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The genus *Arctomelon* Dall, 1915 in Alaskan waters, with the description of a new species

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ABSTRACT The Volutid genus *Arctomelon* Dall, 1915 in Alaskan waters is examined, four species are recognized. A new species, *Arctomelon borealis* sp. nov. is described from bathyal depths of the central Aleutian Islands. *A. stearnsii ryosukei* (Habe & Ito, 1965) is recognized as a distinct species.

KEYWORDS Alaska, Biodiversity, *Arctomelon*, Gastropod, Mollusca

INTRODUCTION

The genus *Arctomelon* Dall, 1915 contains three known species (WoRMS, http://www.marinespecies.org/aphia.php?p=taxdetails&id=382314), two in Alaskan waters, and another from the Gulf of Panama. However, only one species is relatively well known. *Arctomelon stearnsii* (Dall, 1872) is an uncommon northeastern Pacific mollusk, found throughout much of Alaska (Oldroyd, 1927). A subspecies *A. stearnsii ryosukei* (Habe & Ito, 1965) was described from the Bering Sea, and because of its sympatric distribution and similar appearance I had considered it to be only a form of the variable *A. stearnsii*. However, a recent re-examination of images of the type specimens, (Tiba & Kosuge, 1980, and Matsukuma, *et. al.*, 1991) suggest that it may in fact be a distinct species, and is herein recognized as such.

For many years, there were rumors (mostly from crab fishermen) of another species of "Alaskan Volute" with axial ribs occurring in the Aleutian Islands, but nobody seemed to be able to produce one (Rae Baxter personal communication, in 1983). In 1994, while participating in a NOAA/NMFS resource assessment survey in the Aleutian Islands, I collected two specimens of the ribbed volute. I sent the specimens to Dr. M. G. Harasewych at USNM for identification. He identified them as *Arctomelon tamikoae* Kasuge, 1970. The type was later illustrated by Higo, *et. al*., 2001).

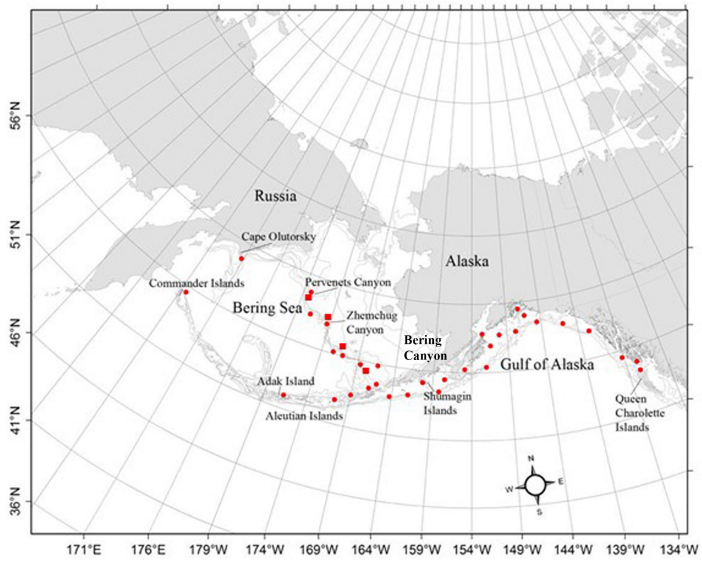

Figure 1. Distribution map of *Arctomelon stearnsii* (Dall, 1872) (•) and *Arctomelon ryosukei* (Habe & Ito, 1965) (■).

Arctomelon tamikoae was said to have come from the South China Sea. However, that is unquestionably an error, as the species is

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endemic to the Aleutians. The type specimen seems to be a victim of a "label mix-up". I have subsequently obtained several additional specimens (most in poor condition) on subsequent Aleutian surveys [1997-2016].

