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*Graptemys pseudogeographica* Gray in Nebraska, with Reports of  
Additional Species of Trematodes from Nebraska Turtles**

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# **TELORCHIS GUTTUROSI SP. N. (TREMATODA: TELORCHIIDAE) FROM GRAPTEMYS PSEUDOGEOGRAPHICA GRAY IN NEBRASKA, WITH REPORTS OF ADDITIONAL SPECIES OF TREMATODES FROM NEBRASKA TURTLES**

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**ABSTRACT:** One species of digenean is described and 8 others reported from turtles in Nebraska. *Telorchis gutturosi*, described from *Graptemys pseudogeographica*, resembles *T. stossichi*, *T. pseudoaculeatus*, and *T. pleroticus* in having an acetabulum significantly smaller than the oral sucker, but differs by possessing a pharynx which is as large as the acetabulum and having the ovary only  $\frac{1}{10}$  the body length from the acetabulum. *Telorchis necturi* is considered the senior synonym of *T. cryptobranchi*; *Graptemys pseudogeographica* is a new host. *Hapalorhynchus stunkardi* is reported for the first time since its description. Based on new morphological evidence, the generic diagnosis of *Hapalorhynchus* is emended and a key to the species provided. *Spirorchis scripta*, *S. parvus*, *Protenes angustus*, and *Eustomos chelydrae* are reported for the first time from Nebraska. *Graptemys pseudogeographica* is a new host for *Heronimus mollis*; *Kinosternon flavescens* is a new host for *Telorchis corti*.

Twenty-one species of platyhelminth parasites have been reported from Nebraska turtles (Brooks and Mayes, 1975). The present study reports seven additional species, one of which is described as new, and new hosts for two previously reported species.

Worms were removed from the host, flattened with slight coverslip pressure or not flattened (spirorchiids), fixed with AFA, stored in 70% ethanol, stained with Mayer's hematoxylin or Mayer's carmalum, and mounted in Canada balsam for study as whole mounts. Measurements are in micrometers unless otherwise stated; figures were drawn with the aid of a drawing tube.

## **TELORCHIIDAE Stunkard 1924**

### ***Telorchis gutturosi* sp. n.**

(Figs. 1-3)

**Description** (based on 9 complete and 1 partial specimens): Body elongate, 3.72 to 4.27 mm long by 0.42 to 0.68 mm wide. Tegument with spines extending to level of acetabulum. Oral sucker subterminal, rounded, without lappets; 248 to 300 long by 240 to 324 wide. Prepharynx short; pharynx 120 to 132 long by 144 to 200 wide; cerebral ganglia conspicuous; esophagus 50 to 70 long; bifurcation 11 to 12% body length from anterior end, ceca extending to near posterior end of body.

Acetabulum weakly-developed, rounded, 136 to 172 long by 124 to 176 wide. Forebody 23 to 30% total body length. Ratio of sucker widths 1: 0.49 to 0.64; ratio of pharynx width to acetabulum width 1: 0.88 to 1.16.

Testes spherical, tandem, contiguous, intercecal; 140 to 180 in diameter; posttesticular space equal to 11 to 13% body length. Cirrus sac 820 to 870 long, reaching level of posterior margin of ovary or slightly beyond, containing coiled seminal vesicle, prostatic cells, and eversible cirrus. Genital pore median, midway between acetabulum and bifurcation; genital atrium shallow.

Ovary 8 to 11% body length posterior to acetabulum, intercecal, amphitypic; ovoid; 108 to 160 long by 92 to 132 wide. Seminal receptacle small; Mehlis' gland and Laurer's canal present. Descending and ascending loops of uterus confined to intercecal space between anterior testis and ovary; space occupied by uterus 36 to 40% total body length; metraterm equal to  $\frac{1}{2}$  length of cirrus sac. Vitelline follicles lateral, confined to extracecal space between level of anterior testis and midway between ovary and acetabulum. Eggs 36 to 40 long by 13 to 18 wide.

Excretory vesicle Y-shaped, bifurcation immediately postovarian; arms short, extending to anterior margin of ovary; excretory pore terminal.

