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**Short Note**

# A New Record of the Enigmatic Bornean Earless Monitor Lizard (*Lanthanotus borneensis*) from Brunei Darussalam with Notes on their Retreat Sites

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The Bornean Earless Monitor Lizard (*Lanthanotus borneensis*) is the only known representative of the lizard family Lanthanotidae (Rieppel, 1980). This rare Bornean endemic has only been found, so far, in the coastal lowlands of Sarawak, North Kalimantan and West Kalimantan (Yaap et al., 2012; Vergner, 2013; Langner, 2017; Leah et al., 2023). Owing to its restricted range and presumed low population sizes (Proud, 1978; Das & Yakoob, 2007; Yaap et al., 2012; Verger, 2013), the Earless Monitor Lizard is currently classified as Endangered in the IUCN Red List (Das & Auliya, 2021). It is rare to find the Earless Monitor Lizard even in its known range due to its nocturnal and semi-aquatic nature, as well as its secretive habits (Rehak et al., 2019; Leah et al., 2025). *Lanthanotus borneensis* is increasingly in danger of impending threats from overcollection for the pet trade, habitat loss, and climate warming. Therefore, gathering data on its ecology and understanding its response to these threats are paramount to prevent further population reductions. Here we document the northernmost record of the Bornean Earless Monitor Lizard, *Lanthanotus borneensis*. The specimen was found 185 km northeast of the nearest record (Niah Caves, Sarawak) and it is the first record of its occurrence in Brunei Darussalam (Fig. 1).

During a heavy thunderstorm on the evening of 5 December 2022 in search of reptiles, the first author discovered the Earless Monitor Lizard (Fig. 2) along a torrential stream in a primary forest in Ulu Temburong (Fig. 3). The monitor was fully exposed, above ground approximately five meters from a torrential rocky stream. The individual had a body size of 16.11 cm (snout-vent length) and a tail length of 18.55 cm. Head width at its widest was 1.53 cm. Gape width was 1.26 cm. Total body length of 34.66 cm is within the range of wild caught individuals from Sarawak. We temporarily removed the individual and placed it in an aquarium filled with 15 cm of water and rocks from the adjacent streambed. The monitor was observed to wedge itself under rocks with just the nostrils and eyes above water. It remained in this position for several hours. Subsequent early evening visits to the site in 2024 revealed three individuals sitting in separate retreat sites between cracks along the rocky banks of the stream. Attempts to capture the individuals failed as they retreated further into the fissures between the weathered sandstone rock bed.

Water quality measurements of the nearby rocky stream were taken with a water quality meter (YSI 556 MPS) at five independent locations 100–200 m apart along the stream. Average salinity was 0.0584 mS/cmc, average dissolved oxygen 11.162 mg/L, and average pH was 6.05.

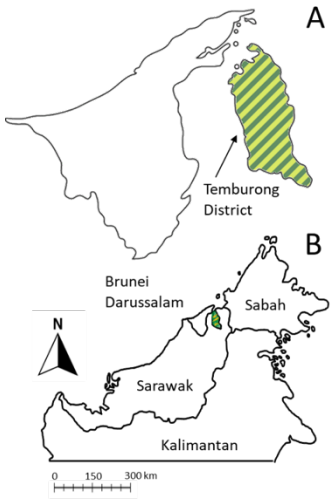


**Figure 1:** New location record of the Bornean Earless Monitor Lizard (*Lanthanotus borneensis*). **A.** Location of Temburong District within Brunei Darussalam. **B.** Location of Brunei Darussalam on the northern coast of the Island of Borneo.

**Figure 2:** The Bornean Earless Monitor Lizard (*Lanthanotus borneensis*) found in Brunei Darussalam above ground during a torrential downpour. Note the dorsal longitudinal rows of strongly keeled scales.

**Figure 3:** Section of the rocky stream at which the Bornean Earless Monitor Lizards (*Lanthanotus borneensis*) were found.

To record water and air temperatures, self-contained and self-powered temperature loggers (Maxim Integrated iButtons) were placed inside the stream and 1–2 m away from the stream on the ground within the leaf litter, as well as within the three known retreat sites. Temperatures over a period of two weeks in April and May 2024 ranged between 25.5–26.5 °C and 25.5–29.5 °C in water and air, respectively. Retreat site temperatures measured over a period of two weeks in August and November 2024 ranged between 26.5–27.8 °C (retreat site 1), 25.1–27.0 °C (retreat site 2), and 25.5–29.1 °C (retreat site 3), indicating very stable temperature regimes in the retreat sites with maximum daily fluctuations of a mere 1.3 °C for site 1.

