

**A new species of *Placiphorella* (Polyplacophora: Mopaliidae)
from the North American Pacific coast**

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ABSTRACT A new deep-sea chiton of the genus *Placiphorella* Dall, 1879, *Placiporella laurae* n. sp. is described from the Pacific coast of North America. It is compared with its congener *Placiphorella pacifica* Berry, 1919, from which it differs primarily by having granular valves, lacking false beaks, a papillose girdle, and the characteristics of its girdle spicules.

KEY WORDS Polyplacophora, Chiton, *Placiphorella*, *Placiporella laurae* n. sp.

INTRODUCTION

White shelled, bathyal (*i.e.* 200-2,000+ m) chitons of the genus *Placiphorella* Dall, 1879 were once believed to represent a single cosmopolitan species, *Placiphorella atlantica* (Verrill & S.I. Smith, in Verrill, 1882) (Kaas & van Belle, 1994; Clark, 1994). Saito *et al.* (2008), revived *P. pacifica* Berry, 1919 and *P. albitestae* I. Taki, 1954 as distinct from *P. atlantica*, described two new species with similar morphology from thermal vents: *P. isaotakii* Saito, Fujikura & Tsuchida, 2008, *P. okutanii* Saito, Fujikura & Tsuchida, 2008, and also briefly characterized a still-undescribed species from Madagascar. Likewise, Schwabe and Sellanes (2010) briefly described, but did not name, a putative new species from southern Chile, and Irisarri *et al.* (2014) published sequences of a likely new species, referred to as *Placiphorella* sp. A, from seamounts off southern California at 551-1,412 m depth, and this species is currently under study by D.J. Eernisse and A. Draeger (D.J. Eernisse, *in litt.* 19 April 2019). The author is also aware of two other likely undescribed species, one from Alaska, and one from the sub-Antarctic region (RNC personal notes), but the latter has not yet

been sufficiently compared with those from Madagascar or Chile.

The presently described species is similar to *P. pacifica*, with which it is sympatric, but differs in the granular tegmentum, lack of a false beak on the intermediate valves, and papillose surface of the girdle (mantle).

Abbreviations used in the text.

CASIZ, California Academy of Sciences, Invertebrate Zoology.

LACM, Los Angeles County Museum of Natural History.

NMFS, National Marine Fisheries Service.

NOAA, National Oceanic and Atmospheric Administration.

RNC, Roger N. Clark, Personal Reference Collection.

SBMNH, Santa Barbara Museum of Natural History.

SYSTEMATICS

Class: Polyplacophora

Subclass: Neoloricata

Order: Chitonida

Suborder: Acanthochitonina

Superfamily: Moplaioidea

Family: Mopaliidae Dall, 1889

Genus: *Placiphorella* Dall, 1879

Type (OD): *P. velata* (Carpenter MS, Dall, 1879)

Placiphorella laurae Clark, new species
(Figure 1 A-I, L-M)

Placiphorella pacifica A.G. Smith & Hanna,

1952, non *P. pacifica* Berry, 1919;

Placiphorella "pacifica" Saito, *et. al.*, 2008.

Type locality. Off Del Norte Co., California (41°41.96 N, 125°00.73 W), 855 m. (NMFS 21-200101-106) (ex RNC 2178).

Type material. Holotype (ethanol), SBMNH 169025, 45 mm. (*leg.* RNC, 23 October, 2001); trawled R/V Miller Freeman, 855 m; Paratype 1 (glycerin dried), LACM 3336, 29 mm; Paratype 2 (ethanol), 31 mm & Paratype 3 (glycerin dried), 44 mm RNC 2178. All types from the type locality.

Referred material. 1, CASIZ 064802, 25 mm. Pioneer Seamount, off San Mateo Co., California (37°24.4 N, 123°23.5 W), trawled, 650 m; 2, RNC 2012, 42 & 38 mm. Off Curry Co., Oregon (42°31.56 N, 124°53.66 W); trawled R/V Miller Freeman, 1186 m. (NMFS 21-199513-27); 1, RNC 2013, 46 mm. Off Clallum Co., Washington (48°N); F/V Sea Blazer, trawled 850 m (ex William Ritter); 1, RNC 2014, 32 mm. Monterey Sea Canyon (36°45.16 N, 122°03.44 W), trawled R/V Point Sur, 650 m. (*leg.* RNC, 21 October, 1998).

