

## AARK *EX SITU* MANAGEMENT GUIDELINES:

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### BIOLOGY AND FIELD DATA

#### Taxonomy:

**Order:** Anura  
**Family:** Hylidae  
**Genus:** *Hylomantis* [was previously described in the genus *Phyllomedusa*]  
**Species:** *lemur*  
**Common names:** Lemur leaf frog

**Comments:** Currently, described as a single species across the entire range, throughout Colombia, Panama and Costa Rica. Scientific work is ongoing [unpublished at time of writing] which may suggest that Costa Rican and Panamanian populations are genetically different and may be separate species. Initial observations do suggest that there are morphological [size] differences [in frogs and egg clutches] as well as differing abilities to tolerate different temperature ranges.

#### Description:

**Size:** Adult females: Approx 40 to 45mm in length by 15 to 20mm across the widest part of the abdomen in resting position and roughly 4 grams in weight [Costa Rican form].  
Adult males: Approx 30 to 35mm in length and 10 to 15mm across the widest part of the abdomen in resting position and roughly 2 grams in weight [Costa Rican form].  
Size at metamorphosis is approximately 22mm in length by 10mm wide.

**Coloration:** As a young frog, the skin on the dorsum is almost a uniform pale or lime green at rest [or during the daytime]. As the frog matures, dark speckles appear over the entire skin surface. During periods of activity, there is a dramatic change in colouration to a much darker green, almost brown colouration. Ventral colouration is white.

The skin does appear to be very smooth, but on closer inspection is actually quite grainy. No warts or tubercles are present.

Larvae are a pale, greyish-brown and gradually turn green as they approach metamorphosis.

**Morphological characters:** An apparently frail, thin frog lacking any apparent musculature in the arms and legs. No inter-digital webbing present on front or hind limbs.

#### Longevity:

Longevity is unknown in the wild, but has been kept in captivity in excess of 5 years.

#### Zoogeography/ecology:

**Distribution:** Costa Rica, Panama and historically on the Colombian border

**Habitat:** Humid lowland and montane primary forest [440 to 1600m asl], and is not found in degraded habitats. In Costa Rica, it can be found on the fringes of degraded habitat and also in secondary forest.

**Population:** It was once considered to be a reasonably common species in Costa Rica, but most populations have recently disappeared. The species is still considered to be reasonably common in lower elevation in central and eastern parts of Panama (where, for example, there are recent records from Palmarazo), but an extensive declines have been recorded in western Panama from the Reserva Forestal Fortuna, Chiriquí, (no records from this site since 1999) and El Copé, Coclé (declined from 2004), although it persists at a very reduced abundance. There is no recent population information from

Colombia.

Chytrid fungus and habitat loss are thought to be the main reasons for this species' decline.

**Status:** This species is listed as Critically Endangered (Cr) in the IUCN Red List of Threatened Species ([www.globalamphibians.org](http://www.globalamphibians.org)).

#### Diet:

Not known but assumed to be most small invertebrates such as crickets and moths etc...

#### Reproduction:

**Sexual maturity/age at first breeding:** In captivity, maturity can be achieved in one year, although reliable breeding appears to require a little longer.

**Seasonality:** Most breeding activity is noted in the spring and summer

**Eggs/oviposition/clutch size/ development:** Egg clutch of up to 20 eggs are usually deposited on the undersides of smooth leaves usually overhanging water. They are a blueish green or grey in colouration and surrounded by a typical jelly mass. Tadpoles develop rapidly and will usually drop into the water below after approximately 7 days. Metamorphosis can take from 90 to 150 days dependant on temperature and food availability.

#### Activity and other notable behaviour:

These frogs are primarily nocturnal and spend the daytime resting on the underneath surfaces of smooth leaves

### MAINTENANCE IN CAPTIVITY

#### Accommodation

##### Adult animals:

**Enclosure design:** Exo-Terra-style or "Dartfrog-designed" glass vivaria are recommended and have been used by the author with reasonable success for groups of adult frogs. 30% of the floor space is given up to a shallow water trough which can allow the frogs to bathe regularly and helps to keep humidity up. 25% to 50% of the top panel of the vivarium should consist of fine mesh that will retain small insects but allow some of the UVB from the overhead lights through.

