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# *Trichuris elatoris* sp. n. (Nematoda: Trichuridae) from the Texas Kangaroo Rat (*Dipodomys elator*)

GARY S. PFAFFENBERGER[1] AND TROY L. BEST[2]

[1] Department of Life Sciences, Eastern New Mexico University, Portales, New Mexico 88130 and
[2] Department of Zoology and Wildlife, 331 Funchess Hall, Auburn University, Auburn, Alabama 36849-4201

ABSTRACT: This paper represents the first report of an endoparasite from the endangered Texas kangaroo rat (*Dipodomys elator*). Thirteen of 20 hosts examined harbored a previously undescribed species of trichurid. *Trichuris elatoris* is described and illustrated. SEM's of spicule and spicule sheath of both *Trichuris elatoris* and *Trichuris dipodomis* are included.

KEY WORDS: taxonomy, morphology, *Dipodomys elator, Trichuris dipodomis,* Trichuridae, nematode taxonomy, north-central Texas, southwestern Oklahoma.

The Texas kangaroo rat (*Dipodomys elator*) is limited in distribution to north-central Texas and 2 localities in southwestern Oklahoma (Baumgardner, 1987; Best, 1987; Jones et al., 1988). In a recent phenomorphic study among populations from 3 counties in Texas, Best (1987) observed considerable geographic differences in sexual dimorphism and morphometric variation. Best (1987) suggested that restricted resources, harsh peripheral environmental conditions, or perhaps even physiological dimorphism may account for the observed phenetic differences. In addition to morphological variation, significant interpopulation variation was also detected from electrophoretic samples (Hamilton et al., 1987). Because of the significant morphologic and genetic differences among populations within such a limited geographic area, we felt it would be of interest to examine hosts for possible impact of host variation on parasites.

The extent to which host isolation may have effected parasite speciation or the extent to which parasitism may have acted as a selective force on the hosts is not known. While examining *D. elator* for parasites we encountered a previously undescribed species of trichurid. The purposes of this paper are (1) to provide a description of the new species and (2) to include SEM's of the spicule and spicule sheath of both *T. elatoris* and *Trichuris dipodomis* Read, 1956. Information regarding prevalence and intensity of parasitism in *D. elator* will be presented elsewhere.

## Materials and Methods

*Dipodomys elator* were live-trapped from 7 localities in Texas on 12 and 13 March 1985. These are the same specimens examined by Hamilton et al. (1987) and are preserved as standard museum specimens and deposited at Texas Tech University. A scientific collecting permit was granted to E. Rex Wahl, and traps were provided by the Texas Parks and Wildlife Department. Partial funding was provided by The Nature Conservancy—Texas Natural Heritage Program.

We examined trichurids recovered from 13 infected hosts among 20 examined from Hardeman, Wilbarger, and Wichita counties, Texas. The material studied comprised 8 male and 6 female whipworms recovered from the large intestine of 13 infected hosts, of which 7 were infected females.

Nematodes were fixed in 36% acetic acid, gradually cleared in 70% ethanol/5% glycerin mixture followed by pure glycerin, and then stored in FGA (5 parts formalin, 5 parts glycerin, 90 parts 70% ethanol). Permanent mounts were in euparal (neutral mounting medium, Carolina Biological Supply Company). Measurements were obtained using a Graticules LTD (200 × 0.01 = 2 mm) stage micrometer. All illustrations were made using a Leitz laborlux binocular microscope with camera lucida attachment.

For scanning electron microscope (SEM) studies trichurids were subjected to a dehydration series (90%, 95%, absolute ethanol), critical point dried, coated with gold-palladium, and examined using an ISI-100B SEM at an accelerated voltage of 15 kV. All descriptive and illustrative measurements occur in millimeters unless stated otherwise. In the following description the character designation is followed by 3 measurements. The first measurement is that of the holotype or allotype, the second measurement is a range (in parentheses), and the third is a mean measurement. Where single measurements appear they were consistent for all specimens examined.

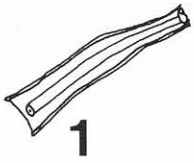
Type specimens of *Trichuris dipodomis* were obtained from the U.S. National Museum Helminthological Collection (U.S. Department of Agriculture, Beltsville, Maryland 20705) accession number 38035.

## *Trichuris elatoris* sp. n. (Figs. 1–8)

### Description

GENERAL: Trichuridae, with characteristics of the genus.

