

We feel that the above two records probably do not represent individuals from indigenous populations, but are rather released animals. The lack of subsequent sightings of *K. s. subrubrum* at either of the above two sites (E. Briggs, N. Proctor, pers. comm.) supports this contention. Furthermore, it is not unusual to encounter exotic turtles in the field in Connecticut. Near the collection site of *K. s. subrubrum* in Bethel two species of sea turtles (Cheloniidae) were removed at different times from freshwater ponds (E. Briggs, pers. comm.).

In the northeast *K. s. subrubrum* appears to have been recorded only as far north as Long Island and Staten Island, New York and northern New Jersey (one exception noted below). Northernmost records include the following: New Jersey: Plainfield, Union Co. (AMNH 44359—see Acknowledgments for abbreviations not given in text); Sayerville, Middlesex Co. (AMNH 43889); Cheesequake Creek, Middlesex Co. (AMNH 49903); New York: Staten Island, Richmond Co. (UMMZ 39931); Watchogue, Richmond Co. (AMNH 62638); Riverhead, Suffolk Co. (Long Island) (NYSM 33694); Southold, Suffolk Co. (NYSM 33911); Orient, Suffolk Co. (NYSM 33821); Moriches, Suffolk Co. (AMNH 4746); Mastic, Suffolk Co. (AMNH 16947-48, 36491, 89512); Brookhaven, Suffolk Co. (AMNH 32581); and Speonk, Suffolk Co. (AMNH 62071-80415). In addition, there is an old record from Sing Sing, Ossining, Westchester Co., N.Y. (RMNH 9479 = USNM 80305). Literature records also exist for East Patchogue, Suffolk Co., N.Y.; Casino Lake, Flushing, Queens Co., N.Y. and Prospect Park, Brooklyn, Kings Co., N.Y. (Murphy, 1916). The latter two records are from extreme southwestern Long Island in now heavily urbanized areas.

It is notable that the above records trace a line roughly parallel to the southern terminus of the Wisconsin glacier (Flint, 1947; Ct. Dept. Env. Prot., 1977). The New Jersey records fall south of the moraine, the Watchogue, Staten Island record lies less than 1 km north of the moraine, and those from Riverhead, Orient and Southold, Long Island range approximately 7 to 20 km north of the Ronkonkoma terminal moraine, and less than 1 to 4 km south of the Harbor Hill recessional moraine. The Flushing record, if valid, probably lies about 4 km north of the terminal moraine (Casino Lake is probably the same as the present Lake Kissena). In light of these data it appears that *K. s. subrubrum* has not colonized appreciably north of the terminal moraine and probably does not occur naturally in northernmost New Jersey, most of mainland New York, or Connecticut. We suggest that a combination of change in substrate type and the physical barriers of Long Island Sound and the Hudson River have prevented this species from ranging further north.

The only documented exception to the distribution outlined above is the specimen (verified) from Sing Sing. This locality is approximately 55 km due north of the terminal moraine on the east side of the Hudson River. The specimen, collected about 1884 at the mouth of the Croton River, may have come from a small, probably now extinct, disjunct population. There is a possible parallel in this record to the well documented disjunct population of the Fence Lizard, *Sceloporus undulatus* (Latreille), on the Putnam-Dutchess County line on the east side of the Hudson River. Two other literature records for mainland New York, including Dekay's (1842) for the southern counties west of the Hudson River, and Pope's (1939) for Schenectady, are without substantiation and are not generally accepted (Blair et al., 1968; Conant, 1975; Ernst and Barbour, 1972).

ACKNOWLEDGMENTS.—We thank the following individuals for providing us with distributional data: E. Briggs, N. S. Proctor, and E. W. Stiles. We also acknowledge the American Museum of Natural History (AMNH); British Museum (Natural History); National Museum of Natural History (USNM); Rijksmuseum van Natuurlijke Historie, Leiden; New York State Museum (NYSM); University of Michigan, Museum of Zoology (UMMZ); and Yale University, Peabody Museum for providing us with specimen data. G. A. Clark and J. A. Slater kindly reviewed the manuscript.

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Accepted 1 Mar 1980

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1980 JOURNAL OF HERPETOLOGY 14(3):295-297

ALLOMETRIC CHANGES IN THE SKULL AND BRAIN OF *CAIMAN CROCODILUS*.

Museum specimens of crocodylians and marine turtles tend to be preserved entire if they are hatchlings, while only skulls and skeletons, study skins and shells will be preserved to document the adult condition. Hence, we lack information on the proportional and other changes from the juvenile to the adult condition. The few morphometric studies of crocodylians provide us only with the comparisons of skulls to each other (cf. Bustard and Singh, 1977; Greer, 1974; Kälin, 1933; Quiring, 1950; Spector, 1956; Webb and Messel, 1978), and a few comment on soft portions of the anatomy. However, allometric growth curves form an important basis for other studies. They allow one to predict the absolute size of an adult animal from isolated skeletal remains and to establish how the proportions of internal organs change during ontogeny. Particularly, proportional changes of the nervous system are providing the basis for interesting comparisons among Recent reptiles and speculations about fossil ones (Jerison, 1973) and lead to questions of obvious interest to paleontologists and functional morphologists.

