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On the Genus *Fusinus* in Japan II: *F. undatus*, *F. similis* and Related Pacific Taxa, with the Description of *F. mauiensis* n. sp. (Gastropoda: Fasciolariidae)

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Abstract: In the second part of a review of the genus *Fusinus* in Japan, several species commonly confused or associated with *F. undatus* (Gmelin, 1791) and *F. similis* (Baird, 1873) are examined via their types and material from various collections. *F. undatus* and *F. similis* have been frequently confused in literature, but are here shown to be separate species. *F. similis* is further compared with the types and other examples of the morphologically similar *F. galatheae* Powell, 1967, *F. bountyi* Rehder & Wilson, 1975 and *F. genticus* (Iredale, 1936). In addition, *F. sandvichensis* (Sowerby III, 1880), *F. michaelrodgersi* Goodwin, 2001 and *F. midwayensis* Kosuge, 1979 are illustrated for comparison. The new species *Fusinus mauiensis* is described from Hawaii, where it is apparently endemic to the island of Maui. Lectotypes are selected for *Fusinus undatus*, *F. similis* and *F. sandvichensis*.

Keywords: *Fusinus*, Japan, *mauiensis*, new species, *undatus*, *similis*

Introduction

The purpose of the present paper is to define *Fusinus undatus* and *F. similis*, with particular reference to Japanese specimens of the former, and to clarify the identity of material assigned these names in literature. This can be a particularly difficult pair of species to distinguish from shells alone, as they share varying numbers of characters in nominally sympatric populations.

The nomenclature of *Fusinus* in the Japanese literature has been strongly influenced by the work of Kuroda, whose revision of the genus in Japan (1949) treated the species in considerable detail but crucially lacked figures. In addition to his use of the name *F. longicaudus* to describe *F. perplexus* (see Callomon & Snyder, 2004), he confused *F. undatus* with *F. similis* and treated the latter as a subspecies of the former. The two are sympatric in at least part of their respective ranges. Kuroda's treatment of the Japanese *Fusinus* was followed by Kira in his illustrated guide to the Japanese Mollusca (1954), and supported by numerous subsequent authors.

Abbreviations: AM – Australian Museum, Sydney, Australia; ANSP – The Academy of Natural Sciences, Philadelphia, USA; BMNH – The Natural History Museum, London, UK; IMT – Institute of Malacology, Tokyo, Japan; MNHN – Muséum national d'Histoire Naturelle, Paris, France; SC – M. A. Snyder collection, Villanova, Pennsylvania, USA; SL – Shell length [measurement planes follow Higo *et al.* (2001)]; TC – Chris Takahashi collection, Honolulu, Hawaii; USNM – National Museum of Natural History, Smithsonian Institution, Washington, DC, USA; ZMUC – Zoological Museum, University of Copenhagen, Denmark.

Systematics

Family Fasciolariidae Gray, 1853

Fusinus undatus (Gmelin, 1791)

(Figs. 1–13, 24)

Murex colus Linné: Born, 1778: 310; Born, 1780: 310. Not *Murex colus* Linnaeus, 1758.

Murex undatus Gmelin, 1791: 3556, no. 115. Reference to Chemnitz, 1780, pl. 145, fig. 1343.

Fusinus undatus (Gmelin, 1791): Cernohorsky, 1972: 162, pl. 48, fig. 2; McDowall, 1974: 8, fig.; Springsteen & Leobrera, 1986: 174, pl. 47, fig. 1; Wilson, 1994, pl. 13, fig. 14; Kubo & Kurozumi, 1995: 101, fig. 1; Okutani & Tsuchiya, 2000: 515, pl. 256, fig. 44; Dharma, 2005: 108, pl. 29, fig. 14; Thach, 2005: pl. 42, figs. 9–11; Mallard & Robin, 2005: pl. 34, leftmost figure; pl. 35, leftmost 2 figs.

Fusinus undatus similis (Baird): Kuroda, 1949: 4; Kira, 1954: pl. 29, fig. 5. Not *Fusus* (*Colus*) *similis* Baird, 1873.

Fusinus undatus Gmelin: Quirk & Harrison, 1972: 21, fig. 6.

Fusinus sandvicensis [sic]: Schoenberg, 1982: 1, center figure. Not *Fusus sandvichensis* Sowerby III, 1880.

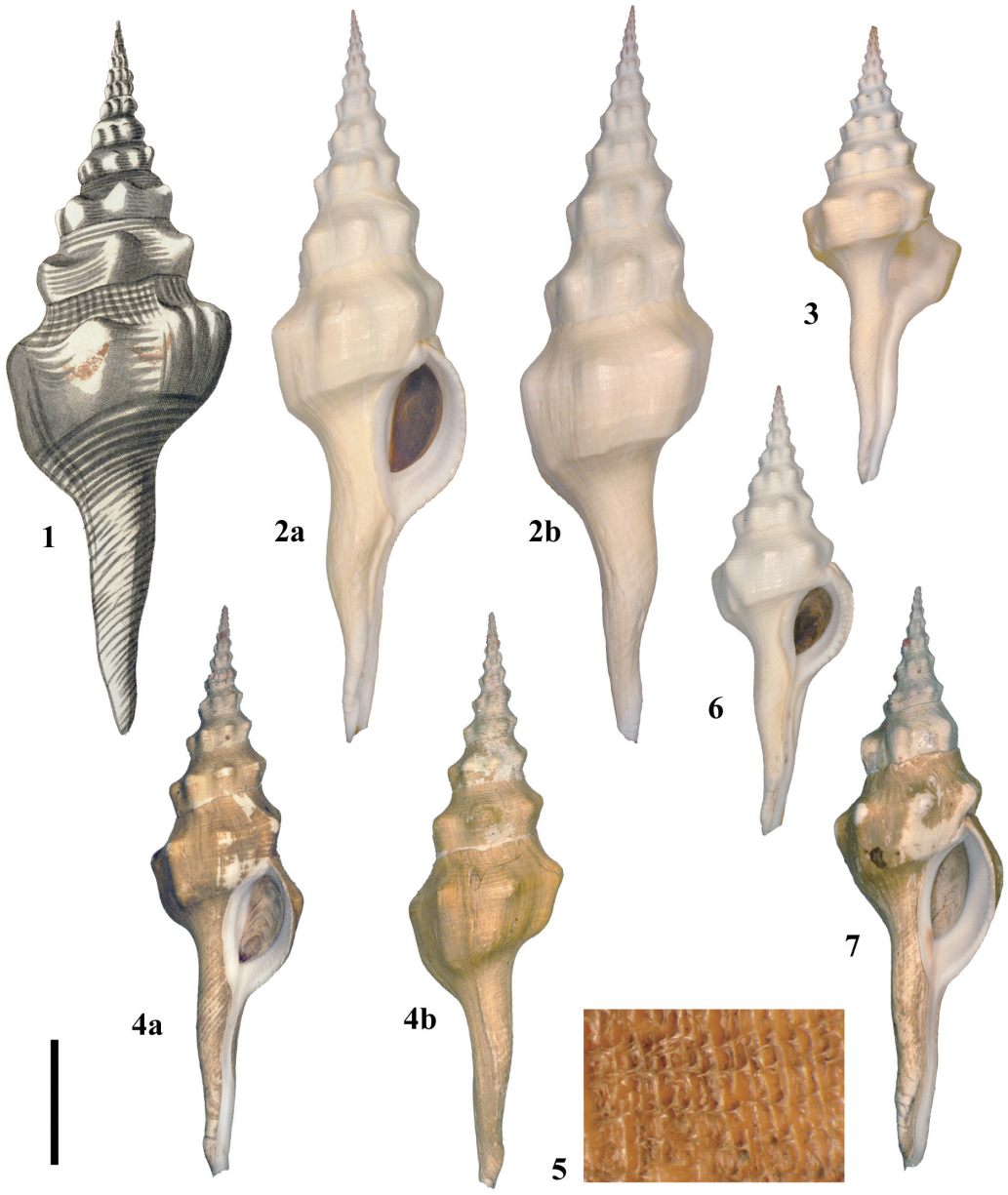
Type material: The specimen figured by Chemnitz was purchased from a dealer in Vienna. His figure 1343, cited by Gmelin (Fig. 1), is adequate to define the species and is here selected as the lectotype.

