Report to the Department of Conservation and Land Management on:

Sea turtle research trip to Cape Domett and surrounds, Kimberley Western Australia

21 – 24 April 2006

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Introduction

Flatback sea turtles, *Natator depressus*, have a range restricted to the Australia and south Asian waters with nesting occurring in sub-tropical and tropical Australia. *N. depressus* is protected under state and federal legislations and is listed as Vulnerable in Western Australia. In northern Australia, continued on-ground monitoring of flatback nesting rookeries has occurred on Bare Sand Island NT, Field Island NT, Crab Island Qld, Peak Island Qld, Wild Duck Island Qld, Curtis Island Qld and the Woongarra coast Qld. There are few consistent studies of flatback turtles in Western Australia and very little is known about the nesting flatback turtle population on Cape Domett.

The nesting flatback population at Cape Domett is thought to be substantial in size and possibly one of the largest flatback nesting rookeries in Western Australia (Prince 1990). In 1990 and 1994 limited monitoring censuses were conducted by CALM but very little is still known about the dynamics of the population including the extent of nesting or the seasonality. The remote location, large rookery and extended nesting season of turtles at Cape Domett have caused problems with monitoring this nesting flatback rookery. This study aims to gather baseline information about the nesting rookery to establish cost-effective and practical protocols for ongoing monitoring of the substantial and regionally important nesting rookery.

This initial field trip was conducted with the long-term aims to:

- develop cost effective monitoring protocols for nesting beaches
- provide new information on turtles at Cape Domett
- provide managers with options for management in the future
- rate this region in comparison to other long term areas (for example near Darwin)
- Be comparable and work within the framework of existing National Recovery Plan protocols for nesting beaches

Methods

On 21 April 2006 an aerial survey of the Cape Domett area in the Kimberley, Western Australia (Figure 1 & Figure 2) was conducted using a light aircraft, Cessna 210. This was conducted to gain an indication of turtle nesting on Cape Domett and the surrounding areas, including Lacrosse Island and neighbouring beaches. The beaches were flown over at low speed and low altitude and the number of fresh tracks were counted. This was conducted on a falling tide so that the daily nesting activity could be distinctly identified.

Standard monitoring protocols (following Limpus *et al.* 1983) were used to survey nesting turtles on Cape Domett. Cape Domett is a sandy beach approx. 2 km in length (Figure 3) with known turtle nesting but to my knowledge the extent of nesting and the seasonal trend has not been quantified.

The beach was patrolled at night on foot to encounter as many turtles as possible. Turtles were located by looking for fresh tracks and once the turtle or track was recorded a line was marked over the track to indicate that the turtle had been processed (Figure 4).

For each turtle encountered, we recorded the date, time, species, activity, carapace length and width. Turtles encountered were tagged after the completion of laying. Turtles were tagged using Trovan PIT tags. Unfortunately standard tagging techniques using titanium turtle tags (Stockbrands Co., Perth) were not used as the tags could not be obtained prior to the field trip. This hindered the field trip and it is imperative that sufficient tags are available for future trips. A small skin sample was taken from the shoulder of turtles for future genetic analysis. Each nest was marked with a pink marker so that the nest can be followed through incubation and hatching success can be determined.

Two nests were excavated after the completion of laying and the eggs were counted and a sample of ten eggs was measured (min and max diameter and mass).

