

**THE GREEN SEA TURTLE (*Chelonia mydas*):
NESTING ON ASCENSION ISLAND 1973-1974**

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(Reprinted from J Zool, Lond. (1976) 179, 153~163 (Accepted 6 August 1975))

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INTRODUCTION

The collection of eggs of *Chelonia mydas* from beaches on Ascension Island and elsewhere for hatching at the Mariculture Ltd farm on Grand Cayman was described in a previous paper (Simon, 1975). Improved organization of these collections has made it possible to record many incidental observations which throw light on the nesting behaviour and performance of the female *Chelonia*, and Ascension Island, because of its small size, numerous beaches and good communications, proved to be particularly favourable for such research. The present paper records observations made in February and March 1973 and 1974. The second author has contributed only by the analysis of the data and the preparation of the paper.

ASCENSION ISLAND

Ascension Island lies in the Atlantic about 450 miles south of the equator midway between the mouth of the Zaire river in Africa and the eastern extremity of South America at Recife in Brazil. It is of volcanic origin and about 9 miles from East to West and 7 miles from North to South. A central peak rises to 2820 ft. Much of the coastline is rocky. The main group of beaches is on the west, but there are others on the north, northeast and southwest **Figure I**.

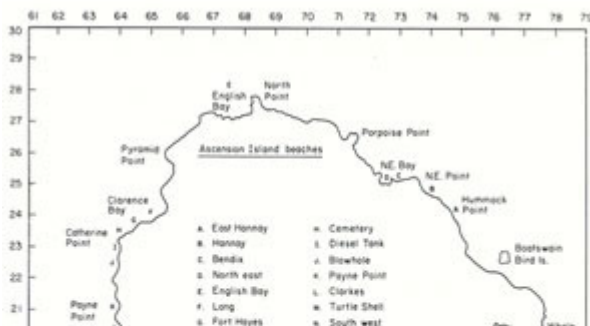


Figure I. Sketch map of Ascension Island, showing the beaches.
(The figures on the horizontal and vertical axis refer to a local grid.)

The western beaches are composed of coarse sand containing shell fragments. the northeast beaches are largely made up of sand of volcanic origin and

contain a lot of fine material. There are no coral formations or lagoons and no turtle grass, but the island has long been famous for its nesting turtles (Hart-Davis, 1972) which leave their feeding grounds off Brazil to nest on the beaches of Ascension Island. This curious migration pattern has perhaps evolved as a result of the gradual separation of feeding and nesting sites by continental drift over millions of years (Carr & Coleman, 1974).

METHODS

In 1973, observations were made between 5 February and 1 April, and in 1974 between 9 February and 14 March. Almost all the beaches were visited every night, some of them several times. Every turtle encountered crawling on a beach was tagged and recorded or, if already tagged was recorded. The operative date was that on which the night watch started. Many turtles were encountered more than once during the same night, but such encounters were recorded only as one, unless they were on different beaches. In addition to the routine observations of tag numbers length and width of carapace, time and date, beach and nesting, the following were recorded where present: signs of previous tagging or notching, supernumerary scutes, deformities, barnacle patterns, damaged flippers and skin lesions. For record purposes the scutes were numbered as shown in [Figure 2](#).

Figure 2. Notation of scutes used in work on Ascension Island.

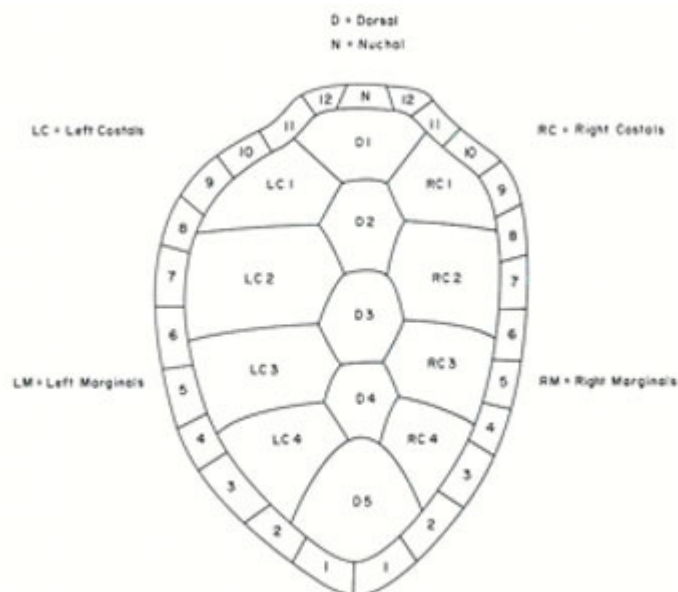


FIG. 2. Notation of scutes used in work on Ascension Island.

