

## First Record of *Laticauda semifasciata* (Reptilia: Squamata: Elapidae: Laticaudinae) from Korea

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### ABSTRACT

The Chinese sea snake *Laticauda semifasciata* (Reinwardt in Schlegel, 1837) is newly reported from Korean waters based on three specimens collected from Jeju Island, Korea, in August, September, and November 2015. This is the first time that the genus *Laticauda* and subfamily Laticaudinae has been reported from Korean waters. The subfamily Laticaudinae has ventrals that are four to five times wider than the adjacent dorsals, which are unlike the ventrals that are similar or up to two times wider than adjacent dorsals in the subfamily Hydrophiinae. *Laticauda semifasciata* is distinct from other species because it has three prefrontals and its rostrals are horizontally divided into two. As the result of this report, four species (*L. semifasciata*, *Hydrophis (Pelamis) platurus*, *Hydrophis cyanocinctus*, and *H. melanocephalus*) of sea snakes have been reported in Korean waters.

**Keywords:** sea snake, Hydrophiinae, Laticaudinae, Chinese sea snake, *Laticauda semifasciata*

### INTRODUCTION

Globally, 70 sea snakes (aquatic elapids) of 8 genera in the two subfamilies Hydrophiinae and Laticaudinae have been reported in the tropical and subtropical waters of the Indian Ocean and the Pacific Ocean from the east coast of Africa in the west to the Gulf of Panama in the east (David and Ineich, 1999; Rasmussen et al., 2011; Reptile Database, 2015). In East Asia, which includes Taiwan Province of China, Japan, China and Korea, 16 species (13 in Hydrophiinae and 3 in Laticaudinae) have been listed (Dunson, 1975; Kang and Yoon, 1975; Mao and Chen, 1980; Heatwole, 1987; Szyndlar and O, 1987; Zhao and Adler, 1993; Goris and Maeda, 2004).

In Korea, three sea snake species have been reported based on anecdotal capture cases and newspaper reports, and they are all within the Hydrophiinae subfamily (the Yellow-bellied sea snake *Hydrophis (Pelamis) platurus*, Slender-necked sea snake *Hydrophis melanocephalus* and Annulated sea snake *H. cyanocinctus*) (Kang and Yoon, 1975; Lee et al., 2003; Lee et al., 2013; Sanders et al., 2013). No one has undertaken a rigorous and well-documented classification of any sea snake species caught in Korean waters.

In this study, we report the Chinese sea snake *Laticauda*

*semifasciata* (Reinwardt in Schlegel, 1837) of the genus *Laticauda* and subfamily Laticaudinae for the first time in Korean waters based on the specimens collected in Jeju Island in 2015. In addition, we provide keys to the species of Korean sea snakes from the subfamilies Laticaudinae and Hydrophiinae.

The specimens were collected from Gangjeong-dong (33° 12'58.08"N, 126°29'19.23"E), Aewol-eup (33°27'54.2"N, 126°16'59.7"E) and Namwon-eup (33°15'10.00"N, 126°42'50.00"E), Seogwipo-si, Jeju-do by fishermen (Park YH, Ko YS, and Shin CY) on 26 Aug, 17 Sep and 3 Nov 2015, respectively, and they were transported to the Herpetology Laboratory of Kangwon National University. The snake from Aewol-eup died on 17 Oct 2015 of unknown causes during indoor captivity and the snake from Namwon-eup was sacrificed by the fisherman on the collecting site. They were collected, with one being preserved in 10% neutral formalin and the other in 95% EtOH before being deposited into the herpetological collection of the University (G470LS, G475LS in order). The snake from Gangjeong-dong is being kept in an indoor pool (4.5 m long, 2.2 m wide, 0.84 m high, and 8 cm water depth, G469LS). We measured the snout-vent length and tail length of the specimens using a tape ruler

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accurate to within 0.1 cm, and the body weights were measured using a digital balance (ELT 4001; Sartorius-Korea, Seoul, Korea) accurate to within 0.1 g. We classified the specimens following Mao and Chen (1980) and Rasmussen et al. (2011). Photographs used in this study were taken with a digital camera (EOS 600D; Canon, Tokyo, Japan), and the brightness and contrast of the photographs were adjusted in Photoshop (ver. 12.0).

