

Two New Species of Opisthobranch Mollusks from the Tropical Eastern Pacific

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An aeolid nudibranch belonging to the genus *Cuthona* Alder and Hancock, 1855 and a pleurobranchid of the genus *Berthella* Blainville, 1825 are described based on specimens collected at localities of the tropical eastern Pacific, from Manzanillo, Colima; Bahía de Banderas, Jalisco-Nayarit, and Zihuatanejo, Guerrero, Mexico to Parque Nacional de Coiba, Panama. Both are distinct from previously known species of these genera. *Cuthona riosi* sp. nov. is distinct for its notable translucent white body with opaque white markings and pink salmon colored cerata with black proximal markings, simple rhinophores and oral tentacles also salmon colored. The radula has unique thorn-like denticles on the base of each tooth. *Berthella grovesi* sp. nov. has a tuberculate pale brown mantle with opaque white ringlets, a dark spot in the center, randomly distributed on some of the tubercles. The shape and size of the radular teeth are the same in the middle and outer most portions of the radula, jaw platelets rounded, slender and close-set together. The reproductive system is triaulic. Shell calcified, with axial lines visible and typical *Berthella* sculpture.

KEY WORDS: *Cuthona*, *Berthella*, Pleurobranchidae, tropical eastern Pacific

Resumen

Un nudibranquios aeólido del género *Cuthona* Alder y Hancock, 1855 y un pleurobranquido del género *Berthella* Blainville, 1825 se describen basados en especímenes colectados en localidades del Pacífico este tropical, desde Manzanillo, Colima; Bahía de Banderas, Jalisco-Nayarit, y Zihuatanejo, Guerrero, México a Parque Nacional de Coiba, Panamá. Ambas son distintas de especies conocidas de estos géneros. *Cuthona riosi* sp. nov. es distinta por su notable cuerpo blanco transparente con marcas blanco opaco y sus cerata color salmón con marcas negras en la base, los rinóforos simples y los tentáculos orales también color salmón. La rádula tiene unos denticulos en forma de espina muy característicos en la base de cada diente. *Berthella grovesi* sp. nov. tiene el manto tuberculado, color café claro con aros blanco opaco con un punto oscuro al centro, distribuidos aleatoriamente en algunos de los tubérculos. La forma y tamaño de los dientes no varían entre los más cercanos al centro y los del extremo de la rádula. Las placas masticatorias son redondeadas, delgadas y se encuentran muy cercanas unas a otras. El aparato reproductor es triáulico. La concha es calcificada, con líneas axiales perfectamente marcadas y una escultura típica de *Berthella*.

PALABRAS CLAVE: *Cuthona*, *Berthella*, Pleurobranchidae, Pacífico este Tropical

The opisthobranch fauna of Bahía de Banderas is relatively well known due to an intensive survey conducted from 2002 to 2006 (Hermosillo-González 2006). Up until now, there are about 140 species documented for this 115 km-long bay, many of which have been described recently by several authors, including Gosliner and Bertsch, 2004 (*Okenia angelica*, *Okenia cochimi* and *Okenia mexicorum*); Dayrat, 2005 (*Discodoris aliciae*); Hermosillo and Valdés, 2005 (*Peltochlamys lopezi* and *Trapania goddardi*); Hermosillo and Valdés, 2007a (*Cuthona millenae*, *Cerberilla chavezii* and *Eubranchius yolandae*); *Flabellina fogata* (Millen and Hermosillo, 2007); *Polycera kaiseriae* (Hermosillo and Valdés, 2007b). Despite this effort, more species remain undescribed. In this paper, we describe two of additional new species. One of them belongs to the genus *Cuthona* Alder and Hancock, 1855 and has only been seen sporadically in a few sites in Bahía de Banderas. The other species is a member of the genus *Berthella* Blainville, 1825; it was first observed in Bahía de Banderas and later found in Isla Isabel, Nayarit, Manzanillo, Colima, Zihuatanejo, Guerrero, and Parque Nacional de Coiba, Panama.

MATERIALS AND METHODS

The material examined was collected from 2002 to 2007 in Bahía de Banderas (Jalisco-Nayarit); Manzanillo (Colima); and Zihuatanejo, Guerrero, Pacific coast of Mexico and Parque Nacional de Coiba, Panama. The collecting sites included habitats of coral and rocky reefs in the shallow subtidal. The specimens were deposited in the Malacology Section of the Natural History Museum of Los Angeles County (LACM) and the Department of Invertebrate Zoology and Geology of the California Academy of Sciences, San Francisco (CASIZ). The specimens were relaxed in freezing (0°C) seawater and preserved in 90% ethanol. We dissected the specimens by making a dorsal incision from posterior to anterior. The internal features were examined and drawn using a dissecting microscope with a *camera lucida* attachment.