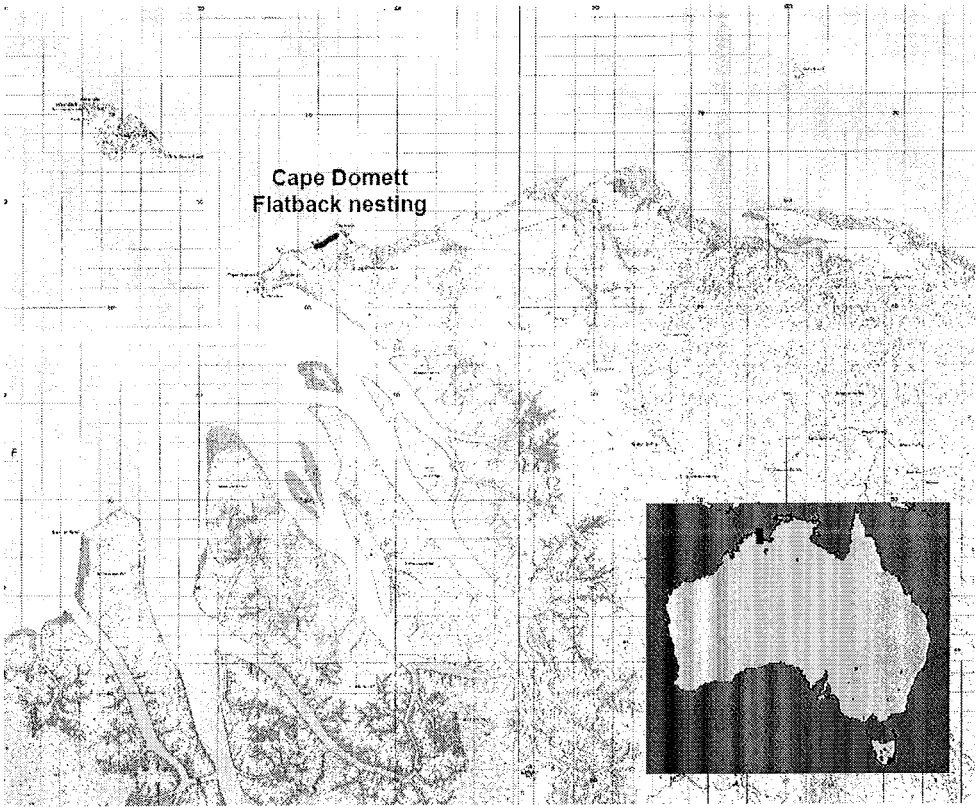

Figure 1: Location of the Cape Domett flatback nesting rookery in the Joseph Bonaparte Gulf, Kimberley Western Australia.

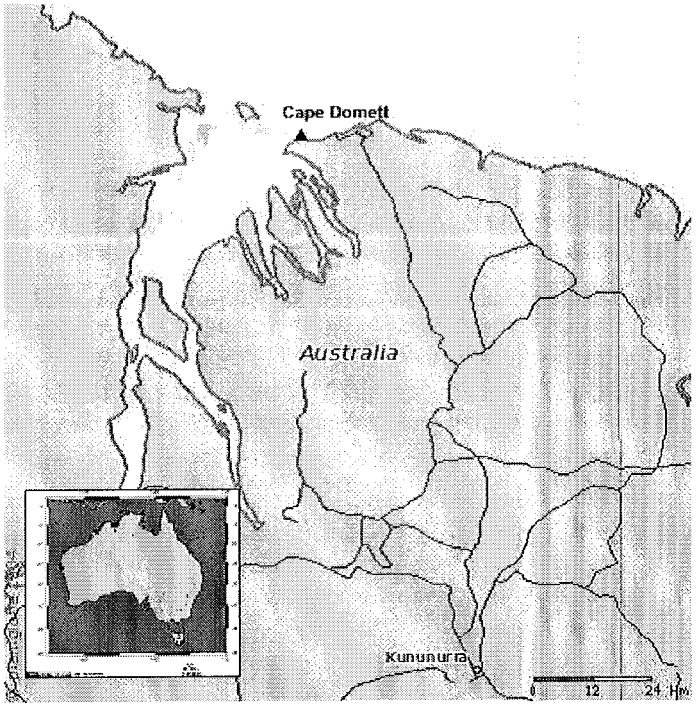

Figure 2: Location of the Cape Domett flatback nesting rookery in relation to Kununurra, Kimberley Western Australia

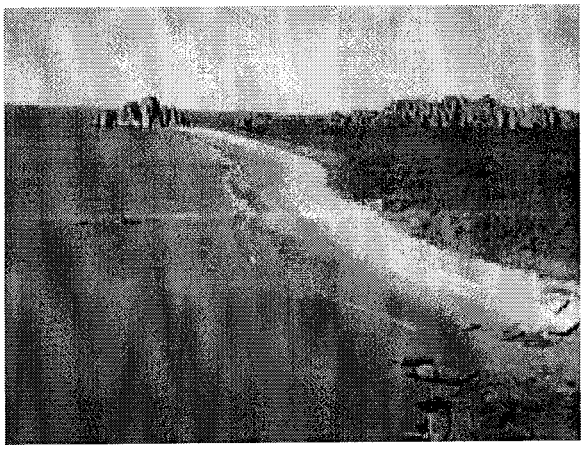

Figure 3: Cape Domett nesting beach in the Bonapart Gulf, Kimberley Western Australia

