

DIRK HARTOG ISLAND LOGGERHEAD TURTLE NESTING POPULATION STUDY

A SHARK BAY WORLD HERITAGE AREA MANAGEMENT PROJECT
being part of the Western Australian Marine Turtle Project

REPORT on the 1998/99 SEASONAL WORK PROGRAM

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Introduction

Field work at the Dirk Hartog Island loggerhead turtle nesting beaches along the Turtle Bay - Cape Levillain coast was commenced in January 1994 (Prince 1994). The work was interrupted over season 1994/95, but recommenced in season 1995/96, and was continued through seasons 1996/97 and 1997/98. This report covers work undertaken during the 1998/99 nesting season. It includes results of the seasonal beach work program, and information gleaned from reports of captures and/or recoveries of previously tagged turtles from among those handled in seasons 1993/94 and 1995/96 through 1997/98.

Work Program

The main field sampling and monitoring of the adult female loggerhead turtles nesting at Dirk Hartog Island through summer 1998/99 was conducted over 14 nights between 8 and 22 January 1999. Supplementary visits to sample across the whole span of early season build up and late season decline of nesting activity were also included. These were planned and undertaken, as previously through the 1997/98 nesting season, by a local nature-based tour operator/project volunteer couple over: 5-7 December (2 nights), 12-14 December (2 nights), 27-29 December 1998 (2 nights), 2-4 January (2 nights), 6-8 February (1 night ashore only due to adverse weather and seas), 13-15 February (2 nights), 20-22 February (2 nights), and 6-8 March 1999 (1 night only ashore main nesting beach).

Through January 1999, two three member work parties were primarily responsible for the interception, tag and release of new nesting turtles, and the monitoring and appropriate action required to deal with previously tagged turtles when found. These latter included remigrant turtles tagged in seasons 1993/94, 1995/96, 1996/97, and 1997/98, as well as further on beach encounters with 1998/99 tagged turtles.

The nature-based tour operator/project volunteer couple mentioned above also assisted overnight in setting up camp and commencing this work program on 8-9 January 1999. The one group of six persons then remained on site until completion of this job on 22 January 1999. Work parties were selected as required for the tasks assigned. Some further limited data only on aspects of breeding success were obtained.

Results

Moderate numbers of turtles beaching overnight were found on the first visit over 5-7 December 1998, when twenty-two new nesting turtles were tagged and released, and another five remigrant turtles intercepted. The numbers of beaching turtles had increased substantially by the next mid-December 1998 visit, and remained high through late-January 1999, as expected.

Numbers of turtles beaching nightly to nest throughout the latter period were perhaps slightly greater than the numbers found through the 1997/98 season, with a range of new nesting turtles, plus other already tagged turtles making repeat trips ashore, and additional remigrants, being ca. 75 - 120 turtles/night.

The number of turtles beaching overnight had apparently declined to around early- to mid-December 1998 levels by the time of the mid-February 1999 visit, and tailed off sharply into early March 1999 (only 1 turtle intercepted ashore plus two other crawls overnight noted 6/7 March 1999), as in previous years.

In total, 920 new nesting female loggerhead turtles were tagged and released, and another 214 previously tagged remigrant turtles were encountered during season 1998/99 work. Cumulatively, 3 553 adult female loggerhead turtles have now been tagged and released from among those nesting at Dirk Hartog Island, and 401 have been recorded as remigrants. One other turtle first tagged and released at its feeding ground at the bottom of Exmouth Gulf late October 1994 was found on the Cape Levillain beach on 21 January 1999. This turtle was not known to have attempted nesting anywhere previous to this discovery.

Among the remigrant turtles recorded over the 1998/99 season, 28 were first records at 5 years from first encounter, 82 were at 3 years, 81 were at 2 years, and 7 were at 1 year only. One other remigrant turtle, having lost its tags, could not be assigned any specific interval. No four year interval remigrants were observable, due to the interruption of nesting beach work over season 1994/95 (noted above, and previously). Fifteen other turtles were found for the second time, including 12 from the original 1993/94 tagged group, one from the 1995/96 group, and two from the 1996/97 group. These last two turtles have thus been seen ashore over three consecutive nesting seasons.

Ten of the twelve turtles from the 1993/94 group above have recorded [1st at 3 years + 2nd at two years] interval combinations; the other two have recorded the reverse interval combinations of [3 years + 2 years]. The single 1995/96 group turtle recorded a [1st at 1 year + 2nd at 2 years] interval combination.

