

Notes on the husbandry, behaviour and breeding of captive tegu lizards

Tupinambis teguixin

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Although the tegu lizard *Tupinambis teguixin*¹ is relatively common in zoos, few references to its captive husbandry and breeding have appeared in the literature. At the National Zoological Park in Washington these lizards have successfully mated and the young have been reared. This paper will discuss their captive husbandry, breeding and behaviour.

The present adult group consists of two ♂♂ and three ♀♀. The breeding ♂ and one ♀ were both received in 1971, the second ♂ and another ♀ in 1973, and the breeding ♀ was acquired in 1974. In length they range from 305–345 mm (snout-vent) and weigh from 925–2000 g (Table 1).

SEX DETERMINATION

Both published accounts (Bellairs, 1970; Hoogmoed, 1973) and our own observations indicate a certain degree of sexual dimorphism. In adult

♂ tegus there is an obvious hypertrophy of the jaw muscles, and the neck appears as wide as the body. The differences in girth between adult ♂♂ and ♀♀, as reflected in measurements taken around the base of the tail and around the head, are shown in Table 1. Similar measurements in the small juvenile sample have been inconclusive. As is also clear from the table, there is no significant sexual variation in the number of pre-anal and femoral pores; however, in the two adult ♂♂, the waxy plugs in these pores are more prominent and are orange-tan in colour, as opposed to greyish in the ♀♀.

Taking account of the fact that all these secondary sexual characteristics are liable to vary with age and condition, and from individual to individual, it has been our experience that the most reliable method of sex determination is the manual probe. In adult ♂♂ a 2 mm ball-end

¹ Four or more species of tegu have at various times been distinguished (Peters & Donoso-Barros, 1970; Presch, 1973). In this paper the author follows Presch's revision of the genus *Tupinambis* in recognising only two species *T. teguixin* and *T. rufescens*, differing in their respective wet, and arid/semi-arid habitats; *T. nigropunctatus* is placed in the synonymy of the former.

SEX	SNOUT-			NO. OF		WEIGHT (g)
	VENT LENGTH (mm)	TOTAL LENGTH (mm)	TAIL BASE* (mm)	HEAD† (mm)	FEMORAL AND PRE-ANAL PORES	
♂ ₁	345	985	170	220	20	1750
♂ ₂	335	952	168	230	24	2000
♀ ₁	305	875	133	132	19	950
♀ ₂	310	875	135	155	17	925
♀ ₃	323	928	140	152	25	1150
♀ ₄	330	877	143	155	21	925

* measurements taken around the tail c. 10 mm posterior to cloacal flap.

† measurements taken around posterior part of head over ear openings.

Table 1. Weights and measurements of adult tegus *Tupinambis teguixin* currently kept at the National Zoological Park, Washington. (Measurements of ♀₄, not part of the present group, are shown as additional data.)

probe, coated with a sterile lubricant, will penetrate 30 mm or more into the base of the tail, whereas in ♀♀ it will barely reach past the posterior margin of the cloacal flap. The 1 mm probe used on the three juveniles could not, in the one (presumed) ♀, be inserted past the cloacal flap, but in the two presumed ♂♂ it penetrated almost 10 mm.

CAGING AND DIET

The 4.25 × 2.0 × 2.5 m high exhibit is one-third occupied by a pool, 61 cm deep, with a rock ledge rising 40 cm above it. The land area is covered by 5 cm of pea gravel, two branches and two sections of hollow log completing the furnishing. One of the branches lies across the pool and the other extends the length of the cage from the top of the rock ledge. The logs are positioned lengthwise near the front of the exhibit, side by side. Directly and 3.75 m above the cage is a roof skylight, while additional lighting and heat are supplied by two incandescent lamps, one infra-red and one ultra-violet, suspended 2 m above the cage floor. The lamps are kept burning from 0700 to 1630 hours during October–March, and from 0700 to 1800 during April–September. The temperature ranges from 28–30°C in winter and 22–36.7°C in summer; night temperatures average about 22°C throughout the year.

