

## Studies on Monogenetic Trematodes XIX The Status of North American Dactylogyrinae and Tetraonchinae

JOHN D. MIZELLE, University of Notre Dame

The genus *Dactylogyrus* was erected by Diesing (1850), to include Monopisthocotylea which were superficially similar to species of *Gyrodactylus*. The validity of this category was confirmed in 1933 when Bychowsky established the Dactylogyridae. Presently this family is composed of the subfamilies Bothitrematinae Price, 1936; Rhamnocercinae Monaco et al., 1954; Diplectaninae Monticelli, 1903; Dactylogyrinae Bychowsky, 1933; and Tetraonchinae Monticelli, 1903. The Bothitrematinae is distinguished principally by the presence of an almost complete circle of tubular structures on the haptor. Other characters are: cephalic glands scattered throughout the preoral area, one pair of anchors, two bars, and fourteen hooks. It consists of a single monotypic genus (*Bothitrema*). The Rhamnocercinae is characterized principally by accessory cuticular armament on the haptor which differs from that in other subfamilies, and the possession of spine-like hooks throughout the length of the peduncle. Other characters include four anchors, three bars, and 12 or 14 hooks. This subfamily also consists of a single monotypic genus (*Rhamnocercus*). The Diplectaninae is conspicuous by the presence of a squamodisc on each of the dorsal and ventral surfaces of the haptor. Other characters are: two pairs of anchors; two, three, or five bars, and 14 hooks (usually). This subfamily includes the genera *Diplectanum* Diesing, 1859; *Lamello-discus* Johnston & Tiegs, 1922; *Lepidotrema* Johnston & Tiegs, 1922; *Neodiplectanum* Mizelle & Blatz, 1941; and *Squamodiscus* Yamaguti, 1934. The Dactylogyrinae and Tetraonchinae are remarkably similar morphologically. The most conspicuous difference consists of the presence of one pair of anchors in the Dactylogyrinae and two pairs of these structures in the Tetraonchinae. The haptor in these two subfamilies does not possess accessory cuticular structures.

The genus *Dactylogyrus* existed without question from 1850 to 1938 when Price defined *Neodactylogyrus* to include species of the former genus which possessed two "Haptoral hooks (anchors) supported by 2 similar or dissimilar bars." Since only one of these bars supports the anchors, the generic diagnosis is erroneous, in part. The single pair of anchors and the accompanying bar are situated in the dorsal portion of the haptor; the second bar is situated ventrally and is interpreted as a relict structure which once supported the bases of a ventral pair of anchors which disappeared in the evolution of these species. This statement presupposes a *Dactylogyrus* ancestor with a dorsal and a ventral pair of anchors, and receives support in the fact that all of the other Dactylogyridae except the Bothitrematinae (one species) possesses this ancestral condition. In some species of *Dactylogyrus* the relict ventral bar has increased in size beyond that of the functional dorsal bar; in others it is smaller; and in still others it is absent. In many species the ventral bar is so small that it cannot be observed with certainty and especially so in fixed specimens.

*Neodactylogyrus* therefore is rejected because the relict ventral bar on which it is based, is so variable that it fails to be a reliable structure and its use results in synonymy, which is to be avoided. Further, the present author does not consider this single structure to be of generic level. *Neodactylogyrus* has been recognized (Kimpel, 1939; Sproston, 1946), ignored (Malevitskaja, 1941; Mizelle & Klucka, 1953; Mizelle & Webb, 1953; Monaco & Mizelle, in press), and rejected Mizelle & Donahue, 1944. *Dogelius* Bychowsky, 1936 (monotypic), is the only other genus in the Dactylogyrinae.

The subfamily Tetraonchinae is composed of twenty recognized genera (Sproston, 1946). North American investigations on this subfamily began in 1932 with the description of *Urocleidus aculeatus* by Van Cleave and Mueller. Subsequent work proceeded so rapidly that some of the newly created genera were questioned by Mizelle and Hughes (1938) who reduced nine of these (*Actinocleidus*, *Aristocleidus*, *Cleidodiscus*, *Haplocleidus*, *Leptocleidus*, *Onchocleidus*, *Pterocleidus*, *Tetracleidus*, *Urocleidus*, all of Mueller) to three, namely *Actinocleidus*, *Cleidodiscus* and *Urocleidus*. Price defined the genus *Murraytrema* in 1937, Mizelle and Blatz described *Rhabdosynochus* in 1941, and Mizelle erected the genus *Anchoradiscus* in 1941. This makes a total of six valid North American genera. Whether or not some of these are sufficiently different from Old World genera to warrant recognition is not considered in this paper.