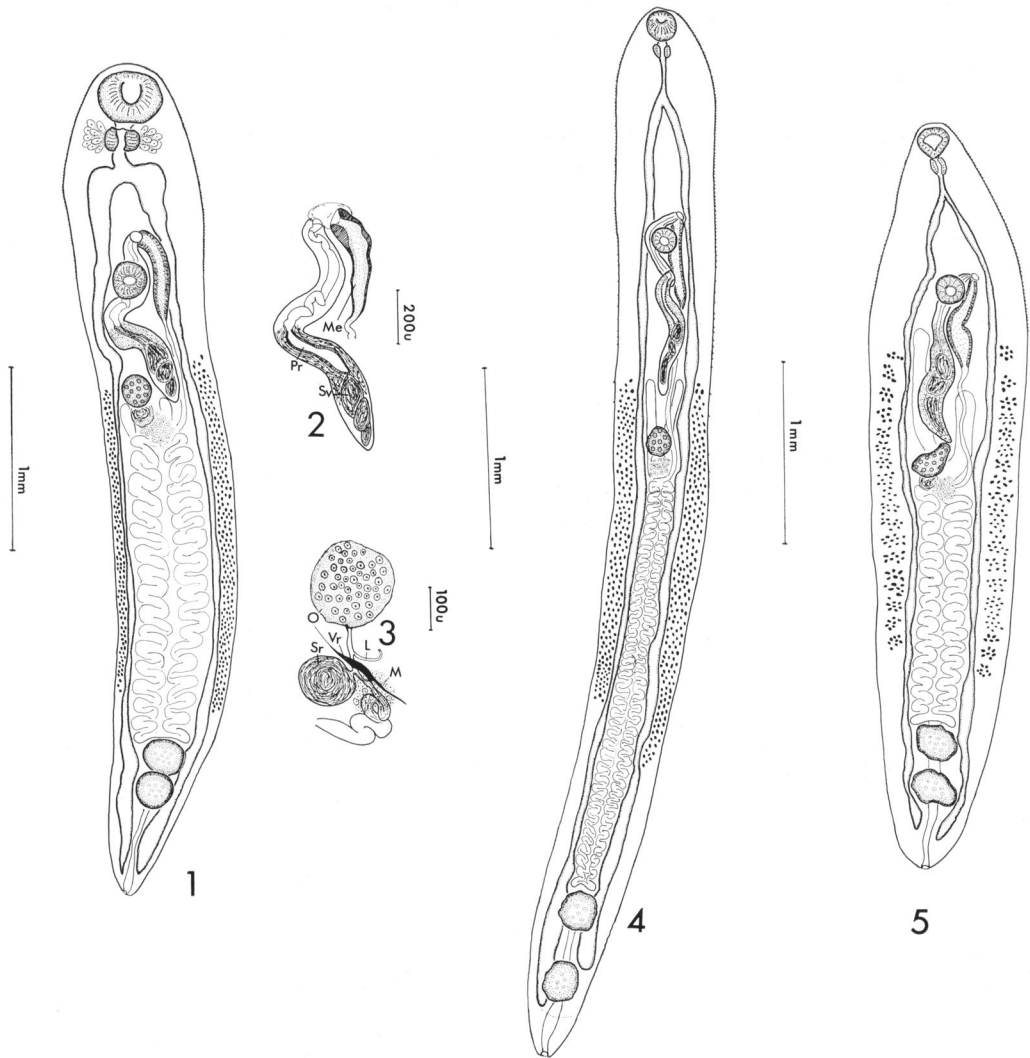
**Host:** *Graptemys pseudogeographica* Gray, false map turtle (10 in 1 host).

**Site:** Small intestine.

**Locality:** Missouri River, 1.5 miles south of Brownville, Nebraska.

**Holotype:** USNM Helm Coll. No. 73522; paratypes: USNM Helm Coll. No. 73523; Univ. Neb.

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FIGURES 1-5. Trematodes from Nebraska turtles. 1-3. *Telorchis gutturosi*. 1. Holotype, ventral view. 2. Terminal genitalia, ventral view. 3. Ootype region, dorsal view. 4. *Telorchis corti*, ventral view. 5. *Telorchis necturi*, ventral view. Legend: L = Laurer's canal; M = Mehlis' gland; Me = Metraterm; O = Ovary; Pr = Prostatic complex; Sr = Seminal receptacle; Sv = Seminal vesicle; Vr = Vitelline reservoir.

State Mus., H. W. Manter Lab No. 20231, and in collections of authors.

**Etymology:** The specific name is Latin for "enlarged throat" used as a noun in the genitive singular and refers to the relative size of the pharynx.

Three previously described species of *Telorchis* have an acetabulum significantly smaller than the oral sucker: *T. pleroticus* (Braun 1899) Wharton 1940; *T. pseudoaculeatus* Dollfus 1929; and *T. stossichi* Goldberger 1911. In

all those species the pharynx is approximately half the size of the acetabulum, while the pharynx and acetabulum of *T. gutturosi* are subequal. The ovary of *T. gutturosi* is  $\frac{1}{10}$  body length from the acetabulum; that of *T. pleroticus* is  $\frac{1}{6}$  body length, and for *T. stossichi* and *T. pseudoaculeatus*  $\frac{1}{4}$  body length. *T. pleroticus* further has a long prepharynx, no measurable esophagus, and a cirrus sac which does not reach the level of the ovary; *T. pseudo-*

*aculeatus* has slightly larger eggs and a cirrus sac which does not reach the level of the ovary. The most similar species, *T. stossichi*, occurs in Europe, North Africa and Asia Minor in *Emys orbicularia*, a member of the same family (Emydidae) as *Graptemys pseudogeographica*.

