

BRACHYLAIMA DOLICHODIRUS N. SP.
FROM A SHREW, BLARINA BREVICAUDA¹

JOE MASON, JR.

Department of Zoology and Entomology
The University of Tennessee, Knoxville, Tennessee

Ten mature and seven immature specimens of a digenetic trematode were recovered from the small intestine of a shrew, *Blarina brevicauda* Say, 1823, which was trapped during a small animal survey of Backbone Rock State Park, Johnson County, Tennessee, in March and April, 1951. Upon examination these worms proved to be of the genus *Brachylaima*. The helminths were fixed in modified Carnoy solution (six parts absolute alcohol, three parts chloroform, one part acetic acid). Six specimens were mounted whole. Four of these were stained with a mixture of three parts alum-cochineal to one part Harris' haematoxylin after having been flattened by softening with dilute acetic acid and ethanol, and hardened with 95 percent alcohol while under pressure; and two were mounted whole and unstained. Three flukes were sectioned and stained with Heidenhain's Iron Haematoxylin. Perhaps because the shrew had been frozen before examination, the flukes were rather soft and unfavorable for histological study. Both ordinary and phase-contrast microscopy were used; drawings were made utilizing a micro-projector.

Brachylaima dolichodirus n. sp. (Plate 1)

Specific diagnosis: Characters of the genus, *Brachylaima*, as defined by Allison, 1943. Body very elongated, with an unusually long neck, greatest width at anterior portion of posterior fifth of worm in region of genital pore. From this point, lateral margins gradually tapering anteriorly to acetabulum. Portion in front of acetabulum sloping more quickly, leveling out into an elongated neck. Cuticle without spines. Oral sucker subterminal, well-developed and 0.283—0.406 mm. long by 0.233—0.366 mm. wide, extending completely across anterior end of helminth. Acetabulum well developed with a deep cavity, circular, 0.239—0.566 mm., nearly extending across width of worm, located in anterior portion of posterior three-fifths of worm. Prepharynx short or absent; pharynx very closely connected with, and slightly overlapping posterior end of oral sucker, muscular, 0.159—0.266 mm. long by 0.139—0.209 mm. wide. No esophagus present. Ceca straight, rather thin-walled, medium-sized tubes that bifurcate immediately behind pharynx and turn almost directly posterior, without any lateral or anterior looping, then run closely parallel down through neck region, diverging at anterior extremity of uterus anterior to acetabulum, and continuing down body near each lateral margin until they terminate just behind posterior testis at end of body. Genital pore ventral, sinistral, irregularly oblong, 0.116—0.216 mm. wide by 0.126—0.213 mm. long, located at anterior portion of posterior fifth of worm. External openings of male and female ducts situated in this common atrium,

¹Contribution number 56 from the Department of Zoology and Entomology, The University of Tennessee, Knoxville, Tennessee. Appreciation is expressed for the advice given by Dr. A. W. Jones of the University who directed this study. According to McIntosh (1950), the name *Brachylaima* should be used instead of the generally used name *Brachylaemus*.

metraterm being lateral to cirrus. Testes, when mature, oval to broadly triangular; smooth bordered. Posterior testis 0.223—0.532 mm. long by 0.199—0.382 mm. wide, median, cradled in ends of ceca; anterior testis 0.299—0.499 mm. long by 0.209—0.333 mm. wide, sinistral, directly behind genital