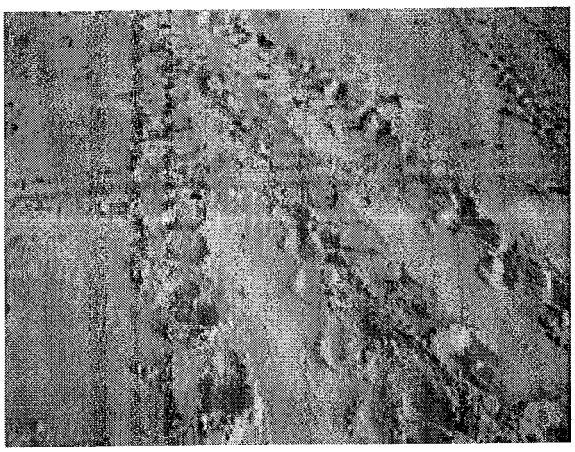

Figure 4: Flatback turtle tracks with line drawn across in sand to indicate the turtle has been processed

Results

All turtle nesting observed was from flatback turtles, *Natator depressus*, with numbers of turtles varying from four to 45 turtle tracks per night (Table 1). Although unquantified, nesting success appeared to be high as no turtles encountered left the beach without laying and of those we did not stay with, none were seen returning on subsequent nights.

Table 1: Summary of nesting activity on Cape Domett for flatback turtles (*Natator depressus*), 19-23 April 2006

Date	Tagged turtles	Total track count	Emerged clutches
19/4/2006*		15	
20/4/2006*		15	
21/4/2006	7	45	0
22/4/2006	2	4	0
23/4/2006	2	4	0

* identified by track counts on 21/4/2006

Eleven turtles were tagged with PIT tags (Table 2) and measured. The mean curved carapace length (ccl) of flatback turtles was 85.3 (s.d.=2.6, range= 81.4-89.0, n=12) and mean curved carapace width (ccw) was 72.0 (s.d.=3.2, range=65.5-78.0, n=12).

Table 2: Summary of information for turtles tagged at Cape Domett, Western Australia

Species	Date	ID	Tagst	Sp	Sex	Agecl	PIT tag	ccl	ccw
N. depressus	21/04/2006	CD1	P	F	F	A	00068284C6	83.5	65.5
N. depressus	21/04/2006	CD2	P	F	F	A	0006829F9B	85.0	70.7
N. depressus	21/04/2006	CD3	P	F	F	A	000682EE26	83.6	73.9
N. depressus	21/04/2006	CD4	P	F	F	A	000682D4A0	81.4	71.3
N. depressus	21/04/2006	CD5	P	F	F	A	000682CC39	87.3	73.8
N. depressus	21/04/2006	CD6	P	F	F	A	000682CD13	89.0	74.4
N. depressus	21/04/2006	CD7	P	F	F	A	000682ECA5	85.0	70.8
N. depressus	22/04/2006	CD8	P	F	F	A	000682E75D	81.5	68.8
N. depressus	22/04/2006	CD9	P	F	F	A	000682CC40	88.3	71.7
N. depressus	23/04/2006	CD10	P	F	F	A	000682D9F7	86.5	71.2
N. depressus	23/04/2006	CD11	P	F	F	A	000682E194	88.0	78.0

Codes: Tagst= Tag status (P=primary – not previously tagged); Sp= Species (F= flatback); Sex= Sex (F= female); Agecl= Age class (A= adult)

Eggs from two clutches were measured and the results are presented in Table 3.

Table 3: Egg and nest measurements for two clutches of flatback nests on Cape Domett, Western Australia

Species	Date	Clutch size	Depth to top egg (cm)	Depth to bottom of nest (cm)	Mean egg diam (cm)	Range egg diam (cm)	Egg mass (g) and s.d.	Egg mass range (g)	N
N. depressus	22/4/2006	54	29.5	48.0	4.81 (0.04)	4.74 – 4.85	59.8 (2.02)	56 – 63	10
N. depressus	23/4/2006	72	32.5	51.5	4.96 (0.07)	4.85 –5.09	62.4 (2.23)	58 – 65	10

Discussion

Cape Domett was confirmed to have relatively high density nesting flatback sea turtles during the April field trip. This aerial survey and previous observations (R.I.T. Prince, pers. Comm.) have indicated only limited turtle activity at small beaches in close proximity to Cape Domett (eg. Lacrosse Island and beaches to the south-west of the main Cape Domett nesting beach). The reasonable isolation of the Cape Domett nesting beach from other known nesting areas within close proximity makes it a good study site to intercept the majority of the nesting females within that rookery. In addition, the beach is only two kilometers in length and there is good access for both turtles and people for the entire beach, allowing the entire length of the beach to be monitored regularly each night. Despite the difficulty in reaching the nesting beach because of it's remote location, the Cape Domett nesting beach remains a preferred study site as an index beach for the North-east Kimberley.

