

range near its release point; no datum of this animal appears in the figure.

While the mechanisms of orientation are unknown, the data suggest that the box turtle is able to move in a predetermined direction over periods of several days and considerable distances. This ability could facilitate the maintenance of a directional course when basic orientation cues are temporarily obscured by poor weather or dense canopy (also see Gould 1957). Such mechanisms operate in migrating birds (Matthews, 1958).

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ECOLOGIC IMPLICATIONS OF SIZE AND GROWTH IN CHELONIA.¹—Among the conspicuous gaps in the natural history of marine turtles is a dearth of information on growth after maturity is reached. During the course of a 15-year tagging program at the nesting ground of the Atlantic green turtle, *Chelonia mydas*, at Tortuguero, Costa Rica, 47 remigration returns were recorded, after absences of two years or more. There have been 42 two-time returns to the beach, and three turtles have returned three times to the date on which they were originally banded (Carr and Carr, 1970). Although extremely slow (see Fig. 1) the growth of mature females in the west-Caribbean population can now be assessed with some ac-

curacy, and the relation between individual size and population density can be appraised.

In the Caribbean, as in other parts of the circumtropical range of *Chelonia*, a decrease in population density has evidently been in progress for at least a century. While good census data are not available, evidence of the decline can be seen in the cessation of group nesting in many localities; in the disappearance of green turtles from *Thalassia* beds where once they were abundant; and perhaps in a long-term decline in maximum body size—as indicated by comparison of modern measurements with those of commercial turtling records of the 19th century. At the Tortuguero nesting ground this trend appears to have caused a foreshortening and early termination of the season, a fall in the number of nesting arrivals on the northernmost part of the 22-mile breeding beach, and an almost complete cessation of nesting on the southern six miles of the shore.

At the close of the 1969 nesting season at Tortuguero, the shell-length data that had accumulated for 15 years were tabulated, both to determine growth rate and to see whether any long-term reduction in maximum body-length (claimed by commercial turtlers) had occurred. It came as a surprise to learn that there has been no such trend (Table 1). Because the growth of all reptiles, including sea turtles, supposedly continues indefinitely, and because continuous depredations by man must steadily lower both the maximum and the average ages of individuals in the populations involved, the failure of the data to show a downward trend in body-size during the last 15 years is noteworthy. The data suggest (Fig. 2) that observed body sizes may be more strongly influenced by differential size on reaching maturity than by the post-maturity growth rate (Fig. 1). Unpublished information indicates that during the first years of life green turtles grow rapidly and this rate probably continues until sexual maturity is reached. It has until now been our supposition that the big "wind-turtles," as oversized green turtles are called at Tortuguero, were simply very old ones, while the 29- and 30-inch females were young individuals nesting for the first time. It now appears that some green turtles mature at small, and others at large sizes; and that once they are mature—that is, once they have made their first trip to the nesting beach—their growth becomes negligible, as com-

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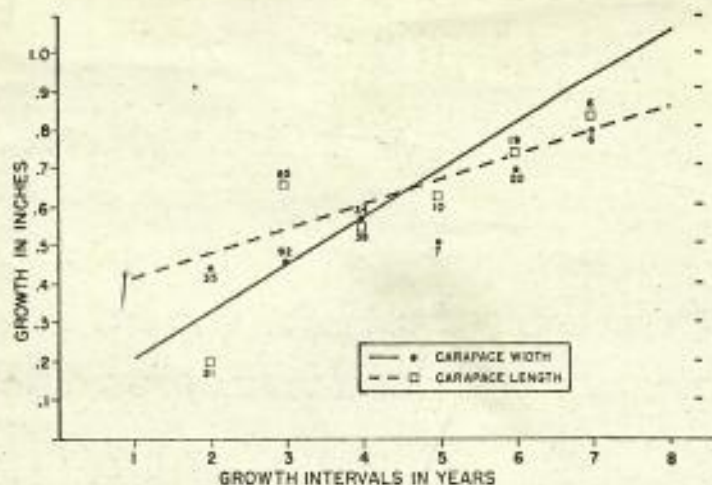


Fig. 1. Growth of mature female green turtles at Tortuguero, Costa Rica. Squares and circles show mean growth for the corresponding growth interval. Numbers indicate size of samples represented by means.

pared with individual variation in maturity-size.

