, but this month still had reasonable numbers. The highest count, done in October 1997, was 340+. This estimate consisted of mostly old nesting pits but with plenty of fresh nesting as well. Locating and assessing tracks in areas of coral rubble is more difficult even though the signs remain there longer than in sand. However, along with the previous coast section the longer retention time may over inflate counts on a comparative basis to normal sand beaches.

In the October survey, done with Dr. Colin Limpus, species were identified as mostly Hawksbill Turtle, with some Flatback Turtles and a few Green Turtles.

Anindilyakwa Land Council from Groote Eylandt (*pers. comm.*) recorded laying in each of the months between July and October during ground surveys done in 1995. They did not record species. With this information and the results from my surveys, laying can be confirmed in March and then from June to November. It is also likely, with the three confirmed nesting species, that some laying would occur outside of these months as well.

The islands are frequently visited by Indigenous people from Groote Eylandt to harvest eggs. Goanna predation was not recorded, but there is a water source on the island so it is possible.

APPROXIMATE SUMMATION OF SPECIES NESTING SIGNIFICANCE IN COAST SECTION 7.23			
[Very High (OOOO), High (OOO), Medium (OO), Low (O) numbers;			
O = Certain, ⚡ = Probable]			
Flatback	Green	Hawksbill	Olive Ridley
O⚡⚡	O⚡⚡	OO⚡	

OCCURENCE OF LAYING (ALL SPECIES COMBINED) BY MONTH											
IN COAST SECTION 7.23											
O = Egg laying confirmed; X = Nil egg laying recorded;											
? = Not surveyed or current laying not assessed											
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
?	?	O	?	?	O	O	O	O	O	O	?

Coast Section 7.24

Site(s): Bickerton Is. (13° 45' S, 136° 12.3' E).



Bickerton Island (22 521 ha) is the next largest island to Groote Eylandt. Roughly double horseshoed in shape it is approximately 25 km by 20 km. Much of the northern part of the island is high rocky country. The Aboriginal community of Milyakburra is located in the south of the island.

Bickerton Island has about a dozen small islands scattered around it. There was not a lot of turtle nesting recorded on Bickerton Island itself. Most nesting was recorded on the smaller islands around the southern half of Bickerton Island. Woody Island, one of these smaller islands off the south western part of Bickerton Island was most used. Anindilyakwa Land Council from Groote Eylandt (*pers. comm.*) recorded laying in the month of September in a ground survey done in 1995, but did not record species.

Aerial surveys were done around parts of this island and the associated smaller islands in the months of March, September and November, between 1993 and 1994. The highest count was around 70 tracks, but most of these were on Woody Island. Other nesting was of small numbers on the scattered beaches around the southern half of the island and on some of the other small islands just off shore. Species were not identified.

No ground surveys were done and there is insufficient information to produce meaningful summary tables for this coast section.



Plate 69. NW Bickerton Island (within coast section 7.24), February 1996. Photo R. Chatto.

Coast Section 7.25

Site(s): Mainland, Cape Barrow (13° 40' S, 136° 05' E)
to Nyinpinti Pt (14° 25.5' S, 135° 40' E).



The final section of mainland coast to be discussed in this bioregion is the approximately 130 km of coast from Cape Barrow to Nyinpinti Point, which is just south of Numbulwar. Turtle nesting along this coast section consists mostly of scattered single nests. No high density nesting beaches were located in this coast section. Nesting along the northern part of this coast was higher than the middle section, and there were no nests recorded south of Numbulwar (14° 16.5' S, 135° 44.6' E) within this coast section. The percentage of this coast section that has sand beach is considerably less than the previous mainland coast sections (e.g. 7.2, 7.3, 7.8 and 7.10) to the north. Much of this coast is composed of wide intertidal mud/sand that backs onto mangroves or saline flats. Those beaches that do occur along this coast section (i.e. south of Blue Mud Bay) are also much narrower and shallower than those to the north where the large numbers of Green Turtles nest. Also the adjacent coastal waters are shallower. As such the density of nesting and total numbers of nests is considerably less, and the dominance by Green Turtle nesting north of Blue Mud Bay changes to a mixture of Flatback Turtle (mostly) and Green Turtle to the south of Blue Mud Bay. Neither, Hawksbill or Olive Ridley Turtles were confirmed in this coast section.

There are only two small islands along this coastline and neither is suitable for turtle nesting and so all discussions regarding turtle nesting for this coast section refer to mainland nesting.

Aerial surveys were conducted along the full length of this coast in the months of February, March, May, July and November, between 1993 and 1999. There were also two ground surveys done in May (1999), one being about mid way along the coast section and the other midway between there and Cape



Plate 70. Low density Flatback and occasional Green Turtle nesting beach along the coast south of Cape Barrow (within coast section 7.25), May 1999. Photo R. Chatto.

Barrow in the north. Both were to examine what were examples of the scattered few tracks along this coast section at that time. Tracks/nests were recorded in all surveys. Two other aerial surveys were done of the southern section of this coast section in the months of September and October. Neither of these surveys recorded tracks/nests but very little of this area ever had any turtle nesting recorded.

The highest total count of tracks/nests along this coast section was 52 in a November (1993) survey. This is likely to include tracks/nests accumulated from earlier in the season. A total count of 20 tracks/nests was recorded in a July survey but all other counts totaled less than ten tracks/nests. Although concentrating on other species of wildlife in this area meant that some parts of beach were missed or inadequately surveyed with respect to turtle nests, it is clear that this coast section is not highly significant for marine turtle nesting.

Examination of six nests from the May ground surveys recorded two older Green Turtle nests, and three fresh and one older Flatback Turtle nests. One of the Flatback Turtle nests had been taken by a goanna.

Laying was confirmed in the months of February, March, May to July, October and November, with higher counts from July onwards. This would be expected with this coast section being more suitable for predominantly Flatback Turtle nesting. Although the large increase in the number of tracks between July and November surveys suggests continued laying through this period, it cannot be confirmed in August and September.

APPROXIMATE SUMMATION OF SPECIES NESTING SIGNIFICANCE IN COAST SECTION 7.25			
[Very High (OOOO), High (OOO), Medium (OO), Low (O) numbers;			
O = Certain, O = Probable]			
Flatback	Green	Hawksbill	Olive Ridley
OO	O		

OCCURENCE OF LAYING (ALL SPECIES COMBINED) BY MONTH											
IN COAST SECTION 7.25											
O = Egg laying confirmed; X = Nil egg laying recorded;											
? = Not surveyed or current laying not assessed											
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
?	O	O	?	O	O	O	?	?	O	O	?

Coast Section 7.26 – Although around 60 tracks/nests were recorded in total for this coast section, the large number of islands and length of Groote Eylandt coastline involved means the overall density of nesting is very low and insignificant when compared to the other coast sections discussed for this bioregion. Further, no ground surveys were done of this coast section. As such this coast section is not discussed in further detail.

The next group of islands that are significant for marine turtle nesting are off the north eastern part of Groote Eylandt. These consist of Hawk and Lane Islands, and North East Isles. All have considerable marine turtle nesting, and are particularly significant for Hawksbill Turtle nesting.

Coast Section 7.27

Site(s): Hawk Is. (13° 40.2' S, 136° 53.9' E).



Hawk Island (226 ha) is the most westerly of the group of islands to the NE of Groote Eylandt. It is approximately 4 km long and 1 km wide and is aligned in a NE/SW direction. It is partially vegetated with a large percentage of sandy beach around its shoreline. Most nesting occurs along the north western coast. The island is a very significant Hawksbill Turtle nesting area, but also has Flatback and Green Turtle nesting.

Aerial surveys were conducted in February, March, May, July and September to December, between 1993 and 1997. Ground surveys were done in February (1996), May (1994) and September (1996). All surveyed months recorded tracks/nests present.



Plate 71. Nesting beaches on Hawk Island (coast section 7.27), October 1997. Photo R. Chatto.

The highest counts of tracks/nests were recorded in the later parts of the year but aerial counts of tracks early in the year (e.g. February, >50) still suggested reasonably good nesting at this time as well. The highest estimation of tracks/nests was recorded as 220+ October (1997) and 175 in early December (1993). The heavily pitted sections of beach suggested nesting signs counted were inclusive of an accumulation of nests and nesting attempts over time.

Ground counts confirmed both fresh and old nesting signs of Hawksbill and Flatback Turtles on all occasions, and some Green Turtle nesting in the September survey. The vast majority of nests confirmed to species level were of Hawksbill and Flatback Turtles, with more of the former in September and more of the latter in February and May.

Most, but not all, Hawksbill Turtle nesting was up under the she-oak trees backing much of the beach on this island, while most Flatback Turtle nesting was along the wider middle parts of the beaches. Although an occasional Olive Ridley Turtle nest was suspected, none was confirmed.

Despite the good seasonal spread of ground surveys, none recorded a high percentage of fresh nesting compared to older sign. Although fresh nesting was found over the entire February to December period for both Hawksbill and Flatback Turtles, it is not possible to confirm peak nesting times. Laying of all species combined was confirmed in all months of the year except June, but it is likely a survey at this time would confirm laying continuing through this month as well.

Scott Whiting (*pers. comm.*) counted six Hawksbill Turtle nests laid overnight and 137 sets (i.e. the up and down tracks of a nest or nesting attempt) of Hawksbill Turtle tracks that were between two nights and a month old in a walk around the entire island in mid September 2007. On this same survey there were no new Flatback Turtle nests from the previous night but there were 14 sets of tracks up to a month old. This supports the findings from my surveys in that, at this time of year, Hawksbill Turtles are clearly the dominant nesting species on this island. His total track counts were in the same general range as the counts recorded as high counts in my surveys of this island.

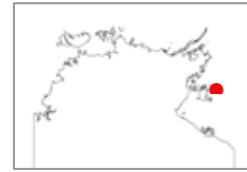
Goanna predation was recorded in the September survey but only of a small percentage of the nests and mostly of the shallower nesting Hawksbill Turtles. Traditional harvest was not recorded.

APPROXIMATE SUMMATION OF SPECIES NESTING SIGNIFICANCE IN COAST SECTION 7.27			
[Very High (OOOO), High (OOO), Medium (OO), Low (O) numbers; O = Certain, ⚡ = Probable]			
Flatback	Green	Hawksbill	Olive Ridley
OO⚡	O⚡	OOO⚡	⚡

OCCURENCE OF LAYING (ALL SPECIES COMBINED) BY MONTH IN COAST SECTION 7.27											
O = Egg laying confirmed; X = Nil egg laying recorded; ? = Not surveyed or current laying not assessed											
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
O	O	O	O	O	?	O	O	O	O	O	O

Coast Section 7.28

Site(s): Lane Is. (13° 39.8' S, 136° 55.8' E).



Lane Island (55 ha) is the smallest of the islands in the group of the three larger islands to the north east of Groote Eylandt. It lies between Hawk Island and North East Isles and is another with a shoreline dominated by sandy beach with reasonably significant marine turtle nesting.

Aerial surveys were done in February, March, July and September to December, between 1993 and 1997. Ground counts were done in February (1996), May (1994) and October (1994), but all ground checks were brief and only small numbers of nests were checked. Tracks/nests were recorded in all surveyed months of this island, although the May ground survey recorded only old nest pits at the one site checked. The highest counts of tracks/nests were recorded in October 1997 (~100) and September 1994 (50+) but the heavily pitted sections of beach suggested some nesting signs counted were likely inclusive of an accumulation of nests and nesting attempts over time.

Ground counts confirmed Flatback and Hawksbill Turtles as dominating the nesting on this island. The limited data from a February survey recorded five Flatback Turtle to two Hawksbill Turtle nests, with one of the Flatback Turtle nests being from the previous night. An October (1997) aerial survey suggested that by this time of the year there were more Hawksbill Turtle tracks/nests compared to Flatback Turtles on the island. Green or Olive Ridley Turtle nesting was not confirmed on this island, but it is likely that the former species would nest here given the size of some of the old body pits, and that they nested on similar beaches on the other two nearby islands.

Considering all species, laying was confirmed in all months except the April to June period. No surveys were done in April and June, and the May ground check recorded only old nesting pits but this was only at the one site. Fresh laying in May was confirmed on the two nearby islands (7.27 and 7.29) on either side of Lane Island.

Goanna predation was also confirmed on this island, but some of this may have been of small species opportunistically feeding in the high density nesting areas where turtles were digging up and scattering previously laid eggs.

APPROXIMATE SUMMATION OF SPECIES NESTING SIGNIFICANCE IN COAST SECTION 7.28			
[Very High (OOOO), High (OOO), Medium (OO), Low (O) numbers;			
O = Certain, = Probable]			
Flatback	Green	Hawksbill	Olive Ridley
OO		OO	

OCCURENCE OF LAYING (ALL SPECIES COMBINED) BY MONTH											
IN COAST SECTION 7.28											
O = Egg laying confirmed; X = Nil egg laying recorded;											
? = Not surveyed or current laying not assessed											
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
O	O	O	?	X	?	O	O	O	O	O	O



Plate 72. Lane Island (coast section 7.28), October 1997. Photo R. Chatto.



Plate 73. A common preference of Hawksbill Turtles is to nest under a tree, NE Isle (coast section 7.29), September 1996. Photo R. Chatto.

Coast Section 7.29

Site(s): North East Isles (13° 38.1' S, 136° 56.7' E).



North East Isles (422 ha) is slightly larger than Hawk Island and is the most easterly of the three islands in this group. This island was another to have significant turtle nesting around its predominantly sand beach shoreline. Most of the nesting was in the western half of this island and here the northern shoreline had the higher density of nesting. In some places the density of turtle, goanna, crocodile and bird (being an important night roost for seabirds) tracks along with the high density of nesting pits made assessment of species and timing of nesting difficult to establish in the relatively short ground visits to the island.

Aerial surveys were conducted in February, March, May, July and September to November, between 1993 and 1997. Ground surveys to varying degrees of intensity were done in February (1996), May (1994), September (1996) and October (1994). Tracks/nests were recorded in all surveyed months.

Track/nest counts were in excess of 100 on most occasions, including in February. The highest counts were recorded in July 1996 and October 1997 (both 150+) and in September 1996 (170+) but the heavily pitted sections of beach suggested nesting signs counted were inclusive of an accumulation of signs of nests and nesting attempts over time.



Plate 74. Flatback Turtle (mainly) nesting on NE Isles (coast section 7.29), September 1996. Photo R. Chatto.

Ground surveys recorded extensive nesting of Hawksbill, Flatback and to a lesser extent, Green Turtles. Green Turtles nested more frequently on this outer island compared to the inner two islands in this group of three nearby islands. North East Isles also showed more extensive fresh nesting in the February survey compared to the other two islands, but like the other two islands in the vicinity, fresh nesting did not dominate in any of the surveys, suggesting nesting signs remain for some time on beaches on these islands. Flatback Turtles dominated nesting in the February survey, but by October, Hawksbill Turtle nesting was most encountered. As with Hawk Island, a small amount of Olive Ridley Turtle nesting was suspected but not confirmed.

Scott Whiting (*pers. comm.*) counted 14 previous night Hawksbill Turtle nests and 159 sets of Hawksbill Turtle tracks that were between two nights and a month old in a walk around the entire island in mid September 2007. On this same survey there were no Flatback Turtle nests from the previous night but there were 11 sets of tracks up to a month old. This supports the findings from my surveys in that, at this time of year, Hawksbill Turtles are clearly the dominant nesting species on this island.

Eggs from two Hawksbill Turtle nests were collected from this island in mid February, 1998 (Pushpa Palaniappan *pers. comm.*). One was estimated to be about 7 weeks into incubation and the other about one week.

Information on all species combined from this island confirms laying in all months of the year, except August, but no surveys were done in that month.

Goanna predation was recorded in the September survey on one Hawksbill Turtle nest. Other goanna predation was suspected as being due to eggs they found thrown out of laid nests by other nesting turtles in some of the high density nesting places on the island.

APPROXIMATE SUMMATION OF SPECIES NESTING SIGNIFICANCE IN COAST SECTION 7.29			
[Very High (OOOO), High (OOO), Medium (OO), Low (O) numbers; O = Certain, O = Probable]			
Flatback	Green	Hawksbill	Olive Ridley
OOO	O O O	OOOO	O

OCCURENCE OF LAYING (ALL SPECIES COMBINED) BY MONTH IN COAST SECTION 7.29											
O = Egg laying confirmed; X = Nil egg laying recorded; ? = Not surveyed or current laying not assessed											
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
O	O	O	O	O	O	O	?	O	O	O	O

Coast Section 7.30 – This small, un-named island located 5 km off the north east tip of Groote Eylandt at 13° 44.4' S, 136° 55.2' E was surveyed (mostly from the air) on a number of occasions covering most months between 1993 and 1997 but primarily concentrating on its importance for seabird breeding. Turtle tracks/nests were recorded in only three of these aerial surveys but there were no zero records so it is not known if current turtle nesting may have been present but not noted. Further, as no species confirmed, this island will not be discussed in detail. Nevertheless, as one of those records (in December, 1993) was of 'many' tracks it's significance may be more than realized and it should be investigated further – especially at this time of the year.

Groote Eylandt

The large continental island of Groote Eylandt has been divided into a number of sections for discussion. Much of this large island (the third largest in Australia, behind Tasmania and Melville Island) has little or no marine turtle nesting, but other parts have the densest marine turtle nesting in the NT. In general the western and most of the northern coasts have little if any turtle nesting while the eastern (particularly the southern part) and the southern coast have dense turtle nesting, as do many of the associated small and medium sized islands.

Coast Section 7.31

Site(s): Groote Eylandt, Umbakumba

(13° 51.4' S, 136° 49.6' E) to Lagadamanja Pt.

(14° 05.2' S, 136° 45.2' E).



The first of the Groote Eylandt 'mainland' coast sections to be discussed starts at the Aboriginal community of Umbakumba on the western side of the large headland that juts out on the north east of Groote Eylandt. The coast section continues around this headland and down the eastern side of Groote Eylandt to Lagadamanja Point, about two thirds of the way down. Most of this coast is sandy beach and there are some long (many kilometres) sections of unbroken beach. There is reasonably significant marine turtle nesting along all but the western side of the north eastern headland. Along the eastward facing shoreline of this coast section, higher density nesting was concentrated around the point/headland areas such as at 13° 48.5' S, 136° 55.4' E (north), Mamalimandja Point (mid) and Lagadamanja Point (south). There are very few small islands adjacent the coast along this section, unlike the southern part of the east coast of Groote Eylandt which has numerous inshore islands. Flatback, Green and Hawksbill Turtles were confirmed nesting in this coast section.

Parts or all of this coast section were surveyed from the air in February, March, May, July and September to December, between 1993 and 1999. Two sites were ground surveyed on the one day in October (1999). One site was in the north and one in the south of the coast section. Tracks/nests were not recorded in March and May surveys, although the latter survey was concentrating on seabird islands and missed some but not all of the beach sections. Tracks/nests were recorded in all other surveyed months.

Track/nest counts were higher in the July to November surveys. The highest count of tracks/nests was in October (1997) where more than 300 were recorded along this approximate 100 km length of coast. Of those confirmed to species level from the air by Dr. Colin Limpus (accompanying this survey) 54 were Flatback Turtle, 34 Green Turtle and 5 Hawksbill Turtle. The lesser numbers of Hawksbill Turtles breeding in this coast section is at least partly reflective of the fewer islands, which were found to be preferred by Hawksbill Turtles for nesting.

No Olive Ridley Turtles were confirmed nesting in this coast section during these surveys, but there were two aerial survey records of tracks/nests of the smaller track nesting species of Hawksbill or Olive Ridley Turtles on beaches that looked suitable for Olive Ridley Turtles to nest. A record of eight Olive Ridley Turtle nests at Amirriba Beach, just to the north of Mamalimandja Point, by Wohling and others (WWF) in late July 2001 confirms that this species also nests, at least in small numbers, in this coast section.

With all four species nesting here it is likely that some laying would occur in all months of the year but these surveys only confirmed laying in January, February, June, July and September to November.

No animal predation was confirmed in this coast section but the small amount of ground surveying limited the potential for such observations. Traditional harvest of eggs was confirmed.

APPROXIMATE SUMMATION OF SPECIES NESTING SIGNIFICANCE IN COAST SECTION 7.31			
[Very High (OOOO), High (OOO), Medium (OO), Low (O) numbers; O = Certain, O = Probable]			
Flatback	Green	Hawksbill	Olive Ridley
OO O	OO	O	O

OCCURENCE OF LAYING (ALL SPECIES COMBINED) BY MONTH IN COAST SECTION 7.31												
O = Egg laying confirmed; X = Nil egg laying recorded; ? = Not surveyed or current laying not assessed												
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
O	O	X	?	?	O	O	?	O	O	O	?	



Plate 75. Mid east coast of Groote Eylandt (coast section 7.31), September 1996. Photo R. Chatto.

Coast Section 7.32 – Not discussed, due to relatively insignificant amounts of nesting.

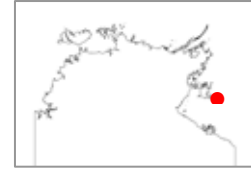
Coast Section 7.33, 7.34 & 7.35

Site(s): Groote Eylandt SE coast, from Dalumbu Bay

(14° 09.2' S, 136° 46.9' E) to Cape Beatrice

(14° 18.3' S, 136° 57.1' E) and small islands between

14° 10.3' S, 136° 58.7' E and 14° 18.2' S, 136° 57.7' E.



These coast sections incorporate the remote south east of Groote Eylandt. Both Groote Eylandt itself and the adjacent smaller islands in this area have extensive sections of sandy coast interspersed with large, sometimes high, rocky outcrops. It is a very scenic and spectacular coastline.

Within this coast section, the area between Dalumbu Bay and the western side of Ungwariba Point (14° 08.4' S, 136° 54.6' E) has scattered nesting. Eastward from here the amount of nesting becomes much greater and high density nesting continues to the east and then to the south around Cape Beatrice, both on Groote Eylandt and many of the adjacent smaller islands. Some of the beaches between Ungwariba Point and Cape Beatrice (particularly to the 2 km to the west and about 6 km to the south of the point at 14° 14' S 136° 52.5' E) were observed to have the highest density of turtle tracks and nest pits anywhere in the NT. Most of this nesting is dominated by Green Turtles, which at times could be seen in large numbers in the shallows just off the beach waiting to come ashore and nest. Some were also seen to haul out for a daytime rest just above the water line. This is the only place in the NT where such numbers of turtles waiting just off the beach and hauling out on to the beach was observed, although most parts of the NT coastal waters are too turbid to permit such observations.

Aerial surveys were conducted in this area in February, March, May (selected occasional small islands only) July, September, October and November. All were done between 1993 and 1997. Because of the geographically complex nature of this part of Groote Eylandt and its many adjacent smaller islands, surveys could not cover the full coast each time. Sometimes emphasis was put on the small islands and sometimes on Groote Eylandt itself. There was only one surveyed month that covered at least a fair percentage of this coast section in which no tracks/nests were seen. This was in March (1994).

Counts from aerial surveys consistently recorded numbers in the 'hundreds' of tracks/nests per beach (most varying between about ½ km and 2 km in length) with the highest count in excess of 650 tracks/nests in October (1997). The large tracks and deep nesting pits of Green Turtles would remain on some of these beaches for many months, perhaps from one season to another in the case of nesting pits, and so such counts were clearly an accumulation of fresh and old tracks/nests.

The following discussion of this area will first focus on the area immediately either side of Ungwariba Point and around to Cape Beatrice, and then the smaller islands off this length of coast. Concluding summary tables will combine both areas.

Ground surveys of Groote Eylandt were done in the months of February (1996) and September (1996). Seven separate locations were surveyed. These were spread throughout but more were done in the northern part of this coast section. Green Turtle nesting in the latter part of the year was clearly dominant. Comment was made in the September ground survey that there were 'hundreds' of fresh and old Green Turtle tracks/nests and 'thousands' of hatchling trails observed in about a 500 m section of beach. Above the high tide line it was difficult to find sections of more than a metre or two wide that did not have relatively fresh tracks of adult or hatchling turtles.




Although Green Turtles dominated the nesting in this area, Flatback, Hawksbill and Olive Ridley Turtle nesting was also recorded. Although only occasional Flatback Turtle nesting was actually

confirmed, it is possible that more of the wider tracks recorded in aerial surveys from earlier in the year (when there is less Green Turtle nesting) could have belonged to Flatback Turtles. There was not much Hawksbill Turtle nesting recorded on Groote Eylandt itself, except the occasional beaches that were small, narrow and tree or rock backed, but there was considerable nesting recorded on some of the adjacent islands. There was a single Olive Ridley Turtle nest recorded in this coast section in October 1994.

There was frequent sign of Traditional harvest of both turtles and eggs on beaches in the north of this coast section. Dingo predation on turtle nests was also recorded at sites in both the north and the south of this coast section.

There are around a dozen small islands off Groote Eylandt in this area. Those with sand beaches (most) were recorded to have reasonably good turtle nesting on them but few records were made to species level. However, Green, Flatback and Hawksbill Turtles were still confirmed nesting. There was only a single ground survey done on these islands during these surveys. This was on an island (14° 10' S, 136° 57' E) in the northern part of this section in September (1996). This island was recorded to have high density Hawksbill Turtle nesting. Nest pits scattered all over the beach at this site were not typical of most other Hawksbill Turtle nesting sites observed in other parts of the NT. This type of nesting was more typical of high density Green or Flatback Turtle nesting area rather than that of Hawksbill Turtles, which more commonly prefer to nest up under the trees or rocks at the top of beaches. At this time both fresh nests and fresh hatchling tracks of Hawksbill Turtles were observed. Total counts were not done but most nesting sign was of nesting that had accumulated over some time. Higher density nesting recorded from aerial surveys of other islands along this section of coast that appeared to have similar nesting beach characteristics to this site could therefore also have included such high density Hawksbill Turtle nesting.

Considering all species on both the main part Groote Eylandt and the smaller islands in these combined coast sections, laying was confirmed from June through to February, less December which was not surveyed. This would be expected with the large number of Green Turtles nesting in the coast section. The fewer records of nesting through what would be the main Flatback Turtle nesting period could be due to a lower intensity of surveying in the April to June period or lower numbers of nesting Flatback Turtles in this area. Future surveys in this period are needed to show which is the case.

APPROXIMATE SUMMATION OF SPECIES NESTING SIGNIFICANCE IN COAST SECTIONS			
7.33, 7.34 & 7.35			
[Very High (OOOO), High (OOO), Medium (OO), Low (O) numbers;			
O = Certain,  = Probable]			
Flatback	Green	Hawksbill	Olive Ridley
OO 	OOOO	OO 	O

OCCURENCE OF LAYING (ALL SPECIES COMBINED) BY MONTH											
IN COAST SECTIONS 7.33, 7.34 & 7.35											
O = Egg laying confirmed; X = Nil egg laying recorded;											
? = Not surveyed or current laying not assessed											
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
O	O	X	?	X	O	O	O	O	O	O	?



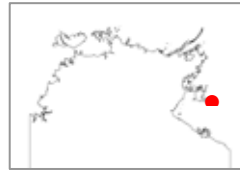
Plate 76. Typical high density Green Turtle nesting beaches near Ungwariba Point on SE Groote Eylandt (coast section 7.34), February 1996. Photo R. Chatto.



Plate 77. One of many good turtle nesting islands off the SE of Groote Eylandt (coast section 7.36), March 1994. Photo R. Chatto.

Coast Sections 7.36 & 7.37

Site(s): Small islands (around 14° 20.6' S, 136° 56' E)
 off Cape Beatrice and small islands
 (around 14° 18.6' S, 136° 47.2' E) off
 Marangala Pt. (SE Groote)



There are around 20 small islands along the eastern half of the southern coast of Groote Eylandt. Most of these are dominated by rocky habitat but four also have some sand beach on them. These four all had turtle nesting recorded on them, three of them with quite good nesting. These islands will be discussed together.

Aerial surveys were conducted in this area in February, March, May, July, and September to December, between 1993 and 1997, though not every island was flown on every survey. Ground surveys were done in May (1994), September (1994) and October (1996). Three islands were checked, two on one occasion and one on three occasions. Aerial surveys of the four islands with turtle nesting regularly recorded over 100 tracks/nests as a total on the four islands after the month of July. The highest single count was in excess of 300 tracks/nests in September (1996). Aerial counts between the months of February and May recorded maximum counts of around 50 tracks/nests. This again suggests both increased nesting activity in the latter part of the year and nesting sign (pits) accumulation during the year, before the wet season storms late in the year remove such signs.

Hawksbill and Green Turtles were confirmed breeding on all four of the islands. In an October aerial survey Dr. Colin Limpus recorded higher counts of Hawksbill Turtle tracks compared to Green Turtles on all four islands, particularly the eastern ones (approximately 8:1 Hawksbill Turtles to Green Turtles). The dominance of Hawksbill Turtles over Green Turtles was also confirmed in a September ground survey on a coral rubble beach on one of the islands. Flatback Turtles were confirmed breeding on two of the islands but the many turtle *spp.* records and wide track species aerial records, particularly earlier in the year, could also have included Flatback Turtles on these other two islands.

With all species combined laying was confirmed in all months except August in which no surveys were done. No predation or harvesting of eggs was recorded on any of these islands.

APPROX. SUMMATION OF SPECIES NESTING SIGNIFICANCE IN COAST SECTIONS 7.33, 7.34 & 7.35			
[Very High (OOOO), High (OOO), Medium (OO), Low (O) numbers; O = Certain, = Probable]			
Flatback	Green	Hawksbill	Olive Ridley
O	OO	OOO	

OCCURENCE OF LAYING (ALL SPECIES COMBINED) BY MONTH IN COAST SECTIONS 7.33, 7.34 & 7.35												
O = Egg laying confirmed; X = Nil egg laying recorded; ? = Not surveyed or current laying not assessed												
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
O	O	O	O	O	O	O	?	O	O	O	O	

Coast Sections 7.38 & 7.39

Site(s): Groote southern coast from Cape Beatrice
(14° 18.3' S, 136° 57.1' E) to Tasman Point
(14° 12.5' S, 136° 20.3' E).



The last part of Groote Eylandt to be discussed is its southern coast. This coast has numerous beaches scattered along its length. Separating these beaches are sections of rocky coast. Beaches vary from small bays (more so in the east) to long stretches of open beach (more so in the west). The longest and widest beach extends for approximately 12 km along the coast to the east from Tasman Point. However, this area is very exposed and on the open long beaches wind blown sand tended to relatively quickly obscure much of the nesting signs.

Marine turtle nesting was recorded along most of the length of this coast section. Some beaches were recorded as having quite high density nesting, others with a much lower density. It was generally observed, particularly in the eastern half of this coast section that the smaller, rock-backed, reddish sand bays had some quite dense nesting (often Hawksbill Turtles) while the longer, grayish sand beaches, often backed by She-oak Trees, had considerably less nesting, even when both types of beach were adjacent to each other.

Aerial surveys with varying extents of coverage along the southern mainland coast of Groote Eylandt were conducted between 1993 and 1999. (The numerous small bays and inshore islands along the eastern part of this coast meant that all beaches could not be covered in each survey). Aerial surveys were done in the months of February, March, May, July and September to November. On two days (in May 1994 and September 1996) ground surveys were also conducted at eight separate locations spread along this section of coast. All surveyed months except a March survey, which did not cover the eastern half of the coast section in much detail, recorded turtle tracks/nests.



Plate 78. One of the numerous well used turtle nesting bays in the western part of the southern coast of Groote Eylandt (coast section 7.38), September 1996. Photo R. Chatto.

No surveys covered the entire beach length of this complex coast. Aerial counts, where a significant part of this coast was surveyed, consistently recorded in excess of 100 tracks/nests, with the highest being in excess of 300 in October (1997). Many counts were simply recorded as turtle *spp.* Some of the larger nesting pits of Flatback Turtles and more so of Green Turtles (laid prior to, and during the wet season) remained over the wet season in some areas that were sheltered from the weather. In a February (1996) survey it was noted that most of the count was old nest pits and only a small number were fresh. The percentage of fresher nesting signs observed from aerial surveys later in the season (i.e. July and later) was considerably higher.

All four species of the marine turtle that regularly nest in the NT were recorded nesting along this coast line, although only a single Olive Ridley Turtle nest was confirmed in one of the ground surveys. In the eastern half of this coast section nesting was dominated by Hawksbill Turtles (both on the smaller islands and on Groote Eylandt itself) and to a lesser extent by Green Turtles (most on Groote Eylandt beaches). Dr. Colin Limpus, who was also present in an October (1997) survey of this area, recorded tracks and/or nests at approximately 70% Hawksbill Turtle, 20% Green Turtle and 10% Flatback Turtle. In the western half of the southern side of Groote Eylandt nesting was dominated by Green and Flatback Turtles with considerably less Hawksbill Turtle nesting. In the survey mentioned above Limpus recorded approximately 60% Green Turtle, 30% Flatback Turtle and 10% Hawksbill Turtle. These figures would of course have been influenced (in relation to fresher nesting at least) by the fact that Flatback Turtle nesting commences much earlier in the year than October, whereas the other two species tend to nest later in the year.

With all species combined laying could be confirmed in all months except March and April in which surveys were not done. With all four species normally nesting in the NT recorded here, it is likely that future surveys would also confirm laying in these two months.

Numerous vehicle tracks associated with egg harvesting were recorded in the western third of this southern coast. Dog predation was also observed in this coast section.

APPROX. SUMMATION OF SPECIES NESTING SIGNIFICANCE IN COAST SECTIONS 7.38 & 7.39			
[Very High (OOOO), High (OOO), Medium (OO), Low (O) numbers;			
O = Certain, O = Probable]			
Flatback	Green	Hawksbill	Olive Ridley
OO O	OOO O	OOO O	O

OCCURENCE OF LAYING (ALL SPECIES COMBINED) BY MONTH												
IN COAST SECTIONS 7.38 & 7.39												
O = Egg laying confirmed; X = Nil egg laying recorded;												
? = Not surveyed or current laying not assessed												
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
O	O	?	?	O	O	O	O	O	O	O	O	

Non-nesting Notes

A number of areas in this bioregion have significant problems with marine turtles becoming entangled (and often dying) in discarded or lost commercial fishing nets. The coast section south of Cape Arnhem and around parts of Groote Eylandt are particularly effected. Sections of net either accidentally lost or deliberately discarded from Australian prawn trawlers and foreign commercial fishing boats (both outside the EEC line and illegally within Australian waters) circulate around the Gulf of Carpentaria and then blow ashore along this coastline with the commencement of the south easterly dry season winds starting around April/May. Many of these nets contain entangled turtles, of both adult and sub-adult size. This was noticed very early in the survey period and a program was set up with the Dhimurru Land Management Corporation, and later through WWF (Darwin) to deal with rescuing the turtles and investigating the issue. This program continues, and has been expanded NT wide and to involve other Aboriginal groups. Reports such as Leitch (2000) provide further information on this problem in the NE Arnhem Land area.

Table 7. Locations of significant nesting activity in the Groote Bioregion with combined sum of nests and tracks >5 for all surveys between 1993 and 1999 and number of surveys (number of unique visit dates) for each coast section.

Coast section	Observation	Flatback Turtle	Green Turtle	Mix of Flatback or Green	Hawksbill Turtle	Olive Ridley Turtle	Mix of Hawksbill or Olive Ridley	Unknown species	No. of surveys
7.1 Bremer Is & Bremer Islet	Nest	51	10		67			10	12
	Tracks			3	1			102	
7.2 Cape Arnhem to Port Bradshaw	Nest	12	8	1	18	1	5	241	16
	Tracks	11	106	6	5			295	
7.3 Port Bradshaw to Pt. Alexander	Nest		194		2		2	742	18
	Tracks		440	7			2	681	
7.4 Three Hummocks	Nest	10			2				6
	Tracks	1			10				
7.5 McNamara Is	Nest							31	9
	Tracks		16						
7.6 Bridgland Is	Nest	4	23	50	6			60	13
	Tracks		92		17		4	31	
7.7 Dudley Is	Nest		17		30		2	100	12
	Tracks		36	11	4		2	147	

Coast section	Observation	Flatback Turtle	Green Turtle	Mix of Flatback or Green	Hawksbill Turtle	Olive Ridley Turtle	Mix of Hawksbill or Olive Ridley	Unknown species	No. of surveys
7.8 Caledon Bay to Cape Grey	Nest	1	3					33	11
	Tracks		235		2			207	
7.9 Guyuwiri Pt area.	Nest							60	6
	Tracks							38	
7.10 Bald Pt to Cape Shield	Nest	2	51					492	10
	Tracks	7	625	38				515	
7.11 Gooninnah Is	Nest							1	8
	Tracks		9					55	
7.12 Round Hill Is	Tracks	3	4					11	3
7.13 Orunyah Is	Tracks							24	2
7.14 Fowler Is	Tracks							12	2
7.15 Morgan & Meringa Is	Nest							62	6
	Tracks							14	
7.16 Marrinan Is	Nest							10	3
	Tracks							6	
7.17 Isle Woodah	Nest	61	1	5				186	8
	Tracks	51	41	53				138	
7.18 Nicol Is Group	Nest	13						55	9
	Tracks			12				94	
7.19 Burney Is	Tracks							101	4
7.20 Amabirra Is	Nest	1		1				11	5
	Tracks		4	4		1		3	
7.21 Wedge Rock	Nest							50	5
	Tracks			10				143	
7.22 Hawknest Is	Nest			1				185	7
	Tracks	6	2	56	41		5	310	
7.23 Bustard Is	Nest							150	5
	Tracks	21	7		65			448	

Coast section	Observation	Flatback Turtle	Green Turtle	Mix of Flatback or Green	Hawksbill Turtle	Olive Ridley Turtle	Mix of Hawksbill or Olive Ridley	Unknown species	No. of surveys
7.24 Bickerton Is	Tracks							107	5
7.25 C. Barrow to Nyinpinti Pt	Nest	7	1	1					12
	Tracks	3	1	14				60	
7.26 Groote mid north coast & islands	Nest	6	1					11	6
	Tracks	8						40	
7.27 Hawk Is	Nest	10		54	5		20	65	10
	Tracks	6	4	5	11		16	660	
7.28 Lane Is	Nest	7		1	12		6	125	10
	Tracks	11	2	50	6		51	29	
7.29 North East Isles	Nest	7		10			1		8
	Tracks	35	58	9	76		1	408	
7.30 Small Is btn NE Groote & Hawk Is	Tracks							55	6
7.31 Umbakumba to Lugadamanja Pt	Nest	2	3				1	117	8
	Tracks	63	36	15	5			252	
7.32 Small Is of Lugadamanja Pt	Tracks	17	1		1			10	9
7.33 Dalumbu Bay to Ungwariba Pt	Nest	1	1				3	87	9
	Tracks	86	87	40				80	
7.34 Ungwariba Pt to Cape Beatrice	Nest	2	16				3	421	10
	Tracks		39	67		1	1	1321	
7.35 Small Islands off SE of Groote	Nest		3		52			100	11
	Tracks	6	14	22	10			323	
7.36 Small Is S of Cape Beatrice	Nest			50				160	11
	Tracks	5	11	2	82		1	290	

Coast section	Observation	Flatback Turtle	Green Turtle	Mix of Flatback or Green	Hawksbill Turtle	Olive Ridley Turtle	Mix of Hawksbill or Olive Ridley	Unknown species	No. of surveys
7.37 Small islands off Marangala Pt	Nest	2		1				201	11
	Tracks		43	122	28		61	163	
7.38 Cape Beatrice to Pt Inamalamandja	Nest		4		2		3	146	6
	Tracks	36	23	61	84		22	300	
7.39 Inamalamandja Pt to Tasman Pt	Nest	3	1					151	8
	Tracks	23	54	6	5			156	



Plate 79. Nesting Green Turtle (with transmitter attached). Photo S. Whiting,

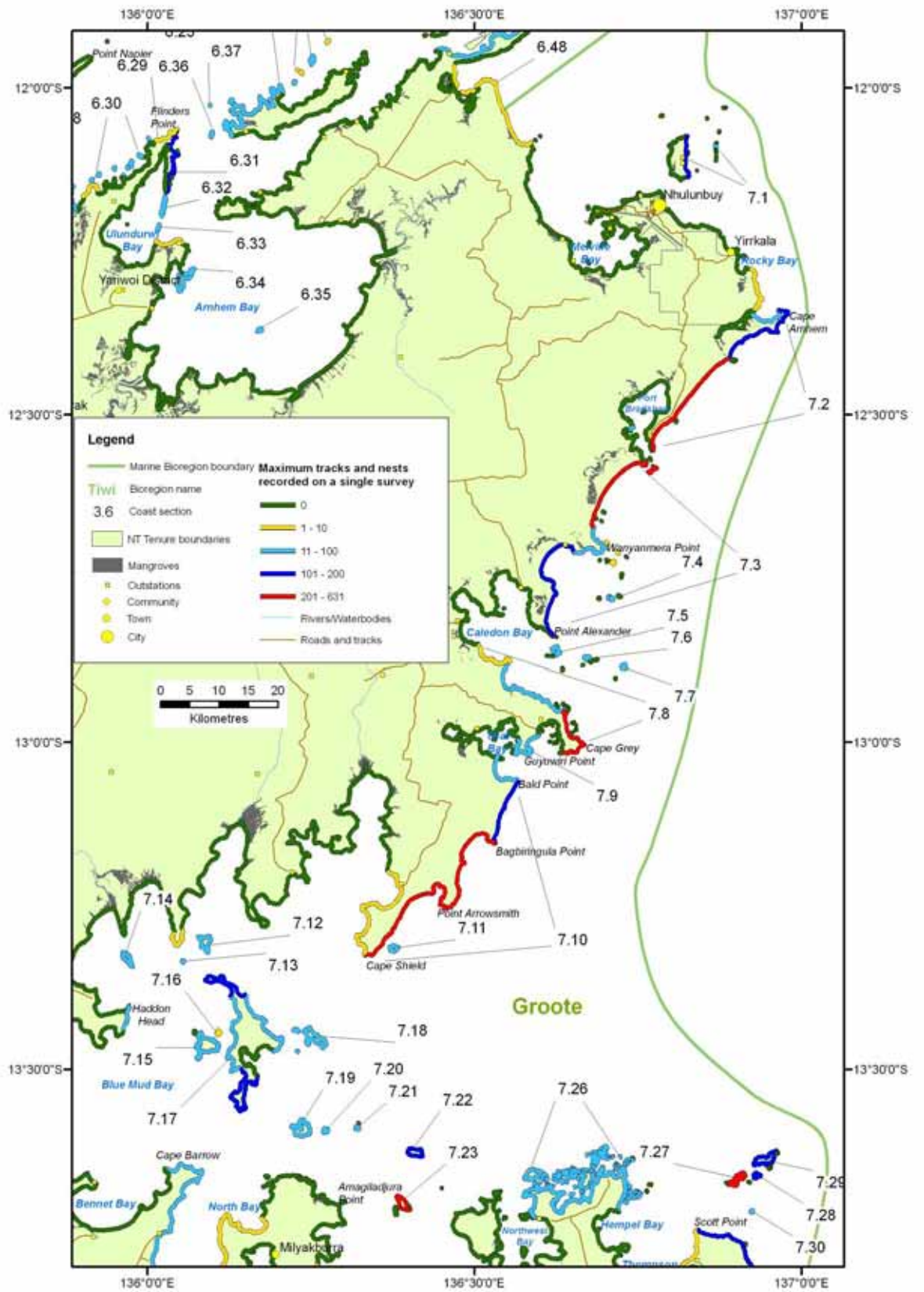


Figure 24. Relative importance of nesting beaches using maximum sum of nests and tracks of all species in a single survey between 1993 and 1999 in the Groote Bioregion (northern section).

