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ECTOPARASITES OF *DIPODOMYS ELATOR* FROM NORTH-CENTRAL TEXAS WITH SOME DATA FROM SYMPATRIC *CHAETODIPUS HISPIDUS* AND *PEROGNATHUS FLAVUS*

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ABSTRACT—Seven species of parasites were collected from 21 Texas kangaroo rats (*Dipodomys elator*). A listrophorid mite (*Geomylichus dipodomius*), a louse (*Fahrenholzia pinnata*), a laelapid mite (*Echinonyssus incomptis*), and a chigger (*Euschoengastia decipiens*) were the most abundant species collected. Seven hispid pocket mice (*Chaetodipus hispidus*) were hosts of eight species of ectoparasites: *G. inaequalis*, *F. zacatecae*, *Androlaelaps fahrenholzi*, *E. decipiens*, and *E. perognathi* were the most abundant, while the three chiggers *Cheladonta micheneri*, *Hyponeocula montanensis*, and *Odontacarus dentatus* occurred less often. Five *Perognathus flavus* were parasitized by *G. perognathus* and *E. decipiens*. Ectoparasite communities of the three heteromyid rodents were quite different with only the habitat-specific chigger *E. decipiens* being common to all three species. The parasite communities of *D. elator* and *P. flavus* were most similar. Several new host and locality records of parasitic species are reported.

Dipodomys elator (Texas kangaroo rat) is a geographically restricted species of kangaroo rat of north-central Texas and southern Oklahoma (Carter et al., 1985). The systematic relationship of *D. elator* to other species of *Dipodomys* has not been resolved. Through the use of electrophoretic data Hamilton et al. (1987) placed *D. elator* with *Dipodomys phillipsii*. A previous study by Blair (1954), utilizing bacular morphology, placed *D. elator* close to *Dipodomys merriami*. The nearest population of *D. phillipsii* to *D. elator* is several hundred kilometers away in central Mexico, while the nearest population of *D. merriami* is only 320 km to the west. *Geomylichus texensis* occurs on *D. merriami*, and *Geomylichus dipodomius* has been reported from *D. phillipsii* (Fain et al., 1978). Since *Geomylichus* is extremely host-specific, the exclusive occurrence of *G. texensis* or *G. dipodomius* on *D. elator* would provide evidence of *D. merriami* or *D. phillipsii* as the ancestral host. Other sources of external parasites may be from sympatric heteromyid rodents that are ecological associates. In north-central Texas, two such associates, *Chaetodipus hispidus* and *Perognathus flavus*, were collected.

There are three previous records of external parasites from *D. elator*. Carter et al. (1985) reported the sucking louse *Fahrenholzia pinnata* and the tick *Amblyoma americanum*; Hedeen (1953) reported the flea *Meringis arachnis*. Pfaffenberger and Best (1989) reported *Trichiurus elatoris* as the only record of an internal parasite from *D. elator*. Thirty and 27 species, respectively, of external parasites have been reported for *C. hispidus* and *P. flavus* (Whitaker, in press). The purposes of this paper are to report new host and locality records of external parasites from three species of heteromyid rodents from north-central Texas and describe the extent of parasite community variation resulting from parasite mixing among hosts of heteromyid rodents.

MATERIALS AND METHODS—From 9 to 13 March 1985, 26 heteromyid rodents (19 *D. elator*, 2 *C. hispidus*, 5 *P. flavus*) were collected at the following localities in north-central Texas: Wilbarger Co., 3.2 km W Harrold (7 *D. elator*, 3 *P. flavus*); Wichita Co., 3.2 km W, 8 km N Iowa Park (2 *D. elator*, 1 *C. hispidus*); Hardeman Co., 6.1 km N, 2.9 km E jct. FM 2006 and U.S. 287 (5 *D. elator*, 1 *P. flavus*). One *D. elator* was collected from each of two localities in Hardeman Co. (6.6 km N, 4.8 km W jct. FM 2006 and U.S. 287; 5.6 km N, 3.2 km E jct. FM 2006 and U.S. 287). Seven *C. hispidus* were collected from: Motley Co., 16 km E Matador (2); Hardeman Co., 4.2 km E, 2.4 km N Acme (1); 4.2 km E, 0.8 km N Acme (2); and Wichita Co., 4.8 km W, 11.2 km N Iowa Park (2).

