would result in the animals' death. However, hardly surprisingly, they drink water like all mammals.

Reproduction in both species seems to follow the same pattern in the zoo as in the wild. Sclater and Thomas (1894–1900) states that 'Saiga antelope give birth to a single young in their first breeding season. The second and subsequent seasons they bring forth twins as a rule.' Reproduction at Dallas Zoo has followed the same pattern. The only exception was in 1964 when one of our females produced triplets, one male and two females. All are living and in excellent condition.

Pronghorn antelope also produce one young the first year and usually twins in subsequent years.

Both species are short-lived in captivity. The females appear to live much shorter periods than the males, as observed in Dallas Zoo. One Pronghorn antelope lived at the Bronx Zoo for two years, eight months and eighteen days, while another specimen at the National Zoological Park, Washington, lived for four years, nineteen days. One animal lived in Dallas Zoo for four years, six months and twenty-eight days, dying of pneumonia. A male Pronghorn arrived at Dallas Zoo on 15 December 1956, aged 18 months. This animal is still alive and is now nine years and six months old (April 1965). He is still the herd buck and sired young in the 1964 season.

In our opinion, early death in captivity of both Saiga and Pronghorn antelopes is largely due to enterotoxaemia. We have inoculated both sexes against this disease and have succeeded in maintaining a representative herd of each species. We have had excellent breeding results with both species, all animals having been immunised against enterotoxaemia and fed the diet described above.

We have not found all the answers to the problems of keeping these antelope in captivity but we have found that good hygiene, good food, clean water and preventive medicine have contributed in no small measure to the good results we have achieved with these species at Dallas Zoo.

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SIZE AND GROWTH IN CAPTIVE CROCODILIANS

by Herndon G. Dowling and Peter Brazaitis

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AMONG the improvements to the facilities of the ancient Reptile House (built in 1898) of the New York Zoological Park, when it was renovated in 1954, was the provision of 'tempered water' for the five crocodilian enclosures. In contrast to the previously-supplied cold water, which was warmed in an erratic fashion by heating pipes in the pools, water was supplied to the pools at a temperature of about 85°F (30°C). Sufficient flow was provided to maintain the water temperatures at about 80°F (26·7°C) throughout the year. Heating coils were also placed under the land areas of the enclosures. These provide enough heat to allow the animals to raise their body temperatures to 90°F (32°C), or more.

These new facilities enabled us to keep many species of crocodilians that have high temperature requirements and New York Zoological Park is unique among American zoos in the large number of crocodilian species (12 to 15) that have been on exhibit since 1954. This ten-year period has provided a number of interesting growth records under these constant 'subtropical' conditions. Selected examples are given here.

The Reptile Department until recently has not attempted to maintain growth records of any but unusual individual reptiles. Most of the records given here, therefore, were obtained by the junior author because of his special interest in this group of animals. Since the measurements were obtained as the occasions presented themselves, they are not as complete as would be desired under ideal conditions. Nevertheless, they present information on captive growth and weight-length relationships that do not appear to be available elsewhere.

The growth rates of the captive individuals are compared with those of individuals in nature in the few cases where this information is available.

AMERICAN ALLIGATOR
Alligator mississipiensis

American alligators, which are temperate-zone animals, are more resistant to the cold-water conditions typical of older reptile houses than are crocodilians which have a tropical distribution. Therefore, they probably outnumber all other species in captivity in American and European zoos and have built up impressive records of longevity. Flower (1937: 22) gave a record of 56 years for an alligator at Dresden Zoo, Germany, and this record undoubtedly has been exceeded at other zoos.

However, many of these individuals, even the long-lived ones, are stunted from the conditions of low temperatures, inadequate diets, or a combination of both. The small size of some old specimens, their shortened snouts, irregularly protruding teeth, and weak body and limb musculature indicate poor conditions of some kind. Many such individuals are less than 8 ft long at ages of more than 30 years.

For many reptiles there might be some question of what is the natural growth rate. Fortunately, in the case of the American alligator, and for it alone of all crocodilians, there is an extensive and long-term study of its growth in nature that can be used as a base for 'normality'. This study, done more than 30 years ago by E. A. McIlhenny, was based on records of 38 hatchling alligators that were marked at birth and released under natural conditions at his private wildlife reserve in southern Louisiana. The growth and habits of these individuals were studied for more than ten years (McIlhenny, 1934, 1935).

We have in the Reptile House a pair of alligators that arrived in 1950 at lengths of 'less than 18 inches'. In 1963 the male measured slightly more than 10 ft and weighed 514 lb. The female was 7 ft 10 in. and weighed 234 lb. No attempts were made to obtain growth rates on these individuals in early years. However, their calculated age was one year upon arrival. Their lengths in recent years are about that which would have been expected of animals in nature (*Figure 1*).

