TERAMACHIA DUPREYAE NEW SPECIES, FROM OFF WESTERN AUSTRALIA (GASTROPODA: VOLUTIDAE)

William K. Emerson
Department of Invertebrates
American Museum of Natural History
New York, NY 10024

ABSTRACT

Teramachia dupreyae, *a new species from deep water 200 miles NW of Broome, Australia, is described and compared with related species of the volutid subfamily Calliotectinae. In addition to this newly described taxon, the following species are recognized in the genus* Teramachia: tibiaeformis *Kuroda, 1931,* dalli *(Bartsch, 1942),* smithi *(Bartsch, 1942),* johnsoni *(Bartsch, 1942),* mirabilis *(Clench and Aguayo, 1941), and* shinzatoensis *MacNeil, 1961.*

Through the kind offices of Robert and Dorothy Janowsky, proprietors of *Mal de Mer Enterprises* of West Hempstead, New York, the presence of recently obtained specimens of this interesting discovery were brought to my attention. I am pleased to describe this new western Australian volute in honor of Constance Duprey of Nashville, Tennessee, who generously submitted her specimens for study and donated the holotype to the American Museum of Natural History (AMNH).

A total of seven species, including the new taxon described herein, are recognized in the genus *Teramachia* at the present time. Five living and one extinct species are known from the western Pacific. A single extant species is reported from the western Atlantic.

The previously known species-group taxa referable to *Teramachia* are listed in sequence of publication:

1. *Teramachia tibiaeformis* Kuroda, 1931, pp. 45-47, figs. 2, 3; Kuroda and Habe, 1950, pp. 36, 37, pl. 5, fig. 1, text fig. 5 (operculum), "Tosa in 100 fms." [182 meters]; Habe, 1952, p. 132, fig. 12 (radula); Azuma, 1960, p. 48, pl. 2, fig. 9, off Tosa, in 182 meters; Kira, 1962, p. 92, pl. 33, fig. 4 (illus. in color), "Honshû and southwards, rarely found at 100-150 fathoms depth" [182-274 meters]; Shikama, 1963, p. 97, pl. 79 (illus. in color), Hyuga, Japan; Weaver and duPont, 1970, p. 179, pl. 76 E, F (illus. in color), text fig. 41b (operculum); Abbott and Dance, 1982, p. 224 (illus. in color). Type locality: "Off Kii", [Honshû, Japan]. The type species of *Teramachia* Kuroda, 1931. This well-known, small species (length to 90 mm) seems to be restricted to southern Japanese waters. The holotype is in The Academy of Natural Sciences of Philadelphia.

2. *Teramachia mirabilis* (Clench and Aguayo, 1941), pp. 177, 178, pl. 14, fig. 2; Clench and Turner, 1964, p. 177, pl. 114 (holotype); Weaver and duPont, 1970, p. 178, pl. 76 A, B (holotype, illus. in color). Type locality: "off Matanzas, Matanzas Prov., Cuba,...in 289 fathoms [528 meters]". The type species of *Howellia* Clench and Aguayo, 1941.

3. *Teramachia dalli* (Bartsch, 1942), pp. 10, 11, pl. 2, figs. 1 (operculum), 4; Weaver and duPont, 1970, p. 177, pl. 75 E, F (holotype, illus. in color), text fig. 41a (operculum); Lan, 1980, p. 63, pl. 25, figs. 55, 55a, "SW off Taiwan"; Bouchet, 1981, p. 10, illus., NW of Mindoro, Philippines, in 680-770 m; Abbott and Dance, 1982, p. 224 (holotype, illus. in color); Okutani, 1983, p. 10, pl. 33, fig. 5, "Taiwan"; Wells, 1983, p. 5, illus., off Port Hedland, northwest Australia, in 376 meters. Type locality: "off Cape Santiago, Luzon, [Philippines], in 394 fathoms [720 meters]." The type species of *Prodallia* Bartsch, 1942. This stout but thin shelled species attains 175 mm in length. The prominent suture is deeply grooved and off-set by regular and evenly spaced ribs, which are terminally cuspate at the summit. The periostracum on fresh specimens is a blackish brown.

