

A report of four unrecorded species of opisthobranch molluscs from Korea

Daewui Jung¹, Jongrak Lee² and Chang-Bae Kim^{1,*}

¹Department of Life Science, Sangmyung University, Seoul 110-743, Korea

²Marine Biodiversity Research Institute, INTHESEA KOREA Inc., Jeju 697-110, Korea

*Correspondent: evodevo@smu.ac.kr

Four species of opisthobranch molluscs collected from Jeju Island were identified as *Pleurobranchus peronii* Cuvier, 1804, *Pleurobranchus weberi* (Bergh, 1905), *Aplysiopsis nigra* (Baba, 1949) and *Stiliger aureomarginatus* Jensen, 1993. All of the species and genera examined here are new to Korea. *Pleurobranchus peronii* and *P. weberi* were easily distinguished to each species by dorsal tubercles and markings. In this report, we provided descriptions and photographs of these species for identification.

Keywords: *Aplysiopsis nigra*, Korea, Pleurobranchomorpha, *Pleurobranchus peronii*, *Pleurobranchus weberi*, Sacoglossa, *Stiliger aureomarginatus*, Taxonomy

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INTRODUCTION

We collected and taxonomically examined four species of opisthobranch molluscs included in the orders Pleurobranchomorpha and Sacoglossa from Korean coastal areas.

Species in the order Pleurobranchomorpha are characterized by two cylindrical rhinophores, two oral tentacles on oral veil, and gill on the right side of body between the mantle and the foot (Coleman, 2008). This order is composed of 70 valid species from 12 genera in 2 families that are distributed across the world (Gofas, 2013). In Korea, only two species of *Berthellina citrina* (Rüppell & Leuckart, 1828) and *Pleurobranchaea japonica* Thiele, 1925 have been reported by Choe and Lee (1994) from this order.

Animals included in the order Sacoglossa are small in size. They have well developed radula and mouth part for eating algae and have shell or lack shell (Gosliner *et al.*, 2008). This order consists of 284 species from 29 genera in 10 families (Jensen, 2007). Only one species, *Elysia ornata* (Swainson, 1840) has been recorded with no description in Korean waters (Lee and Min, 2002).

This study provided re-descriptions with photographs of four species included in the Pleurobranchomorpha and Sacoglossa that were newly reported to Korean opisthobranch fauna. As a result of the study, 4 species in 3 genera of 2 families in the order Pleurobranchomorpha and

3 species in 3 genera of 3 families in the order Sacoglossa have been reported for the Korean opisthobranch fauna.

MATERIALS AND METHODS

Materials were collected from subtidal zones in Jeju Island on SCUBA diving. Specimens were narcotized in 1 : 1 mixture of sea-water and 7% MgCl₂ solution for 2-8 hour and were fixed in 10% neutral buffered formalin for morphological preservation. The prepared specimens were then examined with a stereoscopic microscope (Olympus SZ-61 with FuzhouTucsen TCA-3). Body lengths were measured from the anterior end to the posterior tip. Identification was based on diagnostic morphological characters from the following references: Cuvier, 1804; Tryon and Philsbry, 1895; Bergh, 1905; Baba, 1949; 1959; 1971; Jensen, 1993; 1997; Okutani, 2000; Gosliner *et al.*, 2008. After examination, the specimens were deposited in the National Institute of Biological Resources (NIBR), Incheon, Korea and Sangmyung University, Seoul, Korea. If NIBR specimen numbers were assigned, the numbers are shown within parentheses beside each specimen's information.

