

Notes on Breeding *Varanus albigularis microstictus* in Captivity

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Abstract – This article describes the husbandry and successful reproduction of *Varanus albigularis microstictus* in captivity. A total of 88 hatchlings have been produced over two successive years by a male and two females through a partnership between the author and the Mátra Museum. A further clutch of eggs laid by a second group of *V. albigularis microstictus* in the author's collection is currently incubating at the time of this writing.

Introduction

Varanus albigularis is a large varanid lizard (to 2 m in total length [TL]) that is commonly maintained in captivity. It was first hatched in captivity at the San Diego Zoo in 1962 (Staedeli, 1962), and has since been successfully reproduced on many occasions in both zoos and private collections worldwide. Several published accounts have documented cases of successful captive breeding (Bom & Bom, 1989; Davidson, 1993; Le Poder, 2007; Rese, 1983; van Duinen, 1983; Visser, 1981; Wesiak, 2006; Wesiak & Riedel, 2009). This article seeks to add to what is presently known about the reproduction of *V. albigularis* by documenting further instances of captive breeding in the subspecies *V. albigularis microstictus*.

History and Husbandry of Adults

In 2009, the Mátra Museum in Gyöngyös, Hungary acquired a juvenile *V. albigularis* that was recently imported by a Hungarian reptile dealer. The lizard, which was later determined to be male, reached ca. 180 cm TL by 2012, and today measures 200 cm TL. At the Mátra Museum, this animal has been housed in a large terrarium measuring 300 x 230 x 240 cm (L x W x H). The terrarium is furnished with large tree limbs and a large water basin that the animal could submerge in. Bark and gravel were used as a substrate. A basking spot was generated by three 160 W infrared bulbs and a 160 W mercury vapor lamp which also provided UV light. Given the large size of the terrarium, two electric heaters mounted to the walls of the enclosure provided

supplemental heat.

In November 2010, the author acquired a wild-caught subadult female *V. albigularis* (herein referred to as Female #1) that had been imported from Tanzania. Although the animal's exact age was unknown, based on its size at the time of its arrival (ca. 90-100 cm TL), age was estimated at around three years. A second wild-caught Tanzanian female (Female #2) was acquired in January 2013. The age of this animal, an adult measuring 150 cm TL at the time of its arrival, was unknown.

Outside of breeding introductions, each female is maintained in its own terrarium measuring 170 x 170 x 80 cm. An assortment of tree limbs and water bowls are offered as furnishings and bark is used as a substrate. Both have access to UV light produced by ReptiGlo 10.0 compact fixtures, and heating is provided by a 160 W infrared bulb and a flood lamp. Both animals are fed once or twice a week depending on the prey type, which may include fish (trout and catfish), small chicks and chicken parts (gizzard, heart, leg, wing, neck), and occasionally rodents. Both females typically experience a reduction in appetite beginning in late October which can last for two to three months; complete refusal of food for a few weeks is not uncommon. Disturbance to the lizards during this period is avoided.

Reproduction

2012

On 12 May 2012, Female #1 was introduced to the



Fig. 1. Copulation with Female #1 on 11 August 2012.

male's terrarium at the Mátra Múzeum. Copulation was first observed on 10 August, and continued over the next three days with each copulation lasting around one and a half hours (Fig. 1). During this period, the male was observed alternating the use of each hemipenis between copulations. The pair was left together in the terrarium after copulations had ceased.

During the period of copulations, an empty nestbox measuring 90 x 50 x 47 cm was constructed from wood and placed in the terrarium (Fig. 2). Two entrance holes measuring 15 cm in diameter were drilled; each on opposite ends of the box. Three quarters of nest box's cover could be opened for human access. After a week inside the terrarium for the female to investigate, the nest box was filled with 130 L of dampened peat. Digging was observed as soon as the female discovered the substrate in the nestbox, with all efforts focused in the corners. The female rarely left the nest box during



Fig. 2. Nest box for *Varanus albigularis microstictus*.

this period.