The buccal mass and shell were removed and placed in 10% sodium hydroxide until the shell, radula and jaws were isolated from the surrounding tissue. The shell, radula and jaws were then rinsed in water, dried, and mounted for examination with a scanning electron microscope (Hitachi S-3000N). Notes on the external features of the living animals were taken in the field using a dissecting microscope or a 10x magnification loupe. When possible, the specimens were photographed *in situ* or in an aquarium using a Nikon Coolpix 995 digital camera with two INON strobes; white balance set up to bright day light. The color plate was composed with Adobe Photoshop CS3, colors of the images were not modified.

SPECIES DESCRIPTIONS

Family Tergipedidae Bergh, 1889

Genus *Cuthona* Alder and Hancock, 1855

Cuthona riosi Hermosillo and Valdés, sp. nov.

Figures 1A, 2-3.

MATERIAL EXAMINED.—HOLOTYPE: 1 specimen, 2 mm long, Bajo de la Vuida, Bahía de Banderas, Pacific coast of Mexico (20°43.973'N, 105°23.544'W), 24 November 2004 (CASIZ 176834). PARATYPES: 2 specimens 3 mm long, Bahía de Banderas, Pacific coast of Mexico, 8 December 2004 (LACM 3100). 1 specimen, 4 mm long, Los Arcos, Bahía de Banderas, Pacific coast of Mexico (20°32.855'N, 105°17.340'W), 17 February 2005 (LACM 3101).

EXTERNAL MORPHOLOGY.—The body is narrow and elongate. The foot is thickened ante-

riorly, expanded slightly to form round pedal corners, the posterior end of the foot is long, in most specimens up to one half of the length of the body. The cerata are club shaped, slightly inflated with blunt tips, long and large compared with the size of the body. The cerata are arranged in linear rows, the cerata located more ventrally are smaller than those located more dorsally (Fig. 2A). The first arch of cerata has five ceras on each side of the body, with fewer cerata in the posterior ones. The gonopore is visible on the right side, ventral to the first group of cerata. The anal opening was observed in a relatively ventral (pleuroproct) position, whereas all other species of *Cuthona* have an aceleioproct anus, which is more dorsal. This could be due to preservation-related distortion of the specimens (Fig. 2B). The oral tentacles and rhinophores are simple, elongated and cylindrical, tapering to blunt apices. The oral tentacles in holotype, paratypes and most other specimens observed were not complete, nonetheless, one specimen was photographed with oral tentacles that seemed intact, these were longer than the rhinophores. The color of the body is translucent white, with opaque irregular white patches on the dorsum, beginning at the center of the cephalic region and ending in a line on the posterior end of the foot. The size and shape of these patches can vary amongst individuals. In some, the opaque white covers the dorsum entirely. The black eyespots are visible on clear areas on the base of the rhinophores. The basal portion of the cerata is black, medially salmon pink with a white tip. The ceratal sheath is opaque, the liver diverticula can not be observed through it. The rhinophores are the same salmon pink color of the cerata, with a clear tip. The oral tentacles are the same coloration as the rhinophores.

INTERNAL ANATOMY.—*Radula and jaws:* The radular formula is $23 \times 0.1.0$ for the 4 mm long paratype and a $21 \times 0.1.0$ for the 3 mm long specimen. The radular teeth bear smooth central cusps, which are shorter than the denticles on either side of it (Fig. 3A, 3B, 3C). The base of the central

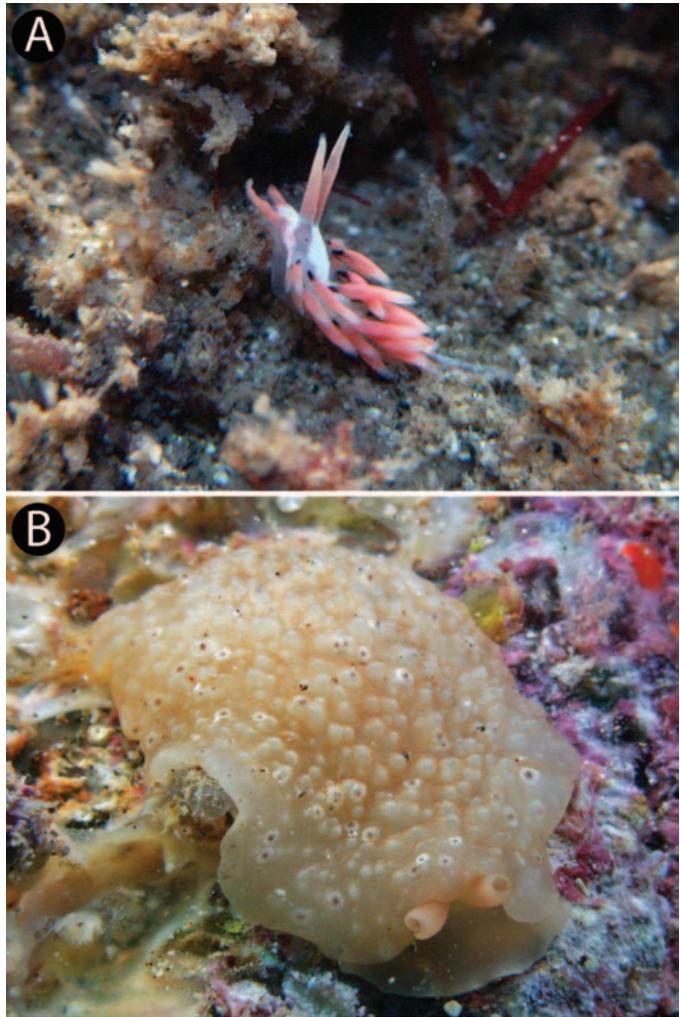


FIGURE 1. *In situ* photographs. A. *Cuthona riosi* sp. nov., paratype, 3 mm long (LACM 3100). B. *Berthella grovesi* sp. nov., paratype 23 mm long (LACM 3102).