Adult tegus are fed twice weekly, each receiving two or three dead grown mice on one day and on the other, crickets or tropical cockroaches *Blaberus discoidalis* powdered with Pervinal, a vitamin-mineral supplement. Once a month day-old chicks are given in place of the mice. After eating the chicks, the lizards will investigate the cage and lap any residual yolk from the substrate. When a salad of diced fruits and vegetables was experimentally offered, it was readily eaten but some hours later was apparently regurgitated. After this had happened again the following week the procedure was discontinued, although in view of the fact that vegetable matter such as fruits, berries and leaves has been found amongst the stomach contents of wild tegus (Beebe, 1945) the regurgitation is hard to explain. According to Beebe (1925, 1945), they also eat crabs, spiders, grasshoppers, beetles, wasps, ants, centipedes, rats, snakes, frogs and other lizards. Occasionally the Washington animals have been seen selecting and eating a few pieces of pea gravel which are later expelled in the faeces.

Since feeding produces intense activity in these voracious lizards, it is extremely difficult to ascertain whether each individual is receiving adequate amounts of food, and a close watch must be maintained for any perceptible weight losses. All animals tend to bite, chase and steal food from one another, although none has so far sustained injury. Courtship activity may also take place during this melee.

BEHAVIOUR

The ♀♀ spend most of the day under one of the hollow logs, periodically emerging to drink from the pool or investigate their surroundings. This activity lasts for only a few minutes and generally involves only one ♀ at a time. The ♂♂ tend to lie in front of the pool under the infra-red lamp, sometimes joined for a short time by a ♀ – usually the breeding ♀. Active movement is seen only during feeding or when the cage is sprayed with water. A few minutes' spraying morning and afternoon increases humidity and appears also to aid shedding; aggressive or breeding behaviour may sometimes ensue.

All specimens have been observed drinking from or swimming in the pool. When swimming, they propel themselves with the tail, feet held

close against the body, much as a crocodilian does. They drink either by drawing water into the mouth while the snout is submerged, or by lapping it with the tongue. Arboreal activity is infrequent, but this may be because the tree limb is thin and lacks foliage. The animals appear awkward when trying to cross, and they have been observed falling and jumping from it.

Although approximately similar in size (Table 1), of the two ♂♂ the breeding ♂ is definitely the more aggressive, and will occasionally assert his dominance by chasing and biting the other on the tail or back, without however inflicting injury. The subordinate ♂ will sometimes seek refuge in the pool and remain on the bottom for as long as 30 minutes. This period of submersion is apparently not unusually long; Beebe (1945) immersed a young tegu in a 50% alcohol solution for one-and-a-half hours, whereafter it seemed as strong and active as before. Except during feeding, no interaction has been observed amongst the ♀♀.

BREEDING BEHAVIOUR

Six courtship encounters culminating in successful copulation have been timed to last from 18–64 minutes. Courtship usually begins with the ♂ in slow pursuit of the ♀, but rapid chase may sometimes occur (Billiau, 1970). She eventually lies still, except for flicking the tongue, while the ♂ strokes her head, back or side with his snout and chin. He may claw or rake her back and side with one of his forefeet, an action which has also been observed at this zoo during the courtship of the Savannah monitor lizard *Varanus exanthematicus* and which W. Auffenberg (pers. comm.) has reported in the Komodo dragon *V. komodoensis*. As the ♂ tegu claws, he makes jerky or spasmodic head movements and flicks his tongue. Here the ♀ may voluntarily arch her tail, and this leads to an unusual behaviour performed by the ♂ which we have termed 'marching in place'. It occurs either when he is alongside the ♀ or when his forebody is positioned over her dorsum. With his body raised well off the ground, he lifts high and lowers alternate hind limbs, repeating the motion (in the nine encounters observed) two to four times with each limb. During this 'marching' action body and tail undulate laterally; then, with the forelegs, the ♂ clasps the ♀ at mid-body. Occasionally a similar but slower movement is performed where the hind limbs are

alternately stretched instead of raised, the legs in this case being fully extended caudad.

As observed by the author at the National Zoo, the association of courtship behaviour with intense feeding activity is not unusual in many species of reptile, including groups composed entirely of ♂♂. During feeding the dominant ♂ tegu has been seen initiating courtship with one or more of the ♀♀. This generally consists of head jerking, chasing, tail biting, marching in place, clasping, and a mount from which the ♀ usually escapes within a few seconds; the ♂ may or may not stop to feed before he makes another attempt. The subordinate ♂ has often suffered multiple bites during the course of this activity and while he is feeding he tries as far as possible to keep out of the other's way. Only once, when he was seen trying to mount a ♀ in the pool, did this ♂ exhibit any signs of breeding behaviour. None of the feeding encounters has resulted in a complete copulation, which to date has occurred only with the breeding ♀.

