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Sometimes two arms are enough—an unusual life-stage in brittle stars (Echinodermata: Ophiuroidea)

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Abstract

Off West Africa (Angola–Morocco), benthos samples were collected in the years 2005–2012. These contained 124 specimens of brittle stars with two long arms and three extremely short or absent arms and an elongated, narrow disc. These unusual brittle stars, as well as 33 specimens with five fully developed arms, were identified as *Amphiura ungulata*. The specimens with unequal arms were juvenile stages, whereas adults had five equal arms. The large number of specimens with unequal arms suggests that this condition is not the result of damage and regeneration, but a normal growth pattern in this species. This study documents the morphology by SEM, amends the species description, and discusses possible explanations for the evolution of this condition. Although brittle star species with unequal arm growth have been reported, this is an extreme case that was unknown before this study.

Key words: unequal growth, ontogeny, SEM, morphology, taxonomy

Introduction

Madsen (1970) described a new species of brittle star, *Amphiura ungulata* Madsen, 1970, from West Africa (off Liberia and Niger Delta). The type specimens were small, about 2–4 mm in disc diameter. As the most distinguishing feature of this species he reported the long ventral arm spine which is in cross section hoof-shaped. This shape is so unique and characteristic among amphiurid brittle stars that damaged specimens can be identified beyond doubt by this spine.

Since 2005, the Institute of Marine Research (Bergen, Norway) has been running several ecosystem surveys in the Guinea Current and Canary Current Large Marine Ecosystem areas as part of the EAF-Nansen programme. These surveys have resulted in a rich collection of ophiuroids, among them a number of unusual specimens. They had an elongated disc and only two arms. Other specimens had two long and three short arms at an elongated, but slightly wider disc. Close examination revealed the typical hoof-shaped arm spines of *A. ungulata*. We concluded that these unusual specimens were juveniles of that species. This is the first species of ophiuroid known to have such an extremely unequal growth pattern affecting both arms and disc (Ludwig 1899; Schoener 1967; Stöhr 2005; Sumida *et al.* 1998; Webb & Tyler 1985), although unequal arm growth has been reported for at least two other species of Amphiuridae (Muus 1981; Turner 1974).

Here we present a first description of the unusual ontogeny of *A. ungulata* and additional observations on its morphology by scanning electron microscopy. It is also the first report of the species since its original discovery.

Materials and methods

Brittle stars were collected along the west coast of Africa, from northern Angola to Morocco, from 2005 to 2012, under the MIWA project on the research vessel *Dr. F. Nansen*. For locality data see Table 1. Most samples were

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