RECORD OF THE GENUS NEODIPLOSTOMUM (FIBRICOLA) (DIPLOSTOMIDAE, TREMATODA) FROM TAMIA GHAT, CHHINDWARA, M.P., INDIA.*

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Received June 20, 1966

(Communicated by Dr. B. S. Chauhan, F.A.Sc.)

ABSTRACT

Neodiplostomum (Fibricola) singhi n. sp. is described from the intestine of a deer, Antilope cervicapra, shot in Tamia Ghat of Chhindwara, M.P. The subgenus is reviewed in detail. The author proposes synonymy of Neogogatea Chandler and Rausch (1947) with Gogatea Lutz (1935) as now the host specificity fails to be a criterion in taxonomic consideration.

INTRODUCTION

The author collected thirty parasites belonging to the genus Neodiplostomum (Fibricola) from the intestinal washing of a deer shot in hunting in the Tamia Ghat (Chhindwara, M.P.) and which the shoemaker brought for the skinning. In fact the intestinal washing contained more than hundred such parasites but only thirty were living and rest dead. These parasites have been found new, hence described under the name N. (F.) singhi n.sp.

The present research work was carried out in the Department of Zoology, Government Degree College, Chhindwara and Government Science College, Jabalpur, M.P.

Family : DIPLOSTOMIDAE Poirier, 1886.
Subfamily : DIPLOSTOMINAE Monticelli, 1892.
Genus : NEODIPLOSTOMUM Raillet, 1919.
Subgenus : Fibricola Dubois, 1932.
Syn. : Theriodiplostomum Dubois, 1944.

* Part of the thesis approved and eligible for the degree of Doctor of Philosophy in the University of Jabalpur, M.P., in March, 1966.
Neodiplostomum (Fibricola Dubois, 1932), Raillet, 1919

Barker and Noll (1915) described Hemistomum cratera for the diplostomes obtained from the intestine of American musk rat *Fiber zibethicus*. La Rue and Bosma (1928) collected a new species Neodiplostomum lucidus from the intestine of Fidelphys virginiana. Dubois (1932) described the genus Fibricola in which Hemistomum cratera and Neodiplostomum lucidus were transferred under the name *F. cratera* (Barker and Noll, 1915) and *F. lucidus* (La Rue and Bosma, 1928) respectively with *F. cratera* as type species. Dubois (1936) added *F. minor* from the intestine of Hydromys chrysogaster. Miller (1940) described *F. laruei* from the racoon which was later synonymised with the type species because of its close resemblance. Chandler (1942) added *F. texensis* from the intestine of racoon. Zerecero (1943) described *F. caballeroi* for the diplostomes obtained from the intestine of *Rattus norvegicus*. Dubois (1944) erected the genus Theriodiplostomum (Subfamily Diplostominae) for Neodiplostomum lucidus and Fibricola texensis because of their common occurrence in mammals and similar extension of vitellaria into hind body. Theriodiplostomum is an intermediate genus between Neodiplostomum and Fibricola, i.e., a link between subfamily Diplostominae and Alariinae respectively. Chandler and Rausch (1946) described *F. nanus* from Sciurus hudsonicus which was later synonymised with *F. cratera*. Chandler and Rausch (1946) and Read (1948) opposed the erection of the genus Theriodiplostomum. Read (1948) stated that Neodiplostomum can be distinguished from Fibricola as there was the tendency of the concentration of vitellaria in fore-body in the latter. Dubois and Rausch (1950) held Theriodiplostomum synonym of Fibricola. On the basis of the concentration of vitellaria in fore-body, bigger vitelline follicles and mammalian host specificity Dubois and Rausch (1950) further distinguished Fibricola from Neodiplostomum. Dubois (1953) continued to employ host specificity as a major taxonomic criterion for the separation of the two subfamilies Diplostominae and Alariinae respectively. Ulmer (1955) conducted several experiments with laboratory-reared white mice, fed with encysted metacercariae from the pelvic muscles of Rana pipens and recovered a series of worms which were morphologically intermediate between *F. cratera* and *F. texensis*. In some specimens the follicles extended into the hind body up to the anterior level of anterior testis. Ulmer (1955) on the basis of his experiments questioned the host specificity supported by Dubois (1953) and others. Sandaras (1957) reported *F. sarcophila* from the intestine of Australian marsupial. Pearson (1959) while describing *N. intermedium* from the rat Rattus assimilis discovered that *N. intermedium* bears mixed characters of Neodiplostomum and Fibricola. On the basis of his findings Pearson questioned the validity.
of distinction between *Fibricola* and *Neodiplostomum* which was doubted by Chandler (1942), questioned by Chandler and Rausch (1946) but supported by Read (1948) and by Dubois and Rausch (1950). Because of the close similarity of *Neodiplostomum*, *Conodiplostomum* and *Fibricola* Pearson (1959) made them the subgenera under the genus *Neodiplostomum*. In order to accommodate the three subgenera under the genus *Neodiplostomum* he revised the diagnosis of the genus *Neodiplostomum*. According to Pearson (1959) all the species of the genus *Neodiplostomum* parasitic in mammals are derived from a single line of evolution from the subgenus *Neodiplostomum*. If it is correct then the asymmetry of the anterior testis in *Fibricola* spp. and in most of the *Neodiplostomum* spp. is a parallel development. Lumsden (1961) described *F. cratera* and *F. lucidus* from the small mammals of Louisiana.