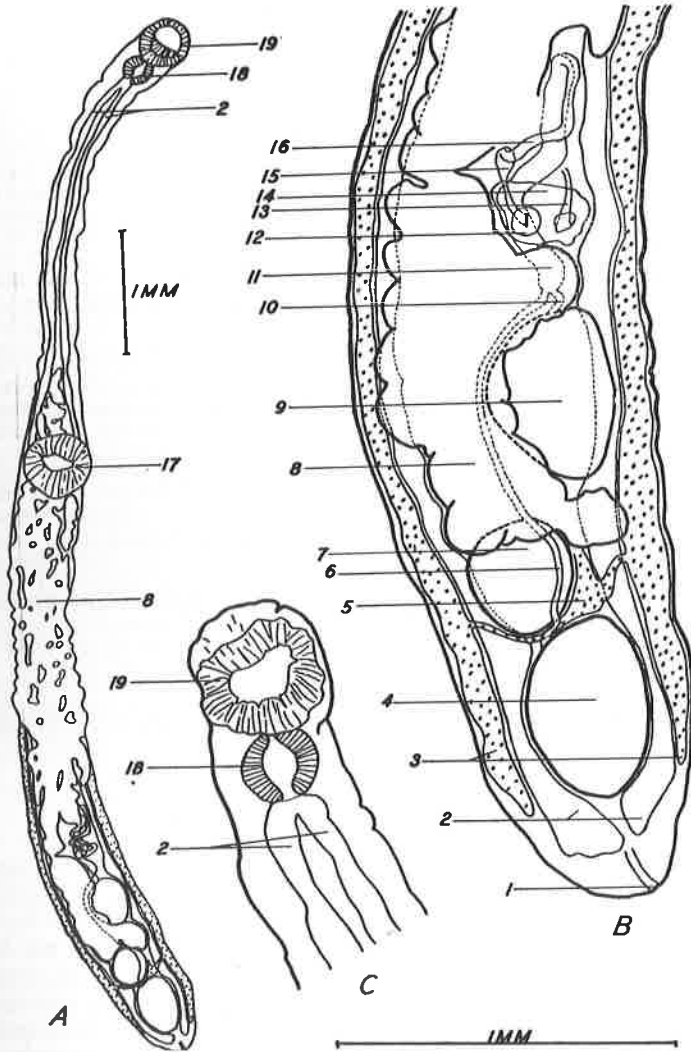


Plate 1. *Brachylaima dolichodirus*, ventral views. A. Whole mount. B. Posterior portion. C. Anterior portion illustrating ceca. 1, excretory pore; 2, intestinal ceca; 3, vitellaria; 4, posterior testis; 5, yolk reservoir; 6, posterior vas efferens; 7, ovary; 8, uterus; 9, anterior testis; 10, anterior vas efferens; 11, posterior vas deferens; 12, cirrus; 13, metraterm; 14, genital atrium; 15, seminal vesicle; 16, anterior vas deferens; 17, acetabulum; 18, pharynx; 19, oral sucker. (All figures drawn with the aid of a micro-projector and reproduced at the indicated magnifications.)

pore, usually smaller than posterior testis and more irregular in shape. Posterior vas efferens, 0.009—0.011 mm. in diameter, attached to ventral, forward edge of posterior testis and moving either ventral to and across ovary, or following its median border. Leaving ovary, tube traces course around median side of anterior testis where it enters vas deferens, along with anterior vas efferens, 0.011 mm., from anterior portion of anterior testis. Vas deferens 0.019—0.056 mm. in diameter, slightly sinuous, dorsal in position, extends anteriorly past genital pore to a point where uterus blocks its forward direction. It then re-curves ventrally upon itself and turns toward median line where it forms seminal vesicle, a tear-drop shaped structure 0.089×0.059 mm. that tapers into ejaculatory duct 0.009 mm. in diameter that leads to cirrus. Cirrus glandular in nature, non-spinous, circular in cross-section 0.051—0.069 mm. Cirrus pouch, if present, indistinguishable. Ovary 0.119—0.349 mm. by 0.199—0.333 mm., located slightly dextral to median line, ventral, and nearer posterior than anterior testis, smooth-bordered, ranging in shape from ovoid in mature to triangular in old specimens. Oviduct and ootype (which could not be distinguished because of poor condition of specimens) typically should be dorsal to yolk reservoir (Sinitsin, 1931). Laurer's canal present. Uterus dorsal, at level of forward edge of posterior testis, filling entire remaining space except that occupied by genital pore and various tubes; ascending limb beginning at left of ovary as a small tube 0.020 mm. in diameter, which quickly expands to approximately 0.100 mm., with the transparent, thin-shelled eggs in it. Color of the eggs ranging from yellow in posterior ventral portion of ascending limb, which reaches past acetabulum to approximately one-fifth of distance from ventral to oral sucker, to dark brown in anterior portion of ascending limb and descending limb that forms regular folds across width of worm posteriorly and curves around area of genital pore to anterior portion of anterior testis. Distal portion of uterus a slender, elongated, metraterm 0.011—0.016 mm. in diameter. Eggs 0.013—0.016 mm. by 0.028 mm. Vitellaria lateral to caeca, beginning approximately two-thirds of distance anteriorly between posterior end of body and acetabulum, and extending to posterior end of posterior testis. Two yolk ducts, ventral to caeca, connecting vitellaria with yolk reservoir which is situated dextral to ovary and anterior to posterior testis. Bladder a narrow tube bifurcating at posterior testis.

