

## New Records of Two Dendronotid Nudibranchs from Korea

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### ABSTRACT

Two cold water species of dendronotid nudibranchs are described for the first time in Korea: *Dendronotus frondosus* (Ascanius, 1774) and *Dendronotus robilliardi* Korshunova, Sanamyan, Zimina, Fletcher & Martynov, 2016. *Dendronotus frondosus* is characterized by the color pattern of deep dark-brown with white specks and mottles on the dorsum. *Dendronotus robilliardi* is distinguished by the body of translucent white with milky stripes and orange-brown markings in papillae, and *D. robilliardi* from Korean water is commonly examined with white dots on the anterior dorsum. Images of external morphology and brief re-descriptions of two species were provided. Further, we confirmed the opinion of Korshunova et al. that the Korean *D. albus* image by Koh would be *D. robilliardi*.

**Keywords:** Nudibranchia, Dendronotidae, taxonomy, *Dendronotus frondosus*, *Dendronotus robilliardi*, Korea

### INTRODUCTION

The family Dendronotidae Allman, 1845 is characterized by the presence of an elongated body with numerous branching appendages on the dorsal sides and a diverse color pattern. The genus *Dendronotus* Alder & Hancock, 1845 is distributed in temperate and cold water habitats, especially in the northern hemisphere (Thompson and Brown, 1984; Ekimova et al., 2015, 2016; Korshunova et al., 2016; Gosliner et al., 2018). Twenty-nine species of dendronotid nudibranch have been reported worldwide within the only genus *Dendronotus* of the family Dendronotidae (WoRMS, 2020), but there was no record in Korea, until now (National Institute of Biological Resource, 2019). In this study, two species of dendronotid nudibranchs are re-described as new records for Korean malacofauna.

Samples were obtained by scuba diving: *Dendronotus frondosus* (Ascanius, 1774) was found within a depth of 5 m at Donghae harbor in Gangwon-do and Guryongpo harbors in Gyeongsangbuk-do. Two individuals of *D. robilliardi* Korshunova, Sanamyan, Zimina, Fletcher & Martynov, 2016 were found within a depth of 20 m at Yangyang, Gangwon-do. Pho-

tographs were taken underwater and in an acrylic tray using a TG-5 camera (Olympus, Tokyo, Japan) equipped with a ring light. Samples were frozen in dry ice and then fixed in 10% neutral-buffered formalin (Sigma, St. Louis, MO, USA) or 95% ethanol (Samchun, Seoul, Korea). Materials were observed with a stereoscopic microscope (M205 C; Leica, Wetzlar, Germany). The specimens examined in this study were deposited in the National Institute of Biological Resources (NIBR), Incheon, Korea. The specimen numbers for NIBR were indicated in the information for the corresponding specimens.

### SYSTEMATIC ACCOUNTS

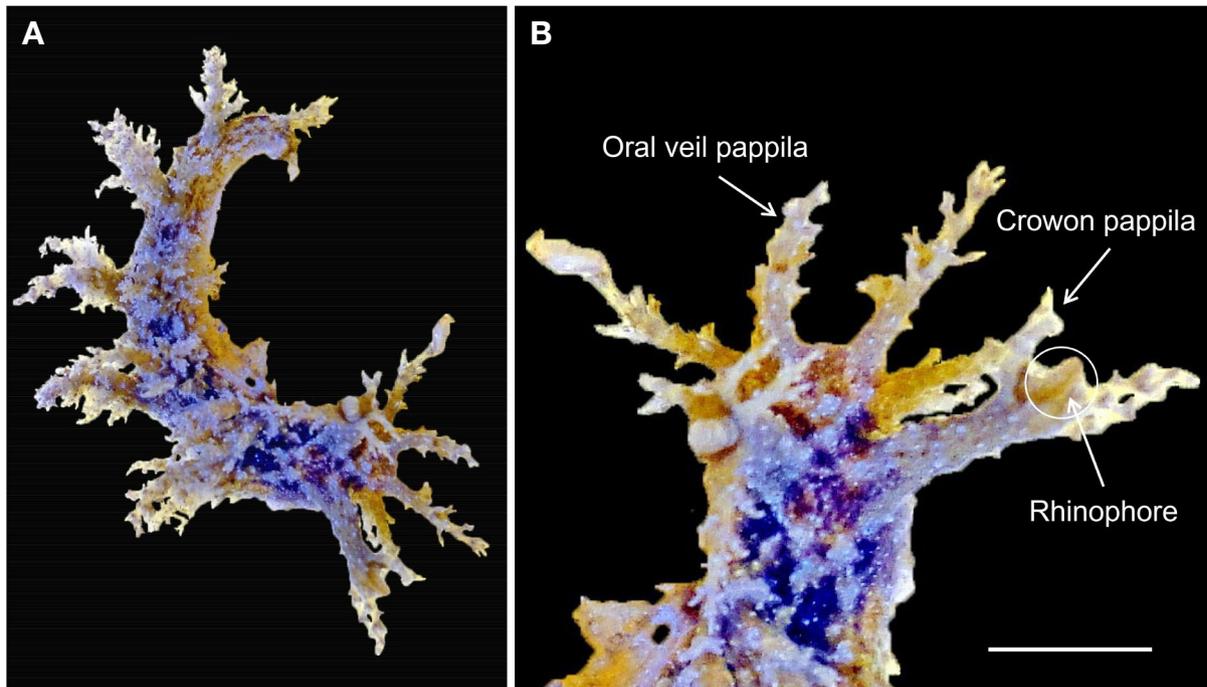
Class Gastropoda Cuvier, 1797  
Order Nudibranchia Cuvier, 1817  
Superfamily Dendronotoidea Allman, 1845  
Family <sup>1\*</sup>Dendronotidae Allman, 1845