The availability of some series of *Caiman crocodilus*, commercially obtained and sacrificed for other purposes, made it possible to determine the proportions and weights of body, skull and brain. Even though these measurements were only determined for smaller animals, although they were obtained from specimens of uncertain locality (though identified as *Caiman crocodilus*), although these specimens had been kept in captivity for various periods, and although these specimens had been stored in a deepfreeze for diverse periods after death, the correlation coefficients indicate that the procedure is indeed appropriate and that the regression lines obtained should permit predictions about other samples and some level of extrapolation to other size ranges as well. The data sets are offered here in the hopes that others will be willing to complete them as more (and larger) specimens of this species become available.

METHODS

Upon sacrifice for reasons unrelated to the present study, the specimens of *Caiman crocodilus* were wrapped in multiple layers of plastic and accumulated in a deepfreeze at -5°C for a period

LE 1. *Caiman crocodilus*. Raw data for measurements and weights.

Animal	A	B	C	D	E	F	G	H	I	J	K
Linear Proportions—cm:											
nout to top of skull	14.1	11.4	13.1	8.6	9.6	9.4	6.0	8.1	10.1	9.4	8.2
oss width	5.6	5.5	5.5	3.6	3.9	3.8	2.5	3.3	4.3	3.9	3.8
ead width	9.7	9.2	10.0	6.2	6.6	6.3	4.1	5.4	6.9	6.1	5.9
nout to cloaca	63.8	61.3	59.3	36.6	40.4	38.7	23.4	32.1	44.8	36.5	34.2
loaca to caudal tip	58.6	45.9	49.8	35.5	39.7	36.5	24.5	31.0	45.6	29.3	36.4
Angular Proportions—cm:											
length	3.62	3.53	3.23	2.60	—	2.63	2.26	2.35	2.88	2.59	2.56
edullar depth	0.52	0.71	0.66	0.52	—	0.47	0.47	0.43	0.61	0.48	0.48
aximum cerebellar width	1.93	2.04	1.85	1.79	—	1.75	1.68	1.84	1.96	1.95	1.80
aximum tectal (midbrain) width	1.27	1.38	1.26	1.23	—	1.10	1.04	1.23	1.29	1.20	1.20
aximum medullar width	1.00	1.02	0.95	0.71	—	0.76	0.61	0.69	0.83	0.74	0.74
factory bulb length	1.45	1.20	1.18	0.91	—	0.98	0.57	0.71	1.09	0.93	1.10
factory peduncle (tract) length	2.2	1.87	2.02	1.36	—	1.21	0.73	—	1.33	—	1.31
factory bulb + peduncle (tract) length	3.65	3.07	3.20	2.27	—	2.19	1.30	—	2.42	—	2.41
Weights—g:											
body—frozen	7371.0	5018.0	5688.0	1219.0	1361.0	1304.0	255.0	624.0	2523.0	907.0	1304.0
total brain	3.367	3.496	3.545	1.791	—	2.006	1.275	—	2.768	2.233	1.957
factory bulbs	0.181	0.191	0.211	—	—	0.100	0.038	—	0.123	0.076	0.076
elencephalon	1.277	1.232	1.307	—	—	0.812	0.491	—	1.027	0.922	0.814
elencephalon	0.191	0.226	0.224	—	—	0.124	0.069	—	0.136	0.132	0.132
elencephalon	0.311	0.349	0.350	—	—	0.263	0.190	—	0.275	0.297	0.245
erebellum	0.126	0.143	0.139	—	—	0.121	0.074	—	0.123	0.129	0.082
edulla	0.532	0.545	0.563	—	—	0.368	0.201	—	0.425	0.338	0.330



TABLE 2. *Caiman crocodilus*. Correlation, values and coefficients of the linear (least squares) regression equation ($y = mx + b$) for the logarithms of data listed in Table 1 and the values for *Alligator* cited by Quiring (1950).

