

# Notes on the systematics, morphology and biostratigraphy of fossil holoplanktonic Mollusca, 24<sup>1</sup>. First observation of a genuinely Late Mesozoic thecosomatous pteropod

ARIE W. JANSSEN

Naturalis Biodiversity Center (Palaeontology Department), P.O. Box 9517, NL-2300RA Leiden, The Netherlands

JAMES L. GOEDERT

Burke Museum of Natural History and Culture, University of Washington, Seattle, Washington 98195, U.S.A.;

author's post address: P.O. Box 153, Wauna, Washington 98395, U.S.A.

A single specimen of a limacinid thecosomatous pteropod is recorded from Late Cretaceous (late Campanian) rocks of the northeast United States of America. It represents the oldest known occurrence of this gastropod group, predating the next form from the latest Paleocene of Europe and the U.S.A. by some 20 million years.

Key words: *Heliconoides*, Cretaceous, Campanian, first occurrence.

## INTRODUCTION

Currently, the stratigraphically earliest thecosomatous gastropods are assumed to be of latest Paleocene age (Janssen & King, 1988: 358, fig. 168). The oldest species on record, prior to the present note, was the limacinid *Heliconoides mercinensis* (Watelet & Lefèvre, 1885), originally described from Ypresian (Early Eocene) strata of the Paris Basin (France), but already occurring in late Paleocene rocks in the North Sea Basin (Denmark, England) and in Alabama, U.S.A. (Janssen & Peijnenburg, 2013: 347, fig. 19.7).

Formerly, many Palaeozoic forms, such as representatives of the genera *Conularia*, *Hyolithes*, *Phragmotheca*, *Pterotheca* and *Tentaculites* (see e.g., Barrande, 1867, and references therein), were thought to represent Pteropoda on account of their morphological resemblance to Recent species. To date, such fossils are

assigned to several other extinct groups and are no longer thought to constitute pteropods. For some, the molluscan nature is even in doubt (Brookes Knight et al., 1960: 324).

A widely discussed Jurassic fossil from Switzerland, referred to as 'Organisme C' by Favre & Richard (1927), was later described as a new pteropod species, *Vaginella striata*, by Carozzi (1954: 111, fig. 1, plate-figs 1-38). However, Farinacci (1963) was of the opinion that it might well represent a teredinid bivalve of the genus *Bankia*. Eventually, it was recognised as a plant fossil (green algae, Dasycladophyceae, *Campbelliella striata*), by Bernier (1974), as subsequently acknowledged by Flügel (2004: 440).

Further latest Mesozoic (Cretaceous) pteropod occurrences were published by Blanckenhorn (1889, 1934), who described several pteropod species from Syria and Turkey, but these finds were later (Avnimelech, 1945) recognised as being of Miocene age.

Troelsen (1938: 183, figs 1-2) introduced the 'pteropod' *Hyalocylix* (?) *ravni* from 'Senonian' (= late Maastrichtian) rocks in Denmark. However, Voigt (1952: 148, pl. 8 figs 1-13) demonstrated that these, in fact, represent spiculae of siliceous sponges (Porifera).

In their first attempt to construct a biostratigraphical zonation based on pteropods, Janssen & King (1988) designated a number of pteropod zones for the late Palaeocene-Pliocene interval of the North Sea Basin, but included the oldest known (i.e., late Paleocene) species in their zone PZ 6, leaving the numbers 1-5 for possible future records of earlier occurrences.

<sup>1</sup> For no. 23 in this series see Basteria 77 (1-3): 13-16 (2013).

In the present paper we describe the first known Late Mesozoic euthecosomatous pteropod, from upper Campanian rocks of the northwestern United States.

#### MATERIAL AND METHODS

The diminutive specimen was discovered by one of us (JLG) on the fractured surface of an internal mould of the bivalve *Inoceramus vancouverensis* Shumard, 1858 and was carefully removed from the matrix (by AWJ) to enable SEM imaging. The fossil was collected on the beach along the southern end of a small island locally referred to as Little Sucia Island, just southwest of Sucia Island (Fig. 1). The fossil is housed in the collections of the Burke Museum of Natural History and Culture, University of Washington, Seattle (abbreviated UWBM), and in order to maintain the connection between the pteropod and the inoceramid that it was associated with, they are both catalogued under a locality number that will not be used for any other fossils from Little Sucia Island.

The bedrock of this small island, from which the *Inoceramus* shell originates, is concretionary sandstone of Late Cretaceous (early to middle Campanian, *vancouverense* Zone) age, the Cedar District Formation (Clapp, 1912; Haggart, 1991), identical to that exposed on the southwest side of Sucia Island itself.

Fossils from Cretaceous strata exposed on Sucia Island (and on Little Sucia Island) have been studied for over 150 years (e.g., Meek, 1861, 1876), but the molluscan fauna has never been the subject of any detailed, monographic treatment. McLellan (1927) mapped the strata on Sucia Island and described some fossils, while in more recent times there has been some work on specific taxa or groups (e.g., Blake, 1973; Ward, 1978; Haggart, 1989, 1991; Haggart & Ward, 1989; Squires & Saul, 2006; Saul & Squires, 2008; Squires & Graham, 2014) that include fossils from Sucia Island. The Cedar District Formation on Sucia Island has recently been dated as early to middle Campanian, corresponding to global chron C33r, according to Ward et al. (2012), and indicated to have been deposited in a 'shallow marine – shelf'. In places, plant fossils are common, inclusive of permineralised fruits and seeds, leaves and fragments of wood (JLG, pers. obs.); a dinosaur bone has recently been recorded as well (Peacock & Sidor, 2015). A terrestrial gastropod is also known (Roth, 2000) and other small to minute marine molluscs abound. In many cases gastropod protoconchs are well preserved, but most of these have not been studied. Larval ammonites are not uncommon; these all preserve sutures, even in the smallest specimens that we have collected, making differentiation from gastropods straightforward.