**Diagnosis.** Body elongated with numerous branching appendages on dorsal sides, which lack cnidosacs from digestive glands. Oral veil with branching papillae. Rhinophore

Korean name: <sup>1\*</sup>긴수지갯민숭이과

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**Fig. 1.** *Dendronotus frondosus* (Ascanius, 1774). A, Whole body, dorsal (body length 10 mm, living animal); B, Rhinophores and oral veil papillae. Scale bar: B=2 mm.

lamellate, surrounded by a sheath with branching processes (Thompson and Brown, 1984).

Genus <sup>1\*</sup>*Dendronotus* Alder & Hancock, 1845

**Diagnosis.** Body laterally or dorsoventrally compressed, with white, red, or variegated color patterns, with brown stripes or spots, or with both on dorsolateral sides. Rhinophoral sheath with lateral papillae or absent. Oral veil bears 4–12 branching papillae. Dorsolateral processes dendritic (Ekimova et al., 2016).

<sup>2\*</sup>*Dendronotus frondosus* (Ascanius, 1774) (Fig. 1)

*Amphitrite frondosa* Ascanius, 1774: 155. fig. 2.

*Dendronotus frondosus*: Ekimova et al., 2015: 848–857, figs. 1–5, 6a, 7a, 8a; 2016: 15–42, figs. 3–5; Chichvarkhin, 2016: 19, fig. 7b.

**Material examined.** Korea: 1 individual, Gangwon-do: Donghae-si, Daedong-ro, 210, Donghae harbor, 11 Feb 2012 (NIBRIV0000876676); 1 individual, Gyeongsangbuk-do: Pohang-si, Nam-gu, Guryongpo-ri, Guryongpo harbor, 12 Feb 2012 (NIBRIV0000876677).

**Diagnosis.** Body elongate, laterally compressed, less than

10 mm in length. Ground color deep dark-brown, sprinkled with white specks; mottled dorsally, and turning paler at the ventral posterior and tail. Foot short and white. Apices of oral veil and dorsal papillae opaque white pigment. Oral veil with 6 slender lip papillae and short secondary twigs. Rhinophore pale brown and lamellate. Rhinophoral sheath long with 1 lateral and 5 crown papillae.

