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ABSTRACT: A new genus, *Scelidotoma*, type species *Emarginula bella* Gabb, is proposed for three North Pacific species, and a new name, *Diodora arnoldi*, is proposed, with adequate description, for "*Diodora murina*" of authors, not of Arnold, 1903.

During the course of a revision of the Fissurellidae of the temperate provinces of western North America, I have found that one new genus is needed and also a new name for a species. Preliminary to the use of these names in a dissertation submitted to Stanford University I am here describing them.

ACKNOWLEDGMENTS

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The generic assignment of the uncommon Californian species known as *Hemitoma bella* (Gabb) has not been questioned by American malacologists, although Japanese authors have for some time been using a different genus for two related species that occur in Japanese waters. Consideration of this discrepancy has convinced me that usage of *Hemitoma* Swainson is no longer appropriate; neither is the Japanese solution satisfactory. Thus, the erection of a new genus to contain these species seems advisable.

***Scelidotoma*, new genus**

Type species: Emarginula bella Gabb, 1865 (equals *Subemarginula yatesii* Dall, 1901). Figures 1 and 2.

Diagnosis: Shell large, white, apex posterior to center. Radial sculpture of numerous primary and secondary ribs, intersecting the concentric growth lines as imbrications. Juvenile shell deeply notched by an *Emarginula*-like slit, mature shell with arched selenizone indenting the margin. Interior with channel corresponding to selenizone; muscle scar horseshoe-shaped, with inturned hooked process.

Additional assignable species: Subemarginula gigas von Martens, 1881 (Kira, 1962: 6, pl. 5, fig. 14; Habe and Ito, 1965: 6, pl. 3, fig. 4); *Emarginula*

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vadosinuata Yokoyama, 1922 (Kira, 1962: 6, pl. 5, fig. 13; Habe and Ito, 1965: 6, pl. 3, fig. 3).

Remarks: The juvenile shell of *Scelidotoma bella* figured here is 4.9 mm. in length; its slit measures 0.85 mm., 17% of the shell length. Judging from the growth marks visible on mature shells, a similar deep incision is present in juvenile shells of *S. gigas*. *Scelidotoma vadosinuata* is morphologically very close to *S. bella*; I can detect no distinguishing features in the illustrations. According

