

# THE NEW SOUTH WALES PYRAMIDELLIDAE AND THE GENUS *MATHILDA*.

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(Figures 1-98.)

## INTRODUCTION.

This paper is intended primarily as an illustrated check-list of the species of Pyramidellidae of the Neoperonian Zoogeographical Province, and it includes mainly gasteropods with heterotrophe protoconchs. This widens the family limits as dealt with in Hedley's Check List (1917), but in addition to affording a more convenient classification, it is in general keeping with present-day opinion abroad. Opinions as to the phylogenetic value of the protoconch may differ, but in some families it is of undoubted importance. Here, at least, it affords a very definite character which, in the absence of any knowledge of anatomy and life history, links a number of shells with many other characters in common.

The family is old geologically and has a world-wide range, and the list of known species is great and continually growing. Of late years some detailed research on the animal and its life history has been done in Europe and America, but in Australia the systematist still holds the field. Here the immediate necessity is to determine and list the numerous species, so that deeper research may begin. In New South Wales the only knowledge of the animal so far is the description and figure of *Linopyrga pascoei* by Charles Hedley (1916). Hedley points out that this agrees very well with the animal of the other species of the family, as known elsewhere. Anatomically, the absence of a radula is held as a family characteristic, as is the presence of a horny, pauci-spiral operculum, notched to conform with the columella fold, and with the nucleus sub-marginal and anterior.

## THE HETEROTROPHE PROTOCONCH.

This type of protoconch is very distinctive and varies little right throughout the family. Its peculiar form depends on the fact that in its larval state the animal is sinistral while in the adult stage it is dextral. The actual change takes place within and before the close of the larval period; it may be comparatively rapid or more or less prolonged, and there is nearly always a stage during which the symmetry of the animal is balanced and the resultant shell is in the form of a straight tube. It is these factors which make slight differences in the apices of the different species.

Typically the extreme nucleus is sinistral, consisting of generally two, but sometimes three or even four helicoid whorls, the first minute, the second inflated. When the change to the dextral form is rapid the whorl bends right back on itself and, still in the larval stage, encloses or passes below the apex in half or even a complex dextral whorl. At the close of the larval stage there is a pause, and the protoconch may be separated from the first adult whorl by a distinct varix which is, however, rarely visible. The angle the first dextral turn makes with the sinistral nucleus has a varying effect. In some species the nucleus is so enfolded as to be quite invisible; in many of the Turbonillas it lies recumbent on the peak of the adult shell. In the Eulimellas, particularly, the neutral stage, that is between sinistral and dextral, is so prolonged that the whole protoconch is extended, or lies at an angle with the axis of the mature shell. Figures 95-98 show protoconchs of four species of different genera, and illustrate variations in the coiling.

An important aspect of the heterotrophe protoconch is that recent research suggests that it shows a free-swimming larval stage. Larval sinistral shells have been found in numbers in plankton in European waters, and have been dealt with comprehensively by the Danish zoologist Gunnar Thorson (1946). He has identified these with local species of Pyramidellidae, and holds the view that the sinistral types are free-swimming