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A New Cidarid Echinoid from Northern New Zealand

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Abstract

A NEW cidarid echinoid, *Goniocidaris corona*, is described from specimens collected between 14 and 132m off the north-eastern coast of New Zealand. The new species is the fourth member of the subgenus *Goniocidaris* s.s., which is characterised by lacking basal discs on the radioles. It is closely related to another northern New Zealand species, *G. magi* Pawson, and an Australian species, *G. tubaria* (Lamarck). *G. corona* is brood-protecting, the young stages probably being carried on the aboral side. A similar brood-protecting habit is first recorded here for *G.* (*Aspidocidaris*) *parasol* Fell, a southern New Zealand species.

INTRODUCTION

THE cidaroid genus *Goniocidaris* is complex and large: approximately 18 living species are known, and these fall into five subgenera. The genus ranges the Indo-West Pacific oceans from Japan to New Zealand, with the Indonesian region as the probable centre of distribution. Of five species hitherto known from Australasian waters, three are typical of the subgenus *Goniocidaris* s.s.: *G. tubaria* (Lamarck), *G. magi* Pawson, and *G. umbraculum* Hutton; the remaining two species, *G. australiae* Mortensen and *G. parasol* Fell, fall in the subgenus *Aspidocidaris*. *G. magi, G. umbraculum,* and *G. parasol* are apparently restricted to New Zealand waters.

Three living specimens of a new species of *Goniocidaris* s.s. were recently discovered by skin divers in shallow water near Cape Brett and the Poor Knights Islands, New Zealand. This species, possessing thorny radioles without basal discs, which are typical of the subgenus, is closely related to *G. magi* and the Australian species *G. tubaria*. Its discovery lends support to Fell's (1954) observation that most New Zealand cidaroids are endemic.

Order CIDAROIDA Claus, 1880

Family CIDARIDAE Gray, 1825

Subfamily GONIOCIDARINAE Mortensen, 1928

Goniocidaris Desor, 1846

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Goniocidaris corona n.sp. Pl. 1, Fig. 1

DESCRIPTION: Test circular at ambitus, sides arched, flattened above and below. Apical system and peristome slightly less than half h.d. Ambs very slightly sinuate, interporiferous area approximately twice the width of pore zone. Pores of equal size, oblique, separated by an elevated wall. Marginal tubercles regular, not contiguous. Two small tubercles between and internal to marginals. Median part of amb naked, slightly sunken, horizontal sutures pitted.

Interambs broad (amb. = 23–30% interamb.); 7–8 plates in each vertical column. Primary tubercles perforate, non-crenulate. Areoles not confluent, transversely oval at ambitus. Scrobicular tubercles forming complete ring, secondary tubercles more abundant medially. Median area narrowly sunken, with deeper pits where horizontal sutures meet median vertical suture.

Apical system monocyclic, genital pores large, not entirely enclosed by genital plates. Ocular and genital plates uniformly tuberculated (Fig. 1, J).

Primary radioles variable in form: aboral radioles smooth with fine longitudinal striations, uniformly tapered to a blunt point (Fig. 1, F); adapical and ambital radioles stout, very thorny, flared into a distinct crown distally; crown usually partly eroded (Fig. 1, A, B, E). A layer of sharp, distally pointing, anastomosing hairs covers radioles. Oral primaries bluntly spear-shaped, flattened, smooth on one side, serrate or ridged on the other (Fig. 1, G, I). Scrobicular radioles flattened, edges straight or undulate, slightly widened and excavate distally (Fig. 1, H). Miliary radioles club-shaped.

Valves of globiferous pedicellariae with 3–4 small terminal teeth and finely serrate edges (Fig. 1, C), or, rarely, with single short end-tooth (Fig. 1, D).

COLOUR: In life, test light brown, scrobicular radioles dark brown, primary radioles light brown or pinkish; denuded test cream, with median areas of ambs and interambs green.

VARIATION: In smallest specimen (h.d. 5.5mm) primary ambital radioles glassy and uneroded, flared crown well developed (Fig. 1, E); in larger specimens, thorns eroded, crown reduced to terminal fluting (Fig. 1, A, B). Oral radioles of small specimen more perfectly serrate than those of larger specimens (Fig. 1, G, I).

MATERIAL EXAMINED: 17/12/62, fragment of test from fine, grey sandy mud, 77m, 5 mls off Whangaruru Hbr. (N.Z. Oceanographic Institute Sta. C776 (174° 25.8′ E, 35° 20′ S); 18/12/62, 1 primary radiole, 132m, 12 mls off Whangaruru Hbr (N.Z.O.I. Sta. C777, 174° 32.4′ E, 35° 19.4′ S); 16/4/66, 2 living specimens from bryozoan covered sea floor at 36m, Poor Knights Is (174° 44′ E, 35° 28′ S), collected by skin divers J. Laxton and W. Palmer; 7/1/67, 1 living specimen from rock face at 14m, Piercy Is (174° 19′ E, 35° 10′ S), collected by skin diver W. Palmer (holotype).

