

Fleas and Lice Parasitizing Mammals in Missouri

Thomas M. Kollars, Jr.¹, Lance A. Durden, and James H. Oliver, Jr.

*Institute of Arthropodology and Parasitology, P. O. Box 8056,
Georgia Southern University, Statesboro, GA 30460 USA.*

*¹Present address: Department of Entomology, U.S. Army Medical
Component, Armed Forces Research Institute of Medical Sciences,
315/6 Rajvithi Road, Bangkok 10400, Thailand.*

Journal of Vector Ecology

Society for Vector Ecology

Vol. 22, No. 2: 125-132, December, 1997

Fleas and Lice Parasitizing Mammals in Missouri

Thomas M. Kollars, Jr.¹, Lance A. Durden, and James H. Oliver, Jr.

*Institute of Arthropodology and Parasitology, P. O. Box 8056,
Georgia Southern University, Statesboro, GA 30460 USA.*

¹*Present address: Department of Entomology, U.S. Army Medical
Component, Armed Forces Research Institute of Medical Sciences,
315/6 Rajvithi Road, Bangkok 10400, Thailand.*

Received 15 June 1997; Accepted 22 September 1997.

ABSTRACT: Three species of chewing lice, 11 species of sucking lice, and 28 species of fleas are recorded from mammals in Missouri. Of these, seven species of sucking lice (*Hoplopleura acanthopus*, *Hoplopleura hesperomydis*, *Hoplopleura sciuricola*, *Neohaematopinus sciuri*, *Neohaematopinus sciurinus*, *Neohaematopinus sciuropteri*, and *Solenopotes ferrisi*) and one species of flea (*Doratopsylla blarinae*) represent new state records. From 1993 to 1995, 773 individual mammals were examined for ectoparasites in southeastern Missouri. One species of chewing louse, 6 species of sucking lice, and 11 species of fleas were recovered from 18 of the 21 mammal species examined. *Ctenophthalmus pseudagyrtis* was recovered from more mammal species (6) than any other flea species; and the white-footed mouse, *Peromyscus leucopus*, was parasitized by more flea species (5) than other hosts examined. Except for *H. sciuricola*, which was recovered from two congeneric species of tree squirrels, each species of louse was confined to a separate host species.

Keyword Index: Fleas, lice, host associations, new state records, Missouri.

INTRODUCTION

Except for a statewide flea survey by Palmer and Wingo (1972), few studies on the fleas and lice of Missouri mammals have been completed. Pratt and Good (1954) documented the geographical distributions of domestic rat ectoparasites in the United States including Missouri; and Fox (1940), Trembley and Bishopp (1940), Portman (1944), Enns (1947), Johnson and Traub (1954), and Lewis (1957) provide additional flea records for this state. More recently, McLean et al. (1996) documented some mammal fleas from southeastern Missouri as part of a study on the enzootiology of Potosi virus. Kim et al. (1986) provide records of three species of sucking lice, and Timm and Price (1980) document two species of chewing lice from Missouri. During a Lyme disease survey, an opportunity was afforded to collect fleas and lice from various species of mammals in southeastern Missouri and to compare the results with previous species records for these two groups of ectoparasites for the state.

MATERIALS AND METHODS

Mammals were captured using a variety of live traps and baits in Bollinger, Cape Girardeau, Scott, Stoddard, and Wayne counties in southeastern Missouri from 1993 to 1995. White-tailed deer were examined at hunter check stations and by monthly sampling. Individual mammals were either killed, anesthetized, or restrained before being combed for ectoparasites. Mammal taxonomy in this paper follows Wilson and Reeder (1993).

Fleas and lice were stored in individually labelled vials containing 70% ethanol until they could be further examined. Unless identification could be completed without clearing, ectoparasites were cleared in 10% potassium hydroxide, rinsed in distilled water, dehydrated in an alcohol series of ascending strengths, further cleared in xylene, and then slide-mounted in Canada balsam for microscopical identification. Voucher fleas and lice from this study are deposited in the Institute of Arthropodology and Parasitology at Georgia Southern University.

