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Oligocene Echinoids from Trelissic Basin, New Zealand

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Abstract

A small collection of early to middle Oligocene echinoids includes a new genus and new species of Temnopleuridae, and a new species of *Brissopsis* closely allied to the extant Indo-West-Pacific *B. luzonica*. The occurrence of *Brissopsis* in New Zealand so early as the Oligocene is significant, for the genus (though otherwise widely distributed) is unknown from South America and Antarctica; the Oligocene species is evidently an early member of the typical *Kleinia* assemblage, still surviving in the Indo-West-Pacific, and already known to have been present in Java in the Miocene. The ecology of *Brissopsis* forbids dispersal by epiplanktonic drift, and probably demands a benthal dispersal route. Such route must therefore have been lacking between New Zealand and South America (and Antarctica) since the Oligocene. The other Oligocene genera also point to Indo-West-Pacific derivation and contraindicate southern connexions of the New Zealand plateau.

THE following brief report on fossil echinoids from the Trelissic Basin, Canterbury, New Zealand, is intended merely to establish their nomenclature and to facilitate their citation in other contexts. The co-operation of the New Zealand Geological Survey, and in particular of Dr C. A. Fleming, is gladly acknowledged. I am grateful to Mr M. D. King, Victoria University of Wellington, for the photographs which illustrate the type specimens. The zoogeographic implications of the faunule are consistent with inferences previously drawn from study of Tertiary and Recent echinoderms of New Zealand and adjacent regions.

Order TEMNOPLEUROIDA

Family TEMNOPLEURIDAE

Goniosigma n. g.

A temnopleurid resembling *Grammechinus*, but differing in having the small secondary tubercles of the interradial (admedian) angles of the interamb plates arranged in vertical zig-zag series, parallel to the abradial sutures, so as to form sigmoid patterns on either side of the interradius. The generic name is of neuter gender.

TYPE SPECIES. *Echinus enysi* Hutton, 1873.

Goniosigma enysi (Hutton) (Plate 1, figs. 1, 2).

Echinus enysi Hutton, F. W. *Catalogue of the Tertiary Mollusca and Echinodermata of New Zealand,* 1873, p. 39.

DIAGNOSIS. As for the genus, only the type species being known.

Hutton's brief description matches the type, though the species would have been quite unrecognisable but for the preservation of the holotype in the collection of the N.Z. Geological Survey. The characteristic temnopleurid sculpture and non-crenulate imperforate tubercles are not mentioned by Hutton, nor the sigmoidal pattern of the secondary tubercles, the distinctive feature of the genus; no figure was given. Hutton's name may, nonetheless, be retained on the basis of the labelled holotype specimen.

The genus *Grammechinus* Duncan and Sladen was recorded from New Zealand by Hawkins (1925) on the basis of *Echinus enysi*, and this determination was accepted by Fell (1953). However, a review of the temnopleurid genera since carried out suggests that *E. enysi* should not be referred to *Grammechinus*, for the differences from the type of that Indian Miocene genus (indicated in the diagnosis of *Goniosigma*) are of the order now regarded as generic rather than specific. Other differences of lesser value are the presence on each ambital amb plate of one primary and one secondary tubercle (as opposed to three similar tubercules in *Grammechinus*), and the lack of horizontal sunken sutural depressions in *Goniosigma*. The two genera are doubtless related, and both share the unusually broad interambulacral plates, bearing a horizontal series of enlarged secondary tubercles, with a slightly larger primary placed midway along the series. *Goniosigma*, though restricted to New Zealand, should probably be considered as an Indo-West-Pacific element therefore.

HOLOTYPE. Registration No. EC272, in the collection of the New Zealand Geological Survey. Horizontal diameter 28 mm, height approximately 16 mm. Apical region lost. Peristome obscured, but evidently small, approximately 8 mm diameter.

LOCALITY. "Broken River (L)", Trelissic Basin, Canterbury.

HORIZON. Whaingaroan-Duntroonian (Lower-Middle Oligocene).

Irenechinus Fell, 1963

Genotype: *Irenechinus hentyi* Fell, 1963, *Mem. Nat. Mus. Victoria.*

Irenechinus minor n. sp. (Plate 2, figs. 3, 4).