SYSTEMATIC ACCOUNTS

Phylum Mollusca Linnaeus, 1758
Class Gastropoda Cuvier, 1795

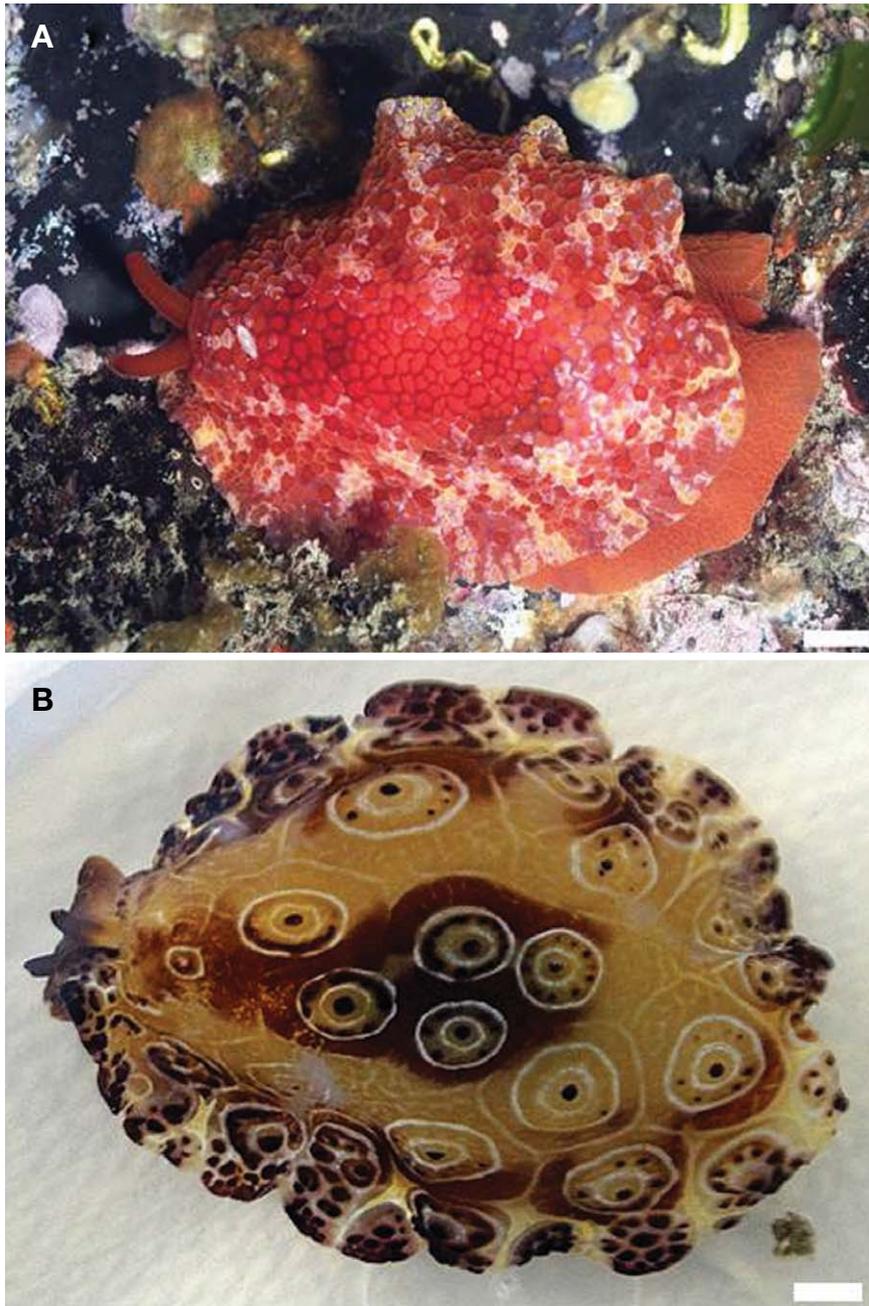


Fig. 1. *Pleurobranchus peronii* Cuvier, 1804 and *Pleurobranchus weberi* (Bergh, 1905). A. *P. peronii* (body length: 102 mm, width: 81 mm), living animal, dorsal view. B. *P. weberi* (body length: 92 mm, width: 78 mm), living animal, dorsal view. Scales=10 mm.

Order Pleurobranchomorpha Schmekel, 1985
 Family Pleurobranchidae Gray, 1827
 Genus *Pleurobranchus* Cuvier, 1804

Diagnosis. Retractable conical tubercles on mantle. Gills with double row of alternated tubercles on rhachis. Large internal shell, about half of body length. External penial sheath non-retractable, surrounding genital opening (Thompson, 1976).

***Pleurobranchus peronii* Cuvier, 1804 (Fig. 1A)**

Pleurobranchus peronii Cuvier, 1804: 266, 275, pl. 18, fig. 1-6; Tryon and Pilsbry, 1895: 207-208, pl. 48, fig. 24-28, pl. 74, fig. 88-90; Gosliner *et al.*, 2008: 100.

Pleurobranchus hirasei Baba, 1971: 24-25, pl. 3; Okutani 2000: 771.

Materials examined. 3 individuals, Hwasun-ri, Andeok-myeon, Seogwipo-si, Jeju-do, 25 May 2013 (D. Jung)

(KOSPIV0000185832).