RESULTS

The following species and numbers of mammals were examined for fleas and lice: Virginia opossum, *Didelphis virginiana* Kerr (31); northern short-tailed shrew, *Blarina brevicauda* (Say) (11); white-tailed deer, *Odocoileus virginianus* (Zimmermann) (81); bobcat, *Lynx rufus* (Schreber) (1); raccoon, *Procyon lotor* (L.) (10); coyote, *Canis latrans* Say (1); southern flying squirrel, *Glaucomys volans* (L.) (5); eastern gray squirrel, *Sciurus carolinensis* Gmelin (14); fox squirrel, *Sciurus niger* L. (9); eastern chipmunk, *Tamias striatus* (L.) (7); prairie vole, *Microtus ochrogaster* (Wagner) (80); pine vole, *Microtus pinetorum* (Le Conte) (16); golden mouse, *Ochrotomys nuttalli* (Harlan) (24); cotton mouse, *Peromyscus gossypinus* (Le Conte) (6); white-footed mouse, *Peromyscus leucopus* (Rafinesque) (317); deer mouse, *Peromyscus maniculatus* (Wagner) (11); western harvest mouse, *Reithrodontomys megalotis* (Baird) (24); rice rat, *Oryzomys palustris* (Harlan) (11); house mouse, *Mus musculus* L. (34); and eastern cottontail, *Sylvilagus floridanus* (J. A. Allen) (80).

Eighteen of the 21 mammal species examined were infested by fleas and/or lice; uninfested species were the coyote, golden mouse, and house mouse. TABLES 1 and 2 show the flea and louse associations, respectively, recorded for these mammal species.

DISCUSSION

Collections of the shrew flea *Doratomyella blarinae* C. Fox reported here, represent a new state record for Missouri. Three species of rabbit fleas were collected from eastern cottontails: *Euhoplopsyllus glacialis affinis* (Baker) (17 of 80 infested = 21%), *Cediopsylla simplex* (Baker) (10 of 80 infested = 13%), and *Odontopsyllus multispinosus* (Baker) (4 of 80 infested = 5%). Interestingly, these same three flea species were also recovered from the bobcat, suggesting that it had been feeding on rabbits. *Ctenophthalmus pseudagyrtes* Baker was the most frequently collected flea in this survey and it parasitized more species of mammals (6) than any other flea species collected (TABLE 1). More species of fleas (5) were recovered from the white-footed mouse than from any other mammal species examined (TABLE 1). Predictable flea records include the cat flea *Ctenocephalides felis* (Bouché) from the Virginia opossum, the squirrel flea *Orchopeas howardi* (Baker) from both species of tree squirrels (*Sciurus* spp.), and *Stenoponia americana* (Baker) from *Peromyscus* spp. An unusual flea record, presumed to reflect an accidental infestation, is that of *O. howardi* from a white-tailed deer.

Other notable records of fleas from Missouri

mammals are provided by Fox (1940), Johnson and Traub (1954), Pratt and Good (1954), Lewis (1957), and Palmer and Wingo (1972). The statewide survey of Palmer and Wingo (1972) documented the presence of 26 species of fleas. Based on our findings, *D. blarinae* should be added to that list as an additional species occurring in Missouri. Also in southeastern Missouri, McLean et al. (1996) collected *C. felis* from the Virginia opossum and raccoon, *C. pseudagyrtes* and *O. howardi* from the Virginia opossum, and *Orchopeas sexdentatus* (Baker) (subspecies not stated) from the eastern woodrat, *Neotoma floridana* (Ord). Recently, Lewis (1998) has described an additional species of flea, *Orchopeas illinoensis*, from Illinois and Missouri.