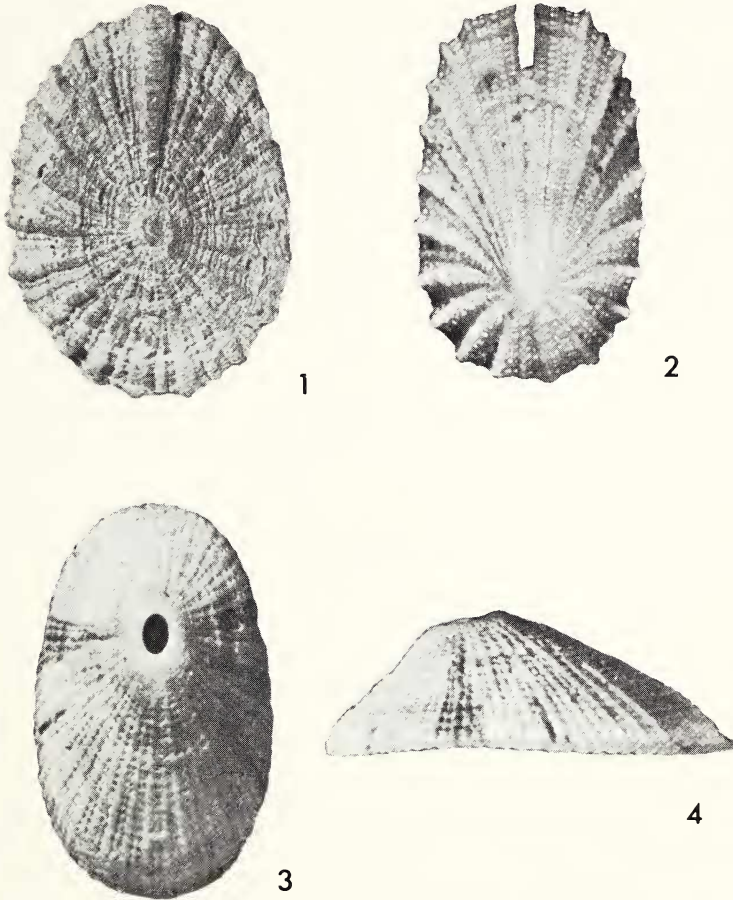


Figure 1. *Scelidotoma bella* (Gabb). Holotype, *Submarginula yatesii* Dall, USNM 162062, Monterey, California. Long. 51, lat. 36, alt. 13 mm.

Figure 2. *Scelidotoma bella* (Gabb). Juvenile, LACM, Carmel, California. Long. 4.9, lat. 2.9, alt. 1.8 mm.

Figures 3 and 4. *Diodora arnoldi* new species. Holotype, LACM 1143, Carmel, California. Long. 17.7, lat. 10.6, alt. 6.2 mm.

to Kira (1962), it has been taken at 150 to 200 fathoms off Iwate Prefecture, Japan, considerably deeper than has been recorded for *S. bella*. *Scelidotoma vadosinuata* may qualify as a synonym of *S. bella*.

Hemitoma Swainson, 1840 (type species *Patella octoradiata* Gmelin, 1791), and its subgenus *Montfortia* Récluz, 1843 (type species *Emarginula australis* Quoy and Gaimard, 1834), differ from *Scelidotoma* in the following ways: (1) Species of *Hemitoma* are usually higher in proportion but reach only one-fourth the length of *Scelidotoma*, (2) the epipodium is brightly pigmented and the interior of the shell is colored in *Hemitoma*, whereas these features lack color in *Scelidotoma*, (3) radial sculpture in *Hemitoma* includes eight to ten strong primary ribs; the number in *Scelidotoma* is over eighteen, (4) the selenizone in *Hemitoma* coincides with one of the primary ribs, which is no larger than the two adjacent primary ribs; the primary rib forming the selenizone of *Scelidotoma* is larger than all other primary ribs, (5) juvenile shells of *Hemitoma* lack the deep anterior slit of *Scelidotoma*, (6) the fifth lateral tooth of the radula in *Hemitoma* has two small cusps adjacent to the shorter of the two large cusps, making a total of four cusps, whereas the radula of *Scelidotoma bella* is of the basic emarginulid type, with only two cusps on the fifth lateral², (7) *Hemitoma* is a tropical group; *Scelidotoma* is a cool-water group, ranging north to southern Alaska.

The genus *Clypidina* Gray, 1847 (type species *Patella notata* Linnaeus, 1758), is similar to *Hemitoma*, but its radula departs markedly from the emarginulid type; the central and all of the lateral teeth are cusped, as figured by Thiele (1929: 34, fig. 19).

Japanese authors (Kuroda and Habe, 1952; Habe, 1953b; Kira, 1955) assigned *Scelidotoma gigas* and *S. vadosinuata* to the genus *Tugali* Gray, 1843 (type species *Emarginula parmophoidea* Quoy and Gaimard, 1834). Most species of *Tugali* that I have studied have fine radial and concentric sculpture with a barely perceptible selenizone. The anterior margin is rounded, as seen from above, and early growth stages show no evidence of the *Emarginula*-like slit. However, one species examined, *Tugali decussata* A. Adams, 1852 (see Habe, 1953b: 45, pl. 2, figs. 25, 29), shows coarse radial and concentric sculpture with a more prominent anterior rib, but the margin is not sinuous, nor is there evidence of the slit in early stages (ANSP 224670).

