

A NEW SPECIES OF TREMATODE OF THE FAMILY
HETEROPHYIDAE, WITH A NOTE ON THE GENUS
APOPHALLUS AND RELATED GENERA

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During the summer of 1929, Dr. Eloise B. Cram, of the Zoological Division, Bureau of Animal Industry, conducted an investigation in cooperation with representatives of the Bureau of Biological Survey to determine if parasites were a factor in causing the death of ducks from the so-called "duck disease" at Klamath Falls, Oreg. Among the specimens of parasites collected from water birds in this vicinity were a number of trematodes, one species of which appears to be new. This fluke belongs to the family Heterophyidae Odhner, 1914, and to the genus *Apophallus* Lühe, 1909. For this trematode the name *Apophallus crami* is proposed, the species being named for the collector.

APOPHALLUS CRAMI, new species

FIGURE 1

Specific diagnosis.—*Apophallus*: Body slender, 1.5 mm. to 1.9 mm. long by 279μ to 341μ wide in the vicinity of the testes; preacetabular portion of body flattened and showing a slight constriction in the region between the acetabulum and the intestinal bifurcation; postacetabular portion more or less cylindrical. The cuticle is covered with small scalelike spines. Oral sucker subterminal, 45μ to 60μ in diameter; prepharynx very short; pharynx ovoid, 45μ long by 30μ wide. Esophagus slender, about 337μ long, bifurcating about one-fifth of the body length from the anterior end; intestinal ceca slender, extending to near the posterior end of the body. Acetabulum 52μ to 62μ in diameter, situated at the equator of the body and opening into the genital sinus. Genital pore at anterior end of genital sinus, the aperture being guarded by two ovoid, papillalike gonotyls. Testes globular or slightly ovoid in shape and placed obliquely in the poste-

rior fourth of the body, the right caudad of the left. The left testis is 180μ to 187μ in diameter and the right 150μ to 160μ long by 187μ to 210μ wide. Seminal vesicle well developed, S-shaped, and situated in the median line caudad of the acetabulum. Ovary globular or slightly ovoid in shape, 75μ to 97μ in greatest diameter, situated a short distance in front of the anterior testis and to the right of the median line. Seminal receptacle ovoid, 50μ to 67μ long by 60μ to 82μ wide, and situated immediately caudad of the ovary. The vitellaria are composed of relatively large follicles, which extend anteriorly to about 150μ to 155μ caudad of acetabulum; posteriorly they extend to the posterior end of the body and almost completely fill the post-testicular space. Uterus with relatively few loops and confined to the intercecal space between ovary and acetabulum. Eggs ovoid, 33μ long by 25μ wide, with yellowish-brown shells.

Host.—California gull (*Larus californicus*).

Location.—Lower part of small intestine.

Distribution.—United States (Klamath Falls, Oreg.).

Type specimen.—U.S.N.M. Helm. Coll. No. 29245; paratypes No. 29779.

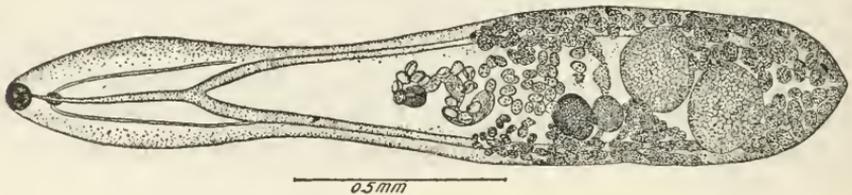


FIGURE 1.—*Apophallus crami*, new species. Ventral view

Remarks.—*Apophallus crami* resembles *A. mühlingi* (Jägerskiöld) more closely than it does any of the other species of the genus, the principal difference between the two being in the extent of the vitellaria anteriorly. In *A. mühlingi* the vitellaria extend anteriorly to the level of the acetabulum, while in *A. crami* they stop abruptly at or near the level of the posterior end of the seminal vesicle. Other minor differences exist, but they are not regarded as being of particular specific value. The distribution of the vitellaria appears to be a constant character in members of the genus. In the species described in this paper, about 100 specimens were examined, and the variation as regards this character was found to be insignificant. In one specimen the vitelline follicles on the left side were found to extend as far anterior as the acetabulum, but on the right side they did not extend beyond the posterior margin of the seminal receptacle. This specimen was clearly an anomalous one and of no significance so far as the constancy of the distribution of the vitellaria is concerned.

