Gulf and Caribbean Research

Volume 18 | Issue 1

January 2006

Marionia tedi Ev. Marcus, 1983 (Nudibranchia, Tritoniidae) in the Gulf of Mexico: First Record of an Opisthobranch Mollusk from Hydrocarbon Cold Seeps

Angel Valdes
Natural History Museum of Los Angeles County

DOI: 10.18785/gcr.1801.05

Gulf and Caribbean Research Vol 18, 41–46, 2006 Manuscript received July 20, 2005; accepted January 13, 2006

SHORT COMMUNICATION

MARIONIA TEDI EV. MARCUS, 1983 (NUDIBRANCHIA, TRITONIIDAE) IN THE GULF OF MEXICO: FIRST RECORD OF AN OPISTHOBRANCH MOLLUSK FROM HYDROCARBON COLD SEEPS

Ángel Valdés
Natural History Museum of Los Angeles County, 900 Exposition Boulevard, Los Angeles, California 90007 USA, E-mail avaldes@nhm.org

Introduction

Cold seeps in the Gulf of Mexico contain relatively diverse molluscan assemblages primarily composed of species that support chemoautotrophic symbionts, such as vesicomyid and mytilid bivalves, but also numerous species of shelled gastropods, bivalves, monoplacophorans, and polyplacophorans (Cordes 2004).

Recent exploration of hydrocarbon seep sites in the Mississippi Canyon and the Vioska Knoll revealed the presence of an unidentified species of nudibranch. The present paper describes the single specimen collected, which constitutes the first published record of an opisthobranch mollusk from a cold seep. The material examined is deposited at the Field Museum of Natural History (FMNH).

Species Description

Marionia tedi Ev. Marcus, 1983
(Figures 1–3)

Marionia tedi Marcus 1983: 203–207, Figures 48–74.

Material examined

R/V *Seward Johnson II*, Submersible *Johnson Sea-Link* Dive 4605, Mississippi Canyon site 885 (28º03.903'N, 89º42.721'W), Louisiana Slope, USA, 1 specimen 16 mm preserved length, 15 September 2003, 624 m depth, leg. J. Voight (FMNH 306187).

R/V *Seward Johnson II*, Submersible *Johnson Sea-Link* Dive 3355, Viosca Knoll site 826 (29º09.3'N, 88º01.4'W), Louisiana Slope, USA, 540 m depth, photo only.

External morphology

Two specimens were photographed alive (Figure 1) and never collected. A single specimen was collected and here studied (FMNH 306187). The specimens are elongate in the living state, wider anteriorly. The dorsum bears a series of short and ramified dorso-lateral cerata, arranged in a single row (Figures 1–2). There are 12–16 cerata on each side of the body. The velum is bilobed with about 6 processes on each lobe. The rhinophores have 9 irregular, vertical lamellae and an elongate, ramified apex.

The color is uniformly translucent white with a pinkish tinge. The viscera are visible through the skin as an opaque white mass. Rhinophores, cerata and velum are the same color as the rest of the body.

Anatomy

Digestive system. The large, oval, muscular buccal bulb has a thick muscular ring near the anterior end, attach-

