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VARIATION IN THE NUMBER OF ORAL SPINES OF *PHAGICOLA LONGICOLLIS* KUNTZ AND CHANDLER, 1956, AND THE DESCRIPTION OF *P. INGLEI* N. SP. (TREMATODA: HETEROPHYIDAE)*

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During the course of investigations on a species of *Phagicola* from *Mugil cephalus* L., the Striped Mullet, and *M. curema* Cuvier & Valenciennes, the White Mullet, we have had the opportunity to examine numerous specimens of *Phagicola longicollis*. Through the courtesy of Allen McIntosh, Parasitologist, Animal Disease and Parasite Research Branch, U. S. Department of Agriculture, the type slide, U. S. National Museum Helminthological Collection No. 38169, was obtained. This slide contains a number of specimens of *P. longicollis* (Fig. 1), two *P. ascolonga* (Witenberg, 1929) Price, 1932, and several *Heterophyes heterophyes* (Siebold, 1852) Stiles & Hassall, 1900. *Phagicola longicollis* can be readily separated from the 2 specimens of *P. ascolonga* by the fact that in the former the uterus never extends posteriorly beyond the testes while in the latter the uterus always extends beyond the testes. Other differences include shape of body, structure of gonotyl, and posterior extent of the oral appendage.

We observed, on the type slide, some specimens (syntypes) of *P. longicollis* with 14, others with 15, and three with 16 oral spines in a single row. Some damaged specimens had less than 14 oral spines. The original description of this species by Kuntz and Chandler (1956) states: ". . . Mouth surrounded by single circle of 14, sometimes 15, spines, . . ." The late Dr. A. C. Chandler, in a personal communication (1957), stated: ". . . I counted the oral spines on several dozen specimens of *Phagicola longicollis* and found 14 in most, 15 in some, and thought I counted 16 in a few, but decided I had made an error. However, it is quite possible that there is a variation from 14 to 16 in this species, so some of the specimens on which you found 16 spines *may* belong to this species. . . ."

Dr. Chandler kindly sent us most of his specimens of *P. longicollis* and *P. ascolonga* for examination. Included in this material were specimens of a species of *Phagicola* that were obviously not *P. ascolonga*. Except for 1 specimen (Fig. 3) having a coronet of 17 oral spines in a single row and others having 16 oral spines they conform with the original description of *P. longicollis*.

We feel, therefore, from the observations stated above, the description of *P. longicollis* should be expanded to include a variation of from 14 to 17 oral spines.

Stunkard and Uzmann (1955) discuss the *Ascocotyle-Phagicola* complex. They conclude, "Decision on the taxonomic status of *Phagicola* should await more complete information, especially on the developmental stages of its members." Additional information may show that *Phagicola* is not a valid genus. However, it has

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been the practice of some workers (Chandler, 1941; Kuntz and Chandler, 1956; Robinson, 1956) to describe several species under the generic name of *Phagicola.* They evidently separated *Phagicola* from *Ascocotyle* because the former had a single row or an incomplete second row of oral spines, body incompletely spined and vitellaria not extending forward beyond the level of the ovary, while the latter has 2 complete rows of oral spines, body completely spined and vitellaria extending forward anterior to the level of the ovary. We choose to follow the above practice of separating *Phagicola* from *Ascocotyle,* at least until the taxonomic status of *Phagicola* is accurately determined.

While examining the slides sent to us by Dr. Chandler one of us (RFH) observed 1 specimen of a species of *Phagicola* very closely related to *P. longa* (Fig. 2) and *P. longicollis.* It differs in a number of characteristics from either *P. longa* or *P. longicollis.* Because of this we considered it an undescribed species for which we propose the name of *P. inglei.* The name *inglei* is in honor of R. M. Ingle, Director of Research, Florida State Board of Conservation, in recognition of his foresight in establishing a marine parasite and disease program at our Laboratory.