With the exception of *Trichodectes octomaculatus* Paine, all species of lice we report from southeastern Missouri—*Hoplopleura acanthopus* (Burmeister), *Hoplopleura hesperomydis* (Osborn), *Hoplopleura sciuricola* Ferris, *Neohaematopinus sciuri* Jancke, *Neohaematopinus sciuropteri* (Osborn), and *Solenopotes ferrisi* (Fahrenholz)—represent new state records (Kim et al. 1986). Sucking lice previously documented from wild mammals in Missouri are *Enderleinellus marmotae* Ferris, *Hoplopleura pacifica* Ewing, and *Polyplax spinulosa* (Burmeister) (Ferris 1919, Pratt and Good 1954, Kim et al. 1986). We also report a new state record of *Neohaematopinus sciurinus* (Mjöberg) recovered from a fox squirrel near Potosi in Washington county.

Because of the host specificity exhibited by many species of lice (Emerson and Price 1985, Kim 1985) it is not surprising that six of the seven species we collected were associated with separate host species (TABLE 2). The only exception, *H. sciuricola*, was recorded from both species of *Sciurus* and is known to parasitize several species of New World tree squirrels belonging to this genus and to the genus *Tamiasciurus* (Durden and Musser 1994).

The impact of flea and lice infestations on the health of wild mammal hosts is poorly understood. Large infestations can cause anemia, intense grooming and pelage/skin damage, but small infestations are presumed to have little impact on the host. Because zoonotic diseases, such as plague, murine typhus, tularemia, and sporadic epidemic typhus are rare or absent from Missouri, the importance of fleas and lice infesting reservoir mammals to public health may be small. Similarly, although *Borrelia burgdorferi* Johnson, Schmid, Hyde, Steigerwalt, and Brenner s. lat., the etiologic agent of Lyme disease, has been detected in, or isolated from, a few fleas and sucking lice, the role of these ectoparasites in maintaining or transmitting this pathogen is presumed to be minimal (Teltow et al. 1991, Doby et al. 1994).

TABLE 2. Mammal-lice associations in southeastern Missouri, 1993-1995.

HOST SPECIES	LOUSE SPECIES						
	<i>Trichodectes octomaculatus</i>	<i>Hoplopleura acanthopus</i>	<i>Hoplopleura hesperomydis</i>	<i>Hoplopleura sciuricola</i>	<i>Neohaematopinus sciuri</i>	<i>Neohaematopinus sciuropteri</i>	<i>Solenopotes ferrisi</i>
<i>Odocoileus virginianus</i>							+
<i>Procyon lotor</i>	+						
<i>Glaucomys volans</i>						+	
<i>Sciurus carolinensis</i>				+	+		
<i>Sciurus niger</i>				+			
<i>Microtus ochrogaster</i>		+					
<i>Peromyscus leucopus</i>			+				

ANNOTATED LIST OF LICE AND FLEAS RECOVERED FROM MISSOURI MAMMALS

*Denotes a new county record; **denotes a new state record; REL denotes records of flea specimens in the collection of Robert E. Lewis in Ames, Iowa.

CHEWING LICE

FAMILY TRICHODECTIDAE

Geomydoecus geomydis (Osborn).

Holt and Lewis counties, ex *Geomys bursarius majusculus* Swenk (Plains pocket gopher) (Timm and Price 1980, Timm 1983).

Geomydoecus spickai Timm and Price.

Charles, Crawford, and St. Louis counties, ex *Geomys bursarius missouriensis* McLaughlin (Plains pocket gopher) (Spicka 1981, Timm and Price 1980, Timm 1983).

Trichodectes octomaculatus Paine.

Bollinger* county, ex *P. lotor* (present survey).

SUCKING LICE

FAMILY ENDERLEINELLIDAE

Enderleinellus marmotae Ferris.

Taney county, ex *Marmota monax* (L.) (woodchuck) (Ferris 1919, Kim et al. 1986).

FAMILY HOPLOPLEURIDAE

Hoplopleura acanthopus (Burmeister)**.

