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## Abstracts

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## The Buchonomyiinae (Diptera: Chironomidae) from Cretaceous Burmese amber

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Non-biting midges (Chironomidae) are frequently found in ambers of diverse age and origin: from Cretaceous ambers from Lebanon, Great Britain and Myanmar, through Eocene ambers from India, China, France and undoubtedly the best studied amber of the Baltic region, to various Miocene deposits. Some chironomids found in ambers belong to extant tribes, genera or species groups, being a valuable tool for the assessment of past environmental conditions and analyses of the community structure (Stebner et al. 2017). Both extant and extinct Chironomidae taxa reported from ambers are unique in term of diagnostic characters, their combinations, as well as geographical distribution patterns which allow to understand evolutionary trends in these nematocerans (Giłka et al. 2013, 2016; Zakrzewska and Gilka 2014, Baranov et al. 2017).

Within 12 chironomid subfamilies the Buchonomyiinae Brundin et Sæther, 1978 is one of the smallest, known from 6 species. For nearly 40 years it was monotypic, with the only genus *Buchonomyia* Fittkau, 1955 including 3 extant species recorded from the Palaearctic region (*B. thienemanni* Fittkau, 1955), Myanmar (*B. burmanica* Brundin et Sæther, 1978) and Costa Rica (*B. brundini* Andersen et Sæther, 1995), and the single fossil representative found in Eocene Baltic amber – *B. succinea* Seredusz et Wichard, 2002. Most recently, the subfamily was enriched by another genus, *Furcobuchonomyia* Baranov, Góral et Ross, 2017 and two species: *F. saetheri* Baranov, Góral et Ross, 2017 and *F. pankowskii* Gilka et Zakrzewska, 2017, found in Cretaceous amber from Myanmar.

The most characteristic features of Buchonomyiinae adults are the antennal flagellum with the penultimate flagellomere several times longer than that ultimate, the scale-like setae of the wing, the MCu cross-vein reaching M far before RM and the hypopygium bearing only one pair of volsellae, with the gonostylus split into lobes. While the last character is found in both extant and fossil species, the gonostylus with the dorsal lobe additionally divided into two branches is a character exclusive for the Cretaceous genus *Furcobuchonomyia* (Baranov et al. 2017, Gilka and Zakrzewska 2017).

A unique morphology of the larva of *Buchonomyia thienemanni*, found in a characteristically constructed case most likely built by caddisfly larvae of the Psychomyiidae family, suggests a probable adaptation to ectoparasitism, what is presumed to be an explanation for the rarity of Buchonomyiinae species at present

(Ashe et al. 2015). Interestingly, a substantial number of *Buchonomyiinae* species from Cretaceous Burmese amber remains undescribed (authors' forthcoming data, Figure 1), moreover, preliminary inventories indicate that whole the family is abundant in this resin (Grimaldi et al. 2002). The two *Furcobuchonomyia* species, however, are the only chironomids described from Burmese amber so far.



**Fig. 1.** Adult males of two *Buchonomyiinae* species – inclusions in Cretaceous Burmese amber.

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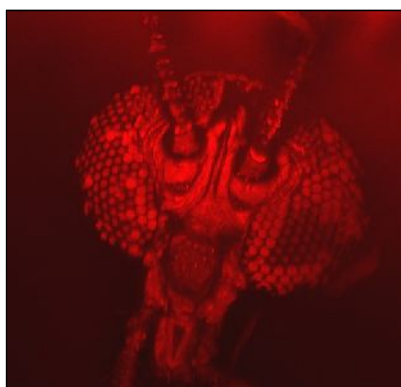
## Revisiting mouthparts development in modern and fossil Chironomidae (Diptera)

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One of the particularly intriguing topics in the deep-time history of the Chironomidae is an evolution of the mouthparts and in particular mandibles. Most of the modern Chironomidae are lacking functional mandibles (save for three genera: *Archeochlus*, *Austrochlus* and *Afrochlus*, native for the Southern Africa and Australia) (Cranston et al. 1987, Cranston and Edward 1998). Previous researchers have found several fossil genera possessing a functional mandibulae in females or both sexes. These genera were scattered throughout the rich geological history of the family from Early Jurassic to Late Cretaceous (Azar et al. 2008, Lukashevich and Przhiboro 2011). Presence of mandibles in Chironomidae was considered to be a plesiomorphic trait, shared with a sister group of Ceratopogonidae (Cranston et al. 1987). Our current researches are, however starting to contradict this notion. Our studies of Chironomidae species complexes from Lebanese (early Cretaceous), Burmese (mid-Cretaceous), Indian, Baltic and Rovno ambers (early to mid-Eocene) amber deposits have revealed high diversity and disparity of “mandibulate” Chironomidae taxa, scattered in the subfamilies Aenninae, Tanypodinae and Podonominae, within both crown and stem clades, possessing the complex functional mandibulae and laciniae.



**Fig. 1.** Head of mandibulate specimen of undescribed Tanypodinae female from Eocene amber. LCSM scan by Dr Tomasz Goral, NHM London.

What's more, we have found functional mandibles in some highly derived Tanypodinae midges, as it confirmed by the geological records and dated phylogeny (Figure 1). A sum of evidence seems to be pointing, towards multiple independent loss and reacquisitions of the mandibles by non-biting midges, in violation of the Dollo's law, via re-evolution of complex, once lost character. Such case was only currently confirmed for the single clade's evolution – the case of loss and re-acquisitions of the mandibular teeth by