DIAGNOSIS. Differing from the type species in having less numerous secondary tubercles, which are arranged more densely, so as to leave no areas of smooth test between the epistromal ridges; differing also in having the epistromal ridge completely encircling the pore-pairs of each amb-element, instead of being mainly developed around the aboral and lateral margins of each pore-pair.

HOLOTYPE. Registration No. EC273, in the collection of the New Zealand Geological Survey. Horizontal diameter approximately 9 mm, height approximately 7 mm. Apical region lost. Peristome obscured.

LOCALITY. An old collection from the Trelissic Basin, Canterbury, from either the Lower Tuffs of Tuffs between limestones.

HORIZON. Whaingaroan-Duntroonian (Lower-Middle Oligocene).

REMARKS. The species closely resembles *Brochopleurus* spp. but differs in having crenulate primary tubercles, the diagnostic character by which *Irenechinus* is distinguished from *Brochopleurus*. The crenulations can be observed on those primary tubercles which have not been excessively abraded or leached, and number 12–16, according to the size of the tubercles. They could not be observed on secondary tubercles. *I. minor* is considerably smaller than *I. hentyi* (h.d. 15 mm),

and the crowded secondaries do not form spaced series like strings of pearls, as they do in the latter. The more generalised character of *I. minor* is in accordance with its occurrence in an older horizon (Lower-Middle Oligocene) than that from which the Victorian species is known (Batesfordian, Lower Miocene). Despite its smaller test, *I. minor* has the same number of amb-plates (13–14 in each series), and interamb-plates (11 in each series) as does the larger genotype species. No other species of *Irenechinus* is so far known. The new species points to *Brochopleurus* as the probable closest relative of *Irenechinus* among the Temnopleuridae, and it would not be surprising if traces of crenulation will be found in one or other of the species of *Brochopleurus,* in much the same way as vestigial crenulation has been observed in *Pseudechinus* spp., the latter genus being also a suspected derivative of *Brochopleurus* (Fell, 1962).

A fragment of what may be an immature specimen of *I. minor,* N.Z. Geol. Survey Reg. No. EC274, carries the locality Coleridge Creek, Tuff in Marl, GS3355, age Whaingaroan-Duntroonian; its identity, however, is uncertain as it is badly leached. On this smaller test, horizontal diameter ca. 7 mm, the primary tubercles of the amb are closer together, with few intervening secondaries, and the dense tuberculation is reminiscent of *Arbacina,* a genus from which *Brochopleurus* and *Irenechinus* might have arisen.

Order SPATANGOIDA

Family BRISSIDAE

Brissopsis L. Agassiz

Subgenus **Kleinia** Gray, 1851

Subgenotype: *Kleinia luzonica* Gray, 1851

Brissopsis praeluzonica n. sp. (Plate 3, fig. 5; Plate 4, fig. 6).

DIAGNOSIS. As *luzonica,* but differing in having the abradial pore of each zygopore on the lateral ambs fully developed, and equal in size to the adradial pore. The anterolateral ambs are of the same length as the posterolateral ambs, but diverge laterad somewhat more strongly than in *luzonica,* forming an angle of approximately 50° with the anterior unpaired amb, as against about 40° in *luzonica.*

HOLOTYPE. Registration No. EC275, in the collection of the New Zealand Geological Survey. Length approximately 58 mm, breadth approximately 46 mm, height approximately 30 mm (estimated, the adoral surface lacking).

LOCALITY. An old collection from the Trelissic Basin, Canterbury, from either the Lower Tuffs or Tuffs between limestones.

HORIZON. Whaingaroan-Duntroonian (Lower-Middle Oligocene).

A second and badly crushed specimen EC276, possibly referable to the same species, is labelled as from GS5117, lower tuffs at Gorge, Broken River, Trelissic, and considered to be of the same age.

Brissopsis praeluzonica closely resembles the Recent species *B. luzonica,* the type of the subgenus *Kleinia.* The subgeneric character, namely the confluence of the posterolateral ambs, which shape a sweeping curve with the anterolateral ambs, is here developed almost exactly as in *luzonica,* with only the distal 6–7 zygopores developed in the inner series, where the extremity of the amb is turned outwards. The fasciole has been lost, as also the whole of the adoral surface.

