

***Fessisentis acutulus* (Van Cleave, 1931) comb. n. (Acanthocephala: Fessisentidae): A Parasite of Caudate Amphibians in North America, with Comments on the Single North American Report of *A. ranae* (Schrank, 1788)**

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ABSTRACT: Based on anatomical grounds, specimens in the type series of the acanthocephalan *Acanthocephalus acutulus* Van Cleave, 1931, from the red-spotted newt, *Notophthalmus viridescens* (Rafinesque, 1820), belong to the genus *Fessisentis*. This conforms with knowledge of the host-parasite relationships within the genus *Fessisentis*. The single North American report for *A. ranae* (Schrank, 1788) clearly is not this species and probably is *Acanthocephalus dirus* (Van Cleave, 1931) Van Cleave and Townsend, 1936.

KEY WORDS: Acanthocephala, Amphibia, *Acanthocephalus acutulus*, *Acanthocephalus dirus*, *Acanthocephalus ranae*, *Fessisentis acutulus*.

With the exception of several members of the genus *Fessisentis* Van Cleave, 1931, acanthocephalans have been infrequently reported as parasitic in North American amphibians. In the earliest report, Stiles and Hassall (1894) recorded *Echinorhynchus* sp. from *Notophthalmus viridescens* (Rafinesque, 1820), the red-spotted newt, collected in Maryland. Van Cleave (1915) identified the 7 specimens in this collection as *Acanthocephalus ranae* (Schrank, 1788), a species typical of European amphibians. Subsequently, a series of 12 worms collected by Holl (1932) from the red-spotted newt in North Carolina were described by Van Cleave (1931a) as *A. acutulus*.

Acanthocephalus acutulus has been rarely collected since its original description. Rankin (1937) reported the species in the North Carolina salamanders *Ambystoma opacum*, *Desmognathus fuscus*, *Plethodon glutinosus*, and *N. viridescens*. Nickol (1969) collected a single immature specimen from *Plethodon glutinosus* in Louisiana, and Dyer and Brandon (1973) found 5 specimens in a single *Cryptobranchus alleghaniensis* in Missouri. *Acanthocephalus ranae* has not been reported in North America since the publication of Van Cleave (1915).

Here I review the status of these specimens and resolve several problems of systematics and biogeography presented by these reports.

Materials and Methods

The following specimens were borrowed and examined.

- i. *Acanthocephalus ranae* (Schrank, 1788): Two mature males and 1 gravid female, of the 7 specimens reported by Van Cleave (1915) (USNPC No. 6322).
- ii. *Acanthocephalus acutulus* Van Cleave, 1931: Eleven of the 12 worms in the type series, mounted on 10 slides (USNPC No. 81541). One of these specimens was cross-sectioned and stained in celestin blue B, Mayer's hematoxylin, and eosin for examination of the muscular structure of the proboscis receptacle.
- iii. *Acanthocephalus acutulus* Van Cleave, 1931: Single specimen reported by Nickol (1969) (collection of Dr. Brent Nickol, University of Nebraska).
- iv. *Acanthocephalus ranae* (Schrank, 1788): Single gravid female from *Rana esculenta* Linnaeus, 1758 (USNPC No. 81866).

Attempts to locate specimens of *A. acutulus* reported by Rankin (1937) and those collected by Holl (1932) additional to the type series were unsuccessful. Specimens of Dyer and Brandon (1973) were accidentally destroyed (W. G. Dyer, pers. comm.).

Results and Discussion

***Acanthocephalus ranae* (Schrank, 1788)**

Two of Van Cleave's specimens are fragmented, including the single female that is also overstained. Van Cleave (1931b) noted that his identification of *A. ranae* was based on "rather unsatisfactory material." These specimens differ from European *A. ranae* (Schrank, 1788) and the closely related *A. falcatus* (Frolich, 1789) examined by Grabda-Kazubaska (1962). *Acanthocephalus ranae* (Schrank, 1788) rarely possesses 12 hook rows, and then only in males. Of the 4