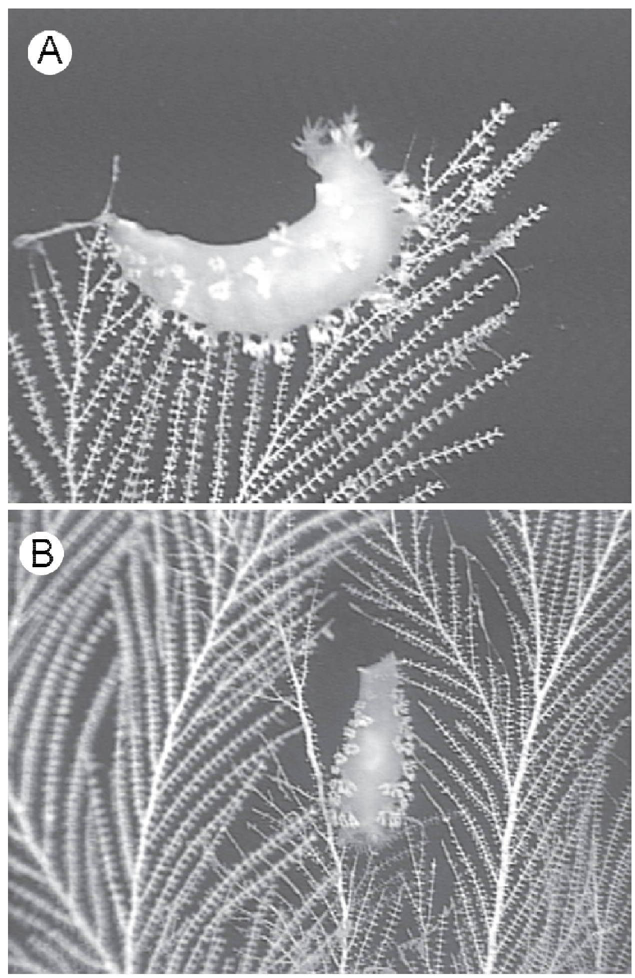

Figure 1. *Marionia tedi* Ev. Marcus, 1983 living animals on *Callogorgia americana* Cairns and Bayer, 2002. A, Animal from Mississippi Canyon (28º03.903'N, 89º42.721'W). B, Animal from Viosca Knoll (29º09.3'N, 88º01.4'W), photo by Stephane Hourdez.

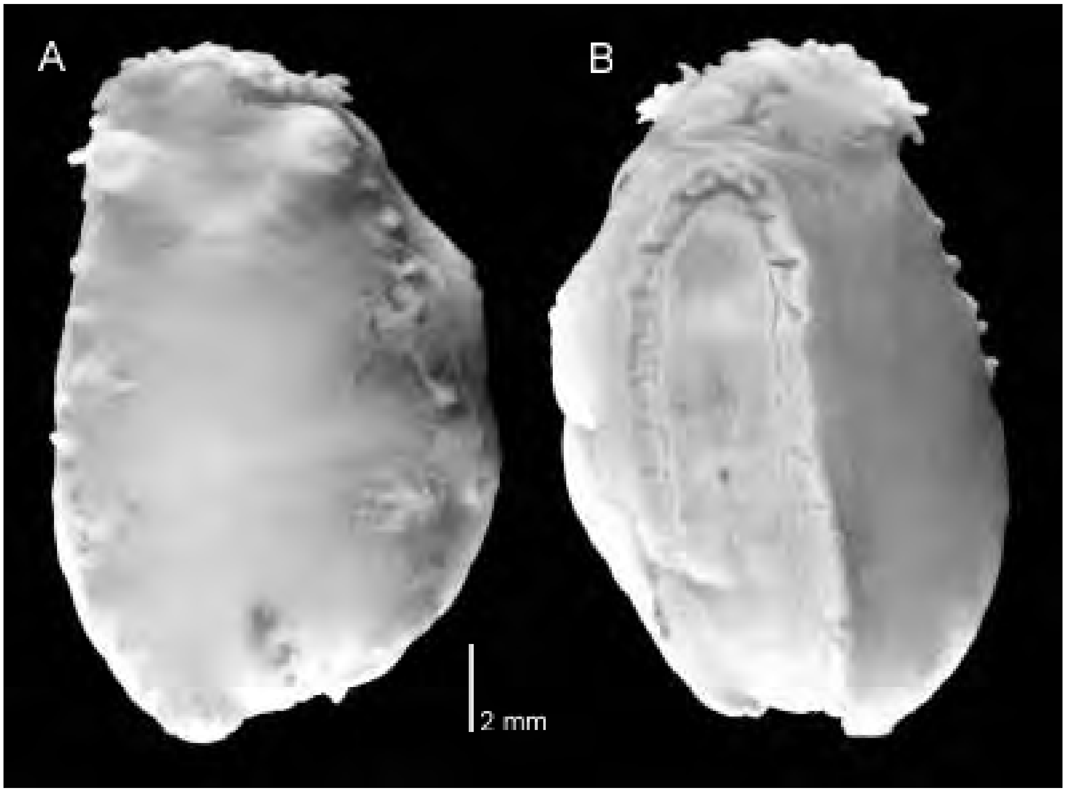

Figure 2. *Marionia tedi* Ev. Marcus, 1983, preserved specimen from Mississippi Canyon (FMNH 306187). A, Dorsal view. B, Ventral view.