Copulation is accomplished quickly by the ♂ suddenly thrusting his tail under that of the ♀; her tail is arched and crossed over his. During mating the ♂ may bite his partner in the neck or thoracic region, which produces in her a vigorous lateral head shaking. The six observed complete copulatory sequences have averaged 153 seconds in duration (121–185 seconds). Afterwards the ♀ lowers her tail and the ♂ walks off wiping his vent on the substrate.

The breeding season in the wild is undetermined and probably varies throughout the species' range. In Guyana, Beebe (1945) observed breeding in April, May, June and August, but at Washington complete copulation has been seen in September, October, November and February.

INCUBATION TECHNIQUES

The eggs of *T. teguixin* are creamy white and ellipsoid in shape; Reese (1922) describes the shell as leathery in texture but partly calcareous, and effervescent if treated with hydrochloric acid. Reported clutches range from 2–12 eggs (Reese, 1922; Beebe, 1945). Although no precise information is available as to the number of clutches laid during a year, Milstead (1961) dissected a ♀ in southern Brazil containing 32 oviducal eggs and approximately 50 enlarged

WEIGHT (g)	LENGTH (mm)	WIDTH (mm)	INCUBATION (days)	REMARKS
18.2	41.8	26.5		infertile
16.6	41.7	26.3		infertile
18.5	43.1	26.4		infertile
17.9	42.6	26.4		infertile
17.1	42.2	25.5		opened 5 Dec; dead
17.2	41.7	26.9	152	hatched 26 Jan
18.2	43.4	26.1	154	hatched 28 Jan
17.4	42.5	26.3	156	hatched 30 Jan
17.6	42.4	26.3	154	mean

Table 2. Measurements at laying and incubation periods for a clutch of eight tegu eggs laid on 26 August 1975.

ovarian follicles, suggesting that a second clutch would soon follow the first.

At the National Zoo, eggs were laid on 26–27 August 1975. The first four were deposited randomly on the pea gravel substrate. They were retrieved, one from the mouth of a ♂, and the laying ♀ was moved to a 38 litre aquarium. The following day she laid another four eggs which were also immediately removed, one of them forcibly from her mouth.

The eight eggs averaged 17.6 g in weight and 42.4×26.3 mm in length and width (Table 2). Each was placed in an individual 4.7 litre jar on top of two layers of substrate, the bottom of small pea gravel and the top of sand. This was moistened so that the water level reached to approximately two-thirds the depth of the gravel; a screened hole in the top of the jar, 38 mm in diameter, allowed air to circulate. The jars were enclosed in a 38 litre aquarium, covered with a plastic lid for maximum heat and humidity retention. A heat lamp suspended at a suitable height over the tank maintained a temperature of *c.* 29°C, and misting daily, or every other day, maintained humidity levels.

Although four of the eggs were seen almost immediately to develop mould, the apparatus was not disturbed for the first two weeks for fear of adversely affecting the remainder. All were candled on 12 October, the mouldy eggs being found infertile and the remaining four showing clearly the blood vessels and dark areas indicative of embryonic development. In one of the latter, candled again 28 days later, the blood vessels

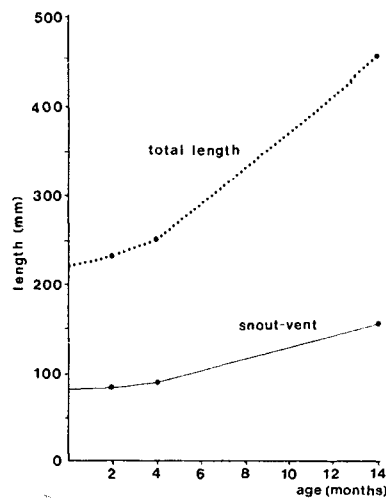


Fig. 1. Average growth of the three young tegus *Tupinambis teguixin* hatched on 26–30 January 1976 during their first 14 months.

appeared to be disintegrating and it was opened to reveal a dead embryo apparently midway through development. It had no patterning and was 100 mm in total length. The three viable eggs hatched after a mean incubation of 154 days.

HATCHLINGS

Measurements at hatching were 80–83 mm (snout-vent) and 222–226 mm (total length). Growth during the first 14 months is shown in Fig. 1. Relatively slow for the first four months, it later accelerated considerably, the tail in particular developing at a faster rate than the body.