cusps is wide, it narrows slightly and tapers to a rounded tip. Each tooth has seven to eight primary smooth denticles on each side of the central cusp. A distinct characteristic in the radula is the presence of numerous smaller denticles that continue on all the way to the base of each tooth. These are pointy, thorn-like and variable in number. The jaw is ovoid in shape (Fig. 3D) and translucent. The masticatory edge of the jaw could not be observed.

Reproductive system: The reproductive system is diaulic (Fig. 2B). The ampulla is elongated and tubular, without convolutions. It tapers slightly before connecting directly with the female gland. The prostate is long, about the same length of the female gland. The prostate folds over and narrows abruptly into the deferent duct. The penial gland is large, spherical and connects directly to the vaginal duct. An oval organ was observed below the atrium where the deferent duct and the penial gland join, this is likely the bursa copulatrix. A penial stylet was not found.

GEOGRAPHIC RANGE.— This species has only been observed in Bahia de Banderas, Pacific coast of Mexico as *Cuthona* sp. 2 in Behrens and Hermosillo (2005) and as *Cuthona* sp. 3 in Hermosillo et al. (2006).

NATURAL HISTORY.— Specimens of this species were found on rocks with abundant hydroid coverage.

ETYMOLOGY.— We named this species in recognition of our friend and colleague Dr. Eduardo Rios Jara, from the Universidad de Guadalajara, for participating in and supporting our work, and to celebrate his contributions to the knowledge of the malacological fauna of the Mexican Pacific.

REMARKS.— The placement of this species in *Cuthona* is based upon the presence of several diagnostic features of the genus, as discussed by Gosliner (1981), such as rounded corners of the foot; smooth, tentacular rhinophores; club-shaped cerata; reproductive system with an accessory penial gland; and uniseriate radula. A penial stylet may or may not be present in members of *Cuthona* (Gosliner 1981). A penial stylet was not present in *Cuthona riosi*.

The genus *Cuthona* is among the most numerous and well represented aeolid genera worldwide with over 170 described species. There are 25 species of *Cuthona* known for the eastern Pacific. Gosliner (1981) reported 18 species of *Cuthona* for the eastern Pacific; Behrens (1985, 1987) described two additional species: *Cuthona longi* from the Gulf of California and *Cuthona hamanani* from San Diego, California. Millen (1986) described *Cuthona punicea* from Vancouver, Canada. Angulo-Campillo and Valdés (2003) described *Cuthona lizae* from the Pacific coast of Mexico. Three more species of *Cuthona* were recently described by Hermosillo and Valdés (2007): *Cuthona destinyae*, *Cuthona millenae* and *Cuthona behrensi*.

Cuthona riosi is distinguishable from other members of the genus in several regards. The striking contrast of a white body with black and salmon colored cerata, salmon color rhinophores and oral tentacles, large cerata and the presence of thorn like denticles on the base of each radular tooth.

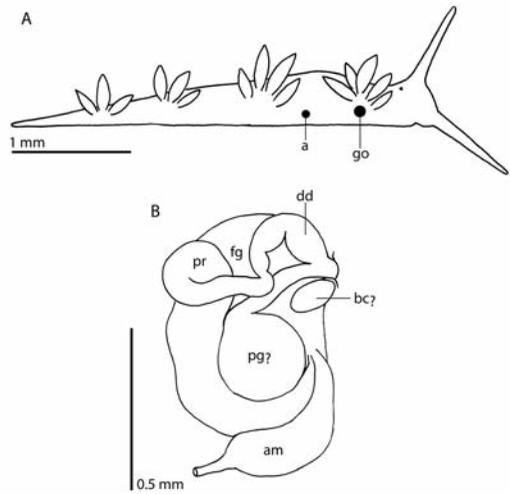


FIGURE 2. *Cuthona riosi* sp. nov., paratype (LACM 3101). A. Arrangement of the anal opening and the gonopore. B. Reproductive system. Abbreviations: a, anal opening; am, ampulla; bc? possible bursa copulatrix; dd, deferent duct; fg, female gland; go, gonopore; pg?, possible penial gland; pr, prostate. Scale bar = (A) 1 mm, (B) 0.5 mm.