Phagicola inglei n. sp.
(Figs. 4–10)
(All measurements in microns)

Host: Domestic dog.
Location: Small intestine.
Locality: Streets of Cairo, Egypt.
Date of Collection: December 8, 1953.
Holotype: U. S. Nat. Mus. Helm. Coll. No. 38390.

Diagnosis (Based on a single specimen): *Phagicola sensu stricto:* Body shaped like elongated sack, tapering gradually towards anterior end. Cuticle spiny, except for narrow band immediately posterior to oral sucker and extreme posterior part of body. Length 1132; maximum width 373. Anterior end of oral sucker with rounded lip. Single row of 19 spines surrounding mouth; spines approximately 17 to 22 long with oval bases and curved tips. Oral sucker 68 in diameter with elongated oral appendage about 227 long, extending 282 from anterior end of body or approximately 7/8 distance to pharynx. Pharynx 64 long by 55 wide, located approximately 1/3 distance from anterior end of body. Esophagus about 126 long. Ceca about twice diameter of esophagus, extending posteriorly beyond level of acetabulum where they are no longer visible (possibly the result of overclearing of specimen and occlusion by eggs and other internal structures). Acetabulum rounded, about 68 long by 72 wide; located about 2/3 distance from anterior end of body. Genital pore a transverse slit-like opening immediately anterior and median to acetabulum. Lobes of gonotyl not visible. Testes 108 to 120 long by 79 to 82 wide; side by side near posterior end of body. Ovary about 105 long by 88 wide; anterior to dextral testis. Seminal vesicle large, median, posterior to acetabulum. Seminal receptacle indistinct, anterior to testes and sinistral to ovary. Vitellaria follicular, 6 to 8 follicles on each side of body, lateral around outer border of testes; extending from behind testes to anterior border of ovary. Uterus occupying area from anterior border of testes and vitellaria to immediately behind acetabulum in 3 to 4 transverse loops. Eggs 25 to 28 long by 12 to 14 wide. Excretory vesicle not observed.

DISCUSSION

Stunkard and Uzmann (1955) have questioned the validity of the genus *Phagicola* Faust, 1920, and have discussed their view in detail. Price (1932, 1935) has retained *Phagicola* Faust, 1920, and maintains that this genus differs from *Ascocotyle* Looss, 1899 by possessing a single crown of oral spines as compared with 2 complete rows of oral spines in *Ascocotyle.* Stunkard and Uzmann (1955) have rightly questioned Price's (1935) reasoning. *Phagicola angrense* (Travassos, 1916) Price, 1932; *P. diminuta* (Stunkard and Haviland, 1924) Price, 1932; and *P. lageniformis* Chandler, 1941, all possess, in addition to a complete anterior row of crown spines, 2 accessory spines which are dorsally located behind the first row of

spines, and which definitely form an incomplete partial row. *P. nana* (Ransom, 1920) Price, 1932 also possesses an incomplete posterior dorsal row of crown spines, but instead of 2 there are 3 to 4 accessory spines. Stunkard and Haviland (1924) named the sub-genus *Parascocotyle* for *Ascocotyle (Parascocotyle) diminuta.* These authors were apparently unaware of Faust's (1920) genus *Phagicola.* The original description of *P. diminuta* made no mention of 2 accessory spines in the posterior crown. Stunkard and Uzmann (1955) later corrected this *lapsus.* Witenberg (1929) elevated *Parascocotyle* to generic status on the basis of the vitellaria extending anterior to the ovary in *Ascocotyle* species, and restricted behind the ovary in the former genus. Price (1932) clarified the error in the original description of the gonotyl of *P. pithecophagicola* and considered *Ascocotyle (Parascocotyle) diminuta* in the genus *Phagicola.* He not only synonymized *Parascocotyle* with *Phagicola,* but in 1935 considered *Metascocotyle witenbergi* Ciurea, 1933, type species, a synonym of *Phagicola longa* (Ransom, 1920) Price, 1932. *Metascocotyle* Ciurea, 1933, is definitely a synonym of *Phagicola* Faust, 1920. Ciurea (1933) was misled by Ransom's (1920) description of the gonotyl in *Ascocotyle longa* Ransom, 1920. Until life cycle studies prove differently, we prefer to retain the genera *Ascocotyle* Looss, 1899, *Phagicola* Faust, 1920, and *Parascocotyle* Stunkard and Haviland, 1924.