The hatchlings were housed in a screened-top aquarium containing a small water dish, hide box and newspaper flooring. This was kept in a 2 × 3 m holding room lit by two banks of fluorescent lighting switched on from 0700–1630 hours daily. While the bright, unclouded patterning of the newly hatched young did not lead us to expect imminent ecdysis (Beebe, 1945), within the first two hours all had completed shedding.

Each day the hatchlings were offered a variety of food items—crickets, newborn mice, maggots and chopped earthworms—but it was not until they were ten days old that they began feeding. They first accepted chopped earthworms dipped in egg yolk, and it is possible that had the egg

yolk been offered before, feeding might have occurred sooner. At present their weekly diet consists of young mice, fed on Tuesdays, and crickets powdered with Pervinal, fed on Thursdays.

An unusual behaviour, perhaps defensive, was first observed when the young tegus were about two months old. When approached, they would assume a bipedal stance with forelegs held in the air and close to the body. The posture is held for several seconds and is sometimes accompanied by opened mouth and hissing; it has never been seen in the adults.

DISCUSSION

Because of its unsatisfactory zoo record, husbandry procedures for this species underwent several fundamental changes during the course of 1972–1973. Previously it had been housed in a group of four to six, in a small (1.2 × 1.2 × 2.4 m high) enclosure, and fed on a diet of horsemeat and raw egg. Sex ratio was never determined and no breeding behaviour or interaction of any kind was noted. Specimens tended towards obesity, were very lethargic and mortality was high. Post-mortem usually revealed muscular dystrophy, abnormal fat deposits or hepatitis. Two specimens were found to contain eggs. As individuals died, they were replaced by donations from the public, most of which had been fed as pets on a diet of hamburger and egg.

The first of the changes, instituted in July 1972, was nutritional. The horsemeat and egg diet was initially replaced by one of whole mice and chicks, and all animals—denied their customary food—had fully accepted it within a period of three weeks. Later in the year this was augmented with crickets powdered with Pervinal. At the same time the tegus were moved to their present larger quarters, and in mid-1974 the practice of spraying the cage twice daily was begun. The successful breeding is probably the result of one, or of a combination, of the above mentioned

innovations. In time we hope to establish the age of sexual maturity, and perhaps to discover why it is that only one pair in the group breeds. A second captive-born generation is the ultimate objective.

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PRODUCTS MENTIONED IN THE TEXT

Pervinal: vitamin-mineral supplement, manufactured by Thayer Laboratories, Inc., Pet Products Division, New York 10017, USA.

Sexing probes: tempered stainless steel probes, manufactured by Fuhrman Diversified, 1212 W Flamingo, Seabrook, Texas 77586, USA.

Speed King (candler): manufactured by Schlueter Company, Janesville, Wisconsin, USA.

REFERENCES

- BEEBE, W. (1925): Studies of a tropical jungle – one quarter of a square mile of jungle at Kartabo, British Guiana. *Zoologica* **1925** (6): 130–134.
- BEEBE, W. (1945): Field notes on the lizards of Kartabo, British Guiana and Caripito, Venezuela. Part 3, Teiidae, Amphisbaenidae and Scincidae. *Zoologica* **1945** (30): 24–27.
- BELLAIRS, A. (1970): *The life of reptiles*. 2. London: Weidenfeld & Nicolson.
- BILLIAU, F. (1970): Ervaringen met tegu's en enige andere grote hagedissen. *Lacerta* **29** (2): 15–16.
- HOOGMOED, M. S. (1973): Notes on the herpetofauna of Surinam IV. *Biogeographica*. The Hague: Dr W. Junk.
- MILSTEAD, W. W. (1961): Notes on teiid lizards in southern Brazil. *Copeia* **1961**: 493–495.
- PETERS, J. A. & DONOSO-BARROS, R. (1970): Catalogue of the neotropical Squamata. Part II. Lizards and amphisbaenians. *Bull. U.S. natn. Mus.* **297**: 1–293.
- PRESCH, W. (1973): A review of the tegus, lizard genus *Tupinambis* (Sauria: Teiidae) from South America. *Copeia* **1973**: 740–746.
- REESE, A. M. (1922): A note on breeding habits of tegu. *Copeia* **1922**: 69–72.

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