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Research Article

Captive management and reproduction of the Savu Island python *Liasis mackloti savuensis* (Brongersma, 1956)

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INTRODUCTION

The Savu Island python, *Liasis mackloti savuensis*, is a poorly-studied taxon both in captivity and in the wild. The lack of scientific literature is evidence for this. Although *L. m. savuensis* was described many decades ago (Brongersma, 1956), specimens were collected for the first time in 1993 for the private sector and zoological institutions (Barker & Barker, 1994). Juvenile colouration is light orange but adults are dark brown or black. The iris changes from orange/gold to bright white, and the latter gives the subspecies a unique appearance (Klingenberg, 1999; Young, 2011). The subspecies is endemic to Savu, located in the Lesser Sunda Islands, and has the smallest geographical distribution of any pythonid (Barker & Barker, 1994). According to the IUCN Red List (09/06/12) the conservation status of *L. m. savuensis* is unknown. Habitat loss is affecting their population size (Ibarrondo, 2006) and ecological studies are needed to assess the population to determine if this taxon is in fact endangered (De Lang, 2011). There is limited information on this species either under natural or captive conditions, particularly with regards to reproduction. This paper gives details of the successful captive breeding of *L. m. savuensis* at Birmingham Nature Centre (BNC) in 2010.

MATERIALS & METHODS

Three males and one female were used in the captive breeding programme. All were wild caught and so could not be accurately aged. The males weighed between 600 and 800 g, the female weighed 1,300 g. The snakes were housed individually and only introduced together for breeding purposes. They were housed in plastic and fibreglass vivaria, measuring 60 x 60 x 60 cm for the males and 90 x 60 x 60 cm for the female. Branches were provided to facilitate climbing and a large pile of dried leaves in each cage was used as a retreat. A large basking area was also provided.

Ambient daytime temperature was 26-30°C with a basking area surface temperature of 35°C. Ambient night temperature was 22-25°C. Temperatures were recorded using an Exo Terra digital min/max thermometer and an Extech 42509 I-R thermometer. Relative humidity was maintained at 40-50% with sporadic spraying of each enclosure with warm water. Orchid bark substrate and sphagnum moss helped to maintain the humidity. Males were fed up to three weaner rats per month, but the larger female was fed a small or medium-sized adult rat each month.

RESULTS

All four snakes were introduced together into a larger enclosure measuring 120 x 80 x 100 cm in early September. This was furnished in the same way as the smaller enclosures. A photoperiod of 10 hours light/ 14 hours dark was implemented using two 10% UVB true lights and a large 250 W infra-red bulb was used to provide a basking spot. Once introduced, all three males displayed rapid tongue flicking and explored the enclosure. After two hours of observation, all males were resting under leaf litter and the female was basking.

On the first night the ambient temperature was lowered to 18-20°C and this night time temperature was maintained for one month. The ambient and basking temperatures were not altered. No mating behaviour or copulation was observed in September. At the beginning of October, the night temperature was further

Figure 1. Female Savu python coiled around egg clutch.

reduced to 14-16°C. This was immediately followed by the female sloughing overnight. During the following morning, one male was observed using his spurs down the body of the female. Copulation was observed within the next hour. Further copulation was sporadic and observed on only two occasions in October and one in November, all involving the same male. All snakes were offered food: the males refused, the female continued to eat until the beginning of December.

All three males were observed attempting to copulate during December; no antagonistic or aggressive behaviour was recorded. Copulation usually occurred in the morning from 08:00 h and it occasionally continued until 16:00 h. Overall, copulation was recorded 18 times during December, most frequently by the same male. Pre-mating behaviour, including movement of the spurs and rapid tongue flicking, was occasionally observed following a rise in humidity after spraying, and copulation usually followed.

During mid-January the female was basking continually and raising her body temperature to 29-36°C, measured using the infra-red thermometer. When handled, six large eggs were easily palpated. She was removed and isolated in an enclosure measuring 60 x 60 x 60 cm. A nest box containing dry sphagnum moss was provided. Relative humidity was maintained between 70-90% using wet sphagnum moss around the nest box and spraying twice daily with warm water. The female had a pre-oviposition slough on February 12th. She was usually in the nest box between 08:00 h and 09:00 h but then spent time basking until 17:00 h although she sometimes re-entered the nest box for about an hour. During the final week of gestation, the female was observed rotating her body ventrally, exposing her body to the heat above.

On March 22nd, 39 days after the slough the female laid 9 eggs in total and was found coiled around a clutch of 6 eggs outside the nest box (Fig. 1). A further three eggs were discarded to the side by the female and after analysing were determined infertile. The female was removed from the eggs to allow a quick collection of data before incubating. The six fertile eggs had a combined mass of 236 g and their mean dimensions were 64 x 38 mm. One of the eggs looked malformed but because it adhered to the others it was allowed to remain.