Bollinger* county, ex *M. ochrogaster* (present survey).

Hoplopleura hesperomydis (Osborn)**.

Bollinger* county, ex *P. leucopus* (present survey).

Hoplopleura pacifica Ewing (tropical rat louse).

Jackson county, ex domestic rats (Pratt and Karp 1953; Pratt and Good 1954; Kim et al. 1986).

Hoplopleura sciuricola Ferris**.

Bollinger* county, ex *S. carolinensis* and *S. niger* (present survey).

FAMILY LINOGNATHIDAE

Solenopotes ferrisi (Fahrenholz)**.

Cape Girardeau* county, ex *O. virginianus* (present survey).

FAMILY PEDICULIDAE

Pediculus mjobergi Ferris.

"Central Missouri," ex black-handed spider monkeys, *Ateles geoffroyi* Kuhl, in a roadside petting zoo (Ronald and Wagner 1973). Although *P. mjobergi* is not native to the United States, this case is noteworthy because it involved several heavily infested monkeys, two of which died of anemia resulting from louse bites. Humans contacting the monkeys were also bitten and one person developed an allergic reaction to the louse bites (Ronald and Wagner 1973).

FAMILY POLYPLACIDAE

Neohaematopinus sciuri Jancke**.

Bollinger* county, ex *S. carolinensis* (present survey).

Neohaematopinus sciurus (Mjöberg)**.

Washington* county, ex *S. niger* (present survey).

Neohaematopinus sciuropteri (Osborn)**.

Bollinger* county, ex *G. volans* (present survey).

Polyplax spinulosa (Burmeister) (spined rat louse).

Charles and Jackson counties, ex domestic rats (Pratt and Karp 1953; Pratt and Good 1954, Kim et al. 1986).

FLEAS

FAMILY CERATOPHYLLIDAE

Nosopsyllus fasciatus (Bosc) (northern rat flea).

Jackson, St. Louis, and unspecified counties, ex *Rattus rattus* L. (black rat), "domestic rats", and *S. floridanus* (Portman 1944, Pratt and Good 1954, Palmer and Wingo 1972).

Orchopeas howardi (Baker).

Bollinger*, Boone, Cape Girardeau*, Cass, Cooper, Dent, Marion, Pulaski, Taney, Vernon, Washington, and Wayne counties, ex *D. virginiana*, *F. sylvestris* (domestic cat), *P. lotor*, *O. virginianus*, *G. volans*, *M. monax*, *S. carolinensis*, *S. niger*, and nest of *N. floridana* (Palmer and Wingo 1972, present survey).

Orchopeas illinoiensis Lewis.

Pulaski county, ex *N. floridana* and its nests (Lewis 1998).

Orchopeas leucopus (Baker).

Bollinger*, Boone, Cape Girardeau*, Holt, Jackson, Ozark, Pulaski, and Scotland counties, ex *Pipistrellus*

subflavus (eastern pipistrelle), *Peromyscus boylii* (Baird) (brush mouse), *P. leucopus*, *Peromyscus* sp., *R. megalotis*, and nests of *P. leucopus* and *N. floridana* (Palmer and Wingo 1972, Pitts and Galloway 1993, present survey).

Orchopeas sexdentatus (Baker) (subspecies not stated).

Dent and Washington counties, ex *N. floridana* and its nests (Palmer and Wingo 1972, McLean et al. 1996).

Opisocrostitis bruneri (Baker).

Boone county, ex *Spermophilus tridecemlineatus* (Mitchill) (13-lined ground squirrel) (Palmer and Wingo 1972).

FAMILY HYSTRICHOPSYLLIDAE

Conorhinopsylla stanfordi Stewart.

Boone county, ex *Urocyon cinereoargenteus* (Schreber) (gray fox) (Palmer and Wingo 1972).

Conorhinopsylla nidicola Jellison.

