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▣ BRIEF COMMUNICATION

# Surveys of *Gynaecotyla squatarolae* and *Microphallus koreana* (Digenea: Microphallidae) Metacercariae in Two Species of Estuarine Crabs in Western Coastal Areas, Korea

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**Abstract:** To figure out the geographical distribution of *Gynaecotyla squatarolae* and *Microphallus koreana* metacercariae in Korea, shore crabs of southwestern coastal areas were examined. Eight coastal areas in Inchon-si (A), Gyeonggi-do (B), Chungcheongnam-do (C, D, and E), Jeollabuk-do (F), and Jeollanam-do (G and H) were selected, and 2 kinds of crabs, *Macrophthalmus dilatatus* and/or *Macrophthalmus japonicus*, were caught. After transportation to the laboratory, 15 crabs per each group were grouped and ground in a mortar and pestle, and examined for microphallid metacercariae. In *M. dilatatus*, *G. squatarolae* metacercariae were recovered from 3 (C, E, and H) out of 6 regions, but *M. koreana* metacercariae were not recovered. In the case of *M. japonicus, G. squatarolae* metacercariae were recovered from 6 (B, D, E, F, G, and H) of 7 areas surveyed, and *M. koreana* matacercariae were detected from 5 regions (A, B, D, F, and H). These results indicate that the life cycle of *G. squatarolae* is maintained in the western coastal areas using *M. dilatatus* and *M. japonicus* as intermediate hosts, while that of *M. koreana* is maintained only using *M. japonicus*.

Key words: *Gynaecotyla squatarolae*, *Microphallus koreana*, shore crab, *Macropthalmus japonicus*, *Macrophthalmus dilatatus*, epidemiological survey

*Gynaecotyla squatarolae* (Digenea: Microphallidae) was originally discovered in the small intestine of birds [1], and the second intermediate host is known to be the shore crab, *Macrophathalmus japonicus* and *Macrophthalmus dilatatus* in Japan [2]. In the Republic of Korea, the metacercariae of *G. squatarolae* were discovered from the shore crab, *M. dilatatus* in Taean-eup, Chungcheongnam-do [3], but the investigation on *M. japonicus* has not been performed yet. In addition, the ruddy turnstone, *Arenaria interpres interpres*, a migratory Korean bird, was proved to be a natural definitive host for *G. squatarolae* [4]. Considering that the ruddy turnstone was found at the seashore of Gunsan-si, Jeollabuk-do, a survey on the western coastal areas was needed.

*Microphallus koreana* is also a kind of microphallid, described as a new species in Korea [5]. As in *G. squatarolae*, the crabs, *M. dilatatus*, are known to play a role in maintaining the life cycle of *M. koreana*, but the prevalence and infection density along the coastal areas has not been studied yet. The present study was performed to understand the geographical distribution of *G. squatarolae* and *M. koreana* by examining 2 species of estuarine crabs, *M. dilatatus* and *M. japonicus*, according to the localities.

A total of 8 areas along the western coasts of Korea were selected: Ganghwa-eup, Incheon-si (A), Jebu-ri Seosin-myeon Hwaseong-si, Gyeonggi-do (B), Mageum-ri Geunheung-myeon Taean-gun, Chungcheongnam-do (C), a market of Seosan-si Dongnam-dong, Chungcheongnam-do (D), Namdang-ri Seobu-myeon Hongseong-gun, Chungcheongnam-do (E), Sangdeung-ri Gyehwa-myeon, Buan-gun, Jeollabuk-do (F), Hasa-ri, Baeksu-eup Yeonggwang-gun, Jeollanam-do (G), Sinjang-ri, Aphae-myeon, Sinan-gun, Jeollanam-do (H). These areas were indicated in Fig. 1.

The crabs, *M. japonicus* and *M. dilatatus*, were collected at the areas described above by using a scoop. Along with the collection by scoop, the crabs of Seosan-si, Chungcheongnam-do, were bought in the Seosan market. After transportation to the laboratory, the hepatopancreas of each crab was separated, ground in a mortar with pestle, and filtered through a series of nets. Then, the presence of microphallid metacercariae was investigated under a stereomicroscopy. If metacercariae were present, the number of metacercariae per crab was counted. Each group was consisted of 15 crabs.

In *M. dilatatus* crabs, *G. squatarolae* metacercariae were recov-

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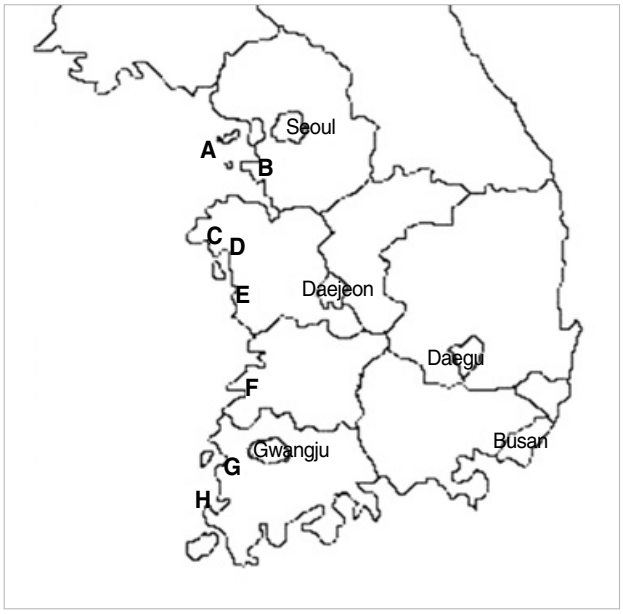