ing to the body wall. Two long salivary glands connect with the buccal bulb on either side of the esophageal junction (Figure 3A). The esophagus is initially thin; it emerges from the dorsal end of the buccal bulb and runs towards the left side of the body. Right after passing through the central nervous system ring, it expands into a wider tube that connects to the digestive gland ventrally (Figure 3A). The stomach is oval, partially embedded in the digestive gland (Figure 3A) and contains numerous irregular, fragile, chitinous plates. At its distal end, the stomach connects to the intestine. The intestine is short and straight, running towards the right side of the body where it opens into the anus.

The jaws consist of 2 oval plates with an elongate masticatory border on each one (Figure 4D). The masticatory border contains numerous irregular rodlets (Figure 4E). The radular formula is 41 x 43.1.43 in the single 16-mm long examined specimen (FMNH 306187). The rachidian teeth are wide, with a strong triangular central cusp bearing a couple of minute denticles on each side (Figure 4A). On each side of the cusp there are 1–2 large, blunt denticles oriented towards the central cusp. The upper end of the rachian teeth have a conspicuous depression. The lateral teeth are hook-shaped and smooth, lacking denticles (Figure 4B). The cusp is normally short and blunt. The outermost teeth are smooth and elongate, with a sharp, triangular cusp (Figure 4C).

Reproductive system. The ampulla is elongate and small, with the hermaphrodite duct and the gonoduct opening on opposite ends (Figure 3E). The gonoduct is very short and connects directly into the female glands. The prostate is tubular, very long, folded and granular. It connects directly to the large and strongly muscular deferent duct (Figure 3C). The deferent duct opens into a common atrium with the vagina. The penis is elongate with a blunt apex bearing a central protuberance (Figure 3D). The vagina is long and curved. Near its proximal end it joins the irregular bursa copulatrix.

Central nervous system. The cerebral and pleural ganglia are fused together and are distinct from the pedal ganglion (Figure 3B). There are 2 and 3 cerebral nerves leading from the left and right cerebral ganglia respectively, one rhinophoral nerve leading from each cerebral ganglion, and one pleural nerve leading from each pleural ganglion. The buccal ganglia are near the rest of the central nervous system, joined to the cerebral ganglia by 2 relatively short connectives. The optical ganglia connect to long nerves leading to the eyes, which are situated at the

