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Helminth Parasites of Unisexual and Bisexual Whiptail Lizards (Teiidae) in North America. I. The Colorado Checkered Whiptail (*Cnemidophorus tesselatus*)

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ABSTRACT: Eleven of 27 (41%) parthenogenetic Colorado checkered whiptails (*Cnemidophorus tesselatus*) from four counties of western and southwestern Texas were infected with one or more helminths. These included a linstowiid cestode (*Oochoristica* sp.), a larval spirurid nematode (*Physaloptera* sp.) and two species of oxyurid nematodes (*Parathelandros texanus* and *Pharyngodon warneri*). This note, the first in a series of reports on helminths of *Cnemidophorus* spp., represents the first record of parasites from *C. tesselatus*.

Key words: Cestoidea, *Cnemidophorus tesselatus*, Cyclophyllidea, helminths, lizards, *Oochoristica* sp., Oxyurida, *Parathelandros texanus*, *Pharyngodon warneri*, *Physaloptera* sp., Spirurida, survey.

The Colorado checkered whiptail (*Cnemidophorus tesselatus*) is a parthenoform (all-female) lizard that ranges from Chihuahua, Mexico northward through the Trans-Pecos and Big Bend of Texas to the high plains of New Mexico and eastward into the western Panhandle of Texas and Oklahoma to central Colorado in the United States (Price, 1986; Dixon, 1987). The species inhabits various habitats ranging in elevation from 250 to 1,829 m on rocky, gravelly and sandy soils of plains, canyons and uplands to floodplains of the Rio Conchos and Rio Grande rivers (Conant, 1975; Stebbins, 1985; Price, 1986). This unisexual teiid is believed to have originated by hybridization between the bisexual marbled whiptail, *C. tigris* (=*marmoratus sensu* Hendricks and Dixon, 1986), and plateau spotted whiptail, *C. septemvittatus* (syn. *scalaris*) (Brown and Wright, 1979). Price (1986) summarized information on the natural history and ecology of *C. tesselatus*; however, nothing is known concerning the helminths of this multiclonal lizard. The purposes of this note, the first in a series of reports on helminths of *Cnemidophorus* spp., is to provide prevalence data and identities of endoparasites infecting this lizard in Texas and to compare these results with previously published parasite information on its parental congeners.

Twenty-seven juvenile and adult female *C. tesselatus* with snout–vent lengths (SVL) ranging from 57 to 105 mm ($\bar{x} \pm$ SE = 82.7 ± 2.8 mm) and which had been fixed in formalin and stored in 70% ethanol were borrowed from the Sul Ross State University Museum (SRSU, Alpine, Texas 79830, USA). Lizards were collected during various months from 1975 to 1985 in Brewster (30°30′N, 103°20′W) (n = 6), Culberson (31°50′N, 104°20′W to 31°50′N, 104°50′W) (n = 3), and Presidio (30°00′N, 104°30′W to 30°20′N, 104°30′W) (n = 13) counties of the Big Bend and Oldham (35°30′N, 102°15′W) County (n = 5) in the western Panhandle region of Texas (USA). The gastrointestinal tract was removed from lizards, slit lengthwise, and examined for helminths with the aid of a dissecting microscope. The liver, ventral musculature and body cavity were examined for encapsulated, encysted or free parasites. Cestodes were stained with Mayer's hematoxylin and eosin counterstain, dehydrated in a series of alcohols, cleared in xylene, and mounted in Permount® mounting medium (Fisher Scientific, Pittsburgh, Pennsylvania 15219, USA). Nematodes were stored in glycerol and studied as temporary mounts. Representative helminth specimens are deposited in the United States National Museum Helminthological Collection (United States Department of Agriculture, Beltsville, Mary-

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TABLE 1. Helminths found in *Cnemidophorus tesselatus*.

Helminth	Prevalence: Number examined/ number infected	Prevalence: %	Intensity: $\bar{x}$ ± SE	Intensity: (Range)
Cestoidea				
Cyclophyllidea				
Oochoristica sp. (d)[a]	3/27	11	2.0 ± 0.6	(1–3)
Nematoda				
Spirurida				
Physaloptera sp. (s)	5/27	19	7.2 ± 4.7	(1–25)
Oxyurida				
Parathelandros texanus (c)	3/27	11	7.0 ± 4.2	(1–15)
Pharyngodon warneri (r)	4/27	15	65.3 ± 45.5	(1–200)

[a] Location of parasites: d, duodenum; s, stomach; c, colon; r, rectum.

land 20705, USA; accession numbers for *Oochoristica* sp. are 80701 to 80702, for *Physaloptera* sp. are 80703, for *Parathelandros texanus* are 80704, and for *Pharyngodon warneri* are 80705).