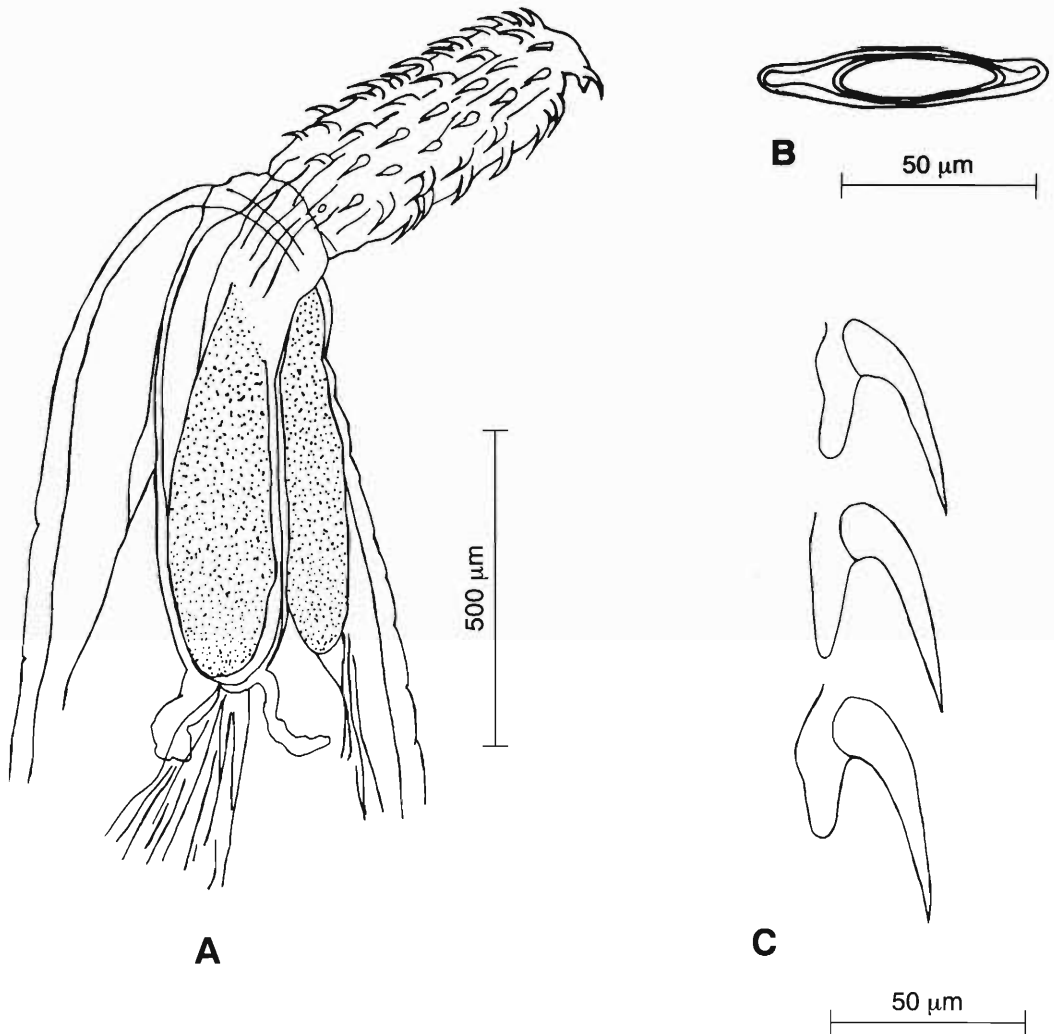


Figure 1. Details of specimens identified as *Acanthocephalus ranae* by Van Cleave (1915). A. Anterior of male. B. Egg. C. Sequence of proboscis hooks from midproboscis in male.

worms that Van Cleave (1915) noted had a protruded proboscis and easily counted rows of hooks, 3 were males and 1 was a female. However, Van Cleave (1915) reported that all worms had 12 hook rows. Grabda-Kazubska (1962) found that *A. ranae* never had 6 or 7 hooks/row, the upper limit being 5–6 for males and 6 for females, with <10% of worms reaching these maxima. All 4 of Van Cleave's (1915) worms noted above have 6 or 7 hooks/row. Grabda-Kazubska (1962) also observed that there is a well-formed neck present in *A. ranae* and that the lemnisci are longer than the proboscis receptacle

and projected away from it in this species (see fig. 2 in Grabda-Kazubska, 1962). These features are not visible in the worms available (Fig. 1A), nor are they visible in the illustration of the worm provided in Van Cleave (1915). The neck is readily visible in the single Old World specimen of *A. ranae* examined.