Only three species overlap the known distribution of *Cuthona riosi*: *Cuthona phoenix* Gosliner, 1981, *Cuthona millenae* Hermosillo and Valdés, 2007 and *Cuthona lizae* Angulo-Campillo and Valdés, 2003. The three species are readily distinguishable from *Cuthona riosi*. *Cuthona lizae* has a brown body with a bright pink cephalic area and it has a large and distinctive white spot on the dorsum (Angulo-Campillo and Valdés 2003). *Cuthona phoenix* is translucent white with an orange tint but the cerata are orange-brown with small brown flecks (Gosliner 1981). *Cuthona millenae* Hermosillo and Valdés, 2007 has a light brown body, with brown diverticula, a characteristic bright orange pigment on the tips of cerata and orange lines on dorsum and cephalic area (Hermosillo and Valdés 2007).

The numerous species of *Cuthona* known for the northern eastern Pacific present a great diversity of shapes and sizes of body, cerata, rhinophores and oral tentacles. Even though several have a white background body color, significant differences can be observed between them and *Cuthona riosi*. All these species are found in areas located north of the known range of *C. riosi* but they should be carefully compared.

Cuthona alboocrusta (MacFarland, 1966) is small sized and the body is covered with opaque white (MacFarland 1966); however, unlike *Cuthona riosi*, the cerata are also covered with opaque white, the rhinophores and oral tentacles are clear white and short. The body of *Cuthona cocoachroma* Williams and Gosliner, 1979 has a brown tint and the cerata are brown with bright white tips (Williams and Gosliner 1979). The shape of the body is also different from that of *Cuthona riosi*, being more slender with narrower cerata, as opposed to the larger inflated cerata of *Cuthona riosi*. *Cuthona concinna* (Alder and Hancock, 1843) has a thick body with brown and slender cerata with white tips while *Cuthona riosi* has more inflated cerata salmon pink; the rhinophores of *Cuthona concinna* are thick at the bases and taper abruptly into pointed apices (Behrens 1991) while those of *Cuthona riosi* are tubular and taper slightly. The rhinophores and oral tentacles of *Cuthona divae* (Er. Marcus, 1961) are the same white color of the body while those of *Cuthona riosi* are the same salmon color of the cerata; the dark to light pink diverticula can be seen through the translucent white cerata (Marcus 1961) and the most notable difference with *C. riosi* is that *C. divae* has cerata in the cephalic area anterior to the rhinophores. *Cuthona flavovultata* (MacFarland, 1966) has an orange or yellowish orange tint, darker on the cephalic region,

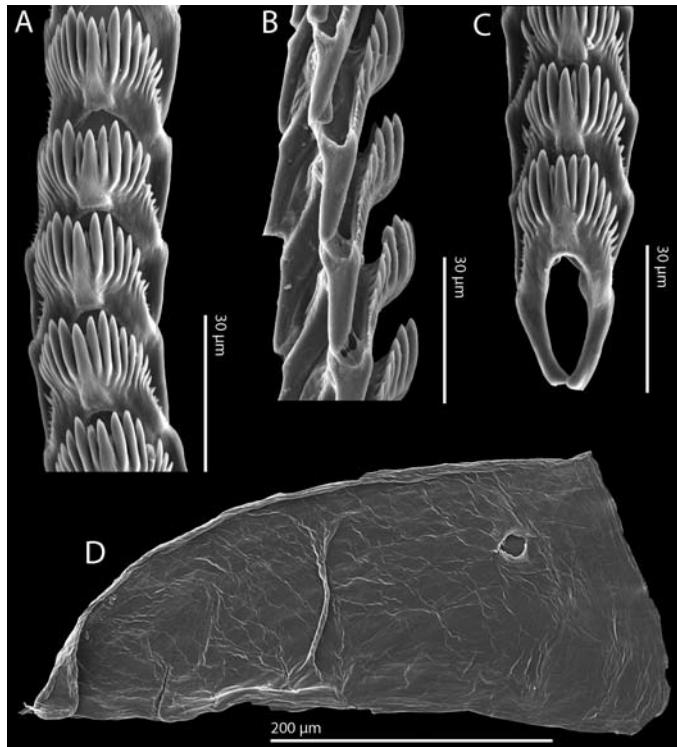


FIGURE 3. *Cuthona riosi* sp. nov. scanning electron micrographs of the radula and jaw. A. Frontal view of radular teeth paratype (LACM 3101), scale bar = 30 μ m. B. Lateral view of radular teeth (LACM 3100), scale bar = 30 μ m. C. View of the last tooth of the radular ribbon (LACM 3101), scale bar = 30 μ m. D. Jaw paratype (LACM 3101), scale bar = 200 μ m.

