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▣ BRIEF COMMUNICATION

Ozobranchus jantseanus (Clitellata: Ozobranchidae) from Reeve's Turtle, *Mauremys reevesii*: New Annelid Fauna in Korea

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Abstract: Turtle leeches have not been recorded in Korea, although they occur in geographically adjacent countries including China and Japan. This study describes a turtle leech, *Ozobranchus jantseanus* (Clitellata: Ozobranchidae), found from Reeve's turtle (*Mauremys reevesii*) in Korea. Of the 143 Reeve's turtles collected from the freshwater reservoir in Jinju City, Gyeongsangnam-do, Korea, 95 unidentified leeches were found in 8 (5.6%) individuals. The leeches had 22 somites with 11 pairs of externally exposed branchiae, body-sized posterior suckers, and spines on the dorsal surface. We identified these leeches as *Ozobranchus jantseanus* Oka, 1912 (Clitellata: Ozobranchidae). This species of turtle leeches found in Korea may fill the gap in the biodiversity of East Asian annulus.

Key words: *Ozobranchus jantseanus*, leech, freshwater turtle, Korea

A total of 7 species of turtle leeches in the genus *Ozobranchus* are distributed globally [1]. The first recorded *O. branchiatus* (Menzies 1791) and *O. margoi* (Apáthy, 1890) are representative turtle leeches that parasitize sea turtles. In addition, 4 species of leeches in freshwater turtles (*O. jantseanus* Oka, 1912; *O. shipleyi* Harding, 1909; *O. papillatus* Kaburaki, 1921; and *O. polybranchus* Sanjeeva Raj, 1951) and 1 species in crocodiles (*Ozobranchus quatrefagesi*) are recorded [2,3]. There are 4 species of turtle leeches found in Asia, which include *O. jantseanus* (hosts on freshwater turtles in East Asia), *O. shipleyi* (hosts on Nicoria trijuga, found in Sri Lanka, India, and Pakistan), *O. papillatus* (hosts on *Kachua tetum* in India), and *O. polybranchus* (hosts on *Pelochelys bibroni* in South and Southeast Asia) [3,4]. *O. jantseanus* parasitizes *Mauremys reevesii* (Gray, 1831), a freshwater turtle that thrives mainly in East Asia, including China, Korea, and Japan. Although no eggs of *O. jantseanus* were found, adult leeches have been recorded in 2 species of turtles, *M. japonica* (Temminck & Schlegel, 1838) and *Trachemys scripta elegans* (Wied, 1839) in Japan [5,6]. Since *M. reevesii* is a freshwater turtle native to Korea, geographically located between China and Japan, the discovery of *O. jantseanus* in Korea has been expected for a long time. In this study, we first report a species of turtle leech, *O. jantseanus* Oka, 1912 (Clitellata; Ozobranchidae) in Korea and describe their morphological characteristics.

From May 1 to June 31, 2021, a total of 143 *M. reevesii* were collected from Geumho Reservoir (35°12'35.14"N, 128°09'08.76"E, a.s.l, 37m) located in Jinju City, Gyeongsangnam-do, Korea. Unidentified leeches and eggs were found in 8 turtles (5.6%). We found 95 leeches with an average of 11.9±3.7 (mean±SD; 2-34 in range) per turtle (Fig. 1). Leeches were parasitic on the soft tissues between the carapace and the plastron of the turtle's armpits and groin (Fig. 1). We investigated the morphological characteristics of leeches, with the possibility of identifying species of the genus *Ozobranchus* [7]. The leeches were stored in 70% ethanol and then gradually relaxed with distilled water to observe external traits. A large sucker was exposed on the opposite side of the leech's head, which was hidden in a small sucker (Fig. 2). We examined the external traits of leeches larger than 1 mm with a dissecting microscope (Model 41, American Optical Corp., Buffalo, New York, USA). We found that the average number of somites was 21.9±0.6 (n=60; range, 18-22). The number of branched-branchiae exposed on both sides of the body was 11 pairs in 58 individuals, but 10 pairs in one individual (Fig. 3A). There were spines along the somites on the back of the leeches (Fig.

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3B). Leech eggs were found in a 5 turtles, which were anchored on the host's carapace in the form of a colony (Fig. 1). No leech eggs were found in the plastron. The samples are deposited in the laboratory of Ewha Animal Behavior in Ewha Womans University in Seoul, Korea.

The leeches were determined to be *O. jantseanus* in the genus *Ozobranchus* based on the following characters: 1) distribution in East Asia, 2) parasitism in freshwater turtles, 3) 11 pairs of external branched-branchiae, and 4) 22 somites on the body [1,3,8,9].

Leeches in the genus *Ozobranchus* mainly parasitize turtles, and *O. jantseanus* is specific to *M. reevesii* [1,10]. Since these species-specific parasites coexist interdependently over a long period of time, these issues may be an important topic for studying host-parasite coevolution [11,12].