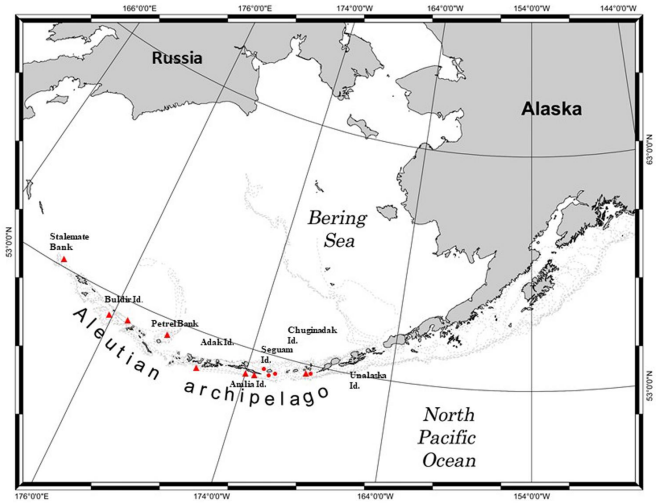

Figure 2. Distribution map of *Arctomelon tamikoae* (Kasuge, 1970) (▲) and *Arctomelon borealis* spec. nov. (•).

Little is known about the biology and natural history of *Arctomelon* spp. In 2010 on a survey in the Bering Sea, I obtained the egg cases of several mollusks, one of these proved to be that of *Arctomelon stearnsii*, the egg case and pre-hatchlings are described and illustrated herein.

A new species, *Arctomelon borealis* restricted to the central Aleutians was discovered on a NMFS survey in 1994, and is herein described and compared to its congeners.

ABBREVIATIONS

ABML, Auke Bay Marine Labs (Juneau, Alaska);
SBMNH, Santa Barbara Museum of Natural History;
LACM, Los Angeles County Museum of Natural History; USNM, United States National Museum (Smithsonian Institution);
NMFS, National Marine Fisheries Service;
RNC, Roger N. Clark, Reference Collection;
NSMT, National Science Museum, Tokyo;
IMT, Imperial Museum, Tokyo.

SYSTEMATICS

Order: Neogastropoda
Superfamily: Muricoidea
Family: Volutidae
Subfamily: Zidoniinae
Genus: *Arctomelon* Dall, 1915

Type species: *Voluta* (*Scaphella*) *stearnsii* Dall, 1872 (by original designation)
A. stearnsii (Dall,1872)
A. ryosukei (Habe & Ito, 1965)
A. tamikoae (Kosuge, 1970)
A. borealis Clark, spec. nov.

Arctomelom stearnsii (Dall, 1872)
(Figures 1, 3A-H, 5I)

Type. USNM 194428

Type locality. Alaska, Aleutian Islands, Shumagin Islands, off Nagai Island (55°00N, 160°00 W).

Description. Shell large (to 160 mm; largest examined 174 mm, ABML) fusiform**,** relatively slender, moderately thick, aperture more than half of shell length; exterior surface smooth, but not glossy (chalky in appearance), except for growth lines, suture appressed (pinched), nucleus small; columella with two plicae, columellar callus in very mature specimens; color blue-gray exteriorly, interior purple-gray to reddish-brown.

Radula (Figure 5I): Rachiglossate (Abbott, 1968); bearing a single tricuspid tooth; central cusp about 1/3 longer than outer cusps; the dorsal side of the central cusp bears a depression into which the tip of the overlying

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tooth lies, lateral cusps shorter, broadly separated from the central cusp.

Egg capsules (Figure 4E): blister-like 23 mm x 9 mm, granular, dark yellow-orange in color, bearing three embryos (Figures 4F & G), measuring 9-11 x 5.2 mm, pale pinkish white in color.

Columellar plicae well developed; protoconch dome-like.