## SYSTEMATIC ACCOUNTS

Order Squamata Oppel, 1811

Family Elapidae Boie, 1827

<sup>1\*</sup>Subfamily Laticaudinae Cope, 1879

<sup>2\*</sup>Genus *Laticauda* Laurenti, 1768

<sup>3\*</sup>*Laticauda semifasciata* (Reinwardt in Schlegel, 1837)

*Platurus semifasciatus* Reinwardt in Schlegel, 1837: 516.

*Platurus fasciatus* var. *semifasciata* Fischer, 1856: 30.

*Platurus fasciatus* var. *Hallowell*, 1860: 489.

*Laticauda semifasciata* Stejneger, 1907: 409; Mertens, 1930:

117; Maki, 1931: 176; Mao and Chen, 1980: 29; Mori,

1982: 80, 102, 123; Toriba, 1994: 207; Welch, 1994: 71;

Rasmussen et al., 2011: 1; Wang et al., 2013: 19.

*Pseudolaticauda semifasciata* Kharin, 1984: 128; 2005: 71;

Wallach et al., 2014: 592.

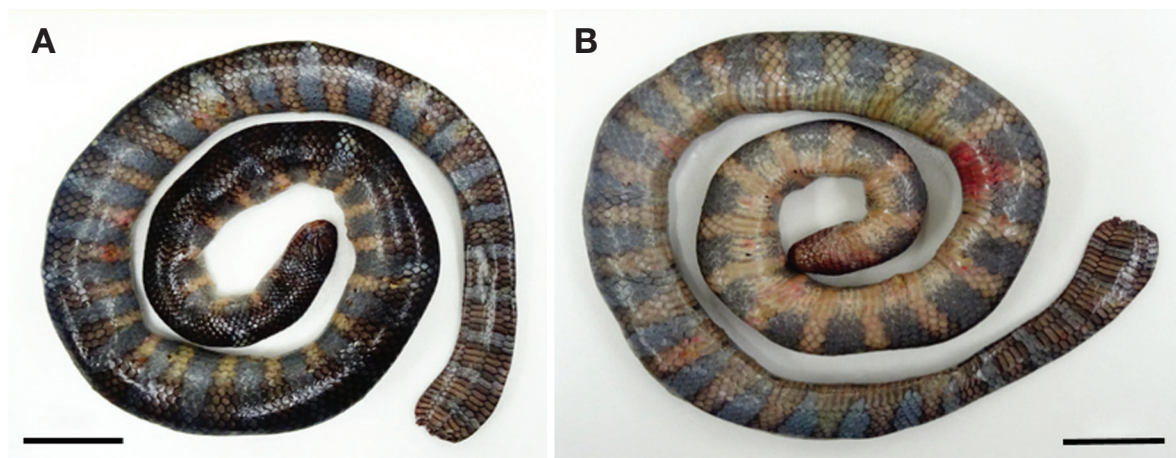
**Material examined.** 3 ♀, Korea: Jeju-do: Seogwipo-si, Gangjeong-dong, 26 Aug 2015, hand net on water surface, coll. Park YH (G469 LS); Seogwipo-si, Aewol-eup, 17 Sep

2015, hand net on water surface, coll. Ko YS (G470 LS); Seogwipo-si, Namwon-eup, 3 Nov 2015, hand net on water surface, coll. Shin CY (G475 LS).