The present author feels that sufficient North American species have now been described to give a reasonably clear picture of this subfamily on this continent. *Murraytrema* Price, 1937, is distinct and warrants no comment as to its validity. Similarly, *Cleidodiscus* Mueller, 1934, with two pairs of anchors (dorsal and ventral), and two individual (disarticulated) bars supporting the anchor bases, a basally articulate cirrus and accessory piece, and a sinistral vagina (when present), presents a generic category of unquestioned validity. *Leptocleidus* Mueller, 1936 (a), as a synonym (in part) of this genus (Mizelle & Hughes, 1938) is upheld. The coiled nature of the cirrus does not present a variation greater than that existing among other species of *Cleidodiscus* or *Urocleidus* Mueller, 1934, emended Mizelle & Hughes, 1938. In addition, the present author has on several occasions observed old specimens of *Cleidodiscus* to possess an enlarged trunk with minimization of the haptor as recorded for *Leptocleidus*.

#### **Rhabdosynochus-Anchoradiscus Group**

Disposition of the two pairs of anchors in the dorsal and ventral portions of the haptor with individual (disarticulated or unfused) bars supporting their bases (e.g. species of *Cleidodiscus* and *Urocleidus*) is regarded as primitive in Tetraonchinae. In *Rhabdosynochus* Mizelle & Blatz, 1941, this condition exists except that the bars have become fused in their midportions (Mizelle & Blatz, 1941, figs. 9, 10). In the genus *Actinocleidus* this association of bars has progressed to the point of structural modification for articulation to each other (Mizelle, 1938, Pl. 3, figs. 41, 43). In addition the ventral bar and associated anchors have moved anteriorly and the dorsal bar and anchors have migrated to the ventral side of the haptor. Thus, these structures are anterior and posterior in species of *Actinocleidus* instead of ventral and dorsal in *Cleidodiscus* and

*Urocleidus* species. It is interesting to note that the haptoral hooks retain their original positions as observed in *Cleidodiscus* forms (Mizelle, 1938). In *Rhabdosynochus* and most species of *Actinocleidus* the anchors and bars are situated in the fleshy portion of the haptor. In some species assigned to *Actinocleidus*, however, these structures have become reduced in size and relegated to a relatively small protuberance in the center of the ventral surface of the haptor which surrounds it in an umbrella-like fashion with a haptoral hook situated in notches on the edge of the haptor (Mueller, 1936a, Pl. 12, fig. 6). The name \**Clavanculus* n. gen. is proposed for inclusion of these species. Articulation of the haptoral bars together with associated changes perhaps reaches highest expression in the genus *Anchoradiscus* Mizelle, 1941. In these the bases of the anchors have developed sufficiently to practically obliterate the anchor shafts and are so large that they occupy the major portion of a lateral plane through the haptor (Mizelle, 1941, fig. A). The anchor points emerge from the lateral rather than the ventral surface of the haptor as in *Actinocleidus* species. Both bars are modified approximately to the same extent and attached to the sides of the anchor bases instead of the edge of the superficial roots of these structures.

#### Urocleidus Group

This assemblage includes species from the old genera *Aristocleidus*, *Haplocleidus*, *Onchocleidus*, *Pterocleidus*, *Tetracleidus*, and *Urocleidus* as originally defined (all of Mueller). After reviewing the species involved, it is considered sound to retain all of them in the genus *Urocleidus* Mueller, 1934, as emended by Mizelle and Hughes (1938), for the following reasons. Originally *Tetracleidus* was distinguished from *Urocleidus* by the presence of a vagina and from *Onchocleidus* in the possession of an accessory piece in the copulatory complex (Mueller, 1936a). Since three of the six species originally described in *Onchocleidus* did not possess a vagina and further an accessory piece has been observed in practically every species of *Onchocleidus* and probably exists in all of them, it is obvious that all of the forms in these three categories belong to a single genus, namely, *Urocleidus*, which has priority. *Aristocleidus* was proposed to include species essentially like those of *Tetracleidus* except for a discrepancy in the shape of the dorsal and ventral anchors (Mueller, 1936b). Since discrepancies in anchor shape also occur in *Cleidodiscus* and *Actinocleidus* species, *Aristocleidus* has no validity and becomes a synonym (in part) of *Urocleidus*. The old genus *Pterocleidus* Mueller, 1937, was distinguished as embracing *Onchocleidus*-like forms which possessed a "flat blade" arising near the distal end of each anchor shaft on the concave surface. Superficially this old category appears valid but the character involved is hardly of subgeneric much less generic level and in the author's opinion cannot be used for generic fission any more than the widespread occurrence of a spine on the posterior border of the haptoral bars of species in this assemblage. Similarly the old genus *Haplocleidus* Mueller, 1937, which was separated from *Onchocleidus* because of the larger size of the dorsal pair of anchors is without validity since some species of *Cleidodiscus*

\* The generic diagnosis is being published elsewhere.

and *Urocleidus* possess anchors with size discrepancies which intergrade with the condition cited as a character of *Haplocleidus*.

The foregoing conclusions concerning the old genera *Haplocleidus* and *Pterocleidus* are based on the premise that genera must be based on characters of more than insignificant magnitude which alone are requisite for sound taxonomic interpretation of valid evolutionary relationships. Generic fission for mere convenience of the novice or because of the presence of a relatively large number of species contained in a given genus, is considered inexcusable.

