

## ABCM Specialty Taxa Husbandry

Phyllomedusines (Leaf Frogs)

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The purpose of the Specialty Taxa Monograph is to provide more information on husbandry and breeding of different taxa that may be encountered in amphibian collections. It is intended to be an addendum to the Basic Husbandry Monograph and other monographs such as Captive Reproduction, where basic principles are addressed. Some husbandry specifics are based on experience at the Atlanta Botanical Garden and others may experience different results.

### 1) Basic morphology and natural history

Phyllomedusines (Leaf Frogs) are among the most commonly maintained and reproduced frogs in captivity. This is easy to understand when we think about the numbers of Red eyed leaf frogs that are imported, bred and distributed via the pet trade and institutions. Leaf frogs, however are much more than this flagship with the brilliant red eyes and have much more to offer than display animals with very distinctive behavioral, biochemical and reproductive features!

Endemic to Central and South America, there are 57 species of phyllomedusines described to date contained in 7 genera including:

<i>Agalychnis</i>	6 species
<i>Cruziohyla</i>	2 species
<i>Hylomantis</i>	8 species
<i>Pachymedusa</i>	1 species
<i>Phasmahyla</i>	4 species
<i>Phrynomedusa</i>	5 species
<i>Phyllomedusa</i>	31 species

Phyllomedusines are easily distinguished from other “tree” frogs by the presence of a vertically elliptical pupil. As the common name implies, they resemble leaves and often are quite cryptic while sleeping on the underside of a leaf. Some species such as *Cruziohyla calcarifer* and *Phyllomedusa bicolor* will rest on the tops of leaves or perched on a branch, fully exposed. Pigments in their skin help protect them from damaging solar radiation while also aiding in their ability to camouflage and regulate skin temperatures. In addition, protein secretions help prevent dehydration and potential fungal or bacterial infections.

Phyllomedusines range in size from 3-5 cm in *Phyllomedusa hypochondrialis* to nearly 18 cm in *P. bicolor*. Most inhabit humid tropical forests but a few, such as *Phyllomedusa sauvagei* and *P. azurea* reside in the very hot and dry “Chaco” region of Paraguay and

Bolivia. (see <http://www.eoearth.org/article/Chaco>). These are important factors when considering husbandry.

Nocturnal by nature, many phyllomedusines typically dwell in vegetation ranging from 1 to 20 or more meters in humid forests, and are very much dependent on water. Depending on the species eggs masses may consist of 10 to hundreds of individual eggs that are deposited on leaves over hanging streams and tadpoles drop in upon hatching. In some cases, the eggs masses are rolled up inside a leaf in a funnel-like fashion while in other cases they are simply adhered to the lower surface of the leaf.

## 2) Justifications/Uses/Purposes

While only a few species are considered critically endangered or threatened (IUCN, Conservation International, and NatureServe. 2008), learning as much about the husbandry and breeding of this group of frogs will certainly help efforts for others in the future. Many species such as *Phyllomedusa bicolor*, *P. sauvagei*, *Pachymedusa dacnicolor* and others make good specimens for public display as they don't mind perching out in full view during daylight hours. Others such as *Hylomantis lemur* and *Agalychnis callidryas* are more difficult to observe due to their nocturnal habits; however, most all also have excellent potential for more specific, one-on-one educational use.

## 3) General Husbandry

### a) Any special physical parameters

1. Enclosures: Species and size are the key factors in selecting an enclosure, but in all cases, a vertically oriented enclosure out-fitted with many perches and basking areas is recommended. Tropical plants with large leaves will allow places for species to sleep during the day. While a fully planted naturalistic terrarium "looks" quite nice for public exhibition and these frogs generally do well in them, we have found that a semi-sterile enclosure works better for maintaining healthy frogs for breeding purposes. This consists of a basic glass terrarium outfitted with a floor drain, false bottom (fashioned from egg crate material and screen), water bowl and 1-2 potted plants. This provides for the basic needs of the frogs while avoiding the situation where parasites such as nematodes can build up in the substrate. In warmer climates, large screen enclosures such as Reptarium® cages work quite well for keeping larger species such as *Phyllomedusa bicolor* and *Agalychnis moreletii*.
2. Furnishings that address natural history aspects: An abundance of smooth, broad-leaf tropical plants along with a large grouping of smaller plants for additional cover. *Heliconia* and *Calathea* are ideal for this purpose. Vertically and horizontally oriented branches will provide additional places for these frogs to perch.