Observations of turtle nesting over five days gave a good indication of the variation in numbers of turtles per night and also the size of the nesting rookery. This information will be used to make simulated data sets of turtle nesting to design more informative monitoring protocols for future monitoring at Cape Domett. Using this information and long-term datasets from other nesting beaches, recommendations for future monitoring at Cape Domett are outlined below.

During this trip, a few discussions with local people have indicated high density nesting during June to September. Further community consultation will help to gain an indication of nesting seasonality and will raise community awareness and participation in this project.

It is envisioned that monitoring will occur throughout the nesting season with minimum monitoring undertaken to ensure that sound scientific conclusions may be drawn (see below for options). This project will involve community participation, capitalising on the apparent interest but limited knowledge of the Cape Domett nesting turtles.

Recommendations for continued research

Data from full-time monitoring censuses of green turtles were used to determine appropriate sub-sampling techniques to estimate yearly numbers of turtles nests (Koch *et al.* 2006). A maximum error in the yearly estimate of nests of 15% was used. Two models were used to calculate yearly nesting numbers:-

1) A sinusoidal curve model (Gratiot *et al.* 2006)
2) A General Additive Model (Bjorndal *et al.* 1999)

Once the shape of the nesting season has been determined, additional, more appropriate models will be used. At present, the models are based on green turtle populations as there

are long-term data available for these species. Monitoring will be based on longer sampling intervals conducted less frequently throughout the nesting season due to the remote location and difficulty and expense in getting to the study site. Monitoring protocols were decided upon based on logistic and financial constraints, minimising the number of trips to the study site while maximising data quality.

Monitoring would be best conducted for at least 3 consecutive days every 7 weeks (see Appendix 2 and 3 for error, from Koch *et al.* 2006). Other options getting to the study site more frequently (eg. at least 3-4 days every 4 weeks) would lower the error in the estimates, but is probably not feasible due to logistic, financial and time constraints. This monitoring would be conducted in conjunction with a two- to three-week consecutive monitoring period. A block consecutive monitoring period will provide important biological information about the nesting flatback turtles, including their renesting interval. This two- or three-week consecutive monitoring period would ideally be conducted during the peak of the nesting season. However, as this is the first year of survey and the true peak of the season is unknown, anytime between July and September (where local people have indicated high nesting numbers) would be suitable. This would be an ideal opportunity for community involvement and education.

Conclusions & Priorities for Research

Flatback turtle nesting at Cape Domett was confirmed to be substantial, with up to 45 turtles nesting per night during the study period.

Monitoring at Cape Domett must be conducted throughout the year to ensure seasonality is identified. This will ensure that future, more restricted monitoring of the nesting population is not biased and can be put into context of the whole rookery.

Recommendations & Priorities for

- Continue monitoring throughout the season to determining seasonality of nesting turtles on Cape Domett and an estimate of the total number of nesting females for the year
- Collate previous knowledge on sea turtle nesting at Cape Domett and surrounding beaches
- CALM Kimberley Region and Charles Darwin University to continue collaborations to determine further population information on the Cape Domett nesting turtle rookery
- For the next two years, this research will form the basis of a long-term monitoring program to monitor population trends
- Field work should be instigated using the above methods to ensure a scientifically sound study
- Develop sound techniques to continue monitoring turtles at Cape Domett in the future to gain valuable information at minimum cost
- Where possible, involve the community in the establishment of a long-term monitoring program

References

Bjorndal KA, Wetherall JA, Bolten AB, Mortimer JA (1999) Twenty-six years of green turtle nesting at Tortuguero, Costa Rica: an encouraging trend. *Conservation Biology* **13**, 126-134.

Gratiot N, Gratiot J, Kelle L, de Thoisy B (2006) Estimation of marine turtles nesting season from incomplete data: Statistical adjustment of a sinusoidal function. *Animal Conservation* **9**, 95-102.

Koch AU, Chaloupka M, Guinea M, Limpus C, Pilcher N, Whiting S, Ali L. (2006). Maximising population information from various beach census regimes, *Proceedings of the 26th Symposium on Sea Turtle Biology and Conservation*, Island of Crete, Greece.

