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A Review of *Pitar* (*Hyphantosoma*) Dall, 1902 (Veneridae: Pitarinae) and a Description of *Pitar* (*H.*) *festoui* sp. nov.

by

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Abstract. *Hyphantosoma* Dall, 1902, a tropical subgenus of *Pitar* (Bivalvia: Veneridae), is characterized by fine zigzag sculpture. It includes six fossil species: four from the Caribbean, one from the eastern Pacific, and one from New Zealand. Of the five living species, three occur in the eastern Pacific. A fourth species, *P.* (*H.*) *intricata* (Dautzenberg, 1907), occurs in the west Pacific. A fifth species, *P.* (*H.*) ***festoui*** sp. nov., is herein described from Tahiti, French Polynesia.

INTRODUCTION

Unlike other major subfamilies in the Veneridae Rafinesque, 1815, no recent published revision exists of the Pitarinae Stewart, 1930, and it remains one of the least understood venerid subfamilies. The nominate genus *Pitar* Römer, 1857, contains 50 or more extant species; KEEN (1969) lists 11 extant subgenera, including *Hyphantosoma* Dall, 1902. *Hyphantosoma* includes pitarine clams with fine zigzag sculpture on their valves, a rare sculptural pattern within the family. Here I review the species of this taxon, describe their past and present distribution, discuss their relationships with other pitarine taxa, and describe a new species.

Museum abbreviations: Academy of Natural Sciences at Philadelphia, ANSP; National Science Museum at Tokyo, NSMT; United States National Museum, USNM; University of California Museum of Paleontology, UCMP.

SYSTEMATIC ACCOUNT

Genus *Pitar* Römer, 1857

Subgenus *Hyphantosoma* Dall, 1902

Hyphantosoma DALL, 1902:354; type species (original designation): *Cytherea* (*Circe*) *carbasea* Guppy, 1866.

Definition: Valves have fine, chiseled zigzag sculpture on part or all of the surface; ovate to subovate and subtrigonal profiles; large lunules; well-developed anterior lateral teeth; smooth internal margins.

Description: DALL (1902) described the taxon simply as "shell with zigzag sculpture on the surface like *Textivenus* Cossmann, of the Venerine series," and the sculpture itself as "fine zigzag chiseling of the surface." Zigzag sculpture is often restricted to the sides; it is evident over the entire surface of *Hyphantosoma aletes* Hertlein & Strong, 1948, but small specimens lack the sculpture, and it is easily eroded off larger specimens (HERTLEIN & STRONG, 1948). Zigzag sculpture is more sharply defined in the tropical mid-and western Pacific species.

Extant species of *Hyphantosoma* have ovate valves, typically with slightly to more pronounced subquadrate posterior ends. The escutcheon is often well defined by a slight ridge, an uncommon state within Pitarinae. The lunule is large, moderately obese, and distinctly, if shallowly, incised. The cardinal teeth are typical of Pitarinae: the right anterior and posterior teeth are dorsally attached, as are the left anterior and median teeth, and the right anterior tooth is partially detached from the hinge plate. The left anterior lateral tooth is well developed, compact, and either close to or moderately separate from the cardinal teeth. The sculpture is of fine, polished, indistinct growth bands, superimposed partly or entirely by fine, nested, zigzag threads. The pallial sinus is well developed, moderately deep, and triangular, with a rounded apex. The valves are white, porcelaneous, often patterned with brown marks or rays, and range from 2 to 8 cm in length.

Remarks: DALL (1902) observed that among American taxa the surface zigzag sculpture is present in Oligocene species, becoming obsolete in the Pliocene and is present only within the shell matrix for Recent species, becoming evident in worn specimens, with color patterns that fre-

quently follow the zigzag pattern. In fact, zigzag sculpture, although not sharply highlighted, occurs on the surface of all three Recent American species. Traces of zigzag sculpture occur on the posterior surface of the type of *Hyphantosoma pollicaris* (Carpenter, 1864) (USNM 1372), and of *H. hertleini* Olsson, 1961 (OLSSON, 1961; herein, Figure 2c).

