

## A New Genus and Species of Chiton from the Aleutian Islands

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**ABSTRACT** An unusual new genus and species of chiton, *Boreacanthus griphus* n. g. & n. sp. is described from the shallow subtidal depths of the central Aleutian Islands, and is tentatively placed in the family Mopaliidae Dall, 1889. The tail valve of the new taxon has a caudal sinus typical of the family Mopaliidae, but differs from all other known members of Mopaliidae in possessing pustulose tegmental sculpture and spike-like, calcareous girdle elements.

**KEY WORDS** Chiton, Mopaliidae, Polyplacophora, *Boreacanthus griphus*, new genus, new species, Aleutian Islands

### INTRODUCTION

The Aleutian Island archipelago is one of the most remote and inaccessible regions in the world (Map 1). The chiton fauna of the Aleutians has been poorly studied, with few published accounts, but is presently the subject of review (Clark, in prep.). Dall (1921) listed 27 species of chitons as occurring the Aleutians, Baxter (1987), listed just 25 species from the region, Vermeij, *et. al.* (1990), reported nine shallow water (0-12 m) species from throughout the chain, and O'Clair (1977), reported finding eight shallow water (0-37 m) species in a survey of Amchitka Island, but little else has been published. During recent SCUBA surveys in the region, aboard the R/V Norseman (AKMAP 2006-2007, ACRA 2008, AIMP 2011), several hundred chiton specimens were collected at depths of 1-18 m, from more than thirty islands, throughout the chain. This collection included two specimens of an enigmatic species with pustulose valves and calcareous spines on the girdle. which resembles a species of *Chaetopleura* or some members *Lepidochitona*, however the tail valve has a caudal sinus, a feature of the family Mopaliidae. *Boreacanthus*

*griphus* Clark, n. gen. and n. sp. is described herein, and tentatively placed in the family Mopaliidae Dall, 1886, following the diagnosis of Kaas & Van Belle (1994).

### ABBREVIATIONS

AIMP, U. S. Department of Energy, Amchitka Island Monitoring Program.  
 AKMAP, Alaska Monitoring and Assessment Program, 2006-2007.  
 AKALE07, AKMAP 2007 station, Aleutian Islands, 2006-2007.  
 ACRA, Aleutian Coralline Red Algae Expedition, 2008.  
 LACM, Natural History Museum of Los Angeles County.  
 RNC, Reference collection of R.N. Clark.  
 SBMNH, Santa Barbara Museum of Natural History.

### METHODS

From 2006-2011 (AKMAP, ACRA & AIMP), several hundred samples of chitons were hand collected by the author, using SCUBA, from shallow (1-18 m) depths throughout the

Aleutian Islands (report in progress). The specimens were flattened and preserved in 80% Ethanol. High resolution images were taken of the valves and girdle by Anthony Draeger, using a photo stacking program. Radulae were imaged with the Scanning Electron Microscope at the Santa Barbara Museum of Natural History by Dr. Daniel Geiger.

*Boreacanthus* new genus

**Diagnosis.** Small chitons (to about 13.2 x 8.0 mm), broadly oval, moderately elevated; valves randomly covered with small (350 to 500  $\mu$ m in diameter) pustules; articulamentum with typically seven slits; Intermediate valves roughly quadrate, lateral areas poorly defined, pustules on lateral areas closer together, sutural laminae fairly broad, single slitted, jugal laminae lacking except in tail valve; tail valve with a caudal sinus, and jugal lamina with slits on either side; insertion slits short or lacking; Girdle relatively broad, about half of intermediate valve five tegmentum width, evenly beset with calcareous spicules, much larger spicules in tufts at valve sutures, and at the girdle margin; Ctenidia; merobranchial, abanal. Radula with large, tri-cuspid major laterals.

**Remarks.** *Boreacanthus* differs from all other Mopaliidae in 1), the absence or weakly indicated slits of the insertion plate of the tail valve, 2), the pustulose valve sculpture, and 3), spiculose girdle elements.

**Type Species.** *Boreacanthus griphus* Clark, sp. nov.

**Etymology.** Greek, *boreios*, “northern” & *akanthos* “prickly”.

*Boreacanthus griphus* Clark, new species  
(Figures 1-9)

**Description.** Small chitons, to 13.2 mm (paratype), holotype 10.5 x 7.0 mm (Figure 1),

broadly oval, moderately elevated (2.25 mm in Holotype) side slopes straight; tegmentum of valves pustulose, pustules about 35  $\mu$ m in diameter; eaves spongy; articulamentum white, with tegmental color showing through; color of valves uniformly light brick-red to burnt orange; girdle yellowish tan dorsally, white ventrally.

