RAILLIETINA (RAILLIETINA) SELFI SP. N. (CESTODA: DAVAINEIDAE) FROM THE DESERT COTTONTAIL IN OKLAHOMA WITH NOTES ON THE DISTRIBUTION OF RAILLIETINA FROM NORTH AMERICAN MAMMALS

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Raillietina (Raillietina) selfi sp. n. is described. The host for this Raillietina was the desert cottontail (Sylvilagus auduboni) from the panhandle area of Oklahoma. A key for differentiating the species of Raillietina found in North American mammals is included. The distribution of Raillietina in the U.S. relative to the distribution of its recorded hosts is discussed.

Although the genus Raillietina has over 200 known species with more than 40 representatives reported in mammals, there have been only five species reported or described from mammals in North America. The previous studies concerning these five species are summarized in Table I.

During a survey of parasites of vertebrates inhabiting prairie dog towns in Oklahoma (5, 6), four desert cottontails, Sylvilagus auduboni, were examined. Three of the four harbored Raillietina (R.) selfi sp. n. The cestode is named in honor of Dr. J. Teague Self, University of Oklahoma, Norman, Oklahoma, for his many contributions to the field of parasitology.

MATERIALS AND METHODS

The procedures describing collection, preservation and preparation for study of this cestode have been previously reported (5, 6). The description is a composite based on measurements of ten gravid cestodes fixed in AFA and stained in Harris's hematoxylin and Semichon's carmine. Egg pouches were teased from fixed gravid proglottids, measured and counted. The size of eggs and oncospheres were determined from eggs teased from fixed egg pouches. Drawings were made with the aid of a camera lucida.

RESULTS

Representative drawings of Raillietina (Raillietina) selfi sp. n. are presented in Fig. 1 to 6. Mature worms with gravid proglottids 100 to 160\( ^{1} \) (145) in length; maximum width in mature proglottids, 2.54 to 3.03 (2.86), tapering down to 1.07 to 1.32 (1.21) in the terminal gravid proglottids. Scolex 0.528 to 0.707 (0.611) long and 0.409 to 0.641 (0.488) wide. Rostellum well developed, minutely spinose; rostellar crown 0.076 to 0.083 in diameter, with 120 to 130 (128) hammer-shaped hooks 18.5 to 22 (20.9) \( \mu \) in length and 7.5 to 8.75 (8.125) \( \mu \) in width, arranged in two rows. Suckers oval, 0.167 to 0.180 (0.175) long.

\( ^{1} \)Measurements are in millimeters unless otherwise specified. Average measurements are shown in parentheses following the range.

Figure 1. Raillietina (R.) selfi sp. n. Scolex.

FIGURE 2. Raillietina (R.) selfi sp. n. Mature proglottids.

FIGURE 3. Raillietina (R.) selfi sp. n. Enlarged view of fimbriae in genital atrium.

FIGURE 4. Raillietina (R.) selfi sp. n. Terminal gravid proglottids.

FIGURE 5. Raillietina (R.) selfi sp. n. Rostellar hooks.


