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A Redescription of the Rare Echinoid *Taimanawa mortenseni* Henderson and Fell (Spatangoida: Brissidae)

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Abstract

The only living species of the brissid *Taimanawa, T. mortenseni* Henderson and Fell, 1969, is redescribed from the first known complete specimen, collected recently from the outer North-West Shelf, Western Australia. Previously the species was known only from two broken fragments collected off the Kei Islands, Indonesia.

Introduction

Henderson and Fell (1969) erected the genus *Taimanawa* for two fossil and one living species of large spatangoids characterised by the possession of subanal, peripetalous and internal fascioles, primary tubercles confined to the posterior plate series of the paired interambulacra and a deep anterior notch. Four fossil species of *Taimanawa* are known from New Zealand: *T. pulchella* Henderson and Fell, 1969, from the Early-Middle Miocene; *T. greyi* (Hutton, 1870) from the Oligocene-Early Miocene; *T. prisca* Henderson, 1975, from the Late Eocene; and *T. rostrata* Henderson, 1975, from the Late Oligocene-Early Miocene.

The two fragmentary specimens upon which Henderson and Fell (1969) erected *T. mortenseni* were collected from off the Kei Islands, Indonesia, in 260 m of water. Mortensen (1951) had earlier been uncertain of the taxonomic position of the fragments, questioningly placing them in *Plagiobrissus.*

In August 1983, during trawling on the outer North-West Shelf of Western Australia by the 'FV Courageous', a single, complete test attributable to *T. mortenseni* was recovered. Associated spatangoids from this region include *Lovenia gregalis* Alcock, 1893, *Lovenia* sp. nov. and *Pericosmus porphyrocardius* McNamara, 1984. This paper provides the first full description of *T. mortenseni,*

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and documents the nature of the labrum, phyllode, adoral plating, posterior of the adoral surface of the test, spines and pedicellariae, which hitherto were unknown.

Measurements on the specimen were carried out using a vernier calliper to a precision of ± 0.1 mm. Relative sizes of features of the test are expressed as percentages of test length (%TL).

Systematics

Order Spatangoida Claus, 1876
Family Brissidae Gray, 1855

Remarks

Although *Taimanawa* possesses an internal fasciole, Henderson and Fell (1969) did not place it in the Loveniidae even though this family is characterised by the possession of an internal fasciole (Mortensen 1951). The genus *Breynia,* which has the three same fascioles, is placed in the Loveniidae. Henderson and Fell (1969) considered that *Taimanawa* is more closely related to a number of brissid genera, such as *Gillechinus* and *Plagiobrissus,* in particular, as it has long, narrow petals, a short labrum, crenulate tubercles, and lacks ampullae. The specimen described below provides nothing to suggest that, internal fasciole apart, *Taimanawa* should be placed in the Loveniidae. On the contrary, the presence of a long, narrow, parallel-sided plastron is far more in keeping with its placement in the Brissidae rather than in the Loveniidae. The presence of an internal fasciole further highlights the problem of using fascioles to provide a familial subdivision of spatangoids. The present, generally unsatisfactory, suprageneric, classification of spatangoids is based largely on the common occurrence of certain types of fascioles. Some problems with this approach have recently been discussed by McNamara and Philip (1980).

Genus *Taimanawa* Henderson and Fell, 1969

Type Species
T. pulchella Henderson and Fell, 1969: 3; by original designation.

Taimanawa mortenseni Henderson and Fell, 1969

Figures 1-4

Plagiobrissus sp. ? – Mortensen 1951: 503, pl.39, fig. 3.
Taimanawa mortenseni Henderson and Fell, 1969: 12-14, pl.5, fig. 1; – Henderson 1975: 47.

Material
The holotype and paratype (University Zoological Museum, Copenhagen) were collected from Station 32 of the Danish Expedition to the Kei Islands in 1922. The single specimen

described here (WAM 43-84), the only other specimen known, was collected from the North-West Shelf north-east of Rowley Shoals at 16°56'S, 120°06'E, from a depth of 431 m on 20th August, 1983 by P. Berry and N. Sinclair. Sediment associated with the specimen consists of a foraminiferal-rich mud.

Diagnosis

Anterior notch very deep and narrow; 23 well-developed pore pairs in anterior petals and 13-15 weakly crenulate primary tubercles in each of the paired interambulacra.