HOLOTYPE: The holotype Ech. 1026 and two paratypes Ech. 1027 are lodged in the echinoderm collection, Dominion Museum, Wellington, New Zealand.

DIMENSIONS: Holotype—horizontal diameter 15mm, height 9mm. Paratypes—(1) H.d. 14mm, height 7mm; (2) H.d. 5.5mm, height 3.5mm.

REMARKS: The new species appears to be most closely related to *Goniocidaris magi* Pawson, a recently discovered species from the Three Kings–North Cape area of New Zealand (Pawson, 1964). *Goniocidaris corona* and *G. magi* both lack the large, globular globiferous pedicellariae which are common in other members of the genus. Also, the small globiferous pedicellariae with a single end-tooth, which are typical of the genus, are particularly rare in *G. corona* and *G. magi.*

The differences between *G. corona* and *G. magi* are difficult to discern without close observation. The radioles of both species are very similar and are often masked with bryozoans and sponges; nevertheless, the radioles of *G. corona* are more coarsely thorny than those of *G. magi,* and the thorns are not arranged in such uniform longitudinal series as they are in the latter species. The flared crown, when uneroded, is much more prominent in the new species. However, the nature of the primary radioles among goniocidarids is particularly variable, and these small differences may not be reliable separating characters. The scrobicular radioles of both species are similar except that the distal excavation is not a constant feature in *G. magi,* and when present is usually poorly developed.