On 27 September, the female spent the entire day inside the nestbox, and then began laying eggs the following morning (Fig. 3). By 1530 h, the female had laid 25 eggs. Another three eggs were discovered buried in the nestbox on 29 September, as the female rested atop the substrate inside. All eggs were removed from the nest (Fig. 4), weighed and measured (averaging 6.0 x 3.5 cm and 55 g), and placed in an incubator set to 29° C. Inside the incubator, the eggs were placed inside two different types of plastic boxes and partially buried in a 1:1 mixture of vermiculite and water by weight. One of the boxes was completely translucent and measured 32 x 19 x 11 cm, while the other was white with only a translucent lid, measuring 32 x 24 x 10 cm. Six small holes were made in the lid of each box, and eggs were checked weekly. Some water in the vermiculite was lost through evaporation and replaced according to the



Fig. 3. Female #1 depositing eggs in the nestbox on 28 September 2012.



Fig. 4. Egg of *V. albigularis microstictus*.



Fig. 5. Candling of the eggs reveals fertility.



Fig. 7. Newly emerged *V. albigularis microstictus* hatchling.

weight of the egg container. Although the eggs continued to be inspected regularly, water was not added to the boxes during the final three weeks of incubation.

By 10 October, one of the eggs had begun to smell foul and was dented, so it was removed from the incubator and dissected. Upon its dissection, the egg contained a gelatinous, yellowish-colored mass and appeared to be infertile. At this time, the other 27 eggs appeared viable and healthy (Fig. 5). Some of the eggs began to dent on 17 February 2013, suggesting imminent hatching. The first egg pipped on 24 February 2013 after 154 days of incubation (Fig. 6), with the hatchling emerging from its egg two days later (Fig. 7). Additional eggs began to hatch on 26 February and continued steadily up until 2 March. At 165 days of incubation, one egg began to show signs of deterioration and was dissected to reveal a fully-developed but deceased set of twins (Fig. 8). All remaining neonates hatched successfully by day 173 of



Fig. 6. The first *V. albigularis microstictus* pips its egg on 26 February 2013.



Fig. 8a-c. Deceased twin *V. albigularis microstictus*.



Figs. 9 & 10. Copulation with Females #1 and #2. in 2003.

incubation. Hatchlings ranged between between 30-40 g and had an average TL of 25 cm.

2013

Copulation was first observed between the original pair on 11 June 2013 (Fig. 9). On 18 June 2013, the second female was introduced to the existing pair's terrarium, resulting in copulations between the male and Female #2 the same day (Fig. 10). Female #2 began laying eggs on 15 July; unfortunately, all were scattered throughout the terrarium and none proved to be viable (Fig. 11). Although a few eggs were deposited in the nest box, these also proved to be infertile. In total, 35 eggs were laid by this female.

Around the same time, both females were seen frequenting the nestbox; sometimes, both were inside the box simultaneously (Fig. 12). This led to aggressive confrontations between the two females, with Female #1 regularly biting the legs and neck of Female #2

whenever they were both at the nest box. To limit this aggression and prevent Female #2 from entering the nestbox whenever Female #1 was inside, the entrances were closed off.

Female #1 began to deposit its eggs on 28 July, 48 days after the first observed copulation (same timespan as the previous year). Eighteen eggs were recovered from the nest box that morning and 17 more including one infertile were discovered in the afternoon. An additional 15 eggs were laid that night, four more were found buried in the nest box the following day, and a crushed egg was discovered later that evening. The eggs were transferred to an incubator set to the same conditions as in the previous year. A total of 43 out of the 55 eggs from the clutch proved to be viable and healthy, with eggs averaging 6 x 4 cm and 48 g.

Female #1 remained inside the nestbox for the next three days, and attacked Female #2 and the author whenever the box was approached. Even though it was decided to remove the nestbox from the terrarium,



Fig. 11. Infertile eggs laid by Female #2 in 2003.



Fig. 12. Both females in nest box together.



Fig. 13. Newly emerged hatchling *V. albigularis microstictus*, 2013.