Description

Test large, 150 mm long; low; maximum height 43% TL, situated at apical system, which is 37% TL from anterior notch; ethmolytic, with four genital pores. Test widest at about mid-test length, width 92% TL. Anterior notch very deep, 10% TL, and narrow. Anterior ambulacrum barely sunken for adapical two-thirds of its course, then deepens rapidly adambitally. Internal fasciole narrow; 15% TL wide across apical system, extending one-third of length of anterior ambulacrum before disappearing; irregular and broken anteriorly. Peripetalous fasciole 69% TL wide at its widest point, slightly anterior of apical system. Anterior petals diverge at about 130°; slightly sinuous; sunken; reaching a maximum width of 5% TL at about half length; total length 33% TL; poriferous zones sub-parallel between fascioles, diminishing rapidly in width adapically, as pore pairs become very small; 23 non-conjugate pore pairs present between fascioles. Posterior petals diverge at about 55°; slightly shorter than anterior pair, being 30% TL long; possessing 21 pore pairs between fascioles; straight and nearly parallel; narrow close to internal fasciole, as pore pairs diminish in size. Posterior plate series of paired interambulacra possess 13-15 primary tubercles set in depressed embayment; tubercles perforate; very weakly crenulate with wide scrobicules. Anterior plate series of interambulacra 2 and 3 bear secondary tubercles close to anterior ambulacrum. Primary spines up to 43 mm in length; secondary spines up to 15 mm in length. Dense miliary spines fine and hair-like, up to 5 mm in length (Figure 1).

Anteriorly situated peristome slightly sunken; only 12% TL from anterior notch; 14% TL wide; only 2% long, as the short labrum projects strongly forward two-thirds of the way across peristome (Figure 2). Phyllode with 11 unipores in ambulacra II and IV; 7 in ambulacrum III; 6-7 in ambulacra I and V. Large periporal areas generally flattened, with slightly raised lateral lips. Adambitally, outermost phyllodal plates have slightly swollen periporal areas (Figure 3). Phyllodal tube feet black (on dried specimen); large; penicillate; discs with papillae, up to 5.5 mm wide (Figure 3). Plastron nearly parallel-sided; narrow, 28% TL; forming a keel, which intensifies adambitally. Periplastronal areas up to 15% TL in width; along with lateral interambulacra, relatively flat. Plate 2 of interambulacrum 1b does not bisect plate 1 and plate 2 of interambulacrum 1a. Subanal fasciole narrowly reniform, width 30% TL; encloses 5 pore pairs in ambulacrum I, and 6 in ambulacrum V. Periproct sunken, circular, diameter 10% TL.

Only two forms of tridentate pedicellariae are present; long and slender (Figure 4), and triangular-shaped with broad, spatulate distal terminations (Figure 4). The slender form reaches a length of 1 mm and is about five times as long as broad, the valves lengthening as the pedicellariae grow. In very small specimens