Distribution. Wide spread in the North Pacific, found throughout much of the Bering Sea From Cape Olutorsky, Russia (59°18.2 N, 170°18.7 E) to (Pervenets Sea Canyon) (60°N), along much of the Aleutian Islands chain, west to at least Adak Island (177°W), near the Commander Islands, Russia (167°E) and throughout the Gulf of Alaska and Prince William Sound (to about 60 N), east and south to the Haida Gwaii (Queen Charlotte Islands) in northern British Columbia (54°N, 132°30 W).

Habitat. Found on muddy, sandy and cobbly bottoms, at depths of 15-1065 m, with bottom temperatures of 2.3-5.0°C.

Remarks. The holotype is in very poor condition, collected from a Codfish stomach, it is badly eroded and discolored, but is easily recognizable. Variable in form, some specimens are very short spired, others tall spired, whorls may be slender or inflated.

At Adak Island in the Aleutians, a dwarf population of *A. stearnsii* rarely exceeding 10 cm in length occurs in shallow water (< 15 m), amongst cobbles and in beds of the horse mussel *Modiolus modiolus* (Figure 4 A). Figure 3 F represents an unusual, highly compressed specimen (similar in form to *A. borealis*) taken at 732 m in the Gulf of Alaska, east of the Shumagin Islands. This appears to be only a variant of *A. stearnsii*, but more material is needed to determine if it may be distinct.

Arctomelon ryosukei (Habe & Ito, 1965)
(Figures 1, 4I-L)

Type. National Science Museum, Tokyo.

Type locality. Bering Sea.

Description. Shell large, to 136 mm (holotype), solid, fusiform, whorls broad, rounded, inflated, aperture more than half of shell height; suture impressed (not appressed as in *S. stearnsii*), nucleus relatively large (4.2-6.6 mm); exterior chalky, blue-gray, interior purple-brown.

Radula type is unknown. At the time of this writing, the radula of *Arctomelon ryosukei* was not available for study.

Distribution. *Arctomelon ryosukei* has a very limited, sympatric distribution with its congener *A. stearnsii,* along the shelf break of the eastern Bering Sea continental shelf, Pervenets Canyon (59°40N, 178°26 W) to Bering Canyon (54°57.24 N, 167°10 W), at depth of 206-312 m.

Habitat. Mud bottoms with a bottom temperature of 2.3°-3.5°C.

Remarks. Described as a subspecies of *A. stearnsii*, but the sympatric distribution belies that designation, and it is herein recognized as a distinct species. *A. ryosukei* may be distinguished from inflated specimens of *A. stearnsii* by the impressed suture (Figure 4L), as opposed to the appressed suture of the latter (Figure 4H).

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Arctomelom tamikoae Kasuge, 1970
(Figures 2, 5A-D, J)

Type. Imperial Museum, Tokyo #80-21 (Figure 5A)

Type Locality. Originally reported as "South China Sea" - in error; Alaska, central Aleutian Islands, here designated as the Petrel Bank, NE of Semisopochnoi Island (52°15 N, 179°W).

Description. Shell large to 200 mm; (largest examined 208 mm, David Stanchfield collection) solid, fusiform. Nuclear whorls bulbous, smooth, often eroded; aperture about one half of shell height; shoulders rounded, sutures impressed; exterior chalky, blue-gray with 27-34 (14 in young specimens < 40 mm) close-set, rounded axial ribs, most prominent on the upper half of the whorls; interior glossy, purple-brown; columnella with two prominent folds; canal short and broad. Animal cream, with light orange mottlings; eyes black.

Radula (Figure 5J)**:** bears a single, broad, tricuspid tooth. Base of tooth crescentic, central cusp broad, triangular, bearing a well-marked depression on the dorsal side were the tip of the overlapping tooth lays, when the teeth are laid flat. The lateral cusps are broad at the base, tapering to a sharp tip, about half as long, and half as wide as the central one, rounded on the lateral margin, and separated from the central cusp by a broad notch.

Distribution. Endemic to the, central and western Aleutian Islands, from south of Yunaska Id. (170°16.06 N, 170°35.7 W) (143-2010-1-31) to Stalemate Bank, west of Attu Island (53°15.14 N, 170°51.68 E) (147-2004-1-226).

