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**Two New Species of *Benthopecten* (Asteroidea)
from New Zealand**

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Abstract

Two new species of *Benthopecten* are described from New Zealand waters; *B. pikei* from 550–630m in the Bay of Plenty, and *B. munidae*, from 740m off the Otago coast. This brings the total of New Zealand species to five. The affinities of the two new species seem to lie with the other New Zealand species.

INTRODUCTION

THE genus *Benthopecten* is widespread with at least 25 species; of these, 13 are known from the Northern Hemisphere, while the remaining 12 are from the Southern Hemisphere. The genus, apparently, is not represented in Arctic or Antarctic waters. The northern representatives show a scattered distribution with a concentration of species in the Indian Ocean region. Three of the southern species are known from the Indonesian region, three from the Atlantic, one from the tropical Pacific, and five species are now known from New Zealand waters. Fell (1958) described the first New Zealand species, *B. pentacanthus*, from the Bay of Plenty; two further species discovered recently, one from south of New Zealand and the other from the Cape Palliser region, are described elsewhere (Clark, in press). Of the species described here, *B. pikei*, is from the Bay of Plenty, and *B. munidae* is from the Otago area.

Order PAXILLOSIDA Perrier, 1884

Sub-order NOTOMYOTINA Ludwig, 1910

Family BENTHOPECTINIDAE Verrill, 1894

Benthopecten Verrill, 1884

***Benthopecten pikei* sp.n. Pl. 1, A, B, Fig. 1, A-D**

DESCRIPTION: Disc small, arms five, long, narrow, flattened, tapering, broken.

On disc centre (Fig. 1, A) plates lobed, contiguous, each bearing 1–4 short, finely rugose spines which may be webbed basally. Laterally on disc and proximally on arms, plates of two sizes with larger, arranged in three more or less parallel rows along midline of arms (Pl. 1, A, Fig. 1, A). Primary plates at base of each arm

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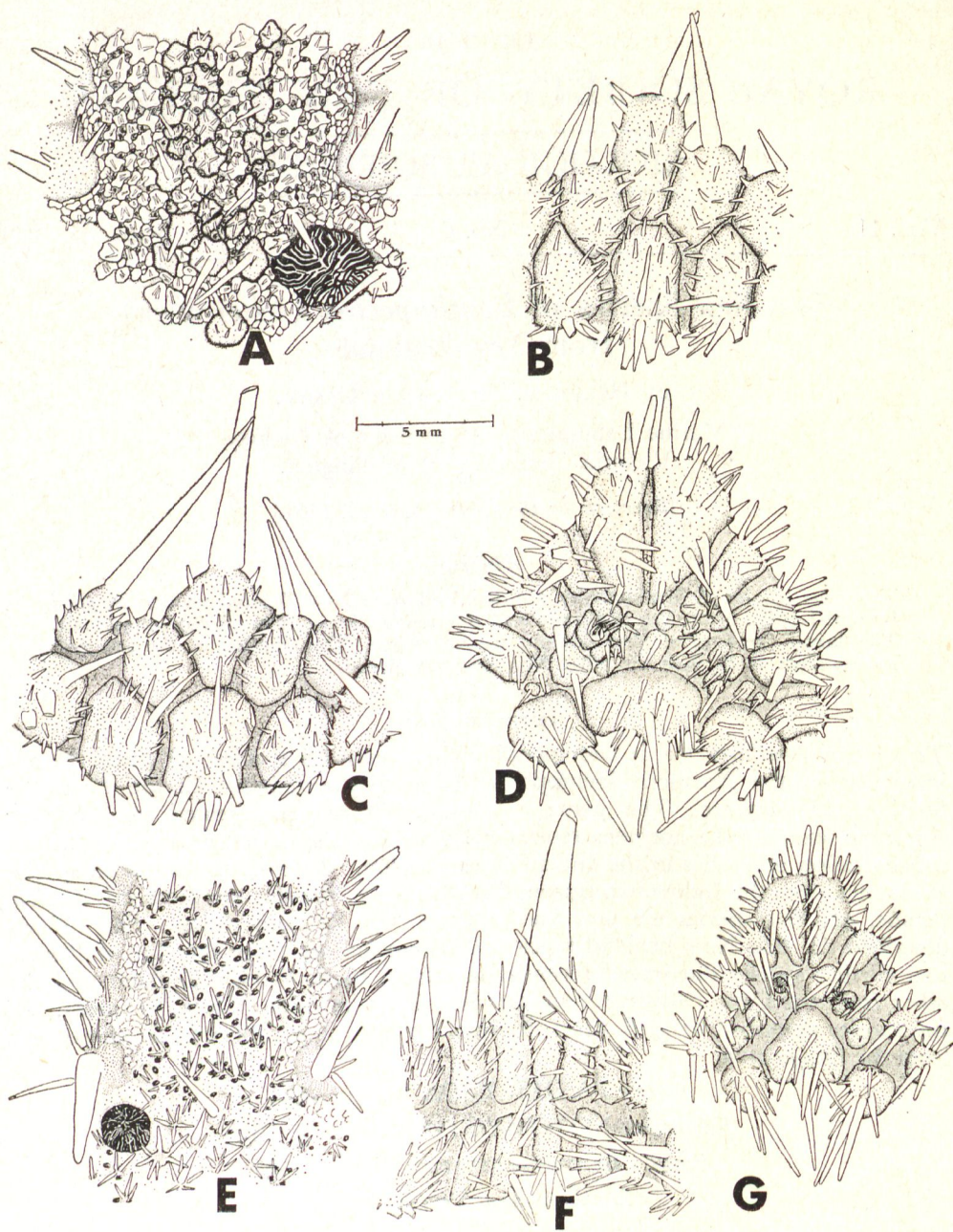