The following key will serve to separate these genera.

1. Vitellaria extending as far forward as acetabulum; with two complete rows of oral spines ..... *Ascocotyle, sensu stricto*
1.—Vitellaria extending forward only to ovary, never beyond; never with two complete rows of oral spines 2
2. With a single complete row of oral spines ..... *Phagicola, sensu stricto*
2.—With a single complete row of oral spines and an incomplete second row of from 2 to 4 accessory spines ..... *Parascocotyle, sensu stricto*

The name *Parascocotyle* Stunkard and Haviland, 1924 is available with *P. diminuta* Stunkard and Haviland, 1924 as type species, in spite of the fact that the authors' definition of the sub-genus was different from our views as presented in the key above. Since Stunkard and Uzmann (1955) have indicated the presence of accessory spines in the oral crown of *P. diminuta,* and we wish to group together the species with accessory spines and vitellaria not extending anteriorly past the ovary, the name *Parascocotyle* must be used by reason of priority. We have obtained specimens of *P. diminuta* by feeding the gills of naturally infected Floridian *Fundulus similisis* to hamsters.

According to the systematic scheme presented above, the following species would be included in the genus *Ascocotyle* Looss, 1899: *A. angeloi* Travassos, 1928, *A. coleostoma* (Looss, 1896) Looss, 1899 (type species); *A. filippei* Travassos, 1928; *A. intermedius* Srivastava, 1935; *A. leighi* Burton, 1956; *A. mcintoshi* Price, 1936; *A. megalocephala* Price, 1932; *A. puertoricensis* Price, 1932; and *A. tenuicollis* Price, 1935.

Under our system the following species would be included in the genus *Phagicola* Faust, 1920: *P. arnaldoi* (Travassos, 1929) Price, 1932; *P. ascolonga* (Witenberg, 1929) Price, 1932; *P. byrdi* Robinson, 1956; *P. italica* (Alessandrini, 1906) Price, 1932; *P. longa* (Ransom, 1920) Price, 1932; *P. longicollis* Kuntz and Chandler, 1956; *P. macrostomum* Robinson, 1956; *P. minuta* (Looss, 1899) Price, 1932; *P. piriforme* (Blanc and Hedin, 1913) Price, 1932; and *P. pithecophagicola* Faust, 1920 (type species).

The following species would be included in this system under the genus *Parascocotyle* Stunkard and Haviland, 1924: *P. angrense* (Travassos, 1916); *P. diminuta* Stunkard and Haviland, 1924 (type species); *P. lageniformis* (Chandler, 1941); and *P. nana* (Ransom, 1920).

Phagicola inglei appears to be most closely related with *Phagicola longa* (Ransom, 1920) Price, 1932. Witenberg (1929) and Martin (1953) have indicated that the oral appendage of *Phagicola ascolonga* and *Parascocotyle lageniformis* respectively, may extend to anterior margin of the pharynx or beyond. Although the significance of the relationship of the oral appendage with the pharynx is questionable, we would like to indicate that in the holotype of *P. inglei* and the syntypes of *P. longa,* of which the anterior end of the body appears to be equally relaxed, the oral appendage almost comes into contact with the pharynx in *P. inglei* as compared with oral appendage almost halfway to pharynx in the other species. The pharynx of *P. inglei* is located less than one-third of the body length from the anterior end while that of *P. longa* approaches the midbody. The vitellaria of *P. inglei* extend to the anterior border of the ovary while they are restricted behind the ovary of *P. longa. P. inglei* possesses 19 very heavy crown spines which are hooked at the tips as compared with 15–18 lighter, straight spines in the syntypes of *P. longa.* The esophagus of *P. inglei* is proportionately about 3 times longer, the eggs (Fig. 7) twice the length and diameter of those (Fig. 10) of the syntypes of *P. longa.* One of us (Hutton, 1957) reported *P. longa* from the mullet (*Mugil cephalus* and *M. curema*). Adult worms were obtained from laboratory-raised white rats fed on mullet. Since that time we have been able to obtain a species of *Phagicola* by feeding naturally infected mullet to hamsters, pelicans, chickens, mink, kittens, herons, and opossums reared in the laboratory. We consider these worms sufficiently similar to *P. longa* so as to be regarded as the same species. Although we have examined several thousand specimens of this species we have not observed a single specimen which could be confused with the holotype of *P. inglei.*

