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The Fleas (Arthropoda: Insecta: Siphonaptera) of Arkansas

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The Fleas (Arthropoda: Insecta: Siphonaptera) of Arkansas

Cover Page Footnote

The Arkansas Game and Fish Commission issued Scientific Collecting Permits to CTM and MBC allowing collection various flea hosts.

The Fleas (Arthropoda: Insecta: Siphonaptera) of Arkansas

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Running Title: Fleas of Arkansas

Abstract

Fleas (Insecta: Siphonaptera) are important ectoparasites of cats, dogs, other mammals (including humans), and birds, and are an important component of the biota of North America. In addition, they can be nuisance biters and serve as vectors or intermediate hosts of several flea-borne disease agents and parasites that negatively affect mammals and birds. In Arkansas, there have been no recent comprehensive summaries of fleas in the last 45+ years. Here, we provide a summary of the 29 species of fleas within 7 families that have been recorded from the state, update their taxonomy, and note their medical and veterinary importance.

Introduction

Fleas are small, wingless, hematophagous (blood-feeding) ectoparasites that mostly infest mammals (about 94% of known species), with the remainder of species parasitizing birds (Durden and Hinkle 2009). There are ca. 246 recognized genera and over 2,500 species within 16 families (Lewis 1998). Some species are notable nuisance biters of humans and domestic animals and some serve as vectors or intermediate hosts of flea-borne disease agents and parasites. Schiefer and Lancaster (1970) provided a checklist of the 21 species of fleas known at that time from Arkansas. However, their collections (made in 1968) were limited to sites in northwestern Arkansas. Since that paper, and despite the medical and veterinary importance of fleas in the state, there have been no attempts to provide a comprehensive list of Arkansas fleas.

The purpose of this report is three-fold: (1) produce an update on the fleas known to occur in Arkansas, (2) provide the most recent taxonomy on these fleas, and (3) note any known medical and veterinary importance of these fleas including species that are vectors for pathogenic microorganisms or intermediate hosts of

parasitic agents.

Methods

We conducted an exhaustive search of the scientific literature and the world-wide web for information on fleas in the state. Records of recent collections of Arkansas fleas reported by us (McAllister *et al.* 2013; Connor *et al.* 2014; Tumilson *et al.* 2015) are also included. In addition, rodent trapping was conducted in Benton, Carroll and Saline counties during 2016 using Museum Special® snap traps and/or Sherman live traps baited with rolled oats.

Flea classification follows Lewis (1998). Common names of fleas listed herein follow the Common Names of Insects Database (Entomological Society of America 2016). Voucher specimens deposited in collections are designated (with accession numbers) as follows: GSUENT: Georgia Southern University Entomology Collection, Statesboro, GA. NMNH: Smithsonian National Museum of Natural History, Washington, DC.

Results

We report a total of 29 species of fleas within 7 families from Arkansas as follows (M = Male[s], F = Female[s]); coll: B.C. Marshall (BCM). Counties with records are provided in Fig. 1; most are in the Ozark Mountains physiographic region. However, not all localities are available from previous publications, including those for 4 species of fleas, particularly from south Arkansas in Pratt and Good (1954).

FAMILY PULICIDAE

Cediopsylla simplex (Baker) – rabbit flea.

1M, 3F ex “rabbit,” Lawrence Co., Imboden, Mar. 1925, coll: BCM (Fox 1940).

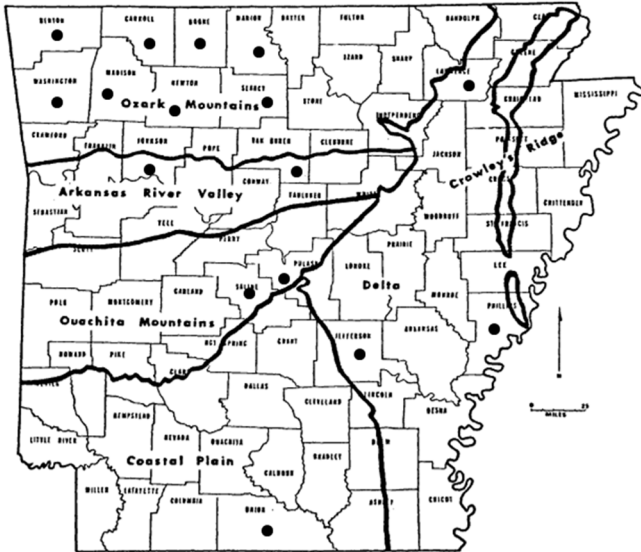


Figure 1. Arkansas counties within physiographic regions with flea records reported herein. Also see Discussion.