FIG. 1.—A, B, C, D *Benthopecten pikei* H. E. S. Clark. A: Portion of disc with madreporite and proximal part of arm showing arrangement of plates, papulae and superomarginals. Note: three parallel rows of plates along arm. B: Arrangement and armature of unpaired and paired marginal plates typical of four inter-radial angles. C: Arrangement and armature of unpaired and paired marginal plates in fifth inter-radial angle. D: Arrangement and armature of oral, adambulacral, actinal and inferomarginal plates in one angle. Note: distinctive pedicellariae. E, F, G *Benthopecten munidae* H. E. S. Clark. E: Portion of disc with madreporite and proximal part of arm showing plates (outlines mostly obscure), papulae and superomarginals. F: Arrangement and armature of unpaired and paired marginal plates. G: Arrangement and armature of oral, adambulacral, actinal and inferomarginal plates in one angle. Note: pedicellariae.

conspicuous; plate near disc centre with longest spine (3–5mm), following plates and spines slightly smaller; plates arranged in v-shape with apex of v on disc, limbs indistinct distally. On arms, plates small, oval or almost pentagonal, contiguous proximally, isolated distally, outlines more or less obscured by membrane; each plate with one or occasionally as many as three short, faintly rugose spines. Plates bordering superomarginals membrane covered, contiguous, generally without spines and forming a gently raised margin to disc and arms.

Papulae distinct (Fig. 1, A) from 3–6 surrounding plates to level of fourth or fifth superomarginal, absent from disc centre.

Madreporite (Fig. 1, A), inter-radial in position near unpaired superomarginal plate, tumid, almost circular, faintly lobed and finely and deeply dissected. Adjacent plates enlarged, with conspicuous spines and slender basal spinules.

Anus near disc centre, adjacent plates slightly enlarged.

Superomarginal plates (Fig. 1, B, C) polygonal with generally a single, enlarged, tapering, blunt-tipped spine (from 3–15mm long), basal spinules 7–15, small, scattered, generally absent from surface bordering abactinal plates. Generally, two most proximal plates flanking unpaired plate with very short spine. Enlarged spine smooth, spinules either smooth or slightly rugose near tip. In general, each superomarginal bears only one enlarged spine but occasionally two spines may be present on several plates in succession, such spines are either subequal or one may be distinctly smaller. Occasional small, intercalated superomarginal plates present lacking conspicuously enlarged spines. Unpaired superomarginal plates (Fig. 1, B, C) tumid, projecting above abactinal surface; in four angles (Fig. 1, B) plates with one short (about 3mm long), sharp-tipped spine and from 13–17 small basal spinules arranged more or less vertically down surface of plate. Fifth unpaired superomarginal (Fig. 1, C), adjacent to madreporite with single, long (about 10mm), blunt-tipped spine; basal spinules similar in number and arrangement to other unpaired plates.