Eleven of 27 (41%) *C. tesselatus* (SVL 57 to 89 mm, 80.9 ± 2.9 mm) were infected with at least one of four helminths (Table 1). These included eight (73%) infected lizards with a single helminth, two (18%) with two, and one (9%) with three species, respectively. Infected whiptails came from Brewster (83%), Presidio (39%) and Culberson (33%) counties; none of the *C. tesselatus* from Oldham County were infected with helminths.

Larval specimens of *Physaloptera* sp. were collected from two adult lizards (88 to 89 mm SVL, SRSU accession numbers 3863 and 4636) in Brewster County and a juvenile (57 mm SVL, SRSU 5631) and two adult lizards (80 to 85 mm SVL, SRSU 3946, 4527) in Presidio County. These helminths have been reported from a variety of lizards in North America (Baker, 1987), including western whiptails (*C. tigris*) from Nevada (Babero and Matthias, 1967), prairie-lined racerunners (*C. sexlineatus viridis*) from South Dakota (Dyer, 1971), Laredo-striped whiptails (*C. laredoensis*) from Texas (McAllister et al., 1986) and giant spotted whiptails (*C. burti stictogrammus*) from Arizona (Goldberg and Bursey, 1989).

Specimens of *Pharyngodon warneri* occurred in two lizards from Brewster County (71, 87 mm SVL, SRSU 5082 and 5088), one lizard from Culberson County (89 mm SVL, SRSU 5690) and a single lizard from Presidio County (84 mm SVL, SRSU 3783). This latter host had a heavy infection of more than 200 helminths. *Pharyngodon warneri* was originally described by Harwood (1932) from *C. sexlineatus* in southeastern Texas and since has been reported from various cnemidophoriine taxa (McAllister et al., 1986).

Six linstowiid cestodes (*Oochoristica* sp.) were found in two adult lizards (SVL 76, 87 mm, SRSU 5082 and 5087) from 40 km northeast of Alpine in Brewster County and another adult (SVL 85 mm, SRSU 4527) from a site in extreme western Presidio County of the Big Bend region of Texas (USA). Because the cestodes had been killed in situ and in an unrelaxed state, species identification was not possible. However, they most closely resembled *O. bivitellobata*, a common cestode previously reported from several *Cnemidophorus* spp. in the United States (see Benes, 1985; McAllister et al., 1985; Lyon, 1986; Goldberg and Bursey, 1989).

A rarely reported nematode, *Parathe-*

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landros texanus was found in three adult lizards (SVL 80 to 85 mm, SRSU 3946, 4527 and 5571) from separate localities in Presidio County. The type locality of *P. texanus* (Stairway Mountain, Black Gap Management Area in Brewster County; Specian and Ubelaker, 1974) is located only 155 km southeast of the present localities. This nematode, originally reported erroneously as *Pharyngodon warneri* by Babero and Matthias (1967) also is known from *C. tigris* in Arizona (Specian and Ubelaker, 1974).

Read and Amrein (1953) described *Pharyngodon cnemidophori* from *C. tesselatus tesselatus* in San Bernardino County, California (USA). However, it is likely these investigators misidentified their host because *C. tesselatus* and *C. tigris* are somewhat similar in appearance. This is further supported by the fact that *C. tesselatus* has never been reported to range any further west than possibly extreme southwestern Arizona and even its current existence in this isolated locale is uncertain (Price, 1986). Further, the only whiptail that occurs in San Bernardino County, California is *C. tigris* (Stebbins, 1985).

In summary, this paper documents new host and distributional records for helminths reported from a parthenogenetic whiptail lizard in western Texas. Although *Pharyngodon warneri* occurs in *C. tesselatus*, it has not been found in either of its biparental ancestors. However, like *C. tesselatus*, both *C. tigris* and *C. septemvittatus* have been reported to serve as hosts for *Parathelandros texanus* (Specian and Ubelaker, 1974). In addition, *C. tesselatus* is similar to *C. tigris* in terms of habitat preference and they are often found in sympatry in southwestern Texas. It could be expected on the basis of similar ecological and inferred coevolutionary patterns that these two lizards should share more parasites and are more closely related. Surveys of additional whiptail lizard taxa could provide an alternative organismal approach of studying host phylogeny compared with molecular techniques. This may aid in further delineating coevolutionary patterns among *Cnemidophorus* spp.

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