The eggs were incubated in a clear sealed plastic box that fitted within a large neonatal incubator. Vermiculite mixed with water (ratio 2:1) was used as substrate. The clutch was placed on top of the vermiculite. Damp sphagnum moss was added to the corners of the box to help to raise the humidity. The eggs were incubated at 30°C and 90-100% relative humidity. The container lid was lifted off for a few seconds every 2-3 days to allow gaseous interchange. The eggs began to dimple and look desiccated on day 63 of incubation. Two hatchlings began to emerge on day 71 (Fig. 2a) and all had emerged by day 73. One egg did not hatch. On examination, this egg was seen to contain a premature embryo that appeared to have died during development. The head and spine both appeared deformed.

The hatchlings were housed and reared individually in contico boxes on a rack system measuring 37 x 25 x 13 cm. Orchid bark chippings and dead leaves were used as substrate and created opportunity to hide. Sticks were provided to allow climbing but were never observed to be used. The hatchlings were often coiled up under dead leaves. They were very defensive and would strike out at any movement.

The hatchlings sloughed from days 6-12 after emerging from the eggs and the humidity was then raised from 40-50% to over 70% to ensure that no skin was left attached. As is usual for this subspecies, the hatchlings were dull brown in colour at birth but after the first slough they turned bright orange (see the cover

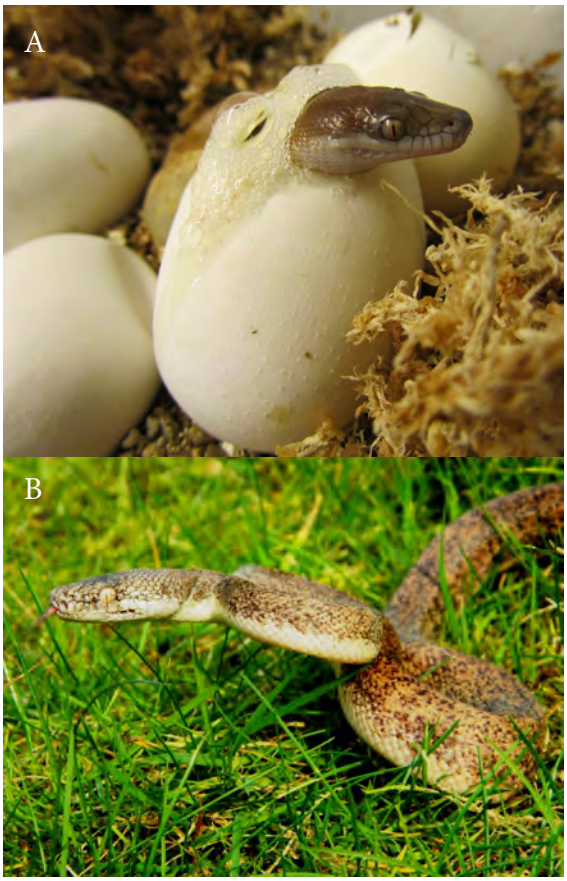

Figure 2a. Hatchlings emerging from the eggs, which took place after 71 to 73 days of incubation. **2b.** Eight month old specimen showing mottled black/brown colouration.

illustration for this issue). After about 8 months the colour changed again, to mottled black/brown (Fig. 2b). The hatchlings readily accepted pinkie mice shortly after the first slough and they quickly progressed to larger mice of appropriate size.

DISCUSSION

There has been little scientific research on the subspecies *L. m.savuensis*: most information comes from magazine articles or the internet. To the best of my knowledge, the subspecies has only been bred twice in UK Zoological Institutions, first at Bristol Zoological Gardens (BZG) in 2003 and at BNC in 2010. A few professional institutions and private keepers outside of the UK have had success, see Barker & Barker (1994), Klingenberg (1999) and Young (2011). Previous attempts at BNC did not involve temperature cycling and no obvious follicular development was observed. Incorrect temperature cycling in many snakes is widely acknowledged to adversely affect spermatogenesis, which can result in infertile ova (Ross & Marzec, 1990). Mating behaviour and copulation in this subspecies have been observed most frequently using multiple males, see for example Klingenberg (1999). Male-male combat has been observed in *L. m. mackloti* (Ross & Marzec, 1990) and *L .m. dunni* (Carmichael et al, 2007), but not in Savu Island pythons.

Incubation temperature clearly affects embryonic development. Eggs incubated at 31.5°C at BZG hatched after 61 days (Skelton, personal communication) compared with 71-73 days at 30°C in this study. *L. m. mackloti* appears to be able to produce fertile eggs throughout the year – the clutch at BZG was produced in September (Skelton, personal communication) and the clutch recorded here in March - and so it is difficult to specify an optimum time for fertility, ovulation and egg production. Overall, it is possible that the main factors in successful reproduction are a sudden drop in night-time temperatures and the introduction of multiple males to a single female.

During the writing of this paper, a different female in the collection at BNC laid a clutch of 8 fertile eggs using the methods described above, except that UVB full spectrum lighting was not used. UVB is therefore unlikely to be a reproductive stimulus. The eggs were incubated at 31°C and four of them hatched after 64-66 days.

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