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Discovery of Recent thecideide brachiopods (Order: Thecideida, Family: Thecideidae) in Sulawesi, Indonesian Archipelago, with implications for reproduction and shell size in the genus *Ospreyella*

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Abstract

For the first time thecideide brachiopods have been discovered in the Indonesian Archipelago. All specimens were collected in a water depth of 30 m from an old shipwreck, the “Mutiara”, which represents a remarkable habitat for these cryptic brachiopods despite its artificial nature. The thecidellinine species *Minutella cf. minuta* and the lacazelline species *Ospreyella mutiara* n. sp. are described and illustrated comprehensively, including their shell ontogeny. The inclusion of the new species *O. mutiara* in the genus *Ospreyella* Lüter and Wörheide, 2003 is based on results of an integrated approach combining morphological, ontogenetic and genetic studies. Relevant morphological characters diagnostic for *Ospreyella* are established. In addition, all Recent lacazelline brachiopod genera are confirmed as valid taxa using molecular methods. The small body size of *O. mutiara* and the weakly developed brachidium in comparison to other *Ospreyella* species as a

consequence of heterochrony is discussed in more detail. *O. mutiara* is the first species of the exclusively gonochoristic genus *Ospreyella* for which hermaphroditism is now documented.

Key words: Brachiopoda, *Minutella*, *Ospreyella*, new species, hermaphroditism, heterochrony, shell ontogeny

Introduction

Thecideide brachiopods are small cementing articulated brachiopods. They live in cryptic habitats and have a world-wide tropical and subtropical distribution. Thecideides have a long fossil record extending back to the Upper Triassic (Baker 2006). Baker (1990) provided a revised taxonomy for this group, evaluating opinions about thecideide classification and ancestry prior to the 1970's in the light of more recent findings. He provided a commonly accepted classification for the Treatise on Invertebrate Paleontology (Baker 2006, 2007). Recent representatives of the Thecideoidea Gray, 1840 are only known from the families Thecidellinidae Elliott, 1958 and Thecideidae Gray, 1840. The subfamily Thecidellinae Elliott, 1958 belonging to the family Thecidellinidae comprises two Recent genera, *Thecidellina* Thomson, 1915 and *Minutella* Hoffmann and Lüter, 2010. The subfamily Lacazellinae belonging to the family Thecideidae Gray, 1840 comprises three Recent genera, *Pajaudina* Logan, 1988, *Lacazella* Munier-Chalmas, 1880 and *Ospreyella* Lüter and Wörheide, 2003. The position of the genus *Kakanuiella* Lee and Robinson, 2003 currently assigned to the family Thecidellinidae is debated by Lee and Robinson (2003), Lüter (2005) and Baker (2007).

At the beginning of the 20th century only a few Recent thecideide brachiopod species were known. In recent years continuous research including trawling or dredging and, in particular, investigations of cryptic environments by SCUBA diving increased the discovery of new genera (Logan 1988; Hoffmann & Lüter 2010) and several new species (Logan 2005; Lüter 2005; Logan 2008; Lüter *et al.* 2008; Hoffmann & Lüter 2009; Hoffmann *et al.* 2009; Hoffmann & Lüter 2010).

In the Indo-Pacific region several species of the thecidellinine genus *Thecidellina* are known, such as *Thecidellina japonica* (Hayasaka, 1938), *Thecidellina congregata* Cooper, 1954, *Thecidellina maxilla* (Hedley, 1899), *Thecidellina insolita* Hoffmann, Klann and Matz, 2009, and *Thecidellina blochmanni* Dall, 1920. In 1981, Cooper described *Thecidellina minuta*, a minute brachiopod trawled from the Samper Bank, southeast of Madagascar, Indian Ocean. A revision of this material allowed Hoffmann and Lüter (2010) to include this species in the new genus *Minutella* together with two new Caribbean species: *M. tristani* Hoffmann and Lüter, 2010 (type species) and *M. bruntoni* Hoffmann and Lüter, 2010. A number of specimens from localities all over the West-Pacific Ocean, e.g. Japan, Fiji, and Great Barrier Reef, have been assigned by these authors to the species *Minutella minuta* based on strong morphological similarity. Furthermore, they described a morphological separation of Caribbean/ Atlantic and Indo-Pacific representatives of *Minutella* by the shape of the median septum. Bitner (2010) documented *Thecidellina minuta*, now assigned to *Minutella cf. minuta* (pers. com. J. Hoffmann), also from New Caledonia.

Representatives of the lacazellines genus *Ospreyella* Lüter and Wörheide, 2003 are known from different regions in the Pacific and Indian Ocean. The type species of this genus, *Ospreyella depressa* Lüter, 2003, was collected from submarine caves at Osprey Reef, Queensland, Australia. Logan (2005) described *O. maldiviana* from submarine caves at Addu Atoll and South Male Atoll in the Maldives Islands which was the first documentation of representatives of the genus *Ospreyella* in the Indian Ocean. In 2008, Logan described *Ospreyella palauensis* from Chandelier cave, Koror Island, Palau. In addition, specimens collected from Lizard Island, Great Barrier Reef, possibly juvenile forms, were described as *Ospreyella* sp. by Hoffmann *et al.* (2009).

"*Lacazella*" *mauritiana* Dall, 1920 is the only species of the exclusively Atlantic genus *Lacazella* described from the Indian Ocean (Mauritius). Cooper (1973) provided the first illustration of the type specimen. *Lacazella mauritiana* was also mentioned by Zezina (1985, 1987) who found this species among material collected by the BENTHEDI-Cruise in the Mozambique Channel. Unfortunately, the type material of *L. mauritiana* is lost (Logan 2005) and thus a proper species description cannot be provided to date. In the Pacific Ocean *Lacazella* sp. is documented from submarine caves in Okinawa, Japan (Motchurova-Dekova *et al.* 2002; Saito *et al.* 2002), and shallow waters around New Caledonia (Bitner 2010). There is ongoing discussion on the affiliation of *Lacazella mauritiana* to the genus *Ospreyella* and not *Lacazella* (pers. com. J. Hoffmann). The assignation of lacazelline specimens in the Indian and Pacific Ocean to the genus *Lacazella* will be discussed later in this paper.