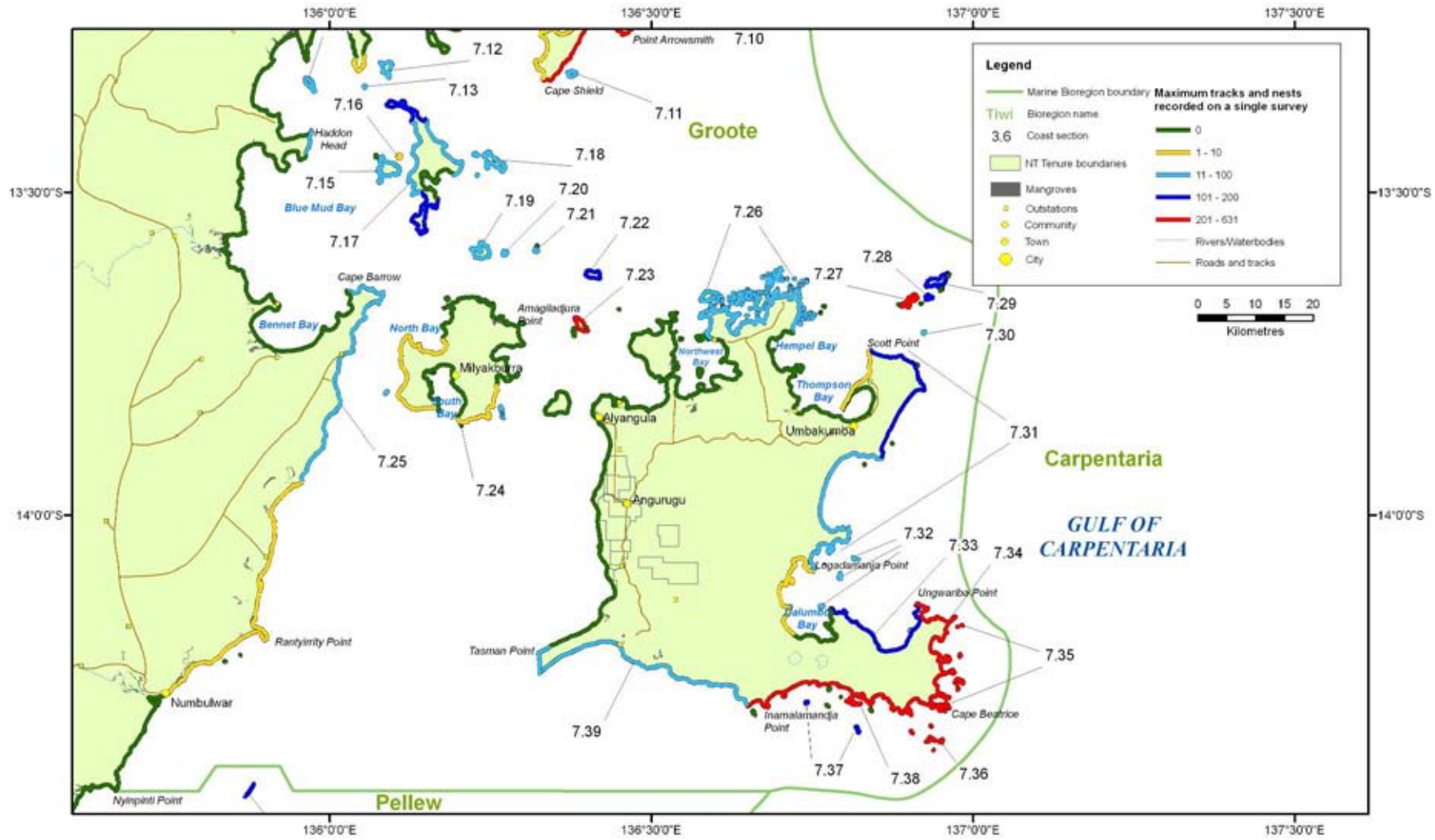


Figure 25. Relative importance of nesting beaches using maximum sum of nests and tracks of all species in a single survey between 1993 and 1999 in the Groote Bioregion (southern section).

Pellew

Location and description

The Pellew Bioregion extends along the south western Gulf of Carpentaria from Nyinpinti Point, south of Numbulwar, to the Queensland border. It also includes the Sir Edward Pellew Islands. In deriving sections for this report, two variations were made on bioregion boundaries: the eastern boundary at the Calvert River (where the Wellesley Bioregion commences) was extended to the Queensland border; and the small Sandy Islands split with the Groote Bioregion were wholly included in the Pellew Bioregion.

The climate of this bioregion is monsoonal with 1 000 to 1 200 mm of rainfall. Tides vary from 2 to 3 metres. The coastline is mainly alluvial plains, composed of clays and muds in varying proportions. On these shores mangroves can be regarded as continuous, extending up to 1 km inshore in parts. Coral reefs are sparse. Significant sea grass beds are found along the coast between the Roper and MacArthur Rivers.

The coast of this bioregion consist of beaches abutted by Aboriginal land (Arnhem Land) in the north and a mixture of Aboriginal land and pastoral properties in the south. There are no towns or communities along the mainland coast of this bioregion but the town of Borroloola is located about 40 km inland along the McArthur River adjacent to the Sir Edward Pellew Islands. Most of the scattered Aboriginal outstations in this bioregion are on islands within the Sir Edward Pelles.

Survey effort

A total of 49 survey days were done between 1993 and 2004 in the Pellew Bioregion. Surveys were done in every month of the year except January and August (Figure 26). With the exception of May (which had the most surveys) there was considerably less surveying done in the first half of the year compared to the second half.

The length of coast is 1 215 km (11% of the NT coast) and the length of coast where wildlife records were not obtained on any survey was 70 km (6% of the bioregion).

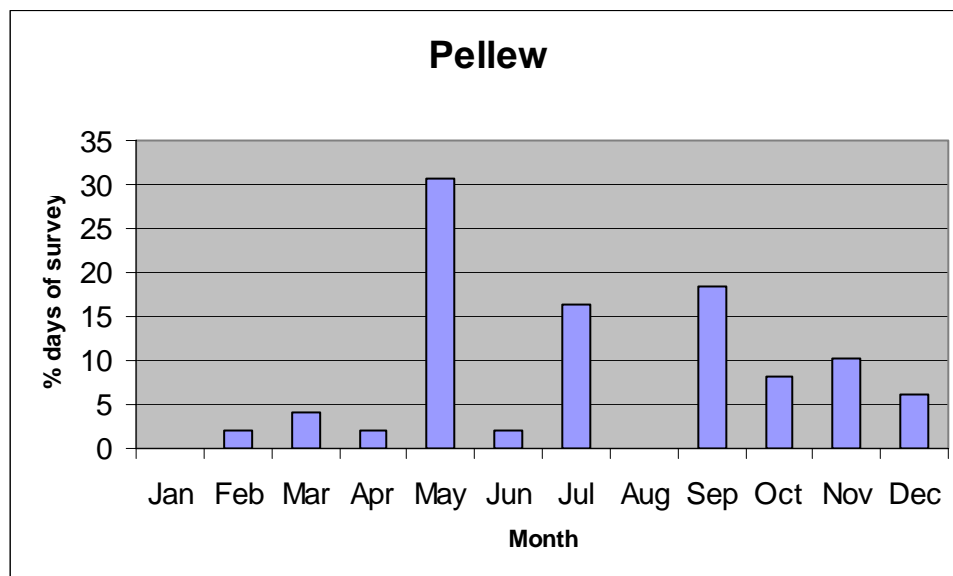


Figure 26. Survey effort by month between 1993 and 2004 in the Pellew Bioregion.

Nesting summary

The Pellew Bioregion is another bioregion that is very important for marine turtle nesting, particularly on the islands. All species that normally nest in the NT were recorded nesting in this bioregion but the Flatback Turtle and the Green Turtle were the most often recorded.

Nesting areas throughout this bioregion are mapped, by the highest counts for any single survey, in Figure 27 (north) and Figure 28 (south), at the end of the bioregion's coast section summaries.

Total numbers of tracks and nests per month for all nesting on islands and mainland beaches in the bioregion is shown in Figure 65, Appendix A.

Coast Section Discussions

Eighteen individual coast sections (8.1 to 8.18) are listed within this bioregion. Track and nest counts for each of these sections are given in Table 8 and the numbered coast sections are shown in Figure 27 (north) and Figure 28 (south). The most significant of these coast sections are discussed in more detail below.

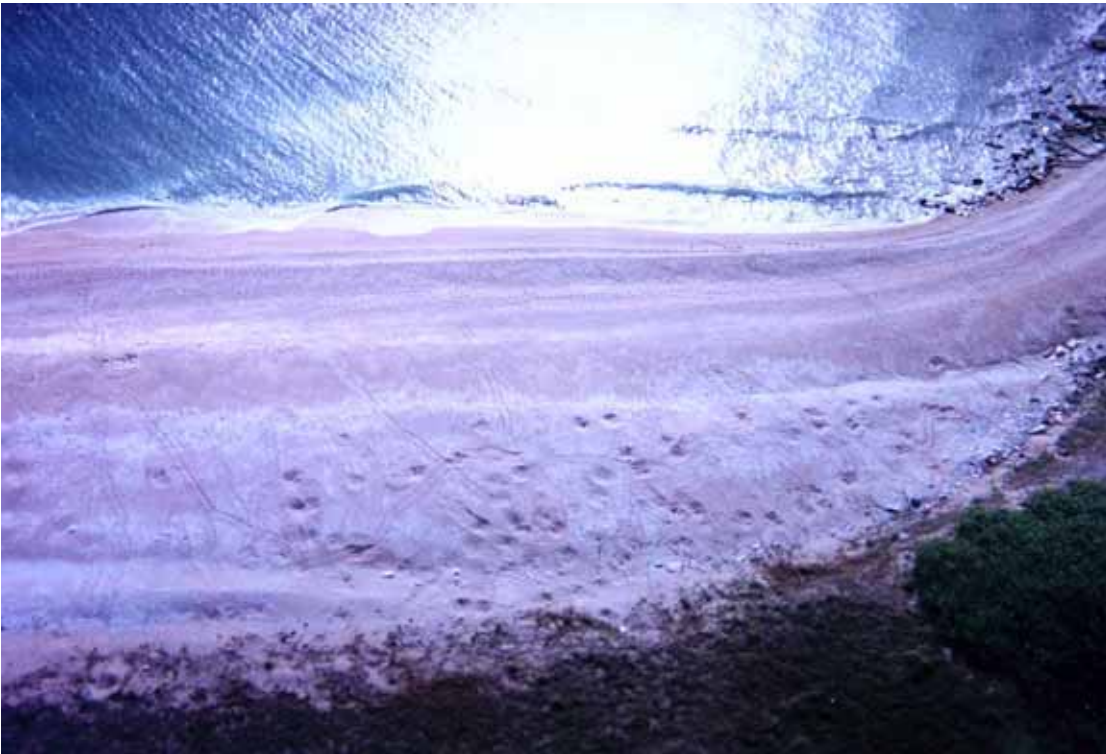
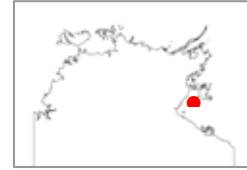


Plate 80. Good Flatback Turtle (mainly) nesting beach on Pearce Islet (coast section 8.12), May 1999. Photo R. Chatto.

Coast Section 8.1

Site(s): Sandy Is. (14° 26.7' S, 136° 52' E).



The first area to be discussed in this bioregion is Sandy Island, which is approximately 55 km south east of Groote Eylandt. The isolated island is also at least 20 km from the nearest other island in the area. It is approximately 3km long but only about 50 m wide. At high tide it forms three separated end to end islands, and at lower tides it breaks up into a series of exposed islands. The island is totally composed of sand. It has some low vegetation but no trees or rocks. The island has a reasonable amount of turtle nesting, with all four species recorded.

The island was surveyed from the air in February, March, July, September, October and December, between 1993 and 1999. It was also ground checked in May and September of 1994, although the priority for these visits was related to seabird breeding. Tracks/nests were recorded on the island in all surveyed months except the February and March surveys.

Observations from February to July record little or no tracks/nests, but September to December counts were always in excess of 50. The highest track/nest count was around 150 in October 1997. At this time Dr. Colin Limpus recorded about one third of the approximately 75 tracks identified to species level to be from the previous night. Also at this time Flatback Turtle and Green Turtle were recorded as the main nesting species, with Hawksbill Turtle also confirmed. However, this observation is at variance with a record of 30 narrow tracks to seven wide tracks in a September (1994) survey.



Plate 81. The isolated Sandy Island (coast section 8.1), May 1994. This small island had all four of the main nesting species recorded on it over the survey period. Photo R. Chatto.

An occasional Olive Ridley Turtle track was suspected from an aerial survey of this island, though never confirmed. The lack of tracks/nests recorded in the February and March surveys would support that Olive Ridley Turtle nesting was, at best, in small numbers on this island. The lower numbers of tracks/nests recorded in the first half of the year compared to the second half would also tend to suggest more nesting by Green and Hawksbill Turtles than Flatback Turtles, although significant Flatback Turtle nesting in the lower latitudes on this (eastern) side of the NT appeared to start earlier and extend later into the season than elsewhere on the NT coast.

Lindsay Joshua (*pers. comm.*) who is a resident of Numbulwar reports all four species breed on the island, but that only Flatback and Olive Ridley Turtle breed on the adjacent mainland.

There is sufficient evidence to confirm laying of all species combined to occur at least in May and September to December, but there were a distinct lack of surveys in the first eight months of the year for this island.

The island has no animal predators to dig up eggs and it is far enough from inhabited land to mean human harvest is infrequent.

APPROXIMATE SUMMATION OF SPECIES NESTING SIGNIFICANCE IN COAST SECTION 8.1			
[Very High (OOOO), High (OOO), Medium (OO), Low (O) numbers; O = Certain, O = Probable]			
Flatback	Green	Hawksbill	Olive Ridley
OO O	OO O	O O O	O

OCCURENCE OF LAYING (ALL SPECIES COMBINED) BY MONTH IN COAST SECTION 8.1											
O = Egg laying confirmed; X = Nil egg laying recorded; ? = Not surveyed or current laying not assessed											
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
?	X	X	?	O	?	?	?	O	O	O	O

Coast Section 8.2 – Not discussed due to relatively insignificant amounts of nesting.

Coast Section 8.3

Site(s): Low Rock (14° 37.8' S, 136° 46.8' E).




Low Rock is another small, isolated island about 20 km off the mainland coast, and 20 km south east of Sandy Island. Low Rock is mostly a rock and mangrove island but has a small section of beach on the western side that is well used by nesting marine turtles, which at least includes Flatback Turtles. This island is also significant for seabird breeding.

Low Rock was surveyed from the air in February, March, May, July, September and December, between 1993 and 1996. As these surveys were primarily concentrating on seabird breeding colony observations, it is possible that if just a small amount of nesting sign was present it may have been missed or not recorded. The island was also ground checked in May and September 1994.

Tracks/nests were recorded in July, September and December surveys, but not in February, March and May surveys. Laying of all species combined could only be confirmed to the months of July, September, November and December, but would likely be shown to be continuous from at least July to December should appropriately timed surveys be done in the future. Counts from July (~12) increased to 'many' in both September and December surveys indicating most nesting on this island is in the latter part of the year. These latter counts also reported both fresh tracks/nests and older nest pits suggesting the build up had occurred from before September.

The only confirmed species identification was of Flatback Turtles, and it is likely that this is the main species using this isolated and small, but well used beach.

The island has no animal predators to dig up eggs and it is far enough from inhabited land to mean human harvest is infrequent.

APPROXIMATE SUMMATION OF SPECIES NESTING SIGNIFICANCE IN COAST SECTION 8.3			
[Very High (OOOO), High (OOO), Medium (OO), Low (O) numbers; O = Certain,  = Probable]			
Flatback	Green	Hawksbill	Olive Ridley
OO			

OCCURENCE OF LAYING (ALL SPECIES COMBINED) BY MONTH IN COAST SECTION 8.3											
O = Egg laying confirmed; X = Nil egg laying recorded; ? = Not surveyed or current laying not assessed											
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
?	X	X	?	X	?	O	?	O	?	O	O

Coast Section 8.4

Site(s): Maria Is. (14° 52.5' S, 136° 43.8' E).



Maria Island (3 893 ha) is the only large island between Groote Eylandt and the Sir Edward Pellew Islands. It is a low, vegetated, roughly oval shaped island except for a section jutting out from the south western corner. It is approximately 10 km long by 7 km wide and has turtle nesting beaches along the eastern and southern shores, particularly on the large sand spit off the south western point.

Part, or all, of this island was surveyed from the air in February, March, May, July, September and December, between 1993 and 1996. (As with the previous two islands there was sometimes most emphasis on surveying seabird breeding on this island). A single ground check that included a brief marine turtle nesting assessment was done in May 1994. Tracks/nests were not recorded in December and February surveys but were in each of the other surveyed months.

The island was recorded as having 20-30 tracks on the beaches on the main (south western tip) nesting area and scattered tracks around other parts of the island in the May aerial survey. A further 40+ tracks/nests were recorded around the island in July and 100+ in two separate September surveys in different years (1993 and 1994). The May survey also recorded 200+ old nest pits around the island and the July survey 100+.

The one quick ground survey, done in May (1994) on the south western tip of the island, sampled four nests and all were confirmed as Flatback Turtles.

Laying was confirmed in all months between March and September, except August when no surveys were done. The continued build up of the number of tracks during the dry season indicate continuing fresh laying, while the lack of narrow tracks recorded and the confirmation of the sampled nests suggest that this island is predominantly a Flatback Turtle nesting site.

There were no signs of dog or goanna tracks recorded and no egg predation was observed during the ground check.

APPROXIMATE SUMMATION OF SPECIES NESTING SIGNIFICANCE IN COAST SECTION 8.4			
[Very High (OOOO), High (OOO), Medium (OO), Low (O) numbers; O = Certain, = Probable]			
Flatback	Green	Hawksbill	Olive Ridley
OOO			

OCCURENCE OF LAYING (ALL SPECIES COMBINED) BY MONTH IN COAST SECTION 8.4												
O = Egg laying confirmed; X = Nil egg laying recorded; ? = Not surveyed or current laying not assessed												
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
?	X	O	O	O	O	O	?	O	?	?	X	

Coast Section 8.5

Site(s): Mainland from Nyinpinti Pt.
(14° 25.5' S, 135° 40' E) to Rosie Creek near
Bing Bong (15° 28' S, 136° 14.8' E).



The first of two mainland areas to be discussed for this bioregion is the coast between Nyinpinti Point (just south of Numbulwar) and Bing Bong which is adjacent to West Island (the most westerly of the large islands in the Sir Edward Pellew Island group). This coast section, which extends for about 200 km around the central western side of the Gulf of Carpentaria, is mostly inter-tidal mudflat abutting open saline mudflats or mangroves. In some places there is hardly a defined coastline between the sea and the land, but there are some sections of narrow, shallow sand beach in other places. These beach sections have a small amount of marine turtle nesting. The only species confirmed nesting in this coast section was the Flatback Turtle.

Most nesting was located on beaches to the north of the Roper River, to the north of Limmen Bight River and to the north of Bing Bong. Although this coastline was surveyed from the air on nearly 20 occasions spread throughout nearly all months of the year it is a low priority area for turtles and high priority area for waterbirds and waders, which consequently received most of the attention during the surveys. Throughout this length of coast there were only 44 tracks/nests recorded in all surveys combined, with the most on a single survey being 29 in October (1996). All tracks observed were of the wider variety belonging to either Flatback or Green Turtle and all tracks/nests confirmed from the ground to species level (7) were Flatback Turtle. Many of the others were recorded as likely to belong to Flatback Turtles.

Aerial surveys giving the full coast section extensive coverage in February, March and May recorded only a single track/nest (in March). All other tracks/nests (including fresh laying) were recorded in the July, September and October surveys, with zero tracks again recorded in November and December surveys. These results indicate that there is a relatively short and small season along this coast and that it is likely to be nearly all Flatback Turtle nesting.

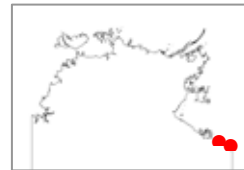
Egg harvest by humans was recorded near Bing Bong but none of the limited number of nests checked were recorded as being taken by animals.

APPROXIMATE SUMMATION OF SPECIES NESTING SIGNIFICANCE IN COAST SECTION 8.5			
[Very High (OOOO), High (OOO), Medium (OO), Low (O) numbers; O = Certain, ⓪ = Probable]			
Flatback	Green	Hawksbill	Olive Ridley
⓪⓪			

OCCURENCE OF LAYING (ALL SPECIES COMBINED) BY MONTH IN COAST SECTION 8.5											
O = Egg laying confirmed; X = Nil egg laying recorded; ? = Not surveyed or current laying not assessed											
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
?	X	O	?	X	?	O	?	O	O	X	X

Coast Section 8.6

Site(s): Mainland, Pelican Spit (15° 52' S, 136° 59.7' E)
to NT/Qld. border (16° 32.5' S, 138° 00' E).



The coast from Pelican Spit, on the eastern side of Port McArthur, to the NT/Queensland border extends for about 150 km. There is considerably more beach along this coast compared to the previously discussed section, and considerably more turtle nesting, but no high density nesting sites. Most of the nesting in this section of coast occurs in two areas. These are between Pelican Spit and the Robinson River mouth (16° 01.8' S, 137° 16.2' E), a 35 km section of fairly extensive but low sand dune country, and for a similar length of coast immediately to the west of the Calvert River mouth (16° 00' S, 137° 44.9' E).

Part or all of this section of coast was surveyed from the air in March, May to July, and October to December, between 1994 and 2000. Eight separate sites were ground surveyed in October and November. Tracks/nests were recorded in all surveyed months except March and May, the latter month having surveys done in three different years.

All tracks recorded beyond the level of 'turtle sp.' were of the wider type belonging to Flatbacks and/or Green Turtles. Both of these species were confirmed nesting in this coast section. Of those tracks/nests confirmed to individual species level, Flatback Turtles were recorded 25 times and Green Turtles on four occasions. All confirmations were in the months between October and December.

Surveys in November and December recorded over twice as many tracks/nests as in a July survey. This could be partially due to some accumulation of nesting sign over this time, but it may also suggest nesting starting later and then extending later into the year for beaches in the more southern latitudes of the NT. Although the confirmation of Green Turtle nesting in this coast section, unlike the previous mainland section, could have influenced the amount of nesting continuing at least well into December, there were still more Flatback Turtles (ratio 2:1) confirmed in a mid November sample ground check than Green Turtles. This further supports the idea that Flatback Turtles nest later in the southern part of their range in the Gulf of Carpentaria.

With all species combined, laying was confirmed from June to December, less August which was not surveyed. It is reasonable to expect that laying would continue through August giving a season from at least June to December, and with Green Turtle nesting involved, possibly extending beyond December but not as far as March. Predation by dogs was recorded at one of the nests in this coast section.

APPROXIMATE SUMMATION OF SPECIES NESTING SIGNIFICANCE IN COAST SECTION 8.6												
[Very High (OOOO), High (OOO), Medium (OO), Low (O) numbers; O = Certain, ⚡ = Probable]												
Flatback	Green	Hawksbill	Olive Ridley									
OO	O											
OCCURENCE OF LAYING (ALL SPECIES COMBINED) BY MONTH IN COAST SECTION 8.6												
O = Egg laying confirmed; X = Nil egg laying recorded; ? = Not surveyed or current laying not assessed												
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
?	?	X	?	X	O	O	?	O	O	O	O	

The Sir Edward Pellew Islands

The final area to be discussed in this report is the Sir Edward Pellew Islands, a large group of mixed sized islands which have varying levels of importance for marine turtle nesting. These islands are located off the south east coast of the NT not far from the Queensland border. Collectively, along with the adjacent mainland coast, the area has a great deal of significance for a range of wildlife, including some fairly significant nesting areas for both Flatback and Green Turtles. Some of the islands had little turtle nesting recorded on them during these surveys and are likely to be of little importance to turtle nesting because of their rocky or mangrove/mudflat shoreline. This particularly applies to the inner and south western parts of the island group, including most coasts of the larger islands of South West and Centre Islands. Most of the nesting in the Pellew Island Group is on the small outer islands or the outer shores of the bigger islands such as West, North and Vanderlin Islands. Islands with less than five records are not included in Table 8 and some of those included in Table 8 will not be discussed here because they have few more than this minimum of five records. Islands not mentioned in Table 8 but for which fewer than five records were made include South West, Centre and Observation Islands. A chain of north south aligned small islands running just offshore along the eastern side of Vanderlin Island are included in the discussion on Vanderlin Island itself.

Coast Section 8.7

Site(s): West Is. (15° 32' S, 136° 33' E).



The first of the Pellew Islands to be discussed is West Island (12 895 ha). This island is the second largest of the Pellew Islands and the western most of the five larger islands. West Island is roughly rectangular in shape and is about 15 km long by 10 km wide. The island has a number of beaches but most of the larger more open ones are on the western, and more particularly, north western side. This is where the majority of turtle nesting was recorded during these surveys. Other nesting was recorded on the south east part of the Island. Flatback, Green and Olive Ridley Turtles were confirmed nesting on this island.

Aerial surveys were conducted of all or part of this island in February, March, July, September and November, between 1993 and 1996. Ground surveys were conducted at two sites on the north western coast in October (1996). Tracks/nests were recorded in all surveyed months.

Highest total counts of tracks/nests were in excess of 50 in September (1994) and November (1993). Lower counts were recorded in February and March, but fresh tracks were still recorded in both of these months.

Flatback Turtles were recorded as the dominant nesting species on this island. Green Turtles were also confirmed in small numbers. In the October (1996) ground checks of 18 fresh and old tracks/nests confirmed to species level recorded 11 Flatback Turtles to 7 Green Turtles, although there was some bias towards investigating Green Turtle tracks/nests because they were the less numerous. The summary comment from this survey was that the beach was dominated by Flatback Turtles at this time of year. Further, this survey revealed more fresher eggs than hatched nests, suggesting the main nesting on this island (in the southern part of the NT) is a little later in the year for Flatback Turtles compared to their main nesting period on beaches further to the north.

Hamman *et. al.* (2006) recorded nesting at a rate of three Flatback Turtles to one Green Turtle in surveys of this main West Island nesting beach in 2001. He does not record a date, but it can be deduced from the paper that it was after 7 June. Although June is more typical of Flatback Turtle

nesting time compared to the normally later in the year nesting Green Turtles, these findings also confirm this beach is Flatback Turtle dominated.

Whiting (*pers. comm.*) noted between four and 25 (average 9) Flatback Turtles coming ashore on the north west of West Island between 25 September and 5 October, 2006. He also observed nests hatching in each night, indicating laying had been occurring since at least July. No other species were observed nesting on this beach in this time period. At a similar time of the year in 2005 all nestings except one (a single Green Turtle) and in 2004 all except one (an Olive Ridley Turtle) were also all Flatback Turtles. In 2006 there were 120 successful clutches laid out of 125 nesting attempts, suggesting that track/nest counts in my surveys were not greatly affected by false crawls being counted in the totals on this beach.

Although only Flatback Turtle (mostly) and Green Turtle were confirmed nesting on West Island during my surveys, a single, fresh narrow track record was made in February (1996) aerial survey. This may have represented an Olive Ridley Turtle nest. The timing of this nesting is in line with normal NT nesting for Olive Ridley Turtles rather than Hawksbill Turtles, and is further supported by Indigenous people reporting turtles smaller than Flatback Turtles arriving early in the year and nesting on the far western end of the main West Island nesting beach (reported in Hamman *et. al.*, 2006).

Results from these surveys and those of Hamman and Whiting confirm laying of all species combined to occur from at least January to March and June to November, but with considerably more later in the second period. This suggests this is another site with some laying all year round but with the lesser nesting period being between March and June.

Human and animal (both dog and goanna) tracks were observed during the ground surveys but there were no observations of eggs taken from nests. Nevertheless, it is still likely that the presence of such tracks on the beach would mean some predation on at least some nests at times, perhaps outside the immediate survey site. It is also possible that if the dogs were new to the island they may have not yet learnt (as observed in other parts of the NT by RC) to dig into turtle nests for eggs, even if they have preyed on nesting females moving on the beach or emerging hatchlings.

APPROXIMATE SUMMATION OF SPECIES NESTING SIGNIFICANCE IN COAST SECTION 8.7			
[Very High (OOOO), High (OOO), Medium (OO), Low (O) numbers;			
O = Certain, O = Probable]			
Flatback	Green	Hawksbill	Olive Ridley
OOO	O O		O

OCCURENCE OF LAYING (ALL SPECIES COMBINED) BY MONTH											
IN COAST SECTION 8.7											
O = Egg laying confirmed; X = Nil egg laying recorded;											
? = Not surveyed or current laying not assessed											
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
O	O	O	?	?	O	O	O	O	O	O	?

Coast Sections 8.8 & 8.9 – Not discussed due to relatively insignificant amounts of nesting.

Coast Section 8.10

Site(s): Watson Is. (15° 33.6' S, 136° 49.4' E).



Watson Island (1 413 ha) is the northern of two reasonably sized islands just to the west of North Island, which is the outer most of the five bigger islands of the Pellew Group. Watson Island is about 7 km long by 3 km wide. The island has a number of beaches, but most of the larger ones are on the northern and western sides. This is where the majority of turtle nesting was recorded during these surveys.

Aerial surveys were conducted of all or part of this island in the months of February, March, July, September and October, between 1993 and 1996. Ground surveys were conducted at three sites in the south west and north east in May (1999) and in October (1996). Tracks/nests were recorded in all surveyed months.

The highest total count of tracks/nests from the combined ground and aerial survey of the western and northern sides of the island was in excess of 115 in the October (1996) survey. Much lower counts were recorded in February and March surveys, but fresh tracks/nests were still recorded in both of these months.



Plate 82. Flatback and Green Turtle nesting beaches on NE Watson Island (coast section 8.10), October 1996. Photo R. Chatto.

All tracks recorded on this island were the wider tracks of Flatback and/or Green Turtles. This was seen in all aerial surveys regardless of time of year. In the October ground check 33 tracks/nests confirmed to species level resulted in 21 Green to 12 Flatback Turtles, with a comment that the beach looked to be more dominated by Green Turtles at this time in contrast to Flatback Turtles dominating on the nearby West Island.

With all species combined fresh laying was confirmed in all months except April, November and December when no surveys were done to confirm or deny laying. There were considerably more tracks/nests recorded in the latter part of the year. Although fresh tracks/nests were recorded in both February and March, there were a higher percentage of old tracks/nests in March compared to February, suggesting nesting numbers may have been starting to decline. Surveys in May also noted mostly old nesting pits, suggesting nesting may decline through the April to June period.

No egg predation was recorded on this island.

APPROXIMATE SUMMATION OF SPECIES NESTING SIGNIFICANCE IN COAST SECTION 8.10			
[Very High (OOOO), High (OOO), Medium (OO), Low (O) numbers; O = Certain, ⚡ = Probable]			
Flatback	Green	Hawksbill	Olive Ridley
OO⚡	OO⚡		

OCCURENCE OF LAYING (ALL SPECIES COMBINED) BY MONTH IN COAST SECTION 8.10												
O = Egg laying confirmed; X = Nil egg laying recorded; ? = Not surveyed or current laying not assessed												
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
O	O	O	?	O	O	O	O	O	O	?	?	



Plate 83. Good Green (and some Flatback) Turtle nesting beaches on the northern end of North Island (coast section 8.11), May 1999. Photo R. Chatto.

Coast Section 8.11



Site(s): North Is. (15° 32' S, 136° 52.6' E).

North Island (5 540 ha) is one of the five large islands of the Pellews Group and extends the furthest northward. It is about 16 km long by about 8 km wide at its widest point. The island has numerous small and large beaches around it, mostly in the northern half. There are two substantial sand dune systems in the northern half of the eastern side of the island. Other shoreline habitat includes sandstone, mostly in the south, and mangroves mostly in the mid sections of both the eastern and western sides. The island has significant marine turtle nesting in places, mostly in the northern quarter of the western side and the northern half of the eastern side.

Aerial surveys were done of parts of North Island in February, March, July and September to November, between 1993 and 1999. Ground surveys were done in September (1994) and October (1996). These involved four sites in the far northern part of the island and one in the south east. Tracks/nests were recorded in all surveyed months.

Counts of in excess of 200 tracks/nests of mixed ages were made in a February (1996) survey and in excess of 100 in a July (1996) surveys. These counts apply only to the northern half of the island and the eastern coast. Other parts of this island were only checked in early surveys and were not resurveyed because of the complex nature of the coastline and because there was little evidence of nesting found in these early surveys.

Although the February count included mostly old nesting pits from the previous main nesting period there were also observations of small numbers of fresh tracks.

The only nesting species confirmed on this island were Green and Flatback Turtles. Both were recorded at each of the main nesting sites and are likely to be the dominant species nesting on the island. Note was made that some beaches were more Green Turtle dominated (particularly the larger sand dune areas on the eastern side) and others were more used by Flatback Turtles. A very occasional narrow track was observed, but these were not able to be confirmed to species level.

With all species combined laying was confirmed to all months except December. It is likely that surveys done in December would also confirm laying in this remaining month.

No predation of eggs was recorded.

APPROXIMATE SUMMATION OF SPECIES NESTING SIGNIFICANCE IN COAST SECTION 8.11											
[Very High (OOOO), High (OOO), Medium (OO), Low (O) numbers;											
O = Certain, ⚡ = Probable]											
Flatback	Green	Hawksbill	Olive Ridley								
OO⚡	OOO⚡										
OCCURENCE OF LAYING (ALL SPECIES COMBINED) BY MONTH											
IN COAST SECTION 8.11											
O = Egg laying confirmed; X = Nil egg laying recorded;											
? = Not surveyed or current laying not assessed											
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
O	O	O	O	O	O	O	O	O	O	O	?

Coast Section 8.12

Site(s): Pearce Islet (15° 29.7' S, 136° 55.1' E).



The two small islands to the north east of North Island are very important for wildlife. They are primarily important for seabird and marine turtle nesting but also for the presence of at least one (unnamed) skink not located on any other island during my surveys. Both islands are less than about ½ km across. Pearce Islet is the more westerly of the two islands and slightly more north. Green and Flatback Turtles were confirmed nesting on this island.

Aerial surveys targeting marine turtles were conducted of Pearce Islet in February, March, July, September and October, between 1993 and 1999. Ground surveys were done in May (1994 and 1999) and October (1996), although priority was given to seabird assessment. Tracks/nests were recorded in all of the above mentioned surveys.

This island had a lot of coral rubble on the beaches making counting and identifying turtle nesting signs more difficult, but there was consistently a lot in all surveys. The highest count was just under 200 tracks/nests in a July survey, but much of this was in the form of old pits - the signs of which remain in the coral rubble for long periods of time. Track/nest counts were higher from July onwards compared to the February and March survey periods. The percentage of fresher nests compared to old ones was also greater after July than in surveys earlier in the year.

Green Turtle track/nest counts were considerably higher than Flatback Turtles, although many of the records confirmed to Green Turtles were of old nets pits. The time of year also had an effect on comparative numbers recorded for the two species. In the May survey, numbers relating to confirmed nesting sign were similar for both species but in October there were more Green Turtle nests confirmed.

A single set of narrow tracks belonging to either a Hawksbill or Olive Ridley Turtle was the only other indication of a nesting species recorded on this island other than Flatback and Green Turtles.

Combining both species records, laying could be confirmed for all months between February and October, except June which was not surveyed. This suggests continuous laying throughout this period at least. With a relatively large amount of Green Turtle nesting it is likely that laying also continued through the November to January period. No predation of nests was recorded on this island.

APPROXIMATE SUMMATION OF SPECIES NESTING SIGNIFICANCE IN COAST SECTION 8.12												
[Very High (OOOO), High (OOO), Medium (OO), Low (O) numbers;												
O = Certain, O with slash = Probable]												
Flatback	Green	Hawksbill	Olive Ridley									
O with slash	OO with slash											
OCCURENCE OF LAYING (ALL SPECIES COMBINED) BY MONTH												
IN COAST SECTION 8.12												
O = Egg laying confirmed; X = Nil egg laying recorded;												
? = Not surveyed or current laying not assessed												
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
?	O	O	O	O	?	O	O	O	O	?	?	

Coast Section 8.13

Site(s): Urquhart Islet. (15° 30.2' S, 136° 57.2' E).



Urquhart Islet (24 ha) lies about 5 km to the south east of Pearce Islet and is a slightly larger island. It is mostly rock and only has a small sand spit off the south western tip which is heavily used by nesting marine turtles.

Although visited chiefly for seabird surveys, Urquhart Islet was surveyed only once from the air and once from the ground for the turtles nesting. An aerial survey in November (1993) recorded ‘many’ turtle nesting signs, then a ground survey in September (1994) on the sand spit of the island recorded 50+ mixed aged tracks and around 50 older nesting pits. Flatback and Green Turtle were confirmed but no assessment was made of which was the most numerous.

Brett Norman (*pers. comm.*) confirmed two fresh nests on this island in May (1999) but did not identify the species

The limited spread of survey months for this island only allow confirmation of laying to be listed for May, August, September and November. Coverage of additional months would undoubtedly extend the confirmed laying months for this island, as was found on the adjacent Pearce Islet.

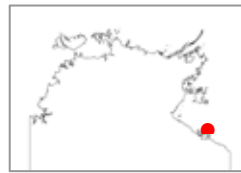
No predation of nests was recorded on this island.

APPROXIMATE SUMMATION OF SPECIES NESTING SIGNIFICANCE IN COAST SECTION 8.13			
[Very High (OOOO), High (OOO), Medium (OO), Low (O) numbers; O = Certain, O = Probable]			
Flatback	Green	Hawksbill	Olive Ridley
O O	O O		

OCCURENCE OF LAYING (ALL SPECIES COMBINED) BY MONTH IN COAST SECTION 8.13											
O = Egg laying confirmed; X = Nil egg laying recorded; ? = Not surveyed or current laying not assessed											
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
?	?	?	?	O	?	?	O	O	?	O	?

Coast Section 8.14

Site(s): Turtle Is. (15° 35.3' S, 136° 57.7' E).



Turtle Islet is a small island just off the Vanderlin Island coast on the western side of its northern end. It has a sand spit off its southern point that consistently had a few turtle tracks recorded on it in four aerial surveys done in May, July, September and November between 1993 and 1996. The greatest number of around 20 was recorded in July (1996). No ground surveys were done of the southern part of this island.

There is insufficient information on this island to produce summary tables.

Coast Section 8.15 & 8.16 – Not discussed due to relatively insignificant amounts of nesting.

Coast Section 8.17

Site(s): Jolly Is. (15° 46' S, 136° 56.8' E).



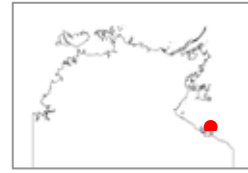
Jolly Island (101 ha) is another of the many islands surrounding Vanderlin Island. It is located towards the south western part of Vanderlin Island and is about 2 km long by 1 km wide. The island did not have much turtle nesting recorded on it, but surveys were limited to one aerial survey in February and one ground survey in October, both in 1996. The ground survey confirmed only Green Turtle nesting. This island is added to the report discussion because it is here that traditional owner Steve Johnson (*pers. comm.*) says he more often sees the narrower nesting tracks. He was not able to say which species, but it is more likely to be the Olive Ridley Turtle.

There is insufficient information to produce a laying summary table for this coast section.

APPROXIMATE SUMMATION OF SPECIES NESTING SIGNIFICANCE IN COAST SECTION 8.17			
[Very High (0000), High (000), Medium (00), Low (0) numbers;			
0 = Certain, 0/ = Probable]			
Flatback	Green	Hawksbill	Olive Ridley
	0		

Coast Section 8.18

Site(s): Vanderlin Is. (15° 42' S, 137° 01' E).



Vanderlin Island (26 248 ha) is the largest island in the Sir Edward Pellews Group, being about 30 km long by 15 km wide. It is also the most easterly. Turtle nesting was recorded only around the island's northern beaches and at scattered locations along its eastern side. Green and Flatback Turtles were the only species confirmed nesting on this island.

Vanderlin Island is another of the larger Pellew Group islands that did not have the entire coast surveyed on each visit to the area. Fewer wildlife were found along most of the western side in early surveys so this side was subsequently usually omitted in order to concentrate on more important areas within the Pellew Islands and the Port McArthur area as a whole. Aerial surveys of parts of the island (concentrating on the eastern and northern parts) were done in most of the months between February and November in the 1993 to 1996 period. Brief ground surveys were done in the north east in May and September in 1994. Tracks/nests were recorded in all of the above mentioned surveys.

Turtle nesting was not observed along the western coast, except in the north. This is likely due the general unsuitability of the small shallow beaches that occur along most of the Vanderlin Island western coast. Although there was scattered turtle nesting recorded along the eastern side, and the northern part of the western side, the majority of nesting was recorded on the sand dune beaches of the northern part of the eastern side.



Plate 84. Looking north along the beaches on the northern part of the east coast of Vanderlin Island (coast section 8.18), October 1996. Photo R. Chatto.

Counts of over 100 tracks/nests were recorded in July and September surveys of this northern eastern part of the island. Fewer tracks/nests were recorded in surveys between February and May, and comment was made then that most nesting sign was of older pits.

Most of the records were not identified to species level, but freshly hatched nests of both Green and Flatback Turtles were recorded in the September survey on the eastern side of the northern end of the island at a rate of five Green Turtles to one Flatback Turtle. At this time a single nest of a Hawksbill or Olive Ridley Turtle was also recorded. Steve Johnson (*pers. comm.*) also said he saw the occasional narrow track at a beach in about the middle of the Vanderlin eastern coast but none were observed in this area during my surveys. Nesting on Vanderlin Island beaches was like other Pellew Islands in being dominated by Green and Flatback Turtles, with Green Turtles possibly being more prevalent on the eastern facing beaches of the eastern islands such as North and Vanderlin Island, and the Flatback Turtles more prevalent on the west or NW facing beaches of West Island on the western side of the Pelles.

Occasional fresh tracks were recorded in February and March surveys but considerably higher percentages of fresh nesting were recorded from September to November surveys. This again suggests nesting later into the year on the more southern latitude NT beaches, particularly when considering the nesting season of Flatback Turtles.

With all species combined fresh laying was confirmed in all months between February and November. With good numbers of Green Turtles nesting on this island it is likely that additional surveys in December and January would also confirm nesting in this period.

No egg predation was recorded on this island.