1F ex eastern cottontail (*Sylvilagus floridanus*, “Arkansas,” coll: J.C. Bequeart (Hopkins and Rothschild 1953).

12M, 14F ex 7 *S. floridanus*, 3M, 8F ex 4 black-tailed jack rabbits (*Lepus californicus*), 2M, 8F ex 2 gray foxes (*Urocyon cinereoargenteus*), unreported numbers ex swamp rabbit (*Sylvilagus aquaticus*), 1968, NW Arkansas (Schiefer and Lancaster 1970).

Ex *S. floridanus*, “Arkansas” (Andrews *et al.* 1980).

This is a widespread flea of lagomorphs and their predators in the eastern two-thirds of North America (Holland 1985, Durden *et al.* 2012). Lagomorphs are reservoir hosts for *Francisella tularensis*, the causative agent of tularemia, and Hopla (1980a) provides evidence for the transmission of this bacterium by fleas.

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

Madison Co., Georgetown (no other data) (Trembley and Bishopp 1940).

1F ex unknown host, Lawrence Co., Imboden, 1928, coll: BCM (Fox 1940).

“Several specimens” ex domestic dog (*Canis lupus familiaris*), NW Arkansas, 1968 (Schiefer and Lancaster 1970).

The dog flea is a nuisance biter of domestic dogs and other canids. It is almost cosmopolitan in distribution and can serve as an intermediate host of both the double-pored dog tapeworm, *Dipylidium caninum* and dwarf tapeworm *Hymenolepis* (= *Vampirolepis*) *nana*. The latter, *H. nana*, is one of the most common cestodes of humans, especially young children in the southern U.S. A filarial worm of dogs,

Dipetalonema reconditum, is also transmitted by this flea (Durden and Hinkle 2009).

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

2F ex 10 striped skunk (*Mephitis mephitis*); 15M, 68F ex 20 Virginia opossum (*Didelphis virginiana*); 1F ex 17 brown rat (*Rattus norvegicus*); 1M, 1F ex 1 eastern spotted skunk (*Spilogale putorius*); “numerous specimens” ex *C. l. familiaris*; 1M, 24F ex 15 domestic cats (*Felis catus*); unreported numbers ex gray fox (*Urocyon cinereoargenteus*) and whitetail deer (*Odocoileus virginiana*); 1968, NW Arkansas (Schiefer and Lancaster 1970).

Benton, Johnson, Newton, Phillips, Saline, and Washington Cos., no host data (McKern *et al.* 2008).

Like the previous species, this flea is almost cosmopolitan. It is a vector of *Bartonella henselae*, the causative agent of cat scratch disease and of *Rickettsia felis*, and the agent of cat flea rickettsiosis (sometimes referred to as cat flea typhus) (Durden *et al.* 2012). Like *C. canis*, it can also serve as an intermediate host of *D. caninum* and *H. nana*, and can also transmit *D. reconditum*. This flea is a nuisance biter of domestic cats and wild felids and is also common on domestic dogs (Durden and Hinkle 2009).

***Echidnophaga gallinacea* (Westwood) – stick-tight flea.**

4F ex “dogs,” Lawrence Co., Imboden, 27 Nov. 1931, coll: BCM (Fox 1940).

Lawrence Co., Imboden (no other data) (Trembley and Bishopp 1940).

Ex *R. norvegicus* and black rat (*Rattus rattus*), 5 localities across Arkansas (Pratt and Good 1954).

Ex *F. catus* and *C. l. familiaris*, “Arkansas” (Becklund 1964).

Ex *F. catus*, NW Arkansas, 1968 (Schiefer and Lancaster 1970).

This small flea is globally widespread in tropical, subtropical and warm temperate regions. It infests a wide diversity of avian and mammalian hosts (Durden *et al.* 2012). This flea has elongate, barbed mouthparts that allow it to embed in host tissue for prolonged periods, as reflected by its common name. It sometimes occurs in clusters of specimens on the host head where oral self-grooming cannot be directed against it by the host.