Limpus CJ, Parmenter CJ, Baker V, Fleay A (1983) The flatback turtle, *Chelonia depressa*, in Queensland: Post-nesting migration and feeding ground distribution. *Australian Wildlife Research* **10**, 557-61.

Prince RIT (1990) The flatback turtle (Natator depressus) in Western Australia: New information from the Western Australian Marine Turtle Project. In 'Australian Marine Turtle Conservation Workshop'. Sea World Nara Resort, Gold Coast. (Ed. R James) pp. 146-149. (Queensland Department of Environment and Heritage and Australian Nature Conservation Agency).

Appendix 1: Field diary (A. Koch)

Friday 21 April 2006

7:45 am Arrived in Kununurra. Met at the airport by Allan Thomson (CALM Kununurra)

8:15 am Departed in Cessna 210 Centurion for aerial survey of Cape Domett and adjacent beaches. Pilot: Brett (Slingair), Passengers: Allan Thomson, Andrea Koch, Jane, John.

Two small beaches to the west of Cape Domett supported turtle nesting – 3 tracks on the beach to the SW of C. Domett and 2 tracks on the nearer back to C. Domett.

C. Domett beach: 15 old tracks and 1 new track counted with many (>50) tracks closer to the dune and partly weathered.

9:30 am Returned to airport, went to CALM office and organised field equipment.

2:15 pm Departed in helicopter (Bell Jetranger) for trip to C. Domett (approx 50 min trip). As we approached C. Domett (~3:00pm), there were three flatback turtles on the beach, with a further two fresh tracks since this morning.

4:00 pm Walked the beach counting old and fresh tracks and processing the turtles on the beach.

9:00 pm – 12:45 am Patrolled the beach looking for nesting turtles – busy night with over 35 tracks encountered.

Saturday 22 April 2006

11:30 am Went for a walk along the beach counting all fresh tracks. We came across a flatback turtle on the beach at 12 noon just finishing laying. Fresh predation of a nest by a dingo was observed.

8:30pm– 1:45am Patrolled the beach for nesting turtles. Very quiet night with total of four turtles.

Sunday 23 April 2006

10:00 am Walked along the beach counting all fresh tracks.

8:00 pm Patrolled the beach for nesting turtles – encountered one nesting turtle on the beach.

1:00 am – 5:30 am Patrolled the beach for nesting turtles.

Monday 24 April 2006

10:00 am Walked along the beach counting all fresh tracks.

1:45 pm Helicopter flight back to Kununurra. As we were leaving C. Domett we went east along the coast to check for turtle tracks and suitable nesting beaches. No suitable beaches were found along this section of the coast.

Tuesday 25 April 2006

Public holiday – spent day entering data and writing report.

Wednesday 26 April 2006

Thursday 27 April 2006

7:15 am Departed Kununurra.

Appendix 2: Error using different monitoring techniques, using data from green turtles on Sabah, Malaysia