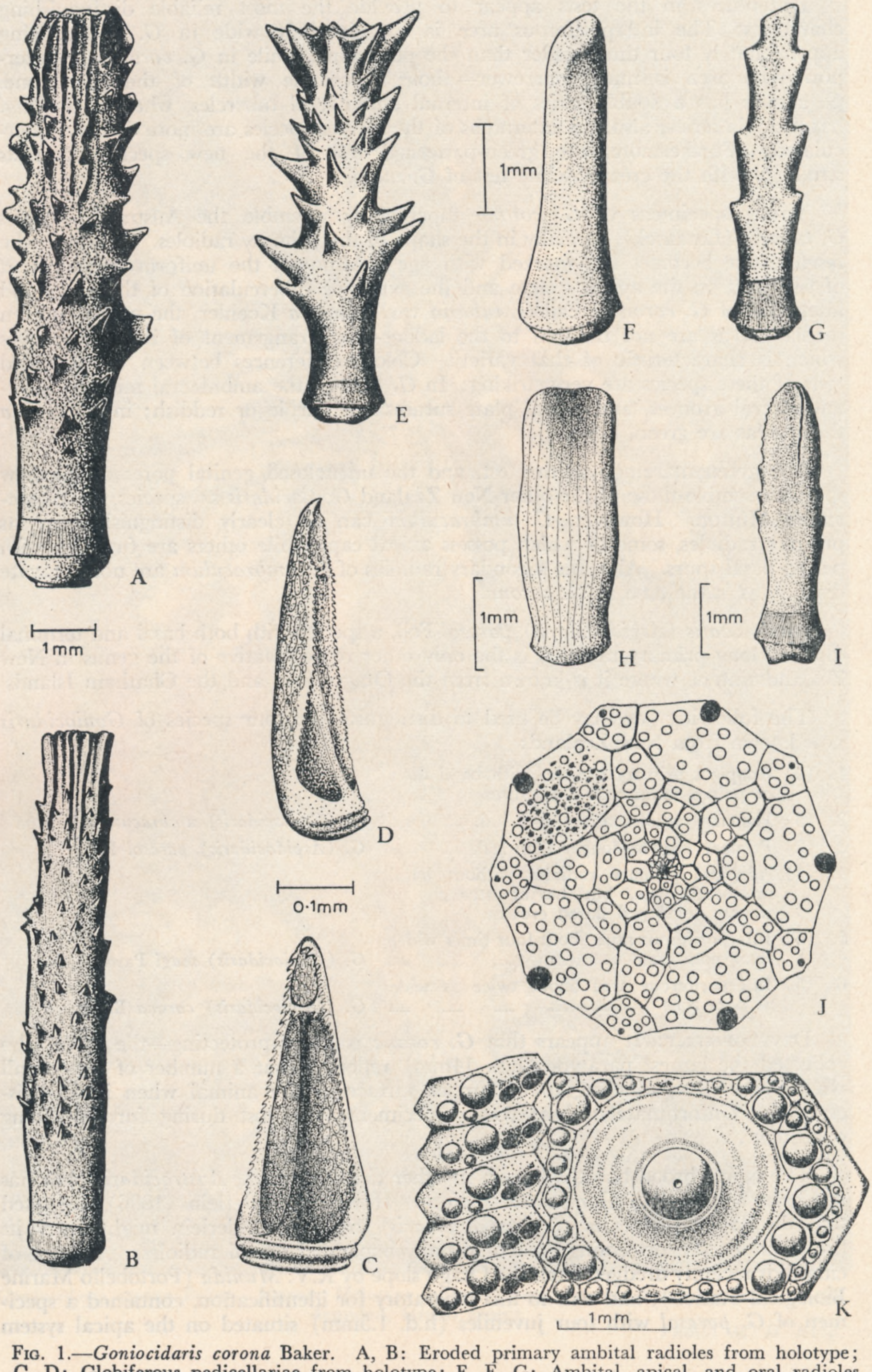


Fig. 1.—*Goniocidaris corona* Baker. A, B: Eroded primary ambital radioles from holotype; C, D: Globiferous pedicellariae from holotype; E, F, G: Ambital, apical, and oral radioles from paratype 2; H, I: Scrobicular and oral radioles from holotype; J: Apical system of holotype; K: Ambital interamb plate with adjacent amb plates from paratype 1.

Differences in the tests appear to provide the most reliable distinguishing characters: The interporiferous area is conspicuously wide in *G. magi,* being approximately four times wider than the pore zone, while in *G. corona* the interporiferous area is much narrower—about twice the width of the pore zone. *G. corona* has a double series of internal ambulacral tubercles, whereas *G. magi* has a single series; also, the interambs of the former species are more densely tuberculated. Furthermore, the green-patterned test of the new species contrasts strikingly with the creamy-white test of *G. magi.*

Young specimens of *G. corona* superficially resemble the Australian species *G. tubaria* (Lamarck), specially in the shape of the primary radioles. However, the resemblance becomes less marked with age. Although the uniform arrangement of tubercles on the apical system and the extensive tuberculation of the ambs and interambs of *G. corona* recall *G. tubaria* var. *impressa* Koehler, the naked, sunken median areas are not reduced to the ladder-like arrangement of isolated grooves which is characteristic of that variety. Colour differences between the denuded tests of these species are very striking: In *G. tubaria* the ambulacral midline, interambulacral grooves, and apical plate sutures are purple or reddish; in *G. corona* these areas are green.

The green markings on the test, and the unenclosed genital pores of the new species resemble those of the other New Zealand *Goniocidaris* s.s. species, *G. umbraculum* Hutton. However, *G. umbraculum* can be clearly distinguished by its primary radioles, some of which possess apical caps while others are fusiform with paired basal spurs. Also, the secondary radioles of *G. umbraculum* are not excavate distally, as is the case in *G. corona.*

