ACANTHOCEPHALUS ALABAMENSIS SP. N.  
(ACANTHOCEPHALATA: ECHINORHYNCHIDAE)  
FROM ALABAMA FISHES

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ABSTRACT: *Acanthocephalus alabamensis* sp. n. is described on the basis of 12 males and seven non-gravid females recovered from six species of four families of Alabama fishes: speckled darter, *Etheostoma stigmaceum*, and redbin darter, *E. whipplei* (Percidae); Alabama hogsucker, *Hypentelium etowanum*, and blacktail red horse, *Moxostoma poecilurum* (Catostomidae); reeye bass, *Micropterus coosae* (Centrarchidae); and carp, *Cyprinus carpio* (Cyprinidae). *Acanthocephalus alabamensis* is most similar to *A. tahlequahensis* but is distinguished from it by having a cylindrical body, larger testes relative to body size, fewer proboscis hooks per row, longer proboscis hooks, and different host and geographical distributions.

During the course of reviewing species of *Acanthocephalus* from North American freshwater fishes, a new form was recognized that was found by Burns (1970, 1971) in two species of *Etheostoma* from Alabama and by Williams (1974a, b) and Williams and Rogers (1982) in four other species of Alabama fishes. Description of this organism raises the number of species of this genus from North American fishes to five: *A. dirus* (Van Cleave, 1931) Van Cleave and Townsend, 1936, *A. jacksonii* Bullock, 1962, *A. parksidei* Amin, 1975, *A. tahlequahensis* Oettinger and Buckner, 1976, and *A. alabamensis* sp. n.

MATERIALS AND METHODS

More than 2,500 freshwater fishes of 142 species and 38 families were collected from all rivers in Alabama except the Tennessee River between 1970 and 1973 by Williams (1974a) and 256 fishes of five species and one family by Burns (1970, 1971). The infected fish collected by Williams were obtained by electrofishing from an unnamed tributary of Loblolly Creek, NNE of Loachapoka, Lee County during January 1971 and from the Cahaba River (Mobile Bay drainage system), north of highway 80, NW of Selma, Dallas County, during January 1973. Those collected by Burns were seineed over an 11-mo period in four sites of the Cahaba River at Overton Road and at highway 150 (Jefferson County) and at Valleydale Road and at Booth’s Ford (Shelby County) (Table I). Fishes were systematically examined for parasites within a few hours after capture. Acanthocephalans were refrigerated in distilled water for 24 to 48 hr then fixed in 5% formalin or AFA. All specimens were stained in Semichon’s carmine and mounted whole in permount or piccolyte.

Measurements and hook data were recorded from specimens with everted proboscis. Width measurements refer to maximum width. Proboscis length is exclusive of the neck. Largest proboscis hooks were measured only in profile. The length of the male reproductive system is the distance between the anterior margin of the anterior testis and the posterior end of the trunk (exclusive of bursa). The largest and smallest cement glands of each male were measured. All hook counts were made from at least two complete and adjacent rows of hooks around the proboscis. All measurements are in micrometers with means in parentheses, unless otherwise noted. Line drawings were made with the aid of a carbon arc microprojector.

*Acanthocephalus alabamensis* sp. n.  
(Figs. 1–11)

Synonyms


Description

General: With characteristics of the genus *Acanthocephalus*. Worms small and cylindrical. Trunk and all other shared structures larger in females than males. Trunk with parallel sides or slightly wider near middle and bluntly tapering at ends (Figs. 1, 2, 9–11). Proboscis of moderate length, cylindrical, and with nearly parallel sides (Fig. 3). Largest hooks near middle of proboscis (Figs. 4–6). Hooks small, all rooted; roots simple, about as long as hooks. Brain at posterior end of double-walled proboscis receptacle. Lemnisci length variable but average somewhat shorter than proboscis receptacle, occasionally unequal.

Males (based on 12 specimens): Trunk 1.36 to 2.76 mm (2.06) long by 280 to 600 (447) wide; mean trunk width 22% of its length. Proboscis 266 to 462 (334) long by 98 to 140 (124) wide, armed with 13 to 16 (14.5) rows of 7 to 10 (8.0) hooks each. Largest hooks 35 to 51 (44) long. Double-walled proboscis receptacle 322 to 672 (519) long by 98 to 182 (143) wide. Lemnisci 210 to 672 (417) long by 42 to 98 (68) wide. Reproductive system length/body length 59 to 84% (71%).

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Table I. Distribution of Acanthocephalus alabamensis in fishes from Alabama.

