

Captive Reproduction of the Orange-legged Monkey Frog (*Phyllomedusa hypocondrialis*), and Development of a Protocol for Phyllomedusine Frog Reproduction in the Laboratory

Danté Fenolio

Amphibia Research Group, P. O. Box 607, Saratoga, California 95070 USA

INTRODUCTION

The orange-legged monkey frog (*Phyllomedusa hypocondrialis*) is a small, neotropical hydrid that ranges east of the Andes mountains in South America, from Colombia, Venezuela, the Guianas, and Suriname, southward to Argentina, Bolivia, Paraguay, and southeastern Brazil (Frost, 1985). Among others studying the reproductive biology of these frogs, Budgett (1899) made observations in the Paraguayan Chaco, while Pyburn and Glidewell (1971) studied them in Colombia.

Phyllomedusine frogs, with few exceptions, oviposit on vegetation above bodies of water (Duellman and Trueb, 1986). In the subfamily Phyllomedusinae, frogs in the genera *Phyllomedusa*, *Phrynomedusa*, *Phasmahyla*, and *Hylomantis* all create funnels around their egg masses by rolling the leaf that eggs are oviposited upon around the clutch. Working from the leaf's bottom to the top, the frogs fold the edges of the leaf or leaves together with their feet while laying eggs (Pyburn and Glidewell, 1971; Pyburn, 1980; Duellman and Trueb, 1986). The edges of the leaves stick together with adhesive residue from the egg laying process. The clutch is commonly concealed from view by the cylindrical leaf funnel. Egg development usually takes from seven to 13 days, after which tadpoles hatch and "slide" through the funnel, falling out of the lower opening into the water below (usually a temporary pool of stagnant water). In *P. hypocondrialis*, a preference for slightly drier, more arid environments is in contrast with many other phyllomedusines. Eggless capsules, filled with water, are deposited alongside the eggs to help hydrate developing larvae (Pyburn, 1980).

Owing to the relative ease of reproducing *P. hypocondrialis* in captivity, a protocol for reproducing phyllomedusine frogs in the laboratory can be made using this species as an example. In captivity, phyllomedusine frogs are best reproduced via simulation of the seasonal weather patterns of the habitat from which they come (especially if the adults are wild caught). Most of the areas inhabited by these frogs experience seasonal change through some form of a "wet season" and a "drier season." The simulation of these conditions has led to the successful reproduction of phyllomedusines in the laboratory.

MATERIALS AND METHODS

My frogs have been housed in tall vivariums with screen tops and/or side screen doors to allow for ample ventilation. To maintain some degree of humidity and moisture for species inhabiting damper habitats, half of the screen top was covered by a piece of thin glass and the enclosure was misted with clean, fresh water once every three or four days. The exact size of the vivarium can vary according to how many frogs it is to contain. A group of 15 adult *P. hypocondrialis* was accommodated in an enclosure that measured 46 x 46 x 76 cm (l x w x h). Sturdy plants were provided with leaves strong enough to easily support the weight of an adult, female frog. A shallow water dish (about 2.5 cm in depth and 7-12 cm in dia.) with clean, dechlorinated, dechloraminated water was available to the frogs at all times. The substrate consisted of seedling orchid bark at a depth of about 3-5 cm. Fluorescent light bulbs, intended for plant growth or simulation of sunlight, were placed above the enclosure and main-

tained on a 12L:12D photoperiod by means of a timer.

Small crickets, shorter than the width of the frog's mouth, were provided every three to five days, in a proportion of four to six crickets per frog. The crickets were placed into "feeding dishes" that measured 10-15 cm deep and 10-15 cm wide. The dishes were made of a substance like smooth glass from which crickets could not escape. Once every eight to 10 feedings, the crickets were dusted with Herptivite® reptile vitamins, and every 16 to 18 feedings with Rep-Cal® calcium supplement. Nighttime temperatures were 20°-22°C. Daytime temperatures of 24°-26°C were attained through the use of an incandescent light bulb above the enclosure.

In pre-reproduction conditioning of the adult frogs, it was important to allow the enclosure to dry a bit to achieve a lower humidity. Misting of the enclosure was terminated. Fresh, clean water was always available in the water dish to avoid desiccation. To enhance "dry season" simulation, temperatures in the enclosure were gradually raised from regular daytime temperatures to about 29°-32°C over the course of two weeks. Methods for temperature increase can include the use of a hanging lamp with a 100W bulb being slowly lowered closer and closer to the top of the enclosure (over the course of the two weeks). Alternatively, a heating pad, with a thermostat, attached to the underside of the enclosure, can be adjusted to gradually increase in temperature. Food was made available at all times. Once the higher daytime temperatures had been achieved, the conditions were continued for another 20 days while the frogs gained weight.

A rain chamber was used to simulate the rainy season. The plexiglass (acrylic) rain chamber for this experiment measured 1.22 x .61 x 1.07 m (this large size is not necessary for *P. hypocondrialis*, which will reproduce in a chamber of the dimensions previously described for a housing enclosure). A screen top was provided for good ventilation. The bottom of the chamber was plumbed with an intake vent through which water passed to a mechanical filtration unit (filtering particulates from the water). The water reentered the chamber through one of two exhausts: the first returned the water directly to the water reservoir in the bottom of the chamber, while the second transferred the

water to sprinkler heads that sprayed down through the chamber from the top. Ball valves (made of PVC) allowed for the transition of the water flow between the two exhausts. Additionally, PVC pipe, 1.3 to 2.5 cm in diameter, was used for all water transport to and from the filtration unit and the sprinkler heads. Bulkhead fittings were used at the water intake site and the exhaust site flowing directly into the water reservoir from the filter. A Lifeguard® canister filtration unit was used, powered by a March MDXT-3® external water pump. Four ceramic plant pots, 10.2 cm in diameter, were placed upside down on the bare bottom of the chamber to act as stands for a "false bottom." A sheet of plastic "egg crating", exactly the dimension of the inside of the chamber, and covered with soft, mesh screening, was placed on the flower pots, effectively creating the new bottom level of the chamber. The water level was shallow, being only 6 mm above the mesh screen. This false bottom prevented frogs from being swept through the flow of water, generated by the filtration process, and drowned. The shallow water depth of only 6 mm helped to further reduce the chance of drowning.

Plants were grown hydroponically and were placed in ceramic plant pots with their roots surrounded by aquarium gravel. These plants and pots were set on the false bottom. Plants with leaves approximately two to three times the length, and no more than three times the width of the female frogs, were used. Additionally, flexible leaves were important so as to allow for funnel formation. New plants were carefully washed, especially the leaves and roots, to ensure no unwanted chemicals entered the system. Several species of plants were offered so as to provide multiple options in leaf type for female frogs looking for oviposition sites. Fluorescent lights, intended for plant growth, were on a 12L:12D photoperiod, which was controlled by a timer. The lighting unit was hung from the ceiling above the rain chamber. Water temperatures were no cooler than 16°C and no warmer than 21°C. The filter was allowed to run 24 hours per day to maintain water quality and chemistry. When frogs were absent from the chamber, the sprinklers were activated every two or three days to maintain appropriate moisture levels in the gravel for the plants. Frequent water changes of the water reservoir