Carapace length and width was measured by callipers or by tape over the curvature of the shell. Of the two, the use of callipers is preferable for measuring width, because the greatest width can be determined more readily than by using a tape. By contrast, the tape is equally good or better for measuring length, depending on the shape of the rear marginal scutes. Also, it is much simpler to use on a restless animal and on a dark night.

Observations

Numbers of turtles

Total encountered

During the period of observation in 1973 (54 nights), 561 different turtles were encountered on the beaches, an average of a little over 10 new ones per night. In 1974 (32 nights), the corresponding figure was 496 giving an average of 15 new ones per night.

Number of times individual turtles encountered

In both years more turtles were seen only once than with greater frequency, but a substantial number were seen two (30%) or three (15%) times. Very few were encountered six times or more.

Number of beaches each turtle visited

In both years, most turtles were encountered on only one beach during the period of observation, but about one-third were encountered on two or more beaches. In 1973 15 turtles were encountered on two different beaches in one night.

Return of previously tagged turtles

In 1973, 16 turtles with tags previously applied by the MCL team on Ascension during earlier egg-collecting expeditions returned to the island's beaches during the period of observation. In addition, 29 showed definite signs of healed tag holes. In 1974, the numbers were 3 and 15 respectively. Old notches, dating from at least several years earlier were noted in the rear marginal scutes of 38 turtles in 1973 and 51 in 1974, and tracings were made of the notchings to assist future identification. It has not so far been possible to trace the source of these old notches.

Size and variation

Size

In 1973, carapace length and width were measured by callipers or by tape over the shell (OS) --in 1974, both types of measurement were made on almost all animals so that a conversion factor could be determined. In 1973, the greatest length measured was 52 1/2 in OS, the smallest 36 1/2 in by callipers. In 1974, the greatest length was 49 1/4 in by callipers and the smallest 37 in. The frequency distribution of OS length in the two years is shown in Figure 3. In both, the most frequent length was in the range 45-46 3/4 in, but substantial numbers of animals were only slightly smaller or larger. The relation of caliper to OS length in 444 turtles within the size range studied was, as expected, linear; over the range 40 to 50 in OS measurement, caliper measurement increased by 6.7 in for every 8.0 in increase in OS length, i.e. caliper length was 0.84 of OS measurement.

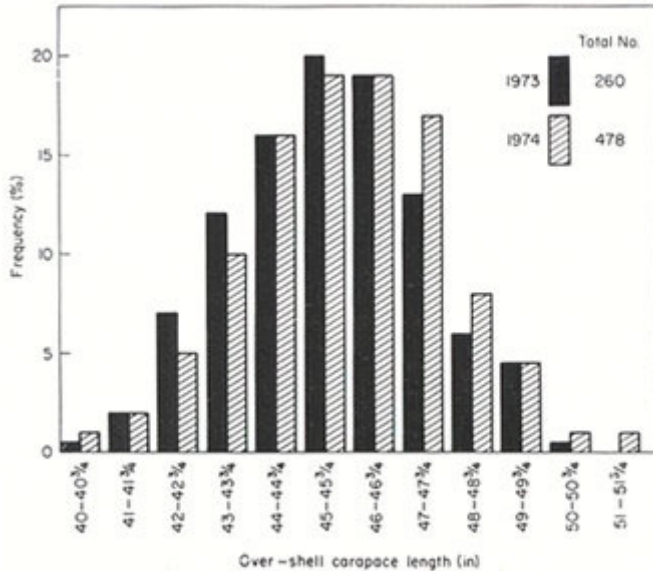


Figure 3. Percentage frequency distribution of overshell length.

FIG. 3. Percentage frequency distribution of overshell length.

