

H U S B A N D R Y

Successful Care and Reproduction of Green Tree Monitors (*Varanus prasinus*) at the San Diego Zoo

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Photographs by the author except where noted.

Natural History

Varanus prasinus, commonly known as the Green Tree Monitor, is a gracile lizard reaching a total length of less than 1 m. Ground color is light to emerald green with some black markings from nape to tail base, usually as lines or chevrons across the back. First described by Schlegel in 1839, this member of the family Varanidae is native to the Cape York Peninsula of Australia, most of New Guinea, and some surrounding islands. Green Tree Monitors lay 2–5 eggs that hatch after 150–190 days. They are notorious for consuming their own eggs in captivity. In the wild, they inhabit the canopies of remaining lowland forests at elevations to 500 m. Little is known of their habits in the wild. Although highly arboreal, these animals are excellent swimmers with keen eyesight. *Varanus prasinus* is reported to lay its eggs in arboreal termite nests. Wild hatchlings probably eat termites or termite eggs. Green Tree Monitors are very wary, nervous animals, fleeing for cover at the slightest disturbance. The prehensile tail is nearly twice the snout to vent length and is used for balance and as a stabilizer or fifth limb when moving through trees, on the ground, or in water. They will curl their tail tightly and flatten their necks dorsally and ventrally to appear larger when in defense mode. The tongue is long and forked, and is used to gather scent molecules, which are interpreted by using the Jacobson's organ in the upper palate. *Varanus prasinus* has very sharp teeth that are used for subduing prey such as invertebrates, mice, lizards, frogs, birds, and bird eggs. Teeth also are used for defense, as is the expulsion of fecal material.

Captive Husbandry

In 1998, the San Diego Zoo acquired a pair of unrelated *V. prasinus*. Following two parasite treatments and two clean fecal checks in quarantine, the pair was brought into the zoo's main reptile building. Lizards are maintained at an ambient temperature of 24–29 °C (75–84 °F), with basking site temperatures reaching 35–38 °C (95–100 °F), using 250-w spotlights (PHILIPS® 250w REFLECTOR) above their enclosures. UV-fluorescent (PHILIPS® F40T12/C50 COLORTONE) and black fluorescent lights (SYLVANIA® BLACKLIGHT F40/350BL) also are used above the enclosures. The ambient lights are on from 0600–1800 h and basking lights from 0700–1700 h. The relative humidity averages 50–75%, and misters above the cages are on 3–4 times per week for 1–2 hours.

The monitors are offered 5–10 gut-loaded and vitamin dusted crickets 2–3 times each week, 3–4 neonatal (pink) mice are offered 2–3 times per week, and ground turkey with supplemental vitamins mixed occasionally with a crushed, boiled egg also is provided 3–4 times a week. The San Diego Zoo has just recently switched from turkey to Dick Van Patten's Natural Balance Zoo Carnivore Diet™ (Pacoima, California). Ovulating females are offered food daily. Males feed very readily and can become obese if their diets are not carefully regulated.



Rows of cages in the section of Klauber-Shaw Reptile House where individual Green Tree Monitors (*Varanus prasinus*) are housed.



A subadult male Green Tree Monitor (*Varanus prasinus*) signals defensive behavior by inflating its throat.

Enclosures are sink cages (plastic sinks without the detachable legs are designed and built by Ed Snow, Naturally Exotic, Valley Center, California). Our versions are custom designed by the author. They have thin plastic walls with screen fronts and tops. The top half opens independently of the bottom half. Dimensions are 220 x 57.6 x 63.5 cm in height, width and depth. The height allows for appropriate heat gradients and security. The cages have nest boxes attached to the sides that are 71.1 x 12.7 x 64.8 cm in size and 105.4 cm above the ground. Access to the box is through a hole 8.9 cm in diameter. Supersoil™ brand potting soil filled to a depth of 30.5–40.6 cm



A juvenile Green Tree Monitor showing defensive posturing.

is used as nest box substrate. The door for outside access to the nest box is hinged and opens down with two latches on each top corner of the door, which is situated near the top and measures 25.4 x 64.8 cm. Long branches are placed at angles from bottom to top of the cage, and another branch is screwed into the sides near the nest box opening. Basking on this perch, the female can attain temperatures of up to 33 °C. During the day, temperatures at the bottom of the cage are around 24–26 °C (75–78 °F). At 61 cm above the bottom, temperatures climb to 26–29 °C (78–81 °F), and at 122 cm, temperatures range from 27–29 °C (81–84 °F). The highest temperatures (46–47 °C (114–117 °F)) are attained in the top corner under spotlights.

The section of the building in which the monitors are housed has built-in skylights situated directly above the enclosure where the two males are on exhibit; the females have no direct access to the skylights. Three of the skylights are opened during cool, rainy months and intermittantly throughout the year. The heating in the section is set at 29 °C (84 °F) at 0600 h and 27 °C (80 °F) at 2200 h. Cooling is set at 30 °C (86 °F) at 0500 h, 31 °C (88 °F) at 0900 h, and 30 °C (86 °F) at 2200 h.