Distribution: The taxon is recorded in fossils ranging from the Early Oligocene to early Pleistocene in the Caribbean (WOODRING, 1982). Several fossil species are recorded from this area and one species from New Zealand. The biogeographic range of living species is exclusively subtropical and tropical Pacific. In the west Pacific, specimens of *Hyphantosoma* have been recorded from the Philippines (HABE & OKUTANI, 1983), southern Japan (HABE, 1981; MATSUKUMA, 1984), Truk and Ponape of the Eastern Caroline Islands (MATSUKUMA, 1984), and Tahiti in the south Pacific (HARTE, 1992). I have personally collected beachdrift specimens from Java, Indonesia, near Jakarta. In the eastern Pacific, *Hyphantosoma* occurs from the Gulf of California to Peru (KEEN, 1971). All species are uncommon to rare, and occur in subtidal offshore sediments of mud, gravelly or shelly sand (HERTLEIN & STRONG, 1948), or coralline sand (HARTE, 1992).

Fossil Species

Pitar (*Hyphantosoma*) *carbasea* (Guppy, 1866)

(Figure 1a–d)

Cytherea (*Circe*) *carbasea* GUPPY, 1866:292, pl. 18, fig. 13; PALMER, 1927:56, pl. 10, figs. 1, 4, 13, 14.

Description: Length, 36 mm; height, 30 mm; semidiameter, 15 mm. A thin, ovate shell sculptured with close, fine, distinct radial grooves that curve upward laterally and broadly zigzag medially (WOODRING, 1925).

Remarks: GUPPY (1866) noted that the sculpture is similar to that of *Gafrarium divaricatum* (Gmelin, 1791), although the latter's sculpture consists of the threads describing a few large zigzags, and not the many small zigzags characteristic of *Hyphantosoma*.

Type material: Holotype, British Museum, Natural History 64086.

Distribution: Miocene. Bowden, Jamaica; Santo Domingo.

Pitar (*Hyphantosoma*) *semipunctata* (Conrad, 1848)

(Figure 1e, f)

Cytherea semipunctata CONRAD, 1848:134, pl. 13, fig. 19; PALMER, 1927:55, pl. 10, figs. 5, 9.

Description: Length, 14 mm; height, 12 mm; semidiameter, 4 mm. An ovate shell sculptured with close, narrow but distinct commarginal ribs, crossed by a zigzag series of punctations.

Remarks: CONRAD (1848) presents no written description of the species, and both his figure and those of PALMER (1927) do not show the zigzag series of punctations, indicating that this sculpture is weak and is dominated by the commarginal ribs.

Type material: Holotype, ANSP 30658.

Distribution: Oligocene. Vicksburg, Mississippi (type location).

Pitar (*Hyphantosoma*) *floridana* Dall, 1903

(Figure 1g)

DALL, 1903:1267, pl. 54, fig. 10; PALMER, 1927:56, pl. 10, fig. 6.

Description: Length, 29 mm; height, 24 mm; width, 17 mm. A solid, subtrigonal shell sculptured with fine commarginal threads, crossed by close, fine, faint zigzag sculpture that appears obsolete anteriorly but present elsewhere. Posterior end emphasized by one or two slight radial ridges; lunule long, rather narrow.

Type material: Holotype, USNM 114753.

Distribution: Lower Miocene. Chipola horizon at Alum, and on the Chipola River at McDonald's farm, Florida.

Pitar (*Hyphantosoma*) *opisthogrammata* Dall, 1903

(Figure 1l)

DALL, 1903:1267, pl. 54, fig. 8; PALMER, 1927:58, pl. 10, fig. 2.

Description: Length, 39 mm; height, 32 mm; width, 22 mm. A subovate, somewhat trigonal shell with a slightly subquadrate posterior end sculptured with fine commarginal lines; fine zigzag sculpture is mostly obsolete, usually discernible only ventrally. Lunule deeply impressed, sharply incised, with a second, fainter, lunular furrow paralleling the ventral boundary.

Remarks: Similar in shape to *Pitar floridana, P. opisthogrammata* has much less zigzag sculpture, no posterior ridge, and a distinctly different lunule.

Type material: Holotype, USNM 109232.

Distribution: Pliocene. Marl of Shell Creek and Alligator Creek near Charlotte Harbor, Florida.