Habitat. Rocky, gravely and coral (hydrocoral) rubble bottoms, at depths of 154-457 m, with a temperature of 3.8-4.3°C, most frequently 4.0°C.

Natural History. Like *Arctomelon stearnsii, A. tamikoae* is a predator/scavenger and is sometimes taken in king crab pots (David Stanchfield, personal communication, May 2016).

Remarks. *Arctomelon tamikoae* closely resembles its Alaskan sibling *A. stearnsii*, but is easily distinguished by: (1) the presence axial ribs, (2) impressed, not appressed, "pinched" suture, and (3) larger, nuclear whorls. *A. tamikoae* is a very rare species, in more than 3,000 trawl samples taken in the Aleutian Island since 1994 fewer than twenty examples have been recovered. Very large specimens frequently have up to 2.5 cm of their apices truncated (worn off, flat) by erosion.

Arctomelon borealis Clark, new species
(Figures 5 E-H, K)

Type material. Holotype, SBMNH 167094 (Figures 5E-F), 82.4 mm; Paratype 1, LACM 3649, 67.8 mm. South of Seguam Island (52°04.99 N, 172°26.34 W), 162 m (NMFS 94-199401-61); Paratype 2, ANSP A476689, 126.0 mm. Seguam Pass (51°58.35 N, 172°36.86 W), 167m (NMFS 94-200201-192); Paratype 3, RNC 4992, 85.1 mm. Seguam Pass (52°04.04 N, 172°33.66 W), 144 m (NMFS 176-201601-45).

Type locality. Alaska, Aleutian Islands South of Chuginadak Island (52°42.08 N, 169°49.78W), 148 m (*leg.* William C. Flerx, 22 May, 1996).

Description. Small for genus, rarely exceeding 90 mm (largest examined 126 mm, Paratype 2) solid, fusiform, aperture more than 2/3 of she height, suture appressed, but not excessively as

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in *A. stearnsii*; nucleus large bulbus, somewhat larger than that of *A. stearnsii*, diameter 5.0-6.2 mm compared with 3.6 mm to 4.8 (rarely 5.0) mm; columella with two plicae; color light gray-brown exteriorly, interiorly brown or purple-brown, overglazed with gray in mature specimens.

Radula (Figure 5K). Typical for genus, with a single tricuspid tooth; tooth similar to that of *A. stearnsii*, but cusps sub-equal in length, central cusp only scarcely longer the lateral cusps, moderately broad; differs from both *A. stearnsii* and *A. tamikoae* in lacking the small depression on the dorsal surface of the central cusp, where tip of the overlying tooth lies.

Distribution. Endemic to the central Aleutian Islands, between Seguam and Samalga Passes (169° W-173° W).

Habitat. Black (volcanic) sand at depths of 144-167 m, with bottom temperatures of 4.2-4.8°C.

Remarks. *Arctomelon borealis* may be distinguished from its congeners by: (1) its brown shell, as opposed to the blue-gray shells of its congeners, and (2) the proportionally large nuclear whorls.

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Robert Lauth, Alaska Fisheries Sciences Center, for generating maps and providing NMFS survey data; Dr. James Orr, Alaska Fisheries Science Center, for continuing to secure mollusk specimens from NMFS surveys; Lindsey Groves (NHMLAC). To Dr. Daniel Geiger of the Santa Barbara Museum of Natural History for taking the SEM micrographs, Dr. Chong Chen, JAMSTEC, Yokohama, Dr. Jerry Harasewych (Smithsonian Institution), for identifying *Arctomelon tamikoae,* Paul Callomon, Academy of Natural Sciences, for providing an image of the type specimen of *Arctomelon tamikoae*, and to David Stanchfield, La Quinta, California, for making his personal collection available for study. The comments of anonymous reviewers were invaluable.