Host: *Blarina brevicauda* Say, 1823.

Locality: Johnson County, Tennessee.

Type specimen: To be deposited in U. S. National Museum, Washington, D. C.

Paratypes: Department of Zoology and Entomology, University of Tennessee.

DISCUSSION

Several workers have written of the confusion existing in what is, or what is not, of value in separating one species of *Brachylaima* from another. The validity of a species described by one worker has been questioned by another worker on the grounds that the diagnostic characters used were too variable to be accurate (Robinson, 1949). Size seems to be of little value. The same species introduced into different hosts demonstrates a marked difference in the measurements of the mature worm (Chandler, 1946). More important are body proportions and position of organs. Even in cases where one organ is missing completely, the remaining organs and ducts usually are placed exactly as if the missing organ were in its normal position (Sinitsin, 1931).

The almost universal opinion of the workers is reflected in the papers of Dollfus (1934), Krull (1933a), and Fonseca (1939).

Dollfus, 1934, stated: "Au cours de ces dix dernières années, plusieurs révisions, plus ou moins heureuses, ont été publiées par Georges Witenberg (1925) (1), Helena Werby (1928), D. Sinitsin (1931) (2) et je ne pense pas que, sans une expérimentation très large et sans un matériel de comparaison très considérable, il soit possible d'obtenir sur la morphologie des *Brachylaemus* des renseignements assez précis pour délimiter les espèces et fixer la systématique." Krull, 1933 a, wrote that "... the work of Dickerson (1930), Hofmann, Joyeux, Baer and Timon-David (1932), McIntosh (1932), Sinitsin (1931), Werby (1928), Witenberg (1925), and others, shows that species in the family Brachylaemidae are exceedingly difficult to determine."

And Fonseca, 1939, expresses the view that "The disparity of opinions about the autonomy of most of the forms known is such that some modern specialists as Witenberg (2), point out numerous species as good ones, whereas others, such as Sinitsin (3), restrain the genus to a minimum of valid units, and sink the majority as synonyms. Others, as Dollfus (4), hold an intermediary position, considering the diversity of the hosts as well as the geographic distribution as elements that contribute for a specific or sub-specific distinction.

"Such a diversity of conception of specific characteristics among specialists with large experience in the group shows that the researches about the limits of the morphologic variations are still incomplete among the species of *Brachylaima*. Unless they present very typical features, differentiation will continue to be difficult and only a future comparative study will permit to remove these difficulties and to decide about the value to be ascribed to each of the morphologic variations used nowadays as elements for the specific distinction."

The species of *Brachylaima*, in general, do not seem to be very host-specific. A number of different host species have been experimentally exposed to the immature forms of one species and have yielded, on examination, the mature forms (Chandler, 1946; Krull, 1934). A comparison of the helminth under consideration with the ones previously described from shrews alone would be inconclusive. Size, although a criterion subject to considerable variation, is more convenient to use since *B. dolichodirus* is at the upper limit for body length in the genus. (In the mature specimens of *B. dolichodirus* the length varies from 7.084 to 9.685 mm. and the width from 0.599 to 0.732 mm.).

