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A Study on the Parasitic Helminths of Domestic Duck (*Anas platyrhynchos* var. *domestica* Linnaeus) in Korea

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INTRODUCTION

In Korea, Issiki (1934) made the first report on the parasite of duck. He observed intestinal trematode *Echinostoma revolutum* (Fröhlich,1802) from a wild bird at Pusan. Yamaguti (1939) reported on the *Acanthoparyphium tyosenense* from the wild duck. Chu *et al.* (1973) found six species of intestinal trematodes; *Echinostoma revolutum*, *E. miyagawai*, *E. gotoi*, *E. koidzumii*, *Cotylurus japonicus* and *Notocotylus attenuatus* of the wild birds. Up to the present, parasites of domestic ducks were unknown in Korea. In the present study, seven species of helminth parasites were collected from domestic duck (*Anas platyrhynchos* var. *domestica* Linnaeus). Among them four trematode species were recorded for the first time in Korea.

MATERIALS AND METHODS

A total of 105 domestic ducks were purchased from Ichon Gun, Pusan City, Kimhae City, Chunchon City, Yanggu Gun, Taejeon City and unknown areas. Among them fifty-one intestines of ducks from unknown localities were collected immediately after slaughtering at Chungang market in Seoul. For the identification of the domestic ducks used in this study, Illustrated Encyclopedia; The Fauna of Korea, Aves (Volume 3, Published by Ministry of Education, Korea, 1962) was referred. Domestic ducks were necropsied one day after starvation to empty the intestines. The internal organs (esophagus, glandular stomach, gizzard, intestine, trachea, lung, heart and liver) were cut open in physiological saline and examined for parasites by naked eyes and with dissecting microscope. Trematodes were fixed in A.F.A. and stained with Semichon's acetocarmine. Nematodes were fixed in hot Travassos' solution and cleared in 70% glycerine alcohol.

RESULTS

Amphimerus Barker, 1911

Amphimerus anatis Yamaguti, 1933

Four specimens of *A. anatis* (Family: Opisthorchiidae) were collected from the bile duct of two domestic ducks. Due to the large body size of this trematode parasite, it was very difficult to obtain worms from bile duct. Measurements were based on one partially damaged specimen.

Description: Eody long, slender, flattened dorsoventrally, measuring 24.5mm in length and 1.25 mm in width, tapers to pointed posterior end; integument smooth; oral sucker 0.45×0.30mm, muscular, followed by pharynx; pharynx strongly muscular, 0.35×0.45mm; esophagus very short,

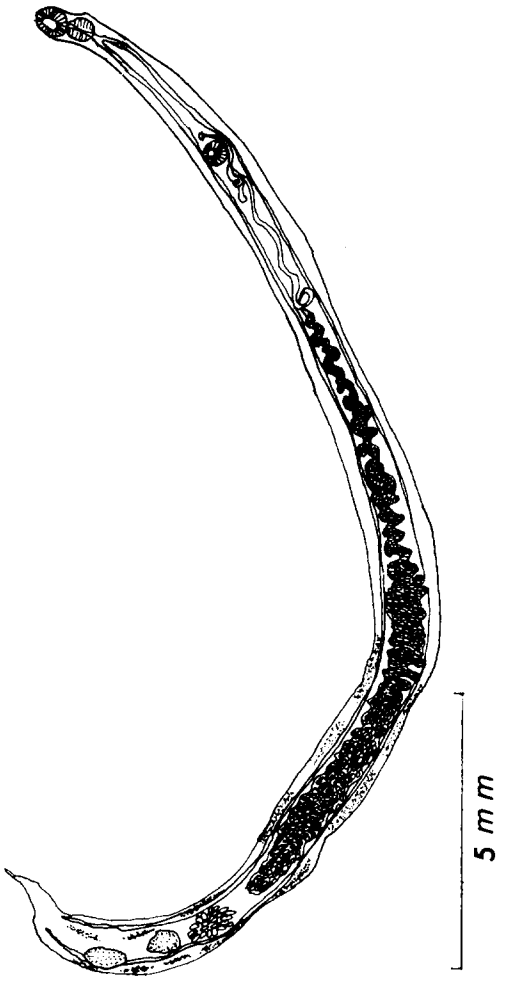

Fig. 1. *Amphimerus anatis* Yamaguti, 1933 (ventral view).