Apart from the 6 turtles first observed during the 1997/98 season then having been recorded twice as [1st at 2 years + 2nd at 2 years] after their original tag and release among the 1993/94 group, no other multiple remigrant combinations have been observable to date, due to the interruption of nesting beach work over season 1994/95 in the first instance, and the limited duration of this Dirk Hartog Island field work so far.

First remigrant interval data recorded to date for the various eligible nesting season groups are suggesting a modal remigration interval of 3 years for many of these female loggerheads, with a relatively high frequency on either side of 2 year and 4 year intervals, plus many with expected longer intervals (≥ 5 years; Figure 1). Cumulative observations of the first time remigrants from each of the year groups also suggest a high proportion of short-term remigrations among this population (Figure 2; ca. 40% remigrant within 5 years maximum span. Note also that: 1 year remigrant interval data unavailable for the 1993/94 group; and no adjustment for possible tag losses included, but practically all of the 1993/94 group double-tagged).

Two of the 1998/99 season remigrant turtles had also previously been reported captured and released from a boat working in the Shark Bay prawn trawl fishery. One of these turtles was being recorded for the first time, the other turtle was seen as a second time remigrant, having also had recorded a second trawl capture over the time since first seen as a remigrant. Thus, we now have obtained records of confirmed survival following a single capture and release at sea of 8 trawled and released turtles from among those tagged from this nesting population. Capture and release at sea reports for 20 Dirk Hartog Island nesting loggerhead turtles total are believed eligible for testing post-trawl capture survival prospects to April 1999.

One clutch count only (by excavation after laying) was done late-January 1999. The count of 150 eggs for this clutch was higher than the averages obtained by

excavation after deposition of eggs for larger samples from previous years [135.9 ± 8.52 (se), $n=15$, 1996/97; 132.6 ± 5.20 (se), $n=22$, 1995/96], but well within the previously observed range of full size eggs per clutch for nesting loggerheads at Dirk Hartog Island [(combined over both seasons) = 61 - 181 eggs].

Excavation analyses of 5 nest sites having produced hatchlings to the beach surface were attempted February-March 1999. Two of these nests were on the main Turtle Bay beach (restricted area = westernmost section of the Turtle Bay - Cape Levillain loggerhead breeding beach complex of northern Dirk Hartog Island, Shark Bay); the other three were from the eastward aspect beach frontage located southward from Cape Levillain (eastward from Turtle Bay).

Apparent clutch sizes indicated for these nests as excavated ranged from 75 - 128 eggs (102.8 eggs uncorrected average, $n=5$). These estimated clutch egg numbers were smaller than obtained from 10 completed nest excavations in season 1997/98 (82 - 159 eggs estimated; 130.9 eggs uncorrected average, $n=10$).

The likely difficulties associated with reconciling nest excavation analyses when assessing fecundity and hatchling production from sea turtle nests were discussed in the 1997/98 Dirk Hartog Island report (Prince 1998). Noting that qualification, these few new nest data generally confirm the previous finding that the majority of eggs laid in each nest do seem likely to have been fertile, but that the estimated hatchling production from eggs was variable: range ca. 0.64 - 0.88 (cf 1997/98 ca. 0.42 - 0.95) for different clutches. Hatchling production to emergence on the beach surface again appeared generally lower than this too: range ca. 0.53 - 0.83 (cf 1997/98 ca. 0.30 - 0.95).

New beach and nest temperature data acquisition relevant to the above was not attempted this season, but a large number of dead plus weak and apparently emaciated hatchlings (ca. 35% of clutch) were again found trapped in one of the nests being excavated.

Discussion

The 1998/99 nesting season observations were generally consistent with similar information obtained from previous work. As before, a few hatchling turtles only were seen emerging from beaches through the focal January 1999 sampling period.

The 920 new turtles intercepted and tagged and released at Dirk Hartog Island during season 1998/99 was the largest new season group handled to date. Likewise, the total of 1 134 turtles intercepted, including the largest group of remigrants yet observed.

The increased number of remigrant turtles found is largely due to the greater number of tagged turtles previously released into the nesting population plus an increase in probability of return for some of these with passing of time. The work groups involved through the season 1998/99 main sampling period, and at other times, also worked particularly well, so the overall effective on-beach effort may have improved. Possible impact of this on the numbers of nesting turtles being intercepted is not readily quantifiable, so a correction cannot readily be factored in to any calculation to standardize the apparent change in the nesting loggerhead turtle abundance at Dirk Hartog Island over season 1998/99 for comparisons. However, it is most probable that there was a real increase of perhaps 10-15% in the nesting loggerhead turtle abundance at Dirk Hartog Island over season 1998/99 relative to results for the past year or so.

