

## Accepted Manuscript

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PII: S0031-0182(17)31159-8  
DOI: <https://doi.org/10.1016/j.palaeo.2018.01.005>  
Reference: PALAEO 8614

To appear in: *Palaeogeography, Palaeoclimatology, Palaeoecology*

Received date: 12 November 2017  
Revised date: 3 January 2018  
Accepted date: 3 January 2018

Please cite this article as: Martin Košťák, Ján Schlögl, Adam Culka, Adam Tomašových, Martin Mazuch, Natália Hudáčková, The unique preservation of Sepia soft tissues in the Miocene deposits (Serravalian, Vienna Basin): Implications for the origin of microbodies in the fossil record. The address for the corresponding author was captured as affiliation for all authors. Please check if appropriate. *Palaeo*(2017), <https://doi.org/10.1016/j.palaeo.2018.01.005>

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**The unique preservation of *Sepia* soft tissues in the Miocene deposits (Serravalian, Vienna Basin): implications for the origin of microbodies in the fossil record**

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**Abstract:** For the first time, we report an ancient cuttlefish ink sac possessing microbodies from the lower Serravallian (Middle Miocene) deposits of the Vienna Basin (Central Paratethys). We compare the geochemistry of these microbodies with the ink sac of the extant genus *Sepia*. The unique preservation of the cuttlefish soft tissue resulted from a high sedimentation rate and a low degree of sediment reworking and bioirrigation, which led to the dominance of anaerobic degradation pathways such as sulfate reduction below a thin oxic surface layer. The Recent *Sepia* melanin extracted from the ink sac is commonly used as a standard in biochemical analyses. However, it was unclear whether melanosomes can be preserved in fossil cuttlefishes. Although some portion of melanin-bearing microbodies is affected by pyritization, we show that some microbodies are still composed of eumelanin using Raman spectroscopy. They consist of particles corresponding to the size and shape of melanosomes observed in extant *Sepia* according to images produced with a scanning electron microscope. The Raman microspectroscopy of these microbodies in the Miocene *Sepia* shows

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