

NEW GENUS AND SPECIES OF SOUTHERN AUSTRALIAN AND PACIFIC ASTERINIDAE (ECHINODERMATA, ASTEROIDEA)

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Abstract

O'Loughlin, P.M., 2002. New genus and species of southern Australian and Pacific Asterinidae (Echinodermata, Asteroidea). *Memoirs of Museum Victoria* 59(2): 277–296.

The diagnostic characters of the Asterinidae species *Asterina atyphoida* H.L. Clark from southern Australia and *Asterina gibbosa* (Pennant) from the Atlantic, type species of *Asterina* Nardo, are reviewed. *Asterina atyphoida* is referred to *Meridiastra* gen. nov., with four other species: *Meridiastra fissura* sp. nov. and *Meridiastra nigranota* sp. nov. from southern Australia, *Meridiastra rapa* sp. nov. from the central south Pacific, and *Meridiastra modesta* (Verrill) from the Pacific coast of Panama and Mexico. *Asterina agustincaso* Caso is synonymised with *Meridiastra modesta* (Verrill). *Asterinides* Verrill is recognised as a valid genus. *Meridiastra fissura* is fissiparous. *Meridiastra* is distributed from southern Australia to the Pacific coast of Mexico and Panama. A key is provided for the species of *Meridiastra*.

Introduction

Rowe (in Rowe and Gates, 1995 and in a note in Campbell and Rowe, 1997) considered that species of the Asterinidae from Australian waters which were assigned to the genus *Asterina* Nardo, 1834 were not congeneric with the type species *Asterina gibbosa* (Pennant, 1777), and required reassignment to an existing or new genus. Rowe and Berents (in an unpublished draft manuscript, cited in this work as pers. com.) anticipated assigning one of these species, *Asterina atyphoida* H.L. Clark, 1916, to a new genus together with a new fissiparous southern Australian species. This anticipated genus is established here, and a second new species from southern Australia is included. The remaining Australian species assigned to *Asterina* are not reallocated to this new genus, and their reassignment is not treated in this work.

Marsh (1974) reported an *Asterina* sp. from Rapa I. in the South Pacific, and this species is described below and assigned to the new genus. The eastern Pacific species *Asterina agustincaso* Caso, 1977 and *Asterina modesta* Verrill, 1870 are synonymised, and *A. modesta* is reassigned to the new genus.

Rowe and Berents (pers. com.), in their anticipated review of the genera of the Asterinidae, considered that the presence or absence of super-

ambulacral internal plates, the internal alignment of abactinal and actinal plates towards the body margin, and the arrangement of cleared actinal plates were helpful in distinguishing the genera. These diagnostic features are included in the descriptions below, without judgement as to their significance. Clark and Downey (1992) used the first two of these characters in their diagnosis of *Asterina*, referring to an absence of superambulacral plates and to the reinforcement of the ventrolateral angle by an internal overlapping of the adjacent abactinal and actinal plates often with additional plates, but did not describe the arrangement of actinal plates. In this study the arrangement of cleared actinal interradial plates was found to be inconsistent for a specimen and a species, and the apparent arrangement on uncleared specimens was sometimes different to that revealed on cleared specimens of the same species. For *Asterina gibbosa* the actinal series on one uncleared specimen appeared to curve at an acute angle distally from furrow to margin (Fig. 1e), while on a cleared specimen the series curved obliquely (obtusely) from furrow to margin (Fig. 1f).

Verrill (1913) reassigned *Asterina modesta* to his new genus *Asterinides* Verrill, 1913. Fisher (1919) synonymised *Asterinides* with *Asterina*. A.M. Clark (1983) and Clark and Downey (1992)

considered that *Asterinides* (type species *Asteriscus folium* Lütken, 1860, from the West Indies) could be revived from its synonymy with *Asterina* and recognised at least as a valid subgenus. Rowe (in Rowe and Gates, 1995 and in a note in Campbell and Rowe, 1997) supported the recognition of *Asterinides* as a valid genus. Rowe and Berents (pers. com.) considered that their anticipated new genus, described below, was close to *Asterinides*, but distinguished the two genera. *Asterinides* is recognised below as a valid genus, but not the appropriate genus for *Asterina modesta*.

Molecular phylogeny studies of Asterinidae species, such as by Byrne et al. (1999), are providing further evidence on which to review the assignment of species to the many existing Asterinidae genera. In the current absence of adequate molecular evidence a review of the assignment of species to *Asterina* and *Asterinides* is not undertaken here.

Terminology here follows that defined in the glossary and illustrated in Figs 2 and 3 of Clark and Downey (1992), except that "papular space" is used for "papular area" ("restricted area with papular pores") and "papulate areas" is used to refer to the parts of the abactinal surface where papulae occur. "Ad-disc" refers to a location adjacent and distal to the plates bordering the disc.

Abbreviations of institutions are as follows: AM, Australian Museum, Sydney, Australia; BPBM, Bishop Museum, Honolulu, USA; ICML-UNAM, Instituto de Ciencias del Mar y Limnología, Universidad Nacional Autónoma de México, Mexico; MCZ, Museum of Comparative Zoology, Harvard University, Massachusetts, USA; NMV, Museum Victoria, Melbourne, Australia; NTM, Northern Territory Museum, Darwin, Australia; SAM, South Australian Museum, Adelaide, Australia; TM, Tasmanian Museum, Hobart, Australia; USNM, Museum of Natural History, Smithsonian Institution, Washington, USA; WAM, Western Australian Museum, Perth, Australia; YPM, Peabody Museum of Natural History, Yale University, Connecticut, USA; ZMUC, Zoological Museum, University of Copenhagen, Denmark.

Asterinidae Gray, 1840

Asterina Nardo, 1834

Synonymy. See Clark and Downey (1992: 177).

Type species. *Asterina gibbosa* (Pennant, 1777)

Diagnosis. See Clark and Downey (1992: 177).

Remarks. Rowe (in Rowe and Gates, 1995) listed nine Asterinidae species from Australian waters

which were assigned to *Asterina*: *A. alba* H.L. Clark, 1938 from the Tasman Sea; *A. anomala* H.L. Clark, 1921 from Torres Strait; *A. atyphoida* H.L. Clark, 1916 from southern Australia; *A. cepheus* (Müller and Troschel, 1842) from northern Australia; *A. coronata* von Martens, 1866 from northern Australia; *A. heteractis* H.L. Clark, 1938 from the Tasman Sea; *A. inopinata* Livingstone, 1933 from eastern Australia; *A. sarasini* (de Lorient, 1897) from northern Australia; and *A. scobinata* Livingstone, 1933 from south-eastern Australia. Rowe (in Rowe and Gates, 1995) considered that these species assigned to *Asterina* were not congeneric with the type species *Asterina gibbosa* (Pennant, 1777) and required reassignment to an existing or new genus. Of the above nine species only *Asterina atyphoida* H.L. Clark is assigned here to a new genus. None of the remaining eight species is congeneric with *A. atyphoida* (pers. obs. of AM specimens of all species). Possible reassignment of these eight species is not undertaken in this work. Rowe (in Rowe and Gates, 1995) considered that the genus *Asterina* might be restricted to Atlantic waters.

With the description of a new genus below and inclusion of two species previously assigned to *Asterina*, and the raising below of *Asterinides* out of synonymy with *Asterina*, the diagnosis of *Asterina* requires emendment. But a re-examination of the many species currently assigned to *Asterina* should be appropriately undertaken when the emerging molecular evidence is adequate, and an emended diagnosis is not given here.

Asterina gibbosa (Pennant, 1777)

Figures 1a–f, 7f

Synonymy. See Clark and Downey (1992: 184).

Material examined. Atlantic Ocean, European seas (no other data), AM J1250 (1); Ireland, Co. Down, Granagh Bay, 5 Aug 1959, NMV F87241 (3); Wales, Gwynedd, Anglesey, Rhosneigr, under rocks, 28 Sep 1971, NMV F87242 (5). Mediterranean Sea, France, Marseilles, Jun 1978, AM J 12408 (3); Italy, Bay of Naples, AM G11524 (2); donation from Naples Aquarium, 1890, NMV F45108 (3); Mediterranean (no other data), AM G7575 (2).

Diagnosis. See Clark and Downey (1992: 184–185).

Remarks. *Asterina gibbosa* material examined in this study differed in minor ways from the diagnosis by Clark and Downey (1992), and these differences and additional observations are noted. The first five radials involved in forming a pentagon bordering the disc were separated by single