4. *Teramachia smithi* (Bartsch, 1942), p. 11,

pl. 2, fig. 5; Weaver and duPont, 1970, pp. 178, 179, pl. 76 C, D (holotype, illus. in color); Greene, 1975, p. 12, illus., "10 miles southeast Taghilaran, Bohol, Philippines, trawled alive"; Clover, 1978, pp. 60, 61 (illus. in color), "Off Boho, Philippines, in 200 meters"; Abbott and Dance, 1982, p. 224 (holotype, illus. in color). Type locality: "off Balicasag Island, Bohol [Philippines], in 439 fathoms [802 meters]". This large shell (length 173.5 mm, Duprey coll. A429) is characterized by the narrow spire, inflated body whorl, with a wide aperture and a widely flaring outer lip. The periostracum is a tannish brown.

5. *Teramachia johnsoni* (Bartsch, 1942), p. 12, pl. 2, fig. 3; Weaver and duPont, 1970, p. 178, pl. 75 G, H (holotype, illus. in color); Rehder, 1972, p. 8, figs. 3, 7; Lan, 1980, p. 63, pl. 25, figs. 54, 54a, "SW off Taiwan" (not *T. tibiaeformis*); Okutani, 1983, p. 10, pl. 33, fig. 4, "Cebu, Philippines" (not *T. tibiaeformis*), fig. 6, "South China Sea" (not *T. smithi*) and fig. 7, "Taiwan". Type locality: "3½ miles NW of Cagayan Island, [Philippines], in the northern Sulu Sea, in 344 fathoms [628 meters]," *fide* Rehder, 1972, p. 8. Originally described on the basis of an immature specimen, Rehder (1972, pp. 8, 9, figs. 3, 7) subsequently described an adult specimen of this narrowly and elongately fusiform species, which is known to attain 145 mm in length. The light brown periostracum covers a grayish to tannish shell with the suture stained a darker gray. The outer lip is strongly arcuate. Populations from the Formosa Strait were afforded subspecific recognition by Rehder; see *T. j. williamsorum, infra citato.*

6. *Teramachia shinzatoensis* MacNeil, 1961, p. 96, pl. 9, fig. 1; Rehder, 1972, p. 8, figs. 5, 6 (holotype). Type locality: "Shinzato tuff member, [Neogene, Okinawa, Japan]". This small (length 69.8 mm), Mio-Pliocene fossil is compared with *T. johnsoni* by MacNeil (1961, *op. cit.*) and Rehder (1972, *op. cit.*).

7. *Teramachia johnsoni williamsorum* Rehder, 1972, pp. 8, 9, figs. 1, 2, 4; Abbott and Dance, 1982, p. 224 (holotype, illus. in color). Type locality: "30 miles south of Tung-Chiang, Taiwan, in 150 fathoms [274 meters]". All the specimens I have examined of this form are from the Formosa Strait. Abbott and Dance (*op. cit.*) consider this taxon to be an infrasubspecific form of *T. johnsoni* Bartsch. The available data suggest that Rehder's taxon is conspecific with *T. johnsoni.* As in the new species, shell dimorphism is expressed by a stout form (Rehder, 1972, figs. 1, 4, holotype of *T. j. williamsorum*) and a slender form (Rehder, 1972, figs. 3, 7).

Family Volutidae Fleming, 1822
Subfamily Calliotectinae
Pilsbry and Olsson, 1954
Genus ***Teramachia*** Kuroda, 1931

Teramachia Kuroda, 1931, p. 45, type species by monotypy, *Teramachia tibiaeformis* Kuroda, 1931, pp. 45-47, figs. 2, 3, off Kii, Japan.

Howellia Clench and Aguayo, 1941, p. 177, with its type species by monotypy, *Howellia mirabilis* Clench and Aguayo, 1941, pp. 177, 178, pl. 14, fig. 2, off Cuba, in 285 fathoms [520 meters], was based solely on the holotype, without knowledge of the soft parts and operculum, and was provisionally placed in the Fasciolariidae. Clench and Turner (1964, p. 178, pl. 114) subsequently assigned *Howellia* to the Volutidae, subfamily Calliotectinae, following Pilsbry and Olsson (1954, p. 19). Clench and Turner (*op. cit.*) noted the close resemblance in shell morphology of the type species to the genus *Teramachia.* The western Atlantic *T. mirabilis* does recall examples of *T. tibiaeformis* from Japan, but differs in having the strong axial sculpture carried on to the body whorl. A more precise systematic assessment of *Howellia* must await knowledge of the soft parts and the radular characters of the type species.