***Euhoplosyllus glacialis affinis* (Baker) – no common name (NCN).**

1M, 1F ex 20 *D. virginiana*; 2M, 2F ex 4 *L. californicus*; 18M, 25F ex 7 *S. floridanus*; 1M, 1F ex 2

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U. cinereoargenteus; 1M, 1F ex 15 *F. catus*), NW Arkansas, 1968 (Schiefer and Lancaster 1970).

This flea is mainly associated with lagomorphs and mostly known from some mid-western states extending south to Texas (Hopkins and Rothschild 1953; Holland 1985). It has no known medical-veterinary importance although it could be an enzootic vector of *F. tularensis* (Hopla 1980a).

***Pulex irritans* Linnaeus – human flea.**

2F ex unknown host, Lawrence Co., Imboden, 1928, coll: BCM (Fox 1940).

Boone (no other data) and Madison Cos., Georgetown (no other data) (Trembley and Bishopp 1940).

9M, 11F ex 10 *M. mephitis*; 4F ex 20 *D. virginiana*; 1M, 1E ex 1 *S. putorius*; 1M ex 7 *S. floridanus*; 14M, 21 F ex 2 *U. cinereoargenteus*; “numerous specimens” ex *C. l. familiaris*; unreported numbers ex domestic cattle (*Bos taurus*) and bobcat (*Lynx rufus*), NW Arkansas, 1968 (Schiefer and Lancaster 1970).

The human flea is globally and widely-distributed mainly as an ectoparasite of medium-sized and large mammals (Hopla 1980b). It can serve as intermediate host of *D. caninum* and *H. nana*, which can also be transmitted to humans, especially children who have close contact with flea-infested cats and dogs. The role of this flea in human-to-human transfer of the plague bacterium is uncertain, but it is thought to be significant in some outbreaks (Hopla 1980b).

***Pulex simulans* Baker – NCN.**

2M, 6F ex 3 northern raccoons (*Procyon lotor*), Van Buren Co., 1989–1990 (Richardson *et al.* 1994).

This flea is widely distributed in the Americas as an ectoparasite of carnivores and some other medium-sized and large mammals (Hopla 1980b). Morphologically, it is very similar to *P. irritans* and prior to 1958, it was not recognized as part of the North American flea fauna. Other than biting domestic dogs and cats and sometimes humans (Durden *et al.* 2012), it has no known medical-veterinary importance.

***Pulex* sp.**

Ex *S. floridanus*, “Arkansas” (Andrews *et al.* 1980).

Females of *P. irritans* and *P. simulans* cannot be separated morphologically and prior to the paper by Smit (1958), all *Pulex* spp. fleas in North America were assigned to *P. irritans*. Therefore, any records of *P. irritans* prior to 1958 could actually represent either *P. irritans* or *P. simulans* and only collections that include male specimens can be identified with certainty since

1958. Therefore, some of the specimens recorded above as *P. irritans*, could have actually been *P. simulans*.

***Xenopsylla cheopis* – Oriental rat flea.**

Ex *R. norvegicus* and *R. rattus*, 23 localities across Arkansas (Pratt and Good 1954).

1M, 3F ex 17 *R. norvegicus*, NW Arkansas, 1968 (Schiefer and Lancaster 1970).

This flea is an important vector of the bacteria *Yersinia pestis* and *Rickettsia typhi*, the causative agents of plague and murine typhus, respectively (Durden and Hinkle 2009). Plague does not occur in Arkansas but human cases of murine typhus were recorded in the state in the first half of the 20th century until intensive domestic rat and flea control operations were implemented throughout the southern United States (Pratt and Good 1954). *Rickettsia typhi* may still circulate in enzootic transmission cycles between mammals and their ectoparasites in Arkansas as it does in some other southern states (Durden *et al.* 2012).

FAMILY RHOPALOPSYLLIDAE

***Polygenis gwyni* (C. Fox) – NCN.**

2M, 2F ex *D. virginiana*, Pulaski Co., North Little Rock, Camp Robinson, 30 Sept. 1943, coll: C.A. Hubbard (Smit 1987).