3. Any other special features? None.

b) Environmental considerations

1. Temperature: Most common species such as *Agalychnis callidryas*, *Phyllomedusa bicolor* and *P. hypochondrialis* can be maintained at 75-85 degrees F with a temperature drop of 5-15 degrees at night. Given it's natural habitat in the Chaco, *Phyllomedusa sauvagei* can certainly take temperatures in the mid-nineties for periods during the day. Some species such as *Hylomantis lemur* and *Agalychnis annae*, from slighter higher elevations, are comfortable with nighttime temperatures approaching 65 degrees F and will not tolerate day time temperatures over 85 degrees F for long.

2. Water (humidity, running water, etc.): Clean, filtered water may be provided in small bowls (include smooth rocks that will prevent smaller species from drowning inadvertently). Change daily. Many of these species do not like direct misting but a general misting of enclosures will keep the humidity up. Automatic mist systems are fine to use, but should be set to come on more at night allowing the enclosure to dry out a bit during the day. A range of 50-75% relative humidity is fine for the more humid-forest species and natural fluctuations through the day are acceptable. Frequent misting, either by hand or automatic system should be avoided with the more xeric species such as *Phyllomedusa sauvagii* and *P. azurea*. Access to water via a sponge contained in dish of water on the enclosure floor is sufficient in place of misting the enclosure.

3. Light: Power compact fluorescent lights or other full-spectrum fluorescent lighting deemed appropriate for plant growth is adequate for most phyllomedusine enclosures; however, due to their arboreal nature, we may need to give more consideration to UV radiation with some species. Eiko® halogen spot lights can be provided for providing basking areas and UV-B radiation, but should be used cautiously as these do increase temperatures and decrease humidity. It should be noted that until we know the precise requirements of the different species, that these UV bulbs should be utilized with some degree of caution. Clearly some of these phyllomedusines, especially those which are found higher in the canopy or clearly perch on the top sides of leaves (*Cruziohyla* sp. for example) would potentially receive higher amounts of UV radiation and probably benefit from the addition of these halogen spot lights.

4. Modifications to induce breeding? Generally speaking, breeding of most phyllomedusines that have been worked with in captivity seems to involve inducing a dry period for 4-5 weeks prior to introducing males and females (although separation of the sexes first is not always required), followed by a distinct and abrupt "rain event." Red eyed leaf frogs (*Agalychnis callidryas*) are bred like clockwork in many collections

around the world and in many different fashions. Some find that moving animals to a separate “rain chamber” is helpful while others simply make adjustments to an existing enclosure. (See Basic Amphibian Husbandry and Captive Reproduction sections of ABM Course materials for more information on rain chambers). Having an enclosure with a floor drain is very helpful as it is far easier to simply add a mist bar or other water source for drastically increasing humidity without having to worry about getting rid of the excess water.

- c) Feeding, Nutrition, Veterinary Considerations: In the terrarium, phyllomedusines will accept a variety of food items and will even acclimate to tong feeding. Crickets, roaches, wax moths, house flies (and larvae) are among the common food items. Adult *Phyllomedusa bicolor* will even tank pinky mice although these should be offered sparingly. Food items should be dusted alternately with powdered vitamin supplement of known formulation (we have been using a commercially available Men’s Health vitamin which is pulverized to powder form) and calcium supplement (we use Rep-Cal with Vitamin D3). Newly metamorphosed frogs will normally accept *D. hydei* or 1/8” crickets as their first meal.

Common veterinary concerns are lungworm (*Rhabdias* sp.) and other nematode infections. *Hylomantis lemur* has shown some dislike of Drontal Plus®, but others seem to have issues with this. Ivermectin has proven fatal when applied topically to *Agalychnis callidryas*. (Dr. Sam Rivera, Zoo Atlanta pers. comm.). Rostral abrasions that can arise from rubbing snouts in small enclosures or during shipping can be treated with antibiotic ointment.