**Description.** Ground body color pale blue (Fig. 1A), ventral color yellowish (Fig. 1B), upper lip color bluish-brown or pale-blue (Fig. 2A), stripe color light brown to gray (Fig. 1A, B). Stripes ‘V’ shaped (Fig. 1B), being broader dorsally and tapering toward the belly. 36, 34, and 37 stripes on body and 7, 6, and 6 on tail, respectively, in the Gangjeong, Aewol, and Namwon specimens. Rostrals horizontally divided into two, smaller upper scale lies between nasals (Fig. 2A), two internasals, three prefrontals, one frontals and two parietals (Fig. 1B), excepting in Namwon specimen, one of three prefrontals separated into two. Seven supralabials of which the 3rd and 4th touch the eye, one supraocular, one preocular and two postoculars and 2+3 temporals on each side of the head (Fig. 2C). One mental and 7 infralabials (Fig. 2D) excepting Gangjeong specimen six supralabials on the left side. 199, 202, and 199 ventrals; 35, 36, and 36 subcaudals; 2, 2, and 2 anals; 21, 23, and 23 dorsals on the neck; 21, 23, and 23 dorsals on mid-body; 21, 21, and 21 dorsals near anal opening; 78.7, 103.0, and 96.5 cm snout-vent length; 12.9, 13.8, and 12.8 cm tail length; and 841.2, 750.9, and 736.1 g body weight for the Gangjeong, Aewol and Namwon specimens, respectively.

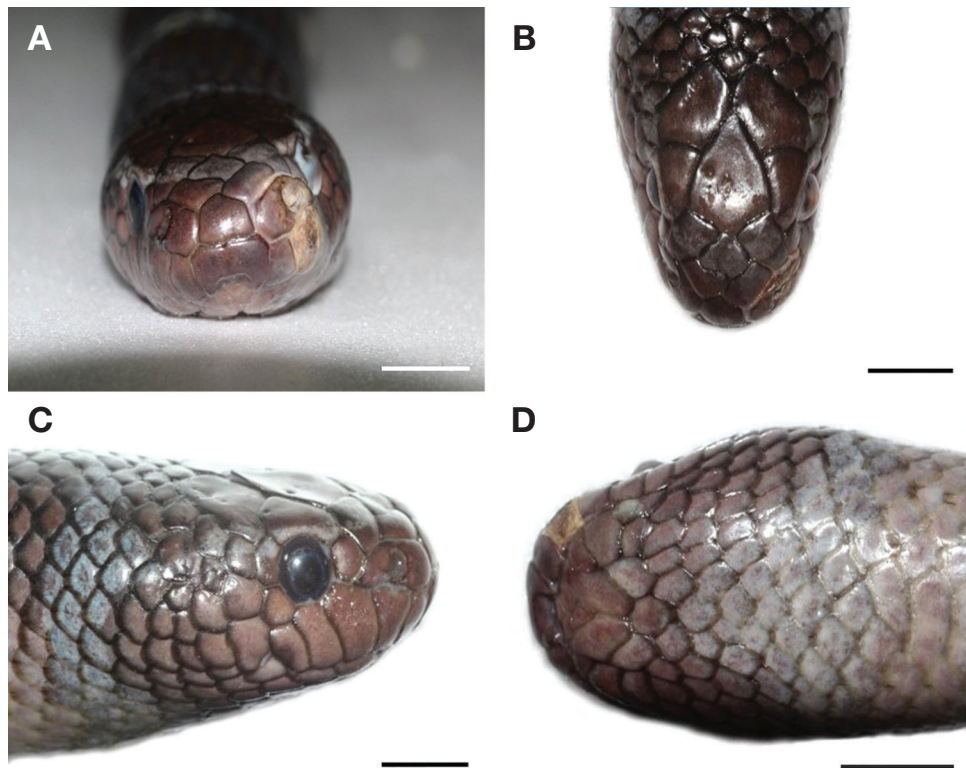
**Distribution.** Far East Maritime Reserve (Peter the Great Bay, Japan Sea), Yellow Sea, Japan (Ryukyu Islands), South Chinese Sea, Taiwan, Philippines, Indonesia (Mao and Chen, 1980; Zhao and Adler, 1993; Kharin and Czeblukov, 2006; Rasmussen et al., 2011).

**Remarks.** All sea snakes have a prominent vertically flatten-



**Fig. 1.** *Laticauda semifasciata* caught at Aewol-eup, Jeju Island, on 17 Sep 2015. The dorsal (A) and ventral (B) surfaces. Scale bars: A, B=5 cm.

