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## Ectoparasites of Sciurid Rodents in Arkansas, Including New State Records for *Neohaematopinus* spp. (Phthiraptera: Anoplura: Polyplacidae)

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Running Title: Ectoparasites of Sciurid Rodents in Arkansas

Compared to its surrounding states, little is known about the ectoparasites (bugs, fleas, flies, lice, mites, ticks) infesting the wild mammals of Arkansas (AR) (Bequaert 1946, Sealander and Young 1954, Tugwell and Lancaster 1962, Schiefer and Lancaster 1970, Lancaster 1973, Whitaker and Wilson 1974, Ellis 1975, Price et al. 1982, Steward et al. 1986, Durden and Musser 1994). However, some studies specifically on ectoparasites of mammals have been published. For example, Richardson et al. (1994) reported records of various ectoparasites from raccoons (*Procyon lotor*) in the state, and Elrod et al. (1996) reported ectoparasites from the endemic Ozark pocket gopher (*Geomys bursarius ozarkensis*). Here, we report information on a flea, 3 ticks, a chigger, and 3 sucking lice species from sciurid rodents, including the first report of the sucking lice, *Neohaematopinus sciurinus* (Mjöberg) and *Neohaematopinus sciuropteri* (Osborn) from the state.

Various sciurid rodents, including 2 eastern gray squirrels (*Sciurus carolinensis*) and their nests, 2 fox squirrels (*Sciurus niger*), and a single eastern chipmunk, (*Tamias striatus*) from Marion Co., and 10 southern flying squirrels (*Glaucomys volans*) from Union Co. were collected using live box traps from Dec. 2012 to Feb. 2013. After being euthanized, according to accepted guidelines (Sikes et al. 2011), specimens were processed following standard methods (Gardner 1996) and their ectoparasites identified using appropriate guides (Wharton and Fuller 1952, Keirans and Clifford 1978, Benton 1983, Kim et al. 1986, Keirans and Durden 1998). Voucher specimens of hosts were deposited in the mammal collection at Henderson State University (HSU). Ectoparasites were deposited in the General Ectoparasite Collection in the Department of Biology at Georgia Southern University (accession nos. L3549–3553, L3559–3560, L3570–3571, L3593–3594

Both *S. carolinensis* and *S. niger* were infested with sucking lice, including 1 *S. carolinensis* with 2

female *Neohaematopinus sciuri* Jancke, 2 *S. niger* with *N. sciurinus* (1 squirrel with 1 male louse, the other with 2 female lice), and 1 *G. volans* with a female *N. sciuropteri*. In addition, a single *S. niger* was infested with a female squirrel tick, *Ixodes marxi* Banks and 1 larval American dog tick, *Dermacentor variabilis* (Say). Two *S. niger* were infested with lone star ticks, *Amblyomma americanum* (Linnaeus); 1 squirrel had 5 nymphs and the other, 26 nymphs; the former host was multiply parasitized by 2 male *D. variabilis* and 2 larval chiggers, *Eutrombicula alfreddugesi* (Oudemans). A single *G. volans* was infested with a larval *D. variabilis*. Two *S. carolinensis*, 1 *S. niger* and 2 of 10 (20%) *G. volans* harbored fleas, *Orchopeas howardi* (Baker); the single *T. striatus* was negative.

### Siphonaptera: Ceratophyllidae

*Orchopeas howardi* was previously reported in AR from *S. carolinensis*, *S. niger*, and *G. volans* (Schiefer and Lancaster 1970), and commonly infests tree squirrels and some other rodents in many other states (Lewis 2000). It was therefore not surprising to find this flea on these hosts and associated nests.

### Acari: Ixodidae

*Ixodes marxi* is not commonly reported and there are few records of this hard tick in AR (Lancaster 1973). This tick is a parasite of squirrels and is known to occur both east and west of the Mississippi River from at least 18 states (plus the District of Columbia) and Canada (Cooney and Hays 1972, Lancaster 1973, Keirans and Clifford 1978, Durden and Keirans 1996). It has been previously reported from the state on *S. carolinensis* (Tugwell and Lancaster 1962).

Immature stages (both larvae and nymphs) of *D. variabilis*, parasitize a wide range of small mammals and a few medium-sized mammals mainly in the eastern USA (Bequaert 1946, Tugwell and Lancaster 1972, Cooney and Hays 1972, Nicholson et al. 2009)

(there is also an isolated population of *D. variabilis* along the west coast of North America). However, Pung et al. (2000) recorded only 2 tick specimens (one *Amblyomma maculatum* and 1 *Ixodes scapularis*) from 70 *G. volans* in Georgia which suggests that ticks are not common on flying squirrels. They speculated that this is because *Glaucomys* spp. spend more time in arboreal habitats than on the ground where most ticks quest for hosts. *Dermacentor variabilis* is the principal vector of *Rickettsia rickettsii*, the causative agent of Rocky Mountain spotted fever, in the eastern USA (Chapman et al. 2006).

*Amblyomma americanum* is a widespread tick in AR (Lancaster 1973) and the southeastern USA where all active stages parasitize a variety of mammalian hosts including humans and immature stages also parasitize birds (Keirans and Durden 1998, Kinsey et al. 2000). This tick has become more abundant in some regions in recent years, and a number of zoonotic pathogens are known to be transmitted by it including *Ehrlichia chaffeensis* and *Ehrlichia ewingii*, causative agents of human ehrlichiosis, and *Borrelia lonestari* and *Rickettsia amblyommii*, putative agents of Southern Tick Associated Rash Illness (Childs and Paddock 2003, Billeter et al. 2007).

#### Acari: Trombiculidae

Only the larval stages of chiggers are ectoparasitic; nymphs and adults are predators of small arthropods or their eggs (Wharton and Fuller 1952). *Eutrombicula alfreddugesi* is a widespread pest chigger species in North America that parasitizes a wide variety of reptiles, birds and mammals, including humans (Wrenn and Loomis 1984). This species has previously been recorded from AR (Wicht and Rowland 1987).

#### Phthiraptera: Polyplacidae

*Neohaematopinus sciuri* is a Holarctic species that parasitizes *S. carolinensis* in North America (and introduced populations of this mammal in some other parts of the world) and the Eurasian red squirrel (*Sciurus vulgaris*) in Europe (Kim et al. 1986, Durden and Musser 1994). It has previously been reported from *S. carolinensis* in St. Francis Co., AR (Kim et al. 1986). However, *N. sciurinus*, to our knowledge, has not been previously reported from AR mammals and we document herein a new state record for this sucking louse. This louse parasitizes *S. niger* in North America and at least 6 other species of *Sciurus* in Central America (Durden and Musser 1994). *Neohaematopinus sciuropteri* is widespread across North America on both *G. volans* and the northern flying squirrel,

*Glaucomys sabrinus* (Durden and Musser 1994). However, there do not appear to be any previous records of this louse from Arkansas (Kim et al. 1986). *Neohaematopinus sciuropteri* is a vector of the zoonotic agent of sporadic epidemic typhus (caused by certain strains of *Rickettsia prowazekii*) to flying squirrels which act as reservoir hosts for this agent (Bozeman et al. 1981).

In conclusion, some sciurid ectoparasites that had not previously been reported from AR are probably widespread in the state. We suggest additional ectoparasite surveys on AR mammals, which appear to be uncommonly reported from hosts in the state. For example, prior to our study, only 1 species of parasitic mite has been reported from native mammals in AR (Richardson et al. 1994).

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