Brissopsis (*Kleinia*) *latior* Herklots, from the Miocene of Java has been considered by Mortensen (1951) as a probable ancestor of the Recent *B. luzonica*. The present species, of Oligocene age, has equal claim to be so regarded. *B. luzonica* in Recent seas ranges between the Red Sea, Mozambique, South Japan, Hawaii, Tahiti and Queensland, in depths of 10–1,000 (? 2,000) m. The *Challenger* record of the species from New Zealand has been shown (Fell, 1958) to be a probable misidentification of juvenile *B. oldhami*. The genus *Brissopsis* is widely represented, but is conspicuously absent from South America, as also from the Arctic and Antarctic. Its presence in the New Zealand Oligocene, and its representation then by a species so close to *luzonica*, must indicate an Indo-West-Pacific element in the fauna. Species of *Brissopsis* occur on soft bottom. The great majority of Recent New Zealand samples (of *B. oldhami*) come from depths between 600 and 1,000 metres, though it ranges up to the outer part of the shelf, in 100 metres. The ecology of *Brissopsis*, and its fragility, would effectively exclude epiplanktonic dispersal. Hence its absence from South America and Antarctica does not imply a lack of mid-Tertiary West-Wind-Drift, but suggests an absence of bathyal dispersal routes. Ecological factors may have limited the dispersal of the other echinoids mentioned here.

Hutton (1873, p. 41) described *Kleinia conjuncta* from Grey River. The description, which lacks figures, suggests that the species was correctly placed in *Kleinia*, but does not permit closer identification for unfortunately the holotype has been lost. A supposed syntype in the collection of the N.Z. Geological Survey is an indistinct internal and external mould, and cannot be determined even to genus. In these circumstances, therefore, the specific name *conjuncta* is a *nomen nudum*.

CHECK LIST

The following Oligocene echinoids are now known from the Trelissic Basin.

CIDAROIDA

1. *Histocidaris mackayi* Fell, 1954.
(*Nom. corr., pro H. mckayi*, as now required by *Règles.*) GS243: Fan Coral Bed, coll. J. D. Enys, 1866, 1879. Isolated radioles, EC 144. Duntroonian. See Fell, H. B., 1954, *Pal. Bull.* 23 (N.Z. Geol. Surv., Wellington). The species is known from other Duntroonian and Waitakian localities in the South Island.

TEMNOPLEUROIDA

2. *Goniosigma enysi* (Hutton, 1873), herein.
3. *Irenechinus minor* n. sp., herein.

SPATANGOIDA

4. *Brissopsis praeluzonica* n. sp., herein.

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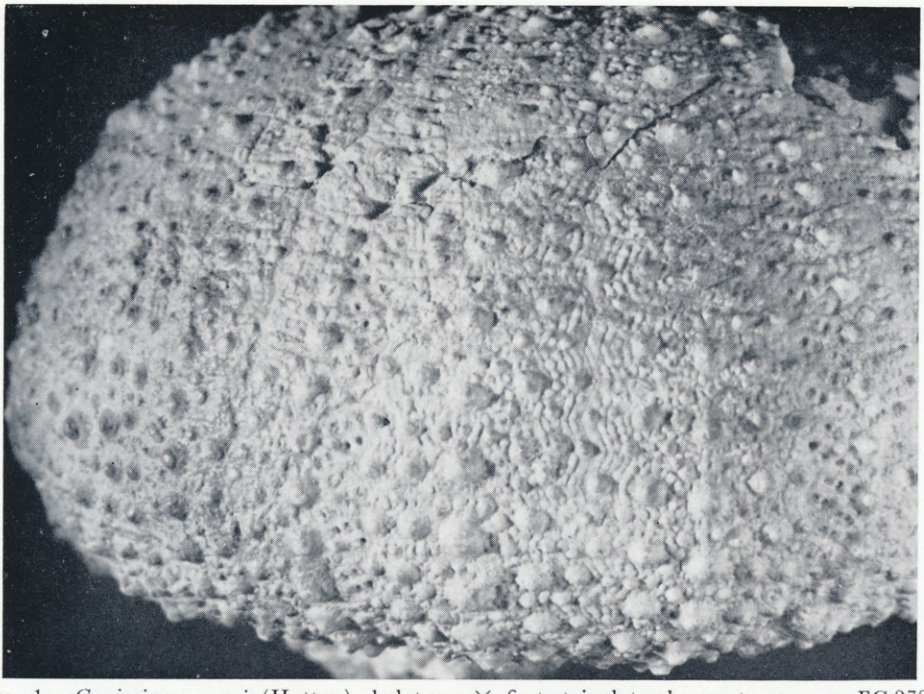