APPROXIMATE SUMMATION OF SPECIES NESTING SIGNIFICANCE IN COAST SECTION 8.18			
[Very High (OOOO), High (OOO), Medium (OO), Low (O) numbers;			
O = Certain, X = Probable]			
Flatback	Green	Hawksbill	Olive Ridley
OOX	OOX		X

OCCURENCE OF LAYING (ALL SPECIES COMBINED) BY MONTH											
IN COAST SECTION 8.18											
O = Egg laying confirmed; X = Nil egg laying recorded;											
? = Not surveyed or current laying not assessed											
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
?	O	O	O	O	O	O	O	O	O	O	?

Table 8. Locations of significant nesting activity in the Pellew Bioregion with combined sum of nests and tracks >5 for all surveys between 1993 and 2004 and number of surveys (number of unique visit dates) for each coast section.

Coast section	Observation	Flatback Turtle	Green Turtle	Mix of Flatback or Green	Hawksbill Turtle	Olive Ridley Turtle	Mix of Hawksbill or Olive Ridley	Unknown species	No. of surveys
8.1 Sandy Is	Tracks	32	33	7	4		31	232	6
8.2 Edward Is	Nests	3		5				3	8
	Tracks							7	
8.3 Low Rock	Nests							50	4
	Tracks			13				51	
8.4 Maria Is	Nests							100	6
	Tracks	4		3				287	
8.5 Nyinpinti Pt to Bing Bong	Nests	5		2					19
	Tracks	2		14				19	
8.6 Pelican Spit. To QLD border	Nests	8	2	3				10	11
	Tracks	19	2	48				56	
8.7 West Is	Nests	7	5					72	9
	Tracks	1		5			1	159	
8.8 Black Islet	Tracks			5					5
8.9 Skull Is	Nests							1	3
	Tracks						1	7	
8.10 Watson Is	Nests	14	17					61	6
	Tracks	2	2	84				77	
8.11 North Is	Nests	6	9	61			1	247	10
	Tracks		7	84			1	260	
8.12 Pearce Islet	Nests	3	101	1				162	11
	Tracks	10		25			1	76	
8.13 Urquhart Islet	Nests							50	11
	Tracks	1	1	50			1	2	
8.14 Turtle Islet	Tracks							50	7
8.15 Wheatley Islet	Tracks							8	5

Coast section	Observation	Flatback Turtle	Green Turtle	Mix of Flatback or Green	Hawksbill Turtle	Olive Ridley Turtle	Mix of Hawksbill or Olive Ridley	Unknown species	No. of surveys
8.16 Brown Islet	Nests							10	5
8.17 Jolly Islet	Nests		4					10	4
	Tracks			13					
8.18 Vanderlins	Nests	1	1				1	50	11
	Tracks		4	1				385	



Plate 85. Relative low density Flatback (mostly) and Green Turtle nesting beaches to the west of the Robinson River (coast section 8.6), May 1999. Photo R. Chatto.

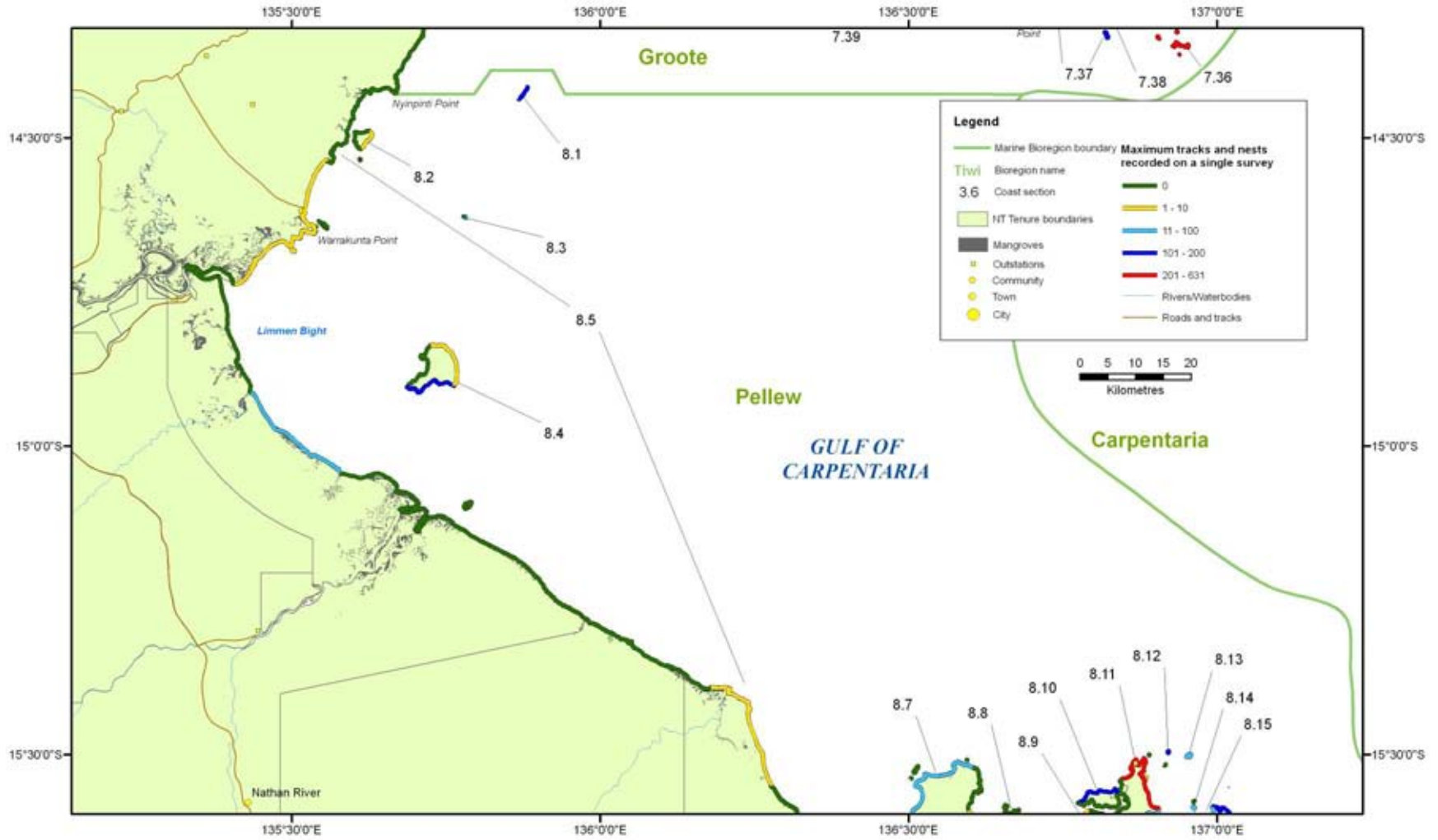


Figure 27. Relative importance of nesting beaches using maximum sum of nests and tracks of all species in a single survey between 1993 and 2004 in the Pellew Bioregion (northern section).

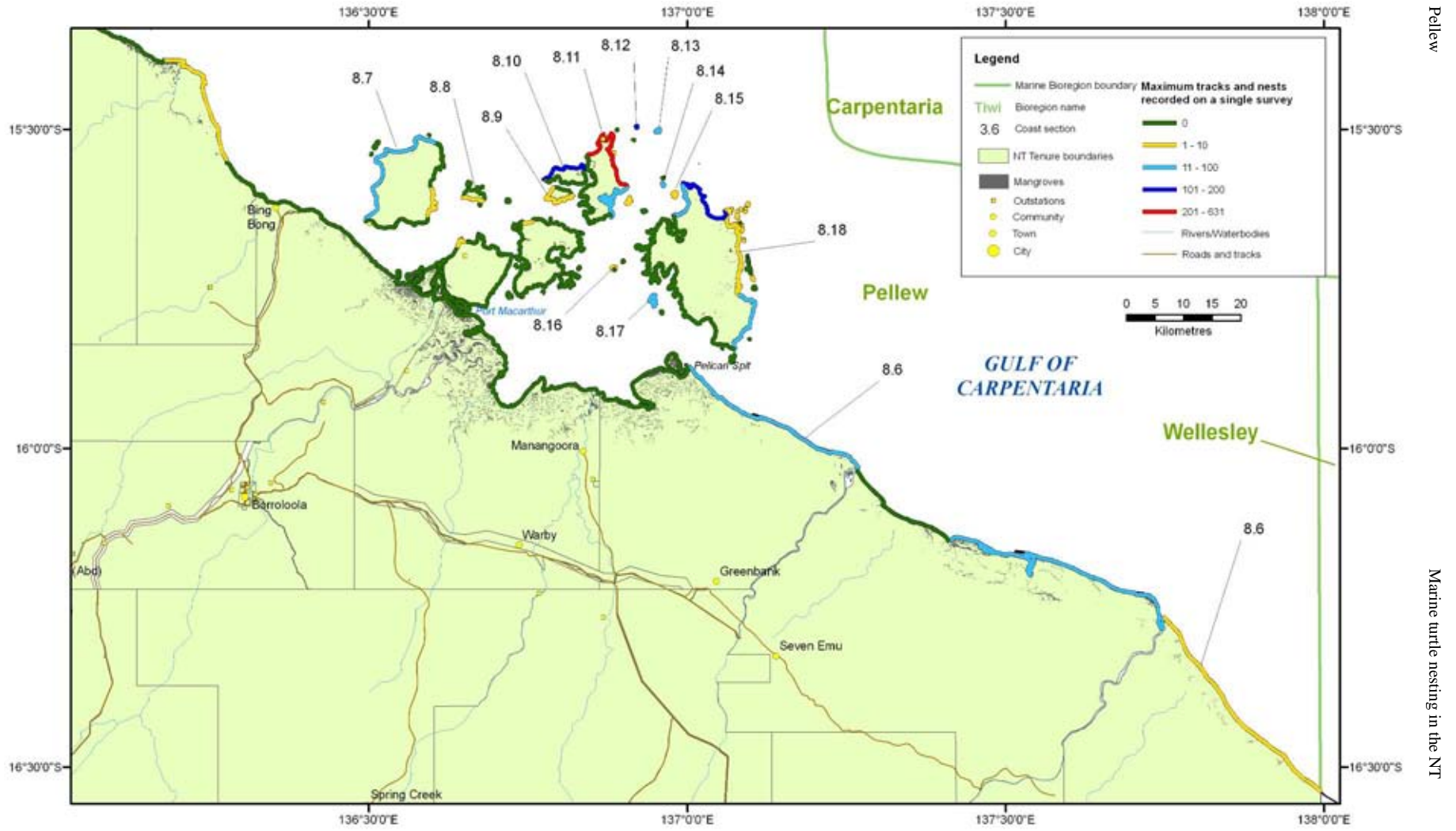


Figure 28. Relative importance of nesting beaches using maximum sum of nests and tracks of all species in a single survey between 1993 and 2004 in the Pellew Bioregion (southern section).

NESTING ACTIVITY BY SPECIES

Overview of NT

This section discusses the nesting activity by individually confirmed species and by mixed species combinations. Table 9 shows the number of nests and tracks recorded for each species or species group within each bioregion.

Table 9. Overview of nesting activity for all species and bioregions for the years 1991-2004. Numbers are the total of all observations.

Species	Bioregion	Nests	Tracks	Other Nest activity
Flatback Turtle	Cambridge-Bonaparte	37	3	2
	Anson Beagle	456	231	4
	Tiwi	313	123	18
	Van Diemens Gulf	69	32	0
	Cobourg	273	36	0
	Arnhem Wessel	433	127	2
	Groote	203	399	5
	Pellew	47	71	2
Green Turtle	Cambridge-Bonaparte	0	0	0
	Anson Beagle	0	0	0
	Tiwi	12	5	2
	Van Diemens Gulf	0	0	0
	Cobourg	27	53	1
	Arnhem Wessel	29	14	4
	Groote	337	1990	64
	Pellew	139	49	3
Mix of Flatback or Green	Cambridge-Bonaparte		25	0
	Anson Beagle	43	31	0
	Tiwi	12	235	0
	Van Diemens Gulf	50	79	0
	Cobourg	110	607	0
	Arnhem Wessel	436	367	1
	Groote	175	618	3
	Pellew	72	348	1
Hawksbill Turtle	Cambridge-Bonaparte	0	0	0
	Anson Beagle	0	0	0
	Tiwi	1	14	0
	Van Diemens Gulf	0	0	0
	Cobourg	0	7	0
	Arnhem Wessel	109	472	107
	Groote	206	453	1
	Pellew		4	0

Species	Bioregion	Nests	Tracks	Other Nest activity
Olive Ridley Turtle	Cambridge-Bonaparte	0	0	0
	Anson Beagle	2	0	0
	Tiwi	539	54	0
	Van Diemens Gulf	1	0	0
	Cobourg	24	1	0
	Arnhem Wessel	148	65	2
	Groote	1	2	0
	Pellew	0	0	0
Mix of Hawksbill or Olive Ridley	Cambridge-Bonaparte	0	0	0
	Anson Beagle	1		0
	Tiwi	115	23	0
	Van Diemens Gulf	1	2	0
	Cobourg	24	44	0
	Arnhem Wessel	47	209	1
	Groote	46	166	3
	Pellew	2	36	0
Unknown species	Cambridge-Bonaparte	10	226	0
	Anson Beagle	264	1222	2
	Tiwi	448	1529	1
	Van Diemens Gulf	11	129	0
	Cobourg	476	3135	0
	Arnhem Wessel	1948	3758	20
	Groote	4064	7649	31
	Pellew	826	1680	2

Predation and traditional harvesting of nests

Over 1 300 nests were recorded as taken between 1991 and 2004, almost 10% of the total 14 000 nestings recorded as nests as apposed to sets of tracks (Figure 29). Figure 30 -33 show the distribution of recorded nest predation by goannas, dogs, people and unknown predators recorded during these surveys.

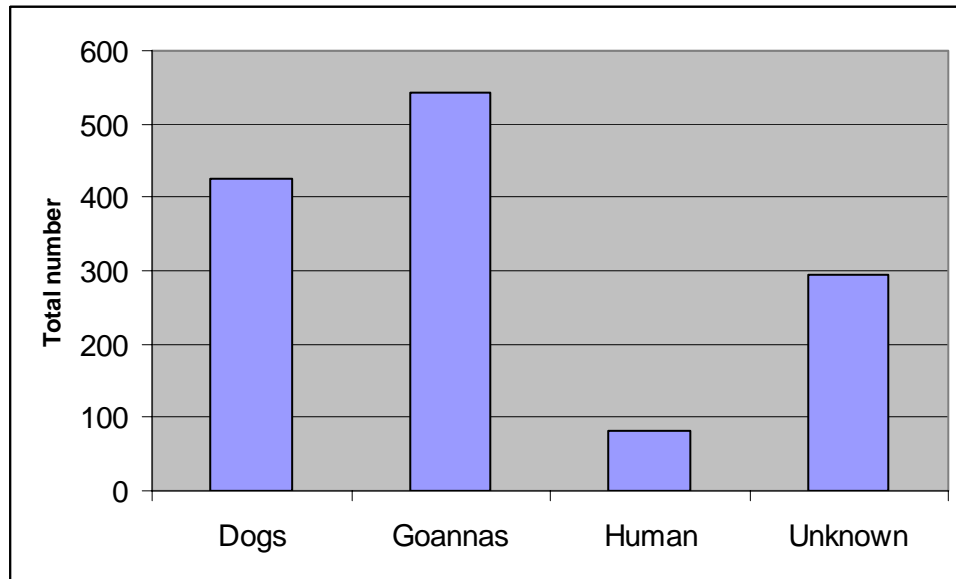


Figure 29. Sum of predation and hunting of nests between 1991 and 2004 across all bioregions in the NT.



Plate 86. Large crocodile taking nesting Olive Ridley Turtle, Melville Is., May 2008. Photo S. Whiting

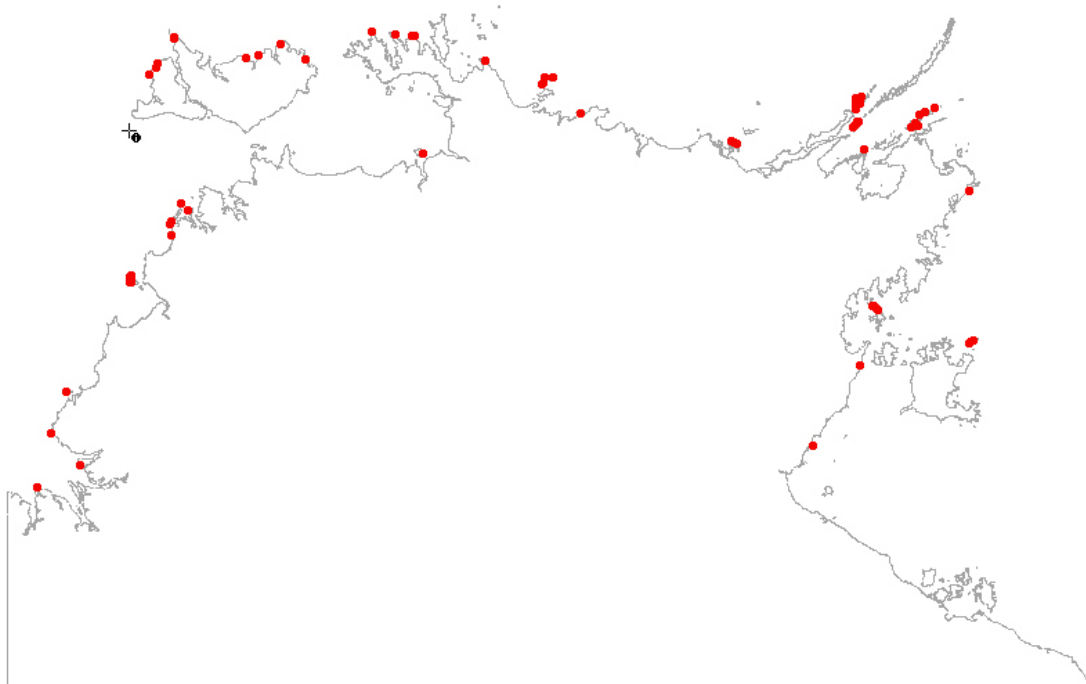


Figure 30. Location of goanna predation of eggs between 1991 and 2004 across the NT.

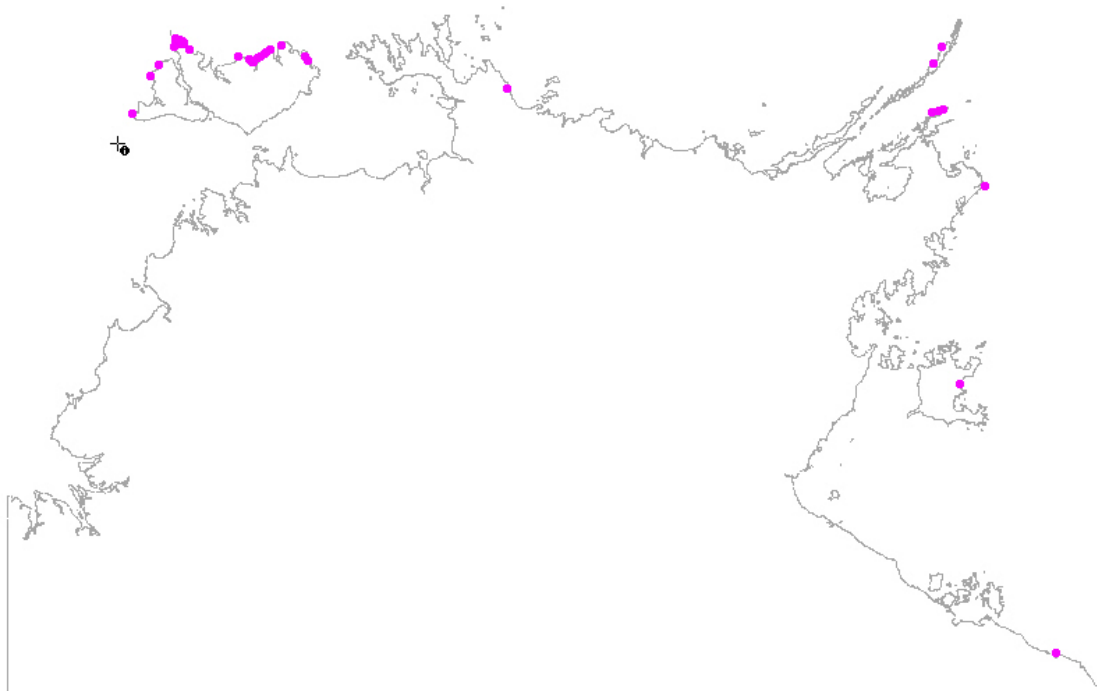


Figure 31. Location of feral dog or dingo predation of eggs between 1991 and 2004 across the NT.

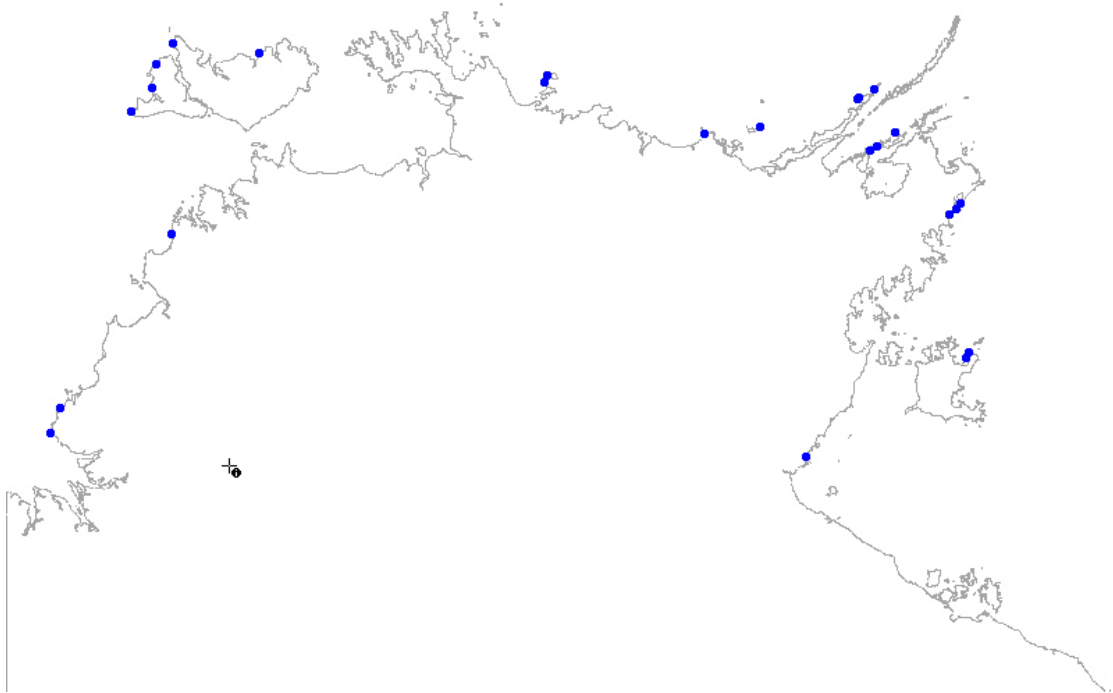


Figure 32. Location of human predation of eggs between 1991 and 2004 across the NT.

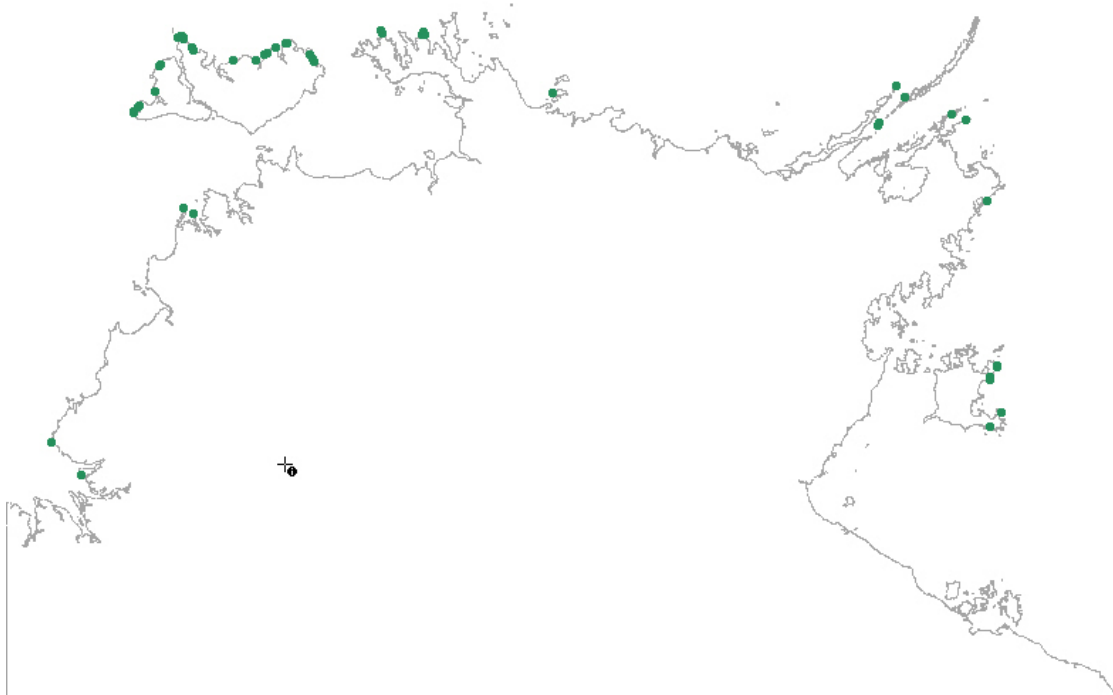


Figure 33. Location of unknown predation of eggs between 1991 and 2004 across the NT.

Flatback Turtle

Legal and Conservation Status

NT [Territory Parks and Wildlife Conservation Act (2006)]

Legal Status - Protected Wildlife

Conservation Status - Data Deficient *

(* NB. This status was derived prior to information produced in this report and may change subject to consideration of data from these surveys).

AUSTRALIA [Environment Protection and Biodiversity Conservation Act (1999)]

Conservation Status - Vulnerable

INTERNATIONAL [International Union for the Conservation of Nature]

Conservation Status - Data Deficient

Geographic distribution of nesting locations

Flatback Turtle (*Natator depressus*) nesting occurs only in Australia, on islands and mainland beaches from the Pilbara region across northern Australia to Mon Repos in southern Queensland. In the NT Flatback Turtles were recorded nesting all around the coast, on both mainland and on islands (Figure 34).

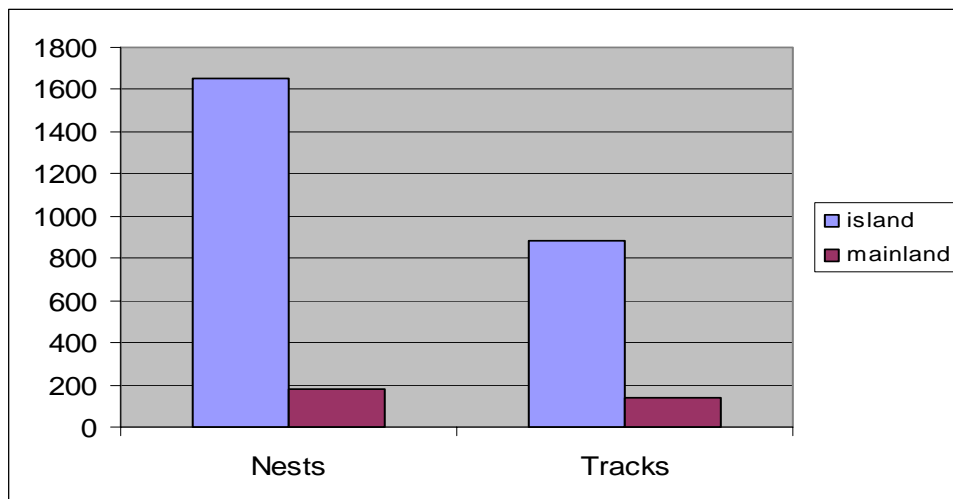


Figure 34. Total number of Flatback Turtle nests and tracks recorded on islands and mainland areas between 1991 and 2004 in the NT.

Flatback Turtles were clearly the most widely spread nesting marine turtle species in the NT, nesting on suitable beaches of a wide variety of types all around the entire coastline. They were recorded nesting on nearly every beach where marine turtle nesting was confirmed to a species level, regardless of whether or not other species also nested at that location.

Almost all of the marine turtle nesting on the western side of the NT was recorded to be of Flatback Turtles. Only very occasional nests of other species were recorded along turtle nesting beaches on

islands (except the Tiwi Islands) and mainland beaches between the WA border and Cape Don on the Cobourg Peninsula to the east of Darwin.

The location of confirmed NT Flatback Turtle nesting areas recorded during these surveys is shown in Figure 74, Appendix B. This distribution map only includes records confirmed to species level. (Because of the high numbers involved in unconfirmed species counts, this map does not include all Flatback Turtle nesting areas, or necessarily the true number ranges, so it is included in the Appendix rather than here. See also related Methods discussion).

By comparing the confirmed Flatback Turtle distribution with those for Flatback and/or Green Turtle nesting records (Figure 87, Appendix D) and unknown turtle *spp.* nesting records (Figure 108, Appendix H) further areas of possible significant Flatback Turtle nesting can be inferred. For example the south eastern coast of Melville Island is shown in Figure 81 as confirmed Flatback and/or Green Turtle nesting area but given the distribution of the two species this area is almost certainly going to be mostly a Flatback Turtle nesting area.

Sites with higher numbers (where the total of sets of tracks and/or nests is >20 for all surveys combined) of confirmed Flatback Turtle tracks/nests can also be seen in Table 18, Appendix B.

Significant Nesting Areas

The majority of the many significant Flatback Turtle nesting beaches around the NT are on islands. Table 10 lists areas within each bioregion where confirmed and inferred significant Flatback Turtle nesting was located. Areas where Flatback Turtles are likely to be a significant part of a nesting beach that had high counts of unconfirmed species are included in this table and marked with an ‘*’ in terms of such being inferred. All sites in Table 10 are numbered and mapped in Figure 35.

Each of these significant sites has been individually discussed in the individual coast section summaries earlier in this report. The relevant coast section numbers are also listed in Table 10.



Plate 87. A Flatback Turtle returning to the water after nesting on Casuarina Beach, Darwin. July 1999. Photo R. Chatto.

Table 10. Significant areas of Flatback Turtle nesting located across the NT between 1991 and 2004.

Bioregion	Significant Area (* = Inferred as highly likely from unconfirmed species counts)	Figure 35 Map Ref. No.	Relevant Coast Section(s) Ref. (Refer 'Nesting Activity Within Bioregions' section of report)
Cambridge-Bonaparte	Turtle Point Area	1	1.1
	Whale Flat Is (west)	2	1.2
Anson Beagle	North Peron Is.	3	2.6
	Native Pt to Five Mile Beach	4	2.8
	Bare Sand Is.	5	2.9
	Quail Is.	6	2.10
Tiwi	Bathurst Is. (SW)	7	3.4 & 3.5
	Melville Is. (NW)	8	3.8 & 3.9
	Melville Is. (Mid Nth)*	9	3.10 & 3.11
	Melville Is. (NE)	10	3.12
Van Diemens Gulf	Greenhill Is.	11	4.2
	Mogogout Is. *	12	4.3
Cobourg	Danger Pt. *	13	5.6
	Darch Is. *	14	5.9
	Templer Is. *	15	5.10
	Valencia Is. *	16	5.11
	Grant Is. *	17	5.12
	Lawson Is.	18	5.13
	McClure Is. *	19	5.17
	North Goulburn Is.	20	5.19
Arnhem Wessel	Mooroongga Is.	21	6.6
	NW Crocodile Is.	22	6.8
	Drysdale Is. *	23	6.13
	Burgunngura Is. *	24	6.15
	Stevens Is. *	25	6.16
	Bumaga Is. *	26	6.23
	Flinders Peninsula (NE)	27	6.29

Bioregion	Significant Area (* = Inferred as highly likely from unconfirmed species counts)	Figure 35 Map Ref. No.	Relevant Coast Section(s) Ref. (Refer 'Nesting Activity Within Bioregions' section of report)
Arnhem Wessel (cont)	Probable Is. (Nth end) *	28	6.31
	Small Is. NE of Inglis Is.	29	6.39
	(Largest) Bromby Is.	30	6.46
Groote	Isle Woodah (Nth end)	31	7.17
	Nicol Is. *	32	7.18
	Wedge Rock *	33	7.21
	Hawknest Is. *	34	7.22
	Bustard Is. *	35	7.23
	Hawk Is.	36	7.27
	Lane Is.	37	7.28
	North East Isle	38	7.29
	Groote Eylandt (NE)	39	7.31
	Groote Eylandt (SE) – several sites *	40	7.33 - 35
	Groote Eylandt (Sth coast) – several sites*	41	7.36 - 39
Pellew	Sandy Is. *	42	8.1
	Maria Is. (SE) *	43	8.4
	West Is. (NW) *	44	8.7
	North Is. (Nth end) *	45	8.11
	Vanderlin Is. (NE) *	46	8.18

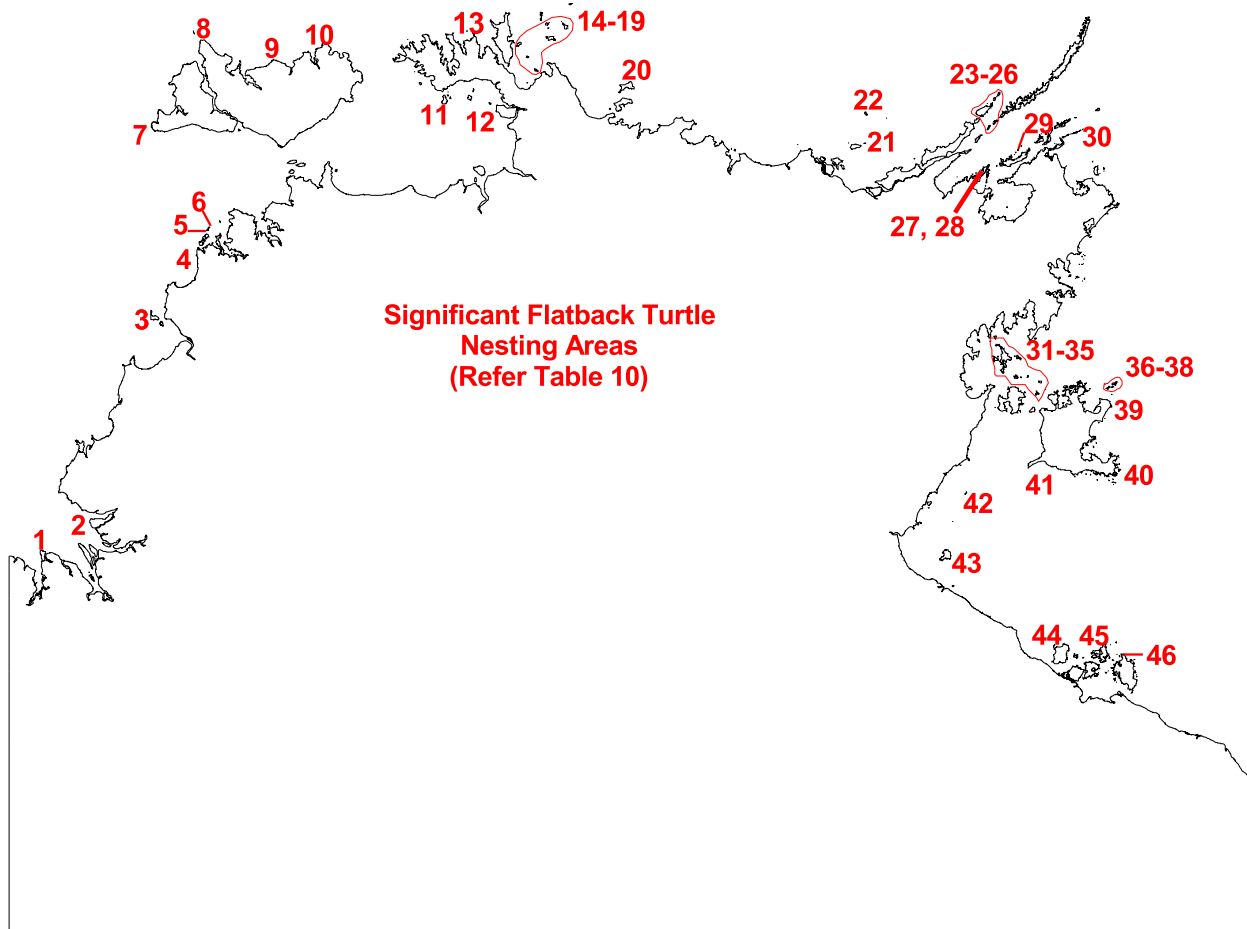


Figure 35. Significant Flatback Turtle nesting area in the NT. (Refer Table 10).

Numbers

Throughout the surveys there were 861 records totalling 3 127 nests and/or tracks for Flatback Turtles throughout the NT. These included both old and fresh tracks/nests. They represented 52% of all records confirmed to individual species level, and 38% of the total number of tracks/nests confirmed to species level. These figures indicate that more than half the records of nesting turtles recorded to species level were of Flatback Turtles, and that they were over a third of the total number of tracks/nests recorded to species level.

There were also 547 additional records totalling 3 841 tracks/nests of Flatback and/or Green Turtle combined, and 2 583 records totalling 31 557 tracks/nests of unknown species. Flatback Turtles are likely to have been a significant part of these mixed unconfirmed species records, particularly over much of the western and northern coasts of the NT.

Further, the number of Flatback and/or Green Turtle combination records was more than twice the number of Hawksbill and/or Olive Ridley Turtle combination records and more than four times the total counts respectively. This clearly suggests that there would be more Flatback and/or Green Turtle tracks/nests compared to Hawksbill and/or Ridley Turtle tracks/nests within the number of records and total counts of the unconfirmed species data.

Seasonality of nesting

Over the NT as a whole, freshly laid and freshly hatched Flatback Turtle nests were recorded in every month of the year. Because of the possibility of seasonal variation between areas of different latitude around the NT coast and the inability to relate effort to different areas it would be unwise to produce a graph of all monthly records for the entire survey area. However, as possible latitude variations are not likely to be effected at a bioregional level, monthly track and nest totals can be seen for each bioregion in Figure 66 to 61, Appendix B.

For the western coast, the northern coast and the northern part of the eastern coast of the NT the main nesting period was recorded between May and October. It is difficult to show this in terms of the data because of the complexity of the surveys and difficulty of applying survey effort to the results, but this is best shown in the most frequently surveyed Anson-Beagle Bioregion (Figure 67, Appendix B).

The only beach to have had every nest recorded throughout the year was Casuarina Beach near Darwin. This was done for an eight year period between 1999 and 2006. Casuarina Beach does not have large numbers of nesting turtles but they are nearly all Flatback Turtles. Totalled monthly nesting during this eight year period showed a small drop off in numbers around the normally coldest month of July (Figure 36). This was not reflected in the individual bioregion figures in Appendix B but survey effort could not be factored into these totals.

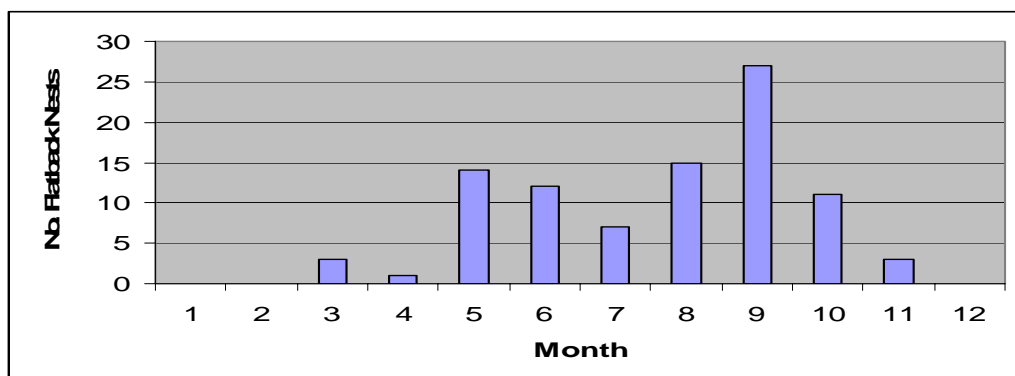


Figure 36. Total number of Flatback Turtle laid nests on Casuarina Beach between 1999 and 2006.

The seasonality of the main nesting months was also found to have some variation in the more southern latitudes of the eastern NT coast at least. This was observed in the southern part of the Groote Eylandt Bioregion and the Pellew Bioregion. Although nesting also occurred all year round in this part of the NT, the main nesting period here was suspected of commencing a bit later and then extending later into the year to at least November, possibly through into February. Unfortunately the December/January period was generally poorly represented in surveys so the ending time could not be clearly shown, but there were generally fewer Flatback Turtle nests by March and through to July in this area. Again the lack of survey effort figures complicates showing this clearly from the data but Figure 72 (Groote) and Figure 73 (Pellew) provide some evidence of such.

Animal predation and traditional harvesting of nests and hatchlings

Flatback Turtle eggs were subject to considerable predation on the mainland throughout the NT by dingoes/dogs, goannas and from Indigenous people. Flatback Turtles were the species targeted in 33 of 79 separate records of predation confirmed to species level. This relatively high figure of 42% of records is reflected in the wide distribution of Flatback Turtle nests around the NT, particularly on the mainland where most predation occurs.

Egg predation by animals was recorded on nearly every mainland beach where Flatback Turtles nested, but only on a few inner islands (e.g. North Perron Island) that were too small to be inhabited by people. Over the NT as a whole the numbers of nests predated was higher during the dry season and as such was reflective of the main dry season nesting period for Flatback Turtles (Figure 37).

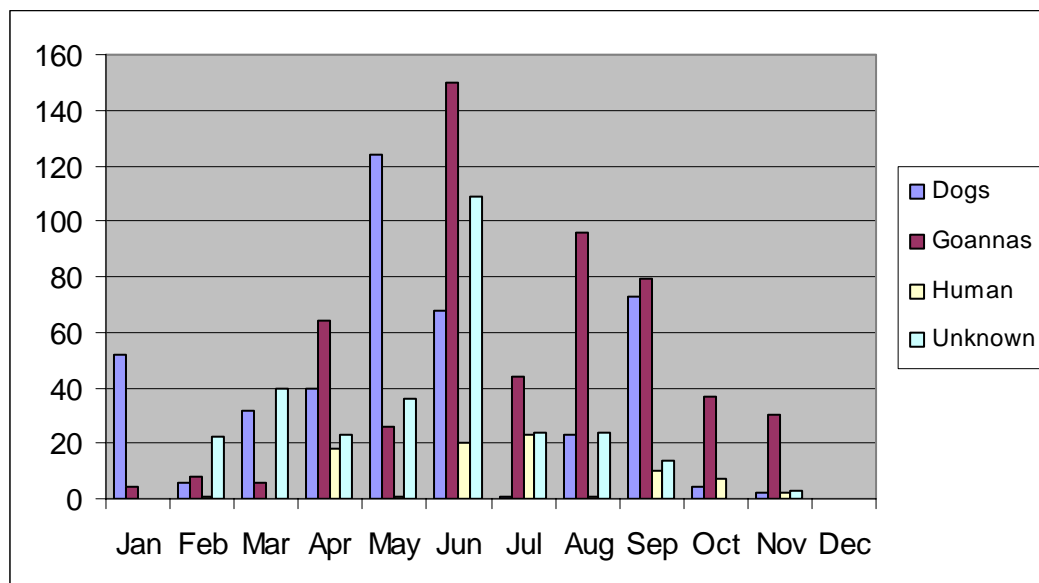


Figure 37. Sum of predation and harvesting of Flatback Turtle nests between 1991 and 2004 across all bioregions in the NT by month of activity.