### Literature Cited

- BYCHOWSKY, B. 1933. Beitrag zur Kenntnis neuer monogenetischer Fischtrematoden aus dem Kaspisee nebst einigen Bemerkungen über die Systematik der Monopisthodiscinea Fuhrmann, 1928. Zool. Anz. **105**: 17-38.
- . 1936. Die monogenetischen Trematoden der Fische des Tschu-Flusses. Trav. Exped. Et. Republ. Kirghiz, Moscow **3**: 245-275.
- DIESING, K. M. 1850. Systema helminthum. 1. Vindobonae.
- . 1859. Nachträge und Verbesserungen zur Revision der Myzhelminthen. Sitz. Ber. Akad. Wiss. Wien. **35**: 421-451.
- JOHNSTON, T. H., and O. W. TIEGS. 1922. New gyroductyloid trematodes from Australian fishes, together with a reclassification of the superfamily Gyroductyloidea. Proc. Linn. Soc. N. S. Wales **47**: 83-131.
- KIMPEL, H. G. 1939. Studies on the taxonomy of the genus *Neodactylogyrus*, with descriptions of a new species, and the immunity of fresh-water fishes to gill trematodes (Gyroductyloidea). Private Publication.
- MALEVITSKAJA, M. 1941. Neue *Dactylogyrus*-arten (Trematoda) aus dem Dnjepr. C. R. (Doklady) Acad. Sci. U.R.S.S. **30**: 269-271.
- MIZELLE, J. D. 1938. Comparative studies on trematodes (Gyroductyloidea) from the gills of North American fresh-water fishes. Ill. Biol. Monogr. **17**: 1-81.
- . 1941. Studies on monogenetic trematodes. IV. *Anchoradiscus*, a new dactylogyrid genus from the bluegill and the stumpknocker sunfish. J. Parasit. **27**: 159-163.
- & V. BLATZ. 1941. Studies on monogenetic trematodes. VI. Two new dactylogyrid genera from Florida fishes. Amer. Midl. Nat. **26**: 105-109.
- & M. A. DONAHUE. 1944. Studies on monogenetic trematodes. XI. *Dactylogyridae* from Algonquin Park fishes. Ibid. **31**: 600-624.
- & R. C. HUGHES. 1938. The North American fresh-water *Tetraonchinae*. Ibid. **20**: 341-353.
- & A. R. KLUCKA. 1953. Studies on monogenetic trematodes. XIV. *Dactylogyridae* from Wisconsin fishes. Ibid. **49**: 720-733.
- & F. O. WEBB. 1953. Studies on monogenetic trematodes. XV. *Dactylogyridae* from Alaska, Wisconsin, and Wyoming. Ibid. **50**: 206-217.
- MONTICELLI, F. S. 1903. Per una nuova classificazione degli "Heterocotylea." Monit. Zool. Ital. **14**: 334-336.
- MONACO, L. H., R. A. WOOD, & J. D. MIZELLE. 1954. Studies on monogenetic trematodes. XVI. *Rhamnocercinae*, a new subfamily of *Dactylogyridae*. Amer. Midl. Nat. **52**: 129-132.
- & J. D. MIZELLE (in press). Studies on monogenetic trematodes. XVII. The genus *Dactylogyrus* in North America. Ibid.
- MUELLER, J. F. 1934. Parasites of Oneida Lake fishes. Part IV. Additional notes on parasites of Oneida Lake fishes, including descriptions of new species. Roosevelt Wild Life Annals **3**: 335-373.
- . 1936a. Studies on North American Gyroductyloidea. Trans. Amer. Micros. Soc. **55**: 55-72.
- . 1936b. New gyroductyloid trematodes from North American fishes. Ibid. **55**: 457-464.
- . 1937. Further studies on North American Gyroductyloidea. Amer. Midl. Nat. **18**: 207-219.

- PRICE, E. W. 1936. North American monogenetic trematodes. *Geo. Wash. Univ. Bull.* (Summaries of Doctoral theses, 1934-1936 : 10-13.
- . 1937. North American monogenetic trematodes. I. The superfamily Gyrodactyloidea. *J. Wash. Acad. Sci.* 27 : 114-130 ; 27 : 146-164.
- . 1938. A new species of *Dactylogyrus*, with the proposal of a new genus. *Proc. Helminth. Soc. Wash.* 5 : 48-49.
- SPROSTON, N. G. 1946. A synopsis of the monogenetic trematodes. *Trans. Zool. Soc. London* 25 : 185-600.
- VAN CLEAVE, H. J., & J. F. MUELLER. 1932. Parasites of Oneida Lake fishes. Part I. Descriptions of new genera and new species. *Roosevelt Wild Life Annals* 3 : 1-72.
- YAMAGUTI, S. 1934. Studies on the helminth fauna of Japan. Part 2. Trematodes of fishes, 1. *Jap. J. Zool.* 5 : 249-251.