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Figure 3 A-H *Arctomelon stearnsii.*
A = Holotype, USNM 194428; **B** = RNC 4935, 145.3 mm, SE of Shumagin Is. (*leg.* RNC, 6 June, 2009) (NMFS 159-200901-76); **C** = RNC 4936, 92.4 mm, SW of Montague Island (*leg.* RNC, 12 July, 2009) (NMFS 94-200901-226); **D** = RNC 4566, 155 mm, N of Umnak Island, 91 m (*leg.* William C. Flerx, 9 June, 1994) (NMFS 94-199401-30); **E** = RNC 4717, 133 mm, Icy Strait, 25 m (*leg.* Lou Barr, circ. 1980's); **F** = RNC 4887, 113.8 mm, Gulf of Alaska,732 m (*leg.* RNC, 13 June, 2005) (NMFS 134-200501-85); **G** = RNC 4551, 89 mm, W of Ketchikan, 120 m (Carmelita Zwick, November, 1990); **H** = RNC 4965, 84 mm, Bering Sea, 1,065 m (*leg.* RNC, 6 July, 2010) (NMFS 94-201001-143).

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Figure 4 A-H *Arctomelon stearnsii.* I-L *Arctomelon ryosukei*.
A = RNC 5049, 95.0 mm, Adak Island, 15 m (*leg.* Stephen C. Jewett, 19 July, 2011); **B** = RNC 4966, 115.1 mm, Bering Sea, 236 m (*leg.* RNC, 22 June, 2010) (NMFS 94-201001-87); **C** = RNC 4501, 93.5 mm, Mitkof Island, shore (dead) (*leg.* RNC, August, 1983); **D** = RNC 4613, 38.6 mm, Gulf of Alaska, 209 m (*leg.* RNC, 9 June, 1999) (23-199901-109); **E** = RNC 4902, Egg capsule, 23 mm x 9 mm, NE of Unalaska Island, 425 m (*leg.* RNC 18 July, 2010) (NMFS 94-201001-203); **F** = RNC 4902, juv., 11 mm, NE of Unalaska Island, 425 m (*leg.* RNC 18 July, 2010) (NMFS 94-201001-203); **G** = RNC 4902, 9 mm, NE of Unalaska Island, 425 m (*leg.* RNC 18 July, 2010) (NMFS 94-201001-203); **H** = close-up of appressed suture; **I** = Paratype, Kawamura coll., NSMT # ? (after Matsukuma, *et. al.*, World Shells of Rarity and Beauty); **J** = RNC 4903, 100.7 mm, Bering Sea, 206 m (*leg.* RNC, 6 June, 2010) (NMFS 94-201001-13); **K** = RNC 4906,110.5 mm, Bering Sea, 312 m (*leg.* RNC 11 June, 2010) (NMFS 94-201001-40); **L** = close-up of impressed suture.

