

Two new species of Admetinae (Gastropoda: Cancellariidae) from the northeastern Pacific Ocean

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ABSTRACT

Two new species of the cancellariid subfamily Admetinae are described from bathyal depths of the northeastern Pacific Ocean. *Admete verenae* is presently known only from the hydrothermal vents of the Juan de Fuca Ridge, at depths of 2192 to 2415 m. It differs from other *Admete* in having a large shell with a high spire, strong spiral sculpture, and anteriorly tapering aperture with a deflected siphonal canal and a distinctive siphonal fasciole. Egg capsules, each containing 5–8 embryos, are broadly oval, V-shaped in end view, and raised on a short, broad stalk. *Neadmete ahoi*, from off northern California and Washington State at depths of 276 to 732 m, may be recognized by its distinctive tabulate spire profile and broad, strongly channeled sutural ramp, as well by its anteriorly tapered aperture.

Additional keywords: Mollusca, Neogastropoda, *Admete*, *Neadmete*, Bathyal, hydrothermal vents, egg capsules

INTRODUCTION

The Cancellariidae are a large and diverse family of neogastropods characterized by a highly specialized anterior alimentary system adapted for suctional feeding. The majority of species are tropical or temperate, but members of the subfamily Admetinae inhabit soft sediments at subtidal to hadal depths in polar regions and intervening deeper waters. Some southern hemisphere admetines share a distinctive radular morphology (Oliver, 1982). Other austral species as well as all boreal Admetinae studied to date lack a radula, but retain a distinctive jaw with its distal portion joined ventrally to form a tube (Harasewych and Petit, 1986). Admetines are neither common nor diverse in the North Atlantic (Bouchet and Warén, 1985:257; Høisæter, 2011), but are more widespread and represented by greater numbers of named species and genera in the fauna of the northern Pacific Ocean (Abbott, 1974; Higo et al., 1999; Kantor and Sysoev, 2005).

Over the past several years, we have received samples of two distinctive species of Admetinae. One was collected during a series of research cruises to the hydrothermal vents along the Juan de Fuca Ridge off British Columbia, and provided by Dr. Verena Tunnicliffe of the University of Victoria, Canada. The other was obtained from commercial fishing vessels working off the coast of Washington State, USA, by Mr. Jon Aho. These two new species are described herein. Abbreviations: CMN: Canadian Museum of Nature, Ottawa; USNM: National Museum of Natural History, Smithsonian Institution, Washington, DC.

SYSTEMATICS

Family Cancellariidae Forbes and Hanley, 1851
Subfamily Admetinae Troschel, 1865 (as Admetacea)

