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Husbandry and Reproduction of *Varanus glauerti* in Captivity

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Abstract- This article describes the successful breeding of *Varanus glauerti* in captivity. In 2010 a breeding pair laid four consecutive clutches totaling 24 eggs. Eighteen eggs have successfully hatched to date and three eggs remain incubating at the time of this writing.

Introduction

Described by Mertens in 1957, *Varanus glauerti* is a small (ca. 60-70 cm in total length) rock- and tree-dwelling monitor lizard indigenous to northern Australia. Due to its beautiful coloration and overall appearance, *V. glauerti* is populair in captivity. Successful incubation of its eggs can be difficult; however, an increasing number of specimens are being kept and bred in Europe. Despite its growing popularity in captive collections, few reports on the husbandry and breeding of *V. glauerti* exist (Retes & Bennett, 2001; Bedford, 2005; Husband & Bonnett, 2009). This report seeks to contribute to what is currently known about the captive management of *V. glauerti* by providing details on its husbandry and reproduction.

Acquisition and Husbandry

A female *V. glauerti* (Fig. 1) hatched in December 2008 by a Swedish breeder was obtained in March 2009 as an unsexed juvenile. A young sub-adult male (Fig. 2) hatched by a German breeder in November 2008 was acquired in September 2009. The pair was introduced together in September 2009 to a wooden enclosure measuring 190 x 100 x 105 cm (length x width x height), with a 15 cm deep substrate comprised of sand and humus at a ratio of 3:1 (Fig. 3). Cork tiles were affixed to the walls and the enclosure was furnished with many branches and hollow cork logs. Ambient temperatures ranged between 26-32° C and two basking spots ranging from 45-55° C were provided by outdoor Philips par38 80W lamps and a Megaray 120W lamp. Additional

Fig. 1. Adult female *Varanus glauerti*.

Fig. 2. Adult male *V. glauerti*.

lighting was provided by a Truelight 38w TL. To maintain adequate humidity levels of around 60-80%, the enclosure was misted twice a week.

The pair was fed three times a week, mainly with crickets (*Gryllus assimilis*), roaches (*Blabtica dubia*), and occaisonly sub-adult mice. Crickets and roaches were gutloaded and dusted with a mineral supplement.

The pair showed no noticeable signs of aggression and were very tolerant of eachother, seen basking together on many occasions.

Beginning in late October 2009, the photoperiod was slowly decreased from 12:12 to 8:16 h and the enclosure was kept a bit drier than usual. In early January 2010, the photoperiod was slowly adjusted back to 12:12 h and the enclosure was sprayed heavily twice a week.

A nest box constructed of an opaque plastic box measuring 50 x 30 x 35 cm (l x w x h) was placed in the enclosure in December 2009. A plywood sheet with an access hole 40 mm in diameter served as the lid of the nest box. Inside, the substrate was comprised of a slightly moistened mixture of sand and humus at a ratio of 1:1 by volume. A 7W heat mat was placed beneath one corner of the nest box for additional heating.

Courtship, Copulation and Nesting

Courtship and mating were first noticed in late January 2010. The male approached the female multiple times while frequently tongue-flicking the female's body. Although the female was not interested in the male's

Fig. 3. Vivarium housing an adult pair of *V. glauerti*.

advances for the first few days, the male persistently followed the female around the enclosure until the female finally accepted mating. Copulation occurred several times a day for about three days.

A few days after copulations had ended, the female's abdomen began to increase in size, and over the following week, substantially increased its food intake, which consisted predominately of *B. dubia* and sub-adult mice offered every other day. One week after the last observed copulation, the female began digging throughout the enclosure, searching for a nest site. The nest box was quickly discovered, and a dozen test holes were made in it. Two weeks after copulations had ceased, the female could be seen basking for extended periods of time throughout the day and began to refuse food more frequently, stopping altogether a few days prior to oviposition. In the final week prior to nesting, the female was frequently seen hanging vertically from the cork tiles.

Eight eggs were laid by the female around 22 February 2010, but were not found until approximately two days after their suspected laying date. The eggs were buried deep in a corner of the nest box above the heat mat at a temperature of 28.8° C (Fig. 4), and were removed as quickly as possible for artificial incubation. Removal of the eggs caused considerable stress for the female, since she inspected the nest box for several hours after they were removed.

In the week following egg deposition, the female consumed an enormous amount of food, primarily sub-adult mice and *B dubia*. The mice were injected with a water/calcium solution to provide additional water and calcium to improve the female's strength. One week after oviposition, the pair began to copulate again. On 23 March 2010, exactly 22 days after the first day of mating, the female laid a clutch of four eggs. Unlike the previous reproductive event, the female did not refuse any food during gravidity.