Measures of canopy cover (DSLR Nikon with fish-eye lens) at the three retreat sites were between 92–94% reflecting the forested nature of the stream. Furthermore, stream slope at the three retreat sites was measured using a 10 m long transparent water hose and a tape measure following LaPierre & Martin (1986). Stream slope varied between 11.4° (site 1), 15.5° (site 3) and 19.5° (site 2) indicating that the retreat sites were within stream sections of moderate to high stream velocity. *L. borneensis* is known to inhabit moist, shaded forest environments with dense vegetation and canopy cover (Langner, 2017; Leah et al., 2023, 2025). While water chemistry parameters such as pH were measured in this study, there is currently no direct evidence that *L. borneensis* displays a preference for acidic water conditions. Instead, factors such as microhabitat structure, microclimatic stability, and prey availability are likely to be more critical to its habitat selection.

Our understanding of the species-specific physiological tolerances is limited. However, it is remarkable that the retreat sites showed very stable temperature regimes suggesting that retreat sites might be chosen by the lizards to regulate body temperatures. Indeed, Leah et al. (2023) found that radio-tagged individuals of *L. borneensis* in the Kapit region of central Sarawak maintain a narrow range of body temperatures (22.8–28.0°C) suggesting that this species is a thermal specialist, by seeking out suitable thermally-stable microhabitats as documented for other herpetofauna (e.g. Spranger et al., 2024). Furthermore, Leah et al. (2023) documented individuals in six microhabitat types: rocks underwater, rocks on dry streambank, within fissures of exposed bedrock, underground in loose soil, under fallen logs and in isolated, shallow water pools. We only found individuals on open ground (n=1) and within rock fissures (n=3) reflecting our limited ability to detect the lizards in other known microhabitats.

Bornean Earless Monitor Lizards are known to be relatively sedentary, remaining within refugia for up to eight days (Leah et al., 2023), a behaviour also seen in captive individuals bred in zoos (Weisenbacher & Velensky, 2018; Rehak et al., 2019; Grafe pers. observations). *L. borneensis* faces threats from overcollection for the pet trade and habitat loss, which are significant drivers of its declining wild populations. Although pressures from the pet trade are declining thanks to the successful *ex situ* breeding programmes of zoos worldwide (e.g. Schönbrunn Zoo, Vienna), the threats from collectors persist (Rehak et al., 2019). For this reason, further details of the site and microhabitat used by *Lanthanotus* in Brunei are not reported here.

The Earless Monitor Lizard is protected under CITES Appendix II and efforts are underway to protect its habitat in Brunei. The Brunei population may be disjunct from other populations as there have been no records from Niah, the nearest record to Brunei, for the past 30 years (Das & Auliya, 2021). Despite being protected across its range in Brunei, Indonesia, and Malaysia, individuals continue to be smuggled out of Borneo (Stoner & Nijman 2015) and this fact has led to a recent proposal by the US Fish and Wildlife Service to list *L. borneensis* as threatened under the US Endangered Species Act to improve international protection (Rahman, 2025).

Our discovery highlights the value of continuous efforts in biodiversity research and conservation across the region. The management implications for the endangered Bornean Earless Monitor Lizard involve stringent habitat protection, enhanced regulation and enforcement of the international pet trade, as well as targeted field research to identify the habitat preferences and habitat suitability of streams in the region. These actions are necessary to address the main threats of habitat loss and illegal collection. Thankfully, the Bornean Earless Monitor Lizard is already totally protected by the 1984 Brunei Wildlife Act due to past anticipatory conservation efforts of the Brunei government.

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## DECLARATIONS

**Research permit(s).** Research permit was issued under the number: (UBD/AVC-R1/1.21.1[a]/2024/004).
**Ethical approval/statement**. Ethical approval was issued under the number: (UBD/AVC-R1/1.21.1[a]/2024/004).
**Generative AI use.** We declare that generative AI was not used in this study nor in the writing of this article.

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