

Short Communication

Rediscovery of the Critically Endangered giant land snail *Bertia cambojiensis* (Reeve, 1860) in Cambodia

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Paper submitted 12 October 2019, revised manuscript accepted 9 December 2019.

The phylum Mollusca contains the second highest number of species after the phylum Arthropoda. Land snails belong to the most diverse class (Gastropoda) in the phylum which comprises three main groups: shell-snails, shell-less slugs, and intermediate semi-slugs (Schilthuisen, 2017). Land snails are shelled snails which require calcium carbonate (CaCO₃) for growth and production of egg shells (Mand *et al.*, 2000; Uchidal *et al.*, 2013). Dyakiidae comprise large and medium-sized land snails belonging to 12 genera, including three that are sinistral. One of these, *Bertia* Ancey, 1887, is endemic to eastern Indochina and has three recognized species (Thach, 2015; Sutcharit *et al.*, 2019). *Bertia* was initially described as a monotypic genus based on *Helix cambojiensis* Reeve, 1860 due to its very large and sinistral, helicoid shell (Sutcharit *et al.*, 2019). This has the largest diameter of any land snail shell in Southeast Asia (Schileyko, 2016).

Once thought to be extinct, the giant land snail *B. cambojiensis* is currently listed as Critically Endangered (Naggs, 2014) and has hitherto only been recorded in the present-day territory of Southern Vietnam (Naggs, 2014; Schileyko, 2011; Sutcharit *et al.*, 2019) (Fig. 1). As high-levels of deforestation are occurring in the region (Warren-Thomas *et al.*, 2018), further information is required to improve understanding of its population

status and enable monitoring and conservation actions. We document the first records of *B. cambojiensis* in Cambodia and describe the morphology of individuals encountered relative to descriptions provided by Schileyko (2011).

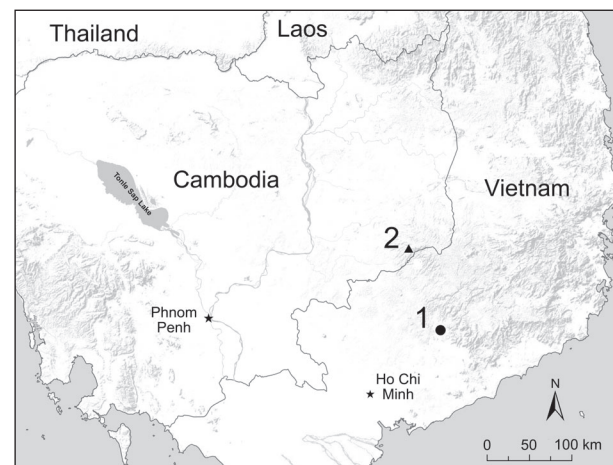


Fig. 1 Records for *B. cambojiensis* in Southeast Asia: 1) Cat Tien National Park (Sutcharit *et al.*, 2019), 2) Keo Siema Wildlife Sanctuary (this study).

CITATION: Hun S., Samorn V., Ith S. & Chan B. (2019) Rediscovery of the Critically Endangered giant land snail *Bertia cambojiensis* (Reeve, 1860) in Cambodia. *Cambodian Journal of Natural History*, 2019, 128–130.

In November 2018, four live individuals and a 14 empty shells of *B. cambojiensis* were encountered in O'Reang District, Mondulkiri Province (12°18'N, 107°05'E) (Fig. 1). This area forms part of the Keo Seima Wildlife Sanctuary (KSWs) which was declared in 2016 and is managed by the Cambodian Ministry of Environment (Evans & Delattre, 2005; WCS, 2016). Keo Seima Wildlife Sanctuary supports a rich biodiversity, including 34 globally threatened vertebrate species and at least five primate species (Pollard *et al.*, 2008). The climate of the area is tropical monsoonal with a dry season from November to April and a wet season from May to October (WCS, 2016). Total annual rainfall varies between 2,200–2,800 mm, >85% of which occurs during the wet season (WCS, 2016). Hundreds of seasonal grassy wetlands and natural ponds occur within the sanctuary, as do two tributaries which drain into Dong Nai River in Southern Vietnam.

Following sightings, live snails were kept in suitable habitats to encourage them to emerge from their shells for photography. Specimens of live individuals and empty shells were preserved and later deposited in the Zoological Collection of the Centre for Biodiversity Conserva-

tion at the Royal University of Phnom Penh, Cambodia. Morphological characters were measured using a digital calliper.

***Bertia cambojiensis* (Reeve, 1860)**

Diagnosis: The species is characterised by a sinistral, helicoid shell which has a black and red-brown base encircled by a broad white band. A narrow dark brown stripe with a helical shape is present along the suture edge of body whorl and broadens close to the lip (Fig. 2).

Description: Sinistral helicoid shell, width greater than height. Shell height ranges from 49.9–56.6 mm and shell width from 80.5–85.1 mm ($n=16$). Aperture relatively smaller than *B. setzeri*, deep spiral umbilicus, cone shape spire with blunt protoconch. Live animals have a light orange foot and dark brown eyes.

Habitat: *B. cambojiensis* was observed in evergreen forest in KSWs. During our survey in the early dry season of November, live snails were sighted on the dry ground in leaf litter ≤ 20 metres from a stream with water. Others were found in shade under logs and fallen trees. Shells were also found in forest away from the stream.



Fig. 2 Views of *B. cambojiensis* specimen collected in the Keo Seima Wildlife Sanctuary, eastern Cambodia.

Remarks: The geographical range of *B. cambojiensis* is poorly known and despite its presumed occurrence in Cambodia, the species was hitherto recorded only from a small area in Southern Vietnam (Naggs, 2014; Sutcharit *et al.*, 2019) (Fig. 1). As *B. cambojiensis* is Critically Endangered, our confirmation of its occurrence in a protected area in eastern Cambodia is welcome news for conservation management. However, habitat loss likely presents a threat to the species. Further, as we observed many empty shells of *B. cambojiensis* outside houses in KSWs that were evidently discarded after cooking, harvesting for local consumption may also present a serious threat. Further surveys are consequently recommended to improve understanding of the distribution, ecology, and conservation status of the species in Cambodia.

Acknowledgements

We are grateful to Fauna & Flora International and the Centre for Biodiversity Conservation for providing financial support for this study. We thank Hoang Duc Huy and Nguyen Ngoc Thach for providing helpful information and Nuon Sithun for his assistance in producing a map for this paper.

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