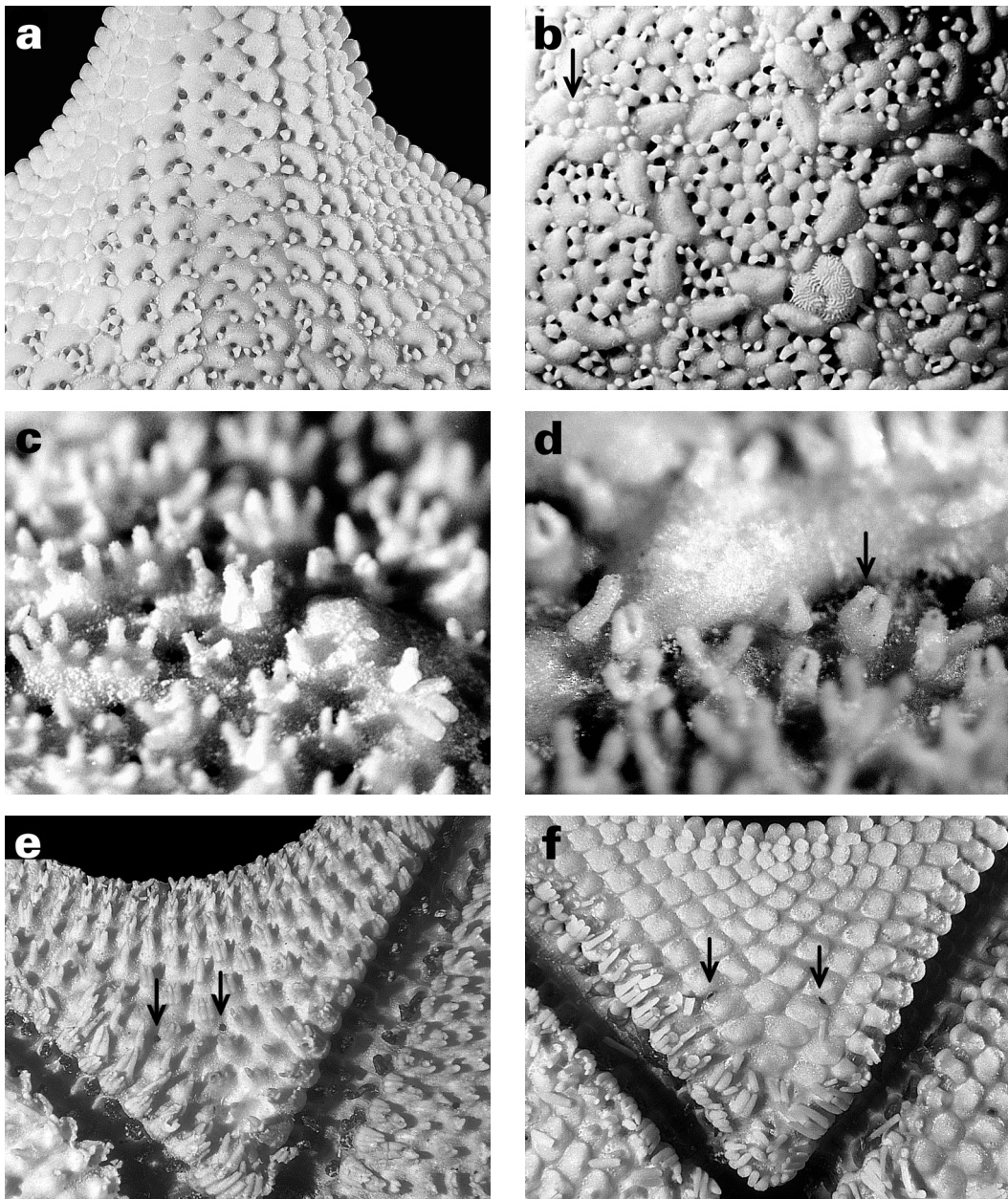


Figure 1. *Asterina gibbosa* (Pennant) (Mediterranean specimens, lot NMV F45108). a, cleared abactinal ray ($R = 19$ mm); b, cleared disc and madreporite (lower right), with one non-papular proximal interradius (arrow); c, abactinal spinelets (0.3 mm long); d, abactinal pedicellariae (one at arrow, 0.25 mm long); e, actinal interradius with gonopores (arrows); f, cleared actinal interradius, with plates in series curving obliquely from furrow towards margin, and with gonopores (arrows).

interradial plates. Papulate areas were more extensive than non-papulate areas. The madreporite was oval to lobed, not triangular. A carinal series of plates in the mid-third of each ray was distinct, the carinals typically separated by pairs of secondary plates. Secondary plates numbered up to six in some pore areas. The superomarginals were the smallest of the abactinal interradial plates, were generally aligned with the proximal edge of the projecting inferomarginals, and were interspersed with varying numbers of secondary plates. Associated with the distinctive disc there were four ad-disc triangular interradial papular spaces each with more than two secondary plates and more than two papulae (fifth space occupied predominantly by the madreporite), and distal to these were five interradial areas which had secondary plates and pedicellariae but which lacked papulae and spines. There were some conspicuous glassy convexities around the margin but not on the crown of abactinal plates. Abactinal spinelets were typically 0.3 mm long. There were clusters of up to 6–8 papular pores. Suboral spines were noticeably tall, and some plates had up to three. The first row of actinal adradial plates bore a complete series of typical actinal spines. There was an irregular series of secondary plates at the actinal edge of the inferomarginal series. There were no internal superambulacral plates, but there were internal tapered contiguous projections on the distal actinal and abactinal interradial plates giving structural support to the ventrolateral angle. Cleared actinal interradial plates curved in oblique (obtuse) series from the furrow to the margin.

***Meridiastra* gen. nov.**

Type species. Asterina atyphoida H.L. Clark, 1916

Diagnosis. Small, up to R = 13 mm; R/r = 1.2–1.3; rays 5 (6–8 in fissiparous species), ends rounded, interradial margins straight or slightly incurved; pentagonal or near-pentagonal if 5-rayed; body flat orally, thin, acute angle at margin, body slightly domed or low pyramidal

aborally; pedicellariae absent; triangular madreporite.

Abactinal plates closely imbricating, in regular series; disc poorly defined or not distinct; papular spaces small; projecting plates fan-shaped, except radially, never predominantly crescentic or deeply notched; papulate areas smaller than non-papulate areas; papulae few, proximal, predominantly radial, mostly single; abactinal plates granular, covered with glassy convexities; abactinal plates with readily-detached glassy spinelets, smaller than 0.3 mm long, across free margin on proximal plates, not in tufts on proximal plates; superomarginal plates not extending to margin, generally aligned with proximal edges of projecting inferomarginals; lacking superambulacral internal plates; distal actinal and abactinal interradial plates with internal tapered vertical contiguous projections.

Projecting inferomarginal plates form margin, with distal fine spinelets forming marginal fringe; actinal plates in regular series; actinal interradial plates with 1–3 spines; adambulacral plates with 1–2 subambulacral spines, 2–3 webbed adambulacral (furrow) spines.

Species. Meridiastra atyphoida (H.L. Clark, 1916); *M. fissura* sp. nov.; *M. modesta* (Verrill, 1870); *M. nigranota* sp. nov.; *M. rapa* sp. nov.

Etymology. From the Latin *meridies* (south) with *astrum* (star), referring to the southern Australian and Pacific occurrence of this seastar genus (feminine).

Distribution. From southern Western Australia to the Pacific coasts of Mexico and Panama; 0–59 m.

Remarks. Rowe (in Rowe and Gates, 1995) considered that *A. atyphoida* was not congeneric with *A. gibbosa*, the type species of *Asterina*, and this judgement is supported here. The combination of characters distinguishing the *Asterina* type species, *A. gibbosa*, and *Meridiastra* are listed in Table 1. The diagnostic distinctions between *Meridiastra* and the *Asterinides* type species, *A. folium*, are listed in Table 3. Distinguishing characters are evident in small to large specimens.

Key to species of *Meridiastra*

1. Arms 6–8, form irregular (post fissipary); more than 1 madreporite; fissiparous; only distal abactinal plates in regular series..... *Meridiastra fissura* sp. nov.
- Pentagonal form; single madreporite; not fissiparous; abactinal plates in regular series2

2. Secondary plates numerous proximally; abactinal gonopores each with 1–3 proximal spinous secondary plates; actinal interradiial plates with predominantly 2 spines *Meridiastra modesta* (Verrill, 1870)
- Secondary plates rare or absent proximally; abactinal or actinal gonopores lacking secondary plates; actinal interradiial plates with predominantly 1 spine 3
3. Disc not distinct; proximal carinal series very irregular, extending less than half ray length; actinal adradial row of interradiial plates with complete series of spines *Meridiastra rapa* sp. nov.
- Disc distinct; regular proximal carinal series extending three quarters ray length; actinal adradial row of interradiial plates with spines irregularly present or lacking 4
4. Gonopores abactinal; abactinal spinelets predominantly in single series on proximal plate edge; subambulacral spines predominantly single; single suboral spine frequently present; live colour variable cream, yellow, orange, mauve, red, brown *Meridiastra atyphoida* (H.L. Clark, 1916)
- Gonopores actinal; abactinal spinelets frequently in irregular double series on proximal plate edge; subambulacral spines predominantly paired; suboral spines rarely present; live colour white with small black spots abactinally *Meridiastra nigranota* sp. nov.

***Meridiastra atyphoida* (H.L. Clark) comb. nov.**

Figures 2a–f

Asterina atyphoida H.L. Clark, 1916: 57, pl. 17.—H.L. Clark, 1928: 389.—Cotton and Godfrey, 1942: 201.—H.L. Clark, 1946: 130.—A.M. Clark, 1966: 324–325.—Shepherd, 1968: 745.—Dartnall, 1970a: 73.—Dartnall, 1980: 34, map 6(1).—Zeidler and Shepherd, 1982: 411–412, fig. 10.6(d).—Rowe and Vail, 1982: 222.—O’Loughlin, 1984: 134.—Clark, A.M., 1993: 207.—Marsh and Pawson, 1993: 281 (part, Esperance specimens).—Rowe (in Rowe and Gates), 1995: 34.—Edgar, 1997: 344–345.

Material examined. Holotype. South Australia, 15 miles NW of Cape Jervis, 31 m, AM E6303.

Paratypes. Kangaroo I., off Cape Marsden, 30 m, AM E859 (2).

Other material (selection for distribution and depth range). Victoria, East Gippsland Scallop Survey St. 41, 38°50’S, 147°41’E, 22 m, 28 Jan 1971, NMV F73005 (2); Port Albert, donated 23 May 1906 (no other data), NMV F71937 (1); San Remo, 1 Apr 1990, NMV F58684 (2); Crib Point, 15 m, 12 Aug 1970, NMV F71939 (3); Shoreham, 20 Aug 1972, TM H841 (1); Flinders ocean platforms, 12 Dec 1993, NMV F87229 (1); Port Phillip Bay, Portsea Jetty, 5 m, May 1975, AM J9246 (1); Portland, Saxon Reef, 11 m, 5 Mar 1992, NMV F87235 (1). Tasmania, Tamar River, Greens Beach, 13 Jul 1969, TM H1059 (1); Deal I., East Cove, 5 m, 4 May 1974, AM J16573 (1); Erith I., 21 m, 1974, NMV F87160 (1); Bass Strait Survey St. 138, off Flinders I., 52 m, 6 Feb 1981, NMV F87228 (9); St. 160, off Deal I., 59 m, 13 Nov 1981, NMV F87236 (1). South Australia [SA material referred to by H.L. Clark (1916, 1928): SAM K103 (1), K104 (6), K105 (1), K1878 (6), K1879 (14)]; Victor Harbour, 5 m, 2 Apr 1980, NMV F87168 (1); Kangaroo I., The Pages, NE of Cape Willoughby, 27 m, 12 Apr 1941, SAM K1890 (1);

Cape Jervis Jetty, 2 m, 9 Mar 1984, SAM K1887 (1); Investigator Strait, 15 Jan 1971, NMV F87163 (2); Yorke Peninsula, Edithburgh Jetty, 3–4 m, 10 Sep 1995, SAM K1872 (1); Sir Joseph Banks Group, Lusby I., 6 m, 11 Jan 1984, SAM K1885 (2); Port Lincoln, 19 Mar 1968, NMV F87233 (1); Elliston, 18 m, 12 May 1971, NMV F87158 (1); Nuyts Archipelago, Franklin I., 6–8 m, 15 Apr 1983, SAM K1871 (1); Point Sinclair, 10 May 1973, NMV F87161 (3). Western Australia, Esperance, between Sandy Hook I. and Cape Le Grand, 31–35 m, 23–25 Jun 1986, WAM Z6855 (5).