Cuthona riosi has no other coloration but clear and opaque white. The oral tentacles and simple rhinophores of *Cuthona flavovulta* are translucent white with scattered opaque white patches (MacFarland 1966), the ceratal digestive gland duct ranges in color from a deep blackish brown to light green which differs from the opaque salmon cerata of *Cuthona riosi*. *Cuthona fulgens* (MacFarland, 1966) has some opaque white speckling. The cerata have opaque white spots on the skin and the digestive gland duct ranges from yellow-brown to dark-brown. There is a light yellow brown band at the base of each cerata and another subterminally (Behrens 1991). *Cuthona lagunae* (O'Donoghue, 1926) has orange rhinophores and ceratal tips, opaque white oral tentacles and median line on posterior foot, and dark, usually black ceratal digestive gland duct, these characteristics contrast with the larger cerata and coloration of *Cuthona riosi*. The most remarkable difference between *Cuthona riosi* and *Cuthona punicea* Millen, 1986 is the pomegranate color of the cerata and that the rhinophores and oral tentacles are the same color of the body (Millen 1986). *Cuthona pustulata* (Alder and Hancock, 1854) has scattered irregularly shaped white spots on the cerata, rhinophores and oral tentacles, and the ceratal digestive gland duct may be yellow, pink or light brown in colour (Gosliner and Millen, 1984) which is different from the opaque salmon color cerata of *Cuthona riosi*. *Cuthona viridis* (Forbes, 1840) has opaque white pigment scattered on rhinophores and oral tentacles, the digestive gland duct is green with some black specks (Millen 1989) and *Cuthona virens* (MacFarland, 1966) has deep green ceratal cores with yellowish tips and streaks between the oral tentacles (MacFarland 1966), these colorations contrast with the opaque salmon cerata of *Cuthona riosi*.

Other regions of the world have species of *Cuthona* with white body color. Those with the most similarities to *Cuthona riosi* will be compared.

Cuthona barbadiana Edmunds and Just, 1983 is known from western Europe and the Mediterranean; the color of the body is white, the cerata are color pink with vertical white lines on cerata and the cephalic region of the body has pink lines as well (Edmunds and Just 1983). *Cuthona caerulea* (Montagu, 1804) reported for Western Europe and the Mediterranean, the digestive gland can be seen through the cerata, and it varies from black, shades of blue, to green with a subterminal yellow, red or orange band (Thompson and Brown 1984). *Cuthona diversicolor* Baba, 1975 is known from Japan and Hong Kong; it has a white body, orange cephalic region, orange spots, green cerata with white tips and orange rings (Baba 1975). *Cuthona genovae* O'Donoghue, 1926 is known from the Mediterranean Sea and the Atlantic, the body is translucent white with opaque white markings, with a distinctive symmetrical pattern of orange streaks on the dorsum and a broad yellow median band running from between the rhinophores back to the heart. The coloration of the rhinophores and oral tentacles is distally yellow, with a medial orange band and basally clear. The cerata have a broad subapical yellow band, the ceratal wall is translucent clear, with the digestive gland visible through it, sometimes with patches of white dusting or white spots (Brown 1980). *Cuthona gymnota* (Couthouy, 1838) is reported for the North Atlantic and the Mediterranean; the color of the body is translucent white, but it lacks the opaque white patches. The cerata are reddish pink with clear tips but they do not have the black base of the cerata. The rhinophores are white and the oral tentacles are short (Thompson and Brown 1984). *Cuthona pinnifera* (Baba, 1949) known from Japan and Hawaii (Gosliner 1980) is clear with opaque white; however it has annulate rhinophores and irregularly bulbous cerata (Gosliner 1980). *Cuthona pupillae* (Baba, 1961) is known from Japan; the color of the body is translucent white with a yellow tint, with opaque white patches on the body, dorsum covered with minute white spots, the cerata are irregularly inflated, proximally clear, with a medial opaque yellow band and an opaque white tip. The rhinophores and oral tentacles are thin and tubular, with a red band at the distal third (Baba 1961). *Cuthona purpureoanulata* (Baba 1961), known from the Indopacific, has a white body, but it is characterized by

the bright purple subapical ring on the cerata, and the pair of purple rings on the smooth rhinophores and the oral tentacles (Brown 1980).

Family Pleurobranchidae Gray, 1827

Genus *Berthella* Blainville, 1825

Berthella grovesi Hermosillo and Valdés, sp. nov.

Figures 1B, 4–5.

MATERIAL EXAMINED.— HOLOTYPE: Zihuatanejo, Guerrero, Mexico, 11 November 1976 (CASIZ 76021).

PARATYPES: 2 specimens collected together; 23 (dissected) and 11 mm long, Majahuitas, Bahía de Banderas, Pacific coast of Mexico (20°29.111'N, 105°35.057'W), 29 May 2004 (LACM 3102).

EXTERNAL MORPHOLOGY.— The body is oval, the paratypes measuring 23 × 16 mm and 11 × 6 mm. The mantle protrudes over the wide foot, covering the gill completely and oral veil and rhinophores partially. The mantle is covered with tubercles, large and small tubercles are observed distributed irregularly on the mantle. The mantle does not have an anterior notch. The internal shell cannot be seen through the mantle. The rhinophores are rolled, short and stout, joined basally. The foot is bilabiate anteriorly. The oral veil is rounded, with the corners protruding slightly from the mantle. The gill is located on the right side of the body, lying longitudinally between the mantle and the foot, it is attached to the body for more than half front of its length. The gill is bipinnate, with 22 pinnae on either side of the rachis (Fig. 4B). The rachis is smooth. The anus is situated dorsal to the central area of the gill. A pedal gland was not observed at the posterior end of the foot.