A simple overflow [with a mesh cover] at a depth of about 1cm to 2cm is incorporated into the floor of the vivarium to allow excess water from the automatic misting system to drain away. Water is collected in a container below to allow routine disinfection prior to disposal down the domestic drains. This water area is manually flushed through on alternate days to remove faeces and dead insects that may have accumulated here.

Basic furnishings such as a potted plant [e.g. *Ficus* sp.] and cork bark to allow feeder crickets to climb up and be more accessible to the frogs appear to be sufficient. *Heliconia* sp or *Philodendron* sp. seedlings also make good furnishings, especially during breeding as it's easy to remove leaves or parts of leaves with spawn on with minimal disturbance. If the plants are potted and easily removable along with the resting frogs behind the leaves, vivarium cleaning will be much easier. Damp paper towel can be used as substrate and is easily changed on a daily basis to maintain adequate hygiene. Currently the author uses no substrate. Faeces are both washed into the water area and rinsed away with automatic misting or are wiped off the glass by hand on a daily basis.

**Enclosure dimensions:** A vivarium of 45cm X 45cm X 60 cm is adequate for around 10 to 12 adult frogs. Very small juveniles may be kept in higher densities initially, but should be thinned out as they grow to avoid overcrowding and excessive competition for food.

**Temperature regime:** As this species thrives at moderate elevations in the wild [440m to 1600m asl], daytime temperatures should not exceed 25 degrees C for any prolonged period.

We recommend a daytime high of 24 to 25 degrees with a 5 to 7 degree drop at night.

**Humidity/rainfall:** Humidity is maintained at around 50 to 75% in winter and at 90 to 100% in the summer. This is achieved by a variable timed automatic misting system with a single spray nozzle mounted at the top of each vivarium, but could be achieved by use of a hand sprayer if only one or two vivaria are being maintained.

**Photoperiod:** Artificial photoperiod of 10hours light/14 hours dark is achieved using strip-lighting in the frog room and Reptisun 10% fluorescent light tubes positioned immediately above the mesh panel on the top of the vivaria. This is not varied throughout the seasons. However, our frog room is subject to outside influence due to the position of the frog room and the large south-facing windows. In effect, they are subject to a natural UK photoperiod.

#### Recent metamorphs:

Young metamorphs should be housed and maintained exactly the same way as the adults in groups of no more than 20 and with a water area or large but shallow dish below to help to maintain humidity. Some pebbles or a piece of cork bark in the water will allow the frogs and any food items that fall in to climb out more easily.

#### Larvae:

Tadpoles can be housed in basic glass or plastic tanks of varying dimensions depending on the clutch size. A clutch of 20 can easily be raised communally in a container of roughly 30cm X 25cm with 10cm of water depth. Water should be changed daily. No substrate is necessary.

#### Life-support details:

Artificial photoperiod is maintained at 10 hours light and 14 hours night. However, the room contains large south facing windows and photoperiod is essentially governed by the local photoperiod.

Temperatures are thermostatically controlled to give a maximum daytime temperature of 24 degrees with a 5 to 7 degree drop at night.

Automatic misting system maintains ambient humidity at between 50 and 90%RH depending on the frequency and duration of the misting periods. During the winter [non-breeding] months, misting is restricted to one period of 60 seconds. This is increased to 3 or 4 periods of 60 seconds during the late Spring to encourage spawning. If spawning does not begin spontaneously, misting can be extended with additional periods throughout the night. Conventional rain-chambers also work well for this species.

The exact frequency of misting does not seem to affect this frog's willingness to breed so long as there is some noticeable difference between dry and wet seasons.

All water is filtered through a sediment filter and a carbon filter before being used for spraying or for rearing tadpoles.

#### Diet

##### Food items:

**Adult:** 2<sup>nd</sup> instar crickets, *Gryllus sp* or *Acheta sp* are fed almost exclusively in captivity. However most insects between 5 and 10mm will be consumed. Greenbottle flies, e.g. *Lucilia sp*, have also recently been offered with success.

**Recent metamorphs and juveniles:** Same cricket species as for the adults but at 2 to 5 mm in length. Fruit-flies, *Drosophila sp* are also consumed avidly by smaller metamorphs.

For all adult and metamorph stages, food is lightly dusted with Nutrobal [VetArk products] once per week.

**Larvae:** Equal amounts of Aquarian flake fish food and Spirulina powdered and mixed together form the dry diet which is then mixed with a very small amount of water and the resultant dry paste rolled into pea-sized lumps and dropped into the water.