Most animal predation occurred on mainland beaches because most of the islands were probably unable to support permanent populations of the larger predatory *Varanus panoptes* goanna or dingoes/dogs. Smaller species of goanna were not confirmed raiding turtle nests even when present on islands where *V. panoptes* was absent, although they may have attempted to eat eggs turfed out of nests by other nesting turtles.

Pig predation was only recorded as significant on Bathurst Island, where on some beaches very few nests of any species survived with goannas, dogs, pigs and people all taking eggs from nests. It was also recorded on a single occasion on Whale Flat in the Cambridge/Bonaparte Bioregion, and may be occurring on Bremer Island in NE Arnhem Land. Despite the large number of pigs in wetlands and

rainforests adjacent to many Flatback Turtle nesting beaches around the NT coast they were not recorded predated on turtle nests at any other places. Tracks, and sometimes pigs themselves, were recorded on a few beaches around the NT during these surveys. Tracks were even recorded showing pigs walking over turtle nests without evidence of digging into them. This suggests that digging down into turtle nests is a learned behaviour – something that had been learnt by pigs on Bathurst Island but in few other places in the NT. This is also the case with feral dogs. Although there were also examples of dogs walking over fresh turtle nests without apparently taking further interest, it was much less common, and it appeared that it did not take dogs long to learn to dig into a turtle nest. Goannas on the other hand rarely missed a nest, which at certain times of the year were probably their main diet. At non nesting times goannas were seen to be extremely malnourished but during nesting times they were often seen to be in peak condition.

Some evidence was recorded of northern bandicoots eating eggs but this was suspected only to have occurred after other animals had dug into the nests. This was noticed on Melville Island in relation to Flatback and Olive Ridley Turtle nests. It is also possible that they may have joined a host of other animals such as birds (including Beach Thick-knee, Jabiru, Nankeen Night Heron, Eastern Reef Egret and more), dogs and crocodiles that were confirmed predated on emerging hatchlings. Hatchling predation by goannas was less prevalent because most turtle nests emerged at night. It was also less prevalent with another bird hunter, the Silver Gull, because of the larger size of the Flatback Turtle hatchlings compared to the other species of turtle hatchlings. Silver Gulls were observed to walk beside, and on occasions unsuccessfully try to eat, a Flatback Turtle hatchlings but were observed to successfully swallow other species of hatchling.

Traditional harvest of eggs was influenced by the location of the nesting beach relative to the location of communities or outstations, and also the availability of vehicles and/or boats. Islands further away from communities or further offshore were less often harvested, but beaches able to be easily accessed were often continually harvested.

The sum of all traditional harvest and predation throughout the project by bioregion showed that most was recorded in the Anson/Beagle and Tiwi Bioregions (Figure 38).

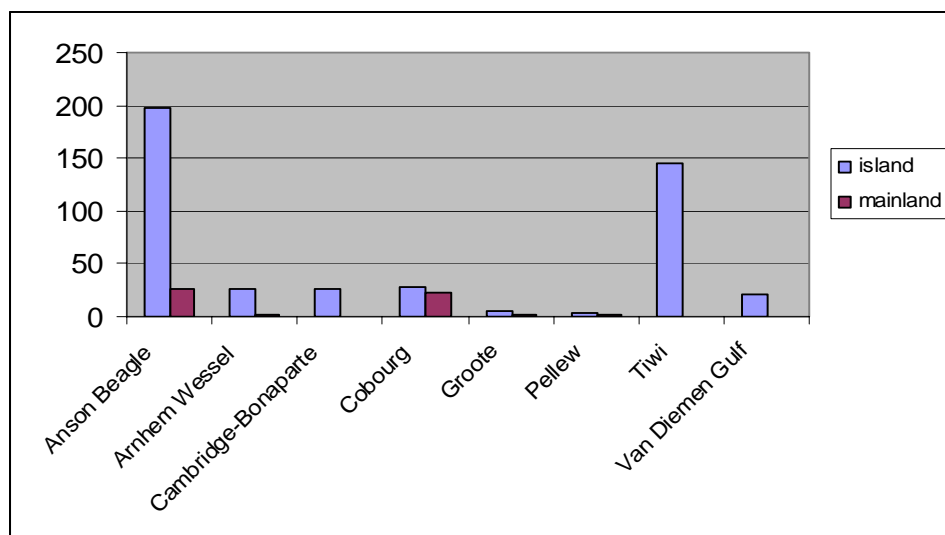


Figure 38. Sum of predation and traditional harvesting of Flatback Turtle nests between 1991 and 2004 in bioregions across the NT on islands and mainland areas.

Other measurements

Random measurements taken of track widths, clutch size and egg diameter are shown in Table 11.

Flatback Turtle eggs were the largest of the four species that regularly nest in the NT but their clutch size was the smallest. Although variation in track width is influenced by a number of factors additional to turtle size, Flatback Turtles in general had the second widest of the tracks.

Table 11. Track width, clutch size and egg size measurements for Flatback Turtles in the NT.

	Mean	Min	Max	N
Track width (mm)	939.00	780	1100	95
Clutch size	54.17	34	107	30
Egg size (mm)	49.67	39.6	53	75



Plate 88. A Silver Gull looking at Flatback Turtle hatchling on route to the water as a potential food source but was unable to eat it, Casuarina Beach 2006. Photo R. Chatto.

Green Turtle

Legal and Conservation Status

NT [Territory Parks and Wildlife Conservation Act (2006)]

Legal Status - Protected Wildlife

Conservation Status - Least Concern *

(* NB. This status was derived prior to information produced in this report and may change subject to consideration of data from these surveys).

AUSTRALIA [Environment Protection and Biodiversity Conservation Act (1999)]

Conservation Status - Vulnerable

INTERNATIONAL [International Union for the Conservation of Nature]

Conservation Status - Endangered

Geographic distribution of nesting locations

Green Turtle (*Chelonia mydas*) nesting occurs in Australia from the Pilbara region across northern Australia to Mon Repos in southern Queensland on islands and mainland beaches.

In the NT, Green Turtles were recorded nesting in bioregions across the north and the east of the Top End. They were not recorded (apart from the very rare nest) nesting in the Cambridge/Bonaparte, Anson and Van Diemens Gulf Bioregions of the western side of the NT. Green Turtles were recorded nesting on both on the mainland and on islands, with most of the island nesting being accounted for by nesting on the larger islands of Groote Eylandt, and North and Vanderlin Islands in the Sir Edward Pellews (Figure 39). The high count for mainland tracks is greatly influenced by the large numbers of tracks along the wide beaches south of Cape Arnhem that could be confirmed as Green Turtle from the air after ground checks revealed little else in the way of other species.

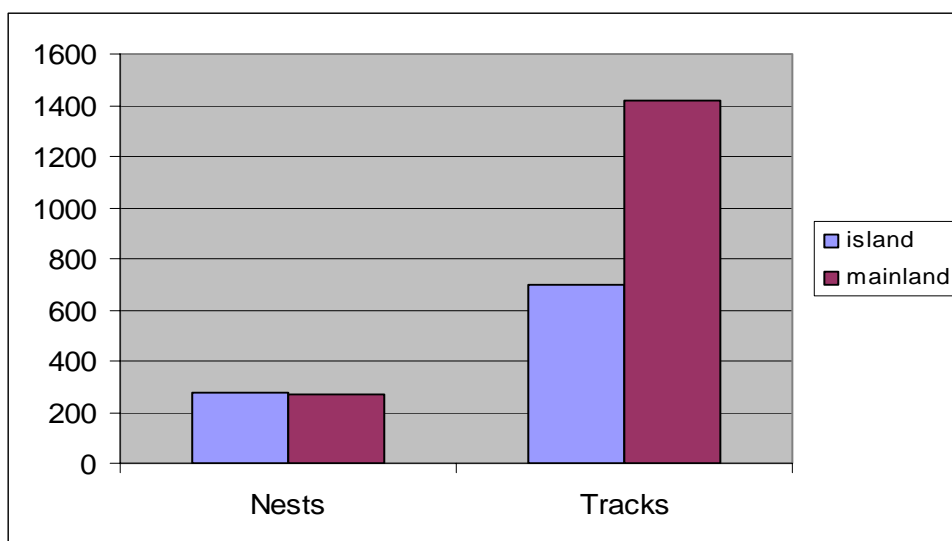


Figure 39. Total number of Green Turtle nests and tracks recorded on islands and mainland areas between 1991 and 2004 in the NT.

Green Turtles appeared to prefer the wider, deeper, often large dune-backed oceanic beaches to nest and therefore did not nest in as many locations as the previously discussed Flatback Turtle. Although Green Turtle nesting was fairly widespread across the north and east of the NT, high density nesting beaches were not very common across the north. The vast majority of Green Turtle nesting in the NT was recorded on the large beaches between Cape Arnhem and Blue Mud Bay, on the south eastern part of Groote Eylandt and to a lesser extent on the outer part of North Island in the Sir Edward Pellew Island Group. In the former two areas, the density of nesting was greater than for any species of turtle anywhere in the NT.

The location of confirmed NT Green Turtle nesting areas recorded during these surveys is shown in Figure 80, Appendix C. This distribution map only includes records confirmed to species level. (Because of the high numbers involved in unconfirmed species counts, this map does not include all Green Turtle nesting areas, or necessarily the true number ranges, so it is included in the Appendix rather than here. See also related Methods discussion).

By comparing the confirmed Green Turtle distribution with those for Flatback and/or Green Turtle nesting records (Figure 87, Appendix D) and unknown turtle *spp.* nesting records (Figure 108, Appendix H) a small number of additional areas of likely significant Green Turtle nesting can be inferred. For example, Lawson Island in the Cobourg Bioregion is shown in Figure 81 as significant Flatback and/or Green Turtle nesting area, but comments from aerial observations based on nest pit size and beach type suggest these records are likely to mostly be Green Turtles, rather than Flatback Turtles.

Sites with higher numbers (where the total of sets of tracks and/or nests is >20 for all surveys combined) of confirmed Green Turtle tracks/nests can also be seen in Table 19, Appendix C.

Significant Nesting Areas

Table 12 lists areas within each bioregion where confirmed and inferred significant Green Turtle nesting was located. Areas where Green Turtles are likely to be a significant part of a nesting beach that had high counts of unconfirmed species are included in this table and marked with an ‘*’ in terms of such being inferred. All sites in Table 12 are numbered and mapped in Figure 40.

Each of these significant sites has been individually discussed in the individual coast section summaries earlier in this report. The relevant coast section numbers are also listed in Table 12.

Table 12. Significant areas of Green Turtle nesting located across the NT between 1991 and 2004.

Bioregion	Significant Area (* = Inferred as highly likely from unconfirmed species counts)	Figure 40 Map Ref. No.	Relevant Coast Section(s) Ref. (Refer 'Nesting Activity Within Bioregions' section of report)
Cobourg	Black/Smith Pt. *	1	5.3
	Lawson Is. *	2	5.4
Arnhem Wessel	Drysdale Is. *	3	6.13

Bioregion	Significant Area (* = Inferred as highly likely from unconfirmed species counts)	Figure 40 Map Ref. No.	Relevant Coast Section(s) Ref. (Refer 'Nesting Activity Within Bioregions' section of report)	
Groote	Cape Arnhem to Port Bradshaw (all mainland beach)	4	7.2	
	Port Bradshaw to Pt Alexander (all mainland beach)	5	7.3	
	Bridgland Is.	6	7.6	
	Dudley Is.	7	7.7	
	Caledon Bay to Cape Grey (some mainland beaches)	8	7.8	
	Bald Pt. to Cape Shield (all mainland beach)	9	7.10	
	Isle Woodah (Nth tip)	10	7.17	
	Wedge Rock *	11	7.21	
	Hawknest Is. *	12	7.22	
	North East Isle	13	7.29	
	Dalumbu Bay to Ungwariba Pt. (some beaches)	14	7.33	
	Ungwariba Pt. to Cape Beatrice (some beaches)	15	7.34	
	Small Islands off SE Groote (some)	16	7.35	
	Small Islands off Cape Beatrice (some)*	17	7.36	
	Small Islands off Marangala Pt. (some)*	18	7.37	
	Cape Beatrice to Inamalamandja Pt. (some beaches)*	19	7.38	
	Inamalamandja Pt. to Tasman Pt. (some beaches)	20	7.39	
	Pellew	Sandy Is. *	21	8.1
		Watson Is. (N) *	22	8.10
		North Is. (N&E) *	23	8.11
Pearce Is.		24	8.12	
Vanderlin Is. (NE) *		25	8.18	

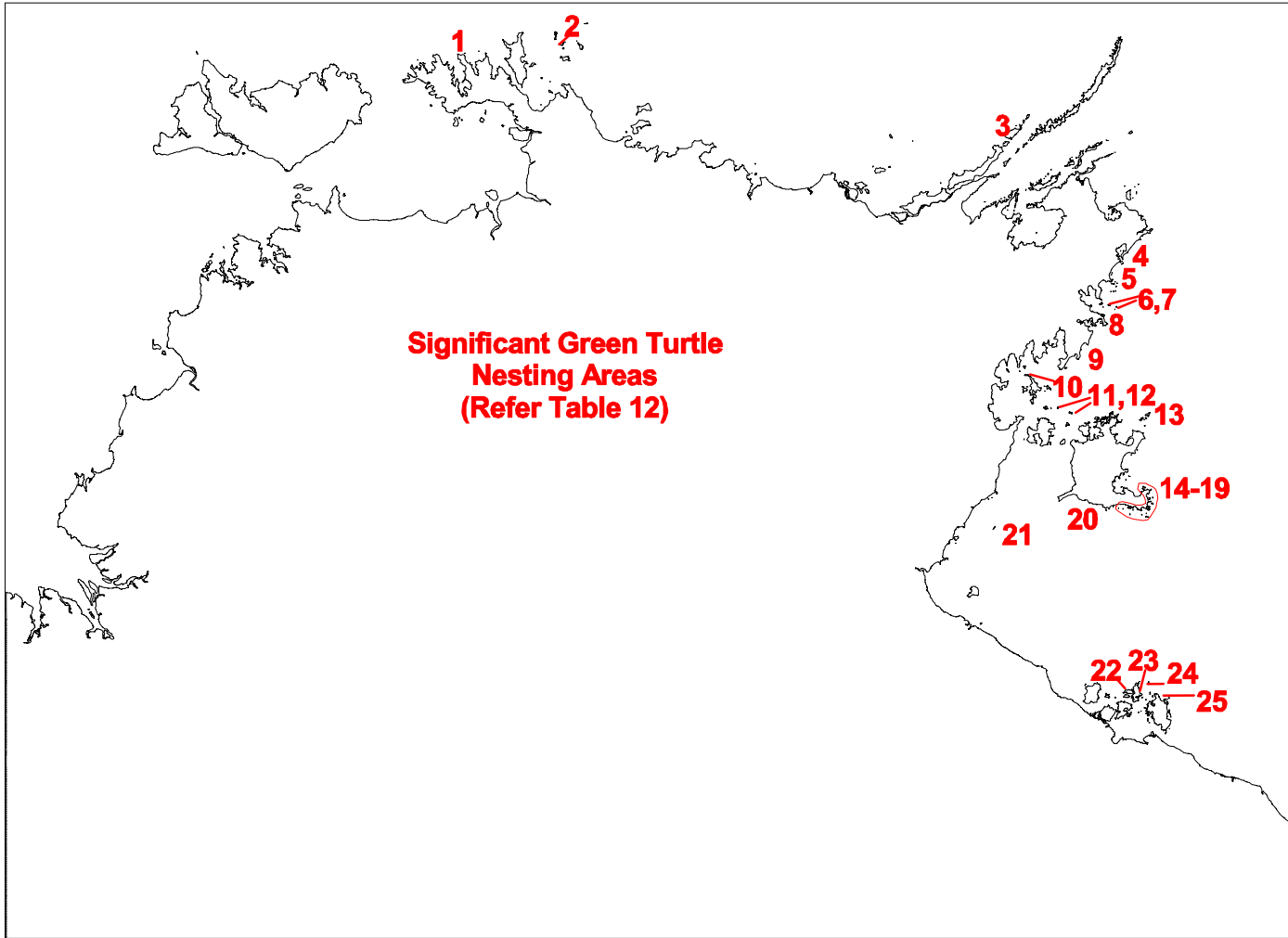


Figure 40. Significant Green Turtle nesting area in the NT. (Refer Table 12).

Numbers

Throughout the surveys there were 362 records totalling 2 780 nests and/or tracks for Green Turtles around the NT coast. These included both old and fresh sign. They represented 22% of all records confirmed to individual species level and 34% of the total number of tracks/nests confirmed to species level.

There were also 547 additional records totalling 3 841 tracks/nests of Flatback and/or Green Turtle combined, and 2 583 records totalling 31 557 tracks/nests of unknown species. Green Turtles would have been a significant part of these mixed unconfirmed species in their main nesting beaches south of Cape Arnhem and on Groote Eylandt.

Overall, there were twice the number of records, and four times the total numbers, of Flatback and/or Green Turtles compared to Hawksbill and/or Olive Ridley Turtles. This clearly suggests that there would be more Flatback and/or Green Turtle tracks/nests compared to Hawksbill and/or Ridley Turtle tracks/nests within the number of records and total counts of the unconfirmed species data.

The number of records gives an indication of the distribution of nesting and the total numbers an indication of the amount of nesting. These figures show Green Turtles to be the second most frequently recorded nesting species and that it had the second highest (just behind Flatback Turtles) total track/nest counts. The recording of Green Turtles as a nesting species at a rate of less than half as often as the Flatback Turtle is interesting as the Green Turtle is by far the most frequently observed species in the water, and is also easily the species most frequently taken by Aboriginal hunters, although there is a preference for Green Turtle flesh over the other species (Chatto, *pers. obs.*).



Plate 89. A Green Turtle hauled out to rest on beach in the SE of Groote Eylandt during the day, September 1996. Photo R. Chatto.

Seasonality of nesting

Over the NT as a whole, fresh Green Turtle tracks/nests were recorded in every month of the year. Because of the possibility of seasonal variation between areas of different latitude around the NT coast and the inability to relate effort to different areas it would be unwise to produce a graph of all monthly records for the entire survey area. However, as possible latitude variations are not likely to be effected at a bioregional level, monthly track and nest totals can be seen for each bioregion in Figure 75 to 69, Appendix C).

Clearly most Green Turtle nesting was recorded in the second half of the calendar year. Although it is difficult to show precise variations because of the complexity of the surveys, there was some variation recorded in nesting on a regional basis. Green Turtle nesting in the Groote and Pellew Bioregions in the eastern half of the NT where the big nesting Green Turtle beaches were, was recorded as being less prevalent in the early part of the year (e.g. Figure 78 and Figure 79, Appendix C) than in the Tiwi and Cobourg Bioregions in the west, where nesting was less dense (e.g. Figure 75 and Figure 76, Appendix C).

Animal predation and traditional harvesting of nests and hatchlings

Green Turtle eggs were subject to predation by dingoes/dogs, goannas and from Indigenous people throughout the NT. However, animal predation was less frequent with this species because of their much deeper nests. Green Turtles were the species targeted in 9 of 79 (11%) separate incidents of predation confirmed to species level.

Nest predation was higher during the latter part of the year to coincide with the greater amount of nesting (Figure 41).

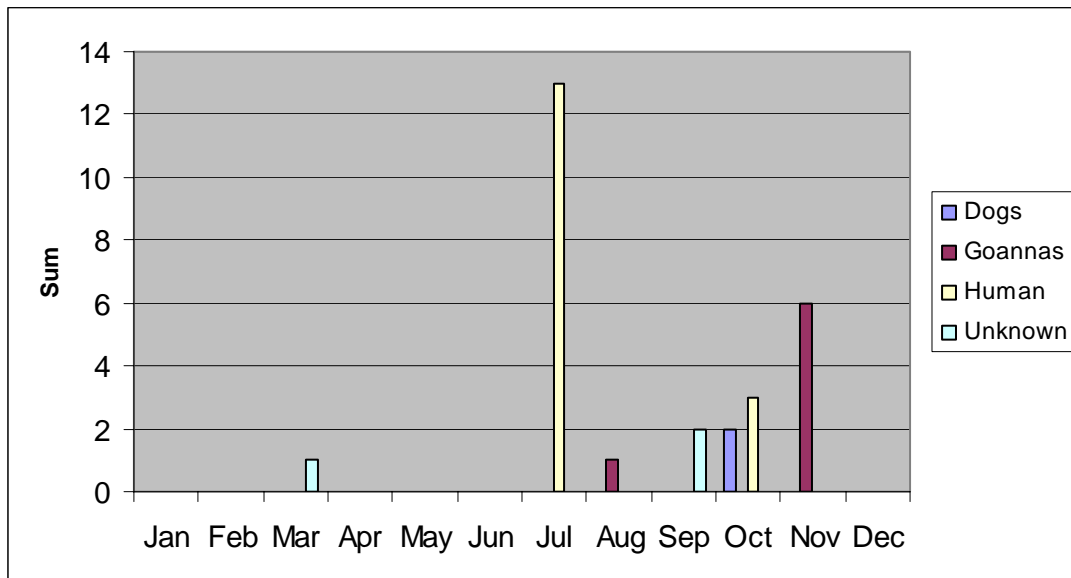


Figure 41. Sum of predation and traditional harvesting of Green Turtle nests between 1991 and 2004 across all bioregions in the NT by month of activity.

As with Flatback Turtles most animal predation occurred on mainland beaches or large islands because they supported permanent populations of the larger predatory *Varanus panoptes* goanna or dingos/dogs.

Pig predation on Green Turtle nests was only recorded on Bathurst Island. Despite the large number of pigs in wetlands and rainforests adjacent to many Green Turtle nesting beaches around the NT coast they were not recorded predated on Green Turtle nests at any other places.

Traditional harvest of eggs was influenced by the location of the nesting beach in relative to communities or outstations, and also the availability of vehicles and/or boats in a working condition. Islands further away from communities or further offshore were less often harvested, but beaches able to be easily accessed were often continually harvested.

The sum of all traditional harvest and predation throughout the project by bioregion showed that most occurred in the Cobourg and Groote Bioregions (Figure 42).

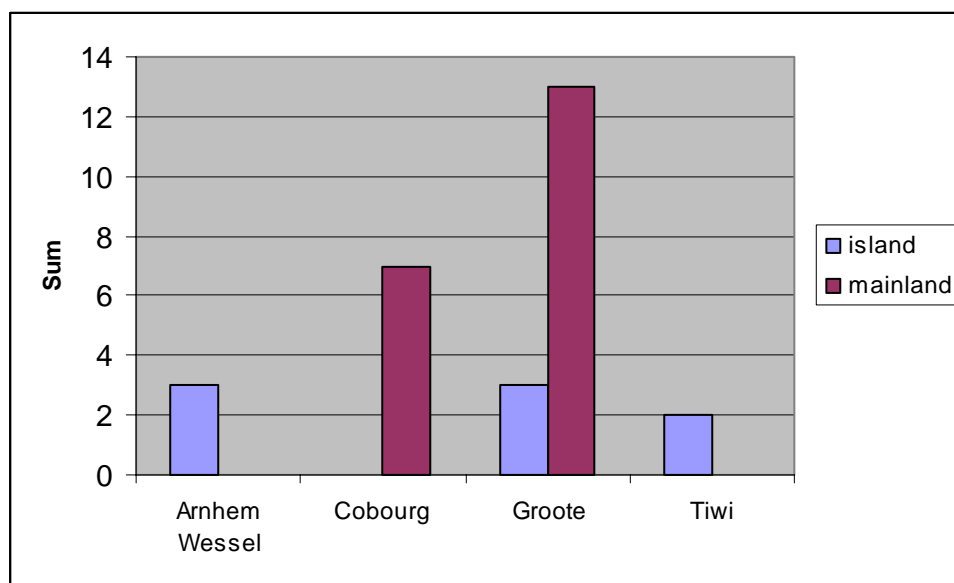


Figure 42. Sum of predation and traditional harvesting of Green Turtle nests between 1991 and 2004 in bioregions across the NT on islands and mainland areas.

Other measurements

Random measurements taken of track widths, clutch size and egg diameter are shown in Table 13.

Green Turtle eggs were the second largest in size and also clutch number of the four species that regularly breed in the NT. Although variation in track width is influenced by a number of factors additional to turtle size, Green Turtles in general had the widest of the tracks.

Table 13. Track width, clutch size and egg size measurements for Green Turtles in the NT.

	Mean	Min	Max	N
Track width (mm)	1084.82	900	1200	61
Clutch size	86.50	82	91	2
Egg size (mm)	43.11	40.5	46	18

Flatback and/or Green Turtle records

Geographic distribution and important nesting locations

Many records were collected as a mix of Flatback and/or Green Turtles during aerial surveys where tracks or nests could not be confirmed to either species, but could be confirmed as not belonging to Hawksbills and/or Olive Ridley Turtles. (See methods for further explanation). Flatback and/or Green Turtle tracks/nests were recorded primarily to assist in indicating numbers (or at least potentially important sites) of either or both species nesting in an area, and/or increase the overall NT nesting range of each species.

Flatback and/or Green Turtle tracks/nests were recorded from all around the NT coast, although to some extent this is to be expected given the combined nesting distribution of the two individual species.

Most Flatback and/or Green Turtle tracks/nests records relate to island nesting rather than mainland nesting (Figure 43).

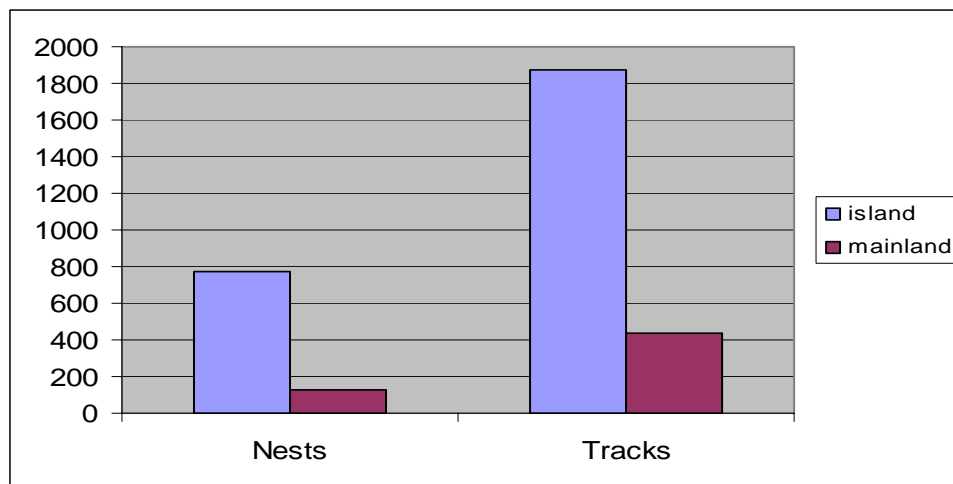


Figure 43. Total number of Flatback and/or Green Turtle nests and tracks recorded on islands and mainland areas between 1991 and 2004 in the NT.

Comparing the total distribution of all confirmed records of Flatback or Green Turtles (Figure 74 and Figure 80) individually to the distribution of all Flatback and/or Green Turtle combination records (Figure 87) shows areas where one or both of the individual species nesting range could be increased. Such areas are mentioned in the discussion, and indicated by an * in each of Figure 10 and Table 12, in the individual species summaries. Consequently, a separate table of significant Flatback and/or Green Turtle records is not included here. However, further detail can be seen in Table 20, Appendix D, which shows nesting numbers recorded per coast section.

Numbers

Flatback and/or Green Turtle nesting was recorded on 547 occasions. These records totalled 3 841 tracks/nests. Behind unidentified turtle *spp.* and Flatback records this number of records and total track/nest count is the next highest. It is also respectively two and four times higher than the relevant figures for Hawksbill and/or Olive Ridley Turtle records, which are the other paired species records.

Seasonality of nesting

This section is not overly appropriate for a combined species series of records and so will not be discussed. Nevertheless, Figure 81 to 78 in Appendix D show the numbers of tracks and nests recorded

per month for each bioregion as the data may be of some use in the future if further surveys detail particular species to specific areas.

Animal predation and traditional harvesting of nests

Flatback and/or Green Turtle nest predation was recorded as taken was mostly by dogs or goannas. Most of this was recorded in January, April, September and October (Figure 44). Predation on islands was higher than mainland (Figure 45). Predation on each or the individual species is discussed in more detail under each of the species.

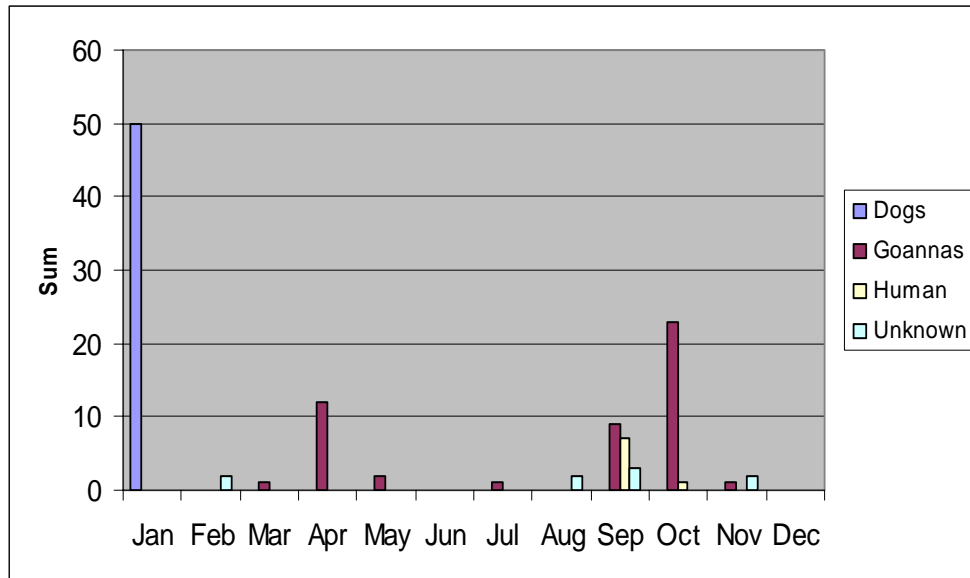


Figure 44. Sum of predation and traditional harvesting of Flatback and/or Green Turtle nests between 1991 and 2004 across all bioregions in the NT by month of activity.

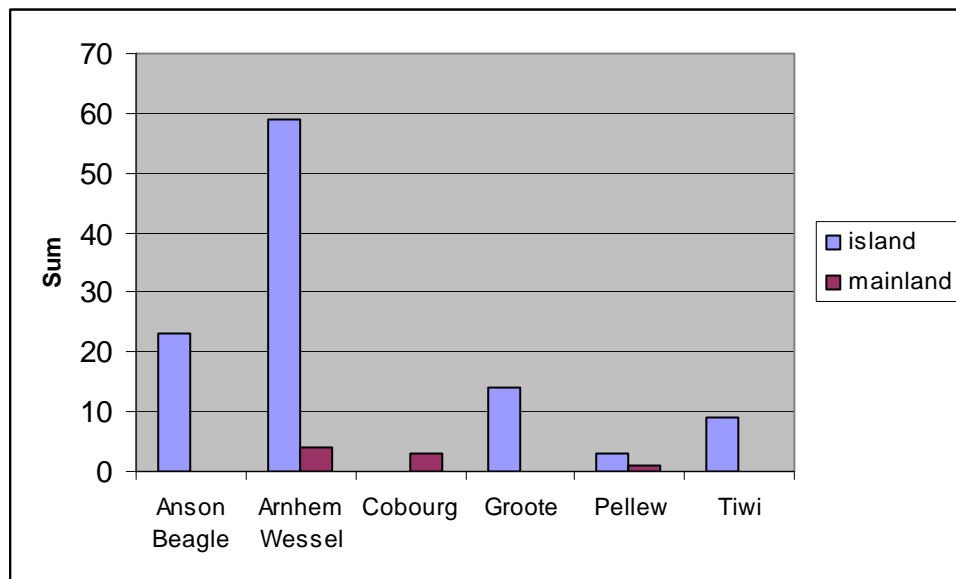


Figure 45. Sum of predation and traditional harvesting of Flatback and/or Green Turtle nests between 1991 and 2004 in bioregions across the NT on islands and mainland areas.

Hawksbill Turtle

Legal and Conservation Status

NT [Territory Parks and Wildlife Conservation Act (2006)]

Legal Status - Protected Wildlife

Conservation Status - Data Deficient *

(* NB. This status was derived prior to information produced in this report and may change subject to consideration of data from these surveys).

AUSTRALIA [Environment Protection and Biodiversity Conservation Act (1999)]

Conservation Status - Vulnerable

INTERNATIONAL [International Union for the Conservation of Nature]

Conservation Status - Critically Endangered

Geographic distribution of nesting locations

Hawksbill Turtle (*Eretmochelys imbricata*) nesting was not confirmed along the western coast of the NT and infrequently recorded across most of the northern coast or the eastern coast south of Groote Eylandt. The vast majority of the Hawksbill Turtle nesting recorded during these surveys was observed in the area from the Bromby Island chain (just north of Nhulunbuy) south to Groote Eylandt. Nearly all Hawksbill Turtle nesting was on islands (Figure 46).

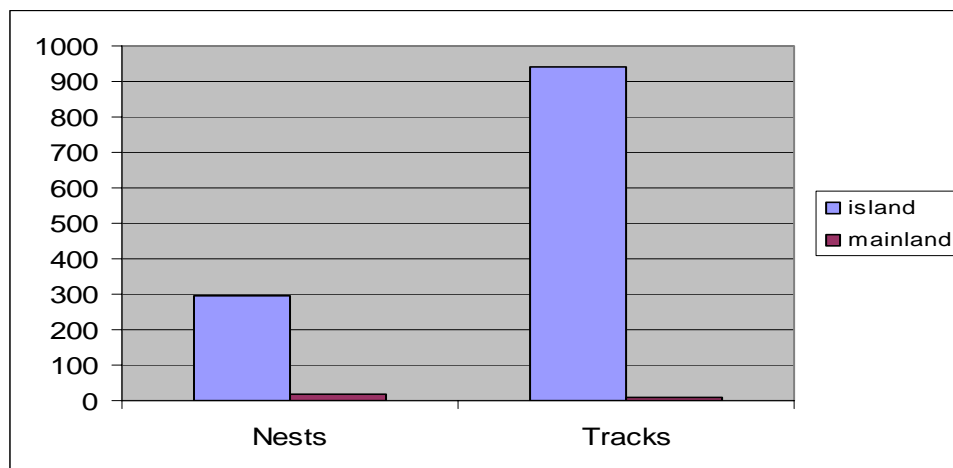


Figure 46. Total number of Hawksbill Turtle nests and tracks recorded on islands and mainland areas between 1991 and 2004 in the NT.

Of the four marine turtle species that regularly nest in the NT the Hawksbill Turtle is the species that is least likely to nest on mainland (or large island) beaches. Hawksbill Turtles were recorded as mostly preferring to nest on smaller islands, and more often up under trees (often She-oaks) or against rocks compared to other species.

The location of confirmed NT Hawksbill Turtle nesting areas recorded during these surveys is shown in Figure 90, Appendix E. This distribution map only includes records confirmed to species level.

(Because of the high numbers involved in unconfirmed species counts, this map does not include all Hawksbill Turtle nesting areas, or necessarily the true number ranges, so it is included in the Appendix rather than here. See also related Methods discussion).

By comparing the confirmed Hawksbill Turtle distribution with those for Hawksbill and/or Olive Ridley Turtle nesting records (Figure 99, Appendix G) and unknown turtle species nesting records (Figure 108, Appendix H) there is little indication of other likely significant Hawksbill Turtle nesting sites, suggesting the confirmed species map gives a good coverage of significant Hawksbill Turtle nesting sites. Sites with higher numbers (where the total of sets of tracks and/or nests is >20 for all surveys combined) of confirmed Hawksbill tracks/nests can also be seen in Table 21, Appendix E.

Significant Nesting Areas Table 14 lists areas within each bioregion where confirmed and inferred significant Hawksbill Turtle nesting was located. Sandy Island is the only area where Hawksbill Turtles were likely to be a significant user of a nesting beach that had high counts of unconfirmed species. This is shown in this table as marked with an '*' in terms of this area being inferred. All sites in Table 14 are numbered and mapped in Figure 47.

Each of these significant sites has been individually discussed in the individual coast section summaries earlier in this report. The relevant coast section numbers are also listed in Table 14.

Table 14. Significant areas of Hawksbill Turtle nesting located across the NT between 1991 and 2004.

Bioregion	Significant Area (* = Inferred as highly likely from unconfirmed species counts)	Figure 47 Map Ref. No.	Relevant Coast Section(s) Ref. (Refer 'Nesting Activity Within Bioregions' section of report)
Arnhem/Wessel	Truant Is.	1	6.45
	Bromby Chain of Islands	2	6.46
Groote	Bremer Is and East Bremer Islet	3	7.1
	Bridgland Is.	4	7.6
	Dudley Is.	5	7.7
	Hawk Is.	6	7.27
	Lane Is.	7	7.28
	North East Isle	8	7.29
	Ungwariba Pt. to Cape Beatrice (some beaches)	9	7.34
	Small Islands off SE Groote (some)	10	7.35
	Small Islands off Cape Beatrice (some)	11	7.36
	Small Islands off Marangala Pt. (some)	12	7.37
	Cape Beatrice to Inamalamandja Pt. (some beaches)	13	7.38
Pellew	Sandy Is. *	14	8.1

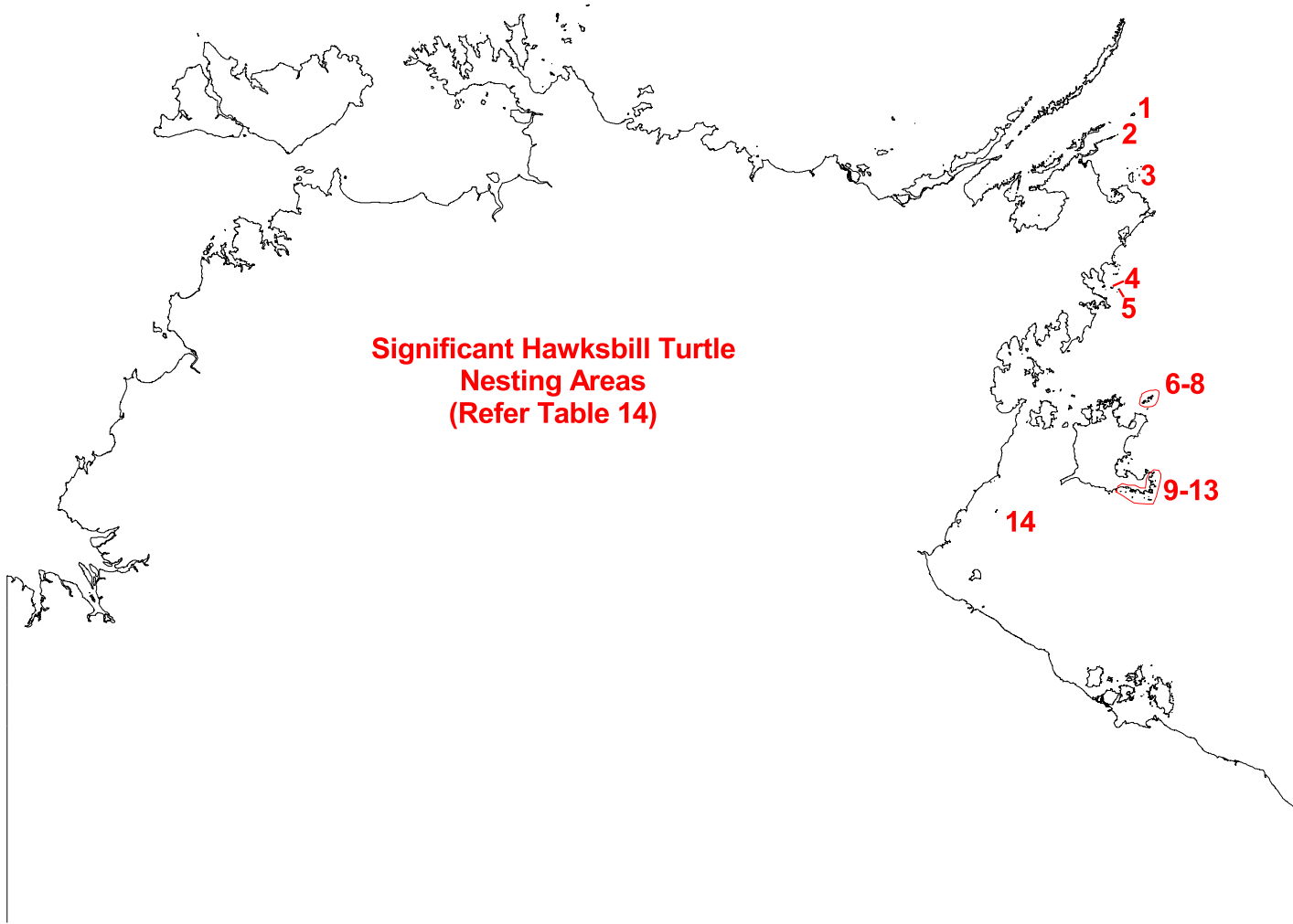


Figure 47. Significant Hawksbill Turtle nesting area in the NT. (Refer Table 14).

Numbers

Throughout the surveys there were 190 records totalling 1 296 nests and/or tracks for Hawksbill Turtles. These included both old and fresh tracks/nests. They represented 11% of all records confirmed to individual species level and 16% of the total number of tracks/nests confirmed to species level. These figures show that the Hawksbill Turtle had the lowest number of records for the confirmed species and the second lowest total numbers of tracks/nests, ahead of the Olive Ridley Turtle. The low number of records is consistent with the smaller geographic distribution of Hawksbill Turtle nesting in the NT relative to the other species (especially Flatback Turtles).

There were also 237 additional records totalling 912 tracks/nests of Hawksbill and/or Olive Ridley Turtles combined, and 2 583 records totalling 31 557 tracks/nests of unknown species. Hawksbill Turtles would have been a significant part of the mixed Hawksbill and/or Olive Ridley Turtle tracks/nests on islands in the area between the Bromby Islands and Groote Eylandt, but probably not elsewhere.

As the counts of Hawksbill and/or Olive Ridley Turtle tracks/nests were considerably less than Flatback and/or Green Turtle tracks/nests, this suggests that the percentage of Hawksbill Turtles likely to be part of the very large unknown species counts would not be as high as for Flatback or Green Turtles.