The Van Cleave (1915) specimens are distinguished from *A. falcaus*, a European amphibian parasite closely related to *A. ranae* and long confused with it, by the following: the eggs present in the single existing Van Cleave (1915) female are unlike those illustrated for *A. falcaus*

Table 1. Morphometrics of specimens identified as *Acanthocephalus ranae* by Van Cleave (1915) compared with ranges and means for *A. dirus* as reported by Amin (1984). Figures in parentheses represent means. Body length and width are shown in millimeters. All other measurements are in micrometers.

	<i>A. ranae</i> , USNPC No. 6322			<i>A. dirus</i> , Amin (1984)			
	♂	♂	♀	♂		♀	
Body length	2.63	3.46	6.44	2.20–6.00	(3.41)	2.40–20.00	(8.65)
Body width	0.59	0.56	0.93	0.32–1.50	(0.58)	0.32–1.44	(0.76)
Proboscis length	465	—	688	310–742	(520)	460–882	(647)
Proboscis width	175	—	280	98–240	(156)	140–392	(216)
Proboscis receptacle length	635	830	800	364–1,300	(697)	350–1,680	(852)
Proboscis receptacle width	175	200	215	126–308	(190)	140–392	(216)
No. hook rows	12	—	12	11–20	(13.7)	12–19	(14.9)
No. hooks/row	6–7	—	6–7	6–13	(9.1)	8–14	(9.8)
Lemnisci length	525	682.5	—	196–1,078	(588)	280–1,526	(765)
Leminisci width	104	125	—	42–322	(137)	5–364	(163)
Anterior testes length	465	500	—	308–1,008	(622)	—	—
Anterior testes width	215	225	—	168–686	(322)	—	—
Posterior testes length	390	515	—	210–924	(617)	—	—
Posterior testes width	210	215	—	168–644	(322)	—	—
No. cement glands	6	6	—	0–12	(5.67)	—	—
Cement gland length	225	350	—	98–588	(231)	—	—
Cement gland width	175	175	—	84–420	(177)	—	—

by Grabda-Kazubaska (1962), but are identical to *A. dirus* (Van Cleave, 1931) (= *A. parksidei* Amin 1975, Fig. 1B); in *A. falcatus*, the roots of the proboscis hooks are considerably shorter than the spines and weakly formed (see fig. 3 in Grabda-Kazubaska 1962), a feature not present in the worms of Van Cleave (1915) (Fig. 1C).

Table 1 compares Van Cleave's material with the redescription of *A. dirus* of Amin (1984), an expanded diagnosis synonymizing *A. jacksoni* Bullock, 1962, and *A. parksidei* Amin, 1975. The measurements for *A. ranae* of Van Cleave (1915) fall within the range of variation for *A. dirus* described by Amin (1984).

Acanthocephalus acutulus Van Cleave (1931)

With the exception of 4 specimens, the type series was originally mounted in glycerin by Holl. In 1948, 17 yr after Van Cleave described *A. acutulus*, the glycerin-mounted material was demounted, stained, and remounted in balsam. In the process, many of the specimens were damaged. Two worms are now reduced to poorly stained posterior fragments. Five whole mounts include 2 with retracted proboscides. The remaining specimens are uninformative. In total, 7 worms have features assignable to the genus *Fessisientis*.

The proboscis receptacles of these 7 specimens have a thickened posterior end where several prominent nuclei are present, a defining

character of the Fessisientidae (Fig. 2A, B). No mature males in the type series are available, and the form of the testes could therefore not be documented. The form of the female reproductive system agrees with that illustrated for the genus (Fig. 2C; see Van Cleave, 1931b; Amin, 1980). Serial sections of the proboscis receptacle sac show the distinctive muscular structure of the genus *Fessisientis* (Fig. 2D; Nickol, 1972; Buckner and Nickol, 1978).

