

## Three Coitocoecid Trematodes (Digenea : Opecoelidae) from the Marine Fish of the Korean Southern Sea

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Three species of *Coitocoecum*, *C. orthorchis*, *C. latum* and *C. glandulosum* were found from the marine fish of the Korean southern sea. Among them, *C. latum* and *C. glandulosum* were reported for the first time in Korea, and *Acanthopagrus schlegeli* was recorded as a new host species for *C. glandulosum*. Two species, *C. acanthogobium* and *C. koreanum*, reported by Park (1939) were treated as synonyms of *C. orthorchis*.

**Key words:** *Coitocoecum orthorchis*, *C. latum*, *C. glandulosum*, Digenea, Marine fish

The genus *Coitocoecum* was erected by Nicoll (1915) to accommodate a new species, *Coitocoecum gymnophallum*. Later, Ozaki (1926 & 1929) and Yamaguti (1934, 1940 & 1942) reported 9 new species of *Coitocoecum* from freshwater and marine fish in Japan. In Korea, *C. acanthogobium* and *C. koreanum* were reported as new species by Park (1939) from the alimentary canal of *Acanthogobius hasta*.

In the present study, we found three species of *Coitocoecum*, *C. orthorchis*, *C. latum* and *C. glandulosum*, from the marine fish of the Korean southern sea. Among them, *C. latum* and *C. glandulosum* were reported for the first time in Korea, and *Acanthopagrus schlegeli* was recorded as a new host species for *C. glandulosum*.

### Materials and Methods

Marine fish were collected using a small trawl from the Kwang-yang Bay and the Chinhae Bay during the period from 1996 through 1998. Living

worms were fixed in hot AFA (ethanol-formalin-acetic acid), stored in 70% ethanol, and stained with acetocarmine in the routine preparation of whole mounts. Specimens were measured with an ocular micrometer, and were drawn with the aid of a camera lucida. Measurements, unless otherwise stated, are in millimeters.

### Results

***Coitocoecum orthorchis* Ozaki, 1926** (Fig. 1)

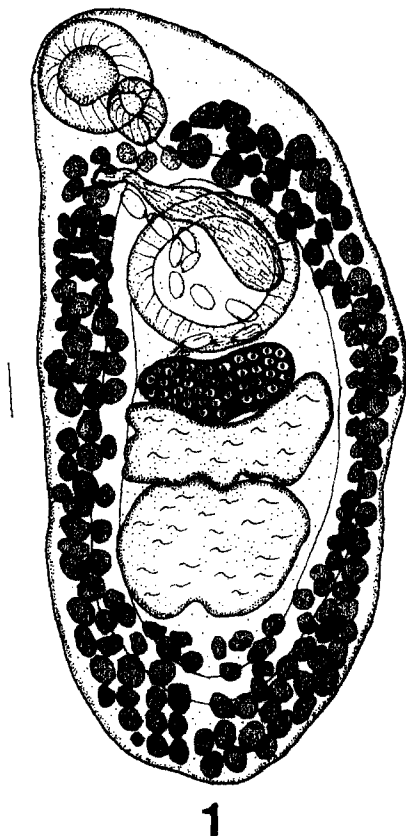
Synonym: *Coitocaecum orthorchis*: Ozaki, 1926

*Coitocaecum acanthogobium* Park, 1939

*Coitocaecum koreanum* Park, 1939

The description is based on 5 mature specimens. Each value is the mean with the range in parentheses. Body elongated oval, 1.49 (1.34-1.68) long by 0.56 (0.42-0.72) in maximum width. Tegument smooth. Oral sucker subterminal, 0.15 (0.12-0.17) long by 0.17 (0.14-0.20) wide. Ventral sucker pre-equatorial, 0.26 (0.21-0.28) long by 0.30 (0.25-0.33) wide. Ratio of mean diameters of oral and ventral suckers 1 : 1.74

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**Fig. 1.** *Coitocoecum orthorchis* (Ozaki, 1926) from the intestine of *Acanthogobius flavimanus*. Whole mount, dorsal view. Bar scale: 0.1 mm.

(1: 1.69-1.77). Prepharynx short. Pharynx well developed, 0.11 (0.06-0.14) long by 0.10 (0.09-0.11) wide. Ratio of mean diameters of oral sucker and pharynx 1:0.65 (1:0.58-0.76). Intestinal caeca simple, united at the posterior body region.