Description. Body ovate and large; length 67-102 mm, width 63-81 mm in living animal; yellow to reddish purple. Mantle covered foot except posterior end. Whole dorsum covered with small rounded tubercles; several tips of tubercles white, orange or dark purple. Reticulate pigment around the tubercles dark or white. Rhinophores enrolled and wrinkled; joined basally. Oral veil small and reversely trapezoid. Gills on right side of body, covered by mantle; bipinnated and alternated 22-23 pinnae on each side. Foot wide; anteriorly bilabiated; metapodium blunted and orange in color.

Distribution. Korea, Japan, Hawaii, Indonesia, Malaysia, Papua New Guinea, Australia, South Africa, Madagascar, Tanzania.

Remarks. *P. peronii* has a range of body colors that includes pale translucent white, yellow, brown and deep purple (Rudman, 1999). Specimens examined in this study were yellow to reddish orange in body color. Also, brighter colors were shown in younger specimens.

***Pleurobranchus weberi* (Bergh, 1905) (Fig. 1B)**

Oscanius weberi Bergh, 1905: 53-55, pl. 2, fig. 1, pl. 6, fig. 1-6.

Pleurobranchus weberi: Gosliner *et al.*, 2008: 99.

Materials examined. 1 individual, Mun-seom, Seogwido, Seogwipo-si, Jeju-do, Korea, 1 April 2013 (D. Jung) (KOSPIV0000180756).

Description. Body ovate and large; body length 92 mm, width 78 mm in living animal; ground color light brown. Mantle widely spreads to covered whole foot; mantle edge slightly undulated. Dorsal markings milky white double rings around tubercles decrease in size toward to mantle edge. Translucent white lines on dorsal surface, short, irregular length. Dorsal tubercles small and rounded; increase in number to edge of mantle. Rhinophores short and enrolled; upper half dark brown; joined basally. Oral veil reversely trapezoid; deeper in color to posteriorly. Gills on right side between mantle and foot; gills bipinnated with 25 pinnae alternated on each side; cen-