Diagnosis. Animal relatively large (to 4.5 cm), broadly oval; girdle expanded anteriorly, perinotum with spinose setae; valves depressed, carinated, granular (often faintly), not false beaked, tail valve triangular with strong marginal ribs.

Description. Mopaliid chiton of moderate size, to 4.5 cm in length, including girdle (Holotype,

4.5 cm) (Figure 1 A, B); body broadly oval in outline; Valves depressed, carinated, short, broad, tegmentum minutely (often obsoletely) granular, particularly on terminal valves and lateral areas of intermediate valves; uniformly white in color. Girdle broadly expanded anteriorly, rather coarsely papillose dorsally and ventrally; uniformly white or cream in color.

Valves: Head valve (Figure 1 C) only moderately crescentic, (Holotype) 19 x 3.5 mm, with 8 weak radial sulci; insertion teeth low, thick, blunt 22 in number due to irregular splitting of 10 primary teeth, slit rays obsolete; Intermediate valves (Figure 1 D) much broader than long (valve V, 25.6 mm x 5 mm), lateral areas raised, sharply defined by flattened diagonal and marginal ribs separated by a weak, medial sulcus, sutural laminae well developed, separated by broad jugal sinus, insertion teeth one (sometimes two due to splitting) per side, slit rays obsolete; Tail valve (Figure 1 E) broadly triangular, 11.1 x 4 mm, mucro terminal; ante-mucronal area concave; margins sharply thickened, rib-like; sutural laminae well developed, straight along anterior edge, jugal sinus relatively wide; insertion teeth lacking.

Girdle: Perinotum (dorsal surface) densely covered with low, irregular papillae to 1 mm in diameter, and profusely scattered slender, white spicules, in groups of 1-3+, to 400 x 25 µm (Figure 1 F), and scattered slender setae (Figure 1 G) to 2 mm in length, bearing slender spicules 400 x 25 µm; margin of girdle with 2-3 alternating rows of short, thick spinose bristles (Figure 1 H) to 3 mm in length, bearing spicules to 350 x 40 µm. Hyponotum (ventral surface) densely covered with low round papillae to 500 µm, disposed in irregular radial series, and scattered spicules to 150 x 30 µm, in groups of 1-3, mostly between papillae. Pallial fold well developed, modified anteriorly, into pre-

cephalic feeding tentacles; 4-5 primary and 3-5 secondary tentacles.

Ctenidia: holobranchial, abanal, 18/17 per side in holotype.

Radula: (Figure 1 I) Rachidian tooth near rectangular, about 145 μm in length, working edge 60 μm in width, slightly wider near the base; minor laterals sub-triangular, 125 μm in length and about 50 μm at the base; major laterals, relatively large, about 300 μm in length, head tri-cuspid about 90 μm x 90 μm , denticles about equal in length, sharply pointed.

Paratypes. Paratypes agree well with the holotype in all major characters, but there are some minor variations in the granulation of the tegmentum, and the hirsuteness of the girdle, larger specimens tending to be more hirsute.

Remarks. *Placiphorella laurae* n. sp. differs from the similar and sympatric *Placiphorella pacifica* (Figure 1 J, K), in: (1) the (often nearly obsolete) granulation of the tegmentum (the tegmentum of *P. pacifica* is smooth); (2) false beaks on intermediate valves lacking; (3) jugal laminae lacking; (4) triangular, pointed tail valve with concave ante-mucronal slope (the ante-mucronal slope in *P. pacifica* is convex); and (5) numerous tufts or groups of spicules on the girdle.

Placiphorella laurae n. sp. Also resembles *Placiphorella okutanii*, from near hydrothermal vents in the South China Sea, south of Japan, but differs in: (1) the carinated valves; (2) less granular tegmentum; (3) less crescentric head valve; and (4) the thick marginal rib of the tail valve that extends to the anterio-lateral corner.

In addition to these described species, at least three other as yet undescribed species are known, one from Alaska, one from the sub-

Antarctic region (RNC, personal observation), and one from near Madagascar (Saito, *et. al.*, 2008).