Seasonality of nesting

Throughout the NT fresh Hawksbill Turtle nests were confirmed in every month of the year except November and December, but this was probably a reflection of a lack of appropriately timed surveys rather than no nesting, as Pushpa Palaniappan (*pers. comm.*) collected eggs in February whose age suggested nesting in December. Most Hawksbill Turtle nesting was recorded around the September/October period, but their main nesting period is likely to extend past October. These surveys could not show any evidence of geographical timing of nesting, mostly because Hawksbill Turtle nesting was only recorded in a small area. There are only two bioregions for which reasonable Hawksbill Turtle nesting was recorded (Figure 88 and Figure 89, Appendix E).

Animal predation and traditional harvesting of nests and hatchlings

Hawksbill Turtles were the species targeted for egg predation in only 2 of 79 separate incidents that were confirmed to species level. Both of these were in the Groote Eylandt area. This relative low figure of 3% of records is determined in part in the apparent preference of Hawksbill Turtles to nest on islands where goannas and dogs were not present.

Other measurements

Random measurements taken of track widths, clutch size and egg diameter are shown in Table 15.

Hawksbill Turtle eggs were the smallest of the four species, while their clutch size was similar to Olive Ridley Turtles as the largest. Although variation in track width is influenced by a number of factors additional to turtle size, Hawksbill Turtles in general had the second narrowest of the tracks.

Table 15. Track width, clutch size and egg size measurements for Hawksbill Turtles in the NT.

	Mean	Min	Max	N
Track width (mm)	729.29	650	800	21
Clutch size	108.33	62	158	3
Egg size (mm)	35.78	33.3	37.8	34

Olive Ridley Turtle

Legal and Conservation Status

NT [Territory Parks and Wildlife Conservation Act (2006)]

Legal Status - Protected Wildlife

Conservation Status - Data Deficient *

(* NB. This status was derived prior to information produced in this report and may change subject to consideration of data from these surveys).

AUSTRALIA [Environment Protection and Biodiversity Conservation Act (1999)]

Conservation Status - Endangered

INTERNATIONAL [International Union for the Conservation of Nature]

Conservation Status - Endangered

Geographic distribution of nesting locations

Existing information indicates Olive Ridley (*Lepidochelys olivacea*) nesting in Australia extends from the western coastline of Cape York, in the east, westward to Fog Bay, NT (see Whiting, 1997). These surveys extended the western range to Port Keats, which is about 200 km further to the south west along the NT coast.

Olive Ridley Turtles were recorded nesting in all bioregions of the NT, though far less frequently in the more southern latitudes. They were recorded nesting on both mainland and on island beaches, but mainly the latter (Figure 48, Appendix F). Although nesting mainly on islands like the Hawksbill Turtle, Olive Ridley Turtles would nest on large islands such as the Tiwi Islands and Groote Eylandt. (These could almost be classed as ‘mainland’ type beaches compared to the small islands on which Hawksbill Turtles appeared to prefer to nest).

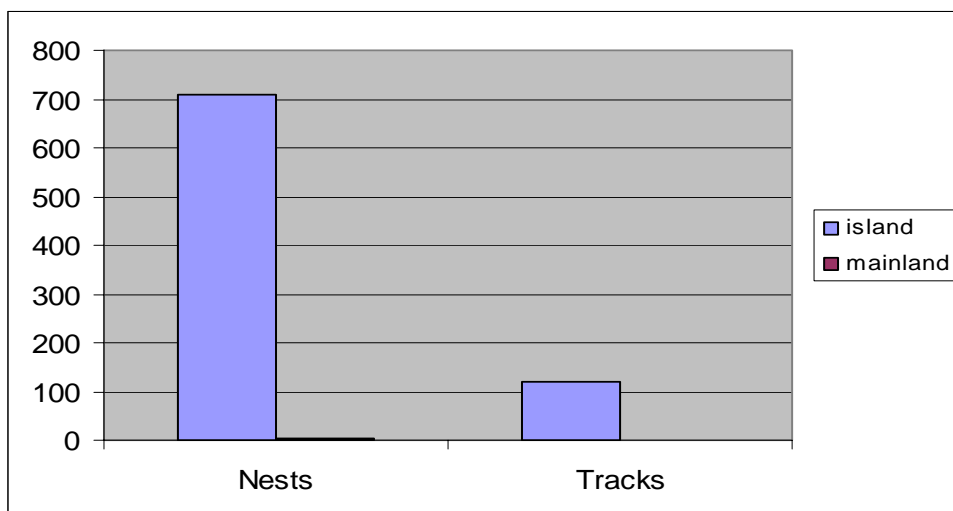


Figure 48. Total number of Olive Ridley Turtle nests and tracks recorded on islands and mainland areas between 1991 and 2004 in the NT.

Olive Ridley Turtles had a somewhat different nesting method compared to the other species. They rarely walked far from water to nest, most choosing to nest just above the high tide line. This meant that waves during high tides would sometimes flow briefly over the nest site. They also dug a much shallower nesting chamber than the other species, and then flattened the nesting area to remove sign of a nesting pit by raising and lifting their bodies and pounding the nesting area flat. As such it was much harder to detect nests of this species compared to the other species that walked further up beaches (leaving longer crawl trails) and that also left a nesting pit on completion of nesting.

The location of confirmed NT Olive Ridley Turtle nesting areas recorded during these surveys is shown in Figure 93, Appendix F. This distribution map only includes records confirmed to species level. (Because of the high numbers involved in unconfirmed species counts, this map does not include all Olive Ridley Turtle nesting areas, or necessarily the true number ranges, so it is included in the Appendix rather than here. See also related Methods discussion).

By comparing the confirmed Olive Ridley Turtle distribution with those for Hawksbill and/or Olive Ridley Turtle nesting records (Figure 99, Appendix G) and unknown turtle species nesting records (Figure 108, Appendix H) a small number of additional areas of likely significant Olive Ridley Turtle nesting can be inferred. For example, Drysdale and Stevens Islands in the east of the Arnhem/Wessel Bioregion are shown in Figure 97 as significant Hawksbill and/or Olive Ridley Turtle nesting area, but the general distribution of Olive Ridley Turtles compared to Hawksbill Turtles in this area suggest these records are more likely to include substantial Olive Ridley Turtle nesting.

Sites with higher numbers (where the total of sets of tracks and/or nests is >20 for all surveys combined) of confirmed Olive Ridley Turtle tracks/nests can also be seen in Table 22, Appendix F.



Plate 90. An Olive Ridley Turtle nesting during the morning on Melville Island. Photo R. Chatto.

Significant Nesting Areas

Table 16 lists areas within each bioregion where confirmed and inferred significant Olive Ridley Turtle nesting was located. Areas where Olive Ridley Turtle are likely to be a significant part of a nesting beach that had high counts of unconfirmed species are included in this table and marked with an ‘*’ in terms of such being inferred. All sites in Table 16 are numbered and mapped in Figure 43.

Each of these significant sites has been individually discussed in the individual coast section summaries earlier in this report. The relevant coast section numbers are also listed in Table 16.

Table 16. Significant areas of Olive Ridley Turtle nesting located across the NT between 1991 and 2004.

Bioregion	Significant Area (* = Inferred as highly likely from unconfirmed species counts)	Figure 43 Map Ref. No.	Relevant Coast Section(s) Ref. (Refer 'Nesting Activity Within Bioregions' section of report)
Tiwi	Bathurst Is. (Some beaches West side, mostly towards north)	1	3.7
	Melville Is. (NW)	2	3.8 & 3.9
	Melville Is. (some beaches, Mid Nth)	3	3.10 & 3.11
	Melville Is. (some beaches, NE)	4	3.12
	Grant Is.	5	5.12
	Lawson Is. *	6	5.14
	Oxley Is. *	7	5.15
	New Year Is. *	8	5.16
Arnhem Wessel	Mooroonga Is.	9	6.6
	NW Crocodile Is.	10	6.8
	Drysdale Is. *	11	6.13
	Burgungura Is.	12	6.15
	Stevens Is. *	13	6.16
	Raragala Is. (W)	14	6.21

Numbers

Throughout the surveys there were 246 records totalling 988 nests and/or tracks for Olive Ridley Turtles. These included both old and fresh signs. They represented 15% of all records confirmed to individual species level and 12% of the total number of tracks/nests confirmed to species level. These figures show that the Olive Ridley Turtle had the second lowest number of records for the confirmed species and the second lowest total numbers of tracks/nests, just ahead of the Hawksbill Turtle.

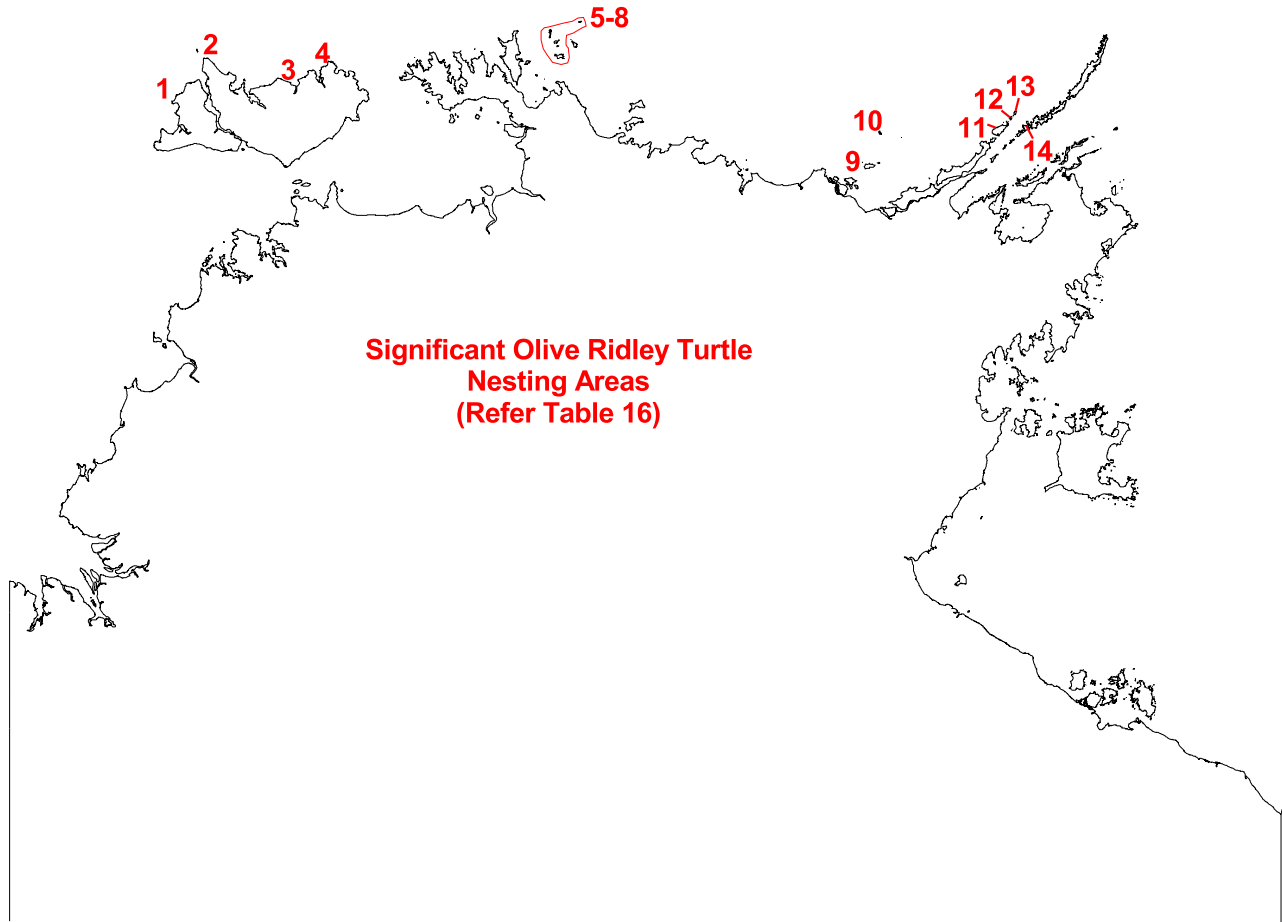


Figure 49. Significant Olive Ridley Turtle nesting area in the NT. (Refer Table 16).

There were also 237 additional records totalling 912 tracks/nests of Hawksbill and/or Olive Ridley Turtle combined, and 2 583 records totalling 31 557 tracks/nests of unknown species. Olive Ridley Turtles would have been a significant part of these mixed unconfirmed species records in the NE and NW of the Tiwi Islands and the islands to the NE of Elcho Island.

As the counts of Hawksbill and/or Olive Ridley Turtle tracks/nests were considerably less than Flatback and/or Green Turtle tracks/nests, this suggests that the percentage of Olive Ridley Turtles likely to be part of the very large unknown species counts would not be as high as for Flatback or Green Turtles.

Seasonality of nesting

Throughout the NT fresh Olive Ridley Turtle nests were confirmed or inferred in every month of the year. Nesting activity of Olive Ridley Turtles peaked in the Tiwi Bioregion in March, April and May, while in the Arnhem Wessel Bioregion its major nesting was recorded around September and October (Figure 91 and Figure 92, Appendix F).

Although this suggests some geographical variation with respect to nest timing in an east/west direction, there was no evidence to suggest such in more southerly latitudes as there was for other species. Nevertheless there was relatively little Olive Ridley Turtle nesting recorded in the more southern latitudes to compare potential differences.

Animal predation and traditional harvesting of nests and hatchlings

Olive Ridley Turtle eggs are laid in the shallowest of the marine turtle nests and are therefore more prone to predation by animals. Olive Ridley Turtles were the species targeted 35 of 79 (44%) separate incidents of predation confirmed to species level. Large numbers of Olive Ridley Turtle nests were taken by dogs and goannas in many locations. Predation was mainly recorded during the dry season which coincided with the majority of Olive Ridley Turtle nesting in the NT (Figure 50).

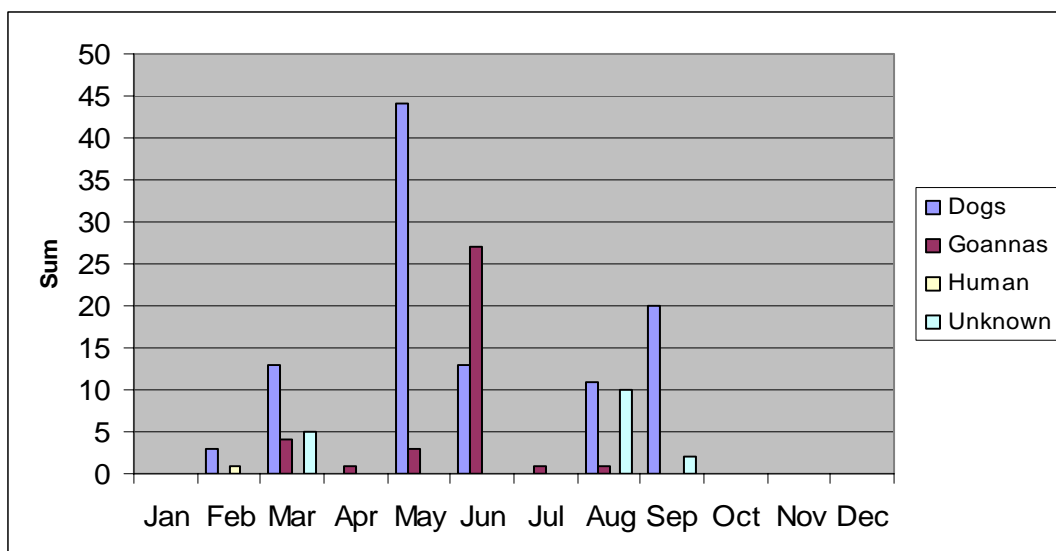


Figure 50. Sum of predation and traditional harvesting of Olive Ridley Turtle nests between 1991 and 2004 across all bioregions in the NT by month of activity.

Most egg predation was recorded on the Tiwi Islands (Figure 51). On Melville Island in particular, large numbers of eggs were recorded being taken by feral dogs along the northern shoreline. Dogs were baited at a number of locations along this shoreline in 2003 and 2004 (Chatto, 2004). This greatly improved subsequent hatchling emerging success. Olive Ridley Turtles were also among those that benefited from the dog baiting of Wigram Island (Coast section 6.43, this report).

Despite the large number of pigs in wetlands and rainforests adjacent to many turtle nesting beaches around the NT, records of pig predation were mainly restricted to Bathurst Island. Here they predated heavily on Olive Ridley Turtle nests.

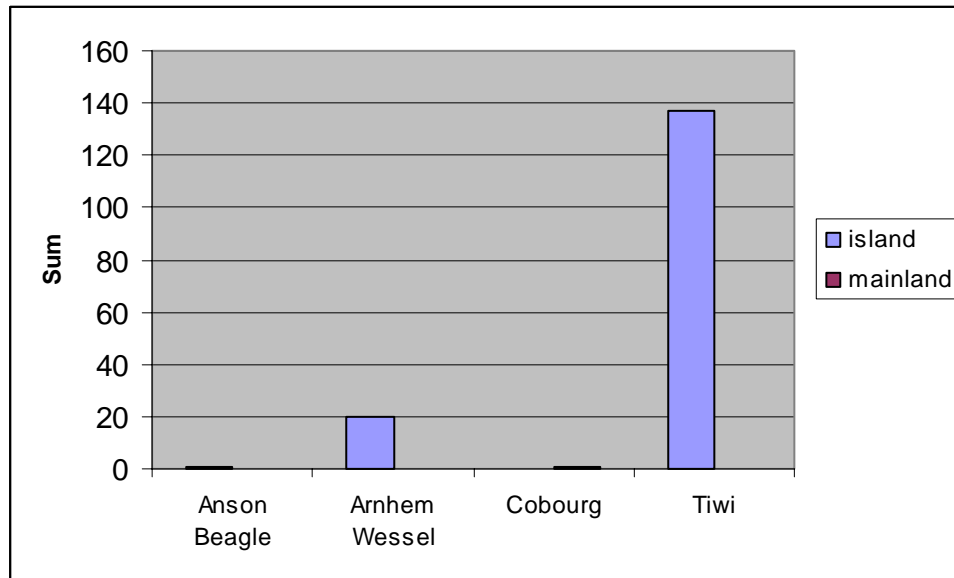


Figure 51. Sum of predation and traditional harvesting of Olive Ridley nests between 1991 and 2004 in bioregions across the NT on islands and mainland areas.

Other measurements

Random measurements taken of track widths, clutch size and egg diameter are shown in Table 17.

Olive Ridley Turtle eggs were the second smallest of the four species, but their clutch size was similar to Hawksbill Turtles, with both being greater than Flatback or Green Turtles. Although variation in track width is influenced by a number of factors additional to turtle size, Olive Ridley Turtles generally had the second narrowest of the tracks. In these surveys track widths were found to vary between 600mm and 850mm. Scott Whiting measured tracks on Cape Van Diemen to be 770-830 in dry sand and 760-820 in wet sand.

Table 17. Track width, clutch size and egg size measurements for Olive Ridley Turtles in the NT.

	Mean	Min	Max	N
Track width (mm)	706.35	600	850	26
Clutch size	106.17	42	140	6
Egg size (mm)	37.83	33	43.5	43

Hawksbill and/or Olive Ridley Turtle records

Geographic distribution of nesting locations

Many records were collected as a mix of Hawksbill and/or Olive Ridley Turtles during aerial surveys where tracks or nests could not be confirmed to either species, but could be confirmed as not belonging to Flatback and/or Green Turtles. (See methods for further explanation). These were recorded primarily to assist in indicating numbers (or at least potentially important sites) of either or both species nesting in an area, and/or increase the overall NT nesting range of each species.

Hawksbill and/or Olive Ridley Turtle tracks/nests were recorded from along the northern and eastern coasts of the Top End, although to some extent this is to be expected given the combined nesting distribution of the two individual species.

All Hawksbill and/or Olive Ridley Turtle tracks/nests records relate to island nesting, though some of the larger islands are effectively ‘mainlands’ (Figure 52).

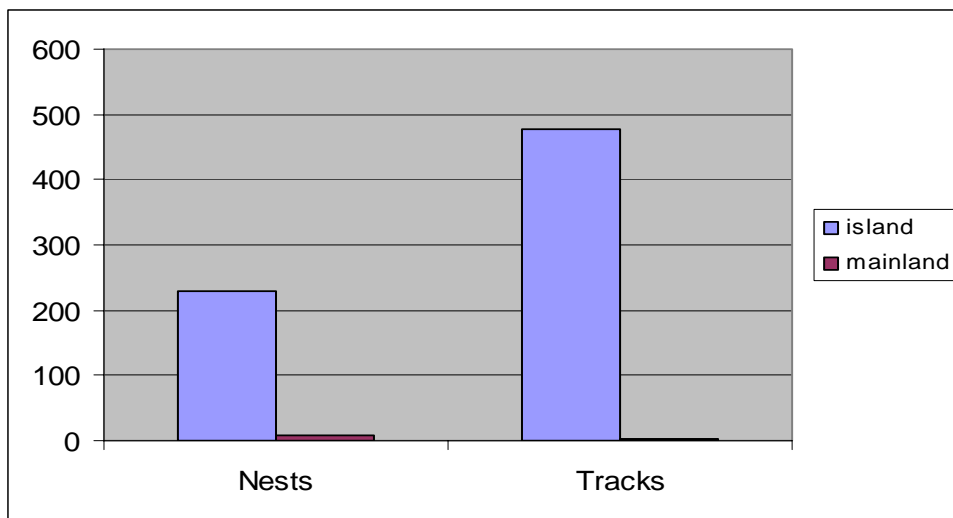


Figure 52. Total number of Hawksbill and/or Olive Ridley Turtle nests and tracks recorded on islands and mainland areas between 1991 and 2004 in the NT.

Comparing the total distribution of all confirmed records of Hawksbill and Olive Ridley Turtles (Figure 90 and Figure 93) individually to the distribution of all Hawksbill and/or Olive Ridley Turtle combination records (Figure 99) shows areas where one or both of the individual species nesting range could be increased. Such areas are mentioned in the discussion, and indicated by an * in each of Table 14 and 16, in the individual species summaries. Consequently, a separate table of significant Hawksbill and/or Olive Ridley Turtle records is not included here. However, further detail can be seen in

Table 23, Appendix G, which shows nesting numbers recorded per coast section.

Numbers

Hawksbill and/or Olive Ridley Turtle nesting was recorded on 237 occasions. These records totalled 912 tracks/nests. These were the lowest of each of the unconfirmed species records and total track/nest counts. It is also respectively two and four times less than the relevant figures for Flatback and/or Green Turtle records, which are other paired species records.

Seasonality of nesting

This section is not overly appropriate for a combined species series of records and so will not be discussed. Nevertheless, Figure 94 to 94, Appendix G show the numbers of tracks and nests recorded

per month for each bioregion as the data may be of some use in the future if further surveys can detail particular species to specific areas.

Animal predation and traditional harvesting of nests

Hawksbill and/or Olive Ridley Turtle nest predation was recorded as taken was mostly by dogs or goannas. Most of this was recorded in May and June (Figure 53). Predation on islands was recorded as much higher than mainland (Figure 54). Predation on each or the individual species is discussed in more detail under each of the species.

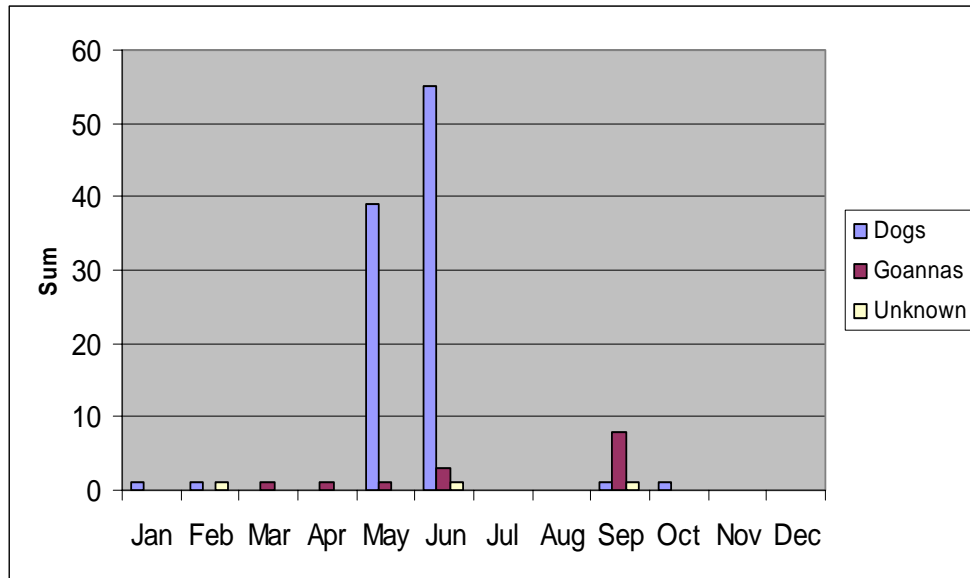


Figure 53. Sum of predation and traditional harvesting of a mix of Hawksbill and/or Olive Ridley Turtle nests between 1991 and 2004 across all bioregions in the NT by month of activity.

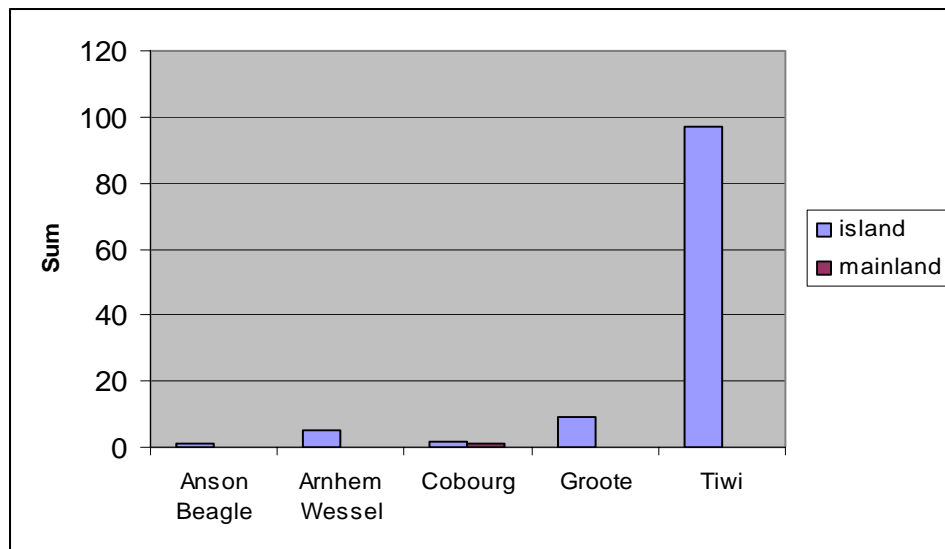


Figure 54. Sum of predation and traditional harvesting of Olive Ridley nests between 1991 and 2004 in bioregions across the NT on islands and mainland areas.

Unknown species records

Geographic distribution of nesting locations

Most turtle nesting records during these surveys were collected as a mix of unknown species. These were record which, for a number of reasons, did not have their tracks or nests confirmed to a particular species. These were recorded primarily to assist in indicating numbers (or at least potentially important sites) of marine turtle nesting in an area, and/or increase the overall NT nesting range of individual species.

Unknown species tracks/nests were recorded from all around the NT coast, although to some extent this is to be expected given the combined nesting distributions of all species combined.

Most unknown species tracks/nests records relate to island nesting (Figure 55).

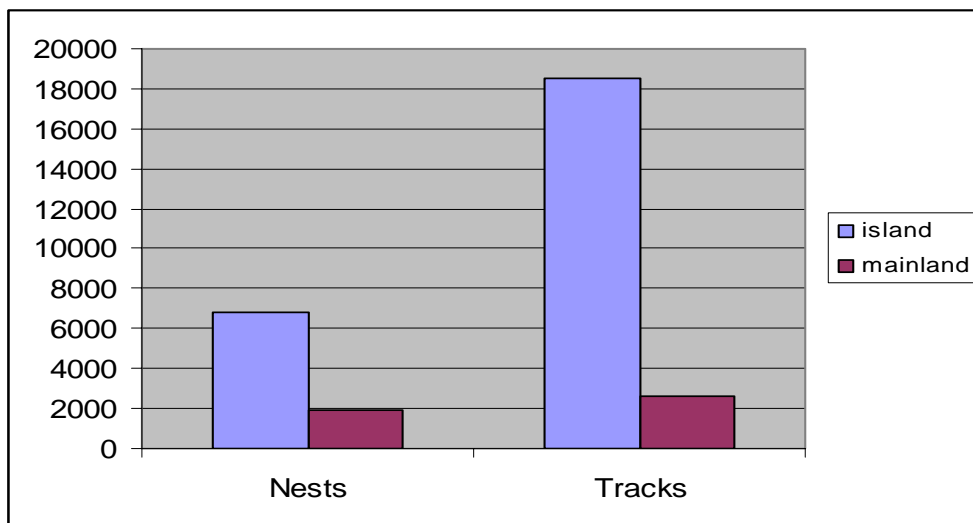


Figure 55. Total number of unknown species nests and tracks recorded on islands and mainland areas between 1991 and 2004 in the NT.

Comparing the total distribution of all confirmed records of individual species (Figure 74, Figure 80, Figure 90 and Figure 93) or paired species groups Flatback and/or Green Turtle (Figure 87) and Hawksbills and/or Olive Ridley Turtles (Figure 99) to the distribution of all significant counts of unknown species (Figure 108) shows at least eight areas where the unknown species records show likely significance for a species which was not individually confirmed in large numbers in that area. These areas include Whale Flat in Joseph Bonaparte Gulf (Flatback), some of the islands to the NE of Croker Island (mixed species), Mooroonnga Island (mixed species), part of the NE coast of Groote Eylandt (mixed species), Maria Island (Flatback), and West Island (Flatback) and the NE of Vanderlin Island (Green Turtle) in the Sir Edward Pellew Islands.

Significant records of unknown species that were used to assist in depicting important sites for individual species are all documented in the individual species sections. They are listed in the columns headed “likely to represent a significant part of unconfirmed species counts” in the tables associated with the respective species summary sections. Although a separate table of significant unknown species records is not included in this section, further detail can be seen in Table 24, Appendix H, which shows nesting numbers recorded per coast section.

Numbers

Unknown species nesting was recorded on 2 584 occasions. These records totalled 31 557 tracks/nests. These were clearly higher in the number of records and total track/nest counts than for any single species or species grouping.

Seasonality of nesting

This section is not overly appropriate for a combined species series of records and so will not be discussed. Nevertheless, Figure 100 to 105, Appendix H show the numbers of tracks and nests recorded per month for each bioregion as the data may be of some use in the future if further surveys can detail particular species to specific areas.

Animal predation and traditional harvesting of nests

Unknown species nest predation was recorded as taken mostly by dogs, goannas or unknown predators. Most of this was recorded in the April to September period (Figure 56). Predation on islands was recorded as much higher than mainland (Figure 57). Most unknown species were predated in the Arnhem Wessel Bioregion, where ground access to identify predators was difficult.

Where dingo or feral dog numbers were higher, goanna numbers were lower, but if the dogs were removed the goanna numbers increased and the eggs were still taken, though in generally lesser numbers (Chatto, *pers. obs.*). Observations during the surveys suggested that although goannas are better at finding nests they do not eat as many eggs each time.

Predation on each or the individual species is discussed in more detail under each of the species.

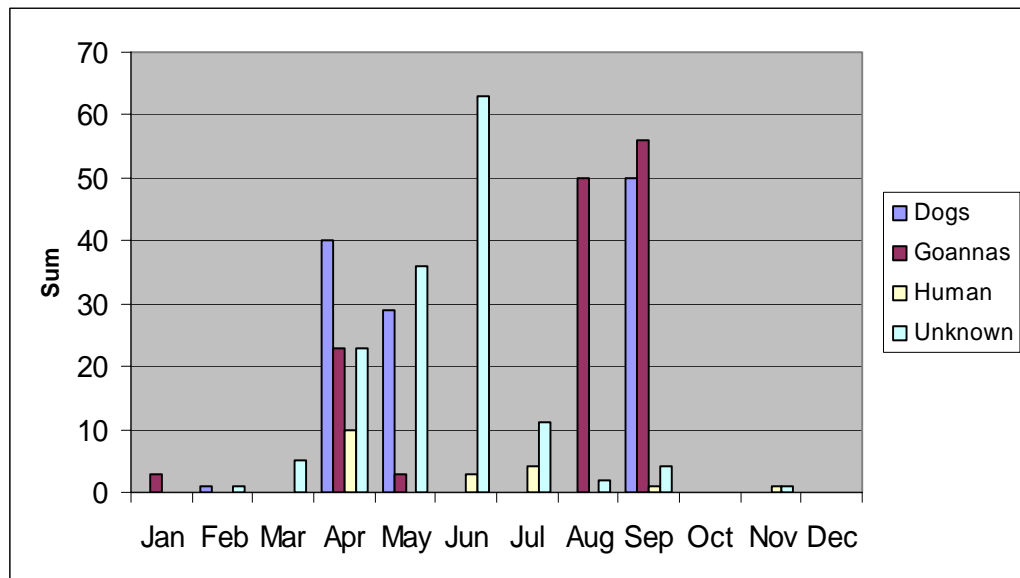


Figure 56. Sum of predation and traditional harvesting of unknown species of marine turtle nests between 1991 & 2004 across all bioregions in the NT by month of activity and predation type.

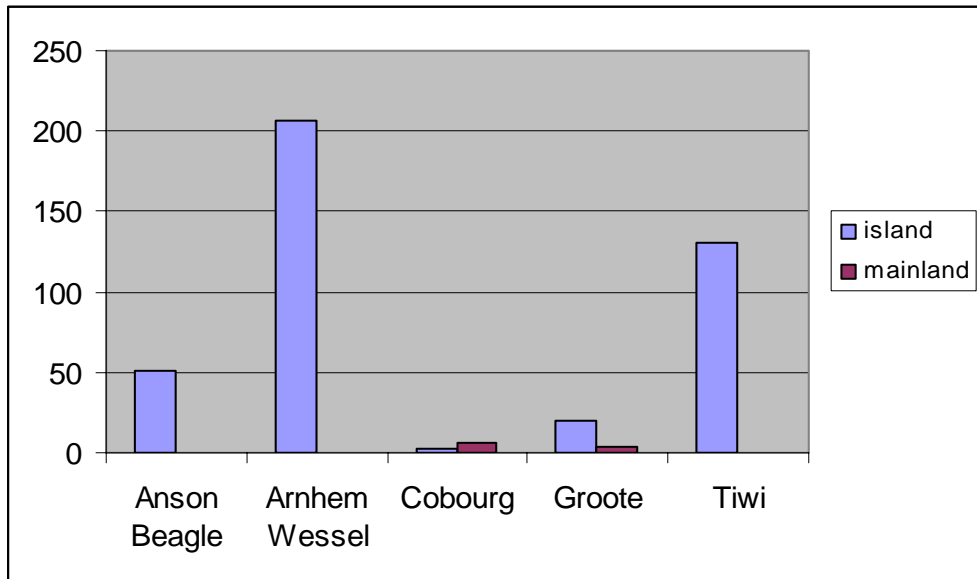


Figure 57. Sum of predation and traditional harvesting of unknown species of marine turtle nests between 1991 and 2004 in bioregions across the NT on islands and mainland areas.



Plate 91. Young Green Turtle caught in discarded foreign fishing net south of Cape Arnhem, May 1996. Photo M. Stevens.

Leatherback Turtle

Legal and Conservation Status

NT [Territory Parks and Wildlife Conservation Act (2006)]

Legal Status - Protected Wildlife

Conservation Status - Vulnerable

AUSTRALIA [Environment Protection and Biodiversity Conservation Act (1999)]

Conservation Status - Vulnerable

INTERNATIONAL [International Union for the Conservation of Nature]

Conservation Status - Critically Endangered

Geographic Distribution, Numbers and Seasonality

The Leatherback Turtle (*Dermochelys coriacea*) is normally distributed in tropical and temperate waters, with large numbers feeding off the southern Queensland, New South Wales, and Western Australian coasts. There are no large rookeries in Australia, but scattered nesting has been previously recorded in Queensland and the NT (Limpus, 2004).

The only nesting confirmed for Leatherbacks during this project was at Danger Point on the Cobourg Peninsula. Probable tracks at this site were recorded from an aerial survey in December (1996) but a ground survey which subsequently confirmed nesting at this site was not able to be done until April (2004).

Nesting at the same site has been noted by Park Ranger Peter Fitzgerald in the two to three years prior to, and including 2007. Each possible nesting was in the December/January period. In late January 2007 Marine Biodiversity Group Scientist Dr. Scott Whiting visited the site with Fitzgerald to further investigate. At this time Whiting noted an unknown number of turtles had laid 13 nests or nesting attempts in early January (Whiting, *pers. comm.*). Unfortunately the success or otherwise of these nests was not followed up because of flooding to the access road and other Park priorities. It is aimed to investigate any further nesting in future years.

Anecdotal information passed on to the RC over the years has suggested the species had been observed nesting at this site and on Croker Island prior to this project (former Park Ranger F. Woerle, *pers. comm.*). Other information includes very occasional nesting many years ago in the Sir Edward Pellews (S. Johnson, *pers. comm.*) and that a single animal came up onto Elcho Island in the late 1990s but was disturbed by people and did not nest.

Loggerhead Turtle

Legal and Conservation Status

NT [Territory Parks and Wildlife Conservation Act (2006)]

Legal Status - Protected Wildlife

Conservation Status - Endangered

AUSTRALIA [Environment Protection and Biodiversity Conservation Act (1999)]

Conservation Status - Endangered

INTERNATIONAL [International Union for the Conservation of Nature]

Conservation Status - Endangered

Geographic Distribution

The Australian breeding population of the Loggerhead Turtle (*Caretta caretta*) has two independent genetic groups, one on the eastern coast centred in the southern Great Barrier Reef and adjacent mainland near Bundaberg, and one on the western coast centred on the area from the southern Northwest Shelf to Shark Bay (Limpus, 2004).

Nesting was not observed for this species in these surveys, nor has it been previously documented in the NT. Although Loggerheads were recorded on a number of occasions as by-catch in inshore water prawn trawls along the eastern and northern coasts of the NT (Robins *et. al.*, 2002) and were reported to RC by Aboriginal hunters as being seen and caught from time to time, there was only the single confirmed sighting during this project. This was an adult observed by RC as one of 100 turtles identified as part of an investigation into major shark gill net capture in Fog Bay in 1991.



Plate 92. A nesting Loggerhead Turtle – a sight yet to be recorded in the NT. Photo S. Whiting.

RECOMMENDATIONS

Future surveys and monitoring.

Although these surveys were not designed to exclusively target marine turtle nesting, and not all turtle nesting beaches were surveyed in all months, the results presented in this report clearly show that the NT has many highly significant nesting sites for marine turtles. They have also shown that most of these sites have not been largely affected by human activity. However, a number of locations may be compromised by high rates of predation on nests by humans, dogs/dingos and goannas. The surveys also show that there are still a lot of gaps that need further survey work in order to better identify species, numbers and seasonality of nesting, as well as year to year variations and any long term trends in nesting effort.

Filling these gaps may be a task that could be undertaken in conjunction with Indigenous sea ranger groups that have begun work at a number of locations. But even with these gaps, there is probably sufficient information to select a few sites for more detailed longer term monitoring. Future potential developments, ongoing site problems (e.g. excessive predation by feral animals) and the logistics and costs of ongoing and regular access to sites should also be given important consideration in the selection of such sites.

Although not considered explicitly in these surveys, future work should also look at locating and studying important feeding areas for marine turtles in the NT. There is still very little known about this and it is likely that the NT will be shown to have many significant feeding areas just as it has many significant nesting areas.

Additional specific research should be conducted into determining genetic variation across the NT and the national range. Such work would also include consultation with other Government Departments, NGO's and interest groups to encourage reporting of marine turtle strandings and incidents from which DNA samples can be obtained.

Work also needs to be done in relation to the predation of eggs from nests. This would include assessment of harvest by Indigenous people in relation to insuring future sustainable harvest levels, particularly in high take areas. Possibly more urgent, is the need to carry out ongoing predator control programs where feral animals are seriously impacting on the success of nesting in some areas e.g. the Tiwi Islands.

Further mapping

Mapping of beaches would provide more accurate information on the location of nesting and areas to manage. Mapping of NT beaches has been done for the Oil Spill Response Atlas (Wardrop and Ball, 2000), as is used by the Environment Protection Agency and other sections of NRETA, but this was unable to be assessed for this report. If these data are not at a resolution useful for mapping nesting using satellite imagery with classifications of beach sections would be the best approach.

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APPENDICES (ADDITIONAL NESTING DATA)

Appendix A – ALL SPECIES COMBINED

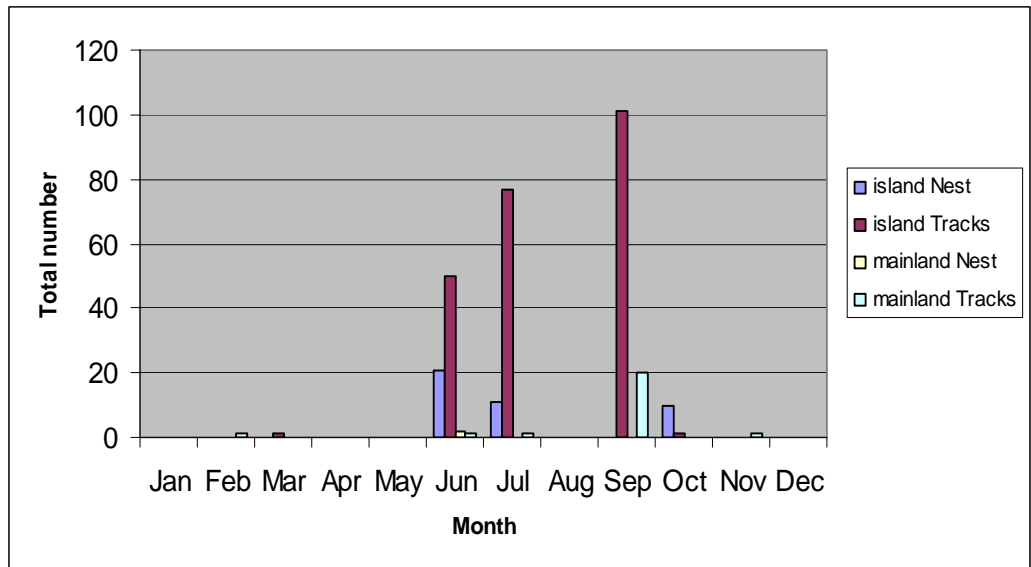


Figure 58. Sum of nests and tracks of all species for each month recorded between 1992 and 2004 for all species on mainland and island areas in the Cambridge-Bonaparte Bioregion.

