

## A NEW LOCALITY FOR THE THORNY BUSH FROG, *THELODERMA HORRIDUM* BOULENGER (AMPHIBIA: ANURA: RHACOPHORIDAE) IN SINGAPORE

Alex Figueroa<sup>1\*</sup> and Prarthini M. Selveindran<sup>2</sup>

<sup>1</sup>Department of Biological Sciences, University of New Orleans,  
2000 Lakeshore Drive, New Orleans, Louisiana 70148, USA

<sup>2</sup>Department of Biological Sciences, National University of Singapore,  
14 Science Drive 4, Singapore 117576, Republic of Singapore

(\*Corresponding author: [afigueroa21@gmail.com](mailto:afigueroa21@gmail.com))

### INTRODUCTION

*Theلودerma* is a genus of rhacophorid frogs characterised by tuberculate skin, a distinct tympanum, and Y-shaped terminal phalanges. They lay eggs in water-filled cavities, and are distributed from Sri Lanka and northeastern India to Myanmar, southern China, Indochina, Malaysia, Singapore, Sumatra, and Borneo (Inger, 1995; Leong et al., 1996; McLeod & Norhayati, 2007; Bain et al., 2009).

The thorny bush frog, *Theلودerma horridum* Boulenger, was recorded from Singapore for the first time in 1996 in Taban Valley in the Bukit Timah Nature Reserve (Leong et al., 1996). The species is distributed from southern Peninsular Thailand, West Malaysia, Singapore, the Mentawai Islands, and northern Borneo (Boulenger, 1903; Dring, 1979; Smith, 1976; Inger, 1995; Leong et al., 1996). Within Singapore, *Theلودerma horridum* is believed to be “restricted to a few areas and rare” (Baker & Lim, 2008: 159), and regarded as being critically endangered (Lim & Leong, 2008), although it is not currently protected. Until now, all records of this species have only been from Taban Valley in the Bukit Timah Nature Reserve, and it was believed to be locally restricted to this small patch of primary dryland rainforest.

Herein, we report on the first observation of *Theلودerma horridum* outside of Taban Valley and the Bukit Timah Nature Reserve. The latest record is from the Nee Soon Swamp Forest (NSSF), a small patch of primary freshwater swamp forest within the adjacent Central Catchment Nature Reserve, another area of major biodiversity significance in Singapore (Ng & Lim, 1992; Ng et al., 2011).

### RECORDS AND OBSERVATIONS

The first *Theلودerma horridum* specimen collected in Singapore was on 18 Mar.1996, 1.2 m up the trunk of a large tree along a forest trail during the day in Taban Valley of the Bukit Timah Nature Reserve. The individual measured 23.4 mm in snout-vent length and was believed to be a juvenile, and is currently preserved in the Zoological Reference Collection (ZRC) of the Raffles Museum of Biodiversity Research (RMBR) at the National University of Singapore, under the catalogue number ZRC 1.3278 (Leong et al., 1996).

On 16 Aug.1996, between 2000–2030 hours, an individual was observed by L. C. Tan and T. S. Tan climbing up a tree trunk approximately 1 m from the ground also at Taban Valley (Leong et al., 1996).

In total, six individuals were observed in Taban Valley between Mar.1996 and Jul.1997. All of the frogs were found at approximately 1–2 m above the ground, clinging to tree trunks where they were “superbly camouflaged against lichen-covered bark”. *Theلودerma horridum* is believed to spend the majority of its time hidden in the forest canopy during the day, descending to the understorey at night to hunt (Teo & Rajathurai, 1997). A photograph of a *Theلودerma horridum* by K. L. Lee from one of the six sightings appears in Baker & Lim (2008: 61).

On 29 Jan.2009, at 1150 hours, another individual of about 2.5 cm snout-vent length was found by L. Leong at Taban Valley. The frog was found crouching on a green leaf in the forest’s understorey, and was initially mistaken for a lump of bird droppings. This specimen was photographed, and its identification confirmed by Kelvin K. P. Lim (pers. comm.). We have not sought permission to publish this photograph.

