

## OBSERVATIONS ON THE BREEDING BEHAVIOR OF *Philautus regius* MANAMENDRA-ARACHCHI AND PETHIYAGODA, 2005 (AMPHIBIA: RANIDAE: RHACOPHORINAE) IN NILGALA, MONARAGALA DISTRICT IN SRI LANKA

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Breeding behavior of the recently described *Philautus regius* Manamendra-Arachchi and Pethiyagoda, 2005 in Nilgala forest vicinity is the firstly described observation on the breeding of *Philautus regius* documented in the nature. According to our observation this is the first record of a *Philautus* species digging two holes, similar to those by nesting marine turtles.

**Keywords:** Amphibians, Ranidae, *Philautus*, Breeding behavior, Conservation, Sri Lanka.

### INTRODUCTION

There are 103 species of amphibians in Sri Lanka and 87 of them are endemic (De Silva, 1996; Dutta and Manamendra-Arachchi, 1996; Manamendra-Arachchi and Pethiyagoda, 1998, 2001a, 2001b, 2005; Meegaskumbura and Manamendra-Arachchi, 2005; Pethiyagoda and Manamendra-Arachchi, 1998; Pethiyagoda et al., 2006).

These 103 species are presented by amphibians of 4 families: Bufonidae, Microhylidae, Ranidae (Raninae and Rhacophorinae), and Ichthyophidae. There are 66 species of Rhacophorinae subfamily distributed in Sri Lanka, 65 of them are endemic to the island (Dutta and Manamendra-Arachchi, 1996; Manamendra-Arachchi and Pethiyagoda, 1998, 2001a, 2001b, 2005; Meegaskumbura and Manamendra-Arachchi, 2005; Pethiyagoda et al., 2006). Subfamily Rhacophorinae is presented by two genera *Philautus* and *Polypedates*. The genus *Philautus* is one of the most common shrub frog genera only distributed in Asia (Pough et al., 2004). There are 61 species that belong to genus *Philautus* in Sri Lanka and all of them are endemic, while 17 are extinct (Manamendra-Arachchi and Pethiyagoda, 2005). According to the literature data “Polonnaruwa shrub frog” *Philautus regius* (Fig. 1) is presently known only from a few specimens from dry, shrubby habitats near rice fields around

Polonnaruwa, in the north central dry zone (Fig. 4) Globally conservation status of this species is Data Deficient (Pethiyagoda et al., 2006). This species is endemic to Sri Lanka, limited to a few localities in the dry zone (Fig. 4).

Since *Philautus regius* (as well as other rare and endemic *Philautus* species.) is a rare endemic with inadequate information on its natural history, documenting their breeding behaviors, breeding conditions etc. are very important in planning out conservation programs for these unique amphibians. Bahir et al. (2005) has bred several *Philautus* species under captive conditions in glass tanks and recorded their breeding behavior. However, only a few observations were recorded in the nature. The current observation is the first one where the breeding of *Philautus regius* has been documented in the wild.

The present observations were made in a *Swietenia mahogoni* (Meliaceae) nursery, which maintained by villagers at a forest edge that located in near Nilgala forest (altitude 218 m) in Monaragala district in Uva province of Sri Lanka. The study area is located between 7°12' N and 81°16' E, approximately 10.5 km away from Bibile town.

### MATERIAL AND METHODS

The observations were made by the naked eye, 1 m away from the frog from 19:00 to 01:30. No disturbance was made to the animal during the time of observation. All measurements were taken to the nearest 0.1 mm with

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**Fig. 1.** *Philautus regius*. *a*, Mature male (lateral view), Nilgala forest in Sri Lanka (not collected); *b*, *regius*. Mature female (dorsal view), Nilgala forest in Sri Lanka (not collected).



**Fig. 2.** The plastic bags where the plants have been grown in the nursery.

dial calipers and to the nearest 01 mm with measuring tapes after observing. After taking all the measurements frogs were released. After taking out all the eggs they were measured. After that all the eggs were kept the same place. Headlights were used at night (red color light).