The ground color varies from a light to a darker pink-brown. Both large and small tubercles are lighter than the rest of the dorsum, which gives the animal the aspect of mottling. A few of the large tubercles have a dark brown spot on the highest part of the tubercle, surrounded by an opaque white ringlet. These ringlets are the most distinctive characteristic in the coloration of this species. They are present in all specimens observed but the numbers and distribution varies amongst individuals, from numerous, to only a few.

Internal anatomy.— *Shell:* The shell is located centrally in the dorsal area, fully internal. The shell is elongate, there is evidence of low comarginal undulations overlain by radial rays of elongate pustules. The axial growth lines are clearly visible (Fig. 5E, F, G).

Radula and jaws: The radular formula was $83 \times 56.0.56$ for the 23 mm long paratype (Fig. 5A, B and C). The teeth are smooth hook shaped, with a wide base. The teeth of the central portion of the radula (Fig. 5A) are of the same size and shape of the ones in the middle portion of the half-

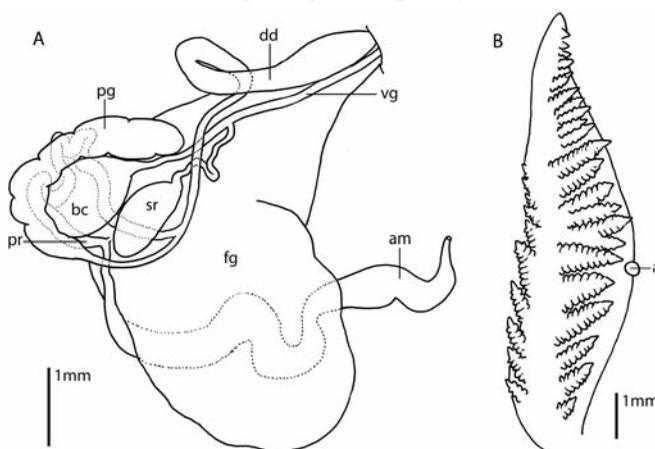


FIGURE 4. *Berthella grovesi* sp. nov. A. Reproductive system. B. Detail of the gill. Abbreviations: a, anal opening; am, ampulla; bc, bursa copulatrix; dd, deferent duct; fg, female gland; pg, penial gland; pr, prostate; sr, receptaculum seminis; vg, vagina. Scale bar = 1 mm.

