Trinidad Stream Frog
Mannophryne trinitatis

Figure 1. *M. trinitatis* (BT)

Introduction

Description

Mannophryne trinitatis (formerly in the genus *Colostethus*), commonly referred to as the Trinidad stream frog or yellow-throated frog, is a drably coloured dendrobatid (Fig. 1). The dorsal surface is brown and the flanks are dark or mottled. This species can reach 35mm snout vent length (SVL).

Distribution

Mannophryne trinitatis is endemic to Trinidad's Northern and Central ranges. (IUCN *et al.*, 2006). The characteristic habitat of the species in the northern range is mountainous, but its range does descend to sea level. The area occupied by the Central range population does not descend to sea level (Jowers & Downie, 2005).

Conservation Status and Threats

Mannophryne trinitatis is listed as Vulnerable on the IUCN Red List due to its relatively small range (less than 20, 000km^2) and because its habitat is decreasing in extent and quality (IUCN *et al*., 2006).

Habitat and Ecology

This species is diurnal, and can be found in undisturbed moist montane forest (IUCN *et al*., 2006), where it occurs in and around steep mountain streams (Jowers et al., 2006). *M. trinitatis* lack the aposemetic colouration typical of other dendrobatid frogs. *M. trinitatis* also lacks the alkaloid skin toxins found in the other dendrobatid lineages (Brunes, 1999). The diet consists of small invertebrates.

Sexing Individuals

The males of the species are smaller and have nuptial pads on the inside of the thumbs; these are more obvious in the breeding season. Males have visible lateral vocal sacs, and call loudly. The throat of adult males is grey, while the throat of territorial females is yellow (Fig. 2). In captivity, sexual maturity can be reached at five months after metamorphoses.

Figure 2. Sexual dichromatism in *M. trinitatis*. (BT)

Reproduction and Larval Development

Female *M. trinitatis* are territorial and will chase intruders away by posturing, wrestling or jump attacks. Males call to attract females. Males exhibit behavioural dichromatism, changing from brown to black when calling in a matter of minutes (Wells, 1980). When calling the male may be approached by the female whose territory he is in. When this occurs the male responds by adding additional notes to each call (Wells, 1980). Females then leave their territories and follow males to oviposition sites.

Figure 3 *M. trinitatis* eggs and tadpoles (MG)

Females lay clutches of up to 13 eggs on land (Fig. 3). Each egg measures 3.5mm in diameter and takes 21 days to develop (Kenny, 1969). Egg clutches are guarded by the male (Smith *et a*l, 2006). When the tadpoles hatch, the male frog carries them on his back and deposits them in a suitable stream or pool (Smith *et al*, 2006). Males have well developed anti-predator behaviour, and preferentially deposit tadpoles in pools which lack predators (Jowers *et al*, 2006). Males also select pools which are large and have a good food supply and refugia in the form of leaf litter (Jowers & Downie, 2005). The free-swimming tadpoles are

herbivorous and metamorphose approximately 56 days later (Kenny, 1969).

Longevity and Age at Sexual Maturity
Lifespan and age at sexual maturity in the wild have not been reported.

Captive Management

Durrell first obtained this species is 1994.

Identifying Individuals
Specimens were managed as a group and were not individually marked.

Housing
This species was housed in a mixed-species public exhibit (*M. trinitatis*, *Dendrobates auratus* and *Bothriechis schlegelii*). The enclosure measured 2.0 x 1.0 m x 1.2 m, and the substrate was peat, live moss and leaf litter (Fig. 4). A pool was provided (diameter 250mm, depth 100mm). Natural tree branches and plants (including large bromeliads) were provided. Petri dishes covered by coconut halves were used for additional refugia and oviposition sites.


Figure 4. Set up for housing *M. trinitatis* (BT)

Temperature, Humidity and Lighting
Temperatures ranged from 24 – 29^{o}C (night/day in summer) to 20 - 24^{o}C (night/day winter). Two 250 W metal halide lamps were provided above the enclosure. The enclosure was lightly misted with tap water on a daily basis.

Routine Husbandry
The enclosure was sprayed with tap water daily, bromeliads were topped up with fresh water every day. Partial (50%) water changes were carried out on the pool every other day. The Petri dishes were checked for eggs and wiped clean with paper towel every other day.