0.11mm in length; ceca run parallel from intestinal bifurcation to acetabulum, terminate at the end of body; acetabulum round, 0.19×0.22mm, locates on median line; testes longitudinally elongated, hind end of posterior testis 2.2mm front of the posterior end of body, anterior testis 5.8×4.7 mm, posterior testis 7.4×3.9mm; vas deferens forms a convoluted seminal vesicle and opens in genital pore; ovary 1.0×0.5mm, looks like a mulberry; vitelline follicles interrupted at short intervals on either side of uterus, extends beyond posterior testis; eggs elliptical, light yellowish brown, operculated, average 0.028×0.016mm.

Host: *Anas platyrhynchos* var. *domestica* Linnaeus

Habitat: Bile duct of liver

Locality: Kangwon Do (Chunchon City), and Pusan City, Korea

A. anatis was firstly described by Yamaguti (1933) as *Opisthorchis anatis* in the larger bile duct of *Anas platyrhyncha platyrhyncha* and *Nyroca ferina ferina* in Japan. Later it was corrected as genus *Amphimerus* which is differentiated from *Opisthorchis* by the interruption of the vitellaria at the level of ovary (Yamaguti, 1958). This parasite is apt to be overlooked owing to its concealed habitat. The eggs of *A. anatis* are very similar to *Clonorchis sinensis* eggs in their shape and size, it might be misdiagnosed in stool examination. This opisthorchid trematode is the first record from Korea.

Echinostoma Rudolphi, 1809

Echinostoma miyagawai Ishii, 1932

Fifteen specimens of *E. miyagawai* (Family: Echinostomatidae) were obtained from six domestic ducks. Measurements were performed on twelve specimens.

Description: Body elongate, cylindrical, flattened dorsoventrally and rounded at both extremities, 15.7～18.5mm in width; head collar 0.62～0.94×0.4～0.56mm, armed with 37 spines, arranged in two rows; end group spines, 0.09～0.11×0.03mm, five on each side; oral sucker ventro-terminal, 0.25～0.46mm in diameter, followed by prepharynx, 0.03～0.16mm; pharynx, 0.18～0.26×0.14～0.29mm; esophagus 0.82～1.46mm in length, bifurcates just in front of the acetabulum; simple ceca terminate at the end of body; acetabulum cup shaped, 0.82～1.04mm in diameter, lies at the middle of anterior fifth of body and slightly overlap cirrus sac; testes slightly lobed, nearly round, situate tandem in median line at the anterior part of the posterior half of body, anterior testis 0.90～1.15×0.79～1.10mm, posterior testis 0.85～1.05×0.72～0.95mm; cirrus sac oval, 0.40～0.70×0.30～0.48mm, lies anterodorsal to acetabulum with its posterior end not reaching to the middle of acetabulum; ovary oval, 0.30～0.59×0.42～0.65mm; seminal receptacle lies behind ovary, ovary lies in the median line, 0.06～0.11mm in

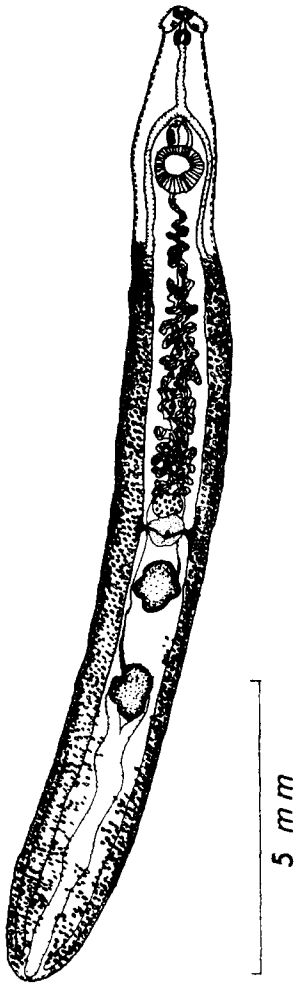

Fig. 2. *Echinostoma miyagawai* Ishii, 1932 (ventral view).

front of the anterior testis; uterine coil fill up the space between acetabulum and ovary, do not overlap ceca; lateral vitelline follicles extend from the level of anterior fourth of worm to extreme posterior end of body; eggs oval, 0.08 ~0.09×0.06~0.07mm, light brown.

Host: *Anas platyrhynchos* var. *domestica* Linnaeus

Habitat: Small intestine

Locality: Kangwon Do(Chunchon City), Korea

E. miyagawai was firstly described by Ishii (1932) from domestic and wild birds in Japan. Chu *et al.* (1973) reported this species from wild bird; *Anas platyrhynchos platyrhynchos* and *Anas poecilorhyncha zonorhyncha* for the first time in Korea.

