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First Photographic and Video Record of an Asian Black-Spined Toad (*Duttaphrynus* cf. *melanostictus*) Preying upon an Earthworm in Thailand

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The Asian black-spined toad *Duttaphrynus melanostictus* (formerly *Bufo melanostictus*), also referred to as the Asian common toad, is widely distributed in South and Southeast Asia (Wogan *et al*., 2016; Reilly *et al*., 2017; Othman *et al*., 2020; Jablonski *et al*., 2022). Genetic analyses have indicated this toad is a species complex comprising multiple distinct evolutionary clades (Wogan *et al*., 2016; Othman *et al*., 2020; Jablonski *et al*., 2022) with the most recent analysis showing that *D. melanostictus* comprises two distinct species (Dufresnes *et al*., 2025). The first species, "true" *D. melanostictus*, is distributed in the Indian subcontinent and is invasive in Wallacea. The second species, which has an unsettled nomenclature, diverged from *D. melanostictus* ~7 Mya and diversified across Southeast Asia, and is invasive in Madagascar (Dufresnes *et al*., 2025). These two species have been respectively identified as *D. melanostictus* sensu stricto (western) and *D.* cf. *melanostictus* (eastern) (Dufresnes *et al*., 2025).

The diet of the *D. melanostictus* group has been investigated in numerous countries throughout its range although published studies from Thailand are uncommon (Table 1). *D. melanostictus* is considered a generalist invertebrate feeder consuming prey such as annelids, arachnids, crustaceans, chilopods, diplopods, and insects (see papers listed in Table 1). There is one record of consumption of vertebrate prey (a blindsnake: O'Shea *et al*., 2013). Most diet studies have been based on analysis of gut contents (Table 1) with only two studies providing photographic records of predation. O'Shea *et al*. (2013) photographed a blindsnake exiting alive headfirst from the cloaca of a *D. melanostictus* in Timor-Leste but dying 7.5 h later. Hawkeswood & Sommung (2017) provided a photograph of a *D. melanostictus* that entered a house in Thailand to feed on insects attracted to lights, although the photograph does not show actual predation. Published video records of predation from any location are apparently absent. We provide photographic and video documentation from a field observation in Thailand.

On the night of 14 November 2025, we searched the grounds of Baan Maka Nature Lodge (Phetchaburi Province, Central Thailand) for herpetofauna using torchlights. At 2029:40 h, we observed an adult *D.* cf. *melanostictus* (approximately 10 cm snout-vent length; taxonomy as per Dufresnes *et al*., 2025) with a live earthworm protruding from the left side of its mouth (Fig. 1). Approximately one-third of the earthworm was already inside the toad at this time. The exterior portion of the earthworm would occasionally wriggle, sometimes touching the left side of the toad's head. In response to such movement, the toad would swipe at the outer side of the earthworm with its left forelimb. The toad ingested the earthworm by

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Table 1. Published studies of the diet of *Duttaphrynus melanostictus*, formerly *Bufo melanostictus*. * Earthworm (order Haplotaxida) included in prey items.

Country	Methodology	Reference
India	Gut contents	CHANDA, 1993; BAHUGUNA *ET AL.*, 2019*
Indonesia	Gut contents	WATI & HIDAYAT, 2014
Malaysia	Gut contents, rectum contents	BERRY & BULLOCK, 1962*
Nepal	Gut contents	SAPKOTA *ET AL.*, 2022*
Singapore	Gut contents, rectum contents	BERRY & BULLOCK, 1962*
Sri Lanka	Gut contents	SARATHCHANDRA *ET AL.*, 2020
Taiwan	Gut contents	NORVAL *ET AL.*, 2014*
Thailand	Direct observation, fecal pellet analysis	HAWKESWOOD & SOMMUNG, 2017; THONGPROH *ET AL.*, 2019
Timor-Leste	Gut contents, direct observation	O'SHEA *ET AL.*, 2013; DÖRING *ET AL.*, 2017

keeping its hands and feet stationary on the ground but lunging forward with its body to take in small sections of the earthworm at a time. Videos of the predation event are provided in the Supplementary Material. The toad completed ingestion of the earthworm at 2031:05 h (85 sec after our first observation). We observed another three adult *D.* cf. *melanostictus* (two males, one female) in the same general area on the same night between 1905 to 2035 h, but none were seen feeding.