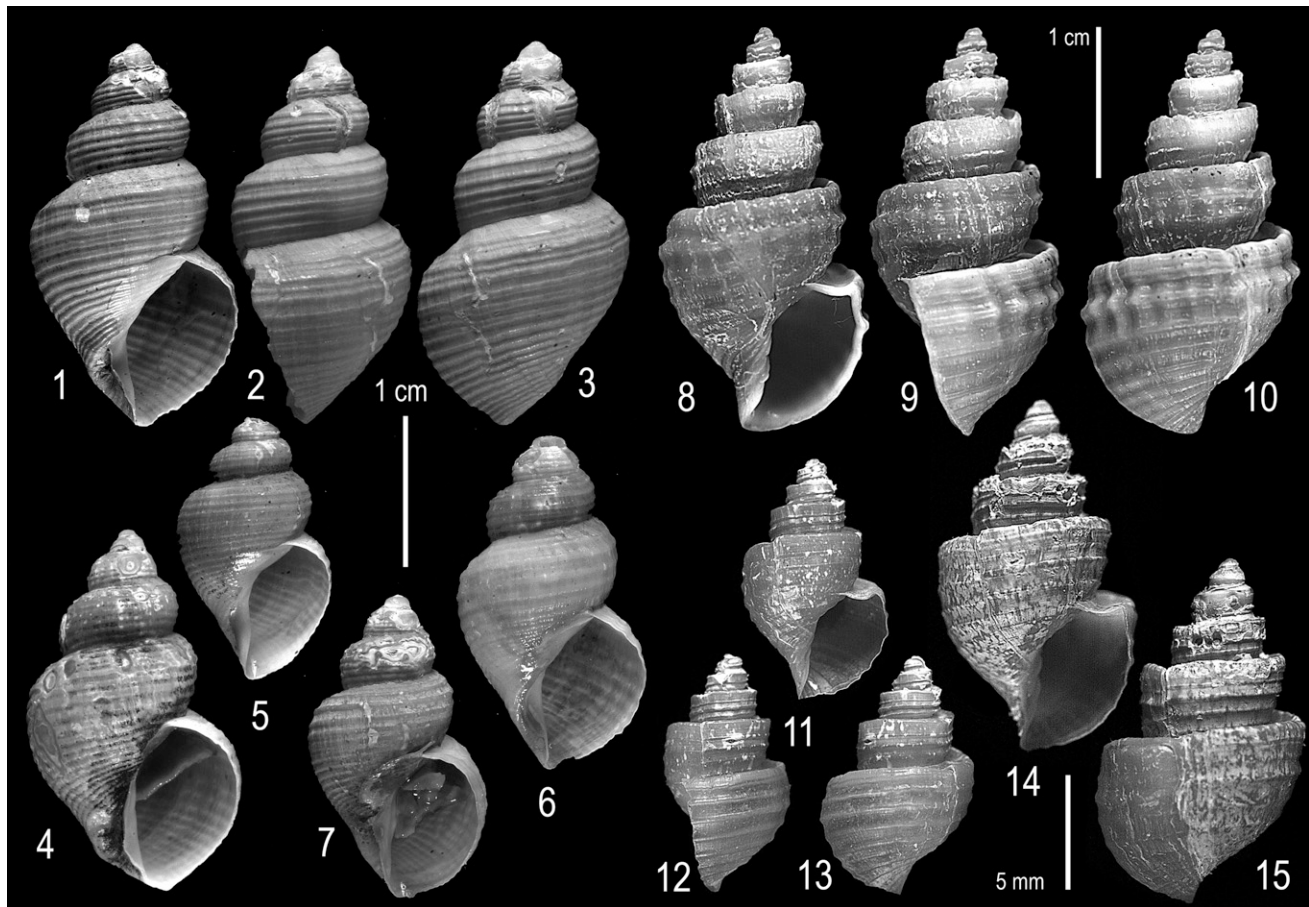
Genus *Admete* Krøyer in Möller, 1842

Admete Krøyer in Möller, 1842.

Type Species: *Admete crista* Möller, 1842 (= *Tritonium viridulum* Fabricius, 1780), by monotypy.

***Admete verenae* new species**
(Figures 1–7)

Description: Shell (Figures 1–7) moderately large (to 25.6 mm), thin, with tall, stepped spire (spire angle 44–51°), broadly ovate aperture, and short, tapering siphonal canal. Protoconch unknown, early whorls eroded in all specimens. Teleoconch of 6+ weakly shouldered whorls, becoming more rounded with increasing shell size. Suture minutely impressed. Spiral sculpture of: 2–3 weak cords between suture and shoulder; strong cord along shoulder; 16–18 low, broad, rounded cords between shoulder and siphonal canal; 3–4 finer cords on siphonal canal. Cords slightly broader than intervening spaces, both cords and intervening spaces becoming progressively narrower toward siphonal canal. Five cords between suture and shoulder of penultimate whorl. Axial sculpture of very fine prosocline growth



Figures 1–15. Species of *Admete* and *Neadmete*. **1–7.** *Admete veranae*, new species. **1**, Apertural, **2**, lateral, and **3**, dorsal views of the holotype, USNM 1150387. Apertural views of **4**, paratype 1, **5**, paratype 2, **6**, paratype 3, USNM 1150388, and **7**, paratype 4, USNM 1150389. All from Chowder Hill, HHF, Middle Valley, Juan de Fuca Ridge, 48°27.50' N, 128°42.50' W, in 2415 m. Collected by ROV ROPOS. **8–15.** *Neadmete ahoi*, new species. **8**, Apertural, **9**, lateral, and **10**, dorsal views of the holotype, USNM 1150394, from off southwestern Washington State, in 457–732 m. **11**, Apertural, **12**, lateral, and **13**, dorsal views of paratype 1, **14**, Apertural and **15**, dorsal views of paratype 2, USNM 1150395, trawled on mud bottom west of Crescent City, California (41°45.91' N, 124°28.97' W), in 276 m, R/V MILLER FREEMAN (NOAA), on large dead chunks of the hexactinellid sponge *Aphrocallistes vastus*.