A single fossil species is recorded from Panama:

Pitar (*Hyphantosoma*) *centangulata* Brown & Pilsbry, 1911

(Figure 1h–k)

BROWN & PILSBRY, 1911:369; PALMER, 1927:264–265, pl. 10, figs. 7, 8, 10, 12; WOODRING, 1982:686–687, pl. 122, figs. 4–8, 11.

Description: Length, 51 mm; height, 40 mm; semidiameter, 16 mm. A thin ovate shell without any posterior ridge;

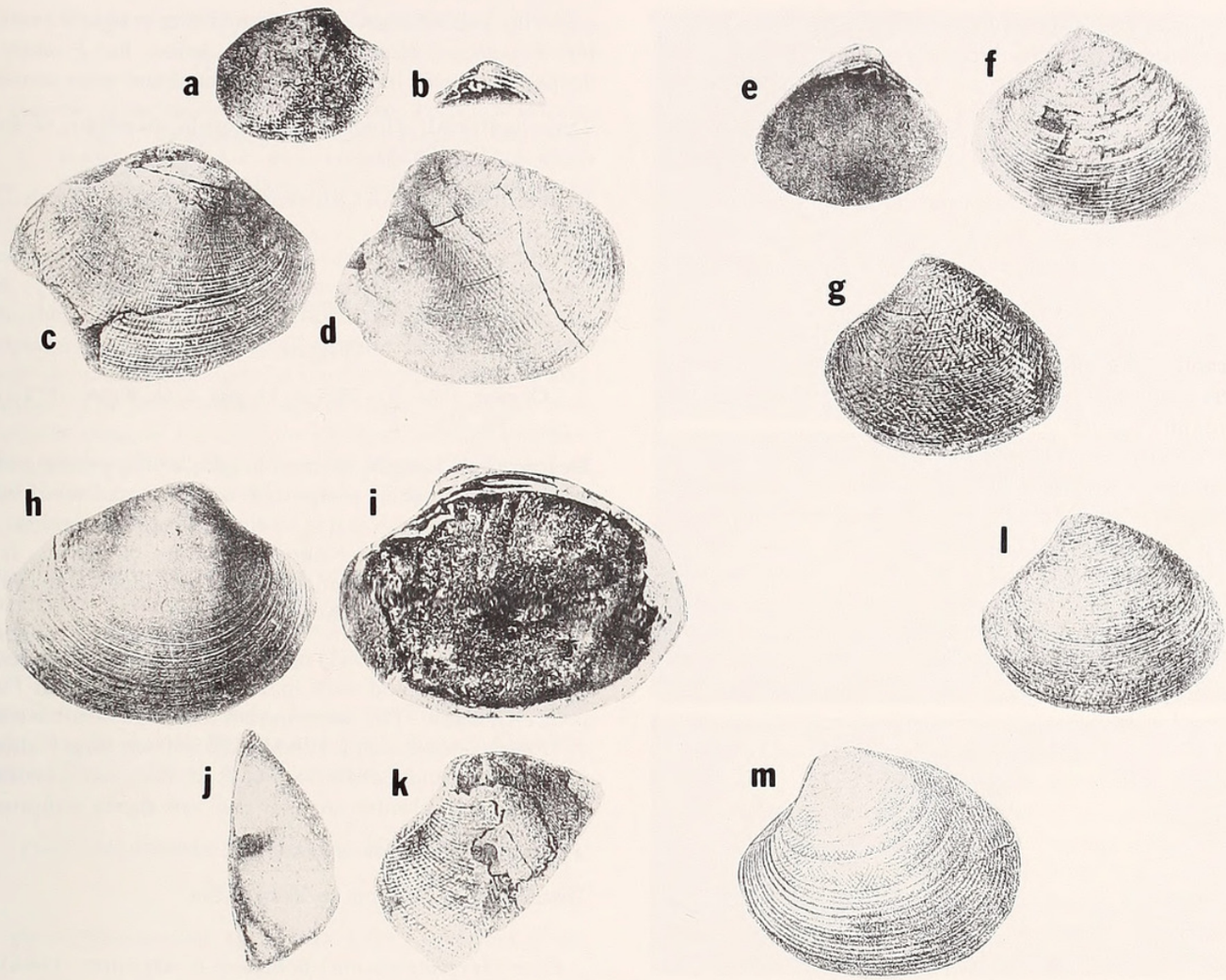

Figure 1

a–d. *Pitar* (*Hyphantosoma*) *carbasea* (Guppy). a. Length (L) = 36 mm. b. Hinge of right valve. c. L = 37 mm. d. L = 44 mm. e, f. *P.* (*Hyphantosoma*) *semipunctata* (Conrad). e. L = 11.5 mm. f. L = 14 mm. g. *P.* (*Hyphantosoma*) *floridana* Dall, L = 30 mm. h–k. *P.* (*Hyphantosoma*) *centangulata* Brown & Pilsbry. h, i. L = 52 mm. j. L = 36 mm, semidiameter = 13 mm. l. *P.* (*Hyphantosoma*) *opisthogrammata* Dall, L = 32 mm (1a-l from PALMER, 1927). m. *P.* (*Hyphantosoma*) *sculpturata* (Marshall), L = 30 mm (from BEU & MAXWELL, 1990).

fine zigzag sculpture is obsolete dorsally but otherwise present.

Remarks: The sculpture of *Pitar centangulata* is similar to that of *P. floridana,* although the former is larger, differently shaped, and lacks a posterior ridge. Observing no real differences in shape and areas with zigzag sculpture between *P. centangulatus* and *P. carbasea,* WOODRING (1982) distinguished them solely on the zigzag sculpture which, PALMER (1927) observed, was much finer in *P. centangulatus.*

Type material: Holotype, ANSP 1764.

Distribution: Early–Mid Miocene. Gatun Locks excavations of Canal Zone, Panama: Quarry on west side of Gatun locks.

MARWICK (1927) noted one fossil species from New Zealand:

Pitar (*Hyphantosoma*) *sculpturata* (Marshall, 1918)

(Figure 1m)

Macrocallista sculpturata MARSHALL, 1918:272, pl. 20, figs. 6–6a; MARWICK, 1927:594–595, pl. 41. figs. 74–76.