Holt and Pulaski counties, ex *N. floridana* and nests of *P. leucopus* (Palmer and Wingo 1972, REL).

Corrodopsylla hamiltoni (Traub).

Boone and Pike counties, ex *Cryptotis parva* (Say) (least shrew) and its nests (Enns 1947, Palmer and Wingo 1972, REL).

Ctenophthalmus pseudagyrtis Baker.

Bollinger*, Boone, Cole, Holt, Linn, Nodaway, Pike, Pulaski, Scott*, Washington, and Wayne counties, ex *D. virginiana*, *B. brevicauda*, *Scalopus aquaticus* (L.) (eastern mole), *P. lotor*, *T. striatus*, *N. floridana*, *M. ochrogaster*, *M. pinetorum*, *P. leucopus*, *O. palustris*, *Sigmodon hispidus* Say and Ord (hispid cotton rat), *Mus musculus* L. (house mouse), *Rattus norvegicus* (Berkenhout) (Norway rat), undetermined mice, and nests of *P. leucopus* (Palmer and Wingo 1972, McLean et al. 1996, present survey).

Doratopsylla blarinae C. Fox**.

Bollinger* county, ex *B. brevicauda* (present survey).

Epitedia neotomae Jameson.

Pulaski county, ex *N. floridana* and its nests (Palmer and Wingo 1972, REL).

Epitedia wenmanni (Rothschild).

Bollinger*, Boone, Holt, Marion, and Scotland counties, ex *F. sylvestris*, *P. leucopus*, *O. palustris*, *R.*

megalotis, nests of *P. leucopus*, and nests of undetermined species of mice (Palmer and Wingo 1972, present survey).

***Rhadinopsylla orama* Smit.**

Holt county, ex *P. leucopus* (Palmer and Wingo 1972).

***Stenoponia americana* (Baker).**

Ozark, Pulaski, Scott*, Stone, and Taney counties, ex *P. boylii*, *P. gossypinus*, *P. leucopus*, *M. pinetorum*, *S. niger*, and nest of *M. ochrogaster* (Brown 1963, Palmer and Wingo 1972, present survey, REL).

FAMILY ISCHNOPSYLLIDAE

***Nycteridopsylla chapini* Jordan.**

Pulaski county, ex *Eptesicus fuscus* (Beauvois) (big brown bat) (Lewis 1957, Palmer and Gunier 1975, REL).

***Myodopsylla insignis* (Rothschild).**

Atchison and Boone counties, ex *Myotis lucifugus* (LeConte) (little brown bat) (Jellison and Good 1942, Palmer and Wingo 1972, Palmer and Gunier 1975).

FAMILY LEPTOPSYLLIDAE

***Odontopsyllus multispinosus* (Baker).**

Bollinger*, Boone, Jefferson, Osage, Pulaski, Stoddard, Wayne and unspecified counties, ex *D. virginiana*, *L. rufus*, *U. cinereoargenteus*, and *S. floridanus* (Portman 1944, Palmer and Wingo 1972, present survey, REL).

***Peromyscopsylla scotti* I. Fox.**

Bollinger*, Boone, Ozark, Pulaski, and Scott* counties, ex *P. boylii*, *P. leucopus*, *P. maniculatus*, *Peromyscus* sp., *R. megalotis*, and undetermined mouse (Johnson and Traub 1954, Palmer and Wingo 1972, present survey).

FAMILY PULICIDAE

***Cediopsylla simplex* (Baker) (rabbit flea).**

Atchison, Barry, Bollinger*, Boone, Carter, Dent, Jackson, Linn, Marion, Mercer, Osage, Polk, Pulaski, Saline, Scott*, St. Charles, Stoddard, Vernon, and unspecified county, ex *D. virginiana*, *C. latrans*, *L. rufus*, *Vulpes vulpes* (L.) (red fox), *U. cinereoargenteus*, *F. sylvestris*, *S. floridanus* and *Sylvilagus aquaticus* (Bachman) (swamp rabbit) (Kohls 1940, Portman 1944, Hopkins and Rothschild 1953, Palmer and Wingo 1972, present survey).