lines. Weak axial ribs producing tubercles along spiral cord on shoulder (18–20 per whorl) present in uneroded portions of first 3–4 whorls. Aperture broadly ovate, broadest just below shoulder, tapering anteriorly, deflected from coiling axis by 18–22°. Outer lip broadly rounded, weakly corrugated, reflecting spiral sculpture. Parietal region nearly straight to weakly rounded, forming angle of 132–136° with columella at siphonal fasciole. Columella very weakly sigmoidal, nearly straight with 1–2 barely perceptible columellar folds. Inductural area with thin glaze to weak callus that continues along columella, flaring over pseudoumbilicus before forming weak siphonal fold at juncture with siphonal canal. Siphonal canal short, broad, slightly deflected to the right, forming distinctive siphonal fasciole. Shell color white to cream inside and out. Periostracum thin, lamellose, yellowish to amber in color. Shell strongly eroded, reinforced from within in areas where periostracum worn or absent. Operculum absent.

Anatomy: Anatomical observations are based on the holotype (♂) and paratype 3 (♀). General anatomical features as in *Admete viridula* (see Harasewych and Petit, 1986). Preserved animal comprises 2½ to 3 whorls; mantle cavity spans ½ whorl, kidney 1/6 whorl, digestive gland 2 whorls. Foot broad anteriorly, tapering posteriorly, uniformly golden tan in color without discernible color pattern. Tentacles are short, tubular, right longer and narrower than left, eyes absent. Mantle edge is thickened, smooth, siphon short, distinct. Osphradium long, narrow (L/W ~ 6), with 28 leaflets below, 35 leaflets above broad ganglion. Leaflets low, narrow twice as broad as ganglion above, equal to ganglion below. Ctenidium as wide and about twice as long as osphradium, extending beyond its anterior and posterior margins. Leaflets narrow, deeply pendant. Hypobranchial gland voluminous, as broad as osphradium and ctenidium, thick, transversely pleated. Pallial gonoducts and rectum run along right side of mantle cavity, partially covered by hypobranchial gland. Kidney only slightly larger than

pericardium. Proboscis short, broad, pleurombolic, with long retractor muscles extending to columellar muscle. Buccal mass small, anterior dorsal surface covered by thin, cuticularized jaw that forms long, thin tube extending toward mouth. Radula absent, paired salivary and accessory salivary glands present, very narrow, tubular. Valve of Leiblein at rear of buccal mass. Esophagus extends posteriorly, passing through nerve ring, running anteriorly to join thin, U-shaped stomach that lines anterior wall of digestive gland. Intestine runs along right wall of mantle cavity, expanding to form rectum. Penis large, long, broad, thick, with a terminal papilla emanating from an obliquely truncated distal surface. Female pallial gonoduct of albumen gland, large capsule gland, small bursa copulatrix.

Egg Capsules: Several egg capsules, recently hatched, were collected at the type locality. Capsules were 5 ¼ mm wide, 4 ½ mm tall, 2 mm wide, oval in profile, V-shaped in end view, and raised above substrate by short (1.5 mm), broad (4 mm), ribbon-like stalk. The long axis of the capsule was tilted with respect to substrate. The dorsal surface (between and just below the free ends of V) has a large, round hatching aperture nearer to the side of capsule tilted toward substrate. Capsules collected at the Grotto Vent site were smaller, but with similar proportions, and contained 5–8 embryos per capsule.

Type Locality: Chowder Hill, Middle Valley, Juan de Fuca Ridge, 48°27.50' N, 128°42.50' W, in 2,415 m. Collected by ROV ROPOS.