Testes tandem, in posterior intercaecal region, entire or irregularly indented; anterior testis 0.15 (0.13-0.18) long by 0.32 (0.22-0.43) wide; posterior testis 0.20 (0.16-0.25) long by 0.29 (0.18-0.41) wide. Cirrus sac small, surrounds only the terminal part of male genitalia. External seminal vesicle sinuous or tubular, extending to midlevel or to posterior border of ventral sucker. Genital pore submedian, to left of pharynx.

Ovary transversely oval, entire or irregularly indented, adjacent to anterior testis, 0.12 (0.10-0.14)

long by 0.25 (0.21-0.33) wide. True seminal receptacle not present. Initial portion of uterus serve as uterine seminal receptacle. Laurer's canal arise from right end of uterine seminal receptacle passing downward to median region of ovary, opening dorsally. Ootype complex anterior to ovary. Vitelline follicles extending from posterior or lateral margin of pharynx to posterior extremity of body, embracing caeca. Uterus extending to anterior border of ovary. Eggs oval, 80.8  $\mu\text{m}$  (70-88  $\mu\text{m}$ ) long by 41.5  $\mu\text{m}$  (35-48  $\mu\text{m}$ ) wide.

Host: *Acanthogobius flavimanus*

Locality: The Kwang-yang Bay (Oct. 12, 1996; Dec. 19, 1996), The Chinhae Bay (Jan. 22, 1988)

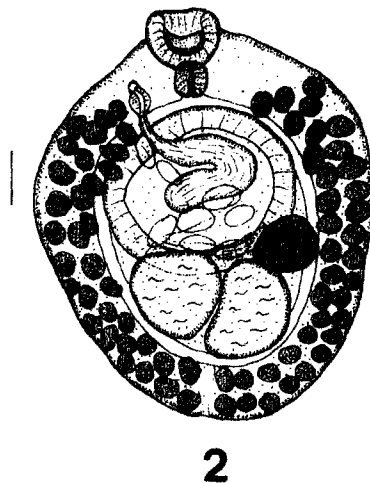
Location in host: Intestine

Specimens deposition: PKNU (Pukyong National University) Helminth Collection

***Coitocoecum latum* Ozaki, 1929 (Fig. 2)**

Synonym: *Coitocaecum latum*: Ozaki, 1929

The description is based on 3 mature specimens. Body round, 0.64 (0.56-0.75) long by 0.51 (0.46-



**Fig. 2.** *Coitocoecum latum* (Ozaki, 1929) from the intestine of *Ditrema temmincki*. Whole mount, dorsal view. Bar scale: 0.1 mm.

0.59) in maximum width. Tegument smooth. Oral sucker subterminal, 0.09 (0.08-0.10) long by 0.09 (0.07-0.11) wide. Ventral sucker large, central of body, 0.24 (0.20-0.30) long by 0.27 (0.21-0.35) wide. Ratio of mean diameters of oral and ventral suckers 1:2.82 (1:2.16-3.20). Prepharynx short. Pharynx well developed, 0.08 (0.07-0.09) long by 0.07 (0.06-0.08) wide. Ratio of mean diameters of oral sucker and pharynx 1:0.76 (1:0.67-0.87). Intestinal caeca simple, united at the posterior body region.

Testes symmetrical or slightly oblique, in posterior intercaecal region, entire and oval; left testis 0.13 (0.12-0.15) long by 0.12 (0.09-0.17) wide; right testis 0.15 (0.12-0.18) long by 0.12 (0.11-0.13) wide. Cirrus sac small, surrounds only the terminal part of male genitalia. External seminal vesicle sinuous, extending to midlevel of ventral sucker. Genital pore submedian, to left of pharynx.

Ovary oval, entire, adjacent to anterior border of right testis, 0.08 (0.05-0.10) long by 0.08 (0.06-0.11) wide. True seminal receptacle not present. Initial portion of uterus serve as uterine seminal receptacle. Ootype complex left to ovary. Vitelline follicles extending from posterior level of pharynx to posterior extremity of body, embracing caeca. Uterus extending to anterior border of testes. Eggs oval, 62.7  $\mu\text{m}$  (60-65  $\mu\text{m}$ ) long by 35  $\mu\text{m}$  (33-38  $\mu\text{m}$ ) wide.