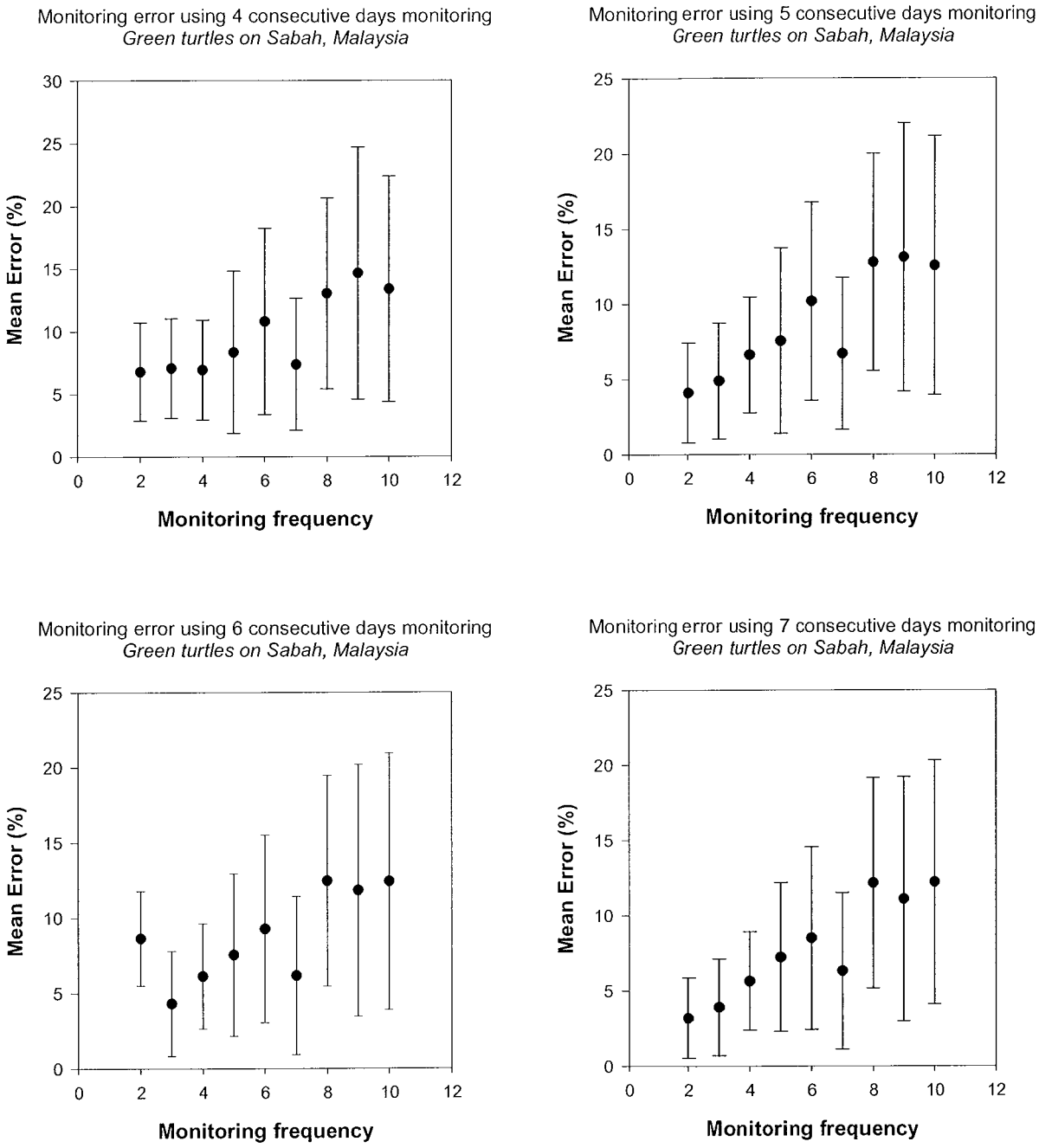

Figure 5: Error using different monitoring techniques, using data from green turtles on Sabah, Malaysia

Appendix 3: Error using different number of consecutive days monitoring for a 7-week monitoring interval

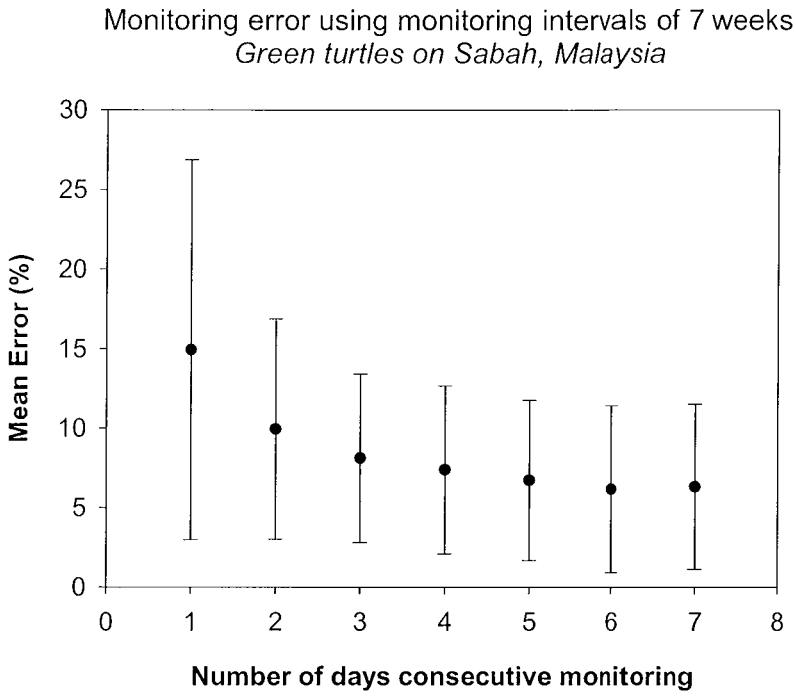

Figure 6: Error using different number of consecutive days monitoring for a 7-week monitoring interval