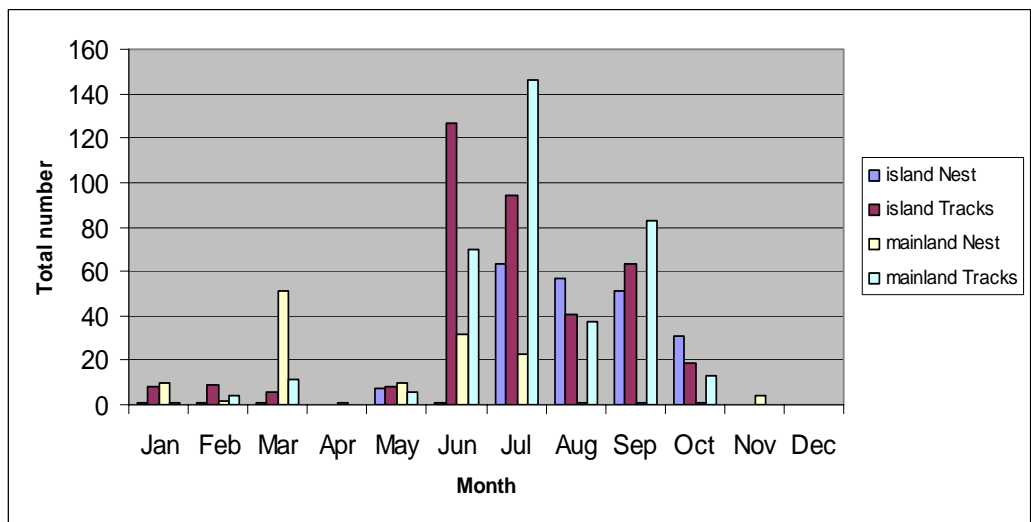


Figure 59. Sum of nests and tracks of all species for each month recorded between 1991 and 2004 for all species on mainland and island areas in the Anson Beagle Bioregion.

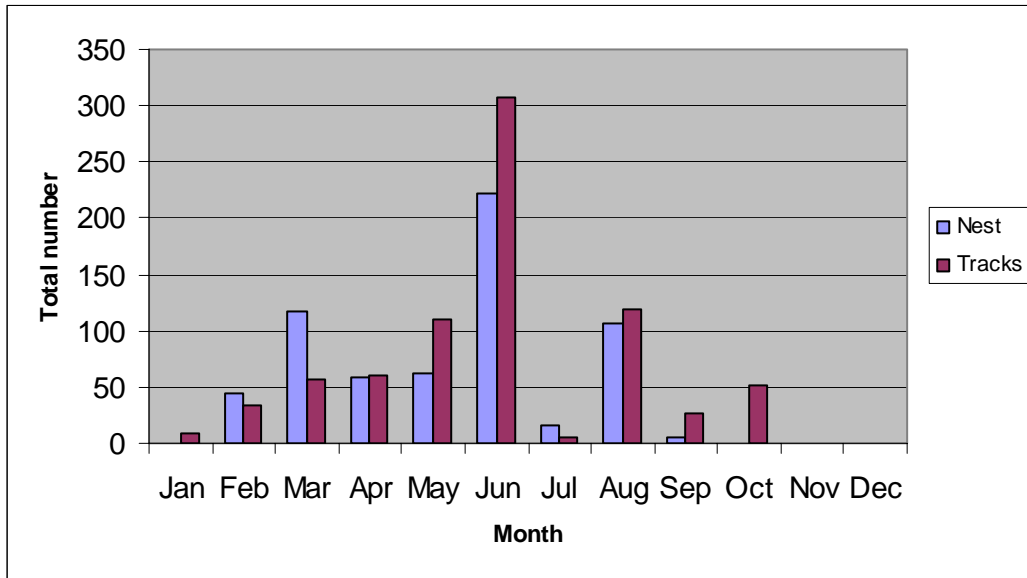


Figure 60. Sum of nests and tracks of all species for each month recorded between 1993 and 2004 for all species in the Tiwi Bioregion.

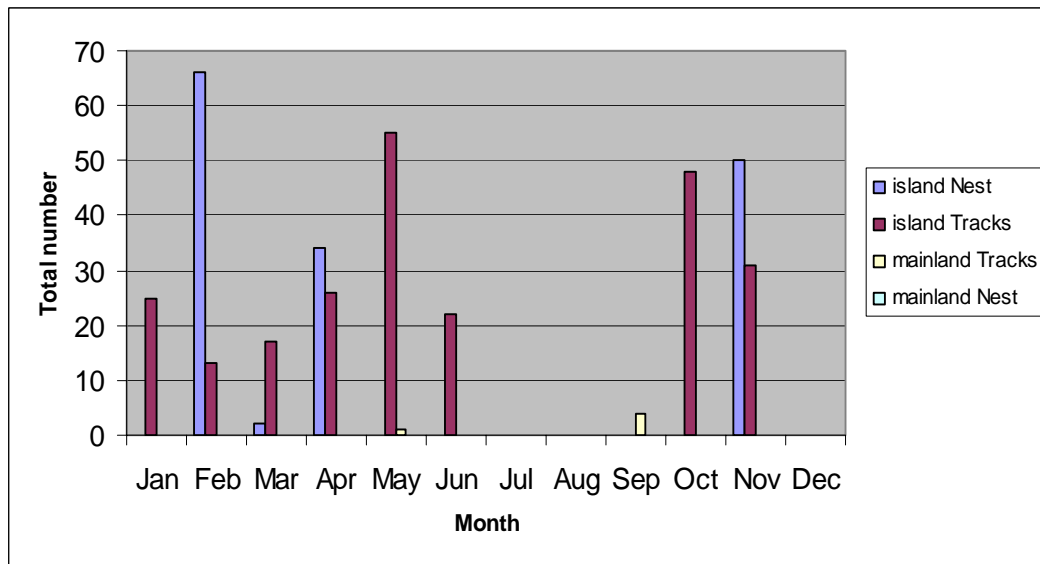


Figure 61. Sum of nests and tracks of all species for each month recorded between 1991 and 2004 for all species on mainland and island areas in the Van Diemens Gulf Bioregion.

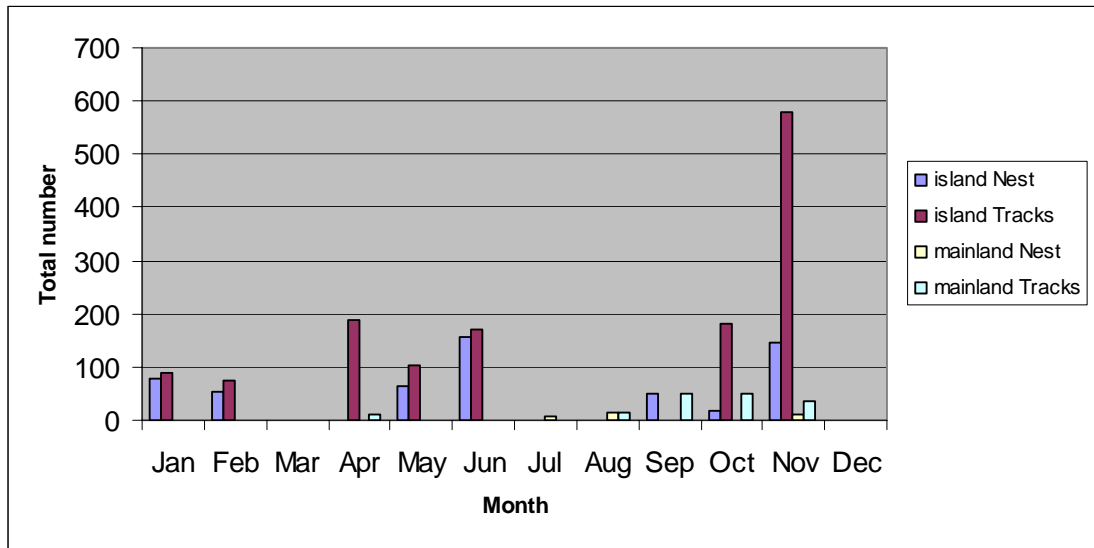


Figure 62. Sum of nests and tracks of all species for each month recorded between 1991 and 2004 for all species on mainland and island areas in the Cobourg Bioregion.

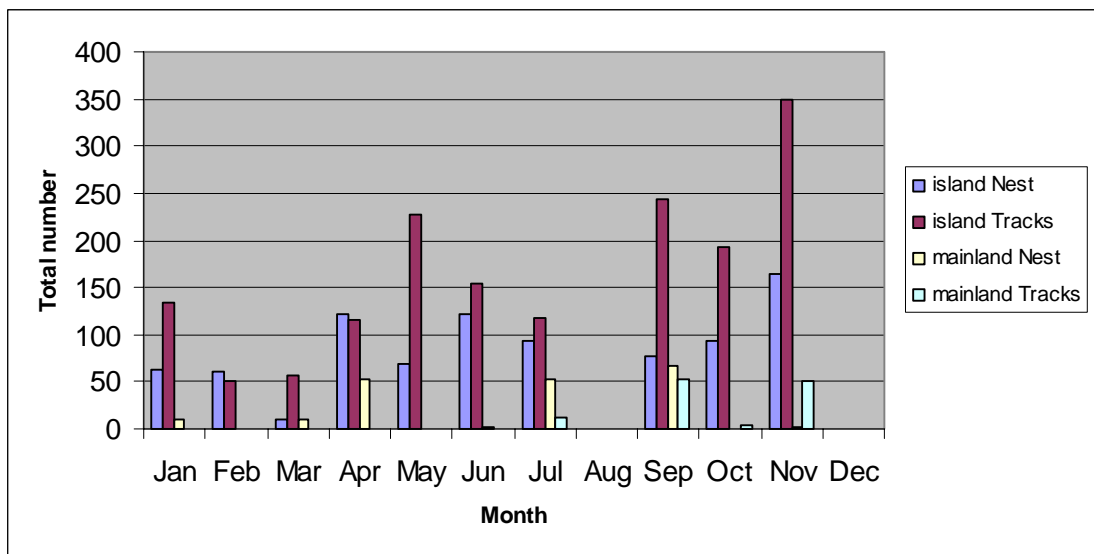


Figure 63. Sum of nests and tracks of all species for each month recorded between 1991 and 2004 for all species on mainland and island areas in the Arnhem Wessel Bioregion.

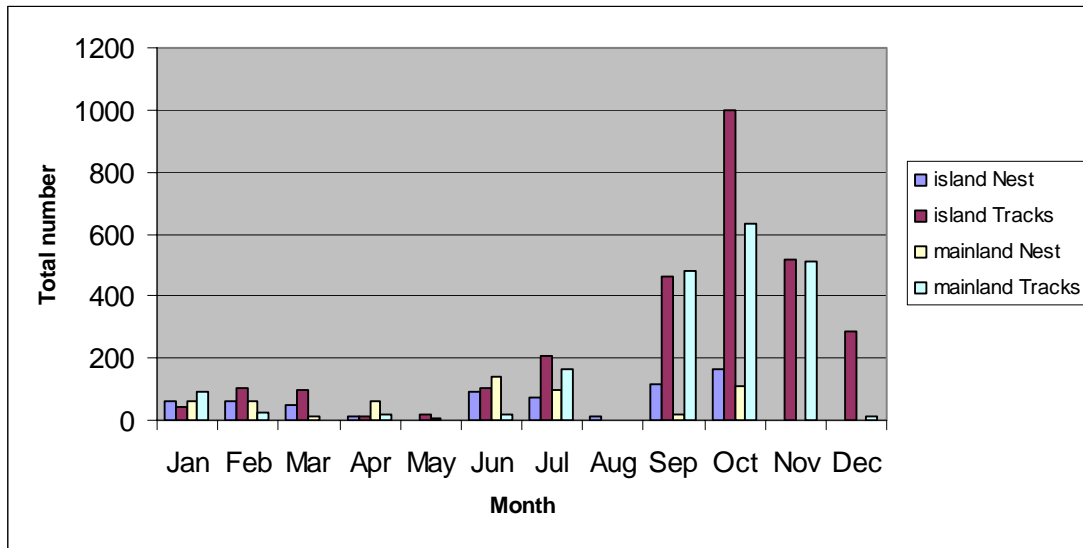


Figure 64. Sum of nests and tracks of all species for each month recorded between 1993 and 1999 for all species on mainland and island areas in the Groote Bioregion.

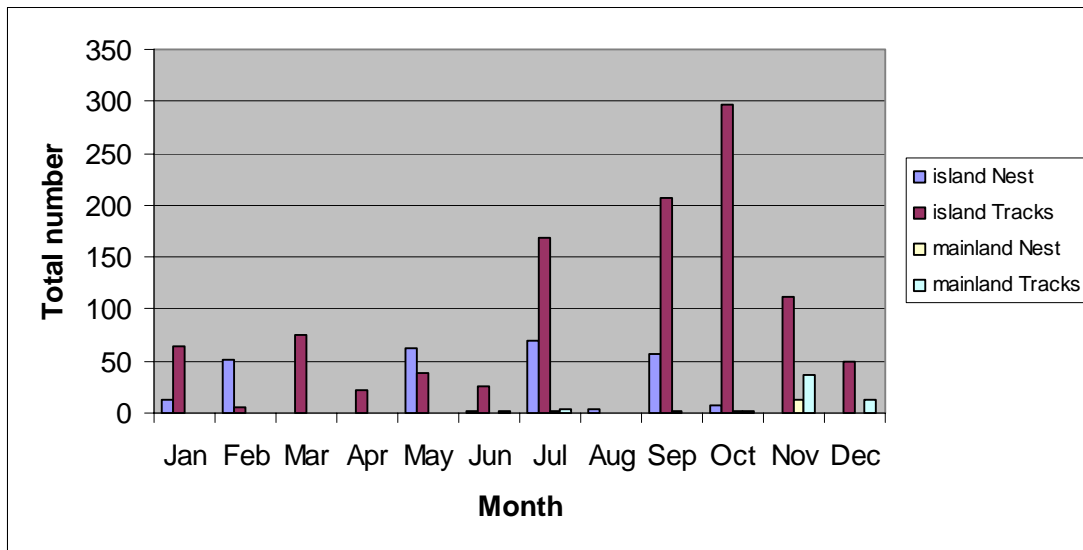


Figure 65. Sum of nests and tracks of all species for each month recorded between 1993 and 2004 for all species on mainland and island areas in the Pellew Bioregion.

Appendix B – FLATBACK TURTLE

Table 18. Areas of higher numbers of Flatback Turtle nesting (for coast areas where the combined sum of tracks and nests >20 for all surveys) recorded between 1991 and 2004. Length of coast section calculated using AUSLIG 100k coast feature.

Bioregion	Coast section (coast number)	Coast length (km)	Number of surveys	Nests	Tracks
Anson Beagle	Bare Sand Is (2.9)	1.8	15	103	52
Anson Beagle	Indian Is north end (2.11)	11.7	14	55	6
Anson Beagle	Native Point to Five Mile Beach (2.8)	25.8	33	8	63
Anson Beagle	Quail Island (2.10)	3.6	15	33	31
Anson Beagle	Wadeye coast (2.1)	37.4	11	50	6
Arnhem Wessel	Burgunngura Is (6.15)	7.0	12	21	13
Arnhem Wessel	North side Wigram Is (6.43)	34.1	13	11	16
Arnhem Wessel	North West Crocodile Island (6.8)	7.8	7	155	5
Arnhem Wessel	Small Is NE end Inglis Is (6.39)	12.3	15	115	1
Arnhem Wessel	Stevens Is (6.16)	7.5	11	29	2
Arnhem Wessel	Truant Is (6.45)	9.1	7	10	13
Arnhem Wessel	Yabooma Is (6.5)	24.8	10	34	
Cambridge Bonaparte	Turtle Point island (1.1)	6.1	5	22	
Cobourg	North Goulburn Island (5.19)	39.9	7	166	
Groote	Bremer Island east side (7.1)	8.1	3	50	
Groote	Bustard Is (7.23)	7.8	5		21
Groote	North East Isles (7.29)	13.8	8	7	35
Groote	North end Isle Woodah (7.17)	16.2	8	56	50
Pellew	Sandy Is (8.1)	2.9	5		32
Tiwi	Brenton Bay to Tinganuwu Bay (3.12)	56.0	16	91	16
Tiwi	Johnson Pt to Lethbridge Bay (3.10)	48.3	13	13	14
Tiwi	NW tip Melville Is (3.8)	50.3	22	38	16
Tiwi	Seagull Is (3.9)	6.1	13	43	5
Tiwi	West end Bathurst Is (3.5)	29.4	10	78	57
Van Diemens Gulf	Greenhill Is (4.2)	20.1	6	67	1

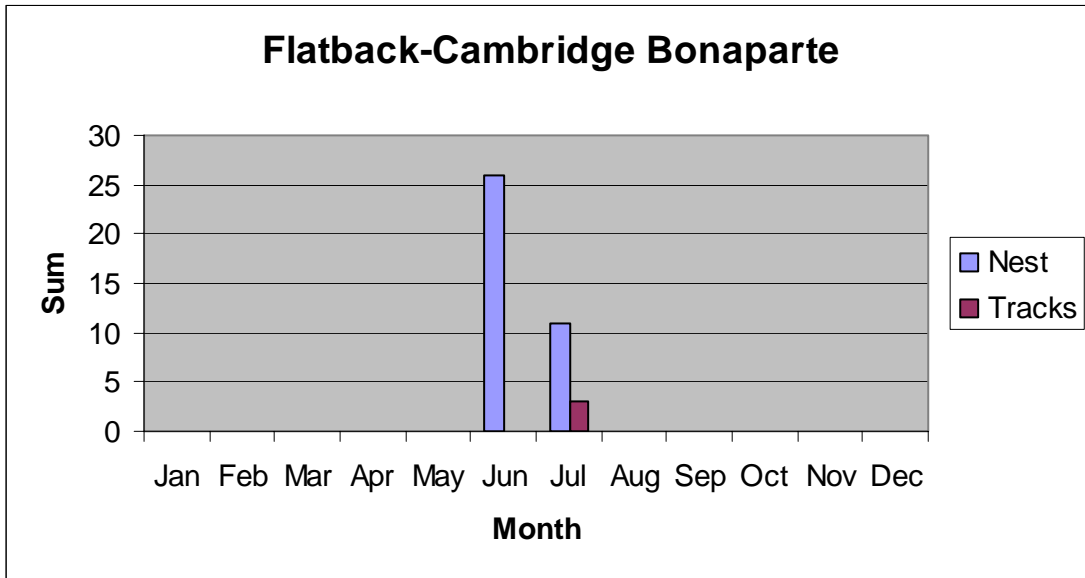


Figure 66. Number of nests and tracks per month for the Cambridge Bonaparte Bioregion.

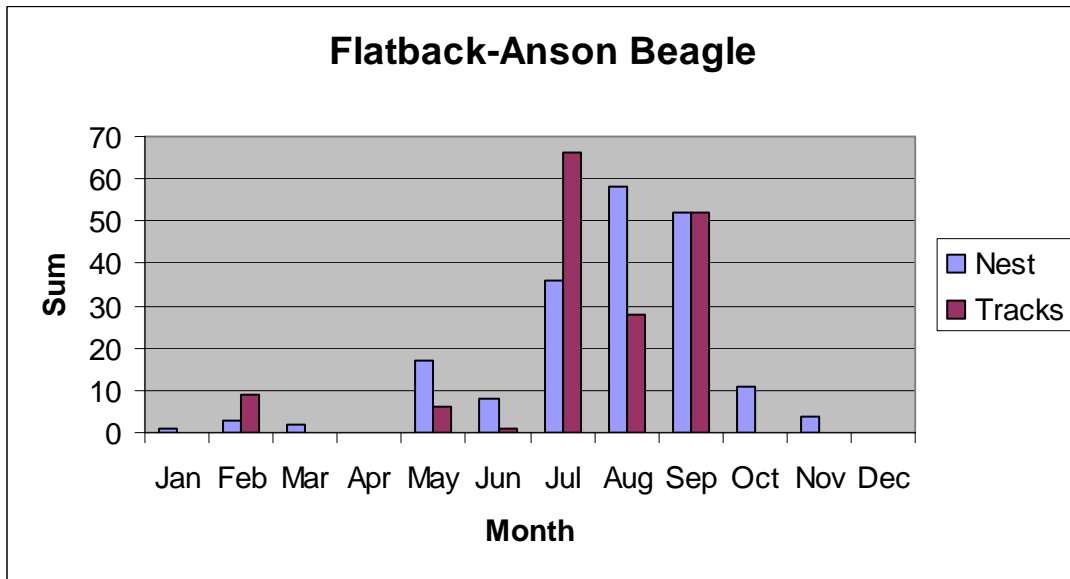


Figure 67. Number of nests and tracks per month for the Anson Beagle Bioregion.

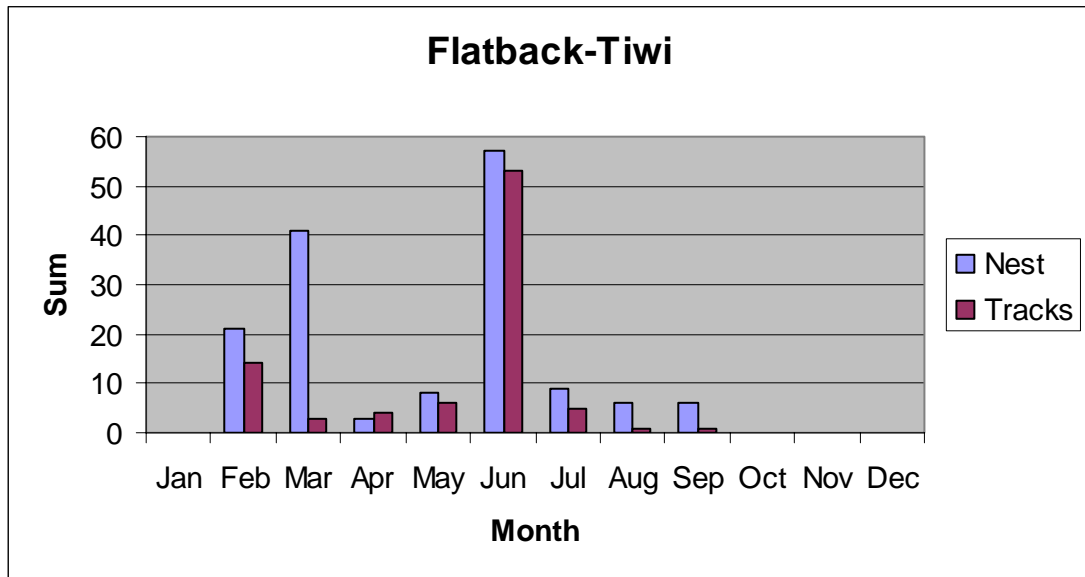


Figure 68. Number of nests and tracks per month for the Tiwi Bioregion.

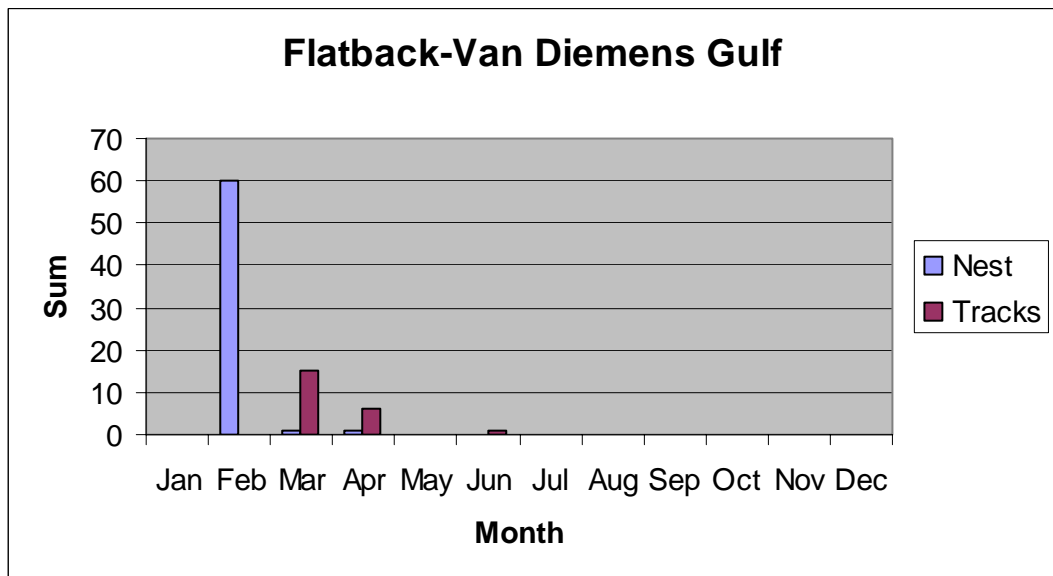


Figure 69. Number of nests and tracks per month for the Van Diemens Gulf Bioregion.

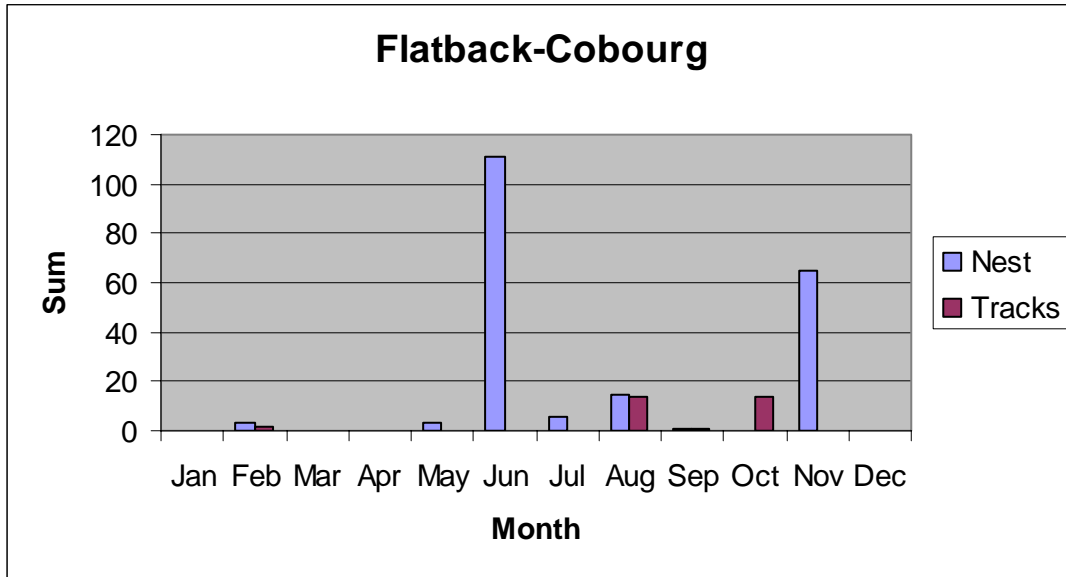


Figure 70. Number of nests and tracks per month for the Cobourg Bioregion.

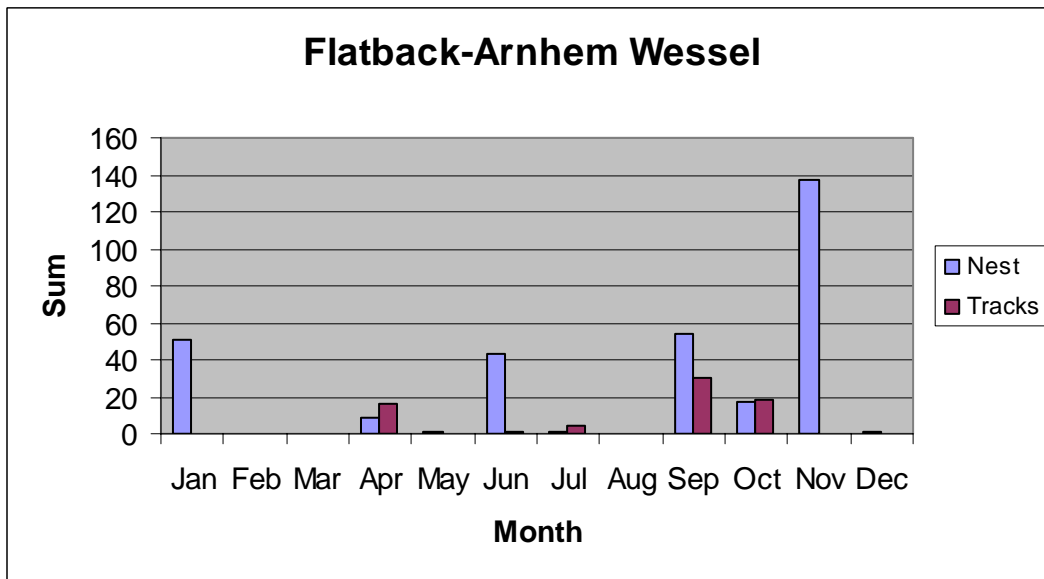


Figure 71. Number of nests and tracks per month for the Arnhem Wessel Bioregion

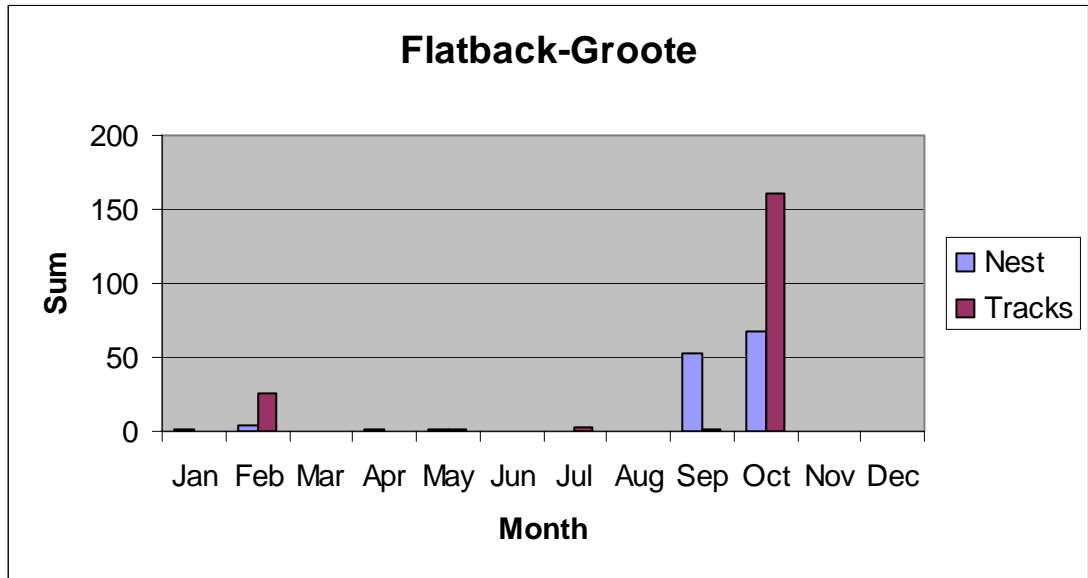


Figure 72. Number of nests and tracks per month for the Groote Bioregion.

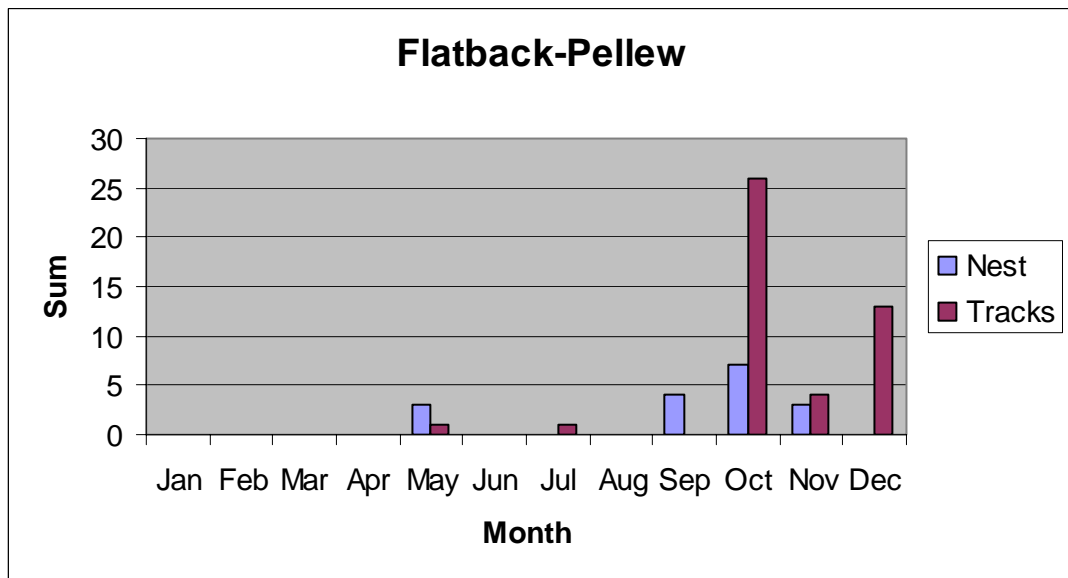


Figure 73. Number of nests and tracks per month for the Pellew Bioregion.

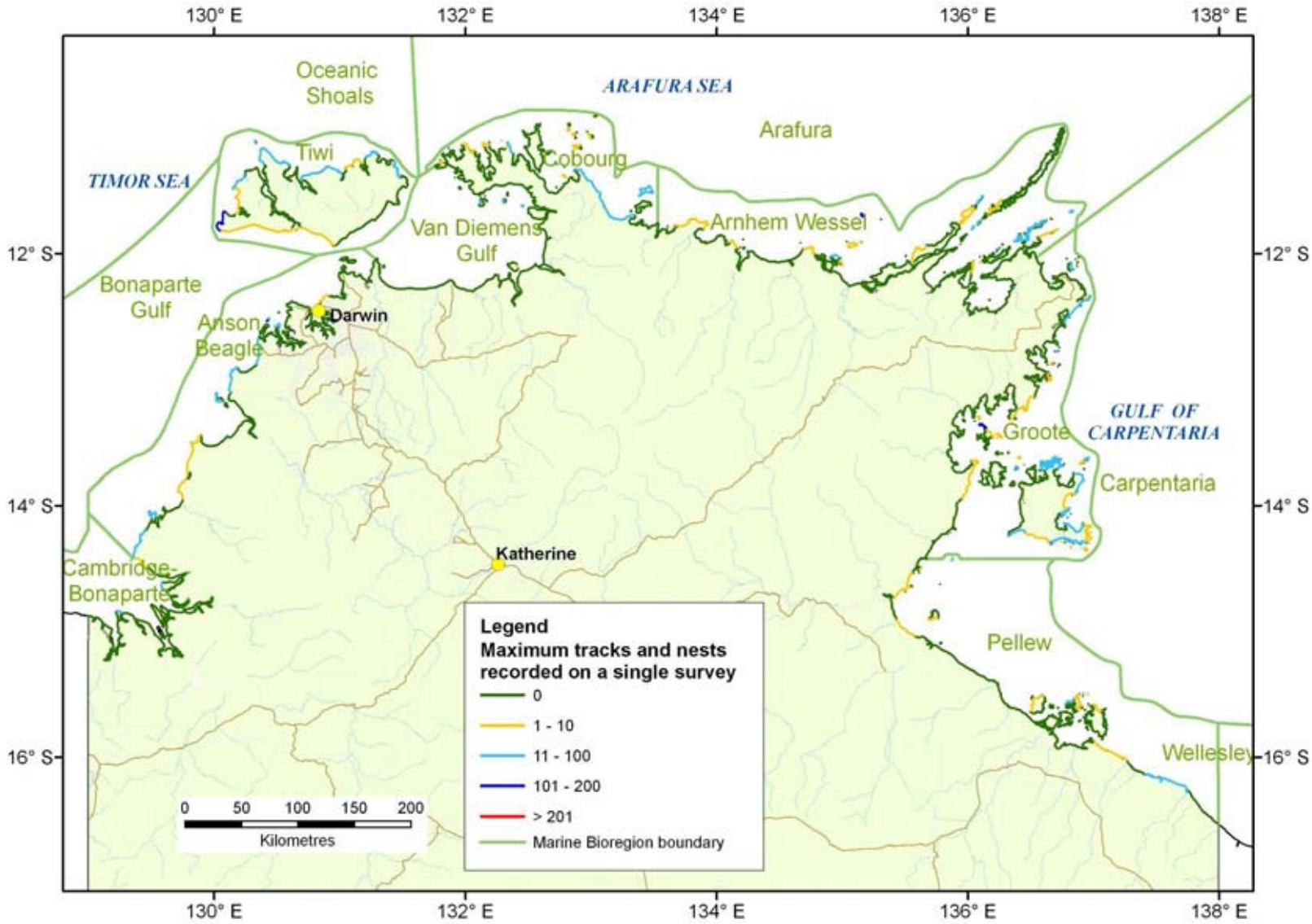


Figure 74. Overview of Flatback Turtle nesting areas shown as the maximum number of combined tracks and nests for any one survey between 1991 and 2004.

Appendix C – GREEN TURTLE

Table 19. Areas of higher numbers of Green Turtle nesting (for coast areas where the combined sum of tracks and nests >20 for all surveys) recorded between 1991 and 2004. Length of coast section calculated using AUSLIG 100k coast feature.

Bioregion	Coast section (coast number)	Coast length (km)	Number of surveys	Nests	Tracks
Cobourg	Lawson Is (5.14)	8.4	9	2	23
Groote	Bald Pt to Cape Shield (7.10)	83.4	12	51	614
Groote	Bridgland Is (7.6)	3.6	13	23	92
Groote	Caledon Bay to Cape Grey (7.8)	41.9	11	3	223
Groote	Cape Arnhem Wessel to Port Bradshaw (7.2)	46.8	16	3	48
Groote	Cape Arnhem Wessel to Port Bradshaw (7.2)	46.8	13	1	53
Groote	Dudly Is (7.7)	2.4	12	17	36
Groote	Inamalamandga Pt to Tasman Point (7.39)	55.0	8		45
Groote	North East Isles (7.29)	13.8	8		58
Groote	North end Isle Woodah (7.17)	16.2	8		41
Groote	Port Bradshaw to Pt Alexander (7.3)	63.7	16	140	210
Groote	Small islands off Marangala Pt (7.37)	3.9	11		43
Pellew	Sandy Is (8.1)	2.9	5		33

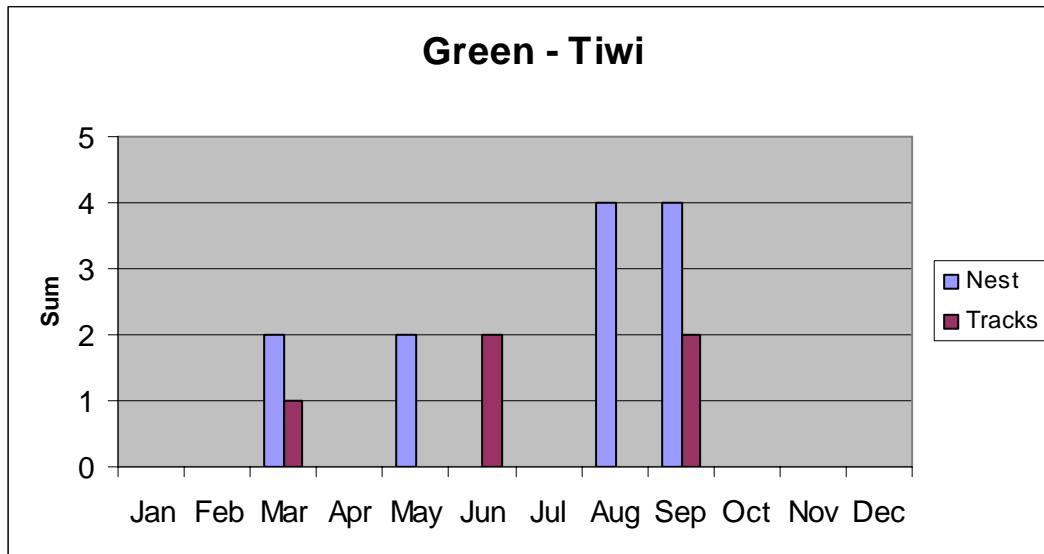


Figure 75. Number of nests and tracks per month for the Tiwi Bioregion.

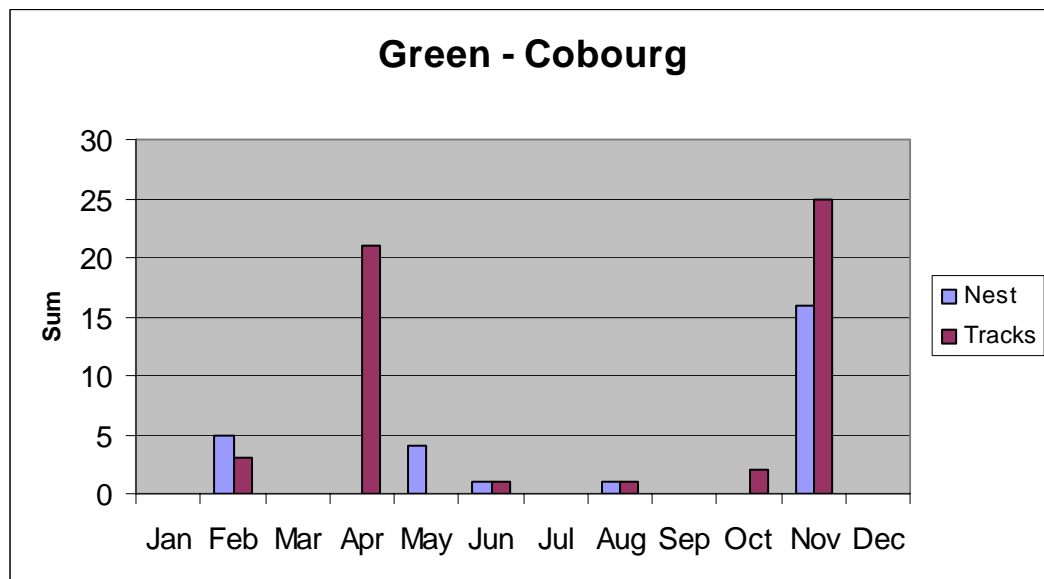


Figure 76. Number of nests and tracks per month for the Cobourg Bioregion

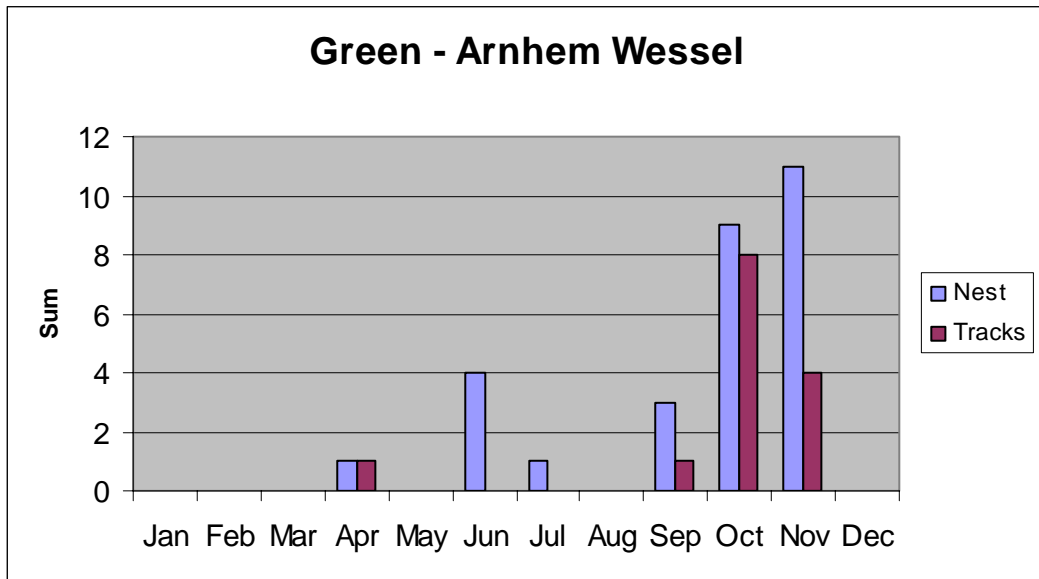


Figure 77. Number of nests and tracks per month for the Arnhem Wessel Bioregion.