FIG. 1.—*Goniosigma enysi* (Hutton), holotype, × 6, test in lateral aspect; reg. no. EC 272, N.Z. Geological Survey.

Photo, M. D. King.

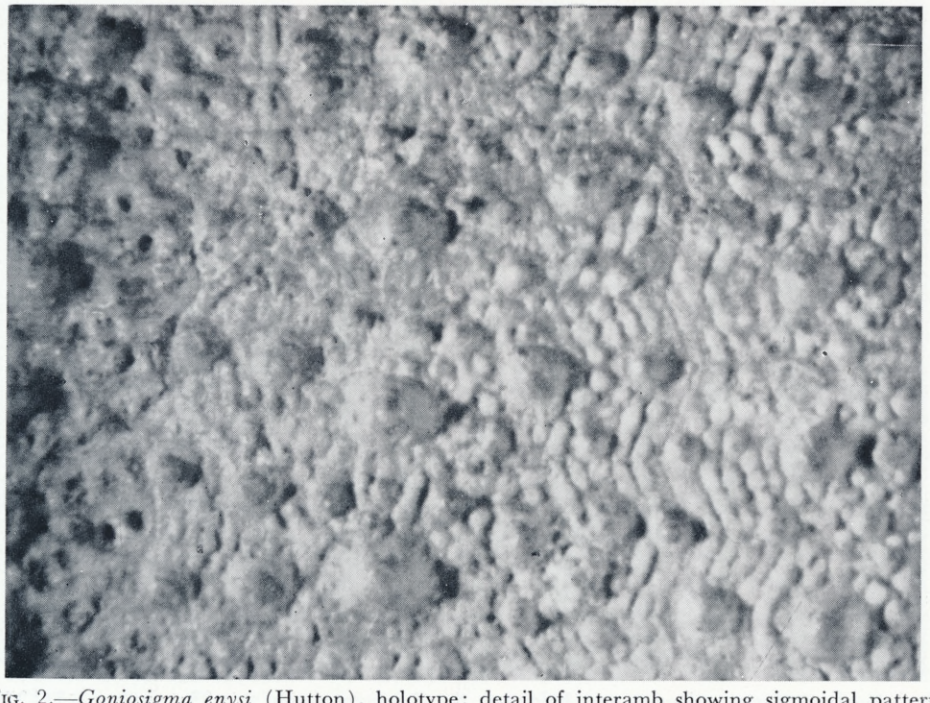

FIG. 2.—*Goniosigma enysi* (Hutton), holotype; detail of interamb showing sigmoidal pattern of secondary tubercles, and part of amb (on left side); × 15.

Photo, M. D. King.