Echinochasmus Dietz, 1909

Echinochasmus japonicus Tanabe, 1926

Thirty-five specimens of *E. japonicus*(Family: Echinostomatidae) were obtained from two domestic ducks. It was difficult to meet gravid adult worm containing eggs. More than 20 mounted specimens, only one gravid worm was observed on which the following measurements and description were based.

Description: Body small, 0.76mm in length, 0.19mm in maximum width at the level of testes, posterior end bluntly pointed; integument covered with spines; head collar prominent, 0.15mm in transverse diameter, armed on each side with 12 spines, dorsally interrupted, end group spines three on each side; oral sucker 0.10mm in diameter; prepharynx long, 0.06mm in length; pharynx round, 0.05mm in diameter; esophagus 0.23mm in length, bifurcates in front

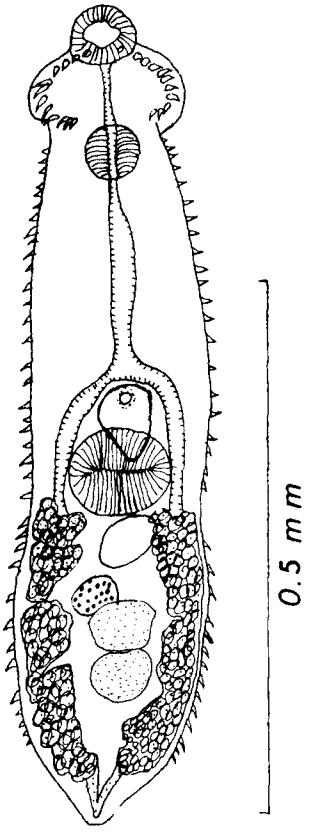

Fig. 3. *Echinochasmus japonicus* Tanabe, 1926(ventral view).

of the cirrus sac; ceca extend almost to posterior extremity; acetabulum 0.08×0.09mm; testes oval, anterior testis 0.05×0.08mm, posterior testis 0.05×0.08mm; cirrus pouch ellipsoidal, 0.05mm in diameter, overlaps acetabulum but not reaches to the lower limit of acetabulum; vitellaria extends over ceca and confined to the posterior half of body; egg large, oval, 0.075×0.060mm.

Host: *Anas platyrhynchos* var. *domestica* Linnaeus

Habitat: Small intestine, cecum

Locality: Kyungsangnam Do (Kimhae City), Korea

Tanabe (1919) firstly found the metacercariae of this fluke encysted in the gills of a number of Japanese fresh water fishes and demonstrated, by feeding the metacercariae to cat, dog, mouse, white rat and chicken, that it represents a new variety of *E. perfoliatus*, later he raised it to specific rank, proposing *Echinochasmus japonicus* n. sp. (Tanabe, 1926). Kurisu (1932) obtained this species from domestic fowls in Japan. This is the first record of this species from Korea.

Cryptocotyle Lühe, 1899

Cryptocotyle sp. (Family: Heterophyidae)

Twelve specimens of *Cryptocotyle sp.* were collected from only one intestine of domestic duck of unknown locality. Description and measurements of this small parasite were based on one best specimen.

Description: Body angular, very small, 0.49 mm in length, 0.48mm in width; integument with spines all over the body; oral sucker 0.05 mm in diameter; prepharynx 0.003mm in length; pharynx 0.01mm in length; esophagus very short or absent; ceca bifurcation locates one third of body length from anterior end and extends into the posterior end of body; ceca terminates behind the level of testes; genital sucker transversely oval, 0.06×0.08mm, locates one third of body from the posterior end; testes transversely elongated oval, near the posterior end of body, side by side, 0.04~0.05×0.11~0.12mm, distance between testes 0.09mm; seminal vesicle well developed, winding in median field; ovary transversely elongated, 0.10×0.03mm; vitellaria extend anteriorly to the level of intestinal bifurcation, fill up the post-testicular region posteriorly; uterus disposed with a few loops in front of testes, behind genital sucker; eggs elliptical, 0.035~0.040×0.020~0.021mm.

Host: *Anas platyrhynchos* var. *domestica* Linnaeus

Habitat: Small intestine

Locality: Southern Korea

This unidentified heterophyid trematode is closely allied to *Cryptocotyle concavum* (Creplin, 1825) Fischoeder, 1903. But in our specimen, the testes are not lobed or serrated and the width of the body is almost equal or wider than the length. The body length is approximately half of the *C. concavum* (Ransom, 1920) and the genital sucker is relatively small. This heterophyid trematode is the first record of this genus from Korea.