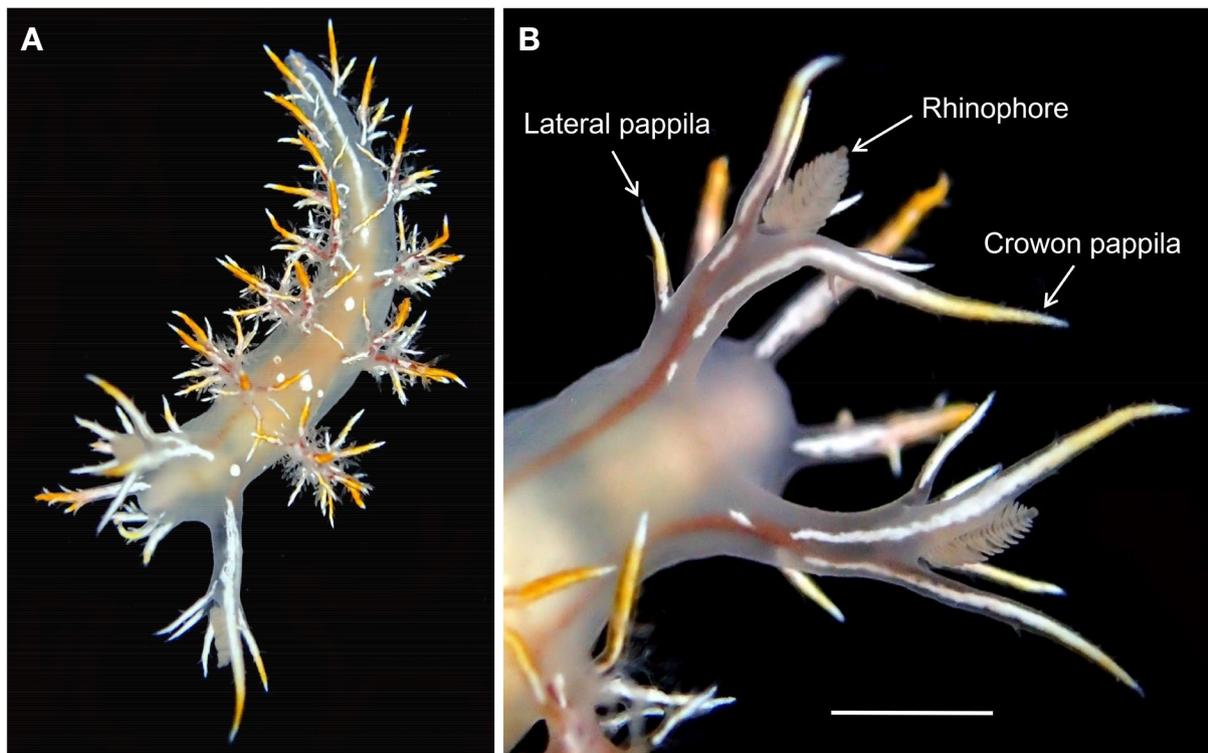
**Distribution.** Korea (East Sea), Russia (Peter the Great Bay, Sea of Okhotsk, Barents Seas, White Seas), Norway (Norwegian Sea), France (Bay of Biscay), USA (New Jersey Bight, Gulf of California, Gulf of Alaska).

**Remarks.** The deep dark-brown coloration of the present specimens matches the variegated pattern among the three types of white, red, and mottled colors (Ekimova et al., 2016). *Dendronotus frondosus* was previously detected at a depth of 400 m by Robilliard (1970), but Ekimova et al. (2015, 2016) recently insisted that the depth of this species does not exceed 20 m. The present specimens were also collected at shallow depths in an artificial wall of the harbor.

<sup>3\*</sup>*Dendronotus robilliardi* Korshunova, Sanamyan, Zimina, Fletcher & Martynov, 2016 (Fig. 2)

*Dendronotus robilliardi* Korshunova, Sanamyan, Zimina, Fletcher & Martynov, 2016: 28, figs. 1, 2b; Korshunova et

Korean name: <sup>1\*</sup>긴수지갯민숭이속, <sup>2\*</sup>흰긴수지갯민숭이, <sup>3\*</sup>얼룩긴수지갯민숭이



**Fig. 2.** *Dendronotus robilliardi* Korshunova, Sanamyan, Zimina, Fletcher & Martynov, 2016. A, Whole body, dorsal (body length 40 mm, living animal); B, Rhinophores and papillae. Scale bar: B=5 mm.

al., 2019: 10–11, fig. 3h–j.

*Dendronotus albus* (non MacFarland, 1966): Robilliard 1970: 466–470, Pl. 64, fig. 34.

**Material examined.** Korea: 2 individuals, Gangwon-do: Yangyang-gun, Hyunnam-myeon, Dongsan-ri, 17 Apr 2019 (NIBRIV0000876678).

**Diagnosis.** Body elongate, smooth, and less than 40 mm in length. Ground color translucent white with opaque white stripes on papillae, rhinophoral sheath, and dorsum; orange-brown marks in middle of papillae. Oral with 6 papillae without twigs. Rhinophore dark beige and lamellate. Rhinophoral sheath slender with 1 lateral and 5 crown papillae. White low warts lined up or scattered on anterior parts of dorsum.

**Distribution.** Korea (East Sea), Japan (Coast of northern Honshu), Russia (Coast of Kamchatka), USA (Sinclair Inlet).

**Remarks.** The external morphology of all specimens agrees well with the description of Korshunova et al. (2016) but differs by the presence of white warts on the dorsum anteriorly, which seems to be a common variation in body color. Korshunova et al. (2016) mentioned that the image of *D. albus* recorded from South Korea (Koh, 2006) would be *D. robilliardi*. Considering the habitat and locality information of this

species from the study, Koh's image of *D. albus* is appropriate for *D. robilliardi*. The authors agree with the opinion of Korshunova et al. (2016).

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## CONFLICTS OF INTEREST

No potential conflict of interest relevant to this article was reported.

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