The feeding behaviour we observed was likely in response to the large size of the earthworm prey. Firstly, the movement of the toad's forelimb to swipe the earthworm may be an example of "wiping", a behaviour widespread among anuran species where the hand or forelimb is used to orient prey protruding from the side of the mouth toward the midline for ease of consumption (GRAY *ET AL.*, 1997). In our observations, the toad's left forelimb always came in contact with the outer side of the earthworm, pushing the earthworm toward the toad's head. Secondly, when feeding on small prey, anurans use tongue protraction for capture and swallowing but switch to using head movement and jaw prehension when dealing with larger prey (ANDERSON, 1993; NISHIKAWA & SCHWENK, 2001; HERREL *ET AL.*, 2019). The forward lunges of the toad to incrementally swallow the earthworm one small section at a time allowed the toad to handle and swallow this elongate prey item using its jaws. Some anurans also use the back of the hand to push large prey into the mouth, a behaviour referred to as "scooping" (GRAY *ET AL.*, 1997). However, we did not observe this behaviour. Consistent with this, GRAY *ET AL.* (1997) reported scooping behaviour to be absent in a number of bufonid species, including *B. melanostictus*.

Earthworms (subclass Oligochaeta, order Haplotaxida) are a known part of the diet of *D. melanostictus* but are rarely reported. Only four of the 11 dietary studies listed in Table 1 mention such predation, with earthworms constituting <3% of prey diet when recorded. Unidentified Haplotaxida were listed in the toad's diet in Taiwan (NORVAL *ET AL.*, 2014; 0.06% of total prey) and India (BAHUGUNA *ET AL.*, 2019; 2.8% of total prey). Earthworms were specifically identified as prey items in Singapore and Malaysia (BERRY & BULLOCK, 1962) although presumably in very low frequency because unlike other prey taxa reported in that paper, the percent of diet constituted by earthworms was not quantified. SAPKOTA *ET AL.* (2022) reported earthworms as 0.68% of prey consumed in Nepal. However, inferring the relative contribution of prey based on gut contents or fecal samples is problematic for anurans because digestion can occur rapidly. For example, Braun's dwarf frog *Physalaemus*

Figure 1. Adult Asian black-spined toad (*Duttaphrynus* cf. *melanostictus*) consuming an earthworm at Baan Maka Nature Lodge (Phetchaburi Province, Central Thailand) on 14 November 2025. Photograph by M. R. Crossland and S. F. Chan.

lisei showed no trace of earthworms in the stomach 4 h after ingestion whereas beetle elytra were still detected 12 h post-ingestion (Solé & Rödder, 2009). Thus, anuran diet studies based on gut and/or fecal analyses are prone to underestimate the proportion of soft tissue prey such as earthworms. Additionally, for earthworms there is likely to be significant temporal variation in ingestion rates at any given location based on ground surface moisture. On nights following or during rainfall, ground-dwelling anurans such as toads are more likely to encounter and consume earthworms that are more active at such times. Direct observations of predation on any prey taxa are also fortuitous given that the toad we observed consumed about two-thirds of the large earthworm in 85 s. Ultimately, predation rates on earthworms by large ground-dwelling anurans are likely higher than currently recognised, but accurately quantifying such predation remains a challenge.

As far as we are aware, our observation is the first photographic and video record of predation by *D.* cf. *melanostictus* on any prey taxa in Thailand, and the first photographic and video record of predation by the *D. melanostictus* species group on an earthworm throughout the toad's distribution.

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Supplementary Material:

Video footage of the Asian black-spined toad (*Duttaphrynus* cf. *melanostictus*) consuming an earthworm is available on figshare (https:doi.org/10.6084/m9.figshare.31419035). Videos by M. R. Crossland and S. F. Chan.