Significance of this apparent seasonal increase in nesting abundance in terms of any population change is presently uncertain. We have not yet obtained the necessary continuous long-term data required for such assessment. We are also not able to properly judge any possible change in status relevant to previous times due to lack of necessary quality baseline data. Among the Western Australian region nesting loggerhead turtles, however, the Dirk Hartog Island

nesting group does appear to be in much better shape now than does the North West Cape - Muiron Islands nesting group (see below).

The seasonal breeding pattern indicated for the Dirk Hartog Island nesting loggerhead turtles for 1998/99 was similar to that previously described, ie; the nesting period can generally be expected to lie within outer bounds from late October-early November through March, with the seasonal peak of activity around late December through January each year, plus some occasional out of season beaching and egg laying. The hatchling emergence lags behind nesting: mid-late January through May is the period generally expected.

Aggregation for mating obviously precedes commencement of egg laying - the expected timing is ca. 2-4 weeks before the females come ashore. A few further observations of time and location at sea of mating pairs were reported this season, but we lack essential comprehensive data on mating aggregations and activities for these loggerheads. Internesting habitat use patterns also still need to be properly documented for the nesting females. This requires use of tracking technology at sea, as previously suggested (Prince 1998).

The few new dispersal data obtained for 1998/99 from reports of tagged turtles at sea reinforced previous findings, ie; that adult loggerhead females nesting at Dirk Hartog Island include some turtles having their home feeding grounds within the Shark Bay WHA, while others have their feeding grounds far northward in Kimberley coastal waters. The Exmouth Gulf tagged Dirk Hartog Island nesting loggerhead turtle record for 1998/99 was, however, the first documenting this particular feeding ground/nesting beach link. The fact that some of the adult female loggerhead turtles apparently resident within the Shark Bay WHA also choose to nest at South Muiron Island, off Exmouth Gulf, WA, was previously reported (Prince 1997).

Detailed definition of the full range and location of all the feeding grounds occupied by the loggerhead turtles breeding at either Dirk Hartog Island, Shark Bay, or in the North West Cape - Muiron Islands area of Western Australia is still not practicable with the data to hand, but the broad picture for this major regional stock, genetically different from the eastern Australian breeding loggerheads (Fitzsimmons *et al* 1996), is clear (WAMTP: Prince, unpublished data).

Similarly, the broad picture from the still limited at-sea interaction data being obtained for the Shark Bay prawn and scallop trawl fisheries with Shark Bay resident adult loggerhead turtles remains unchanged. This information is relevant to further review of management provisions for the Shark Bay WHA, although circumstances will alter if fleet-wide use of BRD gear technology is adopted in the near future by these fisheries. For now, survival records for some of the known trawled and released tagged turtles are very encouraging for current fisheries operators.

Nevertheless, we do not know how many adult loggerhead turtles might be resident within the Shark Bay WHA, the proportion of the Shark Bay resident loggerheads that might be sharing the prawn and scallop trawl grounds being fished in Shark Bay, or the proportions of these turtles that are part of the Shark Bay or Exmouth region nesting populations.

Similar questions are posed for turtles from these stocks elsewhere within their range at sea, where trawl and other fisheries overlap, eg; across the Australian Northern Prawn Fishery, and also external fisheries in Indonesian waters, where turtles from the North West Cape - Muiron Islands breeding group in particular are known to go.

The Western Australian breeding loggerhead turtle marked population study in progress has not yet been run for long enough to provide adequate sampling of the nesting female turtles likely to be dependent on breeding sites at Dirk Hartog Island, or in the North West Cape - Muiron Islands area. Data available to date also do not provide good indications of individual nesting frequencies in the long term, particularly because of forced interruptions to the field programs in place (WAMTP: Prince, unpublished data), but the early indication

of a high frequency of relatively short remigration intervals (see Figure 1) for turtles from the Dirk Hartog Island nesting group is interesting. Specific data on clutch frequencies per season will ultimately be needed to help interpret reproductive performance, along with more substantial data on clutch size and hatchling production than has been possible to obtain to date.

Preliminary breeding success data obtained for season 1997/98 suggested that the Turtle Bay beach (*sensu lato*) provided a less than optimal environment for production of hatchling turtles from the eggs laid, but the nest temperature data available suggested that young of either sex could be produced here over a nesting season. Similar investigation for comparison of breeding success on the easternmost part of the Dirk Hartog Island nesting beach complex around Cape Levillain, where much substrate appears to be of coarser grained sand, and seaward beach aspect and surface slopes differ from Turtle Bay beach, was suggested. No substantial work to add to this knowledge was possible through season 1998/99.