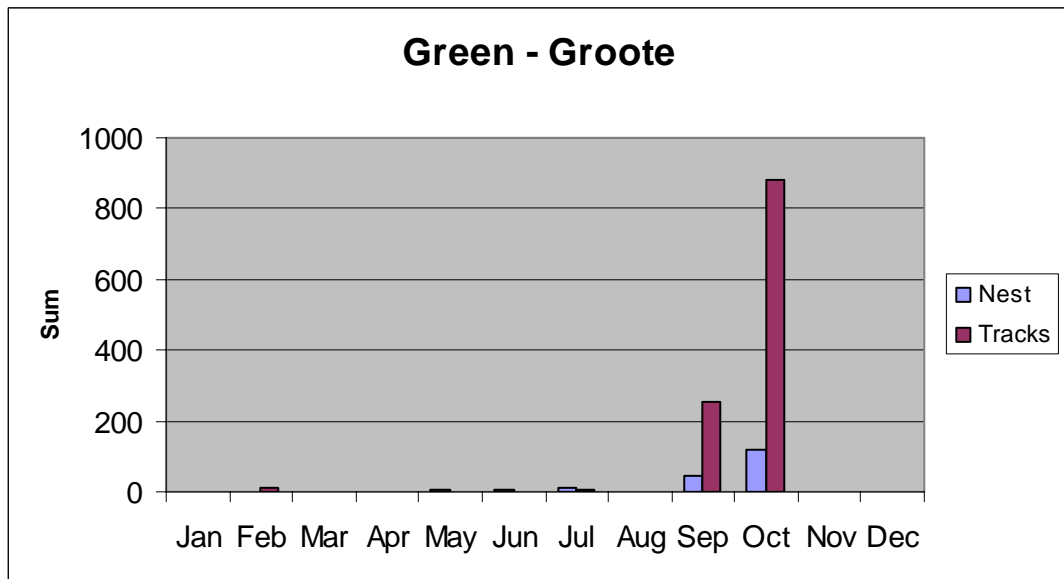


Figure 78. Number of nests and tracks per month for the Groote Bioregion.

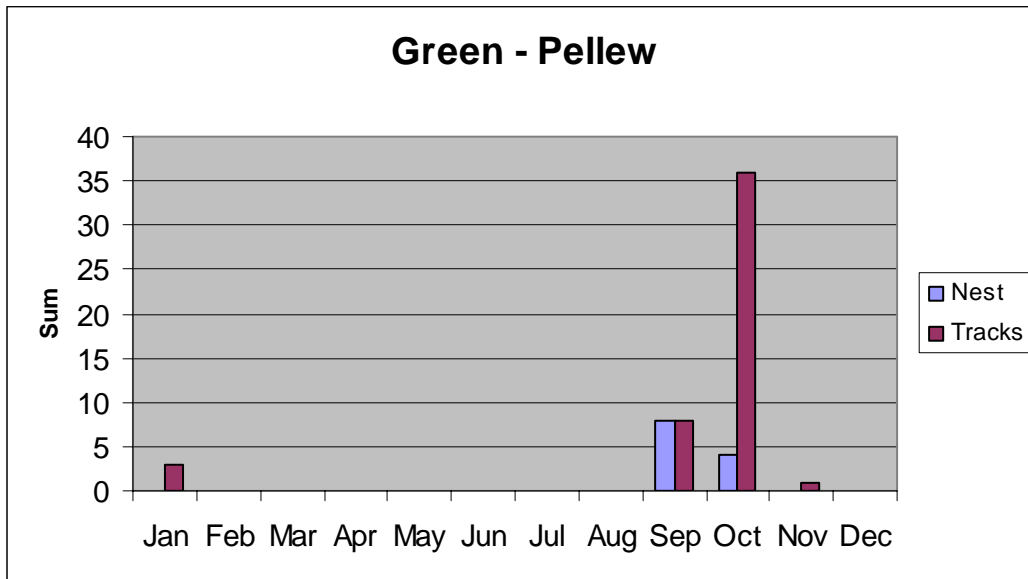


Figure 79. Number of nests and tracks per month for the Pellew Bioregion.

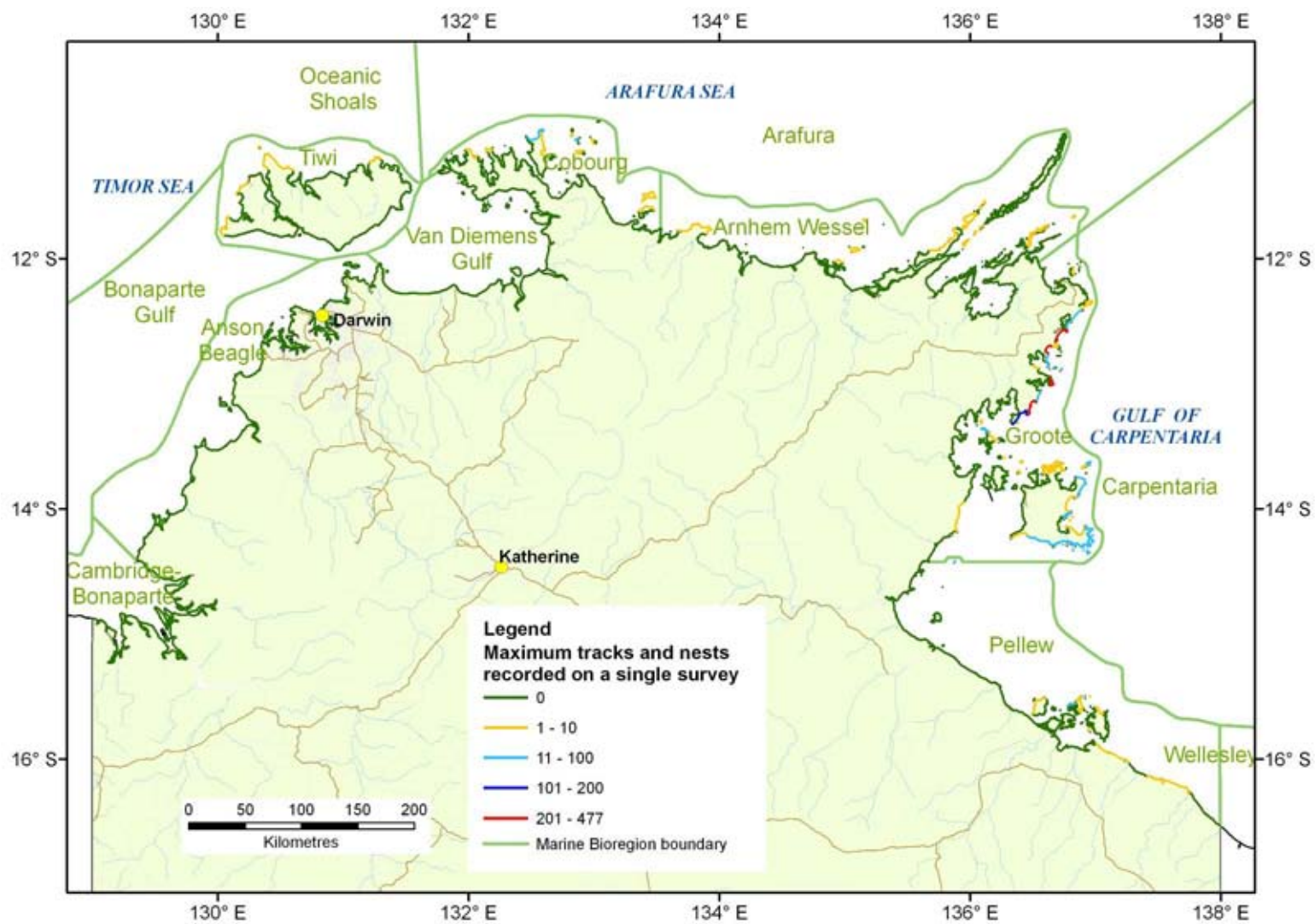


Figure 80. Overview of Green Turtle nesting areas shown as the maximum number of combined tracks and nests for any one survey between 1991 and 2004.

Appendix D – FLATBACK and/or GREEN TURTLE

Table 20. Areas of higher numbers of Flatback and/or Green Turtle nesting (for coast areas where the combined sum of tracks and nests >20 for all surveys) recorded between 1991 and 2004. Length of coast section calculated using AUSLIG 100k coast feature.

Bioregion	Coast section (coast number)	Coast length (km)	Number of surveys	Nests	Tracks
Anson Beagle	Dorcherty Is-north (2.2)	23.7	11	40	
Arnhem Wessel	Bromby Islands (6.46)	27.1	20	50	50
Arnhem Wessel	Burgunngura Is (6.15)	7.0	12	51	55
Arnhem Wessel	Drysdale Is (6.13)	35.0	11	3	94
Arnhem Wessel	Flinders Peninsula north (6.29)	42.9	7	104	51
Arnhem Wessel	Garalja Is (6.36)	2.0	9	22	10
Arnhem Wessel	Low Is (6.35)	2.0	6		57
Arnhem Wessel	North side Wigram Is (6.43)	34.1	13	54	1
Arnhem Wessel	Stevens Is (6.16)	7.5	11	82	1
Cambridge Bonaparte	Whale Flat Is seaward (1.2)	9.3	7		25
Cobourg	Danger Point to Raffles Bay (5.6)	14.8	6		22
Cobourg	Grant Is (5.12)	21.8	10		32
Cobourg	Lawson Is (5.14)	8.4	8	1	58
Cobourg	McCluer Is (5.17)	14.9	10		42
Cobourg	North Goulburn Island (5.19)	39.9	7	50	165
Cobourg	North side Croker Is (5.8)	27.5	2		41
Cobourg	Templer Is (5.10)	5.1	8	36	21
Groote	Bald Pt to Cape Shield (7.10)	83.4	12		22
Groote	Bridgland Is (7.6)	3.6	13	50	
Groote	Hawk Is (7.27)	9.2	10	54	5
Groote	Hawknest Is (7.22)	7.2	7	1	56
Groote	Lane Is (7.28)	4.2	10	1	50
Groote	North end Isle Woodah (7.17)	16.2	8	1	48
Groote	Small islands off Marangala Pt (7.37)	3.9	11	1	122
Groote	Small Islands off SE of Groote (7.35)	23.0	11		22

Bioregion	Coast section (coast number)	Coast length (km)	Number of surveys	Nests	Tracks
Pellew	Calvert River to Seven Emu (8.6)	59.6	9	2	24
Pellew	N North Is (8.11)	22.0	16	60	83
Pellew	North side Watson Is (8.10)	9.8	6		84
Tiwi	Johnson Pt to Lethbridge Bay (3.10)	48.3	13		36
Tiwi	NW tip Melville Is (3.8)	50.3	22	4	68
Tiwi	West end Bathurst Is (3.5)	29.4	10	1	22
Van Diemens Gulf	Greenhill Is (4.2)	20.1	6		50
Van Diemens Gulf	Mogogout Is (4.3)	5.7	3	50	11

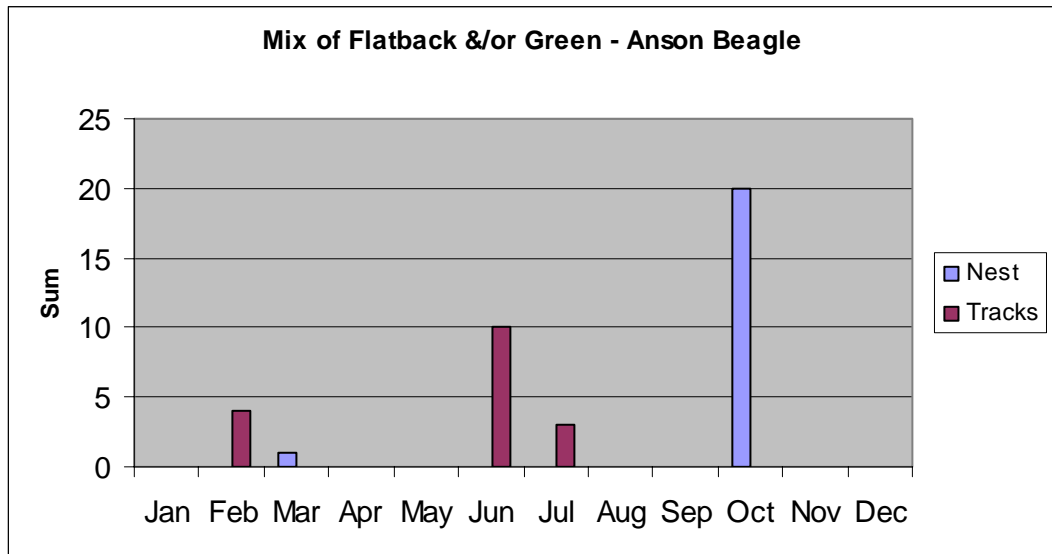


Figure 81. Number of nests and tracks per month for the Anson Beagle Bioregion.

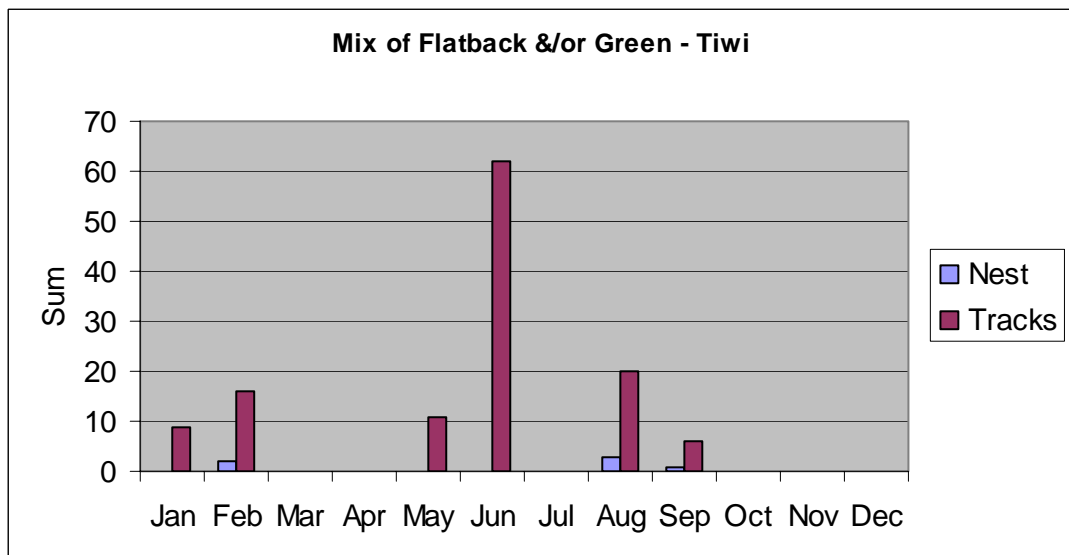


Figure 82. Number of nests and tracks per month for the Tiwi Bioregion.

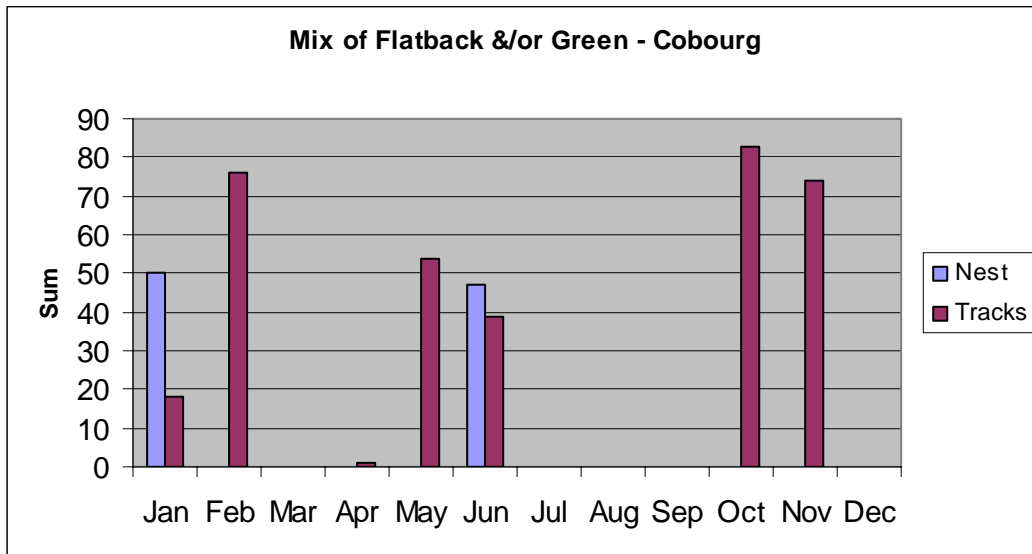


Figure 83. Number of nests and tracks per month for the Cobourg Bioregion.

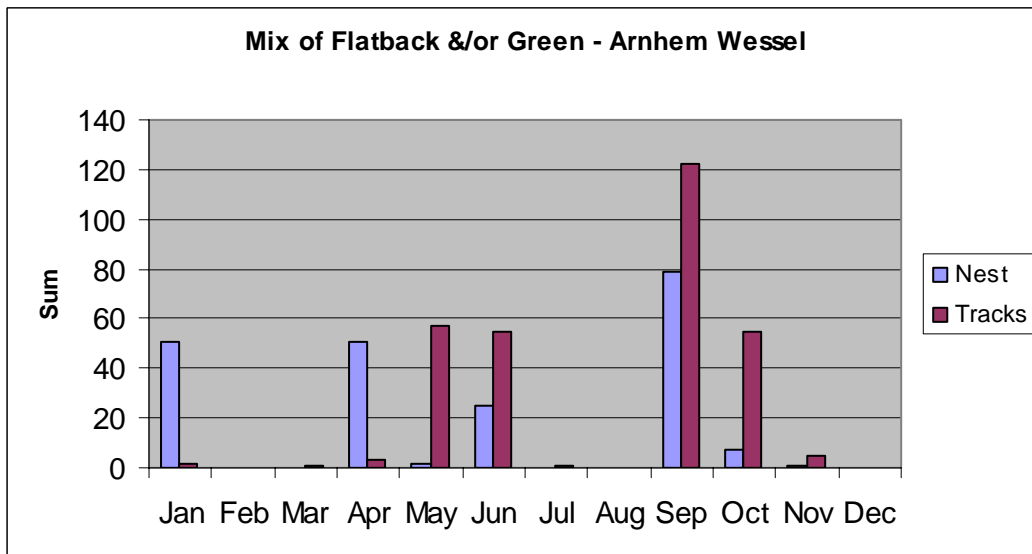


Figure 84. Number of nests and tracks per month for the Arnhem Wessel Bioregion.

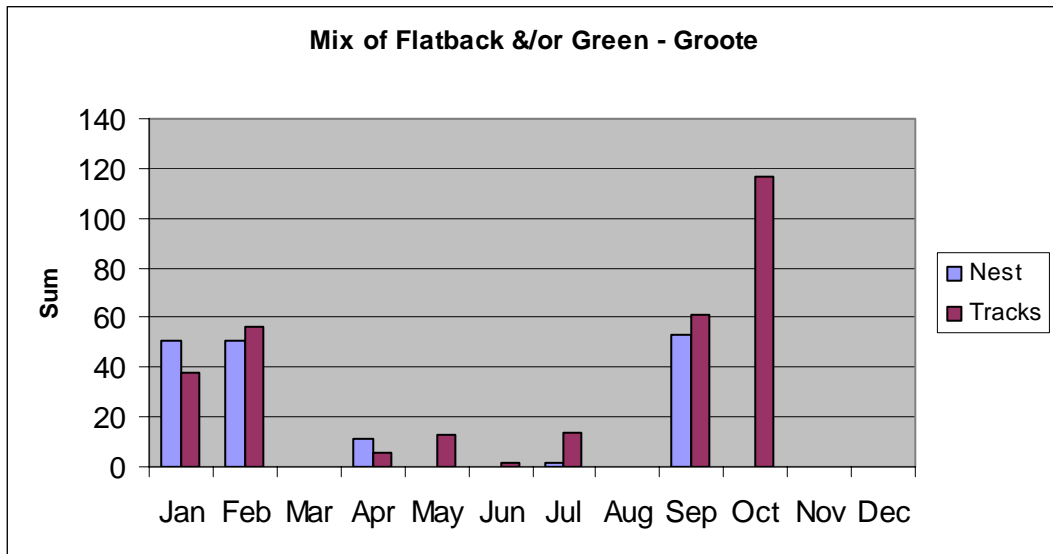


Figure 85. Number of nests and tracks per month for the Groote Bioregion.

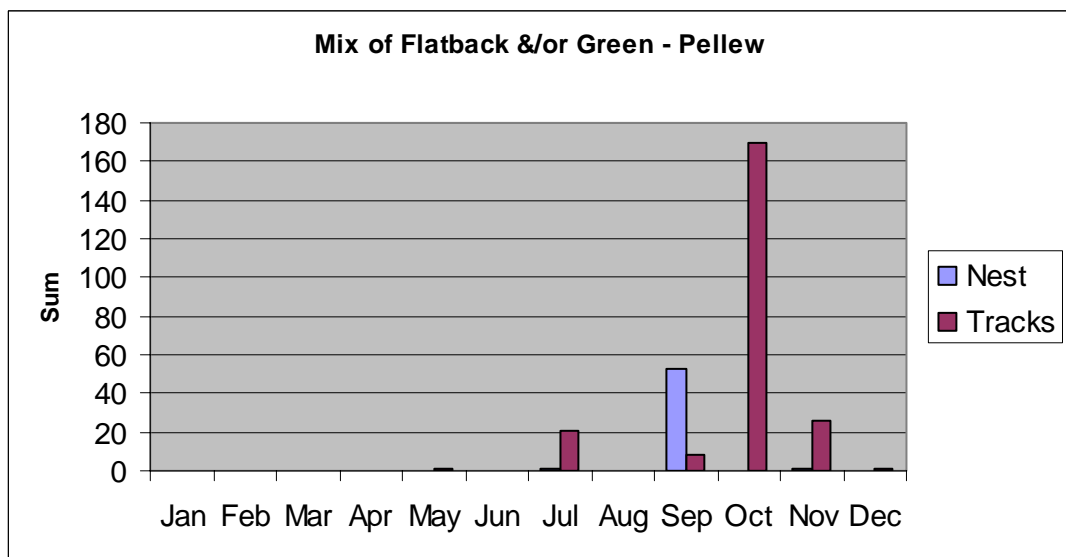


Figure 86. Number of nests and tracks per month for the Pellew Bioregion.

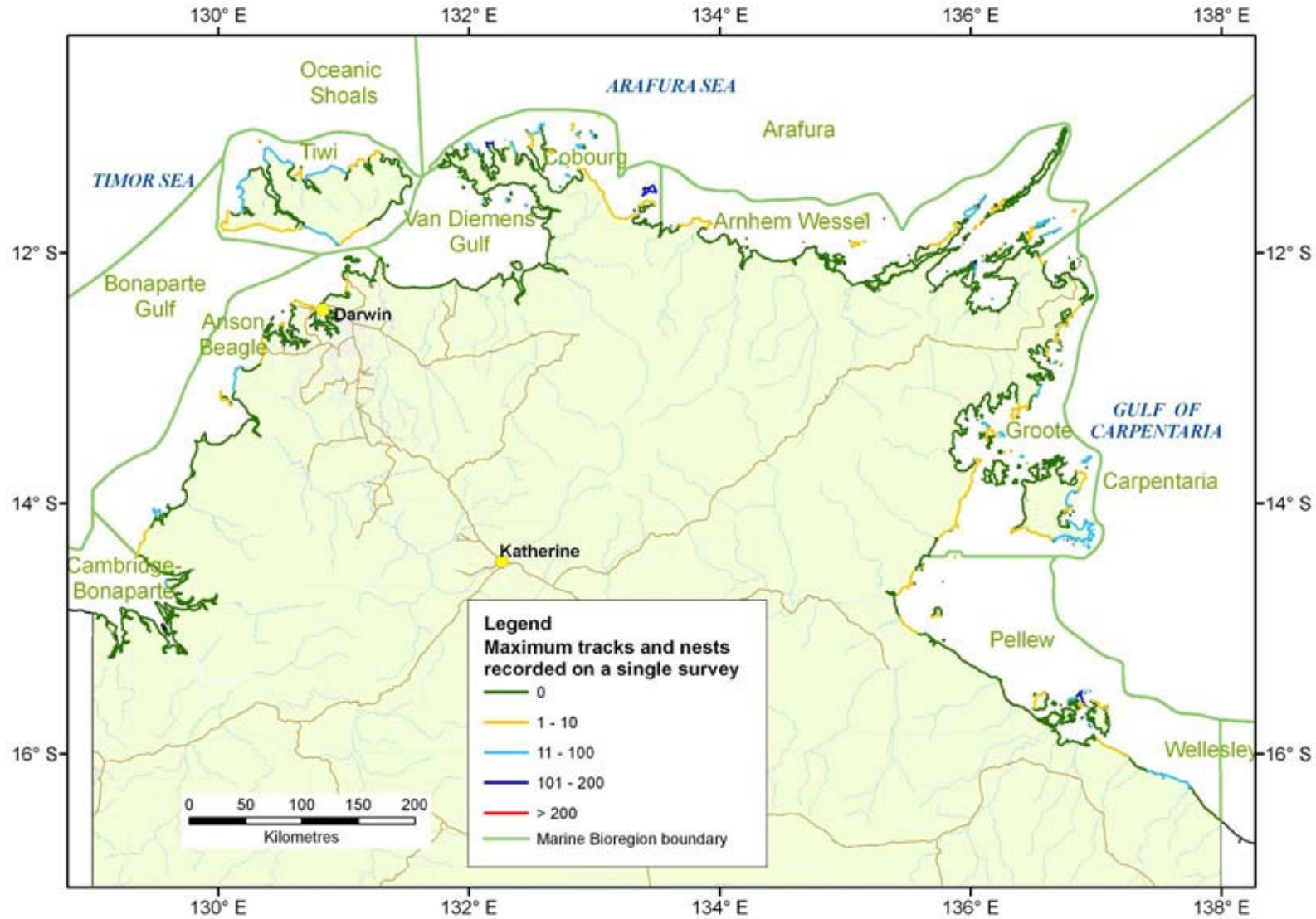


Figure 87. Overview of Flatback &/or Green Turtle nesting areas shown as the maximum number of combined tracks and nests for any one survey between 1991 and 2004.

Appendix E – HAWKSBILL TURTLE

Table 21. Areas of higher numbers of Hawksbill Turtle nesting (for coast areas where the combined sum of tracks and nests >20 for all surveys) recorded between 1991 and 2004. Length of coast section calculated using AUSLIG 100k coast feature.

Bioregion	Coast section (coast number)	Coast length (km)	Number of surveys	Nests	Tracks
Arnhem Wessel	Bromby Islands (6.46)	27.1	20	60	307
Arnhem Wessel	Stevens Is (6.16)	7.5	11	13	54
Arnhem Wessel	Truant Is (6.45)	9.1	7	29	72
Groote	Bremer Island east side (7.1)	8.1	3	50	1
Groote	Bridgland Is (7.6)	3.6	13	6	17
Groote	Bustard Is (7.23)	7.8	5		65
Groote	Dudly Is (7.7)	2.4	12	30	4
Groote	Hawknest Is (7.22)	7.2	7		41
Groote	North East Isles (7.29)	13.8	8		76
Groote	Small islands off Marangala Pt (7.37)	3.9	11		28
Groote	Small Islands off SE of Groote (7.35)	23.0	10	52	2

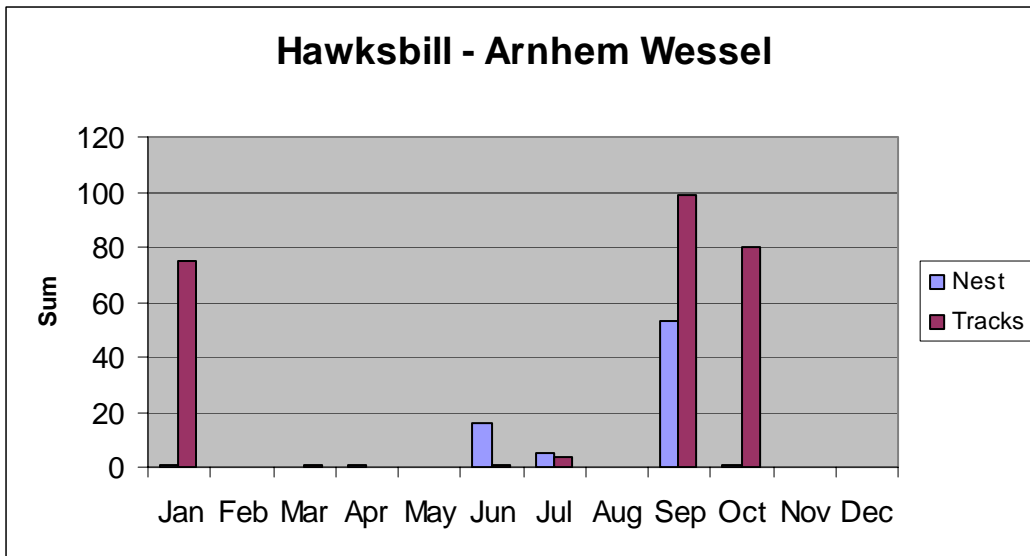


Figure 88. Number of nests and tracks per month for the Arnhem Wessel Bioregion

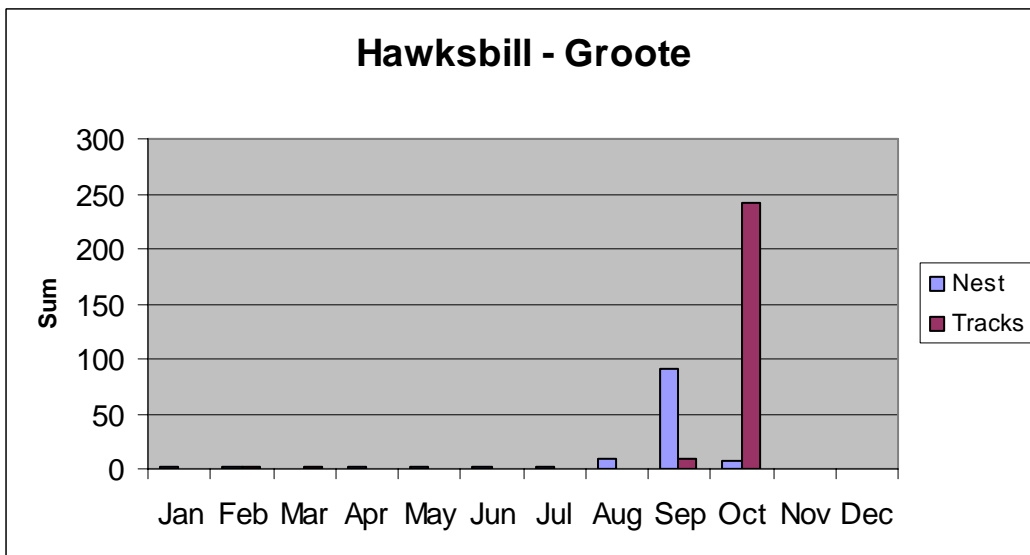


Figure 89. Number of nests and tracks per month for the Groote Bioregion.

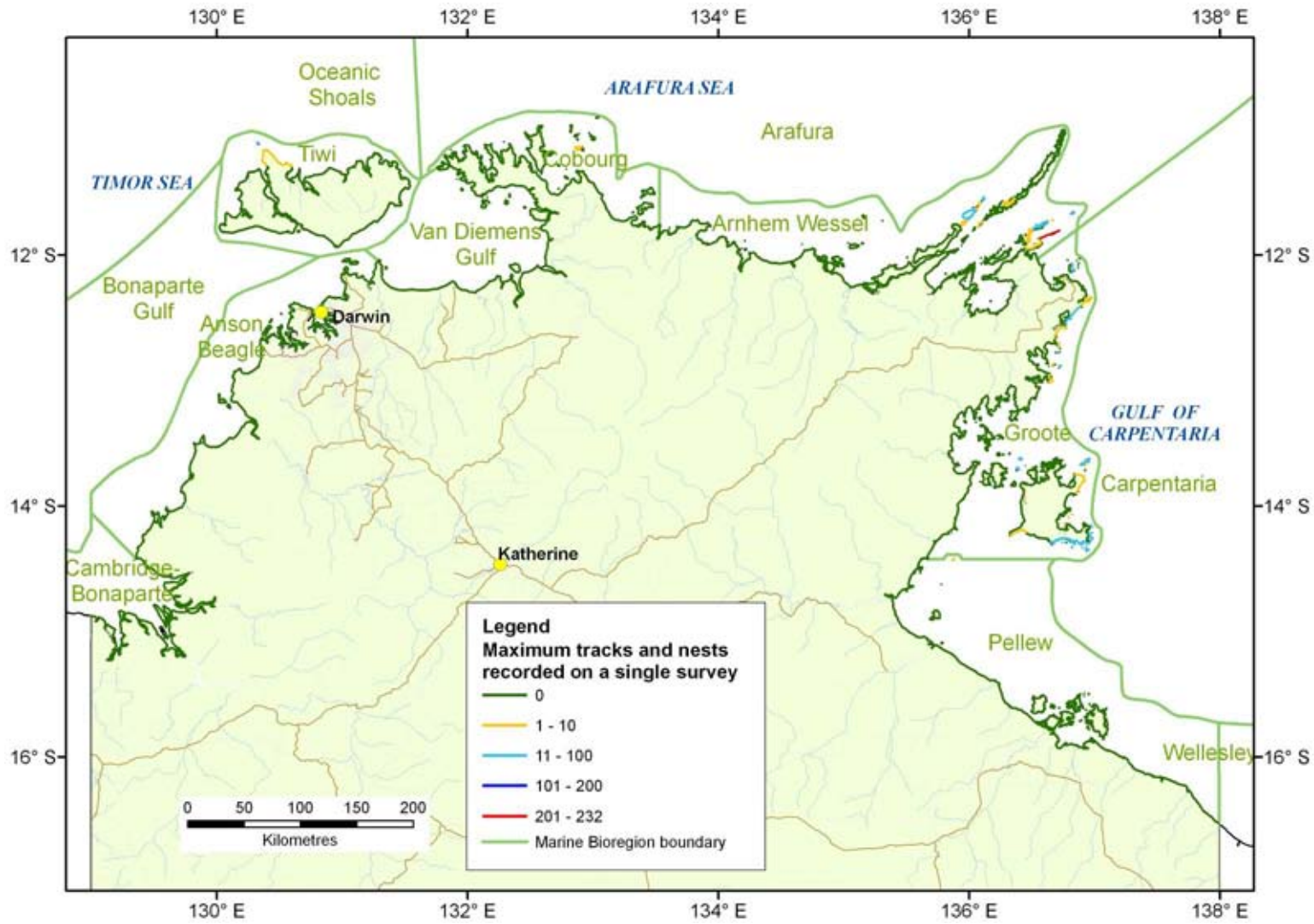


Figure 90. Overview of Hawksbill Turtle nesting areas shown as the maximum number of combined tracks and nests for any one survey between 1991 and 2004.

Appendix F – OLIVE RIDLEY TURTLE

Table 22. Areas of higher density Olive Ridley nesting (for coast areas where the total sum of tracks and nests >20 for all surveys) recorded between 1991 and 2004. Length of coast section calculated using AUSLIG 100k coast feature.

Bioregion	Coast section (coast number)	Coast length (km)	Number of surveys	Nests	Tracks
Arnhem Wessel	Burgunngura Is (6.15)	7.0	9	50	
Arnhem Wessel	NE side Raragala Is (6.20)	36.9	4		50
Arnhem Wessel	North West Crocodile Island (6.8)	7.8	7	37	
Tiwi	Brenton Bay to Tinganuwu Bay (3.12)	56.0	16	33	5
Tiwi	Johnson Pt to Lethbridge Bay (3.10)	48.3	13	40	2
Tiwi	NW tip Melville Is (3.8)	50.3	22	181	7
Tiwi	Seagull Is (3.9)	6.1	13	145	38

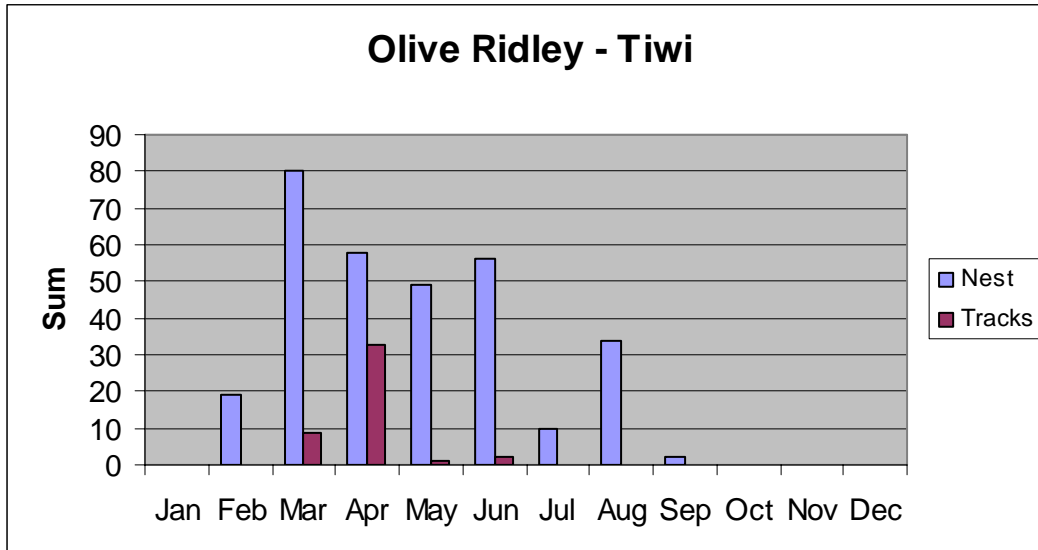


Figure 91. Number of nests and tracks per month for the Tiwi Bioregion.

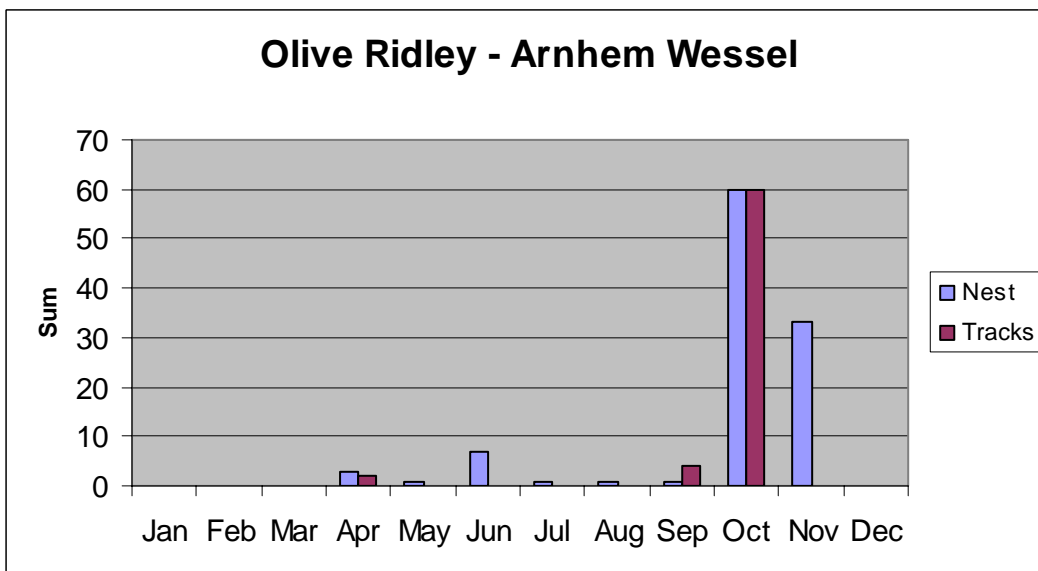


Figure 92. Number of nests and tracks per month for the Arnhem Wessel Bioregion

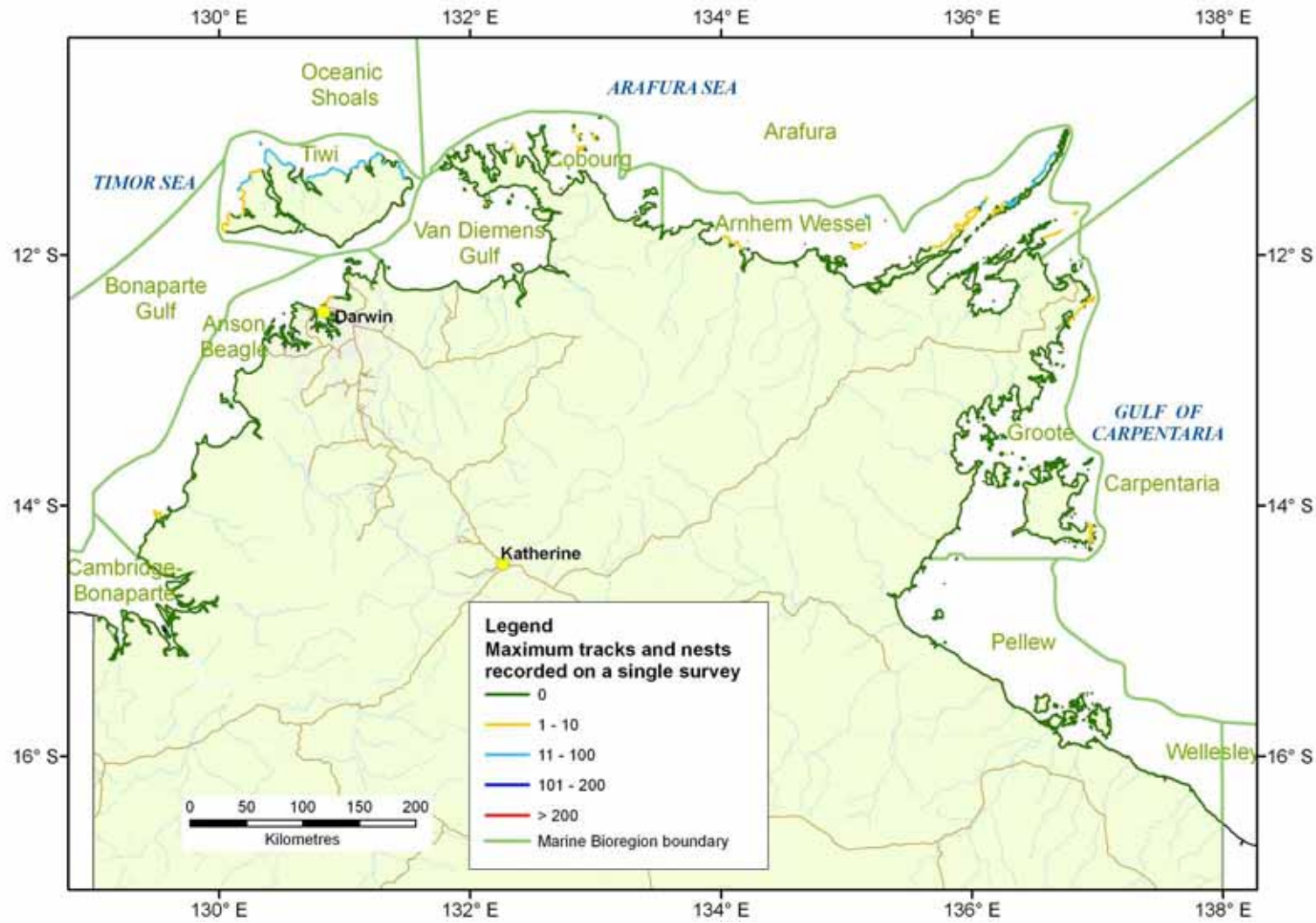


Figure 93. Overview of Olive Ridley Turtle nesting areas shown as the maximum number of combined tracks and nests for any one survey between 1991 and 2004.

