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The growth in juvenile spectacled caimans at The Lost World of Tambun Malaysia

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ABSTRACT: The spectacled caiman needs to be better studied, and its basic life history needs to be explored. Growth rates and changes in growth with age and size are essential life history characteristics. This study aimed to determine the growth rate of juvenile spectacled caimans in captivity and understand the factors that affect the growth rate of juvenile spectacled caimans. Fourteen juvenile spectacled caimans were used in the present study. The study shows that the growth rate of all the juvenile spectacled caimans varied, where specimens such as Delta and 9th Dot had the highest growth rate in terms of weight at 0.98 g/day and 0.89g/day, respectively. However, Little Foot had the lowest growth rates in snout-vent length and weight parameters at 0.03 cm/day and 0.08 cm/day. This study shows that the growth rate of juvenile spectacled caimans that dominance has a strong effect on the growth rate of juvenile spectacled caimans in captivity. Other factors that could be affected were social behavior, feeding behavior, and natural selection.

Keywords:
crocodiles, growth rate, juvenile spectacled caimans, snout-vent length, body weight

■ INTRODUCTION

Spectacled caimans (Caiman crocodilus) are crocodilians found throughout the Americas, with the most extensive range among caimans and New World crocodilians. Listed as a species of most minor concern on the IUCN Red List, females typically grow to 1.08–1.4m, occasionally reaching nearly 2m, and weigh between 7-40 kg, with males usually heavier. Research has investigated the correlation between morphometry, reproductive success, testosterone levels (Barragán-Contreras et al. 2021), and dietary variations across life stages (Soria-Ortizet al. 2020). Their diet includes crabs, fish, mammals, snails, and sometimes plant matter (Thorbjarnarson 1993).

Breeding occurs from May to August, with 14–40 eggs laid between July and August. The growth rates of reptiles, such as alligators, vary geographically, and different sibling groups may exhibit varying growth and survival rates (Andrews, 1982). The relationship between total length, snout-vent length, and body mass was used to evaluate the condition factors (Taylor 1979). Spectacled caimans are found in many zoos worldwide for conservation education. The Lost World of Tambun in Malaysia successfully bred Caiman crocodiles. This study aimed to determine juvenile spectacled caimans' growth rate and length in captivity from hatchlings to 22 weeks.

■ MATERIALS AND METHODS

Study Time and Place: This study was conducted for 22 weeks at the Animal Care Center, Lost World of Tambun, Ipoh, Malaysia. **Animals and Materials**: Fourteen juvenile spectacled caimans (JSC) were used in this study. A measuring tape, a weighing scale, and permanent markers were used. The caimans were housed in a 1.5m x 1.5m x 0.5m container. During the observation period, the JSC was divided into three separate tubs based on size to avoid overcrowding and competition for feed. Tubs 1, 2, and 3 consist of 7 individuals with more than 40.0 gr, four individuals with 35.1- 40.0 gr, and less than 35.0 gr subsequently. They were fed crickets, chickens, and fish according to their needs over time. **Data collection**: Growth data were obtained by measuring the snout-vent length and weighing each juvenile spectacled caiman. These data were routinely collected every two weeks for 22 weeks after hatching. Juvenile behavior was also observed. **Data Analysis**: Data recording was carried out biweekly; however, for analysis using Microsoft Excel® 2016, four weeks of data were used. Descriptive analysis was applied to this research.

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■ RESULT AND DISCUSSION

The results showed that the Delta and 9th Dot had the fastest weight increases (Table 1) because of their dominance within the clutches. The growth rates of caimans vary with habitat productivity and density (Da Silveira *et al*. 2013). Although the snout-vent length growth rate for Delta and 9th Dot was 0.09 cm/day and 0.08 cm/day, respectively, these rates were still higher than others. Little Foot had the lowest weight and snout-vent length growth rate due to a poor feeding response and being the smallest in the clutch. Little Foot's lower dominance was evident compared with Delta and the 9th Dot.

Observations of juvenile spectacled caimans in the Lost World of Tambun Malaysia have revealed a dominance hierarchy based on size and weight. Early life behavioral predispositions in crocodilians influence juvenile interactions (Reber *et al.* 2021). Larger juveniles show more aggressiveness, vigilance, and territorial behavior, whereas smaller juveniles' group together and display submissive behavior. Aggressive behaviors include leaping, tail wagging, and tooth intimidation. Smaller juveniles flee or hide from threats, while larger ones maintain vigilance and assert dominance. Dominant juveniles obtain more space and food, spend much time basking, and exhibit mouth gaping, possibly to regulate body temperature (Loveridge 1984). Juvenile spectacled caimans also show dominance during feeding periods, with larger juveniles needing sized food. Crocodilians use a fish-trapping technique to trap prey against the shore (Schaller & Crawshaw 1982). During feeding, they remain immobile, are exposed to the sun, and struggle to maintain an ideal body temperature (Marques 2020).

Table 1. Growth rate of each juvenile spectacled caiman in Lost World of Tambun, Malaysia in 142 days.

Specimen	Growth rate based on weight			Growth rate based on snout-vent length		
	Initial (gr)	End (gr)	Daily growth rate (gr/day)	Initial (cm)	End (cm)	Daily growth rate (cm/day)
9nd Dot	41	160	0.84	22	36	0.10
Delta	41	180	0.98	24	37	0.09
2nd Dot	43	160	0.83	22	35	0.09
3nd Dot	44	120	0.54	23	33	0.07
6nd Dot	44	140	0.68	23	32	0.06
Blue	44	160	0.82	21	35	0.10
Charlie	45	140	0.67	23	35	0.08
4nd Dot	37	140	0.73	23	34	0.08
7nd Dot	37	140	0.73	23	36	0.09
Echo	38	140	0.72	24	34	0.07
5nd Dot	38	120	0.57	23	33	0.07
Little Foot	29	40	0.08	19	23	0.03
8nd Dot	33	160	0.89	22	34	0.08
Alpha	34	120	0.61	22	34	0.08

Natural selection favors the survival and reproduction of well-adapted species, whereas less-adapted species die out. This process, measured by the covariance between traits and fitness, depends on genetics (Endler 1986). For instance, more giant dominant juvenile spectacled caimans have better survival rates in the wild. Studies on crocodylomorph evolution have shown that ecological opportunities impact evolutionary changes in skull and jaw shapes (Stubbs *et al.* 2021).

■ CONCLUSION

This study showed that juvenile spectacled caimans' growth rates varied due to dominance, feed, feeding behavior, environment, stress, and natural selection.

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