Other material examined: *Philippines*: 232 mm SL (Fig. 2), 205 mm SL, off Panglao Island, Bohol (SC); 144.7 mm SL (Fig. 3), off Masbate, 10–20 m (SC). *Japan*: 181.5 mm SL (Figs. 4, 5), 158.0 mm SL, 166.3 mm SL, 184.3 mm SL (Fig. 7), Kii Strait off Minabe, Wakayama Prefecture (SC, *ex* K. Noda); 142.0 mm SL (Fig. 6), Kii Strait off Shimo-Kusui, Gobo Town, Wakayama, 40–80 m (SC); 172.0 mm SL, Kusui, Gobo Town, Wakayama, USNM 824909; 154.4 mm SL, 165.0 mm SL (Fig. 24), Sesoko, Okinawa, bottom of ledge on sand (TC). *Belau*: 158.0 mm SL, Arakabesan Passage, west of Koror, ANSP 202486 (Fig. 8). *Tahiti*: 146.0 mm SL (Fig. 9), 160.0 mm SL (Fig. 10), Tahiti, *ex* T. B. Wilson, ANSP 36421; 145.9 mm SL (Fig. 11), by scuba in silty sand at 12–18m, off Tarabao, Tahiti (SC). *New Caledonia*: 171.5 mm SL (Fig. 12), off Pointe d'Easo at 18–35m, Baie du Santal, Lifou, Loyalty Islands (MNHN). *Marquesas*: 173.5 mm SL (Fig. 13), by scuba at 12–20 m, in sand and rubble off Taiohae, Nuka Hiva (SC). *Hawaii*: 171.7 mm SL, dredged in rubble at 60 m, off Koloa Landing, Kauai (SC, *ex* E. R. Cross).

Original description: *M. testa solida ventricosa undato-multangula tenuissime transversim striata, spira mucronata: antifractibus basi nodosis, labro denticulato. Martin. Conch. 4. t.145. f.1343. Habitat rarus in India, testa alba, 8½ pollicem longa ponderosa, spirae antifractibus 14, cauda subincurva.*

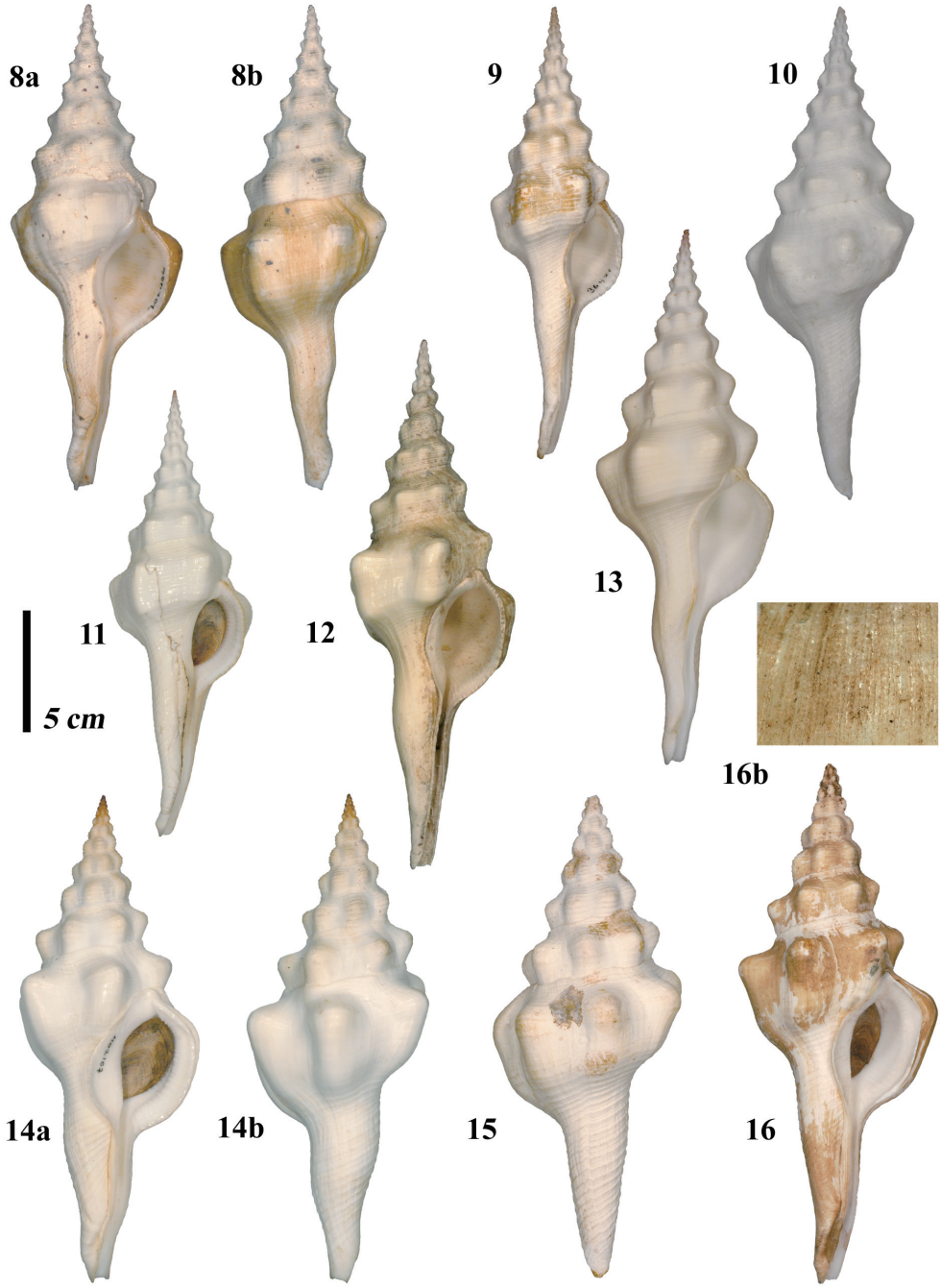
Chemnitz described this species thus: Die längste weisse glatte eckigt wellenförmige Spindel [The long, white, smooth, angular wavy spindle]. *Fusus longissimus glabratus, leviter et tenuiter striatus, undatus angulosus ventricosus rostro flexuoso uti lit. S.* [Long, smooth Fusus, lightly and thinly striated; angular and undulating, ventricose, rostrum twisted like the letter 'S']. Chemnitz mentioned both the locality ('Ostindien', the East Indies) and the key point that this species remains angulate to the end of its growth.

