Zootaxa 1975: 1–57 (2009)
www.mapress.com/zootaxa/

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

Systematics and preliminary phylogeny of Bornellidae (Mollusca: Nudibranchia: Dendronotina) based on morphological characters with description of four new species

MARTA POLA[1], WILLIAM B. RUDMAN[2] & TERRENCE M. GOSLINER[3]

[1]*California Academy of Sciences, 55 Music Concourse Dr., Golden Gate Park, San Francisco 94118-4503, California, USA. E-mail: mpolaperez@calacademy.org*

[2]*The Australian Museum, 6 College Street, Sydney, New South Wales 2010, Australia. E-mail: billr@seaslugforum.net*

[3]*California Academy of Sciences, 55 Music Concourse Dr., Golden Gate Park, San Francisco 94118-4503, California, USA. E-mail: tgosliner@calacademy.org*

Table of contents

Accepted by M. Schroedl: 14 Nov. 2008; published: 12 Jan. 2009

Abstract

In this study all available species of the nudibranch family Bornellidae (*Bornella* Gray, 1850, *Pseudobornella* Baba, 1932) are re-examined anatomically and their status re-evaluated. Of these, *B. hancockana* Kelaart, 1859 **syn. nov.,** *B. arborescens* Pease, 1871 **syn. nov.,** *B. caledonica* Crosse, 1875a **syn. nov.,** and *B. marmorata* Collingwood, 1881 **syn. nov.** are considered to be new synonyms of *B. stellifer* (Adams and Reeve in Adams, 1848), and *B. japonica* Baba, 1949 **syn. nov.** is considered to be a new synonym of *B. hermanni* Angas, 1864. Two species, *B. excepta* Bergh, 1884 and *B. simplex* Eliot, 1904, are at present unrecognizable, *B. semperi* Crosse 1875b is here considered a *nomen nudum*, and four new species, *B. dotoides* **sp. nov.**, *B. pele* **sp. nov.**, *B. valdae* **sp. nov.** and *B. johnsonorum* **sp. nov.** are proposed. These are compared with a further four recognized species, *B. calcarata* Mörch, 1863, *B. anguilla* Johnson, 1984, *B. sarape* Bertsch, 1980 and *B. irvingi* Edmunds and Preece, 1996. The presence of an unpaired oral gland in *Bornella* is reported for the first time. The reproductive system is diaulic, and the morphology of the penis and the arrangement of the penial spines are considered diagnostic for most species. The monotypic genus *Pseudobornella* is re-examined for the first time. A comparative table for all recognized species is also provided. The review of the morphological differences within the family provides the basis for a phylogenetic analysis of the group. *Bornella* is shown to represent a monophyletic clade while the monophyly of the family Bornellidae is not supported.

Key words: *Bornella*, Dendronotina, New species, Nudibranchia, Phylogeny, *Pseudobornella*, Taxonomy

Introduction

The family Bornellidae contains a group of aeolidiform members of the Dendronotina, and consists of two genera, *Bornella* Gray, 1850, with at least ten species, and the monotypic genus *Pseudobornella* Baba, 1932. Species of *Bornella* are characterised externally by their elongate bodies bearing paired cerata-like dorsolateral processes which can be branched and have the gills attached to them. Their head is rounded and on each side of the mouth there is a lobe-like oral tentacle bearing several finger-like papillae along its edge. *Pseudobornella* differs externally in being broader in shape and having three tapering tentacles on each side of the mouth. In both *Bornella* and *Pseudobornella* the rhinophoral sheath is high and usually very similar in shape to the dorsolateral processes.

No comparative study of the anatomy of these animals has been previously undertaken, and for most species, little published anatomical information is available other than that found in the original descriptions. In this study we show that species of *Bornella* can be characterised externally by their colour pattern, number of dorsolateral processes, and branching of the rhinophore sheaths, and internally, by their radular morphology and penial armature. Little is know about their biology other than that they appear to feed exclusively on hydroids (Gosliner 1987a, Rudman 1998). Many species of the genus *Bornella* Gray 1850 have been described, but as we discuss below, many of the names appear to be synonyms of *B. stellifer* (Adams and Reeve in Adams 1848). We recognize eight species of *Bornella* from the Indo-West Pacific, including four new species. A single species is also known from the tropical eastern Pacific and another from the western Atlantic. *Pseudobornella* Baba, 1932, is known from a single species, *P. orientalis* Baba, 1932, from Japan and nearby parts of the Western Pacific. This study is the first comprehensive review of the systematics and phylogeny of this family.

Material and methods

Material deposited in the collections of the following institutions was examined: California Academy of Sciences, San Francisco, USA (CASIZ), Australian Museum, Sydney, Australia (AM), Natural History Museum of Los Angeles County, Los Angeles, USA (LACM), National Science Museum, Tsukuba, Japan (NSMT), Iziko South African Museum (SAM) and Museu de Zoologia da Universidade de Sao Paulo, Brazil (MZUSP).