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GROWTH RATES OF *Crocodylus porosus* (SALTWATER CROCODILES) JUVENILES IN CAPTIVE CONDITION FROM MADRAS CROCODILE BANK TRUST CENTRE FOR HERPETOLOGY

[1,*]Chandrasekar, K., [1]Srinivasan, M., [1]Balakrishnan, S. and [2]Nikhil Whitaker

[1]Centre of Advanced Study in Marine Biology, Annamalai University, Parangipettai, Tamil Nadu, India
[2]Madras Crocodile Bank Trust Centre for Herpetology, Chennai, Tamil Nadu

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ABSTRACT

The Present study was carried out on *Crocodylus porosus* from Madras Crocodile Bank Trust, Tamil Nadu during June 2007 to May 2008. The growth rates were higher in monsoon season and lesser in post monsoon season. Of 15 captive juvenile from 3 clutches marked and were recaptured for growth analysis. The survived seven animals were taken for growth ratio of length and weight. The minimum growth ratio of length and weight group of animal was CODE: 301 (Length = 0.015) and (Weight = 0.149). The maximum growth ratio length and weight was recorded in CODE: 315 (Length = 0.040) and (Weight = 0.542). The one year growth increment of captive hatchlings was 13.4 cm/yr which was higher than other hatchlings. The minimum growth rates of animals among the three were found in Code: 301 hatchlings, perhaps because of low food consumption. A linear relationship was observed between total length and weight of the crocodiles.

INTRODUCTION

A saltwater crocodile (*Crocodylus porosus*) exists in a wide range of aquatic habitats on Madras Crocodile Bank Trust, Centre for Herpetology (MCBT). In the captive, saltwater crocodile eggs are subject to flooding (Hines *et al.* 1968, Jennings *et al.* 1988), depredation (Goodwin and Marion 1978, Deitz and Hines 1980) and disturbances by nesting turtles (Goodwin and Marion 1977, Deitz and Jackson 1979). It is a common practice around the world to remove crocodilian eggs and hatchlings from the wild for commercial use and restocking of endangered species. In MCBT, a proportion of crocodile eggs were collected and incubated in captivity for research purposes and the hatchlings released. A key question is whether this practice affects growth and survival rates of repatriated hatchlings. Growth rates and changes in growth with age and size are important life-history characteristics. Growth rates of numerous reptiles including alligators are known to vary geographically as well as by habitat and individual (Andrews 1982). It is evident that different pods (groups of siblings) have different growth and survival rates, which could be due to many factors. The logarithmic relationship between total length or snout-vent length and body mass is used to evaluate condition factors (Taylor 1979). Condition factors are an index 2 of animal's health (Le Cren 1951). The factors have been used to make seasonal and habitat comparisons (Taylor 1979, Elsey *et al*., 1992). Crocodiles are most susceptible to mortality, through natural causes and from predators, while embryonic in the nest or during the first few years of life. While in the nest, eggs are subject to fluctuations of environmental parameters and direct predation of egg-eating animals taking a heavy toll of unguarded clutches, both by day and night (Woodward *et al.* 1989). Most of the generalities about crocodilians can be applied to alligators. Many species occupy densely vegetated or remote areas. They are behaviorally very sophisticated reptiles. An early work has demonstrated that crocodilians possess well developed sensory abilities (Bellairs 1971), display repertoires and social systems (Modha 1967, Garrick and Lang 1977, Garrick *et al.*, 1978), learning abilities (Northcutt and Heath 1971) and reproductive behaviors which include extensive parental care (Hunt 1975, Pooley 1977). McIlhenny (1935) described parental behaviors of alligators

***Corresponding author: Chandrasekar, K.,**
Centre of Advanced Study in Marine Biology, Annamalai University, Parangipettai, Tamil Nadu, India

previously unreported for any crocodilian or, in fact, any reptile. Alligator nest guarding and nest opening behaviors were discussed, and Kushlan (1973) first described maternal duties from moving her fresh hatchlings to defending of groups of sibling (pods). Carr (1976) pointed out that most of McIlhenny's and Kushlan's observations were supported by subsequent investigations. This leads to the question of whether growth and survival of naturally hatched pods is different from that of repatriated pods. Understanding the reasons of early age mortality will aid in the management and conservation of the species.

MATERIALS AND METHODS

Weekly random samples were collected belonging to different length groups from Madras Crocodile Bank Trust, at Chennai. The total length of the crocodile i.e. from the tip of the snout to the end of tail was measured to the nearest millimeter and the weight of the crocodile was recorded to the nearest milligram. Crocodiles were separated into three categories as males, females, and juveniles in the present study. 15 juveniles of crocodiles *C. porosus* were taken, among them seven were survived. From seven juveniles growth rates of length and weight were measured. Animals were made with interesting tagging system known as code. Individual crocodile Scutes on tails were counted. This method is used for Crocodiles for the behavioral studies.

Data Analysis

Growth rate was calculated as a Total Length (TL) change per growth day (cm/day). I used TL rather than SVL because there is greater standardization among researchers in the measurement of TL (Addison Jr. 1993 and Moler 1992). Growth days were referred to Deitz's thesis (1979) as the period prior to and after the monsoon periods when no growth occur. During no-growth period the water temperature dropped below 20°C (Coulson and Hernandez 1983). The length of this period is 11 months and weight was taken in 3 months. Log transformation was used to transform TL, SVL, and W to make them normally distributed. The total length change, then, was calculated by this equation.