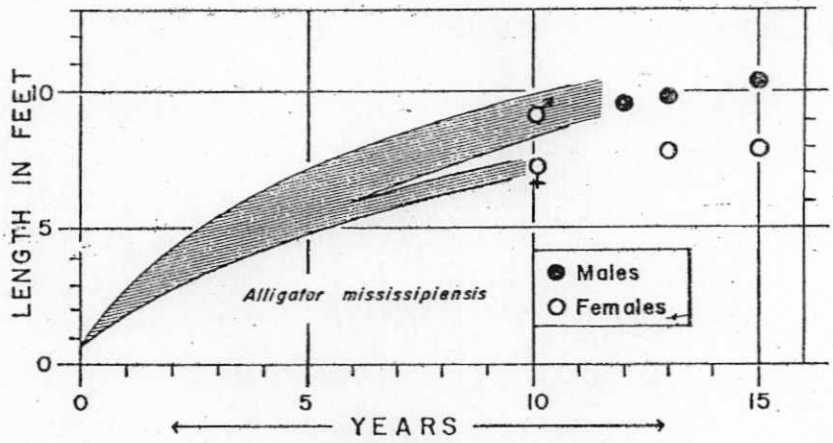

Figure 1. Growth-rate of American alligators, *Alligator mississipiensis*, at the New York Zoological Park (circles) compared with individuals in nature (shaded area: data from McIlhenny 1935).

Another alligator shows the rapid rate of growth characteristic of the early years of life. This individual was captured in the spring of 1961 and was donated to the Zoological Park in October of that year. When measured in November it was exactly 12 in. long. Thus, it must have hatched in the autumn of 1960 (about September) and its five-month period of captivity during the summer of 1961 had retarded its growth. Since that time, however, it has exceeded the growth-rates of animals in nature (*Figure 2*).

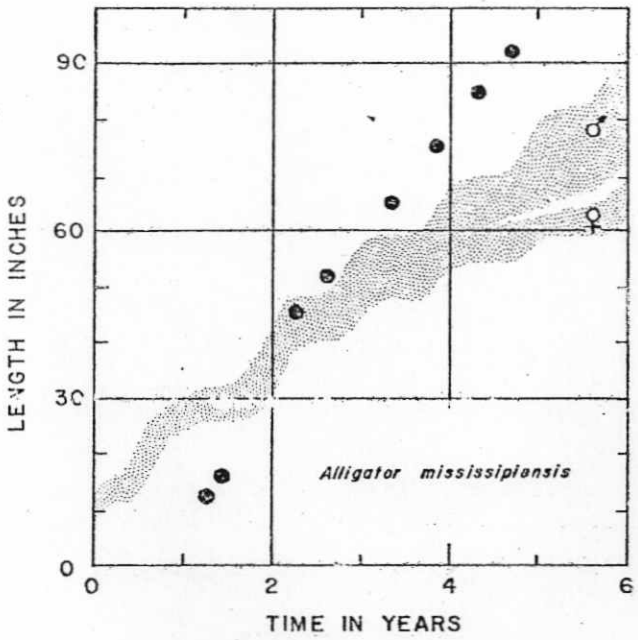

Figure 2. Early growth-rate of an American alligator, *Alligator mississipiensis*, at the New York Zoological Park (circles) compared with growth in nature (shaded area: data from McIlhenny, 1935).

This is to be expected because the alligators in Louisiana hibernate for about five months of the year. The alligators in the Reptile House do not hibernate and their growth rate probably more nearly approximates that of an alligator in the Everglades of southern Florida.

The enormous increase in weight with additional length is very impressive in alligators. An analysis of our specimens compared with the population in nature shows them to be somewhat heavier, but not excessively so (*Figure 3*). The considerable disparity in size between the sexes appears to be characteristic of crocodilians.

CHINESE ALLIGATOR
Alligator sinensis

Our single male Chinese alligator was received in 1956 but was not measured until 1959, when it was 4 ft. 5 in. long. It grew an additional foot in five years, and measured 5 ft 5 in. in 1964.

A female received in the autumn of 1961 measured 4 ft 11 in. She has gained only 1½ in. since that time and measured 5 ft 1½ in. in January 1965. However, her weight increased from 28 to 42 lb. Another female, received in July 1962, at a length of 3 ft 8 in., has gained 11 in. It measured 4 ft 7 in. in January 1965.

The growth rates of these animals suggest that the maximum length of female Chinese alligators is near 5 ft. The males probably exceed 6 ft in length. None appears to have been recorded of this size.