and 0.152 to 0.157 (0.154) wide, with numerous hooks of varying form, 6.25 to 11.88 µ long and 3.75 to 5.625 µ wide, arranged in diagonal rows with 18 to 22 hooks per row. Neck 0.66 to 2.07 long. Genital pores unilateral, situated in posterior third of each segment; genital atrium nearly filled by fimbriae extending from its anterior wall. Testes approximately spherical, 65 to 84 (74) in number, measuring 0.05 to 0.06 (0.057) in diameter; arranged in two groups, about 25 poral and 50 aporal, and distributed between the conspicuous ventral excretory canals. Vas deferens becomes evident at about the center of each proglottid and extends laterally with many convolutions to the base of the cirrus sac. Cirrus sac muscular, 0.086 to 0.098 (0.092) wide and 0.147 to 0.160 (0.151) long; extending in an anteroposterior direction and not reaching the ventral excretory canal; cirrus unarmed. Ovary approximately central in
proglottid, lobate, occupying about two-thirds of the anteroposterior length of the proglottid and 0.328 to 0.397 (0.355) wide. Vitelline gland smooth, may appear to have three or four lobes; located median and posterior to ovary. Vagina unconvoluted, situated posterior to vas deferens, extends laterally dorsal to the ventral excretory canal and enters the genital atrium immediately posterior to the cirrus. Gravid proglottids contain 145 to 180 egg pouches, each with 3 to 8 (4) eggs; egg pouches irregularly oval, 0.137 to 0.180 (0.153) long and 0.107 to 0.167 (0.140) wide, located between ventral excretory canals. Eggs (fixed in AFA) 30.7 to 39.6 (35.5) \( \mu \) by 28.2 to 34.8 (31.8) \( \mu \); oncosphere (fixed in AFA) oval, 16.02 to 18.0 (16.85) \( \mu \) long by 14.22 to 18.0 (15.7) \( \mu \) wide. Location: small intestine
Type locality: Near Boise City in Cimarron County, Oklahoma
Syntypes: USNM Helm. Coll. No. 73186

Comparisons

Raillietina (R.) selfi sp. n. was compared with the type specimens and descriptions of the five previously described species in this genus from North American mammals. It can be differentiated from all five by the minutely spinescent rostellar hooks, by the posterior position of the cirrus sac, and by the presence of well-developed fimбриae in the genital atrium.

The new species can be further differentiated from the two species occurring in rodents, R. bakeri Chandler, 1942, and R. sigmodontis Smith, 1954, by having a greater length and width, a larger scolex, a greater number of rostellar hooks, larger suckers with larger hooks, a greater number of testes, and a greater number of egg pouches. It can be further differentiated from R. salmoni (Stiles, 1896) and R. retractilis (Stiles, 1896) by the subgeneric characteristics of these two species, viz., unilateral genital pores as compared to irregularly alternating genital pores in R. salmoni and more than one egg per pouch as compared to one egg per pouch in R. retractilis. Characteristics that further differentiate the new species from R. loeweni Bartel and Hansen, 1964 include: shorter length; smaller scolex; two rows of rostellar hooks; smaller suckers; smaller number of egg pouches; and smaller eggs.

**KEY TO THE SPECIES OF RAIIJETINA IN NORTH AMERICAN MAMMALS**

(adapted from Bartel and Hansen, 1964)

1. Genital pores alternating irregularly
   - R. (P.) salmoni
   Genital pores unilateral 2
2. Egg pouches less than 100 \( \mu \) in diameter, one egg per pouch R. (P.) retractilis
   Egg pouches 100 \( \mu \) or more in diameter, one or more eggs per pouch 3
3. One to five eggs per pouch, one row of rostellar hooks 4
   One or more eggs per pouch, two rows of rostellar hooks 2
4. Three to eight eggs per pouch
   145 to 180 pouches R. (R.) selfi
   Six to ten eggs per pouch, 80 to 90 pouches R. (R.) bakeri
   Fifteen to twenty-five eggs, per pouch, 30 to 35 pouches R. (R.) sigmodontis

**DISCUSSION**

The reported distribution of Raillietina in North American mammals is listed in Table 1 and further illustrated in Figure 7. It is apparent that, with three exceptions, the reports concerning this genus have come from west of the Mississippi River. This western distribution of the genus Raillietina in mammals can be directly correlated to the distribution of the hosts. For example, of the 19 hosts listed in Table 1, 13 (viz., L. californicus, L. alleni, S. auduboni, S. nuttalli, S. bachmani, S. idabensis, C. ludovicianus, M. flaviventris, S. variegatus, D. ordi, N. lepida, N. fuscipes and N. cinerea) are found only west of the Mississippi. Additionally, the distributions of two others, L. townsendi and G. bursarius, are almost entirely west of the Mississippi. Only four recorded hosts, then, have significant distributions, east of the Mississippi River. These are: S. floridanus, S. aquaticus, S. niger and S. bispidus. It should be noted, however, that Raillietina has been reported only in S. floridanus and S. bispidus east of the Mississippi, the single reports from S. niger and S. aquaticus being from southeast Texas.