	r ²	m	b
Length of _____ versus snout-cloaca length (independent variable)			
Snout to top of skull length	0.948	0.775	-0.237
Boss width	0.977	0.787	-0.622
Head width	0.984	0.870	-0.577
Cloaca to caudal tip length	0.879	0.775	0.322
Total brain length	0.932	0.484	-0.333
Medullary depth	0.560	0.383	-0.895
Maximum cerebellar width	0.522	0.133	0.053
Maximum tectal (midbrain) width	0.710	0.233	-0.287
Maximum medullary width	0.791	0.534	-0.958
Olfactory bulb length	0.813	0.775	-1.227
Olfactory peduncle (tract) length	0.929	0.978	-1.443
Olfactory bulb + peduncle (tract) length	0.913	0.869	-1.029
Body weight	0.971	3.254	-2.036
Weight of _____ versus body weight (independent variable)			
Total brain	0.921	0.316	-0.660
[<i>Alligator</i> , Quiring, 1950]	0.981	0.317	-0.612]
Olfactory bulbs	0.964	0.509	-2.637
Telencephalon	0.930	0.279	-0.943
Diencephalon	0.925	0.334	-1.941
Mesencephalon	0.769	0.150	-1.051
Cerebellum	0.576	0.165	-1.484
Medulla	0.966	0.301	-1.397

ontogenetic changes of the crocodylian brain. As none of the individuals available for this study was as yet sexually mature, only the early stages of an ongoing process are here sampled (cf. Gans, 1976). However, the limited data for larger animals provided by Quiring (1950), for *Alligator* suggest that the slopes of the regression line probably do not change; still, it would be useful to compare these data with those from at least a few adult specimens of *Caiman crocodilus*. This note is intended not only to make these data available, but to stress that the death of zoo specimens of any crocodylian and the occasional availability of adult material as part of cropping schemes provides an opportunity for the accumulation of critically important data.

ACKNOWLEDGMENTS.—I am grateful to Lyn Marie Dolson and Robert Villforth for technical assistance, to R. Glenn Northcutt for assistance with the subdivision of the brain and to NSF DEB 7702605 for support.

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parts is apparently due to differential shrinkage, to inadequacy of preservation and to error in subdividing these small parts. Good correlation of the proportions of cranial elements with snout-vent lengths and with weight of brain and body have been reported by Jerison (1973) and the evidence for reptiles as a whole is summarized by Platel (1979). A first study correlating the weight of parts of the reptilian brain to the whole is that of Platel et al. (1976). The brain and body weights provided by Quiring (1950) for *Alligator* provide a very similar regression line.

The view of the crocodylian brain offered in most textbooks is that of an embryo as indicated by the short length of the olfactory bulb and olfactory peduncle. The differences in the slopes of y-intercepts for the several correlations, underlines the major

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Accepted 3 Jan 1980

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1980 JOURNAL OF HERPETOLOGY 14(3):297-301

FEEDING HABITS OF *NERODIA TAXISPILOTA* WITH COMPARATIVE NOTES ON THE FOODS OF SYMPATRIC CONGENERS IN GEORGIA

The few reports on the foods of the brown water snake, *Nerodia taxispilota* (Holbrook), have generally dealt with small numbers of snakes or observations (Carr, 1940; Collins, 1969; Richmond, 1944; Wright and Bishop, 1915). Furthermore, no work has been done on possible competition of *N. taxispilota* with any sympatric *Nerodia*.

Throughout much of the Coastal Plain of Georgia, *N. taxispilota* is sympatric with the banded water snake, *N. fasciata* (Linnaeus); whereas throughout the lower Piedmont and Red Hills provinces of Georgia (Wharton, 1977), *N. taxispilota* is sympatric with the midland water snake, *N. sipedon pleuralis* (Cope). Several studies have examined the diets of these other two species (Brown, 1958, 1979; Clark, 1949; Diener, 1957; Gentry, 1944; Kofron, 1978; Laughlin, 1959; Muschinsky and Hebrard, 1977; and Zelnick, 1978), however none have been made in Georgia.

It was felt that this study might demonstrate, in part, mechanisms by which competition is reduced between *N. taxispilota* and both *N. sipedon* and *N. fasciata* as well as provide information on the foods of these three species in Georgia.

MATERIALS AND METHODS

Water snakes were collected from March, 1977 through June, 1979. Thirteen *N. taxispilota* and twenty-six *N. fasciata* were collected from areas of known sympatry in Crisp, Dodge, Lee, Pulaski, and Sumter Counties, Georgia. Eighty-three *N. taxispilota* and twenty-six *N. sipedon* were collected from known sympatric areas in Lee, Stewart, Sumter, Terrell, and Webster Counties, Georgia. Some of the specimens listed as *N. fasciata* collected from Sumter County appeared to be intermediate between *N. fasciata* and *N. sipedon* (Camp et al., 1977); however, these specimens were more easily identified to *N. fasciata*, and the food data for them were referred to this species.

Snakes were killed in the field and immediately injected with 10% formalin, and stomachs were later examined for foods. Stomach contents were measured volumetrically by water displacement in a graduated cylinder. Constituent items were identified to species when possible. Slight traces of completely unidentifiable material were listed as amorphous when present in an otherwise empty stomach.