Fig. 1. Map showing the areas (A-H) where the crabs were collected and examined for *Gynaecotyla squatarolae* and *Microphallus koreana* metacercariae.

ered from C, E, and H out of 6 areas, and the highest density was recorded in H (79.1) (Table 1). All the crabs were infected with *G. squatarolae* in H, whereas the infection rate was 86.7% in C. The infection density was the highest in H, followed by E (44.3) (Table 1). However, metacercariae of *Microphallus koreana* were not recovered from *M. dilatatus* in the surveyed areas. A lot of metacercariae of unknown trematodes were recovered, but their identification is still underway.

In the case of *M. japonicus*, all the surveyed areas except A had *G. squatarolae* metacercariae (Table 2). Crabs from D had the highest prevalence (87.7%), whereas the number of metacercariae was the highest in crabs from H, followed by those from D. In the remaining areas positive for *G. squatarolae*, the prevalence ranged from 20% to 80%, and the number of metacercariae was less than 5.0 per crab (Table 2). Five out of 7 areas were positive for *M. koreana* metacercariae, and the prevalence was from 6.7% in A to 80% in D. The infection density was less than 10 per crab, and the highest number was recorded in F, followed by D. Undetermined metacercariae were also recovered from *M. japonicus*.

Our results suggested that *G. squatarolae* and *M. koreana* are distributed widely along the southwestern coastal areas of Korea. The crabs of Sinjang-ri, Shinan-gun, Jeollanam-do, was proved to be heavily infected with *G. squatarolae*. This Sinjang-ri area, Shinan-gun, is known to be the endemic area of *Gymnophalloides seoi*, a human infecting gymnophallid transmitted by oysters [6], and an avian host, the Paleartic oystercatcher, was proved to be a natural definitive host [7]. Microphallids have also been known as parasites of birds; for example, *Microphallus sabanensis* was collected from the wild birds of Venezuela [8], and *Maritrema novaezealandensis* was found from the red-billed gulls of New Zealand [9]. In addition, adult worms of *G. squatarolae* were collected from the intestine of the ruddy turnstone, a migratory bird of Korea [4]. Since the natural definitive host of *M. koreana* is not discovered yet, special attention should be paid to shore birds for the study of microphallids.

According to our previous researches [3,5], both *G. squatarolae* and *M. koreana* metacercariae were recovered from *M. dilatatus* purchased at a market of Seosan-si, Chungcheongnam-do, and the infection density was 4.3 per crab for *G. squatarolae* and 4.7 per crab for *M. koreana*. However, in the present study, *M. koreana* metacercariae were found only in *M. japonicus*, but not in *M. dilatatus*. Environmental changes, such as the oil outflow accident in Taean-gun, Chungcheongnam-do in 2007, might have changed the geographical distribution of larval trematodes. However, it may be reasonable to regard that *M. japonicus* is a more important intermediate host for *M. koreana* than *M. dilatatus* nowadays in Korea. More studies on microphallids are needed to elucidate this point.

Table 1. Number of metacercariae recovered from *M. dilatatus*

| | *G. squatarolae* | *M. koreana* | Unknown |
|---|---|---|---|
| Ganghwa-eup (A) | 0 | 0 | 0 |
| Jebu-ri (B) | 0 | 0 | 160.7 (5-898) |
| Mageum-ri (C) | 5.3 (1-16) | 0 | 145.6 (45-325) |
| Namdang-ri (E) | 44.3 (2-355) | 0 | 25.0 (5-96) |
| Sangdeung-ri (F) | 0 | 0 | 0 |
| Sinjang-ri (H) | 79.1 (6-510) | 0 | 241.9 (61-721) |

[a]The number of examined crabs were 15 per each site.

Table 2. Number of metacercariae recovered from *M. japonicus*

| Area surveyed | *G. squatarolae* | *M. koreana* | Unknown |
|---|---|---|---|
| Ganghwa-eup (A) | 0 | 0.1 (2) | 0 |
| Jebu-ri (B) | 4.8 (1-13) | 3.0 (1-24) | 1.1 (1-4) |
| A market, Seosan-si (D) | 11.5 (1-36) | 7.5 (1-53) | 1.5 (1-9) |
| Namdang-ri (E) | 2.7 (1-23) | 0 | 6.8 (1-72) |
| Sangdeung-ri (F) | 7.8 (2-20) | 0.9 (2-9) | 0.2 (1-2) |
| Hasa-ri (G) | 1.8 (1-27) | 0 | 1.4 (2-19) |
| Sinjang-ri (H) | 17.6 (4-76) | 1.8 (1-9) | 75.7 (3-216) |

[a]The number of examined crabs were 15 per each site.

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