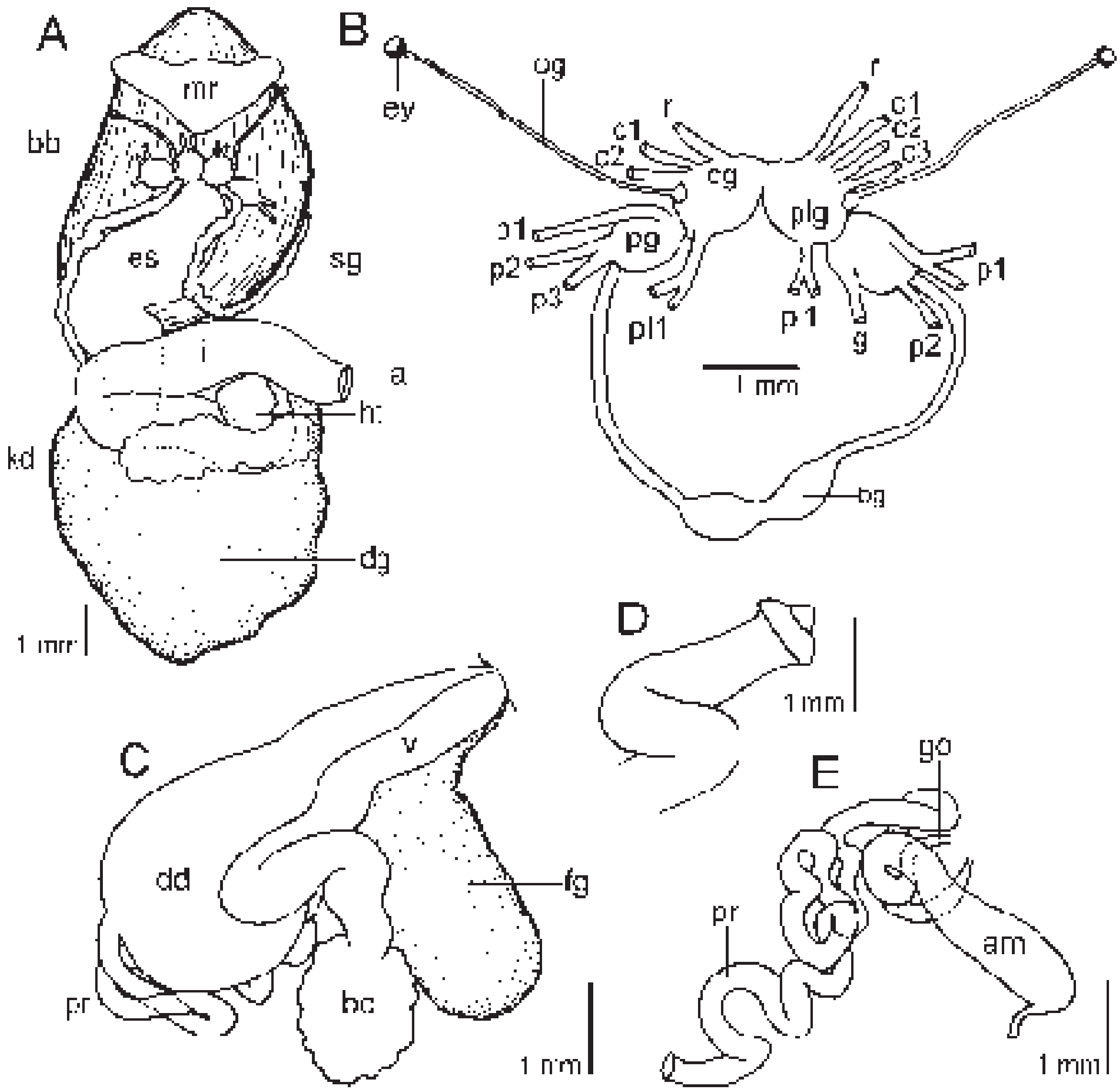

Figure 3. *Marionia tedi* Ev. Marcus, 1983, anatomy. A, Dorsal view of the general anatomy. B, Central nervous system. C, Reproductive system. D, Penis. E, Detail of prostate-ampulla connection. Abbreviations: a, anus; am, ampulla; bb, buccal bulb; bc, bursa copulatrix; bg, buccal ganglion; c, cerebral nerve; cg, cerebral ganglion; dd, deferent duct; dg, digestive gland; es, esophagus; ey, eye; fg, female glands; g, genital nerve; go, gonoduct; ht, heart; i, intestine; kd, kidney; mr, muscular ring; op, optic ganglion; p, pedal nerve; pg, pedal ganglion; pl, pleural nerve, plg, pleural ganglion; pr, prostate; r, rhinophoral nerve; sg, salivary gland; v, vagina.

base of the rhinophores. There are no distinct gastro-esophageal nor rhinophoral ganglia. The pedal ganglia are clearly separated, having 3 nerves leading from the left one and 2 nerves from the right one. The genital nerve leads from the right pedal ganglion.

Circulatory and excretory systems. The circulatory system consists of a small heart situated on the central-right side of the body (Figure 3A). The excretory system has a large, glandular kidney (Figure 3A).

Biology

Specimens of *Marionia tedi* were collected or photographed on the gorgonian *Callogorgia americana* Cairns and Bayer, 2002, which most likely constitutes their prey. Examination of esophageal contents revealed the presence of an amorphous mass with no spicules or other recognizable structures.