## HABITAT

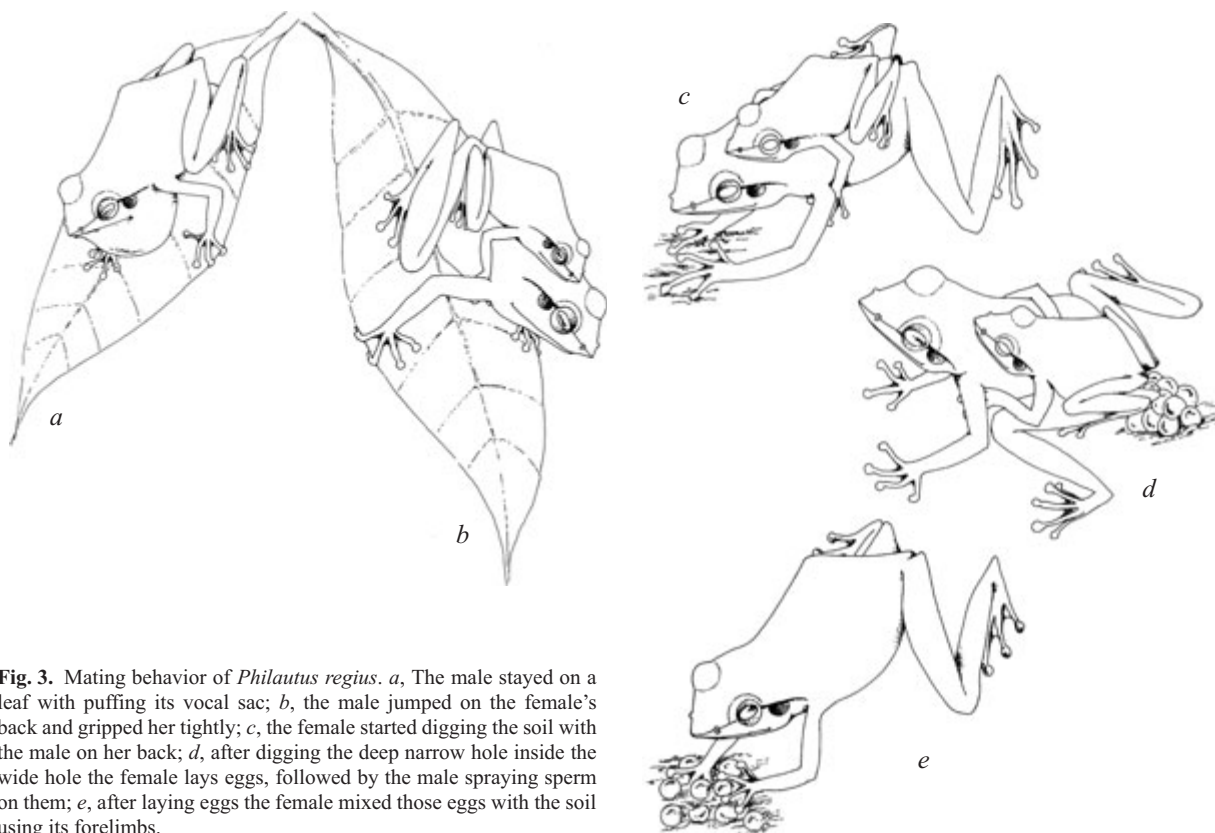
According to the Gunatilleke and Gunatilleke (1990) the major vegetation type in this area is lowland

tropical dry mixed evergreen forest. The mean annual rainfall varies between 1500 to 2000 mm (mainly during Northern east monsoon), while the mean annual temperature of the area varies between 26°C to 29°C. The amount of leaf litter on the ground is low and it is dry. The canopy cover is about 35% (in side the nursery, the canopy cover is about 90%) and the undergrowth also was very poor. The soil is rough, hard and it contains reddish brown earth. The dominant tree species are *Phyllanthus acidus* (Euphorbiaceae), *Cocos nucifera* (Palmae), *Swietenia mahagoni*, and some ornamental home garden trees.

## OBSERVATION ON BREEDING BEHAVIOR

An adult male *Philautus regius* (snout to vent length 19 mm) was observed on January 7, 2006, at about 19:00 while it was lying on a leaf (Fig. 3a) about 1120 mm above ground level of *Swietenia mahagoni* plant (height 200 mm, D.B.H. 64 mm). The temperature and the humidity of that time were 27°C and 59%, respectively. The weather was cold and the moon was half-risen. The frog was calling by puffing its vocal sac and releasing a sharp call (Fig. 3a). After calling for about 30 min, an adult female *Philautus regius* (snout to vent length 27 mm) came to the base of *Swietenia mahagoni* plant where the male was waiting. Then the female climbed up the plant and reached to the male. Then it stayed on a leaf (length 47.2 mm, width 24.4 mm) that was hanging down. Then the male also moved to that leaf. At once the male jumped to the female's back and using its mouth caught and gripped her tightly (Fig. 3b).