APOPHALLUS AND RELATED GENERA

The species that have been assigned to the genus *Apophallus* by previous writers are as follows: *Apophallus mühlingi* (Jägerskiöld, 1899), Lühe, 1909 (type of genus), *A. brevis* Ransom, 1920, and *A. major* Szidat, 1924. According to Witenberg (1929), *A. major* is a synonym of *A. mühlingi* and *A. brevis* a synonym of *Rossicotrema donicum* Skrjabin and Lindtrop, 1919. The writer has reexamined the type specimens of *A. brevis* and feels that it should be regarded as a distinct species, at least until more material is available for study. According to the writer's conception of the genus it stands closer to *A. mühlingi* than to *R. donicum*.

In a recent paper, Witenberg (1930) states that "after restudying the available material of the genera *Rossicotrema*, Skrjabin, and *Tocotrema* (Looss), I concluded that they shall not be regarded as distinct ones, as they are presented in my paper. The differences between their representatives are rather of specific value, not greater than say between *Parascocotyle longa* (Ransom) and any other species of the genus *Parascocotyle*, i. e., in the number of gonotyls. I therefore find it suitable to regard the genus *Rossicotrema* as synonym of *Tocotrema*." In view of this statement the writer has examined the available material of the species of *Rossicotrema* and related genera, but can not concur in Witenberg's conclusion. A brief review of the case shows the following situation:

Ransom (1920) recognized the genus *Cryptocotyle* Lühe as valid and *Tocotrema* Looss as a synonym and stated: "Looss (1899b) took *lingua* as type of the genus *Tocotrema*, but its characters are so similar to those of the type of *Cryptocotyle* (*C. concava*) that the two can not be separated generically." On the contrary, Witenberg (1929) states: "In the species designated as types for *Cryptocotyle* and *Tocotrema* essential differences exist in the arrangement of the testes and in the shape of the body, both these characters being correlated. Thus, these two species can not be retained in one genus but must be separated; i. e., both *Cryptocotyle* and *Tocotrema* should be considered valid." The generic name *Ciureana* Skrjabin, 1923, is made a synonym of *Cryptocotyle*. Africa (1929) found considerable variation in the position of the testes in a small number of specimens of *C. lingua* and noted that out of ten specimens two showed the testes opposed as in *C. concava* and the others varied from this type to that described for *C. lingua*, and he states: "It seems that there is a wide range of variation both as to shape and position in the same species of the hitherto believed to be fixed structures." The writer has examined a number of specimens of species of *Cryptocotyle* and of the related genus *Rossicotrema* and is convinced that the "arrangement of the testes" and the "shape of the body"

are correlated characters but not characters of generic value. In specimens of *C. lingua* some were found in which the body was ovoid or piriform in shape and the testes opposite each other, while in others from the same lot these characters conform to the usual type, that is, body linguiform in shape and the testes placed obliquely to the long axis. The same variations were observed in specimens of *Rossicotrema donicum*. From these observations it is the writer's opinion that the position of the testes in the Heterophyidae, and possibly also in members of some of the other families, depends upon the shape of the body, and both body shape and position of testes depend upon the state of contraction of the specimens when killed.

It is frequently difficult to decide upon the relative value of characters and to determine which are of generic and which are of specific value. This is especially true with respect to the trematodes. In checking over the characters as given for the genera *Cryptocotyle* Lühe, *Tocotrema* Looss, *Ciureana* Skrjabin, *Rossicotrema* Skrjabin and Lindtrop, and *Apophallus* Lühe, only one character appears sufficiently constant to be of generic value, namely, the genital sinus and the arrangement of its accessory structures. In the first three of these genera the genital sinus is a spacious, somewhat muscular structure; the acetabulum is greatly reduced and situated in the anterior wall of the sinus; the genital aperture is post-acetabular; and the genital ducts open into the sinus caudad of the acetabulum at the base of a single, papillalike gonotyl. In the genera *Rossicotrema* (syn. *Cotylophallus*) and *Apophallus* this arrangement is entirely different. The genital sinus is reduced in size and its walls weakly developed; the acetabulum is relatively strongly developed and opens into the sinus caudad of the genital pore; the genital ducts open into the sinus cephalad of the acetabulum and two papillalike gonotyls are present. Other characters are similar in members of these genera and such variations as are present are regarded as of specific value. It is the opinion of the writer, therefore, that all the above-named genera should be reduced to two, namely, *Cryptocotyle* (syns. *Tocotrema* and *Ciureana*) and *Apophallus* (syns. *Rossicotrema* and *Cotylophallus*). To the first of these genera, *Cryptocotyle*, the following species are referred: *C. concava* (Creplin), *C. lingua* (Creplin), *C. jejuna* (Nicoll), *C. quinqueangulare* (Skrjabin), *C. cryptocotyloides* (Issaichikoff), and *C. echinata* (von Linstow); and to the second genus, *Apophallus*, the following species: *A. mühlengi* (Jägerskiöld), *A. donicum* (Skrjabin and Lindtrop) (syns. *C. venustus* and *C. similis*), *A. brevis* Ransom, and *A. crami*, new species.