Redescription: Shell medium sized to large for genus (average 170.6 mm SL, n=17), adults heavy and robust. Protoconch smaller than following whorls, rarely preserved; one or one and a half whorls, smooth, unsculptured. Teleoconch of 12–13 whorls in adults. Early whorls bear thick, somewhat flattened spiral cords, lowermost abutting suture, increasing in number from four to six



Figs. 1–7. *Fusinus undatus.* **1.** Lectotype, Chemnitz (1780: figure 1343). **2.** Off Panglao Island, Bohol, Philippines (SC), 232 mm SL. **3.** Off Masbate, Philippines,10–20 m (SC), 144.7 mm SL. **4.** Kii Strait off Minabe, Wakayama Prefecture, Japan (SC), 181.5 mm SL. **5.** Detail of periostracum of specimen in Fig. 4. **6.** Kii Strait off Shimo-Kusui, Gobo Town, Wakayama Prefecture, Japan, 40–80 m (SC), 142.0 mm SL. **7.** Kii Strait off Minabe, Wakayama Prefecture, Japan (SC), 184.3 mm SL.

or seven by seventh whorl; thereafter, minor cords develop between majors, gradually thickening as teleoconch progresses. By 11th whorl, six major and numerous minor cords interspersed near periphery by numerous fine axial riblets that do not cross major cords. Axial riblets become fine fissures intersecting cords in area immediately below suture. Shell surface in later whorls distinctly



Figs. 8–13. *Fusinus undatus*. **8.** Arakabesan Passage, W. of Koror, Belau, ANSP 202486, 158.0 mm SL. **9.** Tahiti, *ex* T. B. Wilson, ANSP 36421, 146.0 mm SL. **10.** Tahiti, *ex* T. B. Wilson, ANSP 36421, 160.0 mm SL. **11.** Off Tarabao, Tahiti (SC), 145.9 mm SL. **12.** Off Pointe d'Easo at 18–35m, Baie du Santal, Lifou, Loyalty Islands (MNHN), 171.5 mm SL. **13.** Off Taiohae, Nuka Hiva, Marquesas Islands (SC), 173.5 mm SL.

Figs. 14–16. *Fusinus mauiensis* n. sp. **14.** Holotype, off Maalaea Bay, Maui, Hawaii, 55 m, ANSP 402107, 159.0 mm SL. **15.** Off Kihei, Maui, Hawaii, 73 m (TC), 157.1 mm SL. **16.** On silty bottom in Maalaea Bay, Maui (SC), 168.4 mm SL (b: detail of periostracum).

glossy, with intersection of axial and spiral sculpture giving malleate appearance on final whorls. From approximately ninth whorl, spiral cord at periphery can become more prominent than others. Spiral cords become finer, more broadly spaced and less distinct in final three whorls; typically 11 cords above periphery on body whorl. Suture adpressed, no subsutural band. Axial teleoconch sculpture of heavy, rounded buttresses with straight to concave crowns, set oblique to axis with broadest span at upper extremity. Buttresses persist onto body whorl; those on early whorls often set in gaps between those on preceding whorl, giving appearance of axial torsion. On body whorl, previously subsumed lower angle of buttress becomes visible; lower angle rounded to sharp, but not bearing distinct cord. Profile of shell above periphery strongly concave; below lower peripheral angle on body whorl, profile sharply constricted with angular ramp connecting lower angle of buttress with upper section of neck.

Neck thick and cylindriform in upper half to two thirds; lower portion tapering, often with strong recurvature near distal tip. Area from lower buttress angle to distal tip of neck bears numerous (typically approx. 35) indistinct spiral cords, irregularly spaced. Body whorl bears numerous very fine axial growth lines.

Aperture with thickened labral margin in adults that bears fine, sharp teeth formed at terminals of spiral cords on outer surface; labral margin gently sinuous, opisthocline in upper third, thereafter forming slight prosocline curve until constriction at entrance to siphonal canal. Parietal shield expressed with sharp edge from just below lower buttress angle to distal tip of siphonal canal. Parietal wall of aperture bears numerous fine, discontinuous spiral threads that terminate some way behind parietal margin; at termination, threads may join each other or be broken into elongated papillae. Labral wall of aperture bears numerous (typically 30–35) fine spiral threads that terminate some distance from labral margin, leaving smooth band between their terminals and labral dentition; labral wall slightly reflexed just below suture terminus, forming channel. Labral margin of siphonal canal somewhat incurved in adults, constricting canal.

Operculum typical for genus; thick and chitinous with nucleus at anterior terminus. Thin, pale brown periostracum on final whorls, rarely preserved in collections.

Notes: Several of the specimens examined from Wakayama Prefecture retain an opaque pale greenish-brown periostracum with a dense, axial lamellar structure. The lamellae are closely spaced (3–4 per mm) and bear fine triangular tufts (Fig. 5). The periostracum of a specimen from Okinawa (Fig. 24) is similar in appearance, but thinner and with reduced tufts. The thickness of the periostracum may be related to the temperature and/or oxygen levels of the surrounding water, but this remains to be investigated. See also the remarks on the periostracum of *F. mauiensis* below.

Specimens from Japan are often more slender in appearance than those from the Philippines (Figs. 4, 7), with a correspondingly narrower parietal shield. The characteristic whorl profile and glossy surface are present in all cases, however.

