

As the genus *Spisula* has a generalised morphology and the least complex hinge in the Mactridae, it seems reasonable to suppose that other Mactrids evolved from a shell of similar form to that genus.

EVOLUTION OF *Resania*

In the Tongaporutuan and Opoitian Ages (and presumably in the time between) two forms of *Resania* inhabited New Zealand. One was a very elongate form, *elongata* n.sp., and the other was considerably shorter and higher and is considered to have evolved into the Pleistocene and Recent *R. lanceolata*.

As *Resania* is considered to have evolved from a *Spisula* type of shell, the more elongate form might be thought to be the more advanced. This is *R. elongata*, the oldest species. The relationship of the two types of shell is difficult to assess. It is possible that the groups diverged very early, e.g., in the Eocene, and one group evolved more rapidly than the other, producing the extreme *R. elongata*. The other group perhaps evolved more slowly, and was more tolerant of falling water temperatures in the Upper Tertiary, thus surviving to the present day as *R. lanceolata*.

An alternative possibility seems more likely. In the *exoptata-lanceolata* group the direction of change of shape is the reverse of what would be expected if the more elongate form is the more advanced. All records of *R. elongata* are from the basin on the east side of the North Island, from Hawke's Bay to north of Gisborne. Records of *R. exoptata* of the same age are from the basins covering the western side of the North Island. The Taranaki Basin was probably in contact with the East Coast sea through a rather narrow channel only, to the south of the present Tongariro National Park area. During warm Lower and Middle Tertiary times *R. elongata* may have been widespread in New Zealand, and part of the stock may have been isolated in the west by the diminishing of basins of deposition, during later Tertiary times. In this view *R. exoptata* would have evolved in the isolated basin through response to changing environment, particularly falling water temperature, while the more widespread original species, *R. elongata*, was unable to evolve at the necessary rate to survive. The *exoptata* stock would then be able to invade the rest of the country as conditions permitted, and by the Waitotaran was living in Hawkes Bay. This form evolved into the Pleistocene and Recent *R. lanceolata*, which now lives throughout the two main islands.

The existence of *R. elongata* in the Lower or Middle Miocene indicates that the genus had already undergone a long evolution, but the details of this are quite unknown and are likely to remain so.

EVOLUTION IN *Zenatia*

The most important character for determining relationships in *Zenatia* is the cardinal angle, and the second most important is the form of the lunule. They indicate that the main line of evolution was from *Z. cretacea* through *Z. cf. acinaces* to *Z. acinaces*. These three forms appear to represent a classical case of recapitulation, as the adult lunule and adductor groove of *Z. cretacea* are found in juveniles of *Z. acinaces*. *Z. cretacea* appears to have had no distinct juvenile form. Each form in turn occupied almost all of New Zealand, commencing with *Z. precursor* in the early Tertiary and continuing with *Z. acinaces* in the present day.

While the present unusual lunule and anterior adductor scar of the main lineage were developing, a second lineage was evolving in the north of New Zealand.