Kira (1962) and Habe and Ito (1965) placed the two Japanese species in the genus *Tugalina* Habe, 1953a (type species *Tugalina radiata* Habe, 1953a). Kira used *Tugalina* as subgenus of *Tugali*, but Habe and Ito gave it full generic status. The type species, *Tugalina radiata* (see Habe, 1953a: 183; 1953b: 47, pl. 2, fig. 2), was described from Okinawa, Ryukyu Islands, and is said to have a thin shell with broad irregular ribs and raised fasciole. There is no anterior

²The radula of *Hemitoma octoradiata* was illustrated by Thiele (1929: 33, fig. 18) and that of *Hemitoma emarginata* (Blainville) by Turner (1959: 338, pl. 17). Although Turner showed only two cusps on the fifth lateral in her illustration of *H. octoradiata*, my own mounts of both of these species show the four cusps.

slit in the juvenile shell implied in the description and figure, and the anterior termination of the selenizone is shown to be slightly projecting. Another species clearly congeneric with Habe's type species and therefore also referable to *Tugalina* is *T. plana* (Schepman, 1908) (see Habe, 1964: 4, pl. 2, fig. 2). *Tugalina plana* is probably equivalent to the *Tugali scutellaris* of Habe (1953b: 46, pl. 2, fig. 1) not A. Adams, 1852 (as figured by Reeve, Conch. Icon., vol. 17, *Tugalia*, fig. 1). Examination of shells I identify as *Tugalina plana* (ANSP 224894) shows that there is a strong anterior ridge in mature shells (16 mm. in length), which markedly projects beyond the anterior shell margin. There is no evidence of the slit in juvenile shells in this lot.

The genus *Tugalina* is evidently the generic unit closest to *Scelidotoma*, but it is unsatisfactory for the allocation of the species concerned because of the fundamental difference in the selenizone. In *Tugalina* the deep slit of the juvenile shell is lacking and in the mature shell the selenizone comes to project beyond the margin of the shell. *Tugalina* may further be distinguished from *Scelidotoma* in size and distribution. The largest known specimens of *Tugalina* species reach only one quarter of the length of large *Scelidotoma*. *Tugalina* is a tropical group, whereas the species of *Scelidotoma* occur in cold provinces of the North Pacific.

Although the three generic units, *Tugali*, *Tugalina*, and *Scelidotoma* could be ranked as subgenera of *Tugali*, the structural distinction in the juvenile shell of *Scelidotoma* readily distinguishes it from both *Tugali* and *Tugalina*. In this feature, and in size and distribution, *Scelidotoma* forms a compact group. *Tugalina* is distinguished from *Tugali* by its raised, projecting selenizone. I therefore favor recognition of the three units as full genera.

The name *Scelidotoma* is derived from the Greek noun *skelis*, rib cage, and *tome* (f.), cutting or separation, with reference to the arched selenizone.

***Diodora arnoldi*, new species**

Figures 3 and 4

"*Fissurella (Glyphis) murina* Carpenter"—Dall, 1885: 543 [*nomen nudum*].

"*Fissuridea murina* (Carpenter) Dall"—Dall, 1892: 197 [*nomen nudum*].

"*Fissuridea murina* Carpenter"—Dall, 1894: 200 [*nomen nudum*].

"*Fissuridea murina* (Carpenter) Dall"—Keep, 1904: 260 [not Arnold, 1903].

"*Diodora murina* (Arnold, 1903)"—Burch, 1946, no. 60, p. 26 [not Arnold, 1903]—Palmer, 1958, p. 120 [not Arnold, 1903].

Not "*Fissuridea murina* (Carpenter) Dall"—Arnold, 1903: 399 [a description of *Diodora aspera* (Rathke)].

Not "*Fissuridea murina* Carpenter"—Arnold, 1907: 545, pl. 50, fig. 3 [a specimen of *Megathura crenulata* (Sowerby)].