Description: Length, 30 mm; height, 20 mm; width, 25 mm. A broadly ovate to subovate shell sculptured with fine commarginal lines superimposed by faint fine zigzag sculpture, strongest at both ends; it is very thin (A. Beu, personal communication). The left anterior lateral is long, well separated from the cardinals, and the lunule is large.

Remarks: BEU & MAXWELL (1990) note that the Clifden

specimens differ from the Pakaurangian topotypes in having narrower but higher umbones and might not be conspecific with them.

Type material: Holotype, TM 4567, Institute of Geological and Nuclear Sciences, Lower Hutt, New Zealand.

Distribution: Upper Oligocene: Otaian-Altonian. New Zealand: Pakau-rangi Point, Kaipara (type location); bed 6A, Clifden, Southland; east of the Puketoi Range, southern Hawke's Bay.

Key to Fossil Species of *Hyphantosoma*

1. Pacific species 2
1. Atlantic species 3
2. New Zealand species; ovate; sculpture of many fine zigzags ..... *sculpturata*
2. Eastern Pacific species; ovate; zigzag sculpture of curving radials laterally and broad zigzag medially ..... *centangulata*
3. Zigzag sculpture consists of series of punctations crisscrossing distinct commarginal cords ..... *semipunctata*
3. Zigzag sculpture consists of fine, close-set threads and grooves 4
4. Shell ovate, thin; zigzag sculpture of curving radials laterally, broad zigzag centrally ..... *carbasea*
4. Shell subovate to subtrigonal; zigzag sculpture of several zigzags 5
5. Subtrigonal; posterior end with 1 or 2 slight radial ridges; zigzag sculpture absent anteriorly .. *floridana*
5. Subovate, somewhat subtrigonal; posterior end slightly subquadrate, with no radial ridges; zigzag sculpture usually only discernible ventrally ..... *opisthogrammata*

Living Species

Of the five living species, three occur in the eastern Pacific:

Pitar (*Hyphantosoma*) *aletes* Hertlein & Strong, 1948

(Figure 3F)

Hertlein & Strong, 1948:172–173, pl. 1, figs. 9, 11–13; Olsson, 1961:277–278, pl. 49, fig. 3; Keen, 1971:170, fig. 404.