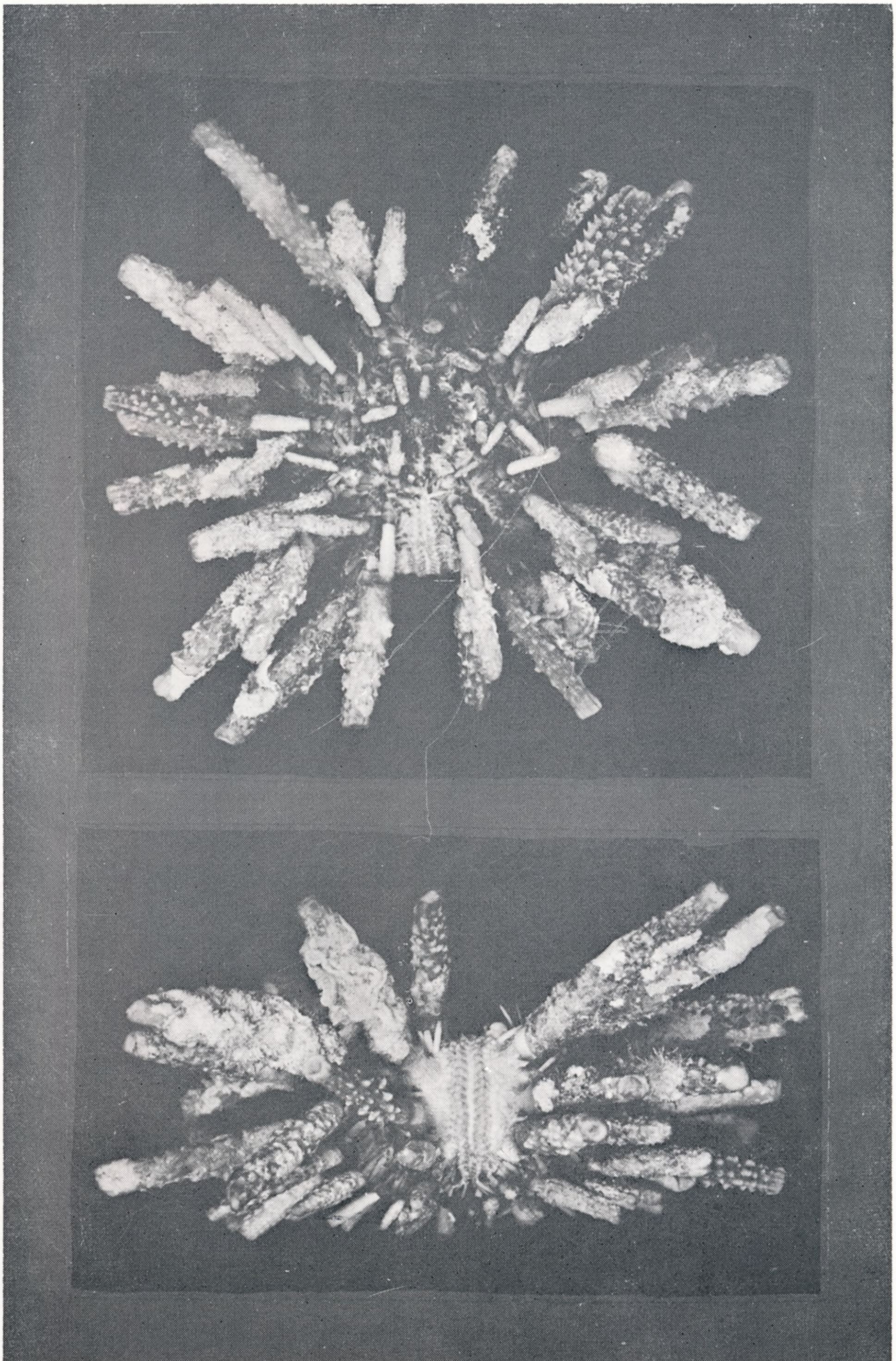
Goniocidaris (*Aspidocidaris*) *parasol* Fell, a species with both basal and terminal discs on long primary radioles, is the only other representative of the genus in New Zealand waters, where it is known from the Otago coast and the Chatham Islands.

The following key may be used to distinguish the four species of *Goniocidaris* now known from New Zealand:

1.	(4)	Adapical primary radioles with basal discs or paired spurs, and distal discs.	
2.	(3)	Primary radioles about $\frac{1}{2}$–$\frac{3}{4}$ h.d.	*G.* (*Goniocidaris*) *umbraculum* Hutton
3.	(2)	Primary radioles longer than h.d.	*G.* (*Aspidocidaris*) *parasol* Fell
4.	(1)	Adapical primary radioles without basal or distal discs, but having strongly or weakly developed flared crowns.	
5.	(6)	Interporiferous area about four times wider than pore zone	*G.* (*Goniocidaris*) *magi* Pawson
6.	(5)	Interporiferous area about twice as wide as pore zone	*G.* (*Goniocidaris*) *corona* Baker

Development: It appears that *G. corona* is brood-protecting—the diver who collected the largest paratype (h.d. 14mm) reported that a number of very small sea urchins were adhering to the upper surface of the animal when it was discovered. Unfortunately, these young specimens were lost during further diving operations.

The apical-brood habit is known in other cidaroids (e.g., *Austrocidaris*) but has not been recorded in *Goniocidaris* before. However, Döderlein (1886) suggested that the Japanese species *G.* (*Aspidocidaris*) *clypeata* Döderlein might carry its brood under the protecting roof of distally expanded apical radioles. A series of cidaroids recently dredged from the Otago slope by R.V. *Munida* (Portobello Marine Biological Station), and sent to this laboratory for identification, contained a specimen of *G. parasol* with four juveniles (h.d. 1.5mm) situated on the apical system



Goniocidaris corona Baker. Upper: Holotype, adoral aspect; Lower: Same specimen, partly denuded, lateral aspect.

Photo: *M. D. King.*

under the wide distal discs of the apical radioles. Thus Döderlein's theory is substantiated for one member of the subgenus *Aspidocidaris.*

Mortensen (1928) noted that a specimen of *G. umbraculum,* despite having distal discs on the apical primaries, actually carried its young on the peristome. Although many specimens of *G. umbraculum* have been examined in recent years, Mortensen's observation has not been repeated.

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