Discussion

The single specimen here examined fits within the variability of *Marionia tedi* Ev. Marcus, 1983, and there-

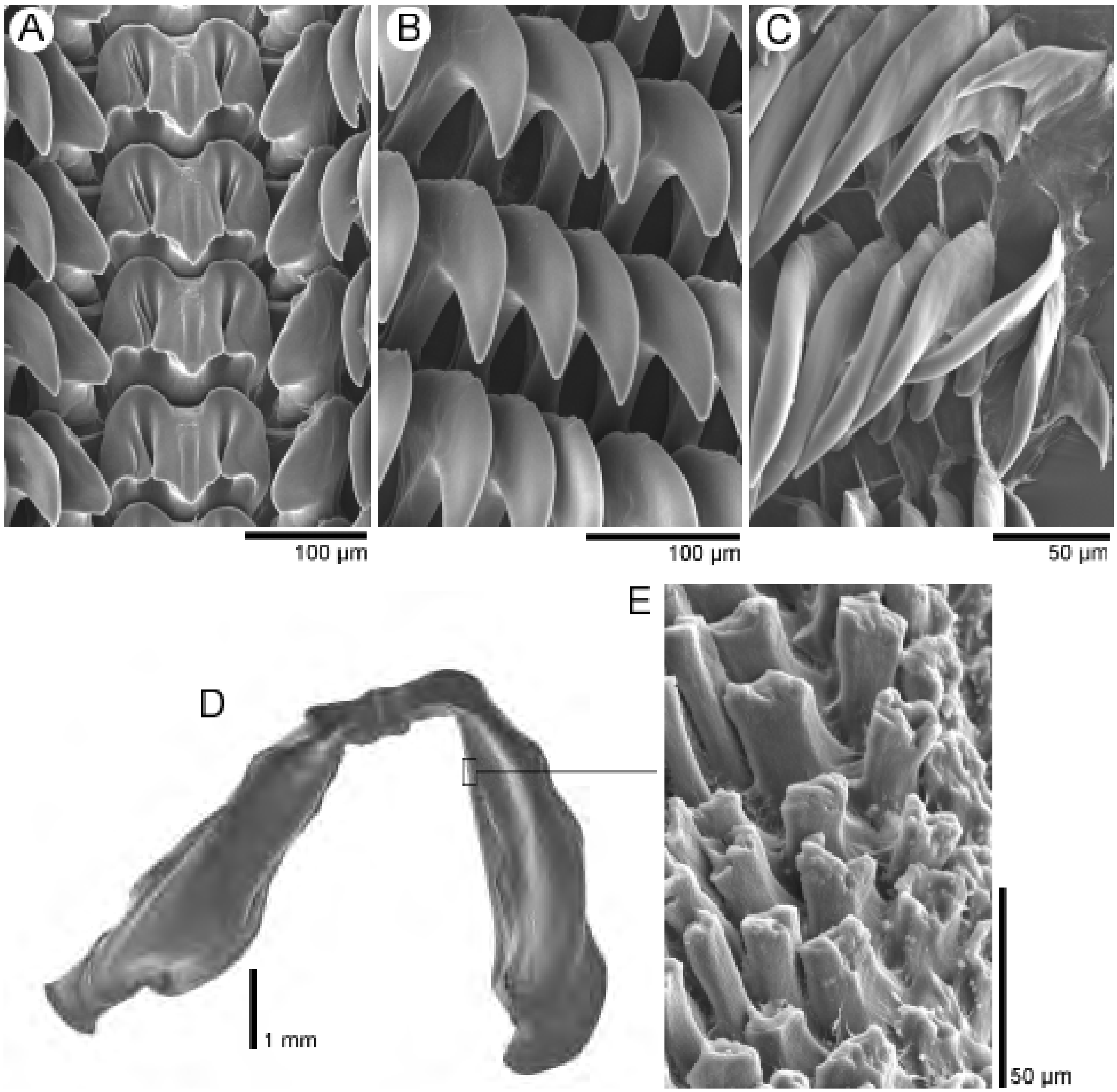

Figure 4. *Marionia tedi* Ev. Marcus, 1983, scanning electron micrographs of radula and jaws. A, Rachidian and innermost lateral teeth. B, Mid-lateral teeth. C, Outer lateral teeth. D, Jaws. E, Jaw masticatory border.