The hispid cotton rat (*Sigmodon hispidus*) is the most commonly recorded host of *P. gwyni* but there are also several records from *D. virginiana* and some other mammals throughout its range in the southern U.S. (Smit 1987, Durden *et al.* 2012). This flea is an inefficient vector of *R. typhi* (Pratt and Good 1954).

FAMILY CTENOPHTHALMIDAE

***Conorhinopsylla stanfordi* Stewart – NCN.**

1M, 1F ex 24 eastern fox squirrels (*Sciurus niger*), NW Arkansas, 1968 (Schiefer and Lancaster 1970).

This is a nidicolous flea of tree squirrels in eastern North America especially in northern U.S. states (and in Ontario, Canada) (Benton and Day 1980; Holland 1985; Eckerlin and Painter 1986). It has no known medical-veterinary importance.

***Conorhinopsylla nidicola* Jellison – NCN.**

1M ex 3 eastern woodrat (*Neotoma floridana*) nests, NW Arkansas, 1968 (Schiefer and Lancaster 1970).

This rarely encountered flea occurs in nests of *N. floridana* and was described from specimens collected in Kansas (Hopkins and Rothschild 1962). It has no known disease relationships.

***Corrodopsylla hamiltoni* (Traub) – NCN.**

1F ex 3 least shrews (*Cryptotis parva*), NW Arkansas, 1968 (Schiefer and Lancaster 1970).

1M ex *C. parva*, Benton Co., Bella Vista, W. Tanyard Hollow Rd., 9 Jun. 2016, coll.: K.G. Roberts (GSUENT L3807).

Cryptotis parva is the principal host of this flea which has been recorded mainly in the mid-western U.S. as far south as northcentral Texas (McAllister 1989). It has no known medical-veterinary importance.

***Ctenophthalmus pseudagyrtis* Baker – NCN.**

1M, 1F ex 20 *D. virginiana*; 4M, 7F ex 11 woodland voles (*Microtus pinetorum*); 2M, 2F ex 3 eastern moles (*Scalopus aquaticus*); 1M, 1F ex 3 *C. parva*; 1M, 1F ex 15 *S. hispidus*, NW Arkansas, 1968 (Schiefer and Lancaster 1970).

1F ex golden mouse (*Ochrotomys nuttalli*), Union Co., El Dorado, 10 Feb. 2013, coll: M.B. Connior (Tumlison *et al.* 2015) (GSUENT L3568).

1F ex *S. hispidus*, Marion Co., Mull, 9 Feb. 2015, coll: M.B. Connior (Tumlison *et al.* 2015) (GSUENT L3716).

1M ex southern short-tailed shrew (*Blarina carolinensis*), Union Co., El Dorado, 11 Feb. 2013 (Connior *et al.* 2014) (GSUENT L3569).

1M, 1F ex 2 *S. aquaticus*, Union Co., El Dorado, 7 & 8 May 2013, coll: M.B. Connior (Connior *et al.* 2014) (GSUENT L3588-L3589).

2F ex *S. aquaticus*, Union Co., El Dorado, 5 Sept. 2014, coll: M.B. Connior (GSUENT L3700).

1F ex *S. aquaticus*, Benton Co., Bentonville, 15 Feb. 2016, coll: M.B. Connior (GSUENT L3737).

Ctenophthalmus pseudagyrtis is mainly an ectoparasite of small mammals, especially Soricomorpha, in eastern North America as far west as Texas (Holland 1985; Durden *et al.* 2012; McAllister and Wilson 2012). It has no known medical-veterinary importance.

***Doratopsylla blarinae* Fox – NCN.**

1M, 1F ex *B. carolinensis*, Union Co., El Dorado, 28 Apr. 2013, coll: M.B. Connior (Connior *et al.* 2014) (GSUENT L3587).

1F ex northern short-tailed shrew (*Blarina brevicauda*), Searcy Co., 3 km S of Mull, 30 Aug. 2014 (Tumlison *et al.* 2015) (GSUENT L3701).

As reflected in the collection data reported here for Arkansas, this flea is associated with *Blarina* shrews and is widely distributed in eastern North America (Durden *et al.* 2012). It has no known medical-veterinary importance.

***Epitedia neotomae* Jameson – NCN.**

296M, 235F ex 3 *N. floridana* nests; 1F ex 3 *C. parva*; 2M ex 20 *D. virginiana*; NW Arkansas, 1968 (Schiefer and Lancaster 1970).