On 20 Jul.2011, at 2139 hours, we encountered an adult of about 4 cm snout-vent length at approximately 1.7 m up on the trunk of a large tree along the pipeline trail, in the southern part of the Nee Soon Swamp-forest (Figs. 1, 2). The tree



Fig. 1. Dorsal view of *Theلودerma horridum*; snout-vent length ca. 4 cm. Photograph taken at the Nee Soon Swamp Forest on the evening of 20 Jul.2011. (Photograph by: Alex Figueroa).



Fig. 2. Dorso-lateral view; snout-vent length ca. 4 cm. Photograph taken at the Nee Soon Swamp Forest on the evening of 20 Jul.2011. (Photograph by: Alex Figueroa).

was in an exposed position on the side of the trail right next to a patch of marshy ground. Upon observation, the individual remained in the same position and made no attempts to move.

## DISCUSSION

The breeding habits and larvae of *Theلودerma horridum* have not been observed in Singapore, but an account can be found in the original description of the species by Boulenger (1903; as *Ixalus horridus*) based on specimens and field observations from Bukit Besar in Pattani, peninsular Thailand (see also: Leong & Chou, 1999; Manthey & Grossmann, 1997). The frog lays its eggs in a frothy nest approximately 0.5 m above small bodies of water collected in tree holes or in cavities between tree root buttresses. The tadpoles range from 15–50 mm in total length, and are dark brown to blackish with distinct whitish lines marking the sensory organs. Their head and body are strongly depressed, slightly longer than broad, almost circular when viewed from above. The eyes are located on the dorsum and the vent or anal tube is dextral. The lips are fringed with papillae on the sides of the lower edge, and there is an infra-marginal row of papillae on the lower lip.

The cinnamon bush frog, *Nyctixalus pictus*, occurs sympatrically with *Theلودerma horridum* in the Bukit Timah Nature Reserve. *Nyctixalus pictus* is also a phytotelm breeder, and its tadpoles seem to resemble those of *Theلودerma horridum* in being dark-coloured, with depressed head and body, and dorsally-placed eyes. It can be distinguished by its median vent/anal tube, and the arrangement of papillae on the lips. The papillae are in staggered double rows across the lower lip, and concentrated at the corners of the upper lip (Leong & Chou, 1999).

The knowledge that *Theلودerma horridum* is not confined to one small area in the Bukit Timah Nature Reserve brings a slight relief to the long-term survival of the species in Singapore. The new observation suggests that this amphibian is not specific to a certain forest type, and that it may not be as rare as it seems. Grismer (2011) observed that *Theلودerma horridum* is “found only in primary and old secondary forests”, and that “individuals are most active at night following rain showers” where they “are usually found from 1–3 m above the ground on the trunks of large trees”.

Until more individuals are located and the behaviour and ecology of this species become better understood, it is probably best to maintain the present local status of *Theلودerma horridum* as critically endangered (see Lim & Leong, 2008). Because of its cryptic colouration, and the assumption that it probably spends most of its time high in the forest canopy (Teo & Rajathurai, 1997), *Theلودerma horridum* is obviously a difficult species to observe as attested by its disjunct distribution and recent discoveries in Borneo (Inger, 1995) and Singapore (Leong et al., 1996). The call of *Theلودerma horridum* has been described as “low grunts or croaks, uttered singly at intervals” (Boulenger, 1903: 140), and can aid in future detections of the species.

## CONCLUSION

The present discovery of the thorny bush frog, *Theلودerma horridum* in the Nee Soon Swamp Forest confirms that this species, considered to be critically endangered within Singapore, is not locally confined to the Bukit Timah Nature Reserve. This is a small but significant contribution to our ever-growing knowledge of Singapore’s amphibian fauna.

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