Description of material. Small, up to R = 13 mm; form pentagonal, interradiial edges straight, sometimes near-pentagonal with interradiial margins incurved, typically $R/r = 1.3$; rays 5, rarely 6, ends rounded; body flat orally, thin, slightly domed or low pyramidal aborally, acute angle at margin; single triangular madreporite; not fissiparous; pedicellariae absent; paired interradiial gonopores abactinal.

Abactinal plates closely imbricate, in regular series; papular spaces small; papulate areas less extensive than non-papulate areas; secondary plates rare, disc and margin only, never separating carinal plates; disc variably distinct, bordered by irregular pentagon comprising 5 proximal carinal and 5 interradiial plates; each radius with 5 longitudinal series of plates in mid-ray; distinct proximal carinal series comprises up to 10 (rarely 11) plates extending three quarters of ray length, distally typically 6 (up to 14) zig-zag radial plates; carinals with proximal edge slightly convex or straight or concave, some with slight median lobe; some radials indented proximally for 1 or rarely 2 papulae; projecting interradiial plates

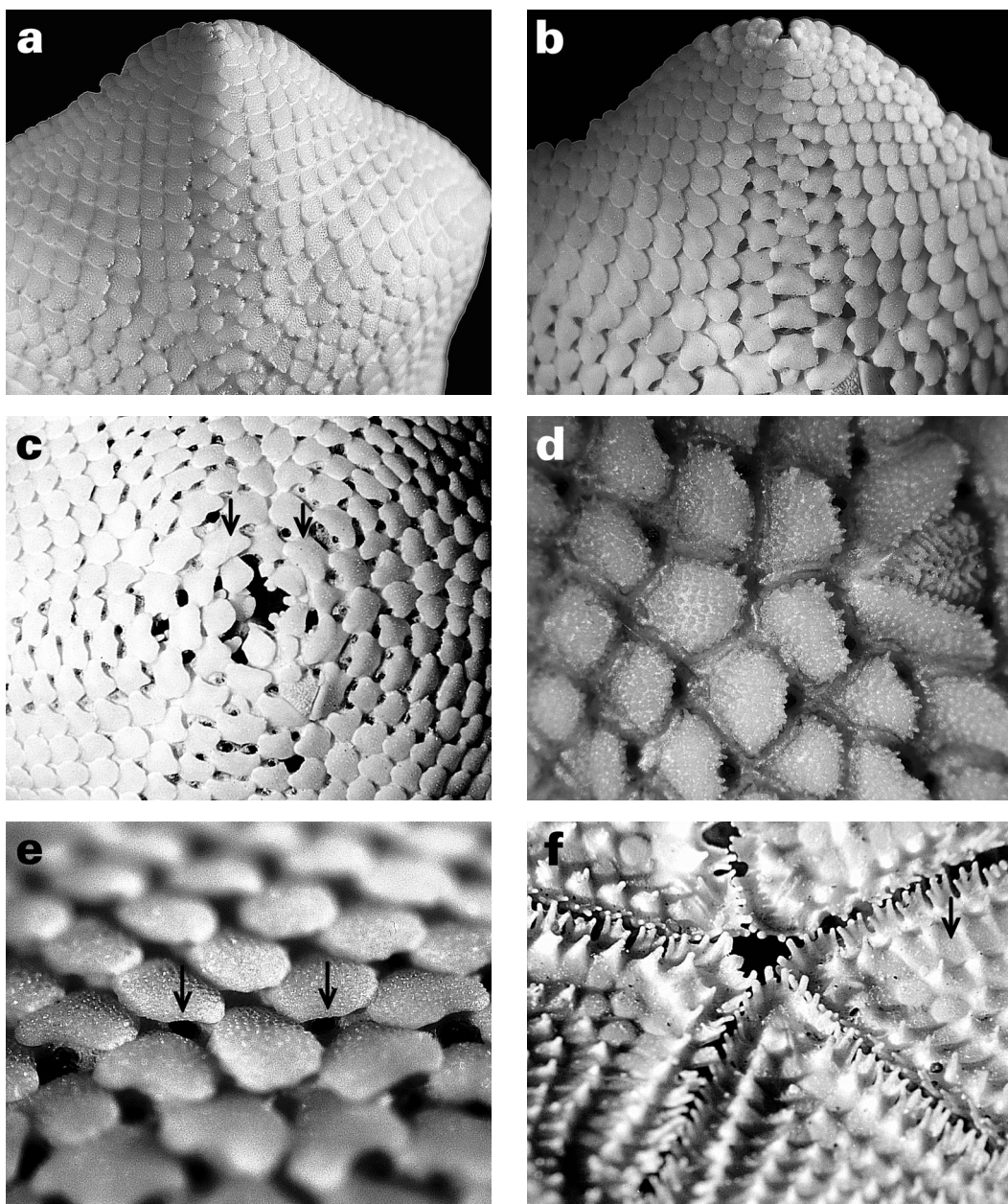


Figure 2. *Meridiastra atypoida* (H.L. Clark) comb. nov. a, abactinal ray and interradial plates (R = 10 mm) (NMV F87229); b, cleared abactinal ray and interradial plates (R = 11 mm) (NMV F45092); c, cleared proximal abactinal plates, madreporite (lower right of disc), and indistinct disc (arrows at two proximal carinal plates) (NMV F45092); d, abactinal plates with spinelets (0.1 mm long), glassy convexities, and madreporite (upper right) (NMV F73465); e, cleared abactinal interradial plates with two gonopores (arrows) (NMV F45092); f, proximal actinal view, with absence of spines on adradial actinal plates (arrow) (NMV F87229).

fan-shaped; abactinal plates granular, covered with conspicuous glassy convexities; plates with commonly up to about 10 (rarely up to 20) fine bluntly-pointed readily-detached glassy spinelets, up to 0.15 mm long, mostly across proximal edge in irregular single transverse series, rarely over plate, decreasing in number distally; papulae small, mostly single, on proximal two-thirds of radial areas, in proximal third only of carinal series, up to 6 longitudinal series in mid-ray, few on proximal interradial areas; superomarginals not extending to margin, generally aligned with proximal edge of projecting inferomarginals, each with up to 6 vertical spinelets on projecting crown of plate; some secondary plates proximal to superomarginal series; lacking internal superambulacral plates between ambulacrals and actinals; distal abactinal and actinal interradial plates with internal tapered vertical contiguous projections.

Projecting inferomarginal plates form margin, each with marginal fringe of 6–7 distal fine spinelets, typically 0.25 mm long, proximal transverse row of shorter spinelets (typically 5); some secondary plates at actinal edge of inferomarginal series; cleared actinal plates in regular series, curving acutely from furrow to margin or perpendicular to furrow; actinal interradial plates with 1 spine, rarely 2 in mid-interradius, 1–3 very small spines distally; adradial row of actinal interradial plates lacking spines; adambulacral plates with 1 thick to tall subambulacral spine (sometimes 2 in mid-ray and distally), 3 (rarely 4) webbed furrow spines (2–1 distally); oral spines 4–6 (commonly 5); 1 suboral spine frequently present on every oral plate, rarely none.

Live colour. Aboral colour varies, uniform or spotted or mottled, with white, pale brown, pink, red, red-brown, red-orange, mauve, yellow; disc and ends of rays dark grey-green to black; orally white with some irregular orange to reddish-brown flecking (Victorian specimens). Shepherd (1968) reported pale cream, yellow or light brown for South Australian specimens.

Distribution. Southern Australia, East Gippsland, Victoria, to Esperance, Western Australia; Bass Strait coast of Tasmania; 0–59 m.

Remarks. Material from Rottneest I., Western Australia, reported by Marsh and Pawson (1993) as *A. atyphoida*, and a single specimen from Flinders, Victoria, reported by Dartnall (1970b) as *A. atyphoida*, are the closely related *M. nigranota* described below. No evidence was found to confirm a distribution of *M. atyphoida* as far west as Rottneest I., as reported by Rowe (in Rowe and

Gates, 1995). Nor was evidence found to confirm a distribution as far south as SE Tasmania, as reported by Dartnall (1980). Within *Meridiastra* the combination of diagnostic characters which distinguish *M. atyphoida* are the pentagonal form; long regular proximal carinal series of plates extending more than half the ray length; absence of proximal secondary plates except rarely within the disc; absence of spines on the adradial actinal plates; predominantly single subambulacral spines; frequent presence of suboral spines; and abactinal gonopores.

Meridiastra fissura sp. nov.

Figures 3a–f

Material examined. Holotype. Victoria, Flinders, ocean platforms, sublittoral rocky shallows, M. O'Loughlin and J. Ortenburg, 9 May 1993, NMV F87157.

Paratypes. Type locality, 16 Nov 1980, NMV F71878 (1); 13 Apr 1985, NMV F86021 (7); 5 Oct 1991, NMV F87227 (1); 22 Feb 1992, NMV F71880 (1); 12 Apr 1993, NMV F71879 (3); 12 Dec 1993, NMV F86019 (1).