Prodallia Bartsch, 1942, p. 10, with its type species by original designation, *Prodallia dalli* Bartsch, 1942, p. 10, off Luzon, Philippines, *ex*-Bartsch ms., was introduced in a 20-page brochure circulated at a banquet in honor of William Healey Dall, on April 21, 1915. Because the banquet brochure was not available to the general public, these taxa were not nomenclaturally available until 1942 when Bartsch first validly proposed the names.

Kuroda (1931, p. 47) provisionally placed the genus *Teramachia* in the Volutidae largely on the basis of shell and opercular morphology. This familial assignment was retained by Kuroda and Habe (1950, p. 36). Subsequently, Habe (1952, p. 132, fig. 12) figured the rachidian teeth of *T. tibiaeformis,* without comment.

Pilsbry and Olsson (1954, p. 19) included *Teramachia* (with *Prodallia* in synonymy) in their volutid subfamily Calliotectinae. They illustrated a tricuspid rachidian tooth (Pilsbry and Olsson, 1954, pl. 3, fig. 16) of the type species of *Calliotectum* Dall, 1890, which has rachidian dentition similar to that illustrated by Habe (1952, *op. cit.*) for *T. tibiaeformis*. The radular and opercular characters of *Teramachia tibiaeformis* strongly indicate placement of this genus in the Volutidae (Weaver and duPont, 1970, p. 176; Rehder, 1972, p. 7; Cernohorsky, 1973, p. 127; Emerson and Old, 1979, p. 11; Quinn, 1981, p. 73), although some authors have assigned *Teramachia* to the Turbinellidae (*olim* Xancidae) largely on the basis of shell morphology (Bayer, 1971, p. 195; Abbott and Dance, 1982, p. 224).

Rehder (1972, p. 7) reported the presence of two oblique folds on the columella of immature specimens of *T. tibiaeformis* and *T. johnsoni*, which become obscure in the adult stage. These folds are weakly developed. None of the specimens I have examined of the species herein referred to *Teramachia* possesses columellar plications. Taxa with columellar plaits, which were previously assigned to the calliotectine volutes, are now placed in the Turbinellidae (Rehder, 1967, 1972; Cernohorsky, 1973; and Quinn, 1981). This includes *Prodallia barthelowi* Bartsch (1942, pp. 12, 13, fig. 2) from the Philippines.

The new species of *Teramachia* is one of many new or otherwise interesting deep-water species recently obtained by shrimp boats trawling off the northwest coast of Australia; see Davis and Ward (1984). Kosuge (1985) lists and illustrates some of these findings in a preliminary report on the mollusks.

Teramachia dupreyae *new species*

Figs. 1-8

Teramachia aff. *T. dalli* (Bartsh [*sic*], 1942), Slack-Smith, 1980, p. 1, illus., "SW of Cape Leeuwin, W. Australia, in 488-496 m." Not *Teramachia dalli* (Bartsch, 1942).

Teramachia johnsoni (Bartsch, 1942), Kosuge, 1985, p. 58, pl. 23, fig. 1, off the northwestern coast of Australia. Not *Teramachia johnsoni* (Bartsch, 1942).

Diagnosis: Shell large for genus, exterior a tannish white, aperture a glossy white, suture and anterior portion of columellar wall stained a brownish lavender; periostracum inconspicuous, thin, yellowish buff. The darkly colored sutural line against the light color of the shell immediately distinguishes this elegant volute from its congeners.

Description: Shell large, attaining 195+ mm in length, slenderly elongate fusiform. Protoconch missing; remaining whorls of holotype 10½. Lined suture narrow, canaliculate on early whorls, with axial ribs, numbering 33 to 37 on last completely ribbed whorl; ribs obsolete on lower portion of antepenultimate whorl and wanting on the penultimate and body whorls, on which irregular growth lines occur. Aperture elongate, outer lip flaring, edge thin; anal sulcus with narrow sinus at juncture with suture; anterior siphonal canal widely open; parietal lip thinly glazed; columella without plications, and weakly folded. Operculum typical for the genus (Kuroda and Habe, 1950, p. 46, fig. 5). Soft parts not preserved. Color, see Diagnosis above.