Description: Shell of medium size for the genus; anterior slope straight, posterior and lateral slopes convex, sides nearly parallel, anterior end narrowed. Foramen oval, one third of the distance back from the anterior margin of the shell. Sculpture of approximately 30 narrow primary ribs, with secondary ribs appearing at later growth stages, crossed by fine concentric ribs, producing beading and squarish pits at intersections. Color yellow-white, often with interrupted gray radial rays. Margin finely crenulate, interior glossy white, muscle scar dull surfaced, callus truncate posteriorly. Dimensions (in mm.): long. 17.7, lat. 10.6, alt. 6.2 (holotype).

Type Locality: Three miles south of Carmel, Monterey Co., California (San Jose Creek Beach), depth 70 feet. James H. McLean, collector, February 6, 1964.

Type Material: Holotype, Los Angeles County Museum of Natural History, cat. no. 1143; paratypes, cat. no. 1144. Additional paratypes to be distributed to U.S. National Museum (USNM), Stanford University, California Academy of Sciences (CAS), Santa Barbara Museum of Natural History, and the San Diego Museum of Natural History.

Distribution: Crescent City, Del Norte Co., California (USNM 104121) to San Martin Island, Baja California (CAS 24041). Dall (1921) cited Magdalena Bay as the southern limit for "*Diodora murina*," but the specimen (USNM 212710, Santa Margarita Island) is a specimen of *Diodora inaequalis* (Sowerby), having an elongate fissure.

Remarks: The description of *Diodora arnoldi* as new, to replace the familiar "*D. murina*," is necessary to solve a long standing controversy in the literature. "*Diodora murina*" has been variously cited as of Carpenter or Dall, but as pointed out by Keen in Burch (1964) and Palmer (1958), the earliest description of a shell under that name was given by Arnold (1903). Three earlier citations by Dall are but notes concerning equivalence. Dall (1885): "This is *Glyphis densiclathrata* of Californian conchologists, and for a time of Carpenter, but not of Reeve." Dall (1892): "This is *Glyphis densiclathrata* of Californian conchologists but not of Reeve; *G. saturnalis* of Pilsbry not of Carpenter, and *G. densiclathrata* var. *murina* of Carpenter." Dall's remarks of 1894 are identical to those of 1892, but the reference is to specimens from the Gulf of California and must apply to some other species.

No description accompanied the name "*murina*" until that of Arnold (1903: 399), quoted in full:

Shell resembling *F. aspera* in general outline; apical hole nearly central, circular; radiating ridges numerous and smooth, except for fine incremental lines; inner margin of shell quite evenly crenulated; color white. Dimensions: long. 46, lat. 30, alt. 16 mm. Distinguishable from *F. aspera* by lack of coloration, finer and more numerous ribs, more central and more nearly round apical hole.

This description clearly pertains to a white-shelled specimen of *Diodora aspera* (Rathke); it can not include "*D. murina*" of authors because the foramen of the latter is never centrally located and the maximum size observed for "*D. murina*" is 22 mm., less than half the size cited by Arnold.

A shell figured by Arnold (1907) as "*Fissuridea murina* Carpenter" is evidently a juvenile specimen of *Megathura crenulata* (Sowerby), judging from its central fissure and low elevation. Despite the misconceptions of Arnold, some authors of the period were correctly referring to the species in question. Keep (1904) presented an acceptable description of "*Diodora murina*":

Fissuridea murina (Cpr.) Dall, the white key-hole-limpet, (*Glyphis densicathrata*). This species has a much smaller and more delicate shell than the last. It is oblong in shape, with curved ends. The roundish oval hole is one-third of the shell's length from one extremity, and there are numerous fine ribs, checked by concentric ridges. The color is pure white, at least in dead specimens, and the length is about 15 mm., a little less than the diameter of a silver dime.

Had Arnold's description not been published a year earlier, "*Diodora murina*" could have been cited as of Keep and the name retained.

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