**Head valve** (Figure 2), semi-circular, posterior margin widely v-shaped, width 3.2 mm, margins slightly thickened; pustules randomly spaced; articulamentum, holotype with six slits (due to two central insertion teeth being fused together), paratype with seven slits, insertion teeth; teeth long, smooth. **Intermediate valves** (Figure 3), roughly sub-quadrate, tegmentum slightly more than twice as wide as long, valve five tegmentum 4.0 mm in width, slightly beaked; central areas pustules set one to two diameters apart; lateral areas poorly defined, pustules set one diameter or less apart; sutural laminae quite long (about 1/3 tegmentum length), rounded, with one slit per side; jugal laminae absent; insertion plates with a single slit.

**Tail valve** (Figure 4), tegmentum 2.5 mm in width, roughly trapezoidal, mucro about 20% of distance from posterior margin, post mucronal area swollen, slope straight; pustule distribution similar to intermediate valves, those of the post-mucronal area closer together than those of the antemucronal area. Insertion plate with 0 to one slits per side. The two type specimens contrast in this character, in that the holotype lacks slits, but the paratype has one short slit per side. This variability is seen in *Cryptochion stelleri* as well, which occasionally lacks slits in the tail valve.

**Aesthetes** (Figure 5), megalaesthetes, one atop of each tegmental granule, roughly circular, approx. 10  $\mu$ m in diameter, microaesthetes scattered about shell surface, slightly smaller in diameter than megalaesthetes. **Girdle** (Figures 6 & 7), relatively broad, somewhat less than half the width of valve five tegmentum, wider at sides than at ends; dorsal surface (Figure 6), densely clothed with smooth, sharp, bent

spicules, to about 200  $\mu\text{m}$  in length, longer, nearly straight or slightly curved spicules, to about 1.0 mm around the margin, and in tufts of three or four at valve sutures; ventral surface (Figure 7), densely covered with bluntly pointed, outwardly directed spicules, about 75  $\mu\text{m}$  in length. **Ctenidia** (Figure 8), merobranchial, abanal, extending a little more than one half of foot length; 13 gills per side. **Radula** (Figure 9), typical mopalioid, with large tri-cuspid major lateral teeth, about 250  $\mu\text{m}$  in length, cusps bluntly pointed; rachidian tooth long, tongue shaped, about 100  $\mu\text{m}$  in length, with a medial ridge; minor laterals with broadly triangular base, and slender upper half; spatulate uncinial teeth narrow, only moderately expanded distally, nearly as long as major laterals; outer uncinial teeth flattened, roughly diamond shaped; marginal teeth pentagonal, distal side longest, flattened, slightly thickened, pointed medial on the proximal side.

**Type Locality.** Bay of Islands, west side of Adak Island, Andreanof Islands, Aleutian Islands, Alaska (51°49.02' N, 176°50.38' W), 16 m on side of boulder (*leg.* Roger N. Clark, 9 July, 2007) (AKALE07-0005).

**Type Material.** Holotype SBMNH 184006, 10.5 x 7.0 mm (ex-RNC 2338); Paratype LACM 3798, Hawadax Island, Rat Islands, Aleutian Islands, Alaska (51°48.54' N, 178°19.87' E), 12 m, on bedrock (*leg.* Roger N. Clark, 8 June, 2008), 13.2 x 8 mm. (ex-RNC 2394) (ACRA08-7).

**Distribution.** Known so far only from the central Aleutian Islands, from Adak Island, Andreanof Is., to Hawadax Island, Rat Is. 176°50' W to 178°19' E. (Map 1).

**Habitat.** Bedrock and boulders encrusted with the, crustose coralline red algae *Clathromorphum nereostracum* Lebednik, 1977, and others, and various encrusting invertebrates, at depths of 12-16 m.

**Etymology.** *griphus*, Latin, griphus “riddle, mystery”, a singular noun in the nominative case used in apposition.

**Discussion.** *Boreacanthus griphus* is apparently a rare or very cryptic species, as only two specimens have been collected so far, despite much searching at Adak and Amchitka Islands (AIMP, 2011). The new taxon is tentatively placed in Mopaliidae based upon the family diagnosis in Kaas and Van Belle (1994), particularly the caudal sinus in the articulation of the tail valve, but it is unique amongst the Mopaliidae in its randomly pustulose sculpture and ill-defined lateral areas. The new taxa resemble members of the chiefly southern hemisphere genus *Plaxiphora* Gray, 1847, which lacks slits in the tail valve, and has diverse girdle ornamentation, including calcareous spines. It also has affinities with *Cryptochiton* Middendorff, 1847, which also sometimes lacks slits in the tail valve, and has tufts of minute calcareous spicules.