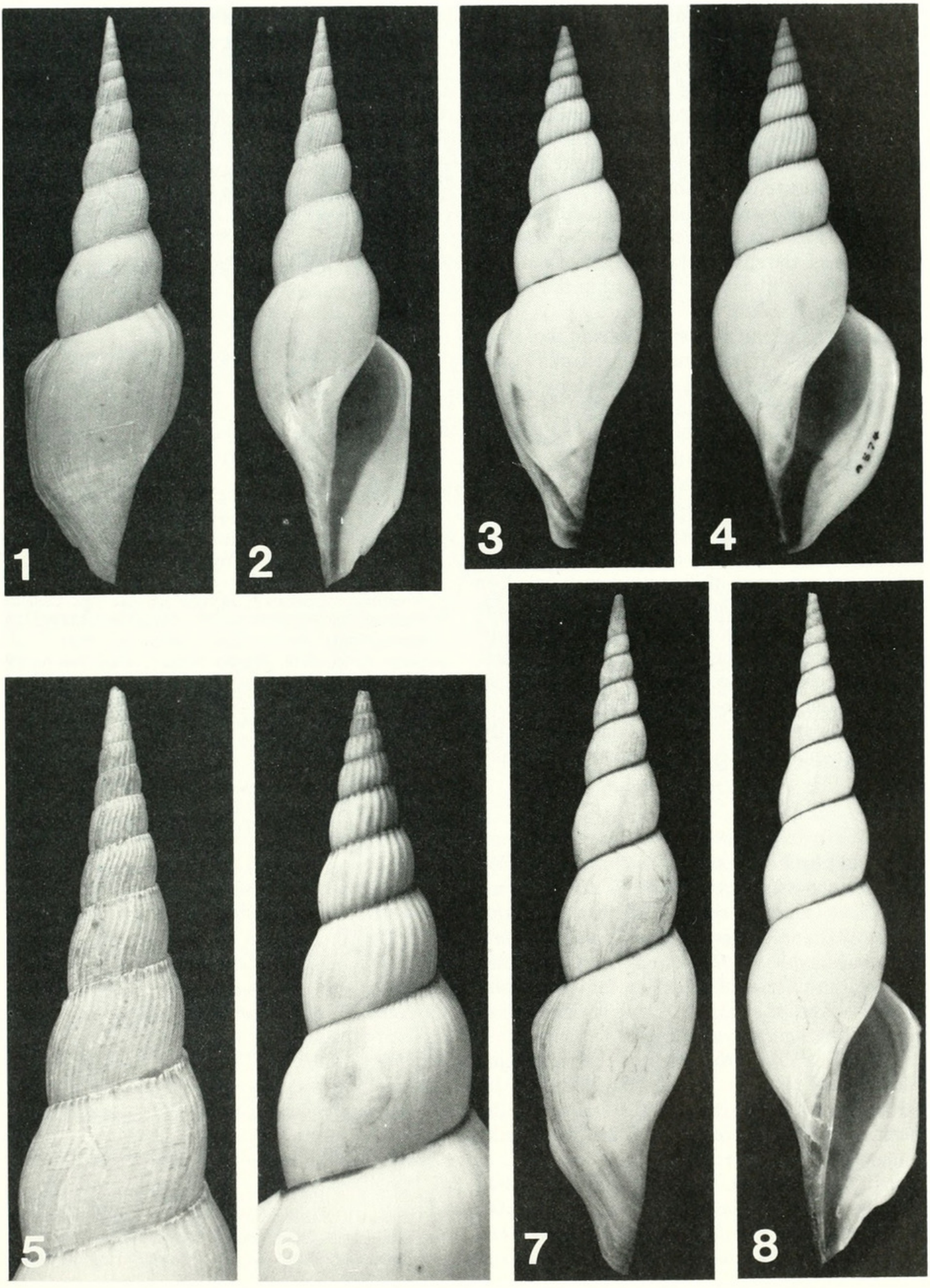
Shell dimorphism is characterized by slender individuals (holotype, here illustrated, figs. 7, 8 and paratypes C and D) and a shorter, inflated form (paratype A, here illustrated, figs. 3, 4).