Type Material: Holotype ♂ (length = 25.6 mm), USNM 1150387; paratypes 1–3, USNM 1150388, all from the type locality (Clam bed scoop 1), collected 22 June 1992, University of Victoria coll. R192-360; paratype 4, USNM 1150389; paratypes 5–6, CMNML 094280, all from the type locality (Clam bed scoop 2), collected 22 June 1992, University of Victoria coll. R192-361. USNM 1150392, Egg capsules, from the type locality (Clam bed scoop 2), collected 22 June 1992, University of Victoria coll. R192-2230.

Other Material Examined: USNM 1150390, (9 specimens), Finn Vent, Mothra Field, Endeavour Segment, Juan de Fuca Ridge, 47°55.44' N, 129°06.53' W, in 2281 m, collected 19 July 1999, University of Victoria coll. R507-8204; USNM 1150391, (5 specimens), Grotto Vent (chimney side) Main Field, Endeavour Segment, Juan de Fuca Ridge, 47°57.10' N, 129°06.00' W, in 2192 m, collected 16 July 1991, University of Victoria coll. A2409-363; USNM 1150393, egg capsules, Grotto Vent (chimney side) Main Field, Endeavour Segment, Juan de Fuca Ridge, 47°57.10' N, 129°06.00' W, in 2192 m, collected 16 July 1991, University of Victoria coll. A2409-2232, collected by ROV ROPos.

Etymology: This new species honors Dr. Verena Tunnicliffe, of the School of Earth and Ocean Sciences,

University of Victoria, for her contributions to the study of the ecology and evolution of the deep sea and hot vent biota.

Comparative Remarks: *Admete verenae* is readily distinguished from its congeners by its large size, high spire, anteriorly tapering aperture with a short siphonal canal slightly deflected to the right, and conspicuous siphonal fasciole. *Admete viridula* (Fabricius, 1780) and several nominal species to which it is closely related have axial sculpture on the early whorls that sometimes continues onto the posterior portion of later whorls. *Admete regina* Dall, 1911, (Macginitie, 1959: pl. 5, fig. 1), which may be as large or larger, has a weak siphonal fasciole, but differs in having a much broader, generally heavier shell with a proportionally shorter spire, much weaker and finer spiral sculpture, and a much larger, rounder aperture with a concavely curved columella. *Admete bruuni* Knudsen, 1964, from 6660–6770 m in the Kermadec Trench, is similar in size, but has a very thin shell with numerous (~50) very fine and faint spiral threads, a larger, more evenly ovate aperture, and a longer siphonal canal that crosses the coiling axis of the shell and lacks a siphonal fasciole.

The egg capsules of *Admete verenae* are similar to those of *Admete viridula* (illustrated by Bouchet and Warén, 1985: fig. 687), but differ in being flatter, and elevated on a short, broad stalk, with a hatching aperture that is not medial but displaced laterally. The number of embryos per capsule (5–8) is comparable to that of other admetine species (Pawlik et al., 1988: 52).

Identical egg capsules collected by DSV ALVIN on the Endeavour Segment of the Juan de Fuca Ridge were described and illustrated by Gustafson, Littlewood and Lutz (1991: 39, figs. 22–25), who attributed them to the genus *Admete*, but noted that no species of *Admete* had been collected from the Juan de Fuca Ridge. These capsules, which contained 1–6 large larvae that complete development within the egg capsule, can now be attributed to *Admete verenae*, suggesting that this species has a paucispiral protoconch.

Genus *Neadmete* Habe, 1961.

Type Species: *Neadmete okutanii* Petit, 1974, by I.C. Z.N, 1986.