fore it is assigned to this species. *Marionia tedi* was originally described based on several specimens collected from the southern Gulf of Mexico, the Straits of Florida, and the southeastern Caribbean Sea at depths between 60–348 m. The specimen here examined is from nearly 300 m deeper than any of the others previously recorded. The internal anatomy of the species is very variable, particularly the morphology of the radula and jaws (see Marcus 1983). Very little is known about the environment on which the original specimens were collected, with the exception that they were dredged off hard or rocky bottoms. The radular morphology of the specimen here described is very similar to Ev. Marcus' specimen 64 from the Straits of Florida, showing shorter and wider lateral teeth compared to the other specimens. No other species of *Marionia* has been described from the western Atlantic.

This is the first species of opisthobranch mollusk recorded from a cold seep. A species of Dendronotidae, *Dendronotus comteti* Valdés and Bouchet, 1998, was described from the Lucky Strike hydrothermal vent in the Mid-Atlantic Ridge (Valdés and Bouchet 1998), constituting the only previous record of a shell-less gastropod from

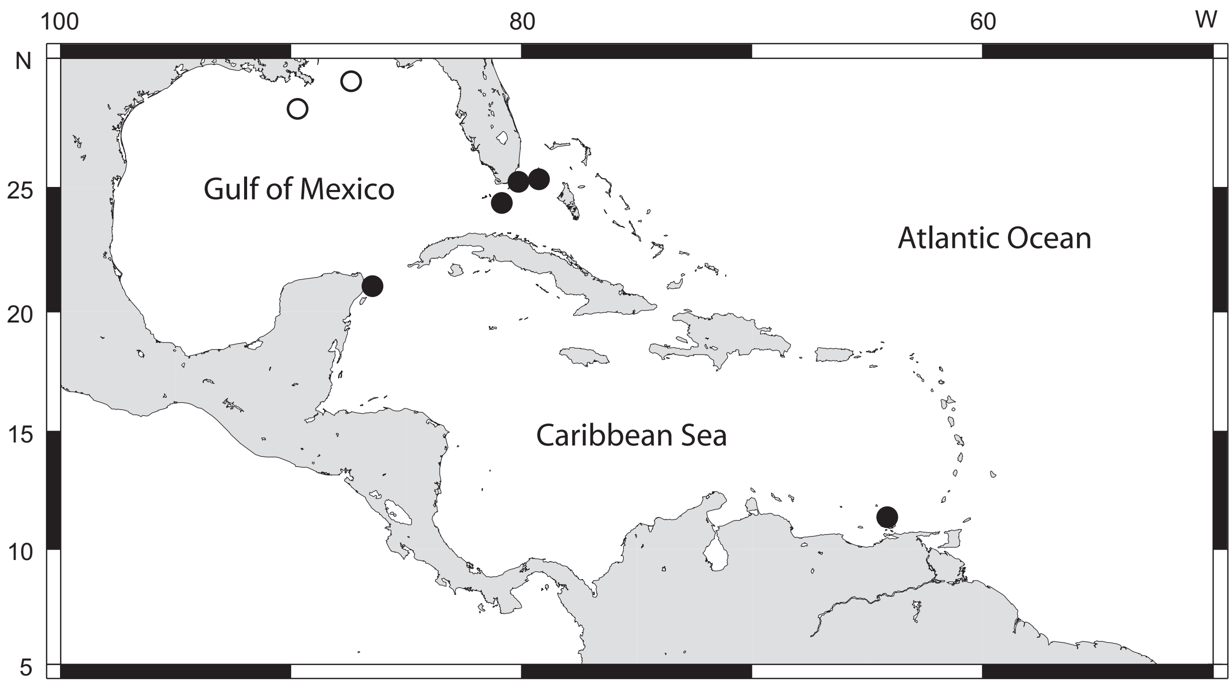

Figure 5. Map of collecting localities of specimens of *Marionia tedi* Ev. Marcus, 1983. Solid circles = historic collections; white circles = new collections.

deep-sea chemosynthetic-based environments. Valdés and Bouchet (1998) argued that the lower toxicity and unique chemical composition of the Lucky Strike hydrothermal field probably accounts for the presence of an uncovered nudibranch species. Additionally, *D. comteti* appears to inhabit the cooler peripheral areas of the vent, where high concentrations of its hydroid prey were also found.