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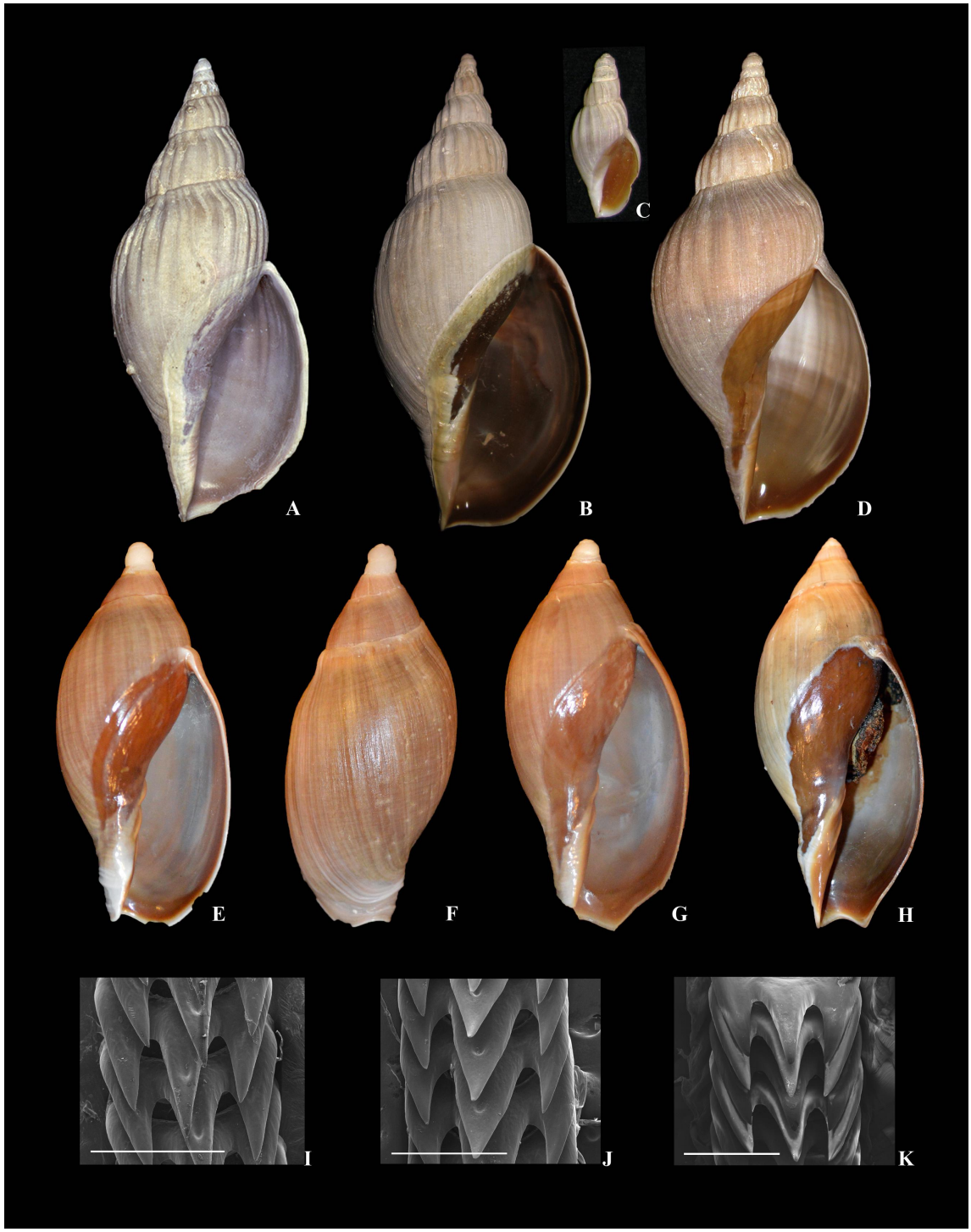

Figure 5 A-D, J *Arctomelon tamikoae*. E-H, K *A. borealis,* I *Arctomelon stearnsii*.
A = Holotype, IMT 80-21, 130.4 mm, Aleutian Is. (Petrel Bank); **B** = RNC 4744, 168 mm, SW of Buldir Island, 194 m (*leg.* 18 July, 2016) (NMFS148-201201-169); **C & D** = RNC 4612, 39.4 mm & 126.8 mm (*leg.* RNC, 7 July, 2002) (NMFS 94-200201-157); **J** = Radula (NMFS 143-2010-60); **E & F** = Holotype, SBMNH 167094, 82.4 mm; **G** = Paratype 1, LACM 3649, 67.8 mm (*leg.* Theresa Turk, 15 June, 1994) (NMFS 94-199401-61); **H** = Paratype 2, ANSP A476689, 126 mm (*leg.* RNC, 18 July, 2002) (NMFS 94-200201-192); **I** = Radula (NMFS 94-201001-60); **K** = Radula, Paratype 3, RNC 4992 (176-201601-45).