Host: *Ditrema temmincki*

Locality: The Chinhae Bay (Jan. 22, 1988)

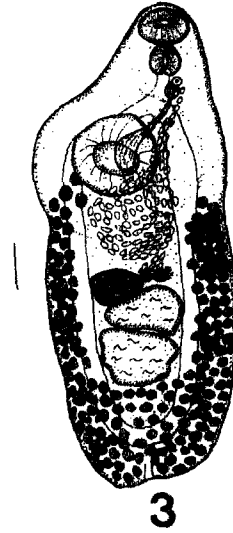
Location in host: Intestine

Specimens deposition: PKNU (Pukyong National University) Helminth Collection

***Coitocoecum glandulosum* Yamaguti, 1934 (Fig. 3)**

Synonym: *Coitocaecum glandulosum*: Yamaguti, 1934

The description is based on 2 mature specimens. Body elongated oval, 2.14 (2.12-2.16) long by 0.84 (0.83-0.85) in maximum width. Tegument smooth. Oral sucker subterminal, 0.17 (0.14-0.19) long by



**Fig. 3.** *Coitocoecum glandulosum* (Yamaguti, 1934) from the intestine of *Acanthopagrus schlegeli*. Whole mount, ventral view. Bar scale: 0.2 mm.

0.22 (0.21-0.23) wide. Ventral sucker pre-equatorial, prominent, elevated by larger surrounding non-muscular disc, 0.36 (0.34-0.37) long by 0.41 (0.38-0.44) wide. Ratio of mean diameters of oral and ventral suckers 1:2.00 (1:1.93-2.06). Prepharynx short, 0.05-0.06 long. Pharynx well developed, 0.16 (0.13-0.18) long by 0.16 wide. Ratio of mean diameters of oral sucker and pharynx 1:0.82 (1:0.81-0.83). Intestinal caeca simple, united at the posterior body region.

Testes tandem, in posterior intercaecal region, transversely oval, entire or slightly indented; anterior testis 0.24 (0.22-0.25) long by 0.36 (0.35-0.37) wide; posterior testis 0.25 (0.24-0.25) long by 0.37 (0.35-0.38) wide. Cirrus sac small, surrounds only the terminal part of male genitalia. External seminal vesicle sinuous, extending to midlevel of ventral sucker. Genital pore submedian, to left of pharynx.

Ovary transversely oval, entire, adjacent to anterior testis, slightly right to median line of body, 0.16 (0.15-0.16) long by 0.27 (0.24-0.29) wide. True seminal receptacle not present. Initial portion of uterus serve as uterine seminal receptacle. Ootype complex anterior to ovary. Vitelline follicles extending from

posterior margin of ventral sucker to posterior extremity of body, embracing caeca. Uterus extending to anterior border of ovary. Eggs oval, 64  $\mu\text{m}$  (63-65  $\mu\text{m}$ ) long by 39  $\mu\text{m}$  (38-41  $\mu\text{m}$ ) wide.

Host: *Acanthopagrus schlegeli*

Locality: The Kwang-yang Bay (Oct. 19, 1996)

Location in host: Intestine

Specimens deposition: PKNU (Pukyong National University) Helminth Collection

### Discussion

According to Nicoll's (1915) original description, *Coitocoecum gymnophallum*, the type species of *Coitocoecum*, does not have the cirrus pouch. However, Ozaki (1926 & 1929) reported five new species in the genus *Coitocoecum*, and observed the presence of a small cirrus pouch. Later, Yamaguti (1934) mentioned that Nicoll (1915) had probably mistaken in stating absence of cirrus pouch. Furthermore Crowcroft (1951) proved the presence of a small membranous cirrus pouch enclosing a short terminal por-

tion of the male duct from *C. gymnophallum*. Therefore, it is clear that the genus *Coitocoecum* has the cirrus pouch.

Ozaki (1926, 1929) first described *C. orthorthis* from the intestine of *Tridentiger obscurus* in Japan. Later, Park (1939) reported 2 new species, *C. acanthogobium* and *C. koreanum*, from the alimentary canal of *Acanthogobius hasta* in North Korea. Park (1939) described that *C. acanthogobium* resembled to *C. plagiorthis* Ozaki, 1926, and distinguished these two species from the other species of *Coitocoecum* by the distribution pattern of the vitellaria, which were confluent at both body end regions. However, the other species of *Coitocoecum*, except *C. gymnophallum*, *C. glandulosum* and *C. callyodontis*, have similar distribution pattern of the vitellaria with *C. acanthogobium* and *C. plagiorthis*. Furthermore, the original description and figures of *C. acanthogobium* well coincided with those of *C. orthorthis* except the size of eggs (Table 1). The sizes of eggs in our specimens were so variable that we regarded them as an inadequate character for distinguishing *C. acanthogobium* from *C. orthorthis*. Therefore, we treated *C. acanthogobium* as the