Description: Length, 54 mm; height, 46 mm; width, 34 mm. A white, subovate, somewhat subtrigonal shell sculptured with fine, polished commarginal lines, superimposed by fine close zigzag sculpture covering most of the shell. Zigzag sculpture is absent on juveniles and possibly some specimens (Hertlein & Strong, 1948). The pallial sinus is less than half the shell length.

Remarks: Hertlein & Strong (1948) noted that *Pitar aletes* closely resembles *P. carbasea* but has a more angular posterior end. Olsson (1961) stated that it closely resembles *P. pollicaris* (Carpenter, 1864), below, but *P. aletes* is deeper (height vs. length), more trigonal and more convex.

Type material: Holotype, California Academy of Sciences, CAS 065554.

Distribution: Gulf of California to Costa Rica. Depth 77–110 m. Rare.

Pitar (*Hyphantosoma*) *hertleini* Olsson, 1961

(Figure 2c, d)

Olsson, 1961:276–277, pl. 45, figs. 6–6a; Keen, 1971:170, fig. 405.

Description: Length, 36 mm; height, 29 mm; width, 19.5 mm. An ovate shell sculptured with fine polished commarginal lines, with traces of zigzag sculpture evident on its posterior end, but otherwise obscure or absent. It is richly patterned with brown zigzag markings and radial rays against a cream white background.

Remarks: Olsson (1961) notes it is thinner, smaller, more strongly colored and with more convex valves than *Pitar pollicaris,* below. The patterns and coloring resemble some *P.* (*Pitar*) *newcombianus* (Gabb, 1865) from Baja California, Mexico, and California, but *P. hertleini* has a broader posterior end, blunter anterior end and zigzag sculpture.

Type material: Holotype, ANSP 218921.

Distribution: Panama to Peru. Rare.

Pitar (*Hyphantosoma*) *pollicaris* (Carpenter, 1864)

(Figure 2a)

Callista pollicaris Carpenter, 1864:312; Olsson, 1961:277, pl. 49, figs. 7–7a; Keen, 1971:170, fig. 406.

Description: Length, 66 mm; height, 57 mm; width, 36 mm. A large, ovate, white shell, with zigzag sculpture present in adults as faint traces at the ends. Juveniles have zigzag markings and sculpture; pallial sinus long, extending to nearly half the shell length (Keen, 1971). It is the largest species of *Hyphantosoma* (Figure 1a), a large specimen measuring: length, 80 mm, height, 60 mm, width, 39 mm (Hertlein & Strong, 1948).

Remarks: Hertlein & Strong (1948) note that the species resembles *Pitar* (*Pitar*) *prora* (Conrad, 1837) (see Figure 2b).

Type material: Holotype, USNM 13721.

Distribution: Gulf of California to Colombia. The species probably occurs just beyond the low tide line (Keen, 1971); it has been dredged from sandy bottoms at 13–14 m. Rare.

Two more species exist in the tropical west and South Pacific, respectively:

Pitar (*Hyphantosoma*) *intricata* (Dautzenberg, 1907)

(Figure 3D, E)

Meretric (*Pitar*) *intricata* DAUTZENBERG, 1907:333–334, pl. 6, fig. 1. *Callogonia philippinensis* HABE & OKUTANI, 1983:1–3; figs. 1–4. *Pitar* (*Hyphantosoma*) *limatulum* (Sowerby, 1851), of HABE, 1977, and MATSUKUMA, 1984, *non* Sowerby, 1851.

Description: Length, 50 mm; height, 41 mm; width, 31 mm. This ovate shell is sculptured with fine, polished, indistinct, commarginal lines, superimposed by fine zigzag sculpture over most of the shell (Figure 3D, E). The umbones are prominent, and the posterior end is broad and rounded. The left anterior lateral tooth is compact and relatively close to the anterior cardinal, unlike in other living species. The shell is often patterned with flecked or solid brown rays of variable width, sometimes traversed by concentric bands of brown.

Type material: Holotype, Laboratoire de Biologie des Invertebres Marins et Malacologie collection, Museum National d'Histoire Naturelle, Paris. Hypotypes, NSMT Mo-61187, NSMT Mo-54072.