Whether the variation in size at maturity is genetic rather than a result of ecologic vicissitudes on the residence range cannot be determined, partly because the residence territory of nesting females is never known. However, if it could be shown that large size is adaptive light might be shed on the question. Comparison of the Tortuguero

green turtles with those from Ascension Island suggests that body size may be related in some degree to the length of the breeding migration. The Ascension turtles are perhaps the biggest representatives of the genus in the world (Fig. 3), and are markedly larger than those of the Tortuguero population. The average migration that Ascension turtles have to make from the Brazilian coast to the breeding ground is much longer

TABLE 1. SHELL-LENGTH (OVERALL, STRAIGHT LINE), IN INCHES, OF MATURE FEMALE GREEN TURTLES, TORTUGUERO, COSTA RICA.

Year	No. Measured	Range	\bar{x}	S. D.	Mode
1956	109	36.5-46	39.41	1.86	39.0
1957	258	31-44.5	39.00	2.13	40.0
1958	147	30-45	39.08	2.44	39.5
1959	201	30-46.25	39.28	2.34	39.0
1960	403	32-44.5	39.61	2.00	39.0
1961	404	31-44.5	38.87	2.84	38.0
1962	338	29.5-45	39.29	2.21	38.0
1963	576	28.5-45.75	39.44	1.96	40.0
1964	386	30.75-44.5	39.68	1.88	39.5
1965	322	29.25-47.0	39.39	2.15	39.0
1966	93	29.75-44	39.23	2.50	37.75, 40
1967	387	31.5-44.25	39.49	1.83	40.0
1968	268	31-45.5	39.63	1.97	39.0, 40
OVERALL	3912	28.5-47	39.37	2.17	

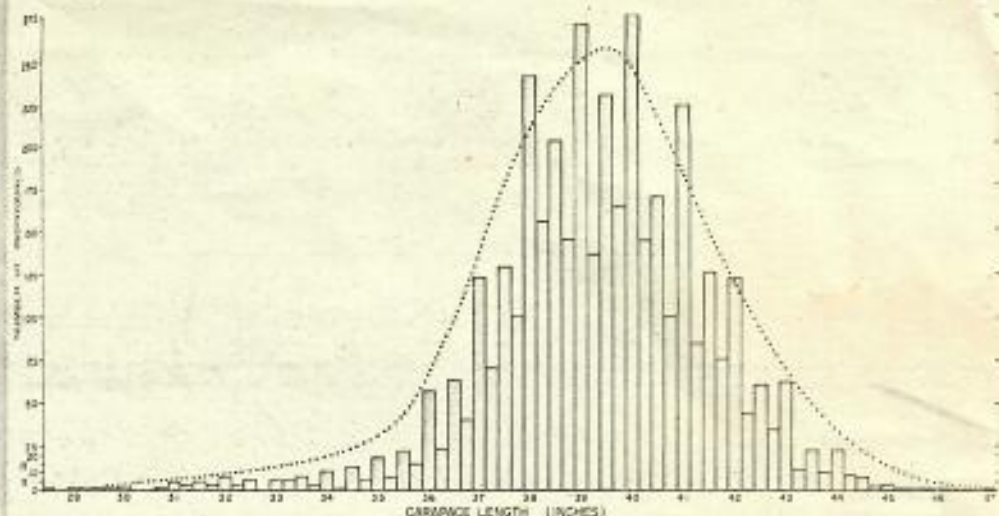


Fig. 2. Carapace length (overall, straight line) of mature female green turtles at Tortuguero, Costa Rica.

than the average distance travelled by the Tortuguero migrants (Carr and Hirth, 1962; Carr, 1967). The Ascension migration involves at least 3000 miles of swimming in abyssal water where food is not available. During their stay of from six weeks to two months at Ascension, the migrants either continue to fast, or piece out a desultory diet of invertebrates and algae on the narrow edges of the island shelf. It may logically

be assumed that large size is advantageous to this population because it imparts greater locomotor efficiency, greater fat-storing capacity per unit of surface drag, or both. There might be additional advantage in the decreased metabolic rate per unit of tissue that occurs as body weight increases (Hemmingsen, 1960). In any case, body-space for fat-storage would seem critical.