***Telorchis necturi* (Perkins 1928) Wharton 1940**  
(Fig. 5)

Synonym: *Telorchis cryptobranchi* McMullen and Roudabush 1935 *new synonymy*.

*Host*: *Graptemys pseudogeographica* (4 in 1 host), *new host*.

*Site*: Small intestine.

*Specimens*: 2, Univ. Neb. State Museum, H. W. Manter Lab. No. 20213.

The four specimens identified as *T. necturi* agree very closely with the original description by Perkins (1928). *Telorchis necturi* and *T. cryptobranchi* are distinguishable on the basis of a single attribute; *T. necturi* has a cirrus sac which terminates at the level of the posterior margin of the ovary, while the cirrus sac of *T. cryptobranchi* terminates immediately anterior to the ovary. Watertor (1967) clearly demonstrated that the posterior extent of the cirrus sac among members of *Telorchis* may be a plastic character and that minor differences in the extent of the cirrus sac are not sufficient grounds for recognizing a new species. The four specimens collected in this study have cirrus sac which terminate at varying points from immediately anterior to the ovary to the level of the posterior margin of the ovary, otherwise, they are indistinguishable. Therefore, *T. necturi* and *T. cryptobranchi* are considered synonymous.

***Telorchis corti* Stunkard 1915**  
(Fig. 4)

*Host*: *Kinosternon flavescens* Agassiz (7 in 1 host, *new host*).

*Site*: Small intestine.

*Specimens*: 2, Univ. Neb. State Mus., H. W. Manter Lab No. 20212.

Over 100 specimens of *T. corti* have now been collected from *Chelydra serpentina*, *Chrysemys picta*, and *Trionyx spiniferus* (Brooks and Mayes, 1975), *Kinosternon flavescens* (present report), and *Thamnophis sirtalis* (Brooks and Mayes, unpublished) in Nebraska. All specimens agree very closely with the original description; in no case does

the cirrus sac terminate closer than one ovarian diameter anterior to the ovary.

***Protenes angustus* (Stafford 1900) Ward 1918**

*Host*: *Chrysemys picta* (1 in 1 host).

*Site*: Small intestine.

*Specimen*: 1, Univ. Neb. State Mus., H. W. Manter Lab. No. 20230.

This is the first report of *P. angustus* from Nebraska. Brooks and Mayes (1975) erroneously cited Barker and Covey (1911) as reporting *P. angustus* from Nebraska; their specimens were in fact from *Chrysemys picta* in Minnesota.

**SPIRORCHIIDAE Stunkard 1921**

***Hapalorhynchus stunkardi* Byrd 1939**

*Host*: *Chelydra serpentina* L. (4 worms in 1 host).

*Site*: Blood vessels of lungs.

*Specimens*: 2, Univ. Neb. State Mus., H. W. Manter Lab. No. 20217.

Byrd (1939) described *H. stunkardi* from the blood vessels of the lungs of *Kinosternon* (= *Sternothaerus*) *carinatum* (Gray) in Tennessee. Since this is the first report of the species since its description, both the host and locality are new.

Stunkard (1923) erected the genus *Hapalorhynchus* for *H. gracilis* from *Chelydra serpentina*, stating that there was no cirrus sac or cirrus present. Mehra (1933) erected the genus *Coeuritrema* for *C. lyssemus* and *C. odhnerensis*, stating that they were generically different from *H. gracilis* because they possessed well-developed cirri. Thapar (1933) erected the genus *Tremarhynchus* for *T. indicus*, but Mehra (1934) pointed out that *T. indicus* possesses a rudimentary cirrus and thus belongs in *Coeuritrema*. Price (1934) considered *Tremarhynchus* a synonym of *Hapalorhynchus*, and Byrd (1939) considered both *Tremarhynchus* and *Coeuritrema* synonyms of *Hapalorhynchus*. Skrjabin (1951) and Yamaguti (1958, 1971) both considered *Coeuritrema* and *Hapalorhynchus* separate genera. Our specimens and the original description of *Hapalorhynchus stunkardi* both show a well-developed cirrus. Additionally, Brooks and Mayes (1975) described *Hapalorhynchus foliorchis* and reported a weakly muscular ductus ejaculatorius leading from the seminal vesicle to the genital pore; examination of the holotype

of *H. gracilis* revealed a similar morphology as did Thapar's description of *Tremarhynchus indicus*. Since a weakly-muscular ductus ejaculatorius may be termed a rudimentary or poorly-developed cirrus, the synonymy of *Coeuritrema* and *Tremarhynchus* with *Hapalorhynchus* is justified, and the generic diagnosis is hereby emended for the first time to include species with either a well-developed or poorly-developed cirrus.