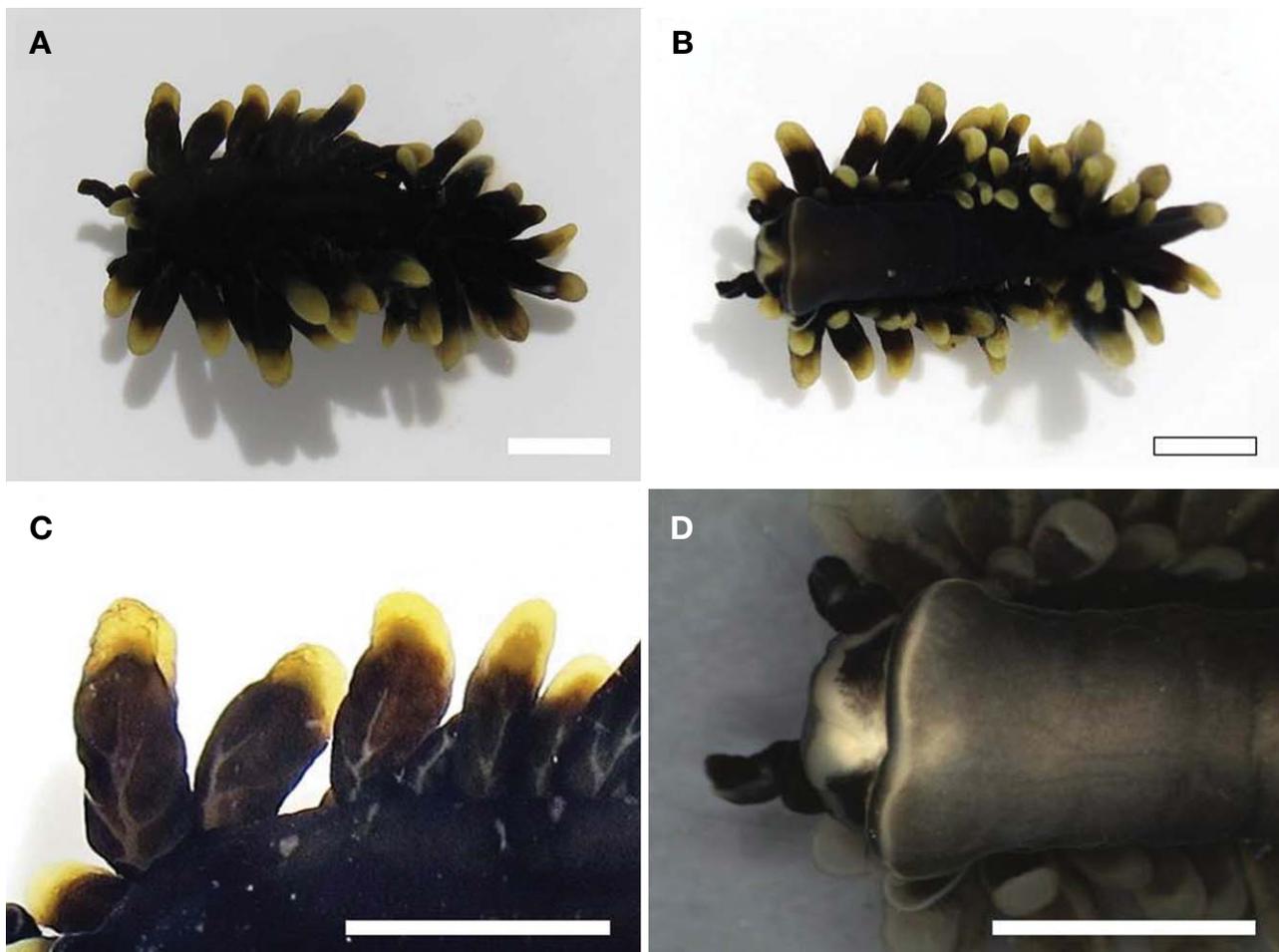


Fig. 2. *Aplysiopsis nigra* (Baba, 1949). A. dorsal view. B. ventral view. C. branchial papillae. D. ventral view of head and sole of foot. A-D. preserved specimen (body length: 23 mm, width: 4 mm). Scales=5 mm.

tral axis dark. Foot wide; anterior unilabiate; metapodium short and blunted.

Distribution. Korea, Indonesia, Philippines.

Remarks. This species is similar to *P. peronii* in the external morphology but can be easily distinguished by following characteristics:

Species	<i>P. peronii</i>	<i>P. weberi</i>
Dorsal tubercle	Many tubercles covering the entire dorsum	A few tubercles dorsum
Dorsal marking	Several dark purple tips of tubercles, and dark	Milky white double ring patches

Many species in the genus *Pleurobranchus* show a variety of body coloration. A previous study (Gosliner *et al.*,

2008) described this species as having a dark red ground color. Specimen examined in the present study showed a light brown ground color with several chocolate brown patches on the body except on the sole.

Order Sacoglossa Ihering, 1876

Family Hermaeidae H. Adams & A. Adams, 1854

Genus *Aplysiopsis* Deshayes, 1853

***Aplysiopsis nigra* (Baba, 1949) (Fig. 2)**

Hermaeina nigra Baba, 1949: 15, text-fig. 22-23, 33-34, 130-131, pl. 8, fig. 24; Baba, 1959: 332.

Aplysiopsis nigra: Okutani, 2000: 763.

Materials examined. 1 individual, Seongsan-ri, Seongsan-eup, Seogwipo-si, Jeju-do, Korea, 29 April 2013 (D. Jung) (KOSPIV0000185830).

Description. Body aeolidiform; ground color black; body length about 23 mm and width 4 mm in preserved speci-