Analysis of the relation between length and width by caliper for 689 turtles showed that over the range 37/38 in to 45/46 in, width increased by 1 in for every 2 in increase in length (Figure 4). Obviously, a similar relationship cannot hold for smaller turtles.



Figure 4. Relation between length and width of carapace, by caliper measurement, over the range of carapace length 31-46 in. (____) Observed measurements on 689 turtles; (-----) line for 1 in increase in width and 2 in increase in length.

TABLE I Abnormalities observed among female turtles beaching on Ascension Island

Abnormalities	1973		1974	
	Number	%	Number	%
Additional dorsal scute between 4 & 5	4	0.7	7	1.4
Deformation such as lumps, depressions and cracks	44	7.8	35	7.1
Barnacle patterns	20	3.6	41	8.3
Loss of part of flipper	49	8.9	28	5.6
Skin lesions above mating marks	15	2.7	15	3.0

Abnormalities

Abnormalities observed in both years are shown in **Table I**. The most common were slight deformities or loss of part of one or more flippers. Additionally in 1974, 31 of the 496 turtles were noted as having abnormal scute patterns (6.25%). Of these, 16 had variations in the left costals, 21 in the dorsals and 9 in the right costals, some of the animals having more than one abnormality.

Nesting

Number of times encountered on beach before nesting

The results are shown in **Table II**. The larger number of females visiting one or two beaches before nesting in 1974 may be due to the sand having been particularly dry during that season.

TABLE II Number of times an individual turtle was encountered on a beach before nesting. The periods of observation are given in

brackets

Number of beaches	Number of turtles found	
	1973 203 turtles (54 nights)	1974 231 turtles (32 nights)
1	14	80
2	7	26
3	8	8
4	8	5
5	4	2
6	2	-
7	2	-
8	2	-

Number of nests per turtle

The results are given in **Table III** which shows that 203 laying turtles were encountered. In 1973 and 231 in 1974. In the second year there was therefore a higher proportion of layers among the smaller number of turtles encountered during the shorter period of observation, suggesting, as do the figures given in **Table II**, a more concentrated breeding season in 1974. But the figures for the number of nests mean little since the stage of the nesting cycle of any particular animal is not known.

TABLE III Number of nests per laying turtle

Number of nests	Number of turtles	
	1973	1974
1	169	189
2	31	39
3	3	3
Total turtles	203	231
Total nests	240	276

Number of beaches nested upon

In view of the number of different beaches visited by turtles before laying, and the myth that turtles always go back to the beach down which they ran as hatchlings, the number of beaches actually used is of interest. Unfortunately only a minority of the turtles were known to lay more

than once during the observation periods in the two years so that analysis must be very incomplete, but of the 34 females which nested more than once in 1973, four laid on two different, and one on three different beaches (15%). In 1974, of the 39 turtles nesting twice, nine (23%) did so on different beaches. Had the females observed to nest only once been followed through the complete nesting cycles probably averaging five nests, the number using more than one beach would almost certainly have been greatly increased, and as hatchlings can hardly run down more than one beach to the sea the idea that the female always returns to its natal beach stands in need of qualification.