**DESCRIPTION OF Neodiplostomum (Fibricola) singhi** N.SP.

The worms are small, flesh-coloured and measure 1.88–2.05 mm. in length. The body is divided by a transverse constriction in the middle into fore and hind-body. Fore-body, spoon-shaped, concave ventrally and measures 0.93–1.02 mm. in length and 0.85–0.96 mm. in breadth in the level of tribocytic organ. Hind-body is cylindrical narrower, tapers posteriorly and measures 0.95–1.03 mm. in length and 0.68–0.69 mm. in breadth in the level in between the two testes. The ratio in between the lengths of fore-body to hind-body is 1.009 : 1.02, *i.e.*, fore and hind-body are almost equal in length. Oral sucker is terminal round and measures 0.068–0.069 mm. in length and 0.059–0.076 mm. in breadth. Ventral sucker is bigger than oral sucker situated 0.38–0.39 mm. from the anterior end and measures 0.042–0.051 mm. in length and 0.090–0.11 mm. in breadth. Ratio in the size of the two suckers is 1 : 1.4.

Minute prepharynx is present measuring 0.01 mm. in length. Pharynx is elongated, oval and measures 0.076–0.085 mm. in length and 0.057–0.059 mm. in breadth. Oesophagus is very small, can be easily overlooked and measures 0.008–0.017 mm. in length. Intestinal bifurcation measures 0.16–0.17 mm. from the anterior end of the body and almost the same length from the ventral sucker. Caeca run laterally outside the ventral sucker, tribocytic organ and extend in the hind-body a little in front of the genital opening.

Tribocytic organ is elongated, situated in the centre of fore-body, 0.061–0.063 mm. from the ventral sucker and measures 0.22–0.26 mm. in length and 0.15–0.17 mm. in breadth, *i.e.*, about one-third to one-fourth of the
Neodiplostomum (Fibricola)

length of the fore-body. Opening of tribocytic organ is slit-like, median, parallel to the length of the body and measures 0.12-0.14 mm. in length.

Gonads are confined into hind-body only.

Testes are transversely elongated and post-ovarian. Anterior testis, situated in the first half of the hind-body ventral to the right caecum, measures 0.17-0.19 mm. in length and 0.57-0.59 mm. in breadth; right part touches the body wall and left does not extend beyond the left caecum. Posterior testis bilobed, dumb-bell-shaped, just below the yolk reservoir, anterior and posterior margin notched, laterally extends up to body wall.
little broader than anterior testis and measures 0.16–0.18 mm. in length and 0.61–0.64 mm. in breadth.

Fig. 2. Neodiplostomum (Fibrincola) singhi n.sp. (dorsal view of the reproductive organs).

Ovary pre-testicular, oval in shape, transverse axis horizontal or oblique median or a little towards right side of median line touching the hind border of fore-body and measures 0.15–0.17 mm. in length and 0.27–0.30 mm. in breadth. “Mehlis’s” gland is intertesticular. Vitelline follicles big, distributed in the fore-body up to the level of intestinal bifurcation leaving a clear space dorsal to the ventral sucker and tribocytic organ, extend in hind-body up to genital opening in form of a median, elongated sheet. In all the specimens the vitelline follicles in fore-body are darkly stained but in hind-body the column of vitellaria is faintly stained and can be easily overlooked. The yolk reservoir is intertesticular and receives the lateral vitelline ducts, running in between the two testes on both the sides of the body. Genital cone is absent. Bursa is present which bears subterminal genital
opening measuring $0.081-0.084\text{mm.}$ from the hind-body. Maximum numbers of eggs recorded are three which are more elongated and slender but relatively smaller than the ovary in comparison to other species and measures $0.101-0.108\text{mm.}$ in length and $0.044-0.048\text{mm.}$ in breadth.

**Fig. 3. Neodiplostomum (Fibricola) singhi** n. sp. (median sagittal section).

**DISCUSSION**

The subgenus *Fibricola* Dubois (1932) at present includes eight species *N. (F.) cratera* Dubois (1932) from North America and New Orleans; *N. (F.) caballeroi* Zerecero (1943) from Mexico; *N. (F.) lucidus* (La Rue and Bosma, 1928) from U.S.A. and New Orleans; *N. (F.) minor* Dubois (1936) from Australia; *N. (F.) nanus* Chandler and Rausch (1946) from Australia; *N. (F.) texensis* Chandler (1942) from East Texas; *N. (F.) sacrophila* Sandaras, (1957) from Australia and *N. (F.) intermedium* Pearson, (1959) from Queensland. Till now no *Fibricola* spp. have been reported from India.
The worms under discussion have been included in the subgenus *Fibricola* because of the body divided into two regions; tribocytic organ situated almost in the centre of the fore-body; absence of pseudosuckers; small oral sucker and pharynx; asymmetrical development of anterior testis in front of “Mehlis’s” gland; no genital cone; distribution of vitellaria in fore and hind-body [like *N. (F.) sarcophila*] and lastly a mammalian host.