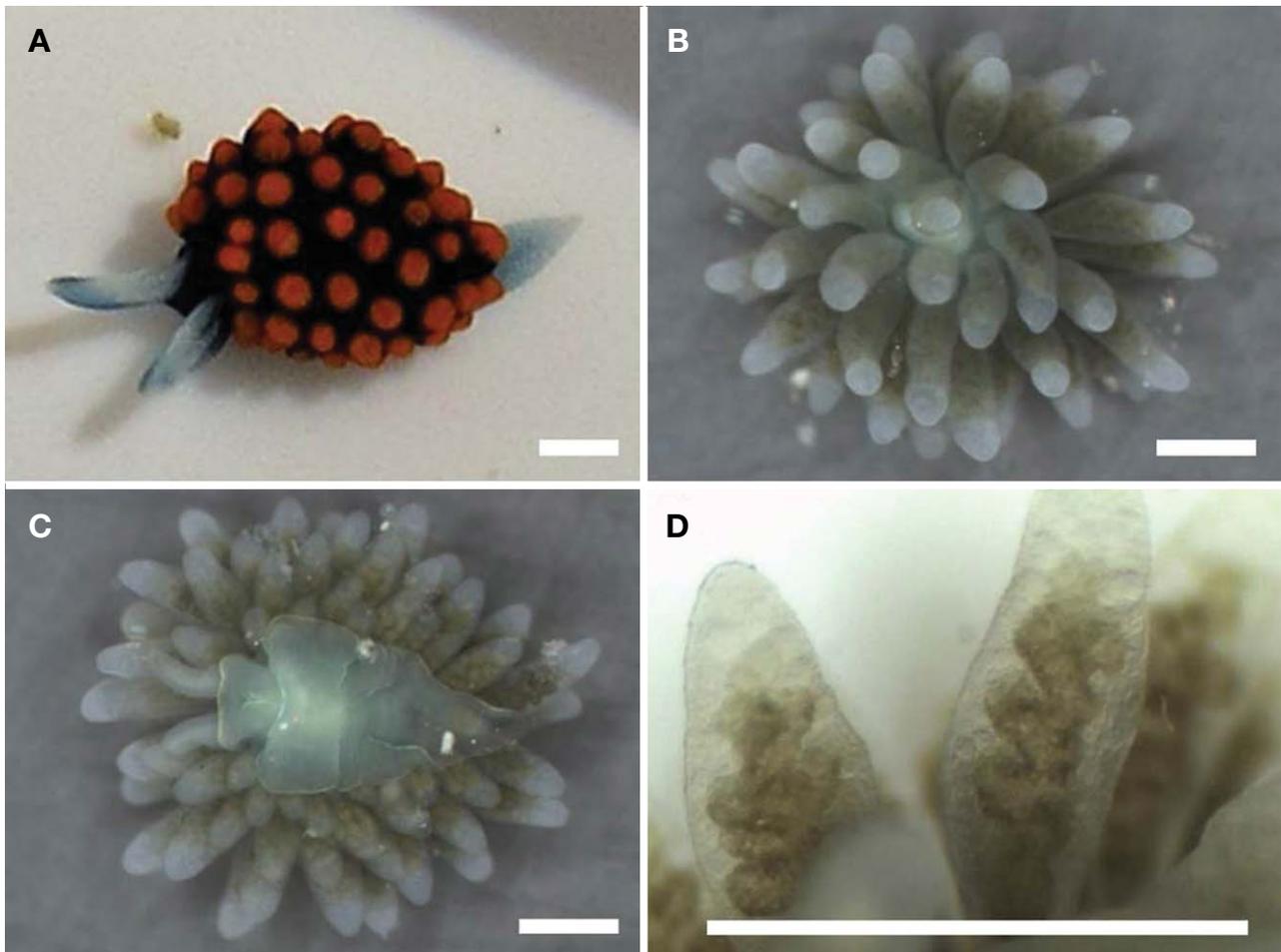


Fig. 3. *Stiliger aureomarginatus* Jensen, 1993. A. dorso-lateral view. B. dorsal view. C. ventral view. D. digestive gland in cerata. A. living animal. B-D. preserved specimen (body length: 5 mm, width: 1 mm). Scales=1 mm.

men. Rhinophore with a white patch reaching from its tip to its eye. Branchial papillae slightly fusiform, black; tips white to yellow, rounded end (Fig. 2A, B); inner surface convex with white veins (Fig. 2C); outer surface flat, veins absent; arranged in 25 rows, forming into 2-4 files. Oral tentacles digitiform, short; tips with yellowish white. Foot little wide anteriorly, posterior narrow; margin yellowish white; sole dark gray (Fig. 2D).

Distribution. Korea, Japan.

Family Limapontiidae Gray, 1847

Genus *Stiliger* Ehrenberg, 1828

***Stiliger aureomarginatus* Jensen, 1993 (Fig. 3)**

Stiliger aureomarginatus Jensen, 1993: 232-236, fig. 20-24; Jensen, 1997: 332.

Materials examined. 1 individual, Seogwi-dong, Seogwipo-si, Jeju-do, Korea, 1 April 2013 (D. Jung) (KOS-PIV0000185831).

Description. Body aeolidiform, very small; living animal 5 mm in length, 1 mm in width; ground color black. Head distinct from body. Rhinophores long and simple; sky blue with deeper in color to tip. Branchial papillae fusiform; numerous; black with orange tips in living animal; ramiform digestive gland appeared in only preserved specimen, not showed in living animal (Fig. 3C, D). Metapodium pointed end; sky blue with fade to posterior end. Oral tentacles absent.

Distribution. Korea, Japan, Australia.

Remarks. This species shows black or dark bluish-green body color with orange or yellow tips of cerata and a band of white dots with a light yellowish tinge below them (Jensen, 1993). Specimen examined here showed black body color and orange tips of cerata. However, it did not show a band of white dots below the ceratal tips.

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