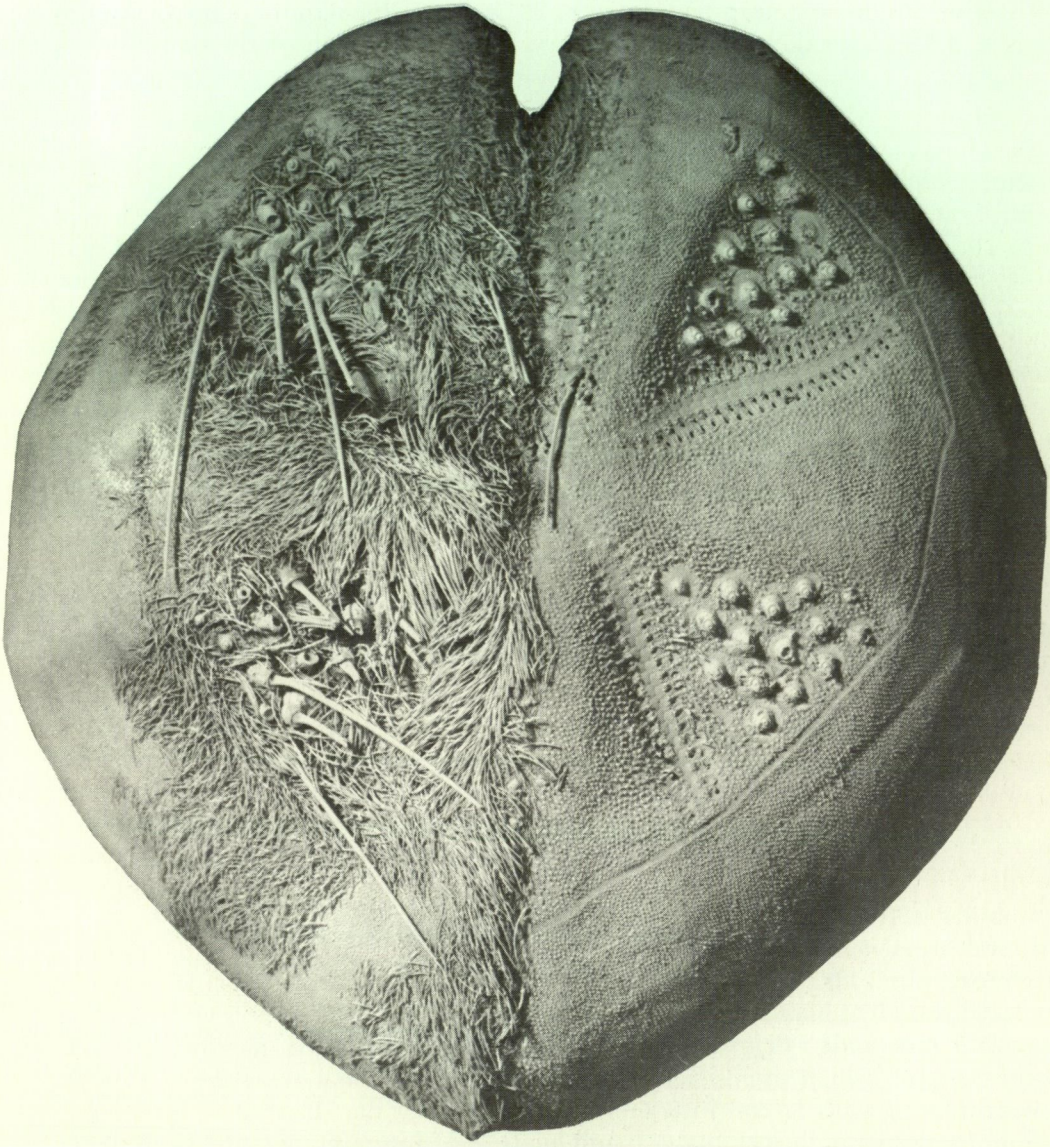

Figure 1 Aboral view of *Taimanawa mortenseni,* WAM 43-84, x 1.

the long, slender spatulate termination arises directly from the swollen base. With growth a thin shaft develops which may exceed the length of the spatulate termination and bear up to six irregularly positioned, double pointed denticles (Figure 4). The long, spatulate termination is edged by about 60 small (5μ long) interdigitating denticles (Figure 4). The broad tridentate pedicellariae are only half as long again as broad. Each valve has a broad spatulate termination about