TL2 – TL1

Growth days from capture1 to capture2

Growth increment was also calculated using SVL to avoid problems resulting from tail tip loss. In order to find out the best index

SVL2 – SVL1

Growth days from capture1 to capture2

Change in weight was calculated by growth rate. This was a relative weight gain since it was compared to each other.

Weight 2 – Weight 1

Growth days from capture1 to capture2

Condition factors (Le Cren 1951) are an index of the robustness of an animal and can be an indicator of well-being (Taylor 1979).

RESULTS

Of 15 captive and hatchling a crocodile from 3 clutches marked and released during the study, (3 females and 12 males) or 100% were recaptured and used for growth analysis (Table 1). Mean hatchling crocodile measurements of captive animals (n = 15). The minimum size group of animal was CODE: 315 are as follows: SVL = 55.9 ± 12.7 mm (range = 31.3 to 74.5mm); SW =11.1 ± 1.6 mm (range = 9.5 to 14.7 mm); LCR = 17.3 ± 1.3 mm (range = 14.9 to 19.2mm). TBL = 47.3 ± 7.0 (range = 35.4 to 59.7cm); SVL: 24.0 ± 3.8mm (range = 17.2 to 30.6mm) and maximum size group of animal was CODE: 301 are as follows: SL = 62.1 ± 7.1mm (range = 44.9 to 69.6mm); SW = 13.1± 0.9mm (range = 11.8 to 15.1mm); LCR = 17.8 ± 0.6mm (16.4 to 18.8mm); TBL = 50.7± 2.4cm (range = 44.5 to 53.2cm); SVL = 25.1±1.5 cm (range = 21.4 to 26.9cm) (Fig 1).

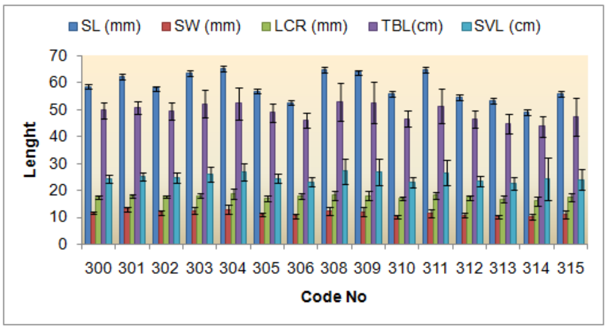

Fig.1. Graph shows the growth rates of length and weight

Table 1. Growth ratio of length and weight

CODE No	Length	Weight
301	0.015	0.149
315	0.040	0.542
303	0.028	0.882
304	0.032	0.616
308	0.039	0.017
309	0.024	0.770
311	0.036	0.725

Totally 15 juveniles were taken for grow in captive condition among these 7 were survived. The survived 7 animal were taken for growth ratio of length and weight. The minimum growth ratio of length and weight group of animal was CODE: 301 (Length = 0.015) and (weight = 0.149). The maximum growth ratio length and weight was recorded in CODE: 315 (Length = 0.040) and (Weight = 0.542).

DISCUSSION

In general, growth rates and growth ratio of length and weight hatchlings grows in a suitable captive habitat. However growth rates and growth ratio are among study areas of Madras crocodile Bank Trust. The difference was not consistent and depended on treatment. Growth rates of length and weight were taken from hatchlings juveniles from the Madras Crocodile Bank. The one year growth increment of captive hatchlings was 13.4 cm/yr which was higher than other hatchlings. The minimum growth rates of animals among the three were found in Code: 301 hatchlings, perhaps because of low food availability. Everglades National Park has an extremely low growth rate (Kushlan and Jacobsen 1990). Kushlan and Jacobsen suggested that the lower growth rate of

Everglades's alligators was due to seasonal shortages of food combined with the prolonged growing season with high ambient temperatures. Deitz (1979) studied the mean yearly growth increment in north Florida (11.9-21.1 cm/yr) about the same as in Louisiana (22.0 cm/yr) reported by Chabreck and Joanen (1979). However, it was higher than that reported by Fuller (1981) in North Carolina (12.4 cm/yr) and Dalrymple (1996) in south Florida (13.6 cm/yr). For example, alligators in Differences in growth rates among study areas were determined primarily by differences in the thermoregulatory behaviour of individuals, which appeared to be, inherited (Sinervo 1990). Therefore, differences in growth rate of hatchling alligators may be related to temperature differences. Nonetheless, the growth rate in this study (Table 7) was higher than that reported by Fuller (1981) in North Carolina (12.4 cm/yr) and Dalrymple (1996) in south Florida (13.6 cm/yr). Consequently, the period of growth days was limited to eleven months in madras crocodile bank. In an earlier study on 44 captive-reared hatchling alligators, growth rates of 0.2 cm/day for the first year were recorded (Joanen and McNease 1970). In the present study showed that growth rates of juveniles were increased very days and months. As described in Deitz (1979), Wilkinson and Rhodes (1997), Brandt (1991), and Elsey *et al*. (1992), male and female hatchling alligators have equal growth rate in their early years. Correlation was obtained for initial hatchling size and % increase in body weight. The results indicated that size based dominance is not an important factor determining hatchling growth.

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