Notocotylus Diesing, 1839

Notocotylus attenuatus (Rudolphi, 1809) Kossack, 1911

Twenty-seven specimens of *N. attenuatus* (Family: Notocotylidae) were obtained from three domestic ducks. Measurements were based on seven specimens. Some of the rest specimens were not mounted to observe the pattern of the ventral glands more clearly.

Description: Body flat, 2.65~3.5mm in length, 0.6~1.2mm in width, cylindrical with rounded extremities; ventral surface covered with three lines of glandular pits, 14 in the median and 16 each in the submedian lines, anterior gland of the median line on anterior fifth to sixth of body, overlapping cirrus sac, glands almost same in size; oral sucker terminal, 0.09~0.14×0.11~0.18mm; esophagus 0.07~0.14mm in length; narrow ceca terminate almost at the posterior end of body; testes elongated, 0.34~0.56×0.13~0.24mm, laterally lobed, lie symmetrically outside of terminal ceca; cirrus pouch elongated, club shaped, 0.61~1.10mm in length, terminate at the beginning of uterus; genital pore lie immediately behind the bifurcation; ovary irregularly lobed, 0.17~0.22×0.13~0.30mm, lies in

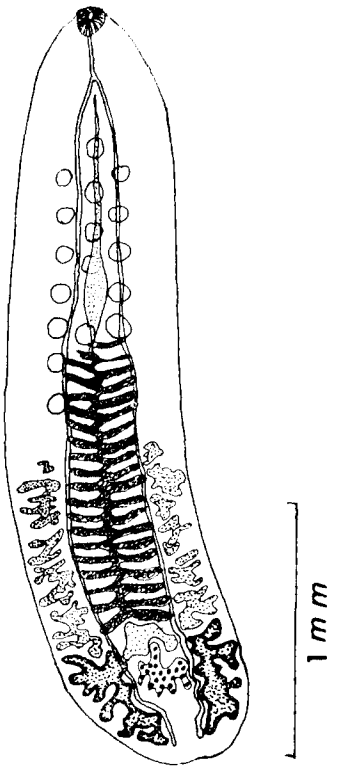

Fig. 4. *Notocotylus attenuatus* (Rudolphi, 1809) Kossack, 1911 (ventral view).

median field in front of the posterior end of body between testes; Mehlis' gland 0.11～0.66 ×0.09～0.22mm, lies immediately in front of the ovary; vitelline follicles arrange in longitudinal extracecal bands on either side of body; vitelline ducts originate from the posterior end of vitelline glands to meet on the ventral surface of Mehlis' gland; transverse uterine coil do not overlap vitelline glands; eggs 0.011～0.013× 0.019～0.022mm in life, operculated both sides with two long filaments, 0.05～0.06mm in length.

Host: *Anas platyrhynchos* var. *domestica* Linnaeus

Habitat: Cecum

Locality: Kangwon Do (Chunchon City) and Pusan City, Korea

This notocotylid trematode species has no ventral sucker and easily distinguishable from other trematodes with characteristic ventral glandular pits and the eggs with typical polar filaments. Its primary hosts are domestic ducks, goose and fowl. Yamaguti (1934) reported on the observation of *N. attenuatus* in the cecum from the Korean origin *Olor bewicki jankowskii* (Alpheraky). This species was also found by Chu *et al.* (1973) from the wild bird; *Podiceps crestatus*, *Anas falcata* in Korea.

Apatemon Szidat, 1928

Apatemon sp. (Family: Strigeidae)

Totally ten specimens were obtained from six domestic ducks. Six worms out of them were not fully grown and three were partially destroyed. Description and measurements were based on one adult specimen.

Description: Body divided into two parts, cup shaped, forebody 0.47mm in length and 0.41mm in width, widely opens anteriorly, plump hindbody 0.77mm in length and 0.42mm in width, constricted off from forebody and truncated at posterior extremity, ratio of body length/forebody 2.64; oral sucker 0.08×0.75mm; ventral sucker globular, 0.095×0.1mm; adhesive gland 0.05× 0.08mm, locates at the base of holdfast organ; testes kidney-shaped, places one in front of the other, on the middle of hindbody, anterior testis 0.19×0.16mm, posterior testis 0.5×0.20mm; seminal vesicle lying behind the posterior testis close to dorsal body wall; vitelline follicles confined to ventral side of hindbody; extending to posterior extremity; ovary round, 0.09mm in diameter, places in front of the anterior testis, dorsal to uterus; genital cone exist at posterior end of hindbody; eggs elongated oval, operculated, 0.09～0.10×0.07mm.