Other material (selection for distribution and depth range). New South Wales, Little Bay, Sydney, 17 Jun 2001, NMV F89161(1); Eden, Twofold Bay, Yallumgo Cove, 24 Nov 1984 (pers. obs.). Victoria, Cape Conran, 5–6 m, 15 Apr 1998, NMV F87155 (1); Waterloo Bay, 10 m, 27 Feb 1996, NMV F87066 (1); Venus Bay, Twin Reefs, 4 Mar 1982, NMV F71755 (1); Cape Paterson, 14 Feb 1981, NMV F87237 (1); Harmers Haven, 24 Feb 1983, NMV F71736 (2+2 cleared); Phillip I., Kitty Miller Bay, 8 Jan 1986, NMV F87411 (1); Cheviot Beach, 31 Mar 1998, NMV F87065 (14); Port Phillip Heads, 15 m, 1 Jul 1982, NMV F86022 (2); Portsea Jetty, 5 m, May 1975, AM J9243 (1); Torquay, Point Danger, 28 May 1982, NMV F87239 (1); Mullet Holes, 10 km NE Apollo Bay, 2 Jan 1988 (pers. obs.); Portland, 28 Feb 1992, NMV F71883 (4). Tasmania, Alonnah, 12 Jan 1989 (pers. obs.); Maria I., 30 m, 23 Apr 1985, NMV F86020 (1); Deal I., East Cove, 15 m, 26 Mar 1981, NMV F71877 (5+3 cleared). South Australia, Robe, 9 Jan 1990 (pers. obs.); Victor Harbour, 9 Nov 1988 (pers. obs.); Cape Jervis, 10 Nov 1988, NMV F87412 (1); Normanville, 11 Nov 1988 (pers. obs.); Point Labatt, under rocks, intertidal, 15 Jan 1976, AM J10867 (7). Western Australia, Cheyne Beach, Lookout Point, 10 Nov 1969, NMV F87238 (2); Perth, Garden I., 1–2 m, 10 Dec 1983, WAM Z9695 (3).

Description. Small, up to $R = 9$ mm; rays 6–8, frequently 7, ends rounded, interradial edges slightly incurved, typically $R/r = 1.3$; form frequently asymmetrical (post fissipary), rays may be 3–4; body flat orally, thin, slightly domed aborally, acute angle at margin; madreporites up to 4, inconspicuous; anal openings up to 5; fissiparous; pedicellariae absent; 1–2 gonopores in each abactinal interradius.

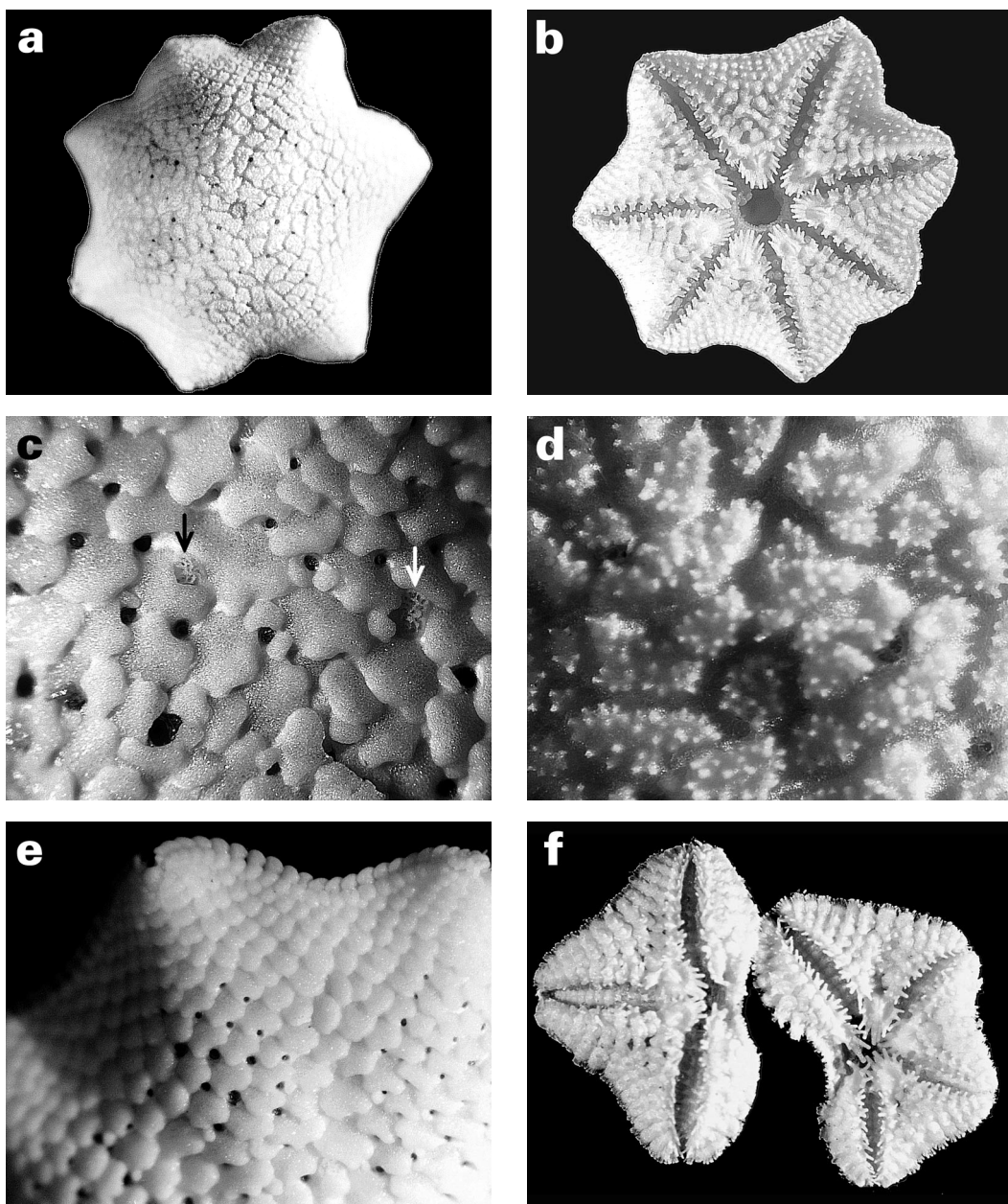


Figure 3. *Meridiastra fissura* sp. nov. a, abactinal view of holotype ($R = 5$ mm) (NMV F87157); b, actinal view of holotype; c, cleared proximal abactinal plates, and two madreporites (arrows) (NMV F71736); d, abactinal spinelets (0.1 mm long) (holotype); e, cleared abactinal rays and interradius (NMV F71736); f, actinal view of two specimens immediately after fissipary (NMV F87240).

Abactinal plates closely imbricate except proximally, in regular series distally only, in irregular mosaic proximally; papular spaces small; papulate areas similar in extent to non-papulate areas; secondary plates apically and distally, never separating carinals; lacking distinct disc; 5 longitudinal series of radial plates mid-ray; carinal series in mid-ray only; distal projecting abactinal plates fan-shaped, some radials with slightly concave proximal edge; size and form of proximal abactinal plates irregular; single (rarely paired) large papulae irregularly over proximal abactinal surface, absent from distal radial and interradial areas, proximal plates frequently slightly notched for single papula; abactinal plates granular, covered with fine glassy convexities; plates with up to about 30 small rugose frequently-webbed readily-detached glassy spinelets, typically 0.1 mm long, upright, scattered over plate, concentrated marginally, some plates with series on proximal edge pointing apically; superomarginals not extending to margin, generally aligned with proximal edges of projecting inferomarginals, some secondary plates along proximal edge of superomarginal series; lacking internal superambulacral plates between ambulacrals and actinals; distal abactinal and actinal interradial plates with internal tapered vertical contiguous projections.

Projecting inferomarginal plates form margin, each with marginal fringe of up to 7 distal fine spinelets, typically 0.2 mm long; non-calcareous actinal interradial areas proximally; cleared actinal interradial plates in regular series distally, curving acutely from furrow to margin; some secondary plates at actinal edge of inferomarginal series; actinal interradial plates frequently with 2–3 spines proximally; adradial row of actinal interradial plates with incomplete series of single often-reduced spines; adambulacral plates with 2 webbed subambulacral spines, 3 (rarely 4) webbed furrow spines; 6–4 oral spines; lacking suboral spines.

Live colour. Aborally faun to cream to white proximally, white distally, with a few irregular orange to red to dark reddish-brown spots, some spots brownish distally; madreporites yellow; rare dark greenish-black markings around ends of rays; some anal openings surrounded by dark greenish-black or red; white orally.

Distribution. Southern Australia, from Sydney (central New South Wales) to Garden I. (SW Western Australia); D'Entrecasteaux Channel, Alonnah (southern Tasmania); rock substrate, 0–30 m.

Etymology. From Latin *fissura* (split), referring to the fissiparous reproductive habit.

Remarks. This small species is fissiparous, and post-fissipary forms are frequently found. The number of arms (6–8), fissiparous habit, irregular form, multiple inconspicuous madreporites, very irregular proximal abactinal plates, and proximal abactinal spinelets not predominantly across the free margin of the plates distinguish this species and make it exceptional within the genus. But the small size, slightly incurved margins, distal abactinal plate arrangement, papular arrangement, small glassy readily-detached abactinal spinelets, actinal spination and absence of pedicellariae justify placement in *Meridiastra* rather than the establishment of a new monotypic Asterinidae genus.

Meridiastra modesta (Verrill) comb. nov.

Figures 4a–f

Asterina (*Asteriscus*) *modesta* Verrill, 1870: 277.

Asterinides modesta.—Verrill, 1913: 482.—Verrill, 1915: 61.

Asterina modesta.—Fisher, 1919: 410.—H.L. Clark, 1916: 57.—H.L. Clark, 1946: 130.—A.M. Clark, 1993: 211–212.

Asterina agustincasoi Caso, 1977: 209–231, figs 8–16, tpls 2–3 (syn. nov.)

Material examined. *Asterina modesta*. Lectotype (YPM 24175, alcohol). Panama, F.H. Bradley, 1866.

Paralectotypes. Type series, YPM 605A (3, dry, mounted); YPM 605B (3, alcohol); MCZ 776 (1, dry); Panama, Pearl I., F.H. Bradley, 1866, YPM 1536 (1, alcohol).

Other material. Panama, Panama Bay, Taboga I., Jun 1914, USNM 39110 (1).