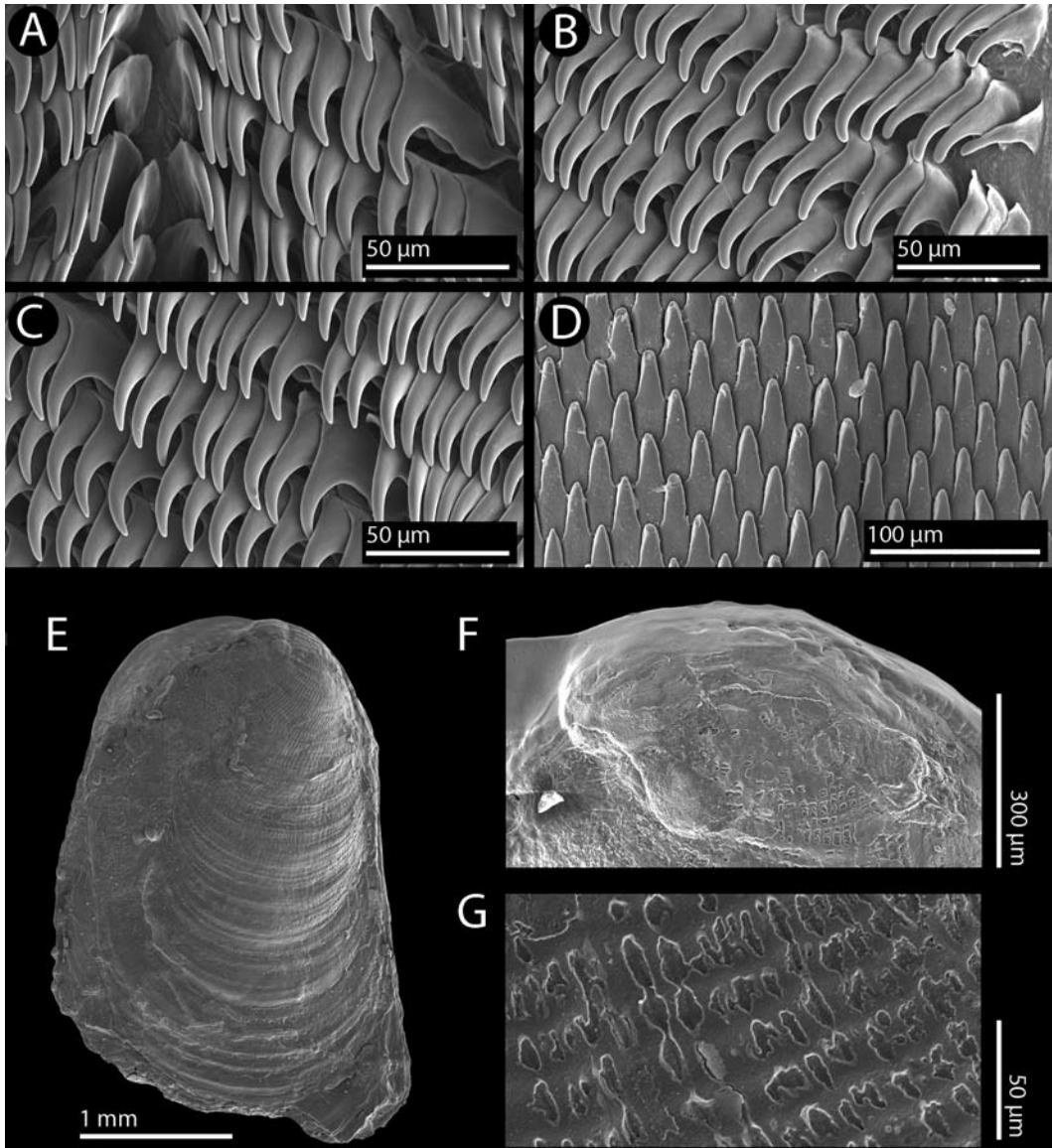


FIGURE 5. *Berthella grovesi* sp. nov., paratype 23 mm long (LACM 3102), scanning electron micrographs of the radula, jaw and shell. A. Radular teeth, central portion of the radula, scale bar = 50 μm . B. Outer most radular teeth, scale bar = 50 μm . C. Lateral teeth, middle portion of the half row, scale bar = 50 μm . D. Detail of the jaw platelets, scale bar = 100 μm . E. Complete shell, scale bar = 1 mm. F. Detail of the protoconch, scale bar = 300 μm . G. Detail of the sculpture, scale bar = 50 μm .

row and outer most ones (Fig. 5B and 5C). The jaw platelets are slender, rounded and close-set (Fig. 5D) and lack any denticles.

Reproductive system: The reproductive system is triaulic (Fig. 4A). The mass of the female gland is large, adjacent to the remaining genital organs. The nidamental opening has its own orifice at the genital atrium. The prostate is narrow, elongate and highly convoluted; it is connected to a wide and tubular penial gland and to a thin and elongated duct that becomes the deferent duct,

which widens into the distal ejaculatory portion. The ampulla is elongate, tubular shaped with some convolutions. The Ampulla divides in the oviduct, connecting with the female gland and the penial gland. The penial gland is wide, elongate; it is connected to a tubular shaped, thin and elongated duct that folds over and becomes the deferent duct, which widens and then narrows in the distal ejaculatory portion. The vagina is elongated and thin, without convolutions, it exits between the deferent duct and the nida- mental openings. The vagina divides into the bursa copulatrix and the receptaculum seminis. The bursa copulatrix is large and spherical while the receptaculum seminis is smaller and pyriform.

GEOGRAPHIC RANGE.— This species has been observed in Isla Isabel, Nayarit; Bahia de Banderas, Jalisco-Nayarit; Manzanillo, Colima; Caleta de Campos, Michoacan; Pacific coast of Mexico and Parque Nacional de Coiba, Panama as *Berthellina* sp. 1 in Behrens and Hermosillo (2005) and Hermosillo et al. (2006).

NATURAL HISTORY.— Specimens of this species were found under rocks in the shallow subtidal.

ETYMOLOGY.— We named this species in recognition of our friend and colleague Lindsey Groves, collections manager of Malacology of the Natural History Museum of Los Angeles County who has been supportive of our research over the years, helped with the curation of specimens, and provided invaluable advice and assistance for this paper.

REMARKS.— The placement of this species in *Berthella* is based upon the presence of several diagnostic features of the genus, as discussed by Willan (1987) and Gosliner and Bertsch (1988) such as oval body with smooth dorsum, presence of a wide oral veil and rolled rhinophores, which are partially covered by the mantle; a bipinnate gill on the right side with lies longitudinally between the mantle and the foot; fully internal shell; large radula, with no rachidian tooth and smooth lateral teeth; smooth blades to the mandibular elements; triaulic reproductive system with receptaculum seminis and distinct prostate; anus situated in front of the middle of the suspensory membrane of the gill.

There are 16 species of *Berthella* known from the world's oceans; occurring widespread geographically and bathymetrically (Willan 1987; Gosliner and Bertsch 1988; Cervera et al. 2000). Several species are common in the intertidal and shallow subtidal zones.

Berthella grovesi is clearly distinct from all the other known species of the genus. No other species presents the characteristic tubercles, with dark spots in the middle of thick opaque white ringlets. The radula of *Berthella grovesi* is different from others because the size and shape of the teeth remains constant along the 56 teeth per half row. The jaw platelets are slender, rounded and close-set.