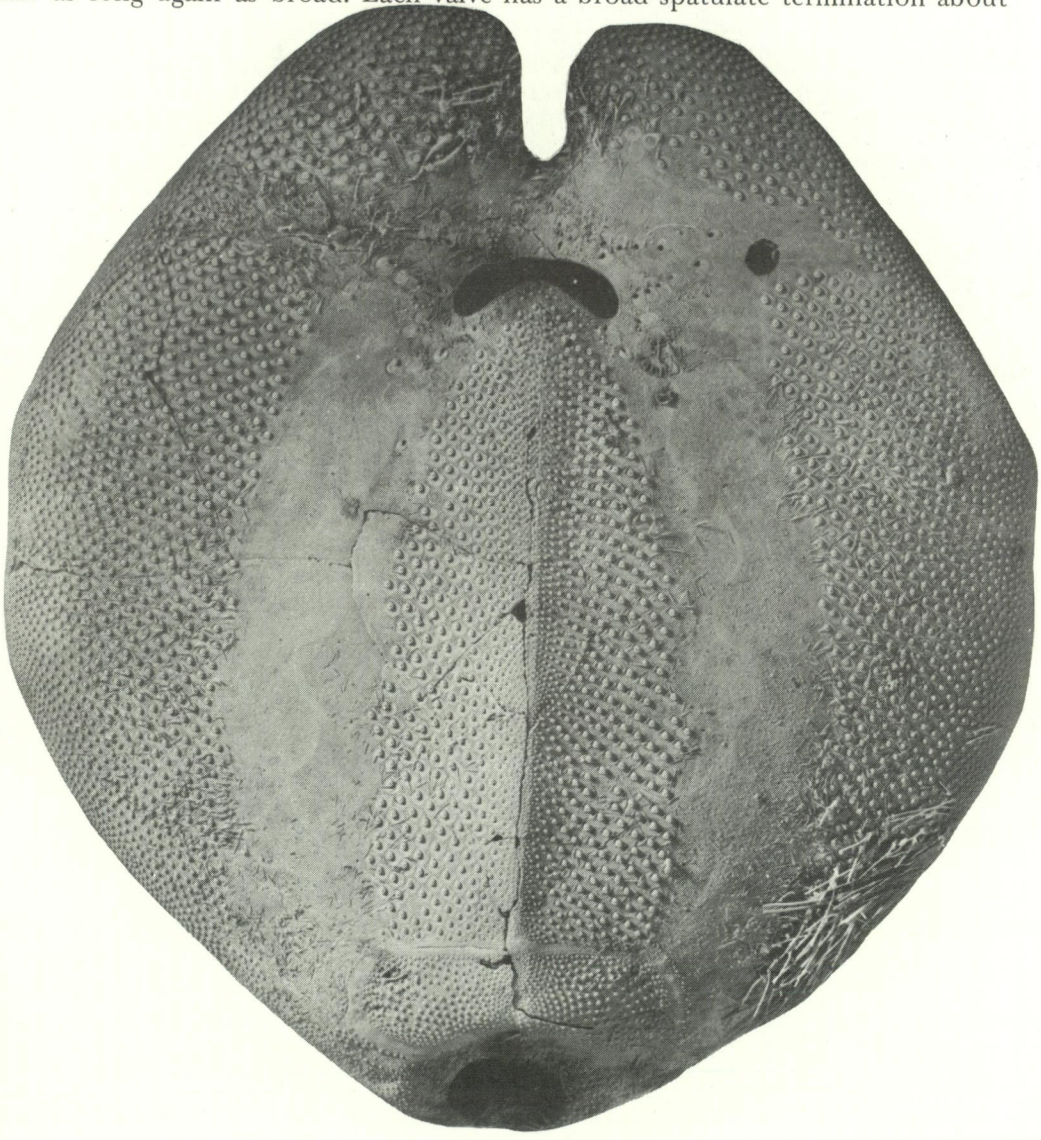

Figure 2 Adoral view of *Taimanawa mortenseni*, WAM 43-84, x 1.

two-thirds the width of the swollen base. It is tipped by a fine spine, and has finely denticulate edges. Near its base it may carry one or two large denticles. The broad form is confined to the aboral surface, whereas the slender form is more numerous and occurs over the entire test.

Remarks

Even though the type material is so fragmentary, there seems little reason to doubt that WAM 43-84 should be assigned to *T. mortenseni.* The North-West Shelf specimen and the holotype from the Kei Islands were collected about 1800 km apart. Both have a similar number of primary tubercles in the anterior paired interambulacra. There is a slight difference in the number of pore pairs in the anterior petals, 23 in WAM 43-84, 25 in the holotype. However, *T. greyi* shows a similar range of variations in this character (Henderson and Fell 1969: 11). The anterior of the holotype is damaged, but, like WAM 43-84, it seems to have possessed a very deep anterior notch. Both specimens are very large.

T. mortenseni can be distinguished from the four New Zealand fossil species by its larger size, longer petals, deeper anterior notch and less strongly crenulate

Figure 3 *Taimanawa mortenseni:* phyllodal pores in ambulacrum IV; note also a dried phyllodal tube foot; x 4.