**Table 1.** Dimensions<sup>a)</sup> of *Coitocoecum orthorthis* from the intestine of *Acanthogobius flavimanus* in Korea and comparison with those of previous reports

Characters	<i>C. acanthogobium</i> Park (1939)	<i>C. koreanum</i> Park (1939)	<i>C. orthorthis</i> Ozaki (1929)	<i>C. orthorthis</i> (Present study)
Body	1.42-1.74 × 0.42-0.54	1.57 × 0.61	1.15-2.03 × 0.29-0.55	1.34-1.68 × 0.42-0.72
Oral sucker (Os)	0.148-0.179 × 0.137-0.168	0.196 × 0.204	0.15-0.18 in diameter	0.12-0.17 × 0.14-0.20
Ventral sucker (Vs)	0.196-0.260 × 0.213-0.277	0.235 × 0.298	0.17-0.24 × 0.19-0.22	0.21-0.28 × 0.25-0.33
Os : Vs Ratio	1:1.50	1:1.33	1:1.31	1:1.69-1.77
Pharynx (Ph)	0.090 × 0.087-0.120	0.132 × 0.148	0.10 in diameter	0.06-0.14 × 0.09-0.11
Os : Ph Ratio	1:0.61	1:0.70	1:0.63	1:0.58-0.76
Anterior testis	0.138-0.208 × 0.208-0.277	0.156 × 0.294	0.19-0.33 in diameter	0.13-0.18 × 0.22-0.43
Posterior testis	0.190-0.235 × 0.208-0.277	0.190 × 0.277		0.16-0.25 × 0.18-0.41
Ovary	0.085 × 0.190	0.165 × 0.207	0.14-0.25 × 0.06-0.17	0.10-0.14 × 0.21-0.33
Anterior limit of vitellaria	posterior level of pharynx	level of caecal bifurcation	lateral level of pharynx	posterior or lateral level of pharynx
Eggs	0.076-0.090 × 0.028-0.039	0.064-0.070 × 0.031-0.036	0.058-0.078 × 0.040-0.045	0.070-0.088 × 0.035-0.048
Hosts	<i>Acanthogobius hasta</i>	<i>A. hasta</i>	<i>Tridentiger obscurus</i> and <i>A. flavimanus</i>	<i>A. flavimanus</i>
Locality	North Korea	North Korea	Japan	Korea

<sup>a)</sup> Length × width; Unit is mm

synonym of *C. orthorchis*. Park (1939) reported *C. koreanum* as a new species using only one specimen, and distinguished it from *C. orthorchis* by the distribution of vitellaria, the presence of pars prostatica and the larger pharynx. The vitellaria in our specimens extended to the sides of pharynx or caecal bifurcation according to the individuals, and the size of pharynx, also, was variable according to the specimens. Ozaki (1929) described that the distinct pars prostatica appeared to be absent in *C. orthorchis*.

However, considering the other species of *Coitocoecum* and the illustration of *C. orthorchis* by Ozaki (1929), it could be inferred that *C. orthorchis* had the pars prostatica in the cirrus pouch. Therefore we treated *C. koreanum* as the same species of *C. orthorchis*. Yamaguti (1958), also, considered *C. acanthogobium* and *C. koreanum* as the synonyms of *C. orthorchis*.

*C. latum* was first described by Ozaki (1929) from the intestine of *Ditrema temmincki* in Japan.

**Table 2.** Dimensions<sup>a)</sup> of *Coitocoecum latum* from the intestine of *Ditrema temmincki* in Korea and comparison with those of previous reports

Character	Ozaki (1929)	Yamaguti (1934)	Present study
Body	1.32×0.91	0.97-1.16 in length	0.56-0.75×0.46-0.59
Oral sucker (Os)	0.12 in diameter	0.095-0.120 in diameter	0.08-0.10×0.07-0.11
Ventral sucker (Vs)	0.44 in diameter	0.26-0.36 in diameter	0.20-0.30×0.21-0.35
Os : Vs Ratio	1:3.67	1:2.88	1:2.16-3.20
Pharynx (Ph)	0.08 in diameter	0.074-0.095 in diameter	0.06-0.08×0.06-0.08
Os : Ph Ratio	1:0.67	1:0.79	1:0.67-0.87
Left testis	0.20-0.22 in diameter	0.12-0.14×0.17-0.18	0.12-0.15×0.09-0.17
Right testis			0.12-0.18×0.11-0.13
Ovary	0.13×0.11	0.060-0.084×0.084-0.105	0.05-0.10×0.06-0.11
Eggs	0.055-0.060×0.038-0.042	0.058-0.066×0.037	0.060-0.065×0.033-0.038
Hosts	<i>Ditrema temmincki</i>	<i>D. temmincki</i>	<i>D. temmincki</i>
Locality	Japan	Japan	Korea