Asterina agustincasoi. Paralectotypes. Type series, Mexico, Guerrero, 12 km W of Zihuatanejo, Ixtapa I., Jan 1963, ICML-UNAM 2.42.0 (9).

Description of material. Small, up to R = 10 mm; form pentagonal, interradial edges straight, sometimes near-pentagonal with interradial margins incurved, typically R/r = 1.2–1.3; rays 5, rarely 4, ends rounded; body flat orally, thin, slightly domed aborally, acute angle at margin; single triangular madreporite; not fissiparous; pedicellariae absent; paired interradial gonopores abactinal, under proximal edge of same or separate plates, with 1–3 proximal spinous secondary plates.

Abactinal plates closely imbricate, in regular series; papular spaces small; papulate areas less extensive than non-papulate areas; numerous secondary plates proximally, 1–5 in papular spaces radially and interradially, frequently between carinal plates, proximal to abactinal gonopores in

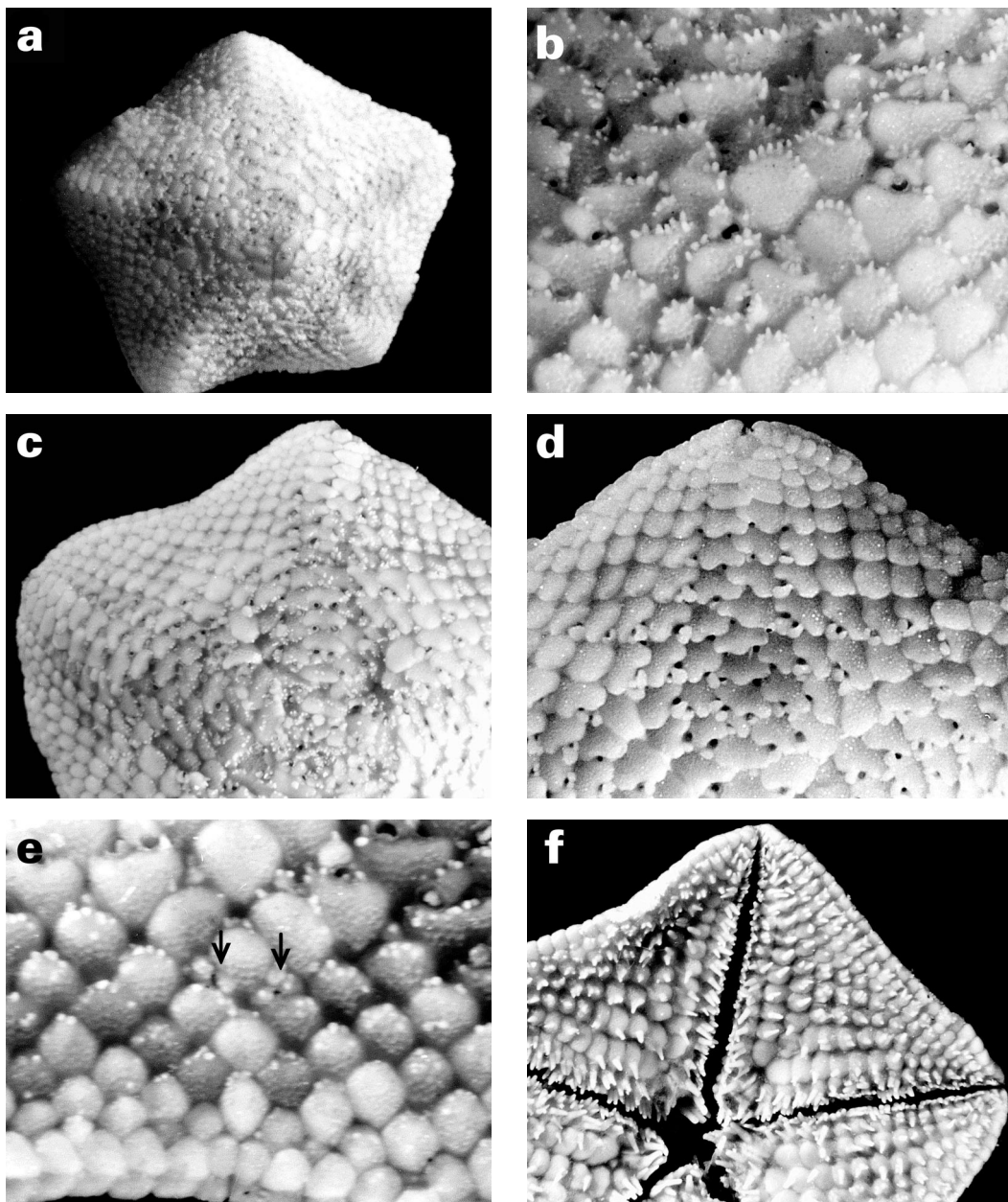


Figure 4. *Meridiastra modesta* (Verrill) comb. nov. a, abactinal view of lectotype (R = 7 mm) (YPM 24175); b, abactinal primary and secondary plates, and spinelets (0.15 mm long) (USNM 39110); c, abactinal rays and interradius (R = 10 mm) (USNM 39110); d, cleared abactinal ray and interradii (R = 7 mm) (paralectotype of *agustincasoi*); e, margin (lower) and distal interradii primary and secondary plates and spines, with spinous secondary plates proximal to two gonopores (arrows) (USNM 39110); f, actinal surface (USNM 39110).

mid-interradius, adjacent proximally to superomarginal plates; disc variably distinct, bordered by irregular pentagon comprising 5 proximal carinal and 5 smaller interradial plates; each radius with 4 longitudinal series of plates in mid-ray; radial plates with proximal edge slightly convex or straight or slightly concave, sometimes with slight median lobe; some radials indented proximally for 1 or commonly 2 or rarely 3 papulae; short proximal carinal series comprises typically 5 plates extending third to half ray length, distally 12–14 zig-zag radial plates; projecting interradial plates fan-shaped; abactinal plates granular, covered with conspicuous glassy convexities; plates with up to 12 short bluntly-pointed readily-detached glassy spinelets, 0.10–0.15 mm long, on proximal edge of plates in 1–2 irregular transverse rows, pointing apically; 4–6 vertical spinelets on crown of distal abactinal interradial plates; papulae commonly paired, small, longitudinal series along three quarters of ray laterally, few in proximal interradial areas; superomarginal plates not extending to margin, aligned with proximal edge of projecting inferomarginals except in mid-ray, each with up to 5 vertical spinelets concentrated distally on plate; secondary plates along proximal edge of superomarginals; lacking internal superambulacral plates between ambulacra and actinals; distal abactinal and actinal interradial plates with internal tapered vertical contiguous projections.

Projecting inferomarginal plates form margin, each with marginal fringe of double oblique combs each up to 7 spinelets, up to 0.3 mm long; secondary plates adjacent to inferomarginals actinally; cleared actinal interradial plates in series curving obliquely or acutely from furrow to margin (from mid-ray); actinal interradial plates with predominantly 2 spines, variably 1–3; actinal adradial row of interradial plates lacking spines proximally, then irregular series of spines, predominantly 1, sometimes 2 mid-ray; adambulacral plates with predominantly 2 webbed subambulacral spines proximally, 1 distally; 4 furrow spines proximally, 3 mid-ray, 2 distally, webbed to tips; oral spines typically 5, subspatulate, not pointed; suboral spines 1, tall, tapered.

Live colour. Ivory, almost white (Caso, 1977).

Distribution. Pacific coasts of Panama and Mexico; rocky shallows.

Remarks. Caso (1977) distinguished *Asterina agustincasoi* from *Asterina miniata* Brandt, but did not distinguish the new species from *Asterina modesta*. Type material of *A. agustincasoi* and *A.*

modesta was examined, and the species are synonymised. A lectotype and paralectotype series are established for *A. modesta*, and this species is reassigned to *Meridiastra*. H.L. Clark (1916, 1946) noted the similarity of *A. modesta* to *A. atyphoida*. Within the genus *M. modesta* is distinguished by: the short proximal carinal series of plates, some of which are doubly papulate; numerous proximal secondary plates; spinous secondary plates proximal to the abactinal gonopores; and predominantly paired actinal interradial spines. Having numerous proximal secondary plates makes the species unique within the new genus. The form of the abactinal spinelets, and disposition across the proximal edge of the plates, are characters quite similar to the type species *M. atyphoida*.

Meridiastra nigranota sp. nov.

Figures 5a–f

Asterina atyphoida.—Dartnall, 1970b: 19, fig. 1 [non *Asterina atyphoida* H.L. Clark, 1916].—Marsh and Pawson, 1993: 281 (part, Rottneest I. specimens) [non *Asterina atyphoida* H.L. Clark, 1916].

Material examined. Holotype. Australia, Victoria, Flinders, ocean platforms, shallow rocky sub-littoral, M. O'Loughlin, 13 Apr 1985, NMV F87414.

Paratypes. Type locality, 6 Jun 1969, TM H1058 (1); 17 Dec 1969, NMV F87232 (2+1 cleared); TM H493 (3); 6 Feb 1972, NMV F71938 (1); 10 Apr 1970, NMV F87413 (1); 7 Apr 1980, NMV F73002 (1); 13 Apr 1985, NMV F72030 (1+1 cleared); 12 Dec 1985, NMV F71930 (1); 17 Feb 1990, NMV F71931 (2); 11 Aug 1990, NMV F71941 (1); 5 Oct 1991, NMV F87234 (1); 22 Feb 1992, NMV F65914 (1); 12 Apr 1993, NMV F87174 (11); 9 May 1993, NMV F87226 (6); 12 Dec 1993, NMV F87231 (1).

Other material (selection for distribution and depth range). Victoria, Wilsons Promontory, 10 Mar 1984, NMV F71936 (1); Cape Paterson, 6 Mar 1982, NMV F71932 (2); Western Port, Crawfish Rock, 15 Feb 1969, NMV F73140 (1); Port Phillip Bay, Portarlington, 13 Mar 1977, NMV F73003 (1); Cape Nelson, 3 Mar 1984, NMV F71934 (1). Tasmania, NE between Ringarooma Bay and Waterhouse Point, Mar 1970, TM H1330 (1); King I., Currie, 10 Mar 1980, NMV F87162 (2); Tasman Peninsula, N of Thumbs Point, 6–10 m, 31 Jul 1991, SAM K1894 (5). South Australia, Port McDonnell, 18 Mar 1976, AM J9909 (5); off Cape Northumberland, 30 m, 14 Jul 1974, SAM K1892 (1). Western Australia, Rottneest I., Little Armstrong Bay, 0 m, 9 Jan 1991, WAM Z6856 (1); Ricey Beach, 0–1 m, 14 Jan 1991, WAM Z6857 (1).

