Zootaxa 3779 (1): 061–080
www.mapress.com/zootaxa/

Article

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

http://dx.doi.org/10.11646/zootaxa.3779.1.8
http://zoobank.org/urn:lsid:zoobank.org:pub:7CE74DE8-BEF2-4E42-A727-FEF9833878D4

The genus *Cerithideopsis* Thiele, 1929 (Gastropoda: Potamididae) in the Indo-West Pacific region

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Abstract

The genus *Cerithideopsis* is most common in mangrove and salt marsh habitats of the New World tropics, but there is also a small radiation in the Indo-West Pacific region. Previously, these Indo-Pacific snails have generally been classified as *Cerithidea largillierti* (Philippi, 1848). Molecular phylogenetic analysis (partial sequences of mitochondrial COI and 16S rRNA, and nuclear 28S rRNA) of 15 specimens from 8 localities between Japan and Australia reveal three clades, among which there are small morphological differences and which show allopatric distributions. *Cerithideopsis largillierti sensu stricto* is restricted to Japan and China, while the two other species are described as new: *C. australiensis* occurs in tropical Australasia and *C. malayensis* is found from Malaysia to Java and the Philippines. All occur on mud and in pools with leaf litter, in the shaded landward and middle zones of mangrove forests, and do not climb the trees. The species accounts include full synonymies, detailed descriptions of shells based on 82 museum samples, descriptions of living animals, distribution records and maps, and notes on habitat and conservation status.

Key words: COI, molecular phylogeny, mangrove, endangered species

Introduction

The cerithioidean family Potamididae shows a close association with mangroves. The great majority of its approximately 40 living species occur in mangrove habitats, where they are variously dependent upon the plants for shelter, as a substrate or for food (e.g. Houbrick 1984, 1991; Plaziat 1984; Glaubrecht 1997; Willan 2013; Reid 2014). This ecological association has a long evolutionary history and is believed to have been characteristic of the family since its origin in the Tethyan realm during the Eocene (Reid *et al.* 2008).

Traditionally, the generic classification of potamidids has been based upon characters of the shell and soft anatomy (Houbrick 1984, 1991). A recent molecular study of the living genera supported the monophyly and distinctness of the familiar *Terebralia* and *Telescopium* in the Indo-West Pacific region (IWP), and of the monotypic *Tympanotonos* in the eastern Atlantic, but divided the large pantropical genus *Cerithidea s. l.* into three full genera: *Cerithidea s. s.*, *Cerithideopsilla* and *Cerithideopsis* (Reid *et al*. 2008). These groups had previously been recognized only as subgenera (Houbrick 1984). *Cerithidea* is restricted to the IWP, where most species climb up mangrove trunks during high tide and migrate to the mud below to feed at low tide. Fifteen species have been characterized by a combination of molecular, morphological and geographical study (Reid *et al*. 2013, 2014). *Cerithideopsilla* species are found on the sediment, usually beneath the mangrove canopy but also on open mud flats. Traditionally, four species have been recognized in the IWP (Van Regteren Altena 1940; Brandt 1974), but molecular study has added one species from the Mediterranean and Indian Ocean (Reid *et al*. 2008) and suggests a much higher overall diversity of about 12 species (T. Ozawa, Y. Wei, C. Fu & D.G. Reid, unpublished). *Cerithideopsis* is represented by three species in the western Atlantic (Bequaert 1942; Abbott 1974) and approximately three in the eastern Pacific (Keen 1971; Abbott 1974; Miura, Torchin & Bermingham 2010), which are found on mud flats, among saltmarsh vegetation, or climbing on mangrove trees (Race 1981; Houbrick 1984; Plaziat 1984).

There remains one enigmatic species, traditionally classified as *Cerithidea largillierti* (Philippi, 1848) (see e.g. monographs by A. Adams 1855, Sowerby 1866, Kobelt 1890). In his review of the subgeneric classification of

Accepted by M. deMaintenon: 31 Jan. 2014; published: 13 Mar. 2014

Acknowledgements

For helpful discussion during this work we are grateful to E.E. Strong (USNM), M. Glaubrecht (MZB), T. Ozawa (Cyber University, Nagoya), R.C. Willan (NTM) and K.M. Way (NHMUK). We thank T. Ozawa, H. Fukuda (Okayama University), Y-X. Yan (Zhunan, Taiwan), T. Goulding and B. Dayrat (Pennsylvania State University) and H. Tomkins (James Cook University), who sent us specimens or images for study. Both H. Fukuda and A.J. Bourke (Coconut Grove, Northern Territory) kindly provided photographs of living animals. For assistance in the field we thank S. Panha (Chulalongkorn University, Bangkok), and S.H. Tan and Z. Yasin (Universiti Sains Malaysia, Penang). We are grateful to the following curators and staff for access to the collections in their care: P. Bouchet and V. Héros (MNHN), M. Glaubrecht (MZB), J. Goud (RMNH), A. Miller (AM), G. Rosenberg (ANSP), B. Sirenko (ZISP), E.E. Strong (USNM) and V. Vongpanich (PMBC). The images of shells were expertly made by H. Taylor (NHMUK). Some molecular sequencing was done by L. Smith (NHMUK). We thank two anonymous reviewers for their careful reading and improvements.

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