The first case of aggregation in a Cretaceous Burmese amber species of scorpion: *Palaeoburmesebuthus ohlhoffi* Lourenço, 2015 (Scorpiones: Palaeoburmesebuthidae)

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Abstract: A case of aggregation in the Cretaceous Burmese amber scorpion *Palaeoburmesebuthus ohlhoffi* Lourenço, 2015 is reported. This represents the first observation of aggregation in a scorpion species trapped in amber. The five specimens observed in the amber piece represent in fact exuviae, which also suggests a group-effect during the molting process.
Key words: Scorpiones, Palaeoburmesebuthidae, aggregation, exuviae, Cretaceous amber.

Primer caso de agregación en una especie de escorpión del ámbar birmano del Cretácico: *Palaeoburmesebuthus ohlhoffi* Lourenço, 2015 (Scorpiones: Palaeoburmesebuthidae)
Resumen: Se presenta un caso de agregacion en el escorpión del ámbar birmano *Palaeoburmesebuthus ohlhoffi* Lourenço, 2015. Se trata de la primera observación de agregación en escorpiones atrapados en ámbar. Los cinco ejemplares observados in el trozo de ámbar son de hecho exuvias, lo que además sugiere un efecto de grupo durante el proceso de muda.
Palabras clave: Scorpiones, Palaeoburmesebuthidae, agregación, exuvias, ámbar cretácico.

Introduction

As already outlined in previous publications (Lourenço, 2016), scorpions remain relatively rare among the Arthropods found trapped in amber. However, an important number of new specimens have become available in recent years, in particular from Lower Cretaceous of Myanmar. These discoveries led to the description of several new taxa, comprising species, genera and families (Lourenço, 2016). They also revealed some particular curiosities such as the presence of a number of exuviae among the specimens trapped (Lourenço & Weitschat, 2000; Lourenço, 2015a, 2016) and, even one case of a pre-adult specimen trapped during the molting process (Lourenço & Velten, 2017). In the present note a case of aggregation for a Cretaceous amber species, *Palaeoburmesebuthus ohlhoffi* Lourenço, 2015 is reported. This is the first case of aggregation even observed for a scorpion species trapped in amber.

Material and methods

The specimens investigated are preserved in a relative clear oval piece of reddish-yellow amber that measures 22x14x3-4 mm. The five specimens observed are approximately complete, but since these are in fact exuviae they were largely crushed by the pressure of the resin. Consequently, several characters are not clearly visible. Nevertheless some fundamental characters such as the position of trichobothria and the shape of the telson (Figs. 1-3) allow the identification of the scorpions as belonging to the genus *Palaeoburmesebuthus* Lourenço, 2002 and most certainly to the species *Palaeoburmesebuthus ohlhoffi* Lourenço, 2015. Illustrations were produced with the aid of a Wild M5 stereomicroscope equipped with a drawing tube (camera lucida) and an ocular micrometer. Trichobothria were definitely recorded only when their bothria (areoles) could be observed. The amber piece is now deposited in the collection of Mr Hans-Georg Müller (Gelsenkirchen, Germany).

Results

The present observation reveals five specimens of scorpions, in fact five exuviae lying side by side (Fig. 4). We took measurements of the three better preserved specimens obtaining total lengths of 10.71, 10.84 and 11.22 mm what is in accordance with the value observed for the type specimen of *Palaeoburmesebuthus ohlhoffi*, also a juvenile, with 12.28 mm (Lourenço, 2015b). The position of the exuviae clearly suggests a case of gregarious behaviour, but also a group-effect during the molting process. This behaviour has also been observed for some extant species of scorpions (Lourenço, 1991a).

Although scorpions are generally defined as non-social, solitary animals that interact with conspecifics only during courtship, at birth or in cases of cannibalism (Polis, 1990), varying degrees of sociality have been observed in a number of species (Polis, & Lourenço, 1986). Two evolutionary routes have been associated with the existence of eusociality (Wilson, 1975; Polis & Lourenço, 1986): the familial route, whereby aggregation occurs among relatives and the communal or parasocial route, whereby association occurs among nonrelatives. Early stages of both evolutionary pathways can be observed in scorpions. Besides the cases of sociality, other types of aggregation can also be observed, mainly in species of the family Buthidae. In these cases, unrelated individuals regularly aggregate in the field, in groups comprising 5 to more than 30 individuals. In North America, individuals of *Centruroides exilicauda* (Wood, 1863) were found in aggregations reaching 20 to 30 individuals (Stahnke, 1966). Similarly, in the Colombian Andes, individuals of *Tityus columbianus* (Thorell, 1876) were regularly aggregated in the field in numbers reaching 25 to 45 individuals under the same stone (Lourenço, 1991b). Another case of aggregation was reported for *Lychas marmoreus* (C. L. Koch, 1844) by Polis (1990). Observations were made by A. Lockett (in litt.-1987) in Australia where 10 to 17 specimens of this species were observed aggregated under *Eucalyptus* bark. More recently, a new case was described for the species *Lychas mucronatus* in Lao PDR (Ziegler *et al*., 2015).