<sup>a)</sup> Length x width; Unit is mm

**Table 3.** Dimensions<sup>a)</sup> of *Coitocoecum glandulosum* from the intestine of *Acanthoparus schlegeli* in Korea, and comparison with those of *C. gymnophallum* and a previous report

Characters	<i>C. gymnophallum</i> (Nicoll, 1915)	<i>C. glandulosum</i> (Yamaguti, 1934)	<i>C. glandulosum</i> (Present study)
Body	3.0×1.0 in maximum	2.8-3.5 in length	2.12-2.16×0.83-0.85
Oral sucker (Os)	0.27×0.31	0.22-0.28 in diameter	0.14-0.19×0.21-0.23
Ventral sucker (Vs)	0.43×0.57	0.38-0.41×0.44-0.50	0.34-0.37×0.38-0.44
Os : Vs Ratio	1:1.72	1:1.73	1:1.93-2.06
Prepharynx length	0.10	0.05	0.05-0.06
Pharynx (Ph)	0.21 in diameter	0.18-0.20 in length	0.13-0.18×0.16
Os : Ph Ratio	1:0.72	1:0.76	1:0.81-0.83
Anterior testis	0.28×0.46	0.16-0.25×0.26-0.30	0.22-0.25×0.35-0.37
Posterior testis			0.24-0.25×0.35-0.38
Ovary	0.12×0.19	0.11-0.18×0.25-0.26	0.15-0.16×0.24-0.29
Eggs	0.081-0.084×0.042-0.043	0.063-0.070×0.039-0.042	0.063-0.065×0.038-0.041
Hosts	<i>Sparus australis</i>	<i>Epinephelus akkara</i> and <i>S. macrocephalus</i>	<i>Acanthoparus schlegeli</i>
Locality	Australia	Japan	Korea

<sup>a)</sup> Length × width; Unit is mm

This species differs from the other species of *Coitocoecum* by having a round body shape. Although the body sizes of our specimens were smaller than those of Ozaki's specimens (Table 2), the overall morphological characteristics were so similar that we identified them as *C. latum*.

*C. glandulosum* from the intestine of *Epinephelus akaara* and *Sparus macrocephalus* in Japan is very similar to *C. gymnophallum* from the intestine of *Sparus australis* in Australia. There appears to be no substantial morphological difference between the species and they have been recorded in closely related hosts although in widely separated geographical areas. Yamaguti (1934) compared the two species, and mentioned that the difference between the species was only egg size. Therefore, it can be surmised that *C. glandulosum* is a geographical subspecies of *C. gymnophallum*. To prove this fact, elaborate phylogenetic work should be conducted. So in the present paper, we treated *C. glandulosum* as a distinct species. The egg sizes of our specimens belonged to *C. glandulosum* rather than *C. gymnophallum* (Table 3).

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## 한국 남해안 해산어에 기생하는 결맹흡충(*Coitocoecum*) 속 흡충류 3종

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한국 남해안(평양만, 진해만)에 서식하는 해산어의 장에서 *Coitocoecum* 속 흡충류 3종을 발견하여 기재하였다. *C. orthorchis*는 문절망둑(*Acanthogobius flavimanus*)에, *C. latum*은 망상어(*Diurema temmincki*)에 그리고 *C. glandulosum*은 감성돔(*Acanthopagrus schlegeli*)의 장에 기생하고 있는 것으로 밝혀졌다. 이 중 *C. latum*과 *C. glandulosum*은 한국 미기록종이었으며, 감성돔은 *C. glandulosum*의 새로운 종숙주로 밝혀졌다. 또한 *C. acanthogobium*과 *C. koreanum*은 *C. orthorchis*의 동종이명으로 분류하였다.

*Key words:* *Coitocoecum orthorchis*, *C. latum*, *C. glandulosum*, Digenea, Marine fish