Using the key to the genus *Fessisientis* provided by Amin (1980), and the measurements presented in Van Cleave (1931a), these specimens can be assigned to *Fessisientis friedi* Nickol, 1972. However, the range for hooks/row reported by Van Cleave (1931a) (9–12 hooks in 18–24 rows) is higher than that reported by Fried and Koplín (1967) for a variable population of *F. friedi* in Pennsylvania. Other measurements, such as the total length given by Van Cleave (1931a) of 3.5–5 mm, as well as measurements I have taken from the remaining specimens, are at the lower limit or below the ranges reported for the species by these authors and by Haley and Bullock (1953).

Acanthocephalus acutulus has been reported on 3 occasions since the original description of Van Cleave (1931a). Unfortunately, only the single specimen of *A. acutulus* reported by Nickol (1969) is still available for examination. This worm is not a member of the genus *Fessisientis*.

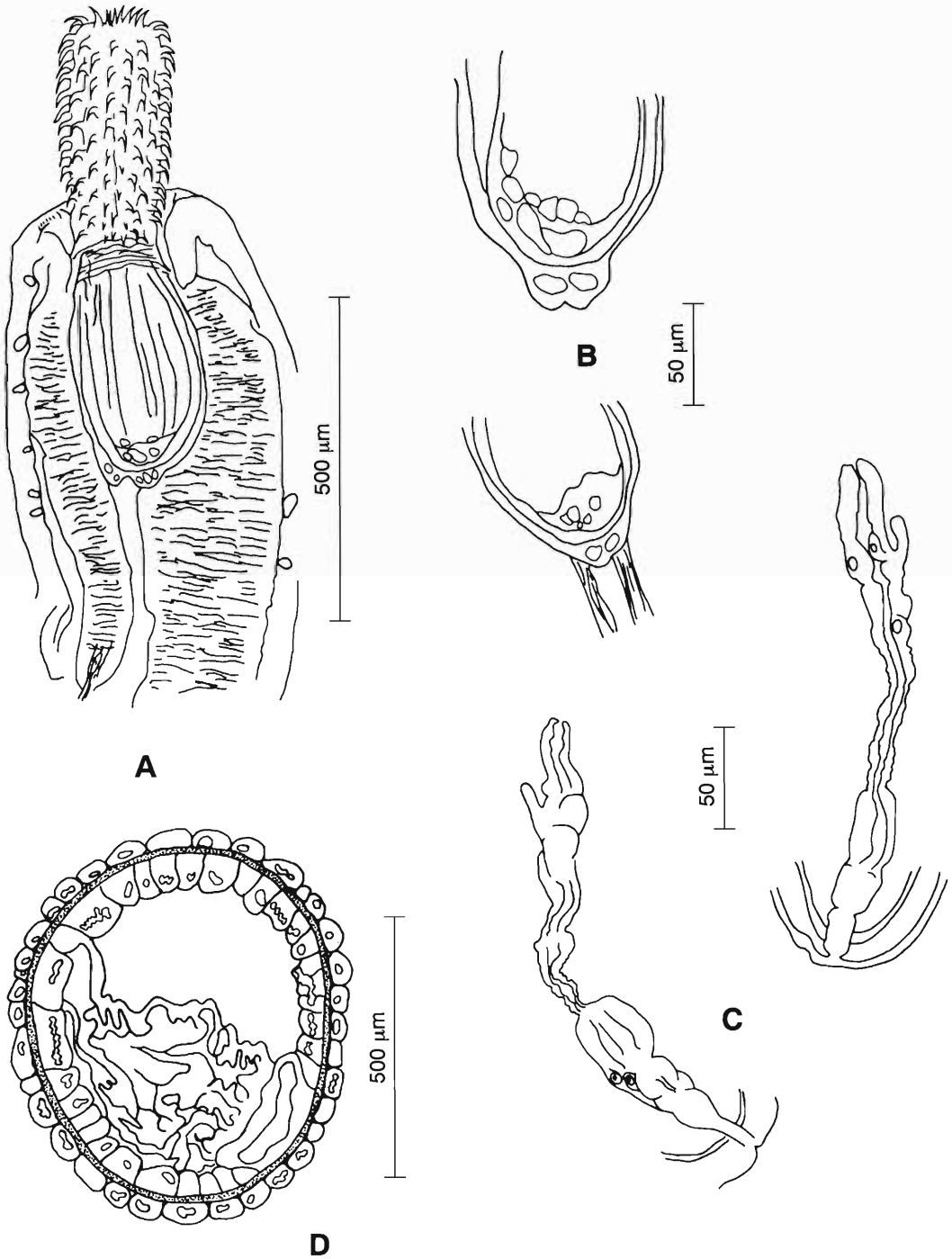


Figure 2. Details of specimens from type series of *Acanthocephalus acutulatus* Van Cleave, 1931. A. Anterior of specimen No. 2308.8. This specimen is illustrated as figure 2 in the original description. B. Posterior end of proboscis receptacles in Nos. 2308.1 (top) and 2308.9. C. Female reproductive system in Nos. 2308.1 and 2308.9. D. Serial section (7 μm) through the proboscis receptacle of No. 2308.9.

The structure of the proboscis receptacle is readily visible, the specimen lacking a nuclear pouch. Although the specimen is clearly of the genus *Acanthocephalus*, the worm is immature. The 23 longitudinal hook rows of 10–11 alternating hooks/row (B. Nickol, pers. comm.) are outside the range in hook rows (11–20) provided by Amin (1984) for *A. dirus*.

Although the foregoing resolves the anomalous report of *A. ranae* in North America, identification of the material as *A. dirus* is unsatisfactory. *Acanthocephalus dirus* is the most variable and widespread member of the genus from North American freshwater fishes (Amin, 1984), and various populations may not be conspecific (B. Nickol, pers. comm.). Although Amin (1984) synonymized *A. jacksoni* and *A. parksidaei*, he recognized this problem, suggesting that the resulting extreme variation within the species