Fig. 14. Deformed hatchling missing lower jaw.

Female #1 continued to defend the area where the nest box was located. During this period, the male ignored both females and no aggressive interactions were observed between Female #1 and the male. Since aggression continued between the females, Female #1 was removed from the male's terrarium and returned to the author's collection.

The first egg pipped on 24 December 2013 after 151 days of incubation, with the hatchling emerging a few days later on 27 December. By 11 January 2014, a total of 42 neonates had hatched (Fig. 13), with only one egg remaining in the incubator. A small incision made in the egg's shell revealed a live neonate, so it was left in the incubator to hatch on its own. However, by 3 February, the egg had begun to smell foul. Dissection revealed a deformed neonate missing the lower jaw (Fig. 14). Two other deformities were present among the successfully hatched neonates from this clutch: one individual featured a kinked spine posterior to the pelvis, whereas the other had a stocky body and died a few days after hatching. Hatchlings averaged 25 cm TL.

On 8 August 2013, the male copulated with Female #2 again, resulting in a clutch of 36 eggs (eight of which were infertile) that was laid in the nest box 34 days later on 11 September (Fig. 15). Eggs averaged 7 x 4 cm and 54 g. Incubation parameters were kept the same as for previous clutches. During incubation, some of the eggs began to grow mould and were deemed infertile. Eggs began to pip on 15 February 2014 after 157 days of incubation, with the first neonate emerging from its egg on 17 February. All remaining hatchlings emerged by 23

February (Fig. 16). A set of twins successfully hatched on 21 February; both animals appear to be healthy and continue to do well despite being substantially smaller than their siblings. Hatchlings averaged 25 cm TL.

2014

In 2014, Female #2 was kept together with the male for the entire year, whereas Female 1# was reintroduced to the group on 7 May. On 3 June, Female 1#, who measured 160 cm TL at the time, was found dead in the enclosure. There were no apparent signs of aggression between the animals and a necropsy was inconclusive due to the animal's advanced state of decay. The terrarium was cleaned and sterilized, and the two remaining animals were separated as a precaution. Female #2 was returned to the author's collection, where breeding is



Fig. 15. Female #2 depositing eggs in 2013.



Fig. 16. *Varanus albigularis microstictus* offspring from 2013.

planned for the following year.

An additional pair of *V. albigularis* in the author's collection began mating on 7 July 2014. Copulation between the male (150 cm TL), a three year old Tanzanian import acquired in December 2012, and the female (130 cm TL), a four year old adult female acquired in September 2013, took place over three days. Following copulation, two wooden boxes with dimension of 80 x 40 x 40 cm were joined together, and a hole 12 cm in diameter was cut into the box for nesting access. Shortly after its placement inside the enclosure, the female entered the nestbox, filled with dampened moss, spending an entire day inside.

On 26 August, 30 days after the first observed copulation, the female laid 27 eggs, of which one was infertile. Eggs averaged 55 g, and were set up for incubation using the same parameters as before. This clutch is still incubating as of this writing and is expected to hatch around February-March 2015.

Husbandry of Hatchlings

Hatchlings were initially housed together in groups of 10 in terrariums measuring 100 x 50 x 50 cm. For

the first 1-2 months, newspaper and paper towels were used as a substrate, and water bowl was available for soaking. Each terrarium is heated with a 70 W flood lamp and illuminated by a ReptiGlo 10.0 compact fixture. As they grew, the newspaper was switched to a fine bark substrate, and virgin cork bark was added to each terrarium for refuge.

For the first few months, hatchlings were only fed insects (crickets, locusts, roaches). Later, superworms and pinky mice were added, as well as small chick heads on occasion. Once large enough to accept mice, they were fed only after defecating their previous prey meal. Vitamin supplementation is always offered with their food.

Maintaining the juveniles together in groups was unproblematic until they began taking rodents. When offered mice, the animals would fight over the same food items, and eventually had to be fed separately. Additionally, when animals consumed too many mice, they often regurgitated. As of this writing, a new enclosure system is being constructed for individually housing the juveniles.

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