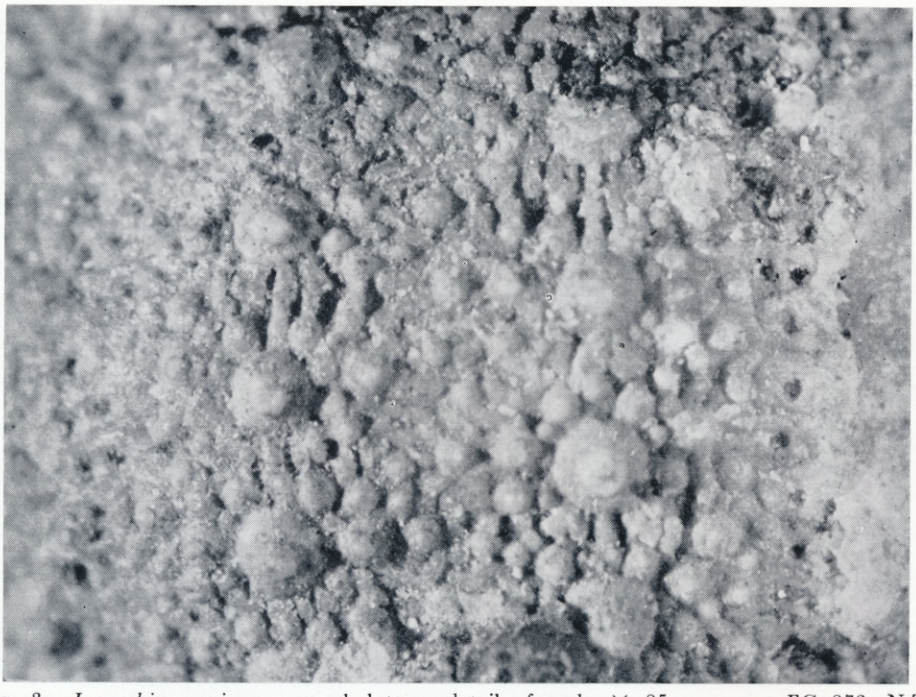

FIG. 3.—*Irenechinus minor* n. sp., holotype, detail of amb, × 25; reg. no. EC 273, N.Z. Geological Survey.

Photo, M. D. King.

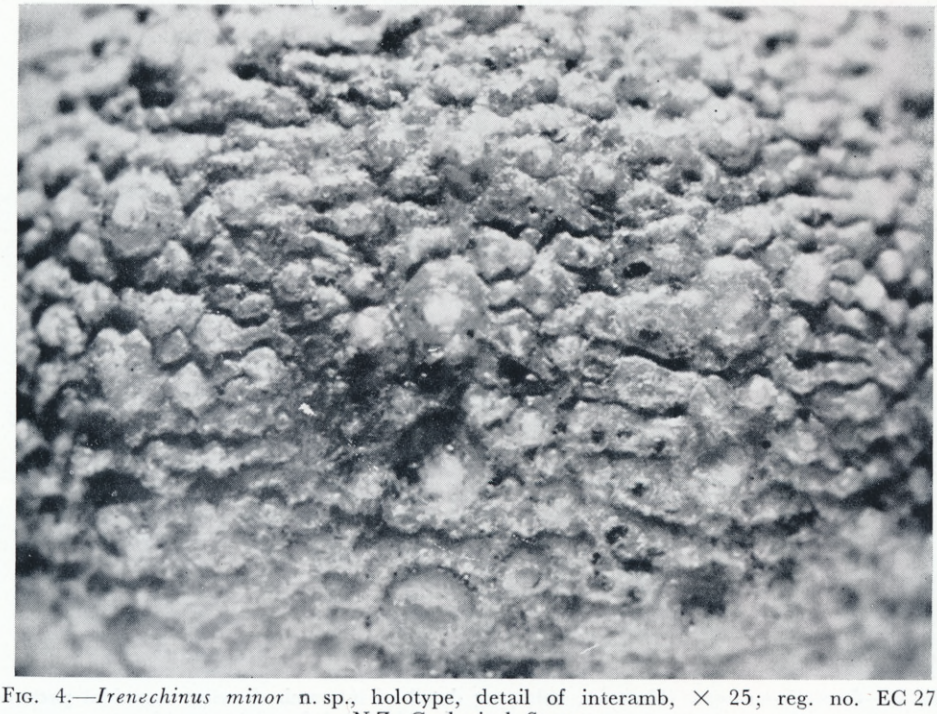

FIG. 4.—*Irenechinus minor* n. sp., holotype, detail of interamb, × 25; reg. no. EC 273, N.Z. Geological Survey.

Photo, M. D. King.