This flea mainly occurs in nests of *N. floridana* in the eastern and central U.S. (Hopkins and Rothschild 1962). It has no known disease relationships.

***Epitedia wenmanni* (Rothschild) – NCN.**

1M, 1F ex 2 *P. leucopus*, Marion Co., Mull, 18 Feb. 2013, coll: M.B. Connior (Tumlison *et al.* 2015) (GSUENT L3573 & L3578).

This is a flea associated with *Peromyscus* spp., and sometimes other rodents and their predators, across North America (Holland 1985; Durden *et al.* 2012). It has no known medical-veterinary importance.

***Rhadinopsylla fraterna* (Baker) – NCN.**

5M, 8F ex 3 *N. floridana* nests, NW Arkansas, 1968 (Schiefer and Lancaster 1970).

Rhadinopsylla fraterna mainly occurs in the Great Plains where it parasitizes ground squirrels, other rodents and, sometimes, their predators (Hopkins and Rothschild 1962; Holland 1985). It has no known medical-veterinary importance.

***Stenoponia americana* Baker – NCN.**

Ex: *P. leucopus* NW Arkansas, 1968 (Schiefer and Lancaster 1970).

1F ex *P. maniculatus*, 16 Mar. 1954, coll: J.P. Redman; 1M, 5F ex 5 *P. leucopus*, Jefferson Co., Jan.-Feb. 1955, coll: C.E. Hoffman (Hastriter *et al.* 2006) (NMNH, BZ-95, BZ-626, BZ-679, BZ-686).

This is the largest flea species in Arkansas and it mainly parasitizes *Peromyscus* spp. mice, some of the smallest mammals in the state. *Stenoponia americana* is widely distributed in eastern North America and Hastriter *et al.* (2006) also document a few records from the southwestern U.S. It is not known to transmit any pathogens or parasites.

FAMILY CERATOPHYLLIDAE***Ceratophyllus celsus* Jordan – NCN.**

Ex northern cliff swallow (*Petrochelidon pyrrhonota*), Washington Co. (Baerg 1944).

5M, 5F ex *P. pyrrhonota* nests, NW Arkansas, 1968 (Schiefer and Lancaster 1970).

“Arkansas” (no other data) (Traub *et al.* 1983; Lewis and Galloway 2001).

This flea is a host-specific parasite of *P. pyrrhonota* and is mainly known from certain midwestern U.S. states (Traub *et al.* 1983). Hopla and Loye (1983)

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suggested that *C. celsus* is a vector of an avian-associated trypanosome.

***Nosopsyllus fasciatus* (Bosc) – northern rat flea.**

Ex *R. norvegicus* and *R. rattus*, 21 localities across Arkansas (Pratt and Good 1954).

2F ex 17 *R. norvegicus*, NW Arkansas, 1968 (Schiefer and Lancaster 1970).

The northern rat flea can serve as an intermediate host for the rat tapeworm, *Hymenolepis diminuta*, a cosmopolitan worm that infects *Rattus* spp., but human infections are not uncommon. It can also transmit *R. typhi*, the causative agent of murine (flea-borne or endemic) typhus and the non-pathogenic kinetoplastid protist *Trypanosoma lewisi* from rat to rat (Durden and Hinkle 2009).

***Opisodasys pseudarctomys* (Baker) – NCN.**

1F ex southern flying squirrel (*Glaucomys volans*), NW Arkansas, 1968 (Schiefer and Lancaster 1970).

This flea is a host-specific ectoparasite of flying squirrels in eastern North America and is typically more common in the host nest (Benton and Day 1980, Eckerlin and Painter 1986). It has no known medical-veterinary importance but it could be an enzootic vector of North American strains of *Rickettsia prowazekii* (see comments below for *O. howardi*).

***Orchopeas howardi* (Baker) – NCN.**

3M, 11F ex 24 *S. niger*; 13M, 17F ex 26 eastern gray squirrels (*Sciurus carolinensis*); 1M, 2F ex 20 *D. virginiana*; 1F ex 3 *N. floridana* nests; ex *G. volans*, NW Arkansas, 1968 (Schiefer and Lancaster 1970).