Distribution: *Fusinus undatus* is known from throughout the western Pacific, including Australia (Wilson, 1994) and the Coral Sea (Loch, 1986), Tahiti (ANSP), Belau (ANSP), Hawaii (McDowall, 1974; present study), Indonesia (Dharma, 2005) and Japan (Okutani & Tsuchiya, 2000). In addition to *F. mauiensis* n. sp., typical *F. undatus* occur in Hawaii, though apparently not throughout the islands. McDowall (1974) illustrated a live-taken specimen from 90 feet (30 m) off Kauai, and mentioned two previous records from the same spot. He differentiated his find from the 'Maui Spindle', although he incorrectly cited the latter as *F. sandvichensis* (see below). The specimen figured by Quirk & Harrison (1972: 21, fig. 6) as 'Maui Spindle *Fusinus undatus* Gmelin' apparently does represent *F. undatus.* Schoenberg (1982: center figure) figured a typical *F. undatus* as '*F. sandvicensis*' [sic]. The specimen examined here from Kauai is of a form closer to *F. mauiensis* n. sp. than any other seen, but is still distinguishable as *F. undatus*. A series of ten *F. undatus* specimens illustrated from a single locality in the Coral Sea by Loch (1986) approach *F. mauiensis* in some characters, particularly the shorter, thicker neck, but nevertheless can be dis-

tinguished by their more numerous buttresses with well-developed lower sections, and by their tall, slender spires. Unfortunately, none were illustrated in ventral view. The *Fusinus* specimens figured by Donner (1972: figs. 6, 8, 9) are all apparently typical *F. undatus*; no detailed locality information was given, but the general area was within the Hawaiian islands.

Fusinus mauiensis n. sp.

(Figs. 14–16)

Fusinus mauiensis Quirk & Wolfe, 1974: 12, 'Spindles' fig. 7. *Nomen nudum*.

Fusinus undatus Schoenberg, 1982: 1, rightmost figure; 13, right figure; Fair, 1972, lower left two figures. Not *Murex undatus* Gmelin, 1791.

Type material: Holotype: 159.0 mm SL, off Maalaea Bay, Maui, 55 m, ANSP 402107 (Fig. 14). Paratypes: 1) 157.5 mm SL, McKinna Beach, Maui, buried in sand at 82 m, USNM 888395. 2) 157.1 mm SL, off Kihei, Maui, 73 m (TC, *ex* G. Donner) (Fig. 15). 3) 165.5 mm SL, buried deep in sand at 55 m, off Kihei, Maui (TC). 4) 165.0 mm SL, on sand and rubble at 13m, Hale Pan Hana, Maui (SC). 5) 161.0 mm SL, under coral at 10 m, off Maalaea Bay, Hawaii (MNHN).

Other material examined: 153.0 mm SL, deep water off Maui (TC, *ex* G. Donner); 153.0 mm SL, off Kihei, Maui, 73 m (TC, *ex* G. Donner); 158.0 mm SL, off Kiehi, Maui, 82 m (TC); 155.5 mm SL, off Kihei, Maui, 55–110 m (TC, *ex* J. McDowall); 168.4 mm (Fig. 16), 164.4 mm, 162.0 mm SL, on silty bottom in Maalaea Bay, Maui (SC, *ex* E. R. Cross).

Description: Shell resembling *F. undatus*, but somewhat smaller (average 157.9 mm SL, n=7) and proportionately much heavier (0.837 g/mm SL, n=7 versus 0.464 g/mm SL, n=17). Shape similar to that of *F. undatus*, but with more thickened upper neck and more prominent knobs on upper buttresses that may protrude upwards and/or be reflected anteriorly. Early whorls bear three thick spiral cords, increasing to four and then five by seventh whorl; single slender cord present between each major cord on early whorls, becoming obsolete after fifth to seventh whorl. Lower buttress margin usually reduced and rounded. Neck and canal strongly thickened in upper section, with broad, flared detachment of parietal canal margin. Neck straight in some specimens (Fig. 15), but where not, recurved lower section relatively shorter than in *F. undatus*. Gap between labral dentition and spiral cords within aperture often reduced or absent. Aperture wall in adults often thickened and constricted with very pronounced labral dentition. Prominent spiral cords over entire body whorl, especially on neck.

Shell dull white overall, occasionally tinged with pink; surface usually dull and chalky. Protoconch and first three to four whorls often mid-brown, color fading away by sixth whorl.

Periostracum present on one specimen examined (Figs. 16a, 16b); thin, translucent, mid-brown, bearing numerous axial lamellae; lamellae somewhat more closely spaced than in Japanese *F. undatus* (4–7 per mm), with ragged edges; lamellar margins can bear irregular hair-like projections, but only in places.

Notes: *Fusinus mauiensis* can be distinguished from *F. undatus* by its smaller size, far greater weight, more thickened upper neck and larger and more prominent knobs on the upper buttresses, which are fewer in number than in *F. undatus*. Its spiral sculpture persists onto the body whorl, and the spiral cords are especially prominent from the lower buttress margin to the tip of the neck. The columellar margin of the canal tends to be flared and detached in adults, to a much greater extent than in *F. undatus*. With the limited samples to hand, the significance of the difference in periostracum characters is not clear. The surface of the bodywhorl in *F. mauiensis* is usually dull and somewhat chalky, in contrast to the smooth and often polished surface of *F. undatus*.

Apart from *F. undatus*, *Fusinus mauiensis* resembles somewhat another endemic Hawaiian species, *F. michaelrogersi* Goodwin, 2001 (Fig. 34). The latter is of similar size, with an average SL of

136.2 mm (n=14; Goodwin, 2001) and bears distinct buttresses, but is of much thinner and lighter construction with an open canal and distinctive thick spiral cords on the entire body whorl. The neck of *F. michaelrogersi* is relatively short, and is not as thickened as in *F. mauiensis*. In addition, it lacks the pronounced detachment of the inner canal margin, and bears a larger number of buttresses on the body whorl. The holotype of *F. michaelrogersi* is clearly a juvenile specimen, but the specimen shown in Goodwin's figure 3 is also probably immature, with a less developed parietal shield and apertural margin than in any adult example of *F. mauiensis* seen by the present authors.

Distribution: All specimens of *F. mauiensis* seen and reported in literature so far have been from the island of Maui, with the majority coming from the area of Maalaea Bay. A specimen of *F. undatus* examined from Kauai, in the northwestern Hawaiian chain, resembles *F. mauiensis* in many respects but is still considered to belong to the nominate form. It thus seems possible that *F. mauiensis* represents the development in isolation of an 'end of the line' population of *F. undatus* at the northeastern extreme of its Pacific distribution.

Fusinus similis (Baird, 1873)

(Figs. 17–23)

Fusus (*Colus*) *similis* Baird, 1873: 432, pl. 36.

Fusinus undatus (Gmelin, 1791): Abbott & Dance, 1982: 187, center row, second from right. Not *Murex undatus* Gmelin, 1791.

?*Fusinus longissimus*: Thach, 2005: pl. 42, figs. 2, 3, 12. Not *Murex longissimus* Gmelin, 1791.

Original description: Shell elongately fusiform, spindle-shaped, moderately thick, rather solid, somewhat deeply grooved and ridged throughout transversely, and finely striated across the ridges longitudinally; spire acuminated; whorls slanting round the upper part, noduled in the middle; nodules moderate-sized, not distant from each other, about 10 or 11 in number in each whorl; interior of the aperture pure white, sharply ridged in the throat, guttately noduled at the inferior part, columella callus slightly wrinkled. Rostrum long, bent about the middle of its length; canal twisted. Of a dull white colour throughout, externally. The spire in the specimen we described is broken at the tip. Length of remainder 6 inches. Breadth of body whorl 2 inches. *Hab*. New Caledonia.