References

CHANDLER, A. C. 1941 Helminths of muskrats in southeast Texas. J. Parasitol. **27:** 175–181.

CIUREA, I. 1933 Les vers parasites de l'homme, des mammiferes, et des oiseaux provenant des poissons du Danube et de la Mer Noire. Premier memoire. Trematodes, famille Heterophyidae Odhner, avec un essai de classification des trematodes de la superfamille Heterophyoidea Faust. Arch. Roumaines Path. Exper. et Microbiol. **6:** 5–134.

FAUST, E. C. 1920 Notes on trematodes from the Philippines. Philipp. J. Sci. **17:** 627–633.

HUTTON, R. F. 1957 Preliminary notes on Trematoda (Heterophyidae and Strigeoidea) encysted in the heart and flesh of Florida mullet, *Mugil cephalus* L. and *M. curema* Cuvier and Valenciennes. The Bulletin, Dade County Med. Assoc. (March), 2 pp.

KUNTZ, R. E. AND CHANDLER, A. C. 1956 Studies on Egyptian trematodes with special reference to the heterophyids of mammals. I. Adult flukes, with descriptions of *Phagicola longicollis* n. sp., *Cynodiplostomum namrui* n. sp., and a *Stephanoprora* from cats. J. Parasitol. **42:** 445–459.

MARTIN, W. E. 1953 Redescription of *Phagicola lageniformis* Chandler (Trematoda: Heterophyidae) and observations on part of its life cycle. Tapar Commen. Vol. Pp. 201–208.

PRICE, E. W. 1932 On the genus *Phagicola* Faust, 1920. J. Parasitol. **19:** 88–89.

———1935 Descriptions of some heterophyid trematodes of the subfamily Centrocestinae. Proc. Helm. Soc. Wash. **2:** 70–73.

RANSOM, B. H. 1920 Synopsis of the trematode family Heterophyidae with descriptions of a new genus and five new species. Proc. U. S. Nat. Mus. **57:** 527–573.