***Neadmete ahoi* new species**
(Figures 8–15)

Description: Shell (Figures 8–15) large for genus (to 26.9 mm), moderately thick, with tall, tabulate spire (spire angle 46–58°), sharply angled shoulder, ovate aperture, and short, siphonal canal. Protoconch unknown, early whorls eroded and pitted in all specimens. Teleoconch of 6+ strongly shouldered whorls. Suture weakly adpressed and incised. Spiral sculpture: absent in broad channel between suture and shoulder, strong cord at shoulder, 7–8 strong cords between shoulder and siphonal canal, 4–5 weaker cords on siphonal canal, with 0–3 finer threads between strong cords. Cords

much narrower than intervening spaces, becoming weaker toward siphonal canal. Three cords between suture and shoulder of penultimate whorl. Axial sculpture of fine prosocline growth striae. Axial ribs (18–20 per whorl) appear by whorl 5, extend from shoulder to mid-whorl, forming raised tubercles on intersection with spiral cords. Tubercles appear on shoulder, are strongest on first spiral cord, reduced on second spiral cord, indistinct or absent on other cords. Aperture ovate, tapering anteriorly, deflected from coiling axis by 25–29°. Outer lip slightly prosocline, smooth, with porcellaneous glaze weakly furrowed beneath shoulder and major cords. Parietal region short, weakly rounded, forming angle of 137–141° with columella. Columella nearly straight, axial, with 2 weak oblique columellar folds posteriorly, 2 stronger cords anteriorly, and a pronounced siphonal fold. Siphonal canal short, broad, slightly deflected to the left, crossing the coiling axis of the shell. Shell straw caramel colored externally, with white aperture. Periostracum thin, lamellose, yellowish. Operculum absent.

Anatomy: The anterior portion of a single, partially preserved female specimen, paratype 2 (figs. 14–15), was available for study. General anatomical features were similar to those of *Admete viridula* (see Harasewych and Petit, 1986). Foot broad anteriorly, tapering posteriorly, body color pale, creamy white, tentacles long, tapering, with large, black eyes at their bases. Osphradium, ctenidium large, hypobranchial gland voluminous. Intestine, long, narrow extending beyond anterior edge of capsule gland and small bursa copulatrix. Proboscis short, containing minute buccal mass. Cuticularized jaw covering dorsal and anterior surface of buccal mass formed anteriorly directed tube. Radula absent.

Type Locality: Off southwestern Washington State, USA, in 457–732 m [“250–400 fathoms”].

Type Material: Holotype (length = 26.9 mm), USNM 1150394, from the type locality. Paratypes 1, 2, USNM 1150395, West of Crescent City, California (41°45.912' N, 124°28.968' W), trawled, R/V MILLER FREEMAN (NOAA), 276 m, on large dead chunks of the ridged hexactinellid sponge *Aphrocallistes vastus*, on mud bottom, coll. Roger N. Clark, 1 November, 1999.

Etymology: We take pleasure in naming this species for Mr. Jon Aho of Warrenton, Oregon, who generously made the holotype available.

Comparative Remarks: *Neadmete ahoi* differs from all known species of *Neadmete*, as well as from other admetines, in having a strongly channeled sutural ramp.

Kanakoff and McLean (1966) reviewed the Recent northeastern Pacific species, recognizing *Neadmete modesta* (Carpenter, 1864), *N. circumcincta* (Dall, 1873), and provisionally *N. unalaskaensis* (Dall, 1873) as a possible variant of *N. modesta*, noting that these species were all highly variable in shell proportions, thickness

and strength of sculpture. These authors also described *N. sutherlandi*, a Late Pliocene species.

Neadmete ahoi somewhat resembles the holotype of *Neadmete modesta*, but differs in having a strongly tabulate spire profile with a broadly channeled sutural ramp, as well as in having a narrower aperture that tapers anteriorly.

Kanakoff and McLean noted that a characteristic of *Neadmete* is the “continuous spiral sculpture in the columella area, that increases the number of columellar plaits.” *Neadmete* species have the two columellar folds and siphonal fold that are typical of cancellariids. In addition, there may be 0–2 thinner, sharper folds posterior to the typical columellar folds that overlay the posteriormost spiral cords of the siphonal canal. These thinner folds are not parallel to the columellar folds or siphonal fold.

Cancellaria turrita Sowerby, 1874, a forgotten taxon that is probably a synonym of *N. unalashkensis*, was described by Sowerby as having a “columella straight with 3 folds.” In the next paragraph he continued his description, stating that “the folds on the columella appear to be 6 or 7, through the intersection of the transverse ribs passing into the interior.”

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