MALE (Figs. 1–4): Total length 18.75, (15.0–



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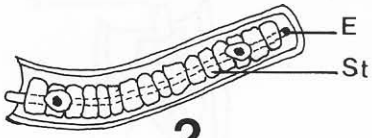


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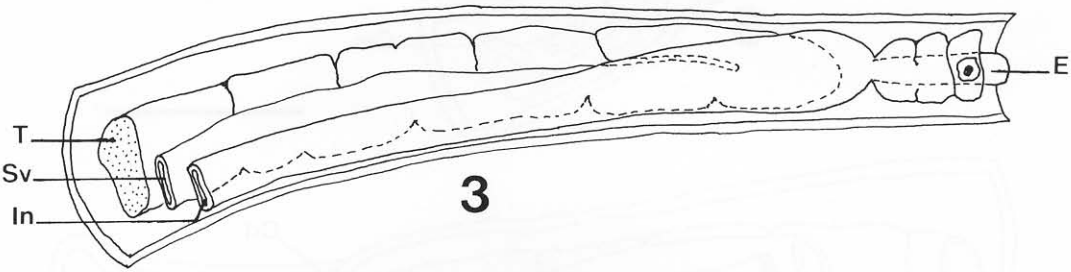


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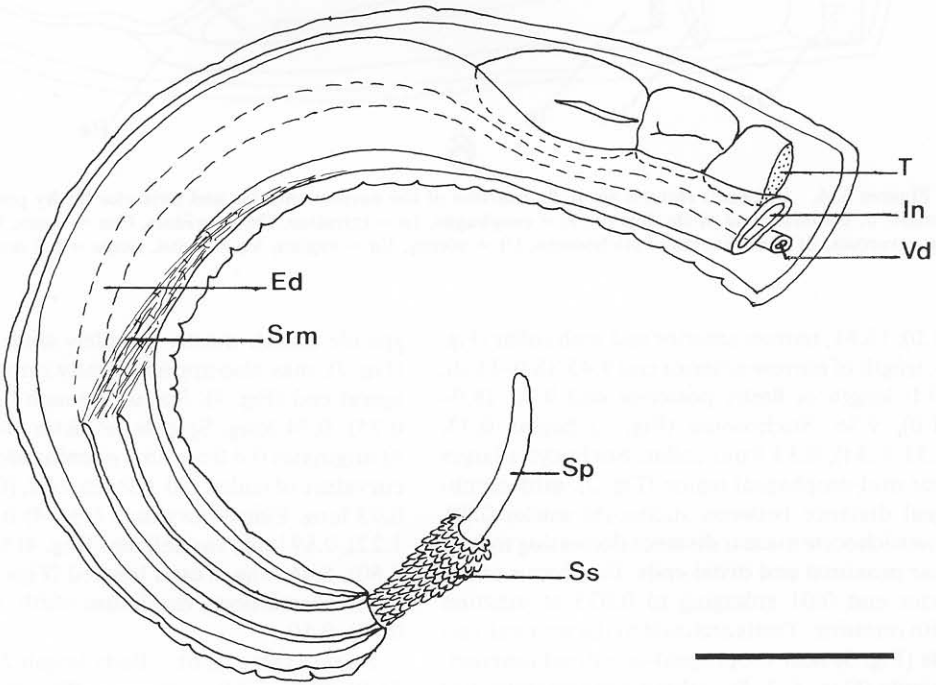