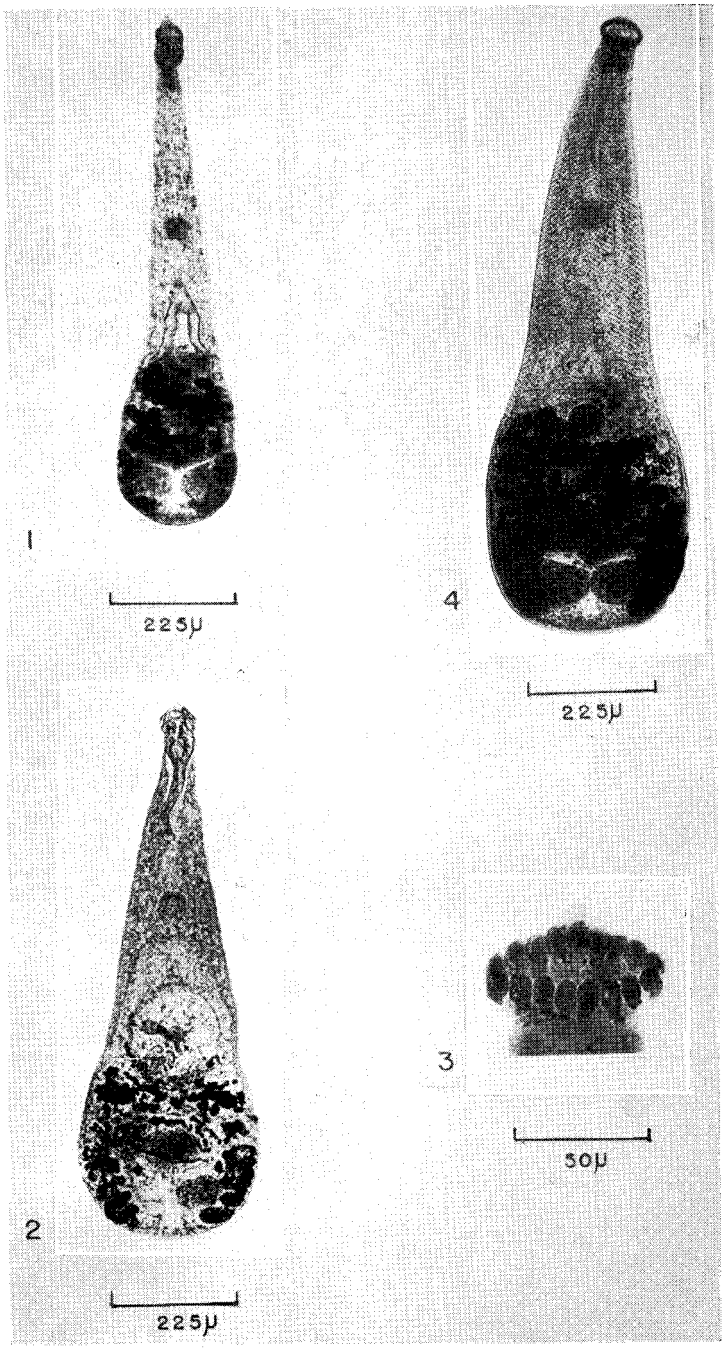
ROBINSON, E. J., JR. 1956 Two flukes, *Phagicola macrostomus* n. sp. and *Phagicola byrdi* n. sp., from the turkey vulture (Trematoda: Heterophyidae). J. Parasitol. **42:** 326–331.

STUNKARD, H. W. AND HAVILAND, C. B. 1924 Trematodes from the rat. Amer. Mus. Novit. No. **126:** 1–10.

——— AND UZMANN, J. R. 1955 The killifish, *Fundulus heteroclitus,* second intermediate host of the trematode, *Ascocotyle (Phagicola) diminuta.* Biol. Bull. **109:** 475–483.

WITENBERG, G. 1929 Studies on the trematode family Heterophyidae. Ann. Trop. Med. Parasit. **23:** 131–239.