O. jantseanus was found with *M. reevesii* in 1916 in Kyoto, Japan [10]. Since *M. reevesii* turtle is a species introduced to Japan, *O. jantseanus* might be introduced along with the turtle [13,14]. *O. jantseanus* has only been found in turtles living in China, but not in those in Korea, therefore, it is not known how it was introduced into Japan [8]. This study confirmed that *O. jantseanus* thrives in Korea. In the future, it will be possible to study the migration and spread of *M. reevesii* between continents and islands through genetic phylogenetic studies.

Although *M. reevesii* is an exotic species in Japan, it is quite widespread. Interestingly, the parasite *O. jantseanus* shows the same distribution pattern as that of the turtle host [6]. Since *M. reevesii* is distributed throughout Korea, *O. jantseanus* is expected to be found nationwide along with the host [15]. There are several interesting issues about the relationships between tur-

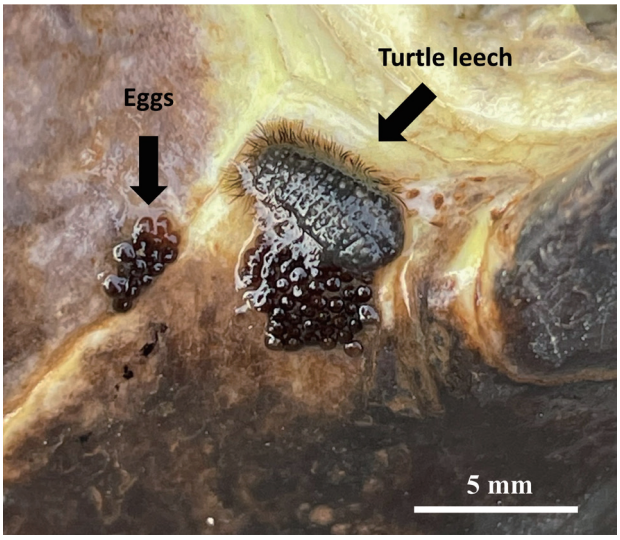

Fig. 1. A leech and eggs attached on the carapace of *Mauremys reevesii*.

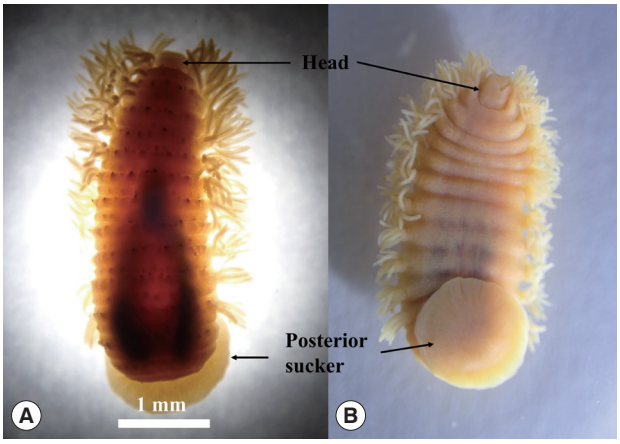

Fig. 2. Dorsal (A) and ventral (B) view of a leech under a dissecting microscope.

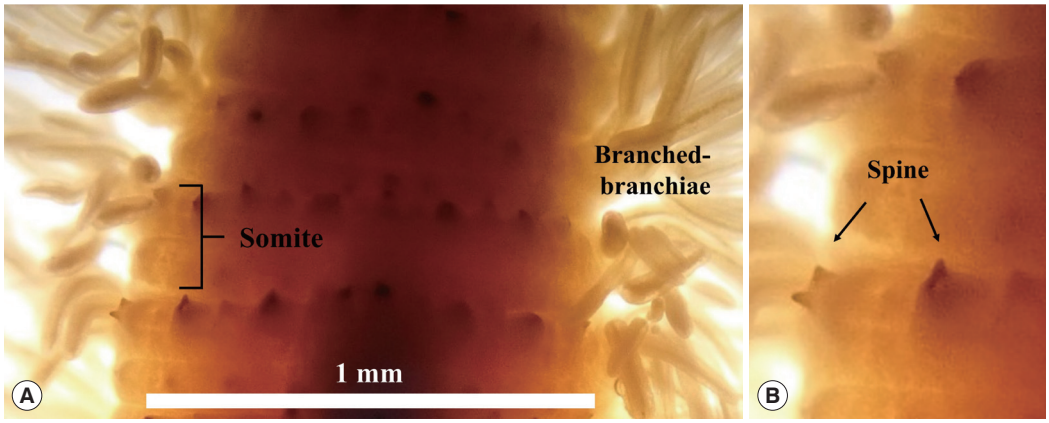

Fig. 3. (A) The body separated as somites and many branched-branchiae on the body side. (B) The spines are arranged horizontally on the dorsal surface.

tles and turtle leeches. The phylogeographic relationship should be first studied separately in the host and the parasite species, after which the evolutionary relationship between the host and parasite species should be examined. These studies will shed light on the coevolution of the turtles and turtle leeches.

In conclusion, our discovery is important for filling the turtle leech biodiversity gap in East Asia beyond documenting new species in Korea. It will further enable the subsequent investigations of the genus *Ozobranchus*, which is rarely studied despite its global distribution.

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CONFLICT OF INTEREST

The authors declare no conflict of interest related to this study.

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