Members of the genus *Placiphorella* are unusual among chitons, in that they capture active prey. This behavior is also known as a probable case of convergent evolution in two other genera in completely separate families (Eernisse, 2007), but it was first observed in *Placiphorella* by McLean (1962), in *P. velata*. I have observed this feeding behavior in *P. velata*, *P. pacifica*, and *P. rufa* Berry, 1917 (personal observation). Like its congeners, *P. laurae* n. sp. is undoubtedly an ambush predator as inferred from the expanded anterior girdle and pre-cephalic tentacles.

Distribution. (Figure 1 M), Juan de Fuca Sea Canyon, off Clallum County, Washington (48°N), to Monterey Sea Canyon, Monterey County, California (36°45'N), at bathyal depths of 650 to 1,186 m, on boulders.

Etymology. It is with great pleasure that I name this chiton in honor of my dear friend Mrs. Laura Burghardt of Oakdale California, co-author (with her husband Glenn) of the book *West Coast Chitons* (Burghardt, 1969), which served as "The" primary identification guide for chitons for many years and inspired generations of chiton collectors and researchers.

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REFERENCES

- Burghardt, G.E. & L.E. Burghardt. 1969.** A Collectors Guide to West Coast Chitons. Special publication No. 4. San Francisco Aquarium Society, Inc., Golden Gate Park, San Francisco, California.
- Clark, R.N. 1994.** Review of the genus *Placiphorella* Dall, 1879, ex Carpenter MS (Polyplacophora: Mopaliidae) with descriptions of two species. *The Veliger* 37(3):290-311.
- Eernisse, D.J. 2007.** Chitons. pp. 127-133, in: *Encyclopedia of Tidepools and Rocky Shores*. M.W. Denny and S.D. Gaines (Eds.) University of California Press, Berkeley, California.
- Irisarri, I., D.J. Eernisse & R. Zardoya. 2014.** Molecular phylogeny of Acanthochitonina (Mollusca: Polyplacophora: Chitonida): three new mitochondrial genomes, rearranged gene orders and systematics. *Journal of Natural History*, 48:2825-2853.
- Kaas, P. & R.A. Van Belle. 1994.** Monograph of Living Chitons, Vol. 5, Suborder Ischnochitonina: Ischnochitonidae (concluded), Callistoplacinae; Mopaliidae; Additions to Volumes 1-4. E. J. Brill, Leiden, The Netherlands.
- McLean, J.H. 1962.** Feeding behavior of the chiton *Placiphorella*. *Proceedings of the Malacological Society of London* 35:23-36.
- Saito, H., K. Fujikura & S. Tsuchida. 2008.** Chitons (Mollusca: Polyplacophora) associated with hydrothermal vents and methane seeps around Japan, with descriptions of three new species. *American Malacological Bulletin* 25:113-124.
- Schwabe E. & J. Sellanes. 2010.** Revision of Chilean bathyal chitons (Mollusca: Polyplacophora) associated with cold-seeps, including description of a new species of *Leptochiton* (Leptochitonidae). *Organisms, Diversity & Evolution*. DOI 10.1007/s13127-009-0002-6.
- Smith, A.G. & G.D. Hanna. 1952.** A rare chiton from Pioneer Seamount off central California. *Proceedings of the California Academy of Sciences (fourth Series)* 27(14):389-392.

FIGURE CAPTION: (see Figure on next page)

Figure 1. *Placiphorella laurae* n. sp. compared with *P. pacifica*. A-I, L = *Placiphorella laurae* n. sp. Holotype: SBMNH XXXXX. A, whole animal (dorsal), 45 mm; B, whole animal (ventral), 45 mm; C, head valve, 19.0 mm; D, intermediate valve 5, 25.6 mm; E, tail valve, 11.1 mm; F, Perinotum, bar = 1.0 mm; G, slender dorsal setae, bar = 400 µm; H, marginal bristle, bar = 350 µm; I, radula, scale bar = 200 µm; L, living animal, in situ.

J-K = *Placiphorella pacifica*, RNC 2016, SW of Tanaga Island, Aleutian Islands, Alaska; trawled, 168 m; J, intermediate valve 5, 21.0 mm; K, tail valve, 11.0 mm.

M = *Placiphorella laurae* Distribution, West coast of North America, Juan de Fuca Strait, Washington to Monterey Bay, California. Depth curves, 600, 800, 1000, and 1200 m; *P. laurae* (red circles on map = ●).