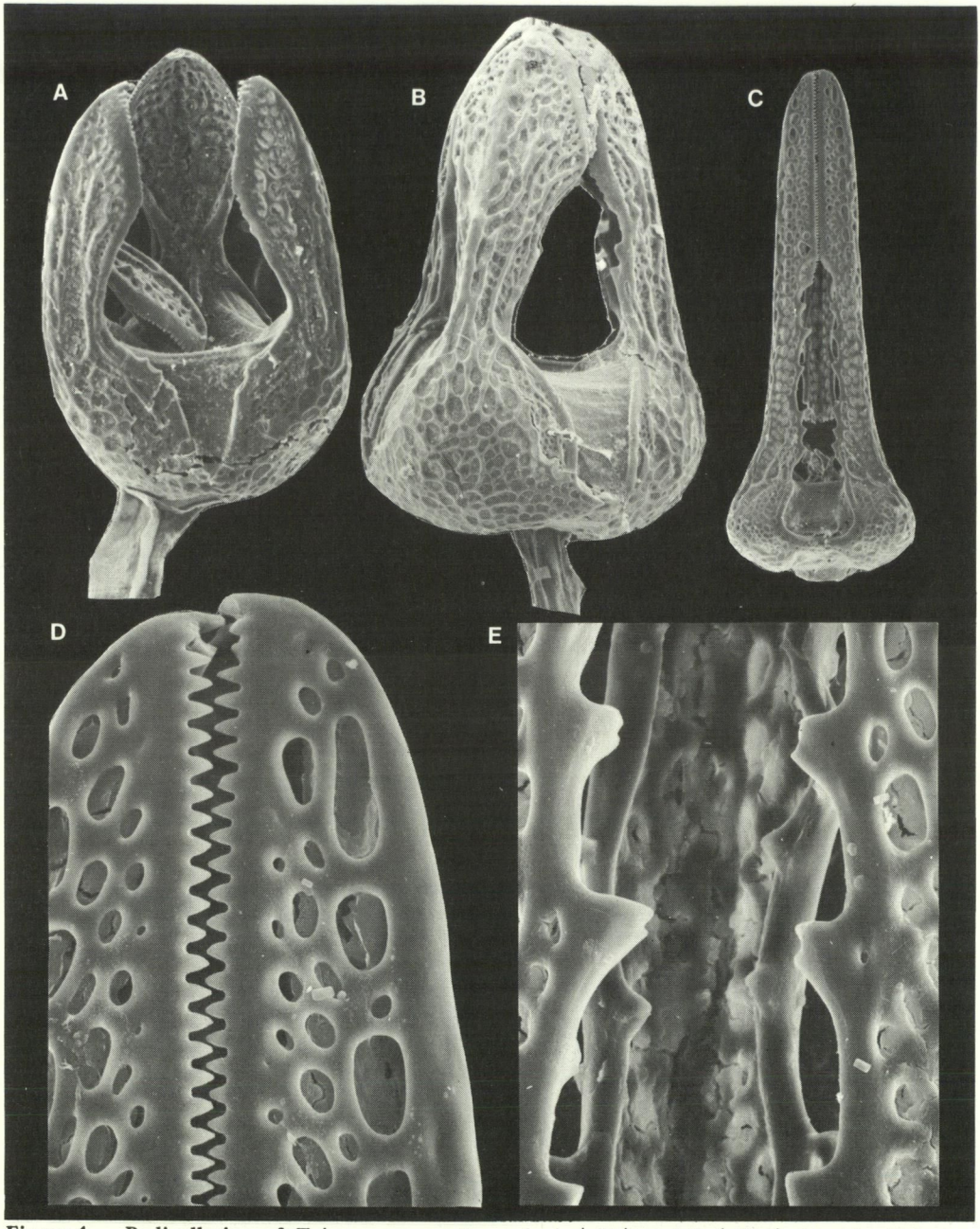

Figure 4 Pedicellariae of *Taimanawa mortenseni:* A (x90) and B (x110), broad tridentate form; C (x100), slender tridentate form; D (x750), enlargement of apex of C; E (x750), enlargement of denticles on shaft of C.

primary tubercles. It differs most from the oldest known species, the Late Eocene *T. prisca,* which is a much smaller form, with fewer primary tubercles and a much shallower, wider anterior notch. This species is close to *Gillechinus,* which is its presumed ancestor (Henderson and Fell 1969), essentially differing only in its possession of an internal fasciole. The three Oligocene-Miocene species are morphologically much closer to *T. mortenseni.* The youngest species, the Early-Middle Miocene *T. pulchella,* is, not surprisingly, most similar to *T. mortenseni,* differing only in its shallower anterior notch and shorter petals, with fewer pore pairs. In addition to its deeper anterior notch, *T. mortenseni* differs from *T. greyi* in its more anteriorly positioned apical system and fewer primary tubercles, and from *T. rostrata* in its longer petals and more numerous pore pairs in the paired petals.

The North-West Shelf specimen has a prominent circular hole in the anterior of the adoral surface of the test. A specimen of *T. pulchella* has a similar hole (Henderson and Fell 1969: 8). Both were probably attacked and killed by predatory gastropods. WAM 43-84, when collected, was covered by a large number of specimens of the lysianassoid amphipod *Scopelocheirus* (J. Lowry, pers. comm.), which were probably scavenging a recently killed individual. The trawl which contained the material from the North-West Shelf was capable of penetrating only slightly into the sediment. The recovery of only a single, dead test suggests the possibility that the living *Taimanawa* is a relatively deep burrower which escapes being picked up by a trawl which barely penetrates into the sediment.

Although Henderson and Fell (1969) considered the fossil species to be shallow water inhabitants, the living species is a moderately deep water, outer shelf species, having been collected from between 260 and 431 m.

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