Reproductive History

On 6 February 2003, a captive-bred male was introduced to the female and copulation was observed on the same day. Four desiccated eggs were found in the enclosure on 10 March 2003. Two were inside the nest box on top of soil and two were on top of the nest box. These eggs were incubated for two weeks but did not rehydrate. No further eggs were found and the female showed no obvious weight gain until 11 January 2004, when

one egg was found in the nest box; it went bad early in the incubation. Another two desiccated eggs were removed from the top of the soil in the nest box on 25 April 2004; these did not rehydrate. Four eggs were removed from the bottom of the soil in the new nest box on 24 October 2004. A tunnel was dug down one side to the bottom and across to the other side of the nest box. These eggs went bad 2–3 weeks into incubation. On 5 July 2004, this female was moved into a new cage with the dimensions listed above. In 2005, she laid four eggs on 30 January, four eggs on 11 May, five eggs on 15 August, and five eggs on 11 November. On 27 February 2006, she laid two eggs in the water bowl. More soil was added to the nest box, increasing the depth from 10 in to 16 in. She laid two more eggs in the nest box the next day. On 17 May 2006, this female laid another clutch of five eggs that quickly went bad and displayed no signs of fertility. She had been with the male for only three days (23, 24, and 25 March) between 17 May 2006 and the last clutch. In August 2006, she laid one egg on the top of the soil in the nest box. The following day, she laid four more eggs in the bottom of the soil of the nest box. These eggs also were infertile. She had been with a male seven days in total since the last clutch on 17 May (11 and 12 June, and 16, 17, 25, and 26 July). Copulation was observed on 25 July 2006. The male was introduced to her again on 22 and 23 August 2006. He still showed interest in her, chasing her around the cage. She laid the last

clutch on 25–26 August 2006. The days between laying from March 2003 and May 2006 were 251 days, 105, 182, 98, 101, 96, 92, 104, 79, and 100 days.



San Diego Zoo captive-hatched adult male Green Tree Monitor feeding on Carnivore Diet.



Captive-hatched male Green Tree Monitor (*Varanus prasinus*) copulating with a wild caught female.



When the time is right, male Green Tree Monitors aggressively chase females, which quickly submit.



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Green Tree Monitor (*Varanus prasinus*) egg #1 slit just a few hours before fully emerging.

All *Varanus prasinus* are kept separately. Other institutions report housing groups of two or more animals together, including more than one male with no problems. During 2005, a captive-bred male was introduced to the female at certain times during the year for no more than a week at a time, sometimes for only 1–2 days: 15 and 28 February, 15 March, 23 May, 26 July, 10, 17, and 23 August, 25 September, 23 November 2005, and 14 February 2006. On several occasions, the female ate 2–4 of her eggs.

On 28 February 2005, the male showed interest, tongue-flicking with jerky motions over her back and along her side, and pushing his vent area close to hers. On 23 May, he displayed similar behavior. On 26 July, the male chased the female around the cage while tongue-flicking and trying to copulate. On 27 July, the pair was observed in copula during both morning and afternoon. On 30 August, he also chased her, but both were observed later in the day basking on separate branches. On 23 November, the female was put on exhibit with a wild-caught male and removed the next day. On 11 January 2006, she was placed with a wild-caught male on exhibit, and they were observed copulating in the afternoon and on the following day. She was removed 16 January and placed back into her enclosure. This female has bred with a male and had clutches of eggs periodically beginning in 2000. Successful hatches did not occur with this female until 2004, when two of four eggs laid 24 October 2004 hatched on 1 April 2005. The incubation period for this clutch was 151 days. The second successful clutch was five eggs laid 15 August 2005. These eggs hatched 14–17



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All *Varanus prasinus* successfully hatched at the San Diego Zoo have slit and fully emerged from their eggs within 24 hours.

January 2006 with an incubation period of 153–156 days. The third successful clutch consisted of four eggs laid 27 February 2006. Two eggs arrested 2–3 weeks into incubation, but the other two hatched on 28 and 29 July 2006 with incubation periods of 152 and 153 days.

A female *V. prasinus* no longer in the zoo's collection laid three eggs in a log in her enclosure on 8 April 2000. One egg went bad, one went full-term but died, and one hatched on 10 September 2000 with a 153-day incubation period. This animal is the father of two successful clutches. He is an aggressive feeder of Natural Balance Zoo Carnivore Diet™ and crickets, but refuses pink mice.

Eggs are incubated at 30 °C (86 °F) in a substrate with a 1:1 ratio of water to vermiculite. Average mean egg weight is 9.8 g. Average weight of the female over the last year was 238 g and average weight for the male was 414 g.

Husbandry of Juveniles

Average mean weight for hatchlings is 8.5 g. About one week after hatching, juveniles can be enticed to eat two-week-old crickets by either releasing 2–3 into the cage or by tong-feeding. Some individuals are more difficult to feed than others during the first 2–3 weeks. During the third week, they are offered Natural Balance Zoo Carnivore Diet™ with vitamin supplements. They also may need to be tong-fed turkey or the carnivore diet if they are not taking it from a plate. In the third or



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Day-old Green Tree Monitors are very quick and ready to disperse.



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Newly hatched Green Tree Monitor (*Varanus prasinus*).



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Neonate Green Tree Monitors at the San Diego Zoo have had well-absorbed yolk sacs and few remnants of an umbilicus.

fourth week, a pinky mouse chopped into four pieces is added to the turkey plate. This is offered about 2–3 times a week. Three or four crickets are offered twice a week. Once the hatchlings start eating regularly, they can gain from 0.25–0.50 times their body weight each month.

All juveniles are maintained separately. The substrate in juvenile enclosures is wet sphagnum moss. Branches are angled from top to bottom of the enclosure, a piece of bark is provided for cover, and a bowl of water, which is just large enough to accommodate the animal, is used. A 50-w spotlight (PHILIPS™ Indoor Flood), and fluorescent UV- and black lights (SYLVANIA™ BLACKLIGHT F40/350BL) are situated above each cage. Cages are custom glass tanks that are 45.7 x 25.4 x 50.8 cm in size and have sliding screen tops and fronts.

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