Type material: Lectotype, here selected: Baird's figured specimen (1873, pl. 36), 147.7 mm SL, 'New Caledonia', BMNH 1982169 (Fig. 17). Baird's words 'in the specimen we described' suggest that other material may have been recovered together with the figured specimen, making it a figured syntype in the original work.

Other material examined: *New Caledonia*: 148.8 mm SL (broken both ends), 'Nouvelle Caledonie, Lambert' (MNHN) (Fig. 18); 154.8 mm SL, Lifou, Baie du Santal, Baie de Chépénéhé, 15–35 m (MNHN) (Fig. 19); 153.0 mm SL, off Gomeu, west coast (SC). *Japan*: 151.5 mm SL (Fig. 20), 145.2 mm SL, 161.3 mm SL, 152.0 mm SL, 158.2 mm SL, off Shimo-Kusui port, Nada, Wakayama Prefecture (SC, *ex* K. Noda); 173.5 mm SL (Fig. 21), 159.3 mm SL (Fig. 22), 158.0 mm SL, 183.0 mm SL, off Sakai Port, Minabe, Wakayama Prefecture (SC, *ex* K. Noda); 184.2 mm SL (Fig. 23), 158.8 mm SL, in lobster nets at 20–60 m, Nada, Wakayama Prefecture (SC). *Philippines*: 170.0 mm SL, Manila Bay, Luzon (SC).

Redescription: Shell medium size for genus (162.2 mm SL, n=12), elongate fusiform, teleoconch of 10–13 whorls (average 11.5, n=10). Protoconch damaged or lost in all material examined; approximately 1.5 mm in diameter. Early whorls usually eroded, but bearing thick, prominent spiral cords, lowermost abutting suture, increasing in number from four to six or seven by seventh whorl; thereafter, minor cords develop between majors, tending to thicken as teleoconch progresses but varying in prominence. Spaces between spiral ribs with numerous axial growth lines whose interstices can be deep enough to form decussate sculpture in early whorls. Spiral cords remain

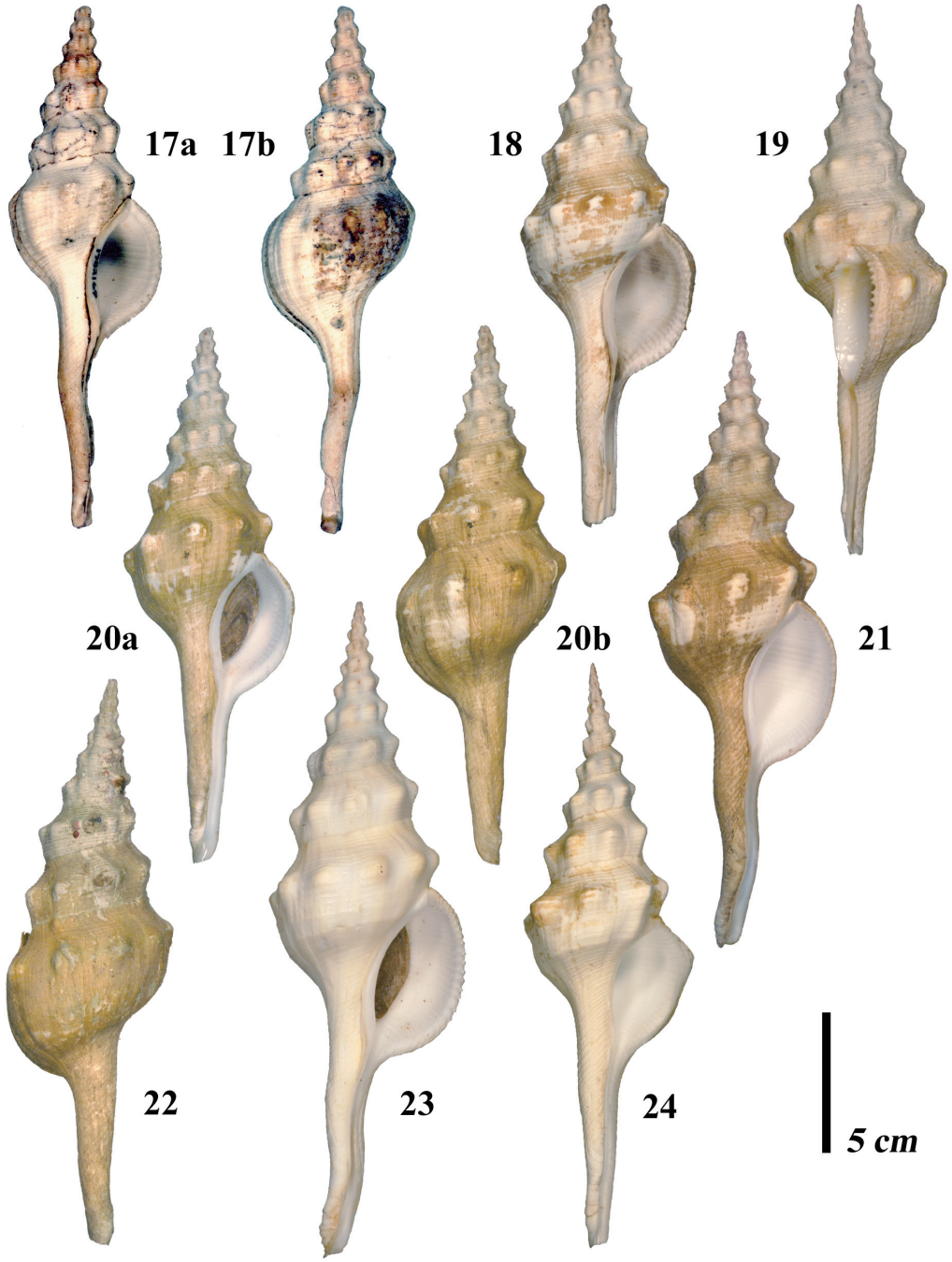


Fig. 17–23. *Fusinus similis*. **17.** Lectotype, 'New Caledonia', BMNH 1982169, 147.7 mm SL. **18.** Nouvelle Caledonie, MNHN, 148.8 mm SL. **19.** Lifou, Baie du Santal, Baie de Chépénéhé, New Caledonia, 15–35 m, MNHN, 154.8 mm SL. **20.** Off Shimo-Kusui port, Nada, Wakayama Prefecture, Japan (SC, *ex* K. Noda), 151.5 mm SL. **21.** Off Sakai Port, Minabe, Wakayama Prefecture, Japan (SC), 173.5 mm SL. **22.** Off Sakai Port, Minabe, Wakayama Prefecture, Japan (SC), 159.3 mm SL. **23.** In lobster nets at 20–60 m, Nada, Wakayama Prefecture (SC), 184.2 mm SL.
Fig. 24. *Fusinus undatus*. Sesoko, Okinawa, bottom of ledge on sand (TC), 165.0 mm SL.