Measurements: Holotype, 185 mm in height, 46 mm in width; paratype A, 145 mm in height, 48.5 mm in width; paratype B, 153 mm in height, 44 mm in width; paratype C, 192 mm in height, 48.7 mm in width; paratype D, 197 mm in height, 42.5 mm in width; paratype E, 184.2 mm in height, 42.8 mm in width; and paratype F, 166 mm in length, 39.9 mm in width.

Type locality: 200 miles NW of Broome, Australia off McDonnell Reef in 400 meters, February 1985. Type specimens: holotype, AMNH 213477 (figs. 7, 8); paratypes A (figs. 3, 4, 6) and B (figs. 1, 2, 5) and C from type locality, Constance Duprey collection; paratype D, AMNH 213438, here transferred to the Western Australian Museum, Perth, from 200 miles NW of Broome, between Rowley Shoals and Scotts Reef, in 450 meters; paratype E, AMNH 214367, off Broome, in 184 meters; and paratype F, AMNH 214368, off Port Hedland, NW Australia, in 166 meters.

Remarks: Of the nominal species of *Teramachia*, the present species most closely resem-

FIGS. 1-8. *Teramachia dupreyae* new species. **1, 2,** Paratype B. **3, 4,** Paratype A. **5, 6,** enlarged early whorls, **5,** Paratype B; **6,** Paratype A. **7, 8,** Holotype, AMNH 213477. **1-4, 7, 8** approximately × ⅔; **5, 6** approximately × 1.5.


1
2
3
4
5
6
7
8

bles in general appearance *T. johnsoni,* which differs in having the body whorl and penultimate whorl purplish gray, the early whorls yellowish white or white, and the outer lip a grayish purple with a brownish margin inside the whitish edge of the lip (Rehder, 1972, p. 9). In *T. tibiaeformis,* a dark spiral band appears below the suture on the body whorl and penultimate whorl of some specimens (cf. Abbott and Dance, 1982, illus. on p. 224). In *T. dupreyae* new species, the spiral coloration is restricted to a thin brownish lavender line within the suture (see figures herein).

Specimens of the new species from the continental slope off northwest Australia were previously recorded and illustrated by Slack-Smith (1980, p. 1), who compared her specimen with *Teramachia dalli* (Bartsch), and by Kosuge (1985, pl. 23, fig. 1), who referred his to *T. johnsoni* (Bartsch). *Teramachia dalli* is also reported from off the northwest coast of Australia in moderate depths (Wells, 1983, p. 5, illus.); Kosuge, 1985, p. 59, pl. 23, fig. 6). An additional specimen of *T. dalli* was trawled, in March 1985, off McDonnell Reef, 200 miles NW of Broome, Australia and was examined by me courtesy of Constance Duprey. This dark-colored species differs from the present species in the presence of stronger, axial ribs, which extend to upper part of the body whorl, and in the development of a deeply and broadly channeled suture.

Acknowledgments

In addition to Constance K. Duprey and Dot and Bob Janowsky, I should like to thank my AMNH colleagues for their contributions to this study: Walter E. Sage III for advice and technical assistance, Susan Klofak for specimen preparation, Peter J. Harries for the photography, and Stephanie Crooms for word-processing the manuscript.

Dr. Richard S. Houbrick of the National Museum of Natural History, Smithsonian Institution, and Mr. Russell H. Jensen of the Delaware Museum of Natural History kindly lent me specimens from their respective collections for study. Mrs. Gloria Scarboro of Indian Harbour Beach, Florida, generously donated Paratype D to the collection of the AMNH. Mr. Donald H. Y. Dan of Oak Brook, Illinois, and Mr. John Landin of Palos Park, Illinois, kindly provided specimens for study.

LITERATURE CITED

Abbott, R. T. and Dance, S. P. 1982. *Compendium of Seashells,* New York, 411 pp., illus.

Azuma, M. 1960. *A catalogue of the shell-bearing Mollusca of Okinoshima, Kashiwajima and the adjacent area (Tosa Province) Shikoku, Japan.,* 102 + 17 pp., 5 pls., 2 text figs.

