

Notes on the captive husbandry and breeding of the Shovel-footed Squeaker, *Arthroleptis stenodactylus* (Pfeffer 1893)

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ARTHROLEPTIS *stenodactylus* is a small robust frog with a blunt head and prominent eyes (Fig. 1). Adult female specimens measure up to 45 mm snout vent length (SVL) and males up to 35 mm. The colouration is highly variable. The ground colour of the dorsal surface is brown and most specimens have a marked dark stripe running from the snout which extends above the tympanum and terminates at the shoulder. The dorsum features a pair of dark spots on the sacrum, three lobed dorsal bands and sometimes a lighter vertebral line. The ventral surface may be speckled or unmarked. *A. stenodactylus* has large inner metatarsal tubercles on the hind feet at least as long as the first toe (Fig. 2).

This species is listed as Least Concern on the IUCN Red List due to its widespread distribution and tolerance of a range of habitats. It is notable, however, that it may represent a complex of cryptic species, and taxonomic revision of the complex is required (Channing & Howell, 2006). *Arthroleptis stenodactylus* is found throughout coastal Kenya, eastern and southern Tanzania, the island of Zanzibar, Mozambique, Zambia, the southern Democratic Republic of the Congo to western Angola, northern Botswana, Zimbabwe and north-eastern South Africa. It is found from 0-1,500 m a.s.l. (IUCN et al., 2006). *A. stenodactylus* is terrestrial and often associated with leaf-litter in a variety of habitats that include forest, savannah woodland and suburban gardens (IUCN et al., 2006). In the wild its diet includes arthropods, worms, snails and other frogs (Channing & Howell, 2006).

Males have an elongated third finger (Fig. 3). This third finger is used in aggressive encounters when males drive other males away from their calling sites (Channing & Howell, 2006). The throat of the male is dark with loose vocal sack skin. Females have a pale throat which is speckled

(Channing & Howell, 2006). When females are gravid the eggs become visible through the skin in the ventral and dorsolateral surfaces (Fig. 4).

Breeding commences in December at the start of the summer rains (Minter et al., 2004). Males call from the ground among leaf-litter throughout the day, with peak vocal activity after rainfall (Minter et al., 2004; Channing & Howell, 2006). The call is a short (0.05 secs.), high pitched (3.5 KHz) whistle which is repeated at half second intervals. Between 33-80 eggs are laid in hollows or burrows. Eggs are 2 mm in diameter and are creamy white. Males have been observed guarding eggs (Minter et al., 2004; Channing & Howell, 2006). The eggs undergo direct development where there is no free swimming tadpole stage. The frogs measure 2.0-2.8 mm SVL when they emerge (Harper & Vonesh, 2003). *Arthroleptis* sp. live between two to seven months once they have reached sexual maturity. Their short longevity is possibly due to predation pressures and difficulty in surviving the dry season (Barbault & Trefaut-Rodrigues, 1979; Wells, 2007). The maximum lifespan in captivity is unknown. In captivity sexual maturity can be reached in less than one year (pers. obs.).

CAPTIVE HUSBANDRY

Management

Durrell obtained two wild caught specimens in July 2006 which fortunately turned out to be a pair. The animals were seized by customs from illegal importation at Heathrow. The animals originated from an unknown location, but were probably from Tanzania. The pair were housed and bred in a converted plastic storage box, 400 x 2500 x 300 mm. The lid of this box was meshed for ventilation. For substrate, a 60 mm layer of *Sphagnum* sp. moss was used. Small rocks were placed in the enclosure. Artificial plants were provided for



Figure 1. Adult *Arthrolepis stenodactylus*.

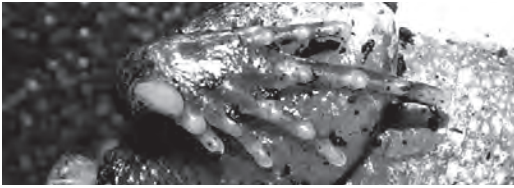


Figure 2. The large inner metatarsal tubercle of *A. stenodactylus*.

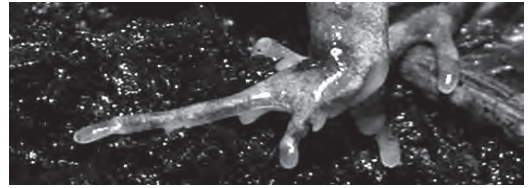


Figure 3. The fore foot of a male *A. stenodactylus*. Note the elongated third finger.



Figure 5. Captive housing.

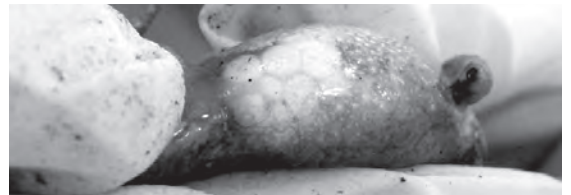


Figure 4. Eggs visible through the side and ventral surface of a female *A. stenodactylus*.