PLATE I

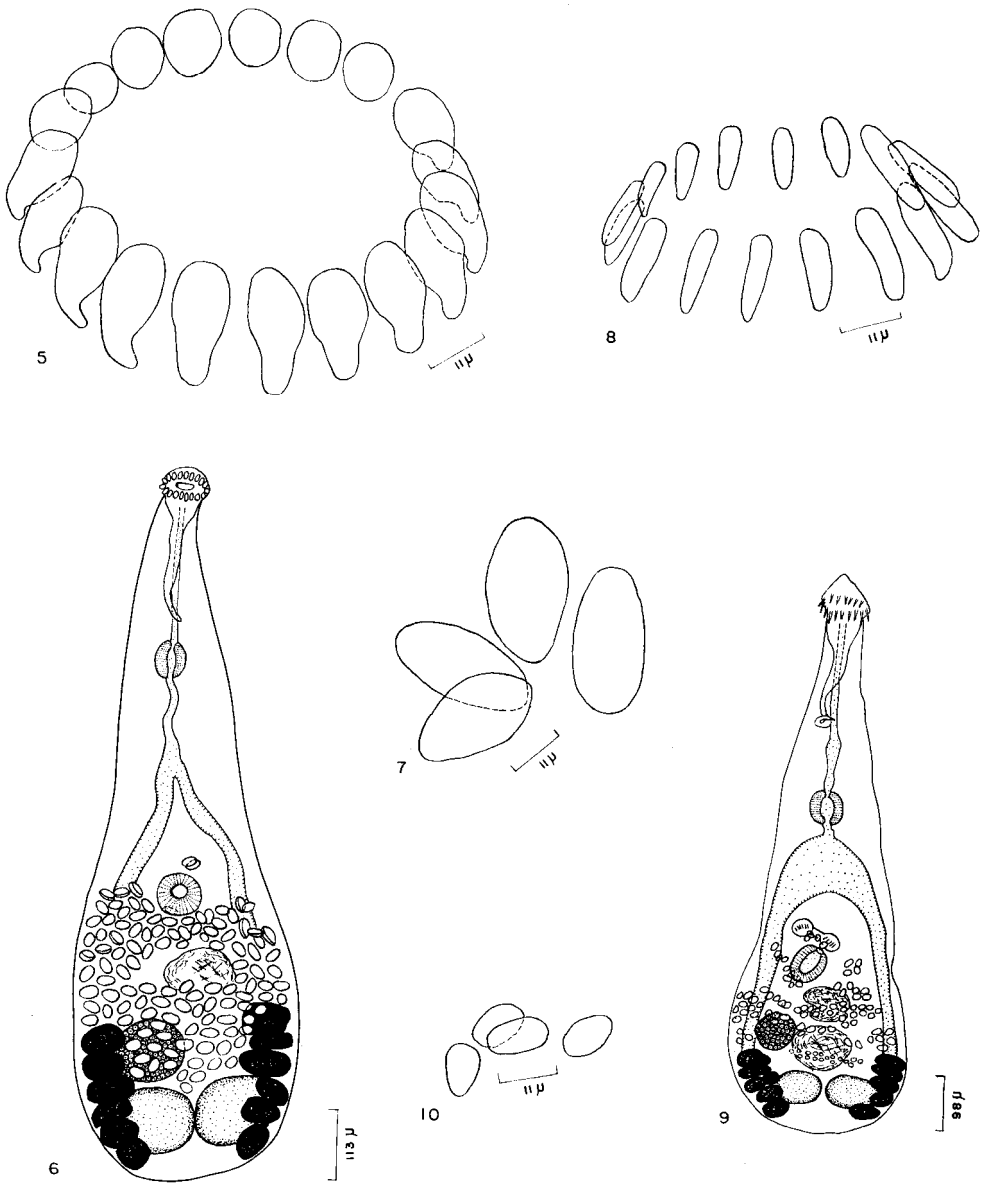


EXPLANATION OF PLATES

(All Photomicrographs)

FIGURE 1. Adult, *Phagicola longicollis* Kuntz and Chandler, 1956, ventral view.
FIGURE 2. Adult, *P. longa* (Ransom, 1920) Price, 1932, ventral view of syntype.
FIGURE 3. Mouth of *P. longicollis* surrounded by a coronet of seventeen spines, ventral view.
FIGURE 4. Adult, *P. inglei* n. sp., ventral view of holotype.

PLATE II



(All figures drawn with aid of camera lucida)

FIGURE 5. *P. inglei* n. sp., showing coronet of nineteen oral spines, ventral view of holotype.
FIGURE 6. Adult, *P. inglei* n. sp., ventral view of holotype.
FIGURE 7. Eggs of *P. inglei* n. sp. from holotype.
FIGURE 8. *P. longa* showing coronet of sixteen oral spines, ventral view of syntype.
FIGURE 9. Adult, *P. longa,* ventral view of syntype.
FIGURE 10. Eggs of *P. longa* from syntype.