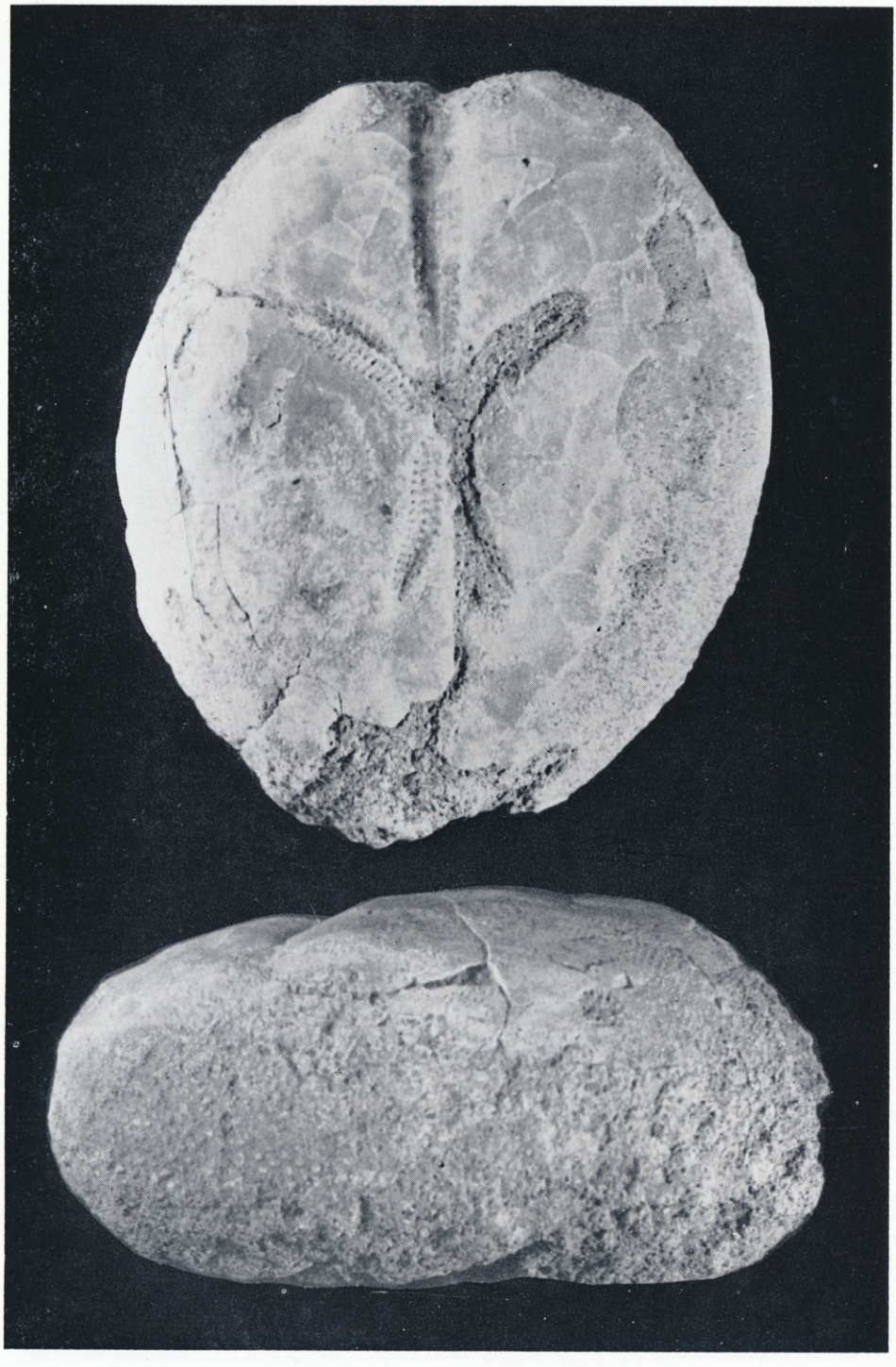

FIG. 5.—*Brissopsis* (*Kleinia*) *praeluzonica* n. sp., holotype, reg. no. EC 275, N.Z. Geological Survey. Above, aboral aspect; below, left lateral aspect; × 1.8.
Photo, M. D. King.

FIG. 6.—*Brissopsis* (*Kleinia*) *praeluzonica* n. sp., holotype, reg. no. EC 275, N.Z. Geological Survey. Detail of petals, × 3.5.

Photo, M. D. King.

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