<table>
<thead>
<tr>
<th>Locality</th>
<th>Species</th>
<th>No. exam.</th>
<th>Percent infect.</th>
<th>A. alabamensis recovered (♀, ♂)</th>
<th>Fish species not infected, no. exam. (family)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Loblockee Creek</td>
<td>Hypentelium etowanum</td>
<td>82</td>
<td>2.4</td>
<td>6 (3, 3)</td>
<td>Lepomis auritus, 6; L. gulosus, 3; L. macrochirus, 1; L. megalotis, 3; Micropterus punctulatus, 2 (Centrarchidae); Campostoma anomalum, 12; Notropis callistus, 20; N. chryscephalus, 4; N. trichoistius, 10; N. venustus, 15 (Cypeindidae); Ictalurus natalis, 3; Noturus leptacanthus, 3 (Ictaluridae); Mosoxostoma poecilurum, 1 (Catostomidae); Percina palmaris, 1 (Percidae)</td>
</tr>
<tr>
<td></td>
<td>Micropterus coosae</td>
<td>12</td>
<td>?</td>
<td>2 (0, 2)</td>
<td></td>
</tr>
<tr>
<td>Cahaba River</td>
<td>Cyprinus carpio</td>
<td>4</td>
<td>25.0</td>
<td>1 (0, 1)</td>
<td>Carpioedus cyprinus, 2; C. velifer, 14; Ictiobus bubalus, 1; Mosoxostoma carinatum, 1; M. duquesnei, 1 (Catostomidae); Notropis venustus, 1 (Cyprinidae); Amplocrysta asperella, 3 (Percidae); Pomoxis annularis, 1 (Centrarchidae); Lebistes siculus, 3 (Atherinidae); Apodopus grunniens, 2 (Sciaenidae); Dorosoma cepedianum, 4 (Clupeidae); Hiodon tergisus, 1 (Hiodontidae)</td>
</tr>
<tr>
<td></td>
<td>Mosoxostoma poecilurum</td>
<td>10</td>
<td>10.0</td>
<td>9 (7, 2)</td>
<td></td>
</tr>
<tr>
<td>Cahaba River*</td>
<td>Etheostoma stigmaeum</td>
<td>200</td>
<td>48.8</td>
<td>?</td>
<td>Etheostoma rupestrae, 20; E. jordani, 3; E. sp., 9 (Percidae)</td>
</tr>
<tr>
<td></td>
<td>Etheostoma whipplei</td>
<td>24</td>
<td>35.7</td>
<td>?</td>
<td></td>
</tr>
</tbody>
</table>

* From Burns (1971).

Tests about equal in size, spherical to elongate ellipsoidal (Figs. 1, 2), large compared to body size; anterior testis length and width average 20% and 58% of body length and width; anterior testis 252 to 560 (421) long by 210 to 308 (260) wide; posterior testis 252 to 588 (433) long by 196 to 350 (261) wide. Cement glands ovoid to claviform (Fig. 7), usually 6 (7 in one specimen); 84 to 308 (178) long by 42 to 266 (138) wide.

Females (based on 7 non-gravid specimens): Trunk 3.28 to 6.16 (4.55) long by 400 to 680 (554) wide; mean trunk width 12% of its length. Proboscis 406 to 574 (482) long by 126 to 182 (160) wide, armed with 15 to 17 (16) rows of 8 to 12 (10.1) hooks each. Largest hooks 48 to 54 (51) long. Double-walled proboscis receptacle 546 to 798 (697) long by 168 to 252 (189) wide. Lemnisci 252 to 672 (478) long by 42 to 112 (77) wide. Reproductive system as in Figure 8. Eggs unavailable.


Paratypes: USNM Helm. Coll. No. 77365, 77686, 76688-90, 10 males and five females.

Type host: Speckled darter, Etheostoma stigmaeum (Jordan) (Percidae).

Other hosts: Etheostoma whipplei (Girard) (Percidae); Cyprinus carpio Linn. (Cyprinidae); Micropterus coosae Hubbs and Bailey (Centrarchidae); and Mosoxostoma poecilurum (Jordan) and Hypentelium etowanum (Jordan) (Catostomidae).

Site of infection: Intestine.

Type locality: The Cahaba River (Jefferson County), Mobile Bay drainage system, Alabama.

Other localities: Loblockee Creek, Lee County, Alabama.

Etymology: Named for the state of Alabama.

Specimens examined

All the Williams material, except specimens from M. coosae (Table I), and three of Burns' specimens (2 males, 1 female) as well as types and many paratypes of A. dirus, A. jacksoni, A. parksidei, and A. tahlequahensis.

Distribution

Acanthocephalus alabamensis occurred in small, upland, steep-gradient tributaries, e.g., Loblockee Creek, and a large major river (Cahaba River) of the Mobile Bay drainage system. Its abundance in Etheostoma spp. (36-49%) (Table I) suggests that these fishes are its usual host. Highest frequency of infection (with predominantly immature worms) was noted in February, with January ranking second (Burns, 1971). One hundred forty-five other species representing 38 families of freshwater fishes were also examined but none was infected. Those from the above two locations are listed in Table I. Two thousand two hundred thirty-one specimens representing 151 species of marine and brackish fishes were similarly negative (Williams and Gaines, 1974).