Hosts were live-trapped, removed from the trap, placed in individual paper bags, and sacrificed. Hosts were frozen in the field and later examined for external parasites. Parasites were recovered by first washing the host in detergent and using filter paper to retrieve parasites with the aid of a dissecting microscope. Parasites were preserved in 70% isopropyl alcohol, placed in Nesbitt's acid fuchsin stain for 7 days, and mounted on microscope slides using Hoyer's medium. Hosts were prepared as standard museum specimens and deposited in The Museum, Texas Tech University, Lubbock, Texas.

External parasites recovered from *D. elator* and *C. hispidus* and their abundance are listed in Table 1. To examine similarities of external-parasite communities among the sympatric host populations (*D. elator, C. hispidus,* and *P. flavus*), pairwise Jaccard and simple matching similarity coefficient values were computed. All published ectoparasite records for these hosts (Whitaker, in press) were included in the similarity coefficient computation. Both types of similarity coefficient values were computed by first including all reported species of external parasites, excluding all species of chiggers, and exclusion of the mesostigmatid mite *Androlaelaps fahrenholzi*.

RESULTS AND DISCUSSION—Eight species of external parasites were taken on 18 of 21 (85.7%) Texas kangaroo rats (Table 1). The five most abundant and prevalent species of parasites were a listrophorid mite (*Geomylichus dipodomius*), a sucking louse (*Fahrenholzia pinnata*), and laelapid mite (*Echinonyssus incomptis*), a chigger (*Euschoengastia decipiens*), and a flea (*Meringis agilis*). These five are primarily heteromyid parasites, thus indicating the overall specialization and isolation of such parasite communities. *Geomylichus dipodomius* previously has been reported from *Dipodomys spectabilis* from Santa Fe, New Mexico, and *D. phillipsii* from Catorce, San Luis Potosi, Mexico (Fain et al., 1978). *F. pinnata* has been found on many species of kangaroo rats, as have *E. incomptis, E. decipiens,* and fleas of the genus *Meringis*. The three remaining taxa were *A. fahrenholzi* ($n = 3$), larval *Ixodes* sp. ($n = 3$), and one immature *Echinonyssus* sp. (Table 1). *Androlaelaps fahrenholzi* is the most ubiquitous external parasite of mammals in North America (Whitaker and Wilson, 1974). *Androlaelaps fahrenholzi* and the *Ixodes* sp. were the only parasites from *D. elator* that are not essentially heteromyid parasites. With the exception of *F. pinnata,* the parasites reported here are new host records. The record of *G. dipodomius* from Texas is a new state record.

Three species of external parasites were recovered from five individuals of *P. flavus* collected sympatrically with *D. elator*. These were *Geomylichus perognathi* ($n = 10$; frequency of occurrence $f = 80.0\%$), *E. decipiens* ($n = 6; f = 40.0\%$), and *A. fahrenholzi* ($n = 1; f = 20.0\%$). Two of the three parasitic species recovered from *P. flavus* were also recovered from sympatric *D. elator*. *Euschoengastia decipiens* probably was recovered from the three host species because it is habitat rather than host specific. *Androlaelaps fahrenholzi* has been recovered from a large number of North American rodents. The host-specific listrophorid mite *G. perognathi* did not occur on *D. elator* or *C. hispidus*.

Eight species of parasites were recovered from eight of nine (88.9%) *C. hispidus* examined (Table 1). The louse *Fahrenholzia zacatecae,* the listrophorid mite *Geomylichus inaequalis,* and the laelapid mite *Echinonyssus perognathi* represented the three most prevalent and abundant parasites and were found only on this host. In addition, four species of habitat-specific chiggers were collected from this host, with *E. decipiens* being the most abundant and prevalent (Table 1). The occurrence of *E. decipiens* indicates a commonality of habitat between *C. hispidus* and *D. elator*. However, the three other chiggers were limited to *C. hispidus,* perhaps indicating that a portion of the habitat was not shared. The remaining species found on *C. hispidus* was the catholic *A. fahrenholzi* also found on *D. elator*. There were no differences between the external parasite communities of *C. hispidus* that were symaptric or allopatric with *D. elator* (Table 1).

The total sample of *C. hispidus* was compared to that of *D. elator* and *P. flavus* because there were no differences between the external parasite communities of *C. hispidus* that were sympatric or allopatric with *D. elator*. Comparisons of the external parasite communities by means of both Jaccard and simple matching coefficients demonstrated a high degree of similarity among the three sympatric species when species of habitat-

TABLE 1—Ectoparasites of 21 Texas kangaroo rats (*Dipodomys elator*) and nine hispid pocket mice (*Chaetodipus hispidus*) from north-central Texas. Parenthetical values are for the parasites recovered from *C. hispidus* hosts collected sympatrically with *D. elator*.