Acknowledgments

The continuing help of Craig and Jessie Shankland ('James Scheerer' Research Charter, Denham), who again aided with setting up for the main sampling program work, supplied transport needed for the supplementary nesting season work program, and also materially assisted with and carried that additional work as program volunteers is gratefully acknowledged. Other changes in program arrangements and personnel from previous years required new recruits for the intensive 1998/99 work. Assistance of Peter Lambert, skipper of CALM vessel 'Pseudorca', in managing provisioning and help with transport for the group, and in help with the beach work, and of volunteer Peter Beloff as a work team leader on the beach, and for camp maintenance duties are worthy of special note. Marj Hollands' enthusiasm on site, skill at fishing, and in spreading the turtle conservation message further afterward, and the help of David Heyhoe and Marion Shaw are also appreciated. Further necessary support and help was provided by Paul Brown and Cheryl Cowell (CALM Denham). Craig Trinidad (FisheriesWA, Denham) assisted with return transport from Turtle Bay on completion of the January 1999 sampling work.

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Figures

Figure 1. Fraction of Year Group at Observed First Remigrant Intervals.

Figure 2. Cumulative Fraction of Year Group Observed to Maximum First Remigrant Time.

Dirk Hartog Island - Loggerheads

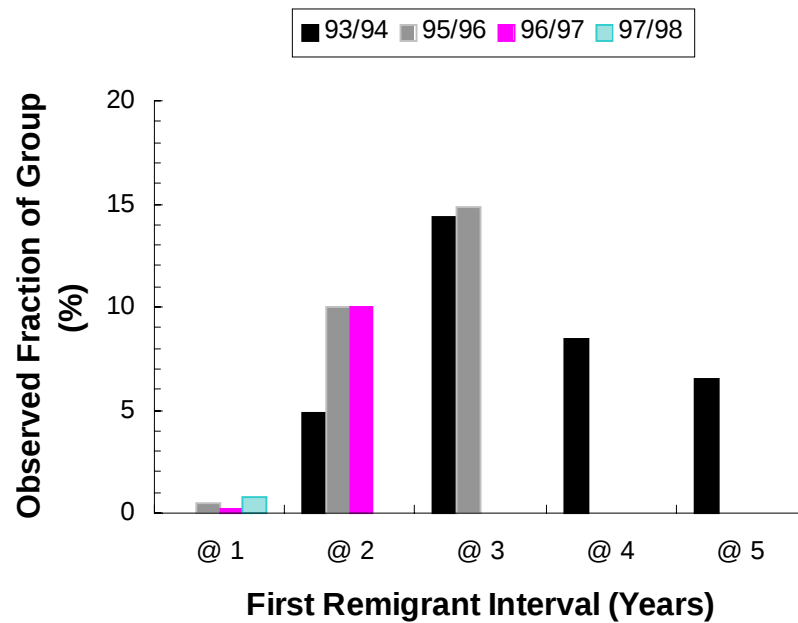


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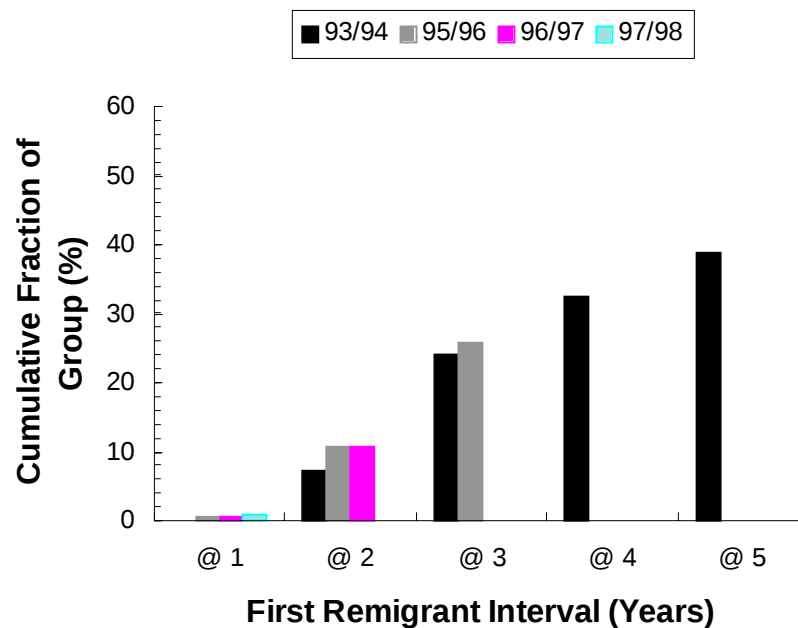


Figure 2. Cumulative Fraction of Year Group Observed to Maximum First Remigrant Time.