



## Redescription of two ghost shrimps (Decapoda: Axiidea: Callianassidae) from the Middle Miocene of the Central Paratethys: systematics, intraspecific variation, and *in situ* preservation

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### Abstract

A redescription of two Middle Miocene burrowing ghost shrimps of the Central Paratethys, *Callianassa brocchii* Lörenthey, 1897 and *Callianassa pseudorakosensis* Lörenthey in Lörenthey & Beurlen, 1929, is provided. Material forming the basis of this study comes from the Studienka Formation (lower 'Sarmatian', Serravallian) of the Slovak part of the Vienna Basin and exhibits preservation allowing reassignment of the studied taxa to the genera *Neocallichirus* Sakai, 1988 and *Eucalliax* Manning & Felder, 1991 respectively. The major cheliped of both species exhibits two distinct morphotypes interpreted herein as possible sexual dimorphism. Several specimens of both taxa are preserved within the tube structures and are interpreted as *in situ* preservation within the burrows. Type material of both studied taxa and additional collections from the roughly coeval strata of Hungary and Austria were also studied.

**Key words:** Ghost shrimp, *Neocallichirus brocchii* **comb. nov.**, *Eucalliax pseudorakosensis* **comb. nov.**, Middle Miocene, Central Paratethys, *in situ* preservation

### Introduction

The fossil Callianassidae Dana, 1852 of the Central Paratethys have never received much attention in the literature. The most comprehensive systematic treatments on this topic were published by Lörenthey & Beurlen (1929) and Müller (1984). Since publication of the latter, however, many changes in taxonomy have been proposed, and several major systematic contributions of extant taxa appeared (Manning & Felder 1991; Poore 1994; Sakai 1999, 2005, 2011; Ngoc-Ho 2003 with references therein). Although still inconsistent, the literature on the systematics of extant taxa published in the last 20 years forms the basis for reassignment of fossil material, which has been traditionally classified almost exclusively within the genus *Callianassa* in its widest sense. Recently, a major classification both of extant and fossil decapod crustacean genera summarized the most updated state of systematic arrangement of extant ghost shrimps (De Grave *et al.* 2009). The systematic part of this paper follows the work by De Grave *et al.* (2009) rather than the classification proposed by Sakai (1999, 2005, 2011).

Since the publication of Müller (1984), the Callianassidae of the Central Paratethys have been at least partly discussed by Müller (1996, 1998) and Hyžný & Müller (2010). More recently Hyžný (2011a: table 2) provided a list of Middle Miocene Callianassidae reported from the Central Paratethys and discussed *in situ* preservation of callianassid ghost shrimps.

Hyžný & Müller (2010) were the first to try to apply one of the biological generic concepts on the Miocene ghost shrimps of the Central Paratethys. This research is currently in progress as documented by the present contribution that re-evaluates the fossil record of two Middle Miocene species: "*Callianassa*" *brocchii* Lörenthey, 1897, and "*Callianassa*" *pseudorakosensis* Lörenthey in Lörenthey & Beurlen, 1929. Herein a redescription of both species is provided, including emended diagnoses, generic reassignment, descriptions of intraspecific variations, and *in situ* preservation.