Zootaxa 3013: 1–47 (2011)
www.mapress.com/zootaxa/

Article

ISSN 1175-5326 (print edition)
ZOOTAXA
ISSN 1175-5334 (online edition)

Lateral arm plate morphology in brittle stars (Echinodermata: Ophiuroidea): new perspectives for ophiuroid micropalaeontology and classification

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Abstract

Lateral arm plates, the spine-bearing plates of the ophiuroid arm skeleton, have long been assumed to display sufficient morphological diversity to be used for species identifications in ophiuroid micropalaeontology. As a consequence, many new brittle-star species have been described on the basis of isolated fossil lateral arm plates. A substantial lack of information on the morphological variability of lateral arm plates in respect of taxon concepts, however, has led to increasing confusion over species limits and excessive extensions of stratigraphic species ranges. In this study, we therefore performed a detailed assessment of the variability of lateral arm plate morphology within and between species in order to test to what extent isolated lateral arm plates can be used for species identifications. To this end, we investigated the morphological variability of lateral arm plates within species according to ontogenetic changes and according to the position of the plates along the arm. Furthermore, we examined the lateral arm plates of 56 Recent species, belonging to 27 genera and 10 families, and systematically assessed their morphology in the light of currently accepted taxon concepts. The results of this study demonstrate that lateral arm plate morphology is in accordance with most family, genus and species limits. Some of the currently accepted taxon concepts, including the affinities between the Ophiacanthidae and Ophiocomidae, however, are challenged by lateral arm plate morphology. Differences in lateral arm plate morphology between taxa are the most conspicuously displayed by adult proximal lateral arm plates, as a consequence of their high degree of differentiation compared to distal or juvenile lateral arm plates. Differences at species level, often pertain to characters which were considered to be within-species variation in previous micropalaeontological works, suggests that species identifications based on isolated fossil lateral arm plates require a much more detailed and careful morphological assessment. Some of the species studied herein displayed indistinguishable lateral arm plate morphologies, but belonged to the same genus in all cases. Our study endorses the use of isolated fossil lateral arm plates for taxonomic interpretations in ophiuroid micropalaeontology, including species identifications and the creation of new taxa, providing that descriptions are based on pristinely preserved adult proximal LAPs, described and illustrated using SEM-pictures of both the external and internal sides of the plate.

Accepted by M. Eleaume : 18 Jul. 2011; published: 5 Sep. 2011