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The family Diaphanidae (Gastropoda: Heterobranchia: Cephalaspidea) in Europe, with a redescription of the enigmatic species *Colobocephalus costellatus* M. Sars, 1870

LENA TINA OHNHEISER¹ & MANUEL ANTÓNIO E. MALAQUIAS

Phylogenetic Systematics and Evolution Research Group, Natural History Collections, University Museum of Bergen, University of Bergen, PB 7800, 5020 Bergen, Norway. E-mail: Lena.Ohnheiser@um.uib.no; Manuel.Malaquias@um.uib.no

¹Corresponding author. E-mail: Lena.Ohnheiser@um.uib.no

Abstract

Diaphanidae has traditionally been considered the basal family of the heterobranch gastropod clade Cephalaspidea with 14 species present in Europe ascribed to five genera. The monophyletic status of the family is controversial because of lack of sound synapomorphies. In this paper we present a review of the diversity of Diaphanidae in Europe and give new data on the morphology and anatomy of 50% of the species together with a synopsis of the relevant systematic characters to distinguish between all European species and genera. The rare species *Colobocephalus costellatus* is redescribed and shown alive for the first time.

Further evidence supporting the non-monophyly of Diaphanidae is given; no synapomorphies were found to unite traditional Diaphanidae taxa, but three groups can be recognized: (1) Diaphaninae with genus *Diaphana* is united by a globose external, thin, and umbilicate shell and radulae with a bilobed rachidian tooth; (2) Toledoniinae, with genera *Toledonia* and *Bogasonia* share the presence of a shell with elevated spire and radulae with a unicuspid rachidian tooth; and (3) an unnamed group, with *Colobocephalus* and *Colpodaspis* which are the only genera with internal shells, sculptured and globose with short but protruding spires, and radulae lacking rachidian tooth and with smooth hook-shaped lateral teeth.

Key words: Mollusca, diaphanids, diversity, systematics

Introduction

Diaphanidae is considered the basal family of the Order Cephalaspidea (Malaquias *et al.* 2009) with an estimated 49 valid species worldwide (Bouchet 2012a, c; Bouchet & Gofas 2012a, b, c, d; Gofas 2012). In Europe 14 species ascribed to five genera are recognized as valid (Bouchet 2012b). Diaphanid snails have small shells (<5 mm) and can be found from the tidal zone down to abyssal depths across all ocean basins from the Arctic to the Antarctic. They live on soft substrate, algae, bryozoans, and hydroids (Schiøtte 1998; Engl 2012). The diet of these animals is unknown (Schiøtte 1998).

The definition and monophyly of the family Diaphanidae Odhner, 1913 is surrounded by controversy since its original description. Odhner (1913) introduced the family for the genera *Diaphana* T. Brown, 1827 and *Toledonia* Dall, 1902, the latter a genus he could not place within any other taxon. Odhner (1913) did not clearly define the family, providing only a comparison of species from both genera. This lack of a sound definition opened the possibility to use Diaphanidae as a ‘dumptaxon’ for diaphanid-like species of difficult taxonomic placement, like those in the genera *Toledonia*, *Bogasonia* Warén, 1989, *Colpodaspis* M. Sars, 1870 and *Colobocephalus* M. Sars, 1870 (Odhner 1939; Marcus 1976; Brown 1979; Warén 1989; Schiøtte 1998; Golding 2010).

Despite the apparent morphological heterogeneity of Diaphanidae attempts to provide a definition can be found in Thiele (1992) and Burn and Thompson (1998). The authors stated that snails in this family are characterized by an umbilicate thin, fragile, voluminous shell into which the animal is capable of retreating completely; jaws and gizzard plates are absent and usually a radula with a single lateral tooth on each side and a rachidian is present. The foot is usually forked posteriorly and lacks parapodia and the penis is armed.

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