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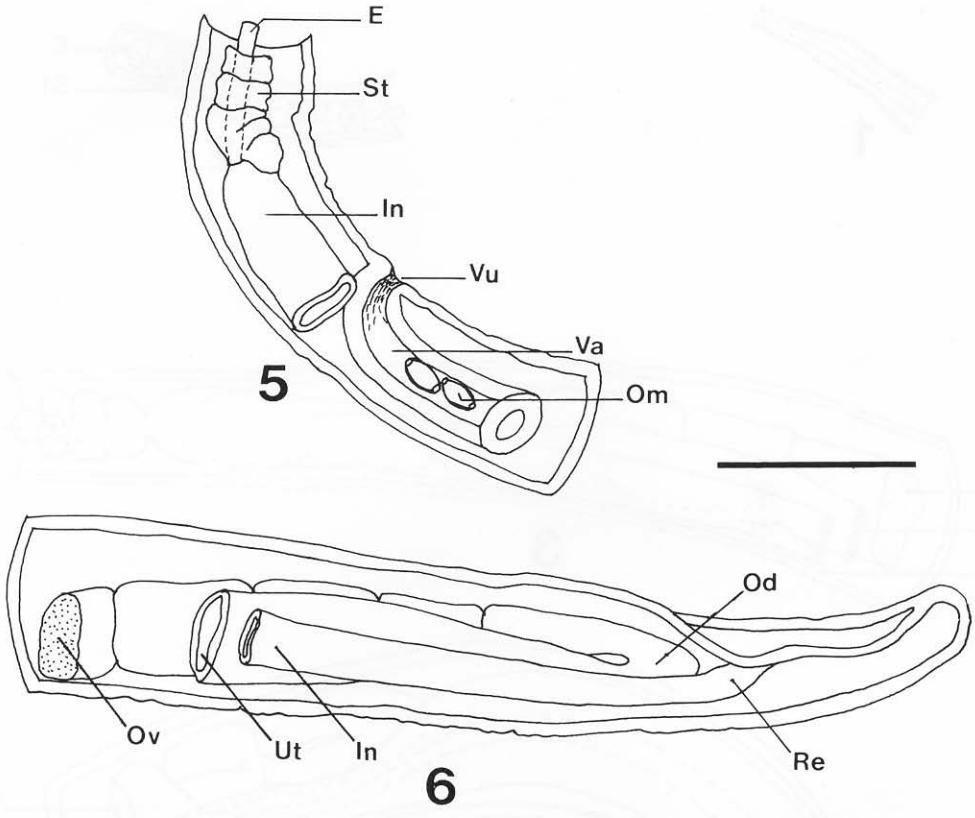
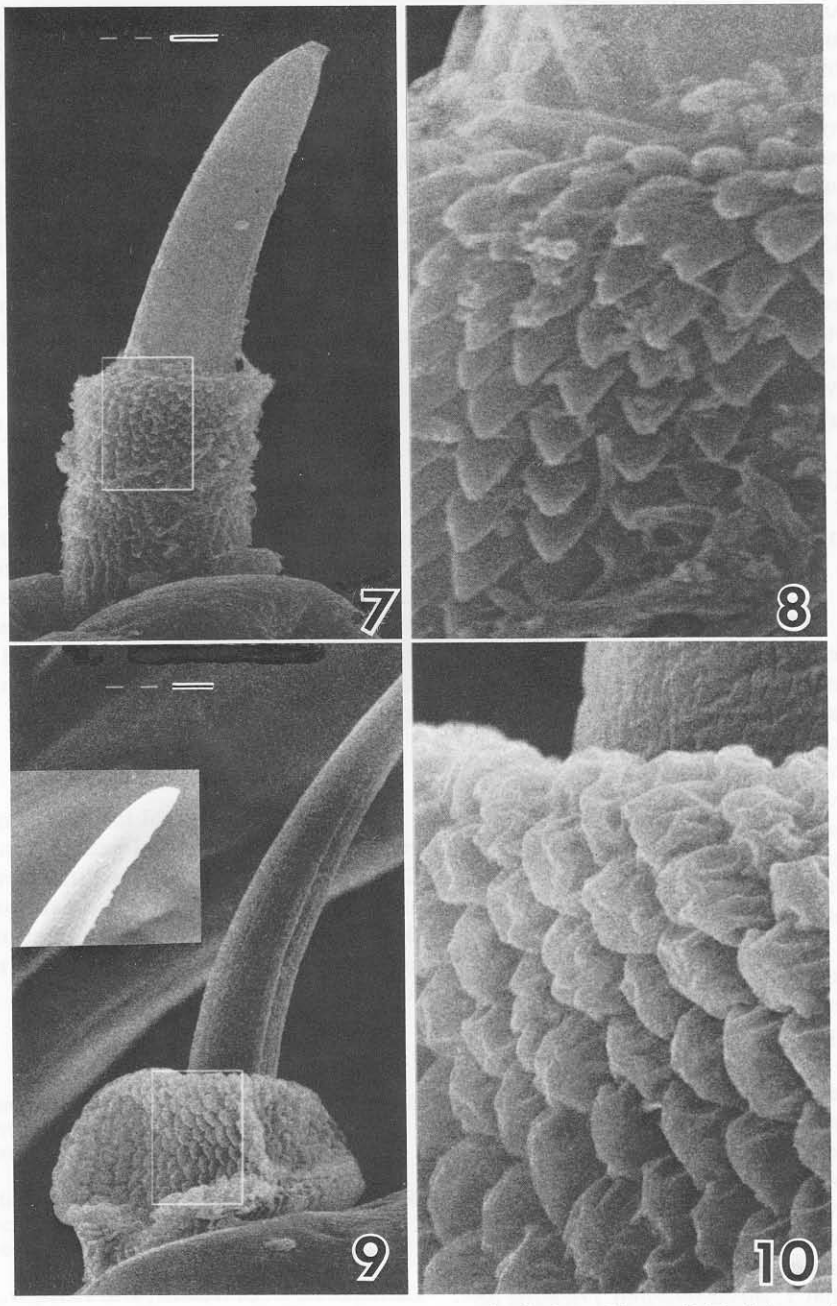
**Figures 1–4.** ***Trichuris elatoris*** **sp. n. 1. Anterior end of male and female. 2. Mid-stichosomal region of male and female. 3. The junction of the narrow anterior and posterior fleshy portions of the male. 4. The posterior end of the male. E = esophagus, Ed = ejaculatory duct, In = intestine, Sp = spicule, Srm = spicule retractor muscle, Ss = spicule sheath, St = stichocyte of stichosome, T = testis, Vd = vas deferens. Scale = 0.2 mm.**