Host: *Anas platyrhynchos* var. *domestica* Linnaeus

Habitat: Small intestine

Locality: Kangwon Do(Chunchon City), Korea

This strigeid trematode species is closely allied to *Cotylurus japonicus* Ishii, 1932 from Japan, but differs from it by the absence of the genital bulb, an important key for differentiation between the genus *Apatemon* and *Cotylurus* (Schell, 1970). The present specimen has genital cone which is the characteristic of the genus *Apatemon*. This strigeid trematode is the first record from Korea.

***Heterakis* Dujardin, 1845**

Heterakis gallinarum Schrank, 1788

Twenty-one nematode specimens of *H. gallinarum* (Family: Heterakidae) were obtained from one domestic duck. Measurements were performed on six female and six male specimens.

Description: Male worms 6.5~7.5mm in length, 0.25~0.34mm in width; female worms 7.4~8.2mm in length, 0.25~0.34mm in width; esophagus has prominent bulb; lateral alae on the head part, well developed; tail of female with pin-pointed tapering termination, distance between anus and posterior extremities, 0.9~1.0mm; vulva opening 3.5mm apart from anterior extremity; tail of male has large alae with a prominent pre-cloacal sucker and 12 pairs of papillae; Two spicules different in size, left spicule 0.7~0.8mm in length, right spicule 2.1~2.2mm in length, distal end of left spicule has typical shape; eggs oval, with thick shell, 0.068~0.072×0.038~0.041mm.

Host: *Anas platyrhynchos* var. *domestica* Linnaeus

Habitat: Cecum

Locality: Kyunggi Do (Ichon Gun), Korea

H. gallinarum (Syn. *H. gallinae*) is a common nematode in the ceca of domestic duck (Soulsby, 1965). Jang (1958) reported this species from Korean domestic fowls.

SUMMARY

During February 1982 to September 1983, a total of 105 domestic ducks (*Anas platyrhynchos* var. *domestica* Linnaeus) were collected from Ichon Gun, Pusan City, Chunchon City, Yanggu Gun, Taejeon City and unknown areas in Korea.

In the results, six trematode and one nematode species of helminth parasites were obtained and described as follows: *Amphimerus anatis* Yamaguti, 1933, *Echinostoma miyagawai* Ishii, 1932, *Echinochasmus japonicus* Tanabe, 1926, *Cryptocotyle sp.*, *Notocotylus attenuatus* (Rudolphi, 1809) Kossack, 1911, *Apatemon sp.* and nematode species, *Heterakis gallinarum* Schrank, 1788. From this collection, *Amphimerus anatis* Yamaguti, 1933, *Echinochasmus japonicus* Tanabe, 1926, genus *Cryptocotyle* Lühe, 1899 and genus *Apatemon* Szidat, 1928 were firstly recorded in Korea.

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=國文抄錄=

집오리(*Anas platyrhynchos* var. *domestica* Linnaeus)의 蠕蟲類에 관한 硏究

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1982年 2月부터 1983年 9月까지 韓國産 집오리(*Anas platyrhynchos* var. *domestica* Linnaeus)에 寄生하고 있는 腸內蠕蟲類에 대하여 調査하였다. 剖檢에 사용된 105首의 집오리는 利川郡, 釜山市, 金海市, 春川市, 楊口郡, 大田市 및 서울 中央市場에서 購入한 것이다.

檢出된 寄生蟲의 分類 結果 6種의 吸蟲類, *Amphimerus anatis* Yamaguti, 1933(春川市, 釜山市), *Echinostoma miyagawai* Ishii, 1932(春川市), *Echinochasmus japonicus* Tanabe, 1926(金海市), *Cryptocotyle sp.*(韓國), *Notocotylus attenuatus* (Rudolphi, 1809) Kossack, 1911(春川市, 釜山市), *Apatemon sp.*(春川市) 및 1種의 線蟲類, *Heterakis gallinarum* Schrank, 1788(利川)으로 同定하였다.

以上 7種의 寄生蟲 중 *Amphimerus anatis* Yamaguti, 1933, *Echinochasmus japonicus* Tanabe, 1926, genus *Cryptocotyle* Lühe, 1899 및 genus *Apatemon* Szidat, 1928의 4種은 韓國에서 처음으로 發見 報告하는 것이다.