Description. Small, up to R = 13 mm; form pentagonal, interradial edges straight, sometimes near-pentagonal with interradial margins incurved, typically R/r = 1.3; rays 5, ends

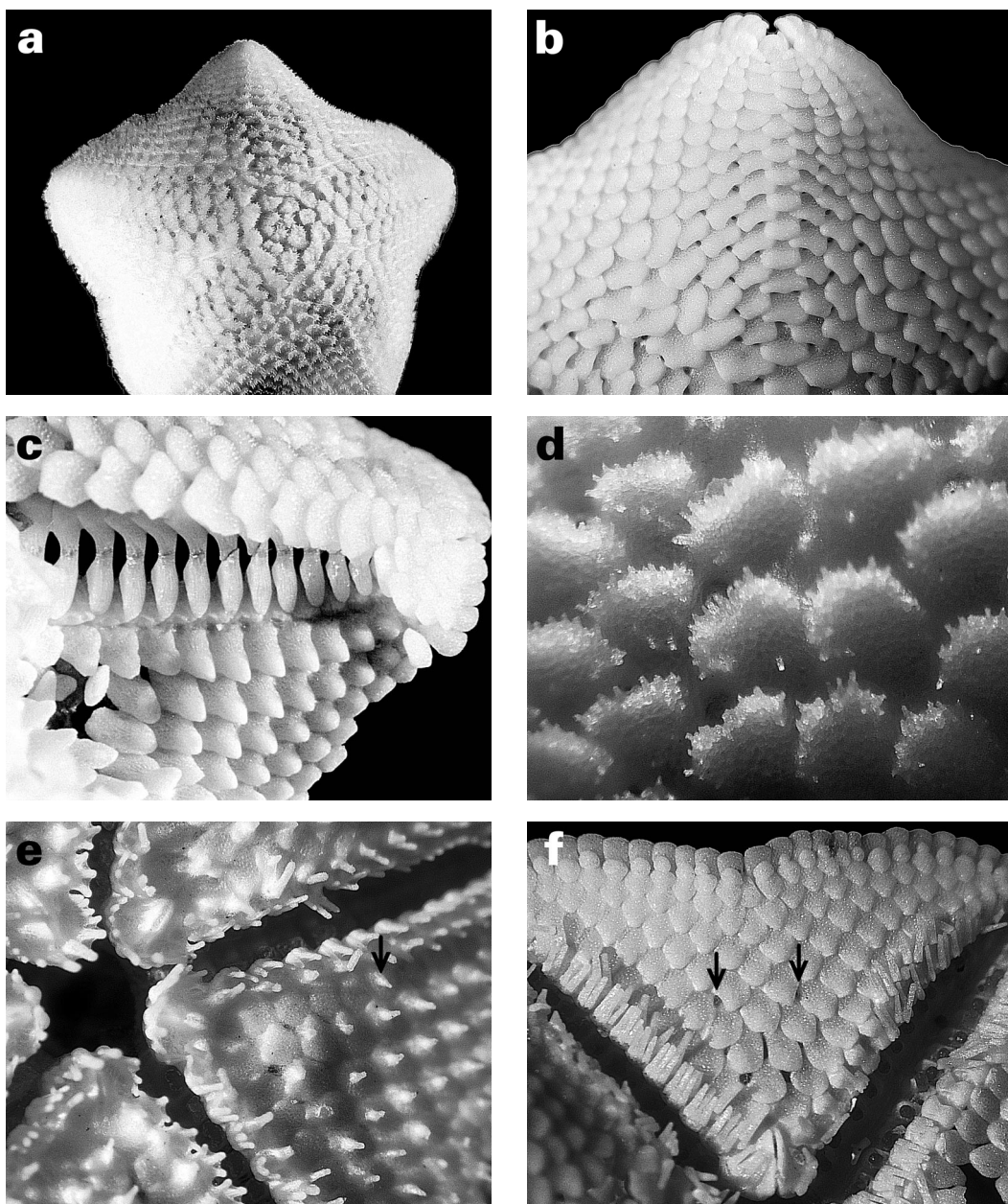


Figure 5. *Meridiastra nigranota* sp. nov. a, abactinal view of holotype (R = 7 mm) (NMV F87414); b, cleared abactinal ray and interradius (paratype NMV F87232; R = 8 mm); c, abactinal view of dissected and cleared interradius, showing ambulacral plates and absence of superambulacral plates (paratype NMV F87232); d, abactinal plates and spinelets (0.15 mm long) (holotype); e, proximal actinal view, with single spine (arrow) on adradial plates (NMV F87162); f, cleared actinal view, with gonopores (arrows) (paratype NMV F87232).

rounded; body flat orally, thin, slightly domed or low pyramidal aborally, acute angle at margin; single triangular madreporite; not fissiparous; pedicellariae absent; paired interradial gonopores actinal.

Abactinal plates closely imbricate, in regular series; papular spaces small; papulate areas less extensive than non-papulate areas; secondary plates rare, apical and marginal only, never separating carinal plates; disc variably distinct, bordered by irregular pentagon comprising 5 proximal carinal and 5 interradial plates; each radius with 5 longitudinal series of plates in mid-ray; distinct proximal carinal series comprises up to 12 (rarely 13) plates extending three quarters of ray length, distally 2–12 zig-zag radial plates; carinals with proximal edge slightly convex or straight or concave, some with slight median lobe; some radials indented proximally for 1 or rarely 2 papulae; projecting interradial plates fan-shaped; abactinal plates granular, covered with conspicuous glassy convexities; plates with frequently more than 20 fine pointed rugose terminally-spinous frequently-webbed readily-detached glassy spinelets, up to 0.2 mm long, clustered across proximal edge in irregular single and double transverse series, frequently also scattered over plate, on projecting crown of distal interradial plates; papulae small, mostly single, on disc and proximal two-thirds of radial areas, in proximal third only of carinal series, 4 longitudinal series in mid-ray, few on proximal interradial areas; superomarginals not extending to margin, aligned with proximal edge of projecting inferomarginals, each with up to 6 vertical spinelets; some secondary plates along proximal edge of superomarginal series; lacking internal superambulacral plates between ambulacra and actinals; distal abactinal and actinal interradial plates with internal tapered vertical contiguous projections.

Projecting inferomarginal plates form margin, each with marginal fringe of 5–6 distal fine webbed spinelets, typically 0.25 mm long, proximal transverse row of shorter spinelets (typically 4); some secondary plates at actinal edge of inferomarginal series; cleared actinal plates in regular series, curving obliquely or acutely from furrow to margin or perpendicular to furrow; actinal interradial plates with 1 spine, frequently 2 in mid-interradius, 1–3 very small spines distally; actinal adradial row of interradial plates with none to very few to incomplete series of frequently reduced spines; adambulacral plates with 1–2 tall subambulacral spines proximally, frequently 2 from mid-ray distally; 3 webbed furrow

spines, 2–1 distally; oral spines 4–6 (commonly 5); suboral spines rarely present, frequently reduced if present.

Live colour. Aboral colour white to faun to pale grey, with irregular black to dark reddish-black to dark greenish-black spotting, some brownish-red to red spots distally; disc dark greenish-black; madreporite white; faint red flecking around ends of rays; white orally.

Distribution. Southern Australia, Wilsons Promontory, Victoria, to Rottnest I., Western Australia; Tasmania south to Tasman Peninsula; 0–30 m.

Etymology. From Latin *niger* (black) and *nota* (spot), referring to the fine black aboral spotting on live animals.

Remarks. Within *Meridiastra* the combination of diagnostic characters which distinguish *M. nigra-nota* are the pentagonal form; long regular proximal carinal series of plates extending more than half the ray length; absence of proximal secondary plates except rarely within the disc; absence or irregular presence of spines on the adradial actinal plates; predominantly paired subambulacral spines; frequent absence of suboral spines; and actinal gonopores. Within the new genus *M. nigranota* is most closely related to *M. atyphoida*, from which it is distinguished by live colour and actinal gonopores.

Meridiastra rapa sp. nov.

Figures 6a–f

Asterina sp.—Marsh, 1974: 92–93.

Material examined (all dry). Holotype. South Pacific, Austral Ridge, Rapa I., Haurei Bay, off Point Tura-gainuu, under basalt boulders, 1–2 m, D.M. Devaney, Feb 1971, BPBM W3507.

Paratypes. Type series, BPBM W3033 (3); WAM Z6875 (2).

Other material. Type locality, 27 Nov 1963, USNM E53099 (1).

Description of material. Small, up to $R = 5.5$ mm (type series; $R = 7$ mm for flattened USNM E53099); form pentagonal, interradial edges straight, or near-pentagonal with interradial margins incurved, typically $R/r = 1.3$; rays 5, ends rounded; body flat orally, thin, slightly domed aborally, acute angle at margin; single triangular madreporite; not fissiparous; pedicellariae absent; paired interradial gonopores abactinal.