#### **4) Raising of Larva/Neonates:**

- a) Eggs: Phyllomedusines deposit eggs in masses either on the surfaces of leaves and in many species, in cylindrical leaf “funnels” that are rolled up during oviposition and the funnel held in place by residue produced during this event. In some cases, egg-less water capsules are deposited to help keep eggs hydrated. In most cases, egg masses are removed upon discovery by simply removing the leaf on which the mass is deposited. The leaf/egg mass combo can then be placed in a plastic container with some water on the bottom, but not enough to completely immerse the eggs. In cases where the petiole of the leaf is also attached, this can be used to “hang” the mass just over the standing water by securing the petiole to the lid or side of incubation container. Containers with eggs are stored at approximately 75 degrees F. under normal lighting conditions. If a few of the eggs slip into the water, this is generally of no concern and they should still develop normally. Hatching takes roughly 5-14 days depending on species and temperature.

b) Larva: The larvae of most phyllomedusines are pelagic (free swimming in the water column, as opposed to bottom dwelling). Two methods that have worked well at ABG for raising larvae include:

1) Aquarium: A simple 10 or 20 gallon (long-type tank, to increase surface area) aquarium works well. A fine sand substrate is added to a depth of ½-1 inch deep. Aquatic plants such as java moss, *Anacharis*, or *Lemna* (duckweed) can be added for cover and grazing. A small powerhead or filter/pump combo is added to keep the water moving helps keep water aerated and clean. We find the new “micro” canister filters (such as the “Rapids” model) are excellent for this. For most species a temperature of 75 degrees is adequate. Up to 30 tadpoles can be housed in a 10-gallon aquarium if the water is kept clean. A weekly water change of 25-30% is recommended although up to 50% is may be required as the tadpoles get larger and produce more waste.

2) Simple Tubs: Here, larger plastic “shoeboxes” such as 8 or 10-quart size Sterilite® or Rubbermaid® boxes are used in place of the aquarium. A very thin layer of fine sand (1/8 inch) or gravel is added as a substrate, again combined with a few small rocks. Live java moss is added for additional cover. The tub is filled ¾ of the way with filtered water. No powerheads are used and the tubs merely need to sit for a couple of hours to stabilize to room temperature. A dozen or more tadpoles may be housed in these containers, more if careful attention is paid to water quality. A water change of 50% every other day will keep water quality stable.

The diet of phyllomedusine larvae at ABG begins with sera-micron powder applied to the water surface twice daily for approximately 2 weeks, followed by addition of a balanced flake fish food. They will also accept freeze-dried tubifex worms.

c) Neonates: In general, this is a fairly easy and straightforward process. Tadpoles will begin metamorphosis at about 40-90 days, depending on species. Once they have all four limbs, metamorphs are removed from the rearing tanks/tubs and placed in 32 oz deli cups with vented lids. A tall leaf is placed on a slant inside the cup to provide a haul out point. The cup should also have roughly ¼ inch of water in the bottom. Once tails have been fully absorbed, they are transferred to small “Pet Pal” type enclosures with a layer of high quality sphagnum moss or paper towel on the bottom. Using plastic pots normally used for greenhouse plants as “furniture” is a good way to provide places for perching or sleeping and they are easily disinfected. First meals are usually 2-3 *Drosophila hydei*. Be careful not to feed too many flies at once as the neonates are easily stressed by a large amount of food items in the enclosure. Small (1/8 to ¼”) crickets can be offered within a week or two but care must be taken as sometimes too

many large food items can result in cloacal prolapse. Mist daily and feed every other day. After the first few delicate weeks, raising of the froglets is very straightforward. The juveniles can be moved in groups to “Pet Pal®” type enclosures once they are eating well. A 3 gallon-size enclosure can house 10 or 15 neonates for several weeks before they begin to outgrow it.

Species in captivity:

*Agalychnis annae, callidryas, moreletti, saltator, spurrelli*

*Cruziohyla calcarifer*

*Hylomantis lemur, Hylomantis hulli*

*Pachymedusa dacnicolor*

*Phyllomedusa azurea, bicolor, boliviana, hypochondrialis, tarsiis, tomopterna, vaillanti*

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