BLACK CAIMAN
Melanosuchus niger

A Black caiman received in October 1958, measured 36 in. in November 1959. Evidence from other specimens and a graph of its subsequent growth (*Figure 4*) suggests that it was about two years old at the time of measurement. Black caimans appear to hatch at lengths of 12 to 15 in. Its growth has shown no signs of slowing at an estimated age of seven-plus years. Unfortunately,

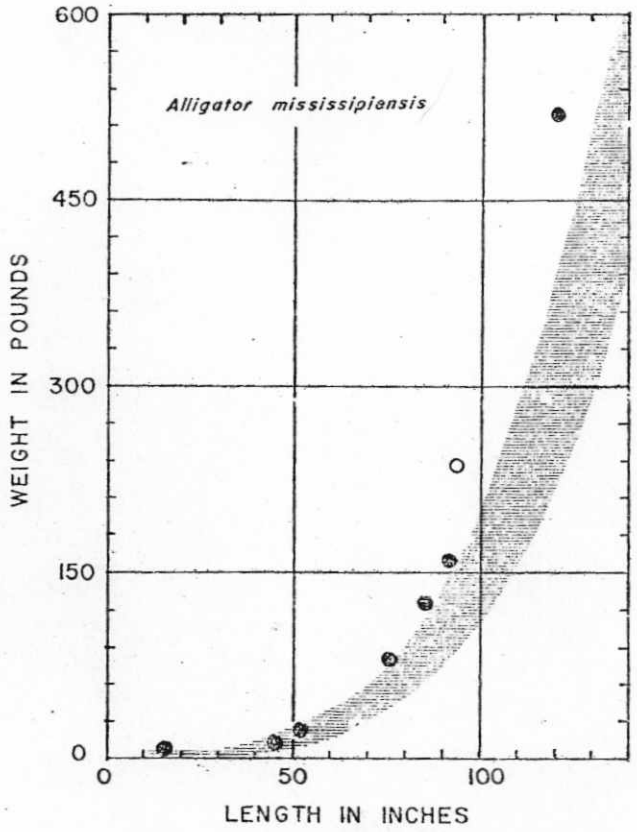

Figure 3. Length-weight relationships in American alligators, *Alligator mississipiensis.* The shaded area indicates relationships in nature (data from McIlhenny, 1935). Circles at 160 lb and below are from the single individual shown in *Figure 2.* The two higher circles are for male and female individuals shown in *Figure 1.*

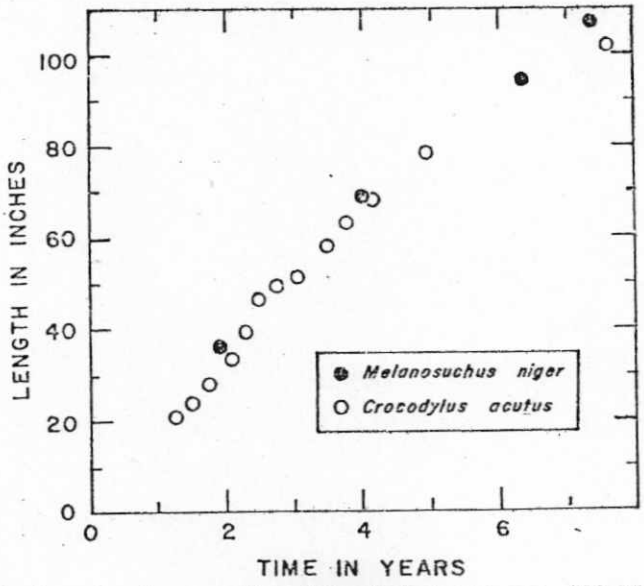

Figure 4. Growth of two American crocodilians during the first seven years of life. The Black caiman, *Melanosuchus,* shows no reduction of growth rate but the growth rate of the crocodile appears to slow down in the seventh year.

there is no information on the growth rate of this species in the wild.

NILE CROCODILE

Crocodylus niloticus

The only other crocodilian for which data are available on growth in nature is the Nile crocodile. Even this is based on a single individual (Cott, 1961: 245).

Two small individuals of this species were received in the Zoological Park in May 1961. When measured in November of that year they were 22 and 24 in. long. They were estimated to have hatched in December 1960. If this is correct, their further growth has paralleled that of the individual in nature very closely (*Figure 5*).

It is notable that such heavy-bodied species as the American alligator practically double their weight for each foot of length between 3 and 8 ft. Most crocodiles appear to follow the same ratio between 3 and 6 ft but gain proportionately less thereafter. Dwarf forms such as *Alligator sinensis*, *Paleosuchus* and *Osteolaemus* have an even greater proportional gain as they reach maturity. But even in the relatively slender crocodiles, the 100-lb difference between an 8-ft and a 9-ft animal is very impressive (note *Crocodylus palustris* and *C. porosus*).