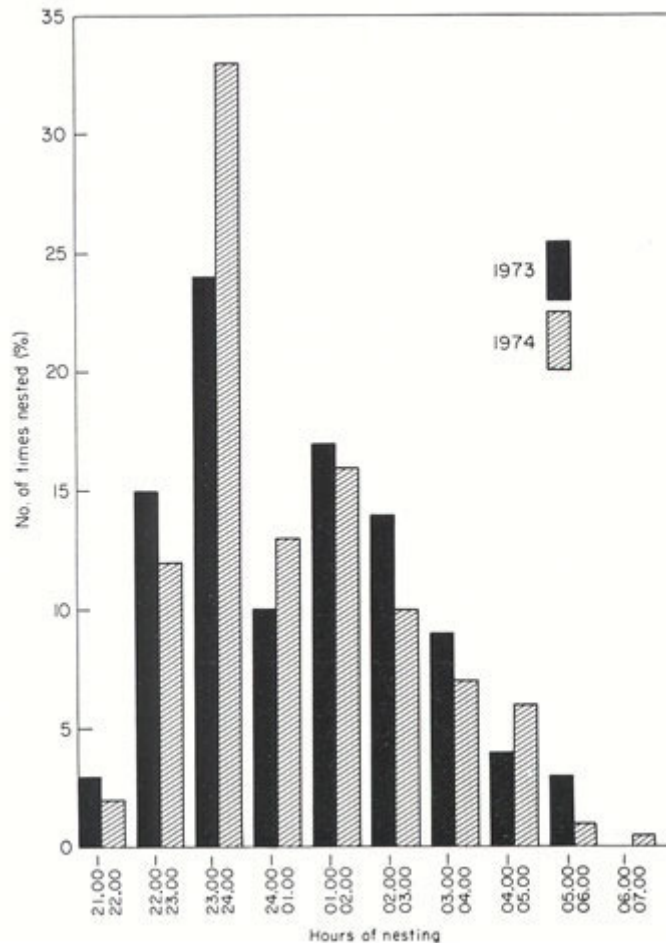


Figure 5. Percentage time of nesting.

Time of laying

In both years all nests were laid between 21.00 hours. and 05.00 hours.. The peak number was laid between 23.00 hours. and midnight, the concentration at this time being greater than in 1974

Figure 5. Comparison of the observations on NE beach with the overall ones for 1973 suggested that the timing was similar on all beaches, as did

the few nests laid on Hannay beach.

Oviposition

The complete sequence of oviposition was observed in one turtle on 8 February 1973. Of 131 eggs laid 31 were laid as singles, 76 in pairs and 24 in trios. This result is very similar to that recorded for two clutches laid on the Mariculture beach in 1973 (Simon & Ulrich & Parkes, 1975) in that the great majority of the eggs were deposited in singles, but the proportion of pairs is higher.

TABLE IV Part sequences of egg laying

No. of turtle	Date	Total Number of eggs	Number of contractions observed	Egg sequences observed			
				Singles	Pairs	Trios	Quartets

B1924	February 11	132	38	10	25	3	0
B1909	February 11	131	18	6	8	3	1
B1928	February 13	116	40	11	17	10	2
B1859	February 14	82	20	11	9	0	0
B1939	February 15	137	55	31	19	5	0
B1875	February 16	122	50	15	28	5	2
B1891	February 18	136	45	5	27	12	1
B1802	February 19	160	18	8	10	0	0
B1998	February 22	100	48	14	29	5	0
B1912	February 22	128	66	14	37	15	0
A252	February 24	157	58	26	21	11	0
B1884	February 12	-	38	19	9	9	1
B1879	February 28	106	15	4	6	5	0

Parts of the laying sequence, usually from about the middle to the end of laying were observed in 13 other turtles - the results are tabulated in **Table IV**. They follow the usual pattern, except for the appearance of a few quartets.

Inter-nesting interval

The results, **Table V**, show that, by two-day groups, intervals of 11-12 days were most common in both years (average 41.0%), but there were numerous ones in the 13-14 day range (average 25.3%). Two nests made on successive days by the same female and two at a two-day interval, obviously containing split clutches, are not included in the Table. The secondary concentration for each year in the 21-26 day range probably indicates that a number of nests were missed, giving double intervals for a few animals. The intervals recorded for the MCL beach in 1973 included two such double ones, the great majority being of 9-10 days, rather shorter than the mode interval recorded above.