Distribution: Kii Peninsula, Japan; the Philippines; Celebes; Java, Indonesia; Ponape and Truk, Eastern Caroline Islands. Depth: 10–42 m. Uncommon.

Pitar (*Hyphantosoma*) ***festoui*** Harte, sp. nov.

(Figure 3A–C)

Pitar (*Hyphantosoma*) sp.: HARTE, 1992:7, cover figs. 9–10.

Description: Length, 22 mm; height, 18 mm; width, 14 mm. An ovate shell sculptured with fine, polished, indistinct, commarginal lines, superimposed by fine zigzag sculpture over most of the shell (Figure 3A–C). It is marked irregularly with light brown patches of variable size, sometimes almost forming large, irregular, compounded chevrons. A bib of deep rosy red extends laterally on either side from the base of the umbo, skirting the border of the lunule, and fading anteriorly to the main part of the escutcheon. A gray concentric band, occurring medially, interrupts the otherwise white background of the type specimen. The escutcheon is fairly well defined, and marked with a few brown zigzags. The lunule is large, moderately obese, and distinctly incised. In the left valve, a compact, well-developed, anterior lateral tooth is moderately separated from the cardinal teeth. A moderately thick, triangular anterior cardinal is connected dorsally to a longer, wedge-shaped median cardinal. The posterior cardinal is a long, narrow ridge. In the right valve, there are two smaller anterior lateral teeth, and a short triangular anterior cardinal connected to and aligned perpendicularly to a long, narrow, slightly bifid posterior cardinal. The right median cardinal is short, triangular, close to and in parallel with the anterior cardinal. The pallial sinus is deep, triangular, and rounded at the apex.