Appendix G – HAWKSBILL and/or OLIVE RIDLEY TURTLE

Table 23. Areas of higher density Hawksbill &/or Olive Ridley Turtle nesting (for coast areas where the total sum of tracks and nests >20 for all surveys) recorded between 1991 and 2004. Length of coast section calculated using AUSLIG 100k coast feature.

Bioregion	Coast section (coast number)	Coast length (km)	Number of surveys	Nests	Tracks
Arnhem Wessel	Bromby Islands (6.46)	27.1	20	8	25
Arnhem Wessel	Burgunngura Is (6.15)	7.0	12	2	102
Cobourg	McCluer Is (5.17)	14.9	10	5	17
Groote	Hawk Is (7.27)	9.2	10	20	16
Groote	Lane Is (7.28)	4.2	10	6	51
Groote	Small islands off Marangala Pt (7.37)	3.9	11		61
Pellew	Sandy Is (8.1)	2.9	5		31
Tiwi	Johnson Pt to Lethbridge Bay (3.10)	48.3	13	26	13

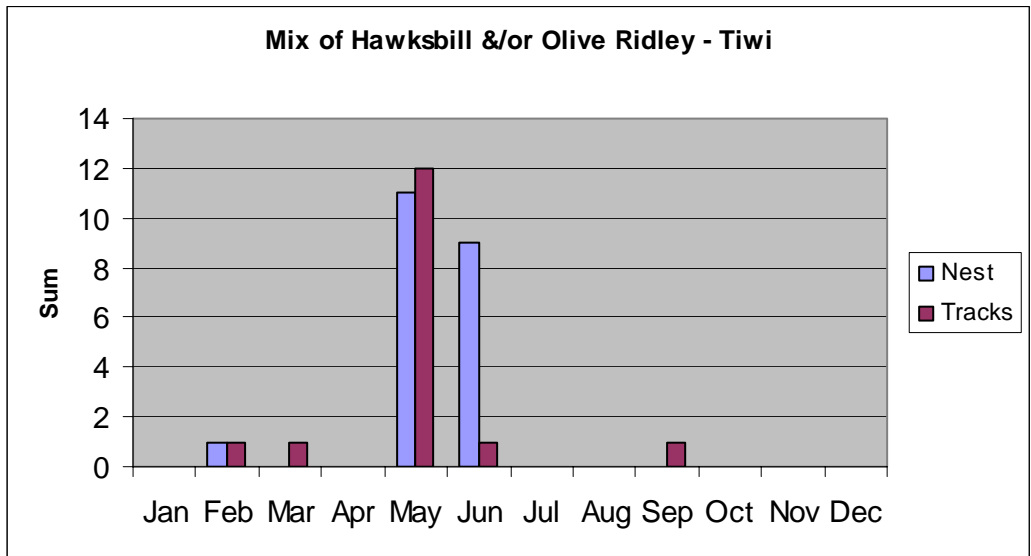


Figure 94. Number of nests and tracks per month for the Tiwi Bioregion.

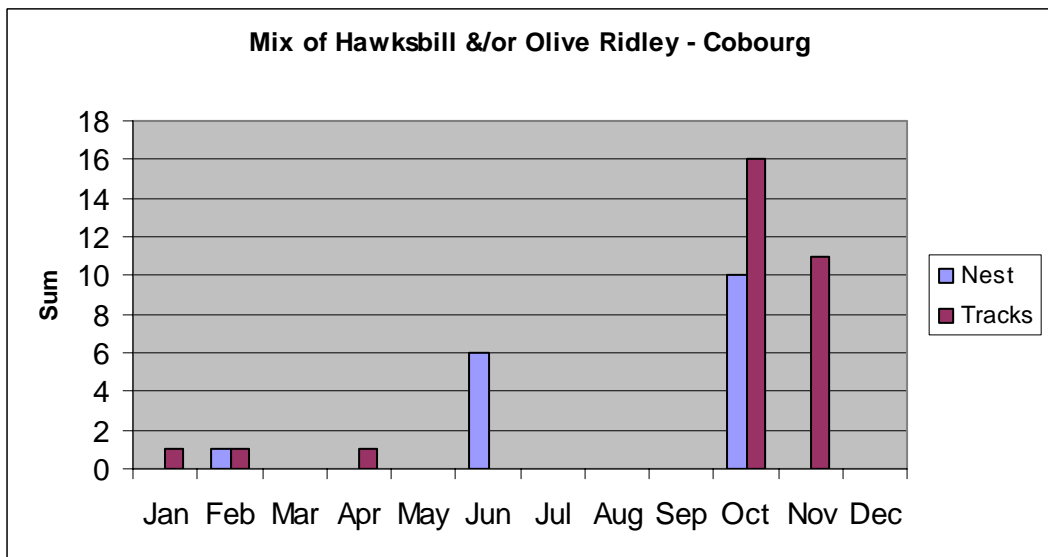


Figure 95. Number of nests and tracks per month for the Cobourg Bioregion.

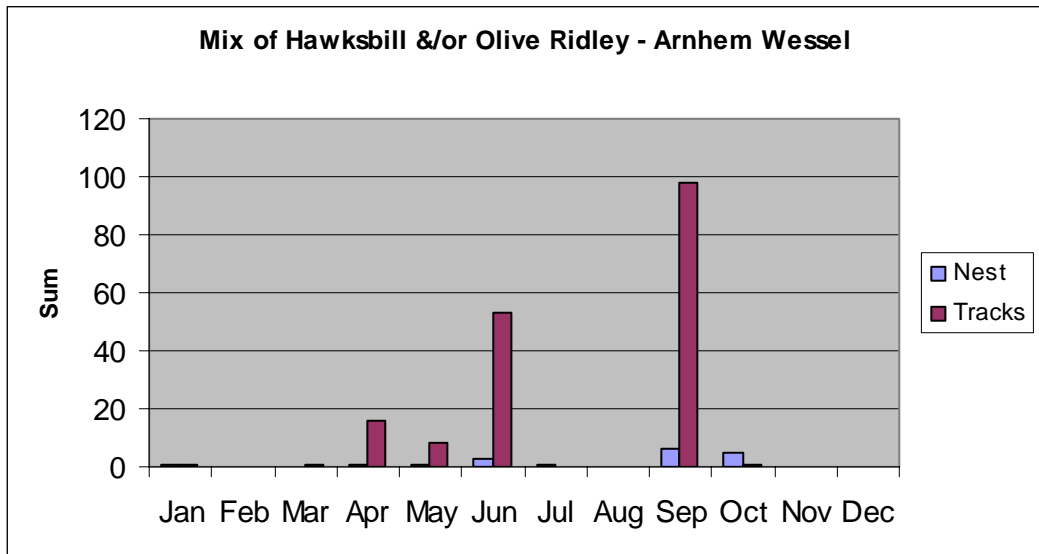


Figure 96. Number of nests and tracks per month for the Arnhem Wessel Bioregion

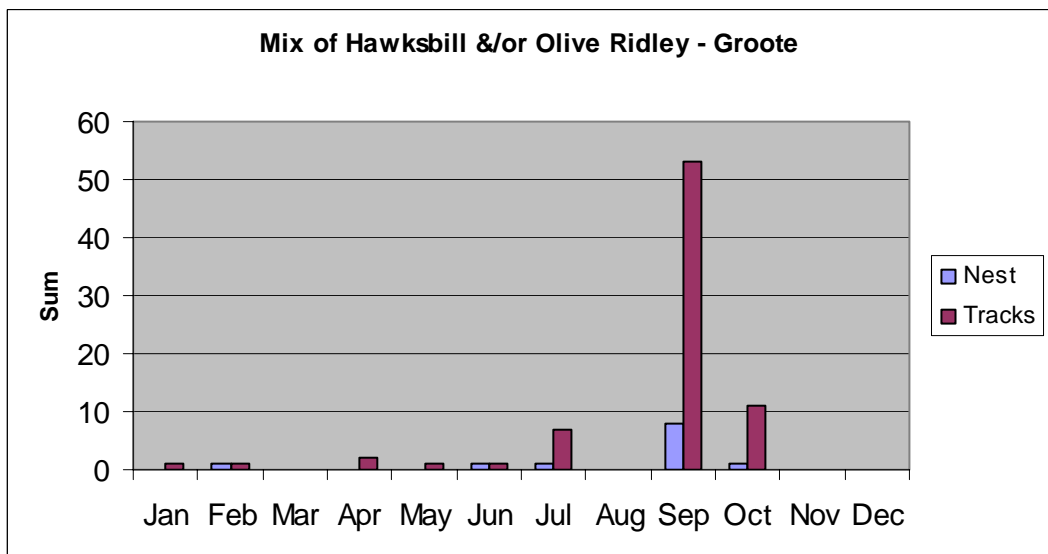


Figure 97. Number of nests and tracks per month for the Groote Bioregion.

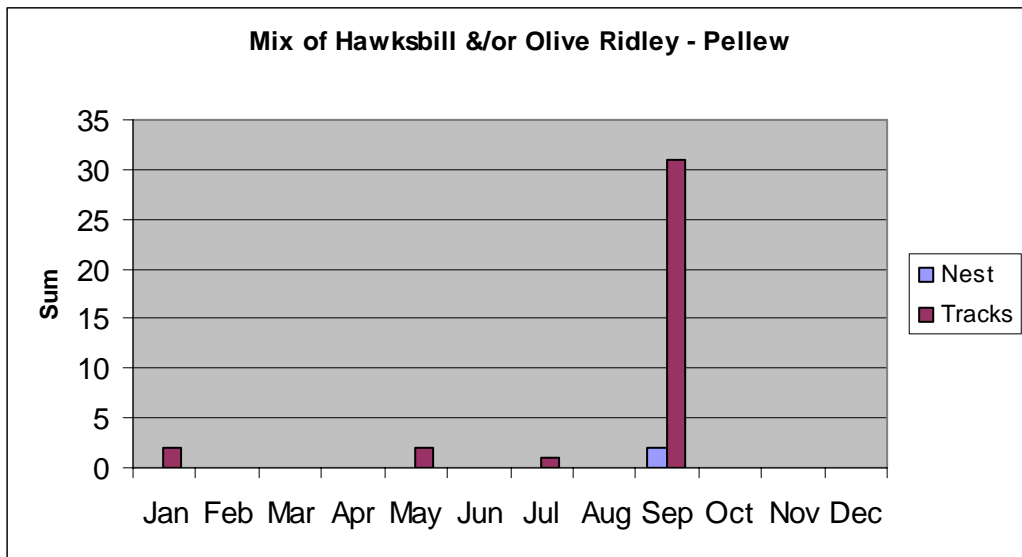


Figure 98. Number of nests and tracks per month for the Pellew Bioregion.

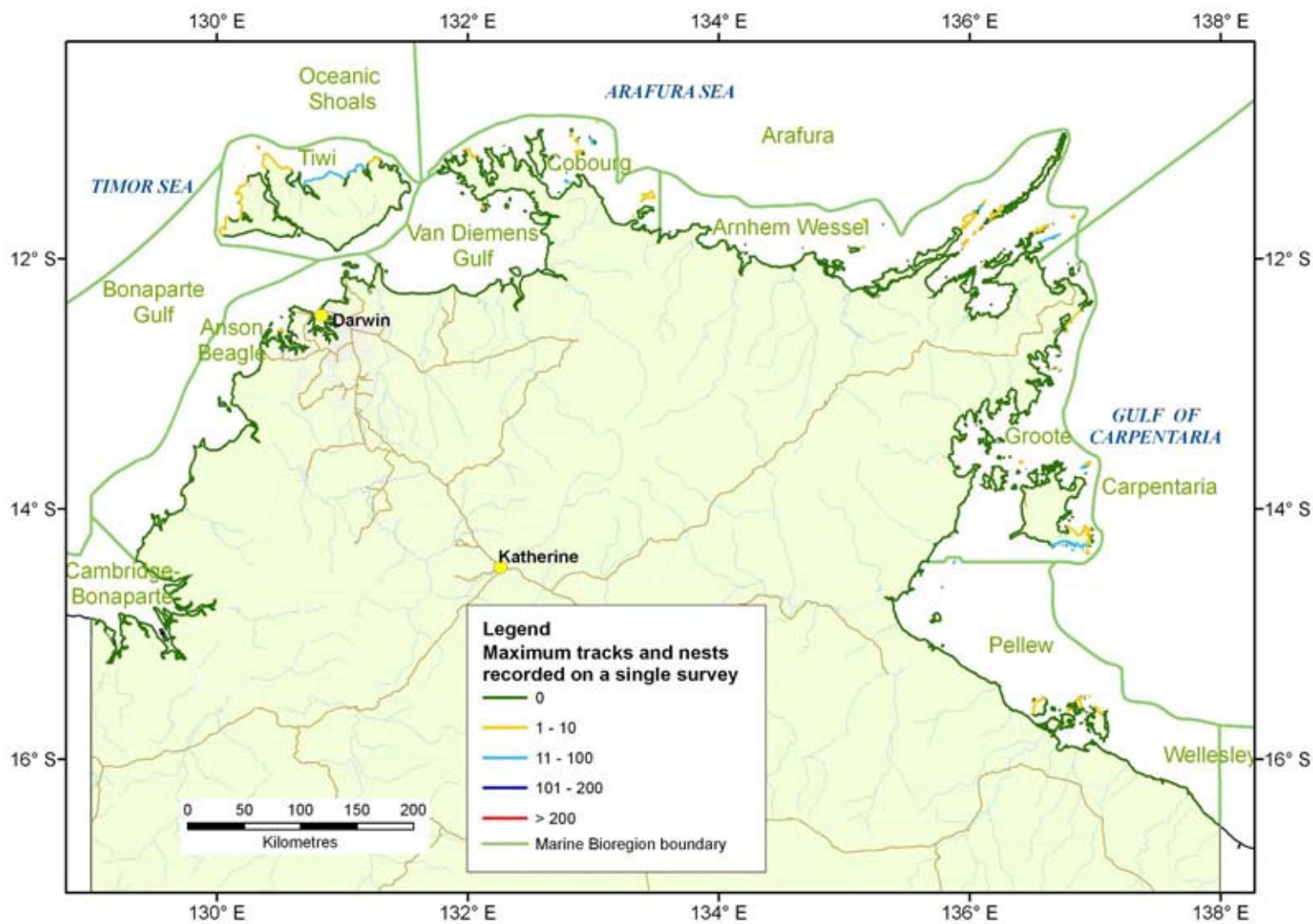


Figure 99. Overview of Hawksbill &/or Olive Ridley Turtle nesting areas shown as the maximum number of combined tracks and nests for any one survey between 1991 and 2004.

Appendix H – UNKNOWN SPECIES OF TURTLE

Table 24. Areas of higher numbers of nesting activity for data recorded as unknown species (for coast areas where the total sum of tracks and nests >20 for all surveys) recorded between 1991 and 2004. Length of coast section calculated using AUSLIG 100k coast feature.

Bioregion	Coast section (coast number)	Coast length (km)	Number of surveys	Nests	Tracks
Anson Beagle	Anson Beagle Bay south (2.5)	31.3	25		21
Anson Beagle	Bare Sand Is (2.9)	1.8	15	50	287
Anson Beagle	Dorcherty Is-north (2.2)	23.7	11		22
Anson Beagle	Indian Is north end (2.11)	11.7	14		61
Anson Beagle	Mangrove creek to Cape Dombey (2.3)	16.0	15		27
Anson Beagle	Native Point to Five Mile Beach (2.8)	25.8	33	109	384
Anson Beagle	Point Jenny to near Channel Point (2.7)	32.1	28		27
Anson Beagle	Quail Island (2.10)	3.6	15	53	220
Arnhem Wessel	Alger Is (6.25)	19.8	7	37	14
Arnhem Wessel	Astell Is (6.40)	29.7	9	27	22
Arnhem Wessel	Bromby Islands (6.46)	27.1	20	80	577
Arnhem Wessel	Bumaga Is (6.23)	7.3	8	84	110
Arnhem Wessel	Burgunngura Is (6.15)	7.0	12	27	304
Arnhem Wessel	Cotton Is (6.42)	39.3	8	11	53
Arnhem Wessel	Drysdale Is (6.13)	35.0	11	151	711
Arnhem Wessel	Flinders Peninsula north (6.29)	42.9	8	151	12
Arnhem Wessel	Garalja Is (6.36)	2.0	9	20	6
Arnhem Wessel	Graham Is (6.12)	15.6	4	50	60
Arnhem Wessel	Gulon Point to Junction Bay (6.1)	47.5	13	5	67
Arnhem Wessel	Gwakura Is (6.32)	7.2	3	61	11
Arnhem Wessel	Hardy Is (6.34)	11.9	2	51	20
Arnhem Wessel	Islands in Buckingham Bay (6.27)	1.3	9	60	4
Arnhem Wessel	Islands on north side Flinders Peninsula (6.30)	10.8	10	24	2
Arnhem Wessel	Jirrgari Is (6.22)	9.5	7	20	10

Bioregion	Coast section (coast number)	Coast length (km)	Number of surveys	Nests	Tracks
Arnhem Wessel	Low Is (6.35)	2.0	6		105
Arnhem Wessel	Mooroonga Is (6.6)	21.5	9		98
Arnhem Wessel	North side Wigram Is (6.43)	34.1	13	198	37
Arnhem Wessel	North West Crocodile Island (6.8)	7.8	7		345
Arnhem Wessel	NW side Raragala Is (6.21)	40.9	6		21
Arnhem Wessel	Rekala Is (6.33)	2.5	5	100	
Arnhem Wessel	Small Is NE end Inglis Is (6.39)	12.3	15	180	114
Arnhem Wessel	Small Is NW end Inglis Is (6.37)	2.6	7	10	12
Arnhem Wessel	Stevens Is (6.16)	7.5	11	180	316
Arnhem Wessel	Truant Is (6.45)	9.1	7	60	205
Arnhem Wessel	Unnamed NE of Mooroonga Is (6.7)	3.7	6	51	62
Arnhem Wessel	Warnawi Is (6.24)	9.4	9	47	115
Arnhem Wessel	Yargara Is (6.14)	6.1	6	1	40
Cambridge Bonaparte	Turtle Point island (1.1)	6.1	5		153
Cambridge Bonaparte	Whale Flat Is seaward (1.2)	9.3	7	10	50
Cobourg	Danger Point to Raffles Bay (5.6)	14.8	6	3	171
Cobourg	Darch Is (5.9)	13.2	3		100
Cobourg	Grant Is (5.12)	21.8	10	10	214
Cobourg	Lawson Is (5.14)	8.4	8	151	632
Cobourg	McCluer Is (5.17)	14.9	10	75	453
Cobourg	New Year Is (5.16)	4.8	7	10	265
Cobourg	North Goulburn Island (5.19)	39.9	7	89	152
Cobourg	Sandy Is No1 (5.4)	1.6	3		23
Cobourg	Sandy Is No2 (5.4)	1.2	3		46
Cobourg	South Goulburn Island (5.20)	52.2	8	4	23
Cobourg	Templer Is (5.10)	5.1	8	25	309
Cobourg	Unnamed Is S of Lawson Is (5.13)	2.7	9		81
Cobourg	Valencia Is (5.11)	9.7	8	55	83
Groote	Bald Pt to Cape Shield (7.10)	83.4	12	471	514
Groote	Bremer Island east side (7.1)	8.1	3		51

Bioregion	Coast section (coast number)	Coast length (km)	Number of surveys	Nests	Tracks
Groote	Bridgland Is (7.6)	3.6	13	60	31
Groote	Burney Is (7.19)	12.4	4		101
Groote	Bustard Is (7.23)	7.8	5	150	448
Groote	Caledon Bay to Cape Grey (7.8)	41.9	11	33	206
Groote	Cape Arnhem Wessel to Port Bradshaw (7.2)	46.8	16	123	216
Groote	Cape Beatrice to Inamalamandga Pt (7.38)	54.9	6	81	57
Groote	Dudly Is (7.7)	2.4	12	100	147
Groote	East Bremer Islet (7.1)	0.8	12	10	51
Groote	East side Isle Woodah (7.17)	9.7	8		56
Groote	Gooninnah Is (7.11)	4.1	8	1	55
Groote	Hawk Is (7.27)	9.2	10	65	660
Groote	Hawknest Is (7.22)	7.2	7	185	310
Groote	Inamalamandga Pt to Tasman Point (7.39)	55.0	8	121	85
Groote	Lane Is (7.28)	4.2	10	125	29
Groote	McNamara Is (7.5)	5.5	9	31	
Groote	Morgan Is (7.15)	17.0	6	62	14
Groote	Nicol Is (7.18)	16.1	9	55	94
Groote	North East Isles (7.29)	13.8	8		408
Groote	North end Isle Woodah (7.17)	16.2	8	45	58
Groote	Port Bradshaw to Pt Alexander (7.3)	63.7	16	421	514
Groote	Sandy Islets S of Bickerton (7.24)	4.2	5		22
Groote	Small Is between NE Groote & Hawk Is (7.30)	1.2	6		55
Groote	Small islands off Marangala Pt (7.37)	3.9	11	201	163
Groote	Small Islands off SE of Groote (7.35)	23.0	11	100	323
Groote	South end Isle Woodah (7.17)	21.4	3	130	14
Groote	South of Cape Barrow (7.25)	41.6	11		40
Groote	Wedge Rock (7.21)	1.9	5	50	143

Bioregion	Coast section (coast number)	Coast length (km)	Number of surveys	Nests	Tracks
Groote	West side Isle Woodah (7.17)	18.3	4	11	10
Groote	Woody Is (7.24)	1.4	3		70
Pellew	Calvert River to Seven Emu (8.6)	59.6	9	10	20
Pellew	Low Rock (8.3)	0.7	4	50	51
Pellew	McArthur R to Robinson River (8.6)	36.4	12		21
Pellew	N North Is (8.11)	22.0	16	237	247
Pellew	North side Watson Is (8.10)	9.8	6	61	77
Pellew	North Vanderlin Is (8.18)	22.7	9	50	369
Pellew	S Maria Is (8.4)	11.6	6	100	286
Pellew	Sandy Is (8.1)	2.9	5		226
Pellew	West side West Is (8.7)	26.9	10	72	158
Tiwi	Brenton Bay to Tinganuwu Bay (3.12)	56.0	16	20	244
Tiwi	Johnson Pt to Lethbridge Bay (3.10)	48.3	13	6	188
Tiwi	NW tip Melville Is (3.8)	50.3	22	124	444
Tiwi	Seagull Is (3.9)	6.1	13	80	211
Tiwi	West end Bathurst Is (3.5)	29.4	10	74	230
Van Diemens Gulf	Greenhill Is (4.2)	20.1	6	1	91
Van Diemens Gulf	Morse Is (4.4)	25.3	4		21

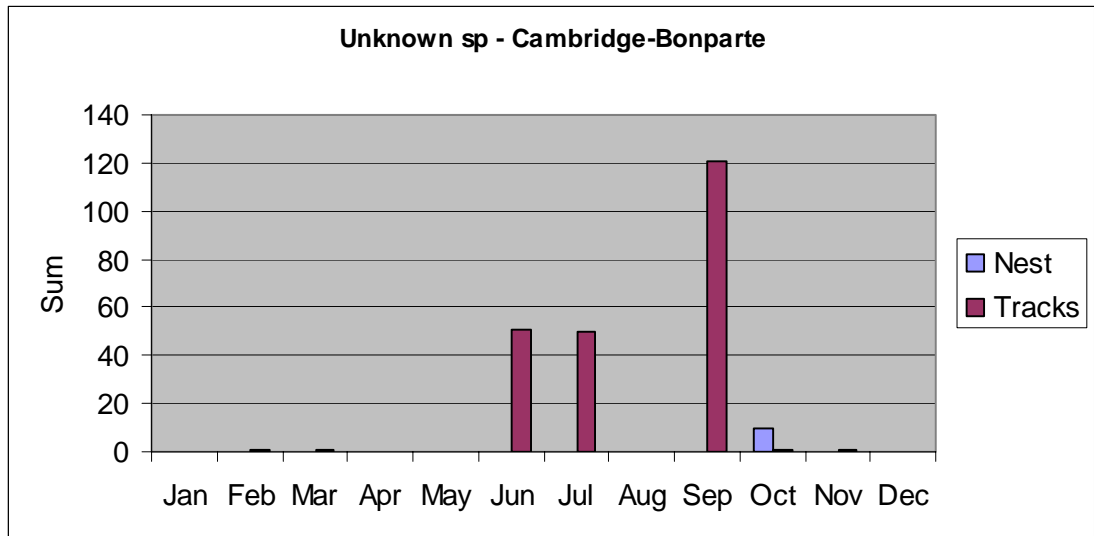


Figure 100. Number of nests and tracks per month for the Cambridge Bonaparte Bioregion.

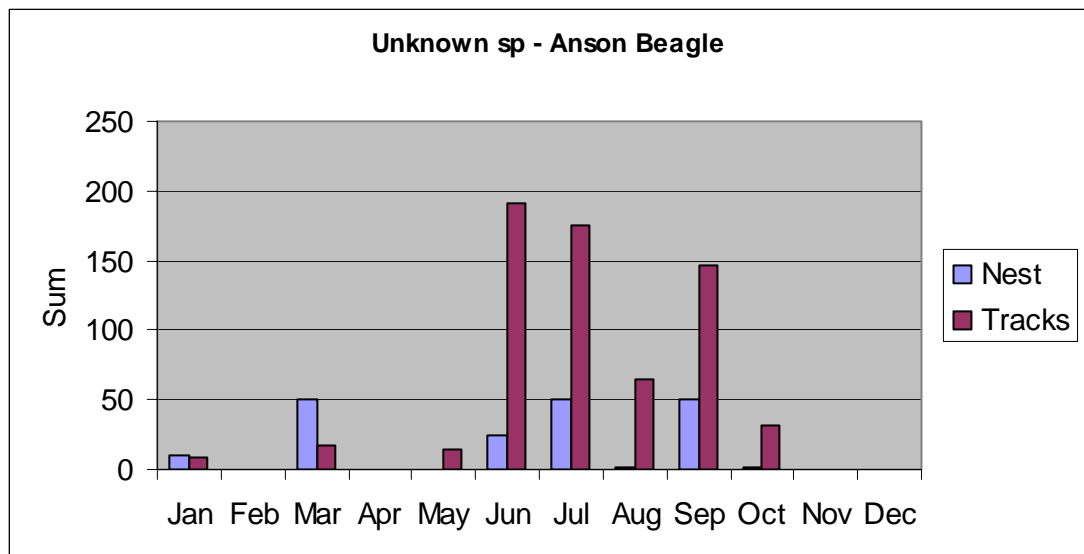


Figure 101. Number of nests and tracks per month for the Anson Beagle Bioregion.

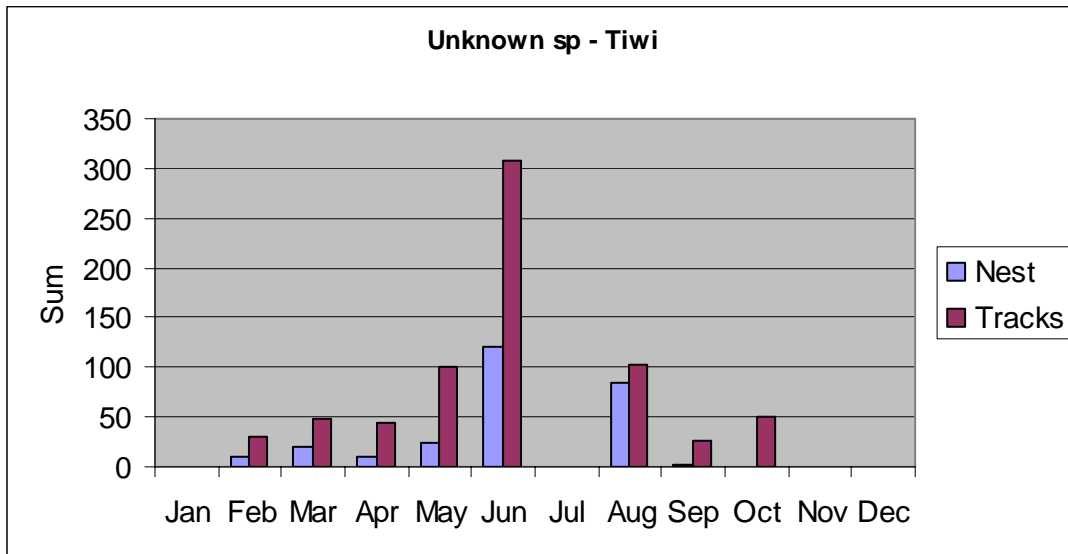


Figure 102. Number of nests and tracks per month for the Tiwi Bioregion.

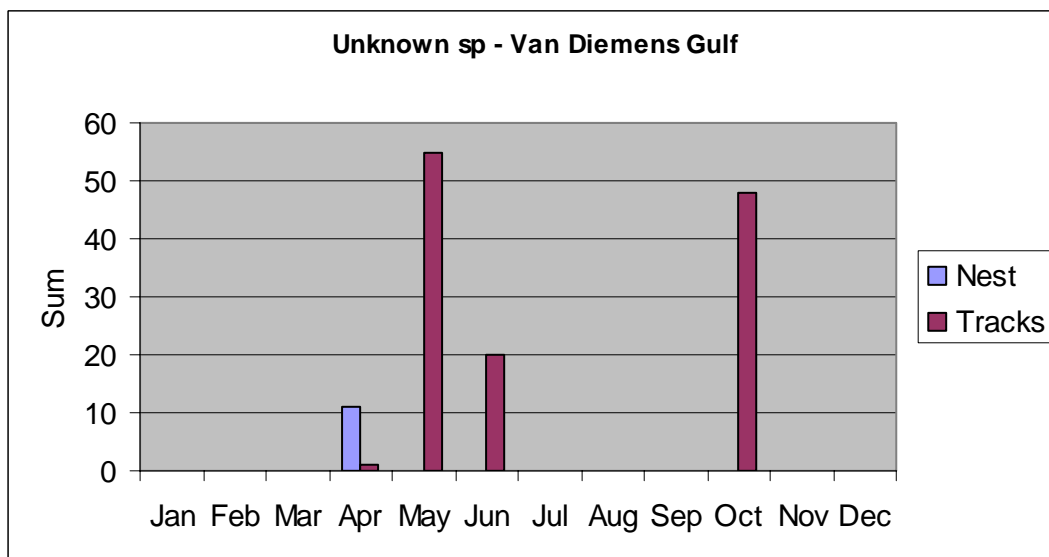


Figure 103. Number of nests and tracks per month for the Van Diemens Gulf Bioregion.

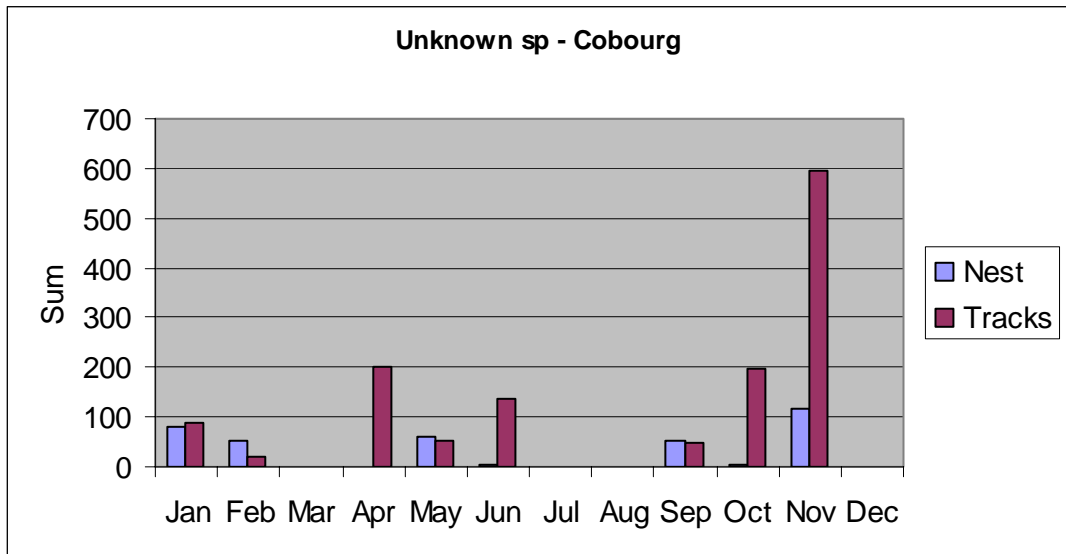


Figure 104. Number of nests and tracks per month for the Cobourg Bioregion.

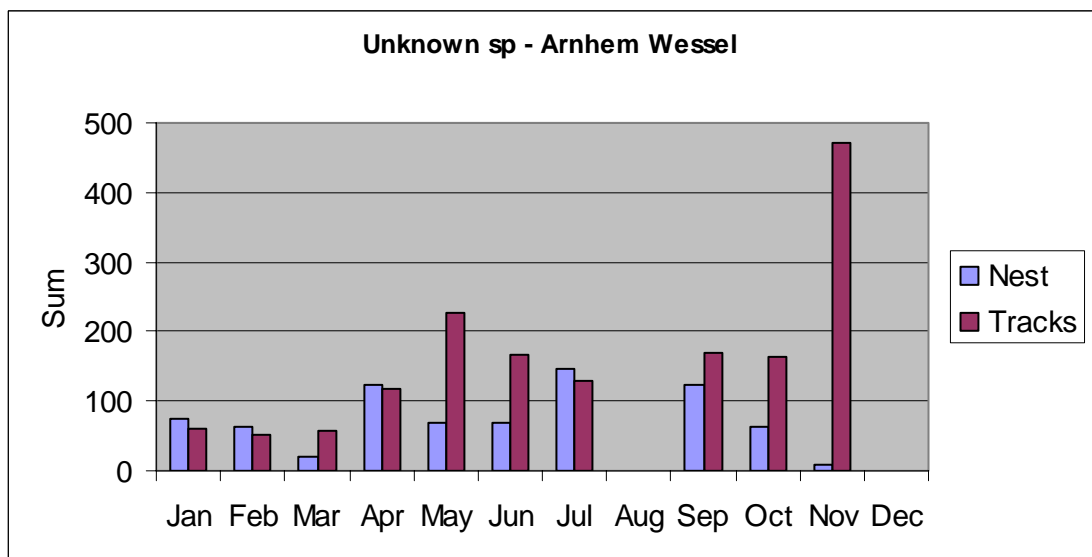


Figure 105. Number of nests and tracks per month for the Arnhem Wessel Bioregion

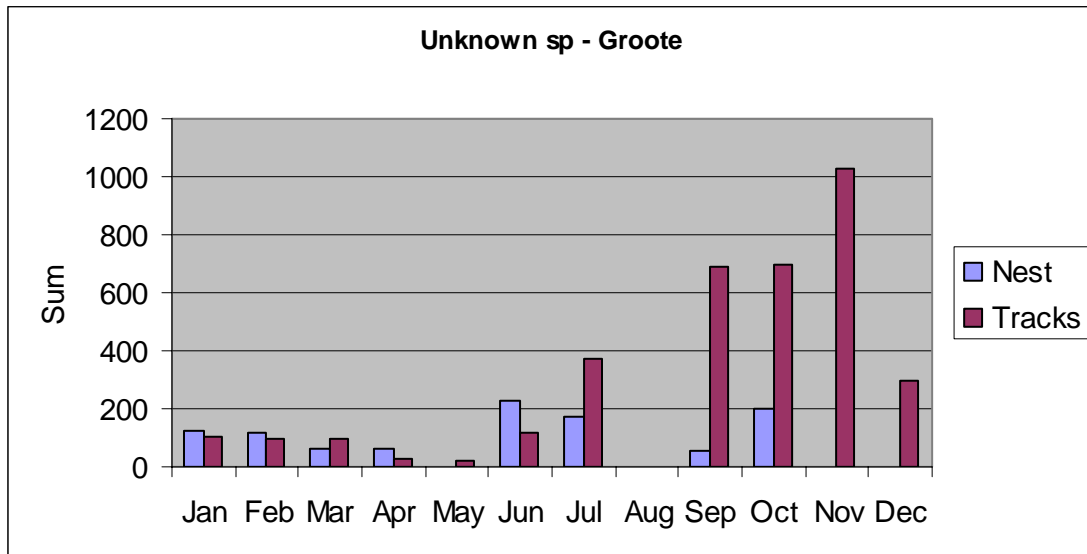


Figure 106. Number of nests and tracks per month for the Groote Bioregion.

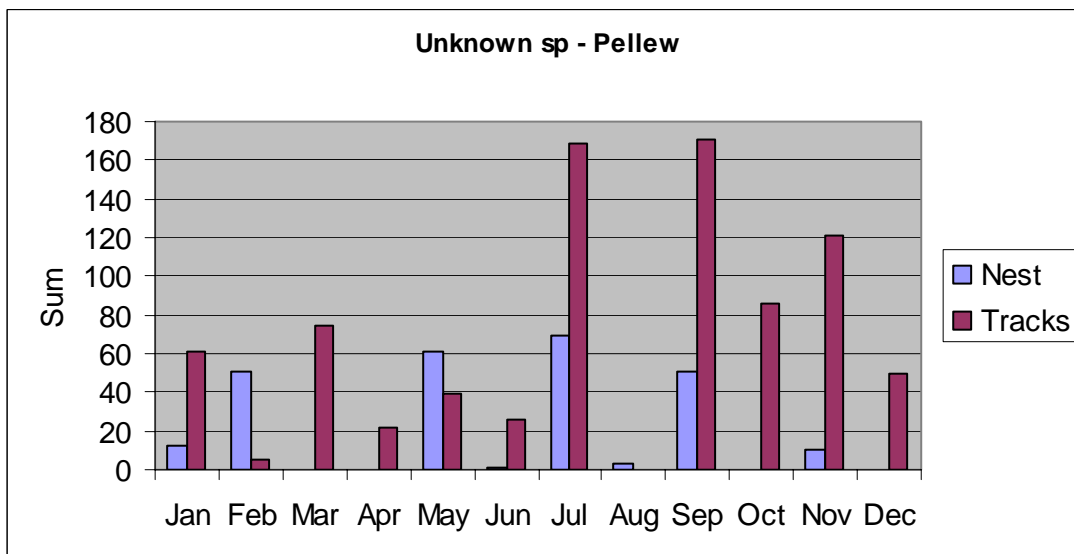


Figure 107. Number of nests and tracks per month for the Pellew Bioregion.

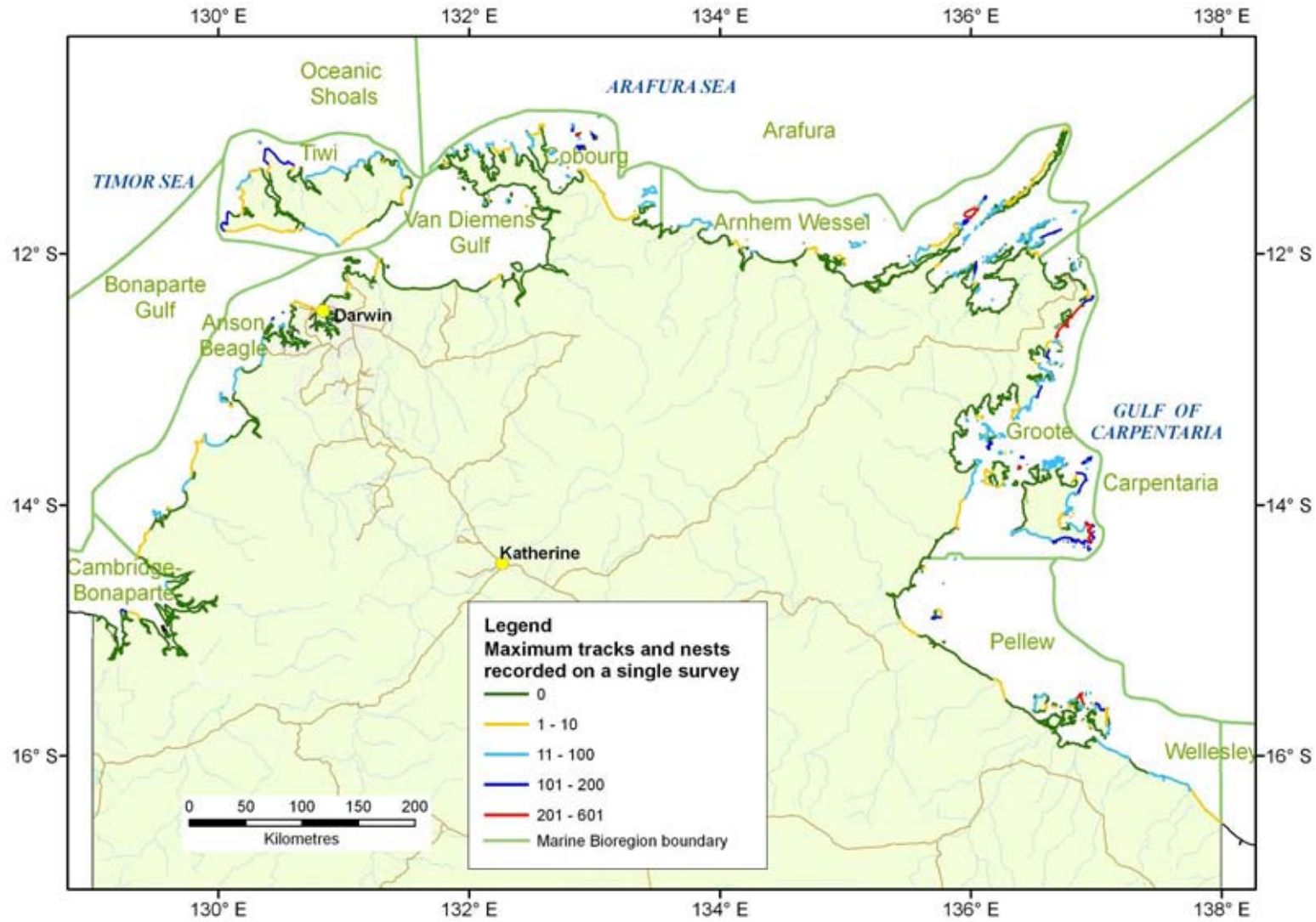


Figure 108. Overview of nesting areas for data recorded as unknown species, shown as the maximum number of combined tracks and nests for any one survey between 1991 and 2004.