**Figures 5, 6.** ***Trichuris elatoris*** **sp. n. 5. Junction of the narrow anterior and posterior fleshy portions of the female. 6. Posterior end of the female. E = esophagus, In = intestine, Od = oviduct, Om = ovum, Ov = ovary, Re = rectum, St = stichocyte of stichosome, Ut = uterus, Va = vagina, Vu = vulva. Scale = 0.2 mm.**

21.0), 18.81; narrow anterior end with collar (Fig. 1), length of narrow anterior end 9.45, (8.0–11.0), 10.1; length of fleshy posterior end 9.30, (8.0–11.0), 9.36. Stichosome (Fig. 2) begins 0.33, (0.31–0.34), 0.33 from collar. Stichocytes larger near mid-esophageal region (Fig. 2), mid-esophageal distance between stichocyte nuclei 0.20, interstichocyte nuclear distance decreasing to 0.13 near proximal and distal ends. Esophagus at anterior end 0.01 enlarging to 0.035 at junction with intestine. Testis arches into the seminal vesicle (Fig. 3) near esophageal–intestinal junction. Spicule (Figs. 4, 7, 8) without ornamentation or grooves, length 0.94, (0.92–1.03), 0.95; width of spicule at proximal end 0.05, (0.04–0.06), 0.05; at middle of shaft 0.03, (0.03–0.05), 0.035; at blunt distal end 0.014, (0.014–0.015), 0.014. Observed surface of spicule sheath (Figs. 4, 7, 8) covered with longitudinal columns of uniform-sized, pointed projections. Basal width of projections 12 $\mu$m, length to tip 18 $\mu$m. Shape of spicule sheath mostly parallels shaft of spicule (Fig. 7), may also appear slightly campanulate at apical end (Fig. 4). Spicular pouch 0.73, (0.70–0.75), 0.74 long. Spicule retractor muscle (Fig. 4) originates 0.4 from anal opening along ventral curvature of coiled tail. Cloaca 0.89, (0.85–1.07), 0.93 long. Ejaculatory duct (Fig. 4) 0.80, (0.73–1.22), 0.89 long; vas deferens (Fig. 4) 5.14, (4.22–6.80), 5.46 long. Testis lobated (Figs. 3, 4) with 47–56 sacculations, maximum width 0.10, (0.09–0.10), 0.10.

FEMALE (Figs. 5, 6): Body length 29.0, (25.0–31.0), 29.8; esophageal region (Fig. 2) 11.0, (9.0–12.0), 10.7; posterior body 18.0, (16.0–19.0), 18.3. Maximum body width 0.45, (0.33–0.50), 0.44, width at esophageal junction 0.18, (0.14–0.19), 0.18. Vulva (Fig. 5) without prominent lips, 0.23, (0.15–0.33), 0.24 from intestinal–esophageal junction. Length of vagina (Fig. 5) 0.62, (0.50–1.03), 0.62; width 0.07, (0.05–0.08), 0.067. Ovary (Fig. 6) 0.33, (0.29–0.34), 0.33 from posterior




**Figures 7–10. 7. Spicule and sheath of *Trichuris elatoris*. Scale = 10 μm. 8. Dual image from Figure 7, showing longitudinal rows of pointed projections. 9. Spicule and sheath of *T. dipodomis*. Notice ventral groove on spicule. Inset is tip of spicule. Scale = 10 μm. 10. Dual image from Figure 9, showing oblique rows of sacculelike projections.**

end. Rectum (Fig. 6) 0.07, (0.06–0.08), 0.07 long. Anus 0.2, (0.17–0.21), 0.19 from posterior end of bluntly rounded tail.