was sufficient reason to call for a reappraisal of the systematics of the genus from North American freshwater fishes. However, until there is a better understanding of the systematics of *A. dirus*, I believe the Maryland specimens from newts originally identified as *A. ranae* should be considered *A. dirus*. The record of *A. acutulus* reported by Nickol (1969), although certainly *Acanthocephalus*, does not appear to be *A. dirus* and cannot be assigned to species at the moment. Material identified by Rankin (1937) and Dyer and Brandon (1973) as *A. acutulus* is unavailable and can at best now be assigned to *Acanthocephala* sp.

It is clear that *A. acutulus* is a member of the genus *Fessisentis*. Although the material resembles *F. friedi*, it should be noted that the body lengths of all of the 5 females remaining in the series fall at the extreme lower end or below the overall range cited by Amin (1980) for *F. friedi* and well below the range reported for females by Fried and Koplín (1967). Fried and Koplín (1967) note that females are usually larger than males.

Additionally, monthly prevalences in the red-spotted newt that ranged from 50 to 100% (Holl, 1932) suggest that these *Fessisentis* infections were not accidental. This conforms with knowledge of the host–parasite relationships within the genus, several members of which are typically parasites of amphibians (Nickol, 1972). *Fessisentis necturorum* Nickol, 1967, and *F. vanleavei* (Hughes and Moore, 1943), only known as parasites of amphibians, and *F. fessus* Van

Cleave, 1931, usually a fish parasite, have been recorded at similarly high prevalences in amphibian hosts. One would not expect such high prevalences in an atypical host where the infection is accidental. However, *Fessisentis friedi* has been recorded only once from a caudate amphibian and is normally a parasite of fish (McAlpine, 1996).

Until additional *Acanthocephala* from North American amphibians have been collected, particularly from newts, it will not be possible to resolve satisfactorily the status of *Fessisentis* described by Van Cleave from *N. viridescens*. At present, these specimens should be referred to as *Fessisentis acutulus* (Van Cleave, 1931).

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