	D. elator				*C. hispidus*			
	Parasites		Hosts		Parasites		Hosts	
Parasite	n[1]	$\bar{X}$[2]	n[3]	%[4]	n	$\bar{X}$	n	%
Acari								
Listrophoridae								
Geomylichus dipodomius	300	16.6	18	86				
Geomylichus inaequalis					95	10.6	5	55
					(31)	(15.5)	(2)	(100)
Laelaptidae								
Echinonyssus incomptis	37	1.8	8	38				
Echinonyssus perognathi					9	1.0	5	55
					(1)	(0.5)	(1)	(50)
Androlaelaps fahrenholzi	3	0.1	3	14	20	2.2	4	44
					(4)	(2.0)	(1)	(50)
Trombiculidae								
Euschoengastia decipiens	26	1.2	7	33	17	1.9	5	55
					(12)	(6.0)	(1)	(50)
Cheladonta micheneri					10	1.1	1	11
Hyponeocula montanensis					7	0.8	2	22
					(5)	(2.5)	(1)	(50)
Odontacarus dentatus					3	0.3	1	11
Ixodidae								
Ixodes sp. larvae	3	0.1	1	5				
Anoplura								
Fahrenholzia pinnata	130	6.2	15	71				
Fahrenholzia zacatecae					66	7.3	3	33
Siphonaptera								
Meringis agilis	13	0.6	6	29				

[1] Abundance of each parasite species recovered.
[2] Mean abundance of the parasite species per infected host.
[3] Number of hosts harboring the parasite.
[4] Percent prevalence of the parasite species.

specific chiggers were included (Table 2). However, when chiggers were removed from analyses, there was a greater similarity seen between the parasite communities of *D. elator* and *P. flavus*. When *A. fahrenholzi* was excluded from analyses, the degree of similarity between *D. elator* and *P. flavus* was further increased (Table 2).

The host-specific listrophorid mite *G. dipodomius* reported herein from *D. elator* is different from *G. texensis* known from *D. merriami*. The presence of *G. dipodomius* on both *D. elator* and *D. phillipsii* would support the *elator-phillipsi* grouping proposed by Hamilton et al. (1987). Little is known about the external parasite community of *D. phillipsii*.

It appeared that the external parasite community of *D. elator* was isolated from heteromyids that were ecological associates, with three of seven species restricted to this host. However, the similarity between parasite communities of *D. elator* and *P. flavus* suggested some degree of niche overlap. A similar niche overlap was not demonstrated between sympatric *D. elator* and *C. hispidus*. It appeared that these two hosts inhabited quite

TABLE 2—Jaccard (below diagonal) and simple matching (above diagonal) similarity coefficients comparing the external parasite communities of *Dipodomys elator*, *Chaetodipus hipidus*, and *Perognathus flavus*.

Parasite community	*D. elator*	*C. hispidus*	*P. flavus*
All external parasites			
D. elator		0.05	0.12
C. hispidus	0.64		0.23
P. flavus	0.71	0.63	
Trombiculids excluded			
D. elator		0.04	0.08
C. hispidus	0.55		0.08
P. flavus	0.79	0.55	
Trombiculids and *Androlaelaps fahrenholzi* excluded			
D. elator		0.00	0.20
C. hispidus	0.58		0.04
P. flavus	0.77	0.54	

different niches, or their parasites were intolerant of the other host. Since chiggers are habitat rather than host specific, it appeared that the hosts inhabit different microhabitats.

The listrophorid mites were verified by A. Fain (Institut Royal des Sciences Naturelles de Belgique, Rue Vautier, Brussels, Belgium), the lice by K. C. Emerson (Sanibel Island, Florida), the chiggers by W. J. Wrenn (University of North Dakota), the fleas by R. E. Lewis (Iowa State University), and the ticks by N. Wilson (University of Northern Iowa). We thank all of these individuals. We thank C. R. Wahl for assistance in the field, F. S. Dobson, C. Sunderman, and R. E. Mirarchi for reviewing an early draft of the manuscript, and the Texas Parks and Wildlife Commission for issuing a scientific collecting permit and providing field equipment. This study was supported in part by the Texas Heritage Program, The Nature Conservancy, and a Professional Development Grant from Fitchburg State College. This is journal article no. 15-892126P of the Alabama Agricultural Experimental Station.

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