Fig. 1. Geographical position of Little Sucia Island, San Juan Islands, San Juan County, Washington State, U.S.A. The locality that yielded the specimen discussed herein is marked with a red cross.

#### SYSTEMATIC PALAEOLOGY

Class Gastropoda Cuvier, 1797

Order Thecosomata de Blainville, 1824

Superfamily Limacinoidea Gray, 1847

Family Limacinidae Gray, 1847

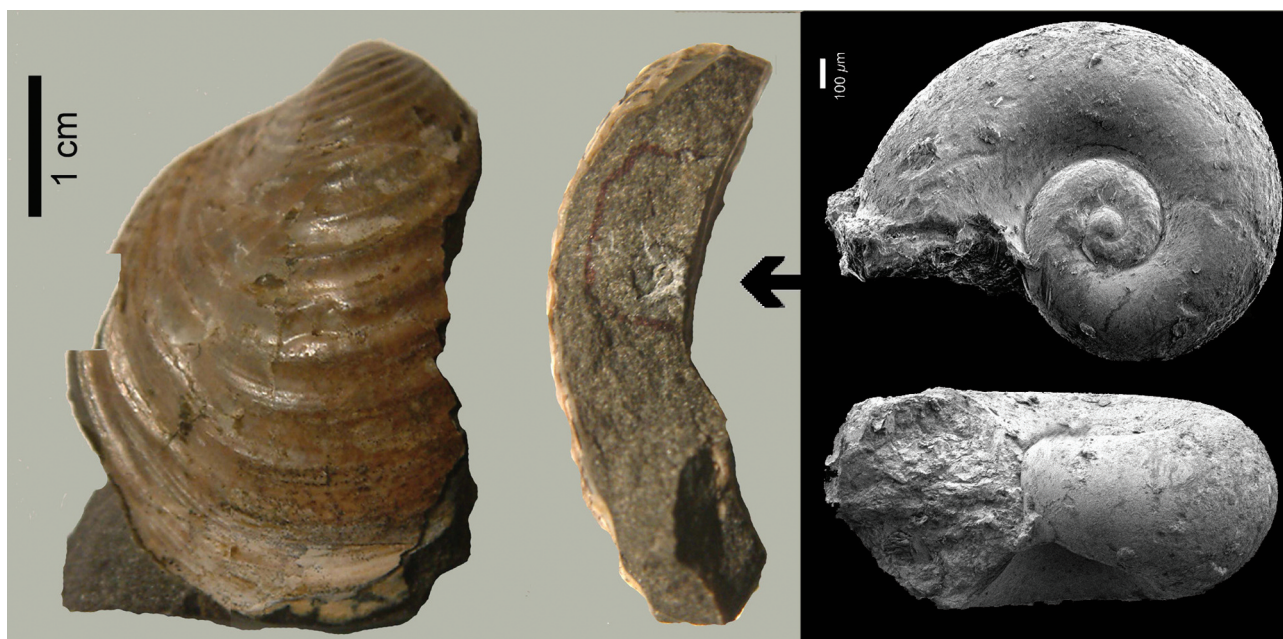
*Heliconoides* d'Orbigny, 1835

Type species. – '*Atlanta inflata* d'Orb.', by subsequent designation of Herrmannsen (1847: 514) = *Heliconoides inflatus* (d'Orbigny, 1834) (Recent).

*Heliconoides* sp. (Fig. 2)

Description. – Internal mould of a limacinid of planorboid shape, H 0.46, W 0.90 mm, consisting of 2¼ rounded whorls, regularly increasing in diameter and separated by an incised suture. The nucleus of the protoconch is slightly globular and not sharply demarcated from later whorls. The periphery of the last whorl is perfectly rounded. The umbilicus occupies one-fifth of the shell's diameter. The shape of the aperture seems to have been circular, but is concealed by matrix; a very small part of the upper apertural margin is retained, showing it to have been slightly widened in this form.

Material. – A single specimen, UWBM 104227, in internal mould preservation, isolated from an internal mould of the right valve of *Inoceramus vancouverensis*



**Fig. 2.** *Inoceramus vancouverensis* Shumard, 1858 (left; UWBM 104228) in dorsal and anterior lateral view, with the specimen of *Heliconoides* sp. (right, apical and apertural views; UWBM 104227) still in situ.

Shumard, 1858 (UWBM 104228), collected by the second author, on June 29, 2010.

Locality (Fig. 1). – UWBM locality no. B8357; from a concretion found loose on the beach terrace at the base of the cliff on the southern end of Little Sucia Island, San Juan Islands, San Juan County, Washington State, GPS co-ordinates: 48.752410° N, 122.916947° W; Cedar District Formation (Late Cretaceous, early to middle Campanian).

Discussion. – The present specimen closely resembles *Heliconoides mercinensis* and differs only, as far as can be observed, in having one whorl less. The apparently widened apertural margin likens UWBM 104227 to *Heliconoides*, which is, as explained by Janssen (2003: 168), undoubtedly a polyphyletic genus in which species are grouped by the possession of apertural reinforcements of various shapes.

Considering the marked time interval between the present occurrence and the next younger species (more than 20 myr), it appears very likely that this specimen represents an undescribed species, but introducing a new name on the basis of a single, rather poorly preserved specimen appears premature and we prefer to retain it in open nomenclature for the time being.

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This paper is dedicated to Robert G. Moolenbeek at the occasion of his retirement.

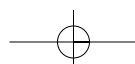
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