Bartsch, P. 1942. Some deep-sea Philippine volutids. *The Nautilus* **56**(1):9–13, pl. 2.

Bayer, F. M. 1971. New and unusual mollusks collected by R/V *John Elliott Pilsbury* and R/V *Gerda* in the tropical western Atlantic. *Bull. Mar. Sci.* **21**(1):111–236, figs. 1–72.

Bouchet, P. 1981. Oceanographic expedition at Lubang Island, 1980. *Carfel Philippine Shell News* **3**(2):3, 4 and 10, 10 figs.

Cernohorsky, W. O. 1973. The taxonomy of *Benthovoluta hilgendorfi* (Von Martens) and allied turbinellid genera. (Mollusca: Volutacea). *Rec. Auckland Inst. Mus.* **10:** 123–131, 16 figs.

Clench, W. J. and Aguayo, C. G. 1941. Notes and descriptions of new deep-water Mollusca obtained by the Harvard-Havana Expedition off the coast of Cuba. IV. *Mem. Soc. Cubana Hist. Nat.* **15**(2):177–180, pl. 14.

Clench, W. J. and Turner, R. D. 1964. The subfamilies Volutinae, Zidoninae, Odontocymbiolinae, and Calliotectinae in the western Atlantic. *Johnsonia* **4**(43):129–180, pls. 80–114.

Clover, P. W. 1978. Smith's volutas. *Shell Collector* (Ft. Lauderdale, Florida), no. 1, pp. 60, 61, illus.

Davis, T. L. O., and Ward, T. J. 1984. CSIRO finds two new scampi grounds off the North West shelf. *Australian Fisheries* **43**(8):41–45.

Emerson, W. K. and Old, W. E., Jr. 1979. *Scaphella contoyensis,* a new volutid (Gastropoda) from east Mexico. *The Nautilus* **93**(1):10–14, 7 figs.

Greene, J. 1975. A 'long-lost' volute. *Hawaiian Shell News,* **23**(12):12, 1 fig.

Habe, T. 1952. Pholadomyidae, Clavagellidae, Pandoridae, Juliidae and Condylocardiidae in Japan. *Illustrated Catalogue of Japanese Shells,* No. 18, pp. 121–132, pl. 18, 28 text figs.

Kira, T. 1962. *Shells of the Western Pacific in Color.* Osaka, i-ix + 1–224, pls. 1–72.

Kosuge, S. 1985. Noteworthy Mollusca from north-western Australia (1), (Preliminary report). *Bull Inst. Malac. Tokyo* **2**(3):58–59, pls. 22, 23.

Kuroda, T. 1931. Two new species of Volutacea. *Venus* **3**(1): 45–49, 3 figs.

Kuroda, T. and Habe, T. 1950. Volutidae in Japan. *Illustrated Catalogue of Japanese Shells,* No. 5, pp. 31–38, pls. 5–7, 6 text figs.

Lan, T. C. 1980. *Rare Shells of Taiwan in Color.* Taipei, pp. 1–144, 63 pls.

MacNeil, F. S. 1961. Tertiary and Quaternary gastropods of Okinawa. *U.S. Geol. Surv. Prof. Paper* **339** ("1960"): i-iv + 1–148, pls. 1–19, (distributed March 17, 1961).

Okutani, T. 1983. *World Seashells of Rarity and Beauty.*

Kawamura Collection. National Science Museum, Tokyo, i-iii + 1–12, 48 pls.

Pilsbry, H. A. and Olsson, A. A. 1954. Systems of the Volutidae. *Bull. Amer. Paleont.* **35**(152):271–306, pls. 25–28.

Quinn, J. F., Jr. 1981. A new genus of Turbinellidae (Gastropoda: Prosobranchia), with the description of a new species from the Caribbean Sea. *The Nautilus* **95**(2):72–77, 5 figs.

Rehder, H. A. 1967. A new genus and two new species in the families Volutidae and Turbinellidae (Mollusca: Gastropoda) from the western Pacific. *Pacific Sci.* **21**(2):182–187, 11 figs.

_____ 1972. Some notes on the genus *Teramachia* (Volutidae: Calliotectinae). *The Veliger* **15**(1):7–10, 7 figs.

Shikama, T. 1963. *Selected Shells of the World Illustrated in Color.* Tokyo, pp. 1–154, pls. 1–102, 211 text figs.