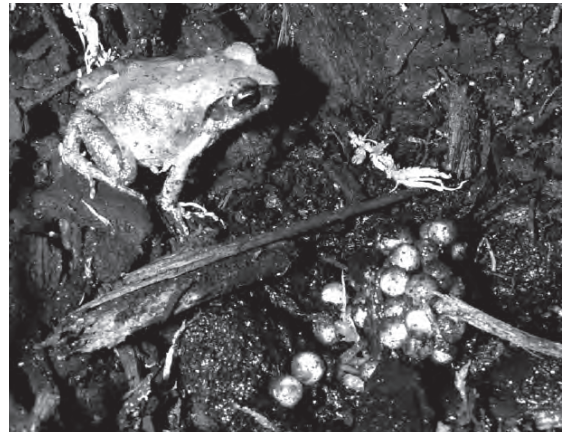


Figure 6. Clutch of *A. stenodactylus* eggs.

refugia. The F1 specimens were housed in 400 x 250 x 200 mm converted plastic storage boxes (Fig. 5). Half of the lid was mesh to allow good ventilation. Mulch and Mix Organic Compost™ was used as a substrate (moist paper towel, for ease of servicing, was used temporarily and caused no problems). Moss covered one third of the area of the mulch and mix. Leaf-litter (Oak, *Quercus robur*), cork bark and artificial plants were also provided for refugia.

The original pair bred when they were housed in quarantine. The quarantine room was heated to 20-26°C (night/day summer) and 20-24°C (night/day winter) the hatchling frogs were kept there for one year. After one year the animals were moved from quarantine and kept in a room heated to 23-27°C (night/day summer) and 20-25°C (night/day winter). Initially, a ZooMed™ Reptisun 2.0 strip light was used for lighting, but this was later changed to a ZooMed™ Reptisun 5.0 strip light (see health section later on). A shallow (10 mm deep) water dish was provided at all times. The enclosure was lightly misted with tap water daily. Powder free latex gloves were used at all times when servicing the amphibians. All animals were visually inspected every seven days. The water bowl was wiped out with a paper towel daily. Chemical cleaners or disinfectants were not used when cleaning the water bowl or enclosure. The substrate and furnishings were changed when they became substantially soiled or waterlogged.

Arthroleptis stenodactylus were fed on live invertebrates, predominantly crickets (*Gryllus assimilis* and *Gryllus bimaculatus*) and occasionally the Cowpea Beetle (*Callosobruchus chinensis*). Hatchling frogs were fed on Springtails (miscellaneous *Collembolla* sp.). Juvenile animals were fed on live pin head crickets and *Drosophila melanogaster*. Food items (with the exception of spring tails) were dusted with Nutrobal® (dietary supplement) immediately prior to being fed to the frogs. Adults were fed every three to six days (depending on season and condition). Juveniles up to six weeks of age were fed daily.

Reproduction

In captivity, eggs were laid directly onto *Sphagnum* sp. moss and bark chip. Egg clutches consisted of

30-40 eggs which were usually clumped together but occasionally laid singly or in small groups of up to four eggs over an area 6 cm in diameter. Eggs measured 2.5-3.0 mm diameter (Fig. 6). The eggs were covered by up to 50 mm of moss or bark chip. Eggs were left in-situ and took approximately one month to hatch. If egg clutches were found they were kept humid and disturbance was minimised, so as not to perturb the male who was sometimes observed guarding the eggs.

The water dish in the enclosure was shallow enough for the tiny hatchling frogs to climb out of. Hatchling frogs measured 4.0 mm SVL. Hatchlings were carefully removed from the enclosure of the adults as they required slightly modified husbandry. The hatchlings were housed in small enclosures with humid *Sphagnum* sp. moss and leaf-litter as substrate. A small shallow water dish was provided. The water dish was small enough to enable the froglets to enter and exit easily. To reduce the risk of drowning gravel or submerged leaves were used to raise the water level in the dish.

Froglets were not housed in groups of more than ten for ease of servicing and monitoring. The hatchlings were raised at the same temperature as the adults (20-26°C), and were also provided with a ZooMed™ Reptisun 5.0 strip light. Hatchlings were fed daily until about six weeks of age with Springtails. When large enough, pin head crickets and *Drosophila melanogaster* were added to their diet. Larger items were dusted with Nutrobal®. After six weeks, the feeding interval was gradually increased to once every three days. As the hatchlings grew they were sorted by size and larger frogs were housed together to avoid potential cannibalism (although cannibalism was not observed).

The males of the F1 generation were heard calling for the first time at 19 months of age (which may have indicated them reaching sexual maturity). The first egg clutches were successfully produced by females aged 22 months.

Health

Specimens were treated for parasites using Ivermectin. The frogs were bathed in dilute Ivermectin (10 mg/l) for one hour, once a week, for three weeks. No mortality of, or adverse effects on, specimens undergoing this treatment

was observed. Even with food supplementation, this species seems to suffer from metabolic bone disease (including poor bone mineralisation with subsequent breaks and curved long bones) if UV light is not provided. X-rays before and after the provision of UV-B radiation (measured at 40 μ W/cm² at the level of the substrate) showed improved bone mineralisation after two months.

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