Whereas *Dendronotus comteti* appears to be an endemic to hydrothermal vent environments, *Marionia tedi* is probably an opportunistic visitor. The latter was previously recorded from 5 other localities (Figure 5), none of which appear to correspond to known cold seep environments. Original specimens of *M. tedi* were collected during the R/V *John Elliott Pillsbury* and R/V *Gerda* expeditions in the tropical western Atlantic. There is not much environmental or ecological information available for those sites, but a review of faunal compositions cited in the report of the R/V *John Elliott Pillsbury* expedition (Voss 1967) and other monographs on mollusks collected by these 2 expeditions (Bayer 1971), contains no records of species indicative of cold seeps in the areas where specimens of *M. tedi* were collected.

Marionia tedi most likely feeds on *Callogorgia americana* Cairns and Bayer, 2002; the 2 nudibranch specimens observed alive were crawling on individuals of the gorgonian (Figure 1). Two subspecies of *C. americana* are currently recognized (Cairns and Bayer 2002), *C. americana americana* is widespread in the Caribbean: Straits of Florida, Campeche Bank, and Lesser Antilles from Puerto Rico to Venezuela. *Callogorgia americana delta* Cairns and Bayer, 2002 is endemic to the northern Gulf of Mexico: Green Canyon and Viosca Knoll; Cairns and Bayer (2002) do not describe the environments from which specimens of *C. americana delta* were collected, but the collecting localities are rich in cold seeps where this taxon has been recorded (Cordes 2004). Hydrocarbon cold seeps often produce carbonate substrates by authigenic precipitation, which generate hard bottoms for gorgonian settlement (Cordes 2004). The geographic range of both subspecies of *Callogorgia americana* perfectly matches the range of *Marionia tedi* (Figure 5) suggesting a close relationship between the 2 species.

Acknowledgements

I am very grateful to Janet Voight for making the specimen available for study and for providing all kinds of useful information regarding the collection site and cold seep environments. Erik Cordes provided me with photographs of the living animals and additional station data. Stephane Hourdez captured the photograph of one of the living animals. Finally, Nancy Voss provided me with a copy of the R/V John Elliott Pillsbury Expedition report and other useful bibliographic information.

This paper has been supported by the US National Science Foundation through the PEET grant "Phylogenetic systematics of the Nudibranchia" (DEB-0329054) to T.M Gosliner and the author. The SEM work was conducted at the Natural History Museum of Los Angeles County facility supported by the NSF MRI grant DBI-0216506.

LITERATURE CITED

Bayer, F.M. 1971. Biological results of the University of Miami Deep-Sea Expeditions, 79. New and unusual mollusks collected by R/V *John Elliott Pillsbury* and R/V *Gerda* in the tropical Western Atlantic. Bulletin of Marine Science 21:111–236.

Cairns, S.D. and F.M. Bayer. 2002. Studies on western Atlantic Octocorallia (Coelenterata: Anthozoa). Part 2: The genus *Callogorgia* Gray, 1858. Proceedings of the Biological Society of Washington 115:840–867.

Cordes, E. E. 2004. The ecology of seep communities in the Gulf of Mexico: Biodiversity and role of *Lamellibrachia luymesi*. Ph.D. thesis, Pennsylvania State University, University Park, PA, USA, 203 p.

Marcus, Ev. 1983. The western Atlantic Tritonidae. Boletim de Zoologia 6:177–214.

Valdés, A., and P. Bouchet. 1998. Naked in toxic fluids: A nudibranch mollusc from hydrothermal vents. Deep-Sea Research II 45:319–327.

Voss, G.L. 1967. Narrative of the R/V *John Elliott Pillsbury* Cruise P-6703 in the Gulf of Panamá, April 29-May 11, 1967. Institute of Marine Science, University of Miami, Miami, FL, USA.