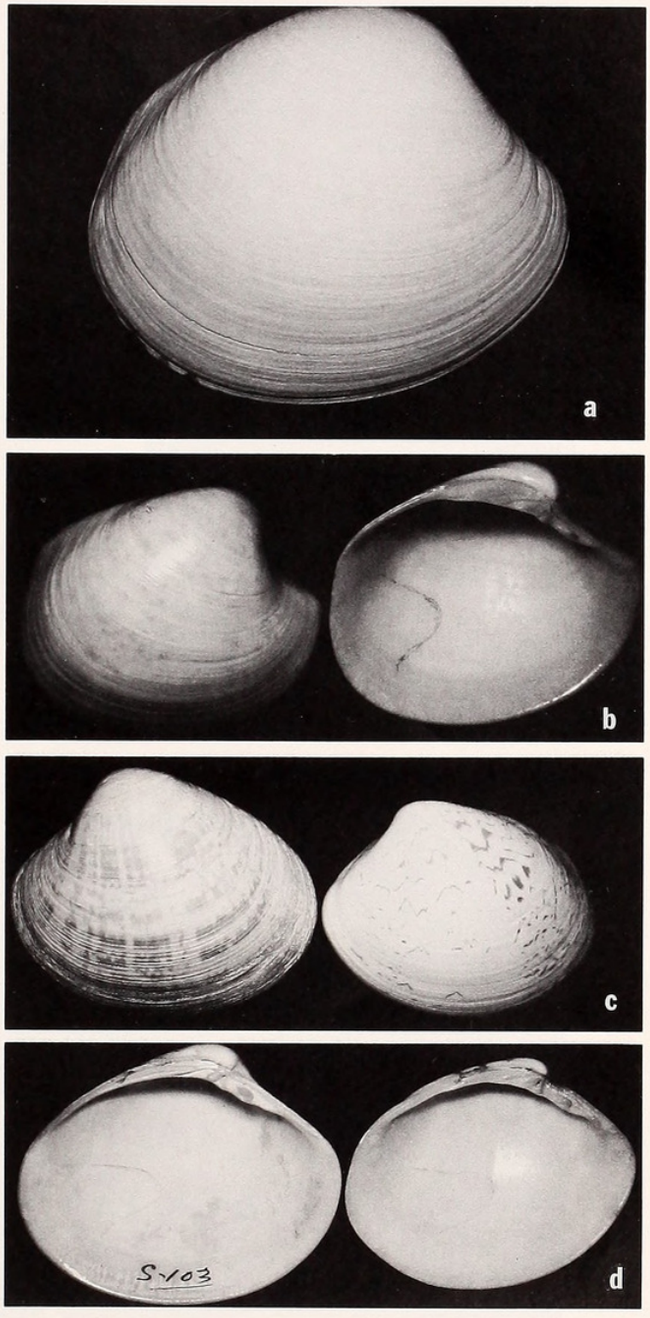

Figure 2

a. *Pitar* (*Hyphantosoma*) *pollicaris* (Carpenter), Baja California, Mexico, Length (L) = 64 mm. b. *Pitar* (*Pitar*) *prora* (Conrad), Tahiti, L = 34 mm. c, d. *Pitar fulminatus* (Menke), Florida, L = 50 mm (left), *P.* (*Hyphantosoma*) *hertleini* Olsson, Baha California, Mexico, L = 46 mm (right). c. Exteriors. d. Interiors. UCMP specimens.

Remarks: While the sculpture of *Pitar* ***festoui*** is similar to that of *P. intricata,* the anterior end of *P.* ***festoui*** is more

