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On some Vetigastropoda (Mollusca, Gastropoda) from the Plio-Pleistocene of the Philippines with descriptions of three new species

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Abstract

We studied representatives of seven vetigastropod families in an extremely well-preserved Plio-Pleistocene mollusc fauna found in relatively deep water sediments (c. 200–300 m paleodepth) from the north-western Philippines. The fauna is systematically described and its paleoenvironmental and paleobiogeographical character is explored. Twenty-six species of gastropods were studied, three of which are described as new: *Halystina conoidea* **n. sp.**, *Calliotropis arenosa* **n. sp.** and *Ethminolia wareni* **n. sp.** Four new combinations are proposed: *Pseudotalopia taiwanensis* (Chen, 2006), *Solariella segersi* (Poppe, Tagaro & Dekker, 2006), *Zetela tabakotanii* (Poppe, Tagaro & Dekker, 2006) and *Ilanga konos* (Vilvens, 2009). Fourteen species are known living. Most extant species nowadays occur around the Philippines. Two of the species also occur in Neogene deposits from western Pacific islands. The new fauna offers insights into the character of relatively deep water Indo-West Pacific mollusc faunas prior to the onset of the late Quaternary ice ages.

Key words: taxonomy, new species, gastropod, mollusk, fossil, deep water, Indo-West Pacific

Introduction

Our understanding of the biodiversity and phylogenetics of Vetigastropoda has increased rapidly over the last years. This is especially true for the Indo-West Pacific vetigastropods, which are the focus of publications by Poppe, Tagaro & Dekker (2006), Vilvens (2006; 2007; 2009), Kano (2008), Geiger (2012), Williams (2012) and Williams *et al.* (2008; 2013). Studies on fossil vetigastropods from the same region have lagged behind, even though fossils contain valuable information, e.g. for understanding taxonomy, dating molecular phylogenies and for understanding the history of the Indo-West Pacific marine biodiversity hotspot.

During an expedition to northwestern Philippines in 1999 John de Vos (Naturalis) collected a few sediment samples in shore outcrops on the island of Cabarruyan that contained a very well preserved diverse mollusk fauna, including pelagic groups such as pteropod and heteropod snails. These samples were initially studied by Arie W. Janssen (Naturalis), who participated in a second visit to the island localities in 2001. During this second visit two cliff sections were sampled and an additional road section in the same deposits on the neighboring mainland of Luzon was studied as well. The material contained the most diverse fossil pteropod and heteropod gastropod fauna found globally to date (Janssen 2007). The material also yielded a very diverse benthic fauna, comprising several hundreds of species. The deep-water character of the fauna (c 200–300 m paleo-water depth; Janssen 2007) makes this one of the very rarely well-preserved fossil deep-water faunas.

Several of the benthic mollusk groups are currently under investigation. The new material contains new species but also taxa that hitherto have only been known from Recent material. Vetigastropods occur from intertidal to abyssal or even hadal environments, but in the newly studied material we almost exclusively encountered subtidal taxa of considerable depths (c. 100–1000 m). The group is representative for the deep-water character of the newly studied fauna. Representatives of seven vetigastropod families were investigated; other families, such as Fissurellidae, Scissurellidae, Anatomidae, Lepetellidae, Lepetodrilidae and Skeneidae, are the subject of ongoing study. This study aims at a taxonomic characterization of the fauna, a reconstruction of depositional environments

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mollusk species have had a very broad distribution. Additionally, the extensive work of Geiger (2012) on modern scissurellid snails shows no biogeographic differentiation within the western tropical Pacific (including New Zealand, New Caledonia and the Philippine area). More data on the taxonomy and species distribution ranges (including depth ranges) for the groups treated in this paper is needed to establish whether deep water gastropod provinces in the Indo-Pacific do exist at all.

Scanning electron microscope (SEM) micrographs proved to be essential in the documentation of morphological characters. Protoconch, teleoconch and umbilicus often bear intricate microsculpture that can only be studied using SEM. For many of the modern taxa such images and data are still lacking, making comparisons difficult. The extremely well preserved state of the studied material is also illustrated by the SEM micrographs, as most specimens showed hardly any sign of corrosion. The material in some samples, notably Anda 5 and Tiep 1, is partially decalcified and a substantial part of the material consists of broken shells, but there are also many undamaged specimens of a wide variety of species present in the material. Well preserved fossil deep water mollusk faunas from the Indo-Pacific are rare, making this exquisitely preserved, diverse fauna very valuable.

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