Alabama as late as approximately 2500 years ago. The elk is not present in Alabama today (Holliman, 1963). Based on ethnographic records, the elk constituted only a small portion, if any, of the diet of the historic inhabitants of the southeastern United States (Swanton, 1946). Therefore, the reduction of the range of the elk appears to have occurred within the last 2500 years.

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Composition of Eggs of the Diamondback Terrapin

ABSTRACT: Twenty-one eggs of the diamondback terrapin (*Malaclemys terrapin*), representing three eggs from each of seven clutches, were analyzed for water, lipid and lipid-free dry matter. The egg contents contained an average of 68.9% water and 8.2% lipid. Lipid constituted 26.4% of the dry weight. The average energy content of the eggs was estimated to be 2.14 kcal/g wet weight and 6.88 kcal/g dry weight. Percent water and proportion of lipid in the dry matter of the egg were largely independent of egg size. Variation in egg size within the sample was related primarily to differences between clutches.

The water content of terrapin eggs is similar to, but the lipid content is much lower than, that of precocial birds. Variation in egg contents among species of reptiles indicates a need for studies relating egg composition to incubation period and the size and yolk reserves of the newly hatched young.

INTRODUCTION

Composition of avian eggs varies among species in relation to patterns of embryonic development, posthatching growth and parental care (Collins and LeCroy, 1972; Nice, 1962; Ricklefs, 1974). Correlations presumably exist between these factors and the composition of reptilian eggs, but there are too few data to support this hypothesis.

This article reports the average composition of eggs and variation in composition as a function of egg size in the diamondback terrapin (*Malaclemys terrapin*).

MATERIALS AND METHODS

The first, second and third eggs were collected from each of seven freshly laid clutches near Brigantine, New Jersey, between 12 June 1974 and 13 July 1974. (Normal clutch size is 4-12 eggs.) The eggs were frozen for subsequent analysis of water, lipid and lipid-free dry content. Contents of the thawed eggs were dried in a vacuum oven at 50-60C. Lipids were extracted in a 5:1 mixture of petroleum ether and chloroform. Total energy content of eggs was estimated using the following equivalents: extractable lipid = 9.5 kcal/g and lipid-free matter (assumed to be mostly protein) = 5.65 kcal/g (Kleiber, 1961). These values overestimate energy content to the extent that (1) nonlipid components were extracted by the solvents and (2) carbohydrate and mineral ash are included in the lipid-free dry component.

RESULTS

Water comprised 68.9% of the egg on the average. Lipid constituted 26.4% of the dry weight of the egg (8.2% of the total egg contents). The lipid-free dry component constituted 22.9% of the egg contents. Average energy density of the egg contents was 2.14 kcal/g wet weight and 6.88 kcal/g dry weight (Table 1).

TABLE 1.—Composition of the contents of eggs of the diamondback terrapin (based on 21 eggs)

Measurement	Minimum	Maximum	Mean	Standard deviation	Standard error of mean
Wet weight (g)	5.04	9.77	7.26	1.51	0.33
Dry weight (g)	1.76	2.95	2.24	0.37	0.08
Water content (% of wet weight)	62.5	71.7	68.9	2.5	0.5
Lipid content (% of dry weight)	20.0	30.3	26.4	2.0	0.4
Energy density (kcal/g wet weight)	1.91	2.54	2.14	0.20	0.04

TABLE 2.—Analysis of variance in wet weight of eggs within and between clutches of diamondback terrapins

	Sum of squares	Degrees of freedom	Mean square	F ratio	p
Total	45.52	20			
Between clutches	43.00	6	7.17	39.8	0.001
Within clutches	2.52	14	0.180		

Analysis of variance (Table 2) showed the differences in egg weight between clutches were responsible for 94% of the total variation (sum of the squared deviations from the mean) in the sample.

Neither the proportion of water in the egg nor the proportion of lipid in the dry matter of the egg varied appreciably with variation in egg weight, with the exception that lighter eggs appeared to have a reduced proportion of water (Fig. 1).

DISCUSSION

Cunningham and Hurwitz (1936) found that terrapin eggs collected at Beaufort, North Carolina, and dried at 95C were 68% water, which compares

favorably with our value of 68.9%. The percent water in the terrapin egg is more similar to that of the eggs of some precocial birds (range 70-75%), than to that of altricial birds (77-83%) (Ricklefs, 1974). Average water content of lizard eggs varied from 47 to 66% in eight species (Ballinger and Clark, 1973) and has been found to be as high as 80% in others (D. W. Tinkle, pers. comm.).