<b>Feeding method:</b>
<p><b>Adults:</b> Crickets are placed onto cork bark and planted areas within the vivaria late in the afternoon since these frogs are nocturnal feeders.</p> <p><b>Larvae:</b> As detailed above. Water must be changed regularly and any uneaten food removed.</p>
<b>Reproduction</b>
<b>Social structure:</b>
<p>It is probably important for males to call against each other during courtship, so we tend to keep multiple males in with multiple females. The exact ratio is probably not important. The total group size will depend primarily on size of vivarium and availability of [and hence competition for] insect food items. A group size of 5.5 works well for us in vivaria of the size outlined above.</p>
<b>Courtship and spawning:</b>
<p>During the breeding season, which can be whenever the frequency of misting is increased, males can be heard calling with a short “plick” which is repeated at intervals of several seconds to minutes. Since the majority of this behaviour is carried out during the hours of darkness, much of the detail is not known to the author. However, pairs can be seen in amplexus for many hours or days prior to spawning. Eggs clutches are laid on the underside of smooth leaves, overhanging the water. They are a pale greenish colour when laid and can number approx 6 to 20. Clutch size and individual egg size also varies between Panamanian and Costa Rican forms of this species.</p>
<b>Care of eggs and larvae:</b>
<p><b>Eggs:</b> Eggs can be left to develop in situ and sprayed regularly unless they are within the area regularly wetted by the spray system. Tadpoles hatch out and drop into the water below after approx 7 days. For a more controllable system, the entire leaf with spawn can be removed and placed into a suitable tub, such as a plastic “cricket-box” and sprayed daily. When the tadpoles are about to hatch, simply add more water to a depth of about 1cm initially.</p> <p><b>Larvae:</b> should be removed and reared in a separate tank for easier observation and monitoring.</p>
<b>Other details:</b>
<b>Handling and transport:</b>
<p>These frogs are extremely delicate and so extra care should be taken when handling or if transportation is required. Any necessary handling should only be attempted using gloved hands. Wetted vinyl gloves appear to be the best for the frogs. Travel containers should have a substrate of damp paper towel to keep humidity up, but may require very little in the way of furniture as the frogs will simply cling to the sides of the container. A length of <i>Scindapsis</i> vine or any other smooth-leafed plant may be packed into the container to afford additional clinging points and for extra security. Alternatively, a 50 ml plastic centrifuge pot or similar with a ventilated lid and a plug of moss in the bottom, works well and can accommodate 1 or 2 adults without allowing too much space for them to jump around and injure themselves. All transportation should conform to the Welfare of Animals during Transport order 1994, and IATA regulations if being transported by air. An ‘Animal Transport Certificate’ should accompany the animals during their journey and their containers should in no way compromise their welfare. CITES permits are not currently required for international transport, but a signed health certificate should accompany the animals.</p> <p>Extremes of temperature should be avoided, especially during warm weather as these frogs will not tolerate high temperatures over 25 degrees for any length of time.</p>
<b>Health and veterinary care:</b>
<p>Due to the delicate nature of these frogs, excessively invasive or disruptive procedures on a regular basis are not recommended.</p>

Regular faecal checks for internal parasites should be carried out quarterly, with treatment as required. Chytrid swabbing, especially of new arrivals is recommended.

We have successfully wormed this species using a diluted suspension of fenbendazole [Pancur], administered using a fine intravenous catheter attached to a 1ml syringe. We used a dose of 0.05ml of 1:100 dilution of Panacur 10%. [20mg/kg] without any toxic results.

In the USA, a de-worming drug known as Drontal Plus [a combination of Panacur plus two other drugs] has also been demonstrated to be very effective in treating Panamanian lemur leaf frogs for internal parasites, but elicited a toxic response in Costa Rican forms.

## References

### Unpublished reports and bibliography:

**Stuart, S.N., Hoffmann, M., Chanson, J.S., Cox, N.A., Berridge, R.J., Ramani, P, and Young, B.E. (eds)** (2008). Threatened Amphibians of the World. Lynx Edicions, Barcelona , Spain; IUCN, Gland, Switzerland; and Conservation International, Arlington, Virginia, USA.

For further information on natural history and conservation by Brian Kubicki, Ron Gagliardo and Andrew Gray see; <http://www.costaricaexpedition.co.uk/Lemur%20Introduction.htm>  
and

<http://www.costaricaexpedition.co.uk/Lemur%20Conservation%20Project.htm>