Table 1. Average measurements of three characters. Bodywhorl and neck are measured from the terminus of the suture to the tip of the siphonal canal.

Species	Average SL (range) in mm	Bodywhorl and neck as % of SL	Weight (g/mm SL)	n
undatus	170.6 (142.0–232.0)	58	0.464	17
mauiensis	157.9 (153.0–165.5)	61	0.837	7
similis	162.2 (151.5–184.2)	57	0.34	12

dominant sculptural feature onto body whorl. Axial sculpture in early whorls of thick rounded ribs, contiguous but slightly staggered in vertical placement; major spiral cords cross ribs without weakening. Ribs shorten to become knobs after 5th to 7th whorl; knobs persist onto body whorl, occasionally weakening in final quarter turn. Suture adpressed, smoothly but irregularly undulating, no subsutural band. Lower angle of body whorl normally rounded, but occasionally slightly angulate; however, knobs do not form buttresses. Profile of shell above periphery straight to concave, creating distinctive angularity of upper aperture. Neck slender and tapering, straight or weakly recurved near distal tip. Spiral cords persist to tip of neck, their angle relative to axis steepening distally. Aperture normally angulate in upper part, with little or no thickening of labral margin in adults. Adult labral margin bears prominent, sharp teeth formed at terminals of spiral cords on inner surface (Fig. 19); viewed laterally, labral margin parallel to axis. Parietal margin of aperture slightly expressed in some adult specimens to form long, narrow shield that enters canal; parietal margin of canal only occasionally expressed, and then only in distal quarter. Parietal wall of aperture normally smooth, though occasionally with two indistinct spiral cords directly adjacent to suture. Labral wall of aperture bears numerous distinct spiral threads that terminate close to labral margin, leaving narrow and often indistinct smooth band between their terminals and labral dentition. Labral wall slightly reflexed just below suture terminus, forming channel. Canal usually open and unconstricted over entire length, even where neck is recurved. Operculum typical for genus; thick and chitinous with nucleus at anterior terminus. Thick, medium brown periostracum on entire shell, especially in Japanese specimens.

Notes: As mentioned above, only one of the types of *F. similis* is known. Among the New Caledonia material examined here are specimens that do not closely resemble the lectotype, and none are identical to it in all characters. There is nevertheless agreement in all major shell characters, and the species is thus here considered to be represented equally by the type and the material examined.

The specimens figured by Thach (2005: pl. 42, figs. 2, 3, 11) probably are *F. similis*. All three are freaks, however, and Thach confuses matters by not figuring any normal specimens. See Table 1 for comparison with *F. undatus*.

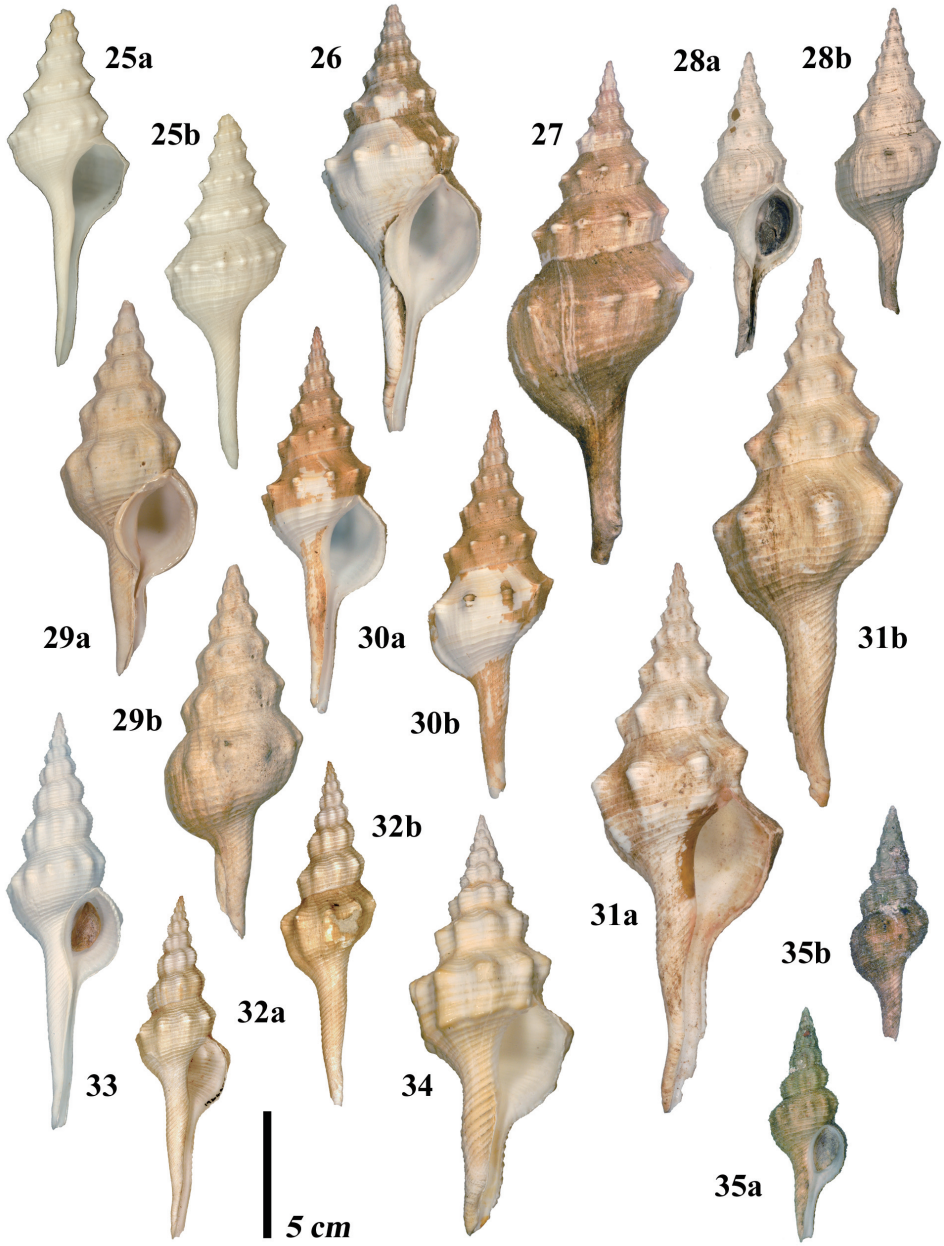
Fusinus genticus (Iredale, 1936)

(Figs. 25–27)

Colus genticus Iredale, 1936: 316, pl. 23, fig. 5.
Fusinus genticus, Mallard & Robin, 2005: pl. 23, leftmost figure.

Type material: Holotype, AM C60666, 111.0 mm SL, (Fig. 25), off New Zealand (‘from the Dundas dump’, Iredale, 1936: 316), not examined.

