

the lower one divided in two at the anterior edge of the callus rib (as also happens in a few individuals of *Z. acinaces*) and very close to the posterior dorsal corner of the adductor scar. Posterior muscle scars not seen. Cardinal angle low, not visible in the holotype (a closed specimen) but ranging from 46 to 62deg. in four paratypes and averaging 56.25deg. External growth ridges prominent but radial ridges weak, tending to lie in rather straight lines parallel to the dorsal margin.

#### Dimensions

	Valve	Double		Height	Cardinal Angle
		Inflation	Length		
Holotype	double	24.5	90.4	41.6	—
Paratype, Waipipi Formation	double	23.9	96.0	38.0	—
Paratype, Waipipi Formation	left	—	82.1	37.9	58
Paratype, Waipipi Formation	right	—	—	32.9	62
Figured paratype, Waipipi Formation	left	—	—	—	46
Paratype, Bremer Shell Grit	right	—	—	—	59
Paratype, Rawhitiroa Track	right	—	60+	27.3	—

Average cardinal angle = 56.25deg.

Localities: G.S.4254, Waipipi Formation half a mile west of mouth of Wairoa Stream, near Waverley, Wanganui District, holotype and four paratypes (Waipipian); G.S.4250, Bremer Shell Grit one and a half miles west of mouth of Wairoa Stream and one third of a mile west of Snapper Point, near Waverley, Wanganui District, two incomplete paratypes (Waipipian); G.S.1167, Kapara, Taranaki, one incomplete paratype (Waipipian); G.S.1168, track between Rawhitiroa Road and Te Rere-O-Haupā Waterfall, Taranaki, one incomplete paratype (Waipipian); other poor specimens are known from G.S.1166, Ngamatapouri, Taranaki (Waipipian) and G.S.1172, Waingongoro River, South Taranaki (Waipipian).

This species has the relatively great inflation, rounded posterior outline and low cardinal angle of *Zenatraria*. It is more like *Zenatia* s. s. in shape than is *Z. vellai*, and has pedal retractor scars similar to those of *Z. acinaces*.

Figured specimens: the photograph in Plate 1, figure 6, is of the holotype (T.M.3842). This is a closed double-valved specimen. The paratype (T.M.3843), figured in text-figure 1c is the only specimen in which the muscle scars can be seen.

## EVOLUTION

### EVOLUTION OF THE SUBFAMILIES

It is thought that the burrowing mode of life has been evolved many times in the Mactridae, from many different starting points. Several elongate Mactrinae show progression towards a *Lutraria* type of morphology. Such forms generally have a groove across the anterior adductor muscle scar. Mactrinae I have examined which show this feature include *Mactrotoma*, *Scalpomactra* and *Longimactra*. These presumably burrow more deeply than short Mactrinae such as *Mactra* and *Spisula*. The Subfamilies Zenatiinae and Resaniinae represent two of the lines which have led to different types of burrowing. Probably the Subfamily Lutrariinae, as defined by Dall (1898), is a heterogeneous assemblage. It seems likely that all these lines had begun to evolve by the Eocene at the latest, as they have a fossil history from the Oligocene in most cases, and were then already fully developed. The elongate Mactrinae mentioned above indicate the sorts of forms these subfamilies must have passed through in their evolution, but it is unlikely that they themselves represent the steps.