Unfortunately, the present Reptile House does not have adequate facilities for crocodilians that are more than 10 ft long. Some day we hope to have them – together with enough keepers to measure such animals.

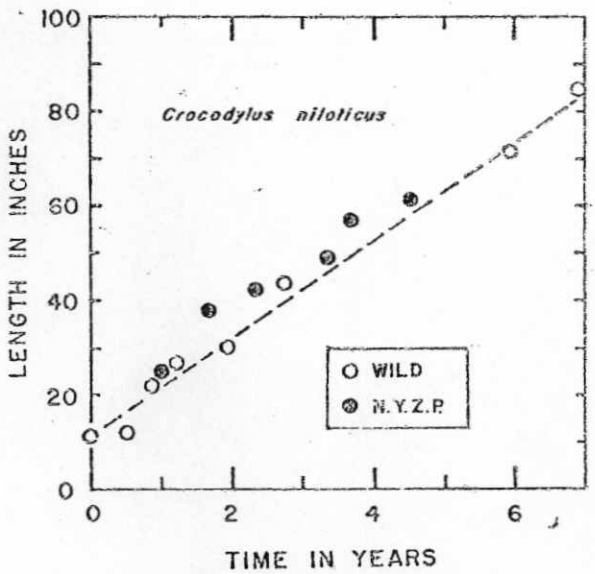

Figure 5. Early growth rate of Nile crocodiles, *Crocodylus niloticus*, in nature and at the New York Zoological Park. (Data for wild individual obtained from Cott, 1961: 245.)

OTHER CROCODILIANS

No other individual crocodilians have been studied as closely as the species listed before but a considerable amount of information has accumulated on the relationship between length and weight in several species. These data are compiled in the accompanying *Table 1*.

ACKNOWLEDGMENTS

We greatly appreciate the aid that our friends and associates have contributed to this study. The considerable help of Reptile Keepers Robert Brandner and Itzchak Gilboa deserves special acknowledgment.

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Table 1. Length-weight relationships in several species of crocodilians. All lengths are rounded off to the nearest foot. Weights under 10 lb are to the nearest 10th; weights over 10 lb are to the nearest lb.

Species	1	2	3	4	5	6	7	8	9	10
Alligator										
mississipiensis	0·2	3·5	5·5	13–23		56–81	97–125	234		514
sinensis				16	33–46					
Melanosuchus niger	0·2	1·8	6·5–14							
Paleosuchus trigonatus		1·7–2·5	4·9	17						
Crocodylus										
acutus		1·4–1·7	5·4–7	11–18	26–36	53–71	113	173		
cataphractus			5–6·5	10–17	28–38	42–53		139		
moreleti			5·2–9	15–21	33–42					
niloticus		1·4–1·8	5·7	8·0	26–36				280	
palustris								199	246	
porosus						41		123	226	
rhombifer				14	38	72		217		
Osteolaemus tetraspis	0·5	1·8	5·0	21	43–47					
Tomistoma schlegeli				13	26	43				
Gavialis gangeticus			1·8–2·9	7–10	27					

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VETERINARY WORK

RO 5-2807/B10*(VALIUM) AS A TRANQUILLISER IN ZOO ANIMALS

by Reuben David

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THE successful management of wild animals in a zoo involves many problems. Apart from diet and health, a very important factor is the control of stress.

When animals are brought into captivity from the wild they are subjected to new, often disturbing conditions and they may react by becoming shy or aggressive. The additional strain of being in proximity to man, of living in strange conditions, of insecurity, of being moved from one place to another, of living at too close quarters for too long a period with a cage-mate, can all make an animal frightened, nervous, or aggressive to a point where it becomes a danger to itself, or to its cage-mates or to attendants.

In trying to alleviate these conditions we have in the past used barbiturates and tranquilliser drugs on animals in the zoo but we have found these drugs unsatisfactory. My attention was drawn to a report on the use of Librium in wild animals (Heuschele, 1961). Valium (Ro-2807), an analogue of Librium, is found to have the same properties but is a more potent anxiolytic and muscle-relaxant drug. It seemed to be particularly suitable for use in zoo animals; moreover, it had already been used successfully to catch wild animals (Pienaar and Van Niekerk, 1963, Van Niekerk, *et al* 1963, Ditman 1964).

*The trials described in this report were carried out by using a trial preparation in the form of tablets containing 60 mg of Ro 5-2807/B10 which had been specially prepared for use in veterinary medicine.