TABLE V Inter nesting interval 1973 mid 1974

Interval	No. of intervals		%	

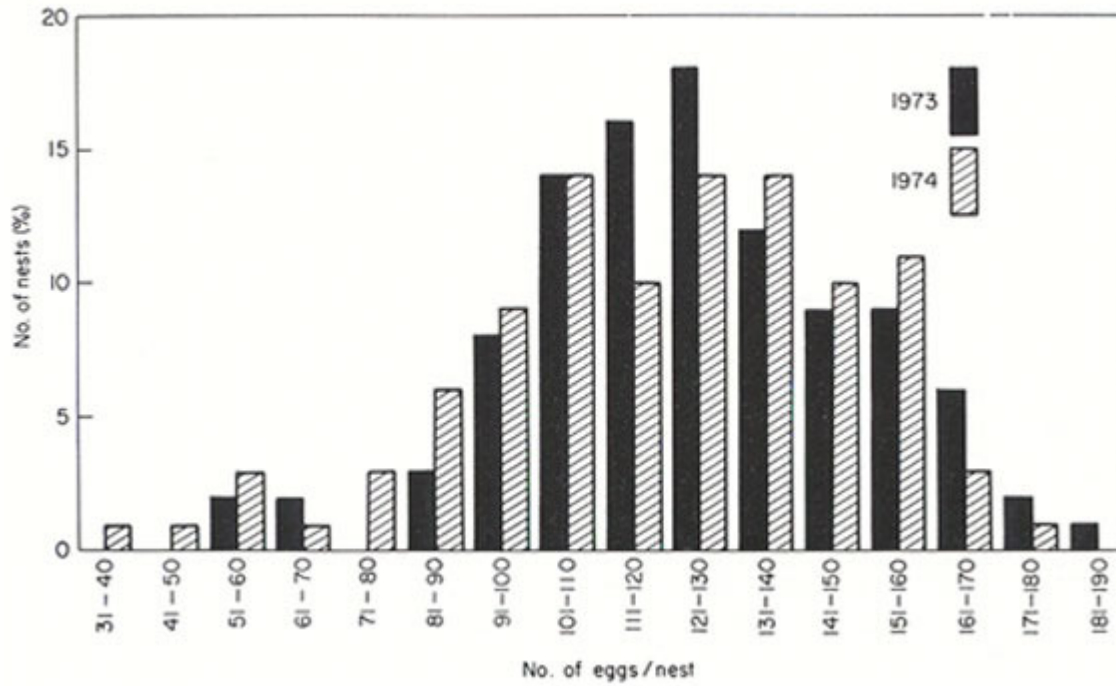
(days)	1973	1974	1973	1974
9-10	1	1	3.2	2.3
11-12	13	18	41.9	40.9
13-14	7	12	22.5	27.3
15-16	1	2	3.2	4.5
17-18	3	2	9.7	4.5
19-20	--	1	--	2.2
21-22	4	2	12.9	4.5
23-24	1	3	3.2	6.8
25-26	1	3	3.2	6.8
Total	31	44	99.8	99.8

Size of clutch

Frequency distribution

In 1973, the peak number of eggs per nest was in the range 121-130. In 1974 the peak was less well defined, being stretched between 101 and 140 eggs (Figure 6); in 1973 the average 169 nests checked was 116.3 eggs per nest and in 1974 of 163 nests it was 127.0. These averages are well within the range recorded for Caribbean turtles (Costa Rica and Surinam). As between different beaches in 1973, 126 nests on NE Beach averaged 116.8 eggs, 26 nests on Hannay Beach 108.5 eggs, 17 nests on all other beaches, 124.6 eggs. The smaller observed clutch size on Hannay Beach was possibly due to some of the turtles, frustrated in digging by the exceptionally dry sand, dropping part of the clutch in the water, where some eggs at least were seen by divers.

Figure 6. Percentage frequency distribution of number of eggs per clutch, 1973, 1974. Four nests made in 97 containing less than 10 eggs, being obviously aberrant, are omitted from the calculations.



Relation with its body' size

A Table based on 127 turtles and 15,169 eggs recorded in the two periods of observation omitting on or two abnormally small, probably split, clutches showed a good correlation between the size of the animal, as indicated by carapace, and the number of eggs in clutch. Averaging clutch size for 3 in intervals of carapace length gave a line approximating closely to the equation that, over the range of body size involved, 3 increase in length equalled an increase of 10 eggs per clutch (Figure 7).