Scorpion aggregations are certainly due to shortage of suitable overwintering sites or due to an active attraction between conspecifics, as for example to a source of food (Ziegler *et al*., 2015).

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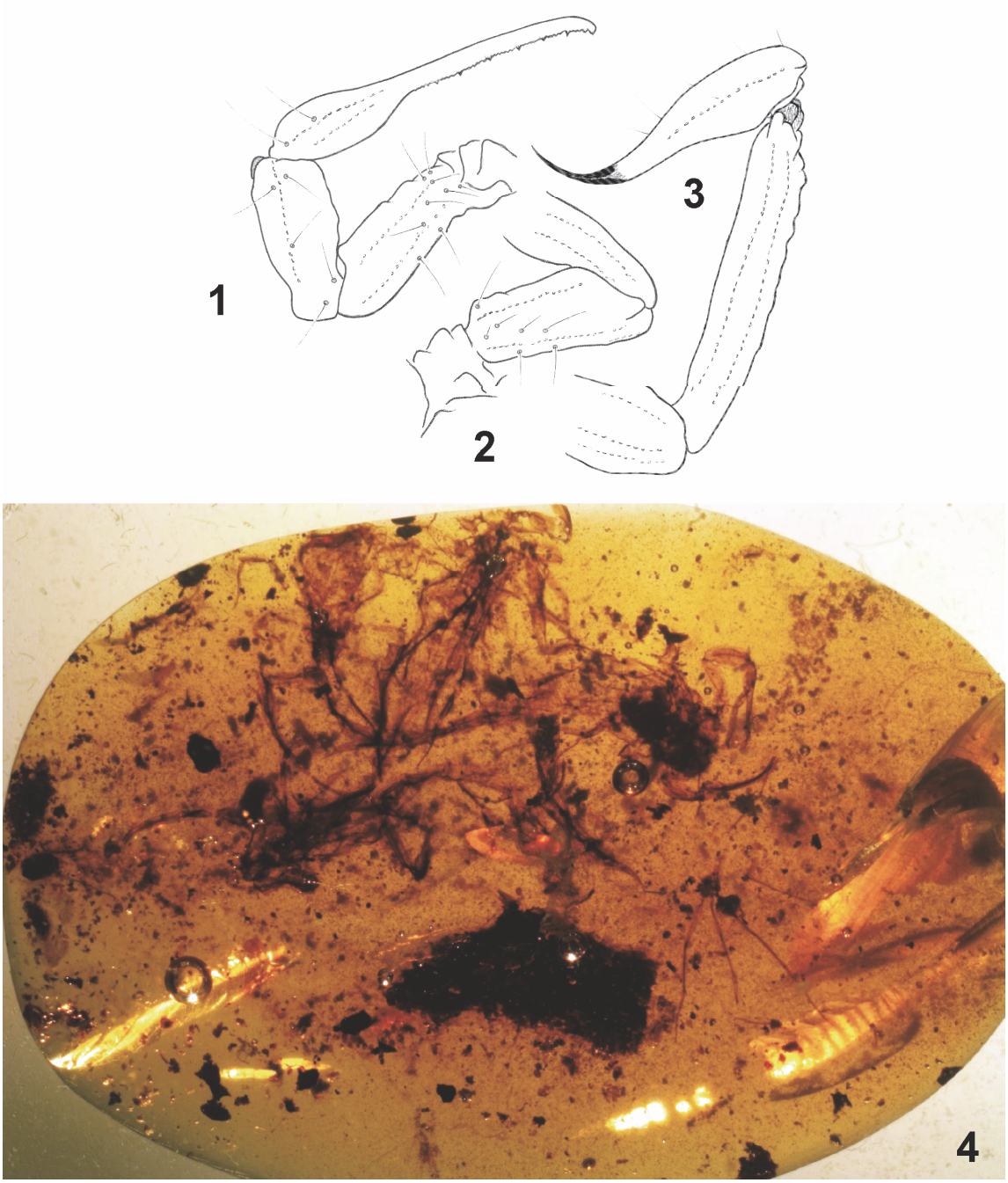


Fig. 1-3. *Palaeoburmesebuthus ohlhoffi*. **1-2**. Trichobothrial pattern of specimens I and II, showing the typical A-alpha disposition for the dorsal trichobothria of the femur. **3**. Metasomal segment V and telson, lateral aspect. The structure shows a slight distortion typical in Burmese amber specimens. **Fig. 4.** A global view of the Burmese amber piece showing the five scorpion exuviae.

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