The following generic diagnoses, to which are appended keys to species, represent the writer's conception of the two genera:

Genus CRYPTOCTYLE Lühe, 1899

Synonyms.—*Tocotrema* Looss, 1899; *Hallum* WIGDOR, 1918; *Ciureana* SKRJABIN, 1923.

Generic diagnosis.—Heterophyidae: Body ovoid to linguiform in shape. Prepharynx very short; esophagus short; intestinal bifurcation nearer to oral sucker than to acetabulum; intestinal ceca slender, extending into posterior end of body and terminating caudad of testes. Acetabulum rudimentary, in anterior wall of the spacious, more or less muscular, genital sinus; genital ducts open into sinus at base of a single papilliform gonotyl; genital aperture postacetabular, in center of genital sinus. Seminal vesicle well developed, curved in a more or less S-like manner, dorsal to uterine coils. Testes near posterior end of body, irregularly oval or slightly lobed, either side by side or right testis obliquely behind left. Ovary irregularly oval or lobed, situated to right of median line and cephalad of seminal receptacle. Vitellaria fill postcecal space and extend anteriorly to acetabulum or beyond. Uterus with few loops, confined to intercecal space between ovary and genital sinus.

Type species.—*Cryptocotyle concava* (Creplin, 1825) Fiscoeder, 1903.

KEY TO SPECIES OF CRYPTOCTYLE

1. Vitellaria extend to level of intestinal bifurcation or beyond;
eggs reniform----- 2
Vitellaria do not extend to intestinal bifurcation; eggs ovoid----- 3
2. Vitellaria extend to anterior end of esophagus; ovary not lobed;
genital sinus 60 μ wide; eggs 38 μ by 15 μ -----quinqueangulare
Vitellaria extend to near level of intestinal bifurcation; ovary
lobed; genital sinus 127 μ to 159 μ wide; eggs 40 μ by 20 μ .
cryptocotyloides
3. Vitellaria extend to level of, or slightly cephalad of, acetabulum----- 4
Vitellaria extend about one-half the distance between acetabu-
lum and intestinal bifurcation----- 5
4. Genital sinus 55 μ in diameter; eggs 31 μ to 36 μ by 16 μ to 19 μ -----jejuna
Genital sinus about 280 μ wide; eggs 52 μ by 25 μ -----echinata
5. Body usually ovoid in shape, with testes placed side by side;
eggs 34 μ to 38 μ by 16 μ to 20 μ -----concava
Body usually linguiform in shape, with testes placed obliquely;
eggs 40 μ to 50 μ by 18 μ to 25 μ -----lingua

Genus AOPHALLUS Lühe, 1909

Synonyms.—*Rossicotrema* Skrjabin and Lindtrop, 1919; *Cotyllophallus* Ransom, 1920.

Generic diagnosis.—Heterophyidae: Body ovoid to very elongated in shape. Prepharynx short; esophagus long; intestinal bifurcation usually nearer to acetabulum than to oral sucker; intestinal ceca slender, terminating as in *Cryptocotyle*. Acetabulum relatively well

developed, opening into a small, nonmuscular genital sinus; genital ducts open into genital sinus at base of two papilliform gonotyls; genital pore cephalad of acetabulum. Seminal vesicle well developed, C or S shaped, dorsal to uterine coils. Testes ovoid or globular, situated near posterior end of body, the right testis usually behind left. Ovary ovoid or globular, situated to right of median line cephalad of seminal receptacle. Vitellaria fill post-testicular space and extend usually to acetabulum or beyond. Uterus as in *Cryptocotyle*.

Type species.—*Apophallus mühlingi* (Jägerskiöld, 1899) Lühe, 1909.

KEY TO SPECIES OF APOPHALLUS

1. Body elongated, with more or less distinct constriction between acetabulum and bifurcation of intestine..... 2
 Body ovoid or elongated piriform in shape..... 3
2. Vitellaria extend to level of acetabulum; intestinal bifurcation about one-third of body length from anterior end..... *mühlingi*
 Vitellaria do not extend anteriorly as far as acetabulum; intestinal bifurcation about one-fifth of body length from anterior end..... *crami*
3. Body ovoid in shape; vitellaria extend to level of intestinal bifurcation or slightly beyond..... *donicum*
 Body elongated piriform in shape; vitellaria extend only slightly beyond acetabulum..... *brevis*

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