Diet in captivity
At Durrell *M. trinitatis* were fed on live invertebrates, predominantly giant *Drosophila (D. hydei)* and occasionally the cowpea beetles (*Callosobruchus chinensis*). Juvenile animals were fed small *Drosophila* with vestigial wings (*D. melanogaster*). All food items were dusted with Nutrobal ® (vitamin and mineral supplement) immediately prior to being fed out.
Mannophryne trinitatis were fed every other day. Additionally two jars, one containing a colony of *D. melonagaster* and the other *D. hydei* were left at each end of the enclosure permanently to ensure that all individuals had access to food of a suitable size.

Reproduction in Captivity

Breeding Seasonality
Specimens breed through out the year

Provision of Breeding Sites
Specimens laid eggs on the surface of flat rocks and in the leaf axils of bromeliads. Artificial oviposition sites were used, these were created by covering a Petri dish with halve a coconut shell.

Tadpole Husbandry and Development
Eggs and Tadpoles were usually left *in-situ*. The tadpoles *in-situ* were not provisioned with additional food. Instead they were left to feed on the leaf litter and algae found in the pond in the enclosure.
Some tadpoles were rised *ex-situ*. After hatching, tadpoles were transferred to a glass tank measuring 300 x 200 x 250 mm. At Durrell aged tap water was used to rear tadpoles, and oak leaves were added to soften the water. Partial (20 – 30%) water changes occurred two to three times per week. Air stream sponge filters were used for filtration, and were cleaned at each partial water change. The water was not heated and ranged in temperature from 23 – 26^{o}C.
Tadpoles were fed predominantly on a powdered tadpole food (components: ground tropical fish flake, grass pellet, trout pellets, tubifex, river shrimp, spirulina algae and cuttlefish bone).

Rearing Metamorphs
Metamorphs were housed in small Pal Pens 250 x 150 x 200mm. in groups of up to 6 (groups were divided amongst larger Pal Pens as individuals grew). Mulch and Mix organic compost was used as a substrate and was kept permanently damp. This was replaced as necessary. Oak leaves and a coconut hide were provided for refugia. A Petri dish was provided as a water dish. The metamorphs were raised at 23 - 27˚C. Metamorphs were misted with room temperature tap water once daily, and were provisioned with a Reptisun 5.0 strip light. Metamorphs were fed daily with *D. hydei and* occasionally pin head crickets. All food items were dusted with Nutrobal ®.

Health

Problems Encountered in Captivity
Renal failure and severe oedema due to polycystic kidney disease, the cause of which remains unknown.

Bibliography

Brunes, E. 1999. The complete encyclopaedia of terrarium. Grange Books, Rochester 320pp.

Duellman, W. E. & Trueb, L. 1994. Biology of Amphibians. John Hopkins University Press, Baltimore. 672pp

Jowers, M.J., Campbell-Palmer, R., Walsh, P.T. & Downie, J.R. 2006. Intraspecific variation in the avoidance response of stream frog (*Mannophryne trinitatis*) tadpoles to fish and prawn predators. Herpetological Journal 16 (4): 337-346

Jowers, M.J. & Downie, J.R. 2005. Tadpole deposition behaviour in male stream frogs *Mannophryne trinitatis* (Anura: Dendrobatidae) Journal of Natural History 30 (32): 3013-3027.

Kenny, J.S. 1969 The Amphibia of Trinidad, Stud. Fauna Curaçao Caribbean Isl., 29:1-78.

IUCN, Conservation International, and NatureServe. 2006. Global Amphibian Assessment. <www.globalamphibians.org>. Accessed on 09 October 2007.

Smith, J.M., Buchanan, J., Downie. J.R. & Riehle, M.O. 2006. Larval transport does not affect locomotor performance in the stream frog *Mannophryne trinitatis*. Herpetological Journal 16 (3): 333-336.

Staniszewski, M. 1995. Amphibians in Captivity. T.F.H Publications INC, U.S.A. 544 pp.

Wells, K. D. 1980. Social behaviour and communication of a Dendrobatid frog (*Colostethus trinitatis*) .Herpetologica 36: 189-199.

Authorship
Benjamin Tapley

Photography
Benjamin Tapley & Matthias Goetz

Date
16th January 2008.