Byrd (1939) compiled a key to the species of *Hapalorhynchus*, and based his first couplet on the presence or absence of a body constriction at the level of the acetabulum. He described *H. stunkardi* as lacking such a constriction, but our specimens of *H. stunkardi* (which were fixed without pressure) have the constriction. The diagnosis of *H. stunkardi* is hereby emended to include such a constriction and the use of the presence or absence of such a constriction for distinguishing species eliminated. We have prepared the following new key to the species of *Hapalorhynchus* in light of the new morphological information.

Key to Species of *Hapalorhynchus* Stunkard 1923  
Synonyms: *Coeuritrema* Mehra 1933; *Tremarhynchus* Thapar 1933

- 1a. Cirrus well-developed

5
- 1b. Cirrus poorly developed

2
- 2a. Testes smooth

3
- 2b. Testes lobed

4
- 3a. Esophageal diverticula present

*evaginatus* Byrd 1939
- 3b. Esophageal diverticula absent

*gracilis* Stunkard 1923
- 4a. Ovary lobed

*indicus* (Thapar 1933)  
Price 1934
- 4b. Ovary smooth

*foliorchis* Brooks and  
Mayes 1975
- 5a. Vitelline follicles extending into forebody

6
- 5b. Vitelline follicles not extending into forebody

*lyssemus* (Mehra 1933)  
Byrd 1939
- 6a. Oral sucker smaller than acetabulum

7
- 6b. Oral sucker larger than acetabulum

*odhnerensis* (Mehra 1933)  
Byrd 1939
- 7a. Testes lobed, vitelline follicles extending to bifurcation

8
- 7b. Testes smooth, vitelline follicles not extending to bifurcation

*yoshidai* Ozaki 1939

- 8a. Ovary a narrow transverse band

*reelfooti* Byrd 1939
- 8b. Ovary ovoid

*stunkardi* Byrd 1939

***Spirorchis scripta* Stunkard 1923**

*Host:* *Chrysemys picta* Schneider (5 in 1 host).  
*Site:* Cranial cavity, blood vessels of heart.  
*Specimens:* 3, Univ. Neb. State Mus., H. W. Manter Lab. No. 20214.

The specimens collected in Nebraska are uniformly larger than any previously reported. The body is 1.9 to 2.37 mm long by 0.34 to 0.47 mm wide; the oral sucker is 89 to 113 long by 57 to 65 wide; and the eggs are 41 to 65 long by 34 to 57 wide. The anterior testis in all specimens is immediately postbifurcal, a configuration unique to *S. scripta*. Nebraska is a new locality for the species.

***Spirorchis parvus* Stunkard 1923**

*Host:* *Chrysemys picta* (1 in 1 host).  
*Site:* Mesenteric blood vessels.  
*Specimen:* 1, Univ. Neb. State Mus., H. W. Manter Lab. No. 20223.

This is the only known species of *Spirorchis* with five testes, and the single specimen was easily identified on that basis. Nebraska is a new locality.

**PLAGIORCHIIDAE Luhe 1901**  
***Eustomos chelydrae* MacCallum 1921**

*Host:* *Chrysemys picta* (12 in 1 host).  
*Site:* Small intestine.  
*Specimens:* 8, Univ. Neb. State Mus., H. W. Manter Lab. No. 20224.

MacCallum (1921) described *E. chelydrae* from *Chelydra serpentina* from an undisclosed locality. McMullen (1935) redescribed *E. chelydrae* and reported its life cycle from material collected from *Chrysemys picta* and *Chelydra serpentina* from Michigan. Guilford (1959) reported *E. chelydrae* from the same hosts in Wisconsin. Esch and Gibbons (1967) reported it from *Chrysemys picta marginata* Agassiz in Michigan; Gibbons and Esch (1971) reported it from *Sternotherus m. minor* from Florida. Nebraska is a new locality.

**HERONIMIDAE Ward 1917**  
***Heronimus mollis* (Leidy 1856) Stunkard 1964**

*Host:* *Graptemys pseudogeographica* (10 in 1 host), *new host*.  
*Site:* Lungs.

*Specimens*: 5, Univ. Neb. State Mus., H. W. Manter Lab. No. 20218.

This is the first report of *H. mollis* from *G. pseudogeographica*. Brooks and Mayes (1975) reported *H. mollis* from *Chrysemys picta*, *Chelydra serpentina*, and *Emydoidea blandingi*. Our statement that the first report of the species from Nebraska was by Barker and Parsons (1914) was in error, since Barker and Parson's report was from *Chelydra serpentina* in Iowa.

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