Slack-Smith, S. 1980. New records for the western Australian continental slope. *Australian Shell News,* Malac. Soc. Australia, no. 32, pp. 1, 2, illus.

Weaver, C. S. and duPont, J. E. 1970. *Living volutes:* a monograph of Recent Volutidae of the world. Delaware Mus. Nat. Hist. Mong. Ser., No. 1, xv + 374 pp., 79 col. pls., 44 figs., 13 maps.

Wells, F. 1983. Wonders from the Northwest. *Australian Shell News,* Malac. Soc. Australia, no. 43, pp. 4, 5, illus.

ADDITIONAL COLORADO RECORDS OF *ANODONTA GRANDIS GRANDIS* SAY (BIVALVIA: UNIONIDAE)

Scott J. Herrmann and **James R. Fajt**
Department of Life Sciences
University of Southern Colorado
Pueblo, CO 81001

Upon first finding *Anodonta grandis grandis* Say, 1829, in large numbers in the Colorado Fuel and Iron Reservoirs No. 2 and No. 3 near Pueblo, Colorado, in August of 1982, we became concerned about the rarity of them elsewhere in the state. Since the summer of 1982 we have been searching eastern Colorado for viable populations of this freshwater mussel.

All the water in C.F.&I. Reservoir No. 3 had to be released by February 1983 so a new water control valve could be installed in the dam before the spring runoff began. As the water level was lowered, thousands of *Anodonta grandis grandis* became exposed. In February 1983 we transferred 412 adults from the C.F.&I. Reservoir No. 3 to the newly formed Pueblo Reservoir. Statewide news media coverage of this transplanting operation brought many calls and messages regarding the occurrence of bivalves elsewhere in eastern Colorado. Each of these notices was investigated. If during these investigations *A. grandis grandis* was found, we attempted to collect the largest (in length) and smallest specimens available. In addition, from each site at which *A. grandis grandis* was found a 1 liter composite (surface to near bottom) water sample was collected and kept on ice in a cooler until our return to the laboratory. In the Water Resources Laboratory of the University of Southern Colorado standard methods were used to analyze the cooled water samples. Atomic absorption spectrophotometric methods were used for the analysis of Na, K, Cu, Mn, Fe, and Zn. Sediment was examined in the field for relative particle size.

Burch (1973) indicated the North American range for *Anodonta grandis grandis* as being throughout the Mississippi-Missouri River drainage. In Colorado Brandauer and Wu (1979) cite only two old records for this species: one from 1911 in Boulder County, 30 miles north of Denver, consisting of 1 specimen; and a second collected 10 October 1915 from Yuma County, a pool in Black Wolf Creek, 1½ miles north and 1 mile west of Beecher Island, consisting of 35 specimens. The large collection from Black Wolf Creek in far eastern Colorado was made by Ellis (1916), who reported they were abundant and tightly embedded in the dense blue clay bottom. On 21 October 1983 we visited the vicinity of Black Wolf Creek described by Ellis (1916) and Brandauer and Wu (1978) and attempted to collect living specimens. All we found after searching about a mile segment were four shell frag-

1985. "Teramachia dupreyae new species, from off Western Australia (Gastropoda: Volutidae)." *The Nautilus* 99, 102–107. https://doi.org/10.5962/bhl.part.2793.

View This Item Online: https://www.biodiversitylibrary.org/item/34230
DOI: https://doi.org/10.5962/bhl.part.2793
Permalink: https://www.biodiversitylibrary.org/partpdf/2793

Holding Institution
MBLWHOI Library

Sponsored by
MBLWHOI Library

Copyright & Reuse
Copyright Status: In copyright. Digitized with the permission of the rights holder.
Rights Holder: Bailey-Matthews National Shell Museum
License: http://creativecommons.org/licenses/by-nc-sa/3.0/
Rights: https://biodiversitylibrary.org/permissions

This document was created from content at the **Biodiversity Heritage Library**, the world's largest open access digital library for biodiversity literature and archives. Visit BHL at https://www.biodiversitylibrary.org.

This file was generated 30 May 2023 at 12:44 UTC