Two successive clutches of nine and three eggs were laid on 18 April and 21 May 2010, respectively. The female refused food approximately one week prior to nesting for the third clutch, but not for the fourth. Since food was refused for eight and nine egg clutches and not for clutches of three or four eggs, the female's feeding patterns while gravid may be influenced by clutch size. To prevent exhaustion and calcium depletion, the female was separated from the male and housed individually following the fourth consecutive clutch. The pair will be reintroduced in late 2010.

Incubation and Hatching

Upon their retrieval, each clutch was placed in a 4.5 l plastic container for incubation with the eggs partially buried in perlite. The perlite was first sifted to remove any dust, and then baked for 2.5 h at 250° C in an oven to eliminate any residual moisture. Once dried, the perlite was then mixed with water at a ratio of slightly less than 1:1 by weight. The containers were placed in a homemade incubator modified from a refrigerator and maintained between 28.5 and 29.5° C. Initially, the containers were vented twice a week for oxygen exchange; towards the end of incubation, the containers where vented daily.

Two eggs from the first clutch and one egg from the third were discarded within the first few weeks of incubation. Eggs from the first clutch also started to dent mid-incubation. These dented eggs where moved towards the sides of the incubation container and buried deeper in the perlite, which allowed them to take on more humidity from the substrate. These eggs also began

Fig. 4. Clutch of *V. glauerti* eggs deposited in the nest box.

Table 1. Egg and hatchling data for *Varanus glauerti*. Data represent measurements taken from one egg and hatchling from each clutch. All eggs were incubated at 28.5-29.5 °C.

Clutch No.	Gestation (days)	No. Eggs	Egg Length (cm)	Egg Weight (g)	Incubation Period (days)	No. Hatchlings	Hatchling Weight (g)	Hatchling SVL (cm)	Hatchling TL (cm)
I	~21	8	-	-	104-105	6	2.3	5.6	9.1
II	~21	4	2.8	6.6	107-109	4	3.6	6.3	9.5
III	~21	9	2.9	7.2	108-110	8	4.2	6.7	10.1
IV	~21	3	3	6.9	*	*	*	*	*

* *currently incubating*

to dent two weeks prior to hatching; however, this time no action was taken. The most dented egg from the first clutch was the first to pip on 7 June 2010; all other eggs started to pip within 24 hours.

Eggs from the second and third clutches grew slowly in size for around the first 3/4 of incubation, then began to lose some volume and eventually dented a few days prior to hatching.

Once pipped, the eggs where moved to another container where the hatchlings remained in their eggs for ca. 24 h to absorb their yolk sacks before emerging. Interestingly, there was a strong odor of ammonia when the third clutch pipped that wasn‘t noticed in the first two clutches. Upon emergence, one hatchling from the first clutch had a large yolk sac which was not absorbed. The yolk sac was tied off close to the body with wire and then cut with scissors. This animal was kept in a small container inside the incubator for ca. 72 h, and was then later placed in the same enclosure as its siblings, where it has grown and developed well.

Husbandry of Hatchlings

After emerging from their eggs (Fig. 5), the

Fig. 5. Recently-hatched *V. glauerti* offspring.

Fig. 6. Captive-bred *V. glauerti* offspring at 2 months in age.

hatchlings were kept in the incubator for ca. 48 h, and then transferred together to wooden enclosures measuring 60 x 40 x 40 cm (l x w x h); each enclosure housed no more than four hatchlings. Paper towels were used as a substrate for the first two weeks, which were then replaced with cypress mulch. The enclosure was simply furnished, with only a stack of wooden boards beneath the basking spot and a plastic hide box on the cool side (Fig. 6). The ambient temperatures were kept between 28-32° C, with a basking spot of 55° C on the surface of the wooden boards. Basking temperatures were provided by a 25W e27 Philips spotlight, and a 23w Nambia terra UV-plus D3 compact lamp provided UV-B and additional lightning. The hatchlings were noticeably active when there was a higher humidity, so the enclosures were misted daily.

The hatchlings began feeding after a week, primarily on small crickets and chopped sub-adult mice. They remained extremely shy and could not be observed eating during the first month. However, after a month, they became less wary and could be seen chasing and eating crickets throughout the enclosure.

One of the four hatchlings from the third clutch died unexpectedly 22 days after hatching. The belly was abnormally-colored, which might suggest an infection of the umbilical tissue. All other hatchlings from the three clutches developed normally, and there were no signs of dehydration or picky feeders.

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