Inferomarginal plates (Fig. 1, B, C, D) similar in size and shape to superomarginals but slightly transposed thus appearing alternate. Each plate generally with two enlarged, sharp-tipped, tapering spines (3–9mm long), always shorter than those of superomarginals, lower (actinal) spine shortest. Enlarged spines smallest on most proximal plates; small spinules present basally on all plates. Unpaired inferomarginal plates (Fig. 1, B, C, D) polygonal with triangle of three short (3–5mm) rather flattened spines, shorter spines actinally. No single conspicuously enlarged spine; basal spinules present similar to those of neighbouring plates. A fragment of arm, apparently from near the tip, shows one pectinate pedicellaria; this is composed of five slender, sharp-tipped spines on the outer edge of the adambulacral plate which interlock with five similar spines from adjacent inferomarginal plate.

Pedicellariae absent from abactinal and superomarginal surfaces.

Adambulacral plates (Fig. 1, D) with fan of 5–8 furrow spines; spines slender, faintly rugose, tapering to blunt tips, webbed basally, outer spines shortest, central longest. Two, occasionally three proximally, enlarged (2–3mm long) subambulacral spines with two or three, slender, basal spinules generally forming a row adorally. Subambulacral spines on proximal plates small. Muscular intervals separating plates very distinct, especially distally.

Actinal inter-radial areas (Fig. 1, D) small, not extending beyond proximal margin of first paired inferomarginal plates. Each plate with 1–3 slender tapering spines; outlines of plates often indistinct. One or two pectinate pedicellariae in each angle consisting of 4–6 slender, tapering spines which interlock with similar spines from neighbouring plates.

Oral plates (Fig. 1, D) tumid with 5–7 short, slender, tapering furrow spines often webbed basally, three distal spines slightly higher on plate than those overhanging mouth. Suboral spines 7–10, arranged in more or less regular longitudinal rows; spines large, sturdy (2–4mm long) especially most proximal ones. Plates separated by wide muscular areas, distally they appear toothed and interlocking. In one angle, plates separate, free edges ridged or toothed, teeth of one interlocking with those of other.

Ambulacral grooves deep distally, tube feet biserial with small sucking discs.

No colour notes accompany the present specimen. In preservative and dried: white, with pale brown papular areas and darker tube feet.

MATERIAL EXAMINED: One specimen collected by Dr R. B. Pike, 30/9/62, eight miles east of White Island, Bay of Plenty, 550–630m.

HOLOTYPE: In echinoderm collection, Dominion Museum, Wellington, New Zealand (Ech. 1002). Size: R about 80mm (arm tips missing); r = 11mm.

REMARKS: This new species seems most closely allied to a new sea-star described from south of New Zealand (Clark, in press), but it differs in having fewer oral furrow spines and only occasional inferomarginal pedicellariae. *B. pikei* differs from both the Indonesian species *B. styracius* Fisher and *B. polycetenius* Fisher, in lacking abactinal pedicellariae, and in differences in the armature of the adambulacral and oral plates. Similar to *B. rhopalophorus* Djakonov from the Okhotsk Sea, but differs from that species in details of the abactinal and marginal plates.