The present worm differs from *N. (F.) cratera* (syn. *F. laruei, F. nanus*), *N. (F.) caballeroi; N. (F.) lucidus* and *N. (F.) minor* in having the vitellaria distributed from the caecal bifurcation up to the posterior end of the body. In the character of distribution of vitellaria it shows resemblance to *N. (F.) texensis* and *N. (F.) sarcophila*. Chandler (1942) reports that in *N. (F.) texensis* few vitellino follicles extend into hind-body up to the level of posterior testis or beyond it. In the worms under study the vitelline follicles in all the specimens extend up to the posterior end of the body in the form of a median dense sheet though they are faintly stained. In fact in the character of distribution of vitellaria the worms show close resemblance to *N. (F.) sarcophila* from which they can be distinguished in having central situation of tribocytic organ in the fore-body, tribocytic organ elongated with its opening running parallel to the length of the body; in the shape of anterior and posterior testis *N. (F.) sarcophila, posterior testis horse-shoe-shaped*, in the present worm dumb-bell-shaped], more slender eggs, maximum three in one specimen and the body length.

Further the worms differ from *N. (F.) intermedium* Pearson (1959) in the anterior extension of vitellaria up to the caecal bifurcation and posterior extension up to the genital opening in form of a sheet and not two lateral columns; elliptical shape of the ovary; no spines in ventral surface; anterior testis asymmetrical and very long eggs [size of eggs in *N. (F.) intermedium* 66–67 × 49–52 μ]. Lastly the worms can be differentiated from any of the species of the subgenus *Fibricola* in having equal lengths of fore and hind-body. In order to accommodate these worms the author has described *N. (F.) singhi* n.sp. after Dr. S. N. Singh (Hyderabad, India).

*Comparison of Neogogatea Chandler and Rausch (1947) with Gogatea Lutz (1935).*

The author has compared *Neogogatea* Chandler and Rausch (1947) with *Gogatea* Lutz (1935) in light of the revised definition of *Neogogatea* recorded by Hoffman and Dunbar (1963). The co-authors have revised the situation of ovary as intertesticular and/or dextral or sinistral to testes. Now both the genera after this revision so closely resemble to each other
Neodiplostomum (Fibricola) except in the relative dimension of oral sucker, pharynx and ventral sucker. In Gogatea the oral sucker is larger than ventral sucker whereas in Neogogatea oral sucker is poorly developed and pharynx is larger than oral sucker. Though these differences have no generic value still the genus Neogogatea was maintained till now due to host specificity. Gogatea is recorded from reptiles and Neogogatea from birds. As now the host specificity fails to be a criterion in taxonomic consideration the author proposes that Neogogatea Chandler and Rausch (1947) should be synonymised with Gogatea Lutz 1935.

Specific diagnosis of N. (F.) singhi n.sp.

Flesh-coloured small worms, body divided into equal fore and hind-body; ventral sucker bigger than oral sucker situated between intestinal bifurcation and tribocytic organ, ratio in the size of two suckers 1:1.4; minute prepharynx present, pharynx longer than oral sucker, oesophagus very small, easily overlooked, intestinal bifurcation in between anterior end and ventral sucker, caeca extending up to a little in front of the genital opening; tribocytic organ, elongated behind the ventral sucker, about one-third to one-fourth of the length of fore-body, opening longitudinal; anterior testis, situated in the first half of the hind-body, submedian, right part touching the right body wall, posterior testis bilobed dumb-bell-shaped, transversely elongated to cover entire breadth of the hind-body; ovary pretesticular, oval, transverse axis horizontal, median touching the hind-border of fore-body, “Mehlis’s” gland, yolk reservoir intertesticular; vitellaria distributed in the fore-body upto the level of intestinal bifurcation leaving a clear space dorsal to the ventral sucker and tribocytic organ, extend in the hind-body up to genital opening; genital cone absent; bursa present which bears subterminal genital opening; eggs elongated and slender.

Host .. Deer, Antilope cervicapra.
Location .. Intestine.
Locality .. Tamia Ghat, Chhindwara (M.P.), India.

ACKNOWLEDGEMENT

I wish to express my grateful appreciation and indebtedness to Dr. G. P. Jain for his kind interest in guiding this work. I am also grateful to Dr. B. S. Chauhan, Calcutta, Principal G. R. Inamdar, Jabalpur, Prof. G. W. Vaidya and Dr. D. R. Sharama of the Government Science College, Jabalpur, Dr. J. N. Saksena, Rewa and Principal Shri P. C. Sethi, Chhindwara, for their various types of help.
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