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## ***Macrobothriotaenia ficta* (Cestoda: Proteocephalidea), a parasite of sunbeam snake (*Xenopeltis unicolor*): example of convergent evolution**

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### **Abstract**

The poorly known proteocephalidean cestode *Macrobothriotaenia ficta* (Meggitt, 1931) from the sunbeam snake *Xenopeltis unicolor* (Ophidia: Xenopeltidae) is redescribed on the basis of re-examination of its type specimens from Burma (Myanmar), and vouchers from Thailand and Vietnam. The peculiar morphology of the scolex, which is formed by four pedunculate lobe-bearing pincer-shaped suckers, is described for the first time using scanning electron microscopy. In scolex morphology, *M. ficta* closely resembles phyllobothriidean cestodes, parasites of elasmobranchs. However, this similarity does not reflect phylogenetic relatedness of these cestodes but instead presents an example of convergent morphological evolution of attachment organs of unrelated groups of cestodes that parasitize different groups of vertebrates. Besides scolex morphology, the genus is characterised by the possession of a very large cirrus-sac, which may reach up to the midline of proglottides, few testes (less than 60), vitelline follicles limited to the dorsal side of proglottides, a large vaginal sphincter, and eggs with a three-layered embryophore covered with rounded projections. Numerous errors in the diagnosis of *M. ficta*, which appeared in the literature as a result of uncritical compilation of data without examination of original material, are corrected. Multilocus phylogenetic analysis of nuclear ribosomal RNA genes *ssr-* and *lsrDNA* and mitochondrial genes *rrnL* and *cox1* place this species among other snake-parasitizing proteocephalideans of the genus *Ophiotaenia*. The convergent evolution of scolex morphology across distantly related taxa is discussed.

**Key words:** morphology, scolex, multilocus phylogenetic analysis, convergent evolution, redescription, Ophidia, Xenopeltidae, South-East Asia

### **Introduction**

The helminth fauna of reptiles frequently includes tapeworms (Cestoda), although these parasitic flatworms are overall less abundant compared to roundworms (Nematoda) and some groups of trematodes (Digenea) (Freze 1965; Sharpilo 1976, 1983; Baker 1984; Schmidt 1986; Pérez-Ponce de León *et al.* 2002). One such cestode group is the Proteocephalidea, with their prevalence and intensity of infection being typically low (see, e.g., Ammann & de Chambrier 2008; Coquille & de Chambrier 2008; Marsella & de Chambrier 2008; de Chambrier *et al.* 2010, 2012; de Chambrier & Gil de Perterra 2012; Gamil 2012; Rambeloson *et al.* 2012).

One of the most enigmatic proteocephalidean taxa is the monotypic genus *Macrobothriotaenia* Freze, 1965. In addition to its rare occurrence, its most striking feature is its tetraphyllidean-style scolex. This peculiar scolex morphology led Freze (1965) to erect this genus to accommodate *Crepidobothrium fictum* Meggitt, 1931 [syn. *Proteocephalus fictus* (Meggitt, 1931) Hughes, Baker & Dawson, 1941].

Since its original, very brief, description by Meggitt (1931), this tapeworm has not been reported in databases such as Web of Science or Zoological Record. This may be because voucher specimens from Thailand and Vietnam were deposited in several helminthological collections (see below) under incorrect names (*Crepidobothrium*