Only a few species of *Brachylaima* approach this size. *Brachylaima gallinus* (Witenberg, 1923) reaches a size of 8.0 mm. long by 2.0 mm. wide (Alicata, 1940); *B. hawaiiensis* (Guberlet, 1928) has been observed 3.0 to 7.0 mm. long; *B. rauschi* (McIntosh, 1950) is up to 5.9 mm. long; and *B. mazzanti* (Travassos, 1927) is recorded 2.2 to 6.2 mm. long and 0.4 to 1.1 mm. wide. Each of these can be eliminated by a study of its morphology. *Brachylaima gallinus*, considered by some experts to be synonymous with *B. hawaiiensis*, *B. horizawai*, and *B. commutatus* (see Joyeux and Houde-mer, 1928; Yamaguti, 1933), has vitellaria which reach posteriorly to the anterior edge of the anterior testis, the ventral sucker dividing

the body by a ratio of 1:2. The vitellaria of *B. dolichodirus* reach to the posterior end of the posterior testis and the body is divided by a ratio of 2:3. All the mentioned species are found in the intestine of the chicken, except *B. mazzanti* which is found in the pigeon intestine and *B. rauchi* in a lemming. *B. mazzanti* possesses vitellaria from the bifurcal zone of the intestinal ceca to the ovarian zone, and the oral sucker is slightly larger than the ventral sucker. The oral sucker of *B. dolichodirus* is definitely smaller than the ventral sucker. In *B. rauchi* the gonads are more anterior than in *B. dolichodirus*.

B. dolichodirus combines certain characteristics of anatomy which set it distinctly apart from previously described species. The unusually large size, the intestinal ceca which turn directly posterior without the characteristic lateral or antero-lateral turnings immediately posterior to the pharynx, the extension of the vitellaria aborally to the level of the posterior end of the posterior testis (in most other species, they characteristically reach approximately the anterior end of the anterior testis), and the long neck, distinguish the worm sufficiently from other species in the genus to warrant its designation as a new species.

SUMMARY

1. A new species of *Brachylaemus* is described from the shrew, *Blarina brevicauda*.
2. The large size and the long neck, together with the morphology of the intestinal ceca at the bifurcation and the extent of the vitellaria, distinguish this from other species in the genus.

BIBLIOGRAPHY

- Alicata, J. E. 1940. The life cycle of *Postharmostomum gallinum*, the cecal fluke of poultry. *Jour. Par.*, 26 (2):135-143.
- Allison, L. N. 1943. *Leucochloridiomorpha constantiae* (Mueller) (Brachylaemidae), its life cycle and taxonomic relationships among digenetic trematodes. *Trans. Amer. Mic. Soc.*, 62:127-168.
- Chandler, Asa C. 1946. Helminths of armadillos, *Dasypus novemcinctus*, in eastern Texas. *Jour. Par.*, 32 (3):237-241.
- Dollfus, R. Ph. 1934. Sur quelques *Brachylaemus* de la faune française récoltés principalement à Richelieu (Indre-et-Loire). *Ann. de Parasitol.*, 12:55-575.
- Fonseca, Flavio da. 1939. Novo trematóide parasita da galinha, *Brachylaemus fleuryi* sp. n. (Brachylaemidae Fascioloidea) Nota prévia. [A new trematode, *B. fleuryi* parasitizing chickens]. *Bol. Biol.* [Sao Paulo], 4 (1):114-116.
- Guberlet, J. E. 1928. Parasitic worms of Hawaiian chickens with a description of a new trematode. *Trans. Amer. Mic. Soc.*, 47:444-453.
- Joyeux, Ch., et E. Houdemer. 1928. Recherches sur la faune helminthologique de l'Indo-chine (Cestodes et Trematodes). *Ann. Parasitol. Hum. et Compar.*, 6 (1):27-28.
- Krull, C. E. 1933. The opossum, *Didelphis virginiana virginiana* Kerr, a new host for *Brachylaemus spinosulum* (Hofmann, 1899). *Jour. Par.*, 20:98-99.
- Krull, W. H. 1934. New experimental hosts for *Brachylaemus virginiana* (Dickerson) Krull. *Washington Acad. Sci. Jour.*, 24:483-485.
- McIntosh, A. 1950. *Brachylaima rauschi* n. sp. from an Arctic Lemming, *Dicrostonyx groenlandicus rubricatus* (Richardson, 1839). *Jour. Par. Sup.*, Vol. 20.
- Robinson, Edwin J., Jr. 1949. The life history of *Postharmostomum helicus* (Continued on page 85)