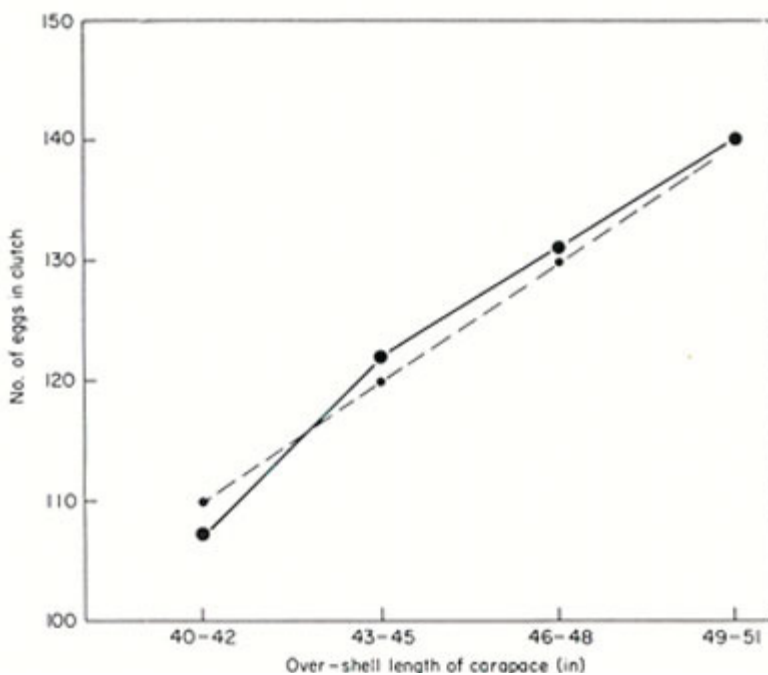


Figure 7. Relation between size of female and number of eggs in clutch. (————) Observations on 62 turtles 1973 and 67 in 1974; (-----) line for an increase of 10 eggs per clutch for every 3 increase in length of female.

DISCUSSION

The relation between clutch size and body size of turtles examined on Ascension Island is similar to that obtained on the much smaller number of females laying on the MCL beach on Grand Cayman Island in 1973. Apart from the far larger numbers involved the result is more significant because of its being obtained on a single geographical race instead of on a mixed population of Surinam and Costa Rican animals. The fact that other things being equal, larger turtles lay bigger clutches of eggs raises an interesting question. As even adult turtles continue to increase slowly in size it implies, again other things being equal, that older turtles lay larger clutches. There must be an end-point to this progression but, as yet, it has not been possible to determine whether the waning of reproductive capacity in old females is signalled by the production of smaller clutches or the abrupt cessation of laying.

SUMMARY

Observations were made on 561 female Green turtles on the beaches of Ascension Island between February 5 and April 1, 1973 and on 496 between February 9 and March 14, 1974. All were tagged and measured, and the beach involved, nesting activity and any abnormalities noted. Most turtles were encountered only once, but a substantial number in both years were seen three or more times on different nights.

In 1973, the largest turtle recorded measured 52 $\frac{1}{4}$ in by tape over the shell; in 1974 greatest length was 49 $\frac{1}{4}$ in by callipers. In both years the most frequent length was in the range 45-46 $\frac{3}{4}$ in. Over the range of size studied width increased by approximately 1 in every 2 in increase in length. During the comparatively short periods of observation, most nesting turtles were observed to nest only once. Of those observed to nest twice or more, 14 used more than one beach. Peak nesting time was 23.00 -24.00 hours. Peak number of eggs in a clutch was in the range 121-130, but there was wide scatter in both years. The most frequent inter-nesting interval was 11-12 days, the next most frequent 13-14. Larger females laid larger clutches, at a rate closely approximating to 10 additional eggs per clutch for each 3 increase in length.

Permission for the egg collections was negotiated with the Governor of St. Helena by the administrators of Ascension Island, Brigadier H. W. D. McDonald in 1973 and Mr G. Guy in 1974. Much help was received on the Island from the U.S. Base Commanders, the Shipping Department and Cable and Wireless Ltd.

The team, led by M.H.S., was flown to Ascension from Cape Kennedy and back each year by the U.S. Air Force. Men of the U.S. Air Detachment on the Island, under Major Cardell, and members of the British community gave valuable help in tagging and recording. Peter and Grace Critchley provided vehicles, storage space and helped in many other ways. To all these Mariculture acknowledges its indebtedness and members of the team offer their grateful thanks not only for operational assistance, but also for much personal kindness.

Much of the tabulation and plotting of the extensive data was carried out by Miss Oona Ault and Mrs Dee King. The authors are again indebted to Dr I. W. Rowlands, Dept. of Anatomy, Cambridge, for reading the script and commenting.

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