Korean name: <sup>1\*</sup>큰바다뱀아과 (신칭), <sup>2\*</sup>큰바다뱀속 (신칭), <sup>3\*</sup>넓은띠큰바다뱀 (신칭)



**Fig. 2.** *Laticauda semifasciata* caught at Aewol-eup, Jeju Island, on 17 Sep 2015. The frontal (A), dorsal (B), lateral (C), and ventral (D) surfaces of the head. Scale bars: A–D = 1 cm

ed, paddle-like tail (Fig. 1A, B). Although the genus name, *Pseudolaticauda* has been introduced, *Laticauda* is still more widely accepted (Heatwole et al., 2005; Wang et al., 2013). Among the three Laticaudinae sea snake species (*L. colubrina*, *L. laticaudata*, and *L. semifasciata*) that have been listed in East Asia, only *L. semifasciata* has clearly divided rostral scales and evident ‘V’ shaped stripes on its body trunk (Mao and Chen, 1980; Rasmussen, 2000; Goris and Maeda, 2004; Heatwole et al., 2005; Rasmussen et al., 2011). The number of ventrals, head scales and body stripes is also within the range of *L. semifasciata* (Mao and Chen, 1980; Toriba, 1994; Rasmussen, 2000; Rasmussen et al., 2011). Unlike *L. semifasciata*, *L. colubrina* has a uniquely yellow to white upper lip (thus, the coining of its English name, yellow-lipped sea krait), uniform black cylindrical stripes on its body trunk and an undivided rostral scale (Rasmussen et al., 2011). *Laticauda laticaudata* also has uniform black cylindrical stripes on its body trunk and an undivided rostral scale with more than 215 ventral scales (Rasmussen et al., 2011). In addition, *L. laticaudata* has only two prefrontal scales unlike *L. semifasciata* and *L. colubrina* (Mao and Chen, 1980). Another sea snake species, which is closely related to *L. semifasciata*, *Laticauda schistorhynchus*, has

been observed on Niue Island, Tonga, and Samoa, 6,500 km east of the distribution range of *L. semifasciata*, but it has only 187–195 ventrals and 18–31 strips on the body, unlike *L. semifasciata* (McCarthy, 1986; Greer, 1997; Heatwole et al., 2005; Kharin and Czeblukov, 2006).

Our study is the first detailed description of any of the sea snakes in Korea and also the first capture report of Laticaudinae sea snakes from Korean waters, resulting in total four sea snake species listed in Korea. Considering that reports on sea snakes in Korea are very rare and global warming is continuing (Poloczanska et al., 2013), further updating of information on Korean sea snakes is strongly suggested. Accumulating more sea snake samples and analyzing their originalities using various molecular markers could elucidate if Laticaudinae sea snakes inhabits all the year round in Korean waters and also, might allow us to determine possible drift or immigrant routes of the sea snakes found in Korean waters.

#### Key to the species of Laticaudinae and Hydrophiinae in Korean waters

**Laticaudinae.** Ventrals much wider than adjacent dorsals, approximately 4 times as broad as long.

1. Rostral divided into two horizontally; three prefrontals ..... *Laticauda semifasciata*

**Hydrophiinae.** Small ventrals, each not more than twice as broad or similar to adjacent body scales.

1a. Head elongated and dorsoventrally slightly flattened; gap of mouth very wide; dorsal black and ventral yellowish; no cross bands or rings ..... *Hydrophis (Pelamis) platurus*

1b. Not as above ..... 2

2a. Head small; eye larger than preocular, one anterior temporal ..... *Hydrophis melanocephalus*

2b. Head moderate; eye not larger than preocular, two or three anterior temporals, interspaces between bands narrower than bands posteriorly, 50–77 bands ..... *Hydrophis cyanocinctus*

## ACKNOWLEDGMENTS

This research was supported by Basic Science Research Program through the National Research Foundation of Korea (NRF) funded by the Ministry of Education (2014R1A1A4 A01005302). Animal handling and experimental procedures were conducted in accordance with guidelines established by the Kangwon National University Institutional Animal Care and Use Committee.

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Received November 13, 2015  
Revised March 28, 2016  
Accepted March 31, 2016