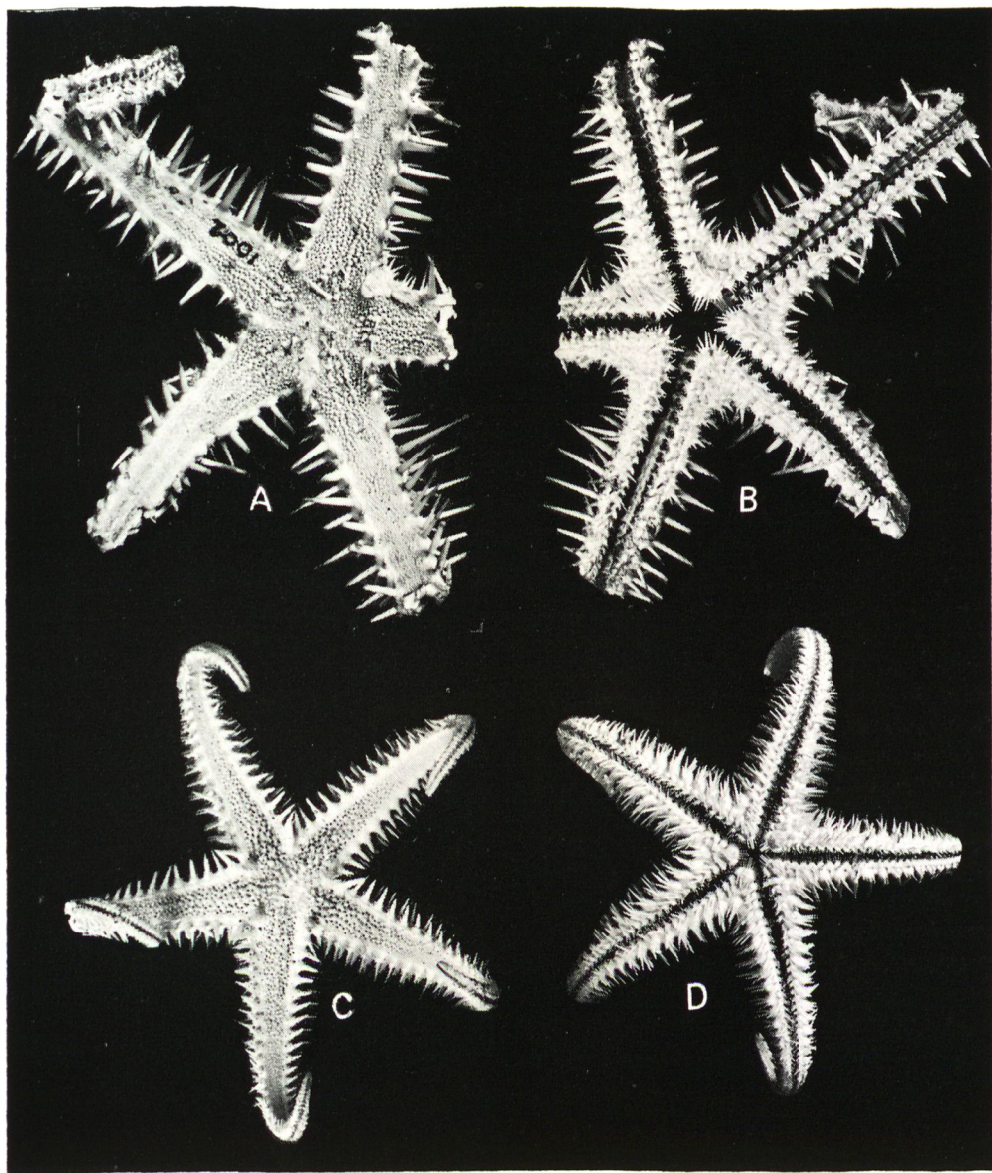
Fell (1958) described *B. pentacanthus* from juvenile specimens taken off Mayor Island, Bay of Plenty. The present specimen differs considerably from *B. pentacanthus*, particularly in the armature of the marginal plates; thus the majority of superomarginals carry only one enlarged spine, whereas in *B. pentacanthus* two such spines are present; similarly, in the present specimen, the inferomarginals carry two enlarged subequal spines while in *B. pentacanthus* there is only one. Differences also occur in the armature of the adambulacral and oral plates and in the presence, in *B. pikei*, of actinal plates. These last differences may be attributed to the larger size of the present animal when compared with the two known specimens of *B. pentacanthus*. In the author's opinion armature of marginal plates is a more stable character and it seems improbable that with an increase in size the number of superomarginal spines would be reduced to one. Possibly, as more material is collected and a size range of specimens established, the present specimen will be recognised as an adult *pentacanthus*; in the meantime the differences warrant its recognition as a separate species.

This species is named for its collector, Dr R. B. Pike.

Benthopecten munidae sp.n. Pl. 1, C, D, Fig. 1, E-G

DESCRIPTION: Disc small, slightly tumid; arms five, flat, narrow, tapering very rapidly in last half to sharp tips.

Plates of disc (Fig. 1, E) of two sizes, tumid, contiguous, outlines obscured by membrane. Each plate generally with conspicuously enlarged, sturdy central spine tapering to sharp tip; basally 3–5 finely toothed spinules; smaller plates of disc without enlarged central spine but with group of 2–5 subequal spinules. Primary plates of disc 5, one at base of each arm, each with slender spine about 3mm long. On arms enlarged central spines of plates less conspicuous, often missing distally; smaller plates, generally surrounding larger plates, with from 1–4 short spines; plates often isolated especially near arm tips where outlines indistinct. Along arm edges plates small, tumid, generally with few spines, forming bevelled margin to disc and arms. Arm tip protected by small saddle-shaped plate with few, small, sturdy spinules near abactinal border.