Material examined: 157.5 mm SL (Fig. 26), Doubtless Bay, New Zealand (SC); 133.2 mm SL (Fig. 27), trawled off Doubtless Bay, New Zealand (SC).



Figs. 25–27. *Fusinus genticus*. **25.** Holotype, New Zealand, AM C60666, 111.0 mm SL. Photo courtesy of Ms. Alison Miller. **26.** Doubtless Bay, New Zealand (SC), 157.5 mm SL. **27.** Trawled off Doubtless Bay, New Zealand (SC), 133.2 mm SL.
Figs. 28–29. *Fusinus galatheae*. **28.** Holotype, Raoul Island, Kermadec Islands, ZMUC, 95.6 mm SL. **29.** Off NW coast of Pitcairn Island, USNM 707231 (paratype of *F. galatheae bountyi*), 116.6 mm SL.
Figs. 30–31. *Fusinus bountyi*. **30.** Holotype, off NW coast of Pitcairn Island, USNM 707230, 121.0 mm SL. **31.** Crabbed in lobster traps, 80–120 m, Pitcairn Island (SC), 170.7 mm SL.
Figs. 32–33. *Fusinus sandvichensis*. **32.** Lectotype, Sandwich Islands, BMNH 1964409, 107.0 mm SL. **33.** Off Necker Island, northwestern Oahu (SC), 129.6 mm SL.
Fig. 34. *Fusinus michaelrogersi*, 131.0 mm SL, Penguin Banks off Maui, Hawaii, 150–200 m (SC).
Fig. 35. *Fusinus midwayensis*. Holotype, Midway Islands, 28°34.9′E, 176°38.8′W, 76 m, IMT 79–17, 73.3 mm SL.

Notes: Wilson (1994: 69) suggested that *F. genticus* might be a synonym of *F. salisburyi* Fulton, 1930, a species treated in the first paper in this series (Callomon & Snyder, 2004). Although there are similarities between the two species, *F. genticus* can be distinguished by the lack of a recurved inner siphonal canal margin (Fulton's 'false umbilicus'). In comparison with *F. similis*, *F. genticus* differs by its broader, more inflated body whorl and by the smaller, sharper and more numerous knobs on its periphery.

Fusinus galatheae Powell, 1967

(Figs. 28–29)

Fusinus galatheae Powell, 1967: 197, pl. 38, fig. 3.

Type material: Holotype, 95.6 mm SL (Fig. 28), *Galathea* sta. 674, Raoul Island, Kermadec Islands, 29°15′S., 177°57′W., 75–15 m, ZMUC.

Other material examined: 116.6 mm SL (Fig. 29), off NW coast of Pitcairn Island, 100–119 m, on stones and coral rubble, USNM 707231 (paratype of *F. galatheae bountyi*).

Notes: *Fusinus galatheae* was compared in the original description with *F. colus* and *F. nicobaricus*, but not with *F. similis*, which it resembles considerably more than either of the former. It may nevertheless be distinguished from *F. similis* by its thinner construction, more angular spire whorls, and the single row of regular knobs that become reduced only on the final part of the body whorl. In addition, the parietal shield in *F. galatheae* can be strongly expressed and thickened, a feature it shares with *F. bountyi*.

While its shell characters distinguish it from *F. similis*, however, *F. galatheae* may prove to be a form of *F. genticus*. There is not enough material to hand to separate the two with the same confidence as with the other species treated here. This remains an extremely rare species, known from a handful of specimens.

Fusinus bountyi Rehder & Wilson, 1975

(Figs. 30–31)

Fusinus galatheae bountyi Rehder & Wilson, 1975: 10, figs. 6–8; Mallard & Robin, 2005: pl. 21, 2nd figure from lower right.

Type material: Holotype, 121.0 mm SL (subadult), off NW coast of Pitcairn Island, USNM 707230 (Fig. 30).

Other material examined: 170.7 mm SL (Fig. 31), 160.5 mm SL, 140.5 mm SL (neck missing), 134.6 mm SL, crabbed in lobster traps, 80–120 m, Pitcairn Island (SC).

Notes: The figured paratype of *F. bountyi* (Rehder & Wilson, 1975: fig. 6b) (Fig. 29) is actually a specimen of *F. galatheae*. The rarity of both notwithstanding, they are distinguishable once adult *F. bountyi* are examined. *F. galatheae* is smaller and thicker, with fewer and more rounded knobs at the shoulder. There are some similarities between *F. bountyi* and *F. similis*, particularly in the angular aperture profile, the rounded lower body whorl and the persistence of spiral cords over the whole shell, but *F. bountyi* can be distinguished by its more pointed shoulder knobs and resulting angular whorl profile, as well as by the highly expressed and thickened adult parietal shield.

Fusinus sandvichensis (Sowerby III, 1880)

(Figs. 32–33)

Fusus sandvichensis Sowerby III, 1880: 72, pl. 4, fig. 25.

Fusinus sandwichensis [sic], Quirke & Wolfe, 1974: 12, fig. 8.

Fusinus undatus sandvichensis Sowerby II [sic], 1880: Mallard & Robin, 2005: pl. 33, lower rightmost figure.

Type material: Lectotype, here selected, 107.0 mm SL, Sandwich Islands, BMNH 1964409, *ex* J. Lombe Taylor (Fig. 32); Paralectotype, same data, 112.8 mm SL, BMNH 1964410.

Other material examined: *Hawaii*: 129.6 mm SL (Fig. 33), 135.2 mm SL, off Necker Island, northwestern Oahu (SC); 118.0 mm SL, 107.2 mm SL, 113.4 mm SL, 109.0 mm SL, traps off Maro Reef, northwest of Oahu (SC); 107.3 mm SL, 106.0 mm SL, 84.5 mm SL, 66.4 mm SL, 105.5 mm SL, 74.8 mm SL, lobster traps at Haleiwa, Oahu (SC); 102.3 mm, 102.1 mm, by scuba at Haleiwa, Oahu (SC). *Philippines*: 166.0 mm SL, Punta Engano, Cebu (SC).

Notes: *Fusinus sandvichensis* is included in the present study for comparison, as the name has been used to identify at least one of the other species treated here (*F. undatus*, see above). This is also the first published record of this species from outside Hawaii, albeit with reservations.

F. sandvichensis resembles *F. similis* and *F. undatus* in certain respects; the former in having a single row of knobs at the periphery, though they do not become reduced on the body whorl, and the latter in the tendency of the knobs to form buttresses. *F. sandvichensis* is smaller than both others, however (average 108.7 mm SL, n=17), and bears finer and more numerous spiral cords over the entire teleoconch. Its neck is rarely recurved, and is not thickened in the upper part as in *F. undatus*.

A single specimen to hand from Punta Engano in the Philippines (SC) is identical to the Hawaiian *F. sandvichensis*. In addition, material recently examined from trawls off New Caledonia (MNHN) apparently confirms the presence of this species outside Hawaii.

