

学位論文の要旨

論文題目 Taxonomic studies on monogeneans parasitic on cyprinids and alien freshwater fishes in Japan

(日本産コイ科魚類および外来魚に寄生する単生類の分類学的研究)

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The class Monogenea van Beneden, 1858 (Platyhelminthes) is commonly parasitic on or in aquatic or amphibious vertebrates, mainly fishes, but rarely on aquatic invertebrates. In Japan, 227 monogenean species have been reported from only about 169 species of fishes, 3 species of reptiles, 9 species of amphibians, and 3 species of invertebrates. Of these monogeneans, 76 nominal species have been reported from freshwater fishes, and most of these fishes are commercially important species and have been examined from the viewpoints of fish diseases.

This doctoral thesis deals with taxonomy of monogeneans from Japanese cyprinids and alien freshwater fishes in central Honshū to the Ryūkyū Islands, Japan, and 10 monogenean species are included. They are six introduced species [*Ligictaluridus pricei* (Mueller, 1936); *Unilatus unilatus* Mizelle and Kritsky, 1967; *Unilatus brittani* Mizelle, Kritsky, and Crane, 1968; *Trinigyrus peregrinus* Nitta and Nagasawa, 2016; *Heteropriapulius heterotylus* (Jogunoori, Kritsky and Venkatanarasaiah, 2004); *Salsuginus seculus* (Mizelle and Arcadi, 1945)] and four native species [*Dactylogyrus squameus* Gussev, 1955; *Bivaginogyrus obscurus* (Gussev, 1955); *Ancyrocephalus pseudorasbora* Achmerow, 1952; *Dactylogyrus bicorniculus* Nitta and Nagasawa, 2016], containing one endemic species (*D. bicorniculus*).

Dactylogyrus squameus, *Bivaginogyrus obscurus* and *Ancyrocephalus pseudorasbora* were collected from the gills of topmouth gudgeon *Pseudorasbora parva* (Temminck and Schlegel, 1846) and shinai topmouth gudgeon *Pseudorasbora pumila* Miyadi, 1930 in Ibaraki, Nagano, Okayama, Tottori and Saga prefectures. *Dactylogyrus squameus* and *B. obscurus* are known as alien parasites in Europe, and all of the three monogeneans found in this study are considered to be native to Japan. However, they might have become established outside of their original range on these fishes in Japan as domestic alien parasites.

Dactylogyrus bicorniculus is described from the gills of kazetoge bittering *Rhodeus atremius atremius* (Jordan and Thompson, 1914), an endemic species in Japan, from Saga Prefecture, northern Kyūshū. A phylogenetic analysis of 28S rDNA shows that *D. bicorniculus* is a basal species with the T-shaped ventral bar in the genus. This species has strict host-specificity to *R. a. atremius*, one of the endangered freshwater fishes in Japan, and may face the danger of co-extinction with its host.

The alien monogenean *Ligictaluridus pricei* (Mueller, 1936) from the gills of channel catfish *Ictalurus punctatus* (Rafinesque, 1818), is described from Lake Kasumigaura, Ibaraki Prefecture, central Honshū. This monogenean is native to North America and is known as an introduced parasite in Eurasia. As it is not strictly host-specific to ictalurids, native freshwater fishes in Japan have a risk of infection by this monogenean species.

Four alien monogeneans, *Unilatus unilatus*, *U. brittani*, *Trinigyrus peregrinus*, and *Heteropriapulid heterotylus*, were collected from the gills of vermiculated sailfin catfish *Pterygoplichthys disjunctivus* (Weber, 1991) in inland waters of Okinawa-jima island, Okinawa Prefecture. These monogeneans are all considered to be native to South America and to have been co-introduced with the host fish into the inland waters of the island by release of ornamental pet fish.

Salsuginus seculus (Mizelle and Arcadi, 1945) was found infecting the gills of mosquitofish *Gambusia affinis* (Baird and Girard, 1853) from Okinawa, Aichi, Tokushima, and Kyōto prefectures. This parasite was most likely introduced along with mosquitofish from Texas (USA) through Hawaii and Taiwan into Japan in the late 1910s. It appears to have low salinity tolerance.

A number of freshwater fishes occur as endemic and have been currently listed in the Red Data Book in Japan, where endemic monogeneans also may occur. Extinction and sudden decrease of wild hosts and alteration of local ecosystems have been suggested to cause co-extinction of their parasites, and host-specific monogeneans may be under the same situation. The parasite fauna of Japanese endemic fishes is poorly understood. Moreover, despite the fact that some of them are regarded as endangered, only 10 monogenean species have been reported from such fishes. One species of Japanese freshwater fish is estimated to harbor 1.3–1.8 species of monogenean. As about 500 species of freshwater fish occur, 650–900 monogenean species may be found in Japanese inland waters. It is highly desirable to clarify the parasite fauna of the freshwater fishes being on the verge of co-extinction and to conserve biological diversity including the parasitic species in Japan.

Based on the previous and present studies, a total of 31 nominal species of monogeneans have been described in Okinawa Prefecture, the Ryūkyū Islands, southern Japan. Subtropical fishes have been suggested to shift their distribution northward to the Japanese main islands with global warming, and research on the monogeneans should be more intensively conducted in southern Japan to monitor their distributional change. Eight species of monogeneans have been identified to species level from freshwater fishes in Okinawa Prefecture, but all of them are alien species. About 20 species of ornamental fishes have been recorded from the inland waters of Okinawa-jima island, and it is most likely that ornamental fish trade is one of the major invasion routes of alien fish monogeneans to Okinawa Prefecture. As about 500 fish species occur in the inland waters of Okinawa Prefecture, more study is needed to clarify the monogenean fauna of the fresh- and brackish-water fishes of the prefecture.

Several reports have described high negative impacts of alien monogeneans on certain wild fishes, and dramatic decreases in wild fish stocks due to heavy and uncontrolled infections by introduced monogeneans are known. In addition, the monogeneans can establish more readily together with their hosts than other groups of parasites because of their simple life cycle. There are several comprehensive studies on the monogenean fauna of introduced fishes in terms of dangerousness of alien parasites. Based on this and previous studies, 15 species of alien monogeneans have been reported from nine species of introduced freshwater fishes in Japan. In Japan, there are records of about 50 species of introduced fishes from other countries, and almost all of those introduced live fishes are considered to bring foreign monogeneans to Japanese waters. Therefore, the equivalent or more number of species of monogeneans may have already established in Japan. Moreover, no information is available about parasites of Japanese domestic alien fishes. The risk of introduced monogeneans is poorly understood in Japan, and it is necessary to clarify the monogenean fauna of such domestic alien fishes to take necessary actions.