6M, 19F ex 10 *P. lotor*, Van Buren Co., 1989–1990 (Richardson *et al.* 1994).

1M, 3F ex *G. volans*, Union Co., 11 km W of El Dorado, 5 Feb. 2013, coll: M.B. Connior (McAllister *et al.* 2013) (GSUENT L3549).

2M, 3F ex *G. volans*, Union Co., El Dorado, 5 Feb. 2013, coll: M.B. Connior (McAllister *et al.* 2013) (GSUENT L3560).

1M, 1F ex *S. niger*, Marion Co., Mull, 23 Dec. 2012, coll: M.B. Connior (McAllister *et al.* 2013) (GSUENT L3550).

1M, 2F ex 2 *S. carolinensis*, Marion Co., Mull, 23 Dec. 2012, coll: M.B. Connior (McAllister *et al.* 2013) (GSUENT L3551-L3552).

2F ex 2 *S. carolinensis* nests, Union Co., El Dorado, 7 & 9 Feb. 2013 (McAllister *et al.* 2013) (GSUENT 3570-3571).

Lewis (2000) designated a female *O. howardi* (host not reported) from Little Rock, Pulaski County, as the

source of the female diagnostic characters for this species. Lewis (2000) also noted that *O. howardi* had been found on humans, though usually singly, but he did not know of published records of its feeding. This flea can transmit North American strains of *R. prowazekii*, the causative agent of sporadic epidemic typhus which is maintained enzootically in flying squirrel populations (McDade 1987). Serologically confirmed human cases of this disease have been recorded in Arkansas (McDade 1987).

***Orchopeas leucopus* (Baker) – NCN.**

1F ex *P. leucopus*, Marion Co., Mull, 18 Feb. 2013, coll: M.B. Connior (Tumilson *et al.* 2015) (GSUENT 3577).

4M, 4F ex 3 Texas mice (*Peromyscus attwateri*), Searcy Co., 3 km S of Mull, 19 Jan. 2015, coll: M.B. Connior (Tumilson *et al.* 2015) (GSUENT L3717–L3719).

1M ex *P. attwateri*, Carroll Co., NE of Berryville, 14 May 2016, coll: M.B. Connior (GSUENT L3799).

1M, 1F ex *P. maniculatus*, Benton Co., NE of Maysville, 21 May 2016, coll: M.B. Connior (GSUENT L3800).

Orchopeas leucopus occurs across North America mainly as an ectoparasite of *Peromyscus* spp. mice, although there are records from other mammals (Durden *et al.* 2012). It has no known medical-veterinary importance.

***Orchopeas pennsylvanicus* (Jordan) – NCN.**

141M, 190F ex 3 *N. floridana* nests; 1F ex *P. leucopus*, NW Arkansas, 1968 (Schiefer and Lancaster 1970).

Schiefer and Lancaster (1970) reported this flea as “*Orchopeas sexdentatus* subsp.” implying *O. sexdentatus pennsylvanicus* which was the name for the previously recognized subspecies that parasitizes *N. floridana*. Lewis (2000) elevated this subspecies to full species status. It occurs in eastern North America as an ectoparasite of woodrats (Lewis 2000) and has no known medical-veterinary importance.

FAMILY LEPTOPSYLLIDAE

***Odontopsyllus multispinosus* Baker – NCN.**

1F ex 2 *D. virginiana*; 1F ex 7 *S. floridanus*; 1F ex 2 *U. cinereoargenteus*; NW Arkansas, 1968 (Schiefer and Lancaster 1970).

This is a large flea associated with leporids and their predators in eastern North America (Holland 1985, Durden *et al.* 2012). It has no known medical-veterinary

importance but, based on data presented by Hopla (1980a), it could be an enzootic vector of *F. tularensis*.

***Leptopsylla segnis* (Schönherr) – European mouse flea.**

Ex *R. norvegicus* and *R. rattus*, 10 localities across the southern two-thirds of Arkansas (Pratt and Good 1954).

The European mouse flea is distributed across North America as an ectoparasite of the house mouse (*Mus musculus*) and of peridomestic *Rattus* spp. (Durden *et al.* 2012). However, it appears to be less common in the U.S. than it was during the first half of the 20th century when intensive rat and rat-flea elimination programs were widely implemented, especially in the southern U.S. (Pratt and Good 1954). This flea is an inefficient vector of the causative agents of murine typhus and plague (Durden and Hinkle 2009).