Abactinal plates closely imbricate, in regular series except proximally; papular spaces small; papulate areas slightly less extensive than

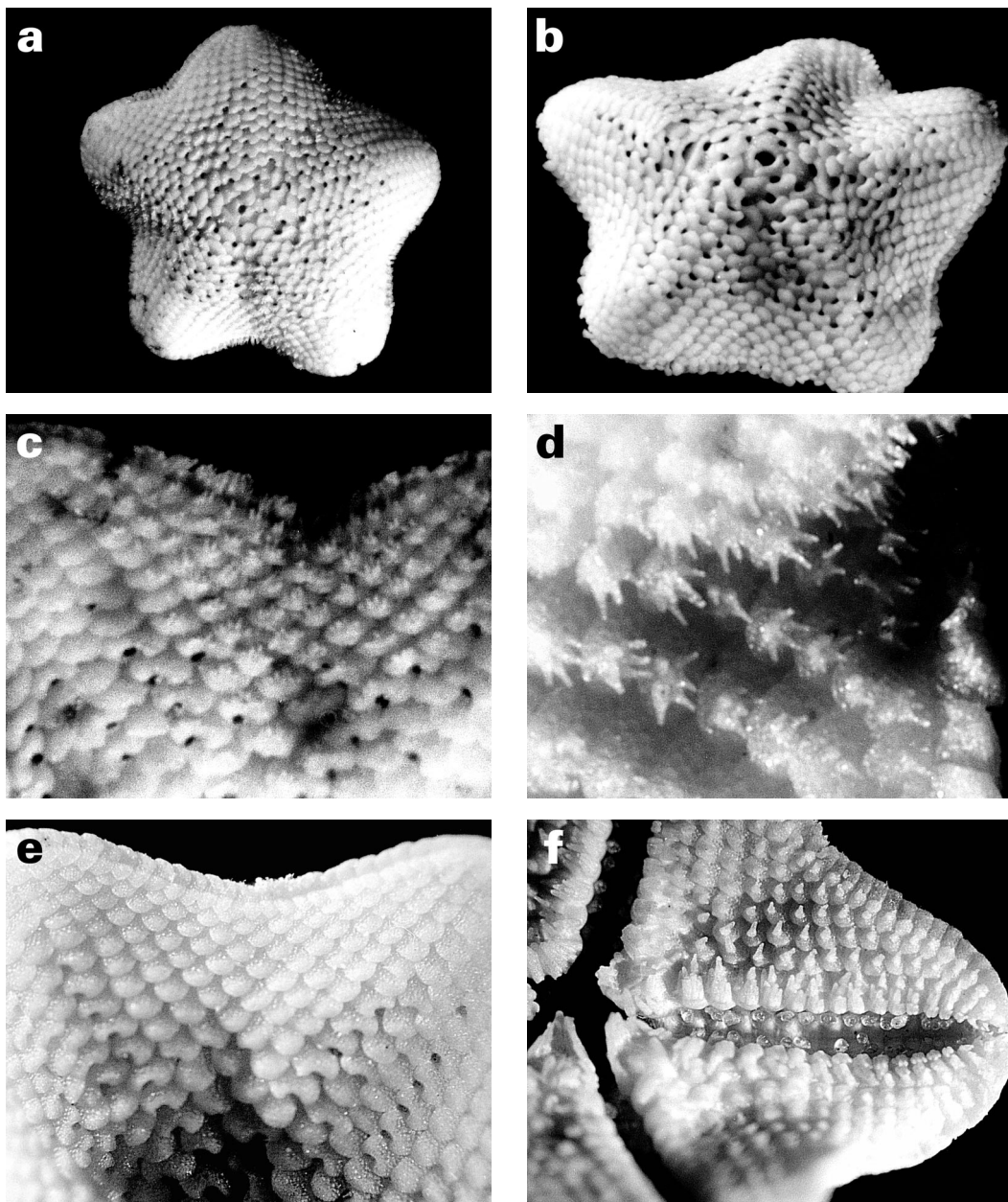


Figure 6. *Meridiastra rapa* sp. nov. a, abactinal view of holotype (R = 5.5 mm) (BPBM W3507); b, abactinal view of cleared paratype (R = 5 mm) (BPBM W3033); c, abactinal interradius of holotype showing spinelets (0.1 mm long); d, distal abactinal interradii spinelets (0.1 mm long) (paratype WAM Z6875); e, abactinal rays and interradius (paratype WAM Z6875); f, actinal view (paratype WAM Z6875).

non-papulate areas; secondary plates absent abactinally; lacking distinct disc; apical plates large, irregular; lacking regular carinal series of plates, sometimes about 4 irregular proximal carinal plates; ray defined by 2 lateral longitudinal series of plates singly notched for proximal two-thirds of ray; mid-ray longitudinally comprises 2 series of alternating plates for length of ray, least regular proximally, sparsely papulate with proximal plate edge slightly notched or concave for proximal half of ray; each ray with 4 longitudinal series of plates in mid-ray; projecting interradial plates fan-shaped; abactinal plates granular, covered with fine glassy convexities; plates with up to 14 fine pointed readily-detached glassy spinelets, typically 0.15 mm long, vertical across free edge of proximal plates in irregular double series, sometimes webbed, on crown of distal plates; papulae single, papular spaces small, papulae principally radial, distinct single series along proximal two-thirds of ray laterally, 3 irregular longitudinal series of papulae in mid-ray; some on proximal interradial areas; superomarginals not extending to margin, aligned with proximal edge of projecting inferomarginals, each with typically 2–3 vertical spinelets; lacking internal superambulacral plates between ambulacra and actinals; distal abactinal and actinal interradial plates with some internal vertical contiguous projections.

Projecting inferomarginal plates form margin; marginal fringe of oblique combs of spinelets, sometimes webbed, sometimes double series, up to 8, typically 0.2 mm long; few secondary plates adjacent to inferomarginals; actinal plates (cleared) in series curving obliquely (obtusely) from furrow to margin; actinal interradial plates with 1–2 spines, predominantly 1; actinal adradial row of interradial plates all with 1 spine; adambulacral plates with 1–2 tall subambulacral spines, predominantly 2; predominantly 3 webbed furrow spines, 2 distally; oral spines 5; suboral spines 1–2.

Etymology. Named after the type locality, Rapa I., noun in apposition.

Distribution. Rapa I.; 0–2 m.

Remarks. Within *Meridiastra* the combination of diagnostic characters which distinguish *M. rapa* are the close to pentagonal form; very small size (up to $R = 5.5$ mm); very irregular short proximal carinal series of plates; irregular proximal plates and absence of a distinct disc. *M. rapa* and *M. fissura* both have irregular proximal abactinal plates, and lack a distinct disc.

Asterinides Verrill

Figures 7a–e

Asterinides Verrill, 1913: 479.—Verrill, 1915: 58.—Fisher, 1919: 410.—A.M. Clark, 1983: 364.—Clark and Downey, 1992: 178.—A.M. Clark, 1993: 214.—Rowe (in Rowe and Gates), 1995: 33.—Rowe (in Campbell and Rowe), 1997: 131.

Type species. *Asteriscus folium* Lütken, 1860.

Diagnosis. Small, up to $R = 15$ mm; form near-pentagonal, interradial margins slightly incurved, $R/r = 1.3$; rays 5, ends rounded; body flat orally, low dome aborally, acute angle at margin; madreporite plate with pores centrally only; pedicellariae absent; abactinal gonopores.

Abactinal plates imbricate, in regular series; papular spaces prominent; papulate areas more extensive than non-papulate areas; disc clearly delineated, 4 (one occupied by madreporite) addisc interradial papular spaces with 2 papulae separated by 1–2 secondary plates; proximal secondary plates rare; proximal radial and interradial plates with distinct papular notch creating near-crescentic appearance; some proximal and distal interradial plates with small dome on crest; abactinal plates granular, covered with conspicuous glassy convexities; abactinal proximal plates with central tuft of up to 20 slender readily-detached glassy spinelets, up to 0.25 mm long, distal and midinteradial superomarginal plates with vertical clusters of near-paxilliform radiating spinelets; superomarginal plates not extending to margin, not always aligned with inferomarginals; distal interradial and superomarginal plates small, irregular in size and form; papulae numerous, large, single, in distinct papular notch; lacking superambulacral internal plates; distal actinal and abactinal interradial plates with internal tapered vertical contiguous projections.

Projecting inferomarginal plates form margin, each with clusters of crowded radiating spinelets, up to 0.25 mm long; cleared actinal interradial plates in regular series, curving acutely from furrow to margin; actinal interradial plates with 3–4 spines midradially; adambulacral plates with 3–4 webbed subambulacral spines; 3–5 webbed furrow spines; 1–6 suboral spines.

Remarks. Verrill (1913) distinguished *Asterinides* from *Asterina* by the former's lack of pedicellariae. Verrill (1913) assigned *A. cepheus* (Müller and Troschel) from northern Australia, and *A. modesta* (Verrill) from the eastern Pacific, to *Asterinides*. Fisher (1919) did not regard the presence or absence of pedicellariae as a reliable diagnostic character, and based on the similarity of the