A, B *Benthopecten pikei* H. E. S. Clark. A Abactinal and B actinal surfaces of holotype.
C, D *Benthopecten munidae* H. E. S. Clark. C Abactinal and D actinal surfaces of holotype.

—Photos: M. D. King.

Papulae (Fig. 1, E) distinct, from 4–6 surrounding larger plates; absent from disc centre but present on arms to level of seventh or eighth superomarginal plate.

Madreporite (Fig. 1, E) small, circular, tumid, finely dissected, lying interradially near unpaired superomarginal spine.

Anus conspicuous, almost central on disc, small, oval, slightly depressed; membrane covered.

Superomarginals (Fig. 1, F) more or less rectangular, tumid, each with single conspicuously enlarged (3–4mm long), tapering, finely spinulose spine, surrounded by 11–19 slender pointed spinules; spinules always largest immediately below spine, but markedly smaller and more slender than primary spine. Unpaired superomarginal plate (Fig. 1, F) tumid, projecting above level of abactinal plates, carrying single, long (6–8mm), sturdy, spine; 4–5 slender, sharp-tipped spines confined to outer edge of plate basally.

Inferomarginals (Fig. 1, F, G) similar in size to superomarginals; more or less alternating with them; each plate with vertical row of at least three and sometimes four or five enlarged (2–3mm) slender spines, those adjacent to superomarginals longest. Inferomarginal spines conspicuously shorter than superomarginals. Basal spinules similar to those of superomarginals; near arm tip only two or three small spines present. Unpaired inferomarginal plate (Fig. 1, F, G) with six or seven enlarged spines, at least three forming more or less central vertical row; spines adjacent to unpaired superomarginal longest, several small basal spinules present.

Abactinal and inferomarginal pedicellariae absent.

Adambulacral plates (Fig. 1, G) with fan of six, or seven proximally and five distally, furrow spines. Spines slender, tapering, blunt-tipped with central ones longest and proximal very short, slender, slightly inside plate edge. Two subambulacral spines (2–3mm) longer and sturdier than furrow spines; very small slender spinules may be present on edge of plate near outer spines.

Actinal inter-radial areas (Fig. 1, G) very small, plates scarcely reaching level of proximal margin of first paired inferomarginals. Outlines of plates more or less obscured by membrane; plates generally with one slender, elongate spine and one or two basal spinules; two or three pectinate pedicellariae present in each angle; pedicellariae with 5–8 slender spines which interlock with similar spines from neighbouring plates.

Oral plates (Fig. 1, G) tumid, small, with furrow series of 11 or 12 blunt-tipped spines; most proximal two longest (about 1.5mm), remainder subequal except for most distal which is small. Suboral spines four or five, blunt-tipped, similar in length to most proximal furrow spine.

Tube feet biserial with small sucking discs.

Colour of living animal, from colour transparency taken by Dr E. J. Batham, is scarlet on abactinal surface, shading to pink in last third of arms, marginal spines and enlarged spines of disc white; actinal surface of arm tips (arms recurved) white, suggesting this surface is white or very pale pink. In preservative and dried: white, tube feet brown.

MATERIAL EXAMINED: 12–67, Papanui Canyon, E, S.E. of Taiaroa Heads, Otago, New Zealand, 45° 51' S, 171° 02' E; 740m, one specimen collected by Dr E. J. Batham from the "Munida".

HOLOTYPE: In Otago Museum, Dunedin, New Zealand (A 68.1). Size: R/r = 45/7mm.

REMARKS: This new species differs from *B. pikei* in general body form, the greater extent of the papular areas, in having more numerous inferomarginal and

oral furrow spines, in having fewer suboral spines and in the smaller actinal inter-radial areas. It can be distinguished from *B. pentacanthus* Fell by the presence of a single superomarginal spine, and by differences in adambulacral and oral furrow spines. It is similar to a new species (Clark, in press) from south of New Zealand, but it lacks inferomarginal pectinate pedicellariae, the papular areas are considerably more extensive, and there are differences in the abactinal plates. When compared with the Indonesian species differences include the absence, in this new species, of abactinal and inferomarginal pedicellariae.

The specific name refers to the Portobello Marine Biological Station's research vessel, "Munida".

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