***Peromyscosylla scotti* I. Fox – NCN.**

Ex *P. leucopus*, NW Arkansas, 1968 (Schiefer and Lancaster 1970).

Peromyscosylla scotti mainly parasitizes *Peromyscus* spp. in the eastern U.S. and there are previous records from Kansas and Oklahoma (Holland 1985; Durden *et al.* 2012). It has no known medical-veterinary importance.

FAMILY ISCHNOPSYLLIDAE

***Nycteridopsylla chapini* (Jordan) – NCN.**

1M ex big brown bat (*Eptesicus fuscus*), Benton Co., Indian Cave, 19 Jan. 1941, coll: E. Crawley (Sanderson 1941; Lewis 1957; Lewis and Wilson 1982).

1F ex *E. fuscus*, Madison Co., Mitchell Cave, 26 Feb. 1955, coll: J.A. Sealander (Lewis and Wilson 1982).

Nycteridopsylla chapini is an ectoparasite of bats, especially *E. fuscus*, in the eastern and midwestern United States (Lewis 1957; Lewis and Wilson 1982). Examination of numerous *E. fuscus* by CTM in July 2002 from Cushman (Blowing) Cave, Independence County, Arkansas, did not find this flea. It has no known medical-veterinary importance.

FAMILY VERMIPSYLLIDAE

***Chaetopsylla lotoris* (Stewart) – NCN.**

15M, 24F ex 9 *P. lotor*, Van Buren Co., 1989–1990 (Richardson *et al.* 1994).

This flea is a specific parasite of *P. lotor* in eastern North America from Maine to North Carolina westward to Ontario and Arkansas (Holland 1985, Richardson *et al.* 1994). It has no known medical-veterinary

importance.

UNIDENTIFIED ARKANSAS FLEAS

Caster *et al.* (1994) reported that 80% of nest boxes used by *G. volans* in Garland County of the Ouachita Mountains harbored fleas. To our knowledge, unfortunately, these fleas were not identified; therefore, records are not placed in that county on Fig. 1. Benton and Day (1980) and Eckerlin and Painter (1986) reported 4 common species of fleas infesting *G. volans* and their nests in New York, Vermont and Virginia, namely *O. howardi*, *C. stanfordi*, *Epitedia faceta*, and *O. pseudarctomys*. All of these species except *E. faceta* are also reported in this paper from Arkansas and 2 of these (*O. howardii* and *O. pseudarctomys*) were collected from *G. volans*.

Discussion

We have provided a synopsis of the 29 species of fleas recorded from Arkansas, an increase of 8 species over the work of Schiefer and Lancaster (1970). We suggest that, in addition to examination of animals for fleas, examination of their nests is also warranted, for the possibility of recording additional fleas of the state. The majority of flea records have been reported for counties in the Ozark Mountains physiographic region (Fig. 1). However, not all records reported herein could be placed on Fig. 1 because those for 4 species of fleas (*X. cheopis*, *N. fasciatus*, *E. gallinacea*, *L. segnis*) were not specified in a previous report (Pratt and Good 1954). Therefore, additional surveys are warranted for counties in other physiographic regions in eastern, western, and southern Arkansas.

Several of the flea species recorded here in the state have medical-veterinary importance. In addition to the flea-borne pathogens and parasites mentioned in the species accounts, some fleas such as *C. felis*, are nuisance biters. Some pets and humans are hypersensitive to flea bites and develop flea bite allergies that lead to intense pruritus (itching), scratching, dermatitis, and the possibility of secondary bacterial infections (Durden and Hinkle 2009). There is circumstantial evidence that rodent associated fleas transmit *Bartonella* spp. and other bacteria to their hosts (Abbott *et al.* 2007). Fleas in Arkansas may also transmit *F. tularensis*, *Coxiella burnetii* (the causative agent of Q fever) and other microorganisms such as certain rickettsial bacteria, especially in enzootic transmission cycles involving wild mammals (Durden and Hinkle 2009).

Fleas of Arkansas

Acknowledgments

The Arkansas Game and Fish Commission issued Scientific Collecting Permits to CTM and MBC allowing collection various flea hosts.

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