The percentage lipid content of the dry matter of the terrapin egg (26.0%)

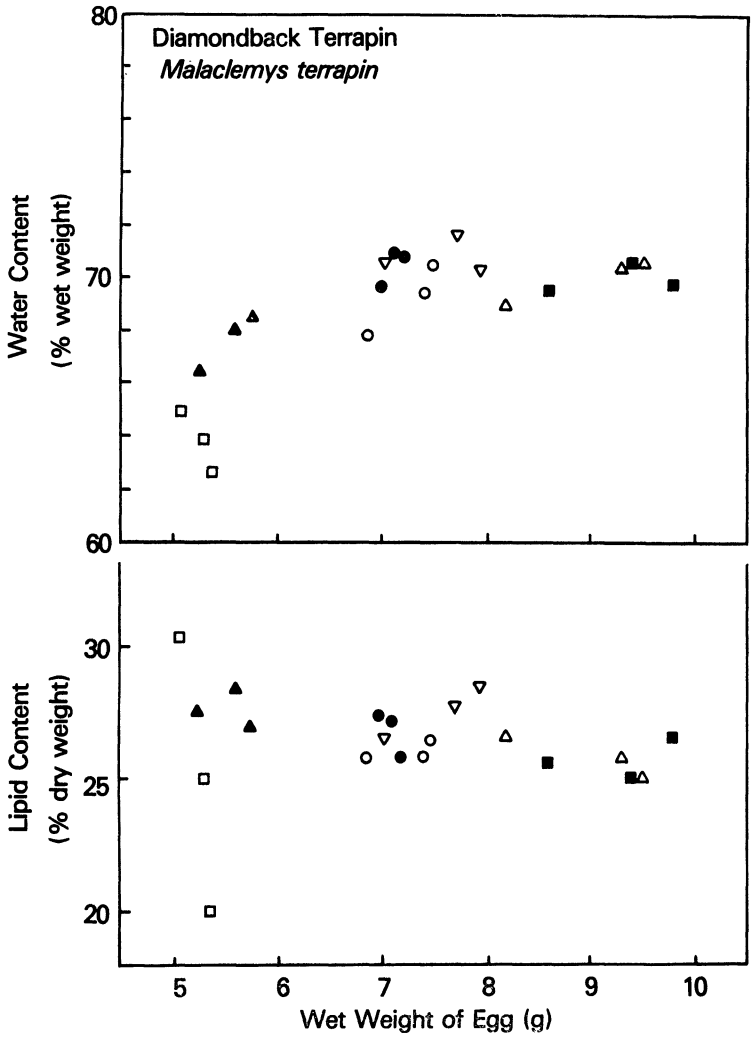

Fig. 1.—Relationship of water content (above) and lipid content (below) to the wet weight of the egg contents of 21 diamondback terrapin eggs. Clutches are represented by unique symbols

is much lower than that in the eggs of precocial birds (46-50%). The low lipid content of turtle eggs may be typical of reptile eggs generally: Slobodkin (1962) commented on the low energy content of the yolk of reptile eggs compared to that of bird eggs. The caloric content of iguana egg yolk (6.13 kcal/g dry weight in fresh eggs; Ricklefs and Cullen, 1973) indicates a lipid content of 12.5% of the dry weight, assuming energetic equivalents of 5.65 kcal/g lipid-free dry weight and 9.5 kcal/g extractable lipid. Ballinger and Clark (1973) found the average energy content of eggs of 13 species of lizards to be 6.16 kcal/g dry weight (range 6.00-6.36). Tinkle and Hadley (1975) reported a mean value of 6.37 kcal/g ash-free dry weight for 10 species of lizards (range 5.87-7.20).

It would be premature to relate variation in the lipid and lipid-free dry matter content of the reptilian egg to the length of the incubation period or to the size and yolk reserves of the newly hatched young, but further studies of the egg composition of reptiles with varied ecological relationships seem worthwhile.

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An Analysis of Migration as a Mortality Factor in the Gray Bat Based on Public Recoveries of Banded Bats

ABSTRACT: Public band recoveries of *Myotis grisescens* over a 15-year period are compared by month of recovery, age and sex. Peaks in recoveries coincide exactly with the major migrational movements in spring and autumn, and migration is considered to be a major source of stress leading to mortality. Juvenile mortality is significantly higher than that of adults, and there is a slight but nonsignificant trend toward higher public recovery of males.