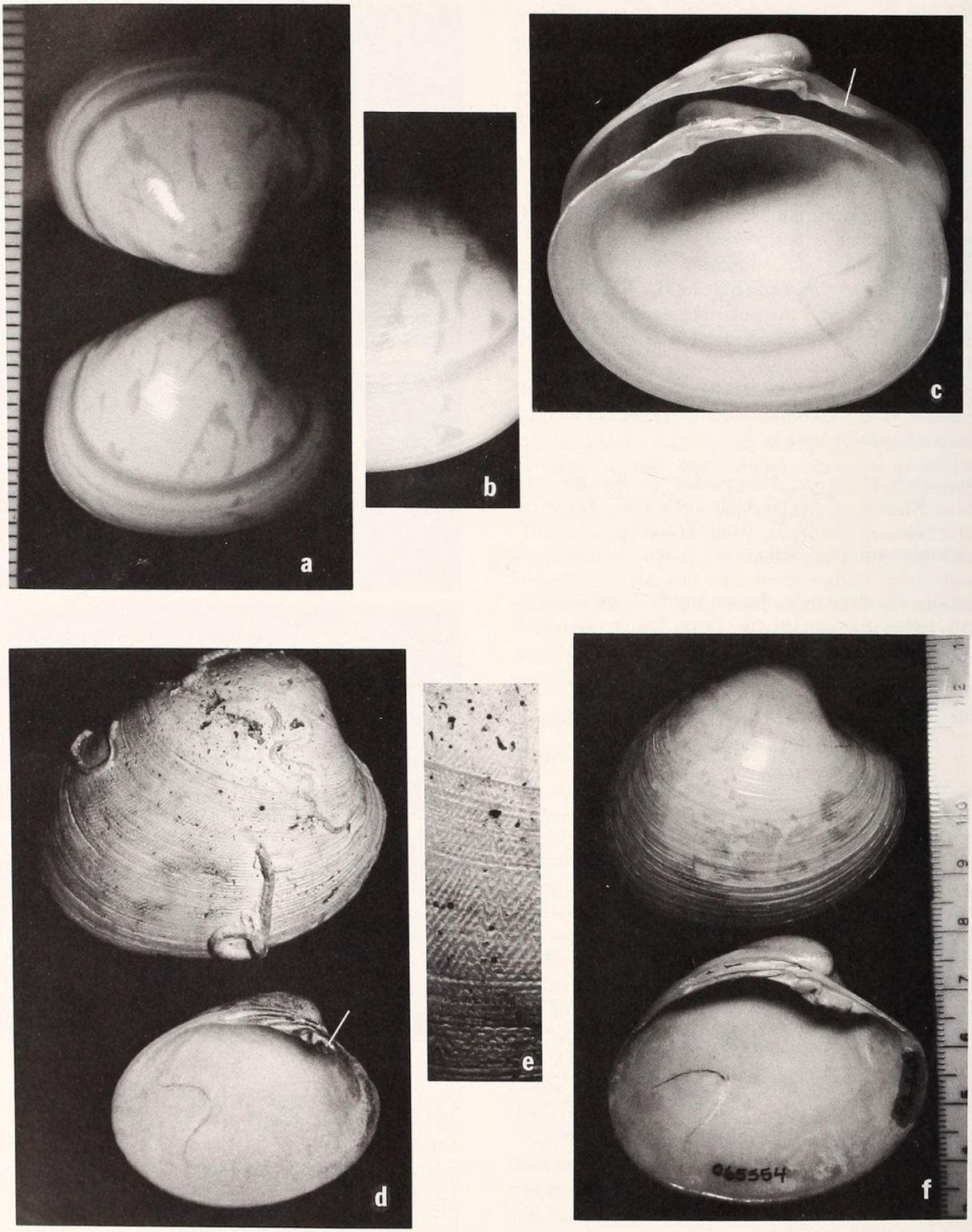

Figure 3

a–c. *Pitar* (*Hyphantosoma*) ***festoui*** sp. nov., Tahiti, Holotype, L = 22 mm. a. Both valves. b. Inset of right valve, showing fine zigzag sculpture. c. Hinge and interior of holotype valves. d, e. *Pitar* (*H.*) *intricata* (Dautzenberg), Indonesia. d. Worn valves, L = 53 mm, 38 mm. e. Inset of larger valve, showing fine zigzag sculpture. UCMP specimens. f. *Pitar* (*H.*) *aletes* Hertlein & Strong, holotype, CAS 065554.

pronounced and the posterior end is narrower, and more subquadrate. The left anterior lateral of *P. intricata* is closer to the cardinal teeth than that of *P. **festoui***.

Type material: Holotype, UCMP 398606.

Type location: Off Afaahiti, Tahiti, French Polynesia (149°15′N, 17°45′W). Two specimens, one of which was subsequently misplaced, were found in coralline sand near clumps of living corals at 60 m, near the end of the water column blue zone.

Key to Recent Species of *Hyphantosoma*

1. Shell from the eastern Pacific 2
1. Shell from the western or central tropical Pacific 3
2. External color patterns absent; if present, pallial sinus nearly half the shell length 4
2. External color patterns obvious; pallial sinus less than half the shell length ..... *hertleini*
3. Umbo rose colored; left anterior lateral well separated from cardinals ..... ***festoui***
3. Umbo not rose colored; left anterior lateral situated close to the cardinal ..... *intricata*
4. Pallial sinus less than half the shell length; shell roundly subtrigonal ..... *aletes*
4. Pallial sinus nearly half the shell length; shell ovate ..... *pollicaris*

DISCUSSION

Conchological characteristics link living *Hyphantosoma* closely to American and Pacific species of *Pitar* s. s. The pan-Pacific *Pitar* (*Pitar*) *prora* (Conrad, 1837), for example, has the somewhat well-defined escutcheon and deep, triangular pallial sinus characteristic of *Hyphantosoma* (Figures 2b, 3c, d). *Pitar* (*H.*) *hertleini* has color patterns similar to the eastern Pacific *P.* (*P.*) *newcombianus* (Gabb, 1865), and the Caribbean *P.* (*P.*) *simpsoni* (Dall, 1889), and *P.* (*P.*) *fulminatus* (Menke, 1828). *Pitar hertleini* and *P. fulminatus* have similar hinge plates and pallial sinuses (Figures 2c, d). Dall (1903) linked *P. simpsoni,* marked with zigzags, to *Hyphantosoma* via sculpture, observing that erosion of specimens of *P. simpsoni* revealed zigzag sculpture; how much this might be due to selective erosion of either pigmented or nonpigmented parts of the shell, however, is unknown.

The lunule of *Hyphantosoma* is similar to that of *Pitar* (*Pitarenus*) Rehder & Abbott and *Pitar* (*Pitarella*) Palmer, but the latter two taxa are generally chalky, more obese, and with a well-developed but narrow left anterior lateral tooth. While the restriction of zigzag sculpture within Pitarinae to *Hyphantosoma* indicates monophyly, the geographic range of the subgenus and its similarities to both Pacific and Caribbean taxa of *Pitar* allow the possibility of parallel acquisition of zigzag sculpture among those taxa. Anatomical and biomolecular studies could further clarify the taxonomic relationship of *Hyphantosoma* to the various subgenera of *Pitar*.

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