Fusinus midwayensis Kosuge, 1979

(Fig. 35)

Fusinus midwayensis Kosuge, 1979: 31, pl. 5, fig. 6.

Type material: Holotype, 73.3 mm SL, Midway Islands, 28˚34.9´E, 176˚38.8´W, 76 m, IMT 79-17 (Fig. 35).

Notes: This species remains poorly known, but the type is clearly distinct from the others treated here. It is smaller and has a relatively shorter neck, numerous strong spiral cords and weak axial ribs. Its type locality is several hundred miles northwest of the northernmost Hawaiian island. The poor figure in Mallard & Robin (2005: pl. 26, upper left) is apparently not of this species.

Discussion

In his monograph of *Fusinus* in Japan, Kuroda (1949: 4) stated (here translated): '*Fusinus undatus similis* (Baird) [Japanese name: Migaki-naganishi]. Also distributed in New Caledonia. Another large tropical species that is known from the Ryukyus and was first discovered in Honshu by Iwao Taki about 20 years ago, on the coast of the southern Kii Peninsula. A flesh-colored species, with a comparatively smooth shell surface.' The latter sentence suggests that Kuroda was referring to *F. undatus,* and his use of '*similis* (Baird)' and mention of New Caledonia may thus have caused the subsequent confusion of the two species in Japanese literature.

Fusinus undatus can be distinguished from *F. similis* by its generally heavier construction, its less recurved neck with a distinctly thickened upper portion, and by the persistence of the axial sculpture in proportionate scale to the end of the body whorl, which results in a relatively smaller aperture. The body whorl of *F. undatus* bears heavy angular axial buttresses, whereas the sculpture

in *F. similis* is normally a row of knobs at the shoulder, with little or no lower angulation of the body whorl. The surface of the later whorls in some *F. undatus* specimens and the body whorl in all of them is distinctively glossy. The aperture of *F. similis* is usually angular in its upper part and has a less thickened margin in adults, with finer dentition. The parietal shield is longer and narrower.

It is easy to separate the two species when only their typical forms are considered, but as with so many other *Fusinus* there are a number of variants of both that share some major characters and might at first glance be considered intergrades. A good example is one of the two specimens examined here from Sesoko, Okinawa (Fig. 24) and here assigned to *F. undatus* for its angular body whorl profile and early sculpture of fewer and larger knobs. Its slender neck, thin shell and light weight nevertheless initially led the authors to identify this subadult specimen as *F. similis*.

Although the lack of typical fusinid spiral cords on the body whorl in most *F. undatus* has been noted from the beginning, some of the Japanese specimens examined here bear distinct spiral sculpture, as do some that are figured in literature. One example was figured by Kira (1954: pl. 29, fig. 5), and represents a form of *F. undatus* that has since been cited as *F. undatus similis* in the Japanese literature to distinguish it from the nominate form. Though it bears distinct spiral cords, it differs from *F. similis* in having a shorter, thicker neck that is not recurved, and in the persistence of the axial buttresses onto the body whorl. Another problematic figure is in Abbott & Dance (1982: 187, center row, second from right). It shows a pair of specimens that apparently represent *F. similis*. The shell on the left is unusual in that it retains the peripheral knobs on the entire body whorl, but its slender neck and rounded lower body whorl distinguish it as *F. similis*. The absence of the original material or the locality information for these specimens makes further investigation impractical.

One notable difference between *F. undatus* and the other species treated here is the very broad range of adult size (Table 1). In the material examined, fully adult specimens (defined as those with fully developed parietal shields and dentate labral aperture margins) of *F. undatus* ranged from 142.0 mm SL to 232.0 mm, a difference between the largest and smallest of 63%; in contrast, *F. similis* varied in adult size by just 21.6%, and *F. mauiensis* by 8.1%.

As mentioned above, *Fusinus undatus* and *F. similis* are often taken together, at least in Japan and New Caledonia. The known range of *F. similis* falls within that of *F. undatus*, in the same way as *F. ferrugineus* is found within the range of the morphologically similar *F. perplexus* (see Callomon & Snyder, 2004). More detailed bathymetric data and analysis of the genetic characters of these species might well shed more light on this aspect of their ecology.

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日本産ナガニシ属の研究 II：ミガキナガニシとゲンコツナガニシ（新称）および 1 新種を含む太平洋産近似種

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要　旨

日本産ナガニシ属に関する再検討の第 2 報として，ミガキナガニシとしばしばそれに混同されてきた種類について検討を行った。従来日本の文献ではミガキナガニシは *Fusinus undatus similis* (Baird, 1873) に同定されることが多かったが，タイプ標本や原記載の図，および日本および太平洋の各地から採集された標本を詳細に調べた結果，*Fusinus undatus* (Gmelin, 1791) と *Fusinus similis* (Gmelin, 1791) は明らかに独立した別種であり，ミガキナガニシは前者に該当することが明らかになった。また，ハワイから *Fusinus undatus* として報告されていた種類は，これらとは別の未記載種であることが明らかとなったため，新種 *Fusinus mauiensis* として記載した。さらに，これらミガキナガニシ種群と形態的に類似した *F. galatheae* Powell, 1967，*F. bountyi* Rehder & Wilson, 1975，*F. genticus* (Iredale, 1936)，*F. sandvichensis* (Sowerby III, 1880)，*F. michaelrodgersi* Goodwin, 2001 と *F. midwayensis* Kosuge, 1979 についても図示し，比較を行った。

Fusinus undatus (Gmelin, 1791)　ミガキナガニシ

殻はこの属としては中型（17 個体の平均殻長 170 mm），厚く堅固で重い。殻口はやや小さく，水管はあまり後ろへ反り返らない。縦肋は太く板状で，通常体層の底部まで連続する。殻表は淡黄褐色で平滑であるが，日本産の新鮮な個体では褐色の比較的厚い殻皮で被われる。

分布：紀伊半島以南，フィリピン～ニューカレドニア，パラオ，タヒチ，マルケサスからハワイ。

Fusinus similis (Baird, 1873)　ゲンコツナガニシ（新称）

ミガキナガニシに殻形やサイズ（12 個体の平均殻長 162 mm）は似るが，殻がやや薄く軽い。水管の反り返りはより強い。縦肋はミガキナガニシよりも弱く，肩部に結節列を形成するのみで，殻底に達しない。また，体層の背面で弱まる。

分布：紀伊半島以南，フィリピンを経てニューカレドニアまで。

Fusinus mauiensis n. sp.　マウイナガニシ（新種・新称）

ミガキナガニシに近似するが，やや小型であること（7 個体の平均殻長 158 mm），殻が極めて厚く重く，殻長あたりの重量が約 2 倍であること，水管の基部が太く，また縦肋が肩部で著しく発達することなどで形態的に区別される。

分布：タイプ産地（ハワイ，マウイ島）からしか知られていない。