Comparative studies of fat-storage, involv-

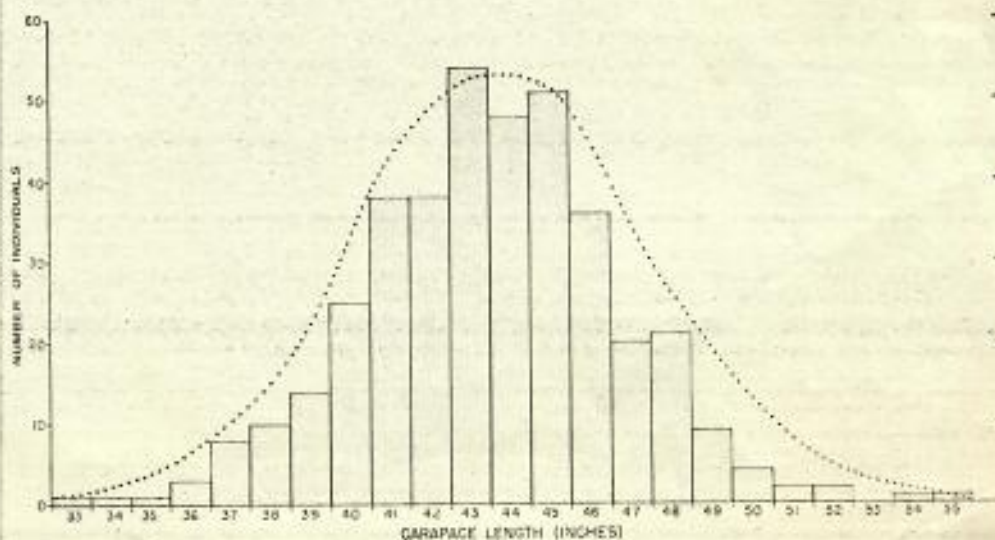


Fig. 3. Carapace length (overall, straight line) of mature female green turtles at Ascension Island, South Atlantic Ocean.

ing green turtles taken at different seasons and with different patterns of migratory travel, have not been made. However, people who take turtles on nesting beaches believe that females killed late in the nesting season are "meagre"—that is, lean; and Carr (1964) cited verbal reports from the Galapagos Islands that in the migratory and non-migratory populations of *Chelonia* that appear to mix there, the group considered migratory yielded several times more oil than the resident turtles when processed by the local oil industry. It therefore seems reasonable to suggest that in Ascension turtles, as well as in those of the Tortuguero colony, adult body size is influenced more by maturation size and by factors involved with migratory movement than by growth after maturity, and that the Ascension turtles are large because they have to travel farther without feeding.

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- ARCHIE CARR AND DONALD GOODMAN, *Department of Zoology, University of Florida, Gainesville, Florida 32601.*

CHANGES IN THE NAME AND GENERIC STATUS OF THE MEXICAN SNAKE *CHERSODROMUS ANNULATUS* ZWEIFEL (COLUBRIDAE).—Zweifel (1954) described *Chersodromus annulatus* from Chilpancingo, Guerrero, Mexico on the basis of a single specimen. This snake was not mentioned again in the literature until Zweifel (1960) compared it and several other

species of black and white banded snakes with *Exelencophis nelsoni* of the Tres Marias Islands, in an attempt to clarify the relationships of *Exelencophis*. Smith and Layman (1966) listed the species in the addendum to the reprint edition of the Mexican checklist and mentioned a paper in which Scott (1967) synonymized *Chersodromus annulatus* with *Tropidodipsas annulifera*.

On 19 July 1966 we collected a second specimen of *C. annulatus* 6.2 miles S Caernavaca, Morelos, Mexico, elevation 3700 ft (1021 m), 95 miles from the type locality. The weather was very cloudy and the snake was collected AOR at 2035 hr.

A description of the specimen (EAL 1817, Ernest A. Liner private collection) follows: adult male; snout-vent length, 628 mm; tail length, 55 mm; ventrals, 141; subcaudals, 18; anal plate single; supralabials 7-7, with 4th and 5th entering orbit; infralabials 8-9, first pair in contact behind mental, four on left and five on right in contact with anterior chin shields; loreal entering orbit; no preoculars; postoculars 2-2; a single prefrontal; temporals 1 + 2; dorsal scale rows 17-17; two scale pits present on faintly keeled scales of rows 5-13, no scale pits present on smooth scales, maxilla with 11 recurved subequal teeth.

The ground color is black (from freshly preserved specimen) with seven white rings completely encircling the body and three on the tail. The white body rings are 2-4 scales long dorsally, widening on the ventrals to cover 7-8 ventrals. The white head band is complete, terminating three dorsal scales posterior to the parietals (holotype with head band narrowly incomplete at parietals). The tail bands are of equal length dorsally and ventrally. The white scales on the dorsum are faintly black-tipped.

Our specimen agrees with the holotype of *C. annulatus* in most respects, except the holotype has 6-6 supralabials, 7-7 infralabials, no scale pits, keels on 11 dorsal scale rows, and eight white rings on the body. Our specimen has partial suture on the right side which almost outlines a small preocular above the loreals. Scott (1967) has shown that in *T. annulifera* the supralabials vary from 6 to 7, the infralabials from 7 to 9, and scale pits and keels are present or absent. Thus the holotype of *C. annulatus* and our specimen falls within the range of variation of *T. annulifera*.