Remarks

Specimens from E. stigmaeum were somewhat smaller than those from non-percid hosts. One female from M. poecilurum had a poste-
riorly incomplete row of proboscis hooks (with 3 anterior hooks) that was bordered by two rows incomplete anteriorly as well as an anteriorly directed posterior hook. Another female from *H. etowanum* had a cement plug indicating recent copulation. One male from *M. poecilurum* had a blisterlike swelling of the body wall similar to others previously observed to result from glycogen-phospholipid metabolic dysfunction in other *Acanthocephalus* worms (Amin, 1982).

The five species of *Acanthocephalus* from North American freshwater fishes appear to fall into two natural groups by size. *Acanthocephalus diirus*, *A. jacksoni*, and *A. parksidei* are larger forms
(males 2.2–6.0 mm and females 2.4–20.0 long) which have considerably larger proboscis hooks (Largest hooks 35–84 long in males and 42–103 in females) and testes (anterior testis 308–1,008 long by 168–686 wide) compared to the second group comprising A. tahlequahensis and A. alabamensis (males of A. alabamensis 1.4–2.8 mm and females 3.3–6.2 long; largest hooks 35–51 long in males and 48–54 in females; anterior testis 252–560 long by 210–308 wide).

The latter two species are more similar to each other. However, A. alabamensis can be separated from A. tahlequahensis in that the former has (1) a cylindrical rather than a spindle-shaped body (width averages 22% of length in males and 12% in females compared to 25% and 18% in A. tahlequahensis); (2) larger testes relative to body size (anterior testis length and width average 20% and 58% of body length and width, respectively, compared to 14% and 41% in A. tahlequahensis); (3) fewer proboscis hooks per row (7–10 in males and 8–12 in females compared to 10–14 and 10–16 in A. tahlequahensis); (4) longer hooks (largest hooks 35–51 long in males and 48–54 in females compared to 27–38 and 35–46 in A. tahlequahensis); (5) different host and geographical distribution: A. alabamensis from E. stigmæum, E. whipplei, H. etowanum, C. carpio, M. pescium, and M. coosae in Alabama (this study) and A. tahlequahensis from E. punctulatum, E. spectabile, N. asper, and N. pilsbryi in Oklahoma (Oetinger and Buckner, 1976).

Other Acanthocephalus species of comparable size to A. alabamensis include A. clavula (Dujardin, 1845) in England, A. curtus (Achmerow and Dombrovskaya-Achmerova, 1941) in USSR, A. minor Yamaguti, 1935, in Japan, A. opsarichthydis Yamaguti, 1935, in Japan, A. tenuirostris (Achmerow and Dombrovskaya-Achmerova, 1941) in USSR, and A. tumescens (Linstow, 1896) Porta, 1905, in Terra del Fuego, all from fish, as well as A. acutulus Van Cleave, 1931, in USA, A. elongatus Van Cleave, 1937, in China, and A. falcatus (Froel., 1789) Lühe, 1911, in Europe, from amphibians. Using proboscisc hook patterns alone, these species can be distinguished from A. alabamensis as follows: A. clavula males have 16 to 20 proboscis hook rows with 13 or 14 hooks each (16–20 × 13–14) and females 17–18 × 14–16 (Grabda-Kazubka and Chubb, 1968), A. curtus 28 hooks in eight transverse rows (Yamaguti, 1963), A. minor 13–15 × 7–9 (Yamaguti, 1935; 1963), A. opsarichthydis 8–11 × 5–7 (Nakajima and Egusa, 1975), A. te-

nuirostris 6 × 5 (Yamaguti, 1963), A. tumescens 12 × 5–6 (Petrochenko, 1956), A. acutulus 18–24 × 9–12 (Van Cleave, 1931), A. elongatus 16 × 13–15 (Van Cleave, 1937), and A. falcatus males 11–15 × 5–8 and females 12–17 × 5–8 (Grabda-Kazubka, 1962). Acanthocephalus clavula and A. opsarichthydis are more similar to A. alabamensis, particularly in body form, but can be further distinguished from it by the smaller testes in the first species and the anterior projection of proboscis hook roots in the second. Among the species with larger worms, A. lucii (Müller, 1777) Lühe, 1911 (12–16 × 7–9), and A. ranae (Schrank, 1788) Lühe, 111 (12–20 × 4–6), are more similar to A. alabamensis, but in addition to the size difference, their males have smaller testes compared to body size and proboscis hook roots are triangularly shaped in A. lucii (Petrochenko, 1956; Yamaguti, 1963).

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LITERATURE CITED