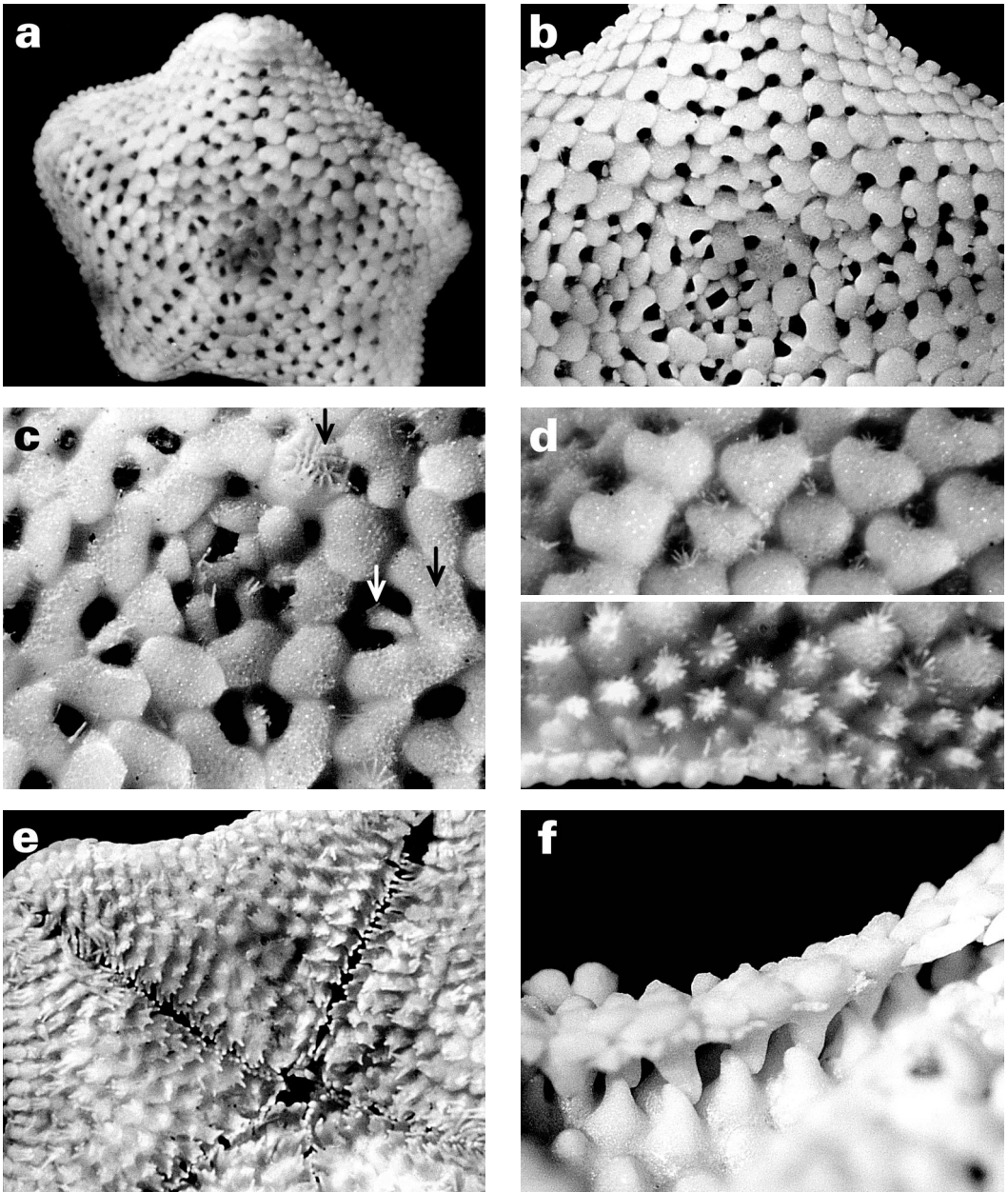


Figure 7. a–e, *Asterinoides folium* (Lütken). a, uncleared abactinal view (R = 7 mm) (USNM 38811); b, cleared abactinal proximal plates, showing disc (USNM 38811); c, uncleared disc with madreporite (top, arrow), ad–disc papular spaces with longitudinal secondary plates (one at white arrow) and subtending pairs of concave plates (one at black arrow) (USNM 38811); d (upper), abactinal proximal interrarial plates with tufts of spinelets (up to 0.25 mm long) (USNM 38811); d (lower), abactinal distal interrarial plates with near-paxilliform clusters of spinelets (USNM 38236); e, actinal view (USNM 38811); f, *Asterina gibbosa* (Pennant), dissected and cleared distal interradius with contiguous internal projections of abactinal and actinal plates (NMV F87241).

abactinal skeleton and spines synonymised *Asterinides* with *Asterina*. A.M. Clark (1983) and Clark and Downey (1992) considered that *Asterinides* might be revived, based on the delicate abactinal spinelets and relatively low and near-pentagonal body form. Rowe and Berents (pers. com.) and Rowe (in Rowe and Gates, 1995 and in a note in Campbell and Rowe, 1997) supported the recognition of *Asterinides* as a valid genus. *A. modesta* is reassigned above to *Meridiastra* gen. nov. Specimens of *A. cepheus* from Queensland (AM J23331) and New Guinea (AM J22934) were examined. Although the arms were distinct and secondary plates absent, having a combination of slender glassy abactinal spinelets, numerous actinal spines on each plate, abactinal plates notched for single papulae, small papular spaces, papulate more extensive than non-papulate areas, irregular carinal series, abactinal gonopores, and no pedicellariae supports a retention of this species in *Asterinides*.

Based on the two type species *Asterina gibbosa* (Pennant) and *Asterinides folium* (Lütken), the combination of characters distinguishing *Asterina* Nardo and *Asterinides* Verrill are listed in Table 2. Based on the type species *Asterinides folium* (Lütken), the combination of characters distinguishing *Asterinides* Verrill and *Meridiastra* gen. nov. are listed in Table 3.

Asterinides folium (Lütken, 1860)

Figures 7a–e

Synonymy. See Clark and Downey (1992: 182–183).

Material examined. Holotype. Virgin Is, St Thomas, Consul Krebs (ZMUC).

Other material. Atlantic Ocean, Gulf of Mexico, Florida, Florida Keys, off Key West, Sand Key Reef, J.B. Henderson, no date, USNM 38811 (3); Bermuda, Hungry Bay, Sep 1901, USNM 38236 (4).

Description of material. Small, up to $R = 15$ mm; form near-pentagonal to arms slightly petaloid, typically $R/r = 1.4$; rays 5, ends rounded; body flat orally, low dome aborally, acute angle at margin; single madreporite, not triangular, pores centrally only on plate; not fissiparous; pedicellariae absent; paired interradial gonopores abactinal.

Abactinal plates imbricate, in regular series; papular spaces conspicuous; papulate areas more extensive than non-papulate areas; secondary plates sometimes in papular spaces, some along superomarginal series, some next to inferomarginals actinally; disc inconspicuous but distinctive, bordered by pentagon comprising 5

proximal carinal and 5 interradial plates, 5 ad-disc interradial papular spaces each with 2 lateral papulae separated by 1–2 secondary plates or madreporite plate; carinal plates irregularly present proximally, series up to 7 extending one third of ray distally, midradials zig-zag longitudinally for distal two-thirds of ray; proximal radial and interradial plates with papular notch creating near-crescentic appearance, up to 2 carinals doubly notched; some proximal and distal interradial plates with small dome on crown; distal interradials and superomarginals small, irregular in size and arrangement, superomarginals not always aligned with inferomarginals; abactinal plates granular, covered with conspicuous glassy convexities; proximal plates with central tuft of up to 20 very slender, pointed, very readily-displaced, glassy spinelets, up to 0.25 mm long, orientated apically over papular space, some spinelet clusters near-paxilliform; distal interradial plates and midinteradial superomarginal plates with vertical clusters of near-paxilliform radiating spinelets; papulae large, single except for 1–2 carinals, distinct papular notches, some papular spaces with 1–3 secondary plates, papulae extending four fifths of ray distally, up to three quarters of interradius distally; longitudinal papular series up to 8-wide in mid-ray; lacking internal superambulacral plates between ambulacrals and actinals; distal abactinal and actinal interradial plates with internal tapered vertical contiguous projections.

Projecting inferomarginal plates form margin, each with clusters of crowded laterally-radiating spinelets up to 0.25 mm long; cleared actinal interradial plates in regular series, curving acutely from furrow to margin from mid-ray distally; actinal interradial plates with 2–5 slender webbed spines, predominantly 3–4 in midinteradius; adradial row of actinal interradial plates with 3–4 webbed spines; adambulacral plates with 3–4 webbed subambulacral spines, 3–5 webbed furrow spines; oral plates with 5–6 spines; 1–6 suboral spines, some webbed.

Distribution. See Clark and Downey (1992: 183).

Remarks. Verrill (1915) noted the absence of “gyri” (wavy perforations) around the base of the madreporite plate. The abactinal plates of the Bermuda specimens (USNM 38236) frequently had domes on the crests, which were not evident on the holotype or in the Florida material (USNM 38811). Subsequent to the synonymy of Clark and Downey (1992), Rowe (in Rowe and Gates, 1995 and in a note in Campbell and Rowe, 1997) discussed the referral of *A. folium* to *Asterinides*, as noted above.

Table 1. Characters distinguishing *Asterina gibbosa* (Pennant) and *Meridiastra* gen. nov.

<i>Asterina gibbosa</i> (Pennant)	<i>Meridiastra</i> gen. nov.
larger size; R up to 35 mm	small size; R up to 13 mm
short-rayed stellate form; arms distinct	pentagonal or near-pentagonal form
crescentic, openly imbricating, abactinal plates	fan-shaped, closely imbricating, abactinal plates
oval or lobed madreporite	triangular madreporite
clearly delineated disc	disc poorly delineated or not distinct
ad-disc triangular interradian papular spaces with more than two secondary plates	lacking ad-disc triangular interradian papular spaces
papulate areas greater than non-papulate	non-papulate areas greater than papulate
large papular spaces with numbers of papulae	small papular spaces with single papulae
pedicellariae present	pedicellariae absent
blunt opaque firmly-attached abactinal spinelets	fine glassy readily-detached spinelets
abactinal spinelets on crown of plates	abactinal spinelets on free margin of plates

Table 2. Characters distinguishing *Asterina* Nardo and *Asterinides* Verrill.

<i>Asterina gibbosa</i> (Pennant)	<i>Asterinides folium</i> (Lütken)
larger size; R up to 35 mm	small size; R up to 15 mm
short-rayed stellate form; arms distinct	pentagonal or near-pentagonal form
numerous secondary plates abactinally	rare secondary plates abactinally
whole madreporite plate with pores	madreporite plate with pores centrally only
ad-disc triangular interradian papular spaces with more than 2 secondary plates	ad-disc triangular interradian papular spaces divided by 1–2 secondary plates
papular spaces large, with numbers of papulae	papular spaces smaller, with single papulae
pedicellariae present	pedicellariae absent
blunt opaque firmly-attached abactinal spinelets	fine glassy readily-detached spinelets
abactinal spinelets over crown of plates	abactinal spinelets in tufts on plates
gonopores actinal	gonopores abactinal

Table 3. Characters distinguishing *Asterinides* Verrill and *Meridiastra* gen. nov.

<i>Asterinides folium</i> (Lütken)	<i>Meridiastra</i> gen. nov.
abactinal plates prominently notched, near-crescentic	abactinal plates fan-shaped, not near-crescentic
madreporite plate with pores centrally only	whole madreporite plate with pores
ad-disc triangular interradian papular spaces divided by 1–2 secondary plates	lacking ad-disc triangular interradian papular spaces
papular spaces conspicuous	papular spaces inconspicuous
papulate areas greater than non-papulate	non-papulate areas greater than papulate
abactinal spinelets in tufts on plates	abactinal spinelets across free margin
actinal interradian plates with 3–4 spinelets in mid-ray	actinal interradian plates with 1–2 spinelets in mid-ray

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