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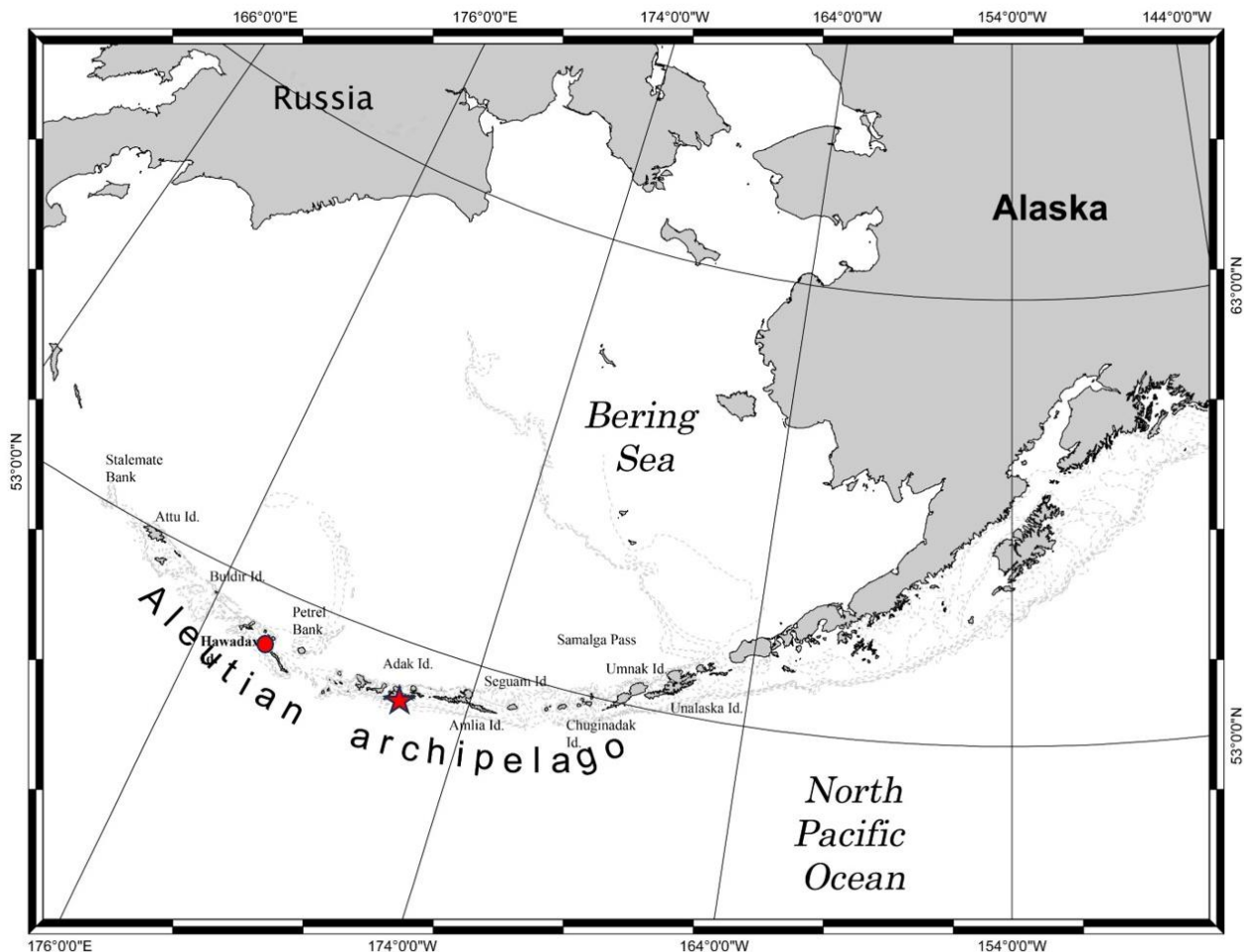
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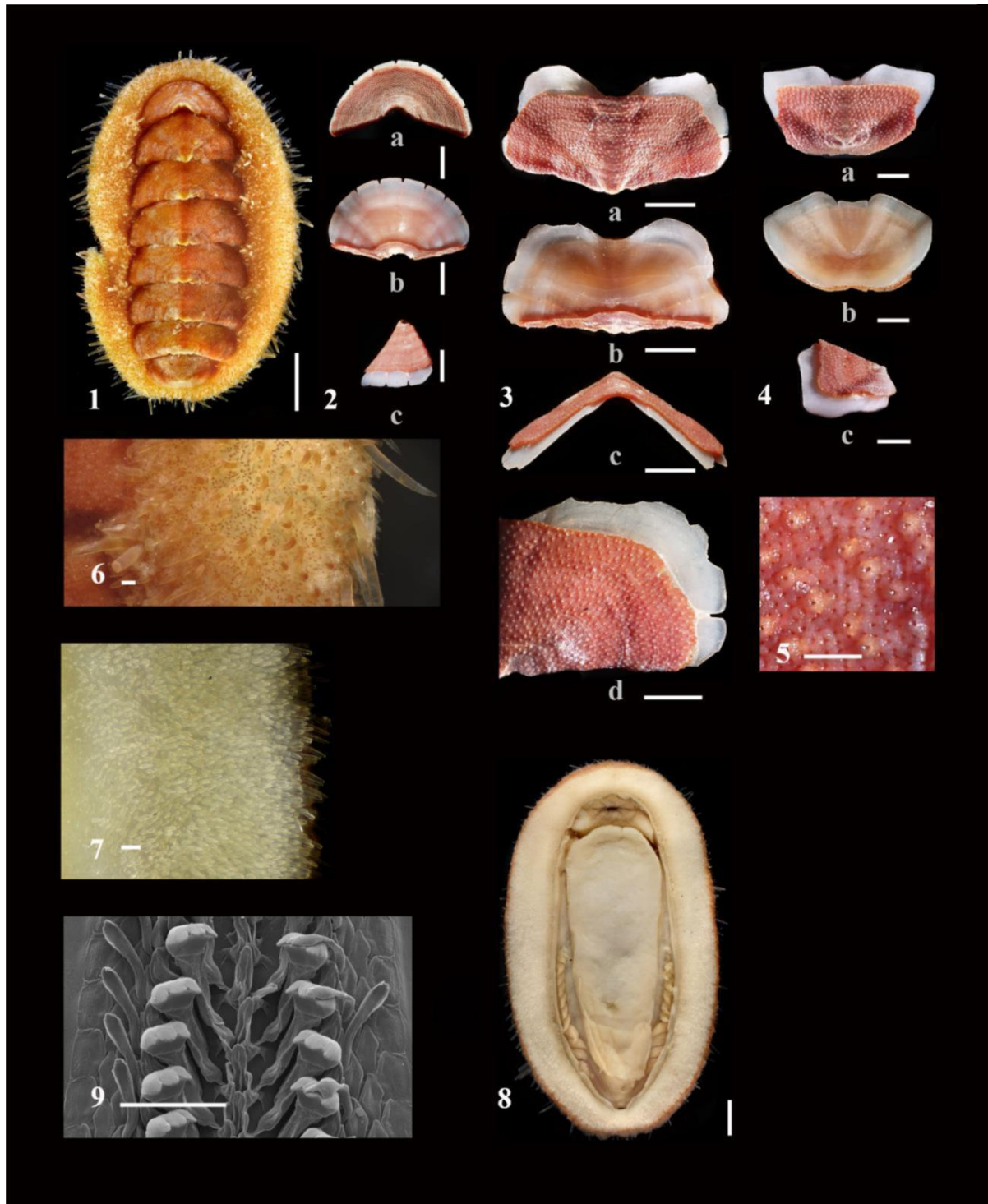
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**Map 1.** Aleutian Islands. Red star, indicates the type locality, red circle, paratype site.



**Figures 1-9.** *Boreacanthus griphus* n. sp. Holotype, 1, 3-7, 9 (SBMNH 184006); Paratype, 2, 8; Figure 1= whole animal, dorsal view, bar = 2 mm; Figure 2= head valve, bars equal 1 mm; Figure 3= Intermediate valve V, bars = 1 mm; Figure 4= tail valve, bars = 0.5 mm; Figure 5= close-up, 300  $\mu$ m square of tegmentum, showing aesthetes, bar = 100  $\mu$ m; Figure 6= Dorsal surface of girdle, showing dorsal and marginal spicules, bar = 100  $\mu$ m; Figure 7= Ventral surface of girdle, showing ventral spicules, bar = 100  $\mu$ m; Figure 8= whole animal, ventral view, bar = 1 mm; Figure 9= Radula, bar = 200  $\mu$ m.