EGGS: Figure 5. Dimensions of eggs within vagina include length 0.061–0.066 (includes polar plugs), width 0.027–0.029.

TYPE HOST: *Dipodomys elator* Merriam, 1894.

LOCATION: Large intestine.

TYPE LOCALITY: 3.2 mi N Jct FM 2006 & US 287, Hardeman Co., Texas.

ETYMOLOGY: Named for host.

TYPE SPECIMENS: U.S.N.M. Helm. Coll. Nos. 78988 (holotype male), 78987 (allotype female), and 79015 (paratypes, vialed males and females). Specimens in Eastern New Mexico University Medical Zoology Collection under accession numbers 1363–1397 (slides) and 223–231 (vials).

LOCALITY OF INFECTED HOSTS: Number and sex of infected hosts collected at each of the following localities appear in parentheses following dates of collection. 12-III-85: (2 females) 2 mi W Harrold, Wilbarger Co.; (2 males) 2 mi W, 5 mi N, (1 male, 1 female) 9 mi N, Iowa Park, Wichita Co., Texas. 13-III-85: (1 female) 4.1 mi N, 3 mi W, (1 male) 3.5 mi N, 2 mi E, (1 male, 1 female) 3.8 mi N, 1.8 mi E, (1 male, 2 females) 3.2 mi N Jct FM 2006 & US 287, Hardeman Co., Texas.

## Discussion

Only 4 species of parasites, all ectoparasites, have been recovered from *D. elator* (Carter et al., 1985). Carter et al. (1985) also identified 19 different species of mammals that typically cohabit the same general areas where Texas kangaroo rats have been collected. Among those only 1 host (*Peromyscus maniculatus*) has been reported as host to a species of *Trichuris* (*Trichuris stansburyi* Frandsen and Grundmann, 1961). *Trichuris elatoris* is readily distinguished from *T. stansburyi* by the shape of the spicule. Spicular dimensions of *T. elatoris* demonstrate only a gradual taper from proximal to distal ends, whereas the proximal spicular end of *T. stansburyi* is 1.2–1.7× wider than mid-shaft which narrows abruptly toward the distal end (Frandsen and Grundmann, 1961).

Because the types of all other described *Trichuris* species were not examined during this study we encountered difficulty when we compared our description with other vague and oftentimes incomplete descriptions. From the literature we determined that *T. dipodomis* and *Trichuris perognathi* were closely related morphotypes. Although the Ord's kangaroo rat (*Dipodomys ordii* Woodhouse) has not been observed within the geographic range of *D. elator* (Carter et al., 1985), its trichurid parasite (*T. dipodomis*) appears to be most like *T. elatoris.*

*Trichuris elatoris, T. dipodomis,* and *T. perognathi* may be distinguished by combinations of spicular dimensions and body lengths. *Trichuris perognathi* is longer in body length (25.0–30.0) and possesses a spicular constriction between the broadened proximal end (0.05) and the expanded mid-portion (0.045) (Chandler, 1945). *Trichuris dipodomis* is characterized by an intermediate body length (19.7–25.1) and a much longer spicule (1.21–1.33; Read, 1956) than observed in the other 2 species. The width of the proximal spicule in *T. dipodomis* is also 1.5× greater than the 0.05 observed in the other 2 species. Finally, the body length of *T. elatoris* is somewhat shorter (15.0–21.0) as is the spicular length (0.92–1.03) when compared to *T. dipodomis.*

An SEM of the spicule and sheath of *T. dipodomis* is shown in Figures 9 and 10. By comparing Figures 7 and 8 with 9 and 10, additional differences are evident which may be of significance. The presence of sacculations on the sheath and an apparent groove along the ventral curvature of the spicule of *T. dipodomis* are enlightening. However, the relevance of these and other characters will only become meaningful when all described *Trichuris* species can be examined and compared.

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