There are six other species of *Berthella* known for the eastern Pacific. All these species have coloration in the white-yellow-brown shades. Some of them present white spots, lines or markings. In *Berthella californica* (Dall, 1900), the body is translucent white with minute and dense opaque white spots on mantle, oral veil and foot. Edge of mantle and foot with an opaque white line, the gill is tuberculate (Gosliner and Bertsch 1988). The radular teeth are more pointed, the outer lateral teeth almost tubular, slightly hooked. *Berthella agassizi* (MacFarland, 1909), is translucent reddish brown to pink with scattered opaque white spots (Gosliner and Bertsch 1988), the most characteristic difference with *Berthella grovesi* is in the jaw elements, they have one central pointed cusp with six denticles per side of each element (Gosliner and Bertsch 1988). *Berthella martensi* (Pilsbry, 1896) shows a wide variation in color, has the ability to autotomise large sections of its mantle when disturbed. The dorsum is smooth and of a clear color with dark pockadots, or dark colored with light polkadots, the jaw platelets are similar to those of *Berthella grovesi* but the radular teeth are remarkably different, they have the shape of smooth hooks that sharply curve toward the

growing end of the radula (Gosliner and Bertsch 1980). *Berthella stellata* (Risso, 1826) has a translucent white background with a network of white lines around low pustules. The brownish viscera is visible through the mantle wall with a white cross-like mark in the center of the mantle, the jaw elements have three to four denticles per side of the cusp, while those of *B. grovesi* are smooth (Gosliner and Bertsch 1988). *Berthella strongi* (MacFarland, 1966) is whitish, to yellow or clear brown, with a smooth dorsum; the jaw platelets have three large denticles on either side of the cusp (Gosliner and Bertsch 1988). *Berthella platei* (Bergh, 1898) is known in South America, from Chile to Patagonia (Schrödl 1999). It has an orange-yellowish coloration, which is different from the pale brown color of *Berthella grovesi*. Nonetheless, the most distinct characteristic of these two species are the jaw platelets, being smooth for *Berthella grovesi* and denticulate with three denticle per side of the cusp for *Berthella platei* (Schrödl 1999).

Berthella grovesi should also be compared with species from other regions that have similarities. *Berthella ocellata* (delle Chiaje, 1828) is known from the Atlantic and Mediterranean (Cervera et al. 2000). It is tan colored and has whitish spots surrounded by white oval rings (Cattaneo-Vietti 1986), it is the most similar in coloration to *Berthella grovesi*. *Berthella ocellata* has a smooth dorsum except where the white spots and rings are present while *Berthella grovesi* is fully tuberculate. In *Berthella ocellata* the shell is visible through the mantle. The white spots in *Berthella ocellata* are larger, more numerous and regular, of a brighter white (Cattaneo-Vietti 1986) than those in *B. grovesi* and lack the dark spots present in the later. The internal anatomy of these species is also distinct. The radular teeth of *Berthella ocellata* have a very wide base but short cusps and have more pronounced hooks (Cervera et al. 2000) than those of *Berthella grovesi*. The jaw platelets of *Berthella grovesi* are more rounded, tapering gently instead of those more pointy cruciform of *Berthella ocellata* that taper abruptly. The jaw platelets of *Berthella grovesi* are more numerous and close-set than those of *Berthella ocellata* (Cattaneo-Vietti, 1986).

Berthella aurantiaca (Risso, 1818) known from the Atlantic and Mediterranean is yellow to light reddish (Gantès 1956) as opposed to brown as *Berthella grovesi*, the dorsum is smooth with calcareous deposits, it lacks the dark spots and white ringlets of *Berthella grovesi*. The jaw platelets are pointy, with three to four denticles per side (Cattaneo-Vietti 1986). *Berthella africana* (Provot-fol, 1953) from the Mediterranean and Atlantic is orange with multiple dark subdermical spots (Cervera et al. 2000). *Berthella canariensis* Cervera et. al., 2000 is known only from the Canary Islands, the mantle is grey and smooth, with black and opaque white spots scattered over the dorsal surface; the black spots are more numerous than the white. *Berthella canariensis* has a tuberculate gill rachis (Cervera et al. 2000). *Berthella plumula* (Montagu, 1803) from the northeastern Atlantic and Mediterranean, pale lemon-yellow to orange, often with net-like markings in the middle of the smooth dorsal mantle, stellate calcareous spicules are present in the skin (Thompson 1988). *Berthella medietas* Burn, 1962, from Australia and New Zealand, pale, brownish-orange mantle, highly porous texture, with scattered white spots and a dark black-brown central patch from the digestive gland showing through the body wall, sinuous anterior margin of the oral veil, jaw elements with denticles (Willan and Bertsch 1987). *Berthella pellucida* (Pease, 1860) from the Indopacific, the color is translucent and pale honey brown, with white specks, mantle covered with pores and glands, the jaw elements are rather smooth. The outermost radular teeth are elongated and sharply curved (Willan 1984).

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