***Ctenocephalides canis* (Curtis) (dog flea).**

Boone, Jackson, Macon, Marion and St. Louis counties, ex *C. lupus*, *F. sylvestris*, *S. floridanus* and unspecified hosts (Trembley and Bishopp 1940, Fox 1940, Palmer and Wingo 1972).

***Ctenocephalides felis* Bouché (cat flea).**

Bollinger*, Boone, Carter, Marion, Pulaski, St. Louis, Washington and unspecified counties, ex *D. virginiana*, *C. lupus*, *U. cinereoargenteus*, *P. lotor*, *F. sylvestris*, *S. floridanus* and unspecified host (Trembley and Bishopp 1940, Portman 1944, Palmer and Wingo 1972, McLean et al. 1996).

***Echidnophaga gallinacea* (Westwood) (sticktight flea).**

Butler, Mississippi and Wayne counties, ex domestic rats, domestic chickens and unspecified hosts (Trembley and Bishopp 1940, Enns 1947, Pratt and Good 1954).

***Euhoplopsyllus glacialis affinis* (Baker).**

Bollinger*, Scott*, and unspecified counties, ex *L. rufus* and *S. floridanus* (Portman 1944, present survey).

***Pulex irritans* L. (human flea).**

Audrain, Boone, Macon, Mississippi, Saline counties and unspecified county, ex *Sus scrofa* L. (swine), *Homo sapiens* L. (humans) and unspecified hosts (Ewing 1931, Bishopp and Trembley 1940, Fox 1940, Becklund 1964).

***Pulex simulans* Baker.**

Boone, Carter, Cole, Howard and Shelby counties, ex *C. lupus*, *U. cinereoargenteus*, *V. vulpes*, *P. lotor* and *M. monax* (Palmer and Wingo 1972).

***Xenopsylla cheopis* (Rothschild) (Oriental rat flea).**

Jackson and St. Louis counties, ex domestic rats (Pratt and Good 1954, REL).

FAMILY VERMIPSYLLIDAE

***Chaetopsylla lotoris* (Stewart).**

Boone, Jefferson, Saline and Shelby counties, ex *P. lotor* and *U. cinereoargenteus* (Palmer and Wingo 1972).

Acknowledgments

This study was funded by the Centers for Disease Control and Prevention (cooperative agreement U50/CCU410281); the Lyme Disease Institute, Cape Girardeau, MO; the Department of Biology, University of Memphis, TN; Memphis and Shelby Co. Health Dept., TN; and the Group Health Foundation, St. Louis,

- bursarius missouriensis*. Can. J. Zool. 59: 1903-1908.
- Teltow, G. J., P. V. Fournier, and J. A. Rawlings. 1991. Isolation of *Borrelia burgdorferi* from arthropods collected in Texas. Am. J. Trop. Med. Hyg. 44: 469-474.
- Timm, R. M. 1983. Fahrenheit's rule and resource tracking: a study of host-parasite coevolution, Pg. 225-265, in *Coevolution* (M. H. Nitecki, ed.). University of Chicago Press, Chicago, 392 pp.
- Timm, R. M. and R. D. Price. 1980. The taxonomy of *Geomydoecus* (Mallophaga: Trichodectidae) from the *Geomys bursarius* complex (Rodentia: Geomyidae). J. Med. Entomol. 17: 126-145.
- Trembley, H. L. and F. C. Bishopp. 1940. Distribution and hosts of some fleas of economic importance. J. Econ. Entomol. 33: 701-703.
- Wilson, D. E. and D. M. Reeder (editors). 1993. *Mammal species of the world. A taxonomic and geographic reference*. 2nd. edn. Smithsonian Institution Press and American Society of Mammalogists, Washington, DC, 1,206 pp.