It might be suspected that the lack of reports of Raillietina from mammals east of the Mississippi could be due to a lack of investigations of the typical hosts, e.g., hares, rabbits and other gnawing rodents as indicated in Table 1. However, this does
not seem to be the case since many studies
have been done on these mammals in the
eastern U.S., but few have reported Railliet-
ina, suggesting that this genus is uncom-
mon in mammals east of the Mississippi
River.

Hares (Lepus spp.) and rabbits (Sylvila-
gus spp.) seem to be the most popular hosts
for this genus in the U.S., being the hosts of
record for four of the six species in 15
studies. Additionally, one study (23) re-
ported an unidentified raillietinid in a
hare in Arizona. Each of the other hosts
has been reported only once except for
*Sigmodon hispidus* which has been record-
ed as host for two of the species in four
separate studies and *Neotoma fuscipes*
which was found to harbor *R. retractilis*
in two separate studies in California.

Raillietina retractilis appears to be the
most versatile of the six North American
species, being found in twelve different
mammals in the U.S. Its distribution based
on investigations to date, however, is re-
stricted to five western states, viz., Cali-
ifornia, Nevada, Utah, Colorado and Wy-
oming (Fig. 7). It has also been recorded
once outside the U.S. in *Rattus rattus* from
Madagascar (25). *Raillietina salmoni*, on
the other hand, has been found in only five
host species (Table 1) but is the most wide-
ly distributed (Fig. 7). *Raillietina sigmo-
donis* seems to be the least versatile of the
six described species, having been reported
only in *S. hispidus*.

Undoubtedly, the distribution and num-
ber of hosts for the species in this genus
which are found in North American mam-
als will continue to change as more in-
formation concerning these parasites be-
comes known. It is hoped that this study
will stimulate further work in this area.

ACKNOWLEDGMENTS

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Tyler, Cameron College, Lawton, Okla-
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hosts for this study, and Dr. J. Ralph
Lichtenfels, Parasitological Laboratory,
USDA, Beltsville, for lending the type
specimens of *R. salmoni, R. retractilis, R.
loeweni*, and *R. sigmodontis* and the para-
types of *R. bakeri*.
### Table 1. Summary of previous reports of raiiliisina in North American mammals

<table>
<thead>
<tr>
<th>Parasite</th>
<th>Host</th>
<th>Location and Literature Reference</th>
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<tbody>
<tr>
<td><em>R. (F.) salmoni</em></td>
<td><em>Lepus californicus</em></td>
<td>Texas (1); Wyoming (2)</td>
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<tr>
<td></td>
<td><em>Sylvilagus floridanus</em></td>
<td>Maryland (1); Wyoming (2);</td>
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<td></td>
<td><em>Sylvilagus andersoni</em></td>
<td>Alabama (3)</td>
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<td></td>
<td><em>Sylvilagus aquaticus</em></td>
<td>Wyoming (2)</td>
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<td></td>
<td><em>Cynomys ludovicianus</em></td>
<td>Texas (4)</td>
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<td>Oklahoma (6)</td>
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<td><em>R. (P.) reclusus</em></td>
<td><em>Lepus californicus</em></td>
<td>Utah (7); California (8)</td>
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<td></td>
<td><em>Lepus townsendi</em></td>
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<tr>
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<td><em>Sylvilagus andersoni</em></td>
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<td></td>
<td><em>Sylvilagus auduboni</em></td>
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<td></td>
<td><em>Spermophilus undulatus</em></td>
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<td><em>Spermophilus dussumieri</em></td>
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<td><em>Spermophilus variegatus</em></td>
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<td><em>Dipodomys ordi</em></td>
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<td><em>Neotoma cinerea</em></td>
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<td><em>R. (R.) roeweni</em></td>
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<td><em>Sylvilagus auduboni</em></td>
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<td><em>R. (R.) bakeri</em></td>
<td><em>Sciurus niger</em></td>
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<td></td>
<td><em>Sigmodon hispidus</em></td>
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### REFERENCES