After catching the female for about 10 min they waited on the leaf for about another 10 min. At once the female jumped over with the male on her back to another



**Fig. 3.** Mating behavior of *Philautus regius*. *a*, The male stayed on a leaf with puffing its vocal sac; *b*, the male jumped on the female's back and gripped her tightly; *c*, the female started digging the soil with the male on her back; *d*, after digging the deep narrow hole inside the wide hole the female lays eggs, followed by the male spraying sperm on them; *e*, after laying eggs the female mixed those eggs with the soil using its forelimbs.

leaf of another plant (height 108 mm) that was 450 mm away from the first tree. Without waiting on that tree it jumped over to another plant (height 580 mm) that was 280 mm away from the second plant. On that time the female sprayed a liquid from its cloacae. After that it got down from the plant with the male keeping long steps slowly. After about 5 min it came in to a plastic bag where the plant has been grown. These plastic bags were cylindrical (height 8 cm, diameter 12 cm) (Fig. 2). It stayed in the bag for a while and went to another bag. Likewise it went in to four bags to check the conditions of the soil and the litter, with the male. After searching 20 min it came again to the first bag that contained 20 mm thick leaf litter. Next it started digging the soil in the bag, using its forelimbs (Fig. 3c). In this way it dug a wide hole for about one hour continuously.

After digging the wide hole it turned around clockwise inside the hole and pressed the soil using its lower jaw. The diameter of the hole was 37.8 mm and the depth is 5.1 mm. Secondly it started digging another deep narrow hole inside the above-mentioned wide hole. It dug the hole slantwise to an angle of about 25°. It did

this for about 1.5 h. The diameter of the hole was 18.6 mm and the depth is 13.5 mm.

Afterwards it started laying eggs in to that narrow hole. It laid 17 eggs. It took about one hour to lay eggs, while the male sprayed sperm on them (Fig. 3d). All those eggs were spherical shaped pure white eggs. The mean diameter of 17 eggs is 3.1 mm. After egg laying the male, which was on the back of female, came out from the hole. Then it removed the soil off its body using its forelimbs and climbed up about 1.5 m of the plant, which was in the bag.

Finally the female mixed those eggs with the soil using its forelimbs and pressed them using its lower jaw (Fig. 3e). With the help of its forelimbs it started to drag soft soil first. After pressing soft soil it dragged soft litter that contained dried *Phyllanthus acidus* leaves. Then it dragged rough litter that contained dry *Swietenia mahagoni* leaves. Somehow it took for about 45 min for it to conceal the nest site, in this manner. Next it come out from the litter and removed the soil from its body using its forelimbs. Then it started to walk but, did not jump or climb up to a plant. While it was walking about 50 cm

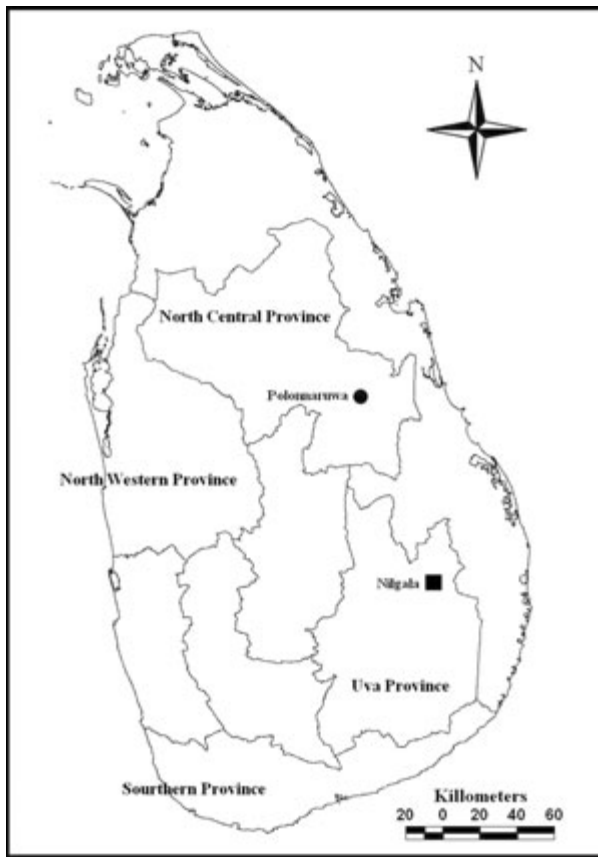


Fig. 4. Modern distribution patterns of *Philautus regius*: ■, new location is Nilgala forest; ●, type locality “Angammadilla, Polonnaruwa in Sri Lanka”.

we caught it to obtain measurements, and released it to its original habitat.

The digging behavior of *P. regius* shows a difference to the digging behavior of other *Philautus* species. The main difference being that, after digging the wide hole (as some other *Philautus* species do) it started digging another deep narrow hole inside the above mentioned wide hole. According to our observation this is the first record of a *Philautus* species dig two holes, similar to ones dug by nesting marine turtles. This observation also complements the breeding methods documented by Bahir et al. (2005).

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